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BODY CODE PLATE

DESCRIPTION

A metal Body Code plate is located in the engine compartment and attached to the top of the right frame rail. The information listed on the plate (Fig. 1) is used for manufacturing and service purposes.

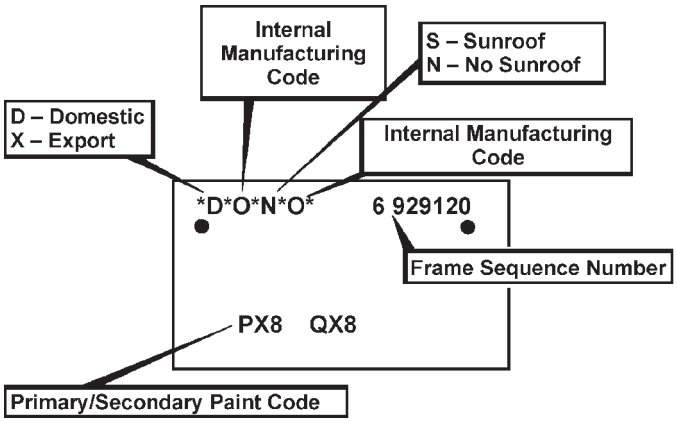


Fig. 1 Body Code Plate

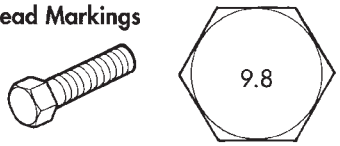
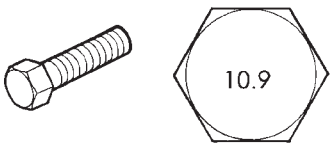
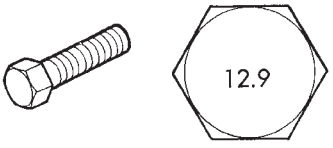
FASTENER IDENTIFICATION

DESCRIPTION

The SAE bolt strength grades range from grade 2 to grade 8. The higher the grade number, the greater the bolt strength. Identification is determined by the line marks on the top of each bolt head. The actual bolt strength grade corresponds to the number of line marks plus 2. The most commonly used metric bolt strength classes are 9.8 and 10.9. The metric strength class identification number is imprinted on the head of the bolt. The higher the class number, the greater the bolt strength. Some metric nuts are imprinted with a single-digit strength class on the nut face. Refer to the Fastener Identification and Fastener Strength Charts (Fig. 2) and (Fig. 3).

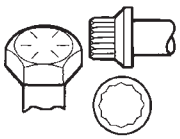
FASTENER IDENTIFICATION (Continued)

Bolt Markings and Torque - Metric

Commercial Steel Class	9.8	10.9	12.9
Bolt Head Markings			

Body Size	Torque				Torque				Torque			
Diam.	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
mm	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
6	9	5	7	4	14	9	11	7	14	9	11	7
7	14	9	11	7	18	14	14	11	23	18	18	14
8	25	18	18	14	32	23	25	18	36	27	28	21
10	40	30	30	25	60	45	45	35	70	50	55	40
12	70	55	55	40	105	75	80	60	125	95	100	75
14	115	85	90	65	160	120	125	95	195	145	150	110
16	180	130	140	100	240	175	190	135	290	210	220	165
18	230	170	180	135	320	240	250	185	400	290	310	230

Bolt Markings and Torque Values - U.S. Customary

SAE Grade Number	5	8
Bolt Head Markings These are all SAE Grade 5 (3) line			

Body Size	Bolt Torque - Grade 5 Bolt				Bolt Torque - Grade 8 Bolt			
	Cast Iron		Aluminum		Cast Iron		Aluminum	
	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1/4 - 20	9	7	8	6	15	11	12	9
- 28	12	9	9	7	18	13	14	10
5/16 - 18	20	15	16	12	30	22	24	18
- 24	23	17	19	14	33	24	25	19
3/8 - 16	40	30	25	20	55	40	40	30
- 24	40	30	35	25	60	45	45	35
7/16 - 14	60	45	45	35	90	65	65	50
- 20	65	50	55	40	95	70	75	55
1/2 - 13	95	70	75	55	130	95	100	75
- 20	100	75	80	60	150	110	120	90
9/16 - 12	135	100	110	80	190	140	150	110
- 18	150	110	115	85	210	155	170	125
5/8 - 11	180	135	150	110	255	190	205	150
- 18	210	155	160	120	290	215	230	170
3/4 - 10	325	240	255	190	460	340	365	270
- 16	365	270	285	210	515	380	410	300
7/8 - 9	490	360	380	280	745	550	600	440
- 14	530	390	420	310	825	610	660	490
1 - 8	720	530	570	420	1100	820	890	660
- 14	800	590	650	480	1200	890	960	710

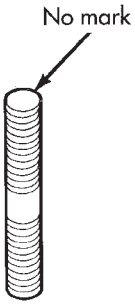
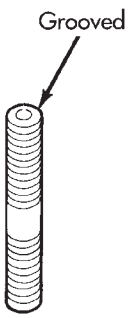
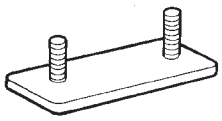
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Fig. 2 FASTENER IDENTIFICATION

FASTENER IDENTIFICATION (Continued)

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class
Hexagon head bolt	 Bolt head No. 4 — 4T; 5 — 5T; 6 — 6T; 7 — 7T; 8 — 8T; 9 — 9T; 10 — 10T; 11 — 11T	
	 No mark	4T
Hexagon flange bolt w/washer hexagon bolt	 No mark	4T
Hexagon head bolt	 Two protruding lines	5T
Hexagon flange bolt w/washer hexagon bolt	 Two protruding lines	6T
Hexagon head bolt	 Three protruding lines	7T
Hexagon head bolt	 Four protruding lines	8T

	Mark	Class
Stud bolt	 No mark	4T
	 Grooved	6T
Welded bolt		4T

95IN-4

Fig. 3 FASTENER STRENGTH

FASTENER USAGE

DESCRIPTION - FASTENER USAGE

WARNING: USE OF AN INCORRECT FASTENER MAY RESULT IN COMPONENT DAMAGE OR PERSONAL INJURY.

Fasteners and torque specifications references in this Service Manual are identified in metric and SAE format.

During any maintenance or repair procedures, it is important to salvage all fasteners (nuts, bolts, etc.) for reassembly. If the fastener is not salvageable, a fastener of equivalent specification must be used.

THREADED HOLE REPAIR

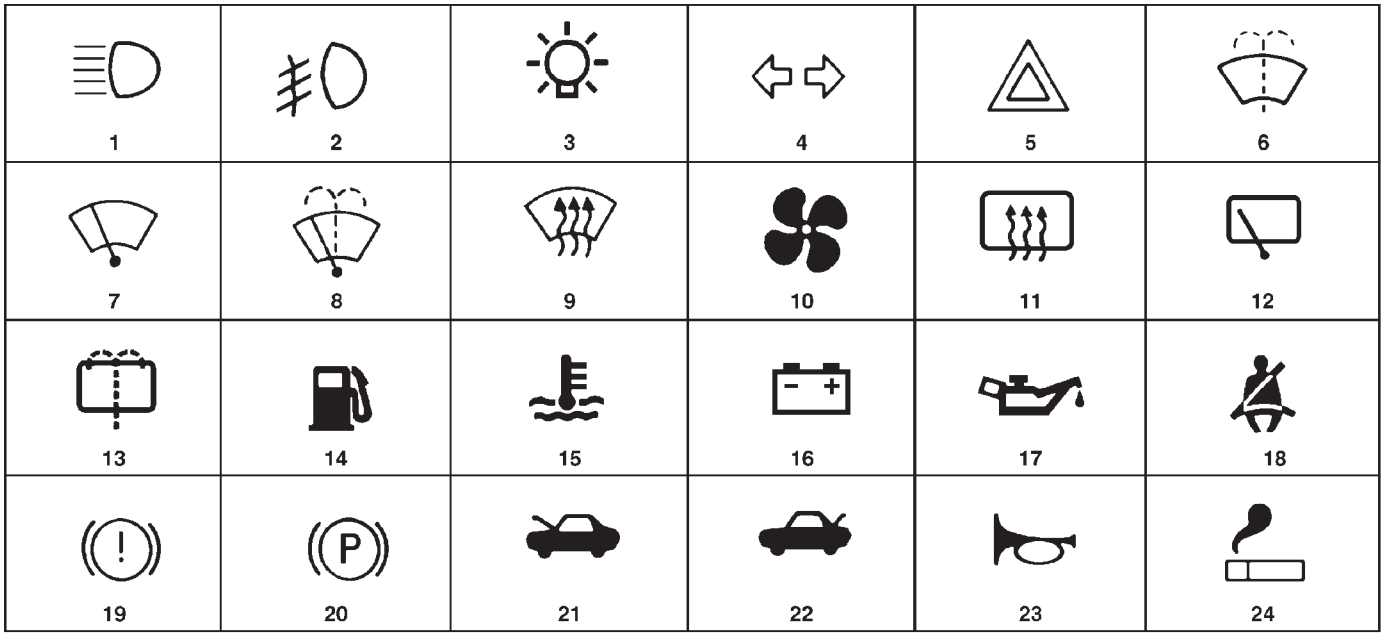
DESCRIPTION - THREADED HOLE REPAIR

Most stripped threaded holes can be repaired using a Helicoil®. Follow the vehicle or Helicoil® recommendations for application and repair procedures.

INTERNATIONAL SYMBOLS

DESCRIPTION - INTERNATIONAL SYMBOLS

The graphic symbols illustrated in the following International Control and Display Symbols Chart are used to identify various instrument controls. The symbols correspond to the controls and displays that are located on the instrument panel.



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INTERNATIONAL SYMBOLS

1	High Beam	13	Rear Window Washer
2	Fog Lamps	14	Fuel
3	Headlamp, Parking Lamps, Panel Lamps	15	Engine Coolant Temperature
4	Turn Warning	16	Battery Charging Condition
5	Hazard Warning	17	Engine Oil
6	Windshield Washer	18	Seat Belt
7	Windshield Wiper	19	Brake Failure
8	Windshield Wiper and Washer	20	Parking Brake
9	Windscreen Demisting and Defrosting	21	Front Hood
10	Ventilating Fan	22	Rear hood (Decklid)
11	Rear Window Defogger	23	Horn
12	Rear Window Wiper	24	Lighter

METRIC SYSTEM

DESCRIPTION

The metric system is based on quantities of one, ten, one hundred, one thousand and one million.

The following chart will assist in converting metric units to equivalent English and SAE units, or vise versa.

CONVERSION FORMULAS AND EQUIVALENT VALUES

MULTIPLY	BY	TO GET	MULTIPLY	BY	TO GET
in-lbs	x 0.11298	= Newton Meters (N·m)	N·m	x 8.851	= in-lbs
ft-lbs	x 1.3558	= Newton Meters (N·m)	N·m	x 0.7376	= ft-lbs
Inches Hg (60° F)	x 3.377	= Kilopascals (kPa)	kPa	x 0.2961	= Inches Hg
psi	x 6.895	= Kilopascals (kPa)	kPa	x 0.145	= psi
Inches	x 25.4	= Millimeters (mm)	mm	x 0.03937	= Inches
Feet	x 0.3048	= Meters (M)	M	x 3.281	= Feet
Yards	x 0.9144	= Meters	M	x 1.0936	= Yards
mph	x 1.6093	= Kilometers/Hr. (Km/h)	Km/h	x 0.6214	= mph
Feet/Sec	x 0.3048	= Meters/Sec (M/S)	M/S	x 3.281	= Feet/Sec
mph	x 0.4470	= Meters/Sec (M/S)	M/S	x 2.237	= mph
Kilometers/Hr. (Km/h)	x 0.27778	= Meters/Sec (M/S)	M/S	x 3.600	Kilometers/Hr. (Km/h)

COMMON METRIC EQUIVALENTS

1 inch = 25 Millimeters	1 Cubic Inch = 16 Cubic Centimeters
1 Foot = 0.3 Meter	1 Cubic Foot = 0.03 Cubic Meter
1 Yard = 0.9 Meter	1 Cubic Yard = 0.8 Cubic Meter
1 Mile = 1.6 Kilometers	

Refer to the Metric Conversion Chart to convert torque values listed in metric Newton- meters (N·m). Also, use the chart to convert between millimeters (mm) and inches (in.) (Fig. 4).

METRIC SYSTEM (Continued)

in-lbs to N•m

in- lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m
2	.2260	42	4.7453	82	9.2646	122	13.7839	162	18.3032
4	.4519	44	4.9713	84	9.4906	124	14.0099	164	18.5292
6	.6779	46	5.1972	86	9.7165	126	14.2359	166	18.7552
8	.9039	48	5.4232	88	9.9425	128	14.4618	168	18.9811
10	1.1298	50	5.6492	90	10.1685	130	14.6878	170	19.2071
12	1.3558	52	5.8751	92	10.3944	132	14.9138	172	19.4331
14	1.5818	54	6.1011	94	10.6204	134	15.1397	174	19.6590
16	1.8077	56	6.3270	96	10.8464	136	15.3657	176	19.8850
18	2.0337	58	6.5530	98	11.0723	138	15.5917	178	20.1110
20	2.2597	60	6.7790	100	11.2983	140	15.8176	180	20.3369
22	2.4856	62	7.0049	102	11.5243	142	16.0436	182	20.5629
24	2.7116	64	7.2309	104	11.7502	144	16.2696	184	20.7889
26	2.9376	66	7.4569	106	11.9762	146	16.4955	186	21.0148
28	3.1635	68	7.6828	108	12.2022	148	16.7215	188	21.2408
30	3.3895	70	7.9088	110	12.4281	150	16.9475	190	21.4668
32	3.6155	72	8.1348	112	12.6541	152	17.1734	192	21.6927
34	3.8414	74	8.3607	114	12.8801	154	17.3994	194	21.9187
36	4.0674	76	8.5867	116	13.1060	156	17.6253	196	22.1447
38	4.2934	78	8.8127	118	13.3320	158	17.8513	198	22.3706
40	4.5193	80	9.0386	120	13.5580	160	18.0773	200	22.5966

N•m to in-lbs

N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb	N•m	in-lb
.2	1.7702	4.2	37.1747	8.2	72.5792	12.2	107.9837	16.2	143.3882
.4	3.5404	4.4	38.9449	8.4	74.3494	12.4	109.7539	16.4	145.1584
.6	5.3107	4.6	40.7152	8.6	76.1197	12.6	111.5242	16.6	146.9287
.8	7.0809	4.8	42.4854	8.8	77.8899	12.8	113.2944	16.8	148.6989
1	8.8511	5	44.2556	9	79.6601	13	115.0646	17	150.4691
1.2	10.6213	5.2	46.0258	9.2	81.4303	13.2	116.8348	17.2	152.2393
1.4	12.3916	5.4	47.7961	9.4	83.2006	13.4	118.6051	17.4	154.0096
1.6	14.1618	5.6	49.5663	9.6	84.9708	13.6	120.3753	17.6	155.7798
1.8	15.9320	5.8	51.3365	9.8	86.7410	13.8	122.1455	17.8	157.5500
2	17.7022	6	53.1067	10	88.5112	14	123.9157	18	159.3202
2.2	19.4725	6.2	54.8770	10.2	90.2815	14.2	125.6860	18.5	163.7458
2.4	21.2427	6.4	56.6472	10.4	92.0517	14.4	127.4562	19	168.1714
2.6	23.0129	6.6	58.4174	10.6	93.8219	14.6	129.2264	19.5	172.5970
2.8	24.7831	6.8	60.1876	10.8	95.5921	14.8	130.9966	20	177.0225
3	26.5534	7	61.9579	11	97.3624	15	132.7669	20.5	181.4480
3.2	28.3236	7.2	63.7281	11.2	99.1326	15.2	134.5371	21	185.8736
3.4	30.0938	7.4	65.4983	11.4	100.9028	15.4	136.3073	22	194.7247
3.6	31.8640	7.6	67.2685	11.6	102.6730	15.6	138.0775	23	203.5759
3.8	33.6342	7.8	69.0388	11.8	104.4433	15.8	139.8478	24	212.4270
4	35.4045	8	70.8090	12	106.2135	16	141.6180	25	221.2781

ft-lbs to N•m

ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m
1	1.3558	21	28.4722	41	55.5885	61	82.7049	81	109.8212
2	2.7116	22	29.8280	42	56.9444	62	84.0607	82	111.1770
3	4.0675	23	31.1838	43	58.3002	63	85.4165	83	112.5328
4	5.4233	24	32.5396	44	59.6560	64	86.7723	84	113.8888
5	6.7791	25	33.8954	45	61.0118	65	88.1281	85	115.2446
6	8.1349	26	35.2513	46	62.3676	66	89.4840	86	116.6004
7	9.4907	27	36.6071	47	63.7234	67	90.8398	87	117.9562
8	10.8465	28	37.9629	48	65.0793	68	92.1956	88	119.3120
9	12.2024	29	39.3187	49	66.4351	69	93.5514	89	120.6678
10	13.5582	30	40.6745	50	67.7909	70	94.9073	90	122.0236
11	14.9140	31	42.0304	51	69.1467	71	96.2631	91	123.3794
12	16.2698	32	43.3862	52	70.5025	72	97.6189	92	124.7352
13	17.6256	33	44.7420	53	71.8583	73	98.9747	93	126.0910
14	18.9815	34	46.0978	54	73.2142	74	100.3316	94	127.4468
15	20.3373	35	47.4536	55	74.5700	75	101.6862	95	128.8026
16	21.6931	36	48.8094	56	75.9258	76	103.0422	96	130.1586
17	23.0489	37	50.1653	57	77.2816	77	104.3980	97	131.5144
18	24.4047	38	51.5211	58	78.6374	78	105.7538	98	132.8702
19	25.7605	39	52.8769	59	79.9933	79	107.1196	99	134.2260
20	27.1164	40	54.2327	60	81.3491	80	108.4654	100	135.5820

N•m to ft-lbs

N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb	N•m	ft-lb
1	.7376	21	15.9888	41	30.2400	61	44.9913	81	59.7425
2	1.4751	22	16.2264	42	30.9776	62	45.7289	82	60.4801
3	2.2127	23	16.9639	43	31.7152	63	46.4664	83	61.2177
4	2.9502	24	17.7015	44	32.4527	64	47.2040	84	61.9552
5	3.6878	25	18.4391	45	33.1903	65	47.9415	85	62.6928
6	4.4254	26	19.1766	46	33.9279	66	48.6791	86	63.4303
7	5.1629	27	19.9142	47	34.6654	67	49.4167	87	64.1679
8	5.9005	28	20.6517	48	35.4030	68	50.1542	88	64.9545
9	6.6381	29	21.3893	49	36.1405	69	50.8918	89	65.6430
10	7.3756	30	22.1269	50	36.8781	70	51.6293	90	66.3806
11	8.1132	31	22.8644	51	37.6157	71	52.3669	91	67.1181
12	8.8507	32	23.6020	52	38.3532	72	53.1045	92	67.8557
13	9.5883	33	24.3395	53	39.0908	73	53.8420	93	68.5933
14	10.3259	34	25.0771	54	39.8284	74	54.5720	94	69.3308
15	11.0634	35	25.8147	55	40.5659	75	55.3172	95	70.0684
16	11.8010	36	26.5522	56	41.3035	76	56.0547	96	70.8060
17	12.5386	37	27.2898	57	42.0410	77	56.7923	97	71.5435
18	13.2761	38	28.0274	58	42.7786	78	57.5298	98	72.2811
19	14.0137	39	28.7649	59	43.5162	79	58.2674	99	73.0187
20	14.7512	40	29.5025	60	44.2537	80	59.0050	100	73.7562

in. to mm

in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
.01	.254	.21	5.334	.41	10.414	.61	15.494	.81	20.574
.02	.508	.22	5.588	.42	10.668	.62	15.748	.82	20.828
.03	.762	.23	5.842	.43	10.922	.63	16.002	.83	21.082
.04	1.016	.24	6.096	.44	11.176	.64	16.256	.84	21.336
.05	1.270	.25	6.350	.45	11.430	.65	16.510	.85	21.590
.06	1.524	.26	6.604	.46	11.684	.66	16.764	.86	21.844
.07	1.778	.27	6.858	.47	11.938	.67	17.018	.87	22.098
.08	2.032	.28	7.112	.48	12.192	.68	17.272	.88	22.352
.09	2.286	.29	7.366	.49	12.446	.69	17.526	.89	22.606
.10	2.540	.30	7.620	.50	12.700	.70	17.780	.90	22.860
.11	2.794	.31	7.874	.51	12.954	.71	18.034	.91	23.114
.12	3.048	.32	8.128	.52	13.208	.72	18.288	.92	23.368
.13	3.302	.33	8.382	.53	13.462	.73	18.542	.93	23.622
.14	3.556	.34	8.636	.54	13.716	.74	18.796	.94	23.876
.15	3.810	.35	8.890	.55	13.970	.75	19.050	.95	24.130
.16	4.064	.36	9.144	.56	14.224	.76	19.304	.96	24.384
.17	3.318	.37	9.398	.57	14.478	.77	19.558	.97	24.638
.18	4.572	.38	9.652	.58	14.732	.78	19.812	.98	24.892
.19	4.826	.39	9.906	.59	14.986	.79	20.066	.99	25.146
.20	5.080	.40	10.160	.60	15.240	.80	20.320	1.00	25.400

mm to in.

mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
.01	.00039	.21	.00827	.41	.01614	.61	.02402	.81	.03189
.02	.00079	.22	.00866	.42	.01654	.62	.02441	.82	.03228
.03	.00118	.23	.00906	.43	.01693	.63	.02480	.83	.03268
.04	.00157	.24	.00945	.44	.01732	.64	.02520	.84	.03307
.05	.00197	.25	.00984	.45	.01772	.65	.02559	.85	.03346
.06	.00236	.26	.01024	.46	.01811	.66	.02598	.86	.03386
.07	.00276	.27	.01063	.47	.01850	.67	.02638	.87	.03425
.08	.00315	.28	.01102	.48	.01890	.68	.02677	.88	.03465
.09	.00354	.29	.01142	.49	.01929	.69	.02717	.89	.03504
.10	.00394	.30	.01181	.50	.01969	.70	.02756	.90	.03543
.11	.00433	.31	.01220	.51	.02008	.71	.02795	.91	.03583
.12	.00472	.32	.01260	.52	.02047	.72	.02835	.92	.03622
.13	.00512	.33	.01299	.53	.02087	.73	.02874	.93	.03661
.14	.00551	.34	.01339	.54	.02126	.74	.02913	.94	.03701
.15	.00591	.35	.01378	.55	.02165	.75	.02953	.95	.03740
.16	.00630	.36	.01417	.56	.02205	.76	.02992	.96	.03780
.17	.00669	.37	.01457	.57	.02244	.77	.03032	.97	.03819
.18	.00709	.38	.01496	.58	.02283	.78	.03071	.98	.03858
.19	.00748	.39	.01535	.59	.02323	.79	.03110	.99	.03898
.20	.00787	.40	.01575	.60	.02362	.80	.03150	1.00	.03937

J901N-10

Fig. 4 METRIC CONVERSION CHART

TORQUE REFERENCES

DESCRIPTION

Individual Torque Charts appear within many or the Groups. Refer to the Standard Torque Specifications Chart for torque references not listed in the individual torque charts (Fig. 5).

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N•m	kgf-cm	ft-lbf	N•m	kgf-cm	ft-lbf
4T	6	1	5	55	48 in.-lbf	6	60	52 in.-lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	—	—	—
5T	6	1	6.5	65	56 in.-lbf	7.5	75	65 in.-lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	—	—	—
6T	6	1	8	80	69 in.-lbf	9	90	78 in.-lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	—	—	—
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	—	—	—
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

Fig. 5 TORQUE SPECIFICATIONS

VEHICLE EMISSION CONTROL INFORMATION (VECI)

DESCRIPTION

All vehicles are equipped with a combined vehicle emission control information (VECI) label(s). The label is located in the engine compartment on the vehicle hood (Fig. 6). Two labels are used for vehicles built for sale in the country of Canada.

The VECI label(s) contain the following:

- Engine family and displacement
- Evaporative family
- Emission control system schematic
- Certification application
- Spark plug and gap

The label also contains an engine vacuum schematic. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both the English and French languages. These labels are permanently attached and cannot be removed without defacing information and destroying label.

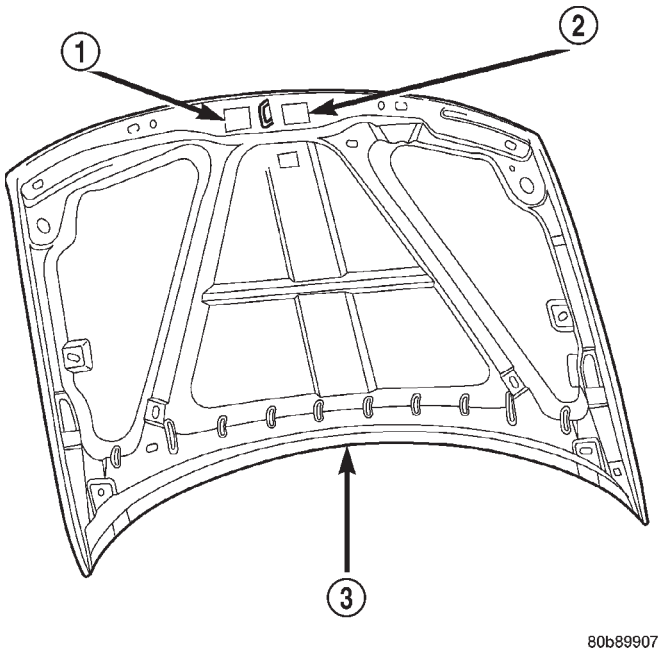


Fig. 6 VECI Label Location

1 - VECI LABEL (CANADIAN)
2 - VECI LABEL
3 - HOOD

VEHICLE IDENTIFICATION NUMBER

DESCRIPTION

The Vehicle Identification Number (VIN) plate is attached to the top left side of the instrument panel. The VIN contains 17 characters that provide data concerning the vehicle. Refer to the decoding chart to determine the identification of a vehicle.

VEHICLE IDENTIFICATION NUMBER DECODING CHART

POSITION	INTERPRETATION	CODE = DESCRIPTION
1	Country of Origin	1 = United States
2	Make	J = Jeep
3	Vehicle Type	4 = MPV
4	Gross Vehicle Weight Rating	G = 5001-6000 lbs.
5	Vehicle Line	X = Grand Cherokee 4X2 (LHD) W = Grand Cherokee 4X4 (LHD)
6	Series	3 = Sport 4 = Laredo 5 = Limited 6 = Overland
7	Body Style	8 = 4dr Sport Utility
8	Engine	S = 4.0 Liter Gasoline N = 4.7 Liter Gasoline
9	Check Digit	0 through 9 or X
10	Model Year	2=2002
11	Assembly Plant	C = Jefferson Assembly
12 thru 17	Vehicle Build Sequence	

VEHICLE SAFETY CERTIFICATION LABEL

DESCRIPTION

A vehicle safety certification label (Fig. 7) is attached to every DaimlerChrysler Corporation vehicle. The label certifies that the vehicle conforms to all applicable Federal Motor Vehicle Safety Standards. The label also lists:

- Month and year of vehicle manufacture.
- Gross Vehicle Weight Rating (GVWR). The gross front and rear axle weight ratings (GAWR's) are based on a minimum rim size and maximum cold tire inflation pressure.
- Vehicle Identification Number (VIN).
- Type of vehicle.
- Type of rear wheels.
- Bar code.
- Month, Day and Hour (MDH) of final assembly.
- Paint and Trim codes.
- Country of origin.

The label is located on the driver-side door shut-face.

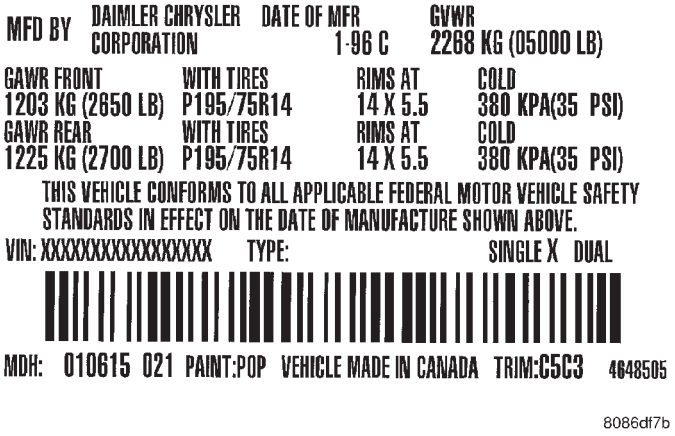


Fig. 7 VEHICLE SAFETY CERTIFICATION LABEL - TYPICAL

LUBRICATION & MAINTENANCE

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LUBRICATION & MAINTENANCE

SPECIFICATIONS - FLUID CAPACITIES

DESCRIPTION	SPECIFICATION
FUEL TANK	20 U.S. Gallons (76 Liters)****
Engine Oil - with Filter - 2.7L Diesel	6.5L (6.9 qts.)
Engine Oil - with Filter - 4.0L	5.7 L (6.0 qts.)
Engine Oil - with Filter - 4.7L	5.7 L (6.0 qts.)
Cooling System - 2.7L Diesel	14.2L (15 qts.)***
Cooling System - 4.0L	14.1 L (15 qts.)***
Cooling System - 4.7L	13.7 L (14.5 qts.)***
AUTOMATIC TRANSMISSION	
Service Fill - 42RE	3.8 L (4.0 qts.)
Service Fill - 545RFE	2WD - 5.2 L (11 pts.) 4WD - 6.2 L (13 pts.)
O-haul Fill - 42RE	9.1-9.5 L (19-20 pts.)
O-haul Fill - 545RFE	13.33 L (28.0 pts.)
Dry fill capacity Depending on type and size of internal cooler, length and inside diameter of cooler lines, or use of an auxiliary cooler, these figures may vary. (Refer to appropriate 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC/FLUID - STANDARD PROCEDURE).	
TRANSFER CASE	
NV242	1.35L (2.85 pts.)
NV247	1.6L (3.4 pts.)
FRONT AXLE ± 0.3 L (1 oz.)	
186 FBI (Model 30)	1.18 L (2.5 pts.)*
* With Vari-Lok add 0.07 L (2.5 oz.) of Friction Modifier.	
REAR AXLE ± 0.3 L (1 oz.)	
198 RBI (Model 35)	1.66 L (3.5 pts.)*
226 RBA (Model 44)	2.24 L (4.75 pts.)**
* With Trac-lok add 0.07 L (2.5 oz.) of Friction Modifier.	
** With Trac-lok or Vari-Lok, add 0.07 L (2.5 oz.) of Friction Modifier.	
*** Includes 0.9L (1.0 qts.) for coolant reservoir.	
****Nominal refill capacities are shown. A variation may be observed from vehicle to vehicle due to manufacturing tolerance and refill procedure.	

INTERNATIONAL SYMBOLS

DESCRIPTION

DaimlerChrysler Corporation uses international symbols to identify engine compartment lubricant and fluid inspection and fill locations (Fig. 1).

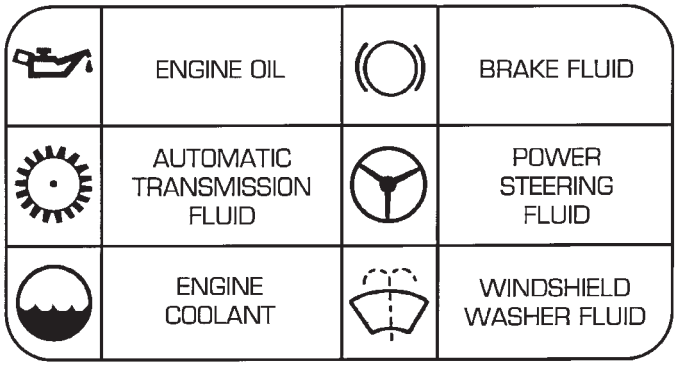


Fig. 1 INTERNATIONAL SYMBOLS

PARTS & LUBRICANT RECOMMENDATION

STANDARD PROCEDURE - PARTS & LUBRICANT RECOMMENDATIONS

Lubricating grease is rated for quality and usage by the NLGI. All approved products have the NLGI symbol (Fig. 2) on the label. At the bottom NLGI symbol is the usage and quality identification letters. Wheel bearing lubricant is identified by the letter “G”. Chassis lubricant is identified by the latter “L”. The letter following the usage letter indicates the quality of the lubricant. The following symbols indicate the highest quality.

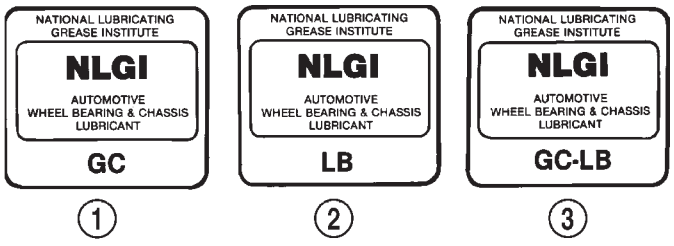


Fig. 2 NLGI Symbol

1 - WHEEL BEARINGS
2 - CHASSIS LUBRICATION
3 - CHASSIS AND WHEEL BEARINGS

When service is required, DaimlerChrysler Corporation recommends that only Mopar® brand parts, lubricants and chemicals be used. Mopar provides the best engineered products for servicing DaimlerChrysler Corporation vehicles.

FLUID TYPES

DESCRIPTION

DESCRIPTION - ENGINE COOLANT

ETHYLENE-GLYCOL MIXTURES

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37 deg. C (-35 deg. F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7 deg. C (-90 deg. F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149 deg. C (300) deg. F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22 deg. C (-8 deg. F).

PROPYLENE-GLYCOL MIXTURES

It’s overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32 deg. C (-26 deg. F). 5 deg. C higher than ethylene-glycol’s freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125 deg. C (257 deg. F) at 96.5 kPa (14 psi), compared to 128 deg. C (263 deg. F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

FLUID TYPES (Continued)

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

DESCRIPTION - ENGINE COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water-Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water-Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or

FLUID TYPES (Continued)

becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR® provides engine oils that conform to this service grade.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 3).

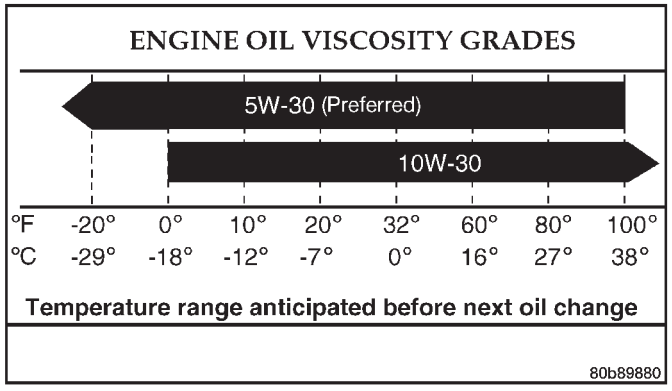


Fig. 3 Temperature/Engine Oil Viscosity - 4.7L

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 4).



9400-9

Fig. 4 API SYMBOL

DESCRIPTION - ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR® provides engine oils that conform to this service grade.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30. These oils are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 5).

FLUID TYPES (Continued)

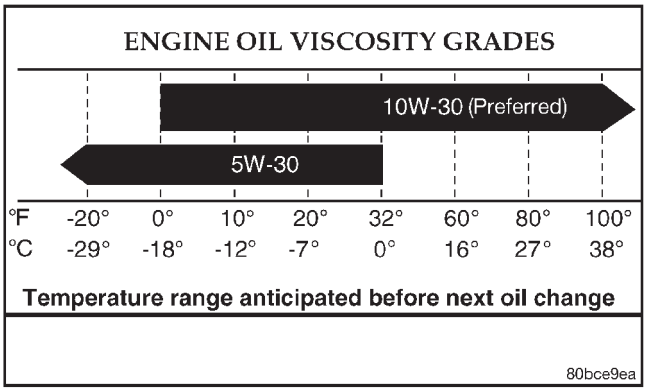


Fig. 5 Temperature/Engine Oil Viscosity - 4.0L

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 6).



9400-9

Fig. 6 API Symbol

DESCRIPTION

A multi-purpose, hypoid gear lubricant which conforms to MIL-L-2105C and API GL 5 quality specifications should be used. Mopar Hypoid Gear Lubricant conforms to these specifications.

FRONT AXLE

- Lubricant is SAE 75W-140 SYNTHETIC.

REAR AXLE

- Lubricant is a thermally stable SAE 80W-90 gear lubricant.
- Lubricant for heavy-duty or trailer tow use is SAE 75W-140 SYNTHETIC.

NOTE: Trac-lok® and Vari-lok® equipped axles require a friction modifier be added to the lubricant.

DESCRIPTION - TRANSFER CASE - NV242

Recommended lubricant for the NV242 transfer case is Mopar® ATF+4, type 9602 Automatic Transmission Fluid.

DESCRIPTION - TRANSFER CASE - NV247

Mopar® Transfer Case Lubricant (P/N 05016796) is the only lubricant recommended for the NV247 transfer case.

DESCRIPTION - AUTOMATIC TRANSMISSION FLUID

NOTE: Refer to Service Procedures in this group for fluid level checking procedures.

Mopar® ATF +4, type 9602, Automatic Transmission Fluid is the recommended fluid for DaimlerChrysler automatic transmissions.

Dexron II fluid IS NOT recommended. Clutch chatter can result from the use of improper fluid.

Mopar® ATF +4, type 9602, Automatic Transmission Fluid when new is red in color. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. **This is normal.** ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

FLUID ADDITIVES

DaimlerChrysler strongly recommends against the addition of any fluids to the transmission, other than those automatic transmission fluids listed above. Exceptions to this policy are the use of special dyes to aid in detecting fluid leaks.

Various “special” additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of DaimlerChrysler and these additives **must not be used.** The use of transmission “sealers” should also be avoided, since they may adversely affect the integrity of transmission seals.

FLUID TYPES (Continued)

DESCRIPTION - ENGINE OIL - DIESEL ENGINES

Use only Diesel Engine Oil meeting standard **MIL-2104C** or API Classification **CD or higher** or **CCML D4, D5**.

SAE VISCOSITY GRADE

CAUTION: Low viscosity oils must have the proper API quality or the CCMC G5 designation.

To assure of properly formulated engine oils, it is recommended that SAE Grade 10W-40 engine oils that meet Chrysler material standard MS-6395, be used. European Grade 10W-40 oils are also acceptable.

Oils of the SAE 5W-40 or 8W-80 grade number are preferred when minimum temperatures consistently fall below -12°C.

OPERATION - AUTOMATIC TRANSMISSION FLUID

The automatic transmission fluid is selected based upon several qualities. The fluid must provide a high level of protection for the internal components by providing a lubricating film between adjacent metal components. The fluid must also be thermally stable so that it can maintain a consistent viscosity through a large temperature range. If the viscosity stays constant through the temperature range of operation, transmission operation and shift feel will remain consistent. Transmission fluid must also be a good conductor of heat. The fluid must absorb heat from the internal transmission components and transfer that heat to the transmission case.

FLUID FILL/CHECK LOCATIONS

INSPECTION - FLUID FILL/CHECK LOCATIONS

The fluid fill/check locations and lubrication points are located in each applicable group.

MAINTENANCE SCHEDULES

DESCRIPTION

″Maintenance Schedule Information not included in this section, is located in the appropriate Owner's Manual.″

LIFT POINTS

STANDARD PROCEDURE - HOISTING AND JACKING RECOMMENDATIONS

FLOOR JACK

When properly positioned, a floor jack can be used to lift a WJ vehicle (Fig. 7). Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.

CAUTION: Do not attempt to lift a vehicle with a floor jack positioned under:

- **An axle tube.**
- **Aluminum differential.**
- **A body side sill.**
- **A steering linkage component.**
- **A drive shaft.**
- **The engine or transmission oil pan.**
- **The fuel tank.**
- **A front suspension arm.**

HOIST

A vehicle can be lifted with:

- A single-post, frame-contact hoist.
- A twin-post, chassis hoist.
- A ramp-type, drive-on hoist.

NOTE: When a frame-contact type hoist is used, verify that the lifting pads are positioned properly (Fig. 7).

WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE VEHICLE TO HOISTING DEVICE WHEN THESE CONDITIONS EXIST.

LIFT POINTS (Continued)

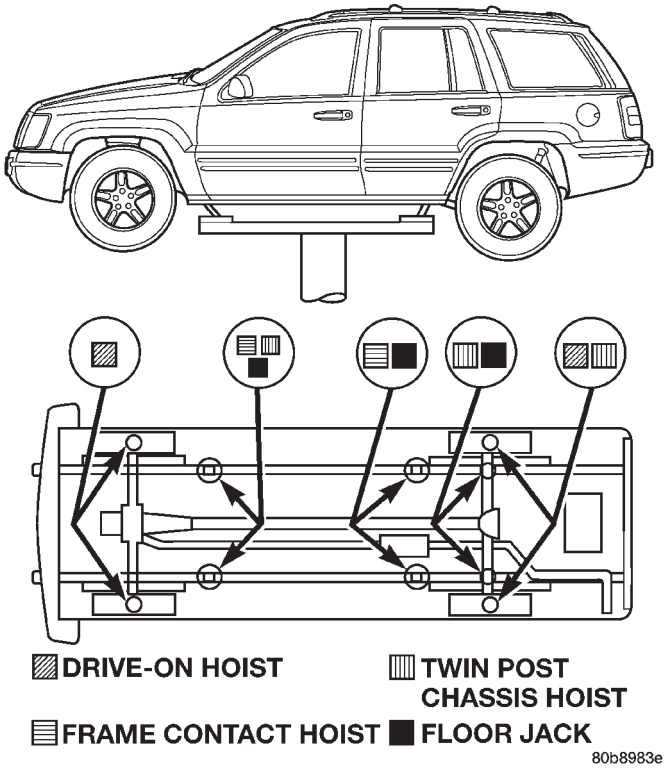


Fig. 7 Correct Vehicle Lifting Locations

JUMP STARTING

STANDARD PROCEDURE - JUMP STARTING

WARNING: REVIEW ALL SAFETY PRECAUTIONS AND WARNINGS IN GROUP 8A, BATTERY/STARTING/CHARGING SYSTEMS DIAGNOSTICS. DO NOT JUMP START A FROZEN BATTERY, PERSONAL INJURY CAN RESULT. DO NOT JUMP START WHEN MAINTENANCE FREE BATTERY INDICATOR DOT IS YELLOW OR BRIGHT COLOR. DO NOT JUMP START A VEHICLE WHEN THE BATTERY FLUID IS BELOW THE TOP OF LEAD PLATES. DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE. DO NOT USE OPEN FLAME NEAR BATTERY. REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT. WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW BATTERY VOLTAGE TO EXCEED 16 VOLTS. REFER TO INSTRUCTIONS PROVIDED WITH DEVICE BEING USED.

CAUTION: When using another vehicle as a booster, do not allow vehicles to touch. Electrical systems can be damaged on either vehicle.

TO JUMP START A DISABLED VEHICLE:

(1) Raise hood on disabled vehicle and visually inspect engine compartment for:

- Battery cable clamp condition, clean if necessary.
- Frozen battery.
- Yellow or bright color test indicator, if equipped.
- Low battery fluid level.
- Generator drive belt condition and tension.
- Fuel fumes or leakage, correct if necessary.

CAUTION: If the cause of starting problem on disabled vehicle is severe, damage to booster vehicle charging system can result.

(2) When using another vehicle as a booster source, park the booster vehicle within cable reach. Turn off all accessories, set the parking brake, place the automatic transmission in PARK or the manual transmission in NEUTRAL and turn the ignition OFF.

(3) On disabled vehicle, place gear selector in park or neutral and set park brake. Turn off all accessories.

(4) Connect jumper cables to booster battery. RED clamp to positive terminal (+). BLACK clamp to negative terminal (-). DO NOT allow clamps at opposite end of cables to touch, electrical arc will result. Review all warnings in this procedure.

(5) On disabled vehicle, connect RED jumper cable clamp to positive (+) terminal. Connect BLACK jumper cable clamp to engine ground as close to the ground cable attaching point as possible (Fig. 8).

(6) Start the engine in the vehicle which has the booster battery, let the engine idle a few minutes, then start the engine in the vehicle with the discharged battery.

CAUTION: Do not crank starter motor on disabled vehicle for more than 15 seconds, starter will overheat and could fail.

(7) Allow battery in disabled vehicle to charge to at least 12.4 volts (75% charge) before attempting to start engine. If engine does not start within 15 seconds, stop cranking engine and allow starter to cool (15 min.), before cranking again.

JUMP STARTING (Continued)

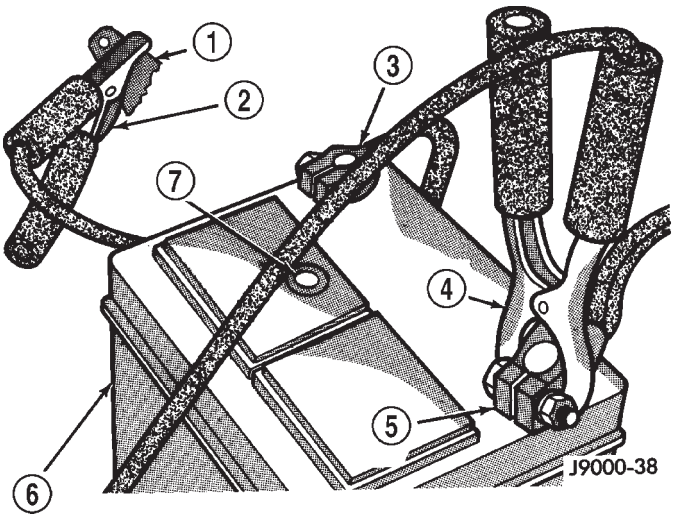


Fig. 8 Jumper Cable Clamp Connections

1 - ENGINE GROUND
2 - NEGATIVE JUMPER CABLE
3 - BATTERY NEGATIVE CABLE
4 - POSITIVE JUMPER CABLE
5 - BATTERY POSITIVE CABLE
6 - BATTERY
7 - TEST INDICATOR

DISCONNECT CABLE CLAMPS AS FOLLOWS:

- Disconnect BLACK cable clamp from engine ground on disabled vehicle.
- When using a Booster vehicle, disconnect BLACK cable clamp from battery negative terminal. Disconnect RED cable clamp from battery positive terminal.
- Disconnect RED cable clamp from battery positive terminal on disabled vehicle.

EMERGENCY TOW HOOKS

DESCRIPTION

WARNING: REMAIN AT A SAFE DISTANCE FROM A VEHICLE THAT IS BEING TOWED VIA ITS TOW HOOKS. THE TOW STRAPS/CHAINS COULD BREAK AND CAUSE SERIOUS INJURY.

Some Jeep vehicles are equipped with front emergency tow hooks (Fig. 9). The tow hooks should be used for **EMERGENCY**purposes only.

CAUTION: DO NOT use emergency tow hooks for tow truck hook-up or highway towing.

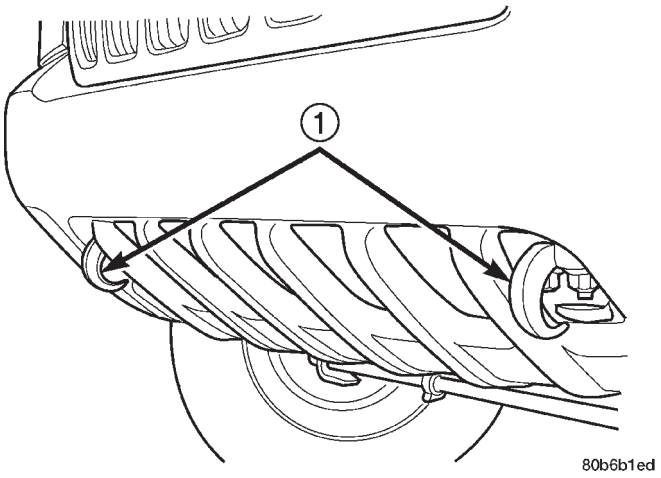


Fig. 9 Emergency Tow Hooks

1 - TOW HOOK

TOWING

STANDARD PROCEDURE - TOWING RECOMMENDATIONS

A vehicle equipped with SAE approved wheel lift-type towing equipment can be used to tow WJ vehicles. When towing a 4WD vehicle using a wheel-lift towing device, use tow dollies under the opposite end of the vehicle. A vehicle with flatbed device can also be used to transport a disabled vehicle (Fig. 10).

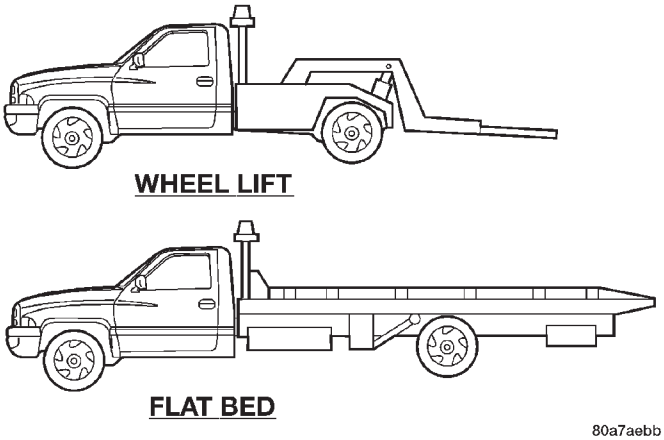


Fig. 10 Tow Vehicles With Approved Equipment

SAFETY PRECAUTIONS

CAUTION: The following safety precautions must be observed when towing a vehicle:

- Secure loose and protruding parts.
- Always use a safety chain system that is independent of the lifting and towing equipment.

TOWING (Continued)

- Do not allow towing equipment to contact the disabled vehicle's fuel tank.
- Do not allow anyone under the disabled vehicle while it is lifted by the towing device.
- Do not allow passengers to ride in a vehicle being towed.
- Always observe state and local laws regarding towing regulations.
- Do not tow a vehicle in a manner that could jeopardize the safety of the operator, pedestrians or other motorists.
- Do not attach tow chains, T-hooks, or J-hooks to a bumper, steering linkage, drive shafts or a non-reinforced frame hole.
- Do not tow a heavily loaded vehicle. Use a flat-bed device to transport a loaded vehicle.

TWO-WHEEL-DRIVE VEHICLE TOWING

DaimlerChrysler Corporation recommends that a vehicle be towed with the rear end lifted, whenever possible.

WARNING: WHEN TOWING A DISABLED VEHICLE AND THE DRIVE WHEELS ARE SECURED IN A WHEEL LIFT OR TOW DOLLIES, ENSURE THE TRANSMISSION IS IN THE PARK POSITION (AUTOMATIC TRANSMISSION) OR A FORWARD DRIVE GEAR (MANUAL TRANSMISSION).

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

TWO WHEEL DRIVE TOWING-REAR END LIFTED

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

2WD vehicles can be towed with the front wheels on the surface for extended distances at speeds not exceeding 48 km/h (30 mph).

(1) Attach wheel lift device to rear wheels.
(2) Place the transmission in neutral.
(3) Raise vehicle to towing position.
(4) Attach safety chains. Route chains so not to interfere with tail pipe when vehicle is lifted.
(5) Turn the ignition switch to the OFF position to unlock the steering wheel.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(7) Place transmission in park.

TWO WHEEL DRIVE TOWING-FRONT END LIFTED

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

(1) Attach wheel lift device to rear wheels.
(2) Place the transmission in neutral.
(3) Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.
(4) Attach wheel lift device to front wheels and raise vehicle to towing position.
(5) Attach the safety chains.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.
(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(8) Place transmission in park.

FOUR-WHEEL-DRIVE VEHICLE TOWING

DaimlerChrysler Corporation recommends that a 4WD vehicle be transported on a flat-bed device. A Wheel-lift device can be used provided **the trailing wheels are off the ground and positioned in tow dollies.**

WARNING: WHEN TOWING A DISABLED VEHICLE AND THE DRIVE WHEELS ARE SECURED IN A WHEEL LIFT OR TOW DOLLIES, ENSURE THE TRANSMISSION IS IN THE PARK POSITION.

CAUTION: Many vehicles are equipped with air dams, spoilers, and/or ground effect panels. To avoid component damage, a wheel-lift towing vehicle or a flat-bed hauling vehicle is recommended.

FOUR WHEEL DRIVE TOWING—REAR END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

(1) Attach wheel lift device to front wheels.
(2) Place the transmission in neutral.
(3) Raise the front of the vehicle off the ground and install tow dollies under front wheels.
(4) Attach wheel lift device to rear wheels and raise vehicle to towing position.
(5) Attach safety chains. Route chains so not to interfere with tail pipe when vehicle is lifted.

TOWING (Continued)

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(8) Place transmission in park.

FOUR WHEEL DRIVE TOWING—FRONT END LIFTED

WARNING: ENSURE VEHICLE IS ON A LEVEL SURFACE OR THE WHEELS ARE BLOCKED TO PREVENT VEHICLE FROM ROLLING.

(1) Attach wheel lift device to rear wheels.
(2) Place the transmission in neutral.
(3) Raise the rear of the vehicle off the ground and install tow dollies under rear wheels.
(4) Attach wheel lift device to front wheels and raise vehicle to towing position.
(5) Attach the safety chains.

CAUTION: Do not use steering column lock to secure steering wheel during towing operation.

(6) Turn the ignition switch to the OFF position to unlock the steering wheel.
(7) Secure steering wheel in straight ahead position with a clamp device designed for towing.
(8) Place transmission in park.

SUSPENSION

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SUSPENSION

DIAGNOSIS AND TESTING - SUSPENSION AND STEERING SYSTEM

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn wheel bearings.	1. Adjust or replace wheel bearings.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
EXCESSIVE PLAY IN STEERING	1. Loose or worn wheel bearings.	1. Adjust or replace wheel bearings.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Loose or worn steering gear.	3. Adjust or replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearings.	1. Adjust or replace wheel bearings.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Tires worn or out of balance.	3. Replace or balance tires.
	4. Alignment.	4. Align vehicle to specifications.
	5. Leaking steering dampener.	5. Replace steering dampener.
VEHICLE INSTABILITY	1. Loose or worn wheel bearings.	1. Adjust or replace wheel bearings.
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Tire pressure.	3. Adjust tire pressure.
	4. Alignment.	4. Align vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear.	1. Adjust or replace steering gear.
	2. Power steering fluid low.	2. Add fluid and repair leak.
	3. Column coupler binding.	3. Replace coupler.
	4. Tire pressure.	4. Adjust tire pressure.
	5. Alignment.	5. Align vehicle to specifications.

SUSPENSION (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
VEHICLE PULLS TO ONE SIDE DURING BRAKING	1. Uneven tire pressure. 2. Worn brake components. 3. Air in brake line.	1. Adjust tire pressure. 2. Repair brakes as necessary. 3. Repair as necessary.
VEHICLE LEADS OR DRIFTS FROM STRAIGHT AHEAD DIRECTION ON UNCROWNED ROAD	1. Radial tire lead. 2. Brakes dragging. 3. Weak or broken spring. 4. Uneven tire pressure. 5. Wheel Alignment. 6. Loose or worn steering or suspension components. 7. Cross caster out of spec.	1. Cross front tires. 2. Repair brake as necessary. 3. Replace spring. 4. Adjust tire pressure. 5. Align vehicle. 6. Repair as necessary. 7. Align vehicle.
KNOCKING, RATTLING OR SQUEAKING	1. Worn shock bushings. 2. Loose, worn or bent steering/ suspension components. 3. Shock valve.	1. Replace shock. 2. Inspect, tighten or replace components as necessary. 3. Replace shock.
IMPROPER TRACKING	1. Loose, worn or bent track bar. 2. Loose, worn or bent steering/ suspension components.	1. Inspect, tighten or replace component as necessary. 2. Inspect, tighten or replace components as necessary.

WHEEL ALIGNMENT

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WHEEL ALIGNMENT

DESCRIPTION

Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber and toe position (Fig. 1).

CAUTION: Never attempt to modify suspension or steering components by heating or bending.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

NOTE: Periodic lubrication of the front suspension/ steering system components may be required. Rubber bushings must never be lubricated, Refer to Lubrication And Maintenance for the recommended maintenance schedule.

OPERATION

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns (Fig. 1).
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire. The angle is not adjustable, damaged component(s) must be replaced to correct the camber angle (Fig. 1).
- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires. Incorrect wheel toe position is the most common cause of unstable steering and uneven tire wear. The wheel toe position is the **final** front wheel alignment adjustment (Fig. 1).
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted. The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, damaged component(s) must be replaced to correct the steering axis inclination angle.
- **THRUST ANGLE** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle (Fig. 1).

STANDARD PROCEDURE

STANDARD PROCEDURE - CAMBER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

To obtain an accurate alignment, a 4 wheel alignment machine must be used and the equipment calibration verified.

The wheel camber angle is preset. This angle is not adjustable and cannot be altered.

WHEEL ALIGNMENT (Continued)

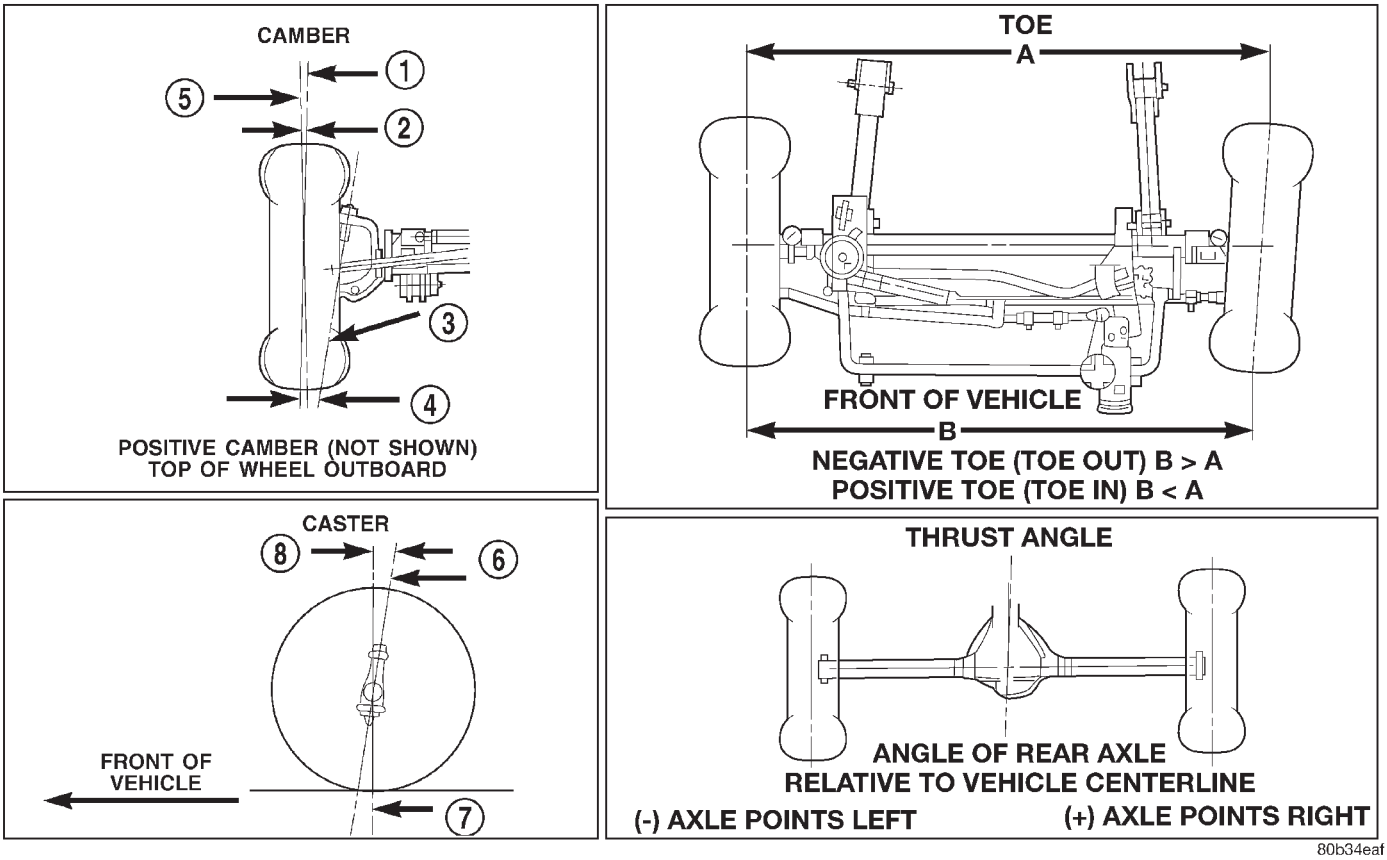


Fig. 1 Wheel Alignment Measurements

1 - WHEEL CENTERLINE
2 - NEGATIVE CAMBER ANGLE
3 - PIVOT CENTERLINE
4 - SCRUB RADIUS
5 - TRUE VERTICAL
6 - KING PIN
7 - VERTICAL
8 - POSITIVE CASTER

STANDARD PROCEDURE - CASTER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

To obtain an accurate alignment, a 4 wheel alignment machine must be used and the equipment calibration verified.

The wheel caster angle is preset. This angle is not adjustable and cannot be altered.

STANDARD PROCEDURE - TOE POSITION

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

To obtain an accurate alignment, a 4 wheel alignment machine must be used and the equipment calibration verified.

NOTE: For an accurate wheel toe position adjustment the engine must be engine running.

(1) Apply parking brakes.

(2) Start the engine and turn wheels both ways before straightening the steering wheel. Center and secure the steering wheel.

(3) Loosen the tie rod adjustment sleeve clamp bolts (Fig. 2).

(4) Turn the sleeve to obtain the preferred positive TOE-IN specification. Position the clamp bolts as shown (Fig. 2) for proper clearance.

(5) Tighten the clamp bolts to 68 N·m (50 ft. lbs.).

WHEEL ALIGNMENT (Continued)

NOTE: Make sure the toe setting does not change during clamp tightening.

(6) Verify alignment specifications, then turn the engine off.

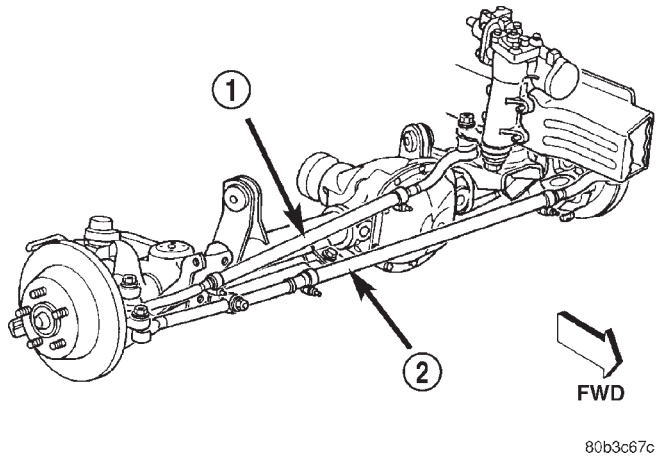


Fig. 2 Steering Linkage

1 - DRAG LINK ADJUSTMENT SLEEVE
2 - TIE ROD ADJUSTMENT SLEEVE

STEERING WHEEL CENTERING

NOTE: The steering wheel can be centered without affecting the toe position.

(1) Loosen the drag link adjustment sleeve clamp bolts.
(2) Turn the adjustment sleeve to center the wheel.
(3) Position the clamp bolts as shown (Fig. 2)for proper clearance.
(4) Tighten the clamp bolts to 68 N·m (50 ft. lbs.).
(5) Road test the vehicle to verify the wheel is centered.

SPECIFICATIONS

ALIGNMENT

NOTE: Specifications are in degrees.

FRONT WHEELS - STANDARD SUSPENSION

SPECIFICATIONS

DESCRIPTION	SPECIFICATION		
PREFERRED	CASTER + 6.75°	CAMBER − 0.37°	TOTAL TOE-IN + 0.20°
RANGE	+ 6.0° to + 7.5°	− 0.75° to + 0.5°	+ .14° to + .26°
MAX RT/LT DIFFERENCE	0.5°	0.5°	0.5°

FRONT WHEELS - UP-COUNTRY SUSPENSION

SPECIFICATIONS

DESCRIPTION	SPECIFICATION		
PREFERRED	CASTER + 6.5°	CAMBER − 0.37°	TOTAL TOE-IN + 0.20°
RANGE	+ 5.7° to + 7.2°	− 0.75° to + 0°	+ 0.0° to + .36°
MAX RT/LT DIFFERENCE	0.5°	0.5°	0.06°

REAR AXLE

SPECIFICATIONS

DESCRIPTION	SPECIFICATION		
PREFERRED	CAMBER –.37°	THRUST ANGLE 0°	TOTAL TOE-IN +.37°
RANGE	0° to –.75°	± 0.25°	0° to +.70°

FRONT

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FRONT

DESCRIPTION

The front suspension (Fig. 1) is a link/coil design comprised of :

- Drive axle
- Shock absorbers
- Coil springs
- Upper and lower suspension arms
- Stabilizer bar
- Track bar
- Jounce bumpers

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

CAUTION: Suspension components with rubber bushings must be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort will be affected and cause premature bushing wear.

STANDARD PROCEDURE - SERVICE WARNINGS AND CAUTIONS

CAUTION: Suspension components with rubber bushings must be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort will be affected and cause premature bushing wear.

FRONT (Continued)

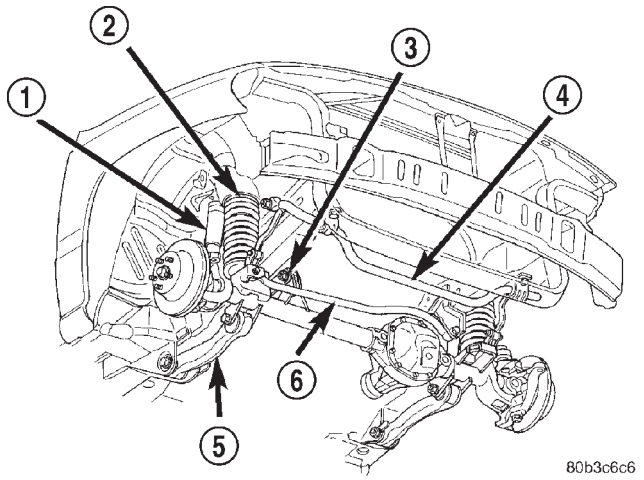


Fig. 1 Front

1 - SHOCK
2 - COIL SPRING
3 - UPPER SUSPENSION ARM
4 - STABILIZER BAR
5 - LOWER SUSPENSION ARM
6 - TRACK BAR

SPECIFICATIONS

TORQUE CHART

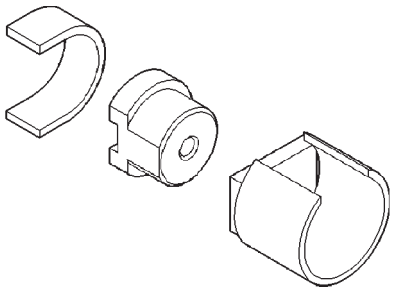
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Shock Absorber Upper Nut	35	26	—
Shock Absorber Lower Nut	28	—	250
Suspension Arm Upper Axle Bracket Nut	61	45	—
Suspension Arm Upper Frame Bracket Bolt	61	45	—
Suspension Arm Lower Axle Bracket Nut	163	120	—
Suspension Arm Lower Frame Bracket Bolt	156	115	—
Stabilizer Bar Retainer Bolts	92	68	—
Stabilizer Bar Link Upper Nut	106	78	—
Stabilizer Bar Link Lower Nut	106	78	—
Track Bar Frame Bracket Nut	108	80	—
Track Bar Axle Bracket Bolt	100	74	—
Hub Bearing Knuckle Bolts	102	75	—

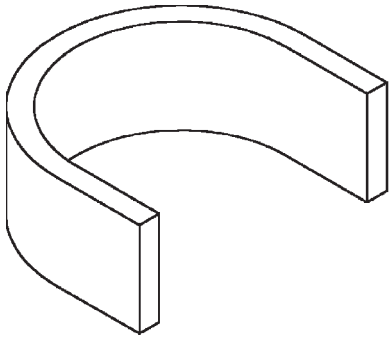
FRONT (Continued)

SPECIAL TOOLS

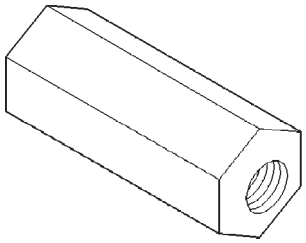
FRONT SUSPENSION



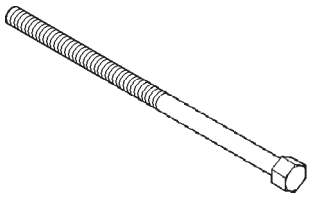
Remover/Installer Suspension Bushing 7932



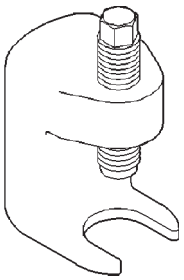
Spacer 8279



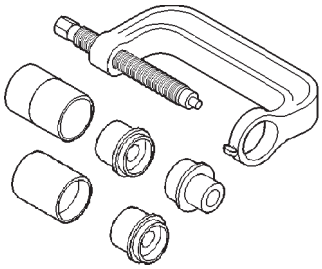
Nut, Long 7603



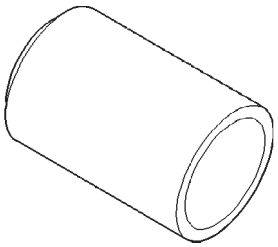
Bolt, Special 7604



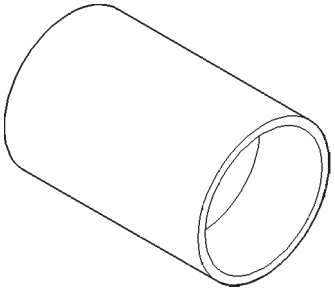
Remover C-4150A



Remover/Installer 6289



Reciever 6761



Installer 6752

BUSHINGS

REMOVAL

(1) Remove the upper suspension arm from axle.
(2) Position Spacer 8279 over the axle bushing on a 4x2 vehicle and right side on a 4x4 vehicle.
(3) Place Receiver 7932-1 over flanged end of the bushing. (Fig. 2).
(4) Place small end of Remover/Install 7932-2 against other side of the bushing.
(5) Install bolt 7604 through remover, bushing and receiver.
(6) Install Long Nut 7603 and tighten nut too pull bushing out of the axle bracket.

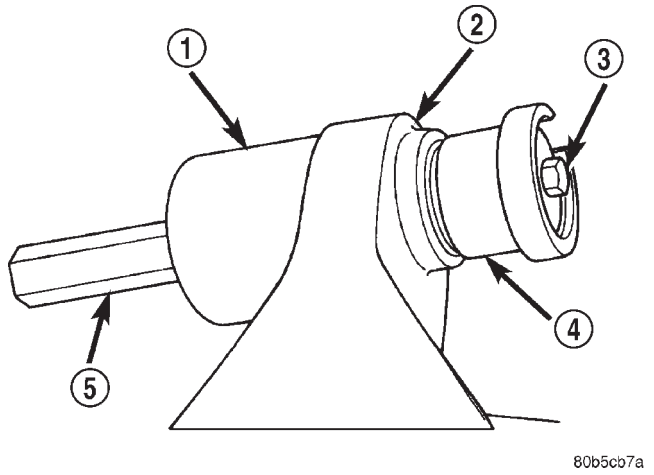


Fig. 2 Bushing Removal

1 - RECEIVER
2 - AXLE BRACKET
3 - BOLT
4 - REMOVER/INSTALLER
5 - LONG NUT

(7) Remove nut, bolt, receiver, remover and bushing.

NOTE: On 4x2 vehicle and right side of 4x4 vehicle, leave Spacer 8279 in position for bushing installation.

INSTALLATION

(1) Place Receiver 7932-1on the other side of the axle bracket.
(2) Position new bushing up to the axle bracket., and large end of Remover/Install 7932-2 against the bushing (Fig. 3).
(3) Install bolt 7604 through receiver, bushing and installer.
(4) Install Long Nut 7603 and tighten nut to draw the bushing into the axle bracket.

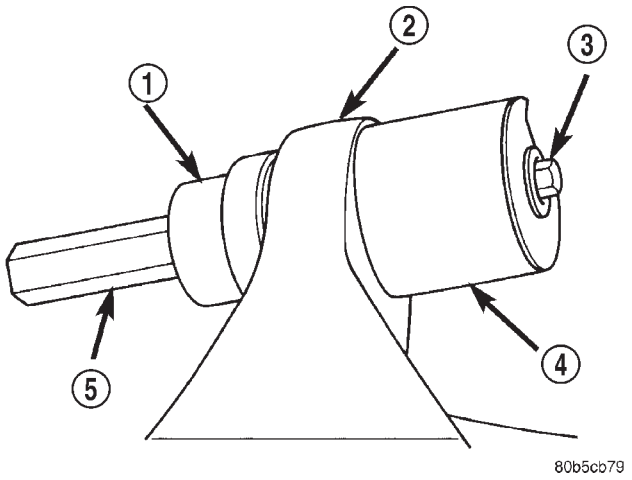


Fig. 3 Bushing Installation

1 - REMOVER/INSTALLER
2 - AXLE BRACKET
3 - BOLT
4 - RECEIVER
5 - LONG NUT

(5) Remove tools and install the upper suspension arm.

HUB / BEARING

DESCRIPTION

The bearing used on the front hub of this vehicle is the combined hub and bearing unit type assembly. This unit assembly combines the front wheel mounting hub (flange) and the front wheel bearing into a one piece unit. The wheel mounting studs are the only replaceable component of the hub/bearing assembly.

OPERATION

The hub/bearing assembly is mounted to the steering knuckle and is retained by three mounting bolts accessible from the back of the steering knuckle. The hub/bearing unit is not serviceable and must be replaced as an assembly if the bearing or the hub is determined to be defective.

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the wheel and tire assembly.
(3) Remove the brake caliper, caliper anchor, rotor and ABS wheel speed sensor,(Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - REMOVAL).
(4) Remove the cotter pin, nut retainer and axle hub nut.
(5) Remove the hub bearing mounting bolts from the back of the steering knuckle. Remove hub bear-

ing (Fig. 4) from the steering knuckle and off the axle shaft.

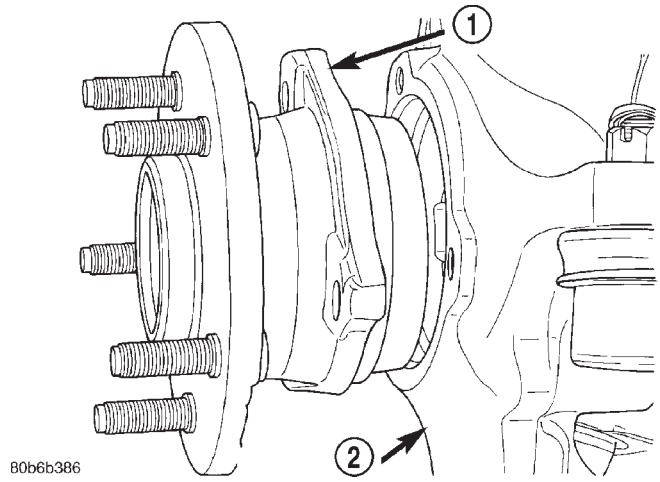


Fig. 4 Hub Bearing & Knuckle

1 - HUB BEARING
2 - KNUCKLE

INSTALLATION

(1) Install the hub bearing to the knuckle.
(2) Install the hub bearing to knuckle bolts and tighten to 102 N·m (75 ft. lbs.).
(3) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.). Install the nut retainer and a new cotter pin.
(4) Install the brake rotor, caliper anchor, caliper and ABS wheel speed sensor,(Refer to 5 - BRAKES/ELECTRICAL/FRONT WHEEL SPEED SENSOR - INSTALLATION).
(5) Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).
(6) Remove the support and lower the vehicle.

KNUCKLE

DESCRIPTION

The knuckle is a single casting with legs machined for the upper and lower ball joints. The knuckle also has machined mounting locations for the front brake calipers and hub bearing.

OPERATION

The steering knuckle pivot between the upper and lower ball joint. Steering linkage attached to the knuckle allows the vehicle to be steered.

REMOVAL - STEERING KNUCKLE

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

(1) Remove hub bearing and axle shaft.
(2) Disconnect the tie-rod or drag link from the steering knuckle arm,(Refer to 19 - STEERING/LINKAGE/TIE ROD END - REMOVAL) .
(3) Remove the cotter pins from the upper and lower ball studs.
(4) Remove the upper and lower ball stud nuts.
(5) Strike the steering knuckle with a brass hammer to loosen knuckle from the ball studs. Remove knuckle from ball studs (Fig. 5).

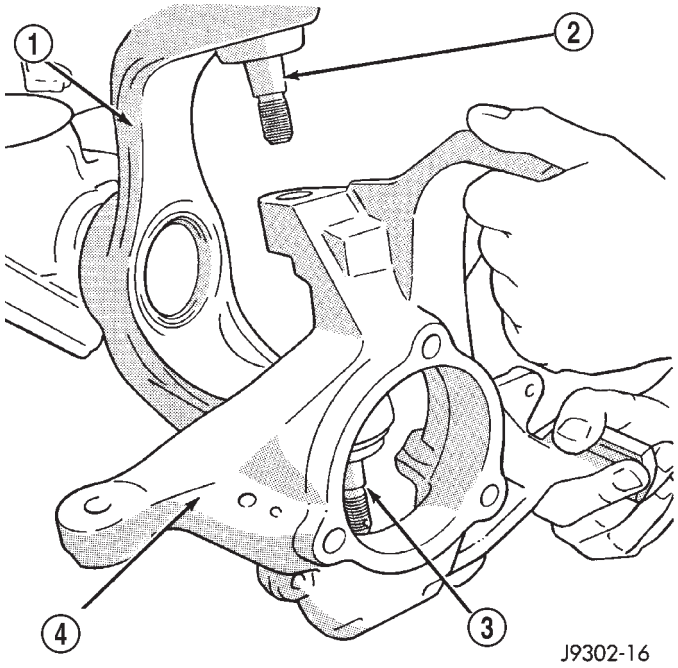


Fig. 5 Steering Knuckle Removal/Installation

1 - AXLE YOKE
2 - UPPER BALL STUD
3 - LOWER BALL STUD
4 - STEERING KNUCKLE

INSTALLATION

(1) Position the steering knuckle on the ball studs.
(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.
(3) Install and tighten the top retaining nut to 101 N·m (75 ft. lbs.) torque. Install new cotter pin.
(4) Install the hub bearing and axle shaft.
(5) Connect the tie-rod or drag link end to the steering knuckle arm.,(Refer to 19 - STEERING/LINKAGE/TIE ROD END - INSTALLATION) .

LOWER BALL JOINT

REMOVAL

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

(1) Position tools as shown to remove and install ball stud (Fig. 6).

LOWER CONTROL ARM

DESCRIPTION

The lower suspension arms are hydroformed steel and use voided oval bushings at one end of the arm.

OPERATION

The bushings provide isolation from the axle. The arms mount to the unibody frame rail bracket and the axle brackets. The arm and bushings provide location and react to loads from the axle.

REMOVAL

(1) Raise the vehicle and support the front axle.

(2) Remove the lower suspension arm nut and bolt from the axle bracket (Fig. 7).

(3) Remove the nut and bolt from the frame rail bracket and remove the lower suspension arm (Fig. 7).

INSTALLATION

(1) Position the lower suspension arm in the axle bracket and frame rail bracket.

NOTE: The end of the arm with the oval bushing attaches to the axle bracket.

(2) Install the axle bracket bolt and nut finger tight.

(3) Install the frame rail bracket bolt and nut finger tight.

(4) Remove support and lower the vehicle.

(5) With the vehicle on the ground tighten the frame bracket bolt to 156 N·m (115 ft. lbs.). Tighten the axle bracket nut to 163 N·m (120 ft. lbs.).

(6) Check the alignment if new parts were installed.

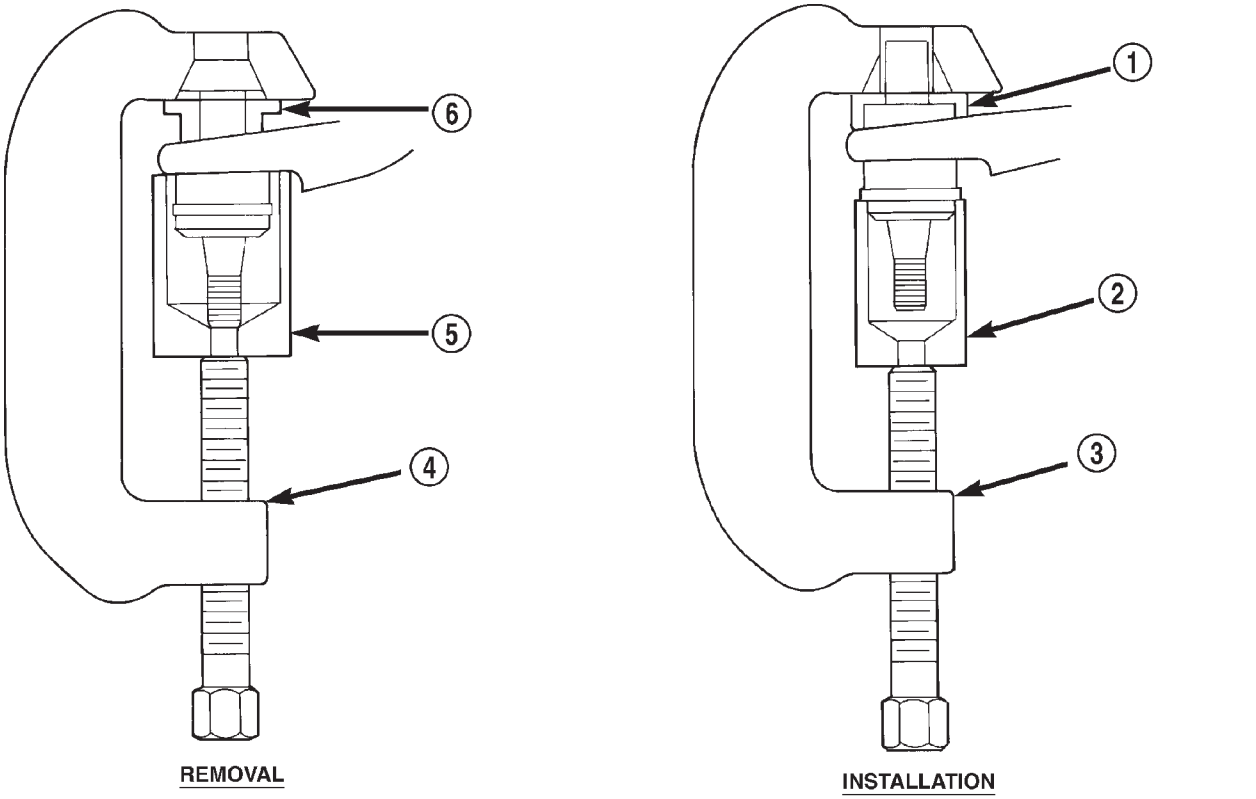


Fig. 6 Lower

1 - SPECIAL TOOL 6289–12
2 - SPECIAL TOOL 6289–4
3 - SPECIAL TOOL 4212F
4 - SPECIAL TOOL 4212F
5 - SPECIAL TOOL 6289–1
6 - SPECIAL TOOL 6289–3

LOWER CONTROL ARM (Continued)

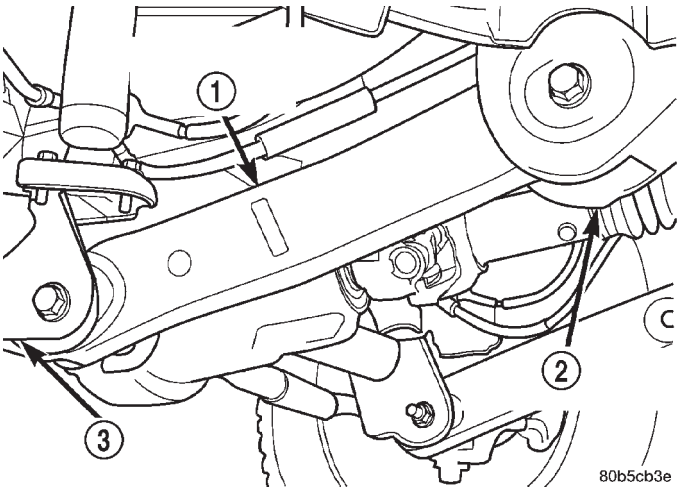


Fig. 7 Lower Suspension Arm

1 - LOWER SUSPENSION ARM
2 - FRAME RAIL BRACKET
3 - AXLE BRACKET

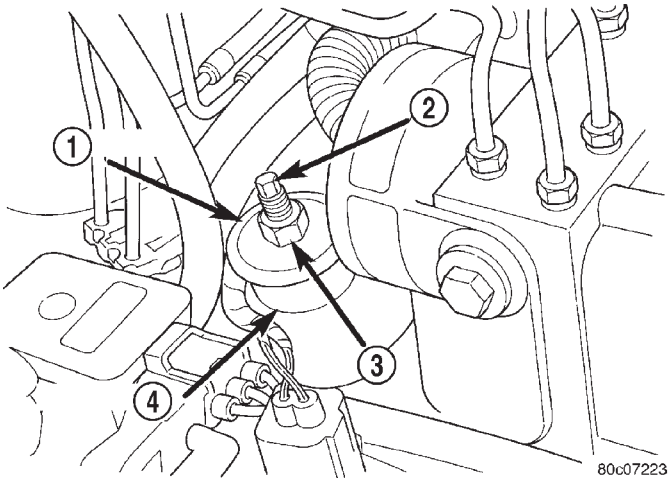


Fig. 8 Upper Shock Mounting

1 - RETAINER
2 - STUD
3 - NUT
4 - GROMMET

SHOCK

DESCRIPTION

The top of the shock absorbers are bolted to the body. The bottom of the shocks are bolted to the axle brackets. The standard shocks have conventional twin tube construction and are low pressure gas charged. Gas charging prevents cavitation during rough road operation. Up-Country shocks are mono tube design and are high pressure gas charged.

OPERATION

The shock absorbers dampen jounce and rebound motion of the vehicle over various road conditions and limit suspension rebound travel.

REMOVAL

(1) Remove the nut, retainer and grommet from the shock stud in the engine compartment (Fig. 8).
(2) Raise and support the front axle.
(3) Remove the lower mounting nuts from the axle bracket (Fig. 9). Remove the shock absorber.

INSTALLATION

(1) Position the lower retainer and grommet on the shock stud. Insert the shock absorber through the shock tower hole.
(2) Install the lower shock studs into the axle bracket.
(3) Install the mounting nuts and tighten to 28 N·m (250 in. lbs.).
(4) Remove support and lower the vehicle.

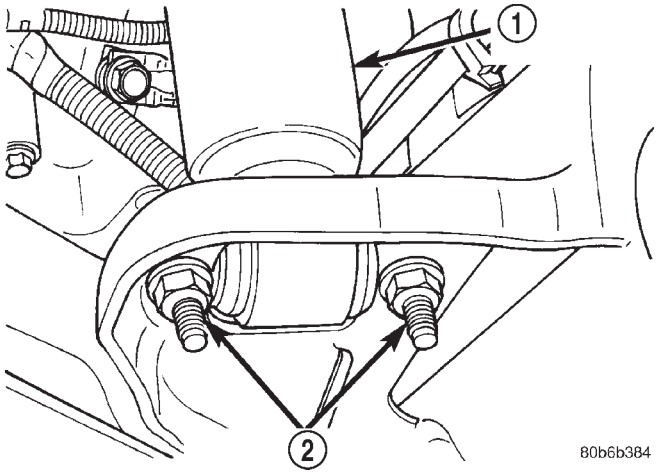


Fig. 9 Lower Shock Mounting

1 - SHOCK ABSORBER
2 - MOUNTING NUTS

(5) Install the upper grommet, retainer and nut on the stud in the engine compartment. Hold the shock stud with a 8 mm wrench and tighten the nut to 35 N·m (26 ft. lbs.).

SPRING

DESCRIPTION

The coil springs mount up in the wheelhouse which is part of the unitized body bracket. A rubber doughnut isolator is located between the top of the spring and the body. The bottom of the spring seats on a axle isolator made of rubber with a steel insert.

SPRING (Continued)

OPERATION

The coil springs control ride quality and maintain proper ride height. The isolators provide road noise isolation.

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the wheel and tire assemblies.
(3) Position a hydraulic jack under the axle to support it.
(4) Remove shock absorbers lower mounting nuts from the axle brackets.
(5) Remove the track bar mounting bolt from the axle bracket.

NOTE: Make sure the lower part of the shock does not hold tension on the brake lines at the axle tube housing located at the lower shock mounting area.

(6) Lower the axle until the spring is free from the upper mount and isolator (Fig. 10).

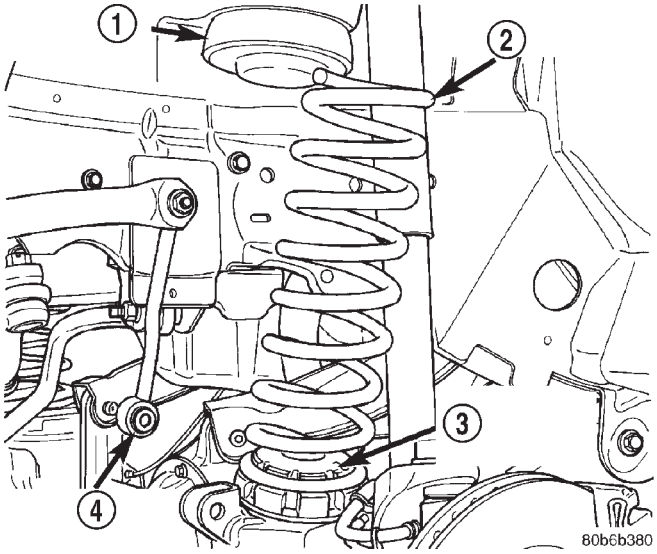


Fig. 10 Front Coil Spring

1 - UPPER ISOLATOR
2 - COIL SPRING
3 - LOWER ISOLATOR
4 - STABILIZER LINK

(7) Remove the spring from the vehicle.
(8) Remove and inspect the upper and lower spring isolators.

INSTALLATION

(1) Install the upper isolator.
(2) Install the lower isolator with the isolator locator nub in the axle pad hole (Fig. 11).
(3) Position the coil spring on the axle spring pad.

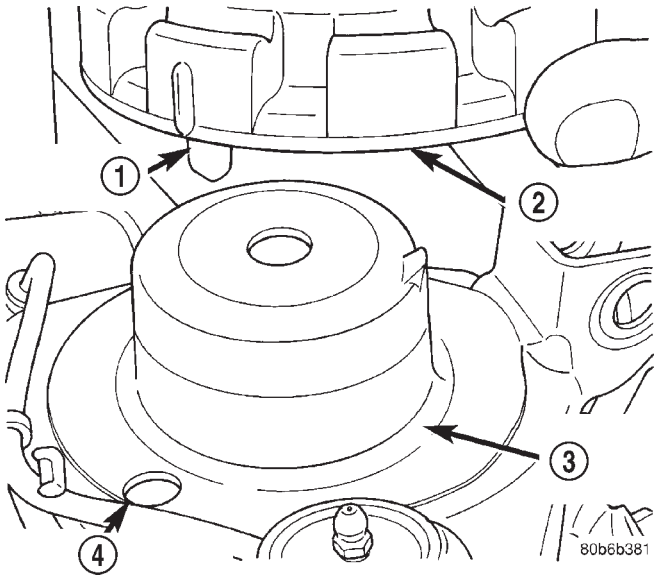


Fig. 11 Lower Isolator

1 - LOCATING NUB
2 - LOWER ISOLATOR
3 - AXLE SPRING PAD
4 - LOCATING HOLE

CAUTION: Ensure the spring is positioned on the lower isolator with the end of the spring coil against the isolator spring locator (Fig. 12).

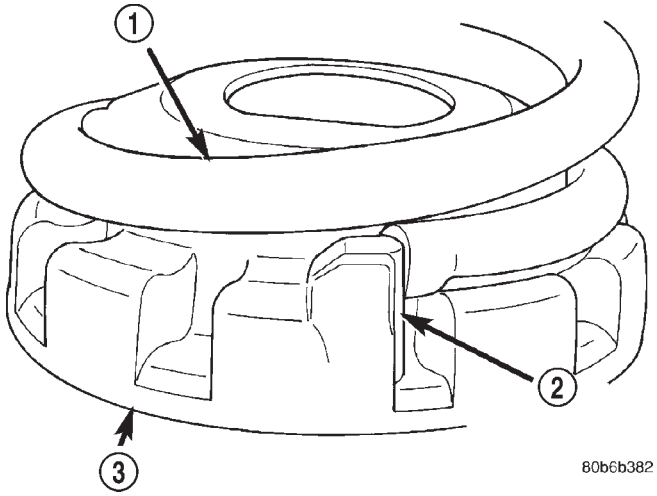


Fig. 12 Isolator Spring Locator

1 - COIL SPRING
2 - SPRING LOCATOR
3 - LOWER ISOLATOR

(4) Raise the axle and guide the springs onto the spring upper mounts and lower shock studs into the axle brackets.
(5) Install the shock absorbers lower mounting nuts.

SPRING (Continued)

(6) Install the track bar to the axle bracket and install the mounting bolt.

NOTE: It may be necessary to pry the axle assembly over to install the track bar bolt.

(7) Remove the hydraulic jack from under the vehicle.
(8) Tighten all suspension components to proper torque.
(9) Install the wheel and tire assemblies.
(10) Remove support and lower vehicle.

STABILIZER BAR

DESCRIPTION

The bar extends across the front underside of the chassis and is mounted to the frame rails. Links are connected from the bar to the axle brackets. The stabilizer bar and links are isolated by rubber bushings.

OPERATION

The stabilizer bar is used to control vehicle body roll during turns. The spring steel bar helps to control the vehicle body in relationship to the suspension.

REMOVAL

(1) Raise and support the vehicle.
(2) Remove link nuts and bolts (Fig. 13) and remove the links.
(3) Remove the stabilizer bar retainer bolts (Fig. 13)from the frame rails and remove the stabilizer bar.

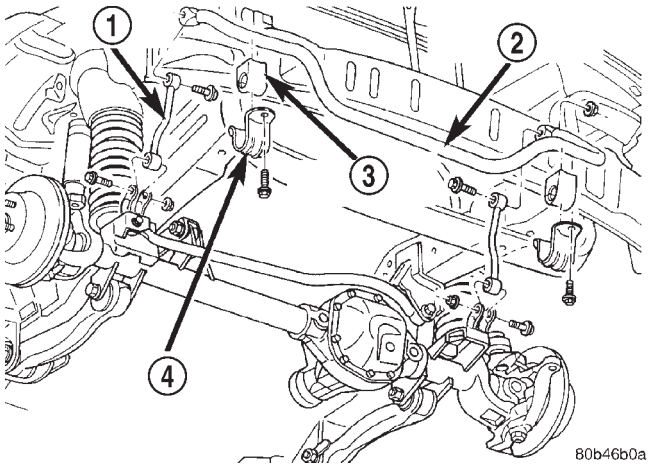


Fig. 13 Stabilizer Bar

1 - LINK
2 - STABILIZER BAR
3 - BUSHING
4 - RETAINER

INSTALLATION

(1) Position the stabilizer bar on the frame rail and install the retainers and bolts. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 92 N·m (68 ft. lbs.).
(2) Install the links onto the stabilizer bar and axle brackets and install the bolts and nuts finger tight.
(3) Remove the supports and lower the vehicle.
(4) With the vehicle on the ground tighten the stabilizer bar link nuts to 106 N·m (78 ft. lbs.).

TRACK BAR

DESCRIPTION

The bar is attached to a frame rail bracket and axle bracket. The bar is forged and has non replaceable isolator bushings at both ends.

OPERATION

The track bar is used to control front axle lateral movement and provides cross car location of the axle assembly.

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the nut and bolt from the frame rail bracket (Fig. 14).

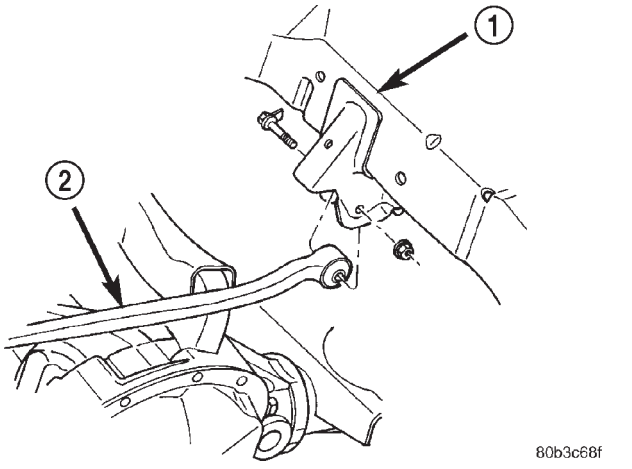


Fig. 14 Track Bar Frame Rail Bracket

1 - FRAME RAIL
2 - TRACK BAR

(3) Remove the bolt from the axle shaft tube bracket (Fig. 15). Remove the track bar.

INSTALLATION

(1) Install the track bar to the axle tube bracket. Install the retaining bolt finger tight.

TRACK BAR (Continued)

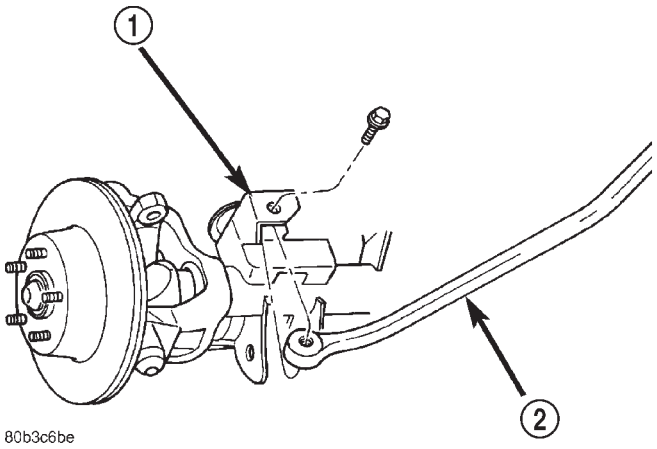


Fig. 15 Track Bar Axle Bracket

1 - AXLE BRACKET
2 - TRACK BAR

(2) Install track bar to the frame rail bracket. Install the bolt and nut finger tight.

NOTE: It may be necessary to pry the axle assembly over to install the track bar to the frame rail bracket.

(3) Remove the supports and lower the vehicle.
(4) With the vehicle on the ground tighten the nut at the frame rail bracket and to the bolt at the axle bracket to 100 N·m (74 ft. lbs.).
(5) Check alignment specifications if a new track bar was installed.

UPPER BALL JOINT

REMOVAL

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

(1) Position tools as shown to remove and install ball stud (Fig. 16).

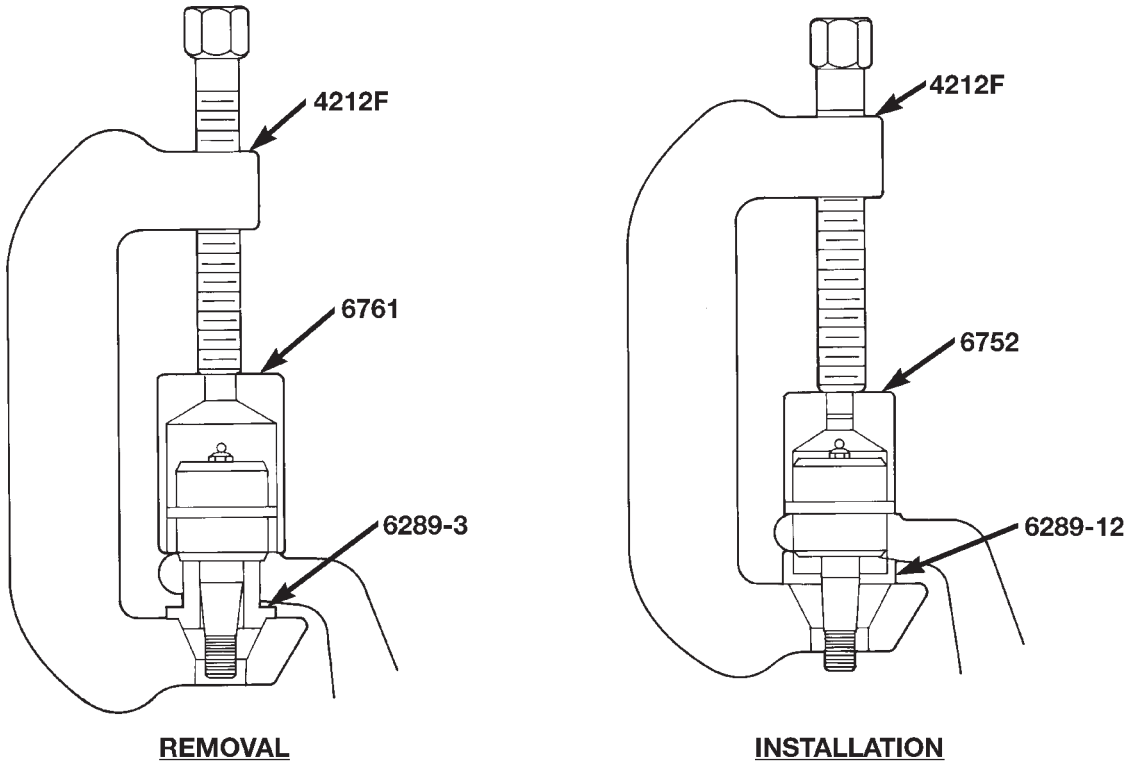


Fig. 16 Upper

UPPER CONTROL ARM

DESCRIPTION

The upper suspension arms are hydroformed steel and use rubber bushings at each end of the arm.

OPERATION

The arms mount to the unibody frame rail bracket and the axle brackets. The arm and bushings provide location and react to loads from the axle. The bushings provide isolation from the axle.

REMOVAL

(1) Raise vehicle and support the axle.

(2) Remove the upper suspension arm mounting nut and bolt (Fig. 17) from the axle bracket.

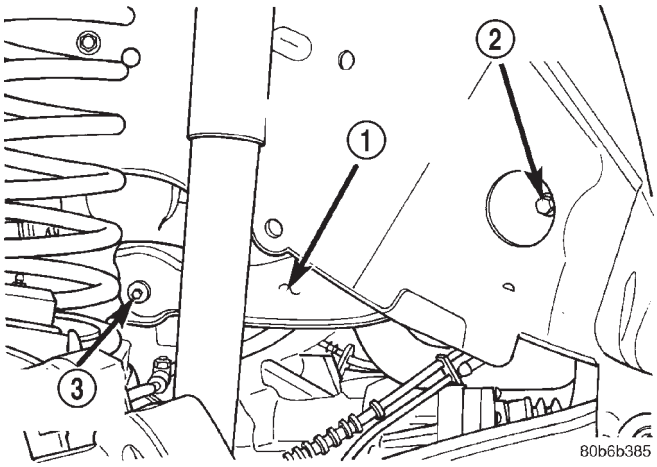


Fig. 17 Upper Suspension Arm

1 - UPPER SUSPENSION ARM
2 - FRAME BOLT
3 - AXLE BOLT

(3) Remove the nut and bolt (Fig. 17) at the frame rail and remove the upper suspension arm.

INSTALLATION

(1) Position the upper suspension arm at the axle and frame rail.

(2) Install the bolts and finger tighten the nuts.

(3) Remove the supports and lower the vehicle.

(4) With the vehicle on the ground tighten the axle bracket nut and the frame bracket bolt to 61 N·m (45 ft. lbs.).

(5) Check the alignment if new parts were installed.

REAR

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REAR

DESCRIPTION

The rear suspension (Fig. 1) is comprised of :

- Drive axle
- Shock absorbers
- Coil springs
- Lower suspension arms
- Upper suspension arm
- Stabilizer bar

CAUTION: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. This will maintain vehicle ride comfort and prevent premature bushing wear.

WARNING

WARNING:: Suspension components with rubber bushings must be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort will be affected and cause premature bushing wear.

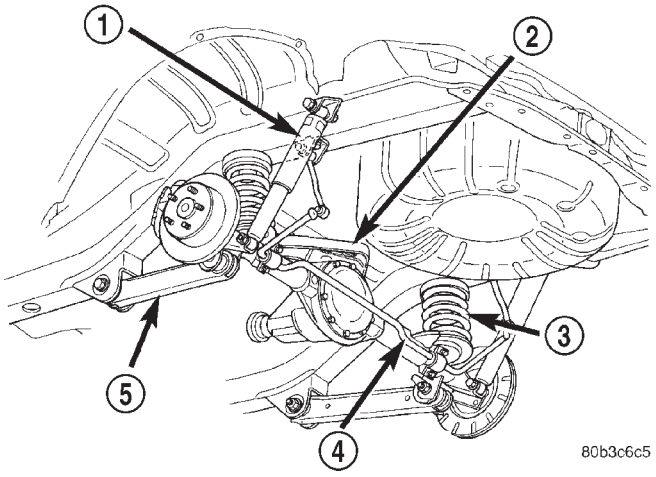


Fig. 1 Rear Suspension

1 - SHOCK
2 - UPPER SUSPENSION ARM
3 - COIL SPRING
4 - STABILIZER BAR
5 - LOWER SUSPENSION ARM

REAR (Continued)

DIAGNOSIS AND TESTING - REAR SUSPENSION

CONDITION	POSSIBLE CAUSES	CORRECTION
VEHICLE INSTABILITY	1. Loose or worn wheel bearings. 2. Loose, worn or bent suspension components. 3. Tire pressure.	1. Replace wheel bearings. 2. Inspect, tighten or replace components as necessary. 3. Adjust tire pressure.
VEHICLE PULLS TO ONE SIDE	1. Weak or broken spring. 2. Alignment. 3.Tires. 4. Brakes.	1. Replace spring. 2. Align vehicle to specifications. 3. Replace tires. 4. Repair as necassary.
KNOCKING, RATTLING OR SQUEAKING	1. Worn shock bushings. 2. Loose shock mounting. 3. Shock valve. 4. Loose upper ball joint. 5. Loose, worn or bent suspension components.	1. Replace shock. 2. Tighten to specifications. 3. Replace shock. 4. Replace ball joint. 5. Inspect, tighten or replace components as necessary.
IMPROPER TRACKING	1. Loose, worn or bent suspension components. 2. Bent axle.	1. Inspect, tighten or replace components as necessary. 2.Replace axle.

SPECIFICATIONS

TORQUE CHART

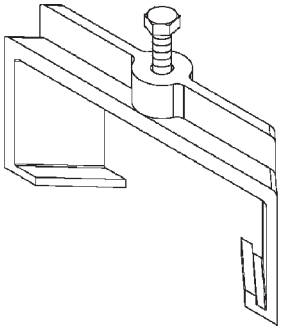
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Shock Absorber Upper Nut	108	80	—
Shock Absorber Lower Nut	115	85	—
Suspension Arm Upper Ball Joint Nut	142	105	—
Suspension Arm Upper Frame Bolts	100	74	—
Ball Joint Plate Bolts	136	100	—
Suspension Arms Lower Axle Bracket Nut	163	120	—
Suspension Arms Lower Frame Bracket Nut	156	115	—
Stabilizer Bar Retainer Bolts	54	40	—
Stabilizer Bar Bar Link Nut	54	40	—
Stabilizer Bar Bracket Link Nut	92	68	—

REAR (Continued)

SPECIAL TOOLS

REAR SUSPENSION



Remover 8278

LOWER CONTROL ARM

DESCRIPTION

The lower suspension arms are hydroformed steel and use voided oval bushings at each end of the arm.

OPERATION

The bushings provide isolation from the axle. The arms mount to the unibody frame rail bracket and the axle brackets. The arm and bushings provide location and react to loads.

REMOVAL

(1) Raise the vehicle and support the rear axle.

(2) Remove the lower suspension arm nut and bolt from the axle bracket (Fig. 2).

(3) Remove the nut and bolt (Fig. 2) from the frame rail and remove the lower suspension arm.

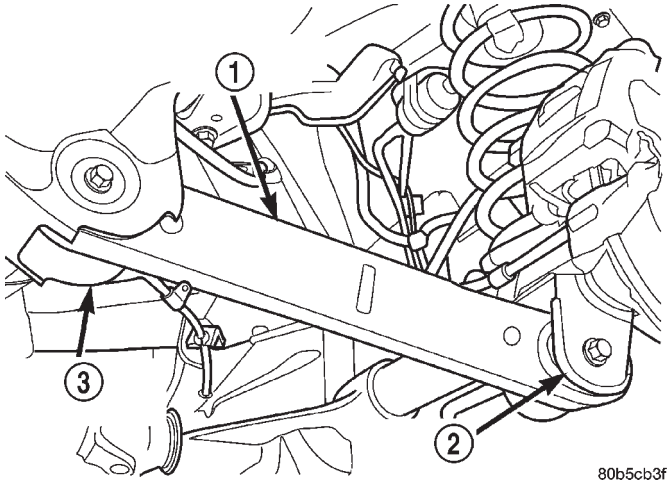


Fig. 2 Lower Suspension Arm

1 - LOWER SUSPENSION ARM
2 - AXLE BRACKET
3 - FRAME BRACKET

INSTALLATION

(1) Position the lower suspension arm in the axle bracket and frame rail bracket.

NOTE: The end of the arm with the oval bushing attaches to the axle bracket.

(2) Install the axle bracket bolt and nut finger tight.

(3) Install the frame rail bracket bolt and nut finger tight.

(4) Remove the supports and lower the vehicle.

(5) With the vehicle on the ground tighten the nut at the frame to 156 N·m (115 ft. lbs.). Tighten the nut at the axle bracket to 163 N·m (120 ft. lbs.).

SHOCK

DESCRIPTION

The top of the shock absorbers are bolted to the body. The bottom of the shocks are bolted to the axle brackets. The standard shocks have conventional twin tube construction and are low pressure gas charged. Gas charging prevents cavitation during rough road operation. Up-Country shocks are mono tube design and are high pressure gas charged.

OPERATION

The shock absorbers dampen jounce and rebound motion of the vehicle over various road conditions and limit suspension rebound travel.

REMOVAL

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support the axle.

CAUTION: Do not allow the axle to hang from the upper suspension arm ball joint.

(2) Remove the upper nut and bolt from the frame bracket (Fig. 3).

(3) Remove the lower nut and bolt from the axle bracket. Remove the shock absorber.

INSTALLATION

(1) Install the shock absorber in the frame bracket and install the bolt and nut.

(2) Install the shock absorber in the axle bracket and install the bolt and nut.

(3) Tighten the upper mounting nuts to 108 N·m (80 ft. lbs.). Tighten the lower mounting nuts to 115 N·m (85 ft. lbs.).

(4) Remove the supports and lower the vehicle.

SHOCK (Continued)

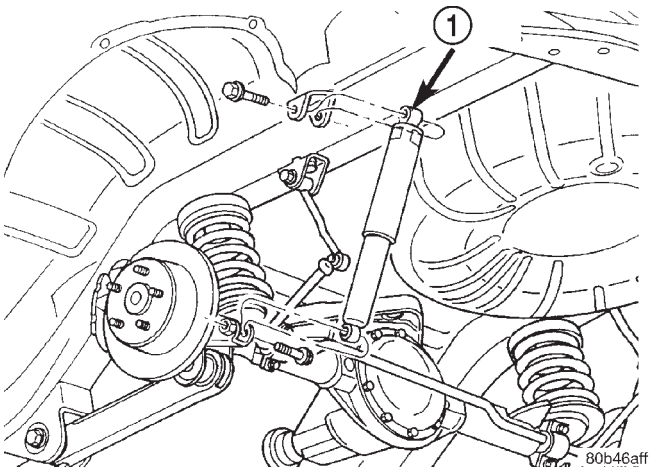


Fig. 3 Shock Absorber

1 - SHOCK

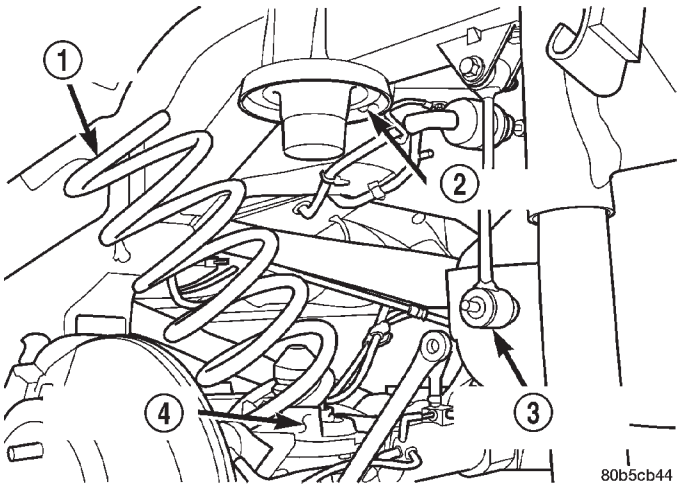


Fig. 4 Coil Spring

1 - COIL SPRING
2 - ISOLATOR
3 - STABILIZER LINK
4 - ISOLATOR

SPRING

DESCRIPTION

The coil springs mount up in the wheelhouse which is part of the unitized body bracket. A rubber doughnut isolator is located between the top of the spring and the body. The bottom of the spring seats on a axle isolator made of rubber with a steel insert. The isolators provide road noise isolation

OPERATION

The coil springs control ride quality and maintain proper ride height.

REMOVAL

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support the axle.

(2) Remove the wheel and tire assemblies.

(3) Remove the stabilizer bar link from the stabilizer bar (Fig. 4).

(4) Remove the shock absorber lower bolt from the axle bracket.

(5) Lower the hydraulic jack and tilt the axle and remove the coil spring (Fig. 4).

(6) Remove and inspect the upper and lower spring isolators (Fig. 4).

INSTALLATION

(1) Install the upper isolator.

(2) Install the lower isolator with the isolator locator nub in the axle pad hole (Fig. 5).

(3) Pull down on the axle and position the coil spring in the lower isolator.

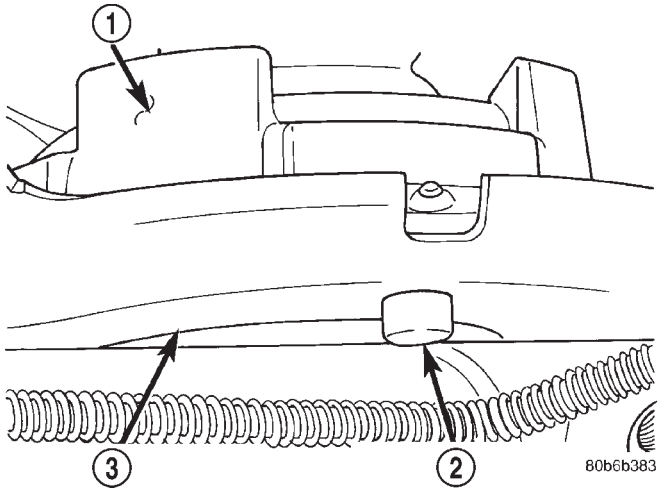


Fig. 5 Isolator Locator Nub

1 - LOWER ISOLATOR
2 - LOCATOR NUB
3 - AXLE SPRING PAD

CAUTION: Ensure the spring is positioned on the lower isolator with the end of the spring coil against the isolator spring locator (Fig. 6).

(4) Raise the axle with the hydraulic jack.

(5) Install the shock absorber to the axle bracket and tighten to specification.

(6) Install the stabilizer bar link to the stabilizer bar.

(7) Install the wheel and tire assemblies.

(8) Remove the supports and lower the vehicle.

(9) Tighten the stabilizer bar links to specification.

SPRING (Continued)

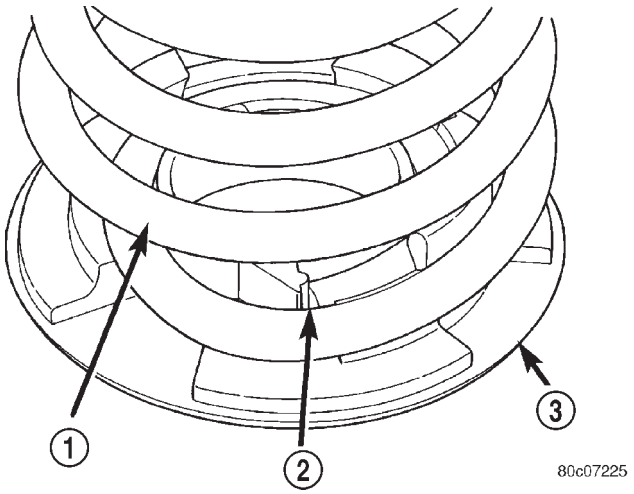


Fig. 6 Isolator Spring Locator - Typical

1 - LOWER ISOLATOR
2 - SPRING LOCATOR
3 - COIL SPRING

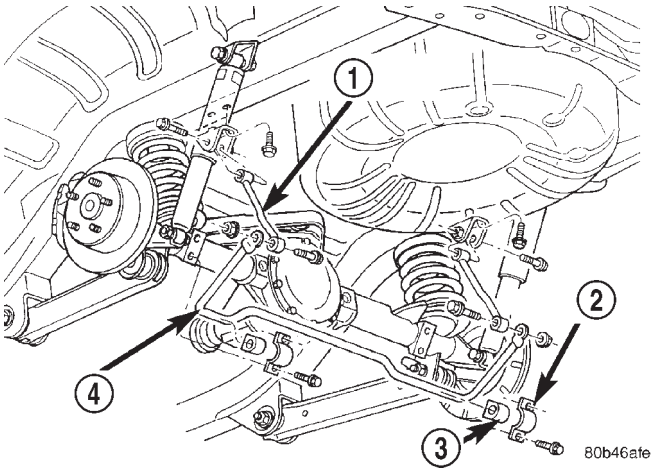


Fig. 7 Rear Stabilizer Bar

1 - LINK
2 - RETAINER
3 - BUSHING
4 - STABILIZER BAR

STABILIZER BAR

DESCRIPTION

The stabilizer bar extends across the back side of the rear axle. Links are connected between the bar and frame rail brackets. The stabilizer bar and links are isolated by rubber bushings.

OPERATION

The stabilizer bar is used to control vehicle body roll, during turns. The bar helps control the vehicle body in relationship to the suspension.

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the stabilizer bar links from stabilizer bar and frame mount. (Fig. 7).
(3) Remove the stabilizer bar retainer bolts.
(4) Remove the stabilizer bar.

INSTALLATION

(1) Position the stabilizer bar on the axle and install the retainers and bolts. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 54 N·m (40 ft. lbs.).
(2) Install the links to the stabilizer bar and frame brackets.
(3) Tighten the nuts at the stabilizer bar to 54 N·m (40 ft. lbs.).
(4) Tighten the nuts at the frame brackets to 92 N·m (68 ft. lbs.).
(5) Remove support and lower the vehicle.

UPPER BALL JOINT

DESCRIPTION - UPPER SUSPENSION ARM, BUSHINGS, AND BALL JOINT

The suspension arm uses vertical spool bushings to isolate road noise. The suspension arm is bolted through bushings to cage nuts in the body and a ball joint plate to the top of the differential housing.

OPERATION - UPPER SUSPENSION ARM, BUSHINGS, AND BALL JOINT

The upper suspension arm provides fore/aft and lateral location of the rear axle. The suspension arm travel is limited through the use of jounce bumpers in compression and shock absorbers in rebound.

REMOVAL

(1) Raise and support the vehicle.
(2) Support the rear axle with a hydraulic jack.
(3) Remove the ball joint nut from the top of the upper suspension arm (Fig. 8).
(4) Separate ball joint from the arm with Remover 8278 (Fig. 9).

NOTE: It may be necessary to strike the upper control arm with a hammer to separate the ball joint from the arm.

(5) Remove the ball joint mounting bolts (Fig. 10)from the differential housing.
(6) Remove the ball joint from the differential housing.

UPPER BALL JOINT (Continued)

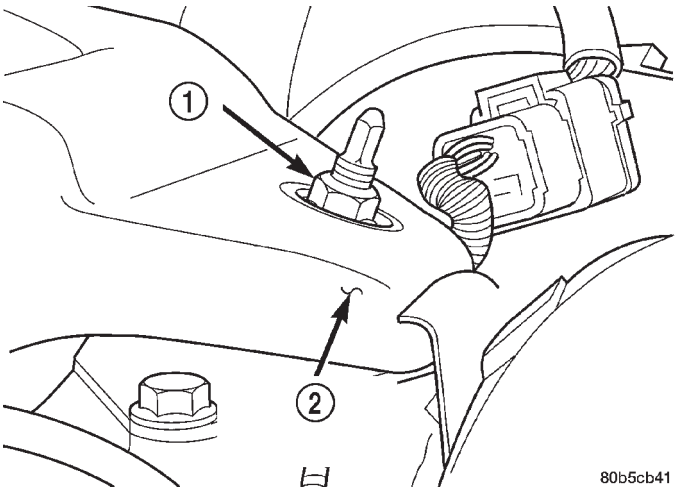


Fig. 8 Ball Joint Nut

1 - BALL JOINT NUT
2 - UPPER SUSPENSION ARM

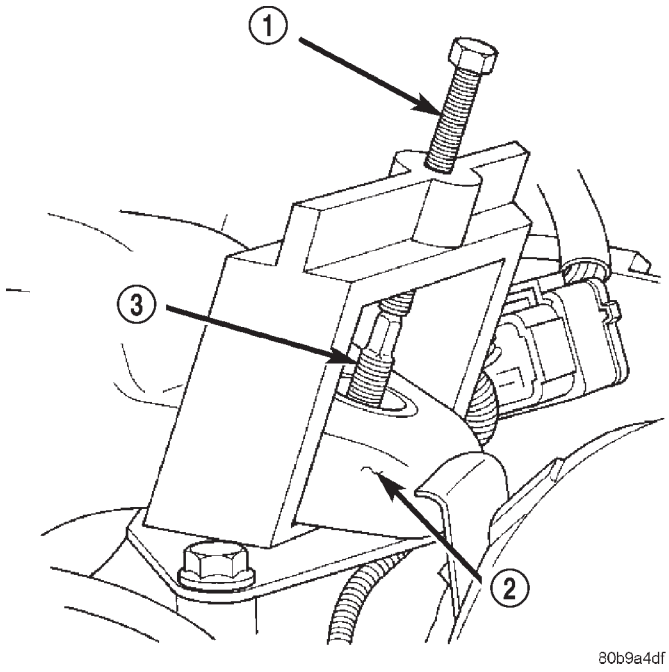


Fig. 9 Separate Ball Joint

1 - REMOVER
2 - UPPER SUSPENSION ARM
3 - BALL JOINT STUD

INSTALLATION

(1) Install the ball joint on the differential housing.

(2) Install the ball joint mounting bolts and tighten to 136 N·m (100 ft. lbs.).

(3) Raise the rear axle with a hydraulic jack to align the upper arm with the ball joint.

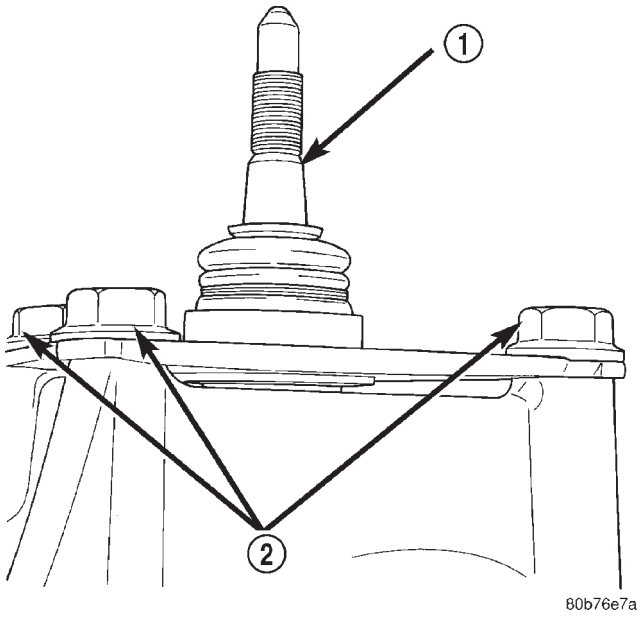


Fig. 10 Ball Joint Mounting Bolts

1 - BALL JOINT
2 - MOUNTING BOLTS

(4) Pull the arm down on the ball joint stud and install a **new** nut. Tighten the nut to 142 N·m (105 ft. lbs.).

(5) Remove the supports and lower the vehicle.

UPPER CONTROL ARM

DESCRIPTION

The suspension arm uses vertical spool bushings to isolate road noise. The suspension arm is bolted through bushings to cage nuts in the body and a ball joint plate to the top of the differential housing.

OPERATION

The upper suspension arm provides fore/aft and lateral location of the rear axle. The suspension arm travel is limited through the use of jounce bumpers in compression and shock absorbers in rebound.

REMOVAL

(1) Raise and support the vehicle.

(2) Support the rear axle with a hydraulic jack.

(3) Remove the park brake cables and brake hose from the arm (Fig. 11).

(4) Remove the ball joint nut from the top of the upper suspension arm (Fig. 12).

(5) Separate ball joint from the arm with Remover 8278 (Fig. 13).

UPPER CONTROL ARM (Continued)

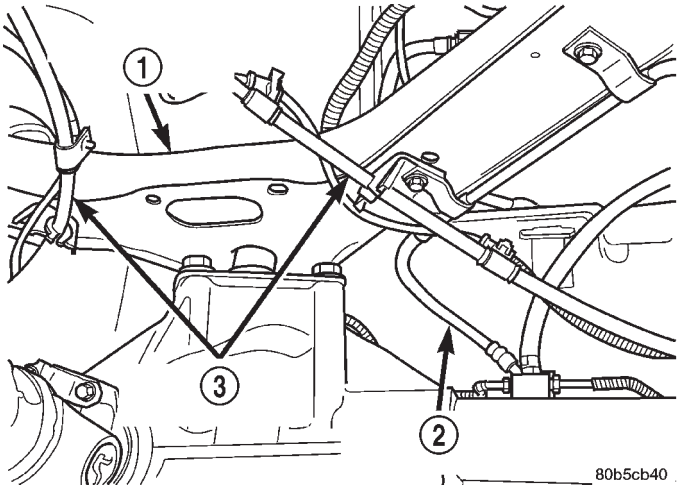


Fig. 11 Park Brake Cables And Brake Hose

1 - UPPER SUSPENSION ARM
2 - REAR BRAKE HOSE
3 - PARK BRAKE CABLES

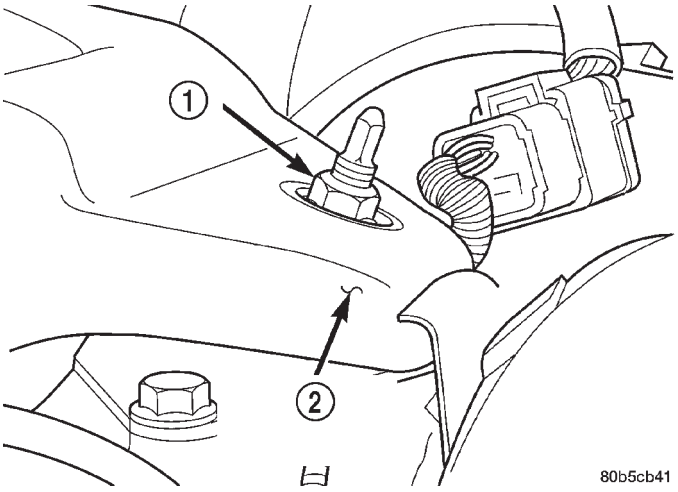


Fig. 12 Ball Joint Nut

1 - BALL JOINT NUT
2 - UPPER SUSPENSION ARM

NOTE: It may be necessary to strike the upper control arm with a hammer to separate the ball joint from the arm.

(6) Remove the upper suspension arm mounting bolts and remove the arm (Fig. 14).

INSTALLATION

(1) Position the upper suspension arm in the frame rail brackets.

(2) Install the mounting bolts and tighten to 100 N·m (74 ft. lbs.).

(3) Pull the arm down on the ball joint stud and install a **new** nut. Tighten the nut to 142 N·m (105 ft. lbs.).

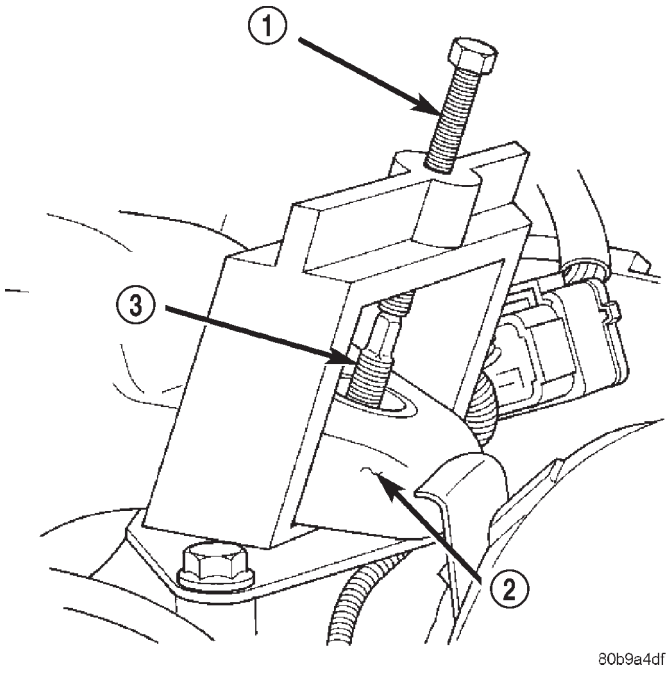


Fig. 13 Separate Ball Joint

1 - REMOVER
2 - UPPER SUSPENSION ARM
3 - BALL JOINT STUD

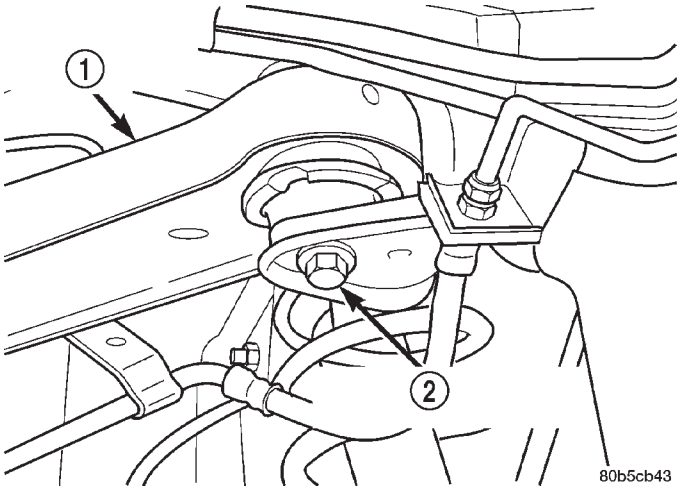


Fig. 14 Upper Suspension Arm Mounting Bolt

1 - UPPER SUSPENSION ARM
2 - MOUNTING BOLT

(4) Install the park brake cables and brake hose to the arm.

(5) Remove the supports and lower the vehicle.

DIFFERENTIAL & DRIVELINE

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PROPELLER SHAFT

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PROPELLER SHAFT

DIAGNOSIS AND TESTING

VIBRATION

Tires that are out-of-round, or wheels that are unbalanced, will cause a low frequency vibration. (Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

Brake rotors that are unbalanced will cause a harsh, low frequency vibration. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING)

Driveline vibration can also result from loose or damaged engine mounts.

Propeller shaft vibration increases as the vehicle speed is increased. A vibration that occurs within a specific speed range is not usually caused by a propeller shaft being unbalanced. Defective universal joints, or an incorrect propeller shaft angle, are usually the cause of such a vibration.

PROPELLER SHAFT (Continued)

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1) Undercoating or other foreign material on shaft.	1) Clean exterior of shaft and wash with solvent.
	2) Loose U-joint clamp screws.	2) Install new clamps and screws and tighten to proper torque.
	3) Loose or bent U-joint yoke or excessive runout.	3) Install new yoke.
	4) Incorrect driveline angularity.	4) Measure and correct driveline angles.
	5) Rear spring center bolt not in seat.	5) Loosen spring u-bolts and seat center bolt.
	6) Worn U-joint bearings.	6) Install new U-joint.
	7) Propeller shaft damaged or out of balance.	7) Installl new propeller shaft.
	8) Broken rear spring.	8) Install new rear spring.
	9) Excessive runout or unbalanced condition.	9) Re-index propeller shaft, test, and evaluate.
	10) Excessive drive pinion gear shaft runout.	10) Re-index propeller shaft and evaluate.
	11) Excessive axle yoke deflection.	11) Inspect and replace yoke if necessary.
	12) Excessive transfer case runout.	12) Inspect and repair as necessary.
Universal Joint Noise	1) Loose U-joint clamp screws.	1) Install new clamps and screws and tighten to proper torque.
	2) Lack of lubrication.	2) Replace U-joints as necessary.

BALANCE

NOTE: Removing and re-indexing the propeller shaft 180° relative to the yoke may eliminate some vibrations.

If propeller shaft is suspected of being unbalanced, it can be verified with the following procedure:

(1) Raise the vehicle.

(2) Clean all the foreign material from the propeller shaft and the universal joints.

(3) Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**

(4) Inspect the universal joints to ensure that they are not worn, are properly installed, and are correctly aligned with the shaft.

(5) Check the universal joint clamp screws torque.

(6) Remove the wheels and tires. Install the wheel lug nuts to retain the brake drums or rotors.

(7) Mark and number the shaft six inches from the yoke end at four positions 90° apart.

(8) Run and accelerate the vehicle until vibration occurs. Note the intensity and speed the vibration occurred. Stop the engine.

(9) Install a screw clamp at position 1 (Fig. 1).

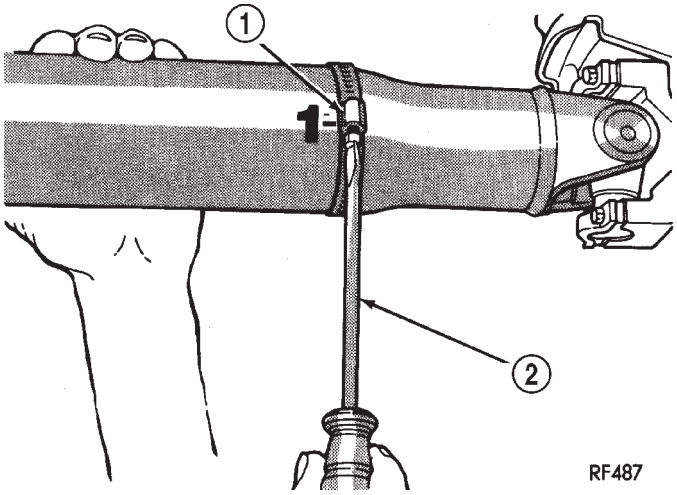


Fig. 1 CLAMP SCREW - POSITION 1

1 - CLAMP
2 - SCREWDRIVER

PROPELLER SHAFT (Continued)

(10) Start the engine and re-check for vibration. If there is little or no change in vibration, move the clamp to one of the other three positions. Repeat the vibration test.

(11) If there is no difference in vibration at the other positions, the source of the vibration may not be propeller shaft.

(12) If the vibration decreased, install a second clamp (Fig. 2) and repeat the test.

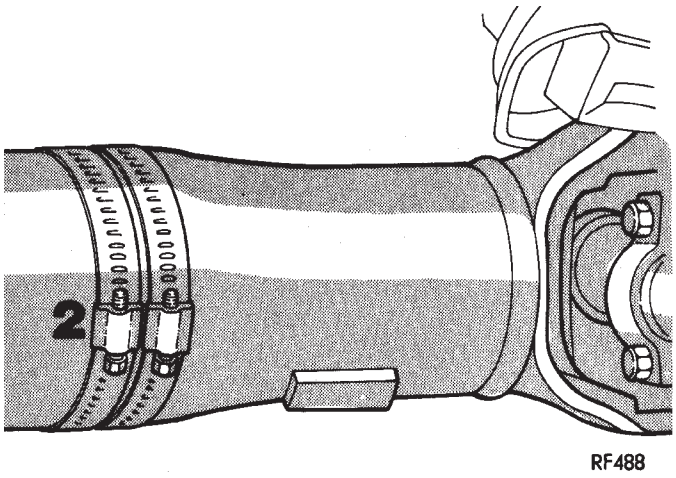


Fig. 2 TWO CLAMP SCREWS

(13) If the additional clamp causes an additional vibration, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 3).

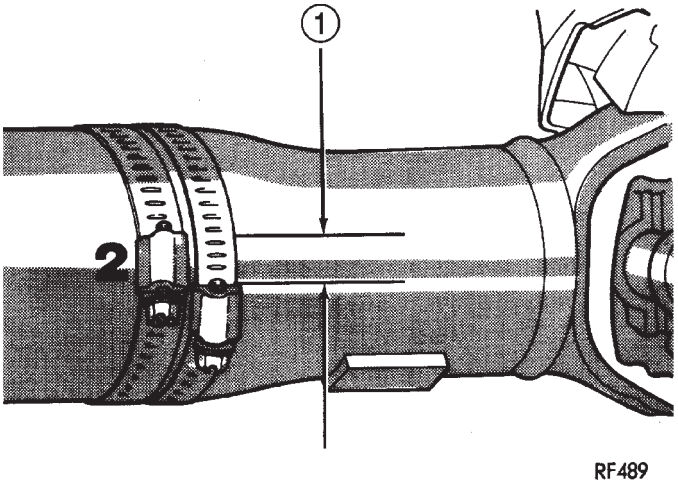


Fig. 3 CLAMP SCREWS SEPARATED

1 - ½ INCH

(14) Increase distance between the clamp screws and repeat the test until the amount of vibration is at the lowest level. Bend the slack end of the clamps so the screws will not loosen.

(15) If the vibration remains unacceptable, apply the same steps to the front end of the propeller shaft.

(16) Install the wheel and tires. Lower the vehicle.

RUNOUT

(1) Remove dirt, rust, paint, and undercoating from the propeller shaft surface where the dial indicator will contact the shaft.

(2) The dial indicator must be installed perpendicular to the shaft surface.

(3) Measure runout at the center and ends of the shaft sufficiently far away from weld areas to ensure that the effects of the weld process will not enter into the measurements.

(4) Refer to Runout Specifications chart.

(5) If the propeller shaft runout is out of specification, remove the propeller shaft, index the shaft 180°, and re-install the propeller shaft. Measure shaft runout again.

(6) If the propeller shaft runout is now within specifications, mark the shaft and yokes for proper orientation.

(7) If the propeller shaft runout is not within specifications, verify that the runout of the transmission/transfer case and axle are within specifications. Correct as necessary and re-measure propeller shaft runout.

(8) Replace the propeller shaft if the runout still exceeds the limits.

RUNOUT SPECIFICATIONS

Front of Shaft	0.020 in. (0.50 mm)
Center of Shaft	0.025 in. (0.63 mm)
Rear of Shaft	0.020 in. (0.50 mm)
note: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. For tube lengths under 30 inches, the maximum allowed runout is 0.020 in. (0.50 mm) for the full length of the tube.	

STANDARD PROCEDURES

This procedure applies to both the front propeller shafts and the rear propeller shaft. To obtain the front (output) angle on the C/V front propeller shaft, the inclinometer is placed on the machined ring of the pinion flange. To obtain the propeller shaft angle measurement on the C/V front propeller shaft, the inclinometer is placed on the propeller shaft tube.

PROPELLER SHAFT ANGLE

(1) Raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn.

(2) Remove any external bearing snap rings from universal joint if equipped, so the inclinometer base will sits flat.

PROPELLER SHAFT (Continued)

(3) Rotate the shaft until transmission/transfer case output yoke bearing cap is facing downward, if necessary.

NOTE: Always make measurements from front to rear.

(4) Place Inclinometer on yoke bearing cap, or the pinion flange ring, (A) parallel to the shaft (Fig. 4). Center bubble in sight glass and record measurement.

NOTE: This measurement will give you the transmission or Output Yoke Angle (A).

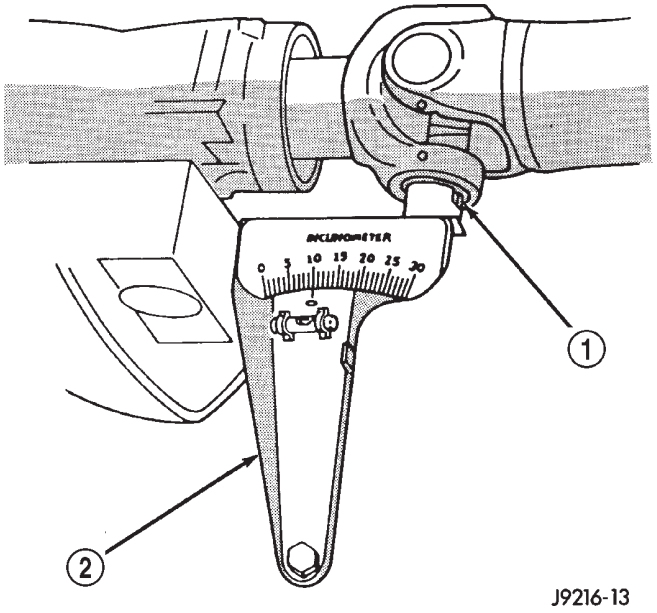


Fig. 4 OUTPUT YOKE ANGLE (A)

1 - SLIP YOKE BEARING CAP
2 - INCLINOMETER

(5) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap, or propeller shaft tube on C/V propeller shaft, parallel to the shaft (Fig. 5). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

NOTE: This measurement will give you the propeller shaft angle (C).

(6) Subtract smaller figure from larger (C minus A) to obtain transmission output operating angle.

(7) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing cap parallel to the shaft (Fig. 6). Center bubble in sight glass and record measurement.

NOTE: This measurement will give you the pinion shaft or input yoke angle (B).

(8) Subtract smaller figure from larger (C minus B) to obtain axle Input Operating Angle.

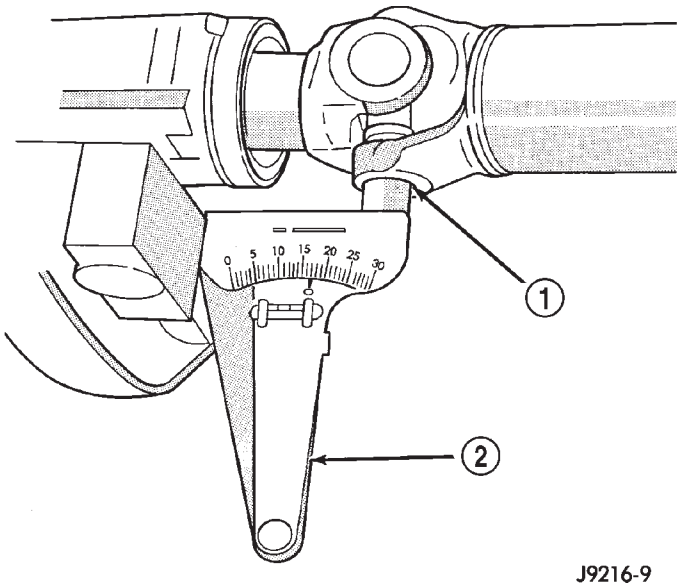


Fig. 5 PROPELLER SHAFT ANGLE (C)

1 - SHAFT YOKE BEARING CAP
2 - INCLINOMETER

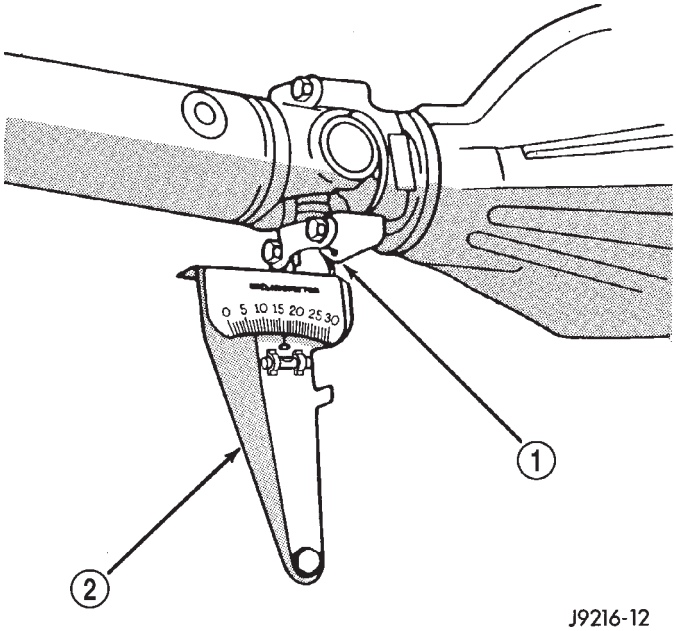


Fig. 6 INPUT YOKE ANGLE (B)

1 - PINION YOKE BEARING CAP
2 - INCLINOMETER

Refer to rules given below and the example in (Fig. 7) for additional information.

- Good cancellation of U-joint operating angles (within 1°).
- Operating angles less than 3°.
- Operating angles less than 10° for double cardan U-joint.
- At least 1/2 of one degree continuous operating (propeller shaft) angle.

PROPELLER SHAFT (Continued)

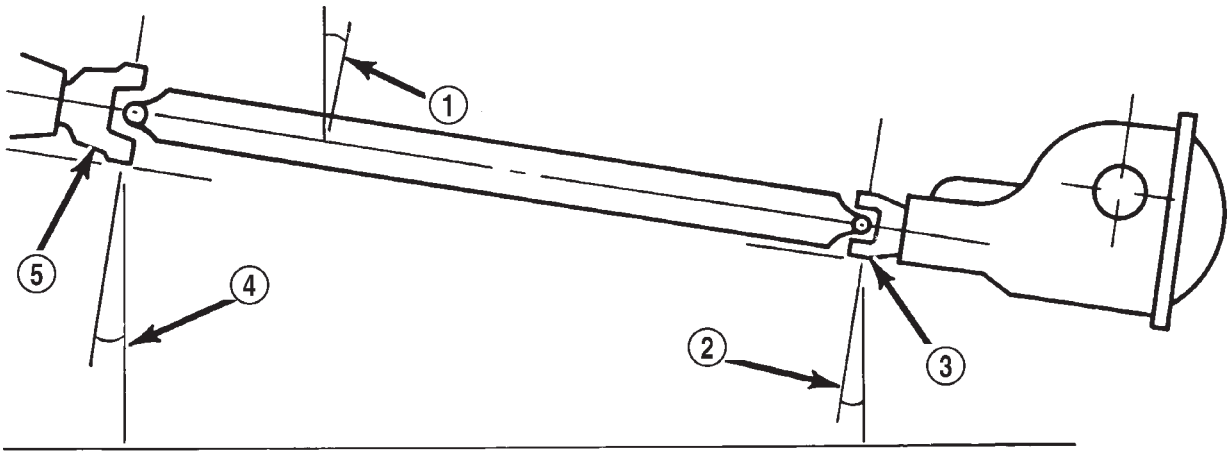


Fig. 7 U-JOINT ANGLE EXAMPLE

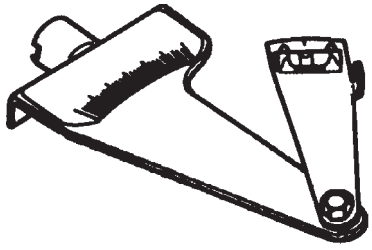
1 - 4.9° Angle (C)
2 - 3.2° Angle (B)
3 - Input Yoke
4 - 3.0° Angle (A)
5 - Output Yoke

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front Shaft - Companion Flange Bolts	32	24	-
4.7L Front Shaft - Axle Yoke Nuts	19	14	-
4.7L Front Shaft - Transfer Case Bolts	27	20	-
Rear Shaft - Yoke Nuts	19	14	-

SPECIAL TOOLS



Inclinometer 7663

PROPELLER SHAFT - FRONT

REMOVAL

NOTE: Different length propeller shafts are used for different drivetrain applications. Ensure that the correct propeller shaft is used.

(1) Place vehicle on floor or drive-on hoist with full weight of vehicle on suspension.
(2) Shift the transmission and transfer case, if necessary, into the Neutral position.
(3) Measure the distance from the face of the C/V joint cup to the end of the C/V joint boot (Fig. 8).

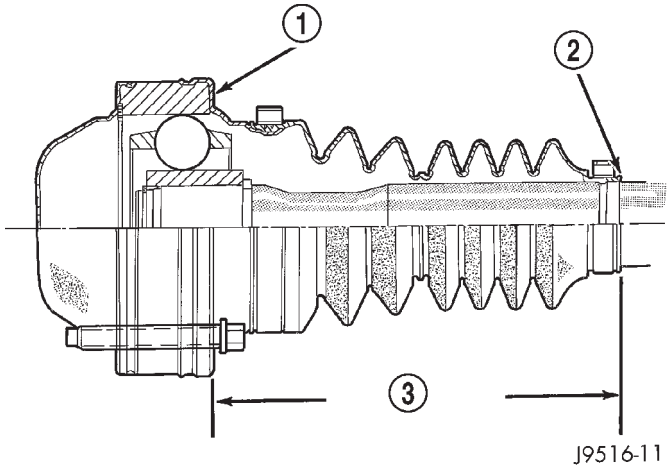


Fig. 8 MEASUREMENT

1 - C/V JOINT CUP
2 - C/V BOOT END
3 - MEASUREMENT

(4) The correct length is 142.7 mm (5.61 in.).

NOTE: If the measurement is not correct, the wrong shaft may have been installed or a mating component (front axle or transfer case) may be installed incorrectly. Investigate and correct as necessary.

(5) Mark a line across the companion flange at the transfer case and C/V joint at the rear of the front propeller shaft for installation reference.
(6) Mark a line across the C/V joints and the pinion companion flanges for installation reference.
(7) Remove bolts from the front C/V joint to the pinion companion flange.
(8) Remove bolts from the rear C/V joint to the transfer case companion flange.
(9) Push the propeller shaft forward to clear transfer case companion flange and remove the shaft.

INSTALLATION

NOTE: Different length propeller shafts are used for different drivetrain applications. Ensure that the correct propeller shaft is used.

(1) Install the shaft between companion flanges.
(2) The shaft should rotate freely in the pinion flange.
(3) Align marks on the companion flanges with the marks on the C/V joints.
(4) Install bolts to the front C/V joint and tighten bolts to 32 N·m (24 ft. lbs.).
(5) Install the bolts to the rear C/V joint and tighten bolts to 32 N·m (24 ft. lbs.).
(6) Verify propeller shaft length.
(7) Lower vehicle.

PROPELLER SHAFT - FRONT 4.7L

REMOVAL

(1) Raise and support vehicle.
(2) Remove crossmember/skid plate as necessary to gain access to the propeller shaft.
(3) Shift transmission and transfer case, if necessary into Neutral.
(4) Mark a line across the yoke at the transfer case, link yoke and propeller shaft yoke at the rear of the front propeller shaft for installation reference (Fig. 9).
(5) Mark a line across the propeller shaft yoke and pinion shaft yoke for installation reference.

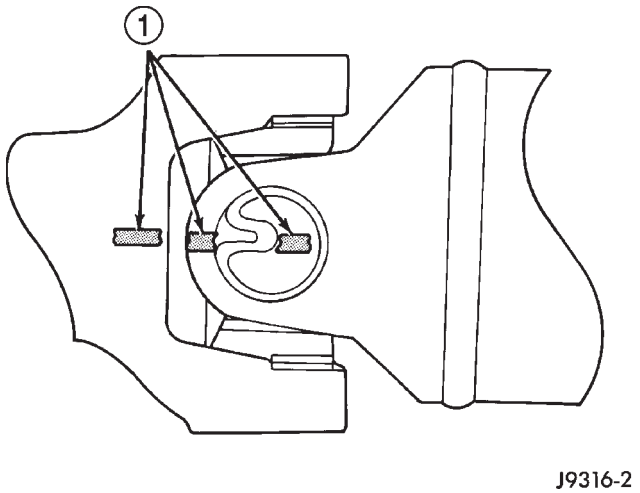


Fig. 9 REFERENCE MARKS ON YOKES

1 - REFERENCE MARKS

PROPELLER SHAFT - FRONT 4.7L (Continued)

(6) Remove the U-joint strap bolts at the pinion shaft yoke (Fig. 10).

(7) Remove bolts holding rear universal joint to the transfer case yoke.

(8) Separate the rear universal joint from the transfer case yoke.

(9) Push rear of propeller shaft upward to clear transfer case yoke.

(10) Separate front universal joint from front axle.

(11) Separate propeller shaft from vehicle.

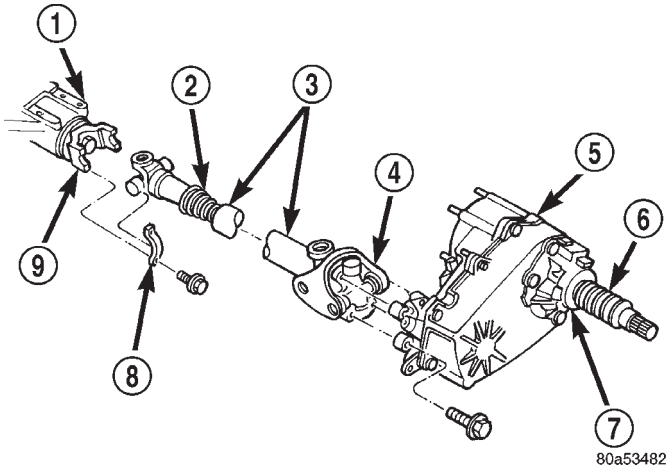


Fig. 10 FRONT PROPELLER SHAFT - 4.7L

1 - FRONT AXLE
2 - BOOT
3 - PROPELLER SHAFT
4 - DOUBLE CARDAN U-JOINT
5 - TRANSFER CASE
6 - BOOT
7 - SLINGER
8 - CLAMP
9 - YOKE

INSTALLATION

(1) Position front propeller shaft under vehicle with rear universal joint over the transfer case yoke.

(2) Place front universal joint into the axle pinion yoke.

(3) Align mark on the rear link yoke and universal joint to the mark on the transfer case yoke.

(4) Loosely install bolts to hold universal joint to transfer case yoke.

(5) Align mark on front universal joint to the mark on the axle pinion yoke.

(6) Tighten the U-joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.).

(7) Tighten the universal joint to transfer case bolts to 27 N·m (20 ft. lbs.).

(8) Lower the vehicle.

PROPELLER SHAFT - REAR

REMOVAL

(1) Raise and support vehicle on safety stands.

(2) Shift the transmission and transfer case if necessary, to their neutral positions.

(3) Mark a line across the axle pinion yoke and the propeller shaft yoke for installation reference.

(4) Remove the bolts holding the universal joint clamps to the pinion yoke.

(5) Slide the slip yoke off of the transmission, or transfer case, output shaft and remove the propeller shaft (Fig. 11).

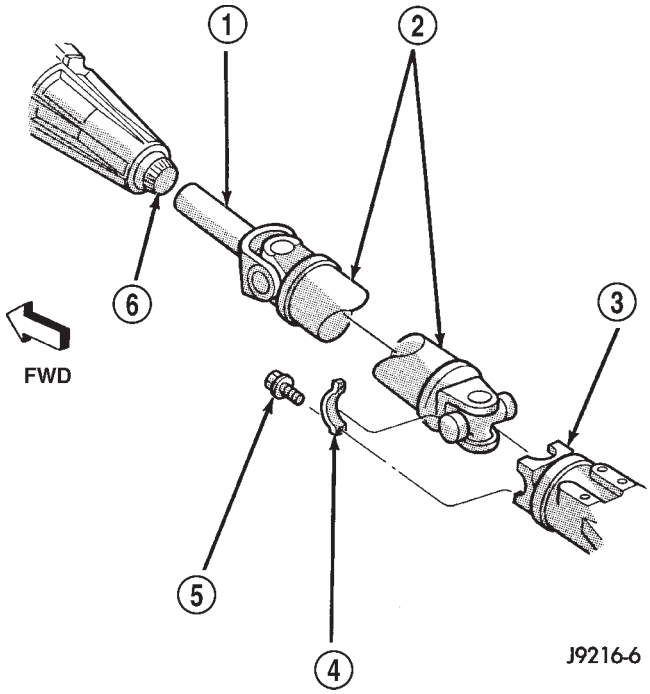


Fig. 11 REAR PROPELLER SHAFT

1 - SLIDING YOKE
2 - PROPELLER SHAFT
3 - PINION YOKE
4 - CLAMP/STRAP
5 - BOLT
6 - OUTPUT SHAFT

INSTALLATION

(1) Slide the slip yoke on the transmission, or transfer case, output shaft.

(2) Align the installation reference marks made on the propeller shaft and pinion yoke.

(3) Position universal joint into pinion yoke.

(4) Install the universal joint clamp and clamp bolts to the pinion yoke. Tighten bolts to 19 N·m (14 ft. lbs.).

(5) Lower the vehicle.

SINGLE CARDAN UNIVERSAL JOINTS

DISASSEMBLY

NOTE: Individual components of cardan universal joints are not serviceable. If worn or leaking, they must be replaced as an assembly.

(1) Remove the propeller shaft.
(2) Tap the outside of the bearing cap assembly with a drift to loosen snap ring.
(3) Remove snap rings from both sides of yoke (Fig. 12).

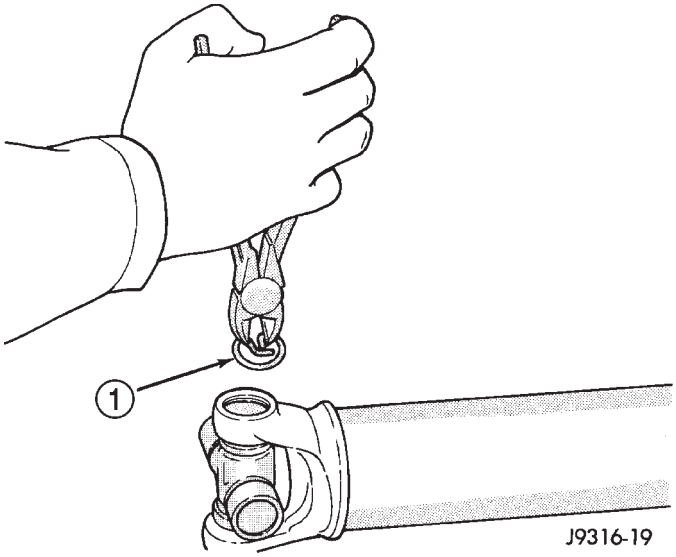


Fig. 12 REMOVE SNAP RING

1 - SNAP RING

(4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.
(5) Position the yoke with the grease fitting, if equipped, pointing up.
(6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 13).
(7) If the bearing cap will not pull out of the yoke by hand after pressing, tap the yoke ear near the bearing cap to dislodge the cap.
(8) To remove the opposite bearing cap, turn the yoke over and straighten the cross in the open hole. Then, carefully press the end of the cross until the remaining bearing cap can be removed (Fig. 14).

CAUTION: If the cross or bearing cap are not straight during installation, the bearing cap will score the walls of the yoke bore and damage can occur.

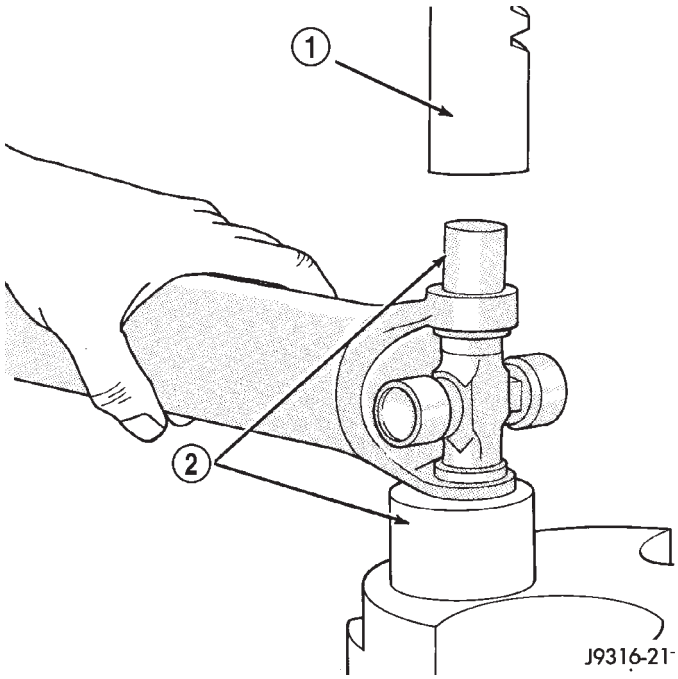


Fig. 13 PRESS OUT BEARING

1 - PRESS
2 - SOCKET

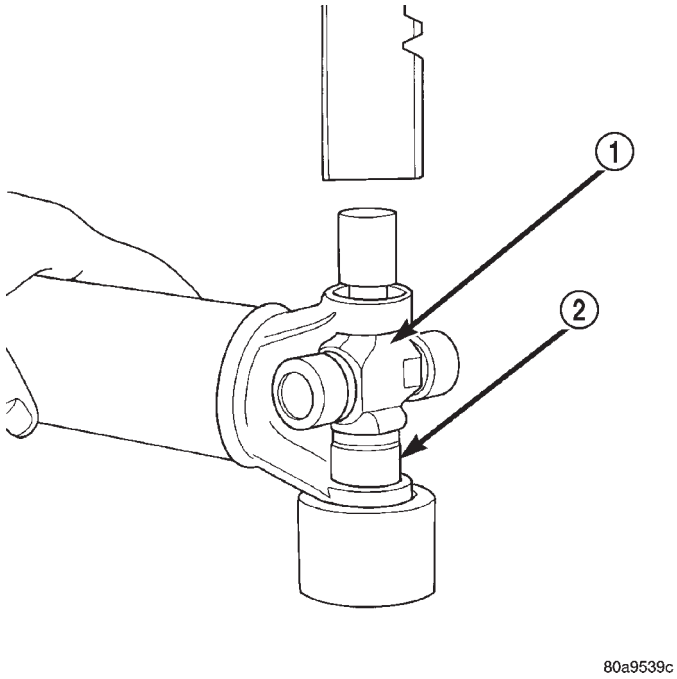


Fig. 14 PRESS OUT REMAINING BEARING

1 - CROSS
2 - BEARING CAP

SINGLE CARDAN UNIVERSAL JOINTS (Continued)

ASSEMBLY

(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores.

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 15).

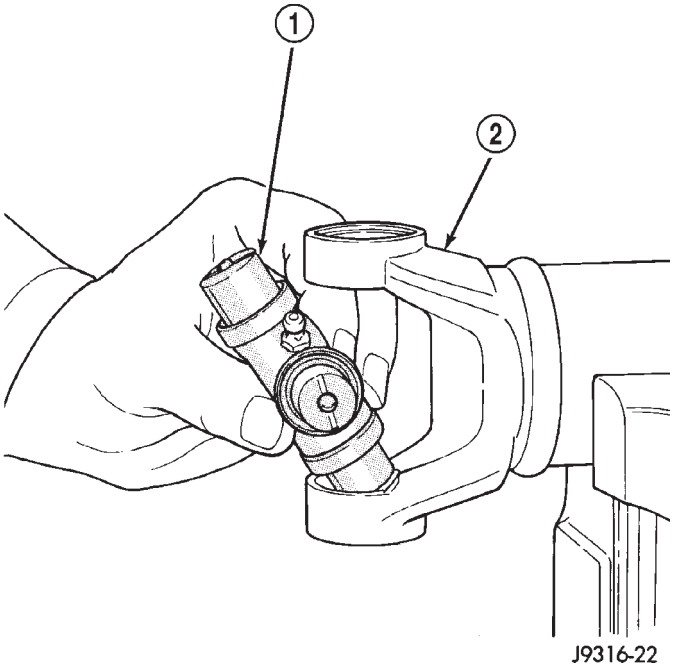


Fig. 15 CROSS IN YOKE

1 - CROSS
2 - YOKE

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 16). Keep the needle bearings upright in the bearing cap.

(4) Press the bearing cap into the yoke bore enough to clear snap ring groove.

(5) Install a snap ring.

(6) Repeat Step 3 and Step 4 to install the opposite bearing cap.

NOTE: If the joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

(7) Add grease to lube fitting, if equipped.

(8) Install the propeller shaft.

DOUBLE CARDAN UNIVERSAL JOINTS

DISASSEMBLY

NOTE: Individual components of cardan universal joints are not serviceable they must be replaced as an assembly.

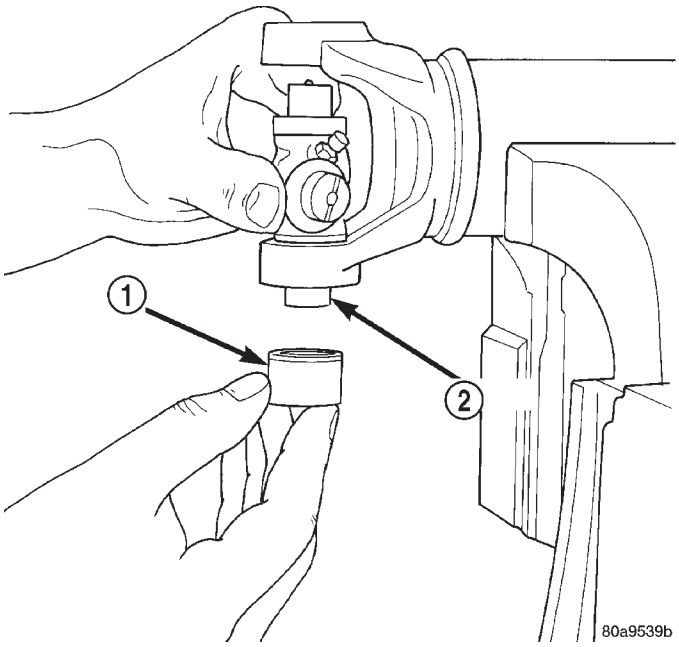


Fig. 16 INSTALL BEARING ON TRUNNION

1 - BEARING CAP
2 - TRUNNION

(1) Remove the propeller shaft.

(2) Mark the propeller shaft yoke and link yoke for assembly reference.

(3) Tap the outside of the bearing cap assembly with drift to loosen snap rings.

(4) Remove all the bearing cap snap rings (Fig. 17).

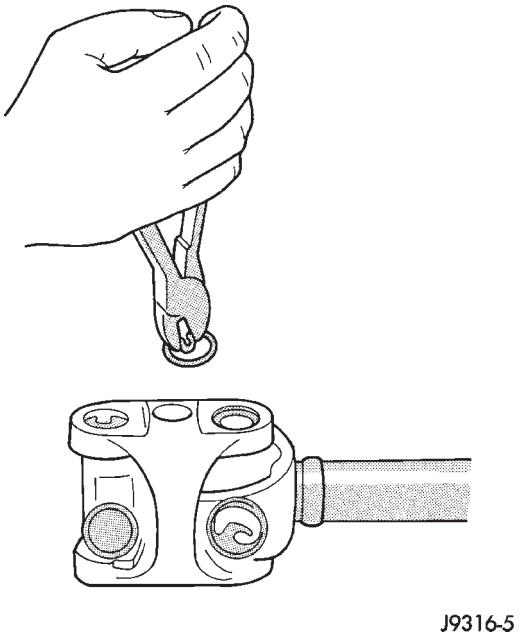


Fig. 17 SNAP RINGS

DOUBLE CARDAN UNIVERSAL JOINTS (Continued)

(5) Remove any grease fittings if equipped.

(6) Position a socket on the press with an inside diameter large enough to receive the bearing cap under the link yoke.

(7) Place another socket with an outside diameter smaller than the bearing cap on the upper bearing cap.

(8) Press one bearing cap from the outboard side of the link yoke enough to grasp the cap with vise jaws (Fig. 18).

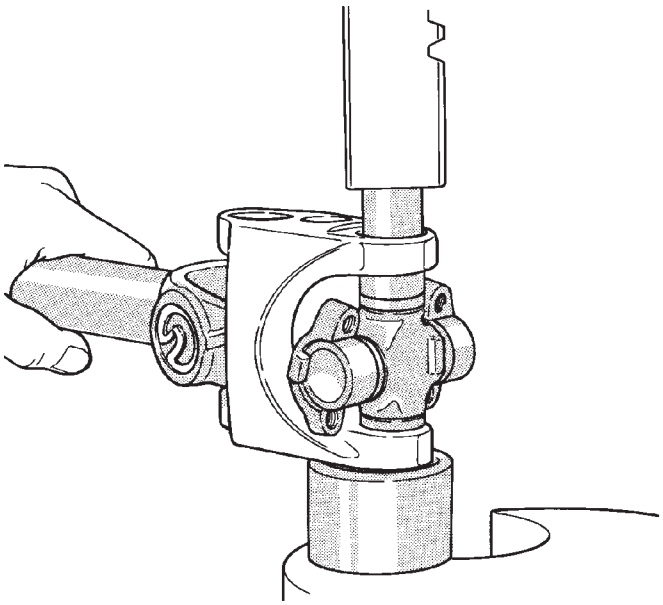


Fig. 18 PRESS OUT BEARING

(9) Grasp protruding bearing cap with vise jaws and tap link yoke with a mallet and drift to remove bearing cap (Fig. 19).

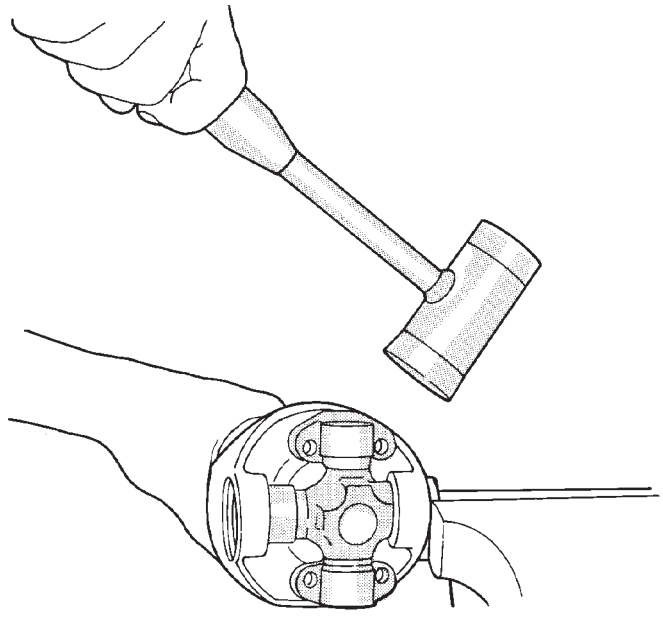


Fig. 19 REMOVE BEARING FROM YOKE

(10) Flip assembly and repeat Step 6, Step 7, Step 8 and Step 9 to remove the opposite bearing cap.

(11) Remove the cross centering kit assembly and spring (Fig. 20).

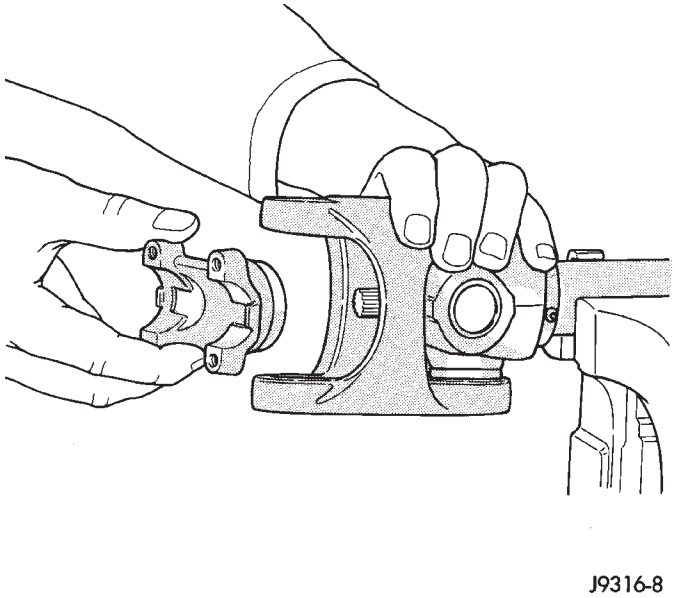


Fig. 20 REMOVE CENTERING KIT

(12) Press the remaining bearing caps out the other end of the link yoke as described above to complete the disassembly.

ASSEMBLY

CAUTION: All alignment marks on the link yoke and propeller shaft yoke must be aligned during assembled.

(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores.

(2) Fit a cross into the propeller shaft yoke (Fig. 21).

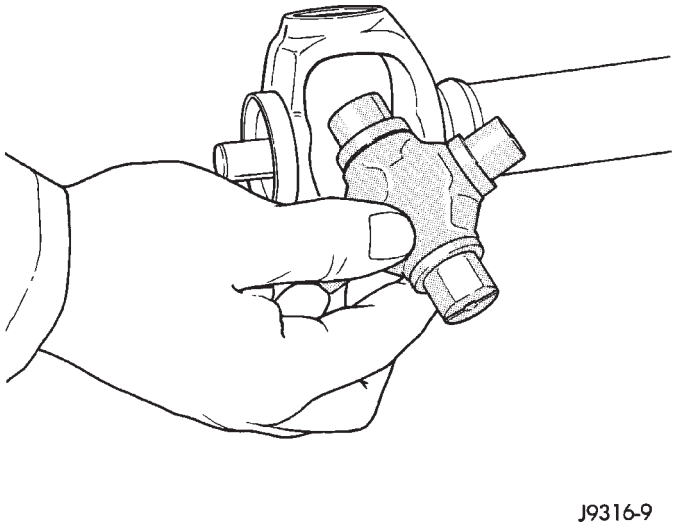


Fig. 21 INSTALL CROSS IN YOKE

DOUBLE CARDAN UNIVERSAL JOINTS (Continued)

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 22). Keep needle bearings upright in the bearing cap.

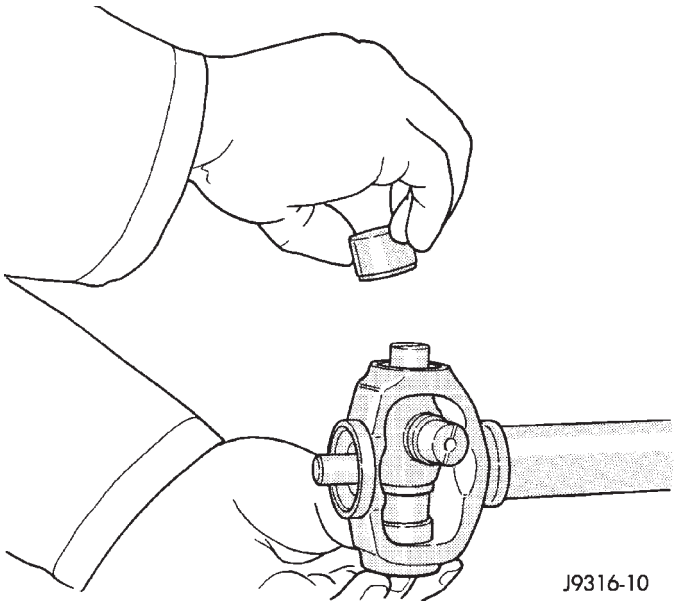


Fig. 22 INSTALL BEARING CAP

(4) Press bearing cap into the yoke bore enough to clear snap ring groove (Fig. 23).

(5) Install a snap ring.

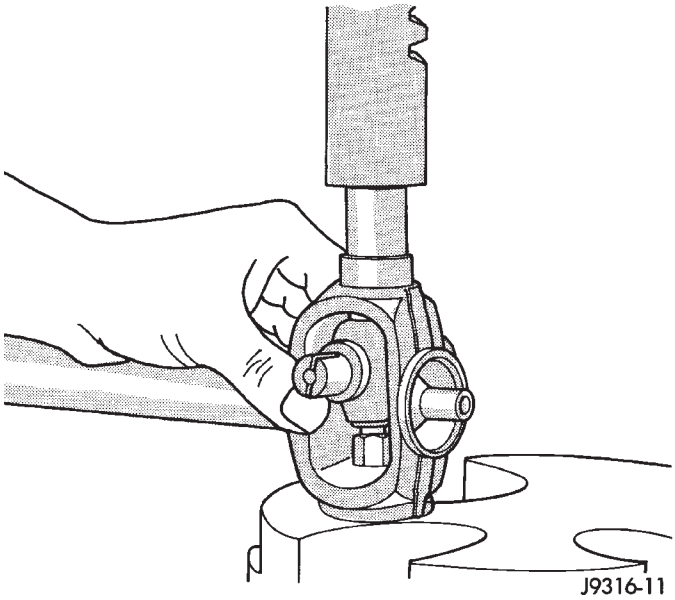


Fig. 23 PRESS BEARING CAP

(6) Flip propeller shaft yoke and install other bearing cap onto the opposite trunnion and install a snap ring (Fig. 24).

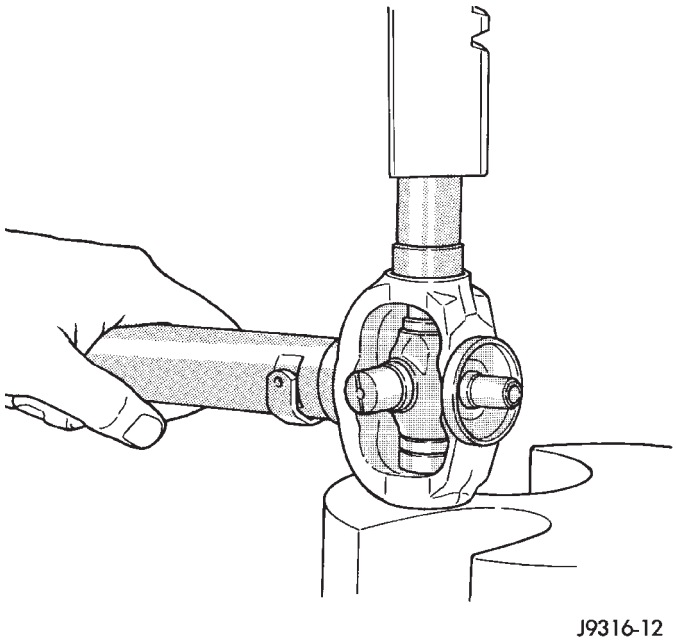


Fig. 24 PRESS BEARING CAP

(7) Fit the link yoke onto the remaining trunnions and press both bearing caps into place and install snap rings (Fig. 25).

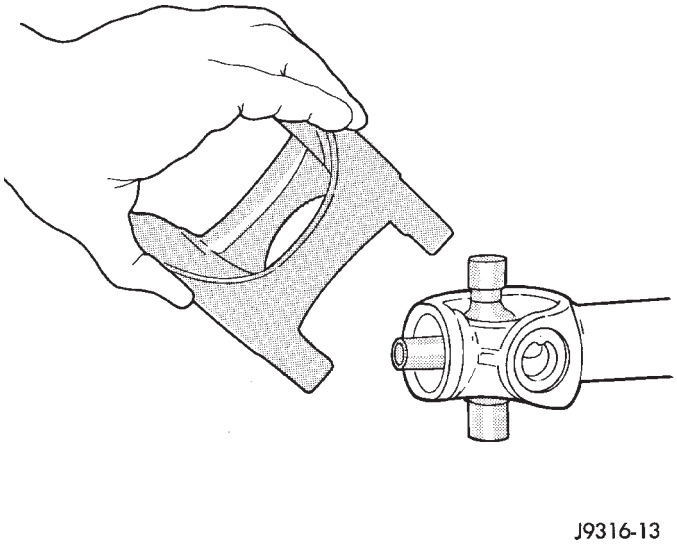


Fig. 25 INSTALL LINK YOKE

DOUBLE CARDAN UNIVERSAL JOINTS (Continued)

(8) Install centering kit assembly inside the link yoke (Fig. 26).

NOTE: Making sure the spring is properly positioned.

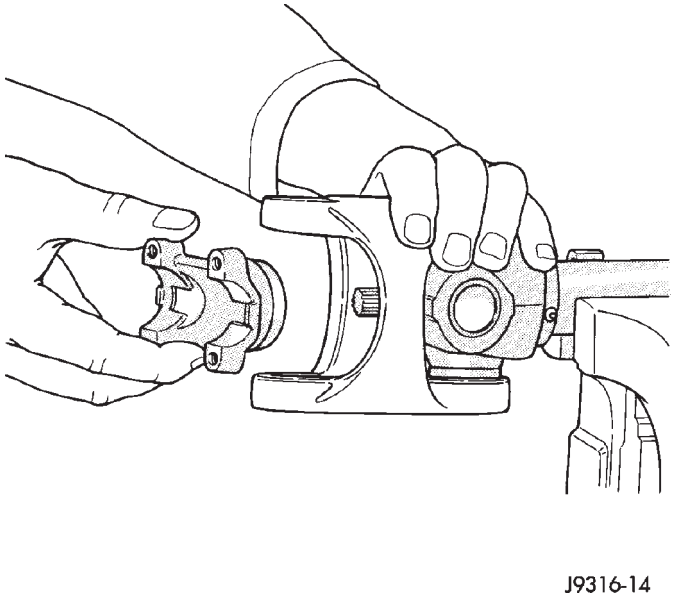


Fig. 26 CENTERING KIT

(9) Place two bearing caps on opposite trunnions of the remaining cross. Fit the open trunnions into the link yoke bores and the bearing caps into the centering kit (Fig. 27).

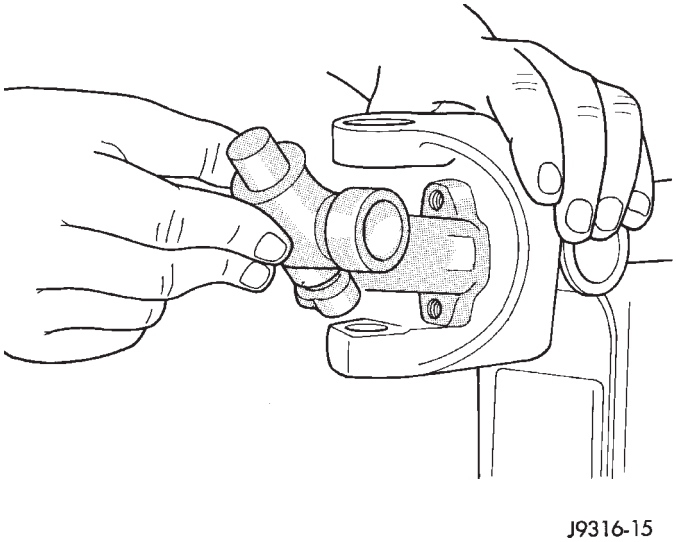


Fig. 27 REMAINING CROSS

(10) Press the remaining two bearing caps into place and install snap rings (Fig. 28).

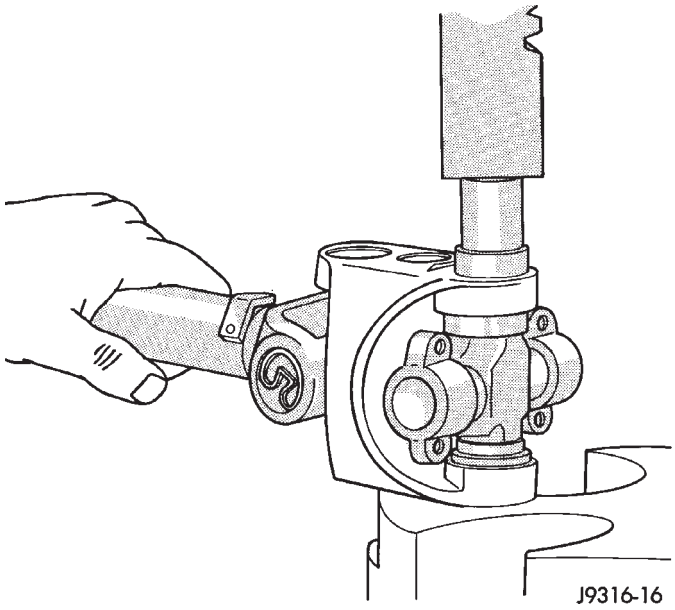


Fig. 28 PRESS BEARING CAP

(11) Tap the snap rings to seat them into the grooves (Fig. 29).

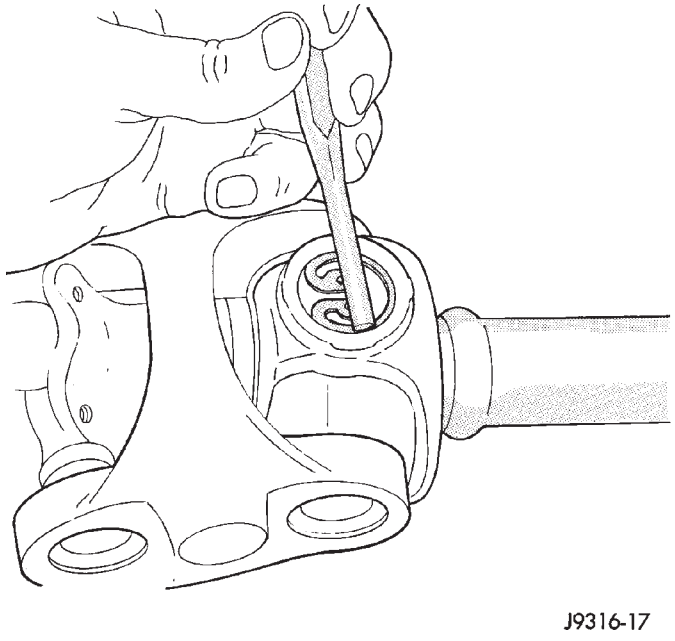


Fig. 29 SEAT SNAP RINGS

DOUBLE CARDAN UNIVERSAL JOINTS (Continued)

(12) Verify for proper assembly. Flexing the joint beyond center, the joint should snap over-center in both directions if correctly assembled (Fig. 30).

(13) Install the propeller shaft.

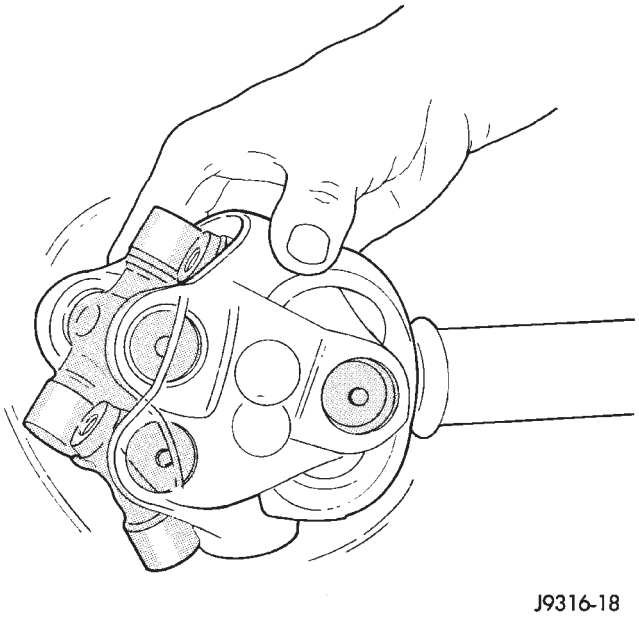


Fig. 30 VERIFY ASSEMBLY

FRONT TUBE AXLE

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FRONT TUBE AXLE

REMOVAL

(1) Raise and support the vehicle.
(2) Position a lifting device under the axle and secure axle to lift.
(3) Remove the wheels and tires.
(4) Remove the brake rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL) and calipers.
(5) Disconnect wheel sensor wiring harness from the vehicle wiring harness.
(6) Remove stabilizer bar links at the axle.
(7) Remove shock absorbers from axle brackets.
(8) Removet track bar.
(9) Remove tie rod and drag link from the steering knuckle.
(10) Remove steering damper from the axle bracket.
(11) Remove upper and lower suspension arms from the axle brackets.
(12) Lower the lift enough to remove the axle. The coil springs will drop with the axle.
(13) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners are tightened. If not at their normal ride position, ride height and handling could be affected.

(1) Install springs and retainer clips and tighten retainer bolts to 21 N·m (16 ft. lbs.).
(2) Lift and position axle under the vehicle and align it with the spring pads.
(3) Position upper and lower suspension arms in the axle brackets and loosely install bolts and nuts.
(4) Install track bar to the axle bracket and loosely install bolt.
(5) Install shock absorbers and tighten bolts to 23 N·m (17 ft. lbs.).
(6) Install stabilizer bar links to the axle brackets and tighten nuts to 95 N·m (70 ft. lbs.).
(7) Install drag link and tie rod to the steering knuckles.
(8) Install steering damper to the axle bracket and tighten nut to 75 N·m (55 ft. lbs.).
(9) Install the brake rotors and calipers.
(10) Connect wheel speed sensor wiring harness, if equipped.
(11) Install the wheel and tire assemblies.
(12) Remove lift from the axle and lower the vehicle.
(13) Tighten upper suspension arm nuts to 75 N·m (55 ft. lbs.). Tighten lower suspension arm nuts to 115 N·m (85 ft. lbs.).
(14) Tighten track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.).
(15) Check the front wheel alignment.

FRONT AXLE - 186FBI

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FRONT AXLE - 186FBI

DESCRIPTION

The Front Beam-design Iron (FBI) axle consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded. The axles are semi-floating axle shafts, meaning the loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings.

The differential case is a one-piece design. Differential bearing preload and ring gear backlash is adjusted by the use of shims located between the differential bearing cups and housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. A differential cover provides a means for inspection and servicing.

An optional Vari-Lok® differential has a one-piece differential case which contains the gerotor pump assembly and the clutch mechinism. This unit is serviced as an assembly.

OPERATION

The axle receives power from the transfer case through the front propeller shaft. The front propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

STANDARD DIFFERENTIAL

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

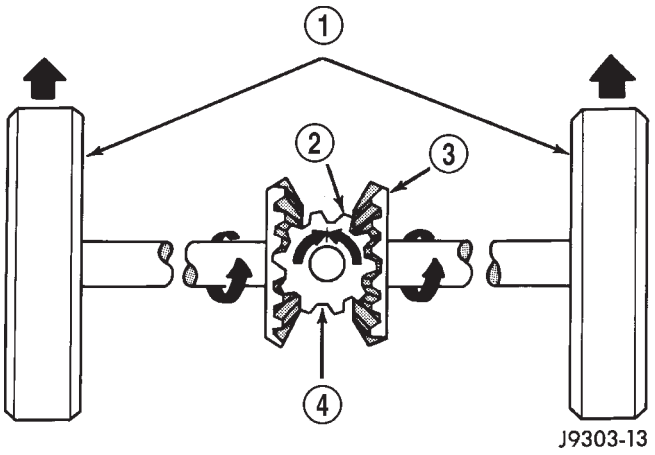


Fig. 1 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

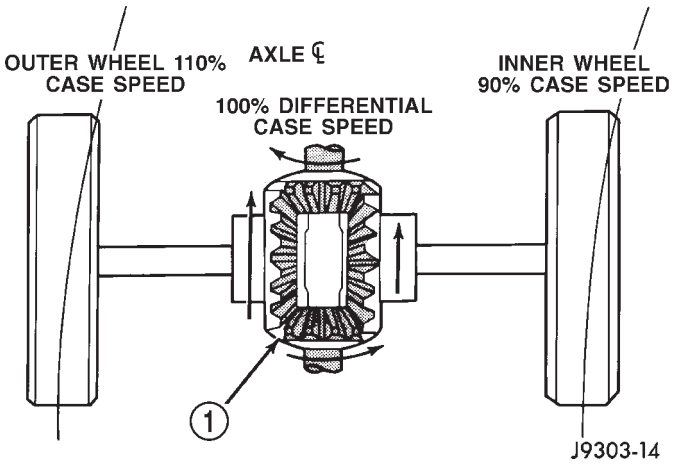


Fig. 2 DIFFERENTIAL-ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

VARI-LOK® DIFFERENTIAL

In a standard differential if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

A gerotor pump and clutch pack are used to provide the torque transfer capability. One axle shaft is splined to the gerotor pump and one of the differential side gears, which provides the input to the pump. As a wheel begins to lose traction, the speed differential is transmitted from one side of the differential to the other through the side gears. The motion of one side gear relative to the other turns the inner rotor of the pump. Since the outer rotor of the pump is grounded to the differential case, the inner and outer rotors are now moving relative to each other and therefore creates pressure in the pump. The tuning of the front and rear axle orifices and valves inside the gerotor pump is unique and each system includes a torque-limiting pressure relief valve to protect the clutch pack, which also facilitates vehicle control under extreme side-to-side traction variations. The resulting pressure is applied to the clutch pack and the transfer of torque is completed.

Under conditions in which opposite wheels are on surfaces with widely different friction characteristics, Vari-lok® delivers far more torque to the wheel on the higher traction surface than do conventional Trac-lok® systems. Because conventional Trac-lok® differentials are initially pre-loaded to assure torque transfer, normal driving (where inner and outer wheel speeds differ during cornering, etc.) produces torque transfer during even slight side-to-side speed variations. Since these devices rely on friction from this preload to transfer torque, normal use tends to cause wear that reduces the ability of the differential to transfer torque over time. By design, the Vari-lok® system is less subject to wear, remaining more consistent over time in its ability to transfer torque. The coupling assembly is serviced as a unit. From a service standpoint the coupling also benefits from using the same lubricant supply as the ring and pinion gears.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

FRONT AXLE - 186FBI (Continued)

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front–end components or engine/transmission mounts. These components can contribute to what appears to be a rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

FRONT AXLE - 186FBI (Continued)

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.

FRONT AXLE - 186FBI (Continued)

Condition	Possible Causes	Correction
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.

FRONT AXLE - 186FBI (Continued)

Condition	Possible Causes	Correction
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

VARI-LOK®

(1) Park the vehicle on a level surface or raise vehicle on hoist so that the vehicle is level.

(2) Remove the axle fill plug.

(3) Verify that the axle fluid level is correct. The fluid level is correct if the fluid is level with the bottom of the fill hole.

(4) Shift the transfer case into the 4WD full-time position.

(5) Drive the vehicle in a tight circle for 2 minutes at 5mph to fully prime the pump.

(6) Block the tires opposite the axle to be tested to prevent the vehicle from moving.

(7) Shift the transfer case into the 4WD Low position and the transmission into the Park position.

(8) Raise both the wheels of the axle to be tested off of the ground.

(9) Rotate the left wheel by hand at a minimum of one revolution per second while an assistant rotates the right wheel in the opposite direction.

(10) The left wheel should spin freely at first and then increase in resistance within 5 revolutions until the wheels cannot be continuously rotated in opposite directions.

(11) The Vari-lok® differential has engaged properly if the wheels cannot be rotated in opposite directions for a moment. After the wheels stop rotating for a moment, the fluid pressure will drop in the differential and the wheels begin to rotate once again.

(12) If the system does not operate properly, replace the Vari-lok® differential.

REMOVAL

(1) Raise and support the vehicle.

(2) Position a suitable lifting device under the axle.

(3) Secure axle to lift.

(4) Remove the wheels and tires.

(5) Remove the brake calipers and rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL) from the axle.

(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness.

(7) Disconnect the vent hose from the axle shaft tube.

(8) Mark propeller shaft and yoke/pinion flange for installation alignment reference.

(9) Remove propeller shaft.

(10) Disconnect stabilizer bar links at the axle.

(11) Disconnect shock absorbers from axle brackets.

(12) Disconnect track bar.

(13) Disconnect the tie rod and drag link from the steering knuckle.

(14) Disconnect the steering damper from the axle bracket.

(15) Disconnect the upper and lower suspension arms from the axle brackets.

(16) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.

(17) Remove the coil springs from the axle.

FRONT AXLE - 186FBI (Continued)

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.).
(2) Support the axle on a lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Install vent hose to the axle shaft tube.
(6) Install track bar in the axle bracket and install the bolt loosely.
(7) Install shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.).
(8) Install stabilizer bar links to the axle brackets and tighten the nuts to 95 N·m (70 ft. lbs.).
(9) Install drag link and tie rod to the steering knuckles.
(10) Install steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.).
(11) Install the brake rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION) and calipers.
(12) Connect the wheel speed sensor wiring harness to the vehicle wiring harness.
(13) Align the previously made marks on the propeller shaft and the yoke/pinion flange.
(14) Install propeller shaft to pinion flange bolts , if equipped.
(15) Install propeller shaft to yoke straps and bolts, if equipped.
(16) Check and fill axle lubricant.
(17) Install the wheel and tire assemblies.
(18) Remove the lifting device from the axle and lower the vehicle.
(19) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.). Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.).
(20) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.).
(21) Check the front wheel alignment.

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched onto each gear (Fig. 3). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.1 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

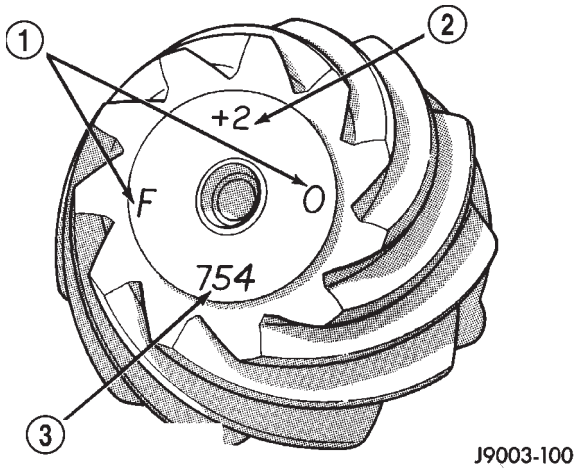


Fig. 3 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - DRIVE PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER

Compensation for pinion depth variance is achieved with a select shim/oil slinger. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 4).

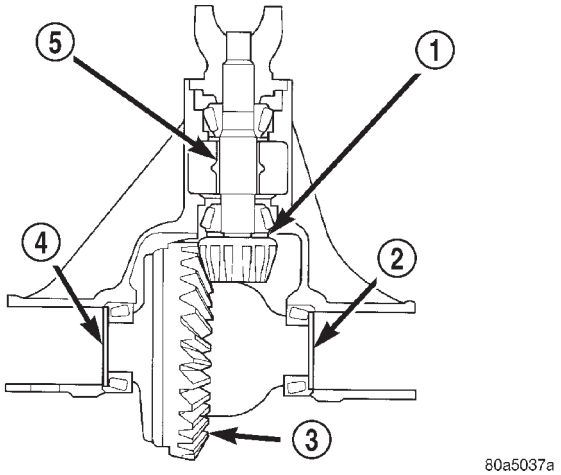


Fig. 4 ADJUSTMENT SHIM LOCATIONS

1 - PINION DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

FRONT AXLE - 186FBI (Continued)

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract this number from the thickness of the original depth shim/oil slinger to compensate for the difference in the depth variances. Refer to the Pinion Gear Depth Variance chart.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the etched number on the face of the pinion gear head (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 5).

(1) Assemble Pinion Height Block 6739, Pinion Block 8804 and rear pinion bearing onto Screw 6741 (Fig. 5).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 6).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 5).

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position, in the housing side bearing cradles (Fig. 7). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 6732 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Posttion Scooter Block/Dial Indicator so dial probe and scooter block are flush on the surface of the pinion height block (Fig. 5). Hold scooter block and zero the dial indicator.

(7) Hold scooter block against the pinion height block and slowly slide across the pinion height block to the arbor (Fig. 8). Move the scooter block till the dial probe crests the arbors and record the highest reading.

(8) Select a shim/oil slinger equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 3). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

FRONT AXLE - 186FBI (Continued)

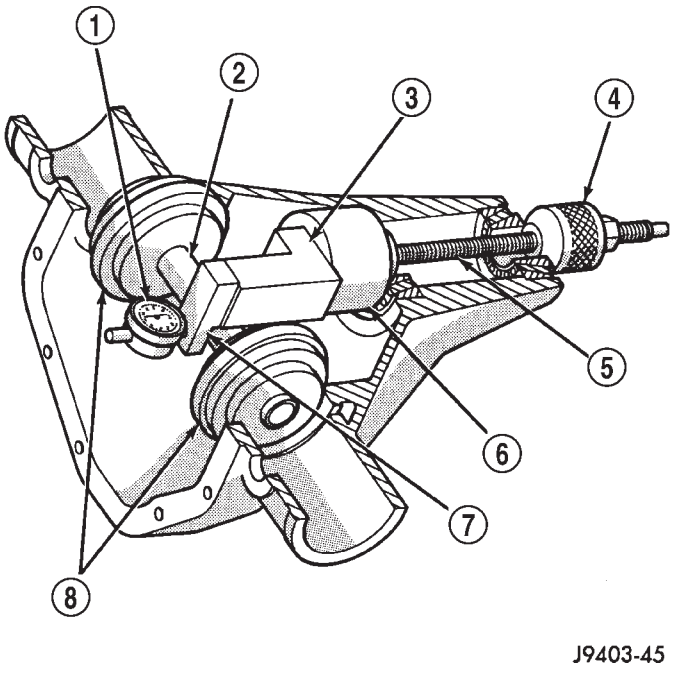


Fig. 5 PINION GEAR DEPTH TOOLS

1 - DIAL INDICATOR
2 - ARBOR
3 - PINION HEIGHT BLOCK
4 - CONE
5 - SCREW
6 - PINION BLOCK
7 - SCOOTER BLOCK
8 - ARBOR DISC

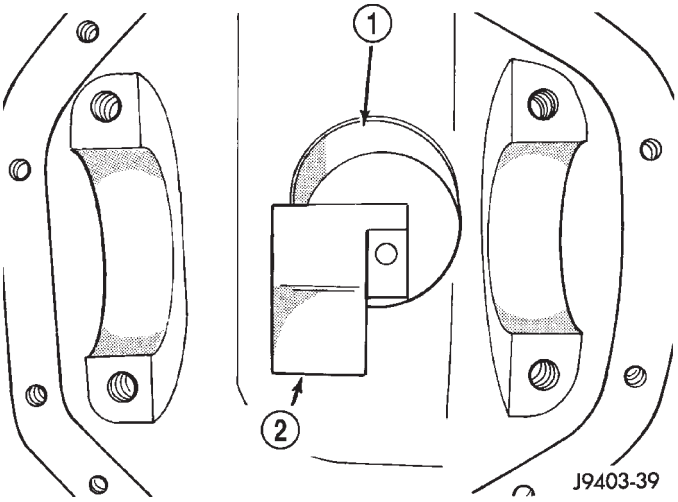


Fig. 6 PINION HEIGHT BLOCK

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

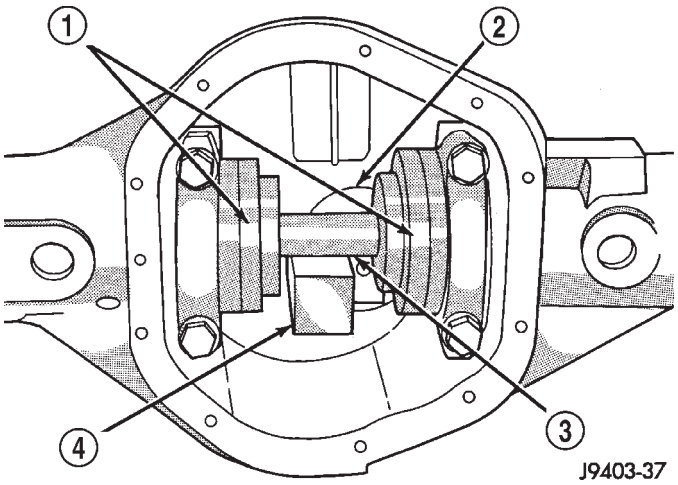


Fig. 7 GAUGE TOOLS IN HOUSING

1 - ARBOR DISC
2 - PINION BLOCK
3 - ARBOR
4 - PINION HEIGHT BLOCK

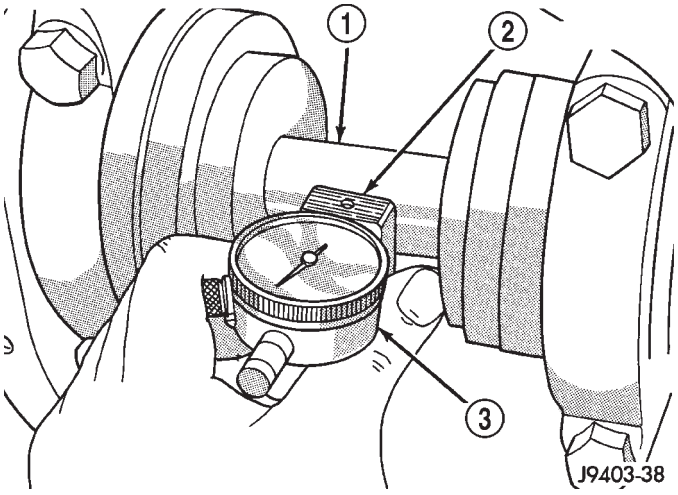


Fig. 8 PINION GEAR DEPTH MEASUREMENT

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

FRONT AXLE - 186FBI (Continued)

DIFFERENTIAL

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit Dummy Bearings D-348 in place of the differential side bearings and a Dial Indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 9). Differential shim measurements are performed with spreader W-129-B removed.

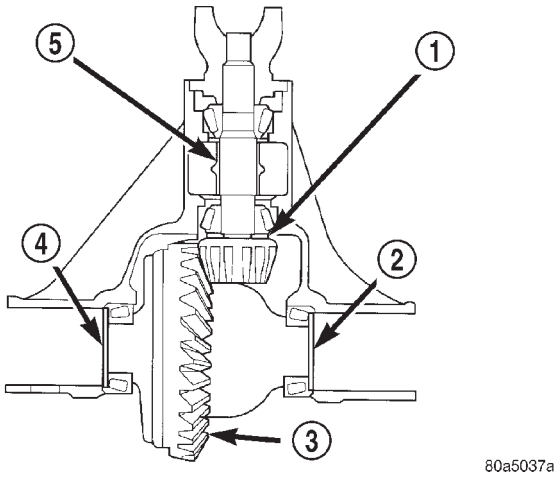


Fig. 9 ADJUSTMENT SHIM LOCATIONS

1 - PINION DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove differential side bearings from differential case.
(2) Install ring gear on differential case and tighten bolts to specification.
(3) Install dummy side bearings D-348 on differential case.
(4) Install differential case in the housing.

CAUTION: When installing a Vari-Lok® differential, the oil feed tube must point to the bottom of the housing. If differential is forced in with the oil feed towards the top, the anti-rotation tabs will be damaged.

(5) Record the thickness of Dummy Shims 8107. Insert the shims between the dummy bearings and the differential housing (Fig. 10).

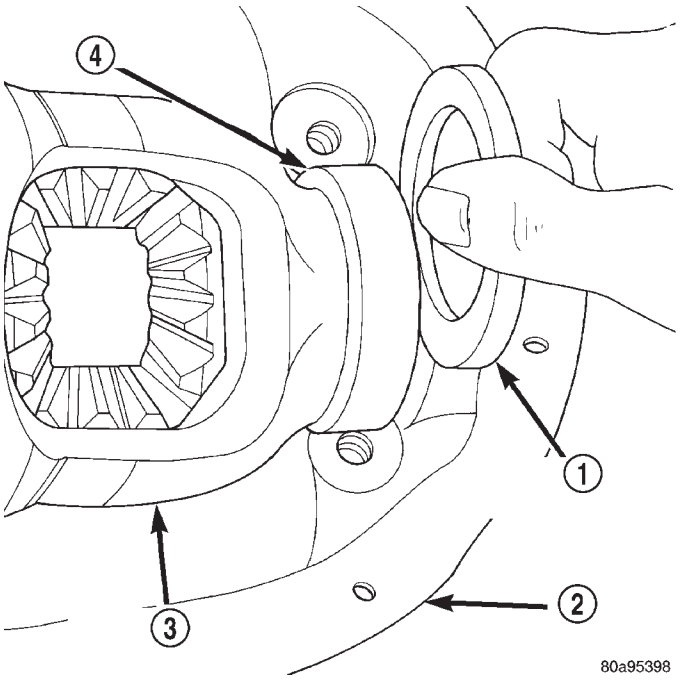


Fig. 10 DUMMY SHIM LOCATION

1 - DUMMY SHIM
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE
4 - DUMMY BEARINGS

FRONT AXLE - 186FBI (Continued)

(6) Install the bearing caps in their correct positions and snug the bolts (Fig. 11).

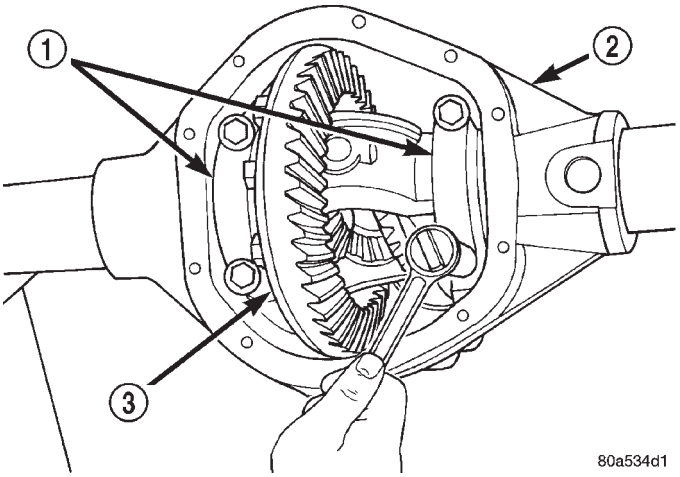


Fig. 11 BEARING CAP BOLTS

1 - BEARING CAP
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE

(7) With a dead-blow hammer, seat the differential dummy bearings to each side of the housing (Fig. 12) and (Fig. 13).

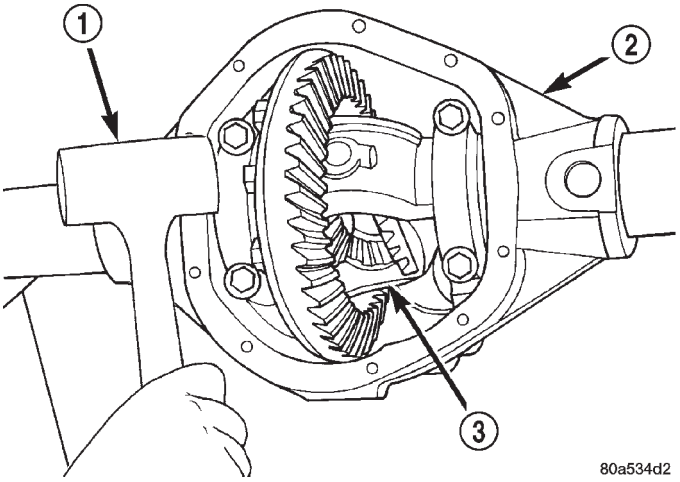


Fig. 12 SEAT DUMMY BEARING PINION SIDE

1 - HAMMER
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE

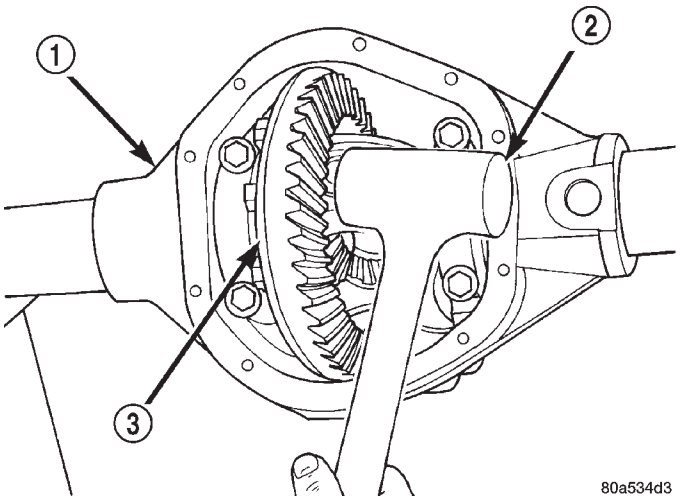


Fig. 13 SEAT DUMMY BEARING RING GEAR SIDE

1 - DIFFERENTIAL HOUSING
2 - HAMMER
3 - DIFFERENTIAL CASE

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear (Fig. 14).

(9) Attach a dial indicator C-3339 to Pilot Stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 14).

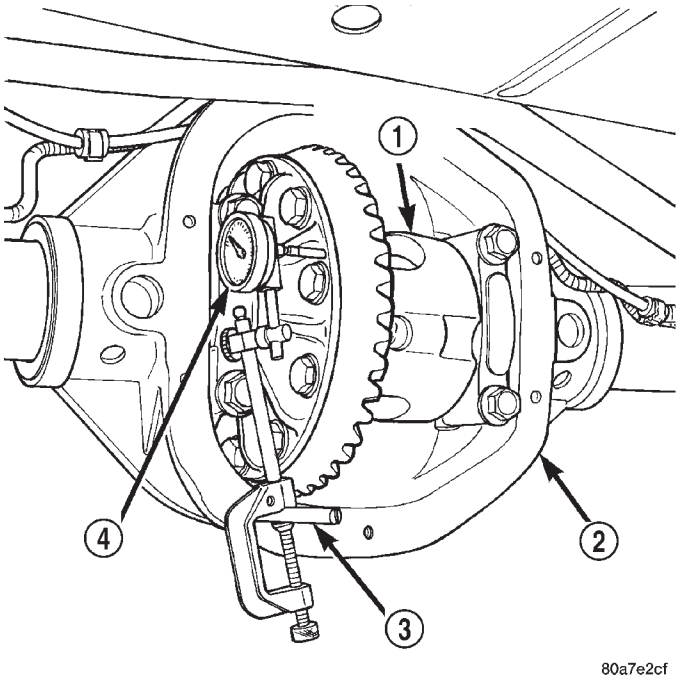


Fig. 14 DIFFERENTIAL SIDE PLAY MEASUREMET

1 - DIFFERENTIAL CASE
2 - DIFFERENTIAL HOUSING
3 - PILOT STUD
4 - DIAL INDICATOR

FRONT AXLE - 186FBI (Continued)

(10) Push and hold differential case to pinion gear side of the housing and zero dial indicator (Fig. 15).

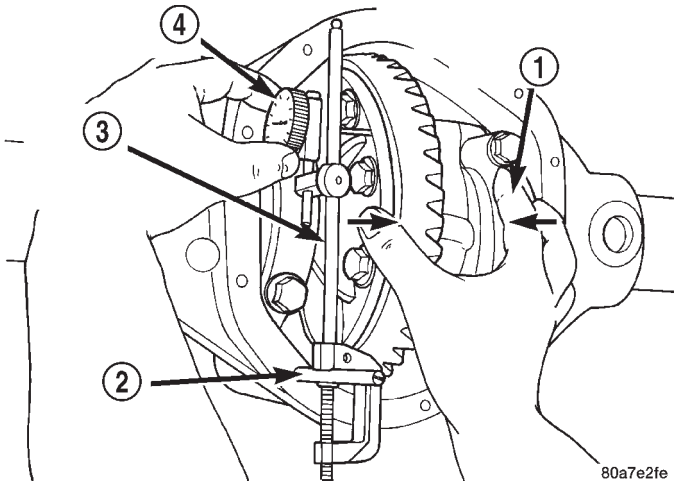


Fig. 15 ZERO DIAL INDICATOR

1 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 - PILOT STUD
3 - INDICATOR EXTENSION
4 - DIAL INDICATOR FACE

(11) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 16).

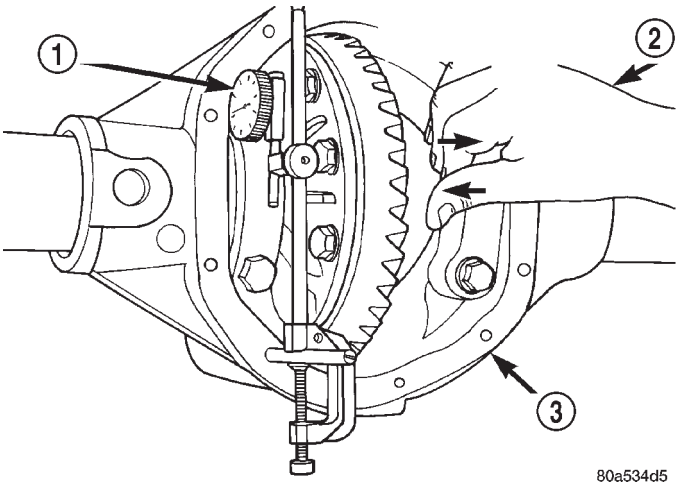


Fig. 16 RECORED DIAL INDICATOR READING

1 - DIAL INDICATOR
2 - DIFFERENTIAL CASE TO RING GEAR SIDE
3 - DIFFERENTIAL HOUSING

(12) Add 0.152 mm (0.006 in.) to the zero end play total. This new total represents the thickness of shims to compress or preload the new bearings when the differential is installed.

(13) Rotate dial indicator out of the way on the pilot stud.

(14) Remove differential case and dummy bearings from the housing.

(15) Install the pinion gear in the housing. Install the pinion yoke and establish the correct pinion rotating torque.

(16) Install differential case and Dummy Bearings D-348 in the housing.

(17) Install a single dummy shim in the ring gear side. Install bearing caps and tighten bolts snug.

(18) Seat ring gear side dummy bearing (Fig. 13).

(19) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 14).

(20) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 17).

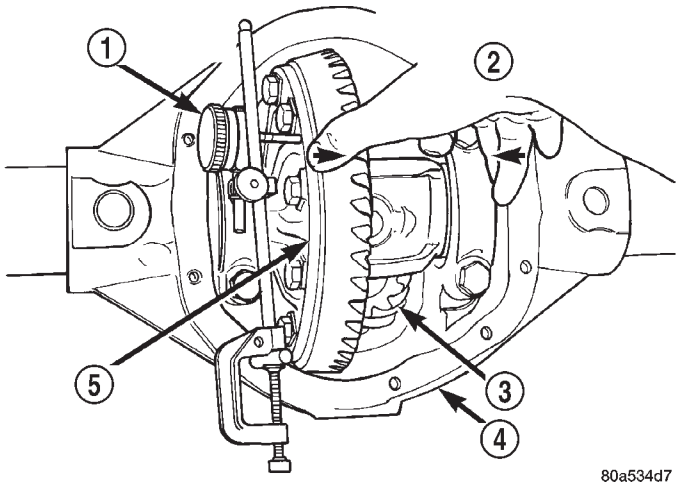


Fig. 17 ZERO DIAL INDICATOR

1 - DIAL INDICATOR
2 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

FRONT AXLE - 186FBI (Continued)

(21) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 18). Add dummy shim thickness to this reading. This will be the total shim thickness to achieve zero backlash.

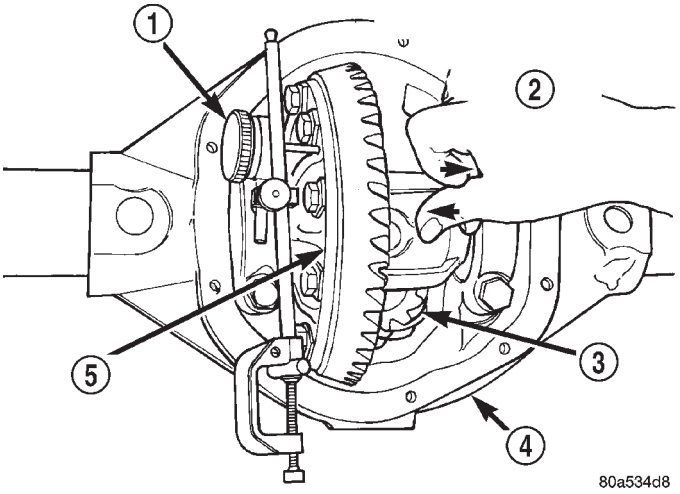


Fig. 18 RECORED DIAL INDICATOR READING

1 - DIAL INDICATOR
2 - DIFFERENTIAL CASE TO RING GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

(22) Subtract 0.076 mm (0.003 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(23) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the axle housing.

(24) Rotate dial indicator out of the way on pilot stud.

(25) Remove differential case and dummy bearings from the housing.

(26) Install side bearings and cups on differential case.

(27) Install spreader W-129-B with Adapter Set 6987 on the housing and spread axle opening enough to receive differential case.

(28) Place the bearing preload shims in the axle housing, against the axle tubes.

(29) Install differential case into the housing.

CAUTION: When installing a Vari-Lok® differential, the oil feed tube must point to the bottom of the housing. If differential is forced in with the oil feed towards the top, the anti-rotation tabs will be damaged.

(30) Remove spreader from the housing.

(31) Rotate the differential case several times to seat the side bearings.

(32) Position the indicator plunger against a ring gear tooth (Fig. 19).

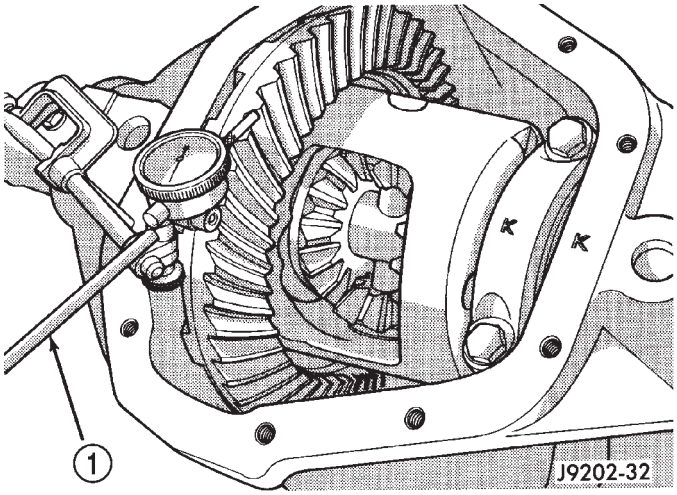


Fig. 19 RING GEAR BACKLASH

1 - DIAL INDICATOR

(33) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(34) Zero dial indicator face to pointer.

(35) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the housing to the other (Fig. 20).

(36) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

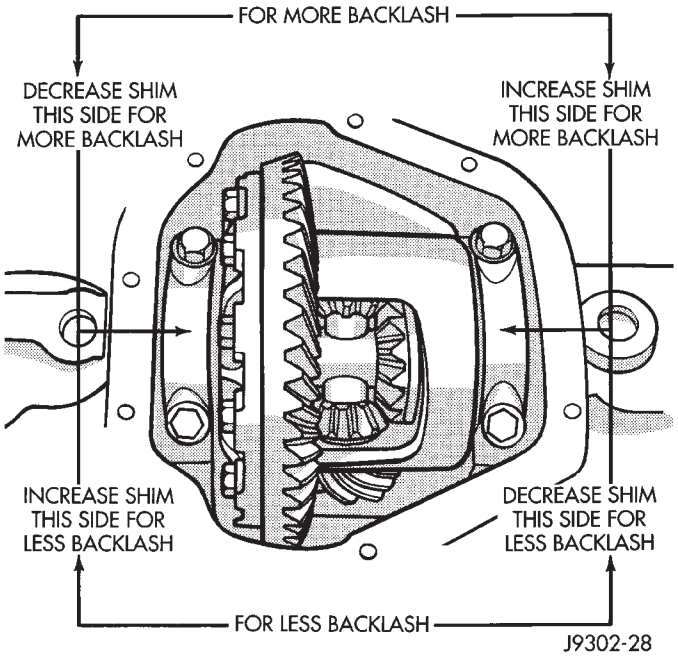


Fig. 20 BACKLASH SHIM ADJUSTMENT

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

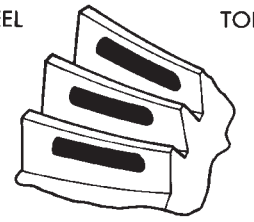
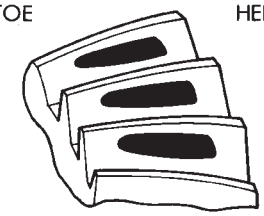
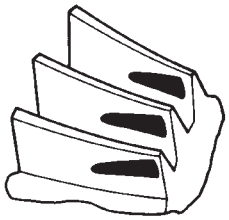
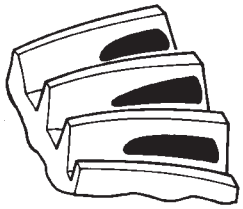
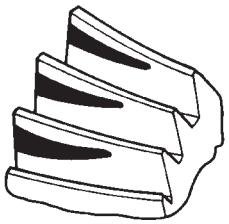
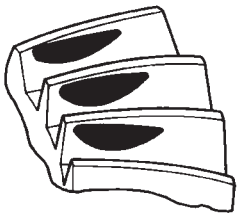
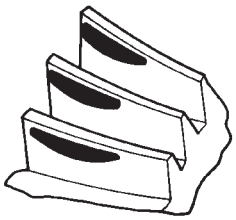
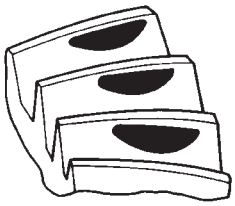
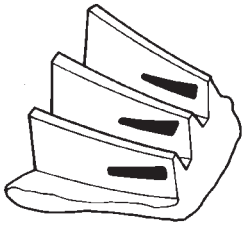
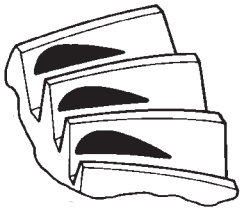
(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(2) Wrap, twist and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 21)and adjust pinion depth and gear backlash as necessary.

FRONT AXLE - 186FBI (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 21 GEAR TOOTH CONTACT PATTERNS

FRONT AXLE - 186FBI (Continued)

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion should be the torque to rotate the pinion plus 0.79-1.24 N·m (7-11 in. lbs.).

SPECIFICATIONS

AXLE SPECIFICATIONS

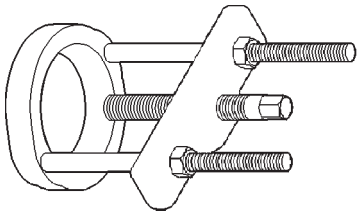
DESCRIPTION	SPECIFICATION
Axle Ratio	3.31, 3.55, 3.73, 3.91
Differential Side Gear Clearance	0.13-0.20 mm (0.005-0.008 in.)
Differential Bearing Preload	0.152 mm (0.006 in.)
Ring Gear Diameter	186 mm (7.33 in.)
Ring Gear Backlash	0.13-0.20 mm (0.005-0.008 in.)
Pinion Gear Std. Depth	92.08 mm (3.625 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1.7-3.4 N·m (15-30 in. lbs.)

TORQUE SPECIFICATIONS

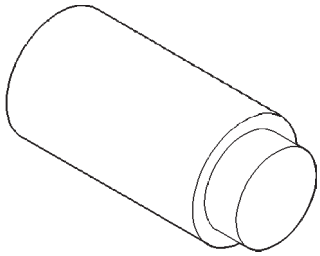
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fill Hole Plug	34	25	-
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	61	45	-
Ring Gear Bolts	108	80	-
Axle Nut	237	175	-
Hub Bearing Bolts	102	75	-

FRONT AXLE - 186FBI (Continued)

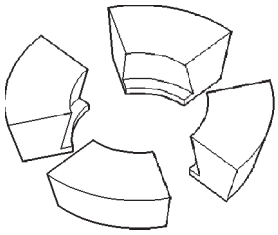
SPECIAL TOOLS



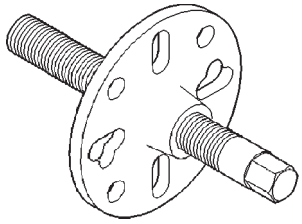
PULLER C-293-PA



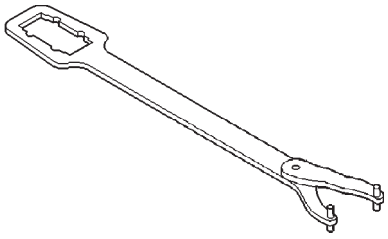
PLUG SP-3289



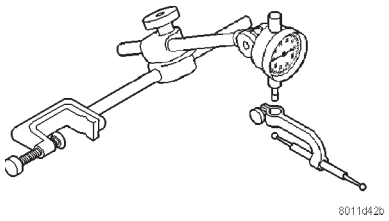
ADAPTER C-293-42



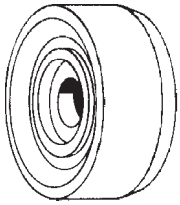
PULLER C-452



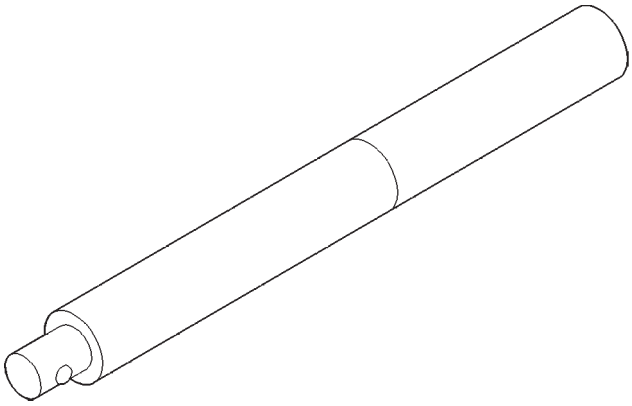
FLANGE WRENCH C-3281



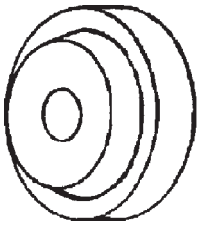
DIAL INDICATOR C-3339



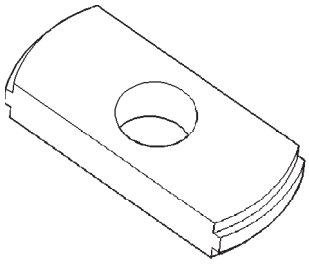
INSTALLER C-3716-A



HANDLE C-4171

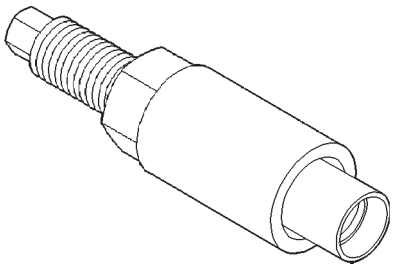


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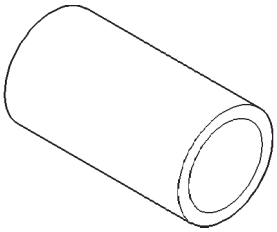


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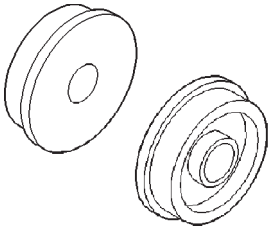
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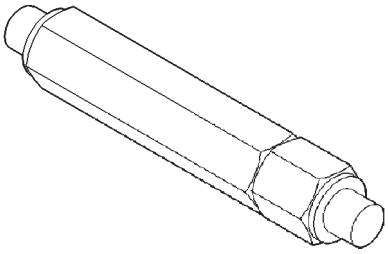
INSTALLER W-162-D



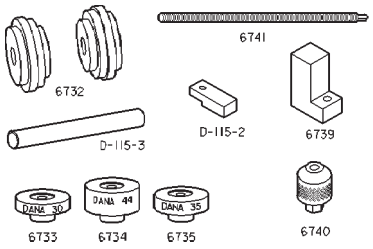
CUP 8109



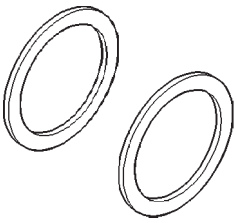
SEAL INSTALLER 8110



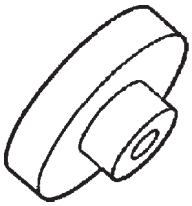
TURNBUCKLE 6797



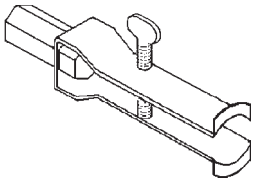
PINION DEPTH SET 6774



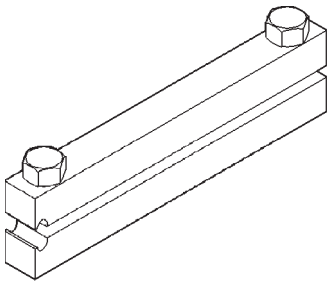
DUMMY SHIMS 8107



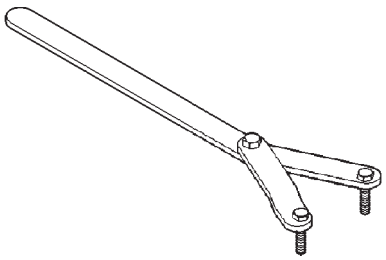
PINION BLOCK 8804



SEAL REMOVER 7794-A

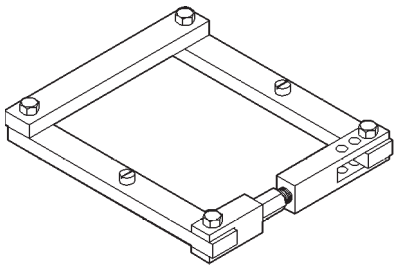


CLAMP INSTALLER C-4975-A

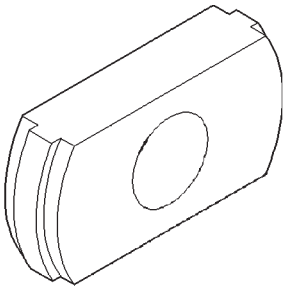


SPANNER WRENCH 6958

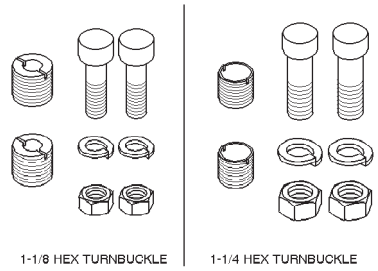
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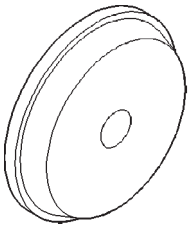
SPREADER W-129-B



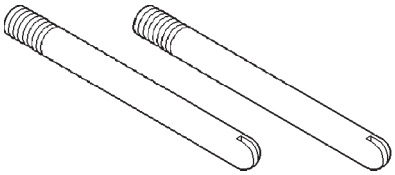
REMOVER D-158



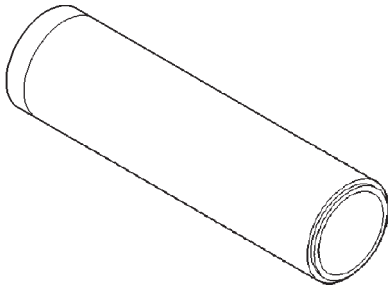
ADAPTER KIT 6987B



INSTALLER D-144



PILOT STUD C-3288-B



INSTALLER 6448

AXLE SHAFTS

REMOVAL

If the axle shaft and hub bearing are being removed in order to service another component, the axle shaft and hub bearing can be removed as an assembly.

(1) Raise and support the vehicle.
(2) Remove the wheel and tire assembly.
(3) Remove brake caliper, rotor and ABS wheel speed sensor.
(4) Remove cotter pin, nut retainer and axle nut.
(5) Remove the hub bearing bolts (Fig. 22).

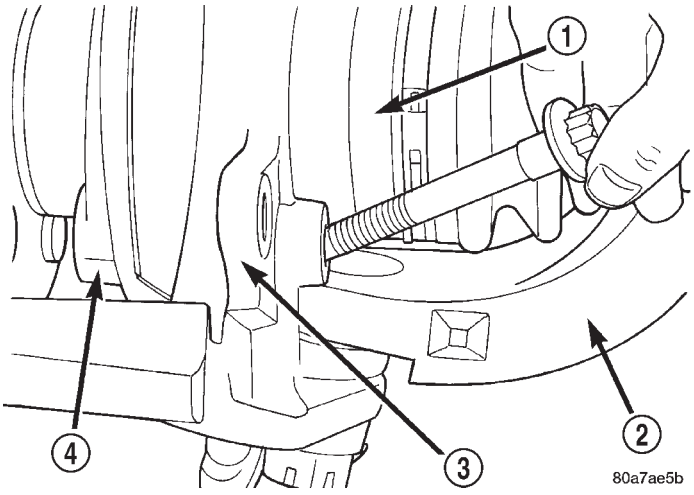


Fig. 22 HUB BEARING BOLTS

1 - AXLE SHAFT
2 - AXLE
3 - KNUCKLE
4 - HUB BEARING

(6) Remove hub bearing and axle shaft assembly (Fig. 23). **Avoid damaging the axle shaft oil seals in the axle housing.**
(7) Remove brake rotor shield from the hub bearing or knuckle.

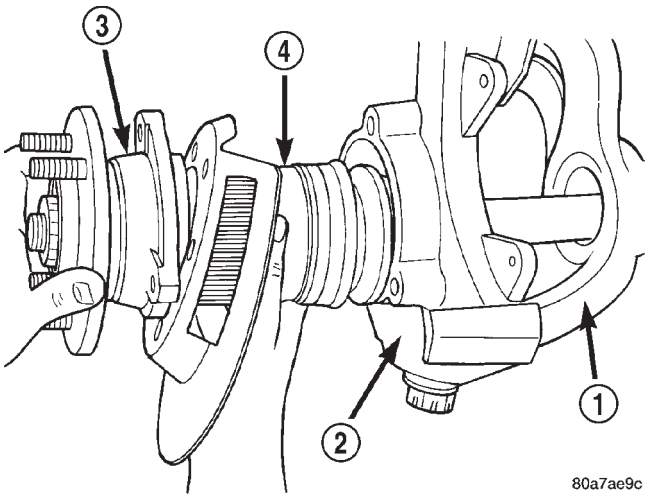


Fig. 23 HUB BEARING AND AXLE ASSEMBLY

1 - AXLE
2 - KNUCKLE
3 - HUB BEARING
4 - AXLE SHAFT

INSTALLATION

(1) Thoroughly clean the axle shaft and apply a thin film of Mopar Wheel Bearing Grease or equivalent to the shaft splines, seal contact surface and hub bore.
(2) Install brake rotor shield to the knuckle.
(3) Install hub bearing and axle shaft assembly or axle shaft into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the axle housing.
(4) Install the hub bearing.
(5) Install hub bearing bolts and tighten to 102 N·m (75 ft. lbs.).
(6) Install axle hub washer and nut and tighten nut to 237 N·m (175 ft. lbs.). Install the nut retainer and a new cotter pin.
(7) Install ABS wheel speed sensor, brake rotor and caliper.
(8) Install the wheel and tire assembly.
(9) Remove support and lower the vehicle.

AXLE SHAFT SEALS

REMOVAL

(1) Raise and support vehicle.
(2) Remove axle shafts.
(3) Remove differential assembly.
(4) Remove inner axle shaft seals with a pry bay.

INSTALLATION

(1) Remove any sealer remaining from original seals.
(2) Install oil seals with Discs 8110 and Turnbuckle 6797 (Fig. 24). Tighten tool until disc bottoms in housing.

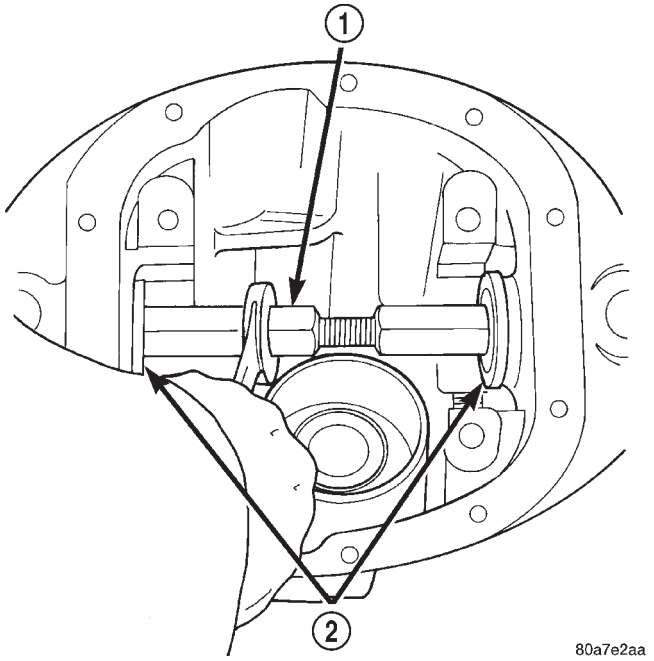


Fig. 24 AXLE SEAL TOOLS

1 - TURNBUCKLE
2 - DISCS

(3) Install differential and axle shafts.
(4) Fill differential with lubricant.
(5) Remove support and lower vehicle.

AXLE - C/V JOINT

REMOVAL

NOTE: The only service procedure to be performed on the axle C/V joint, is the replacement of the joint seal boot. If any failure of internal axle shaft components is diagnosed during a vehicle road test, the axle shaft must be replaced as an assembly.

(1) Remove axle shaft.
(2) Remove large and small C/V boot clamps (Fig. 25) and discard.
(3) Slid boot off the C/V joint housing and slide it down the axle shaft.

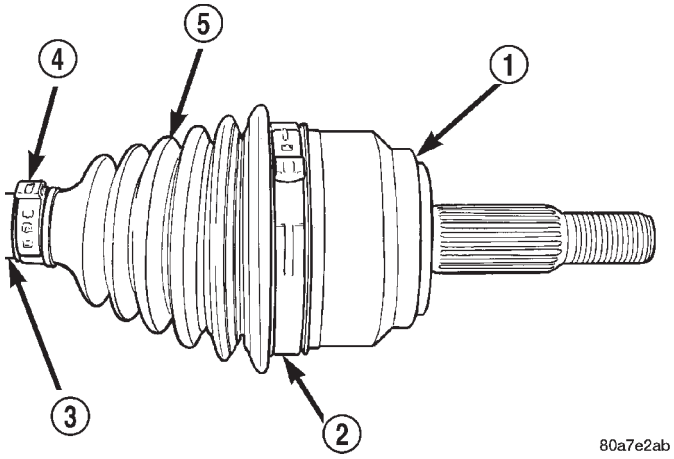


Fig. 25 OUTER C/V BOOT CLAMPS

1 - C/V JOINT HOUSING
2 - LARGE CLAMP
3 - AXLE SHAFT
4 - SMALL CLAMP
5 - SEALING BOOT

(4) Remove C/V joint from axle then slid boot off the axle.
(5) Thoroughly clean and inspect axle C/V joint assembly and axle shaft for any signs of excessive wear.

INSTALLATION

(1) Slide **new** boot over axle shaft.
(2) Install C/V joint onto the axle shaft.
(3) Distribute 1/2 the amount of grease provided in seal boot service package **(DO NOT USE ANY OTHER TYPE OF GREASE)** into axle C/V joint assembly housing. Put the remaining amount into the sealing boot.
(4) Position boot on the axle locating grove and on the C/V joint.

AXLE - C/V JOINT (Continued)

CAUTION: Boot must not be dimpled, stretched or out of shape in any way. If not shaped correctly, equalize pressure in boot and shape it by hand.

(5) Install the two boot clamps.

(6) Crimp the boot clamps with Clamp Installer C-4975A. Place clamp tool over bridge of clamp (Fig. 26).

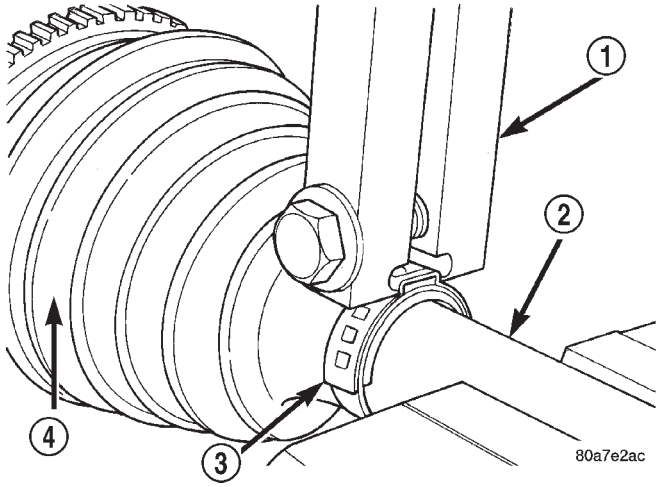


Fig. 26 CRIMPING TOOL

1 - INSTALLER
2 - AXLE SHAFT
3 - CLAMP
4 - SEALING BOOT

(7) Tighten nut on the tool until jaws on tool are closed completely together (Fig. 27) and (Fig. 28).

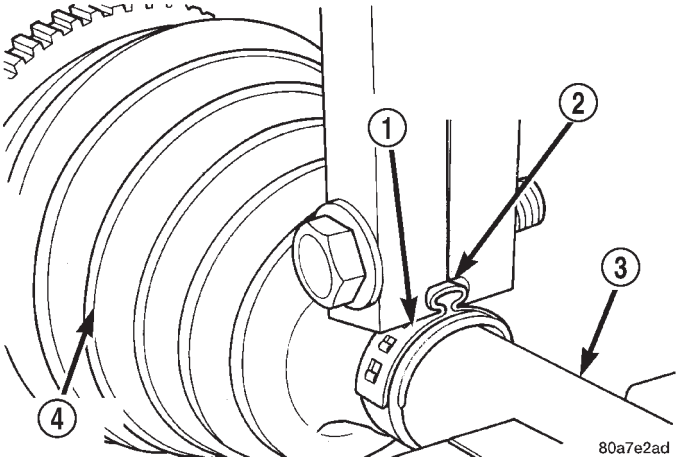


Fig. 27 SMALL BOOT CLAMP

1 - CLAMP
2 - INSTALLER
3 - AXLE SHAFT
4 - SEALING BOOT

(8) Install the axle shaft.

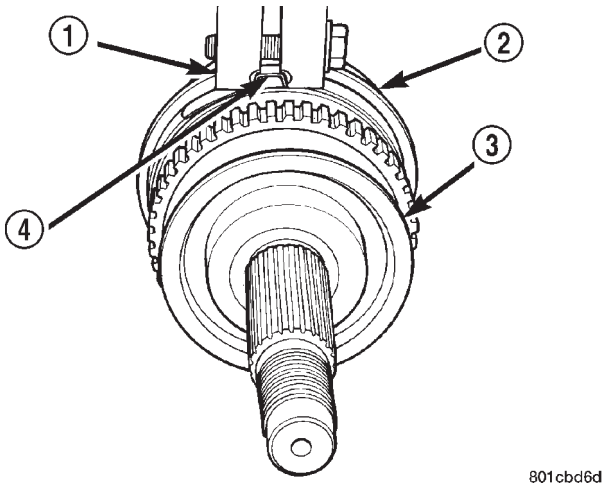


Fig. 28 LARGE BOOT CLAMP

1 - CLAMP TOOL
2 - SEALING BOOT
3 - OUTER C/V JOINT
4 - BOOT CLAMP

AXLE - U-JOINT

REMOVAL

CAUTION: Clamp only the narrow forged portion of the yoke in the vise. Do not over tighten the vise jaws, to avoid distorting the yoke.

(1) Remove axle shaft.

(2) Remove the bearing cap retaining snap rings (Fig. 29).

NOTE: Saturate the bearing caps with penetrating oil prior to removal.

(3) Locate a socket with an inside diameter is larger than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed.

(4) Locate a socket with an outside diameter is smaller than the bearing cap. Place the socket (driver) against the opposite bearing cap.

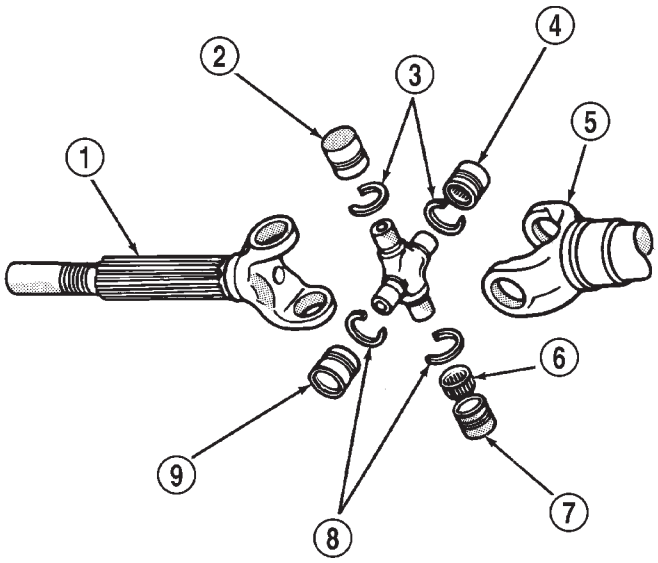
(5) Position the yoke with the sockets in a vise (Fig. 30).

(6) Tighten the vise jaws to force the bearing cap into the larger socket (receiver).

(7) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.

(8) Repeat the above procedure for the remaining bearing cap and remove spider from the propeller shaft yoke.

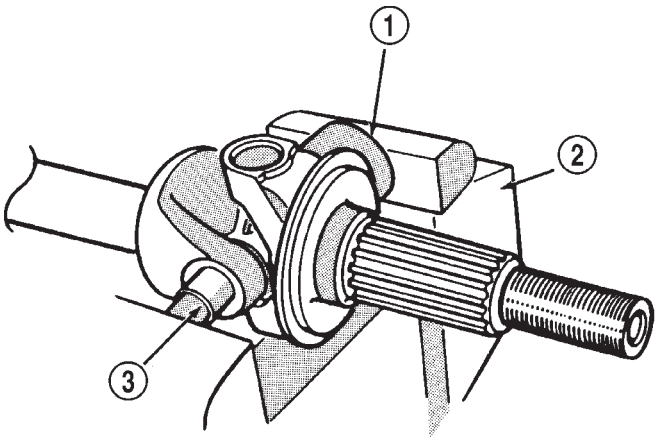
AXLE - U-JOINT (Continued)



J8902-15

Fig. 29 AXLE SHAFT OUTER U-JOINT

1 - SHAFT YOKE
2 - BEARING CAP
3 - SNAP RINGS
4 - BEARING CAP
5 - SPINDLE YOKE
6 - BEARING
7 - BEARING CAP
8 - SNAP RINGS
9 - BEARING CAP



J8902-16

Fig. 30 YOKE BEARING CAP

1 - LARGE-DIAMETER SOCKET
2 - VISE
3 - SMALL-DIAMETER SOCKET

INSTALLATION

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium-base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings, then tap bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket in a vise.

(4) Tighten the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.

(5) Install the bearing cap retaining clips.

(6) Install axle shaft.

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers, refer to 5 Brakes for procedures.

(4) Mark propeller shaft and pinion companion flange for installation reference.

(5) Remove the propeller shaft from the pinion companion flange.

(6) Rotate the pinion gear a minimum of ten times and verify the pinion rotates smoothly.

(7) Record torque necessary to rotate the pinion gear with a inch pound torque wrench.

(8) Using a short piece of pipe and Spanner Wrench 6958 to hold the pinion companion flange and remove the pinion nut and washer.

(9) Remove pinion companion flange with Remover C-452 and Flange Wrench C-3281.

(10) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 31).

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate installer (Fig. 32).

(2) Install pinion companion flange on the pinion gear with Installer W-162-D, Cup 8109 and Wrench 6958.

CAUTION: Never exceed the minimum tightening torque 298 N·m (220 ft. lbs.) while installing pinion nut at this point. Damage to collapsible spacer or bearings may result.

(3) Install the pinion washer and a **new** nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

PINION SEAL (Continued)

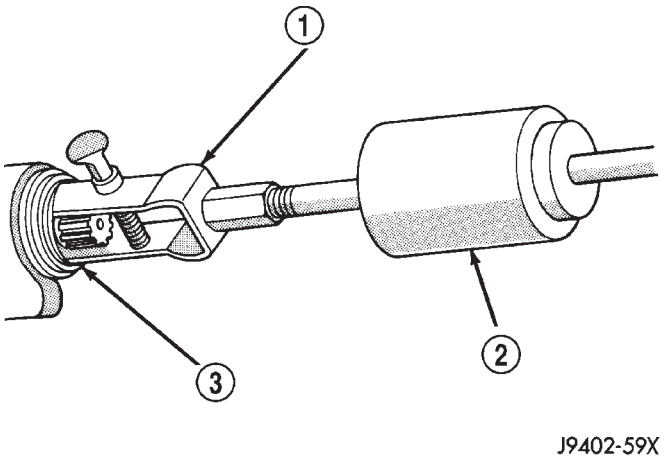


Fig. 31 PINION SEAL

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

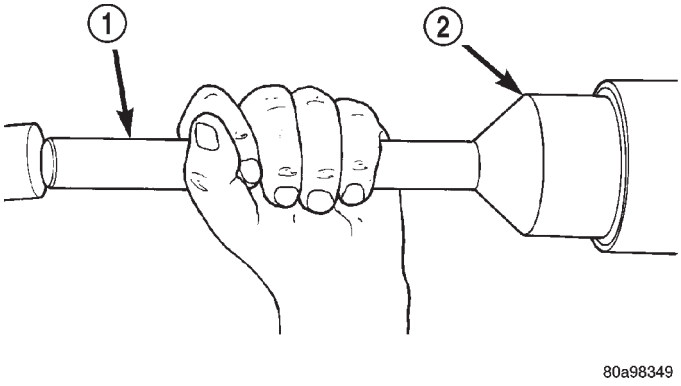


Fig. 32 PINION SEAL

1 - HANDLE
2 - INSTALLER

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(4) Rotate pinion a minimum of ten time and verify pinion rotates smoothly. Rotate the pinion shaft with an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal plus 0.56 N·m (5 in. lbs.) (Fig. 33).

(5) If the rotating torque is low, use Spanner Wrench 6958 to hold the pinion companion flange (Fig. 34), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

CAUTION: If maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

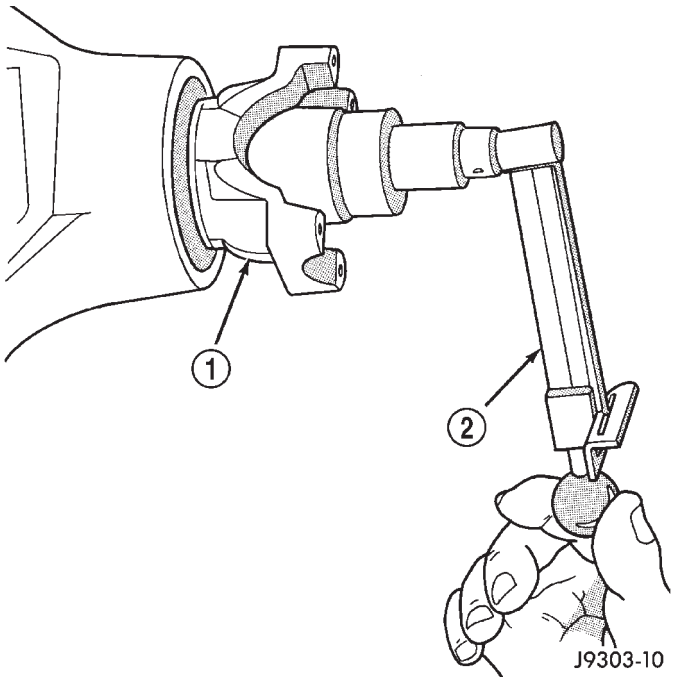


Fig. 33 PINION ROTATION TORQUE

1 - PINION YOKE/COMPANION FLANGE
2 - INCH POUND TORQUE WRENCH

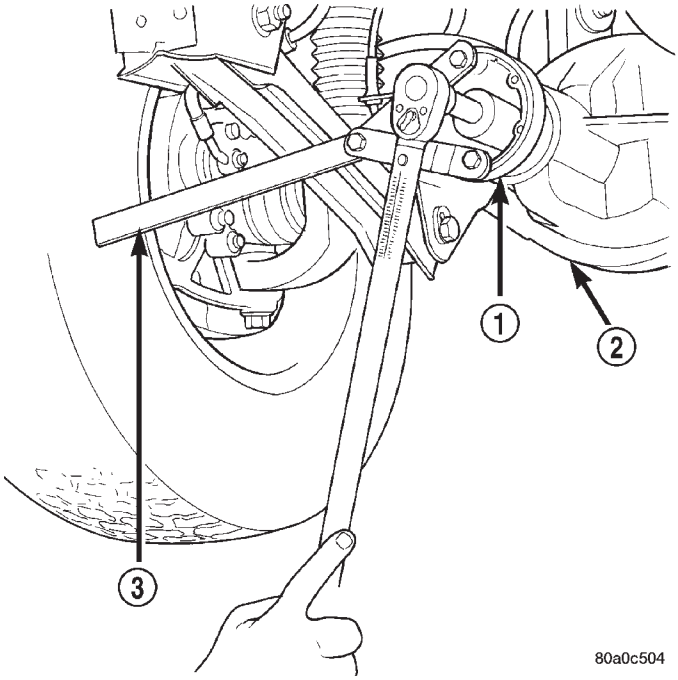


Fig. 34 PINION SHAFT NUT

1 - PINION FLANGE
2 - FRONT AXLE
3 - SPANNER WRENCH

PINION SEAL (Continued)

(6) Install propeller shaft with installation reference marks aligned.
(7) Fill differential with gear lubricant.
(8) Install brake rotors and calipers.
(9) Install wheel and tire assemblies.
(10) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove brake rotors and calipers. Refer to 5 Brakes for procedures.
(4) Mark the propeller shaft and pinion companion flange for installation reference.
(5) Remove propeller shaft from the pinion companion flange.
(6) Rotate pinion gear a minimum of ten times and verify pinion rotates smoothly.
(7) Record pinion gear rotating torque with a torque wrench for installation reference.
(8) Remove pinion nut and washer. Using a short piece of pipe and Spanner Wrench 6958 to hold the pinion companion flange.
(9) Remove pinion companion flange with Remover C-452 and Flange Wrench C-3281.
(10) Remove pinion shaft seal with Remover 7794-A and slide hammer (Fig. 35).

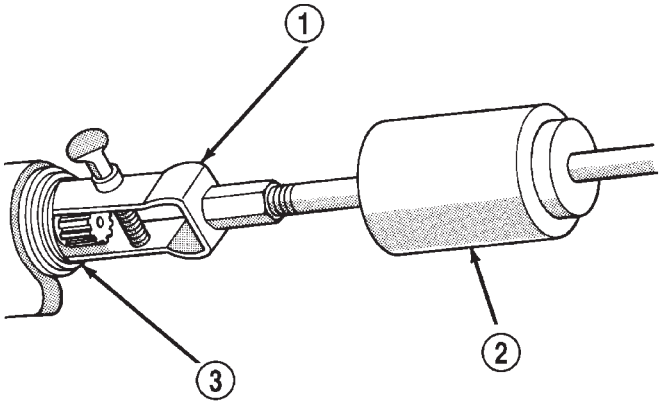


Fig. 35 PINION SEAL PULLER

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(11) Remove front pinion bearing using a pair of pick tools to pull the bearing straight off pinion shaft.

NOTE: If bearing becomes bound on the pinion shaft, lightly tap the end of the pinion gear with a rawhide/rubber mallet.

(12) Remove the collapsible spacer.

INSTALLATION

(1) Install a **new** collapsible preload spacer on pinion shaft.
(2) Install pinion front bearing.
(3) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate installer (Fig. 36).

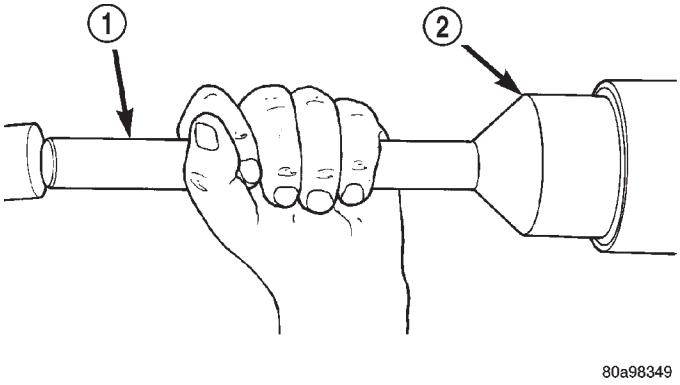


Fig. 36 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(4) Install pinion companion flange with Installer W-162-D, Cup 8109 and Flange Holder 6958.
(5) Install pinion washer and a **new** nut on the pinion gear. Tighten the nut to 298 N·m (220 ft. lbs.) minimum. **Do not overtighten.** Maximum torque is 500 N·m (368 ft. lbs.).

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed.

(6) Using Spanner Wrench 6958, a length of 1 in. pipe and a torque wrench set at 500 N·m (368 ft. lbs.) crush collapsible spacer until bearing end play is taken up (Fig. 37).
(7) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the required rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer.
(8) Rotate pinion gear a minimum of ten times and verify pinion rotates smoothly. Check rotating torque with an inch pound torque wrench. The rotating torque should be the amount recorded during removal plus:

- Original Bearings: 0.56 N·m (5 in. lbs.).

COLLAPSIBLE SPACER (Continued)

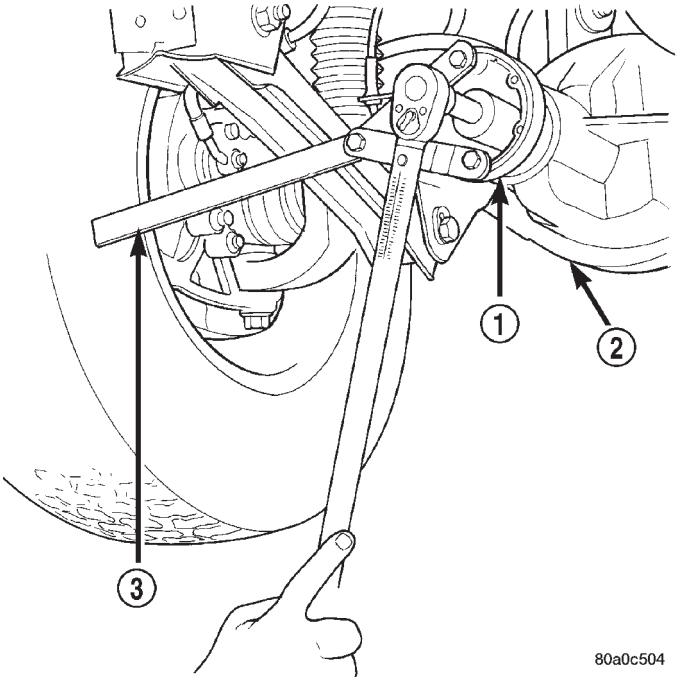


Fig. 37 PINION COMPANION FLANGE

1 - COMPANION FLNAGE
2 - DIFFERENTIAL HOUSING
3 - SPANNER WRENCH

- New Bearings: 1.7 to 3.4 N·m (15 to 30 in. lbs.).

(9) Install propeller shaft with reference marks aligned.

(10) Install brake rotors and calipers.

(11) Add gear lubricant if necessary.

(12) Install wheel and tire assemblies.

(13) Lower vehicle.

DIFFERENTIAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove lubricant fill hole plug from the differential housing cover.

(3) Remove differential cover and drain lubricant.

(4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Never use water, steam, kerosene or gasoline for cleaning.**

(5) Remove hub bearings and axle shafts.

(6) Note installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 38).

(7) Loosen the differential bearing cap bolts.

(8) Position Spreader W-129-B with Adapter Kit 6987B on differential locating holes (Fig. 39). Install hold down clamps and tighten the tool turnbuckle finger-tight.

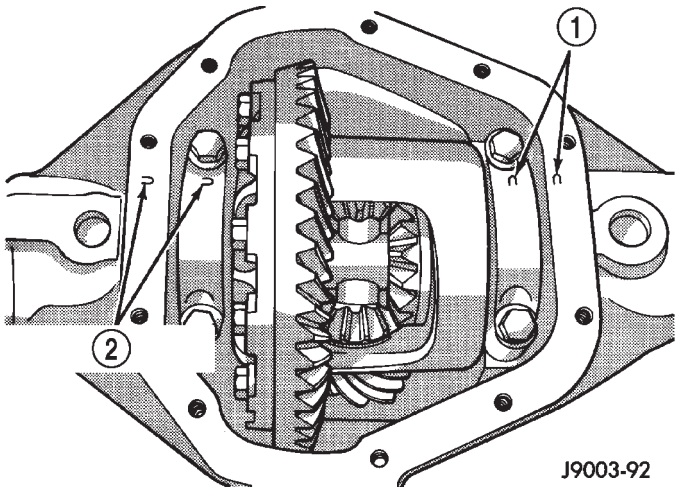


Fig. 38 BEARING CAP IDENTIFICATION

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

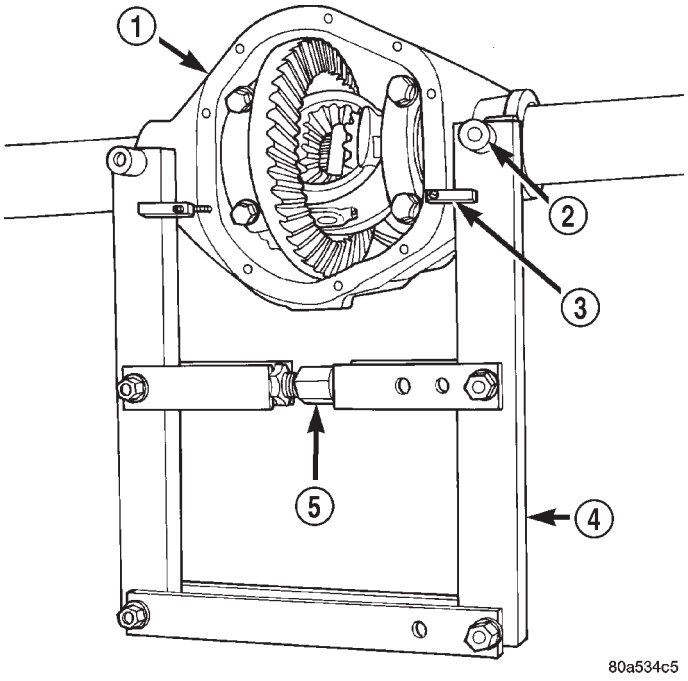


Fig. 39 DIFFERENTIAL SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - ADAPTER
3 - HOLD DOWN CLAMPS
4 - SPREADER
5 - TURNBUCKLE

DIFFERENTIAL (Continued)

(9) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to stud. Load the lever adapter against the opposite side of the housing (Fig. 40) and zero the indicator.

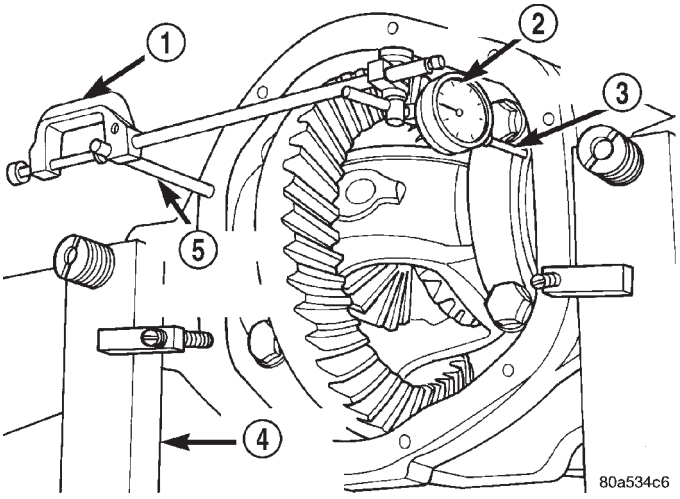


Fig. 40 DIAL INDICATOR LOCATION

1 - CLAMP
2 - DIAL INDICATOR
3 - LEVER ADAPTER
4 - SPREADER
5 - PILOT STUD

(10) Spread housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 41).

CAUTION: Never spread the housing over 0.50 mm (0.020 in). If housing is over-spread, it could distorted and damaged the housing.

(11) Remove the dial indicator.
(12) Hold differential case in position and remove differential bearing cap bolts and caps.
(13) Remove differential from the housing and tag differential bearing cups to ensure location (Fig. 42).
(14) Remove differential case preload shims from the axle housing.
(15) Remove spreader from housing. Tag differential bearing preload shims to ensure correct location.

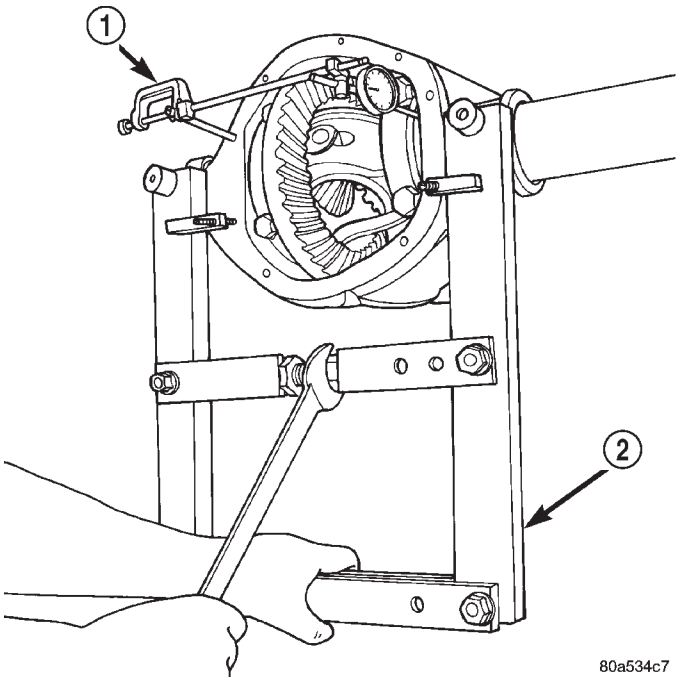


Fig. 41 SPREAD DIFFERENTIAL HOUSING

1 - DIAL INDICATOR
2 - SPREADER

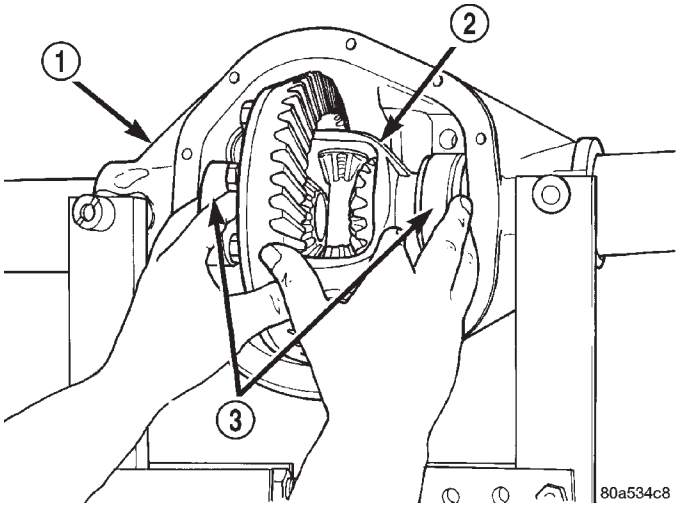


Fig. 42 DIFFERENTIAL CASE REMOVAL

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - BEARING CUPS

DIFFERENTIAL (Continued)

DISASSEMBLY

(1) Remove the ring gear.

(2) Drive out the roll pin holding pinion gear mate shaft with a hammer and punch (Fig. 43).

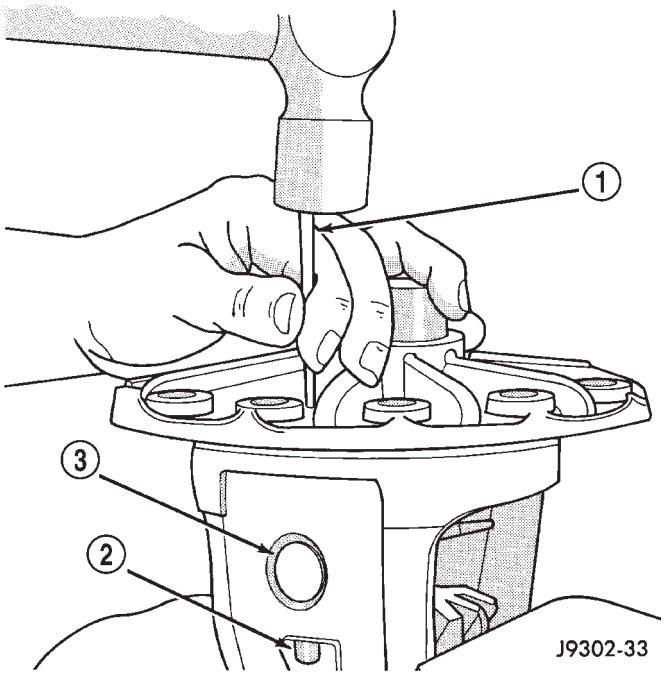


Fig. 43 MATE SHAFT ROLL PIN

1 - PUNCH
2 - LOCKPIN
3 - MATE SHAFT

(3) Remove pinion gear mate shaft from the differential case and the pinion mate gears.

(4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 44).

(5) Remove differential side gears and thrust washers.

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install pinion mate gears and thrust washers.

(3) Install pinion gear mate shaft. Align the roll pin holes in shaft and the differential case.

(4) Install the roll pin in the differential case (Fig. 45).

(5) Install the ring gear.

(6) Lubricate all differential components with hypoid gear lubricant.

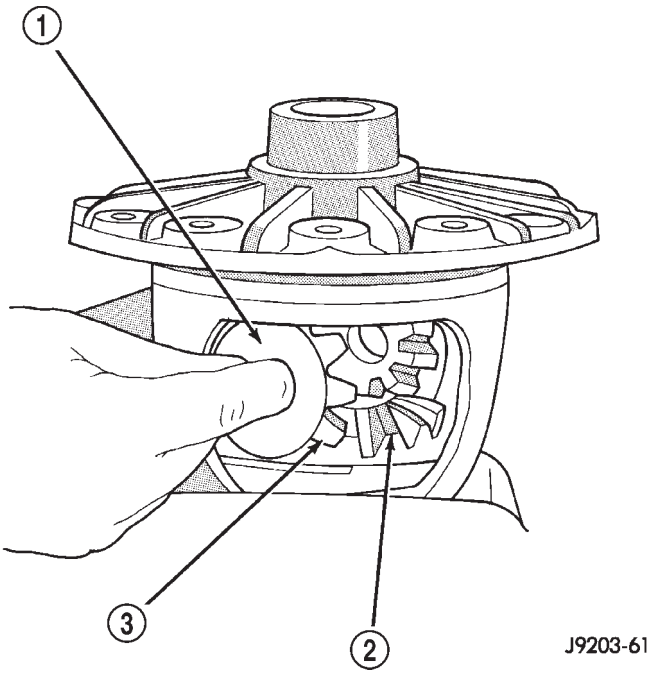


Fig. 44 PINION MATE GEAR

1 - THRUST WASHER
2 - SIDE GEAR
3 - PINION MATE GEAR

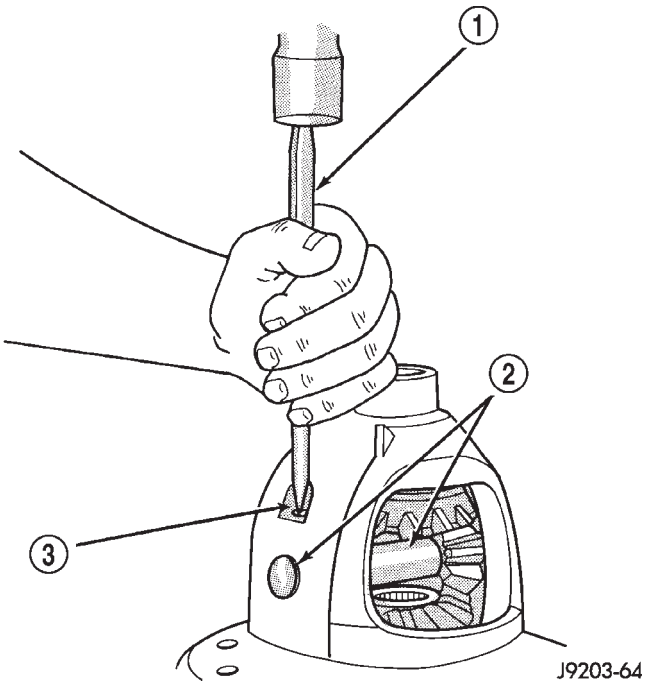


Fig. 45 MATE SHAFT ROLL PIN

1 - PUNCH
2 - PINION MATE SHAFT
3 - MATE SHAFT LOCKPIN

DIFFERENTIAL (Continued)

INSTALLATION

NOTE: If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to Adjustments (Differential Bearing Preload and Gear Backlash) to determine the proper shim selection.

(1) Position Spreader W-129-B with Adapter Kit 6987B on differential locating holes. Install hold down clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator.

CAUTION: Never spread the housing over 0.50 mm (0.020 in). If housing is over-spread, it could distorted and damaged the housing.

(4) Remove the dial indicator.

(5) Install differential case in the housing (Fig. 46). Make sure the differential bearing cups remain on the bearings and the preload shims remain between the face of the bearing cup and housing. Tap the differential case to ensure the bearings cups and shims are fully seated in the housing.

CAUTION: On a Vari-lok® differential the oil feed tube must be pointed at the bottom of the housing. If differential is installed with the oil feed tube pointed at the top, the anti-rotation tabs will be damaged.

(6) Install the bearing caps at their original locations (Fig. 47).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

(9) Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.).

(10) Install the hub bearings and axle shafts.

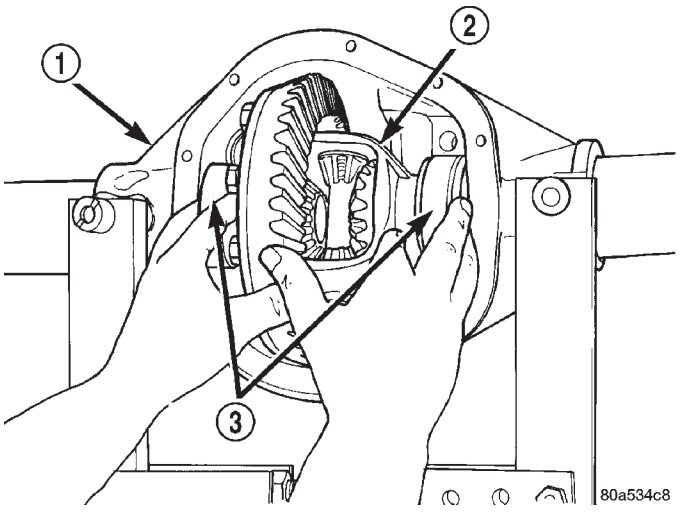


Fig. 46 DIFFERENTIAL CASE REMOVAL

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - BEARING CUPS

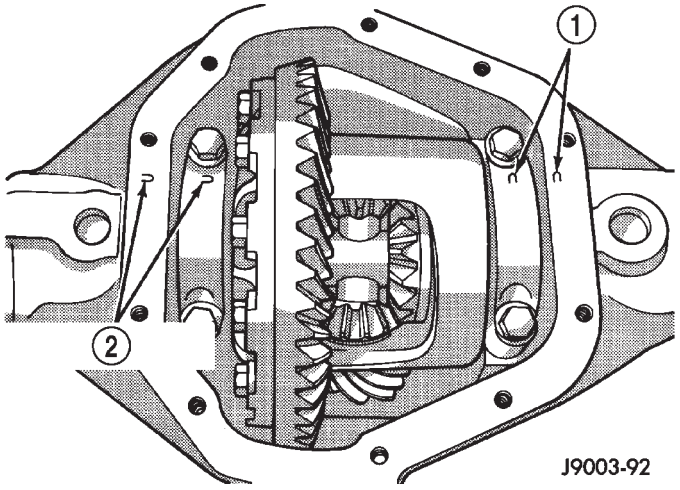


Fig. 47 Bearing Cap Reference

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

DIFFERENTIAL (Continued)

(11) Apply a bead 6.35mm (1/4 inch) of red Mopar Silicone Rubber Sealant or equivalent to the housing cover (Fig. 48).

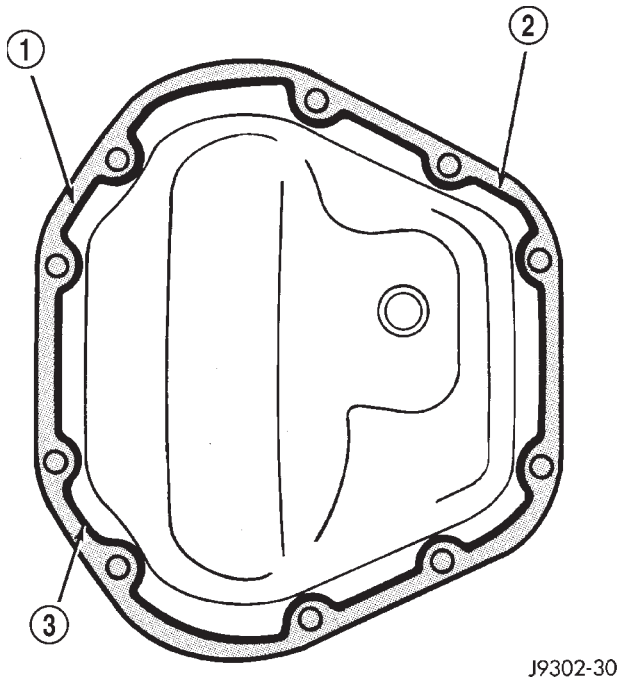


Fig. 48 DIFFERENTIAL COVER

1 - COVER
2 - SEALANT
3 - SEALANT BEAD

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(12) Install differential cover and tighten cover bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).
(13) Fill differential with gear lubricant to bottom of the fill plug hole.
(14) Tighten fill plug to 34 N·m (25 ft. lbs.).
(15) Remove support and lower the vehicle.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential case from housing.
(2) Remove bearings from the differential case with Puller C-293-PA, Adapters 8352 and Plug SP-3289 (Fig. 49).

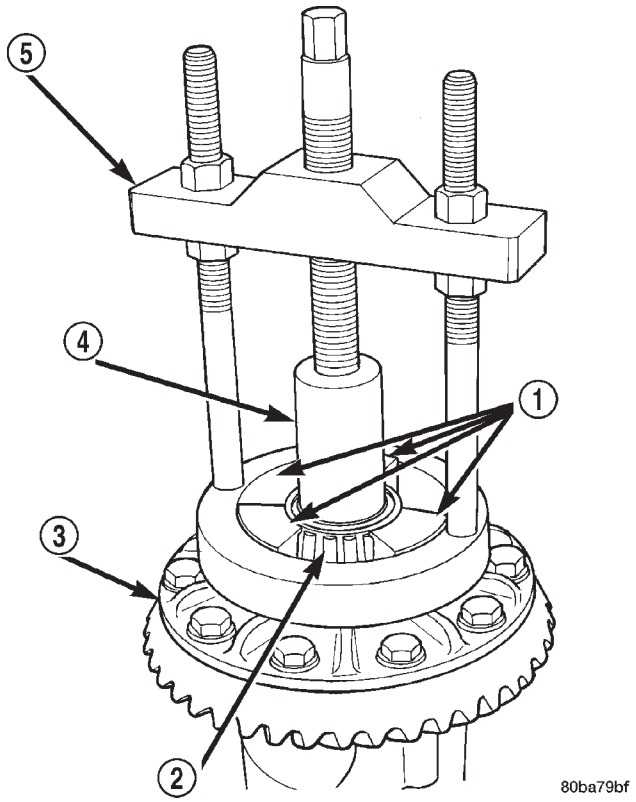


Fig. 49 DIFFERENTIAL CASE BEARING

1 - ADAPTERS
2 - BEARING
3 - DIFFERENTIAL
4 - PLUG
5 - PULLER

INSTALLATION

NOTE: If replacement differential side bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to Adjustments (Differential Bearing Preload and Gear Backlash) to determine the proper shim selection.

CAUTION: Vari-lok® plenum must be fully seated against the differential case prior to installing the ring gear side differential bearing.

(1) Install differential side bearings with Handle C-4171 and Installer C-3726-A (Fig. 50).
(2) Install differential in housing.

DIFFERENTIAL CASE BEARINGS (Continued)

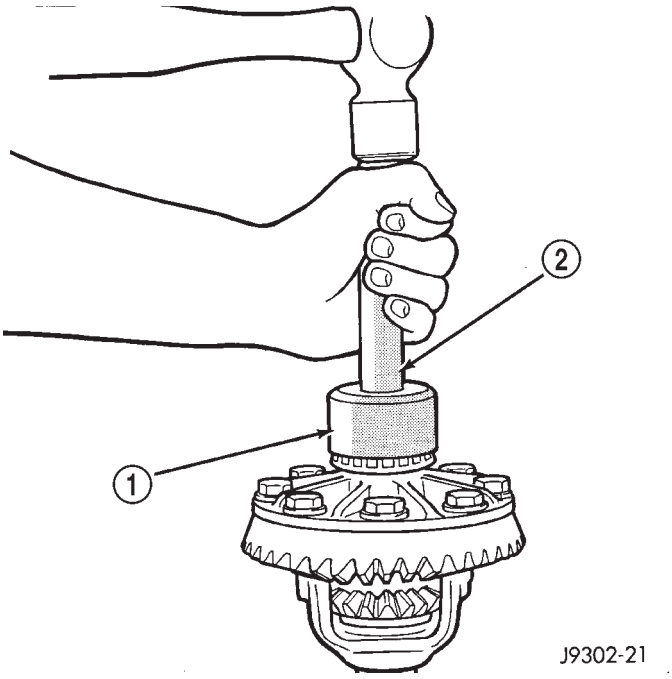


Fig. 50 DIFFERENTIAL CASE BEARING

1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR

REMOVAL

NOTE: The ring gear and pinion are serviced as a matched set. Nevar replace one gear without replacing the other matching gear.

(1) Raise and support vehicle
(2) Mark pinion companion flange and propeller shaft for installation alignment.
(3) Remove propeller shaft from pinion companion flange and tie propeller shaft to underbody.
(4) Remove differential from axle housing.
(5) Place differential case in a vise with soft metal jaw (Fig. 51).
(6) Remove bolts holding ring gear to differential case.

NOTE: On Veri-Lok® differential the side bearing and oil feed plenum must be removed before removing the ring gear bolts.

(7) Driver ring gear off the differential case with a rawhide hammer (Fig. 51).

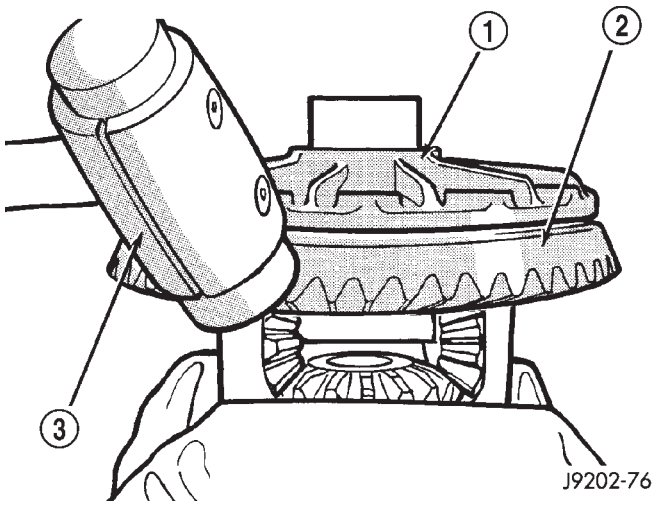


Fig. 51 RING GEAR

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - HAMMER

(8) With Spanner Wrench 6958 and a short length of 1 in. pipe, hold pinion companion flange and remove pinion nut and washer (Fig. 52).
(9) Remove pinion companion flange from pinion shaft with Remover C-452 and Flange Wrench C-3281.

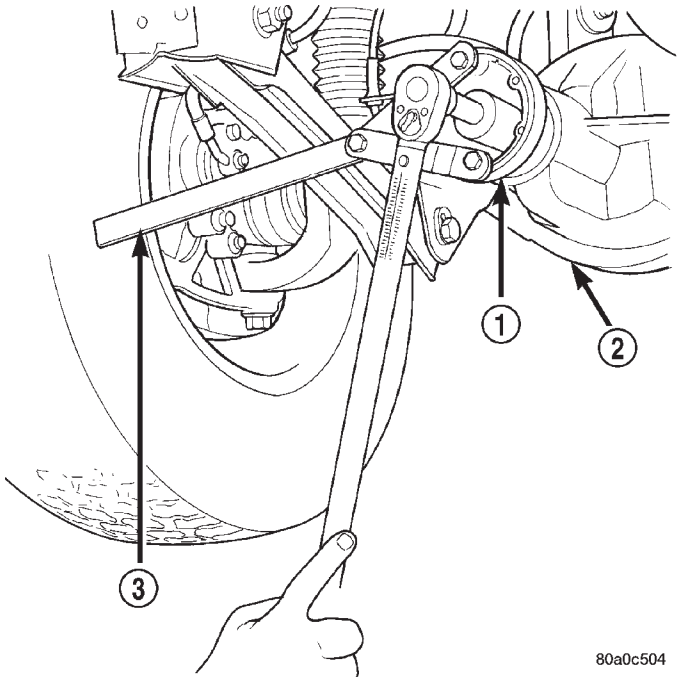


Fig. 52 Pinion Flange

1 - PINION FLANGE
2 - FRONT AXLE
3 - SPANNER WRENCH

PINION GEAR/RING GEAR (Continued)

(10) Remove pinion gear and collapsible spacer from housing (Fig. 53).

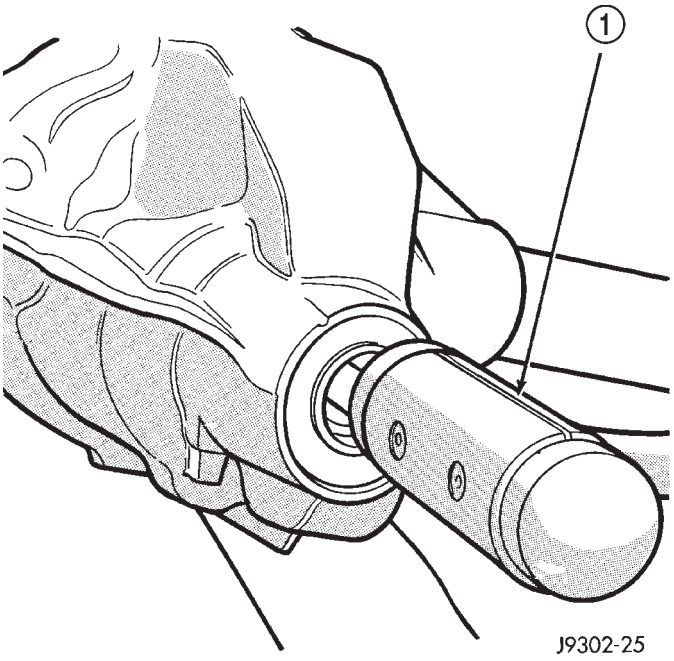


Fig. 53 REMOVE PINION GEAR

1 - RAWHIDE HAMMER

(11) Remove front pinion bearing cup, bearing, oil slinger and pinion seal with Remover D-158 and Handle C-4171 (Fig. 54).

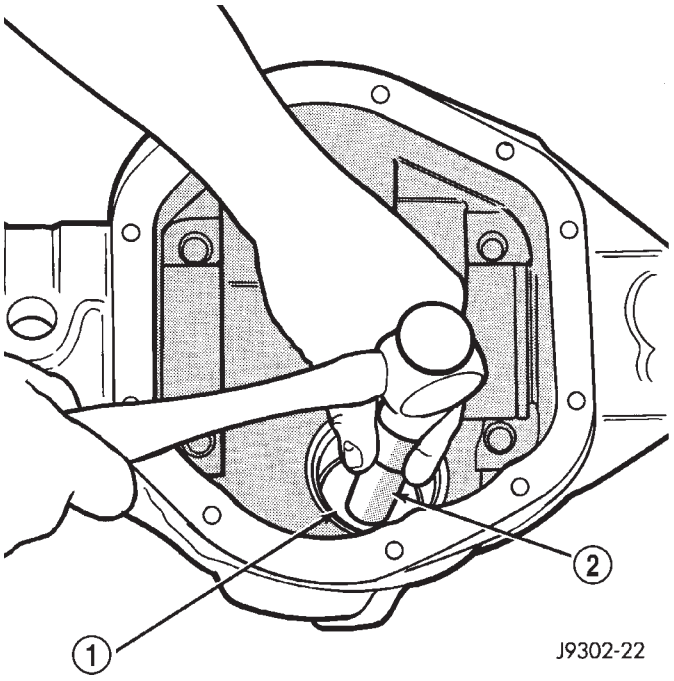


Fig. 54 FRONT PINION BEARING CUP

1 - REMOVER
2 - HANDLE

(12) Remove rear pinion bearing cup (Fig. 55) with Remover C-4307 and Handle C-4171.

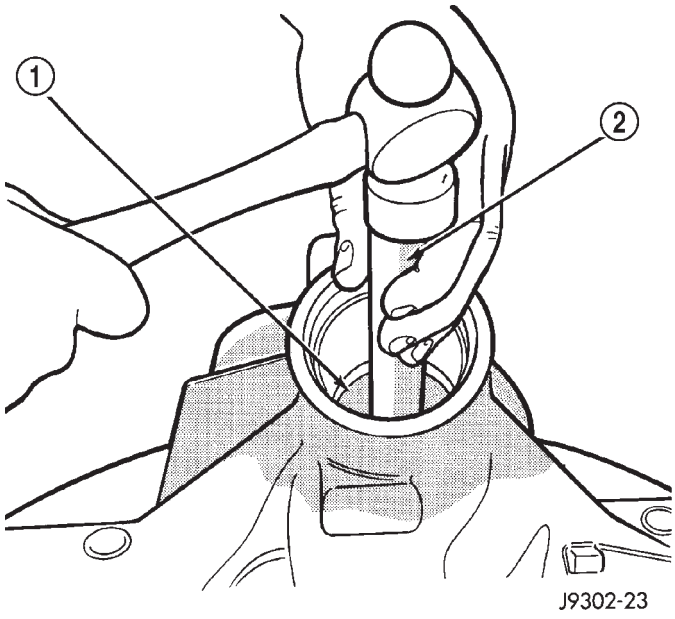


Fig. 55 REAR PINION BEARING CUP

1 - REMOVER
2 - HANDLE

(13) Remove collapsible preload spacer from pinion gear (Fig. 56).

(14) Remove rear pinion bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-42 (Fig. 57). Remove oil slinger/pinion depth shim from the pinion shaft and record thickness.

INSTALLATION

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and the pinion head to achieve proper ring and pinion gear mesh. If ring and pinion gears are reused, the pinion oil slinger/ depth shim should not require replacement. Refer to Adujstments (Pinion Gear Depth) to select the proper thickness shim before installing pinion gear.

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of pinion bearing cups.

(2) Install rear bearing cup with Installer C-4308 and Handle C-4171 and verify cup is seated (Fig. 58).

(3) Install bearing cup with Installer D-144 and Handle C-4171 (Fig. 59) and verify cup is seated.

(4) Install front pinion bearing, and oil slinger if equipped.

PINION GEAR/RING GEAR (Continued)

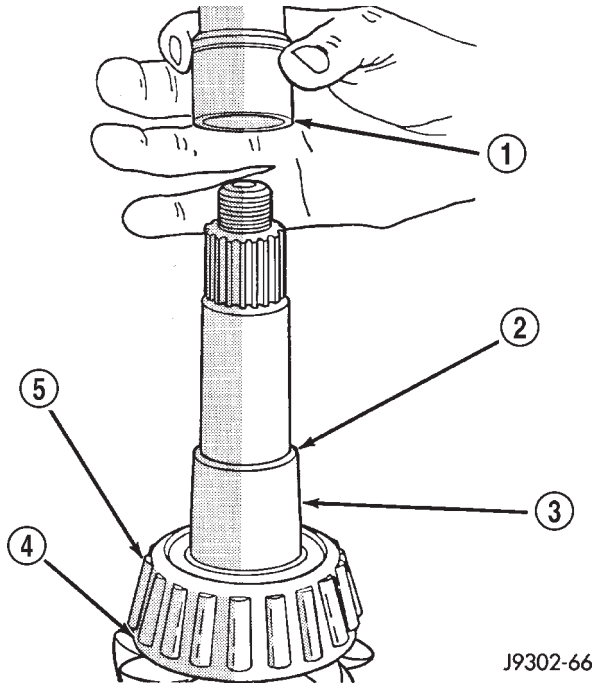


Fig. 56 COLLAPSIBLE SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - DEPTH SHIM
5 - REAR BEARING

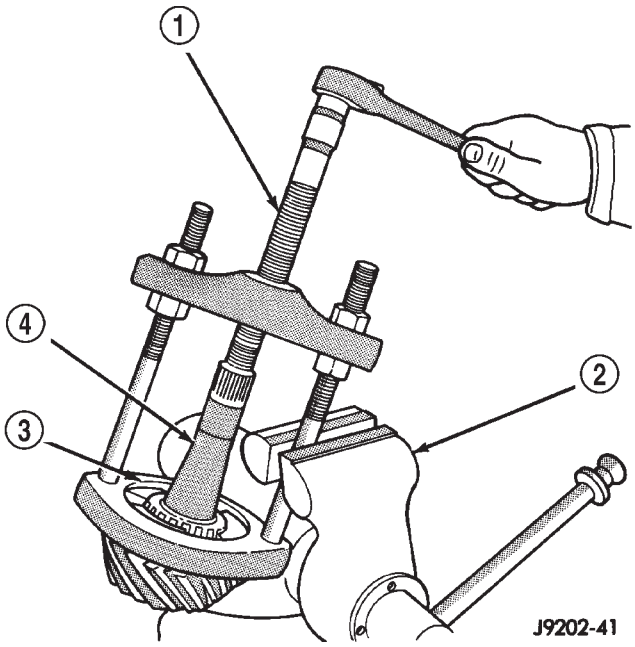


Fig. 57 REAR PINION BEARING

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

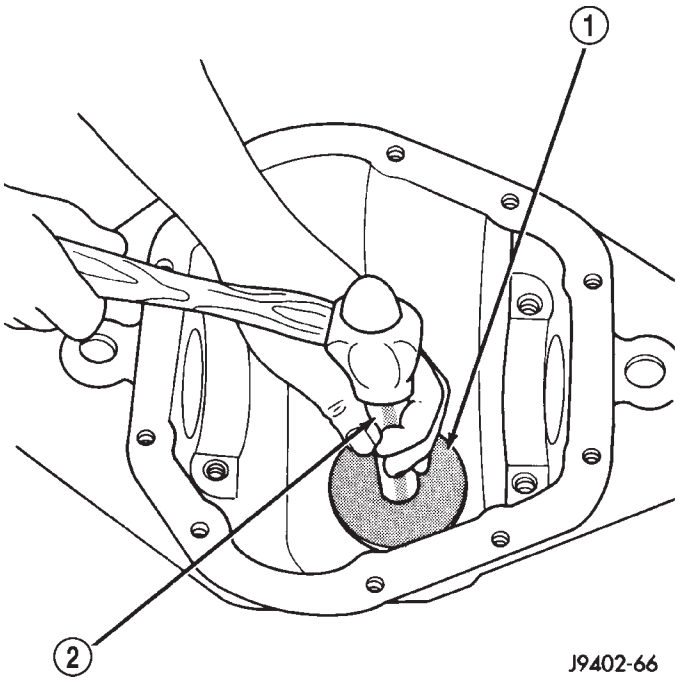


Fig. 58 REAR PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

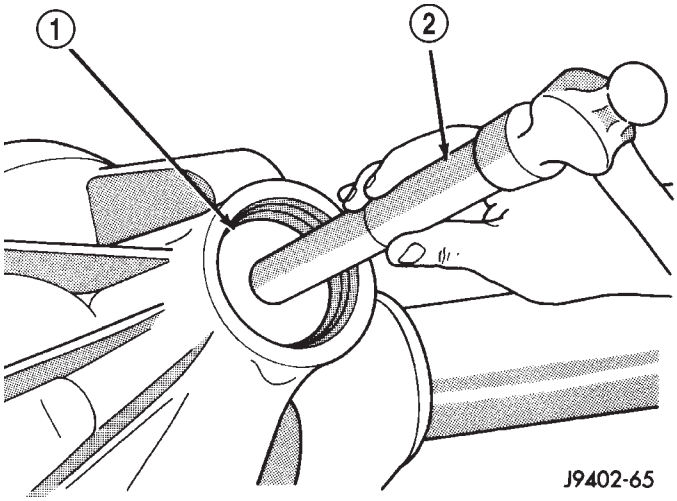


Fig. 59 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(5) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with an appropriate installer (Fig. 60).

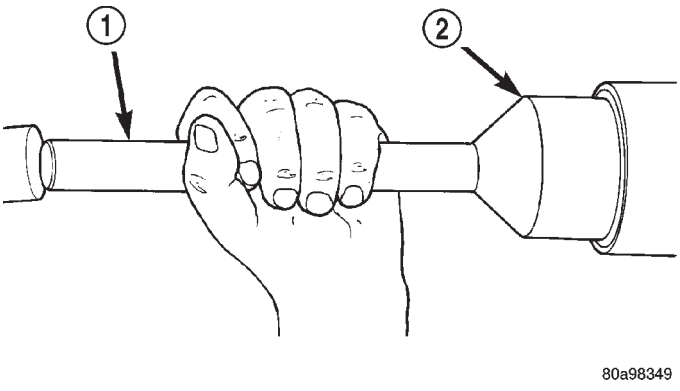


Fig. 60 PINION SEAL

1 - HANDLE
2 - INSTALLER

(6) Install rear pinion bearing and oil slinger/depth shim onto the pinion shaft with Installer 6448 and a press (Fig. 61).

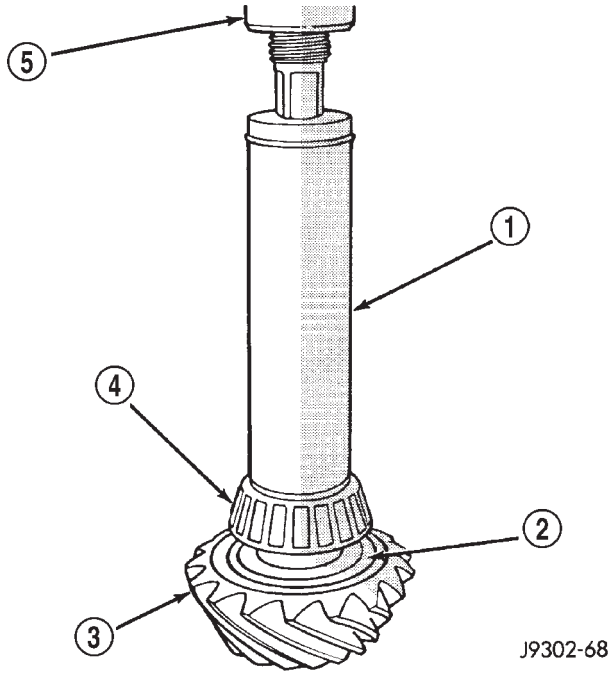


Fig. 61 REAR PINION BEARING

1 - INSTALLER
2 - OIL SLINGER
3 - PINION GEAR
4 - REAR PINION BEARING
5 - PRESS

(7) Install a **new** collapsible spacer on pinion shaft and install the pinion into the housing (Fig. 62).

(8) Install pinion companion flange, with Installer W-162-B, Cup 8109 and Spanner Wrench 6958.

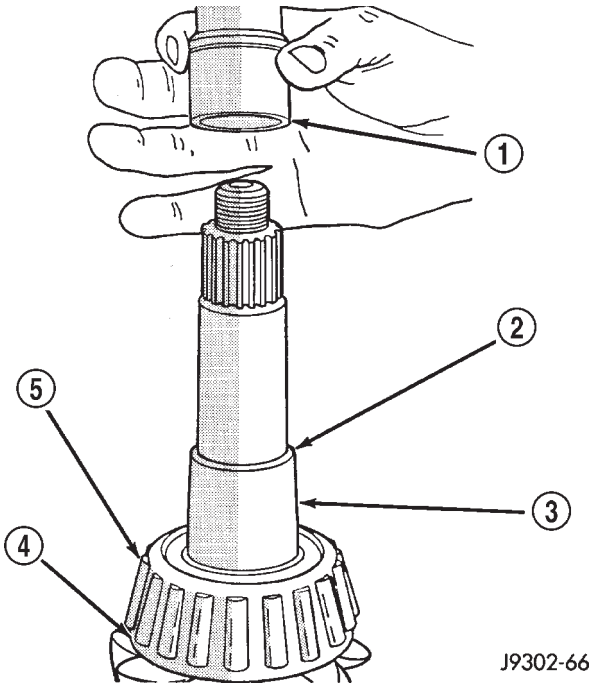


Fig. 62 COLLAPSIBLE PRELOAD SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - DEPTH SHIM
5 - REAR BEARING

(9) Install pinion washer and a **new** nut onto the pinion gear and tighten the nut to 298 N·m (220 ft. lbs.). **Do not over-tighten.**

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed.

(10) Use Flange Wrench 6958, a length of 1 in. pipe and a torque wrench set at 500 N·m (368 ft. lbs.) and crush collapsible spacer until bearing end play is taken up (Fig. 63).

(11) Slowly tighten the nut in 6.8 N·m (5 ft. lb.) increments until the required rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 64).

(12) Rotate the pinion a minimum of ten times. Verify pinion rotates smoothly and check rotating torque with an inch pound torque wrench (Fig. 64). Pinion gear rotating torque is:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 1.7 to 3.4 N·m (15 to 30 in. lbs.).

(13) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

PINION GEAR/RING GEAR (Continued)

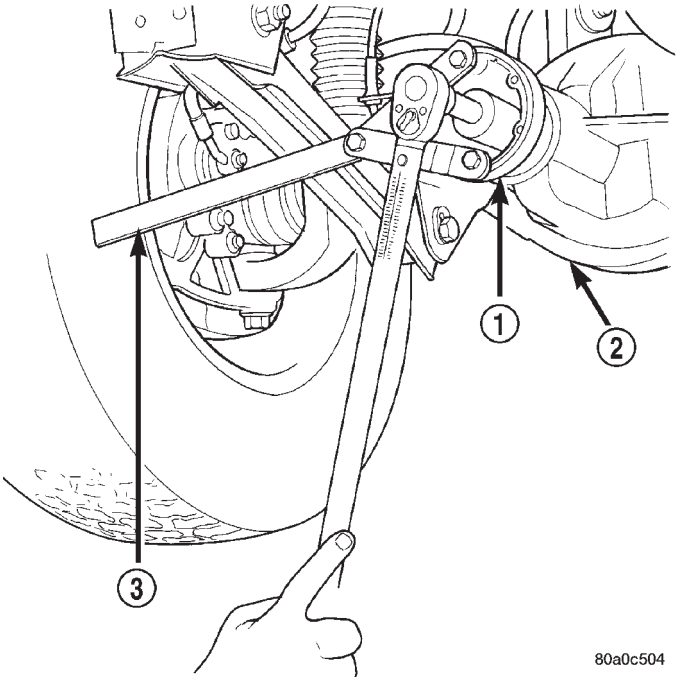


Fig. 63 Pinion Nut

1 - PINION FLANGE
2 - FRONT AXLE
3 - SPANNER WRENCH

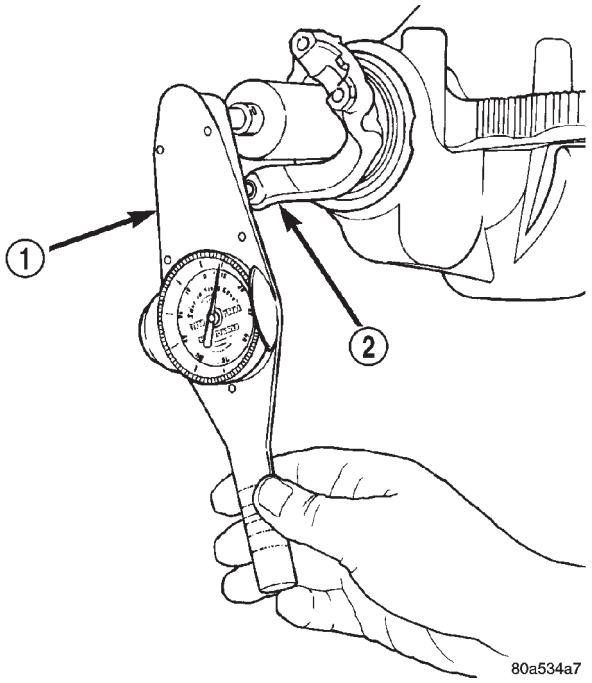


Fig. 64 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE/FLANGE

(14) Invert the differential case in the vise.

(15) Install new ring gear bolts and alternately tighten to 108 N·m (80 ft. lbs.) (Fig. 65).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

NOTE: If equipped with Veri-Lok® differential install oil feed plenum and side bearing.

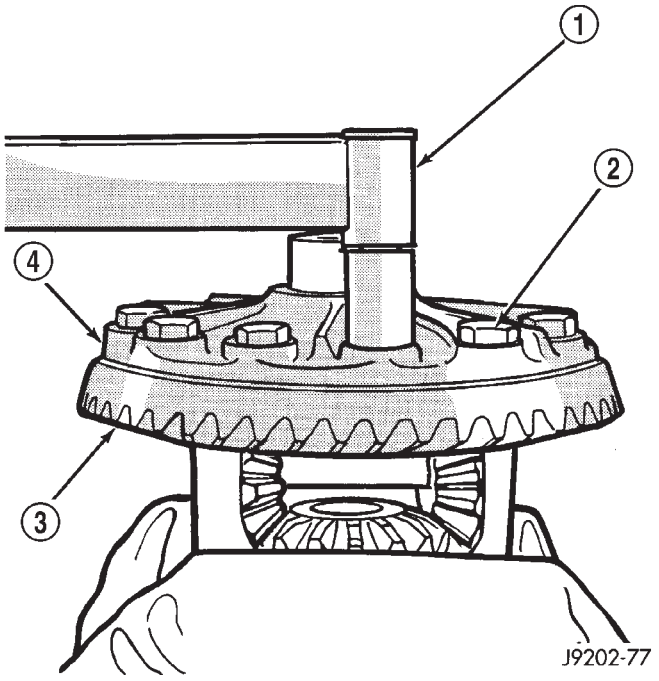


Fig. 65 RING GEAR BOLTS

1 - TORQUE WRENCH
2 - RING GEAR BOLTS
3 - RING GEAR
4 - DIFFERENTIAL CASE

(16) Install differential in housing and verify differential bearing preload, gear mesh and contact pattern. Refer to Adjustment for procedure.

(17) Install differential cover and fill with gear lubricant.

(18) Install propeller shaft with reference marks aligned.

(19) Remove supports and lower vehicle.

REAR AXLE - 198RBI

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REAR AXLE - 198RBI

DESCRIPTION

The Rear Beam-design Iron (RBI) axle housing has an iron center casting with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing. The axles has semi-floating axle shafts, meaning that loads are supported by the axle shaft and bearings. The axle shafts are retained by bearing retainer plates on the axles which are bolted to flanges at the outboard end of the axle tubes.

The differential case is a one-piece design. Differential bearing preload and ring gear backlash is adjusted by the use of selective spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer. A differential cover provides a means for inspection and service.

Axles with optional Trac-Lok® differential have a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

OPERATION

The axle receives power from the transmission/transfer case through the rear propeller shaft. The rear propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

STANDARD DIFFERENTIAL

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

REAR AXLE - 198RBI (Continued)

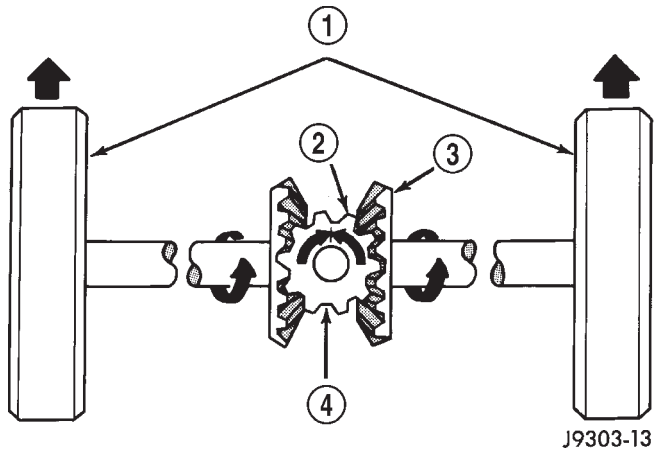


Fig. 1 STRAIGHT AHEAD DRIVING

1 - WHEELS ROTATE AT CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

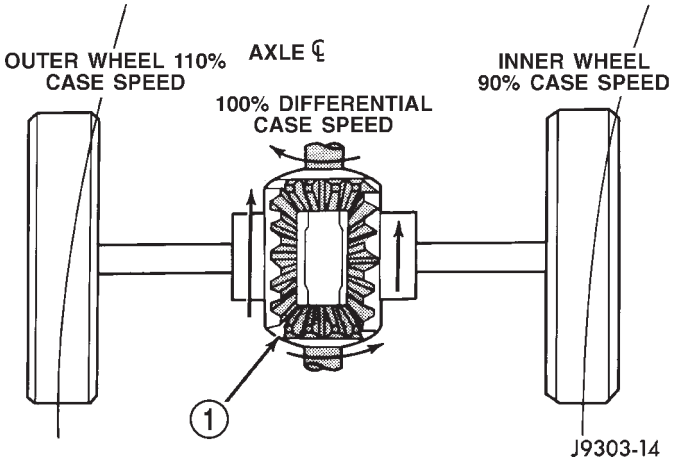


Fig. 2 DIFFERENTIAL ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

TRAC-LOK® DIFFERENTIAL

This differentials clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 3).

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. This differential resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

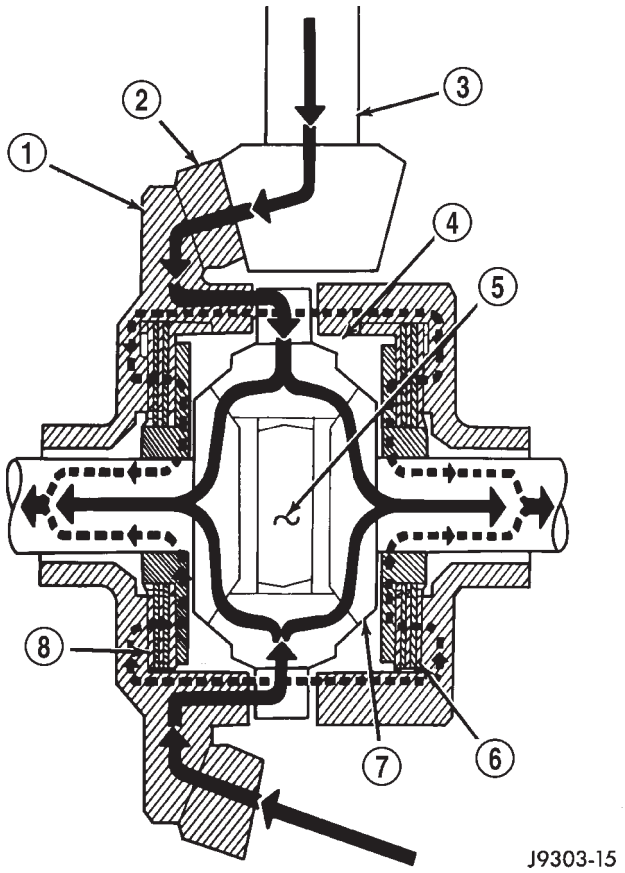


Fig. 3 TRAC-LOK LIMITED SLIP DIFFERENTIAL

1 - CASE
2 - RING GEAR
3 - DRIVE PINION
4 - PINION GEAR
5 - MATE SHAFT
6 - CLUTCH PACK
7 - SIDE GEAR
8 - CLUTCH PACK

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the

peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side–gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

REAR AXLE - 198RBI (Continued)

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.

REAR AXLE - 198RBI (Continued)

Condition	Possible Causes	Correction
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.

REAR AXLE - 198RBI (Continued)

Condition	Possible Causes	Correction
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

VARI-LOK®

(1) Park the vehicle on a level surface or raise vehicle on hoist so that the vehicle is level.

(2) Remove the axle fill plug.

(3) Verify that the axle fluid level is correct. The fluid level is correct if the fluid is level with the bottom of the fill hole.

(4) Shift the transfer case into the 4WD full-time position.

(5) Drive the vehicle in a tight circle for 2 minutes at 5mph to fully prime the pump.

(6) Block the tires opposite the axle to be tested to prevent the vehicle from moving.

(7) Shift the transfer case into the 4WD Low position and the transmission into the Park position.

(8) Raise both the wheels of the axle to be tested off of the ground.

(9) Rotate the left wheel by hand at a minimum of one revolution per second while an assistant rotates the right wheel in the opposite direction.

(10) The left wheel should spin freely at first and then increase in resistance within 5 revolutions until the wheels cannot be continuously rotated in opposite directions.

(11) The Vari-lok® differential has engaged properly if the wheels cannot be rotated in opposite directions for a moment. After the wheels stop rotating for a moment, the fluid pressure will drop in the differential and the wheels begin to rotate once again.

(12) If the system does not operate properly, replace the Vari-lok® differential.

REMOVAL

(1) Raise and support the vehicle.

(2) Position a lifting device under the axle and secure axle.

(3) Remove the wheels and tires.

(4) Remove brake calipers and rotors.

(5) Disconnect parking brake cables from brackets and lever.

(6) Remove wheel speed sensors.

(7) Remove brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the calipers.

(8) Disconnect the vent hose from the axle shaft tube.

(9) Mark propeller shaft and yokes for installation reference.

(10) Remove propeller shaft.

(11) Disconnect stabilizer bar links.

(12) Remove upper suspension arm rear axle ball joint nut.

REAR AXLE - 198RBI (Continued)

(13) Separate rear axle ball joint from the upper suspension arm with Remover 8278 (Fig. 4).

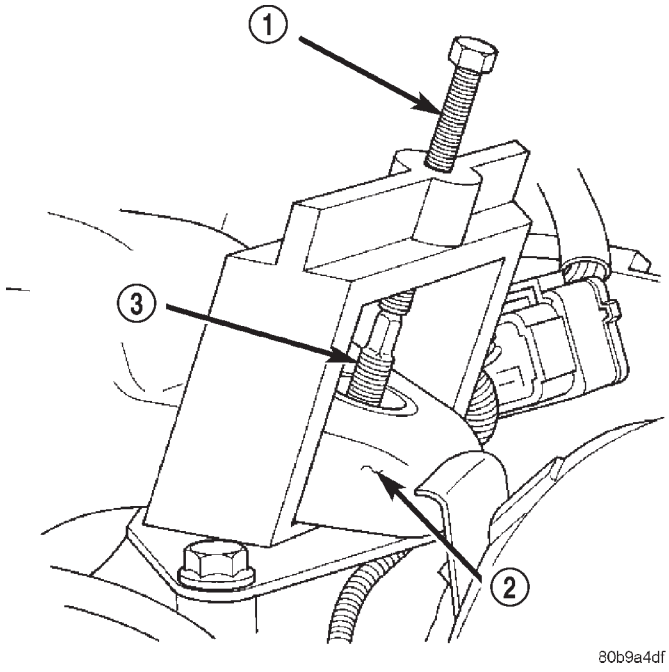


Fig. 4 REAR BALL JOINT

1 - REMOVER
2 - UPPER SUSPENSION ARM
3 - BALL JOINT STUD

(14) Disconnect shock absorbers from axle.
(15) Disconnect track bar.
(16) Disconnect lower suspension arms from the axle brackets.
(17) Separate the axle from the vehicle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners are tightened. If springs are not at their normal ride position, vehicle ride height and handling could be affected.

(1) Raise axle with lift and align coil springs.
(2) Install lower suspension arms in axle brackets. Install nuts and bolts, do not tighten bolts at this time.
(3) Install upper suspension arm on rear axle ball joint.
(4) Install rear axle ball joint nut and tighten to 122 N·m (90 ft.lbs.) (Fig. 5).
(5) Install track bar and attachment bolts, do not tighten bolts at this time.
(6) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.).

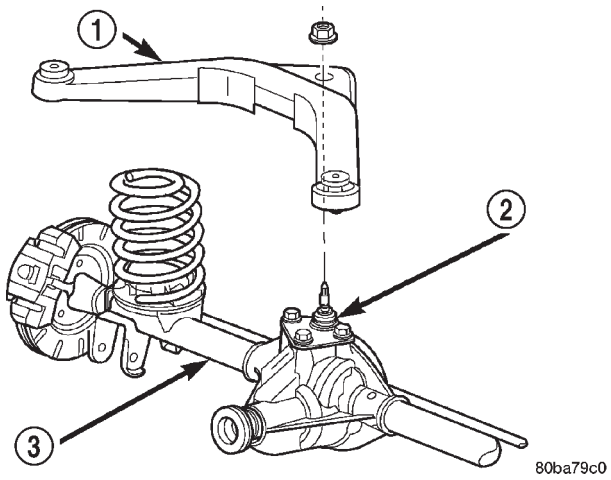


Fig. 5 REAR BALL JOINT NUT

1 - UPPER SUSPENSION ARM
2 - REAR AXLE BALL JOINT
3 - REAR AXLE

(7) Install stabilizer bar links and tighten nuts to 36 N·m (27 ft. lbs.).
(8) Install wheel speed sensors.
(9) Connect parking brake cable to brackets and lever.
(10) Install brake rotors and calipers.
(11) Install the brake hose to the axle junction block.
(12) Install axle vent hose.
(13) Align propeller shaft and pinion yoke reference marks. Install U-joint straps and nuts tighten to 19 N·m (14 ft. lbs.).
(14) Install the wheels and tires.
(15) Add gear lubricant, if necessary.
(16) Remove support and lower the vehicle.
(17) Tighten lower suspension arm bolts to 177 N·m (130 ft. lbs.).
(18) Tighten track bar bolts to 100 N·m (74 ft. lbs.).

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 6). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.850 mm (3.813 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

REAR AXLE - 198RBI (Continued)

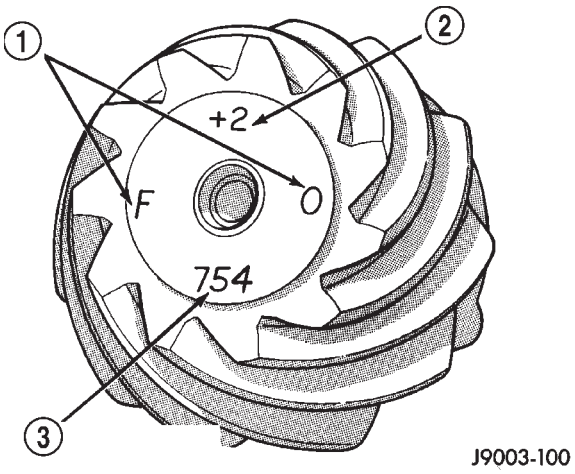


Fig. 6 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER

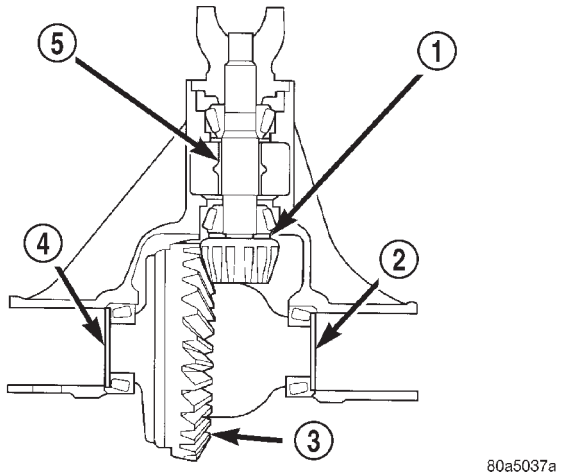


Fig. 7 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

Compensation for pinion depth variance is achieved with a select shim. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 7).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract this number from the thickness of the original depth shim/oil slinger to compensate for the difference in the depth variances. Refer to the Pinion Gear Depth Variance chart.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the etched number on the face of the pinion gear head (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

REAR AXLE - 198RBI (Continued)

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 8).

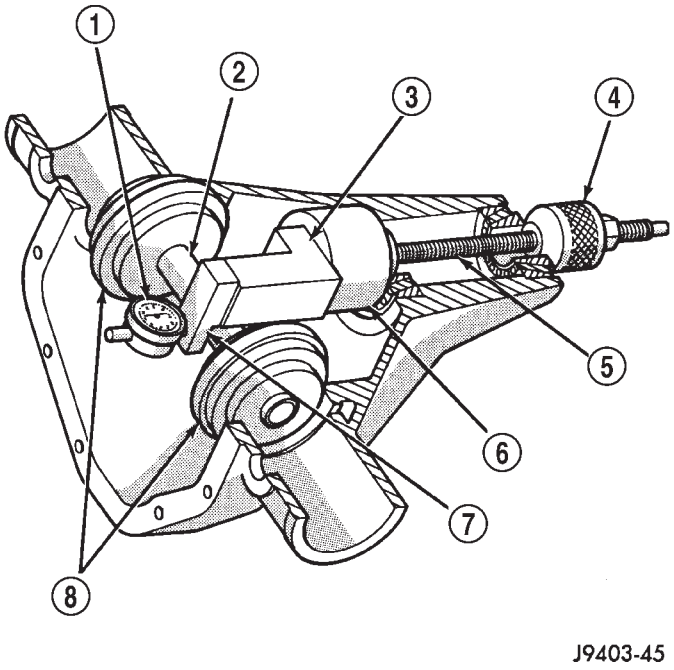


Fig. 8 PINION GEAR DEPTH GAUGE TOOLS

1 - DIAL INDICATOR
2 - ARBOR
3 - PINION HEIGHT BLOCK
4 - CONE
5 - SCREW
6 - PINION BLOCK
7 - SCOOTER BLOCK
8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 6735 and rear pinion bearing onto Screw 6741 (Fig. 8).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 9).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 8).

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 10). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 6732 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

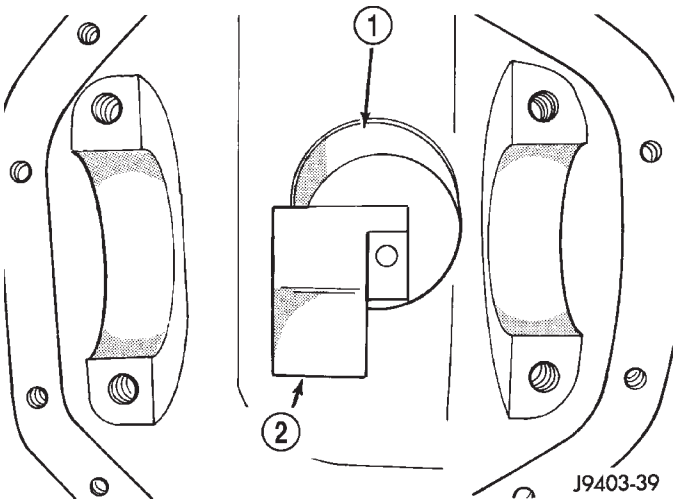


Fig. 9 PINION HEIGHT BLOCK

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

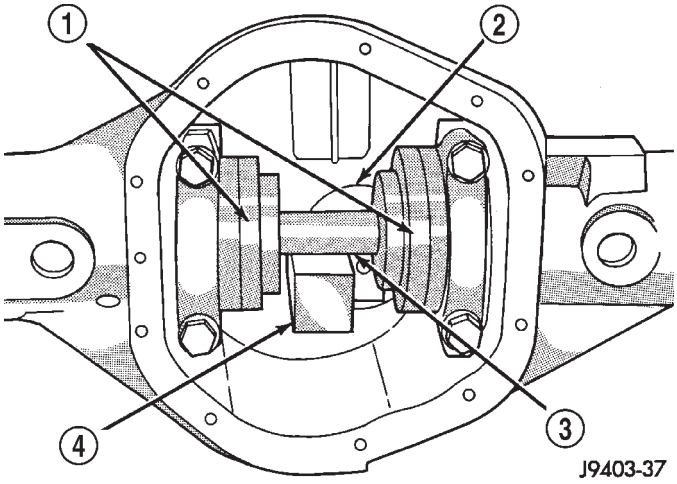


Fig. 10 GAUGE TOOLS IN HOUSING

1 - ARBOR DISC
2 - PINION BLOCK
3 - ARBOR
4 - PINION HEIGHT BLOCK

(6) Place Scooter Block/Dial Indicator in position in the housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 8). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

REAR AXLE - 198RBI (Continued)

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 11). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 6). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

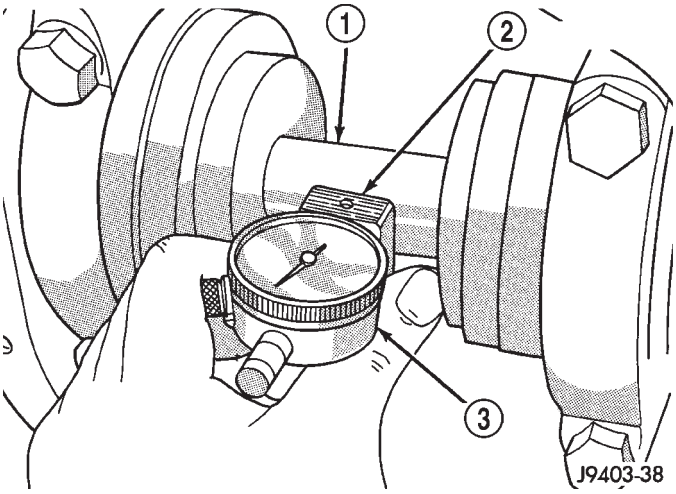


Fig. 11 PINION GEAR DEPTH MEASUREMENT

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

DIFFERENTIAL

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential cas bearing cups. The proper shim thickness can be determined using slip-fit Dummy Bearings D-348 in place of the differential side bearings and a Dial Indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 12). Differential shim measurements are performed with the spreader W-129-B removed.

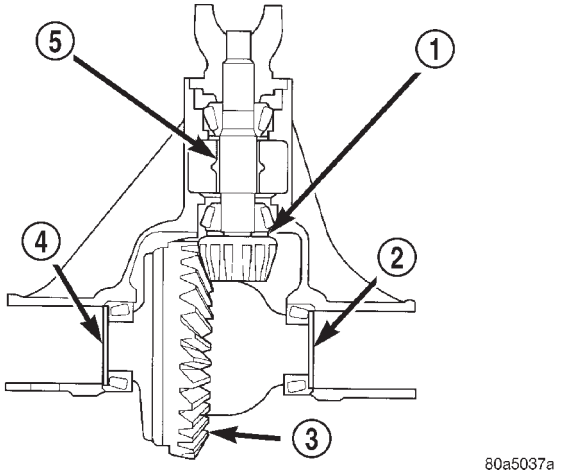


Fig. 12 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

PRELOAD SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove differential side bearings from differential case.

(2) Install ring gear on differential case and tighten bolts to specification.

(3) Install Dummy Bearings D-348 on differential case.

(4) Install differential case in the housing.

REAR AXLE - 198RBI (Continued)

(5) Record the thickness of Dummy Shims 8107. Insert the shims between the dummy bearings and the differential housing (Fig. 13).

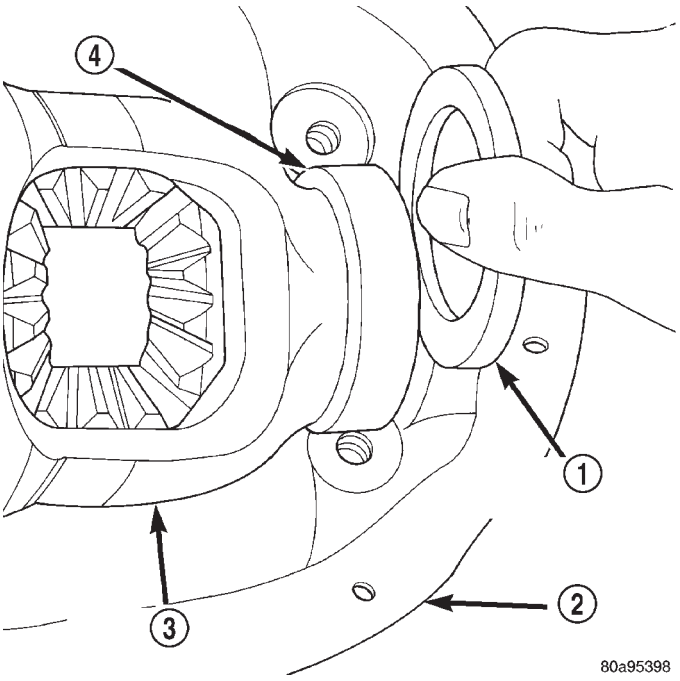


Fig. 13 SHIM POINT

1 - DUMMY SHIM
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE
4 - DUMMY BEARINGS

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 14).

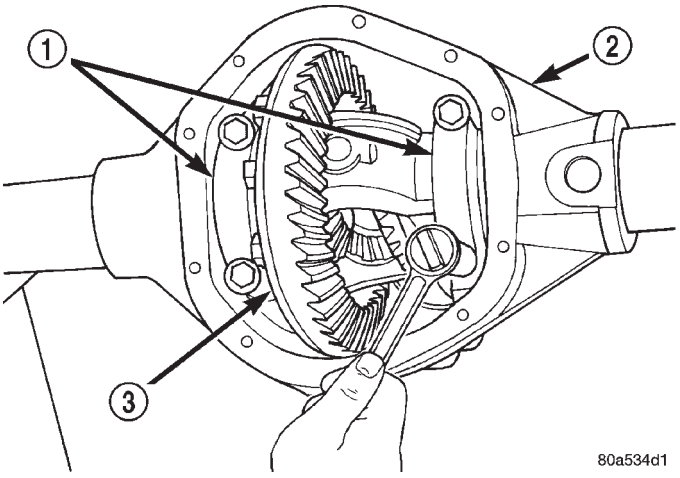


Fig. 14 BEARING CAP BOLTS

1 - BEARING CAP
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE

(7) Using a dead-blow type hammer seat the differential dummy bearings to each side of the housing (Fig. 15) and (Fig. 16).

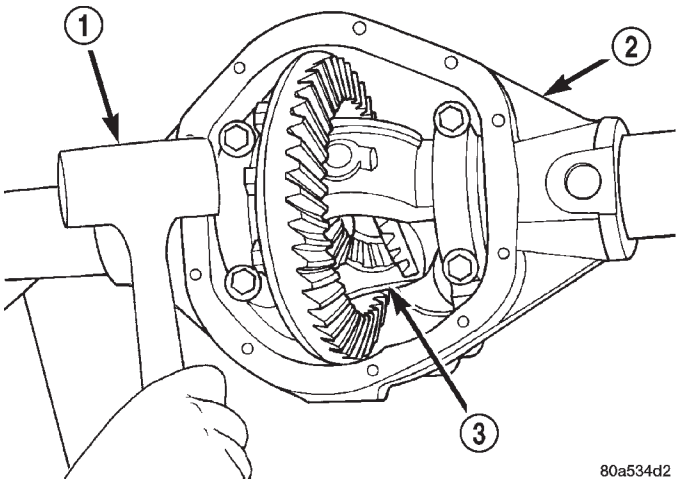


Fig. 15 SEAT PINION SIDE BEARING

1 - MALLET
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL CASE

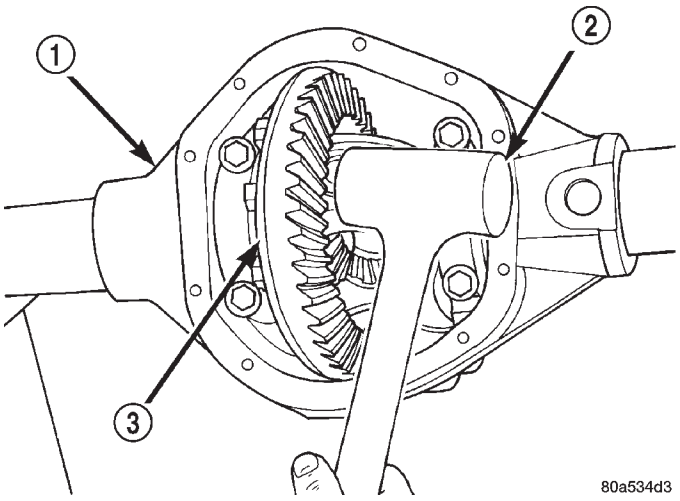


Fig. 16 SEAT RING GEAR SIDE BEARING

1 - DIFFERENTIAL HOUSING
2 - MALLET
3 - DIFFERENTIAL CASE

REAR AXLE - 198RBI (Continued)

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear (Fig. 17).

(9) Attach a Dial Indicator C-3339 to pilot stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 17).

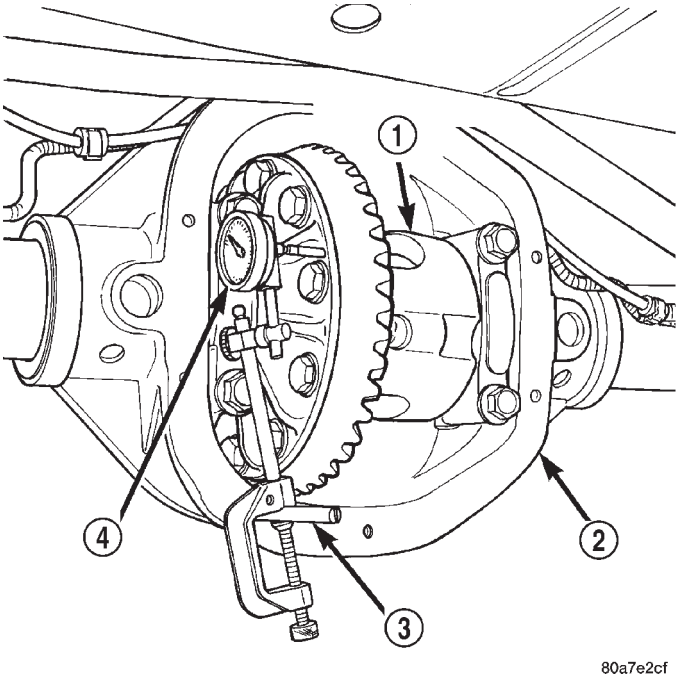


Fig. 17 DIFFERENTIAL SIDE PLAY

1 - DIFFERENTIAL CASE
2 - DIFFERENTIAL HOUSING
3 - PILOT STUD
4 - DIAL INDICATOR

(10) Push and hold differential case to pinion gear side of the housing and zero dial indicator (Fig. 18).

(11) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 19).

(12) Add 0.152 mm (0.006 in.) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(13) Rotate dial indicator out of the way on the pilot stud.

(14) Remove differential case and dummy bearings from the housing.

(15) Install the pinion gear in axle housing. Install the pinion yoke and establish the correct pinion rotating torque.

(16) Install differential case and Dummy Bearings D-348 in the housing.

(17) Install a single dummy shim in the ring gear side. Install bearing caps and tighten bolts snug.

(18) Seat ring gear side dummy bearing (Fig. 16).

(19) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 17).

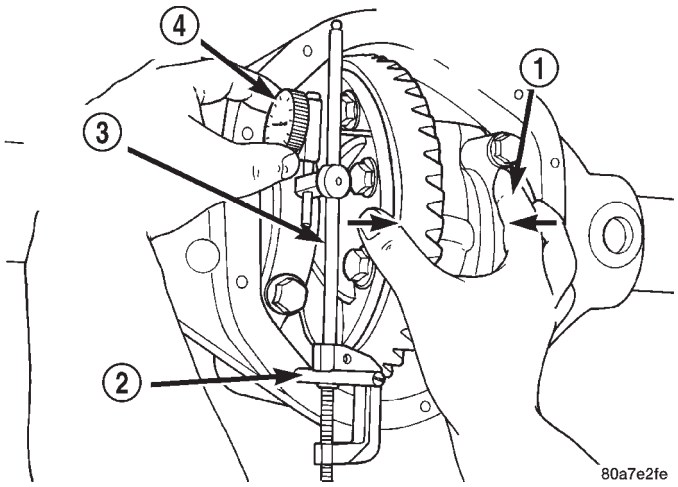


Fig. 18 ZERO DIAL INDICATOR

1 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 - PILOT STUD
3 - DIAL INDICATOR
4 - ZERO DIAL INDICATOR FACE

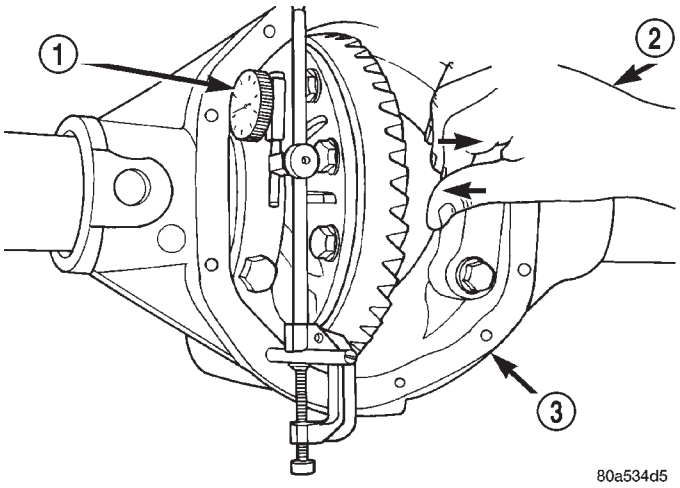


Fig. 19 DIFFERENTIAL TO RING GEAR SIDE

1 - DIAL INDICATOR
2 - FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 - DIFFERENTIAL HOUSING

(20) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 20).

(21) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 21). Add dummy shim thickness to this reading. This will be the total shim thickness to achieve zero backlash.

(22) Subtract 0.076 mm (0.003 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(23) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is

REAR AXLE - 198RBI (Continued)

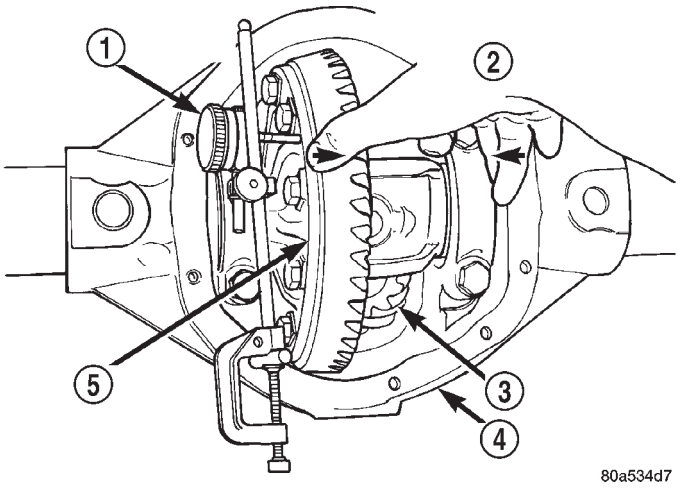


Fig. 20 ZERO DIAL INDICATOR

1 - DIAL INDICATOR FACE
2 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

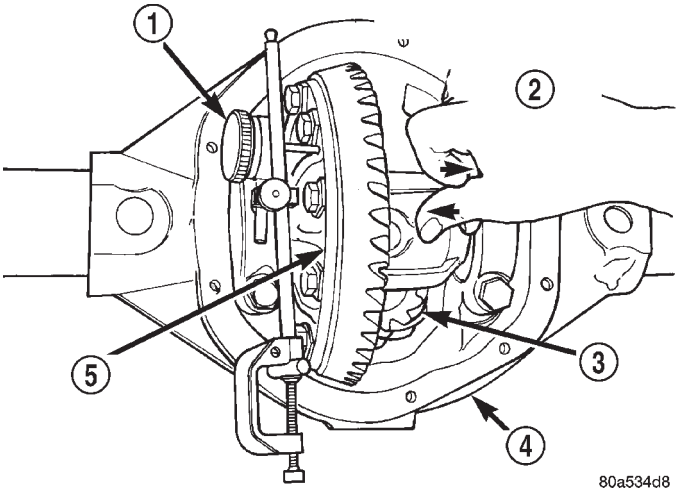


Fig. 21 DIFFERENTIAL TO RING GEAR SIDE

1 - DIAL INDICATOR
2 - FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

the shim thickness required on the pinion side of the housing.

(24) Rotate dial indicator out of the way on pilot stud.

(25) Remove differential case and dummy bearings from the housing.

(26) Install side bearings and cups on differential case.

(27) Install spreader W-129-B utilizing some items from Adapter Set 6987, on the housing and spread axle opening enough to receive differential case.

CAUTION: Never spread over 0.38 mm (0.015 in.). If housing is over-spread, it could be distorted or damaged.

(28) Place the bearing preload shims in the housing, against the axle tubes.

(29) Install differential case into the housing.

(30) Remove spreader from the housing.

(31) Install differential bearing caps in their original locations.

(32) Install bearing cap bolts and tighten to 77 N·m (57 ft. lbs.).

(33) Rotate the differential case several times to seat the side bearings.

(34) Position the indicator plunger against a ring gear tooth (Fig. 22).

(35) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(36) Zero dial indicator face to pointer.

(37) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12-0.20 mm (0.005-0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the axle housing to the other (Fig. 23).

(38) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern Analysis procedure.

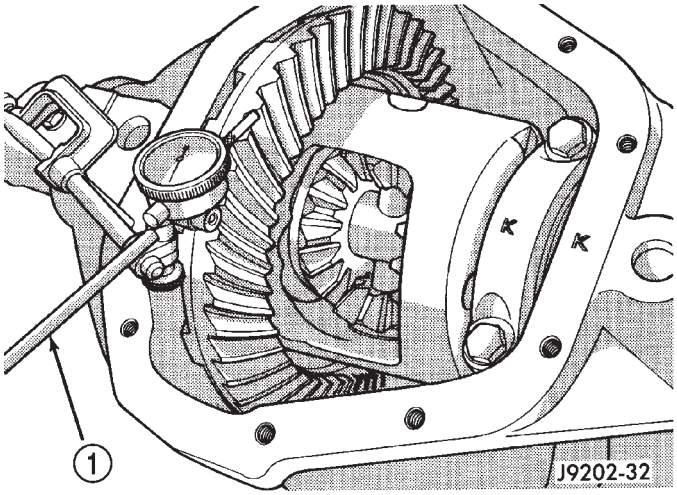


Fig. 22 RING GEAR BACKLASH MEASUREMENT

1 - DIAL INDICATOR

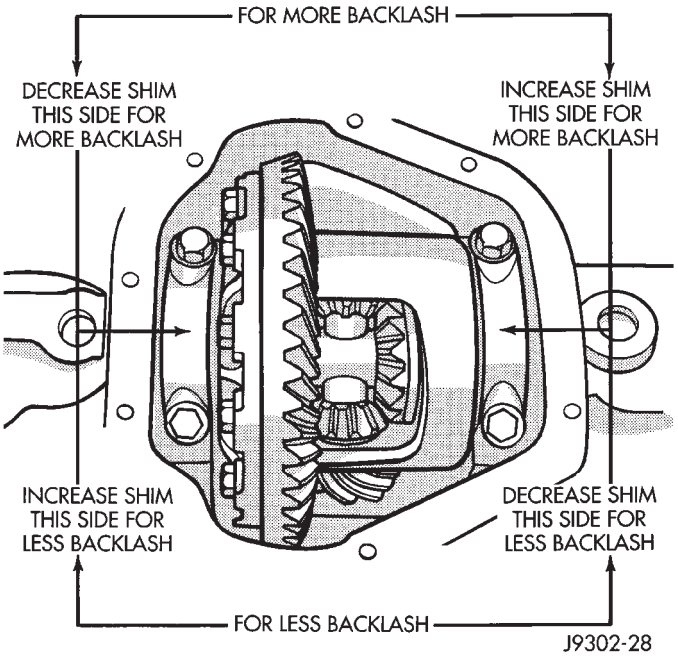


Fig. 23 BACKLASH SHIM

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

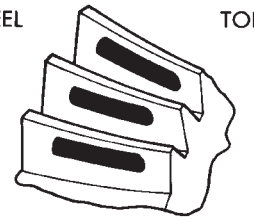
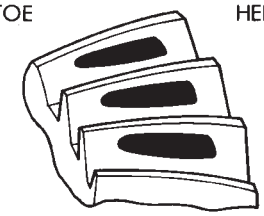
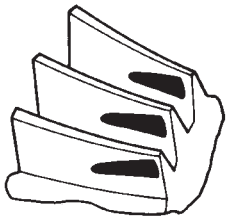
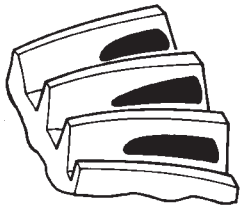
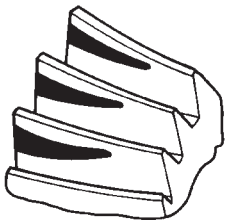
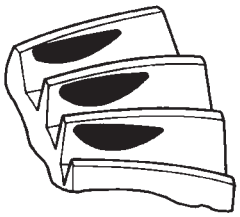
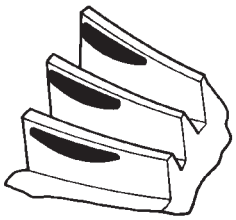
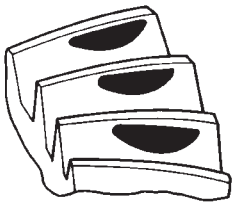
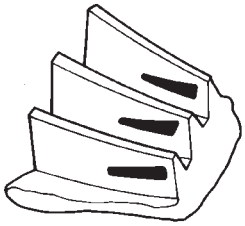
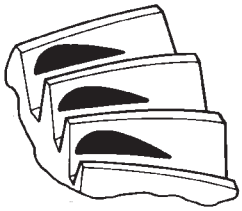
(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(2) Wrap, twist and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 24) and adjust pinion depth and gear backlash as necessary.

REAR AXLE - 198RBI (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 24 GEAR TOOTH CONTACT PATTERNS

REAR AXLE - 198RBI (Continued)

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion should be the torque to rotate the pinion plus 0.79-1.24 N·m (7-11 in. lbs.).

SPECIFICATIONS

AXLE SPECIFICATIONS

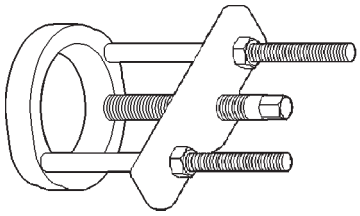
DESCRIPTION	SPECIFICATION
Axle Ratio	3.07, 3.31, 3.55, 3.73, 4.11
Differential Bearing Preload	0.1 mm (0.004 in.)
Ring Gear Diameter	198 mm (7.795 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Pinion Gear Std. Depth	96.85 mm (3.813 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1.7-3.9 N·m (15-35 in. lbs.)

TORQUE SPECIFICATIONS

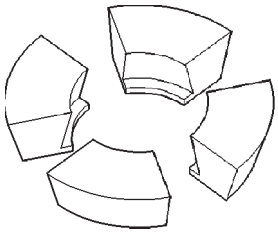
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	77	57	-
Ring Gear Bolts	129-142	95-105	-
Pinion Nut Minimum	272	200	-
Pinion Mate Shaft Screw	16.25	12	-
Axle Bearing Retainer Plate Nuts	61	45	-

REAR AXLE - 198RBI (Continued)

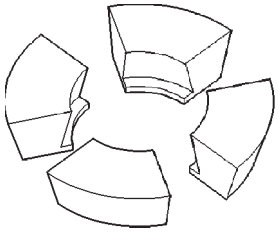
SPECIAL TOOLS



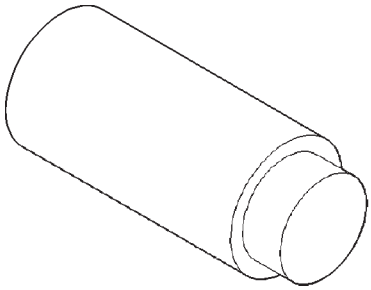
PULLER C-293-PA



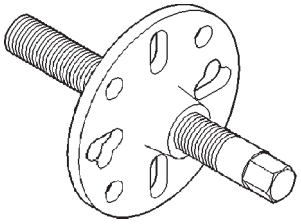
ADAPTER 8352



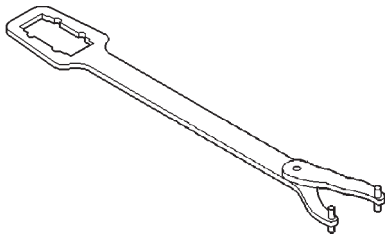
ADAPTER C-293-40



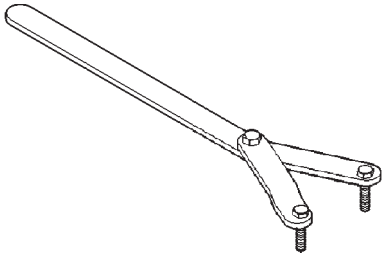
PLUG SP-3289



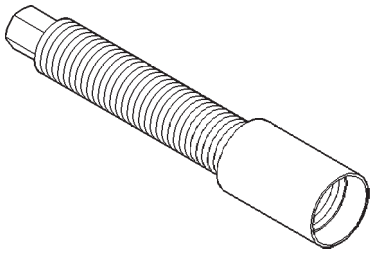
Puller C-452



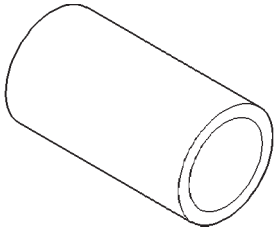
Wrench C-3281



Spanner Wrench 6958

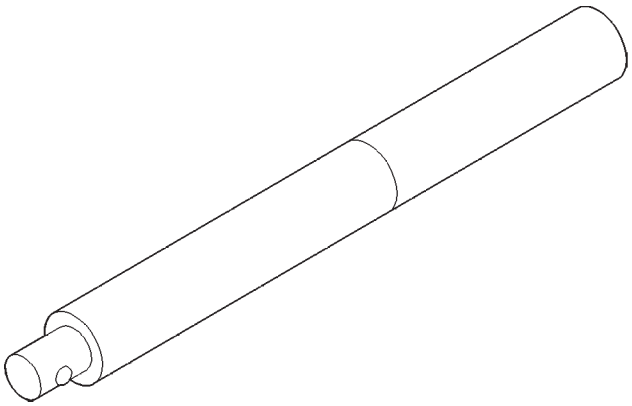


INSTALLER 8112

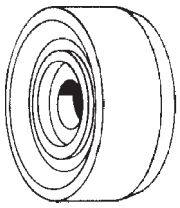


CUP 8109

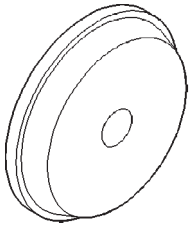
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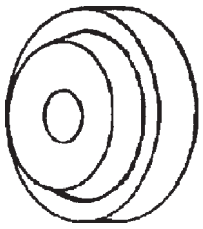
HANDLE C-4171



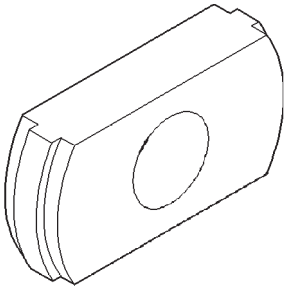
INSTALLER C-3716-A



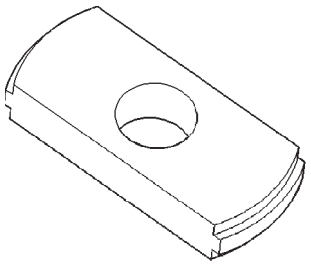
INSTALLER D-130



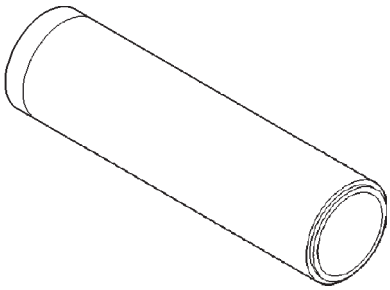
INSTALLER D-146



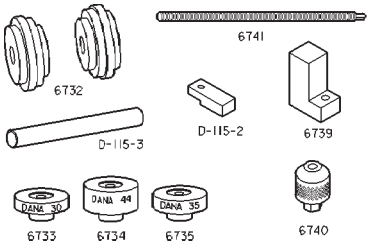
REMOVER C-4345



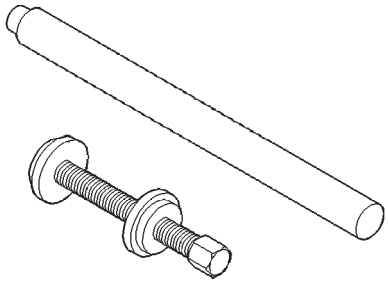
REMOVER D-149



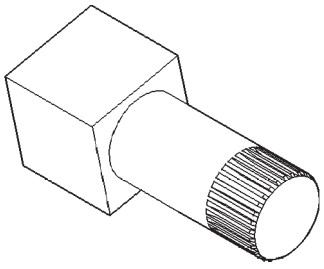
INSTALLER W-262



PINION DEPTH 6774

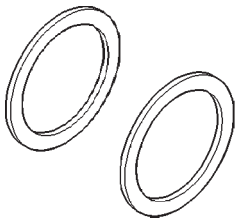


TRAC-LOK TOOLS 6960

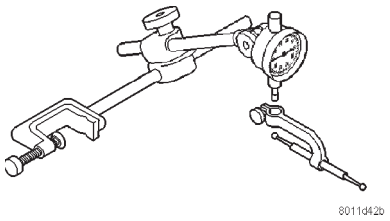


FIXTURE 6965

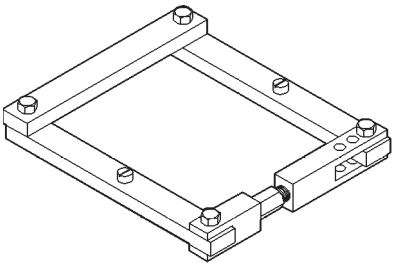
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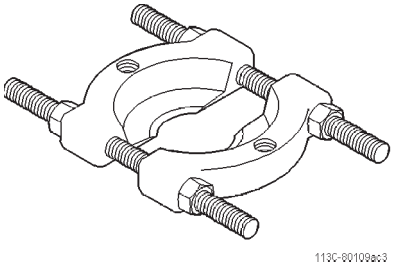
SHIMS DUMMY 8107



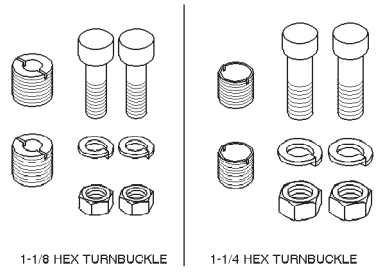
DIAL INDICATOR C-3339



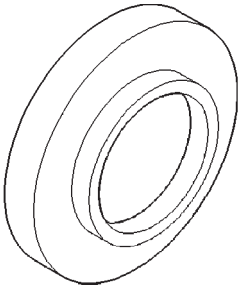
SPREADER W-129-B



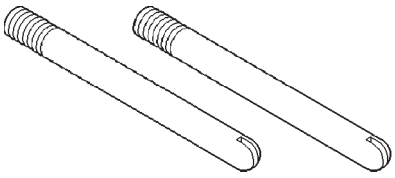
SPLITTER BEARING 1130



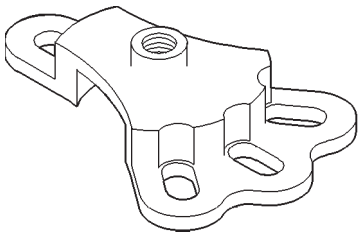
ADAPTER KIT 6987



INSTALLER 7913-A



PILOT STUDS C-3288-B



PULLER 6790

AXLE SHAFTS

REMOVAL

(1) Place transmission in neutral.
(2) Raise and support vehicle.
(3) Remove wheel and tire assembly.
(4) Remove brake caliper and rotor.
(5) Remove nuts holding axle retainer plate to axle tube from the rear of the axle flange.
(6) Pull axle shaft from the axle with Slide Hammer 7420 and Adapter 6790. Mount the adapter to the axle with lug nuts.

NOTE: The axle bearing race is normally loose in the axle tube.

INSTALLATION

(1) Insall axle into the axle tube with the flat area of the retainer plate upward.
(2) Insert retaining plate studs into the brake backing plate and axle tube flange.
(3) Install retainer nuts and tighten nuts to 61 N·m (45 ft. lbs.).
(4) Install the brake rotor and caliper.
(5) Install wheel and tire.
(6) Check and fill the differential with gear lubricant.
(7) Lower vehicle.

AXLE BEARINGS/SEALS

REMOVAL

(1) Remove axle shaft from vehicle.

NOTE: The axle bearing race is normally loose in the axle tube.

(2) Drill a shallow hole into soft steel axle bearing retaining ring with a 3/8 in. drill bit (Fig. 25). Use a drill depth stop to avoid marking the axle.
(3) With a cold chisel cut the retaining ring across drilled hole. (Fig. 26)
(4) Slide retaining ring from axle shaft.

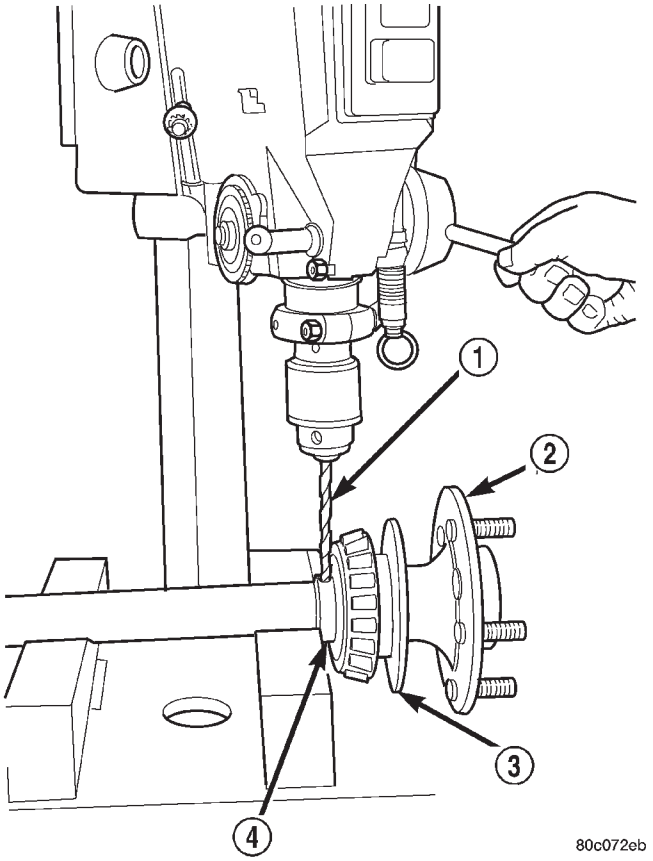


Fig. 25 DRILL RETAINING RING

1 - DRILL BIT
2 - AXLE
3 - RETAINING PLATE
4 - RETAINING RING

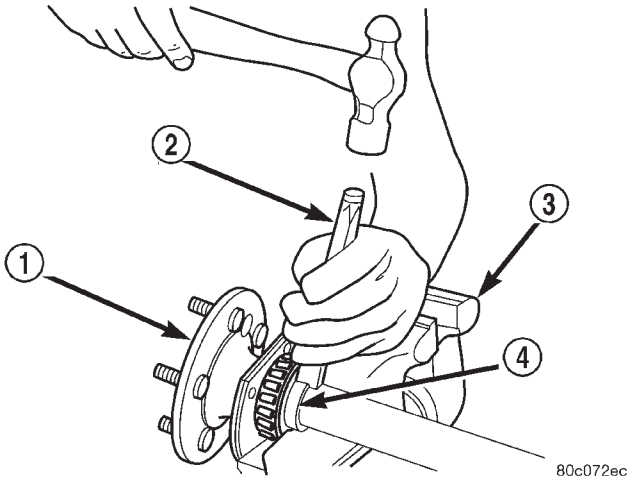


Fig. 26 RETAINING RING

1 - AXLE
2 - COLD CHISEL
3 - VISE
4 - RETAINING RING

AXLE BEARINGS/SEALS (Continued)

(5) Remove axle bearing from the shaft with, a press and Splitter 1130 placed between the seal and bearing (Fig. 27).

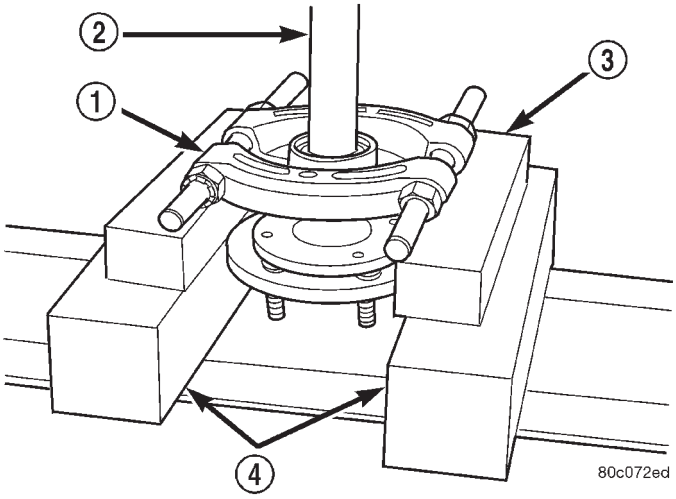


Fig. 27 AXLE BEARING AND SEAL

1 - SPLITTER
2 - AXLE
3 - BLOCKS
4 - PRESS PLATES

(6) Remove seal from axle.
(7) Remove retaining plate from axle shaft.

INSTALLATION

(1) Verify axle shaft retaining plate is flat with a straight edge.

NOTE: If the plate is warped or the studs are loose in the plate replace the retaining plate.

(2) Install retaining plate on the axle shaft (Fig. 28).
(3) Apply a coat of multi-purpose grease on sealing surface of axle seal.
(4) Install seal on the axle shaft with cavity away from retaining plate (Fig. 28).
(5) Lubricate bearing with Mopar Wheel Bearing Grease or equivalent. Wipe excess grease from the bearing.
(6) Install bearing on the axle shaft with Installer 7913 and a press (Fig. 29).

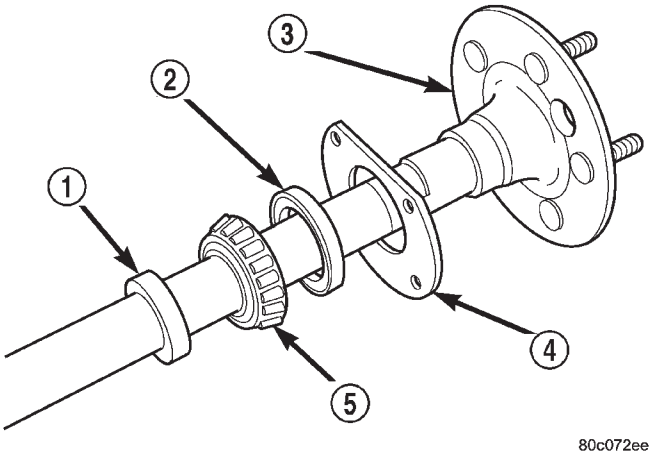


Fig. 28 AXLE BEARING AND SEAL COMPONENTS

1 - RETAINING RING
2 - SEAL
3 - AXLE
4 - RETAINING PLATE
5 - AXLE BEARING

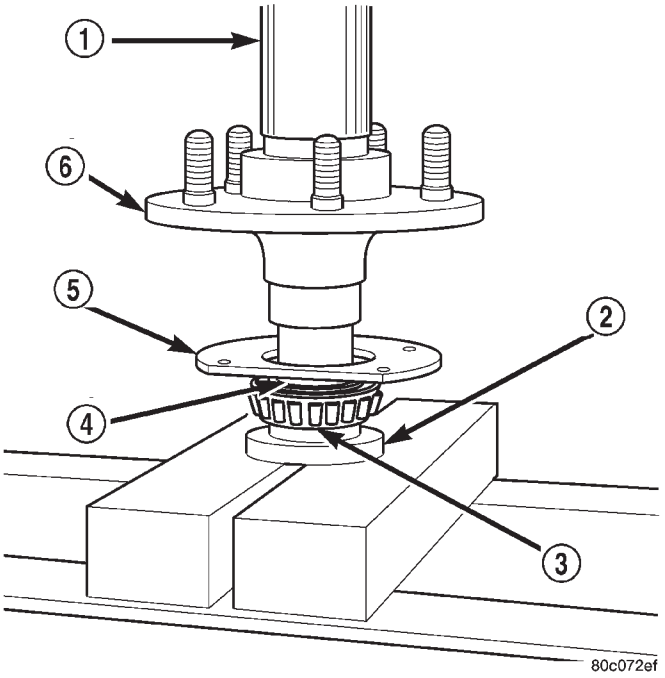


Fig. 29 PRESS BEARING ON AXLE

1 - PRESS RAM
2 - INSTALLER
3 - AXLE BEARING
4 - SEAL
5 - RETAINING PLATE
6 - AXLE

AXLE BEARINGS/SEALS (Continued)

(7) Press metal retaining ring onto axle shaft with Installer 7913 and a press (Fig. 30).

(8) Install axle in vehicle.

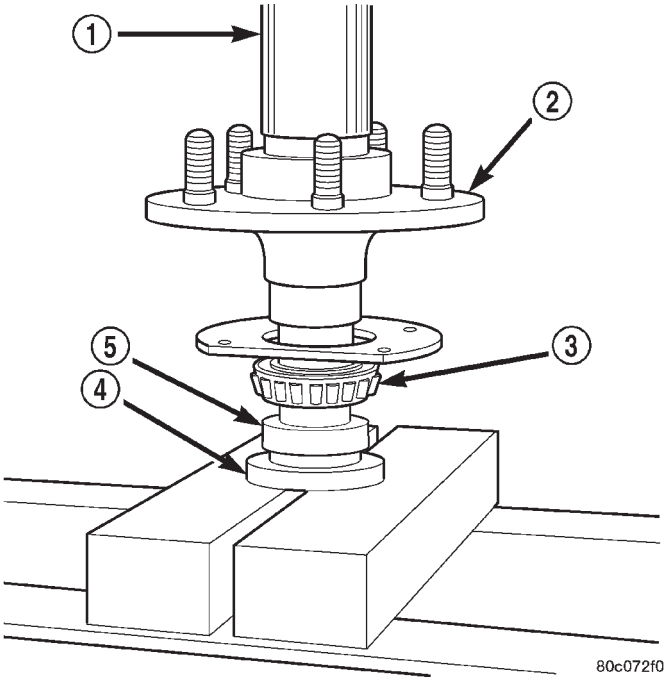


Fig. 30 BEARING RETAINING RING

1 - PRESS
2 - AXLE
3 - AXLE BEARING
4 - INSTALLER
5 - METAL RETAINING RING

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake calipers and rotors.

(4) Mark propeller shaft and pinion yoke for installation reference.

(5) Remove propeller shaft from the yoke.

(6) Rotate pinion gear a minimum of ten times and verify pinion rotates smoothly.

(7) Record rotating torque of the pinion gear with an inch pound dial-type torque wrench, for installation reference.

(8) Hold the pinion yoke with Spanner Wrench 6958 and remove the pinion nut and washer (Fig. 31).

(9) Remove pinion yoke with Remover C-452 and Wrench C-3281 (Fig. 32).

(10) Remove pinion gear seal with Remover 7794-A and slide hammer (Fig. 33).

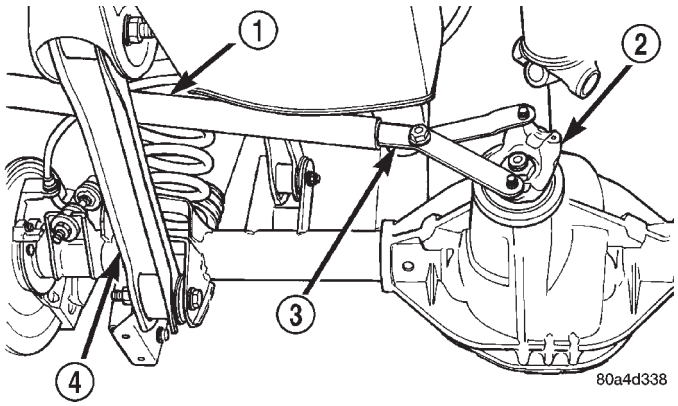


Fig. 31 PINION YOKE HOLDER

1 - PIPE
2 - PINION YOKE
3 - SPANNER WRENCH
4 - LOWER CONTROL ARM

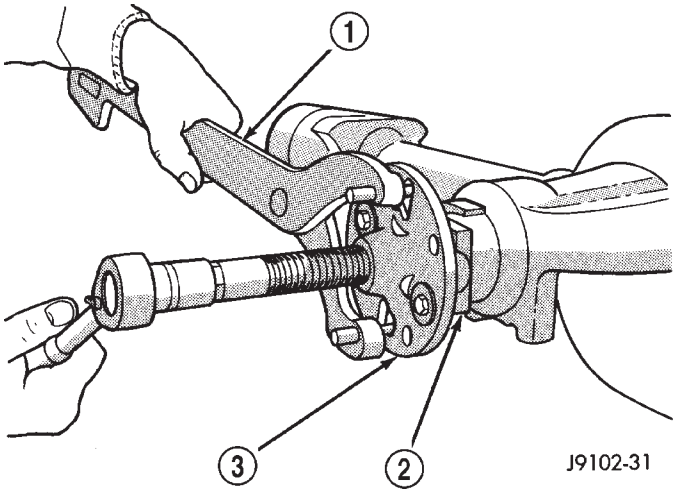


Fig. 32 PINION YOKE

1 - FLANGE WRENCH
2 - YOKE
3 - YOKE PULLER

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with an appropriate installer (Fig. 34).

(2) Install yoke on pinion gear with Screw 8112, Cup 8109 and Spanner Wrench 6958 (Fig. 35).

CAUTION: Do not exceed the minimum tightening torque 271 N·m (200 ft. lbs.) when installing the pinion yoke at this point. Damage to the collapsible spacer or bearings may result.

(3) Install yoke washer and a **new** nut on the pinion gear and tighten the nut until there is zero bearing end-play.

PINION SEAL (Continued)

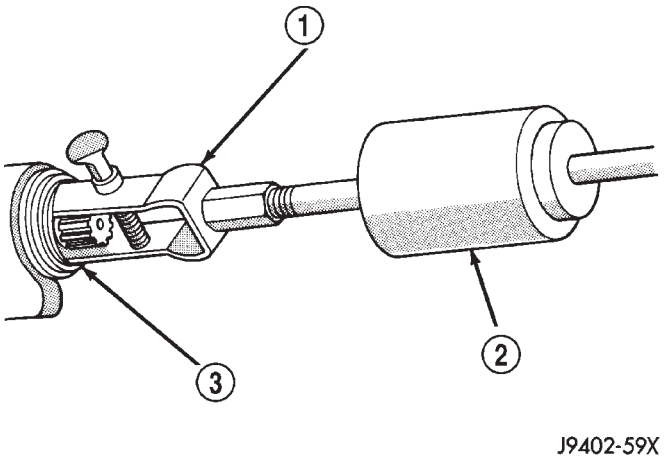


Fig. 33 PINION SEAL

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

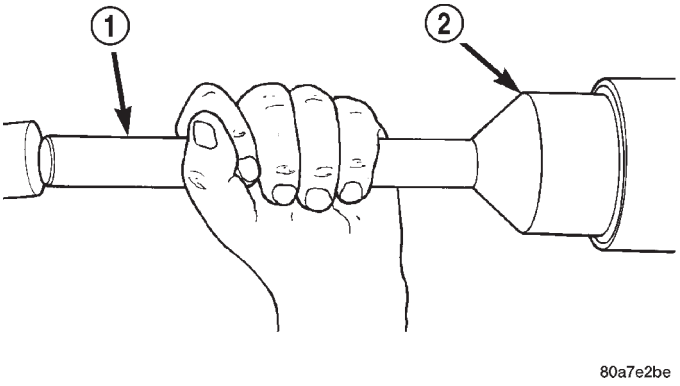


Fig. 34 PINION SEAL

1 - HANDLE
2 - INSTALLER

(4) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(5) Rotate the pinion gear a minimum of ten times and verify pinion rotates smoothly. Rotate pinion shaft an inch pound torque wrench. Rotating torque should be equal to recorded reading plus an additional 0.56 N·m (5 in. lbs.) (Fig. 36).

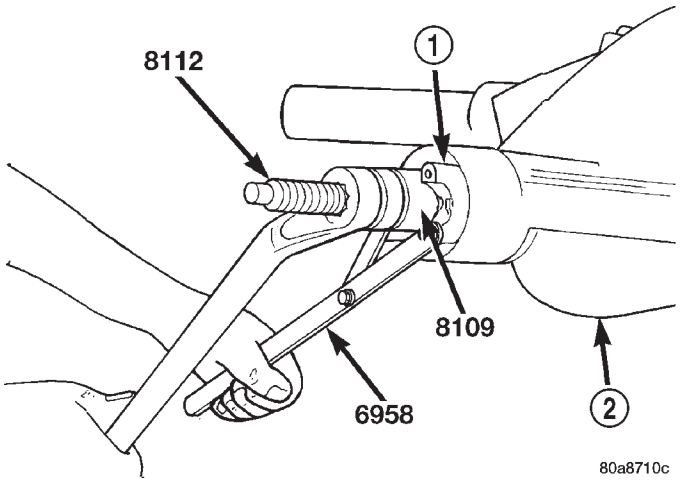


Fig. 35 PINION YOKE

1 - PINION YOKE
2 - DIFFERENTIAL HOUSING

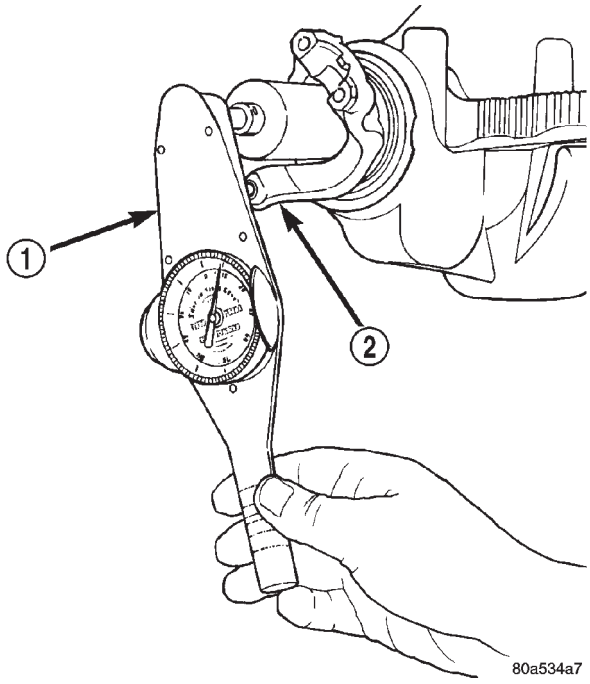


Fig. 36 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

PINION SEAL (Continued)

(6) If the rotating torque is low, use Spanner Wrench 6958 to hold the pinion yoke (Fig. 37), and tighten the pinion nut in 6.8 N·m (5 ft. lbs.) increments until the proper rotating torque is achieved.

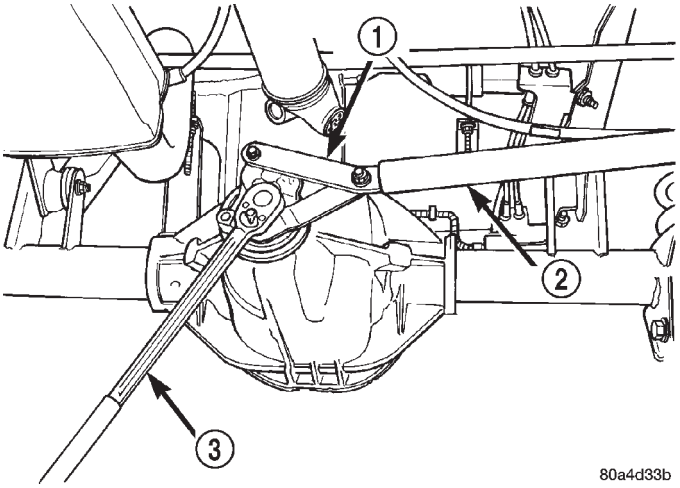


Fig. 37 PINION SHAFT NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

CAUTION: If maximum tightening torque is reached prior to reaching required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(7) Install the propeller shaft with reference marks aligned.
(8) Add gear lubricant to the differential if necessary.
(9) Install brake rotors and calipers.
(10) Install wheel and tire assemblies.
(11) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake calipers and rotors.
(4) Mark propeller shaft and pinion yoke for installation reference and remove propeller shaft.
(5) Rotate pinion gear a minimum of ten times and verify pinion rotates smoothly.
(6) Record rotate torque of the pinion gear, with an inch pound torque wrench.
(7) Hold pinion yoke with Spanner Wrench 6958 and remove pinion nut and washer (Fig. 38).
(8) Remove pinion yoke with Remover C-452 and Wrench C-3281 (Fig. 39).

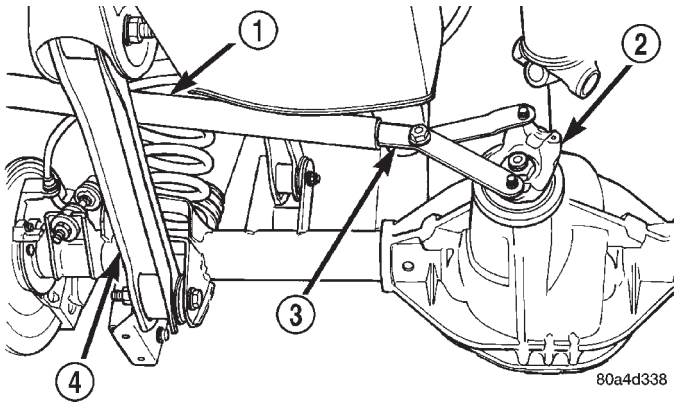


Fig. 38 PINION YOKE HOLDER

1 - 1 in. PIPE
2 - PINION YOKE
3 - SPANNER WRENCH
4 - LOWER CONTROL ARM

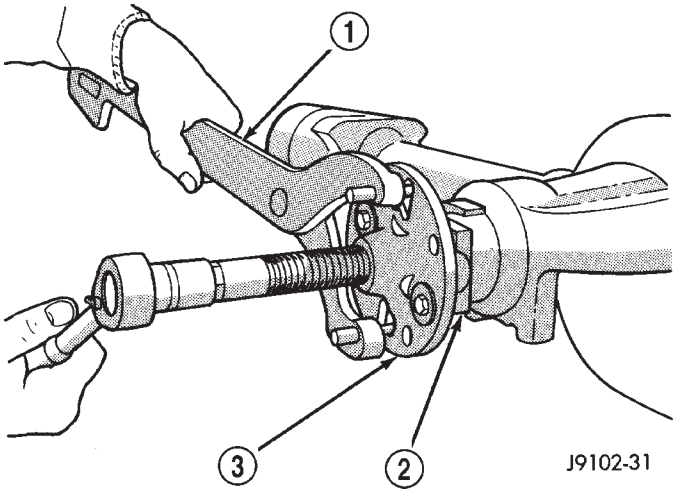


Fig. 39 PINION YOKE PULLER

1 - WRENCH
2 - PINION YOKE
3 - PULLER

(9) Remove pinion shaft seal with Remover 7794-A and slide hammer (Fig. 40).
(10) Remove front pinion bearing using a pair of pick tools to pull the bearing off the pinion gear shaft.

NOTE: If the pinion bearing becomes bound on the pinion shaft, lightly tap the end of the shaft with a rawhide/rubber mallet.

(11) Remove the collapsible spacer.

INSTALLATION

(1) Install a **new** collapsible spacer on pinion shaft.
(2) Install pinion front bearing on the pinion shaft.

COLLAPSIBLE SPACER (Continued)

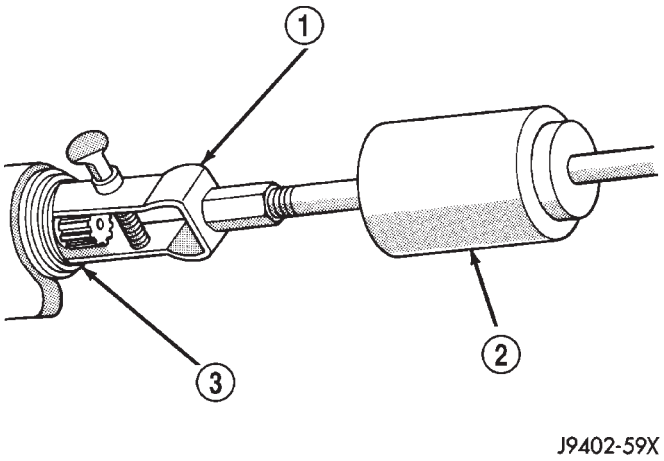


Fig. 40 PINION SEAL REMOVER

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(3) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with an appropriate installer (Fig. 41).

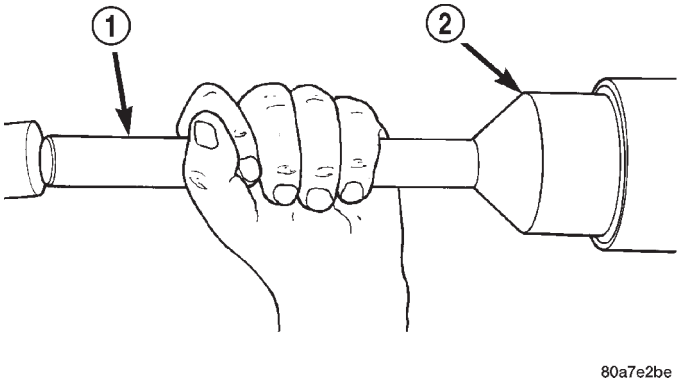


Fig. 41 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(4) Install yoke with Screw 8112, Cup 8109 and Spanner Wrench 6958 (Fig. 42).

(5) Install yoke washer and **new** nut on the pinion gear. Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(6) Using yoke with Spanner Wrench 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), (Fig. 43) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 44).

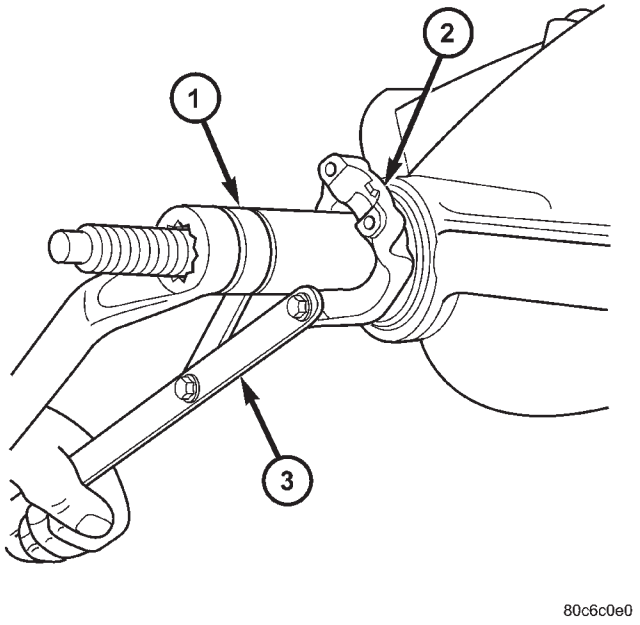


Fig. 42 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - SPANNER WRENCH

NOTE: If more than 474 N·m (350 ft. lbs.) torque is required to crush the collapsible spacer, the spacer is defective and must be replaced.

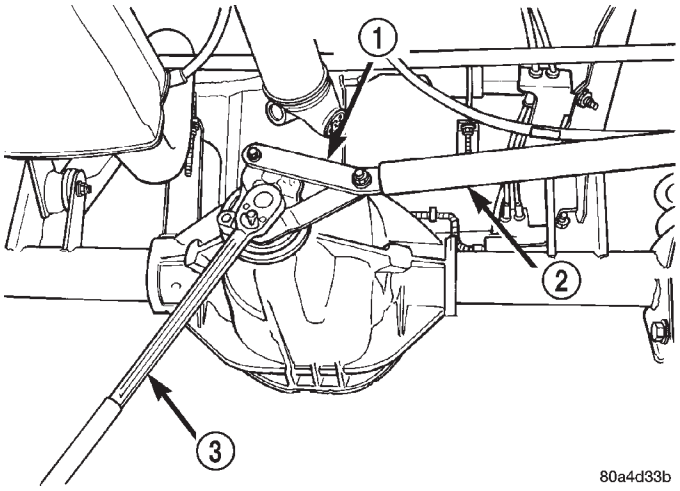


Fig. 43 PINION NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

COLLAPSIBLE SPACER (Continued)

(7) Check rotating torque with an inch pound torque wrench (Fig. 44). The rotating torque of the pinion gear should be, the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).

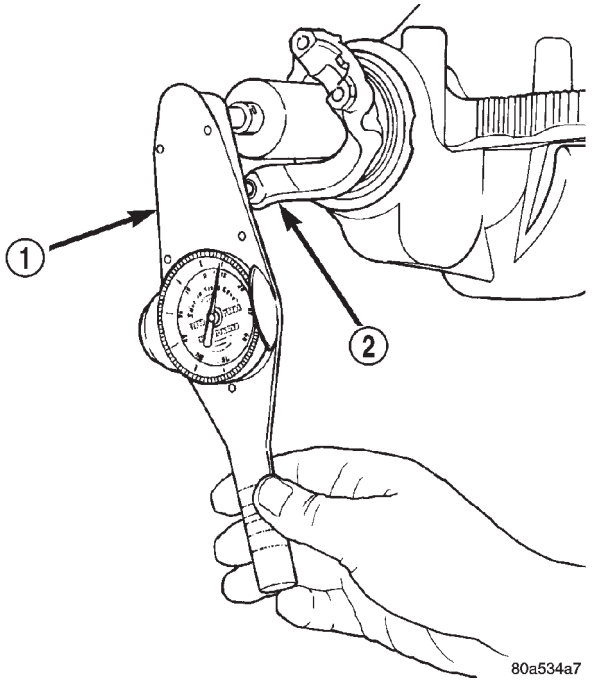


Fig. 44 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

(8) Install propeller shaft with reference marks align.

(9) Install rear brake calipers and rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).

(10) Add gear lubricant, if necessary.

(11) Install wheel and tire assemblies.

(12) Remove supports and lower vehicle.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove fill hole plug from the differential housing cover.

(3) Remove differential housing cover and drain fluid.

(4) Clean the housing cavity with flushing oil, light engine oil or lint free cloth.

NOTE: Do not use water, steam, kerosene or gasoline for cleaning.

(5) Remove axle shafts.

(6) Note the reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 45).

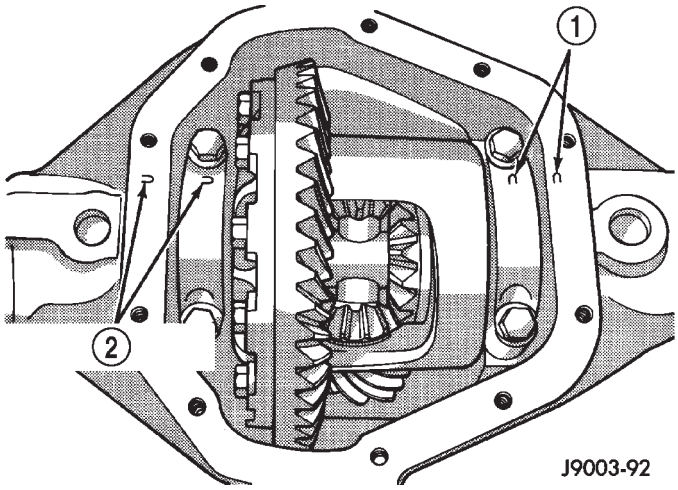


Fig. 45 BEARING CAP REFERENCE

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

(7) Loosen the differential bearing cap bolts.

(8) Position Spreader W-129-B with Adapter Kit 6987B on differential locating holes (Fig. 46). Install holddown clamps and tighten the turnbuckle finger-tight.

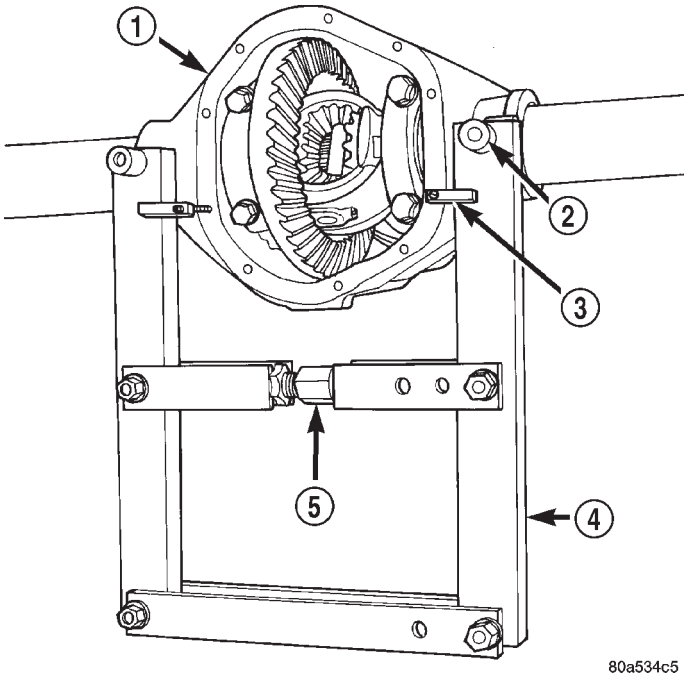


Fig. 46 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - DOWEL
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

DIFFERENTIAL (Continued)

(9) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 47) and zero the indicator.

CAUTION: Never spread the housing over 0.38 mm (0.015 in). If housing is over-spread, it could distorted and damaged the housing.

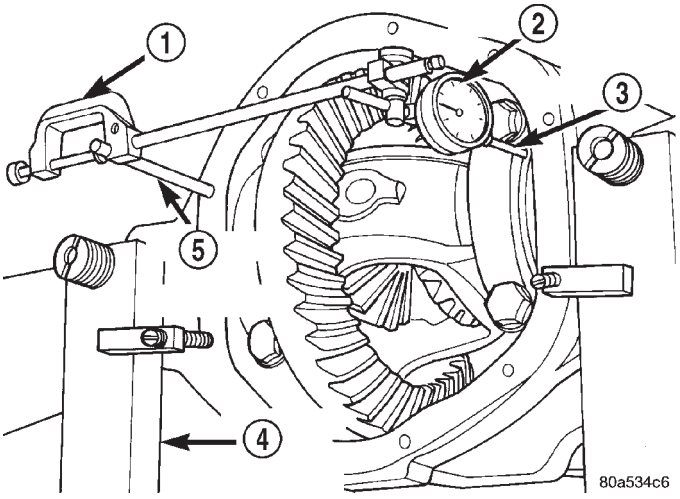


Fig. 47 DIAL INDICATOR LOCATION

1 - CLAMP
2 - DIAL INDICATOR
3 - LEVER ADAPTER
4 - SPREADER
5 - PILOT STUD

(10) Spread housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 48).

(11) Remove the dial indicator.

(12) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(13) Remove differential from the housing and tag differential bearing cups to indicate location (Fig. 49).

(14) Remove spreader from housing.

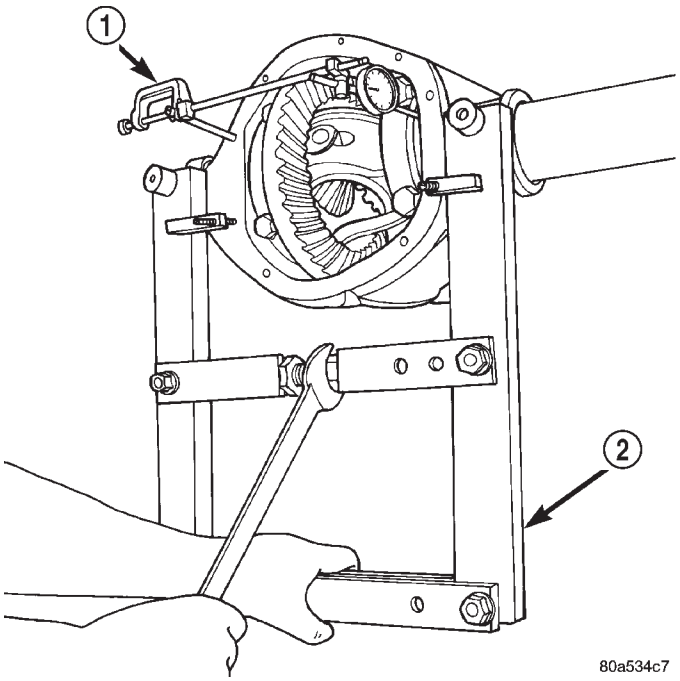


Fig. 48 SPREAD DIFFERENTIAL HOUSING

1 - DIAL INDICATOR
2 - SPREADER

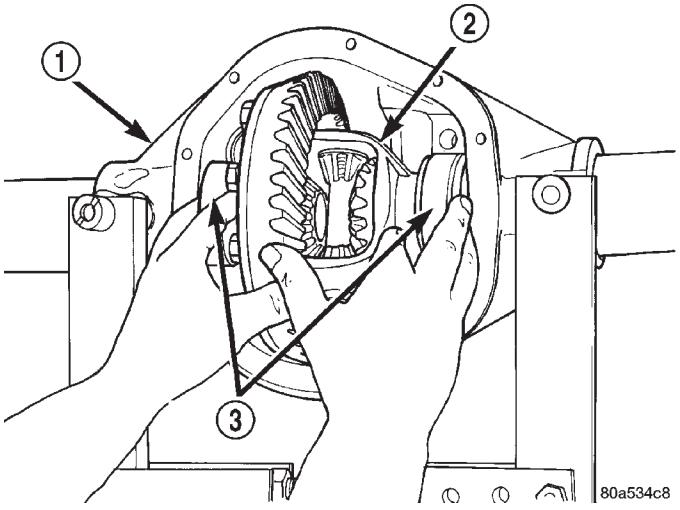


Fig. 49 DIFFERENTIAL CASE REMOVAL

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - BEARING CUPS

DIFFERENTIAL (Continued)

DISASSEMBLY

(1) Remove pinion shaft lock screw (Fig. 50).

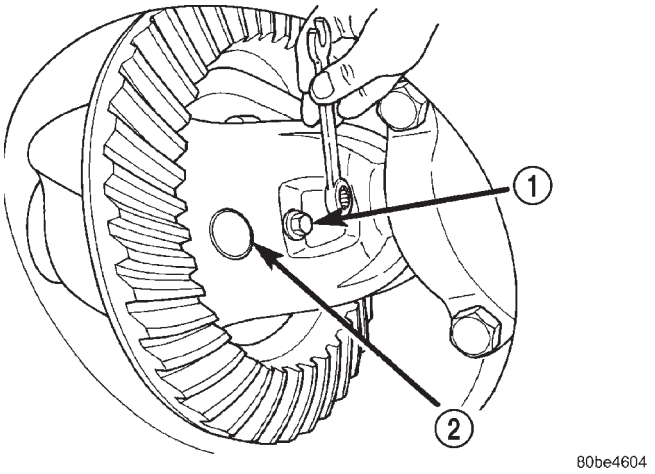


Fig. 50 SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION SHAFT

(2) Remove pinion shaft.

(3) Rotate differential side gears and remove differential pinions and thrust washers (Fig. 51).

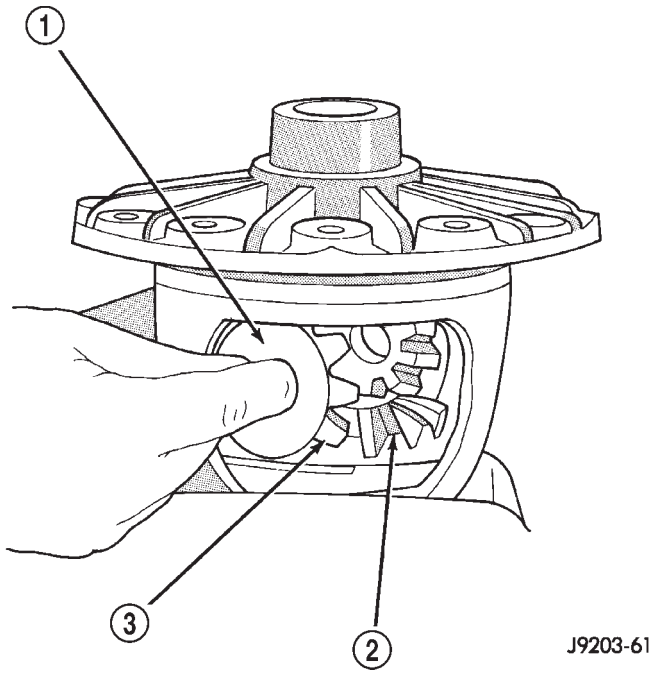


Fig. 51 DIFFERENTIAL GEARS

1 - THRUST WASHER
2 - SIDE GEAR
3 - DIFFERENTIAL PINION

(4) Remove differential side gears and thrust washers.

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install differential pinion gears and thrust washers.

(3) Install the pinion mate shaft.

(4) Align hole in the pinion mate shaft with the hole in the differential case and install the pinion mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

INSTALLATION

NOTE: If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer Adjustments (Differential Bearing Preload and Gear Backlash) to determine the proper shim selection.

(1) Position Spreader W-129-B with Adapter set 6987 on differential housing locating holes. Install the holddown clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.

CAUTION: Never spread the housing over 0.38 mm (0.015 in). If housing is over-spread, it could be distorted or damaged.

(3) Spread housing enough to install the case in the housing.

(4) Remove the dial indicator.

(5) Install differential case in housing (Fig. 52). Verify differential bearing cups remain in position on the bearings and preload shims are between the face of the bearing cup and the housing. Tap the differential case to ensure bearings cups and shims are seated in the housing.

CAUTION: On a Vari-lok® differential the oil feed tube must be pointed at the bottom of the housing (Fig. 53). If differential is installed with the oil feed tube pointed at the top, the anti-rotation tabs will be damaged.

(6) Install bearing caps in their original locations (Fig. 54).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

(9) Tighten bearing cap bolts in a criss-cross pattern to 77 N·m (57 ft. lbs.).

(10) Install the axle shafts.

DIFFERENTIAL (Continued)

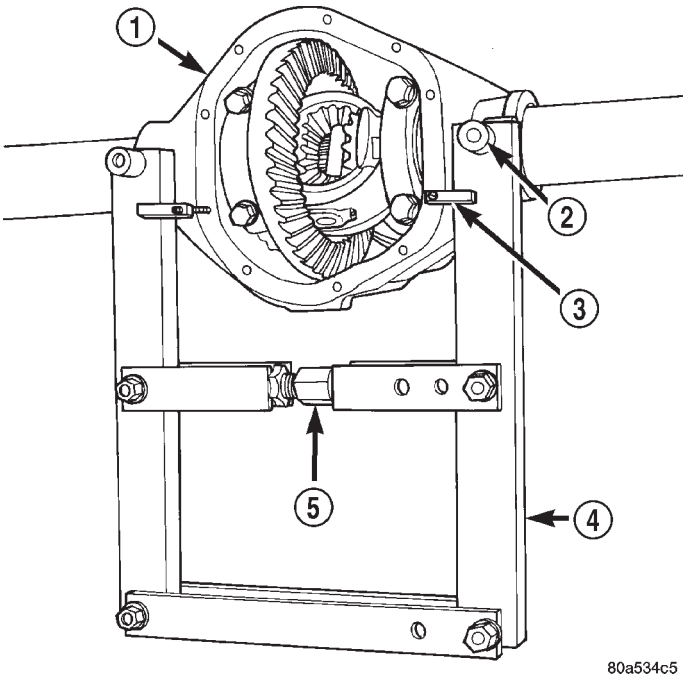


Fig. 52 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - DOWEL
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

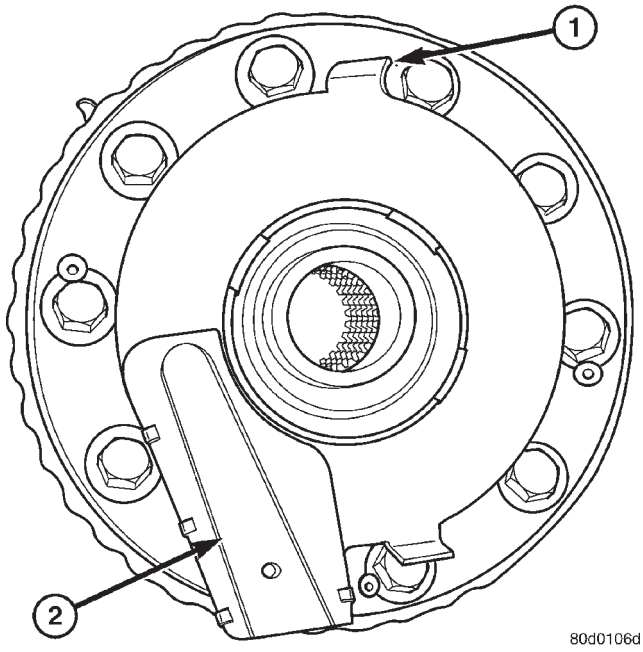


Fig. 53 VARI-LOK

1 - ANTI-ROTATION TAB
2 - OIL FEED TUBE

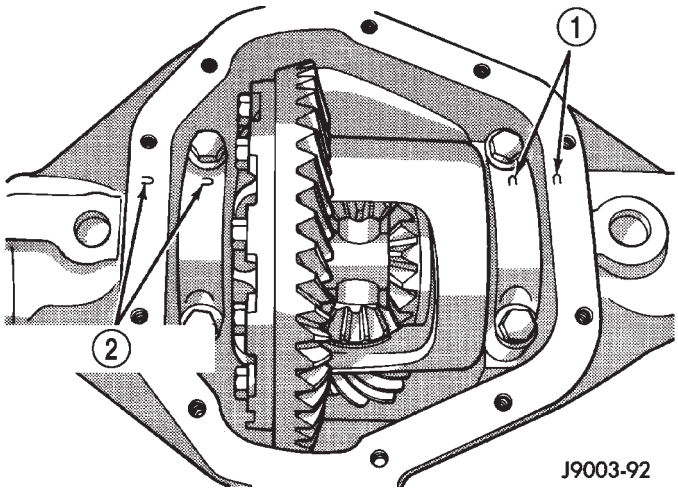


Fig. 54 BEARING CAP REFERENCE

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

(11) Apply a 6.35mm (1/4 in.) bead of red Mopar Silicone Rubber Sealant or equivalent to the housing cover (Fig. 55).

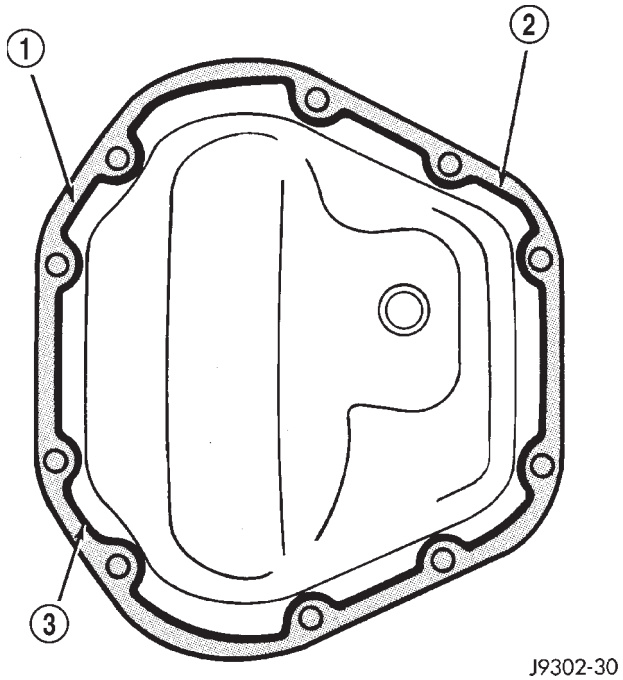


Fig. 55 DIFFERENTIAL COVER - TYPICAL

1 - COVER
2 - SEALANT
3 - SEALANT BEAD

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

DIFFERENTIAL (Continued)

(12) Install cover and tighten bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).

(13) Refill the differential with Mopar Hypoid Gear Lubricant or equivalent to bottom of the fill plug hole.

(14) Install fill hole plug.

(15) Remove support and lower the vehicle.

DIFFERENTIAL-TRAC-LOC

DIAGNOSIS AND TESTING

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIFFERENTIAL TEST

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 56).

(6) If rotating torque is less than 41 N·m (56 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DISASSEMBLY

(1) Clamp side gear Holding Fixture 6965 in a vise and position the differential case on the Holding Fixture (Fig. 57).

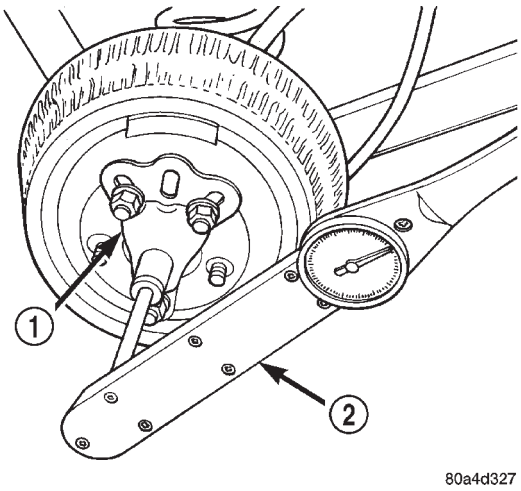


Fig. 56 ROTATING TORQUE TEST

1 - SPECIAL TOOL WITH BOLT IN CENTER HOLE
2 - TORQUE WRENCH

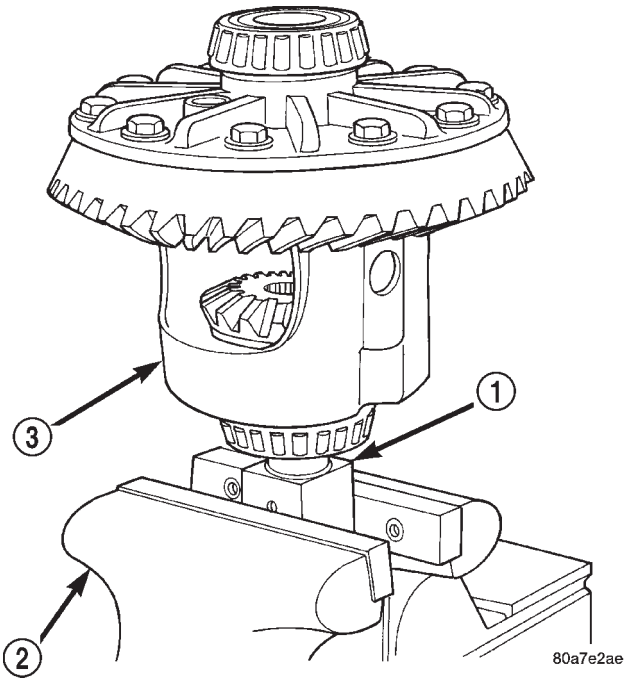


Fig. 57 DIFFERENTIAL CASE FIXTURE

1 - HOLDING FIXTURE
2 - VISE
3 - DIFFERENTIAL

DIFFERENTIAL-TRAC-LOC (Continued)

(2) Remove ring gear if the ring gear is to be replaced. The Trac-lok® differential can be serviced with the ring gear installed.

(3) Remove the pinion gear mate shaft lock screw (Fig. 58).

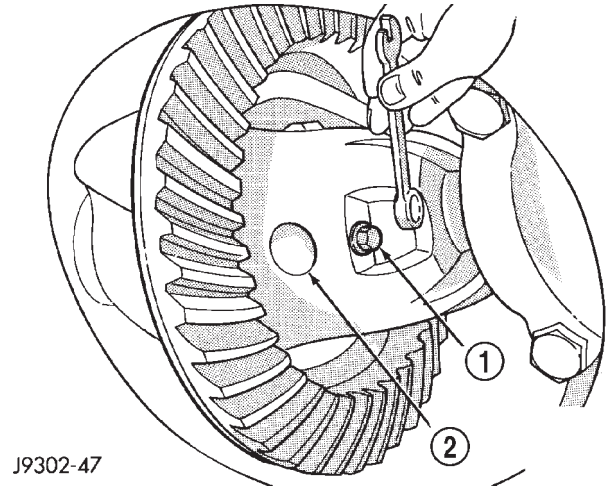


Fig. 58 MATE SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION GEAR MATE SHAFT

(4) Remove pinion gear mate shaft with a drift and hammer (Fig. 59).

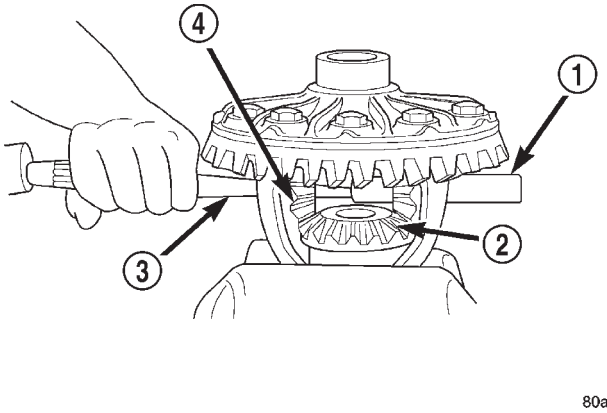


Fig. 59 PINION MATE SHAFT

1 - PINION MATE SHAFT
2 - SIDE GEAR
3 - DRIFT
4 - PINION MATE GEAR

(5) Install and lubricate Step Plate C-6960-3 (Fig. 60).

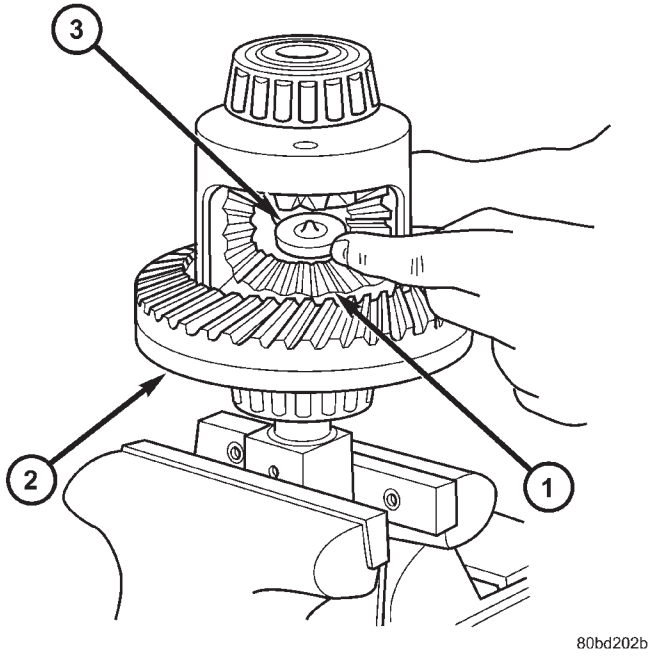


Fig. 60 Step Plate

1 - LOWER SIDE GEAR
2 - DIFFERENTIAL CASE
3 - STEP PLATE

(6) Assemble Threaded Adapter C-6960-1 into top side gear. Thread Forcing Screw C-6960-4 into adapter until it becomes centered in adapter plate.

(7) Position a small screw driver in slot of Threaded Adapter Disc C-6960-1 (Fig. 61) to prevent adapter from turning.

(8) Install Forcing Screw C-6960-4 and tighten screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 62).

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 63).

(10) Insert Turning Bar C-6960-2 into the pinion mate shaft hole in the case (Fig. 64).

(11) Loosen the Forcing Screw in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar.

(12) Rotate differential case until the pinion gears can be removed.

(13) Remove pinion gears from differential case.

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

DIFFERENTIAL-TRAC-LOC (Continued)

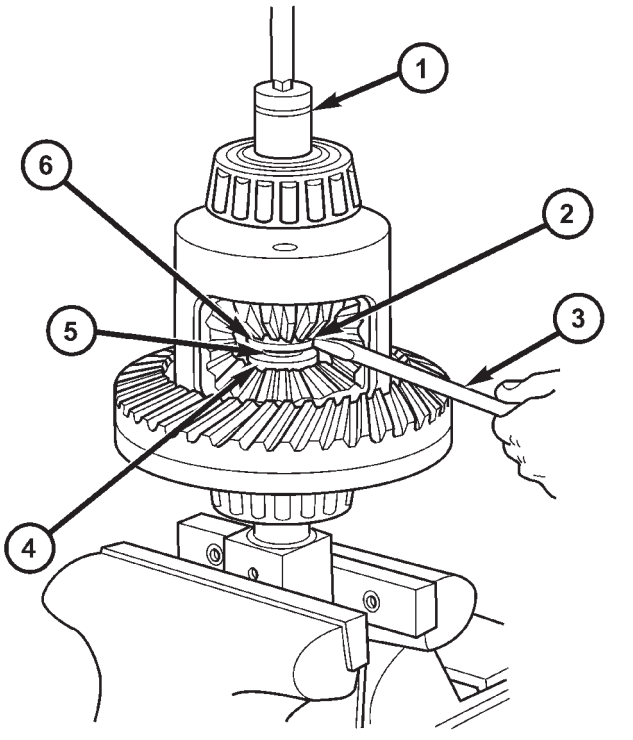


Fig. 61 Threaded Adapter Disc

1 - SOCKET
2 - SLOT IN ADAPTER
3 - SCREWDRIVER
4 - STEP PLATE
5 - FORCING SCREW
6 - THREAD ADAPTER DISC

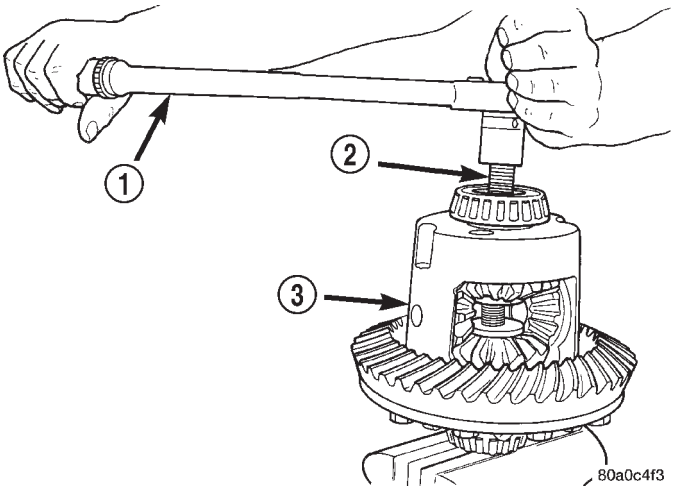


Fig. 62 COMPRESS BELLEVILLE SPRING

1 - TORQUE WRENCH
2 - TOOL ASSEMBLED
3 - DIFFERENTIAL CASE

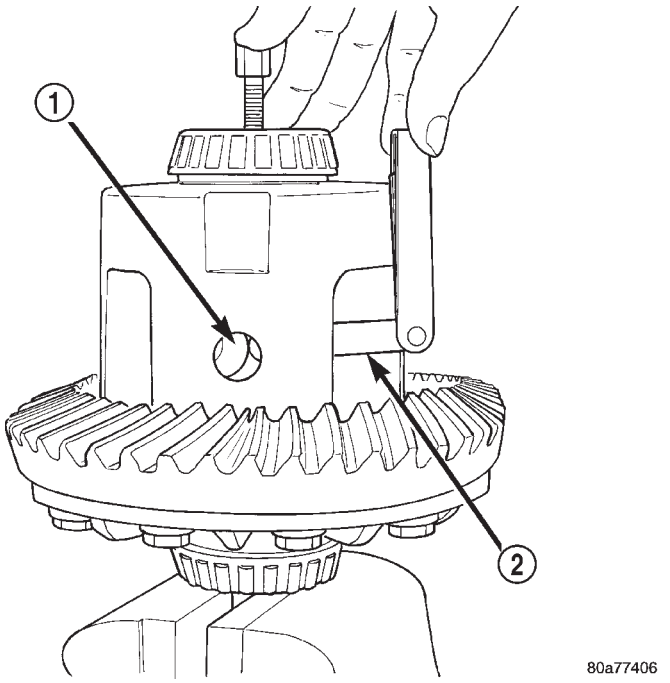


Fig. 63 PINION GEAR THRUST WASHER

1 - THRUST WASHER
2 - FEELER GAUGE

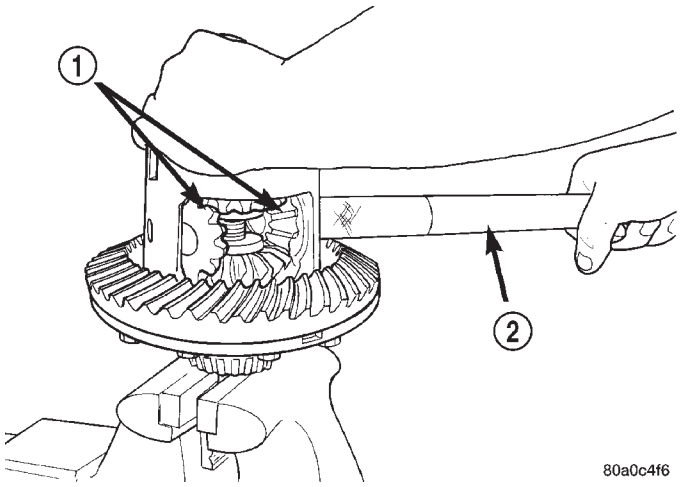
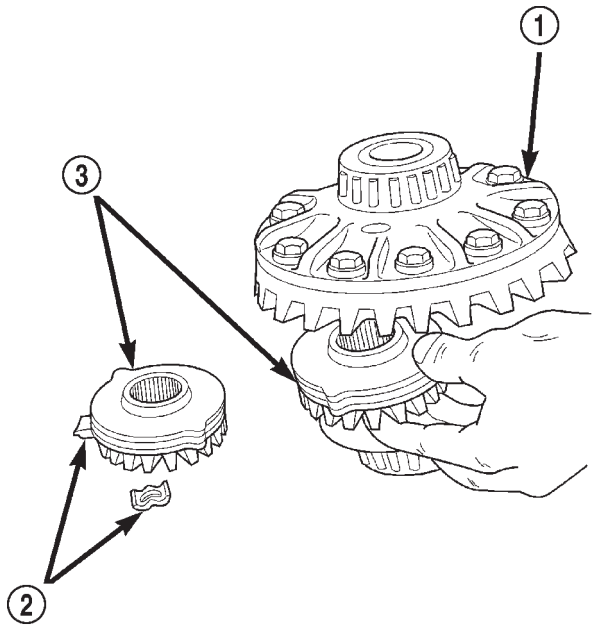


Fig. 64 PINION GEARS

1 - PINION GEARS
2 - TURNING BAR

DIFFERENTIAL-TRAC-LOC (Continued)

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal (Fig. 65).



80a98382

Fig. 65 SIDE GEARS AND CLUTCH DISCS

1 - DIFFERENTIAL CASE
2 - RETAINER
3 - SIDE GEAR AND CLUTCH DISC PACK

(16) Remove differential case from the Holding Fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal.

CLEANING

Clean all components in cleaning solvent and dry components with compressed air.

INSPECTION

Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears for cracks chips or damage and replace as necessary. Inspect differential case and pinion shaft and replace if worn or damaged.

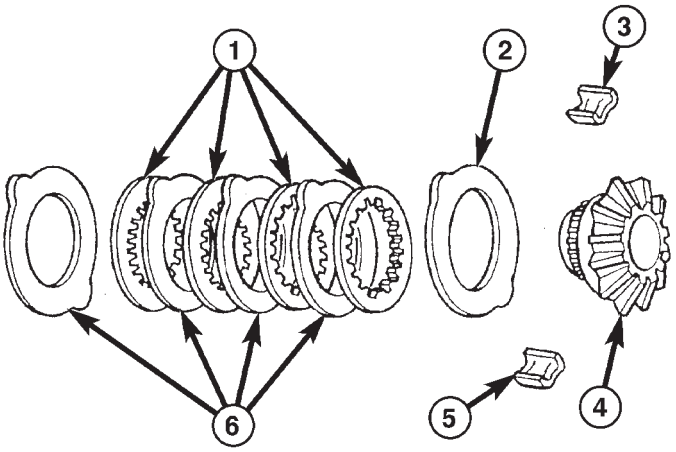
ASSEMBLY

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

(1) Lubricate components with gear lubricant.

(2) Assemble clutch discs into packs and secure disc packs with retaining clips (Fig. 66).

NOTE: Dished plate is position with the convex side against the side gear.



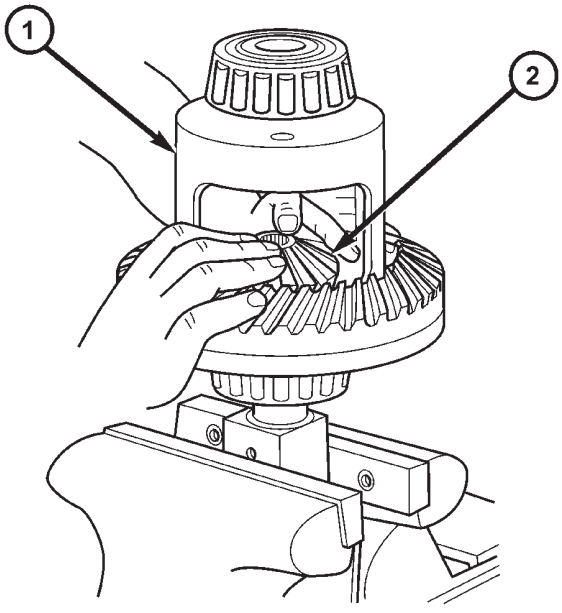
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Fig. 66 CLUTCH PACK

1 - DISCS
2 - DISHED PLATE
3 - RETAINER
4 - SIDE GEAR
5 - RETAINER
6 - PLATES

(3) Position assembled clutch disc packs on the side gear hubs.

(4) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 67).**Verify clutch pack retaining clips are in position and seated in the case pockets.**



80bd270c

Fig. 67 CLUTCH PACK AND LOWER SIDE GEAR

1 - DIFFERENTIAL CASE
2 - SIDE GEAR AND CLUTCH PACK

DIFFERENTIAL-TRAC-LOC (Continued)

(5) Position the differential case on the Holding Fixture 6965.

(6) Install lubricated Step Plate C-6960-3 in lower side gear (Fig. 68).

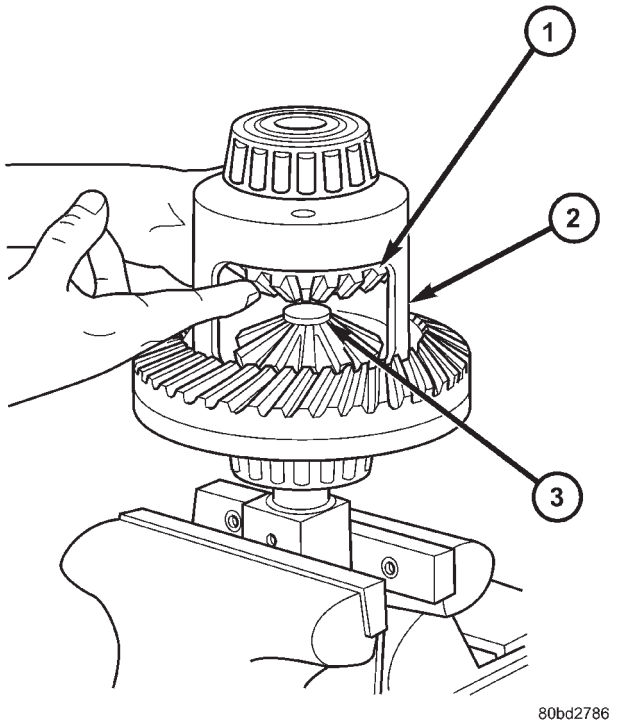


Fig. 68 CLUTCH PACK AND UPPER SIDE GEAR

1 - SIDE GEAR AND CLUTCH PACK
2 - DIFFERENTIAL CASE
3 - STEP PLATE

(7) Install the upper side gear and clutch disc pack (Fig. 68).

(8) Hold assembly in position. Insert Threaded Adapter C-6960-1 into top side gear.

(9) Install Forcing Screw C-6960-4 and tighten screw to slightly compress clutch disc.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(11) Rotate case with Turning Bar C-6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Raise and support vehicle.

(2) Remove differential case from axle housing.

(3) Remove bearings from the differential case with Puller/Press C-293-PA, Adapter 8352 and Plug SP-3289 (Fig. 69).

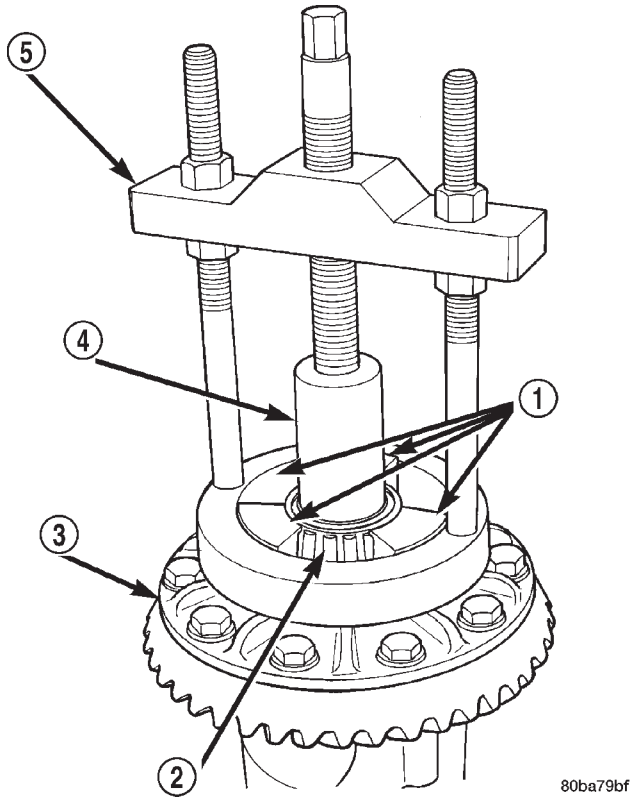


Fig. 69 Differential Bearing

1 - ADAPTERS
2 - BEARING
3 - DIFFERENTIAL
4 - PLUG
5 - PULLER

DIFFERENTIAL CASE BEARINGS (Continued)

INSTALLATION

NOTE: If differential side bearings or differential case are replaced, differential side bearing shim requirements may change. Refer to Adjustments (Differential Bearing Preload and Gear Backlash) for procedures.

(1) Install differential side bearings with Installer C-3716-A and Handle C-4171 (Fig. 70).

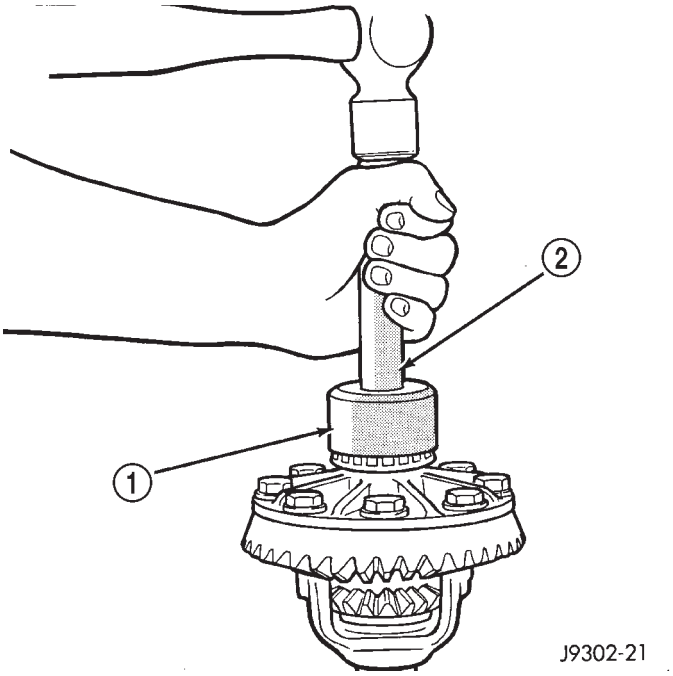


Fig. 70 Differential Side Bearing

1 - INSTALLER
2 - HANDLE

(2) Install differential in axle housing.
(3) Remove support and lower vehicle.

PINION GEAR/RING GEAR

REMOVAL

NOTE: The ring and pinion gears are serviced as a matched set. Never replace one gear without the other gear.

(1) Raise and support vehicle.
(2) Mark pinion yoke and propeller shaft for installation reference.
(3) Disconnect propeller shaft from pinion yoke and tie shaft to underbody.
(4) Remove differential from the housing.
(5) Place differential case in a vise with soft metal jaw.
(6) Remove bolts holding ring gear to differential case.
(7) Drive ring gear from differential case with a rawhide hammer (Fig. 71).

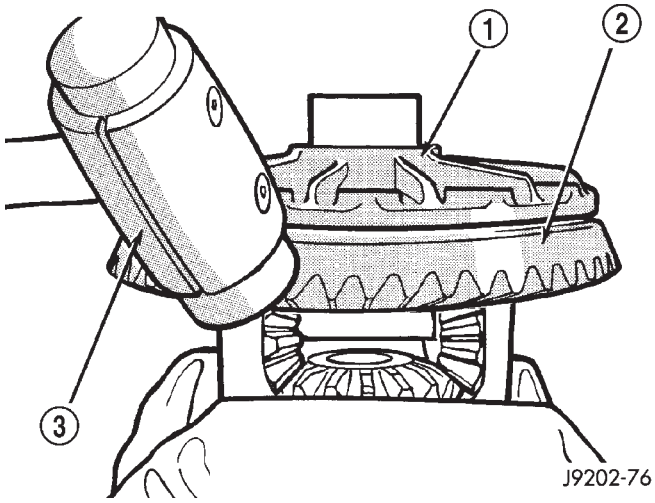


Fig. 71 RING GEAR

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - HAMMER

(8) Hold the pinion yoke with Spanner Wrench 6958 and remove the pinion yoke nut and washer (Fig. 72).

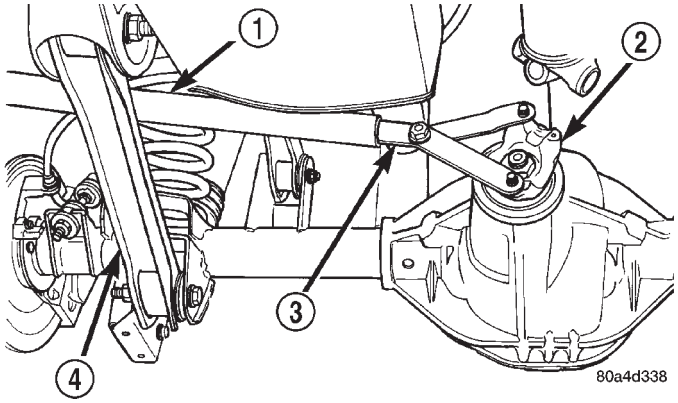


Fig. 72 PINION YOKE HOLDER

1 - 1 in. PIPE
2 - PINION YOKE
3 - HOLDER
4 - LOWER CONTROL ARM

PINION GEAR/RING GEAR (Continued)

(9) Remove pinion yoke from pinion shaft with Remover C-452 and Flange Wrench C-3281 (Fig. 73).

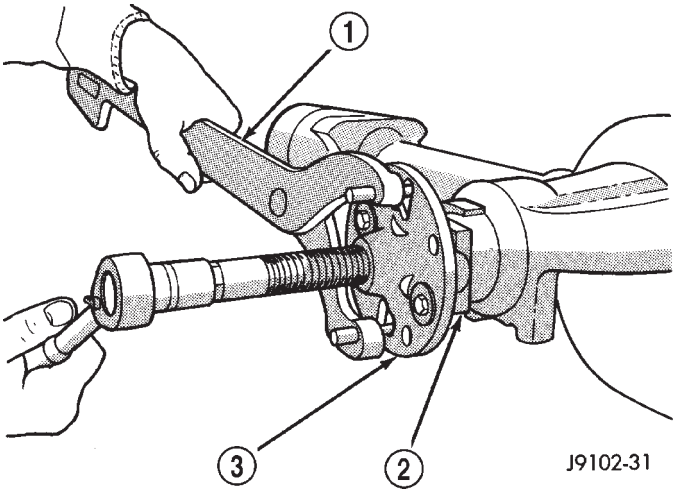


Fig. 73 PINION YOKE REMOVER

1 - FLANGE WRENCH
2 - YOKE
3 - REMOVER

(10) Remove pinion gear from housing (Fig. 74).

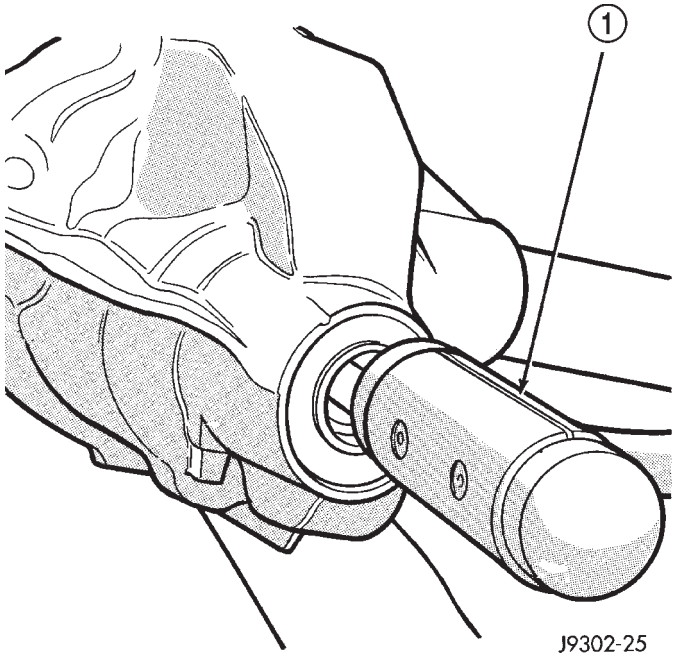


Fig. 74 PINION GEAR REMOVAL

1 - RAWHIDE HAMMER

(11) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 75).

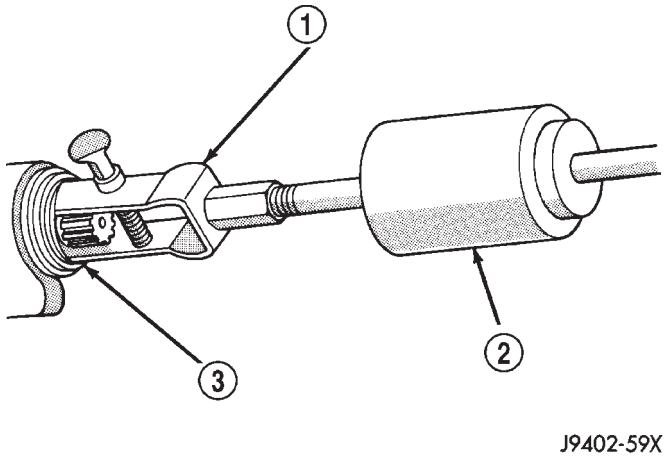


Fig. 75 PINION SEAL

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(12) Remove oil slinger, if equipped, and front pinion bearing.

(13) Remove front pinion bearing cup with Remover C-4345 and Handle C-4171 (Fig. 76).

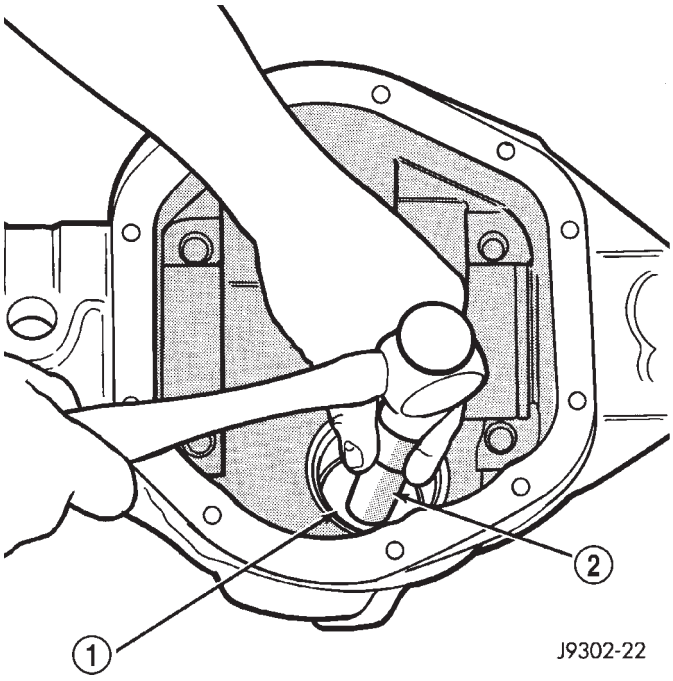


Fig. 76 FRONT PINION BEARING CUP

1 - REMOVER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(14) Remove rear bearing cup (Fig. 77) with Remover D-149 and Handle C-4171.

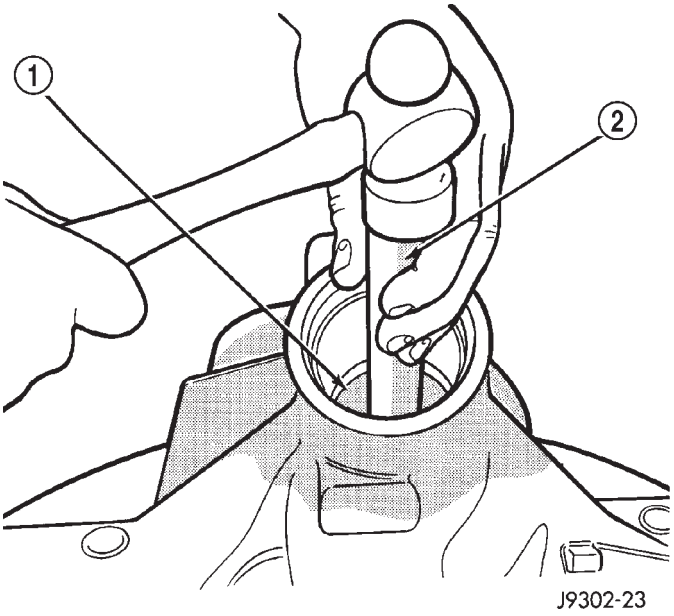


Fig. 77 REAR PINION BEARING CUP

1 - REMOVER
2 - HANDLE

(15) Remove collapsible preload spacer (Fig. 78).

(16) Remove rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-40 (Fig. 79).

(17) Remove depth shims from the pinion gear shaft and record shim thickness.

INSTALLATION

NOTE: A pinion depth shim/oil slinger is placed between the rear pinion bearing cone and the pinion head to achieve proper ring gear and pinion mesh. If ring gear and pinion are reused, the pinion depth shim/oil slinger should not require replacement. Refer to Adjustment (Pinion Gear Depth) to select the proper thickness shim/oil slinger if ring and pinion gears are replaced.

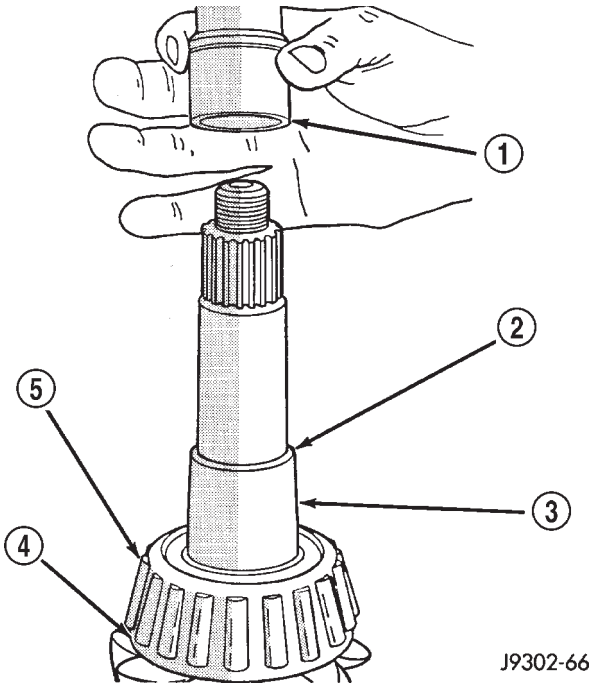


Fig. 78 COLLAPSIBLE SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - SHIM
5 - REAR BEARING

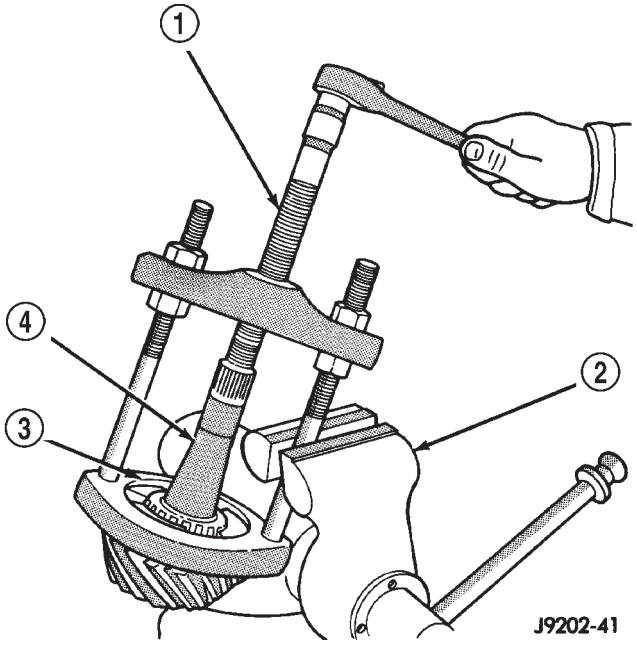


Fig. 79 REAR PINION BEARING

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

PINION GEAR/RING GEAR (Continued)

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of the pinion bearing cups.

(2) Install pinion rear bearing cup with Installer D-146 and Driver Handle C-4171 (Fig. 80) and verify cup is seated.

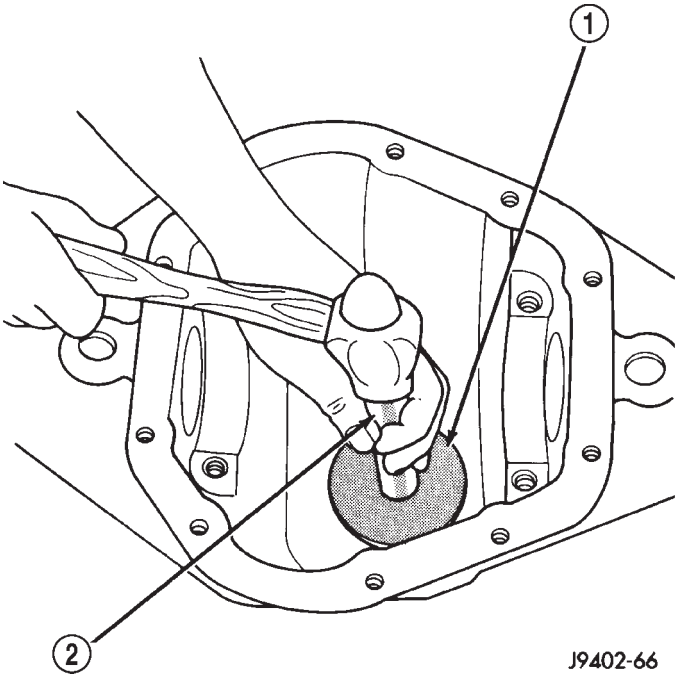


Fig. 80 REAR PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

(3) Install pinion front bearing cup with Installer D-130 and Handle C-4171 (Fig. 81) and verify cup is seated.

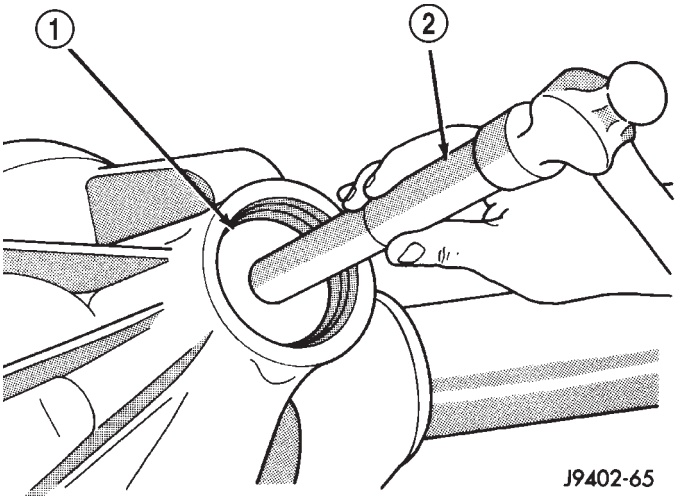


Fig. 81 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

(4) Install pinion front bearing and oil slinger, if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate installer (Fig. 82).

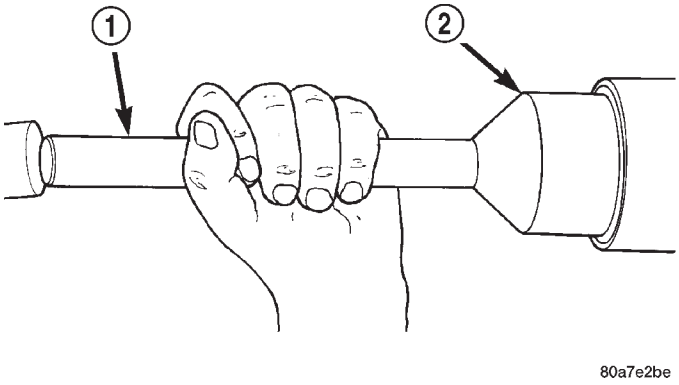


Fig. 82 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(6) Install depth shim on the pinion gear.

(7) Install rear bearing and slinger if equipped, on the pinion gear with Installer W-262 and a press (Fig. 83).

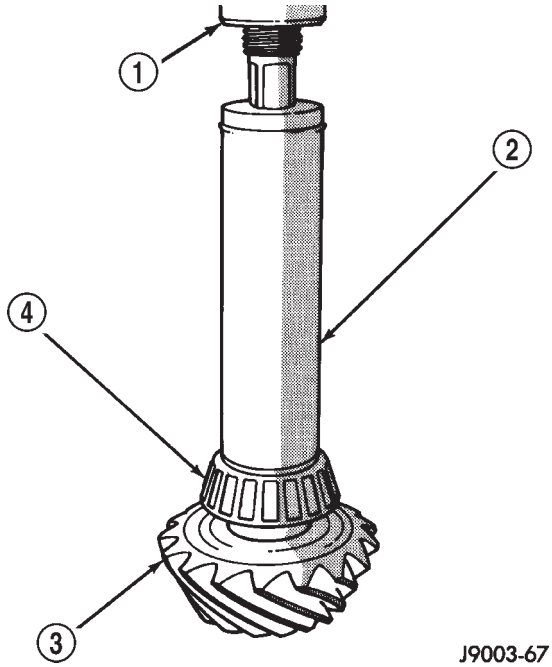


Fig. 83 REAR PINION BEARING

1 - PRESS
2 - INSTALLER
3 - PINION GEAR
4 - PINION BEARING

PINION GEAR/RING GEAR (Continued)

(8) Install a **new** collapsible preload spacer on pinion shaft and install pinion gear in the housing (Fig. 84).

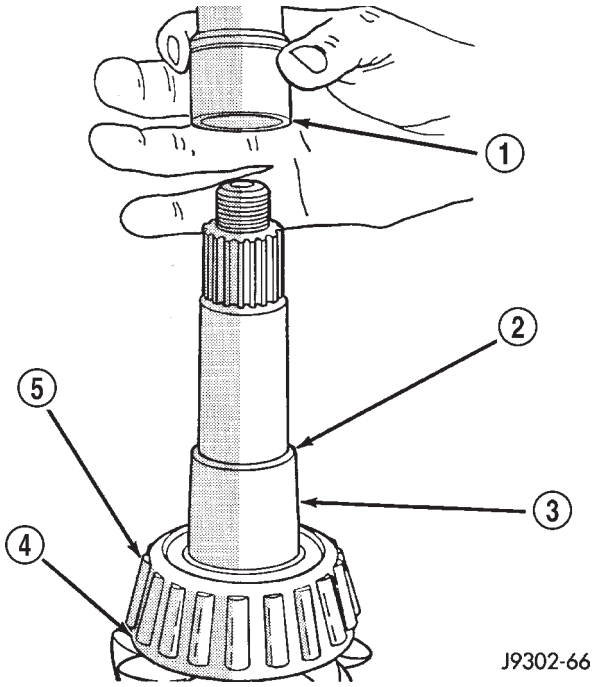


Fig. 84 COLLAPSIBLE SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - DEPTH SHIM
5 - REAR BEARING

(9) Install yoke with Installer C-3718 and Spanner Wrench 6958 (Fig. 85).

(10) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(11) Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(12) Using Spanner Wrench 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), (Fig. 86) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 87).

NOTE: If more than 474 N·m (350 ft. lbs.) torque is required to crush the collapsible spacer, the spacer is defective and must be replaced.

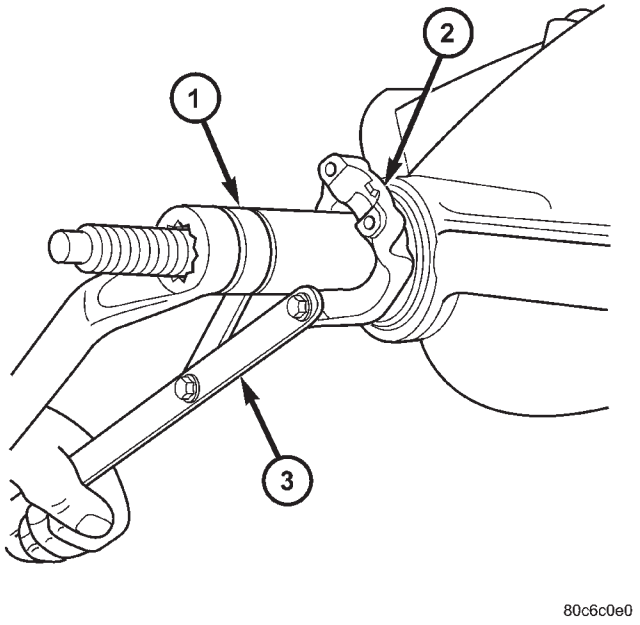


Fig. 85 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE

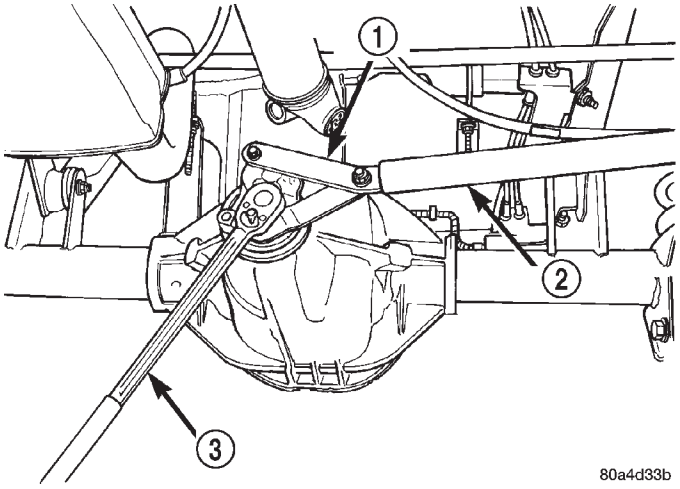


Fig. 86 PINION NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

(13) Check bearing rotating torque with a inch pound torque wrench (Fig. 87). The pinion gear rotating torque should be:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 1.7 to 3.9 N·m (15 to 35 in. lbs.).

(14) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

PINION GEAR/RING GEAR (Continued)

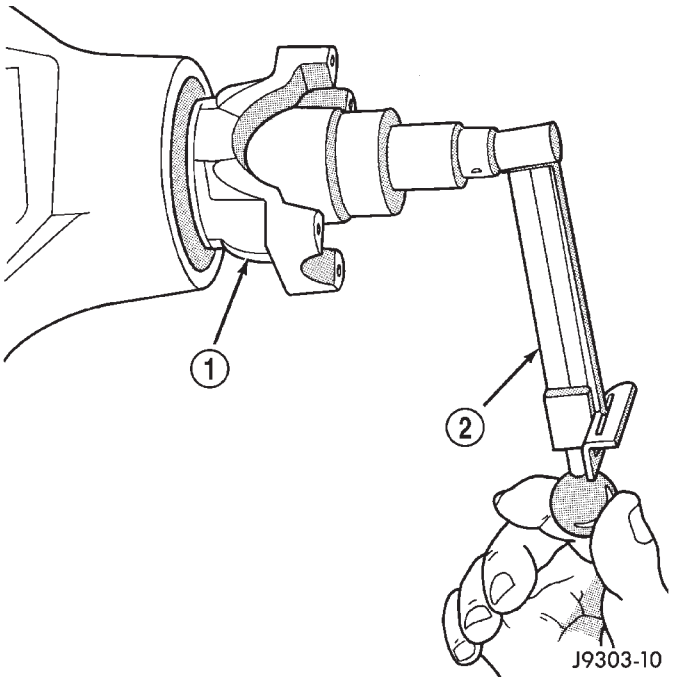


Fig. 87 PINION ROTATING TORQUE

1 - PINION YOKE/COMPANION FLANGE
2 - INCH POUND TORQUE WRENCH

(15) Invert the differential case in the vise.
(16) Install **new** ring gear bolts and alternately tighten to 136 N·m (100 ft. lbs.) (Fig. 88).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

(17) Install differential in housing and verify differential bearing preload, gear mesh and contact pattern. Refer to Ajustments for procedure.

CAUTION: When installing a Vari-lok® differential (Fig. 89), the oil feed tube must point to the bottom of the housing. If differential is installed with the oil feed tube pointed toward the top, the anti-rotation tabs will be damaged.

(18) Install differential cover and fill with gear lubricant.
(19) Install the propeller shaft with the reference marks aligned.
(20) Remove supports and lower vehicle.

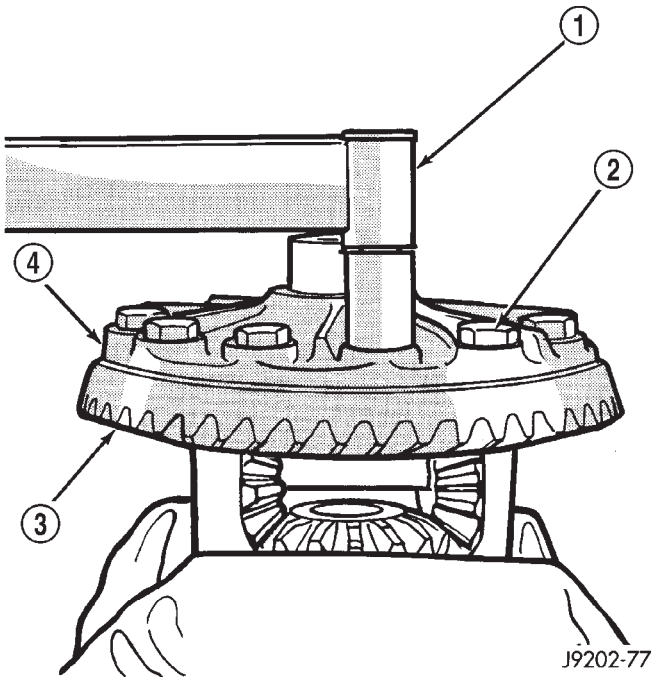


Fig. 88 RING GEAR

1 - TORQUE WRENCH
2 - RING GEAR BOLT
3 - RING GEAR
4 - CASE

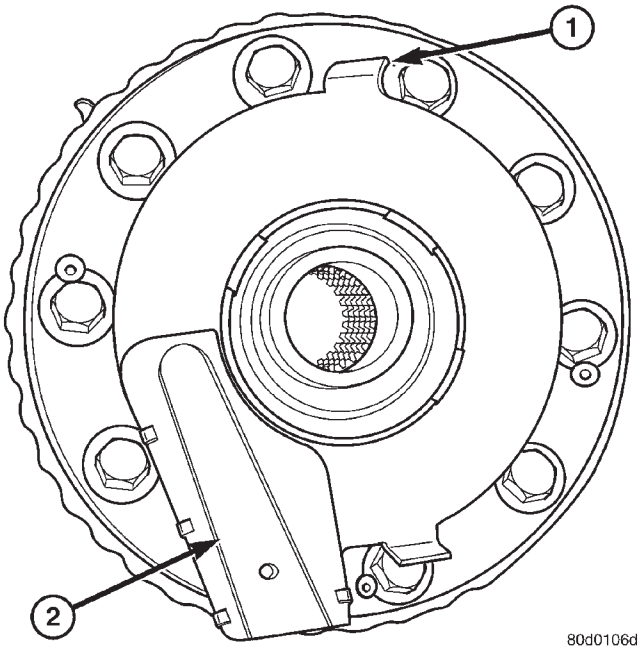


Fig. 89 VARI-LOK

1 - ANTI-ROTATION TAB
2 - OIL FEED TUBE

REAR AXLE - 226RBA

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REAR AXLE - 226RBA

DESCRIPTION

The Rear Beam-design Aluminum (RBA) axle housing has an aluminum center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into the differential housing to form a one-piece axle housing. The axle has semi-floating axle shafts, meaning that vehicle load is supported by the axle shaft and bearings.

The differential case is a one-piece design. Differential bearing preload and ring gear backlash is adjusted with selective shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The cover provides a means for inspection and service.

Optional Trac-Lok® differential differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

Optional Vari-Lok® differential has a one-piece differential case which contains the gerotor pump assembly and the clutch mechinism. The unit is serviced only as an assembly.

OPERATION

The axle receives power from the transfer case through the front propeller shaft. The front propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

STANDARD DIFFERENTIAL

During straight-ahead driving the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

REAR AXLE - 226RBA (Continued)

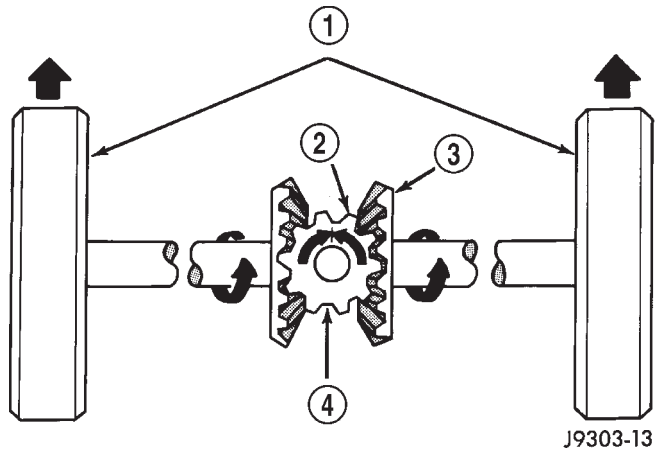


Fig. 1 OPERATION-STRAIGHT AHEAD DRIVING

1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

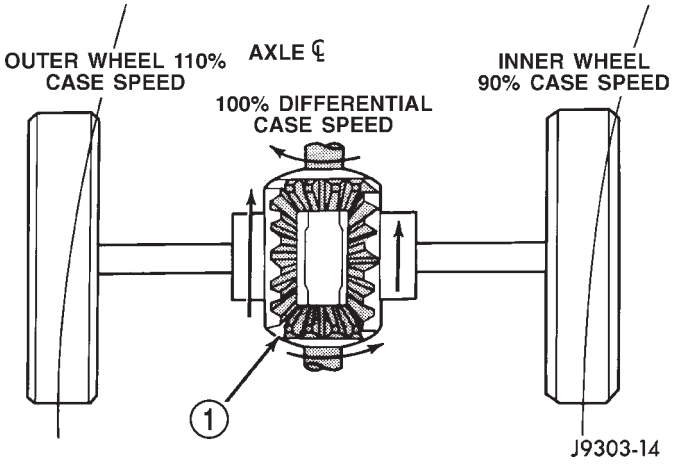


Fig. 2 OPERATION-ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

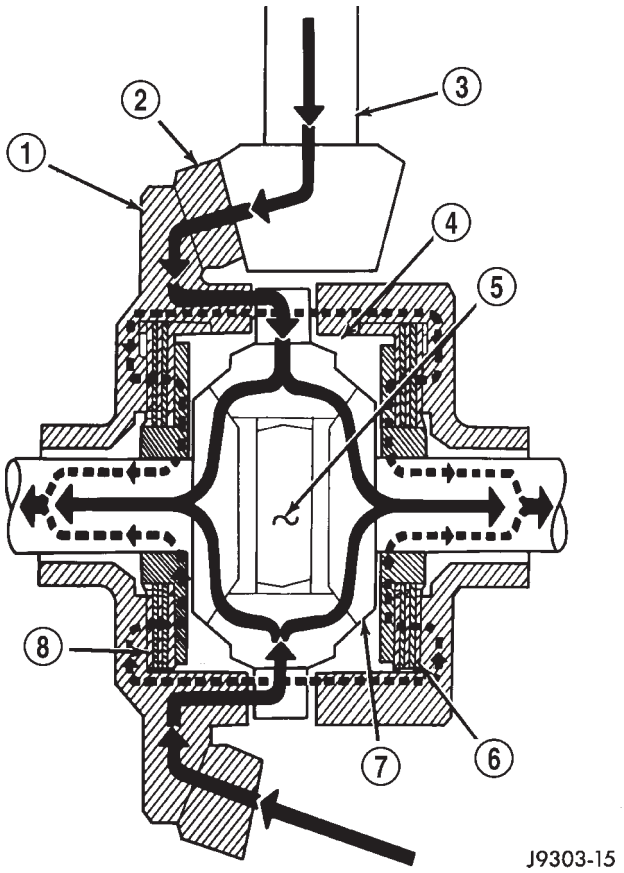


Fig. 3 TRAC-LOK LIMITED SLIP DIFFERENTIAL

1 - CASE
2 - RING GEAR
3 - DRIVE PINION
4 - PINION GEAR
5 - MATE SHAFT
6 - CLUTCH PACK
7 - SIDE GEAR
8 - CLUTCH PACK

TRAC-LOK® DIFFERENTIAL

The differential clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 3).

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. The differential resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, the operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

VARI-LOK® DIFFERENTIAL

In a standard differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

A gerotor pump and clutch pack are used to provide the torque transfer capability. One axle shaft is splined to the gerotor pump and one of the differential side gears, which provides the input to the pump. As a wheel begins to lose traction, the speed differential is transmitted from one side of the differential to the other through the side gears. The motion of one side gear relative to the other turns the inner rotor of the pump. Since the outer rotor of the pump is grounded to the differential case, the inner and outer rotors are now moving relative to each other

and therefore creates pressure in the pump. The tuning of the front and rear axle orifices and valves inside the gerotor pump is unique and each system includes a torque-limiting pressure relief valve to protect the clutch pack, which also facilitates vehicle control under extreme side-to-side traction variations. The resulting pressure is applied to the clutch pack and the transfer of torque is completed.

Under conditions in which opposite wheels are on surfaces with widely different friction characteristics, Vari-lok® delivers far more torque to the wheel on the higher traction surface than do conventional Trac-lok® systems. Because conventional Trac-lok® differentials are initially pre-loaded to assure torque transfer, normal driving (where inner and outer wheel speeds differ during cornering, etc.) produces torque transfer during even slight side-to-side speed variations. Since these devices rely on friction from this preload to transfer torque, normal use tends to cause wear that reduces the ability of the differential to transfer torque over time. By design, the Vari-lok® system is less subject to wear, remaining more consistent over time in its ability to transfer torque. The coupling assembly is serviced as a unit. From a service standpoint the coupling also benefits from using the same lubricant supply as the ring and pinion gears.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side–gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

REAR AXLE - 226RBA (Continued)

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.

REAR AXLE - 226RBA (Continued)

Condition	Possible Causes	Correction
Differential Cracked	1. Improper adjustment of the differential bearings.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.
	2. Excessive ring gear backlash.	2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.
	3. Vehicle overloaded.	3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.
	4. Erratic clutch operation.	4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication.	1. Replace scored gears. Fill differential with the correct fluid type and quantity.
	2. Improper grade of lubricant.	2. Replace scored gears. Fill differential with the correct fluid type and quantity.
	3. Excessive spinning of one wheel/tire.	3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high.	1. Drain lubricant to the correct level.
	2. Worn axle shaft seals.	2. Replace seals.
	3. Cracked differential housing.	3. Repair as necessary.
	4. Worn pinion seal.	4. Replace seal.
	5. Worn/scored yoke.	5. Replace yoke and seal.
	6. Axle cover not properly sealed.	6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low.	1. Fill differential to correct level.
	2. Improper grade of lubricant.	2. Fill differential with the correct fluid type and quantity.
	3. Bearing pre-loads too high.	3. Re-adjust bearing pre-loads.
	4. Insufficient ring gear backlash.	4. Re-adjust ring gear backlash.

REAR AXLE - 226RBA (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading.	1. Replace gears. Examine other gears and bearings for possible damage.
	2. Erratic clutch operation.	2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.
	3. Ice-spotted pavement.	3. Replace gears and examine remaining parts for damage.
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant.	1. Fill differential with the correct fluid type and quantity.
	2. Improper ring gear and pinion adjustment.	2. Check ring gear and pinion contact pattern.
	3. Unmatched ring gear and pinion.	3. Replace gears with a matched ring gear and pinion.
	4. Worn teeth on ring gear and/or pinion.	4. Replace ring gear and pinion.
	5. Loose pinion bearings.	5. Adjust pinion bearing pre-load.
	6. Loose differential bearings.	6. Adjust differential bearing pre-load.
	7. Mis-aligned or sprung ring gear.	7. Measure ring gear run-out. Replace components as necessary.
	8. Loose differential bearing cap bolts.	8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued tot he proper specification.
	9. Housing not machined properly.	9. Replace housing.

VARI-LOK®

(1) Park the vehicle on a level surface or raise vehicle on hoist so that the vehicle is level.

(2) Remove the axle fill plug.

(3) Verify that the axle fluid level is correct. The fluid level is correct if the fluid is level with the bottom of the fill hole.

(4) Shift the transfer case into the 4WD full-time position.

(5) Drive the vehicle in a tight circle for 2 minutes at 5mph to fully prime the pump.

(6) Block the tires opposite the axle to be tested to prevent the vehicle from moving.

(7) Shift the transfer case into the 4WD Low position and the transmission into the Park position.

(8) Raise both the wheels of the axle to be tested off of the ground.

(9) Rotate the left wheel by hand at a minimum of one revolution per second while an assistant rotates the right wheel in the opposite direction.

(10) The left wheel should spin freely at first and then increase in resistance within 5 revolutions until the wheels cannot be continuously rotated in opposite directions.

(11) The Vari-lok® differential has engaged properly if the wheels cannot be rotated in opposite directions for a moment. After the wheels stop rotating for a moment, the fluid pressure will drop in the differential and the wheels begin to rotate once again.

(12) If the system does not operate properly, replace the Vari-lok® differential.

REMOVAL

(1) Raise and support the vehicle.

(2) Position a lifting device under the axle and secure axle.

(3) Remove the wheels and tires.
(4) Remove brake calipers and rotors.
(5) Disconnect parking brake cables from brackets and lever.
(6) Remove wheel speed sensors.
(7) Remove brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the calipers.
(8) Disconnect the vent hose from the axle shaft tube.
(9) Mark propeller shaft and yokes for installation reference.
(10) Remove propeller shaft.
(11) Disconnect stabilizer bar links.
(12) Remove upper suspension arm rear axle ball joint nut.
(13) Separate rear axle ball joint from the upper suspension arm with Remover 8278 (Fig. 4).

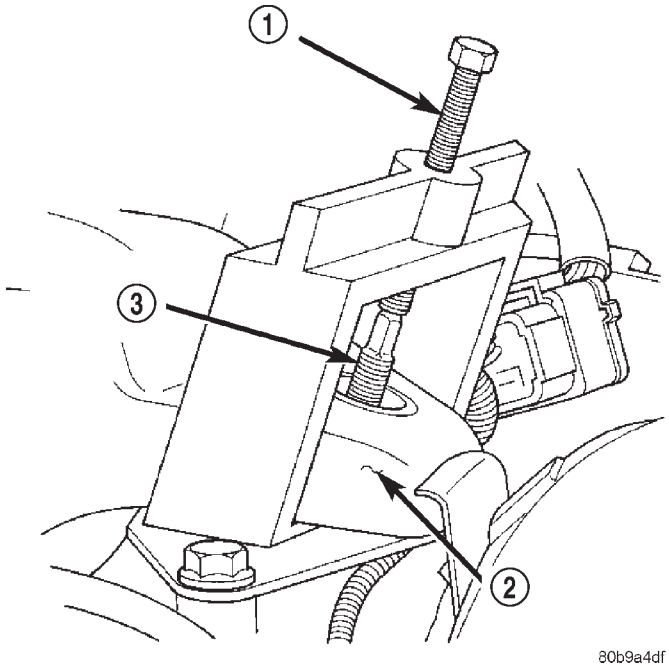


Fig. 4 REAR BALL JOINT

1 - REMOVER
2 - UPPER SUSPENSION ARM
3 - BALL JOINT STUD

(14) Disconnect shock absorbers from axle.
(15) Disconnect track bar.
(16) Disconnect lower suspension arms from the axle brackets.
(17) Separate the axle from the vehicle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners are tightened. If springs are not at their normal ride position, vehicle ride height and handling could be affected.

(1) Raise axle with lift and align coil springs.
(2) Install lower suspension arms in axle brackets. Install nuts and bolts, do not tighten bolts at this time.
(3) Install upper suspension arm on rear axle ball joint.
(4) Install rear axle ball joint nut and tighten to 122 N·m (90 ft.lbs.) (Fig. 5).

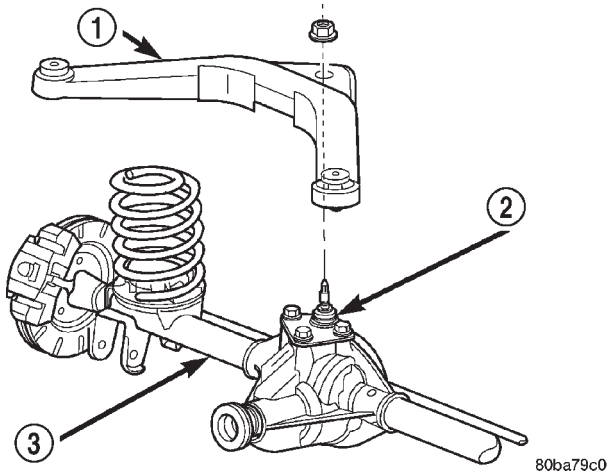


Fig. 5 REAR BALL JOINT NUT

1 - UPPER SUSPENSION ARM
2 - REAR AXLE BALL JOINT
3 - REAR AXLE

(5) Install track bar and attachment bolts, do not tighten bolts at this time.
(6) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.).
(7) Install stabilizer bar links and tighten nuts to 36 N·m (27 ft. lbs.).
(8) Install wheel speed sensors.
(9) Connect parking brake cable to brackets and lever.
(10) Install brake rotors and calipers.
(11) Install the brake hose to the axle junction block.
(12) Install axle vent hose.
(13) Align propeller shaft and pinion yoke reference marks. Install U-joint straps and nuts tighten to 19 N·m (14 ft. lbs.).
(14) Install the wheels and tires.
(15) Add gear lubricant, if necessary.
(16) Remove support and lower the vehicle.
(17) Tighten lower suspension arm bolts to 177 N·m (130 ft. lbs.).
(18) Tighten track bar bolts to 100 N·m (74 ft. lbs.).

REAR AXLE - 226RBA (Continued)

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 6). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 109.52 mm (4.312 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern in this section for additional information.

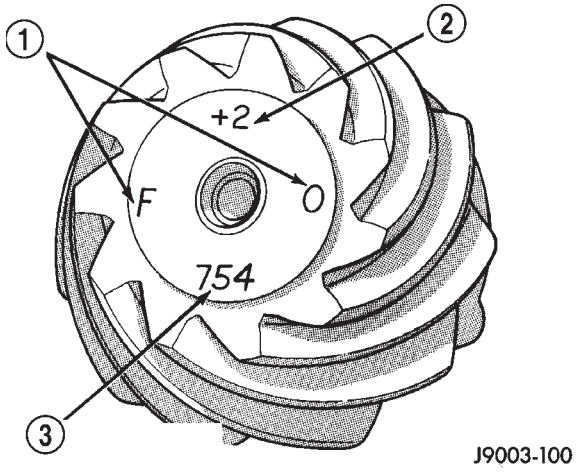


Fig. 6 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - DRIVE PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

Compensation for pinion depth variance is achieved with a select shim/oil baffle. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 7).

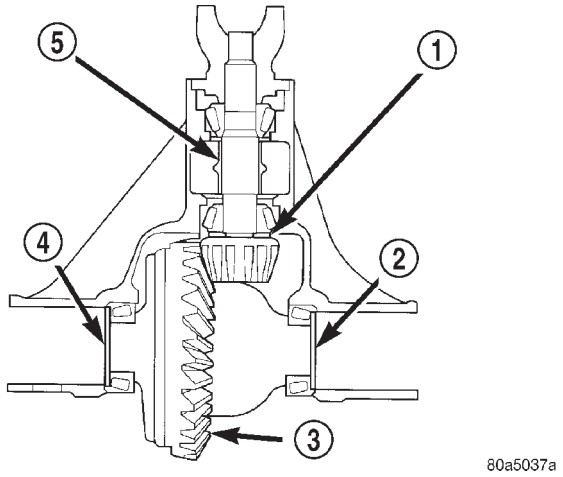


Fig. 7 ADJUSTMENT SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract this number from the thickness of the original depth shim/oil slinger to compensate for the difference in the depth variances. Refer to the Pinion Gear Depth Variance chart.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the etched number on the face of the pinion gear head (–1, –2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

REAR AXLE - 226RBA (Continued)

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set 6775 and Dial Indicator C-3339 (Fig. 8).

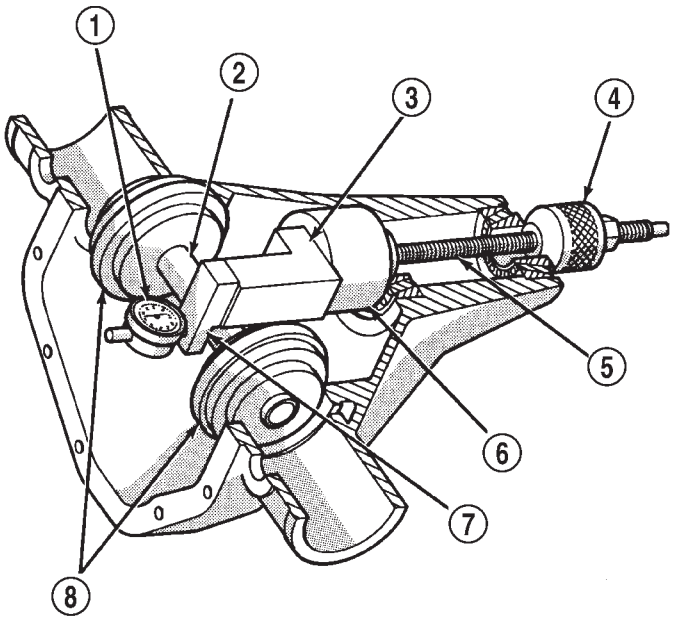


Fig. 8 PINION GEAR DEPTH GAUGE

1 - DIAL INDICATOR
2 - ARBOR
3 - PINION HEIGHT BLOCK
4 - CONE
5 - SCREW
6 - PINION BLOCK
7 - SCOOTER BLOCK
8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 8144 and rear pinion bearing onto Screw 6741 (Fig. 8).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 9).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 8).

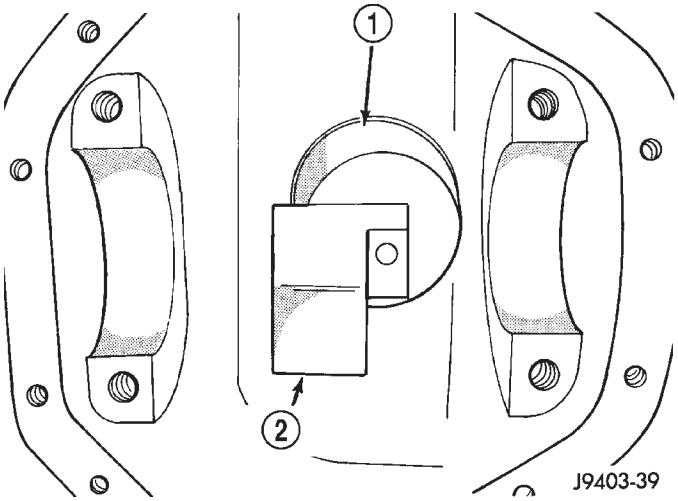


Fig. 9 PINION HEIGHT BLOCK

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

(4) Place Arbor Disc 6927A on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 10). Install differential bearing caps in their original positions on arbor discs and tighten cap bolts to 85 N·m (63 ft. lbs.).

REAR AXLE - 226RBA (Continued)

NOTE: Arbor Discs 6927A has different step diameters to fit other axles. Choose proper step for axle being serviced.

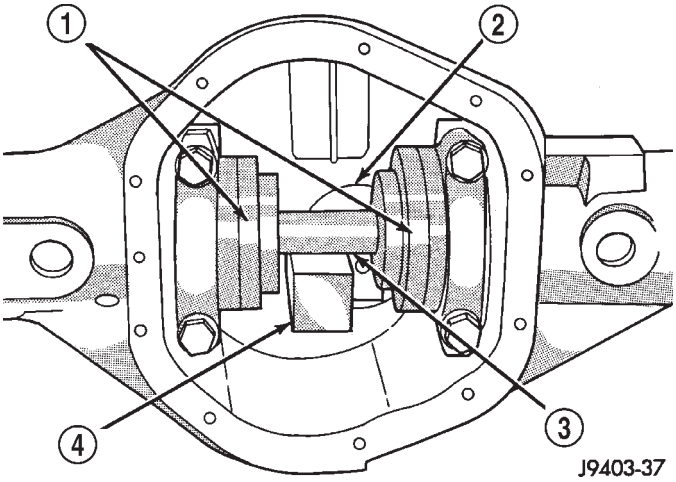


Fig. 10 GAUGE TOOLS IN HOUSING

1 - ARBOR DISC
2 - PINION BLOCK
3 - ARBOR
4 - PINION HEIGHT BLOCK

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 8). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 11). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a depth shim equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 6). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

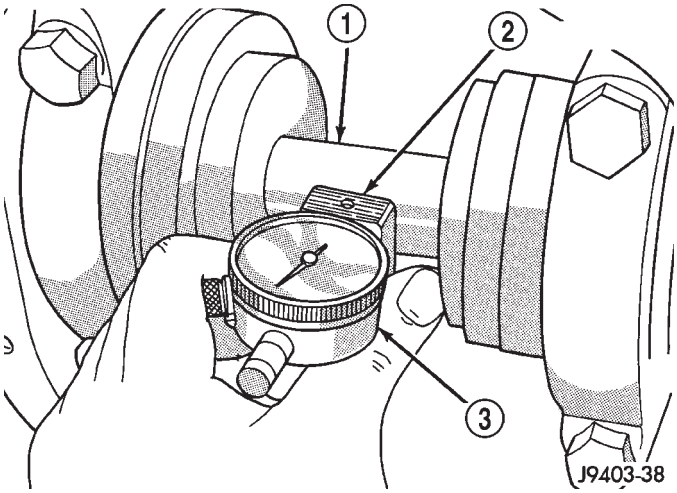


Fig. 11 PINION GEAR DEPTH MEASUREMENT

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

DIFFERENTIAL BEARING PRELOAD & GEAR BACKLASH

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit Dummy Bearings 6929-A in place of the differential side bearings and a Dial Indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 12). Differential shim measurements are performed with the spreader W-129-B removed.

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

(1) Remove differential side bearings from differential case.

REAR AXLE - 226RBA (Continued)

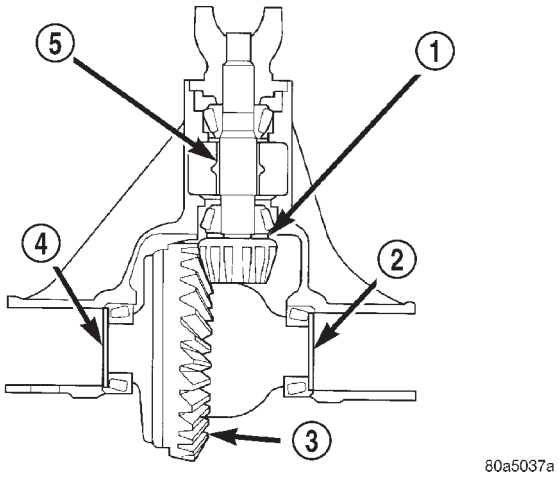


Fig. 12 ADJUSTMENT SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

(2) Install ring gear on differential case and tighten bolts to specification.

(3) Install Dummy Bearings 6929-A on differential case.

(4) Install differential case in the housing.

(5) Record the thickness of Dummy Shims 8107, then insert the shims between the dummy bearings and the differential housing (Fig. 13).

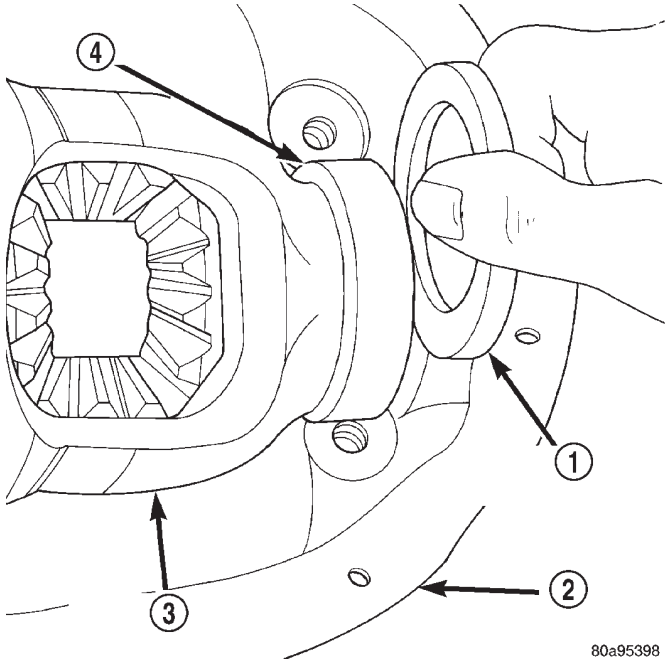


Fig. 13 DUMMY SHIM POINT

1 - DUMMY SHIMS
2 - HOUSING
3 - DIFFERENTIAL CASE
4 - DUMMY BEARINGS

(6) Install the bearing caps in their original positions and snug the bolts (Fig. 14).

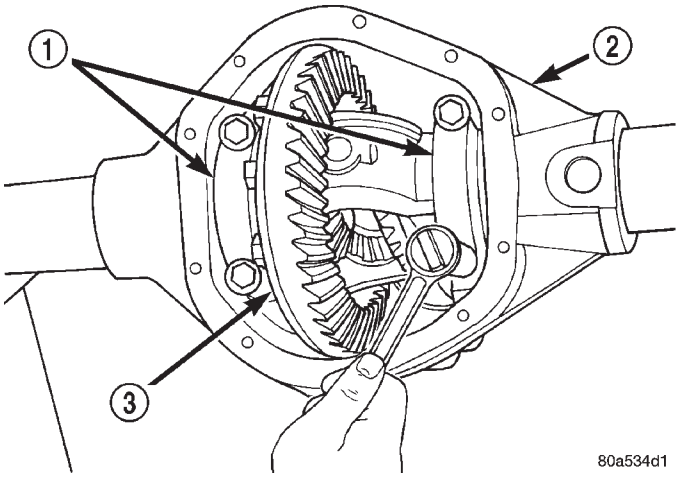


Fig. 14 TIGHTEN BEARING CAP BOLTS

1 - BEARING CAPS
2 - HOUSING
3 - DIFFERENTIAL CASE

(7) With a dead-blow hammer, seat the differential dummy bearings to each side of the housing (Fig. 15) and (Fig. 16).

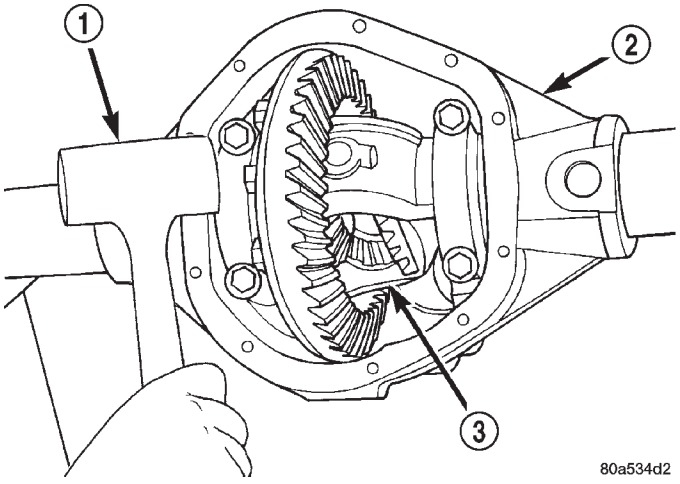


Fig. 15 SEAT DUMMY BEARING

1 - HAMMER
2 - HOUSING
3 - DIFFERENTIAL CASE

REAR AXLE - 226RBA (Continued)

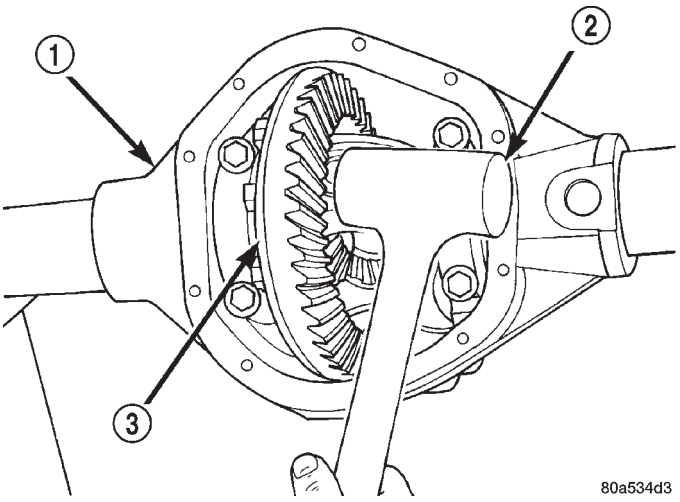


Fig. 16 SEAT DUMMY BEARING

1 - HOUSING
2 - HAMMER
3 - DIFFERENTIAL CASE

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear (Fig. 17).

(9) Attach the Dial Indicator C-3339 to pilot stud and position the indicator plunger on the flat surface between the ring gear bolts (Fig. 17).

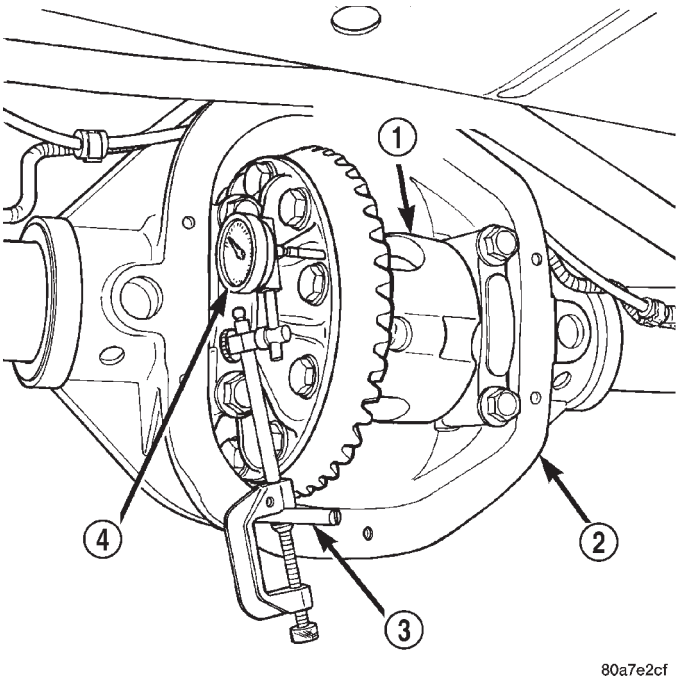


Fig. 17 DIFFERENTIAL SIDE PLAY MEASUREMENT

1 - DIFFERENTIAL CASE
2 - HOUSING
3 - PILOT STUD
4 - DIAL INDICATOR

(10) Push and hold differential case to pinion gear side of the housing and zero dial indicator (Fig. 18).

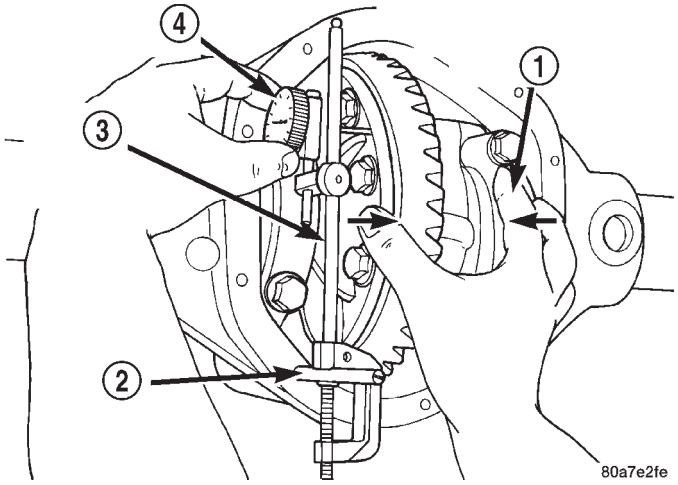


Fig. 18 DIFFERENTIAL CASE PINION GEAR SIDE

1 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
2 - PILOT STUD
3 - DIAL INDICATOR
4 - DIAL INDICATOR FACE

(11) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 19).

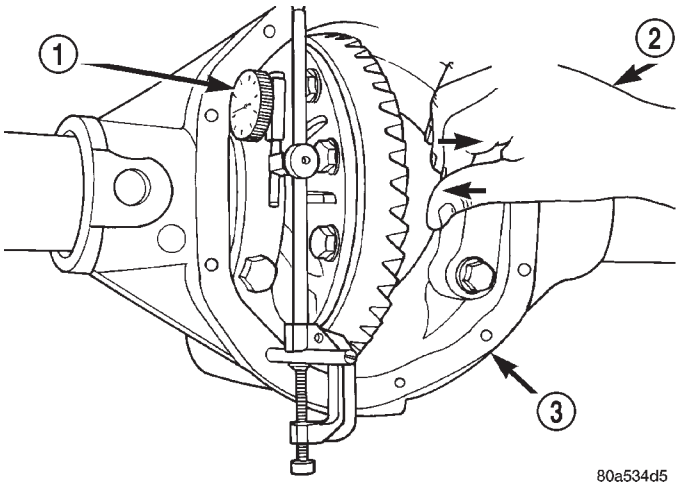


Fig. 19 DIFFERENTIAL CASE RING GEAR SIDE

1 - READ DIAL INDICATOR
2 - FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 - DIFFERENTIAL HOUSING

(12) Add 0.0254 mm (0.001 in.) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.

(13) Rotate dial indicator out of the way on the pilot stud.

REAR AXLE - 226RBA (Continued)

(14) Remove differential case and dummy bearings from the housing.

(15) Install the pinion gear in the housing. Install the pinion yoke and establish the correct pinion rotating torque.

(16) Install differential case and Dummy Bearings 6929-A in the housing.

(17) Install a single dummy shim in the ring gear side. Install bearing caps and tighten bolts snug.

(18) Seat ring gear side dummy bearing (Fig. 16).

(19) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 17).

(20) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 20).

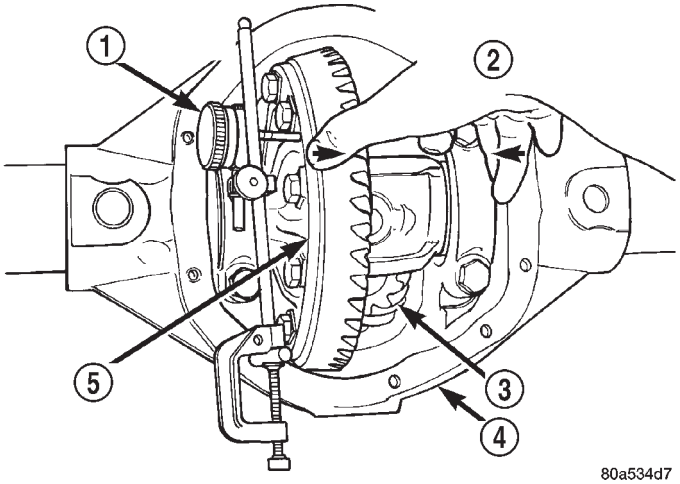


Fig. 20 ZERO DIAL INDICATOR

1 - DIAL INDICATOR FACE
2 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
3 - PINION GEAR
4 - HOUSING
5 - DIFFERENTIAL CASE

(21) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 21). Add Dummy Shim thickness to this reading. This will be the total shim thickness to achieve zero backlash.

(22) Subtract 0.152 mm (0.006 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

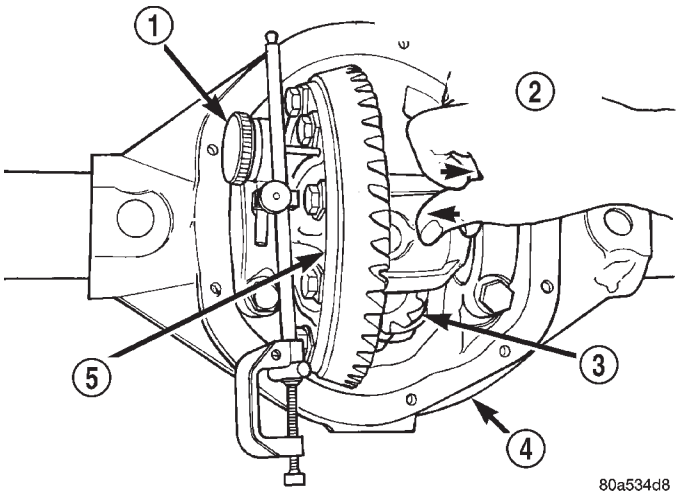


Fig. 21 DIFFERENTIAL CASE RING GEAR SIDE

1 - READ DIAL INDICATOR
2 - FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
3 - PINION GEAR
4 - DIFFERENTIAL HOUSING
5 - DIFFERENTIAL CASE

(23) Subtract backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the housing.

(24) Rotate dial indicator out of the way on pilot stud.

(25) Remove differential case and dummy bearings from the housing.

(26) Install side bearings and cups on differential case.

(27) Install spreader W-129-B, utilizing some items from Adapter Set 6987, on the housing and spread axle opening enough to receive differential case.

(28) Place the bearing preload shims in the housing against the axle tubes.

(29) Install differential case into the housing.

(30) Remove spreader from housing.

(31) Rotate the differential case several times to seat the side bearings.

REAR AXLE - 226RBA (Continued)

(32) Position the indicator plunger against a ring gear tooth (Fig. 22).

(33) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(34) Zero dial indicator face to pointer.

(35) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.076 mm (0.003 in.) and 0.15 mm (0.006 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the housing to the other (Fig. 23).

(36) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform Gear Contact Pattern procedure.

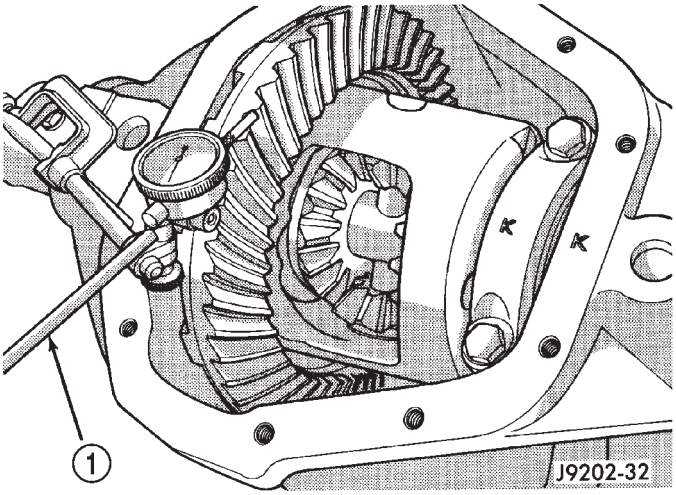


Fig. 22 RING GEAR BACKLASH

1 - DIAL INDICATOR

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

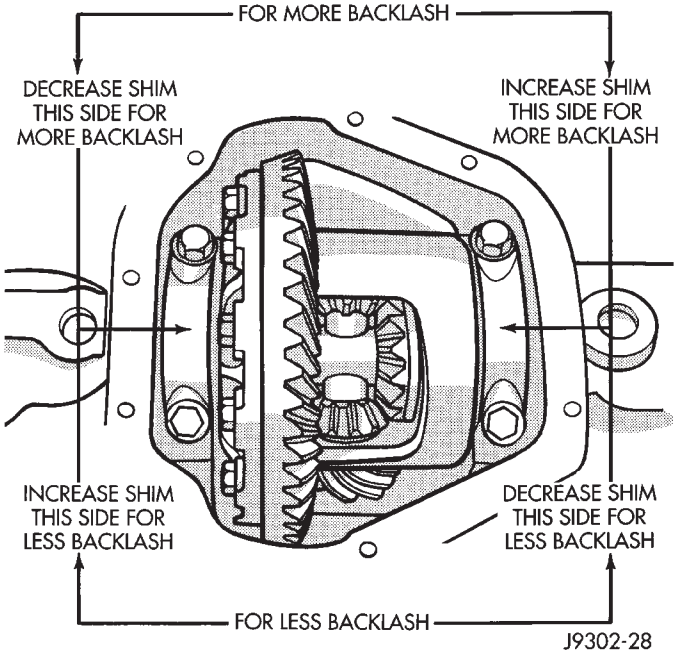


Fig. 23 BACKLASH SHIM

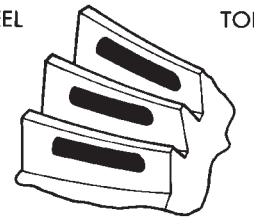
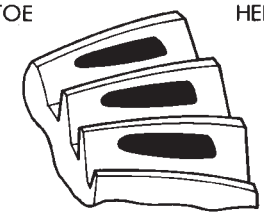
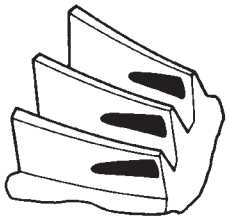
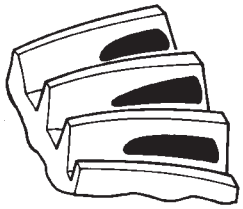
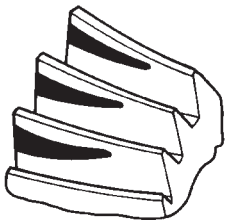
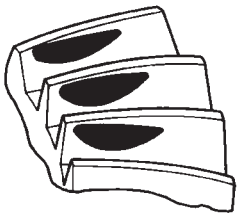
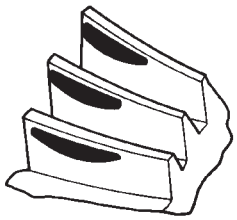
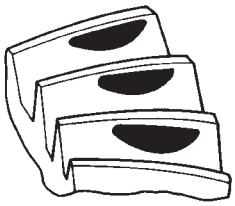
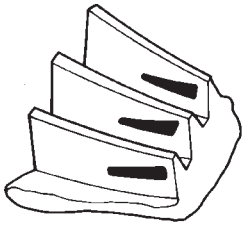
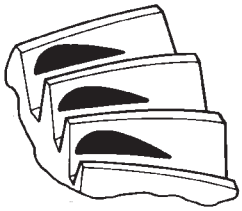
(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(2) Wrap, twist and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) With a boxed end wrench on a ring gear bolt, rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 24) and adjust pinion depth and gear backlash as necessary.

REAR AXLE - 226RBA (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 24 Gear Contact Patterns

REAR AXLE - 226RBA (Continued)

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion should be the torque to rotate the pinion plus 0.79-1.24 N·m (7-11 in. lbs.).

SPECIFICATIONS

AXLE SPECIFICATIONS

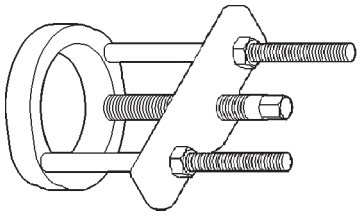
DESCRIPTION	SPECIFICATION
Axle Ratio	3.31, 3.55, 3.73, 3.91
Differential Bearing Preload	0.025 mm (0.001 in.)
Ring Gear Diameter	226 mm (8.9 in.)
Ring Gear Backlash	0.076.-0.15 mm (0.003-0.006 in.)
Pinion Gear Std. Depth	109.52 mm (4.312 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	2.8-4 N·m (25-35 in. lbs.)

TORQUE SPECIFICATIONS

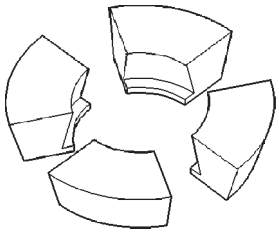
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	85	63	-
Ring Gear Bolts	136	100	-
Pinion Nut	298-380	220-280	-
Pinion Mate Shaft Screw	17.6	13	-
Axle Bearing Retainer Plate Nuts	61	45	-

REAR AXLE - 226RBA (Continued)

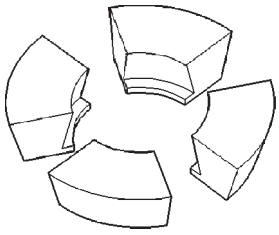
SPECIAL TOOLS



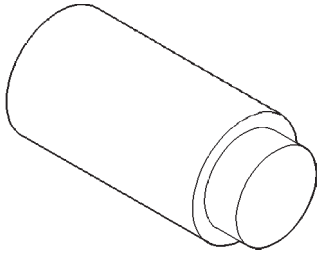
Puller Set C-293-PA



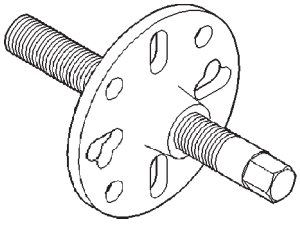
Adapter 8353



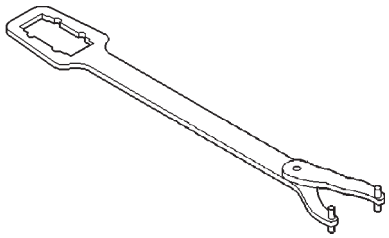
Adapter 8353



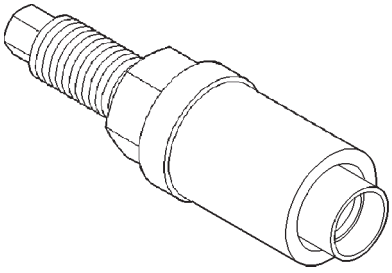
Adapter Plug C-293-3



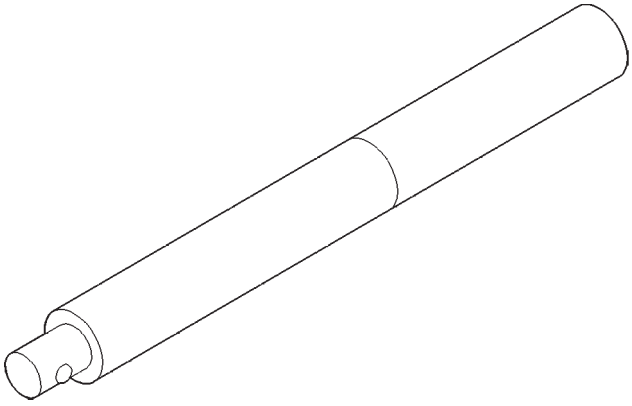
Remover C-452



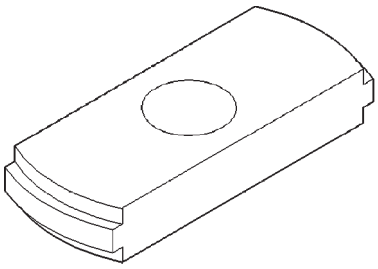
Wrench Flange C-3281



Installer C-3718

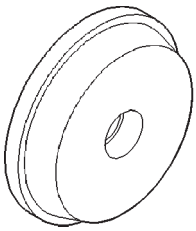


Handle C-4171

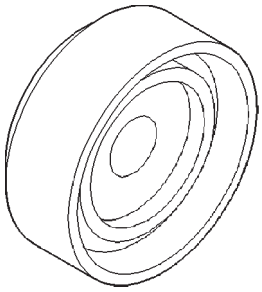


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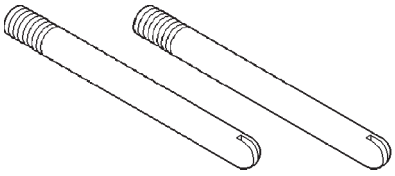
REAR AXLE - 226RBA (Continued)



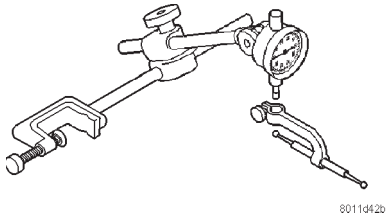
Installer C-4308



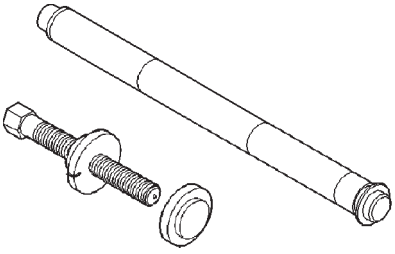
Installer C-4340



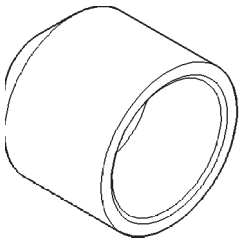
Pilot Studs C-3288-B



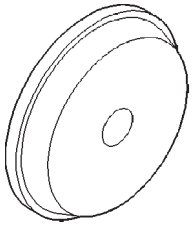
Dial Indicator C-3339



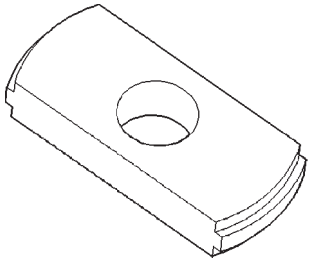
Trac-lok Tool C-4487



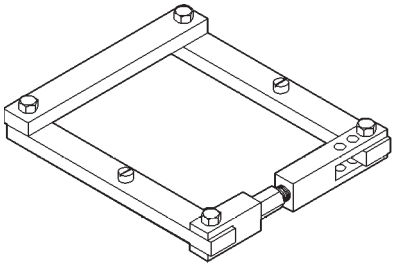
Installer C-3972-A



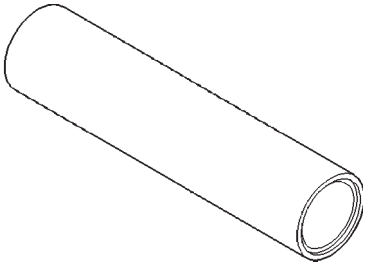
Installer D-129



Remover D-103

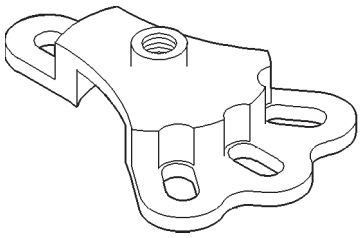


Spreader

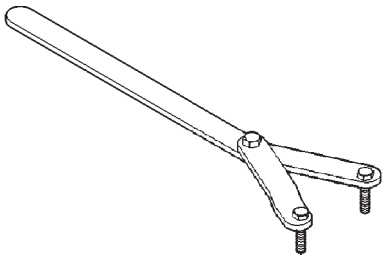


Installer 6448

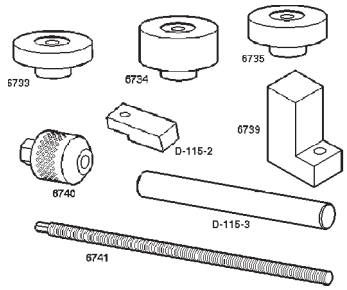
REAR AXLE - 226RBA (Continued)



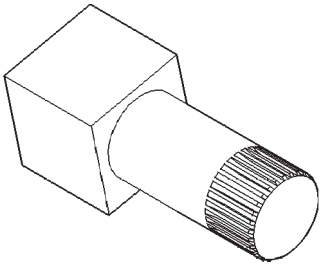
Adapter 6790



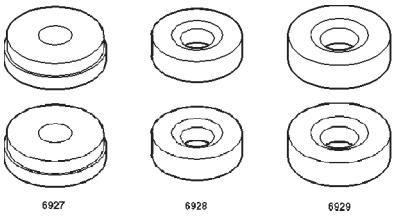
Wrench Spanner 6958



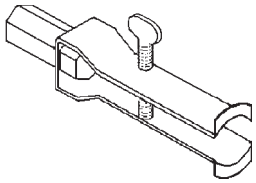
Pinion Depth Set 6955



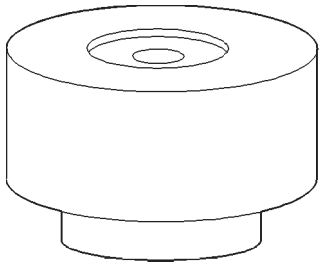
Fixture Holding 6963-A



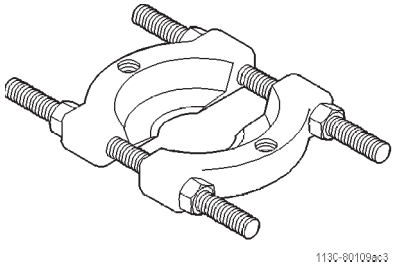
Bearing Dummy Set 6956



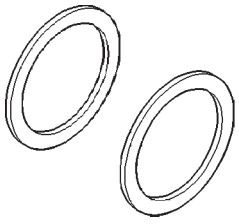
Remover 7794-A



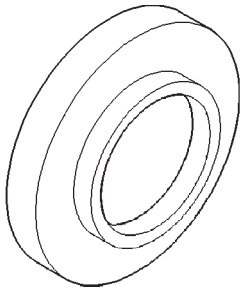
Gauge Block 8144



Splitter Bearing 1130



Shims Dummy 8107



Installer Gear/Bearing 7913-A

AXLE SHAFTS

REMOVAL

(1) Place transmission in neutral.
(2) Raise and support vehicle.
(3) Remove wheel and tire assembly.
(4) Remove brake caliper and rotor.
(5) Remove nuts holding axle retainer plate to axle tube from the rear of the axle flange.
(6) Pull axle shaft from the axle with Slide Hammer 7420 and Adapter 6790. Mount the adapter to the axle with lug nuts.

NOTE: The axle bearing race is normally loose in the axle tube.

INSTALLATION

(1) Insall axle into the axle tube with the flat area of the retainer plate upward.
(2) Insert retaining plate studs into the brake backing plate and axle tube flange.
(3) Install retainer nuts and tighten nuts to 61 N·m (45 ft. lbs.).
(4) Install the brake rotor and caliper.
(5) Install wheel and tire.
(6) Check and fill the differential with gear lubricant.
(7) Lower vehicle.

AXLE BEARINGS/SEALS

REMOVAL

(1) Remove axle shaft from vehicle.

NOTE: The axle bearing race is normally loose in the axle tube.

(2) Drill a shallow hole into soft steel axle bearing retaining ring with a 3/8 in. drill bit (Fig. 25). Use a drill depth stop to avoid marking the axle.
(3) With a cold chisel cut the retaining ring across drilled hole. (Fig. 26)
(4) Slide retaining ring from axle shaft.

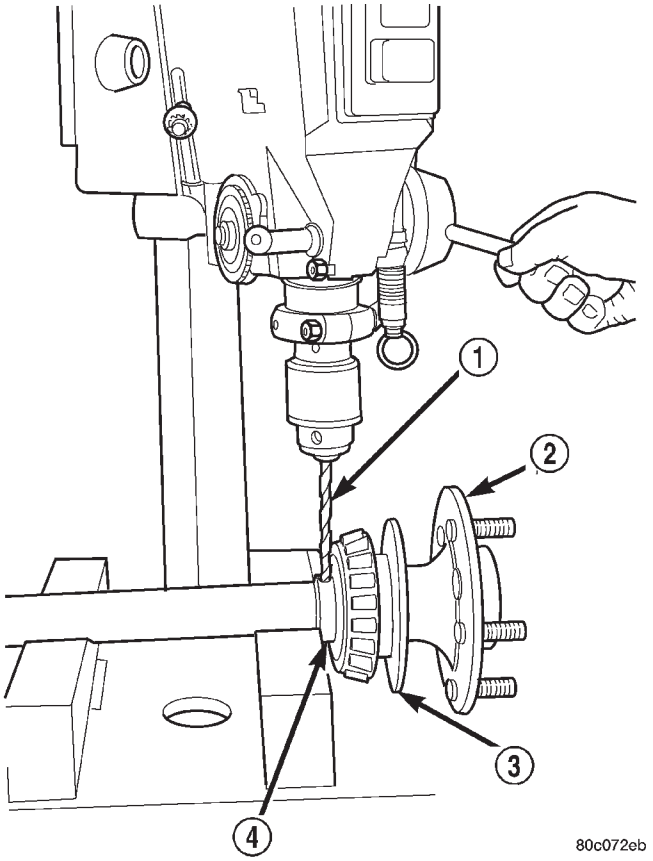


Fig. 25 DRILL RETAINING RING

1 - DRILL BIT
2 - AXLE
3 - RETAINING PLATE
4 - RETAINING RING

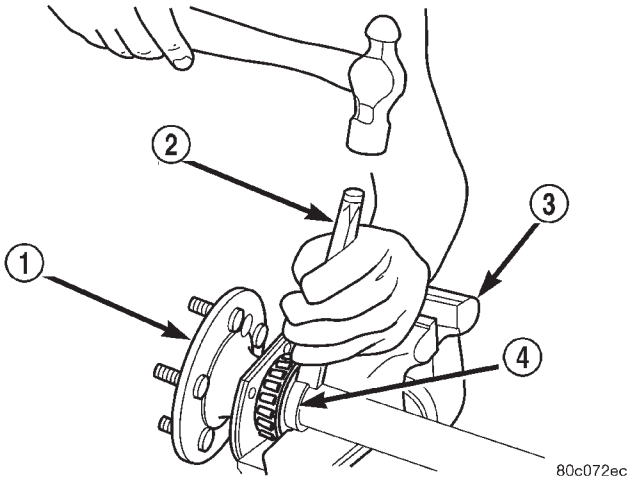


Fig. 26 RETAINING RING

1 - AXLE
2 - COLD CHISEL
3 - VISE
4 - RETAINING RING

AXLE BEARINGS/SEALS (Continued)

(5) Remove axle bearing from the shaft with, a press and Splitter 1130 placed between the seal and bearing (Fig. 27).

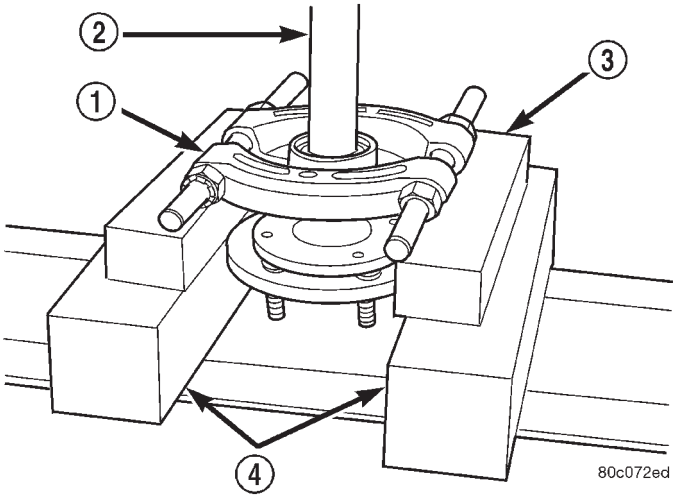


Fig. 27 AXLE BEARING AND SEAL

1 - SPLITTER
2 - AXLE
3 - BLOCKS
4 - PRESS PLATES

(6) Remove seal from axle.
(7) Remove retaining plate from axle shaft.

INSTALLATION

(1) Verify axle shaft retaining plate is flat with a straight edge.

NOTE: If the plate is warped or the studs are loose in the plate replace the retaining plate.

(2) Install retaining plate on the axle shaft (Fig. 28).
(3) Apply a coat of multi-purpose grease on sealing surface of axle seal.
(4) Install seal on the axle shaft with cavity away from retaining plate (Fig. 28).
(5) Lubricate bearing with Mopar Wheel Bearing Grease or equivalent. Wipe excess grease from the bearing.
(6) Install bearing on the axle shaft with Installer 7913 and a press (Fig. 29).

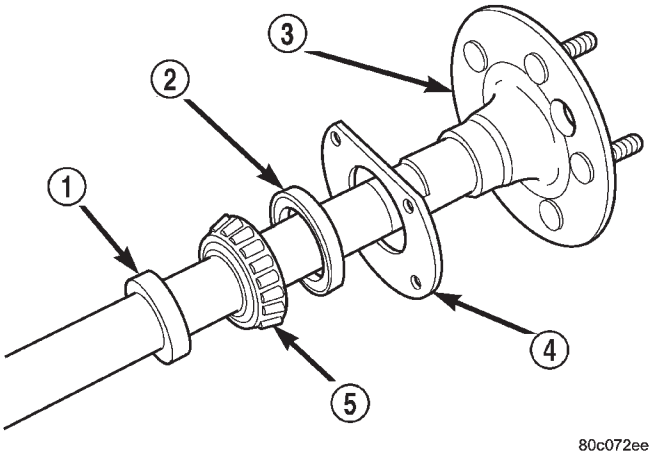


Fig. 28 AXLE BEARING AND SEAL COMPONENTS

1 - RETAINING RING
2 - SEAL
3 - AXLE
4 - RETAINING PLATE
5 - AXLE BEARING

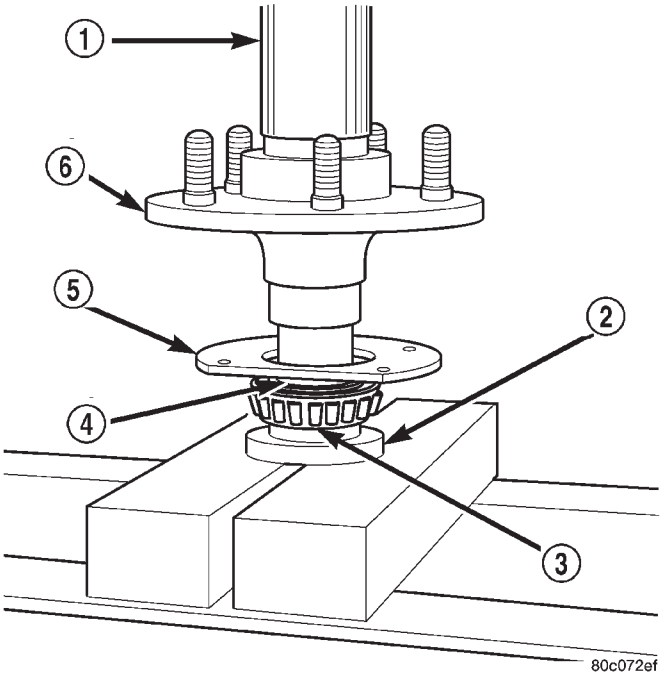


Fig. 29 PRESS BEARING ON AXLE

1 - PRESS RAM
2 - INSTALLER
3 - AXLE BEARING
4 - SEAL
5 - RETAINING PLATE
6 - AXLE

AXLE BEARINGS/SEALS (Continued)

(7) Press metal retaining ring onto axle shaft with Installer 7913 and a press (Fig. 30).

(8) Install axle in vehicle.

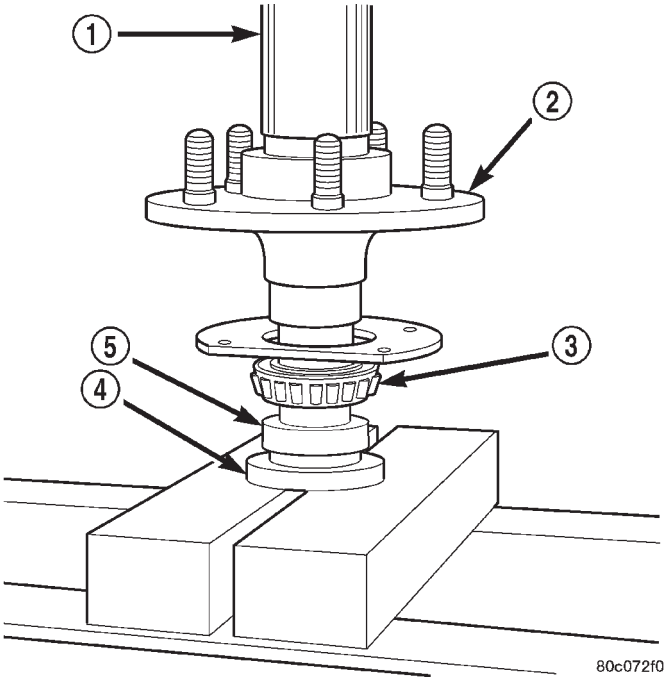


Fig. 30 BEARING RETAINING RING

1 - PRESS
2 - AXLE
3 - AXLE BEARING
4 - INSTALLER
5 - METAL RETAINING RING

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove rear brake calipers and rotors.

(4) Mark propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

(6) Rotate pinion gear three or four times and verify that pinion rotates smoothly.

(7) Record torque necessary to rotate the pinion gear with a inch pound dial-type torque wrench.

(8) Using a short piece of pipe and Spanner Wrench 6958 to hold the pinion yoke and remove pinion nut and washer (Fig. 31).

(9) Remove pinion companion flange with Remover C-452 and Flange Wrench C-3281. (Fig. 32)

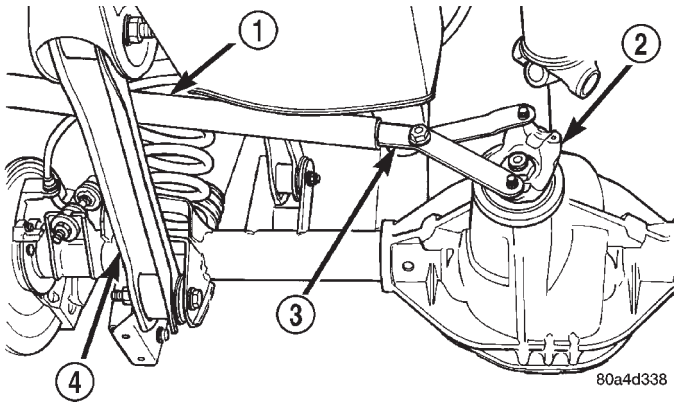


Fig. 31 Pinion Yoke Holder

1 - PIPE
2 - PINION YOKE
3 - SPANNER WRENCH
4 - LOWER CONTROL ARM

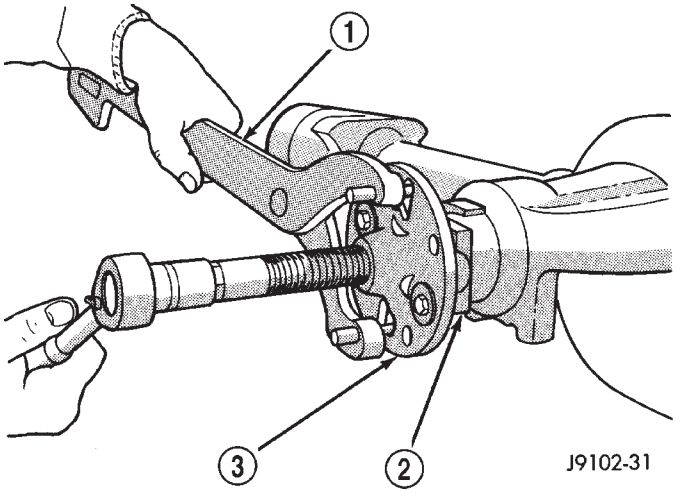


Fig. 32 Pinion Yoke Remover

1 - FLANGE WRENCH
2 - YOKE
3 - YOKE PULLER

PINION SEAL (Continued)

(10) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 33).

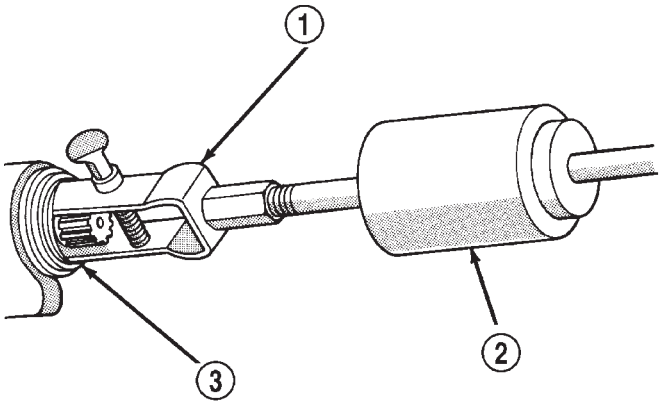


Fig. 33 Pinion Seal Remover

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate in installer (Fig. 34).

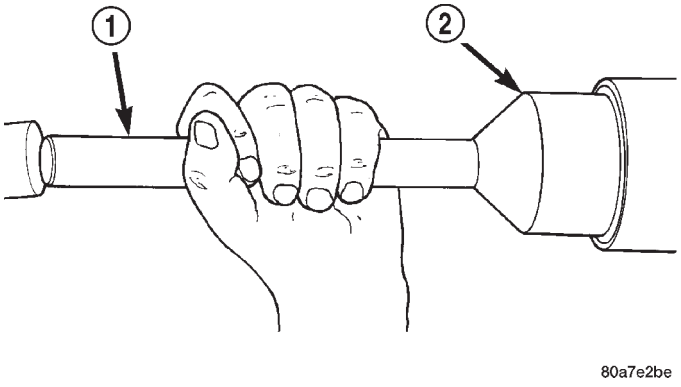


Fig. 34 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(2) Install yoke on the pinion gear with Installer C-3718 and Spanner Wrench 6958 (Fig. 35).

(3) Install a **new** nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

CAUTION: Do not exceed the minimum tightening torque 298 N·m (220 ft. lbs.) when installing the pinion yoke retaining nut at this point. Damage to collapsible spacer or bearings may result.

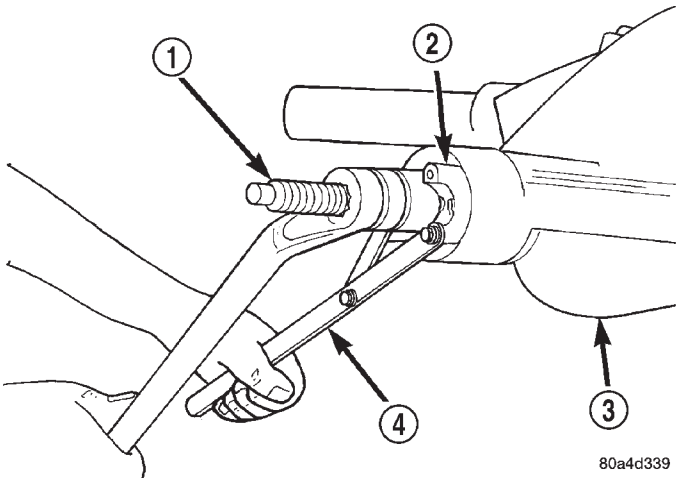


Fig. 35 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - DIFFERENTIAL HOUSING
4 - SPANNER WRENCH

(4) Rotate the pinion a minimum of ten times and verify pinion rotates smoothly. Rotate the pinion shaft using an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal, plus 0.56 N·m (5 in. lbs.) (Fig. 36).

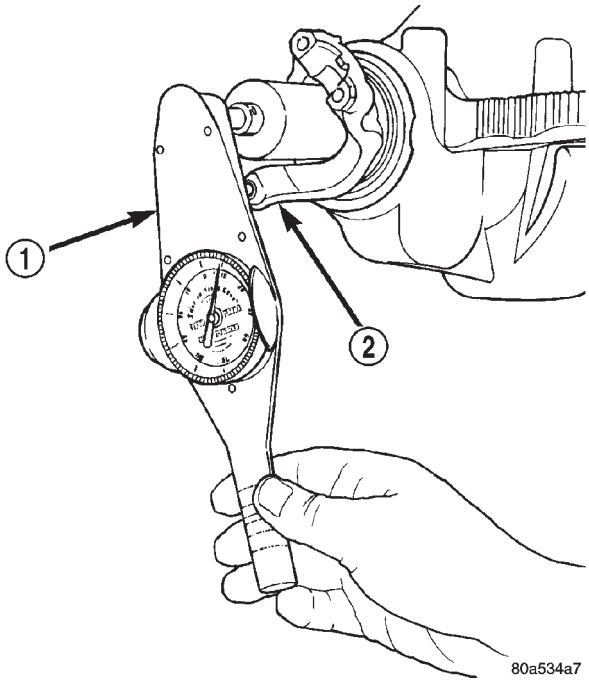


Fig. 36 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

PINION SEAL (Continued)

(5) If rotating torque is low, use Wrench 6958 to hold the pinion yoke (Fig. 37) and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until rotating torque is achieved.

CAUTION: If the maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

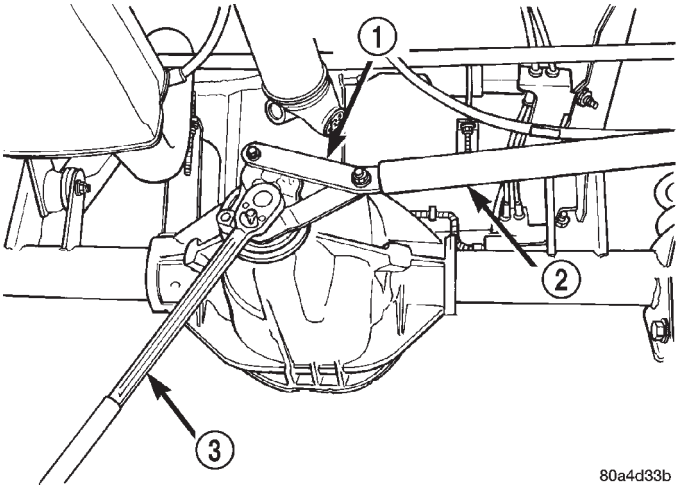


Fig. 37 PINION SHAFT NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

(6) Install propeller shaft with reference marks aligned.
(7) Fill differential with gear lubricant.
(8) Install the brake rotors and calipers.
(9) Install wheel and tire assemblies.
(10) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake calipers and rotors.
(4) Mark propeller shaft and pinion yoke for installation reference and remove propeller shaft.
(5) Rotate pinion gear a minimum of ten times and verify pinion rotates smoothly.
(6) Record rotate torque of the pinion gear, with an inch pound torque wrench.
(7) Hold pinion yoke with Spanner Wrench 6958 and remove pinion nut and washer (Fig. 38).
(8) Remove pinion yoke with Remover C-452 and Wrench C-3281 (Fig. 39).

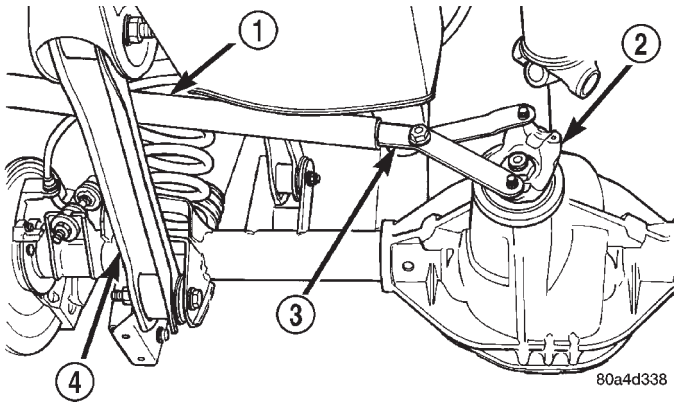


Fig. 38 PINION YOKE HOLDER

1 - 1 in. PIPE
2 - PINION YOKE
3 - SPANNER WRENCH
4 - LOWER CONTROL ARM

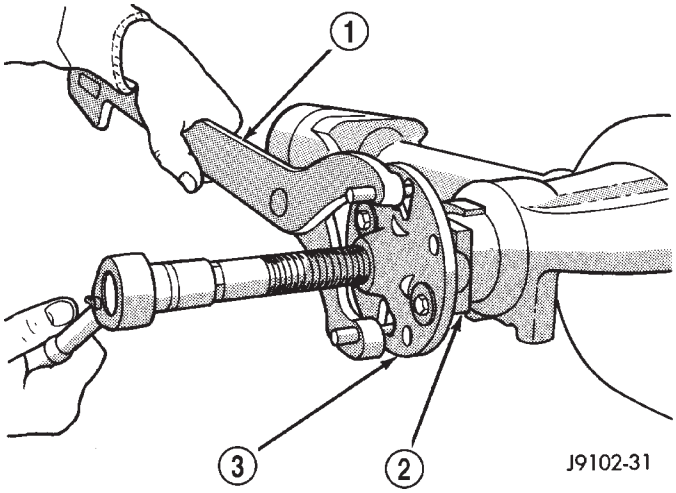


Fig. 39 PINION YOKE PULLER

1 - WRENCH
2 - PINION YOKE
3 - PULLER

COLLAPSIBLE SPACER (Continued)

(9) Remove pinion shaft seal with Remover 7794-A and slide hammer (Fig. 40).

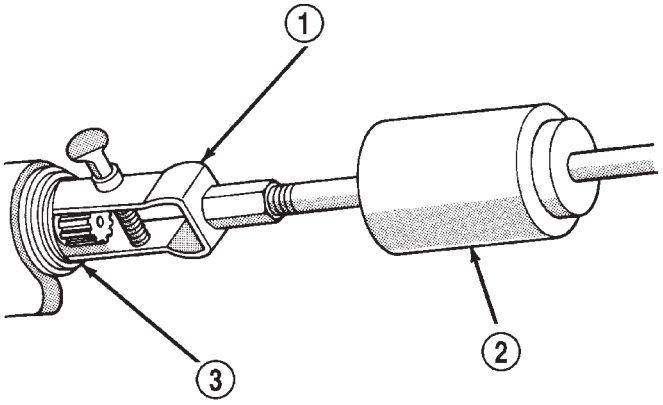


Fig. 40 PINION SEAL REMOVER

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(10) Remove front pinion bearing using a pair of pick tools to pull the bearing off the pinion gear shaft.

NOTE: If the pinion bearing becomes bound on the pinion shaft, lightly tap the end of the shaft with a rawhide/rubber mallet.

(11) Remove the collapsible spacer.

INSTALLATION

(1) Install a **new** collapsible spacer on pinion shaft.

(2) Install pinion front bearing on the pinion shaft.

(3) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with an appropriate installer (Fig. 41).

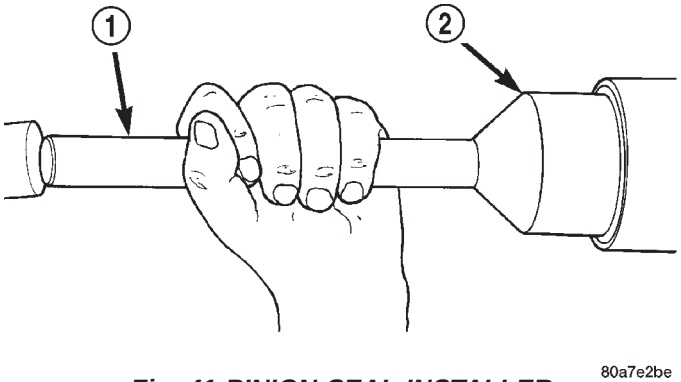


Fig. 41 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(4) Install yoke with Installer C-3718 and Spanner Wrench 6958 (Fig. 42).

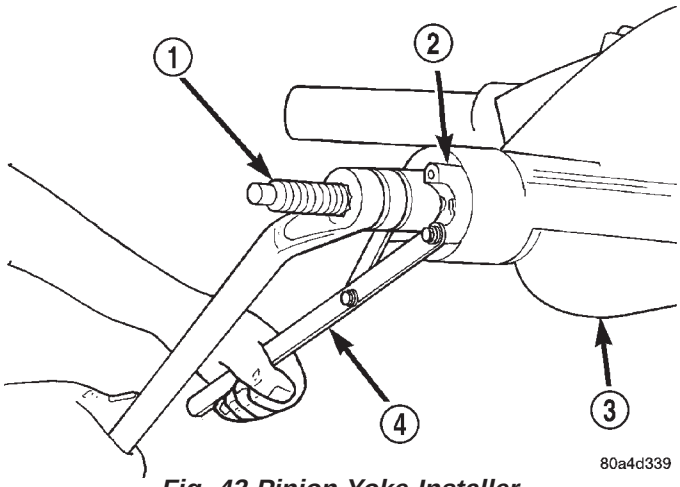


Fig. 42 Pinion Yoke Installer

1 - INSTALLER
2 - PINION YOKE
3 - DIFFERENTIAL HOUSING
4 - SPANNER WRENCH

(5) Install yoke washer and **new** nut on the pinion gear. Tighten the nut to 271 N·m (200 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(6) Using yoke with Spanner Wrench 6958 and a torque wrench set at 380 N·m (280 ft. lbs.), (Fig. 43) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 44).

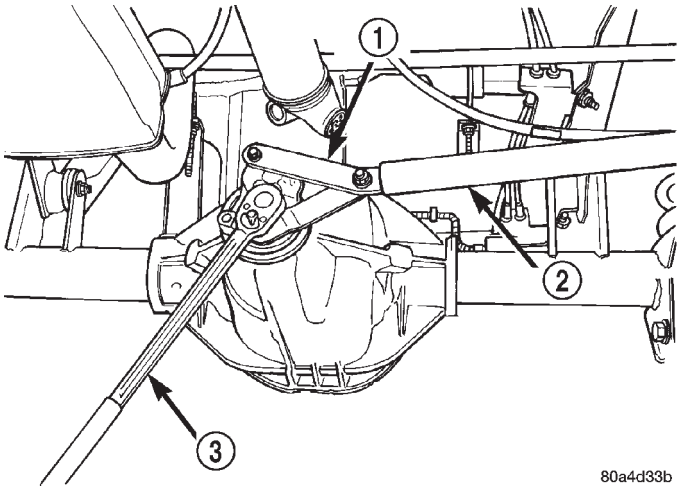


Fig. 43 PINION NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

COLLAPSIBLE SPACER (Continued)

NOTE: If more than 380 N·m (280 ft. lbs.) torque is required to crush the collapsible spacer, the spacer is defective and must be replaced.

(7) Check rotating torque with an inch pound torque wrench (Fig. 44). The rotating torque of the pinion gear should be, the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).

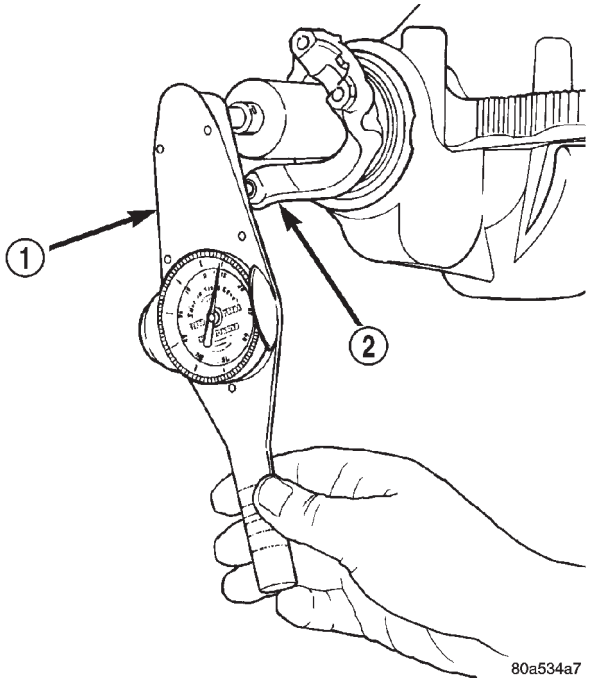


Fig. 44 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

(8) Install propeller shaft with reference marks align.
(9) Install rear brake rotors and calipers.
(10) Add gear lubricant, if necessary.
(11) Install wheel and tire assemblies.
(12) Remove supports and lower vehicle.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.
(2) Remove fill hole plug from the differential housing cover.
(3) Remove differential housing cover and drain fluid.
(4) Clean the housing cavity with flushing oil, light engine oil or lint free cloth.

NOTE: Do not use water, steam, kerosene or gasoline for cleaning.

(5) Remove axle shafts.

(6) Note the reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 45).

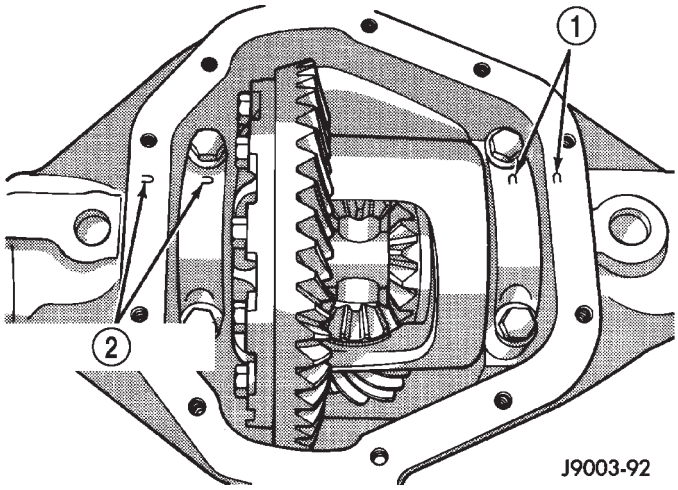


Fig. 45 BEARING CAP REFERENCE

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

(7) Loosen the differential bearing cap bolts.
(8) Position Spreader W-129-B with Adapter Kit 6987B on differential locating holes (Fig. 46). Install holddown clamps and tighten the turnbuckle finger-tight.

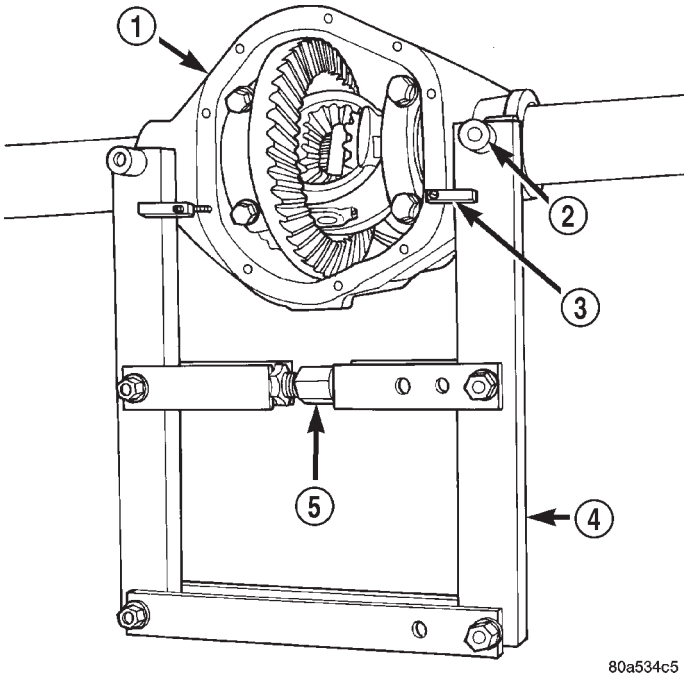


Fig. 46 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - DOWEL
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

DIFFERENTIAL (Continued)

(9) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 47) and zero the indicator.

CAUTION: Never spread the housing over 0.38 mm (0.015 in). If housing is over-spread, it could distorted and damaged the housing.

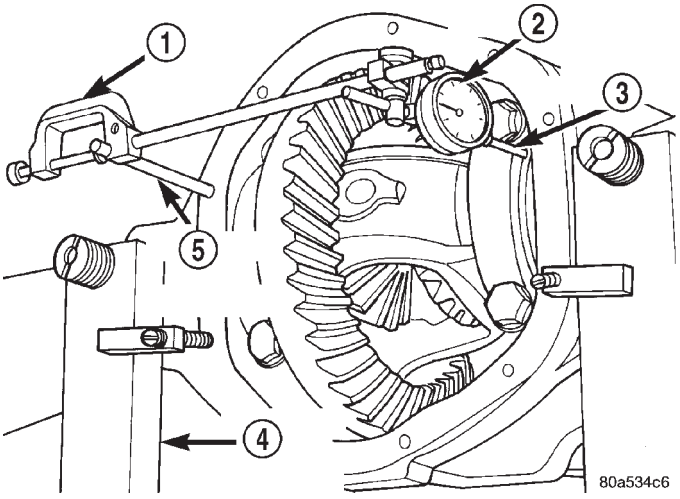


Fig. 47 DIAL INDICATOR LOCATION

1 - CLAMP
2 - DIAL INDICATOR
3 - LEVER ADAPTER
4 - SPREADER
5 - PILOT STUD

(10) Spread housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 48).

(11) Remove the dial indicator.

(12) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(13) Remove differential from the housing and tag differential bearing cups to indicate location (Fig. 49).

(14) Remove spreader from housing.

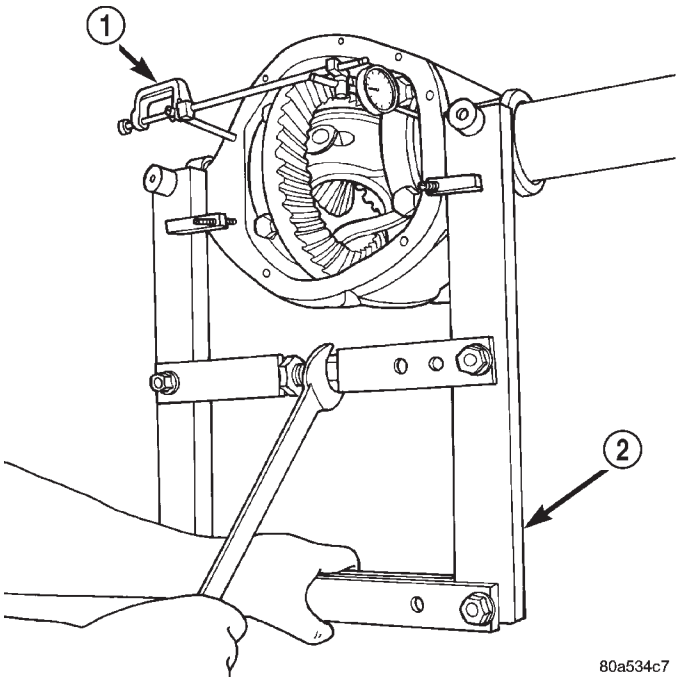


Fig. 48 SPREAD DIFFERENTIAL HOUSING

1 - DIAL INDICATOR
2 - SPREADER

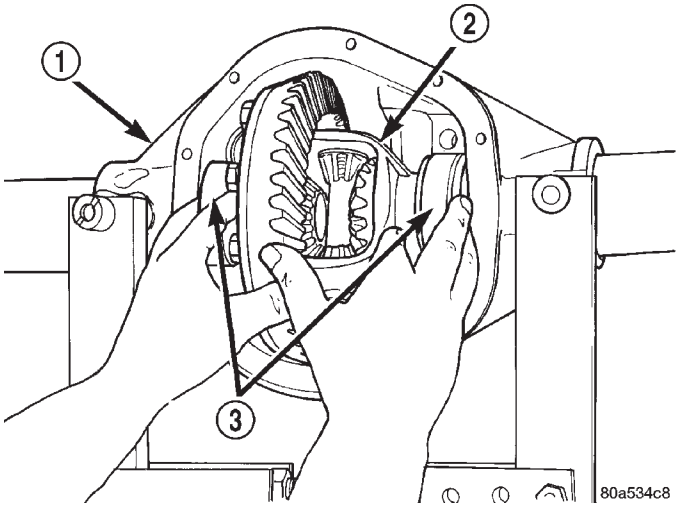


Fig. 49 DIFFERENTIAL CASE REMOVAL

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - BEARING CUPS

DIFFERENTIAL (Continued)

DISASSEMBLY

(1) Remove pinion shaft lock screw (Fig. 50).

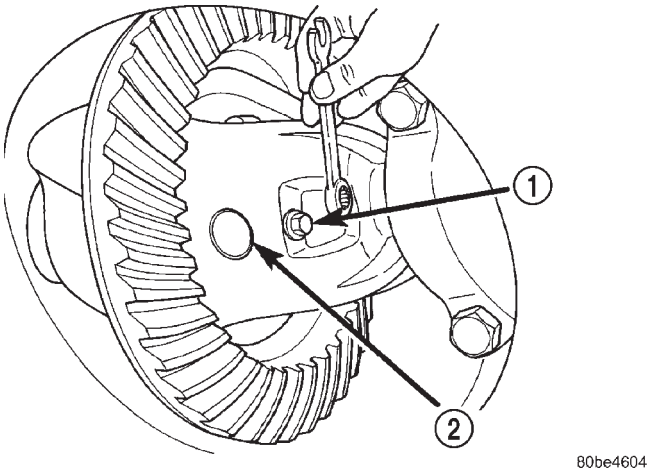


Fig. 50 SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION SHAFT

(2) Remove pinion shaft.

(3) Rotate differential side gears and remove differential pinions and thrust washers (Fig. 51).

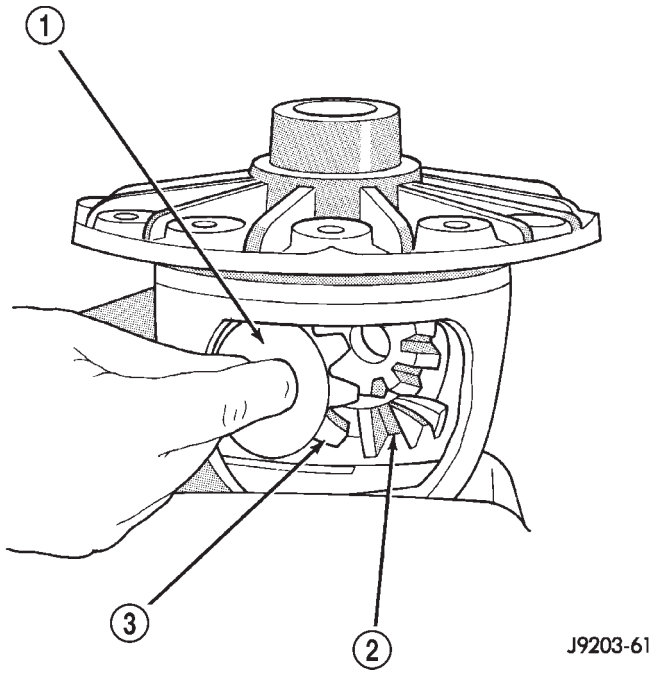


Fig. 51 DIFFERENTIAL GEARS

1 - THRUST WASHER
2 - SIDE GEAR
3 - DIFFERENTIAL PINION

(4) Remove differential side gears and thrust washers.

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install differential pinion gears and thrust washers.

(3) Install the pinion mate shaft.

(4) Align hole in the pinion mate shaft with the hole in the differential case and install the pinion mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

INSTALLATION

NOTE: If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer Adjustments (Differential Bearing Preload and Gear Backlash) to determine the proper shim selection.

(1) Position Spreader W-129-B with Adapter set 6987 on differential housing locating holes. Install the holddown clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.

CAUTION: Never spread the housing over 0.38 mm (0.015 in). If housing is over-spread, it could be distorted or damaged.

(3) Spread housing enough to install the case in the housing.

(4) Remove the dial indicator.

(5) Install differential case in housing (Fig. 52). Verify differential bearing cups remain in position on the bearings and preload shims are between the face of the bearing cup and the housing. Tap the differential case to ensure bearings cups and shims are seated in the housing.

CAUTION: On a Vari-lok® differential the oil feed tube must be pointed at the bottom of the housing (Fig. 53). If differential is installed with the oil feed tube pointed at the top, the anti-rotation tabs will be damaged.

(6) Install bearing caps in their original locations (Fig. 54).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

(9) Tighten bearing cap bolts in a criss-cross pattern to 77 N·m (57 ft. lbs.).

(10) Install the axle shafts.

DIFFERENTIAL (Continued)

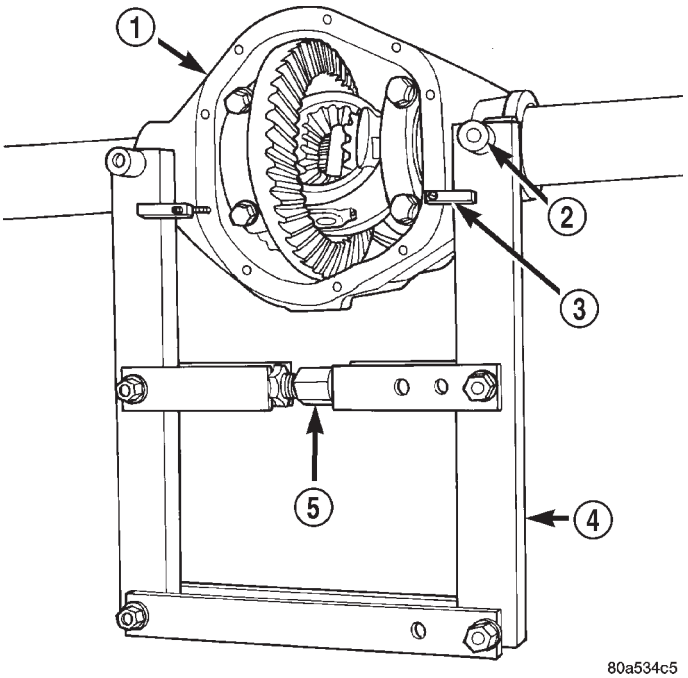


Fig. 52 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - DOWEL
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

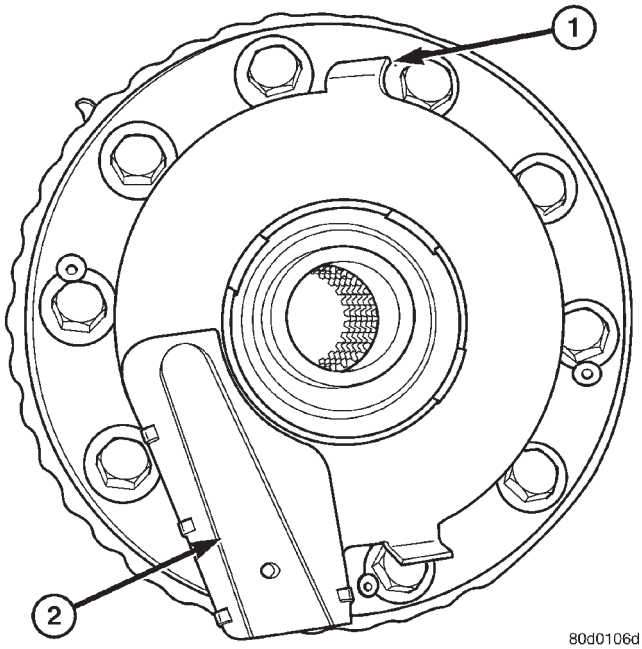


Fig. 53 VARI-LOK

1 - ANTI-ROTATION TAB
2 - OIL FEED TUBE

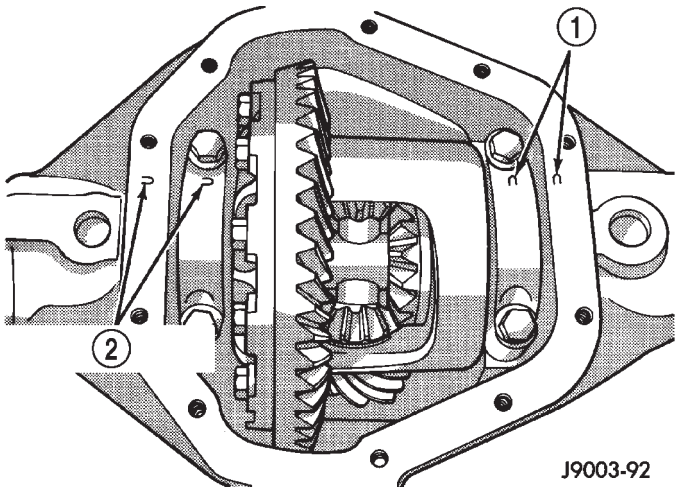


Fig. 54 BEARING CAP REFERENCE

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

(11) Apply a 6.35mm (1/4 in.) bead of red Mopar Silicone Rubber Sealant or equivalent to the housing cover (Fig. 55).

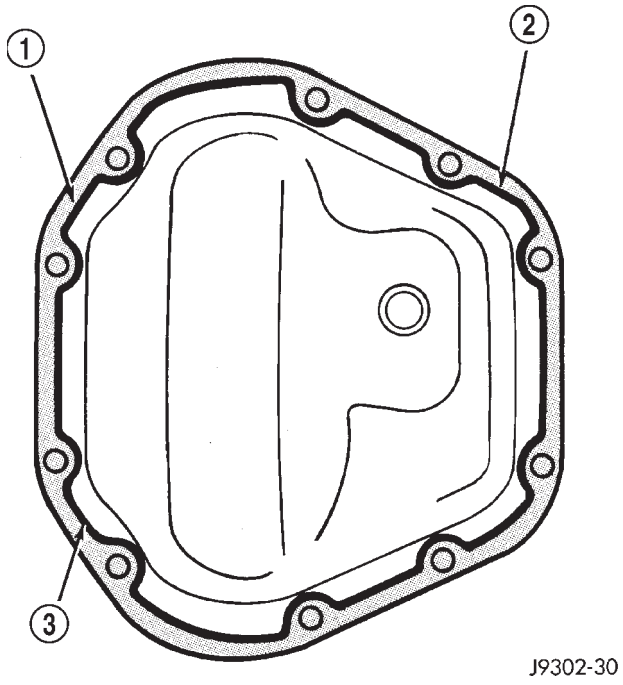


Fig. 55 DIFFERENTIAL COVER - TYPICAL

1 - COVER
2 - SEALANT
3 - SEALANT BEAD

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

DIFFERENTIAL (Continued)

(12) Install cover and tighten bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).

(13) Refill the differential with Mopar Hypoid Gear Lubricant or equivalent to bottom of the fill plug hole.

(14) Install fill hole plug.

(15) Remove support and lower the vehicle.

DIFFERENTIAL - TRAC-LOK

DIAGNOSIS AND TESTING

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIFFERENTIAL TEST

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 56).

(6) If rotating torque is less than 41 N·m (56 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DISASSEMBLY

(1) Clamp side gear Holding Fixture 6965 in a vise and position the differential case on the Holding Fixture (Fig. 57).

(2) Remove ring gear if the ring gear is to be replaced. The Trac-lok® differential can be serviced with the ring gear installed.

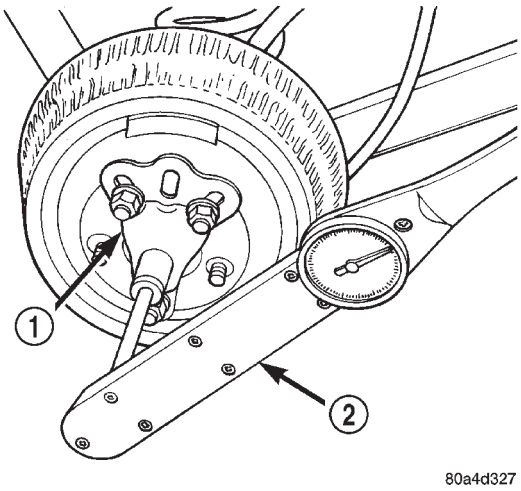


Fig. 56 ROTATING TORQUE TEST

1 - SPECIAL TOOL WITH BOLT IN CENTER HOLE
2 - TORQUE WRENCH

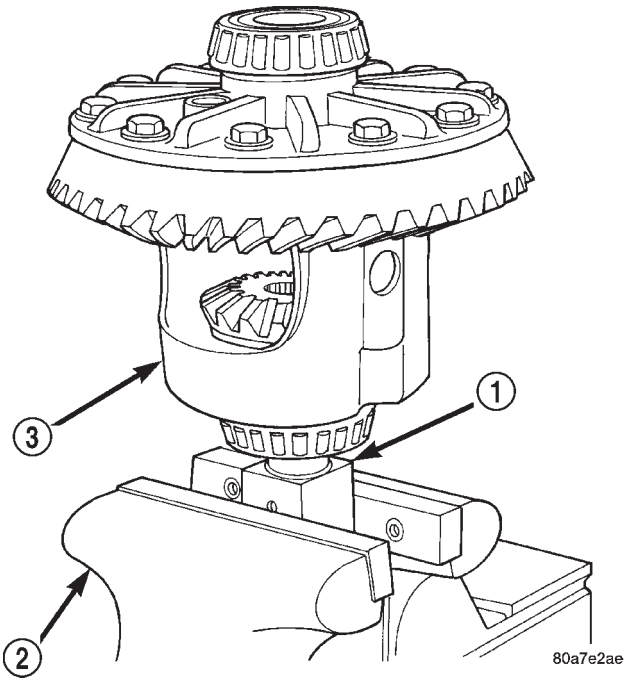


Fig. 57 DIFFERENTIAL CASE FIXTURE

1 - HOLDING FIXTURE
2 - VISE
3 - DIFFERENTIAL

DIFFERENTIAL - TRAC-LOK (Continued)

(3) Remove the pinion gear mate shaft lock screw (Fig. 58).

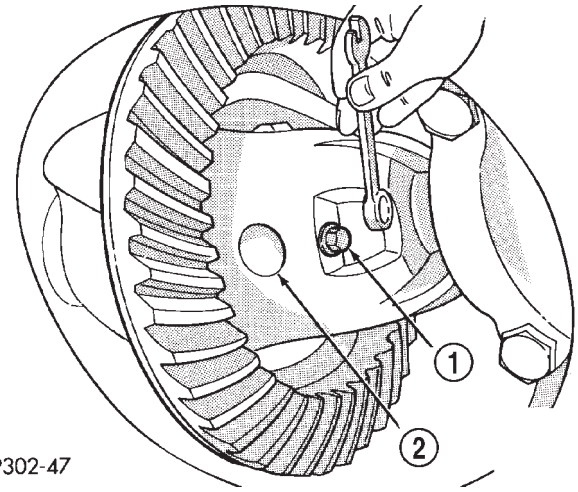


Fig. 58 MATE SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION GEAR MATE SHAFT

(4) Remove pinion gear mate shaft with a drift and hammer (Fig. 59).

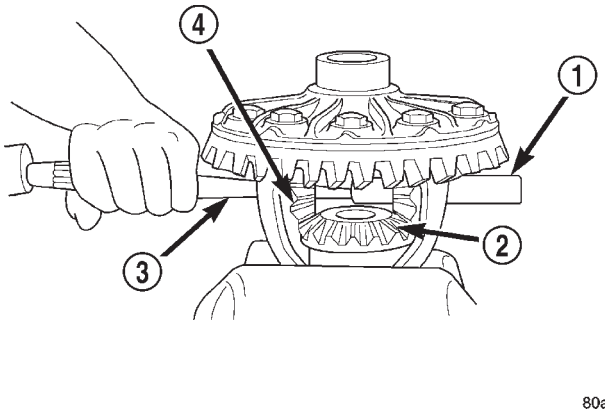


Fig. 59 PINION MATE SHAFT

1 - PINION MATE SHAFT
2 - SIDE GEAR
3 - DRIFT
4 - PINION MATE GEAR

(5) Install and lubricate Step Plate C-6960-3 (Fig. 60).

(6) Assemble Threaded Adapter C-6960-1 into top side gear. Thread Forcing Screw C-6960-4 into adapter until it becomes centered in adapter plate.

(7) Position a small screw driver in slot of Threaded Adapter Disc C-6960-1 (Fig. 61) to prevent adapter from turning.

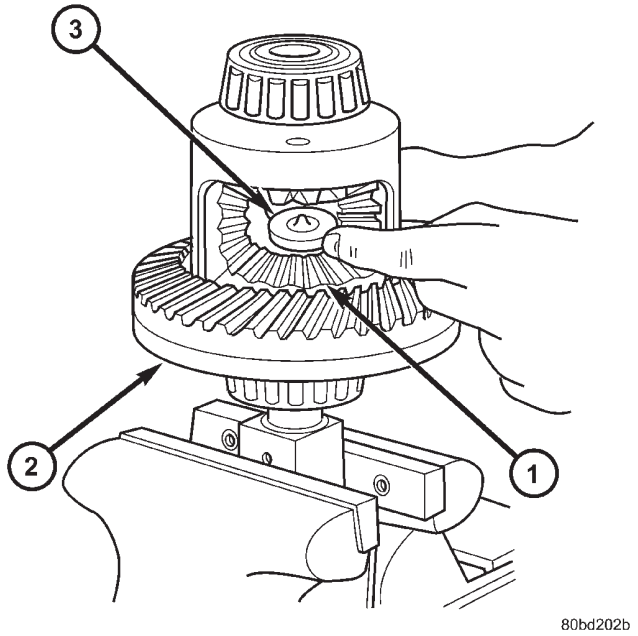


Fig. 60 Step Plate

1 - LOWER SIDE GEAR
2 - DIFFERENTIAL CASE
3 - STEP PLATE

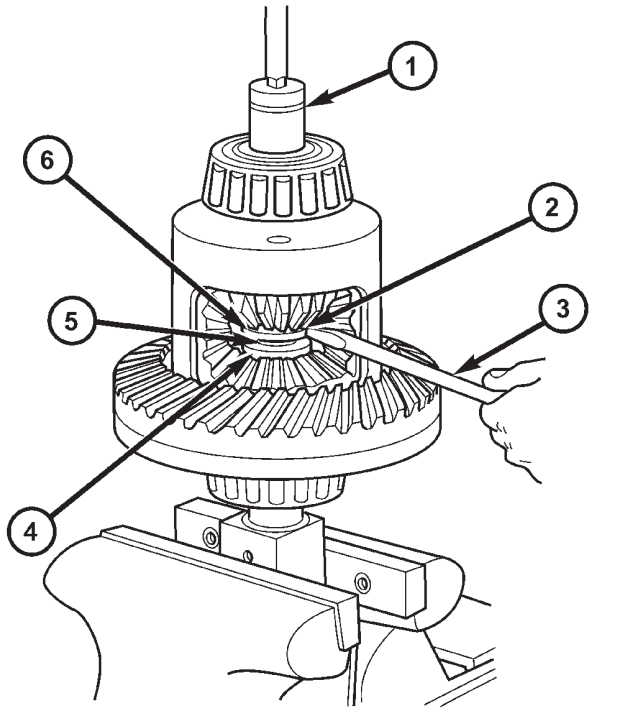


Fig. 61 Threaded Adapter Disc

1 - SOCKET
2 - SLOT IN ADAPTER
3 - SCREWDRIVER
4 - STEP PLATE
5 - FORCING SCREW
6 - THREAD ADAPTER DISC

DIFFERENTIAL - TRAC-LOK (Continued)

(8) Install Forcing Screw C-6960-4 and tighten screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 62).

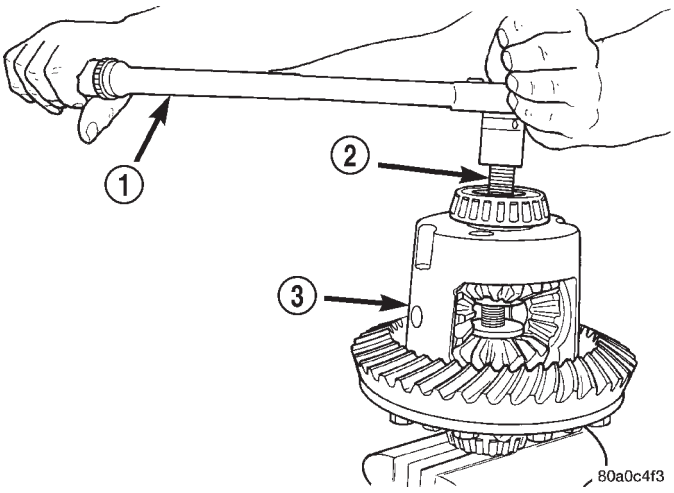


Fig. 62 COMPRESS BELLEVILLE SPRING

1 - TORQUE WRENCH
2 - TOOL ASSEMBLED
3 - DIFFERENTIAL CASE

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 63).

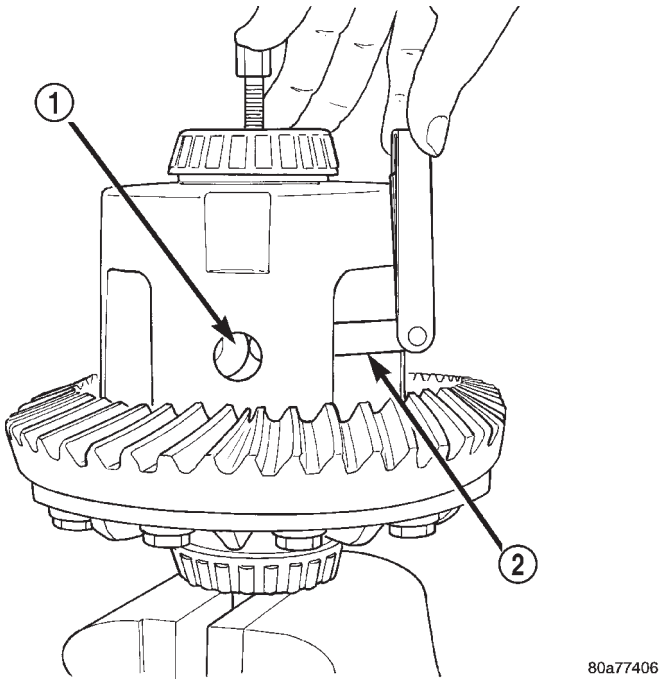


Fig. 63 PINION GEAR THRUST WASHER

1 - THRUST WASHER
2 - FEELER GAUGE

(10) Insert Turning Bar C-6960-2 into the pinion mate shaft hole in the case (Fig. 64).

(11) Loosen the Forcing Screw in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar.

(12) Rotate differential case until the pinion gears can be removed.

(13) Remove pinion gears from differential case.

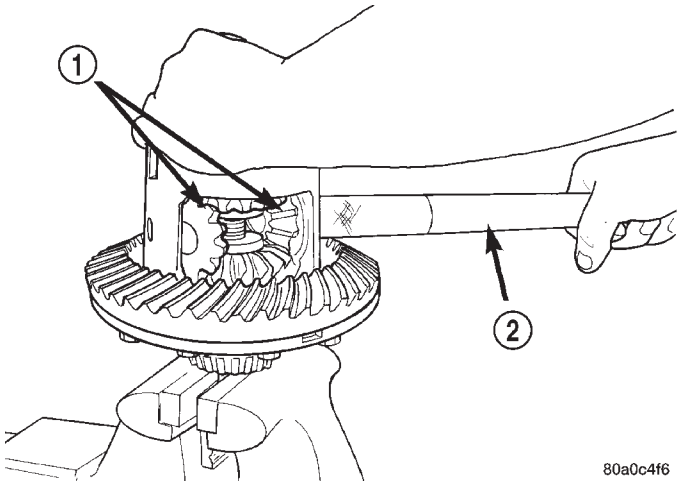


Fig. 64 PINION GEARS

1 - PINION GEARS
2 - TURNING BAR

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal (Fig. 65).

(16) Remove differential case from the Holding Fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal.

CLEANING

Clean all components in cleaning solvent and dry components with compressed air.

INSPECTION

Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears for cracks chips or damage and replace as necessary. Inspect differential case and pinion shaft and replace if worn or damaged.

ASSEMBLY

Clean all components in cleaning solvent and dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is

DIFFERENTIAL - TRAC-LOK (Continued)

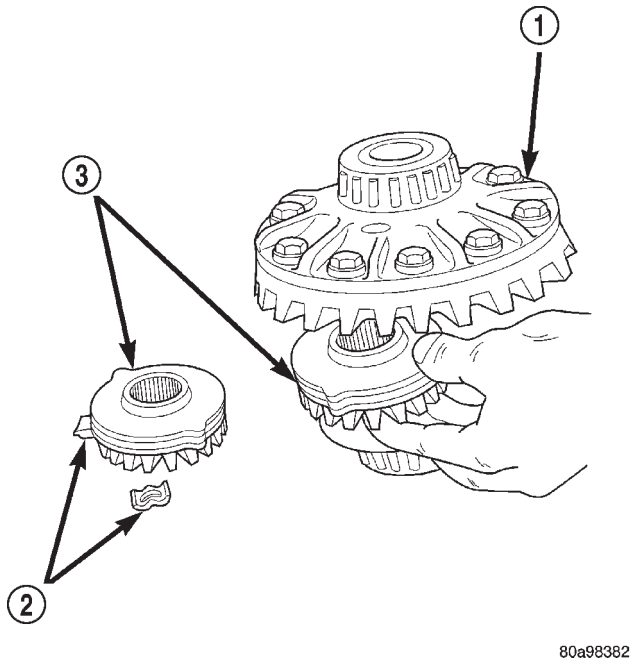


Fig. 65 SIDE GEARS AND CLUTCH DISCS

1 - DIFFERENTIAL CASE
2 - RETAINER
3 - SIDE GEAR AND CLUTCH DISC PACK

damaged. Inspect side gears and pinions. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

(1) Lubricate each component with gear lubricant before assembly.

(2) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 66).

NOTE: Dished plate is position with the convex side against the side gear.

(3) Position assembled clutch disc packs on the side gear hubs.

(4) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 67). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(5) Position the differential case on the Holding Fixture 6965.

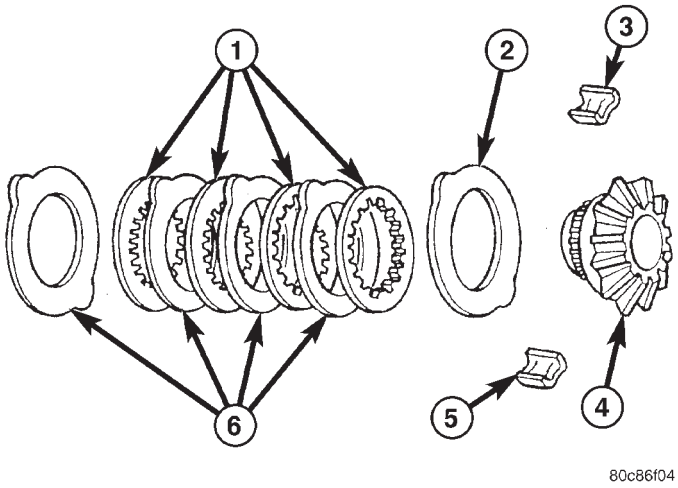


Fig. 66 CLUTCH PACK

1 - DISCS
2 - DISHED PLATE
3 - RETAINER
4 - SIDE GEAR
5 - RETAINER
6 - PLATES

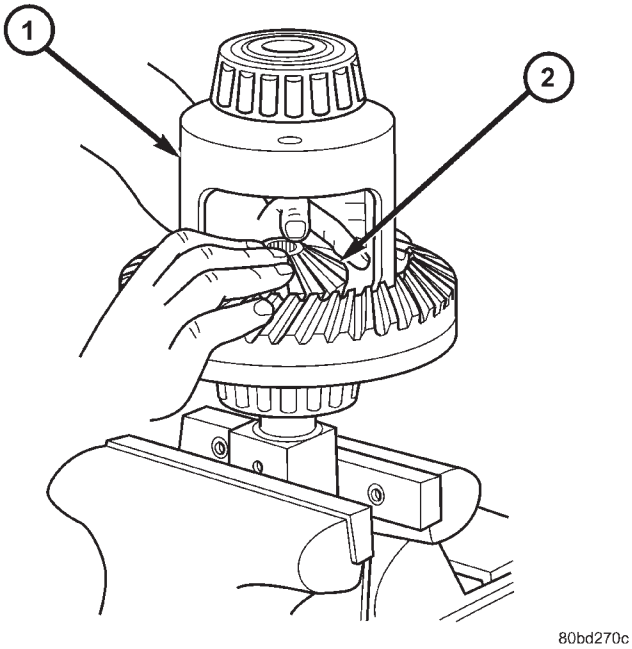


Fig. 67 CLUTCH PACK AND LOWER SIDE GEAR

1 - DIFFERENTIAL CASE
2 - LOWER SIDE GEAR AND CLUTCH DISC PACK

DIFFERENTIAL - TRAC-LOK (Continued)

(6) Install lubricated Step Plate C-6960-3 in lower side gear (Fig. 68).

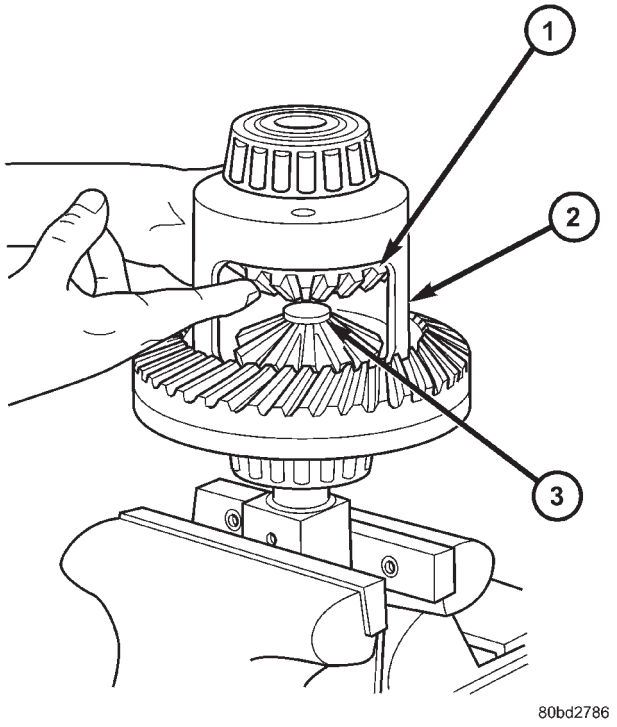


Fig. 68 CLUTCH PACK AND UPPER SIDE GEAR

1 - SIDE GEAR AND CLUTCH PACK
2 - DIFFERENTIAL CASE
3 - STEP PLATE

(7) Install the upper side gear and clutch disc pack (Fig. 68).

(8) Hold assembly in position. Insert Threaded Adapter C-6960-1 into top side gear.

(9) Install Forcing Screw C-6960-4 and tighten screw to slightly compress clutch disc.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(11) Rotate case with Turning Bar C-6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove side bearings from the differential case with Puller/Press C-293-PA, Adapters 8353 and Plug C-293-3 (Fig. 69).

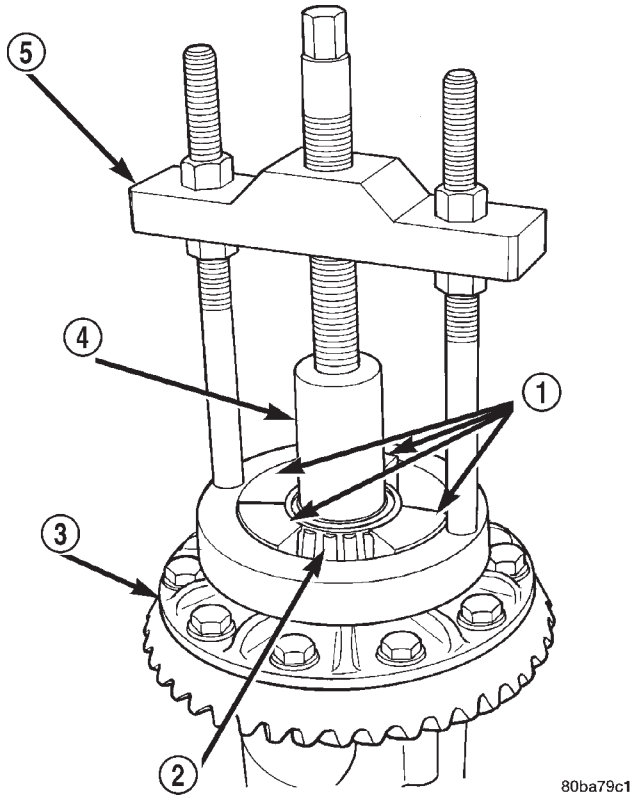


Fig. 69 Differential Bearing Removal

1 - ADAPTERS
2 - BEARING
3 - DIFFERENTIAL
4 - PLUG
5 - PULLER

INSTALLATION

NOTE: If differential side bearings or differential case are replaced, differential side bearing shim requirements may change. Refer to Adjustments (Differential Bearing Preload and Gear Backlash) for procedures.

DIFFERENTIAL CASE BEARINGS (Continued)

CAUTION: Vari-lok® plenum must be seated against the differential case prior to installing the ring gear side differential bearing.

(1) Install differential side bearings with Installer C-4340 and Handle C-4171 (Fig. 70).

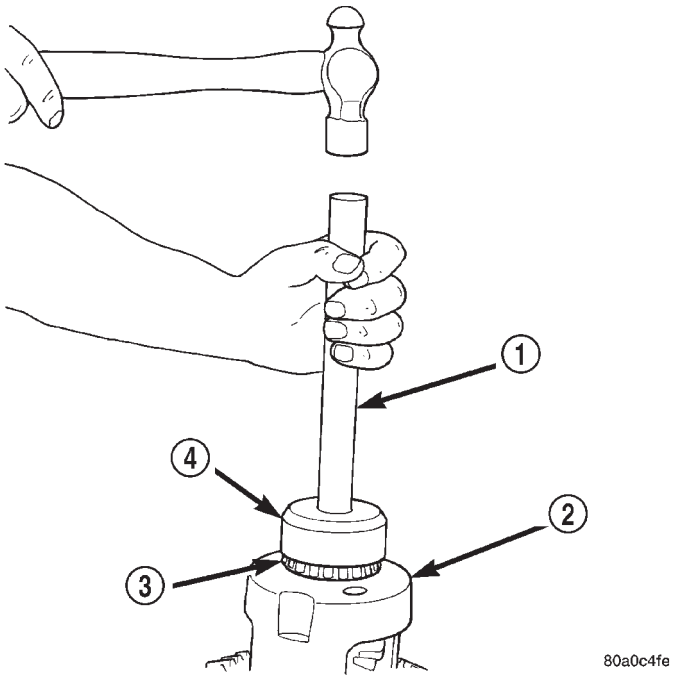


Fig. 70 Install Differential Side Bearings

1 - HANDLE
2 - DIFFERENTIAL
3 - BEARING
4 - INSTALLER

(2) Install differential case into the housing.
(3) Remove support and lower vehicle.

PINION GEAR/RING GEAR

REMOVAL

NOTE: The ring and pinion gears are serviced as a matched set. Never replace one gear without the other matched gear.

(1) Raise and support vehicle.
(2) Mark pinion yoke and propeller shaft for installation reference.
(3) Disconnect propeller shaft from pinion yoke and tie shaft to underbody.
(4) Remove differential from axle housing.
(5) Place differential case in a vise with soft metal jaw.
(6) Remove bolts holding ring gear to differential case.
(7) Drive ring gear from differential case with a rawhide hammer (Fig. 71).

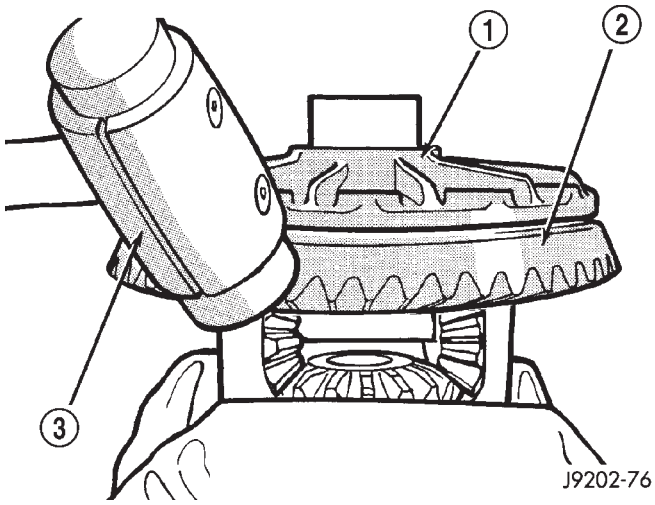


Fig. 71 RING GEAR

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - RAWHIDE HAMMER

(8) Hold the pinion yoke with Spanner Wrench 6958 and remove the pinion yoke nut and washer (Fig. 72).

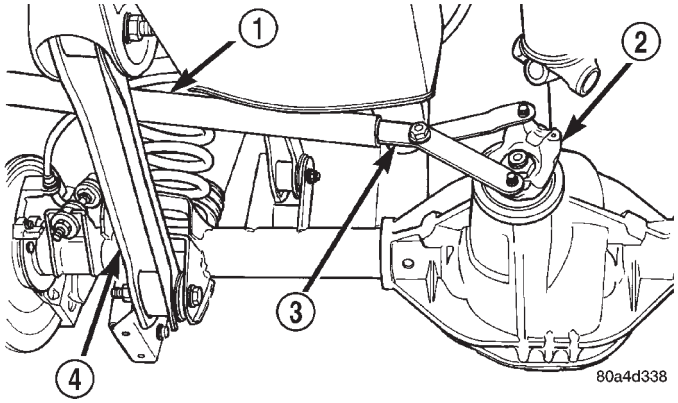


Fig. 72 Pinion Yoke Holder

1 - PIPE
2 - PINION YOKE
3 - SPANNER WRENCH
4 - LOWER CONTROL ARM

PINION GEAR/RING GEAR (Continued)

(9) Remove pinion yoke from pinion shaft with Remover C-452 and Wrench C-3281 (Fig. 73).

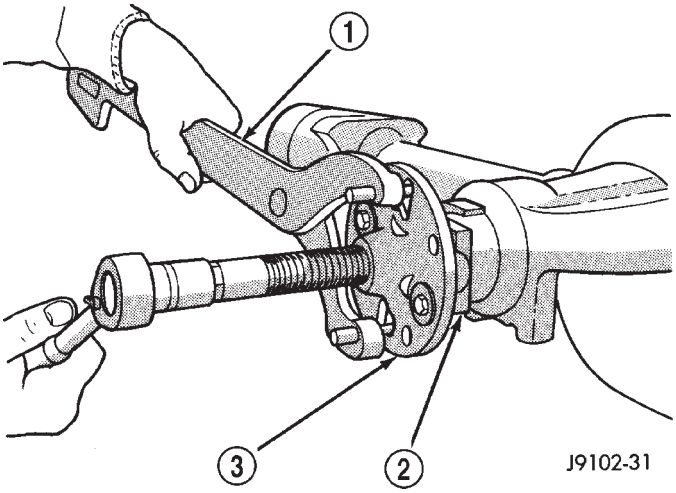


Fig. 73 Pinion Yoke Remover

1 - FLANGE WRENCH
2 - YOKE
3 - YOKE PULLER

(10) Remove pinion gear from housing (Fig. 74).

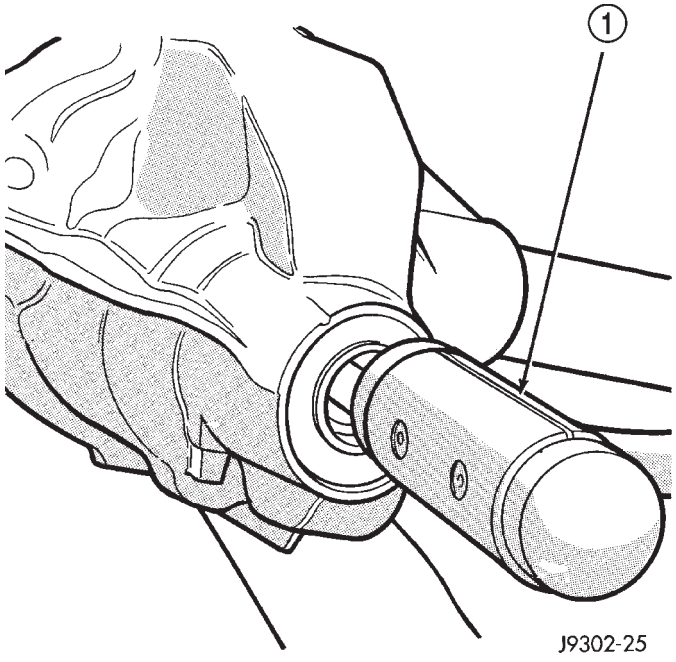


Fig. 74 Pinion Gear

1 - RAWHIDE HAMMER

(11) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 75).

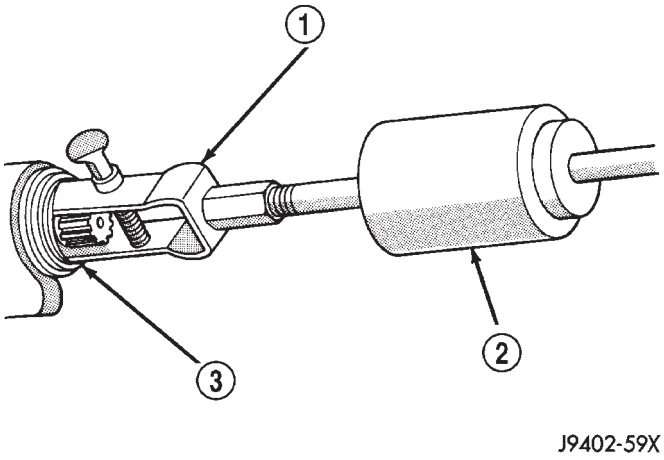


Fig. 75 Pinion Seal Remover

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(12) Remove oil slinger, if equipped, and front pinion bearing.

(13) Remove the front pinion bearing cup with Remover D-103 and Handle C-4171 (Fig. 76).

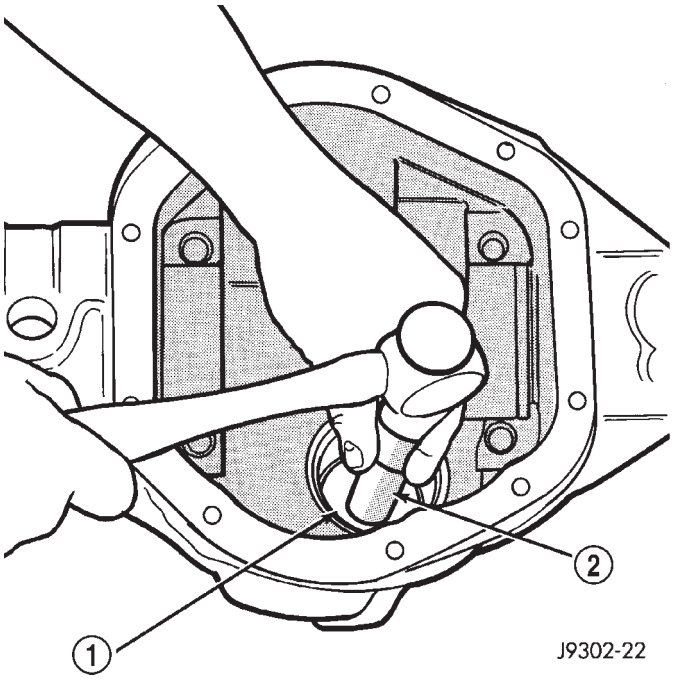


Fig. 76 Front Pinion Bearing Cup

1 - REMOVER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(14) Remove rear bearing cup from housing (Fig. 77) with Remover C-4307 and Handle C-4171.

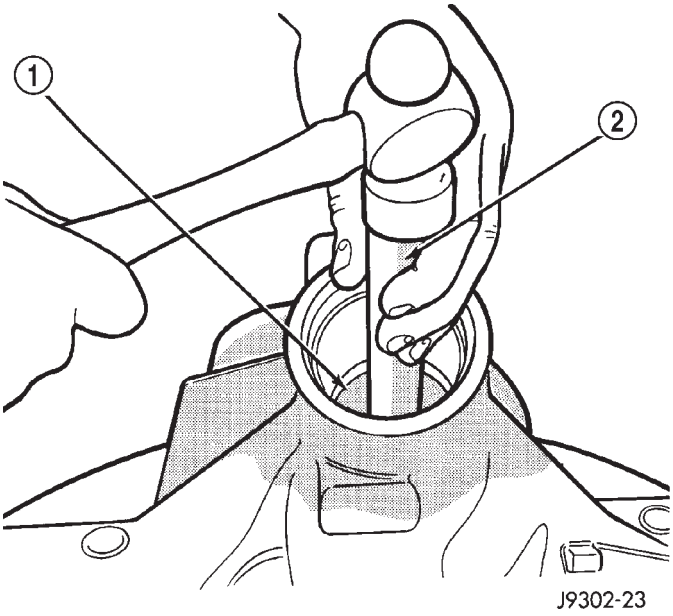


Fig. 77 Rear Pinion Bearing Cup

1 - REMOVER
2 - HANDLE

(15) Remove collapsible preload spacer (Fig. 78).

(16) Remove rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-42 (Fig. 79).

(17) Remove depth shims from the pinion gear shaft and record shim thickness.

INSTALLATION

NOTE: A pinion depth shim/oil slinger is placed between the rear pinion bearing cone and the pinion head to achieve proper ring gear and pinion mesh. If ring gear and pinion are reused, the pinion depth shim/oil slinger should not require replacement. Refer to Adjustment (Pinion Gear Depth) to select the proper thickness shim/oil slinger if ring and pinion gears are replaced.

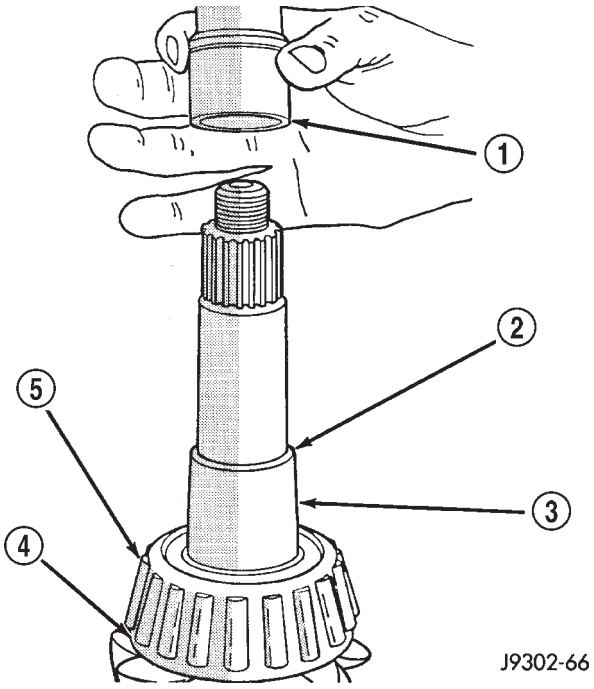


Fig. 78 Collapsible Spacer

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - DEPTH SHIM
5 - REAR BEARING

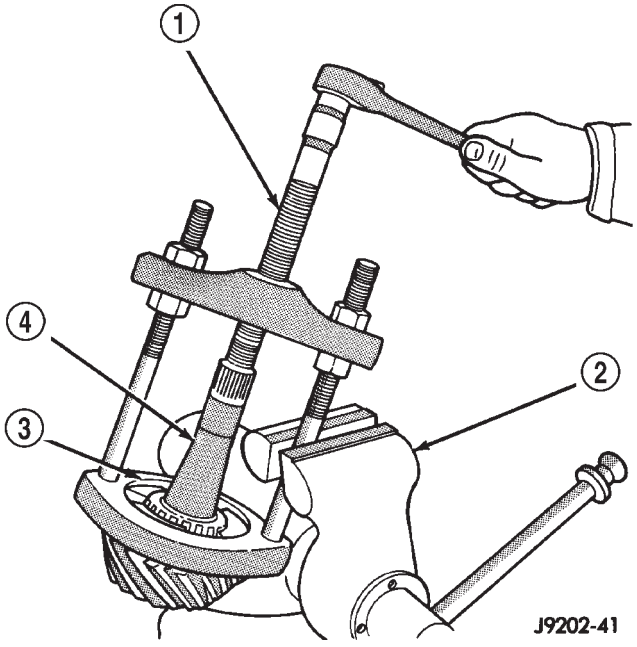


Fig. 79 Rear Pinion Bearing Puller

1 - PULLER
2 - VISE
3 - ADAPTERS
4 - PINION GEAR SHAFT

PINION GEAR/RING GEAR (Continued)

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of pinion bearing cups.

(2) Install pinion rear bearing cup with Installer C-4308 and Driver Handle C-4171 (Fig. 80) and verify cup is seated.

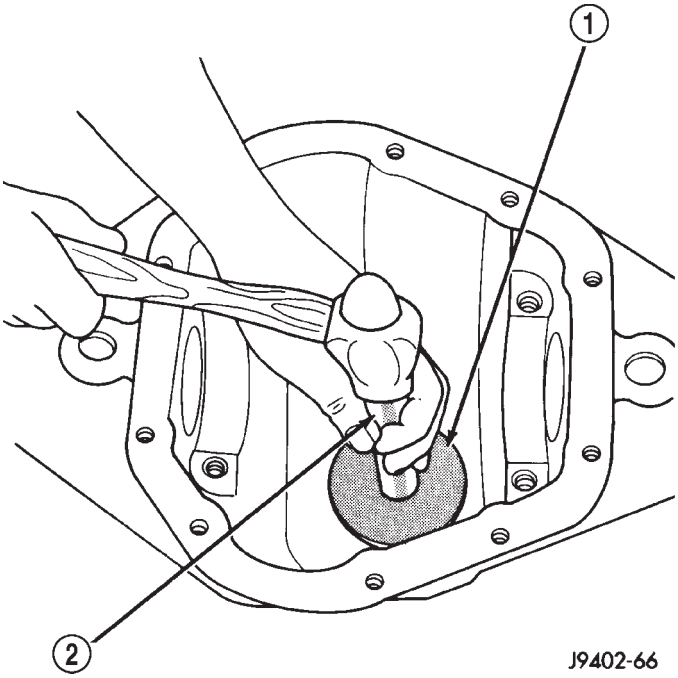


Fig. 80 Rear Pinion Bearing Cup

1 - INSTALLER
2 - HANDLE

(3) Install pinion front bearing cup with Installer D-129 and Handle C-4171 (Fig. 81) and verify cup is seated.

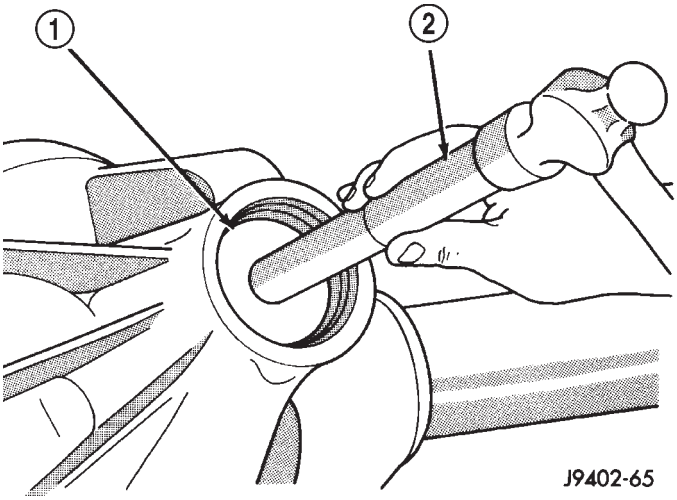


Fig. 81 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

(4) Install pinion front bearing and oil slinger, if equipped.

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate (Fig. 82).

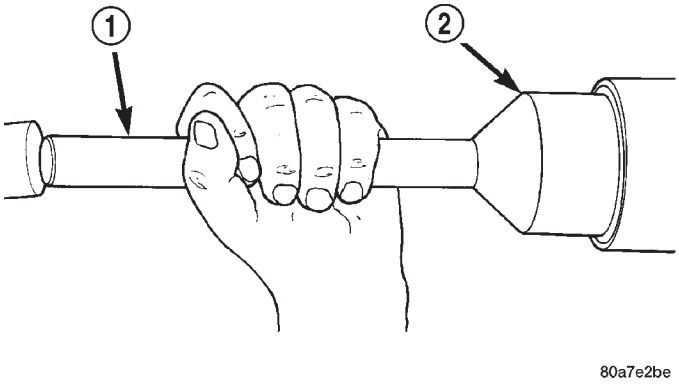


Fig. 82 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(6) Install depth shim on the pinion gear.

(7) Install rear bearing on the pinion gear with Installer 6448 and a press (Fig. 83).

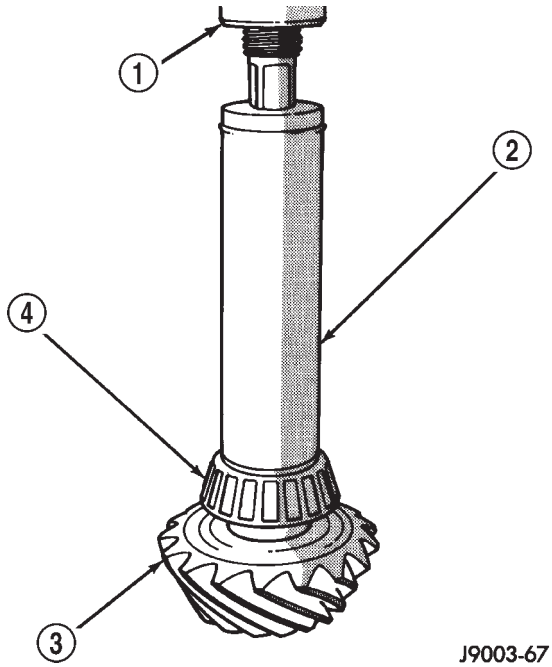


Fig. 83 REAR PINION BEARING

1 - PRESS
2 - INSTALLER
3 - PINION GEAR
4 - PINION BEARING

PINION GEAR/RING GEAR (Continued)

(8) Install a **new** collapsible preload spacer on pinion shaft and install pinion gear in the housing (Fig. 84).

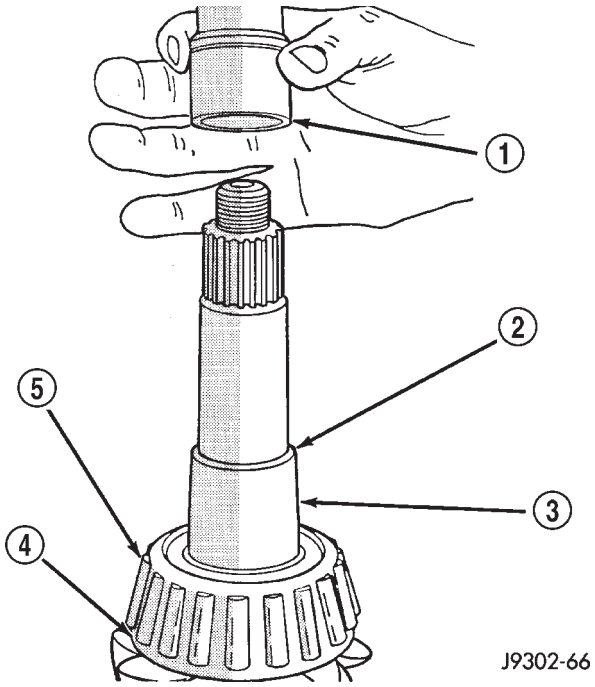


Fig. 84 COLLAPSIBLE SPACER

1 - COLLAPSIBLE SPACER
2 - SHOULDER
3 - PINION GEAR
4 - DEPTH SHIM
5 - REAR BEARING

(9) Install yoke with Installer C-3718 and Spanner Wrench 6958 (Fig. 85).

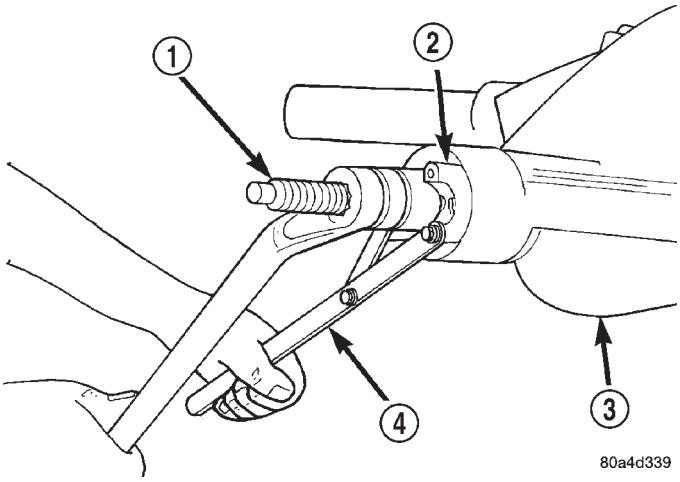


Fig. 85 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - DIFFERENTIAL HOUSING
4 - SPANNER WRENCH

(10) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

(11) Tighten the nut to 298 N·m (220 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(12) Using Spanner Wrench 6958 and a torque wrench set at 380 N·m (280 ft. lbs.), (Fig. 86) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 87).

NOTE: If more than 380 N·m (280 ft. lbs.) torque is required to crush the collapsible spacer, the spacer is defective and must be replaced.

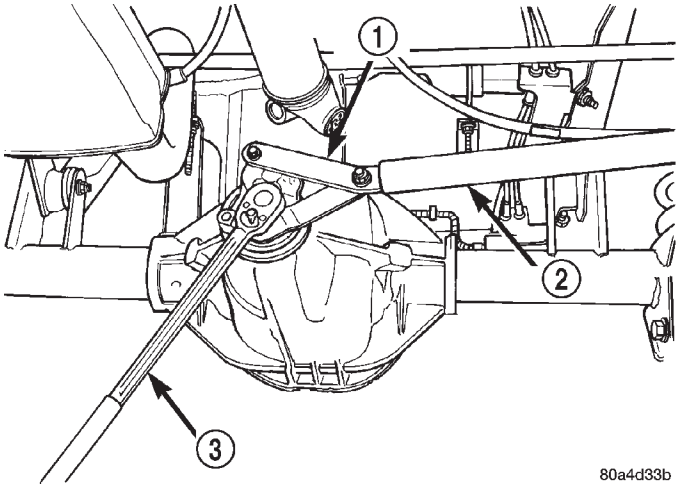


Fig. 86 PINION NUT

1 - SPANNER WRENCH
2 - PIPE
3 - TORQUE WRENCH

PINION GEAR/RING GEAR (Continued)

(13) Check bearing rotating torque with a inch pound torque wrench (Fig. 87). The pinion gear rotating torque should be:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 2.8 to 4 N·m (25 to 35 in. lbs.).

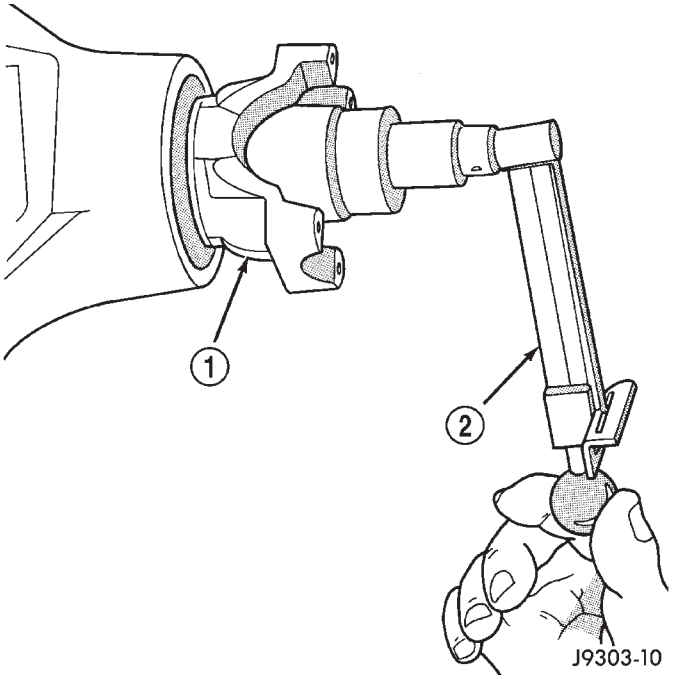


Fig. 87 PINION ROTATING TORQUE

1 - PINION YOKE/COMPANION FLANGE
2 - INCH POUND TORQUE WRENCH

(14) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(15) Invert the differential case in the vise.

(16) Install **new** ring gear bolts and alternately tighten to 129-142 N·m (95-105 ft. lbs.) (Fig. 88).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

NOTE: If equipped with Veri-Lok® differential install oil feed plenum and side bearing.

(17) Install differential in housing.

CAUTION: When installing a Vari-lok® differential (Fig. 89), the oil feed tube must point to the bottom of the housing. If differential is installed with the oil feed tube pointed toward the top, the anti-rotation tabs will be damaged.

(18) Verify differential bearing preload, gear mesh and contact pattern. Refer to Ajustments for procedure.

(19) Install differential cover and fill with gear lubricant.

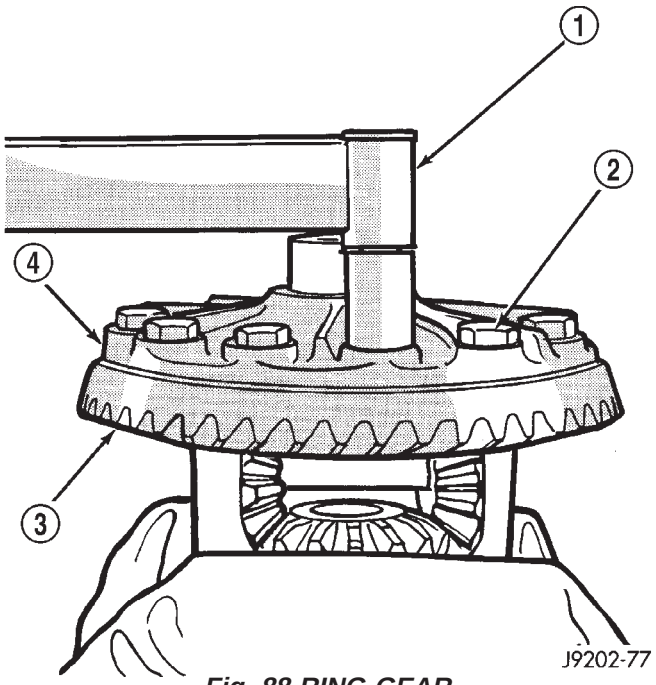


Fig. 88 RING GEAR

1 - TORQUE WRENCH
2 - RING GEAR BOLT
3 - RING GEAR
4 - CASE

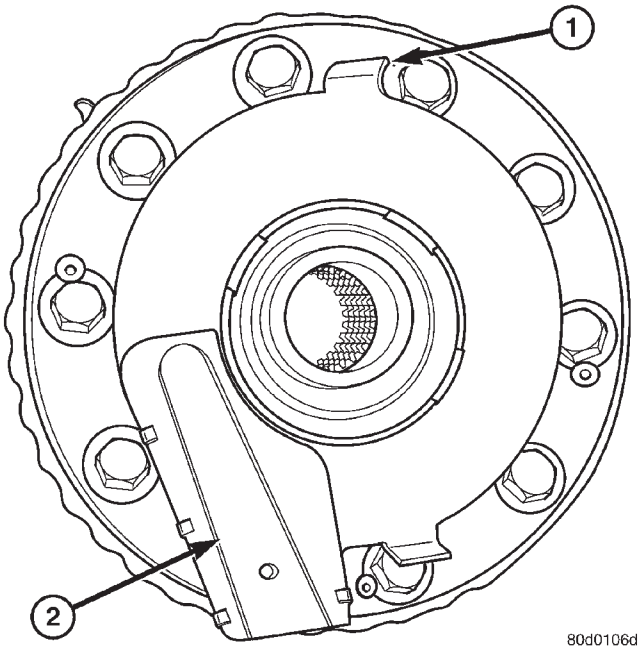


Fig. 89 VARI-LOK

1 - ANTI-ROTATION TAB
2 - OIL FEED TUBE

(20) Install the propeller shaft with the reference marks aligned.

(21) Remove supports and lower vehicle.

BRAKES

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BRAKES - BASE

DESCRIPTION

Dual piston disc brake calipers are used on the front. Single piston disc brake calipers are used on the rear. Ventilated disc brake rotors are used on the front and solid rotors are used on the rear.

Power brake assist is supplied by a vacuum operated, dual diaphragm power brake booster. The master cylinder used for all applications has an aluminum body and nylon reservoir with single filler cap. A fluid level indicator is mounted to the side of the reservoir.

The braking force of the rear wheels is controlled by electronic brake distribution (EBD). The EBD functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

Factory installed brake linings on all models consists of organic base material combined with metallic particles.

DIAGNOSIS AND TESTING - BASE BRAKE SYSTEM

Base brake components consist of the brake shoes, calipers, rear park brake drums/rotors, front brake rotors, brake lines, master cylinder, booster, HCU and parking brake shoes.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, electrical or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

(1) Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.

BRAKES - BASE (Continued)

(2) If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.

(3) Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**

(a) If fluid level is abnormally low, look for evidence of leaks at calipers, brake lines, master cylinder, and HCU.

(b) If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals, cups, hoses, master cylinder, and HCU will also have to be replaced after flushing. Use clean brake fluid to flush the system.

(4) Check parking brake operation. Verify free movement and full release of cables and lever. Also note if vehicle was being operated with parking brake partially applied.

(5) Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.

(6) Check booster vacuum check valve and hose.

(7) If components checked appear OK, road test the vehicle.

ROAD TESTING

(1) If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.

(2) Check brake pedal response with transmission in neutral and engine running. Pedal should remain firm under constant foot pressure.

(3) During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.

(4) Attempt to stop the vehicle with the parking brake only (do not exceed 25 mph) and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brake line, fitting, hose, or caliper. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS system may also be the problem with no visual fluid leak.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up, the most likely causes are worn linings, rotors, or calipers are not sliding on the slide pins. The proper course of action is to inspect and replace all worn component.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However substandard brake hoses can cause a spongy pedal. The proper course of action is to bleed the system, and replace substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster, check valve, check valve seal/grommet or vacuum leak could also cause a hard pedal or high pedal effort.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation. Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake release. Drag can be minor or severe enough to overheat the linings, rotors and park brake drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and park brake drums from the overheat-cool down process. In most cases, the rotors, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

BRAKES - BASE (Continued)

Common causes of brake drag are:
- Parking brake partially applied.
- Loose/worn wheel bearing.
- Seized caliper.
- Caliper binding.
- Loose caliper mounting.
- Mis-assembled components.
- Damaged brake lines.

If brake drag occurs at the front, rear or all wheels, the problem may be related to a blocked master cylinder return port, faulty power booster (binds-does not release) or the ABS system.

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:
- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake shoes
- Damaged rotor
- Wheel alignment.
- Tire pressure.

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE DRAG OR PULL

Rear drag or pull may be caused by improperly adjusted park brake shoes or seized parking brake cables, contaminated lining, bent or binding shoes or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or ABS system could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers or worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

NOTE: Propshaft angle can also cause vibration/ shudder.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. Tire damage such as a severe bruise, cut, ply separation, low air pressure can cause pull and vibration.

BRAKE NOISES

Some brake noise is common on some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake shoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors may become so scored that replacement is necessary.

BRAKES - BASE (Continued)

NOTE: The front outer brake shoes are equipped with a wear indicator. The indicator will produce an audible noise when it contacts the rotor surface.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components.

STANDARD PROCEDURE

STANDARD PROCEDURE - MANUAL BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

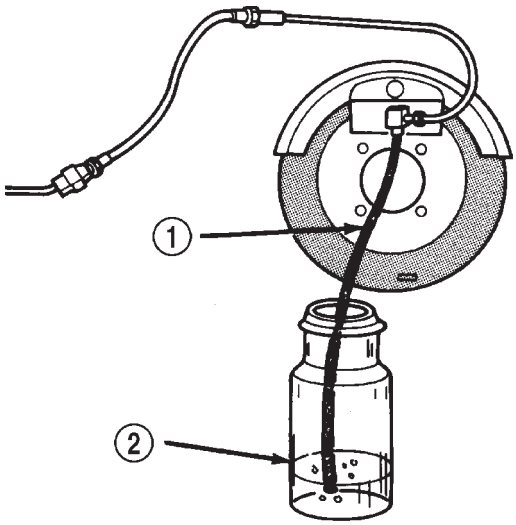
Bleed only one brake component at a time in the following sequence:

(1) Fill the master cylinder reservoir with brake fluid.

(2) If calipers are overhauled, open all caliper bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.

(3) Attach one end of bleed hose to bleed screw and insert opposite end in glass container partially filled with brake fluid (Fig. 1). Be sure end of bleed hose is immersed in fluid.

(4) Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.



J8905-18

Fig. 1 Bleed Hose Setup

1 - BLEED HOSE
2 - FLUID CONTAINER PARTIALLY FILLED WITH FLUID

STANDARD PROCEDURE - PRESSURE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

Bleed only one brake component at a time in the following sequence:

Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 51-67 kPa (15-20 psi) is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system. Use adapter provided with the equipment or Adapter 6921.

BRAKES - BASE (Continued)

SPECIFICATIONS

BRAKE COMPONENTS

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Front Disc Brake Caliper Type	Floating
Front Disc Brake Caliper Piston	48 mm (1.889 in.)
Front Disc Brake Rotor Type	Ventilated
Front Disc Brake Rotor Diameter	305 mm (12 in.)
Front Disc Brake Rotor Max. Runout	0.05 mm (0.002 in.)
Front Disc Brake Rotor Max. Thickness Variation	0.0127 mm (0.0005 in.)
Front Disc Brake Rotor Min. Thickness	24.5 mm (0.9646 in.)
Rear Disc Brake Caliper Type	Floating

DESCRIPTION	SPECIFICATION
Rear Disc Brake Caliper Piston	48 mm (1.889 in.)
Rear Disc Brake Rotor Type Diameter	Solid
Rear Disc Brake Rotor Diameter	305 mm (12 in.)
Rear Disc Brake Rotor Max. Runout	0.76 mm (0.003 in.)
Rear Disc Brake Rotor Max. Thickness Variation	0.0127 mm (0.0005 in.)
Rear Disc Brake Rotor Min. Thickness	8.5 mm (0.335 in.)
Rear Disc Brake Rotor Drum Max. Diameter	196 mm (7.7166 in.)
Brake Booster Type	Dual Diaphragm

TORQUE CHART

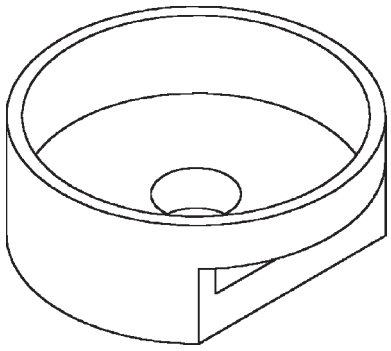
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Pedal Support Bolt	23-24	17-25	—
Brake Pedal Pivot Nut	27-35	20-26	—
Brake Pedal Bracket Adjustable pedals	28	21	250
Brake Pedal Bracket To Dash	12	9	105
Brake Booster Mounting Nuts	39	29	—
Master Cylinder Mounting Nuts	25	18	—
Master Cylinder Primary Brake Line	16	—	144
Master Cylinder Secondary Brake Line	16	—	144
Front Caliper Slide Pins	29-41	21-30	—
Front Caliper Anchor Bolts	90-115	66-85	—
Front Caliper Brake Hose Banjo Bolt	31	23	—
Front Caliper Bleed Screw	16	—	144
Rear Caliper Slide Pins	29-41	21-30	—
Rear Caliper Anchor Bolts	90-115	66-85	—
Rear Caliper Brake Hose Banjo Bolt	31	23	—
Rear Caliper Bleed Screw	16	—	144

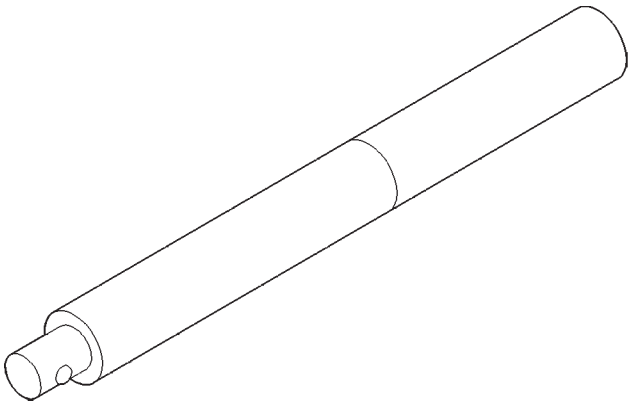
BRAKES - BASE (Continued)

SPECIAL TOOLS

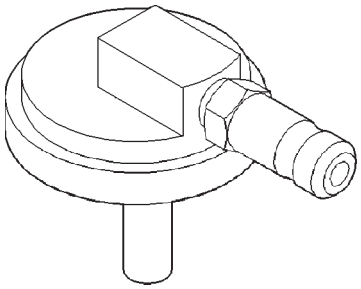
BASE BRAKES



Installer Caliper Dust Boot 8280



Handle C-4171



Adapter Pressure Bleeder 6921

BRAKE FLUID LEVEL SWITCH

REMOVAL

(1) Remove the wire connector from the fluid level sensor.

(2) From the same side of the master cylinder reservoir release the sensor locking taps with a small screw driver.

(3) Pull the sensor out of the reservoir from the connector side of the sensor.

INSTALLATION

(1) Install the sensor with a new o-ring into the reservoir until the locking tabs are engaged.

(2) Install the wire connector to the fluid level sensor.

RED BRAKE WARN INDICATOR SWITCH

DESCRIPTION

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument cluster.

OPERATION

The lamp is turned on momentarily when the ignition switch is turn to the on position. This is a self test to verify the lamp is operational.

The red warning light alerts the driver if the fluid level is low or the parking brakes are applied. A red warning lamp with an amber warning lamp may indicate a electronic brake distribution fault.

DIAGNOSIS AND TESTING - RED BRAKE WARNING LAMP

The red warning lamp illuminates when the parking brake is applied or when the fluid level in the master cylinder is low. It will also illuminate at start up as part of a bulb check.

If the light comes on, first verify that the parking brakes are fully released. Then check pedal action and fluid level. If a problem is confirmed, inspect the brake hydraulic system for leaks.

A red warning lamp with a amber warning lamp may indicate a electronic brake distribution fault.

ADJUSTABLE PEDAL SWITCH

REMOVAL

(1) Remove the steering column opening cover (Fig. 2)(Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - REMOVAL).

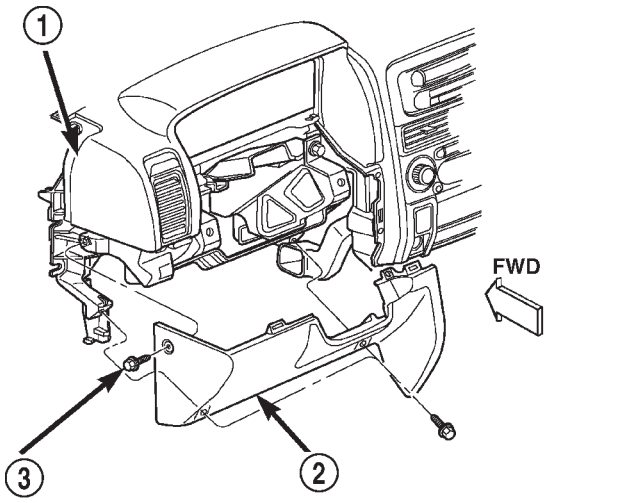


Fig. 2 STEERING COLUMN OPENING COVER REMOVAL/INSTALL

1 - INSTRUMENT PANEL TOP PAD
2 - STEERING COLUMN OPENING COVER
3 - SCREW (3)

(2) Disconnect the electrical connector from the adjustable pedal switch.

(3) Remove the switch from the steering column opening cover by squeezing the retaining clips together and pushing the switch outwards (Fig. 3).

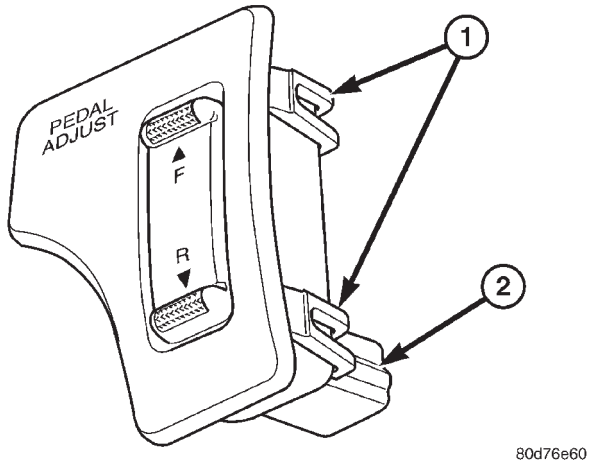


Fig. 3 ADJUSTABLE PEDAL SWITCH

1 - RETAINING CLIPS
2 - ELECTRICAL CONNECTION

INSTALLATION

(1) Install the switch to the steering column opening cover by pushing the switch inwards seating the retaining clips to the steering column opening cover (Fig. 3).

(2) Reconnect the electrical connector to the adjustable pedal switch.

(3) Install the steering column opening cover (Fig. 2)(Refer to 23 - BODY/INSTRUMENT PANEL/ STEERING COLUMN OPENING COVER - INSTALLATION).

BRAKE LINES

DESCRIPTION

Flexible rubber hose is used at both front brakes, rear brakes and at the rear axle junction block. Double walled steel tubing is used. Double inverted style and ISO style flares are used on the brake lines.

DIAGNOSIS AND TESTING - BRAKE HOSES AND LINES

Flexible rubber hose is used at both front and rear brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, at every engine oil change, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. All of these conditions can lead to scuffing, cracking and eventual failure.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper gaskets at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

BRAKE LINES (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - DOUBLE INVERTED FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

Special bending tools are needed to avoid kinking or twisting of metal brake tubes. Special flaring tools are needed to make a double inverted flare or ISO flare.

(1) Cut off damaged tube with Tubing Cutter.
(2) Ream cut edges of tubing to ensure proper flare.
(3) Install replacement tube nut on the tube.
(4) Insert tube in flaring tool.
(5) Place gauge form over the end of the tube.
(6) Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.
(7) Tighten the tool bar on the tube
(8) Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc (Fig. 4).
(9) Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.
(10) Remove the plug gauge and complete the inverted flare.

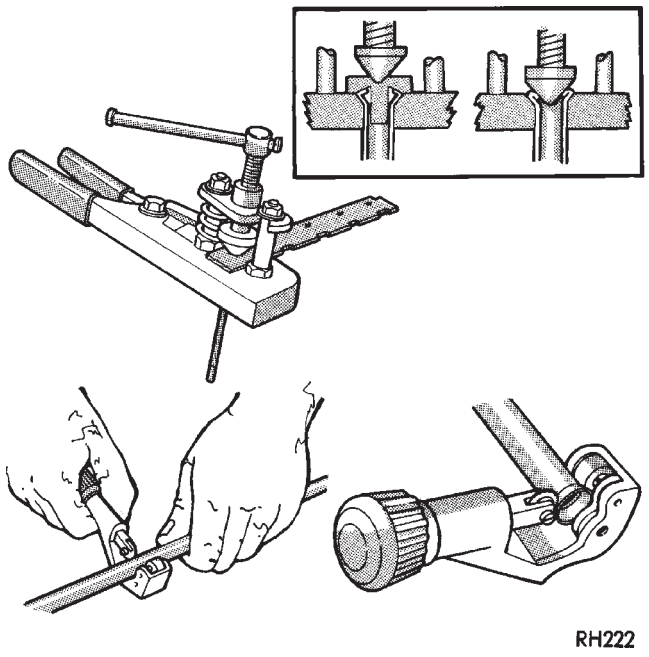


Fig. 4 Inverted

STANDARD PROCEDURE - ISO FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

Special bending tools are needed to avoid kinking or twisting of metal brake tubes. Special flaring tools are needed to make a double inverted flare or ISO flare.

To make a ISO flare use Snap-On® Flaring Tool TFM-428 or equivalent.

(1) Cut off damaged tube with Tubing Cutter.
(2) Remove any burrs from the inside of the tube.
(3) Install tube nut on the tube.
(4) Position the tube in the flaring tool flush with the top of the tool bar (Fig. 5). Then tighten the tool bar on the tube.
(5) Install the correct size adaptor on the flaring tool yoke screw.
(6) Lubricate the adaptor.
(7) Align the adaptor and yoke screw over the tube (Fig. 5).
(8) Turn the yoke screw in until the adaptor is squarely seated on the tool bar.

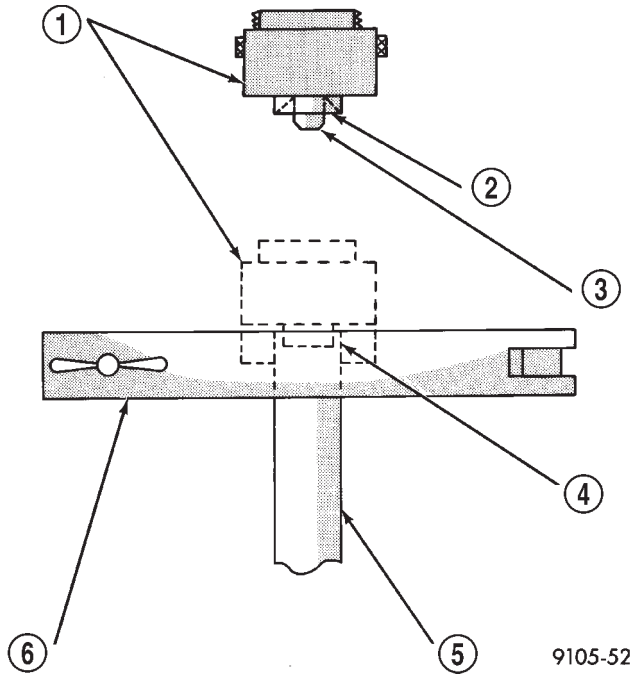


Fig. 5 ISO Flaring

1 - ADAPTER
2 - LUBRICATE HERE
3 - PILOT
4 - FLUSH WITH BAR
5 - TUBING
6 - BAR ASSEMBLY

BRAKE PADS / SHOES

DESCRIPTION

DESCRIPTION - FRONT DISC BRAKE SHOES

The calipers are twin piston type. The calipers are free to slide laterally on the anchor, this allows continuous compensation for lining wear.

DESCRIPTION - REAR DISC BRAKE SHOES

The rear disc brakes consist of single piston floating-type calipers and solid rotors. The rear caliper is mounted on an anchor attached to an adapter attached the rear axle tube flange. The anchors are secured to the adapters with mounting bolts. The disc brake rotor splash shield is part of the adaptor. The disc brake rotor has a built in brake drum used for the parking brakes (Fig. 6). The parking brake shoes are mounted to the adaptor.

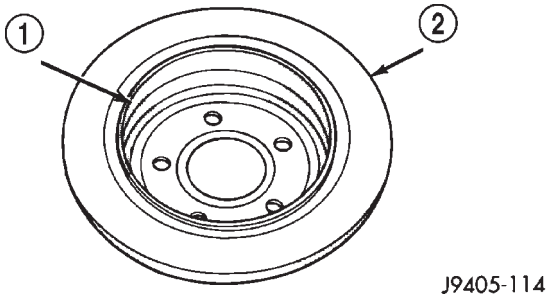


Fig. 6 Rear Disc Brake Rotor

1 - PARKING BRAKE DRUM SURFACE
2 - REAR DISC BRAKE ROTOR

OPERATION

OPERATION - FRONT DISC BRAKE SHOES

When the brakes are applied fluid pressure is exerted against the caliper pistons. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper pistons and within the caliper bores will be equal (Fig. 7).

Fluid pressure applied to the pistons is transmitted directly to the inboard brake shoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bores forces the caliper to slide inward on the slide pins. This action brings the outboard brake shoe lining into contact with the outer surface of the disc brake rotor.

Fluid pressure acting simultaneously on the pistons and caliper to produces a strong clamping action. When sufficient force is applied, friction will stop the rotors from turning and bring the vehicle to a stop.

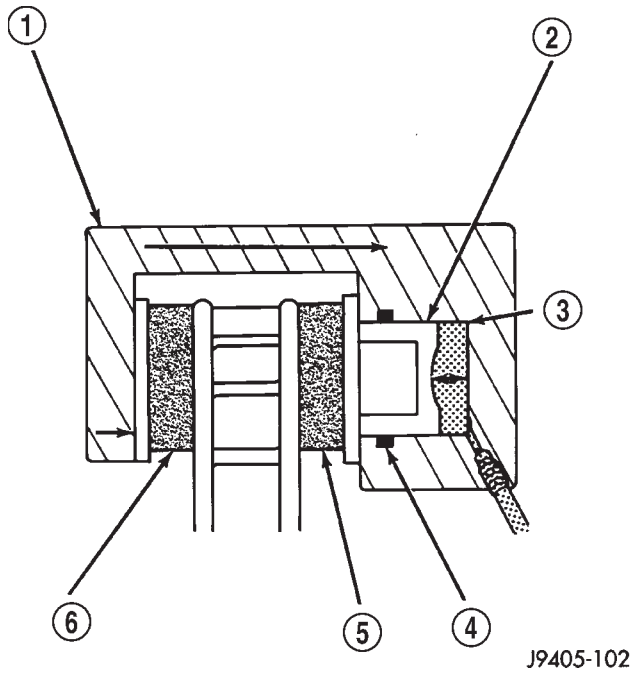


Fig. 7 Brake Caliper Operation

1 - CALIPER
2 - PISTON
3 - PISTON BORE
4 - SEAL
5 - INBOARD SHOE
6 - OUTBOARD SHOE

Application and release of the brake pedal generates only a very slight movement of the caliper and pistons. Upon release of the pedal, the caliper and pistons return to a rest position. The brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seals control the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seals are deflected outward by fluid pressure and piston movement (Fig. 8). When the brakes (and fluid pressure) are released, the seals relax and retract the pistons.

The front outboard brake shoes have wear indicators.

OPERATION - REAR DISC BRAKE SHOES

When the brakes are applied fluid pressure is exerted against the caliper pistons. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper pistons and within the caliper bores will be equal (Fig. 7).

Fluid pressure applied to the pistons is transmitted directly to the inboard brake shoe. This forces the

BRAKE PADS / SHOES (Continued)

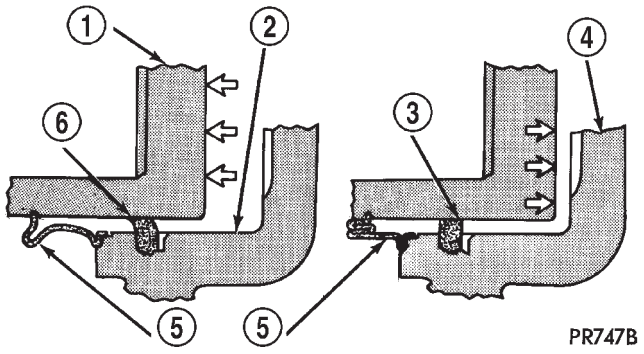


Fig. 8 Lining Wear Compensation By Piston Seal

1 - PISTON
2 - CYLINDER BORE
3 - PISTON SEAL BRAKE PRESSURE OFF
4 - CALIPER HOUSING
5 - DUST BOOT
6 - PISTON SEAL BRAKE PRESSURE ON

shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bores forces the caliper to slide inward on the slide pins. This action brings the outboard brake shoe lining into contact with the outer surface of the disc brake rotor.

Fluid pressure acting simultaneously on the pistons and caliper to produces a strong clamping action. When sufficient force is applied, friction will stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and pistons. Upon release of the pedal, the caliper and pistons return to a rest position. The brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seals control the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seals are deflected outward by fluid pressure and piston movement (Fig. 8). When the brakes (and fluid pressure) are released, the seals relax and retract the pistons.

The front outboard brake shoes have wear indicators.

REMOVAL

REMOVAL- FRONT DISC BRAKE SHOES

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Drain small amount of fluid from master cylinder brake reservoir with **clean** suction gun.
(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 9).

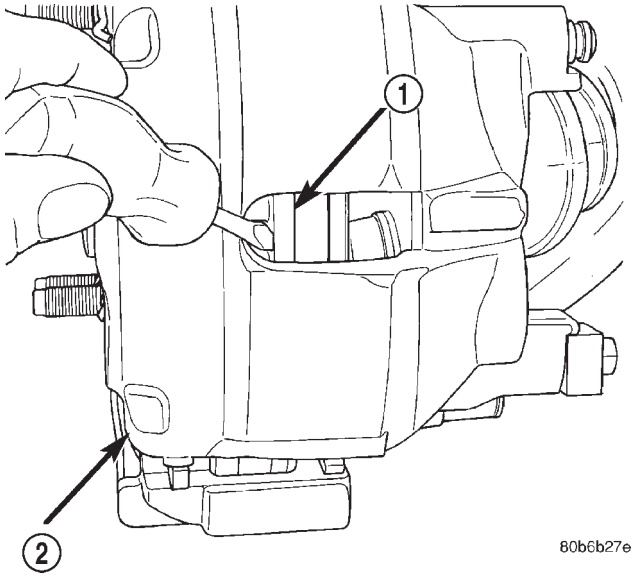


Fig. 9 Bottoming Caliper Piston

1 - ROTOR
2 - CALIPER

(5) Remove the caliper support spring by prying the spring out of the caliper (Fig. 10).

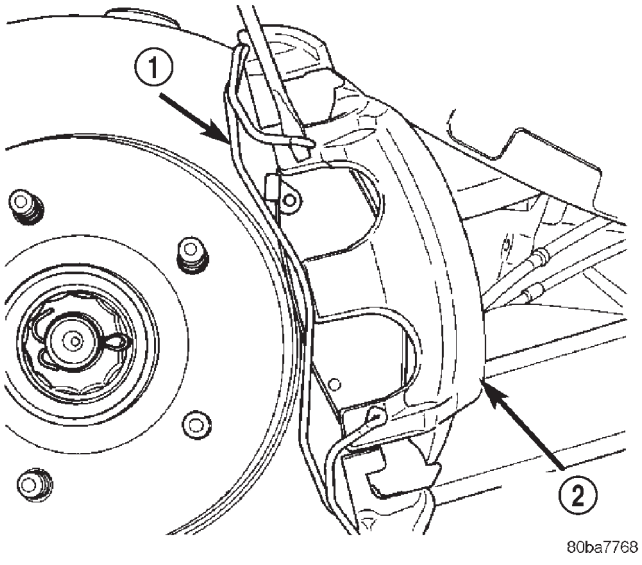


Fig. 10 Caliper Support Spring

1 - SUPPORT SPRING
2 - CALIPER

(6) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 11).
(7) Remove caliper from the anchor.

BRAKE PADS / SHOES (Continued)

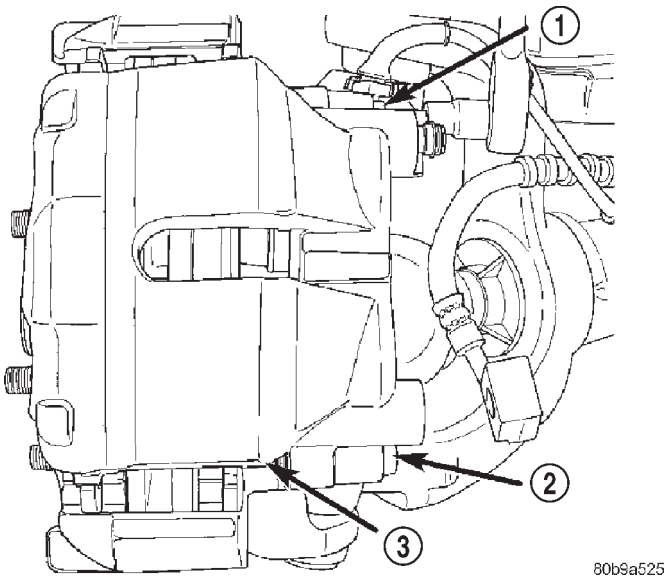


Fig. 11 Caliper Slide

1 - SLIDE PIN
2 - SLIDE PIN
3 - CALIPER

(8) Secure caliper to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**

(9) Remove the inboard brake shoe from the caliper (Fig. 12).

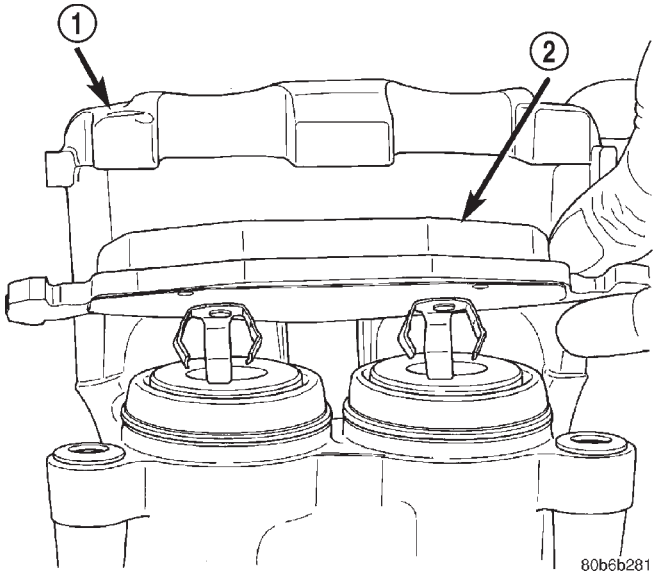


Fig. 12 Inboard Brake Shoe

1 - CALIPER
2 - INBOARD SHOE

(10) Remove the outboard brake shoe (Fig. 13) from the caliper anchor.

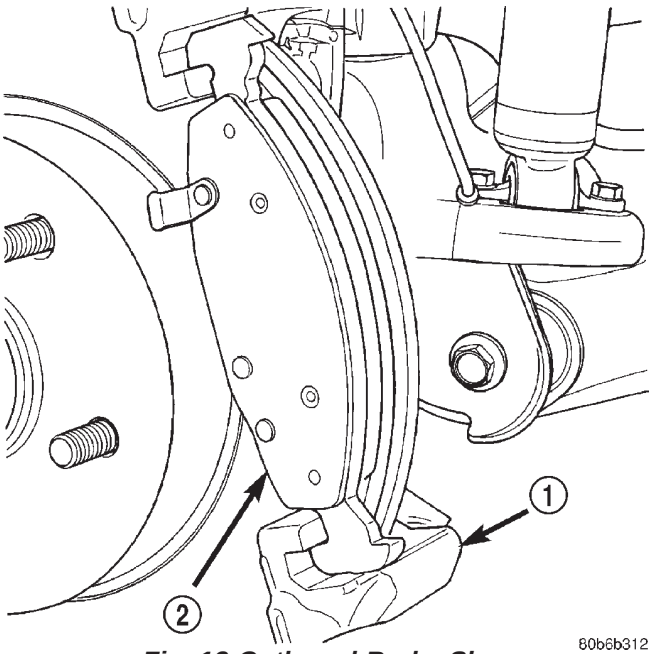


Fig. 13 Outboard Brake Shoe

1 - CALIPER ANCHOR
2 - OUTBOARD BRAKE SHOE

REMOVAL - REAR DISC BRAKE SHOES

(1) Raise and support vehicle.

(2) Remove rear wheel and tire assembly.

(3) Drain small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.

(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 14).

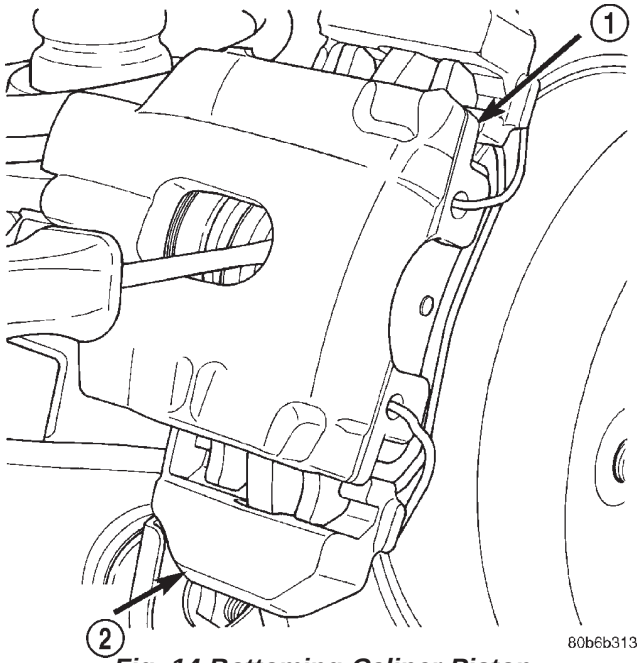


Fig. 14 Bottoming Caliper Piston

1 - CALIPER
2 - CALIPER ANCHOR

BRAKE PADS / SHOES (Continued)

(5) Remove the caliper support spring by prying the spring out of the caliper (Fig. 15).

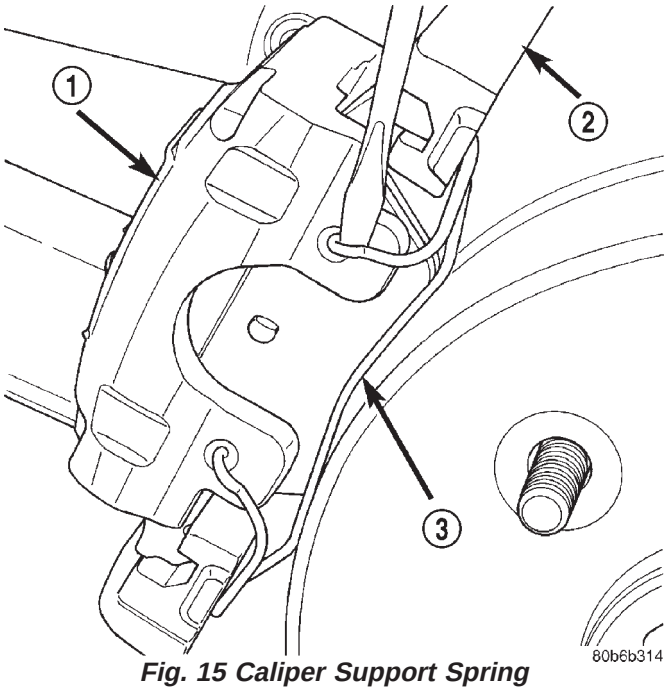


Fig. 15 Caliper Support Spring

1 - CALIPER
2 - ANCHOR
3 - SUPPORT SPRING

(6) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 16).

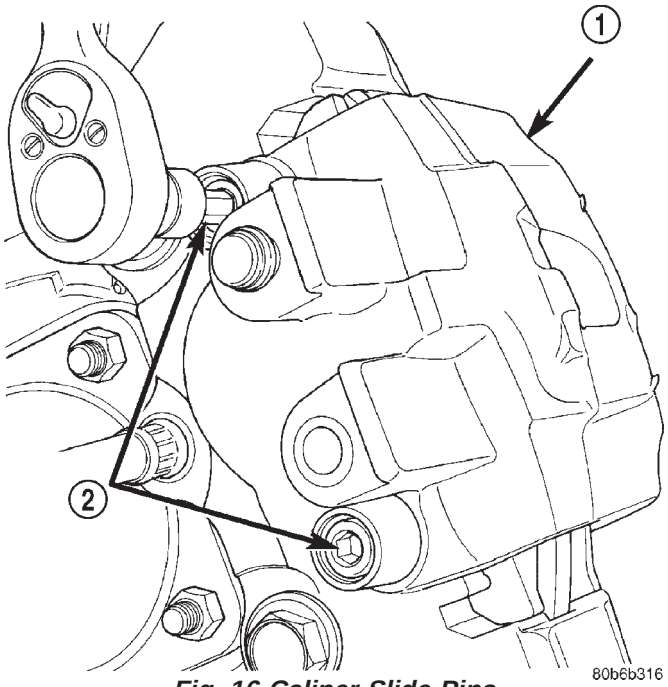


Fig. 16 Caliper Slide Pins

1 - CALIPER
2 - SLIDE PINS

(7) Remove caliper from the anchor.

(8) Secure caliper to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**

(9) Remove the inboard brake shoe from the caliper (Fig. 17).

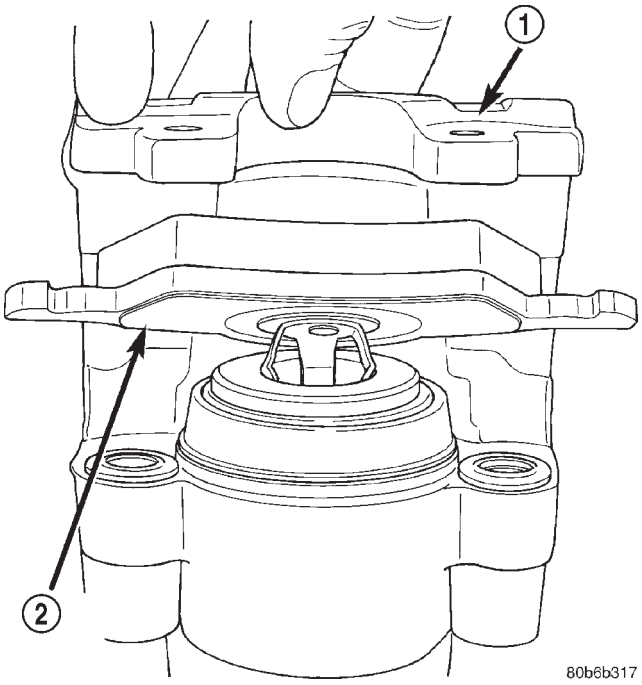


Fig. 17 Inboard Brake Shoe

1 - CALIPER
2 - INBOARD SHOE

(10) Remove outboard brake shoe (Fig. 18) from the caliper anchor.

INSTALLATION

INSTALLATION - FRONT DISC BRAKE SHOES

(1) Install the inboard brake shoe onto the caliper (Fig. 12).

(2) Install the outboard shoe onto the caliper anchor (Fig. 13).

(3) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the brake shoes.

(4) Install caliper on the caliper anchor.

(5) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(6) Install the caliper slide pin bushing caps.

(7) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

BRAKE PADS / SHOES (Continued)

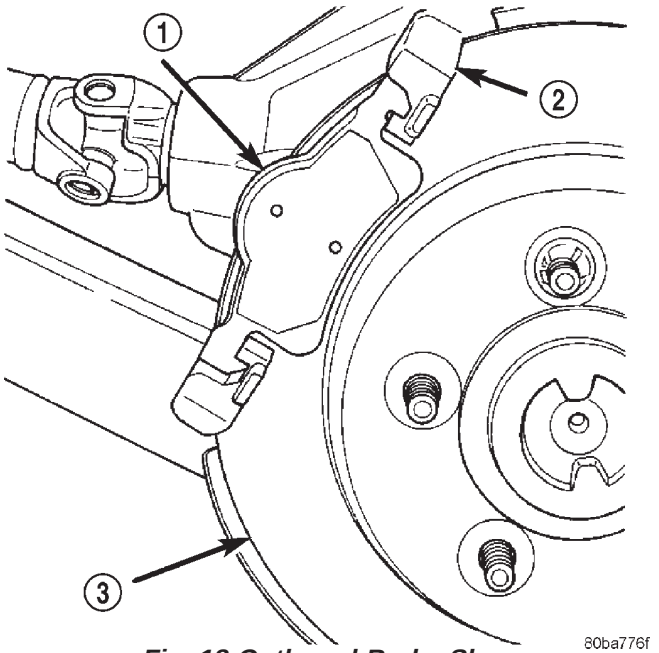


Fig. 18 Outboard Brake Shoe

1 - OUTBOARD BRAKE SHOE
2 - CALIPER ANCHOR
3 - ROTOR

(8) Install wheel and tire assembly.
(9) Remove support and lower vehicle.
(10) Pump brake pedal until caliper pistons and brake shoes are seated and a firm brake pedal is obtained.
(11) Fill brake fluid.

INSTALLATION - REAR DISC BRAKE SHOES

(1) Install the inboard brake shoe onto the caliper (Fig. 17).
(2) Install the outboard brake shoe onto the caliper anchor (Fig. 18).
(3) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the brake shoes.
(4) Install caliper on the anchor.
(5) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).
(6) Install the caliper slide pin bushing caps.
(7) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.
(8) Install wheel and tire assembly.
(9) Remove support and lower vehicle.
(10) Pump brake pedal until caliper piston and brake shoes are seated and a firm brake pedal is obtained.
(11) Fill brake fluid level if necessary.

DISC BRAKE CALIPERS

REMOVAL

REMOVAL - FRONT DISC BRAKE CALIPER

(1) Raise and support vehicle.
(2) Remove front wheel and tire assembly.
(3) Drain small amount of fluid from master cylinder brake reservoir with **clean** suction gun.
(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 19).

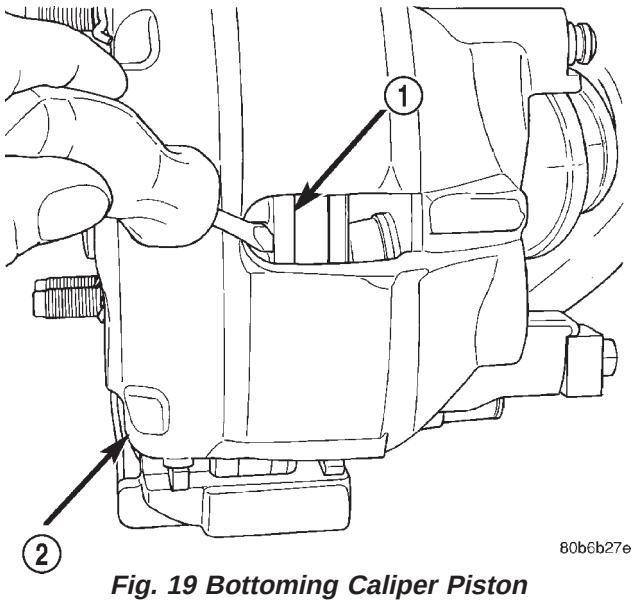


Fig. 19 Bottoming Caliper Piston

1 - ROTOR
2 - CALIPER

DISC BRAKE CALIPERS (Continued)

(5) Remove brake hose banjo bolt and gasket washers. Discard gasket washers.

(6) Remove the caliper support spring by prying the spring out of the caliper (Fig. 20).

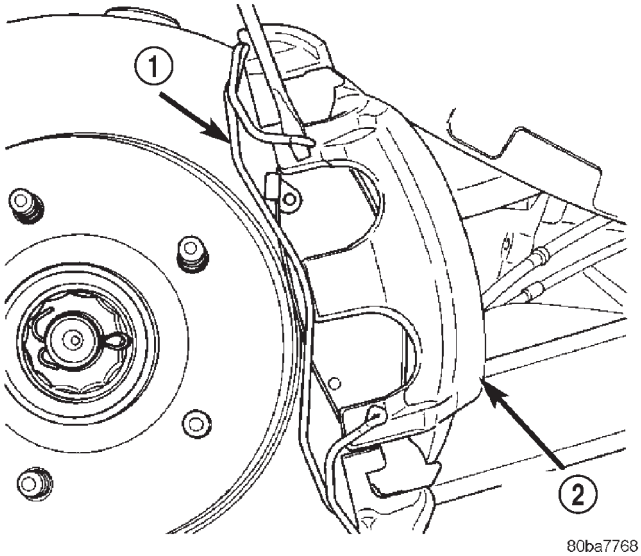


Fig. 20 Caliper Support Spring

1 - SUPPORT SPRING
2 - CALIPER

(7) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 21).

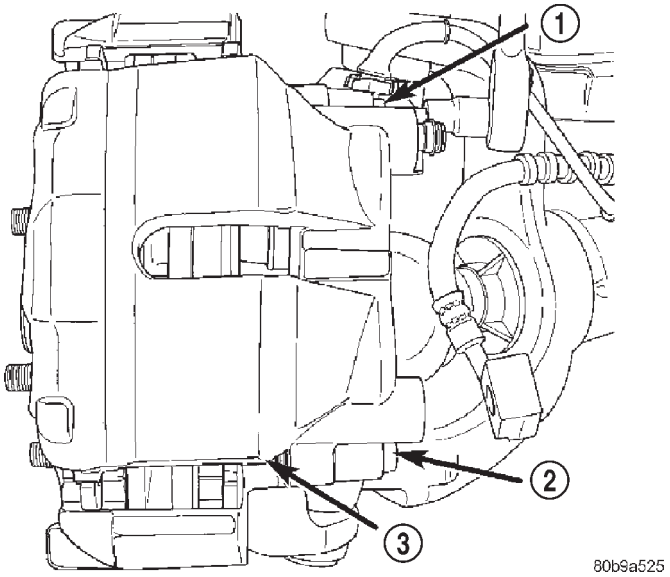


Fig. 21 Slide Pins

1 - SLIDE PIN
2 - SLIDE PIN
3 - CALIPER

(8) Remove caliper from the anchor.

(9) Remove the inboard brake shoe (Fig. 22).

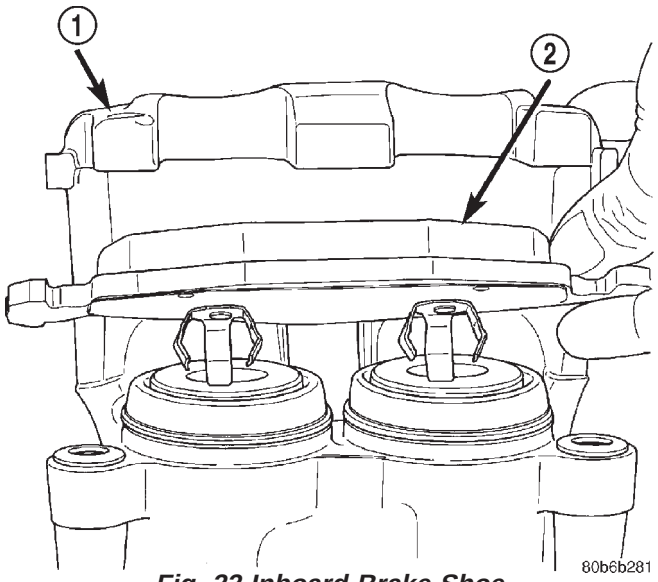


Fig. 22 Inboard Brake Shoe

1 - CALIPER
2 - INBOARD SHOE

REMOVAL - REAR DISC BRAKE CALIPER

(1) Raise and support vehicle.

(2) Remove rear wheel and tire assembly.

(3) Drain small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.

(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 23).

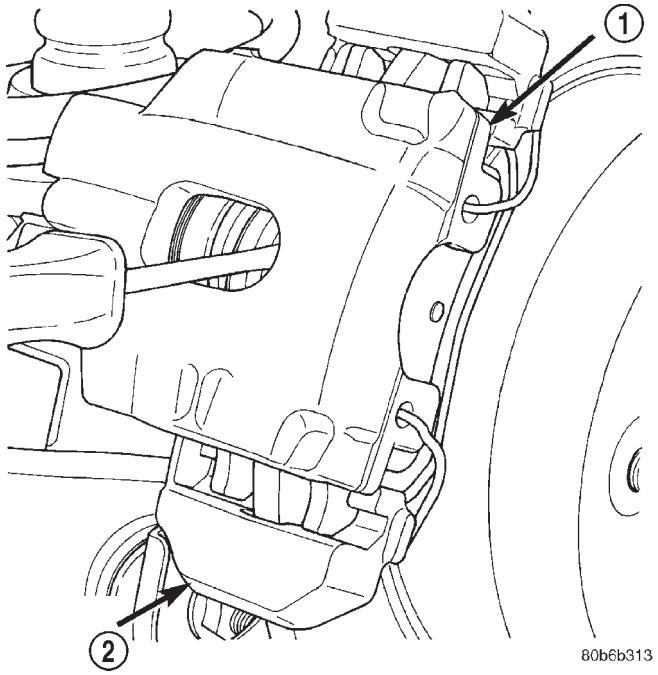


Fig. 23 Bottoming Caliper Piston

1 - CALIPER
2 - CALIPER ANCHOR

DISC BRAKE CALIPERS (Continued)

(5) Remove brake hose banjo bolt and discard gasket washers.

(6) Remove the caliper support spring by prying the spring out of the caliper (Fig. 24).

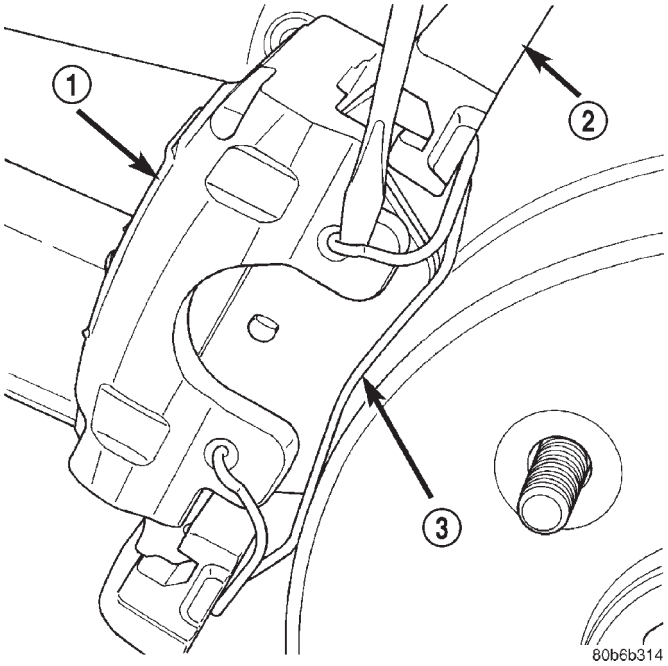


Fig. 24 Caliper Support Spring

1 - CALIPER
2 - ANCHOR
3 - SUPPORT SPRING

(7) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 25).

(8) Remove caliper from the anchor.

(9) Remove the inboard brake shoe (Fig. 26).

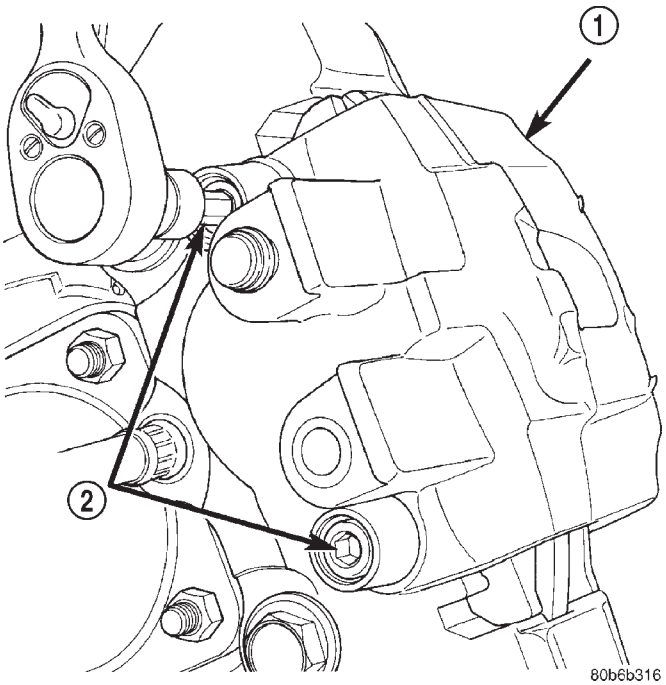


Fig. 25 Caliper Slide Pins

1 - CALIPER
2 - SLIDE PINS

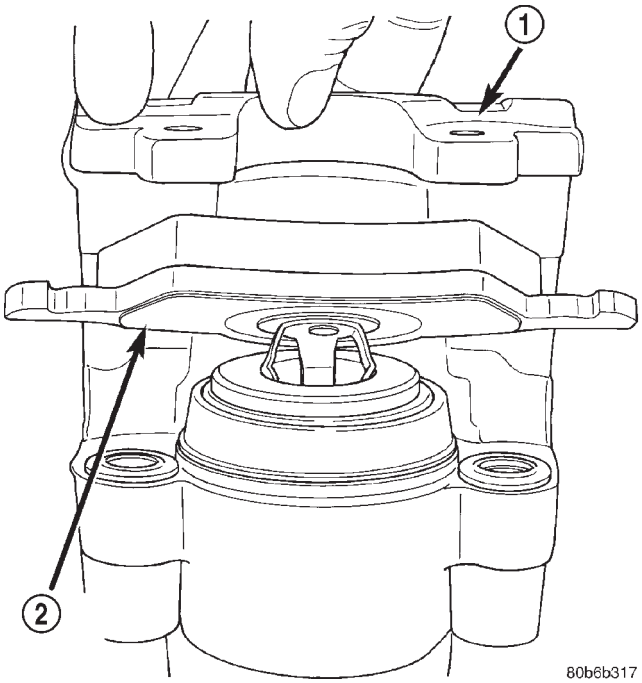


Fig. 26 Inboard Brake Shoe

1 - CALIPER
2 - INBOARD SHOE

DISC BRAKE CALIPERS (Continued)

DISASSEMBLY

DISASSEMBLY - FRONT DISC BRAKE CALIPER

(1) Drain the brake fluid from caliper.

(2) C-clamp a block of wood over one piston (Fig. 27).

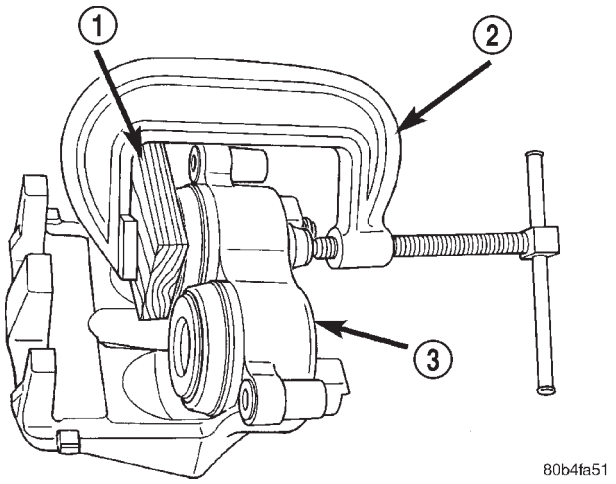


Fig. 27 C-Clamp One Piston

1 - BLOCK OF WOOD
2 - C-CLAMP
3 - CALIPER

(3) Take another piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the other piston. This will cushion and protect caliper piston during removal (Fig. 28).

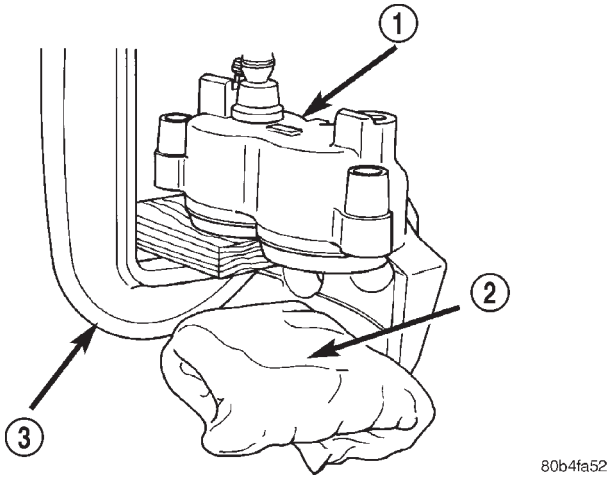


Fig. 28 Protect Caliper Piston

1 - CALIPER
2 - PADDED BLOCK OF WOOD
3 - C-CLAMP

(4) To remove the caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port. Use only enough air pressure to ease the piston out.

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS COULD RESULT IN PERSONAL INJURY.

(5) Remove the C-clamp and block of wood from the caliper and clamp it over the dust boot of the first piston removed. This will seal the empty piston bore.

(6) Move the padded piece of wood in front of the other piston.

(7) Remove the second piston using the same procedure with **short bursts of low pressure air**.

(8) Remove piston dust boots with a suitable pry tool (Fig. 29)and discard.

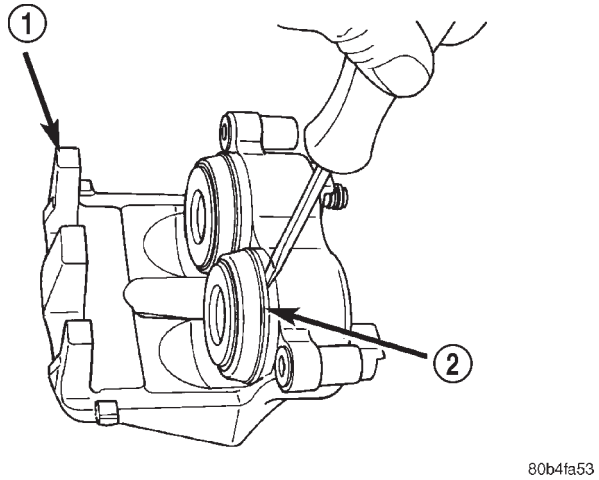


Fig. 29 Piston Dust Boot Removal

1 - CALIPER
2 - PISTON DUST BOOT

DISC BRAKE CALIPERS (Continued)

(9) Remove piston seals from caliper (Fig. 30) and discard.

CAUTION: Do not scratch piston bore while removing the seals.

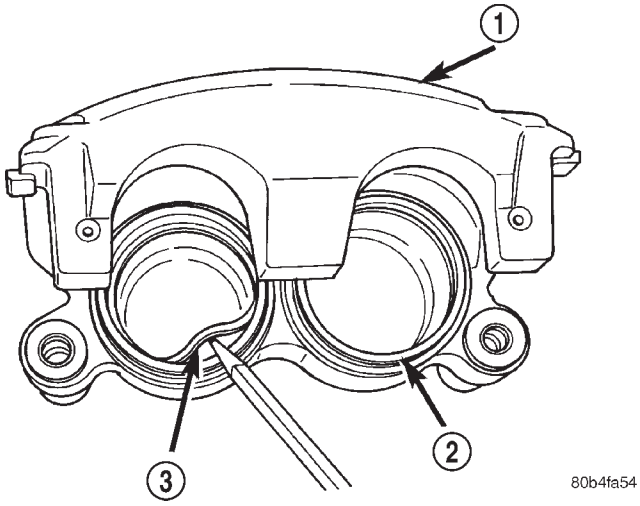


Fig. 30 Piston Seal

1 - CALIPER
2 - PISTON BORE
3 - PISTON SEAL

(10) Remove caliper slide pin bushings (Fig. 31).

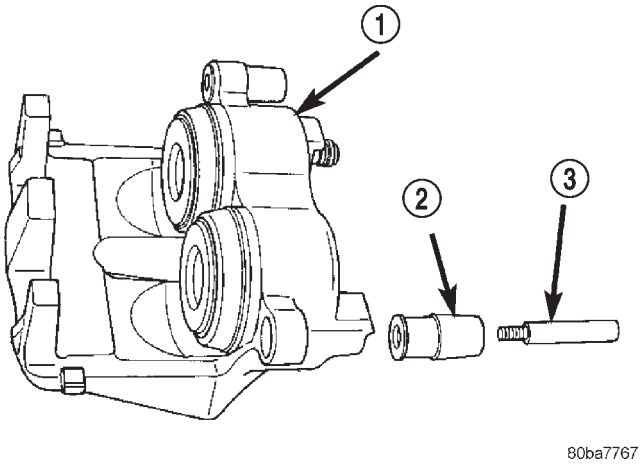


Fig. 31 Caliper Slide Pin Bushings

1 - CALIPER
2 - BUSHING
3 - CALIPER SLIDE PIN

(11) Remove caliper bleed screw.

DISASSEMBLY - REAR DISC BRAKE CALIPER

(1) Drain brake fluid out of caliper.

(2) Take a piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the piston. This will cushion and protect caliper piston during removal (Fig. 32).

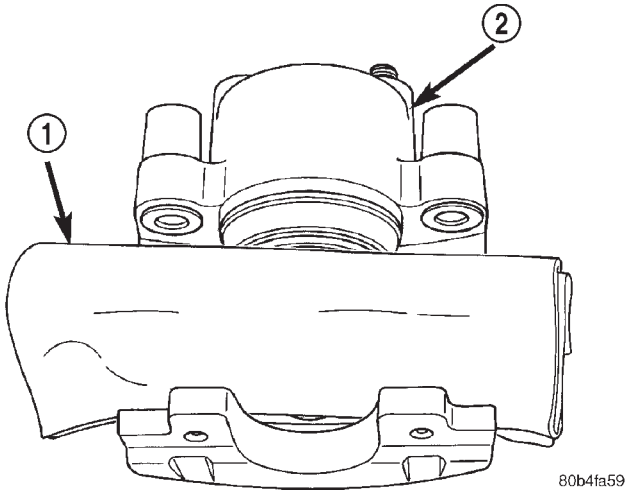


Fig. 32 Padding Caliper Interior

1 - SHOP TOWELS OR CLOTHS
2 - CALIPER

(3) To remove caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port (Fig. 33). Use only enough air pressure to ease the piston out.

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS MAY RESULT IN PERSONAL INJURY.

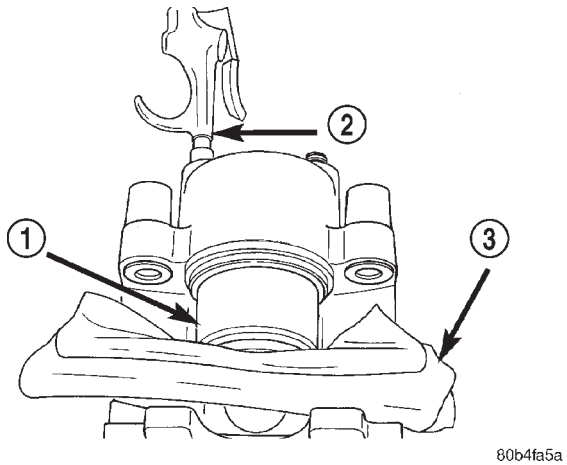


Fig. 33 Caliper Piston Removal

1 - CALIPER PISTON
2 - AIR GUN
3 - PADDING MATERIAL

DISC BRAKE CALIPERS (Continued)

(4) Remove caliper piston dust boot with a suitable pry tool (Fig. 34) and discard.

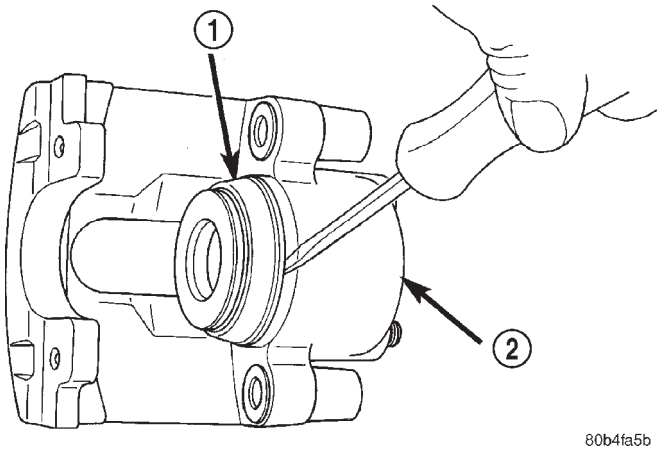


Fig. 34 Caliper Piston Dust

1 - PISTON DUST BOOT
2 - CALIPER

(5) Remove piston seal from the caliper (Fig. 35)and discard.

CAUTION: Do not scratch the piston bore while removing the seal.

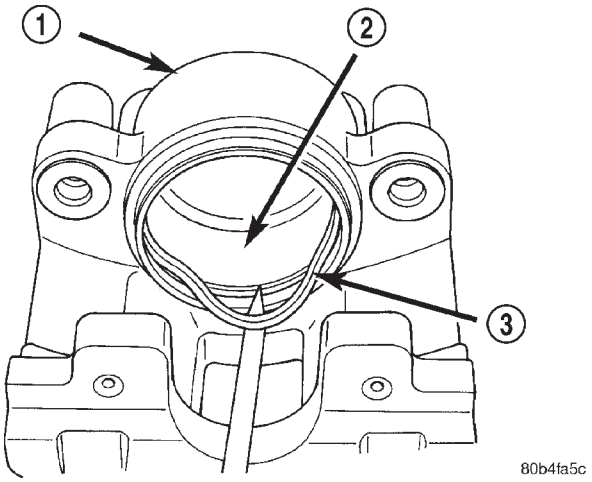


Fig. 35 Piston Seal Removal

1 - CALIPER
2 - PISTON BORE
3 - PISTON SEAL

(6) Remove caliper slide pin bushings (Fig. 36).
(7) Remove caliper bleed screw.

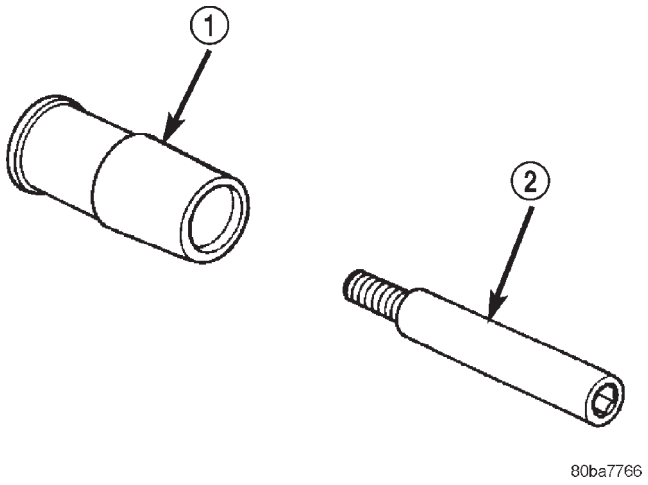


Fig. 36 Slide Pin And Bushing

1 - BUSHING
2 - CALIPER SLIDE PIN

CLEANING - DISC BRAKE CALIPER

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

CAUTION: Do not use gasoline, kerosene, paint thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

INSPECTION - DISC BRAKE CALIPER

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone to remove very minor surface imperfections (Fig. 37). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

DISC BRAKE CALIPERS (Continued)

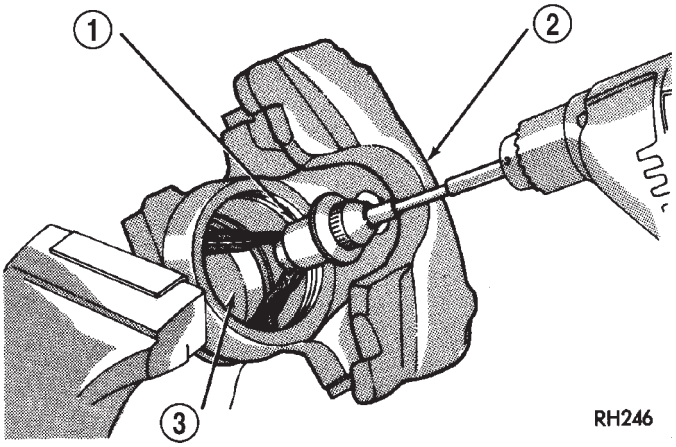


Fig. 37 Polishing Piston Bore

1 - SPECIAL HONE
2 - CALIPER
3 - PISTON BORE

ASSEMBLY

ASSEMBLY - FRONT DISC BRAKE CALIPER

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

(1) Lubricate caliper pistons, piston seals and piston bores with clean brake fluid.

(2) Install new piston seals into seal groove with finger (Fig. 38).

NOTE: Verify seal is fully seated and not twisted.

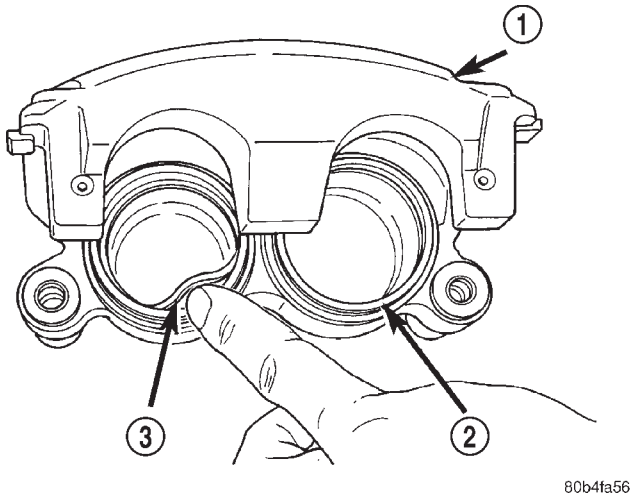


Fig. 38 Piston Seal

1 - CALIPER
2 - PISTON BORE
3 - PISTON SEAL

(3) Install new dust boot on caliper piston and seat boot lip into piston groove (Fig. 39).

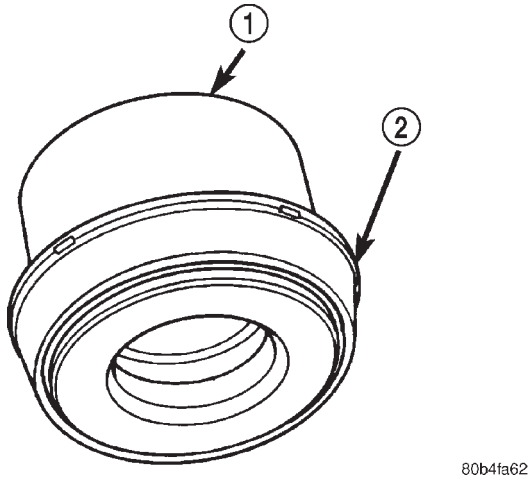


Fig. 39 Dust Boot On Piston

1 - PISTON
2 - DUST BOOT

(4) Stretch boot rearward to straighten boot folds, then move boot forward until folds snap into place.

(5) Install piston into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle (Fig. 40).

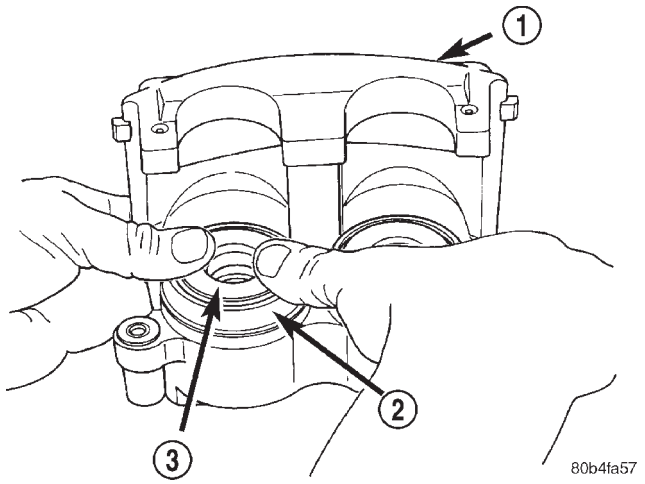


Fig. 40 Caliper Piston Installation

1 - CALIPER
2 - DUST BOOT
3 - PISTON

DISC BRAKE CALIPERS (Continued)

(6) Seat dust boot in caliper (Fig. 41) with Installer 8280 and Handle C-4171.

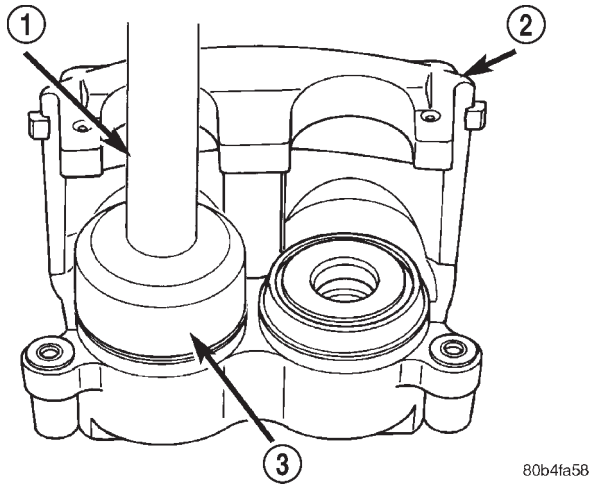


Fig. 41 Seating Dust Boot

1 - HANDLE
2 - CALIPER
3 - DUST BOOT INSTALLER

(7) Install the second piston and dust boot.
(8) Install caliper slide pin bushings into the caliper.
(9) Install caliper bleed screw.

ASSEMBLY - REAR DISC BRAKE CALIPER

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

(1) Lubricate caliper piston, piston seal and piston bore with clean brake fluid.
(2) Install new piston seal into seal groove with finger (Fig. 42).

NOTE: Verify seal is fully seated and not twisted.

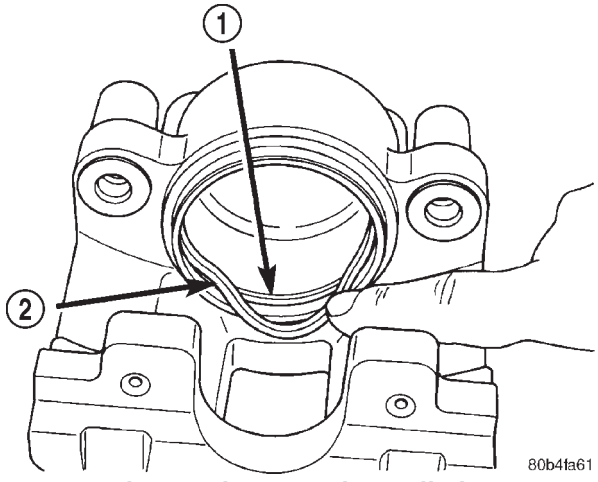


Fig. 42 Piston Seal Installation

1 - SEAL GROOVE
2 - PISTON SEAL

(3) Install new dust boot on caliper piston and seat boot lip into piston groove (Fig. 43).

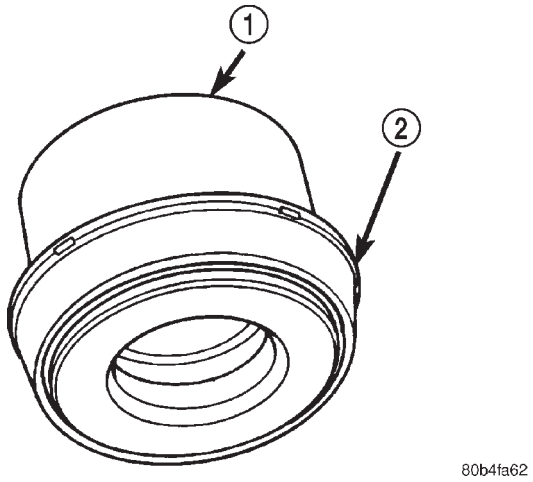


Fig. 43 Dust Boot On Piston

1 - PISTON
2 - DUST BOOT

(4) Stretch boot rearward to straighten boot folds, then move boot forward until folds snap into place.
(5) Install piston into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle (Fig. 44).

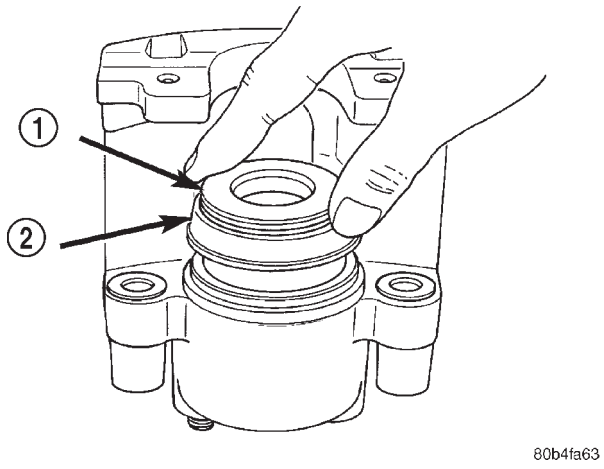


Fig. 44 Caliper Piston Installation

1 - PISTON
2 - BOOT

DISC BRAKE CALIPERS (Continued)

(6) Seat dust boot in caliper with Installer 8280 and Handle C-4171 (Fig. 45).

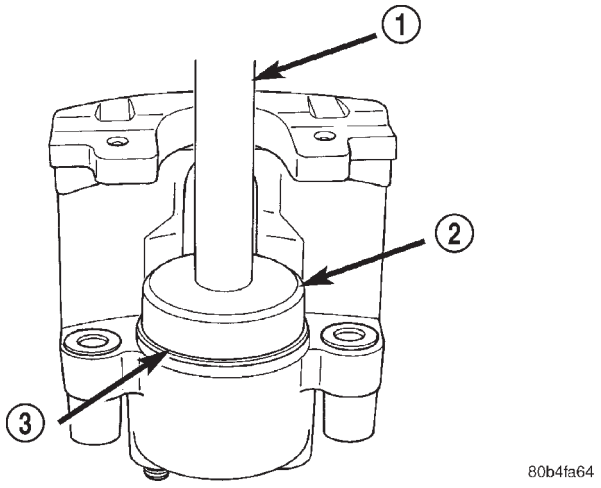


Fig. 45 Piston Dust Boot Installation

1 - HANDLE
2 - INSTALLER
3 - DUST BOOT

(7) Install caliper slide pin bushings into the caliper (Fig. 46).

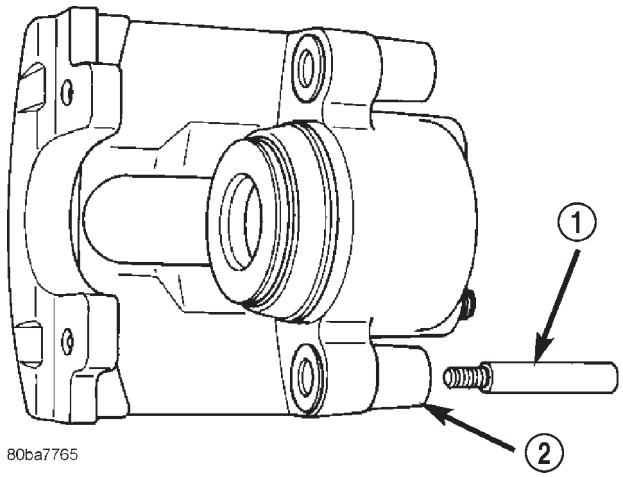


Fig. 46 Slide Pin And Bushing

1 - CALIPER SLIDE PIN
2 - BUSHING

(8) Install caliper bleed screw.

INSTALLATION

INSTALLATION - FRONT DISC BRAKE CALIPER

(1) Install the inboard brake shoe (Fig. 22).

(2) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the caliper.

(3) Install the caliper on the anchor.

(4) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(5) Install the caliper slide pin bushing caps.

(6) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

(7) Install brake hose to caliper with **new gasket washers** and tighten banjo bolt to 31 N·m (23 ft. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening banjo bolt.

(8) Fill and bleed brake system.

(9) Install wheel and tire assemblies.

(10) Remove supports and lower vehicle.

(11) Verify brake fluid level.

INSTALLATION - REAR DISC BRAKE CALIPER

(1) Install the inboard brake shoe (Fig. 26).

(2) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the caliper.

(3) Install the caliper on the anchor.

(4) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(5) Install the caliper slide pin caps.

(6) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

(7) Install brake hose to caliper with a **new** gasket washers and tighten banjo bolt to 31 N·m (23 ft. lbs.).

(8) Fill and bleed brake system.

(9) Install wheel and tire assemblies.

(10) Remove supports and lower vehicle.

FLUID

DIAGNOSIS AND TESTING - BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid sepa-

FLUID (Continued)

rates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder with reservoir, caliper seals, HCU and all hydraulic fluid hoses.

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container of brake fluid will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

FLUID RESERVOIR

REMOVAL

(1) Remove reservoir cap and remove fluid with a **clean**suction gun.

(2) Remove the wire connector from the brake fluid level sensor.

(3) Insert the tool (Fig. 47) provided with the reservoir to release the reservoir retaining tabs.

(4) Pull the reservoir straight up out of the cylinder.

(5) Remove and discard grommets from the cylinder body.

INSTALLATION

(1) Lubricate new grommets with clean brake fluid. Install new grommets into the cylinder body.

CAUTION: Do not use tools to install the grommets. Tools may cut, or tear the grommets. Install the grommets using finger pressure only.

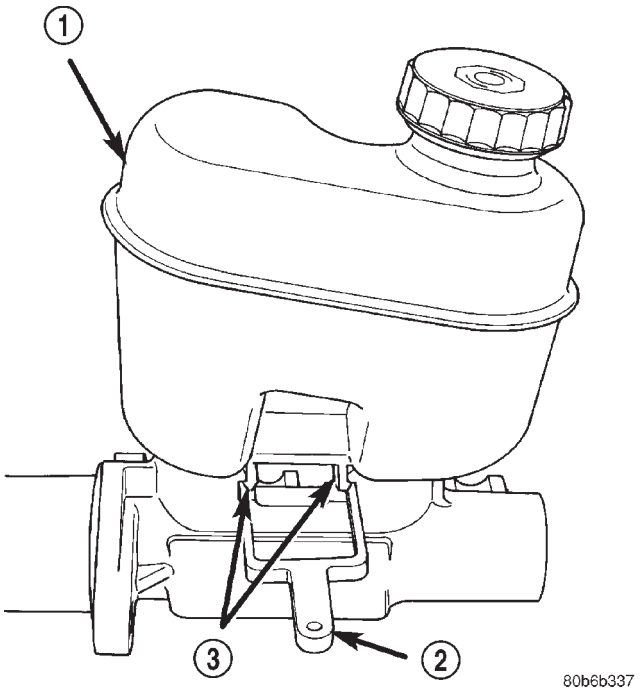


Fig. 47 Release Tool

1 - RESERVOIR
2 - RELEASE TOOL
3 - RETAINING TABS

(2) Start reservoir in grommets then press the reservoir straight down to seat the reservoir into the cylinder grommets.

CAUTION: Do not rock the reservoir during installation.

(3) Verify retaining tabs are seated.

(4) Install the wire connector to the brake fluid level sensor.

(5) Fill master cylinder.

MASTER CYLINDER

DESCRIPTION

The master cylinder body is made of aluminum and contains a primary and secondary piston assembly. The cylinder body including the piston assemblies are not serviceable. If diagnosis indicates an internal problem with the cylinder body, it must be replaced as an assembly. The master cylinder has a removable reservoir and fluid level indicator. The reservoir, reservoir grommets, reservoir cap and fluid level switch are the only replaceable parts on the master cylinder.

MASTER CYLINDER (Continued)

OPERATION

The master cylinder bore contains a primary and secondary piston. The primary piston supplies hydraulic pressure to the front brakes. The secondary piston supplies hydraulic pressure to the rear brakes. The master cylinder reservoir stores reserve brake fluid for the hydraulic brake circuits.

DIAGNOSIS AND TESTING - MASTER CYLINDER/POWER BOOSTER

NOTE: Inspect and repair any external fluid leaks before performing test.

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away the master cylinder or HCU may be faulty (internal leakage).

(5) Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and turn off the engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, some component of the booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 48).

(2) Start and run engine at curb idle speed for one minute.

(3) Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.

(4) Clamp hose shut between vacuum source and check valve.

(5) Stop engine and observe vacuum gauge.

(6) If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm, check valve or check valve seal/grommet is faulty.

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

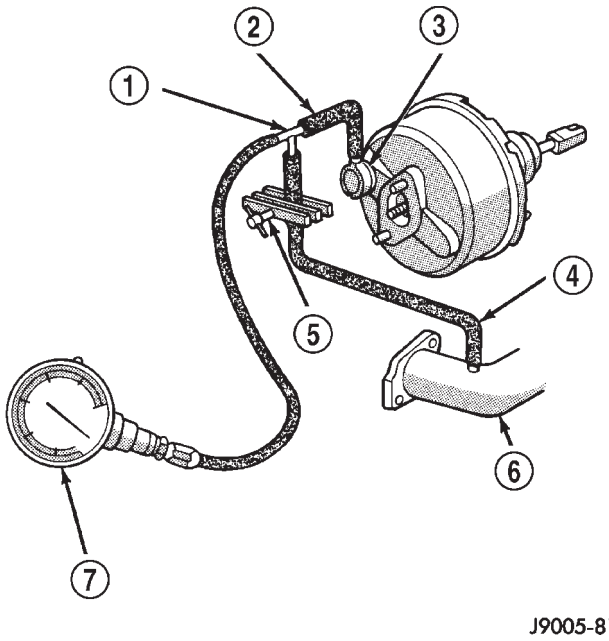


Fig. 48 Typical Booster Vacuum Test Connections

1 - TEE FITTING
2 - SHORT CONNECTING HOSE
3 - CHECK VALVE
4 - CHECK VALVE HOSE
5 - CLAMP TOOL
6 - INTAKE MANIFOLD
7 - VACUUM GAUGE

(4) Apply 51-67 kPa (15-20 in.) vacuum at large end of check valve (Fig. 49).

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss the check valve and seal should be replaced.

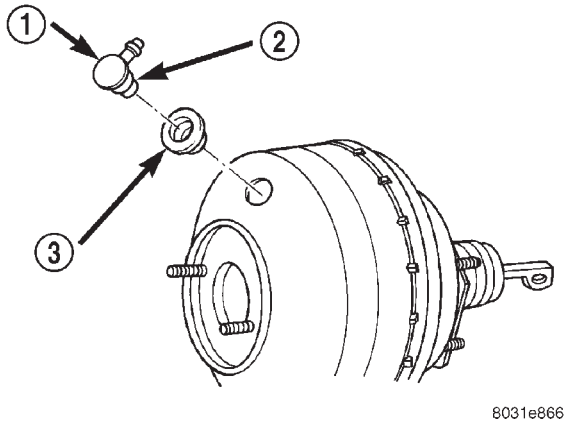


Fig. 49 Vacuum Check Valve And Seal

1 - BOOSTER CHECK VALVE
2 - APPLY TEST VACUUM HERE
3 - VALVE SEAL

MASTER CYLINDER (Continued)

STANDARD PROCEDURE - MASTER CYLINDER BLEEDING PROCEDURE

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

(1) Mount master cylinder in vise with brass jaws.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end into the bottom of the reservoir (Fig. 50).

(3) Fill reservoir with fresh brake fluid.

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

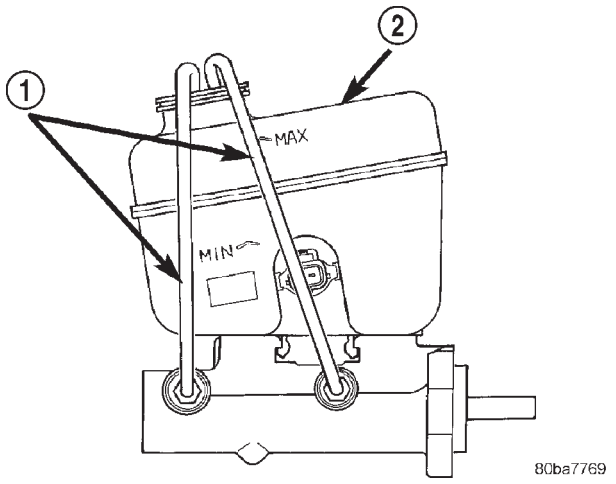


Fig. 50 Master Cylinder Bleeding

1 - BLEEDING TUBES
2 - RESERVOIR

REMOVAL

(1) Remove the wire connector from the brake fluid level sensor.

(2) Remove brake lines from master cylinder.

(3) Remove nuts that attach master cylinder to booster studs (Fig. 51).

(4) Remove master cylinder from booster.

INSTALLATION

NOTE: Bleed new master cylinder on bench before installation, refer to Service Procedures.

(1) Have an assistant depress the brake pedal while guiding the master cylinder on the booster rod and mounting studs.

CAUTION: Do not depress brake pedal too hard and ensure the booster rod is in the master cylinder piston or booster/master cylinder damage will occur.

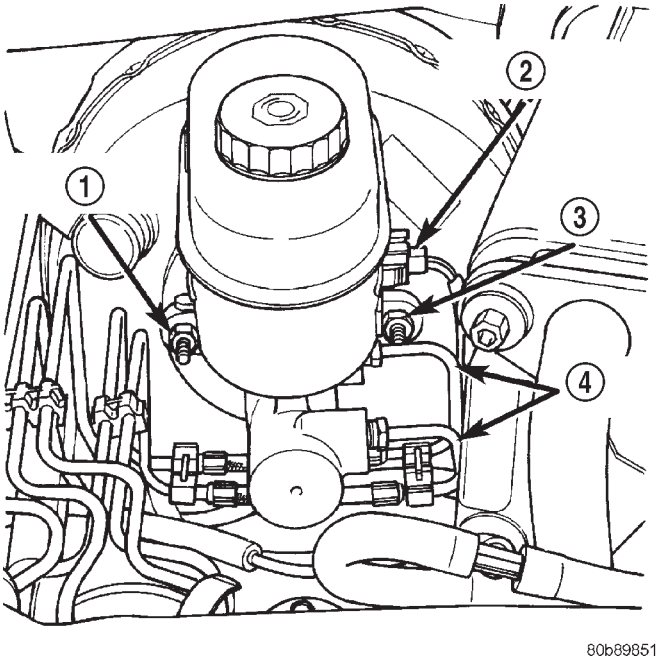


Fig. 51 Master Cylinder Mounting

1 - MOUNTING NUT
2 - SENSOR CONNECTOR
3 - MOUNTING NUT
4 - BRAKE LINES

(2) Install master cylinder mounting nuts and tighten nuts to 25 N·m (18 lb. lbs.).

NOTE: Use original or factory replacement nuts only.

(3) Install brake lines and tighten to 16 N·m (144 in. lbs.).

(4) Install fluid level sensor connector.

(5) Fill and bleed brake system.

PEDAL

DESCRIPTION

DESCRIPTION - STANDARD PEDAL

A suspended-type brake pedal is used, the pedal pivots on a shaft mounted in the pedal support bracket. The bracket is attached to the dash panel.

The brake pedal assembly and pedal pad are the only serviceable component.

DESCRIPTION - ADJUSTABLE PEDALS

The Adjustable Pedals System (APS) is designed to enable the fore and aft repositioning of the brake and accelerator pedals. This results in improved ergonomics in relation to the steering wheel for taller and shorter drivers. Being able to adjust the pedal posi-

PEDAL (Continued)

tions also allows the driver to set steering wheel tilt and seat position to the most comfortable position. The position of the brake and accelerator pedals can be adjusted without compromising safety or comfort in actuating the pedals. Repositioning the pedals does not change the effort required for actuation.

Change of pedal position is accomplished by means of a motor driven screw. Operating the adjustable pedal switch activates the pedal drive motor. The pedal drive motor turns a screw that changes the position of the brake and accelerator pedals. The pedal can be moved rearward (closer to the driver) or forward (away from driver). The brake pedal is moved on its drive screw to a position where the driver feels most comfortable (Fig. 52).

The accelerator pedal is moved at the same time and the same distance as the brake pedal. The accelerator pedal adjustment screw is turned by a flexible shaft slaved off the brake adjustment screw.

Neither the pedal drive motor nor drive mechanism are subject to the mechanical stress of brake or accelerator application.

- SYSTEM FEATURES:
  - Range of Adjustment: The pedals may be adjusted up to 3 in. (75 mm)
  - Pedal Adjustment Speed: 0.5 in./sec (12.5 mm/sec)
  - Pedal Adjustment Inhibitors: Pedal adjustment is inhibited when the vehicle is in reverse or when cruise control is activated.
  - Memory: An optional memory feature is available. This allows storing of one or two preferred pedal positions in the Adjustable Pedal Module (APM). A preferred position can be stored and recalled using the door-mounted switches. A stored pedal position can be recalled (but not stored) using the Remote Keyless Entry (RKE).
  - Adjustable Pedal Feedback Message: The Electronic Vehicle Information Center (EVIC) will display a message when the APS is disabled. ie: ″Adjustable Pedal Disabled - Cruise Control Engaged″ or ″Adjustable Pedal Disabled - Vehicle in Reverse″.
  - Damage Prevention: Foot pressure or debris can stall pedal adjustment. In order to avoid damage to system components during pedal adjustment, the APM will monitor pedal position sensor voltage. If the APM does not detect expected voltage change within 1.5 seconds, it will cut power to the adjustable pedal motor.

OPERATION

The brake pedal is attached to the booster push rod. When the pedal is depressed, the primary booster push rod is depressed which moves the booster secondary rod. The booster secondary rod depresses the master cylinder piston.

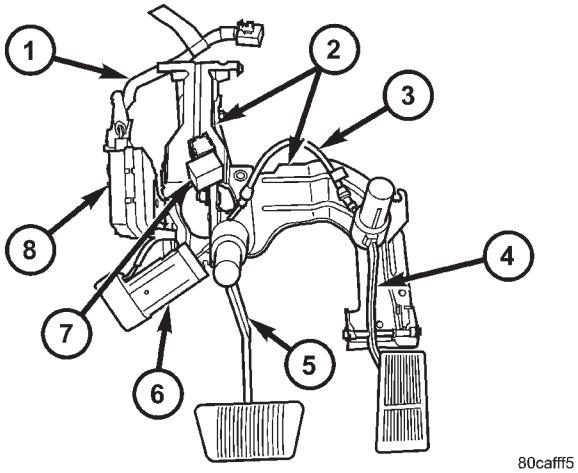


Fig. 52 ADJUSTABLE PEDALS ASSEMBLY

1 - HARNESS
2 - ADJUSTABLE PEDAL BRACKET
3 - CABLE
4 - ACCELERATOR PEDAL
5 - BRAKE PEDAL
6 - ADJUSTABLE PEDAL MOTOR
7 - BRAKE LIGHT SWITCH
8 - ADJUSTABLE PEDALS MODULE

REMOVAL

REMOVAL - NON-ADJUSTABLE PEDAL

(1) Remove retainer clip that holds booster to pedal pin (Fig. 53).

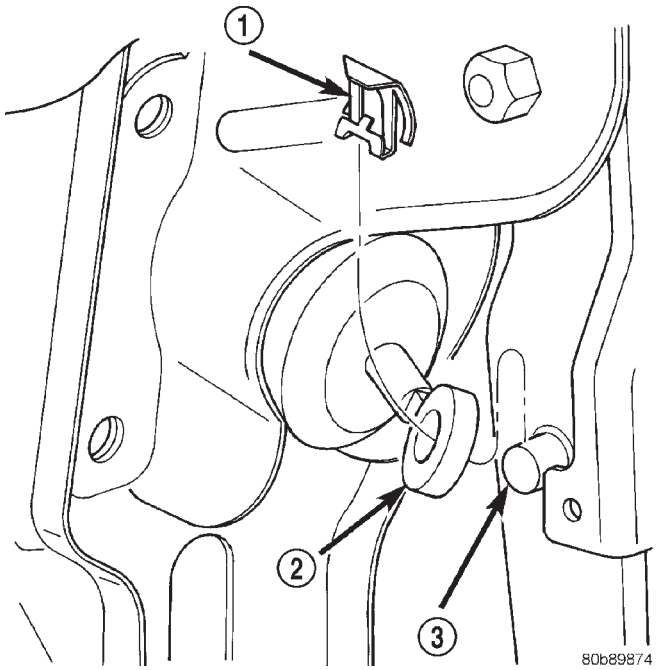


Fig. 53 Push Rod Retainer Clip

1 - RETAINER CLIP
2 - PUSH ROD
3 - PEDAL PIN

PEDAL (Continued)

(2) Remove nut from pedal shaft.
(3) Slide pedal shaft out and remove brake pedal.
(4) Remove pedal bushings (Fig. 54) if they are to be replaced.

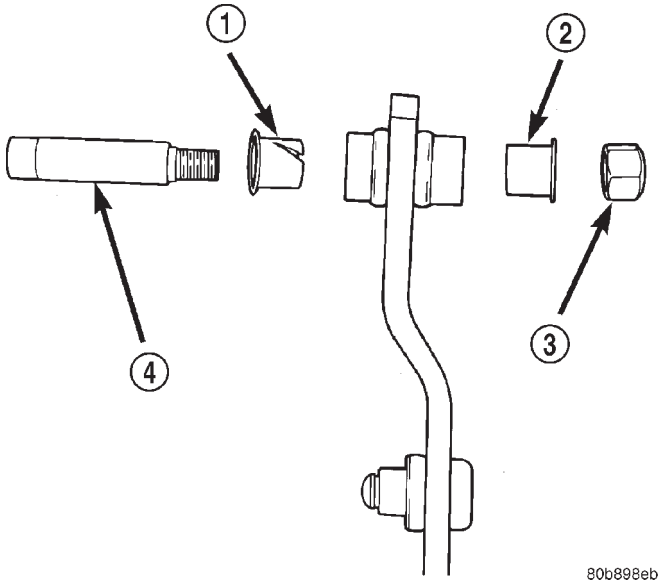


Fig. 54 Pedal Bushings

1 - BUSHING
2 - BUSHING
3 - SHAFT NUT
4 - PEDAL SHAFT

REMOVAL - ADJUSTABLE PEDALS

NOTE: If possible put the pedals in the full forward position.

(1) Disconnect the negative battery cable.
(2) Remove the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
(3) Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
(4) Disconnect the module electrical connector.
(5) Remove the brake light switch.
(6) Disconnect the booster rod clip (Fig. 53).
(7) Disconnect the accelerator cable from the pedal.
(8) Lock the steering wheel into place.
(9) Remove the lower steering shaft pinch bolt (Fig. 56).
(10) Separate the lower shaft coupler and push forward (Fig. 56).
(11) Remove the two pedal bracket upper nuts (Fig. 55).
(12) Remove the brake booster nuts (Fig. 56).
(13) Remove the accelerator pedal nuts (Fig. 57).

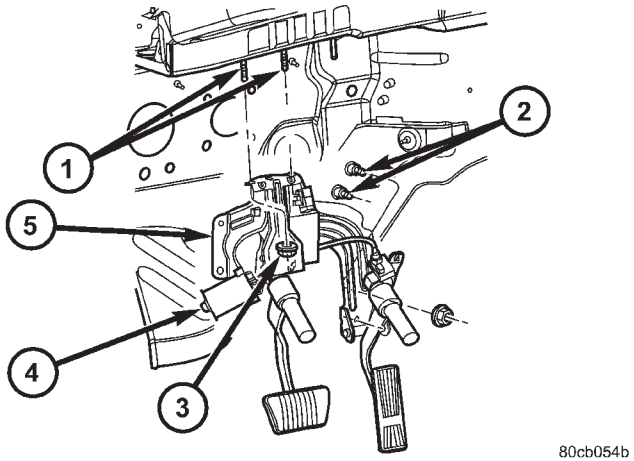


Fig. 55 UPPER MOUNTING NUTS

1 - UPPER MOUNTING STUDS
2 - ACCELERATOR MOUNTING STUDS
3 - UPPER MOUNTING NUT
4 - MOTOR
5 - ADJUSTABLE PEDAL BRACKET

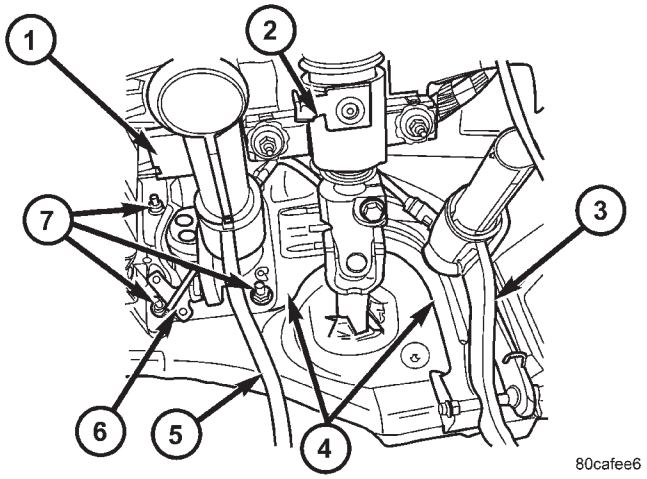


Fig. 56 ADJUSTABLE PEDAL BRACKET

1 - BRAKE LIGHT SWITCH
2 - STEERING COLUMN
3 - ACCELERATOR PEDAL
4 - ADJUSTABLE PEDALS MOUNTING BRACKET
5 - BRAKE PEDAL
6 - MOTOR MOUNTING BRACKET
7 - BRAKE BOOSTER MOUNTING NUTS (4)

(14) Remove the ICU mounting bracket nuts and bolts and move the ICU and booster forward this will allow enough clearance to remove the adjustable pedal bracket from over the booster push rod.
(15) Remove the pedal from the vehicle (Fig. 56).
(16) Transfer the module if needed.

PEDAL (Continued)

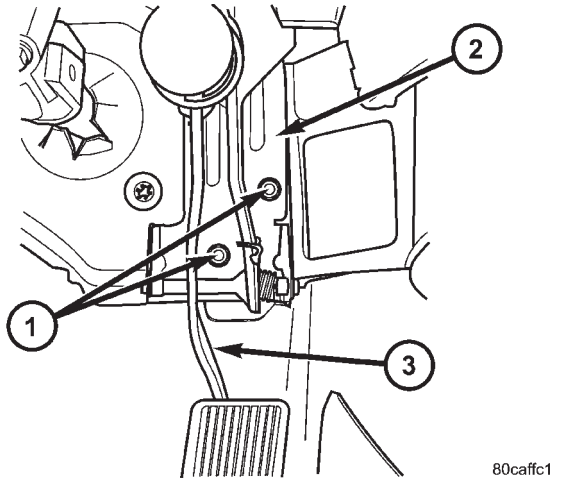


Fig. 57 ACCELERATOR MOUNTING BRACKET

1 - ACCELERATOR MOUNTING NUTS
2 - ADJUSTABLE PEDALS BRACKET
3 - ACCELERATOR PEDAL

INSTALLATION

INSTALLATION - NON-ADJUSTABLE PEDAL

(1) Lubricate bushings, pedal shaft and pedal pin with Mopar multi-mileage grease.
(2) Install bushings into pedal.
(3) Position pedal in bracket and install pedal shaft in support and through pedal.
(4) Install new nut on pedal shaft and tighten to 27 N·m (20 ft. lbs.).

NOTE: Pedal shaft nut should not be reused.

(5) Install booster push rod on pedal pin and install retainer clip on pedal pin.
(6) Check and adjust stop lamp switch if necessary.

INSTALLATION - ADJUSTABLE PEDALS

(1) Install the pedal to the vehicle (Fig. 56).
(2) Reposition the ICU and booster, Install the ICU mounting bracket nuts and bolts.
28 N
(3) Install the brake booster nuts. Tighten to 28 N·m (21 ft. lbs.). (Fig. 56).
(4) Install the pedal bracket upper nuts. Tighten to 12 N·m (9 ft. lbs.). (Fig. 56).
(5) Install the accelerator pedal nuts. Tighten to 28 N·m (21 ft. lbs.). (Fig. 57).
(6) Install the lower steering shaft coupler over the shaft (Fig. 56).
(7) Install the lower steering shaft pinch bolt (Fig. 56).
(8) Unlock the steering wheel.
(9) Reconnect the accelerator cable to the pedal (Fig. 56).
(10) Reconnect the booster rod clip (Fig. 56).
(11) Install the brake light switch.
(12) Reconnect the module electrical connector.
(13) Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
(14) Install the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).
(15) Reconnect the negative battery cable.

PEDAL MOTOR

REMOVAL

(1) Disconnect the negative battery cable.
(2) Remove the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
(3) Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
(4) Remove the two mounting screws (Fig. 58).
(5) Disconnect the electrical connector (Fig. 58).
(6) Remove the adjustable pedal motor (Fig. 58).

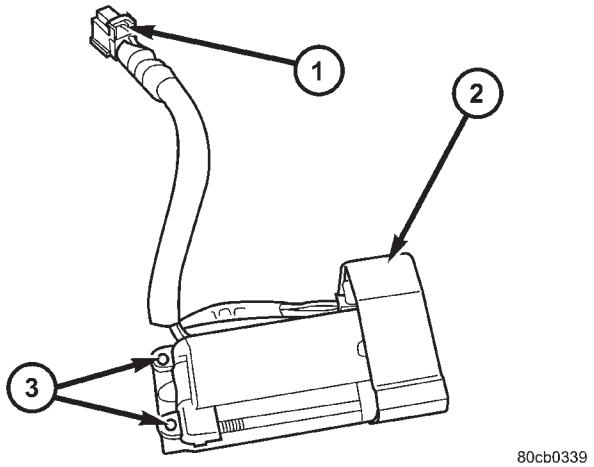


Fig. 58 ADJUSTABLE PEDALS MOTOR

1 - ELECTRICAL CONNECTOR
2 - PEDALS MOTOR
3 - MOUNTING SCREWS HOLES

INSTALLATION

(1) Install the adjustable pedal motor (Fig. 58).
(2) Reconnect the electrical connector (Fig. 58).
(3) Install the two mounting screws (Fig. 58).
(4) Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

PEDAL MOTOR (Continued)

(5) Install the cluster bezel (Refer to 23 - BODY/ INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(6) Reconnect the negative battery cable.

POWER BRAKE BOOSTER

DESCRIPTION

The booster assembly consists of a housing divided into separate chambers by two internal diaphragms. The outer edge of each diaphragm is attached to the booster housing.

Two push rods are used in the booster. The primary push rod connects the booster to the brake pedal. The secondary push rod connects the booster to the master cylinder to stroke the cylinder pistons.

OPERATION

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is through a hose attached to an intake manifold fitting at one end and to the booster check valve at the other. The vacuum check valve in the booster housing is a one-way device that prevents vacuum leak back.

Power assist is generated by utilizing the pressure differential between normal atmospheric pressure and a vacuum. The vacuum needed for booster operation is taken directly from the engine intake manifold. The entry point for atmospheric pressure is through a filter and inlet valve at the rear of the housing (Fig. 59) .

The chamber areas forward of the booster diaphragms are exposed to vacuum from the intake manifold. The chamber areas to the rear of the diaphragms, are exposed to normal atmospheric pressure of 101.3 kilopascals (14.7 pounds/square in.).

Brake pedal application causes the primary push rod to open the atmospheric inlet valve. This exposes the area behind the diaphragms to atmospheric pressure. The resulting pressure differential provides the extra apply force for power assist.

The booster check valve, check valve grommet and booster seals are serviceable.

POWER BRAKE BOOSTER (Continued)

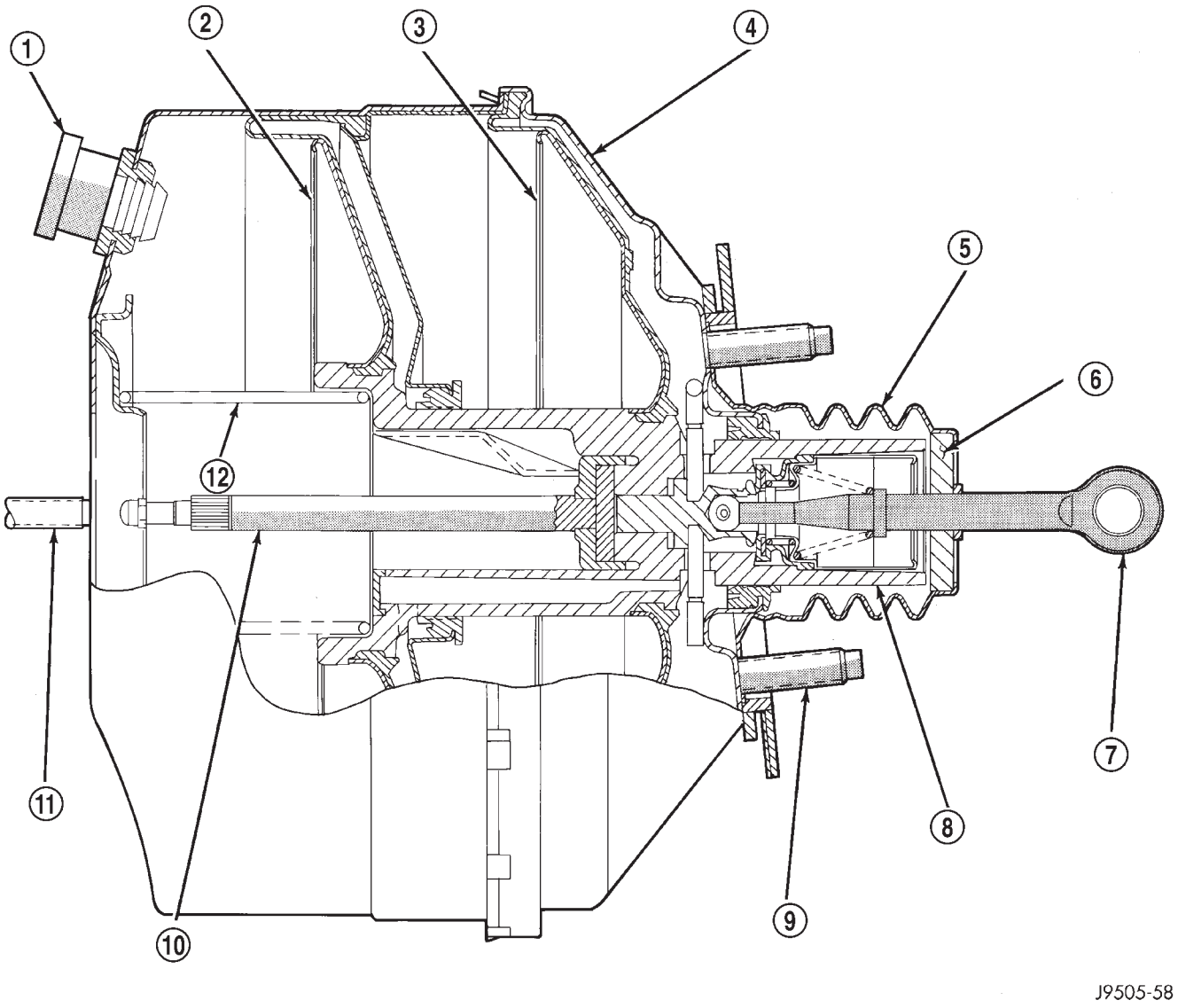


Fig. 59 Power Brake Booster–Typical

1 - VACUUM CHECK VALVE
2 - FRONT DIAPHRAGM
3 - REAR DIAPHRAGM
4 - HOUSING
5 - SEAL
6 - AIR FILTER
7 - PRIMARY PUSH ROD (TO BRAKE PEDAL)
8 - ATMOSPHERIC INLET VALVE ASSEMBLY
9 - BOOSTER MOUNTING STUDS (4)
10 - SECONDARY PUSH ROD (TO MASTER CYLINDER)
11 - MASTER CYLINDER MOUNTING STUD (2)
12 - SPRING

POWER BRAKE BOOSTER (Continued)

REMOVAL

(1) Remove the master cylinder.
(2) Disconnect vacuum hose at booster check valve.
(3) Remove retainer clip (Fig. 60) that holds booster push rod on pedal pin. Then slide push rod off pin.

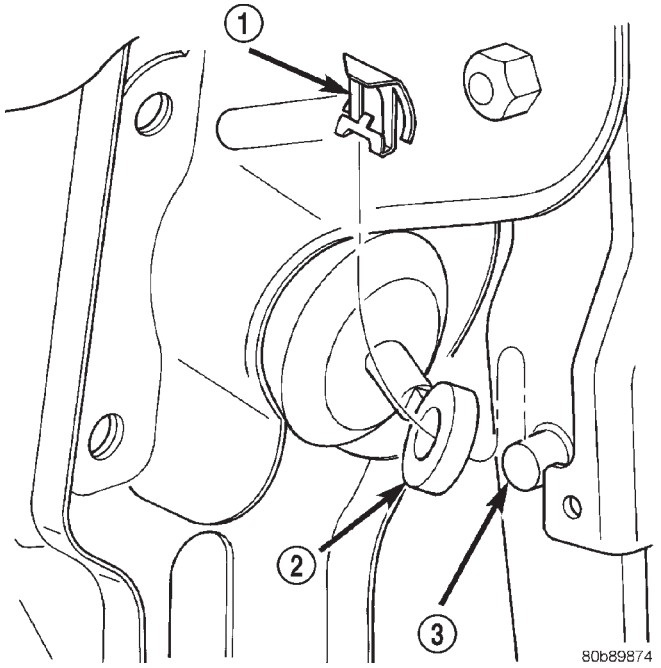


Fig. 60 Retainer Clip

1 - RETAINER CLIP
2 - PUSH ROD
3 - PEDAL PIN

(4) Remove four nuts (Fig. 61) that attach booster to dash panel.
(5) In engine compartment, slide booster forward, tilt it upward slightly, and remove it from engine compartment.

INSTALLATION

(1) Check condition of grommet that secures check valve in booster. Replace grommet if cut, torn, or loose.
(2) Install new booster dash seal.
(3) Align and position booster on engine compartment side of dash panel.
(4) Inside passenger compartment:
(a) Lubricate pedal pin Mopar multi-mileage grease.
(b) Install booster attaching nuts on studs. Tighten attaching nuts to 39 N·m (29 ft. lbs.).
(c) Slide booster push rod on pedal pin. Then secure rod to pin with retainer clip.
(5) In engine compartment, attach vacuum hose to booster check valve.

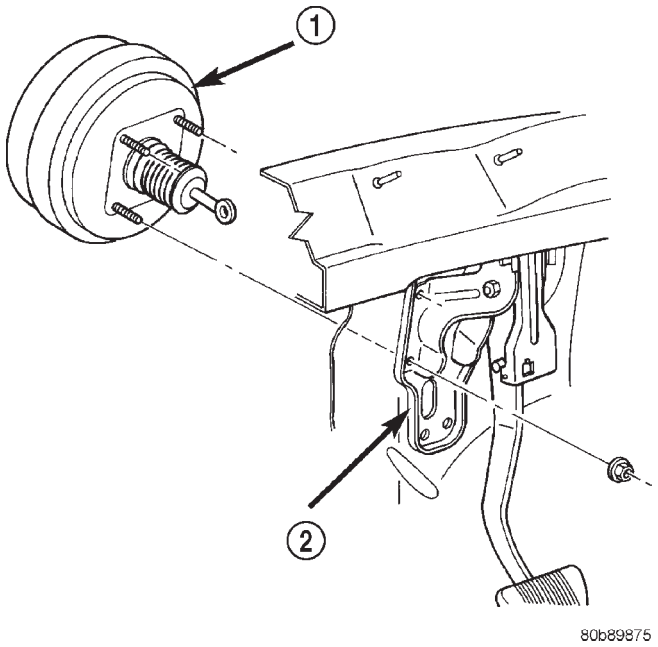


Fig. 61 Power Brake Booster Mounting

1 - BOOSTER
2 - DASH PANEL

(6) Install the master cylinder with new gasket and nuts.

CAUTION: The master cylinder installation procedure must be perform as written or damage to the booster/master cylinder may occur.

(7) Fill and bleed brake system.

ROTORS

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - FRONT DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Rotor minimum usable thickness is 24.5 mm (0.964 in.). Do not resurface a rotor if machining would cause thickness to fall below this limit.

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if refinishing would reduce thickness below the allowable minimum.

FRONT ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

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ROTORS (Continued)

Measure rotor thickness a minimum of six points around the rotor face. Position the micrometer approximately 19 mm (3/4 in.) from the rotor outer circumference for each measurement (Fig. 62).

Thickness should not vary by more than 0.0127 mm (0.0005 in.) from point to point on the rotor. Refinish or replace the rotor if necessary.

NOTE: A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

CAUTION: For vehicles equipped with the Quadra-Drive System, consisting of the NV-247 transfer case and a Vari-Lok differential in the front and rear axles, the following steps must be done prior to the use of a hub mounted on-vehicle brake lathe. Disconnect the driveshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL) from the respective axle on which the brake rotors are being machined. Temporarily remove both brake calipers (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) from the axle while disc rotor machining is in process. Both steps will prevent unnecessary loads to the hub mounted on-vehicle lathe and speed machining times. Install a thread lock material to the driveshaft attaching bolts when reinstalling (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

Front rotors and hub/bearings are matched mounted for minimum lateral runout. Before removing the rotor, mark the rotor and hub/bearing to maintain original orientation.

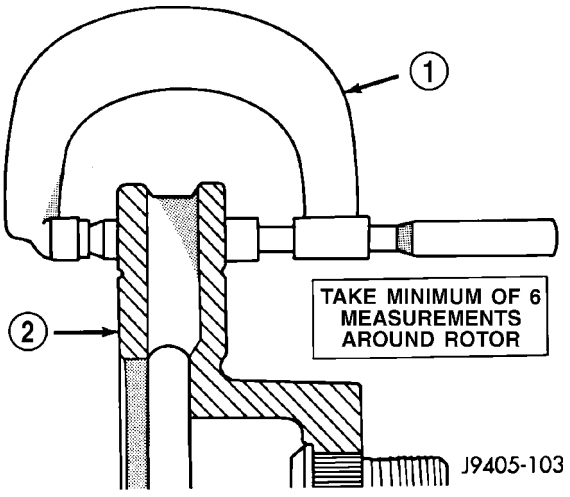


Fig. 62 Measuring Rotor Thickness Variation

1 - MICROMETER
2 - ROTOR

FRONT ROTOR LATERAL RUNOUT

Check rotor lateral runout whenever pedal pulsation, or rapid, uneven brake lining wear has occurred.

The rotor must be securely clamped to the hub to ensure an accurate runout measurement. Secure the rotor with a minimum of 3 lug nuts and large diameter flat washers on each stud.

Use a dial indicator to check lateral runout (Fig. 63).

Maximum allowable rotor lateral runout is 0.05 mm (0.002 in.).

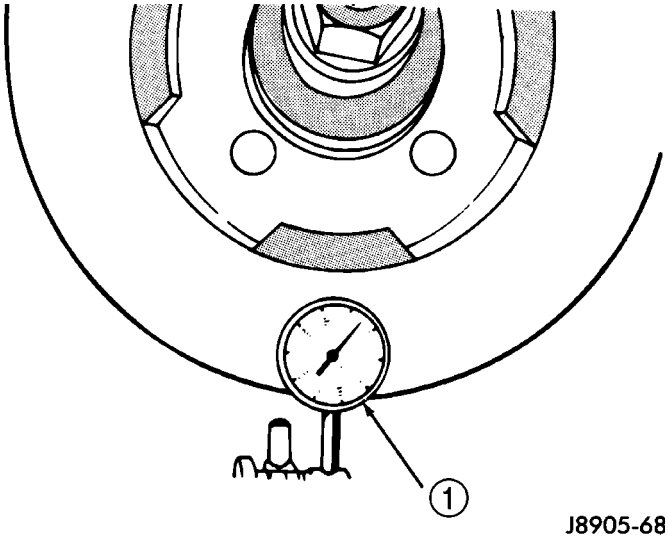


Fig. 63 Checking Rotor Lateral Runout

1 - DIAL INDICATOR

DIAGNOSIS AND TESTING - REAR DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Minimum usable thickness of the rear disc brake rotor is 8.5 mm (0.335 in.). The thickness specification is located on the center section of the rotor.

Never resurface a rotor if machining would cause thickness to fall below this limit.

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if refinishing would reduce thickness below the allowable minimum.

REAR ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at a minimum of six points around the rotor face. Position the micrometer approximately 19 mm (3/4 in.) from the rotor outer circumference for each measurement (Fig. 62).

Thickness should not vary by more than 0.0127 mm (0.0005 in.) from point to point on the rotor. Refinish or replace the rotor if necessary.

REAR ROTOR LATERAL RUNOUT

Check rotor lateral runout whenever diagnosis indicates pedal pulsation and rapid, uneven brake lining wear.

The rotor must be securely clamped to the hub to ensure an accurate runout measurement. Secure the rotor with the wheel nuts and 4 or 5 large diameter flat washers on each stud.

Use a dial indicator to check lateral runout (Fig. 63). Maximum allowable lateral runout is 0.76 mm (0.003 in.).

ROTORS (Continued)

STANDARD PROCEDURE - DISC ROTOR MACHINING

CAUTION: For vehicles equipped with the Quadra-Drive System, consisting of the NV-247 transfer case and a Vari-Lok differential in the front and rear axles, the following steps must be done prior to the use of a hub mounted on-vehicle brake lathe. Disconnect the driveshaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL) from the respective axle on which the brake rotors are being machined. Temporarily remove both brake calipers (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) from the axle while disc rotor machining is in process. Both steps will prevent unnecessary loads to the hub mounted on-vehicle lathe and speed machining times. Install a thread lock material to the driveshaft attaching bolts when reinstalling (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

NOTE: A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

The disc brake rotor can be machined if scored or worn. The lathe must machine both sides of the rotor simultaneously with dual cutter heads. The rotor mounting surface must be clean before placing on the lathe. Equipment capable of machining only one side at a time may produce a tapered rotor.

CAUTION: Brake rotors that do not meet minimum thickness specifications before or after machining must be replaced.

REMOVAL

REMOVAL - FRONT DISC BRAKE ROTOR

NOTE: Front rotors and hub/bearings are matched mounted for minimum lateral runout. Before removing the rotor, mark the rotor and hub/bearing to maintain original orientation.

(1) Raise and support the vehicle.
(2) Remove wheel and tire assembly.
(3) Remove the caliper anchor bolts (Fig. 64) and remove the caliper and anchor as an assembly from the steering knuckle.
(4) Secure caliper anchor assembly to nearby suspension part with a wire. **Do not allow brake hose to support caliper weight.**
(5) Mark the rotor and hub/bearing to maintain original orientation. Remove retainers securing rotor to hub studs.
(6) Remove rotor from hub/bearing.

REMOVAL - REAR DISC BRAKE ROTOR

(1) Raise and support the vehicle.
(2) Remove wheel and tire assembly.
(3) Remove the caliper anchor bolts (Fig. 65).
(4) Remove caliper and anchor as an assembly.

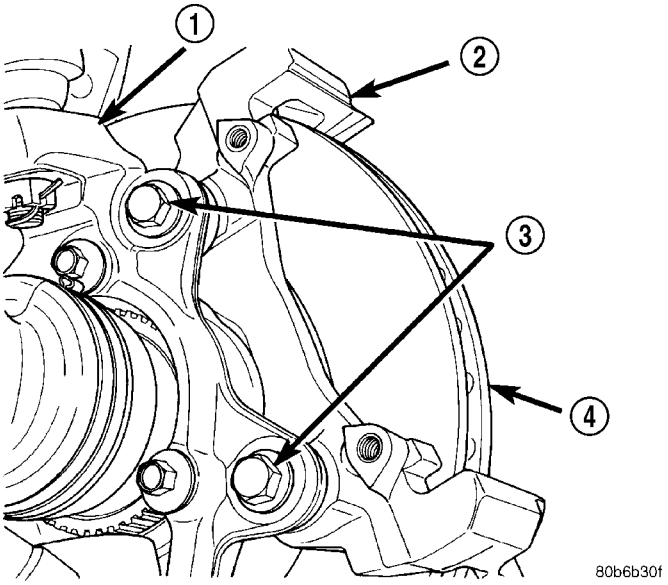


Fig. 64 Caliper Anchor Bolts

1 - KNUCKLE
2 - ANCHOR
3 - ANCHOR BOLTS
4 - ROTOR

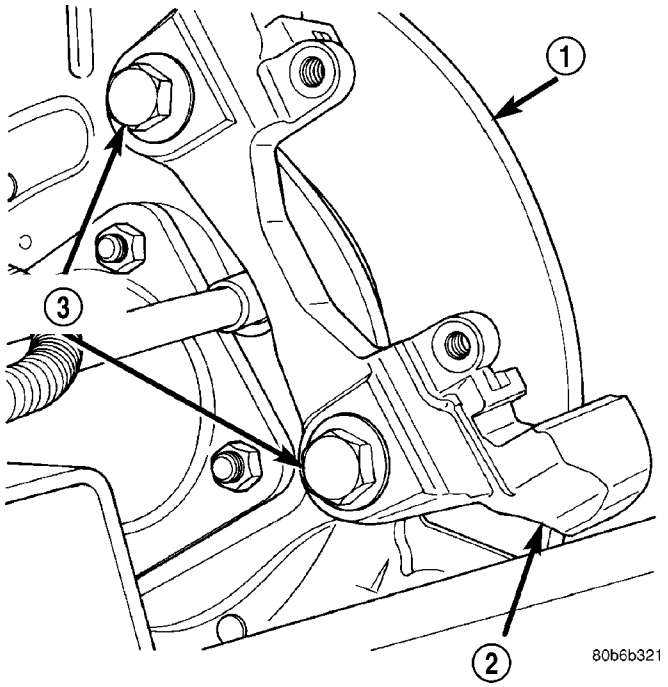


Fig. 65 Caliper Anchor Bolts

1 - ROTOR
2 - ANCHOR
3 - ANCHOR BOLTS

(5) Secure caliper anchor assembly to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**
(6) Remove retainers securing rotor to axle studs.
(7) Remove rotor off axle studs.

ROTORS (Continued)

INSTALLATION

INSTALLATION - FRONT DISC BRAKE ROTOR

NOTE: If a new rotor is installed it must be match mounted to the hub/bearing.

(1) Install rotor on hub studs in its original location.
(2) Install the caliper anchor assembly on the knuckle. Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).
(3) Install wheel and tire assembly.
(4) Remove support and lower the vehicle.
(5) Pump brake pedal to seat caliper pistons and brake shoes. Do not move vehicle until firm brake pedal is obtained.

INSTALLATION - REAR DISC BRAKE ROTOR

(1) Install rotor on axle studs.
(2) Install the caliper anchor assembly.
(3) Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).
(4) Install wheel and tire assembly.
(5) Remove support and lower the vehicle.
(6) Pump brake pedal until caliper pistons and brake shoes are seated.

PARKING BRAKE

OPERATION

The parking brakes operated by a automatic tensioner mechanism built into the hand lever and cable system. The front cable is connected to the hand lever and the equalizer. The rear cables attached to the equalizer and the parking brake shoe actuator.

A set of drum type brake shoes are used for parking brakes. The shoes are mounted to the rear disc brake adaptor. The parking brake drum is integrated into the rear disc brake rotor.

Parking brake cable adjustment is controlled by an automatic tensioner mechanism. The only adjustment if necessary is to the park brake shoes if the linings are worn.

DIAGNOSIS AND TESTING - PARKING BRAKE

NOTE: Parking brake adjustment is controlled by an automatic cable tensioner and does not require adjustment. The only adjustment that may be necessary would be to the park brake shoes if they are worn.

The parking brake switch is in circuit with the red warning lamp in the dash. The switch will cause the lamp to illuminate only when the parking brakes are applied. If the lamp remains on after parking brake release, the switch or wires are faulty.

If the red lamp comes on a fault has occurred in the front or rear brake hydraulic system.

If the red warning lamp and yellow warning lamp come on, the electronic brake distribution may be at fault.

In most cases, the actual cause of an improperly functioning parking brake (too loose/too tight/won't hold), can be traced to a parking brake component.

NOTE: The leading cause of improper parking brake operation, is excessive clearance between the parking brake shoes and the shoe braking surface. Excessive clearance is a result of lining and/or drum wear, drum surface machined oversize.

Excessive parking brake lever travel (sometimes described as a loose lever or too loose condition), is the result of worn brake shoes, improper brake shoe adjustment, or improperly assembled brake parts.

A too loose condition can also be caused by inoperative or improperly assembled parking brake shoe parts.

A condition where the parking brakes do not hold, will most probably be due to a wheel brake component.

Items to look for when diagnosing a parking brake problem, are:

- Brake shoe wear
- Drum surface (in rear rotor) machined oversize
- Front cable not secured to lever
- Rear cable not attached to actuator
- Rear cable seized
- Parking brake lever not seated
- Parking brake lever bind

CABLES

REMOVAL

REMOVAL - FRONT PARKING BRAKE CABLE

(1) Remove center console,(Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(2) Lift up rear seat and carpet covering the parking brake cables.

(3) Place a screw driver through the front cable eyelet (Fig. 66) and pry back on the front cable.

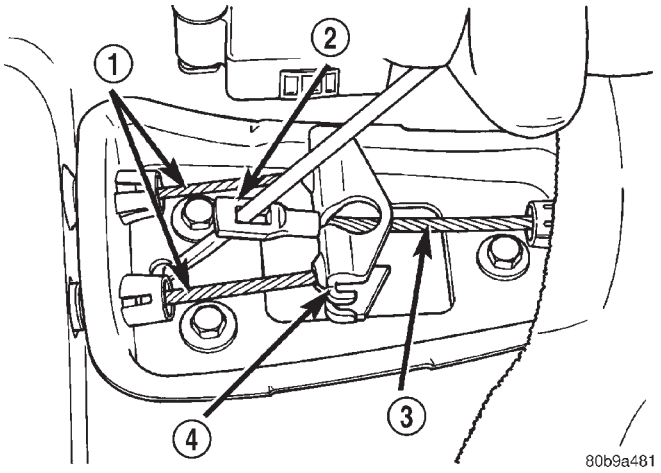


Fig. 66 Front Cable Eyelet

1 - REAR CABLES
2 - FRONT CABLE EYELET
3 - FRONT CABLE
4 - EQUALIZER

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 67) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

(5) Disengage front cable end from the equalizer (Fig. 68).

(6) Disengage front cable end from the parking brake lever.

(7) Remove the front carpet,(Refer to 23 - BODY/INTERIOR/CARPETS AND FLOOR MATS - REMOVAL).

(8) Remove front cable retainer nuts (Fig. 69) from the floor pan.

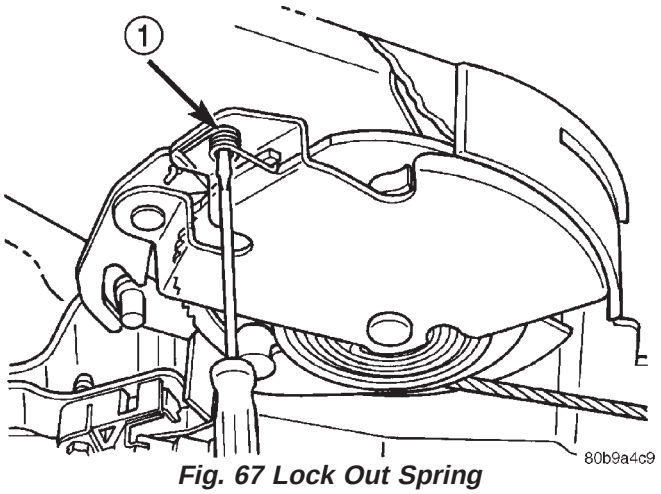


Fig. 67 Lock Out Spring

1 - LOCK OUT SPRING

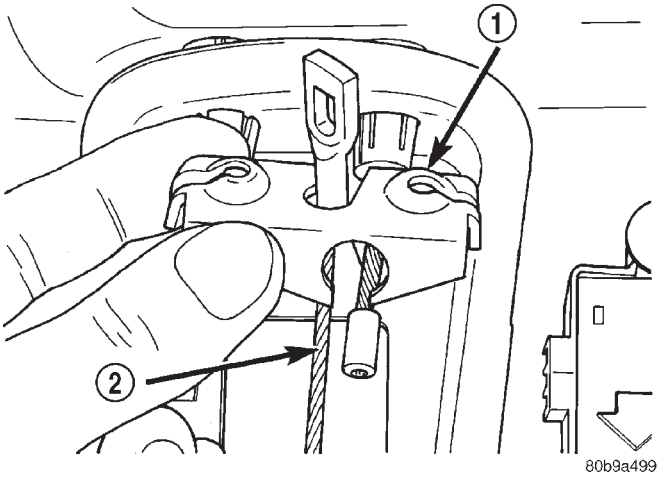


Fig. 68 Cable Equalizer

1 - EQUALIZER
2 - FRONT CABLE

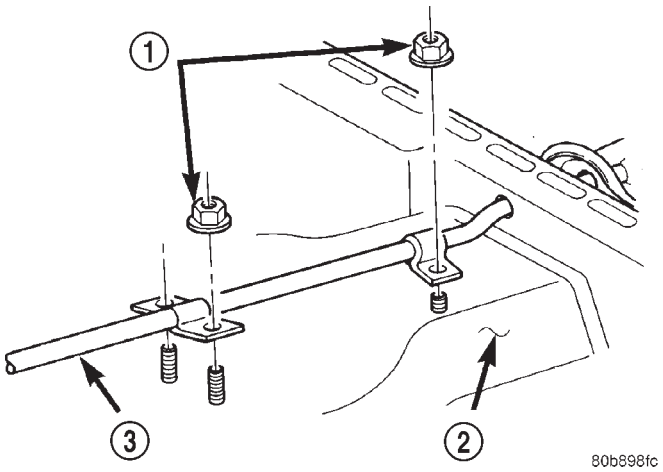


Fig. 69 Front Parking Brake Cable

1 - RETAINER NUT
2 - FLOOR PAN
3 - FRONT CABLE

CABLES (Continued)

(9) Compress the cable retainers with a 13 mm wrench (Fig. 70). Remove the cable from parking brake lever bracket and equalizer bracket.

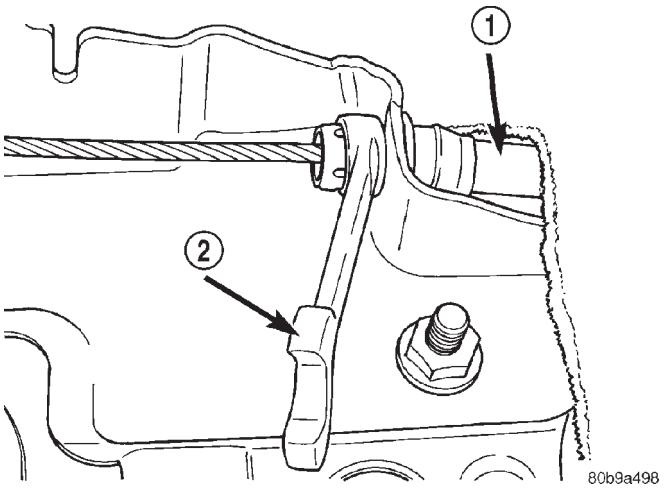


Fig. 70 Brake Lever Bracket

1 - FRONT CABLE
2 - WRENCH

REMOVAL - REAR PARKING BRAKE CABLES

(1) Remove center console, (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(2) Lift up rear seat and carpet covering the parking brake cables.

(3) Place a screw driver through the front cable eyelet (Fig. 71) and pry back on the front cable.

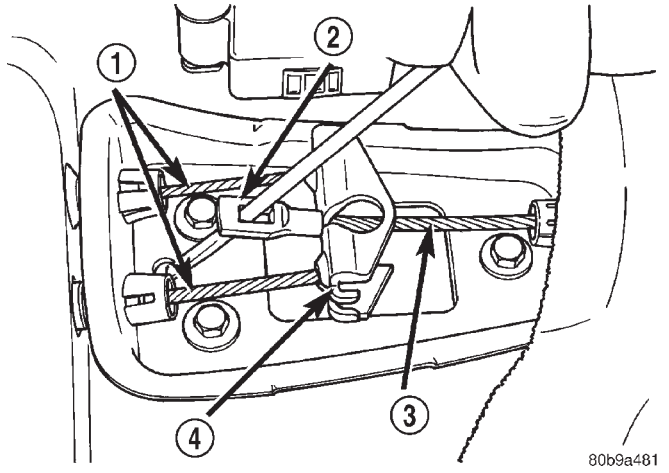


Fig. 71 Front Cable Eyelet

1 - REAR CABLES
2 - FRONT CABLE EYELET
3 - FRONT CABLE
4 - EQUALIZER

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 72) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

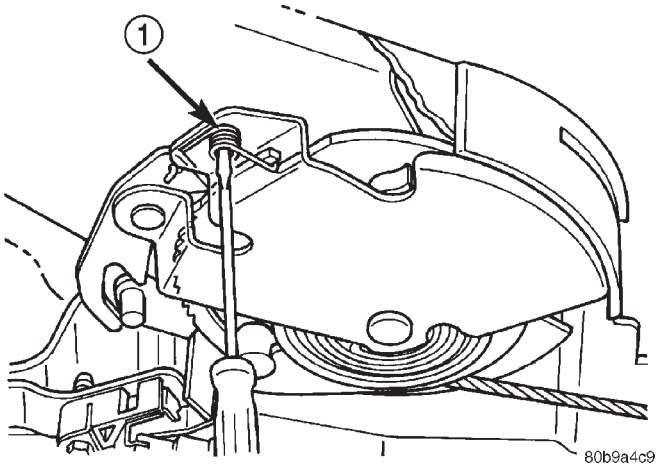


Fig. 72 Lock Out Spring

1 - LOCK OUT SPRING

(5) Disengage rear cables ends from the equalizer.

(6) Compress the cable retainers with a 13 mm wrench (Fig. 73) and remove the cable from equalizer bracket.

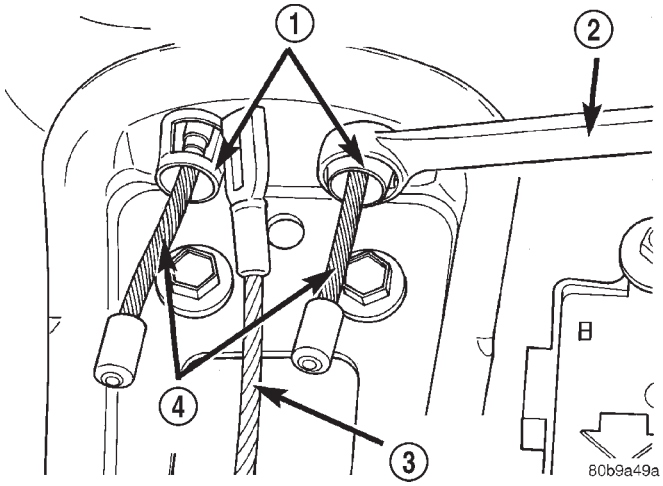


Fig. 73 Cable Retainers

1 - CABLE RETAINER
2 - WRENCH
3 - FRONT CABLE
4 - REAR CABLES

CABLES (Continued)

(7) Raise and support the vehicle.
(8) Remove the wheel and tire assemblies.
(9) Remove the brake calipers, caliper anchors and rotors.
(10) Remove the ABS sensor wiring harness (Fig. 74)from the rear brake cables.

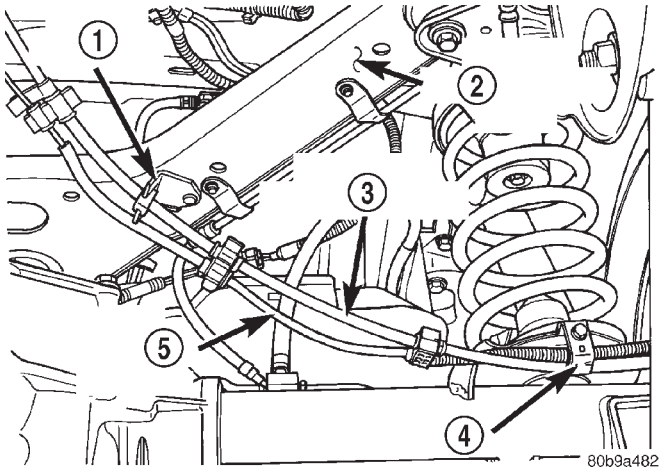


Fig. 74 Left Rear Parking Brake Cable

1 - CABLE BRACKET
2 - UPPER SUSPENSION ARM
3 - PARKING BRAKE CABLE
4 - CABLE RETAINER
5 - ABS SENSOR WIRING

(11) Remove the cable retainer bolts (Fig. 74) from the rear spring pads.
(12) Pull the cables out of the upper suspension arm brackets.
(13) Push the cable in and lift up the end of cable with a small screw driver to disengage the cable from the parking brake actuator (Fig. 75).
(14) Remove the cable from the vehicle.

INSTALLATION

INSTALLATION - FRONT PARKING BRAKE CABLE

(1) Install thecable into the parking brake lever bracket and equalizer bracket.
(2) Install the front cable to the floor pan and install retainer nuts.
(3) Engage the front cable ends to the parking brake lever and equalizer.
(4) Install the front carpet, (Refer to 23 - BODY/ INTERIOR/CARPETS AND FLOOR MATS - INSTALLATION).
(5) Pull on the lever to release the lock out spring.
(6) Install the center console, (Refer to 23 - BODY/ INTERIOR/FLOOR CONSOLE - INSTALLATION).
(7) Fold down the rear carpet cover and rear seat.

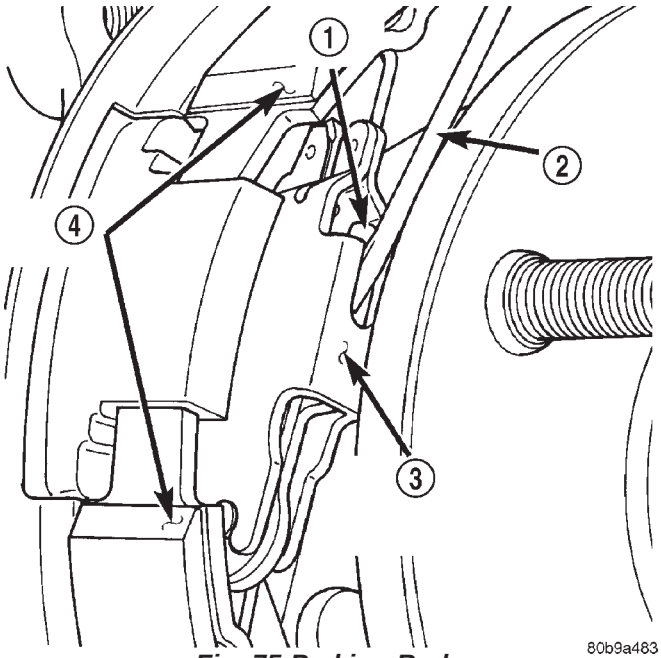


Fig. 75 Parking Brake

1 - CABLE END
2 - SCREW DRIVER
3 - PARKING BRAKE ACTUATOR
4 - BRAKE SHOES

INSTALLATION - REAR PARKING BRAKE CABLES

(1) Install the cables through the caliper anchor mount. Then push the end of cable strand in to engage the cable end to the parking brake actuator.
(2) Feed the other end of the cables through the body and into the equalizer bracket (Fig. 76).

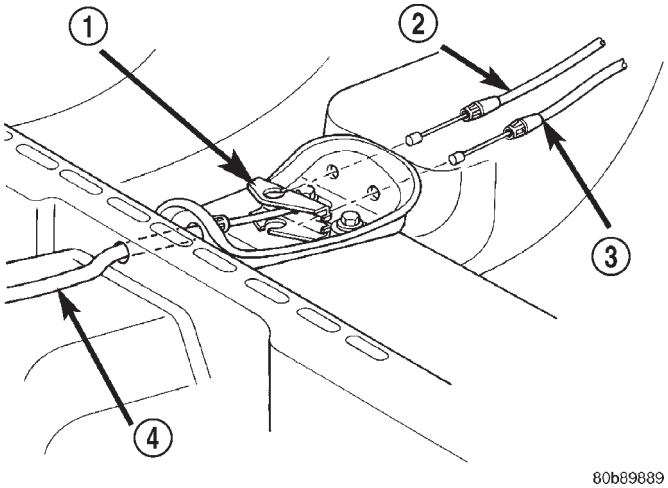


Fig. 76 Equalizer Bracket

1 - EQUALIZER
2 - RIGHT REAR CABLE
3 - LEFT REAR CABLE
4 - FRONT CABLE

CABLES (Continued)

(3) Push the cables into the upper suspension arm brackets.
(4) Install the cable retainer bolts to the rear spring pads.
(5) Install the ABS sensor wiring harness to the rear brake cables.
(6) Install the rotors, caliper anchors and brake calipers.
(7) Install the wheel and tire assemblies.
(8) Remove support and lower the vehicle.
(9) Engage the cable ends into the parking brake equalizer.
(10) Pull on the lever to release the lock out spring.
(11) Install center console, (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).
(12) Fold down the rear carpet cover and rear seat.
(13) Verify parking brake operation.

LEVER

REMOVAL

(1) Remove center console,(Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
(2) Lift up rear seat and carpet covering the parking brake cables.
(3) Place a screw driver through the front cable eyelet (Fig. 77) and pry back on the front cable.

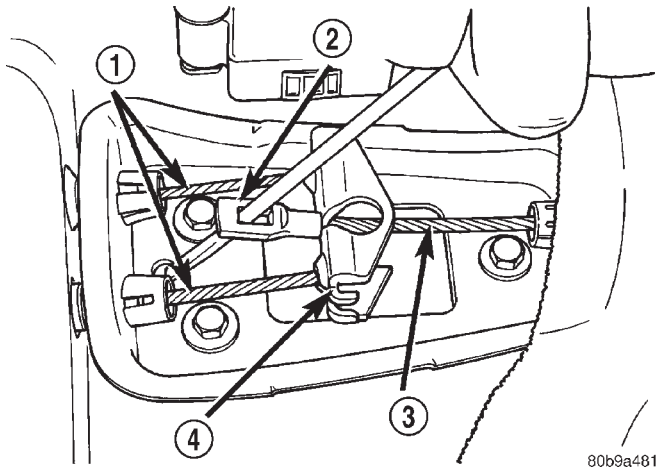


Fig. 77 FRONT CABLE

1 - REAR CABLES
2 - FRONT CABLE EYELET
3 - FRONT CABLE
4 - EQUALIZER

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 78) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

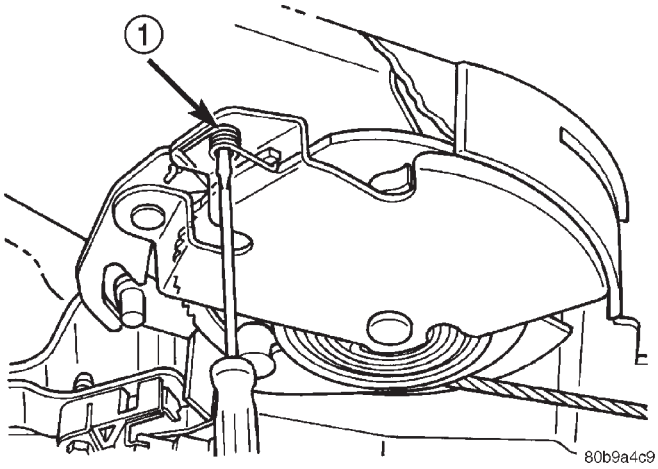


Fig. 78 Lock Out Spring

1 - LOCK OUT SPRING

(5) Disconnect parking brake switch wiring connector.
(6) Disengage front cable end from parking brake lever.
(7) Compress the cable retainer with a 13 mm wrench (Fig. 79) and remove the cable from the parking brake lever bracket.

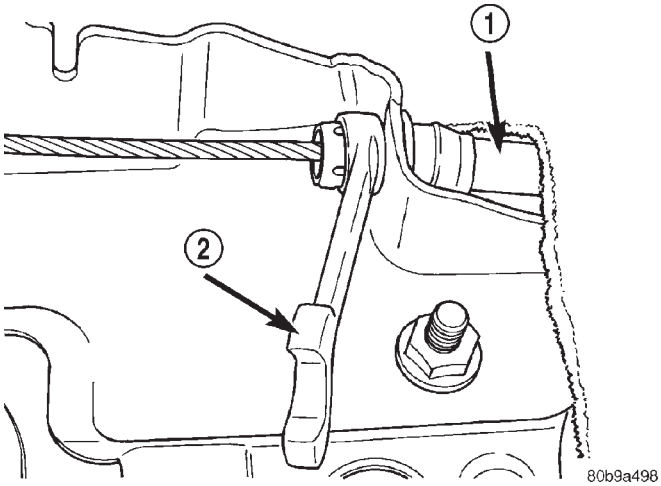


Fig. 79 Parking Brake Lever Bracket

1 - FRONT CABLE
2 - WRENCH

LEVER (Continued)

(8) Remove the park brake lever mounting nuts and console bracket (Fig. 80).

(9) Lift the lever assembly off the mounting studs and pull the front cable out of the lever bracket.

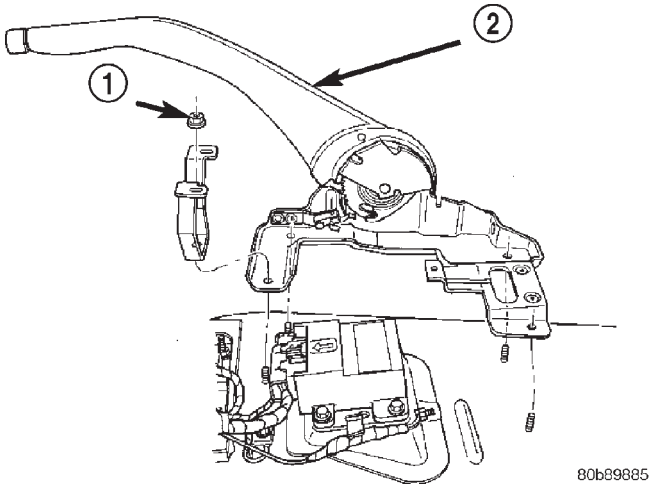


Fig. 80 Parking Brake Lever Mounting

1 - MOUNTING NUT
2 - PARK BRAKE LEVER

INSTALLATION

(1) Install the lever assembly on the mounting studs while feeding the front cable into the lever bracket.

(2) Install the console bracket (Fig. 80) and mounting nuts.

(3) Engage the front cable end to the lever.

(4) Connect parking brake switch wire connector.

(5) Pull on the lever to release the lock out spring.

(6) Install center console,(Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(7) Fold down the rear carpet cover and rear seat.

SHOES

REMOVAL

(1) Lock out park brake lever (Fig. 81).

(2) Raise vehicle.

(3) Remove rear wheel and tire assembly.

(4) Remove caliper and anchor as an assembly.

(5) Remove rubber access plug from back of rear disc brake splash shield.

(6) If necessary retract parking brake shoes with brake adjuster tool (Fig. 82). Position tool at top of star wheel and rotate wheel.

(7) Remove rotor from axle hub flange.

(8) Remove the lower shoe to shoe spring/adjuster spring with needle nose pliers (Fig. 83).

(9) Remove the upper shoe to shoe spring/return spring with brake pliers (Fig. 84).

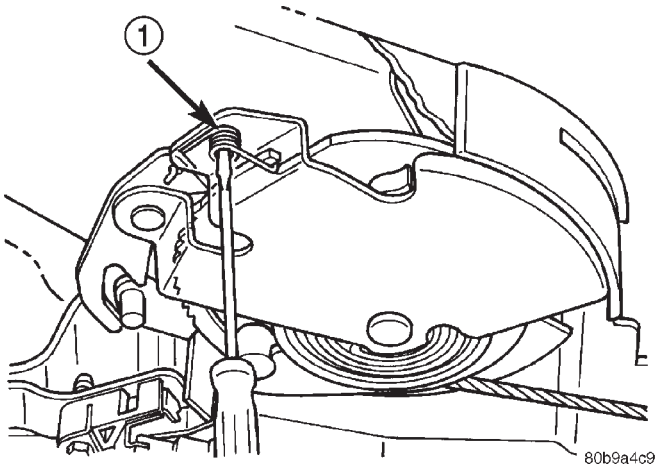


Fig. 81 Lock Out Spring

1 - LOCK OUT SPRING

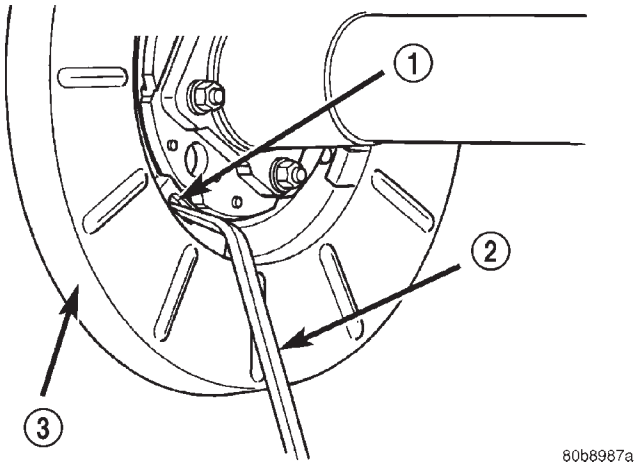


Fig. 82 Retracting Parking Brake Shoes

1 - ACCESS HOLE
2 - BRAKE ADJUSTING TOOL
3 - SPLASH SHIELD

(10) Remove shoe hold-down clips and pins (Fig. 85). Clip is held in place by pin which fits in clip notch. To remove clip, first push clip ends together and slide clip until head of pin clears narrow part of notch. Then remove clip and pin.

(11) Remove shoes and adjuster.

INSTALLATION

(1) Install shoes on splash shield with hold down clips and pins. Be sure shoes are properly engaged in the park brake actuator.

(2) Lubricate and install adjuster screw assembly. Be sure notched ends of screw assembly are properly seated on shoes and that star wheel is aligned with access hole in shield.

SHOES (Continued)

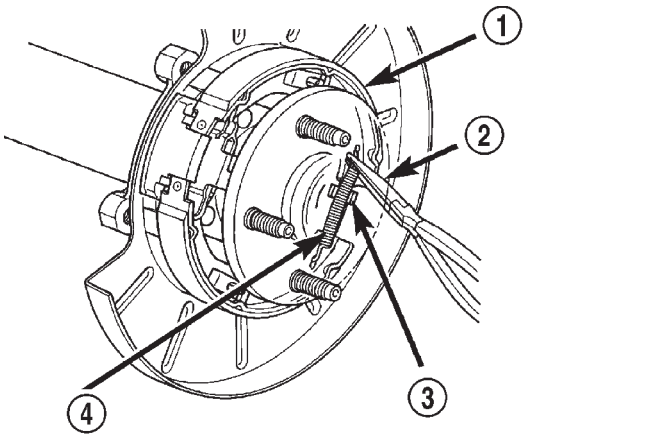


Fig. 83 Lower Spring

1 - REAR SHOE
2 - NEEDLENOSE PLIERS
3 - ADJUSTER SCREW
4 - LOWER SPRING

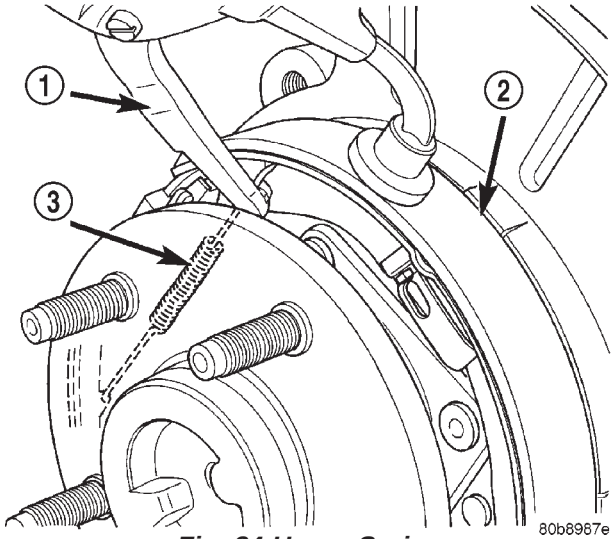


Fig. 84 Upper Spring

1 - BRAKE PLIERS
2 - REAR SHOE
3 - UPPER SPRING

(3) Install lower shoe to shoe spring/adjuster spring. Needle nose pliers can be used to connect spring to each shoe.

(4) Install the upper shoe to shoe spring/return spring with brake pliers (Fig. 83).

(5) Install rotor and caliper anchor assembly.

(6) Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).

(7) Actuate park brake lever to unlock the park brake system.

(8) Adjust the parking brake shoes (Fig. 82).

(9) Install wheel and tire assembly.

(10) Lower vehicle and verify correct parking brake operation.

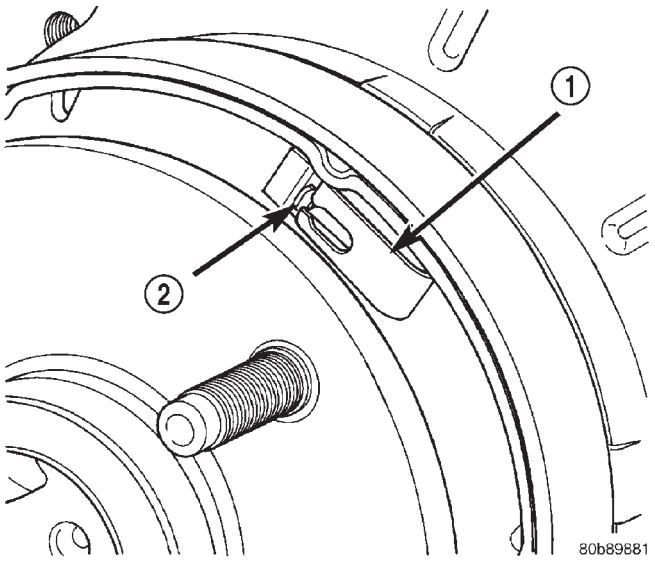


Fig. 85 Hold-Down Clip And Pin

1 - HOLD-DOWN CLIP
2 - HOLD-DOWN PIN

ADJUSTMENTS - PARKING BRAKE SHOE

(1) Remove wheel and tire assemblies.

(2) Secure rotor with two wheel nuts.

(3) Remove rubber access plug from back of splash shield.

(4) Insert brake tool through access hole in splash shield (Fig. 86). Position tool at bottom of star wheel.

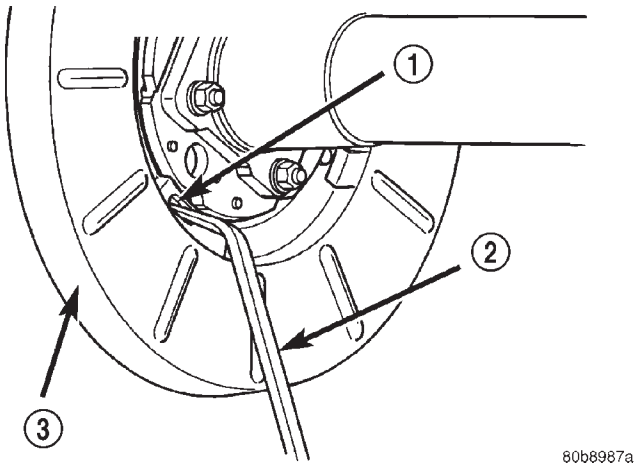


Fig. 86 Park Brake Shoe Adjustment

1 - ACCESS HOLE
2 - BRAKE ADJUSTING TOOL
3 - SPLASH SHIELD

(5) Rotate star wheel upward direction to expand shoes (while facing front of vehicle).

(6) Expand shoes until light drag is experienced. Then back off adjuster screw only enough to eliminate drag.

(7) Install plug in splash shield access hole.

(8) Install wheel and tire assemblies.

BRAKES - ABS

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BRAKES - ABS

DESCRIPTION

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The hydraulic system is a three channel design. The front brakes are controlled individually and the rear brakes in tandem.

The ABS electrical system is separate from other vehicle electrical circuits. A separate controller operates the system.

OPERATION

The antilock CAB activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching 20 to 30 percent of actual vehicle speed during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

Battery voltage is supplied to the CAB ignition terminal when the ignition switch is turned to Run position. The CAB performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 30 kph (18 mph). During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning light and registers a fault code in the microprocessor memory.

ANTILOCK BRAKING

The antilock system prevents lockup during high slip conditions by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a high slip condition activates the CAB antilock program.

Two solenoid valves are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels.

The solenoid valves are not static during antilock braking. They are cycled continuously to modulate pressure. Solenoid cycle time in antilock mode can be measured in milliseconds.

DIAGNOSIS AND TESTING - ANTILOCK BRAKES

The ABS brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the systems input and output circuits to verify the system is operating correctly. If the on board diagnostic system senses that a circuit is malfunctioning the system will set a trouble code in its memory.

NOTE: An audible noise may be heard during the self-test. This noise should be considered normal.

NOTE: The MDS or DRB III scan tool is used to diagnose the ABS system. For additional information refer to the Electrical section. For test procedures refer to the Chassis Diagnostic Manual.

STANDARD PROCEDURE - BLEEDING ABS BRAKE SYSTEM

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

(1) Perform base brake bleeding. (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(2) Connect scan tool to the Data Link Connector.

(3) Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.

(4) Perform base brake bleeding a second time. (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

(5) Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
G-Sensor Bolt	5.6	—	50
Hydraulic Control Unit/Controller Antilock Brakes Mounting Bolts	12	9	125
Hydraulic Control Unit/Controller Antilock Brakes Brake Lines	16	—	144
Hydraulic Control Unit/Controller Antilock Brakes CAB Screws	1.8	—	16
Wheel Speed Sensors Front Sensor Bolt	12-14	106-124	—
Wheel Speed Sensors Rear Sensor Bolt	12-14	106-124	—

ELECTRIC BRAKE

DESCRIPTION

The electronic brake distribution (EBD) functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

OPERATION

Upon entry into EBD the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the HCU resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This will continue until the required slip difference is obtained. At the end of EBD braking (no brake application) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on to prevent a hydraulic short circiut in case of another brake application.

The EBD will remain functional during many ABS fault modes. If the red and amber warning lamps are illuminated the EBD may have a fault.

FRONT WHEEL SPEED SENSOR

DESCRIPTION

A wheel speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors are mounted at the outboard end of the axle. Tone wheels are mounted to the outboard ends of the front and rear axle shafts. The gear type tone wheel serves as the trigger mechanism for each sensor.

OPERATION

The sensors convert wheel speed into a small digital signal. The CAB sends 12 volts to the sensors. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when the toothed tone wheel passes the wheel speed sensor. This digital signal is sent to the CAB. The CAB measures the voltage and amperage of the digital signal for each wheel.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the front wheel sensor mounting bolt (Fig. 1).

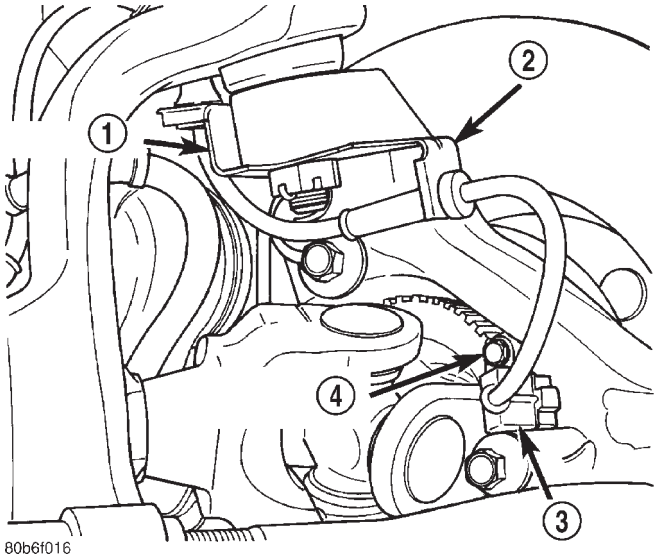


Fig. 1 Sensor Location

1 - BRACKET
2 - BRACKET
3 - WHEEL SPEED SENSOR
4 - MOUNTING BOLT

(3) Remove the sensor from the steering knuckle.

(4) Disengage the sensor wire from the brackets (Fig. 1)on the steering knuckle.

(5) Disconnect the sensor from the sensor harness (Fig. 2)and (Fig. 3).

(6) Remove the sensor and wire.

INSTALLATION

(1) Install the sensor on the steering knuckle.

(2) Apply Mopar Lock N' Seal or Loctite® 242 to the sensor mounting bolt. Use new sensor bolt if original bolt is worn or damaged.

(3) Install the sensor mounting bolt and tighten bolt to 12-14 N·m (106-124 in. lbs.).

(4) Engage the grommets on the sensor wire to the steering knuckle brackets.

(5) Connect the sensor wire to the harness connector.

(6) Check the sensor wire routing. Be sure the wire is clear of all chassis components and is not twisted or kinked at any spot.

(7) Remove the support and lower vehicle.

FRONT WHEEL SPEED SENSOR (Continued)

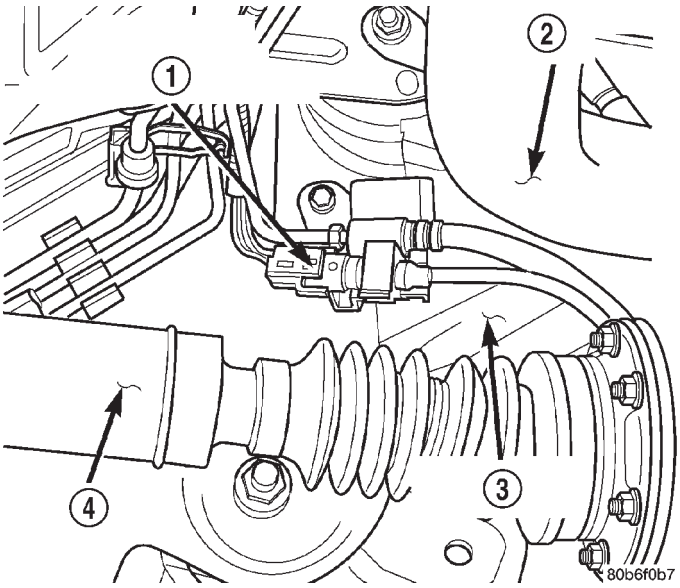


Fig. 2 Left Sensor Connector

1 - LEFT FRONT WHEEL SPEED SENSOR CONNECTOR
2 - ENGINE EXHAUST PIPE
3 - LEFT FRONT FRAME RAIL
4 - FRONT DRIVESHAFT

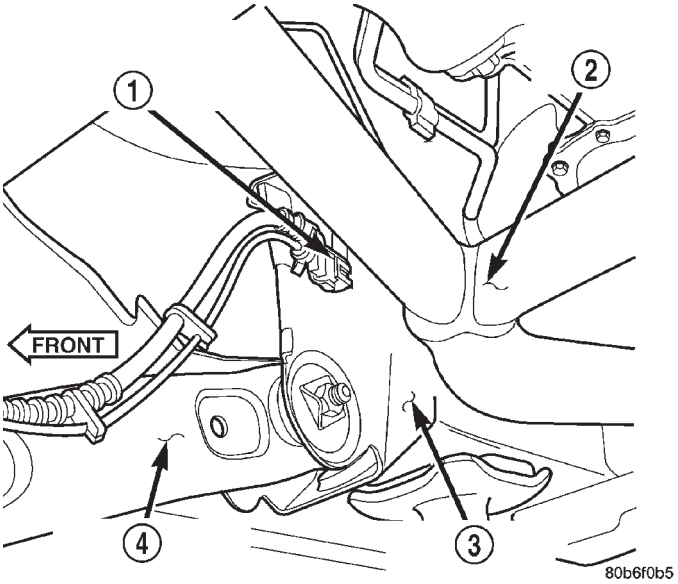


Fig. 3 Right Sensor Connector

1 - RIGHT FRONT WHEEL SPEED SENSOR CONNECTOR
2 - ENGINE EXHAUST Y-PIPE
3 - RIGHT FRONT FRAME RAIL
4 - RIGHT LOWER SUSPENSION ARM

G-SWITCH

DESCRIPTION

The G-switch (Fig. 4) is located under the rear seat. The switch has directional arrow and must be mounted with the arrow pointing towards the front of the vehicle.

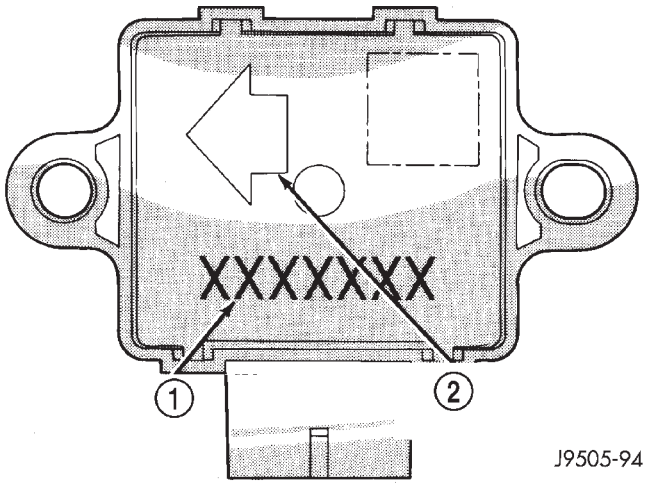


Fig. 4 G-Switch

1 - SWITCH PART NUMBER
2 - ARROW INDICATES FRONT OF SWITCH FOR PROPER MOUNTING

OPERATION

The switch is monitored by the CAB at all times. The switch contains three mercury switches which monitor vehicle deceleration rates (G-force). Sudden changes in deceleration rates trigger the switch, sending a signal to the CAB.

REMOVAL

(1) Fold the rear seat bottom assembly up for access to the switch.

(2) Lift up the carpeting and disconnect the switch harness (Fig. 5).

(3) Remove the switch mounting bolts and remove the switch.

INSTALLATION

CAUTION: The mercury switch (inside the G-Switch), will not function properly if the switch is installed incorrectly. Verify that the switch locating arrow is pointing to the front of the vehicle (Fig. 6).

(1) Note the position of the locating arrow on the switch. Position the switch so the arrow faces forward.

(2) Install the switch and tighten the mounting bolts to 5.6 N·m (50 in. lbs.).

G-SWITCH (Continued)

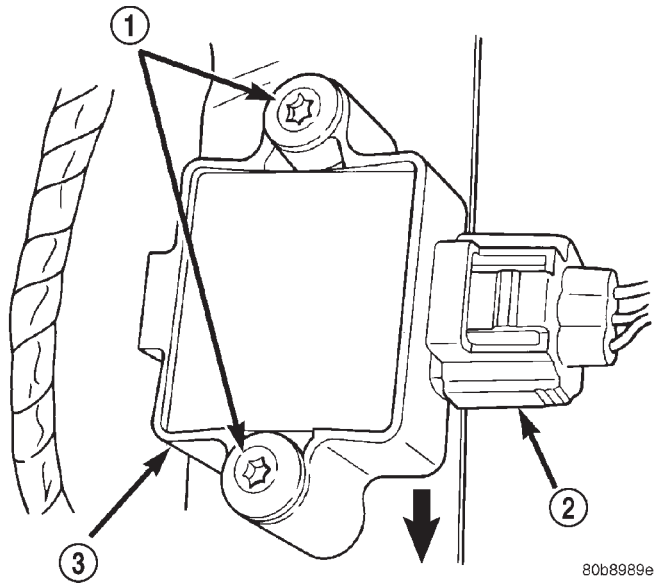


Fig. 5 G-Switch Mounting

1 - MOUNTING BOLTS
2 - CONNECTOR
3 - G-SWITCH

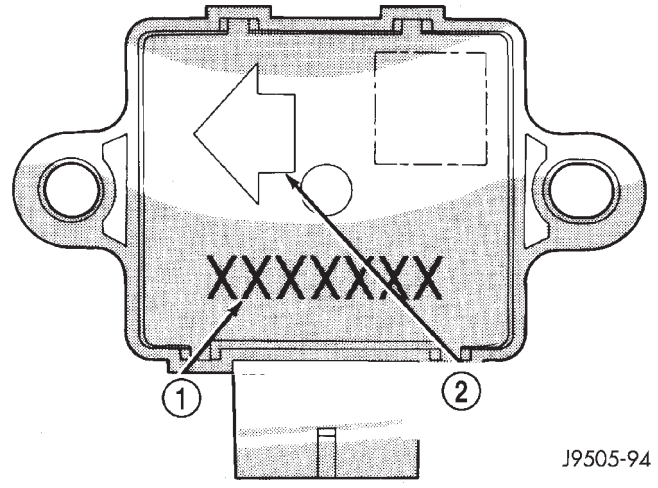


Fig. 6 G-Switch

1 - SWITCH PART NUMBER
2 - ARROW INDICATES FRONT OF SWITCH FOR PROPER MOUNTING

(3) Connect the harness to the switch. Be sure the harness connector is firmly seated.

(4) Place the carpet in position and fold the rear seat back down.

REAR WHEEL SPEED SENSOR

DESCRIPTION

A wheel speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors are mounted at the outboard end of the axle. Tone wheels are mounted to the outboard ends of the front and rear axle shafts. The gear type tone wheel serves as the trigger mechanism for each sensor.

OPERATION

The sensors convert wheel speed into a small digital signal. The CAB sends 12 volts to the sensors. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when the toothed tone wheel passes the wheel speed sensor. This digital signal is sent to the CAB. The CAB measures the voltage and amperage of the digital signal for each wheel.

REMOVAL

(1) Raise and fold the rear seat forward. Then move the carpeting aside for access to the rear sensor connectors.

(2) Disconnect the rear sensor wire at the harness connectors (Fig. 7).

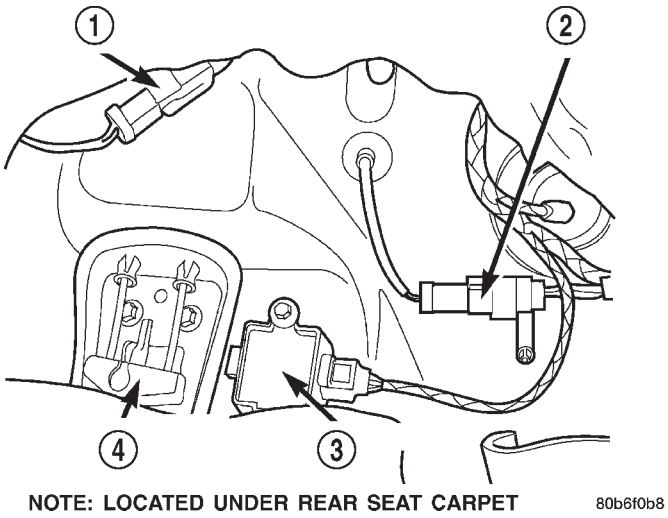


Fig. 7 Rear Sensor Connector

1 - RIGHT REAR WHEEL SPEED SENSOR CONNECTOR
2 - LEFT REAR WHEEL SPEED SENSOR CONNECTOR
3 - G-SWITCH SENSOR
4 - PARKING BRAKE CABLES

(3) Push the sensor wires and grommets through the floorpan holes.

(4) Raise and support the vehicle.

(5) Disengage the sensor wire from the axle and the chassis brackets and from the brake line retainers.

(6) Remove the sensor mounting bolt from the rear brake backing plate. (Fig. 8).

(7) Remove the sensor from the backing plate.

REAR WHEEL SPEED SENSOR (Continued)

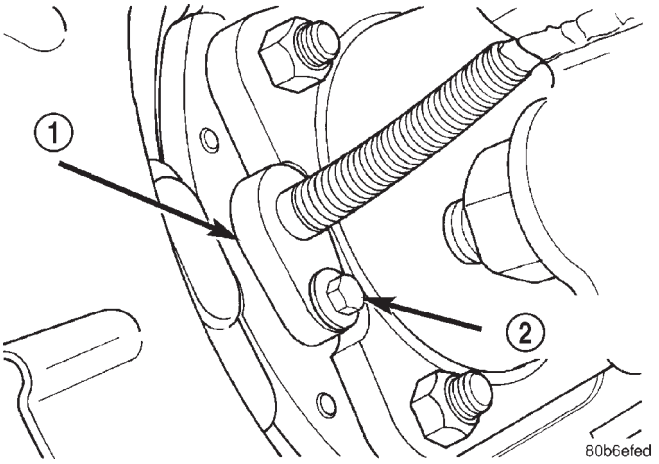


Fig. 8 Sensor Mounting Bolt

1 - WHEEL SPEED SENSOR
2 - MOUNTING BOLT

INSTALLATION

(1) Insert the sensor through the backing plate (Fig. 9).

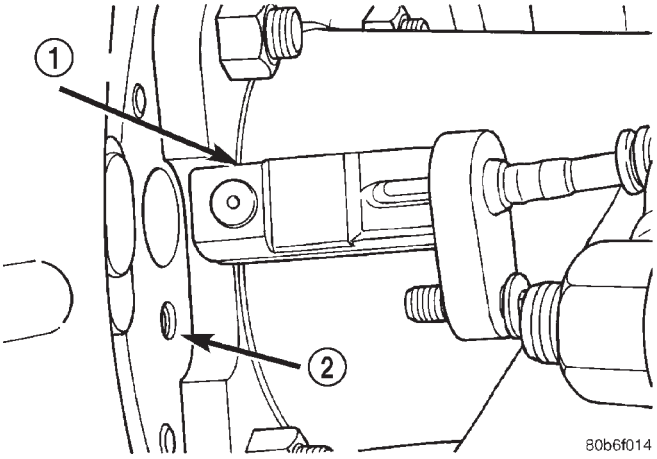


Fig. 9 Wheel Speed Sensor

1 - WHEEL SPEED SENSOR
2 - BACKING PLATE

(2) Apply Mopar Lock N' Seal or Loctite 242® to the original sensor bolt. Use a new bolt if the original is worn or damaged.

(3) Tighten the sensor bolt to 12-14 N·m (106-124 in. lbs.).

(4) Secure the sensor wire in the brackets and the retainers on the rear brake lines. Verify that the sensor wire is secure and clear of the rotating components.

(5) Route the sensor wires to the rear seat area.

(6) Feed the sensor wires the through floorpan access hole and seat the sensor grommets into the floorpan.

(7) Remove the support and lower the vehicle.

(8) Fold the rear seat and carpet forward for access to the sensor wires and connectors.

(9) Connect the sensor wires to the harness connectors.

(10) Reposition the carpet and fold the rear seat down.

HCU (HYDRAULIC CONTROL UNIT)

DESCRIPTION

The HCU consists of a valve body, pump motor, and wire harness.

OPERATION

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump is used to clear the accumulator of brake fluid and is operated by a DC type motor. The motor is controlled by the CAB.

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

HCU (HYDRAULIC CONTROL UNIT) (Continued)

PRESSURE HOLD

Both solenoid valves are closed in the pressure hold cycle. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

REMOVAL

(1) Remove the negative battery cable from the battery.

(2) Remove the air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Pull the CAB harness connector release up and remove connector (Fig. 10).

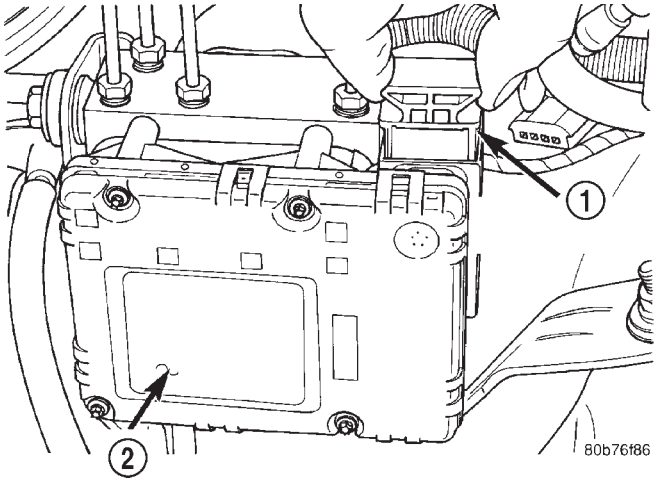


Fig. 10 CAB Connector Release

1 - CONNECTOR RELEASE
2 - CAB

(4) Remove the brake lines from the HCU.

(5) Remove the HCU/CAB side mounting bolt and the two rear mounting bolts. (Fig. 11).

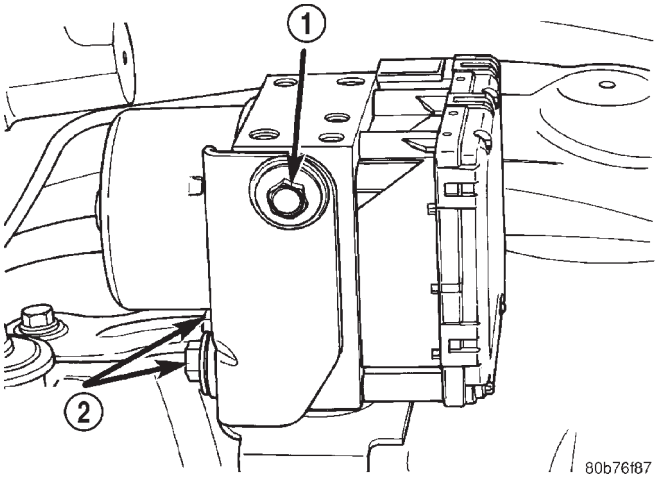


Fig. 11 HCU/CAB Assembly

1 - SIDE MOUNTING BOLT
2 - REAR MOUNTING BOLTS

(6) Remove the HCU/CAB assembly from the vehicle.

INSTALLATION

(1) Install HCU/CAB assembly into the mounting bracket and tighten mounting bolts to 12 N·m (9 ft. lbs.).

(2) Install the brake lines to the HCU and tighten to 16 N·m (12 ft. lbs.).

(3) Install CAB harness connector and push down connector release.

(4) Install air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(5) Install negative battery cable to the battery.

(6) Bleed base and ABS brake systems,(Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).

COOLING

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COOLING

DESCRIPTION

DESCRIPTION - COOLING SYSTEM 4.7L ENGINE

The cooling system consists of the following items:
- Hydraulic cooling fan and fan drive assembly
- Radiator
- Power steering oil cooler
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps

DESCRIPTION - COOLING SYSTEM ROUTING 4.7L ENGINE

For cooling system routing refer to (Fig. 1).

DESCRIPTION—COOLING SYSTEM 4.0L ENGINE

The cooling system consists of:
- A radiator
- Mechanical Cooling Fan
- Thermal viscous fan drive-Low disengaged
- Fan shroud (Fig. 2)
- Radiator pressure cap
- Thermostat
- Coolant reserve/overflow system
- Transmission oil cooler (if equipped with an automatic transmission)
- Coolant
- Water pump
- Hoses and hose clamps
- Accessory drive belt

DESCRIPTION—COOLING SYSTEM ROUTING 4.0L ENGINE

For cooling system routing refer to (Fig. 3).

DESCRIPTION—HOSE CLAMPS

The cooling system utilizes both worm drive and spring type hose clamps. If a spring type clamp

COOLING (Continued)

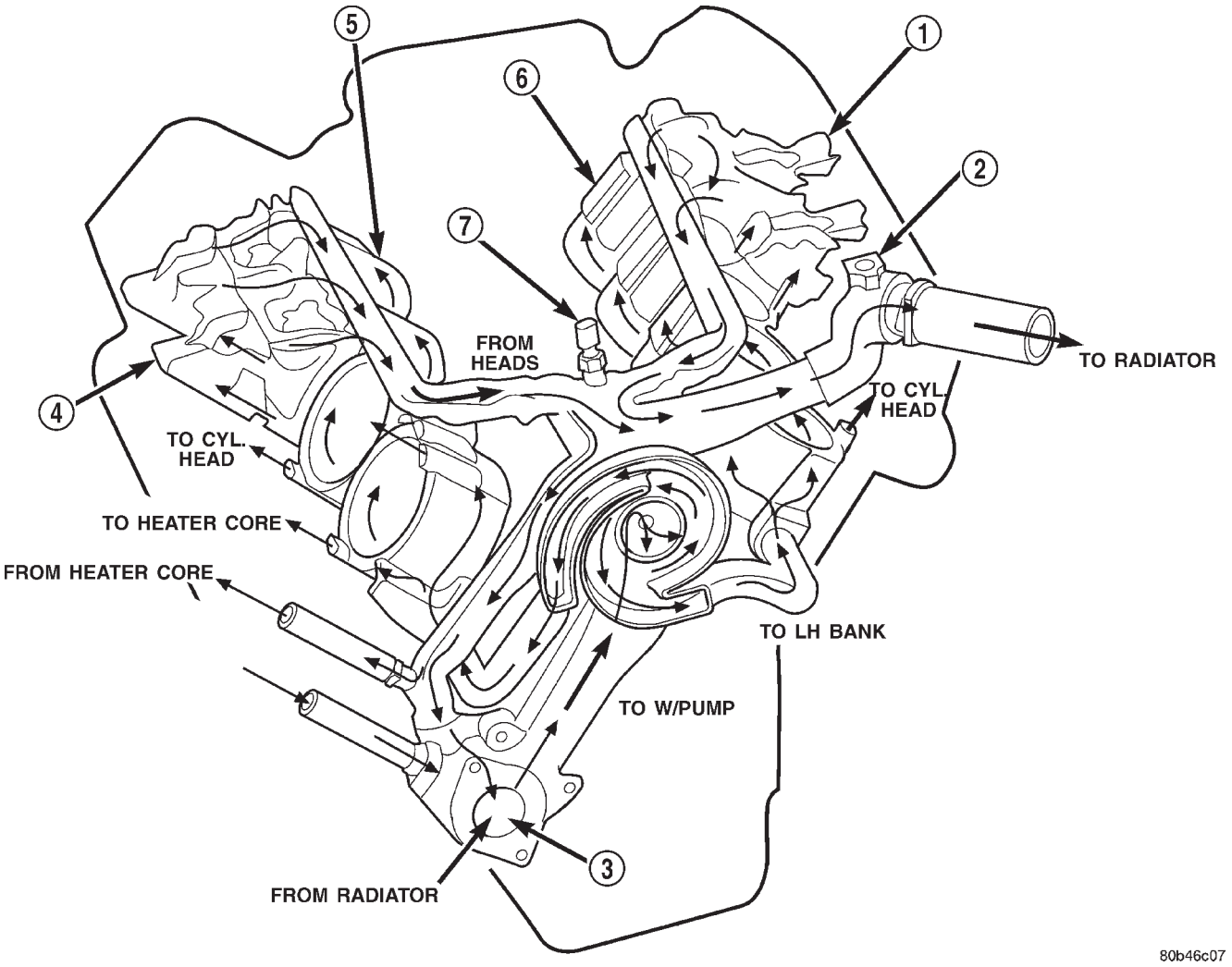


Fig. 1 Engine Cooling System 4.7L Engine

1 - LH CYL. HEAD
2 - AIR BLEED
3 - THERMOSTAT LOCATION
4 - RH CYL. HEAD
5 - RH BANK CYL. BLOCK
6 - LH BANK CYL. BLOCK
7 - COOLANT TEMP. SENSOR

replacement is necessary, replace with the original Mopar® equipment spring type clamp.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only a original equipment clamp with matching number or letter (Fig. 4).

OPERATION

OPERATION—COOLING SYSTEM

The cooling system regulates engine operating temperature. It allows the engine to reach normal operating temperature as quickly as possible. It also maintains normal operating temperature and prevents overheating.

The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid (if equipped). The cooling system is pressurized and uses a centrifugal water pump to circulate coolant throughout the system.

OPERATION—HOSE CLAMPS

The worm type hose clamp uses a specified torque value to maintain proper tension on a hose connection.

COOLING (Continued)

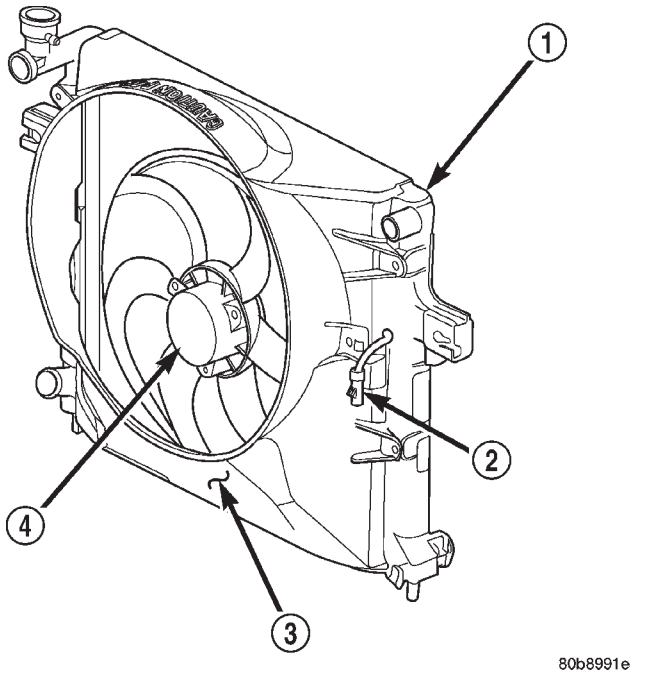


Fig. 2 Cooling Module with Electric Fan

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - ELECTRIC COOLING FAN

The spring type hose clamp applies constant tension on a hose connection. To remove a spring type hose clamp, only use constant tension clamp pliers designed to compress the hose clamp.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING—ON-BOARD DIAGNOSTICS (OBD)

COOLING SYSTEM RELATED DIAGNOSTICS

The powertrain control module (PCM) has been programmed to monitor certain cooling system components:

- If the engine has remained cool for too long a period, such as with a stuck open thermostat, a Diagnostic Trouble Code (DTC) can be set.
- If an open or shorted condition has developed in the relay circuit controlling the electric radiator fan or fan control solenoid circuit controling the hydraulic fan, a Diagnostic Trouble Code (DTC) can be set.

If the problem is sensed in a monitored circuit often enough to indicated an actual problem, a DTC is stored. The DTC will be stored in the PCM memory for eventual display to the service technician. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

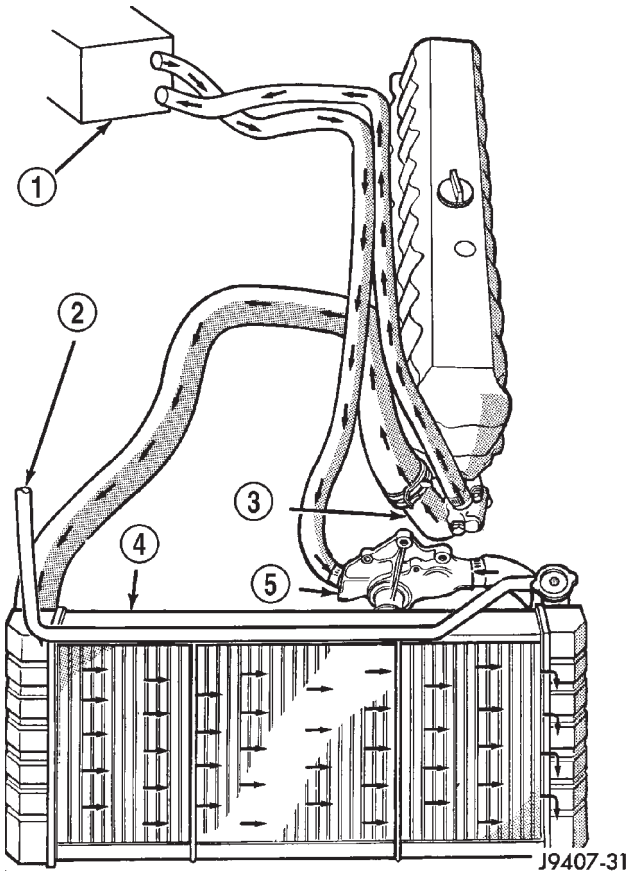


Fig. 3 Engine Cooling System—4.0L Engine—Typical

1 - HEATER CORE
2 - TO COOLANT RESERVE/OVERFLOW TANK
3 - THERMOSTAT HOUSING
4 - RADIATOR
5 - WATER PUMP

ACCESSING DIAGNOSTIC TROUBLE CODES

To read DTC's and to obtain cooling system data, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

ERASING TROUBLE CODES

After the problem has been repaired, use the DRB scan tool to erase a DTC. Refer to the appropriate Powertrain Diagnostic Procedures service information for operation of the DRB scan tool.

DIAGNOSIS AND TESTING—PRELIMINARY CHECKS

ENGINE COOLING SYSTEM OVERHEATING

Establish what driving conditions caused the complaint. Abnormal loads on the cooling system such as the following may be the cause:

- PROLONGED IDLE
- VERY HIGH AMBIENT TEMPERATURE

COOLING (Continued)

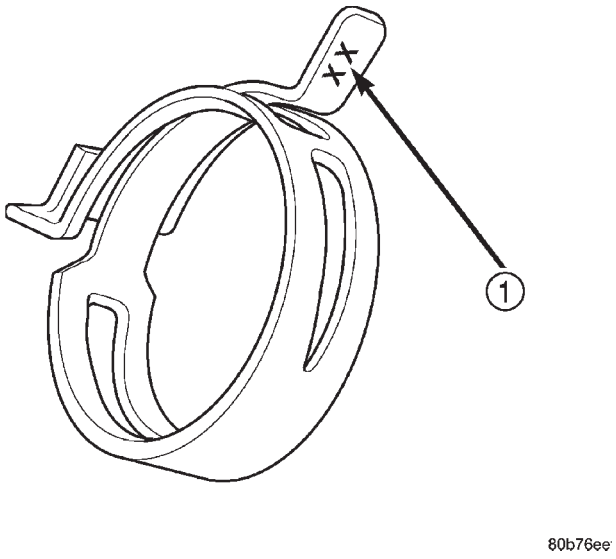


Fig. 4 Spring Clamp Size Location

1 - SPRING CLAMP SIZE LOCATION

- SLIGHT TAIL WIND AT IDLE
- SLOW TRAFFIC
- TRAFFIC JAMS
- HIGH SPEED
- STEEP GRADES

Driving techniques that avoid overheating are:

- Idle with A/C off when temperature gauge is at end of normal range.
- Increase engine speed for more air flow is recommended.

(1) TRAILER TOWING:

Consult Trailer Towing section of owners manual. Do not exceed limits.

(2) AIR CONDITIONING; ADD-ON OR AFTER MARKET:

A maximum cooling package should have been ordered with vehicle if add-on or after market A/C is installed. If not, maximum cooling system components should be installed for model involved per manufacturer's specifications.

(3) RECENT SERVICE OR ACCIDENT REPAIR:

Determine if any recent service has been performed on vehicle that may effect cooling system. This may be:

- Engine adjustments (incorrect timing)
- Slipping engine accessory drive belt(s)
- Brakes (possibly dragging)
- Changed parts. Incorrect water pump, or pump rotating in wrong direction due to belt not correctly routed
- Reconditioned radiator or cooling system refilling (possibly under filled or air trapped in system).

NOTE: If investigation reveals none of the previous items as a cause for an engine overheating complaint, refer to following Cooling System Diagnosis charts.

These charts are to be used as a quick-reference only. Refer to the group text for information.

COOLING (Continued)

DIAGNOSIS AND TESTING - COOLING SYSTEM DIAGNOSIS CHART

COOLING SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
TEMPERATURE GAUGE READS LOW	1. Has a Diagnostic Trouble Code (DTC) been set indicating a stuck open thermostat?	1. Refer to (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for On-Board Diagnostics and DTC information. Replace thermostat if necessary.
	2. Is the temperature sending unit connected?	2. Check the temperature sensor connector. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMP SENSOR - DESCRIPTION). Repair connector if necessary.
	3. Is the temperature gauge operating OK?	3. Check gauge operation. Repair as necessary.
	4. Coolant level low in cold ambient temperatures accompanied with poor heater performance.	4. Check coolant level in the coolant reserve/overflow tank and the radiator. Inspect system for leaks. Repair leaks as necessary.
	5. Improper operation of internal heater doors or heater controls.	5. Inspect heater and repair as necessary. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING)
TEMPERATURE GAUGE READS HIGH OR THE COOLANT LAMP ILLUMINATES. COOLANT MAY OR MAY NOT BE LOST OR LEAKING FROM THE COOLING SYSTEM	1. Trailer is being towed, a steep hill is being climbed, vehicle is operated in slow moving traffic, or engine is being idled with very high ambient (outside) temperatures and the air conditioning is on. Higher altitudes could aggravate these conditions.	1. This may be a temporary condition and repair is not necessary. Turn off the air conditioning and attempt to drive the vehicle without any of the previous conditions. Observe the temperature gauge. The gauge should return to the normal range. If the gauge does not return to the normal range, determine the cause for overheating and repair.
	2. Is the temperature gauge reading correctly?	2. Check gauge. (Refer to Group 8J - INSTRUMENT CLUSTER). Repair as necessary.
	3. Is the temperature warning illuminating unnecessarily?	3. Check warning lamp operation. (Refer to Group 8J - INSTRUMENT CLUSTER).Repair as necessary.
	4. Coolant low in coolant reserve/ overflow tank and radiator?	4. Check for coolant leaks and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	5. Pressure cap not installed tightly. If cap is loose, boiling point of coolant will be lowered. Also refer to the following Step 6.	5. Tighten cap

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	6. Poor seals at the radiator cap.	6. (a) Check condition of cap and cap seals. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING).
		(b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.
	7. Coolant level low in radiator but not in coolant reserve/overflow tank. This means the radiator is not drawing coolant from the coolant reserve/overflow tank as the engine cools	7. (a) Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/ RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING).
		(b) Check condition of radiator filler neck. If neck is bent or damaged, replace radiator.
		(c) Check condition of the hose from the radiator to the coolant tank. It should fit tight at both ends without any kinks or tears. Replace hose if necessary.
		(d) Check coolant reserve/overflow tank and tanks hoses for blockage. Repair as necessary.
	8. Incorrect coolant concentration	8. Check coolant. (Refer to 7 - COOLING/ ENGINE/COOLANT - DESCRIPTION) for correct coolant/water mixture ratio.
	9. Coolant not flowing through system	9. Check for coolant flow at radiator filler neck with some coolant removed, engine warm and thermostat open. Coolant should be observed flowing through radiator. If flow is not observed, determine area of obstruction and repair as necessary.
	10. Radiator or A/C condenser fins are dirty or clogged.	10. Remove insects and debris. (Refer to 7 - COOLING/ENGINE/RADIATOR - CLEANING).
	11. Radiator core is corroded or plugged.	11. Have radiator re-cored or replaced.
	12. Aftermarket A/C installed without proper radiator.	12. Install proper radiator.
	13. Fuel or ignition system problems.	13. Refer to FUEL and /or IGNITION CONTROL for diagnosis.
	14. Dragging brakes.	14. Check and correct as necessary. (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING) for correct procedures.
	15. Bug screen or cardboard is being used, reducing airflow.	15. Remove bug screen or cardboard.
	16. Thermostat partially or completely shut.	16. Check thermostat operation and replaces necessary. (Refer to 7 - COOLING/ENGINE/ ENGINE COOLANT THERMOSTAT - DIAGNOSIS AND TESTING).

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	17. Viscous fan drive not operating properly.	17. Check fan drive operation and replace as necessary. (Refer to 7 - COOLING/ENGINE/ FAN DRIVE VISCOUS CLUTCH - DIAGNOSIS AND TESTING).
	18. Cylinder head gasket leaking.	18. Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). For repair, (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
	19. Heater core leaking.	19. Check heater core for leaks. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/HEATER CORE - REMOVAL). Repair as necessary.
	20. Hydraulic fan speed too low or inopertive.	20. Check for DTC code. Check fan operation speeds. Refer to fan speed operation table. Low power steering pump output. Refer to power steering pump diagnosis - 4.7L engine.
TEMPERATURE GAUGE READING IS INCONSISTENT (FLUCTUATES, CYCLES OR IS ERRATIC)	1. During cold weather operation, with the heater blower in the high position, the gauge reading may drop slightly.	1. A normal condition. No correction is necessary.
	2. Temperature gauge or engine mounted gauge sensor defective or shorted. Also, corroded or loose wiring in this circuit.	2. Check operation of gauge and repair if necessary. Refer to Group 8J, Instrument cluster.
	3. Gauge reading rises when vehicle is brought to a stop after heavy use (engine still running)	3. A normal condition. No correction is necessary. Gauge should return to normal range after vehicle is driven.
	4. Gauge reading high after re-starting a warmed up (hot) engine.	4. A normal condition. No correction is necessary. The gauge should return to normal range after a few minutes of engine operation.
	5. Coolant level low in radiator (air will build up in the cooling system causing the thermostat to open late).	5. Check and correct coolant leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	6. Cylinder head gasket leaking allowing exhaust gas to enter cooling system causing a thermostat to open late.	6. (a) Check for cylinder head gasket leaks. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING). (b) Check for coolant in the engine oil. Inspect for white steam emitting from the exhaust system. Repair as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	7. Water pump impeller loose on shaft.	7. Check water pump and replace as necessary. (Refer to 7 - COOLING/ENGINE/ WATER PUMP - DIAGNOSIS AND TESTING).
	8. Loose accessory drive belt. (water pump slipping)	8. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - DIAGNOSIS AND TESTING). Check and correct as necessary.
	9. Air leak on the suction side of the water pump allows air to build up in cooling system causing thermostat to open late.	9. Locate leak and repair as necessary.
PRESSURE CAP IS BLOWING OFF STEAM AND/OR COOLANT TO COOLANT TANK. TEMPERATURE GAUGE READING MAY BE ABOVE NORMAL BUT NOT HIGH. COOLANT LEVEL MAY BE HIGH IN COOLANT RESERVE/ OVERFLOW TANK	1. Pressure relief valve in radiator cap is defective.	1. Check condition of radiator cap and cap seals. (Refer to 7 - COOLING/ENGINE/ RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace cap as necessary.
COOLANT LOSS TO THE GROUND WITHOUT PRESSURE CAP BLOWOFF. GAUGE READING HIGH OR HOT	1. Coolant leaks in radiator, cooling system hoses, water pump or engine.	1. Pressure test and repair as necessary. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
DETONATION OR PRE-IGNITION (NOT CAUSED BY IGNITION SYSTEM). GAUGE MAY OR MAY NOT BE READING HIGH	1. Engine overheating.	1. Check reason for overheating and repair as necessary.
	2. Freeze point of coolant not correct. Mixture is too rich or too lean.	2. Check coolant concentration. (Refer to 7 - COOLING/ENGINE/COOLANT - DESCRIPTION) and adjust ratio as required.
HOSE OR HOSES COLLAPSE WHILE ENGINE IS RUNNING	1. Vacuum created in cooling system on engine cool-down is not being relieved through coolant reserve/ overflow system.	1. (a) Radiator cap relief valve stuck. (Refer to 7 - COOLING/ENGINE/RADIATOR PRESSURE CAP - DIAGNOSIS AND TESTING). Replace if necessary (b) Hose between coolant reserve/overflow tank and radiator is kinked. Repair as necessary. (c) Vent at coolant reserve/overflow tank is plugged. Clean vent and repair as necessary. (d) Reserve/overflow tank is internally blocked or plugged. Check for blockage and repair as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VISCOUS FAN/DRIVE	1. Fan blades loose - 4.0L.	1. Replace fan blade assembly. (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL)
	2. Fan blades striking a surrounding object.	2. Locate point of fan blade contact and repair as necessary.
	3. Air obstructions at radiator or air conditioning condenser.	3. Remove obstructions and/or clean debris or insects from radiator or A/C condenser.
	4. Thermal viscous fan drive has defective bearing - 4.0L	4. Replace fan drive. Bearing is not serviceable. (Refer to 7 - COOLING/ENGINE/ RADIATOR FAN - REMOVAL).
INADEQUATE HEATER PERFORMANCE.	1.Thermostat failed in open position	
	2. Has a Diagnostic trouble Code (DTC) been set?	2. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION) for correct procedures and replace thermostat if necessary
	3. Coolant level low	3. (Refer to 7 - COOLING - DIAGNOSIS AND TESTING).
	4. Obstructions in heater hose/ fittings	4. Remove heater hoses at both ends and check for obstructions
	5. Heater hose kinked	5. Locate kinked area and repair as necessary
	6. Water pump is not pumping water to/through the heater core. When the engine is fully warmed up, both heater hoses should be hot to the touch. If only one of the hoses is hot, the water pump may not be operating correctly or the heater core may be plugged. Accessory drive belt may be slipping causing poor water pump operation.	6. (Refer to 7 - COOLING/ENGINE/WATER PUMP - DIAGNOSIS AND TESTING). If a slipping belt is detected, (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL). If heater core obstruction is detected, (Refer to 7 - COOLING - STANDARD PROCEDURE) for cooling system reverse flushing.
STEAM IS COMING FROM THE FRONT OF VEHICLE NEAR THE GRILL AREA WHEN WEATHER IS WET, ENGINE IS WARMED UP AND RUNNING, AND VEHICLE IS STATIONARY. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. During wet weather, moisture (snow, ice or rain condensation) on the radiator will evaporate when the thermostat opens. This opening allows heated water into the radiator. When the moisture contacts the hot radiator, steam may be emitted. This usually occurs in cold weather with no fan or airflow to blow it away.	1. Occasional steam emitting from this area is normal. No repair is necessary.
COOLANT COLOR	1. Coolant color is not necessarily an indication of adequate corrosion or temperature protection. Do not rely on coolant color for determining condition of coolant.	1. (Refer to 7 - COOLING/ENGINE/ COOLANT - DESCRIPTION) for coolant concentration information. Adjust coolant mixture as necessary.

COOLING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
COOLANT LEVEL CHANGES IN COOLANT RESERVE/OVERFLOW TANK. TEMPERATURE GAUGE IS IN NORMAL RANGE	1. Level changes are to be expected as coolant volume fluctuates with engine temperature. If the level in the tank was between the FULL and ADD marks at normal operating temperature, the level should return to within that range after operation at elevated temperatures.	1. A normal condition. No repair is necessary.
FAN RUNS ALL THE TIME	1. Fan control sensors inoperative. 2. Fan control solenoid stuck ″on″. 3. Fan control solenoid harness damaged. 4. Transmission temperature too high. 5. Engine coolant temperature too high.	1. Check for DTC's. Verify sensor readings. 2. Check fan operation speeds. Refer to fan speed operation table. 3. Check for DTC 1499. Repair as required. 4. Check for transmission over temp. DTC. 5. (a) Check coolant level. Correct level as required. (b) Thermostat stuck. Replace thermostat. (c) Water pump failed. Replace water pump. (d) Coolant flow restricted. Clean radiator. (e) Air flow over radiator obstructed.Remove obstruction.

DIAGNOSIS AND TESTING - COOLING SYSTEM LEAKS

ULTRAVIOLET LIGHT METHOD

A leak detection additive is available through the parts department that can be added to cooling system. The additive is highly visible under ultraviolet light (black light). Pour one ounce of additive into cooling system. Place heater control unit in HEAT position. Start and operate engine until radiator upper hose is warm to touch. Aim the commercially available black light tool at components to be checked. If leaks are present, black light will cause additive to glow a bright green color.

The black light can be used in conjunction with a pressure tester to determine if any external leaks exist (Fig. 5).

PRESSURE TESTER METHOD

The engine should be at normal operating temperature. Recheck the system cold if cause of coolant loss is not located during the warm engine examination.

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING.

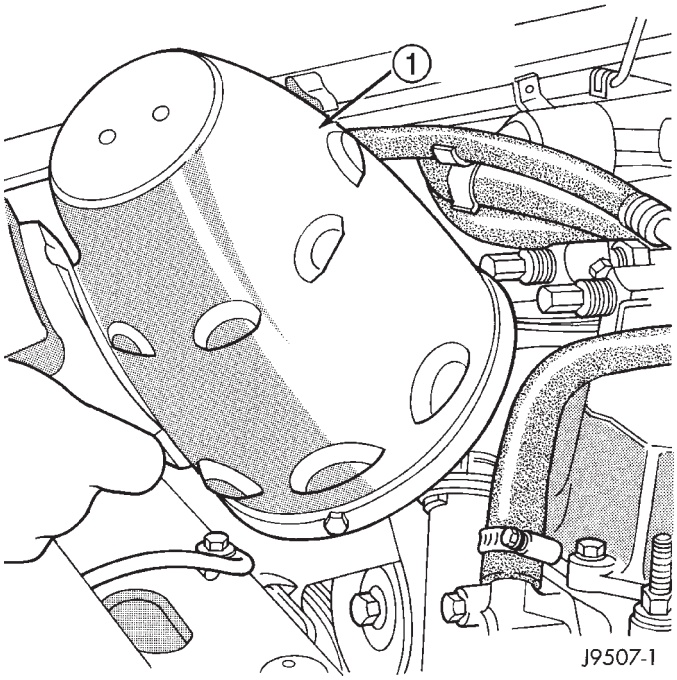


Fig. 5 Leak Detection Using Black Light—Typical

1 - TYPICAL BLACK LIGHT TOOL

COOLING (Continued)

Carefully remove radiator pressure cap from filler neck and check coolant level. Push down on cap to disengage it from stop tabs. Wipe inside of filler neck and examine lower inside sealing seat for nicks, cracks, paint, dirt and solder residue. Inspect radiator-to- reserve/overflow tank hose for internal obstructions. Insert a wire through the hose to be sure it is not obstructed.

Inspect cams on outside of filler neck. If cams are damaged, seating of pressure cap valve and tester seal will be affected.

Attach pressure tester (7700 or an equivalent) to radiator filler neck (Fig. 6).

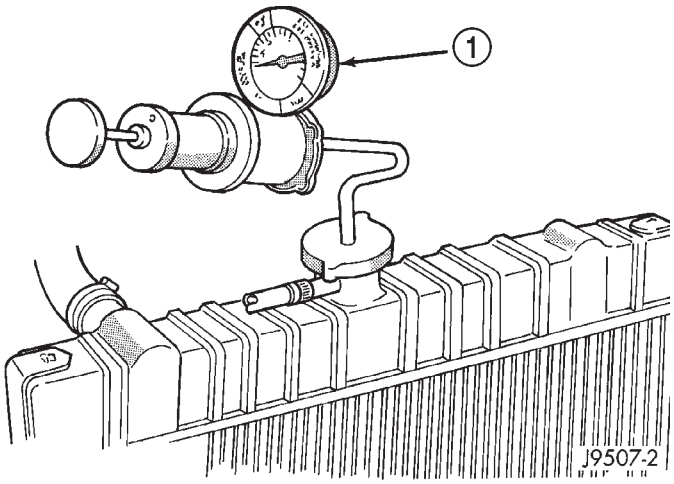


Fig. 6 Pressure Testing Cooling System—Typical

1 - TYPICAL COOLING SYSTEM PRESSURE TESTER

Operate tester pump to apply 103.4 kPa (15 psi) pressure to system. If hoses enlarge excessively or bulges while testing, replace as necessary. Observe gauge pointer and determine condition of cooling system according to following criteria:

Holds Steady: If pointer remains steady for two minutes, serious coolant leaks are not present in system. However, there could be an internal leak that does not appear with normal system test pressure. If it is certain that coolant is being lost and leaks cannot be detected, inspect for interior leakage or perform Internal Leakage Test.

Drops Slowly: Indicates a small leak or seepage is occurring. Examine all connections for seepage or slight leakage with a flashlight. Inspect radiator, hoses, gasket edges and heater. Seal small leak holes with a Sealer Lubricant (or equivalent). Repair leak holes and inspect system again with pressure applied.

Drops Quickly: Indicates that serious leakage is occurring. Examine system for external leakage. If leaks are not visible, inspect for internal leakage. Large radiator leak holes should be repaired by a reputable radiator repair shop.

INTERNAL LEAKAGE INSPECTION

Remove engine oil pan drain plug and drain a small amount of engine oil. If coolant is present in the pan, it will drain first because it is heavier than oil. An alternative method is to operate engine for a short period to churn the oil. After this is done, remove engine dipstick and inspect for water globules. Also inspect transmission dipstick for water globules and transmission fluid cooler for leakage.

WARNING: WITH RADIATOR PRESSURE TESTER TOOL INSTALLED ON RADIATOR, DO NOT ALLOW PRESSURE TO EXCEED 110 KPA (20 PSI). PRESSURE WILL BUILD UP QUICKLY IF A COMBUSTION LEAK IS PRESENT. TO RELEASE PRESSURE, ROCK TESTER FROM SIDE TO SIDE. WHEN REMOVING TESTER, DO NOT TURN TESTER MORE THAN 1/2 TURN IF SYSTEM IS UNDER PRESSURE.

Operate engine without pressure cap on radiator until thermostat opens. Attach a Pressure Tester to filler neck. If pressure builds up quickly it indicates a combustion leak exists. This is usually the result of a cylinder head gasket leak or crack in engine. Repair as necessary.

If there is not an immediate pressure increase, pump the Pressure Tester. Do this until indicated pressure is within system range of 110 kPa (16 psi). Fluctuation of gauge pointer indicates compression or combustion leakage into cooling system.

Because the vehicle is equipped with a catalytic converter, **do not** remove spark plug cables or short out cylinders to isolate compression leak.

If the needle on dial of pressure tester does not fluctuate, race engine a few times to check for an abnormal amount of coolant or steam. This would be emitting from exhaust pipe. Coolant or steam from exhaust pipe may indicate a faulty cylinder head gasket, cracked engine cylinder block or cylinder head.

A convenient check for exhaust gas leakage into cooling system is provided by a commercially available Block Leak Check tool. Follow manufacturers instructions when using this product.

COMBUSTION LEAKAGE TEST - WITHOUT PRESSURE TESTER

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: DO NOT REMOVE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Drain sufficient coolant to allow thermostat removal. (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Remove

COOLING (Continued)

accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

Add coolant to radiator to bring level to within 6.3 mm (1/4 in) of top of thermostat housing.

CAUTION: Avoid overheating. Do not operate engine for an excessive period of time. Open draincock immediately after test to eliminate boil over.

Start engine and accelerate rapidly three times, to approximately 3000 rpm while observing coolant. If internal engine combustion gases are leaking into cooling system, bubbles will appear in coolant. If bubbles do not appear, internal combustion gas leakage is not present.

DIAGNOSIS AND TESTING - COOLING SYSTEM DEAERATION

As the engine operates, any air trapped in cooling system gathers under the radiator cap. The next time the engine is operated, thermal expansion of coolant will push any trapped air past radiator cap into the coolant reserve/overflow tank. Here it escapes to the atmosphere into the tank. When the engine cools down the coolant, it will be drawn from the reserve/overflow tank into the radiator to replace any removed air.

STANDARD PROCEDURE

STANDARD PROCEDURE—DRAINING COOLING SYSTEM 4.7L ENGINE

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS (Fig. 7) OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) DO NOT remove radiator cap first. With engine cold, raise vehicle on a hoist and locate radiator draincock.

NOTE: Radiator draincock is located on the left/lower side of radiator facing to rear of vehicle.

(2) Attach one end of a hose to the draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator. This will empty the coolant reserve/overflow tank. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture. When tank is empty, remove radiator cap and continue draining cooling system.

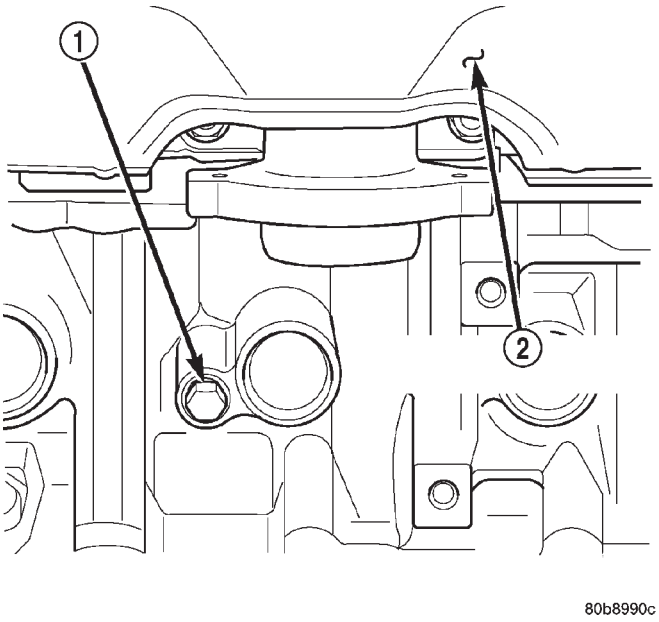


Fig. 7 Drain Plug—4.7L Engine

1 - CYLINDER BLOCK DRAIN PLUG
2 - EXHAUST MANIFOLD AND HEAT SHIELD

STANDARD PROCEDURE - REFILLING COOLING SYSTEM 4.7L ENGINE

(1) Tighten the radiator draincock and the cylinder block drain plug(s) (if removed).

CAUTION: Failure to purge air from the cooling system can result in an overheating condition and severe engine damage.

(2) Remove the cooling system bleed plug from the radiator upper hose inlet housing. (Fig. 8)Fill system using a 50/50 mixture of ethylene-glycol antifreeze and low mineral content water, until coolant begains coming out of the cooling system bleed hole. Install the cooling system bleed plug. Fill radiator to top and install radiator cap. Add sufficient coolant to the reserve/overflow tank to raise level to FULL mark.

(3) With heater control unit in the HEAT position, operate engine with radiator cap in place.

(4) After engine has reached normal operating temperature, shut engine off and allow it to cool. When engine is cooling down, coolant will be drawn into the radiator from the reserve/overflow tank.

(5) Add coolant to reserve/overflow tank as necessary. **Only add coolant to the reserve/overflow tank when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.** To purge the cooling system of all air, this heat up/cool down cycle (adding coolant to cold engine) must be performed three times. Add necessary coolant to raise tank level to the FULL mark after each cool down period.

COOLING (Continued)

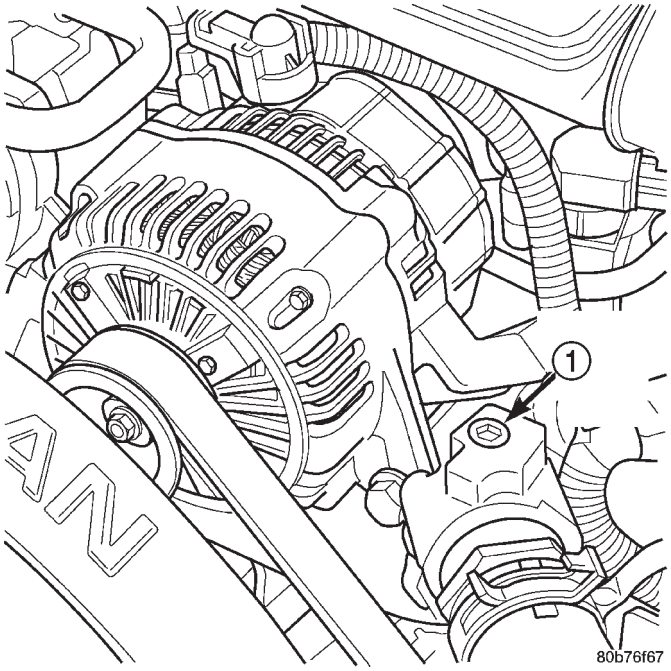


Fig. 8 Cooling System Bleed Plug - 4.7L

1 - COOLING SYSTEM BLEED PLUG

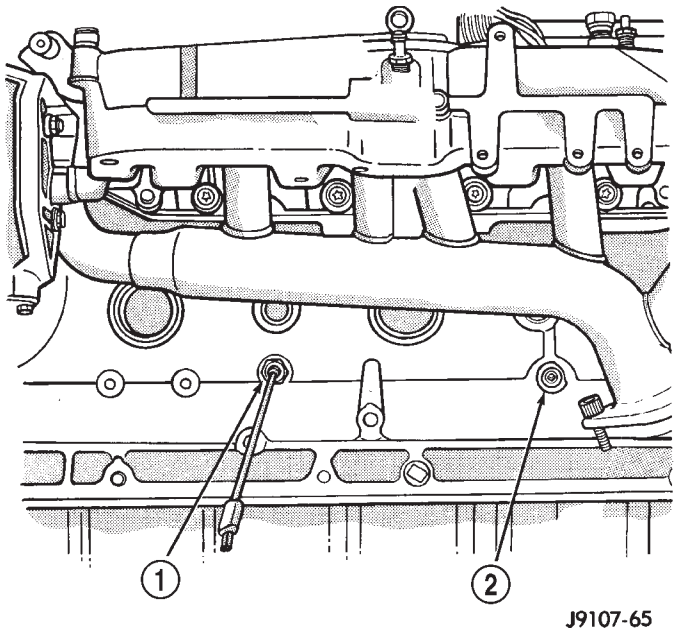


Fig. 9 Drain Plug—4.0L Engine

1 - COOLANT TEMPERATURE SENSOR
2 - BLOCK DRAIN PLUG

STANDARD PROCEDURE - DRAINING COOLING SYSTEM - 4.0L ENGINE

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

(1) DO NOT remove radiator cap first. With engine cold, raise vehicle on a hoist and locate radiator draincock.

NOTE: Radiator draincock is located on the right/ lower side of radiator facing to rear of vehicle.

(2) Attach one end of a hose to the draincock. Put the other end into a clean container. Open draincock and drain coolant from radiator. This will empty the coolant reserve/overflow tank. The coolant does not have to be removed from the tank unless the system is being refilled with a fresh mixture. When tank is empty, remove radiator cap and continue draining cooling system.

To drain the engine of coolant, remove the cylinder block drain plug located on the side of cylinder block (Fig. 9).

STANDARD PROCEDURE - REFILLING COOLING SYSTEM - 4.0L ENGINE

(1) Tighten the radiator draincock and the cylinder block drain plug(s) (if removed).

(2) Fill system using a 50/50 mixture of ethylene-glycol antifreeze and low mineral content water. Fill radiator to top and install radiator cap. Add sufficient coolant to the reserve/overflow tank to raise level to FULL mark.

(3) With heater control unit in the HEAT position, operate engine with radiator cap in place.

(4) After engine has reached normal operating temperature, shut engine off and allow it to cool. When engine is cooling down, coolant will be drawn into the radiator from the reserve/overflow tank.

(5) Add coolant to reserve/overflow tank as necessary. **Only add coolant to the reserve/overflow tank when the engine is cold. Coolant level in a warm engine will be higher due to thermal expansion.** To purge the cooling system of all air, this heat up/cool down cycle (adding coolant to cold engine) must be performed three times. Add necessary coolant to raise tank level to the FULL mark after each cool down period.

STANDARD PROCEDURE - ADDING ADDITIONAL COOLANT

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with

COOLING (Continued)

corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

STANDARD PROCEDURE - COOLING SYSTEM - REVERSE FLUSHING

CAUTION: The cooling system normally operates at 97-to-124 kPa (14-to -18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Reverse flushing of the cooling system is the forcing of water through the cooling system. This is done using air pressure in the opposite direction of normal coolant flow. It is usually only necessary with very dirty systems with evidence of partial plugging.

CHEMICAL CLEANING

If visual inspection indicates the formation of sludge or scaly deposits, use a radiator cleaner (Mopar Radiator Kleen or equivalent) before flushing. This will soften scale and other deposits and aid the flushing operation.

CAUTION: Be sure instructions on the container are followed.

REVERSE FLUSHING RADIATOR

Disconnect the radiator hoses from the radiator fittings. Attach a section of radiator hose to the radiator bottom outlet fitting and insert the flushing gun. Connect a water supply hose and air supply hose to the flushing gun.

CAUTION: The cooling system normally operates at 97-to-124 kPa (14- to-18 psi) pressure. Exceeding this pressure may damage the radiator or hoses.

Allow the radiator to fill with water. When radiator is filled, apply air in short blasts allowing radiator to refill between blasts. Continue this reverse flushing until clean water flows out through rear of radiator cooling tube passages. For more information, refer to operating instructions supplied with flushing equipment. Have radiator cleaned more extensively by a radiator repair shop.

REVERSE FLUSHING ENGINE

Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE). Remove the thermostat housing and thermostat. Install the thermostat housing. Disconnect the radiator upper hose from the radiator and attach the flushing gun to the hose. Disconnect the radiator lower hose from the water pump. Attach a lead away hose to the water pump inlet fitting.

CAUTION: Be sure that the heater control valve is closed (heat off). This is done to prevent coolant flow with scale and other deposits from entering the heater core.

Connect the water supply hose and air supply hose to the flushing gun. Allow the engine to fill with water. When the engine is filled, apply air in short blasts, allowing the system to fill between air blasts. Continue until clean water flows through the lead away hose. For more information, refer to operating instructions supplied with flushing equipment.

Remove the lead away hose, flushing gun, water supply hose and air supply hose. Remove the thermostat housing (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - REMOVAL). Install the thermostat and housing with a replacement gasket (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT THERMOSTAT - INSTALLATION). Connect the radiator hoses. Refill the cooling system with the correct antifreeze/water mixture (Refer to 7 - COOLING - STANDARD PROCEDURE).

SPECIFICATIONS

TORQUE

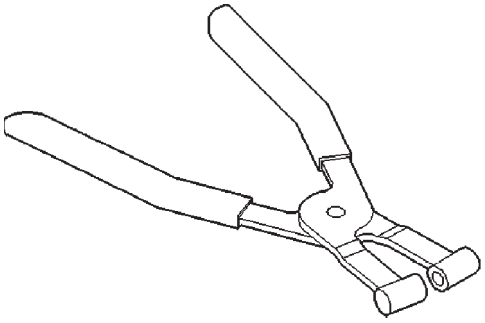
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Automatic Belt Tensioner to Mounting Bracket—Bolt			
4.0L	28	—	250
4.7L	41	30	—
Automatic Belt Tensioner Pulley—Bolt			
(4.7L)	61	45	—
Block Heater—Bolt			

COOLING (Continued)

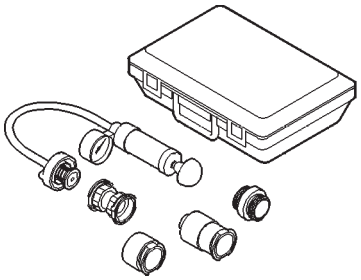
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
4.0L	4	—	32
4.7L	2	—	17
Fan Blade Assy. to Viscous Drive— Bolts 4.0L	23	—	200
Generator Mounting—Bolts 4.0L	57	42	—
Radiator Upper Isolator to Crossmember—Nuts	3	—	20
Radiator Upper Isolator to Radiator— Nuts	4	—	36
Radiator Brace—Bolts	10	—	90
Thermostat Housing—Bolts			
4.0L	22	16	—
4.7L	13	—	115
Upper Radiator Crossmember to Body—Bolts	10	—	90
Water Pump—Bolts			
4.0L	23	17	—
4.7L	54	40	—
Water Pump Pulley to Water Pump— Bolts 4.0L	28	—	250
High Pressure Inlet Hose to Hydraulic Fan Drive—1/2 inch Fitting	49	36	—
High Pressure Outlet Hose to Steering Gear—3/8 inch Fitting	29	21.5	—
Fan Shroud to Radiator Mounting Bolts	6	—	50

SPECIAL TOOLS

COOLING



Pliers 6094



Pressure Tester 7700–A

ACCESSORY DRIVE

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BELT TENSIONERS

REMOVAL

REMOVAL—4.7L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove tensioner assembly from engine front cover (Fig. 1).

WARNING: BECAUSE OF HIGH SPRING TENSION, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY (EXCEPT FOR PULLEY ON TENSIONER).

(3) Remove pulley bolt. Remove pulley from tensioner.

REMOVAL—4.0L ENGINE

(1) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove tensioner assembly from mounting bracket (Fig. 2).

WARNING: BECAUSE OF HIGH SPRING TENSION, DO NOT ATTEMPT TO DISASSEMBLE AUTOMATIC TENSIONER. UNIT IS SERVICED AS AN ASSEMBLY.

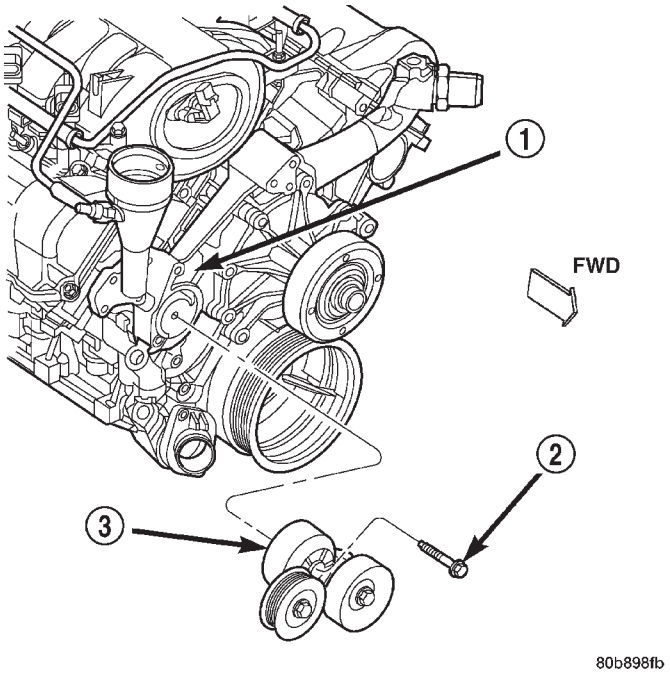


Fig. 1 Automatic Belt Tensioner

1 - TIMING CHAIN COVER
2 - BOLT TORQUE TO 41 N·m (30 FT LBS)
3 - AUTOMATIC BELT TENSIONER

INSTALLATION

INSTALLATION—4.7L ENGINE

(1) Install pulley and pulley bolt to tensioner. Tighten bolt to 61 N·m (45 ft. lbs.) torque.

(2) An indexing slot is located on back of tensioner. Align this slot to the head of the bolt on the front cover. Install the mounting bolt. Tighten bolt to 41 N·m (30 ft. lbs.).

BELT TENSIONERS (Continued)

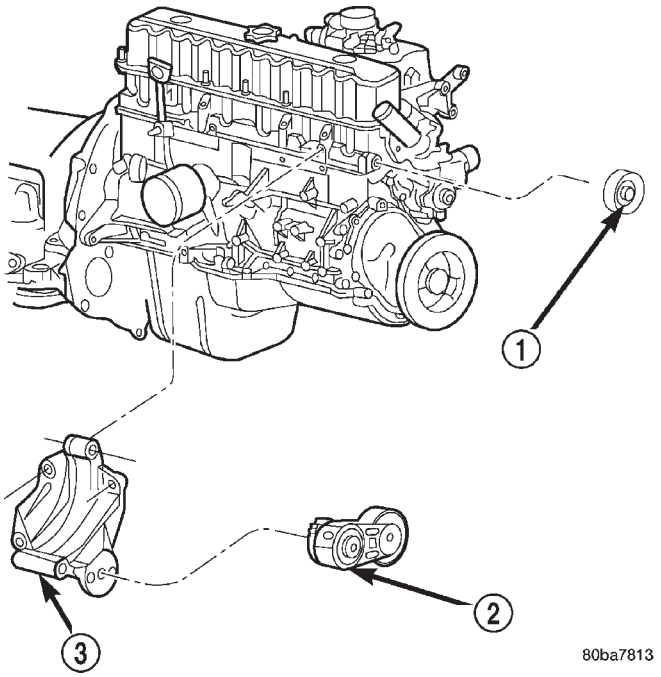


Fig. 2 Automatic Belt Tensioner

1 - IDLER PULLEY TIGHTEN TO 47 N·m (35 FT. LBS.)
2 - AUTOMATIC BELT TENSIONER
3 - GENERATOR MOUNTING BRACKET

(3) Install drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

INSTALLATION—4.0L ENGINE

(1) Install tensioner assembly to mounting bracket, align the two dowels on the tensioner with the mounting bracket and hand start the bolt. Tighten bolt to 28 N·m (250 in. lbs.).

CAUTION: To prevent damage to coil case, coil mounting bolts must be torqued.

(2) Install drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(3) Check belt indexing marks (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

DRIVE BELTS - 4.0L

DIAGNOSIS AND TESTING – SERPENTINE DRIVE BELT

When diagnosing serpentine drive belts, small cracks that run across ribbed surface of belt from rib to rib (Fig. 3), are considered normal. These are not a reason to replace belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 3). Also replace belt if it has excessive wear, frayed cords or severe glazing.

Refer to SERPENTINE DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

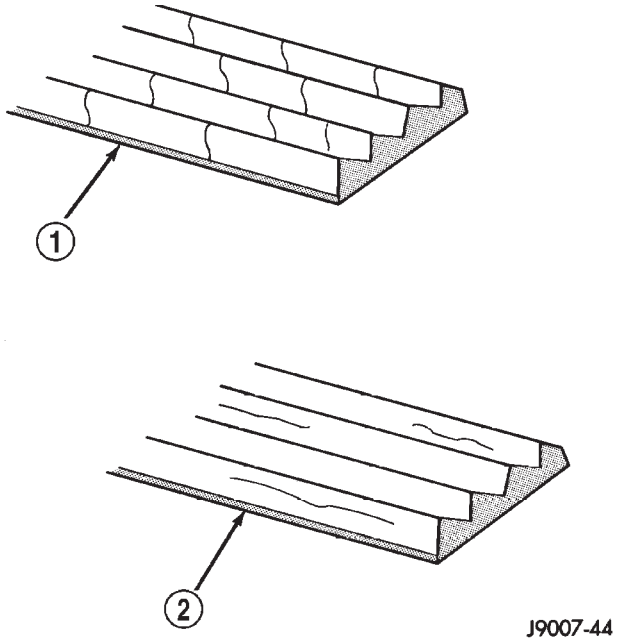


Fig. 3 Serpentine Accessory Drive Belt Wear Patterns

1 - NORMAL CRACKS BELT OK
2 - NOT NORMAL CRACKS REPLACE BELT

DRIVE BELTS - 4.0L (Continued)

SERPENTINE DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage.	2. Replace belt.
RIB OR BELT WEAR	1. Pulley(s) misaligned.	1. Align pulley(s).
	2. Abrasive environment.	2. Clean pulley(s). Replace belt if necessary.
	3. Rusted pulley(s).	3. Clean rust from pulley(s).
	4. Sharp or jagged pulley groove tips.	4. Replace pulley.
	5. Rubber deteriorated.	5. Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	1. Belt has mistracked from pulley groove.	1. Replace belt.
	2. Pulley groove tip has worn away rubber to tensile member.	2. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Belt or pulley subjected to substance (belt dressing, oil ethylene glycol) that has reduced friction.	4. Replace belt and clean pulleys.
	5. Driven component bearing failure.	5. Replace faulty component bearing.
	6. Belt glazed and hardened from heat and excessive slippage.	6. Replace belt.
“GROOVE JUMPING” (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	1. Belt tension either too high or too low.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly.	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Pulley(s) not within design tolerance.	4. Replace pulley(s).
	5. Foreign object(s) in grooves.	5. Remove foreign objects from grooves.
	6. Pulley misalignment.	6. Check and replace.
	7. Belt cord line is broken.	7. Replace belt.

DRIVE BELTS - 4.0L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension.	1. Replace belt and automatic belt tensioner.
	2. Incorrect belt.	2. Replace belt.
	3. Tensile member damaged during belt installation.	3. Replace belt.
	4. Severe misalignment.	4. Check and replace.
	5. Bracket, pulley, or bearing failure.	5. Replace defective component and belt.
NOISE (OBJECTIONABLE SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION)	1. Belt slippage.	1. Replace belt or automatic belt tensioner.
	2. Bearing noise.	2. Locate and repair.
	3. Belt misalignment.	3. Replace belt.
	4. Belt-to-pulley mismatch.	4. Install correct belt.

REMOVAL—4.0L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position. (Fig. 4).

INSTALLATION—4.0L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

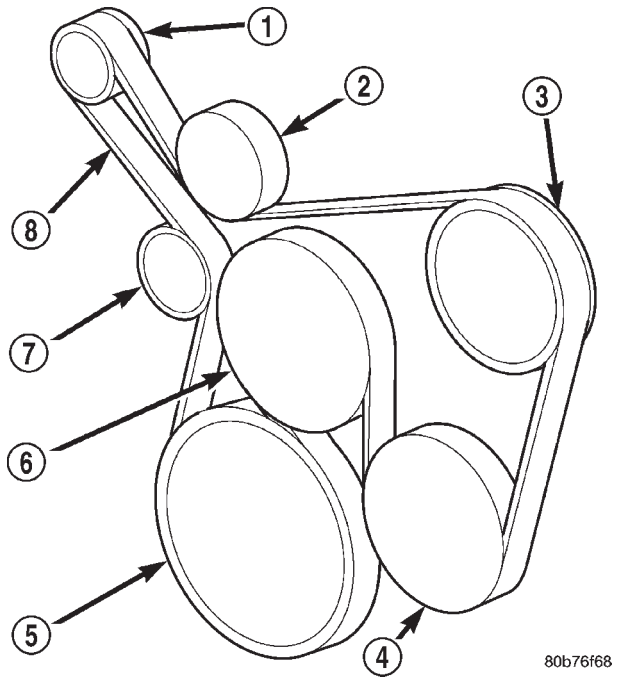


Fig. 4 Belt Routing—4.0L

1 - GENERATOR
2 - IDLER
3 - POWER STEERING
4 - A/C
5 - CRANKSHAFT
6 - WATER PUMP
7 - TENSIONER
8 - ACCESSORY DRIVE BELT

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction (Fig. 4).

DRIVE BELTS - 4.0L (Continued)

(2) Install new belt (Fig. 4). Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

(3) With the drive belt installed, inspect the belt wear indicator (Fig. 5). On 4.0L Engines, the indicator mark must be between the minimum and maximum marks. If the measurement exceedes this specification replace the serpentine accessory drive belt.

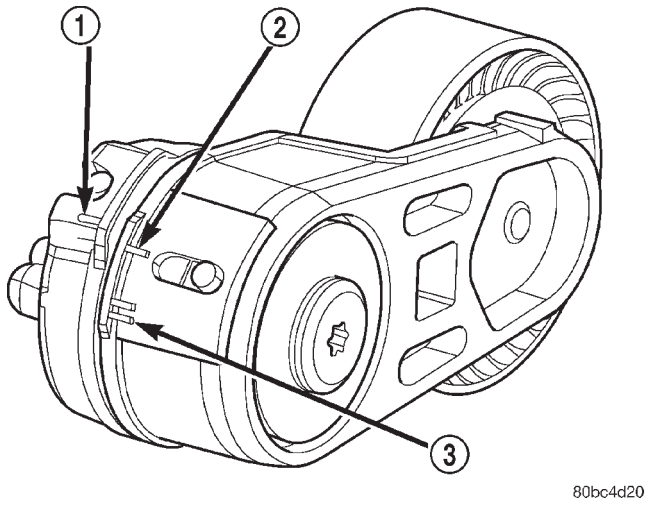


Fig. 5 Accessory Drive Belt Wear Indicator

1 - INDICATOR MARK
2 - MINIMUM TENSION MARK
3 - MAXIMUM TENSION MARK

DRIVE BELTS - 4.7L

DIAGNOSIS AND TESTING – SERPENTINE DRIVE BELT

When diagnosing serpentine drive belts, small cracks that run across ribbed surface of belt from rib to rib (Fig. 6), are considered normal. These are not a reason to replace belt. However, cracks running along a rib (not across) are **not** normal. Any belt with cracks running along a rib must be replaced (Fig. 6). Also replace belt if it has excessive wear, frayed cords or severe glazing.

Refer to SERPENTINE DRIVE BELT DIAGNOSIS CHART for further belt diagnosis.

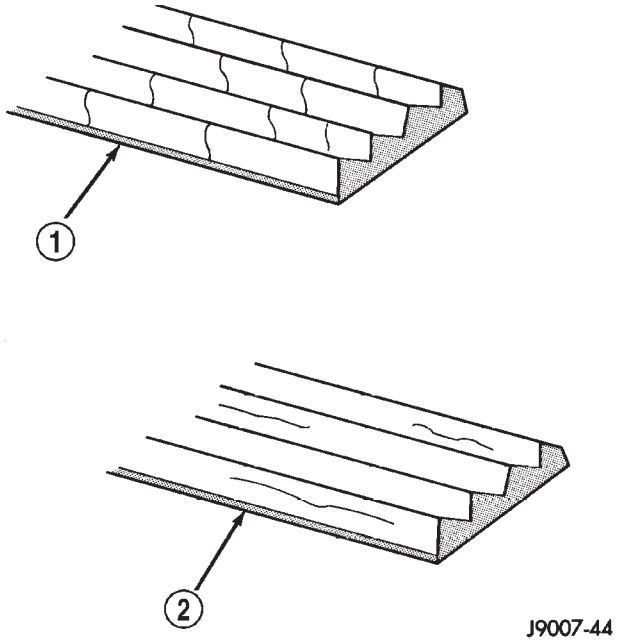


Fig. 6 Serpentine Accessory Drive Belt Wear Patterns

1 - NORMAL CRACKS BELT OK
2 - NOT NORMAL CRACKS REPLACE BELT

DRIVE BELTS - 4.7L (Continued)

SERPENTINE DRIVE BELT DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
RIB CHUNKING (ONE OR MORE RIBS HAS SEPARATED FROM BELT BODY)	1. Foreign objects imbedded in pulley grooves.	1. Remove foreign objects from pulley grooves. Replace belt.
	2. Installation damage.	2. Replace belt.
RIB OR BELT WEAR	1. Pulley(s) misaligned.	1. Align pulley(s).
	2. Abrasive environment.	2. Clean pulley(s). Replace belt if necessary.
	3. Rusted pulley(s).	3. Clean rust from pulley(s).
	4. Sharp or jagged pulley groove tips.	4. Replace pulley.
	5. Rubber deteriorated.	5. Replace belt.
LONGITUDINAL BELT CRACKING (CRACKS BETWEEN TWO RIBS)	1. Belt has mistracked from pulley groove.	1. Replace belt.
	2. Pulley groove tip has worn away rubber to tensile member.	2. Replace belt.
BELT SLIPS	1. Belt slipping because of insufficient tension.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Belt or pulley subjected to substance (belt dressing, oil ethylene glycol) that has reduced friction.	4. Replace belt and clean pulleys.
	5. Driven component bearing failure.	5. Replace faulty component bearing.
	6. Belt glazed and hardened from heat and excessive slippage.	6. Replace belt.
“GROOVE JUMPING” (BELT DOES NOT MAINTAIN CORRECT POSITION ON PULLEY)	1. Belt tension either too high or too low.	1. Replace automatic belt tensioner.
	2. Belt routed incorrectly.	2. Verify belt routing.
	3. Incorrect belt.	3. Replace belt.
	4. Pulley(s) not within design tolerance.	4. Replace pulley(s).
	5. Foreign object(s) in grooves.	5. Remove foreign objects from grooves.
	6. Pulley misalignment.	6. Check and replace.
	7. Belt cord line is broken.	7. Replace belt.

DRIVE BELTS - 4.7L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BELT BROKEN (NOTE: IDENTIFY AND CORRECT PROBLEM BEFORE NEW BELT IS INSTALLED)	1. Excessive tension.	1. Replace belt and automatic belt tensioner.
	2. Incorrect belt.	2. Replace belt.
	3. Tensile member damaged during belt installation.	3. Replace belt.
	4. Severe misalignment.	4. Check and replace.
	5. Bracket, pulley, or bearing failure.	5. Replace defective component and belt.
NOISE (OBJECTIONABLE SQUEAL, SQUEAK, OR RUMBLE IS HEARD OR FELT WHILE DRIVE BELT IS IN OPERATION)	1. Belt slippage.	1. Replace belt or automatic belt tensioner.
	2. Bearing noise.	2. Locate and repair.
	3. Belt misalignment.	3. Replace belt.
	4. Belt-to-pulley mismatch.	4. Install correct belt.

REMOVAL - 4.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

CAUTION: DO NOT LET TENSIONER ARM SNAP BACK TO THE FREEARM POSITION, SEVERE DAMAGE MAY OCCUR TO THE TENSIONER.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Disconnect negative battery cable from battery.

(2) Rotate belt tensioner until it contacts its stop. Remove belt, then slowly rotate the tensioner into the freearm position. (Fig. 7).

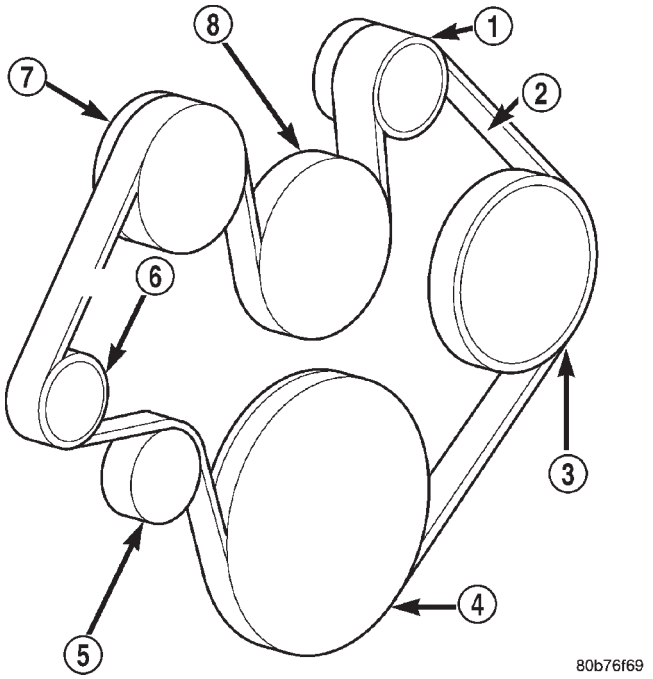


Fig. 7 Belt Routing - 4.7L

1 - GENERATOR PULLEY
2 - ACCESSORY DRIVE BELT
3 - POWER STEERING PUMP PULLEY
4 - CRANKSHAFT PULLEY
5 - IDLER PULLEY
6 - TENSIONER
7 - A/C COMPRESSOR PULLEY
8 - WATER PUMP PULLEY

DRIVE BELTS - 4.7L (Continued)

INSTALLATION - 4.7L ENGINE

NOTE: The belt routing schematics are published from the latest information available at the time of publication. If anything differs between these schematics and the Belt Routing Label, use the schematics on Belt Routing Label. This label is located in the engine compartment.

Belt tension is not adjustable. Belt adjustment is maintained by an automatic (spring load) belt tensioner.

(1) Check condition of all pulleys.

CAUTION: When installing the serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction (Fig. 7).

(2) Install new belt (Fig. 7). Route the belt around all pulleys except the idler pulley. Rotate the tensioner arm until it contacts its stop position. Route the belt around the idler and slowly let the tensioner rotate into the belt. Make sure the belt is seated onto all pulleys.

(3) With the drive belt installed, inspect the belt wear indicator (Fig. 8). On 4.7L Engines the gap between the tang and the housing stop (measurement A) must not exceed 24 mm (.94 inches).

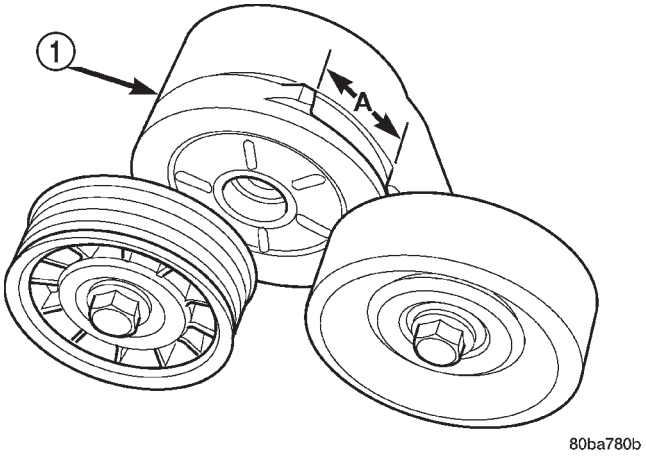


Fig. 8 Accessory Drive Belt Wear Indicator

1 - AUTOMATIC TENSIONER ASSEMBLY

ENGINE

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COOLANT

DESCRIPTION

DESCRIPTION - ENGINE COOLANT

ETHYLENE-GLYCOL MIXTURES

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

The required ethylene-glycol (antifreeze) and water mixture depends upon the climate and vehicle operating conditions. The recommended mixture of 50/50 ethylene-glycol and water will provide protection against freezing to -37 deg. C (-35 deg. F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. **If percentage is lower than 44 percent, engine parts may be eroded by cavitation, and cooling system components may be severely damaged by corrosion.** Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7 deg. C (-90 deg. F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than that of water.

Use of 100 percent ethylene-glycol will cause formation of additive deposits in the system, as the corrosion inhibitive additives in ethylene-glycol require the presence of water to dissolve. The deposits act as insulation, causing temperatures to rise to as high as 149 deg. C (300) deg. F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at 22 deg. C (-8 deg. F).

PROPYLENE-GLYCOL MIXTURES

It's overall effective temperature range is smaller than that of ethylene-glycol. The freeze point of 50/50 propylene-glycol and water is -32 deg. C (-26 deg. F). 5 deg. C higher than ethylene-glycol's freeze point. The boiling point (protection against summer boil-over) of propylene-glycol is 125 deg. C (257 deg. F) at 96.5 kPa (14 psi), compared to 128 deg. C (263 deg. F) for ethylene-glycol. Use of propylene-glycol can result in boil-over or freeze-up on a cooling system designed for ethylene-glycol. Propylene glycol also has poorer heat transfer characteristics than ethylene glycol. This can increase cylinder head temperatures under certain conditions.

Propylene-glycol/ethylene-glycol Mixtures can cause the destabilization of various corrosion inhibitors, causing damage to the various cooling system components. Also, once ethylene-glycol and propylene-glycol based coolants are mixed in the vehicle, conventional methods of determining freeze point will not be accurate. Both the refractive index and specific gravity differ between ethylene glycol and propylene glycol.

DESCRIPTION - HOAT COOLANT

WARNING: ANTIFREEZE IS AN ETHYLENE GLYCOL BASE COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASE COOLANT PROPERLY, CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTER IN YOUR AREA. DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE, PERSONAL INJURY CAN RESULT. AVOID RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED, PERSONAL INJURY CAN RESULT.

CAUTION: Use of Propylene Glycol based coolants is not recommended, as they provide less freeze protection and less corrosion protection.

The cooling system is designed around the coolant. The coolant must accept heat from engine metal, in the cylinder head area near the exhaust valves and engine block. Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

COOLANT (Continued)

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769), or the equivalent ethylene glycol base coolant with organic corrosion inhibitors (called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% Ethylene Glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing of coolants other than specified (non-HOAT or other HOAT), may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.

COOLANT PERFORMANCE

The required ethylene-glycol (antifreeze) and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

Pure Water-Water can absorb more heat than a mixture of water and ethylene-glycol. This is for purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.

100 percent Ethylene-Glycol-The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic and soften solder. The increased temperature can result in engine detonation. In addition, 100 percent ethylene-glycol freezes at -22°C (-8°F).

50/50 Ethylene-Glycol and Water-Is the recommended mixture, it provides protection against freezing to -37°C (-34°F). The antifreeze concentration **must always** be a minimum of 44 percent, year-round in all climates. If percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68 percent antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because specific heat of antifreeze is lower than that of water.

CAUTION: Richer antifreeze mixtures cannot be measured with normal field equipment and can cause problems associated with 100 percent ethylene-glycol.

COOLANT SELECTION AND ADDITIVES

The use of aluminum cylinder blocks, cylinder heads and water pumps requires special corrosion protection. Only Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (glycol base coolant with corrosion inhibitors called HOAT, for Hybrid Organic Additive Technology) is recommended. This coolant offers the best engine cooling without corrosion when mixed with 50% distilled water to obtain to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh properly mixed coolant solution.

CAUTION: Do not use coolant additives that are claimed to improve engine cooling.

OPERATION

Coolant flows through the engine block absorbing the heat from the engine, then flows to the radiator where the cooling fins in the radiator transfers the heat from the coolant to the atmosphere. During cold weather the ethylene-glycol coolant prevents water present in the cooling system from freezing within temperatures indicated by mixture ratio of coolant to water.

COOLANT LEVEL SENSOR

REMOVAL

(1) Open Hood.

(2) Disconnect electrical connector from coolant level sensor.

(3) Pull coolant level sensor out of coolant recovery pressure container.

INSTALLATION

NOTE: Make sure the coolant level sensor fully seats into the rubber grommet. Failure to do so may cause inaccurate coolant level readings and leaks.

COOLANT LEVEL SENSOR (Continued)

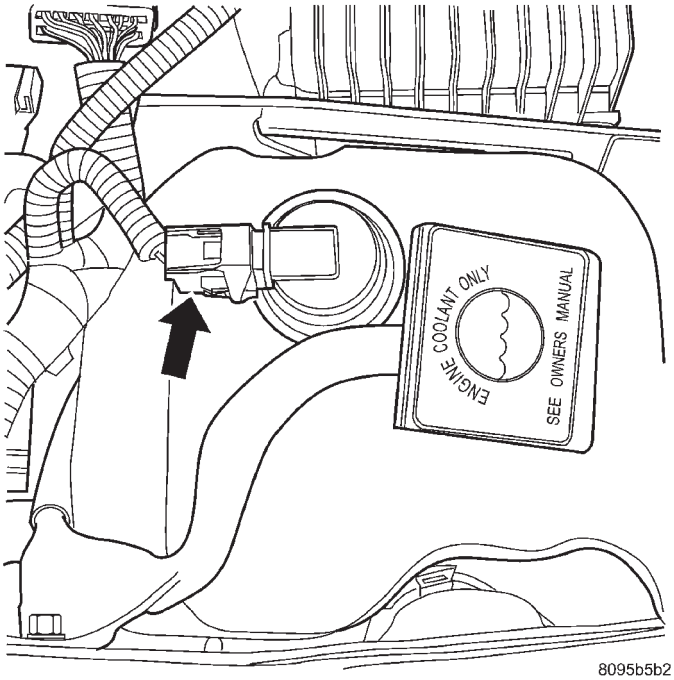


Fig. 1 COOLANT LEVEL SENSOR ELECTRICAL CONNECTOR

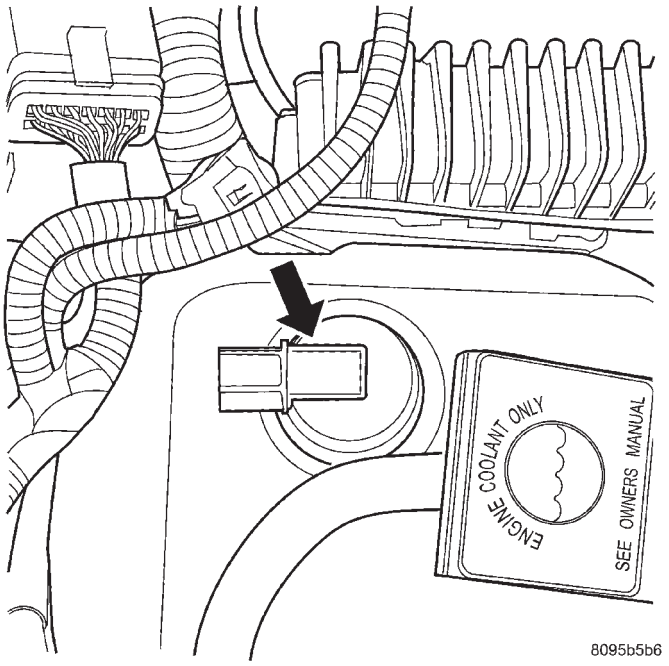


Fig. 2 COOLANT LEVEL SENSOR REMOVAL/ INSTALLATION

(1) Position sensor into the coolant recovery pressure container (Fig. 1).

(2) Connect the coolant level sensor electrical connector (Fig. 2).

(3) Close hood.

COOLANT RECOVERY PRESS CONTAINER

DESCRIPTION

This system works along with the radiator pressure cap. This is done by using thermal expansion and contraction of the coolant to keep the coolant free of trapped air. It provides:

- A volume for coolant expansion and contraction.
- A convenient and safe method for checking/adjusting coolant level at atmospheric pressure. This is done without removing the radiator pressure cap.
- Some reserve coolant to the radiator to cover minor leaks and evaporation or boiling losses.

As the engine cools, a vacuum is formed in the cooling system of both the radiator and engine. Coolant will then be drawn from the coolant tank and returned to a proper level in the radiator.

The coolant reservoir/overflow system has a radiator mounted pressurized cap, an overflow tube and a plastic coolant reservoir/overflow tank (Fig. 3) mounted to the right inner fender.

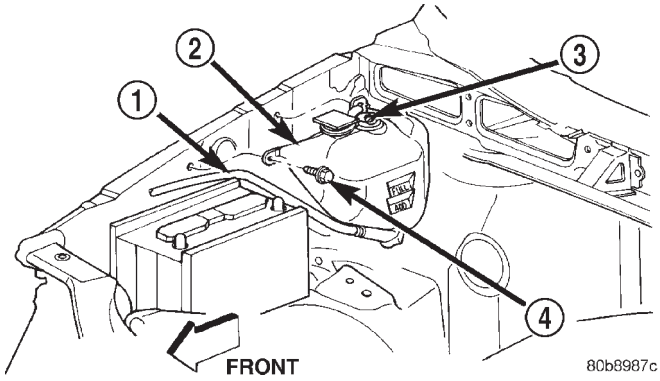


Fig. 3 Coolant Reservoir / Overflow Tank

1 - COOLANT OVERFLOW HOSE
2 - COOLANT RESERVOIR/OVERFLOW TANK
3 - COOLANT LEVEL SENSOR
4 - BOLT

RADIATOR FAN - 4.7L

DESCRIPTION

The hydraulic fan (Fig. 4) used on vehicles equipped the 4.7L engine, replaces both the electric fan and the engine driven mechanical fan. The hydraulic cooling fan is integral to the fan shroud and is located between the radiator and the engine.

The power steering pump supplies the hydraulic fluid and pressure to rotate the cooling fan blade, while the electrical part of the fan is controlled by the JTEC.

The hydraulic fan drive (motor) consists of the three major following components:

- Steering flow control valve

- Fan control valve
- Two stage G-rotor hydraulic drive

The hydraulic fan and drive is not serviceable. Therefore any failure of the fan blade, hydraulic fan drive or fan shroud requires replacement of the fan module because the fan blade and hydraulic fan drive are matched and balanced as a system and servicing either separately would disrupt this balance.

For hydraulic fluid routing information refer to (Fig. 5).

CAUTION: Do not attempt to service the hydraulic cooling fan or fan drive separately replace the cooling module as an assembly. Failure to do so may cause severe damage to the hydraulic cooling fan assembly.

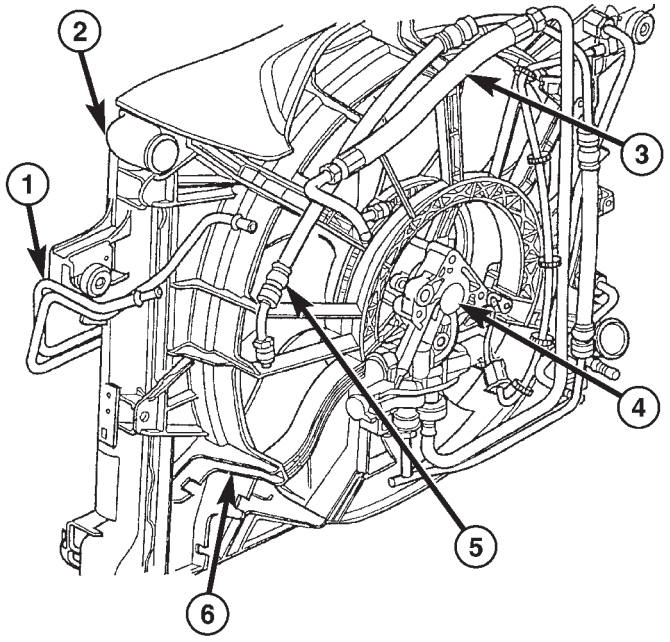


Fig. 4 HYDRAULIC RADIATOR COOLING FAN AND FAN DRIVE

1 - POWER STEERING FLUID COOLER
2 - RADIATOR
3 - HIGH PRESSURE LINE FROM STEERING GEAR PUMP TO HYDRAULIC FAN MOTOR
4 - HYDRAULIC FAN MOTOR
5 - HIGH PRESSURE LINE FROM HYDRAULIC FAN MOTOR TO STEERING GEAR
6 - FAN SHROUD

OPERATION

The hydraulic radiator cooling fan used on the Grand Cherokee with the 4.7L engine replaces both the electric fan and the engine driven mechanical fan. The use of this hydraulic fan provides the 4.7L equipped Grand Cherokee with heavy trailer tow capability while at the same time reducing unnecessary power drain on both the engine and the vehicles electrical system.

HYDRAULIC FAN STRATEGY

The hydraulic radiator cooling fan is controlled by the JTEC. A PWM (Pulse With Modulated) signal from the JTEC controls the fan from 0 to 100% of the available fan speed. There are four inputs to the JTEC that determine what speed percentage of fan is required by the vehicle. These inputs are:

- Engine Coolant Temperature
- Transmission Oil Temperature
- Battery Temperature
- A/C System Pressure

By monitoring these four parameters, the JTEC can determine if cooling airflow is required. If airflow is required, the JTEC will slowly ramp up (speed up) the fan speed until the parameter(s) are under control. Once the temperature or pressure is reduced to within operating parameters the fan will ramp up, ramp down, or hold its speed to maintain the temperature / pressure requirements.

NOTE: Even if the JTEC is not requesting fan on operation the fan blade will usually spin between 100 and 500 RPM when the vehicle is at idle. This is due to a controlled minimum oil flow requirement through the fan drive motor.

ACTIVATING THE HYDRAULIC FAN WITH THE DRB

Under the Engine Systems test heading, there is a subheading. “Hydraulic fan solenoid test”, that has the selections, on /off. Activating the fan with the DRB will run the fan at 100% duty cycle, which will help troubleshoot any system problems, and also help with the deaeration procedure.

NOTE: Engine must be running to activate the fan with the DRB.

RADIATOR COOLING FAN HYDRAULIC FLUID PATH

Hydraulic fluid is pumped through the power steering pump, from the pump the fluid travels though a high pressure delivery line to the fan drive motor. As fluid is diverted through the G-rotors, rotational motion is created as fluid moves from the high-pressure (inlet) side of the motor to the low-pressure (outlet) side. Fluid exiting the drive motor is divided into two paths. Path one continues through a high pressure delivery line to the vehicles steering gear to provide steering assist. and path two sends fluid back to the power steering pump through a low pressure line. Fluid exits the steering gear under low pressure and travels through a low pressure line to the power steering fluid cooler to be cooled before being returned back the the power steering fluid reservoir (Fig. 5).

RADIATOR FAN - 4.7L (Continued)

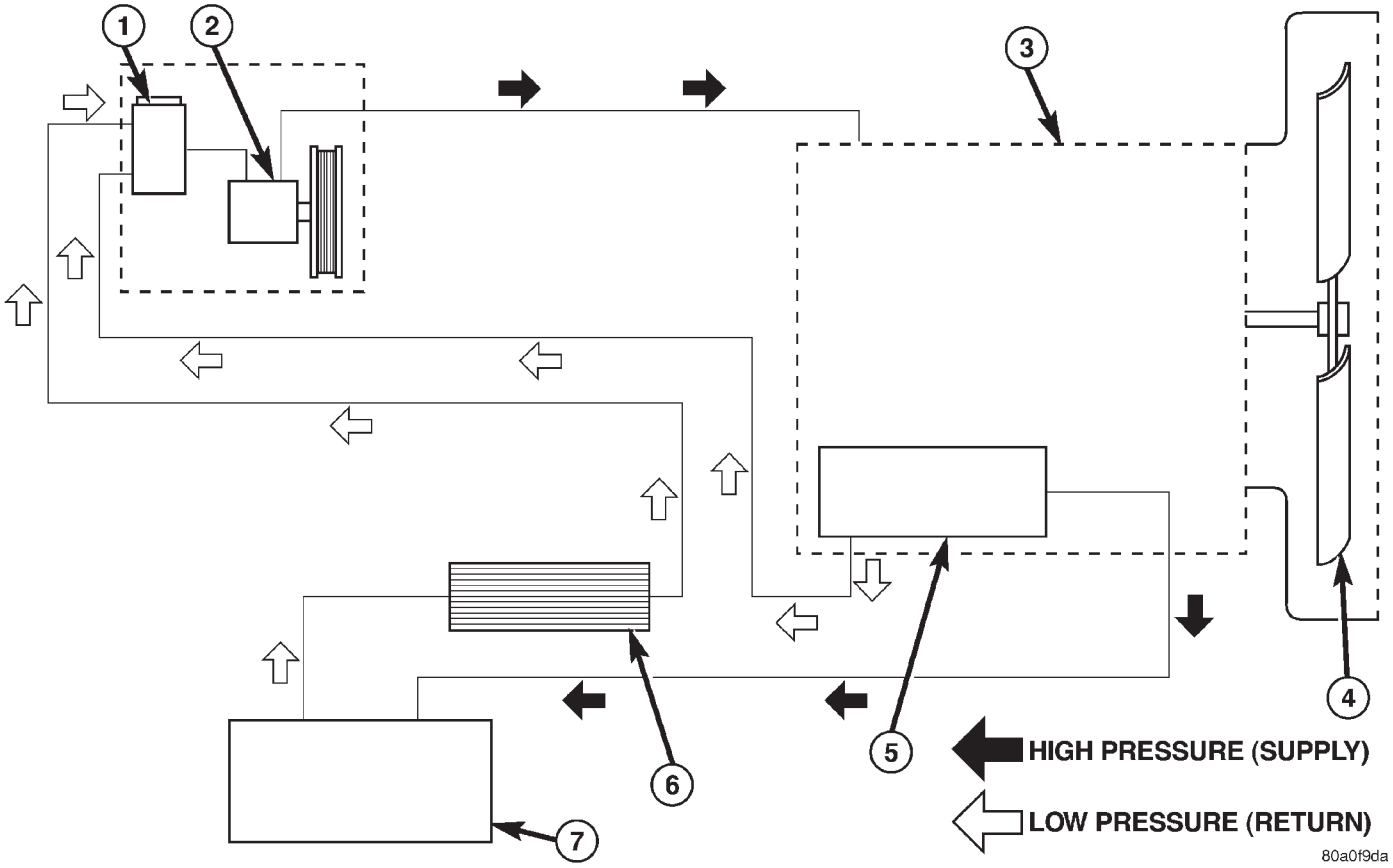


Fig. 5 HYDRAULIC FAN FLUID FLOW CIRCUIT

1 - POWER STEERING RESERVOIR
2 - POWER STEERING PUMP
3 - HYDRAULIC FAN DRIVE ASSEMBLY
4 - FAN BLADE
5 - HYDRAULIC FAN CONTROL SOLENOID
6 - POWER STEERING OIL COOLER
7 - STEERING GEAR

NOTE: There is a steering flow control valve located in the fan drive motor. This valve operates like the flow control valve found in the typical power steering pump. Because of the design of the valve steering assist can not be effected by the radiator cooling fan even during fan drive failure.

REMOVAL

(1) Raise vehicle on hoist.
(2) Drain cooling system.(Refer to 7 - COOLING - STANDARD PROCEDURE)

NOTE: The hydraulic fan drive is driven by the power steering pump. When removing lines or hoses from fan drive assembly use a drain pan to catch any power steering fluid that may exit the fan drive or the lines and hoses.

NOTE: When ever the high pressure line fittings are removed from the hydraulic fan drive the O-rings must be replaced.

(3) Disconnect two high pressure lines at hydraulic fan drive (Fig. 6). Remove and discard o-rings from line fittings.
(4) Disconnect low pressure return hose at hydraulic fan drive (Fig. 6).

NOTE: The lower mounting bolts can only be accessed from under vehicle.

(5) Remove two lower mounting bolts from the shroud (Fig. 8).
(6) Lower vehicle.
(7) Disconnect the electrical connector for the fan control solenoid.
(8) Disconnect the radiator upper hose at the radiator and position out of the way.
(9) Disconnect the power steering gear outlet hose and fluid return hose at the cooler (Fig. 7).

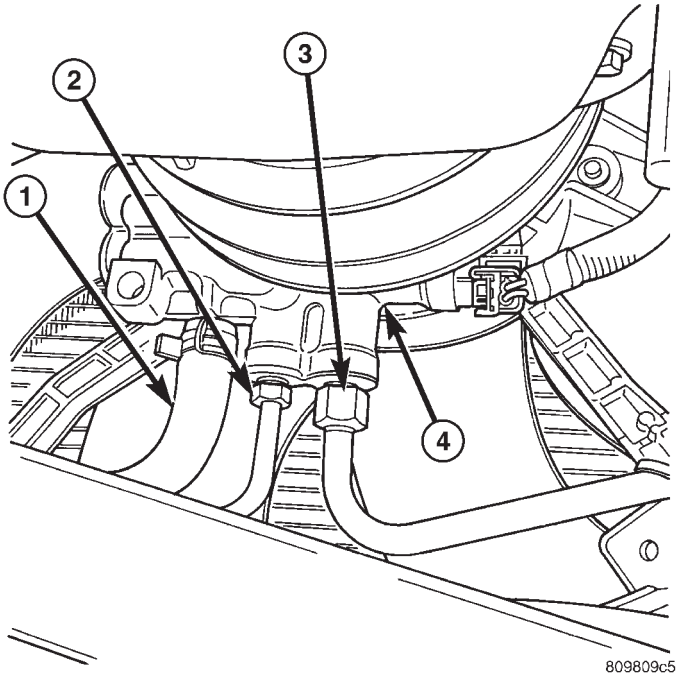


Fig. 6 HYDRAULIC LINES/HOSES AND ELECTRICAL CONNECTOR

1 - LOW PRESSURE RETURN HOSE
2 - HIGH PRESSURE LINE (OUTLET)
3 - HIGH PRESSURE LINE (INLET)
4 - HYDRAULIC FAN DRIVE

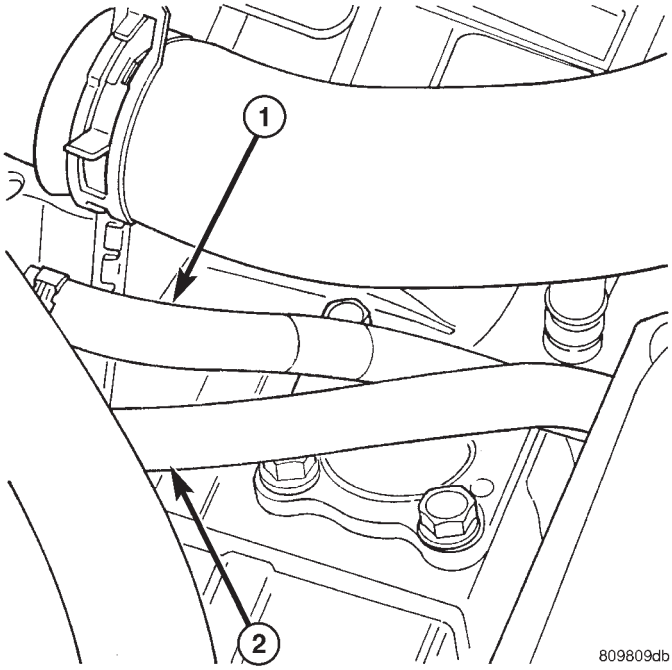


Fig. 7 POWER STEERING GEAR OUTLET AND RETURN HOSES

1 - POWER STEERING COOLER RETURN HOSE
2 - POWER STEERING COOLER SUPPLY HOSE

(10) Remove two upper mounting bolts from the shroud (Fig. 8).

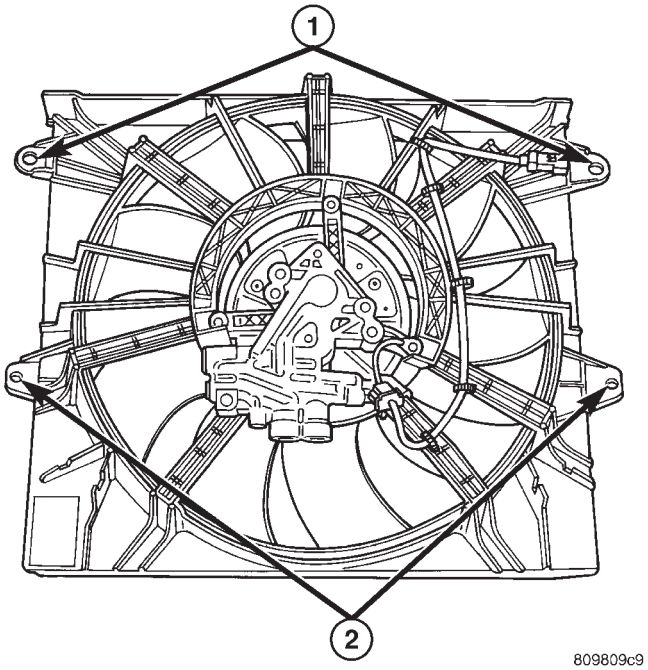


Fig. 8 FAN SHROUD MOUNTING BOLT LOCATIONS

1 - FAN SHROUD UPPER MOUNTING BOLT LOCATIONS
2 - FAN SHROUD LOWER MOUNTING BOLT LOCATIONS

(11) Remove the shroud and fan drive from vehicle.

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSTALLATION

CAUTION: There is an external ground wire connected to the hydraulic fan drive located at the electrical connector on the fan assembly. This ground MUST remain connected at all times. Failure to ensure ground wire is connected when engine is operating can cause severe damage to the JTEC module.

(1) Position fan drive and shroud in vehicle.
(2) Install fan shroud upper mounting bolts. Do not tighten at this time.
(3) Install radiator upper hose onto radiator.
(4) Connect power steering cooler hoses.
(5) Raise vehicle on hoist.
(6) Install fan shroud lower mounting bolts. Tighten to 6 N·m (50 in. lbs.).

RADIATOR FAN - 4.7L (Continued)

NOTE: When ever the high pressure line fittings are removed from the hydraulic fan drive the o-rings located on the fittings must be replaced.

(7) Lubricate the o-rings on the fittings with power steering fluid then connect inlet and outlet high pressure lines to fan drive (Fig. 9). Tighten inlet line to 49 N·m (36 ft. lbs.) tighten outlet line to 29 N·m (21.5 ft. lbs.).

(8) Connect low pressure return hose to fan drive (Fig. 9).

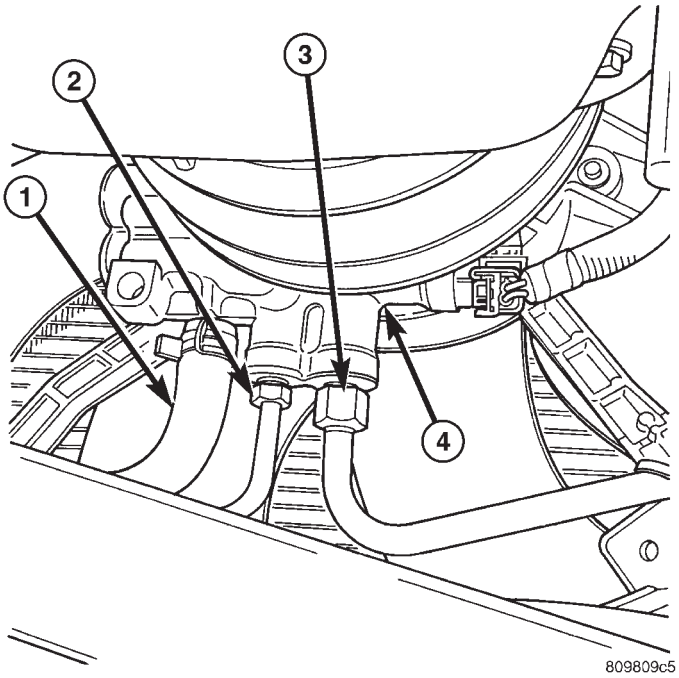


Fig. 9 HYDRAULIC LINES/HOSES AND ELECTRICAL CONNECTOR

1 - LOW PRESSURE RETURN HOSE
2 - HIGH PRESSURE LINE (OUTLET)
3 - HIGH PRESSURE LINE (INLET)
4 - HYDRAULIC FAN DRIVE

(9) Lower vehicle.

(10) Install radiator upper hose.

(11) Connect electrical connector for hydraulic fan control solenoid.

(12) Tighten fan shroud upper mounting bolts to 6 N·m (50 in. lbs.).

(13) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

CAUTION: Do not run engine with power steering fluid below the full mark in the reservoir. Sever damage to the hydraulic cooling fan or the engine can occur.

(14) Refill power steering fluid reservoir and bleed air from steering system (Refer to 19 - STEERING/ PUMP - STANDARD PROCEDURE).

(15) Run engine and check for leaks.

RADIATOR FAN - 4.0L

DESCRIPTION

The radiator cooling fan used on the 4.0L engine is an hybrid fan design. The hybrid fan system consist of a low speed viscous driven mechanical fan and a electrical fan (Fig. 10).

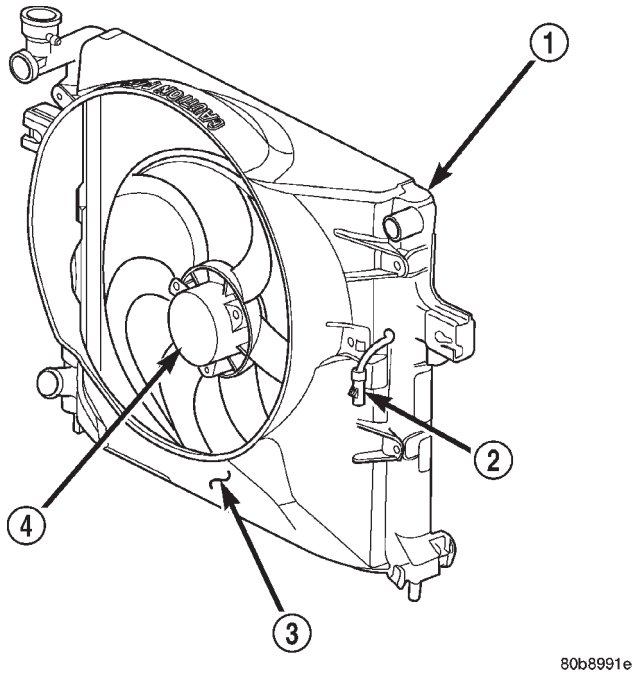


Fig. 10 Radiator Cooling Fan

1 - RADIATOR
2 - ELECTRIC COOLING FAN CONNECTOR
3 - FAN SHROUD
4 - ELECTRIC COOLING FAN

REMOVAL

(1) Disconnect negative battery cable from battery.

(2) The thermal viscous fan drive/fan blade assembly is attached (threaded) to water pump hub shaft. Remove fan blade/viscous fan drive assembly from water pump by turning mounting nut counterclockwise as viewed from front (Fig. 11). Threads on viscous fan drive are **RIGHT HAND.**

(3) Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

(4) Do not unbolt fan blade assembly from viscous fan drive at this time.

(5) Remove fan shroud-to-upper crossmember nuts.

(6) Remove fan shroud and fan blade/viscous fan drive assembly as a complete unit from vehicle.

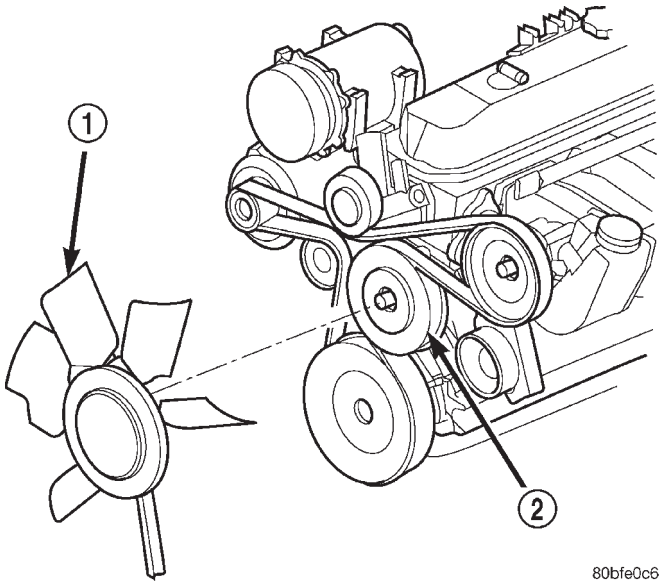


Fig. 11 Fan and Viscous Fan Drive

1 - FAN AND FAN DRIVE
2 - WATER PUMP PULLEY

(7) After removing fan blade/viscous fan drive assembly, **do not** place viscous fan drive in horizontal position. If stored horizontally, silicone fluid in the viscous fan drive could drain into its bearing assembly and contaminate lubricant.

CAUTION: Do not remove water pump pulley-to-water pump bolts. This pulley is under belt tension.

(8) Remove four bolts securing fan blade assembly to viscous fan drive .

CLEANING

Clean the fan blades using a mild soap and water. Do not use an abrasive to clean the blades.

INSPECTION

WARNING: DO NOT ATTEMPT TO BEND OR STRAIGHTEN FAN BLADES IF FAN IS NOT WITHIN SPECIFICATIONS.

CAUTION: If fan blade assembly is replaced because of mechanical damage, water pump and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

(1) Remove fan blade assembly from viscous fan drive unit (four bolts).

(2) Lay fan on a flat surface with leading edge facing down. With tip of blade touching flat surface, replace fan if clearance between opposite blade and surface is greater than 2.0 mm (.090 inch). Rocking motion of opposite blades should not exceed 2.0 mm (.090 inch). Test all blades in this manner.

(3) Inspect fan assembly for cracks, bends, loose rivets or broken welds. Replace fan if any damage is found.

INSTALLATION

(1) Assemble fan blade to viscous fan drive. Tighten mounting bolts to 27 N·m (20 ft. lbs.) torque.

(2) Thread the fan and fan drive onto the water pump pulley.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) for correct belt routing.

ENGINE BLOCK HEATER

DESCRIPTION

DESCRIPTION—4.7L ENGINE

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE. THE POWER CORD MUST BE SECURED IN ITS RETAINING CLIPS AND ROUTED AWAY FROM EXHAUST MANIFOLDS AND MOVING PARTS.

An optional engine block heater (Fig. 12) is available with all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block in place of a freeze plug with the heating element immersed in engine coolant.

DESCRIPTION—4.0L ENGINE

WARNING: DO NOT OPERATE ENGINE UNLESS BLOCK HEATER CORD HAS BEEN DISCONNECTED FROM POWER SOURCE AND SECURED IN PLACE. THE POWER CORD MUST BE SECURED IN ITS RETAINING CLIPS AND ROUTED AWAY FROM EXHAUST MANIFOLDS AND MOVING PARTS.

ENGINE BLOCK HEATER (Continued)

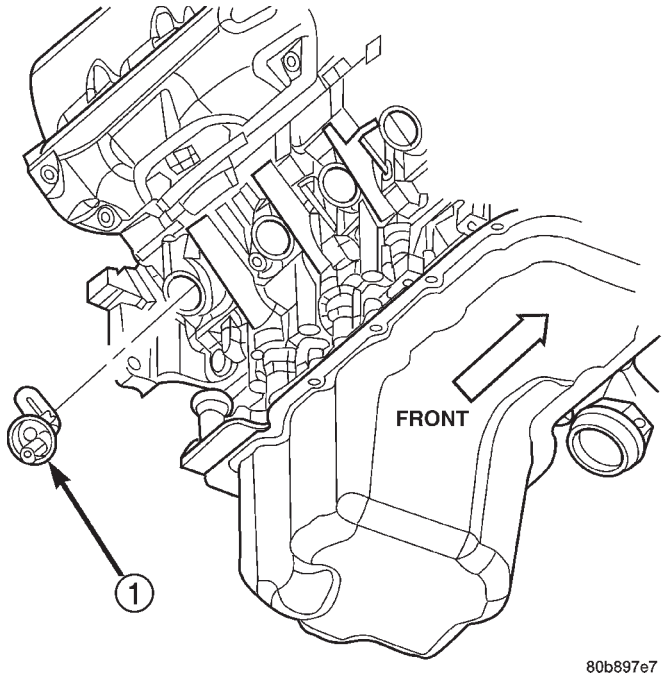


Fig. 12 Engine Block Heater—4.7L

1 - ENGINE BLOCK HEATER

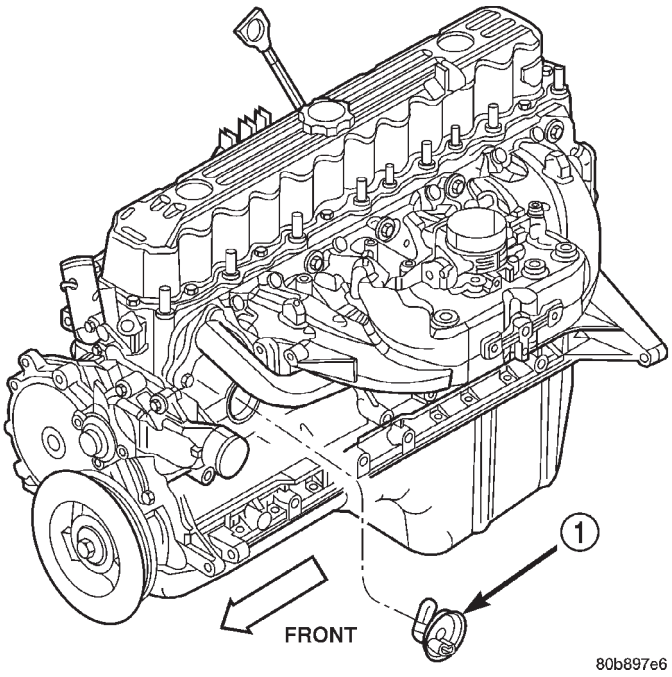


Fig. 13 Block Heater

1 - ENGINE BLOCK HEATER

An optional engine block heater (Fig. 13) is available with all models. The heater is equipped with a power cord. The cord is attached to an engine compartment component with tie-straps. The heater warms the engine providing easier engine starting and faster warm-up in low temperatures. The heater is mounted in a core hole of the engine cylinder block in place of a freeze plug with the heating element immersed in engine coolant.

OPERATION

Connecting the power cord to a grounded 110-120 volt AC electrical outlet with a grounded, three wire extension cord activates the heating element warming the engine coolant.

DIAGNOSIS AND TESTING—ENGINE BLOCK HEATER

If the unit does not operate (Fig. 14) (Fig. 15), possible causes can be either the power cord or the heater element. Test the power cord for continuity with a 110-volt voltmeter or 110-volt test light. Test heater element continuity with an ohmmeter or a 12-volt test light.

CAUTION: To prevent damage, the power cord must be secured in it's retainer clips and away from any components that may cause abrasion or damage, such as linkages, exhaust components, etc.

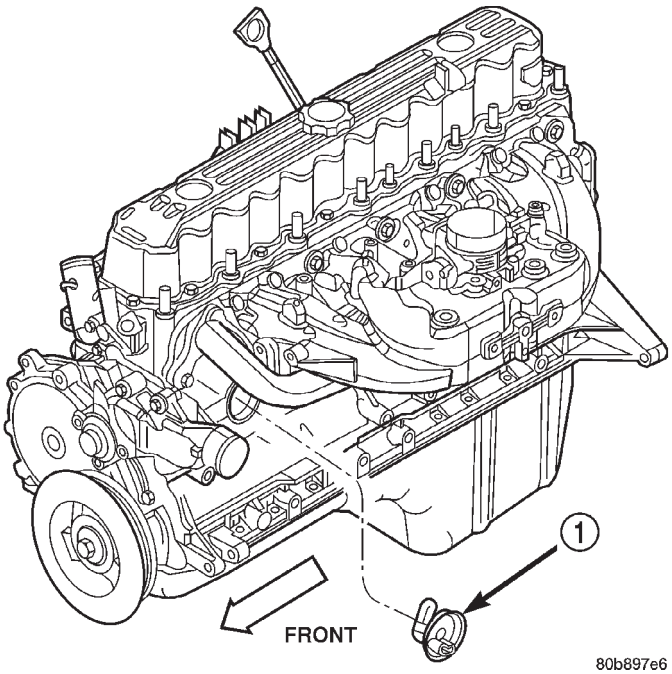


Fig. 14 Engine Block Heater 4.0L Engine

1 - ENGINE BLOCK HEATER

REMOVAL

REMOVAL—4.7L ENGINE

(1) Disconnect negative battery cable from battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

ENGINE BLOCK HEATER (Continued)

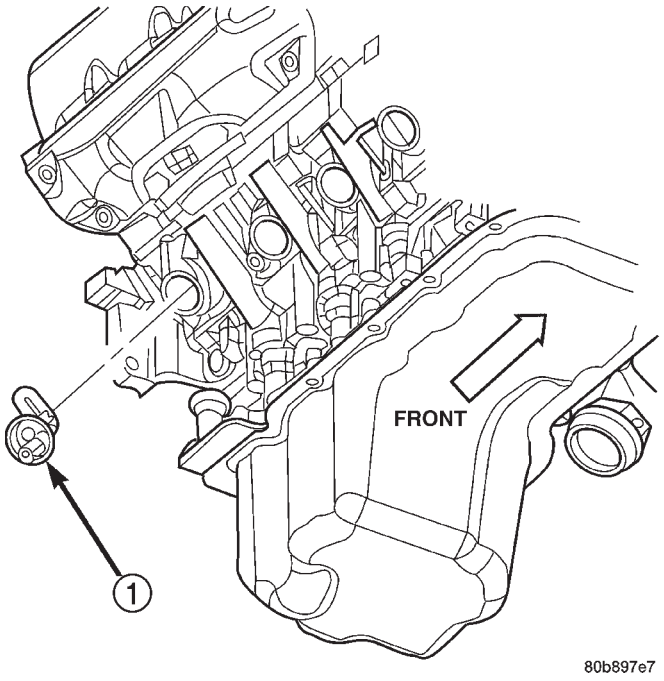


Fig. 15 Engine Block Heater 4.7L Engine

1 - ENGINE BLOCK HEATER

(3) Raise vehicle.

(4) Remove engine cylinder block drain plug(s) located on the sides of cylinder block above the oil pan rail (Fig. 16).

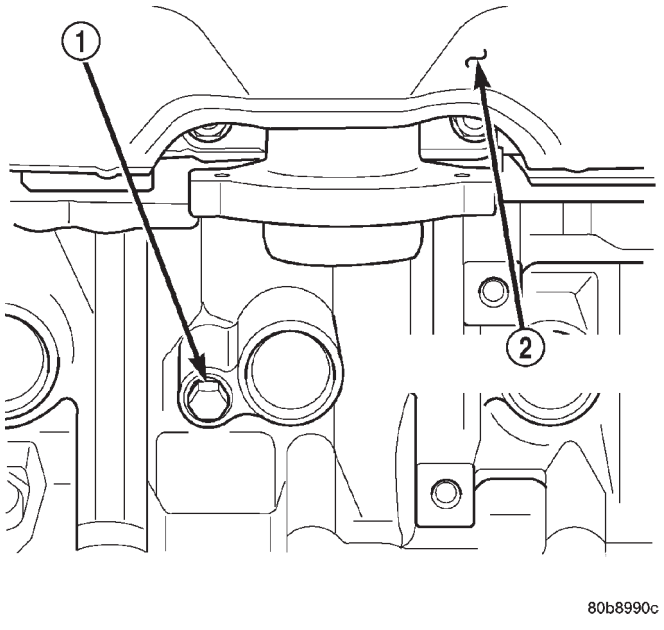


Fig. 16 Drain Plug - 4.7L Engine

1 - CYLINDER BLOCK DRAIN PLUG
2 - EXHAUST MANIFOLD AND HEAT SHIELD

(5) Remove power cord from block heater.

(6) Loosen screw at center of block heater. Remove heater assembly (Fig. 17).

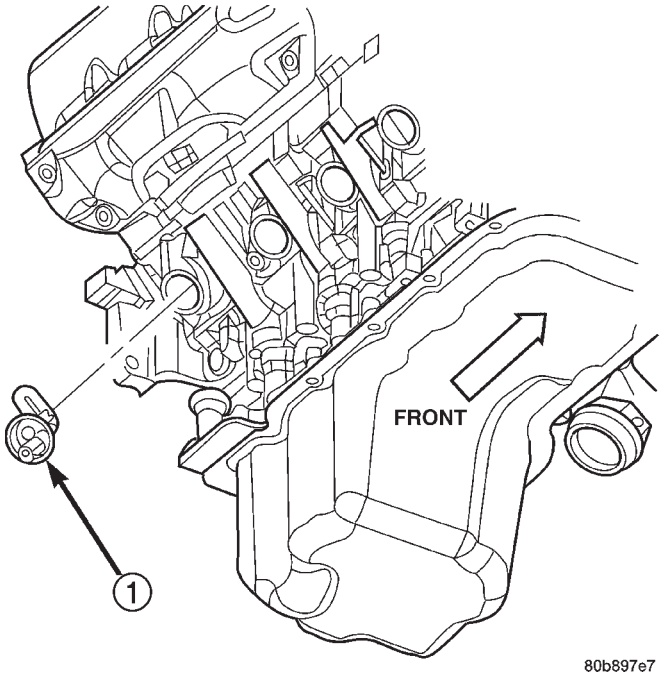


Fig. 17 Engine Block Heater - 4.7L

1 - ENGINE BLOCK HEATER

REMOVAL—4.0L ENGINE

(1) Disconnect negative battery cable from battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Raise vehicle.

(4) Remove engine cylinder block drain plug(s) located on the sides of cylinder block above the oil pan rail (Fig. 18).

(5) Remove power cord from block heater.

(6) Loosen screw at center of block heater. Remove heater assembly (Fig. 19).

INSTALLATION

INSTALLATION—4.7L ENGINE

(1) Thoroughly clean cylinder block core hole and block heater seat.

(2) Insert block heater assembly with element loop pointing at twelve o'clock (Fig. 17).

(3) With block heater fully seated, tighten center screw to 2 N·m (17 in. lbs.) torque.

(4) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Start and warm the engine. Check for leaks.

INSTALLATION—4.0L ENGINE

(1) Thoroughly clean cylinder block core hole and block heater seat.

ENGINE BLOCK HEATER (Continued)

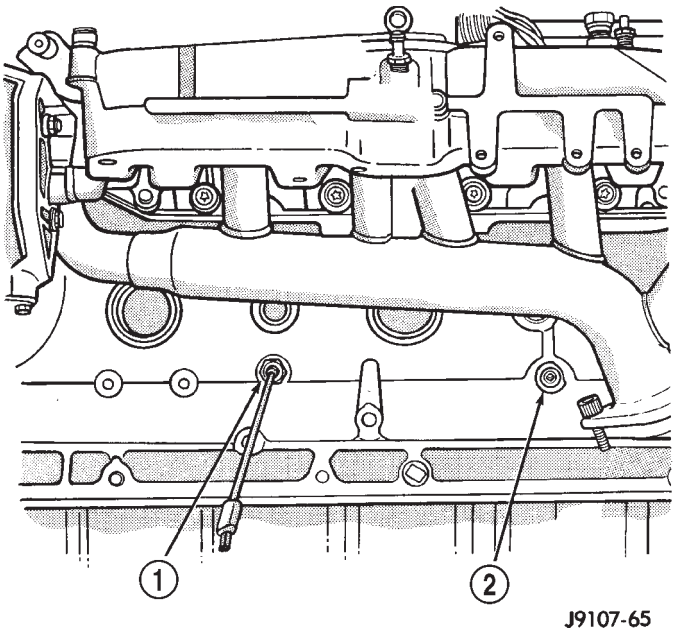


Fig. 18 Drain Plug

1 - COOLANT TEMPERATURE SENSOR
2 - BLOCK DRAIN PLUG

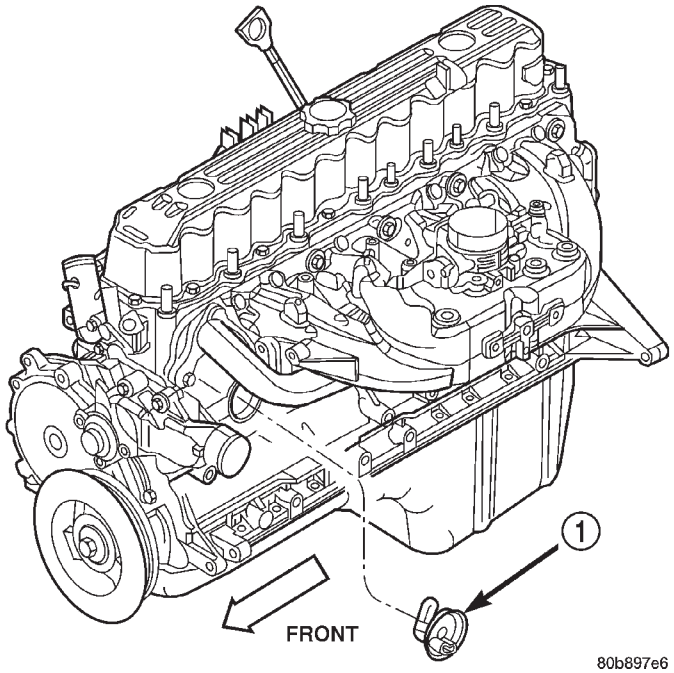


Fig. 19 Engine Block Heater

1 - ENGINE BLOCK HEATER

(2) Insert block heater assembly with element loop pointing at twelve o'clock (Fig. 19).

(3) With block heater fully seated, tighten center screw to 2 N·m (17 in. lbs.) torque.

(4) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Start and warm the engine. Check for leaks.

ENGINE COOLANT TEMP SENSOR

DESCRIPTION

The Engine Coolant Temperature (ECT) sensor is used to sense engine coolant temperature. The sensor protrudes into an engine water jacket.

The ECT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as engine coolant temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

At key-on, the Powertrain Control Module (PCM) sends out a regulated 5 volt signal to the ECT sensor. The PCM then monitors the signal as it passes through the ECT sensor to the sensor ground (sensor return).

When the engine is cold, the PCM will operate in Open Loop cycle. It will demand slightly richer air-fuel mixtures and higher idle speeds. This is done until normal operating temperatures are reached.

The PCM uses inputs from the ECT sensor for the following calculations:

- for engine coolant temperature gauge operation through CCD or PCI (J1850) communications
- Injector pulse-width
- Spark-advance curves
- ASD relay shut-down times
- Idle Air Control (IAC) motor key-on steps
- Pulse-width prime-shot during cranking
- O2 sensor closed loop times
- Purge solenoid on/off times
- EGR solenoid on/off times (if equipped)
- Leak Detection Pump operation (if equipped)
- Radiator fan relay on/off times (if equipped)
- Target idle speed

REMOVAL

REMOVAL—4.0L ENGINE

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE ENGINE COOLANT TEMPERATURE (ECT) SENSOR. REFER TO GROUP 7, COOLING.

(1) Partially drain cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).

ENGINE COOLANT TEMP SENSOR (Continued)

(2) Disconnect electrical connector from ECT sensor (Fig. 20).
(3) Remove sensor from thermostat housing.

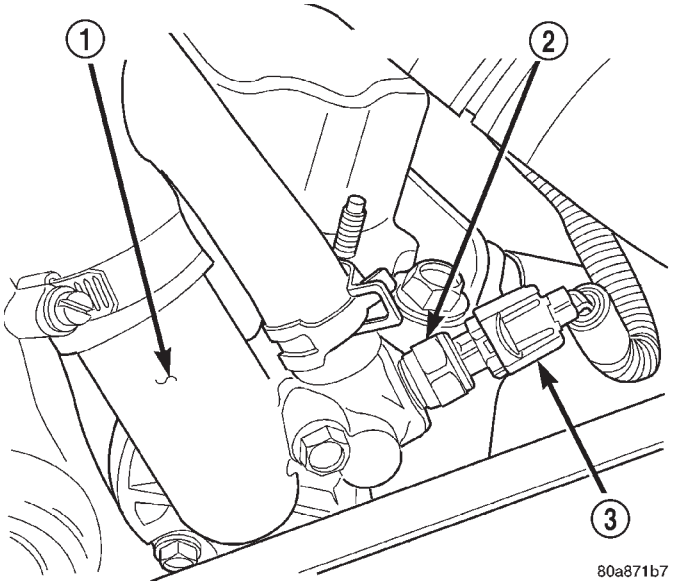


Fig. 20 Engine Coolant Temperature Sensor

1 - THERMOSTAT HOUSING
2 - ENGINE COOLANT TEMPERATURE SENSOR
3 - ELECTRICAL CONNECTOR

REMOVAL—4.7L ENGINE

WARNING: HOT, PRESSURIZED COOLANT CAN CAUSE INJURY BY SCALDING. COOLING SYSTEM MUST BE PARTIALLY DRAINED BEFORE REMOVING THE ENGINE COOLANT TEMPERATURE (ECT) SENSOR. REFER TO GROUP 7, COOLING.

The ECT sensor is located near the front of the intake manifold (Fig. 21).
(1) Partially drain cooling system. (Refer to 7 - COOLING - STANDARD PROCEDURE).
(2) Disconnect electrical connector from ECT sensor.
(3) Remove sensor from intake manifold.

INSTALLATION

INSTALLATION—4.0L ENGINE

(1) Install sensor.
(2) Tighten to 11 N·m (8 ft. lbs.) torque.
(3) Connect electrical connector to sensor.
(4) Replace any lost engine coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE).

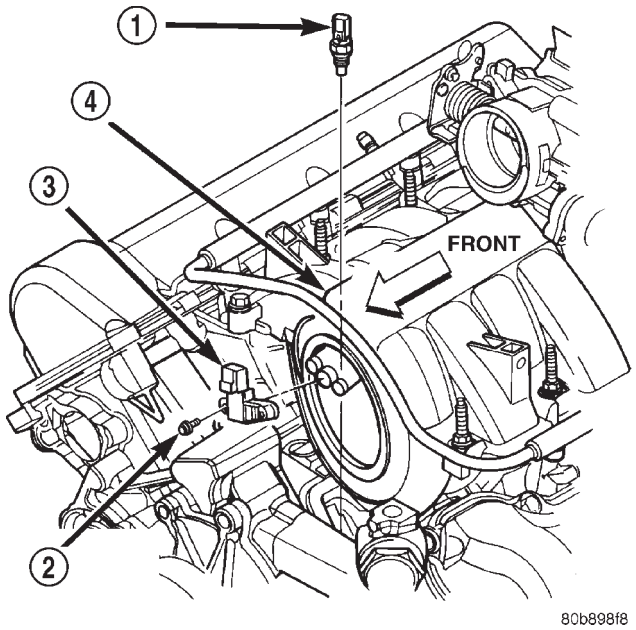


Fig. 21 Engine Coolant Temperature Sensor

1 - ECT SENSOR
2 - MOUNTING BOLTS (2)
3 - MAP SENSOR
4 - INTAKE MANIFOLD

INSTALLATION—4.7L ENGINE

(1) Install sensor.
(2) Tighten to 11 N·m (8 ft. lbs.) torque.
(3) Connect electrical connector to sensor.
(4) Replace any lost engine coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE).

ENGINE COOLANT THERMOSTAT

DESCRIPTION

DESCRIPTION—4.7L ENGINE

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm up and overall temperature control. On the 4.7L engine the thermostat is designed to block the flow of the coolant bypass journal by 50% instead of completely blocking the flow. This design controls coolant temperature more accurately (Fig. 22).

ENGINE COOLANT THERMOSTAT (Continued)

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

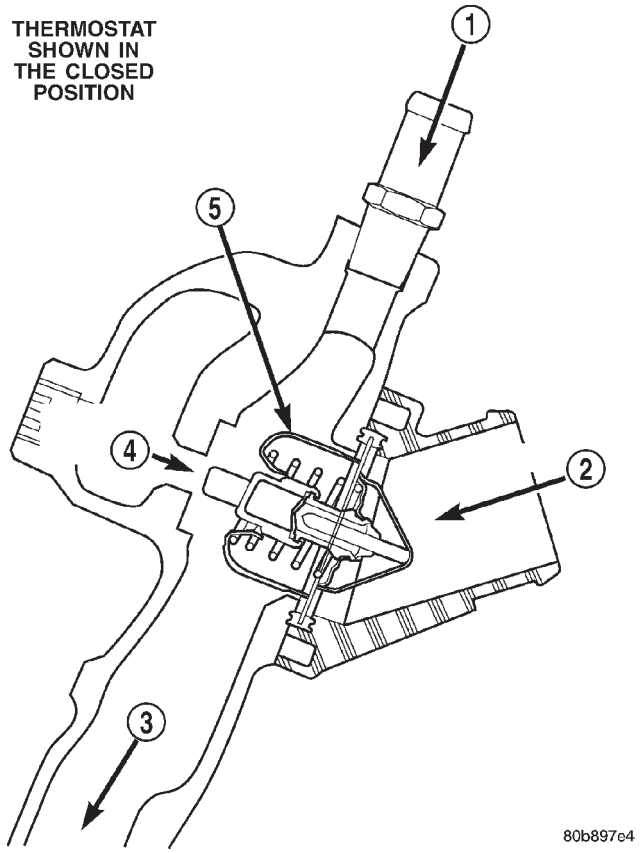


Fig. 22 Thermostat

1 - FROM HEATER
2 - FROM RADIATOR
3 - TO WATER PUMP
4 - ENGINE BYPASS
5 - THERMOSTAT

DESCRIPTION—4.0L ENGINE

CAUTION: Do not operate an engine without a thermostat, except for servicing or testing.

A pellet-type thermostat controls the operating temperature of the engine by controlling the amount of coolant flow to the radiator. On all engines the thermostat is closed below 195°F (90°C). Above this temperature, coolant is allowed to flow to the radiator. This provides quick engine warm up and overall temperature control. (Fig. 23).

The same thermostat is used for winter and summer seasons. An engine should not be operated without a thermostat, except for servicing or testing. Operating without a thermostat causes other problems. These are: longer engine warmup time, unreliable warmup performance, increased exhaust emissions and crankcase condensation. This condensation can result in sludge formation.

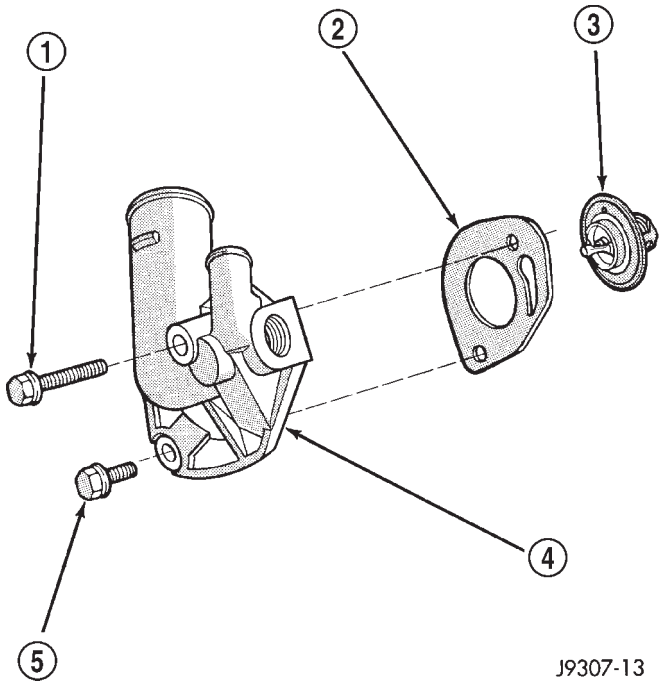


Fig. 23 Thermostat and Housing

1 - LONG BOLT
2 - GASKET
3 - THERMOSTAT
4 - THERMOSTAT HOUSING
5 - SHORT BOLT

OPERATION

The wax pellet is located in a sealed container at the spring end of the thermostat. When heated, the pellet expands, overcoming closing spring tension and water pump pressure to force the valve to open.

DIAGNOSIS AND TESTING—THERMOSTAT

ON-BOARD DIAGNOSTICS

All models are equipped with On-Board Diagnostics for certain cooling system components.If the powertrain control module (PCM) detects low engine coolant temperature, it will record a Diagnostic Trouble Code (DTC). For other DTC numbers, (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

The DTC can also be accessed through the DRB scan tool.

ENGINE COOLANT THERMOSTAT (Continued)

REMOVAL

REMOVAL—4.0L ENGINE

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(1) Drain the coolant from the radiator until the level is below the thermostat housing (Refer to 7 - COOLING - STANDARD PROCEDURE).

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 52). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only an original equipment clamp with matching number or letter.

(2) Remove radiator upper hose and heater hose at thermostat housing.

(3) Disconnect wiring connector at engine coolant temperature sensor.

(4) Remove thermostat housing mounting bolts, thermostat housing, gasket and thermostat (Fig. 24). Discard old gasket.

(5) Clean the gasket mating surfaces.

REMOVAL—4.7L ENGINE

WARNING: DO NOT LOOSEN RADIATOR DRAINCOCK WITH SYSTEM HOT AND PRESSURIZED. SERIOUS BURNS FROM COOLANT CAN OCCUR.

Do not waste reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

If thermostat is being replaced, be sure that replacement is specified thermostat for vehicle model and engine type.

(1) Disconnect negative battery cable at battery.

(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Raise vehicle on hoist.

(4) Remove splash shield.

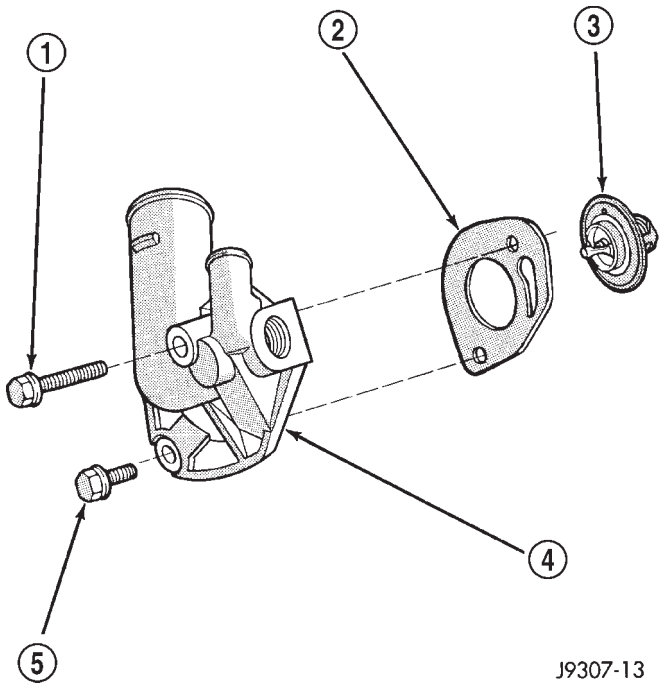


Fig. 24 Thermostat

1 - LONG BOLT
2 - GASKET
3 - THERMOSTAT
4 - THERMOSTAT HOUSING
5 - SHORT BOLT

(5) Remove lower radiator hose clamp and lower radiator hose at thermostat housing.

(6) Remove thermostat housing mounting bolts, thermostat housing and thermostat (Fig. 25).

INSTALLATION

INSTALLATION—4.0L ENGINE

(1) Install the replacement thermostat so that the pellet, which is encircled by a coil spring, faces the engine. All thermostats are marked on the outer flange to indicate the proper installed position.

(a) Observe the recess groove in the engine cylinder head (Fig. 26).

(b) Position thermostat in groove with arrow and air bleed hole on outer flange pointing up.

(2) Install replacement gasket and thermostat housing.

CAUTION: Tightening the thermostat housing unevenly or with the thermostat out of its recess, may result in a cracked housing.

(3) Tighten the housing bolts to 22 N·m (16 ft. lbs.) torque.

(4) Install hoses to thermostat housing.

ENGINE COOLANT THERMOSTAT (Continued)

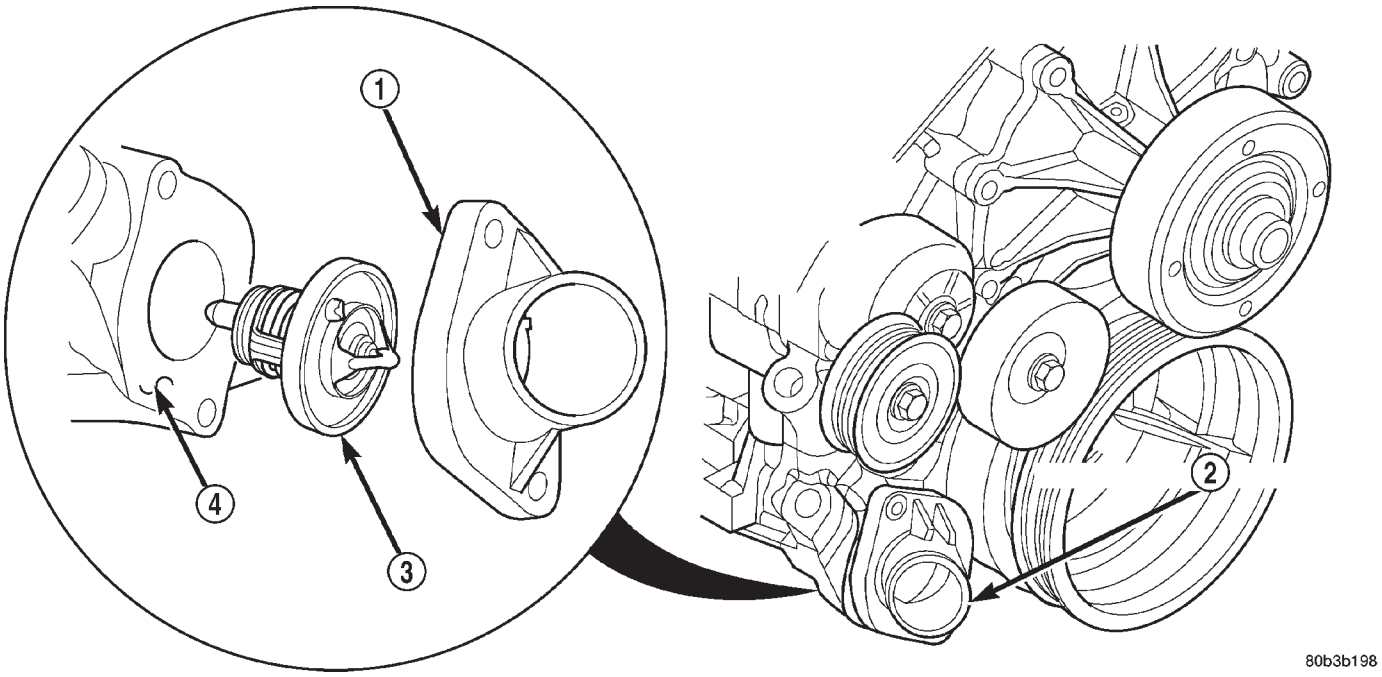


Fig. 25 Thermostat and Thermostat Housing

1 - THERMOSTAT HOUSING
2 - THERMOSTAT LOCATION
3 - THERMOSTAT AND GASKET
4 - TIMING CHAIN COVER

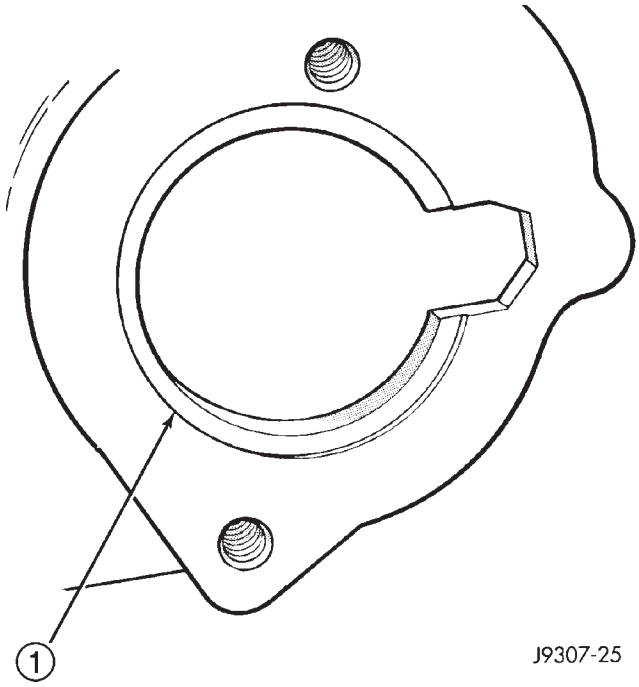


Fig. 26 Thermostat Recess

1 - GROOVE

(5) Install electrical connector to coolant temperature sensor.

(6) Be sure that the radiator draincock is tightly closed. Fill the cooling system to the correct level with the required coolant mixture (Refer to 7 - COOLING - STANDARD PROCEDURE).

(7) Start and warm the engine. Check for leaks.

INSTALLATION—4.7L ENGINE

(1) Clean mating areas of timing chain cover and thermostat housing.

(2) Install thermostat (spring side down) into recessed machined groove on timing chain cover (Fig. 25).

(3) Position thermostat housing on timing chain cover.

(4) Install two housing-to-timing chain cover bolts. Tighten bolts to 13 N·m (115 in. lbs.) torque.

CAUTION: Housing must be tightened evenly and thermostat must be centered into recessed groove in timimg chain cover. If not, it may result in a cracked housing, damaged timing chain cover threads or coolant leaks.

(5) Install lower radiator hose on thermostat housing.

(6) Install splash shield.

(7) Lower vehicle.

(8) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(9) Connect negative battery cable to battery.

(10) Start and warm the engine. Check for leaks.

FAN DRIVE VISCOUS CLUTCH - 4.0L

DESCRIPTION

CAUTION: Engines equipped with serpentine drive belts have reverse rotating fans and viscous fan drives. They are marked with the word REVERSE to designate their usage. Installation of the wrong fan or viscous fan drive can result in engine overheating.

CAUTION: If the viscous fan drive is replaced because of mechanical damage, the cooling fan blades should also be inspected. Inspect for fatigue cracks, loose blades, or loose rivets that could have resulted from excessive vibration. Replace fan blade assembly if any of these conditions are found. Also inspect water pump bearing and shaft assembly for any related damage due to a viscous fan drive malfunction.

The thermal viscous fan drive (Fig. 27) is a silicone-fluid-filled coupling used to connect the fan blades to the water pump shaft. The coupling allows the fan to be driven in a normal manner. This is done at low engine speeds while limiting the top speed of the fan to a predetermined maximum level at higher engine speeds.

An electrical cooling fan located in the fan shroud aids in low speed cooling, It is designed to augment the viscous fan, However, it does not replace the viscous fan.

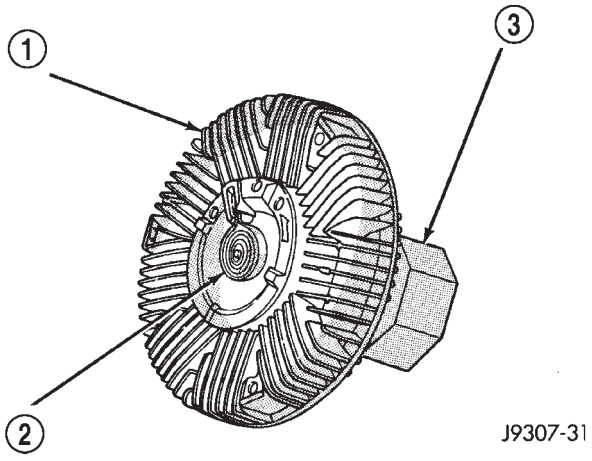


Fig. 27 Viscous Fan Drive

1 - VISCOUS FAN DRIVE
2 - THERMOSTATIC SPRING
3 - MOUNTING NUT TO WATER PUMP HUB

OPERATION

A thermostatic bimetallic spring coil is located on the front face of the viscous fan drive unit (Fig. 27). This spring coil reacts to the temperature of the radiator discharge air. It engages the viscous fan drive for higher fan speed if the air temperature from the radiator rises above a certain point. Until additional engine cooling is necessary, **the fan will remain at a reduced rpm regardless of engine speed. Normally less than three hundred (300) rpm.**

Only when sufficient heat is present, will the viscous fan drive engage. This is when the air flowing through the radiator core causes a reaction to the bimetallic coil. It then increases fan speed to provide the necessary additional engine cooling.

Once the engine has cooled, the radiator discharge temperature will drop. The bimetallic coil again reacts and the fan speed is reduced to the previous disengaged speed.

DIAGNOSIS AND TESTING—VISCOUS FAN DRIVE

If the fan assembly free-wheels without drag (the fan blades will revolve more than five turns when spun by hand), replace the fan drive. This spin test must be performed when the engine is cool.

For the following test, the cooling system must be in good condition. It also will ensure against excessively high coolant temperature.

WARNING: BE SURE THAT THERE IS ADEQUATE FAN BLADE CLEARANCE BEFORE DRILLING.

(1) Drill a 3.18-mm (1/8-in) diameter hole in the top center of the fan shroud.

(2) Obtain a dial thermometer with an 8 inch stem (or equivalent). It should have a range of -18° to 105°C (0° to 220° F). Insert thermometer through the hole in the shroud. Be sure that there is adequate clearance from the fan blades.

(3) Connect a tachometer and an engine ignition timing light (timing light is to be used as a strobe light).

(4) Block the air flow through the radiator. Secure a sheet of plastic in front of the radiator (or air conditioner condenser). Use tape at the top to secure the plastic and be sure that the air flow is blocked.

(5) Be sure that the air conditioner (if equipped) is turned off.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(6) Start the engine and operate at 2400 rpm. Within ten minutes the air temperature (indicated on the dial thermometer) should be up to 93° C (200° F). Fan drive **engagement** should have started to occur at between 91° to 96° C (195° to 205° F). Engagement is distinguishable by a definite **increase** in fan flow noise (roaring). The timing light also will indicate an increase in the speed of the fan.

(7) When the air temperature reaches 93° C (200° F), remove the plastic sheet. Fan drive **disengagement** should have started to occur at between 62° to 85° C (145° to 185° F). A definite **decrease** of fan flow noise (roaring) should be noticed. If not, replace the defective viscous fan drive unit.

PWM FAN CONTROL MODULE - 4.0L

DESCRIPTION

The pulse width modulated (PWM) radiator cooling fan relay is located behind the front bumper fascia below the right headlamp.

OPERATION

The PWM relay is used to control the speed of the electric radiator cooling fan. It allows for multiple fan speeds. This allows for improved fan noise and A/C performance, better engine cooling, and additional vehicle power.

PWM relay operation is controlled by the Powertrain Control Module (PCM). To operate the PWM relay, the PCM looks at inputs from:

- Engine coolant temperature
- Ambient temperature from the body controller
- Vehicle speed
- Transmission oil temperature
- A/C switch position (A/C request)

REMOVAL

The Pulse Width Modulated (PWM) cooling fan relay is located below the right headlamp behind the bumper fascia (Fig. 28).

(1) Remove front bumper and grill assembly.

(2) Remove 1 support bolt near front of reservoir (Fig. 28).

(3) Remove 2 reservoir mounting bolts.

(4) Remove reservoir from vehicle to gain access to vacuum hose (Fig. 29). Disconnect vacuum hose from reservoir fitting at rear of reservoir.

(5) Disconnect electrical connector at relay (Fig. 30).

(6) Remove 2 relay mounting bolts (Fig. 30) and remove relay.

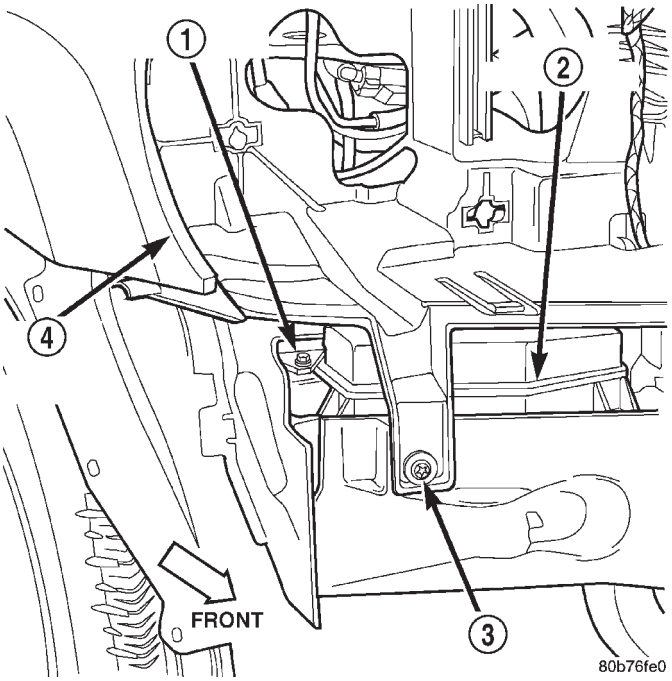


Fig. 28 Radiator Cooling Fan Relay Location

1 - RADIATOR FAN RELAY
2 - VACUUM RESERVOIR
3 - BOLT
4 - RIGHT FRONT FENDER

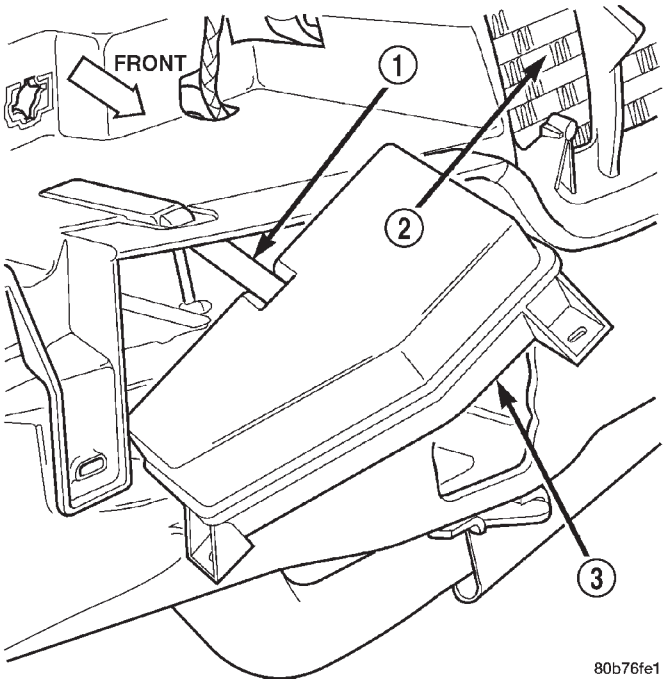


Fig. 29 Vacuum Reservoir Removal/Installation

1 - VACUUM HOSE
2 - RADIATOR
3 - VACUUM RESERVOIR

PWM FAN CONTROL MODULE - 4.0L (Continued)

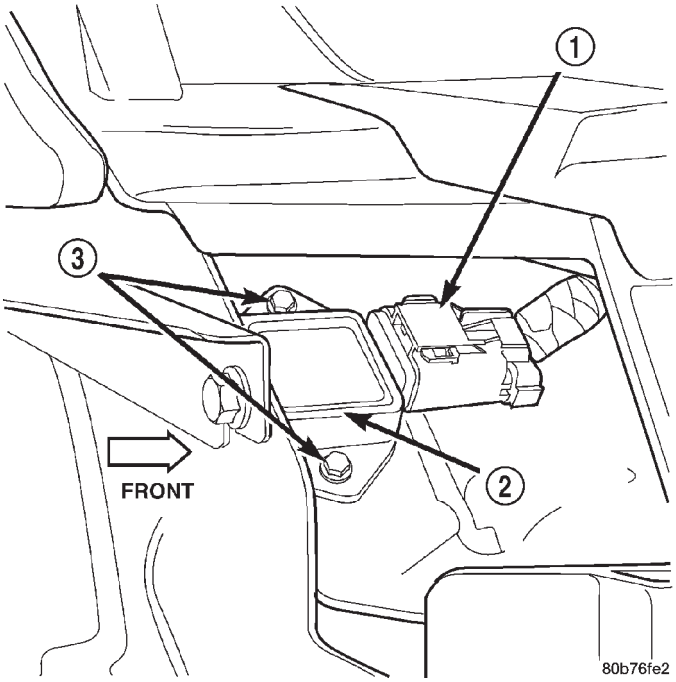


Fig. 30 Radiator Cooling Fan Relay Removal/ Installation

1 - ELECTRICAL CONNECTOR
2 - RADIATOR FAN RELAY
3 - MOUNTING BOLTS (2)

INSTALLATION

(1) Position relay to body and install 2 bolts. Tighten bolts to 3 N·m (25 in. lbs.) torque.
(2) Connect electrical connector to relay.
(3) Connect vacuum hose to reservoir.
(4) Install reservoir and tighten 2 bolts to 3 N·m (25 in. lbs.) torque.
(5) Install front bumper and grill assembly.

RADIATOR - 4.7L

DESCRIPTION

All vehicles are equipped with a cross flow type radiator with plastic side tanks (Fig. 31).

Plastic tanks, while stronger than brass, are subject to damage by impact, such as from tools or wrenches. Handle radiator with care.

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR. REFER TO COOLING SYSTEM DRAINING.

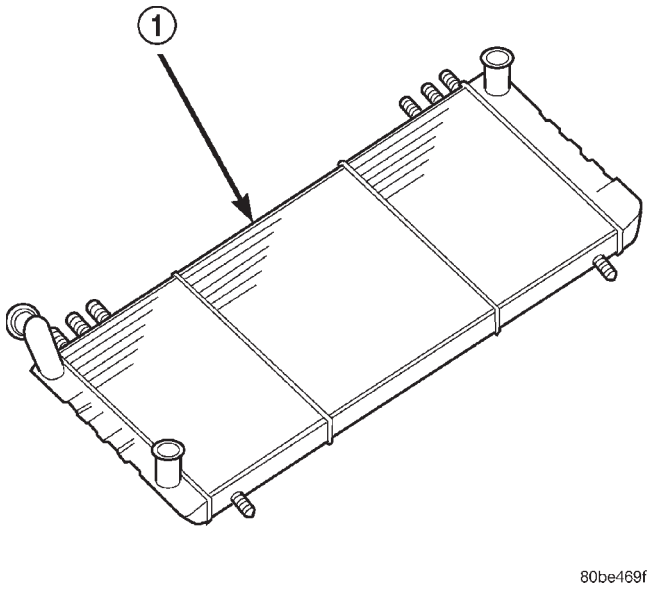


Fig. 31 Cross Flow Radiator - Typical

1 - RADIATOR

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 32). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 33). If replacement is necessary, use only an original equipment clamp with matching number or letter.

CAUTION: When removing the radiator or A/C condenser for any reason, note the location of all radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 34). These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Disconnect the negative battery cable at battery.
(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).
(3) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).

RADIATOR - 4.7L (Continued)

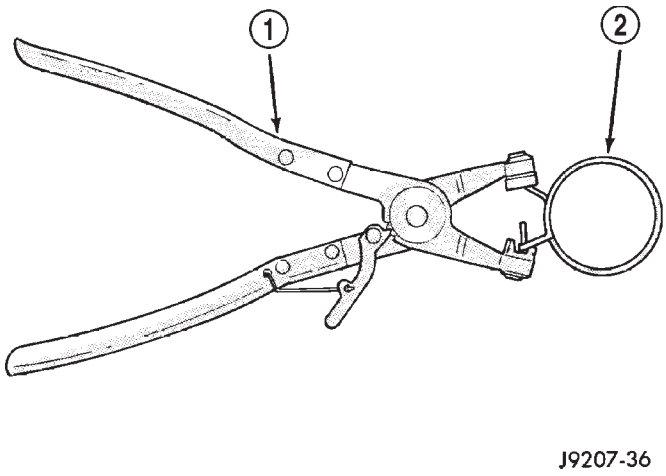


Fig. 32 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

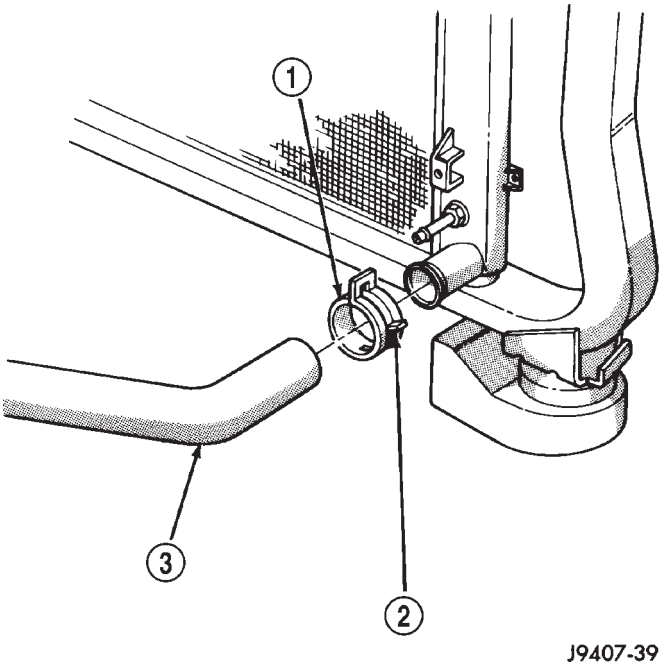


Fig. 33 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

(4) Remove two radiator mounting bolts.
(5) Disconnect both transmission cooler lines from radiator.
(6) Disconnect electrical connector for the fan control solenoid.
(7) Disconnect the power steering cooler line from cooler and filter.
(8) Disconnect the radiator upper and lower hoses.
(9) Disconnect the overflow hose from radiator.
(10) Remove the air inlet duct at the grill.

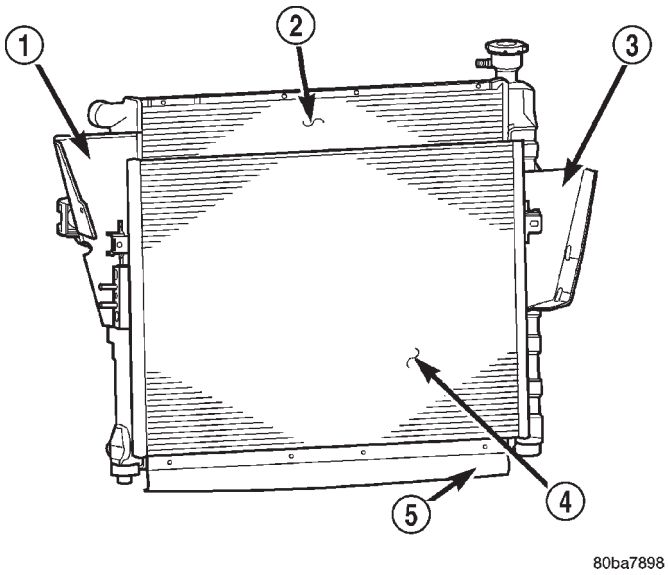


Fig. 34 Air Seals - Typical

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

(11) The lower part of radiator is equipped with two alignment dowel pins (Fig. 35). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

WARNING: THE AIR CONDITIONING SYSTEM (IF EQUIPPED) IS UNDER A CONSTANT PRESSURE EVEN WITH THE ENGINE OFF. REFER TO REFRIGERANT WARNINGS IN, HEATING AND AIR CONDITIONING BEFORE HANDLING ANY AIR CONDITIONING COMPONENT.

NOTE: The radiator and radiator cooling fan can be removed as an assembly. It is not necessary to remove the cooling fan before removing or installing the radiator.

(12) Disconnect the two high pressure fluid lines at the hydraulic fan drive.
(13) Disconnect the low pressure return hose at the hydraulic fan drive.
(14) Gently lift up and remove radiator from vehicle. Be careful not to scrape the radiator fins against any other component. Also be careful not to disturb the air conditioning condenser (if equipped).

CLEANING

Clean radiator fins With the engine cold, apply cold water and compressed air to the back (engine side) of

RADIATOR - 4.7L (Continued)

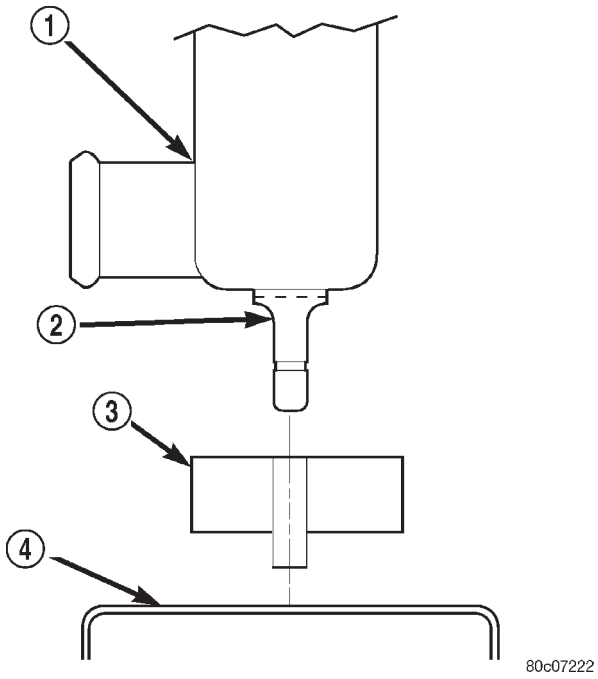


Fig. 35 Radiator Alignment Dowels - Typical

1 - RADIATOR
2 - ALIGNMENT DOWEL
3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

the radiator to flush the radiator and/or A/C condenser of debris.

INSPECTION

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

INSTALLATION

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 39) are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Equipped with air conditioning: Gently lower the radiator and fan shroud into the vehicle. Guide the two radiator alignment dowels through the holes in the rubber air seals first and then through the A/C support brackets (Fig. 40). Continue to guide the alignment dowels into the rubber grommets located in lower radiator crossmember. The holes in the L-shaped brackets (located on bottom of A/C condenser) must be positioned between bottom of rubber air seals and top of rubber grommets.

(2) Connect the radiator upper and lower hoses and hose clamps to radiator.

CAUTION: The tangs on the hose clamps must be positioned straight down.

(3) Install coolant reserve/overflow tank hose at radiator.

(4) Connect both transmission cooler lines at the radiator.

(5) Install both radiator mounting bolts.

(6) Install air inlet duct at grill.

(7) Attach electric connector for hydraulic fan control solenoid.

(8) Install the grill (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).

(9) Connect the two high pressure lines to the hydraulic fan drive. Tighten ½ in. pressure line fitting to 49 N·m (36 ft. lbs.). and the 3/8 in. pressure line fitting to 29 N·m (21.5 ft. lbs.).

(10) Connect the low pressure hose to the hydraulic fan drive. Position the spring clamp.

(11) Connect the power steering filter hoses to the filter. Install new hose clamps.

(12) Rotate the fan blades (by hand) and check for interference at fan shroud.

(13) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(14) Refill the power steering reservoir and bleed air from system (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(15) Connect battery cable at battery.

(16) Start and warm engine. Check for leaks.

RADIATOR - 4.0L

DESCRIPTION

All vehicles are equipped with a cross flow type radiator with plastic side tanks (Fig. 36).

Plastic tanks, while stronger than brass, are subject to damage by impact, such as from tools or wrenches. Handle radiator with care.

REMOVAL

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR. REFER TO COOLING SYSTEM DRAINING.

RADIATOR - 4.0L (Continued)

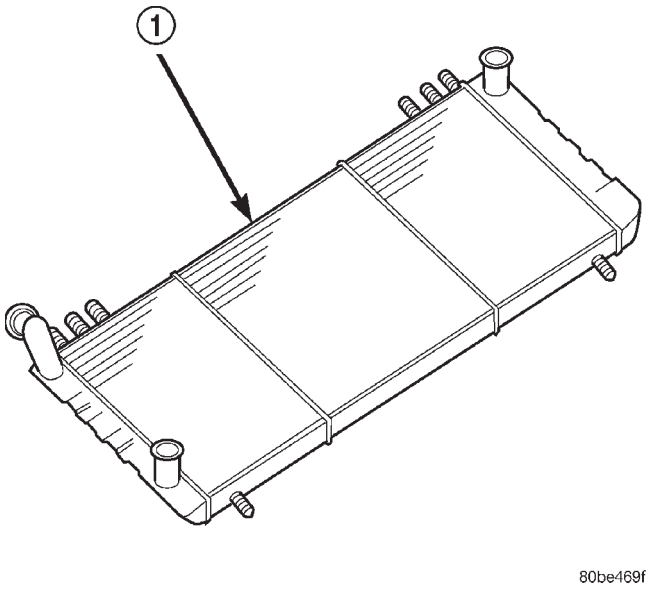


Fig. 36 Cross Flow Radiator - Typical

1 - RADIATOR

Do not waste reusable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 37). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 38). If replacement is necessary, use only an original equipment clamp with matching number or letter.

CAUTION: When removing the radiator or A/C condenser for any reason, note the location of all radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 39). These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Disconnect the negative battery cable at battery.

(2) Drain coolant from radiator (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

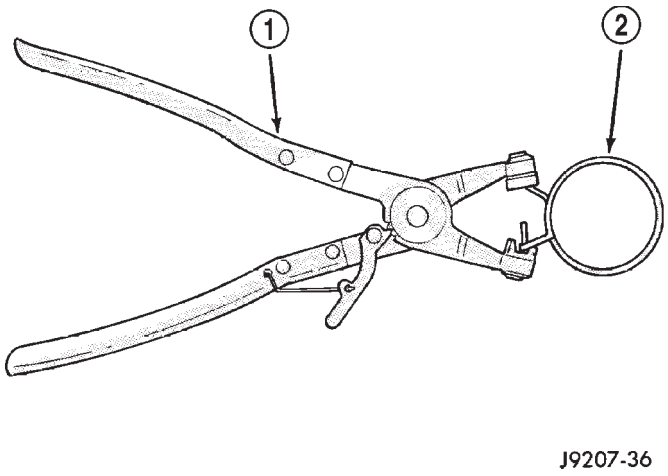


Fig. 37 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

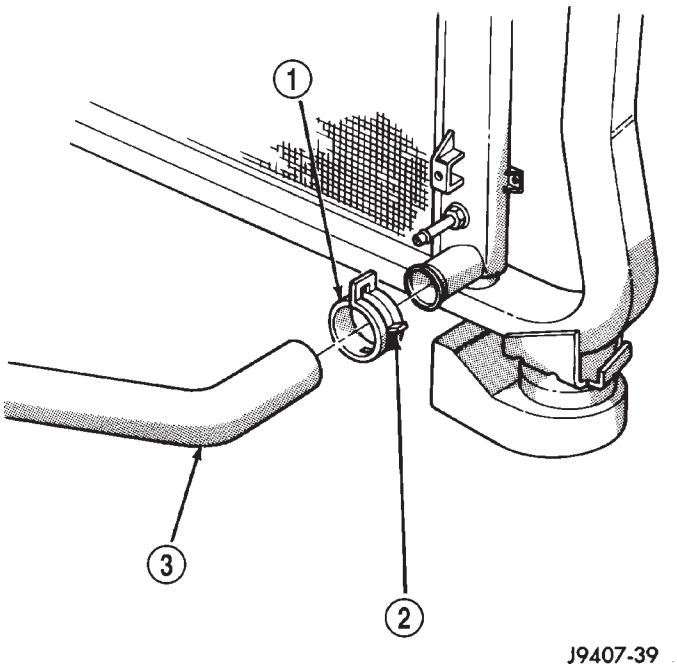


Fig. 38 Clamp Number/Letter Location - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

(4) Remove the front grill (Refer to 23 - BODY/EXTERIOR/GRILLE - REMOVAL).

(5) Remove two radiator mounting bolts (Fig. 41).

(6) Disconnect both transmission cooler lines from radiator.

(7) Disconnect electric fan connector, then disconnect connector harness from shroud (Fig. 41).

(8) Disconnect the radiator upper and lower hoses (Fig. 41).

RADIATOR - 4.0L (Continued)

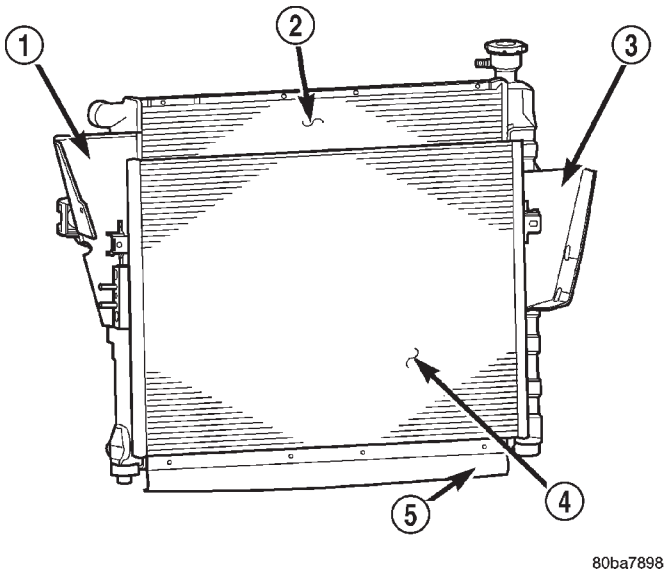


Fig. 39 Air Seals - Typical

1 - AIR DAM
2 - RADIATOR
3 - AIR DAM
4 - A/C CONDENSER
5 - AIR SEAL

(9) Disconnect the overflow hose from radiator (Fig. 41).

(10) Remove the air inlet duct at the grill.

(11) The lower part of radiator is equipped with two alignment dowel pins (Fig. 40). They are located on the bottom of radiator tank and fit into rubber grommets. These rubber grommets are pressed into the radiator lower crossmember.

WARNING: THE AIR CONDITIONING SYSTEM (IF EQUIPPED) IS UNDER A CONSTANT PRESSURE EVEN WITH THE ENGINE OFF. REFER TO REFRIGERANT WARNINGS IN GROUP 24, HEATING AND AIR CONDITIONING BEFORE HANDLING ANY AIR CONDITIONING COMPONENT.

(12) If equipped with an auxiliary automatic transmission oil cooler, use caution when removing radiator. The oil cooler lines are routed through a rubber air seal on the right side of radiator. Do not cut or tear this seal.

(13) Gently lift up and remove radiator from vehicle. Be careful not to scrape the radiator fins against any other component. Also be careful not to disturb the air conditioning condenser (if equipped).

CLEANING

Clean radiator fins With the engine cold, apply cold water and compressed air to the back (engine side) of the radiator to flush the radiator and/or A/C condenser of debris.

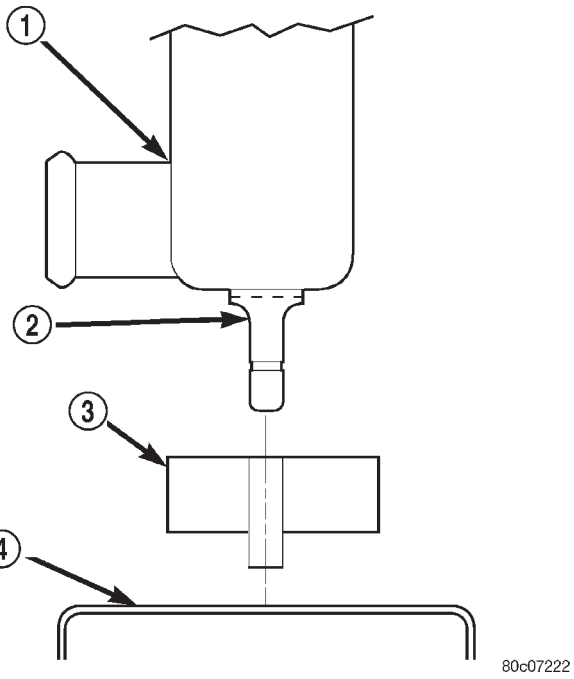


Fig. 40 Radiator Alignment Dowels

1 - RADIATOR
2 - ALIGNMENT DOWEL
3 - RADIATOR LOWER ISOLATOR
4 - RADIATOR LOWER CROSSMEMBER

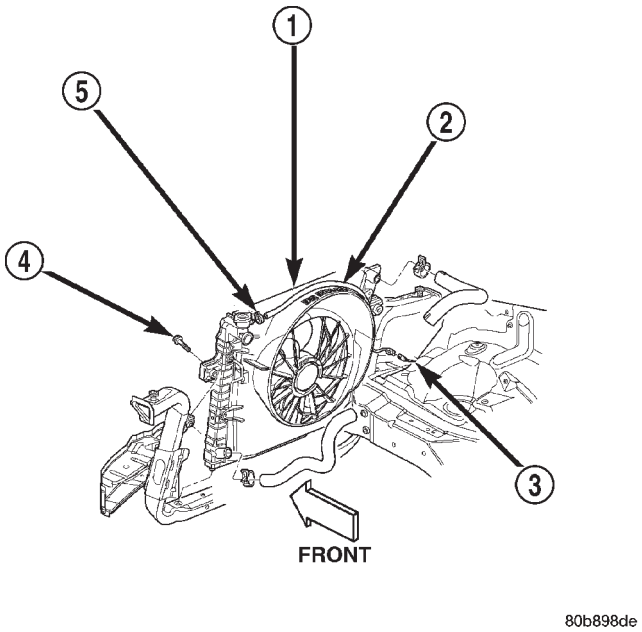


Fig. 41 Radiator, Shroud and Electric Fan

1 - RADIATOR/SHROUD/FAN ASSEMBLY
2 - OVER FLOW HOSE
3 - ELECTRIC FAN CONNECTOR
4 - RADIATOR MOUNTING BOLT(S)
5 - CLAMP

INSPECTION

The radiator cooling fins should be checked for damage or deterioration. Inspect cooling fins to make sure they are not bent or crushed, these areas result in reduced heat exchange causing the cooling system to operate at higher temperatures. Inspect the plastic end tanks for cracks, damage or leaks.

Inspect the radiator neck for damage or distortion.

INSTALLATION

CAUTION: Before installing the radiator or A/C condenser, be sure the radiator-to-body and radiator-to-A/C condenser rubber air seals (Fig. 39) are properly fastened to their original positions. These are used at the top, bottom and sides of the radiator and A/C condenser. To prevent overheating, these seals must be installed to their original positions.

(1) Equipped with air conditioning: Gently lower the radiator into the vehicle. Guide the two radiator alignment dowels through the holes in the rubber air seals first and then through the A/C support brackets (Fig. 40). Continue to guide the alignment dowels into the rubber grommets located in lower radiator crossmember. The holes in the L-shaped brackets (located on bottom of A/C condenser) must be positioned between bottom of rubber air seals and top of rubber grommets.

(2) Connect the radiator upper and lower hoses and hose clamps to radiator (Fig. 41).

CAUTION: The tangs on the hose clamps must be positioned straight down.

(3) Install coolant reserve/overflow tank hose at radiator (Fig. 41).

(4) Connect both transmission cooler lines at the radiator (Fig. 41).

(5) Install both radiator mounting bolts (Fig. 41).

(6) Install air inlet duct at grill.

(7) Attach electric fan harness to shroud, then connect harness to connector (Fig. 41).

(8) Install the grill (Refer to 23 - BODY/EXTERIOR/GRILLE - INSTALLATION).

(9) Install the fan/viscous fan drive assembly to the water pump.

(10) Rotate the fan blades (by hand) and check for interference at fan shroud.

(11) Be sure of at least 25 mm (1.0 inch) between tips of fan blades and fan shroud.

(12) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(13) Connect battery cable at battery.

(14) Start and warm engine. Check for leaks.

RADIATOR FAN MOTOR

DIAGNOSIS AND TESTING—ELECTRIC COOLING FAN

The powertrain control module (PCM) will enter a diagnostic trouble code (DTC) in memory if it detects a problem in the auxiliary cooling fan relay or circuit. (Refer to 25 - EMISSIONS CONTROL - DESCRIPTION).

If the electric cooling fan is inoperative, check the 15A fuse in the junction block and the 40A fuse in the Power Distribution Center (PDC) with a 12 volt test lamp or DVOM. Refer to the inside of the PDC cover for the exact location of the fuse. If fuses are okay, refer to ELECTRICAL for cooling fan and relay circuit schematic.

WATER PUMP - 4.7L

DESCRIPTION

DESCRIPTION—WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a single serpentine drive belt.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary.

Both heater hoses are connected to fittings on the timing chain front cover. The water pump is also mounted directly to the timing chain cover and is equipped with a non serviceable integral pulley (Fig. 42).

DESCRIPTION—WATER PUMP BYPASS

The 4.7L engine uses an internal water/coolant bypass system. The design uses galleries in the timing chain cover to circulate coolant during engine warm-up preventing the coolant from flowing through the radiator. The thermostat uses a stub shaft located at the rear of the thermostat (Fig. 43) to control flow through the bypass gallery.

OPERATION

OPERATION—WATER PUMP

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold,

WATER PUMP - 4.7L (Continued)

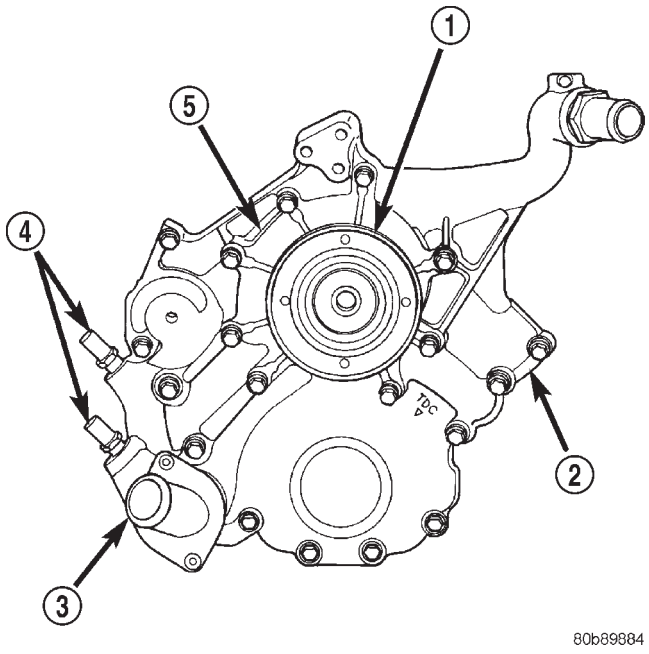


Fig. 42 Water Pump and Timing Chain Cover

1 - INTEGRAL WATER PUMP PULLEY
2 - TIMING CHAIN COVER
3 - THERMOSTAT HOUSING
4 - HEATER HOSE FITTINGS
5 - WATER PUMP

radiator core, cooling system hoses and heater core, this coolant absorbs the heat generated when the engine is running. The pump is driven by the engine crankshaft via a drive belt.

OPERATION—WATER PUMP BYPASS

When the thermostat is in the closed position the bypass gallery is not obstructed allowing 100% flow. When the thermostat is in the open position the stub shaft enters the bypass gallery obstructing bypass coolant flow by 50%. This design allows the coolant to reach operating temperature quickly when cold, while adding extra cooling during normal temperature operation.

DIAGNOSIS AND TESTING—WATER PUMP

LOOSE IMPELLER - 4.0L and 4.7L

NOTE: Due to the design of the 4.0L and 4.7L engine water pumps, testing the pump for a loose impeller must be done by verifying coolant flow in the radiator. To accomplish this refer to the following procedure.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

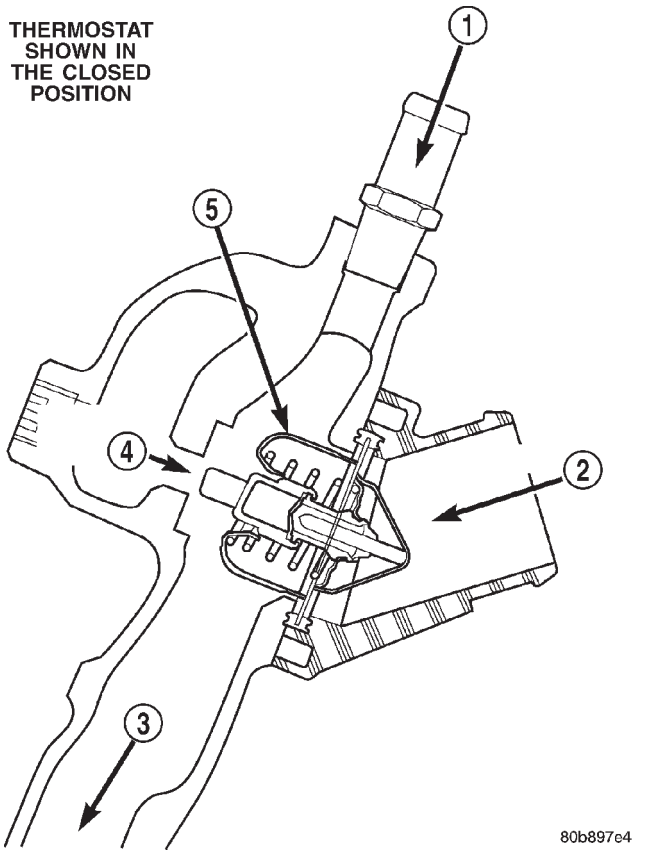


Fig. 43 Water/Coolant Bypass Flow and Thermostat

1 - FROM HEATER
2 - FROM RADIATOR
3 - TO WATER PUMP
4 - ENGINE BYPASS
5 - THERMOSTAT

(1) Drain coolant until the first row of cores is visible in the radiator (Refer to 7 - COOLING - STANDARD PROCEDURE) 4.7L Engine or (Refer to 7 - COOLING - STANDARD PROCEDURE) 4.0L Engine.

(2) Leaving the radiator cap off, start the engine. Run engine until thermostat opens.

(3) While looking into the radiator through the radiator fill neck, raise engine rpm to 2000 RPM. Observe the flow of coolant from the first row of cores.

(4) If there is no flow or very little flow visable, replace the water pump.

INSPECTING FOR INLET RESTRICTIONS

Inadequate heater performance may be caused by a metal casting restriction in the heater hose inlet.

DO NOT WASTE reusable coolant. If solution is clean, drain the coolant into a clean container for reuse.

WATER PUMP - 4.7L (Continued)

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(1) Drain sufficient coolant from the radiator to decrease the level below the heater hose inlet. On 4.7L engines this requires complete draining.
(2) Remove the heater hose.
(3) Inspect the inlet for metal casting flash or other restrictions.

NOTE: On 4.0L engines remove the pump from the engine before removing restriction to prevent contamination of the coolant with debris. . On 4.7L engine remove the fitting from the timing chain cover, If the restriction is in the timing chain cover, remove the timing chain cover.

REMOVAL

The water pump on 4.7L engines is bolted directly to the engine timing chain case/cover.

A gasket is used as a seal between the water pump and timing chain case/cover.

The water pump can be removed without discharging the air conditioning system (if equipped).

(1) Disconnect negative battery cable from battery.
(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE). Do not waste reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps. If replacement is necessary, use only an original equipment clamp with matching number or letter.

(3) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(4) Remove lower radiator hose clamp and remove lower hose at water pump.
(5) Remove seven water pump mounting bolts and one stud bolt.

CAUTION: Do not pry water pump at timing chain case/cover. The machined surfaces may be damaged resulting in leaks.

(6) Remove water pump and gasket. Discard gasket.

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

INSPECTION

Inspect the water pump assembly for cracks in the housing, Water leaks from shaft seal, Loose or rough turning bearing or Impeller rubbing either the pump body or timing chain case/cover.

INSTALLATION

(1) Clean gasket mating surfaces.
(2) Using a new gasket, position water pump and install mounting bolts as shown. (Fig. 44). Tighten water pump mounting bolts to 54 N·m (40 ft. lbs.) torque.

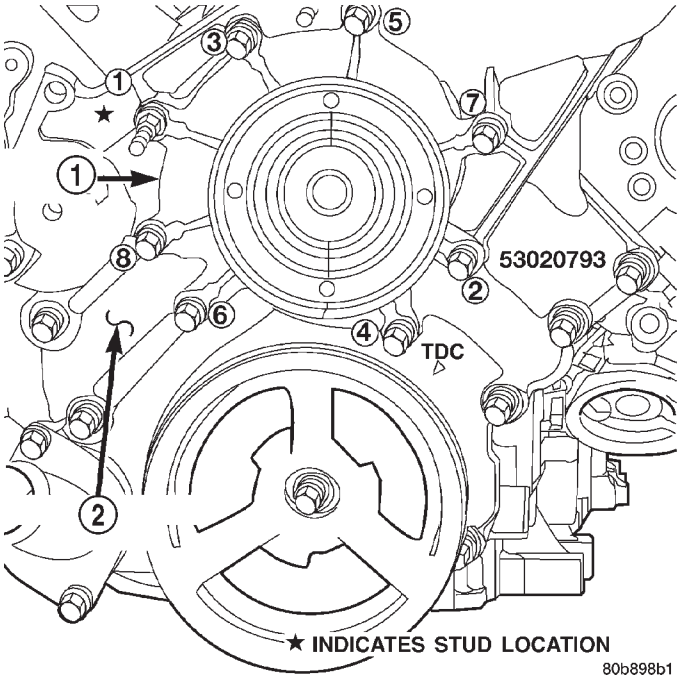


Fig. 44 Water Pump Installation

1 - WATER PUMP
2 - TIMING CHAIN COVER

(3) Spin water pump to be sure that pump impeller does not rub against timing chain case/cover.
(4) Connect radiator lower hose to water pump.
(5) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

WATER PUMP - 4.7L (Continued)

CAUTION: When installing the serpentine accessory drive belt, belt must be routed correctly. If not, engine may overheat due to water pump rotating in wrong direction.

(6) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(7) Connect negative battery cable.
(8) Start and warm the engine. Check for leaks.

WATER PUMP - 4.0L

DESCRIPTION

CAUTION: All 4.0L 6-cylinder engines are equipped with a reverse (counterclockwise) rotating water pump and thermal viscous fan drive assembly. REVERSE is stamped or imprinted on the cover of the viscous fan drive and inner side of the fan. The letter R is stamped into the back of the water pump impeller. Engines from previous model years, depending upon application, may have been equipped with a forward (clockwise) rotating water pump. Installation of the wrong water pump or viscous fan drive will cause engine over heating.

A centrifugal water pump circulates coolant through the water jackets, passages, intake manifold, radiator core, cooling system hoses and heater core. The pump is driven from the engine crankshaft by a single serpentine drive belt.

The water pump impeller is pressed onto the rear of a shaft that rotates in bearings pressed into the housing. The housing has two small holes to allow seepage to escape. The water pump seals are lubricated by the antifreeze in the coolant mixture. No additional lubrication is necessary (Fig. 45).

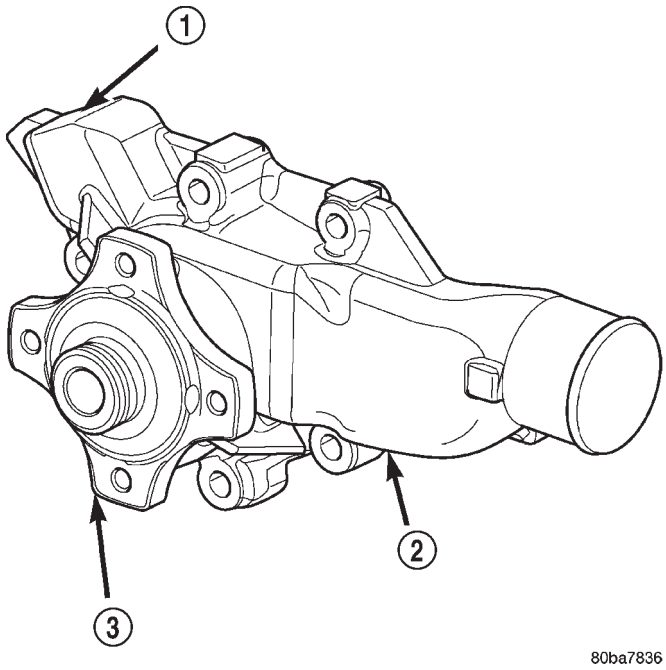


Fig. 45 Water Pump

1 - HEATER HOSE FITTING BORE
2 - WATER PUMP
3 - WATER PUMP HUB

DIAGNOSIS AND TESTING—WATER PUMP

LOOSE IMPELLER - 4.0L and 4.7L

NOTE: Due to the design of the 4.0L and 4.7L engine water pumps, testing the pump for a loose impeller must be done by verifying coolant flow in the radiator. To accomplish this refer to the following procedure.

DO NOT WASTE reusable coolant. If solution is clean, drain coolant into a clean container for reuse.

(1) Drain coolant until the first row of cores is visible in the radiator (Refer to 7 - COOLING - STANDARD PROCEDURE) 4.7L Engine or (Refer to 7 - COOLING - STANDARD PROCEDURE) 4.0L Engine.
(2) Leaving the radiator cap off, start the engine. Run engine until thermostat opens.
(3) While looking into the radiator through the radiator fill neck, raise engine rpm to 2000 RPM. Observe the flow of coolant from the first row of cores.
(4) If there is no flow or very little flow visable, replace the water pump.

INSPECTING FOR INLET RESTRICTIONS

Inadequate heater performance may be caused by a metal casting restriction in the heater hose inlet.

DO NOT WASTE reusable coolant. If solution is clean, drain the coolant into a clean container for reuse.

WARNING: DO NOT LOOSEN THE RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

(1) Drain sufficient coolant from the radiator to decrease the level below the heater hose inlet. On 4.7L engines this requires complete draining.
(2) Remove the heater hose.
(3) Inspect the inlet for metal casting flash or other restrictions.

WATER PUMP - 4.0L (Continued)

NOTE: On 4.0L engines remove the pump from the engine before removing restriction to prevent contamination of the coolant with debris. . On 4.7L engine remove the fitting from the timing chain cover, If the restriction is in the timing chain cover, remove the timing chain cover.

REMOVAL

CAUTION: If the water pump is replaced because of mechanical damage, the fan blades and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

The water pump impeller is pressed on the rear of the pump shaft and bearing assembly. The water pump is serviced only as a complete assembly.

NOTE: The water pump can be replaced without discharging the A/C system.

WARNING: DO NOT REMOVE THE BLOCK DRAIN PLUG(S) OR LOOSEN RADIATOR DRAINCOCK WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM COOLANT CAN OCCUR.

DO NOT WASTE reusable coolant. If the solution is clean, drain coolant into a clean container for reuse.

(1) Disconnect negative battery cable at battery.

(2) Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) The thermal viscous fan drive is attached (threaded) to the water pump hub shaft. Remove fan/viscous fan drive assembly from water pump by turning mounting nut counterclockwise as viewed from front. Threads on viscous fan drive are **RIGHT HAND** Do not attempt to remove fan/viscous fan drive assembly from vehicle at this time.

(4) If water pump is being replaced, do not unbolt fan blade assembly from thermal viscous fan drive.

(5) Remove fan shroud-to-radiator nuts (Fig. 46). Do not attempt to remove fan shroud at this time.

(6) Remove fan shroud and fan blade/viscous fan drive assembly from vehicle as a complete unit.

(7) After removing fan blade/viscous fan drive assembly, **do not** place thermal viscous fan drive in horizontal position. If stored horizontally, silicone fluid in viscous fan drive could drain into its bearing assembly and contaminate lubricant.

Loosen but do not remove the water pump pulley mounting bolts.

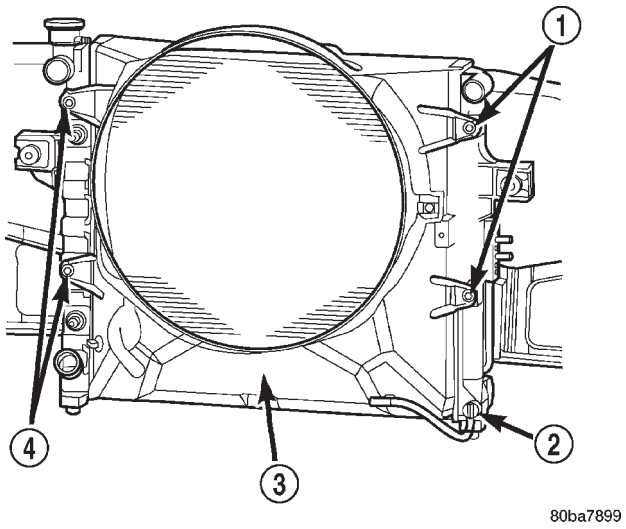


Fig. 46 Fan Shroud Mounting

1 - SHROUD FASTENERS
2 - DRAIN COCK
3 - RADIATOR FAN SHROUD
4 - SHROUD FASTENERS

Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

Remove the water pump pulley.

(8) Remove the idler pulley (located over the water pump).

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 47) SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 48). If replacement is necessary, use only an original equipment clamp with matching number or letter.

(9) Remove lower radiator hose from water pump. Remove heater hose from water pump fitting.

(10) Remove the five pump mounting bolts (Fig. 49) and remove pump from vehicle. Discard old gasket. Note that one of the five bolts is longer than the other bolts.

(11) If pump is to be replaced, the heater hose fitting must be removed. Note position of fitting before removal.

WATER PUMP - 4.0L (Continued)

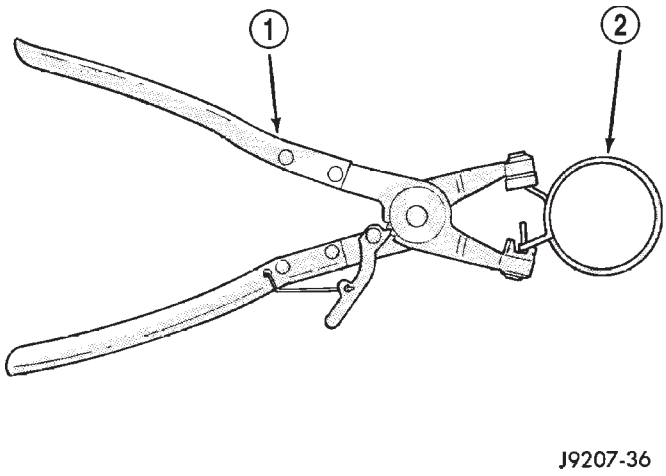


Fig. 47 Hose Clamp Tool - Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP

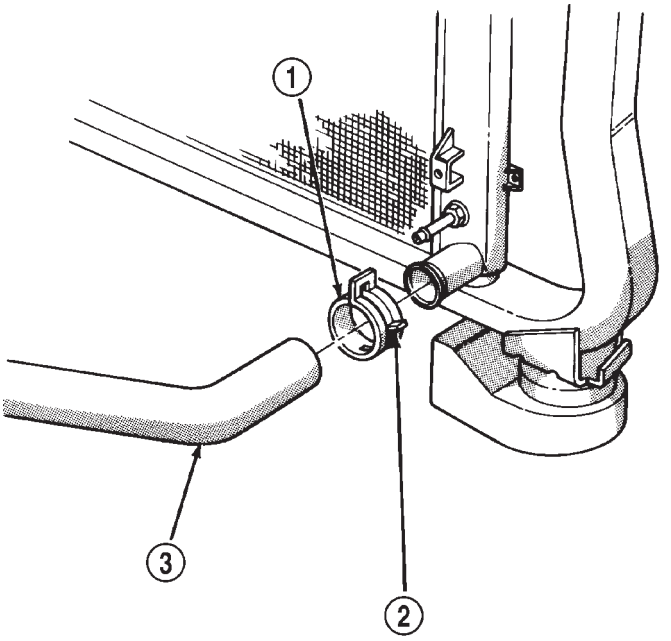


Fig. 48 Clamp - Typical

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

CLEANING

Clean the gasket mating surface. Use caution not to damage the gasket sealing surface.

INSPECTION

Inspect the water pump assembly for cracks in the housing, Water leaks from shaft seal, Loose or rough turning bearing or Impeller rubbing either the pump body or timing chain case/cover.

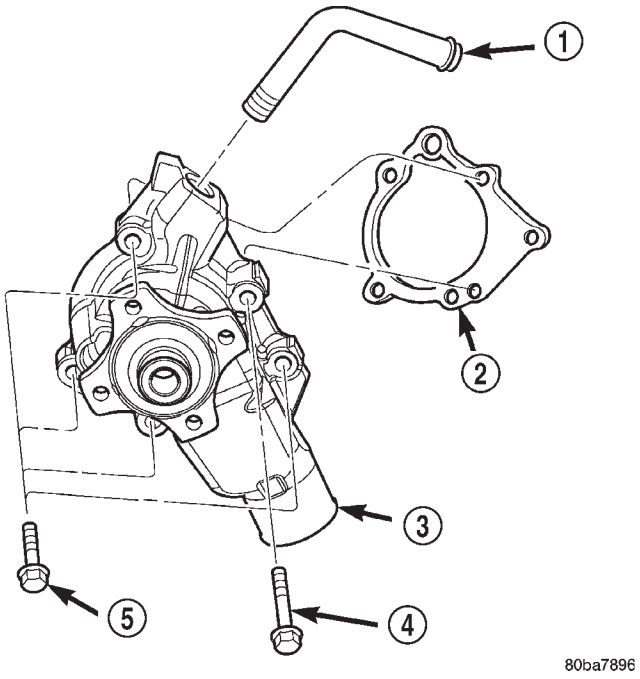


Fig. 49 Water Pump Remove/Install - Typical

1 - HEATER HOSE FITTING
2 - PUMP GASKET
3 - WATER PUMP
4 - LONG BOLT
5 - BOLTS (4) SHORT

INSTALLATION

CAUTION: If the water pump is replaced because of mechanical damage, the fan blades and viscous fan drive should also be inspected. These components could have been damaged due to excessive vibration.

(1) If pump is being replaced, install the heater hose fitting to the pump. Use a sealant on the fitting such as Mopar® Thread Sealant With Teflon. Refer to the directions on the package.

(2) Clean the gasket mating surfaces. If the original pump is used, remove any deposits or other foreign material. Inspect the cylinder block and water pump mating surfaces for erosion or damage from cavitation.

(3) Install the gasket and water pump. The silicone bead on the gasket should be facing the water pump. Also, the gasket is installed dry. Tighten mounting bolts to 30 N·m (22 ft. lbs.) torque. Rotate the shaft by hand to be sure it turns freely.

(4) Connect the radiator and heater hoses to the water pump.

(5) Position water pump pulley to water pump hub. Tighten bolts 28 N·m (250 in. lbs.).

Install the idler pulley. Tighten the bolt 47 N·m (35 ft. lbs.).

WATER PUMP - 4.0L (Continued)

CAUTION: When installing the serpentine engine accessory drive belt, the belt MUST be routed correctly. If not, the engine may overheat due to the water pump rotating in the wrong direction. Refer to the Belt Removal and Installtion in this group for appropriate belt routing. You may also refer to the Belt Routing Label in the vehicle engine compartment.

Install accessory drive belt (Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(6) Install fan blade and viscous fan drive onto water pump.

(7) Fill cooling system with coolant and check for leaks. (Refer to 7 - COOLING - STANDARD PROCEDURE).

(8) Connect battery cable to battery.

(9) Start and warm the engine. Check for leaks.

RADIATOR PRESSURE CAP

DESCRIPTION

All radiators are equipped with a pressure cap (Fig. 50). This cap releases pressure at some point within a range of 124-to-145 kPa (18-to-21 psi). The pressure relief point (in pounds) is engraved on top of the cap

The cooling system will operate at pressures slightly above atmospheric pressure. This results in a higher coolant boiling point allowing increased radiator cooling capacity. The cap contains a spring-loaded pressure relief valve. This valve opens when system pressure reaches the release range of 124-to-145 kPa (18-to-21 psi).

A rubber gasket seals the radiator filler neck. This is done to maintain vacuum during coolant cool-down and to prevent leakage when system is under pressure.

OPERATION

A vent valve in the center of the cap will remain shut as long as the cooling system is pressurized. As the coolant cools, it contracts and creates a vacuum in cooling system. This causes the vacuum valve to open and coolant in reserve/overflow tank to be drawn through connecting hose into radiator. If the vacuum valve is stuck shut, or overflow hose is kinked, radiator hoses will collapse on cool-down.

DIAGNOSIS AND TESTING—RADIATOR PRESSURE CAP

Remove cap from radiator. Be sure that sealing surfaces are clean. Moisten rubber gasket with water and install the cap on pressure tester (tool 7700 or an equivalent) (Fig. 51).

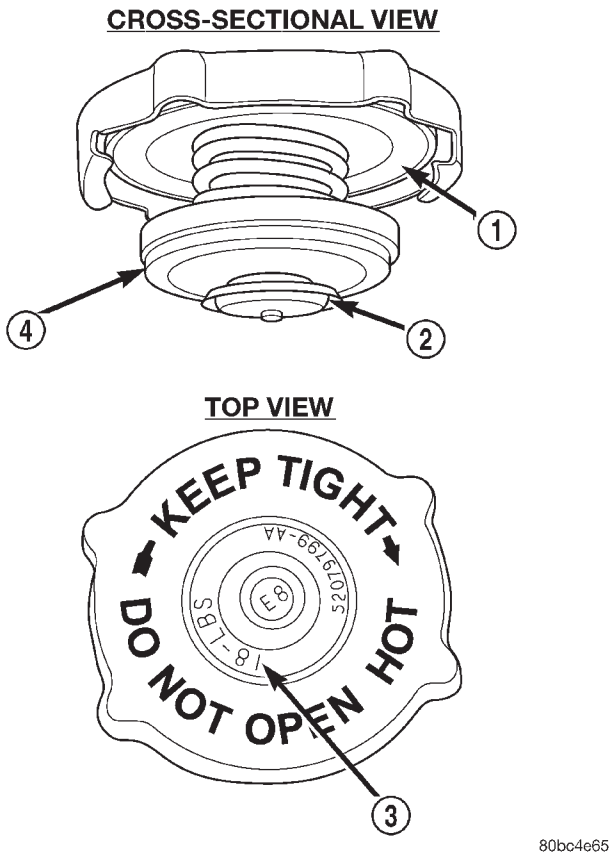


Fig. 50 Radiator Pressure Cap - Typical

1 - FILLER NECK SEAL
2 - VACUUM VENT VALVE
3 - PRESSURE RATING
4 - PRESSURE VALVE

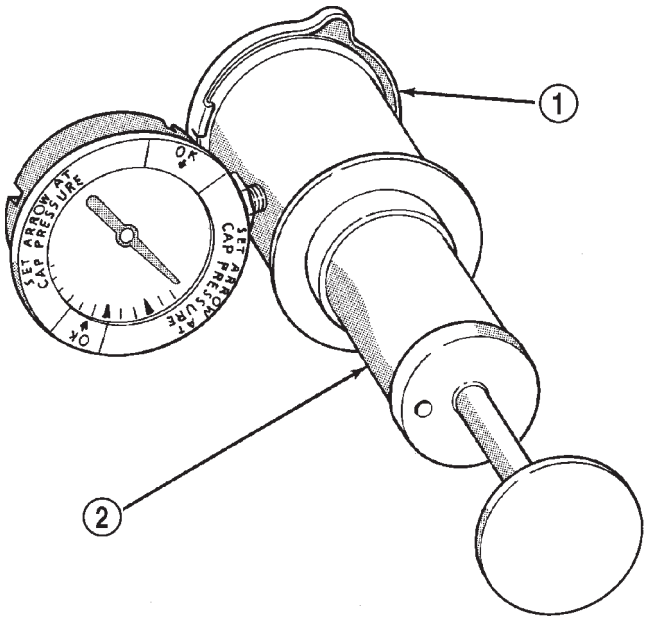
Operate the tester pump and observe the gauge pointer at its highest point. The cap release pressure should be 124 to 145 kPa (18 to 21 psi). The cap is satisfactory when the pressure holds steady. It is also good if it holds pressure within the 124 to 145 kPa (18 to 21 psi) range for 30 seconds or more. If the pointer drops quickly, replace the cap.

CAUTION: Radiator pressure testing tools are very sensitive to small air leaks, which will not cause cooling system problems. A pressure cap that does not have a history of coolant loss should not be replaced just because it leaks slowly when tested with this tool. Add water to tool. Turn tool upside down and recheck pressure cap to confirm that cap needs replacement.

CLEANING

Clean the radiator pressure cap using a mild soap and water only.

RADIATOR PRESSURE CAP (Continued)



J9507-3

Fig. 51 Pressure Testing Radiator Pressure Cap—Typical

1 - PRESSURE CAP
2 - TYPICAL COOLING SYSTEM PRESSURE TESTER

INSPECTION

Visually inspect the pressure valve gasket on the cap. Replace cap if the gasket is swollen, torn or worn. Inspect the area around radiator filler neck for white deposits that indicate a leaking cap.

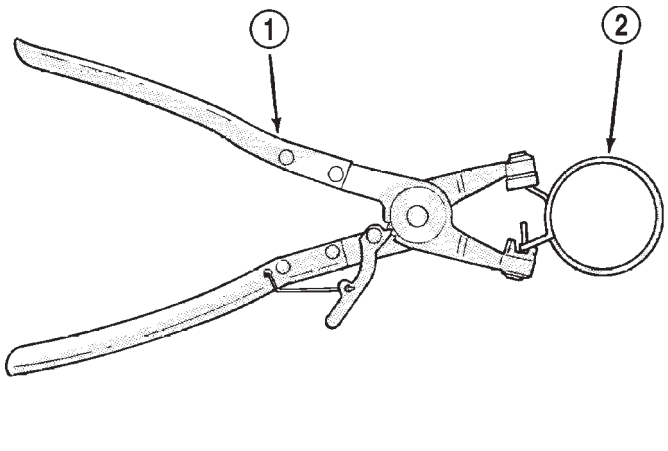
WATER PUMP INLET TUBE

REMOVAL

WARNING: CONSTANT TENSION HOSE CLAMPS ARE USED ON MOST COOLING SYSTEM HOSES. WHEN REMOVING OR INSTALLING, USE ONLY TOOLS DESIGNED FOR SERVICING THIS TYPE OF CLAMP, SUCH AS SPECIAL CLAMP TOOL (NUMBER 6094) (Fig. 52). SNAP-ON CLAMP TOOL (NUMBER HPC-20) MAY BE USED FOR LARGER CLAMPS. ALWAYS WEAR SAFETY GLASSES WHEN SERVICING CONSTANT TENSION CLAMPS.

CAUTION: A number or letter is stamped into the tongue of constant tension clamps (Fig. 53). If replacement is necessary, use only an original equipment clamp with matching number or letter.

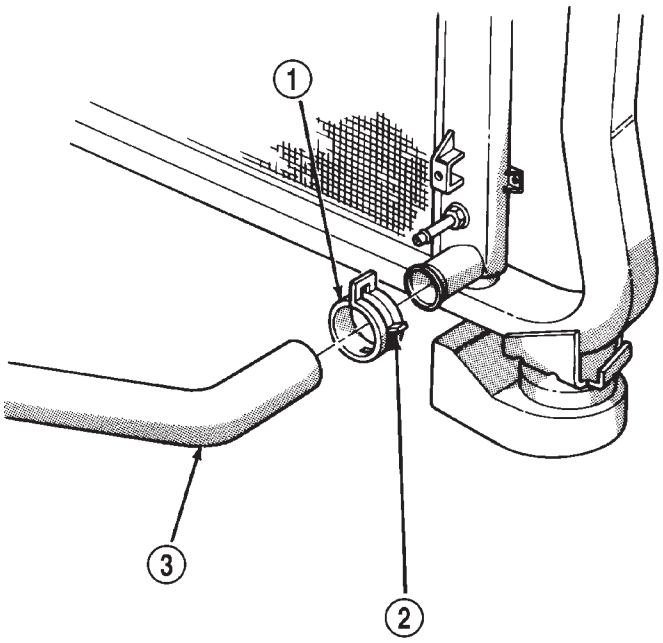
(1) Partially drain cooling system .
(2) Do not waste reusable coolant. If solution is clean, drain coolant into a clean container for reuse.



J9207-36

Fig. 52 Hose Clamp Tool—Typical

1 - HOSE CLAMP TOOL 6094
2 - HOSE CLAMP



J9407-39

Fig. 53 Clamp Number/Letter Location

1 - TYPICAL CONSTANT TENSION HOSE CLAMP
2 - CLAMP NUMBER/LETTER LOCATION
3 - TYPICAL HOSE

(3) Loosen both bypass hose clamps (Fig. 52) and position to center of hose. Remove hose from vehicle.

INSTALLATION

(1) Position bypass hose clamps (Fig. 52) to center of hose.
(2) Install bypass hose to engine.
(3) Secure both hose clamps (Fig. 52).
(4) Refill cooling system .
(5) Start and warm the engine. Check for leaks.

TRANSMISSION

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TRANS COOLER

DESCRIPTION

An internal high capacity/high efficiency cooler is used on all vehicles these coolers are an oil-to-coolant type which consists of plates mounted in the radiator outlet tank (Fig. 36). Because the internal oil cooler is so efficient, no auxiliary oil cooler is offered The cooler is not servicable seperatly from the radiator.

STANDARD PROCEDURE - FLUSHING COOLERS AND TUBES

When a transmission failure has contaminated the fluid, the oil cooler(s) must be flushed. The torque converter must also be replaced. This will insure that metal particles or sludged oil are not later transferred back into the reconditioned (or replaced) transmission.

The only recommended procedure for flushing coolers and lines is to use Tool 6906-B Cooler Flusher.

WARNING: WEAR PROTECTIVE EYEWEAR THAT MEETS THE REQUIREMENTS OF OSHA AND ANSI Z87.1–1968. WEAR STANDARD INDUSTRIAL RUBBER GLOVES.
KEEP LIGHTED CIGARETTES, SPARKS, FLAMES, AND OTHER IGNITION SOURCES AWAY FROM THE AREA TO PREVENT THE IGNITION OF COMBUSTIBLE LIQUIDS AND GASES. KEEP A CLASS (B) FIRE EXTINGUISHER IN THE AREA WHERE THE FLUSHER WILL BE USED.
KEEP THE AREA WELL VENTILATED.
DO NOT LET FLUSHING SOLVENT COME IN CONTACT WITH YOUR EYES OR SKIN: IF EYE CONTAMINATION OCCURS, FLUSH EYES WITH WATER FOR 15 TO 20 SECONDS. REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED SKIN WITH SOAP AND WATER. SEEK MEDICAL ATTENTION.

(1) Remove cover plate filler plug on Tool 6906-B. Fill reservoir 1/2 to 3/4 full of fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean automatic transmission components. **DO NOT** use solvents containing acids, water, gasoline, or any other corrosive liquids.

(2) Reinstall filler plug on Tool 6906-B.

(3) Verify pump power switch is turned OFF. Connect red alligator clip to positive (+) battery post. Connect black (-) alligator clip to a good ground.

(4) Disconnect the cooler lines at the transmission.

NOTE: When flushing transmission cooler and lines, ALWAYS reverse flush.

NOTE: The converter drainback valve must be removed and an appropriate replacement hose installed to bridge the space between the transmission cooler line and the cooler fitting. Failure to remove the drainback valve will prevent reverse flushing the system. A suitable replacement hose can be found in the adapter kit supplied with the flushing tool.

(5) Connect the BLUE pressure line to the OUTLET (From) cooler line.

(6) Connect the CLEAR return line to the INLET (To) cooler line

(7) Turn pump ON for two to three minutes to flush cooler(s) and lines.

(8) Turn pump OFF.

(9) Disconnect CLEAR suction line from reservoir at cover plate. Disconnect CLEAR return line at cover plate, and place it in a drain pan.

(10) Turn pump ON for 30 seconds to purge flushing solution from cooler and lines. Turn pump OFF.

(11) Place CLEAR suction line into a one quart container of Mopar® ATF +4, type 9602, Automatic Transmission Fluid.

(12) Turn pump ON until all transmission fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transmission cooler and lines. Turn pump OFF.

(13) Disconnect alligator clips from battery. Reconnect flusher lines to cover plate, and remove flushing adapters from cooler lines.

AUDIO

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AUDIO

DESCRIPTION

An audio system is standard factory-installed equipment on this model. The standard equipment audio system includes an AM/FM/cassette (RBB sales code) radio receiver, and speakers in six locations. Several combinations of radio receivers and speaker systems are offered as optional equipment on this model. The audio system uses an ignition switched control of battery current so that the system will only operate when the ignition switch is in the On or Accessory positions.

A Compact Disc (CD) changer with a ten disc magazine, remote radio switches with six functions mounted to the backs of the steering wheel spokes, and a memory system that automatically stores and recalls up to twenty radio station presets (ten AM and ten FM) and the last station listened to for two drivers are optional factory-installed equipment on this model. Refer to Electrical, Power Seats for more information on the memory system.

The audio system includes the following components:

- Antenna
- Compact disc changer (available with RBP sales code radio receivers only)
- Power amplifier (with premium speaker system only)
- Radio noise suppression components
- Radio receiver
- Remote radio switches
- Speakers

Certain functions and features of the audio system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect audio system operation are as follows:

- **Body Control Module (BCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODUL - DESCRIPTION) for more information.
- **Driver Door Module (DDM)** (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.
- **Passenger Door Module (PDM)** (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.

The audio system includes the following major components, which are described in further detail elsewhere in this service information:

- **Amplifier** - On models equipped with the optional premium speaker system, an audio power amplifier is located on the rear floor panel underneath the right end of the rear seat cushion in the passenger compartment.
- **Antenna Body and Cable** - The most visible component of the antenna body and cable are the antenna adapter and the antenna cap nut, which are located on the top of the right front fender panel of the vehicle, near the right end of the cowl plenum.
- **Antenna Mast** - The antenna mast is a metal rod that extends upward from the antenna body and cable on the top of the right front fender panel of the vehicle, near the right end of the cowl plenum.
- **Radio** - The radio for this model is located in the instrument panel center stack area, inboard of the instrument cluster and above the heater and air conditioner controls.
- **Radio Noise Suppression Ground Strap** - A radio noise suppression ground strap is installed between the rear of the engine cylinder head(s) and the dash panel sheet metal in the engine compartment.
- **Speaker** - The standard speaker system includes six speakers in six locations, while the premium speaker system includes an amplifier for the six speakers in six locations.

Hard wired circuitry connects the audio system components to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the audio system components through the use of a combination of soldered splices, splice block connectors and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information in this service manual for complete standard and premium audio system circuit diagrams. The wiring information includes proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices, and grounds.

AUDIO (Continued)

OPERATION

The audio system components are designed to provide audio entertainment and information through the reception, tuning and amplification of locally broadcast radio signals in both the Amplitude Modulating (AM) and Frequency Modulating (FM) commercial frequency ranges. Electromagnetic radio signals that are broadcast from a radio station induce electrical modulations into the audio system antenna mast. The antenna body and cable conduct these weak signals from the antenna mast to the radio. The radio then tunes and amplifies these weak radio frequency signals into stronger electrical audio signals that are required in order to operate the audio system speakers. The speakers convert these electrical signals into air movement, which reproduces the sounds being broadcast by the radio station.

Some audio systems also offer the user the option of selecting from and listening to prerecorded audio cassette tapes, audio compact discs, or both. Regardless of the media type, the audio system components provide the user with the ability to electronically amplify and adjust the audio signals being reproduced by the speakers within the vehicle to suit the preferences of the vehicle occupants.

The audio system components operate on battery current received through a fuse in the Junction Block (JB) on a fused ignition switch output (run-acc) circuit so that the system will only operate when the ignition switch is in the On or Accessory positions.

On vehicles that are equipped with the optional remote radio switches, the BCM receives hard wired resistor multiplexed inputs from the remote radio switches. The programming in the BCM allows it to process those inputs and send the proper messages to the radio receiver over the PCI data bus to control the radio volume up or down, station seek up or down, preset station advance, and mode advance functions.

On vehicles equipped with the optional memory system, when the DDM receives a Driver 1 or Driver 2 memory recall input from the memory switch on the driver side front door trim panel or a memory recall message from the Remote Keyless Entry (RKE) receiver in the PDM, the DDM sends a memory recall message back to the radio receiver over the PCI data bus to recall the radio station presets and last station listened to information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of each of the available audio systems.

DIAGNOSIS AND TESTING - AUDIO

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

AUDIO (Continued)

AUDIO SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AUDIO	1. Fuse faulty.	1. Check radio fuse in Junction Block (JB) and Ignition-Off Draw (IOD) fuse in Power Distribution Center (PDC). Replace fuses, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - DIAGNOSIS AND TESTING).
	6. Speakers faulty.	6. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - DIAGNOSIS AND TESTING).
	7. Amplifier faulty (if equipped).	7. (Refer to 8 - ELECTRICAL/AUDIO/AMPLIFIER - DIAGNOSIS AND TESTING).
NO RADIO DISPLAY	1. Fuse faulty.	1. Check radio fuse in Junction Block (JB) and Ignition-Off Draw (IOD) fuse in Power Distribution Center (PDC). Replace fuses, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - DIAGNOSIS AND TESTING).
CLOCK WILL NOT KEEP SET TIME	1. Fuse faulty.	1. Check Ignition-Off Draw (IOD) fuse in the Power Distribution Center (PDC). Replace fuse, if required.
	2. Radio connector faulty.	2. Check for loose or corroded radio connector. Repair, if required.
	3. Wiring faulty.	3. Check for battery voltage at radio connector. Repair wiring, if required.
	4. Radio ground faulty.	4. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	5. Radio faulty.	5. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - DIAGNOSIS AND TESTING).

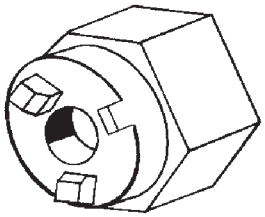
AUDIO (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
POOR RADIO RECEPTION	1. Antenna faulty.	1. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - DIAGNOSIS AND TESTING).
	2. Radio ground faulty.	2. Check for continuity between radio chassis and a known good ground. There should be continuity. Repair ground, if required.
	3. Radio noise suppression faulty.	3. (Refer to 8 - ELECTRICAL/AUDIO/RADIO NOISE SUPPRESSION - DIAGNOSIS AND TESTING).
	4. Radio faulty.	4. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - DIAGNOSIS AND TESTING).
NO/POOR TAPE OPERATION	1. Faulty tape.	1. Insert known good tape and test operation.
	2. Foreign objects behind tape door.	2. Remove foreign objects and test operation.
	3. Dirty cassette tape head.	3. Clean head with Mopar Cassette Head Cleaner.
	4. Faulty tape deck.	4. Exchange or replace radio, if required.
NO COMPACT DISC OPERATION, OR CD SKIPPING SOUND	1. Faulty CD.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. Faulty CD player.	4. Exchange or replace radio, if required.
NO COMPACT DISC CHANGER OPERATION, OR CD SKIPPING SOUND	1. Faulty CD.	1. Insert known good CD and test operation.
	2. Foreign material on CD.	2. Clean CD and test operation.
	3. Condensation on CD or optics.	3. Allow temperature of vehicle interior to stabilize and test operation.
	4. CD changer connector faulty.	4. Check for loose or corroded CD changer connections. Repair, if required.
	5. Wiring faulty.	5. Refer to Compact Disc Changer in the Diagnosis and Testing section of this group.
	6. PCI data bus faulty.	6. Use DRB scan tool and the Diagnostic Procedures manual to test PCI data bus. Repair, if required.
	7. CD changer faulty.	7. Refer to Compact Disc Changer in the Diagnosis and Testing section of this group.

AUDIO (Continued)

SPECIAL TOOLS

AUDIO SYSTEMS



Antenna Nut Wrench C-4816

AMPLIFIER

DESCRIPTION

Models equipped with the Infinity premium speaker package have a separate power amplifier unit. This power amplifier is rated at 180 watts output. The power amplifier unit is mounted to the rear floor panel under the passenger side rear seat cushion. The power amplifier unit can be accessed for service by unlatching and tilting the passenger side rear seat cushion forward.

The power amplifier unit should be checked if there is no sound output noted from the speakers. For diagnosis of the power amplifier, (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - DIAGNOSIS AND TESTING). The power amplifier cannot be repaired or adjusted and, if faulty or damaged, the unit must be replaced.

OPERATION

The power amplifier is energized by a fused 12 volt output from the radio receiver whenever the radio is turned on. The power amplifier receives the sound signal inputs for four speaker channels from the radio receiver, then sends the amplified speaker outputs for each of those channels to the six Infinity speakers. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - AMPLIFIER

The power amplifier unit should be checked if there is no sound output noted from the speakers. For diagnosis of the power amplifier, (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - DIAGNOSIS AND TESTING). For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unlatch and lift the right rear seat cushion to the upright position.

(3) Disconnect the two right body wire harness connectors from the amplifier (Fig. 1).

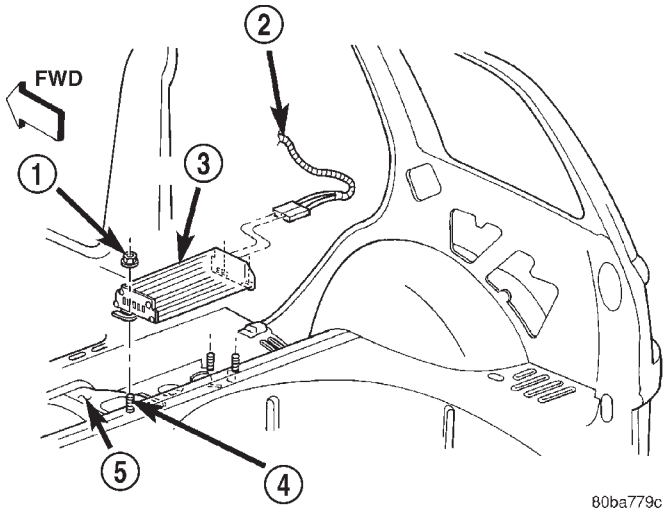


Fig. 1 Power Amplifier Remove/Install

1 - NUT (3)
2 - RIGHT BODY WIRE HARNESS
3 - AMPLIFIER
4 - STUD (3)
5 - RIGHT REAR FLOOR PANEL

(4) Remove the three mounting nuts.

(5) Remove the power amplifier.

INSTALLATION

(1) Position the power amplifier onto the three floor panel studs.

(2) Install the mounting nuts. Tighten the nuts to 11.8 N·m (105 in. lbs.).

(3) Reconnect the two right body wire harness connectors.

(4) Lower the right rear seat cushion to the floor panel.

(5) Reconnect the battery negative cable.

ANTENNA BODY & CABLE

DESCRIPTION

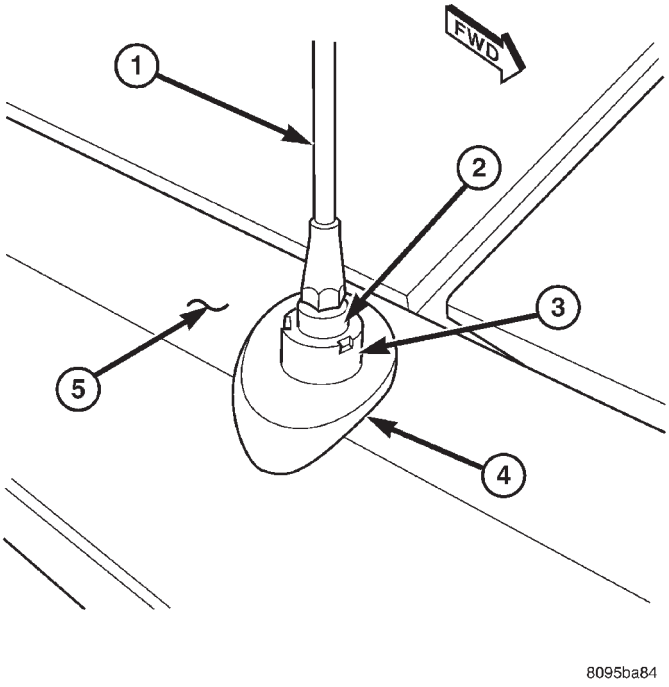


Fig. 2 Antenna Body and Cable

1 - MAST
2 - BODY & CABLE
3 - CAP NUT
4 - ADAPTER
5 - RIGHT FRONT FENDER

The antenna body and cable is secured below the fender panel by the antenna cap nut through a mounting hole in the of the right front fender (Fig. 2). The primary coaxial antenna cable is then routed beneath the fender sheet metal and through a entry hole in the right cowl side panel into the interior of the vehicle. Inside the vehicle, the primary coaxial cable is connected to a secondary instrument panel antenna coaxial cable with an in-line connector that is located behind the right kick panel. The secondary coaxial cable is then routed behind the instrument panel to the back of the radio.

OPERATION

The antenna body and cable connects the antenna mast to the radio. The radio antenna is an electromagnetic circuit component used to capture radio frequency signals that are broadcast by local commercial radio stations in both the Amplitude Modulating (AM) and Frequency Modulating (FM) frequency ranges. These electromagnetic radio frequency signals induce small electrical modulations into the antenna as they move past the mast. The antenna body transfers the weak electromagnetic radio waves induced into the rigid antenna mast into the center conductor of the flexible primary antenna coaxial cable. The braided outer shield of the antenna coaxial cable is grounded through both the antenna body and the radio chassis, effectively shielding the radio waves as they are conducted to the radio. The radio then tunes and amplifies the weak radio signals into stronger electrical signals in order to operate the audio system speakers.

DIAGNOSIS AND TESTING - ANTENNA BODY AND CABLE

The following four tests are used to diagnose the antenna with an ohmmeter:

- **Test 1** - Mast to ground test
- **Test 2** - Tip-of-mast to tip-of-conductor test
- **Test 3** - Body ground to battery ground test
- **Test 4** - Body ground to antenna coaxial cable shield test.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The ohmmeter test lead connections for each test are shown in the illustration (Fig. 3).

ANTENNA BODY & CABLE (Continued)

NOTE: This model has a two-piece antenna coaxial cable. Tests 2 and 4 must be conducted in two steps to isolate an antenna cable problem. First, test the primary antenna cable (integral to the antenna body and cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the antenna body. Then, test the secondary antenna cable (instrument panel antenna cable) from the coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel to the coaxial cable connector at the radio.

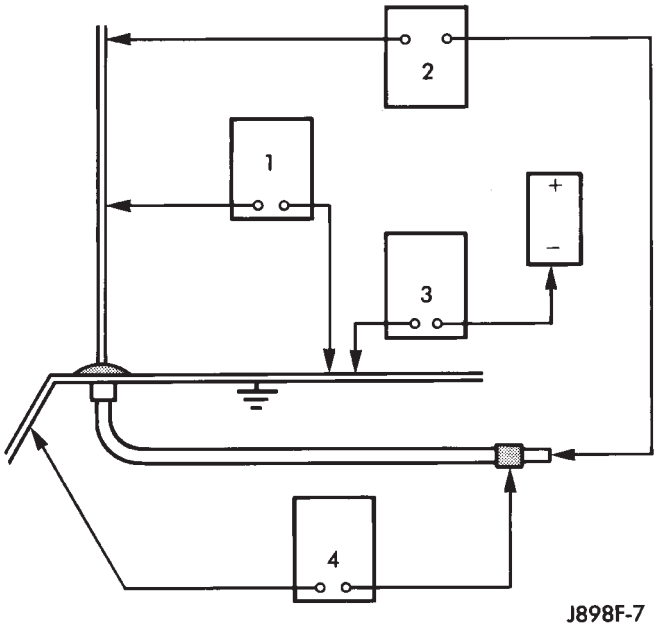


Fig. 3 Antenna Tests - Typical

NOTE: Use extreme caution when checking continuity of center conductor to avoid damage.

TEST 1

Test 1 determines if the antenna mast is insulated from ground. Proceed as follows:

(1) Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the antenna cap nut. Check the ohmmeter reading for continuity.

(3) There should be no continuity. If OK, go to Test 2. If not OK, replace the faulty antenna body and cable.

TEST 2

Test 2 checks the antenna conductor components for an open circuit. This test should be performed first on the entire antenna circuit, from the antenna mast to the center conductor of the coaxial cable connector at the radio. If an open circuit is detected, each of the three antenna conductor components (antenna mast, antenna body and primary cable unit, instrument panel antenna secondary cable) should be isolated and tested individually to locate the exact component that is the source of the open circuit. To begin this test, proceed as follows:

(1) Disconnect the instrument panel (secondary) antenna cable coaxial connector from the back of the radio.

(2) Touch one ohmmeter test lead to the tip of the antenna mast. Touch the other test lead to the center conductor pin of the instrument panel antenna cable coaxial connector for the radio. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register only a fraction of an ohm resistance. High or infinite resistance indicates a damaged or open antenna conductor. If OK, go to Test 3. If not OK, isolate and test each of the individual antenna conductor components. Replace only the faulty antenna conductor component.

TEST 3

Test 3 checks the condition of the vehicle body ground connection. To begin this test, proceed as follows:

(1) This test must be performed with the battery positive cable disconnected from the battery. Disconnect and isolate both battery cables, negative cable first.

(2) Reconnect the battery negative cable.

(3) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the battery negative terminal post. Check the ohmmeter reading for continuity.

(4) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the battery negative terminal and the vehicle body. If OK, go to Test 4. If not OK, check the battery negative cable connection to the vehicle body and the radio noise suppression ground strap connections to the engine and the vehicle body for being loose or corroded. Clean or tighten these connections as required.

TEST 4

Test 4 checks the condition of the connection between the antenna coaxial cable shield and the vehicle body ground as follows:

(1) Disconnect and isolate the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel.

ANTENNA BODY & CABLE (Continued)

(2) Touch one ohmmeter test lead to a good clean ground point on the vehicle fender. Touch the other test lead to the outer crimp on the antenna coaxial cable connector under the right end of the instrument panel near the right cowl side inner panel. Check the ohmmeter reading for continuity.

(3) There should be continuity. The ohmmeter should register less than one ohm resistance. High or infinite resistance indicates a loose, corroded, or damaged connection between the antenna body and the vehicle body or between the antenna body and the antenna coaxial cable shield. If not OK, clean the antenna body to fender mating surfaces and tighten the antenna cap nut to specifications.

(4) Check the resistance again with an ohmmeter. If the resistance is still more then one ohm, replace the faulty antenna body and cable.

REMOVAL

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the scuff plate from the right front door sill. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - REMOVAL) for the procedures.

(3) Remove the trim panel from the right inner cowl side.(Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL) for the procedures.

(4) Reach under the passenger side of the instrument panel near the right cowl side inner panel to disconnect the antenna coaxial cable connector by pulling it apart while twisting the metal connector halves (Fig. 4). Do not pull on the cable.

(5) Remove the lower rear half of the inner liner from the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - REMOVAL) for the procedures.

(6) Reach through the rear of the right front fender wheel house opening to access and unseat the antenna lead grommet from the hole in the right cowl side outer panel.

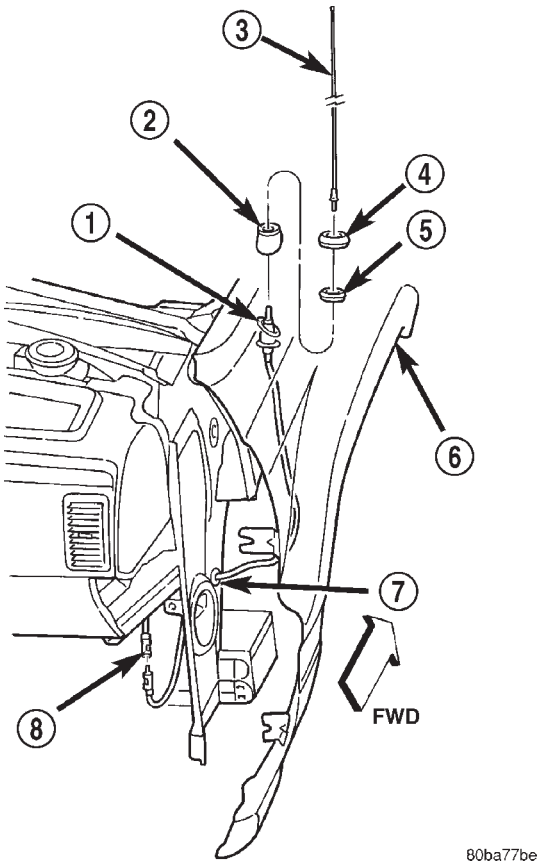


Fig. 4 Antenna Base and Lead Remove/Install

1 - BASE AND LEAD
2 - ESCUTCHEON
3 - MAST
4 - SHROUD
5 - CAP NUT
6 - RIGHT FRONT FENDER
7 - GROMMET
8 - CONNECTOR

(7) Pull the antenna lead coaxial cable and connector out of the passenger compartment and into the right front fender wheel house through the hole in the right cowl side outer panel.

(8) Unscrew the antenna mast from the antenna base (Fig. 5).

(9) Remove the plastic shroud from the antenna base cap nut.

(10) Remove the antenna base cap nut using an antenna nut wrench (Special Tool C-4816) (Fig. 6).

(11) Remove the antenna escutcheon from the antenna base on the top of the right front fender.

(12) Lower the antenna base from the mounting hole in the top of the right front fender.

(13) Remove the antenna base and lead from the rear of the right front fender wheel house opening.

ANTENNA BODY & CABLE (Continued)

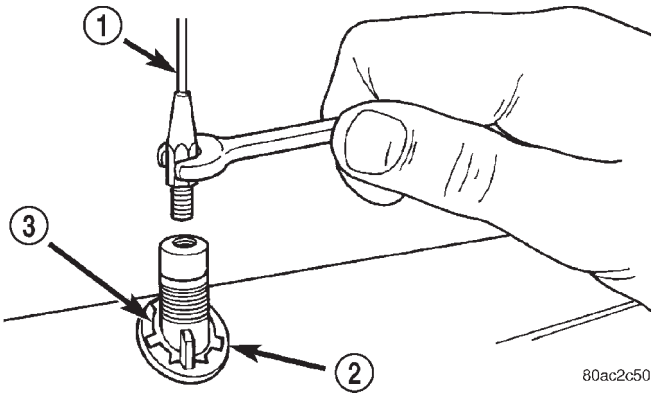


Fig. 5 Antenna Mast Remove/Install - Typical

1 - ANTENNA MAST
2 - ADAPTER
3 - CAP NUT

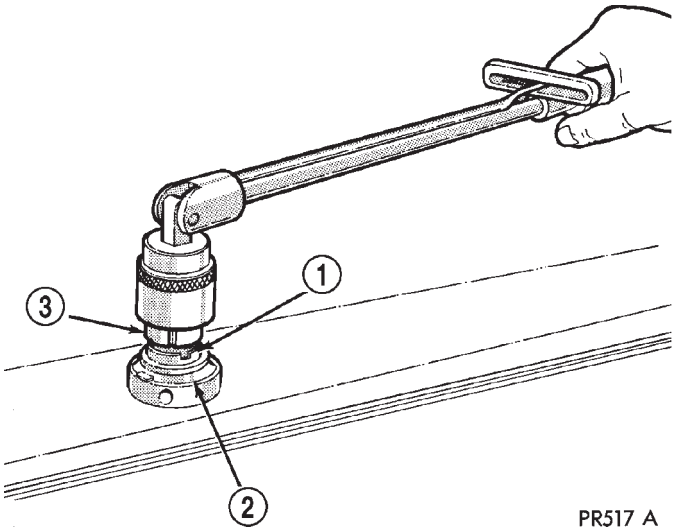


Fig. 6 Antenna Base Cap Nut Remove/Install - Typical

1 - CAP NUT
2 - ANTENNA ADAPTER
3 - TOOL

INSTALLATION

(1) Position the antenna base and lead into the rear of the right front fender wheel house opening.

(2) Insert the antenna base into the mounting hole in the top of the right front fender.

(3) Install the antenna escutcheon onto the antenna base on the top of the right front fender.

(4) Install and tighten the antenna base cap nut using an antenna nut wrench (Special Tool C-4816). Tighten the cap nut to 6.8 N·m (60 in. lbs.).

(5) Install the plastic shroud onto the antenna base cap nut.

(6) Install and tighten the antenna mast onto the antenna base. Tighten the antenna mast to 3.3 N·m (30 in. lbs.).

(7) Reach through the rear of the right front fender wheel house opening to access and insert the antenna lead coaxial cable and connector into the passenger compartment through the hole in the right cowl side outer panel.

(8) From the right front fender wheel house, seat the antenna lead grommet into the hole in the right cowl side outer panel.

(9) Install the lower rear half of the inner liner into the right front fender wheel house.

(10) Reach under the passenger side of the instrument panel near the right cowl side inner panel to reconnect the antenna coaxial cable connector halves.

(11) Install the trim panel onto the right inner cowl side.

(12) Install the scuff plate onto the right front door sill.

(13) Reconnect the battery negative cable.

ANTENNA MODULE - EXPORT

DESCRIPTION

The antenna module (Fig. 7) is an electromagnetic circuit component designed to capture and enhance RF (Radio Frequency) signals in both the AM and FM broadcast bands. The antenna module is mounted to the right rear roof rail under the headliner. The modules mounting brackets also double as the ground circuit. The module has a two wire electrical connector that connects to the electric backlite integral radio antenna, located on the right rear quarter glass, a connector for the radio coax cable and a connector for battery voltage.

ANTENNA MODULE - EXPORT (Continued)

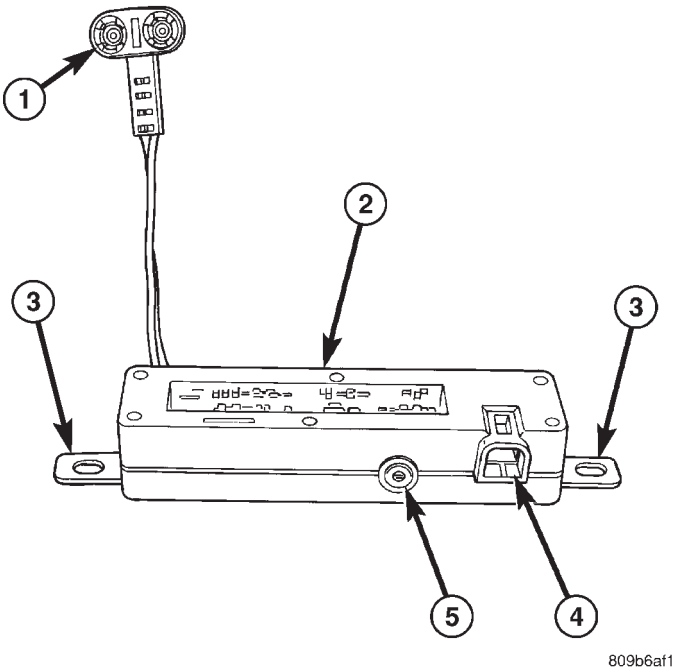


Fig. 7 ANTENNA MODULE

1 - ANTENNA LEAD CONNECTOR
2 - ANTENNA MODULE
3 - ANTENNA MODULE MOUNT/GROUND BRACKETS
4 - BATTERY SUPPLY CONNECTION POINT
5 - COAX CONNECTION POINT

OPERATION

The antenna module receives both AM and FM radio signals supplied by the side window integral radio antenna system and selectively amplifies them while at the same time avoiding unusable or unwanted signals. The amplified signal is then sent through the body length coax cable to the radio input.

DIAGNOSIS AND TESTING - ANTENNA MODULE - EXPORT

ANTENNA MODULE DIAGNOSIS TABLE

CONDITION	POSSIBLE CAUSES	CORRECTION
NO AM RECEPTION, WEAK FM RECEPTION	1. Antenna module to antenna connector open or disconnected.	1. Repair open, reconnect antenna module connector to glass mounted antenna.
	2. Coax open or disconnected.	2. Repair open, reconnect coax.
	3. No battery power at antenna module.	3. Check fuse. if okay, repair open in battery voltage circuit.
NO AM OR FM RECEPTION	1. Coax disconnected at radio.	1. Reconnect coax.
	2. Coax shorted to ground.	2. Repair or Replace coax
WEAK OR NO AM/FM RECEPTION	1. Antenna Module faulty.	1. Substitute known good module. If reception improves, Antenna Module was faulty.

ANTENNA MODULE - EXPORT (Continued)

REMOVAL

(1) Remove the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(2) Disconnect the battery power lead connector from the antenna module.

(3) Disconnect the antenna module connector from the integral antenna (Fig. 8).

(4) Remove the mounting screws and the antenna module.

(5) Disconnect the coax lead from the antenna module.

INSTALLATION

(1) Plug coax into antenna module.

(2) Position antenna module onto right side upper roof rail and install screws. Tighten the screws to 8 N·m (71 in. lbs.).

(3) Connect antenna module lead to the integral antenna.

(4) Connect battery power supply lead to antenna module.

(5) Install headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

CD CHANGER

DESCRIPTION

A factory-installed Compact Disc (CD) changer featuring a ten-CD magazine is an available option on this model when it is also equipped with the premium speaker package and a radio receiver including the CD controls feature. The CD changer is mounted in the cargo area of the passenger compartment on the right rear quarter panel.

The CD changer is connected to a take out from the right body wire harness and receives both ground and radio-switched battery current through the radio receiver. The controls on the radio receiver operate the CD changer through messages sent over the Programmable Communications Interface (PCI) data bus network. The two-channel audio outputs of the CD changer are hard wired back to the radio receiver, which then outputs the signal through four channels to the power amplifier. For diagnosis of the messaging functions of the radio receiver and the CD changer, or of the PCI data bus, a DRB scan tool and the proper Diagnostic Procedures manual are required.

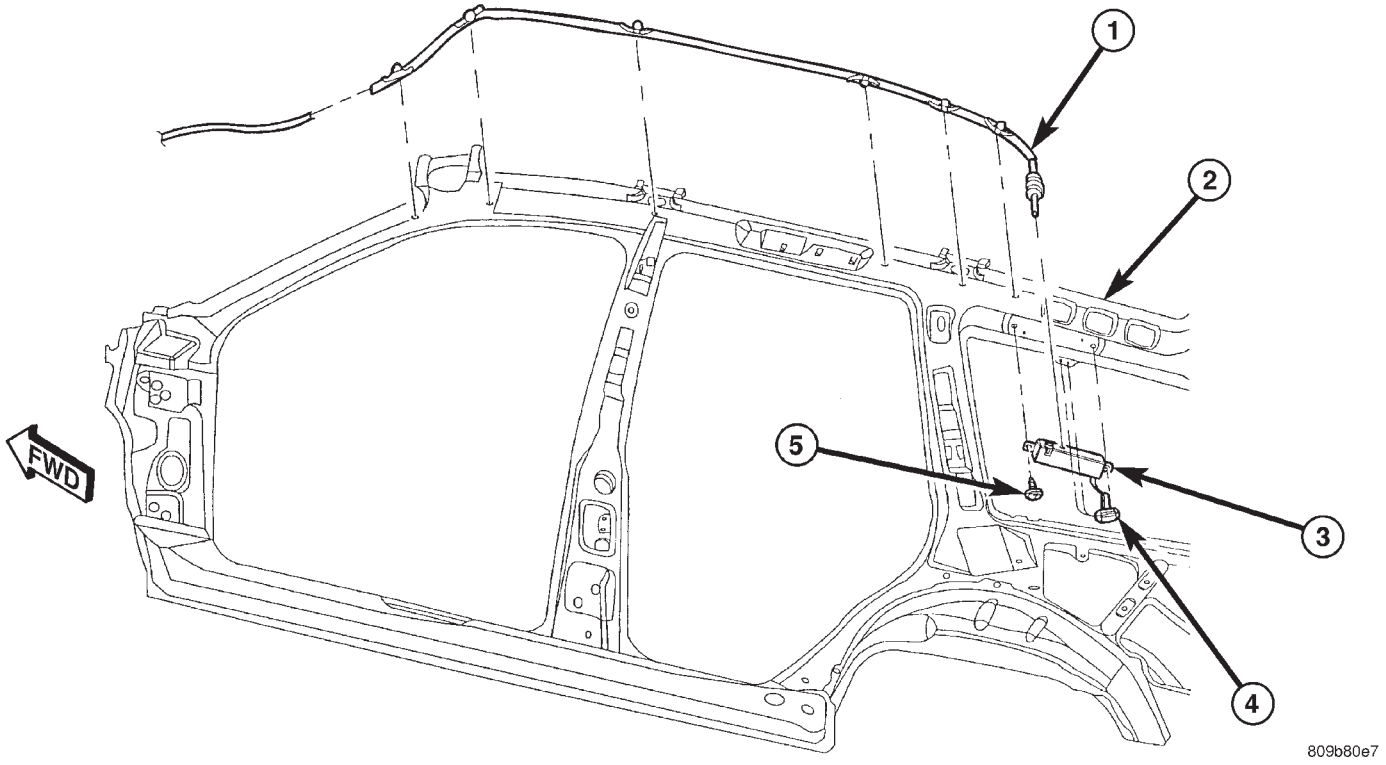


Fig. 8 ANTENNA MODULE

1 - COAX
2 - RIGHT SIDE ROOF RAIL
3 - ANTENNA MODULE
4 - ANTENNA MODULE TO ANTENNA CONNECTOR
5 - SCREW (2)

CD CHANGER (Continued)

The CD changer can only be serviced by an authorized radio repair station. See the latest Warranty Policies and Procedures manual for a current listing of authorized radio repair stations.

OPERATION

The CD changer will only operate when the ignition switch is in the On or Accessory positions, and the radio is turned on. For more information on the features, loading procedures and radio control functions for the operation of the CD changer, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - CD CHANGER

Following are tests that will help to diagnose the hard wired components and circuits of the Compact Disc (CD) changer unit. However, these tests may not prove conclusive in the diagnosis of this unit. In order to obtain conclusive testing of the CD changer unit, the Programmable Communications Interface (PCI) data bus network, the CD changer unit, the radio receiver unit and any other electronic modules that provide inputs to, or receive outputs from the audio system must be checked.

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

COMPACT DISC CHANGER INOPERATIVE

(1) Turn the ignition switch to the On position. Turn the radio receiver on and check its operation. If OK, go to Step 2. If not OK, (Refer to 8 - ELECTRICAL/AUDIO/RADIO - OPERATION).

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the right body wire harness connector from the CD changer connector receptacle. Check for continuity between the power ground (Z17) circuit of the right body wire harness connector for the CD changer and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open power ground circuit to the radio receiver as required.

(3) Reconnect the battery negative cable. Check for battery voltage at the B(+) circuit cavity of the right body wire harness connector for the CD changer. If OK, go to Step 4. If not OK, go to Step 5.

(4) Turn the ignition switch to the On position. Check for battery voltage at the ignition switch output circuit cavity of the right body wire harness connector for the CD changer. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual for further diagnosis. If not OK, go to Step 6.

(5) Disconnect and isolate the battery negative cable. Remove the radio receiver from the instrument panel. Disconnect the 10 pin cable connector from the radio receiver, but do not disconnect the other wire harness connectors. Reconnect the battery negative cable. Check for battery voltage at the B(+) circuit cavity of the 10 pin connector receptacle on the radio receiver. If OK, repair the open B(+) circuit to the CD changer as required. If not OK, check for a shorted B(+) circuit to the CD changer and repair as required, then replace the faulty radio receiver.

(6) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the radio receiver from the instrument panel. Disconnect the 10 pin cable connector from the radio receiver, but do not disconnect the other wire harness connectors. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the ignition switch output circuit cavity of the 10 pin connector receptacle on the radio receiver. If OK, repair the open ignition switch output circuit to the CD changer as required. If not OK, check for a shorted ignition switch output circuit to the CD changer and repair as required, then replace the faulty radio receiver.

NO SOUND OR ONLY ONE CHANNEL SOUND FROM CD CHANGER

(1) Turn the ignition switch to the On position. Turn the radio receiver on and check its audio output operation. If OK, go to Step 2. If not OK, (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - OPERATION).

(2) Disconnect and isolate the battery negative cable. Disconnect the right body wire harness connector from the CD changer connector receptacle. Remove the radio receiver from the instrument

CD CHANGER (Continued)

panel. Disconnect the 10 pin cable connector from the radio receiver. Check for continuity between the audio ground (Z4) circuit cavity of the right body wire harness connector for the CD changer and a good ground. There should be no continuity. If OK, go to Step 3. If not OK, repair the shorted audio ground (Z4) circuit as required.

(3) Check for continuity between the audio ground (Z4) circuit cavity of the right body wire harness connector for the CD changer and the audio ground (Z4) circuit pin of the 10 pin cable connector for the radio receiver. There should be continuity. If OK, go to Step 4. If not OK, repair the open audio ground (Z4) circuit as required.

(4) Check for continuity between the audio out right circuit cavity of the right body wire harness connector for the CD changer and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted audio out right circuit as required.

(5) Check for continuity between the audio out right circuit cavity of the right body wire harness connector for the CD changer and the audio out right circuit pin of the 10 pin cable connector for the radio receiver. There should be continuity. If OK, go to Step 6. If not OK, repair the open audio out right circuit as required.

(6) Check for continuity between the audio out left circuit cavity of the right body wire harness connector for the CD changer and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the shorted audio out left circuit as required.

(7) Check for continuity between the audio out left circuit cavity of the right body wire harness connector for the CD changer and the audio out left circuit pin of the 10 pin cable connector for the radio receiver. There should be continuity. If OK, replace the faulty CD changer. If not OK, repair the open audio out left circuit as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Release the latch and open the lid of the compact disc changer storage bin on the right side quarter trim panel (Fig. 9).

(3) Remove the two mounting screws.

(4) Grasp the bottom of the compact disc changer storage bin firmly with both hands and lift it upwards.

(5) Remove the compact disc changer storage bin from the right side quarter trim panel.

(6) Disconnect the right body wire harness connector from compact disc changer (Fig. 10).

(7) Remove the four mounting nuts.

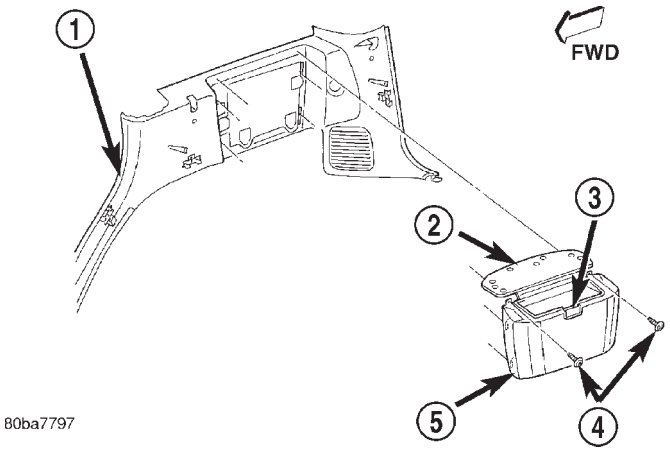


Fig. 9 Compact Disc Changer Storage Bin Remove/ Install

1 - RIGHT SIDE QUARTER TRIM PANEL
2 - LID
3 - LATCH
4 - SCREW (2)
5 - CD CHANGER STORAGE BIN

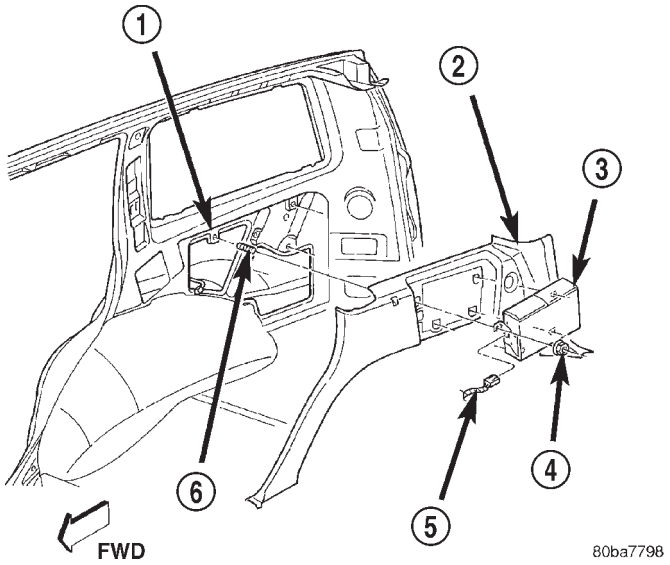


Fig. 10 Compact Disc Changer Remove/Install

1 - RIGHT SIDE QUARTER INNER PANEL
2 - RIGHT SIDE QUARTER TRIM PANEL
3 - COMPACT DISC CHANGER
4 - NUT (4)
5 - RIGHT BODY WIRE HARNESS
6 - STUD (4)

(8) Remove the compact disc changer from the right side quarter inner panel.

INSTALLATION

(1) Position the compact disc changer onto the four studs.

CD CHANGER (Continued)

(2) Install the four mounting nuts. Tighten the nuts to 12 N·m (105 in. lbs.).

(3) Reconnect the right body wire harness connector.

(4) Position the compact disc changer storage bin onto the right side quarter trim panel.

(5) Using both hands push the compact disc changer storage bin firmly and evenly toward the right side quarter trim panel far enough to engage the hooks on the bin with the slots in the panel.

(6) Using both hands push the compact disc changer storage bin firmly and evenly downward far enough to align the screw holes in the bin with the mounting holes in the right side quarter trim panel.

(7) Install the two screws that secure the top of the compact disc changer storage bin. Tighten the screws to 1.7 N·m (15 in. lbs.).

(8) Reconnect the battery negative cable.

INSTRUMENT PANEL ANTENNA CABLE

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the scuff plate from the right front door sill. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - REMOVAL) for the procedures.

(3) Remove the trim panel from the right inner cowl side. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL) for the procedures.

(4) Reach under the passenger side of the instrument panel near the right cowl side inner panel to disconnect the antenna coaxial cable connector by pulling it apart while twisting the metal connector halves. Do not pull on the cable.

(5) Disengage the antenna cable retainer from the mounting hole in the wire harness mounting tab under the passenger side end of the instrument panel.

(6) Remove the radio receiver from the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - REMOVAL) for the procedures.

(7) Remove the passenger side airbag module from the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - REMOVAL) for the procedures.

(8) Disengage the antenna cable retainer from the mounting hole in the top of the radio mount on the instrument panel structural duct (Fig. 11).

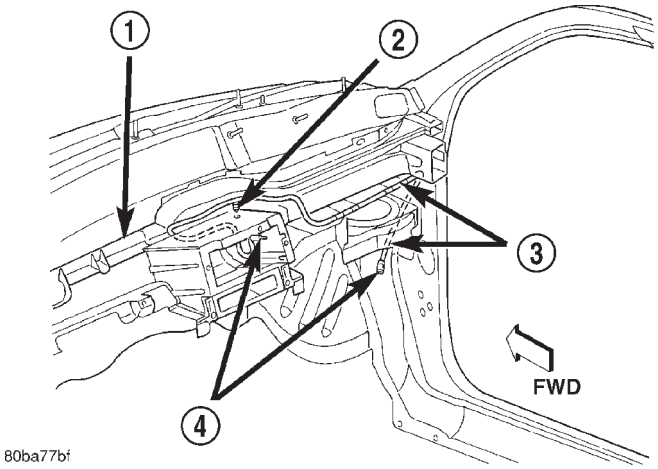


Fig. 11 Instrument Panel Antenna Cable Routing

1 - INSTRUMENT PANEL STRUCTURAL DUCT
2 - RETAINER
3 - COAXIAL CABLE
4 - COAXIAL CABLE CONNECTORS

(9) Disengage the antenna cable from the locator tabs on the top of the instrument panel structural duct above the glove box opening.

(10) Remove the antenna cable from the instrument panel.

INSTALLATION

(1) Position the antenna cable onto the instrument panel.

(2) Engage the antenna cable with the locator tabs on the top of the instrument panel structural duct above the glove box opening.

(3) Engage the antenna cable retainer into the mounting hole in the top of the radio mount on the instrument panel structural duct.

(4) Install the passenger side airbag module onto the instrument panel. (Refer to 8 - ELECTRICAL/RESTRAINTS/PASSENGER AIRBAG - INSTALLATION) for the procedures.

(5) Install the radio receiver onto the instrument panel. (Refer to 8 - ELECTRICAL/AUDIO/RADIO - INSTALLATION) for the procedures.

(6) Engage the antenna cable retainer into the mounting hole in the wire harness mounting tab under the passenger side end of the instrument panel.

INSTRUMENT PANEL ANTENNA CABLE (Continued)

(7) Reach under the passenger side of the instrument panel near the right cowl side inner panel to reconnect the antenna coaxial cable connector halves.

(8) Install the trim panel onto the right inner cowl side. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION) for the procedures.

(9) Install the scuff plate onto the right front door sill. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - INSTALLATION) for the procedures.

(10) Reconnect the battery negative cable.

QUARTER GLASS INTEGRAL ANTENNA - EXPORT

DESCRIPTION

The integral radio antenna element is bonded to the right rear quarter glass and is replaced with the glass assembly only.

OPERATION

The integral antenna receives RF (Radio Frequencies) and sends them to the antenna module for amplification.

DIAGNOSIS AND TESTING - QUARTER GLASS INTEGRAL ANTENNA - EXPORT

For complete circuit diagrams, refer to the Appropriate Wiring Information. To detect breaks in the integral antenna elements, the following procedure is required:

(1) Disconnect the antenna module connector from the antenna.

(2) Using a Ohmmeter, place both leads onto the connector pins on the integral antenna. If continuity is present antenna grid is Okay. If continuity is not present move one lead through the grid in progression until continuity is detected. A break in the antenna grid can be repaired using a Mopar Rear Window Defogger Repair Kit (Part Number 4267922) or equivalent. (Refer to 8 - ELECTRICAL/WINDOW DEFOGGER/REAR WINDOW DEFOGGER GRID - STANDARD PROCEDURE)

RADIO

DESCRIPTION

Available factory-installed radio receivers for this model include an AM/FM/cassette with CD changer control feature (RBB sales code), an AM/FM/CD/2-band graphic equalizer with CD changer control feature (RBK sales code), or an AM/FM/CD/cassette/2-band graphic equalizer (RBP sales code). All factory-installed radio receivers can communicate on the Programmable Communications Interface (PCI) data bus network through a separate wire harness connector. All factory-installed receivers are stereo Electronically Tuned Radios (ETR) and include an electronic digital clock function.

These radio receivers can only be serviced by an authorized radio repair station. See the latest Warranty Policies and Procedures manual for a current listing of authorized radio repair stations.

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse that is removed when the vehicle is shipped from the factory. This fuse feeds various accessories that require battery current when the ignition switch is in the Off position, including the clock. The IOD fuse is removed to prevent battery discharge during vehicle storage.

When removing or installing the IOD fuse, it is important that the ignition switch be in the Off position. Failure to place the ignition switch in the Off position can cause the radio display to become scrambled when the IOD fuse is removed and replaced. Removing and replacing the IOD fuse again, with the ignition switch in the Off position, will correct the scrambled display condition.

The IOD fuse should be checked if the radio or clock displays are inoperative. The IOD fuse is located in the Power Distribution Center (PDC). Refer to the fuse layout label on the underside of the PDC cover for IOD fuse identification and location.

OPERATION

The radio receiver operates on ignition switched battery current that is available only when the ignition switch is in the On or Accessory positions. The electronic digital clock function of the radio operates on fused battery current supplied through the IOD fuse, regardless of the ignition switch position.

For more information on the features, setting procedures, and control functions for each of the available factory-installed radio receivers, refer to the owner's manual. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

DIAGNOSIS AND TESTING - RADIO

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

If the vehicle is equipped with the optional remote radio switches located on the steering wheel and the

RADIO (Continued)

problem being diagnosed is related to one of the symptoms listed below, be certain to check the remote radio switches and circuits. (Refer to 8 - ELECTRICAL/AUDIO/REMOTE SWITCHES - OPERATION).

- Stations changing with no remote radio switch input
- Radio memory presets not working properly
- Volume changes with no remote radio switch input
- Remote radio switch buttons taking on other functions
- CD player skipping tracks
- Mode (AM, FM, CD, CD changer) changes with no remote radio switch input
- Remote radio switch inoperative.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: The speaker output of the radio receiver is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio receiver may result.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(3) Check the fused ignition switch output (acc/run) fuse in the junction block. If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse(s).

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (acc/run) fuse in the junction block. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (acc/run) circuit to the ignition switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the radio receiver from the instrument panel, but do not disconnect the wire harness connectors. Check for continuity between the radio receiver chassis and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Test the radio receiver antenna. (Refer to 8 - ELECTRICAL/AUDIO/ANTENNA BODY & CABLE - DIAGNOSIS AND TESTING). If OK, go to Step 7. If not OK, replace the faulty antenna or coaxial cable as required.

(7) Connect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (acc/run) circuit cavity of the 22 pin radio wire harness connector. If OK, go to Step 8. If not OK, repair the open fused ignition switch output (acc/run) circuit to the junction block fuse as required.

(8) Turn the ignition switch to the Off position. Check for battery voltage at the fused B(+) circuit cavity of the 22 pin radio wire harness connector. If OK, replace the faulty radio receiver. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

REMOVAL

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center upper bezel from the instrument panel.(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Remove the four screws that secure the radio receiver to the instrument panel (Fig. 12).

RADIO (Continued)

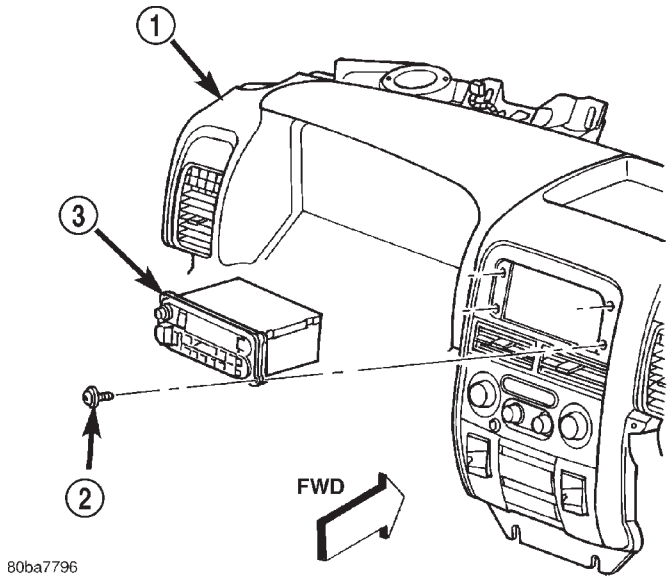


Fig. 12 Radio Remove/Install

1 - INSTRUMENT PANEL
2 - SCREW (4)
3 - RADIO RECEIVER

(4) Disconnect the instrument panel wire harness connectors and the antenna coaxial cable connector from the receptacles on the rear of the radio receiver.

(5) Remove the radio receiver from the instrument panel.

INSTALLATION

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the radio receiver to the instrument panel.

(2) Reconnect the instrument panel wire harness connectors and the antenna coaxial cable connector to the receptacles on the rear of the radio receiver.

(3) Install the four mounting screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(4) Install the center upper bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION) for the procedures.

(5) Reconnect the battery negative cable.

RADIO NOISE SUPPRESSION GROUND STRAP

DESCRIPTION

Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) noise suppression is accomplished primarily through circuitry internal to the radio receivers. These internal suppression devices are only serviced as part of the radio receiver.

External suppression devices that are used on this vehicle to control RFI or EMI noise include the following:

- Radio antenna base ground
- Radio receiver chassis ground wire or strap
- Engine-to-body ground strap(s)
- Exhaust system-to-body and transmission ground strap (4.7L engines only)
- Resistor-type spark plugs
- Radio suppression-type secondary ignition wiring.

For more information on the spark plugs and secondary ignition components, refer to Ignition System in Ignition System.

REMOVAL

REMOVAL - ENGINE-TO-BODY GROUND STRAP

(1) Remove the screw that secures the engine-to-body ground strap eyelet to the lower plenum panel (Fig. 13) or (Fig. 14).

(2) On models with a 4.0L engine, remove the nut that secures the engine-to-body ground strap eyelet to the stud on the right rear side of the engine cylinder head.

(3) On models with a 4.7L engine, remove the two nuts that secure the engine-to-body ground strap eyelets to the studs on the right and left rear sides of the engine intake manifold.

(4) Remove the engine-to-body ground strap eyelet(s) from the stud(s) on the engine.

(5) Remove the engine-to-body ground strap from the engine compartment.

RADIO NOISE SUPPRESSION GROUND STRAP (Continued)

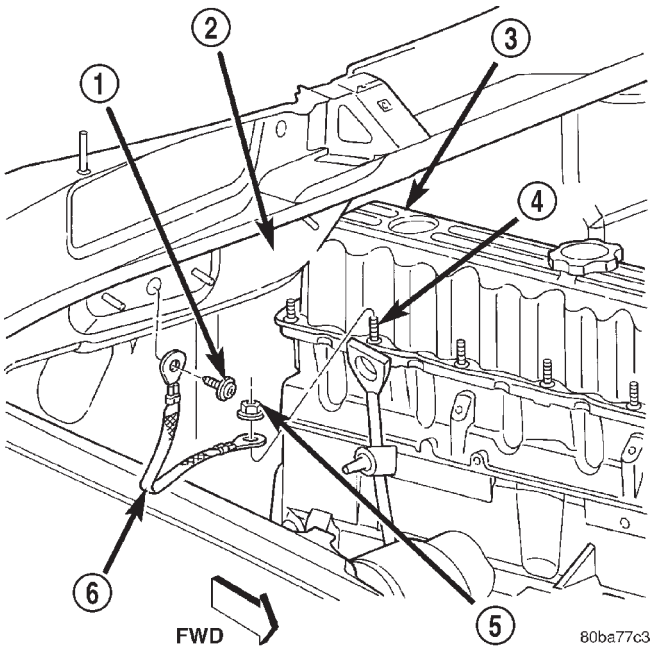


Fig. 13 Engine-To-Body Ground Strap Remove/ Install - 4.0L Engine

1 - SCREW
2 - LOWER PLENUM PANEL
3 - ENGINE
4 - STUD
5 - NUT
6 - GROUND STRAP

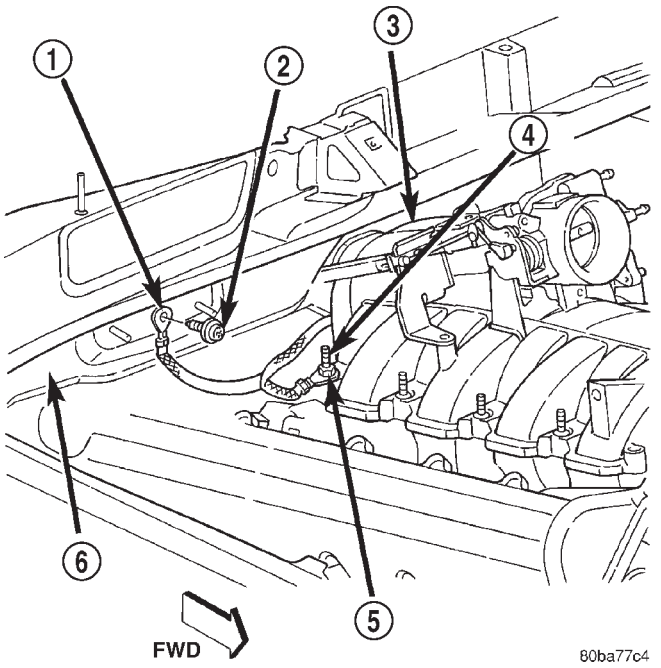


Fig. 14 Engine-To-Body Ground Strap Remove/ Install - 4.7L Engine

1 - GROUND STRAP
2 - SCREW
3 - ENGINE
4 - STUD (2)
5 - NUT (2)
6 - LOWER PLENUM PANEL

REMOVAL - EXHAUST-TO-BODY GROUND STRAP

(1) Raise and support vehicle.
(2) Remove fasteners from exhaust, crossmember and transmission/transfer case.
(3) Remove the ground strap.

INSTALLATION

INSTALLATION - ENGINE TO BODY GROUND STRAP

(1) Position the engine-to-body ground strap into the engine compartment.
(2) Install the engine-to-body ground strap eyelet(s) onto the stud(s) on the engine.
(3) On models with a 4.0L engine, install and tighten the nut that secures the engine-to-body ground strap eyelet to the stud on the right rear side of the engine cylinder head. Tighten the nut to 5.6 N·m (50 in. lbs.).
(4) On models with a 4.7L engine, install and tighten the two nuts that secure the engine-to-body ground strap eyelets to the studs on the right and left rear sides of the engine intake manifold. Tighten the nuts to 11.3 N·m (100 in. lbs.).
(5) Install and tighten the screw that secures the engine-to-body ground strap eyelet to the lower plenum panel. Tighten the screw to 4.5 N·m (40 in. lbs.).

INSTALLATION - EXHAUST-TO-BODY GROUND STRAP

(1) Install the ground strap to the exhaust, crossmember and transmission/transfer case.
(2) Install the fasteners.
(3) Lower the vehicle.

REMOTE SWITCHES

DESCRIPTION

Remote radio control switches are included on models equipped with the optional leather-wrapped steering wheel. The two rocker-type switch units (Fig. 15) are mounted in the upper spoke covers of the rear (instrument panel side) steering wheel trim cover. The switch unit on the left side is the seek switch and has seek up, seek down, and preset station advance switch functions. The switch unit on the right side is the volume control switch and has volume up, volume down, and mode advance switch functions.

REMOTE SWITCHES (Continued)

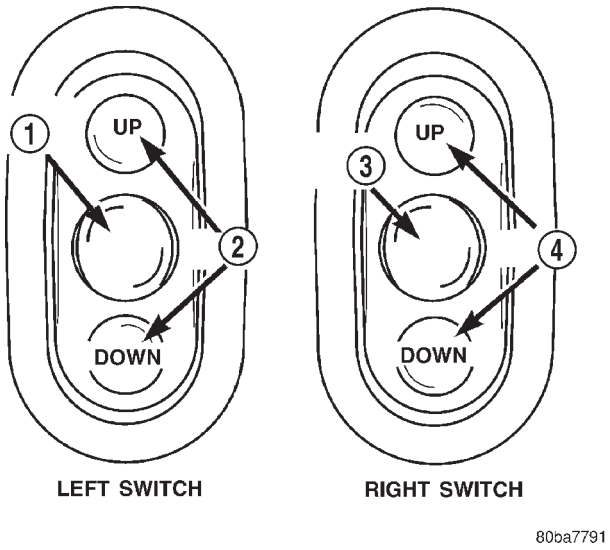


Fig. 15 Remote Radio Switches

1 - PRESET ADVANCE
2 - SEEK
3 - MODE ADVANCE
4 - VOLUME

The two remote radio switch units share a common steering wheel wire harness with the vehicle speed control switches. The steering wheel wire harness is connected to the instrument panel wire harness through the clockspring. (Refer to 8 - ELECTRICAL/ RESTRAINTS/CLOCKSPRING - DESCRIPTION) for more information on this component.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

OPERATION

The six switches in the two remote radio switch units are normally open, resistor multiplexed momentary switches that are hard wired to the Body Control Module (BCM) through the clockspring. The BCM sends a five volt reference signal to both switch units on one circuit, and senses the status of all of the switches by reading the voltage drop on a second circuit.

When the BCM senses an input (voltage drop) from any one of the remote radio switches, it sends the proper switch status messages on the Programmable Communication Interface (PCI) data bus network to the radio receiver. The electronic circuitry within the radio receiver is programmed to respond to these remote radio switch status messages by adjusting the radio settings as requested. For diagnosis of the BCM or the PCI data bus, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

For more information on the features and control functions for each of the remote radio switches, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - REMOTE SWITCHES

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the remote radio switch(es) (Fig. 16) from the steering wheel.

(2) Use an ohmmeter to check the switch resistances as shown in the Remote Radio Switch Test chart. If the remote radio switch resistances check OK, go to Step 3. If not OK, replace the faulty switch.

REMOTE SWITCHES (Continued)

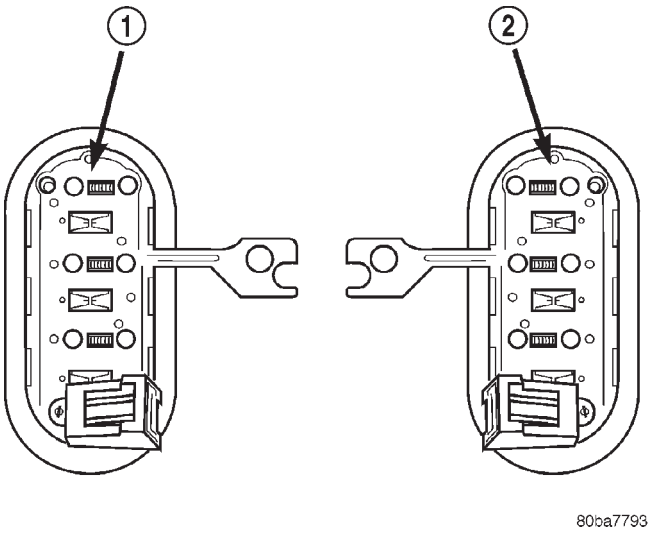


Fig. 16 Remote Radio Switches

1 - BLACK (LEFT) SWITCH
2 - WHITE (RIGHT) SWITCH

Remote Radio Switch Test		
Switch	Switch Position	Resistance
Right (White)	Volume Up	1.210 Kilohms
Right (White)	Volume Down	3.010 Kilohms
Right (White)	Mode Advance	0.0511 Kilohms
Left (Black)	Seek Up	0.261 Kilohms
Left (Black)	Seek Down	0.681 Kilohms
Left (Black)	Pre-Set Station Advance	0.162 Kilohms

(3) Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for 5 volts at the radio control mux circuit cavities of the steering wheel wire harness connectors for both remote radio switches. If OK, go to Step 4. If not OK, repair the open or shorted radio control mux circuit to the Body Control Module (BCM) as required.

(4) Disconnect and isolate the battery negative cable. Disconnect the 22-way instrument panel wire harness connector from the BCM. Check for continuity between the remote radio switch ground circuit cavities of the steering wheel wire harness connectors for both remote radio switches and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted remote radio switch ground circuit to the BCM as required.

(5) Check for continuity between the remote radio switch ground circuit cavities of the steering wheel wire harness connectors for both remote radio switches and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, refer to the proper Diagnostic Procedures manual to test the BCM and the PCI data bus. If not OK, repair the open remote radio switch ground circuit as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the driver side airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/ DRIVER AIRBAG - REMOVAL) for the procedures.

(3) Remove the speed control switch located on the same side of the steering wheel as the remote radio switch that is being serviced. Refer to Electrical, Speed Control for the procedures.

(4) Disconnect the steering wheel wire harness connector from the connector receptacle of the remote radio switch (Fig. 17).

(5) From the inside of the steering wheel rear trim cover, press firmly and evenly outward on the back of the switch.

(6) From the outside of the steering wheel rear trim cover, remove the remote radio switch from the trim cover mounting hole.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the remote radio switch to the mounting hole on the outside of the steering wheel rear trim cover. Be certain that the connector receptacle is oriented toward the bottom of the switch and pointed toward the center of the steering wheel.

REMOTE SWITCHES (Continued)

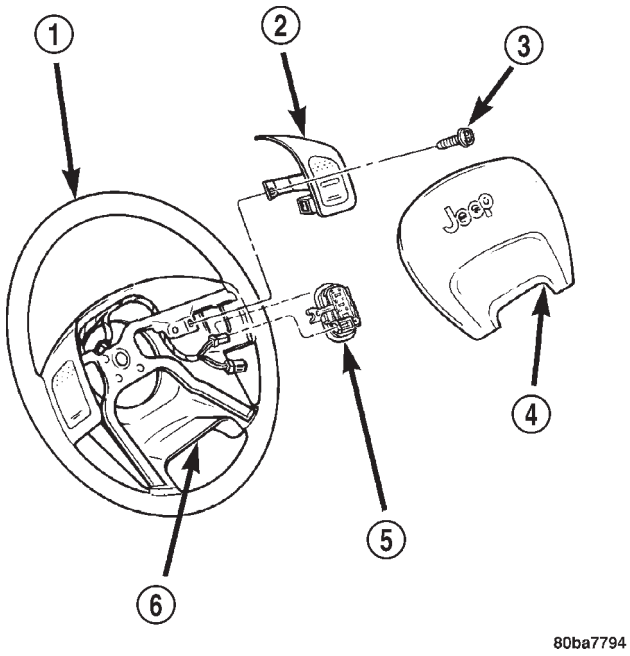


Fig. 17 Remote Radio Switches Remove/Install

1 - STEERING WHEEL
2 - SPEED CONTROL SWITCH
3 - SCREW
4 - DRIVER SIDE AIRBAG MODULE
5 - REMOTE RADIO SWITCH
6 - REAR TRIM COVER

(2) Press firmly and evenly on the remote radio switch until each of the switch snap features is fully engaged in the mounting hole of the steering wheel rear trim cover.

(3) Reconnect the steering wheel wire harness connector to the connector receptacle of the remote radio switch.

(4) Install the speed control switch onto the steering wheel. Refer to Electrical, Speed Control for the procedures.

(5) Install the driver side airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/ DRIVER AIRBAG - INSTALLATION) for the procedures.

(6) Reconnect the battery negative cable.

SPEAKER

DESCRIPTION

STANDARD

The standard equipment speaker system includes speakers in six locations. One 6.4 centimeter (2.50 inch) diameter tweeter is installed on each end of the instrument panel top pad. One 15.2 by 22.9 centimeter (6 by 9 inch) full-range speaker is located in each front door. There is also one full-range 16.5 centimeter (6.5 inch) diameter full-range speaker located in each rear door.

PREMIUM

The optional premium speaker system features six Infinity model speakers in six locations. Each of the standard speakers is replaced with Infinity model speakers. One 6.4 centimeter (2.50 inch) diameter Infinity tweeter is installed on each end of the instrument panel top pad. One 15.2 by 22.9 centimeter (6 by 9 inch) Infinity woofer is located in each front door. There is also one full-range 16.5 centimeter (6.5 inch) diameter Infinity full-range speaker located in each rear door. The premium speaker system also includes an additional Infinity power amplifier. The total available power of the premium speaker system is about 180 watts.

OPERATION

STANDARD

Each of the two tweeters and four full-range speakers used in the standard speaker system is driven by the amplifier that is integral to the factory-installed radio receiver. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

PREMIUM

The six Infinity speakers used in the premium speaker system are all driven by the radio receiver through an Infinity power amplifier. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

SPEAKER (Continued)

DIAGNOSIS AND TESTING - SPEAKER

Any diagnosis of the Audio system should begin with the use of the DRB III® diagnostic tool. For information on the use of the DRB III®, refer to the appropriate Diagnostic Service Manual.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, SEAT BELT TENSIONER, SIDE AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CAUTION: The speaker output of the radio is a "floating ground" system. Do not allow any speaker lead to short to ground, as damage to the radio may result.

(1) Turn the ignition switch to the On position. Turn the radio receiver on. Adjust the balance and fader controls to check the performance of each individual speaker. Note the speaker locations that are not performing correctly. Go to Step 2.

(2) Turn the radio receiver off. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the radio receiver from the instrument panel. If the vehicle is equipped with the Infinity speaker package, also disconnect the wire harness connectors at the power amplifier. Check both the speaker feed (+) circuit and return (–) circuit cavities for the inoperative speaker location(s) at the radio receiver wire harness connectors for continuity to ground. In each case, there should be no continuity. If OK, go to Step 3. If not OK, repair the shorted speaker feed (+) and/or return (–) circuit(s) to the speaker as required.

(3) If the vehicle is equipped with the Infinity speaker package, go to Step 6. If the vehicle is equipped with the standard speaker system, check the resistance between the speaker feed (+) circuit and return (–) circuit cavities of the radio receiver wire harness connectors for the inoperative speaker location(s). The meter should read between 2 and 3 ohms (speaker resistance). If OK, go to Step 4. If not OK, go to Step 5.

(4) Install a known good radio receiver. Connect the battery negative cable. Turn the ignition switch to the On position. Turn on the radio receiver and test the speaker operation. If OK, replace the faulty radio receiver. If not OK, turn the radio receiver off, turn the ignition switch to the Off position, disconnect and isolate the battery negative cable, remove the test radio receiver, and go to Step 5.

(5) Disconnect the wire harness connector at the inoperative speaker. Check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. Repeat the check between the speaker return (–) circuit cavities of the radio receiver wire harness connector and the speaker wire harness connector. In each case, there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open speaker feed (+) and/or return (–) circuit(s) as required.

(6) For each inoperative speaker location, check for continuity between the speaker feed (+) circuit cavities of the radio receiver wire harness connectors and the power amplifier wire harness connectors. Repeat the check for each inoperative speaker location between the speaker return (–) circuit cavities of the radio receiver wire harness connectors and the power amplifier wire harness connectors. In each case, there should be continuity. If OK, go to Step 7. If not OK, repair the open speaker feed (+) and/or return (–) circuit(s) as required.

(7) Check for continuity between the two ground circuit cavities of the power amplifier wire harness connector and a good ground. There should be continuity. If OK, go to Step 8. If not OK, repair the open ground circuit(s) to ground as required.

(8) Check the fused B(+) fuse for the power amplifier in the junction block. If OK, go to Step 9. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(9) Install the radio receiver. Connect the battery negative cable. Check for battery voltage at the fused B(+) fuse for the power amplifier in the junction block. If OK, go to Step 10. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(10) Check for battery voltage at the two fused B(+) circuit cavities of the power amplifier wire harness connector. If OK, go to Step 11. If not OK, repair the open fused B(+) circuit(s) to the power amplifier fuse in the junction block as required.

(11) Turn the ignition switch to the On position. Turn the radio receiver on. Check for battery voltage

SPEAKER (Continued)

at the enable signal to amplifier circuit cavity of the power amplifier wire harness connector. If OK, go to Step 12. If not OK, repair the open enable signal to amplifier circuit to the radio receiver as required.

(12) Turn the radio receiver off. Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. For each inoperative speaker location, check both the amplified feed (+) circuit and the amplified return (–) circuit cavities of the power amplifier wire harness connectors for continuity to ground. In each case there should be no continuity. If OK, go to Step 13. If not OK, repair the shorted amplified feed (+) and/or amplified return (–) circuit(s) to the speaker as required.

(13) For each inoperative speaker location, check the resistance between the amplified feed (+) circuit and the amplified return (–) circuit cavities of the power amplifier wire harness connectors. The meter should read between 2 and 3 ohms (speaker resistance). If OK, replace the faulty power amplifier. If not OK, go to Step 14.

(14) Disconnect the speaker wire harness connector at the inoperative speaker. Check for continuity between the amplified feed (+) circuit cavities of the speaker wire harness connector and the power amplifier wire harness connector. Repeat the check between the amplified return (–) circuit cavities of the speaker wire harness connector and the power amplifier wire harness connector. In each case there should be continuity. If OK, replace the faulty speaker. If not OK, repair the open amplified feed (+) and/or amplified return (–) circuit(s) as required.

REMOVAL

REAR DOOR SPEAKER

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the rear door. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL) for the procedures.

(3) Remove the three screws that secure the speaker to the rear door inner panel (Fig. 18).

(4) Disconnect the rear door wire harness connector from the speaker connector receptacle.

(5) Remove the speaker from the rear door inner panel.

INSTRUMENT PANEL SPEAKER

REMOVAL

(1) Disconnect and isolate the battery negative cable.

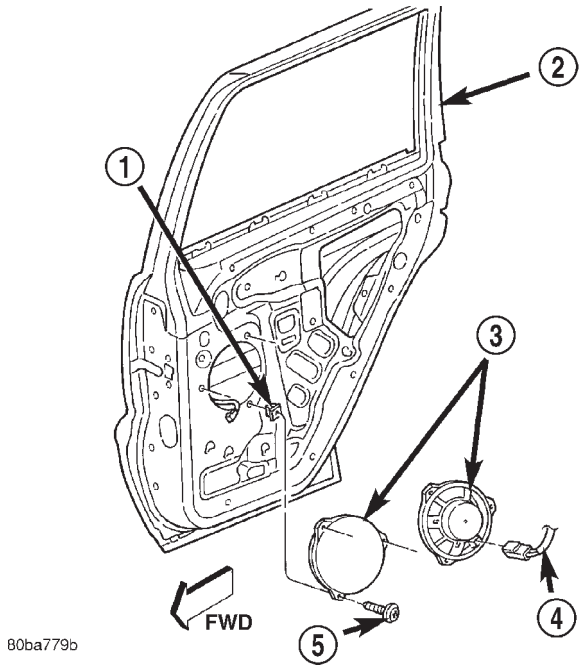


Fig. 18 Rear Door Speaker Remove/Install

1 - PLASTIC NUT (3)
2 - REAR DOOR
3 - REAR DOOR SPEAKER
4 - REAR DOOR WIRE HARNESS
5 - SCREW (3)

(2) Remove the top cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(3) Disconnect the instrument panel wire harness connector from the speaker wire harness connector (Fig. 19).

(4) Remove the two screws that secure the speaker to the top of the instrument panel.

(5) Remove the speaker from the top of instrument panel.

FRONT DOOR SPEAKER

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL) for the procedures.

(3) Remove the four screws that secure the speaker to the front door inner panel (Fig. 20).

(4) Disconnect the front door wire harness connector from the speaker connector receptacle.

(5) Remove the speaker from the front door inner panel.

SPEAKER (Continued)

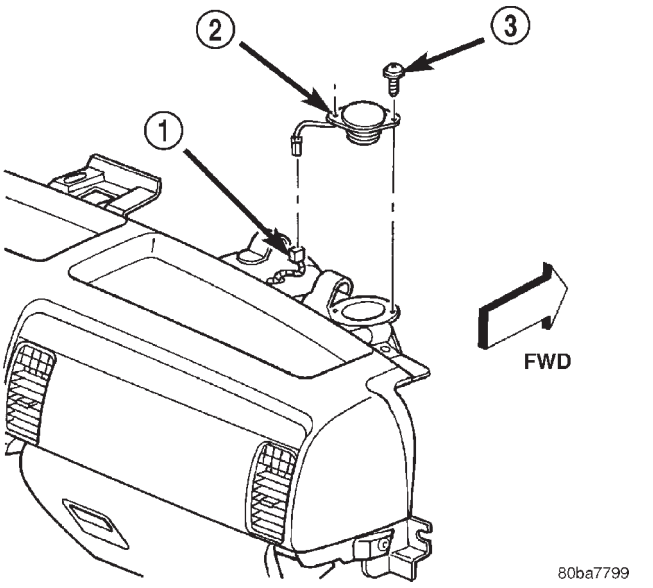


Fig. 19 Instrument Panel Speaker Remove/Install

1 - INSTRUMENT PANEL WIRE HARNESS
2 - INSTRUMENT PANEL SPEAKER
3 - SCREW (2)

INSTALLATION

INSTALLATION - REAR DOOR SPEAKER

(1) Position the speaker to the rear door inner panel.

(2) Reconnect the rear door wire harness connector to the speaker connector receptacle.

(3) Position the speaker onto the rear door inner panel.

(4) Install and tighten the three screws that secure the speaker to the rear door inner panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install the trim panel onto the rear door. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION) for the procedures.

(6) Reconnect the battery negative cable.

INSTALLATION - INSTRUMENT PANEL SPEAKER

(1) Position the speaker onto the top of the instrument panel.

(2) Install and tighten the two screws that secure the speaker to the top of the instrument panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reconnect the instrument panel wire harness connector to the speaker wire harness connector.

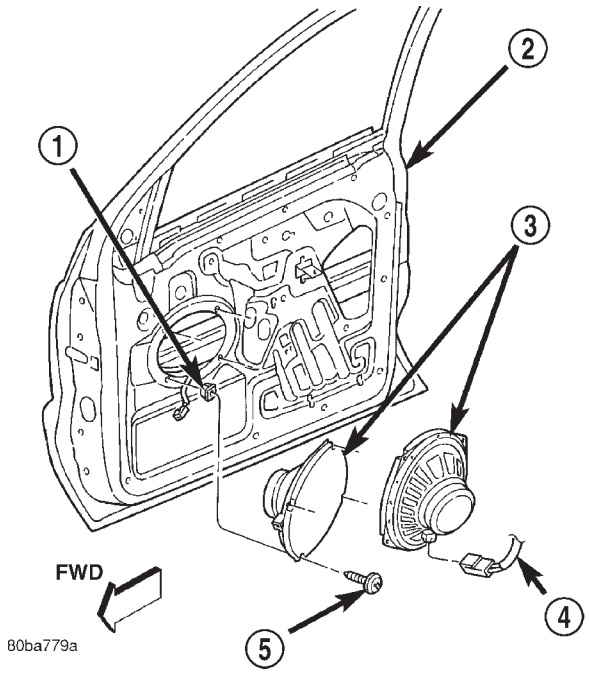


Fig. 20 Front Door Speaker Remove/Install

1 - PLASTIC NUT (4)
2 - FRONT DOOR
3 - FRONT DOOR SPEAKER
4 - FRONT DOOR WIRE HARNESS
5 - SCREW (4)

(4) Install the top cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATIONl for the procedures.

(5) Reconnect the battery negative cable.

INSTALLATION - FRONT DOOR SPEAKER

(1) Position the speaker to the front door inner panel.

(2) Reconnect the front door wire harness connector to the speaker connector receptacle.

(3) Position the speaker onto the front door inner door panel.

(4) Install and tighten the four screws that secure the speaker to the front door inner panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install the trim panel onto the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION) for the procedures.

(6) Reconnect the battery negative cable.

CHIME/BUZZER

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CHIME WARNING SYSTEM

DESCRIPTION

The chime warning system uses a single chime tone generator that is integral to the Body Control Module (BCM) to provide an audible indication of vehicle conditions that may require the attention of the vehicle operator (Fig. 1). The chime warning system includes the following major components:

- Body Control Module
- Door Ajar Switch
- Headlamp Switch
- Ignition Switch
- Seat Belt Switch

Hard wired circuitry connects many of the chime warning system components to each other through the electrical system of the vehicle.

If the BCM or the chime tone generator are damaged or faulty, the BCM unit must be replaced.

OPERATION

The chime warning system components operate on battery voltage received through the Ignition-Off Draw (IOD) fuse in the Power Distribution Center (PDC) on a non-switched B(+) circuit so that the system may operate regardless of the ignition switch position.

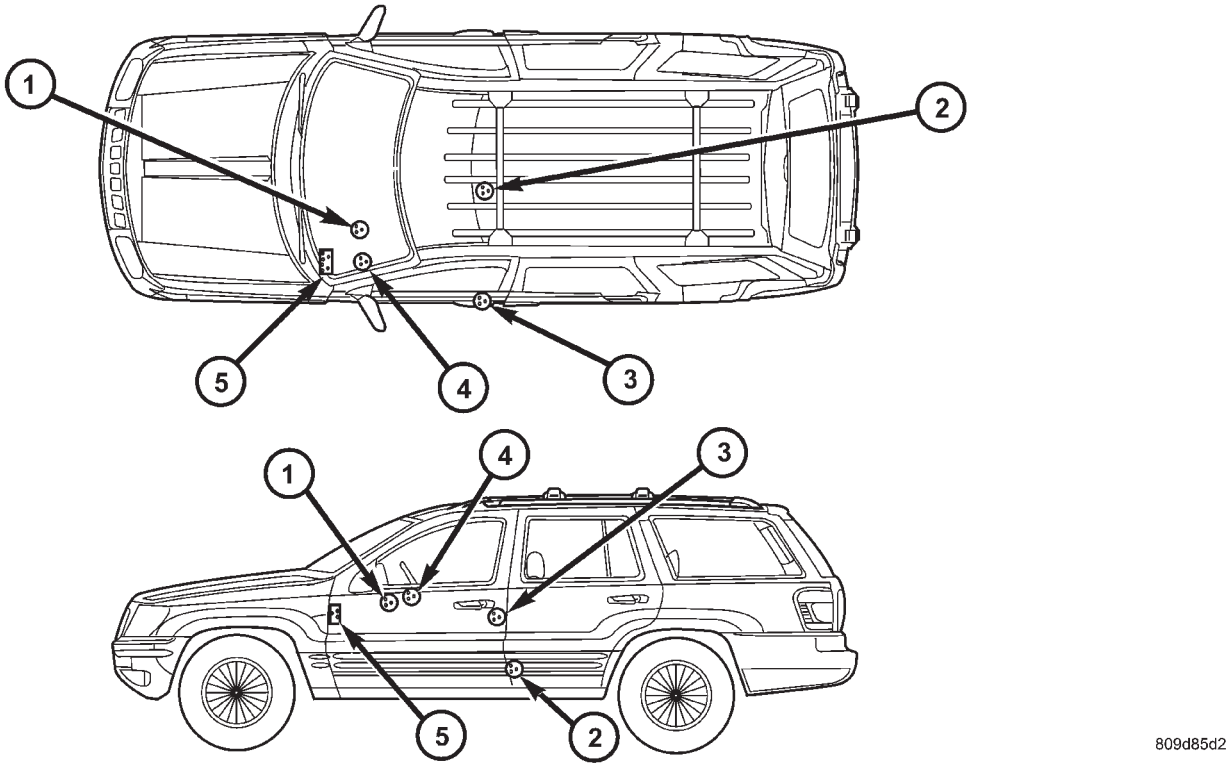


Fig. 1 Chime Warning System

1 - IGNITION SWITCH
2 - SEAT BELT SWITCH
3 - DOOR AJAR SWITCH
4 - HEADLAMP SWITCH
5 - BODY CONTROL MODULE

CHIME WARNING SYSTEM (Continued)

The chime warning system provides an audible indication to the vehicle operator under the following conditions:

- **Fasten Seat Belt Warning** - The Body Control Module (BCM) chime tone generator will generate repetitive chimes to announce that an input from the seat belt switch indicates the driver side front seat belt is not fastened. Unless the driver side front seat belt is fastened, the chimes will continue to sound for a duration of about six seconds each time the ignition switch is turned to the On position or until the driver side front seat belt is fastened.
- **Head/Park Lights-On Warning** - The BCM chime tone generator will generate repetitive chimes at a fast rate to announce that a Programmable Communications Interface (PCI) data bus driver door ajar message, along with hard wired inputs from the headlamp switch indicate that the exterior lamps are turned On with the driver side front door opened. The chime will continue to sound until the exterior lamps are turned Off, the driver side front door is closed, or the ignition switch is turned to the On position.
- **Key-In-Ignition Warning** - The BCM chime tone generator will generate repetitive chimes at a fast rate to announce that a PCI data bus driver door ajar message received from the Driver Door Module (DDM), along with hard wired inputs from the key-in-ignition warning switch indicate that the key is in the ignition cylinder with the driver side front door opened and the ignition switch in the Off position. The chime will continue to sound until the key is removed from the ignition lock cylinder, the driver side front door is closed, or the ignition switch is turned to the On position.
- **Overspeed Warning** - The BCM chime tone generator will generate repetitive chimes at a slow rate to announce that a PCI data bus vehicle speed message received from the Powertrain Control Module (PCM) indicates that the vehicle speed is above 120 kilometers-per-hour (75 miles-per-hour). The chimes will continue to sound until the vehicle speed is below 120 kilometers-per-hour (75 miles-per-hour). This feature is only enabled on a BCM that has been programmed with a Middle East Gulf Coast Country (GCC) country code.
- **Tactile Beep Support** - The BCM chime tone generator will generate a single beep each time a PCI data bus tactile beep request message is received from the Electronic Vehicle Information Center (EVIC) or the Sentry Key Immobilizer Module (SKIM). This beep provides an audible confirmation that an EVIC button was completely depressed, or that the optional Sentry Key Immobilizer System (SKIS) is in the “Customer Learn” mode.
- **Warning Beep Support** - The BCM chime tone generator will generate a short series of beeps each time a PCI data bus warning beep request message is received from the EVIC or the Electro-Mechanical Instrument Cluster (EMIC). These beeps provide an audible alert to the vehicle operator, of certain visual warning indications displayed by the EVIC and/or the EMIC.

The BCM provides chime service for all available features in the chime warning system. The BCM relies upon message inputs received from other modules over the PCI data bus network to provide chime service for all of the remaining chime warning system features.

The internal programming of the BCM determines the priority of each chime tone request input that is received, as well as the rate and duration of each chime tone that is to be generated.

CHIME WARNING SYSTEM (Continued)

DIAGNOSIS AND TESTING - CHIME WARNING SYSTEM

Refer to the appropriate wiring information. Conventional diagnostic methods may not prove conclusive in the diagnosis of the instrument cluster or the Programmable Communications Interface (PCI) data bus network. The most reliable, efficient and accurate means to diagnose the BCM and the PCI data bus network inputs for the chime warning system requires the use of a DRBIII® scan tool and the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

CHIME WARNING SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
NO SEAT BELT WARNING CHIME WITH SEAT BELT UNBUCKLED, BUT OTHER CHIME FEATURES OK	1. Seat belt switch ground circuit open.	1. Check for continuity between the ground circuit of the wire harness connector for the seat belt switch and a good ground. Repair the ground circuit, if required.
	2. Seat belt switch sense circuit open.	2. Check for continuity between the seat belt switch sense circuit of the wire harness connector for the seat belt switch and the body wire harness junction block connector. Repair the seat belt switch sense circuit, if required.
	3. Faulty seat belt switch.	3. Check for continuity between the ground circuit and the seat belt switch sense circuit of the seat belt switch pigtail wire connector. There should be continuity with the seat belt unbuckled. Replace the faulty seat belt, if required.
SEAT BELT WARNING CHIME WITH SEAT BELT BUCKLED	1. Seat belt switch sense circuit shorted.	1. With the wire harness connector for the seat belt switch and the body wire harness junction block connector disconnected, there should be no continuity between the seat belt switch sense circuit and a good ground. Repair the seat belt switch sense circuit, if required.
	2. Faulty seat belt switch.	2. Check for continuity between the ground circuit and the seat belt switch sense circuit of the seat belt switch pigtail wire connector. There should be no continuity with the seat belt buckled. Replace the faulty seat belt, if required.

CHIME WARNING SYSTEM (Continued)

CHIME WARNING SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
NO KEY-IN IGNITION OR HEADLAMPS-ON WARNING CHIME WITH DRIVER SIDE FRONT DOOR OPEN	1. Faulty door ajar switch or circuits.	1. Check that interior lights illuminate with driver door open. If not OK, repair the interior lighting system as required.
	2. Faulty headlamp switch (left multi-function switch) or circuits.	2. Check for proper exterior lighting operation. If not OK, repair the exterior lighting system as required.
	3. Key-in ignition switch sense circuit open.	2. Check for continuity between the key-in ignition switch sense circuit of the instrument panel wire harness connector for the ignition switch and the body wire harness connector for the junction block. Repair the key-in ignition switch sense circuit, if required.
	4. Faulty ignition switch.	3. Check for continuity between the two terminals in the ignition switch connector. There should be continuity with a key in the ignition lock cylinder. Replace the faulty ignition switch, if required.
CHIME SOUNDS WITH DRIVER SIDE FRONT DOOR OPEN	1. Key-in ignition switch sense circuit shorted.	1. Disconnect the instrument panel wire harness connector for the ignition switch and the body wire harness connector for the junction block. There should be no continuity between the key-in ignition switch sense circuit of the instrument panel wire harness connector for the ignition switch and a good ground. Repair the key-in ignition switch sense circuit, if required.
	2. Faulty ignition switch.	2. Check for continuity between the two terminals in the ignition switch connector. There should be no continuity with the key removed from the ignition lock cylinder. Replace the faulty ignition switch, if required.
NO CHIMES AT ALL TIMES	1. Faulty Body Control Module (BCM).	1. Use a DRBIII® scan tool and refer to the appropriate diagnostic information. Replace the faulty BCM, if required

ELECTRONIC CONTROL MODULES

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ELECTRONIC CONTROL MODULES

STANDARD PROCEDURE - PCM/SKIM PROGRAMMING

NOTE: Before replacing the PCM, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM failures are caused by internal component failures (i.e. relays and solenoids) and shorted circuits (i.e. pull-ups, drivers, and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has been set.

When a PCM (JTEC) and the SKIM are replaced at the same time, perform the following steps in order:

(1) Program the new PCM (JTEC).
(2) Program the new SKIM.
(3) Replace all ignition keys and program them to the new SKIM.

PROGRAMMING THE PCM (JTEC)

The SKIS Secret Key is an ID code that is unique to each SKIM. This code is programmed and stored in the SKIM, the PCM, and the ignition key transponder chip(s). When replacing the PCM, it is necessary to program the secret key into the new PCM using the DRBIII® scan tool. Perform the following steps to program the secret key into the PCM.

ELECTRONIC CONTROL MODULES (Continued)

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).
(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.
(3) Select PCM REPLACED (GAS ENGINE).
(4) Enter secured access mode by entering the vehicle four-digit PIN.
(5) Select ENTER to update PCM VIN.

NOTE: If three attempts are made to enter secure access mode using an incorrect PIN, secured access mode will be locked out for one hour. To exit this lockout mode, turn the ignition switch to the ON position for one hour, then enter the correct PIN. (Ensure all accessories are turned off. Also monitor the battery state and connect a battery charger if necessary).

(6) Press ENTER to transfer the secret key (the SKIM will send the secret key to the PCM).
(7) Press Page Back to get to the Select System menu and select ENGINE, MISCELLANEOUS, and SRI MEMORY CHECK.
(8) The DRBIII® will ask, "Is odometer reading between XX and XX?" Select the YES or NO button on the DRBIII®. If NO is selected, the DRBIII® will read, "Enter Odometer Reading (From I.P. odometer)". Enter the odometer reading from the instrument cluster and press ENTER.

PROGRAMMING THE SKIM

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).
(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.
(3) Select PCM REPLACED (GAS ENGINE).
(4) Program the vehicle four-digit PIN into SKIM.
(5) Select COUNTRY CODE and enter the correct country.

NOTE: Be sure to enter the correct country code. If the incorrect country code is programmed into SKIM, it cannot be changed and the SKIM must be replaced.

(6) Select YES to update VIN (the SKIM will learn the VIN from the PCM).
(7) Press ENTER to transfer the secret key (the PCM will send the secret key to the SKIM).
(8) Program ignition keys to the SKIM.

NOTE: If the PCM and the SKIM are replaced at the same time, all vehicle ignition keys will need to be replaced and programmed to the new SKIM.

PROGRAMMING IGNITION KEYS TO THE SKIM

(1) Turn the ignition switch to the On position (transmission in Park/Neutral).
(2) Use the DRBIII® and select THEFT ALARM, SKIM, then MISCELLANEOUS.
(3) Select PROGRAM IGNITION KEY'S.
(4) Enter secured access mode by entering the vehicle four-digit PIN.

NOTE: A maximum of eight keys can be learned to each SKIM. Once a key is learned to a SKIM it (the key) cannot be transferred to another vehicle.

(5) Obtain ignition keys to be programmed from the customer (8 keys maximum).
(6) Using the DRBIII®, erase all ignition keys by selecting MISCELLANEOUS, and ERASE ALL CURRENT IGN. KEYS.
(7) Program all of the ignition keys.
If ignition key programming is unsuccessful, the DRBIII® will display one of the following messages:
- **Programming Not Attempted** - The DRBIII® attempts to read the programmed key status and there are no keys programmed into SKIM memory.
- **Programming Key Failed (Possible Used Key From Wrong Vehicle)** - SKIM is unable to program an ignition key transponder due to one of the following:
  - The ignition key transponder is faulty.
  - The ignition key transponder is or has been already programmed to another vehicle.
- **8 Keys Already Learned, Programming Not Done** - The SKIM transponder ID memory is full.
- **Learned Key In Ignition** - The ID for the ignition key transponder currently in the ignition lock cylinder is already programmed in SKIM memory.

ADJUSTABLE PEDALS MODULE

REMOVAL

(1) Disconnect the negative battery cable.
(2) Remove the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).
(3) Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
(4) Remove the adjustable pedal motor for accessibility. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - REMOVAL).
(5) Remove the two mounting clips from the module (Fig. 1).
(6) Disconnect the electrical connector.
(7) Remove the adjustable pedal module.

ADJUSTABLE PEDALS MODULE (Continued)

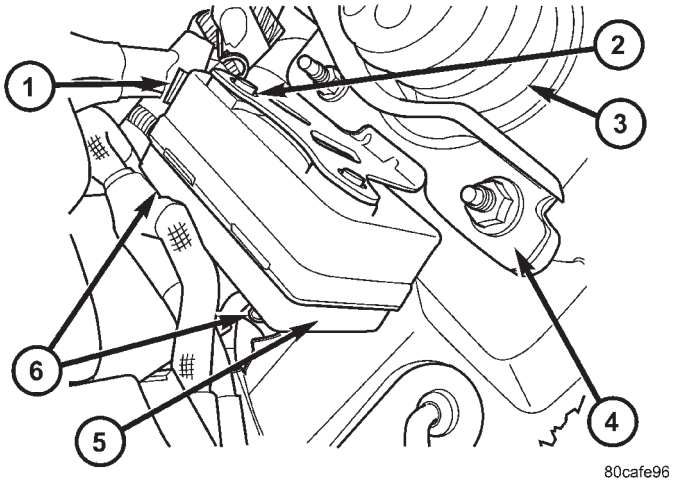


Fig. 1 ADJUSTABLE PEDALS MODULE

1 - ELECTRICAL CONNECTOR
2 - MODULE MOUNTING BRACKET
3 - BRAKE BOOSTER
4 - ADJUSTABLE PEDALS MOUNTING BRACKET
5 - ADJUSTABLE PEDALS CONTROL MODULE
6 - HOLD DOWN CLIPS

INSTALLATION

(1) Install the module on the mounting pins in the vehicle.

(2) Reconnect the electrical connector.

(3) Install the two mounting clips for the module (Fig. 1).

(4) Install the adjustable pedal motor. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - INSTALLATION).

(5) Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(6) Install the cluster bezel (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(7) Reconnect the negative battery cable.

BODY CONTROL MODULE

DESCRIPTION

A Body Control Module (BCM) is concealed below the driver side end of the instrument panel (Fig. 2).

The BCM utilizes integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus network along with many hard wired inputs to monitor many sensor and switch inputs throughout the vehicle. In response to those inputs, the internal circuitry and programming of the BCM allow it to control and integrate many electronic functions and features of the vehicle

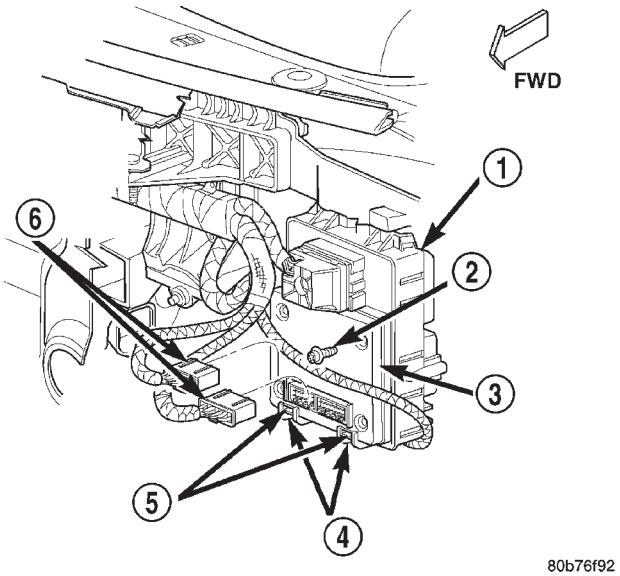


Fig. 2 Body Control Module

1 - JUNCTION BLOCK
2 - SCREWS (4)
3 - BODY CONTROL MODULE
4 - FUSE COVER LOCATOR CHANNELS
5 - FUSE COVER MOUNTING SLOTS
6 - INSTRUMENT PANEL WIRE HARNESS CONNECTORS

through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the PCI data bus. The electronic functions and features that the BCM supports or controls include the following:

The BCM for this model is serviced only as a complete unit. Many of the electronic features in the vehicle controlled or supported by the BCM are programmable using either the Electronic Vehicle Information Center (EVIC) user interface, or the DRBIII® scan tool. In addition, the BCM software is Flash compatible, which means it can be reprogrammed using Flash reprogramming procedures. A BCM can only be repaired by or replaced through an authorized electronic warranty repair station. Refer to the latest version of the Warranty Policies and Procedures manual for a current listing of authorized electronic repair stations.

OPERATION

The Body Control Module (BCM) is designed to control and integrate many of the electronic features and functions of the vehicle. The microprocessor-based BCM hardware and software monitors many hard wired switch and sensor inputs as well as those resources it shares with other electronic modules in the vehicle through its communication over the PCI data bus network. The internal programming of the BCM microprocessor allows the BCM to determine the tasks it needs to perform and their priorities. The

BODY CONTROL MODULE (Continued)

BCM programming then performs those tasks and provides features through both PCI data bus communication with other electronic modules and hard wired outputs to a number of relays. These relays provide the BCM with the ability to control numerous high current accessory systems in the vehicle.

The BCM circuitry operates on battery current received through fuses in the Junction Block (JB) on a non-switched fused B(+) circuit, a fused ignition switch output (start-run) circuit, and a fused ignition switch output (run-accessory) circuit. This arrangement allows the BCM to provide some features regardless of the ignition switch position. The BCM circuitry is grounded through the chassis beneath the center console.

The BCM monitors its own internal circuitry as well as many of its input and output circuits, and will store a Diagnostic Trouble Code (DTC) in electronic memory for any failure it detects. These DTCs can be retrieved and diagnosed using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

HARD WIRED INPUTS

The hard wired inputs to the BCM include the following:

- A/C switch signal
- Ambient temperature sensor signal
- Body control module flash enable
- Coolant level switch sense
- Door ajar switch sense (two circuits - one left rear, and one right rear)
- Driver seat heater switch mux
- Fog lamp switch sense
- Fused B(+)
- Fused ignition switch output (run-acc)
- Fused ignition switch output (st-run)
- Ground (five circuits - two Z1, and three Z2)
- Hazard switch sense
- Headlamp switch mux
- High beam switch sense
- Hood ajar switch sense (export)
- Key-in ignition switch sense
- Liftgate ajar switch sense
- Liftgate courtesy disable
- Liftgate flip-up ajar switch sense
- Panel lamps dimmer signal
- Park lamp relay output
- Passenger seat heater switch mux
- PCI bus
- Radio control mux
- Rear window defogger switch sense
- Seat belt switch sense
- Ultralight sensor signal
- Washer fluid switch sense
- Washer pump switch sense
- Windshield wiper switch mux
- Wiper park switch sense

MESSAGING

The BCM uses the following messages received from other electronic modules over the PCI data bus:

- Accessory Delay Control (DDM/PDM)
- Battery Temperature (PCM)
- Chime Request (EMIC, EVIC, SKIM)
- Cylinder Lock Switch Status (DDM)
- Door Ajar Status/Front Doors (DDM/PDM)
- Door Lock Status (DDM/PDM)
- Engine Model (PCM)
- Engine RPM (PCM)
- Engine Temperature (PCM)
- English/Metric Default (EMIC)
- Fuel Tank Level (PCM)
- Fuel Used/Injector Pulses (PCM)
- Panic Control (PDM)
- Programmable Features Preferences/Audible & Optical Chirps/Headlamp Delay (EVIC)
- RKE Status (PDM)
- Vehicle Identification Number (PCM)
- Vehicle Speed (PCM)

The BCM provides the following messages to other electronic modules over the PCI data bus:

- A/C Switch Status (PCM)
- Ambient Temperature Data (AZC/EVIC/PCM)
- Average/Instantaneous Fuel Economy (EVIC)
- Country Code (EMIC)
- Courtesy Lamp Status (DDM/PDM)
- Distance To Empty (EVIC)
- Elapsed Ignition On Timer (EVIC)
- English/Metric Status (EMIC)
- Front & Rear Door Ajar Status (EVIC)
- Front & Rear Fog Lamp Status (EMIC)
- Heated Seat Switch Status (HSM/MHSM)
- High Beam Status (EMIC)
- Ignition Off Timer (EVIC)
- Ignition Switch Position (DDM/PDM)
- Key-In Ignition Status (DDM/PDM)
- Low Beam Status (EMIC)
- Panel Lamp Status (AZC/EMIC/Radio)
- Rear Window Defogger Relay Status (DDM/PDM)
- Remote Radio Switch Status (Radio)
- Seatbelt Status (EMIC/MHSM/MSM)

DIAGNOSIS AND TESTING - BODY CONTROL MODULE

The hard wired inputs to and outputs from the Body Control Module (BCM) may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information.

Conventional diagnostic methods may not prove conclusive in the diagnosis of the BCM. In order to obtain conclusive testing of the BCM, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide

BODY CONTROL MODULE (Continued)

inputs to or receive outputs from the BCM must also be checked. The most reliable, efficient, and accurate means to diagnose the BCM, the PCI data bus network, and the electronic modules that provide inputs to or receive outputs from the BCM requires the use of a DRBIII® scan tool and the appropriate diagnostic information. The DRBIII® scan tool can provide confirmation that the PCI data bus network is functional, that all of the modules are sending and receiving the proper messages over the PCI data bus, and that the BCM is receiving the proper hard wired inputs and responding with the proper hard wired outputs needed to perform its many functions.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel fuse cover.(Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - REMOVAL).

(3) Access and disconnect the instrument panel wire harness connectors from the BCM (Fig. 3).

(4) Remove the mounting screws (Torx T-20) that secure the BCM to the JB.

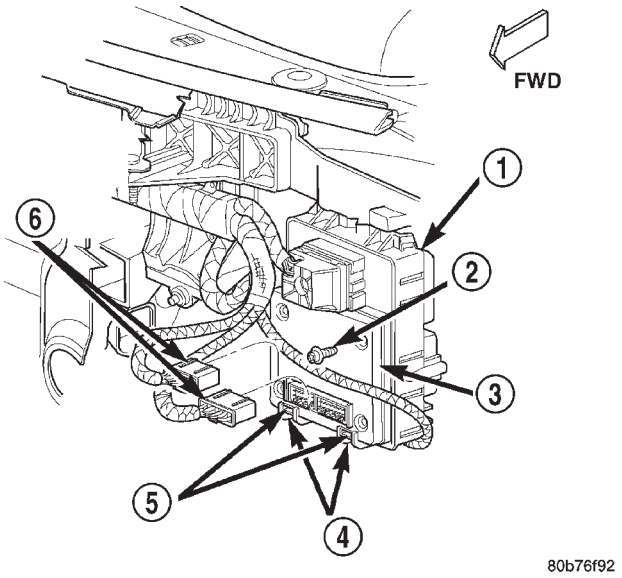


Fig. 3 Body Control Module Remove/Install

1 - JUNCTION BLOCK
2 - SCREWS (4)
3 - BODY CONTROL MODULE
4 - FUSE COVER LOCATOR CHANNELS
5 - FUSE COVER MOUNTING SLOTS
6 - INSTRUMENT PANEL WIRE HARNESS CONNECTORS

(5) Pull the BCM straight out towards the dash panel far enough to disconnect the integral BCM to JB connector.

(6) Remove the BCM.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the Body Control Module (BCM) to its mounting location (Fig. 3).

(2) Align the terminal pins of the BCM connector with the connector on the JB.

(3) Engage the BCM integral connector into the JB.

(4) Install the four screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Connect the two instrument panel wire harness connectors to the BCM.

(6) Reinstall the instrument panel fuse cover to the bottom of the BCM and JB unit. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - INSTALLATION).

(7) Connect the battery negative cable.

COMMUNICATION

DESCRIPTION

The Programmable Communication Interface (PCI) data bus system is a single wire multiplex system used for vehicle communications. Multiplexing is a system that enables the transmission of several messages over a single channel or circuit.

Many of the control modules in a vehicle require information from the same sensing device. Multiplexing reduces wire harness complexity, sensor current loads and controller hardware because each sensing device is connected to only one controller, which reads and distributes the sensor information to the other controllers over the data bus. Also, because each controller on the data bus can access the controller sensor inputs to every other controller on the data bus, more function and feature capabilities are possible.

A multiplex system allows the information flowing between controllers to be monitored using a diagnostic scan tool. This system allows a control module to broadcast message data out onto the bus where all other control modules can read the messages that are being sent. When a module reads a message on the data bus that it requires, it relays that message to its microprocessor. Each module ignores the messages on the data bus that it dosen't recognize.

OPERATION

Data exchange between modules is achieved by serial transmission of encoded data over a single wire broadcast network. The PCI data bus messages are carried over the bus in the form of Variable Pulse Width Modulated (VPWM) signals. The PCI data bus speed is an average 10.4 Kilo-bits per second (Kbps).

The voltage network used to transmit messages requires biasing and termination. Each module on the PCI data bus system provides its own biasing and termination. Each module (also referred to as a node) terminates the bus through a terminating resistor and a terminating capacitor. The Powertrain Control Module (PCM) is the only dominant node for the PCI data bus system.

The PCI bus uses low and high voltage levels to generate signals. The voltage on the buss varies between zero and seven and one-half volts. The low and high voltage levels are generated by means of variable-pulse width modulation to form signals of varying length.

When a module is transmitting on the bus, it is reading the bus at the same time to ensure message integrity.

Each module is capable of transmitting and receiving data simultaneously.

The PCI data bus can be monitored using the DRBIII® scan tool. It is possible for the bus to pass all DRBIII® tests and still be faulty if the voltage parameters are all within the specified range and false messages are being sent.

CONTROLLER ANTILOCK BRAKE

DESCRIPTION

The Controler Antilock Brake (CAB) is mounted to the Hydraulic Control Unit (HCU) and operates the ABS system (Fig. 4).

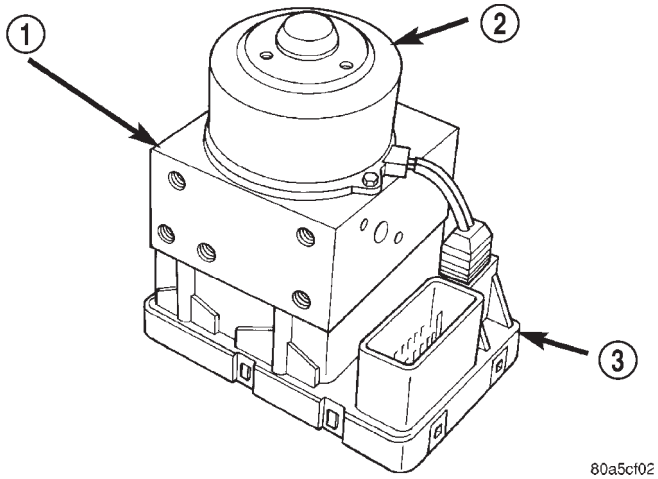


Fig. 4 Controller Antilock Brakes

1 - HCU
2 - MOTOR
3 - CAB

OPERATION

The CAB voltage is supplied by the ignition switch in the RUN position. The CAB contains dual microprocessors. A logic block in each microprocessor receives identical sensor signals. These signals are processed and compared simultaneously. The CAB contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in a diagnostic program memory and are accessible with the DRBIII® scan tool. ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored

CONTROLLER ANTILOCK BRAKE (Continued)

faults are **not** erased if the battery is disconnected. (Fig. 4)

REMOVAL

(1) Remove negative battery cable from the battery.

(2) Remove air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL) OR (Refer to 9 - ENGINE/ AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Release CAB harness connector and remove connector (Fig. 5).

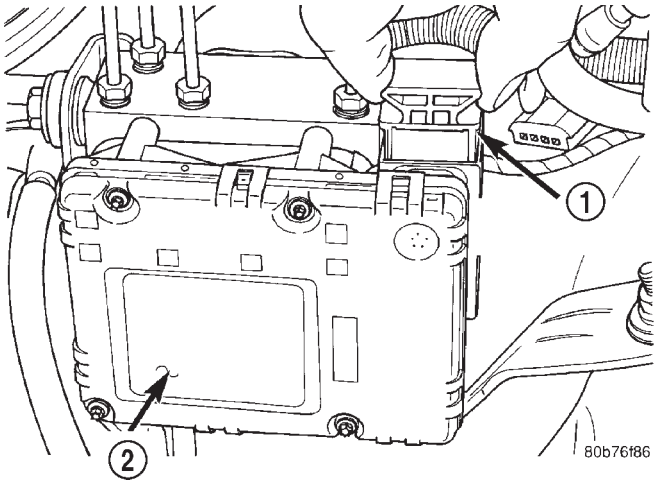


Fig. 5 CAB Connector Release

1 - CONNECTOR RELEASE
2 - CAB

(4) Remove pump motor connector.

(5) Remove CAB mounting bolts (Fig. 6) and remove the CAB from the HCU.

INSTALLATION

(1) Install the CAB onto the HCU and tighten mounting bolts to 1.8 N·m (16 in. lbs.).

(2) Install pump motor connector.

(3) Install CAB harness connector and push down connector release.

(4) Install air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION) OR (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(5) Install negative battery cable to the battery.

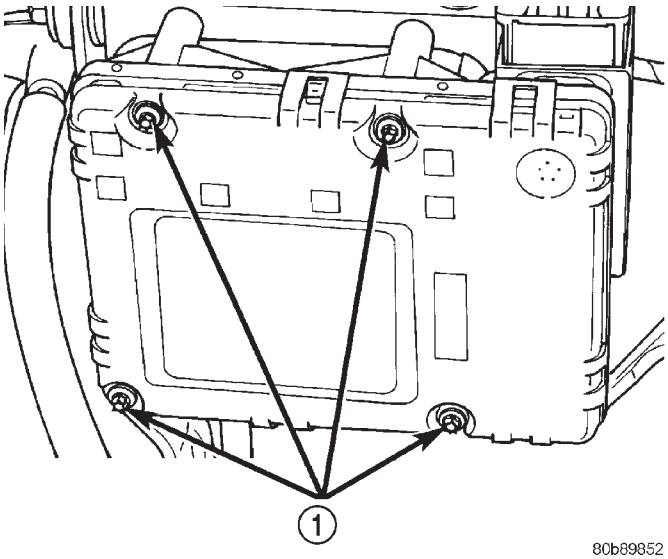


Fig. 6 CAB Mounting Bolts

1 - MOUNTING BOLTS

DATA LINK CONNECTOR

DESCRIPTION - DATA LINK CONNECTOR

The data link connector (DLC) is located at the lower edge of the instrument panel near the steering column.

OPERATION - DATA LINK CONNECTOR

The 16–way DLC links the DRBIII® scan tool or the Mopar Diagnostic System (MDS) with the Powertrain Control Module (PCM).

DOOR MODULE

DESCRIPTION

A door module is concealed behind the trim panel of each front door (Fig. 7).The module on the driver side is referred to as the Driver Door Module (DDM), while the module on the passenger side is the Passenger Door Module (PDM). Each door module houses both the front power lock and power window switches. In addition to the power window and power lock switches for its own door, the DDM also houses individual switches for each passenger door power window, a power window lockout switch, the power mirror switch, and the power foldaway mirror switch for export vehicles.

The DDM and PDM each utilize integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus network along with many hard wired inputs to monitor many sensor and switch inputs throughout the vehicle. The PDM also receives inputs through an integral Radio

DOOR MODULE (Continued)

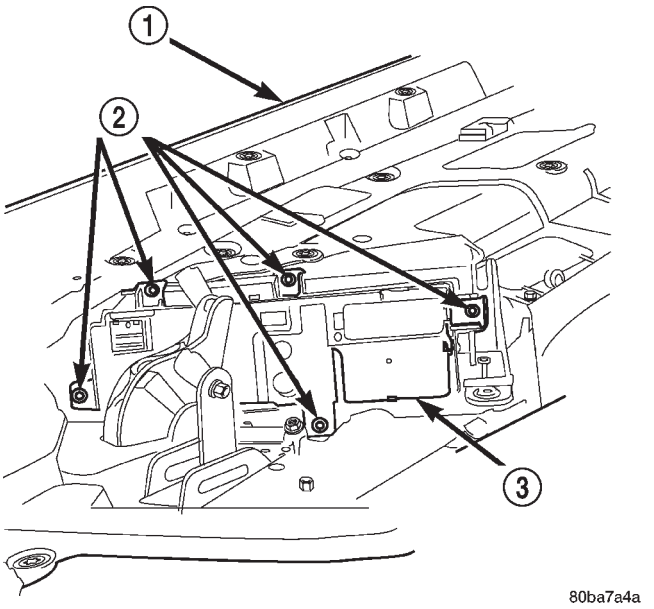


Fig. 7 Door Module

1 - FRONT DOOR TRIM PANEL
2 - SCREW (5)
3 - DOOR MODULE

Frequency (RF) Remote Keyless Entry (RKE) receiver. The DDM and PDM control and integrate many functions and features of the vehicle through both hard wired outputs and messages over the PCI data bus. The functions and features that the door modules support or control include the following:

- **Automatic Door Lock** - The two door modules provide an automatic door lock feature which locks the doors when the vehicle is moving. This is a programmable feature.
- **Automatic Door Unlock On Exit** - The two door modules provide an automatic door unlock on exit feature. This feature will unlock all the doors if they were locked via the automatic door lock feature after the vehicle has stopped moving and the driver door is opened. This is a programmable feature via the EVIC.
- **Customer Programmable Features** - Each door module provides support for certain customer programmable features that are monitored on the PCI bus.
- **Cylinder Lock Switch Status** - The DDM monitors and transmits the status of the cylinder lock switch on the driver side front door lock cylinder.
- **Door Courtesy Lamp Control** - Each door module provides control of its own optional front door-mounted courtesy lamp.
- **Door Lock Inhibit** - Each door module provides a door lock inhibit feature which prevents the doors from being locked with a power lock switch if the key was left in the ignition and a front door is open.
- **Express-Down Window** - The DDM provides an express-down feature for the driver side front door window only.
- **Extended Window Operation** - Both door modules provide an extended power window operation feature that allows operation of the power windows for 45 seconds following ignition Off or until a front door is opened.
- **Front Door Ajar Switch Status** - Each door module monitors and transmits the status of its own front door ajar switch.
- **Heated Mirrors** - Each door module provides control for its own optional heated outside rear view mirror.
- **Illuminated Entry** - Each door module supports an illuminated entry feature through its own optional front door-mounted courtesy lamp.
- **Memory Mirrors** - Each door module provides control for its own optional memory outside rear view mirror.
- **Memory Switch** - The DDM monitors the status of the optional memory switch and controls the illumination of the memory switch “set” Light Emitting Diode (LED) indicator and illumination lamps.
- **Memory System** - The DDM transmits memory set and recall messages based upon inputs from the memory switch. If the optional RKE linked to memory feature is enabled, the DDM will also transmit memory recall messages based upon memory requests received from the Remote Keyless Entry (RKE) system in the PDM. Certain memory system features are programmable.
- **Power Foldaway Mirrors - Export Only** - Each door module provides support for the optional power foldaway outside mirrors. The DDM also houses the control switch for this system.
- **Power Lock Control** - The DDM provides control for the driver side front door power lock motor, while the PDM provides control for the power lock motors of the three remaining doors and the liftgate.
- **Power Lock Switch Status** - Each door module monitors and transmits the status of its own integral power lock switch.
- **Power Window Control** - Each door module provides control for both the front and rear door power window motors and the rear door power window switches on the same side of the vehicle.
- **Power Window Switch Status** - The DDM monitors and transmits the status of its integral passenger side front and rear power window switches.
- **Remote Keyless Entry** - The PDM monitors and transmits the status of the Remote Keyless Entry (RKE) system and provides support for the RKE Lock (with the optional horn chirp and park

DOOR MODULE (Continued)

lamp flash features), Unlock with the optional RKE unlock, and Panic Mode functions. The optional RKE features are programmable.

- **Switch Illumination** - Each door module provides control of the power window and power lock switch illumination for the front and rear doors on the same side of the vehicle. The DDM provides control of the power mirror switch illumination.
- **Window Lockout** - The DDM monitors and transmits the status of its integral window lockout switch to provide the power window lockout feature and coordinate power window switch knob illumination.

The door modules are serviced only as complete units. Many of the features in the vehicle controlled or supported by the door modules are programmable using either the Electronic Vehicle Information Center (EVIC) user interface, or the DRBIII® scan tool. If a door module is damaged or faulty, the entire door module unit must be replaced.

OPERATION

The microprocessor-based DDM and PDM hardware and software monitors integral and hard wired external switch inputs as well as those resources it shares with other electronic modules in the vehicle through its communication over the PCI data bus network. The internal programming and all of these inputs allow the DDM or PDM microprocessor to determine the tasks it needs to perform and their priorities, as well as both the standard and optional features that it should provide.

The DDM and PDM are powered by a fused battery circuit so that they can operate regardless of the ignition switch position. The DDM and PDM circuitry is grounded to the chassis beneath the front seat.

The DDM and PDM can be diagnosed using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

HARD WIRED INPUTS

The hard wired inputs to the door modules include the following:

- Door ajar switch sense
- Driver door key cylinder switch sense (DDM)
- Fused B(+)
- Ground
- Memory switch mux (DDM)
- Mirror horizontal position signal
- Mirror vertical position signal
- PCI bus

HARD WIRED OUTPUTS

The hard wired outputs of the door modules include the following:

- Courtesy lamp driver
- Courtesy lamp ground
- Diagnostic out (DDM)
- Door/liftgate lock driver
- Door/liftgate unlock driver
- Door switch illumination (rear power window)
- Front window driver (down)
- Front window driver (up)
- Memory set indicator driver (DDM)
- Memory switch return (DDM)
- Mirror common driver
- Mirror heater ground
- Mirror heater 12V supply
- Rear window driver (down)
- Rear window driver (up)
- Mirror horizontal driver
- Mirror sensor ground
- Mirror vertical driver
- PCI bus
- Switch illumination driver (memory - DDM)

MESSAGING

The door modules use the following messages received from other electronic modules over the PCI data bus:

- Accessory Delay Control (PDM)
- Courtesy Lamp Status (BCM)
- Door Ajar Status/Rear Doors (BCM)
- Door Lock Status (DDM/PDM)
- Ignition Switch Position (BCM)
- Key-In Ignition Status (BCM)
- Programmable Features Preferences/Auto Lock/Auto Unlock/RKE Unlock Sequence/RKE Link to Memory (EVIC)
- Memory Recall (DDM)
- Rear Window Defogger Relay Status (BCM)
- Vehicle Speed (PCM)

The door modules provide the following messages to other electronic modules over the PCI data bus:

- Cylinder Lock Switch Status (BCM)
- Door Ajar Status/Front Doors (BCM/DDM/PDM)
- Door Lock Status (DDM/PDM)
- Memory Recall (PDM/MHSM/MSM/Radio)
- Memory Set Switch Status (PDM/MHSM/MSM/Radio)
- Panic Control (BCM)
- Power Window Switch Status (PDM)
- RKE Status (BCM/DDM)
- Window Lockout Switch Status (PDM)

DOOR MODULE (Continued)

DIAGNOSIS AND TESTING - DOOR MODULE

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The hard wired inputs to and outputs from the Driver Door Module (DDM) or the Passenger Door Module (PDM) may be diagnosed and tested using conventional diagnostic tools and procedures. It is suggested that the proper operation of the inoperative power window motor, power door lock motor, power liftgate lock motor, power mirror motors, or heated mirror grid be confirmed using jumper wires to bypass the door module. If the inoperative component operates when the door module is bypassed, check the circuits between the component and the door module, as well as the fused B(+) and ground circuits of the door module for shorts or opens.

These conventional diagnostic methods may not prove conclusive in the diagnosis of the DDM or the PDM. In order to obtain conclusive testing of these modules, the Programmable Communications Interface (PCI) data bus network and all of the modules that provide inputs to or receive outputs from the door modules must also be checked. The most reliable, efficient, and accurate means to diagnose the DDM, the PDM, the PCI data bus network, and the modules that provide inputs to or receive outputs from the door modules requires the use of a DRBIII® scan tool and the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).

(3) Remove the door module from the back of the front door trim panel (Fig. 8).

(4) Remove the door module from the front door trim panel.

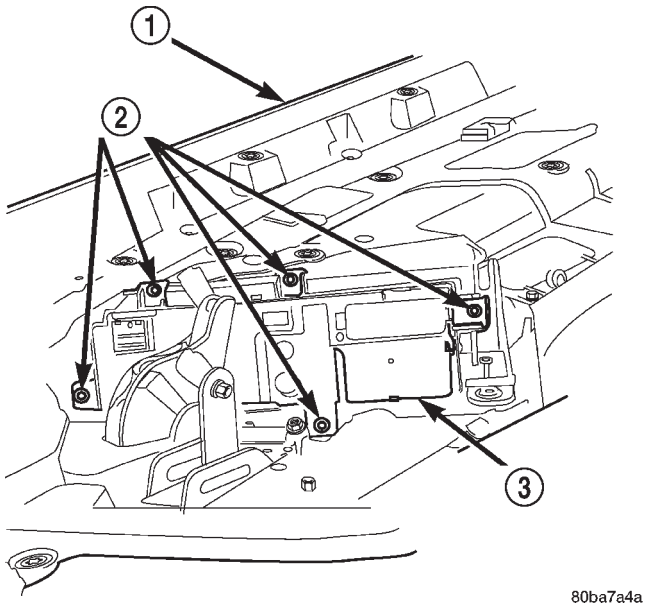


Fig. 8 Door Module Remove/Install

1 - FRONT DOOR TRIM PANEL
2 - SCREW (5)
3 - DOOR MODULE

INSTALLATION

(1) Position the door module onto the front door trim panel.

(2) Install the door module to the back of the front door trim panel (Fig. 8). Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reinstall the trim panel onto the front door. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

(4) Reconnect the battery negative cable.

MEMORY HEATED SEAT/ MIRROR MODULE

DESCRIPTION

There are two different modules that can be used in the optional heated seat system. The Heated Seat Module (HSM) is used on vehicles that are not equipped with the optional Memory System. The Memory Heated Seat Module (MHSM) is used on vehicles that are equipped with the optional Memory System and the optional heated seat system.Refer to **Memory System** in Power Seat Systems for more information on the memory system option.

The module is mounted on a bracket that is located between the power seat track and the seat cushion frame (Fig. 9). The HSM or MHSM is used to control the heated seat system functions for both front seats. The HSM or MHSM contains a central processing unit that communicates with other modules on the

MEMORY HEATED SEAT/MIRROR MODULE (Continued)

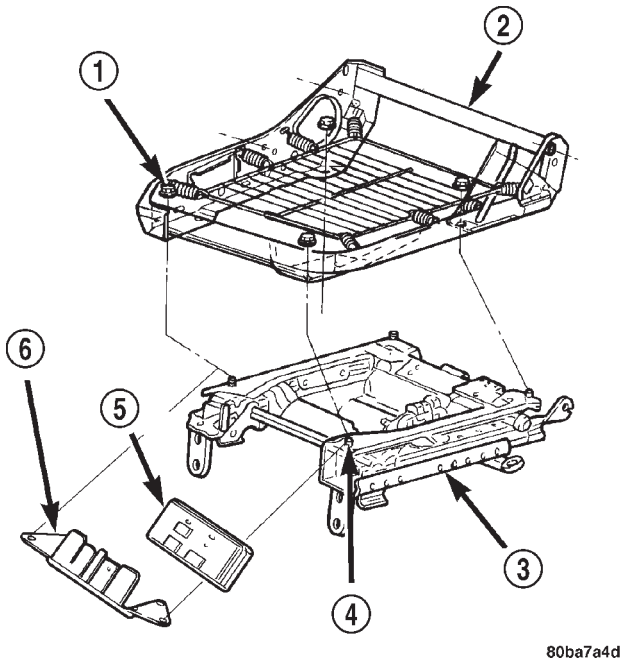


Fig. 9 Heated Seat Module Remove/Install

1 - NUT (4)
2 - SEAT CUSHION FRAME
3 - POWER SEAT TRACK
4 - STUD (4)
5 - MODULE
6 - BRACKET

Programmable Communications Interface (PCI) data bus network.

For diagnosis of the HSM, MHSM or the PCI data bus, a DRBIII® scan tool and the proper Diagnostic Procedures manual are recommended. The HSM or MHSM cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

The MSM receives hard wired inputs from the power seat switch and the potentiometers on each of the driver side power seat motors. The MSM receives messages over the PCI data bus from the Driver Door Module (DDM) (memory switch status), the Powertrain Control Module (PCM) (vehicle speed status), and the Body Control Module (seat belt switch status).The MSM will prevent the seat memory recall function from being initiated if the driver side seat belt is buckled, if the transmission gear selector lever is not in the Park or Neutral positions, or if the vehicle is moving.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HEATED SEAT MODULE

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. If any of the above conditions are present, repair as necessary. If not, use a DRBIII® scan tool and the proper Diagnostic Procedures Manual to test the HSM or MHSM. For complete circuit diagrams, refer to **Power Seat Premium I/III** in Wiring Diagrams.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the driver side front bucket seat from the power seat track unit. Refer to **Bucket Seat Track Adjuster** in Body for the procedure.

(3) Lift the heated seat module off of the power seat track and disconnect the power seat wire harness connectors (Fig. 10).

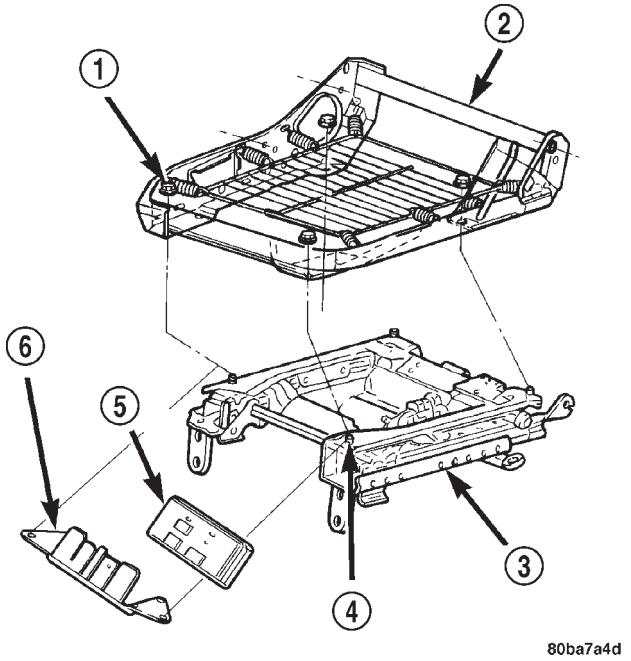


Fig. 10 Heated Seat Module Remove/Install

1 - NUT (4)
2 - SEAT CUSHION FRAME
3 - POWER SEAT TRACK
4 - STUD (4)
5 - MODULE
6 - BRACKET

(4) Remove the module from the bracket.

MEMORY HEATED SEAT/MIRROR MODULE (Continued)

INSTALLATION

(1) Install the MHSM,HSM into the bracket.

(2) Position the heated seat module and mounting bracket onto the power seat track.

(3) Reconnect the power seat wiring harness connectors to the heated seat module.

(4) Install the driver side front bucket seat onto the power seat track unit (Refer to 23 - BODY/ SEATS/SEAT TRACK ADJUSTER - INSTALLATION).

(5) Reconnect the battery negative cable.

NOTE: If the vehicle is equipped with the optional Memory System, following installation, it will be necessary to initialize the Memory Heated Seat Module (MHSM). In order to function properly, the MHSM must "learn" the sensor values of each of the power seat motor position transducers in each of the adjuster hard stop positions. This is done by performing the "Reset Guard Band" procedure using a DRBIII® scan tool and the proper Diagnostic Procedures manual.

WARNING: THE "RESET GUARD BAND" PROCEDURE WILL CAUSE THE DRIVER SIDE FRONT SEAT TO AUTOMATICALLY ADJUST TO EACH OF ITS TRAVEL LIMITS. BE CERTAIN THAT NO ONE IS SEATED IN THE VEHICLE AND THAT THERE IS NOTHING IN THE VEHICLE THAT WILL OBSTRUCT SEAT MOVEMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN PERSONAL INJURIES AND/OR VEHICLE DAMAGE.

POWERTRAIN CONTROL MODULE

DESCRIPTION

DESCRIPTION - PCM

The Powertrain Control Module (PCM) is located in the engine compartment (Fig. 11). The PCM is referred to as JTEC.

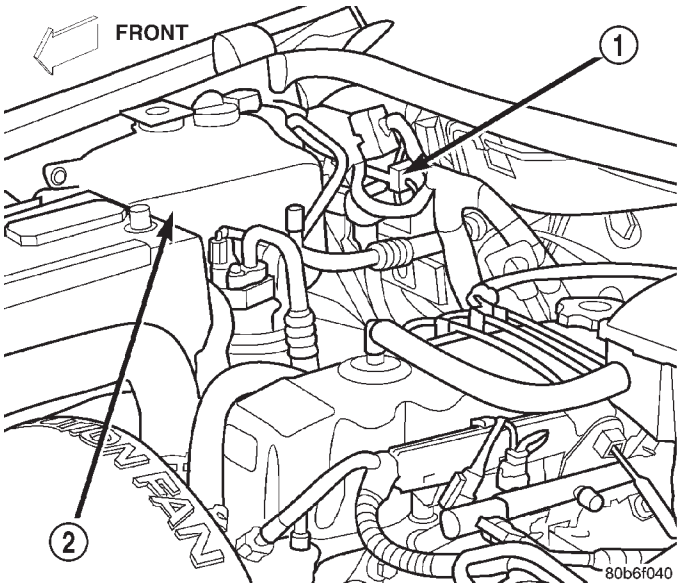


Fig. 11 PCM Location

1 - PCM
2 - COOLANT TANK

MODES OF OPERATION

As input signals to the Powertrain Control Module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

The PCM will operate in two different modes: **Open Loop and Closed Loop**.

During Open Loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen (O2S) sensors is not monitored during Open Loop modes.

During Closed Loop modes, the PCM will monitor the oxygen (O2S) sensors input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air-to-1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch On, engine start-up (crank), engine warm-up, acceleration, deceleration and wide open throttle modes are Open Loop modes. The idle and cruise modes, (with the engine at operating temperature) are Closed Loop modes.

IGNITION SWITCH (KEY-ON) MODE

This is an Open Loop mode. When the fuel system is activated by the ignition switch, the following actions occur:

POWERTRAIN CONTROL MODULE (Continued)

- The PCM pre-positions the idle air control (IAC) motor.
- The PCM determines atmospheric air pressure from the MAP sensor input to determine basic fuel strategy.
- The PCM monitors the engine coolant temperature sensor input. The PCM modifies fuel strategy based on this input.
- Intake manifold air temperature sensor input is monitored.
- Throttle position sensor (TPS) is monitored.
- The auto shutdown (ASD) relay is energized by the PCM for approximately three seconds.
- The fuel pump is energized through the fuel pump relay by the PCM. The fuel pump will operate for approximately three seconds unless the engine is operating or the starter motor is engaged.
- The O2S sensor heater element is energized via the O2S relays. The O2S sensor input is not used by the PCM to calibrate air-fuel ratio during this mode of operation.

ENGINE START-UP MODE

This is an Open Loop mode. The following actions occur when the starter motor is engaged.

The PCM receives inputs from:

- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Starter motor relay
- Camshaft position sensor signal

The PCM monitors the crankshaft position sensor. If the PCM does not receive a crankshaft position sensor signal within approximately 3 seconds of cranking the engine, it will shut down the fuel injection system.

The fuel pump is activated by the PCM through the fuel pump relay.

Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.

The PCM determines the proper ignition timing according to input received from the crankshaft position sensor.

ENGINE WARM-UP MODE

This is an Open Loop mode. During engine warm-up, the PCM receives inputs from:

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)

Based on these inputs the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM adjusts engine idle speed through the idle air control (IAC) motor and adjusts ignition timing.
- The PCM operates the A/C compressor clutch through the clutch relay. This is done if A/C has been selected by the vehicle operator and requested by the A/C thermostat.
- When engine has reached operating temperature, the PCM will begin monitoring O2S sensor input. The system will then leave the warm-up mode and go into closed loop operation.

IDLE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At idle speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Battery voltage
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen sensors

Based on these inputs, the following occurs:

- Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off.
- The PCM monitors the O2S sensor input and adjusts air-fuel ratio by varying injector pulse width. It also adjusts engine idle speed through the idle air control (IAC) motor.
- The PCM adjusts ignition timing by increasing and decreasing spark advance.

POWERTRAIN CONTROL MODULE (Continued)

• The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

CRUISE MODE

When the engine is at operating temperature, this is a Closed Loop mode. At cruising speed, the PCM receives inputs from:

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Oxygen (O2S) sensors

Based on these inputs, the following occurs:

• Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then adjust the injector pulse width by turning the ground circuit to each individual injector on and off.

• The PCM monitors the O2S sensor input and adjusts air-fuel ratio. It also adjusts engine idle speed through the idle air control (IAC) motor.

• The PCM adjusts ignition timing by turning the ground path to the coil on and off.

• The PCM operates the A/C compressor clutch through the clutch relay. This happens if A/C has been selected by the vehicle operator and requested by the A/C thermostat.

ACCELERATION MODE

This is an Open Loop mode. The PCM recognizes an abrupt increase in throttle position or MAP pressure as a demand for increased engine output and vehicle acceleration. The PCM increases injector pulse width in response to increased throttle opening.

DECELERATION MODE

When the engine is at operating temperature, this is an Open Loop mode. During hard deceleration, the PCM receives the following inputs.

- Air conditioning select signal (if equipped)
- Air conditioning request signal (if equipped)
- Battery voltage
- Engine coolant temperature sensor
- Crankshaft position sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal
- Park/neutral switch (gear indicator signal—auto. trans. only)
- Vehicle speed

If the vehicle is under hard deceleration with the proper rpm and closed throttle conditions, the PCM will ignore the oxygen sensor input signal. The PCM will enter a fuel cut-off strategy in which it will not supply a ground to the injectors. If a hard deceleration does not exist, the PCM will determine the proper injector pulse width and continue injection.

Based on the above inputs, the PCM will adjust engine idle speed through the idle air control (IAC) motor.

The PCM adjusts ignition timing by turning the ground path to the coil on and off.

WIDE OPEN THROTTLE MODE

This is an Open Loop mode. During wide open throttle operation, the PCM receives the following inputs.

- Battery voltage
- Crankshaft position sensor
- Engine coolant temperature sensor
- Intake manifold air temperature sensor
- Manifold absolute pressure (MAP) sensor
- Throttle position sensor (TPS)
- Camshaft position sensor signal

During wide open throttle conditions, the following occurs:

• Voltage is applied to the fuel injectors with the ASD relay via the PCM. The PCM will then control the injection sequence and injector pulse width by turning the ground circuit to each individual injector on and off. The PCM ignores the oxygen sensor input signal and provides a predetermined amount of additional fuel. This is done by adjusting injector pulse width.

• The PCM adjusts ignition timing by turning the ground path to the coil on and off.

IGNITION SWITCH OFF MODE

When ignition switch is turned to OFF position, the PCM stops operating the injectors, ignition coil, ASD relay and fuel pump relay.

DESCRIPTION - 5 VOLT SUPPLIES

Two different Powertrain Control Module (PCM) five volt supply circuits are used; primary and secondary.

DESCRIPTION - IGNITION CIRCUIT SENSE

This circuit ties the ignition switch to the Powertrain Control Module (PCM).

POWERTRAIN CONTROL MODULE (Continued)

DESCRIPTION - POWER GROUNDS

The Powertrain Control Module (PCM) has 2 main grounds. Both of these grounds are referred to as power grounds. All of the high-current, noisy, electrical devices are connected to these grounds as well as all of the sensor returns. The sensor return comes into the sensor return circuit, passes through noise suppression, and is then connected to the power ground.

The power ground is used to control ground circuits for the following PCM loads:

- Generator field winding
- Fuel injectors
- Ignition coil(s)
- Certain relays/solenoids
- Certain sensors

DESCRIPTION - SENSOR RETURN

The Sensor Return circuits are internal to the Powertrain Control Module (PCM).

Sensor Return provides a low–noise ground reference for all engine control system sensors. Refer to Power Grounds for more information.

OPERATION

OPERATION - PCM

(1) Also refer to Modes of Operation.

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as Powertrain Control Module (PCM) Outputs. The sensors and switches that provide inputs to the PCM are considered Powertrain Control Module (PCM) Inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to: engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transmission gear selection, engine coolant temperature and from inputs it receives from the air conditioning clutch switch and brake switch.

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

NOTE: PCM Inputs:

- A/C request
- Auto shutdown (ASD) sense
- Battery temperature
- Battery voltage
- Brake switch
- J1850 bus circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connections for DRB scan tool
- Engine coolant temperature sensor
- Five volts (primary)
- Five volts (secondary)
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in on/off/crank/run position)
- Intake manifold air temperature sensor
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Overdrive/override switch
- Oxygen sensors
- Park/neutral switch (auto. trans. only)
- Power ground
- Sensor return
- Signal ground
- Speed control multiplexed single wire input
- Throttle position sensor
- Transmission governor pressure sensor
- Transmission temperature sensor
- Vehicle speed (from ABS module)

NOTE: PCM Outputs:

- A/C clutch relay
- Auto shutdown (ASD) relay
- J1850 (+/-) circuits for: speedometer, voltmeter, fuel gauge, oil pressure gauge/lamp, engine temp. gauge and speed control warn. lamp
- Data link connection for DRBIII® scan tool
- EGR valve control solenoid (if equipped)
- EVAP canister purge solenoid
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Generator lamp (if equipped)
- Idle air control (IAC) motor
- Ignition coil
- Leak detection pump

POWERTRAIN CONTROL MODULE (Continued)

- Malfunction indicator lamp (Check engine lamp). Driven through J1850 circuits.
- Overdrive indicator lamp (if equipped). Driven through J1850 circuits.
- Oxygen sensor heater relays (if equipped).
- Radiator cooling fan relay (pulse width modulated)
- Speed control source
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (if equipped). Driven through J1850 circuits.
- Transmission convertor clutch circuit
- Transmission 3–4 shift solenoid
- Transmission relay
- Transmission temperature lamp (if equipped)
- Transmission variable force solenoid

OPERATION - 5 VOLT SUPPLIES

Primary 5–volt supply:

- supplies the required 5 volt power source to the Crankshaft Position (CKP) sensor.
- supplies the required 5 volt power source to the Camshaft Position (CMP) sensor.
- supplies a reference voltage for the Manifold Absolute Pressure (MAP) sensor.
- supplies a reference voltage for the Throttle Position Sensor (TPS) sensor.

Secondary 5–volt supply:

- supplies the required 5 volt power source to the oil pressure sensor.
- supplies the required 5 volt power source for the Vehicle Speed Sensor (VSS) (if equipped).
- supplies the 5 volt power source to the transmission pressure sensor (if equipped with an RE automatic transmission).

OPERATION - IGNITION CIRCUIT SENSE

The ignition circuit sense input tells the PCM the ignition switch has energized the ignition circuit.

Battery voltage is also supplied to the PCM through the ignition switch when the ignition is in the RUN or START position. This is referred to as the ″ignition sense″ circuit and is used to ″wake up″ the PCM.

REMOVAL

USE THE DRBIII® SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

The PCM is located on the cowl panel in right/rear side of engine compartment (Fig. 12).

The PCM is located on the cowl panel in right/rear side of engine compartment (Fig. 12).

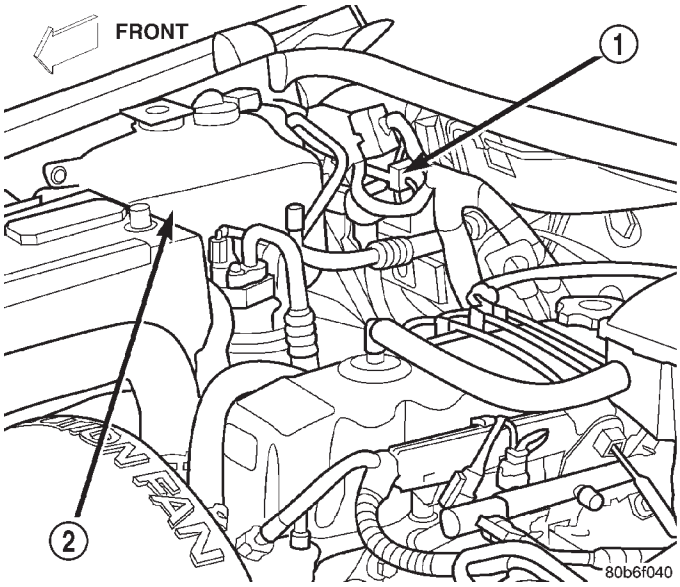


Fig. 12 Powertrain Control Module (PCM) Location

1 - PCM
2 - COOLANT TANK

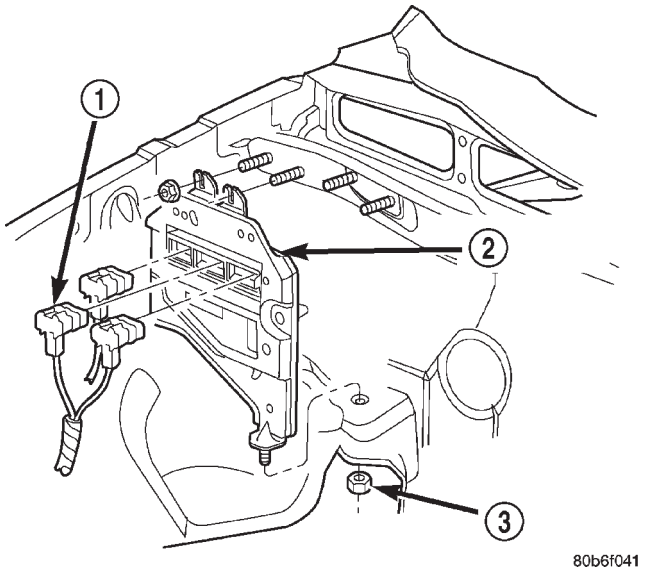


Fig. 13 Powertrain Control Module (PCM) 32–Way Connectors

1 - 3 32–WAY CONNECTORS
2 - PCM/BRACKET ASSEMBLY
3 - BRACKET NUTS (3)

To avoid possible voltage spike damage to PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

(1) Disconnect negative battery cable at battery.

POWERTRAIN CONTROL MODULE (Continued)

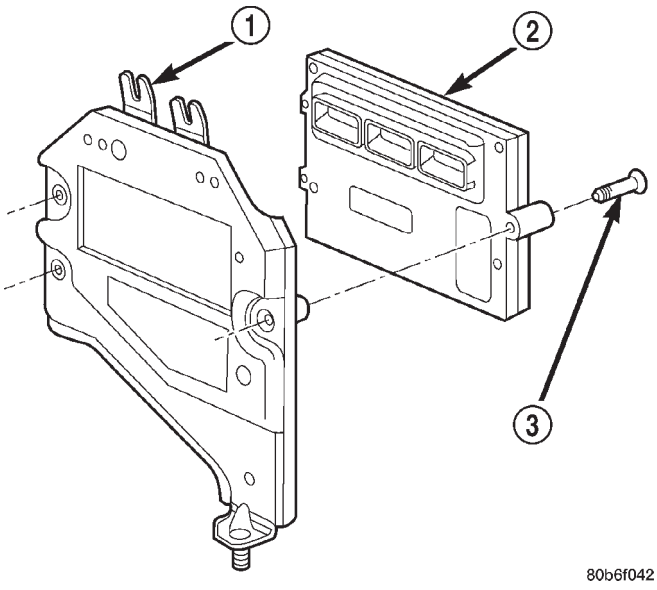


Fig. 14 Powertrain Control Module (PCM) Mounting Bracket

1 - PCM BRACKET
2 - PCM
3 - PCM-TO-BRACKET SCREWS (3)

(2) If equipped, remove Transmission Control Module (TCM).
(3) Remove coolant reserve/overflow tank.
(4) Remove cover over electrical connectors. Cover snaps onto PCM.
(5) Carefully unplug three 32–way connectors at PCM.
(6) Remove three PCM bracket-to-body mounting nuts (Fig. 13).
(7) Remove PCM/PCM bracket assembly from vehicle.
(8) Remove 3 PCM-to-PCM bracket bolts (screws) (Fig. 14).

INSTALLATION

USE THE DRBIII® SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

The PCM is located on the cowl panel in right/rear side of engine compartment (Fig. 12).
(1) Check pins in three 32–way electrical connectors for damage. Repair as necessary.
(2) Install PCM to its mounting bracket. Tighten three mounting bolts to 3 N·m (25 in. lbs.) torque.
(3) Install PCM/PCM bracket to body. Install 3 nuts and tighten 9 N·m (80 in. lbs.) torque.
(4) Install three 32–way connectors.
(5) Install cover over electrical connectors. Cover snaps onto PCM.
(6) Install coolant reserve/overflow tank.
(7) If equipped, install Transmission Control Module (TCM).
(8) Connect negative cable to battery.
(9) Use the DRBIII® scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.

SENTRY KEY IMMOBILIZER MODULE

DESCRIPTION

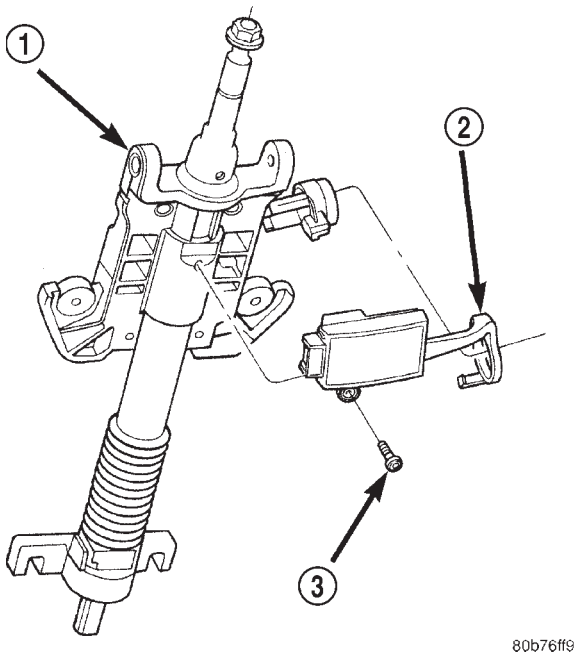


Fig. 15 Sentry Key Immobilizer Module

1 - STEERING COLUMN
2 - SKIM
3 - MOUNTING SCREW

The Sentry Key Immobilizer Module (SKIM) is the primary component of the Sentry Key Immobilizer System (SKIS) (Fig. 15). The SKIM is located in the steering column, below the ignition lock cylinder housing. The SKIM has an integral halo-like antenna ring that extends from one side.

The SKIM cannot be adjusted or repaired. If faulty or damaged, the entire SKIM unit must be replaced.

OPERATION

The Sentry Key Immobilizer Module (SKIM) contains a Radio Frequency (RF) transceiver and a microprocessor. The SKIM transmits RF signals to, and receives RF signals from the Sentry Key tran-

SENTRY KEY IMMOBILIZER MODULE (Continued)

sponder through a tuned antenna ring integral to the SKIM housing. If this antenna ring is not mounted properly around the ignition lock cylinder housing, communication problems between the SKIM and the transponder may arise. These communication problems will result in Sentry Key transponder-related faults. The SKIM also communicates over the Programmable Communications Interface (PCI) data bus with the Powertrain Control Module (PCM), the ElectroMechanical Instrument Cluster (EMIC), the Body Control Module (BCM), and/or the DRBIII® scan tool.

The SKIM retains in memory the ID numbers of any Sentry Key transponder that is programmed into it. A maximum of eight transponders can be programmed into the SKIM. For added system security, each SKIM is programmed with a unique Secret Key code. This code is stored in memory, sent over the PCI data bus to the PCM, and is encoded to the transponder of every Sentry Key that is programmed into the SKIM. Another security code, called a PIN, is used to gain access to the SKIM Secured Access Mode. The Secured Access Mode is required during service to perform the SKIS initialization and Sentry Key transponder programming procedures. The SKIM also stores the Vehicle Identification Number (VIN) in its memory, which it learns through a PCI data bus message from the PCM during SKIS initialization.

In the event that a SKIM replacement is required, the Secret Key code can be transferred to the new SKIM from the PCM using the DRBIII® scan tool and the SKIS replacement procedure. Proper completion of the SKIS initialization will allow the existing Sentry Keys to be programmed into the new SKIM so that new keys will not be required. In the event that the original Secret Key code cannot be recovered, SKIM replacement will also require new Sentry Keys. The DRBIII® scan tool will alert the technician during the SKIS replacement procedure if new Sentry Keys are required.

When the ignition switch is turned to the On position, the SKIM transmits an RF signal to the transponder in the ignition key. The SKIM then waits for an RF signal response from the transponder. If the response received identifies the key as valid, the SKIM sends a valid key message to the PCM over the PCI data bus. If the response received identifies the key as invalid, or if no response is received from the key transponder, the SKIM sends an invalid key message to the PCM. The PCM will enable or disable engine operation based upon the status of the SKIM messages. It is important to note that the default condition in the PCM is an invalid key; therefore, if no message is received from the SKIM by the PCM, the engine will be disabled and the vehicle immobilized after two seconds of running.

The SKIM also sends indicator light status messages to the EMIC over the PCI data bus to tell the EMIC how to operate the SKIS indicator. This indicator light status message tells the EMIC to turn the indicator on for about three seconds each time the ignition switch is turned to the On position as a bulb test. After completion of the bulb test, the SKIM sends indicator light status messages to the EMIC to turn the indicator off, turn the indicator on, or to flash the indicator on and off. If the SKIS indicator lamp flashes or stays on solid after the bulb test, it signifies a SKIS fault. If the SKIM detects a system malfunction and/or the SKIS has become inoperative, the SKIS indicator will stay on solid. If the SKIM detects an invalid key or if a key transponder-related fault exists, the SKIS indicator will flash. If the vehicle is equipped with the Customer Learn transponder programming feature, the SKIM will also send messages to the EMIC to flash the SKIS indicator lamp, and to the BCM to generate a single audible chime tone whenever the Customer Learn programming mode is being utilized. (Refer to 8 - ELECTRICAL/ VEHICLE THEFT SECURITY - STANDARD PROCEDURE - SENTRY KEY TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of Diagnostic Trouble Codes (DTC's) in SKIM memory if a system malfunction is detected. The SKIM can be diagnosed, and any stored DTC's can be retrieved using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

SENTRY KEY IMMOBILIZER MODULE (Continued)

(3) Disconnect the instrument panel wire harness connector from the SKIM connector.

(4) Remove the screw that secures the SKIM to the bottom of the steering column housing (Fig. 16).

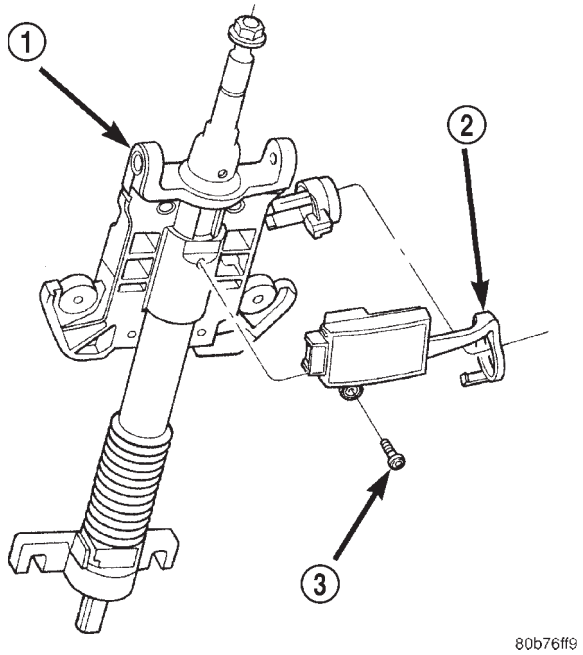


Fig. 16

(5) Disengage the antenna ring of the SKIM from around the ignition lock cylinder housing.

(6) Remove the SKIM from the steering column.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the SKIM to the underside of the steering column (Fig. 16).

(2) Engage the antenna ring of the SKIM around the ignition lock cylinder housing.

(3) Install and tighten the screw that secures the SKIM to the bottom of the steering column housing.Tighten the screw to 3.4 N·m (30 in lbs.).

(4) Reconnect the instrument panel wire harness connector to the SKIM connector.

(5) Reinstall the steering column opening cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(6) Reconnect the battery negative cable.

(7) Perform the SKIS Replacement procedure using the DRBIII®.

(8) Perform the SKIS Initialization Procedure using the DRBIII®.

TRANSMISSION CONTROL MODULE

DESCRIPTION

The Transmission Control Module (TCM) is located in the engine compartment on the right (passenger) side and is mounted to the inner fender (Fig. 17).

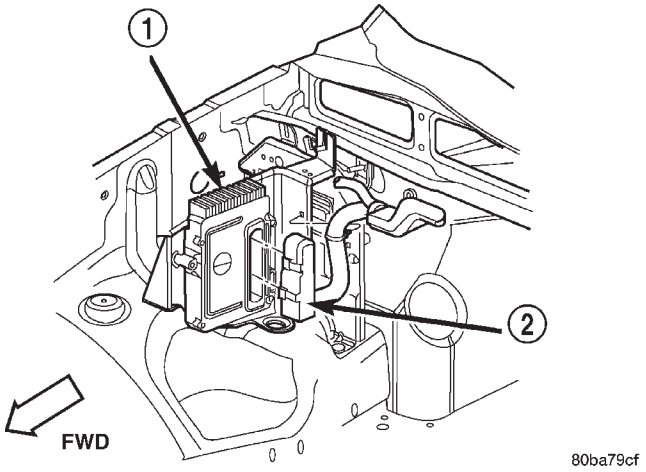


Fig. 17 Transmission Control Module Location

1 - TRANSMISSION CONTROL MODULE (TCM)
2 - 60–WAY CONNECTOR

OPERATION

The Transmission Control Module (TCM) controls all electronic operations of the transmission. The TCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hardwired to, and used specifically by the TCM. Indirect inputs originate from other components/modules, and are shared with the TCM via the vehicle communication bus.

Some examples of **direct inputs** to the TCM are:

- Battery (B+) voltage
- Ignition “ON” voltage
- Transmission Control Relay (Switched B+)
- Throttle Position Sensor
- Crankshaft Position Sensor
- Transmission Range Sensor

TRANSMISSION CONTROL MODULE (Continued)

- Pressure Switches
- Transmission Temperature Sensor
- Input Shaft Speed Sensor
- Output Shaft Speed Sensor
- Line Pressure Sensor

Some examples of **indirect inputs** to the TCM are:

- Engine/Body Identification
- Manifold Pressure
- Target Idle
- Torque Reduction Confirmation
- Engine Coolant Temperature
- Ambient/Battery Temperature
- DRB® Scan Tool Communication

Based on the information received from these various inputs, the TCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of TCM **direct outputs** are:

- Transmission Control Relay
- Solenoids
- Torque Reduction Request

Some examples of TCM **indirect outputs** are:

- Transmission Temperature (to PCM)
- PRNDL Position (to BCM)

In addition to monitoring inputs and controlling outputs, the TCM has other important responsibilities and functions:

- Storing and maintaining Clutch Volume Indexes (CVI)
- Storing and selecting appropriate Shift Schedules
- System self-diagnostics
- Diagnostic capabilities (with DRB® scan tool)

NOTE: If the TCM has been replaced, the "Quick Learn Procedure" must be performed. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ TRANSMISSION CONTROL MODULE - STANDARD PROCEDURE)

BATTERY FEED

A fused, direct battery feed to the TCM is used for continuous power. This battery voltage is necessary to retain adaptive learn values in the TCM's RAM (Random Access Memory). When the battery (B+) is disconnected, this memory is lost. When the battery (B+) is restored, this memory loss is detected by the TCM and a Diagnostic Trouble Code (DTC) is set.

CLUTCH VOLUME INDEXES (CVI)

An important function of the TCM is to monitor Clutch Volume Indexes (CVI). CVIs represent the volume of fluid needed to compress a clutch pack.

The TCM monitors gear ratio changes by monitoring the Input and Output Speed Sensors. The Input, or Turbine Speed Sensor sends an electrical signal to the TCM that represents input shaft rpm. The Output Speed Sensor provides the TCM with output shaft speed information.

By comparing the two inputs, the TCM can determine transmission gear position. This is important to the CVI calculation because the TCM determines CVIs by monitoring how long it takes for a gear change to occur (Fig. 18).

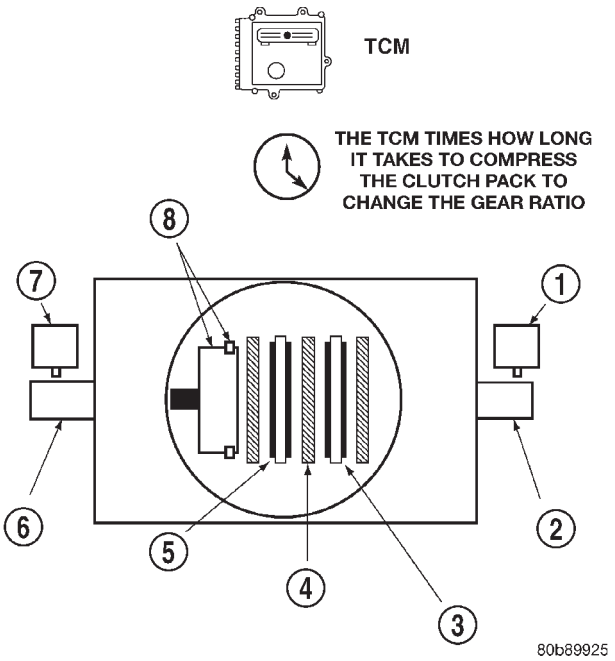


Fig. 18 Example of CVI Calculation

1 - OUTPUT SPEED SENSOR
2 - OUTPUT SHAFT
3 - CLUTCH PACK
4 - SEPARATOR PLATE
5 - FRICTION DISCS
6 - INPUT SHAFT
7 - INPUT SPEED SENSOR
8 - PISTON AND SEAL

Gear ratios can be determined by using the DRBIII® Scan Tool and reading the Input/Output Speed Sensor values in the "Monitors" display. Gear ratio can be obtained by dividing the Input Speed Sensor value by the Output Speed Sensor value.

The gear ratio changes as clutches are applied and released. By monitoring the length of time it takes for the gear ratio to change following a shift request, the TCM can determine the volume of fluid used to apply or release a friction element.

The volume of transmission fluid needed to apply the friction elements are continuously updated for adaptive controls. As friction material wears, the volume of fluid need to apply the element increases.

TRANSMISSION CONTROL MODULE (Continued)

Certain mechanical failures within the input clutch assembly can cause inadequate or out-of-range element volumes. Also, defective Input/Output Speed Sensors and wiring can cause these conditions. The following chart identifies the appropriate clutch volumes and when they are monitored/updated:

CLUTCH VOLUMES		
Clutch	**When Updated**	**Proper Clutch Volume**
L/R	2-1 or 3-1 downshift	45 to 134
2C	3-2 kickdown shift	25 to 85
OD	2-3 upshift	30 to 100
4C	3-4 upshift	30 to 85
UD	4-3 kickdown shift	30 to 100

SHIFT SCHEDULES

As mentioned earlier, the TCM has programming that allows it to select a variety of shift schedules. Shift schedule selection is dependent on the following:

- Shift lever position
- Throttle position
- Engine load
- Fluid temperature
- Software level

As driving conditions change, the TCM appropriately adjusts the shift schedule. Refer to the following chart to determine the appropriate operation expected, depending on driving conditions.

Schedule	Condition	Expected Operation
Extreme Cold	Oil temperature below -16° F	-Park, Reverse, Neutral and 1st and 3rd gear only in D position, 2nd gear only in Manual 2 or L -No EMCC
Super Cold	Oil temperature between -12° F and 10° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - Early 4-3 coastdown shift - High speed 4-2, 3-2, 2-1 kickdown shifts are prevented -Shifts at high throttle openings willl be early. - No EMCC
Cold	Oil temperature between 10° F and 36° F	-Shift schedule is the same as Super Cold except that the 2-3 upshifts are not delayed.
Warm	Oil temperature between 40° F and 80° F	- Normal operation (upshift, kickdowns, and coastdowns) - No EMCC
Hot	Oil temperature between 80° F and 240° F	- Normal operation (upshift, kickdowns, and coastdowns) - Normal EMCC operation
Overheat	Oil temperature above 240° F or engine coolant temperature above 244° F	- Delayed 2-3 upshift - Delayed 3-4 upshift - 3rd gear FEMCC from 30-48 mph - 3rd gear PEMCC above 35 mph - Above 25 mph the torque converter will not unlock unless the throttle is closed or if a wide open throttle 2nd PEMCC to 1 kickdown is made

TRANSMISSION CONTROL MODULE (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - TCM QUICK LEARN

The quick learn procedure requires the use of the DRBIII® scan tool.

This program allows the electronic transmission system to recalibrate itself. This will provide the proper transmission operation. The quick learn procedure should be performed if any of the following procedures are performed:

- Transmission Assembly Replacement
- Transmission Control Module Replacement
- Solenoid Pack Replacement
- Clutch Plate and/or Seal Replacement
- Valve Body Replacement or Recondition

To perform the Quick Learn Procedure, the following conditions must be met:

- The brakes must be applied
- The engine speed must be above 500 rpm
- The throttle angle (TPS) must be less than 3 degrees
- The shift lever position must stay in PARK until prompted to shift to overdrive
- The shift lever position must stay in overdrive after the Shift to Overdrive prompt until the DRB® indicates the procedure is complete
- The calculated oil temperature must be above 60° and below 200°

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BATTERY SYSTEM

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BATTERY SYSTEM

DESCRIPTION

A single 12-volt battery system is standard factory-installed equipment on this model. All of the components of the battery system are located within the engine compartment of the vehicle. The service information for the battery system in this vehicle covers the following related components, which are covered in further detail elsewhere in this service manual:

- **Battery** - The storage battery provides a reliable means of storing a renewable source of electrical energy within the vehicle.
- **Battery Cables** - The battery cables connect the battery terminal posts to the vehicle electrical system.
- **Battery Holddown** - The battery holddown hardware secures the battery in the battery tray in the engine compartment.
- **Battery Tray** - The battery tray provides a secure mounting location in the vehicle for the battery and an anchor point for the battery holddown hardware.

For battery system maintenance schedules and jump starting procedures, see the owner's manual in the vehicle glove box. Optionally, refer to Lubrication and Maintenance for the recommended battery maintenance schedules and for the proper battery jump starting procedures. While battery charging can be considered a maintenance procedure, the battery charging procedures and related information are located in the standard procedures section of this service manual. This was done because the battery must be fully-charged before any battery system diagnosis or testing procedures can be performed. Refer to Standard procedures for the proper battery charging procedures.

OPERATION

The battery system is designed to provide a safe, efficient, reliable and mobile means of delivering and storing electrical energy. This electrical energy is required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery system is also designed to provide a reserve of electrical energy to supplement the charging system for short durations while the engine is running and the electrical current demands of the vehicle exceed the output of the charging system. In addition to delivering, and storing electrical energy for the vehicle, the battery system serves as a capacitor and voltage stabilizer for the vehicle electrical system. It absorbs most abnormal or transient voltages caused by the switching of any of the electrical components or circuits in the vehicle.

DIAGNOSIS AND TESTING - BATTERY SYSTEM

The battery, starting, and charging systems in the vehicle operate with one another and must be tested as a complete system. In order for the engine to start and the battery to maintain its charge properly, all of the components that are used in these systems must perform within specifications. It is important that the battery, starting, and charging systems be thoroughly tested and inspected any time a battery needs to be charged or replaced. The cause of abnormal battery discharge, overcharging or early battery failure must be diagnosed and corrected before a battery is replaced and before a vehicle is returned to service. The service information for these systems has been separated within this service manual to make it easier to locate the specific information you are seeking. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used for the battery, starting, and charging systems include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, a volt/ohmmeter, a battery charger, a carbon pile rheostat (load tester) and a 12-volt test lamp may be required. All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. Refer to Charging System for the proper charging system on-board diagnostic test procedures.

MICRO 420 ELECTRICAL SYSTEM TESTER

The Micro 420 automotive battery tester is designed to help the dealership technicians diagnose a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro 420 electrical system tester.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY SEEMS WEAK OR DEAD WHEN ATTEMPTING TO START THE ENGINE.	1. The electrical system ignition-off draw is excessive.	1. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the excessive ignition-off draw, as required.
	2. The charging system is faulty.	2. Determine if the charging system is performing to specifications. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	3. The battery is discharged.	3. Determine the battery state-of-charge using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Charge the faulty battery, as required.
	4. The battery terminal connections are loose or corroded.	4. Refer to Battery Cables for the proper battery cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	5. The battery has an incorrect size or rating for this vehicle.	5. Refer to Battery System Specifications for the proper size and rating. Replace an incorrect battery, as required.
	6. The battery is faulty.	6. Determine the battery cranking capacity using the Micro 420 battery tester. Refer to the Standard Procedures in this section for additional test procedures. Replace the faulty battery, as required.
	7. The starting system is faulty.	7. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	8. The battery is physically damaged.	8. Inspect the battery for loose terminal posts or a cracked and leaking case. Replace the damaged battery, as required.

BATTERY SYSTEM (Continued)

BATTERY SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
THE BATTERY STATE OF CHARGE CANNOT BE MAINTAINED.	1. The battery has an incorrect size or rating for this vehicle.	1. Refer to Battery System Specifications for the proper specifications. Replace an incorrect battery, as required.
	2. The battery terminal connections are loose or corroded.	2. Refer to Battery Cable for the proper cable diagnosis and testing procedures. Clean and tighten the battery terminal connections, as required.
	3. The electrical system ignition-off draw is excessive.	3. Refer to the IGNITION-OFF DRAW TEST Standard Procedure for the proper test procedures. Repair the faulty electrical system, as required.
	4. The battery is faulty.	4. Test the battery using the Micro 420 battery tester. Refer to Standard Procedures for additional test procedures. Replace the faulty battery, as required.
	5. The starting system is faulty.	5. Determine if the starting system is performing to specifications. Refer to Starting System for the proper starting system diagnosis and testing procedures. Repair the faulty starting system, as required.
	6. The charging system is faulty.	6. Determine if the charging system is performing to specifications using the Micro 420 battery. Refer to Charging System for additional charging system diagnosis and testing procedures. Repair the faulty charging system, as required.
	7. Electrical loads exceed the output of the charging system.	7. Inspect the vehicle for aftermarket electrical equipment which might cause excessive electrical loads.
	8. Slow driving or prolonged idling with high-amperage draw systems in use.	8. Advise the vehicle operator, as required.
THE BATTERY WILL NOT ACCEPT A CHARGE.	1. The battery is faulty.	1. Test the battery using the Micro 420 battery tester. Charge or replace the faulty battery, as required.

ABNORMAL BATTERY DISCHARGING

Any of the following conditions can result in abnormal battery discharging:

1. A faulty or incorrect charging system component. Refer to Charging System for additional charging system diagnosis and testing procedures.
2. A faulty or incorrect battery. Use Micro 420 battery tester and refer to Battery System for additional battery diagnosis and testing procedures.
3. A faulty circuit or component causing excessive ignition-off draw.
4. Electrical loads that exceed the output of the charging system. This can be due to equipment installed after manufacture, or repeated short trip use.
5. A faulty or incorrect starting system component. Refer to Starting System for the proper starting system diagnosis and testing procedures.
6. Corroded or loose battery posts and/or terminal clamps.
7. Slow driving speeds (heavy traffic conditions) or prolonged idling, with high-amperage draw systems in use.

BATTERY SYSTEM (Continued)

CLEANING

The following information details the recommended cleaning procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Clean the battery cable terminal clamps of all corrosion. Remove any corrosion using a wire brush or a post and terminal cleaning tool, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 1).

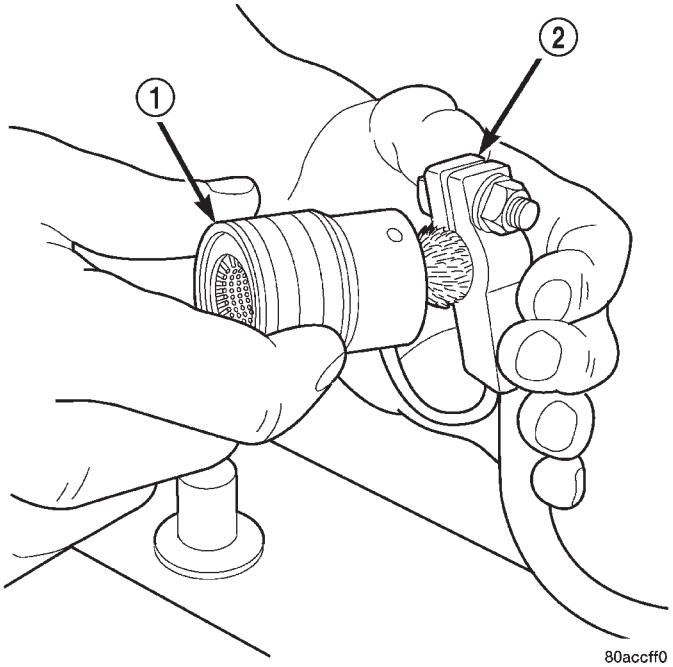


Fig. 1 Clean Battery Cable Terminal Clamp - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE

(2) Clean the battery tray and battery holddown hardware of all corrosion. Remove any corrosion using a wire brush and a sodium bicarbonate (baking soda) and warm water cleaning solution. Paint any exposed bare metal.

(3) If the removed battery is to be reinstalled, clean the outside of the battery case and the top cover with a sodium bicarbonate (baking soda) and warm water cleaning solution using a stiff bristle parts cleaning brush to remove any acid film (Fig. 2). Rinse the battery with clean water. Ensure that the cleaning solution does not enter the battery cells through the vent holes. If the battery is being replaced, refer to Battery System Specifications for the factory-installed battery specifications. Confirm that the replacement battery is the correct size and has the correct ratings for the vehicle.

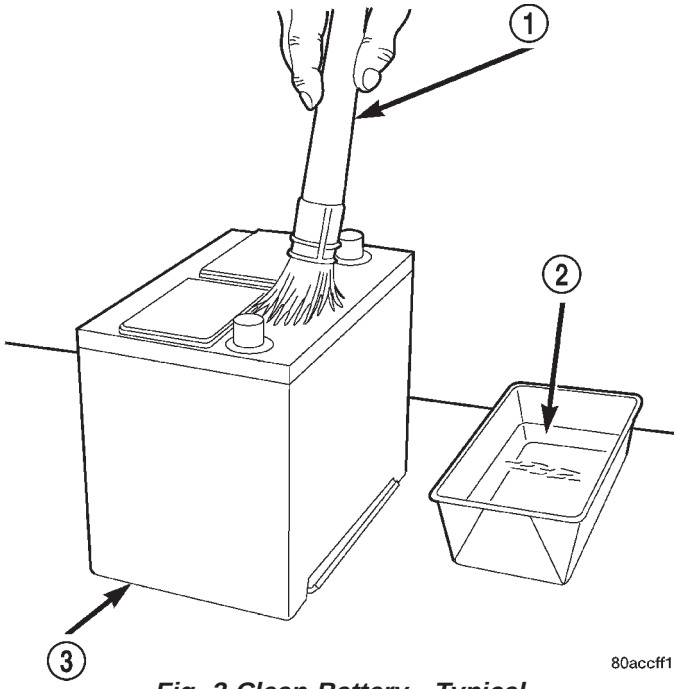


Fig. 2 Clean Battery - Typical

1 - CLEANING BRUSH
2 - WARM WATER AND BAKING SODA SOLUTION
3 - BATTERY

(4) Clean any corrosion from the battery terminal posts with a wire brush or a post and terminal cleaner, and a sodium bicarbonate (baking soda) and warm water cleaning solution (Fig. 3).

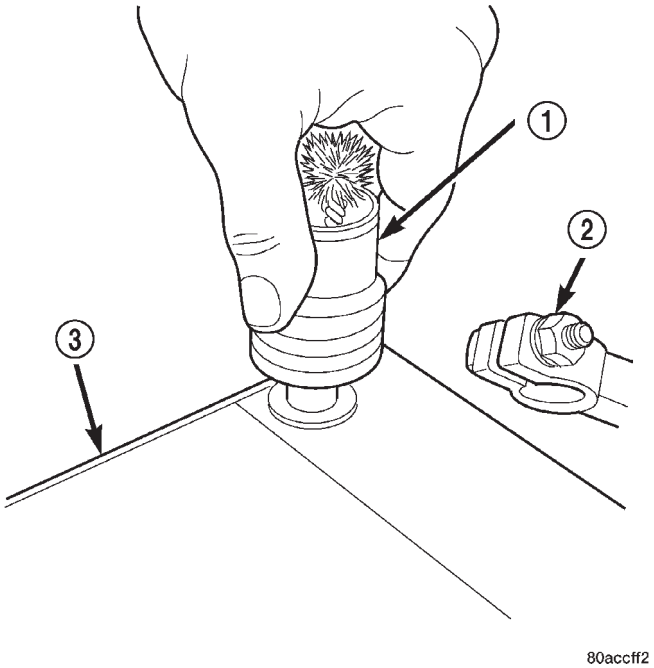


Fig. 3 Clean Battery Terminal Post - Typical

1 - TERMINAL BRUSH
2 - BATTERY CABLE
3 - BATTERY

BATTERY SYSTEM (Continued)

INSPECTION

The following information details the recommended inspection procedures for the battery and related components. In addition to the maintenance schedules found in this service manual and the owner's manual, it is recommended that these procedures be performed any time the battery or related components must be removed for vehicle service.

(1) Inspect the battery cable terminal clamps for damage. Replace any battery cable that has a damaged or deformed terminal clamp.

(2) Inspect the battery tray and battery holddown hardware for damage. Replace any damaged parts.

(3) Slide the thermal guard off of the battery case. Inspect the battery case for cracks or other damage that could result in electrolyte leaks. Also, check the battery terminal posts for looseness. Batteries with damaged cases or loose terminal posts must be replaced.

(4) Inspect the battery built-in test indicator sight glass for an indication of the battery condition. If the battery is discharged, charge as required. Refer to Standard Procedures for the proper battery built-in indicator test procedures. Also refer to Standard Procedures for the proper battery charging procedures.

SPECIFICATIONS

The battery Group Size number, the Cold Cranking Amperage (CCA) rating, and the Reserve Capacity (RC) rating or Ampere-Hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct Group Size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

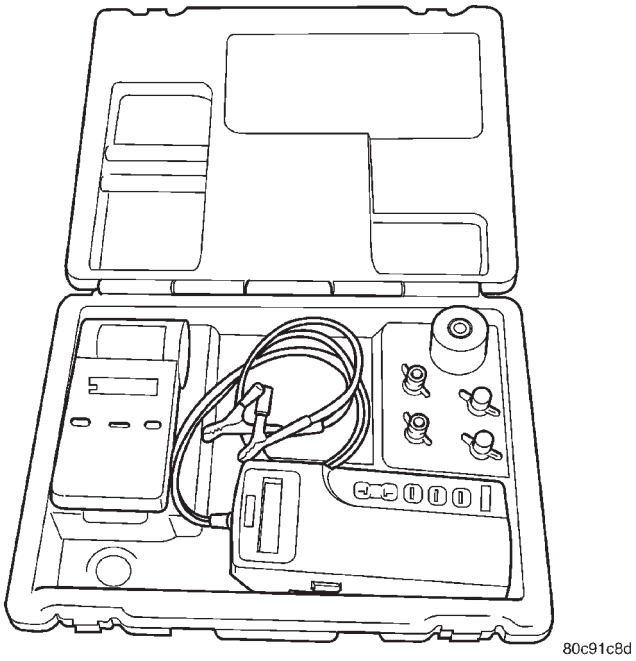
- **Group Size** - The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.
- **Cold Cranking Amperage** - The Cold Cranking Amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18° C (0° F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.
- **Reserve Capacity** - The Reserve Capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7° C (80° F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.
- **Ampere-Hours** - The Ampere-Hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for twenty hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the twenty-hour discharge rating.

BATTERY CLASSIFICATIONS & RATINGS

Part Number	BCI Group Size Classification	Cold Cranking Amperage	Reserve Capacity	Ampere - Hours	Load Test Amperage
56041113	65	625	120 Minutes	69	300

BATTERY SYSTEM (Continued)

SPECIAL TOOLS



MICRO 420 BATTERY AND CHARGING SYSTEM TESTER

BATTERY

DESCRIPTION

A large capacity, low-maintenance storage battery (Fig. 4) is standard factory-installed equipment on this model. Male post type terminals made of a soft lead material protrude from the top of the molded plastic battery case to provide the means for connecting the battery to the vehicle electrical system. The battery positive terminal post is visibly larger in diameter than the negative terminal post, for easy identification. The letters **POS** and **NEG** are also molded into the top of the battery case adjacent to their respective positive and negative terminal posts for additional identification confirmation. Refer to **Battery Cables** in the index of this service manual for the location of more information on the battery cables that connect the battery to the vehicle electrical system.

This battery is designed to provide a safe, efficient and reliable means of storing electrical energy in a chemical form. This means of energy storage allows the battery to produce the electrical energy required to operate the engine starting system, as well as to operate many of the other vehicle accessory systems for limited durations while the engine and/or the charging system are not operating. The battery is made up of six individual cells that are connected in series. Each cell contains positively charged plate groups that are connected with lead straps to the positive terminal post, and negatively charged plate groups that are connected with lead straps to the negative terminal post. Each plate consists of a stiff mesh framework or grid coated with lead dioxide (positive plate) or sponge lead (negative plate). Insulators or plate separators made of a non-conductive material are inserted between the positive and negative plates to prevent them from contacting or shorting against one another. These dissimilar metal plates are submerged in a sulfuric acid and water solution called an electrolyte.

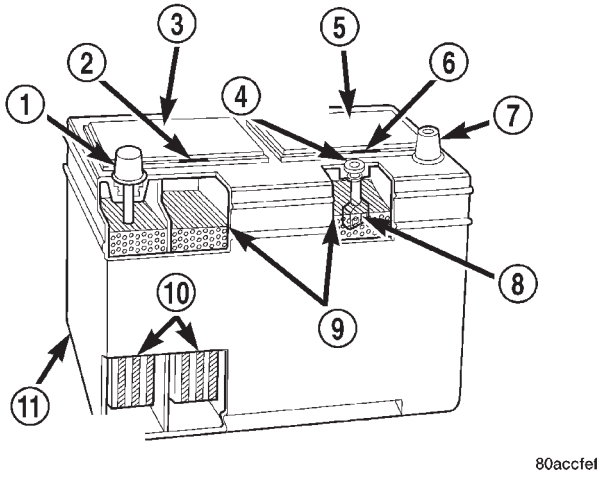


Fig. 4 Low-Maintenance Battery - Typical

1 - POSITIVE POST
2 - VENT
3 - CELL CAP
4 - TEST INDICATOR
5 - CELL CAP
6 - VENT
7 - NEGATIVE POST
8 - GREEN BALL
9 - ELECTROLYTE LEVEL
10 - PLATE GROUPS
11 - LOW-MAINTENANCE BATTERY

Some factory-installed batteries have a built-in test indicator (hydrometer). The color visible in the sight glass of the indicator will reveal the battery condition. For more information on the use of the built-in test indicator, refer to **Standard Procedures The factory-installed low-maintenance battery has removable battery cell caps.** Distilled water can be added to this battery. The battery is not sealed and has vent holes in the cell caps. The chemical composition of the metal coated plates within the low-maintenance battery reduces battery gassing and water loss, at normal charge and discharge rates. Therefore, the battery should not require additional water in normal service. If the electrolyte level in this battery does become low, distilled water must be added. However, rapid loss of electrolyte can be caused by an overcharging condition. Be certain to

BATTERY (Continued)

diagnose the charging system after replenishing the water in the battery for a low electrolyte condition and before returning the vehicle to service. Refer to **Charging System** for additional information.

For battery maintenance schedules and jump starting procedures, see the owner's manual in the vehicle glove box. Optionally, refer to **Maintenance Schedules** and **Jump Starting, Towing and Hoisting** in the index of this service manual for the location of the recommended battery maintenance schedules and the proper battery jump starting procedures. While battery charging can be considered a maintenance procedure, the battery charging procedures and information are located in the service procedures section of this service manual. This was done because the battery must be fully-charged before any battery diagnosis or testing procedures can be performed. Refer to **Standard Procedures** in the index of this service manual for the location of the proper battery charging procedures.

OPERATION

The battery is designed to store electrical energy in a chemical form. When an electrical load is applied to the terminals of the battery, an electrochemical reaction occurs. This reaction causes the battery to discharge electrical current from its terminals. As the battery discharges, a gradual chemical change takes place within each cell. The sulfuric acid in the electrolyte combines with the plate materials, causing both plates to slowly change to lead sulfate. At the same time, oxygen from the positive plate material combines with hydrogen from the sulfuric acid, causing the electrolyte to become mainly water. The chemical changes within the battery are caused by the movement of excess or free electrons between the positive and negative plate groups. This movement of electrons produces a flow of electrical current through the load device attached to the battery terminals.

As the plate materials become more similar chemically, and the electrolyte becomes less acid, the voltage potential of each cell is reduced. However, by charging the battery with a voltage higher than that of the battery itself, the battery discharging process is reversed. Charging the battery gradually changes the sulfated lead plates back into sponge lead and lead dioxide, and the water back into sulfuric acid. This action restores the difference in the electron charges deposited on the plates, and the voltage potential of the battery cells. For a battery to remain useful, it must be able to produce high-amperage current over an extended period. A battery must also be able to accept a charge, so that its voltage potential may be restored.

The battery is vented to release excess hydrogen gas that is created when the battery is being charged or discharged. However, even with these vents, hydrogen gas can collect in or around the battery. If hydrogen gas is exposed to flame or sparks, it may ignite. If the electrolyte level is low, the battery may arc internally and explode. If the battery is equipped with removable cell caps, add distilled water whenever the electrolyte level is below the top of the plates. If the battery cell caps cannot be removed, the battery must be replaced if the electrolyte level becomes low.

DIAGNOSIS AND TESTING - BATTERY

The battery must be completely charged and the terminals should be properly cleaned and inspected before diagnostic procedures are performed. Refer to Battery System Cleaning for the proper cleaning procedures, and Battery System Inspection for the proper battery inspection procedures. Refer to Standard Procedures for the proper battery charging procedures.

MICRO 420 ELECTRICAL SYSTEM TESTER

The Micro420 automotive battery tester is designed to help the dealership technicians diagnose the cause of a defective battery. Follow the instruction manual supplied with the tester to properly diagnose a vehicle. If the instruction manual is not available refer to the standard procedure in this section, which includes the directions for using the Micro420 electrical system tester.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

A battery that will not accept a charge is faulty, and must be replaced. Further testing is not required. A fully-charged battery must be load tested

BATTERY (Continued)

to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is faulty and must be replaced.

NOTE: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

STANDARD PROCEDURE

STANDARD PROCEDURE - BATTERY CHARGING

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- Micro 420 electrical system tester indicates battery is OK.
- All of the battery cells are gassing freely during battery charging.
- Three hydrometer tests, taken at one-hour intervals, indicate no increase in the temperature-corrected specific gravity of the battery electrolyte.
- Open-circuit voltage of the battery is 12.4 volts or above.

WARNING: NEVER EXCEED TWENTY AMPERES WHEN CHARGING A COLD (-1° C [30° F] OR LOWER) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

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WARNING: IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.

CAUTION: Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed sixteen volts while charging a battery. Damage to the vehicle electrical system components may result.

CAUTION: Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.

CAUTION: The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

After the battery has been charged to 12.4 volts or greater, perform a load test to determine the battery cranking capacity. Refer to Standard Procedures for the proper battery load test procedures. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is faulty and must be replaced.

Clean and inspect the battery hold downs, tray, terminals, posts, and top before completing battery service. Refer to Battery System Cleaning for the proper battery system cleaning procedures, and Battery System Inspection for the proper battery system inspection procedures.

CHARGING A COMPLETELY DISCHARGED BATTERY

The following procedure should be used to recharge a completely discharged battery. Unless this procedure is properly followed, a good battery may be needlessly replaced.

(1) Measure the voltage at the battery posts with a voltmeter, accurate to 1/10 (0.10) volt (Fig. 5). If the reading is below ten volts, the battery charging current will be low. It could take some time before the battery accepts a current greater than a few milliamperes. Such low current may not be detectable on the ammeters built into many battery chargers.

BATTERY (Continued)

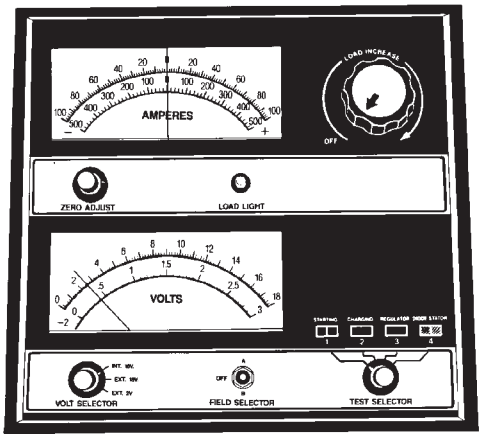


Fig. 5 Voltmeter - Typical

(2) Disconnect and isolate the battery negative cable. Connect the battery charger leads. Some battery chargers are equipped with polarity-sensing circuitry. This circuitry protects the battery charger and the battery from being damaged if they are improperly connected. If the battery state-of-charge is too low for the polarity-sensing circuitry to detect, the battery charger will not operate. This makes it appear that the battery will not accept charging current. See the instructions provided by the manufacturer of the battery charger for details on how to bypass the polarity-sensing circuitry.

(3) Battery chargers vary in the amount of voltage and current they provide. The amount of time required for a battery to accept measurable charging current at various voltages is shown in the Charge Rate Table. If the charging current is still not measurable at the end of the charging time, the battery is faulty and must be replaced. If the charging current is measurable during the charging time, the battery may be good and the charging should be completed in the normal manner.

CHARGE RATE TABLE	
Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

CHARGING TIME REQUIRED

The time required to charge a battery will vary, depending upon the following factors:

- **Battery Capacity** - A completely discharged heavy-duty battery requires twice the charging time of a small capacity battery.
- **Temperature** - A longer time will be needed to charge a battery at -18° C (0° F) than at 27° C (80° F). When a fast battery charger is connected to a cold battery, the current accepted by the battery will be very low at first. As the battery warms, it will accept a higher charging current rate (amperage).
- **Charger Capacity** - A battery charger that supplies only five amperes will require a longer charging time. A battery charger that supplies twenty amperes or more will require a shorter charging time.
- **State-Of-Charge** - A completely discharged battery requires more charging time than a partially discharged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current (amperage) will be low. As the battery charges, the specific gravity of the electrolyte will gradually rise.

The Battery Charging Time Table gives an indication of the time required to charge a typical battery at room temperature based upon the battery state-of-charge and the charger capacity.

BATTERY CHARGING TIME TABLE			
Charging Amperage	5 Amps	10 Amps	20 Amps
Open Circuit Voltage	Hours Charging @ 21° C (70° F)		
12.25 to 12.49	6 hours	3 hours	1.5 hours
12.00 to 12.24	10 hours	5 hours	2.5 hours
10.00 to 11.99	14 hours	7 hours	3.5 hours
Below 10.00	18 hours	9 hours	4.5 hours

STANDARD PROCEDURE - USING MICRO 420 ELECTRICAL TESTER

Always use the Micro 420 Instruction Manual that was supplied with the tester as a reference. If the Instruction Manual is not available the following procedure can be used:

WARNING: ALWAYS WEAR APPROPRIATE EYE PROTECTION AND USE EXTREME CAUTION WHEN WORKING WITH BATTERIES.

BATTERY TESTING

(1) If testing the battery OUT-OF-VEHICLE, clean the battery terminals with a wire brush before testing. If the battery is equipped with side post terminals, install and tighten the supplied lead terminal stud adapters. Do not use steel bolts. Failure to properly install the stud adapters, or using stud adapters that are dirty or worn-out may result in false test readings.

BATTERY (Continued)

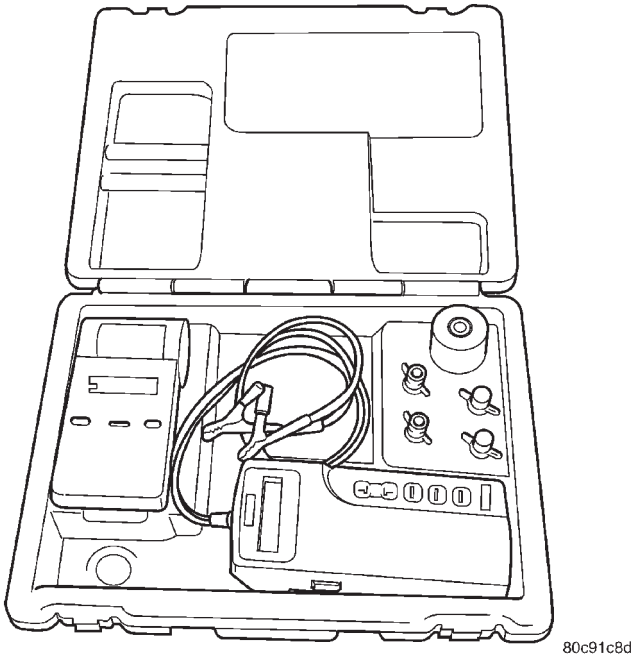


Fig. 6 MICRO 420 BATTERY AND CHARGING SYSTEM TESTER

(2) If testing the battery IN-THE-VEHICLE, make certain all of the vehicle accessory loads are OFF, including the ignition. **The preferred test position is at the battery terminal**. If the battery is not accessible, you may test using both the positive and negative jumper posts. Select TESTING AT JUMPER POST when connecting to that location.

(3) Connect the tester (Fig. 6) to the battery or jumper posts, the red clamp to positive (+) and the black clamp to negative (–).

NOTE: Multiple batteries connected in parallel must have the ground cable disconnected to perform a battery test. Failure to disconnect may result in false battery test readings.

(4) Using the ARROW key select **in** or **out** of vehicle testing and press ENTER to make a selection.

(5) If not selected, choose the Cold Cranking Amp (CCA) battery rating. Or select the appropriate battery rating for your area (see menu). The tester will then run its self programmed test of the battery and display the results. Refer to the test result table noted below.

CAUTION: If REPLACE BATTERY is the result of the test, this may mean a poor connection between the vehicle's cables and battery exists. After disconnecting the vehicle's battery cables from the battery, retest the battery using the OUT-OF-VEHICLE test before replacing.

(6) While viewing the battery test result, press the CODE button and the tester will prompt you for the last 4 digits of the VIN. Use the UP/DOWN arrow buttons to scroll to the correct character; then press ENTER to select and move to the next digit. Then press the ENTER button to view the SERVICE CODE. Pressing the CODE button a second time will return you to the test results.

BATTERY TEST RESULTS	
GOOD BATTERY	Return to service
GOOD - RECHARGE	Fully charge battery and return to service
CHARGE & RETEST	Fully charge battery and retest battery
REPLACE BATTERY	Replace the battery and retest complete system
BAD-CELL REPLACE	Replace the battery and retest complete system

NOTE: The SERVICE CODE is required on every warranty claim submitted for battery replacement.

STANDARD PROCEDURE - BUILT-IN INDICATOR TEST

An indicator (hydrometer) built into the top of the battery case provides visual information for battery testing (Fig. 7). Like a hydrometer, the built-in indicator measures the specific gravity of the battery electrolyte. The specific gravity of the electrolyte reveals the battery state-of-charge; however, it will not reveal the cranking capacity of the battery. A load test must be performed to determine the battery cranking capacity. Refer to Standard Procedures for the proper battery load test procedures.

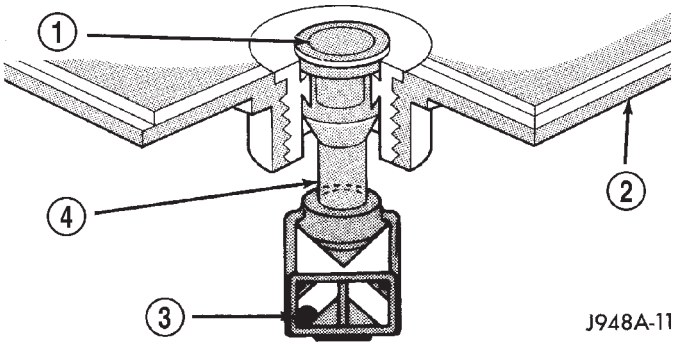


Fig. 7 Built-In Indicator

1 - SIGHT GLASS
2 - BATTERY TOP
3 - GREEN BALL
4 - PLASTIC ROD

BATTERY (Continued)

Before testing, visually inspect the battery for any damage (a cracked case or cover, loose posts, etc.) that would cause the battery to be faulty. In order to obtain correct indications from the built-in indicator, it is important that the battery be level and have a clean sight glass. Additional light may be required to view the indicator. **Do not use open flame as a source of additional light.**

To read the built-in indicator, look into the sight glass and note the color of the indication (Fig. 8). The battery condition that each color indicates is described in the following list:

- **Green** - Indicates 75% to 100% battery state-of-charge. The battery is adequately charged for further testing or return to service. If the starter will not crank for a minimum of fifteen seconds with a fully-charged battery, the battery must be load tested. Refer to Standard Procedures for the proper battery load test procedures.
- **Black or Dark** - Indicates 0% to 75% battery state-of-charge. The battery is inadequately charged and must be charged until a green indication is visible in the sight glass (12.4 volts or more), before the battery is tested further or returned to service. Refer to Standard Procedures for the proper battery charging procedures. Also refer to Diagnosis and Testing for more information on the possible causes of the discharged battery condition.
- **Clear or Bright** - Indicates a low battery electrolyte level. The electrolyte level in the battery is below the built-in indicator. A maintenance-free battery with non-removable cell caps must be replaced if the electrolyte level is low. Water must be added to a low-maintenance battery with removable cell caps before it is charged. Refer to Standard Procedures for the proper battery filling procedures. A low electrolyte level may be caused by an overcharging condition. Refer to Charging System for the proper charging system diagnosis and testing procedures.

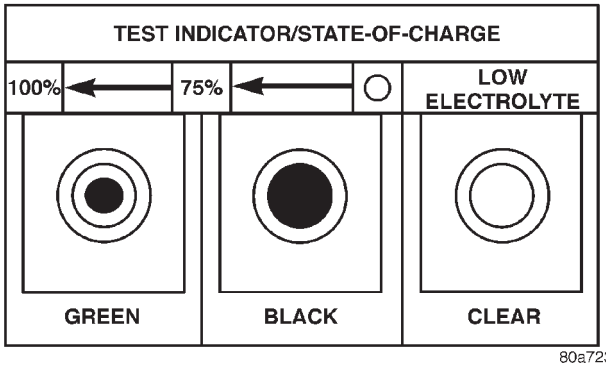


Fig. 8 Built-In Indicator Sight Glass Chart

STANDARD PROCEDURE - OPEN-CIRCUIT VOLTAGE TEST

A battery open-circuit voltage (no load) test will show the approximate state-of-charge of a battery. This test can be used in place of the hydrometer test when a hydrometer is not available, or for maintenance-free batteries with non-removable cell caps.

Before proceeding with this test, completely charge the battery (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

(1) Before measuring the open-circuit voltage, the surface charge must be removed from the battery. Turn on the headlamps for fifteen seconds, then allow up to five minutes for the battery voltage to stabilize.

(2) Disconnect and isolate both battery cables, negative cable first.

(3) Using a voltmeter connected to the battery posts (see the instructions provided by the manufacturer of the voltmeter), measure the open-circuit voltage (Fig. 9).

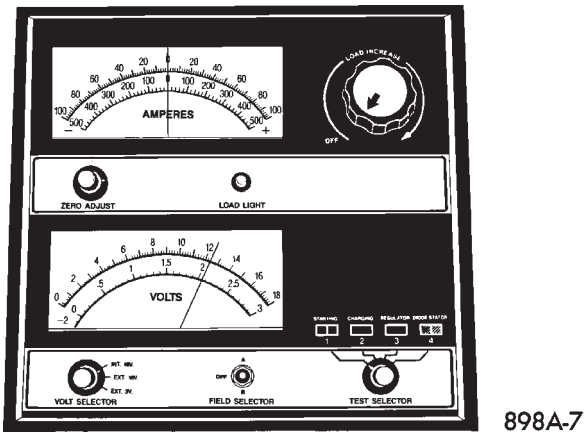


Fig. 9 Testing Open-Circuit Voltage - Typical

See the Open-Circuit Voltage Table. This voltage reading will indicate the battery state-of-charge, but will not reveal its cranking capacity. If a battery has an open-circuit voltage reading of 12.4 volts or greater, it may be load tested to reveal its cranking capacity (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE).

OPEN CIRCUIT VOLTAGE TABLE	
Open Circuit Voltage	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

BATTERY (Continued)

STANDARD PROCEDURE - IGNITION-OFF DRAW TEST

The term Ignition-Off Draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. A normal vehicle electrical system will draw from five to thirty-five milliamperes (0.005 to 0.035 ampere) with the ignition switch in the Off position, and all non-ignition controlled circuits in proper working order. Up to thirty-five milliamperes are needed to enable the memory functions for the Powertrain Control Module (PCM), digital clock, electronically tuned radio, and other modules which may vary with the vehicle equipment.

A vehicle that has not been operated for approximately twenty days, may discharge the battery to an inadequate level. When a vehicle will not be used for twenty days or more (stored), remove the IOD fuse from the Power Distribution Center (PDC). This will reduce battery discharging.

Excessive IOD can be caused by:

- Electrical items left on.
- Faulty or improperly adjusted switches.
- Faulty or shorted electronic modules and components.
- An internally shorted generator.
- Intermittent shorts in the wiring.

If the IOD is over thirty-five milliamperes, the problem must be found and corrected before replacing a battery. In most cases, the battery can be charged and returned to service after the excessive IOD condition has been corrected.

(1) Verify that all electrical accessories are off. Turn off all lamps, remove the ignition key, and close all doors. If the vehicle is equipped with an illuminated entry system or an electronically tuned radio, allow the electronic timer function of these systems to automatically shut off (time out). This may take up to three minutes. See the Electronic Module Ignition-Off Draw Table for more information.

ELECTRONIC MODULE IGNITION-OFF DRAW (IOD) TABLE

Module	Time Out? (If Yes, Interval And Wake-Up Input)	IOD	IOD After Time Out
Radio	No	1 to 3 milliamperes	N/A
Audio Power Amplifier	No	up to 1 milliampere	N/A
Body Control Module (BCM)	No	5.90 milliamperes (max.)	N/A
Powertrain Control Module (PCM)	No	0.95 milliampere	N/A
Transmission Control Module (TCM) 4.7L w/45RFE	YES (20 minutes, ignition on)	130 milliamperes	0.64 milliampere
ElectroMechanical Instrument Cluster (EMIC)	No	0.44 milliampere	N/A
Combination Flasher	No	0.08 milliampere	N/A

(2) Determine that the underhood lamp is operating properly, then disconnect the lamp wire harness connector or remove the lamp bulb.

(3) Disconnect the battery negative cable.

(4) Set an electronic digital multi-meter to its highest amperage scale. Connect the multi-meter between the disconnected battery negative cable terminal clamp and the battery negative terminal post. Make sure that the doors remain closed so that the illuminated entry system is not activated. The multi-meter amperage reading may remain high for up to three minutes, or may not give any reading at all while set in the highest amperage scale, depending upon the electrical equipment in the vehicle. The multi-meter leads must be securely clamped to the battery negative cable terminal clamp and the battery negative terminal post. If continuity between the battery negative terminal post and the negative cable terminal clamp is lost during any part of the IOD test, the electronic timer function will be activated and all of the tests will have to be repeated.

BATTERY (Continued)

(5) After about three minutes, the high-amperage IOD reading on the multi-meter should become very low or nonexistent, depending upon the electrical equipment in the vehicle. If the amperage reading remains high, remove and replace each fuse or circuit breaker in the Power Distribution Center (PDC) and then in the Junction Block (JB), one at a time until the amperage reading becomes very low, or nonexistent. Refer to the appropriate wiring information in this service manual for complete PDC and JB fuse, circuit breaker, and circuit identification. This will isolate each circuit and identify the circuit that is the source of the high-amperage IOD. If the amperage reading remains high after removing and replacing each fuse and circuit breaker, disconnect the wire harness from the generator. If the amperage reading now becomes very low or nonexistent, refer to Charging System for the proper charging system diagnosis and testing procedures. After the high-amperage IOD has been corrected, switch the multi-meter to progressively lower amperage scales and, if necessary, repeat the fuse and circuit breaker remove-and-replace process to identify and correct all sources of excessive IOD. It is now safe to select the lowest milliampere scale of the multi-meter to check the low-amperage IOD.

CAUTION: Do not open any doors, or turn on any electrical accessories with the lowest milliampere scale selected, or the multi-meter may be damaged.

(6) Observe the multi-meter reading. The low-amperage IOD should not exceed thirty-five milliamperes (0.035 ampere). If the current draw exceeds thirty-five milliamperes, isolate each circuit using the fuse and circuit breaker remove-and-replace process in Step 5. The multi-meter reading will drop to within the acceptable limit when the source of the excessive current draw is disconnected. Repair this circuit as required; whether a wiring short, incorrect switch adjustment, or a component failure is at fault.

STANDARD PROCEDURE - CHECKING BATTERY ELECTROLYTE LEVEL

The following procedure can be used to check the battery electrolyte level.

(1) Remove the battery cell caps (Fig. 10).

(2) Look through the battery cap holes to determine the level of the electrolyte in the battery (Fig. 11). The electrolyte should be approximately 1 centimeter above the battery plates or until the hook inside the battery cap holes is covered.

(3) Add only distilled water until the electrolyte level is approx. one centimeter above the plates.

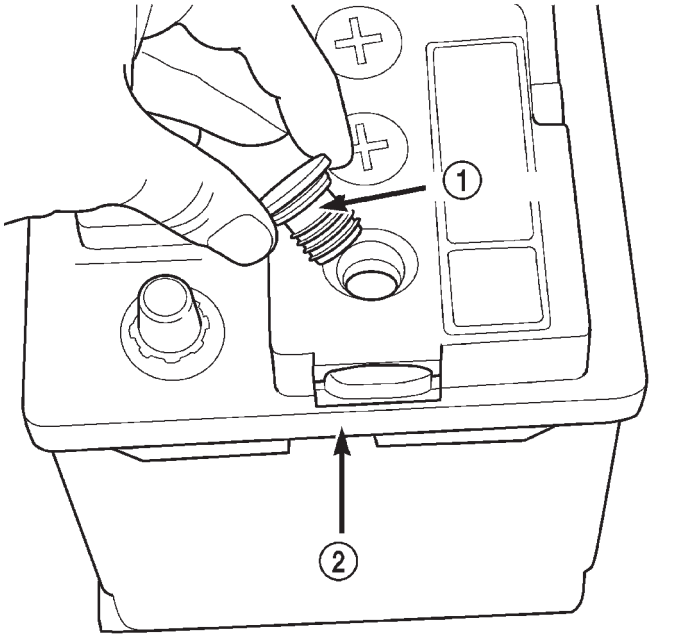


Fig. 10 Battery Caps - Export Battery

1 - BATTERY CAP
2 - BATTERY

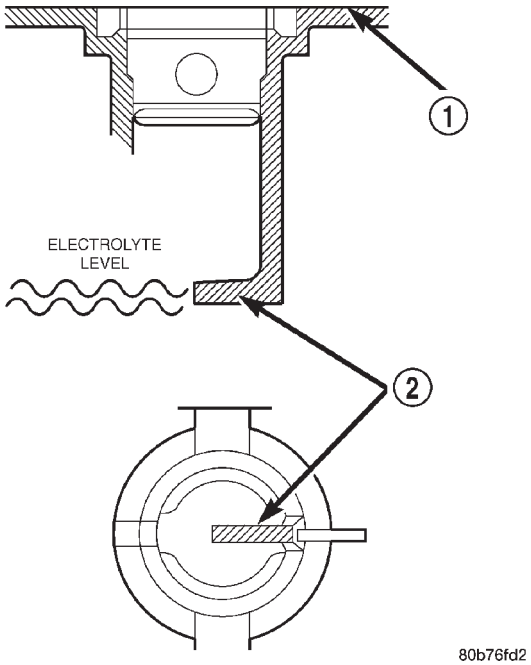


Fig. 11 Hook Inside Battery Cap Holes - Export Battery

1 - BATTERY SURFACE COVER
2 - HOOK

BATTERY (Continued)

REMOVAL

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Loosen the battery negative cable terminal clamp pinch-bolt hex nut.

(3) Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post (Fig. 12).

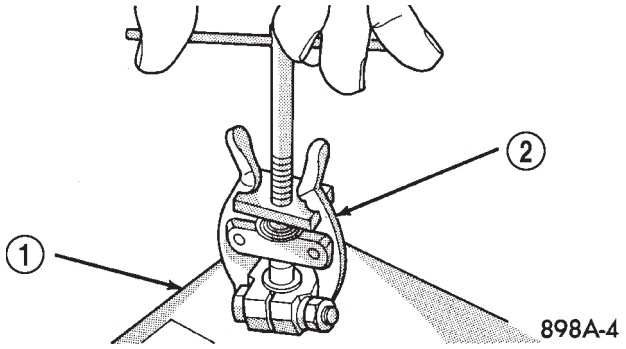


Fig. 12 Remove Battery Cable Terminal Clamp - Typical

1 - BATTERY
2 - BATTERY TERMINAL PULLER

(4) Loosen the battery positive cable terminal clamp pinch-bolt hex nut.

(5) Disconnect the battery positive cable terminal clamp from the battery positive terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

(6) Remove the battery hold down from the battery. Refer to **Battery Hold Down** in this section of the service manual for the procedure.

WARNING: WEAR A SUITABLE PAIR OF RUBBER GLOVES (NOT THE HOUSEHOLD TYPE) WHEN REMOVING A BATTERY BY HAND. SAFETY GLASSES SHOULD ALSO BE WORN. IF THE BATTERY IS CRACKED OR LEAKING, THE ELECTROLYTE CAN BURN THE SKIN AND EYES.

(7) Remove the battery from the battery tray.

INSTALLATION

(1) Clean and inspect the battery. Refer to the procedures in this section.

(2) Position the battery onto the battery tray as a unit. Ensure that the battery positive and negative terminal posts are correctly positioned. The battery cable terminal clamps must reach the correct battery terminal post without stretching the cables (Fig. 13) or (Fig. 14).

(3) Reinstall the battery hold downs onto the battery. Refer to **Battery Hold Downs**

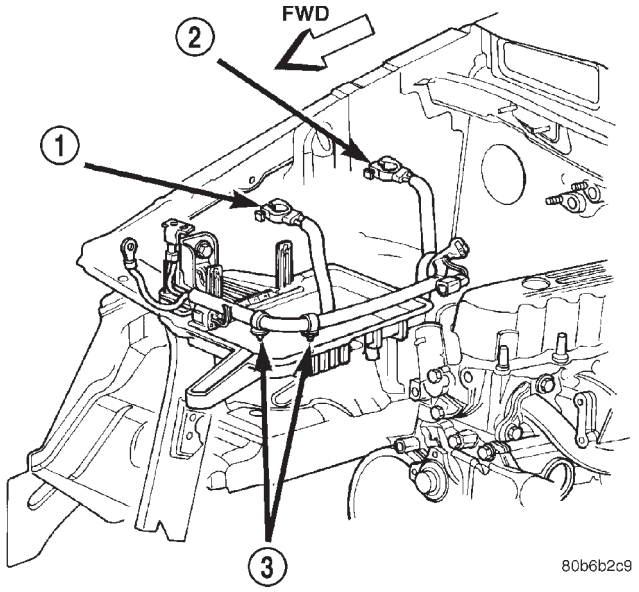


Fig. 13 Battery Cables - 4.0L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

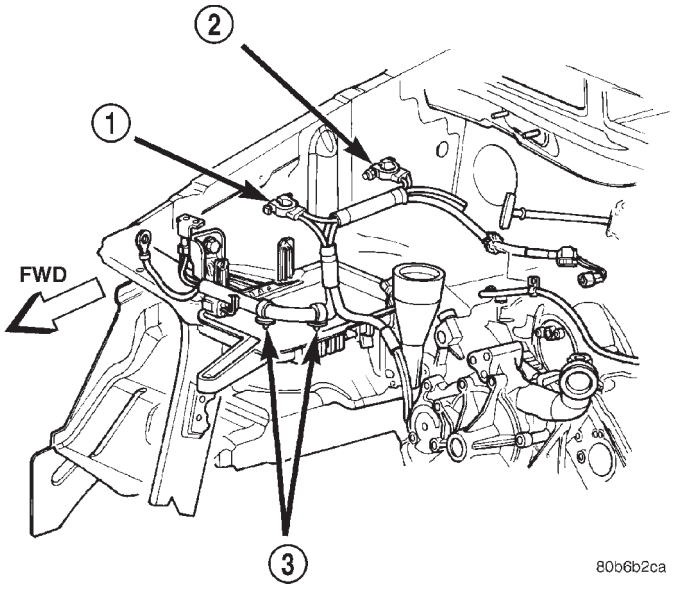


Fig. 14 Battery Cables - 4.7L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

CAUTION: Be certain that the battery cable terminal clamps are connected to the correct battery terminal posts. Reverse battery polarity may damage electrical components of the vehicle.

(4) Clean the battery cable terminal clamps and the battery terminal posts.

BATTERY (Continued)

(5) Reconnect the battery positive cable terminal clamp to the battery positive terminal post. Tighten the terminal clamp pinch-bolt hex nut to 6.8 N·m (60 in. lbs.).

(6) Reconnect the battery negative cable terminal clamp to the battery negative terminal post. Tighten the terminal clamp pinch-bolt hex nut to 6.8 N·m (60 in. lbs.).

(7) Apply a thin coating of petroleum jelly or chassis grease to the exposed surfaces of the battery cable terminal clamps and the battery terminal posts.

BATTERY HOLDDOWN

DESCRIPTION

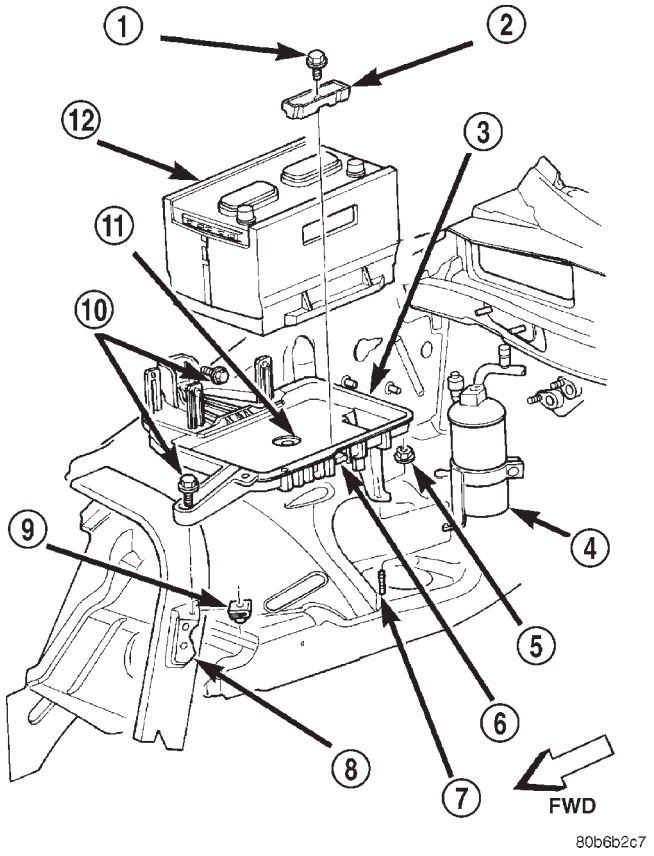


Fig. 15 Battery Hold Downs

1 - SCREW
2 - HOLD DOWN BRACKET
3 - BATTERY SUPPORT
4 - ACCUMULATOR
5 - NUT
6 - U-NUT
7 - STUD
8 - RADIATOR SUPPORT BRACKET
9 - U-NUT
10 - SCREW
11 - BATTERY TEMPERATURE SENSOR
12 - BATTERY

The battery hold down hardware consists of (Fig. 15) a molded plastic lip that is integral to the outboard edge of the battery tray and support unit, a molded plastic hold down bracket, a single hex screw with a coned washer and a U-nut.

When installing a battery into the battery tray, be certain that the hold down hardware is properly installed and that the fasteners are tightened to the proper specifications. Improper hold down fastener tightness, whether too loose or too tight, can result in damage to the battery, the vehicle or both.

OPERATION

The battery holddown secures the battery in the battery tray. This holddown is designed to prevent battery movement during the most extreme vehicle operation conditions. Periodic removal and lubrication of the battery holddown hardware is recommended to prevent hardware seizure at a later date.

CAUTION: Never operate a vehicle without a battery holddown device properly installed. Damage to the vehicle, components and battery could result.

REMOVAL

All of the battery hold down hardware can be serviced without removal of the battery or the battery tray and support unit.

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Loosen the battery negative cable terminal clamp pinch-bolt hex nut.

(3) Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

(4) Remove the screw with washer that secures the battery hold down bracket to the U-nut on the inboard side of the battery tray and support unit (Fig. 16).

(5) Remove the battery hold down bracket from the battery tray and support unit.

INSTALLATION

All of the battery hold down hardware can be serviced without removal of the battery or the battery tray and support unit.

(1) Clean and inspect the battery hold down hardware. Refer to the procedures in this section of the service manual.

(2) Be certain that the battery is properly positioned in the battery tray and support unit. The ledge on the outboard side of the battery case must be engaged under the lip on the outboard side of the battery tray and support unit.

BATTERY HOLDDOWN (Continued)

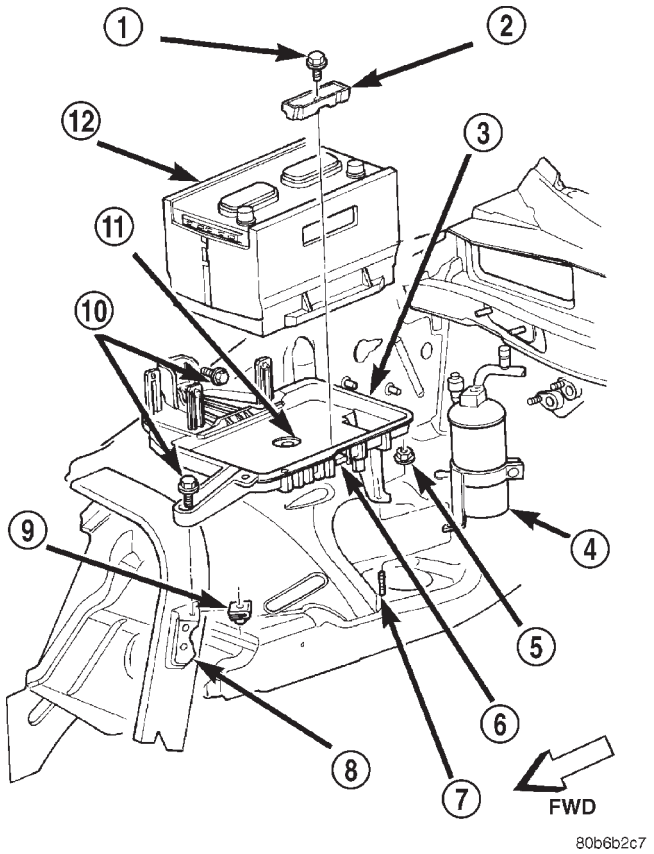


Fig. 16 Battery Hold Downs Remove/Install

1 - SCREW
2 - HOLD DOWN BRACKET
3 - BATTERY SUPPORT
4 - ACCUMULATOR
5 - NUT
6 - U-NUT
7 - STUD
8 - RADIATOR SUPPORT BRACKET
9 - U-NUT
10 - SCREW
11 - BATTERY TEMPERATURE SENSOR
12 - BATTERY

(3) Position the battery hold down bracket over the ledge on the inboard side of the battery case in the battery tray and support unit. Be certain that the ledge on the bottom of the hold down bracket is oriented towards the inboard side of the battery case. Proper hold down bracket orientation may also be determined by noting the direction of the arrow-like formations of the molded reinforcing ribs on the top of the hold down bracket. These arrows should be pointed towards the battery.

(4) Install and tighten the screw that secures the battery hold down bracket to the U-nut on the inboard side of the battery tray and support unit. Tighten thew screw to 3.4 N·m (30 in. lbs.).

(5) Reconnect the battery negative cable terminal clamp to the battery negative terminal post. Tighten the terminal clamp pinch-bolt hex nut to 8.4 N·m (75 in. lbs.).

BATTERY CABLE

DESCRIPTION

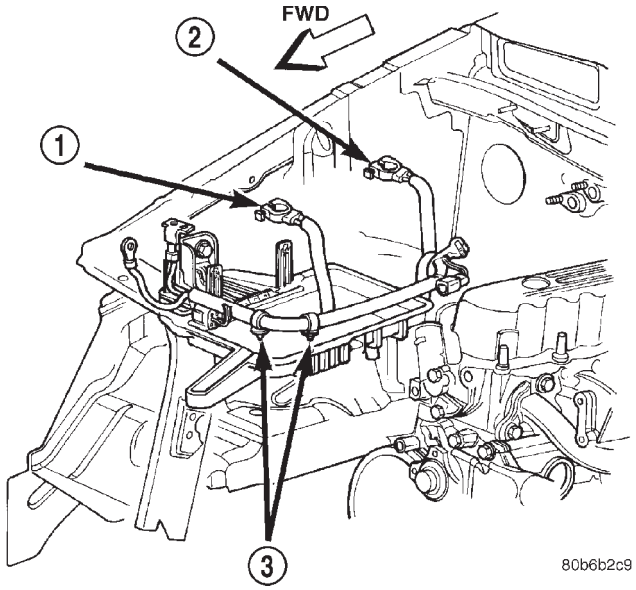


Fig. 17 Battery Cables - 4.0L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

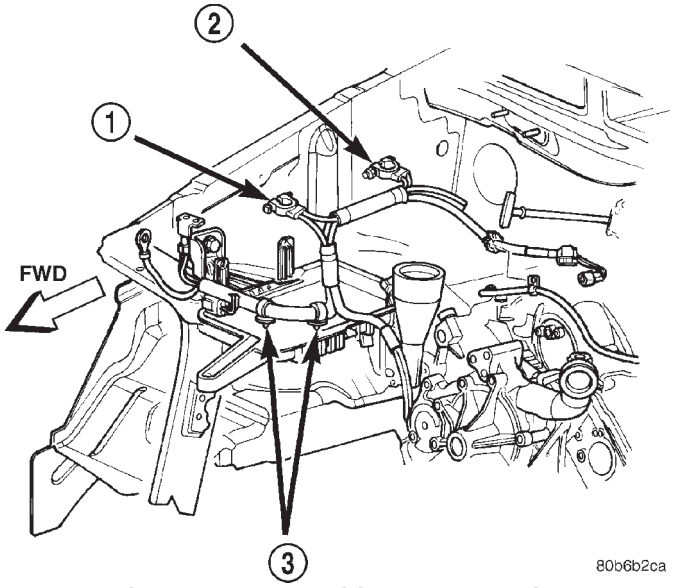


Fig. 18 Battery Cables - 4.7L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

BATTERY CABLE (Continued)

The battery cables (Fig. 17) or (Fig. 18) are large gauge, stranded copper wires sheathed within a heavy plastic or synthetic rubber insulating jacket. The wire used in the battery cables combines excellent flexibility and reliability with high electrical current carrying capacity. Refer to **Wiring Diagrams** for battery cable wire gauge information.

A clamping type female battery terminal made of soft lead is die cast onto one end of the battery cable wire. A square headed pinch-bolt and hex nut are installed at the open end of the female battery terminal clamp. Large eyelet type terminals are crimped onto the opposite end of the battery cable wire and then solder-dipped. The battery positive cable wires have a red insulating jacket to provide visual identification and feature a larger female battery terminal clamp to allow connection to the larger battery positive terminal post. The battery negative cable wires have a black insulating jacket and a smaller female battery terminal clamp.

The battery cables cannot be repaired and, if damaged or faulty they must be replaced. Both the battery positive and negative cables are available for service replacement only as a unit with the battery wire harness, which may include portions of the wiring circuits for the generator and other components on some models. Refer to **Wiring Diagrams** for more information on the various wiring circuits included in the battery wire harness for the vehicle being serviced.

OPERATION

The battery cables connect the battery terminal posts to the vehicle electrical system. These cables also provide a path back to the battery for electrical current generated by the charging system for restoring the voltage potential of the battery. The female battery terminal clamps on the ends of the battery cable wires provide a strong and reliable connection of the battery cable to the battery terminal posts. The terminal pinch bolts allow the female terminal clamps to be tightened around the male terminal posts on the top of the battery. The eyelet terminals secured to the opposite ends of the battery cable wires from the female battery terminal clamps provide secure and reliable connection of the battery cables to the vehicle electrical system.

The battery positive cable terminal clamp is die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the Power Distribution Center (PDC), and the other wire has an eyelet terminal that connects the battery positive cable to the B(+) terminal stud of the engine starter motor solenoid. The battery negative cable terminal clamp is also die cast onto the ends of two wires. One wire has an eyelet terminal that connects the battery negative cable to the vehicle powertrain through a stud on the right side of the engine cylinder block. The other wire has an eyelet terminal that connects the battery negative cable to the vehicle body through a ground screw on the right front fender inner shield, near the battery.

DIAGNOSIS AND TESTING - BATTERY CABLES

A voltage drop test will determine if there is excessive resistance in the battery cable terminal connections or the battery cable. If excessive resistance is found in the battery cable connections, the connection point should be disassembled, cleaned of all corrosion or foreign material, then reassembled. Following reassembly, check the voltage drop for the battery cable connection and the battery cable again to confirm repair.

When performing the voltage drop test, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached. **EXAMPLE:** When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable terminal clamp and to the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud. If you probe the battery positive terminal post and the battery positive cable eyelet terminal at the starter solenoid B(+) terminal stud, you are reading the combined voltage drop in the battery positive cable terminal clamp-to-terminal post connection and the battery positive cable.

VOLTAGE DROP TEST

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing this test, be certain that the following procedures are accomplished:

- The battery is fully-charged and load tested. Refer to Standard Procedures for the proper battery charging and load test procedures.
- Fully engage the parking brake.
- If the vehicle is equipped with an automatic transmission, place the gearshift selector lever in the Park position. If the vehicle is equipped with a manual transmission, place the gearshift selector lever in the Neutral position and block the clutch pedal in the fully depressed position.
- Verify that all lamps and accessories are turned off.
- To prevent the engine from starting, remove the Automatic Shut Down (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. See the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.

BATTERY CABLE (Continued)

(1) Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable terminal clamp (Fig. 19). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery negative cable terminal clamp and the battery negative terminal post.

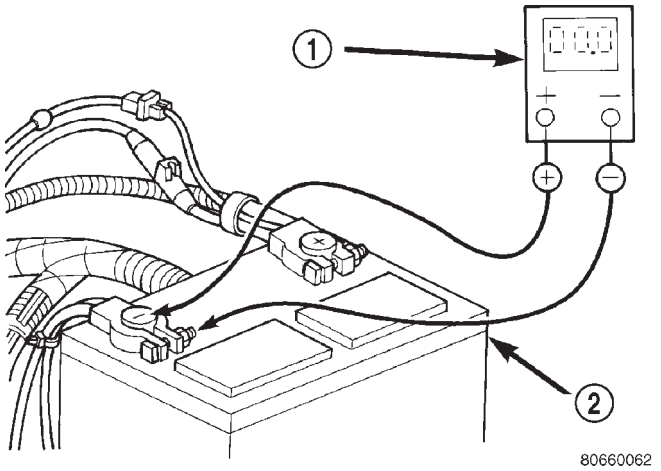


Fig. 19 TEST BATTERY NEGATIVE CONNECTION RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY

(2) Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable terminal clamp (Fig. 20). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor connection between the battery positive cable terminal clamp and the battery positive terminal post.

(3) Connect the voltmeter to measure between the battery positive cable terminal clamp and the starter solenoid B(+) terminal stud (Fig. 21). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery positive cable eyelet terminal connection at the starter solenoid B(+) terminal stud. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

(4) Connect the voltmeter to measure between the battery negative cable terminal clamp and a good clean ground on the engine block (Fig. 22). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable eyelet terminal connection to the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.

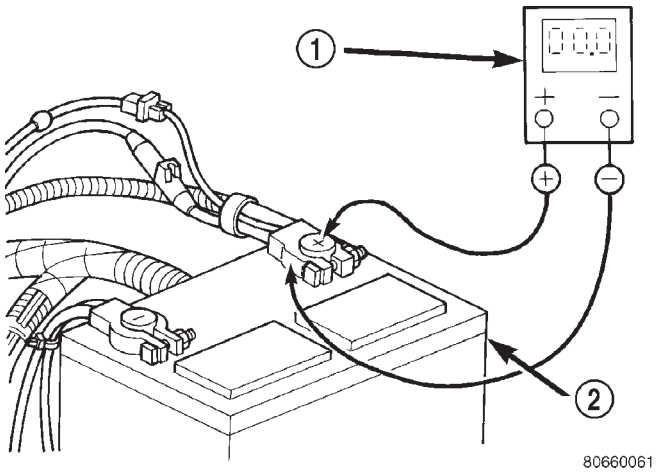


Fig. 20 TEST BATTERY POSITIVE CONNECTION RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY

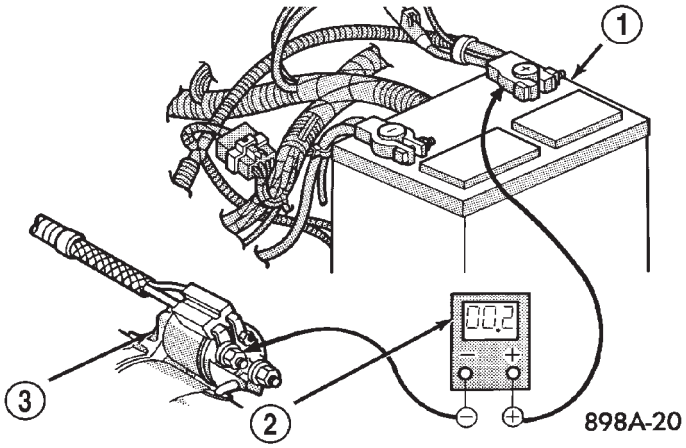


Fig. 21 TEST BATTERY POSITIVE CABLE RESISTANCE - TYPICAL

1 - BATTERY
2 - VOLTMETER
3 - STARTER MOTOR

REMOVAL

Both the battery negative cable and the battery positive cable are serviced in the battery wire harness. If either battery cable is damaged or faulty, the battery wire harness unit must be replaced.

(1) Turn the ignition switch to the Off position. Be certain that all electrical accessories are turned off.

(2) Loosen the battery negative cable terminal clamp pinch-bolt hex nut.

(3) Disconnect the battery negative cable terminal clamp from the battery negative terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

BATTERY CABLE (Continued)

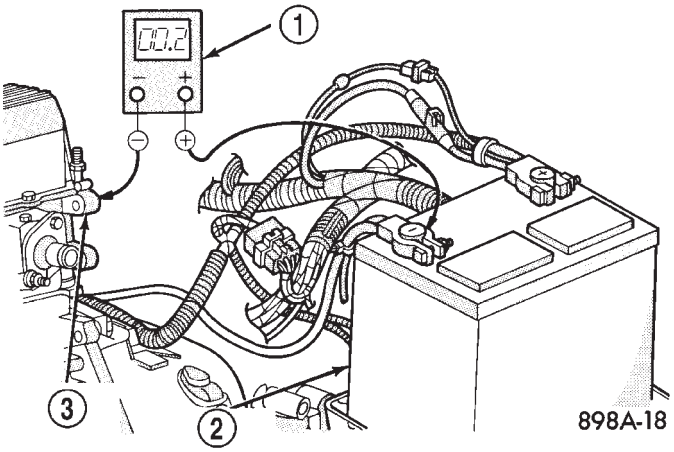


Fig. 22 TEST GROUND CIRCUIT RESISTANCE - TYPICAL

1 - VOLTMETER
2 - BATTERY
3 - ENGINE GROUND

(4) Loosen the battery positive cable terminal clamp pinch-bolt hex nut.

(5) Disconnect the battery positive cable terminal clamp from the battery positive terminal post. If necessary, use a battery terminal puller to remove the terminal clamp from the battery post.

(6) Unlatch and open the cover on the Power Distribution Center (PDC).

(7) Remove the two nuts that secure the battery positive cable and generator output cable eyelet terminal to the B(+) terminal studs in the PDC.

(8) Remove the battery positive cable and generator output cable eyelet terminal from the B(+) terminal studs in the PDC.

(9) Disconnect the battery wire harness connector from the right headlamp and dash wire harness connector located near the front of the battery.

(10) Remove the screw that secures the battery negative cable eyelet terminal to the inner fender shield near the front of the battery.

(11) On models with the 4.7L engine, remove the nut that secures the battery harness clip to the stud on the right side of the intake manifold and remove the clip from the stud.

(12) Unlatch and remove the cover from the generator output terminal stud housing on the back of the generator.

(13) Remove the nut that secures the generator output cable eyelet terminal to the generator output terminal stud.

(14) Remove the generator output cable eyelet terminal from the generator output terminal stud.

(15) Disconnect the battery wire harness connector from the generator field terminal connector receptacle on the back of the generator.

(16) Remove the screw that secures the battery negative cable ground eyelet terminal to the right side of the engine block.

(17) Remove the nut that secures the battery positive cable eyelet terminal to the B(+) terminal stud on the starter solenoid.

(18) Remove the battery positive cable eyelet terminal from the B(+) terminal stud on the starter solenoid.

(19) Disconnect the battery wire harness connector from the connector receptacle on the starter solenoid.

(20) Remove the battery wire harness from the engine compartment.

INSTALLATION

Both the battery negative cable and the battery positive cable are serviced in the battery wire harness. If either battery cable is damaged or faulty, the battery wire harness unit must be replaced.

(1) Clean and inspect the battery cable terminal clamps and the battery terminal posts.

(2) Position the battery wire harness into the engine compartment (Fig. 23) or (Fig. 24).

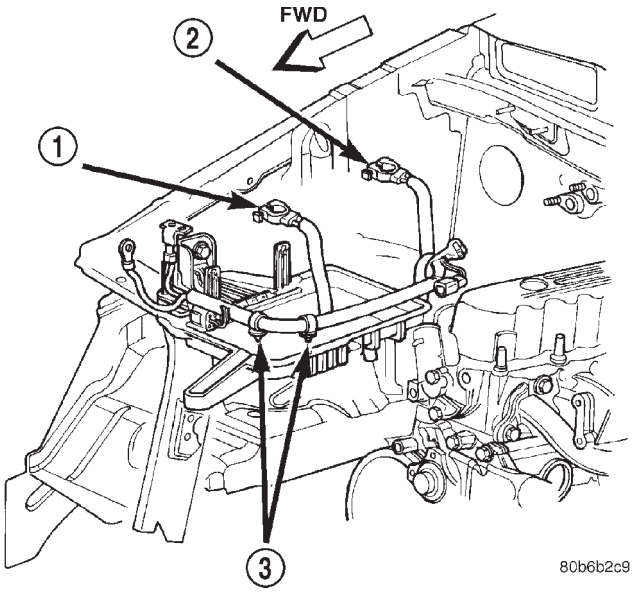


Fig. 23 Battery Cables - 4.0L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

(3) Reconnect the battery wire harness connector to the connector receptacle on the starter solenoid.

(4) Install the battery positive cable eyelet terminal onto the B(+) terminal stud on the starter solenoid.

BATTERY CABLE (Continued)

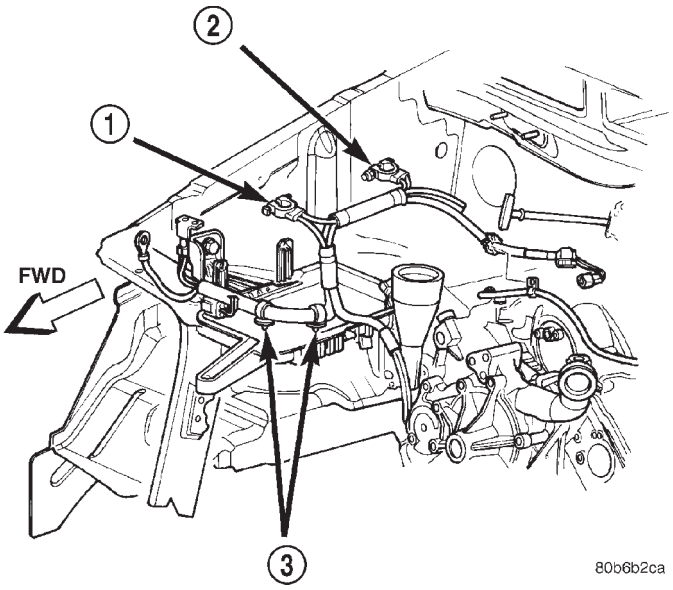


Fig. 24 Battery Cables - 4.7L Engine

1 - BATTERY POSITIVE CABLE
2 - BATTERY NEGATIVE CABLE
3 - CLIPS

(5) Install and tighten the nut that secures the battery positive cable eyelet terminal to the B(+) terminal stud on the starter solenoid. Tighten the nut to 11.3 N·m (100 in. lbs.).

(6) Install and tighten the screw that secures the battery negative cable ground eyelet terminal to the right side of the engine block. Tighten the screw to 10.2 N·m (90 in. lbs.) for 4.0L engines, or 13.0 N·m (115 in. lbs.) for 4.7L engines.

(7) Reconnect the battery wire harness connector to the generator field terminal connector receptacle on the back of the generator.

(8) Install the generator output cable eyelet terminal onto the generator output terminal stud.

(9) Install and tighten the nut that secures the generator output cable eyelet terminal to the generator output terminal stud. Tighten the nut to 10.7 N·m (95 in. lbs.).

(10) Position the cover for the generator output terminal stud housing onto the back of the generator and snap it into place.

(11) On models with the 4.7L engine, install the battery harness clip onto the stud on the right side of the intake manifold, then install and tighten the nut that secures the clip to the stud. Tighten the nut to 11.3 N·m (100 in. lbs.).

(12) Install and tighten the screw that secures the battery negative cable eyelet terminal to the inner fender shield near the front of the battery. Tighten the screw to 28.2 N·m (250 in. lbs.).

(13) Reconnect the battery wire harness connector to the right headlamp and dash wire harness connector located near the front of the battery.

(14) Install the battery positive cable and generator output cable eyelet terminal onto the PDC B(+) terminal studs.

(15) Install and tighten the two nuts that secure the battery positive cable and generator output cable eyelet terminal to the PDC B(+) terminal studs. Tighten the nuts to 11.3 N·m (100 in. lbs.).

(16) Close and latch the PDC cover.

(17) Reconnect the battery positive cable terminal clamp to the battery positive terminal post. Tighten the terminal clamp pinch-bolt hex nut to 6.8 N·m (60 in. lbs.).

(18) Reconnect the battery negative cable terminal clamp to the battery negative terminal post. Tighten the terminal clamp pinch-bolt hex nut to 6.8 N·m (60 in. lbs.).

(19) Apply a thin coating of petroleum jelly or chassis grease to the exposed surfaces of the battery cable terminal clamps and the battery terminal posts.

BATTERY TRAY

DESCRIPTION

The battery is mounted in a molded plastic battery tray and support unit (Fig. 25) located in the right front corner of the engine compartment. The battery tray and support unit is secured at the rear with a nut to a stud on the front wheelhouse inner panel, at the outboard side with a screw to the side cowl reinforcement panel, and at the front with a screw through a U-nut on a bracket of the radiator support.

The battery tray and support unit also includes three upright stanchions that are molded into the outboard side of the unit. These stanchions support the Power Distribution Center (PDC). Refer to **Power Distribution Center** in the Power Distribution section of this service manual for more information on the PDC.

A hole in the bottom of the battery tray is fitted with a battery temperature sensor. Refer to **Battery Temperature Sensor** in the Charging section of this service manual for more information on the battery temperature sensor. Refer to **Battery Hold Down** in this section of the service manual for more information on the battery hold down hardware.

BATTERY TRAY (Continued)

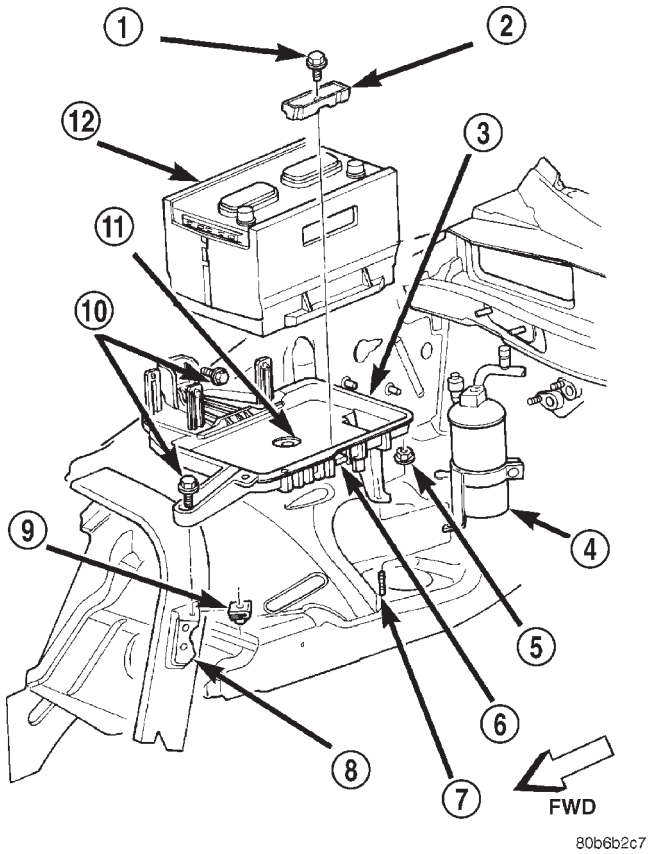


Fig. 25 Battery Tray and Support

1 - SCREW
2 - HOLD DOWN BRACKET
3 - BATTERY SUPPORT
4 - ACCUMULATOR
5 - NUT
6 - U-NUT
7 - STUD
8 - RADIATOR SUPPORT BRACKET
9 - U-NUT
10 - SCREW
11 - BATTERY TEMPERATURE SENSOR
12 - BATTERY

OPERATION

The battery tray provides a secure mounting location and supports the battery. On some vehicles, the battery tray also provides the anchor point/s for the battery holddown hardware. The battery tray and the battery holddown hardware combine to secure and stabilize the battery in the engine compartment, which prevents battery movement during vehicle operation. Unrestrained battery movement during vehicle operation could result in damage to the vehicle, the battery, or both.

REMOVAL

(1) Remove the battery from the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL).

(2) Remove the Power Distribution Center (PDC) from the stanchions on the outboard side of the battery tray and support unit. Refer to **Power Distribution Center** in the Power Distribution section of this service manual for PDC removal procedure.

(3) Remove the one screw that secures the front of the battery tray and support unit to the bracket on the right side of the radiator support (Fig. 26).

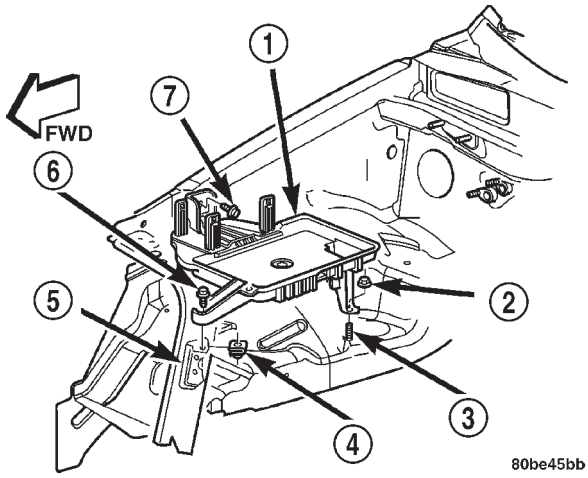


Fig. 26 Battery Tray and Support Remove/Install

1 - BATTERY TRAY AND SUPPORT
2 - NUT (1)
3 - STUD
4 - U-NUT (1)
5 - RADIATOR SUPPORT BRACKET
6 - SCREW (1)
7 - SCREW (1)

(4) Remove the one screw that secures the outboard side of the battery tray and support unit to the right fender side cowl reinforcement.

(5) Remove the one nut that secures the rear of the battery tray and support unit to the stud on the right fender front wheelhouse inner panel.

(6) Remove the battery temperature sensor from the battery tray. Refer to **Battery Temperature Sensor** in the Charging section of this service manual for battery temperature sensor removal procedure.

(7) Remove the battery tray and support unit from the right front corner of the engine compartment.

BATTERY TRAY (Continued)

INSTALLATION

(1) Clean and inspect the battery tray and support unit. Refer to the procedures in this section of the service manual.

(2) Install the battery temperature sensor onto the battery tray. Refer to **Battery Temperature Sensor** in the Charging section of this service manual for battery temperature sensor installation procedure.

(3) Position the battery tray and support unit into the right front corner of the engine compartment. Be certain that no hoses or wire harnesses are trapped or pinched by the installation of the tray.

(4) Install and tighten the one nut that secures the rear of the battery tray and support unit to the stud on the right fender front wheelhouse inner panel. Tighten the nut to 7.3 N·m (65 in. lbs.).

(5) Install and tighten the one screw that secures the outboard side of the battery tray and support unit to the right fender side cowl reinforcement. Tighten the screw to 8.1 N·m (72 in. lbs.).

(6) Install and tighten the one screw that secures the front of the battery tray and support unit to the bracket on the right side of the radiator support. Tighten the screw to 8.1 N·m (72 in. lbs.).

(7) Install the Power Distribution Center (PDC) onto the stanchions on the outboard side of the battery tray and support unit. Refer to **Power Distribution Center** in the Power Distribution section of this service manual for PDC installation procedure.

(8) Install the battery onto the battery tray (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - INSTALLATION).

CHARGING

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CHARGING

DESCRIPTION

The charging system consists of:

- Generator
- Electronic Voltage Regulator (EVR) circuitry within the Powertrain Control Module (PCM)
- Ignition switch
- Battery (refer to 8, Battery for information)
- Battery temperature sensor
- Generator Lamp (if equipped)
- Check Gauges Lamp (if equipped)
- Voltmeter (refer to 8, Instrument Cluster for information)
- Wiring harness and connections (refer to 8, Wiring for information)

OPERATION

The charging system is turned on and off with the ignition switch. The system is on when the engine is running and the ASD relay is energized. When the ASD relay is on, voltage is supplied to the ASD relay sense circuit at the PCM. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source +) at the back of the generator.

The amount of DC current produced by the generator is controlled by the EVR (field control) circuitry contained within the PCM. This circuitry is connected in series with the second rotor field terminal and ground.

A battery temperature sensor, located in the battery tray housing, is used to sense battery temperature. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. This is done by cycling the ground path to control the strength of the rotor magnetic field. The PCM then compensates and regulates generator current output accordingly.

All vehicles are equipped with On-Board Diagnostics (OBD). All OBD-sensed systems, including EVR (field control) circuitry, are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects. Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information.

The Check Gauges Lamp (if equipped) monitors: **charging system voltage,** engine coolant temperature and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The signal to activate the lamp is sent via the CCD bus circuits. The lamp is located on the instrument panel. Refer to 8, Instrument Cluster for additional information.

DIAGNOSIS AND TESTING - CHARGING SYSTEM

The following procedures may be used to diagnose the charging system if:

- the check gauges lamp (if equipped) is illuminated with the engine running
- the voltmeter (if equipped) does not register properly
- an undercharged or overcharged battery condition occurs.

Remember that an undercharged battery is often caused by:

- accessories being left on with the engine not running

CHARGING (Continued)

• a faulty or improperly adjusted switch that allows a lamp to stay on. Refer to Ignition-Off Draw Test in 8, Battery for more information.

INSPECTION

The Powertrain Control Module (PCM) monitors critical input and output circuits of the charging system, making sure they are operational. A Diagnostic Trouble Code (DTC) is assigned to each input and output circuit monitored by the On-Board Diagnostic (OBD) system. Some charging system circuits are checked continuously, and some are checked only under certain conditions.

Refer to Diagnostic Trouble Codes in; Powertrain Control Module; Electronic Control Modules for more DTC information. This will include a complete list of DTC's including DTC's for the charging system.

To perform a complete test of the charging system, refer to the appropriate Powertrain Diagnostic Procedures service manual and the DRB® scan tool. Perform the following inspections before attaching the scan tool.

(1) Inspect the battery condition. Refer to 8, Battery for procedures.

(2) Inspect condition of battery cable terminals, battery posts, connections at engine block, starter solenoid and relay. They should be clean and tight. Repair as required.

(3) Inspect all fuses in both the fuseblock and Power Distribution Center (PDC) for tightness in receptacles. They should be properly installed and tight. Repair or replace as required.

(4) Inspect generator mounting bolts for tightness. Replace or tighten bolts if required. Refer to the Generator Removal/Installation section of this group for torque specifications.

(5) Inspect generator drive belt condition and tension. Tighten or replace belt as required. Refer to Belt Tension Specifications in 7, Cooling System.

(6) Inspect automatic belt tensioner (if equipped). Refer to 7, Cooling System for information.

(7) Inspect generator electrical connections at generator field, battery output, and ground terminal (if equipped). Also check generator ground wire connection at engine (if equipped). They should all be clean and tight. Repair as required.

SPECIFICATIONS

GENERATOR RATINGS - GAS POWERED

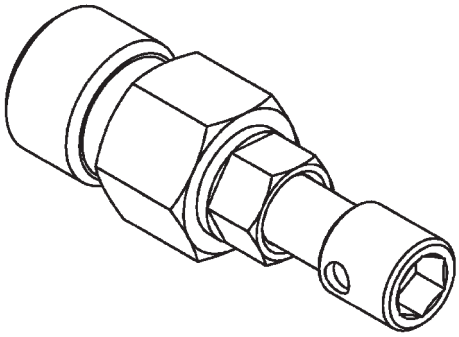
TYPE	PART NUMBER	RATED SAE AMPS	ENGINES	MINIMUM TEST AMPS
BOSCH	56041322	136	4.0L 6-Cylinder	100
DENSO	56041324	136	4.7L V-8	100

TORQUE - GAS POWERED

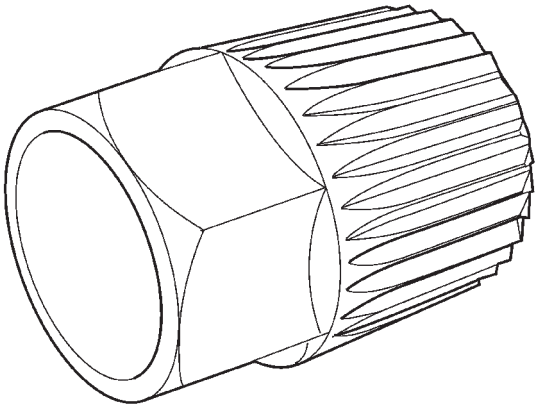
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Generator Mounting Bolts-4.0L	55	41	
Generator Vertical Mounting Bolt-4.7L	40	29	
Generator (long) Horizontal Mounting Bolt-4.7L	55	41	
Generator (short) Horizontal Mounting Bolt-4.7L	55	41	
Generator B+ Terminal Nut	11		95

CHARGING (Continued)

SPECIAL TOOLS



GENERATOR DECOUPLER TOOL #8433



80cb8152

GENERATOR DECOUPLER TOOL #8823

BATTERY TEMPERATURE SENSOR

DESCRIPTION

The Battery Temperature Sensor (BTS) is attached to the battery tray located under the battery.

OPERATION

The BTS is used to determine the battery temperature and control battery charging rate. This temperature data, along with data from monitored line voltage, is used by the PCM to vary the battery charging rate. System voltage will be higher at colder temperatures and is gradually reduced at warmer temperatures.

The PCM sends 5 volts to the sensor and is grounded through the sensor return line. As temperature increases, resistance in the sensor decreases and the detection voltage at the PCM increases.

The BTS is also used for OBD II diagnostics. Certain faults and OBD II monitors are either enabled or disabled, depending upon BTS input (for example, disable purge and enable Leak Detection Pump (LDP) and O2 sensor heater tests). Most OBD II monitors are disabled below 20 degrees F.

REMOVAL

The battery temperature sensor is located under the vehicle battery (Fig. 1) and is attached to a mounting hole on the battery tray.

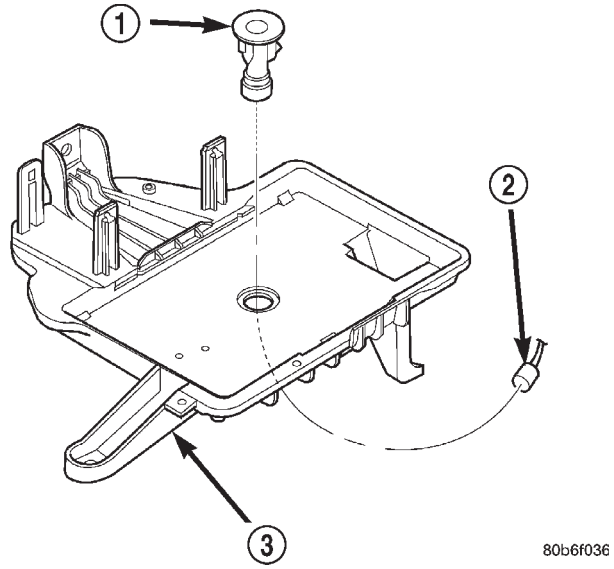


Fig. 1 Battery Temperature Sensor Location

1 - BATTERY TEMPERATURE SENSOR
2 - ENGINE WIRE HARNESS
3 - BATTERY TRAY

The battery temperature sensor is located under the vehicle battery (Fig. 1) and is attached to a mounting hole on the battery tray.

(1) Remove battery. Refer to Group 8A, Battery for procedures.

(2) Remove battery tray.

(3) Pull sensor up from battery tray and disconnect engine wire harness.

(4) Remove sensor from battery tray.

INSTALLATION

The battery temperature sensor is located under the vehicle battery (Fig. 1) and is attached to a mounting hole on the battery tray.

(1) Position sensor into mounting hole and attach wiring harness.

(2) Press sensor into top of battery tray.

(3) Install battery. Refer to Group 8A, Battery for procedures.

GENERATOR

DESCRIPTION

The generator is belt-driven by the engine using a serpentine type drive belt. It is serviced only as a complete assembly. If the generator fails for any reason, the entire assembly must be replaced.

OPERATION

As the energized rotor begins to rotate within the generator, the spinning magnetic field induces a current into the windings of the stator coil. Once the generator begins producing sufficient current, it also provides the current needed to energize the rotor.

The Y type stator winding connections deliver the induced AC current to 3 positive and 3 negative diodes for rectification. From the diodes, rectified DC current is delivered to the vehicle electrical system through the generator battery terminal.

Although the generators appear the same externally, different generators with different output ratings are used on this vehicle. Be certain that the replacement generator has the same output rating and part number as the original unit. Refer to Generator Ratings in the Specifications section at the back of this group for amperage ratings and part numbers.

Noise emitting from the generator may be caused by: worn, loose or defective bearings; a loose or defective drive pulley; incorrect, worn, damaged or misadjusted fan drive belt; loose mounting bolts; a misaligned drive pulley or a defective stator or diode.

REMOVAL

WARNING: DISCONNECT NEGATIVE CABLE FROM BATTERY BEFORE REMOVING BATTERY OUTPUT WIRE (B+ WIRE) FROM GENERATOR. FAILURE TO DO SO CAN RESULT IN INJURY OR DAMAGE TO ELECTRICAL SYSTEM.

(1) Disconnect negative battery cable at battery.

(2) Remove generator drive belt. Refer to Cooling System for procedure.

(3) Unsnap cable protector cover from B+ mounting stud (Fig. 2) .

(4) Disconnect (unsnap) 2–wire field connector at rear of generator (Fig. 2) .

(5) Remove generator mounting bolts (Fig. 3) or (Fig. 4).

(6) Remove generator from vehicle.

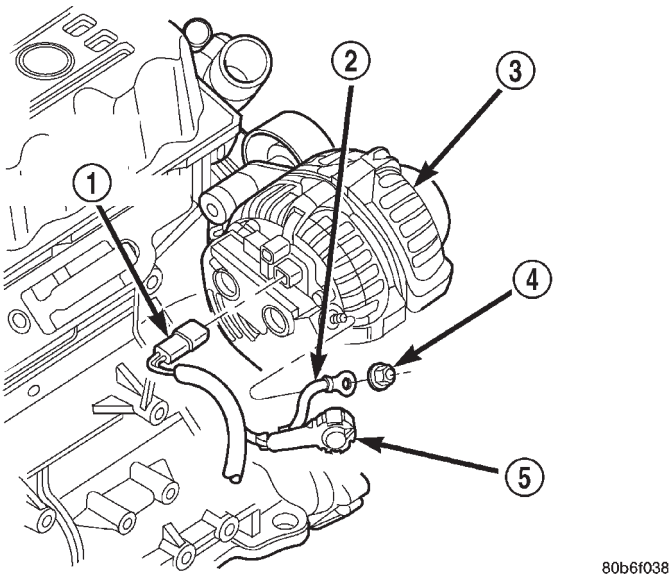


Fig. 2 Generator B+ Cable and Field Wire Connections (Typical—4.0L Engine Shown)

1 - FIELD WIRE CONNECTOR
2 - B+ CABLE
3 - GENERATOR
4 - B+ CABLE MOUNTING NUT
5 - CABLE PROTECTOR

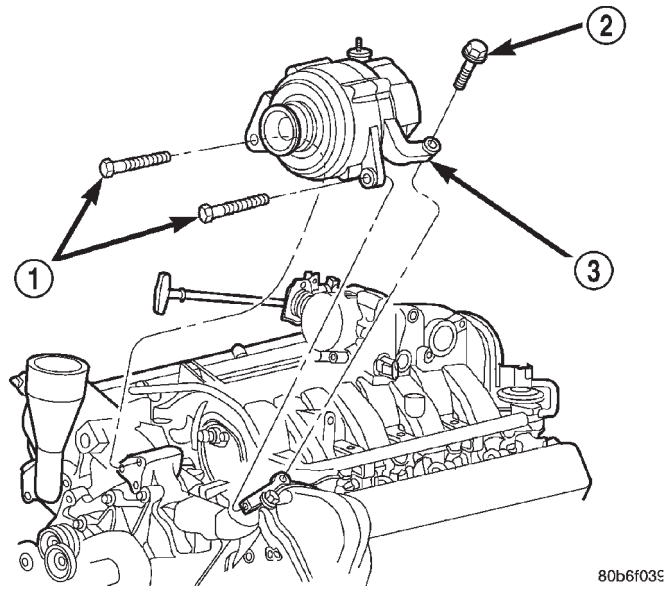


Fig. 3 Remove/Install Generator—4.7L V-8 Engine

1 - LOWER BOLTS
2 - REAR BOLT
3 - GENERATOR

GENERATOR (Continued)

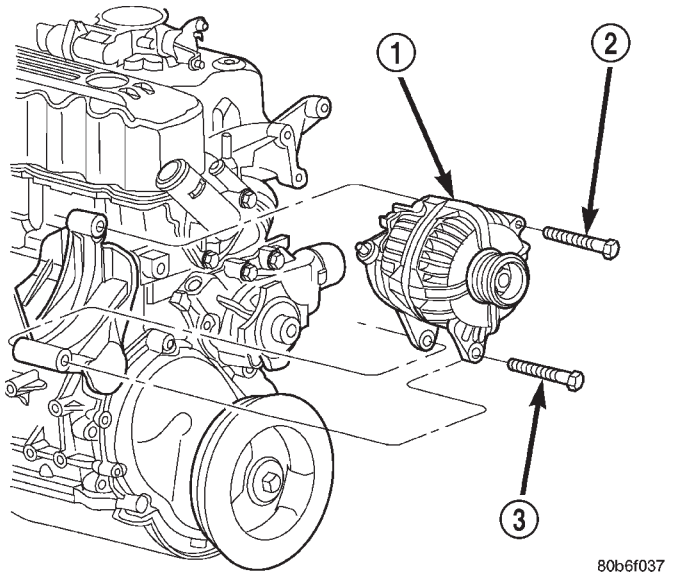


Fig. 4 Remove/Install Generator—4.0L 6–Cylinder Engine

1 - GENERATOR
2 - UPPER BOLT
3 - LOWER BOLT

INSTALLATION

(1) Position generator to engine and install mounting bolts.

(2) Tighten generator mounting bolts as follows:

- Vertical mounting bolt 4.7L engine—40 N·m (29 ft. lbs.)
- Long horizontal mounting bolt 4.7L engine—55 N·m (41 ft. lbs.)
- Short horizontal mounting bolt 4.7L engine—55 N·m (41 ft. lbs.)
- Generator mounting bolts 4.0L engine—55 N·m (41 ft. lbs.)
- B+ terminal nut—11 N·m (95 in. lbs.)

(3) Snap 2–wire field connector into rear of generator.

(4) Snap cable protector cover to B+ mounting stud.

CAUTION: Never force a belt over a pulley rim using a screwdriver. The synthetic fiber of the belt can be damaged.

CAUTION: When installing a serpentine accessory drive belt, the belt MUST be routed correctly. The water pump will be rotating in the wrong direction if the belt is installed incorrectly, causing the engine to overheat. Refer to belt routing label in engine compartment, or refer to Belt Schematics in 7, Cooling System.

(5) Install generator drive belt. Refer to 7, Cooling System for procedure.

(6) Install negative battery cable to battery.

VOLTAGE REGULATOR

DESCRIPTION

The Electronic Voltage Regulator (EVR) is not a separate component. It is actually a voltage regulating circuit located within the Powertrain Control Module (PCM). The EVR is not serviced separately. If replacement is necessary, the PCM must be replaced.

OPERATION

The amount of DC current produced by the generator is controlled by EVR circuitry contained within the PCM. This circuitry is connected in series with the generators second rotor field terminal and its ground.

Voltage is regulated by cycling the ground path to control the strength of the rotor magnetic field. The EVR circuitry monitors system line voltage (B+) and battery temperature (refer to Battery Temperature Sensor for more information). It then determines a target charging voltage. If sensed battery voltage is 0.5 volts or lower than the target voltage, the PCM grounds the field winding until sensed battery voltage is 0.5 volts above target voltage. A circuit in the PCM cycles the ground side of the generator field up to 100 times per second (100Hz), but has the capability to ground the field control wire 100% of the time (full field) to achieve the target voltage. If the charging rate cannot be monitored (limp-in), a duty cycle of 25% is used by the PCM in order to have some generator output. Also refer to Charging System Operation for additional information.

STARTING

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STARTING

DESCRIPTION

An electrically operated engine starting system is standard factory-installed equipment on this model. The starting system is designed to provide the vehicle operator with a convenient, efficient and reliable means of cranking and starting the internal combustion engine used to power the vehicle and all of its accessory systems from within the safe and secure confines of the passenger compartment. See the owner's manual in the vehicle glove box for more information and instructions on the recommended use and operation of the factory-installed starting system.

The starting system consists of the following components:

- Battery
- Starter relay
- Starter motor (including an integral starter solenoid)
- Ignition switch
- Park/neutral position switch
- Wire harnesses and connections (including the battery cables).

This group provides complete service information for the starter motor and the starter relay. Complete service information for the other starting system components can be located as follows:

- Refer to **Battery** in the proper section of Group 8A - Battery for complete service information for the battery.
- Refer to **Ignition Switch and Key Lock Cylinder** in the proper section of Group 8D - Ignition System for complete service information for the ignition switch.
- Refer to **Park/Neutral Position Switch** in the proper section of Group 21 - Transmission for complete service information for the park/neutral position switch.
- Refer to the proper section of **Group 8W - Wiring Diagrams** for complete service information and circuit diagrams for the starting system wiring components.

Group 8A covers the Battery, Group 8B covers the Starting Systems, and Group 8C covers the Charging System. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The battery, starting, and charging systems in the vehicle operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components that are used in these systems must perform within specifications.

The diagnostic procedures used in each of these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. Refer to **On-Board Diagnostic Test For Charging System** in the Diagnosis and Testing section of Group 8C - Charging System for more information.

STARTING (Continued)

OPERATION

The starting system components form two separate circuits. A high-amperage feed circuit that feeds the starter motor between 150 and 350 amperes, and a low-amperage control circuit that operates on less than 20 amperes. The high-amperage feed circuit components include the battery, the battery cables, the contact disc portion of the starter solenoid, and the starter motor. The low-amperage control circuit components include the ignition switch, the park/neutral position switch, the starter relay, the electromagnetic windings of the starter solenoid, and the connecting wire harness components.

Battery voltage is supplied through the low-amperage control circuit to the coil battery terminal of the starter relay when the ignition switch is turned to the momentary Start position. The park/neutral position switch is installed in series between the starter relay coil ground terminal and ground. This normally open switch prevents the starter relay from being energized and the starter motor from operating unless the automatic transmission gear selector is in the Neutral or Park positions.

When the starter relay coil is energized, the normally open relay contacts close. The relay contacts connect the relay common feed terminal to the relay normally open terminal. The closed relay contacts energize the starter solenoid coil windings.

The energized solenoid pull-in coil pulls in the solenoid plunger. The solenoid plunger pulls the shift lever in the starter motor. This engages the starter overrunning clutch and pinion gear with the starter ring gear on the automatic transmission torque converter drive plate.

As the solenoid plunger reaches the end of its travel, the solenoid contact disc completes the high-amperage starter feed circuit and energizes the solenoid plunger hold-in coil. Current now flows between the solenoid battery terminal and the starter motor, energizing the starter.

Once the engine starts, the overrunning clutch protects the starter motor from damage by allowing the starter pinion gear to spin faster than the pinion shaft. When the driver releases the ignition switch to the On position, the starter relay coil is de-energized. This causes the relay contacts to open. When the relay contacts open, the starter solenoid plunger hold-in coil is de-energized.

When the solenoid plunger hold-in coil is de-energized, the solenoid plunger return spring returns the plunger to its relaxed position. This causes the contact disc to open the starter feed circuit, and the shift lever to disengage the overrunning clutch and pinion gear from the starter ring gear.

DIAGNOSIS AND TESTING - STARTING SYSTEM

The battery, starting, and charging systems operate with one another, and must be tested as a complete system. In order for the vehicle to start and charge properly, all of the components involved in these systems must perform within specifications.

Group 8A covers the Battery, Group 8B covers the Starting Systems, and Group 8C covers the Charging System. We have separated these systems to make it easier to locate the information you are seeking within this Service Manual. However, when attempting to diagnose any of these systems, it is important that you keep their interdependency in mind.

The diagnostic procedures used in these groups include the most basic conventional diagnostic methods, to the more sophisticated On-Board Diagnostics (OBD) built into the Powertrain Control Module (PCM). Use of an induction-type milliampere ammeter, volt/ohmmeter, battery charger, carbon pile rheostat (load tester), and 12-volt test lamp may be required.

All OBD-sensed systems are monitored by the PCM. Each monitored circuit is assigned a Diagnostic Trouble Code (DTC). The PCM will store a DTC in electronic memory for any failure it detects. Refer to **On-Board Diagnostic Test For Charging System** in the Diagnosis and Testing section of Group 8C - Charging System for more information.

STARTING (Continued)

Starting System Diagnosis		
CONDITION	POSSIBLE CAUSE	CORRECTION
STARTER FAILS TO OPERATE.	1. Battery discharged or faulty.	1. Refer to Battery in the Diagnosis and Testing section of Group 8A - Battery. Charge or replace the battery, if required.
	2. Starting circuit wiring faulty.	2. Refer to Starting System in Group 8W - Wiring Diagrams. Test and repair the starter feed and/or control circuits, if required.
	3. Starter relay faulty.	3. Refer to Starter Relay in the Diagnosis and Testing section of this group. Replace the starter relay, if required.
	4. Ignition switch faulty.	4. Refer to Ignition Switch and Key Lock Cylinder in the Diagnosis and Testing section of Group 8D - Ignition System. Replace the ignition switch, if required.
	5. Park/Neutral position switch faulty or misadjusted.	5. Refer to Park/Neutral Position Switch in the Diagnosis and Testing section of Group 21 - Transmission. Replace the park/neutral position switch, if required.
	6. Starter solenoid faulty.	6. Refer to Starter Motor in the Diagnosis and Testing section of this group. Replace the starter motor assembly, if required.
	7. Starter motor faulty.	7. If all other starting system components and circuits test OK, replace the starter motor assembly.
STARTER ENGAGES, FAILS TO TURN ENGINE.	1. Battery discharged or faulty.	1. Refer to Battery in the Diagnosis and Testing section of Group 8A - Battery. Charge or replace the battery, if required.
	2. Starting circuit wiring faulty.	2. Refer to Starting System in Group 8W - Wiring Diagrams. Test and repair the starter feed and/or control circuits, if required.
	3. Starter motor faulty.	3. If all other starting system components and circuits test OK, replace the starter motor assembly.
	4. Engine seized.	4. Refer to Engine Diagnosis in the Diagnosis and Testing section of Group 9 - Engine.
STARTER ENGAGES, SPINS OUT BEFORE ENGINE STARTS.	1. Starter ring gear faulty.	1. Refer to Starter Motor in the Removal and Installation section of this group. Remove the starter motor to inspect the starter ring gear. Replace the starter ring gear, if required.
	2. Starter motor faulty.	2. If all other starting system components and circuits test OK, replace the starter motor assembly.
STARTER DOES NOT DISENGAGE.	1. Starter motor improperly installed.	1. Refer to Starter Motor in the Removal and Installation section of this group. Tighten the starter mounting hardware to the correct tightness specifications.
	2. Starter relay faulty.	2. Refer to Starter Relay in the Diagnosis and Testing section of this group. Replace the starter relay, if required.
	3. Ignition switch faulty.	3. Refer to Ignition Switch and Key Lock Cylinder in the Diagnosis and Testing section of Group 8D - Ignition System. Replace the ignition switch, if required.
	4. Starter motor faulty.	4. If all other starting system components and circuits test OK, replace the starter motor assembly.

STARTING (Continued)

INSPECTION

For complete circuit diagrams, refer to **Starting System** in the Contents of Group 8W - Wiring Diagrams. Before removing any unit from the starting system for repair or diagnosis, perform the following inspections:

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

- **Battery** - Visually inspect the battery for indications of physical damage and loose or corroded cable connections. Determine the state-of-charge and cranking capacity of the battery. Charge or replace the battery, if required. Refer to **Battery** in the proper section of Group 8A - Battery for complete service information for the battery.
- **Ignition Switch** - Visually inspect the ignition switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Ignition Switch and Key Lock Cylinder** in the proper section of Group 8D - Ignition System for complete service information for the ignition switch.
- **Park/Neutral Position Switch** - Visually inspect the park/neutral position switch for indications of physical damage and loose or corroded wire harness connections. Refer to **Park/Neutral Position Switch** in the proper section of Group 21 - Transmission for complete service information for the park/neutral position switch.
- **Starter Relay** - Visually inspect the starter relay for indications of physical damage and loose or corroded wire harness connections.
- **Starter Motor** - Visually inspect the starter motor for indications of physical damage and loose or corroded wire harness connections.
- **Starter Solenoid** - Visually inspect the starter solenoid for indications of physical damage and loose or corroded wire harness connections.
- **Wiring** - Visually inspect the wire harnesses for damage. Repair or replace any faulty wiring, as required. Refer to the proper section of **Group 8W - Wiring Diagrams** for complete service information and circuit diagrams for the starting system wiring components.

TESTING

COLD CRANKING TEST

For complete circuit diagrams, refer to **Starting System** in the Contents of Group 8W - Wiring Diagrams. The battery must be fully-charged and load-tested before proceeding. Refer to **Battery** in the Diagnosis and Testing section of Group 8A - Battery for the procedures.

(1) Connect a suitable volt-ampere tester to the battery terminals (Fig. 1). See the instructions provided by the manufacturer of the volt-ampere tester being used.

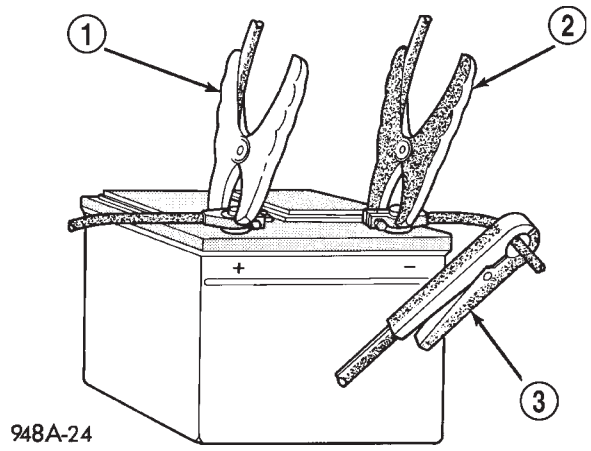


Fig. 1 Volts-Amps Tester Connections - Typical

1 - POSITIVE CLAMP
2 - NEGATIVE CLAMP
3 - INDUCTION AMMETER CLAMP

(2) Fully engage the parking brake.

(3) Place the automatic transmission gearshift selector lever in the Park position.

(4) Verify that all lamps and accessories are turned off.

(5) To prevent the engine from starting, remove the Automatic ShutDown (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. Refer to the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.

(6) Rotate and hold the ignition switch in the Start position. Note the cranking voltage and current (amperage) draw readings shown on the volt-ampere tester.

(a) If the voltage reads below 9.6 volts, refer to **Starter Motor** in the Diagnosis and Testing section of this group. If the starter motor is OK, refer to **Engine Diagnosis** in the Diagnosis and Testing section of Group 9 - Engine for further testing of the engine. If the starter motor is not OK, replace the faulty starter motor.

STARTING (Continued)

(b) If the voltage reads above 9.6 volts and the current (amperage) draw reads below specifications, refer to **Feed Circuit Test** in this section.

(c) If the voltage reads 12.5 volts or greater and the starter motor does not turn, refer to **Control Circuit Testing** in this section.

(d) If the voltage reads 12.5 volts or greater and the starter motor turns very slowly, refer to **Feed Circuit Test** in this section.

NOTE: A cold engine will increase the starter current (amperage) draw reading, and reduce the battery voltage reading.

FEED CIRCUIT TEST

The starter feed circuit test (voltage drop method) will determine if there is excessive resistance in the high-amperage feed circuit. For complete circuit diagrams, refer to **Starting System** in the Contents of Group 8W - Wiring Diagrams.

When performing these tests, it is important to remember that the voltage drop is giving an indication of the resistance between the two points at which the voltmeter probes are attached.

Example: When testing the resistance of the battery positive cable, touch the voltmeter leads to the battery positive cable clamp and the cable connector at the starter solenoid. If you probe the battery positive terminal post and the cable connector at the starter solenoid, you are reading the combined voltage drop in the battery positive cable clamp-to-terminal post connection and the battery positive cable.

The following operation will require a voltmeter accurate to 1/10 (0.10) volt. Before performing the tests, be certain that the following procedures are accomplished:

- Battery is fully-charged and load-tested. Refer to **Battery** in the Diagnosis and Testing section of Group 8A - Battery for the procedures.
- Fully engage the parking brake.
- Place the automatic transmission gearshift selector lever in the Park position.
- Verify that all lamps and accessories are turned off.
- To prevent the engine from starting, remove the Automatic ShutDown (ASD) relay. The ASD relay is located in the Power Distribution Center (PDC), in the engine compartment. Refer to the fuse and relay layout label affixed to the underside of the PDC cover for ASD relay identification and location.

(1) Connect the positive lead of the voltmeter to the battery negative terminal post. Connect the negative lead of the voltmeter to the battery negative cable clamp (Fig. 2). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor contact between the cable clamp and the terminal post.

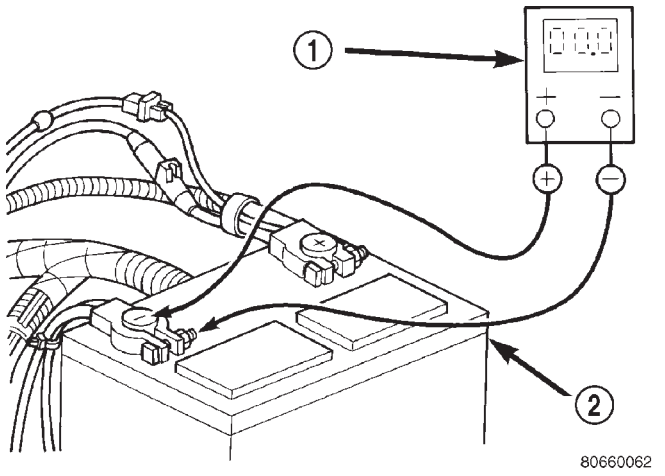


Fig. 2 Test Battery Negative Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(2) Connect the positive lead of the voltmeter to the battery positive terminal post. Connect the negative lead of the voltmeter to the battery positive cable clamp (Fig. 3). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If voltage is detected, correct the poor contact between the cable clamp and the terminal post.

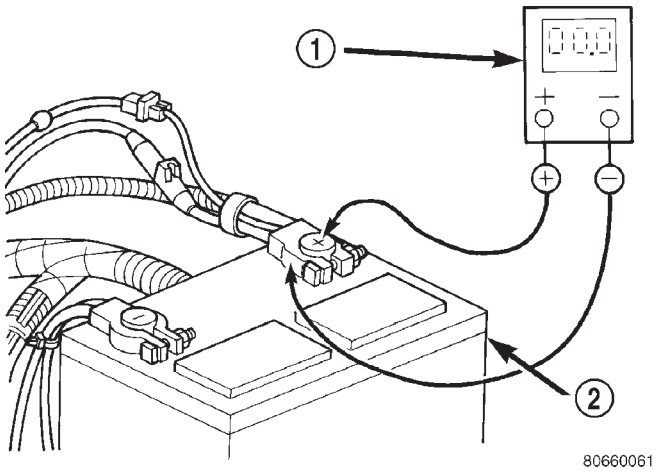


Fig. 3 Test Battery Positive Connection Resistance - Typical

1 - VOLTMETER
2 - BATTERY

(3) Connect the voltmeter to measure between the battery positive terminal post and the starter solenoid battery terminal stud (Fig. 4). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery cable connection at the solenoid.

STARTING (Continued)

Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery positive cable.

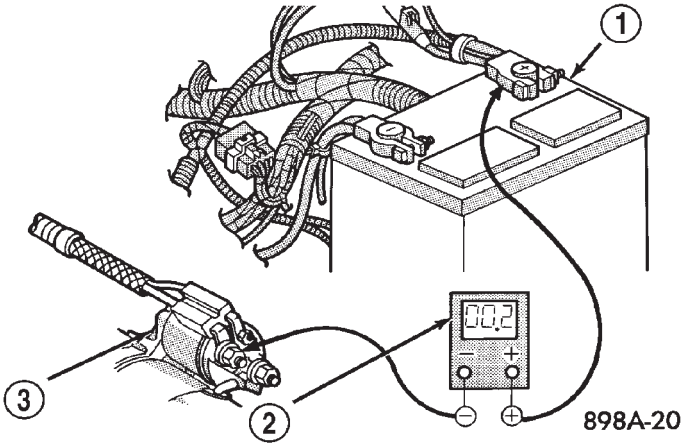


Fig. 4 Test Battery Positive Cable Resistance - Typical

1 - BATTERY
2 - VOLTMETER
3 - STARTER MOTOR

(4) Connect the voltmeter to measure between the battery negative terminal post and a good clean ground on the engine block (Fig. 5). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, clean and tighten the battery negative cable attachment on the engine block. Repeat the test. If the reading is still above 0.2 volt, replace the faulty battery negative cable.

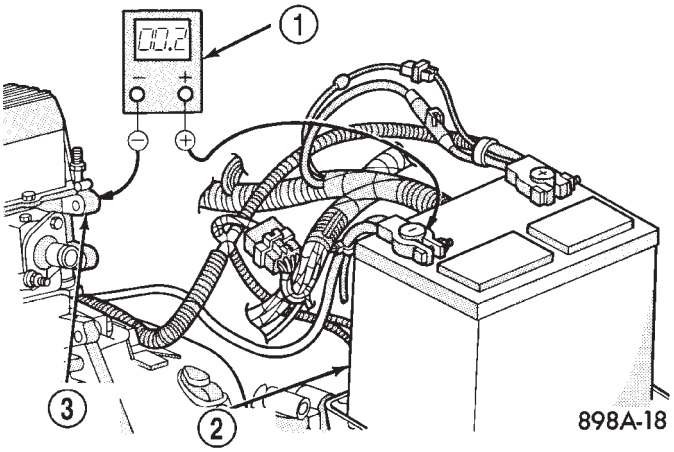


Fig. 5 Test Ground Circuit

1 - VOLTMETER
2 - BATTERY
3 - ENGINE GROUND

(5) Connect the positive lead of the voltmeter to the starter housing. Connect the negative lead of the voltmeter to the battery negative terminal post (Fig. 6). Rotate and hold the ignition switch in the Start position. Observe the voltmeter. If the reading is above 0.2 volt, correct the poor starter to engine block ground contact.

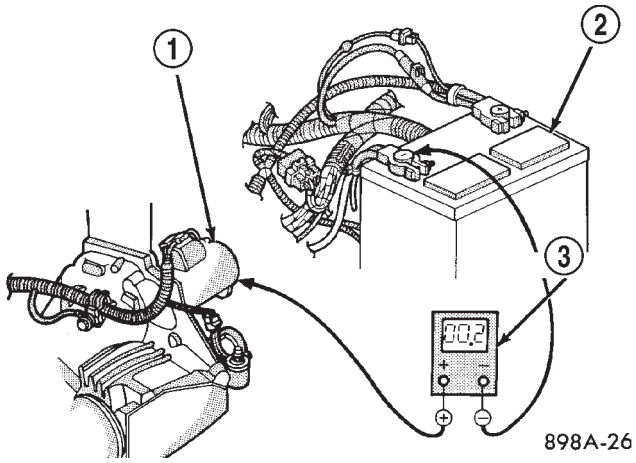


Fig. 6 Test Starter Ground - Typical

1 - STARTER MOTOR
2 - BATTERY
3 - VOLTMETER

If the resistance tests detect no feed circuit problems, refer to **Starter Motor** in the Diagnosis and Testing section of this group.

CONTROL CIRCUIT TESTING

The starter control circuit components should be tested in the order in which they are listed, as follows:

- **Starter Relay** - Refer to **Starter Relay** in the Diagnosis and Testing section of this group for the procedures.
- **Starter Solenoid** - Refer to **Starter Motor** in the Diagnosis and Testing section of this group for the procedures.
- **Ignition Switch** - Refer to **Ignition Switch and Key Lock Cylinder** in the Diagnosis and Testing section of Group 8D - Ignition System for the procedures.
- **Park/Neutral Position Switch** - Refer to **Park/Neutral Position Switch** in the Diagnosis and Testing section of Group 21 - Transmission for the procedures.
- **Wire harnesses and connections** - Refer to **Starting System** in the Contents of Group 8W - Wiring Diagrams for complete circuit diagrams.

STARTING (Continued)

SPECIFICATIONS

TORQUE - STARTER

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Stater Motor (B+) Terminal (Diesel)	27	20	
Stater Motor (B+) Terminal (Except Diesel)	11.3		100
Starter Motor Retaining Bolts (Diesel)	27	20	
Starter Motor Retaining Bolt (Forward Facing 4.0L)	41	30	
Starter Motor Retaining Bolt (Forward Facing 4.7L)	54	40	
Starter Motor Retaining Bolt (Rearward Facing 4.7L)	54	40	

STARTER MOTOR - GAS POWERED

Starter Motor and Solenoid	
Manufacturer	Mitsubishi
Engine Application	4.0L/4.7L
Power Rating	1.4 Kilowatt (1.9 Horsepower)
Voltage	12 Volts
Number of Fields	4
Number of Poles	4
Number of Brushes	4
Drive Type	Planetary Gear Reduction
Free Running Test Voltage	11.2 Volts
Free Running Test Maximum Amperage Draw	90 Amperes
Free Running Test Minimum Speed	2400 rpm
Solenoid Closing Maximum Voltage Required	7.8 Volts
*Cranking Amperage Draw Test	160 Amperes
*Test at operating temperature. Cold engine, tight (new) engine, or heavy oil will increase starter amperage draw.	

STARTER MOTOR

DESCRIPTION

The starter motors used for both the 4.0L and the 4.7L engines available in this model are very similar, but are not interchangeable. Both starter motors are mounted with two screws to the automatic transmission torque converter housing and are located on the right side of the engine.

Each of these starter motors incorporates several of the same features to create a reliable, efficient, compact, lightweight and powerful unit. The electric motors of both starters feature four electromagnetic field coils wound around four pole shoes, and four brushes contact the motor commutator. Both starter motors are rated at 1.4 kilowatts (about 1.9 horsepower) output at 12 volts.

Both of these starter motors are serviced only as a unit with their starter solenoids, and cannot be repaired. If either component is faulty or damaged, the entire starter motor and starter solenoid unit must be replaced.

STARTER MOTOR (Continued)

OPERATION

These starter motors are equipped with a planetary gear reduction (intermediate transmission) system. The planetary gear reduction system consists of a gear that is integral to the output end of the electric motor armature shaft that is in continual engagement with a larger gear that is splined to the input end of the starter pinion gear shaft. This feature makes it possible to reduce the dimensions of the starter. At the same time, it allows higher armature rotational speed and delivers increased torque through the starter pinion gear to the starter ring gear.

The starter motors for both engines are activated by an integral heavy duty starter solenoid switch mounted to the overrunning clutch housing. This electromechanical switch connects and disconnects the feed of battery voltage to the starter motor and actuates a shift fork that engages and disengages the starter pinion gear with the starter ring gear.

Both starter motors use an overrunning clutch and starter pinion gear unit to engage and drive a starter ring gear that is integral to the torque converter drive plate mounted on the rear crankshaft flange.

DIAGNOSIS AND TESTING - STARTER MOTOR

Correct starter motor operation can be confirmed by performing the following free running bench test. This test can only be performed with the starter motor removed from the vehicle. Refer to **Starting System** in the Specifications section of this group for the starter motor specifications.

(1) Remove the starter motor from the vehicle. Refer to **Starter Motor** in the Removal and Installation section of this group for the procedures.

(2) Mount the starter motor securely in a soft-jawed bench vise. The vise jaws should be clamped on the mounting flange of the starter motor. Never clamp on the starter motor by the field frame.

(3) Connect a suitable volt-ampere tester and a 12-volt battery to the starter motor in series, and set the ammeter to the 100 ampere scale. See the instructions provided by the manufacturer of the volt-ampere tester being used.

(4) Install a jumper wire from the solenoid terminal to the solenoid battery terminal. The starter motor should operate. If the starter motor fails to operate, replace the faulty starter motor assembly.

(5) Adjust the carbon pile load of the tester to obtain the free running test voltage. Refer to **Starting System** in the Specifications section of this group for the starter motor free running test voltage specifications.

(6) Note the reading on the ammeter and compare this reading to the free running test maximum amperage draw. Refer to **Starting System** in the Specifications section of this group for the starter motor free running test maximum amperage draw specifications.

(7) If the ammeter reading exceeds the maximum amperage draw specification, replace the faulty starter motor assembly.

STARTER SOLENOID

This test can only be performed with the starter motor removed from the vehicle.

(1) Remove the starter motor from the vehicle. Refer to **Starter Motor** in the Removal and Installation section of this group for the procedures.

(2) Disconnect the wire from the solenoid field coil terminal.

(3) Check for continuity between the solenoid terminal and the solenoid field coil terminal with a continuity tester (Fig. 7). There should be continuity. If OK, go to Step 4. If not OK, replace the faulty starter motor assembly.

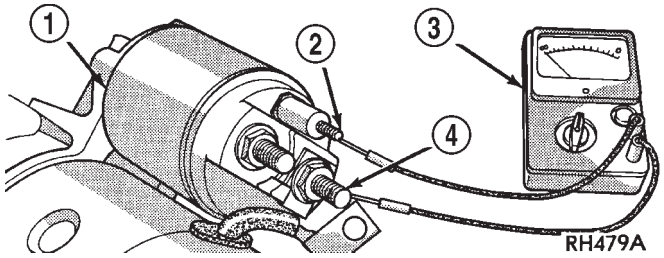


Fig. 7 Continuity Test Between Solenoid Terminal and Field Coil Terminal - Typical

1 - SOLENOID
2 - SOLENOID TERMINAL
3 - OHMMETER
4 - FIELD COIL TERMINAL

(4) Check for continuity between the solenoid terminal and the solenoid case (Fig. 8). There should be continuity. If not OK, replace the faulty starter motor assembly.

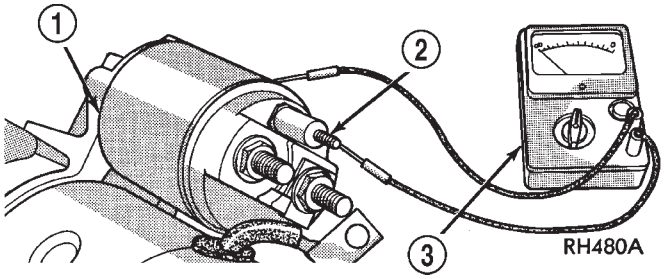


Fig. 8 Continuity Test Between Solenoid Terminal

1 - SOLENOID
2 - SOLENOID TERMINAL
3 - OHMMETER

STARTER MOTOR (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the lower (forward facing) mounting screw securing the starter motor to the automatic transmission torque converter housing (Fig. 9) or (Fig. 10) .

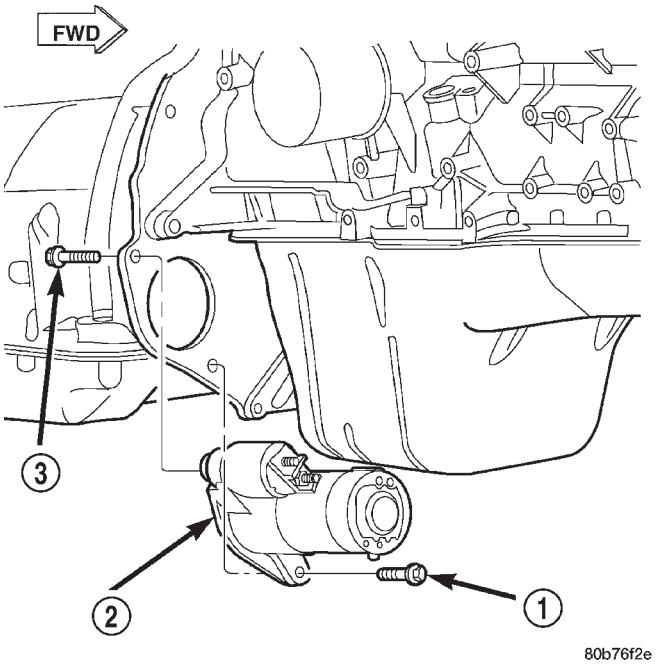


Fig. 9 Starter Motor Remove/Install - 4.0L Engine

1 - SCREW
2 - STARTER MOTOR
3 - SCREW

(4) While supporting the starter motor with one hand, use the other hand to remove the upper (rear facing) mounting screw securing the starter motor to the automatic transmission torque converter housing.

(5) Lower the starter motor from the front of the automatic transmission torque converter housing far enough to access and remove the nut that secures the battery cable eyelet to the solenoid battery terminal (Fig. 11) or (Fig. 12) . Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

(6) Remove the battery cable eyelet from the solenoid battery terminal. Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

(7) Disconnect the solenoid terminal wire harness connector from the connector receptacle on the starter solenoid. Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

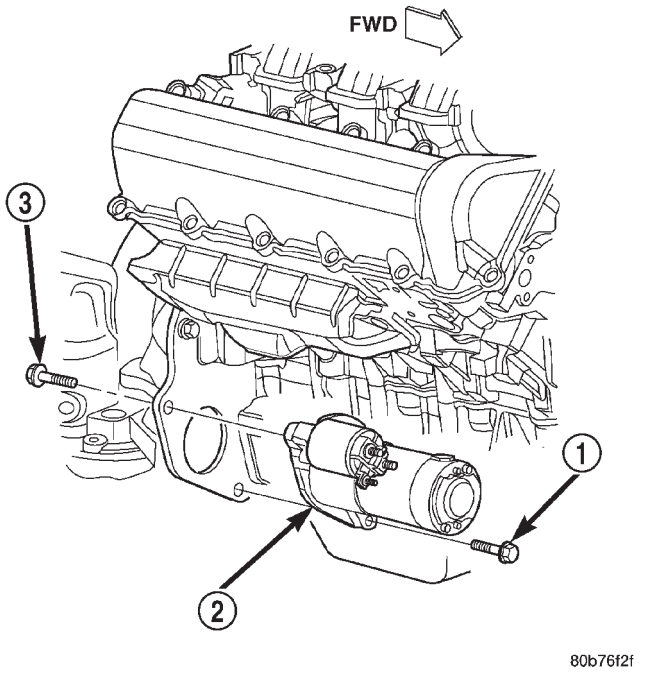


Fig. 10 Starter Motor Remove/Install - 4.7L Engine

1 - SCREW
2 - STARTER MOTOR
3 - SCREW

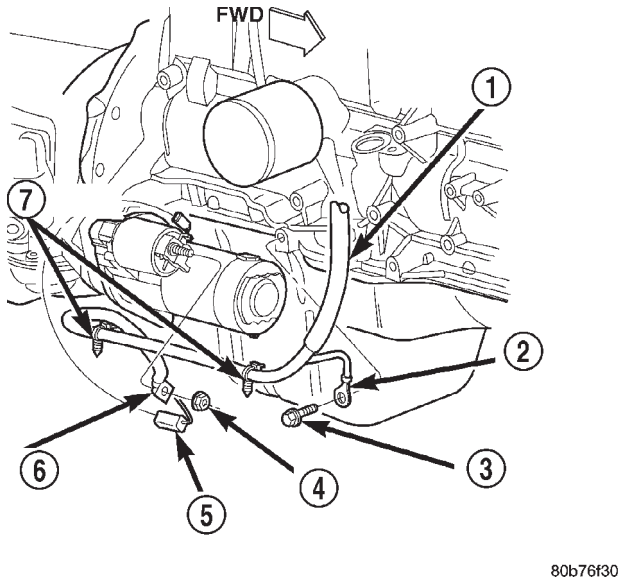


Fig. 11 Starter Wire Harness Remove/Install - 4.0L Engine

1 - BATTERY, STARTER AND GENERATOR WIRE HARNESS
2 - GROUND EYELET
3 - SCREW
4 - NUT
5 - SOLENOID TERMINAL CONNECTOR
6 - SOLENOID BATTERY TERMINAL EYELET
7 - RETAINERS

STARTER MOTOR (Continued)

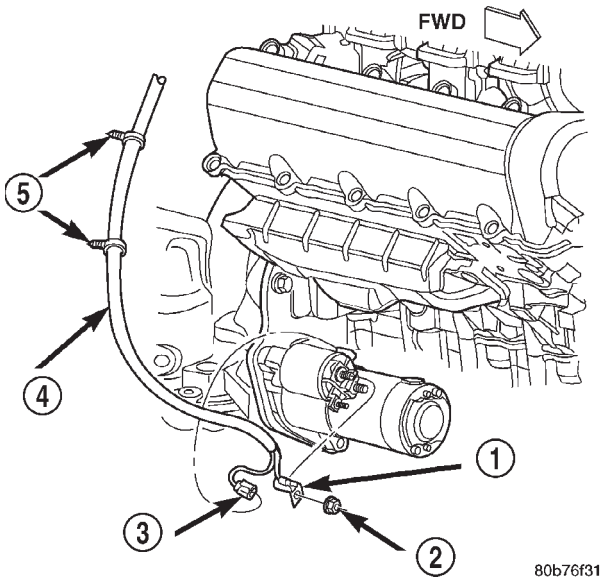


Fig. 12 Starter Wire Harness Remove/Install - 4.7L Engine

1 - SOLENOID BATTERY TERMINAL EYELET
2 - NUT
3 - SOLENOID TERMINAL CONNECTOR
4 - BATTERY STARTER AND GENERATOR WIRE HARNESS
5 - RETAINERS

(8) Remove the starter motor from the engine compartment.

INSTALLATION

(1) Position the starter motor in the engine compartment.

(2) Reconnect the solenoid terminal wire harness connector to the connector receptacle on the starter solenoid. Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

(3) Install the battery cable eyelet onto the solenoid battery terminal. Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

(4) Install and tighten the nut that secures the battery cable eyelet to the solenoid battery terminal. Tighten the nut to 11.3 N·m (100 in. lbs.). Always support the starter motor during this process, do not let the starter motor hang from the wire harness.

(5) Position the starter motor to the front of the automatic transmission torque converter housing and loosely install both the upper and lower mounting screws.

(6) Tighten the lower (forward facing) starter motor mounting screw. On 4.0L engines, tighten the screw to 41 N·m (30 ft. lbs.). On 4.7L engines, tighten the screw to 54 N·m (40 ft. lbs.).

(7) Tighten the upper (rearward facing) starter mounting screw. Tighten the screw to 54 N·m (40 ft. lbs.).

(8) Lower the vehicle.

(9) Reconnect the battery negative cable.

STARTER MOTOR RELAY

DESCRIPTION

The starter relay is an electromechanical device that switches battery current to the pull-in coil of the starter solenoid when the ignition switch is turned to the Start position. The starter relay is located in the Power Distribution Center (PDC), in the engine compartment. See the fuse and relay layout label affixed to the inside surface of the PDC cover for starter relay identification and location.

The starter relay is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The starter relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - STARTER RELAY

The starter relay (Fig. 13) is located in the Power Distribution Center (PDC), in the engine compartment. Refer to the fuse and relay layout label affixed to the underside of the PDC cover for starter relay identification and location. For complete circuit diagrams, refer to **Starting System** in the Contents of Group 8W - Wiring Diagrams.

STARTER MOTOR RELAY (Continued)

(1) Remove the starter relay from the PDC. Refer to **Starter Relay** in the Removal and Installation section of this group for the procedures.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

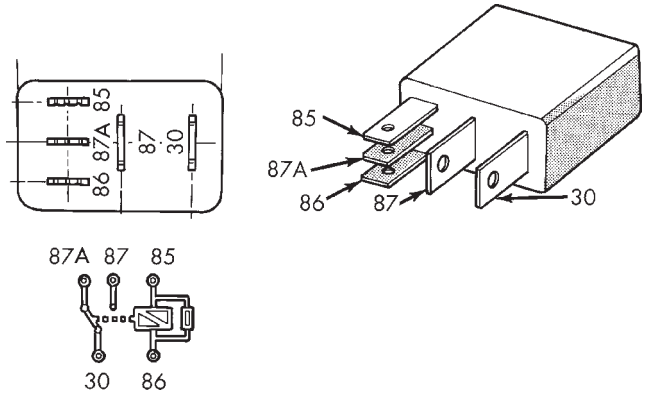


Fig. 13 Starter Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the starter solenoid field coils. There should be continuity between the cavity for relay terminal 87 and the starter solenoid terminal at all times. If OK, go to Step 4. If not OK, repair the open circuit to the starter solenoid as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is energized when the ignition switch is held in the Start position. Check for battery voltage at the cavity for relay terminal 86 with the ignition switch in the Start position, and no voltage when the ignition switch is released to the On position. If OK, go to Step 5. If not OK, check for an open or short circuit to the ignition switch and repair, if required. If the circuit to the ignition switch is OK, refer to **Ignition Switch and Key Lock Cylinder** in the Diagnosis and Testing section of Group 8D - Ignition System for testing of the ignition switch.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. It is grounded through the park/neutral position switch only when the gearshift selector lever is in the Park or Neutral positions. Check for continuity to ground at the cavity for relay terminal 85. If not OK, check for an open or short circuit to the park/neutral position switch and repair, if required. If the circuit to the park/neutral position switch is OK, refer to **Park/ Neutral Position Switch** in the Diagnosis and Testing section of Group 21 - Transmission for testing of the park/neutral position switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 14) .

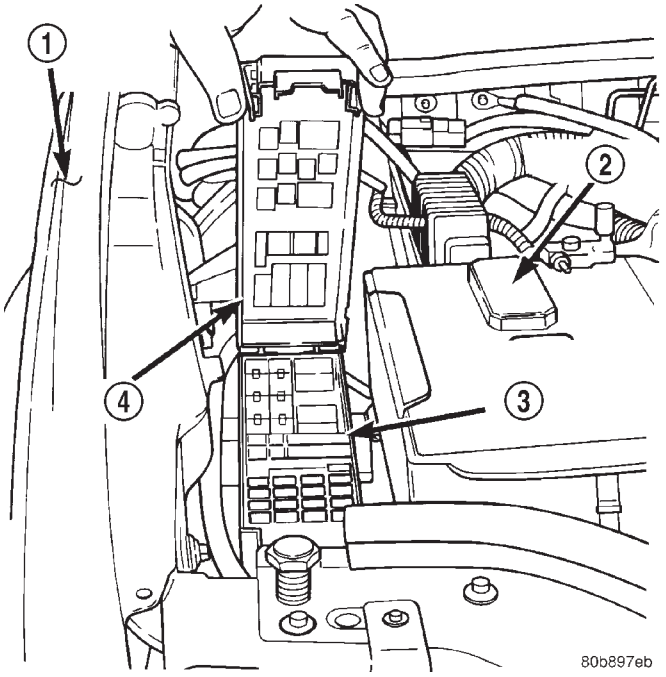


Fig. 14 Power Distribution Center

1 - RIGHT FENDER
2 - BATTERY
3 - POWER DISTRIBUTION CENTER
4 - COVER

STARTER MOTOR RELAY (Continued)

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for starter relay identification and location.

(4) Remove the starter relay from the PDC.

INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper starter relay location.

(2) Position the starter relay in the proper receptacle in the PDC.

(3) Align the starter relay terminals with the terminal cavities in the PDC receptacle.

(4) Push down firmly on the starter relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Install the cover onto the PDC.

(6) Reconnect the battery negative cable.

HEATED SYSTEMS

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HEATED GLASS

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HEATED GLASS

DESCRIPTION - REAR WINDOW DEFOGGER

An electrically heated rear window defogger is standard factory-installed equipment on this model. Electrically heated outside rear view mirrors are available factory-installed optional equipment. When the rear window defogger system is turned on, electric heater grids on the liftgate flip-up glass and behind both outside rear view mirror glasses are energized. These electric heater grids produce heat to help clear the rear window glass and the outside rear view mirrors of ice, snow, or fog. The rear window defogger system control circuit uses ignition switched battery current, so the system will only operate when the ignition switch is in the On position.

This group covers the following components of the rear window defogger system:

- Rear glass heating grid
- Rear window defogger relay
- Rear window defogger switch.

Certain functions and features of the rear window defogger system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, use a DRBIII® scan tool and (Refer to Appropriate Diagnostic Information).

The other electronic modules that may affect proper system operation are:

- **Body Control Module (BCM)** - Refer to Electronic Control Modules for more information.
- **Driver Door Module (DDM)** - Refer to Electronic Control Modules for more information.

HEATED GLASS (Continued)

• **Passenger Door Module (PDM)** - Refer to Electronic Control Modules for more information.

OPERATION - REAR WINDOW DEFOGGER

The rear window defogger system is controlled by a momentary switch that is integral to the a/c heater control located in the center stack area of the instrument panel. A Light-Emitting Diode (LED) in the switch button will light to indicate when the rear window defogger system is turned on. The BCM, which contains the rear window defogger system timer and control logic, monitors the status of the defogger switch through a hard-wired input. The BCM then sends control outputs through a hard wired circuit to energize or de-energize the defogger relay.

The electrically heated outside rear view mirror heating grids are also controlled by the rear window defogger switch. When the BCM receives an input from the switch, it sends a defogger switch status message to the DDM and the PDM over the PCI data bus. The DDM and PDM respond to the defogger switch status messages by energizing or de-energizing the battery current feed to their respective outside rear view mirror heating grids.

The rear window defogger system will be automatically turned off after a programmed time interval of about ten minutes. After the initial time interval has expired, if the defogger switch is turned on again during the same ignition cycle, the defogger system will automatically turn off after about five minutes. The defogger system will automatically shut off if the ignition switch is turned to the Off position, or it can be turned off manually by depressing the rear window defogger switch again.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the rear window defogger system.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

For complete circuit diagrams, (Refer to Appropriate Wiring Information). The operation of the electrically heated rear window defogger system can be confirmed in one of the following manners:

1. Turn the ignition switch to the On position. While monitoring the instrument panel voltmeter, depress the rear window defogger switch to the On position. When the rear window defogger switch is turned On, a distinct voltmeter needle deflection should be noted.

2. Turn the ignition switch to the On position. Depress the rear window defogger switch to the On position. The rear window defogger operation can be checked by feeling the rear window or outside rear view mirror glass. A distinct difference in temperature between the grid lines and the adjacent clear glass or the mirror glass can be detected within three to four minutes of operation.

3. Using a 12-volt DC voltmeter, contact the rear glass heating grid terminal A (right side) with the negative lead, and terminal B (left side) with the positive lead (Fig. 1). The voltmeter should read battery voltage.

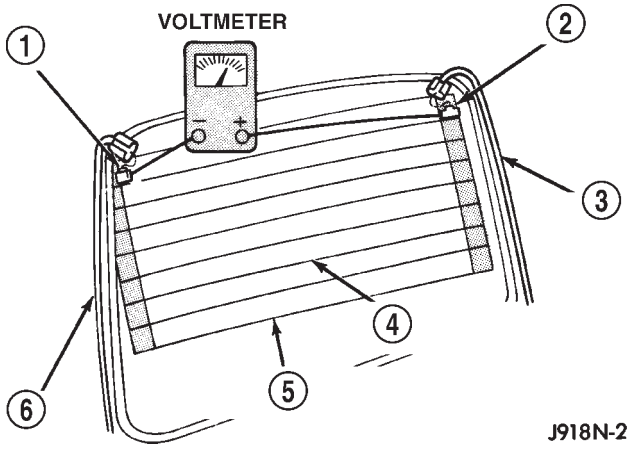


Fig. 1 REAR WINDOW GLASS GRID TEST

1 - TERMINAL "A"
2 - TERMINAL "B"
3 - FEED WIRE
4 - MID-POINT "C" (TYPICAL)
5 - HEATED REAR WINDOW DEFOGGER GRID
6 - GROUND WIRE

The above checks will confirm rear window defogger system operation. Illumination of the rear window defogger switch LED indicator means that there is battery current available at the output of the rear window defogger relay, but does not confirm that battery current is reaching the rear glass heating grid lines.

If the rear window defogger system does not operate, the problem should be isolated in the following manner:

HEATED GLASS (Continued)

(1) Confirm that the ignition switch is in the On position.

(2) Ensure that the rear glass heating grid feed and ground terminals are connected to the glass. Confirm that the ground wire has continuity to ground.

(3) Check the fused B(+) fuse in the Power Distribution Center (PDC). The fuse must be tight in its receptacles and all electrical connections must be secure.

When the above steps have been completed and the rear glass heating grid is still inoperative, one or more of the following is faulty:

- Rear window defogger switch
- Rear window defogger relay
- Body Control Module (BCM)
- Rear window grid lines (all grid lines would have to be broken or one of the feed wires disconnected for the entire system to be inoperative).

When the above steps have been completed and the heated mirror glass heating grid is still inoperative, one or more of the following is faulty:

- Body Control Module (BCM)
- Programmable Communications Interface (PCI) data bus
- Driver Door Module (DDM) or Passenger Door Module (PDM)
- Outside rear view mirror heating grids.

If turning the rear window defogger system on produces a severe voltmeter deflection, check for a short circuit between the rear window defogger relay output and the rear glass heating grid.

REAR WINDOW DEFOGGER GRID

DESCRIPTION

The electrically heated rear window glass is standard equipment on this model. The liftgate flip-up glass has two electrically conductive vertical bus bars and a series of horizontal grid lines made of a silver-ceramic material, which is baked on and bonded to the inside surface of the glass. These grid lines and the bus bars comprise a parallel electrical circuit. A spade type terminal near the top of each bus bar accept the connectors from the two coiled liftgate wire harness take outs.

The grid lines and bus bars are highly resistant to abrasion. However, it is possible for an open circuit to occur in an individual grid line, resulting in no current flow through the line. The grid lines can be damaged or scraped off with sharp instruments. Care should be taken when cleaning the glass or removing foreign materials, decals, or stickers from the glass. Normal glass cleaning solvents or hot water used with rags or toweling is recommended.

A repair kit is available to repair the grid lines and bus bars, or to reinstall the heated glass terminals. (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER GRID - STANDARD PROCEDURE)

OPERATION

The rear glass heating grid is energized and de-energized by the rear window defogger relay. The Body Control Module (BCM) monitors the rear window defogger switch. When the BCM receives an input from the switch, it energizes or de-energizes the rear window defogger relay through a hard wired control output. The rear defogger relay switches fused battery current to the rear window grid lines through the bus bars. The grid lines heat the rear window glass to clear the surface of ice, snow or fog. Protection for the rear glass heating grid circuit is provided by a fuse in the Power Distribution Center (PDC).

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER GRID

For complete circuit diagrams, (Refer to Appropriate Wiring Information). To detect breaks in the rear glass heating grid lines, the following procedure is required:

(1) Turn the ignition switch to the On position. Turn the rear window defogger system on. The rear window defogger switch LED indicator should light. If OK, go to Step 2. If not OK, (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER RELAY - DIAGNOSIS AND TESTING).

(2) Using a 12-volt DC voltmeter, contact the rear glass heating grid vertical bus bar on the right side of the vehicle with the negative lead. With the positive lead, contact the rear glass heating grid vertical bus bar on the left side of the vehicle. The voltmeter should read battery voltage. If OK, go to Step 3. If not OK, repair the open rear window defogger relay output circuit to the rear window defogger relay as required.

(3) With the positive voltmeter lead still contacting the rear glass heating grid vertical bus bar on the left side of the vehicle, move the negative lead of the voltmeter to a good body ground point. The voltage reading should not change. If OK, go to Step 4. If not OK, repair the ground circuit to ground as required.

(4) Connect the negative lead of the voltmeter to the right side bus bar and touch each grid line at midpoint C with the positive lead (Fig. 2). A reading of approximately six volts indicates a line is good. A reading of zero volts indicates a break in the grid line between midpoint C and the left side rear glass heating grid bus bar. A reading of ten to fourteen

REAR WINDOW DEFOGGER GRID (Continued)

volts indicates a break between midpoint C and the right side rear heating grid bus bar. Move the positive lead on the grid line towards the break and the voltage reading will change as soon as the break is crossed.

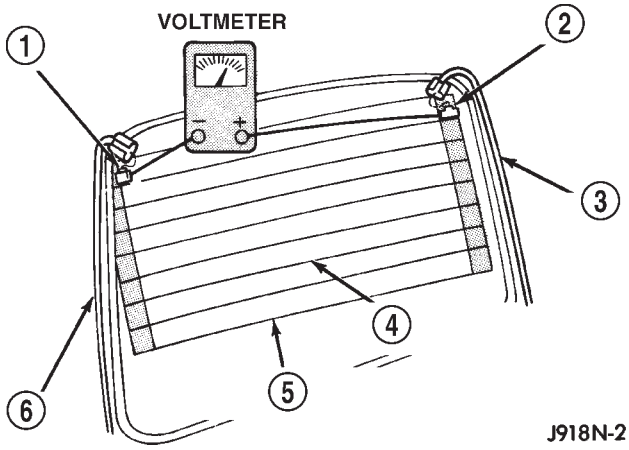


Fig. 2 REAR WINDOW GLASS GRID TEST

1 - TERMINAL "A"
2 - TERMINAL "B"
3 - FEED WIRE
4 - MID-POINT "C" (TYPICAL)
5 - HEATED REAR WINDOW DEFOGGER GRID
6 - GROUND WIRE

STANDARD PROCEDURE - REAR GLASS HEATING GRID REPAIR

Repair of the rear glass heating grid lines, bus bars, and terminals can be accomplished using a Mopar Rear Window Defogger Repair Kit (Part Number 4267922) or equivalent.

WARNING: MATERIALS CONTAINED IN THE REPAIR KIT MAY CAUSE SKIN OR EYE IRRITATION. THE KIT CONTAINS EPOXY RESIN AND AMINE TYPE HARDENER, WHICH ARE HARMFUL IF SWALLOWED. AVOID CONTACT WITH THE SKIN AND EYES. FOR SKIN CONTACT, WASH THE AFFECTED AREAS WITH SOAP AND WATER. FOR CONTACT WITH THE EYES, FLUSH WITH PLENTY OF WATER. DO NOT TAKE INTERNALLY. IF TAKEN INTERNALLY, INDUCE VOMITING AND CALL A PHYSICIAN IMMEDIATELY. USE WITH ADEQUATE VENTILATION. DO NOT USE NEAR FIRE OR FLAME. CONTAINS FLAMMABLE SOLVENTS. KEEP OUT OF THE REACH OF CHILDREN.

(1) Mask the repair area on the inside of the rear glass so that the conductive epoxy can be applied neatly. Extend the epoxy application onto the rear glass heating grid bus bar or grid line on each side of the break (Fig. 3).

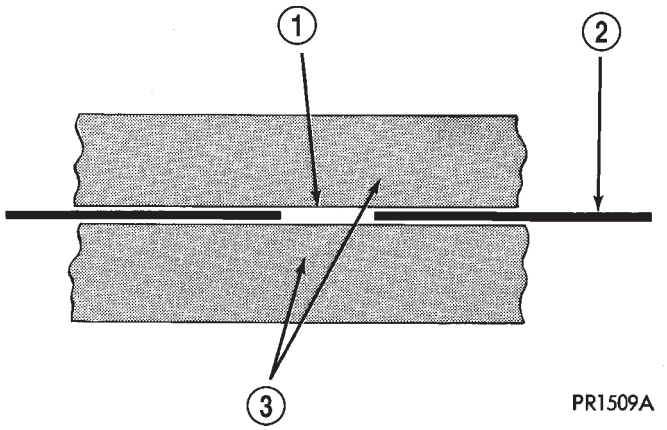


Fig. 3 GRID LINE REPAIR

1 - BREAK
2 - GRID LINE
3 - MASKING TAPE

(2) Follow the instructions in the repair kit for preparing the damaged area.

(3) Remove the package separator clamp and mix the two conductive epoxy components thoroughly within the packaging. Fold the package in half and cut the center corner to dispense the epoxy.

(4) For rear glass heating grid line repairs, mask the area to be repaired with masking tape or a template.

(5) Apply the epoxy through the slit in the masking tape or template. Overlap both ends of the break by at least 19 millimeters (0.75 inch).

(6) For a rear glass heating grid terminal replacement, mask the adjacent areas so the epoxy can be extended onto the adjacent grid line as well as onto the bus bar. Apply a thin layer of epoxy to the area where the terminal was previously fastened and onto the adjacent grid line.

(7) Apply a thin layer of conductive epoxy to the terminal and place it in the proper location on the rear glass heating grid bus bar. To prevent the terminal from moving while the epoxy is curing, it must be wedged or clamped.

(8) Carefully remove the masking tape or template.

CAUTION: Do not allow the glass surface to exceed 204° C (400° F) or the glass may fracture.

(9) Allow the epoxy to cure for 24 hours at room temperature, or use a heat gun with a 260° to 371° C (500° to 700° F) range for fifteen minutes. Hold the heat gun approximately 25.4 centimeters (10 inches) from the repair.

(10) After the conductive epoxy is properly cured, remove the wedge or clamp from the terminal. Do

not attach the wire harness connectors until the curing process is complete.

(11) Check the operation of the rear glass heating grid.

REAR WINDOW DEFOGGER RELAY

DESCRIPTION

The rear window defogger relay is an electromechanical device that switches fused battery current to the rear glass heating grid and the Light-Emitting Diode (LED) indicator of the rear window defogger switch, when the Body Control Module (BCM) rear window defogger timer and logic circuitry grounds the relay coil. The rear window defogger relay is located in the junction block, under the left end of the instrument panel in the passenger compartment.

The rear window defogger relay is a International Standards Organization (ISO) relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

The rear window defogger relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER RELAY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

RELAY TEST

The rear window defogger relay (Fig. 4) is located in the junction block, under the left end of the instrument panel in the passenger compartment. Remove the rear window defogger relay from the junction block to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 10 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, refer to the **Relay Circuit Test**. If not OK, replace the faulty relay.

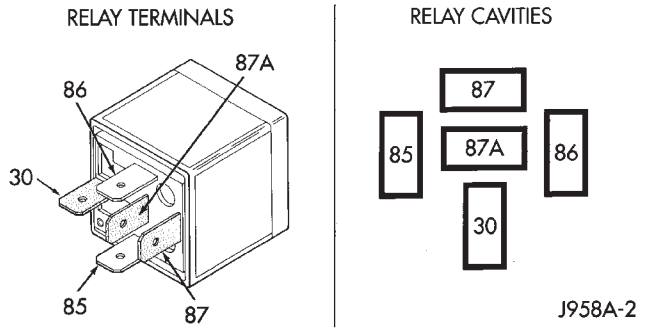


Fig. 4 REAR WINDOW DEFOGGER RELAY

TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

REAR WINDOW DEFOGGER RELAY (Continued)

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the rear glass heating grid and to the fuse in the junction block that feeds the rear window defogger switch LED indicator. There should be continuity between the cavity for relay terminal 87 and the rear glass heating grid and the rear window defogger switch LED indicator at all times. If OK, go to Step 4. If not OK, repair the open rear window defogger relay output circuit as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is connected to battery voltage and should be hot at all times. Check for battery voltage at the cavity for relay terminal 86. If OK, go to Step 5. If not OK, repair the open fused B(+) circuit to the PDC fuse as required.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. This terminal is provided with ground by the Body Control Module (BCM) rear window defogger timer and logic circuitry to energize the defogger relay. There should be continuity to the rear window defogger relay control circuit cavity of the 22-way instrument panel wire harness connector for the BCM. If OK, use a DRB scan tool and refer to the Appropriate Diagnostic Information to test the BCM. If not OK, repair the open rear window defogger relay control circuit as required.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. Refer to Instrument Panel System for the procedures.

(3) The rear window defogger relay is located on the right side of the combination flasher in the junction block (Fig. 5).

(4) Remove the rear window defogger relay from the junction block.

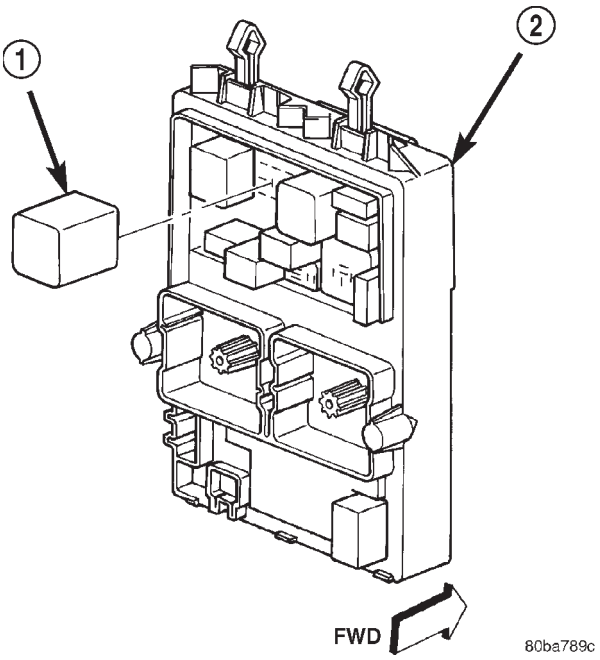


Fig. 5 JUNCTION BLOCK

1 - COMBINATION FLASHER
2 - JUNCTION BLOCK

INSTALLATION

(1) Position the rear window defogger relay in the proper receptacle in the junction block.

(2) Align the rear window defogger relay terminals with the terminal cavities in the junction block receptacle.

(3) Push in firmly on the rear window defogger relay until the terminals are fully seated in the terminal cavities in the junction block receptacle.

(4) Install the steering column opening cover onto the instrument panel. Refer to Instrument Panel System for the procedures.

(5) Reconnect the battery negative cable.

REAR WINDOW DEFOGGER SWITCH

DESCRIPTION

The rear window defogger switch is integral to the a/c heater control, which is located in the instrument panel center stack below the radio receiver. This momentary switch provides a hard wired ground signal to the Body Control Module (BCM) each time it is depressed. A Light Emitting Diode (LED) in the push button for the rear window defogger switch illuminates to indicate when the rear window defogger system is turned on.

The rear window defogger switch and the rear window defogger switch LED indicator cannot be

REAR WINDOW DEFOGGER SWITCH (Continued)

repaired and, if faulty or damaged, the entire a/c heater control must be replaced. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL)

OPERATION

When the rear window defogger switch push button is depressed, it momentarily closes the rear window defogger switch sense circuit for the BCM to ground. The BCM monitors the rear window defogger switch sense circuit. Each time the BCM rear window defogger timer and logic circuitry sees another input from the switch, it toggles a control output to the rear window defogger relay. Energizing the rear window defogger relay provides electrical current to the rear window defogger grid and to the LED indicator in the switch, which lights to indicate when the defogger system is turned on. A dedicated fuse in the junction block protects the rear window defogger relay output circuit to the LED indicator.

DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SWITCH

For complete circuit diagrams, refer to the Appropriate Wiring Information.

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(1) Disconnect and isolate the battery negative cable. Remove the a/c heater control from the instrument panel and disconnect the 11-way (manual temperature control) or 16-way (automatic zone control) instrument panel wire harness connector from the a/c heater control receptacle.

(2) Check for continuity between the ground circuit cavity of the 11-way or 16-way instrument panel wire harness connector for the a/c heater control and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit to ground as required.

(3) Connect two jumper wires to the a/c heater control 11-way or 16-way connector receptacle. Connect one jumper from the ground circuit terminal in the 11-way or 16-way a/c heater control connector receptacle to a good ground. Connect the other jumper from the fused rear window defogger relay output circuit terminal of the 11-way or 16-way connector receptacle to a 12-volt battery feed. The rear window defogger switch LED indicator should light. If OK, go to Step 4. If not OK, replace the faulty a/c heater control.

(4) Check for continuity between the ground circuit and rear window defogger switch sense circuit terminals of the 11-way or 16-way a/c heater control connector receptacle. There should be momentary continuity as the rear window defogger switch push button is depressed, and then no continuity. If OK, go to Step 5. If not OK, replace the faulty a/c heater control.

(5) Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Check for continuity between the rear window defogger switch sense circuit cavity of the 11-way or 16-way instrument panel wire harness connector for the a/c heater control and a good ground. There should be no continuity. If OK, go to Step 6. If not OK, repair the shorted rear window defogger switch sense circuit as required.

(6) Check for continuity between the rear window defogger switch sense circuit cavities of the 11-way or 16-way instrument panel wire harness connector for the a/c heater control and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, refer to (Refer to 8 - ELECTRICAL/HEATED GLASS/REAR WINDOW DEFOGGER RELAY - DIAGNOSIS AND TESTING).

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL)

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HEATED MIRRORS

DESCRIPTION

Electrically heated outside rear view mirrors are optional equipment on this model. These mirrors feature an electric heating grid located behind the mirror glass of each power operated outside rear view mirror. These heating grids consist of a single resistor wire routed in a grid-like pattern and captured between two thin sheets of plastic. When electrical current is passed through the resistor wire, it produces enough heat energy to clear the outside mirror glass of ice, snow or fog. Battery current is directed to the outside mirror heating grid only when the rear window defogger switch is in the On position.

If the outside mirror heating grids and the rear window heating grid are all inoperative, (Refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM). If the outside mirror heating grids are inoperative, but the rear window heating grid is operating as designed, (Refer to 8 - ELECTRICAL/HEATED MIRRORS - DIAGNOSIS AND TESTING)

The heating grid behind each outside mirror glass cannot be repaired and, if faulty or damaged, the entire power mirror unit must be replaced. Refer to Power Mirrors for the procedures.

OPERATION

The outside mirror heating grids are energized and de-energized by the Driver Door Module (DDM) and the Passenger Door Module (PDM) based upon the rear window defogger switch status. The Body Control Module (BCM) monitors the rear window defogger switch. When the BCM receives an input from the switch, it sends a defogger switch status message to the DDM and the PDM over the Programmable Communications Interface data bus. The DDM and PDM respond to the defogger switch status messages by energizing or de-energizing the battery current feed to their respective outside rear view mirror heating grids.

DIAGNOSIS AND TESTING - HEATED MIRRORS

For circuit descriptions and diagrams, (Refer to Appropriate Wiring Information).

(1) If both mirror heaters are inoperative, check for proper operation of the Rear Window Defogger System. (Refer to 8 - ELECTRICAL/HEATED GLASS - DIAGNOSIS AND TESTING - REAR WINDOW DEFOGGER SYSTEM). If Rear Window Defogger System operates correctly, or if only one mirror heater is inoperative, go to Step 2.

(2) Disconnect and isolate the battery negative cable. Remove the front door trim panel on the side of the inoperative mirror heater. Go to Step 3.

(3) Disconnect the door wire harness connector from the door module connector receptacle. Check for continuity between the mirror heater 12 volt supply, and the mirror heater ground. There should be continuity. If OK, go to Step 4. If not OK, check for continuity of the individual circuits between the power mirror and the door module, and of the mirror heater grid right at the power mirror.

(4) Use a DRB III® and (Refer to Appropriate Diagnostic Information) to test the door module and the PCI data bus.

HEATED SEAT SYSTEM

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HEATED SEAT SYSTEM

DESCRIPTION

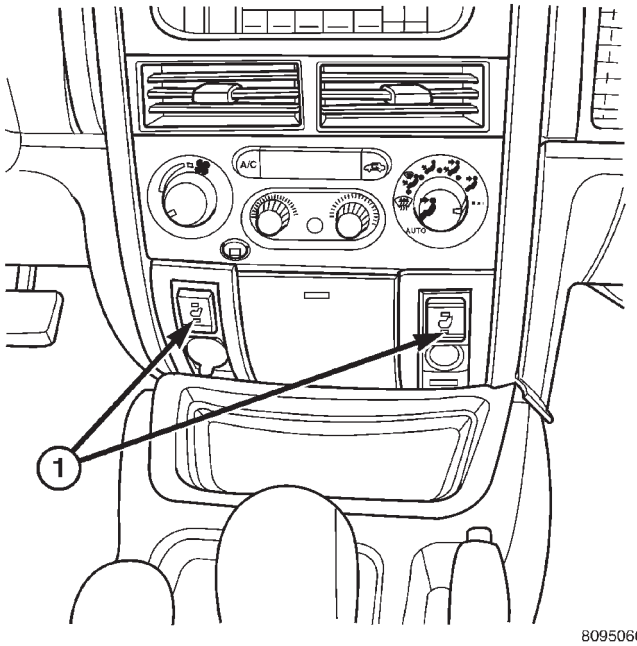


Fig. 1 HEATED SEAT SWITCHES

1 - HEATED SEAT SWITCHES

Individually controlled driver and passenger side electrically heated front seats are available factory-installed optional equipment on this model, when it is also equipped with the power seat option. The heated seat system allows both the driver and the front seat passenger the option to select one of two seat heating ranges, Low or High, or to turn the individual seat heaters Off using the heated seat switches located in the center lower bezel near the bottom of the instrument panel center stack (Fig. 1). The heated seat switch circuit operates on ignition switched battery current supplied through a fuse in the junction block, only when the ignition switch is in the On position.

The heated seat system consists of the following components :

- Heated seat elements
- Heated seat sensors
- Heated seat module (or memory heated seat module)
- Heated seat switches.

The heated seat system also relies upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of

these electronic modules or of the PCI data bus network, the use of a DRB® scan tool and the proper Diagnostic Procedures manual are recommended.

The electronic modules that may affect heated seat system operation are as follows:

- **Body Control Module (BCM)** - Refer to **Body Control Module** in Electronic Control Modules for more information.
- **Heated Seat Module (HSM)** - Refer to **Heated Seat Module** in Electronic Control Modules for more information.
- **Memory Heated Seat Module (MHSM)** - If the vehicle is equipped with the Memory System, refer to **Memory Seat Module** in Electronic Control Modules for more information.

Refer to **Power Seats Premium I/III** in the Contents of Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the major components in the heated seat system.

OPERATION

The heated seat system will only operate when the ignition switch is in the On position, and the surface temperature at the front seat heating element sensors is below the designed temperature set points of the system. The heated seat system will not operate in ambient temperatures greater than about 41° C (105° F). The front seat heating elements and sensors are hard wired to the Heated Seat Module (HSM) or the Memory Heated Seat Module (MHSM).

The heated seat switches are hard wired to the Body Control Module (BCM). The BCM monitors the heated seat switch inputs, then sends heated seat switch status messages to the HSM or MHSM over the Programmable Communications Interface (PCI) data bus. The HSM or MHSM contains the control logic for the heated seat system. The HSM or MHSM responds to the heated seat switch status messages, ignition switch status messages, and the front seat heating element sensor inputs by controlling the output to the front seat heating elements through integral solid-state relays.

When a seat heater is turned on, the sensor located on the seat cushion electric heater element provides the HSM or MHSM with an input indicating the surface temperature of the seat cushion. If the surface temperature input is below the temperature set point for the selected Low or High heated seat switch position, the HSM or MHSM energizes the integral solid-state relay, which supplies battery current to the heating elements in the seat cushion and back. When the sensor input indicates the correct temperature set point has been achieved, the HSM or MHSM de-energizes the solid-state relay. The HSM or MHSM will continue to cycle the solid-state relay as needed to maintain the temperature set point.

The HSM or MHSM and the seat heater elements operate on non-switched battery current supplied through the power seat circuit breaker in the junction block. However, the HSM or MHSM will automatically turn off the heating elements if it detects an open or short in the sensor circuit, a short or open in the heating element circuit causing an excessive current draw, or when the ignition switch is turned to the Off position.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the heated seat system.

DIAGNOSIS AND TESTING - HEATED SEAT SYSTEM

Following are tests that will help to diagnose the components and circuits that are hard wired inputs or outputs of the heated seat system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the heated seat system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the heated seat system components must be checked.

The most reliable, efficient, and accurate means to diagnose the heated seat system requires the use of a DRB scan tool and the proper Diagnostic Procedures manual. The DRB® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the Heated Seat Module (HSM) or Memory Heated Seat Module (MHSM) is receiving the proper hard wired inputs and relaying the proper hard wired outputs to perform its heated seat system functions.

For complete circuit diagrams, refer to **Wiring Diagrams**.

NOTE: DO NOT ATTEMPT TO SWAP MEMORY OR NON-MEMORY HEATED SEAT MODULES FROM ONE VEHICLE TO ANOTHER. MOST OF THESE MODULES ARE VEHICLE FEATURE SPECIFIC AND THEREFORE NOT INTERCHANGEABLE. ALWAYS USE THE CORRECT PART NUMBERED MODULE WHEN DIAGNOSING OR REPLACING A MODULE.

WARNING: REFER TO THE RESTRAINTS SECTION OF THIS MANUAL BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

HEATED SEAT SYSTEM (Continued)

PRELIMINARY TEST

Before testing the individual components in the heated seat system, check the following:

- If the heated seat switch LED indicators do not light with the ignition switch in the On position and the heated seat switch in the Low or High position, check the fused ignition switch output (run) fuse in the junction block. If OK, refer to **Heated Seat Switch Diagnosis and Testing** in this section. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.
- If the heated seat switch LED indicators light, but the heating elements do not heat, check the power seat circuit breaker in the junction block. If OK, refer to **Heated Seat Element Diagnosis and Testing** in this section of the manual. If not OK, replace the faulty power seat circuit breaker.

DRIVER HEATED SEAT SWITCH

DESCRIPTION

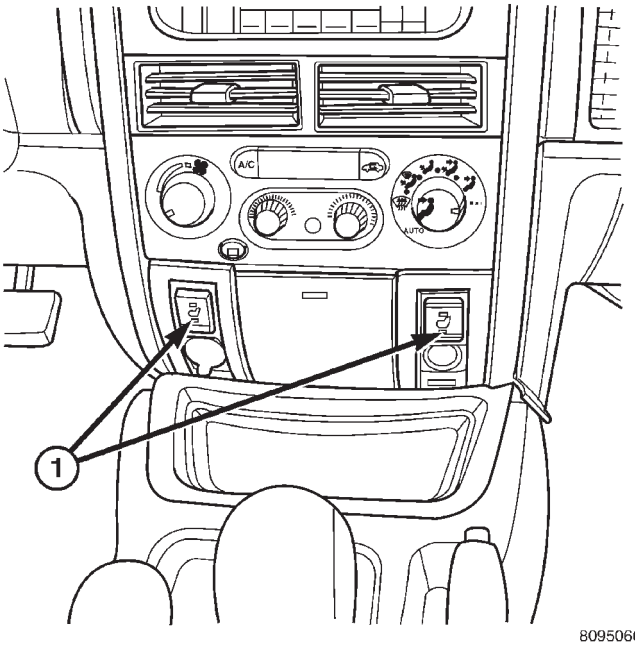


Fig. 2 HEATED SEAT SWITCHES

1 - HEATED SEAT SWITCHES

The heated seat switches are mounted in the instrument panel center lower bezel (Fig. 2), which is located near the bottom of the instrument panel center stack. The two three-position rocker-type switches, one switch for each front seat, provide a resistor multiplexed signal to the Body Control Module (BCM) through separate hard wired circuits. Each switch has an Off, Low, and High position so that both the driver and the front seat passenger can select a preferred seat heating mode. Each switch has two Light-Emitting Diodes (LED), one each for the Low position and the High position, which light to indicate that the heater for the seat that the switch controls is turned on. Each switch is also back lit by a replaceable incandescent bulb.

The heated seat switches and their LEDs cannot be repaired. If either switch or LED is faulty or damaged, the entire switch unit must be replaced. The incandescent switch illumination bulb and bulb holder units are available for service replacement.

OPERATION

There are three positions that can be selected with each of the heated seat switches: Off, Low, or High. When the top of the switch rocker is fully depressed, the High position is selected and the high position LED indicator illuminates. When the bottom of the switch rocker is fully depressed, the Low position is selected and the low position LED indicator illuminates. When the switch rocker is moved to its neutral position, Off is selected and both LED indicators are extinguished.

Both switches provide separate resistor multiplexed hard wire inputs to the BCM to indicate the selected switch position. The BCM monitors the switch inputs and sends heated seat switch status messages to the Heated Seat Module (HSM) or the Memory Heated Seat Module (MHSM) over the Programmable Communications Interface (PCI) data bus. The HSM or MHSM responds to the heated seat switch status messages by controlling the output to the seat heater elements of the selected seat. The Low heat position set point is about 36° C (97° F), and the High heat position set point is about 41° C (105° F).

DIAGNOSIS AND TESTING - DRIVER HEATED SEAT SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

WARNING: REFER TO THE RESTRAINTS SECTION OF THIS MANUAL BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check the fused ignition switch output (run) fuse in the junction block. If OK, go to Step 2. If not

DRIVER HEATED SEAT SWITCH (Continued)

OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run) circuit to the ignition switch as required.

(3) Disconnect and isolate the battery negative cable. Remove the lower center bezel from the instrument panel and disconnect the instrument panel wire harness connectors from both heated seat switch connector receptacles. Check for continuity between the ground circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es) and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es). If OK, turn the ignition switch to the Off position, disconnect and isolate the battery negative cable, and go to Step 5. If not OK, repair the open fused ignition switch output (run) circuit to the junction block fuse as required.

(5) Test the heated seat switch(es) (Fig. 3) as shown in the Heated Seat Switch Test chart. If OK, go to Step 6. If not OK, replace the faulty heated seat switch(es).

HEATED SEAT SWITCH TEST		
SWITCH POSITION	RESISTANCE BETWEEN	RESISTANCE (OHMS)
Off	Pin 1 & 6	55
Low	Pin 1 & 6	1430
High	Pin 1 & 6	365
All resistance values are ±5%.		

(6) Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Check for continuity between the seat heater switch sensor ground circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es) and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the shorted seat heater switch sensor ground circuit as required.

(7) Check for continuity between the seat heater switch sensor ground circuit cavities of the instrument panel wire harness connector for the in operative heated seat switch(es) and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, go to Step 8. If not OK, repair the open seat heater switch sensor ground circuit as required.

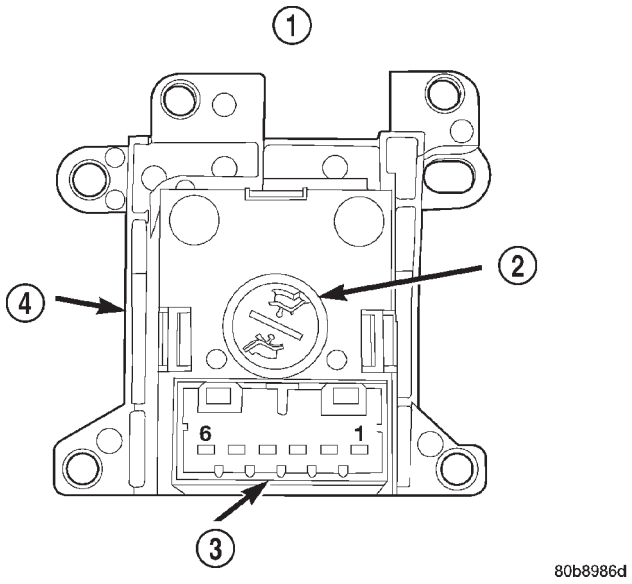


Fig. 3 Rear of Heated Seat Switch

1 - LEFT SHOWN (RIGHT TYPICAL)
2 - ILLUMINATION LAMP
3 - CONNECTOR RECEPTACLE
4 - HEATED SEAT SWITCH

(8) Check for continuity between the seat heater switch mux circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch and a good ground. There should be no continuity. If OK, go to Step 9. If not OK, repair the shorted seat heater switch mux circuit as required.

(9) Check for continuity between the seat heater switch mux circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, use a DRB® scan tool and the proper Diagnostic Procedures manual to test the BCM. If not OK, repair the open seat heater switch mux circuit as required.

REMOVAL

WARNING: REFER TO THE RESTRAINTS SECTION OF THIS MANUAL BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

DRIVER HEATED SEAT SWITCH (Continued)

(2) Remove the center lower bezel from the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in the Body section of this manual for the procedure.

(3) Remove the four screws that secure the heated seat switch to the back of the instrument panel center lower bezel (Fig. 4).

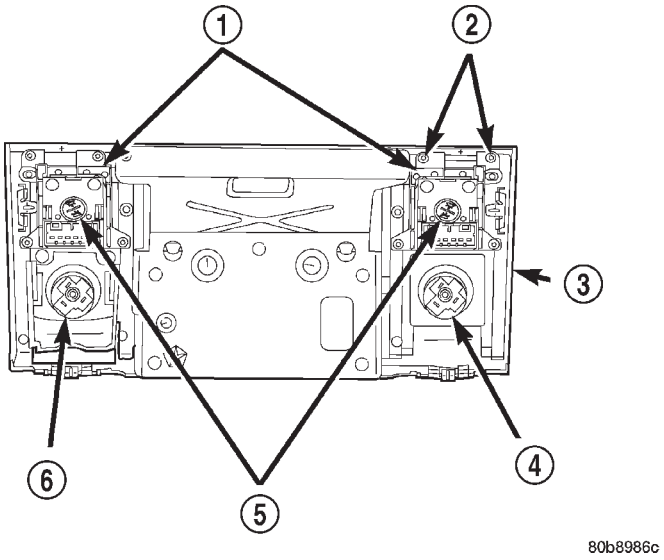


Fig. 4 Heated Seat Switch Remove/Install

1 - HEATED SEAT SWITCHES
2 - SCREWS (4)
3 - CENTER LOWER BEZEL
4 - CIGAR LIGHTER
5 - ILLUMINATION LAMPS
6 - POWER OUTLET

(4) Remove the heated seat switch from the back of the instrument panel center lower bezel.

INSTALLATION

(1) Position the heated seat switch onto the back of the instrument panel center lower bezel.

(2) Install and tighten the four screws that secure the heated seat switch to the back of the instrument panel center lower bezel. Tighten the screws to 1.5 N·m (13 in. lbs.).

(3) Install the center lower bezel onto the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in the Body section of this manual for the procedure.

(4) Reconnect the battery negative cable.

HEATED SEAT ELEMENT

DESCRIPTION

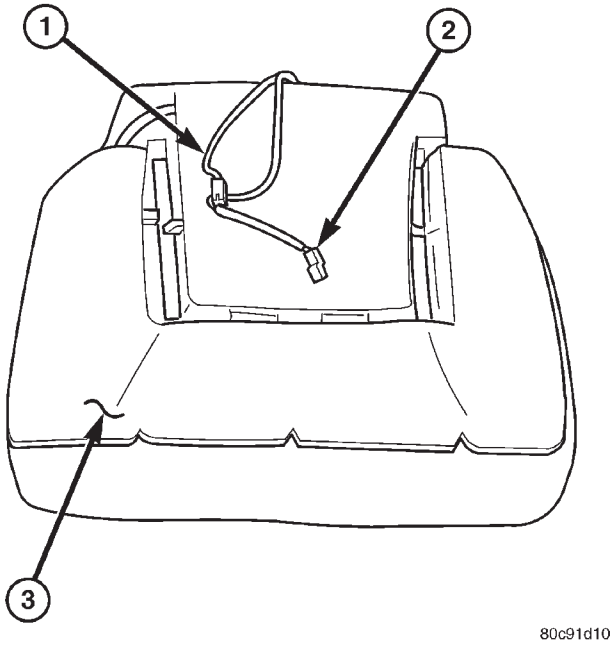


Fig. 5 HEATING ELEMENT INSTALLED

1 - SEAT BACK WIRE HARNESS
2 - HEATED SEAT WIRE HARNESS CONNECTOR
3 - HEATED SEAT CUSHION ELEMENT

The heated seat system includes two seat heating elements in each front seat, one for the seat cushion (Fig. 5)and the other for the seat back. One type of heated seat element is offered. All models use two resistor wire heating elements for each seat that are connected in series with the Heated Seat Module (HSM).

The seat heating elements are glued to the seat and seat back cushions. The heated seat elements can be replaced if faulty or damaged, service replacement seat or seat back elements are available. Refer to the procedure in this section for detailed instructions.

OPERATION

The heated seat elements resist the flow of electrical current. When battery current is passed through the elements, the energy lost by the resistance of the elements to the current flow is released in the form of heat. The temperature sensor is a NTC thermistor. When the temperature of the seat cushion cover rises, the resistance of the sensor decreases. The HSM or MHSM supplies a five-volt current to one side of each sensor, and monitors the voltage drop through the sensor on a return circuit. The MSM or MHSM uses this temperature sensor input to monitor the temperature of the seat, and regulates the current flow to the seat heating elements accordingly.

HEATED SEAT ELEMENT (Continued)

DIAGNOSIS AND TESTING - HEATED SEAT ELEMENT

RESISTOR WIRE ELEMENT

(1) Disconnect and isolate the battery negative cable. The power seat wire harness connectors for the seat cushion and seat back heating elements are secured to a bracket located under the rear edge of the seat cushion frame. Refer to **Wiring** for complete circuit schematics and connector locations.

(2) Disconnect the Heated Seat Module (HSM) or Memory Heated Seat Module (MHSM) C2 connector. Check for continuity between the SEAT HEATER B(+) DRIVER circuit cavity of the C2 connector and the seat cushion frame. There should be NO continuity. If OK, go to Step 3. If not OK, repair the shorted seat heater B(+) driver circuit as required.

NOTE: WHEN CHECKING HEATED SEAT ELEMENTS FOR CONTINUITY, BE CERTAIN TO MOVE THE HEATING ELEMENT BEING CHECKED. MOVING THE ELEMENT, SUCH AS SITTING IN THE SEAT WILL ELIMINATE THE POSSIBILITY OF AN INTERMITTENT OPEN IN THE ELEMENT WHICH WOULD ONLY BE EVIDENT IF THE ELEMENT WAS MOVED IN A CERTAIN DIRECTION. FAILURE TO CHECK THE ELEMENT IN VARIOUS POSITIONS COULD RESULT IN AN INCOMPLETE TEST.

(3) Check for continuity between the SEAT HEATER B(+) DRIVER circuit cavity of the C2 connector and the ground circuit cavity. There should be continuity at all times (even upon moving or sitting in the seat). If OK, proceed with testing the other components in the heated seat system. If not OK, replace the open heating element. Refer to the procedure in this section of the manual.

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the appropriate seat cushion or seat back trim cover. Refer to the Body section of the service manual for the procedures.

(3) Disconnect the inoperative heated seat cushion or seat back element electrical connectors.

(4) Gently peel-off defective heater element from foam cushion.

INSTALLATION

(1) Peel off the adhesive backing on the back of the replacement heating element and install on cushion pad in the same location as the original (Fig. 6).

CAUTION: During the installation of the replacement heating element, be very careful not to fold or crease the element assembly. Folds or creases will cause premature failure.

(2) Connect the new heating element electrical connectors (Fig. 6).

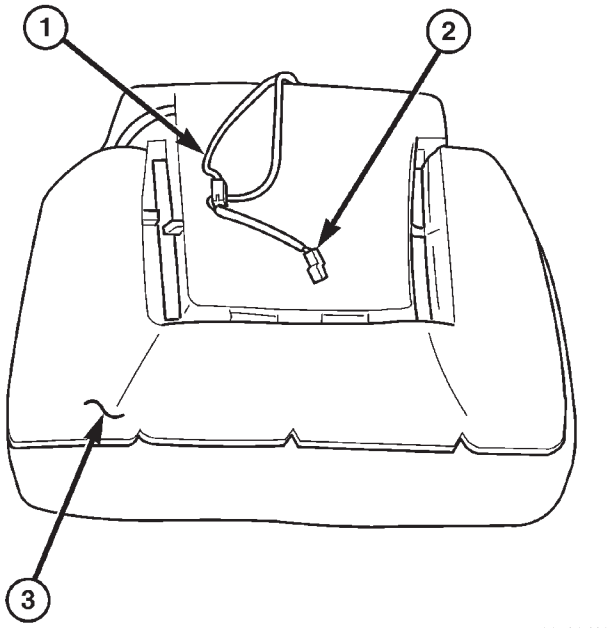


Fig. 6 HEATING ELEMENT INSTALLED

1 - SEAT BACK WIRE HARNESS
2 - HEATED SEAT WIRE HARNESS CONNECTOR
3 - HEATED SEAT CUSHION ELEMENT

(3) Connect the negative battery cable.

(4) Verify heated seat system operation.

(5) Install the appropriate seat cushion or seat back trim cover. Make certain the seat wire harness is correctly routed through the seat and seat back. The excess wire between the cushion and back elements should be securely tucked between the rear of the cushion foam and the rear carpet flap of the trim cover.

HEATED SEAT SENSOR

DESCRIPTION

The heated seat temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. One temperature sensor is used for each seat. This temperature sensor is located in the seat cushion heating element on all models.

The heated seat temperature sensor cannot be repaired or adjusted and must be replaced if defective. The heated seat cushion element must be replaced if the temperature sensor is defective. Refer to the procedure in this section of the service manual.

DIAGNOSIS AND TESTING - HEATED SEAT SENSOR

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect the Heated Seat Module (HSM) or Memory Heated Seat Module (MHSM) C1 connector. Check for continuity between the SEAT SENSOR 5V SUPPLY circuit cavity and the seat cushion frame. There should be **NO** continuity. If OK, go to Step 2. If not OK, repair the shorted seat sensor 5V supply circuit as required.

(2) Check for continuity between the SEAT SENSOR 5V SUPPLY circuit cavity of the 4-way power seat wire harness connector and the C1 connector for the HSM or MHSM. There should be continuity. If OK, go to Step 3. If not OK, repair the open seat sensor 5V supply circuit as required.

(3) Connect the module electrical connector. Turn system ON, using a voltmeter, backprobe the HSM or MHSM C1 connector on the SEAT TEMPERATURE SENSOR INPUT circuit cavity. Voltage should be present (2-4 volts). If OK, proceed with testing the other components in the heated seat system. If not OK, refer to Heated Seat Module Diagnosis and Testing in the electronic control modules section of this manual.

REMOVAL

(1) For heated seat sensor replacement procedure (Refer to 8 - ELECTRICAL/HEATED SEATS/ HEATED SEAT ELEMENT - REMOVAL).

PASSENGER HEATED SEAT SWITCH

DESCRIPTION

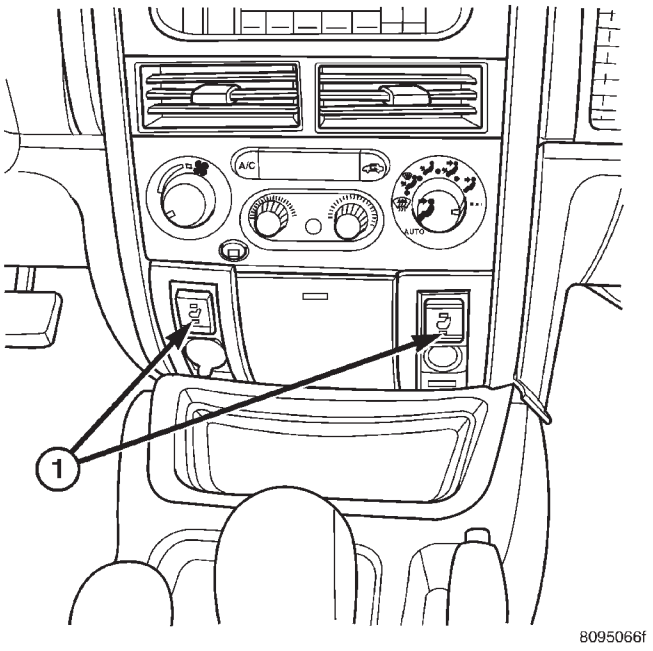


Fig. 7 HEATED SEAT SWITCHES

1 - HEATED SEAT SWITCHES

The heated seat switches are mounted in the instrument panel center lower bezel (Fig. 7), which is located near the bottom of the instrument panel center stack. The two three-position rocker-type switches, one switch for each front seat, provide a resistor multiplexed signal to the Body Control Module (BCM) through separate hard wired circuits. Each switch has an Off, Low, and High position so that both the driver and the front seat passenger can select a preferred seat heating mode. Each switch has two Light-Emitting Diodes (LED), one each for the Low position and the High position, which light to indicate that the heater for the seat that the switch controls is turned on. Each switch is also back lit by a replaceable incandescent bulb.

The heated seat switches and their LEDs cannot be repaired. If either switch or LED is faulty or damaged, the entire switch unit must be replaced. The incandescent switch illumination bulb and bulb holder units are available for service replacement.

PASSENGER HEATED SEAT SWITCH (Continued)

OPERATION

There are three positions that can be selected with each of the heated seat switches: Off, Low, or High. When the top of the switch rocker is fully depressed, the High position is selected and the high position LED indicator illuminates. When the bottom of the switch rocker is fully depressed, the Low position is selected and the low position LED indicator illuminates. When the switch rocker is moved to its neutral position, Off is selected and both LED indicators are extinguished.

Both switches provide separate resistor multiplexed hard wire inputs to the BCM to indicate the selected switch position. The BCM monitors the switch inputs and sends heated seat switch status messages to the Heated Seat Module (HSM) or the Memory Heated Seat Module (MHSM) over the Programmable Communications Interface (PCI) data bus. The HSM or MHSM responds to the heated seat switch status messages by controlling the output to the seat heater elements of the selected seat. The Low heat position set point is about 36° C (97° F), and the High heat position set point is about 41° C (105° F).

DIAGNOSIS AND TESTING - PASSENGER HEATED SEAT SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

WARNING: REFER TO THE RESTRAINTS SECTION OF THIS MANUAL BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check the fused ignition switch output (run) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run) circuit to the ignition switch as required.

(3) Disconnect and isolate the battery negative cable. Remove the lower center bezel from the instrument panel and disconnect the instrument panel wire harness connectors from both heated seat switch connector receptacles. Check for continuity between the ground circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es) and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es). If OK, turn the ignition switch to the Off position, disconnect and isolate the battery negative cable, and go to Step 5. If not OK, repair the open fused ignition switch output (run) circuit to the junction block fuse as required.

(5) Test the heated seat switch(es) (Fig. 8) as shown in the Heated Seat Switch Test chart. If OK, go to Step 6. If not OK, replace the faulty heated seat switch(es).

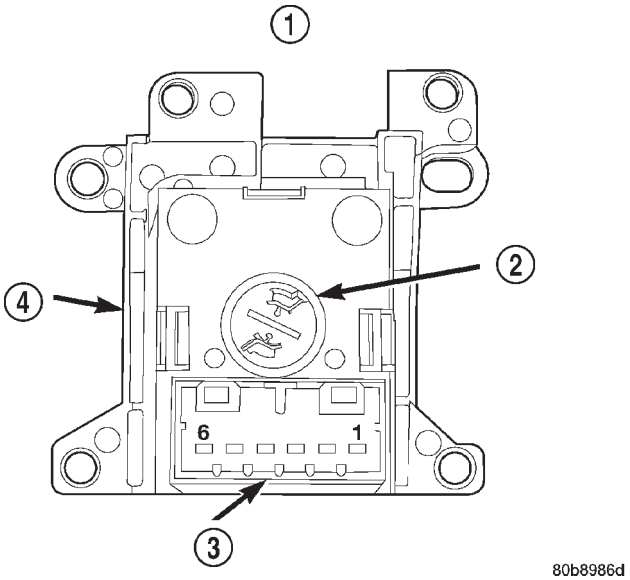


Fig. 8 Rear of Heated Seat Switch

1 - LEFT SHOWN (RIGHT TYPICAL)
2 - ILLUMINATION LAMP
3 - CONNECTOR RECEPTACLE
4 - HEATED SEAT SWITCH

HEATED SEAT SWITCH TEST		
SWITCH POSITION	RESISTANCE BETWEEN	RESISTANCE (OHMS)
Off	Pin 1 & 6	55
Low	Pin 1 & 6	1430
High	Pin 1 & 6	365
All resistance values are ±5%.		

PASSENGER HEATED SEAT SWITCH (Continued)

(6) Disconnect the 22-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Check for continuity between the seat heater switch sensor ground circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch(es) and a good ground. There should be no continuity. If OK, go to Step 7. If not OK, repair the shorted seat heater switch sensor ground circuit as required.

(7) Check for continuity between the seat heater switch sensor ground circuit cavities of the instrument panel wire harness connector for the in operative heated seat switch(es) and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, go to Step 8. If not OK, repair the open seat heater switch sensor ground circuit as required.

(8) Check for continuity between the seat heater switch mux circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch and a good ground. There should be no continuity. If OK, go to Step 9. If not OK, repair the shorted seat heater switch mux circuit as required.

(9) Check for continuity between the seat heater switch mux circuit cavity of the instrument panel wire harness connector for the inoperative heated seat switch and the 22-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, use a DRB® scan tool and the proper Diagnostic Procedures manual to test the BCM. If not OK, repair the open seat heater switch mux circuit as required.

REMOVAL

WARNING: REFER TO THE RESTRAINTS SECTION OF THIS MANUAL BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center lower bezel from the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in the Body section of this manual for the procedure.

(3) Remove the four screws that secure the heated seat switch to the back of the instrument panel center lower bezel (Fig. 9).

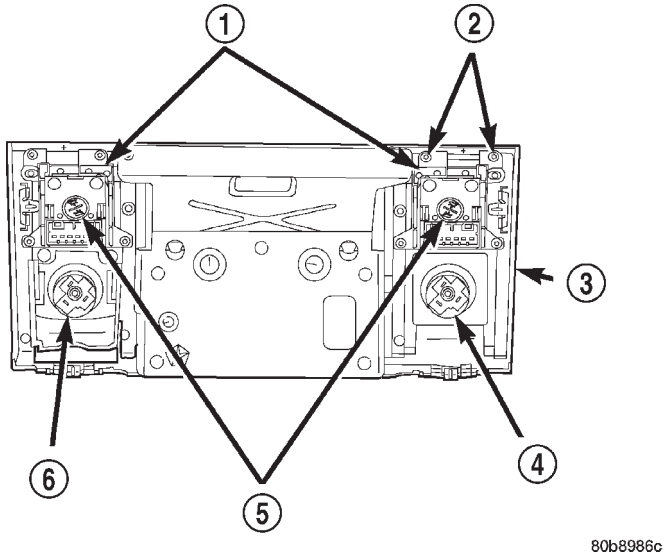


Fig. 9 Heated Seat Switch Remove/Install

1 - HEATED SEAT SWITCHES
2 - SCREWS (4)
3 - CENTER LOWER BEZEL
4 - CIGAR LIGHTER
5 - ILLUMINATION LAMPS
6 - POWER OUTLET

(4) Remove the heated seat switch from the back of the instrument panel center lower bezel.

INSTALLATION

(1) Position the heated seat switch onto the back of the instrument panel center lower bezel.

(2) Install and tighten the four screws that secure the heated seat switch to the back of the instrument panel center lower bezel. Tighten the screws to 1.5 N·m (13 in. lbs.).

(3) Install the center lower bezel onto the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in the Body section of this manual for the procedure.

(4) Reconnect the battery negative cable.

HORN

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HORN SYSTEM

DESCRIPTION

A dual-note electric horn system is standard factory-installed equipment on this model. The standard equipment horn system features one low-note horn unit and one high-note horn unit. The horn system allows the vehicle operator to provide an audible warning of the presence or approach of the vehicle to pedestrians and the drivers of other vehicles in near proximity. The horn system uses a non-switched source of battery current so that the system will remain functional, regardless of the ignition switch position.

The horn system can also be activated by the Body Control Module (BCM). The BCM is programmed to activate the horns in order to provide the following features:

- Remote Keyless Entry (RKE) system lock request audible verification (except export)
- RKE system panic mode audible alert
- Vehicle Theft Security System (VTSS) audible alarm.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. Refer to Overhead Console for more information on the customer programmable feature options. Customer programmable feature options affecting the horn system include:

- **Sound Horn on Lock** - Allows the option of having the horn sound a short chirp as an audible verification that the RKE system received a valid Lock request from the RKE transmitter, or having no audible verification.

The horn system includes the following components:

- Clockspring
- Horns
- Horn relay
- Horn switch

Certain functions and features of the horn system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect horn system operation are as follows:

- **Body Control Module (BCM)** (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODUL - DESCRIPTION) for more information.
- **Electronic Vehicle Information Center (EVIC)** (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION) for more information.

(Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - DESCRIPTION) for more information on this component. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention,

connector pin-out information and location views for the various wire harness connectors, splices and grounds. Following are general descriptions of the remaining major components in the horn system.

OPERATION

The horn system is activated by a horn switch concealed beneath the driver side airbag module trim cover in the center of the steering wheel. Depressing the center of the driver side airbag module trim cover closes the horn switch. Closing the horn switch activates the horn relay. The activated horn relay then switches the battery current needed to energize the horns.

The BCM can also activate the horn system by energizing the horn relay through a single hard wired output circuit. The BCM energizes and de-energizes the horn relay in response to internal programming as well as message inputs received over the Programmable Communications Interface (PCI) data bus network. The BCM can energize the horn relay for a single chirp (RKE lock request), or for extended operation (RKE panic mode and VTSS alarm mode).

Refer to the owner's manual in the vehicle glove box for more information on the features, use and operation of the horn system.

DIAGNOSIS AND TESTING - HORN SYSTEM

In most cases, any problem involving continually sounding horns can be quickly alleviated by removing the horn relay from the Power Distribution Center (PDC). Refer to Horn Relay for the proper removal procedure. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

HORN SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
BOTH HORNS INOPERATIVE	1. Faulty fuse.	1. Check the fuses in the Power Distribution Center (PDC) and the Junction Block (JB). Replace the fuse and repair the shorted circuit or component, if required.
	2. Faulty horn relay.	2. Refer to Horn Relay for the proper horn relay diagnosis and testing procedures. Replace the horn relay or repair the open horn relay circuit, if required.
	3. Faulty horn switch.	3. Refer to Horn Switch for the proper horn switch diagnosis and testing procedures. Replace the horn switch or repair the open horn switch circuit, if required.
	4. Faulty horns.	4. Refer to Horn for the proper horn diagnosis and testing procedures. Replace the horns or repair the open horn circuit, if required.
ONE HORN INOPERATIVE	1. Faulty horn.	1. Refer to Horn for the proper horn diagnosis and testing procedures. Replace the horn or repair the open horn circuit, if required.

HORN SYSTEM (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
HORN SOUNDS CONTINUOUSLY	1. Faulty horn relay.	1. Refer to Horn Relay for the proper horn relay diagnosis and testing procedures. Replace the horn relay or repair the shorted horn relay control circuit, if required.
	2. Faulty horn switch.	2. Refer to Horn Switch for the proper horn switch diagnosis and testing procedures. Replace the horn switch or repair the shorted horn switch circuit, if required.

HORN

DESCRIPTION

The dual electromagnetic diaphragm-type horns are standard equipment on this model. Both horns are secured to a mounting bracket. The mounting bracket is secured with a screw to the back side of the right extension of the radiator closure assembly, just ahead of the right front wheel house and below the front wheel house extension. The two horns are connected in parallel. Each horn is grounded through its wire harness connector and circuit to an eyelet secured to the right inner fender shield near the battery, and receives battery feed through the closed contacts of the horn relay.

The horns cannot be repaired or adjusted and, if faulty or damaged, they must be individually replaced.

OPERATION

Within the two halves of the molded plastic horn housing are a flexible diaphragm, a plunger, an electromagnetic coil and a set of contact points. The diaphragm is secured in suspension around its perimeter by the mating surfaces of the horn housing. The plunger is secured to the center of the diaphragm and extends into the center of the electromagnet. The contact points control the current flow through the electromagnet.

When the horn is energized, electrical current flows through the closed contact points to the electromagnet. The resulting electromagnetic field draws the plunger and diaphragm toward it until that movement mechanically opens the contact points. When the contact points open, the electromagnetic field collapses allowing the plunger and diaphragm to return to their relaxed positions and closing the contact points again. This cycle continues repeating at a very rapid rate producing the vibration and movement of air that creates the sound that is directed through the horn outlet.

DIAGNOSIS AND TESTING - HORN

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect the wire harness connector(s) from the horn connector receptacle(s). Measure the resistance between the ground circuit cavity of the horn(s) wire harness connector(s) and a good ground. There should be no measurable resistance. If OK, go to Step 2. If not OK, repair the open ground circuit to ground as required.

(2) Check for battery voltage at the horn relay output circuit cavity of the horn(s) wire harness connector(s). There should be zero volts. If OK, go to Step 3. If not OK, repair the shorted horn relay output circuit or replace the faulty horn relay as required.

(3) Depress the horn switch. There should now be battery voltage at the horn relay output circuit cavity of the horn(s) wire harness connector(s). If OK, replace the faulty horns. If not OK, repair the open horn relay output circuit to the horn relay as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Raise and support the vehicle.

(3) Remove the lower front half of the inner liner from the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - REMOVAL).

(4) Reach through the front of the right front fender wheel house opening to access and disconnect the two right headlamp and dash wire harness connectors from the horn connector receptacles (Fig. 1). Be certain to disengage the connector lock tabs before disconnecting them from the horn connector receptacles.

(5) Remove the screw that secures the horn mounting bracket to the right extension of the radiator closure assembly.

HORN (Continued)

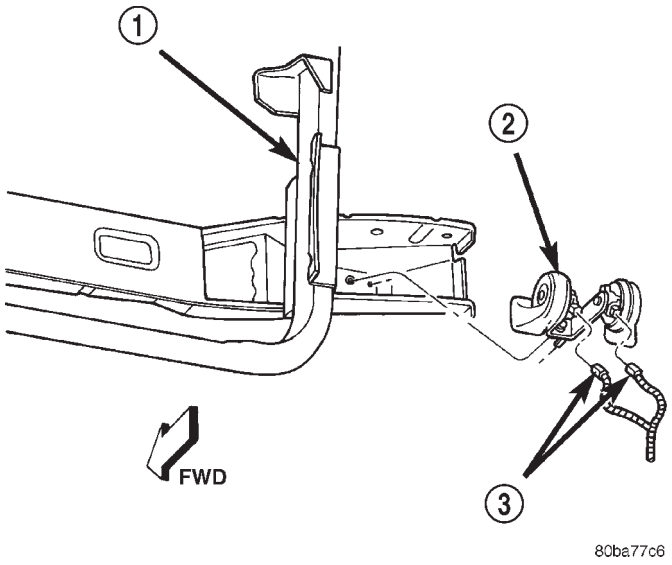


Fig. 1 Horns Remove/Install

1 - RADIATOR CLOSURE ASSEMBLY
2 - HORNS AND MOUNTING BRACKET
3 - RIGHT HEADLAMP AND DASH WIRE HARNESS CONNECTORS

(6) Remove both horns and the mounting bracket from the right extension of the radiator closure assembly as a unit.

INSTALLATION

(1) Position both horns and the mounting bracket onto the right extension of the radiator closure assembly as a unit.

(2) Install and tighten the screw that secures the horn mounting bracket to the right extension of the radiator closure assembly. Tighten the screw to 11.3 N·m (100 in. lbs.).

(3) Reconnect the two right headlamp and dash wire harness connectors to the horn connector receptacles. Be certain to engage the connector lock tabs after reconnecting them to the horn connector receptacles.

(4) Install the lower front half of the inner liner to the right front fender wheel house. (Refer to 23 - BODY/EXTERIOR/FRONT FENDER - INSTALLATION) for the procedure.

(5) Lower the vehicle.

(6) Reconnect the battery negative cable.

HORN RELAY

DESCRIPTION

The horn relay is a electromechanical device that switches battery current to the horn when the horn switch grounds the relay coil. The horn relay is located in the Power Distribution Center (PDC) in the engine compartment. If a problem is encountered with a continuously sounding horn, it can usually be quickly resolved by removing the horn relay from the PDC until further diagnosis is completed. See the fuse and relay layout label affixed to the inside surface of the PDC cover for horn relay identification and location.

The horn relay is a International Standards Organization (ISO) micro-relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The ISO micro-relay terminal functions are the same as a conventional ISO relay. However, the ISO micro-relay terminal pattern (or footprint) is different, the current capacity is lower, and the physical dimensions are smaller than those of the conventional ISO relay.

The horn relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - HORN RELAY

The horn relay (Fig. 2) is located in the Power Distribution Center (PDC) between the battery and the right inner fender shield on the passenger side of the engine compartment. If a problem is encountered with a continuously sounding horn, it can usually be quickly resolved by removing the horn relay from the PDC until further diagnosis is completed. See the fuse and relay layout label affixed to the inside surface of the PDC cover for horn relay identification and location. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

HORN RELAY (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the horn relay from the PDC. (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - REMOVAL) for the procedures.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

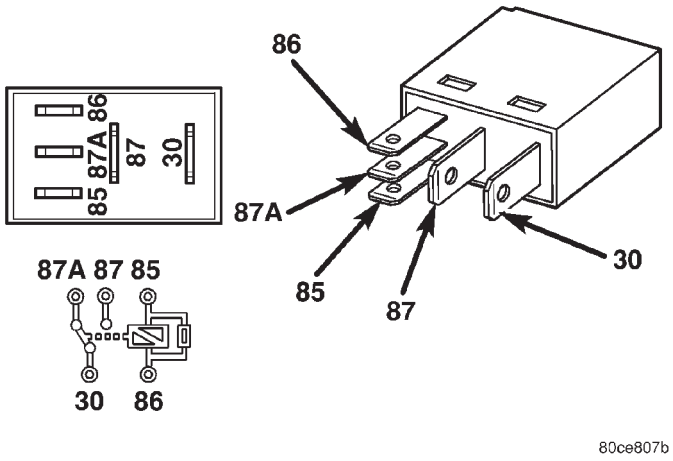


Fig. 2 Horn Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to battery voltage and should be hot at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the horn(s). There should be continuity between the cavity for relay terminal 87 and the horn relay output circuit cavity of each horn wire harness connector at all times. If OK, go to Step 4. If not OK, repair the open circuit to the horn(s) as required.

(4) The coil battery terminal (86) is connected to the electromagnet in the relay. It is connected to battery voltage and should be hot at all times. Check for battery voltage at the cavity for relay terminal 86. If OK, go to Step 5. If not OK, repair the open circuit to the fuse in the PDC as required.

(5) The coil ground terminal (85) is connected to the electromagnet in the relay. It is grounded through the horn switch when the horn switch is depressed. The horn relay coil ground terminal can also be grounded by the Body Control Module (BCM) in response to certain inputs related to the RKE system or the Vehicle Theft Security System. Check for continuity to ground at the cavity for relay terminal 85. There should be continuity with the horn switch depressed, and no continuity with the horn switch released. If not OK, (Refer to 8 - ELECTRICAL/HORN/HORN SWITCH - DIAGNOSIS AND TESTING).

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 3) .

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for horn relay identification and location.

(4) Remove the horn relay from the PDC.

INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper horn relay location.

(2) Position the horn relay in the proper receptacle in the PDC.

(3) Align the horn relay terminals with the terminal cavities in the PDC receptacle.

(4) Push down firmly on the horn relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Install the cover onto the PDC.

(6) Reconnect the battery negative cable.

HORN RELAY (Continued)

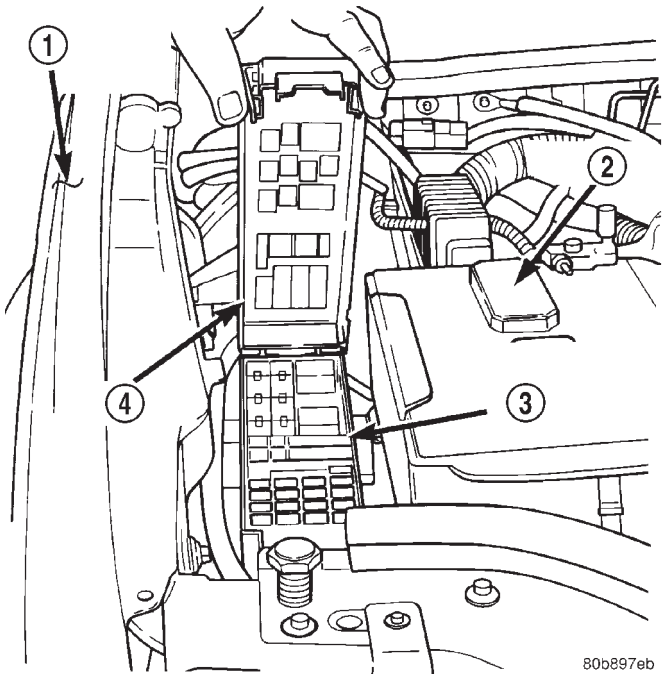


Fig. 3 Power Distribution Center

1 - RIGHT FENDER
2 - BATTERY
3 - POWER DISTRIBUTION CENTER
4 - COVER

HORN SWITCH

DESCRIPTION

A center-blow, normally open, resistive membrane-type horn switch is secured in a plastic tray that is inserted in a pocket sewn on the front of the driver side airbag retainer strap. The horn switch is concealed behind the driver side airbag module trim cover in the center of the steering wheel. The switch consists of two plastic membranes, one that is flat and one that is slightly convex. These two membranes are secured to each other around the perimeter. Inside the switch, the centers of the facing surfaces of these membranes each has a grid made with an electrically conductive material applied to it. One of the grids is connected to a circuit that provides it with continuity to ground at all times. The grid of the other membrane is connected to the horn relay control circuit.

The steering wheel and steering column must be properly grounded in order for the horn switch to function properly. The horn switch and plastic tray are serviced as a unit. If the horn switch is damaged or faulty, or if the driver side airbag is deployed, the horn switch and tray must be replaced as a unit.

OPERATION

When the center area of the driver side airbag trim cover is depressed, the electrically conductive grids on the facing surfaces of the horn switch membranes contact each other, closing the switch circuit. The completed horn switch circuit provides a ground for the control coil side of the horn relay, which activates the relay. When the horn switch is released, the resistive tension of the convex membrane separates the two electrically conductive grids and opens the switch circuit.

DIAGNOSIS AND TESTING - HORN SWITCH

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the steering column opening cover from the instrument panel.

(2) Check for continuity between the metal steering column jacket and a good ground. There should be continuity. If OK, go to Step 3. If not OK, refer to Steering, Column for proper installation of the steering column.

(3) Remove the driver side airbag module from the steering wheel. Disconnect the horn switch wire harness connectors from the driver side airbag module.

(4) Remove the horn relay from the Power Distribution Center (PDC). Check for continuity between the steering column half of the horn switch feed wire harness connector and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted horn relay control circuit to the horn relay in the PDC as required.

(5) Check for continuity between the steering column half of the horn switch feed wire harness connector and the horn relay control circuit cavity for the horn relay in the PDC. There should be continuity. If OK, go to Step 6. If not OK, repair the open horn relay control circuit to the horn relay in the PDC as required.

HORN SWITCH (Continued)

(6) Check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should be no continuity. If OK, go to Step 7. If not OK, replace the faulty horn switch.

(7) Depress the center of the driver side airbag module trim cover and check for continuity between the horn switch feed wire and the horn switch ground wire on the driver side airbag module. There should now be continuity. If not OK, replace the faulty horn switch.

REMOVAL

WARNING:

• ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

• THE HORN SWITCH IS INTEGRAL TO THE DRIVER SIDE AIRBAG MODULE. SERVICE OF THIS COMPONENT SHOULD BE PERFORMED ONLY BY CHRYSLER-TRAINED AND AUTHORIZED DEALER SERVICE TECHNICIANS. FAILURE TO TAKE THE PROPER PRECAUTIONS OR TO FOLLOW THE PROPER PROCEDURES COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim cover from the driver side airbag module. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL) for the procedure.

(3) Remove the horn switch and tray as a unit from the pouch on the retaining strap of the driver side airbag module (Fig. 4).

INSTALLATION

WARNING:

• ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

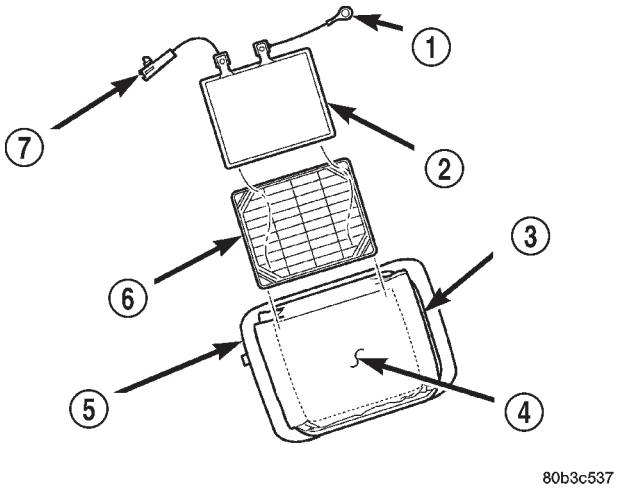


Fig. 4 Horn Switch Remove/Install

1 - HORN SWITCH GROUND WIRE EYELET
2 - HORN SWITCH
3 - AIRBAG RETAINING STRAP
4 - POUCH
5 - DRIVER SIDE AIRBAG MODULE (TRIM COVER REMOVED)
6 - TRAY
7 - HORN SWITCH FEED WIRE CONNECTOR

• THE HORN SWITCH IS INTEGRAL TO THE DRIVER SIDE AIRBAG MODULE. SERVICE OF THIS COMPONENT SHOULD BE PERFORMED ONLY BY CHRYSLER-TRAINED AND AUTHORIZED DEALER SERVICE TECHNICIANS. FAILURE TO TAKE THE PROPER PRECAUTIONS OR TO FOLLOW THE PROPER PROCEDURES COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Install the horn switch and tray as a unit into the pouch on the retaining strap of the driver side airbag module. Be certain that the tray is facing the airbag module, that the horn switch is facing the trim cover, that the horn switch feed wire is on the left, and that the horn switch ground wire is on the right.

(2) Install the trim cover onto the driver side airbag module. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION) for the procedure.

(3) Reconnect the battery negative cable.

IGNITION CONTROL

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IGNITION CONTROL

DESCRIPTION

Two different ignition systems are used. One type of system is for the 4.0L 6–cylinder engine. The other is for the 4.7L V-8 engine.

OPERATION

The 4.0L 6–cylinder engine uses a one-piece coil rail containing three independent coils. Although cylinder firing order is the same as 4.0L engines of previous years, spark plug firing is not. The 3 coils dual-fire the spark plugs on cylinders 1–6, 2–5 and/or 3–4. When one cylinder is being fired (on compression stroke), the spark to the opposite cylinder is being wasted (on exhaust stroke). The one-piece coil bolts directly to the cylinder head. Rubber boots seal the secondary terminal ends of the coils to the top of all 6 spark plugs. One electrical connector (located at the rear end of the coil rail) is used for all three coils.

The 4.7L V-8 engine uses 8 dedicated and individually fired coil for each spark plug. Each coil is mounted directly to the top of each spark plug. A separate electrical connector is used for each coil.

Because of coil design, spark plug cables (secondary cables) are not used on either engine. A **distributor is not used** with either the 4.0L or 4.7L engines.

IGNITION CONTROL (Continued)

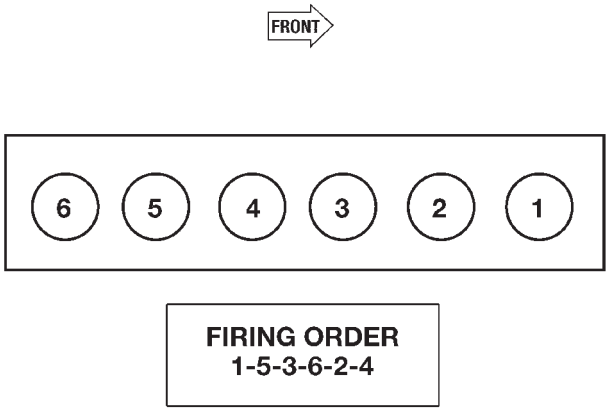
The ignition system is controlled by the powertrain control module (PCM) on all engines.

The ignition system consists of:

- Spark Plugs
- Ignition Coil(s)
- Powertrain Control Module (PCM)
- Crankshaft Position Sensor
- Camshaft Position Sensor
- The MAP, TPS, IAC and ECT also have an effect on the control of the ignition system.

SPECIFICATIONS

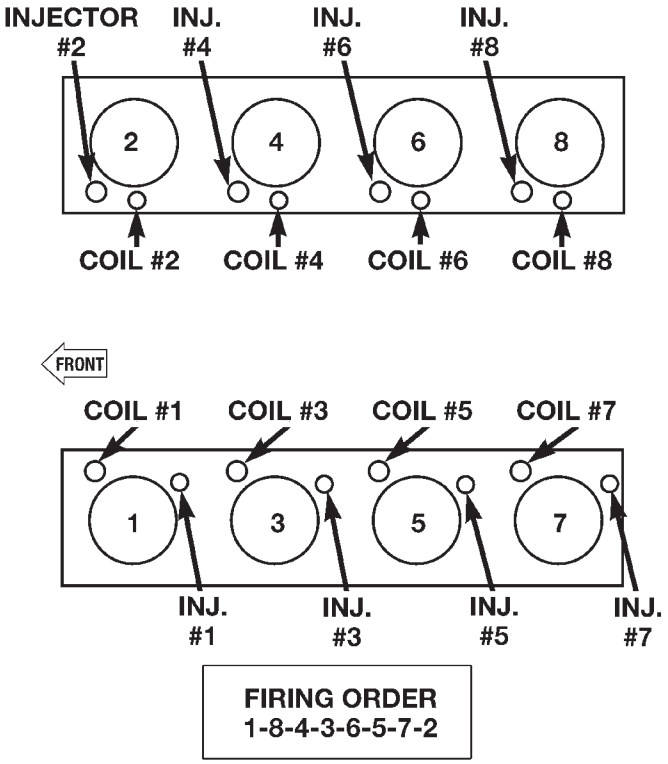
ENGINE FIRING ORDER - 4.0L 6-CYLINDER ENGINE



COILS PAIRED:
CYLINDERS 1-6
CYLINDERS 2-5
CYLINDERS 3-4

80b6f045

ENGINE FIRING ORDER—4.7L V-8 ENGINE



80b6f043

IGNITION COIL RESISTANCE - 4.0L ENGINE

PRIMARY RESISTANCE 21-27°C (70-80°F)
0.71 - 0.88 Ohms

IGNITION COIL RESISTANCE—4.7L V-8 ENGINE

PRIMARY RESISTANCE 21-27°C (70-80°F)	SECONDARY RESISTANCE 21-27°C (70-80°F)
0.6 - 0.9 Ohms	6,000 - 9,000 Ohms

IGNITION TIMING

All ignition timing functions are controlled by the Powertrain Control Module (PCM). Mechanical adjustments are not needed and can't be made.

On the 4.0L 6–cylinder engine, do not attempt to rotate the oil pump drive to adjust timing. This adjustment is used for fuel synchronization after camshaft position sensor replacement.

IGNITION CONTROL (Continued)

SPARK PLUGS

ENGINE	PLUG TYPE	ELECTRODE GAP
4.0L 6-CYL.	RC12ECC	0.89 mm (.035 in.)
4.7L V-8 (Exc. HO)	RC12MCC4	1.01 mm (.040 in.)
4.7L V-8 High Output (HO)	RC7PYCB4	1.01 mm (.040 in.)

TORQUE - IGNITION SYSTEM

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Crankshaft Position Sensor Bolts - 4.0L Engine	7	-	60
Crankshaft Position Sensor Bolt - 4.7L V-8 Engine	28	21	-
Camshaft Position Sensor–to–base bolts - 4.0L Engine	2	-	15
Camshaft Position Sensor Bolt - 4.7L V-8 Engine	12	-	106
Oil Pump Drive Hold-down Bolt - 4.0L Engine	23	17	-
Ignition Coil Rail Mounting Bolts - 4.0L Engine	29	-	250
Ignition Coil Mounting Nut - 4.7L V-8 Engine	8	-	70
* Knock Sensor Bolt - 4.7L HO V-8 Engine	*20	*15	-
Spark Plugs - 4.0L Engine	35-41	26-30	-
Spark Plugs - 4.7L V-8 Engine	24 - 30	18 - 22	-
* Do not apply any sealant, thread-locker or adhesive to bolts. Poor sensor performance may result. Refer to Removal / Installation for additional information.			

AUTO SHUT DOWN RELAY

DESCRIPTION - PCM OUTPUT

The 5–pin, 12–volt, Automatic Shutdown (ASD) relay is located in the Power Distribution Center (PDC). Refer to label on PDC cover for relay location.

OPERATION

OPERATION - PCM OUTPUT

The ASD relay supplies battery voltage (12+ volts) to the fuel injectors and ignition coil(s). With certain emissions packages it also supplies 12–volts to the oxygen sensor heating elements.

The ground circuit for the coil within the ASD relay is controlled by the Powertrain Control Module (PCM). The PCM operates the ASD relay by switching its ground circuit on and off.

AUTO SHUT DOWN RELAY (Continued)

The ASD relay will be shut–down, meaning the 12–volt power supply to the ASD relay will be de-activated by the PCM if:

- the ignition key is left in the ON position. This is if the engine has not been running for approximately 1.8 seconds.
- there is a crankshaft position sensor signal to the PCM that is lower than pre-determined values.

OPERATION - ASD SENSE - PCM INPUT

A 12 volt signal at this input indicates to the PCM that the ASD has been activated. The relay is used to connect the oxygen sensor heater element, ignition coil and fuel injectors to 12 volt + power supply.

This input is used only to sense that the ASD relay is energized. If the Powertrain Control Module (PCM) does not see 12 volts at this input when the ASD should be activated, it will set a Diagnostic Trouble Code (DTC).

REMOVAL

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 1). Refer to label on PDC cover for relay location.

(1) Remove PDC cover.

(2) Remove relay from PDC.

(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.

(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

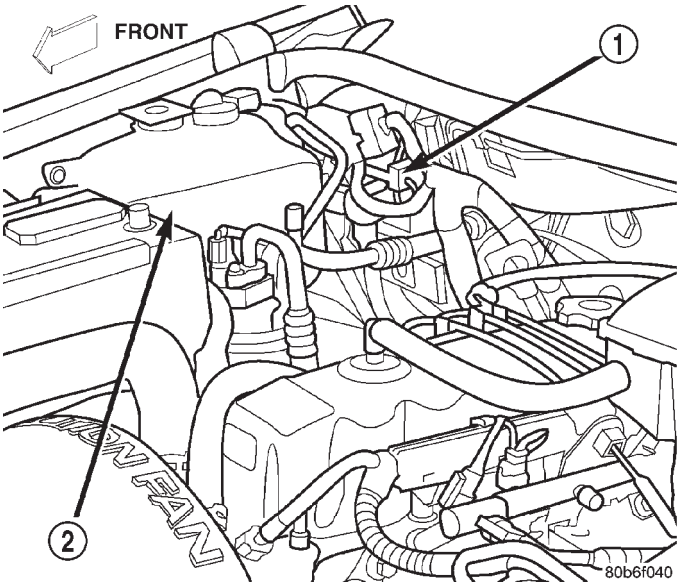


Fig. 1 Power Distribution Center (PDC) Location

1 - PCM
2 - COOLANT TANK

INSTALLATION

The ASD relay is located in the Power Distribution Center (PDC) (Fig. 1). Refer to label on PDC cover for relay location.

(1) Install relay to PDC.

(2) Install cover to PDC.

CAMSHAFT POSITION SENSOR

DESCRIPTION

DESCRIPTION - 4.0L

The Camshaft Position Sensor (CMP) on the 4.0L 6–cylinder engine is bolted to the top of the oil pump drive shaft assembly (Fig. 2). The sensor and drive shaft assembly is located on the right side of the engine near the oil filter (Fig. 3).

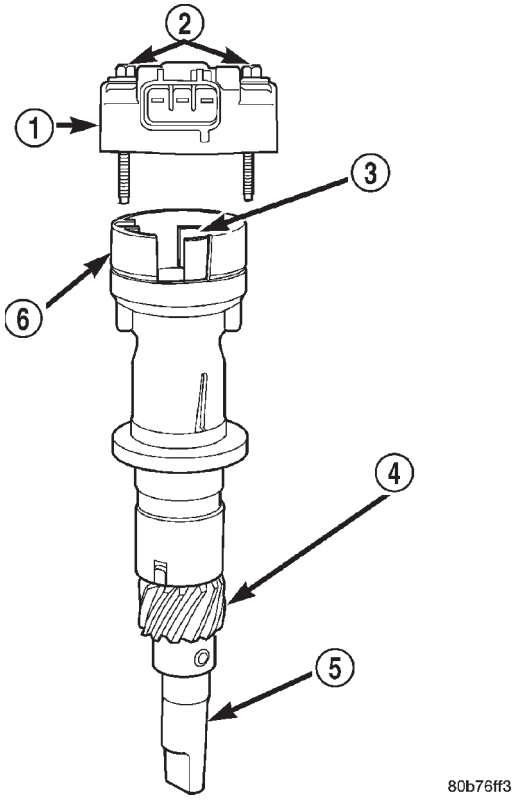


Fig. 2 CMP and Oil Pump Drive Shaft—4.0L Engine

1 - CAMSHAFT POSITION SENSOR
2 - MOUNTING BOLTS (2)
3 - PULSE RING
4 - DRIVE GEAR (TO CAMSHAFT)
5 - OIL PUMP DRIVESHAFT
6 - SENSOR BASE (OIL PUMP DRIVESHAFT ASSEMBLY)

CAMSHAFT POSITION SENSOR (Continued)

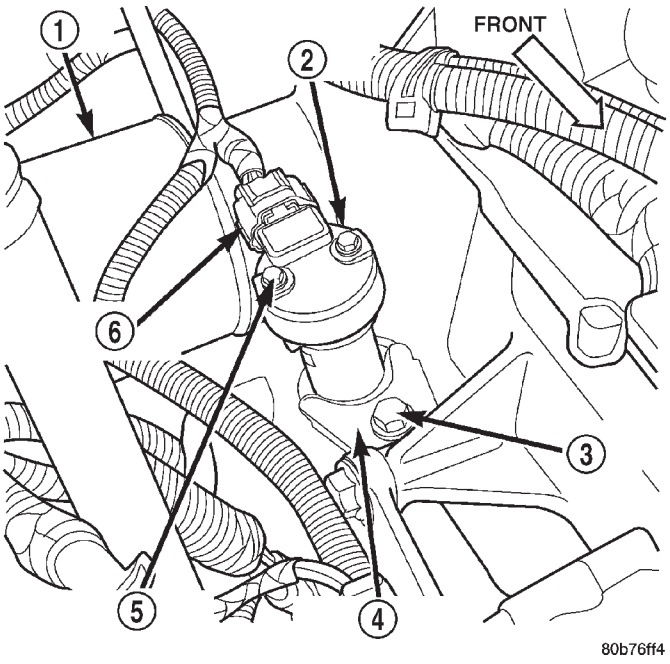


Fig. 3 CMP Location—4.0L Engine

1 - OIL FILTER
2 - CAMSHAFT POSITION SENSOR
3 - CLAMP BOLT
4 - HOLD-DOWN CLAMP
5 - MOUNTING BOLTS (2)
6 - ELEC. CONNECTOR

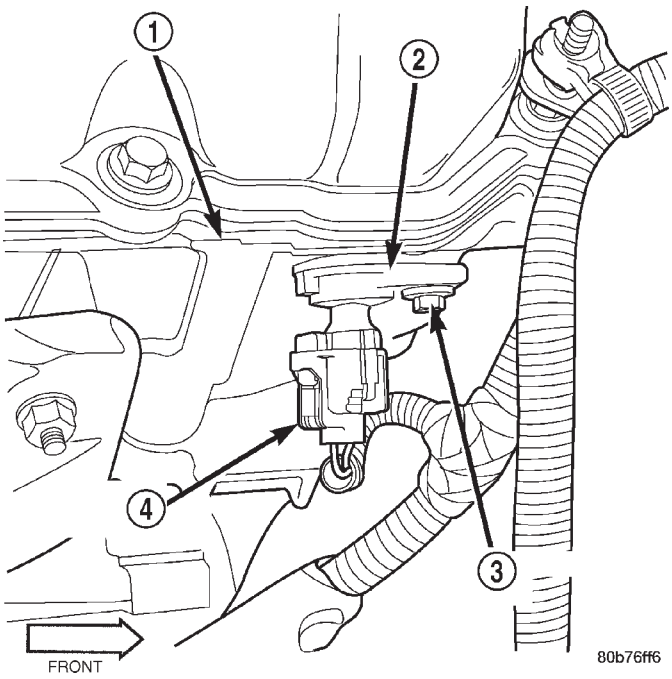


Fig. 4 CMP Location—4.7L Engine

1 - RIGHT CYLINDER HEAD
2 - CAMSHAFT POSITION SENSOR
3 - MOUNTING BOLT
4 - ELEC. CONNECTOR

DESCRIPTION - 4.7L

The Camshaft Position Sensor (CMP) on the 4.7L V–8 engine is bolted to the front/top of the right cylinder head (Fig. 4).

OPERATION

OPERATION - 4.0L

The CMP sensor contains a hall effect device called a sync signal generator to generate a fuel sync signal. This sync signal generator detects a rotating pulse ring (shutter) on the oil pump drive shaft (Fig. 2). The pulse ring rotates 180 degrees through the sync signal generator. Its signal is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

When the leading edge of the pulse ring (shutter) enters the sync signal generator, the following occurs: The interruption of magnetic field causes the voltage to switch high resulting in a sync signal of approximately 5 volts.

When the trailing edge of the pulse ring (shutter) leaves the sync signal generator, the following occurs: The change of the magnetic field causes the sync signal voltage to switch low to 0 volts.

OPERATION - 4.7L

The CMP sensor contains a hall effect device called a sync signal generator to generate a fuel sync signal. This sync signal generator detects notches located on a tonewheel. The tonewheel is located at the front of the camshaft for the right cylinder head (Fig. 5). As the tonewheel rotates, the notches pass through the sync signal generator. The pattern of the notches (viewed counter-clockwise from front of engine) is: 1 notch, 2 notches, 3 notches, 3 notches, 2 notches 1 notch, 3 notches and 1 notch. The signal from the CMP sensor is used in conjunction with the crankshaft position sensor to differentiate between fuel injection and spark events. It is also used to synchronize the fuel injectors with their respective cylinders.

CAMSHAFT POSITION SENSOR (Continued)

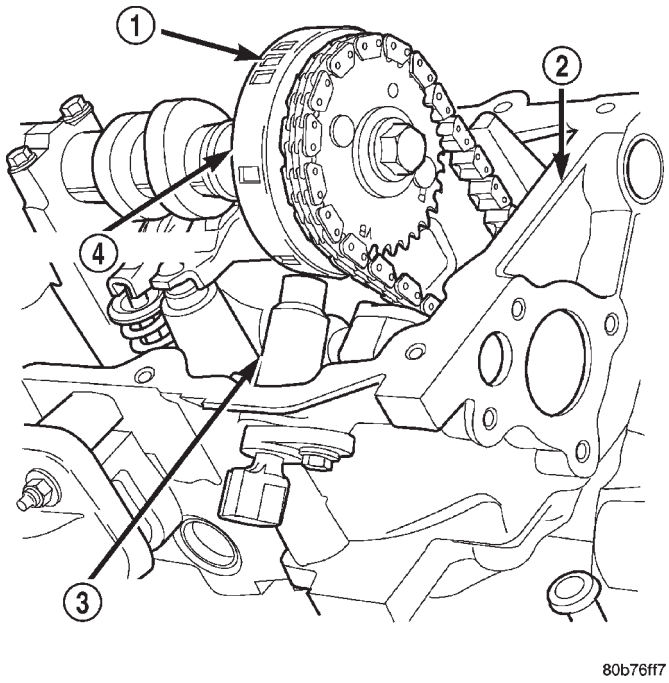


Fig. 5 CMP Sensor and Tonewheel—4.7L Engine

1 - NOTCHES
2 - RIGHT CYLINDER HEAD
3 - CAMSHAFT POSITION SENSOR
4 - TONEWHEEL

REMOVAL

REMOVAL - 4.0L

The Camshaft Position Sensor (CMP) on the 4.0L 6–cylinder engine is bolted to the top of the oil pump drive shaft assembly (Fig. 6). The sensor and drive shaft assembly is located on the right side of the engine near the oil filter (Fig. 7).

The rotational position of oil pump drive determines fuel synchronization only. It does not determine ignition timing.

NOTE: Do not attempt to rotate the oil pump drive to modify ignition timing.

Two different procedures are used for removal and installation. The first procedure will detail removal and installation of the sensor only. The second procedure will detail removal and installation of the sensor and oil pump drive shaft assembly. The second procedure is to be used if the engine has been disassembled.

An internal oil seal is used in the drive shaft housing that prevents engine oil at the bottom of the sensor. The seal is not serviceable.

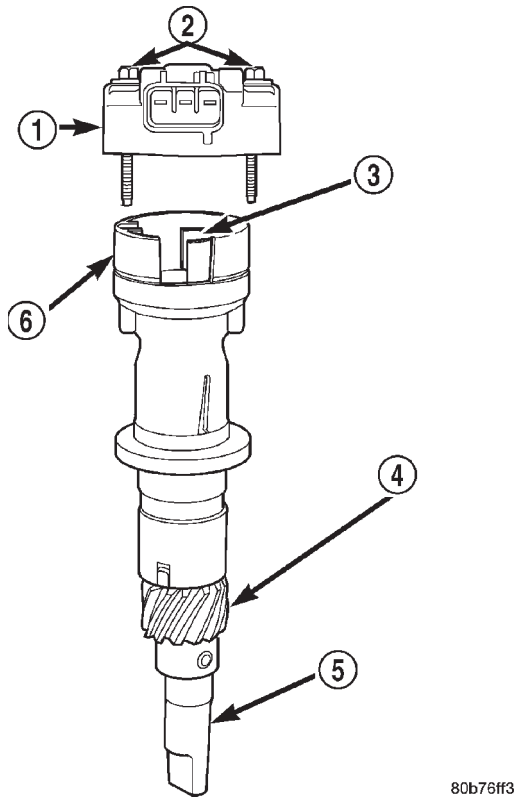


Fig. 6 CMP and Oil Pump Drive Shaft - 4.0L Engine

1 - CAMSHAFT POSITION SENSOR
2 - MOUNTING BOLTS (2)
3 - PULSE RING
4 - DRIVE GEAR (TO CAMSHAFT)
5 - OIL PUMP DRIVESHAFT
6 - SENSOR BASE (OIL PUMP DRIVESHAFT ASSEMBLY)

SENSOR ONLY - 4.0L

(1) Disconnect electrical connector at CMP sensor (Fig. 7).

(2) Remove 2 sensor mounting bolts (Fig. 6) or (Fig. 7).

(3) Remove sensor from oil pump drive.

OIL PUMP DRIVE AND SENSOR - 4.0L

If the CMP and oil pump drive are to be removed and installed, do not allow engine crankshaft or camshaft to rotate. CMP sensor relationship will be lost.

(1) Disconnect electrical connector at CMP sensor (Fig. 7).

(2) Remove 2 sensor mounting bolts (Fig. 6) or (Fig. 7).

(3) Remove sensor from oil pump drive.

(4) Before proceeding to next step, mark and note rotational position of oil pump drive in relationship to engine block. After installation, the CMP sensor should face rear of engine 0°.

(5) Remove hold-down bolt and clamp (Fig. 7).

CAMSHAFT POSITION SENSOR (Continued)

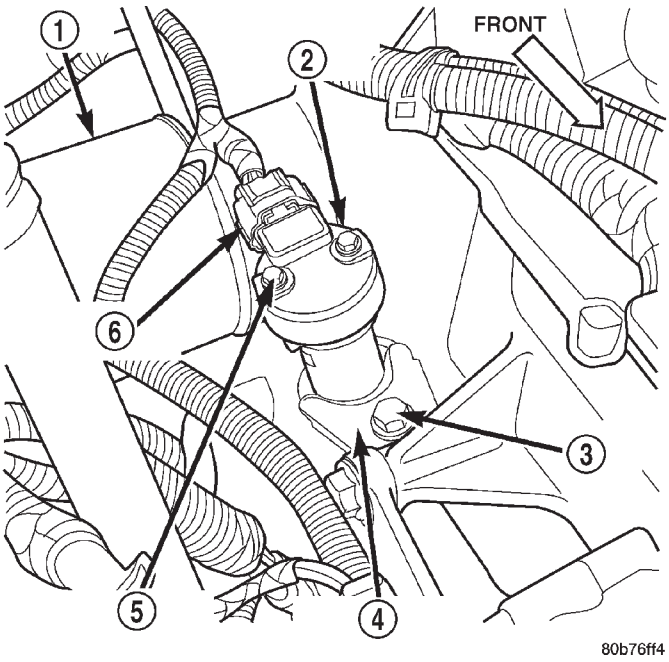


Fig. 7 CMP Location - 4.0L Engine

1 - OIL FILTER
2 - CAMSHAFT POSITION SENSOR
3 - CLAMP BOLT
4 - HOLD-DOWN CLAMP
5 - MOUNTING BOLTS (2)
6 - ELEC. CONNECTOR

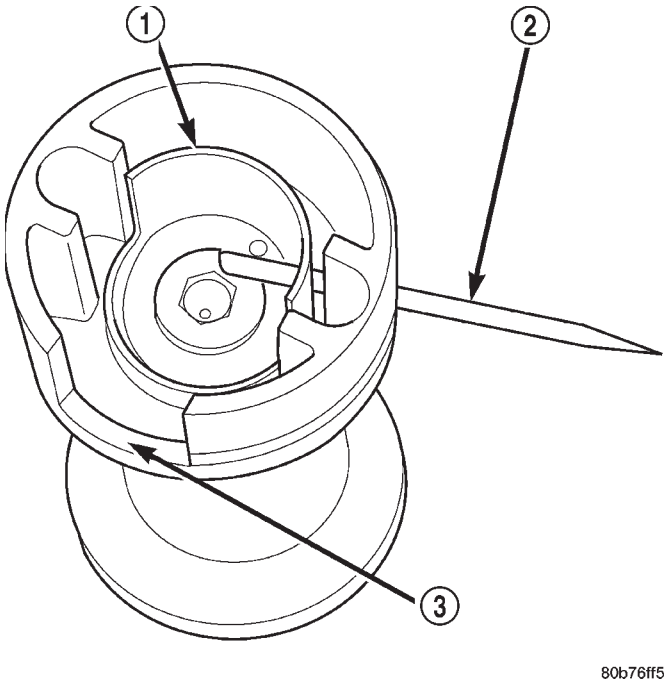


Fig. 8 CMP Pulse Ring Alignment - 4.0L Engine

1 - PULSE RING (SHUTTER)
2 - TOOTHPICK
3 - SENSOR BASE (OIL PUMP DRIVESHAFT ASSEMBLY)

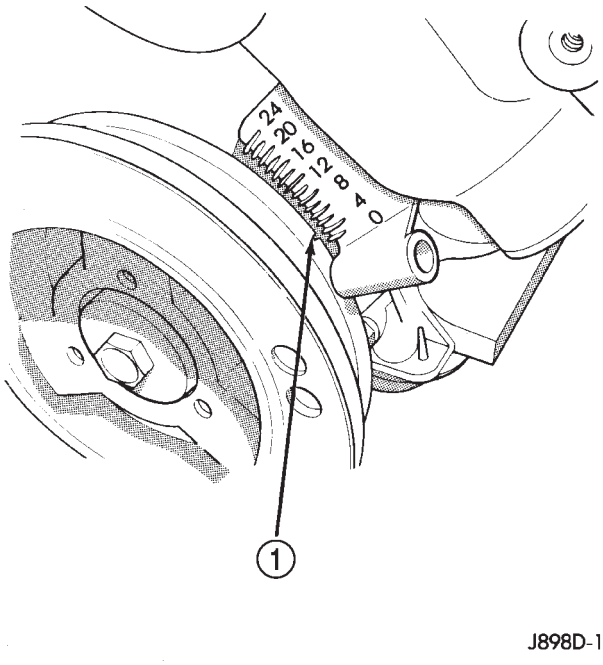


Fig. 9 Align Timing Marks - 4.0L Engine

1 - CRANKSHAFT VIBRATION DAMPER TIMING MARK

(6) While pulling assembly from engine, note direction and position of pulse ring (Fig. 6). After removal, look down into top of oil pump and note direction and position of slot at top of oil pump gear.

(7) Remove and discard old oil pump drive-to-engine block gasket.

REMOVAL - 4.7L

The Camshaft Position Sensor (CMP) on the 4.7L V–8 engine is bolted to the front/top of the right cylinder head (Fig. 10).

It is easier to remove/install sensor from under vehicle.

(1) Raise and support vehicle.

(2) Disconnect electrical connector at CMP sensor (Fig. 10).

(3) Remove sensor mounting bolt (Fig. 10).

(4) Carefully pry sensor from cylinder head in a rocking action with two small screwdrivers. **Some 4.7L engines are equipped with a sensor spacer shim. If equipped, this shim will be located at sensor bolt hole between cylinder head and sensor mounting tang (TSB W08–18–00). Save this shim for sensor installation.**

(5) Check condition of sensor o-ring.

CAMSHAFT POSITION SENSOR (Continued)

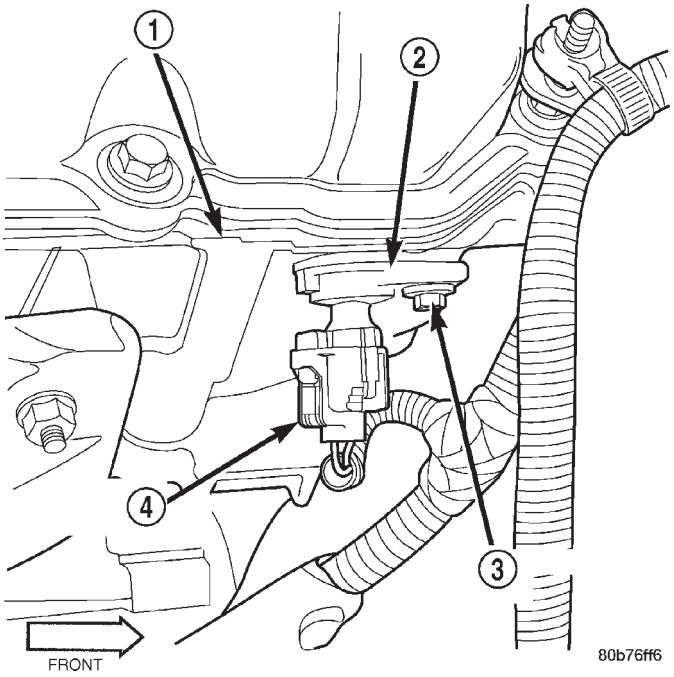


Fig. 10 CMP Location—4.7L Engine

1 - RIGHT CYLINDER HEAD
2 - CAMSHAFT POSITION SENSOR
3 - MOUNTING BOLT
4 - ELEC. CONNECTOR

INSTALLATION

INSTALLATION - 4.0L

SENSOR ONLY - 4.0L

The Camshaft Position Sensor (CMP) on the 4.0L 6–cylinder engine is bolted to the top of the oil pump drive shaft assembly (Fig. 6). The sensor and drive shaft assembly is located on the right side of the engine near the oil filter (Fig. 7).

(1) Install sensor to oil pump drive.

(2) Install 2 sensor mounting bolts and tighten to 2 N·m (15 in. lbs.) torque.

(3) Connect electrical connector to CMP sensor.

OIL PUMP DRIVE AND SENSOR - 4.0L

(1) Clean oil pump drive mounting hole area of engine block.

(2) Install new oil pump drive-to-engine block gasket.

(3) Temporarily install a toothpick or similar tool through access hole at side of oil pump drive housing. Align toothpick into mating hole on pulse ring (Fig. 8).

(4) Install oil pump drive into engine while aligning into slot on oil pump. Rotate oil pump drive back to its original position and install hold-down clamp and bolt. Finger tighten bolt. Do not do a final tightening of bolt at this time.

(5) If engine crankshaft or camshaft has been rotated, such as during engine tear-down, CMP sensor relationship must be reestablished.

(a) Remove ignition coil rail assembly. Refer to Ignition Coil Removal/Installation.

(b) Remove cylinder number 1 spark plug.

(c) Hold a finger over the open spark plug hole. Rotate engine at vibration dampener bolt until compression (pressure) is felt.

(d) Slowly continue to rotate engine. Do this until timing index mark on vibration damper pulley aligns with top dead center (TDC) mark (0 degree) on timing degree scale (Fig. 9). Always rotate engine in direction of normal rotation. Do not rotate engine backward to align timing marks.

(e) Install oil pump drive into engine while aligning into slot on oil pump. If pump drive will not drop down flush to engine block, the oil pump slot is not aligned. Remove oil pump drive and align slot in oil pump to shaft at bottom of drive. Install into engine. Rotate oil pump drive back to its original position and install hold-down clamp and bolt. Finger tighten bolt. Do not do a final tightening of bolt at this time.

(f) Remove toothpick from housing.

(6) Install sensor to oil pump drive. After installation, the CMP sensor should face rear of engine 0°.

(7) Install 2 sensor mounting bolts and tighten to 2 N·m (15 in. lbs.) torque.

(8) Connect electrical connector to CMP sensor.

(9) If removed, install spark plug and ignition coil rail.

To verify correct rotational position of oil pump drive, the DRB scan tool must be used.

WARNING: WHEN PERFORMING THE FOLLOWING TEST, THE ENGINE WILL BE RUNNING. BE CAREFUL NOT TO STAND IN LINE WITH THE FAN BLADES OR FAN BELT. DO NOT WEAR LOOSE CLOTHING.

(10) Connect DRB scan tool to data link connector. The data link connector is located in passenger compartment, below and to left of steering column.

(11) Gain access to SET SYNC screen on DRB.

(12) Follow directions on DRB screen and start engine. Bring to operating temperature (engine must be in “closed loop” mode).

(13) With engine running at **idle speed**, the words IN RANGE should appear on screen along with 0°. This indicates correct position of oil pump drive.

CAMSHAFT POSITION SENSOR (Continued)

(14) If a plus (+) or a minus (-) is displayed next to degree number, and/or the degree displayed is not zero, loosen but do not remove hold-down clamp bolt. Rotate oil pump drive until IN RANGE appears on screen. Continue to rotate oil pump drive until achieving as close to 0° as possible.

The degree scale on SET SYNC screen of DRB is referring to fuel synchronization only. **It is not referring to ignition timing.** Because of this, do not attempt to adjust ignition timing using this method. Rotating oil pump drive will have no effect on ignition timing. All ignition timing values are controlled by powertrain control module (PCM).

(15) Tighten hold-down clamp bolt to 23 N·m (17 ft. lbs.) torque.

INSTALLATION - 4.7L

The Camshaft Position Sensor (CMP) on the 4.7L V–8 engine is bolted to the front/top of the right cylinder head (Fig. 10).

(1) Clean out machined hole in cylinder head.

(2) Apply a small amount of engine oil to sensor o-ring.

(3) Install sensor into cylinder head with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder head. If sensor is not flush, damage to sensor mounting tang may result.

(4) Install mounting bolt and tighten to 12 N·m (106 in. lbs.) torque.

(5) Connect electrical connector to sensor.

(6) Lower vehicle.

COIL RAIL

DESCRIPTION

A one-piece coil rail assembly containing three individual coils is used on the 4.0L 6–cylinder engine (Fig. 11). The coil rail must be replaced as one assembly. The bottom of the coil is equipped with 6 individual rubber boots (Fig. 11) to seal the 6 spark plugs to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately.

(1) The coil is bolted directly to the cylinder head (Fig. 12). One electrical connector (located at rear of coil) is used for all three coils.

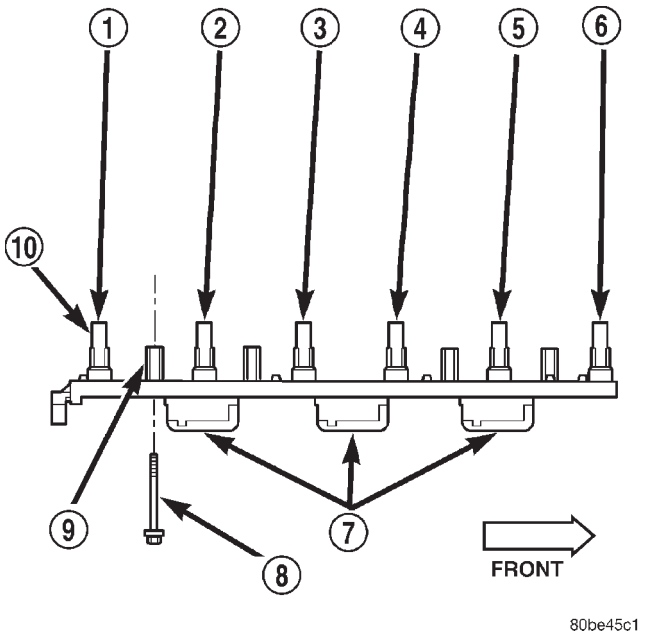


Fig. 11 Ignition Coil Assembly—4.0L 6–Cylinder Engine

1 - CYL. #6
2 - CYL. #5
3 - CYL. #4
4 - CYL. #3
5 - CYL. #2
6 - CYL. #1
7 - COILS (3)
8 - MOUNTING BOLTS (4)
9 - BOLT BASES (4)
10 - RUBBER BOOTS (6)

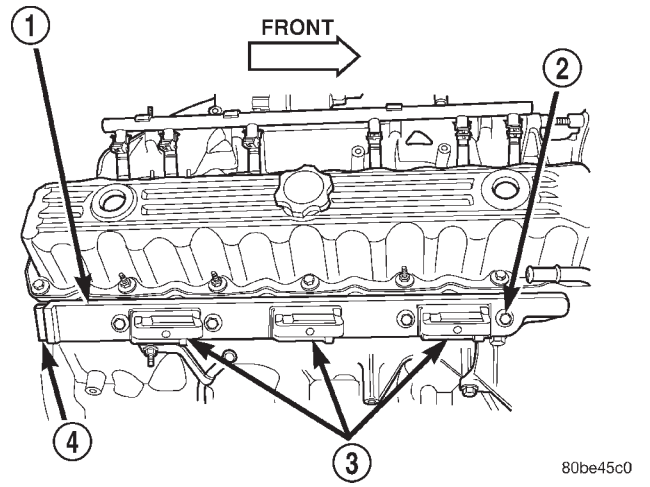


Fig. 12 Coil Location—4.0L Engine

1 - COIL RAIL
2 - COIL MOUNTING BOLTS (4)
3 - COIL
4 - COIL ELECTRICAL CONNECTION

COIL RAIL (Continued)

OPERATION

Although cylinder firing order is the same as 4.0L Jeep engines of previous years, spark plug firing is not. The 3 coils dual-fire the spark plugs on cylinders 1-6, 2-5 and/or 3-4. When one cylinder is being fired (on compression stroke), the spark to the opposite cylinder is being wasted (on exhaust stroke).

Battery voltage is supplied to the three ignition coils from the ASD relay. The Powertrain Control Module (PCM) opens and closes the ignition coil ground circuit for ignition coil operation.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Because of coil design, spark plug cables (secondary cables) are not used. The cables are integral within the coil rail.

REMOVAL

A one-piece coil rail assembly containing three individual coils is used on the 4.0L engine (Fig. 13). The coil rail must be replaced as one assembly. The bottom of the coil is equipped with 6 individual rubber boots (Fig. 13) to seal the 6 spark plugs to the coil. Inside each rubber boot is a spring. The spring is used for an electrical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately.

(1) Disconnect negative battery cable at battery.

(2) The coil is bolted directly to the cylinder head. Remove 4 coil mounting bolts (Fig. 14).

(3) Carefully pry up coil assembly from spark plugs. Do this by prying alternately at each end of coil until rubber boots have disengaged from all spark plugs. If boots will not release from spark plugs, use a commercially available spark plug boot removal tool. Twist and loosen a few boots from a few spark plugs to help remove coil.

(4) After coil has cleared spark plugs, position coil for access to primary electrical connector. Disconnect connector from coil by pushing slide tab outwards to right side of vehicle (Fig. 15). After slide tab has been positioned outwards, push in on secondary release lock (Fig. 15) on side of connector and pull connector from coil.

(5) Remove coil from vehicle.

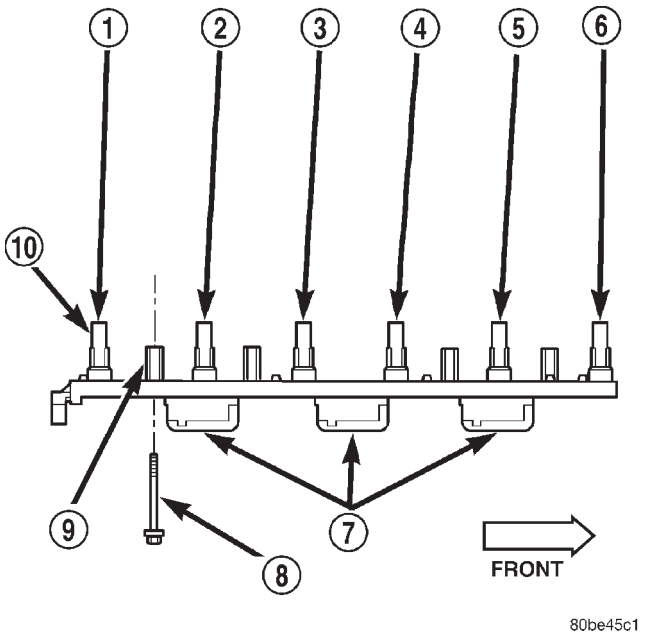


Fig. 13 Ignition Coil Assembly—4.0L 6–Cylinder Engine

1 - CYL. #6
2 - CYL. #5
3 - CYL. #4
4 - CYL. #3
5 - CYL. #2
6 - CYL. #1
7 - COILS (3)
8 - MOUNTING BOLTS (4)
9 - BOLT BASES (4)
10 - RUBBER BOOTS (6)

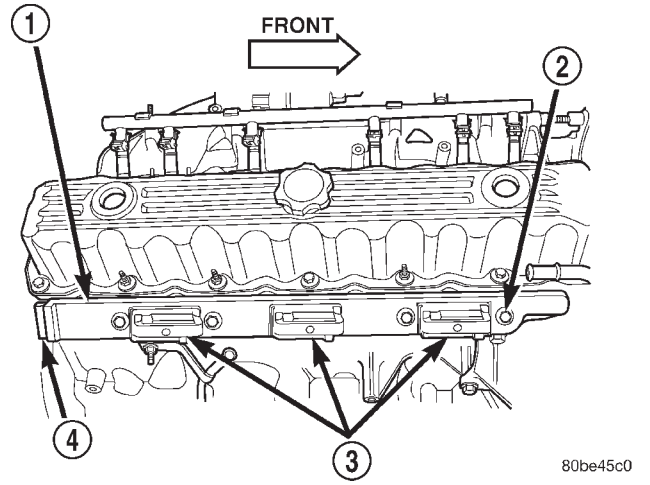


Fig. 14 Ignition Coil Rail Location—4.0L 6–Cylinder Engine

1 - COIL RAIL
2 - COIL MOUNTING BOLTS (4)
3 - COIL
4 - COIL ELECTRICAL CONNECTION

COIL RAIL (Continued)

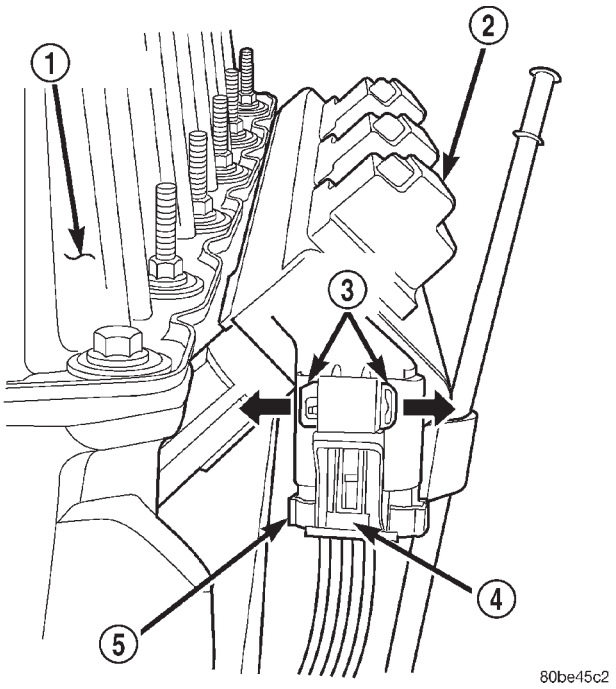


Fig. 15 Ignition Coil Electrical Connector—4.0L 6–Cylinder Engine

1 - REAR OF VALVE COVER
2 - COIL RAIL
3 - SLIDE TAB
4 - RELEASE LOCK
5 - COIL CONNECTOR

INSTALLATION

(1) Connect engine harness connector to coil by snapping into position. Move slide tab towards engine (Fig. 15) for a positive lock.

(2) Position ignition coil rubber boots to all spark plugs. Push down on coil assembly until bolt bases have contacted cylinder head

(3) Install 4 coil mounting bolts. Loosely tighten 4 bolts just enough to allow bolt bases to contact cylinder head. Do a final tightening of each bolt in steps down to 29 N·m (250 in. lbs.) torque. Do not apply full torque to any bolt first.

(4) Connect negative battery cable to battery.

IGNITION COIL

DESCRIPTION

The 4.7L V–8 engine uses 8 dedicated, and individually fired coil (Fig. 16) for each spark plug. Each coil is mounted directly to the top of each spark plug (Fig. 17).

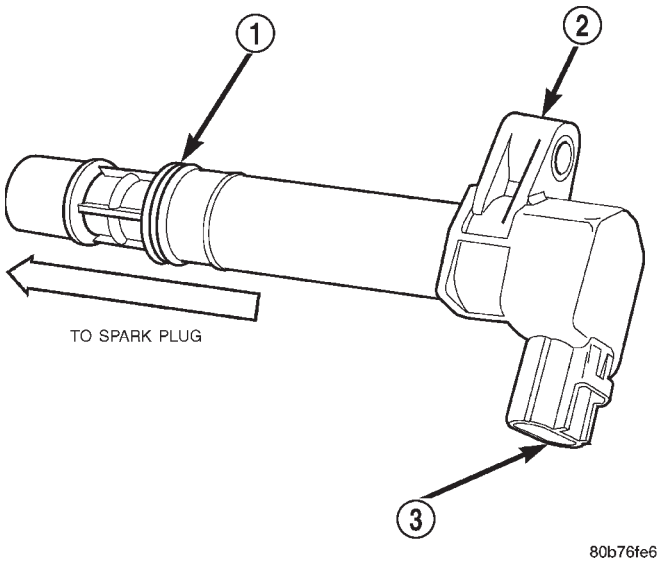


Fig. 16 Ignition Coil—4.7L Engine

1 - O-RING
2 - IGNITION COIL
3 - ELECTRICAL CONNECTOR

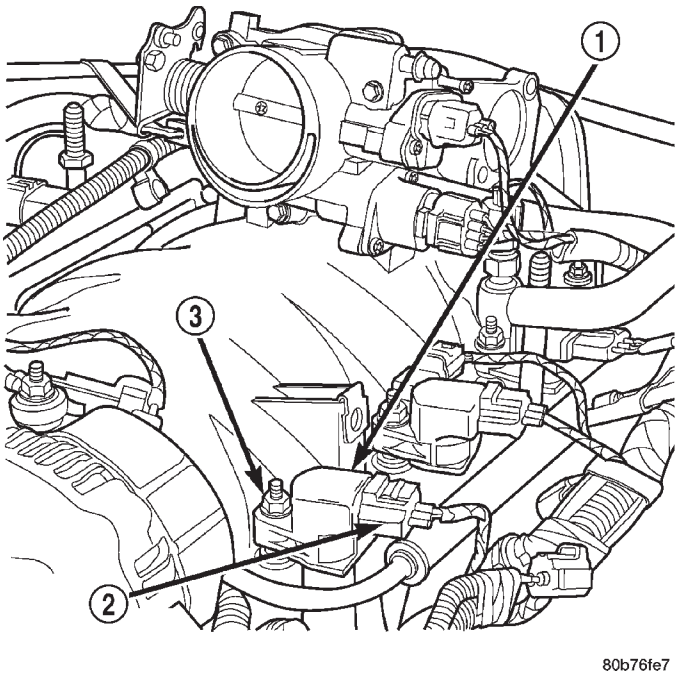


Fig. 17 Ignition Coil Location—4.7L Engine

1 - IGNITION COIL
2 - COIL ELECTRICAL CONNECTOR
3 - COIL MOUNTING STUD/NUT

IGNITION COIL (Continued)

OPERATION

Battery voltage is supplied to the 8 ignition coils from the ASD relay. The Powertrain Control Module (PCM) opens and closes each ignition coil ground circuit at a determined time for ignition coil operation.

Base ignition timing is not adjustable. By controlling the coil ground circuit, the PCM is able to set the base timing and adjust the ignition timing advance. This is done to meet changing engine operating conditions.

The ignition coil is not oil filled. The windings are embedded in an epoxy compound. This provides heat and vibration resistance that allows the ignition coil to be mounted on the engine.

Because of coil design, spark plug cables (secondary cables) are not used.

REMOVAL

An individual ignition coil is used for each spark plug (Fig. 18). The coil fits into machined holes in the cylinder head. A mounting stud/nut secures each coil to the top of the intake manifold (Fig. 19). The bottom of the coil is equipped with a rubber boot to seal the spark plug to the coil. Inside each rubber boot is a spring. The spring is used for a mechanical contact between the coil and the top of the spark plug. These rubber boots and springs are a permanent part of the coil and are not serviced separately. An o-ring (Fig. 18) is used to seal the coil at the opening into the cylinder head.

(1) Depending on which coil is being removed, the throttle body air intake tube or intake box may need to be removed to gain access to coil.

(2) Disconnect electrical connector (Fig. 19) from coil by pushing downward on release lock on top of connector and pull connector from coil.

(3) Clean area at base of coil with compressed air before removal.

(4) Remove coil mounting nut from mounting stud (Fig. 19).

(5) Carefully pull up coil from cylinder head opening with a slight twisting action.

(6) Remove coil from vehicle.

INSTALLATION

(1) Using compressed air, blow out any dirt or contaminants from around top of spark plug.

(2) Check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.

(3) Position ignition coil into cylinder head opening and push onto spark plug. Do this while guiding coil base over mounting stud.

(4) Install mounting stud nut and tighten to 8 N·m (70 in. lbs.) torque.

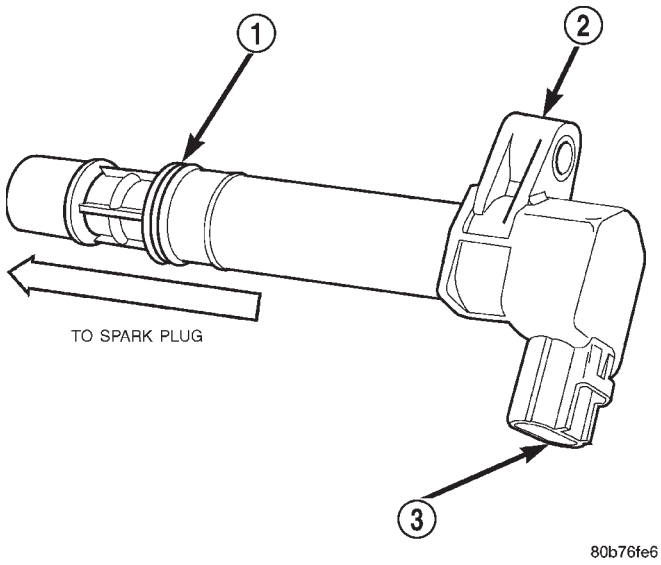


Fig. 18 Ignition Coil—4.7L V–8

1 - O-RING
2 - IGNITION COIL
3 - ELECTRICAL CONNECTOR

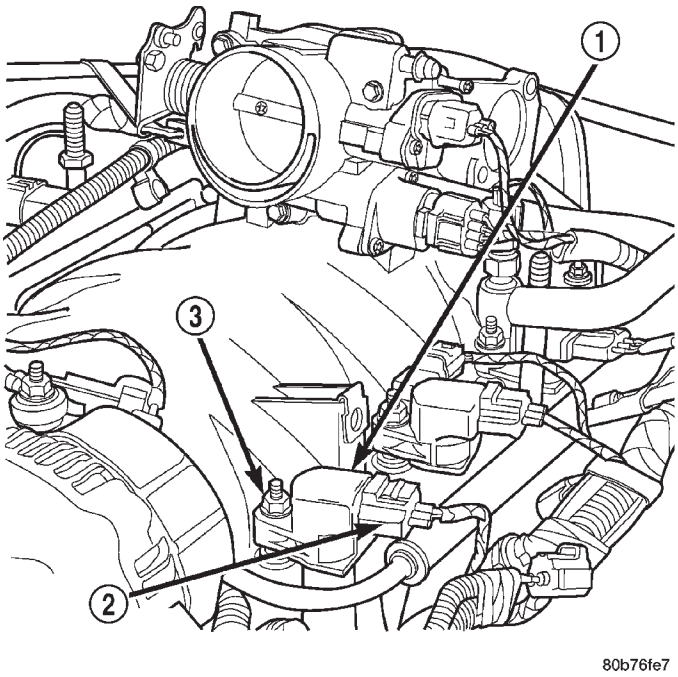


Fig. 19 Ignition Coil

1 - IGNITION COIL
2 - COIL ELECTRICAL CONNECTOR
3 - COIL MOUNTING STUD/NUT

(5) Connect electrical connector to coil by snapping into position.

(6) If necessary, install throttle body air tube or box.

IGNITION COIL CAPACITOR

DESCRIPTION

Two coil capacitors are used. One of them is located near the center of, and on the left side of the intake manifold (Fig. 20). The other capacitor is located near the center of, and on the right side of the intake manifold.

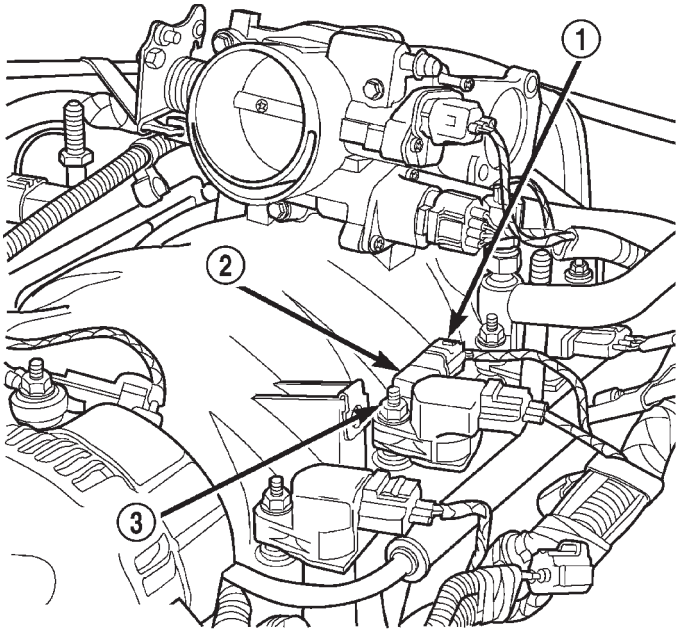


Fig. 20 Coil Capacitor (Left Side Shown)

1 - ELECTRICAL CONNECTOR
2 - COIL CAPACITOR
3 - MUNTING NUT

OPERATION

The 2 coil capacitors are used to prevent high-voltage spikes from interfering with the operation of certain powertrain sensors. They are also used to help prevent radio interference.

REMOVAL

Two coil capacitors are used. One of them is located near the center of, and on the left side of the intake manifold (Fig. 21). The other capacitor is located near the center of, and on the right side of the intake manifold.

(1) Disconnect electrical connector at coil capacitor (Fig. 21).
(2) Remove mounting nut.
(3) Remove capacitor from mounting stud.

INSTALLATION

(1) Position capacitor to manifold mounting stud.

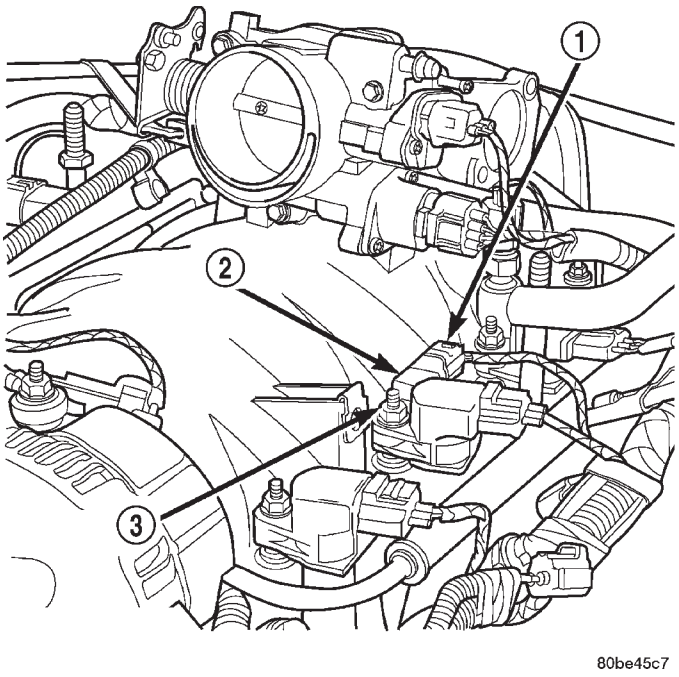


Fig. 21 Coil Capacitor (Left Side Shown)

1 - ELECTRICAL CONNECTOR
2 - COIL CAPACITOR
3 - MOUNTING NUT

(2) Install nut and tighten to 8 N·m (70 in. lbs.) torque.
(3) Connect electrical connector to capacitor (Fig. 21).

KNOCK SENSOR

DESCRIPTION

4.7L High-Output Engine

The 2 knock sensors are bolted into the cylinder block under the intake manifold.

OPERATION

4.7L High-Output Engine

Two knock sensors are used on the 4.7L V-8 engine if equipped with the high-output package; one for each cylinder bank. When the knock sensor detects a knock in one of the cylinders on the corresponding bank, it sends an input signal to the Powertrain Control Module (PCM). In response, the PCM retards ignition timing for all cylinders by a scheduled amount.

Knock sensors contain a piezoelectric material which constantly vibrates and sends an input voltage (signal) to the PCM while the engine operates. As the intensity of the crystal's vibration increases, the knock sensor output voltage also increases.

KNOCK SENSOR (Continued)

The voltage signal produced by the knock sensor increases with the amplitude of vibration. The PCM receives the knock sensor voltage signal as an input. If the signal rises above a predetermined level, the PCM will store that value in memory and retard ignition timing to reduce engine knock. If the knock sensor voltage exceeds a preset value, the PCM retards ignition timing for all cylinders. It is not a selective cylinder retard.

The PCM ignores knock sensor input during engine idle conditions. Once the engine speed exceeds a specified value, knock retard is allowed.

Knock retard uses its own short term and long term memory program.

Long term memory stores previous detonation information in its battery-backed RAM. The maximum authority that long term memory has over timing retard can be calibrated.

Short term memory is allowed to retard timing up to a preset amount under all operating conditions (as long as rpm is above the minimum rpm) except at Wide Open Throttle (WOT). The PCM, using short term memory, can respond quickly to retard timing when engine knock is detected. Short term memory is lost any time the ignition key is turned off.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors.

REMOVAL

4.7L High-Output Engine Only

The 2 knock sensors are bolted into the cylinder block under the intake manifold (Fig. 22).

NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

(1) Disconnect knock sensor dual pigtail harness connector from engine wiring harness connector. This connection is made near the right/rear of intake manifold (Fig. 23).

(2) Remove intake manifold. Refer to Engine section.

(3) Remove sensor mounting bolts (Fig. 22). Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

(4) Remove sensors from engine.

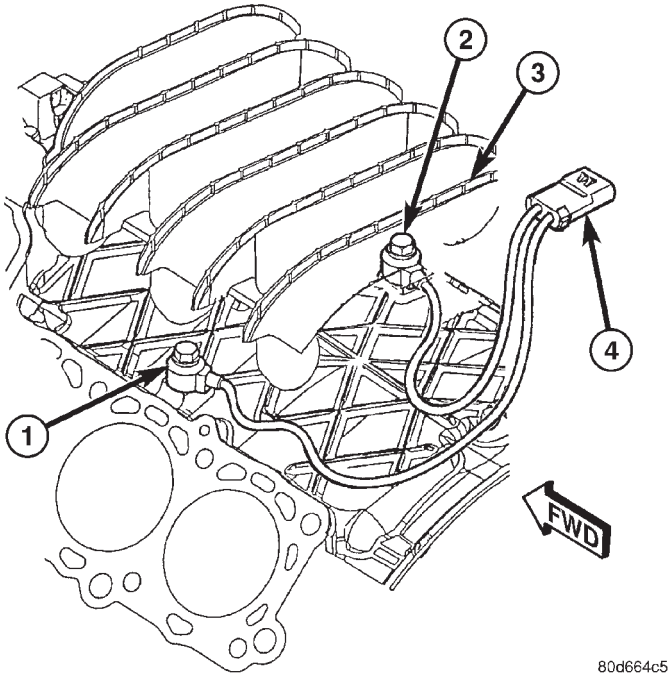


Fig. 22 KNOCK SENSOR LOCATION - 4.7L H.O.

1 - KNOCK SENSORS (2)
2 - MOUNTING BOLTS
3 - INTAKE MANIFOLD (CUTAWAY)
4 - PIGTAIL CONNECTOR

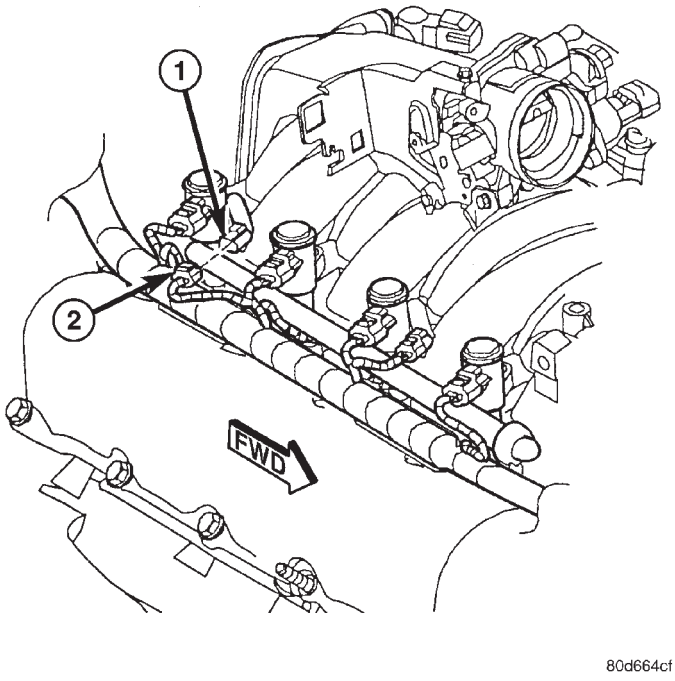


Fig. 23 KNOCK SENSOR ELEC. CONNECTOR - 4.7L H.O.

1 - KNOCK SENSOR PIGTAIL HARNESS CONNECTOR
2 - ENGINE WIRING HARNESS

KNOCK SENSOR (Continued)

INSTALLATION

4.7L High-Output Engine Only

NOTE: The left sensor is identified by an identification tag (LEFT). It is also identified by a larger bolt head. The Powertrain Control Module (PCM) must have and know the correct sensor left/right positions. Do not mix the sensor locations.

(1) Thoroughly clean knock sensor mounting holes.
(2) Install sensors (Fig. 22) into cylinder block.

NOTE: Over or under tightening the sensor mounting bolts will affect knock sensor performance, possibly causing improper spark control. Always use the specified torque when installing the knock sensors. The torque for the knock senor bolt is relatively light for an 8mm bolt.

NOTE: Note foam strip on bolt threads. This foam is used only to retain the bolts to sensors for plant assembly. It is not used as a sealant. Do not apply any adhesive, sealant or thread locking compound to these bolts.

(3) Install and tighten mounting bolts. **Bolt torque is critical.** Refer to torque specification.
(4) Install intake manifold. Refer to Engine section.
(5) Connect knock sensor pigtail wiring harness to engine wiring harness near right / rear of intake manifold (Fig. 23).

SPARK PLUG

DESCRIPTION

Both the 4.0L 6-cylinder and the 4.7L V-8 engine use resistor type spark plugs. Standard 4.7L V-8 engines are equipped with “fired in suppressor seal” type spark plugs using a copper core ground electrode. High-Output (H.O.) 4.7L V-8 engines are equipped with unique plugs using a platinum rivet located on the tip of the center electrode.

Because of the use of an aluminum cylinder head on the 4.7L engine, spark plug torque is very critical.

To prevent possible pre-ignition and/or mechanical engine damage, the correct type/heat range/number spark plug must be used. **Do not substitute any other spark plug on the 4.7L H.O. engine. Serious engine damage may occur.**

Plugs on both engines have resistance values ranging from 6,000 to 20,000 ohms (when checked with at least a 1000 volt spark plug tester). **Do not use an ohmmeter to check the resistance values of the spark plugs. Inaccurate readings will result.** Remove the spark plugs and examine them for burned electrodes and fouled, cracked or broken porcelain insulators. Keep plugs arranged in the order in which they were removed from the engine. A single plug displaying an abnormal condition indicates that a problem exists in the corresponding cylinder. Replace spark plugs at the intervals recommended in Group O, Lubrication and Maintenance.

EXCEPT 4.7L H.O. ENGINE : Spark plugs that have low mileage may be cleaned and reused if not otherwise defective, carbon or oil fouled. Also refer to Spark Plug Conditions. **4.7L H.O. ENGINE :** Never clean spark plugs on the 4.7L H.O. engine. Damage to the platinum rivet will result.

CAUTION: EXCEPT 4.7L H.O. ENGINE : Never use a motorized wire wheel brush to clean the spark plugs. Metallic deposits will remain on the spark plug insulator and will cause plug misfire.

H.O. Gap Adjustment: If equipped with the 4.7L H.O. engine, do not use a wire-type gapping tool as damage to the platinum rivet on the center electrode may occur. Use a tapered-type gauge (Fig. 24).

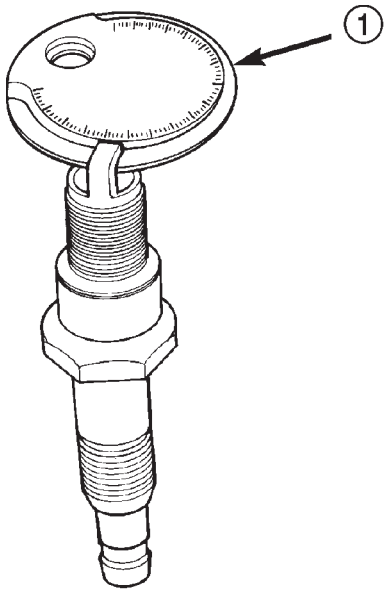


Fig. 24 PLUG GAP - 4.7L H.O.

1 - TAPER GAUGE

DIAGNOSIS AND TESTING - SPARK PLUG CONDITIONS

NORMAL OPERATING

The few deposits present on the spark plug will probably be light tan or slightly gray in color. This is evident with most grades of commercial gasoline

SPARK PLUG (Continued)

(Fig. 25). There will not be evidence of electrode burning. Gap growth will not average more than approximately 0.025 mm (.001 in) per 3200 km (2000 miles) of operation.

Spark plugs **except platinum tipped** that have normal wear can usually be cleaned, have the electrodes filed, have the gap set and then be installed.

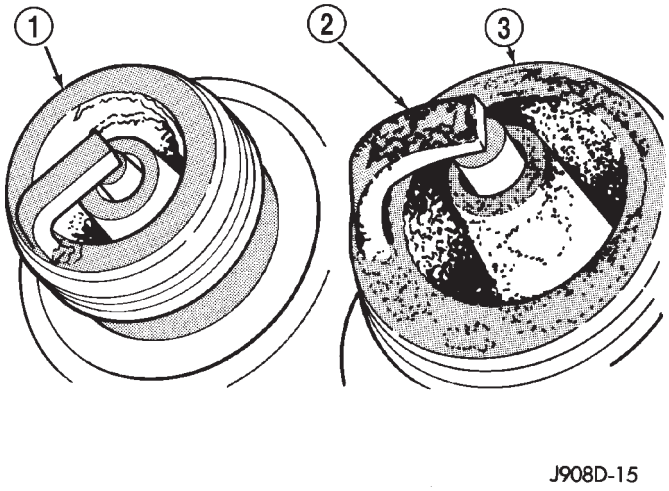


Fig. 25 NORMAL OPERATION AND COLD (CARBON) FOULING

1 - NORMAL
2 - DRY BLACK DEPOSITS
3 - COLD (CARBON) FOULING

Some fuel refiners in several areas of the United States have introduced a manganese additive (MMT) for unleaded fuel. During combustion, fuel with MMT causes the entire tip of the spark plug to be coated with a rust colored deposit. This rust color can be misdiagnosed as being caused by coolant in the combustion chamber. Spark plug performance may be affected by MMT deposits.

COLD FOULING/CARBON FOULING

Cold fouling is sometimes referred to as carbon fouling. The deposits that cause cold fouling are basically carbon (Fig. 25). A dry, black deposit on one or two plugs in a set may be caused by sticking valves or defective spark plug cables. Cold (carbon) fouling of the entire set of spark plugs may be caused by a clogged air cleaner element or repeated short operating times (short trips).

WET FOULING OR GAS FOULING

A spark plug coated with excessive wet fuel or oil is wet fouled. In older engines, worn piston rings, leaking valve guide seals or excessive cylinder wear can cause wet fouling. In new or recently overhauled engines, wet fouling may occur before break-in (normal oil control) is achieved. This condition can usually be resolved by cleaning and reinstalling the fouled plugs.

OIL OR ASH ENCRUSTED

If one or more spark plugs are oil or oil ash encrusted (Fig. 26), evaluate engine condition for the cause of oil entry into that particular combustion chamber.

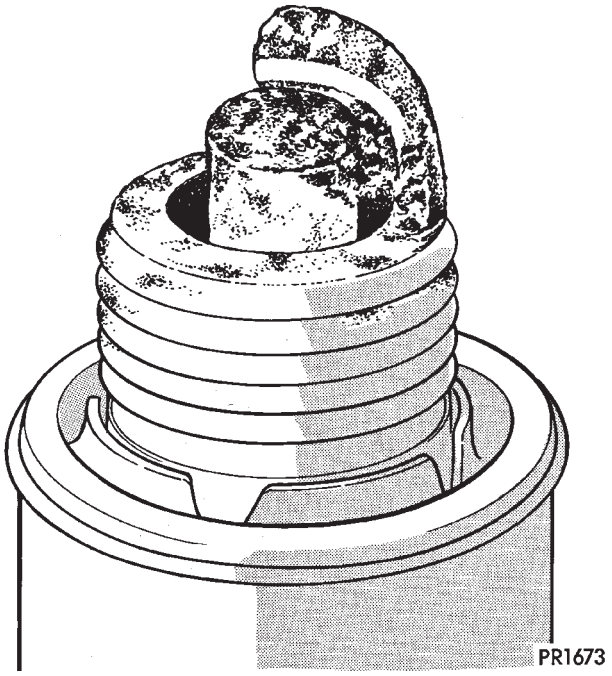


Fig. 26 OIL OR ASH ENCRUSTED

ELECTRODE GAP BRIDGING

Electrode gap bridging may be traced to loose deposits in the combustion chamber. These deposits accumulate on the spark plugs during continuous stop-and-go driving. When the engine is suddenly subjected to a high torque load, deposits partially liquefy and bridge the gap between electrodes (Fig. 27). This short circuits the electrodes. Spark plugs with electrode gap bridging can be cleaned using standard procedures.

SCAVENGER DEPOSITS

Fuel scavenger deposits may be either white or yellow (Fig. 28). They may appear to be harmful, but this is a normal condition caused by chemical additives in certain fuels. These additives are designed to change the chemical nature of deposits and decrease spark plug misfire tendencies. Notice that accumulation on the ground electrode and shell area may be heavy, but the deposits are easily removed. Spark plugs with scavenger deposits can be considered normal in condition and can be cleaned using standard procedures.

SPARK PLUG (Continued)

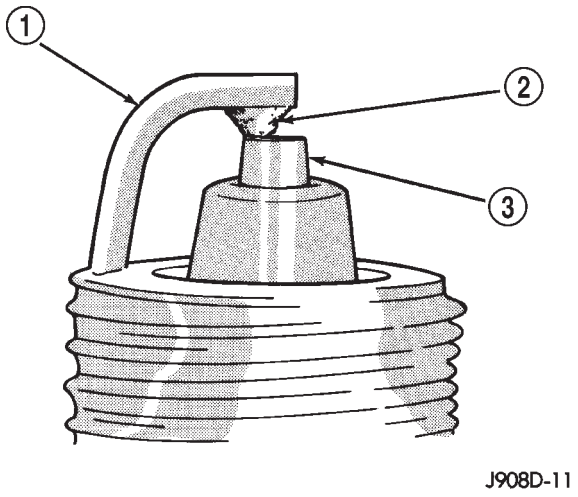


Fig. 27 ELECTRODE GAP BRIDGING

1 - GROUND ELECTRODE
2 - DEPOSITS
3 - CENTER ELECTRODE

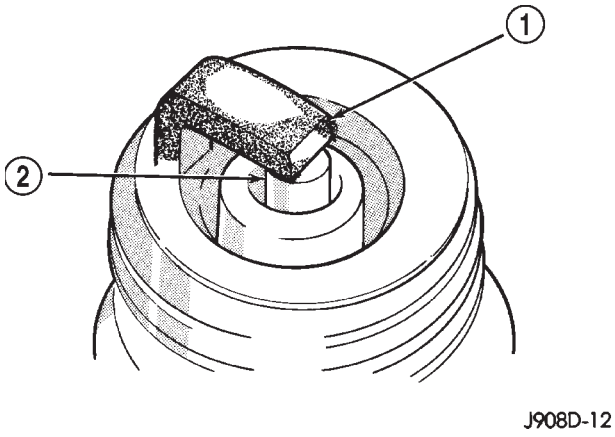


Fig. 28 SCAVENGER DEPOSITS

1 - GROUND ELECTRODE COVERED WITH WHITE OR YELLOW DEPOSITS
2 - CENTER ELECTRODE

CHIPPED ELECTRODE INSULATOR

A chipped electrode insulator usually results from bending the center electrode while adjusting the spark plug electrode gap. Under certain conditions, severe detonation can also separate the insulator from the center electrode (Fig. 29). Spark plugs with this condition must be replaced.

PRE-IGNITION DAMAGE

Pre-ignition damage is usually caused by excessive combustion chamber temperature. The center electrode dissolves first and the ground electrode dissolves somewhat latter (Fig. 30). Insulators appear relatively deposit free. Determine if the spark plug has the correct heat range rating for the engine.

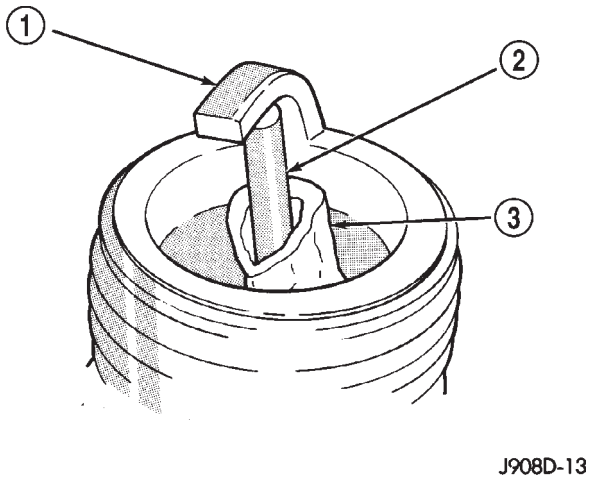


Fig. 29 CHIPPED ELECTRODE INSULATOR

1 - GROUND ELECTRODE
2 - CENTER ELECTRODE
3 - CHIPPED INSULATOR

Determine if ignition timing is over advanced or if other operating conditions are causing engine overheating. (The heat range rating refers to the operating temperature of a particular type spark plug. Spark plugs are designed to operate within specific temperature ranges. This depends upon the thickness and length of the center electrodes porcelain insulator.)

CAUTION: If the engine is equipped with copper core ground electrode, or platinum tipped spark plugs, they must be replaced with the same type/ number spark plug as the original. If another spark plug is substituted, pre-ignition will result.

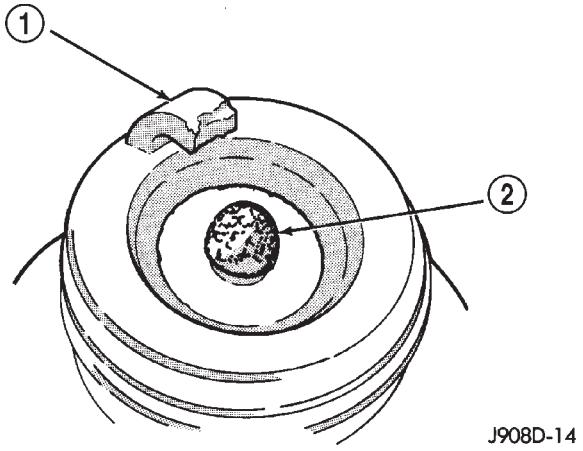


Fig. 30 PRE-IGNITION DAMAGE

1 - GROUND ELECTRODE STARTING TO DISSOLVE
2 - CENTER ELECTRODE DISSOLVED

SPARK PLUG (Continued)

SPARK PLUG OVERHEATING

Overheating is indicated by a white or gray center electrode insulator that also appears blistered (Fig. 31). The increase in electrode gap will be considerably in excess of 0.001 inch per 2000 miles of operation. This suggests that a plug with a cooler heat range rating should be used. Over advanced ignition timing, detonation and cooling system malfunctions can also cause spark plug overheating.

CAUTION: If the engine is equipped with copper core ground electrode, or platinum tipped spark plugs, they must be replaced with the same type/ number spark plug as the original. If another spark plug is substituted, pre-ignition will result.

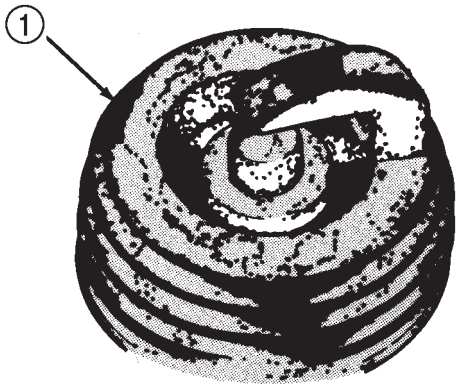


Fig. 31 SPARK PLUG OVERHEATING

1 - BLISTERED WHITE OR GRAY COLORED INSULATOR

REMOVAL

CAUTION: If equipped with a 4.7L H.O. (High-Output) engine, never substitute the original platinum tipped spark plug with a different part number. Serious engine damage may result.

On the 4.0L 6–cylinder engine, the spark plugs are located below the coil rail assembly. On the 4.7L V–8 engine, each individual spark plug is located under each ignition coil.

(1) 4.0L 6–Cylinder Engine: Prior to removing spark plug, spray compressed air around spark plug hole and area around spark plug. This will help prevent foreign material from entering combustion chamber.

(2) 4.7L V–8 Engine: Prior to removing spark plug, spray compressed air around base of ignition coil at cylinder head. This will help prevent foreign material from entering combustion chamber.

(3) On the 4.0L engine the coil rail assembly must be removed to gain access to any/all spark plug. Refer to Ignition Coil Removal/Installation. On the 4.7L V-8 engine each individual ignition coil must be removed to gain access to each spark plug. Refer to Ignition Coil Removal/Installation.

(4) Remove spark plug from cylinder head using a quality socket with a rubber or foam insert. If equipped with a 4.7L V-8 engine, also check condition of coil o-ring and replace as necessary.

(5) Inspect spark plug condition. Refer to Spark Plug Conditions.

CLEANING

Except 4.7L H.O. Engine: The plugs may be cleaned using commercially available spark plug cleaning equipment. After cleaning, file center electrode flat with a small point file or jewelers file before adjusting gap.

CAUTION: Never use a motorized wire wheel brush to clean spark plugs. Metallic deposits will remain on spark plug insulator and will cause plug misfire.

4.7L H.O. Engine: Never clean spark plugs on the 4.7L H.O. engine. Damage to the platinum rivet on the center electrode will result.

INSTALLATION

CAUTION: The standard 4.7L V-8 engine is equipped with copper core ground electrode spark plugs. They must be replaced with the same type/ number spark plug as the original. If another spark plug is substituted, pre-ignition will result.

CAUTION: If equipped with a 4.7L H.O. (High-Output) engine, never substitute the original platinum tipped spark plug with a different type/part number. Serious engine damage may result.

Special care should be taken when installing spark plugs into cylinder head spark plug wells. Be sure plugs do not drop into plug wells as ground straps may be bent resulting in a change in plug gap, or electrodes can be damaged.

Always tighten spark plugs to specified torque. Over tightening can cause distortion resulting in a change in spark plug gap or a cracked porcelain insulator.

(1) Start spark plug into cylinder head by hand to avoid cross threading.

(2) 4.0L 6–Cylinder Engine: Tighten spark plugs to 35-41 N·m (26-30 ft. lbs.) torque.

(3) 4.7L V–8 Engine: Tighten spark plugs to 27 N·m (20 ft. lbs.) torque.

(4) 4.7L V–8 Engine: Before installing coil(s), check condition of coil o-ring and replace as necessary. To aid in coil installation, apply silicone to coil o-ring.

(5) Install ignition coil(s). Refer to Ignition Coil Removal/Installation.

INSTRUMENT CLUSTER

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INSTRUMENT CLUSTER

DESCRIPTION

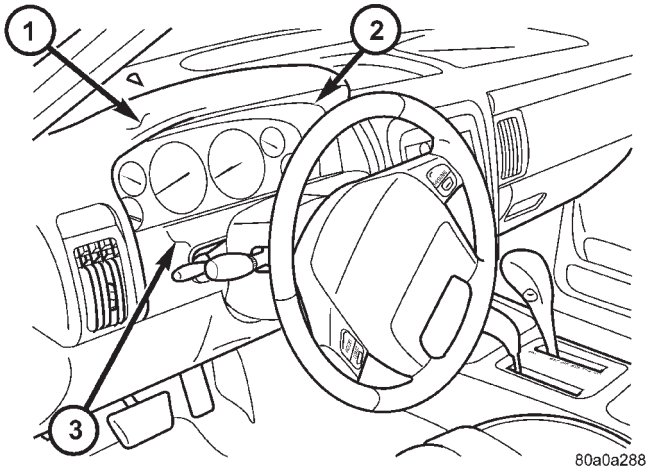


Fig. 1 Instrument Cluster

1 - INSTRUMENT PANEL TOP PAD HOOD FORMATION
2 - INSTRUMENT CLUSTER
3 - CLUSTER BEZEL

The instrument cluster for this model is an ElectroMechanical Instrument Cluster (EMIC) module that is located in the instrument panel above the steering column opening, directly in front of the driver (Fig. 1). The remainder of the EMIC, including the mounts and the electrical connections, are concealed behind the cluster bezel. The EMIC gauges and indicators are protected by an integral clear plastic cluster lens, and are visible through a dedicated hooded opening in the instrument panel top pad. Just behind and integral to the cluster lens are the cluster hood and cluster mask, which are constructed of molded black plastic. Two cluster masks are used: A base version features a black matte face and no trim ring around the perimeter of each gauge opening, while a premium version features a black matte face and a raised trim ring around the perimeter of each gauge opening. The cluster hood serves as a visor and shields the face of the cluster from ambient light and reflections to reduce glare, while the cluster mask serves to separate and define the individual gauges of the EMIC. On the lower edge of the cluster lens just right of the speedometer, the black plastic odometer/trip odometer switch button protrudes through dedicated holes in the cluster mask and the cluster lens. The molded plastic EMIC lens, hood and mask unit has four integral mounting tabs, two tabs extend down vertically from the lower edge of the unit and two tabs extend horizontally rearward from the upper surface of the hood. The two lower mounting tabs are used to secure the EMIC to the molded plastic instrument panel cluster carrier with two screws, while the two upper tabs are secured to the underside of the hood formation of the instrument panel top pad with two screws. A single molded connector receptacle located on the EMIC electronic circuit board is accessed from the back of the cluster housing and is connected to the vehicle electrical system through a single dedicated take out and connector of the instrument panel wire harness.

The cluster mask features two large round openings near its center through which the two major gauges are visible, and two smaller round openings stacked at the outboard side of each of the large openings through which the four minor gauges are visible. The cluster mask and the dial faces of the gauges are laminated plastic units. The dark, visible surface of the mask and the gauge dial faces are the outer layer or overlay, which is translucent. The darkness of this outer layer prevents the cluster from appearing too cluttered or busy by concealing the cluster indicators that are not illuminated, while the translucence of this layer allows those indicators and icons that are illuminated to be readily visible. The underlying layer of the cluster mask overlay is opaque and allows light from the various indicators behind it to be visible through the outer layer of the mask and gauge dial faces only through predetermined cutouts. On the base instrument clusters the graphics, increments, and numerals on the gauge faces are also translucent and illuminated from behind, while the orange gauge pointers are illuminated internally. On the premium instrument clusters the graphics, increments, numerals and gauge needles are opaque while the remainder of the gauge faces are translucent and illuminated from behind by an electro-luminescent lamp. The EMIC electronic circuitry is protected by a molded plastic rear cover that features several round access holes for service of the incandescent cluster indicator and illumination lighting lamps and a large rectangular access hole for the EMIC connector receptacle. The EMIC rear cover is secured to the cluster housing with screws, while the cluster lens, hood, and mask unit is secured to the cluster housing with several integral plastic latch features.

Twelve versions of the EMIC module are offered on this model, two base and ten premium. These versions accommodate all of the variations of optional equipment and regulatory requirements for the various markets in which the vehicle will be offered. This module utilizes integrated circuitry and information carried on the Programmable Communications Interface (PCI) data bus network for control of all gauges and many of the indicators. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - DESCRIPTION - PCI BUS). The

INSTRUMENT CLUSTER (Continued)

EMIC also uses several hard wired inputs in order to perform its many functions. The EMIC module incorporates a blue-green digital Vacuum Fluorescent Display (VFD) for displaying odometer and trip odometer information.

The EMIC houses six analog gauges and has provisions for up to twenty indicators (Fig. 2). The EMIC includes the following analog gauges:

- **Coolant Temperature Gauge**
- **Fuel Gauge**
- **Oil Pressure Gauge**
- **Speedometer**
- **Tachometer**
- **Voltage Gauge**

Some of the EMIC indicators are automatically configured when the EMIC is connected to the vehicle electrical system for compatibility with certain optional equipment or equipment required for regulatory purposes in certain markets. While each EMIC may have provisions for indicators to support every available option, the configurable indicators will not be functional in a vehicle that does not have the equipment that an indicator supports. The EMIC includes provisions for the following indicators (Fig. 2):

- **Airbag Indicator (with Airbags only)**
- **Antilock Brake System (ABS) Indicator**
- **Brake Indicator**
- **Check Gauges Indicator**
- **Coolant Low Indicator (with Diesel Engine only)**
- **Cruise Indicator**
- **Four-Wheel Drive Part Time Indicator (with Selec-Trac NVG-242 Transfer Case only)**
- **Front Fog Lamp Indicator (with Front Fog Lamps only)**
- **High Beam Indicator**
- **Low Fuel Indicator**
- **Malfunction Indicator Lamp (MIL)**
- **Overdrive-Off Indicator (except Diesel Engine)**
- **Rear Fog Lamp Indicator (with Rear Fog Lamps only)**
- **Seatbelt Indicator**
- **Sentry Key Immobilizer System (SKIS) Indicator**
- **Transmission Overtemp Indicator (except Diesel Engine)**
- **Turn Signal (Right and Left) Indicators**
- **Wait-To-Start Indicator (with Diesel Engine only)**
- **Water-In-Fuel Indicator (with Diesel Engine only)**

Many indicators in the EMIC are illuminated by a dedicated Light Emitting Diode (LED) that is soldered onto the EMIC electronic circuit board. The LEDs are not available for service replacement and, if damaged or faulty, the entire EMIC must be replaced. Base cluster illumination is accomplished by dimmable incandescent back lighting, which illuminates the gauges for visibility when the exterior lighting is turned on. Premium cluster illumination is accomplished by a dimmable electro-luminescent lamp that is serviced only as a unit with the EMIC. Each of the incandescent bulbs is secured by an integral bulb holder to the electronic circuit board from the back of the cluster housing. The incandescent bulb/bulb holder units are available for service replacement.

Hard wired circuitry connects the EMIC to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the EMIC through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

The EMIC modules for this model are serviced only as complete units. The EMIC module cannot be adjusted or repaired. If a gauge, an LED indicator, the VFD, the electronic circuit board, the circuit board hardware, the cluster overlay, the electro-luminescent lamp (premium model only) or the EMIC housing are damaged or faulty, the entire EMIC module must be replaced. The cluster lens, hood and mask unit and the individual incandescent lamp bulbs with holders are available for service replacement.

INSTRUMENT CLUSTER (Continued)

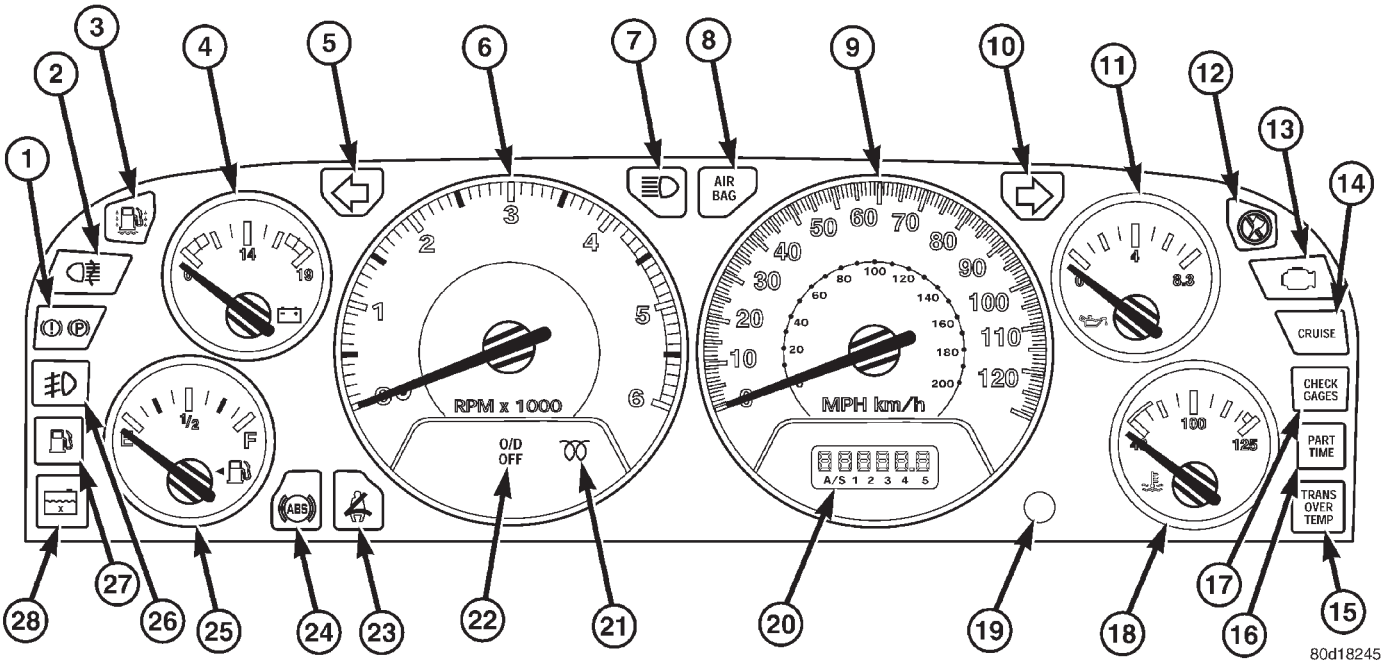


Fig. 2 EMIC Gauges & Indicators

1 - BRAKE INDICATOR
2 - REAR FOG LAMP INDICATOR
3 - WATER-IN-FUEL INDICATOR
4 - VOLTAGE GAUGE
5 - LEFT TURN INDICATOR
6 - TACHOMETER
7 - HIGH BEAM INDICATOR
8 - AIRBAG INDICATOR
9 - SPEEDOMETER
10 - RIGHT TURN INDICATOR
11 - OIL PRESSURE GAUGE
12 - SKIS INDICATOR
13 - MALFUNCTION INDICATOR LAMP (MIL)
14 - CRUISE INDICATOR
15 - TRANSMISSION OVERTEMP INDICATOR
16 - PART TIME 4WD INDICATOR
17 - CHECK GAUGES INDICATOR
18 - ENGINE TEMPERATURE GAUGE
19 - ODOMETER/TRIP ODOMETER SWITCH BUTTON
20 - ODOMETER/TRIP ODOMETER DISPLAY
21 - WAIT-TO-START INDICATOR
22 - OVERDRIVE-OFF INDICATOR
23 - SEATBELT INDICATOR
24 - ABS INDICATOR
25 - FUEL GAUGE
26 - FRONT FOG LAMP INDICATOR
27 - LOW FUEL INDICATOR
28 - COOLANT LOW INDICATOR

OPERATION

The ElectroMechanical Instrument Cluster (EMIC) is designed to allow the vehicle operator to monitor the conditions of many of the vehicle components and operating systems. The gauges and indicators in the EMIC provide valuable information about the various standard and optional powertrains, fuel and emissions systems, cooling systems, lighting systems, safety systems and many other convenience items. The EMIC is installed in the instrument panel so that all of these monitors can be easily viewed by the vehicle operator when driving, while still allowing relative ease of access for service. The microprocessor-based EMIC hardware and software uses various inputs to control the gauges and indicators visible on the face of the cluster. Some of these inputs are hard wired, but most are in the form of electronic messages that are transmitted by other electronic modules over the Programmable Communications Interface (PCI) data bus network. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

The EMIC microprocessor smooths the input data using algorithms to provide gauge readings that are accurate, stable and responsive to operating conditions. These algorithms are designed to provide gauge readings during normal operation that are consistent with customer expectations. However, when abnormal conditions exist, such as low or high battery voltage, low oil pressure or high coolant temperature, the algorithm can drive the gauge pointer to an extreme position and the microprocessor turns on the Check Gauges indicator to provide a distinct visual indication of a problem to the vehicle operator. The instrument cluster circuitry also sends electronic chime tone request messages over the PCI data bus to the Body Control Module (BCM) when it monitors

certain conditions or inputs to provide the vehicle operator with an audible alert to supplement a visual indication.

The EMIC circuitry operates on battery current received through fused B(+) fuses in the Power Distribution Center (PDC) and the Junction Block (JB) on a non-switched fused B(+) circuit, and on battery current received through a fused ignition switch output (run-start) fuse in the JB on a fused ignition switch output (run-start) circuit. This arrangement allows the EMIC to provide some features regardless of the ignition switch position, while other features will operate only with the ignition switch in the On or Start positions. The EMIC circuitry is grounded through two separate ground circuits of the instrument panel wire harness. These ground circuits receive ground through take outs of the instrument panel wire harness with eyelet terminal connectors that are secured by a nut to a ground stud located on the floor panel transmission tunnel beneath the center floor console, just forward of the Airbag Control Module (ACM).

The EMIC also has a self-diagnostic actuator test capability, which will test each of the PCI bus message-controlled functions of the cluster by lighting the appropriate indicators (except the airbag indicator), sweeping the gauge needles across the gauge faces from their minimum to their maximum readings, and stepping the odometer display sequentially from all zeros through all nines. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The self-diagnostic actuator test can be initialized manually or using a DRBIII® scan tool. Refer to the appropriate diagnostic information. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the EMIC.

GAUGES

All gauges receive battery current through the EMIC circuitry when the ignition switch is in the On or Start positions. With the ignition switch in the Off position battery current is not supplied to any gauges, and the EMIC circuitry is programmed to move all of the gauge needles back to the low end of their respective scales. Therefore, the gauges do not accurately indicate any vehicle condition unless the ignition switch is in the On or Start positions. All of the EMIC gauges, except the odometer, are air core magnetic units. Two fixed electromagnetic coils are located within each gauge. These coils are wrapped at right angles to each other around a movable permanent magnet. The movable magnet is suspended within the coils on one end of a pivot shaft, while the gauge needle is attached to the other end of the shaft. One of the coils has a fixed current flowing through it to maintain a constant magnetic field strength. Current flow through the second coil changes, which causes changes in its magnetic field strength. The current flowing through the second coil is changed by the EMIC circuitry in response to messages received over the PCI data bus. The gauge needle moves as the movable permanent magnet aligns itself to the changing magnetic fields created around it by the electromagnets.

The gauges are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/ INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus, and the data bus message inputs to the EMIC that control each gauge requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific operation details for each gauge may be found elsewhere in this service information.

VACUUM-FLUORESCENT DISPLAY

The Vacuum-Fluorescent Display (VFD) module is soldered to the EMIC circuit board. The display is active with the ignition switch in the On or Start positions, and inactive when the ignition switch is in any other position. The illumination intensity of the VFD is controlled by the EMIC circuitry based upon electronic dimming level messages received from the BCM over the PCI data bus, and is synchronized with the illumination intensity of other VFDs in the vehicle. The BCM provides dimming level messages based upon internal programming and inputs it receives from the control knob and control ring on the control stalk of the left (lighting) multi-function switch on the steering column.

The VFD has several display capabilities including odometer and trip odometer information. An odometer/trip odometer switch on the EMIC circuit board is used to control the display modes. This switch is actuated manually by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just right of the speedometer. Actuating this switch momentarily with the ignition switch in the On position will toggle the VFD between the odometer and trip odometer modes. The EMIC microprocessor remembers which display mode is active when the ignition switch is turned to the Off position, and returns the display to that mode when the ignition switch is turned On again. Depressing the switch button for about two seconds while the VFD is in the trip odometer mode will reset the trip odometer value to zero. Holding this switch depressed while turning the ignition switch from the Off position to the On position will initiate the EMIC self-diagnostic actuator test. Refer to the appropriate diagnostic information for additional details on this VFD function.

INSTRUMENT CLUSTER (Continued)

The VFD is diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the data bus message inputs to the EMIC that control the VFD functions requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific operation details for the odometer and trip odometer functions of the VFD may be found elsewhere in this service information.

INDICATORS

Indicators are located in various positions within the EMIC and are all connected to the EMIC circuit board. The turn signal indicators are hard wired. The brake indicator is controlled by PCI data bus messages from the Controller Antilock Brake (CAB) as well as by hard wired park brake switch and brake fluid level switch inputs to the EMIC. The Malfunction Indicator Lamp (MIL) is normally controlled by PCI data bus messages from the Powertrain Control Module (PCM); however, if the EMIC loses PCI data bus communication, the EMIC circuitry will automatically turn the MIL on until PCI data bus communication is restored. The EMIC uses PCI data bus messages from the Airbag Control Module (ACM), the BCM, the PCM, the CAB, the Sentry Key Immobilizer Module (SKIM), and the Transmission Control Module (TCM) to control all of the remaining indicators.

The various indicators are controlled by different strategies; some receive fused ignition switch output from the EMIC circuitry and have a switched ground, others are grounded through the EMIC circuitry and have a switched battery feed, while still others are completely controlled by the EMIC microprocessor based upon various hard wired and electronic message inputs. Some indicators are illuminated at a fixed intensity, while the illumination intensity of others is synchronized with that of the EMIC general illumination lamps.

The hard wired indicators are diagnosed using conventional diagnostic methods. The EMIC and PCI bus message controlled indicators are diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). Proper testing of the PCI data bus and the electronic data bus message inputs to the EMIC that control each indicator require the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information. Specific details of the operation for each indicator may be found elsewhere in this service information.

CLUSTER ILLUMINATION

Two types of general cluster illumination are available in this model. Base versions of the EMIC have several incandescent illumination lamps, while premium versions of the EMIC have a single electro-luminescent lamp. Both types of lamps provide cluster back lighting whenever the exterior lighting is turned On with the control knob on the left (lighting) multi-function switch control stalk. The illumination intensity of these lamps is adjusted by the EMIC microprocessor based upon electronic dimming level messages received from the Body Control Module (BCM) over the PCI data bus. The BCM provides electronic dimming level messages to the EMIC based upon internal programming and inputs it receives when the control ring on the left (lighting) multi-function switch control stalk is rotated (down to dim, up to brighten) to one of six available minor detent positions.

The incandescent illumination lamps receive battery current at all times, while the ground for these lamps is controlled by a 12-volt Pulse Width Modulated (PWM) output of the EMIC electronic circuitry. The illumination intensity of these bulbs and of the vacuum-fluorescent electronic display are controlled by the instrument cluster microprocessor based upon dimming level messages received from the Body Control Module (BCM) over the PCI data bus. The BCM uses inputs from the headlamp and panel dimmer switches within the left (lighting) multi-function switch control stalk and internal programming to decide what dimming level message is required. The BCM then sends the proper dimming level messages to the EMIC over the PCI data bus.

The electro-luminescent lamp unit consists of layers of phosphor, carbon, idium tin oxide, and dielectric applied by a silk-screen process between two polyester membranes and includes a short pigtail wire and connector. The lamp pigtail wire is connected to a small connector receptacle on the EMIC circuit board through a small clearance hole in the cluster housing rear cover. The EMIC electronic circuitry also uses a PWM strategy to control the illumination intensity of this lamp; however, the EMIC powers this lamp with an Alternating Current (AC) rated at 80 volts rms (root mean squared) and 415 Hertz, which excites the phosphor particles causing them to luminesce.

The BCM also has several hard wired panel lamp driver outputs and sends the proper panel lamps dimming level messages over the PCI data bus to coordinate the illumination intensity of all of the instrument panel lighting and the VFDs of other electronic modules on the PCI data bus. Vehicles equipped with the Auto Headlamps option have an automatic parade mode. In this mode, the BCM uses

an input from the auto headlamp light sensor to determine the ambient light levels. If the BCM decides that the exterior lighting is turned on in the daylight, it overrides the selected panel dimmer switch signal by sending a message over the PCI data bus to illuminate all vacuum fluorescent displays at full brightness for improved visibility in daytime light levels. The automatic parade mode has no effect on the incandescent bulb illumination intensity.

The hard wired cluster illumination circuits between the left (lighting) multi-function switch and the BCM may be diagnosed using conventional diagnostic tools and methods. The electro-luminescent lamp is diagnosed using the EMIC self-diagnostic actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). However, proper testing of the EMIC and the electronic dimming level messages sent by the BCM over the PCI data bus requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

CHIME SERVICE

The EMIC is programmed to request chime service from the Body Control Module (BCM) when certain indicators are illuminated. The EMIC chime request for illumination of the low fuel indicator is a customer programmable feature. When the programmed conditions are met, the EMIC generates an electronic chime request message and sends it over the PCI data bus to the BCM. Upon receiving the proper chime request, the BCM activates an integral chime tone generator to provide the audible chime tone to the vehicle operator. (Refer to 8 - ELECTRICAL/CHIME WARNING SYSTEM - OPERATION). Proper testing of the PCI data bus and the electronic chime request message outputs from the EMIC requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - INSTRUMENT CLUSTER

If all of the instrument cluster gauges and/or indicators are inoperative, refer to PRELIMINARY DIAGNOSIS . If an individual gauge or Programmable Communications Interface (PCI) data bus message-controlled indicator is inoperative, refer to ACTUATOR TEST . If an individual hard wired indicator is inoperative, refer to the diagnosis and testing information for that specific indicator. If the base instrument cluster incandescent illumination lighting is inoperative, refer to CLUSTER ILLUMINATION DIAGNOSIS . If the premium instrument cluster electro-luminescent illumination lighting is inoperative, refer to ACTUATOR TEST . Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

NOTE: Occasionally, a condition may be encountered where the gauge pointer for the speedometer or the tachometer becomes caught on the wrong side of the pointer stop. To correct this condition, the technician should use a DRBIII® scan tool and the appropriate diagnostic information to perform the instrument cluster self-diagnostic actuator test procedure. When performed, the actuator test procedure will automatically return the pointer to the correct side of the pointer stop.

PRELIMINARY DIAGNOSIS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

(1) Check the fused B(+) fuse (Fuse 17 - 10 ampere) in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse (Fuse 17 - 10 ampere) in the JB. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit between

INSTRUMENT CLUSTER (Continued)

the JB and the Power Distribution Center (PDC) as required.

(3) Check the fused ignition switch output (run-start) fuse (Fuse 22 - 10 ampere) in the JB. If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-start) fuse (Fuse 22 - 10 ampere) in the JB. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run-start) circuit between the JB and the ignition switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the instrument cluster. Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the instrument cluster. If OK, go to Step 6. If not OK, repair the open fused B(+) circuit between the instrument cluster and the JB as required.

(6) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-start) circuit cavity of the instrument panel wire harness connector for the instrument cluster. If OK, go to Step 7. If not OK, repair the open fused ignition switch output (run-start) circuit between the instrument cluster and the JB as required.

(7) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Check for continuity between each of the ground circuit cavities of the instrument panel wire harness connector for the instrument cluster and a good ground. There should be continuity. If OK, refer to the ACTUATOR TEST . If not OK, repair the open ground circuit(s) between the instrument cluster and ground (G200) as required.

ACTUATOR TEST

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

The instrument cluster actuator test will put the instrument cluster into its self-diagnostic mode. In this mode the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, the PCI data bus message controlled indicators, and the electro-luminescent illumination lamp (if equipped) are capable of operating as designed. During the actuator test the instrument cluster circuitry will sweep each of the gauge needles across the gauge faces, illuminate each of the segments in the Vacuum-Fluorescent Display (VFD), turn all of the PCI data bus message-controlled indicators on and off again, and turn the electro-luminescent illumination lamp (if equipped) on and off again.

Successful completion of the actuator test will confirm that the instrument cluster is operational. However, there may still be a problem with the PCI data bus, the Powertrain Control Module, the Airbag Control Module (ACM), the Body Control Module (BCM), the Controller Anti-lock Brake (CAB), the Sentry Key Immobilizer Module (SKIM), or the inputs to one of these electronic control modules. Use a DRBIII® scan tool to diagnose these components. Refer to the appropriate diagnostic information.

If an individual indicator lamp or the electro-luminescent illumination lamp do not illuminate during the actuator test, the instrument cluster should be removed. However, check that the incandescent lamp bulb is not faulty, that the bulb holder is properly installed on the instrument cluster electronic circuit board, or that the electro-luminescent lamp pigtail wire connector is properly connected to the instrument cluster electronic circuit board before considering instrument cluster replacement. If the bulb and bulb holder, or the electro-luminescent lamp connection check OK, replace the faulty instrument cluster unit.

(1) Begin the test with the ignition switch in the Off position.

(2) Depress the odometer/trip odometer switch button.

(3) While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the On position, but do not start the engine.

(4) Release the odometer/trip odometer switch button.

(5) The instrument cluster will automatically begin the actuator test sequence, as follows:

(a) The cluster will turn on, then off again each of the PCI data bus message controlled indicators (except Airbag) to confirm the functionality of the indicator and the cluster control circuitry:

(b) The cluster will sweep the needles for each of the gauges from minimum to maximum and back to minimum to confirm the functionality of the gauge and the cluster control circuitry:

(c) Only on models with a premium version of the cluster, the cluster will illuminate the electroluminescent lamp and turn it off again to confirm the functionality of the lamp and the cluster control circuitry.

(d) The cluster will sequentially step the odometer/trip odometer VFD display from all zeros (000000) through all nines (999999) to confirm the functionality of all VFD segments and their control circuitry, then display the software version number, followed by "DONE".

(6) The actuator test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test, if the ignition switch is turned to the Off position during the test, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the PCI data bus during the test.

(7) Go back to Step 1 to repeat the test, if required.

CLUSTER ILLUMINATION DIAGNOSIS

On models equipped with a base version of the instrument cluster, the EMIC has several incandescent illumination lamps that are illuminated whenever the exterior lighting is turned On. If the problem being diagnosed is a single inoperative illumination lamp, be certain that the bulb and bulb holder unit are properly installed in the instrument cluster electronic circuit board. If no installation problems are found replace the faulty bulb and bulb holder unit. If all of the cluster illumination lamps are inoperative, the most reliable, efficient, and accurate means to diagnose the cluster illumination function of the instrument cluster requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - REMOVAL).

(3) Remove the two screws that secure the upper mounting tabs of the instrument cluster to the underside of the instrument cluster hood formation of the instrument panel top pad.

(4) Remove the two screws that secure the lower mounting tabs of the instrument cluster to the instrument panel structural duct.

INSTRUMENT CLUSTER (Continued)

(5) Pull the upper mounting tabs of the instrument cluster downward, then pull the instrument cluster rearward far enough to access the instrument panel wire harness connector for the instrument cluster (Fig. 3).

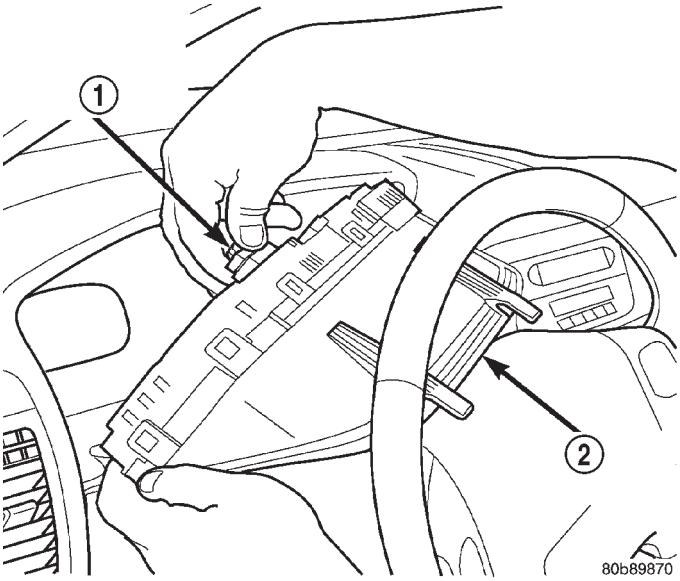


Fig. 3 Instrument Cluster Remove/Install

1 - INSTRUMENT PANEL WIRE HARNESS CONNECTOR
2 - INSTRUMENT CLUSTER

(6) Disconnect the instrument panel wire harness connector for the instrument cluster from the connector receptacle on the back of the instrument cluster housing.

(7) Remove the instrument cluster from the instrument panel.

DISASSEMBLY

Some of the components for the instrument cluster used in this vehicle are serviced individually. The serviced components include: the incandescent instrument cluster indicator and illumination lamp bulbs (including the integral bulb holders), the cluster lens, hood and mask unit, and the cluster housing rear cover. Following are the procedures for disassembling these components from the instrument cluster unit.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

CLUSTER BULB

This procedure applies to each of the incandescent cluster illumination lamp or indicator bulb and bulb holder units. However, the illumination lamps and the indicators use different bulb and bulb holder unit sizes. They must never be interchanged. Be certain that any bulb holder removed from the electronic circuit board is reinstalled in the correct position.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) Turn the bulb holder counterclockwise about sixty degrees on the cluster electronic circuit board (Fig. 4).

(4) Pull the bulb and bulb holder straight back to remove it from the bulb mounting hole in the cluster electronic circuit board.

CLUSTER LENS, HOOD AND MASK

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) Work around the perimeter of the cluster housing to disengage each of the eight latches that secure the cluster lens, hood and mask unit to the cluster housing (Fig. 5).

(4) Gently pull the cluster lens, hood and mask unit away from the cluster housing.

CLUSTER HOUSING REAR COVER

(1) Disconnect and isolate the battery negative cable.

INSTRUMENT CLUSTER (Continued)

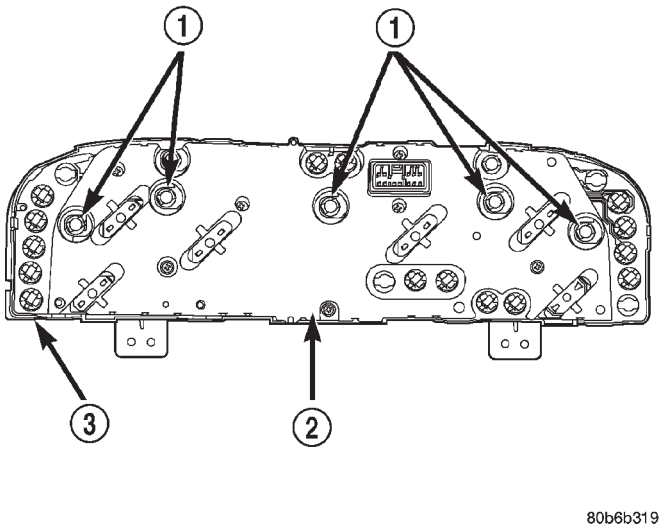


Fig. 4 Cluster Bulb Locations - Typical

1 - ILLUMINATION LAMP BULBS AND HOLDERS (5)
2 - CLUSTER HOUSING REAR COVER
3 - CLUSTER HOUSING

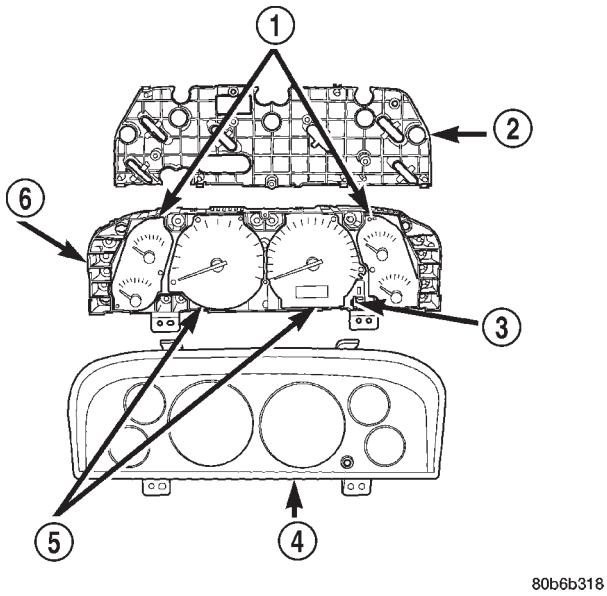


Fig. 5 Instrument Cluster Components

1 - MINOR GAUGE SETS
2 - HOUSING REAR COVER
3 - TRIP ODOMETER RESET KNOB
4 - LENS, HOOD AND MASK
5 - MAJOR GAUGES
6 - CLUSTER HOUSING

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) On models with a premium cluster only, disconnect the electro-luminescent illumination lamp pigtail wire connector from the receptacle on the cluster electronic circuit board and disengage the pigtail wire from the integral routing clip on the rear cover (Fig. 6).

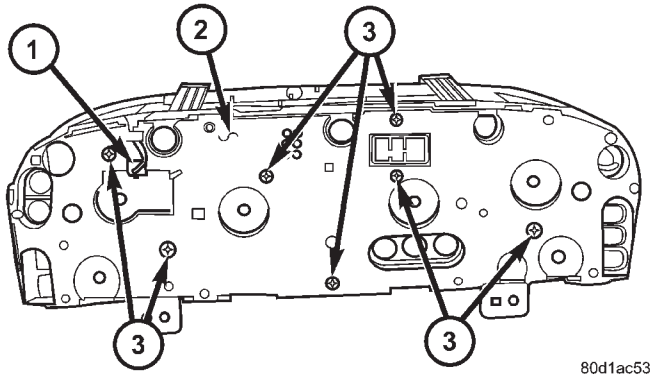


Fig. 6 Cluster Housing Rear Cover Screws

1 - ELECTRO-LUMINESCENT LAMP PIGTAIL WIRE CONNECTOR
2 - REAR COVER
3 - SCREW (7)

(4) Remove the seven screws that secure the rear cover to the back of the cluster housing.

(5) Disengage the eight latch features (four on top, four on the bottom) that secure the upper and lower edges of the rear cover to the top and bottom of the cluster housing.

(6) Remove the rear cover from the back of the cluster housing.

ASSEMBLY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

INSTRUMENT CLUSTER (Continued)

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

CLUSTER BULB

This procedure applies to each of the incandescent cluster illumination lamp or indicator bulb and bulb holder units. However, the illumination lamps and the indicators use different bulb and bulb holder unit sizes. They must never be interchanged.

CAUTION: Be certain that any bulb and bulb holder unit removed from the cluster electronic circuit board is reinstalled in the correct position. Always use the correct bulb size and type for replacement. An incorrect bulb size or type may overheat and cause damage to the instrument cluster, the electronic circuit board and/or the gauges.

(1) Insert the bulb and bulb holder straight into the correct bulb mounting hole in the cluster electronic circuit board (Fig. 4).

(2) With the bulb holder fully seated against the cluster electronic circuit board, turn the bulb holder clockwise about sixty degrees to lock it into place.

(3) Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(4) Reconnect the battery negative cable.

CLUSTER LENS, HOOD AND MASK

(1) Position the cluster lens, hood and mask unit over the face of the instrument cluster (Fig. 5). Be certain that the odometer/trip odometer switch button is inserted through the proper clearance holes in the mask and the lens.

(2) Press firmly and evenly on the cluster lens, hood and mask unit to install it onto the cluster housing.

(3) Work around the perimeter of the cluster housing to be certain that each of the eight latches that secure the cluster lens, hood and mask unit to the cluster housing is fully engaged.

(4) Reinstall the instrument cluster into the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(5) Reconnect the battery negative cable.

CLUSTER HOUSING REAR COVER

(1) Position the rear cover onto the back of the cluster housing (Fig. 6).

(2) Press firmly and evenly on the rear cover until each of the eight latches (four on top, four on the bottom) that secure the upper and lower edges of the rear cover to the top and bottom of the cluster housing are fully engaged.

(3) Install and tighten the seven screws that secure the rear cover to the back of the cluster housing. Tighten the screws to 2 N·m (20 in. lbs.).

(4) On models with a premium cluster only, reconnect the electro-luminescent illumination lamp pigtail wire connector to the receptacle on the cluster electronic circuit board and engage the pigtail wire under the integral routing clip on the rear cover.

(5) Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(6) Reconnect the battery negative cable.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: ON VEHICLES EQUIPPED WITH THE PREMIUM INSTRUMENT CLUSTER, THE CLUSTER CIRCUITRY PROVIDES AN ALTERNATING CURRENT TO SUPPLY POWER TO THE ELECTRO-LUMINESCENT ILLUMINATION LAMP THROUGH A PIGTAIL WIRE AND CONNECTOR THAT IS ACCESSIBLE AT THE BACK OF THE CLUSTER HOUSING. USE PROPER PRECAUTIONS WHEN HANDLING THIS UNIT DURING DIAGNOSIS OR SERVICE TO AVOID ELECTRICAL SHOCK AND POSSIBLE PERSONAL INJURY.

(1) Position the instrument cluster to the instrument panel.

INSTRUMENT CLUSTER (Continued)

(2) Reconnect the instrument panel wire harness connector for the instrument cluster to the connector receptacle on the back of the instrument cluster housing (Fig. 7).

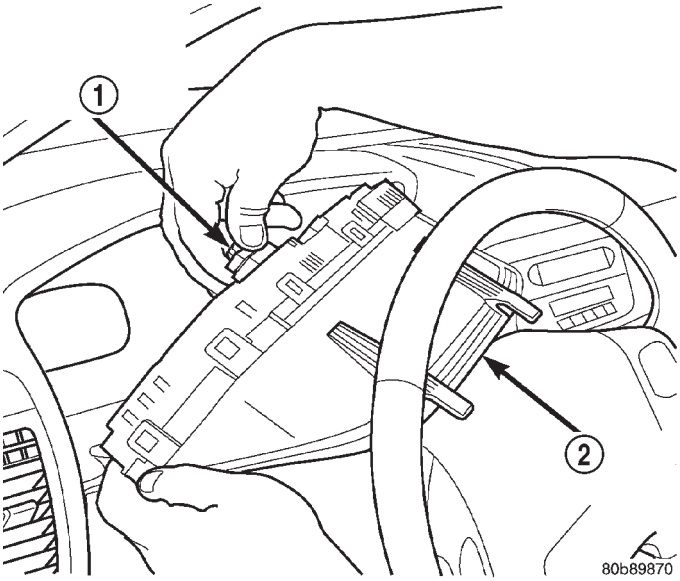


Fig. 7 Instrument Cluster Remove/Install

1 - INSTRUMENT PANEL WIRE HARNESS CONNECTOR
2 - INSTRUMENT CLUSTER

(3) Position the lower mounting tabs of the instrument cluster to the mounting holes on the instrument panel structural duct, then tilt the top of the instrument cluster forward until the upper mounting tabs are positioned to the mounting holes on the underside of the instrument cluster hood formation of the instrument panel top pad.

(4) Install and tighten the two screws that secure the upper mounting tabs of the instrument cluster to the underside of the instrument cluster hood formation of the instrument panel top pad. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install and tighten the two screws that secure the lower mounting tabs of the instrument cluster to the instrument panel structural duct. Tighten the screws to 2.2 N·m (20 in. lbs.).

(6) Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ CLUSTER BEZEL - INSTALLATION).

(7) Reconnect the battery negative cable.

ABS INDICATOR

DESCRIPTION

An Anti-lock Brake System (ABS) indicator is standard equipment on all instrument clusters. The ABS indicator is located on the lower left edge of the instrument cluster, to the left of the tachometer. The ABS indicator consists of a International Control and Display Symbol icon for “Failure of Anti-lock Braking System” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The ABS indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The ABS indicator gives an indication to the vehicle operator when the ABS system is faulty or inoperative. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Controller Anti-lock Brake (CAB) over the Programmable Communications Interface (PCI) data bus. The ABS indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the ABS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the CAB sends an electronic ABS lamp-on message to the cluster which will illuminate the ABS indicator for about four seconds as a bulb test. The entire four second bulb test is a function of the CAB.
- **ABS Indicator Lamp-On Message** - Each time the cluster receives an ABS indicator lamp-on message from the CAB, the ABS indicator will be illuminated. The indicator remains illuminated until the cluster receives an ABS indicator lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no ABS indicator lamp-on or lamp-off messages from the CAB for six consecutive seconds, the ABS indicator is illuminated. The indicator remains illuminated until the cluster receives a valid lamp-on or lamp-off message from the CAB, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the instrument cluster is put through the actuator test, the ABS indica-

ABS INDICATOR (Continued)

tor will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

- **ABS Diagnostic Test** - The ABS indicator is blinked on and off based upon lamp-on and lamp-off messages from the CAB during the performance of the ABS diagnostic tests.

The CAB continually monitors the ABS circuits and sensors to decide whether the system is in good operating condition. The CAB then sends the proper ABS indicator lamp-on or lamp-off messages to the instrument cluster. If the ABS indicator fails to light during the bulb test, replace the bulb with a known good unit. If the CAB sends an ABS indicator lamp-on message after the bulb test, it indicates that the CAB has detected a system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the ABS indicator fails to illuminate due to an open or short in the cluster ABS indicator circuit or bulb, the cluster sends a message notifying the CAB of the condition, then the instrument cluster and the CAB will each store a DTC. For proper diagnosis of the anti-lock brake system, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the ABS indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

AIRBAG INDICATOR

DESCRIPTION

An airbag indicator is standard equipment on all instrument clusters. However, the instrument cluster is programmed to automatically enable this indicator only on vehicles equipped with the airbag system, which is not available in some markets. The airbag indicator is located on the upper edge of the instrument cluster, between the speedometer and the tachometer. The airbag indicator consists of the words “AIR BAG” imprinted on a red lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The “AIR BAG” text appears silhouetted against a red field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a Light Emitting Diode (LED), which is soldered onto the instrument cluster electronic circuit board. The airbag indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The airbag indicator gives an indication to the vehicle operator when the airbag system is faulty or inoperative. The airbag indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Airbag Control Module (ACM) over the Programmable Communications Interface (PCI) data bus. The airbag indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is switched to ground by the instrument cluster transistor. The instrument cluster will turn on the airbag indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the ACM sends an electronic airbag indicator lamp-on message to the cluster which will illuminate the airbag indicator for about six seconds as a bulb test. The entire six second bulb test is a function of the ACM.
- **Airbag Indicator Lamp-On Message** - Each time the cluster receives an airbag indicator lamp-on message from the ACM, the airbag indicator will be illuminated. The indicator remains illuminated for about twelve seconds or until the cluster receives an airbag indicator lamp-off message from the ACM, whichever is longer.
- **Communication Error** - If the cluster receives no airbag indicator lamp-on or lamp-off messages for six consecutive seconds, the airbag indicator is illuminated. The indicator remains illuminated until the cluster receives a single valid airbag indicator lamp-off message from the ACM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the airbag indicator will be turned on, then off again during the bulb check portion of the test to confirm the functionality of the LED and the cluster control circuitry. The actuator test illumination of the airbag indicator is also a function of the ACM.

The ACM continually monitors the airbag system circuits and sensors to decide whether the system is in good operating condition. The ACM then sends the proper airbag indicator lamp-on or lamp-off messages to the instrument cluster. If the ACM sends an airbag indicator lamp-on message after the bulb test, it indicates that the ACM has detected a system malfunction. Such a malfunction could mean that the airbags may not deploy when required, or may deploy when not required. The ACM will store a

AIRBAG INDICATOR (Continued)

Diagnostic Trouble Code (DTC) for any malfunction it detects. Each time the airbag indicator fails to illuminate due to an open or short in the cluster airbag indicator circuit, the cluster sends a message notifying the ACM of the condition, then the instrument cluster and the ACM will each store a DTC. For proper diagnosis of the airbag system, the ACM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the airbag indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

BRAKE/PARK BRAKE INDICATOR

DESCRIPTION

A brake indicator is standard equipment on all instrument clusters. The brake indicator is located near the left edge of the instrument cluster, to the left of the tachometer. There are two versions of the brake indicator. The version used depends upon the market for which the vehicle is manufactured. The version of the brake indicator used for vehicles manufactured for the United States consists of the word “BRAKE” imprinted on a red lens. The Rest-Of-World (ROW) market version of this indicator has two International Control and Display Symbol icons imprinted on the red lens; one is the icon for “Brake Failure”, and the other is the icon for “Parking Brake”. In either case, the lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The “BRAKE” text or the two icons appear silhouetted against a red field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a Light Emitting Diode (LED), which is soldered onto the instrument cluster electronic circuit board. The brake indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The brake indicator gives an indication to the vehicle operator when the parking brake is applied, when the fluid level of the brake hydraulic system is low, or if there are certain malfunctions of the Anti-lock Brake System (ABS). This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming, electronic messages received by the cluster from the Controller Anti-lock Brake (CAB) over the Programmable Communications Interface (PCI) data bus, and a hard wired input to the cluster from the park brake switch. The brake indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the brake indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the brake indicator is illuminated by the instrument cluster for about three seconds as a bulb test.
- **Brake Indicator Lamp-On Message** - Each time the cluster receives a brake indicator lamp-on message from the CAB, the brake indicator will be illuminated. The indicator remains illuminated until the cluster receives a brake indicator lamp-off message from the CAB.
- **Park Brake Switch Input** - Each time the cluster logic circuit detects ground on the park brake switch sense circuit (park brake switch closed = park brake applied or not fully released) the brake indicator is illuminated. The indicator remains illuminated until the park brake switch sense input to the cluster is an open circuit (park brake switch open = park brake fully released), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no brake indicator lamp-on or lamp-off messages from the CAB for six consecutive seconds, the brake indicator is illuminated. The indicator remains illuminated until the cluster receives a single valid brake indicator lamp-off message from the CAB.
- **Actuator Test** - Each time the cluster is put through the actuator test, the brake indicator will be turned on for the duration of the test to confirm the functionality of the LED and the cluster control circuitry.

The park brake switch on the park brake pedal mechanism provides a hard wired ground input to the instrument cluster circuitry through the red brake warning indicator driver circuit whenever the park brake is applied or not fully released. The CAB continually monitors the input from the brake fluid level switch and the circuits of the anti-lock brake system, then sends the proper brake indicator lamp-on or lamp-off messages to the instrument cluster. If the CAB sends a brake indicator lamp-on message after the bulb test, it indicates that the CAB has detected a brake hydraulic system malfunction and/or that the ABS system has become inoperative. The CAB will store a Diagnostic Trouble Code (DTC) for any malfunction it detects.

BRAKE/PARK BRAKE INDICATOR (Continued)

For further diagnosis of the brake indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). The park brake switch input to the instrument cluster can be diagnosed using conventional diagnostic tools and methods. For proper diagnosis of the brake fluid level switch input to the CAB, the anti-lock brake system, the CAB, the PCI data bus, or the electronic message inputs to the instrument cluster that control the brake indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING - BRAKE INDICATOR

The diagnosis found here addresses an inoperative park brake indicator condition. If there are problems with several indicators in the instrument cluster, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the brake indicator stays on with the ignition switch in the On position and the park brake released, or comes on while driving, (Refer to 5 - BRAKES - DIAGNOSIS AND TESTING). If no brake system problem is found, the following procedures will help to locate a shorted or open circuit, or a faulty park brake switch input. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

INDICATOR ILLUMINATES DURING BULB TEST, BUT DOES NOT WHEN PARK BRAKE APPLIED

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the park brake switch from the switch terminal. Apply the parking brake. Check for continuity between the park brake switch terminal and a good ground. There should be continuity. If OK, go to Step 2. If not OK, replace the faulty park brake switch.

(2) Disconnect the instrument panel wire harness connector for the instrument cluster from the cluster connector receptacle. Check for continuity between the red brake warning indicator driver circuit cavities of the instrument panel wire harness connector for the park brake switch and the instrument panel wire harness connector for the instrument cluster. There should be continuity. If not OK, repair the open red brake warning indicator driver circuit between the park brake switch and the instrument cluster as required.

INDICATOR REMAINS ILLUMINATED - BRAKE SYSTEM CHECKS OK

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the park brake switch from the park brake switch terminal. Check for continuity between the terminal of the park brake switch and a good ground. There should be no continuity with the park brake released, and continuity with the park brake applied. If OK, go to Step 2. If not OK, replace the faulty park brake switch.

(2) Disconnect the instrument panel wire harness connector for the instrument cluster from the cluster connector receptacle. Check for continuity between the red brake warning indicator driver circuit cavity of the instrument panel wire harness connector for the park brake switch and a good ground. There should be no continuity. If not OK, repair the shorted red brake warning indicator driver circuit between the park brake switch and the instrument cluster as required.

CHECK GAUGES INDICATOR

DESCRIPTION

A check gauges indicator is standard equipment on all instrument clusters. The check gauges indicator is located on the right edge of the instrument cluster, to the right of the speedometer. The check gauges indicator consists of the words “CHECK GAGES” imprinted on a red lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The “CHECK GAGES” text appears silhouetted against a red field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a Light Emitting Diode (LED), which is soldered onto the instrument cluster electronic circuit board. The check gauges indicator

CHECK GAUGES INDICATOR (Continued)

lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The check gauges indicator gives an indication to the vehicle operator when certain instrument cluster gauge readings reflect a condition requiring immediate attention. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The check gauges indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the check gauges indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the check gauges indicator is illuminated for about three seconds as a bulb test.
- **Engine Temperature High/Critical Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is high or critical [above about 127° C (261° F) for gasoline engines except Gulf Coast Country (GCC), 129° C (264° F) for GCC gasoline engines, and 118° C (244° F) for diesel engines], the check gauges indicator is illuminated. The indicator remains illuminated until the cluster receives a message indicating the engine coolant temperature is not high or critical [about 125° C (255° F) or below for all gasoline engines, or 115° C (239° F) for all diesel engines].
- **Engine Oil Pressure Low Message** - Each time the cluster receives a message from the PCM indicating the engine oil pressure is about 0.28 kg/cm or lower (about 4 psi or lower), the check gauges indicator is illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating that the engine oil pressure is about 0.56 kg/cm or higher (about 8 psi or higher). The cluster will only turn the indicator on in response to an engine oil pressure low message if the ignition switch is in the On position and the engine speed is 300 rpm or greater.
- **System Voltage Low Message** - Each time the cluster receives a message from the PCM indicating a low system voltage condition (system voltage is about eleven volts or lower), the check gauges indicator is illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating there is no low system voltage condition (system voltage is above about eleven volts, but lower than about sixteen volts).
- **System Voltage High Message** - Each time the cluster receives a message from the PCM indicating a high system voltage condition (system voltage is about sixteen volts or higher), the check gauges indicator is illuminated. The indicator remains illuminated until the cluster receives a message from the PCM indicating there is no high system voltage condition (system voltage is below about sixteen volts, but higher than about eleven volts).
- **Actuator Test** - Each time the cluster is put through the actuator test, the check gauges indicator will be turned on for the duration of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the engine temperature, oil pressure, and electrical system voltage, then sends the proper messages to the instrument cluster. For further diagnosis of the check gauges indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the check gauges indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

COOLANT LOW INDICATOR

DESCRIPTION

A coolant low indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The coolant low indicator should not be confused with the coolant level low indication provided by the Electronic Vehicle Information Center (EVIC) of vehicles equipped with a gasoline engine, although they do perform the same function. The coolant low indicator is located in the lower left corner of the instrument cluster, to the left of the tachometer. The coolant low indicator consists of an International Control and Display Symbol icon for “Low Coolant” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the

COOLANT LOW INDICATOR (Continued)

exterior lighting is turned On, the illumination intensity of the coolant low indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The coolant low indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The coolant low indicator gives an indication to the vehicle operator when the diesel engine coolant level is low. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The coolant low indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the coolant low indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the coolant low indicator is illuminated for about three seconds as a bulb test.
- **Coolant Low Indicator Lamp-On Message** - Each time the cluster receives a coolant low indicator lamp-on message from the BCM indicating the engine coolant is below the minimum level in the coolant reservoir, the coolant low indicator will be illuminated. The indicator remains illuminated until the cluster receives a coolant low indicator lamp-off message from the BCM indicating that the engine coolant level is above the minimum level.
- **Actuator Test** - Each time the cluster is put through the actuator test, the coolant low indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The BCM continually monitors the input from the coolant level switch, then sends the proper coolant low indicator lamp-on and lamp-off messages to the instrument cluster. If the coolant low indicator fails to light during the bulb test, replace the bulb with a known good unit. For further diagnosis of the coolant low indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the coolant level switch, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the coolant low indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

CRUISE INDICATOR

DESCRIPTION

A cruise indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with the optional speed control system. The cruise indicator is located on the right edge of the instrument cluster, to the right of the speedometer. The cruise indicator consists of the word “CRUISE” imprinted on a blue/green lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The “CRUISE” text appears silhouetted against a blue/green field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the cruise indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The cruise indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The cruise indicator gives an indication to the vehicle operator when the speed control system is turned On, regardless of whether the speed control is engaged. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The cruise indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the cruise indicator for the following reasons:

- **Cruise Indicator Lamp-On Message** - Each time the cluster receives a cruise indicator lamp-on message from the PCM indicating the speed control

CRUISE INDICATOR (Continued)

system has been turned On, the cruise indicator is illuminated. The indicator remains illuminated until the cluster receives a cruise indicator lamp-off message from the PCM or until the ignition switch is turned to the Off position, whichever occurs first.

- **Actuator Test** - Each time the cluster is put through the actuator test, the cruise indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM continually monitors the speed control switches to determine the proper outputs to the speed control servo. The PCM then sends the proper cruise indicator lamp-on and lamp-off messages to the instrument cluster. If the cruise indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the cruise indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the speed control switches, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the cruise indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

ENGINE TEMPERATURE GAUGE

DESCRIPTION

An engine coolant temperature gauge is standard equipment on all instrument clusters. The engine coolant temperature gauge is located in the lower right corner of the instrument cluster, to the right of the speedometer. The engine coolant temperature gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the gauge dial face that reads left-to-right from 40° C to 125° C, or from 100° F to 260° F, depending upon the market for which the vehicle is manufactured. An International Control and Display Symbol icon for “Engine Coolant Temperature” is located on the gauge dial face.

The engine coolant temperature gauge graphics are either white, gray and orange against a black gauge dial face (base cluster) or black, gray and red against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red graphics still appear red. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The engine coolant temperature gauge is serviced as a unit with the instrument cluster.

OPERATION

The engine coolant temperature gauge gives an indication to the vehicle operator of the engine coolant temperature. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The engine coolant temperature gauge is an air core magnetic unit that is completely controlled by the instrument cluster electronic circuit board. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Temperature Normal Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is within the normal operating range [up to about 124° C (255° F) for gasoline engines, and 115° C (239° F) for diesel engines], the gauge needle is moved to the relative temperature position of the gauge scale.
- **Engine Temperature High Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is high [above about 127° C (260° F) for gasoline engines except Gulf Coast Country (GCC), 129° C (264° F) for GCC gasoline engines, and 118° C (244° F) for diesel engines], the gauge needle is moved to the center of the red warning zone on the gauge scale.
- **Engine Temperature Critical Message** - Each time the cluster receives a message from the PCM indicating the engine coolant temperature is critical [about 132° C (270° F) or higher for all gasoline engines, and 126° C (259° F) for all diesel engines], the gauge needle is moved to the high end of the red warning zone on the gauge scale.
- **Communication Error** - If the cluster fails to receive an engine temperature message, it will hold

ENGINE TEMPERATURE GAUGE (Continued)

the gauge needle at the last indication for about twelve seconds or until a new engine temperature message is received, whichever occurs first. After twelve seconds, the cluster will return the gauge needle to the low end of the gauge scale.

- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the engine coolant temperature sensor to determine the engine operating temperature. The PCM then sends the proper engine coolant temperature messages to the instrument cluster. For further diagnosis of the engine coolant temperature gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster moves the engine coolant temperature gauge needle to indicate a high or critical engine temperature, it may indicate that the engine or the engine cooling system requires service. For proper diagnosis of the engine coolant temperature sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the engine coolant temperature gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

FRONT FOG LAMP INDICATOR

DESCRIPTION

A front fog lamp indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with the optional front fog lamps. The front fog lamp indicator is located on the left edge of the instrument cluster, to the left of the tachometer. The front fog lamp indicator consists of an International Control and Display Symbol icon for “Front Fog Light” imprinted on a green lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against a green field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the front fog lamp indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The front fog lamp indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The front fog lamp indicator gives an indication to the vehicle operator whenever the front fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The front fog lamp indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the indicator can be illuminated regardless of the ignition switch position. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the front fog lamp indicator for the following reasons:

- **Front Fog Lamp Indicator Lamp-On Message** - Each time the cluster receives a front fog lamp indicator lamp-on message from the BCM indicating that the front fog lamps are turned On, the front fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a front fog lamp indicator lamp-off message from the BCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the front fog lamp indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The BCM continually monitors the exterior lighting (left multi-function) switch to determine the proper outputs to the front fog lamp relay. The BCM then sends the proper front fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. If the front fog lamp indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the front fog lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the front fog lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the front fog lamp indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

FUEL GAUGE

DESCRIPTION

A fuel gauge is standard equipment on all instrument clusters. The fuel gauge is located in the lower left corner of the instrument cluster, to the left of the tachometer. The fuel gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the gauge dial face that reads left-to-right from E (or Empty) to F (or Full). An International Control and Display Symbol icon for "Fuel" is located on the gauge dial face. An arrowhead pointed to the left side of the vehicle is imprinted next to the "Fuel" icon on the fuel gauge dial face to provide the driver with a reminder as to the location of the fuel filler access.

The fuel gauge graphics are either white, gray and orange against a black gauge dial face (base cluster) or black and gray against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The fuel gauge is serviced as a unit with the instrument cluster.

OPERATION

The fuel gauge gives an indication to the vehicle operator of the level of fuel in the fuel tank. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The fuel gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full, the cluster moves the gauge needle to the relative fuel level position on the gauge scale. The PCM applies an algorithm to the input from the fuel tank sender to dampen gauge needle movement against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs to the PCM.
- **Less Than 12.5 Percent Tank Full Message** - Each time the cluster receives messages from the PCM indicating the percent tank full is less than 12.5 (one-eighth), the gauge needle is moved to the proper position on the gauge scale and the low fuel indicator is illuminated. The low fuel indicator remains illuminated until the cluster receives messages from the PCM indicating that the percent tank full is greater than 12.5 (one-eighth), or until the ignition switch is turned to the Off position, whichever occurs first.
- **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is less than empty, the gauge needle is moved to the far left (low) end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is a short circuit.
- **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is more than full, the gauge needle is moved to the far left (low) end of the gauge scale and the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is an open circuit.
- **Communication Error** - If the cluster fails to receive a percent tank full message, it will hold the gauge needle at the last indication for about twelve seconds, until a new message is received, or until the ignition switch is turned to the Off position, whichever occurs first. After twelve seconds, the cluster will return the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the fuel tank sender to determine the fuel level. The PCM then applies an algorithm to the input and sends the

FUEL GAUGE (Continued)

proper percent tank full messages to the instrument cluster. For further diagnosis of the fuel gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the fuel tank sender, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the fuel gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

HIGH BEAM INDICATOR

DESCRIPTION

A high beam indicator is standard equipment on all instrument clusters. The high beam indicator is located near the upper edge of the instrument cluster, between the tachometer and the speedometer. The high beam indicator consists of an International Control and Display Symbol icon for “High Beam” imprinted on a blue lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against a blue field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the high beam indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The high beam indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The high beam indicator gives an indication to the vehicle operator whenever the headlamp high beams are illuminated. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The high beam indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the indicator can be illuminated regardless of the ignition switch position. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the high beam indicator for the following reasons:

- **High Beam Indicator Lamp-On Message** - Each time the cluster receives a high beam indicator lamp-on message from the BCM indicating that the headlamp high beams are turned On, the high beam indicator will be illuminated. The indicator remains illuminated until the cluster receives a high beam indicator lamp-off message from the BCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the high beam indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The BCM continually monitors the exterior lighting (left multi-function) switch to determine the proper outputs to the headlamp low beam and high beam relays. The BCM then sends the proper high beam indicator lamp-on and lamp-off messages to the instrument cluster. If the high beam indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the high beam indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the headlamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the high beam indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

LOW FUEL INDICATOR

DESCRIPTION

A low fuel indicator is standard equipment on all instrument clusters. The low fuel indicator is located near the left edge of the instrument cluster, to the left of the tachometer. The low fuel indicator consists of an International Control and Display Symbol icon for “Fuel” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the icon from being clearly visible when the indicator is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the low fuel indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The low fuel indica-

LOW FUEL INDICATOR (Continued)

tor lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The low fuel indicator gives an indication to the vehicle operator when the level of fuel in the fuel tank becomes low. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The low fuel indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is switched to ground by the instrument cluster transistor. The instrument cluster will turn on the low fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the low fuel indicator is illuminated for about three seconds as a bulb test.
- **Less Than 12.5 Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating that the percent tank full is less than about 12.5 (one-eighth), the low fuel indicator is illuminated. The indicator remains illuminated until the cluster receives messages from the PCM indicating that the percent tank full has increased to greater than about 12.5 (one-eighth). The PCM applies an algorithm to the input from the fuel tank sender to dampen the illumination of the low fuel indicator against the negative effect that fuel sloshing within the fuel tank can have on accurate inputs to the PCM.
- **Less Than Empty Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is less than empty, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is a short circuit.
- **More Than Full Percent Tank Full Message** - Each time the cluster receives a message from the PCM indicating the percent tank full is more than full, the low fuel indicator is illuminated immediately. This message would indicate that the fuel tank sender input to the PCM is an open circuit.
- **Communication Error** - If the cluster fails to receive a percent tank full message for more than about twelve seconds, the cluster control circuitry will illuminate the low fuel indicator until a new percent tank full message is received.
- **Actuator Test** - Each time the cluster is put through the actuator test, the low fuel indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM continually monitors the fuel tank sender input to determine the fuel level. The PCM then applies an algorithm to the input and sends the proper percent tank full messages to the instrument cluster. If the low fuel indicator fails to light during the bulb test, replace the bulb with a known good unit. For further diagnosis of the low fuel indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the fuel tank sender, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the low fuel indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

MALFUNCTION INDICATOR LAMP (MIL)

DESCRIPTION

A Malfunction Indicator Lamp (MIL) is standard equipment on all instrument clusters. The MIL is located near the right edge of the instrument cluster, to the right of the speedometer. The MIL consists of an International Control and Display Symbol icon for “Engine” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the icon from being clearly visible when the indicator is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The MIL lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The Malfunction Indicator Lamp (MIL) gives an indication to the vehicle operator when the Powertrain Control Module (PCM) has recorded a Diagnostic Trouble Code (DTC) for an On-Board Diagnostics II (OBDII) emissions-related circuit or component malfunction. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the PCM over the Programmable Communications Interface (PCI) data bus. The MIL bulb is completely controlled by the

MALFUNCTION INDICATOR LAMP (MIL) (Continued)

instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the MIL for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the MIL is illuminated for about three seconds as a bulb test.
- **MIL Lamp-On Message** - Each time the cluster receives a MIL lamp-on message from the PCM, the indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the PCM message. For some DTC's, if a problem does not recur, the PCM will send a MIL lamp-off message automatically. Other DTC's may require that a fault be repaired and the PCM be reset before a MIL lamp-off message will be sent. For more information on the PCM and the DTC set and reset parameters, (Refer to 25 - EMISSIONS CONTROL - OPERATION).
- **Communication Error** - If the cluster receives no MIL lamp-on or lamp-off messages from the PCM for twenty consecutive seconds, the MIL is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid MIL lamp-on or lamp-off message is received from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the MIL will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM continually monitors each of the many fuel and emissions system circuits and sensors to decide whether the system is in good operating condition. The PCM then sends the proper MIL lamp-on or lamp-off messages to the instrument cluster. If the MIL fails to light during the bulb test, replace the bulb with a known good unit. For further diagnosis of the MIL or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the MIL after the bulb test, it may indicate that a malfunction has occurred and that the fuel and emissions system may require service. For proper diagnosis of the fuel and emissions systems, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the MIL, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

ODOMETER

DESCRIPTION

An odometer and trip odometer are standard equipment in all instrument clusters. The odometer and trip odometer information are displayed in a common electronic, blue-green Vacuum-Fluorescent Display (VFD), which is located in the lower edge of the speedometer dial face in the instrument cluster and, when illuminated, is visible through a small window cutout in the gauge overlay. However, the odometer and trip odometer information are not displayed simultaneously. The trip odometer reset switch on the instrument cluster electronic circuit board toggles the display between odometer and trip odometer modes by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens to the right of the speedometer.

All odometer and trip odometer distance information is stored in the instrument cluster memory. This distance information can be increased when the proper inputs are provided to the instrument cluster, but the distance information cannot be decreased. The odometer can display values up to 999,999 kilometers (999,999 miles). The odometer will not roll over, but will latch at the maximum value. The trip odometer can display values up to 999.9 kilometers (999.9 miles) before it rolls over to zero. The odometer display does not have a decimal point and will not show values less than a full unit (kilometer or mile), the trip odometer display does have a decimal point and will show tenths of a unit (kilometer or mile).

The unit of measure for the odometer and trip odometer display is not shown in the VFD. The unit of measure for the odometer/trip odometer is selected at the time that the instrument cluster is manufactured, and cannot be changed. If the instrument cluster has a kilometers-per-hour primary speedometer scale, the odometer/trip odometer registers kilometers; and, if the cluster features a miles-per-hour primary speedometer scale, the odometer/trip odometer registers miles.

During daylight hours (exterior lamps Off) the VFD is illuminated at full brightness for clear visibility. At night (exterior lamps are On) the instrument cluster converts an electronic dimming level message received from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus to a digital dimming level signal for controlling the lighting level of the VFD. However, a "Parade" mode position of the panel lamps dimmer control ring on the control stalk of the left (lighting) multi-function switch allows the VFD to be illumi-

ODOMETER (Continued)

nated at full brightness if the exterior lamps are turned On during daylight hours.

The VFD, the trip odometer switch, and the trip odometer switch button are serviced as a unit with the instrument cluster.

OPERATION

The odometer and trip odometer give an indication to the vehicle operator of the distance the vehicle has traveled. This gauge is controlled by the instrument cluster electronic circuitry based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The odometer and trip odometer information is displayed by the instrument cluster Vacuum Fluorescent Display (VFD). The VFD will only display odometer or trip odometer information after the ignition switch is turned to the On or Start positions, and will display the information in the odometer or trip odometer mode based upon the selection that was active when the ignition switch was last turned to the Off position. The instrument cluster circuitry controls the VFD and provides the following features:

- **Odometer/Trip Odometer Display Toggling** - Actuating the trip odometer reset switch button momentarily with the ignition switch in the On position will toggle the display between the odometer and trip odometer information. Each time the ignition switch is turned to the On or Start positions, the display will automatically return to the last mode selected (odometer or trip odometer) before the ignition switch was turned to the Off position.
- **Trip Odometer Reset** - When the trip odometer reset switch button is depressed and held for longer than about two seconds with the ignitions switch in the On or Start positions, the trip odometer will be reset to 000.0 kilometers (miles). The VFD must be displaying the current trip odometer information in order for the trip odometer information to be reset.
- **Communication Error** - If the cluster fails to receive a distance message during normal operation, it will hold and display the last data received until the ignition switch is turned to the Off position. If the cluster does not receive a distance message within one second after the ignition switch is turned to the On position, it will display the last distance message stored in the cluster memory. If it is determined that the distance information stored in the cluster memory is corrupt, it will display "------" in the VFD. If the cluster is unable to display distance information due to an error internal to the cluster, the VFD display will be blank.
- **Actuator Test** - Each time the cluster is put through the actuator test, the VFD will step sequentially through a display of "000000" through "999999", then display the cluster software version number to confirm the functionality of the VFD and the cluster control circuitry.

The PCM continually monitors the vehicle speed pulse information received from the vehicle speed sensor, then sends the proper distance messages to the instrument cluster. For further diagnosis of the odometer/trip odometer or the instrument cluster circuitry that controls these functions, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the vehicle speed sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the odometer/trip odometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

OIL PRESSURE GAUGE

DESCRIPTION

An oil pressure gauge is standard equipment on all instrument clusters. The oil pressure gauge is located in the upper right corner of the instrument cluster, to the right of the speedometer. The oil pressure gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the gauge dial face that reads left-to-right from 0 kg/cm to 5.4 kg/cm (metric cluster for gasoline engines), from 0 kg/cm to 8.3 kg/cm (metric cluster for diesel engines), or from 0 psi to 80 psi (U.S. cluster), depending upon the market for which the vehicle is manufactured. An International Control and Display Symbol icon for "Engine Oil" is located on the gauge dial face.

The oil pressure gauge graphics are either white, gray and orange against a black gauge dial face (base cluster) or black and gray against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

OIL PRESSURE GAUGE (Continued)

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The oil pressure gauge is serviced as a unit with the instrument cluster.

OPERATION

The oil pressure gauge gives an indication to the vehicle operator of the engine oil pressure. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The oil pressure gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Oil Pressure Normal Message** - Each time the cluster receives a message from the PCM indicating the engine oil pressure is within the normal operating range [above 0.28 kg/cm (above 4 psi), the gauge needle is moved to the relative pressure position of the gauge scale.
- **Engine Oil Pressure Low Message** - Each time the cluster receives a message from the PCM indicating the engine oil pressure is about 0.28 kg/cm or lower (about 4 psi or lower), the gauge needle is moved to the far left (low) end of the gauge scale. The gauge needle remains at the low end of the scale until the cluster receives a message from the PCM indicating that the engine oil pressure is about 0.56 kg/cm or higher (about 8 psi or higher).
- **Communication Error** - If the cluster fails to receive an engine oil pressure message, it will hold the gauge needle at the last indication for about twelve seconds or until a new engine oil pressure message is received, whichever occurs first. After twelve seconds, the cluster will return the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the engine oil pressure sensor to determine the engine oil pressure. The PCM then sends the proper engine oil pressure messages to the instrument cluster. For further diagnosis of the oil pressure gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the check gauges indicator due to a low oil pressure gauge reading, it may indicate that the engine or the engine oiling system requires service. For proper diagnosis of the engine oil pressure sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the oil pressure gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

OVERDRIVE OFF INDICATOR

DESCRIPTION

An overdrive off indicator is standard equipment on all gasoline engine instrument clusters. The overdrive off indicator is located in the lower edge of the tachometer gauge dial face in the instrument cluster. The overdrive off indicator consists of the words “O/D OFF” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the tachometer gauge dial face overlay. The dark outer layer of the gauge dial face overlay prevents the indicator from being clearly visible when it is not illuminated. The words “O/D OFF” appear silhouetted against an amber field through the translucent outer layer of the gauge dial face overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the overdrive off indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The overdrive off indicator lens is serviced as a unit with the instrument cluster.

OPERATION

The overdrive off indicator gives an indication to the vehicle operator when the Off position of the overdrive off switch has been selected, disabling the electronically controlled overdrive feature of the automatic transmission. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster over the Programmable Communications Interface (PCI) data bus. These messages are sent by the Powertrain Control Module (PCM) or by the Transmission Control Module (TCM), depending on the model of the automatic transmission. The overdrive off indicator bulb is com-

OVERDRIVE OFF INDICATOR (Continued)

pletely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the overdrive off indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the overdrive off indicator is illuminated for about three seconds as a bulb test.
- **Overdrive Off Indicator Lamp-On Message** - Each time the cluster receives an overdrive off indicator lamp-on message from the PCM or TCM indicating that the Off position of the overdrive off switch has been selected, the overdrive off indicator will be illuminated. The indicator remains illuminated until the cluster receives an overdrive off indicator lamp-off message from the PCM or TCM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the overdrive off indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM or TCM continually monitors the overdrive off switch to determine the proper outputs to the automatic transmission. The PCM or TCM then sends the proper overdrive off indicator lamp-on or lamp-off messages to the instrument cluster. If the overdrive off indicator fails to light during the bulb test, replace the bulb with a known good unit. For further diagnosis of the overdrive off indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the overdrive control system, the PCM, the TCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the overdrive off indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

REAR FOG LAMP INDICATOR

DESCRIPTION

A rear fog lamp indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with optional rear fog lamps, which are available only in certain international markets where they are required. The rear fog lamp indicator is located on the left edge of the instrument cluster, to the left of the tachometer. The rear fog lamp indicator consists of an International Control and Display Symbol icon for “Rear Fog Light” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. When the exterior lighting is turned On, the illumination intensity of the rear fog lamp indicator is dimmable, which is adjusted using the panel lamps dimmer control ring on the control stalk of the left multi-function switch. The rear fog lamp indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The rear fog lamp indicator gives an indication to the vehicle operator whenever the rear fog lamps are illuminated. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. The rear fog lamp indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will allow this indicator to operate whenever the instrument cluster receives a battery current input on the fused B(+) circuit. Therefore, the indicator can be illuminated regardless of the ignition switch position. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the rear fog lamp indicator for the following reasons:

- **Rear Fog Lamp Indicator Lamp-On Message** - Each time the cluster receives a rear fog lamp indicator lamp-on message from the BCM indicating that the rear fog lamps are turned On, the rear fog lamp indicator will be illuminated. The indicator remains illuminated until the cluster receives a rear fog lamp indicator lamp-off message from the BCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the rear fog lamp indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The BCM continually monitors the exterior lighting (left multi-function) switch to determine the proper outputs to the rear fog lamp relay. The BCM

REAR FOG LAMP INDICATOR (Continued)

then sends the proper rear fog lamp indicator lamp-on and lamp-off messages to the instrument cluster. If the rear fog lamp indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the rear fog lamp indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the rear fog lamp system, the BCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the rear fog lamp indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SEATBELT INDICATOR

DESCRIPTION

A seatbelt indicator is standard equipment on all instrument clusters. The seatbelt indicator is located near the lower edge of the instrument cluster, to the left of the tachometer. The seatbelt indicator consists of an International Control and Display Symbol icon for “Seat Belt” imprinted on a red lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the icon from being clearly visible when the indicator is not illuminated. The icon appears silhouetted against a red field through the translucent outer layer of the overlay when it is illuminated from behind by a Light Emitting Diode (LED), which is soldered onto the instrument cluster electronic circuit board. The seatbelt indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The seatbelt indicator gives an indication to the vehicle operator of the status of the driver side front seatbelt. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming. On models equipped with airbags the indicator is also controlled by electronic messages received by the cluster from the Airbag Control Module (ACM) over the Programmable Communications Interface (PCI) data bus. The seatbelt indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the seatbelt indicator for the following reasons:

- **Seatbelt Reminder Function** - Each time the cluster receives a battery current input on the fused ignition switch output (run-start) circuit, the indicator will be illuminated as a seatbelt reminder for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. This reminder function will occur regardless of the status of the electronic seat belt lamp-on or lamp-off messages received by the cluster from the ACM.
- **Seat Belt Indicator Lamp-On Message** - On models equipped with airbags, following the seatbelt reminder function, each time the cluster receives a seat belt indicator lamp-on message from the ACM indicating the driver side front seat belt is not fastened with the ignition switch in the Start or On positions, the seatbelt indicator will be illuminated. The indicator remains illuminated until the cluster receives a seat belt indicator lamp-off message from the ACM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the seatbelt indicator will be turned on for the duration of the test to confirm the functionality of the LED and the cluster control circuitry.

The instrument cluster continually monitors the status of the ignition switch through the hard wired fused ignition switch output (run-start) circuit to determine when to provide the seatbelt reminder function. On models equipped with airbags, the ACM continually monitors the status of both front seat belt switches to determine the proper airbag system response to a frontal impact of the vehicle. The ACM then sends the proper seatbelt indicator lamp-on and lamp-off messages to the instrument cluster based upon the status of the driver side front seat belt switch input. For further diagnosis of the seatbelt indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the seatbelt switches, the ACM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the seatbelt indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SHIFT INDICATOR (TRANSFER CASE)

DESCRIPTION

A part time indicator is standard equipment on all instrument clusters, but is only functional on vehicles equipped with the standard equipment Selec-Trac four-wheel drive system. The part time indicator is located near the right edge of the instrument cluster, to the right of the speedometer. The part time indicator consists of the words “PART TIME” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The words “PART TIME” appear silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The part time indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The part time indicator gives an indication to the vehicle operator that a four-wheel drive part time operating mode of the transfer case is selected. On vehicles with the standard equipment Selec-Trac four-wheel drive system, the part time indicator illuminates when the NV-242 transfer case is engaged in either the 4 X 4 Part Time or 4 Lo positions. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The part time indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the part time indicator for the following reasons:

- **Part Time Indicator Lamp-On Message** - Each time the cluster receives a part time indicator lamp-on message from the PCM indicating that a four-wheel drive part time position of the transfer case has been selected, the part time indicator will be illuminated. The indicator remains illuminated until the cluster receives a part time indicator lamp-off message from the PCM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the part time indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM continually monitors the transfer case switch to determine the driveline operating mode. The PCM then sends the proper part time indicator lamp-on and lamp-off messages to the instrument cluster. If the part time indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the part time indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the transfer case switch, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the part time indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SKIS INDICATOR

DESCRIPTION

A Sentry Key Immobilizer System (SKIS) indicator is standard equipment on all instrument clusters, but is only operational on vehicles equipped with the optional SKIS. The SKIS indicator is located in the upper right corner of the instrument cluster, to the right of the speedometer. The SKIS indicator consists of a graphical representation or icon of a circled and crossed-out key imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the overlay when it is illuminated from behind by an incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The SKIS indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The Sentry Key Immobilizer System (SKIS) indicator gives an indication to the vehicle operator of the status of the SKIS. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Sentry Key Immobilizer Module (SKIM) over the

SKIS INDICATOR (Continued)

Programmable Communications Interface (PCI) data bus. The SKIS indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is switched to ground by the instrument cluster transistor. The instrument cluster will turn on the SKIS indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position, the SKIM tells the cluster to illuminate the SKIS indicator for about three seconds as a bulb test.
- **SKIS Indicator Lamp-On Message** - Each time the cluster receives a SKIS indicator lamp-on message from the SKIM, the SKIS indicator will be illuminated. The indicator can be flashed on and off, or illuminated solid, as dictated by the SKIM message. For more information on the SKIS and the SKIS indicator control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - OPERATION). The indicator remains illuminated until the cluster receives a SKIS indicator lamp-off message from the SKIM, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Communication Error** - If the cluster receives no SKIS indicator lamp-on or lamp-off messages from the SKIM for twenty consecutive seconds, the SKIS indicator is illuminated by the instrument cluster. The indicator remains controlled and illuminated by the cluster until a valid SKIS indicator lamp-on or lamp-off message is received from the SKIM.
- **Actuator Test** - Each time the cluster is put through the actuator test, the SKIS indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The SKIM performs a self-test each time the ignition switch is turned to the On position to decide whether the system is in good operating condition and whether a valid key is present in the ignition lock cylinder. The SKIM then sends the proper SKIS indicator lamp-on or lamp-off messages to the instrument cluster. If the SKIS indicator fails to light during the bulb test, replace the bulb with a known good unit. For further diagnosis of the SKIS indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster flashes the SKIS indicator upon ignition On, or turns on the SKIS indicator solid after the bulb test, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative. For proper diagnosis of the SKIS, the PCI data bus, or the electronic message inputs to the instrument cluster that control the SKIS indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SPEEDOMETER

DESCRIPTION

A speedometer is standard equipment on all instrument clusters. The speedometer is located to the right of the tachometer in the instrument cluster. The speedometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry, and a fixed 255 degree primary scale on the gauge dial face that reads left-to-right either from 0 to 120 mph, from 0 to 200 km/h, or from 0 to 220 km/h, depending upon the market for which the vehicle is manufactured. Most models also have a smaller secondary inner scale on the gauge dial face that provides the equivalent opposite measurement units from the primary scale. Text appearing in the center of the gauge dial face just beneath the hub of the speedometer needle abbreviates the unit of measure for the primary scale in all upper case letters (i.e.: MPH or KM/H). On models with a secondary scale, the abbreviation for that scale follows the abbreviation for the primary scale in all lower case letters (i.e.: mph or km/h).

The speedometer graphics are either white, gray and orange against a black gauge dial face (base cluster) or black and gray against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The speedometer is serviced as a unit with the instrument cluster.

SPEEDOMETER (Continued)

OPERATION

The speedometer gives an indication to the vehicle operator of the vehicle road speed. This gauge is controlled by the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The speedometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Vehicle Speed Message** - Each time the cluster receives a vehicle speed message from the PCM it will calculate the correct vehicle speed reading and position the gauge needle at that speed position on the gauge scale. The cluster will receive a new vehicle speed message and reposition the gauge pointer accordingly about every 86 milliseconds. The gauge needle will continue to be positioned at the actual vehicle speed position on the gauge scale until the ignition switch is turned to the Off position.
- **Communication Error** - If the cluster fails to receive a speedometer message, it will hold the gauge needle at the last indication for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. If a new speed message is not received after about six seconds, the gauge needle will return to the far left (low) end of the scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the vehicle speed information received from the Controller Anti-lock Brake (CAB) to determine the vehicle road speed, then sends the proper vehicle speed messages to the instrument cluster. For further diagnosis of the speedometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the CAB, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the speedometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TACHOMETER

DESCRIPTION

A tachometer is standard equipment on all instrument clusters. The tachometer is located to the left of the speedometer in the instrument cluster. The tachometer consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry, and a fixed 255 degree scale on the gauge dial face that reads left-to-right from 0 to 7 for gasoline engines, or from 0 to 6 for diesel engines. The text “X 1000” (base cluster) or “RPM X 1000” (premium cluster) imprinted on the cluster overlay directly below the hub of the tachometer needle identifies that each number on the tachometer scale is to be multiplied by 1000 rpm. The gasoline engine tachometer has a red zone beginning at 5800 RPM, while the red zone for the diesel engine tachometer begins at 4200 RPM. The tachometer in the premium version cluster for certain engine and market applications also includes red text located in the center of the gauge dial face just above the hub of the tachometer needle that specifies a special fuel requirement.

The tachometer graphics are either white, gray and orange against a black gauge dial face (base cluster) or black, gray and red against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red graphics still appear red. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The tachometer is serviced as a unit with the instrument cluster.

OPERATION

The tachometer gives an indication to the vehicle operator of the engine speed. This gauge is controlled by the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain

TACHOMETER (Continued)

Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The tachometer is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **Engine Speed Message** - Each time the cluster receives an engine speed message from the PCM it will calculate the correct engine speed reading and position the gauge needle at that speed position on the gauge scale. The cluster will receive a new engine speed message and reposition the gauge pointer accordingly about every 86 milliseconds. The gauge needle will continue to be positioned at the actual engine speed position on the gauge scale until the ignition switch is turned to the Off position.
- **Communication Error** - If the cluster fails to receive an engine speed message, it will hold the gauge needle at the last indication for about six seconds, or until the ignition switch is turned to the Off position, whichever occurs first. If a new engine speed message is not received after about six seconds, the gauge needle will return to the far left (low) end of the scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back in order to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the crankshaft position sensor to determine the engine speed, then sends the proper engine speed messages to the instrument cluster. For further diagnosis of the tachometer or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the crankshaft position sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the tachometer, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TRANS TEMP INDICATOR

DESCRIPTION

A transmission over-temperature indicator is standard equipment on all gasoline engine instrument clusters. The transmission over-temperature indicator is located near the lower right corner of the instrument cluster, to the right of the speedometer. The transmission over-temperature indicator consists of the words “TRANS OVER TEMP” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the indicator from being clearly visible when it is not illuminated. The words “TRANS OVER TEMP” appear silhouetted against an amber field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The transmission over-temperature indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The transmission over-temperature indicator gives an indication to the vehicle operator when the transmission fluid temperature is excessive, which may lead to accelerated transmission component wear or failure. This indicator is controlled by a transistor on the instrument cluster electronic circuit board based upon cluster programming and electronic messages received by the cluster over the Programmable Communications Interface (PCI) data bus. These messages are sent by the Powertrain Control Module (PCM) or by the Transmission Control Module (TCM), depending on the model of the automatic transmission. The transmission over-temperature indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the transmission over-temperature indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the transmission over-temperature indicator is illuminated for about three seconds as a bulb test.
- **Trans Over-Temp Indicator Lamp-On Message** - Each time the cluster receives a trans over-temp indicator lamp-on message from the PCM or TCM indicating that the transmission fluid temperature is 135° C (275° F) or higher, the transmission over-temperature indicator will be illuminated. The indicator remains illuminated until the cluster receives a trans over-temp indicator lamp-off message from the PCM or TCM, or until the ignition

TRANS TEMP INDICATOR (Continued)

switch is turned to the Off position, whichever occurs first.

- **Actuator Test** - Each time the cluster is put through the actuator test, the transmission over-temperature indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM or TCM continually monitors the transmission temperature sensor to determine the transmission operating condition. The PCM or TCM then sends the proper trans over-temp indicator lamp-on or lamp-off messages to the instrument cluster. If the transmission over-temperature indicator fails to light during the bulb test, replace the bulb with a known good unit. If the instrument cluster turns on the transmission over-temperature indicator due to a high transmission oil temperature condition, it may indicate that the transmission or the transmission cooling system are being overloaded or that they require service. For further diagnosis of the transmission over-temperature indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the transmission temperature sensor, the PCM, the TCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the transmission over-temperature indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

TURN SIGNAL INDICATOR

DESCRIPTION

Two turn signal indicators, one right and one left, are standard equipment on all instrument clusters. The turn signal indicators are located near the upper edge of the instrument cluster, the left one is left of the tachometer, and the right one is right of the speedometer. Each turn signal indicator consists of an International Control and Display Symbol icon for “Turn Warning” imprinted on a green lens. Each lens is located behind a dedicated cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents these icons from being clearly visible when they are not illuminated. The icons appear silhouetted against a green field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The turn signal indicator lenses are serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The turn signal indicators give an indication to the vehicle operator that the turn signal (left or right indicator flashing) or hazard warning (both left and right indicators flashing) have been selected and are operating. These indicators are controlled by two individual hard wired inputs from the combination flasher circuitry to the instrument cluster electronic circuit board. Each turn signal indicator bulb is grounded on the instrument cluster electronic circuit board at all times; therefore, these indicators remain functional regardless of the ignition switch position. Each indicator bulb will only illuminate when it is provided with battery current by the combination flasher in the Junction Block (JB).

The turn signal indicators are connected in parallel with the other turn signal circuits. This arrangement allows the turn signal indicators to remain functional, regardless of the condition of the other circuits in the turn signal and hazard warning systems. The combination flasher outputs to the instrument cluster turn signal indicator inputs can be diagnosed using conventional diagnostic tools and methods. For more information on the turn signal and hazard warning system, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - OPERATION - TURN SIGNAL & HAZARD WARNING SYSTEM).

DIAGNOSIS AND TESTING - TURN SIGNAL INDICATOR

The diagnosis found here addresses an inoperative turn signal indicator condition. If the problem being diagnosed is related to inoperative turn signal or hazard warning lamps, be certain to repair the turn signal and hazard warning system before attempting to diagnose or repair the turn signal indicators. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - DIAGNOSIS AND TESTING - TURN SIGNAL & HAZARD WARNING SYSTEM). If no turn signal and hazard warning system problem is found, the following procedure will help locate an open in the turn signal indicator circuit. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

TURN SIGNAL INDICATOR (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Remove the instrument cluster from the instrument panel and disconnect the instrument panel wire harness for the instrument cluster from the cluster connector receptacle.

(2) Reconnect the battery negative cable. Activate the hazard warning system by moving the hazard warning switch button to the On position. Check for battery voltage at the inoperative (right or left) turn signal circuit cavity of the instrument panel wire harness connector for the instrument cluster. There should be a switching (on and off) battery voltage signal present. If OK, replace the faulty (right or left) turn signal indicator bulb. If not OK, repair the open (right or left) turn signal circuit between the instrument cluster and the combination flasher in the Junction Block (JB) as required.

VOLTAGE GAUGE

DESCRIPTION

A voltage gauge is standard equipment on all instrument clusters. The voltage gauge is located in the upper left corner of the instrument cluster, to the left of the tachometer. The voltage gauge consists of a movable gauge needle or pointer controlled by the instrument cluster circuitry and a fixed 90 degree scale on the gauge dial face that reads left-to-right from 9 volts to 19 volts. An International Control and Display Symbol icon for “Battery Charging Condition” is located on the gauge dial face.

The voltage gauge graphics are either white, gray and orange against a black gauge dial face (base cluster) or black, gray and red against a taupe gauge dial face (premium cluster), making them clearly visible within the instrument cluster in daylight. When illuminated from behind by the panel lamps dimmer controlled cluster illumination lighting with the exterior lamps turned On, the base cluster white gauge graphics appear blue-green and the orange graphics still appear orange, while the premium cluster taupe gauge dial face appears blue-green with the black graphics silhouetted against the illuminated background and the red graphics still appear red. The gray gauge graphics for both versions of the cluster are not illuminated. The orange gauge needle in the base cluster gauge is internally illuminated, while the black gauge needle in the premium cluster gauge is not.

Base cluster gauge illumination is provided by replaceable incandescent bulb and bulb holder units located on the instrument cluster electronic circuit board. Premium cluster gauge illumination is provided by an integral electro-luminescent lamp that is serviced as a unit with the instrument cluster. The voltage gauge is serviced as a unit with the instrument cluster.

OPERATION

The voltage gauge gives an indication to the vehicle operator of the electrical system voltage. This gauge is controlled by the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The voltage gauge is an air core magnetic unit that receives battery current on the instrument cluster electronic circuit board through the fused ignition switch output (run-start) circuit whenever the ignition switch is in the On or Start positions. The cluster is programmed to move the gauge needle back to the low end of the scale after the ignition switch is turned to the Off position. The instrument cluster circuitry controls the gauge needle position and provides the following features:

- **System Voltage Message** - Each time the cluster receives a message from the PCM indicating the system voltage, the cluster moves the gauge needle to the relative voltage level position on the gauge scale.
- **System Voltage Low Message** - Each time the cluster receives a message from the PCM indicating the system voltage is low (system voltage is about eleven volts or lower), the gauge needle is moved to the relative voltage position in the red zone of the gauge scale and the check gauges indicator is illuminated. The gauge needle remains in the red zone and the check gauges indicator remains illuminated until the cluster receives a message from the PCM indicating there is no low system voltage condition (system voltage is above about eleven volts, but lower than about sixteen volts).
- **System Voltage High Message** - Each time the cluster receives a message from the PCM indicat-

VOLTAGE GAUGE (Continued)

ing the system voltage is high (system voltage is about sixteen volts or higher), the gauge needle is moved to the relative voltage position in the red zone of the gauge scale and the check gauges indicator is illuminated. The gauge needle remains in the red zone and the check gauges indicator remains illuminated until the cluster receives a message from the PCM indicating there is no high system voltage condition (system voltage is below about sixteen volts, but higher than about eleven volts).

- **Communication Error** - If the cluster fails to receive a system voltage message, it will hold the gauge needle at the last indication for about twelve seconds, until a new message is received, or until the ignition switch is turned to the Off position, whichever occurs first. After twelve seconds, the cluster will return the gauge needle to the low end of the gauge scale.
- **Actuator Test** - Each time the cluster is put through the actuator test, the gauge needle will be swept across the entire gauge scale and back to confirm the functionality of the gauge and the cluster control circuitry.

The PCM continually monitors the system voltage to control the generator output. The PCM then sends the proper system voltage messages to the instrument cluster. For further diagnosis of the voltage gauge or the instrument cluster circuitry that controls the gauge, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the check gauges indicator due to a system voltage low or high condition, it may indicate that the charging system requires service. For proper diagnosis of the charging system, the PCI data bus, or the electronic message inputs to the instrument cluster that control the voltage gauge, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

WAIT-TO-START INDICATOR

DESCRIPTION

A wait-to-start indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The wait-to-start indicator is located near the lower edge of the tachometer gauge dial face, to the right of center. The wait-to-start indicator consists of an International Control and Display Symbol icon for “Diesel Preheat” imprinted on an amber lens. The lens is located behind a cutout in the opaque layer of the tachometer gauge dial face overlay. The dark outer layer of the gauge dial face overlay prevents the icon from being clearly visible when the indicator is not illuminated. The icon appears silhouetted against an amber field through the translucent outer layer of the gauge dial face overlay when the indicator is illuminated from behind by a replaceable incandescent bulb and bulb holder unit located on the instrument cluster electronic circuit board. The wait-to-start indicator lens is serviced as a unit with the instrument cluster.

OPERATION

The wait-to-start indicator gives an indication to the vehicle operator when the diesel engine glow plugs are energized in their preheat operating mode. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The wait-to-start indicator bulb is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The bulb only illuminates when it is switched to ground by the instrument cluster transistor. The instrument cluster will turn on the wait-to-start indicator for the following reasons:

- **Wait-To-Start Indicator Lamp-On Message** - Each time the cluster receives a wait-to-start indicator lamp-on message from the PCM indicating the glow plugs are heating and the driver must wait to start the engine, the wait-to-start indicator will be illuminated. The indicator remains illuminated until the cluster receives a wait-to-start indicator lamp-off message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the wait-to-start indicator will be turned on for the duration of the test to confirm the functionality of the bulb and the cluster control circuitry.

The PCM continually monitors the ambient temperature and the glow plug pre-heater circuits to determine how long the glow plugs must be heated in the pre-heat operating mode. The PCM then sends the proper wait-to-start indicator lamp-on and lamp-off messages to the instrument cluster. If the wait-to-start indicator fails to light during the actuator test, replace the bulb with a known good unit. For further diagnosis of the wait-to-start indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the glow plug pre-heater control circuits, the PCM, the PCI data bus, or the electronic message

inputs to the instrument cluster that control the wait-to-start indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

WATER-IN-FUEL INDICATOR

DESCRIPTION

A water-in-fuel indicator is only found in the instrument clusters of vehicles equipped with an optional diesel engine. The water-in-fuel indicator is located near the left edge of the instrument cluster, to the left of the tachometer. The water-in-fuel indicator consists of an International Control and Display Symbol icon for “Water in Fuel” imprinted on a red lens. The lens is located behind a cutout in the opaque layer of the instrument cluster overlay. The dark outer layer of the overlay prevents the icon from being clearly visible when the indicator is not illuminated. The icon appears silhouetted against a red field through the translucent outer layer of the overlay when the indicator is illuminated from behind by a Light Emitting Diode (LED), which is soldered onto the instrument cluster electronic circuit board. The water-in-fuel indicator lens is serviced as a unit with the instrument cluster lens, hood and mask unit.

OPERATION

The water-in-fuel indicator gives an indication to the vehicle operator when there is excessive water in the fuel system. This indicator is controlled by a transistor on the instrument cluster circuit board based upon cluster programming and electronic messages received by the cluster from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus. The water-in-fuel indicator Light Emitting Diode (LED) is completely controlled by the instrument cluster logic circuit, and that logic will only allow this indicator to operate when the instrument cluster receives a battery current input on the fused ignition switch output (run-start) circuit. Therefore, the indicator will always be off when the ignition switch is in any position except On or Start. The LED only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the water-in-fuel indicator for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position the water-in-fuel indicator is illuminated for about three seconds as a bulb test.
- **Water-In-Fuel Indicator Lamp-On Message** - Each time the cluster receives a water-in-fuel indicator lamp-on message from the PCM indicating there is excessive water in the diesel fuel system, the water-in-fuel indicator will be illuminated. The indicator remains illuminated until the cluster receives a water-in-fuel indicator lamp-off message, or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the water-in-fuel indicator will be turned on for the duration of the test to confirm the functionality of the LED and the cluster control circuitry.

The PCM continually monitors the water-in-fuel sensor to determine whether there is excessive water in the diesel fuel. The PCM then sends the proper water-in-fuel indicator lamp-on and lamp-off messages to the instrument cluster. For further diagnosis of the water-in-fuel indicator or the instrument cluster circuitry that controls the indicator, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). For proper diagnosis of the water-in-fuel sensor, the PCM, the PCI data bus, or the electronic message inputs to the instrument cluster that control the water-in-fuel indicator, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

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LAMPS/LIGHTING - EXTERIOR

DESCRIPTION - TURN SIGNAL & HAZARD WARNING SYSTEM

The turn signal and hazard warning system includes the following major components, which are described in further detail elsewhere in this service information:

- Combination Flasher
- Front Side Marker Lamps
- Hazard Warning Switch
- Turn Signal Cancel Cam
- Turn Signal Indicators
- Turn Signal Lamps
- Turn Signal Switch

The turn signal and hazard warning systems also provide the following features:

- **Flash Lights with Lock** - This customer programmable feature flashes the hazard warning lamps to provide optical verification that the Remote Keyless Entry (RKE) System has received a valid Lock or Unlock request from an RKE transmitter. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION - REMOTE KEYLESS ENTRY SYSTEM).
- **Panic Mode Optical Alert** - This feature flashes the hazard warning lamps to provide an optical alert when the Remote Keyless Entry (RKE) System panic mode is activated by depressing the Panic button on an RKE transmitter. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION - REMOTE KEYLESS ENTRY SYSTEM).
- **Turn Signal On Warning** - This feature provides the vehicle operator with both visual and audible reminders when a turn signal has been left turned on for an extended period. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION).
- **Vehicle Theft Security System (VTSS) Optical Alarm** - This feature flashes the hazard warning lamps to provide an optical alarm when the VTSS is armed and activated by an unauthorized entry into the vehicle. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - DESCRIPTION - VEHICLE THEFT SECURITY SYSTEM).

OPERATION - TURN SIGNAL & HAZARD WARNING SYSTEM

The turn signal system operates on battery current received on a fused ignition switch output (run) circuit so that the turn signals will only operate with the ignition switch in the On position. The hazard warning system operates on non-switched battery current received on a fused B(+) circuit so that the hazard warning remains operational regardless of the ignition switch position. When the turn signal system is activated, the circuitry of the turn signal switch and the combination flasher will cause the selected (right or left) turn signal indicator, front park/turn signal lamp, front side marker lamp and rear tail/stop/turn signal lamp to flash on and off. When the hazard warning system is activated, the circuitry of the hazard warning switch and the combination flasher will cause both the right side and the left side turn signal indicators, front park/turn signal lamps, front side marker lamps and rear tail/stop/turn signal lamps to flash on and off.

The Body Control Module (BCM) can also activate the hazard warning system lamps by energizing the combination flasher through a single hard wired connection to the hazard warning switch sense circuit. The BCM grounds the circuit to energize and de-en-

ergize the combination flasher in response to message inputs received over the Programmable Communications Interface (PCI) data bus network. The BCM can energize the combination flasher when the VTSS is requested.

Vehicles equipped with the optional Electronic Vehicle Information Center (EVIC) use turn signal status messages received from the Electro-Mechanical Instrument Cluster (EMIC) and distance messages received from the Powertrain Control Module (PCM) over the PCI data bus to determine when the Turn Signal On warning should be activated. The EMIC receives hard wired inputs from the combination flasher to operate the turn signal indicators, then sends the proper turn signal status message to the EVIC. If a turn signal is left on for more than about 1.6 kilometers (1 mile) of driving distance, the EVIC will display a visual "Turn Signal On" message and will send a request to the BCM over the PCI data bus to notify the vehicle operator.

During both the turn signal and the hazard warning operation, if the exterior lamps are turned Off, the front park/turn signal lamps and the front side marker lamps will flash in unison. If the exterior lamps are turned On, the front park/turn signal lamps and the front side marker lamps will flash alternately. Refer to the owner's manual.

DIAGNOSIS AND TESTING - TURN SIGNAL & HAZARD WARNING SYSTEMS

When diagnosing the turn signal and hazard warning circuits, remember that high generator output can burn out bulbs rapidly and repeatedly. If this is a concern on the vehicle being diagnosed, test the charging system as required.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Turn the ignition switch to the On position. Actuate the turn signal switch or the hazard warning switch. Observe the turn signal indicator lamp(s) in the instrument cluster. If the flash rate is very high, check for a turn signal bulb that is not lit or is very dimly lit. Repair the circuits to that lamp or replace the faulty bulb, as required. If the turn signal indicator(s) fail to light, go to Step 2.

(2) Turn the ignition switch to the Off position. Check the ignition run fuse and the flasher fuse in the Junction Block (JB). If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse(s).

(3) Check for battery voltage at the flasher fuse in the JB. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the JB and the Power Distribution Center (PDC).

(4) Turn the ignition switch to the On position. Check for battery voltage at the ignition run fuse in the JB. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run) circuit between the JB and the ignition switch.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the combination flasher from the JB and replace it with a known good unit. Reconnect the battery negative cable. Test the operation of the turn signal and hazard warning systems. If OK, discard the faulty combination flasher. If not OK, remove the test flasher and go to Step 6.

(6) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run) circuit cavity in the JB for the combination flasher. If OK, go to Step 7. If not OK, repair the open fused ignition switch output (run) circuit between the combination flasher and the ignition run fuse in the JB.

(7) Turn the ignition switch to the Off position. Check for battery voltage at the B(+) circuit of the JB for the combination flasher. If OK, go to Step 8. If not OK, repair the open B(+) circuit between the combination flasher and the flasher fuse in the JB.

(8) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the turn signal and hazard warning switches from the multi-function switch connector. Check for continuity between the ground circuit of the instrument panel wire harness connector for the left multi-function switch and a good ground. There should be continuity. If OK, go to Step 9. If not OK, repair the open ground circuit.

(9) Check for continuity between the hazard switch sense circuit of the instrument panel wire harness connector for the multi-function switch and a good ground. There should be no continuity. If OK, go to Step 10. If not OK, repair the shorted hazard switch sense circuit between the multi-function switch and the combination flasher.

(10) Check for continuity between the hazard switch sense circuit of the JB for the combination flasher and the instrument panel wire harness con-

nector for the multi-function switch. There should be continuity. If OK, go to Step 11. If not OK, repair the open hazard switch sense circuit between the multi-function switch and the combination flasher.

(11) Check for continuity between the turn switch sense circuit of the instrument panel wire harness connector for the multi-function switch and a good ground. There should be no continuity. If OK, go to Step 12. If not OK, repair the shorted left turn switch sense circuit between the multi-function switch and the combination flasher.

(12) Check for continuity between the left turn switch sense circuit of the JB for the combination flasher and the instrument panel wire harness connector for the multi-function switch. There should be continuity. If OK, go to Step 13. If not OK, repair the open left turn switch sense circuit between the multi-function switch and the combination flasher.

(13) Check for continuity between the right turn switch sense circuit of the instrument panel wire harness connector for the left multi-function switch and a good ground. There should be no continuity. If OK, go to Step 14. If not OK, repair the shorted right turn switch sense circuit between the left multi-function switch and the combination flasher.

(14) Check for continuity between the right turn switch sense circuit of the JB for the combination flasher and the instrument panel wire harness connector for the multi-function switch. There should be continuity. If OK, test the left multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LEFT MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). If not OK, repair the open right turn switch sense circuit between the multi-function switch and the combination flasher as required.

SPECIFICATIONS

EXTERIOR LAMPS

CAUTION: Do not use bulbs other than the bulbs listed in the Bulb Application Table. Damage to lamp can result. Do not touch halogen bulbs with fingers or other oily surfaces. Bulb life will be reduced.

LAMP	BULB TYPE
BACK-UP	3157
CENTER HIGH MOUNTED STOP LAMP	921
FOG LAMP	9005
FRONT SIDE MARKER	194/194NA
FRONT TURN SIGNAL	3157/3157NA
HIGH BEAM	9005XS
LOW BEAM	9006XS
LICENSE PLATE	168
TAIL/BRAKE	3157
REAR TURN SIGNAL	3157
UNDERHOOD LAMP	561

AUTO HEADLAMP SENSOR

DIAGNOSIS AND TESTING - AUTO HEADLAMP SENSOR (AHL)

The auto headlamp sensor needs real sunlight to properly register the light level. When auto headlamps are enabled indoors, the headlamps may be turned on. The sensor is located in the center of the defroster grille at the base of the windshield. There are no faults set in the Body Control Module (BCM) for a inoperative or missing AHL Sensor. Symptom of a missing sensor or unconnected sensor would be that the Headlamps and Parklamps turn on when the vehicle is started and there is a high level of ambient light present (ie. daytime). Auto headlamps should not function in the presence of daylight.

REMOVAL

(1) Remove the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL) for service procedures.

(2) Remove the screw attaching auto headlamp sensor to instrument panel (Fig. 1).

(3) Disengage the harness connector from auto headlamp sensor.

(4) Separate the auto headlamp sensor from instrument panel.

INSTALLATION

(1) Position the auto headlamp sensor on instrument panel.

(2) Engage the harness connector to auto headlamp sensor.

(3) Install the screw attaching auto headlamp sensor to instrument panel.

(4) Install the instrument panel top cover. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION) for service procedures.

AUTO HEADLAMP SENSOR (Continued)

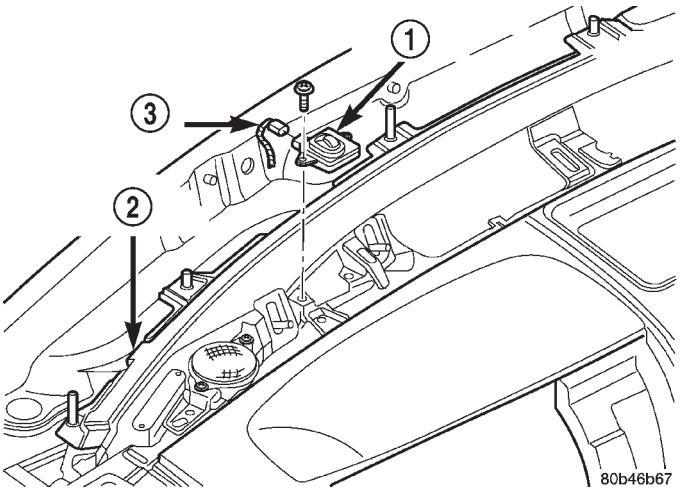


Fig. 1 Auto Headlamp Sensor

1 - AUTO HEADLAMP SENSOR
2 - I/P ASSEMBLY
3 - CONNECTOR

BRAKE LAMP SWITCH

DESCRIPTION

The brake lamp switch is mounted on a bracket attached to the brake pedal support. The switch is adjustable.

OPERATION

The brake lamp switch is used for the brake lamp, speed control and brake sensor circuits.

DIAGNOSIS AND TESTING — BRAKE LAMP SWITCH

Brake lamp switch operation can be tested with an ohmmeter. The ohmmeter is used to check continuity between the pin terminals at different plunger positions (Fig. 2).

SWITCH CIRCUIT IDENTIFICATION

- Terminals 1 and 2: brake sensor circuit
- Terminals 3 and 4: speed control circuit
- Terminals 5 and 6: brake lamp circuit

SWITCH CONTINUITY TEST

NOTE: Disconnect switch harness before testing continuity.

With the switch plunger retracted, attach the test leads to terminal pins 1 and 2. Replace switch if meter indicates no continuity.

With the switch plunger retracted, attach the test leads to terminal pins 3 and 4. Replace switch if meter indicates no continuity.

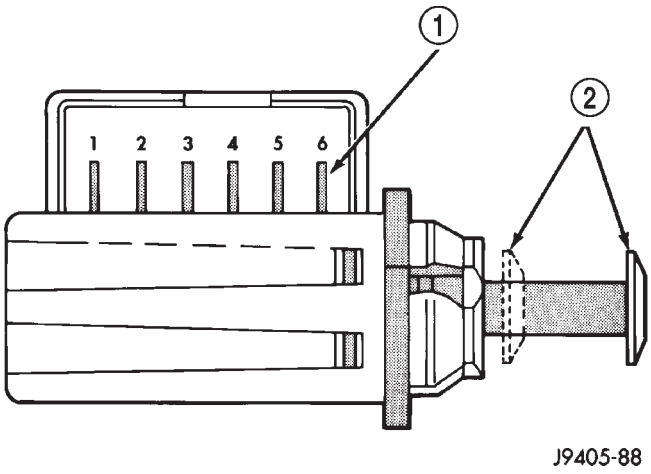


Fig. 2 Brake Lamp Switch Terminal Identification

1 - TERMINAL PINS
2 - PLUNGER TEST POSITIONS

With the switch plunger extended, attach the test leads to terminal pins 5 and 6. Replace switch if meter indicates no continuity.

REMOVAL

(1) Remove the steering column cover and lower trim panel.

(2) Press the brake pedal downward to fully applied position.

(3) Rotate the switch approximately 30° in counterclockwise direction to unlock the switch retainer. Pull switch rearward and out of bracket.

(4) Disconnect switch harness and remove switch from vehicle (Fig. 3).

INSTALLATION

(1) Pull the switch plunger all the way out to fully extended position.

(2) Connect the harness wires to switch.

(3) Press and hold brake pedal in applied position.

(4) Install the switch as follows: Align the tab on the switch with the notch in the switch bracket. Insert the switch in the bracket and turn it clockwise about 30° to lock it in place.

(5) Release the brake pedal. Then pull the pedal lightly rearward. The pedal will set the plunger to the correct position as the pedal pushes the plunger into switch body. The switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs.

BRAKE LAMP SWITCH (Continued)

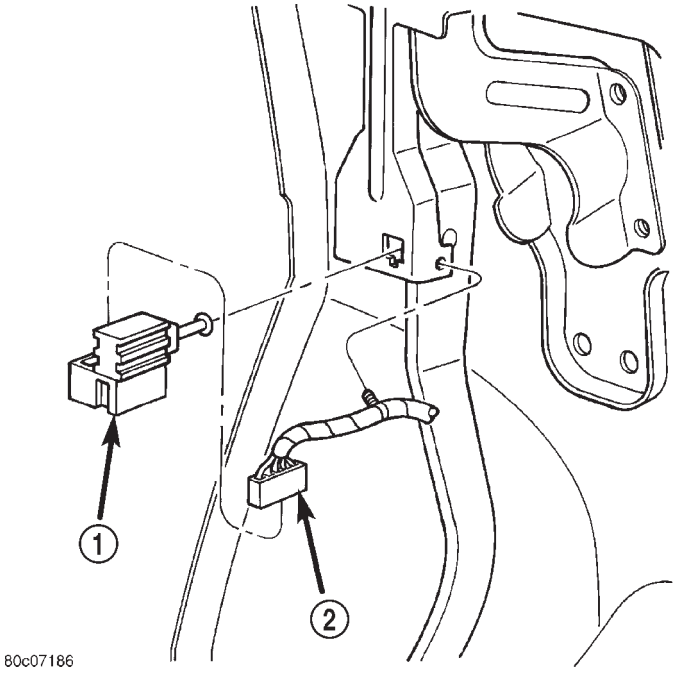


Fig. 3 Brake Lamp

1 - SWITCH
2 - HARNESS CONNECTOR

ADJUSTMENTS

ADJUSTMENT

(1) Press and hold brake pedal in applied position.
(2) Pull switch plunger all the way out to fully extended position.
(3) Release brake pedal. Then pull pedal lightly rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs.

CENTER HIGH MOUNTED STOP LAMP

REMOVAL

REMOVAL - BULB

(1) Remove the screws attaching the lamp housing to the liftgate.
(2) Rotate the bulb socket 1/4 turn and remove it from the housing (Fig. 4).
(3) Remove the bulb from the socket.

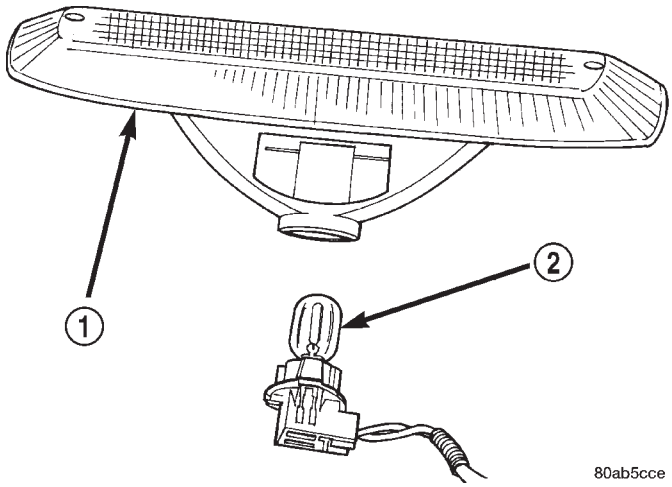


Fig. 4 CHMSL Bulb

1 - CHMSL
2 - CHMSL BULB

REMOVAL - CHMSL

(1) Remove the screws attaching CHMSL to the liftgate (Fig. 5).
(2) Disconnect the wire harness connector.
(3) Separate the CHMSL from the vehicle.

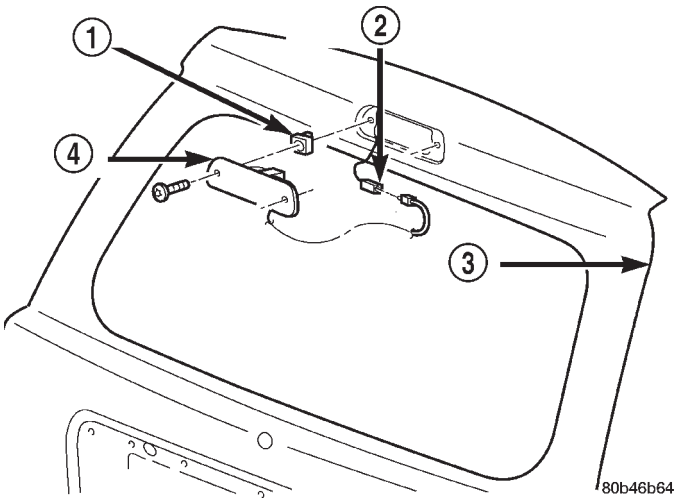


Fig. 5 Center High Mounted Stop lamp

1 - PUSH-IN NUT
2 - CONNECTOR
3 - LIFTGATE
4 - CHSML

INSTALLATION

INSTALLATION - BULB

(1) Push the bulb into the socket.
(2) Position the socket in lamp and rotate 1/4 turn.
(3) Install the screws attaching the lamp housing to liftgate.

CENTER HIGH MOUNTED STOP LAMP (Continued)

INSTALLATION - CHMSL

(1) Connect the wire harness connector.
(2) Position the CHMSL on liftgate.
(3) Install the screws attaching the CHMSL to the liftgate.

COMBINATION FLASHER

DESCRIPTION

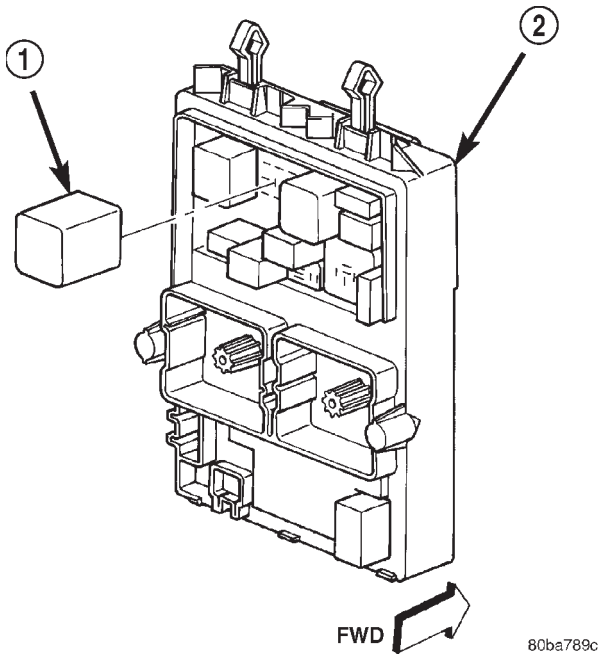


Fig. 6 Combination Flasher

1 - COMBINATION FLASHER
2 - JUNCTION BLOCK

The combination flasher is located in the Junction Block (JB) (Fig. 6). The JB is located underneath the driver side of the instrument panel outboard of the steering column. The combination flasher is a smart relay that functions as both the turn signal system and the hazard warning system flasher. The combination flasher contains active electronic Integrated Circuitry (IC) elements. This flasher is designed to handle the current flow requirements of the factory-installed lighting. If supplemental lighting is added to the turn signal lamp circuits, such as when towing a trailer with lights, the combination flasher will automatically try to compensate to keep the flash rate the same.

The combination flasher has nine blade-type terminals that connect it to the vehicle electrical system. Refer to the appropriate wiring information.

Because of the active electronic elements within the combination flasher, it cannot be tested with conventional automotive electrical test equipment. If the combination flasher is believed to be faulty, test the turn signal system and hazard warning system circuits.(Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - DIAGNOSIS AND TESTING - TURN SIGNAL & HAZARD WARNING SYSTEM). The combination flasher cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The combination flasher controls the following inputs and outputs: B(+), fused ignition switch output, left turn switch sense, right turn switch sense, hazard switch sense, left front turn signal circuit, right front turn signal circuit, left rear turn signal circuit and right rear turn signal circuit. Constant battery voltage is supplied to the flasher so that it can perform the hazard warning function, and ignition switched battery voltage is supplied for the turn signal function. However, when the flasher is idle no current is drawn through the module. The unit does not become active until it is provided a signal ground from the turn signal switch, hazard warning switch or the Body Control Module (BCM).

The IC within the combination flasher (Fig. 7) contains the logic that controls the flasher operation and the flash rate. When a bulb is burnt out, or when a circuit for a lamp is open, the turn signal flash rate will increase. However, an open lamp circuit or burnt out bulb does not change the hazard warning flash rate.

COMBINATION FLASHER (Continued)

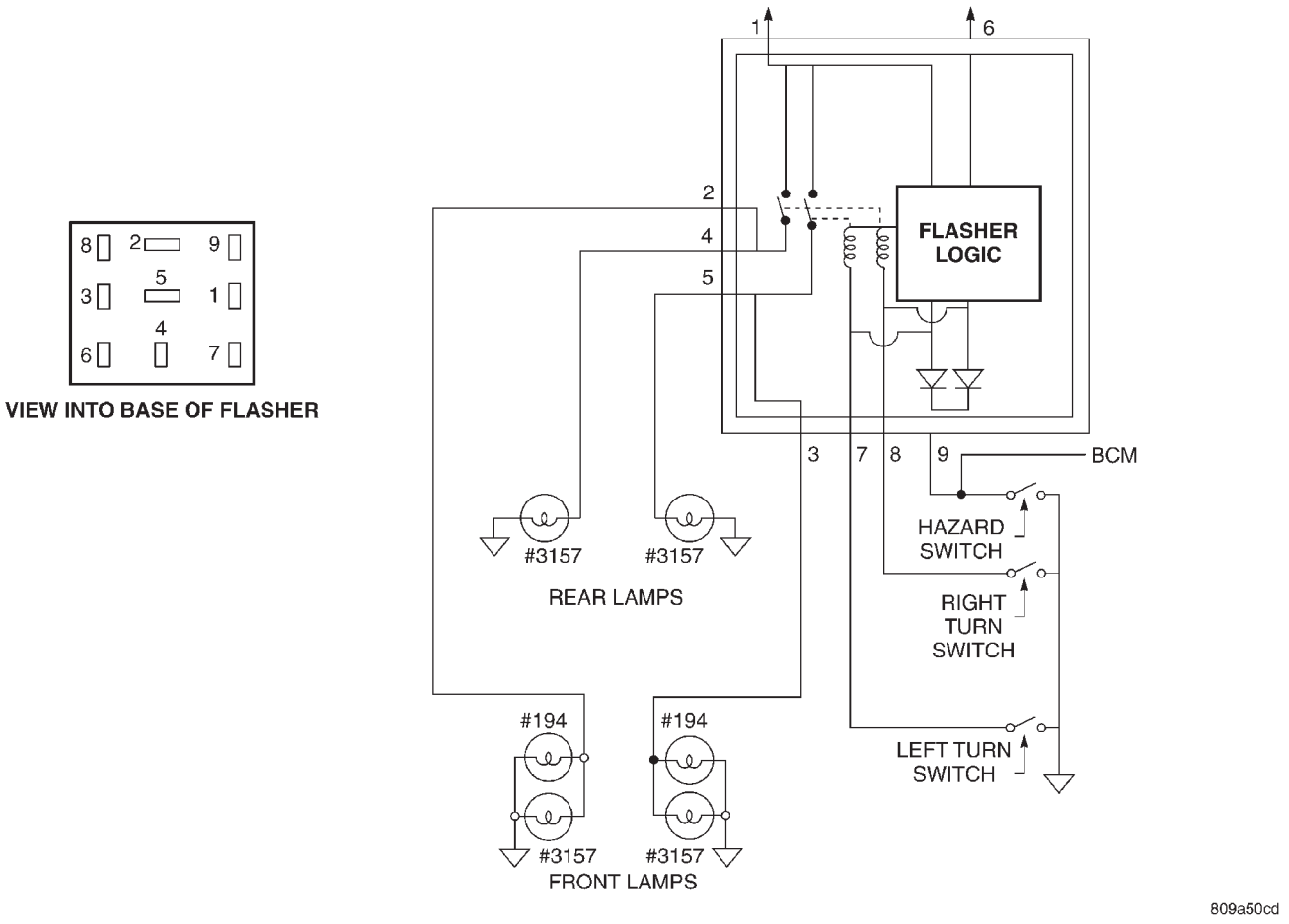


Fig. 7 Combination Flasher

COMBINATION FLASHER CIRCUITS		
CAVITY	**CIRCUIT**	**FUNCTION**
1	L25	Fused B(+)
2	L61	Left Front Turn Signal
3	L60	Right Front Turn Signal
4	L63	Left Rear Turn Signal
5	L62	Right Rear Turn Signal
6	F22	Fused Ignition Switch Output
7	L305	Left Turn Switch Sense
8	L302	Right Turn Switch Sense
9	L91	Hazard Switch Sense

COMBINATION FLASHER (Continued)

Turn signal inputs that actuate the combination flasher are low current grounds, each drawing a maximum of 300 milliamperes.The hazard warning signal input is a low current ground drawing a maximum of 600 milliamperes.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(3) Remove the combination flasher from the Junction Block (JB) (Fig. 8).

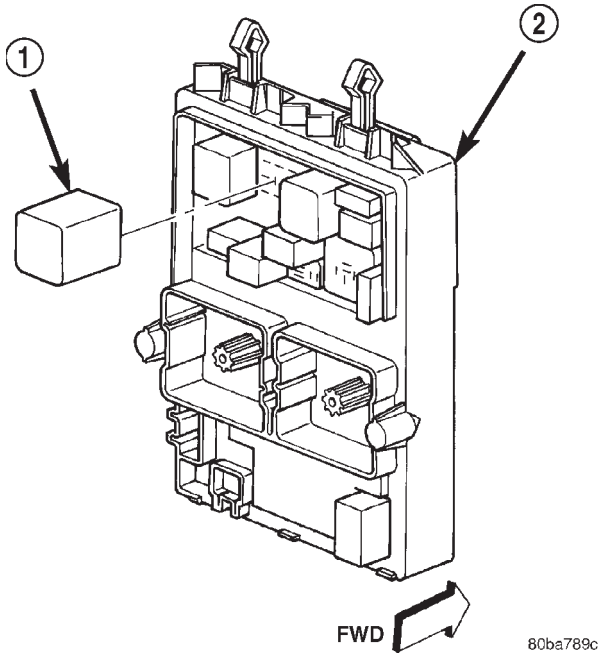


Fig. 8 Combination Flasher

1 - COMBINATION FLASHER
2 - JUNCTION BLOCK

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Align the terminals of the combination flasher with the terminal cavities in the JB. (Fig. 8)

(2) Push in firmly and evenly on the combination flasher until the terminals are fully seated.

(3) Reinstall the steering column opening cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(4) Reconnect the battery negative cable.

DAYTIME RUNNING LAMP MODULE

DESCRIPTION

The Daytime Running Lights (Headlamps) System is installed on vehicles manufactured for sale in Canada only. A separate module, mounted in the junction block under the dash, controls the DRL.

OPERATION

The headlamps are illuminated at a reduced intensity when the engine is running, headlamp switch off, and the parking brake released.

REMOVAL

(1) Lower the junction block. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - REMOVAL) for service procedures.

(2) Remove the module from the junction block.

INSTALLATION

(1) Position the module in the junction block and press to secure.

(2) Install the junction block. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - INSTALLATION) for service procedures.

FOG LAMP

REMOVAL

(1) Disconnect the fog lamp harness connector.
(2) Rotate the bulb socket 1/4 turn counter clockwise.
(3) Remove the bulb socket from lamp (Fig. 9).

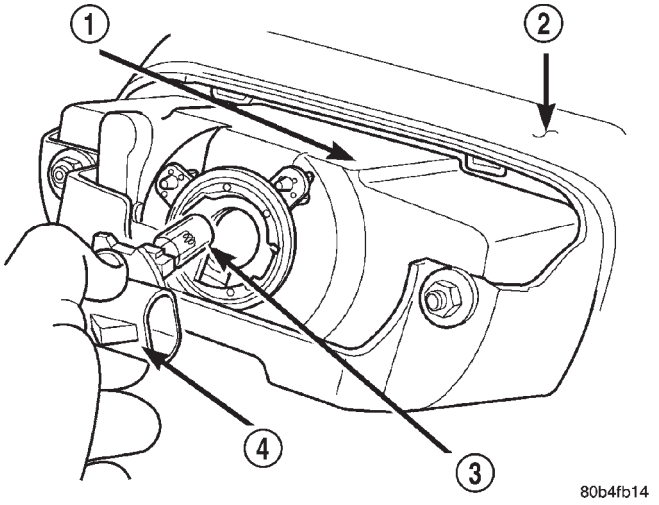


Fig. 9 Fog Lamp Bulb

1 - FOG LAMP
2 - FASCIA
3 - BULB
4 - BULB SOCKET

INSTALLATION

CAUTION: Do not touch the bulb glass with fingers or other oily surfaces. Reduced bulb life will result.

(1) Position the bulb socket in fog lamp.
(2) Rotate the bulb socket 1/4 turn clockwise.
(3) Connect the fog lamp harness connector.

FOG LAMP UNIT

REMOVAL

(1) Disengage the fog lamp electrical connector.
(2) Remove the nuts attaching fog lamp to fascia (Fig. 10).
(3) Separate the fog lamp from vehicle.

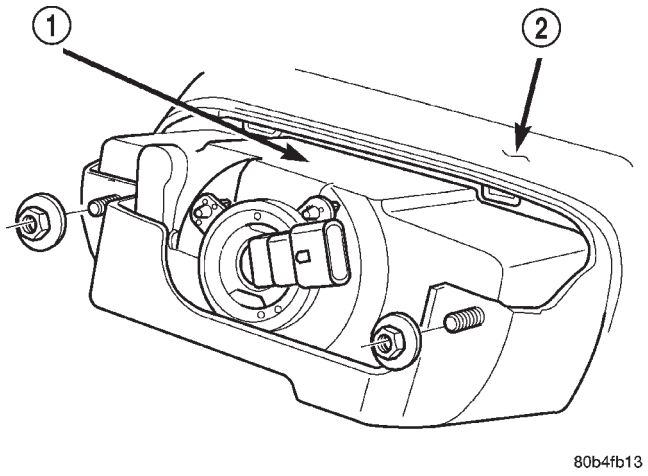


Fig. 10 Fog Lamp

1 - FOG LAMP
2 - FASCIA

INSTALLATION

(1) Position the fog lamp in fascia.
(2) Install the nuts attaching fog lamp to fascia.
(3) Engage the fog lamp electrical connector.
(4) Align the fog lamp, if necessary.

ADJUSTMENTS

FOG LAMP ADJUSTMENT

Prepare an alignment screen. A properly aligned fog lamp will project a pattern on the alignment screen 100 mm (4 in.) below the fog lamp centerline and straight ahead (Fig. 11).

Rotate the adjustment screw to adjust beam height (Fig. 12).

FOG LAMP UNIT (Continued)

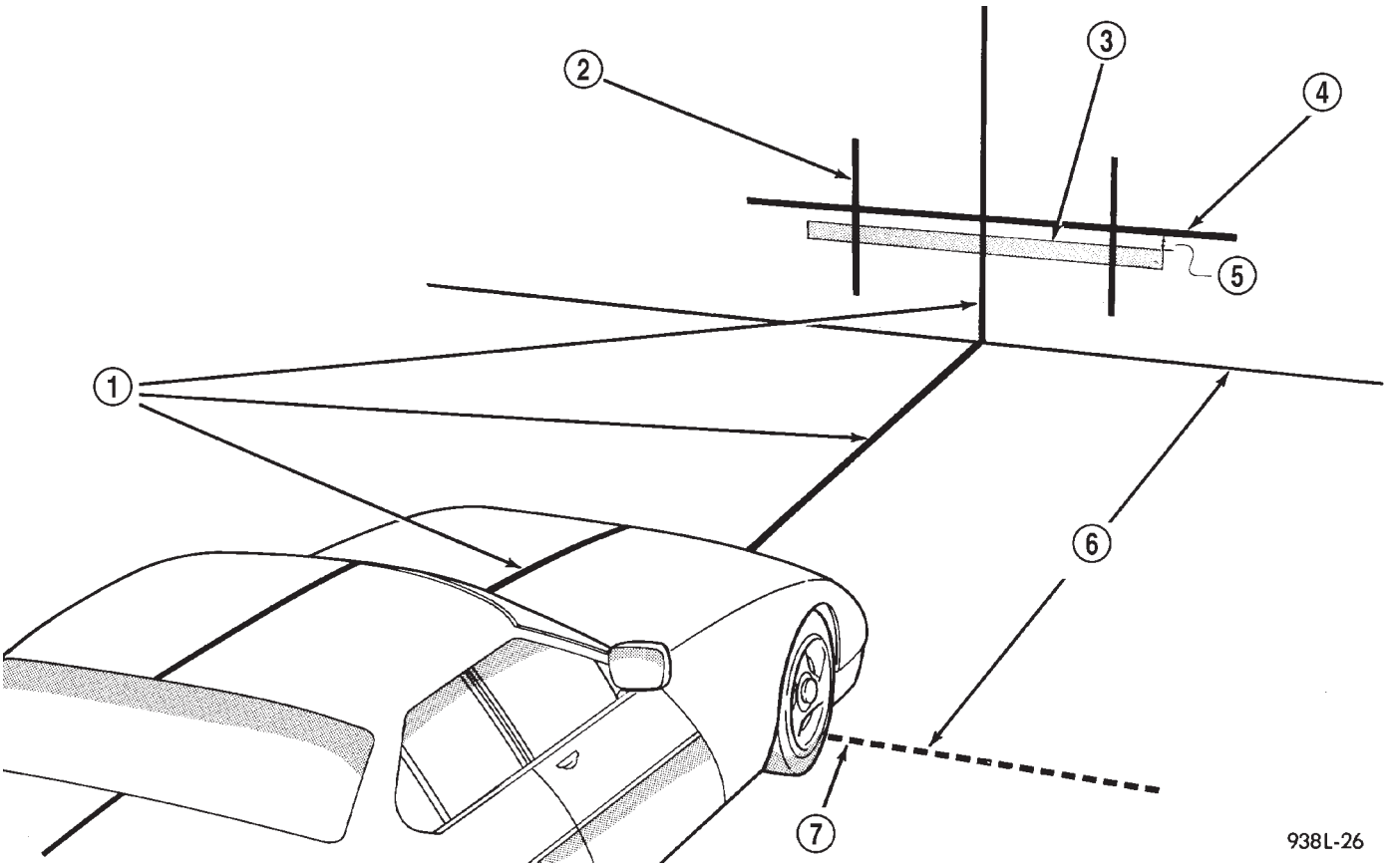


Fig. 11 Fog Lamp Alignment—Typical

1 - VEHICLE CENTERLINE
2 - CENTER OF VEHICLE TO CENTER OF FOG LAMP LENS
3 - HIGH-INTENSITY AREA
4 - FLOOR TO CENTER OF FOG LAMP LENS
5 - 100 mm (4 in.)
6 - 7.62 METERS (25 FEET)
7 - FRONT OF FOG LAMP

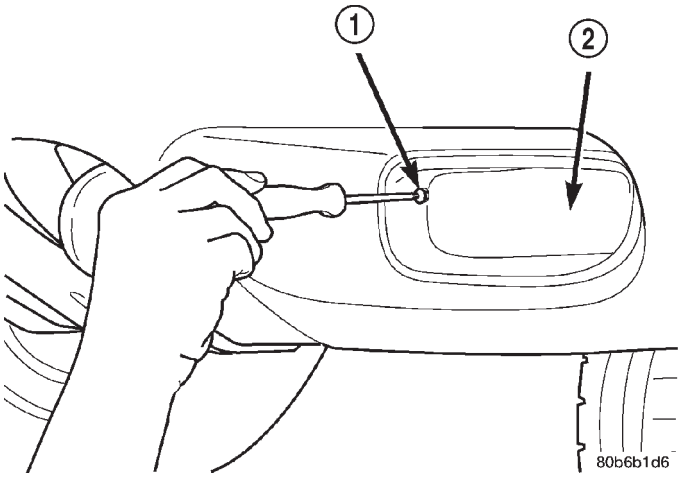


Fig. 12 Fog Lamp Adjustment

1 - ADJUSTMENT SCREW
2 - FOG LAMP

HEADLAMP

DESCRIPTION

The headlamps are modular in design.The headlamp module contains five bulbs; a dual filament headlamp low beam bulb, a single filament high beam bulb, two turnsignal/park bulbs, and a side marker bulb.

OPERATION

All headlamp, turnsignal, park lamp, and high beam operations are controlled by the left multifunction switch. Exterior lamps and bulbs are serviceable separately.

HEADLAMP (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING — HEADLAMP SYSTEM

HEADLAMPS

CONDITION	POSSIBLE CAUSES	CORRECTION
HEADLAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF	1. Loose or corroded battery cables.	1. Clean and secure battery cable clamps and posts.
	2. Loose or worn generator drive belt.	2. Adjust or replace generator drive belt.
	3. Charging system output too low.	3. Test and repair charging system, refer to Electrical, Charging
	4. Battery has insufficient charge.	4. Test battery state-of -charge, refer to Electrical, Battery System.
	5. Battery is sulfated or shorted.	5. Load test battery, refer to Electrical,Battery System.
	6. Poor lighting circuit Z1-ground.	6. Test for voltage drop across Z1-ground locations, refer to Electrical, Wiring Digram Information.
	7. Both headlamp bulbs defective.	7. Replace both headlamp bulbs.
HEADLAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high.	1. Test and repair charging system, refer to Electrical, Charging.
	2. Loose or corroded terminals or splices in circuit.	2. Inspect and repair all connectors and splices, refer to Electrical, Wiring Information.
HEADLAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE*	1. Charging system output too low.	1. Test and repair charging system, refer to Electrical, Wiring Information.
	2. Poor lighting circuit Z1-ground.	2. Test for voltage drop across Z1-ground locations, refer to Electrical, Wiring Information.
	3. High resistance in headlamp circuit.	3. Test amperage draw of headlamp circuit.
	4. Both headlamp bulbs defective.	4. Replace both headlamp bulbs.
HEADLAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1-ground.	1. Test for voltage drop across Z1-ground locations, refer to Electrical, Wiring Information.
	2. High resistance in headlamp circuit.	2. Test amperage draw of headlamp circuit. Should not exceed 30 amps.
	3. Loose or corroded terminals or splices in circuit.	3. Inspect and repair all connectors and splices, refer to Electrical, Wiring Information.
HEADLAMPS DO NOT ILLUMINATE	1. No voltage to headlamps.	1. Repair open headlamp circuit, refer to Electrical, Wiring Information.
	2. No Z1-ground at headlamps.	2. Repair circuit ground, refer to Electrical, Wiring Information.

HEADLAMP (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Faulty headlamp switch.	3. Refer to BCM diagnostics.
	4. Blown fuse for headlamps.	4. Replace fuse refer to Electrical, Wiring Information.
	5. Broken connector terminal or wire splice in headlamp circuit.	5. Repair connector terminal or wire splice.
	6. Both headlamp bulbs defective.	6. Replace both headlamp bulbs.
*Canada vehicles must have lamps ON.		

FOG LAMP

CONDITION	POSSIBLE CAUSES	CORRECTION
FOG LAMPS ARE DIM WITH ENGINE IDLING OR IGNITION TURNED OFF.	1. Loose or corroded battery cables.	1. Clean and secure battery cable clamps and posts.
	2. Loose or worn generator drive belt.	2. Adjust or replace generator drive belt.
	3. Charging system output too low.	3. Test and repair charging system. Refer to Electrical, Charging,
	4. Battery has insufficient charge.	4. Test battery state-of -charge. Refer to Electrical, Battery System.
	5. Battery is sulfated or shorted.	5. Load test battery. Refer to Electrical, Battery System.
	6. Poor lighting circuit Z1-ground.	6. Test for voltage drop across Z1-ground locations. Refer to Electrical, Wiring Information.
FOG LAMP BULBS BURN OUT FREQUENTLY	1. Charging system output too high.	1. Test and repair charging system. Refer to Electrical, Charging.
	2. Loose or corroded terminals or splices in circuit.	2. Inspect and repair all connectors and splices. Refer to Electrical, Wiring Information.
FOG LAMPS ARE DIM WITH ENGINE RUNNING ABOVE IDLE	1. Charging system output too low.	1. Test and repair charging system. Refer to Electrical, Charging.
	2. Poor lighting circuit Z1-ground.	2. Test for voltage drop across Z1-ground locations. Refer to Electrical, Wiring Information.
	3. High resistance in fog lamp circuit.	3. Test amperage draw of fog lamp circuit.
FOG LAMPS FLASH RANDOMLY	1. Poor lighting circuit Z1-ground.	1. Test for voltage drop across Z1-ground locations. Refer to Electrical, Wiring Information.
	2. High resistance in fog lamp circuit.	2. Test amperage draw of fog lamp circuit.
	3. Faulty multifunction switch.	3. Refer to Electrical, Electronic Control Modules.
	4. Loose or corroded terminals or splices in circuit.	4. Inspect and repair all connectors and splices. Refer to Electrical, Wiring Information.

HEADLAMP (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
FOG LAMPS DO NOT ILLUMINATE	1. Blown fuse for fog lamp.	1. Replace fuse. Refer to Electrical, Wiring Information.
	2. No Z1-ground at fog lamps.	2. Repair circuit ground. Refer to Electrical, Wiring Information.
	3. Faulty multifunction switch.	3. Refer to Electrical, Wiring Information.
	4. Broken connector terminal or wire splice in fog lamp circuit.	4. Repair connector terminal or wire splice.
	5. Defective or burned out bulb.	5. Replace bulb.

DAYTIME RUNNING LAMP

CONDITION	POSSIBLE CAUSES	CORRECTION
DAYTIME RUNNING LAMPS DO NOT WORK	1. Poor connection at DRL module.	1. Secure connector on DRL module.
	2. Parking brake engaged.	2. Disengage parking brake.
	3. Parking brake circuit shorted to ground.	3. Check cluster telltale, refer to Group 8W.
	4. Headlamp circuit shorted to ground.	4. Refer to Group 8W.
	5. Defective DRL relay.	5. Replace DRL relay.
	6. Body controller not programed with Canadian country code.	6. Check country code.
	7. DRL relay is missing.	7. Install DRL relay.
	8. Blown fuse for DRL.	8. Replace fuse refer to Electrical, Wiring Information.
Clicking or chattering when DRL is on.	1. Mechanical relay is installed in the junction block.	1. Ensure that the DRL relay is installed in the proper socket in junction block, and that no mechanical relay exists in the low beam socket.

DIAGNOSIS AND TESTING — HEADLAMP

WARNING: EYE PROTECTION SHOULD BE USED WHEN SERVICING GLASS COMPONENTS. PERSONAL INJURY CAN RESULT.

CAUTION: Do not touch the glass of halogen bulbs with fingers or other possibly oily surface, reduced bulb life will result. Do not use bulbs other than those indicated in the Bulb Application table. Damage to lamp and/or Daytime Running Lamp Module can result. Do not use fuses, circuit breakers or relays having greater amperage value than indicated on the fuse panel or in the Owners Manual.

Each vehicle is equipped with various lamp assemblies. A good power feed and ground are necessary for proper lighting operation. Grounding is provided by the lamp socket when it comes in contact with the metal body, or through a separate ground wire.

When changing lamp bulbs check the socket for corrosion. If corrosion is present, clean it with a wire brush and coat the inside of the socket lightly with Mopar Multi-Purpose Grease or equivalent.

REMOVAL - BULB

(1) Remove the headlamp.
(2) Turn the bulb socket one quarter turn counter clockwise.
(3) Remove the socket from lamp (Fig. 13).
(4) Remove the bulb from socket.

HEADLAMP (Continued)

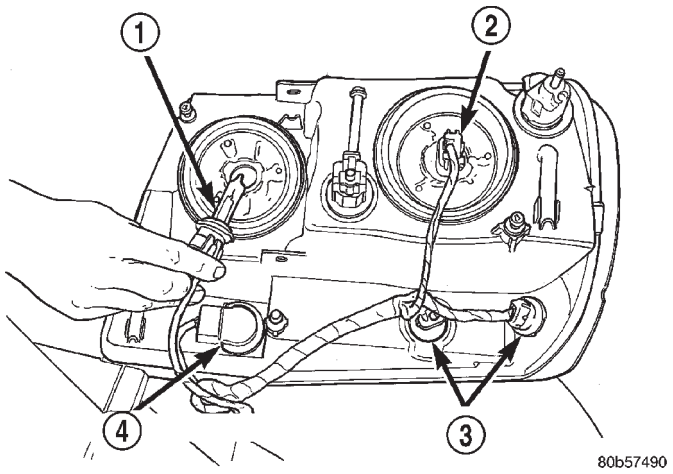


Fig. 13 Headlamp Bulb

1 - HIGH BEAM BULB
2 - LOW BEAM BULB
3 - MARKER BULB
4 - PARK/TURN SIGNAL BULB

INSTALLATION - BULB

CAUTION: Do not touch the bulb glass with fingers or other oily surfaces. Reduced bulb life will result.

(1) Position the bulb into socket and push into place.
(2) Position the bulb socket in headlamp and turn the bulb socket one quarter turn clockwise.
(3) Install the headlamp.

HEADLAMP SWITCH

DESCRIPTION

The headlamp switch is part of the left multi-function switch. A knob on the end of the multi-function switch control stalk controls all of the exterior lighting switch functions. The exterior lighting switch is hard wired to the Body Control Module (BCM).

The exterior lighting switch cannot be adjusted or repaired and, if faulty or damaged, the entire left multi-function switch unit must be replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TURN SIGNAL/HAZARD SWITCH - REMOVAL) for the service procedures. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODUL - DESCRIPTION) for more information on this component.

OPERATION

The exterior lighting switch uses a hard wired five volt reference circuit from the BCM, resistor multiplexing and a hard wired switch output circuit to provide the BCM with a zero to five volt signal that indicates the status of all of the exterior lighting switch settings. The BCM then uses control outputs to energize the headlamp and park lamp relays that activate the exterior lighting circuits.

The BCM monitors the exterior lighting switch status, then sends the proper switch status messages to other modules over the Programmable Communications Interface (PCI) data bus network. The exterior lighting switch status is also used by the BCM as an input for chime warning system operation.

DIAGNOSIS AND TESTING — HEADLAMP SWITCH

Before testing the headlamp switch, turn on the exterior lighting and open the driver side front door. If the exterior lamps of the vehicle operate, but there is no chime warning issued with the driver side front door open, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DIAGNOSIS AND TESTING). If the exterior lamps of the vehicle are inoperative, but the chime warning is issued, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - DIAGNOSIS AND TESTING).

If the exterior lamps and the chime warning are both inoperative, test the left multi-function switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR - DIAGNOSIS AND TESTING). If the multi-function switch tests OK, proceed as follows. The following tests will help to locate a short or open in the hard wired circuits between the multi-function switch and the Body Control Module (BCM). For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector from the left multi-function switch connector. Disconnect the instrument panel wire harness connector from the Body Control Module (BCM). Check for continuity between the headlamp switch mux circuit of the instrument panel wire harness connector for the multi-function switch and a good ground. There should be no continuity. If OK, go to Step 2. If not OK, repair the shorted headlamp switch mux circuit.
(2) Check for continuity between the headlamp switch mux circuit of the instrument panel wire har-

HEADLAMP SWITCH (Continued)

ness connector for the multi-function switch and the instrument panel wire harness connector for the BCM. There should be continuity. If OK, go to Step 3. If not OK, repair the open headlamp switch mux circuit.

(3) Check for continuity between the headlamp switch return circuit of the instrument panel wire harness connector for the multi-function switch and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted headlamp switch return circuit.

(4) Check for continuity between the headlamp switch return circuit of the instrument panel wire harness connector for the multi-function switch and the instrument panel wire harness connector for the BCM. There should be continuity. If OK, use a DRBIII® scan tool and the proper Diagnostic Procedures manual to test the BCM. If not OK, repair the open headlamp switch return circuit.

HEADLAMP UNIT

REMOVAL

(1) Remove the jack screw attaching the top of headlamp to the headlamp mounting module (Fig. 14).

(2) Grasp upper inboard and lower outboard corners of headlamp (Fig. 15) and pull headlamp outward.

(3) Remove all of the bulb sockets from headlamp module.

(4) Separate the headlamp from vehicle.

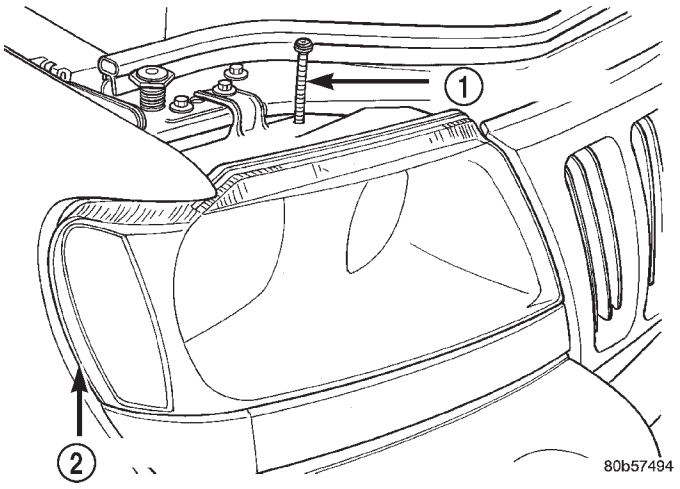


Fig. 14 Headlamp Jackscrew

1 - JACKSCREW
2 - HEADLAMP

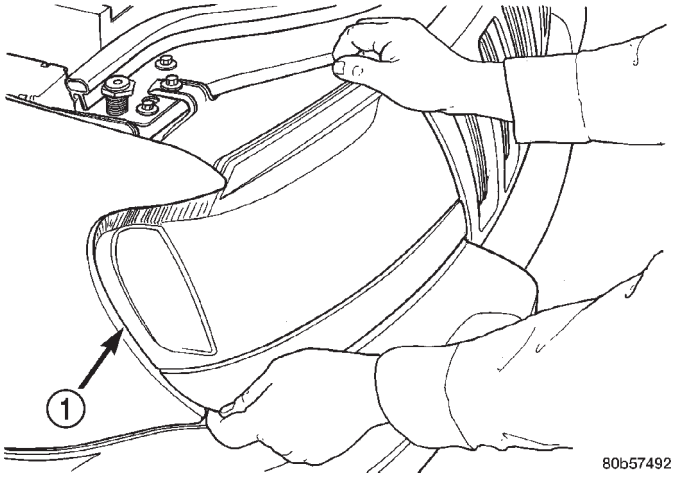


Fig. 15 Headlamp Removal

1 - HEADLAMP

INSTALLATION

CAUTION: Do not touch the bulb glass with fingers or other oily surfaces. Reduced bulb life will result.

(1) Install all of the bulb sockets in headlamp module.

(2) Position the headlamp on the vehicle and align the ball studs with the sockets.

(3) Push the headlamp inward to secure the ball studs with the sockets.

(4) Install the jack screw attaching the top of headlamp to the headlamp mounting module.

ADJUSTMENTS

VEHICLE PREPARATION FOR LAMP ALIGNMENT

(1) Verify headlamp dimmer switch and high beam indicator operation.

(2) Correct defective components that could hinder proper lamp alignment.

(3) Verify proper tire inflation.

(4) Clean lamp lenses.

(5) Verify that luggage area is not heavily loaded.

(6) Fuel tank should be FULL. Add 2.94 kg (6.5 lbs.) of weight over the fuel tank for each estimated gallon of missing fuel.

LAMP ALIGNMENT SCREEN PREPARATION

(1) Position vehicle on a level surface perpendicular to a flat wall 7.62 meters (25 ft) away from front of headlamp lens (Fig. 16).

(2) If necessary, tape a line on the floor 7.62 meters (25 ft) away from and parallel to the wall.

(3) Measure from the floor up 1.27 meters (5 ft) and tape a line on the wall at the centerline of the vehicle. Sight along the centerline of the vehicle

HEADLAMP UNIT (Continued)

(from rear of vehicle forward) to verify accuracy of the line placement.

(4) Rock vehicle side-to-side three times to allow suspension to stabilize.

(5) Jounce front suspension three times by pushing downward on front bumper and releasing.

(6) Measure the distance from the center of headlamp lens to the floor. Transfer measurement to the alignment screen (with tape). Use this line for up/down adjustment reference.

(7) Measure distance from the centerline of the vehicle to the center of each headlamp being aligned. Transfer measurements to screen (with tape) to each side of vehicle centerline. Use these lines for left/right adjustment reference.

HEADLAMP ADJUSTMENT

A properly aimed low beam will project the top edge of the beam intensity pattern on the screen from 25 mm (1 in.) above to 75 mm (3 in.) below headlamp centerline. The side-to-side left edge of the beam intensity pattern should be from 50 mm (2 in.) left to 50 mm (2 in.) right of headlamp centerline (Fig. 17).

(1) Clean front of the headlamps.

(2) Place headlamps on LOW beam.

(3) Cover front of the headlamp that is not being adjusted.

(4) Turn adjustment screw (Fig. 18) and (Fig. 19) until the top edge of the beam intensity pattern is positioned within 25 mm (1 in.) above or 75 mm (3 in.) below the headlamp horizontal centerline.

(5) Cover front of the headlamp and adjust the other headlamp beam as instructed below.

(6) Rotate the adjustment screw until the top edge of the beam intensity pattern is positioned within 25 mm (1 in.) above or 75 mm (3 in.) below the headlamp horizontal centerline.

LICENSE PLATE LAMP

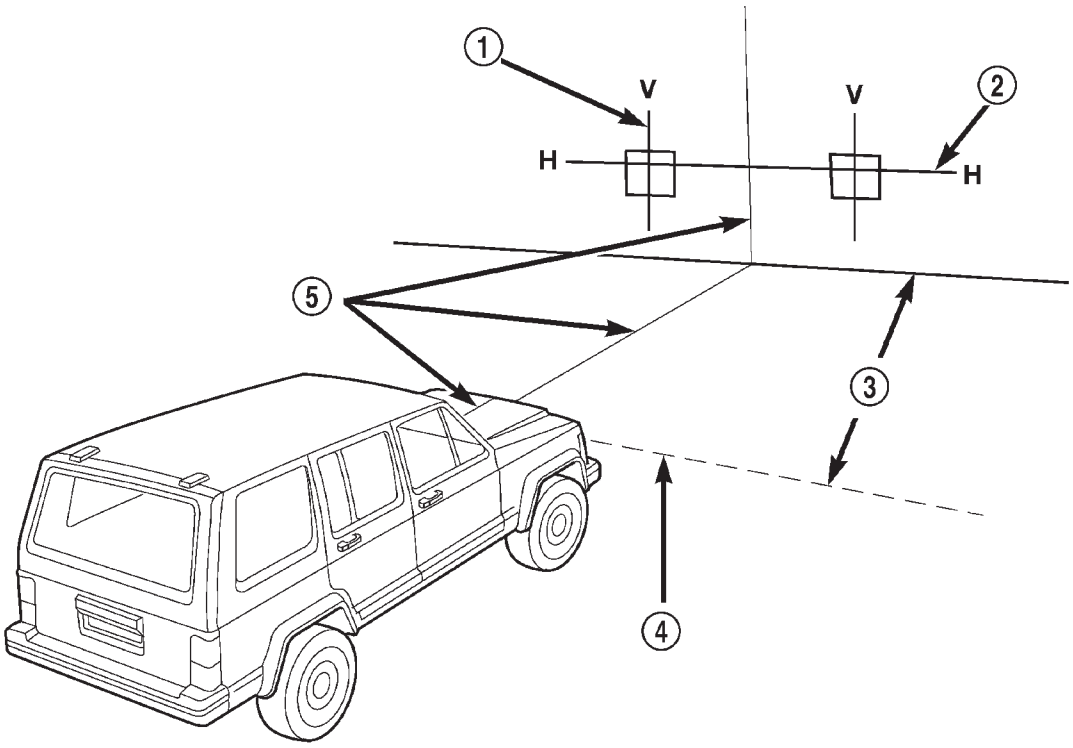
REMOVAL

REMOVAL - BULB

(1) Remove lamp assembly from liftgate lamp module.

(2) Rotate bulb socket counterclockwise to disconnect bulb socket from lamp.

(3) Remove bulb from socket.



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Fig. 16 Headlamp Alignment Screen—Typical

1 - CENTER OF VEHICLE TO CENTER OF HEADLAMP LENS
2 - FLOOR TO CENTER OF HEADLAMP LENS
3 - 7.62 METERS (25 FEET)
4 - FRONT OF HEADLAMP
5 - VEHICLE CENTERLINE

LICENSE PLATE LAMP (Continued)

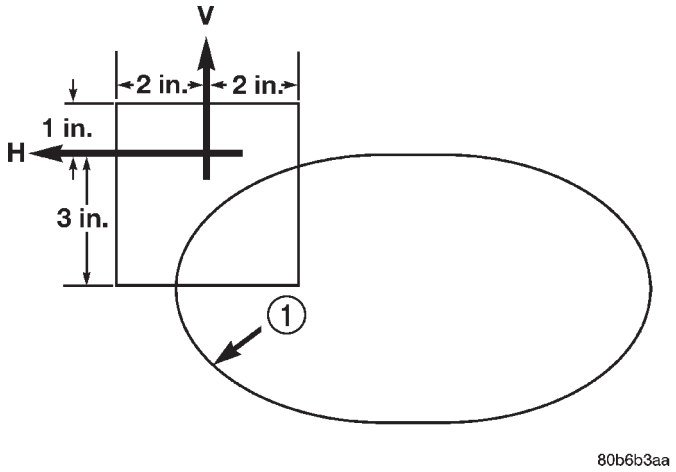


Fig. 17 Low Beam Pattern

1 - LOW BEAM INTENSITY PATTERN (ISO-CANDELA CURVE)

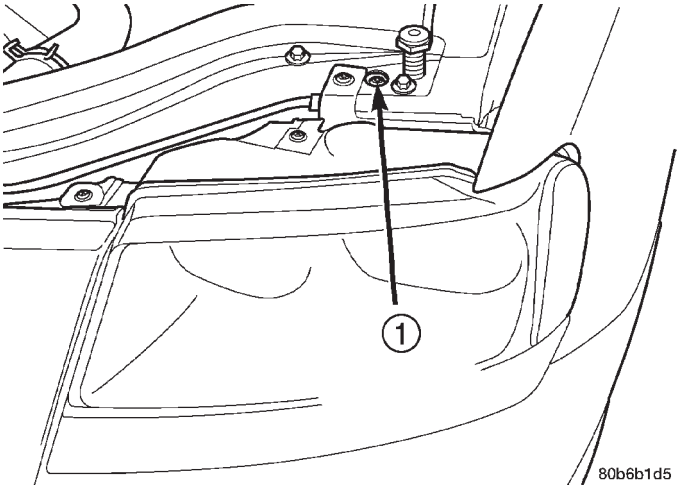


Fig. 18 Headlamp Beam Adjustment Screw

1 - ADJUSTMENT SCREW LOCATION

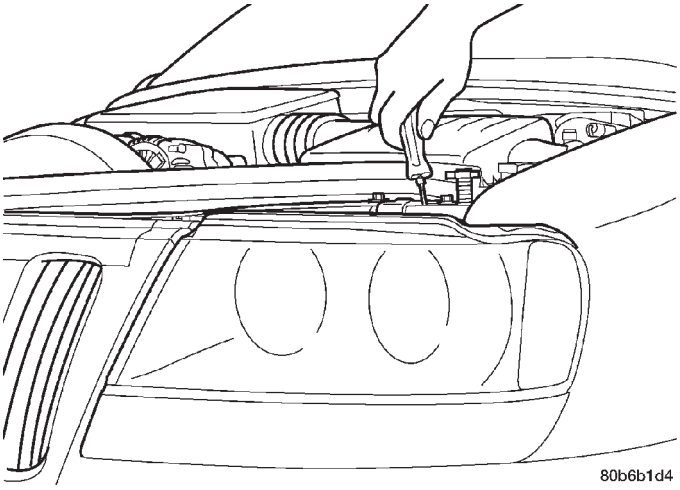


Fig. 19 Headlamp Beam Adjustment

REMOVAL - LAMP

(1) Remove the screws attaching lamp assembly to liftgate. (Fig. 20).

(2) Pull the lamp assembly away from the sheet-metal at extreme outboard edges to disengage the push pins.

(3) Separate lamp assembly harness wiring connector.

(4) Remove lamp.

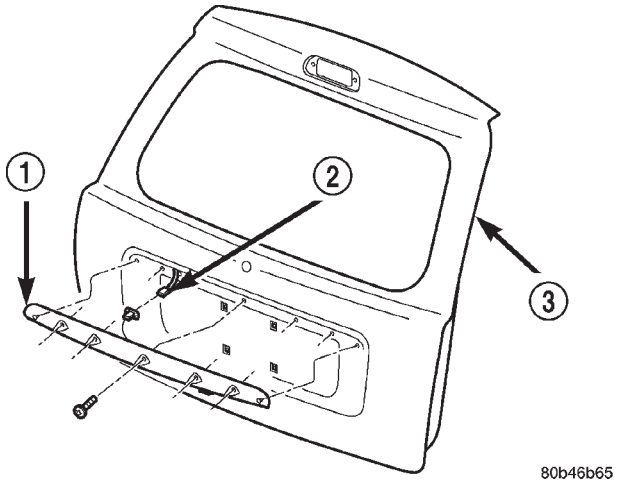


Fig. 20 License Plate Lamp Housing

1 - LICENSE PLATE LAMP
2 - CONNECTOR
3 - LIFTGATE

INSTALLATION

INSTALLATION - BULB

(1) Install bulb in socket.

(2) Install socket and bulb assembly in lamp housing.

(3) Install lamp assembly in liftgate lamp module.

INSTALLATION - LAMP

(1) Connect bulb harness to lamp assembly.

(2) Position lamp assembly on liftgate and press outboard fasteners in place.

(3) Install screws in lamp assembly.

LICENSE PLATE LAMP UNIT

REMOVAL

(1) Remove the screws retaining the lamp housing/trim panel to the liftgate (Fig. 21).

(2) Disconnect the wire harness for the license plate lamps and the flip up glass switch, if equipped.

(3) Remove the license plate lamps and the flip up glass switch, if equipped.

(4) Remove the license plate lamp housing.

LICENSE PLATE LAMP UNIT (Continued)

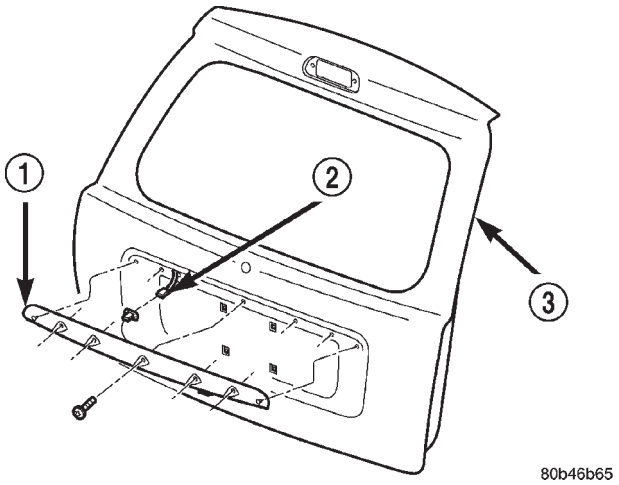


Fig. 21 License Plate Lamp Housing

1 - LICENSE PLATE LAMP
2 - CONNECTOR
3 - LIFTGATE

INSTALLATION

(1) Install the license plate lamps, and the flip up glass switch, if equipped.

(2) Connect the wire harnesses for the license plate lamps and the flip up glass switch.

(3) Install the lamp housing/trim panel on the liftgate.

LEFT MULTI-FUNCTION SWITCH

DESCRIPTION

The left multi-function switch, its mounting provisions, and its electrical connections are all concealed beneath the steering column shrouds, just below the steering wheel (Fig. 22).

A single connector with eleven terminal pins is located on the back of the switch housing and connects the switch to the vehicle electrical system. The left multi-function switch supports the following exterior lighting functions:

- Auto Headlamps
- Front Fog Lamps
- Hazard Warning Control
- Headlamps
- Headlamp Beam Selection
- Headlamp Optical Horn
- Park Lamps
- Rear Fog Lamps
- Turn Signal Control

The left multi-function switch also supports the following interior lighting functions:

- Panel Lamps Dimming
- Interior Lamps Defeat

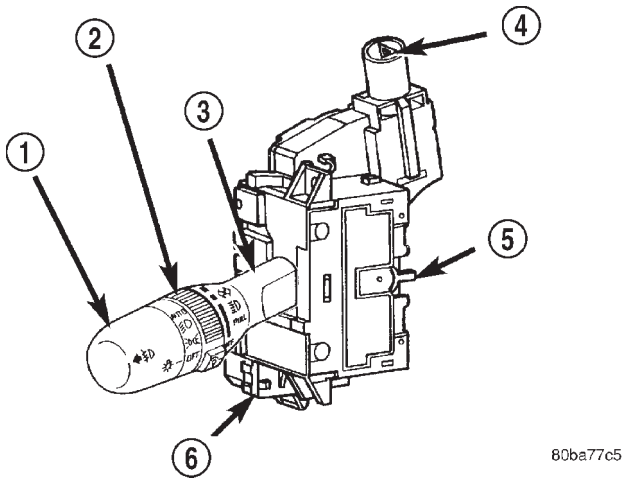


Fig. 22 Left (Lighting) Multi-Function Switch

1 - EXTERIOR LIGHTING CONTROL
2 - INTERIOR LIGHTING CONTROL
3 - CONTROL STALK
4 - HAZARD WARNING BUTTON
5 - CANCEL ACTUATOR
6 - LEFT (LIGHTING) MULTI-FUNCTION SWITCH

- Interior Lamps On
- Parade Mode

The left multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch unit must be replaced.

OPERATION

The left multi-function switch uses a combination of resistor multiplexed and conventionally switched outputs to control the many functions and features it provides using a minimal number of hard wired circuits. The switch is grounded to the chassis beneath the center floor console, just forward of the Airbag Control Module (ACM). Following are descriptions of the how the left multi-function switch operates to control the many exterior lighting functions and features it provides:

- **Auto Headlamps** - The automatic headlamps feature is provided by the Body Control Module (BCM), which monitors an input from a photodiode sensor located on the top of the instrument panel to detect ambient light levels whenever the ignition switch is in the On position. Based upon the multiplexed input from the left multi-function switch and the input of the photodiode sensor, the BCM controls outputs to the park lamp and headlamp relays to illuminate or extinguish all exterior lighting.
- **Front Fog Lamps** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that switched ground input, controls an output to the front fog lamp relay to illuminate or extinguish the front fog lamps.

LEFT MULTI-FUNCTION SWITCH (Continued)

- **Hazard Warning Control** - The hazard warning push button is pressed down to activate the hazard warning system, and pressed down again to turn the system off. The left multi-function switch provides a ground to the hazard warning sense input of the combination flasher to control activation of the hazard warning lamps.
- **Headlamps** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, controls an output to the headlamp low or high beam relays to illuminate or extinguish the headlamps.
- **Headlamp Beam Selection** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that switched ground input, controls an output to the headlamp low or high beam relays to activate the selected headlamp beam.
- **Headlamp Optical Horn** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that switched ground input, controls an output to the headlamp high beam relay to activate the headlamp high beams.
- **Park Lamps** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, controls an output to the park lamp relay to illuminate or extinguish the parking lamps.
- **Rear Fog Lamps** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, controls an output to the rear fog lamp relay to illuminate or extinguish the rear fog lamps.
- **Turn Signal Control** - The left multi-function switch control stalk actuates the turn signal switch. The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, provides a variable voltage output to control the lighting of the turn signals.

Following are descriptions of the how the left multi-function switch operates to control the many interior lighting functions and features it provides:

- **Panel Lamps Dimming** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, provides a variable voltage output through several panel lamps driver circuits to control the lighting of many incandescent panel lamps. The BCM also sends panel lamps dimming messages over the Programmable Communications Interface (PCI) data bus to other modules to control Display lighting levels in those modules.
- **Interior Lamps Defeat** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, internally disables the function the BCM normally provides to control the illumination of the interior lamps.
- **Interior Lamps On** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, provides a control output to activate all of the interior lamp circuits.
- **Parade Mode** - The Body Control Module (BCM) monitors the left multi-function switch then, based upon that multiplexed input, provides a voltage output through several panel lamps driver circuits to control the lighting of many incandescent panel lamps. The BCM also sends panel lamps dimming messages over the Programmable Communications Interface (PCI) data bus to other modules on the bus to control lighting levels in those modules.

DIAGNOSIS AND TESTING - LEFT MULTI - FUNCTION SWITCH

Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector from the multi-function switch connector.

(2) Using an ohmmeter, perform the continuity and resistance tests at the terminals in the multi-function switch connector as shown in the Left Multi-Function Switch Test chart (Fig. 23).

LEFT MULTI-FUNCTION SWITCH (Continued)

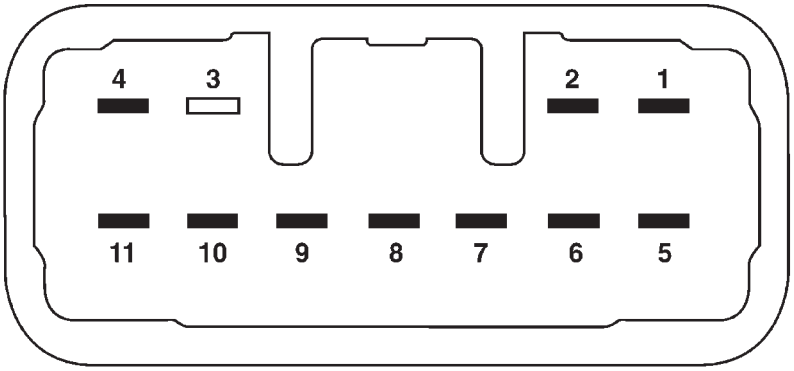


Fig. 23 Left Multi -Function Switch Test

LEFT (LIGHTING) MULTI-FUNCTION SWITCH			
TURN SIGNAL AND HAZARD WARNING SWITCH TESTS			
SWITCH POSITION		CONTINUITY BETWEEN	
TURN	HAZARD		
Neutral	Off	No Related Continuity	
Left	Off	Pins 2 & 8	
Right	Off	Pins 2 & 7	
Neutral	On	Pins 2 & 9	
EXTERIOR LIGHTING SWITCH TESTS			
SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE BETWEEN	RESISTANCE RANGE (OHMS)
Off	-	Pins 4 & 11	3743 - 3824
Park Lamps On	-	Pins 4 & 11	901 - 926
Head Lamps On	-	Pins 4 & 11	345 - 358
Auto Headlamps On	-	Pins 4 & 11	74 - 81
Fog Lamps	Pins 1 & 2	-	-
Optical Horn	Pins 2 & 5	-	-
High Beam	Pins 2 & 6	-	-
INTERIOR LIGHTING SWITCH TESTS			
Dome Lamp Disable On	-	Pins 4 & 9	63 - 70
Panel Lamps Dimming Position 1	-	Pins 4 & 9	198 - 208
Dimming Position 2	-	Pins 4 & 9	551 - 569
Dimming Position 3	-	Pins 4 & 9	905 - 929
Dimming Position 4	-	Pins 4 & 9	1258 - 1290
Dimming Position 5	-	Pins 4 & 9	1611 - 1651
Dimming Position 6	-	Pins 4 & 9	1965 - 2011
Parade Mode On	-	Pins 4 & 9	3534 - 3611
Dome Lamp Enable On	-	Pins 4 & 9	7811 - 7974

LEFT MULTI-FUNCTION SWITCH (Continued)

(3) If the multi-function switch fails any of the continuity or resistance tests, replace the switch.

REMOVAL

REMOVAL - LEFT MULTI-FUNCTION SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.
(2) Remove the lower tilting steering column shroud (Fig. 24).
(3) Unsnap the two halves of the steering column shroud, and remove.
(4) Disconnect the instrument panel wire harness connector from the switch connector.
(5) Remove the screws that secure the left multi-function switch to the housing (Fig. 25).
(6) Remove the left multi-function switch.

REMOVAL - MULTI-FUNCTION SWITCH MOUNTING HOUSING

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

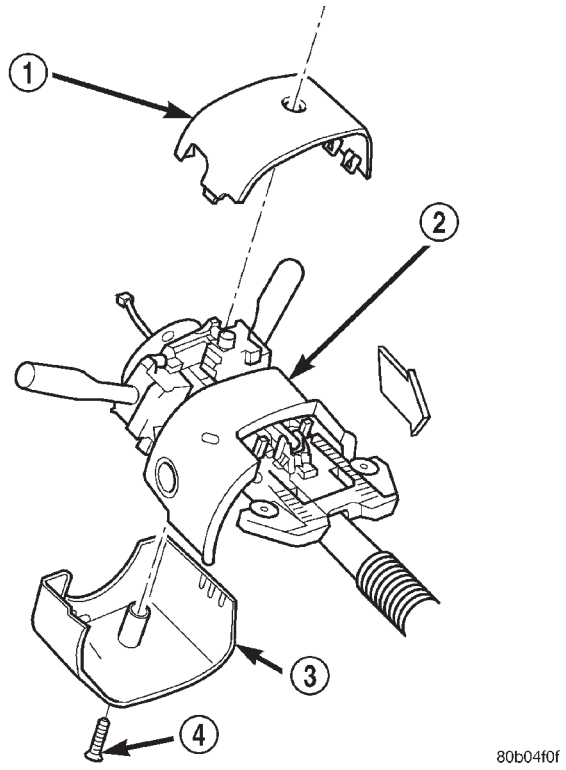


Fig. 24 Steering Column Shrouds Remove/Install

1 - UPPER TILTING COLUMN SHROUD
2 - FIXED COLUMN SHROUD
3 - LOWER TILTING COLUMN SHROUD
4 - SCREW

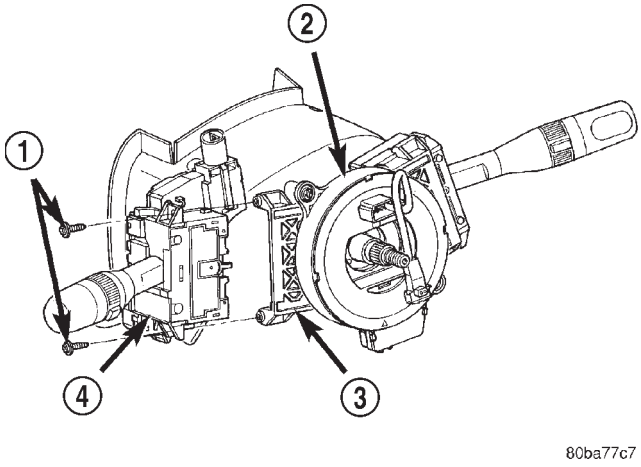


Fig. 25 Left Multi-Function Switch Remove/Install

1 - SCREW (2)
2 - STEERING COLUMN
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING
4 - LEFT MULTI-FUNCTION SWITCH

(1) Disconnect and isolate the battery negative cable.

LEFT MULTI-FUNCTION SWITCH (Continued)

(2) Remove the clockspring from the multi-function switch mounting housing. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

(3) Remove the left multi-function switch from the multi-function switch mounting housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/ LEFT MULTI-FUNCTION SWITCH - REMOVAL - LEFT MULTI-FUNCTION SWITCH).

(4) Remove the right multi-function switch from the multi-function switch mounting housing. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - REMOVAL).

(5) Remove the screw that secures the multi-function switch mounting housing to the steering column housing (Fig. 26).

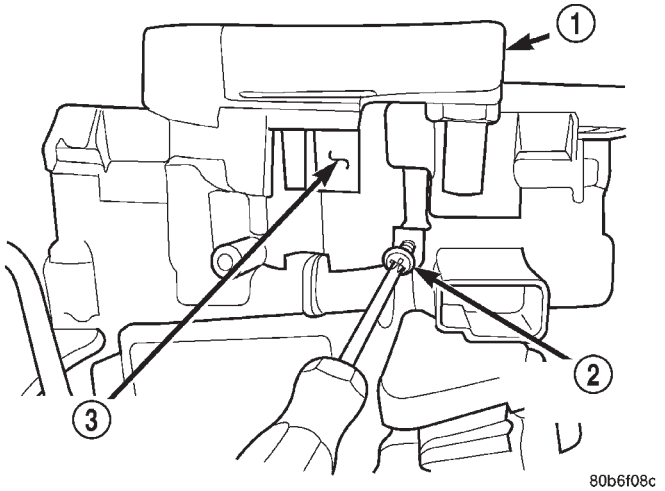


Fig. 26 Multi-Function Switch Mounting Housing Screw Remove/Install

1 - CLOCK SPRING
2 - SCREW
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING

(6) Remove the multi-function switch mounting housing (Fig. 27).

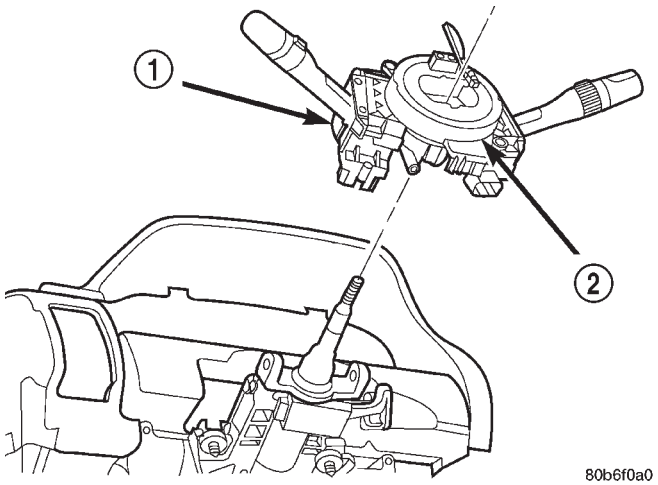


Fig. 27 Multi-Function Switch Mounting Housing Remove/install

1 - MULTI-FUNCTION SWITCH ASSEMBLY
2 - CLOCKSPRING

INSTALLATION

INSTALLATION - LEFT MULTI-FUNCTION SWITCH

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the left multi-function switch onto the housing (Fig. 28).

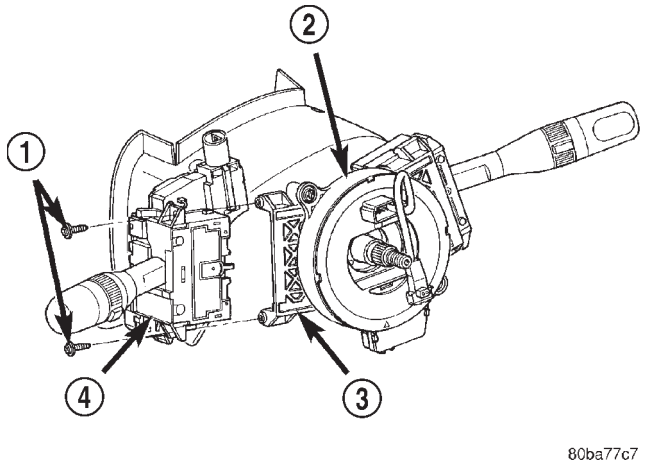


Fig. 28 Left Multi-Function Switch Remove/Install

1 - SCREW (2)
2 - STEERING COLUMN
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING
4 - LEFT MULTI-FUNCTION SWITCH

(2) Install and tighten the screws that secure the left multi-function switch housing. Tighten the screws to 2.5 N·m (22 in. lbs.).

(3) Reconnect the instrument panel wire harness connector to the switch connector.

LEFT MULTI-FUNCTION SWITCH (Continued)

(4) Position the lower tilting steering column shroud to the underside of the steering column (Fig. 29).

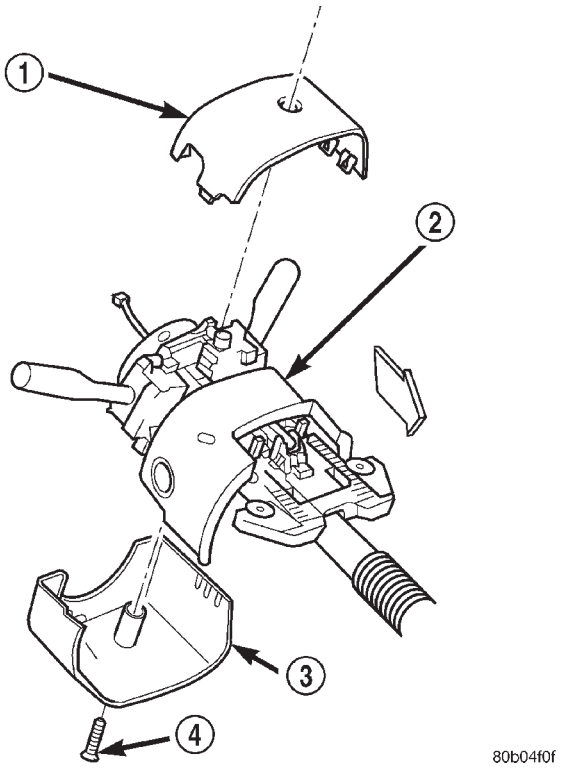


Fig. 29 Steering Column Shrouds Remove/Install

1 - UPPER TILTING COLUMN SHROUD
2 - FIXED COLUMN SHROUD
3 - LOWER TILTING COLUMN SHROUD
4 - SCREW

(5) Install and tighten the screw that secures the lower steering column shroud housing. Tighten the screw to 1.9 N·m (17 in. lbs.).

(6) Align the upper tilting steering column shroud to the lower shroud and snap the two shroud halves together.

(7) Reconnect the battery negative cable.

INSTALLATION - MULTI-FUNCTION SWITCH MOUNTING HOUSING

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain that the front wheels are still in the straight-ahead position.

(1) Rotate the turn signal cancel cam in the multi-function switch housing until the alignment hole in the one cam lobe is aligned with the alignment hole in the back of the housing. The oblong hole in the hub of the cam should now be at the top, and the locating tab in the hub of the cam should be at the bottom (Fig. 30).

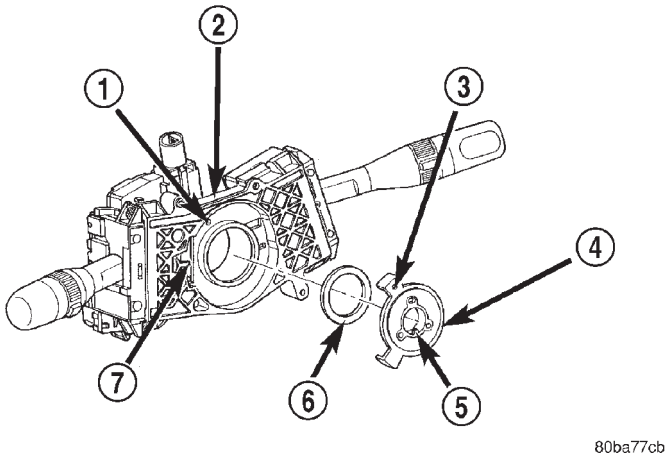


Fig. 30 Turn Signal Cancel Cam Alignment

1 - ALIGNMENT HOLE
2 - MULTI-FUNCTION SWITCH MOUNTING HOUSING
3 - ALIGNMENT HOLE
4 - TURN SIGNAL CANCEL CAM
5 - LOCATING TAB
6 - WASHER
7 - TURN SIGNAL SWITCH CANCEL ACTUATOR

(2) Position the multi-function switch housing onto the top of the steering column. The locating tab in the hub of the turn signal cancel cam must be engaged with the alignment groove in the bottom of the upper steering column shaft.

(3) Install and tighten the screw that secures the multi-function switch housing to the top of the column housing (Fig. 31). Tighten the screw to 1.9 N·m (17 in. lbs.).

(4) Reinstall the right multi-function switch onto the multi-function switch housing. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - INSTALLATION).

(5) Reinstall the left multi-function switch onto the multi-function switch housing. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LEFT

LEFT MULTI-FUNCTION SWITCH (Continued)

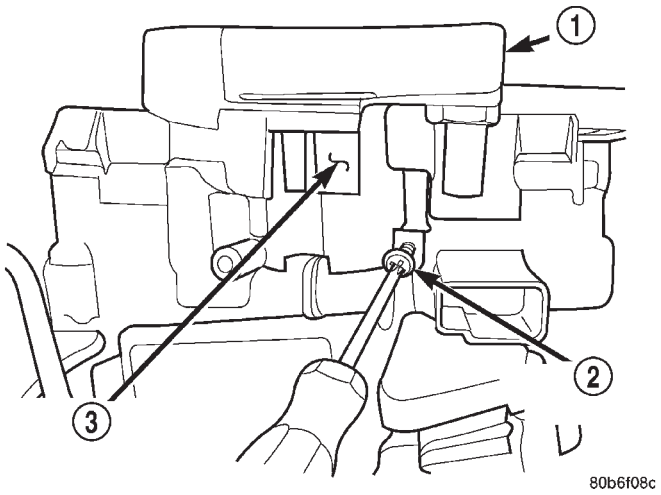


Fig. 31 Multi-Function Switch Mounting Housing Screw Remove/Install

1 - CLOCK SPRING
2 - SCREW
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING

MULTI-FUNCTION SWITCH - INSTALLATION - LEFT MULTI-FUNCTION SWITCH).

(6) Reinstall the clockspring onto the multi-function switch housing. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

(7) Reconnect the battery negative cable.

PARK/TURN SIGNAL LAMP

REMOVAL - BULBS

(1) Remove the headlamp module.

(2) Rotate the turn signal bulb socket 1/4 turn counter clockwise.

(3) Remove the bulb socket from module.

(4) Remove the bulb from socket.

INSTALLATION - BULBS

(1) Press the bulb into socket.

(2) Position the bulb socket in module.

(3) Rotate the turn signal bulb socket 1/4 turn clockwise.

(4) Install the headlamp module.

TAIL LAMP

DESCRIPTION

The taillamp module contains a housing, lens, and three bulbs. A dual filament bulb is used for tail and stop functions. A single filament bulb is used for turn signal operations. A separate bulb is used for back-up illumination.

OPERATION

All exterior lighting function are controlled by the multifunction switch. Stop lamp functions are controlled by the stoplamp switch. The back-up lamps are controlled by the back-up lamp switch.

REMOVAL

REMOVAL - BULBS

The brake, turn signal, back-up, and side marker lamp bulbs are incorporated into the tail lamp.

(1) Remove the tail lamp.

(2) Rotate the bulb socket counterclockwise.

(3) Separate the socket from the lamp

(4) Remove the bulb from the socket (Fig. 32).

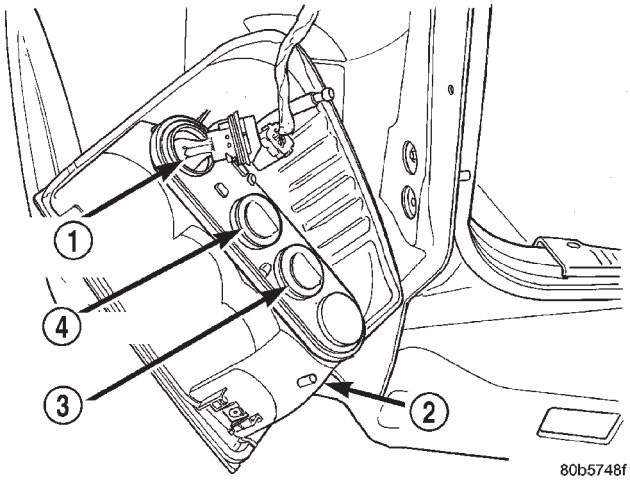


Fig. 32 Tail Lamp Bulbs

1 - TAIL/STOP BULB
2 - TAIL LAMP
3 - BACK-UP BULB
4 - TURN SIGNAL BULB

REMOVAL - LAMP

The brake, turn signal, back-up, and side marker lamps are incorporated in the tail lamp.

(1) Remove the screws attaching the lamp to body (Fig. 33).

(2) Disengage the lamp from the alignment pin.

(3) Disconnect lamp wire harness connector.

(4) Separate lamp from vehicle.

TAIL LAMP (Continued)

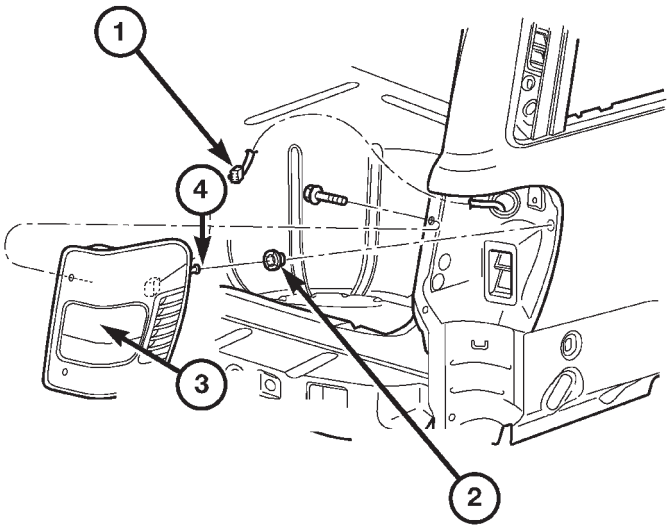


Fig. 33 Tail Lamp

1 - CONNECTOR
2 - RETAINER
3 - TAILLAMP (STOP, TURN, BACK-UP, SIDE MARKER)
4 - PIN

INSTALLATION

INSTALLATION - BULBS

(1) Position the bulb in socket and push into place.
(2) Position the bulb socket in the lamp and rotate clockwise.
(3) Install the lamp.

INSTALLATION - LAMP

The brake, turn signal, back-up, and side marker lamps are incorporated in the tail lamp.
(1) Position the lamp.
(2) Connect the lamp wire harness connector.
(3) Align the pin with the retainer and press the lamp inward to engage.
(4) Install the screws attaching the lamp to body.

TURN SIGNAL CANCEL CAM

DESCRIPTION

The turn signal cancel cam is concealed within the multi-function switch housing below the steering wheel and the clockspring mechanism. The turn signal cancel cam consists of a disc unit with two integral lobes. The upper lobe of the cam has an alignment hole that is used to align it with another hole in the back of the multi-function switch mounting housing. The upper surface of the turn signal cancel cam features three holes, two round and one oblong. These holes engage and key the cancel cam to three matching pins in the hub of the clockspring mechanism. The hub of the clockspring and the turn signal cancel cam rotate with the steering wheel. The centered clockspring housing is then secured to the multi-function switch mounting housing over the top of the turn signal cancel cam.

The turn signal cancel cam is serviced as a assembly with the multi-function switch housing. The turn signal cancel cam cannot be repaired and, if faulty or damaged, the multi-function switch mounting housing unit must be replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/LEFT MULTI-FUNCTION SWITCH - REMOVAL - MULTI-FUNCTION SWITCH MOUNTING HOUSING).

OPERATION

The turn signal cancel cam has two lobes. When the turn signals are activated by moving the left multi-function switch control stalk to a detent position, a turn signal cancel actuator is extended from the inside surface of the multi-function switch housing toward the center of the steering column and the turn signal cancel cam. When the steering wheel is rotated during a turning maneuver, one of the two turn signal cancel cam lobes will contact the turn signal cancel actuator. The cancel actuator latches against the cancel cam rotation in the direction opposite that which is signaled.

UNDERHOOD LAMP

REMOVAL

REMOVAL - BULB

(1) Insert a small flat blade in access slot between the lamp base and lamp lens.

(2) Lift the lamp lens upward and remove the lamp lens (Fig. 34).

(3) Depress bulb terminal inward (Fig. 35) to release bulb.

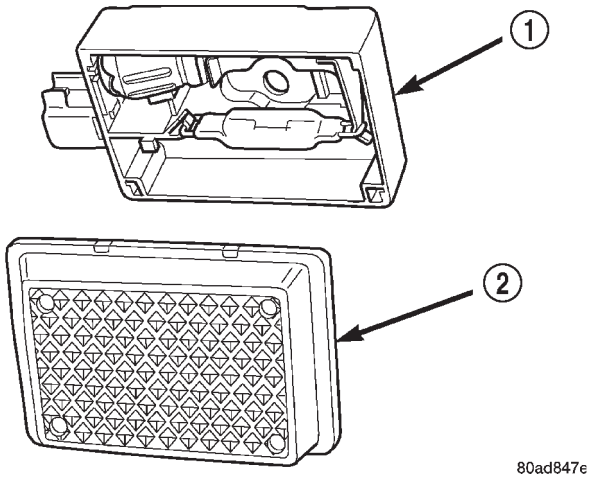


Fig. 34 Underhood Lamp Lens

1 - LAMP
2 - LAMP LENS

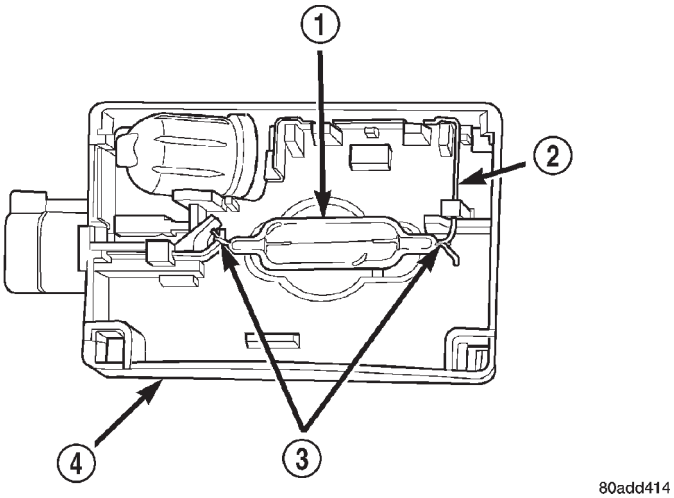


Fig. 35 Underhood Lamp Bulb

1 - BULB
2 - DEPRESS TERMINAL INWARD
3 - BULB WIRE LOOP
4 - LAMP BASE

REMOVAL - LAMP

(1) Disconnect the wire harness connector from lamp.

(2) Remove the screw attaching underhood lamp to inner hood panel (Fig. 36).

(3) Remove the underhood lamp from the vehicle.

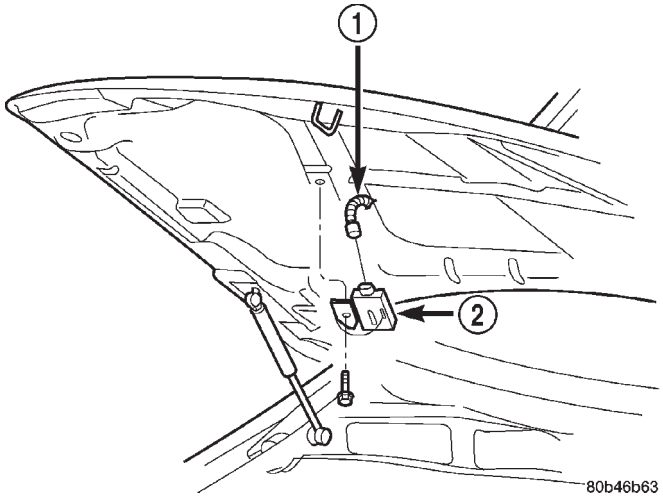


Fig. 36 Underhood Lamp

1 - CONNECTOR
2 - UNDERHOOD LAMP

INSTALLATION

INSTALLATION - BULB

(1) Engage the replacement bulb wire loop to terminal closest to lamp base wire connector.

(2) Depress the opposite terminal inward and engage the remaining bulb wire loop.

(3) Position the lamp lens on the lamp base and press into place.

INSTALLATION - LAMP

(1) Position the underhood lamp on the hood inner panel.

(2) Install the screw attaching the lamp base to the inner hood panel.

(3) Install the lamp housing and press into place.

(4) Connect the wire harness connector.

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LAMPS/LIGHTING - INTERIOR

SPECIFICATIONS

CAUTION: Do not use bulbs other than the bulbs listed in the Bulb Application Table. Damage to lamp can result.

Service procedures for most of the lamps in the instrument panel, are located in Electrical, Instrument Panel. Some components have lamps that can only be serviced by an Authorized Service Center (ASC) after the component is removed from the vehicle.

LAMP	BULB TYPE
A/C HEATER	NOT SERVICED
ASH RECEIVER	161
CLIMATE CONTROL	74
PASSENGER ASSIST HANDLE	214–2
FRONT READING	192
GLOVE COMPARTMENT	194
TELLTALE/HAZARD LAMP	74
HEATER	NOT SERVICED
OVERHEAD CONSOLE	192
RADIO	ASC
REAR CARGO	214–2
UNDER PANEL COURTESY	906
CLUSTER ILLUMINATION	103
SUNVISOR VANITY	CHRYSLER P/N 6501966

COURTESY LAMP

REMOVAL

REMOVAL - BULB

(1) Remove the door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL) for the service procedures.
(2) Remove the bulb socket from the lamp.
(3) Remove the bulb from the socket.

REMOVAL - LAMP

(1) Remove door trim panel. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL) for the procedures.
(2) Disengage the electrical connectors.
(3) Depress the locking tabs and remove the lamp module.
(4) Remove the bulb socket.

INSTALLATION

INSTALLATION - BULB

(1) Install the bulb in the socket.
(2) Install the bulb socket in the lamp.
(3) Install the door trim panel.

INSTALLATION - LAMP

(1) Install the bulb socket into the lamp module.
(2) Align the lamp module with the door trim panel.
(3) Snap the lamp module into place.
(4) Install the door panel.

DOME LAMP

REMOVAL

REMOVAL - BULB

(1) Rotate the the grab handle down.
(2) Remove the screws retaining the grab handle/dome lens.
(3) Remove the grab handle/lens from the module.
(4) Remove the bulb from the lamp terminals.

REMOVAL - LAMP

It will be necessary to partially remove the headliner to remove the bulb socket.
(1) Remove the screws holding the grab handle/lens assembly to the headliner and roof panel.
(2) Lower the headliner as needed. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL) for the service procedure.
(3) Separate the lamp socket from the headliner and roof panel.
(4) Disconnect the wire connector.

INSTALLATION

INSTALLATION - BULB

(1) Insert the bulb into the lamp terminals.
(2) Position the grab handle/lens on the lamp module.
(3) Install the screws retaining the grab handle/lens to the lamp module.

INSTALLATION - LAMP

(1) Position the lamp socket on the headliner and roof panel.
(2) Connect the wire harness.
(3) Install the headliner.
(4) Position the grab handle/lens on the lamp module.
(5) Install the screws retaining the grab handle/lens into the lamp socket.

DOOR AJAR SWITCH

DESCRIPTION

DESCRIPTION - DOOR AJAR SWITCH

The door ajar switches are integral to the door latch mechnicism. The front door ajar switches are actuated by the front door latch mechanisms, and are hard wired between a body ground and the Driver Door Module (DDM) or the Passenger Door Module (PDM). The rear door ajar switches are actuated by the rear door latch mechanisms, and are hard wired between a body ground and the Body Control Module (BCM) through the rear door and body wire harnesses.

The door ajar switches cannot be adjusted or repaired and, if faulty or damaged, the door latch unit must be replaced. (Refer to 23 - BODY/DOOR - FRONT/LATCH - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/LATCH - REMOVAL) for the service procedures. For complete circuit diagrams, refer to the appropriate wiring information.

DESCRIPTION - FLIP UP GLASS AJAR SWITCH

The liftgate flip-up glass ajar switch is integral to the liftgate flip-up glass latch mechnicism. The liftgate flip-up glass ajar switch is actuated by the liftgate flip-up glass latch mechanism, and is hard

DOOR AJAR SWITCH (Continued)

wired between a body ground, the Body Control Module (BCM) and the rear wiper motor module through the liftgate and body wire harnesses.

The liftgate flip-up glass ajar switch cannot be adjusted or repaired and, if faulty or damaged, the liftgate flip-up glass latch unit must be replaced. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/FLIP-UP GLASS LATCH - REMOVAL) for the service procedures. For complete circuit diagrams, refer to the appropriate wiring information.

DESCRIPTION - LIFTGATE AJAR SWITCH

The two liftgate ajar switches are integral to the two liftgate latch mechanisms. The two liftgate ajar switches are actuated by the liftgate latch mechanisms, and are hard wired with each other between a body ground and the Body Control Module (BCM) through the liftgate and body wire harnesses.

The liftgate ajar switches cannot be adjusted or repaired and, if faulty or damaged, the liftgate latch unit must be replaced. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/LATCH - REMOVAL) for the service procedures. For complete circuit diagrams, refer to the appropriate wiring information.

OPERATION

OPERATION - DOOR AJAR SWITCH

The front door ajar switches close a path to ground for the DDM or the PDM when a front door is opened, and opens the ground path when a front door is closed. The rear door ajar switches close a path to ground for the BCM when a rear door is opened, and opens the ground path when a rear door is closed. The DDM, PDM, or BCM read the switch status then send the proper switch status messages to other modules over the Programmable Communications Interface (PCI) data bus network. The door ajar switch status message is used by the BCM as an input for Vehicle Theft Security System (VTSS) operation.

OPERATION - FLIP UP GLASS AJAR SWITCH

The liftgate flip-up glass ajar switch can close a path to ground for the BCM and the rear wiper motor module when the liftgate flip-up glass is opened, and opens the ground path when the liftgate flip-up glass is closed. The rear wiper motor module uses the liftgate flip-up glass ajar switch input to control the rear wiper operation, and will park the rear wiper blade if this input indicates that the liftgate flip-up glass is ajar. The BCM reads the switch status then sends the proper switch status message to other modules over the Programmable Communications Interface (PCI) data bus network. The liftgate flip-up glass ajar switch status message is used by the BCM as an input for Vehicle Theft Security System (VTSS) operation.

OPERATION - LIFTGATE AJAR SWITCH

Each of the liftgate ajar switches can close a path to ground for the BCM when the liftgate is opened, and opens the ground path when the liftgate is closed. The BCM reads the switch status then sends the proper switch status message to other modules over the Programmable Communications Interface (PCI) data bus network. The liftgate ajar switch status message is used by the BCM as an input for Vehicle Theft Security System (VTSS) operation.

DIAGNOSIS AND TESTING - DOOR AJAR SWITCH

The following diagnosis and testing is only for the chime functions. For interior lamp diagnosis, refer to the appropriate wiring information. The driver door ajar switch is hard wired to the Driver Door Module (DDM). The DDM communicates the switch status to the other modules in the vehicle on the Programmable Communications Interface (PCI) data bus network. The following test will diagnose a faulty driver door ajar switch and circuits. For complete circuit diagrams, refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check that the interior lighting switch on the control stalk of the left multi-function switch is not in the dome lamp disable position. Open the driver side front door and note whether the interior lamps light. They should light. If OK, refer to Key-In Ignition Switch in the Diagnosis and Testing section of this group for further diagnosis of the chime warning system. If not OK, go to Step 2.

(2) Disconnect and isolate the battery negative cable. Remove the trim panel from the driver front door and disconnect the 4-way door wire harness connector from the front door latch connector. Check for continuity between the ground circuit of the 4-way door wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the ground circuit.

DOOR AJAR SWITCH (Continued)

(3) Disconnect the door wire harness connector from the Driver Door Module (DDM) connector. Check for continuity between the driver door ajar switch sense circuit of the door wire harness connector for the DDM and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted driver door ajar switch sense circuit.

(4) Check for continuity between the driver door ajar switch sense circuit of the door wire harness connector for the DDM and the 4-way door wire harness connector for the front door latch. There should be continuity. If OK, go to Step 5. If not OK, repair the open driver door ajar switch sense circuit.

(5) Check for continuity between the ground circuit terminal and the driver door ajar switch sense circuit terminal of the front door latch connector. There should be continuity with the driver side front door open, and no continuity with the door closed. If OK, use a DRBIII® scan tool and the proper Diagnostic Procedures manual to test the operation of the PCI data bus and the DDM. If not OK, replace the faulty driver side front door latch unit.

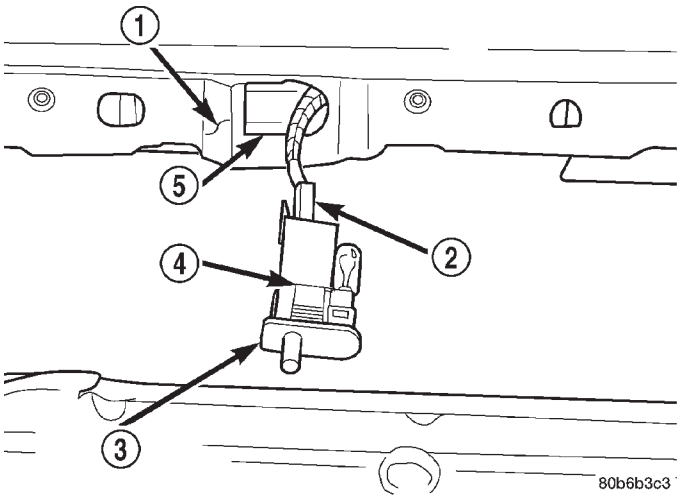


Fig. 1 Glove Box Lamp and Switch Remove/Install

1 - GLOVE BOX OPENING UPPER REINFORCEMENT
2 - WIRE HARNESS CONNECTOR
3 - GLOVE BOX LAMP & SWITCH
4 - LATCH
5 - MOUNTING HOLE

GLOVE BOX LAMP/SWITCH

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Roll down the glove box from the instrument panel.(Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - REMOVAL) for the procedures.

(3) Remove the lower right center bezel from the instrument panel.(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL) for the procedures.

(4) Reach through the glove box opening and depress the retaining latches on the top and bottom of the glove box lamp and switch housing.

(5) While holding the retaining latches depressed, push the glove box lamp and switch out through the mounting hole (Fig. 1).

(6) Disconnect the instrument panel wire harness connector from the glove box lamp and switch connector.

(7) Remove the glove box lamp and switch.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO ELECTRICAL, RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the glove box lamp and switch to the instrument panel.

(2) Reconnect the instrument panel wire harness connector to the glove box lamp and switch connector.

(3) Align the glove box lamp and switch housing with the mounting hole in the instrument panel glove box opening upper reinforcement.

(4) Push the glove box lamp and switch into the mounting hole until the retaining latches are fully engaged.

(5) Install the lower right center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION) for the procedures.

(6) Roll the glove box back up into the instrument panel.(Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - INSTALLATION) for the procedures.

(7) Reconnect the battery negative cable.

READING LAMP

DESCRIPTION

The overhead console in this vehicle is equipped with two individual reading and courtesy lamps.Each lamp has its own switch, bulb, reflector and lens; but both lamps share a common lamp housing within the overhead console.

The overhead console reading and courtesy lamps operate on battery current that is provided at all times, regardless of the ignition switch position. The ground feed for the lamps is switched through the integral reading and courtesy lamp switches or through the door jamb switches.

The reading and courtesy lamp lenses and the lamp housing and reflector unit are serviced only as a unit with the overhead console housing.The reading and courtesy lamp switches, bulb holders and wiring are only available as part of the overhead console wire harness.

For service of the reading and courtesy lamp bulbs, (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/READING LAMP - REMOVAL). For diagnosis of the reading and courtesy lamps, refer to the appropriate wiring information.

OPERATION

All reading and courtesy lamps located in the overhead console are activated by the door jamb switches. When all of the doors are closed, these lamps can be individually activated by depressing the corresponding lens. When any door is open, depressing the lamp lenses to activate the lamp switches will not turn the lamps off.

REMOVAL

(1) Remove the overhead console.

(2) Rotate the console until the bulb is visible (Fig. 2).

(3) Grasp the bulb and remove from the socket.

INSTALLATION

(1) Push the bulb into the bulb socket.

(2) Install the console on the headliner and roof panel.

(3) Align the screw hole and install the screw.

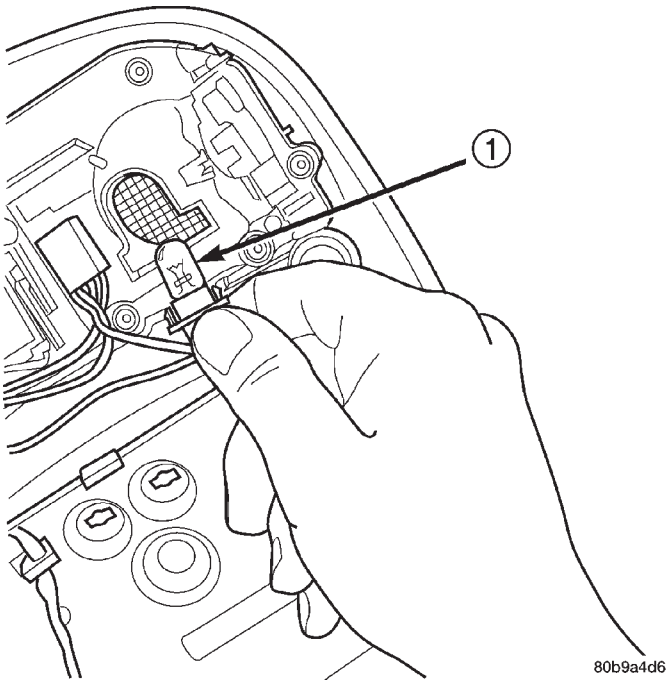


Fig. 2 Overhead Console Reading Lamp Bulb

1 - BULB

TRANS RANGE INDICATOR ILLUMINATION

DESCRIPTION

The Transmission Range Indicator Lamp, mounted on the floor console, uses electroluminescent technology as the light source. This lamp requires a 120 volt AC signal that is provided by a power converter included as part of the assembly. The module is not serviceable separately. Because of a potential shock hazard, diagnostic testing of the lamp assembly should be avoided. Refer to TRANSMISSION, Range Selector Assembly Removal and Installation.

VANITY LAMP

REMOVAL

(1) Fold down the visor.

(2) Using a small flat blade, and staring at the base of the lamp assembly, carefully pry the base of the lamp from the visor.

(3) Disconnect the vanity lamp visor and remove the lamp from the vehicle.

INSTALLATION

(1) Position the lamp at the visor and connect the wire connector.

(2) Press the lamp in place.

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OVERHEAD CONSOLE

DESCRIPTION

An overhead console is standard factory-installed equipment on this model. The overhead console includes the Electronic Vehicle Information Center (EVIC) and two reading and courtesy lamps (Fig. 1). On vehicles equipped with a power sunroof option, the overhead console also houses the power sunroof switch between the two reading and courtesy lamps. The overhead console is mounted with one screw and two snap-clips to a molded plastic retainer bracket located above the headliner. The retainer bracket is secured with adhesive to the inside surface of the roof panel.

Following are general descriptions of the major components used in the overhead console. Refer to **Overhead Console** in Wiring Diagrams for complete circuit diagrams.

OPERATION

See the owner's manual in the vehicle glove box for more information on the use and operation of the various overhead console features.

STANDARD PROCEDURE

STANDARD PROCEDURE - MODULE LAMP REPLACEMENT

(1) Remove the overhead console (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(2) Using a flat blade screwdriver twist out socket/lamp (Fig. 2).

(3) Replace lamp(s) as necessary.

STANDARD PROCEDURE - COURTESY LAMP REPLACEMENT

(1) Open hood, disconnect and isolate the negative battery cable.

OVERHEAD CONSOLE (Continued)

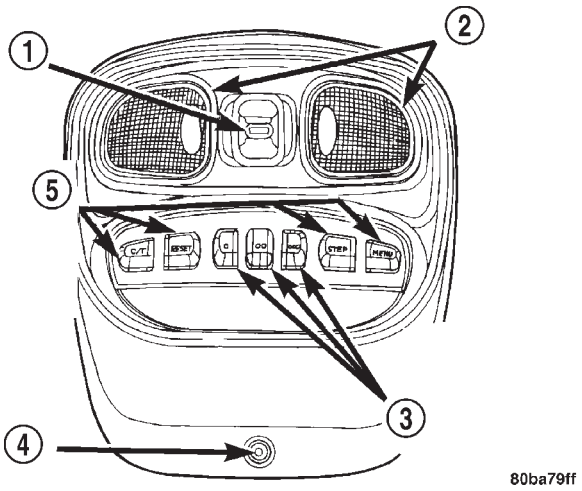


Fig. 1 Overhead Console

1 - POWER SUNROOF SWITCH (IF EQUIPPED)
2 - READING AND COURTESY LAMPS
3 - UNIVERSAL GARAGE DOOR OPENER PUSH BUTTONS (IF EQUIPPED)
4 - SCREW
5 - ELECTRONIC VEHICLE INFORMATION CENTER PUSH BUTTONS

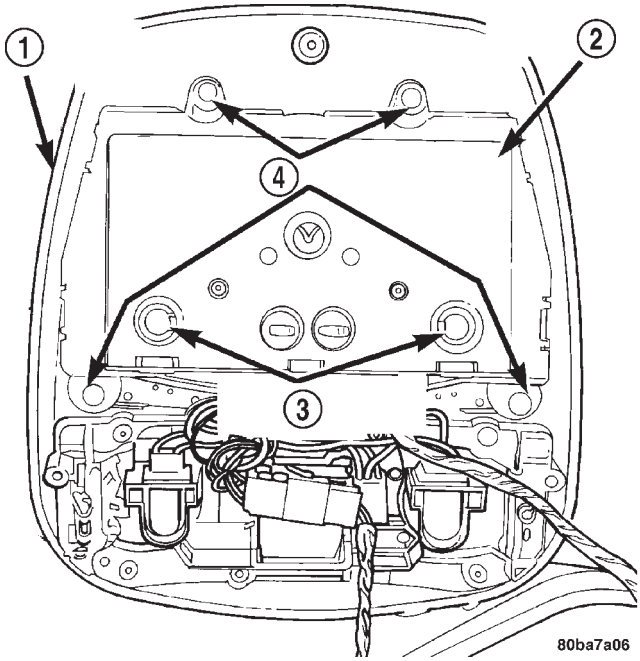


Fig. 2 Top of Overhead Console

1 - OVERHEAD CONSOLE HOUSING
2 - EVIC MODULE
3 - ILLUMINATION LAMPS
4 - SCREWS (4)

(2) Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(3) Remove the lamp and socket assembly from the overhead console.

(4) Remove the lamp bulb by pulling it straight out of its socket.

STANDARD PROCEDURE - MODULE LENS REPLACEMENT

(1) Remove the overhead console (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(2) Remove the electronics module from the overhead console. Refer to the procedure in this section.

(3) Unsnap the lens from the module and replace lens as necessary.

STANDARD PROCEDURE - ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING

EVIC PROGRAMMING MODE

The Electronic Vehicle Information Center (EVIC) provides the vehicle operator with a user interface, which allows the selection of several optional customer programmable electronic features to suit individual preferences. The EVIC must be placed into its programming mode in order to view or change the programmable features. To enter the EVIC programming mode and to view or change the selected programmable features options, proceed as follows:

(1) Turn the ignition switch to the On position.

(2) Depress and release the Menu push button. The first item in the programmable features menu list will appear in the EVIC display.

(3) Momentarily depress and release the Menu push button to step through the programmable features list. Each programmable feature and its currently selected option will appear on the EVIC display in the sequence shown in the Programmable Features list that follows.

(4) Momentarily depress and release the Step push button to step through the available options for the programmable feature being displayed.

(5) The option that last appears in the display with a programmable feature before exiting the programming mode, becomes the newly selected programmable feature option.

(6) The EVIC exits the programming mode and returns to its normal operating mode when the C/T push button is depressed or when the end of the programmable features menu list is reached, whichever occurs first.

OVERHEAD CONSOLE (Continued)

PROGRAMMABLE FEATURES

- **LANGUAGE?** - The options include English, Francaise, Deutsch, Italiana, or Espanol. The default is English. All EVIC display nomenclature, including the trip computer functions, warning messages and the programmable features appear in the selected language.
- **DISPLAY U.S. OR METRIC?** - The options include U.S. and M. The default is U.S. This feature toggles the trip computer temperature, fuel economy and odometer display readings between U.S. and metric units of measure. It also changes the odometer display in the instrument cluster.
- **AUTO DOOR LOCKS?** - The options include Yes and No. The default is Yes. When Yes is selected, all doors and the liftgate lock automatically when vehicle speed reaches 25 kilometers-per-hour (15 miles-per-hour). If YES is selected, a second programmable feature appears, **AUTO UNLOCK ON EXIT?** - The options again include Yes and No. The default is No. When Yes is selected, following each Auto Door Lock event all doors and the liftgate will automatically unlock when the driver door is opened, if the vehicle is stopped and the transmission gear selector is in Park or Neutral. The Auto Door Unlock event will only occur once following each Auto Door Lock event.
- **REMOTE UNLOCK** - The options include Driver Door 1st and All Doors. The default is Driver Door 1st. When Diver Door 1st is selected, only the driver door unlocks when the Unlock button of the Remote Keyless Entry (RKE) transmitter is depressed once. The Unlock button of the RKE transmitter must be depressed twice to unlock all doors and the liftgate. When All Doors is selected, all doors and the liftgate unlock when the Unlock button of the RKE transmitter is depressed once.
- **REMOTE LINKED TO MEMORY?** - This programmable feature only applies to vehicles equipped with the optional memory system. The options include Yes and No. The default is No. When Yes is selected, the memory system will recall the Driver 1 or Driver 2 memory settings assigned to the RKE transmitter being used to unlock the vehicle. When No is selected, the memory system will only recall memory settings when the Driver 1 or Driver 2 push buttons of the memory switch on the driver side front door trim panel are depressed.
- **SOUND HORN ON LOCK?** - The options include Yes and No. The default is No. When Yes is selected, a short horn chirp will provide an audible confirmation when the RKE receiver recognizes a valid Lock signal from an RKE transmitter. When No is selected, no horn chirp will occur with the RKE Lock event. This feature may be selected independent of the **FLASH LIGHTS WITH LOCKS?** programmable feature.
- **FLASH LIGHTS WITH LOCKS?** - The options include Yes and No. The default is Yes. When Yes is selected, a single flash of the hazard warning lamps will provide an optical confirmation when the RKE receiver recognizes a valid Lock signal from an RKE transmitter, and two flashes of the same lamps will occur when the RKE receiver recognizes a valid Unlock signal from an RKE transmitter. When No is selected, no lamp flash will occur with the RKE Lock or Unlock event. This feature may be selected independent of the **SOUND HORN ON LOCK?** programmable feature.
- **HEADLAMP DELAY =** - The options include Off, 30 Sec, 60 Sec, and 90 Sec. The default is 90 Sec. When a time interval is selected, the headlamps will remain on for that length of time when the headlamps are turned off after the ignition is turned off, or if the Auto mode is selected on vehicles with the Auto Headlamps option. When Off is selected, the headlamp delay feature is disabled.
- **HEADLAMPS ON WITH WIPERS?** - This programmable feature only applies to vehicles equipped with the optional Auto Headlamps. The options include Yes and No. The default is No. When Yes is selected, the headlamps will turn on automatically when the windshield wipers are turned on. The headlamps will turn off when the wipers are turned off, as long as the headlamp switch is in the Auto or Off positions. When No is selected, the headlamps will only turn on if manually selected or if the Auto mode is selected and the outside ambient light levels dictate that they should be on.
- **SERVICE INTV. =** - The options include from 1000 to 12000 kilometers in 1000 kilometer increments (2000 to 7500 miles in 500 mile increments). The default is 12000 kilometers (7500 miles). The selected distance becomes the interval at which the Perform Service warning message will be displayed by the EVIC. If a new distance is selected, a second programmable feature appears, **RESET SERVICE DISTANCE?** - The options include No and Yes. The default is Yes. When Yes is selected, the accumulated distance since the last previous Perform Service warning message will be reset to zero because the service interval has been changed. When No is selected, the distance until the next Perform Service warning message is reduced by the accumulated distance since the last previous message.
- **LOW FUEL CHIME?** - The options include Yes and No. The default is Yes. When Yes is selected, a single chime will sound as an audible alert whenever the instrument cluster low fuel warning lamp lights. The chime will sound only once per ignition cycle. When No is selected, only the low fuel warning lamp in the instrument cluster will light and no chime will sound.

OVERHEAD CONSOLE (Continued)

• **RETRAIN TIRE SENSORS?** - This programmable feature only applies to vehicles equipped with the optional tire pressure monitoring system. The options include Yes and No. The default is No. When Yes is selected and the menu button is depressed, the EVIC will enter the training mode starting with the left front tire.

• **EASY EXIT SEAT?** - This programmable feature only applies to vehicles equipped with the optional memory system. The options include Yes and No. The default is No. When Yes is selected, the driver seat moves rearward about 55 millimeters (two inches) or to the farthest rearward position, whichever comes first, when the key is removed from the ignition switch lock cylinder. This provides additional ease for exiting from the vehicle. The seat will automatically return to the memory system setting position when the Driver 1 or Driver 2 button of the memory switch on the door panel is depressed or, if the **REMOTE LINKED TO MEMORY** programmable feature is enabled, when the RKE Unlock button is depressed. While not automatic, an easy entry feature can be obtained by enabling the **EASY EXIT SEAT** feature and disabling the **REMOTE LINKED TO MEMORY** feature. Then the **EASY EXIT SEAT** feature will move the seat back, but the RKE unlock event will not reposition the seat. Thus, the seat remains positioned for easy entry, and the memory switch on the door panel can be depressed after entering the vehicle to return the seat to the desired memory position.

STANDARD PROCEDURE - COMPASS DEMAGNETIZING

A degaussing tool (Special Tool 6029) is used to demagnetize, or degauss, the overhead console forward mounting screw and the roof panel above the overhead console. Equivalent units must be rated as continuous duty for 110/115 volts and 60 Hz. They must also have a field strength of over 350 gauss at 7 millimeters (0.25 inch) beyond the tip of the probe.

To demagnetize the roof panel and the overhead console forward mounting screw, proceed as follows:

(1) Be certain that the ignition switch is in the Off position, before you begin the demagnetizing procedure.

(2) Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.

(3) Slowly approach the head of the overhead console forward mounting screw with the degaussing tool connected.

(4) Contact the head of the screw with the plastic coated tip of the degaussing tool for about two seconds.

(5) With the degaussing tool still energized, slowly back it away from the screw. When the tip of the tool is at least 61 centimeters (2 feet) from the screw head, disconnect the tool.

(6) Place a piece of paper approximately 22 by 28 centimeters (8.5 by 11 inches), oriented on the vehicle lengthwise from front to rear, on the center line of the roof at the windshield header (Fig. 3). The purpose of the paper is to protect the roof panel from scratches, and to define the area to be demagnetized.

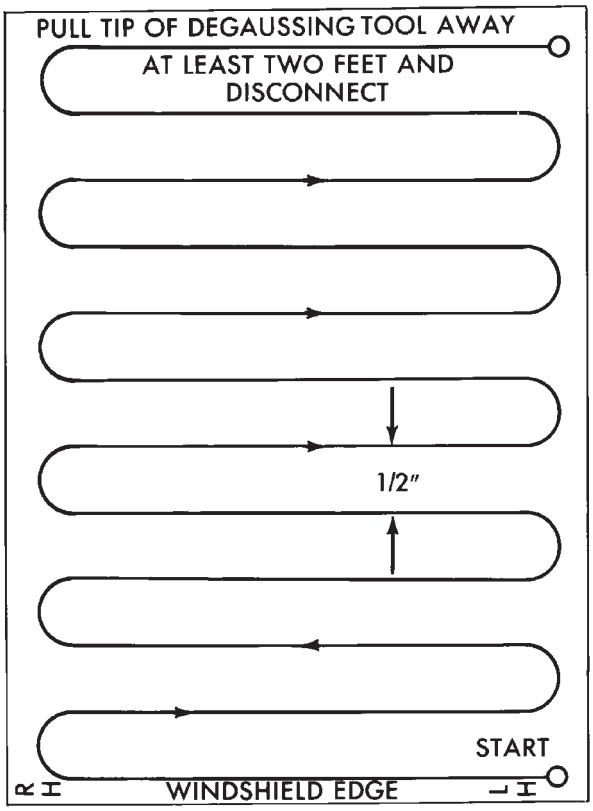


Fig. 3 Roof Demagnetizing Pattern

(7) Connect the degaussing tool to an electrical outlet, while keeping the tool at least 61 centimeters (2 feet) away from the compass unit.

(8) Slowly approach the center line of the roof panel at the windshield header, with the degaussing tool connected.

(9) Contact the roof panel with the plastic coated tip of the degaussing tool. Be sure that the template is in place to avoid scratching the roof panel. Using a slow, back-and-forth sweeping motion, and allowing 13 millimeters (0.50 inch) between passes, move the tool at least 11 centimeters (4 inches) to each side of the roof center line, and 28 centimeters (11 inches) back from the windshield header.

(10) With the degaussing tool still energized, slowly back it away from the roof panel. When the

OVERHEAD CONSOLE (Continued)

tip of the tool is at least 61 centimeters (2 feet) from the roof panel, disconnect the tool.

(11) Calibrate the compass and adjust the compass variance (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - STANDARD PROCEDURE).

STANDARD PROCEDURE - COMPASS CALIBRATION

CAUTION: Do not place any external magnets, such as magnetic roof mount antennas, in the vicinity of the compass. Do not use magnetic tools when servicing the overhead console.

The electronic compass unit features a self-calibrating design, which simplifies the calibration procedure. This feature automatically updates the compass calibration while the vehicle is being driven. This allows the compass unit to compensate for small changes in the residual magnetism that the vehicle may acquire during normal use. If the compass readings appear to be erratic or out of calibration, perform the following calibration procedure. Also, new service replacement Electronic Vehicle Information Center (EVIC) modules must have their compass calibrated using this procedure. Do not attempt to calibrate the compass near large metal objects such as other vehicles, large buildings, or bridges; or, near overhead or underground power lines.

NOTE: Whenever an EVIC module is replaced, the variance number must also be reset. Refer to Compass Variation Adjustment in this group.

Calibrate the compass manually as follows:

(1) Turn the ignition switch to the On position. If the compass/temperature data is not currently being displayed, momentarily depress and release the C/T push button to reach the compass/temperature display.

(2) Depress the Reset push button and hold the button down until “CAL” appears in the display. This takes about ten seconds, and appears about five seconds after “VARIANCE = XX” is displayed.

(3) Release the Reset push button.

(4) Drive the vehicle on a level surface, away from large metal objects and power lines, through one complete circle at between five and eight kilometers-per-hour (three and five miles-per-hour) in not less than 20 seconds. The “CAL” message will disappear from the display to indicate that the compass is now calibrated.

NOTE: If the “CAL” message remains in the display, either there is excessive magnetism near the compass, or the unit is faulty. Repeat the calibration procedure one more time.

NOTE: If the wrong direction is still indicated in the compass display, the area selected for calibration may be too close to a strong magnetic field. Repeat the calibration procedure in another location.

STANDARD PROCEDURE - COMPASS VARIATION ADJUSTMENT

Compass variance, also known as magnetic declination, is the difference in angle between magnetic north and true geographic north. In some geographic locations, the difference between magnetic and geographic north is great enough to cause the compass to give false readings. If this problem occurs, the compass variance setting may need to be changed.

To set the compass variance:

(1) Using the Variance Settings map, find your geographic location and note the zone number (Fig. 4).

(2) Turn the ignition switch to the On position. If the compass/temperature data is not currently being displayed, momentarily depress and release the C/T push button to reach the compass/temperature display.

(3) Depress the Reset push button and hold the button down until “VARIANCE = XX” appears in the display. This takes about five seconds.

(4) Release the Reset push button. “VARIANCE =XX ” will remain in the display. “XX” equals the current variance zone setting.

(5) Momentarily depress and release the Step push button to step through the zone numbers, until the zone number for your geographic location appears in the display.

(6) Momentarily depress and release the Reset push button to enter the displayed zone number into the EVIC module memory.

(7) Confirm that the correct directions are now indicated by the compass.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the screw that secures the front of the overhead console to the front of the overhead console retainer bracket.

(3) Insert the fingertips of both hands between the headliner and the sides of the overhead console housing in the area near the reading and courtesy lamps.

(4) Pull downward on the sides of the overhead console housing firmly and evenly to disengage the two snap clips that secure the rear of the unit from their receptacles in the overhead console retainer bracket.

(5) Lower the overhead console from the headliner far enough to access the wire harness connectors.

OVERHEAD CONSOLE (Continued)

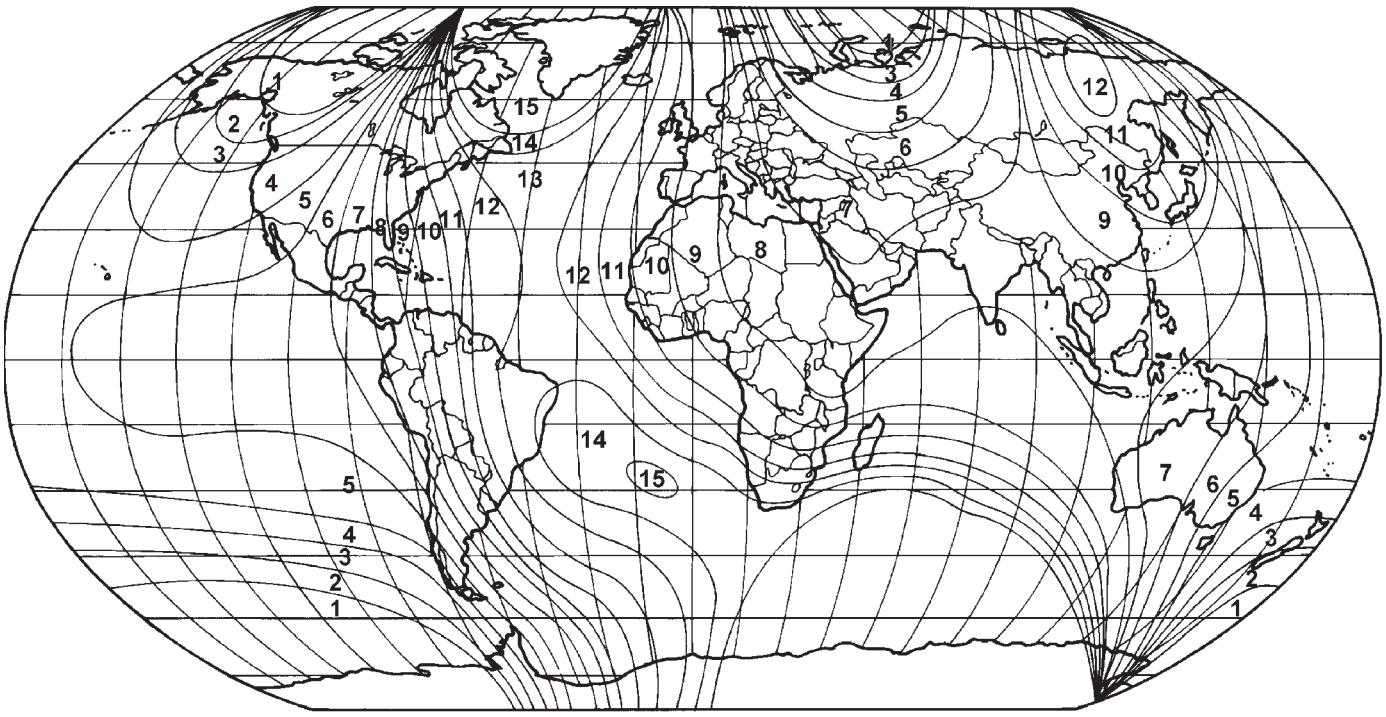


Fig. 4 Variance Settings

(6) Disconnect the roof wire harness connectors from the Electronic Vehicle Information Center connector receptacle, the reading and courtesy lamp wire harness connector and, if the vehicle is so equipped, from the back of the power sunroof switch.

(7) Remove the overhead console from the headliner.

INSTALLATION

(1) Position the overhead console near the mounting location on the headliner.

(2) Reconnect the roof wire harness connectors to the Electronic Vehicle Information Center connector receptacle, the reading and courtesy lamp wire harness connector and, if the vehicle is so equipped, to the back of the power sunroof switch.

(3) Align the two snap clips on the rear of the overhead console housing with their receptacles in the overhead console retainer bracket.

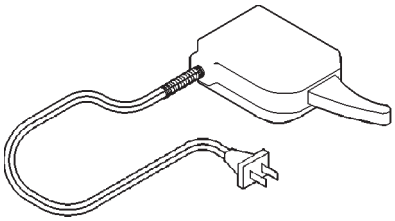
(4) Push upward firmly and evenly on the sides of the overhead console housing over both of the snap clip locations until each of the two snap clips is fully engaged with its receptacle in the overhead console retainer bracket.

(5) Install and tighten the screw that secures the front of the overhead console housing to the overhead console retainer bracket. Tighten the screw to 1.2 N·m (10 in. lbs.).

(6) Reconnect the battery negative cable.

SPECIAL TOOLS

OVERHEAD CONSOLE SYSTEMS



Degaussing Tool 6029

ELECTRONIC VEHICLE INFO CENTER

DESCRIPTION

The Electronic Vehicle Information Center (EVIC) is located in the overhead console on models equipped with this option. Three versions of the EVIC module are available on the Grand Cherokee. These three versions are identical except that some models include an integral three-push button Universal Transmitter transceiver and/or Tire Pressure Monitoring System (TPM). All three EVIC modules feature a large Vacuum Fluorescent Display (VFD) screen for displaying information, and back-lit push buttons function switches labeled C/T (compass/temperature), RESET, STEP, and MENU. The VFD screen can also display a vehicle graphic that is used

ELECTRONIC VEHICLE INFO CENTER (Continued)

for door and liftgate open indications and to show if a turn signal has been left on. The EVIC messages and displays are coordinated with warning indicators in the instrument cluster to avoid duplication.

The EVIC module contains a central processing unit and interfaces with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, reduce internal controller hardware, and reduce component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities.

The EVIC module includes the following display options:

- **Compass and Temperature** - provides the outside temperature and one of eight compass readings to indicate the direction the vehicle is facing.
- **Average fuel economy** - shows the average fuel economy since the last trip computer reset.
- **Distance to empty** - shows the estimated distance that can be travelled with the fuel remaining in the fuel tank. This estimated distance is computed using the average miles-per-gallon from the last 30 gallons of fuel used.
- **Instant fuel economy** - shows the present fuel economy based upon the current vehicle distance and fuel used information.
- **Trip distance** - shows the distance travelled since the last trip computer reset.
- **Elapsed time** - shows the accumulated ignition-on time since the last trip computer reset.
- **Distance to service** - shows the distance remaining until the next scheduled service interval.
- **Tire Pressure** - shows the tire pressure in each tire.
- **Blank screen** - the EVIC compass/temperature/trip computer VFD is turned off.

The EVIC is capable of displaying the following alert messages, which are accompanied by an audible announcement consisting of a series of beeps:

- **TURN SIGNALS ON (with vehicle graphic)** - Indicates that a turn signal has remained on for about 1.6 kilometers (one mile).
- **PERFORM SERVICE** - Indicates that a customer programmable service interval distance has been reached.
- **DOOR OPEN (one or more, with vehicle graphic)** - Indicates that a door is open or not fully closed.
- **LIFTGATE OPEN (with vehicle graphic)** - Indicates that the liftgate is open or not fully closed.
- **LIFTGLASS OPEN (with vehicle graphic)** - Indicates that the liftglass is open or not fully closed.
- **COOLANT LEVEL LOW (with vehicle graphic)** - Indicates that the coolant level in the engine coolant reservoir is low.
- **XX LOW PRESSURE (with vehicle graphic)** - Indicates that the air pressure in the selected tire is low.
- **WASHER FLUID LOW (with vehicle graphic)** - Indicates that the fluid level in the washer fluid reservoir is low.

The EVIC “Menu” push button provides the vehicle operator with a user interface, which allows the selection of several optional customer programmable electronic features to suit individual preferences. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of this group for more information on the customer programmable feature options.

If the vehicle is equipped with the optional memory system, the EVIC will display the following memory system messages:

- **MEMORY #X POSITION SET (X = Driver 1 or Driver 2)** - This message appears in the EVIC display each time the memory system is successfully programmed. It is accompanied by an audible announcement chime tone.
- **MEMORY SYSTEM DISABLED** - The memory system is automatically disabled while the driver side seat belt is fastened and/or while the automatic transmission gear selector is in any position except Park or Neutral. This message appears in the EVIC display as a reminder when a memory switch push button is depressed while the memory system is disabled. If the REMOTE LINKED TO MEMORY customer programmable feature has been selected, this message will also appear when the Unlock button of the Remote Keyless Entry (RKE) transmitter is depressed while the memory system is disabled.

If the vehicle is equipped with the optional Universal Transmitter transceiver, the EVIC will also display messages and an icon indicating when the Universal Transmitter is being trained, which of the three transmitter buttons is transmitting, and when the transceiver is cleared.

If the vehicle is equipped with the optional **Tire Pressure Monitoring System**, the EVIC will also display messages and an icon indicating when the tire air pressure falls below a given set-point, and which of the five tires is transmitting the low pressure warning, and when the condition is cleared. Refer to the Tires/Wheels section of this manual for complete Tire Pressure Monitoring System description. Refer to this section of the service manual for EVIC modules function description for the Tire Pressure Monitoring.

Data input for all EVIC functions, including VFD dimming level, is received through PCI data bus

messages. The EVIC module uses its internal programming and all of its data inputs to calculate and display the requested data. If the data displayed is incorrect, perform the self-diagnostic tests as described in this group. If these tests prove inconclusive, the use of a DRBIII® scan tool and the proper Diagnostic Procedures manual are recommended for further testing of the EVIC module and the PCI data bus.

The EVIC module cannot be repaired, and is available for service only as a unit. This unit includes the push button switches and the plastic housed module. If any of these components are faulty or damaged, the complete EVIC module must be replaced. The incandescent bulbs used for EVIC push button backlighting and the display lens are available for service replacement.

ELECTRONIC VEHICLE INFORMATION CENTER CHIME

The Electronic Vehicle Information Center (EVIC) uses the chime warning system for two different kinds of support. In addition to requesting chime tones from the Body Control Module (BCM) as tactile beep support, the EVIC is programmed to send chime request messages over the Programmable Communications Interface (PCI) data bus when it detects the following conditions:

- **Door Open Warning** - A door is open above a critical speed [about 16 kilometers-per-hour (10 miles-per-hour) for the driver side front door, or about 5 kilometers-per-hour (3 miles-per-hour) for any other door].
- **Liftgate Open Warning** - The liftgate is open above a critical speed [about 5 kilometers-per-hour (3 miles-per-hour)].
- **Liftglass Open Warning** - The liftgate flip-up glass is open above a critical speed [about 5 kilometers-per-hour (3 miles-per-hour)].
- **Low Coolant Level Warning** - The coolant level in the engine coolant reservoir is low.
- **Perform Service Alert** - An audible alert that a “Perform Service” reminder message is being displayed by the EVIC.
- **Turn Signal On Warning** - A turn signal remains on for about 1.6 kilometers (one mile).
- **Washer Fluid Low Warning** - The fluid level in the washer reservoir is low.

See the owner’s manual in the vehicle glove box for more information on the features, use and operation of the EVIC. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION) for more information on the EVIC.

COMPASS

While in the compass/temperature mode, the compass will display the direction in which the vehicle is pointed using the eight major compass headings (Examples: north is N, northeast is NE). The self-calibrating compass unit requires no adjusting in normal use. The only calibration that may prove necessary is to drive the vehicle in one circle at 5 to 8 kilometers-per-hour (3 to 5 miles-per-hour), on level ground, in not less than 20 seconds. This will reorient the compass unit to its vehicle.

The compass unit also will compensate for magnetism the body of the vehicle may acquire during normal use. However, avoid placing anything magnetic directly on the roof of the vehicle. Magnetic mounts for an antenna, a repair order hat, or a funeral procession flag can exceed the compensating ability of the compass unit if placed on the roof panel. Magnetic bit drivers used on the fasteners that hold the overhead console assembly to the roof header can also affect compass operation. If the vehicle roof should become magnetized, the demagnetizing and calibration procedures found in this group may be required to restore proper compass operation.

TEMPERATURE

The outside ambient temperature is displayed in whole degrees. The temperature display can be toggled from Fahrenheit to Celsius by selecting the desired U.S./Metric option from the customer programmable features as described in **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Standard Procedures section of this group. The displayed temperature is not an instant reading of conditions, but an average temperature. It may take the temperature display several minutes to respond to a major temperature change, such as driving out of a heated garage into winter temperatures.

When the ignition switch is turned to the Off position, the last displayed temperature reading stays in the Body Control Module (BCM) unit memory. When the ignition switch is turned to the On position again, the EVIC will display the memory temperature for one minute; then update the display to the current average temperature reading within five minutes.

The temperature function is supported by an ambient temperature sensor. The sensor is mounted outside the passenger compartment near the front and center of the vehicle, and is hard wired to the Body Control Module (BCM). The BCM sends temperature status messages to the EVIC module over the PCI data bus network. The ambient temperature sensor is available as a separate service item.

ELECTRONIC VEHICLE INFO CENTER (Continued)

OPERATION

The EVIC has access to both non-switched and ignition switched sources of battery current so that some of its features remain operational at any time, while others may only operate with the ignition switch in the On position. When the ignition switch is turned to the On position, the EVIC module VFD will return to the last function being displayed before the ignition was turned to the Off position.

The compass/temperature display is the normal EVIC display. With the ignition switch in the On position, momentarily depressing and releasing the C/T (compass/temperature) push button switch will cause the EVIC to return to the compass/temperature/trip computer display mode from any other mode. While in the compass/temperature/trip computer display mode, momentarily depressing and releasing the Step push button will step through the available trip computer display options.

The EVIC trip computer features several functions that can be reset. The functions that can be reset are: average fuel economy, trip odometer and elapsed time. With the ignition switch in the On position and with one of the functions of the trip computer that can be reset currently displayed, depressing the Reset push button twice within three seconds will perform a global reset, and all of the trip computer information that can be reset will be reset to zero. With the ignition switch in the On position and the function that is to be reset currently displayed, momentarily depressing and releasing the Reset push button once will perform a local reset, and only the value of the displayed function will be reset to zero. A global or local reset will only occur if the function currently displayed is a function that can be reset. The distance to service function can also be reset using the local reset method, but it will reset back to the Service Interval distance that is set in the EVIC programmable features mode. Refer to **ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING** in the Service Procedures section of this group for more information on setting the Service Interval.

For more information on the features, control functions and setting procedures for the EVIC module, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - ELECTRONIC VEHICLE INFORMATION CENTER

If the problem with the Electronic Vehicle Information Center (EVIC) is a temperature reading of 130° F or -40°F shown in the compass/temperature display, refer to **Ambient Temperature Sensor Diagnosis and Testing** in this group. If the problem with the EVIC is an inaccurate or scrambled display, refer to **Self-Diagnostic Test** in this group. If the problem with the EVIC is incorrect Vacuum Fluorescent Display (VFD) dimming levels, use a DRB® scan tool and the proper Diagnostic Procedures manual to test for the correct dimming message inputs being received from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus. If the problem is a no-display condition, use the following procedures. For complete circuit diagrams, refer to **Overhead Console** in Wiring Diagrams.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the fused B(+) fuse in the PDC as required.

(3) Check the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (run/start) circuit to the ignition switch as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the overhead console. Check for continuity between the ground circuit cavity of the roof wire harness connector for the EVIC module and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the roof wire harness connector for the EVIC module. If OK, go to Step 7. If not OK, repair the open fused B(+) circuit to the fused B(+) fuse in the junction block as required.

(7) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the roof wire harness connector for the EVIC module. If OK, refer to **Self-Diagnostic Test** below for further diagnosis of the EVIC module and the PCI data bus. If not OK, repair the open fused ignition switch output (run/start) circuit to the fuse in the junction block as required.

SELF-DIAGNOSTIC TEST

A self-diagnostic test is used to determine that the EVIC module is operating properly, and that all PCI

ELECTRONIC VEHICLE INFO CENTER (Continued)

data bus messages are being received for initial operation. Initiate the self-diagnostic test as follows:

(1) With the ignition switch in the Off position, simultaneously depress and hold the C/T button and the Reset button.

(2) Turn the ignition switch to the On position.

(3) Continue to hold both buttons depressed until the EVIC software version information is displayed, then release both buttons.

(4) Following completion of these tests, the EVIC module will display one of the following messages:

a. **Pass Self Test** - Momentarily depress and release the Reset button to return to the compass/temperature/trip computer display mode. The EVIC module is working properly.

b. **Failed Self Test** - The EVIC module has an internal failure. The EVIC module is faulty and must be replaced.

c. **Not Receiving J1850 Message** - The EVIC module is not receiving proper message input through the PCI data bus. This can result from one or more faulty electronic modules in the vehicle, or from a faulty PCI data bus. The use of a DRB scan tool and the proper Diagnostic Procedures manual are required for further diagnosis.

NOTE: If the compass functions, but accuracy is suspect, it may be necessary to perform a variation adjustment. This procedure allows the compass unit to accommodate variations in the earth's magnetic field strength, based on geographic location. Refer to Compass Variation Adjustment in the Standard Procedures section of this group.

NOTE: If the compass reading displays a blank, and only "CAL" appears in the display, demagnetizing may be necessary to remove excessive residual magnetic fields from the vehicle. Refer to Compass Demagnetizing in the Standard Procedures section of this group.

STANDARD PROCEDURE - TIRE PRESSURE SYSTEM TEST

The following test can be used to verify two functions. One, that the tire pressure sensors are transmitting properly and two, the EVIC module is receiving these transmissions accordingly.

(1) Retrain the tire sensors (Refer to 22 - TIRES/WHEELS/TIRE PRESSURE MONITORING/SENSOR - STANDARD PROCEDURE). The tire sensors must be retrained in order to set the proper transmitting time cycle (twice a minute), failure to retrain the sensors will cause a much slower transmitting time cycle (once a hour).

(2) Using the STEP button on the overhead console, scroll to the blank display, then press the RESET button for five seconds, a beep will sound indicating the start of this test. The vehicle icon and transmission counters will now be displayed, (same display as individual tire pressure except counters replace tire pressure values).

(3) Upon entering the test mode, the EVIC will clear the sensor counter and each time a sensor signal for a road tire is received, the EVIC will update the counter value (vehicle must be driven at 25 mph to transmit). The counter values should all read the same value. If any of the road tires indicate a different value than another tire sensor, this is a sign of a problem. Replace the appropriate tire sensor and retest the system. This test will continue until any of the overhead console buttons are pressed or the ignition is turned off.

NOTE: Pressing the RESET button during the test will sound a beep and reset all the counter values back to zero.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the overhead console from the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL).

(3) Remove the four screws that secure the Electronic Vehicle Information Center (EVIC) module to the overhead console housing (Fig. 5).

(4) Remove the EVIC module from the overhead console housing.

INSTALLATION

(1) Position the EVIC module onto the overhead console housing.

(2) Install and tighten the four screws that secure the EVIC module to the overhead console housing. Tighten the screws to 0.9 N·m (8 in. lbs.).

(3) Install the overhead console onto the headliner (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION).

(4) Reconnect the battery negative cable.

NOTE: If a new EVIC module has been installed, the compass will have to be calibrated and the variance set. Refer to Compass Variation Adjustment and Compass Calibration in the Service Procedures section of this group for the procedures.

ELECTRONIC VEHICLE INFO CENTER (Continued)

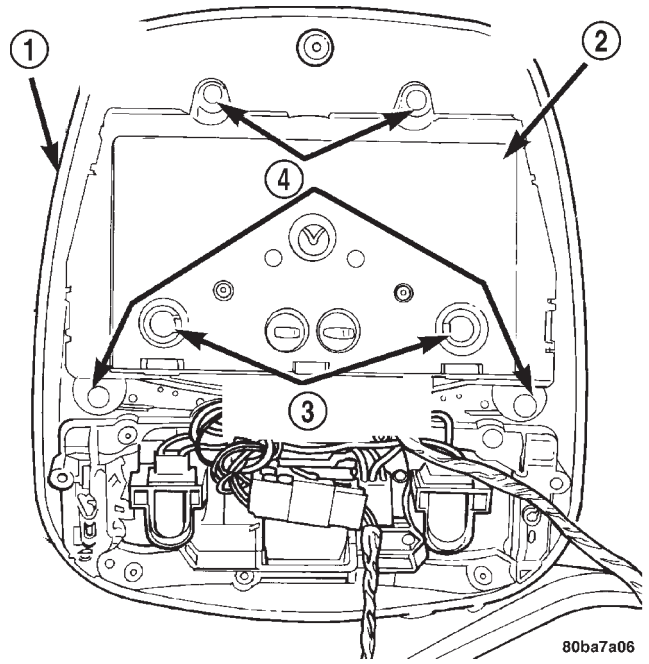


Fig. 5 Top of Overhead Console

1 - OVERHEAD CONSOLE HOUSING
2 - EVIC MODULE
3 - ILLUMINATION LAMPS
4 - SCREWS (4)

NOTE: If the vehicle is equipped with the Tire Pressure Monitoring (TPM) System, and the overhead console electronics module is removed or replaced, the TPM system will need to be retrained. Refer to the Tires/Wheels section of this manual for the procedure.

UNIVERSAL TRANSMITTER

DESCRIPTION

The Grand Cherokee Limited model has a Universal Garage Door Opener (UGDO) transceiver as standard factory-installed equipment. The UGDO is optional on Laredo models. The UGDO transceiver is integral to the Electronic Vehicle Information Center (EVIC), which is located in the overhead console. The only visible component of the UGDO are the three transmitter push buttons centered between the four EVIC push buttons located just rearward of the EVIC display screen in the overhead console. The three UGDO transmitter push buttons are identified with one, two or three dots so that they be easily identified by sight.

Each of the three UGDO transmitter push buttons controls an independent radio transmitter channel. Each of these three channels can be trained to transmit a different radio frequency signal for the remote operation of garage door openers, motorized gate openers, home or office lighting, security systems or just about any other device that can be equipped with a radio receiver in the 288 to 410 MegaHertz (MHz) frequency range for remote operation. The UGDO is capable of operating systems using either rolling code or non-rolling code technology.

The EVIC module displays messages and a small house-shaped icon with one, two or three dots corresponding to the three transmitter buttons to indicate the status of the UGDO. The EVIC messages are:

- **Cleared Channels** - Indicates that all of the transmitter codes stored in the UGDO have been successfully cleared.
- **Training** - Indicates that the UGDO is in its transmitter learning mode.
- **Trained** - Indicates that the UGDO has successfully acquired a new transmitter code.
- **Transmit** - Indicates that a trained UGDO transmitter button has been depressed and that the UGDO is transmitting.

The UGDO cannot be repaired, and is available for service only as a unit with the EVIC module. This unit includes the push button switches and the plastic module. If any of these components are faulty or damaged, the complete EVIC module must be replaced.

OPERATION

The universal transmitter operates on a non-switched source of battery current so the unit will remain functional, regardless of the ignition switch position. For more information on the features, programming procedures and operation of the universal transmitter, see the owner's manual in the vehicle glove box.

DIAGNOSIS AND TESTING - UNIVERSAL TRANSMITTER

If the Universal Transmitter is inoperative, but the Electronic Vehicle Information Center (EVIC) is operating normally, see the owner's manual in the vehicle glove box for instructions on training the Transmitter. Retrain the Transmitter with a known good transmitter as instructed in the owner's manual and test the Transmitter operation again. If the unit is still inoperative, replace the faulty Transmitter and EVIC module as a unit. If both the Transmitter and the EVIC module are inoperative, refer to **Electronic Vehicle Information Center Diagnosis and Testing** in this group for further diagnosis. For complete circuit diagrams, refer to **Wiring Diagrams**.

AMBIENT TEMP SENSOR

DESCRIPTION

Ambient air temperature is monitored by the Electronic Vehicle Information Center (EVIC) through ambient temperature messages received from the Body Control Module (BCM) over the Programmable Communications Interface (PCI) data bus network. The BCM receives a hard wired input from the ambient temperature sensor. The ambient temperature sensor is a variable resistor mounted to a bracket that is secured with a screw to the right side of the headlamp mounting module grille opening, behind the radiator grille and in front of the engine compartment.

Refer to **Body Control Module** in Electronic Control Modules. For complete circuit diagrams, refer to the appropriate wiring information. The ambient temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The ambient temperature sensor is a variable resistor that operates on a five-volt reference signal sent to it by the BCM. The resistance in the sensor changes as temperature changes, changing the temperature sensor signal circuit voltage to the BCM. Based upon the resistance in the sensor, the BCM senses a specific voltage on the temperature sensor signal circuit, which it is programmed to correspond to a specific temperature. The BCM then sends the proper ambient temperature messages to the EVIC over the PCI data bus.

The temperature function is supported by the ambient temperature sensor, a wiring circuit, the Body Control Module (BCM), the Programmable Communications Interface (PCI) data bus, and a portion of the Electronic Vehicle Information Center (EVIC) module. If any portion of the ambient temperature sensor circuit fails, the BCM will self-diagnose the circuit. A temperature reading of 130° F will appear in the EVIC display in place of the temperature when the sensor circuit is shorted. A temperature reading of –40° F will appear in the EVIC display in place of the temperature when the sensor circuit is open.

The ambient temperature sensor circuit can also be diagnosed by referring to **Diagnosis and Testing - Ambient Temperature Sensor, and Diagnosis and Testing - Ambient Temperature Sensor Circuit**. If the temperature sensor and circuit are confirmed to be OK, but the temperature display is inoperative or incorrect, refer to **Diagnosis and Testing - Electronic Vehicle Information Center** in this group. For complete circuit diagrams, refer to the appropriate wiring information.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AMBIENT TEMPERATURE SENSOR

(1) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the ambient temperature sensor wire harness connector.

(2) Measure the resistance of the ambient temperature sensor. At –40° C (–40° F), the sensor resistance is 336.6 kilohms. At 60° C (140° F), the sensor resistance is 2.49 kilohms. The sensor resistance should read between these two values. If OK, refer to **Diagnosis and Testing - Ambient Temperature Sensor Circuit** in this group. If not OK, replace the faulty ambient temperature sensor.

DIAGNOSIS AND TESTING - AMBIENT TEMPERATURE SENSOR CIRCUIT

(1) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the 2-way ambient temperature sensor wire harness connector and the 22-way Body Control Module (BCM) wire harness connector.

(2) Connect a jumper wire between the two terminals in the body half of the 2-way ambient temperature sensor wire harness connector.

(3) Check for continuity between the sensor return circuit and the ambient temperature sensor signal circuit cavities of the 22-way BCM wire harness connector. There should be continuity. If OK, go to Step 4. If not OK, repair the open sensor return circuit or ambient temperature sensor signal circuit to the ambient temperature sensor as required.

(4) Remove the jumper wire from the body half of the 2-way ambient temperature sensor wire harness connector. Check for continuity between the sensor return circuit cavity of the 22-way BCM wire harness connector and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted sensor return circuit as required.

(5) Check for continuity between the ambient temperature sensor signal circuit cavity of the 22-way BCM wire harness connector and a good ground. There should be no continuity. If OK, refer to **Diagnosis and Testing - Electronic Vehicle Information Center** in this group. If not OK, repair the shorted ambient temperature sensor signal circuit as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

AMBIENT TEMP SENSOR (Continued)

(2) Locate the ambient temperature sensor, on the right side of the radiator opening in the headlamp mounting module, behind the grille (Fig. 6).

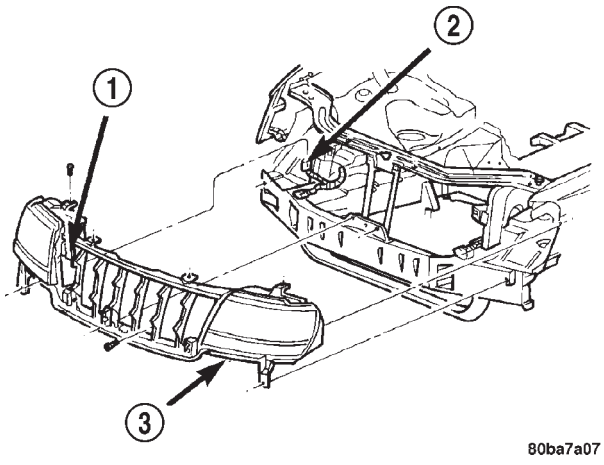


Fig. 6 AMBIENT TEMPERATURE SENSOR

1 - AMBIENT TEMPERATURE SENSOR
2 - WIRE HARNESS CONNECTOR
3 - HEADLAMP MOUNTING MODULE

(3) Remove the radiator grille fascia and insert from the headlamp mounting module. Refer to Body for the procedures.

(4) Disconnect the wire harness connector from the ambient temperature sensor connector receptacle.

(5) Remove the one screw that secures the ambient temperature sensor bracket to the headlamp mounting module.

(6) Remove the ambient temperature sensor from the headlamp mounting module.

INSTALLATION

(1) Position the ambient temperature sensor onto the headlamp mounting module.

(2) Install and tighten the one screw that secures the ambient temperature sensor bracket to the headlamp mounting module. Tighten the screw to 2.2 N·m (20 in. lbs.).

(3) Reconnect the wire harness connector to the ambient temperature sensor connector receptacle.

(4) Install the radiator grille fascia and insert onto the headlamp mounting module. Refer to the Body section of this manual for the procedures.

(5) Reconnect the battery negative cable.

POWER SYSTEMS

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POWER LOCKS

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POWER LOCKS

DESCRIPTION

DESCRIPTION - POWER LOCK SYSTEM

A power operated door and liftgate lock system is standard factory-installed equipment on this model. The power lock system allows all of the doors and the liftgate to be locked or unlocked electrically by operating a switch on either front door trim panel. The power lock system receives non-switched battery feed through a fuse in the Power Distribution Center (PDC), so that the power locks remain operational, regardless of the ignition switch position.

The power lock system for this vehicle also has a door lock inhibit feature, which prevents the power lock system from being energized with a power door lock switch if a front door is open with the key in the ignition. However, the locks can still be operated manually, with a key, energized with the RKE transmitter or by sliding the door lock lever to the appropriate position.

POWER LOCKS (Continued)

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION). Customer programmable feature options affecting the power door lock system include:

- **Auto Door Locks** - Automatically locks all of the vehicle doors and the liftgate when the vehicle reaches a speed of about 24 kilometers-per-hour (15 miles-per-hour) with 10% throttle tip-in.
- **Auto Unlock on Exit** - Automatically unlocks all of the vehicle doors and the liftgate when the driver side front door is opened, if the vehicle is stopped and the transmission gear selector is in the Park or Neutral positions. This feature is linked to the Auto Door Locks feature, and will only occur one time following each Auto Door Lock event.

The power lock system for this vehicle can also be operated remotely using the standard equipment Remote Keyless Entry (RKE) system radio frequency transmitters. (Refer to 8 - ELECTRICAL/POWER LOCKS - DESCRIPTION - REMOTE KEYLESS ENTRY SYSTEM).

The components of the power lock system include:

- **Driver Door Module (DDM)**
- **Passenger Door Module (PDM)**
- **PCI Bus Messages**
- **Power Lock Motors**

Certain functions and features of the power lock system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For proper diagnosis of these electronic modules or of the PCI data bus network, the use of a DRBIII® scan tool and the appropriate diagnostic information are required.

The other electronic modules that may affect power lock system operation are as follows:

- **Body Control Module (BCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODULE - DESCRIPTION).
- **Electronic Vehicle Information Center (EVIC)** - (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION).
- **Powertrain Control Module (PCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION).

Hard wired circuitry connects the power lock system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the power lock system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

DESCRIPTION - REMOTE KEYLESS ENTRY SYSTEM

A Radio Frequency (RF) type Remote Keyless Entry (RKE) system is standard factory-installed equipment on this model. The RKE system allows the use of a remote battery-powered radio transmitter to control the power lock system. The RKE receiver operates on non-switched battery current through a fuse in the Power Distribution Center (PDC), so that the system remains operational, regardless of the ignition switch position.

In addition to Lock and Unlock buttons, the RKE transmitters are also equipped with a Panic button. If the Panic button on the RKE transmitter is depressed, the horn will sound and the exterior lights will flash on the vehicle for about three minutes, or until the Panic button is depressed a second time, if ignition is in the Off position. A vehicle speed of about 24 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

The RKE system can also perform other functions on this vehicle. If the vehicle is equipped with the optional Vehicle Theft Security System (VTSS), the RKE transmitter will arm the VTSS when the Lock button is depressed, and disarm the VTSS when the Unlock button is depressed. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - DESCRIPTION - VEHICLE THEFT SECURITY SYSTEM). If the vehicle is equipped with the optional Memory System, each of the two numbered and color-coded RKE transmitters can be used to recall the stored driver side front seat position, both outside power rear view mirror positions, and the radio station presets for the two assigned drivers. (Refer to 8 - ELECTRICAL/POWER SEATS - DESCRIPTION - MEMORY SYSTEM).

POWER LOCKS (Continued)

The RKE system includes two transmitters when the vehicle is shipped from the factory, but the system can retain the vehicle access codes of up to four transmitters. The transmitter codes are retained in the RKE receiver memory, even if the battery is disconnected. If an RKE transmitter is faulty or lost, new transmitter vehicle access codes can be programmed into the system using a DRBIII® scan tool and the appropriate diagnostic information.

This vehicle also offers several customer programmable features, which allows the selection of several optional electronic features to suit individual preferences. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION). Customer programmable feature options affecting the RKE system include:

- **Remote Unlock** - Allows the option of having only the driver side front door unlock when the RKE transmitter Unlock button is depressed the first time and the remaining doors and the liftgate unlock when the button is depressed a second time, or having all doors and the liftgate unlock upon the first depression of the RKE transmitter Unlock button.
- **Remote Linked to Memory** - If the vehicle is equipped with the Memory System, this feature allows the option of having the RKE transmitter Unlock button activate the recall of the stored settings, or having the recall function assigned solely to the memory switch on the driver side front door trim panel.
- **Sound Horn on Lock** - Allows the option of having the horn sound a short chirp as an audible verification that the doors have locked, or having no audible verification.
- **Flash Lights with Lock** - Allows the option of having the lights flash as an optical verification that the doors have locked, or having no optical verification.

This group covers the following components of the RKE system:

- **RKE Receiver**
- **RKE Transmitter**

Certain functions and features of the RKE system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRBIII® scan tool and the appropriate diagnostic information are required.

The other electronic modules that may affect RKE system operation are as follows:

- **Body Control Module (BCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODULE - DESCRIPTION).
- **Driver Door Module (DDM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).
- **Electronic Vehicle Information Center (EVIC)** - (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE/ELECTRONIC VEHICLE INFO CENTER - DESCRIPTION).
- **Passenger Door Module (PDM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).
- **Powertrain Control Module (PCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - DESCRIPTION).

Hard wired circuitry connects the RKE system components via the PDM to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the RKE system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

COMBINATION FLASHER

The combination flasher is a smart relay that functions as both the turn signal system and the hazard warning system flasher. The combination flasher contains active electronic Integrated Circuitry (IC) elements. This flasher can be energized by the BCM to flash all of the park/turn signal/front side marker lamps as an optical alert for the RKE panic function and, if the Flash Lights with Lock programmable feature is enabled, as an optical verification for the RKE lock event. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/COMBINATION FLASHER - DESCRIPTION).

HORN RELAY

The horn relay is a electromechanical device that switches battery current to the horn when the horn switch grounds the relay coil. The horn relay is located in the Power Distribution Center (PDC) in

the engine compartment. This relay can be energized by the BCM to sound the horns as an audible alert for the RKE panic function and, if the Sound Horn on Lock programmable feature is enabled, as an audible verification for the RKE lock event. (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DESCRIPTION).

LOW BEAM HEADLAMP RELAY

The low beam headlamp relay is a electromechanical device that switches battery current to the headlamp low beams when the BCM grounds the relay coil. The low beam headlamp relay is located in the junction block in the passenger compartment. This relay can be energized by the BCM to flash the headlamp low beams as an optical alert for the RKE panic function. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/HEADLAMP - DESCRIPTION).

DESCRIPTION - LIFTGATE FLIP-UP GLASS POWER RELEASE SYSTEM

A power operated liftgate flip-up glass release system is standard factory installed equipment on this model. The liftgate flip-up glass power release system allows the flip-up glass latch to be released electrically by depressing a switch located on the bottom of the liftgate license plate lamp housing unit, above the license plate on the outside of the liftgate.

The liftgate flip-up glass release system operates on non-switched battery current supplied through a fuse in the junction block so that the system remains functional, regardless of the ignition switch position. However, a limit switch that is integral to the liftgate latch actuator unit opens to prevent the flip-up glass latch from being actuated when the liftgate latch is locked.

The liftgate flip-up glass power release system includes the following components:

- **Liftgate Flip-Up Glass Limit Switch** - The liftgate flip-up glass limit switch is integral to the liftgate latch unit. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/LATCH - REMOVAL) and (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/LATCH - INSTALLATION).
- **Liftgate Flip-Up Glass Release Motor** - The liftgate flip-up glass release motor is integral to the liftgate flip-up glass latch unit. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/FLIP-UP GLASS LATCH - REMOVAL) and (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/FLIP-UP GLASS LATCH - INSTALLATION).
- **Liftgate Flip-Up Glass Release Switch** - The liftgate flip-up glass release switch is integral to the liftgate license plate lamp housing. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/FLIP-UP GLASS SWITCH - REMOVAL) and (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/FLIP-UP GLASS SWITCH - INSTALLATION).

Hard wired circuitry connects the liftgate flip-up glass power release system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the liftgate flip-up glass power release system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

OPERATION - POWER LOCK SYSTEM

The Passenger Door Module (PDM) contains the power door lock control logic and a power lock switch. The Driver Door Module (DDM) contains a power lock switch and controls the output to the driver side front door power lock motor, while the PDM controls the output to the power lock motors for the remaining doors and the liftgate.

When the power lock switch on the DDM is used to lock or unlock the doors, the DDM sends a control output to the driver side front door power lock motor and sends lock or unlock request messages to the PDM over the Programmable Communications Interface (PCI) data bus. The PDM responds to these messages by sending control outputs to the power lock motors of the remaining doors and the liftgate. When the power lock switch on the PDM is used to lock or unlock the doors, the PDM sends control outputs to the power lock motors in the passenger side front door, both rear doors and the liftgate, then sends lock or unlock request messages to the DDM over the Programmable Communications Interface (PCI) data bus. The DDM responds to these messages by sending control outputs to the power lock motor of the driver side front door.

In order to support the auto door locks and unlock on exit features, if enabled, the power lock system logic in the PDM needs to know the door ajar switch status, vehicle speed, and transmission gear selector lever position. The passenger side front door ajar switch is the only hard wired input to the PDM. The PDM obtains the remaining information from messages it receives from other electronic modules over the PCI data bus network.

POWER LOCKS (Continued)

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power lock system.

OPERATION - REMOTE KEYLESS ENTRY SYSTEM

The Passenger Door Module (PDM) contains the RKE system control logic and the RKE receiver. When the RKE receiver recognizes a Lock, Unlock or Panic message from a valid RKE transmitter, the RKE receiver provides that input to the PDM. The PDM circuitry and programming responds by sending the proper messages to the other electronic modules over the Programmable Communications Interface (PCI) data bus.

When an RKE lock message is received, the doors and the liftgate lock, the interior lighting fades to off, the horn chirps (if this feature is enabled), the exterior lamps flash (if this feature is enabled) and, if the vehicle is so equipped, the Vehicle Theft Security System (VTSS) is armed. When an RKE unlock message is received, the driver side front door (or all doors and the liftgate if this feature is enabled) unlock, the interior lighting is turned on and, if the vehicle is so equipped, the VTSS is disarmed. If the vehicle is equipped with the Memory System and the RKE Linked to Memory feature is enabled, the RKE unlock message also recalls the driver seat, outside mirror and radio settings assigned to the RKE transmitter that sent the unlock signal.

When an RKE panic message is received, it causes the exterior lamps (including the headlights) to flash, and the horn to pulse for about three minutes, or until a second panic message is received. A vehicle speed of about 24 kilometers-per-hour (15 miles-per-hour) will also cancel the panic event.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the RKE system.

OPERATION - LIFTGATE FLIP-UP GLASS POWER RELEASE SYSTEM

When the liftgate mounted flip-up glass release switch is depressed, battery current is directed to the electric release motor that is integral to the flip-up glass latch located inside the liftgate. When the release motor is energized the latch releases and the flip-up glass can be opened. A liftgate flip-up glass limit switch is integral to the liftgate latch actuator mechanism. The limit switch automatically enables or disables the liftgate flip-up glass power release circuitry, depending upon the position of the liftgate latch lock mechanism. When the liftgate latch is unlocked, the limit switch closes and battery current is available at the release switch. When the liftgate latch is locked , the limit switch opens, and the release switch is disabled.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the liftgate flip-up glass power release system.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER LOCK SYSTEM

Following are tests that will help to diagnose the hard wired components and circuits of the power lock system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power lock system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the power lock system components must be checked.

The most reliable, efficient, and accurate means to diagnose the power lock system requires the use of a DRBIII® scan tool and the proper Diagnostic Procedures manual. The DRBIII® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the power lock motors are being sent the proper hard wired outputs by the door modules for them to perform their power lock system functions.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the power lock system, note the system operation while you actuate both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter. Then, proceed as follows:

- If the entire power lock system fails to function with either the power lock switches or the RKE transmitter, check the fused B(+) fuse in the Power Distribution Center. If the fuse is OK, proceed to diagnosis of the door modules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ DOOR MODULE - DIAGNOSIS AND TESTING).
- If the power lock system functions with both power lock switches, but not with the RKE transmitter, proceed to diagnosis of the Remote Keyless Entry (RKE) system. (Refer to 8 - ELECTRICAL/POWER LOCKS - DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY SYSTEM).

- If the power lock system functions with the RKE transmitter, but not with one or both power lock switches, proceed to diagnosis of the door modules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DIAGNOSIS AND TESTING).
- If the driver side power lock switch operates only the driver side front door power lock motor, but all other power lock motors operate with the passenger side power lock switch or the RKE transmitter, use a DRBIII® scan tool and the appropriate diagnostic information to diagnose the Programmable Communications Interface (PCI) data bus.
- If only one power lock motor fails to operate with both power lock switches and the RKE transmitter, proceed to diagnosis of the power lock motor. (Refer to 8 - ELECTRICAL/POWER LOCKS/POWER LOCK MOTOR - DIAGNOSIS AND TESTING).

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY SYSTEM

Following are tests that will help to diagnose the Remote Keyless Entry (RKE) system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the RKE system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the RKE system components must be checked.

The most reliable, efficient, and accurate means to diagnose the RKE system requires the use of a DRBIII® scan tool and the appropriate diagnostic information. The DRBIII® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the RKE receiver is being sent the proper radio frequency signals by the RKE transmitters to perform its RKE system functions.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

PRELIMINARY DIAGNOSIS

As a preliminary diagnosis for the RKE system, note the system operation while you perform both the Lock and Unlock functions with the power lock switches and with the Remote Keyless Entry (RKE) transmitter. Then, proceed as follows:

- If the entire power lock system fails to function with either the power lock switches or the RKE transmitter, check the fused B(+) fuse in the Power Distribution Center. If the fuse is OK, proceed to the diagnosis for the door modules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DIAGNOSIS AND TESTING).
- If the power lock system functions with both power lock switches, but not with the RKE transmitter, proceed to the diagnosis for the RKE transmitter. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY TRANSMITTER - DIAGNOSIS AND TESTING).
- If the driver side power lock switch operates only the driver side front door power lock motor, but all other power lock motors operate with the passenger side power lock switch or the RKE transmitter, use a DRBIII® scan tool and the appropriate diagnostic information to diagnose the Programmable Communications Interface (PCI) data bus.

If the problem being diagnosed involves only the Sound Horn on Lock or the Flash Lights with Locks features, be certain that these programmable features are enabled. If the features are enabled and the service horn and turn signals still operate, the Body Control Module (BCM) and the PCI data bus must be tested. For diagnosis of the BCM or the PCI data bus, the use of a DRBIII scan tool and the appropriate diagnostic information are required.

DIAGNOSIS AND TESTING - LIFTGATE FLIP-UP GLASS POWER RELEASE SYSTEM

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Check the fused B(+) fuse in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the JB. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) as required.

(3) Disconnect the liftgate wire harness connector for the liftgate lock motor and flip-up glass limit switch from the motor and switch connector receptacle. Check for battery voltage at the fused B(+) circuit cavity of the liftgate wire harness connector for the liftgate lock motor and flip-up glass limit switch. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the liftgate lock motor and flip-up glass limit switch and the JB as required.

(4) Check for continuity between the two liftgate flip-up glass limit switch terminals. There should be continuity with the liftgate latch unlocked, and no continuity with the latch locked. If OK, go to Step 5.

POWER LOCKS (Continued)

If not OK, replace the faulty liftgate latch actuator (brainplate) unit.

(5) Disconnect the liftgate wire harness connector for the liftgate flip-up glass release switch from the switch connector receptacle. With the liftgate latch unlocked, check for battery voltage at the liftgate flip-up glass limit switch output circuit cavity of the liftgate wire harness connector for the release switch. If OK, go to Step 6. If not OK, repair the open liftgate flip-up glass limit switch output circuit between the release switch and the limit switch as required.

(6) Check for continuity between the two terminals of the liftgate flip-up glass release switch. There should be no continuity. Depress the switch, there should now be continuity. If OK, go to Step 7. If not OK, replace the faulty liftgate flip-up glass release switch.

(7) Disconnect the liftgate wire harness connector for the liftgate flip-up glass latch motor from the motor connector receptacle. Check for continuity between the ground circuit cavity of the liftgate wire harness connector for the latch motor and a good ground. There should be continuity. If OK, go to Step 8. If not OK, repair the open ground circuit to ground as required.

(8) With the liftgate latch unlocked and the flip-up glass release switch depressed, check for battery voltage at the liftgate flip-up glass release switch output circuit cavity of the liftgate wire harness connector for the latch motor. If OK, replace the faulty liftgate flip-up glass latch unit. If not OK, repair the open liftgate flip-up glass release switch output circuit between the latch motor and the release switch as required.

DOOR CYLINDER LOCK SWITCH

DESCRIPTION

The driver cylinder lock switch is integral to the key lock cylinder inside the driver side front door. The driver cylinder lock switch is a resistive multiplexed switch that is hard wired between a body ground and the Driver Door Module (DDM) through the front door wire harness. It maintains a path to ground, and changes voltages through an internal resistor when the lock cylinder is rotated to the lock or unlock position.

The driver cylinder lock switch cannot be adjusted or repaired and, if faulty or damaged, the driver side front door lock cylinder unit must be replaced. (Refer to 23 - BODY/DOOR - FRONT/LOCK CYLINDER - REMOVAL) and (Refer to 23 - BODY/DOOR - FRONT/LOCK CYLINDER - INSTALLATION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The driver cylinder lock switch is actuated by the key lock cylinder when the key is inserted in the lock cylinder and turned to the unlock position. The driver cylinder lock switch maintains a path to ground and changes voltages through an internal resistor for the DDM when the driver door key lock cylinder is in the lock or unlock position. The DDM reads the switch status through an internal pull-up, then sends the proper switch status messages to other electronic modules over the Programmable Communications Interface (PCI) data bus network. The driver cylinder lock switch unlock status message is used by the BCM as an input for Vehicle Theft Security System (VTSS) operation and interior lighting.

POWER LOCK MOTOR

DESCRIPTION

Power operated front door, rear door, and liftgate locking mechanisms are standard equipment on this model. The lock mechanisms are actuated by a reversible electric motor mounted within each door and the liftgate. The power lock motors for the doors are integral to the door latch units. The liftgate power lock motor is a separate unit secured to the latch brainplate near the center of the liftgate and operates the liftgate latch lock mechanism through a connecting linkage rod.

The power lock motors for the four doors cannot be adjusted or repaired and, if faulty or damaged, the entire door latch unit must be replaced. The liftgate power lock motor cannot be adjusted or repaired and, if faulty or damaged, the entire liftgate latch actuator (brainplate) unit must be replaced.

OPERATION

The driver side front door power lock motor is controlled by the Driver Door Module (DDM). The remaining power door lock motors and the liftgate power lock motor are controlled by the Passenger Door Module (PDM). A positive and negative battery connection to the two motor terminals will cause the power lock motor plunger to move in one direction. Reversing the current through these same two connections will cause the power lock motor plunger to move in the opposite direction.

POWER LOCK MOTOR (Continued)

DIAGNOSIS AND TESTING - POWER LOCK MOTOR

Remember, the Driver Door Module (DDM) circuitry controls the output to the driver side front door power lock motor. The Passenger Door Module (PDM) circuitry controls the output to the power lock motors for the remaining doors and the liftgate. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Check each power lock motor for correct operation while moving the power lock switch to both the Lock and Unlock positions. If all of the power lock motors are inoperative, go to Step 2. If one power lock motor is inoperative, go to Step 3.

(2) If all of the power lock motors except the driver side front door are inoperative, the problem may be caused by one shorted motor. Disconnecting a shorted power lock motor from the power lock circuit will allow the good power lock motors to operate. Disconnect the wire harness connector from each PDM-controlled power lock motor, one at a time, and recheck both the lock and unlock functions by operating the power lock switch. If all of the PDM-controlled power lock motors are still inoperative after the above test, check for a short or open circuit between the power lock motors and the PDM. If disconnecting one power lock motor causes the other motors to become functional, go to Step 3 to test the power lock motor that was last disconnected.

(3) Once it is determined which power lock motor is inoperative, that motor can be tested as follows. Disconnect the door or liftgate wire harness connector from the inoperative power lock motor. Apply 12 volts to the lock and unlock driver circuit cavities of the power lock motor connector to check its operation in one direction. Reverse the polarity to check the motor operation in the opposite direction. If OK, repair the shorted or open circuits between the lock motor and the DDM or PDM as required. If not OK, replace the faulty power lock motor.

POWER LOCK SWITCH

DESCRIPTION

The power lock motors are controlled by a two-way momentary switch mounted on the trim panel of each front door. Each power lock switch is illuminated by a Light-Emitting Diode (LED) that is integral to the switch paddle.

The driver side front door power lock switch is integral to the Driver Door Module (DDM), and the passenger side front door power lock switch is integral to the Passenger Door Module (PDM). The power lock switches and their lamps cannot be adjusted or repaired and, if faulty or damaged, the entire DDM or PDM unit must be replaced. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).

OPERATION

The front door power lock switches provide a lock and unlock signal to the door module circuitry. The Driver Door Module (DDM) circuitry controls the output to the driver side front door power lock motor, while the Passenger Door Module (PDM) circuitry controls the output to the passenger side front door, both rear door and the liftgate power lock motors.

When the DDM-integrated power lock switch is actuated, the DDM circuitry sends control outputs to the driver side front door power lock motor and sends a message to the PDM over the Programmable Communications Interface (PCI) data bus to control the output to the passenger side front door, both rear door and the liftgate power lock motors. When the PDM-integrated power lock switch is actuated, the PDM circuitry sends control outputs to the passenger side front door, both rear door and the liftgate power lock motors and sends a message to the DDM over the Programmable Communications Interface (PCI) data bus to control the output to the driver side front door power lock motor.

Each power lock switch is illuminated by a Light-Emitting Diode (LED) when the ignition switch is turned to the On position. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power lock switches.

REMOTE KEYLESS ENTRY MODULE

DESCRIPTION

The Remote Keyless Entry (RKE) receiver is a radio frequency unit contained within the Passenger Door Module (PDM). The PDM also contains the program logic circuitry for the RKE system. The PDM is secured with screws to the back of the trim panel inside the passenger side front door. The RKE receiver has a memory function to retain the vehicle access codes of up to four RKE transmitters. The receiver is designed to retain the transmitter codes in memory, even if the battery is disconnected.

For diagnosis of the RKE receiver, the PDM, or the Programmable Communications Interface (PCI) data bus a DRBIII® scan tool and the appropriate diagnostic information are required. The RKE receiver is only serviced as a unit with the PDM and, if faulty or damaged, the entire PDM unit must be replaced. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).

OPERATION

The RKE receiver is energized by one of three messages from the RKE transmitter: Unlock, Lock, or Panic. The PDM circuitry responds to these messages to lock or unlock the power lock motors that it controls. The PDM circuitry also sends Lock, Unlock, and Panic messages to other electronic modules over the Programmable Communications Interface (PCI) data bus. These messages will result in the Driver Door Module (DDM) locking or unlocking the driver side front door, and the other electronic modules in the vehicle responding as their programming dictates.

REMOTE KEYLESS ENTRY TRANSMITTER

DESCRIPTION

The Remote Keyless Entry (RKE) system Radio Frequency (RF) transmitter is equipped with three buttons, labeled Lock, Unlock, and Panic. It is also equipped with a key ring and is designed to serve as a key fob. The operating range of the transmitter radio signal is up to 10 meters (30 feet) from the RKE receiver.

Each RKE transmitter has a different vehicle access code, which must be programmed into the memory of the RKE receiver in the vehicle in order to operate the RKE system. Two transmitters are provided with the vehicle, but the RKE receiver can retain the access codes of up to four transmitters in its memory. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY TRANSMITTER - STANDARD PROCEDURE - RKE TRANSMITTER PROGRAMMING).

In addition, the RKE transmitters for vehicles equipped with the optional Memory System are color-coded and have a number “1” or “2” molded into the transmitter case to coincide with the “Driver 1 (Black)” and “Driver 2 (Gray)” buttons of the memory switch on the driver side front door trim panel. These transmitters must also have their access codes programmed into the RKE receiver so that they coincide with the “Driver 1” and “Driver 2” buttons of the memory switch. (Refer to 8 - ELECTRICAL/POWER SEATS - DESCRIPTION - MEMORY SYSTEM).

The RKE transmitter operates on two Panasonic CR2016 (or equivalent) batteries. Typical battery life is from one to two years. The RKE transmitter cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the Remote Keyless Entry (RKE) transmitters.

DIAGNOSIS AND TESTING - REMOTE KEYLESS ENTRY TRANSMITTER

(1) Replace the Remote Keyless Entry (RKE) transmitter batteries. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY TRANSMITTER - STANDARD PROCEDURE - RKE TRANSMITTER BATTERIES). Test each of the RKE transmitter functions. If OK, discard the faulty batteries. If not OK, go to Step 2.

(2) Program the suspect RKE transmitter and another known good transmitter into the RKE receiver. Use a DRBIII® scan tool, as described in the appropriate diagnostic information. (Refer to 8 - ELECTRICAL/POWER LOCKS/REMOTE KEYLESS ENTRY TRANSMITTER - STANDARD PROCEDURE - RKE TRANSMITTER PROGRAMMING).

(3) Test the RKE system operation with both transmitters. If both transmitters fail to operate the power lock system, use a DRBIII® scan tool and the appropriate diagnostic information for further diagnosis of the RKE system. If the known good RKE transmitter operates the power locks and the suspect transmitter does not, replace the faulty RKE transmitter.

NOTE: Be certain to perform the RKE Transmitter Programming procedure again following this test. This procedure will erase the access code of the test transmitter from the RKE receiver.

REMOTE KEYLESS ENTRY TRANSMITTER (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - RKE TRANSMITTER PROGRAMMING

To program the Remote Keyless Entry (RKE) transmitter access codes into the RKE receiver in the Passenger Door Module (PDM) requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

STANDARD PROCEDURE - RKE TRANSMITTER BATTERIES

The Remote Keyless Entry (RKE) transmitter case snaps open and shut for battery access. To replace the RKE transmitter batteries:

(1) Using a trim stick or a thin coin, gently pry at the notch in the center seam of the RKE transmitter case halves near the key ring until the two halves unsnap.

(2) Lift the back half of the transmitter case off of the RKE transmitter.

(3) Remove the two batteries from the RKE transmitter.

(4) Replace the two batteries with new Panasonic CR2016, or their equivalent. Be certain that the batteries are installed with their polarity correctly oriented.

(5) Align the two RKE transmitter case halves with each other, and squeeze them firmly and evenly together until they snap back into place.

NOTE: The RKE system for this model uses a rolling code security strategy. This strategy requires that synchronization be maintained between the RKE transmitter and the RKE receiver. RKE transmitter battery removal or replacement can cause a loss of synchronization. If the RKE receiver fails to respond to the RKE transmitter following battery removal or replacement, depress and release the RKE transmitter Unlock button repeatedly while listening carefully for the power door locks in the vehicle to cycle. After between five and eight presses of the Unlock button, the power door locks should cycle, indicating that re-synchronization has occurred.

POWER MIRRORS

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POWER MIRRORS

DESCRIPTION

Driver and passenger side power operated outside rear view mirrors are standard factory-installed equipment on this model. The power mirror system allows the driver to adjust both outside mirrors electrically from the driver seat position by operating a switch on the driver side front door trim panel. The power mirror system receives non-switched battery current through a fuse in the Power Distribution Center (PDC) so that the power mirrors remain operational, regardless of the ignition switch position.

The standard equipment power operated outside rear view mirrors are also equipped with the heated mirror system, which will only operate when the ignition switch is in the On position and the rear window defogger switch is turned on. When the rear window defogger switch is in the On position, electric heater grids on the rear window glass and behind both outside rear view mirror glasses are energized. These electric heater grids produce heat to help clear the rear window glass and outside rear view mirrors of ice, snow, or fog. (Refer to 8 - ELECTRICAL/ HEATED MIRRORS - DESCRIPTION) for more information on this feature.

A driver side automatic dimming outside mirror that dims the mirror to reduce the glare of bright lights approaching the vehicle from behind, and a memory system that automatically positions the power mirrors for two different drivers are optional factory-installed equipment on this model. (Refer to 8 - ELECTRICAL/POWER MIRRORS/AUTOMATIC DAY / NIGHT MIRROR - DESCRIPTION) for more information. (Refer to 8 - ELECTRICAL/POWER SEATS - DESCRIPTION) for more information.

This group covers the following components of the power mirror system:

- Power mirrors
- Power mirror switch.

Certain functions and features of the power mirror system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect power mirror system operation are as follows:

- **Body Control Module (BCM)** (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODUL - DESCRIPTION) for more information.
- **Driver Door Module (DDM)** (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MOD-

ULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.

- **Passenger Door Module (PDM)**(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

OPERATION

The Driver Door Module (DDM) and the Passenger Door Module (PDM) each contain the power mirror control logic for the mirror on its respective door. The DDM also houses the power mirror switch. Each door module controls the positioning of its respective outside mirror through hard wired outputs to that mirror. When the power mirror switch on the DDM is used to position the passenger side outside mirror, the DDM sends mirror positioning messages to the PDM over the Programmable Communications Interface (PCI) data bus. The PDM responds to these messages by sending control outputs to move the passenger side mirror accordingly.

Both the PDM and DDM respond to the defogger switch status messages sent by the Body Control Module (BCM) over the PCI data bus to control the electric heater grids of their respective mirrors. (Refer to 8 - ELECTRICAL/HEATED MIRRORS - DESCRIPTION) for more information on this feature.

On models equipped with the optional memory system, each door module also receives a hard wired input from the two power mirror motor position potentiometers that are integral to each power mirror. Each door module then stores the Driver 1 and Driver 2 mirror position information for its respective mirror. When the DDM receives a Driver 1 or Driver 2 memory recall message from the memory switch on the driver side front door trim panel or from the Remote Keyless Entry (RKE) receiver in the PDM, the DDM positions the driver side mirror and sends a memory recall message back to the PDM over the PCI data bus to position the passenger side mirror.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power mirror system.

DIAGNOSIS AND TESTING - POWER MIRRORS

Following are tests that will help to diagnose the hard wired components and circuits of the power mirror system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power mirror system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the power mirror system components must be checked.

The most reliable, efficient, and accurate means to diagnose the power mirror system requires the use of a DRB scan tool and the proper Diagnostic Procedures manual. The DRB scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, that the power mirror motors are being sent the proper hard wired outputs, and that the mirror position potentiometers are returning the proper outputs to the door modules for them to perform their power mirror system functions.

AUTOMATIC DAY/NIGHT MIRROR

DESCRIPTION

DESCRIPTION - REAR VIEW MIRROR

An automatic day/night mirror system is an available factory-installed option on this model. The automatic dimming inside day/night rear view mirror system is a completely self-contained unit that replaces the standard equipment inside rear view mirror. This system will automatically change the reflectance of the inside rear view mirror to protect the driver from the unwanted headlight glare of trailing vehicles while driving at night. The automatic day/night inside mirror receives ignition switched battery current through a fuse in the junction block, and will only operate when the ignition switch is in the On position.

Vehicles equipped with the automatic day/night mirror system are also available with an optional factory-installed automatic dimming outside rear view mirror for the driver side of the vehicle. (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - DESCRIPTION) for more information on this option.

The automatic day/night mirror sensitivity cannot be repaired or adjusted. If any component of this unit is faulty or damaged, the entire automatic day/night inside rear view mirror unit must be replaced. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

AUTOMATIC DAY/NIGHT MIRROR (Continued)

DESCRIPTION - OUTSIDE REAR VIEW MIRROR

An automatic dimming outside rear view mirror is an available factory-installed option for the driver side of the vehicle, if the vehicle is also equipped with the automatic day/night inside rear view mirror. The automatic dimming outside mirror is completely controlled by the circuitry of the automatic day/night inside rear view mirror. The automatic dimming outside mirror will automatically change the reflectance of the driver side outside rear view mirror to protect the driver from the unwanted headlight glare of trailing vehicles while driving at night. The automatic dimming outside mirror will only operate when the ignition switch is in the On position.

The automatic dimming outside mirror sensitivity cannot be repaired or adjusted. If any component of this unit is faulty or damaged, the entire automatic dimming outside mirror unit must be replaced. (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - DIAGNOSIS AND TESTING). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

OPERATION

OPERATION - REAR VIEW MIRROR

The automatic day/night mirror switch allows the driver a manual control of whether the automatic dimming feature is operational. This switch is a momentary rocker-type switch located on the lower rear-facing surface of the mirror housing. When Auto is selected, a Light-Emitting Diode (LED) on the mirror housing just to the right of the switch illuminates to indicate that automatic day/night mirror is turned on. When Off is selected, the LED is turned off. The mirror also senses the backup lamp circuit, and will automatically disable its self-dimming feature whenever the transmission gear selector is in the Reverse position.

A thin layer of electrochromatic material between two pieces of conductive glass make up the face of the mirror. Two photocell sensors are used to monitor light levels and adjust the reflectance of the mirror. The ambient photocell sensor faces forward, to detect the outside light levels. The headlamp sensor is located on the mirror housing just to the left of the switch and facing rearward, to detect the light level received at the rear window side of the mirror. When the difference between the two light levels becomes too great (the light level received at the rear of the mirror is much higher than that at the front of the mirror), the mirror begins to darken.

On models with an optional driver side automatic dimming outside mirror, the signal to control the dimming of that mirror is generated by the automatic day/night inside rear view mirror circuitry. That signal is then delivered to the driver side outside rear view mirror on a hard wired circuit.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the automatic day/night mirror system.

OPERATION - OUTSIDE REAR VIEW MIRROR

The automatic dimming outside mirror is operated by the same controls and circuitry as the automatic day/night mirror. When the automatic day/night mirror is turned on or off, the automatic dimming outside mirror is likewise turned on or off. Like in the automatic day/night mirror, a thin layer of electrochromatic material between two pieces of conductive glass make up the face of the automatic dimming outside mirror. However, the signal to control the dimming of the outside mirror is generated by the automatic day/night inside rear view mirror circuitry.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the automatic dimming outside mirror.

DIAGNOSIS AND TESTING - AUTOMATIC DAY / NIGHT MIRROR

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Check the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run/start) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused ignition switch output (run/start) circuit to the ignition switch as required.

(3) Disconnect the overhead wire harness connector from the automatic day/night mirror connector receptacle. Check for battery voltage at the fused ignition switch output (run/start) circuit cavity of the overhead wire harness connector for the automatic day/night mirror. If OK, go to Step 4. If not OK, repair the open fused ignition switch output (run/start) circuit to the fuse in the junction block as required.

AUTOMATIC DAY/NIGHT MIRROR (Continued)

(4) Turn the ignition switch to the Off position. Check for continuity between the ground circuit cavity of the overhead wire harness connector for the automatic day/night mirror and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Turn the ignition switch to the On position. Set the parking brake. Place the transmission gear selector lever in the Reverse position. Check for battery voltage at the backup lamp switch output circuit cavity of the overhead wire harness connector for the automatic day/night mirror. If OK, reconnect the overhead wire harness connector to the automatic day/night mirror connector receptacle and go to Step 6. If not OK, repair the open backup lamp switch output circuit as required.

(6) Place the transmission gear selector lever in the Neutral position. Place the automatic day/night mirror switch in the Auto (LED next to the switch is lighted) position (Fig. 1). Cover the forward facing ambient photocell sensor to keep out any ambient light.

NOTE: The ambient photocell sensor must be covered completely, so that no light reaches the sensor. Use a finger pressed tightly against the sensor, or cover the sensor completely with electrical tape.

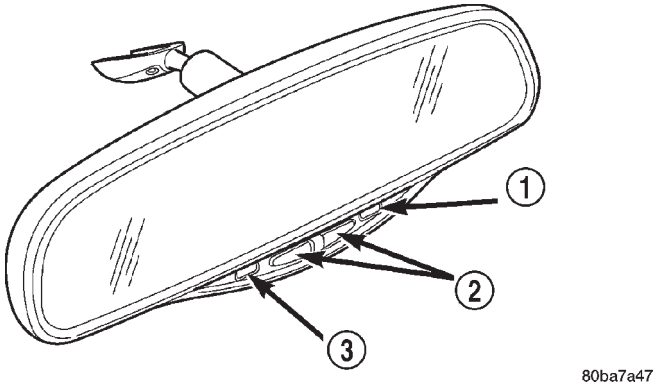


Fig. 1 Automatic Day/Night Mirror

1 - LED INDICATOR
2 - SWITCH
3 - HEADLAMP SENSOR

(7) Shine a light into the rearward facing headlamp photocell sensor. The automatic day/night mirror should darken. If OK, go to Step 8. If not OK, replace the faulty automatic day/night mirror unit.

(8) With the mirror darkened, place the transmission gear selector lever in the Reverse position. The automatic day/night mirror should return to its normal reflectance. If not OK, replace the faulty automatic day/night mirror unit.

POWER FOLD-AWAY MIRROR - EXPORT

DESCRIPTION

Some vehicles are equipped with Power Fold-Away Side View Mirrors. This feature allows both the driver and passenger side view mirrors to fold inward (retract) on demand. This feature is controlled by an additional switch located on the power mirror switch.

The fold-away side view mirror is attached to the vehicle's door in the same manner as mirrors without the fold-away option. The fold-away mirrors unique option is the internal motor which allows the mirrors to fold inward on demand. the fold-away mirror motor is not serviceable separately, and if a motor is found to be faulty the entire side view mirror must be replaced.

OPERATION

When the mirror retract switch is depressed, both of the side view mirrors will fold inward, thus making the overall width of the vehicle the smallest possible. This can be very helpful where parking space is an absolute minimum.

DIAGNOSIS AND TESTING - POWER FOLD-AWAY MIRROR - EXPORT

The most reliable, efficient and accurate means to diagnose the power mirror system requires the use of a DRB scan tool and the proper Diagnostic Procedures manual. The DRB scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, that the power mirror motors are being sent the proper hard wired outputs, and that the mirror position potentiometers are returning the proper outputs to the door modules for them to perform their power mirror system functions.

REMOVAL

The fold-away mirror motor is not serviceable separately, and if a motor is found to be faulty the entire side view mirror must be replaced. (Refer to 8 - ELECTRICAL/POWER MIRRORS/SIDEVIEW MIRROR - REMOVAL).

POWER MIRROR SWITCH

DESCRIPTION

Both the right and left power outside mirrors are controlled by a single multi-function switch unit located on the driver side front door trim panel. The power mirror switch unit includes a three-position rocker selector switch and four momentary directional push button switches.

The power mirror switch unit is integral to the Driver Door Module (DDM). The power mirror switch cannot be repaired or adjusted and, if faulty or damaged, the entire DDM unit must be replaced. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - REMOVAL) for the DDM service procedures.

OPERATION

The power mirror selector switch is moved right (right mirror control), left (left mirror control), or center to turn the power outside mirror system off. When the selector switch is in the right mirror control or left mirror control position, one of the four directional control buttons is depressed to control movement of the selected mirror up, down, right, or left. When the selector switch is in the Off position, depressing any of the directional switches will not change either mirror position.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power mirror switches.

SIDEVIEW MIRROR

DESCRIPTION

Mechanically folding, power operated outside rear view mirrors are standard equipment on this model. Each power mirror housing contains two electric motors, two drive mechanisms, an electric heating grid, the mirror glass case and the mirror glass. One motor and drive controls mirror up-and-down (vertical) movement, and the other controls right-and-left (horizontal) movement. If the vehicle is equipped with the optional memory system, each mirror head also contains two position potentiometers. One position potentiometer monitors the vertical mirror motor, and the other monitors the horizontal mirror motor.

An optional driver side automatic dimming mirror is able to automatically change its reflectance level. This mirror is controlled by the circuitry of the automatic day/night inside rear view mirror. A thin layer of electrochromic material between two pieces of conductive glass make up the face of the mirror. (Refer to 8 - ELECTRICAL/POWER MIRRORS/AUTOMATIC DAY / NIGHT MIRROR - DESCRIPTION) for more information on this feature.

The power mirror unit cannot be repaired. Only the mirror glass and glass case are serviced separately. The replacement mirror glass is supplied with an instruction sheet that details the recommended replacement procedure. If any other component of the power mirror unit is faulty or damaged, the entire power mirror unit must be replaced.

OPERATION

Each of the two outside power mirrors includes two reversible electric motors that are secured within the power mirror housing. Each motor moves the mirror case and glass through an integral drive unit. When a power mirror motor is supplied with battery current and ground, it moves the mirror case and glass through its drive unit in one direction. When the battery current and ground feeds to the motor are reversed, it moves the mirror case and glass in the opposite direction.

The power mirrors are equipped with a standard equipment electric heating grid that is applied to the back of each outside rear view mirror glass. When an electrical current is passed through the resistor wire of the heating grid, it warms the mirror glass. (Refer to 8 - ELECTRICAL/HEATED MIRRORS - DESCRIPTION) for more information on the operation of the heated mirrors and the rear window defogger system.

If the driver side mirror is equipped with the automatic dimming outside mirror option, two photocell sensors on the inside rear view mirror are used to monitor light levels and adjust the reflectance of both the inside and driver side outside mirrors. This change in reflectance helps to reduce the glare of headlamps approaching the vehicle from the rear. (Refer to 8 - ELECTRICAL/POWER MIRRORS/AUTOMATIC DAY / NIGHT MIRROR - OPERATION) for more information on this feature.

If the vehicle is equipped with the optional memory system, the Driver Door Module (DDM) and the Passenger Door Module (PDM) store the mirror position information as monitored through the mirror motor position potentiometers. When the memory system requests a recall of the stored mirror position, the DDM and the PDM are able to duplicate the stored mirror positions by moving the mirror motors until the potentiometer readings match the stored values.

SIDEVIEW MIRROR (Continued)

DIAGNOSIS AND TESTING - SIDEVIEW MIRROR

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

BOTH MIRRORS INOPERATIVE

(1) Check the operation of the power lock switch on the driver side front door. If all of the doors lock and unlock, replace the faulty Driver Door Module (DDM). If not OK, go to Step 2.

(2) Check the operation of the power lock switch on the passenger side front door. If all of the doors lock and unlock, replace the faulty DDM. If not OK, go to Step 3.

(3) Check the fused B(+) fuse in the Power Distribution Center (PDC). If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Check for battery voltage at the fused B(+) fuse in the PDC. If OK, go to Step 5. If not OK, repair the open fused B(+) circuit to the battery as required.

(5) Disconnect and isolate the battery negative cable. Remove the trim panel from the driver side front door. Disconnect the 15-way door wire harness connector from the DDM connector receptacle. Check for continuity between the ground circuit cavity of the 15-way door wire harness connector for the DDM and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the 15-way door wire harness connector for the DDM. If OK, replace the faulty DDM. If not OK, repair the open fused B(+) circuit to the fuse in the PDC as required.

ONE MIRROR INOPERATIVE

(1) If the one inoperative mirror is on the passenger side, go to Step 2. If the one inoperative mirror is on the driver side, go to Step 3.

(2) Check if the passenger front door will lock and unlock using the power lock switch on the driver side front door. If OK, go to Step 3. If not OK, go to Step 6.

(3) Disconnect and isolate the battery negative cable. Remove the trim panel from the front door. Disconnect the 12-way mirror wire harness connector from the door wire harness connector.

(4) Using two jumper wires, test the mirror as shown in the Mirror Test chart (Fig. 2). If the mirror tests OK, go to Step 5. If the mirror does not test OK, replace the faulty mirror.

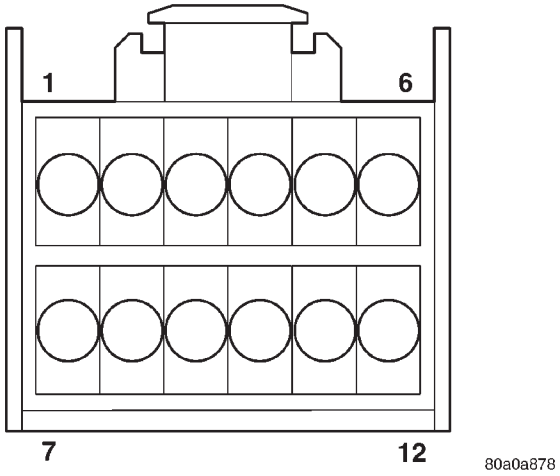


Fig. 2 Mirror Test

POWER MIRROR TEST TABLE

APPLY 12 VOLTS TO:	APPLY GROUND TO:	MIRROR REACTION
	DRIVER SIDE	
1	7	LEFT
7	1	RIGHT
8	7	UP
7	8	DOWN
	PASSENGER SIDE	
1	7	LEFT
7	1	RIGHT
8	7	UP
7	8	DOWN

(5) Disconnect the 12-way door wire harness connector from the door module connector receptacle. Check all of the circuits of the door wire harness between the connector for the mirror and the connector for the door module for opens or shorts. If all of the circuits are OK, replace the faulty door module. If any of the circuits are not OK, repair the open or shorted circuit(s) as required.

(6) Use a DRB scan tool and the proper Diagnostic Procedures manual to test and repair the faulty Programmable Communications Interface (PCI) data bus communication between the two door modules.

NO MIRROR HEAT

If one or both mirror heaters are inoperative, (Refer to 8 - ELECTRICAL/HEATED MIRRORS - DESCRIPTION).

(1) Disconnect and isolate the battery negative cable. Remove the front door trim panel on the side of the inoperative mirror heater.

(2) Disconnect the 12-way door wire harness connector from the door module connector receptacle. Check for continuity between the heater switched ground circuit cavity and the heater 12V supply circuit cavity of the 12-way door wire harness connector

SIDEVIEW MIRROR (Continued)

for the door module. There should be continuity. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to test the door module and the PCI data bus. If not OK, replace the faulty power mirror unit.

NO MIRROR DIMMING (Driver Side Only)

(1) Test the operation of the automatic day/night mirror. (Refer to 8 - ELECTRICAL/POWER MIRRORS/AUTOMATIC DAY / NIGHT MIRROR - OPERATION). If OK, go to Step 2. If not OK, repair the automatic day/night mirror unit as required.

(2) Disconnect and isolate the battery negative cable. Remove the driver side front door trim panel.

(3) Disconnect the door wire harness connector from the power mirror wire harness connector. Connect a voltmeter between the electrochromatic (+) and electrochromatic (–) circuit cavities of the door wire harness connector for the power mirror. Turn on the automatic day/night mirror system while observing the voltmeter. A voltmeter reading of 1.45 ± 0.05 volts indicates a proper dimming signal is being received at the door wire harness connector for the power mirror. If OK, replace the faulty power mirror. If not OK, repair the shorted or open electrochromatic (+) or electrochromatic (–) circuit(s) to the automatic day/night mirror as required.

NO MIRROR MEMORY

For diagnosis of the memory system, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended. (Refer to 8 - ELECTRICAL/POWER SEATS - DESCRIPTION).

POWER SEAT SYSTEM

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POWER SEAT SYSTEM

DESCRIPTION

DESCRIPTION

Driver and passenger power front seats are an available factory-installed option for this vehicle. The power seat system option allows the driver and front seat passenger to electrically adjust their seating positions for optimum control and comfort using the power seat switches located on the outboard seat cushion side shield of each front seat. The power seat system receives battery current through a fuse in the Power Distribution Center (PDC) and a circuit breaker in the junction block so that the power seats remain operational, regardless of the ignition switch position.

Four power seat options are offered on this vehicle, depending upon the model. They are as follows:

- **Six-way power drivers seat with manual passenger seat** - This power seat package is an option on Laredo models equipped with cloth-trimmed seats and includes a six-way adjustable driver seat track with manual seat back recliners.
- **Six-way power driver and passenger seat** - This power seat package is an option on Laredo models equipped with cloth or leather-trimmed seats and includes six-way adjustable seat tracks with manual seat back recliners. Heated Seats are available on leather-trimmed seats.
- **Ten-way power drivers seat with Memory and Six-way power passenger seat** - This power seat package is standard on Limited models. This option includes a six-way adjustable seat track with power seat back recliners and power lumbar supports for the driver and six-way only for the passenger.

POWER SEAT SYSTEM (Continued)

• **Ten-way power drivers and passenger seats with Memory** - This power seat option is standard on Overland models and optional on Limited models. This option includes a six-way adjustable seat cushion track with power seat back recliners and power lumbar supports. Heated Seats are standard with this option.

Refer to **Heated Seat System** for more information on the heated seat option. Refer to **Memory System** in the Memory System section of this group for more information on the memory system.

The power seat system includes the following components:

- Power lumbar adjuster (ten-way power seat only)
- Power lumbar switch (ten-way power seat only)
- Power seat recliner (ten-way power seat only)
- Power seat switch
- Power seat track.

Refer to **Power Seat** in Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the major components in the power seat/ memory seat system.

DESCRIPTION - MEMORY SYSTEM

An electronic memory system is standard equipment on the Limited model. The memory system is able to store and recall the driver side power seat positions (including the power recliner position), and both outside power mirror positions for two drivers. For vehicles with a radio connected to the Programmable Communications Interface (PCI) data bus network, the memory system is also able to store and recall up to twenty - ten AM and ten FM - radio station presets for two drivers. The memory system also will store and recall the last station listened to for each driver, even if it is not one of the twenty preset stations.

The memory system will automatically return to all of these settings when the corresponding numbered and color-coded button (Driver 1 - Black, or Driver 2 - Gray) of the memory switch on the driver side front door trim panel is depressed, or when the doors are unlocked using the corresponding numbered and color-coded (Driver 1 - Black, or Driver 2 - Gray) Remote Keyless Entry (RKE) transmitter. A customer programmable feature of the memory system allows the RKE recall of memory features to be disabled in cases where there are more than two drivers of the vehicle.

The memory system also has a customer programmable easy exit feature that will move the driver seat rearward 55 millimeters (two inches) or to the end of its travel, whichever occurs first, when the key is removed from the ignition switch lock cylinder.

A Memory Seat Module (MSM) or Memory Heated Seat Module (MHSM) are used on this model to control and integrate the many electronic functions and features included in the memory system. On vehicles equipped with the heated seat system option, the MHSM also controls the functions and features of that system.

The memory system includes the following components:

- Memory seat module (or memory heated seat module)
- Memory switch
- Position potentiometers on both outside power mirrors
- Position potentiometers on the driver side power seat track and power seat recliner motors.
- Radio receiver (if PCI data bus capable).

Certain functions and features of the memory system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB® scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect memory system operation are as follows:

• **Body Control Module (BCM)** - Refer to **Body Control Module** in Electronic Control Modules for more information.

• **Driver Door Module (DDM)** - Refer to **Door Module** in Electronic Control Modules for more information.

• **Electronic Vehicle Information Center (EVIC)** - Refer to **Electronic Vehicle Information Center** in Overhead Console Systems for more information.

• **Passenger Door Module (PDM)** - Refer to **Door Module** in Electronic Control Modules for more information.

• **Powertrain Control Module (PCM)** - Refer to **Powertrain Control Module** in Electronic Control Modules for more information.

• **Radio Receiver** - Refer to **Radio Receiver** in Audio Systems for more information.

Refer to **Heated Seat System** for more information on this system. Refer to **Remote Keyless Entry System** in Power Lock Systems for more information on the RKE system. Refer to **Power Mirror** in Power Mirror Systems for more information on the

mirror position potentiometers. Refer to **Power Seat Track** and **Power Seat Recliner** in the Power Seat System section of this group for more information on the driver side power seat position potentiometers.

Refer to **Power Seat** in Wiring Diagrams for complete circuit diagrams. Following are general descriptions of the remaining major components in the factory-installed memory system.

OPERATION

OPERATION - POWER SEAT SYSTEM

The power seat system allows the driver and/or front passenger seating positions to be adjusted electrically and independently using the separate power seat switches found on the outboard seat cushion side shield of each front seat. See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power seat system.

OPERATION - MEMORY SYSTEM

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the memory system. For diagnosis of the MSM, the PCI data bus, or the other electronic modules on the PCI data bus that provide inputs and outputs for the memory system, the use of a DRB® scan tool and the proper Diagnostic Procedures manual are recommended.

DRIVER AND PASSENGER DOOR MODULES

The Driver Door Module (DDM) monitors the memory switch through a hard wired circuit. It also monitors the unlock messages from the Remote Keyless Entry (RKE) receiver in the Passenger Door Module (PDM) sent over the Programmable Communications Interface (PCI) data bus. The DDM is programmed to send memory recall messages and memory system status messages over the PCI data bus to the other electronic modules when it detects a memory recall request.

Refer to **Door Module** in Electronic Control Modules for more information on the DDM and PDM.

ELECTRONIC VEHICLE INFORMATION CENTER

The Electronic Vehicle Information Center (EVIC) serves as the user interface for the memory system. It displays memory system status messages and provides the user with the means for enabling and disabling the many customer programmable features available on the vehicle, including those for the memory system.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the EVIC. Refer to **Electronic Vehicle Information Center** in Overhead Console Systems for more information on the EVIC.

DIAGNOSIS AND TESTING

DIAGNOSIS & TESTING - POWER SEAT SYSTEM

Following are tests that will help to diagnose the hard wired components and circuits of the power seat system. However, if the vehicle is also equipped with the optional memory system, these tests may not prove conclusive in the diagnosis of the driver side power seat. In order to obtain conclusive testing of the driver side power seat with the memory system option, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked.

The most reliable, efficient, and accurate means to diagnose the driver side power seat with the memory system option requires the use of a DRB® scan tool and the proper Diagnostic Procedures manual. The DRB® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the memory system is receiving the proper hard wired inputs and relaying the proper hard wired outputs to perform its driver side power seat functions.

Before any testing of the power seat system is attempted, the battery should be fully-charged and all of the power seat system wire harness connections and pins cleaned and tightened to ensure proper circuit continuity and ground paths. For complete circuit diagrams, refer to **Power Seat** in Wiring Diagrams.

With the dome lamp on, apply the power seat switch in the direction of the failure. If the dome lamp dims, the seat may be jamming. Check under and behind the seat for binding or obstructions. If the dome lamp does not dim, proceed with testing of the individual components and circuits.

DIAGNOSIS & TESTING - MEMORY SYSTEM

Following are tests that will help to diagnose the components and circuits that provide hard wired inputs to the memory system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the memory system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked.

The most reliable, efficient, and accurate means to diagnose the memory system requires the use of a DRB® scan tool and the proper Diagnostic Procedures manual. The DRB® scan tool can provide confirmation that the PCI data bus is functional, that all

POWER SEAT SYSTEM (Continued)

of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the memory system is receiving the proper hard wired inputs and relaying the proper hard wired outputs to perform its functions.

DRIVER SEAT SWITCH

DESCRIPTION

Two different power seat switches are used on this vehicle, depending upon the optional power seat system installed in the vehicle. The six-way power seats are each equipped with a switch featuring three switch control knobs ganged together on the outboard seat cushion side shield (Fig. 1). The ten-way power seats are each equipped with a switch featuring two knobs ganged together on the outboard seat cushion side shield (Fig. 2).

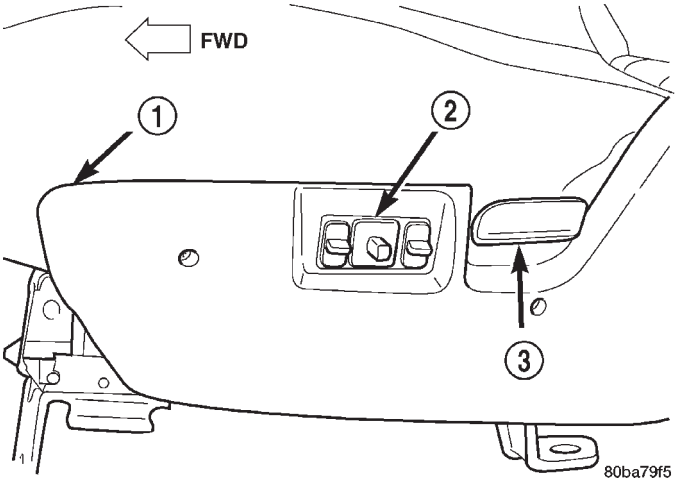


Fig. 1 Six-Way Power Seat Switches - Typical

1 - OUTBOARD SEAT CUSHION SIDE SHIELD
2 - POWER SEAT TRACK SWITCHES
3 - MECHANICAL SEAT BACK RECLINER LEVER

The switch units for both power seat types are secured to the back of the seat cushion side shield with two screws. However, the control knobs for the six-way power seat switch unit remain installed during switch unit removal and installation, while both knobs for the ten-way power seat switch unit must be removed.

The individual switches in both power seat switch units cannot be repaired. If one switch is damaged or faulty, the entire power seat switch unit must be replaced.

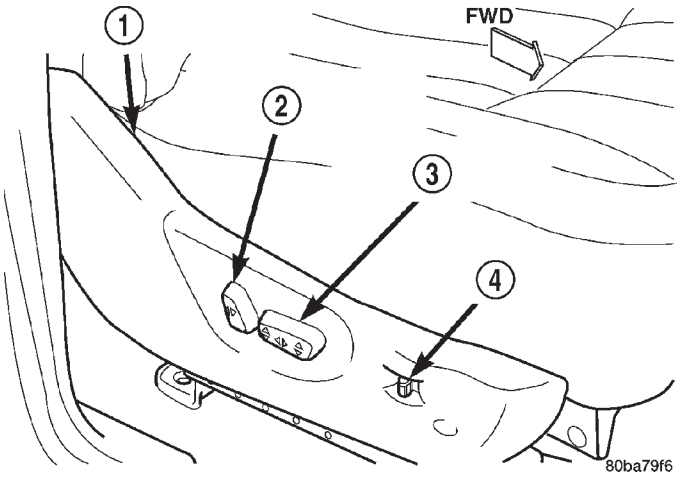


Fig. 2 Ten-Way Power Seat Switches - Typical

1 - OUTBOARD CUSHION SIDE SHIELD
2 - POWER SEAT RECLINER SWITCH
3 - POWER SEAT TRACK SWITCH
4 - POWER LUMBAR SWITCH

OPERATION

The power seat tracks of both the six-way and the ten-way power seat systems can be adjusted in six different ways using the power seat switches. The ten-way system has the additional power seat recliner switch integral to the power seat switch and also has a separate, stand-alone switch to control the power lumbar adjuster. See the owner's manual in the vehicle glove box for more information on the power seat switch functions and the seat adjusting procedures.

When a power switch control knob or knobs are actuated, a battery feed and a ground path are applied through the switch contacts to the power seat track or recliner adjuster motor. The selected adjuster motor operates to move the seat track or recliner through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

No power seat switch should be held applied in any direction after the adjuster has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

DRIVER SEAT SWITCH (Continued)

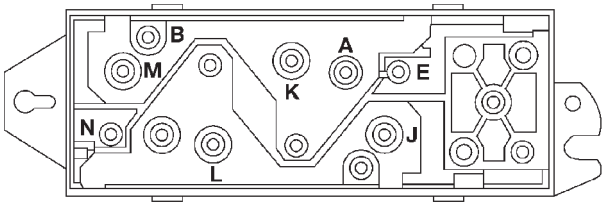
DIAGNOSIS AND TESTING - DRIVER SEAT SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power seat switch from the outboard seat cushion side shield. Refer to the procedure in this section of the manual.

(3) Use an ohmmeter to test the continuity of the power seat switch in each switch position. See the Power Seat Switch Continuity chart (Fig. 3) or (Fig. 4). If OK, refer to **Diagnosis and Testing Power Seat Track** or **Diagnosis and Testing Power Seat Recliner** in this section. If not OK, replace the faulty power seat switch.

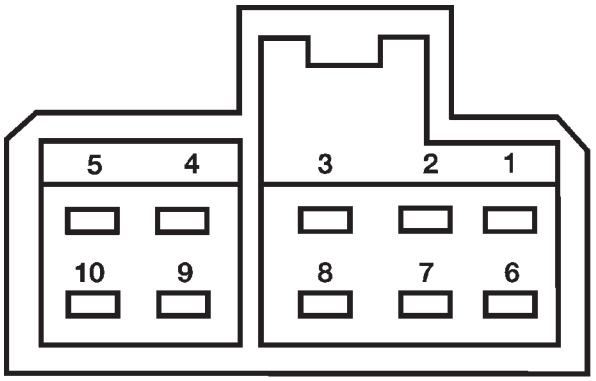


LEFT SIDE SHOWN
(ROTATE 180° FOR RIGHT SIDE)

SIX-WAY POWER SEAT SWITCH TEST		
LEFT SWITCH POSITION	RIGHT SWITCH POSITION	CONTINUITY BETWEEN
OFF	OFF	B-N, B-J, B-M, B-E, B-L, B-K
VERTICAL UP	VERTICAL DOWN	A-J, A-N, B-M, B-E
VERTICAL DOWN	VERTICAL UP	A-E, A-M, B-N, B-J
HORIZONTAL FORWARD	HORIZONTAL REARWARD	A-K, B-L
FRONT TILT UP	FRONT TILT DOWN	A-J, B-E
FRONT TILT DOWN	FRONT TILT UP	A-E, B-J
REAR TILT UP	REAR TILT DOWN	A-N, B-M
REAR TILT DOWN	REAR TILT UP	A-M, B-N

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Fig. 3 Rear Of Six-Way Power Seat Switch



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Fig. 4 Ten-Way Power Seat Switch Connector Receptacle

SWITCH POSITION	CONTINUITY BETWEEN PINS	
	LEFT SEAT	RIGHT SEAT
OFF	PIN 1 to 2	PIN 1 to 2
	PIN 1 to 3	PIN 1 to 3
	PIN 1 to 4	PIN 1 to 4
	PIN 1 to 6	PIN 1 to 6
	PIN 1 to 7	PIN 1 to 7
	PIN 1 to 8	PIN 1 to 8
	PIN 1 to 9	PIN 1 to 9
	PIN 1 to 10	PIN 1 to 10
FRONT RISER UP	PIN 1 to 10	PIN 1 to 7
	PIN 5 to 7	PIN 5 to 10
FRONT RISER DOWN	PIN 1 to 7	PIN 1 to 10
	PIN 5 to 10	PIN 5 to 7
CENTER SWITCH FORWARD	PIN 1 to 3	PIN 1 to 3
	PIN 5 to 6	PIN 5 to 6
CENTER SWITCH REARWARD	PIN 1 to 6	PIN 1 to 6
	PIN 3 to 5	PIN 3 to 5
REAR RISER UP	PIN 1 to 9	PIN 1 to 8
	PIN 5 to 8	PIN 5 to 9
REAR RISER DOWN	PIN 1 to 8	PIN 1 to 9
	PIN 5 to 9	PIN 5 to 8
RECLINER UP	PIN 1 to 4	PIN 1 to 4
	PIN 2 to 5	PIN 2 to 5
RECLINER DOWN	PIN 1 to 2	PIN 1 to 2
	PIN 4 to 5	PIN 4 to 5

DRIVER SEAT SWITCH (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) On models with the ten-way power seat system only, using a push pin remover or another suitable wide flat-bladed tool, gently pry the power seat and power recliner switch knobs off of the switch stems (Fig. 5).

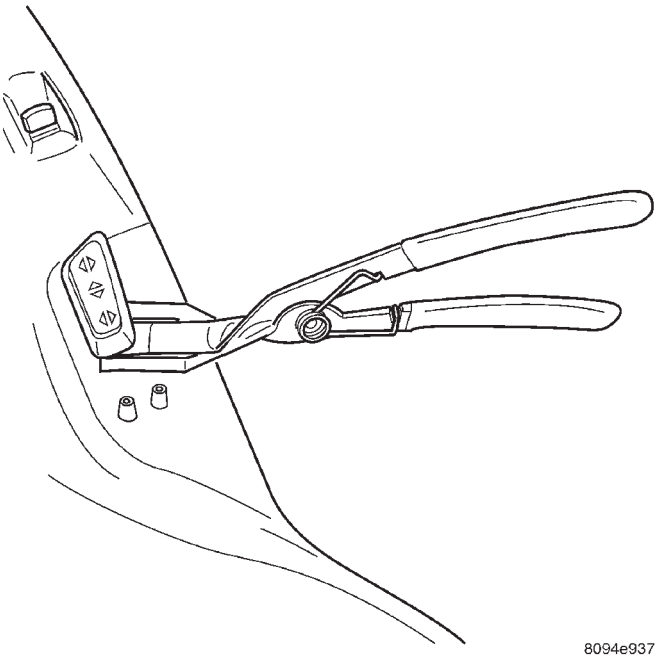


Fig. 5 Removing Switch Control Knobs - Typical

(3) Remove the three screws that secure the outboard seat cushion side shield to the seat cushion frame.

(4) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power seat switch wire harness connector.

(5) Disconnect the power seat wire harness connector from the power seat switch connector receptacle.

(6) Remove the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield (Fig. 6) or (Fig. 7).

(7) Remove the power seat switch from the outboard seat cushion side shield.

INSTALLATION

(1) Position the power seat switch onto the outboard seat cushion side shield.

(2) Install and tighten the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(3) Reconnect the power seat wire harness connector to the power seat switch connector receptacle.

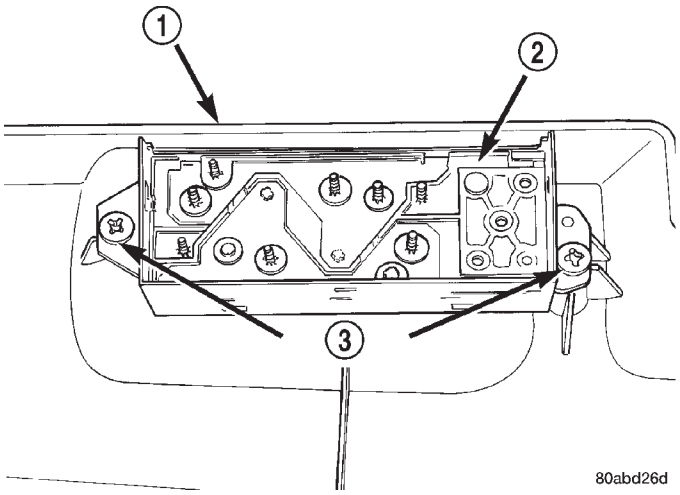


Fig. 6 Six-Way Power Seat Switches Remove/Install

1 - SEAT SIDE SHIELD
2 - POWER SEAT SWITCH
3 - SCREWS

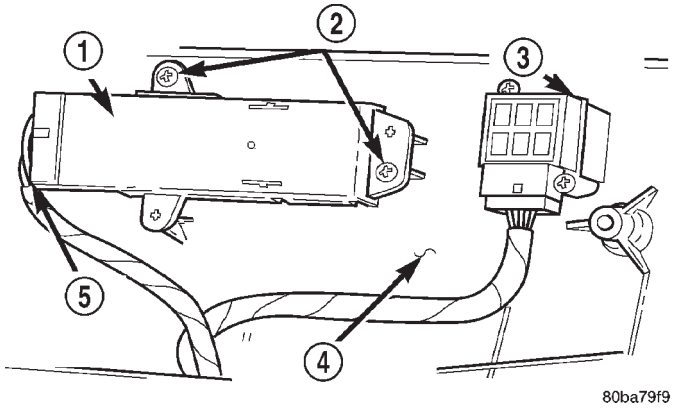


Fig. 7 Ten-Way Power Seat Switches Remove/Install

1 - POWER SEAT SWITCH
2 - SCREWS (2)
3 - POWER LUMBAR SWITCH
4 - SEAT CUSHION SIDE SHIELD
5 - WIRE HARNESS CONNECTOR

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the three screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) On models with the ten-way power seat system only, position the power seat and power recliner switch knobs onto the switch stems and push on them firmly and evenly until they snap into place.

(7) Reconnect the battery negative cable.

LUMBAR CONTROL SWITCH

DESCRIPTION

The ten-way power seat option includes an electrically operated lumbar support mechanism. A single two-way momentary power lumbar switch is located on the outboard seat cushion side shield of each front seat, just forward of the other power seat switches (Fig. 8). The power lumbar switch is secured to the back of the seat cushion side shield with two screws, and the switch paddle protrudes through a hole to the outside of the shield. The switch paddle is located in a shallow depression molded into the outer surface of the seat cushion side shield that helps to shroud it from unintentional actuation when entering or leaving the vehicle.

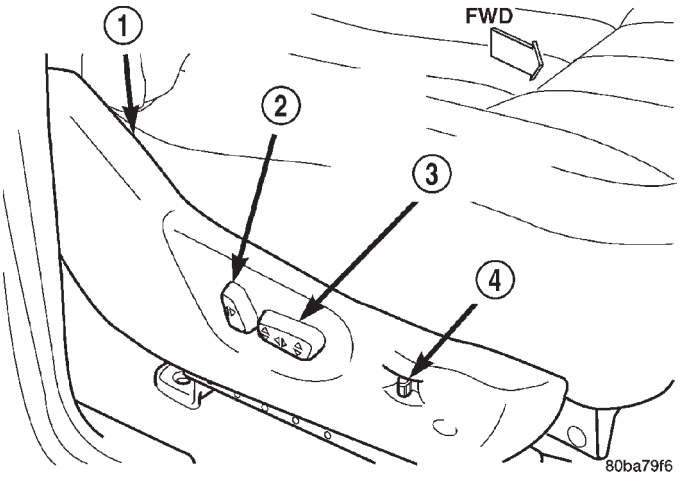


Fig. 8 Ten-Way Power Seat Switches

1 - OUTBOARD CUSHION SIDE SHIELD
2 - POWER SEAT RECLINER SWITCH
3 - POWER SEAT TRACK SWITCH
4 - POWER LUMBAR SWITCH

The power lumbar switches cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.

OPERATION

When the power lumbar switch paddle is actuated, a battery feed and a ground path are applied through the switch contacts to the power lumbar adjuster motor. The motor operates to move the lumbar adjuster through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the motor to run in the opposite direction.

The power lumbar switch should not be held applied in either direction after the adjuster has reached its travel limit. The power lumbar adjuster motor contains a self-resetting circuit breaker to protect it from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

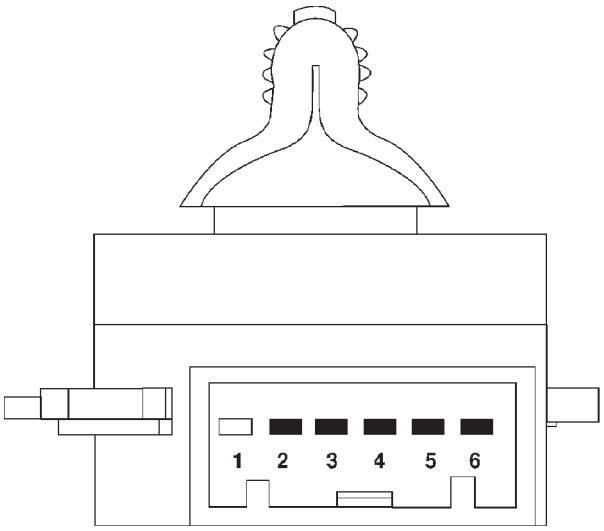
DIAGNOSIS AND TESTING - POWER LUMBAR SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power lumbar switch from the outboard seat cushion side shield. Refer to the procedure in this section of the manual.

(3) Use an ohmmeter to test the continuity of the power lumbar switch in each switch position. See the Power Lumbar Switch Continuity chart (Fig. 9). If OK, refer to **Power Lumbar Adjuster Diagnosis and Testing** in this group. If not OK, replace the faulty power lumbar switch.



POWER LUMBAR SWITCH		
LEFT SWITCH POSITION	RIGHT SWITCH POSITION	CONTINUITY BETWEEN
Off	Off	2-4, 3-5
Forward	Rearward	3-5, 4-6
Rearward	Forward	2-4, 3-6

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Fig. 9 Power Lumbar Switch

REMOVAL

(1) Disconnect and isolate the battery negative cable.

LUMBAR CONTROL SWITCH (Continued)

(2) Remove the three screws that secure the outboard seat cushion side shield to the seat cushion frame.

(3) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power lumbar switch wire harness connector.

(4) Disconnect the power seat wire harness connector from the power lumbar switch connector receptacle (Fig. 10).

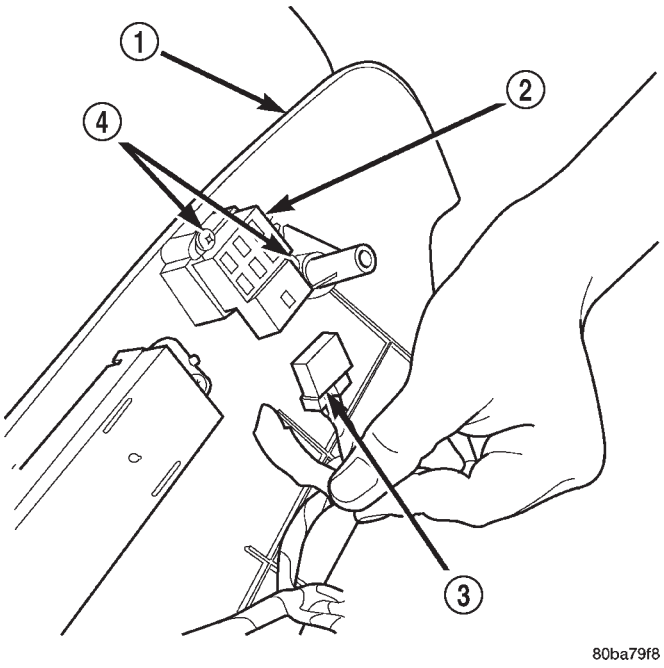


Fig. 10 Power Lumbar Switch Remove/Install

1 - OUTBOARD SEAT CUSHION SIDE SHIELD
2 - POWER LUMBAR SWITCH
3 - WIRE HARNESS CONNECTOR
4 - SCREWS (2)

(5) Remove the two screws that secure the power lumbar switch to the inside of the outboard seat cushion side shield.

(6) Remove the power lumbar switch from the outboard seat cushion side shield.

INSTALLATION

(1) Position the power lumbar switch onto the outboard seat cushion side shield.

(2) Install and tighten the two screws that secure the power lumbar switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(3) Reconnect the power seat wire harness connector to the power lumbar switch connector receptacle.

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the three screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) Reconnect the battery negative cable.

LUMBAR MOTOR

DESCRIPTION

The ten-way power seat option includes an electrically operated lumbar support mechanism. The only visible evidence of this option is the separate power lumbar switch control paddle that is located on the outboard seat cushion side shield, just forward of the other power seat switch control knobs. The power lumbar adjuster and motor are concealed beneath the seat back trim cover and padding, where they are secured to a molded plastic back panel and to the seat back frame (Fig. 11).

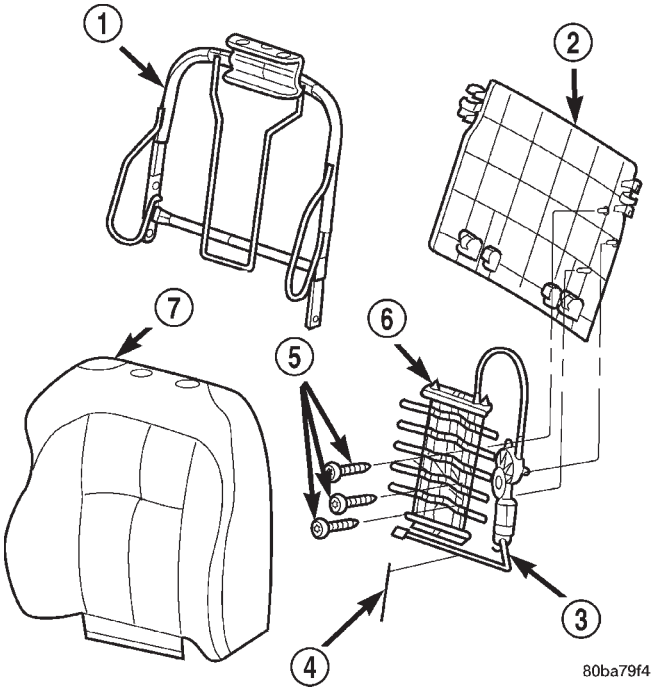


Fig. 11 Power Lumbar Adjuster

1 - SEAT BACK FRAME
2 - SEAT BACK PANEL
3 - LUMBAR MOTOR PIGTAIL TO SEAT WIRE HARNESS
4 - TIE WRAP
5 - SCREW (3)
6 - POWER LUMBAR ADJUSTER
7 - SEAT BACK TRIM COVER AND PADDING

The power lumbar adjuster cannot be repaired, and is serviced only as a unit with the seat back frame. If the power lumbar adjuster or the seat back frame are damaged or faulty, the entire seat back frame unit must be replaced.

LUMBAR MOTOR (Continued)

OPERATION

The power lumbar adjuster mechanism includes a reversible electric motor that is secured to the inboard side of the seat back panel and is connected to a worm-drive gearbox. The motor and gearbox operate the lumbar adjuster mechanism in the center of the seat back by extending and retracting a cable that actuates a lever. The action of this lever compresses or relaxes a grid of flexible slats. The more this grid is compressed, the more the slats bow outward against the center of the seat back padding, providing additional lumbar support.

DIAGNOSIS AND TESTING - POWER LUMBAR ADJUSTER

Actuate the power lumbar switch to move the power lumbar adjuster in each direction. The power lumbar adjuster should move in both directions. It should be noted that the power lumber adjuster normally operates very quietly and exhibits little visible movement. If the power lumbar adjuster fails to operate in only one direction, move the adjuster a short distance in the opposite direction and test again to be certain that the adjuster is not at its travel limit. If the power lumbar adjuster still fails to operate in only one direction, refer to **Diagnosis and Testing Power Lumbar Switch** in this group. If the power lumbar adjuster fails to operate in either direction, perform the following tests. For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Check the power seat circuit breaker in the junction block. If OK, go to Step 2. If not OK, replace the faulty power seat circuit breaker.

(2) Check for battery voltage at the power seat circuit breaker in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the fuse in the Power Distribution Center as required.

(3) Remove the outboard seat cushion side shield from the seat. Disconnect the seat wire harness connector from the power lumbar switch connector receptacle. Check for battery voltage at the fused B(+) circuit cavity of the power seat wire harness connector for the power lumbar switch. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the power seat circuit breaker in the junction block as required.

(4) Check for continuity between the ground circuit cavity of the power seat wire harness connector for the power lumbar switch and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Test the power lumbar switch. Refer to **Diagnosis and Testing Power Lumbar Switch** in this group. If the switch tests OK, test the circuits of the power seat wire harness between the power lumbar adjuster motor and the power lumbar switch for shorts or opens. If the circuits check OK, replace the faulty seat back frame assembly. If the circuits are not OK, repair the power seat wire harness as required.

MEMORY SET SWITCH

DESCRIPTION

Vehicles equipped with the memory system have a memory switch mounted to the driver side front door trim panel (Fig. 12). This switch is used to set and recall all of the memory system settings for up to two drivers. The memory switch is a resistor multiplexed unit that is hard wired to the Driver Door Module (DDM), which is also located on the driver side front door trim panel. The DDM sends out the memory system set and recall requests to the other electronic modules over the Programmable Communications Interface (PCI) data bus.

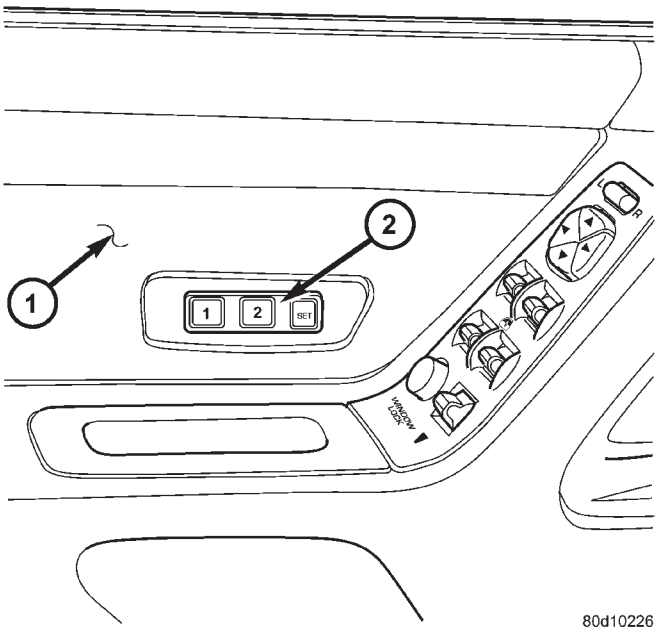


Fig. 12 WJ/WG MEMORY SELECT/SET SWITCH

1 - DRIVER TRIM PANEL
2 - MEMORY SWITCH

The memory switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced. For complete circuit diagrams, refer to **Wiring Diagrams**.

OPERATION

The memory switch has three momentary switch buttons labeled Set, 1 and 2. The Driver 1 and Driver 2 buttons are back-lit with Light-Emitting Diodes

MEMORY SET SWITCH (Continued)

(LED) for visibility, and are also color-coded to coincide with the color-coded Driver 1 and Driver 2 Remote Keyless Entry (RKE) transmitters. The Driver 1 memory switch button and RKE transmitter are black, and the Driver 2 memory switch button and RKE transmitter are gray. The memory switch Set button also has an LED that will illuminate and flash to indicate that the memory system is in the set mode. This LED will automatically be extinguished when a set request has been successfully completed.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the memory switch. For diagnosis of the memory switch, the DDM or the PCI data bus, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

DIAGNOSIS AND TESTING - MEMORY SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the driver side front door trim panel. Refer to the Body section for the procedure.

(3) Disconnect the memory switch wire harness connector from the driver door module connector receptacle.

(4) Use an ohmmeter to test the resistances of the memory switch in each switch position. See the Memory Switch Test chart MEMORY SWITCH TEST . If OK, refer to **Memory System Diagnosis and Testing** in this group. If not OK, replace the faulty memory switch.

MEMORY SWITCH TEST

MEMORY SWITCH POSITION	RESISTANCE BETWEEN	RESISTANCE RANGE (OHMS)
NEUTRAL	A&D	14000 ± 1%
MEMORY 1	A&B	4600 ± 1%
MEMORY 2	A&B	1700 ± 1%
SET	A&B	300 ± 1%

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the driver side front door. Refer to **Front Door Trim Panel** in Body for the procedure.

(3) Disconnect the memory switch wire harness connector from the driver door module connector receptacle.

(4) Remove the two screws that secure the memory switch to the back of the driver side front door trim panel.

(5) Remove the memory switch from the back of the driver side front door trim panel.

INSTALLATION

(1) Position the memory switch onto the back of the driver side front door trim panel.

(2) Install and tighten the two screws that secure the memory switch to the back of the driver side front door trim panel. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reconnect the memory switch wire harness connector to the driver door module connector receptacle.

(4) Install the trim panel onto the driver side front door. Refer to **Front Door Trim Panel** in Body for the procedure.

(5) Reconnect the battery negative cable.

PASSENGER SEAT SWITCH

DESCRIPTION

Two different power seat switches are used on this vehicle, depending upon the optional power seat system installed in the vehicle. The six-way power seats are each equipped with a switch featuring three switch control knobs ganged together on the outboard seat cushion side shield (Fig. 13). The ten-way power seats are each equipped with a switch featuring two knobs ganged together on the outboard seat cushion side shield (Fig. 14).

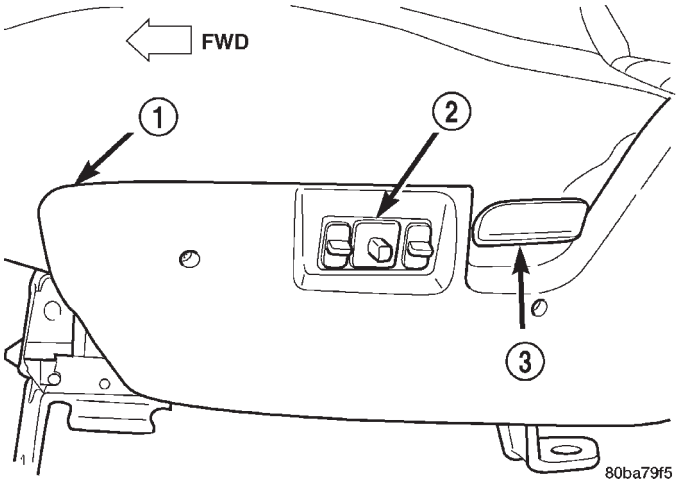


Fig. 13 Six-Way Power Seat Switches - Typical

1 - OUTBOARD SEAT CUSHION SIDE SHIELD
2 - POWER SEAT TRACK SWITCHES
3 - MECHANICAL SEAT BACK RECLINER LEVER

The switch units for both power seat types are secured to the back of the seat cushion side shield with two screws. However, the control knobs for the six-way power seat switch unit remain installed dur-

PASSENGER SEAT SWITCH (Continued)

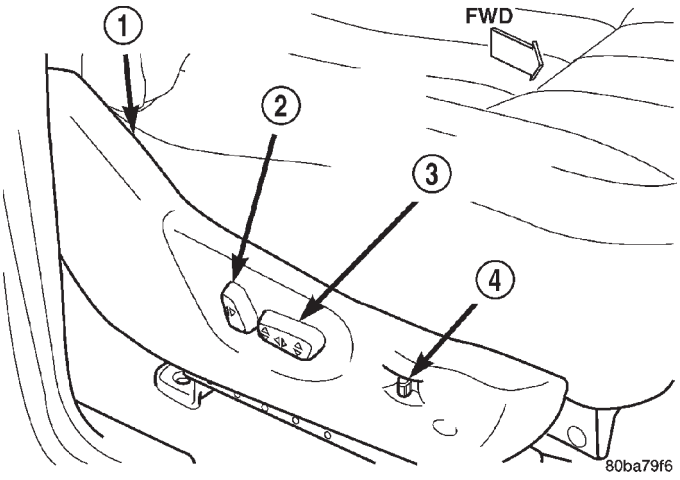


Fig. 14 Ten-Way Power Seat Switches - Typical

1 - OUTBOARD CUSHION SIDE SHIELD
2 - POWER SEAT RECLINER SWITCH
3 - POWER SEAT TRACK SWITCH
4 - POWER LUMBAR SWITCH

ing switch unit removal and installation, while both knobs for the ten-way power seat switch unit must be removed.

The individual switches in both power seat switch units cannot be repaired. If one switch is damaged or faulty, the entire power seat switch unit must be replaced.

OPERATION

The power seat tracks of both the six-way and the ten-way power seat systems can be adjusted in six different ways using the power seat switches. The ten-way system has the additional power seat recliner switch integral to the power seat switch and also has a separate, stand-alone switch to control the power lumbar adjuster. See the owner's manual in the vehicle glove box for more information on the power seat switch functions and the seat adjusting procedures.

When a power switch control knob or knobs are actuated, a battery feed and a ground path are applied through the switch contacts to the power seat track or recliner adjuster motor. The selected adjuster motor operates to move the seat track or recliner through its drive unit in the selected direction until the switch is released, or until the travel limit of the adjuster is reached. When the switch is moved in the opposite direction, the battery feed and ground path to the motor are reversed through the switch contacts. This causes the adjuster motor to run in the opposite direction.

No power seat switch should be held applied in any direction after the adjuster has reached its travel limit. The power seat adjuster motors each contain a self-resetting circuit breaker to protect them from overload. However, consecutive or frequent resetting of the circuit breaker must not be allowed to continue, or the motor may be damaged.

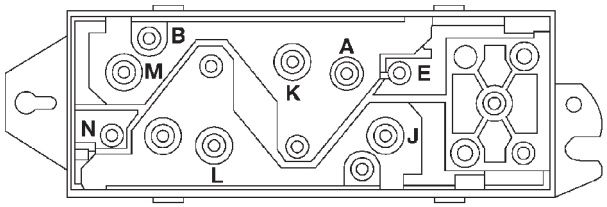
DIAGNOSIS AND TESTING - PASSENGER SEAT SWITCH

For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power seat switch from the outboard seat cushion side shield. Refer to the procedure in this section of the manual.

(3) Use an ohmmeter to test the continuity of the power seat switch in each switch position. See the Power Seat Switch Continuity chart (Fig. 15) or (Fig. 16). If OK, refer to **Diagnosis and Testing Power Seat Track** or **Diagnosis and Testing Power Seat Recliner** in this section. If not OK, replace the faulty power seat switch.



LEFT SIDE SHOWN
(ROTATE 180° FOR RIGHT SIDE)

SIX-WAY POWER SEAT SWITCH TEST		
LEFT SWITCH POSITION	RIGHT SWITCH POSITION	CONTINUITY BETWEEN
OFF	OFF	B-N, B-J, B-M, B-E, B-L, B-K
VERTICAL UP	VERTICAL DOWN	A-J, A-N, B-M, B-E
VERTICAL DOWN	VERTICAL UP	A-E, A-M, B-N, B-J
HORIZONTAL FORWARD	HORIZONTAL REARWARD	A-K, B-L
FRONT TILT UP	FRONT TILT DOWN	A-J, B-E
FRONT TILT DOWN	FRONT TILT UP	A-E, B-J
REAR TILT UP	REAR TILT DOWN	A-N, B-M
REAR TILT DOWN	REAR TILT UP	A-M, B-N

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Fig. 15 Rear Of Six-Way Power Seat Switch

PASSENGER SEAT SWITCH (Continued)

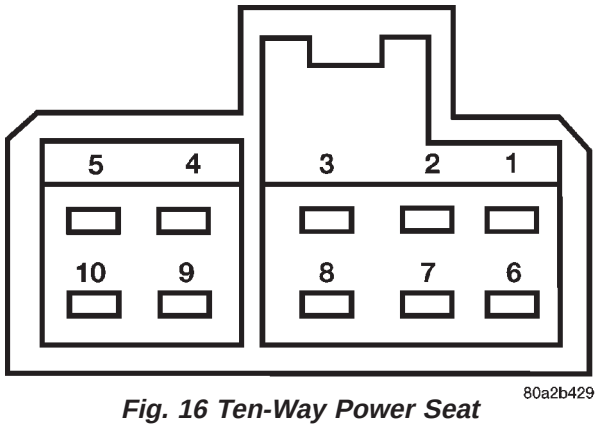


Fig. 16 Ten-Way Power Seat Switch Connector Receptacle

SWITCH POSITION	CONTINUITY BETWEEN PINS	
	LEFT SEAT	RIGHT SEAT
OFF	PIN 1 to 2	PIN 1 to 2
	PIN 1 to 3	PIN 1 to 3
	PIN 1 to 4	PIN 1 to 4
	PIN 1 to 6	PIN 1 to 6
	PIN 1 to 7	PIN 1 to 7
	PIN 1 to 8	PIN 1 to 8
	PIN 1 to 9	PIN 1 to 9
	PIN 1 to 10	PIN 1 to 10
FRONT RISER UP	PIN 1 to 10	PIN 1 to 7
	PIN 5 to 7	PIN 5 to 10
FRONT RISER DOWN	PIN 1 to 7	PIN 1 to 10
	PIN 5 to 10	PIN 5 to 7
CENTER SWITCH FORWARD	PIN 1 to 3	PIN 1 to 3
	PIN 5 to 6	PIN 5 to 6
CENTER SWITCH REARWARD	PIN 1 to 6	PIN 1 to 6
	PIN 3 to 5	PIN 3 to 5
REAR RISER UP	PIN 1 to 9	PIN 1 to 8
	PIN 5 to 8	PIN 5 to 9
REAR RISER DOWN	PIN 1 to 8	PIN 1 to 9
	PIN 5 to 9	PIN 5 to 8
RECLINER UP	PIN 1 to 4	PIN 1 to 4
	PIN 2 to 5	PIN 2 to 5
RECLINER DOWN	PIN 1 to 2	PIN 1 to 2
	PIN 4 to 5	PIN 4 to 5

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) On models with the ten-way power seat system only, using a push pin remover or another suitable wide flat-bladed tool, gently pry the power seat and power recliner switch knobs off of the switch stems (Fig. 17).

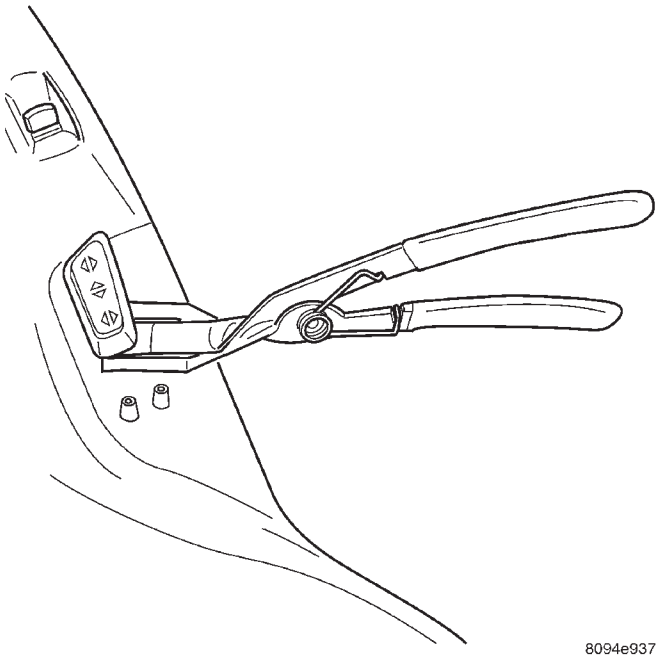


Fig. 17 Removing Switch Control Knobs - Typical

(3) Remove the three screws that secure the outboard seat cushion side shield to the seat cushion frame.

(4) Pull the outboard seat cushion side shield away from the seat cushion frame far enough to access the power seat switch wire harness connector.

(5) Disconnect the power seat wire harness connector from the power seat switch connector receptacle.

(6) Remove the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield (Fig. 18) or (Fig. 19).

(7) Remove the power seat switch from the outboard seat cushion side shield.

INSTALLATION

(1) Position the power seat switch onto the outboard seat cushion side shield.

(2) Install and tighten the two screws that secure the power seat switch to the inside of the outboard seat cushion side shield. Tighten the screws to 1.5 N·m (14 in. lbs.).

(3) Reconnect the power seat wire harness connector to the power seat switch connector receptacle.

PASSENGER SEAT SWITCH (Continued)

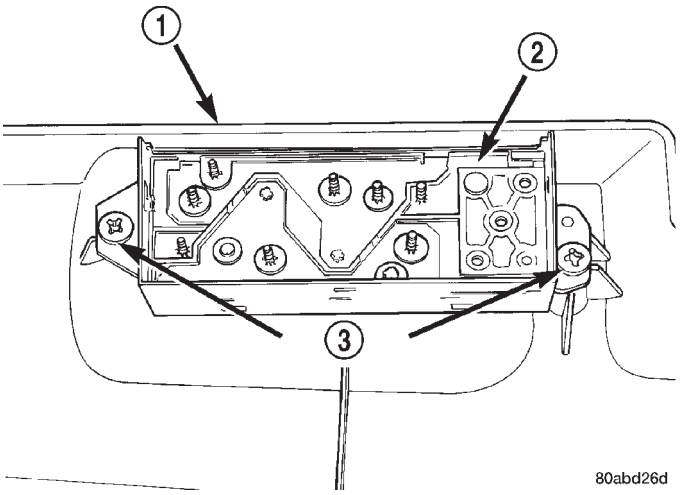


Fig. 18 Six-Way Power Seat Switches Remove/ Install

1 - SEAT SIDE SHIELD
2 - POWER SEAT SWITCH
3 - SCREWS

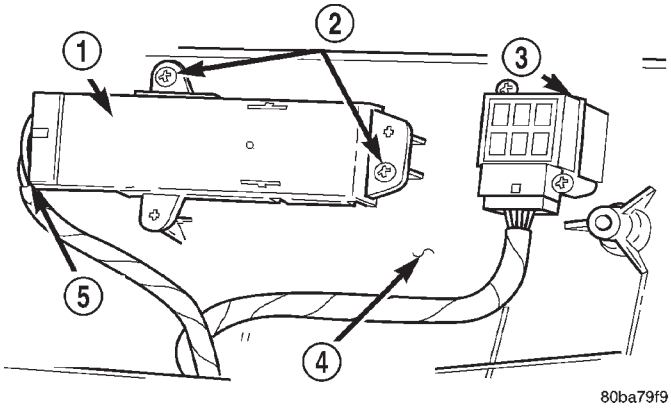


Fig. 19 Ten-Way Power Seat Switches Remove/ Install

1 - POWER SEAT SWITCH
2 - SCREWS (2)
3 - POWER LUMBAR SWITCH
4 - SEAT CUSHION SIDE SHIELD
5 - WIRE HARNESS CONNECTOR

(4) Position the outboard seat cushion side shield onto the seat cushion frame

(5) Install and tighten the three screws that secure the outboard seat cushion side shield to the seat cushion frame. Tighten the screws to 1.5 N·m (14 in. lbs.).

(6) On models with the ten-way power seat system only, position the power seat and power recliner switch knobs onto the switch stems and push on them firmly and evenly until they snap into place.

(7) Reconnect the battery negative cable.

RECLINER MOTOR

DESCRIPTION

The ten-way power seat option includes an electrically operated seat back recliner mechanism. The only visible evidence of this option is the separate power seat recliner switch control knob that is located on the outboard seat cushion side shield, just behind the other power seat switch control knob. The power seat recliner switch is integral to the ten-way power seat switch unit, but is actuated with a separate switch knob.

The power seat recliner unit is mounted in the place of a seat hinge on the outboard side of the seat (Fig. 20). The upper hinge plate of the power seat recliner mechanism is secured with two screws to the seat back frame and is concealed beneath the seat back trim cover and padding. The lower hinge plate and the motor and drive unit of the power seat recliner mechanism is secured with two screws to the seat cushion frame, and is concealed by the outboard seat cushion side shield.

The power seat recliner cannot be repaired. If the unit is faulty or damaged, it must be replaced. Refer to **Bucket Seat Recliner** in Body for the service procedure.

OPERATION

The power seat recliner includes a reversible electric motor that is secured to the lower hinge plate of the recliner unit. The motor is connected to a gearbox that moves the upper hinge plate of the power seat recliner through a screw-type drive unit. The driver side power seat recliner motor used on models equipped with the optional memory system also has a position potentiometer integral to the motor assembly, which electronically monitors the motor position.

DIAGNOSIS AND TESTING - RECLINER MOTOR

Actuate the power seat recliner switch to move the power seat recliner adjuster in each direction. The power seat recliner adjuster should move in both directions. If the power seat recliner adjuster fails to operate in only one direction, move the adjuster a short distance in the opposite direction and test again to be certain that the adjuster is not at its travel limit. If the power seat recliner adjuster still fails to operate in only one direction, refer to **Power Seat Switch Diagnosis and Testing** in this group. If the power recliner adjuster fails to operate in either direction, perform the following tests. For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Check the power seat circuit breaker in the junction block. If OK, go to Step 2. If not OK, replace the faulty power seat circuit breaker.

RECLINER MOTOR (Continued)

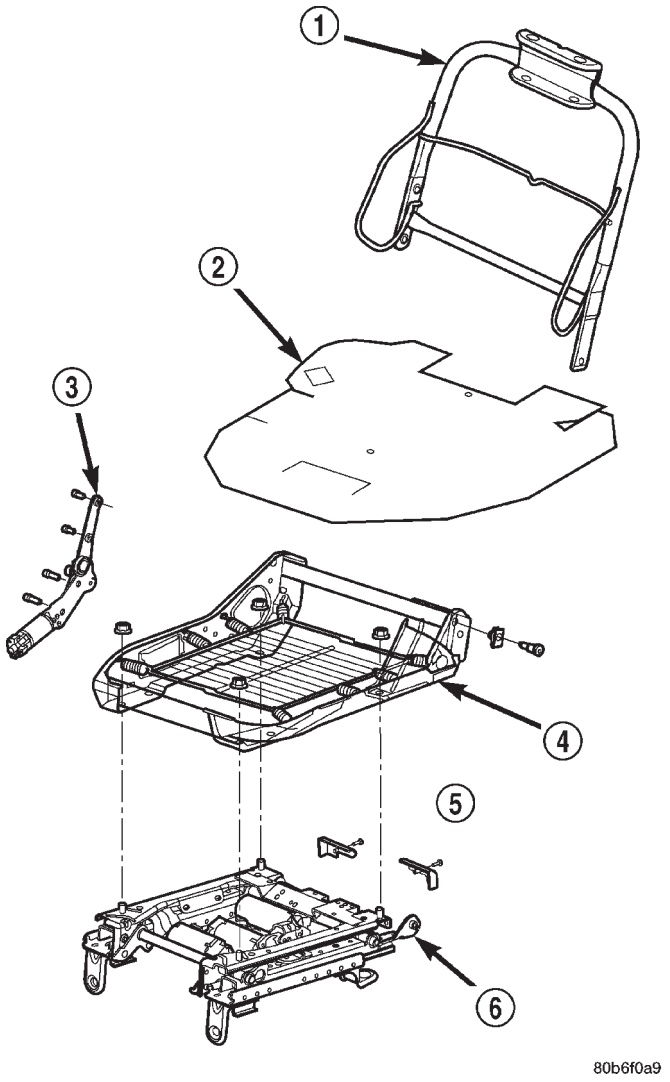


Fig. 20 Power Seat Recliner and Track - Typical

1 - SEAT BACK FRAME
2 - SEAT CUSHION PAD
3 - POWER RECLINER
4 - SEAT CUSHION FRAME
5 - SHIELD
6 - POWER SEAT TRACK ADJUSTER

(2) Check for battery voltage at the power seat circuit breaker in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the fuse in the Power Distribution Center as required.

(3) Remove the outboard seat cushion side shield from the seat. Disconnect the seat wire harness connector from the power seat switch connector receptacle. Check for battery voltage at the fused B(+) circuit cavity of the power seat wire harness connector for the power seat switch. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the power seat circuit breaker in the junction block as required.

(4) Check for continuity between the ground circuit cavity of the power seat wire harness connector for the power seat switch and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Test the power seat switch. Refer to **Power Seat Switch Diagnosis and Testing** in this group. If the switch tests OK, test the circuits of the power seat wire harness between the power seat recliner adjuster motor and the power seat switch for shorts or opens. If the circuits check OK, replace the faulty power seat recliner unit. If the circuits are not OK, repair the power seat wire harness as required.

POWER SEAT TRACK

DESCRIPTION

Both the six-way and the ten-way power seat options include a single electrically operated power seat track unit located under each front bucket seat (Fig. 21). The power seat track unit replaces the standard equipment manual seat tracks. The lower half of the power seat track is secured at the front with two screws to the floor panel seat cross member, and at the rear with two screws to the floor panel. Four nuts secure the bottom of the seat cushion frame to four studs on the upper half of the power seat track unit.

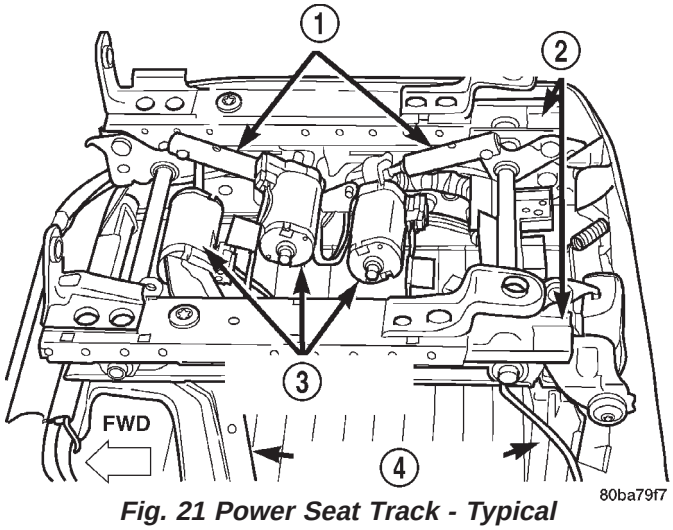


Fig. 21 Power Seat Track - Typical

1 - DRIVE UNITS
2 - LOWER SEAT TRACKS
3 - POWER SEAT MOTORS
4 - SEAT CUSHION FRAME

The power seat track unit cannot be repaired, and is serviced only as a complete unit. If any component in this unit is faulty or damaged, the entire power seat track unit must be replaced. Refer to **Bucket Seat Track Adjuster** in Body for the service procedure.

POWER SEAT TRACK (Continued)

OPERATION

The power seat track unit includes three reversible electric motors that are secured to the upper half of the track unit. Each motor moves the seat adjuster through a combination of worm-drive gearboxes and screw-type drive units. Each of the three driver side power seat track motors used on models equipped with the optional memory system also has a position potentiometer integral to the motor assembly, which electronically monitors the motor position.

The front and rear of the seat are operated by two separate vertical adjustment motors. These motors can be operated independently of each other, tilting the entire seat assembly forward or rearward; or, they can be operated in unison by selecting the proper power seat switch functions, which will raise or lower the entire seat assembly. The third motor is the horizontal adjustment motor, which moves the seat track in the forward and rearward directions.

DIAGNOSIS AND TESTING - POWER SEAT TRACK

Following are tests that will help to diagnose the hard wired components and circuits of the power seat system. However, if the vehicle is also equipped with the optional memory system, these tests may not prove conclusive in the diagnosis of the driver side power seat. In order to obtain conclusive testing of the driver side power seat with the memory system option, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the memory system components must be checked.

The most reliable, efficient, and accurate means to diagnose the driver side power seat with the memory system option requires the use of a DRB® scan tool and the proper Diagnostic Procedures manual. The DRB® scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the memory system is receiving the proper hard wired inputs and relaying the proper hard wired outputs to perform its driver side power seat functions.

Actuate the power seat switch to move all three power seat track adjusters in each direction. The power seat track adjusters should move in each of the selected directions. If a power seat track adjuster fails to operate in only one direction, move the adjuster a short distance in the opposite direction and test again to be certain that the adjuster is not at its travel limit. If the power seat track adjuster still fails to operate in only one direction, refer to **Power Seat Switch Diagnosis and Testing** in this group. If the power seat track adjuster fails to operate in more than one direction, perform the following tests. For complete circuit diagrams, refer to **Wiring Diagrams**.

(1) Check the power seat circuit breaker in the junction block. If OK, go to Step 2. If not OK, replace the faulty power seat circuit breaker.

(2) Check for battery voltage at the power seat circuit breaker in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the fuse in the Power Distribution Center as required.

(3) Remove the outboard seat cushion side shield from the seat. Disconnect the seat wire harness connector from the power seat switch connector receptacle. Check for battery voltage at the fused B(+) circuit cavity of the power seat wire harness connector for the power seat switch. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the power seat circuit breaker in the junction block as required.

(4) Check for continuity between the ground circuit cavity of the power seat wire harness connector for the power seat switch and a good ground. There should be continuity. If OK, go to Step 5. If not OK, repair the open ground circuit to ground as required.

(5) Test the power seat switch. Refer to **Power Seat Switch Diagnosis and Testing** in this group. If the switch tests OK, test the circuits of the power seat wire harness between the inoperative power seat track adjuster motor and the power seat switch for shorts or opens. If the circuits check OK, replace the faulty power seat track unit. If the circuits are not OK, repair the power seat wire harness as required.

POWER WINDOWS

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POWER WINDOWS

DESCRIPTION

Power operated driver side and passenger side front and rear door windows are standard factory-installed equipment on this model. The power window system allows each of the door windows to be raised or lowered electrically by operating a switch on the trim panel for that door. Additionally, the master switches on the driver side front door trim panel allow all of the windows to be operated from the driver seat position. A power window lockout switch on the driver side front door trim panel will allow the driver to disable all of the passenger door window switches.

The power window system functionally operates when the ignition switch is in the On position. However, a unique feature of this system will allow the power windows to be operated for up to forty-five seconds after the ignition switch is turned to the Off position, or until a front door is opened, whichever occurs first.

An auto-down feature allows the driver side front door window to be lowered all the way, even if the window switch is released. The driver side front door window switch must be depressed in the down direction to a second detent to begin an auto-down event. Depressing the switch again in any direction cancel the auto-down event and begin movement in the direction specified.

This group covers the following components of the power window system:

- Power window switches
- Power window motors.

Certain functions and features of the power window system rely upon resources shared with other electronic modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The PCI data bus network allows the sharing of sensor information. This helps to reduce wire harness complexity, internal controller hardware, and component sensor current loads. At the same time, this system provides increased reliability, enhanced diagnostics, and allows the addition of many new feature capabilities. For diagnosis of these electronic modules or of the PCI data bus network, the use of a DRB scan tool and the proper Diagnostic Procedures manual are recommended.

The other electronic modules that may affect power window system operation are as follows:

- **Body Control Module (BCM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL/CENTRAL TIMER MODUL - DESCRIPTION) for more information.
- **Driver Door Module (DDM)** -(Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.
- **Passenger Door Module (PDM)** - (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - DESCRIPTION) for more information.

This group covers diagnosis and service of only the electrical components in the power window system. For service of mechanical components, such as the regulator, lift plate, window tracks, or glass refer to Body. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pinout information and location views for the various wire harness connectors, splices and grounds. Following are general descriptions of the major components in the power window system.

POWER WINDOWS (Continued)

OPERATION

The power window system includes the Driver Door Module (DDM) and Passenger Door Module (PDM), which are mounted in their respective front door, the rear door power window switches mounted on the rear doors, and the power window motors mounted to the window regulator in each door. The DDM houses four master power window switches, the power window lockout switch and the control logic for the driver side front and rear door power windows. The PDM houses the passenger side front door power window switch and the control logic for the passenger side front and rear door power windows.

When a master power window switch on the DDM is used to operate a passenger side power window, the DDM sends the window switch actuation message to the PDM over the Programmable Communications Interface (PCI) data bus. The PDM responds to these messages by sending control outputs to move the passenger side power window motors. In addition, when the power window lockout switch in the DDM is actuated to disable power window operation, a lockout message is sent to the PDM over the PCI data bus.

The Body Control Module (BCM) also supports and controls certain features of the power window system. The BCM receives a hard wired input from the ignition switch. The programming in the BCM allows it to process the information from this input and send ignition switch status messages to the DDM and the PDM over the PCI data bus. The DDM and PDM use this information and hard wired inputs from the front door ajar switches to control the lighting of the power window switch lamps, and to control the operation of the power window after ignition-off feature.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power window system.

DIAGNOSIS AND TESTING - POWER WINDOWS

Following are tests that will help to diagnose the hard wired components and circuits of the power window system. However, these tests may not prove conclusive in the diagnosis of this system. In order to obtain conclusive testing of the power window system, the Programmable Communications Interface (PCI) data bus network and all of the electronic modules that provide inputs to, or receive outputs from the power window system components must be checked.

The most reliable, efficient, and accurate means to diagnose the power window system requires the use of a DRB scan tool and the proper Diagnostic Procedures manual. The DRB scan tool can provide confirmation that the PCI data bus is functional, that all of the electronic modules are sending and receiving the proper messages on the PCI data bus, and that the power window motors are being sent the proper hard wired outputs by the door modules for them to perform their power window system functions.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

ALL WINDOWS INOPERATIVE

(1) Check the operation of the power lock switch on the driver side front door. If all of the doors lock and unlock, but none of the power windows operate, use a DRB scan tool and the proper Diagnostic Procedures manual to check the Body Control Module (BCM), the Driver Door Module (DDM) and the PCI data bus for proper operation. If not OK, go to Step 2.

(2) Check the operation of the power lock switch on the passenger side front door. If the passenger doors lock and unlock, but the driver side front door does not, go to Step 5. If all of the power locks and power windows are inoperative from both front doors, go to Step 3.

(3) Check the fused B(+) fuse in the Power Distribution Center (PDC). If OK, go to Step 4. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(4) Check for battery voltage at the fused B(+) fuse in the PDC. If OK, go to Step 5. If not OK, repair the open fused B(+) circuit to the battery as required.

(5) Disconnect and isolate the battery negative cable. Remove the trim panel from the driver side front door. Disconnect the 15-way door wire harness connector from the DDM connector receptacle. Check for continuity between the ground circuit cavity of the 15-way door wire harness connector for the DDM and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the 15-way door wire harness connector for the DDM. If OK, replace the faulty DDM. If not OK, repair the open fused B(+) circuit to the fuse in the PDC as required.

POWER WINDOWS (Continued)

PASSENGER SIDE FRONT AND REAR WINDOWS INOPERATIVE

If the driver side front and rear power windows operate, but the passenger side front and rear do not, use a DRB scan tool and the proper Diagnostic Procedures manual to check the PCI data bus for proper operation.

ONE WINDOW INOPERATIVE

The window glass and regulator mechanism must be free to slide up and down for the power window motor to function properly. If the window glass and regulator is not free to move up and down, the motor will overload and trip the integral circuit breaker. To determine if the window glass and regulator are free, disconnect the regulator plate from the glass. Then slide the window up and down by hand.

There is an alternate method to check if the window glass and regulator mechanism is free. Position the glass between the up and down stops. Then, shake the glass in the door. Check that the glass can be moved slightly from side to side, front to rear, and up and down. Then check that the glass is not bound tight in the tracks.

If the window glass and regulator mechanism is free, refer to **Door Module** in Electrical, Power Windows. If the glass is not free, inspect the window glass mounting and operating hardware for damage or improperly installed components. Refer to **Body** to check for proper installation or damage of the window glass mounting and operating hardware.

DOOR MODULE

NOTE: The following tests may not prove conclusive in the diagnosis of this component. The most reliable, efficient, and accurate means to diagnose this component requires the use of a DRB scan tool and the proper Diagnostic Procedures manual.

If the problem being diagnosed is a rear door window that does not operate from the rear door switch, but does operate from the master switch on the driver side front door, (Refer to 8 - ELECTRICAL/ POWER WINDOWS/POWER WINDOW SWITCH - DIAGNOSIS AND TESTING). If the problem is a passenger side front or rear window that operates from the switch on that door, but does not operate from the master switch on the driver side front door, use a DRB scan tool and the proper Diagnostic Procedures manual to diagnose the circuitry of both door modules and the PCI data bus. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect and isolate the battery negative cable. Remove the trim panel from the front door, but do not disconnect the door wire harness connectors from the door module. Go to Step 2.

(2) Check the 15-way door wire harness connector for the door module to see that it is fully seated in the door module connector receptacle. If OK, go to Step 3. If not OK, properly connect the 15-way door wire harness connector for the door module to the door module connector receptacle.

(3) Disconnect the 15-way door wire harness connector from the door module connector receptacle. Check for continuity between the ground circuit cavity of the 15-way door wire harness connector for the door module and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground as required.

(4) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the 15-way door wire harness connector for the door module. If OK, go to Step 5. If not OK, repair the open fused B(+) circuit to the fuse in the Power Distribution Center (PDC) as required.

(5) If the inoperative window is on a front door, go to Step 6. If the inoperative window is on a rear door go to Step 9.

(6) Disconnect and isolate the battery negative cable. Disconnect the door wire harness connector from the inoperative power window motor wire harness connector. Check for continuity between the front window driver up circuit cavity of the 15-way door wire harness connector for the door module and a good ground. Repeat the check for the front window driver down circuit. In each case there should be no continuity. If OK, go to Step 7. If not OK, repair the shorted front window driver up or down circuit as required.

(7) Check for continuity between the front window driver up circuit cavities of the 15-way door wire harness connector for the door module and the door wire harness connector for the power window motor. Repeat the check for the front window driver down circuit. In each case there should be continuity. If OK, go to Step 8. If not OK, repair the open front window driver up or down circuit as required.

(8) Reconnect the 15-way door wire harness connector back into the door module connector receptacle. Connect the battery negative cable. Connect the probes of a reversible DC digital voltmeter to the door wire harness connector for the power window motor. Observe the voltmeter while actuating the switch for that window in the up and down directions. There should be battery voltage for as long as the switch is held in both the up and down positions,

and no voltage in the neutral position. If OK,(Refer to 8 - ELECTRICAL/POWER WINDOWS/WINDOW MOTOR - DIAGNOSIS AND TESTING). If not OK, replace the faulty door module.

(9) Check the rear door power window switch continuity. (Refer to 8 - ELECTRICAL/POWER WINDOWS/POWER WINDOW SWITCH - DIAGNOSIS AND TESTING). If OK, go to Step 10. If not OK, replace the faulty rear door power window switch.

(10) Disconnect and isolate the battery negative cable. Reconnect the door wire harness connector to the rear door power window switch. Disconnect the door wire harness connector from the inoperative power window motor wire harness connector. Check for continuity between the rear window driver up circuit cavity of the 15-way door wire harness connector for the door module and a good ground. Repeat the check for the rear window driver down circuit. In each case there should be no continuity. If OK, go to Step 11. If not OK, repair the shorted rear window driver up or down circuit as required.

(11) Check for continuity between the rear window driver up circuit cavities of the 15-way door wire harness connector for the door module and the power window motor wire harness connector. Repeat the check for the rear window driver down circuit. In each case there should be continuity. If OK, go to Step 12. If not OK, repair the open rear window driver up or down circuit as required.

NOTE: The door module feeds battery current to both terminals of the rear door power window motors when the power window lockout switch is in the Unlock position, until the master window switch on the driver side front door is actuated. The door module feeds ground to both terminals of the rear door power window motor when the power window lockout switch is in the Lock position, until the master window switch on the driver side front door is actuated.

(12) Reconnect the 15-way door wire harness connector for the door module to the door module connector receptacle. Connect the battery negative cable. Check for battery voltage at each cavity in the door wire harness connector for the power window motor. Each cavity should have battery voltage when the power window switch is in the neutral position. Each cavity should also have battery voltage in one other switch position, either up or down, and zero volts with the switch in the opposite position. If OK, (Refer to 8 - ELECTRICAL/POWER WINDOWS/WINDOW MOTOR - DIAGNOSIS AND TESTING). If not OK, replace the faulty door module.

POWER WINDOW SWITCH

DESCRIPTION

The power window motors are controlled by a two-way momentary switch mounted on the trim panel of each passenger door, and four two-way momentary switches on the driver side front door trim panel. The driver side front door trim panel also has a two-position power window lockout switch. Each power window switch, except the lockout switch, is illuminated by a Light-Emitting Diode (LED) that is integral to the switch paddle.

The front door power window switches and the power window lockout switch are integral to the Driver Door Module (DDM) and Passenger Door Module (PDM). The front door power window switches and their lamps cannot be adjusted or repaired and, if faulty or damaged, the entire DDM or PDM unit must be replaced. The rear door power window switches and their lamps cannot be adjusted or repaired but, if faulty or damaged, only the affected rear door power window switch must be replaced. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - REMOVAL).

OPERATION

The front door power window switches provide an up or down (or lock and unlock signal in the case of the lockout switch) to the door module circuitry. The Driver Door Module (DDM) circuitry controls the output to the driver side front and rear door power window motors, and supplies electrical current as required for the stand-alone operation of the driver side rear door power window switch. The Passenger Door Module (PDM) circuitry controls the output to the passenger side front and rear door power window motors, and supplies electrical current as required for the stand-alone operation of the passenger side rear door power window switch.

When a DDM-integrated master power window switch for a passenger side window is actuated, or when the power window lockout switch is actuated to disable the passenger door power windows, the DDM circuitry sends a message to the PDM over the Programmable Communications Interface (PCI) data bus to control the output to that power window motor(s).

The power window switch for the driver side front door power window has two detent positions in the Down direction. The first detent provides normal power window down operation. If this switch is depressed to the second detent, the Auto Down circuitry of the DDM is activated. The Auto-Down circuitry will automatically move the driver side front door window to its fully lowered position, even if the power window switch is released. The Auto-Down

POWER WINDOW SWITCH (Continued)

event will be automatically cancelled and the window movement will be stopped if the DDM circuitry detects a second input from the driver side front door power window switch, in either direction.

Each power window switch, except the lockout switch, is illuminated by a Light-Emitting Diode (LED) when the ignition switch is turned to the On position. However, when the lockout switch is placed in the Lock position, the LED for the locked-out front and rear passenger door power window switches is turned off.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of the power window switches.

DIAGNOSIS AND TESTING - POWER WINDOW SWITCH

The diagnosis found here applies only to the rear door power window switches. If the problem being diagnosed is an inoperative power window switch illumination lamp, but the power window switch operates as designed, replace the faulty rear door power window switch **(verify the power lockout switch is not actuated)**. For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the power window switch from the rear door trim panel. (Refer to 8 - ELECTRICAL/ POWER WINDOWS/POWER WINDOW SWITCH - REMOVAL).

(3) Check the rear door power window switch continuity as shown in the Rear Door Power Window Switch Continuity chart (Fig. 1). If OK, (Refer to 8 - ELECTRICAL/POWER WINDOWS/WINDOW MOTOR - DIAGNOSIS AND TESTING). If not OK, replace the faulty rear door power window switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim panel from the rear door. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL) for the procedures.

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the sides of the switch receptacle on the back of the rear door trim panel away from the perimeter of the power window switch to release the switch from the receptacle (Fig. 2).

(4) Remove the power window switch from the rear door trim panel switch receptacle.

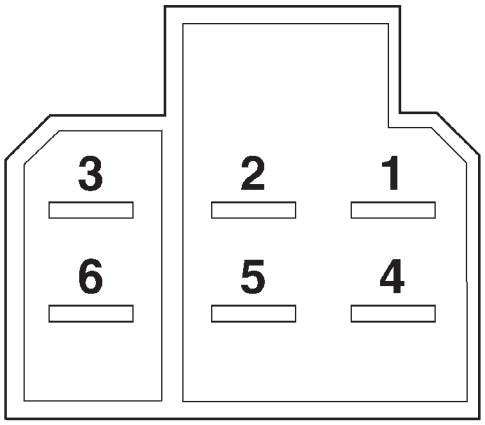


Fig. 1 Rear Door Power Window Switch Continuity

SWITCH POSITION	CONTINUITY BETWEEN
LED	3 AND 6
OFF	1 AND 2
OFF	4 AND 5
FORWARD	1 AND 2
FORWARD	5 AND 6
REARWARD	2 AND 6
REARWARD	4 AND 5

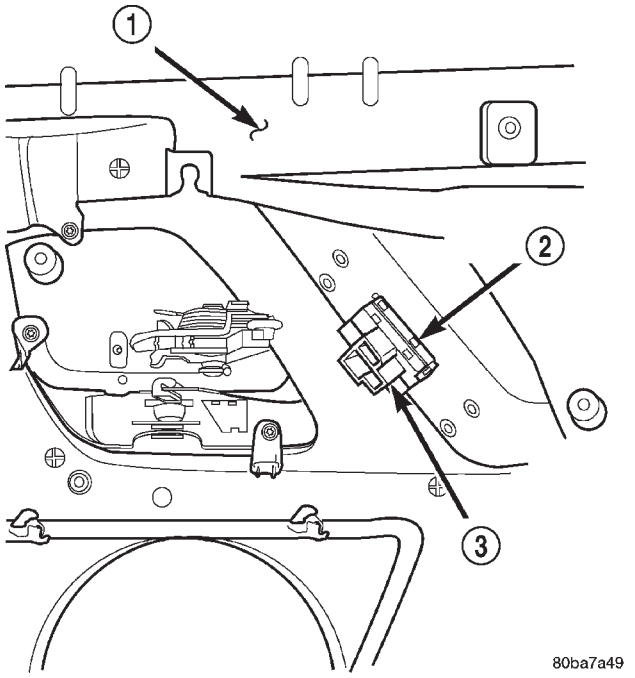


Fig. 2 Rear Door Power Window Switch Remove/ Install

1 - REAR DOOR TRIM PANEL
2 - TRIM PANEL RECEPTACLE
3 - POWER WINDOW SWITCH

POWER WINDOW SWITCH (Continued)

INSTALLATION

(1) Position the power window switch to the rear door trim panel switch receptacle.

(2) Press firmly and evenly on the back of the power window switch until it snaps into rear door trim panel switch receptacle.

(3) Install the trim panel onto the rear door. (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION) for the procedures.

(4) Reconnect the battery negative cable.

WINDOW MOTOR

DESCRIPTION

Power operated front and rear door windows are standard equipment on this model. Each door has a permanent magnet reversible electric motor with an integral right angle gearbox mechanism that operates the window regulator. In addition, each power window motor is equipped with an integral self-resetting circuit breaker to protect the motor from overloads.

The power window motor gearbox housing is secured to the window regulator drum housing with screws. The window regulators used in all four doors are single vertical post cable-and-drum type. A molded plastic slider guided by the post is driven by the regulator cables. The slider raises and lowers the window glass through a steel lift plate attachment. Front and rear glass channels within each door guide and stabilize each end of the glass.

The power window motor and gearbox assembly cannot be repaired and, if faulty or damaged, the entire power window motor and gearbox unit must be replaced. The window regulators are available for service. (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - REMOVAL) for the regulator service procedures.

OPERATION

A positive and negative battery connection to the two motor terminals will cause the power window motor to rotate in one direction. Reversing the current through these same two connections will cause the motor to rotate in the opposite direction.

When the power window motor operates, it rotates the regulator cable drum through its gearbox. The window regulator cable drum is connected through two cables to the plastic slider on the vertical post. As the cable drum rotates, it lets cable out on one side of the drum, and takes cable in on the other side of the drum. The changes in cable length move the slider up or down the vertical post, raising or lowering the window glass.

If the window regulator or window glass bind, encounter obstructions, or reach their travel limits it overloads the power window motor. The overloading condition causes the power window motor self-resetting circuit breaker to open, which stops the motor from running.

DIAGNOSIS AND TESTING - WINDOW MOTOR

Before you proceed with this diagnosis, confirm proper switch operation. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DRIVER DOOR MODULE - OPERATION) or (Refer to 8 - ELECTRICAL/POWER WINDOWS/POWER WINDOW SWITCH - OPERATION). For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

(1) Remove the trim panel from the door with the inoperative power window. (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL) for the procedures.

(2) Disconnect the door wire harness connector from the power window motor wire harness connector. Apply battery current to one cavity of the power window motor wire harness connector, and apply ground to the other cavity of the connector. The power window motor should operate in one direction. Remember, if the window is in the full up or full down position, the motor will not operate in that direction by design. If OK, go to Step 3. If not OK, replace the faulty power window motor.

(3) Reverse the battery and ground connections to the two cavities of the power window motor wire harness connector. The power window motor should now operate in the other direction. Remember, if the window is in the full up or full down position, the motor will not operate in that direction by design. If OK, go to Step 4. If not OK, replace the faulty power window motor.

(4) If the power window motor operates in both directions, check the operation of the window glass and regulator mechanism through its complete up and down travel. There should be no binding or sticking of the window glass or regulator mechanism through the entire travel range. If not OK, (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - REMOVAL) to check for proper installation or damage of the window glass mounting and operating hardware.

WINDOW MOTOR (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the window regulator from the door. (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - REMOVAL) or (Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - REMOVAL) for the procedures.

(3) Place the window regulator on a suitable work surface and remove the screws that secure the power window motor to the window regulator.

(4) Remove the power window motor from the window regulator.

INSTALLATION

(1) Position the power window motor onto the window regulator.

(2) Install and tighten the screws that secure the power window motor to the window regulator. Tighten the screws to 9 N·m (80 in. lbs.).

(3) Install the window regulator onto the door. (Refer to 23 - BODY/DOOR - FRONT/WINDOW REGULATOR - INSTALLATION) or(Refer to 23 - BODY/DOORS - REAR/WINDOW REGULATOR - INSTALLATION) for the procedures.

(4) Reconnect the battery negative cable.

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RESTRAINTS

DESCRIPTION

An occupant restraint system is standard factory-installed safety equipment on this model. Available occupant restraints for this model include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening a seat belt; while passive restraints require no action by the vehicle occupants to be employed (Fig. 1).

RESTRAINTS (Continued)

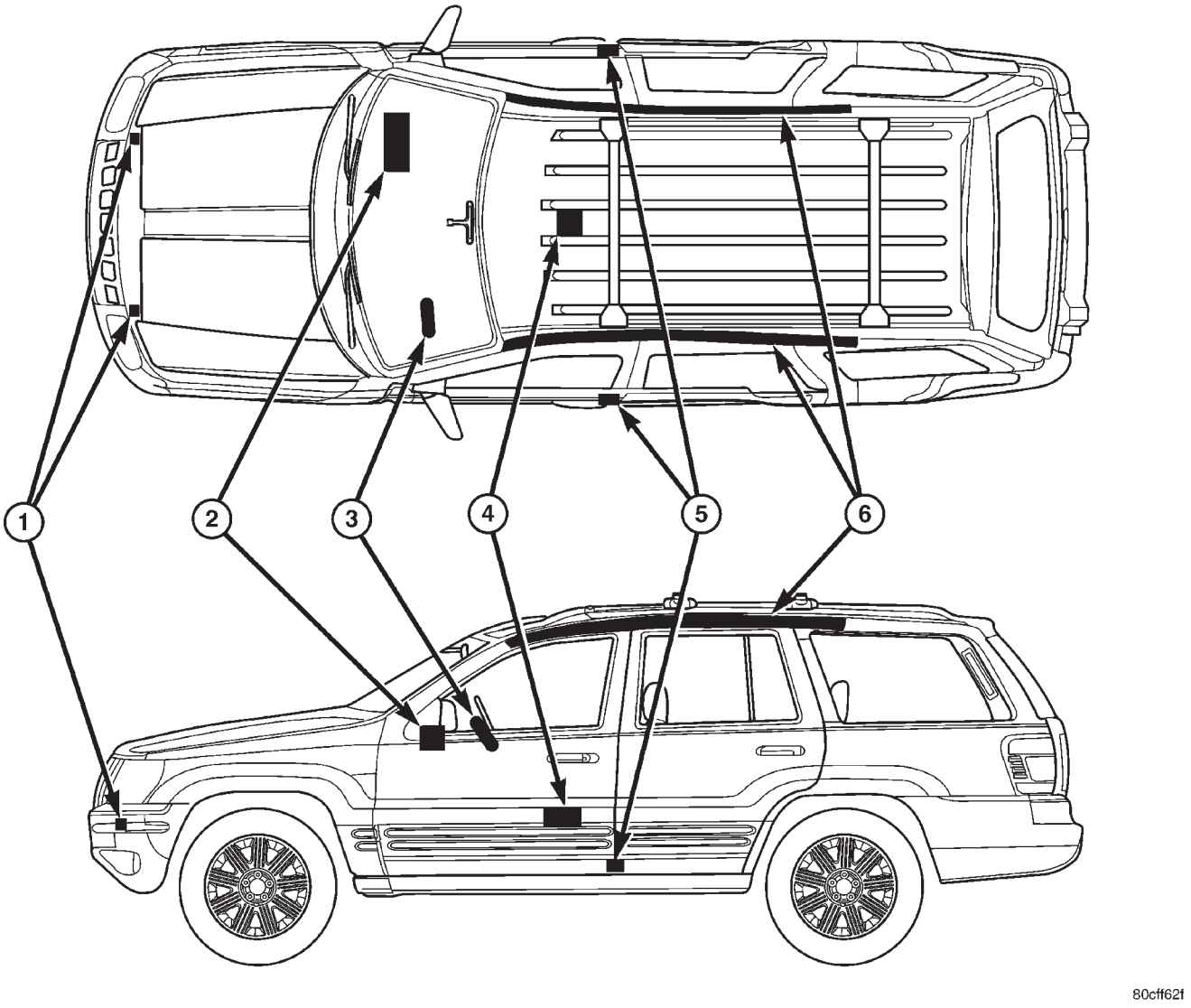


Fig. 1 Supplemental Restraints

1 - FRONT IMPACT SENSOR (2)
2 - PASSENGER AIRBAG
3 - DRIVER AIRBAG
4 - AIRBAG CONTROL MODULE
5 - SIDE IMPACT SENSOR (2)
6 - SIDE CURTAIN AIRBAG (2)

RESTRAINTS (Continued)

ACTIVE RESTRAINTS

The active restraints for this model include:

- **Front Seat Belts** - Both front seating positions are equipped with three-point seat belt systems employing a lower B-pillar mounted inertia latch-type retractor, height-adjustable upper B-pillar mounted turning loops, a fixed lower seat belt anchor secured to the lower B-pillar, and a fixed end-release seat belt buckle secured to the side of the floor panel transmission tunnel. Both front seat belt buckles include an integral Hall-effect seat belt switch that detects whether its respective seat belt has been fastened.
- **Rear Seat Belts** - Both outboard rear seating positions are equipped with three-point seat belt systems. The outboard seating position belts employ a lower C-pillar mounted inertia latch-type retractor, height-adjustable upper C-pillar mounted turning loops, and a fixed lower seat belt anchor secured to the floor panel. The center rear seating position of vehicles manufactured for sale in North America has a lap belt that is anchored to the rear floor panel with the right outboard seat belt buckle. Vehicles manufactured for sale outside of North America are equipped with a three-point seat belt in the rear seat center seating position. This seat belt has an inertia latch-type retractor that is integral to the rear seat back panel, and the lower belt anchor is secured to the rear floor panel with the right outboard seat belt buckle. A cable from the seat back latch locks the center belt retractor spool unless the seat back is fully latched. All three rear seat belts have fixed end-release seat belt buckles secured to the rear floor panel, a single buckle unit on the right side and a double buckle unit on the left side.
- **Child Seat Tether Anchors** - All vehicles are equipped with three, fixed-position, child seat upper tether anchors and two lower anchors. Two upper anchors are integral to the back of the right rear seat back panel, and one is integral to the left rear seat back panel. The two lower anchors are integral to the outboard rear seat back brackets.

PASSIVE RESTRAINTS

The passive restraints available for this model include the following:

- **Dual Front Airbags** - Multistage driver and front passenger airbags are available for this model. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by the “SRS - AIRBAG” logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag door area of the instrument panel top pad above the glove box (Fig. 2). Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the instrument cluster for about seven seconds as a bulb test each time the ignition switch is turned to the On position.
- **Side Curtain Airbags** - Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. This airbag system is a passive, inflatable, Supplemental Restraint System (SRS) and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located on the headliner above each B-pillar (Fig. 2).



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Fig. 2 SRS Logo

The supplemental restraint system includes the following major components, which are described in further detail elsewhere in this service information:

- **Airbag Control Module** - The Airbag Control Module (ACM) is also sometimes referred to as the Occupant Restraint Controller (ORC). The ACM is located on a mount on the floor panel transmission tunnel near the park brake release mechanism, under the center floor console.
- **Airbag Indicator** - The airbag indicator is integral to the ElectroMechanical Instrument Cluster (EMIC), which is located on the instrument panel in front of the driver.
- **Clockspring** - The clockspring is located near the top of the steering column, directly beneath the steering wheel.
- **Driver Airbag** - The driver airbag is located in the center of the steering wheel, beneath the driver airbag trim cover.
- **Driver Knee Blocker** - The driver knee blocker is a structural unit secured to the back side of and integral to the instrument panel steering column opening cover.
- **Front Impact Sensor** - Two front impact sensors are used on vehicles equipped with dual front airbags, one left side and one right side. One sensor is located on a bracket on the lower inboard side of each vertical member of the radiator support.

RESTRAINTS (Continued)

- **Passenger Airbag** - The passenger airbag is located on the instrument panel, beneath the instrument panel top pad and above the glove box on the passenger side of the vehicle.
- **Passenger Knee Blocker** - The passenger knee blocker is a structural reinforcement that is integral to and concealed within the glove box door.
- **Side Impact Sensor** - Two side impact sensors are used on vehicles with the optional side curtain airbags, one left side and one right side. One sensor is located behind the B-pillar trim near the base of each B-pillar.
- **Side Curtain Airbag** - In vehicles equipped with this option, a side curtain airbag is located on each inside roof side rail above the headliner, and extends from the A-pillar to just beyond the C-pillar.

The ACM and the EMIC each contain a central processing unit and programming that allow them to communicate with each other using the Programmable Communication Interface (PCI) data bus network. This method of communication is used by the ACM for control of the airbag indicator on all models equipped with dual front airbags. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ COMMUNICATION - DESCRIPTION).

Hard wired circuitry connects the supplemental restraint system components to each other through the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system, and to the supplemental restraint system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

ACTIVE RESTRAINTS

The primary passenger restraints in this or any other vehicle are the standard equipment factory-installed seat belts. Seat belts are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them. See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed active restraints.

PASSIVE RESTRAINTS

The passive restraints system is referred to as a supplemental restraint system because they were designed and are intended to enhance the protection for the vehicle occupants of the vehicle **only** when used in conjunction with the seat belts. They are referred to as passive systems because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the factory-installed supplemental restraint systems.

The supplemental restraint system electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the Airbag Control Module (ACM). An airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) illuminates for about seven seconds as a bulb test each time the ignition switch is turned to the On or Start positions. Following the bulb test, the airbag indicator is turned on or off by the ACM to indicate the status of the supplemental restraint system. If the airbag indicator comes on at any time other than during the bulb test, it indicates that there is a problem in the supplemental restraint system electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the supplemental restraints depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of deceleration as measured by the forces of gravity (G force) upon the impact sensors. When an impact is severe enough, the microprocessor in the ACM signals the inflator unit of the airbag module to deploy the airbag. During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the front seat passenger to the structure of the instrument panel.

Typically, the vehicle occupants recall more about the events preceding and following a collision than they have of an airbag deployment itself. This is because the airbag deployment and deflation occur so rapidly. In a typical 48 kilometer-per-hour (30 mile-per-hour) barrier impact, from the moment of impact until the airbags are fully inflated takes about 40 milliseconds. Within one to two seconds from the moment of impact, the airbags are almost entirely deflated. The times cited for these events are approximations, which apply only to a barrier impact at the given speed. Actual times will vary somewhat,

RESTRAINTS (Continued)

depending upon the vehicle speed, impact angle, severity of the impact, and the type of collision.

When the ACM monitors a problem in any of the airbag system circuits or components, it stores a fault code or Diagnostic Trouble Code (DTC) in its memory circuit and sends an electronic message to the EMIC to turn on the airbag indicator. Proper testing of the airbag system components, the Programmable Communication Interface (PCI) data bus, the data bus message inputs to and outputs from the EMIC or the ACM, as well as the retrieval or erasure of a DTC from the ACM or EMIC requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

See the owner's manual in the vehicle glove box for more information on the features, use and operation of all of the factory-installed passive restraints.

WARNING - RESTRAINT SYSTEM

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: AN AIRBAG INFLATOR UNIT MAY CONTAIN SODIUM AZIDE AND POTASSIUM NITRATE. THESE MATERIALS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES (SODIUM HYDROXIDE IS FORMED IN THE PRESENCE OF MOISTURE) OR COMBUSTIBLE COMPOUNDS. AN AIRBAG INFLATOR UNIT MAY ALSO CONTAIN A GAS CANISTER PRESSURIZED TO OVER 2500 PSI. DO NOT ATTEMPT TO DISMANTLE AN AIRBAG UNIT OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE, OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93° C (200° F).

WARNING: REPLACE ALL RESTRAINT SYSTEM COMPONENTS ONLY WITH PARTS SPECIFIED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.

WARNING: THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE RESTRAINT SYSTEM COMPONENTS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE RESTRAINT SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANY TIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE DAIMLERCHRYSLER MOPAR PARTS CATALOG.

WARNING: WHEN A STEERING COLUMN HAS AN AIRBAG UNIT ATTACHED, NEVER PLACE THE COLUMN ON THE FLOOR OR ANY OTHER SURFACE WITH THE STEERING WHEEL OR AIRBAG UNIT FACE DOWN.

DIAGNOSIS AND TESTING - SUPPLEMENTAL RESTRAINT SYSTEM

Proper diagnosis and testing of the supplemental restraint system components, the PCI data bus, the data bus message inputs to and outputs from the ElectroMechanical Instrument Cluster (EMIC) or the Airbag Control Module (ACM), as well as the retrieval or erasure of a Diagnostic Trouble Code (DTC) from the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

RESTRAINTS (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

STANDARD PROCEDURE

STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS

At no time should any source of electricity be permitted near the inflator on the back of a non-deployed airbag. When carrying a non-deployed airbag, the trim cover or airbag cushion side of the unit should be pointed away from the body to minimize injury in the event of an accidental deployment. If the airbag unit is placed on a bench or any other surface, the trim cover or airbag cushion side of the unit should be face up to minimize movement in the event of an accidental deployment. In addition, the supplemental restraint system should be disarmed whenever any steering wheel, steering column, driver airbag, passenger airbag, front impact sensor, side impact sensor, side curtain airbag, or instrument panel components require diagnosis or service. Failure to observe this warning could result in accidental airbag deployment and possible personal injury.

All damaged, faulty or non-deployed airbags which are replaced on vehicles are to be handled and disposed of properly. If an airbag unit is faulty or damaged and non-deployed, refer to the Hazardous Substance Control System for proper disposal. Dispose of all non-deployed and deployed airbags in a manner consistent with state, provincial, local and federal regulations.

SUPPLEMENTAL RESTRAINT STORAGE

Airbags must be stored in their original, special container until they are used for service. Also, they must be stored in a clean, dry environment; away from sources of extreme heat, sparks, and high electrical energy. Always place or store any airbag on a surface with its trim cover or airbag cushion side facing up, to minimize movement in case of an accidental deployment.

STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT

Any vehicle which is to be returned to use following a supplemental restraint deployment, must have the deployed restraints replaced. In addition, if the driver airbag has been deployed, the clockspring must be replaced. If the passenger airbag is deployed, the instrument panel top pad must be replaced. If a side curtain airbag has been deployed, the complete airbag unit, the headliner, as well as the upper A, B, C and D-pillar trim must be replaced. These components are not intended for reuse and will be damaged or weakened as a result of a supplemental restraint deployment, which may or may not be obvious during a visual inspection.

The passenger airbag mounting points on the instrument panel structural duct must be closely inspected for damage, and the instrument panel assembly replaced if structural duct damage is evident. On vehicles with an optional sunroof, the sunroof drain tubes and hoses must be closely inspected following a side curtain airbag deployment. It is also critical that the mounting surfaces and/or mounting brackets for the front and side impact sensors be closely inspected and restored to their original conditions following any vehicle impact damage. Because the ACM and each impact sensor are used by the supplemental restraint system to monitor or confirm the direction and severity of a vehicle impact, improper orientation or insecure fastening of these components may cause airbags not to deploy when required, or to deploy when not required.

All other vehicle components should be closely inspected following any supplemental restraint deployment, but are to be replaced only as required by the extent of the visible damage incurred.

AIRBAG SQUIB STATUS

Multistage airbags with multiple initiators (squibs) must be checked to determine that all squibs were used during the deployment event. The driver and passenger airbags in this model are deployed by electrical signals generated by the Airbag Control Module (ACM) through the driver or passenger squib 1 and squib 2 circuits to the two initiators in the airbag inflators. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used due to an airbag system fault; therefore, it is always necessary to confirm that both initiators have been used in order to avoid the improper handling or disposal of potentially live pyrotechnic or hazardous materials. The

RESTRAINTS (Continued)

following procedure should be performed using a DRBIII® scan tool to verify the status of both airbag squibs before either deployed airbag is removed from the vehicle for disposal.

CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to the Hazardous Substance Control System for proper disposal procedures. Dispose of all non-deployed and deployed airbags in a manner consistent with state, provincial, local, and federal regulations.

(1) Be certain that the DRBIII® scan tool contains the latest version of the proper DRBIII® software. Connect the DRBIII® to the 16-way Data Link Connector (DLC). The DLC is located on the driver side lower edge of the instrument panel, outboard of the steering column.

(2) Turn the ignition switch to the On position.

(3) Using the DRBIII®, read and record the active (current) Diagnostic Trouble Code (DTC) data.

Using the active DTC information, refer to the **Airbag Squib Status** table to determine the status of both driver and/or passenger airbag squibs.

AIRBAG SQUIB STATUS		
IF the Active DTC is:	**Conditions**	**Squib Status**
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for both Driver or Passenger squibs are within 15 minutes of each other	Both Squib 1 and 2 were used.
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for Driver or Passenger Squib 2 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 1 by 15 minutes or more	Squib 1 was used; Squib 2 is live.
Driver or Passenger Squib 1 open Driver or Passenger Squib 2 open	**AND** the stored DTC minutes for Driver or Passenger Squib 1 open is GREATER than the stored DTC minutes for Driver or Passenger Squib 2 by 15 minutes or more	Squib 1 is live; Squib 2 was used.
Driver or Passenger Squib 1 open	**AND** Driver or Passenger Squib 2 open is NOT an active code	Squib 1 was used; Squib 2 is live.
Driver or Passenger Squib 2 open	**AND** Driver or Passenger Squib 1 open is NOT an active code	Squib 1 is live; Squib 2 was used.

If none of the Driver or Passenger Squib 1 or 2 open are active codes, the status of the airbag squibs is unknown. In this case the airbag should be handled and disposed of as if the squibs were both live.

CLEANUP PROCEDURE

Following a supplemental restraint deployment, the vehicle interior will contain a powdery residue. This residue consists primarily of harmless particulate by-products of the small pyrotechnic charge that initiates the propellant used to deploy a supplemental restraint. However, this residue may also contain traces of sodium hydroxide powder, a chemical by-product of the propellant material that is used to generate the inert gas that inflates the airbag. Since sodium hydroxide powder can irritate the skin, eyes, nose, or throat, be sure to wear safety glasses, rubber gloves, and a long-sleeved shirt during cleanup (Fig. 3).

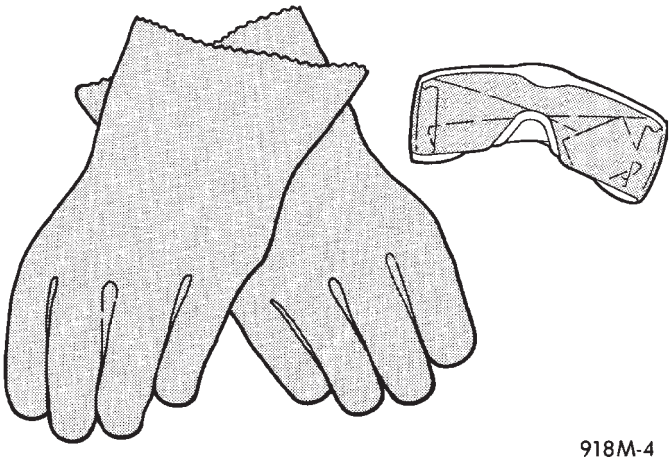


Fig. 3 Wear Safety Glasses and Rubber Gloves - Typical

RESTRAINTS (Continued)

WARNING: IF YOU EXPERIENCE SKIN IRRITATION DURING CLEANUP, RUN COOL WATER OVER THE AFFECTED AREA. ALSO, IF YOU EXPERIENCE IRRITATION OF THE NOSE OR THROAT, EXIT THE VEHICLE FOR FRESH AIR UNTIL THE IRRITATION CEASES. IF IRRITATION CONTINUES, SEE A PHYSICIAN.

(1) Begin the cleanup by using a vacuum cleaner to remove any residual powder from the vehicle interior. Clean from outside the vehicle and work your way inside, so that you avoid kneeling or sitting on a non-cleaned area.

(2) Be certain to vacuum the heater and air conditioning outlets as well (Fig. 4). Run the heater and air conditioner blower on the lowest speed setting and vacuum any powder expelled from the outlets.

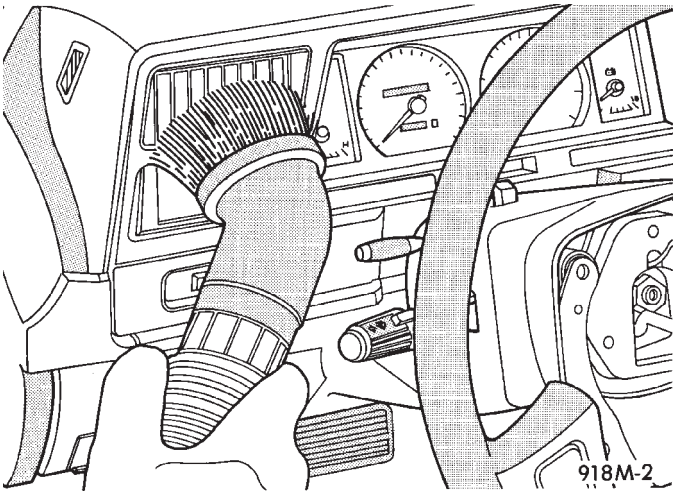


Fig. 4 Vacuum Heater and A/C Outlets - Typical

CAUTION: Deployed front airbags having two initiators (squibs) in the airbag inflator may or may not have live pyrotechnic material within the inflator. Do not dispose of these airbags unless you are sure of complete deployment. Refer to AIRBAG SQUIB STATUS . Refer to the Hazardous Substance Control System for proper disposal procedures. Dispose of all non-deployed and deployed airbags in a manner consistent with state, provincial, local, and federal regulations.

(3) Next, remove the deployed supplemental restraints from the vehicle. Refer to the appropriate service removal procedures.

(4) You may need to vacuum the interior of the vehicle a second time to recover all of the powder.

STANDARD PROCEDURE - VERIFICATION TEST

The following procedure should be performed using a DRBIII® scan tool to verify proper supplemental restraint system operation following the service or replacement of any supplemental restraint system component.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) During the following test, the battery negative cable remains disconnected and isolated, as it was during the airbag component removal and installation procedures.

(2) Be certain that the DRBIII® scan tool contains the latest version of the proper DRBIII® software. Connect the DRBIII® to the 16-way Data Link Connector (DLC). The DLC is located on the driver side lower edge of the instrument panel, outboard of the steering column (Fig. 5).

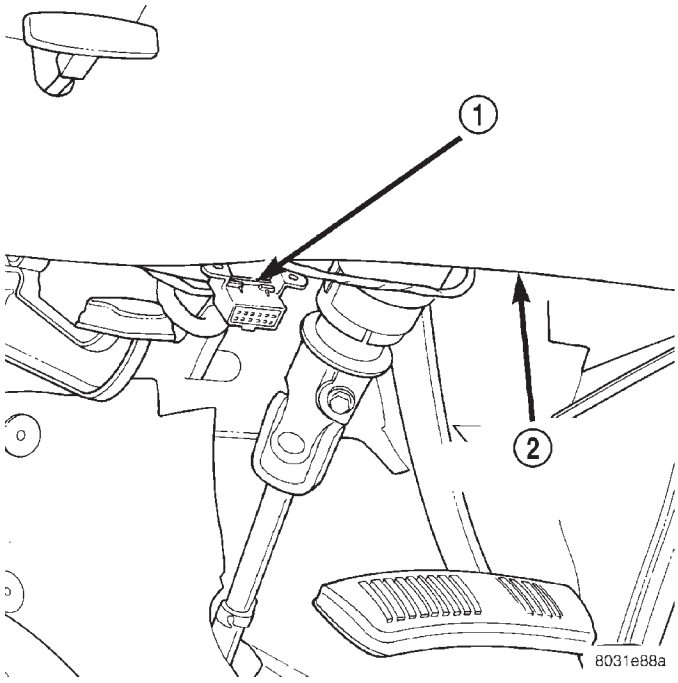


Fig. 5 16-Way Data Link Connector - Typical

1 - 16–WAY DATA LINK CONNECTOR
2 - BOTTOM OF INSTRUMENT PANEL

(3) Turn the ignition switch to the On position and exit the vehicle with the DRBIII® scan tool.

RESTRAINTS (Continued)

(4) Check to be certain that nobody is in the vehicle, then reconnect the battery negative cable.

(5) Using the DRBIII®, read and record the active (current) Diagnostic Trouble Code (DTC) data.

(6) Next, use the DRBIII® to read and record any stored (historical) DTC data.

(7) If any DTC is found in Step 5 or Step 6, refer to the appropriate diagnostic information.

(8) Use the DRBIII® to erase the stored DTC data. If any problems remain, the stored DTC data will not erase. Refer to the appropriate diagnostic information to diagnose any stored DTC that will not erase. If the stored DTC information is successfully erased, go to Step 9.

(9) Turn the ignition switch to the Off position for about fifteen seconds, and then back to the On position. Observe the airbag indicator in the instrument cluster. It should light for six to eight seconds, and then go out. This indicates that the supplemental restraint system is functioning normally and that the repairs are complete. If the airbag indicator fails to light, or lights and stays on, there is still an active supplemental restraint system fault or malfunction. Refer to the appropriate diagnostic information to diagnose the problem.

AIRBAG CONTROL MODULE

DESCRIPTION

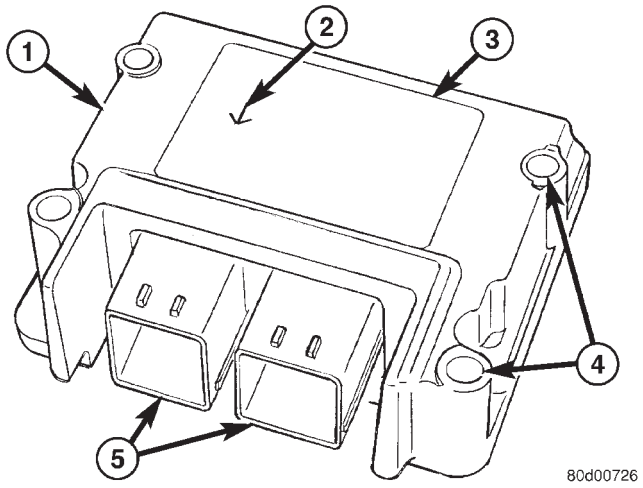


Fig. 6 Airbag Control Module

1 - AIRBAG CONTROL MODULE
2 - ORIENTATION ARROW
3 - LABEL
4 - MOUNTING HOLES (4)
5 - CONNECTOR RECEPTACLE (2)

The Airbag Control Module (ACM) is also sometimes referred to as the Occupant Restraint Controller (ORC) (Fig. 6). The ACM is concealed underneath the center floor console, where it is secured by four screws to a stamped steel mounting bracket welded onto the top of the floor panel transmission tunnel just forward of the park brake mechanism in the passenger compartment of the vehicle.

Concealed within a hollow in the center of the die cast aluminum ACM housing is the electronic circuitry of the ACM which includes a microprocessor, an electronic impact sensor, an electronic safing sensor, and an energy storage capacitor. A stamped metal cover plate is secured to the bottom of the ACM housing with four screws to enclose and protect the internal electronic circuitry and components. A printed label on the top of the ACM housing provides a visual verification of the proper orientation of the unit, and should always be pointed toward the front of the vehicle.

Two molded plastic electrical connector receptacles exit the forward side of the ACM housing. These two receptacles connect the ACM to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness, and a dedicated take out and connector of the airbag overlay wire harness. For vehicles equipped with the optional side curtain airbags, both ACM connector receptacles are black in color and the ACM contains a second bi-directional safing sensor for the side airbags. For vehicles not equipped with the optional side curtain airbags, the ACM connector receptacles are both gray.

The impact sensor and safing sensor internal to the ACM are calibrated for the specific vehicle, and are only serviced as a unit with the ACM. The ACM cannot be repaired or adjusted and, if damaged or faulty, it must be replaced.

OPERATION

The microprocessor in the Airbag Control Module (ACM) contains the supplemental restraint system logic circuits and controls all of the supplemental restraint system components. The ACM uses On-Board Diagnostics (OBD) and can communicate with other electronic modules in the vehicle as well as with the DRBIII® scan tool using the Programmable Communications Interface (PCI) data bus network. This method of communication is used for control of the airbag indicator in the ElectroMechanical Instrument Cluster (EMIC) and for supplemental restraint system diagnosis and testing through the 16-way data link connector located on the driver side lower edge of the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

AIRBAG CONTROL MODULE (Continued)

The ACM microprocessor continuously monitors all of the supplemental restraint system electrical circuits to determine the system readiness. If the ACM detects a monitored system fault, it sets an active and stored Diagnostic Trouble Code (DTC) and sends electronic messages to the EMIC over the PCI data bus to turn on the airbag indicator. An active fault only remains for the duration of the fault or in some cases the duration of the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ACM. For some DTCs, if a fault does not recur for a number of ignition cycles, the ACM will automatically erase the stored DTC. For other internal faults, the stored DTC is latched forever.

The ACM receives battery current through two circuits, on a fused ignition switch output (run) circuit through a fuse in the Junction Block (JB), and on a fused ignition switch output (start-run) circuit through a second fuse in the JB. The ACM is grounded through a ground circuit and take out of the instrument panel floor wire harness. This take out has a single eyelet terminal connector secured by a nut to a ground stud located behind the ACM mount on the floor panel transmission tunnel. These connections allow the ACM to be operational whenever the ignition switch is in the Start or On positions. The ACM also contains an energy-storage capacitor. When the ignition switch is in the Start or On positions, this capacitor is continually being charged with enough electrical energy to deploy the airbags for up to one second following a battery disconnect or failure. The purpose of the capacitor is to provide backup supplemental restraint system protection in case there is a loss of battery current supply to the ACM during an impact.

Two sensors are contained within the ACM, an electronic impact sensor and a safing sensor. The ACM also monitors inputs from two remote front impact sensors located on brackets on the inboard sides of the right and left vertical members of the radiator support near the front of the vehicle. The electronic impact sensors are accelerometers that sense the rate of vehicle deceleration, which provide verification of the direction and severity of an impact. On models equipped with optional side curtain airbags, the ACM also monitors inputs from two remote side impact sensors located near the base of both the left and right inner B-pillars to control the deployment of the side curtain airbag units.

The safing sensor is an electronic accelerometer sensor within the ACM that provides an additional logic input to the ACM microprocessor. The safing sensor is used to verify the need for an airbag deployment by detecting impact energy of a lesser magnitude than that of the primary electronic impact sensors, and must exceed a safing threshold in order for the airbags to deploy. The ACM also monitors a Hall effect-type seat belt switch located in the buckle of each front seat belt to determine whether the seatbelts are buckled, and provides an input to the EMIC over the PCI data bus to control the seatbelt indicator operation based upon the status of the driver side front seat belt switch. Vehicles with the optional side curtain airbags feature a second safing sensor within the ACM to provide confirmation to the ACM of side impact forces. This second safing sensor is a bi-directional unit that detects impact forces from either side of the vehicle.

Pre-programmed decision algorithms in the ACM microprocessor determine when the deceleration rate as signaled by the impact sensors and the safing sensors indicate an impact that is severe enough to require supplemental restraint system protection. The ACM also determines the level of front airbag deployment force required for each front seating position based upon the status of the two seat belt switch inputs and the severity of the monitored impact. When the programmed conditions are met, the ACM sends the proper electrical signals to deploy the multistage dual front airbags at the programmed force levels, and to deploy either side curtain airbag.

The hard wired inputs and outputs for the ACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ACM, the PCI data bus network, or the electronic message inputs to and outputs from the ACM. The most reliable, efficient, and accurate means to diagnose the ACM, the PCI data bus network, and the electronic message inputs to and outputs from the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

Two different Airbag Control Modules (ACM) are available for this vehicle. For vehicles equipped with the optional side curtain airbags, both ACM connector receptacles are black in color and the ACM contains a second bi-directional safing sensor for the side airbags. For vehicles not equipped with the optional side curtain airbags, the ACM connector receptacles are gray.

AIRBAG CONTROL MODULE (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the center console from the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(3) Remove the two nuts that secure the center console bracket to the studs on the floor panel transmission tunnel just forward of the Airbag Control Module (ACM) (Fig. 7).

(4) Remove the center console bracket from the two studs on the floor panel transmission tunnel.

(5) Disconnect the airbag overlay wire harness connector for the ACM from the ACM connector receptacle (Fig. 8). To disconnect the airbag overlay wire harness connector from the ACM:

(a) Slide the red Connector Position Assurance (CPA) lock on the top of the connector toward the front of the vehicle.

(b) Depress the forward edge of the CPA lock to release the connector latch tab and pull the connector straight away from the ACM connector receptacle.

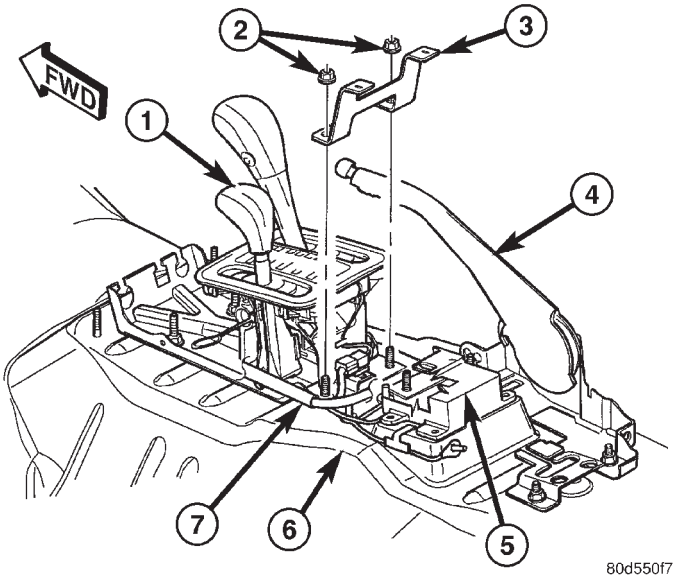


Fig. 7 Center Console Bracket Remove/Install

1 - SHIFTER
2 - NUT (2)
3 - BRACKET
4 - PARK BRAKE LEVER
5 - AIRBAG CONTROL MODULE
6 - FLOOR PANEL TRANSMISSION TUNNEL
7 - INSTRUMENT PANEL WIRE HARNESS

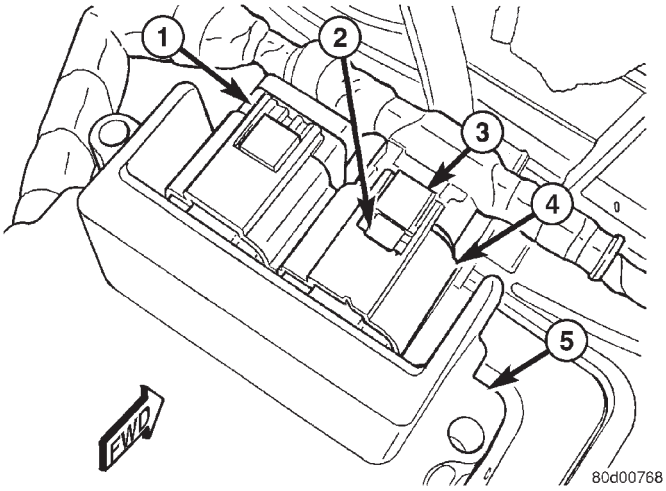


Fig. 8 Airbag Control Module Connector

1 - INSTRUMENT PANEL WIRE HARNESS CONNECTOR
2 - LATCH TAB
3 - CPA LOCK
4 - AIRBAG OVERLAY WIRE HARNESS CONNECTOR
5 - AIRBAG CONTROL MODULE

(6) Disconnect the instrument panel wire harness connector for the ACM from the ACM connector receptacle.

AIRBAG CONTROL MODULE (Continued)

(7) Remove the four screws that secure the ACM to the mount that is welded onto the top of the floor panel transmission tunnel (Fig. 9).

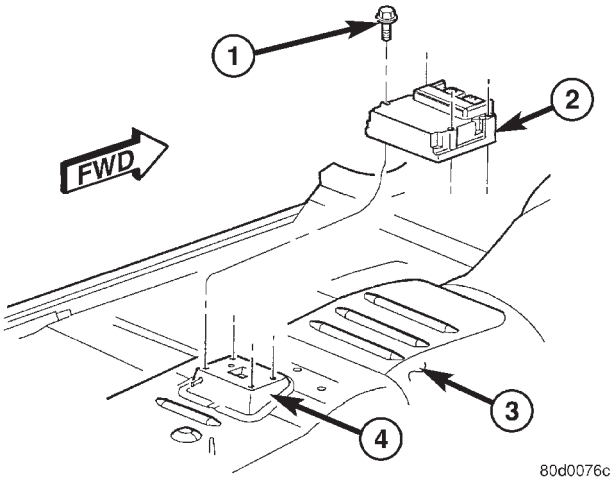


Fig. 9 Airbag Control Module Remove/Install

1 - SCREW (4)
2 - AIRBAG CONTROL MODULE
3 - FLOOR PANEL TRANSMISSION TUNNEL
4 - MOUNT

(8) Remove the ACM from the ACM mount on the top of the floor panel transmission tunnel.

INSTALLATION

Two different Airbag Control Modules (ACM) are available for this vehicle. For vehicles equipped with the optional side curtain airbags, both ACM connector receptacles are black in color and the ACM contains a second bi-directional safing sensor for the side airbags. For vehicles not equipped with the optional side curtain airbags, the ACM connector receptacles are gray.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE AIRBAG CONTROL MODULE CONTAINS THE IMPACT SENSOR, WHICH ENABLES THE SYSTEM TO DEPLOY THE SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE AIRBAG CONTROL MODULE, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN AIRBAG CONTROL MODULE IS ACCIDENTALLY DROPPED DURING SERVICE, THE MODULE MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Carefully position the Airbag Control Module (ACM) to the mount that is welded onto the top of the floor panel transmission tunnel (Fig. 9). The bottom of the ACM housing is keyed. When the ACM is correctly positioned, the bottom of the housing will fit flush with the mount and the orientation arrow on the label on top of the housing will be pointed forward in the vehicle.

(2) Install and tighten the four screws that secure the ACM to the mount that is welded onto the top of the floor panel transmission tunnel. Tighten the screws to 11 N·m (95 in. lbs.).

(3) Reconnect the instrument panel wire harness connector for the ACM to the ACM connector receptacle. Be certain that the connector latch and the red CPA lock are fully engaged (Fig. 8).

(4) Reconnect the airbag overlay wire harness connector for the ACM to the ACM connector receptacle. Be certain that the connector latch and the red CPA lock are fully engaged.

(5) Reinstall the center console bracket onto the two studs on the floor panel transmission tunnel just forward of the ACM (Fig. 7).

(6) Install and tighten the two nuts that secure the center console bracket to the studs on the floor panel transmission tunnel. Tighten the nuts to 28 N·m (21 ft. lbs.).

(7) Reinstall the center console onto the top of the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(8) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

CHILD TETHER ANCHOR

DESCRIPTION

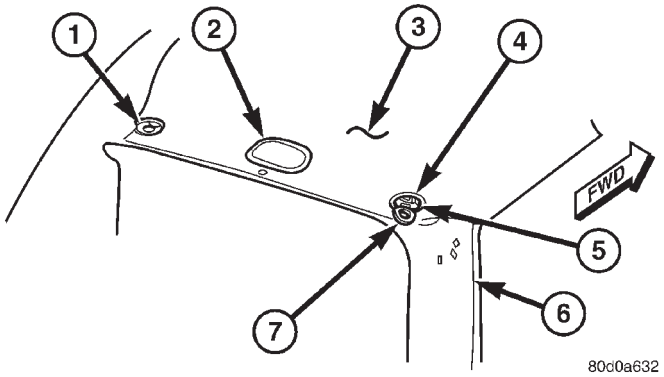


Fig. 10 Child Tether Anchors - North America

1 - CHILD TETHER ANCHOR (RIGHT)
2 - CARGO LAMP
3 - HEADLINER
4 - BEZEL
5 - CHILD TETHER ANCHOR BRACKET
6 - D-PILLAR
7 - CAP

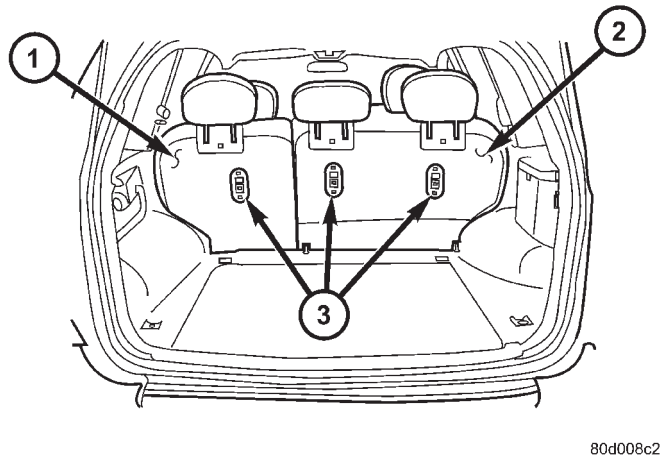


Fig. 11 Child Tether Anchors - Rest-Of-World

1 - REAR SEAT BACK (LEFT)
2 - REAR SEAT BACK (RIGHT)
3 - CHILD TETHER ANCHOR (3)

All vehicles are equipped with fixed-position, child seat tether anchors. Vehicles manufactured for sale in North America have two stamped steel child tether anchor brackets, one secured with a screw to each outboard end of the inner liftgate opening header at the rear of the passenger compartment (Fig. 10). These child tether anchors are concealed behind a removable molded plastic cap that snaps into a bezel located in the headliner over each anchor bracket position. Vehicles manufactured for sale in Rest-Of-World (ROW) markets have two anchors that are integral to the back of the right rear seat back panel, and one that is integral to the left rear seat back panel (Fig. 11). The North American child seat tether anchor brackets are available for separate service replacement. The ROW child seat tether anchors cannot be adjusted or repaired and, if faulty or damaged, they must be replaced as a unit with the rear seat back panel.

OPERATION

See the owner's manual in the vehicle glove box for more information on the proper use of the factory-installed child seat tether anchors.

REMOVAL

The following service procedure applies to vehicles manufactured for sale in North America, which have removable child seat tether anchor brackets that are located on the inner liftgate opening header. Vehicles manufactured for sale in Rest-Of-World (ROW) markets have child tether anchors that are integral to, and are only serviced with the rear seat back panels.

(1) Remove the cover from the child tether anchor bezel in the headliner near the liftgate opening header.

(2) Remove the screw that secures the child tether anchor bracket to the inner liftgate opening header (Fig. 12).

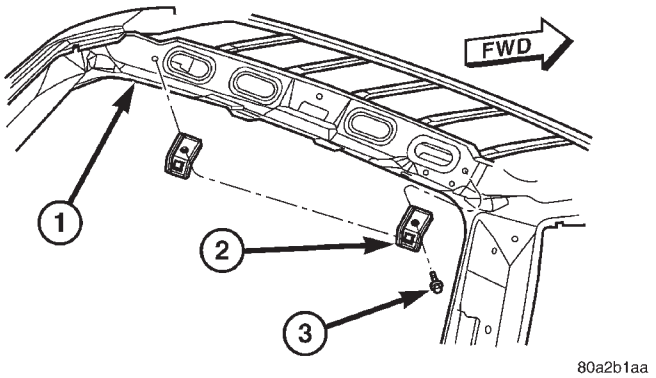


Fig. 12 Child Tether Anchor Remove/Install

1 - INNER LIFTGATE OPENING HEADER
2 - CHILD TETHER ANCHOR BRACKET
3 - SCREW

(3) Remove the child tether anchor bracket from the inner liftgate opening header.

CHILD TETHER ANCHOR (Continued)

INSTALLATION

The following service procedure applies to vehicles manufactured for sale in North America, which have removable child seat tether anchor brackets that are located on the inner liftgate opening header. Vehicles manufactured for sale in Rest-Of-World (ROW) markets have child tether anchors that are integral to, and are only serviced with the rear seat back panels.

(1) Position the child tether anchor bracket onto the inner liftgate opening header (Fig. 12).

(2) Install and tighten the screw that secures the child tether anchor bracket to the inner liftgate opening header. Tighten the screw to 11.8 N·m (105 in. lbs.).

(3) Reinstall the cover into the child tether anchor bezel in the headliner near the liftgate opening header.

CLOCKSPRING

DESCRIPTION

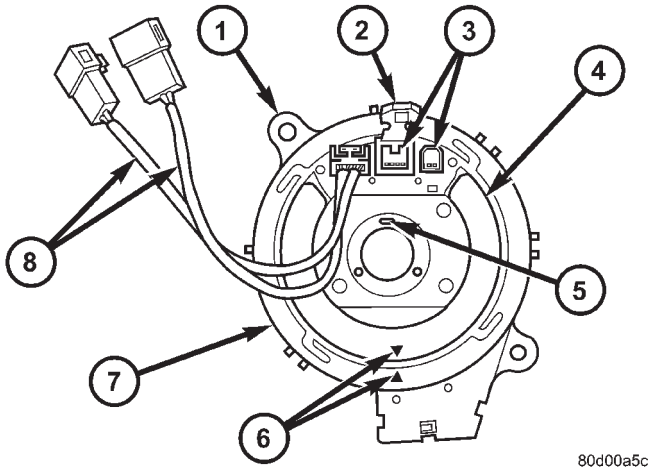


Fig. 13 Clockspring (Upper View)

1 - MOUNTING EAR (2)
2 - LOCKING PIN
3 - UPPER CONNECTOR RECEPTACLE (2)
4 - LABEL
5 - OBLONG PIN
6 - ALIGNMENT ARROWS
7 - CASE
8 - PIGTAIL WIRE (2)

The clockspring assembly is secured with two screws to the multi-function switch mounting housing near the top of the steering column behind the steering wheel (Fig. 13). The clockspring consists of a flat, round molded plastic case with a stubby tail that hangs below the steering column and contains two connector receptacles that face toward the instrument panel (Fig. 14). Within the plastic housing is a spool-like molded plastic rotor with a large exposed hub. The upper surface of the rotor hub has a large center hole, two large flats, an index hole, two short pigtail wires with connectors, and two connector receptacles that face toward the steering wheel.

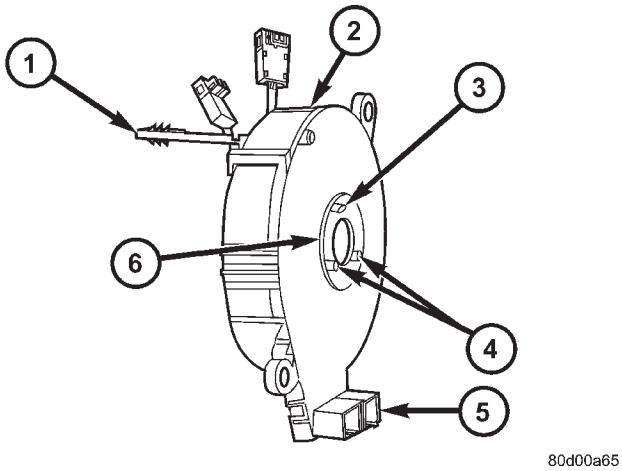


Fig. 14 Clockspring (Lower View)

1 - LOCKING PIN
2 - CASE
3 - OBLONG PIN
4 - ROUND PIN (2)
5 - LOWER CONNECTOR RECEPTACLE (2)
6 - ROTOR

The lower surface of the rotor hub has three pins, two round and one oblong. These pins index the clockspring to the turn signal cancel cam unit in the multi-function switch mounting housing. Within the plastic case and wound around the rotor spool is a long ribbon-like tape that consists of several thin copper wire leads sandwiched between two thin plastic membranes. The outer end of the tape terminates at the connector receptacles that face the instrument panel, while the inner end of the tape terminates at the pigtail wires and connector receptacles on the hub of the clockspring rotor that face the steering wheel.

Service replacement clocksprings are shipped precentered and with a molded plastic locking pin installed. The locking pin secures the centered clockspring rotor to the clockspring case during shipment and handling, but must be removed from the clockspring after it and the multi-function switch mounting housing are installed on the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

The clockspring cannot be repaired. If the clockspring is faulty, damaged, or if the driver airbag has been deployed, the clockspring must be replaced.

CLOCKSPRING (Continued)

OPERATION

The clockspring is a mechanical electrical circuit component that is used to provide continuous electrical continuity between the fixed instrument panel wire harness and the electrical components mounted on or in the rotating steering wheel. On this model the rotating electrical components include the driver airbag, the horn switch, the speed control switches, and the remote radio switches, if the vehicle is so equipped. The clockspring case is positioned and secured to the multi-function switch mounting housing on the upper steering column housing by two screws. The two connector receptacles on the tail of the fixed clockspring case connect the clockspring to the vehicle electrical system through two take outs with connectors from the instrument panel wire harness. The clockspring rotor is movable and is keyed to the hub of the steering wheel by two large flats that are molded into the rotor hub. The three pins (two round and one oblong) on the lower surface of the clockspring rotor hub engage and index the clockspring rotor to the turn signal cancel cam. The turn signal cancel cam is integral to the multi-function switch mounting housing and is keyed to the upper steering column shaft. Two short, yellow-sleeved pigtail wires on the upper surface of the clockspring rotor connect the clockspring to the driver airbag, while a steering wheel wire harness connects the two connector receptacles on the upper surface of the clockspring rotor to the horn switch, the two speed control switches, and the remote radio switches on vehicles that are so equipped.

Like the clockspring in a timepiece, the clockspring tape has travel limits and can be damaged by being wound too tightly during full stop-to-stop steering wheel rotation. To prevent this from occurring, the clockspring must be centered when it is installed on the steering column. Centering the clockspring indexes the clockspring tape to the movable steering components so that the tape can operate within its designed travel limits. However, if the clockspring is removed from the steering column or if the steering shaft is disconnected from the steering gear, the clockspring spool can change position relative to the movable steering components and must be re-centered following completion of the service or the tape may be damaged. Service replacement clocksprings are shipped pre-centered and with a locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column. If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

STANDARD PROCEDURE - CLOCKSPRING CENTERING

The clockspring is designed to wind and unwind when the steering wheel is rotated, but is only designed to rotate the same number of turns (about five complete rotations) as the steering wheel can be turned from stop to stop. Centering the clockspring indexes the clockspring tape to other steering components so that it can operate within its designed travel limits. The rotor of a centered clockspring can be rotated two and one-half turns in either direction from the centered position, without damaging the clockspring tape.

However, if the clockspring is removed for service or if the steering column is disconnected from the steering gear, the clockspring tape can change position relative to the other steering components. The clockspring must then be re-centered following completion of such service or the clockspring tape may be damaged. Service replacement clocksprings are shipped pre-centered and with a molded plastic locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column. If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Place the front wheels in the straight-ahead position.

(2) Remove the clockspring from the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

CLOCKSPRING (Continued)

(3) Hold the clockspring case in one hand so that it is oriented as it would be when it is installed on the steering column (Fig. 15).

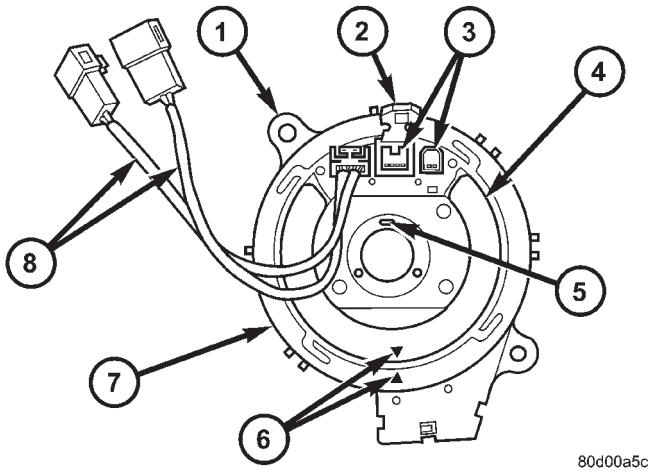


Fig. 15 Clockspring

1 - MOUNTING EAR (2)
2 - LOCKING PIN
3 - UPPER CONNECTOR RECEPTACLE (2)
4 - LABEL
5 - OBLONG PIN
6 - ALIGNMENT ARROWS
7 - CASE
8 - PIGTAIL WIRE (2)

(4) Use your other hand to rotate the clockspring rotor clockwise to the end of its travel. **Do not apply excessive torque.**

(5) From the end of the clockwise travel, rotate the rotor about two and one-half turns counterclockwise, until the arrows on the clockspring rotor label and the clockspring case are aligned. The uppermost pin on the lower surface of the clockspring rotor should now be the oblong pin.

(6) The clockspring is now centered. Secure the clockspring rotor to the clockspring case to maintain clockspring centering until it is reinstalled on the steering column.

(7) The front wheels should still be in the straight-ahead position. Reinstall the clockspring onto the steering column. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

REMOVAL

The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Place the front wheels in the straight-ahead position.

(2) Remove the driver airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(3) Disconnect the steering wheel wire harness connectors from the upper clockspring connector receptacles.

(4) Remove the steering wheel from the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - REMOVAL).

(5) From below the steering column, remove the screw that secures the lower tilting steering column shroud to the steering column multi-function switch mounting housing (Fig. 16).

(6) Using hand pressure, push gently inward on both sides of the upper shroud near the parting line between the upper and lower shrouds to release the snap features that secure the two halves to each other.

(7) Remove both the upper and lower shrouds from the steering column.

(8) Disconnect the two instrument panel wire harness connectors for the clockspring from the two connector receptacles below the steering column on the back of the clockspring case.

(9) Remove the two screws that secure the clockspring case to the multi-function switch mounting housing (Fig. 17).

(10) Remove the clockspring from the multi-function switch mounting housing. The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

(11) If the removed clockspring is to be reused, be certain to secure the clockspring rotor to the clockspring case to maintain clockspring centering until it is reinstalled on the steering column. If clockspring centering is not maintained, the clockspring must be centered again before it is reinstalled. (Refer to 8 -

CLOCKSPRING (Continued)

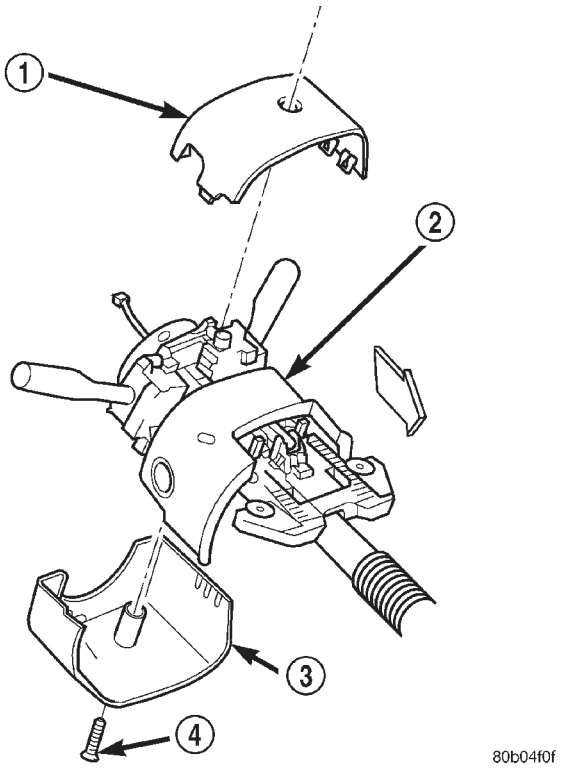


Fig. 16 Steering Column Shrouds Remove/Install

1 - UPPER TILTING COLUMN SHROUD
2 - FIXED COLUMN SHROUD
3 - LOWER TILTING COLUMN SHROUD
4 - SCREW

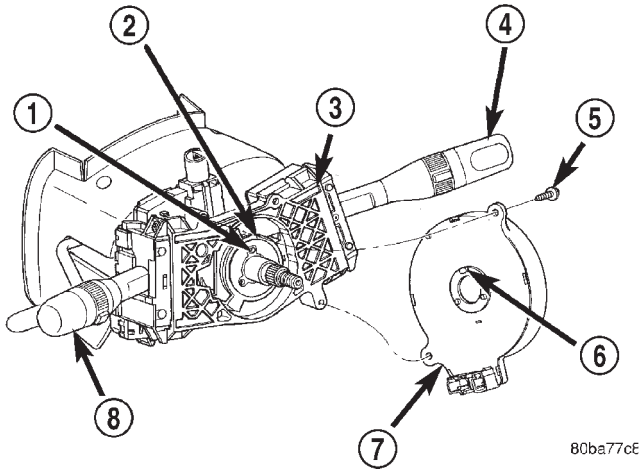


Fig. 17 Clockspring Remove/Install

1 - OBLONG HOLE
2 - TURN SIGNAL CANCEL CAM
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING
4 - RIGHT MULTI-FUNCTION SWITCH
5 - SCREW (2)
6 - OBLONG PIN
7 - CLOCKSPRING
8 - LEFT MULTI-FUNCTION SWITCH

ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING).

INSTALLATION

The clockspring cannot be repaired. It must be replaced if faulty or damaged, or if the driver airbag has been deployed.

If the clockspring is not properly centered in relation to the steering wheel, steering shaft and steering gear, it may be damaged. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - STANDARD PROCEDURE - CLOCKSPRING CENTERING). Service replacement clocksprings are shipped pre-centered and with a locking pin installed. This locking pin should not be removed until the clockspring has been installed on the steering column. If the locking pin is removed before the clockspring is installed on a steering column, the clockspring centering procedure must be performed.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain that the front wheels are still in the straight-ahead position.

(1) While holding the centered clockspring rotor and case stationary in relation to each other, carefully slide the clockspring down over the steering column upper shaft.

(2) Align and seat the three pins on the lower surface of the clockspring rotor hub with the three holes in the hub of the turn signal cancel cam (Fig. 17). It should be noted that when the clockspring is properly centered the uppermost pin on the clockspring rotor hub is the oblong pin, and it will only fit in the oblong hole in the hub of the turn signal cancel cam.

CLOCKSPRING (Continued)

(3) Align and seat the one pin and the two mounting ears on the clockspring case to their respective holes in the multi-function switch mounting housing.

(4) Install and tighten the two clockspring mounting screws. Tighten the screws to 2.5 N·m (22 in. lbs.).

(5) Reconnect the two instrument panel wire harness connectors for the clockspring to the two connector receptacles below the steering column on the back of the clockspring case.

(6) Position the lower tilting steering column shroud onto the steering column (Fig. 16).

(7) Install and tighten the screw that secures the lower tilting steering column shroud to the multi-function switch mounting housing. Tighten the screw to 2 N·m (17 in. lbs.).

(8) Position the upper tilting column shroud onto the steering column with the hazard warning switch button inserted through the hole in the upper surface of the shroud. Align the upper tilting steering column shroud to the lower shroud and snap the two shroud halves together.

(9) Align the snap features on the upper and lower shrouds and apply hand pressure to snap them together.

(10) Reinstall the steering wheel onto the steering column. (Refer to 19 - STEERING/COLUMN/STEERING WHEEL - INSTALLATION).

(11) Reconnect the steering wheel wire harness connectors to the upper clockspring connector receptacles.

(12) Reinstall the driver airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/ DRIVER AIRBAG - INSTALLATION).

DRIVER AIRBAG

DESCRIPTION

The injection molded, thermoplastic driver airbag protective trim cover is the most visible part of the driver airbag (Fig. 18). The driver airbag is located in the center of the steering wheel, where it is secured with two screws to the two horizontal spokes of the four-spoke steering wheel armature. A stamped, satin polished emblem with the Jeep® logo is applied to the center of the trim cover. Concealed beneath the driver airbag trim cover are the horn switch, the folded airbag cushion, the airbag retainer or housing, the airbag inflator, and the retainers that secure the inflator to the airbag housing.

The airbag cushion, housing, and inflator are secured within an integral receptacle molded into the back of the trim cover. The driver airbag trim cover has locking blocks molded into the back side of it that engage a lip formed around the perimeter of the airbag housing. Two stamped metal retainers then fit

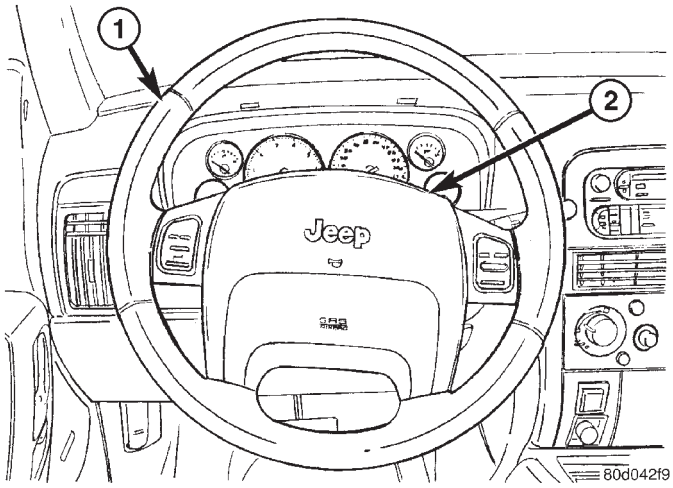


Fig. 18 Driver Airbag Trim Cover

1 - STEERING WHEEL
2 - TRIM COVER

over the inflator mounting studs on the back of the airbag housing and are engaged in slots within the upper and lower trim cover locking blocks, securely locking the cover into place.

The resistive membrane-type horn switch is secured within a plastic tray that is inserted in a pocket or pouch sewn onto the airbag cushion retainer strap, between the trim cover and the folded airbag cushion. The horn switch ground pigtail wire has an eyelet terminal connector that is captured on the upper right inflator mounting stud between the inflator and the upper trim cover retainer. The horn switch feed pigtail wire has a white, molded plastic insulator that is secured by an integral retainer to a mounting hole located in the upper trim cover retainer near the upper left corner on the back of the airbag housing, and is connected to the vehicle electrical system through a take out and connector of the steering wheel wire harness.

The airbag used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. A radial deploying fabric airbag cushion with tethers is used. The airbag inflator is a dual-initiator, non-azide, pyrotechnic-type unit with four mounting studs and is secured to the stamped metal airbag housing using four hex nuts with washers. Two keyed and color-coded connector receptacles on the driver airbag inflator connect the two inflator initiators to the vehicle electrical system through two yellow-jacketed, two-wire pigtail harnesses of the clockspring. The driver airbag cannot be repaired, and must be replaced if deployed or in any way damaged. The driver airbag trim cover and the horn switch are available individually, and may be disassembled from the driver airbag for service replacement.

DRIVER AIRBAG (Continued)

OPERATION

The multistage driver airbag is deployed by electrical signals generated by the Airbag Control Module (ACM) through the driver airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ACM to suit the monitored impact conditions by providing one of four delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy. When the ACM sends the proper electrical signals to each initiator, the electrical energy generates enough heat to initiate a small pyrotechnic charge which, in turn ignites chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce a large quantity of nitrogen gas. The inflator is sealed to the back of the airbag housing and a diffuser in the inflator directs all of the nitrogen gas into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the driver airbag trim cover will split at predetermined breakout lines, then fold back out of the way along with the horn switch and tray unit. Following an airbag deployment, the airbag cushion quickly deflates by venting the nitrogen gas towards the instrument panel through vent holes within the fabric used to construct the back (steering wheel side) panel of the airbag cushion.

Some of the chemicals used to create the nitrogen gas may be considered hazardous while in their solid state before they are burned, but they are securely sealed within the airbag inflator. Typically, both initiators are used and all potentially hazardous chemicals are burned during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic or hazardous materials. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT). The nitrogen gas that is produced when the chemicals are burned is harmless. However, a small amount of residue from the burned chemicals may cause some temporary discomfort if it contacts the skin, eyes, or breathing passages. If skin or eye irritation is noted, rinse the affected area with plenty of cool, clean water. If breathing passages are irritated, move to another area where there is plenty of clean, fresh air to breath. If the irritation is not alleviated by these actions, contact a physician.

REMOVAL

The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG CUSHION AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) From the underside of the steering wheel, remove the two screws that secure the driver airbag to the steering wheel armature (Fig. 19).

(3) Pull the driver airbag away from the steering wheel far enough to access the three electrical connections on the back of the airbag housing.

(4) Disconnect the steering wheel wire harness connector for the horn switch from the horn switch feed pigtail wire connector, which is located on the back of the driver airbag housing.

DRIVER AIRBAG (Continued)

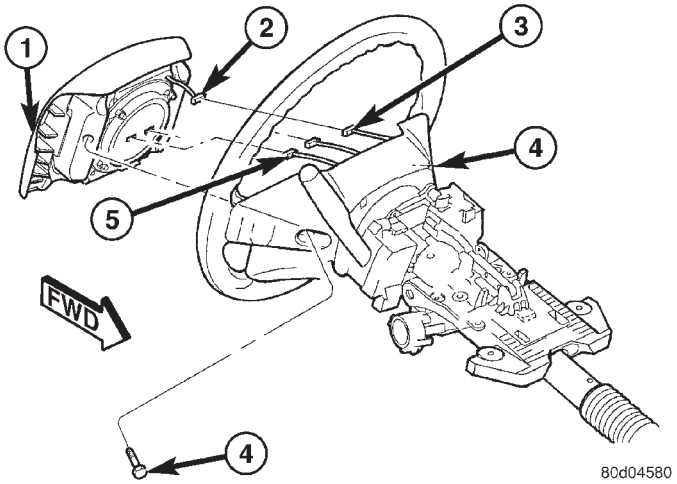


Fig. 19 Driver Airbag Remove/Install

1 - DRIVER AIRBAG
2 - HORN SWITCH FEED WIRE CONNECTOR
3 - STEERING WHEEL WIRE HARNESS CONNECTOR
4 - SCREW (2)
5 - CLOCKSPRING PIGTAIL WIRE CONNECTOR (2)

CAUTION: Do not pull on the clockspring pigtail wires or pry on the connector insulator to disengage the connector from the driver airbag inflator connector receptacle. Improper removal of these pigtail wires and their connector insulators can result in damage to the airbag circuits or connector insulators.

(5) The clockspring driver airbag pigtail wire connectors are secured by an integral lock to the airbag inflator connector receptacles, which are located at the back of the driver airbag housing. Firmly grasp and pull the lock straight out from the connector insulator, then pull the insulators straight out from the airbag inflator to disconnect them from the connector receptacles.

(6) Remove the driver airbag from the steering wheel.

(7) If the driver airbag has been deployed, the clockspring must be replaced. (Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

DISASSEMBLY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE HORN SWITCH IS INTEGRAL TO THE DRIVER AIRBAG UNIT. SERVICE OF THIS UNIT SHOULD BE PERFORMED ONLY BY DAIMLERCHRYSLER-TRAINED AND AUTHORIZED DEALER SERVICE TECHNICIANS. FAILURE TO TAKE THE PROPER PRECAUTIONS OR TO FOLLOW THE PROPER PROCEDURES COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the driver airbag from the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(3) Remove the four nuts that secure the upper and lower trim cover retainers to the studs on the back of the driver airbag housing (Fig. 20).

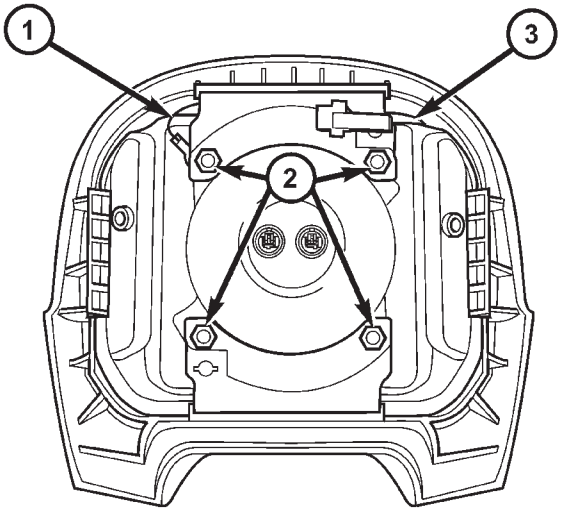


Fig. 20 Driver Airbag Trim Cover Retainer Nuts Remove/Install

1 - HORN SWITCH GROUND PIGTAIL WIRE
2 - NUTS
3 - HORN SWITCH FEED PIGTAIL WIRE

(4) Remove the upper and lower trim cover retainers from the airbag housing studs (Fig. 21).

DRIVER AIRBAG (Continued)

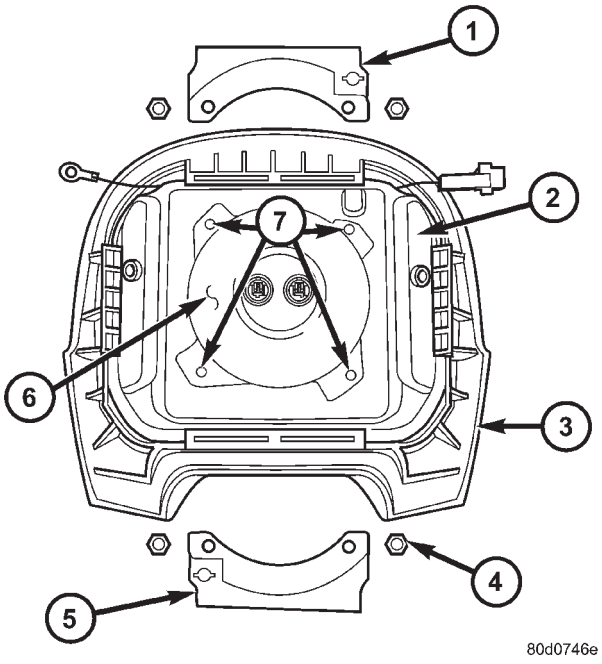


Fig. 21 Driver Airbag Trim Cover Retainers

1 - UPPER RETAINER
2 - AIRBAG HOUSING
3 - TRIM COVER
4 - NUT (4)
5 - LOWER RETAINER
6 - INFLATOR
7 - STUDS

(5) Disengage the horn switch feed pigtail wire connector retainer from the mounting hole in the upper trim cover retainer.

(6) Remove the horn switch ground pigtail wire eyelet terminal from the upper right airbag housing stud.

(7) Disengage the four trim cover locking blocks from the lip around the outside edge of the driver airbag housing and remove the housing from the cover (Fig. 22).

ASSEMBLY

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

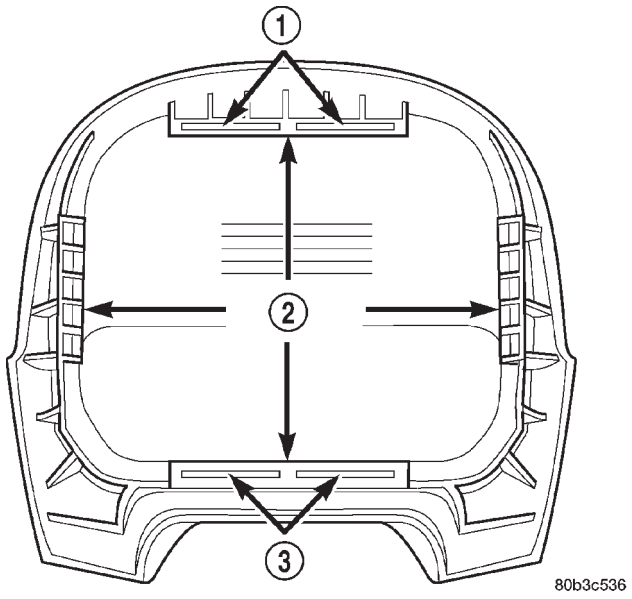


Fig. 22 Driver Airbag Trim Cover Remove/Install

1 - RETAINER SLOTS
2 - LOCKING BLOCKS
3 - RETAINER SLOTS

WARNING: THE HORN SWITCH IS INTEGRAL TO THE DRIVER AIRBAG UNIT. SERVICE OF THIS UNIT SHOULD BE PERFORMED ONLY BY DAIMLERCHRYSLER-TRAINED AND AUTHORIZED DEALER SERVICE TECHNICIANS. FAILURE TO TAKE THE PROPER PRECAUTIONS OR TO FOLLOW THE PROPER PROCEDURES COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE DRIVER AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE DRIVER AIRBAG CUSHION AND THE DRIVER AIRBAG TRIM COVER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

DRIVER AIRBAG (Continued)

WARNING: THE DRIVER AIRBAG TRIM COVER MUST NEVER BE PAINTED. REPLACEMENT TRIM COVERS ARE SERVICED IN THE ORIGINAL COLORS. PAINT MAY CHANGE THE WAY IN WHICH THE MATERIAL OF THE TRIM COVER RESPONDS TO AN AIRBAG DEPLOYMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

NOTE: If the horn switch and tray have been removed from the sewn pouch in the airbag cushion retaining strap, be certain that they are properly reinstalled with the horn switch feed and ground pigtail wires properly oriented before assembling the trim cover onto the airbag housing. (Refer to 8 - ELECTRICAL/HORN/HORN SWITCH - INSTALLATION).

(1) Carefully position the driver airbag in the trim cover. Be certain that the horn switch feed and ground pigtail wires are not pinched between the airbag housing and the trim cover locking blocks.

(2) Engage the upper and lower trim cover locking blocks with the lip of the driver airbag housing, then engage the locking blocks on each side of the trim cover with the lip of the housing. Be certain that each of the locking blocks is fully engaged on the lip of the airbag housing (Fig. 23).

(3) Reinstall the horn switch ground pigtail wire eyelet terminal over the right upper airbag housing stud.

(4) Reinstall the upper and lower airbag trim cover retainers over the airbag housing studs. Be certain that the tabs on each retainer are engaged in the retainer slots of the upper and lower trim cover locking blocks (Fig. 22).

(5) Install and tighten the nuts that secure the trim cover retainers to the airbag housing studs. Tighten the nuts to 6.8 N·m (60 in. lbs.).

(6) Engage the horn switch feed pigtail wire connector retainer in the mounting hole in the upper trim cover retainer.

(7) Reinstall the driver airbag onto the steering wheel. (Refer to 8 - ELECTRICAL/RESTRAINTS/ DRIVER AIRBAG - INSTALLATION).

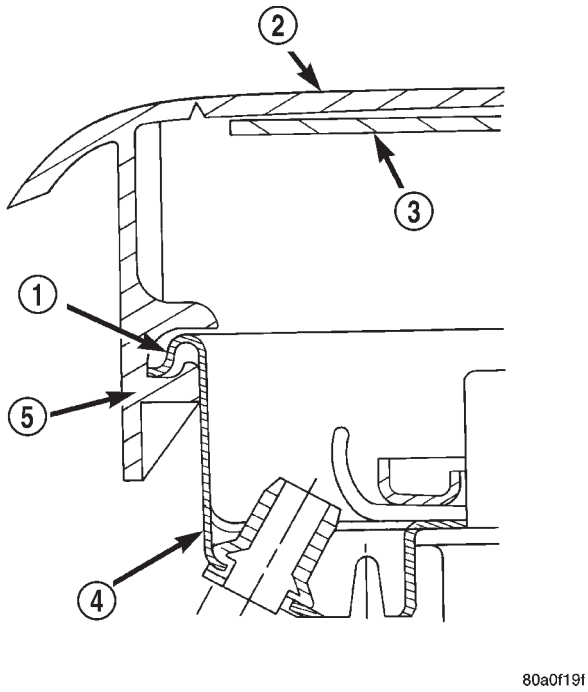


Fig. 23 Driver Airbag Trim Cover Locking Blocks Engaged

1 - LIP
2 - TRIM COVER
3 - HORN SWITCH
4 - AIRBAG HOUSING
5 - LOCKING BLOCK

INSTALLATION

The following procedure is for replacement of a faulty or damaged driver airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the driver airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

DRIVER AIRBAG (Continued)

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE DRIVER AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE DRIVER AIRBAG CUSHION AND THE DRIVER AIRBAG TRIM COVER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

WARNING: THE DRIVER AIRBAG TRIM COVER MUST NEVER BE PAINTED. REPLACEMENT AIRBAGS AND TRIM COVERS ARE SERVICED IN THE ORIGINAL COLORS. PAINT MAY CHANGE THE WAY IN WHICH THE MATERIAL OF THE TRIM COVER RESPONDS TO AN AIRBAG DEPLOYMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Assemble the driver airbag trim cover onto the airbag housing. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - ASSEMBLY).

(2) Position the driver airbag close enough to the steering wheel to reconnect all three electrical connections on the back of the airbag housing.

(3) When installing the driver airbag, reconnect the two clockspring driver airbag pigtail wire connectors to the airbag inflator connector receptacles by pressing straight in on the connectors (Fig. 19), then pushing the locks straight into the connectors. You can be certain that the connector is fully engaged by listening carefully for a distinct, audible click as the connector latches snap into place.

(4) Reconnect the steering wheel wire harness connector for the horn switch to the horn switch feed pigtail wire connector, which is located at the back of the driver airbag housing.

(5) Carefully position the driver airbag in the steering wheel. Be certain that the clockspring pigtail wires and steering wheel wire harness in the steering wheel hub area are not pinched between the driver airbag and the steering wheel armature.

(6) From the underside of the steering wheel, install and tighten the two screws that secure the driver airbag to the steering wheel armature. Tighten the screws to 10 N·m (90 in. lbs.).

(7) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT IMPACT SENSOR

DESCRIPTION

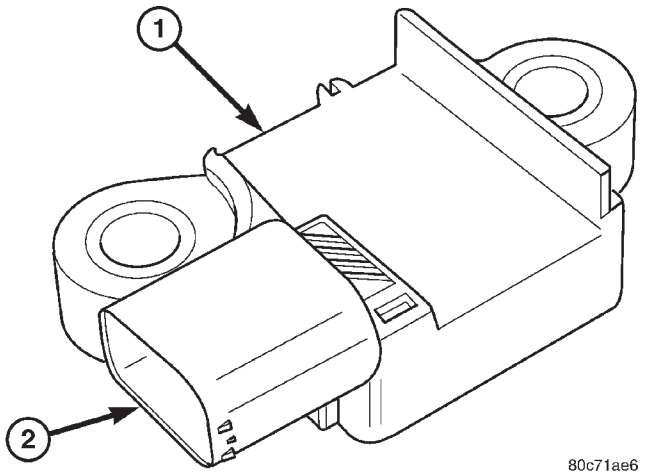


Fig. 24 Front Impact Sensor

1 - SENSOR
2 - CONNECTOR RECEPTACLE

Two front impact sensors are used on this model, one each for the left and right sides of the vehicle (Fig. 24). These sensors are mounted remotely from the impact sensor that is internal to the Airbag Control Module (ACM). The right and left front and side impact sensors are identical in construction and calibration with the exception of the right-hand and left-hand die cast aluminum mounting brackets to which each front impact sensor is secured with two screws. The front impact sensor brackets are secured with three screws to the front and inboard sides of the right and left vertical members of the radiator support within the engine compartment.

The impact sensor housing has an integral connector receptacle and two integral mounting ears, each with a metal sleeve to provide crush protection. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The front impact sensors are each connected to the vehicle electrical system through a dedicated take out and connector of the right or left headlamp and dash wire harnesses.

The front impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced. If a front impact sensor is faulty, only the sensor needs to be replaced. If the sensor or the sensor mounting bracket is damaged or faulty, or if proper tightening torque of the screws that secure the sensor to the bracket cannot be achieved, the sensor and bracket unit must be replaced.

FRONT IMPACT SENSOR (Continued)

OPERATION

The front impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Airbag Control Module (ACM). The ACM microprocessor continuously monitors all of the passive restraint system electrical circuits to determine the system readiness. If the ACM detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly.

The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ACM. The impact sensors and the ACM communicate by modulating the voltage in the sensor plus circuit. The hard wired circuits between the front impact sensors and the ACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ACM or the impact sensors. The most reliable, efficient, and accurate means to diagnose the impact sensors, the ACM, and the electronic message communication between the sensors and the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

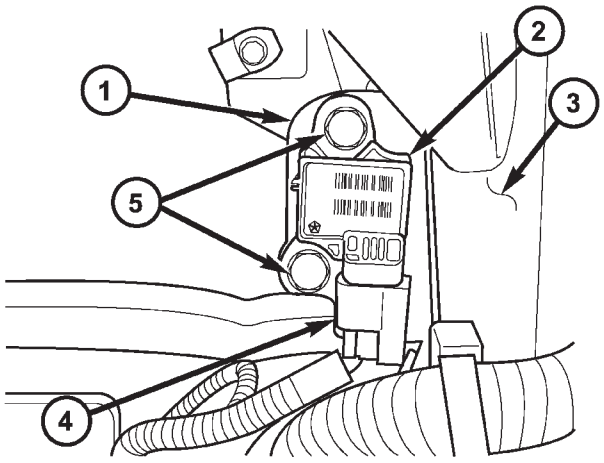
The front and side impact sensors are interchangeable except that the front impact sensors are serviced with a right or left mounting bracket, while the side impact sensors use no mounting bracket. If a front impact sensor is faulty, but not damaged, the sensor may be removed from the sensor mounting bracket and replaced with a side impact sensor. If the front impact sensor or the sensor mounting bracket are damaged in any way, or if proper tightening torque of the screws that secure the sensor to the bracket cannot be achieved, the front impact sensor and bracket must be replaced as a unit.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) From the engine compartment, disconnect the right or left headlamp and dash wire harness connector for the front impact sensor from the sensor connector receptacle (Fig. 25).



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Fig. 25 Front Impact Sensor Remove/Install (Right Side Shown, Left Side Similar)

1 - BRACKET
2 - IMPACT SENSOR
3 - RADIATOR SUPPORT
4 - WIRE HARNESS CONNECTOR
5 - SCREW (2)

FRONT IMPACT SENSOR (Continued)

(3) From the engine compartment, remove the two screws that secure the right or left front impact sensor to the sensor mounting bracket on the right or left radiator support vertical member.

(4) Remove the front impact sensor from the sensor mounting bracket.

INSTALLATION

The front and side impact sensors are interchangeable except that the front impact sensors are serviced with a right or left mounting bracket, while the side impact sensors use no mounting bracket. If a front impact sensor is faulty, but not damaged, the sensor may be removed from the sensor mounting bracket and replaced with a side impact sensor. If the front impact sensor or the sensor mounting bracket are damaged in any way, or if proper tightening torque of the screws that secure the sensor to the bracket cannot be achieved, the front impact sensor and bracket must be replaced as a unit.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the right or left front impact sensor to the sensor mounting bracket on the right or left radiator support vertical member in the engine compartment (Fig. 25).

(2) Install and tighten the two screws that secure the right or left front impact sensor to the sensor mounting bracket. Tighten the screws to 10 N·m (85 in. lbs.).

(3) Reconnect the right or left headlamp and dash wire harness connector for the front impact sensor to the sensor connector receptacle.

(4) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT IMPACT SENSOR & BRACKET

REMOVAL

The front and side impact sensors are interchangeable except that the front impact sensors are serviced with a right or left mounting bracket, while the side impact sensors use no mounting bracket. If a front impact sensor is faulty, but not damaged, the sensor may be removed from the sensor mounting bracket and replaced with a side impact sensor. If the front impact sensor or the sensor mounting bracket are damaged in any way, or if proper tightening torque of the screws that secure the sensor to the bracket cannot be achieved, the front impact sensor and bracket must be replaced as a unit.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

FRONT IMPACT SENSOR & BRACKET (Continued)

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the headlamp mounting module from the front of the vehicle. (Refer to 23 - BODY/EXTERIOR/HEADLAMP MOUNTING MODULE - REMOVAL).

(3) Disconnect the right or left headlamp and dash wire harness connector for the front impact sensor from the sensor connector receptacle.

(4) Remove the three screws that secure the right or left front impact sensor and bracket unit to the right or left radiator support vertical member (Fig. 26).

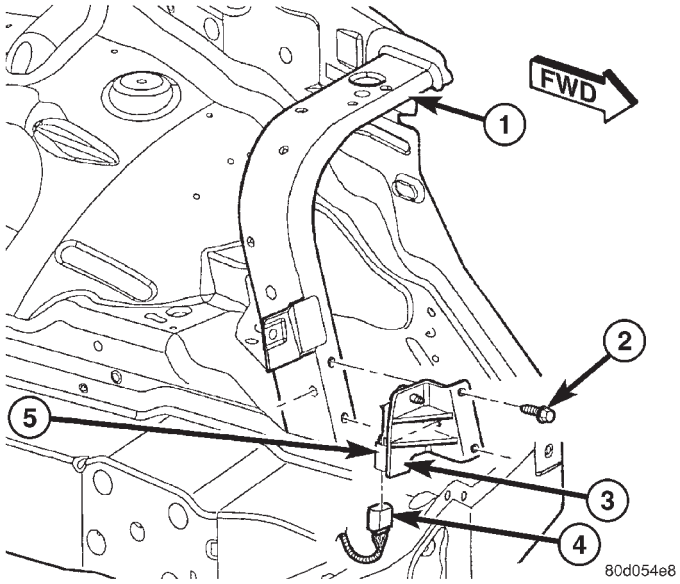


Fig. 26 Front Impact Sensor & B Remove/Install

1 - RADIATOR SUPPORT
2 - SCREW (3)
3 - BRACKET
4 - WIRE HARNESS CONNECTOR
5 - IMPACT SENSOR

(5) Remove the right or left front impact sensor and bracket unit from the front of the vehicle.

INSTALLATION

The front and side impact sensors are interchangeable except that the front impact sensors are serviced with a right or left mounting bracket, while the side impact sensors use no mounting bracket. If a front impact sensor is faulty, but not damaged, the sensor may be removed from the sensor mounting bracket and replaced with a side impact sensor. If the front impact sensor or the sensor mounting bracket are damaged in any way, or if proper tightening torque of the screws that secure the sensor to the bracket cannot be achieved, the front impact sensor and bracket must be replaced as a unit.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE FRONT IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE FRONT SUPPLEMENTAL RESTRAINTS. NEVER STRIKE OR DROP THE FRONT IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER FRONT SUPPLEMENTAL RESTRAINT DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the right or left front impact sensor and bracket unit to the front of the vehicle (Fig. 26).

(2) Position the right or left front impact sensor and bracket unit to the right or left radiator support vertical member.

(3) Loosely install the three screws that secure the right or left front impact sensor and bracket unit right or left radiator support vertical member.

FRONT IMPACT SENSOR & BRACKET (Continued)

(4) For the right impact sensor and bracket unit, the tightening sequence for the three screws that secure it to the right radiator support vertical member is from top to bottom. For the left impact sensor and bracket unit, the tightening sequence for the three screws that secure it to the left radiator support vertical member is from bottom to top. Tighten the screws to 12 N·m (105 in. lbs.).

(5) Reconnect the right or left headlamp and dash wire harness connector for the front impact sensor to the sensor connector receptacle.

(6) Reinstall the headlamp mounting module to the front of the vehicle. (Refer to 23 - BODY/EXTERIOR/HEADLAMP MOUNTING MODULE - INSTALLATION).

(7) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

FRONT SEAT BELT & RETRACTOR

REMOVAL

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Adjust the front seat to its most forward position for easiest access to the front seat belt lower anchor and the B-pillar trim.

(2) Disconnect and isolate the battery negative cable.

(3) Lift the front seat belt lower anchor cover far enough to access the screw that secures it to the lower B-pillar (Fig. 27).

(4) Remove the screw that secures the lower anchor to the B-pillar.

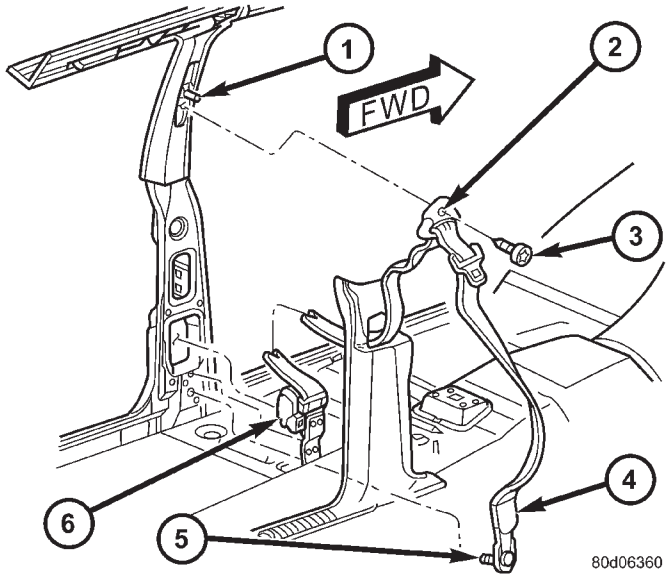


Fig. 27 Front Seat Belt & Retractor Remove/Install

1 - ADJUSTER
2 - TURNING LOOP
3 - SCREW
4 - LOWER ANCHOR
5 - SCREW
6 - RETRACTOR

(5) Using a trim stick or another suitable wide flat-bladed tool, gently pry the top of the turning loop trim cover to unsnap it from the height adjuster and access the screw that secures the front seat belt turning loop to the adjuster on the upper B-pillar (Fig. 28).

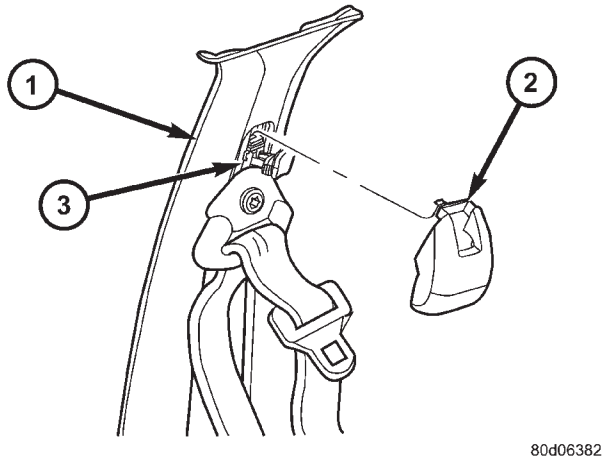


Fig. 28 Turning Loop Cover Remove/Install

1 - PILLAR
2 - TRIM COVER
3 - ADJUSTER

FRONT SEAT BELT & RETRACTOR (Continued)

(6) Remove the screw that secures the seat belt turning loop to the height adjuster on the upper B-pillar.

(7) Remove the seat belt turning loop from the height adjuster.

(8) Remove the trim from the lower B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(9) Pull the front seat belt turning loop and lower anchor through the access hole in the lower B-pillar trim.

(10) Remove the plastic push-in fastener that secures the retractor to the lower B-pillar (Fig. 29).

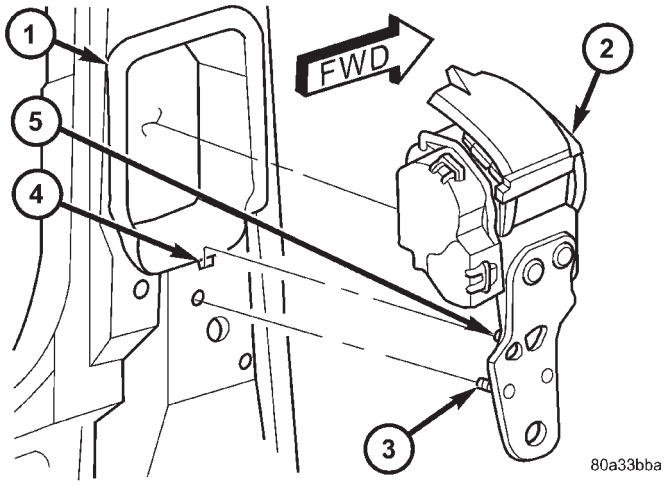


Fig. 29 Front Retractor

1 - SHIELD
2 - RETRACTOR
3 - PLASTIC FASTENER
4 - SLOT
5 - LOCATOR TAB

(11) Disengage the retractor locator tab from the slot in the B-pillar.

(12) Remove the front seat belt and retractor from the B-pillar as a unit.

INSTALLATION

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Be certain that the retractor shield is properly installed in the lower B-pillar and in good condition before reinstalling the retractor (Fig. 29).

(2) Position the front seat belt and retractor to the B-pillar as a unit. Be certain to engage the retractor locator tab in the slot in the lower B-pillar.

(3) Using hand pressure, install the plastic push-in fastener that secures the retractor to the lower B-pillar.

(4) Push the seat belt lower anchor and turning loop through the access hole in the lower B-pillar trim (Fig. 27).

(5) Reinstall the trim onto the lower B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(6) Position the seat belt turning loop onto the height adjuster on the upper B-pillar.

(7) Install and tighten the screw that secures the seat belt turning loop to the height adjuster. Tighten the screw to 37 N·m (27 ft. lbs.).

(8) Using hand pressure, press the top of the turning loop trim cover to snap it onto the height adjuster and cover the screw that secures the front seat belt turning loop to the adjuster on the upper B-pillar (Fig. 28).

(9) Position the front seat belt lower anchor to the lower B-pillar.

(10) Install and tighten the screw that secures the seat belt lower anchor to the B-pillar. Tighten the screw to 37 N·m (27 ft. lbs.).

(11) Pull down the cover over the front seat belt lower anchor far enough to conceal the screw.

(12) Reconnect the battery negative cable.

FRONT SEAT BELT BUCKLE

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

FRONT SEAT BELT BUCKLE (Continued)

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Move the front seat to its most forward position for easiest access to the front seat belt buckle lower anchor screw.

(2) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(3) Disconnect the seat belt switch pigtail wire connector from the body wire harness connector for the seat belt switch with manual seats, or from the power seat wire harness connector for the seat belt switch with power seats (Fig. 30).

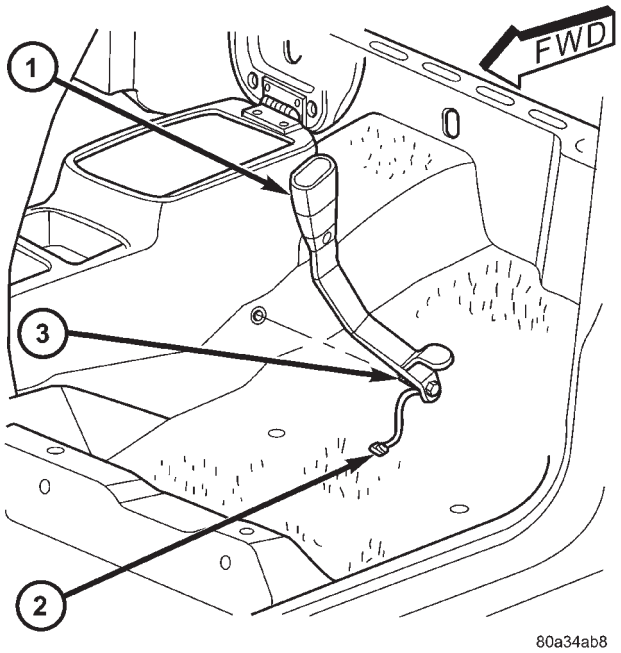


Fig. 30 Front Seat Belt Buckle

1 - SEAT BELT BUCKLE
2 - SEAT BELT SWITCH PIGTAIL WIRE
3 - SCREW

(4) Remove the screw that secures the front seat belt buckle lower anchor to the side of the floor panel transmission tunnel.

(5) Remove the front seat belt buckle from the floor panel transmission tunnel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Position the front seat belt buckle to the side of the floor panel transmission tunnel (Fig. 30).

(2) Install and tighten the screw that secures the front seat belt buckle lower anchor to the side of the floor panel transmission tunnel. Tighten the screw to 43 N·m (32 ft. lbs.).

(3) Reconnect the seat belt switch pigtail wire connector to the body wire harness connector for the seat belt switch with manual seats, or to the power seat wire harness connector for the seat belt switch with power seats.

(4) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

PASSENGER AIRBAG

DESCRIPTION

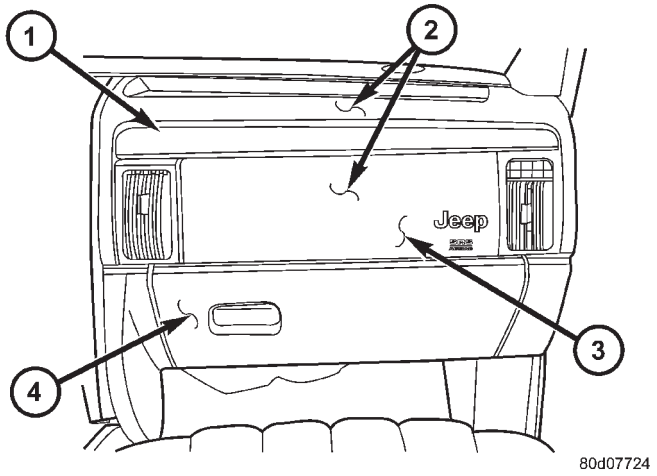


Fig. 31 Passenger Airbag Door

1 - BEZEL
2 - TOP PAD
3 - PASSENGER AIRBAG DOOR
4 - GLOVE BOX DOOR

The rearward facing surface of the instrument panel top pad above the glove box is the most visible part of the passenger airbag (Fig. 31). The passenger airbag is located above the glove box opening in front of the front seat passenger seating position within the instrument panel. The stamped steel passenger airbag door is secured on the back of the instrument panel top pad armature between the two passenger side panel outlets. A stamped metal reinforcement is secured to the instrument panel top pad armature near the upper edge of the passenger airbag door opening, and helps to define a predetermined hinge line beneath the decorative cover of the top pad. The instrument panel passenger side bezel is secured to the airbag door from behind with four screws.

Located behind the passenger airbag door within the instrument panel is the passenger airbag unit. The passenger airbag unit used in this model is a multistage, Next Generation-type that complies with revised federal airbag standards to deploy with less force than those used in some prior models. The passenger airbag unit consists of an extruded aluminum housing, a molded plastic inner airbag cushion dust cover, the airbag cushion, and the airbag inflator. The airbag housing contains the airbag inflator, while the inner dust cover contains the folded airbag cushion. The dust cover completely encloses the airbag cushion and is permanently retained to the housing. The passenger airbag unit is secured with four screws to the instrument panel structural duct. Concealed beneath the instrument panel top pad are the passenger airbag door, the folded airbag cushion, the airbag retainer or housing, and the airbag inflator. The airbag cushion is constructed of a coated nylon fabric. The airbag inflator is a dual-initiator, hybrid-type unit that is secured to and sealed within the airbag housing. A short four-wire pigtail harness with a keyed, yellow connector insulator connects the two inflator initiators to the vehicle electrical system through a dedicated take out and connector of the instrument panel wire harness.

The passenger airbag cannot be repaired, and must be replaced if deployed, faulty, or in any way damaged. The passenger airbag cannot be repaired, and must be replaced if faulty or in any way damaged. The passenger airbag door is serviced only as a unit with the instrument panel top pad. Following a passenger airbag deployment, the passenger airbag and the instrument panel top pad must be replaced. If inspection reveals that the passenger airbag mounting points on the instrument panel structural duct have been cracked or damaged, the instrument panel structural duct assembly must also be replaced.

OPERATION

The multistage passenger airbag is deployed by electrical signals generated by the Airbag Control Module (ACM) through the passenger airbag squib 1 and squib 2 circuits to the two initiators in the airbag inflator. By using two initiators, the airbag can be deployed at multiple levels of force. The force level is controlled by the ACM to suit the monitored impact conditions by providing one of four delay intervals between the electrical signals provided to the two initiators. The longer the delay between these signals, the less forcefully the airbag will deploy.

The hybrid-type inflator assembly includes a small canister of highly compressed gas. When the ACM sends the proper electrical signal to the airbag inflator, the initiator generates enough heat to ignite chemical pellets within the inflator. Once ignited, these chemical pellets burn rapidly and produce the pressure necessary to rupture a containment disk in the pressurized gas canister. The inflator and gas canister are sealed to the airbag cushion so that all of the released inert gas is directed into the airbag cushion, causing the cushion to inflate. As the cushion inflates, the passenger airbag door will bend back the instrument panel top pad at the predetermined hinge line, then fold back over the top of the instrument panel and out of the way. Following an airbag deployment, the airbag cushion quickly deflates by venting the inert gas through vent holes within the fabric used to construct the sides of the airbag cushion.

PASSENGER AIRBAG (Continued)

Typically, both initiators are used during an airbag deployment event. However, it is possible for only one initiator to be used during a deployment due to an airbag system fault; therefore, it is necessary to always confirm that both initiators have been used in order to avoid the improper disposal of potentially live pyrotechnic materials. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

REMOVAL

The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the top pad from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - REMOVAL).

(3) Disconnect the passenger airbag pigtail wire connector from the instrument panel wire harness connector for the airbag. This connector is secured to the outside of the outboard airbag unit end bracket. To disconnect the connector:

(a) Slide the red Connector Position Assurance (CPA) lock on the top of the connector toward the side of the connector.

(b) Depress the connector latch tab and pull the two halves of the connector straight away from each other.

(4) Remove the two screws that secure the two airbag end bracket front mounting tabs to the top of the instrument panel structural duct (Fig. 32).

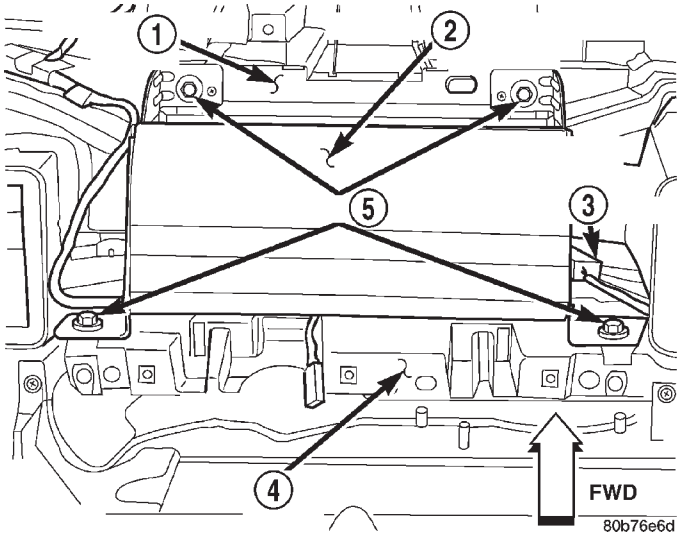


Fig. 32 Passenger Side Airbag Module Remove/ Install

1 - STRUCTURAL DUCT
2 - PASSENGER AIRBAG
3 - WIRE HARNESS CONNECTOR
4 - STRUCTURAL DUCT
5 - SCREWS

(5) Remove the two screws that secure the two airbag end bracket rear mounting tabs to the rear of the structural duct, just above the instrument panel upper glove box opening reinforcement.

(6) Remove the passenger airbag from the instrument panel structural duct as a unit.

PASSENGER AIRBAG (Continued)

INSTALLATION

The following procedure is for replacement of a faulty or damaged passenger airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the passenger airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE PASSENGER AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE PASSENGER AIRBAG CUSHION AND THE INSTRUMENT PANEL TOP PAD. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

WARNING: THE INSTRUMENT PANEL TOP PAD MUST NEVER BE PAINTED. REPLACEMENT TOP PADS ARE SERVICED IN THE ORIGINAL COLORS. PAINT MAY CHANGE THE WAY IN WHICH THE MATERIAL OF THE TOP PAD RESPONDS TO AN AIRBAG DEPLOYMENT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Carefully position the passenger airbag onto the instrument panel structural duct (Fig. 32).

(2) Install and tighten the four screws that secure the passenger airbag to the instrument panel structural duct. Tighten the screws to 11.8 N·m (105 in. lbs.).

(3) Reconnect the instrument panel wire harness connector for the passenger airbag to the passenger airbag pigtail wire connector. This connector is secured to the outside of the outboard airbag unit end bracket. Be certain that the latch on the connector and the red Connector Position Assurance (CPA) lock are each fully engaged.

(4) Reinstall the top pad onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - INSTALLATION).

(5) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

REAR CENTER SEAT BELT & RETRACTOR

REMOVAL

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

REAR CENTER SEAT BELT & RETRACTOR (Continued)

(1) Unlatch and fold the right rear seat cushion forward.

(2) Remove the screw that secures the rear center seat belt lower anchor to the right rear seat belt buckle unit bracket on the rear floor panel (Fig. 33).

(3) Unlatch and fold the right rear seat back forward and separate the cargo area carpet from the base of the seat back panel.

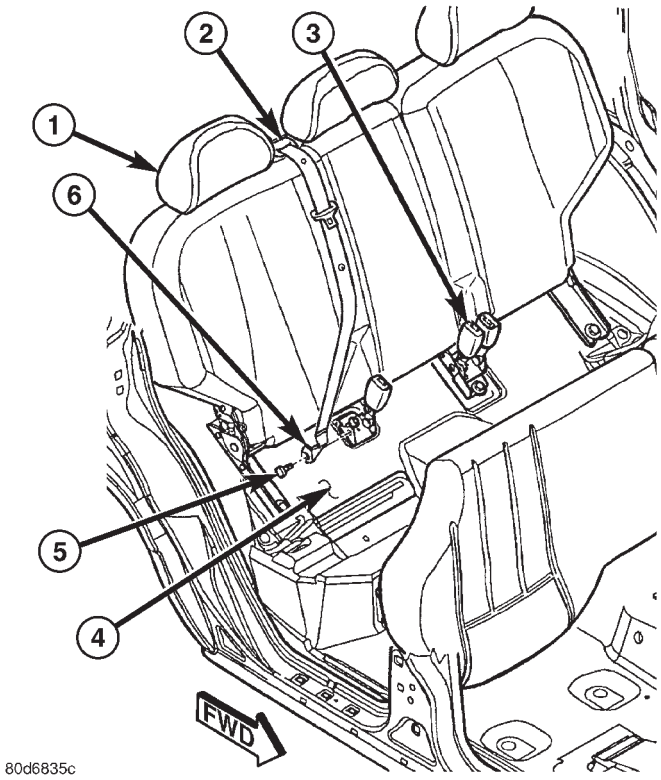


Fig. 33 Rear Center Seat Belt Lower Anchor Remove/Install

1 - REAR SEAT BACK
2 - REAR CENTER SEAT BELT & RETRACTOR
3 - RIGHT REAR SEAT BELT BUCKLE UNIT
4 - REAR FLOOR PANEL
5 - SCREW (1)
6 - LOWER ANCHOR

(4) Remove the right rear seat back panel from the vehicle. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - REMOVAL).

(5) Remove the two screws that secure the belt web guide to the top of the right rear seat back panel.

(6) Remove the trim from the right rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - REMOVAL).

(7) Route the rear seat belt lower anchor and belt web guide through the top of the seat back panel.

(8) Disengage the seat back latch cable fitting from the cable support on the retractor, which is a light snap fit (Fig. 34).

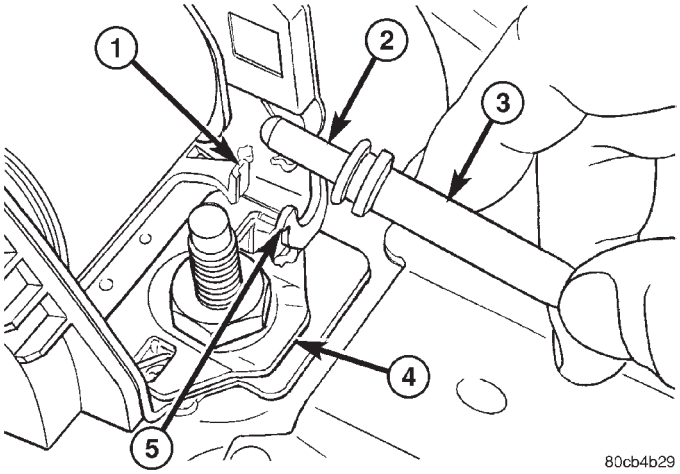


Fig. 34 Seat Back Latch Cable Disengage/Engage

1 - LEVER
2 - PLUNGER
3 - LATCH CABLE FITTING
4 - REAR CENTER RETRACTOR
5 - SUPPORT

(9) Remove the screw that secures the retractor to the rear seat back panel (Fig. 35).

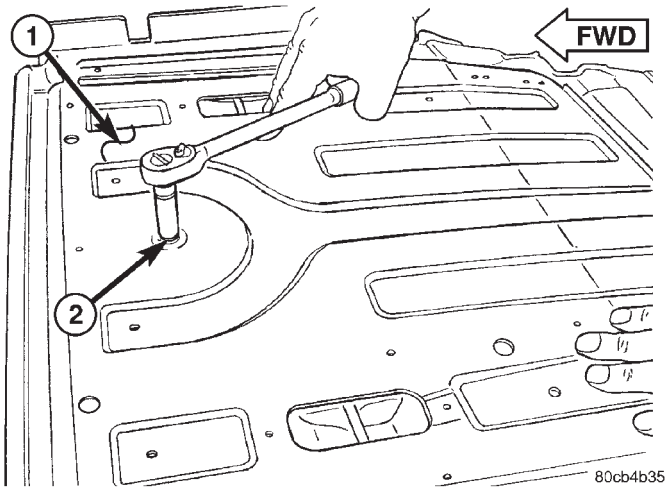


Fig. 35 Rear Center Retractor Remove/Install

1 - REAR SEAT BACK PANEL
2 - SCREW (1)

(10) Remove the rear center seat belt and retractor unit from the seat back panel.

REAR CENTER SEAT BELT & RETRACTOR (Continued)

INSTALLATION

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Position the rear center seat belt and retractor unit onto the seat back panel.

(2) Install and tighten the screw that secures the retractor to the rear seat back panel (Fig. 35). Tighten the screw to 43 N·m (32 ft. lbs.).

(3) Position the seat back latch cable plunger against the retractor latch lever, then engage the cable fitting into the cable support on the retractor, which is a light snap fit (Fig. 34).

(4) Route the rear seat belt lower anchor and belt web guide through the top of the seat back panel.

(5) Reinstall the trim onto the right rear seat back. (Refer to 23 - BODY/SEATS/SEAT BACK COVER - REAR - INSTALLATION).

(6) Install and tighten the two screws that secure the belt web guide to the top of the right rear seat back panel. Tighten the screws to 2 N·m (20 in. lbs.).

(7) Reinstall the right rear seat back panel into the vehicle. (Refer to 23 - BODY/SEATS/SEAT BACK - REAR - INSTALLATION).

(8) Restore the cargo area carpet to the base of the seat back panel and unfold the right rear seat back to its upright position.

(9) Position the rear center seat belt lower anchor to the right rear seat belt buckle unit bracket on the rear floor panel (Fig. 33).

(10) Install and tighten the screw that secures the rear center seat belt lower anchor to the right rear seat belt buckle unit bracket on the rear floor panel. Tighten the screw to 43 N·m (32 ft. lbs.).

(11) Fold and latch the right rear seat cushion in its normal seating position.

REAR OUTBOARD SEAT BELT & RETRACTOR

REMOVAL

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Disengage the rear seat cushion latch by pulling upward on the release strap.

(2) Fold the rear seat cushion forward against the back of the front bucket seat.

(3) Remove the screw that secures the rear outboard seat belt lower anchor to the rear floor panel (Fig. 36).

(4) Remove the lower anchor from the rear floor panel.

(5) Using a trim stick or another suitable wide flat-bladed tool, gently pry the top of the turning loop trim cover to unsnap it from the height adjuster and access the screw that secures the rear outboard seat belt turning loop to the adjuster on the upper C-pillar (Fig. 37).

(6) Remove the screw that secures the seat belt turning loop to the height adjuster on the upper C-pillar.

(7) Remove the seat belt turning loop from the height adjuster.

(8) Remove the trim from the quarter inner panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - REMOVAL).

(9) Remove the screw that secures the retractor to the mounting tab on the inner and outer rear wheelhouse flange.

(10) Disengage the retractor locator tab from the slot in the lower C-pillar (Fig. 38).

(11) Remove the rear outboard seat belt and retractor from the C-pillar as a unit.

REAR OUTBOARD SEAT BELT & RETRACTOR (Continued)

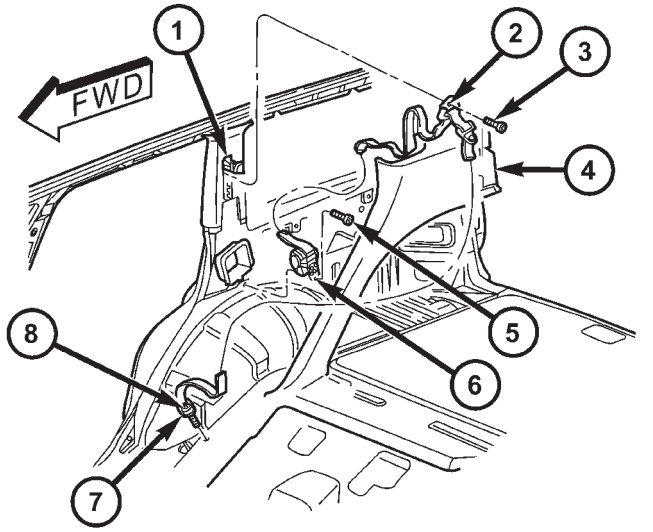


Fig. 36 Rear Outboard Seat Belt & Retractor Remove/Install

1 - ADJUSTER
2 - TURNING LOOP
3 - SCREW
4 - QUARTER TRIM PANEL
5 - SCREW
6 - RETRACTOR
7 - LOWER ANCHOR
8 - SCREW

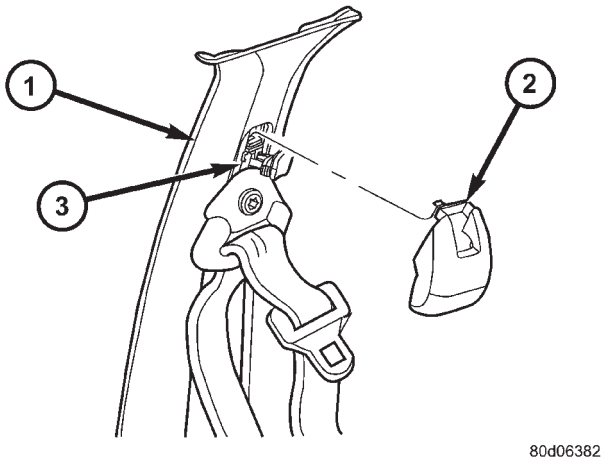


Fig. 37 Turning Loop Cover Remove/Install

1 - PILLAR
2 - TRIM COVER
3 - ADJUSTER

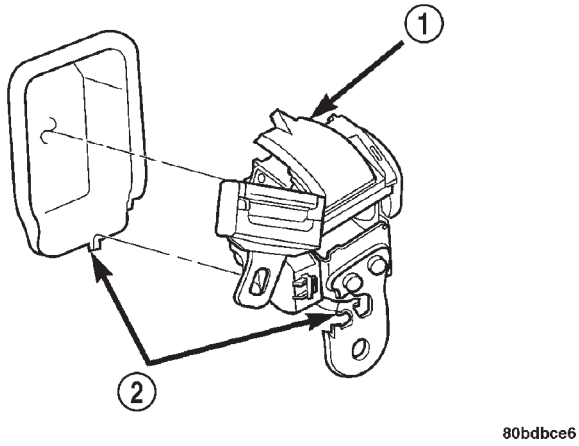


Fig. 38 Rear Outboard Retractor

1 - RETRACTOR
2 - SLOT/LOCATOR TAB

INSTALLATION

WARNING: DURING AND FOLLOWING ANY SEAT BELT SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, AND RETRACTORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INOPERATIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. NEVER ATTEMPT TO REPAIR A SEAT BELT COMPONENT. ALWAYS REPLACE DAMAGED OR FAULTY SEAT BELT COMPONENTS WITH THE CORRECT, NEW AND UNUSED REPLACEMENT PARTS LISTED IN THE MOPAR PARTS CATALOG.

(1) Be certain that the retractor shield is properly installed in the C-pillar and in good condition before installing the retractor.

(2) Position the retractor in the retractor shield and be certain that the retractor locator tab is engaged in the slot in the lower C-pillar below the retractor shield (Fig. 38).

(3) Install and tighten the screw that secures the retractor bracket to the mounting tab on the inner and outer rear wheelhouse flange (Fig. 36). Tighten the screw to 43 N·m (32 ft. lbs.).

(4) Reinstall the trim onto the quarter inner panel. (Refer to 23 - BODY/INTERIOR/QUARTER TRIM PANEL - INSTALLATION).

(5) Position the seat belt turning loop to the height adjuster on the upper C-pillar.

REAR OUTBOARD SEAT BELT & RETRACTOR (Continued)

(6) Install and tighten the screw that secures the seat belt turning loop to the height adjuster. Tighten the screw to 37 N·m (27 ft. lbs.).

(7) Using hand pressure, press the top of the turning loop trim cover to snap it onto the height adjuster and cover the screw that secures the rear outboard seat belt turning loop to the adjuster on the upper C-pillar (Fig. 37).

(8) Position the rear outboard seat belt lower anchor to the rear floor panel.

(9) Install and tighten the screw that secures the seat belt lower anchor to the rear floor panel. Tighten the screw to 43 N·m (32 ft. lbs.).

(10) Fold the rear seat cushion back into the seating position.

REAR SEAT BELT BUCKLE

REMOVAL

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(1) Disengage the rear seat cushion latch by pulling upward on the release strap.

(2) Fold the rear seat cushion forward against the back of the front bucket seat.

(3) Remove the screw that secures the anchor plate of the rear seat lap belt/buckle unit (right side) or buckle/buckle unit (left side) to the rear floor panel (Fig. 39).

NOTE: Vehicles equipped with a three-point center seat belt have the center seat belt lower anchor secured to the right buckle anchor plate with a screw instead of the center lap belt. (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR CENTER SEAT BELT & RETRACTOR - REMOVAL).

(4) Remove the rear seat lap belt/buckle unit (right side) or buckle/buckle unit (left side) from the rear floor panel.

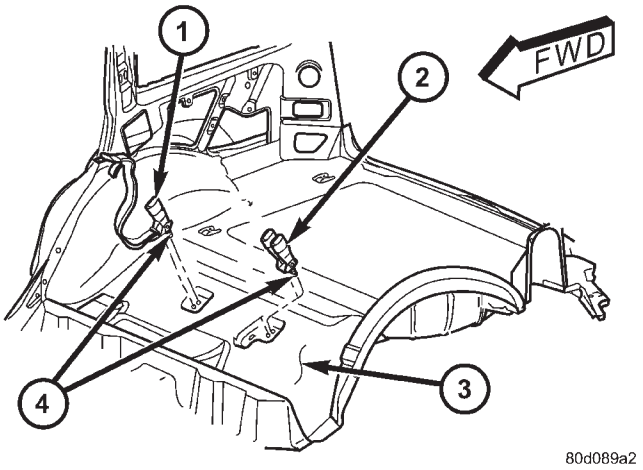


Fig. 39 Rear Seat Lap Belt/Buckle

1 - REAR SEAT LAP BELT/BUCKLE UNIT
2 - REAR SEAT BUCKLE/BUCKLE UNIT
3 - REAR FLOOR PANEL
4 - SCREW

INSTALLATION

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(1) Position the rear seat lap belt/buckle unit (right side) or buckle/buckle unit (left side) onto the rear floor panel (Fig. 39). Be certain the locator tab on the anchor plate is installed in the locator hole near the mounting hole in the rear floor panel.

(2) Install and tighten the screw that secures the anchor plate of the rear seat lap belt/buckle unit (right side) or buckle/buckle unit (left side) to the rear floor panel. Tighten the screw to 43 N·m (32 ft. lbs.).

REAR SEAT BELT BUCKLE (Continued)

NOTE: Vehicles equipped with a three-point center seat belt have the center seat belt lower anchor secured to the right buckle anchor plate with a screw instead of the center lap belt. (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR CENTER SEAT BELT & RETRACTOR - INSTALLATION).

(3) Fold the rear seat cushion back into the seating position.

SEAT BELT SWITCH

DESCRIPTION

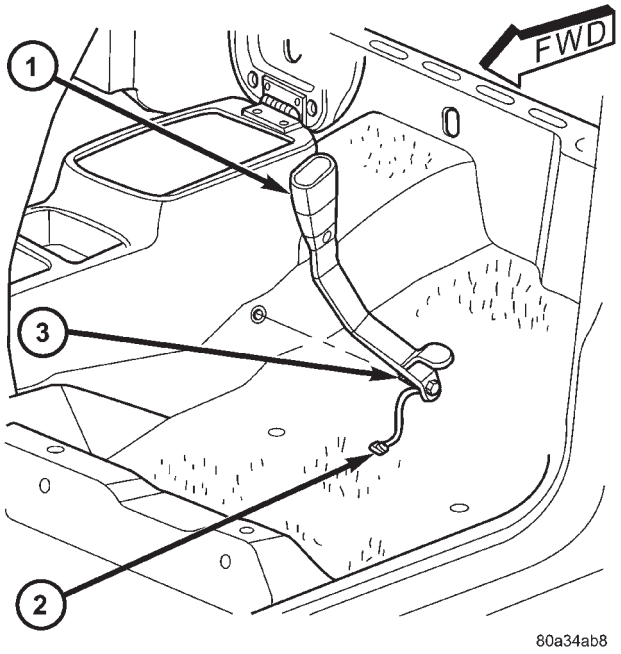


Fig. 40 Front Seat Belt Buckle

1 - SEAT BELT BUCKLE
2 - SEAT BELT SWITCH PIGTAIL WIRE
3 - SCREW

The seat belt switch for this model is actually a Hall Effect-type sensor. This sensor consists of a fixed-position, Hall Effect Integrated Circuit (IC) chip and a small permanent magnet that are integral to each front seat belt buckle. The front seat belt buckles are each located on a stamped steel stanchion within a molded plastic scabbard and secured with a screw to the floor panel transmission tunnel on the inboard side of each front seat cushion (Fig. 40). The seat belt switches are connected to the vehicle electrical system through a two-lead pigtail wire and connector on the seat belt buckle-half, which is connected to a wire harness connector and take out of the body wire harness on vehicles with manual seat adjusters, or to a connector and take out of the power seat wire harness on vehicles with power seat adjusters. A radio noise suppression capacitor is connected in parallel with the IC where the two pigtail wire leads connect to the IC pins.

The seat belt switch cannot be adjusted or repaired and, if faulty or damaged, the entire seat belt buckle-half unit must be replaced.

OPERATION

The seat belt switches are designed to provide a status signal to the seat belt switch sense inputs of the Airbag Control Module (ACM) indicating whether the front seat belts are fastened. The ACM uses the seat belt switch inputs as a factor in determining what level of force with which it should deploy the multistage driver and passenger airbags. In addition, the ACM sends electronic messages to the ElectroMechanical Instrument Cluster (EMIC) to control the seat belt indicator based upon the status of the driver side front seat belt switch. A spring-loaded slide with a small window-like opening is integral to the buckle latch mechanism. When a seat belt tip-half is inserted and latched into the seat belt buckle, the slide is pushed downward and the window of the slide exposes the Hall Effect Integrated Circuit (IC) chip within the buckle to the field of the permanent magnet, which induces a current within the chip. The chip provides this induced current as an output to the ACM, which monitors the current to determine the status of the front seat belts. When the seat belt is unbuckled, the spring-loaded slide moves upward and shields the IC from the field of the permanent magnet, causing the output current from the seat belt switch to be reduced.

The seat belt switch receives a supply current from the ACM, and the ACM senses the status of the front seat belts through its pigtail wire connection to the airbag overlay wire harness. The ACM monitors the condition of the seat belt switch circuits and will illuminate the airbag indicator in the EMIC then store a Diagnostic Trouble Code (DTC) for any fault that is detected in either seat belt switch circuit. For proper diagnosis of the seat belt switches, a DRBIII® scan tool is required. Refer to the appropriate diagnostic information.

SEAT BELT TURNING LOOP ADJUSTER

REMOVAL

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(1) Remove the turning loop from the front or rear seat belt turning loop adjuster. (Refer to 8 - ELECTRICAL/RESTRAINTS/FRONT SEAT BELT & RETRACTOR - REMOVAL) or (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR OUTBOARD SEAT BELT & RETRACTOR - REMOVAL).

(2) Remove the trim from the upper B-pillar (front seat belt adjuster) or upper C-pillar (rear seat belt adjuster). (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL) or (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).

(3) Remove the screw that secures the upper end of the front or rear turning loop adjuster to the pillar (Fig. 41).

(4) Pull the upper end of the turning loop adjuster away from the pillar far enough to disengage the hooks on the lower end of the adjuster from the slots in the pillar.

(5) Remove the turning loop adjuster from the B-pillar (front seat belt) or C-pillar (rear seat belt).

INSTALLATION

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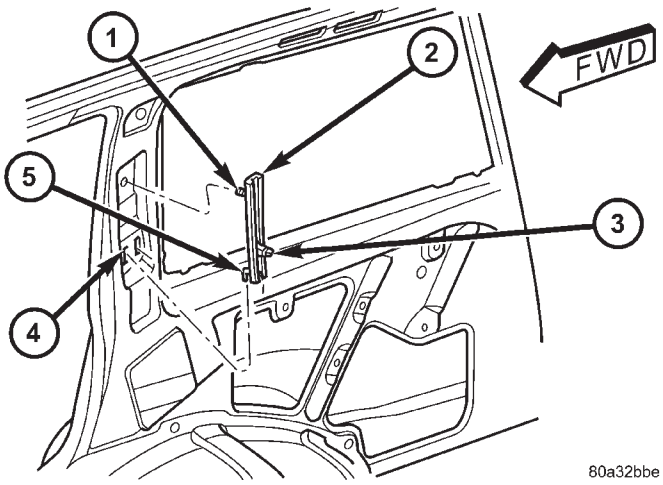


Fig. 41 Seat Belt Turning Loop Adjuster - Typical

1 - SCREW (1)
2 - ADJUSTER
3 - LEVER
4 - SLOTS (2)
5 - HOOKS (2)

(1) Position the turning loop adjuster to the B-pillar (front seat belt) or C-pillar (rear seat belt).

(2) Engage the hooks on the lower end of the adjuster into the slots in the pillar (Fig. 41).

(3) Tilt the upper end of the turning loop adjuster into position against the pillar.

(4) Install and tighten the screw that secures the upper end of the front or rear height adjuster to the pillar. Tighten the screw to 43 N·m (32 ft. lbs.).

(5) Reinstall the trim onto the upper B-pillar (front seat belt adjuster) or upper C-pillar (rear seat belt adjuster). (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION) or (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).

(6) Reinstall the front or rear seat belt turning loop to the adjuster. (Refer to 8 - ELECTRICAL/RESTRAINTS/FRONT SEAT BELT & RETRACTOR - INSTALLATION) or (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR OUTBOARD SEAT BELT & RETRACTOR - INSTALLATION).

SIDE CURTAIN AIRBAG

DESCRIPTION



Fig. 42 SRS Logo

Optional side curtain airbags are available for this model when it is also equipped with dual front airbags. These airbags are passive, inflatable, Supplemental Restraint System (SRS) components, and vehicles with this equipment can be readily identified by a molded identification trim button with the “SRS - AIRBAG” logo located on the headliner above each B-pillar (Fig. 42). This system is designed to reduce injuries to the vehicle occupants in the event of a side impact collision.

Vehicles equipped with side curtain airbags have two individually controlled curtain airbag units. These airbag units are concealed and mounted above the headliner where they are each secured to one of the roof side rails (Fig. 43). Each folded airbag cushion is contained within a long extruded plastic channel that extends along the roof rail from the A-pillar at the front of the vehicle to just behind the C-pillar at the rear of the vehicle. One tether extends down the A-pillar from the front of the airbag cushion, and a second tether extends to the roof rail above the D-pillar. The ends of these tethers are secured to slots in the sheet metal with metal hooks retained by plastic anchor clips.

The hybrid-type inflator for each airbag is secured to the roof rail at the rear of the airbag unit between the C-pillar and the D-pillar, and is connected to the airbag cushion by a long tubular manifold. The inflator bracket and the extruded airbag cushion channel are secured with both plastic push-in fasteners and screws to the roof rail. A dedicated two-wire take out and connector of the body wire harness is routed forward from the D-pillar to the airbag inflator.

The side curtain airbag unit cannot be adjusted or repaired and must be replaced if deployed, faulty, or in any way damaged. Once a side curtain airbag has been deployed, the complete airbag unit, the headliner, the upper A, B, and C-pillar trim, and all other visibly damaged components must be replaced.

OPERATION

Each side curtain airbag is deployed individually by an electrical signal generated by the Airbag Control Module (ACM) to which it is connected through left or right curtain airbag line 1 and line 2 (or squib) circuits. The hybrid-type inflator assembly for each airbag contains a small canister of highly compressed gas. When the ACM sends the proper electrical signal to the airbag inflator, the electrical energy creates enough heat to ignite chemical pellets within the inflator. Once ignited, these chemicals burn rapidly and produce the pressure necessary to rupture a containment disk in the pressurized gas canister. The inflator and gas canister are sealed and connected to a tubular manifold so that all of the released inert gas is directed into the folded side curtain airbag cushion, causing the cushion to inflate.

As the airbag cushion inflates it will drop down from the roof rail between the edge of the headliner and the side glass/body pillars to form a curtain-like cushion to protect the vehicle occupants during a side impact collision. The front and rear tethers keep the side curtain bag taut, thus ensuring that the bag will deploy in the proper position. Following the airbag deployment, the airbag cushion quickly deflates by venting the inert gas through the loose weave of the cushion fabric, and the deflated cushion hangs down loosely from the roof rail.

REMOVAL

The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

SIDE CURTAIN AIRBAG (Continued)

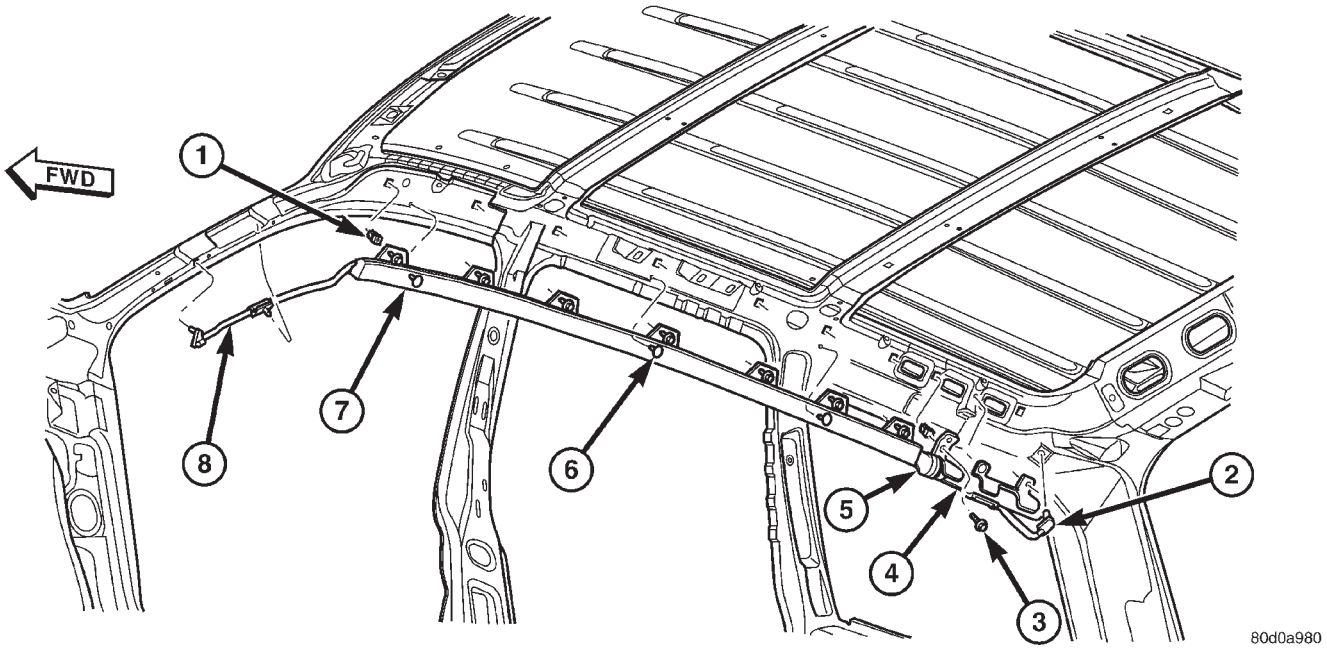


Fig. 43 Side Curtain Airbag

1 - NUT (9)
2 - REAR TETHER
3 - SCREW (9)
4 - INFLATOR
5 - MANIFOLD
6 - PUSH-IN FASTENER (4)
7 - CHANNEL
8 - FRONT TETHER

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE SIDE CURTAIN AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE SIDE CURTAIN AIRBAG CUSHION AND THE HEADLINER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the headliner from the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL).

(3) Disconnect the body wire harness connector for the side curtain airbag inflator from the inflator connector receptacle (Fig. 44).

(4) Disengage the side curtain airbag rear tether hook and plastic retainer clip from the slot in the roof rail near the D-pillar.

(5) Disengage the side curtain airbag front tether hook and plastic retainer clip from the slot in the lower A-pillar (Fig. 45).

(6) Disengage the side curtain airbag front tether plastic retainer from the hole in the upper A-pillar.

SIDE CURTAIN AIRBAG (Continued)

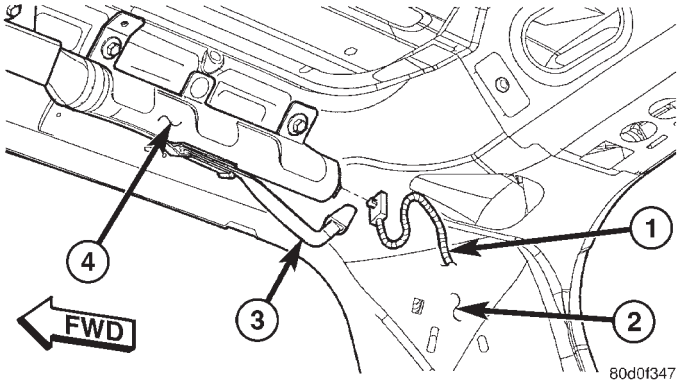


Fig. 44 Side Curtain Airbag Inflator

1 - BODY WIRE HARNESS
2 - D-PILLAR
3 - REAR TETHER
4 - INFLATOR

(7) Remove the nine screws that secure the side curtain airbag channel and inflator mounting bracket to the spring nuts in the roof side rail.

(8) Grasp the extruded plastic channel of the side curtain airbag firmly and pull it straight away from the body far enough to disengage all three plastic push-in fasteners that secure it to the locating holes in the roof side rail.

(9) Grasp the inflator of the side curtain airbag firmly and pull it straight away from the body far enough to disengage the push-in fastener that secures it to the locating hole in the roof side rail.

(10) Remove the side curtain airbag from the vehicle as a unit.

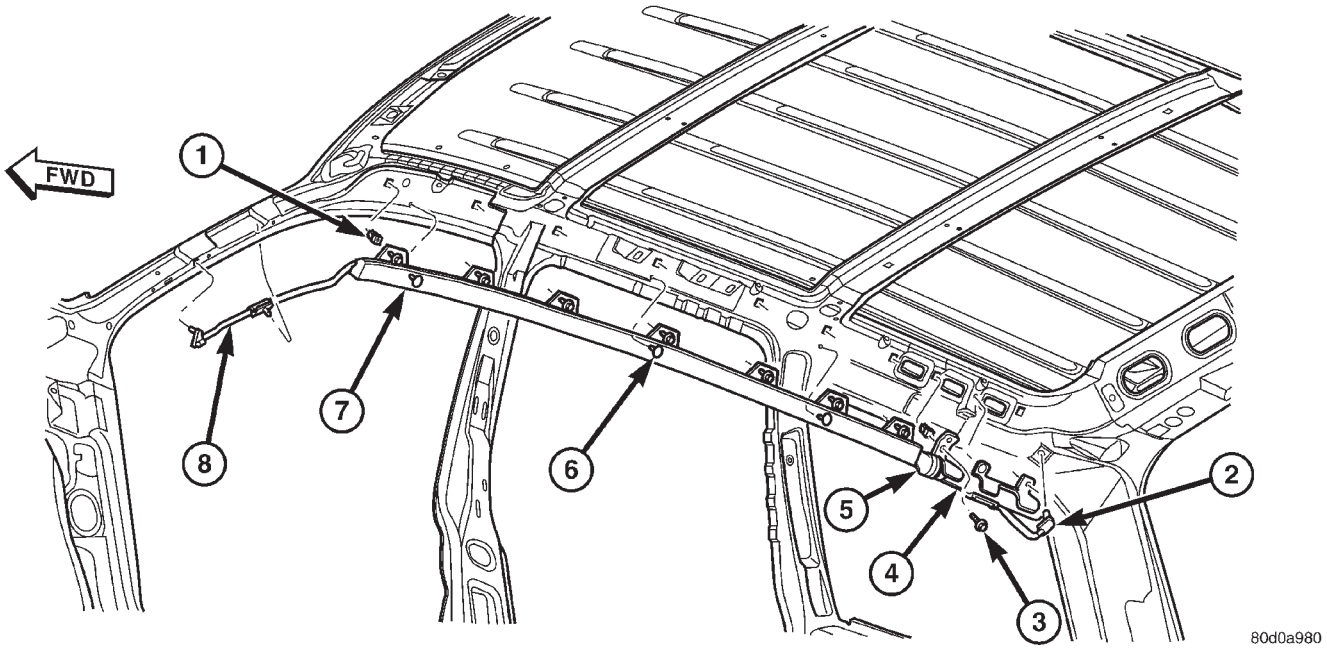


Fig. 45 Side Curtain Airbag Remove/Install

1 - NUT (9)
2 - REAR TETHER
3 - SCREW (9)
4 - INFLATOR
5 - MANIFOLD
6 - PUSH-IN FASTENER (4)
7 - CHANNEL
8 - FRONT TETHER

SIDE CURTAIN AIRBAG (Continued)

INSTALLATION

The following procedure is for replacement of a faulty or damaged side curtain airbag. If the airbag is faulty or damaged, but not deployed, review the recommended procedures for handling non-deployed supplemental restraints. (Refer to 8 - ELECTRICAL/ RESTRAINTS - STANDARD PROCEDURE - HANDLING NON-DEPLOYED SUPPLEMENTAL RESTRAINTS). If the side curtain airbag has been deployed, review the recommended procedures for service after a supplemental restraint deployment before removing the airbag from the vehicle. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - SERVICE AFTER A SUPPLEMENTAL RESTRAINT DEPLOYMENT).

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: WHEN REMOVING A DEPLOYED AIRBAG, RUBBER GLOVES, EYE PROTECTION, AND A LONG-SLEEVED SHIRT SHOULD BE WORN. THERE MAY BE DEPOSITS ON THE AIRBAG UNIT AND OTHER INTERIOR SURFACES. IN LARGE DOSES, THESE DEPOSITS MAY CAUSE IRRITATION TO THE SKIN AND EYES.

WARNING: USE EXTREME CARE TO PREVENT ANY FOREIGN MATERIAL FROM ENTERING THE SIDE CURTAIN AIRBAG, OR BECOMING ENTRAPPED BETWEEN THE SIDE CURTAIN AIRBAG CUSHION AND THE HEADLINER. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN OCCUPANT INJURIES UPON AIRBAG DEPLOYMENT.

(1) Position the side curtain airbag into the vehicle as a unit.

(2) Align the push-in fastener that secures the inflator of the side curtain airbag to the locating hole in the roof side rail and, using hand pressure, push firmly on the retainer until it is fully seated (Fig. 45).

(3) Align the three push-in fasteners that secure the extruded plastic channel of the side curtain airbag to the locating holes in the roof side rail and, using hand pressure, push firmly on each retainer until it is fully seated.

(4) Install and tighten the nine screws that secure the side curtain airbag channel and inflator mounting bracket to the spring nuts in the roof side rail. Tighten the screws to 6 N·m (50 in. lbs.).

(5) Align the side curtain airbag front tether plastic retainer with the hole in the upper A-pillar and, using hand pressure, push firmly on the retainer until it is fully seated.

(6) Engage the side curtain airbag front tether hook and plastic retainer clip into the slot in the lower A-pillar.

(7) Engage the side curtain airbag rear tether hook and plastic retainer clip into the slot in the roof rail near the D-pillar (Fig. 44).

(8) Reconnect the body wire harness connector for the side curtain airbag inflator to the inflator connector receptacle.

(9) Reinstall the headliner into the vehicle. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION).

(10) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SIDE IMPACT SENSOR

DESCRIPTION

Two side impact sensors are used on this model when it is equipped with the optional side curtain airbags, one each for the left and right sides of the vehicle (Fig. 46). These sensors are mounted remotely from the bi-directional safing sensor that is internal to the Airbag Control Module (ACM). The side and front impact sensors are identical in construction and calibration with the exception of the right-hand and left-hand die cast aluminum mounting brackets to which each front impact sensor is secured with two screws. The side impact sensors are secured with two screws to the base of the right and left B-pillars just below the front seat belt retractors and behind the lower B-pillar trim within the passenger compartment.

SIDE IMPACT SENSOR (Continued)

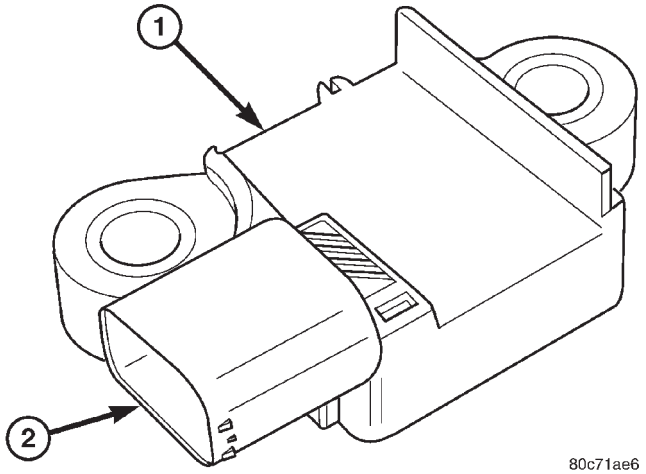


Fig. 46 Side Impact Sensor

1 - SENSOR
2 - CONNECTOR RECEPTACLE

The impact sensor housing has an integral connector receptacle and two integral mounting ears, each with a metal sleeve to provide crush protection. A cavity in the center of the molded black plastic impact sensor housing contains the electronic circuitry of the sensor which includes an electronic communication chip and an electronic impact sensor. Potting material fills the cavity to seal and protect the internal electronic circuitry and components. The side impact sensors are each connected to the vehicle electrical system through a dedicated take out and connector of the airbag overlay wire harness.

The side impact sensors cannot be repaired or adjusted and, if damaged or faulty, they must be replaced.

OPERATION

The side impact sensors are electronic accelerometers that sense the rate of vehicle deceleration, which provides verification of the direction and severity of an impact. Each sensor also contains an electronic communication chip that allows the unit to communicate the sensor status as well as sensor fault information to the microprocessor in the Airbag Control Module (ACM). The ACM microprocessor continuously monitors all of the passive restraint system electrical circuits to determine the system readiness. If the ACM detects a monitored system fault, it sets a Diagnostic Trouble Code (DTC) and controls the airbag indicator operation accordingly.

The impact sensors each receive battery current and ground through dedicated left and right sensor plus and minus circuits from the ACM. The impact sensors and the ACM communicate by modulating the voltage in the sensor plus circuit. The hard wired circuits between the side impact sensors and the ACM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ACM or the impact sensors. The most reliable, efficient, and accurate means to diagnose the impact sensors, the ACM, and the electronic message communication between the sensors and the ACM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE SIDE IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE SIDE CURTAIN AIRBAG. NEVER STRIKE OR DROP THE SIDE IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SIDE CURTAIN AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Disconnect and isolate the battery negative cable. Wait two minutes for the system capacitor to discharge before further service.

(2) Remove the trim from the lower right or left B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(3) Disconnect the airbag overlay wire harness connector for the right or left side impact sensor from the sensor connector receptacle (Fig. 47).

(4) Remove the two screws that secure the right or left side impact sensor to the B-pillar.

(5) Remove the side impact sensor from the B-pillar.

SIDE IMPACT SENSOR (Continued)

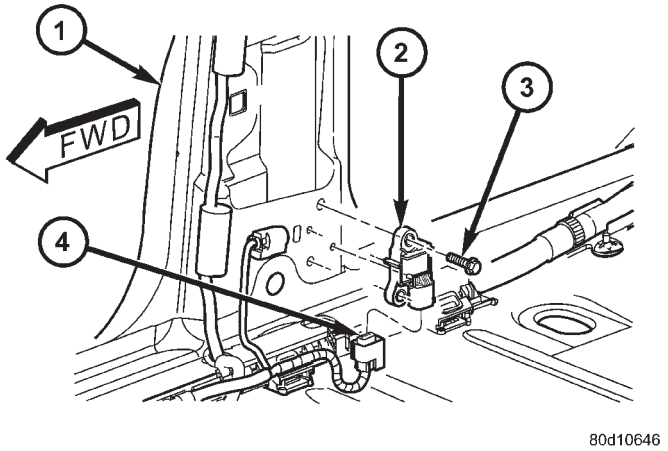


Fig. 47 Side Impact Sensor Remove/Install

1 - B-PILLAR
2 - SIDE IMPACT SENSOR
3 - SCREW (2)
4 - WIRE HARNESS CONNECTOR

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, SIDE CURTAIN AIRBAG, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: THE SIDE IMPACT SENSOR ENABLES THE SYSTEM TO DEPLOY THE SIDE CURTAIN AIRBAG. NEVER STRIKE OR DROP THE SIDE IMPACT SENSOR, AS IT CAN DAMAGE THE IMPACT SENSOR OR AFFECT ITS CALIBRATION. IF AN IMPACT SENSOR IS ACCIDENTALLY DROPPED DURING SERVICE, THE SENSOR MUST BE SCRAPPED AND REPLACED WITH A NEW UNIT. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN ACCIDENTAL, INCOMPLETE, OR IMPROPER SIDE CURTAIN AIRBAG DEPLOYMENT AND POSSIBLE OCCUPANT INJURIES.

(1) Position the right or left side impact sensor onto the B-pillar (Fig. 47).

(2) Install and tighten the two screws that secure the right or left side impact sensor to the B-pillar. Tighten the screws to 12 N·m (105 in. lbs.).

(3) Reconnect the airbag overlay wire harness connector for the right or left side impact sensor to the sensor connector receptacle.

(4) Reinstall the trim onto the lower right or left B-pillar. (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(5) Do not reconnect the battery negative cable at this time. The supplemental restraint system verification test procedure should be performed following service of any supplemental restraint system component. (Refer to 8 - ELECTRICAL/RESTRAINTS - STANDARD PROCEDURE - VERIFICATION TEST).

SPEED CONTROL

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SPEED CONTROL

DESCRIPTION

The speed control system is electronically controlled and vacuum operated. Electronic control of the speed control system is integrated into the Powertrain Control Module (PCM). The controls consist of two steering wheel mounted switches. The switches are labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 30 mph (50 km/h).

WARNING: THE USE OF SPEED CONTROL IS NOT RECOMMENDED WHEN DRIVING CONDITIONS DO NOT PERMIT MAINTAINING A CONSTANT SPEED, SUCH AS IN HEAVY TRAFFIC OR ON ROADS THAT ARE WINDING, ICY, SNOW COVERED, OR SLIPPERY.

OPERATION

When speed control is selected by depressing the ON switch, the PCM allows a set speed to be stored in PCM RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.
- Depressing the clutch pedal (if equipped).

NOTE: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph per second (indicates that the coefficient of friction between the road surface and tires is extremely low)

SPEED CONTROL (Continued)

- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RES/ACCEL switch (when speed is greater than 30 mph) restores the vehicle to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the RES/ACCEL switch. The new target speed is stored in the PCM when the RES/ACCEL is released. The PCM also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

A “tap down” feature is used to decelerate without disengaging the speed control system. To decelerate from an existing recorded target speed, momentarily depress the COAST switch. For each switch activation, speed will be lowered approximately 1 mph.

OVERSHOOT/UNDERSHOOT

If the vehicle operator repeatedly presses and releases the SET button with their foot off of the accelerator (referred to as a “lift foot set”), the vehicle may accelerate and exceed the desired set speed by up to 5 mph (8 km/h). It may also decelerate to less than the desired set speed, before finally achieving the desired set speed.

The Speed Control System has an adaptive strategy that compensates for vehicle-to-vehicle variations in speed control cable lengths. When the speed control is set with the vehicle operators foot off of the accelerator pedal, the speed control thinks there is excessive speed control cable slack and adapts accordingly. If the “lift foot sets” are continually used, a speed control overshoot/undershoot condition will develop.

To “unlearn” the overshoot/undershoot condition, the vehicle operator has to press and release the set button while maintaining the desired set speed using the accelerator pedal (not decelerating or accelerating), and then turning the cruise control switch to the OFF position (or press the CANCEL button if equipped) after waiting 10 seconds. This procedure must be performed approximately 10–15 times to completely unlearn the overshoot/undershoot condition.

DIAGNOSIS AND TESTING - ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Group 8J, Instrument Cluster for speedometer diagnosis.

If a road test verifies a system problem and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose, damaged or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Leaking vacuum reservoir.
- Loose or leaking vacuum hoses or connections.
- Defective one-way vacuum check valve.
- Secure attachment of both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Failed speed control servo. Do the servo vacuum test.

CAUTION: When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

SPEED CONTROL (Continued)

SPECIFICATIONS

TORQUE - SPEED CONTROL

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Servo Mounting Bracket-to-Servo Nuts	8.5		75
Servo Mounting Bracket-to-Body Nuts	28 ± 6		250 ± 50
Switch Module Mounting Screws	.6-1		6-9
Vacuum Reservoir Mounting Bolts	3		25

CABLE

DESCRIPTION

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage.

OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

REMOVAL

REMOVAL - 4.0L

(1) Disconnect negative battery cable at battery.
(2) Remove air box housing from throttle body.
(3) Using finger pressure only, remove speed control cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards drivers side of vehicle (Fig. 1). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**
(4) Remove cable from cable guide at top of valve cover.
(5) Squeeze 2 release tabs (Fig. 1) on sides of cable at bracket and push cable out of bracket.
(6) Remove servo cable from servo. Refer to Speed Control Servo Removal/Installation.

REMOVAL - 4.7L

(1) Disconnect negative battery cable at battery.
(2) Remove air box housing from throttle body.
The accelerator cable must be partially removed to gain access to speed control cable.

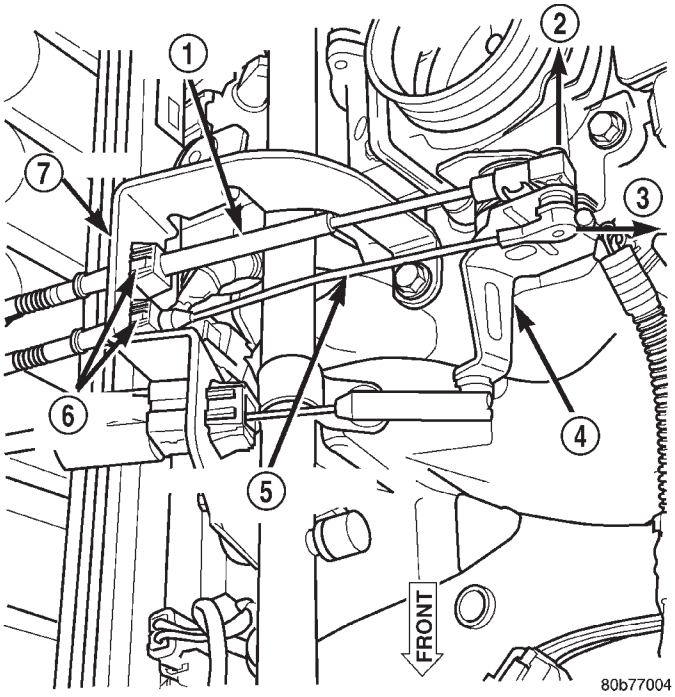


Fig. 1 Speed Control Cable at Bell Crank—4.0L Engine

1 - ACCELERATOR CABLE
2 - OFF
3 - OFF
4 - THROTTLE BODY BELLCRANK
5 - SPEED CONTROL CABLE
6 - RELEASE TABS
7 - BRACKET

(3) Using finger pressure only, disconnect accelerator cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 2). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

CABLE (Continued)

(4) Lift accelerator cable from top of cable cam (Fig. 2).

(5) Press tab (Fig. 3) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (Fig. 3) towards passenger side of vehicle to remove cable from bracket.

(6) Using finger pressure only, disconnect speed control cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 2). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

(7) Slide speed control cable plastic mount towards passenger side of vehicle to remove cable from bracket (Fig. 4).

(8) Remove servo cable from servo. Refer to Speed Control Servo Removal/Installation.

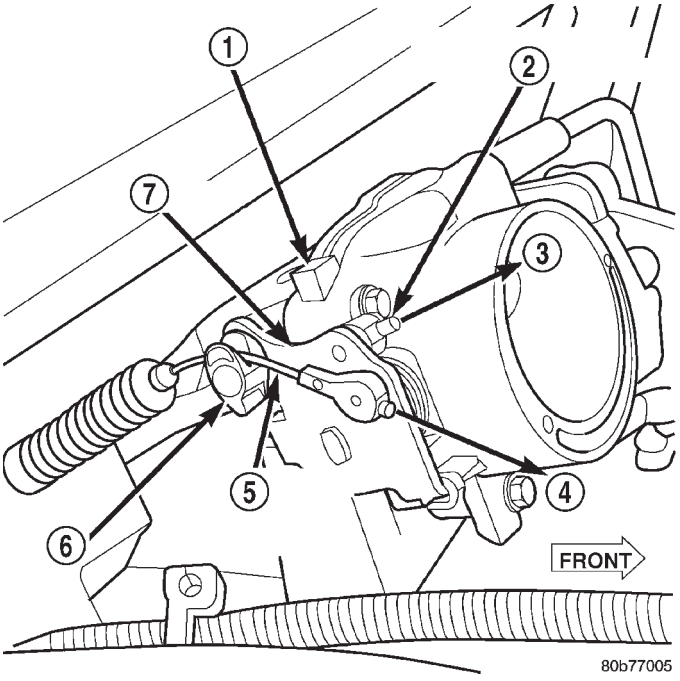


Fig. 2 Cable Connectors at Bell Crank—4.7L V-8 Engine

1 - THROTTLE BODY
2 - SPEED CONTROL CABLE CONNECTOR
3 - OFF
4 - OFF
5 - ACCELERATOR CABLE CONNECTOR
6 - CABLE CAM
7 - BELLCRANK

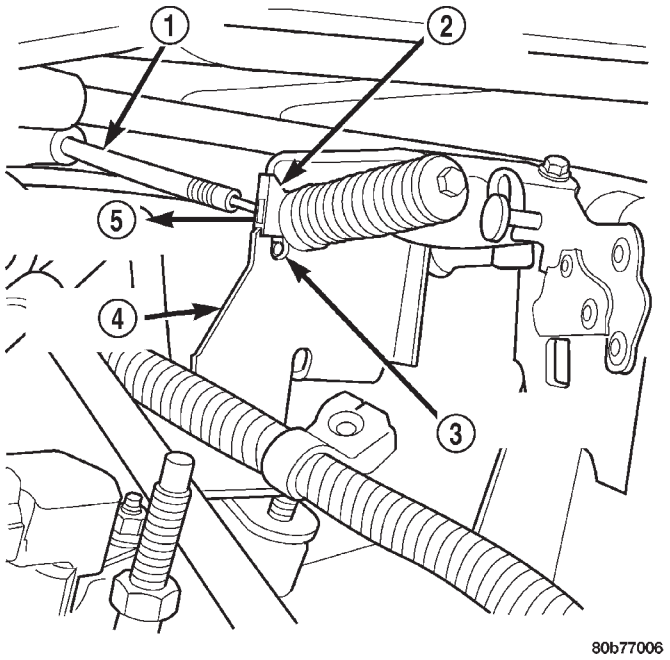


Fig. 3 Accelerator Cable Release Tab—4.7L V-8 Engine

1 - ACCELERATOR CABLE
2 - PLASTIC CABLE MOUNT
3 - PRESS TAB FOR REMOVAL
4 - CABLE BRACKET
5 - SLIDE FOR REMOVAL

INSTALLATION

INSTALLATION - 4.0L

(1) Install end of cable to speed control servo. Refer to Speed Control Servo Removal/Installation.

(2) Install cable into mounting bracket (snaps in).

(3) Install speed control cable connector at throttle body bellcrank pin (snaps on).

(4) Connect negative battery cable at battery.

(5) Before starting engine, operate accelerator pedal to check for any binding.

INSTALLATION - 4.7L

(1) Install end of cable to speed control servo. Refer to Speed Control Servo Removal/Installation.

(2) Slide speed control cable plastic mount into bracket.

(3) Install speed control cable connector onto throttle body bellcrank pin (snaps on).

(4) Slide accelerator cable plastic mount into bracket. Continue sliding until tab (Fig. 3) is aligned to hole in mounting bracket.

(5) Route accelerator cable over top of cable cam (Fig. 2).

(6) Install accelerator cable connector onto throttle body bellcrank pin (snaps on).

(7) Install air box housing to throttle body.

CABLE (Continued)

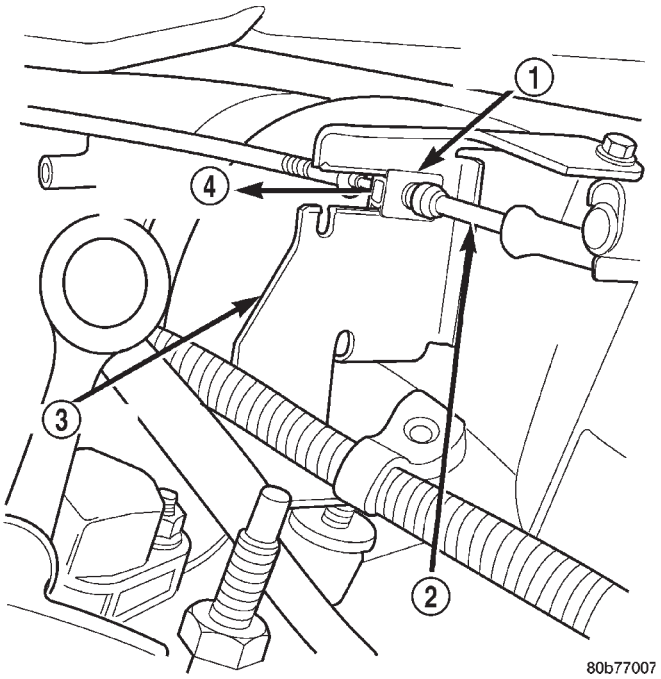


Fig. 4 Speed Control Cable at Bracket—4.7L V-8 Engine

1 - PLASTIC CABLE MOUNT
2 - SPEED CONTROL CABLE
3 - BRACKET
4 - SLIDE FOR REMOVAL

(8) Connect negative battery cable at battery.

(9) Before starting engine, operate accelerator pedal to check for any binding.

SERVO

DESCRIPTION

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.

OPERATION

The Powertrain Control Module (PCM) controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo's by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

The vacuum and vent solenoids must be grounded at the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM duty cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids. When the brake is released, if vehicle speed exceeds 30 mph to resume, 35 mph to set, and the RES/ACCEL switch has been depressed, ground for the vent and vacuum circuits is restored.

REMOVAL

The speed control servo is attached to a bracket. The bracket and servo assembly are located below the battery tray.

(1) Disconnect negative battery cable at battery.

(2) Disconnect positive battery cable at battery.

(3) Remove air cleaner housing at top of throttle body and disconnect servo cable at throttle body. Refer to Servo Cable Removal/Installation.

(4) Remove battery from battery tray.

(5) Disconnect wiring at battery tray.

(6) Disconnect positive battery cable at Power Distribution Center (PDC).

(7) Loosen PDC at battery tray.

(8) Remove 4 battery tray bolts. One of these bolts attaches to speed control bracket flange that supports battery tray. While removing battery tray, disconnect battery temperature sensor electrical connector at sensor.

(9) Disconnect vacuum line at servo vacuum hose fitting (Fig. 5) .

(10) Disconnect electrical connector at servo (Fig. 5) .

If servo and mounting bracket are being removed as one assembly, remove two mounting nuts (Fig. 5) . These are located above right-front tire. Remove inner fender clips and pry inner fender back slightly to gain access to mounting nuts.

SERVO (Continued)

(11) If servo is being removed from its mounting bracket, remove 2 mounting nuts holding servo cable sleeve to bracket (Fig. 6) .

(12) Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (Fig. 6) and remove clip. Note: The servo mounting bracket displayed in (Fig. 6) is a typical bracket and may/may not be applicable to this model vehicle.

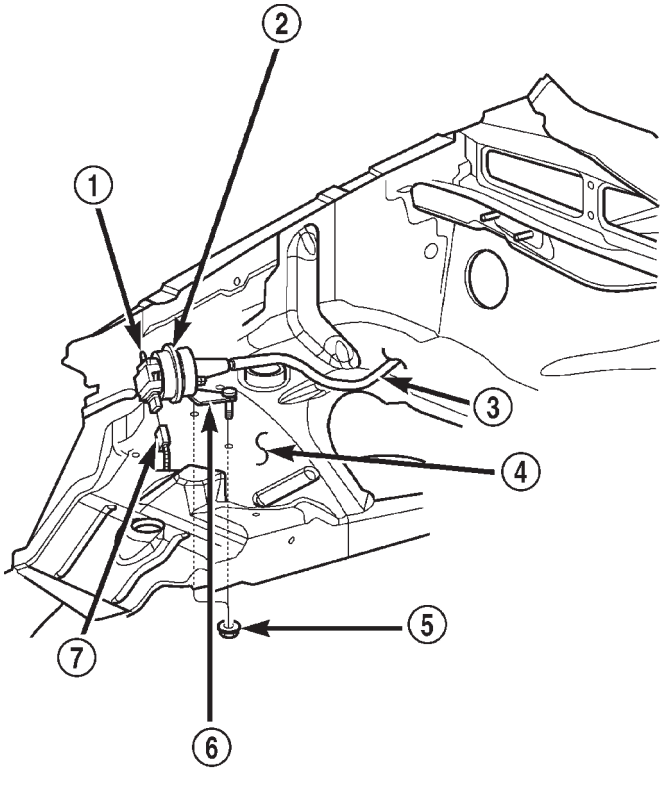


Fig. 5 Speed Control

1 - VACUUM HOSE FITTING
2 - SPEED CONTROL SERVO
3 - SERVO CABLE
4 - RIGHT INNER FENDER
5 - SERVO MOUNTING NUTS (2)
6 - SERVO MOUNTING BRACKET
7 - ELEC. CONNECTOR

(13) Remove servo from mounting bracket or, remove servo and mounting bracket as one assembly.

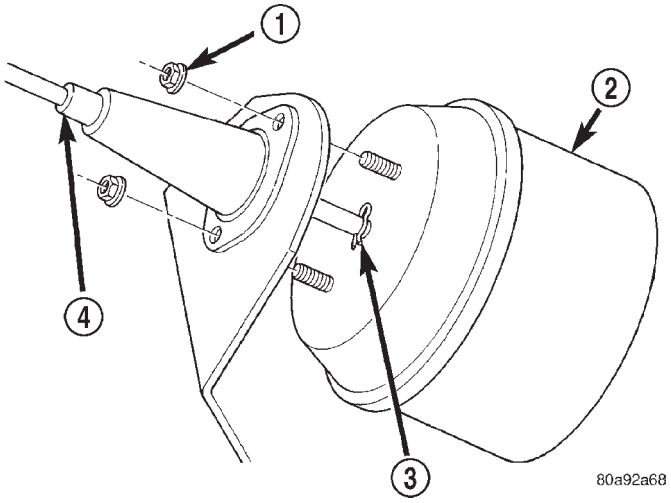


Fig. 6 Servo Cable Clip Remove/Install—Typical

1 - SERVO MOUNTING NUTS (2)
2 - SERVO
3 - CABLE RETAINING CLIP
4 - SERVO CABLE AND SLEEVE

INSTALLATION

(1) Position servo to mounting bracket.

(2) Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip.

(3) Insert servo mounting studs through holes in servo mounting bracket.

(4) Install servo cable mounting nuts (Fig. 6) and tighten to 8.5 N·m (75 in. lbs.) torque. If servo and bracket is being installed as one assembly, install 2 mounting nuts (Fig. 5) and tighten to 28 N·m ±6 N·m (250 in. lbs. ±50 in. lbs.) torque.

(5) Connect vacuum line at servo.

(6) Connect electrical connector at servo.

(7) Connect servo cable to throttle body. Refer to Servo Cable Removal/Installation.

(8) Install battery tray and battery temperature sensor.

(9) Connect wiring to battery tray.

(10) Install battery to battery tray.

(11) Connect positive battery cable to Power Distribution Center (PDC).

(12) Connect positive battery cable to battery.

(13) Connect negative battery cable to battery.

(14) Before starting engine, operate accelerator pedal to check for any binding.

SWITCH

DESCRIPTION

There are two separate switch pods that operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME, ACCELERATE, SET, DECEL and CANCEL modes. Refer to the owner's manual for more information on speed control switch functions and setting procedures.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

OPERATION

When speed control is selected by depressing the ON, OFF switch, the PCM allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between approximately 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- Depressing the clutch pedal.
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is not within 20 mph of the set speed

The previous disengagement conditions are programmed for added safety.

Once the speed control has been disengaged, depressing the ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM.

NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the PCM's RAM when the ACCEL switch is released. The PCM also has a ″tap-up″ feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

Multiplexing

The PCM sends out 5 volts through a fixed resistor and monitors the voltage change between the fixed resistor and the switches. If none of the switches are depressed, the PCM will measure 5 volts at the sensor point (open circuit). If a switch with no resistor is closed, the PCM will measure 0 volts (grounded circuit). Now, if a resistor is added to a switch, then the PCM will measure some voltage proportional to the size of the resistor. By adding a different resistor to each switch, the PCM will see a different voltage depending on which switch is pushed.

Another resistor has been added to the 'at rest circuit' causing the PCM to never see 5 volts. This was done for diagnostic purposes. If the switch circuit should open (bad connection), then the PCM will see the 5 volts and know the circuit is bad. The PCM will then set an open circuit fault.

REMOVAL

WARNING: BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION, REMOVE AND ISOLATE THE NEGATIVE (-) CABLE FROM THE BATTERY. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. THEN WAIT TWO MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE INJURY.

(1) Disconnect and isolate negative battery cable.

(2) Remove airbag module. Refer to Group 8M, Passive Restraint Systems.

(3) Remove electrical connector at switch.

(4) Remove switch-to-steering wheel mounting screw (Fig. 7) .

(5) Remove switch.

INSTALLATION

(1) Install switch and mounting screw.

(2) Tighten screw to 1.5 N·m (15 in. lbs.) torque.

(3) Install electrical connector to switch.

SWITCH (Continued)

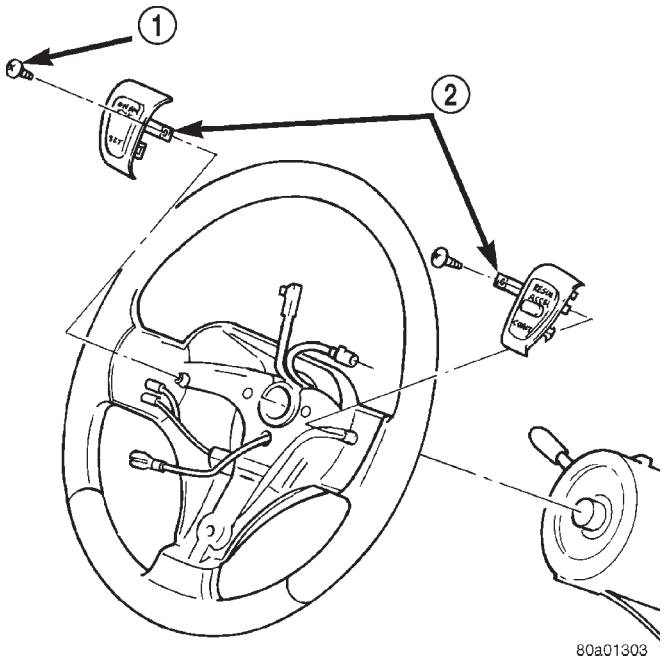


Fig. 7 Speed Control Switches

1 - MOUNTING SCREW
2 - SPEED CONTROL SWITCHES

(4) Install airbag module. Refer to Group 8M, Passive Restraint Systems.

(5) Connect negative battery cable.

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is a plastic storage tank connected to an engine vacuum source by vacuum lines.

OPERATION

The vacuum reservoir is used to supply the vacuum needed to maintain proper speed control operation when engine vacuum drops, such as in climbing a grade while driving. A one-way check valve is used in the vacuum line between the reservoir and the vacuum source. This check valve is used to trap engine vacuum in the reservoir. On certain vehicle applications, this reservoir is shared with the heating/air-conditioning system. The vacuum reservoir cannot be repaired and must be replaced if faulty.

DIAGNOSIS AND TESTING - VACUUM RESERVOIR

(1) Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.

(3) If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.

(4) If vacuum line to engine is not leaking, check for leak at vacuum reservoir. To locate and gain access to reservoir, refer to Vacuum Reservoir Removal/Installation in this group. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.

(5) Verify operation of one-way check valve and check it for leaks.

(a) Locate one-way check valve. The valve is located in vacuum line between vacuum reservoir and engine vacuum source. Disconnect vacuum hoses (lines) at each end of valve.

(b) Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.

(c) Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

REMOVAL

The vacuum reservoir is located in the right/front corner of the vehicle behind the front bumper fascia (Fig. 8).

(1) Remove front bumper and grill assembly.

(2) Remove 1 support bolt near front of reservoir (Fig. 8).

(3) Remove 2 reservoir mounting bolts.

(4) Remove reservoir from vehicle to gain access to vacuum hose (Fig. 9). Disconnect vacuum hose from reservoir fitting at rear of reservoir.

VACUUM RESERVOIR (Continued)

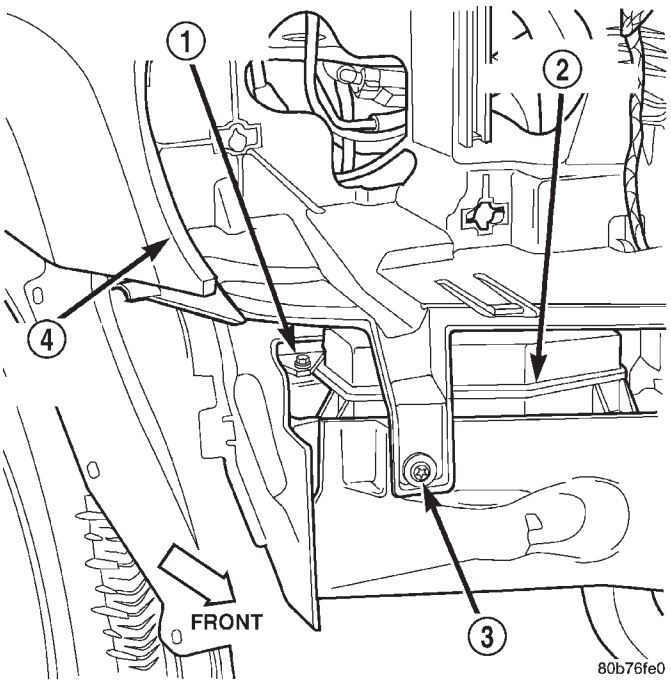


Fig. 8 Vacuum Reservoir Location

1 - RADIATOR FAN RELAY
2 - VACUUM RESERVOIR
3 - BOLT
4 - RIGHT FRONT FENDER

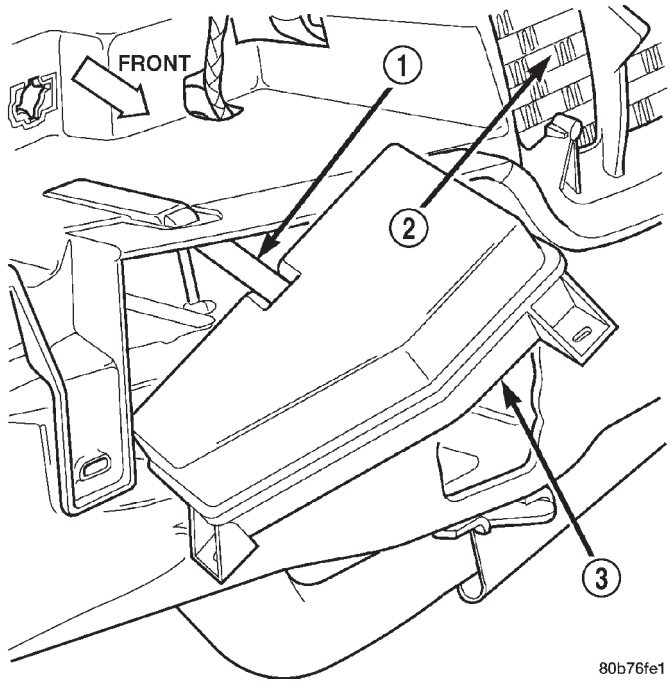


Fig. 9 Vacuum Reservoir Removal/Installation

1 - VACUUM HOSE
2 - RADIATOR
3 - VACUUM RESERVOIR

INSTALLATION

The vacuum reservoir is located in the right/front corner of the vehicle behind the front bumper fascia (Fig. 8).

(1) Connect vacuum hose to reservoir.

(2) Install reservoir and tighten 2 bolts to 3 N·m (25 in. lbs.) torque.

(3) Install front bumper and grill assembly.

VEHICLE THEFT SECURITY

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VEHICLE THEFT SECURITY

DESCRIPTION

DESCRIPTION - VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft Security System (VTSS) is designed to provide perimeter protection against unauthorized vehicle use or tampering by monitoring the vehicle doors, the liftgate, the liftgate flip-up glass, the ignition system and, only on vehicles built for sale in certain international markets where it is required equipment, the hood. If unauthorized vehicle use or tampering is detected, the system responds by pulsing the horn and flashing the exterior lamps. In many markets the VTSS also includes the Sentry Key Immobilizer System (SKIS), which provides passive vehicle protection by preventing the engine from operating unless a valid electronically encoded key is detected in the ignition lock cylinder. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - DESCRIPTION - SENTRY KEY IMMOBILIZER SYSTEM).

The VTSS includes the following major components, which are described in further detail elsewhere in this service manual:

- Body Control Module (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY

VEHICLE THEFT SECURITY (Continued)

CONTROL/CENTRAL TIMER MODULE - DESCRIPTION).

- Combination Flasher (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/COMBINATION FLASHER - DESCRIPTION).
- Door Ajar Switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DESCRIPTION - DOOR AJAR SWITCH).
- Driver Cylinder Lock Switch (Refer to 8 - ELECTRICAL/POWER LOCKS/DOOR CYLINDER LOCK/UNLOCK SWITCH - DESCRIPTION).
- Hood Ajar Switch(Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - DESCRIPTION).
- Horn Relay (Refer to 8 - ELECTRICAL/HORN/HORN RELAY - DESCRIPTION).
- Liftgate Ajar Switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DESCRIPTION - LIFTGATE AJAR SWITCH).
- Liftgate Flip-Up Glass Ajar Switch(Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/DOOR AJAR SWITCH - DESCRIPTION - LIFTGATE FLIP-UP GLASS AJAR SWITCH).
- Low Beam Headlamp Relay
- VTSS Indicator (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/VTSS INDICATOR - DESCRIPTION).

Certain functions and features of the VTSS rely upon resources shared with or controlled by other modules in the vehicle over the Programmable Communications Interface (PCI) data bus network. The other modules that may affect VTSS operation are:

- Driver Door Module (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).
- Passenger Door Module (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/DOOR MODULE - DESCRIPTION).

DESCRIPTION - SENTRY KEY IMMOBILIZER SYSTEM

Vehicles equipped with the Sentry Key Immobilizer System (SKIS) can be identified by the presence of an amber SKIS indicator in the instrument cluster that will illuminate for about three seconds each time the ignition switch is turned to the On position, or by a gray molded rubber cap on the head of the ignition key. Models not equipped with SKIS still have a SKIS indicator in the cluster, but it will not illuminate. Also, models not equipped with the SKIS have a black molded rubber cap on the head of the ignition key.

The SKIS includes the following major components, which are described in further detail elsewhere in this service manual:

- Powertrain Control Module
- Sentry Key Immobilizer Module
- Sentry Key Transponder
- SKIS Indicator

Except for the Sentry Key transponders, which rely upon Radio Frequency (RF) communication, hard wired circuitry connects the SKIS components to the electrical system of the vehicle.Refer to the appropriate wiring information.

OPERATION

OPERATION - VEHICLE THEFT SECURITY SYSTEM

The Vehicle Theft Security System (VTSS) is divided into two basic subsystems: Vehicle Theft Alarm (VTA) and Sentry Key Immobilizer System (SKIS). The following are paragraphs that briefly describe the operation of each of those two subsystems.

A Body Control Module (BCM) is used to control and integrate many of the functions and features included in the Vehicle Theft Security System (VTSS). In the VTSS, the BCM receives inputs indicating the status of the door ajar switches, the driver cylinder lock switch, the ignition switch, the liftgate ajar switches, the liftgate flip-up glass ajar switch, the power lock switches and, in vehicles so equipped, the hood ajar switch. The programming in the BCM allows it to process the information from all of these inputs and send control outputs to energize or de-energize the combination flasher, the horn relay (except vehicles with the premium version of the VTA), and the VTSS indicator. In addition, in vehicles built for certain markets where premium versions of the VTA is required, the BCM also exchanges messages with the Intrusion Transceiver Module (ITM) over the Programmable Communications Interface (PCI) data buss network to provide the features found in this version of the VTA. The control of these inputs and outputs are what constitute all of the features of the VTSS. Following is information on the operation of each of the VTSS features.

ENABLING

The BCM must have the VTSS function enabled in order for the VTSS to perform as designed. The logic in the BCM keeps its VTSS function dormant until it is enabled using a DRBIII® scan tool. Refer to the appropriate diagnostic information.

PRE-ARMING

The VTA has a pre-arming sequence. Pre-arming occurs when a door, the tailgate, or the flip-up glass is open when the vehicle is locked using a power lock

VEHICLE THEFT SECURITY (Continued)

switch, or when the “Lock” button on the Remote Keyless Entry (RKE) transmitter is depressed. The powerlock switch will not initiate the pre-arming sequence if the key is in the ignition switch. When the VTA is pre-armed, the arming sequence is delayed until all of the doors, the tailgate and the flip-up glass are closed.

ARMING

Passive arming of the VTSS occurs when the vehicle is exited with the key removed from the ignition switch, the headlamps are turned off, and the doors are locked while they are open using the power lock switch. The power lock switch will not function if the key is in the ignition switch or the headlamps are turned on with the driver side front door open. The VTSS will not arm if the driver side front door is locked using the key in the lock cylinder or using the mechanical lock button. Active arming of the VTSS occurs when the “Lock” button on the Remote Keyless Entry (RKE) transmitter is depressed to lock the vehicle, even if the doors and/or the liftgate are open when the RKE transmitter Lock button is depressed. However, the VTSS arming will not be complete until all of the doors, the liftgate and the liftgate flip-up glass are closed. On vehicles equipped with the hood ajar switch, VTSS arming will complete if the hood is open, but the underhood area will not be protected unless the hood is closed when the VTSS is armed.

Following successful passive or active VTSS arming, the VTSS indicator on the top of the instrument panel will flash rapidly for about sixteen seconds after the illuminated entry system times out. This indicates that VTSS arming is in progress. Once the sixteen second arming function is successfully completed, the indicator will flash at a slower rate, indicating that the VTSS is armed.

DISARMING

Passive disarming of the VTSS occurs when the vehicle is unlocked using the key to unlock the driver side front door. Active disarming of the VTSS occurs when the vehicle is unlocked by depressing the “Unlock” button of the Remote Keyless Entry (RKE) transmitter. Once the alarm has been activated, either disarming method will also deactivate the alarm. Depressing the “Panic” button on the RKE transmitter will also disarm the VTSS, but the horn will continue to pulse and the exterior lamps will continue to flash for about three minutes as part of the Panic feature function. The Panic feature is overridden if the “Panic” button is depressed a second time, or if a vehicle speed of about 24 kilometers-per-hour (15 miles-per-hour) is attained.

POWER-UP MODE

When the armed VTSS senses that the battery has been disconnected and reconnected, it enters its power-up mode. In the power-up mode the alarm system remains armed following a battery failure or disconnect. If the VTSS was armed prior to a battery disconnect or failure, the technician or vehicle operator will have to actively or passively disarm the alarm system after the battery is reconnected. The power-up mode will also apply if the battery goes dead while the system is armed, and battery jump-starting is then attempted. The VTSS will be armed until it is actively or passively disarmed. If the VTSS is in the disarmed mode prior to a battery disconnect or failure, it will remain disarmed after the battery is reconnected or replaced, or if jump-starting is attempted.

ALARM

The VTA alarm output varies by the version of the VTA with which the vehicle is equipped. In all cases, the alarm provides both visual and audible outputs; however, the time intervals of these outputs vary by the requirements of the market for which the vehicle is manufactured. In all cases, the visual output will be a flashing of the exterior lamps. For vehicles equipped with North American or the base version of the VTA, the audible output will be the pulsing of the horn. For vehicles with the premium version of the VTA, the audible output will be the cycling of the siren. The inputs that will trigger the alarm include the door ajar switch, the flip-up glass ajar switch, and in vehicles built for certain markets where they are required, the hood ajar switch and the Intrusion Transceiver Module (ITM).

TAMPER ALERT

The VTSS tamper alert feature will sound the horn (or the alarm siren for the premium version) three times upon VTA disarming, if the alarm was triggered and has since timed-out (about eighteen minutes). This feature alerts the vehicle operator that the VTA alarm was activated while the vehicle was unattended.

INTRUSION ALARM

The Intrusion Alarm is an exclusive feature of the premium version of the VTA, which is only available in certain markets, where it is required. When the VTA is armed, a motion sensor in the Intrusion Transceiver Module (ITM) monitors the interior of the vehicle for movement. If motion is detected, the ITM sends a message to the BCM over the PCI bus to invoke the visual alarm feature, and sends a message to the alarm siren over a dedicated serial bus to invoke the audible alarm feature. The motion detec-

tion feature of the ITM can be disabled by depressing the “Lock” button on the RKE transmitter three times or cycling the key in the driver door cylinder from the center to lock position within fifteen seconds during VTA arming, while the security indicator is still flashing rapidly. The VTA provides a single short siren “chirp” as an audible conformation that the motion detect disable request has been received. The ITM must be electronically enabled in order for the intrusion alarm to perform as designed. The intrusion alarm function of the ITM is enabled on vehicles equipped with this option at the factory, but a service replacement ITM must be configured and enabled by the dealer using the DRBIII® scan tool. Refer to the appropriate diagnostic information.

OPERATION - SENTRY KEY IMMOBILIZER SYSTEM

The Sentry Key Immobilizer System (SKIS) is designed to provide passive protection against unauthorized vehicle use by disabling the engine after about two seconds of running, whenever any method other than a valid Sentry Key is used to start the vehicle. The SKIS is considered a passive protection system because it is always active when the ignition system is energized and does not require any customer intervention. The SKIS uses Radio Frequency (RF) communication to obtain confirmation that the key in the ignition switch is a valid key for operating the vehicle. The microprocessor-based SKIS hardware and software also uses messages to communicate with other modules in the vehicle over the Programmable Communications Interface (PCI) data bus. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/COMMUNICATION - OPERATION).

Pre-programmed Sentry Key transponders are provided with the vehicle from the factory. Each Sentry Key Immobilizer Module (SKIM) will recognize a maximum of eight Sentry Keys. If the customer would like additional keys other than those provided with the vehicle, they may be purchased from any authorized dealer. These additional keys must be programmed to the SKIM in the vehicle in order for the system to recognize them as valid keys. This can be done by the dealer using a DRBIII® scan tool or, if Customer Learn programming is an available SKIS feature in the market where the vehicle was purchased, the customer can program the additional keys, as long as at least two valid Sentry Keys are already available. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

The SKIS performs a self-test each time the ignition switch is turned to the On position, and will store fault information in the form of Diagnostic Trouble Codes (DTC’s) if a system malfunction is detected. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - VEHICLE THEFT SECURITY SYSTEM

The VTSS-related hard wired inputs to and outputs from the Body Control Module (BCM), the Driver Door Module (DDM), or the Passenger Door Module (PDM) may be diagnosed and tested using conventional diagnostic tools and procedures. Refer to the appropriate wiring information.

However, conventional diagnostic methods may not prove conclusive in the diagnosis of the BCM, the DDM, the PDM, or the Programmable Communications Interface (PCI) data bus network. In order to obtain conclusive testing of the VTSS, the BCM, the DDM, the PDM, and the PCI data bus network must also be checked. The most reliable, efficient, and accurate means to diagnose the VTSS requires the use of a DRBIII® scan tool and the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

VEHICLE THEFT SECURITY (Continued)

DIAGNOSIS AND TESTING - SENTRY KEY IMMOBILIZER SYSTEM

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

SENTRY KEY IMMOBILIZER SYSTEM DIAGNOSIS		
CONDITION	POSSIBLE CAUSES	CORRECTION
SKIS INDICATOR FAILS TO LIGHT DURING BULB TEST	1. Bulb faulty.	1. Perform the instrument cluster actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING - ACTUATOR TEST). Replace the faulty bulb, if required.
	2. Fuse faulty.	2. Check the SKIM fused B(+) fuse and the fused ignition switch output (st-run) fuse in the JB. Replace fuses, if required.
	3. Ground path faulty.	3. Check for continuity to ground at the connector for the SKIM. Repair wiring, if required.
	4. Battery feed faulty.	4. Check for battery current at the connector for the SKIM. Repair wiring, if required.
	5. Ignition feed faulty.	5. Check for battery current at the connector for the SKIM with the ignition switch in the On position. Repair wiring, if required.
SKIS INDICATOR FLASHES FOLLOWING BULB TEST	1. Invalid key in ignition switch lock cylinder.	1. Replace the key with a known valid key.
	2. Key-related fault.	2. Use a DRBIII® scan tool and the appropriate diagnostic information for further diagnosis.
SKIS INDICATOR LIGHTS SOLID FOLLOWING BULB TEST	1. SKIS system malfunction/ fault detected.	1. Use a DRBIII® scan tool and the appropriate diagnostic information for further diagnosis.
	2. SKIS system inoperative.	2. Use a DRBIII® scan tool and the appropriate diagnostic information for further diagnosis.

SKIS INDICATOR FAILS TO LIGHT DURING BULB TEST

If the Sentry Key Immobilizer System (SKIS) indicator in the instrument cluster fails to illuminate for about three seconds after the ignition switch is turned to the On position (bulb test), perform the instrument cluster actuator test. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING - ACTUATOR TEST). If the bulb fails to operate during the actuator test, replace the bulb. If the SKIS indicator still fails to light during the bulb test, a wiring problem resulting in the loss of battery current or ground to the Sentry Key Immobilizer Module (SKIM) should be suspected, and the following procedure should be used for diagnosis. Refer to the appropriate wiring information.

NOTE: The following tests may not prove conclusive in the diagnosis of this system. The most reliable, efficient, and accurate means to diagnose the Sentry Key Immobilizer System requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

(1) Check the fused B(+) fuse in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component and replace the faulty fuse.

VEHICLE THEFT SECURITY (Continued)

(2) Check for battery voltage at the fused B(+) fuse in the JB. If OK, go to Step 3. If not OK, repair the open B(+) circuit between the JB fuse and the Power Distribution Center (PDC).

(3) Check the fused ignition switch output (st-run) fuse in the JB. If OK, go to Step 4. If not OK, repair the shorted circuit or component and replace the faulty fuse.

(4) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (st-run) fuse in the JB. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (st-run) circuit between the JB fuse and the ignition switch as required.

(5) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the Sentry Key Immobilizer Module (SKIM) from the SKIM connector. Check for continuity between the ground circuit of the instrument panel wire harness connector for the SKIM and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit.

(6) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the SKIM. If OK, go to Step 7. If not OK, repair the open fused B(+) circuit between the SKIM and the JB fuse.

(7) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (st-run) circuit of the instrument panel wire harness connector for the SKIM. If OK, refer to the appropriate diagnostic information and use a DRBIII® scan tool to complete the diagnosis of the SKIS. If not OK, repair the open fused ignition switch output (st-run) circuit between the SKIM and the JB fuse.

SKIS INDICATOR FLASHES OR LIGHTS SOLID FOLLOWING BULB TEST

A SKIS indicator that flashes following a successful bulb test indicates that an invalid key has been detected, or that a key-related fault has been set. A SKIS indicator that lights solid following a successful bulb test indicates that the SKIM has detected a system malfunction or that the SKIS is inoperative. In either case, fault information will be stored in the SKIM memory. For retrieval of this fault information and further diagnosis of the SKIS, the PCI data bus, the SKIM message outputs to the instrument cluster, the SKIM message outputs to the Body Control Module (BCM), or the message inputs and outputs between the SKIM and the Powertrain Control Module (PCM), a DRBIII® scan tool and the appropriate diagnostic information are required. Following are preliminary troubleshooting guidelines to be followed during diagnosis using a DRBIII® scan tool:

(1) Using the DRBIII® scan tool, read and record the faults as they exist in the SKIM when you first begin your diagnosis of the vehicle. It is important to document these faults because the SKIM does not differentiate between historical and active faults. If this problem turns out to be an intermittent condition, this information may become invaluable to your diagnosis.

(2) Using the DRBIII® scan tool, erase all of the faults from the SKIM.

(3) Cycle the ignition switch to the Off position, then back to the On position.

(4) Using the DRBIII® scan tool, read any faults that are now present in the SKIM. These are the active faults.

(5) Using this active fault information, refer to the proper procedure in the appropriate diagnostic information for the additional specific diagnostic steps.

STANDARD PROCEDURE

STANDARD PROCEDURE - SKIS INITIALIZATION

The Sentry Key Immobilizer System (SKIS) must be initialized following a Sentry Key Immobilizer Module (SKIM) replacement. SKIS initialization requires the use of a DRBIII® scan tool. Initialization will also require that you have access to the unique four-digit PIN code that was assigned to the original SKIM. The PIN code **must** be used to enter the Secured Access Mode in the SKIM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES - STANDARD PROCEDURE - PCM/SKIM PROGRAMMING).

NOTE: If a Powertrain Control Module (PCM) is replaced on a vehicle equipped with the Sentry Key Immobilizer System (SKIS), the unique Secret Key data must be transferred from the Sentry Key Immobilizer Module (SKIM) to the new PCM using the PCM replacement procedure. This procedure also requires the use of a DRBIII® scan tool and the unique four-digit PIN code to enter the Secured Access Mode in the SKIM. Refer to the appropriate diagnostic information for the proper PCM replacement procedures.

STANDARD PROCEDURE - SENTRY KEY TRANSPONDER PROGRAMMING

All Sentry Keys included with the vehicle are preprogrammed to work with the Sentry Key Immobilizer System (SKIS) when it is shipped from the

VEHICLE THEFT SECURITY (Continued)

factory. The Sentry Key Immobilizer Module (SKIM) can be programmed to recognize up to a total of eight Sentry Keys. When programming a blank Sentry Key transponder, the key must first be cut to match the ignition switch lock cylinde for which it will be used. Once the additional key has been cut, the SKIM must be programmed to recognize it as a valid key. There are two possible methods to program the SKIM to recognize a new or additional valid key, the Secured Access Method and the Customer Learn Method. Following are the details of these two programming methods.

SECURED ACCESS METHOD

The Secured Access method applies to all vehicles. This method requires the use of a DRBIII® scan tool. This method will also require that you have access to the unique four-digit PIN code that was assigned to the original SKIM. The PIN code **must** be used to enter the Secured Access Mode in the SKIM. This PIN number may be obtained from the vehicle owner, from the original vehicle invoice, or from the DaimlerChrysler Customer Center. Refer to the appropriate diagnostic information for the proper Secured Access method programming procedures.

CUSTOMER LEARN METHOD

The Customer Learn feature is only available on domestic vehicles, or those vehicles which have a U.S. country code designator. This programming method also requires access to at least two valid Sentry Keys. If two valid Sentry Keys are not available, or if the vehicle does not have a U.S. country code designator, the Secured Access Method **must** be used to program new or additional valid keys to the SKIM. The Customer Learn programming method procedures are as follows:

(1) Obtain the blank Sentry Key(s) that are to be programmed as valid keys for the vehicle. Cut the blank key(s) to match the ignition switch lock cylinder mechanical key codes.

(2) Insert one of the two valid Sentry Keys into the ignition switch and turn the ignition switch to the On position.

(3) After the ignition switch has been in the On position for longer than three seconds, but no more than fifteen seconds, cycle the ignition switch back to the Off position. Replace the first valid Sentry Key in the ignition switch lock cylinder with the second valid Sentry Key and turn the ignition switch back to the On position. The second valid Sentry Key must be inserted in the lock cylinder within fifteen seconds of removing the first valid key.

(4) About ten seconds after the completion of Step 3, the SKIS indicator in the instrument cluster will start to flash and a single audible chime tone will sound to indicate that the system has entered the Customer Learn programming mode.

(5) Within sixty seconds of entering the Customer Learn programming mode, turn the ignition switch to the Off position, replace the valid Sentry Key with a blank Sentry Key transponder, and turn the ignition switch back to the On position.

(6) About ten seconds after the completion of Step 5, a single audible chime tone will sound and the SKIS indicator will stop flashing, stay on solid for three seconds, then turn off to indicate that the blank Sentry Key has been successfully programmed. The SKIS will immediately exit the Customer Learn programming mode and the vehicle may now be started using the newly programmed valid Sentry Key.

Each of these steps must be repeated and completed in their entirety for each additional Sentry Key that is to be programmed. If the above steps are not completed in the given sequence, or within the allotted time, the SKIS will exit the Customer Learn programming mode and the programming will be unsuccessful. The SKIS will also automatically exit the Customer Learn programming mode if it sees a non-blank Sentry Key transponder when it should see a blank, if it has already programmed eight (8) valid Sentry Keys, or if the ignition switch is turned to the Off position for more than about fifty seconds.

NOTE: If an attempt is made to start the vehicle while in the Customer Learn mode (SKIS indicator flashing), the SKIS will respond as though the vehicle were being started with an invalid key. In other words, the engine will stall after about two seconds of operation. No faults will be set.

NOTE: Once a Sentry Key has been programmed as a valid key to a vehicle, it cannot be programmed as a valid key for use on any other vehicle.

DOOR CYLINDER LOCK SWITCH

DESCRIPTION

Vehicles manufactured for North American markets that are equipped with the optional Vehicle Theft Security System (VTSS) have a door cylinder lock switch secured to the back of the key lock cylinder inside the drivers front door (Fig. 1). The door cylinder lock switch is a resistor multiplexed momentary switch that is hard wired in series between the door lock switch ground and right or left cylinder lock switch mux circuits of the Drivers Door Module (DDM) through the front door wire harness. The door

DOOR CYLINDER LOCK SWITCH (Continued)

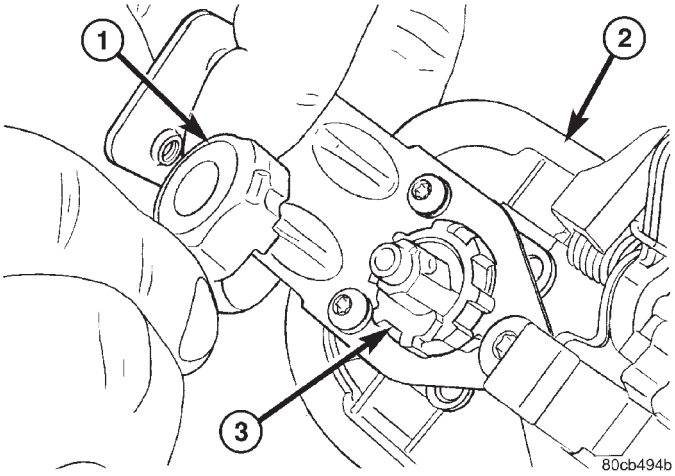


Fig. 1 DOOR CYLINDER LOCK SWITCH

1 - SWITCH
2 - OUTSIDE DOOR HANDLE
3 - DOOR LOCK CYLINDER

cylinder lock switches are driven by the key lock cylinders and contain two internal resistors. One resistor value is used for the Lock position, and one for the Unlock position.

The door cylinder lock switches cannot be adjusted or repaired and, if faulty or damaged, they must be replaced.

OPERATION

The door cylinder lock switches are actuated by the key lock cylinder when the key is inserted in the lock cylinder and turned to the lock or unlock positions. The door cylinder lock switch close a circuit between the door lock switch ground circuit and the left or right cylinder lock switch mux circuits through one of two internal resistors for the Driver Door Module (DDM) when either front door key lock cylinder is in the Lock, or Unlock positions. The DDM reads the switch status through an internal pull-up, then uses this information as an input for the Vehicle Theft Security System (VTSS) operation.

The door cylinder lock switches and circuits can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - DOOR CYLINDER LOCK SWITCH

Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

(1) Disconnect the door cylinder lock switch pigtail wire connector from the door wire harness connector.

(2) Using a ohmmeter, check the switch resistance checks between the two terminals in the door cylinder lock switch pigtail wire connector. Actuate the switch by rotating the key in the door lock cylinder to test for the proper resistance values in each of the two switch positions, as shown in the Door Cylinder Lock Switch Test table.

DOOR CYLINDER LOCK SWITCH TEST		
Switch Position		Resistance (±10%)
Left Side	Right Side	
Lock (Clockwise)	Unlock (Counterclockwise)	473 Ohms
Unlock (Counterclockwise)	Lock (Clockwise)	1.994 Kilohms

(3) If a door cylinder lock switch fails either of the resistance tests, replace the faulty switch.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the outside door handle unit from the outer door panel. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL).

(3) Remove the retainer clip from the pin on the back of the door lock cylinder (Fig. 2).

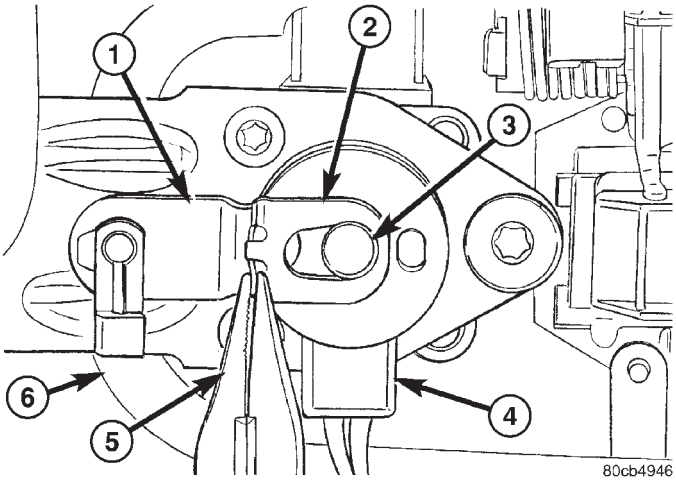


Fig. 2 LOCK CYLINDER LEVER RETAINER RE

1 - LEVER
2 - RETAINER
3 - LOCK CYLINDER
4 - SWITCH
5 - PLIERS
6 - OUTSIDE DOOR HANDLE

(4) Remove the lock lever from the pin on the back of the door lock cylinder.

DOOR CYLINDER LOCK SWITCH (Continued)

(5) Remove the door cylinder lock switch from the back of the lock cylinder.

INSTALLATION

(1) Position the door cylinder lock switch onto the back of the lock cylinder with its pigtail wire harness oriented toward the bottom (Fig. 2).

(2) Position the lock lever onto the pin on the back of the door lock cylinder with the lever oriented toward the rear.

(3) Install the retainer clip onto the pin on the back of the door lock cylinder. Be certain that the center tab of the retainer is engaged in the retention hole on the lock lever.

(4) Reinstall the outside door handle unit onto the outer door panel. (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION).

(5) Reconnect the battery negative cable.

HOOD AJAR SWITCH

DESCRIPTION

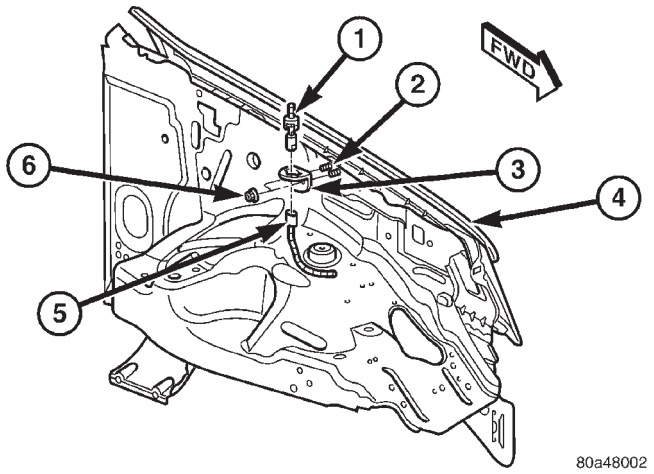


Fig. 3 Hood Ajar Switch

1 - SWITCH
2 - STUD (2)
3 - BRACKET
4 - FENDER
5 - CONNECTOR
6 - NUT (2)

The hood ajar switch is a self-adjusting, normally closed, single pole, double throw momentary switch that is used only on vehicles built for sale in certain international markets where it is required equipment (Fig. 3). The mounting bracket is fastened to the left inner fender. A molded plastic striker with three integral retainers is secured to the underside of the hood panel inner reinforcement to actuate the switch plunger as the hood panel is closed.The switch receives a path to ground through the left inner fender shield in the engine compartment.

The hood ajar switch adjusts itself as the striker pushes the switch body down through the switch when the hood panel is closed after the initial installation. This self-adjustment feature is only functional the first time the hood is closed following installation. If the switch requires adjustment following the initial installation, the switch must be replaced.

OPERATION

The normally closed hood ajar switch is normally held open when the hood panel is closed and latched. When the hood is opened, the switch plunger extends from the switch body and the switch contacts are closed. The hood ajar switch is connected in series between ground and the hood ajar switch sense input of the Body Control Module (BCM). The BCM uses an internal resistor pull up to monitor the state of the hood ajar switch contacts. The hood ajar switch can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - HOOD AJAR SWITCH

The diagnosis found here addresses an inoperative hood ajar switch. If the problem being diagnosed is related to hood ajar switch accuracy, be certain to confirm that the problem is not an improperly adjusted hood ajar switch. If no hood ajar switch adjustment problem is found, the following procedure will help to locate a short or open in the hood ajar switch circuit. Refer to the appropriate wiring information.

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(1) Disconnect and isolate the battery negative cable. Disconnect the hood ajar switch. Check for continuity between the harness ground circuit a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open ground circuit to ground.

HOOD AJAR SWITCH (Continued)

(2) Check for continuity between the two terminals of the hood ajar switch. There should be continuity with the switch plunger extended, and no continuity with the switch plunger depressed. If OK, go to Step 3. If not OK, replace the faulty hood ajar switch.

(3) Disconnect the instrument panel wire harness connector from the Body Control Module (BCM). Check for continuity between the hood ajar switch sense circuit of the hood ajar switch and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted hood ajar switch sense circuit between the hood ajar switch and the BCM.

(4) Check for continuity between the hood ajar switch sense circuit and the instrument panel wire harness connector for the BCM. There should be continuity. If OK, proceed to diagnosis of the Vehicle Theft Security System (VTSS). (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - DIAGNOSIS AND TESTING). If not OK, repair the open hood ajar switch sense circuit between the hood ajar switch and the BCM.

REMOVAL

REMOVAL - HOOD AJAR SWITCH

(1) Open the hood.

(2) Disconnect and isolate the battery negative cable.

(3) Squeeze the two switch latch tabs together and pull the switch upward (Fig. 3)

(4) Disconnect the wiring harness connector.

(5) Remove the hood ajar switch from the mounting bracket.

REMOVAL - HOOD AJAR SWITCH BRACKET

(1) Remove the hood ajar switch from the mounting bracket. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - REMOVAL).

(2) Remove the two nuts that secure the hood ajar switch bracket to the left inner fender (Fig. 3)

(3) Remove the hood ajar switch bracket from the studs on the left inner fender.

REMOVAL - HOOD AJAR SWITCH STRIKER

(1) Open the hood.

(2) Using a trim stick or another suitable wide flat-blade tool, gently raise the hood ajar switch striker away from the inner hood panel reinforcement, and remove. (Fig. 4).

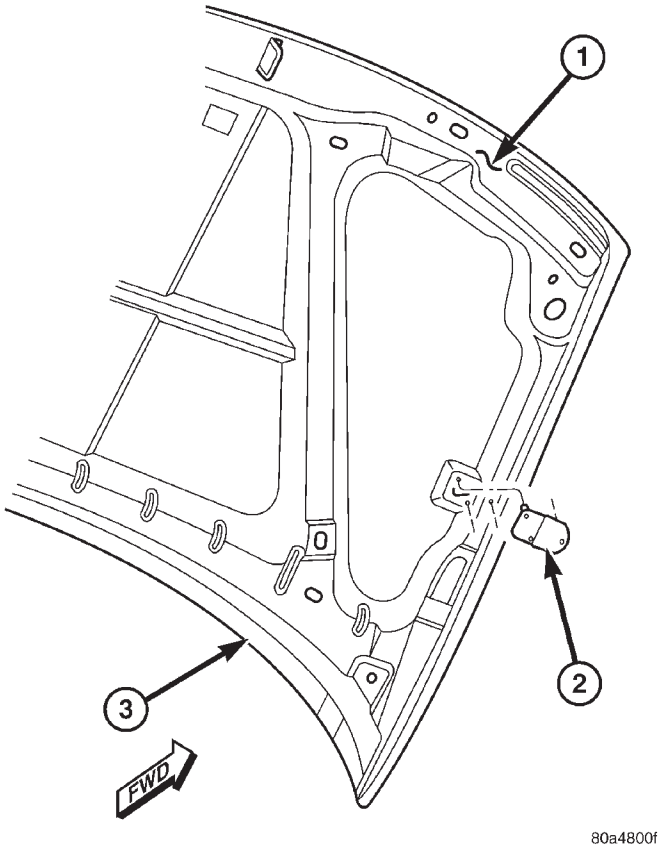


Fig. 4 Hood Ajar Switch Striker

1 - REINFORCEMENT
2 - STRIKER
3 - HOOD

INSTALLATION

INSTALLATION - HOOD AJAR SWITCH

(1) Position the hood ajar switch into the hole in the mounting bracket (Fig. 3)

(2) Reconnect the wiring harness connector.

(3) Press the switch downward into the mounting bracket until the latch tabs lock it into place.

(4) Reconnect the battery negative cable.

(5) Close and latch the hood.

INSTALLATION - HOOD AJAR SWITCH BRACKET

(1) Position the hood ajar switch bracket onto the studs on the left inner fender (Fig. 3)

(2) Install and tighten the two nuts. Tighten the nuts to 11.8 N·m (105 in. lbs.).

(3) Reinstall the hood ajar switch into the mounting bracket. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY/HOOD AJAR SWITCH - INSTALLATION).

HOOD AJAR SWITCH (Continued)

INSTALLATION - HOOD AJAR SWITCH STRIKER

(1) Align the three integral retainers of the hood ajar switch striker with their mounting holes in the inner hood panel reinforcement (Fig. 4).

(2) Using hand pressure, firmly press the hood ajar switch striker against the inner hood panel reinforcement until all of the striker retainers are fully engaged in their mounting holes.

(3) Close and latch the hood.

INTRUSION TRANSCEIVER MODULE

DESCRIPTION

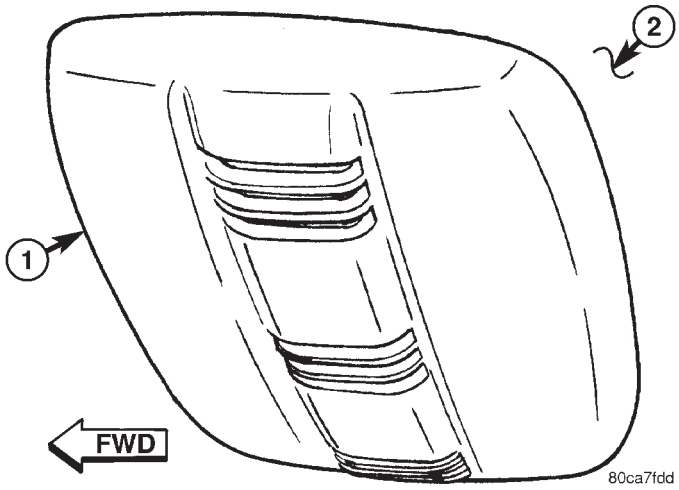


Fig. 5 INTRUSION TRANSCEIVER MODULE

1 - ITM
2 - HEADLINER

An Intrusion Transceiver Module (ITM) is part of the premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS) (Fig. 5). The premium version of the VTA is only available in vehicles built for certain markets, where the additional features offered by this system are required. The ITM is located in the passenger compartment. This unit is designed to provide interior motion detection, and serve as an interface between the Body Control Module (BCM) and the alarm siren module.

The ITM is concealed beneath a dedicated molded plastic trim cover that approximates the size and shape of a typical dome lamp housing. However, rather than a lens, the ITM features three sets of louvered openings. One set of louvered openings is located at each outboard end of the center rib, while the third set is centered. Each of the louvered openings is covered on the inside by a sight shield that extends the length of the center rib. The module is secured to a mounting bracket above the headliner (Fig. 6).

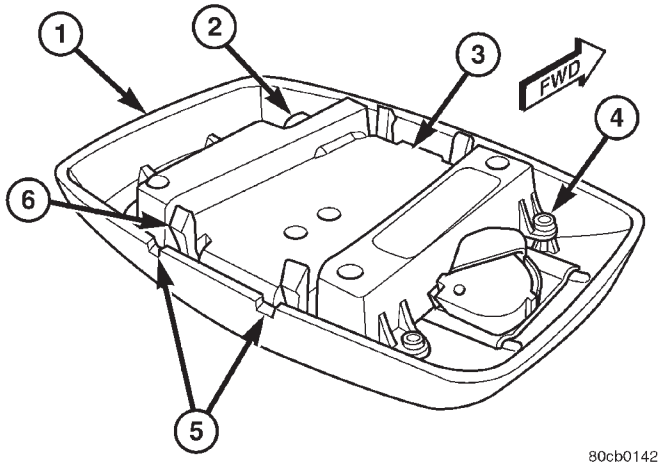


Fig. 6 INTRUSION TRANSCEIVER MODULE

1 - TRIM COVER
2 - CONNECTOR RECEPTACLE
3 - HOUSING
4 - SCREW (4)
5 - SERVICE HOLE (2)
6 - LATCH FEATURE (4)

Concealed within the housing is the circuitry of the ITM which includes a microprocessor, and an ultrasonic receive transducer. Both the transmit transducer on the right side of the module and the receive transducer on the ITM circuit board are aimed through two small round holes in the sight shield of the trim cover. The ITM is connected to the vehicle electrical system by a take out and connector of the overhead wire harness that is integral to the headliner.

The ITM unit cannot be adjusted or repaired and, if faulty or damaged, it must be replaced. The ITM is serviced as a unit with the trim cover.

OPERATION

The microprocessor in the Intrusion Transceiver Module (ITM) contains the motion sensor logic circuits and controls all of the features of the premium version of the Vehicle Theft Alarm (VTA). The ITM uses On-Board Diagnostics (OBD) and can communicate with other modules in the vehicle as well as with the DRBIII® scan tool using the Programmable Communications Interface (PCI) data bus network. This method of communication is used by the ITM to communicate with the Body Control Module (BCM) and for diagnosis and testing. The ITM also communicates with the alarm siren over a dedicated serial bus circuit.

INTRUSION TRANSCEIVER MODULE (Continued)

The ITM microprocessor continuously monitors inputs from its on-board motion sensor as well as inputs from the BCM and the alarm siren module. The ITM motion sensor transmits ultrasonic signals into the vehicle cabin through a transmit transducer, then listens to the returning signals as the bounce off of objects in the vehicle interior. If an object is moving in the interior, a detection circuit in the ITM senses this movement through the modulation of the returning ultrasonic signals that occurs due to the Doppler effect. The motion detect function of the ITM can be disabled by depressing the "Lock" button on the Remote Keyless Entry (RKE) transmitter three times within fifteen seconds, while the security indicator is still flashing rapidly or by cycling the key in the driver door cylinder from the center to the lock position. The ITM will signal the alarm siren module to provide a single siren "chirp" as an audible confirmation that the motion sensor function has been disabled.

If movement is detected, the ITM sends an message to the BCM over the PCI data bus to flash the exterior lighting and send a message to the alarm siren module over a dedicated serial bus line to sound the siren. When the BCM detects a breach in the perimeter protection through a door, tailgate, flip-up glass, or hood ajar switch input, it sends an message to the ITM and the ITM sends an message to the BCM over the PCI data bus to flash the exterior lighting and send a message to the alarm siren module over a dedicated serial bus line to sound the siren. The ITM also monitors inputs from the alarm siren module for siren battery or siren input/output circuit tamper alerts, and siren battery condition alerts, then sets active and stored Diagnostic Trouble Codes (DTC) for any monitored system faults it detects. An active fault only remains for the current ignition switch cycle, while a stored fault causes a DTC to be stored in memory by the ITM. If a fault does not reoccur for fifty ignition cycles, the ITM will automatically erase the stored DTC.

The ITM is connected to the vehicle electrical system through the overhead wire harness. The ITM receives battery voltage on a B(+) circuit through a fuse in the Junction Block (JB), and is grounded to the chassis at G303. These connections allow the ITM to remain operational, regardless of the ignition switch position. The hard wired inputs and outputs for the ITM may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the ITM, the PCI data bus network, or the electronic message inputs to and outputs from the ITM. The most reliable, efficient, and accurate means to diagnose the ITM, the PCI data bus network, and the message inputs to and outputs from the ITM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) While pulling downward lightly on the rear corner of the Intrusion Transceiver Module (ITM) trim cover, insert a small thin-bladed screwdriver through each of the service holes on the rear edge of the trim cover to release the two integral rear latch features of the module from the mounting bracket above the headliner (Fig. 7).

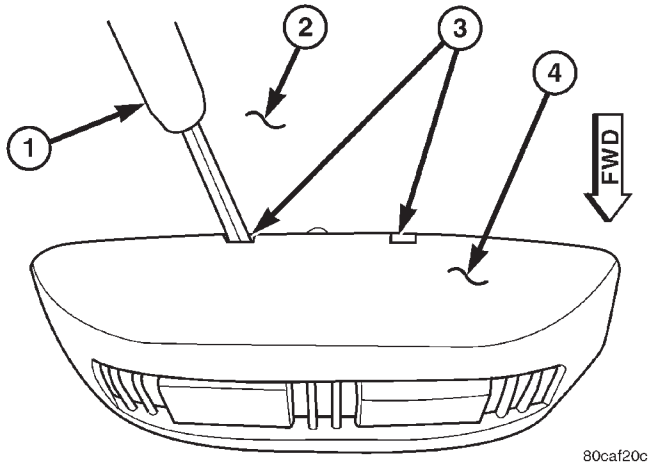


Fig. 7 INTRUSION TRANSCEIVER MODULE REMOVE

1 - SMALL SCREWDRIVER
2 - HEADLINER
3 - SERVICE HOLES
4 - ITM

(3) Pull the ITM trim cover rearward far enough to disengage the two front latch features of the module from the mounting bracket above the headliner.

(4) Pull the ITM and trim cover down from the headliner far enough to access and disconnect the overhead wire harness connector for the ITM from the module connector.

(5) Remove the ITM from the headliner.

INSTALLATION

(1) Position the Intrusion Transceiver Module (ITM) to the headliner.

(2) Reconnect the overhead wire harness connector for the ITM to the module connector.

(3) Align the two front latch features of the ITM with the two front latch receptacles of the mounting bracket above the headliner (Fig. 8).

(4) Push the ITM trim cover forward far enough to insert the two rear latch features of the module into

INTRUSION TRANSCEIVER MODULE (Continued)

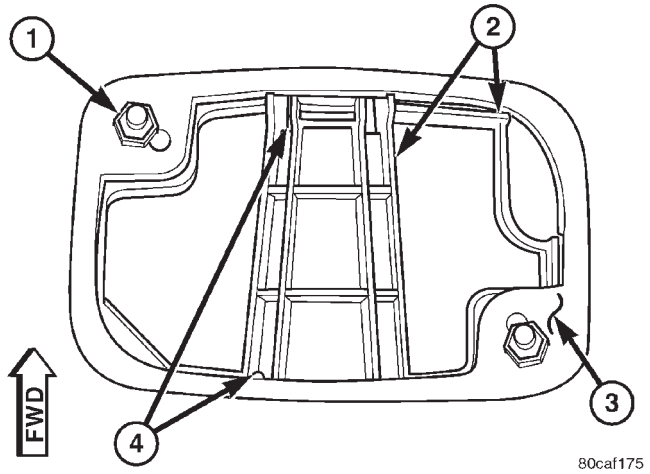


Fig. 8 INTRUSION TRANSCEIVER MODULE RETAINER RING

1 - STAMPED NUT (2)
2 - MOUNTING BRACKET
3 - HEADLINER
4 - LATCH RECEPTACLES (4)

the two rear latch receptacles of the mounting bracket above the headliner.

(5) Push upward firmly and evenly on the rear edge of the ITM trim cover until the two rear latch features of the module are engaged and latched in the mounting bracket above the headliner.

(6) Reconnect the battery negative cable.

NOTE: If the Intrusion Transceiver Module (ITM) has been replaced with a new unit, the new ITM MUST be initialized before the Vehicle Theft Security System can operate as designed. The use of a DRBIII® scan tool is required to initialize the ITM. Refer to the appropriate diagnostic information.

SIREN

DESCRIPTION

An alarm siren module is part of the premium version of the Vehicle Theft Alarm (VTA) in the Vehicle Theft Security System (VTSS) (Fig. 9). The premium version of the VTA is only available in vehicles built for certain markets, where the additional features offered by this system are required. The alarm siren module is located in the right front frame rail. This unit is designed to provide the audible alert requirements for the premium VTA.

The alarm siren module consists of microprocessor, the siren, and a nickel metal hydride backup battery. All of the alarm module components are protected and sealed within the housing.

The alarm siren module cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The microprocessor within the alarm siren module provides the siren unit features and functions based upon internal programming and arm and disarm messages received from the Intrusion Transceiver Module (ITM) over a dedicated serial bus communication circuit. The alarm siren module will self-detect problems with its internal and external power supply and communication circuits, then send messages indicating the problem to the ITM upon receiving a request from the ITM. The ITM will store a Diagnostic Trouble Code (DTC) for a detected alarm siren module fault that can be retrieved with the DRBIII® scan tool over the Programmable Communications Interface (PCI) data bus.

When the premium version of the Vehicle Theft Alarm (VTA) is armed, the alarm siren module continuously monitors inputs from the ITM for messages to sound its siren and enters its auto-detect mode. While in the auto-detect mode, if the alarm siren module detects that its power supply or communication circuits are being tampered with or have been sabotaged, it will sound an alarm and continue to operate through its on-board backup battery. If the arm siren module is in its disarmed mode when its power supply or communication circuits are interrupted, the siren will not sound. The alarm module will also notify the ITM when the backup battery requires charging, and the ITM will send a message that will allow the backup battery to be charged through the battery voltage and ground circuits to the alarm module only when the ignition switch is in the On position and the engine is running. This will prevent the charging of the alarm backup battery from depleting the charge in the main vehicle battery while the vehicle is not being operated.

The alarm siren module receives battery voltage through a fuse in the Power Distribution Center (PDC), and is grounded to the chassis. These connections allow the alarm siren module to remain operational, regardless of the ignition switch position. The hard wired inputs and outputs for the alarm siren module may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods will not prove conclusive in the diagnosis of the internal circuitry or the backup battery of the alarm siren module, the ITM, the serial bus communication line, or the message inputs to and outputs from the alarm siren module. The most reliable, efficient, and accurate means to diagnose the alarm siren module, the ITM, the serial bus communication line, and the electronic

SIREN (Continued)

message inputs to and outputs from the alarm siren module requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the alarm siren module wiring harness connector. (Fig. 9).

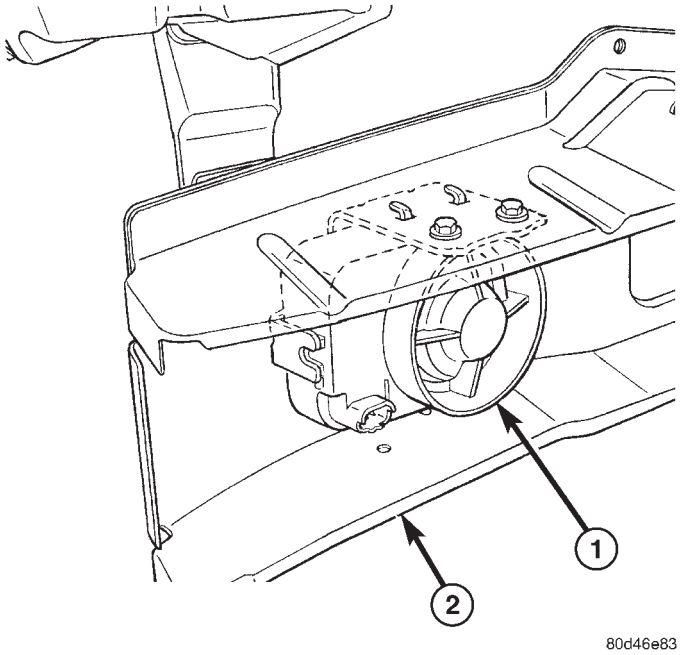


Fig. 9 Siren Remove/Install

1 - SIREN
2 - FRAME

(3) Remove the screws that secure the alarm siren module to the left frame rail.

(4) Remove the alarm siren module.

INSTALLATION

(1) Position the alarm siren module on to the left frame rail. (Fig. 9).

(2) Install and tighten the screws that secure the alarm siren moduleto the frame rail. Tighten the screws to 6 N·m (50 in. lbs.).

(3) Reconnect the alarm siren module wiring harness connector.

(4) Reconnect the battery negative cable.

NOTE: If the alarm siren module has been replaced with a new unit, the new unit MUST be configured in the Intrusion Transceiver Module (ITM) before the Vehicle Theft Security System can operate as designed. The use of a DRBIII® scan tool is required to configure the alarm siren module settings in the ITM. Refer to the appropriate diagnostic information.

SKIS INDICATOR LAMP

DESCRIPTION

A Sentry Key Immobilizer System (SKIS) indicator lamp is standard equipment on all instrument clusters, but is only functional on vehicles equipped with the optional SKIS. The amber SKIS indicator lamp is located to the right of the oil pressure gauge.

OPERATION

The Sentry Key Immobilizer System (SKIS) indicator lamp gives an indication to the vehicle operator of the status of the SKIS. This lamp is controlled by a transistor on the instrument cluster circuit board based upon messages received by the cluster from the Sentry Key Immobilizer Module (SKIM) over the Programmable Communications Interface (PCI) data bus. The SKIS indicator lamp bulb receives battery current on the instrument cluster circuit board through the fused ignition switch output (st-run) circuit whenever the ignition switch is in the On or Start positions. The lamp bulb only illuminates when it is provided a path to ground by the instrument cluster transistor. The instrument cluster will turn on the SKIS indicator lamp for the following reasons:

- **Bulb Test** - Each time the ignition switch is turned to the On position, the SKIM tells the cluster to illuminate the lamp for about three seconds.
- **SKIS Lamp-On Message** - Each time the cluster receives a SKIS lamp-on message from the SKIM, the lamp will be illuminated. The lamp can be flashed on and off, or illuminated solid, as dictated by the message from the SKIM. For more information on the SKIS and the SKIS lamp control parameters, (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - OPERATION - SENTRY KEY IMMOBILIZER SYSTEM). The lamp remains illuminated until the cluster receives a lamp-off message from the SKIM or until the ignition switch is turned to the Off position, whichever occurs first.
- **Actuator Test** - Each time the cluster is put through the actuator test, the lamp will be turned on for the duration of the test to confirm the functionality of the lamp and the cluster.

The SKIM performs a self-test each time the ignition switch is turned to the On position to decide whether the system is in good operating condition. The SKIM then sends a message to the instrument cluster. If the SKIS indicator lamp fails to light during the bulb test, replace the bulb. For further diagnosis of the SKIS indicator lamp or the instrument

SKIS INDICATOR LAMP (Continued)

cluster circuitry that controls the lamp, (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - DIAGNOSIS AND TESTING). If the instrument cluster turns on the SKIS indicator lamp after the bulb test, either solid or flashing, it indicates that a SKIS malfunction has occurred or that the SKIS is inoperative. For proper diagnosis of the SKIS, the PCI data bus, or the message inputs to the instrument cluster that control the SKIS indicator lamp, a DRBIII® scan tool and the appropriate diagnostic information are required.

TRANSPONDER KEY

DESCRIPTION

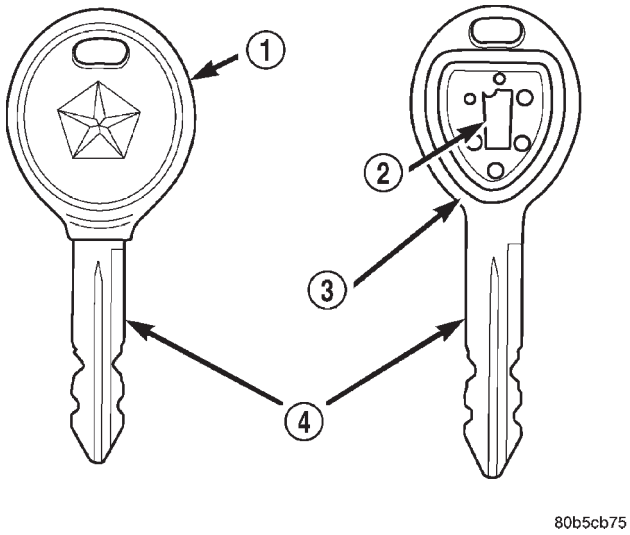


Fig. 10 Sentry Key Immobilizer Transponder

1 - MOLDED CAP
2 - TRANSPONDER CHIP
3 - MOLDED CAP REMOVED
4 - TRANSPONDER KEY

Each ignition key used in the Sentry Key Immobilizer System (SKIS) has an integral transponder chip (Fig. 10). Ignition keys with this feature can be readily identified by a gray rubber cap molded onto the head of the key, while conventional ignition keys have a black molded rubber cap. The transponder chip is concealed beneath the molded rubber cap, where it is molded into the head of the metal key. Each new Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. The Sentry Key transponder if faulty or damaged, must be replaced.

OPERATION

When the ignition switch is turned to the On position, the Sentry Key Immobilizer Module (SKIM) communicates through its antenna with the Sentry Key transponder using a Radio Frequency (RF) signal. The SKIM then waits for a RF response from the transponder through the same antenna. The Sentry Key transponder chip is within the range of the SKIM transceiver antenna ring when it is inserted into the ignition lock cylinder. The SKIM determines whether a valid key is present in the ignition lock cylinder based upon the response from the transponder. If a valid key is detected, that fact is communicated by the SKIM to the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus, and the PCM allows the engine to continue running. If the PCM receives an invalid key message, or receives no message from the SKIM over the PCI data bus, the engine will be disabled after about two seconds of operation. The ElectroMechanical Instrument Cluster (EMIC) will also respond to the invalid key message on the PCI data bus by flashing the SKIS indicator on and off.

Each Sentry Key has a unique transponder identification code permanently programmed into it by the manufacturer. Likewise, the SKIM has a unique Secret Key code programmed into it by the manufacturer. When a Sentry Key is programmed into the memory of the SKIM, the SKIM stores the transponder identification code from the Sentry Key, and the Sentry Key learns the Secret Key code from the SKIM. Once the Sentry Key learns the Secret Key code of the SKIM, it is permanently stored in the memory of the transponder. Therefore, once a Sentry Key has been programmed to a particular vehicle, it cannot be used on any other vehicle. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - STANDARD PROCEDURE - TRANSPONDER PROGRAMMING).

VTSS INDICATOR

DESCRIPTION

The Vehicle Theft Security System (VTSS) indicator consists of a red Light-Emitting Diode that is mounted and integral to the automatic headlamp light sensor photo diode unit, which is located on the top of the instrument panel. The remainder of the housing including the mount and the electrical connection are concealed beneath the instrument panel top cover.

The VTSS indicator cannot be adjusted or repaired the entire automatic headlamp light sensor/VTSS indicator must be replaced. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/AUTO HEADLAMP SENSOR - REMOVAL).

VTSS INDICATOR (Continued)

OPERATION

The Vehicle Theft Security System (VTSS) indicator gives a visible indication of the VTSS arming status. One side of Light-Emittiong Diode (LED) in the VTSS indicator is connected to unswitched battery current through a fused B(+) circuit and a fuse in the Junction Block (JB). The other side of the LED is hard wired to the Body Control Module (BCM), which controls the operation of the VTSS indicator by pulling this side of the LED circuit to ground. When the VTSS arming is in progress, the BCM will flash the LED rapidly on and off for about fifteen seconds. When the VTSS has been successfully armed, the BCM will flash the LED on and off continually at a much slower rate until the VTSS has been disarmed. The VTSS indicator can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - VTSS INDICATOR

The diagnosis found here addresses an inoperative Vehicle Theft Security System (VTSS) indicator condition. If the problem being diagnosed is related to indicator accuracy, be certain to confirm that the problem is with the indicator and not with an inoperative VTSS. (Refer to 8 - ELECTRICAL/VEHICLE THEFT SECURITY - DIAGNOSIS AND TESTING - VEHICLE THEFT SECURITY SYSTEM). If no VTSS problem is found, the following procedure will help to locate a short or open in the VTSS indicator control circuit. Refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check the fused B(+) fuse in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the JB. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit between the JB and the Power Distribution Center (PDC).

(3) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the automatic headlamp light sensor/VTSS indicator from the automatic headlamp light sensor/VTSS indicator pigtail wire connector. Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the instrument panel wire harness connector for the automatic headlamp light sensor/VTSS indicator. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the VTSS indicator and the JB.

(4) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the JB from the JB connector receptacle. Check for continuity between the VTSS indicator driver circuit cavity of the instrument panel wire harness connector for the automatic headlamp light sensor/VTSS indicator and a good ground. There should be no continuity. If OK, go to Step 5. If not OK, repair the shorted VTSS indicator driver circuit between the VTSS indicator and the JB.

(5) Check for continuity between the VTSS indicator driver circuit of the instrument panel wire harness connector for the automatic headlamp light sensor/VTSS indicator and the instrument panel wire harness connector for the JB. There should be continuity. If OK, replace the faulty VTSS indicator. If not OK, repair the open VTSS indicator driver circuit between the VTSS indicator and the JB.

WIPERS/WASHERS

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FRONT WIPERS/WASHERS

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FRONT WIPERS/WASHERS

DESCRIPTION

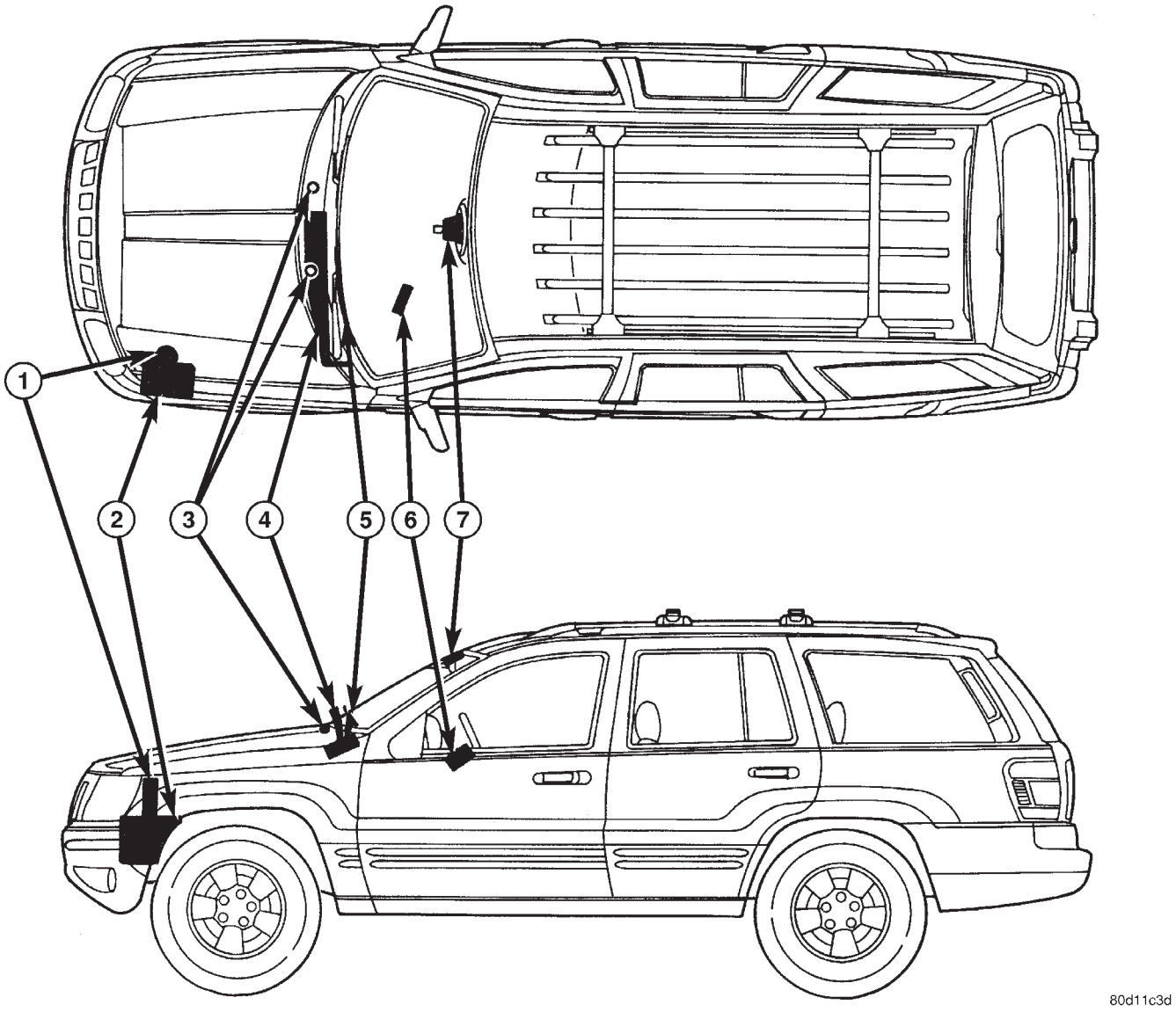


Fig. 1 Front Wiper & Washer System

1 - WASHER RESEVOIR FILLER TUBE
2 - WASHER RESERVOIR, PUMP/MOTOR, FLUID LEVEL SWITCH
3 - WASHER NOZZLE (2)
4 - WIPER MODULE
5 - WIPER ARM & BLADE (2)
6 - RIGHT (WIPER) MULTI-FUNCTION SWITCH RIGHT
7 - RAIN SENSOR MODULE

An electrically operated intermittent front wiper and washer system is standard factory-installed safety equipment on this model (Fig. 1). The front wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **Body Control Module** - The Body Control Module (BCM) is located on the Junction Block (JB) under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/BODY CONTROL MODULE - DESCRIPTION).

FRONT WIPERS/WASHERS (Continued)

- **Front Check Valve** - The front washer system check valve is integral to the wye fitting located in the washer plumbing between the cowl plenum washer hose and the front washer nozzles, and is concealed beneath the cowl plenum cover/grille panel at the base of the windshield.
- **Front Washer Nozzle** - Two fluidic front washer nozzles are secured with integral snap features to dedicated openings in the cowl plenum cover/grille panel located near the base of the windshield.
- **Front Washer Plumbing** - The plumbing for the front washer system consists of rubber hoses and molded plastic fittings. The plumbing is routed along the left side of the engine compartment from the washer reservoir, and through the dash panel into the cowl plenum to the front washer nozzle fittings beneath the cowl plenum cover/grille panel.
- **Front Washer Pump/Motor** - The front washer pump/motor unit is located in a dedicated hole on the lower outboard side of the washer reservoir, behind the inner fender liner ahead of the left front wheel. The front washer pump is located ahead of and below the rear washer pump.
- **Front Wiper Arm** - The two front wiper arms are secured with nuts to the threaded studs on the ends of the two wiper pivot shafts, which extend through the cowl plenum cover/grille panel located near the base of the windshield.
- **Front Wiper Blade** - The two front wiper blades are secured to the two front wiper arms with an integral latch, and are parked on the glass near the bottom of the windshield when the front wiper system is not in operation.
- **Front Wiper Module** - The front wiper pivot shafts are the only visible components of the front wiper module. The remainder of the module is concealed within the cowl plenum beneath the cowl plenum cover/grille panel. The front wiper module includes the module bracket, four rubber-isolated wiper module mounts, the front wiper motor, the wiper motor crank arm, the two wiper drive links, and the two front wiper pivots.
- **Rain Sensor Module** - Models equipped with the optional automatic wiper feature have a Rain Sensor Module (RSM) located behind a trim cover on a bracket bonded to the inside surface of the windshield glass, just above the inside rear view mirror mounting button.
- **Right Multi-Function Switch** - The right (wiper) multi-function switch is secured to the right side of the multi-function switch mounting housing near the top of the steering column, just below the steering wheel. Only the control stalk for the right multi-function switch is visible, while the remainder of the switch is concealed beneath the steering column shrouds. The right multi-function switch contains all of the switches and control circuitry for both the front and rear wiper and washer systems.
- **Washer Fluid Level Switch** - The washer fluid level switch is located in a dedicated hole near the center of the forward surface of the washer reservoir, behind the left front wheel house splash shield.
- **Washer Reservoir** - The washer reservoir is concealed between the left inner fender shield and the left outer fender panel, behind the inner fender liner and ahead of the left front wheel. The washer reservoir filler neck is the only visible portion of the reservoir, and it is accessed from the left front corner of the engine compartment.
- **Wiper High-Low Relay** - The wiper high-low relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.
- **Wiper On-Off Relay** - The wiper on-off relay is an International Standards Organization (ISO) micro relay located in the Power Distribution Center (PDC) in the engine compartment near the battery.

Hard wired circuitry connects the front wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the front wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATING MODES

The components of the front wiper and washer system are designed to work in concert to provide the following operating modes:

- **Automatic Wiper** - In models equipped with the optional automatic wiper feature, the internal circuitry of both the right (wiper) multi-function switch, the rain sensor module, and the BCM work in concert to provide an automatic wiper mode with five sensitivity selections. The BCM tells the Rain Sensor Module (RSM) when the automatic wiper mode is selected and the manually selected sensitivity level, then the rain sensor module tells the BCM each time enough water droplets have accumulated within the wipe pattern on the windshield to require front wiper operation. The BCM then automatically

operates the front wipers at the programmed speed and intervals requested by the RSM to maintain visibility through the windshield.

- **Continuous Wipe Mode** - The control knob on the control stalk of the right (wiper) multi-function switch has two continuous wipe positions, Low and High. When selected, these switch positions will cause the two-speed front wiper motor to operate in a continuous low or high speed cycle.
- **Headlamps On With Wipers** - The BCM provides an automatic headlamps on with wipers feature for models equipped with the optional automatic headlamps. This is a customer programmable feature. If this feature is enabled, the headlamps will turn on automatically when the windshield wipers are turned on; and, if the headlamps were turned on automatically when the wipers were turned on, they will turn off automatically when the wipers are turned off. In models equipped with the optional automatic wiper feature, when the automatic wiper mode is selected the headlamps will turn on automatically only after the wipers complete three automatic wipe cycles within about thirty seconds, and they will turn off automatically after three minutes elapse without any automatic wipe cycles. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - STANDARD PROCEDURE - ELECTRONIC VEHICLE INFORMATION CENTER PROGRAMMING).
- **Mist Wipe Mode** - The control stalk of the right (wiper) multi-function switch has a momentary Mist position. When selected, this switch position will operate the front wipers in a low speed continuous cycle for as long as the switch is held closed, then will complete the current wipe cycle and park the front wiper blades near the base of the windshield when the switch is released.
- **Speed Sensitive Intermittent Wipe Mode** - Except on models equipped with the optional automatic wiper system, the internal circuitry of both the right (wiper) multi-function switch and the BCM work in concert to provide an intermittent wipe mode with five delay interval selections. The BCM automatically adjusts each manually selected delay interval to compensate for vehicle speed.
- **Washer Mode** - When the momentary front wash position of the control stalk for the right (wiper) multi-function switch is selected with the front wiper system operating in a continuous wipe mode, washer fluid will be dispensed onto the windshield glass through the washer nozzles for as long as the washer switch is held closed. When the front washer switch is actuated with the front wiper system operating in an intermittent wipe mode, washer fluid is still dispensed until the switch is released; however, the front wipers will operate in a low speed continuous cycle from the time the washer switch is closed until several wipe cycles after the switch is released, before returning to the selected intermittent wipe mode.
- **Wipe-After-Wash Mode** - When the momentary front wash position of the control stalk for the right (wiper) multi-function switch is selected with the front wiper system turned Off, the internal circuitry of the BCM provides a wipe-after-wash feature. When selected, this feature will operate the front washer pump/motor and the front wipers for as long as the front washer switch is held closed, then provide several additional wipe cycles after the switch is released before parking the front wiper blades near the base of the windshield.

OPERATION

The front wiper and washer system is designed to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the windshield glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blades to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris that might be encountered while driving the vehicle under numerous types of inclement operating conditions from the outside windshield glass surface.

The vehicle operator initiates all front wiper and washer system functions with the control stalk of the right (wiper) multi-function switch that extends from the right side of the steering column, just below the steering wheel. Rotating the control knob on the end of the right (wiper) multi-function switch control stalk selects the Off, Delay (on models not equipped with the optional automatic wiper system), Auto (on models equipped with the optional automatic wiper system), Low, or High front wiper system operating modes. In the Delay mode, the control knob also allows the vehicle operator to select from one of five intermittent wipe Delay intervals. In the Auto mode, the control knob also allows the vehicle operator to select from one of five automatic wiper sensitivity levels. Pulling the right control stalk downwards actuates the momentary front wiper system Mist mode switch, while pulling the right control stalk towards the steering wheel actuates the front washer system switch. The multi-function switch provides hard wired resistor multiplexed inputs to the Body Control Module (BCM) for all of the front wiper sys-

tem functions, as well as separate hard wired sense inputs to the BCM for the high speed continuous wipe and front washer system functions.

The front wiper and washer system will only operate when the ignition switch is in the Accessory or On positions. Battery current is directed from a B(+) fuse in the Power Distribution Center (PDC) to the wiper and washer system circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit. The automatic resetting circuit breaker then provides battery current through a fused ignition switch output (run-acc) circuit to the wiper on/off relay, and the park switch in the front wiper motor. A separate fuse in the JB provides battery current through another fused ignition switch output (run-acc) circuit to the right multi-function switch. The right multi-function switch circuitry uses this battery feed to directly control the operation of the front washer pump/motor unit. The BCM uses low side drivers to control front wiper system operation by energizing or de-energizing the wiper high/low and wiper on/off relays.

The hard wired circuits and components of the front wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the Body Control Module (BCM), or the inputs to or outputs from the BCM that control the front wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the BCM, or the BCM inputs and outputs related to the various front wiper and washer system operating modes requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

Following are paragraphs that briefly describe the operation of each of the front wiper and washer system operating modes.

CONTINUOUS WIPE MODE

When the Low position of the control knob on the control stalk of the right (wiper) multi-function switch is selected, the Body Control Module (BCM) energizes the wiper on/off relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally closed contacts of the de-energized wiper high/low relay to the low speed brush of the front wiper motor, causing the front wipers to cycle at low speed. When the High position of the control knob is selected, the BCM energizes both the wiper on/off relay and the wiper high/low relay. This directs battery current through the normally open contacts of the energized wiper on/off relay and the normally open contacts of the energized wiper high/low relay to the high speed brush of the front wiper motor, causing the front wipers to cycle at high speed.

When the Off position of the control knob is selected, the BCM de-energizes both the wiper on/off and wiper high/low relays, then one of two events will occur. The event that will occur depends upon the position of the wiper blades on the windshield at the moment that the control knob Off position is selected. If the wiper blades are in the down position on the windshield when the Off position is selected, the park switch that is integral to the front wiper motor is closed to ground and the wiper motor ceases to operate. If the wiper blades are not in the down position on the windshield at the moment the Off position is selected, the park switch is closed to battery current from the fused ignition switch output (run-acc) circuit of the front wiper motor. The park switch directs this battery current to the low speed brush of the wiper motor through the wiper park switch sense circuit and the normally closed contacts of the wiper on/off and wiper high/low relays. This causes the wiper motor to continue running at low speed until the wiper blades are in the down position on the windshield and the park switch is again closed to ground.

INTERMITTENT WIPE MODE

On models not equipped with the optional automatic wiper system, when the control knob on the control stalk of the right (wiper) multi-function switch is moved to one of the five Delay interval positions, the BCM electronic intermittent wipe logic circuit responds by calculating the correct length of time between wiper sweeps based upon the selected delay interval input. The BCM monitors the changing state of the wiper motor park switch through a hard wired front wiper park switch sense circuit input. This input allows the BCM to determine the proper intervals at which to energize and de-energize the wiper on/off relay to operate the front wiper motor intermittently for one low speed cycle at a time. The BCM logic is also programmed to provide an immediate wipe cycle and begin a new delay interval timing cycle each time a shorter delay interval is selected, and to add the remaining delay timing interval to the new delay interval timing before the next wipe cycle occurs each time a longer delay interval is selected.

The intermittent wipe mode delay times are speed sensitive. The BCM monitors vehicle speed messages received from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus network in order to provide the speed sensitive delay intervals. Above about sixteen kilometers-per-hour (ten miles-per-hour) the delay is driver adjustable from about one-half second to about eigh-

teen seconds. Below about sixteen kilometers-per-hour (ten miles-per-hour) the delay times are doubled, from about one second to about thirty-six seconds.

AUTOMATIC WIPE MODE

On models equipped with the optional automatic wiper system, when the control knob on the control stalk of the right (wiper) multi-function switch is moved to one of the five Auto sensitivity positions, the BCM sends an electronic message to the Rain Sensor Module (RSM) over the Programmable Communications Interface (PCI) data bus network indicating the selected position. The RSM monitors an area within the wipe pattern of the windshield glass for the accumulation of moisture. Based upon internal programming and the selected sensitivity level, when sufficient moisture has accumulated the RSM sends the appropriate electronic wipe command messages to the BCM over the PCI data bus and the BCM operates the front wiper system accordingly. As the sensitivity level is set higher, the RSM is more sensitive to moisture accumulation and will send wipe commands more frequently. The BCM logic is also programmed to provide an immediate wipe cycle each time the control knob on the control stalk of the right multi-function switch is moved from a non-automatic wipe position to one of the five Auto sensitivity positions, and another immediate wipe cycle each time the control knob is moved from a lower Auto sensitivity position to a higher Auto sensitivity position.

MIST WIPE MODE

When the control stalk of the right (wiper) multi-function switch is moved to the momentary Mist position, the BCM energizes the wiper on/off relay for as long as the Mist switch is held closed, then de-energizes the relay when the state of the Mist switch input changes to open. The BCM can operate the front wiper motor in this mode for only one low speed cycle at a time, or for an indefinite number of sequential low speed cycles, depending upon how long the Mist switch is held closed.

WASH MODE

When the control stalk of the right (wiper) multi-function switch is moved to the momentary front Wash position while the control knob is in the Low or High positions, the circuitry within the switch directs battery current to the front washer pump/motor unit. This will cause the front washer pump/motor unit to be energized for as long as the front Wash switch is held closed, and to de-energize when the front Wash switch is released. When the control stalk of the right (wiper) multi-function switch is moved to the momentary front Wash position while the control knob is in one of the Delay interval or Auto sensitivity positions, the front washer pump/motor operation is the same. However, the BCM energizes the wiper on/off relay to override the selected delay interval or auto sensitivity level and operate the front wiper motor in a continuous low speed mode for as long as the front Wash switch is held closed, then de-energizes the relay and reverts to the selected delay mode interval or auto sensitivity level several wipe cycles after the front Wash switch is released. The BCM detects the front Wash switch state through a hard wired washer pump motor switch output circuit input from the right multi-function switch.

WIPE-AFTER-WASH MODE

When the control stalk of the right (wiper) multi-function switch is moved to the momentary front Wash position while the control knob is in the Off position, the BCM detects that switch state through a hard wired washer pump motor switch output circuit input from the right multi-function switch. The BCM responds to this input by energizing the wiper on/off relay for as long as the Wash switch is held closed, then de-energizes the relay several wipe cycles after the front Wash switch is released. The BCM monitors the changing state of the wiper motor park switch through a hard wired front wiper park switch sense circuit input. This input allows the BCM to count the number of wipe cycles that occur after the front Wash switch state changes to open, and to determine the proper interval at which to de-energize the wiper on/off relay to complete the wipe-after-wash mode cycle.

DIAGNOSIS AND TESTING - FRONT WIPER & WASHER SYSTEM

FRONT WIPER SYSTEM

If the front wiper motor operates, but the wipers do not move on the windshield, replace the faulty front wiper module. If the wipers operate, but chatter, lift, or do not clear the glass, clean and inspect the wiper system components as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - INSPECTION) and (Refer to 8 - ELECTRICAL/ FRONT WIPERS/WASHERS - CLEANING). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

The hard wired circuits and components of the front wiper and washer system may be diagnosed and tested using conventional diagnostic tools and procedures. However, conventional diagnostic meth-

FRONT WIPERS/WASHERS (Continued)

ods may not prove conclusive in the diagnosis of the Body Control Module (BCM), the Rain Sensor Module (RSM), the Powertrain Control Module (PCM) or the inputs to or outputs from these modules that control the various front wiper and washer system operating modes. The most reliable, efficient, and accurate means to diagnose the BCM, the RSM, the PCM or the BCM inputs and outputs related to the various front wiper and washer system operating modes requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

FRONT WASHER SYSTEM

The diagnosis found here addresses an electrically inoperative washer system. If the washer pump/motor operates, but no washer fluid is emitted from the front washer nozzles, be certain to check the fluid level in the reservoir. Also inspect the front washer system components as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - INSPECTION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pinout information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Turn the ignition switch to the On position. Turn the control knob on the control stalk of the right (wiper) multi-function switch to the Low or High wiper position. Check whether the front wiper system is operating. If OK, go to Step 2. If not OK, test and repair the front wiper system before continuing with these tests. Refer to FRONT WIPER SYSTEM

(2) Turn the control knob on the control stalk of the right (wiper) multi-function switch to the Off position. Pull the control stalk of the right (wiper) multi-function switch toward the steering wheel to close the front washer switch. The front washer pump should operate and the front wipers should operate for about three sweep cycles after the switch is released before they park. If the front wipers are OK, but the front washers are not, go to Step 3. If the front washers are OK, but the front wipers are not, go to Step 5.

(3) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector for the front washer pump/motor from the pump/motor connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the front washer pump/motor and a good ground. There should be continuity. If OK, go to Step 4. If not OK, repair the open ground circuit to ground (G106) as required.

(4) Reconnect the battery negative cable. Turn the ignition switch to the On position. While pulling the control stalk of the right (wiper) multi-function switch toward the steering wheel to close the front washer switch, check for battery voltage at the washer pump switch sense circuit cavity of the left headlamp and dash wire harness connector for the front washer pump/motor unit. If OK, replace the faulty front washer pump/motor. If not OK, repair the open washer pump switch sense circuit between the right (wiper) multi-function switch and the front washer pump/motor unit as required.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector (Connector C2) for the Body Control Module (BCM) from the BCM connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. While pulling the control stalk of the right (wiper) multi-function switch toward the steering wheel to close the front washer

switch, check for battery voltage at the washer pump switch sense circuit cavity of the instrument panel wire harness connector (Connector C2) for the BCM. If OK, use a DRBIII® scan tool to diagnose the BCM. Refer to the appropriate diagnostic information. If not OK, repair the open washer pump switch sense circuit between the right (wiper) multi-function switch and the BCM as required.

CLEANING - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegees of wiper blades exposed to the elements for a long time tend to lose their wiping effectiveness. Periodic cleaning of the squeegees is suggested to remove any deposits of salt or road film. The wiper blades, arms, and windshield glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blades continue to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegees of the wiper blades from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegees.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the front washer pump/motor from the reservoir. Clean foreign material from the inside of the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hoses from the washer nozzles, then running the washer pump/motor to run clean washer fluid or water through the system. Plugged or restricted washer nozzles should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegees of the wiper blades.

CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - FRONT WIPER & WASHER SYSTEM

WIPER SYSTEM

The front wiper blades and wiper arms should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

(1) Inspect the wiper arms for any indications of damage, or contamination. If the wiper arms are contaminated with any foreign material, clean them as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING). If a wiper arm is damaged or corrosion is evident, replace the wiper arm with a new unit. Do not attempt to repair a wiper arm that is damaged or corroded.

(2) Carefully lift the wiper blade off of the glass. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(3) Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. Remove the wiper blade from the wiper arm. Either place a small postal scale between the blade end of the wiper arm and the glass, or carefully lift the blade end of the arm away from the glass using a small fish scale. Compare the scale readings between the right and left wiper arms. Replace a wiper arm if it has comparatively lower spring tension, as evidenced by a lower scale reading.

(4) Inspect the wiper blades and squeegees for any indications of damage, contamination, or rubber deterioration (Fig. 2). If the wiper blades or squeegees are contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - CLEANING). After cleaning the wiper blade and the glass, if the wiper blade still fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade. Also, if a wiper blade is damaged or the squeegee rubber is damaged or deteriorated, replace the wiper blade with a new unit. Do not attempt to repair a wiper blade that is damaged.

FRONT WIPERS/WASHERS (Continued)

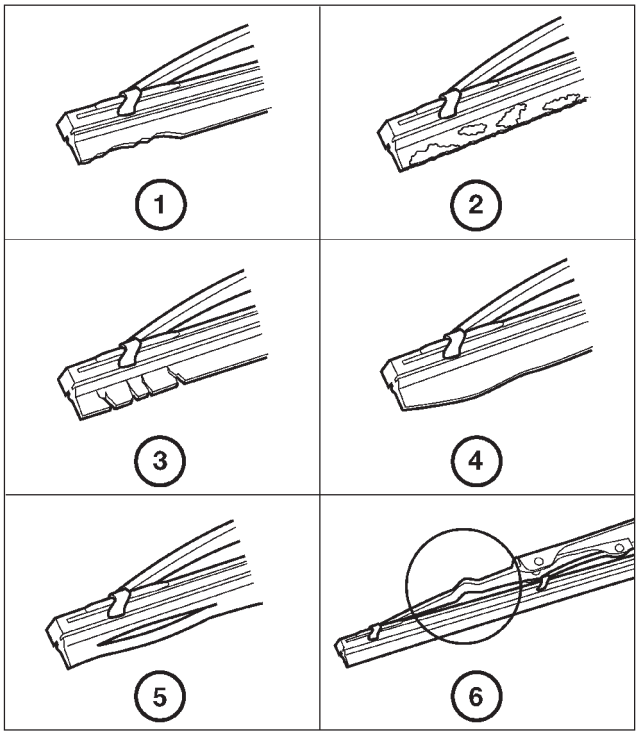


Fig. 2 Wiper Blade Inspection

1 - WORN OR UNEVEN EDGES
2 - ROAD FILM OR FOREIGN MATERIAL DEPOSITS
3 - HARD, BRITTLE, OR CRACKED
4 - DEFORMED OR FATIGUED
5 - SPLIT
6 - DAMAGED SUPPORT COMPONENTS

WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

(1) Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/ FRONT WIPERS/WASHERS - CLEANING).

(2) Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

FRONT CHECK VALVE

DESCRIPTION

A front washer system check valve is standard equipment on this model. The front check valve is integral to the front washer nozzle plumbing wye fitting located in the cowl plenum beneath the cowl plenum cover/grille panel near the base of the windshield. The check valve consists of a molded plastic body with a round center section. Three barbed hose nipples are formed in a wye configuration on the outside circumference of the center section of the valve body. Within the check valve body, a small check valve operated by a small coiled spring restricts flow through the unit until the valve is unseated by a predetermined inlet fluid pressure. The front check valve cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

OPERATION

The front check valve provides more than one function in this application. It serves as a wye connector fitting between the cowl grille panel and washer nozzle sections of the front washer supply hose. It also prevents washer fluid from draining out of the front washer supply hoses back to the washer reservoir. This drain-back would result in a lengthy delay from when the front washer switch is actuated until washer fluid was dispensed through the front washer nozzles, because the front washer pump would have to refill the front washer plumbing from the reservoir to the nozzles. Finally, the front check valve prevents washer fluid from siphoning through the front washer nozzles after the front washer system is turned Off. When the front washer pump pressurizes and pumps washer fluid from the reservoir through the front washer plumbing, the fluid pressure overrides the spring pressure applied to the check valve and unseats the valve, allowing washer fluid to flow toward the front washer nozzles. When the front washer pump stops operating, spring pressure seats the check valve and fluid flow in either direction within the front washer plumbing is prevented.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - REMOVAL).

(3) Open the hood and pull the hood to plenum seal off of the forward flanges of the cowl grille cover and the plenum panel.

FRONT CHECK VALVE (Continued)

(4) Remove the six plastic nuts (2 short and 4 long) that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield (Fig. 3).

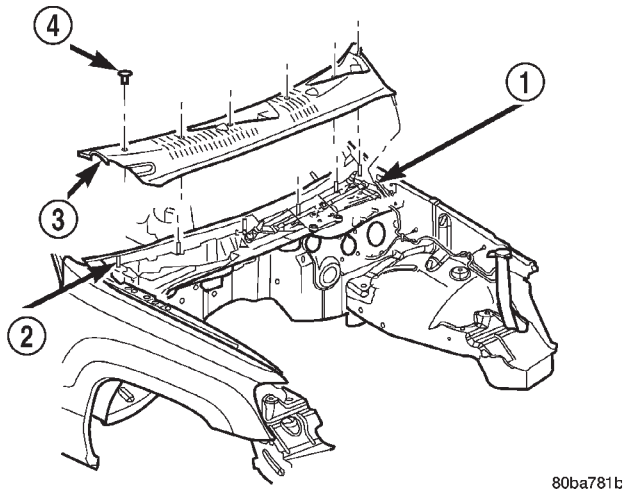


Fig. 3 Cowl Grille Cover Remove/Install

1 - WASHER HOSE CONNECTION
2 - STUDS (6)
3 - COWL GRILLE COVER
4 - PLASTIC NUT (6)

(5) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(6) Disconnect the engine compartment washer hose from the cowl grille cover washer hose at the plastic elbow connector.

(7) Remove the cowl grille cover from the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield.

(8) From the underside of the cowl grille cover, disconnect the washer hoses from the three barbed nipples of the wye fitting/check valve unit.

(9) Remove the wye fitting/check valve unit from the underside of the cowl grille cover.

INSTALLATION

(1) Position the wye fitting/check valve unit to the underside of the cowl grille cover.

(2) From the underside of the cowl grille cover, reconnect the three washer hoses to the barbed nipples of the wye fitting/check valve unit.

(3) Reinstall the washer hoses for the front washer nozzles into their routing clips on the underside of the cowl grille cover.

(4) Position the cowl grille cover onto the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield (Fig. 3).

(5) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(6) Reconnect the cowl grille cover washer hose to the engine compartment washer hose at the elbow connector.

(7) Install the six plastic nuts that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield. These nuts are to be installed by pushing them onto the studs in the following sequence:

(a) First, install the short nuts to the third stud from the right, then the second stud from the left.

(b) Next, install the long nuts to the right outboard stud, then the left outboard stud.

(c) Finally, install the two remaining long nuts to the third stud from the left, then the second stud from the right.

(8) Starting at the ends and working toward the center, push the hood to plenum seal onto the forward flanges of the cowl grille cover and the plenum panel.

(9) Reinstall the wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - INSTALLATION).

(10) Reconnect the battery negative cable.

FRONT WASHER HOSES/ TUBES

DESCRIPTION

The front washer plumbing consists of a small diameter rubber hose that is routed from the barbed outlet nipple of the front washer pump/motor on the washer reservoir along the filler neck into the engine compartment. In the engine compartment, a molded plastic in-line fitting with barbed nipples joins the washer hose to another section of hose that is routed near the left headlamp and dash wire harness to the cowl plenum area. The engine compartment washer hose passes from the engine compartment into the cowl plenum area through a dedicated hole with a rubber grommet near the left end of the cowl plenum panel. A molded plastic elbow fitting with barbed nipples joins the engine compartment hose to the cowl grille cover hose. The cowl grille cover washer hose is routed through routing clips on the underside of the cowl grille cover to a molded plastic wye fitting with barbed nipples and an integral check valve. The cowl grille cover hose is connected to one nipple on the wye fitting and the two washer nozzle hoses are connected to the other two wye fitting nipples. The washer nozzle hoses are routed along the underside of the cowl grille cover to the two washer nozzles.

FRONT WASHER HOSES/TUBES (Continued)

Washer hose is available for service only as roll stock, which must then be cut to length. The molded plastic washer hose fittings cannot be repaired. If these fittings are faulty or damaged, they must be replaced.

OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the front washer pump/motor through the front washer system plumbing and fittings to the two front washer nozzles. Whenever routing the washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

FRONT WASHER NOZZLE

DESCRIPTION

The two front washer nozzles have integral snap features that secure them in dedicated holes in the cowl plenum cover/grille panel located near the base of the windshield. The domed upper surface of the washer nozzle is visible on the top of the plenum cover/grille panel, and the nozzle orifice is oriented towards the windshield glass. The washer plumbing fittings for the washer nozzles are concealed beneath the cowl plenum cover/grille panel. These fluidic washer nozzles are constructed of molded plastic. The cowl plenum cover/grille panel must be removed from the vehicle to access the nozzles for service. The washer nozzles cannot be adjusted or repaired. If faulty or damaged, they must be replaced.

OPERATION

The two front washer nozzles are designed to dispense washer fluid into the wiper pattern area on the outside of the windshield glass. Pressurized washer fluid is fed to each nozzle from the washer reservoir by the front washer pump/motor through a single hose, which is attached to a barbed nipple on each front washer nozzle below the cowl plenum cover/grille panel. The washer nozzles incorporate a fluidic design, which causes the nozzle to emit the pressurized washer fluid as an oscillating stream to more effectively cover a larger area of the glass area to be cleaned.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - REMOVAL).

(3) Unlatch and open the hood.

(4) Pull the hood to plenum seal off of the forward flanges of the cowl grille cover and the plenum panel.

(5) Remove the six plastic nuts (2 short and 4 long) that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield (Fig. 4).

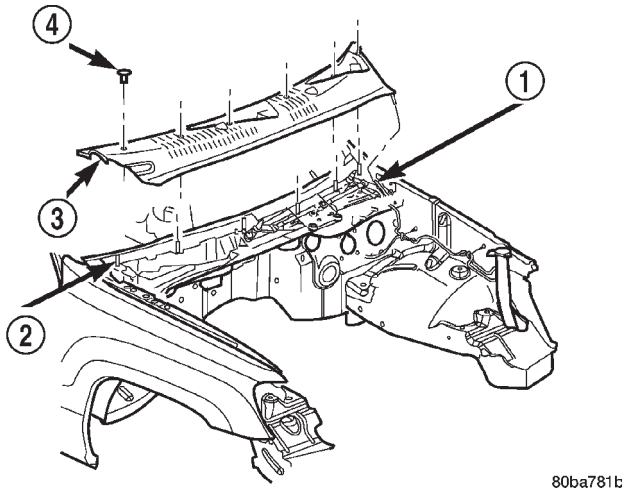


Fig. 4 Cowl Grille Cover Remove/Install

1 - WASHER HOSE CONNECTION
2 - STUDS (6)
3 - COWL GRILLE COVER
4 - PLASTIC NUT (6)

(6) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(7) Disconnect the engine compartment washer hose from the cowl grille cover washer hose at the plastic elbow connector.

(8) Remove the cowl grille cover from the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield.

(9) From the underside of the cowl grille cover, disconnect the washer hose(s) from the barbed nipple(s) of the front washer nozzle(s).

(10) From the underside of the cowl grille cover, release the integral snap features of the front washer nozzle(s) and push the nozzle(s) out through the mounting hole toward the top side of the cowl grille cover.

INSTALLATION

(1) From the top side of the cowl grille cover, insert the nipple end of the front washer nozzle(s) through the mounting hole in the cowl grille cover.

(2) Push firmly and evenly on the top of the front washer nozzle until the integral snap features lock into place on the underside of the cowl grille cover.

(3) From the underside of the cowl grille cover, reconnect the washer hose(s) to the barbed nipple(s) of the front washer nozzle(s).

FRONT WASHER NOZZLE (Continued)

(4) Reinstall the washer hoses for the front washer nozzle(s) into their routing clips on the underside of the cowl grille cover.

(5) Position the cowl grille cover onto the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield (Fig. 4).

(6) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(7) Reconnect the cowl grille cover washer hose to the engine compartment washer hose at the elbow connector.

(8) Install the six plastic nuts that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield. These nuts are to be installed by pushing them onto the studs in the following sequence:

(a) First, install the short nuts to the third stud from the right, then the second stud from the left.

(b) Next, install the long nuts to the right outboard stud, then the left outboard stud.

(c) Finally, install the two remaining long nuts to the third stud from the left, then the second stud from the right.

(9) Starting at the ends and working toward the center, push the hood to plenum seal onto the forward flanges of the cowl grille cover and the plenum panel.

(10) Close and latch the hood.

(11) Reinstall the wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - INSTALLATION).

(12) Reconnect the battery negative cable.

FRONT WASHER PUMP/MOTOR

DESCRIPTION

The front washer pump/motor unit is located on the outboard side and near the front of the washer reservoir, between the left front inner and outer fender panels (Fig. 5). A small permanently lubricated and sealed electric motor is coupled to the rotor-type washer pump. A seal flange with a large barbed inlet nipple on the pump housing passes through a rubber grommet seal installed in one of two dedicated mounting holes near the bottom of the washer reservoir. The front washer pump/motor unit is always mounted in the lower pump mounting hole of the reservoir. A smaller barbed outlet nipple on the pump housing connects the unit to the front washer hose. The washer pump/motor unit is retained on the reservoir by the interference fit between the barbed pump inlet nipple and the grommet seal, which is a light press fit. An integral electrical connector receptacle is located on the top of the motor housing. The front washer pump/motor unit cannot be repaired. If faulty or damaged, the entire washer pump/motor unit must be replaced.

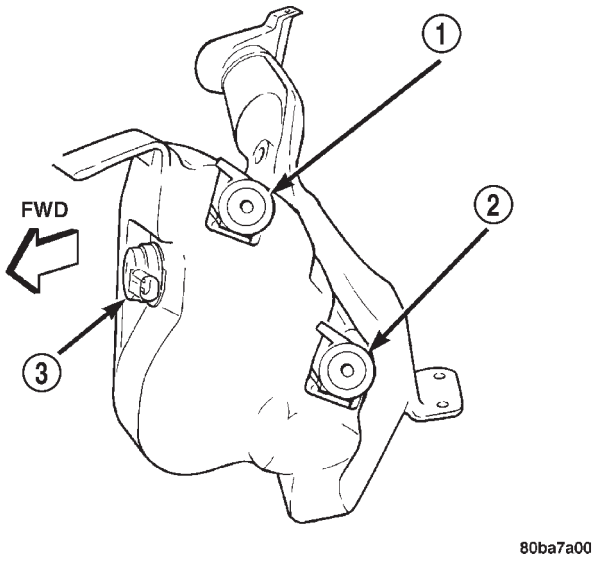


Fig. 5 Washer Pumps (Viewed from Bottom of Reservoir)

1 - REAR WASHER PUMP/MOTOR
2 - FRONT WASHER PUMP/MOTOR
3 - WASHER FLUID LEVEL SWITCH

OPERATION

The front washer pump/motor unit is connected to the vehicle electrical system through a single take out and two-cavity connector of the left headlamp and dash wire harness. The washer pump/motor is grounded at all times through a take out of the left headlamp and dash wire harness with a single eyelet terminal connector that is secured under a ground screw to the top of the left inner fender shield in the engine compartment. The front washer pump/motor receives battery current on a fused ignition switch output (run-acc) circuit through the closed contacts of the momentary front washer switch within the right multi-function switch only when the switch control stalk is pulled towards the steering wheel. Washer fluid is gravity-fed from the washer reservoir to the inlet side of the washer pump. When the pump motor is energized, the rotor-type pump pressurizes the washer fluid and forces it through the pump outlet nipple, the front washer plumbing, and the front washer nozzles onto the windshield glass.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

FRONT WASHER PUMP/MOTOR (Continued)

(2) Raise and support the vehicle.
(3) Remove the liner from the left front fender wheel house.
(4) Disconnect the left headlamp and dash wire harness connector for the front washer pump/motor from the motor connector receptacle (Fig. 6).

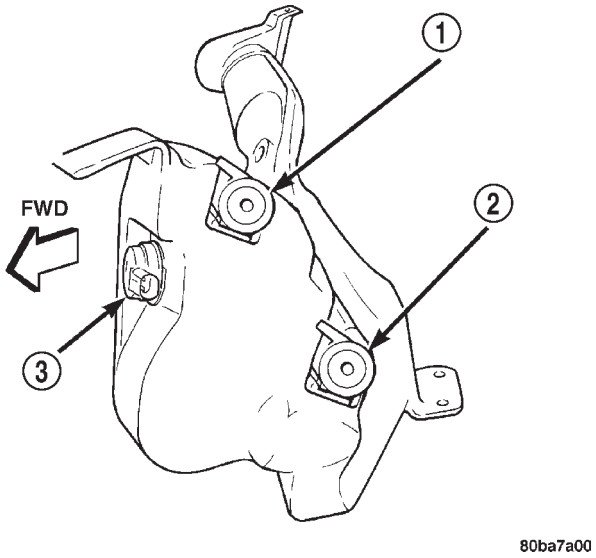


Fig. 6 Washer Pumps (Viewed from Bottom of Reservoir)

1 - REAR WASHER PUMP/MOTOR
2 - FRONT WASHER PUMP/MOTOR
3 - WASHER FLUID LEVEL SWITCH

(5) Disconnect the washer hose from the barbed outlet nipple of the front washer pump/motor and allow the washer fluid to drain into a clean container for reuse.
(6) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed inlet nipple of the washer pump out of the rubber grommet seal in the reservoir. Care must be taken not to damage the reservoir.
(7) Remove the rubber grommet seal from the washer pump mounting hole in the washer reservoir and discard.

INSTALLATION

(1) Install a new rubber grommet seal into the washer pump mounting hole in the washer reservoir. Always use a new rubber grommet seal on the reservoir.
(2) Position the barbed inlet nipple of the washer pump to the rubber grommet seal in the reservoir (Fig. 6).
(3) Press firmly and evenly on the washer pump until the barbed inlet nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.
(4) Reconnect the washer hose to the barbed outlet nipple of the washer pump.
(5) Reconnect the left headlamp and dash wire harness connector for the front washer pump/motor unit to the motor connector receptacle.
(6) Reinstall the liner into the left front fender wheel house.
(7) Lower the vehicle.
(8) Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.
(9) Reconnect the battery negative cable.

FRONT WIPER ARM

DESCRIPTION

The front wiper arms are the rigid members located between the wiper pivots that protrude from the cowl plenum cover/grille panel near the base of the windshield and the wiper blades on the windshield glass. These wiper arms feature an over-center hinge that allows easy access to the windshield glass for cleaning. The wiper arm has a die cast metal pivot end with a large mounting hole with internal serrations at one end. A molded black plastic cap fits over the wiper arm retaining nut to conceal the nut and this mounting hole following wiper arm installation. The wide end of a tapered, stamped steel channel hinges on and is secured with a hinge pin to the blade end of the wiper arm pivot end. One end of a long, rigid, stamped steel strap, with a small hole near its pivot end, is riveted and crimped within the narrow end of the stamped steel channel. The tip of the wiper blade end of this strap is bent back under itself to form a small hook. Concealed within the stamped steel channel, one end of a long spring is engaged with a wire hook on the underside of the die cast pivot end, while the other end of the spring is hooked through the small hole in the steel strap. The entire wiper arm has a satin black finish applied to all of its visible surfaces.

A wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

OPERATION

The front wiper arms are designed to mechanically transmit the motion from the wiper pivots to the wiper blades. The wiper arm must be properly indexed to the wiper pivot in order to maintain the proper wiper blade travel on the glass. The mounting hole formation with internal serrations in the wiper arm pivot end interlocks with the serrations on the outer circumference of the wiper pivot driver, allowing positive engagement and finite adjustment of this

FRONT WIPER ARM (Continued)

connection. The mounting nut locks the wiper arm to the threaded stud on the wiper pivot. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

(1) Lift the front wiper arm to its over-center position to hold the wiper blade off of the glass and relieve the spring tension on the wiper arm to wiper pivot connection.

(2) Carefully pry the plastic nut cap off of the pivot end of the wiper arm (Fig. 7).

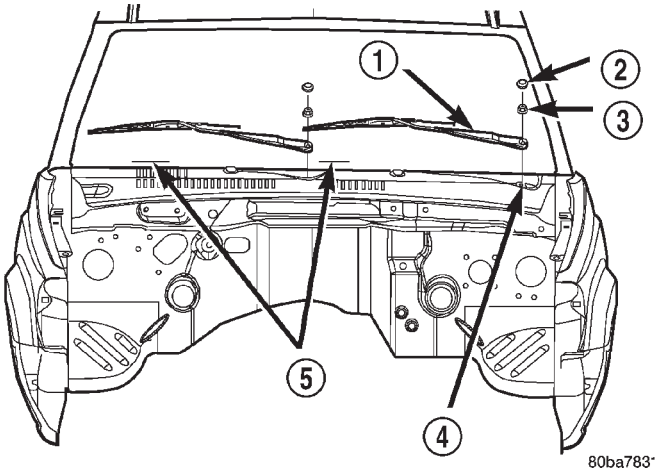


Fig. 7 Wiper Arm Remove/Install

1 - ARM AND BLADE
2 - CAP
3 - NUT
4 - PIVOT SHAFT
5 - ALIGNMENT LINE

(3) Remove the nut that secures the wiper arm to the wiper pivot shaft.

(4) Use a suitable battery terminal puller to disengage the wiper arm from the wiper pivot shaft splines (Fig. 8).

(5) Remove the front wiper arm pivot end from the wiper pivot.

INSTALLATION

NOTE: Be certain that the wiper motor is in the park position before attempting to install the wiper arms. Turn the ignition switch to the On position and move the right multi-function switch control knob to its Off position. If the wiper pivots move, wait until they stop moving, then turn the ignition switch back to the Off position. The wiper motor is now in its park position.

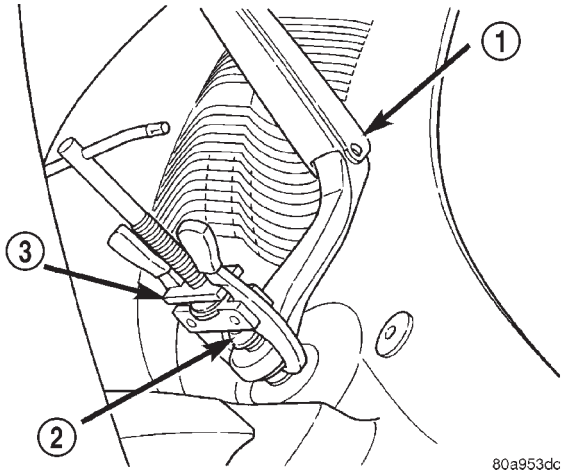


Fig. 8 Wiper Arm Puller - Typical

1 - WIPER ARM
2 - WIPER PIVOT
3 - BATTERY TERMINAL PULLER

(1) The front wiper arms must be indexed to the wiper pivots with the wiper motor in the park position to be properly installed. Position the front wiper arm pivot ends onto the wiper pivots so that the lower edge of the blade is aligned with the wiper alignment lines located in the lower edge of the windshield glass (Fig. 7).

(2) Once the wiper blade is aligned, lift the wiper arm away from the windshield slightly to relieve the spring tension on the pivot end and push the pivot hole on the end of the wiper arm down over the wiper pivot shaft.

(3) Install and tighten the nut that secures the wiper arm to the wiper pivot shaft. Tighten the nut to 23.7 N·m (210 in. lbs.).

(4) Wet the windshield glass, then operate the front wipers. Turn the wiper switch to the Off position, then check for the correct wiper arm position and readjust as required.

(5) Reinstall the plastic nut cap onto the wiper arm pivot nut.

FRONT WIPER BLADE

DESCRIPTION

Each front wiper blade is secured by an integral latching pivot block to the hook formation on the tip of the front wiper arms, and rests on the glass near the base of the windshield when the wipers are not in operation (Fig. 9). The wiper blade consists of the following components:

- **Superstructure** - The superstructure includes several stamped steel bridges and links with claw

FRONT WIPER BLADE (Continued)

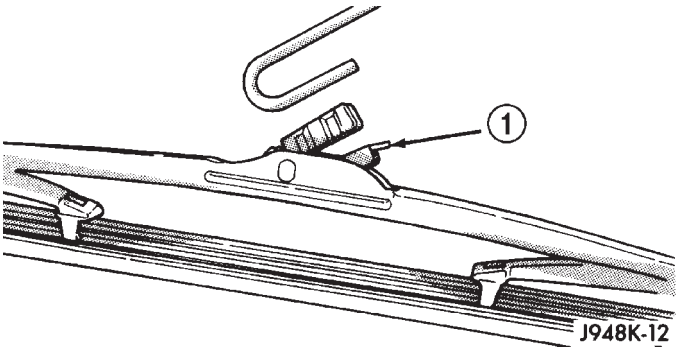


Fig. 9 Wiper Blade - Typical

1 - RELEASE TAB

formations that grip the wiper blade element. Also included in this unit is the latching, molded plastic pivot block that secures the superstructure to the wiper arm. All of the metal components of the wiper blade have a satin black finish applied.

- **Element** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.
- **Flexor** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws of the superstructure.

All Grand Cherokee models have two 52.50 centimeter (20.67 inch) long windshield wiper blades with non-replaceable rubber elements (squeegees). The wiper blades cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

The wiper blades are moved back and forth across the glass by the wiper arms when the wipers are being operated. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature found across the glass surface. The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, but resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

REMOVAL

NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

(1) Lift the front wiper arm to raise the wiper blade and element off of the glass, until the wiper arm hinge is in its over-center position.

(2) To remove the wiper blade from the wiper arm, push the pivot block latch release tab under the tip of the arm and slide the blade away from the tip towards the pivot end of the arm far enough to disengage the pivot block from the hook (Fig. 10).

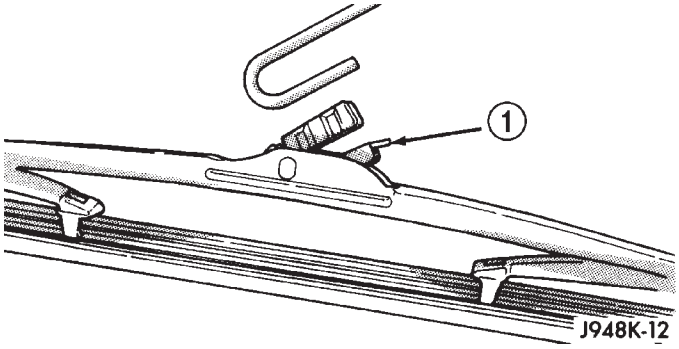


Fig. 10 Wiper Blade Remove/Install - Typical

1 - RELEASE TAB

(3) Extract the hook formation on the tip of the wiper arm from the opening in the wiper blade superstructure ahead of the wiper blade pivot block/latch unit.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(4) Gently lower the wiper arm tip onto the glass.

INSTALLATION

NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the wiper pivot.

(1) Lift the front wiper arm off of the windshield glass, until the wiper arm hinge is in its over-center position.

(2) Position the front wiper blade near the hook formation on the tip of the arm with the notched retainer for the wiper element oriented towards the end of the wiper arm that is nearest to the wiper pivot.

FRONT WIPER BLADE (Continued)

(3) Insert the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure ahead of the wiper blade pivot block/latch unit far enough to engage the pivot block with the hook (Fig. 10).

(4) Slide the wiper blade pivot block/latch up into the hook formation on the tip of the wiper arm until the latch release tab snaps into its locked position. Latch engagement will be accompanied by an audible click.

(5) Gently lower the wiper blade onto the glass.

FRONT WIPER MODULE

DESCRIPTION

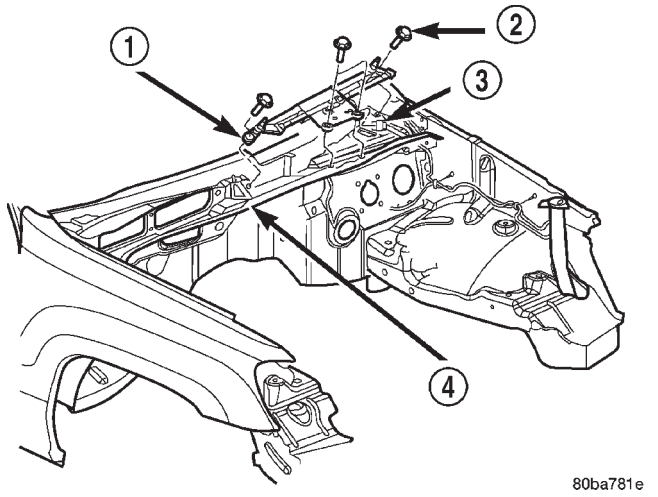


Fig. 11 Front Wiper Module

1 - FRONT WIPER MODULE
2 - SCREW (4)
3 - WIRE HARNESS CONNECTOR
4 - LOWER COWL PLENUM PANEL

The front wiper module is secured with four screws through rubber isolators to the cowl plenum panel beneath the cowl plenum cover/grille panel (Fig. 11). The ends of the wiper pivot shafts that protrude through dedicated openings in the cowl plenum cover/grille panel to drive the wiper arms and blades are the only visible components of the front wiper module. The front wiper module consists of the following major components:

- **Bracket** - The front wiper module bracket consists of a long tubular steel main member that has a stamped pivot bracket formation near each end where the two wiper pivots are secured. A stamped steel mounting plate for the wiper motor is secured with welds near the center of the main member.
- **Crank Arm** - The front wiper motor crank arm is a stamped steel unit with a slotted hole on the driven end that is secured to the wiper motor output shaft with a nut, and a ball stud secured to the drive end.
- **Linkage** - Two stamped steel drive links connect the wiper motor crank arm to the pivot lever arms. The passenger side drive link has a plastic socket-type bushing on each end. The driver side drive link has a plastic socket-type bushing on one end, and a plastic sleeve-type bushing on the other end. The socket-type bushing on one end of each drive link is snap-fit over the ball stud on the lever arm of its respective pivot. The driver side drive link sleeve-type bushing end is then fit over the motor crank arm ball stud, and the other socket-type bushing of the passenger side drive link is snap-fit over the exposed end of the wiper motor crank arm ball stud.
- **Motor** - The front wiper motor is secured with three screws to the motor mounting plate near the center of the wiper module bracket. The wiper motor output shaft passes through a hole in the module bracket, where a nut secures the wiper motor crank arm to the motor output shaft. The two-speed permanent magnet wiper motor features an integral transmission, an internal park switch, and an internal automatic resetting circuit breaker.
- **Pivots** - The two front wiper pivots are secured to the ends of the wiper module bracket. The crank arms that extend from the bottom of the pivot shafts each have a ball stud on their end. The upper end of each pivot shaft where the wiper arms will be fastened each has an externally serrated drum with a threaded stud secured to it.

The front wiper module cannot be adjusted or repaired. If any component of the module is faulty or damaged, the entire front wiper module unit must be replaced. The reinforcement bracket and stud plate are available for service replacement.

OPERATION

The front wiper module operation is controlled by the battery current inputs received by the wiper motor from the wiper on/off and wiper high/low relays. The wiper motor speed is controlled by current flow to either the low speed or the high speed set of brushes. The park switch is a single pole, single throw, momentary switch within the wiper motor that is mechanically actuated by the wiper motor transmission components. The park switch alternately closes the wiper park switch sense circuit to ground or to battery current, depending upon the position of the wipers on the glass. This feature allows the motor to complete its current wipe cycle after the wiper system has been turned Off, and to park the wiper blades in the lowest portion of the wipe pattern. The automatic resetting circuit breaker protects the motor from overloads. The wiper motor

FRONT WIPER MODULE (Continued)

crank arm, the two wiper linkage members, and the two wiper pivots mechanically convert the rotary output of the wiper motor to the back and forth wiping motion of the wiper arms and blades on the glass.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the front wiper arms from the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - REMOVAL).

(3) Unlatch and open the hood.

(4) Remove the hood to plenum seal from the forward flanges of the cowl grille cover and the plenum panel.

(5) Remove the six plastic nuts (2 short and 4 long) that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield (Fig. 12).

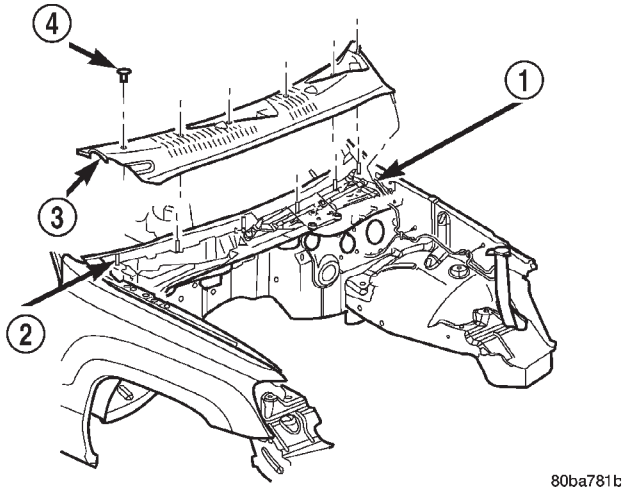


Fig. 12 Cowl Grille Cover Remove/Install

1 - WASHER HOSE CONNECTION
2 - STUDS (6)
3 - COWL GRILLE COVER
4 - PLASTIC NUT (6)

(6) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(7) Disconnect the front washer engine compartment hose from the cowl grille cover hose at the elbow connector.

(8) Remove the cowl grille cover from the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield.

(9) Remove the four screws that secure the front wiper module to the cowl plenum panel (Fig. 13).

(10) Lift the left end of the front wiper module far enough to access the front wiper motor wire harness connector.

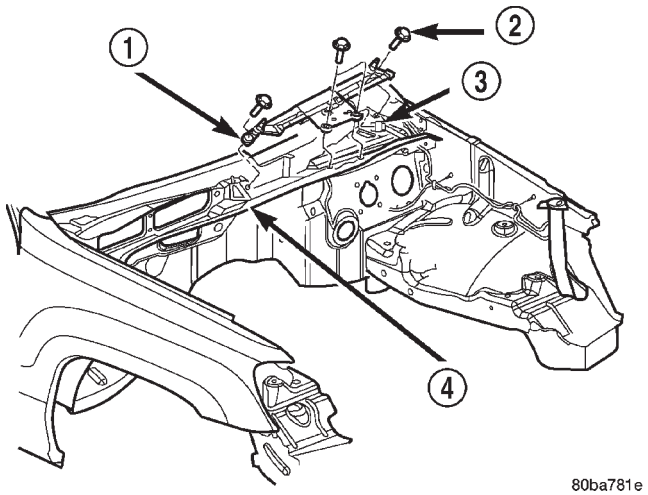


Fig. 13 Front Wiper Module Remove/Install

1 - FRONT WIPER MODULE
2 - SCREW (4)
3 - WIRE HARNESS CONNECTOR
4 - LOWER COWL PLENUM PANEL

(11) Disconnect the left headlamp and dash wire harness connector for the front wiper motor from the front wiper motor pigtail wire connector.

(12) Remove the front wiper module from the cowl plenum as a unit.

INSTALLATION

(1) Position the front wiper module into the cowl plenum as a unit (Fig. 13).

(2) Lift the left end of the front wiper module far enough to access the front wiper motor wire harness connector.

(3) Reconnect the left headlamp and dash wire harness connector for the front wiper motor to the front wiper motor pigtail wire connector.

(4) Loosely install one of the front wiper module mounting screws to the mounting hole near the pivot on the right end of the module to locate the module in the plenum.

(5) Working from left to right, install and tighten the four screws that secure the front wiper module to the cowl plenum panel. Tighten the screws to 8 N·m (72 in. lbs.).

(6) Position the cowl grille cover onto the cowl plenum and cowl top panels through the opening between the hood and the base of the windshield (Fig. 12).

(7) Lift the left end of the cowl grille cover off of the cowl plenum panel far enough to access the front washer plumbing.

(8) Reconnect the front washer system engine compartment hose to the cowl grille cover hose at the elbow connector.

FRONT WIPER MODULE (Continued)

(9) Install the six plastic nuts that secure the cowl grille cover to the studs on the cowl top panel near the base of the windshield. These nuts are to be installed by pushing them onto the studs in the following sequence:

(a) First, install the short nuts to the third stud from the right, then the second stud from the left.

(b) Next, install long nuts to the right outboard stud, then the left outboard stud.

(c) Finally, install the two remaining long nuts to the third stud from the left, then the second stud from the right.

(10) Starting at the ends and working toward the center, push the hood to plenum seal onto the forward flanges of the cowl grille cover and the plenum panel.

(11) Close and latch the hood.

(12) Reinstall the wiper arms onto the wiper pivots. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/FRONT WIPER ARMS - INSTALLATION).

(13) Reconnect the battery negative cable.

RAIN SENSOR MODULE

DESCRIPTION

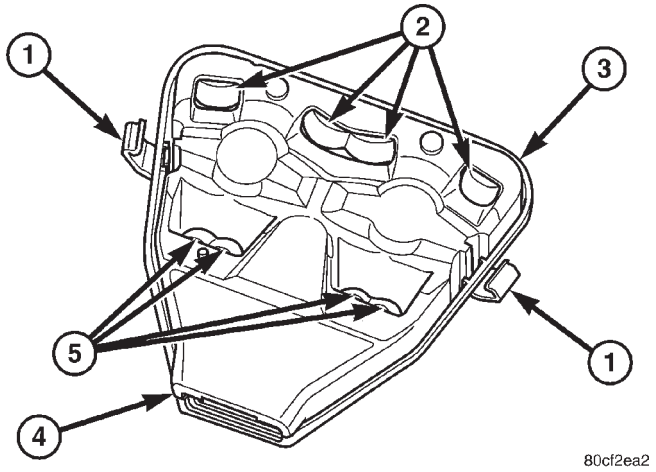


Fig. 14 Rain Sensor Module

1 - SPRING CLIP (2)
2 - INFRARED LENS (4)
3 - HOUSING
4 - CONNECTOR RECEPTACLE
5 - PHOTOCELL LENS (4)

The Rain Sensor Module (RSM) is the primary component of the automatic wiper system (Fig. 14). The RSM is located on the inside of the windshield, between the rear view mirror mounting button and the windshield header and is concealed behind a molded plastic trim cover that snaps over the module housing. The triangular-shaped molded black plastic housing of the RSM has a rectangular opening located on the upper end of the housing for the module connector receptacle, which contains four terminal pins. These terminal pins connect the rain sensor to the vehicle electrical system through a dedicated take out and connector of the overhead wire harness that extends from above the headliner. Five openings on the windshield side of the RSM housing are fitted with eight convex clear plastic lenses. A metal spring clip on each side of the housing near the bottom secures the RSM to a plastic mounting bracket that is bonded to the windshield glass. Concealed within the RSM housing is the electronic circuitry of the module, which includes four InfraRed (IR) diodes, two photocells, and a microprocessor.

The RSM software is Flash compatible, which means it can be reprogrammed using Flash reprogramming procedures. However, if any of the hardware of the RSM is damaged or faulty, the entire module must be replaced. The RSM bracket is serviced as a unit with the windshield glass. If the bracket is faulty, damaged, or separated from the windshield glass, the windshield unit must be replaced.

OPERATION

The microprocessor-based Rain Sensor Module (RSM) senses moisture in the wipe pattern on the outside of the windshield glass and sends wipe commands to the Body Control Module (BCM). Four InfraRed (IR) diodes within the RSM generate IR light beams that are aimed by four of the convex optical lenses near the base of the module through the windshield glass. Four additional convex optical lenses near the top of the RSM are focused on the IR light beams on the outside of the windshield glass and allow the two photocells within the module to sense changes in the intensity of these IR light beams. When sufficient moisture accumulates within the wipe pattern of the windshield glass, the RSM detects a change in the monitored IR light beam intensity.

The internal programming of the RSM then sends the appropriate electronic wipe command messages to the BCM over the Programmable Communications Interface (PCI) data bus. The BCM responds by activating or deactivating the front wiper system. The BCM also sends electronic sensitivity level messages to the RSM over the PCI data bus based upon the driver-selected sensitivity setting of the control knob on the control stalk of the right (wiper) multi-function switch. The higher the selected sensitivity setting the more sensitive the RSM is to the accumulated moisture on the windshield glass, and

RAIN SENSOR MODULE (Continued)

the more frequently the RSM will send wipe commands to the BCM to operate the front wiper system.

The RSM operates on battery current received through a fuse in the Junction Block (JB) on a fused B(+) circuit. This circuit is switched by the power accessory (sunroof) delay relay in the JB so that the RSM will operate whenever the relay is energized by the BCM. The RSM receives ground at all times through a take out of the left body wire harness with an eyelet terminal that is secured by a ground screw to the front seat crossmember on the floor panel under the left front seat. It is important to note that the default condition for the wiper system is automatic wipers Off; therefore, if no message is received from the RSM by the BCM for more than about five seconds, the automatic wipers will be disabled and the BCM will default the front wiper system operation to the low speed continuous wipe mode.

The RSM ground and battery current inputs can be diagnosed using conventional diagnostic tools and methods. However, conventional diagnostic methods may not prove conclusive in the diagnosis of the RSM internal circuitry, the BCM, the PCI data bus network, or the electronic messages received and transmitted by the RSM over the PCI data bus. The most reliable, efficient, and accurate means to diagnose the RSM requires the use of a DRBIII® scan tool. Refer to the appropriate diagnostic information.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Adjust the inside rear view mirror on the windshield downward far enough to access the lower edge of the Rain Sensor Module (RSM) trim cover (Fig. 15).

(3) Using a small thin-bladed screwdriver inserted into the notch at the bottom of trim cover, gently pry the trim cover away from the windshield glass until it unsnaps from the RSM.

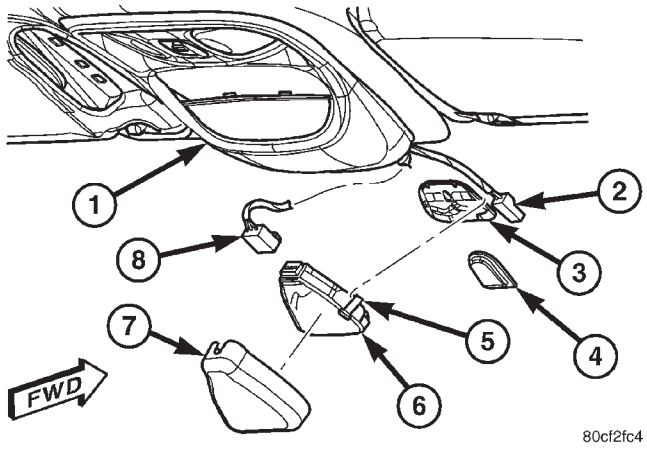


Fig. 15 Rain Sensor Module Remove/Install

1 - OVERHEAD CONSOLE
2 - REAR VIEW MIRROR CONNECTOR
3 - BRACKET
4 - REAR VIEW MIRROR BUTTON
5 - SPRING CLIP (2)
6 - RAIN SENSOR MODULE
7 - TRIM COVER
8 - WIRE HARNESS CONNECTOR

(4) Using a small thin-bladed screwdriver, gently pry the spring clips on each side of the RSM away from the bracket on the windshield.

(5) Pull the RSM away from the bracket on the windshield far enough to access and disconnect the overhead wire harness connector for the module from the module connector receptacle.

(6) Remove the RSM from above the inside rear view mirror.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG, SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

RAIN SENSOR MODULE (Continued)

(1) Position the Rain Sensor Module (RSM) above the inside rear view mirror (Fig. 15).

(2) Reconnect the overhead wire harness connector for the RSM to the module connector receptacle.

(3) Position the RSM to the bracket on the windshield above the inside rear view mirror.

(4) Using hand pressure, press the spring clips on each side of the RSM until they snap over the bracket on the windshield.

NOTE: The spring clips on the RSM will become deformed after numerous (about ten) removal and installation cycles. If the spring clips become deformed, the RSM must be replaced with a new unit.

(5) Align and engage the top of the trim cover over the top of the RSM.

(6) Using hand pressure, press the bottom of the trim cover toward the windshield glass until it snaps over the bottom of the RSM.

(7) Reconnect the battery negative cable.

RIGHT MULTI-FUNCTION SWITCH

DESCRIPTION

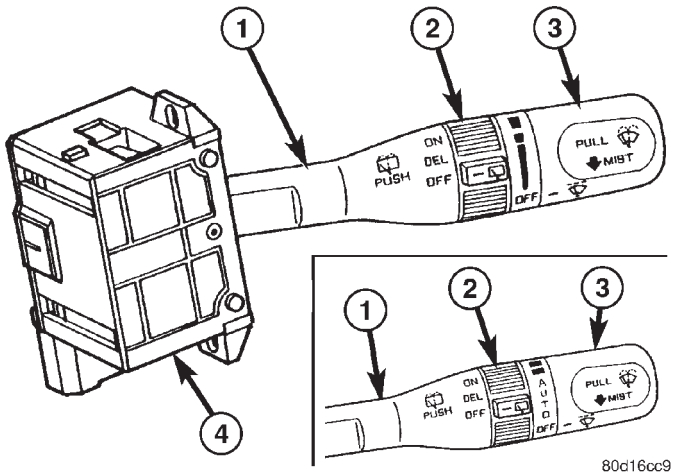


Fig. 16 Right (Wiper) Multi-Function Switch

1 - CONTROL STALK
2 - REAR WIPER CONTROL SLEEVE
3 - FRONT WIPER CONTROL KNOB
4 - RIGHT (WIPER) MULTI-FUNCTION SWITCH

The right (wiper) multi-function switch is secured to the right side of the multi-function switch mounting housing at the top of the steering column, just below the steering wheel (Fig. 16). The only visible component of the right multi-function switch is the control stalk that extends through a dedicated opening in the right side of the steering column shrouds. The remainder of the right multi-function switch is concealed beneath the steering column shrouds. The switch housing and its control stalk are constructed of molded black plastic. A single connector receptacle containing up to ten terminal pins is located on the back of the switch housing and connects the switch to the vehicle electrical system through a take out and connector of the instrument panel wire harness. The switch is secured to the multi-function switch mounting housing near the top of the steering column by two screws.

There are two versions of the right multi-function switch: one to support the standard equipment speed sensitive intermittent front wiper system, and a second to support the optional front automatic wiper system. Each version of the right multi-function switch control stalk has both white nomenclature and International Control and Display Symbol icons applied to it, which clearly identify its many functions. The control stalk has a control knob on its end with a flattened face to allow it to be easily rotated. Just below the control knob is a knurled control sleeve. The right multi-function switch is the primary control for the front and rear wiper and washer systems, and contains switches and circuitry to provide signals to the Body Control Module (BCM) and the rear wiper module.

The right (wiper) multi-function switch cannot be adjusted or repaired. If any function of the switch is faulty, or if the switch is damaged, the entire switch unit must be replaced.

The right (wiper) multi-function switch supports the following functions and features:

- **Automatic Front Wipe Mode** - On models equipped with the optional automatic wiper system, the internal circuitry and hardware of the right (wiper) multi-function switch control knob provide an automatic front wipe mode with five sensitivity positions.
- **Continuous Front Wipe Modes** - The internal circuitry and hardware of the right (wiper) multi-function switch control knob provide two continuous front wipe switch positions, low speed or high speed.

RIGHT MULTI-FUNCTION SWITCH (Continued)

- **Continuous Rear Wipe Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control sleeve provides one continuous rear wipe switch position.
- **Front Washer Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control stalk provide front washer system operation.
- **Front Wipe-After-Wash Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control stalk provide a wipe-after-wash mode.
- **Front Wiper Mist Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control stalk provide a front wiper system mist mode.
- **Intermittent Front Wipe Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control knob provide an intermittent front wipe mode with five delay interval positions, except on models equipped with the optional automatic wiper system.
- **Intermittent Rear Wipe Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control ring provide one fixed interval intermittent rear wipe mode switch position.
- **Rear Washer Mode** - The internal circuitry and hardware of the right (wiper) multi-function switch control stalk provide rear washer system operation.

OPERATION

The right (wiper) multi-function switch uses a combination of resistor multiplexed and conventionally switched outputs to control the many functions and features it provides. The switch receives battery current on a fused ignition switch output (run-acc) circuit from a fuse in the Junction Block (JB) whenever the ignition switch is in the On or Accessory positions, and receives ground from the Body Control Module (BCM) on a windshield wiper switch return circuit. The right (wiper) multi-function switch may be diagnosed using conventional diagnostic tools and methods.

Following are descriptions of how the right (wiper) multi-function switch control stalk operates to control the functions and features it provides:

- **Automatic Wipe Mode** - On models equipped with the optional automatic wiper system, the control knob on the end of the right (wiper) multi-function switch control stalk is rotated to one of five minor intermediate detents to select the desired automatic wipe sensitivity level. The control knob is rotated rearward (counterclockwise) to reduce the sensitivity (increase the interval between wipes), or forward (clockwise) to increase the sensitivity (decrease the interval between wipes). The right (wiper) multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a windshield wiper switch mux circuit. The BCM responds by sending an electronic message to the Rain Sensor Module (RSM) over the Programmable Communications Interface (PCI) data bus indicating the selected sensitivity level, and by operating the front wiper system based upon electronic wipe commands received from the RSM over the PCI data bus.
- **Continuous Front Wipe Modes** - The control knob on the end of the right (wiper) multi-function switch control stalk is rotated to an intermediate detent that is one detent rearward (counterclockwise) from the full forward (clockwise) detent to select the low speed continuous front wiper mode, or to its full forward (clockwise) detent to select the high speed continuous front wiper mode. For the low speed mode, the multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a windshield wiper switch mux circuit, and the BCM responds by energizing the wiper on/off relay in the Power Distribution Center (PDC) for the front low speed continuous wipe mode. For the high speed mode, the multi-function switch provides the same resistor multiplexed output to the BCM on the windshield wiper switch mux circuit as the low speed mode, but also provides a ground output to the BCM on a wiper high control circuit. The BCM responds to these inputs by energizing the wiper on/off relay and the wiper high/low relay in the PDC for the front high speed continuous wipe mode.
- **Continuous Rear Wipe Mode** - The control ring on the right (wiper) multi-function switch control stalk is rotated to the most forward (clockwise) detent to select the continuous rear wiper mode. The multi-function switch provides a battery current output to the rear wiper motor on a rear wiper motor control circuit to signal the rear wiper module to operate the rear wiper motor in the continuous wipe mode.
- **Front Washer Mode** - The control stalk of the right (wiper) multi-function switch is pulled toward the steering wheel to momentarily activate the front washer pump/motor in the front washer mode. The front washer pump will continue to operate in the front washer mode until the control stalk is released. The right (wiper) multi-function switch provides a battery current output on a washer pump motor switch output circuit to energize the front washer pump in the front washer mode.
- **Front Wiper Mist Mode** - The control stalk of the right (wiper) multi-function switch is pushed towards the floor to momentarily activate the front wiper motor in the mist mode. The front wiper motor will continue to operate in the mist mode until the control stalk is released. The right (wiper) multi-

RIGHT MULTI-FUNCTION SWITCH (Continued)

function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a windshield wiper switch mux circuit, and the BCM responds by energizing the wiper on/off relay in the Power Distribution Center (PDC) to operate the front wiper motor momentarily at low speed to provide the front wiper mist mode.

- **Intermittent Front Wipe Mode** - On models not equipped with the optional automatic wiper system, the control knob on the end of the right (wiper) multi-function switch control stalk is rotated to one of five minor intermediate detents to select the desired intermittent front wipe delay interval. The control knob is rotated rearward (counterclockwise) to increase the delay, or forward (clockwise) to decrease the delay. The right (wiper) multi-function switch provides a resistor multiplexed output to the Body Control Module (BCM) on a windshield wiper switch mux circuit. The BCM responds by monitoring electronic vehicle speed messages received from the Powertrain Control Module (PCM) over the Programmable Communications Interface (PCI) data bus, then energizing the wiper on/off relay in the Power Distribution Center (PDC) to operate the front wiper motor at the proper delay intervals.
- **Intermittent Rear Wipe Mode** - The control ring on the right (wiper) multi-function switch control stalk is rotated to the center detent to select the intermittent rear wiper mode. The right (wiper) multi-function switch provides a battery current output to the rear wiper motor on a rear wiper motor delay control circuit to signal the rear wiper module to operate the rear wiper in the intermittent wipe mode.
- **Rear Washer Mode** - The right (wiper) multi-function switch control stalk is pushed forward toward the instrument panel to a momentary positions to activate the rear washer pump/motor in the rear washer mode. The rear washer pump will continue to operate in the rear washer mode until the control stalk is released. The right (wiper) multi-function switch provides battery current on a rear washer pump motor control circuit to energize the rear washer pump in the rear washer mode.

DIAGNOSIS AND TESTING - RIGHT MULTI-FUNCTION SWITCH

Be certain to perform the diagnosis for the front wiper system, front washer system, rear wiper system, and/or rear washer system before testing the right multi-function switch. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS - DIAGNOSIS AND TESTING) or (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - DIAGNOSIS AND TESTING). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE PASSIVE RESTRAINT SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, DRIVER AIRBAG, PASSENGER AIRBAG. SIDE CURTAIN AIRBAG, FRONT IMPACT SENSOR, SIDE IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE PASSIVE RESTRAINT SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the right multi-function switch from the steering column and disconnect the instrument panel wire harness connector for the switch from the switch connector receptacle.

(3) Using an ohmmeter, check the right multi-function switch continuity and resistances at the switch terminals as shown in the Right Multi-Function Switch test chart (Fig. 17).

RIGHT MULTI-FUNCTION SWITCH (Continued)

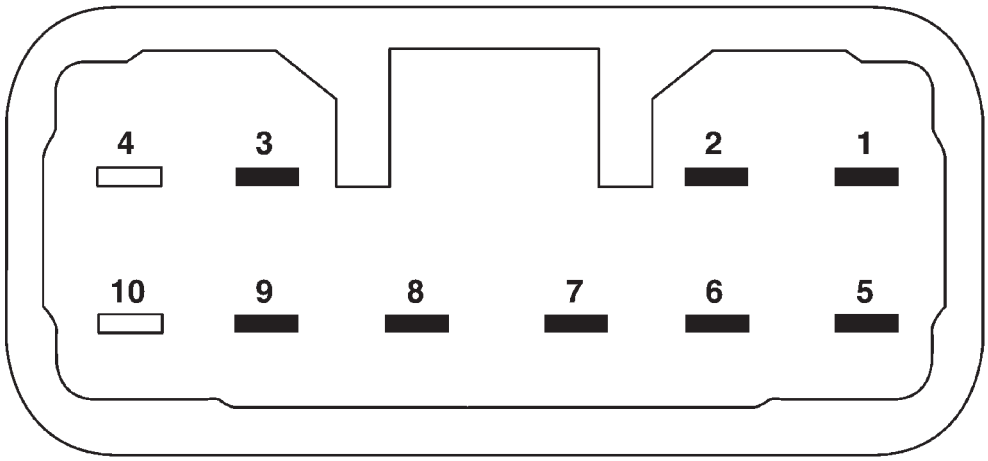


Fig. 17 Right Multi-Function Switch Tests

RIGHT (WIPER) MULTI-FUNCTION SWITCH			
FRONT WIPER/WASHER SWITCH TESTS			
SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE BETWEEN	RESISTANCE RANGE (OHMS)
Off	-	Pins 7 & 8	4286-4379
Intermittent Wipe or Sensitivity Position 1	-	Pins 7 & 8	1445-1480
Intermittent Wipe or Sensitivity Position 2	-	Pins 7 & 8	847-870
Intermittent Wipe or Sensitivity Position 3	-	Pins 7 & 8	556-573
Intermittent Wipe or Sensitivity Position 4	-	Pins 7 & 8	367-380
Intermittent Wipe or Sensitivity Position 5	-	Pins 7 & 8	218-229
Low Speed	-	Pins 7 & 8	99-106
High Speed	Pins 7 & 9	Pins 7 & 8	99-106
Mist	-	Pins 7 & 8	49-56
Wash	Pins 1 & 3	-	-
REAR WIPER/WASHER SWITCH TESTS			
SWITCH POSITION	CONTINUITY BETWEEN	RESISTANCE BETWEEN	RESISTANCE BETWEEN
Off	-	-	-
Delay	Pins 1 & 6	-	-
On	Pins 1 & 5	-	-
Wash	Pins 1 & 5 & 6 & 2	-	-

RIGHT MULTI-FUNCTION SWITCH (Continued)

(4) If the right multi-function switch fails any of the continuity or resistance tests, replace the faulty right multi-function switch as required.

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the screw that secures the lower tilting steering column shroud to the steering column multi-function switch mounting housing (Fig. 18).

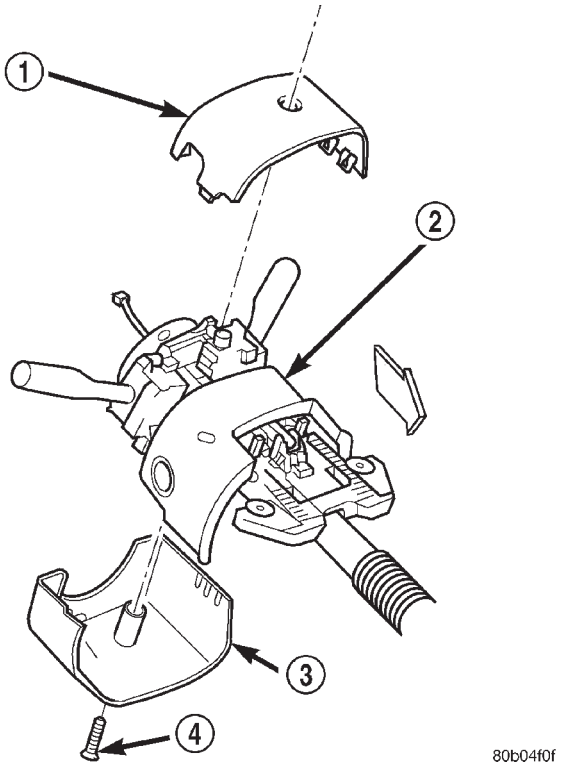


Fig. 18 Steering Column Shrouds Remove/Install

1 - UPPER TILTING COLUMN SHROUD
2 - FIXED COLUMN SHROUD
3 - LOWER TILTING COLUMN SHROUD
4 - SCREW

(3) Unsnap the two halves of the tilting steering column shroud from each other and remove both halves from the steering column.

(4) Disconnect the instrument panel wire harness connector for the right multi-function switch from the switch connector receptacle.

(5) Remove the two screws that secure the right multi-function switch to the multi-function switch mounting housing (Fig. 19).

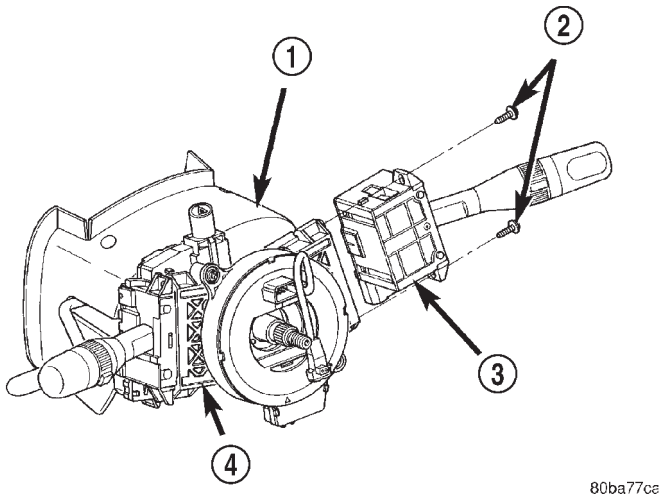


Fig. 19 Right Multi-Function Switch Remove/Install

1 - STEERING COLUMN
2 - SCREWS (2)
3 - RIGHT MULTI-FUNCTION SWITCH
4 - MULTI-FUNCTION SWITCH MOUNTING HOUSING

(6) Remove the right multi-function switch from the multi-function switch mounting housing.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the right multi-function switch onto the multi-function switch mounting housing (Fig. 19).

(2) Install and tighten the two screws that secure the right multi-function switch to the multi-function

RIGHT MULTI-FUNCTION SWITCH (Continued)

switch mounting housing. Tighten the screws to 2.5 N·m (22 in. lbs.).

(3) Reconnect the instrument panel wire harness connector for the right multi-function switch to the switch connector receptacle.

(4) Position the lower tilting steering column shroud to the underside of the steering column (Fig. 18).

(5) Install and tighten the screw that secures the lower tilting steering column shroud to the multi-function switch mounting housing. Tighten the screw to 1.9 N·m (17 in. lbs.).

(6) Position the upper tilting column shroud over the steering column with the hazard warning switch button inserted through the hole in the upper surface of the shroud. Align the upper tilting steering column shroud to the lower shroud and snap the two shroud halves together.

(7) Reconnect the battery negative cable.

WASHER FLUID LEVEL SWITCH

DESCRIPTION

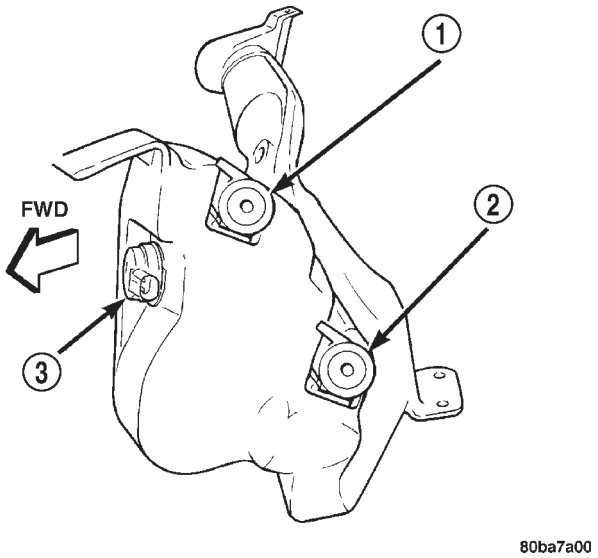


Fig. 20 Washer Fluid Level Switch (Viewed from Bottom of Reservoir)

1 - REAR WASHER PUMP/MOTOR
2 - FRONT WASHER PUMP/MOTOR
3 - WASHER FLUID LEVEL SWITCH

The washer fluid level switch is a single pole, single throw reed-type switch mounted near the front of the washer reservoir, forward of the two washer pump/motors (Fig. 20). Only the molded plastic switch mounting flange and connector receptacle are visible when the switch is installed in the reservoir. A short nipple formation extends from the inner surface of the switch mounting flange, and a barb on the nipple near the switch mounting flange is press-fit into a rubber grommet seal installed in the mounting hole of the reservoir. A small plastic float pivots on the end of a bracket that extends from the switch nipple formation. Within the float is a small magnet, which actuates the reed switch. The washer fluid level switch cannot be adjusted or repaired. If faulty or damaged, the switch must be replaced.

OPERATION

The washer fluid level switch uses a pivoting, oblong float to monitor the level of the washer fluid in the washer reservoir. The float contains a small magnet. When the float pivots, the changing proximity of its magnetic field will cause the contacts of the small, stationary reed switch to open or close. When the fluid level in the washer reservoir is at or above the float level, the float moves to a vertical position and the switch contacts open. When the fluid level in the washer reservoir falls below the pivoting float, the float moves to a horizontal position and the switch contacts close. The switch is connected to the vehicle electrical system through a dedicated take out and connector of the left headlamp and dash wire harness. The switch receives a five volt reference signal from the Body Control Module (BCM) through the washer fluid switch output circuit. The switch is grounded at all times through another take out of the left headlamp and dash wire harness with a single eyelet terminal connector that is secured under a ground screw near the top of the left front fender inner shield in the engine compartment.

When the switch closes, the BCM senses the voltage change on the circuit. The BCM is programmed to send low washer fluid messages to the Electronic Vehicle Information Center (EVIC) over the Programmable Communications Interface (PCI) data bus. The EVIC is programmed to respond to this message by displaying the Washer Fluid Low warning and sending a chime request message back to the BCM over the PCI data bus. Then the BCM generates an audible chime tone warning. A resistor within the washer fluid level switch allows the BCM to monitor and diagnose this circuit. The BCM will store a Diagnostic Trouble Code (DTC) for any fault that it detects. For retrieval of this fault information and further diagnosis of the washer fluid level switch, the BCM, the EVIC, the PCI data bus, the BCM message outputs to the EVIC that control the Low Washer Fluid indicator, or the EVIC message outputs to the BCM that control chime service, a DRBIII® scan tool and the appropriate diagnostic information are required.

WASHER FLUID LEVEL SWITCH (Continued)

REMOVAL

The washer fluid level switch can be removed from the washer reservoir without removing the reservoir from the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the one screw that secures the washer reservoir filler neck to the left inner fender shield.

(3) Raise and support the vehicle.

(4) Remove the liner from the left front fender wheel house.

(5) Disconnect the washer hose from the barbed outlet nipple of the rearmost (front) washer pump/motor unit and allow the washer fluid to drain into a clean container for reuse.

(6) Remove the two screws that secure the inboard mounting flange of the washer reservoir to the left inner wheel house.

(7) Pull the bottom of the washer reservoir rearward far enough to access the left headlamp and dash wire harness connector for the washer fluid level switch on the front of the reservoir.

(8) Disconnect the left headlamp and dash wire harness connector for the washer fluid level switch from the switch connector receptacle.

(9) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed nipple of the washer fluid level switch out of the rubber grommet seal on the front of the reservoir (Fig. 21). Care must be taken not to damage the reservoir.

(10) Remove the washer fluid level switch and float from the washer reservoir.

(11) Remove the rubber grommet seal from the washer fluid level switch mounting hole in the washer reservoir and discard.

INSTALLATION

(1) Install a new rubber grommet seal into the washer fluid level switch mounting hole in the front of the washer reservoir. Always use a new rubber grommet seal on the reservoir.

(2) Position the float of the washer fluid level switch through the rubber grommet seal in the washer reservoir (Fig. 21). The connector receptacle of the washer fluid level switch should be pointed downward.

(3) Press firmly and evenly on the washer fluid level switch using hand pressure until the barbed nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.

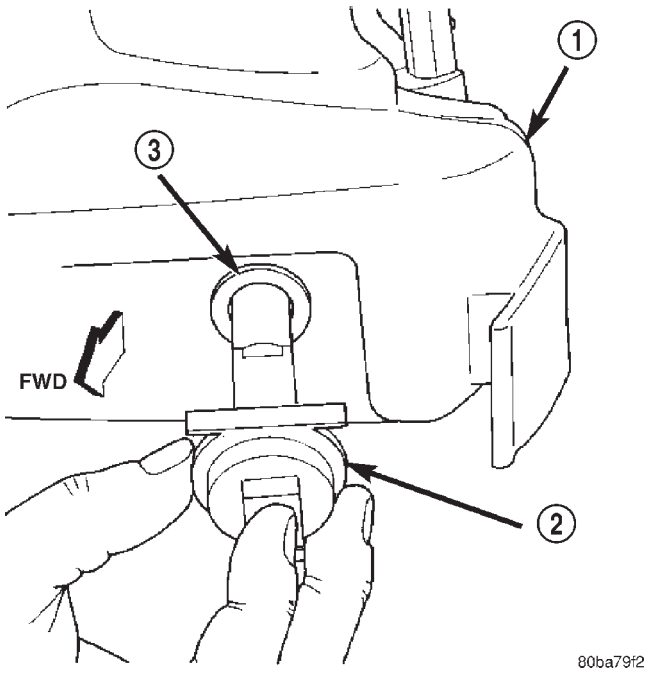


Fig. 21 Washer Fluid Level Switch Remove/Install

1 - WASHER RESERVOIR
2 - WASHER FLUID LEVEL SWITCH
3 - GROMMET SEAL

(4) Reconnect the left headlamp and dash wire harness connector for the washer fluid level switch to the switch connector receptacle.

(5) Reconnect the washer hose to the barbed outlet nipple of the front washer pump/motor unit.

(6) Install and tighten the two screws that secure the inboard mounting flange of the washer reservoir to the left inner wheel house. Tighten the screws to 7.4 N·m (66 in. lbs.).

(7) Reinstall the liner into the left front fender wheel house.

(8) Lower the vehicle.

(9) Install and tighten the one screw that secures the washer reservoir filler neck to the left inner fender shield. Tighten the screw to 7.4 N·m (66 in. lbs.).

(10) Fill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.

(11) Reconnect the battery negative cable.

WASHER RESERVOIR

DESCRIPTION

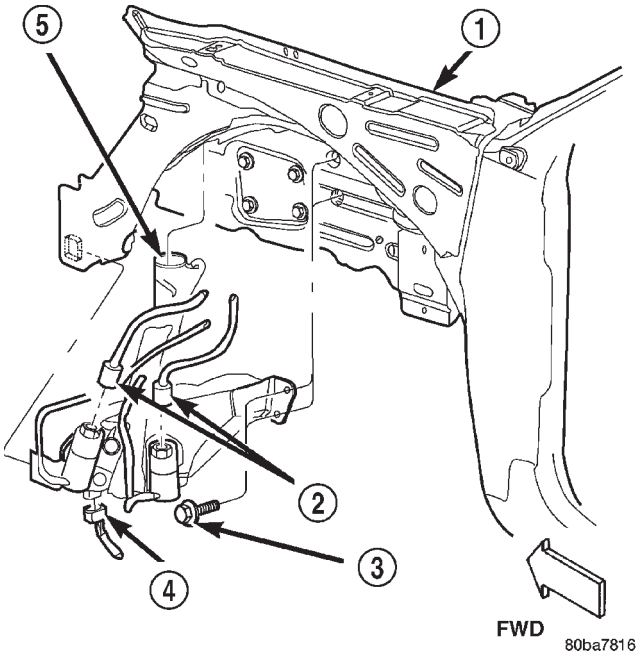


Fig. 22 Washer Reservoir

1 - LEFT FENDER INNER SHIELD
2 - SCREW (2)
3 - WASHER PUMP WIRE HARNESS CONNECTORS
4 - WASHER FLUID LEVEL SWITCH WIRE HARNESS CONNECTOR
5 - WASHER RESERVOIR

A single washer fluid reservoir is used for both the front and rear washer systems (Fig. 22). The molded plastic washer fluid reservoir is concealed between the left front inner and outer fender panels, behind the inner fender liner in front of the left front wheel. The only visible component of the washer reservoir is the filler neck and cap unit, which extends through a hole in the left front wheel house extension panel into the engine compartment. A bright yellow plastic filler cap with a rubber seal and an International Control and Display Symbol icon for “Windshield Washer” and the text “Washer Fluid Only” molded into it snaps over the open end of the filler neck. The cap hinges on and is secured to a molded-in hook formation on the rear of the reservoir filler neck.

There are separate, dedicated holes on the outboard side of the reservoir provided for the mounting of the front and rear washer/pump motor units, and another dedicated hole on the front of the reservoir for the washer fluid level switch. The inboard side of the washer reservoir has an integral flange that is secured to the inside of the left front fender wheel house by two screws, while an integral molded tab engages a slot in the left front fender inner shield to support the outboard side of the reservoir. Another screw secures the reservoir filler neck to the left front fender inner shield near the front of the engine compartment. The left front fender wheel house inner liner must be removed to access the washer reservoir for service.

The washer reservoir cannot be repaired and, if faulty or damaged, it must be replaced. The washer reservoir, the grommet seals for the washer pump/motor units and the washer fluid level switch, and the filler cap are each available for service replacement.

OPERATION

The washer fluid reservoir provides a secure, on-vehicle storage location for a large reserve of washer fluid for operation of the front and rear washer systems. The washer reservoir filler neck provides a clearly marked and readily accessible point from which to add washer fluid to the reservoir. The front and rear washer/pump motor units are located in a sump area near the front of the reservoir to be certain that washer fluid will be available to the pumps as the fluid level in the reservoir becomes depleted. The front washer pump/motor unit is mounted in the lowest position in the sump so that the front washers will operate even after the rear washer system will no longer operate. The washer fluid level switch is mounted just above the sump area of the reservoir so that there will be adequate warning to the vehicle operator that the washer fluid level is low, before the washer system will no longer operate.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the air cleaner housing from the top of the left front fender wheel house. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

WASHER RESERVOIR (Continued)

(3) Disconnect the two washer reservoir washer hoses from the two engine compartment washer hoses at the inline connectors located on the top of the left front fender wheel house (Fig. 23).

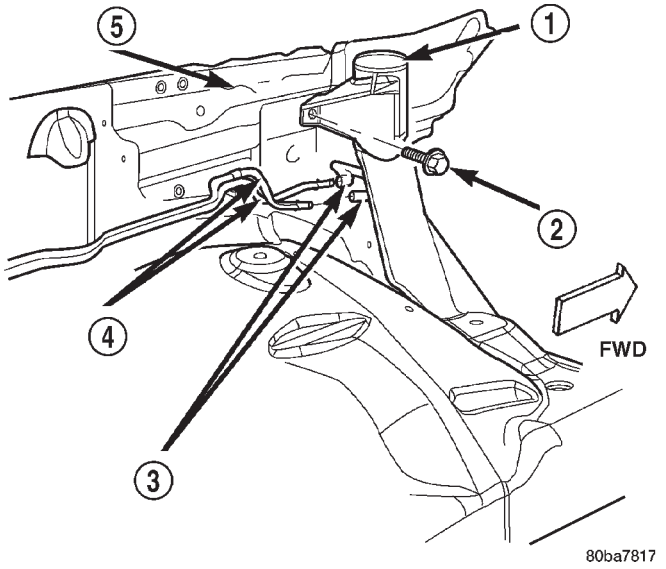


Fig. 23 Washer Reservoir Filler Neck Mounting

1 - WASHER RESERVOIR
2 - SCREW
3 - WASHER HOSES FROM PUMPS
4 - WASHER HOSES TO NOZZLES
5 - LEFT FENDER INNER SHIELD

(4) Open the washer reservoir filler cap and unsnap the filler cap hinge from the hook on the filler neck.

(5) Remove the one screw that secures the washer reservoir filler neck to the left inner fender shield.

(6) Raise and support the vehicle.

(7) Remove the liner from the left front fender wheel house.

(8) Disconnect the left headlamp and dash wire harness connectors for the two washer pump/motor units from the pump/motor connector receptacles (Fig. 24).

(9) Remove the two screws that secure the inboard mounting flange of the washer reservoir to the left front inner wheel house.

(10) Pull the bottom of the washer reservoir rearward far enough to access the left headlamp and dash wire harness connector for the washer fluid level switch on the front of the reservoir.

(11) Disconnect the left headlamp and dash wire harness connector for the washer fluid level switch from the switch connector receptacle.

(12) Pull the bottom of the washer reservoir rearward far enough to disengage the outboard mounting tab from the mounting slot on the left front inner fender shield.

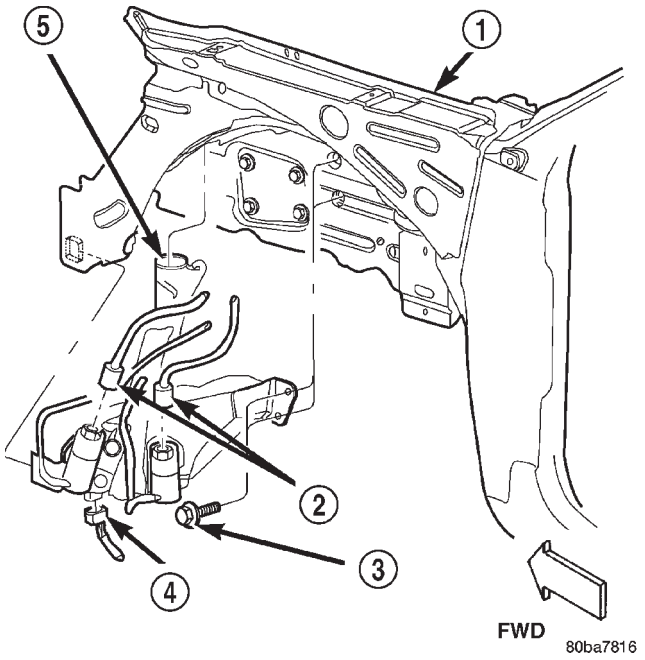


Fig. 24 Washer Reservoir

1 - LEFT FENDER INNER SHIELD
2 - SCREW (2)
3 - WASHER PUMP WIRE HARNESS CONNECTORS
4 - WASHER FLUID LEVEL SWITCH WIRE HARNESS CONNECTOR
5 - WASHER RESERVOIR

(13) Rotate the washer reservoir far enough so that the inboard mounting flange clears the front suspension components, then lower the reservoir far enough to disengage the filler neck from the hole in the left front wheel house extension.

(14) Remove the washer reservoir from the left front fender wheel house.

INSTALLATION

(1) Position the washer reservoir into the left front fender wheel house.

(2) Raise the washer reservoir filler neck through the hole in the left front fender wheelhouse extension into the engine compartment and rotate the reservoir as needed to orient the inboard mounting flange over the top of the front suspension components.

(3) Pull the bottom of the washer reservoir rearward far enough to engage the outboard mounting tab with the mounting slot in the left front inner fender shield (Fig. 24).

(4) Pull the bottom of the washer reservoir rearward far enough to access the washer fluid level switch connector receptacle on the front of the reservoir.

(5) Reconnect the left headlamp and dash wire harness connector for the washer fluid level switch to the switch connector receptacle.

WASHER RESERVOIR (Continued)

(6) Install and tighten the two screws that secure the inboard mounting flange of the washer reservoir to the left inner wheel house. Tighten the screws to 7.4 N·m (66 in. lbs.).

(7) Reconnect the left headlamp and dash wire harness connectors for the two washer pump/motor units to the pump/motor unit connector receptacles.

(8) Reinstall the liner into the left front fender wheel house.

(9) Lower the vehicle.

(10) Install and tighten the one screw that secures the washer reservoir filler neck to the left inner fender shield (Fig. 23). Tighten the screw to 7.4 N·m (66 in. lbs.).

(11) Reinstall the washer reservoir filler cap hinge onto the hook on the filler neck and close the cap.

(12) Reconnect the two washer reservoir washer hoses to the two engine compartment washer hoses at the inline connectors located on the top of the left front fender wheel house.

(13) Reinstall the air cleaner housing onto the top of the left front fender wheel house. (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(14) Reconnect the battery negative cable.

WIPER HIGH/LOW RELAY

DESCRIPTION

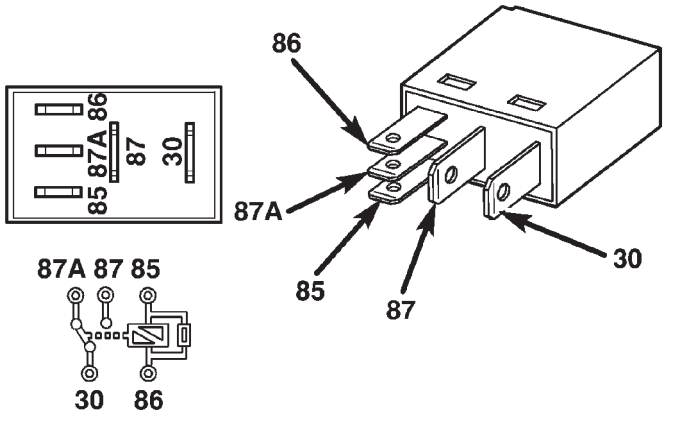


Fig. 25 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The wiper high/low relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. The wiper high/low relay is a conventional International Standards Organization (ISO) micro relay (Fig. 25). Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs by five integral male spade-type terminals that extend from the bottom of the relay base.

The wiper high/low relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The wiper high/low relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the front wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper high/low relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper high/low relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the output of the wiper on/off relay at all times through the wiper on/off relay output circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Body Control Module (BCM) through a front wiper high/low relay control circuit. The BCM controls front wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit.

WIPER HIGH/LOW RELAY (Continued)

- **Normally Open Terminal** - The normally open terminal (87) is connected to the high speed brush of the front wiper motor through a front wiper high/low relay high speed output circuit, and is connected to the high speed brush whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to the low speed brush of the front wiper motor through a front wiper high/low relay low speed output circuit, and is connected to the low speed brush whenever the relay is de-energized.

The wiper high/low relay can be diagnosed using conventional diagnostic tools and methods.

DIAGNOSIS AND TESTING - WIPER HIGH/LOW RELAY

The wiper high/low relay (Fig. 26) is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

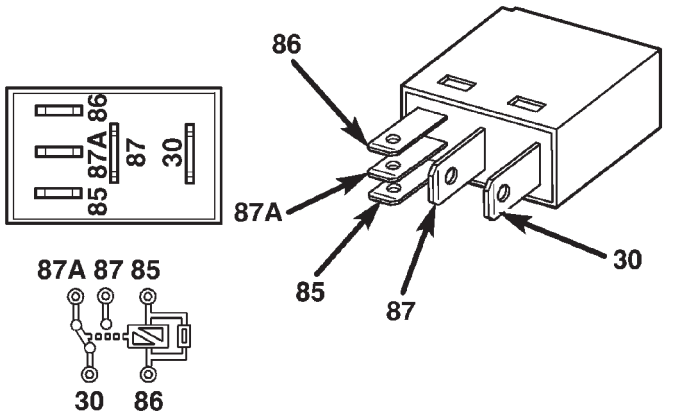


Fig. 26 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the wiper high/low relay from the PDC. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER HIGH/LOW RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 27).

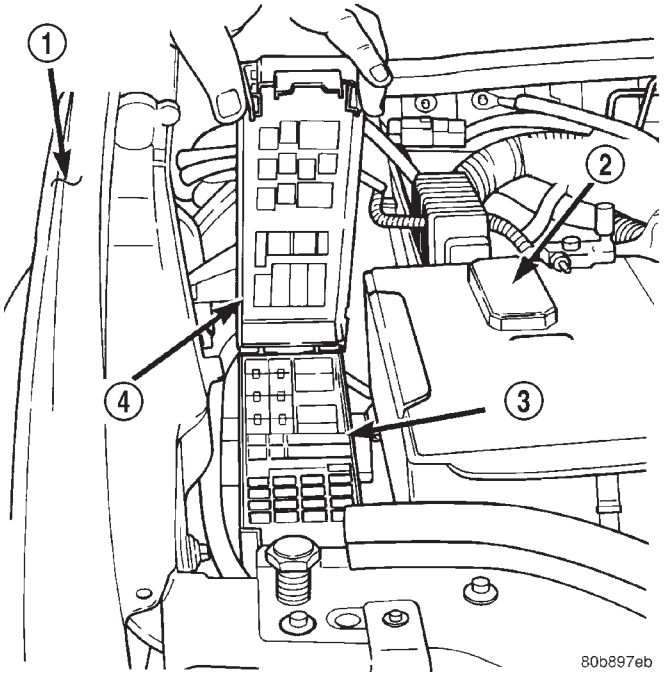


Fig. 27 Power Distribution Center

1 - RIGHT FENDER
2 - BATTERY
3 - POWER DISTRIBUTION CENTER
4 - COVER

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for wiper high/low relay identification and location.

(4) Remove the wiper high/low relay by grasping it firmly and pulling it straight out from the receptacle in the PDC.

INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper wiper high/low relay location (Fig. 27).

WIPER HIGH/LOW RELAY (Continued)

(2) Position the wiper high/low relay in the proper receptacle in the PDC.

(3) Align the wiper high/low relay terminals with the terminal cavities in the PDC receptacle.

(4) Push firmly and evenly on the top of the wiper high/low relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Reinstall the cover onto the PDC.

(6) Reconnect the battery negative cable.

WIPER ON/OFF RELAY

DESCRIPTION

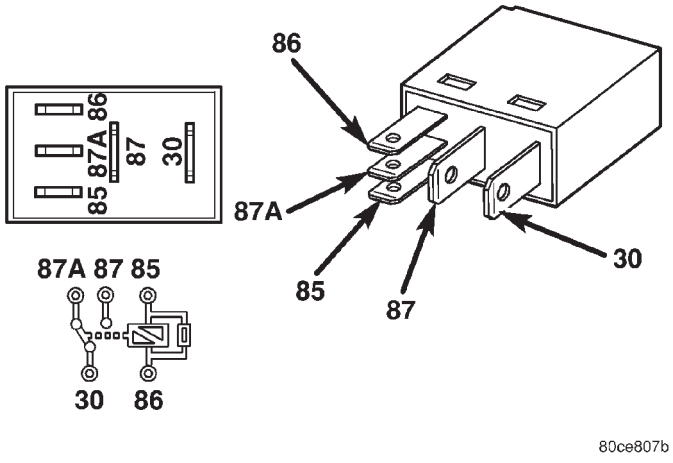


Fig. 28 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

The wiper on/off relay is located in the Power Distribution Center (PDC) in the engine compartment near the battery. The wiper on/off relay is a conventional International Standards Organization (ISO) micro relay (Fig. 28). Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions. The relay is contained within a small, rectangular, molded plastic housing and is connected to all of the required inputs and outputs by five integral male spade-type terminals that extend from the bottom of the relay base.

The wiper on/off relay cannot be adjusted or repaired and, if faulty or damaged, the unit must be replaced.

OPERATION

The wiper on/off relay is an electromechanical switch that uses a low current input from the Body Control Module (BCM) to control a high current output to the front wiper motor. The movable common feed contact point is held against the fixed normally closed contact point by spring pressure. When the relay coil is energized, an electromagnetic field is produced by the coil windings. This electromagnetic field draws the movable relay contact point away from the fixed normally closed contact point, and holds it against the fixed normally open contact point. When the relay coil is de-energized, spring pressure returns the movable contact point back against the fixed normally closed contact point. A resistor is connected in parallel with the relay coil in the relay, and helps to dissipate voltage spikes and electromagnetic interference that can be generated as the electromagnetic field of the relay coil collapses.

The wiper on/off relay terminals are connected to the vehicle electrical system through a connector receptacle in the Power Distribution Center (PDC). The inputs and outputs of the wiper on/off relay include:

- **Common Feed Terminal** - The common feed terminal (30) is connected to the common feed terminal of the wiper high/low relay at all times through the wiper on/off relay output circuit.
- **Coil Ground Terminal** - The coil ground terminal (85) is connected to a control output of the Body Control Module (BCM) through a front wiper on/off relay control circuit. The BCM controls front wiper motor operation by controlling a ground path through this circuit.
- **Coil Battery Terminal** - The coil battery terminal (86) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit.
- **Normally Open Terminal** - The normally open terminal (87) receives battery current at all times from a circuit breaker in the Junction Block (JB) through a fused ignition switch output (run-acc) circuit, and provides battery current to the front wiper on/off relay output circuit whenever the relay is energized.
- **Normally Closed Terminal** - The normally closed terminal (87A) is connected to the wiper park switch in the front wiper motor through the front wiper park switch sense circuit, and is connected to the wiper park switch whenever the relay is de-energized.

The wiper on/off relay can be diagnosed using conventional diagnostic tools and methods.

WIPER ON/OFF RELAY (Continued)

DIAGNOSIS AND TESTING - WIPER ON/OFF RELAY

The wiper on/off relay (Fig. 29) is located in the Power Distribution Center (PDC) in the engine compartment near the battery. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

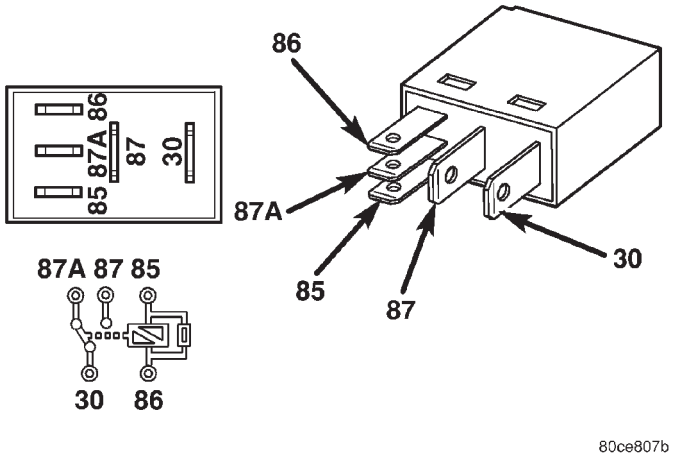


Fig. 29 ISO Micro Relay

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

(1) Remove the wiper on/off relay from the PDC. (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/ WIPER ON/OFF RELAY - REMOVAL).

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 8 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, reinstall the relay and use a DRBIII® scan tool to perform further testing. Refer to the appropriate diagnostic information.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 30).

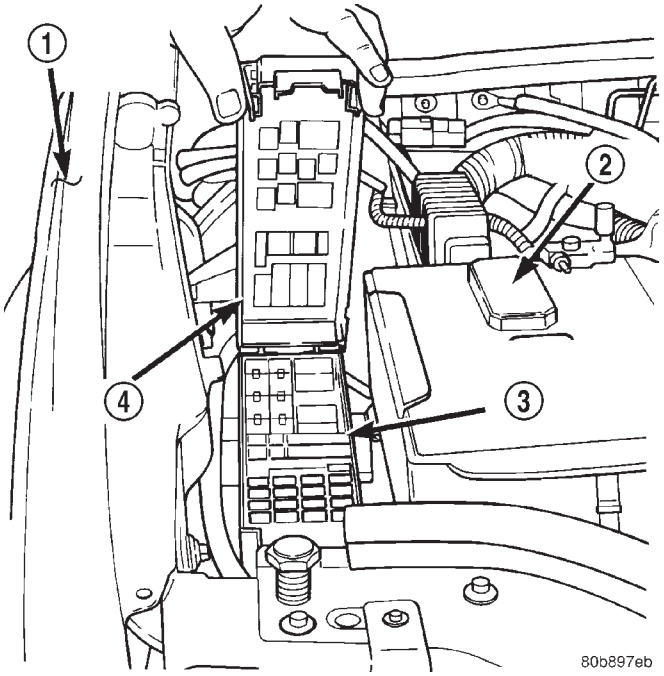


Fig. 30 Power Distribution Center

1 - RIGHT FENDER
2 - BATTERY
3 - POWER DISTRIBUTION CENTER
4 - COVER

(3) See the fuse and relay layout label affixed to the underside of the PDC cover for wiper on/off relay identification and location.

(4) Remove the wiper on/off relay by grasping it firmly and pulling it straight out from the receptacle in the PDC.

INSTALLATION

(1) See the fuse and relay layout label affixed to the underside of the PDC cover for the proper wiper on/off relay location (Fig. 30).

(2) Position the wiper on/off relay in the proper receptacle in the PDC.

(3) Align the wiper on/off relay terminals with the terminal cavities in the PDC receptacle.

(4) Push firmly and evenly on the top of the wiper on/off relay until the terminals are fully seated in the terminal cavities in the PDC receptacle.

(5) Reinstall the cover onto the PDC.

(6) Reconnect the battery negative cable.

REAR WIPERS/WASHERS

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REAR WIPERS/WASHERS

DESCRIPTION

An electrically operated fixed interval intermittent rear wiper and washer system is standard factory-installed equipment on this model. The rear wiper and washer system includes the following major components, which are described in further detail elsewhere in this service information:

- **Rear Washer Nozzle** - The rear washer nozzle is secured by a snap fit onto the top of the liftgate outer panel above the liftgate glass. The rear washer nozzle includes an integral check valve. The rear washer system plumbing is concealed within and routed through the interior of the vehicle.
- **Rear Washer Pump/Motor** - The rear washer pump/motor unit is located in a dedicated hole on the lower outboard side of the washer reservoir, ahead of the left front wheel housing. The rear washer pump mounting hole is located higher on the reservoir than the front washer pump mounting hole.
- **Rear Wiper Arm** - The single rear wiper arm is secured by a nut directly to the rear wiper module output shaft, which extends through the liftgate outer panel near the base of the liftgate glass.
- **Rear Wiper Arm Park Ramp** - The molded rubber rear wiper arm park ramp is secured with a screw to the liftgate outer panel, just below the right side of the liftgate glass. When the rear wiper system is not in operation, the rear wiper arm is parked on this ramp so that it will not interfere with or be damaged by liftgate flip-up glass operation.
- **Rear Wiper Blade** - The single rear wiper blade is secured to the rear wiper arm, and is moved off of the liftgate glass when the rear wiper system is not in operation.
- **Rear Wiper Module** - The rear wiper module output shaft is the only visible component of the rear wiper module. The remainder of the module is concealed within the liftgate beneath the liftgate glass opening. The rear wiper module includes the module bracket, the rear wiper motor, and the rear wiper module electronic control circuitry.
- **Right Multi-Function Switch** - The right (wiper) multi-function switch is secured to the right side of the multi-function switch mounting housing near the top of the steering column. Only the control stalk for the right multi-function switch is visible, the remainder of the switch is concealed beneath the steering column shrouds. The right multi-function switch contains all of the switches and control circuitry for both the front and rear wiper and washer systems.

• **Washer Reservoir** - The rear washer system shares a single reservoir with the front washer system, but has its own dedicated washer pump/motor and plumbing. The washer reservoir is concealed between the left inner fender shield and the left outer fender panel, behind the inner fender liner and ahead of the left front wheel. The washer reservoir filler neck is the only visible portion of the reservoir, and it is accessed from the left front corner of the engine compartment.

Features of the rear wiper and washer system include the following:

• **Continuous Wipe Mode** - When the right multi-function switch control sleeve is moved to the On position, the rear wiper will be operated at a fixed speed, continual wipe cycle until the switch sleeve is moved to the Delay or Off positions, until the ignition switch is turned to the Off position, or until the liftgate flip-up glass is ajar.

• **Intermittent Wipe Mode** - When the right multi-function switch control sleeve is moved to the Delay position, the rear wiper will be operated in a fixed interval, intermittent wipe cycle until the switch sleeve is moved to the On or Off positions, until the ignition switch is turned to the Off position, until the liftgate flip-up glass is ajar, or until the right multi-function switch control stalk is pushed forward to activate the rear washer system. The intermittent wipe mode delay time has a fixed delay interval of about five to eight seconds between sweeps.

• **Washer Mode** - When the right multi-function switch control stalk is pushed forward to activate the rear washer system, washer fluid will be dispensed from the washer reservoir onto the liftgate glass through the rear washer nozzle and the rear wiper will operate in a fixed cycle (not intermittent) for as long as the rear washer pump/motor unit remains energized. When the control stalk is released from the momentary Wash position, the wipe-after-wash feature will continue to operate the rear wiper at a fixed cycle for about three additional wiper sweeps before returning to the previously selected mode.

Hard wired circuitry connects the rear wiper and washer system components to the electrical system of the vehicle. These hard wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system and to the rear wiper and washer system components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices and grounds.

OPERATION

The rear wiper and washer system is intended to provide the vehicle operator with a convenient, safe, and reliable means of maintaining visibility through the liftgate glass. The various components of this system are designed to convert electrical energy produced by the vehicle electrical system into the mechanical action of the wiper blade to wipe the outside surface of the glass, as well as into the hydraulic action of the washer system to apply washer fluid stored in an on-board reservoir to the area of the glass to be wiped. When combined, these components provide the means to effectively maintain clear visibility for the vehicle operator by removing excess accumulations of rain, snow, bugs, mud, or other minor debris from the outside liftgate glass surface that might be encountered while driving the vehicle under numerous types of inclement operating conditions. The vehicle operator initiates all rear wiper and washer system functions with the right multi-function switch located on the right side of the steering column, just below the steering wheel. Moving the switch control sleeve to a detent position selects the rear wiper system operating mode. Moving the switch control stalk forward to a momentary position activates the rear washer pump/motor, which dispenses washer fluid onto the liftgate glass through the rear washer nozzle and operates the rear wiper system in the fixed cycle mode for as long as the washer switch is closed plus about three wiper sweeps.

When the ignition switch is in the Accessory or On positions, battery current from a fuse in the Junction Block (JB) is provided to the right multi-function switch through a fused ignition switch output (run-acc) circuit. A separate fuse in the JB provides battery current to the electronic control circuitry of the rear wiper module through a fused B(+) circuit. When the right multi-function switch control sleeve On position is selected, the On position circuitry within the switch directs a battery current rear wiper motor control signal input to the rear wiper module electronic circuitry, which causes the rear wiper motor to run at a fixed continuous wipe cycle. When the right multi-function switch control sleeve Delay position is selected, the Delay position circuitry within the switch directs a battery current rear washer switch output signal input to the rear wiper module electronic circuitry, which causes the rear wiper motor to run at a fixed intermittent wipe cycle. When the right multi-function switch control

stalk is moved to the rear Wash position, the Wash position circuitry within the switch directs battery current to the rear washer pump/motor unit, and to both the rear wiper motor control and rear washer switch output signal inputs of the rear wiper module electronic circuitry, which causes the wiper motor to run at a fixed cycle for as long as the Wash mode is selected plus about three additional fixed wipe cycles.

The rear wiper module electronic circuitry controls the switching of battery current to the rear wiper motor brush, which controls wiper motor operation. The intermittent wipe and wipe-after-wash features of the rear wiper and washer system are both provided by the rear wiper module electronic circuitry. The rear wiper module electronic circuitry also monitors the liftgate flip-up glass ajar switch and will park the rear wiper blade off of the glass any time it senses that the liftgate flip-up glass is ajar, the ignition switch is turned to the Off position, or the right multi-function switch control sleeve is moved to the Off position. This feature ensures that the rear wiper blade will not interfere with or be damaged by the operation of the liftgate flip-up glass. However, if the ignition switch is turned to the Off position or the liftgate flip-up glass is opened while the rear wiper is operating, the right multi-function switch control sleeve must be cycled to the Off position and back to the On or Delay position after the ignition switch is turned back On or the liftgate flip-up glass is closed before the rear wiper will operate again.

Refer to the owner's manual in the vehicle glove box for more information on the features and operation of the rear wiper and washer system.

DIAGNOSIS AND TESTING - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The diagnosis found here addresses an electrically inoperative rear wiper system. If the rear wiper motor operates, but the wiper does not move on the liftgate glass, replace the faulty rear wiper module. If the wiper operates, but chatters, lifts, or does not clear the glass, clean and inspect the wiper system components as required. (Refer to 8 - ELECTRICAL/ REAR WIPERS/WASHERS - INSPECTION) and (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check that the interior lighting switch on the control stalk of the left multi-function switch is not in the dome lamp disable position. With all four doors and the liftgate closed, open the liftgate flip-up glass. The interior lamps should light. If not, depress the cargo lamp lens to actuate the cargo lamp defeat switch and the interior lamps should light. Close all four doors, the liftgate and the liftgate flip-up glass. Note whether the interior lamps remain lighted. They should turn off after about thirty seconds. If OK, go to Step 2. If not OK, go to Step 9.

(2) Check the fused B(+) fuse (Fuse 8 - 15 ampere) in the Junction Block (JB). If OK, go to Step 3. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(3) Check for battery voltage at the fused B(+) fuse (Fuse 8 - 15 ampere) in the JB. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit between the JB and the Power Distribution Center (PDC) as required.

(4) Check the fused ignition switch output (run-acc) fuse (Fuse 29 - 10 ampere) in the JB. If OK, go to Step 5. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(5) Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-acc) fuse (Fuse 29 - 10 ampere) in the JB. If OK, turn the ignition switch to the Off position and go to Step 6. If not OK, repair the open fused ignition switch output (run-acc) circuit between the JB and the ignition switch as required.

(6) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector for the right multi-function switch from the switch connector receptacle. Reconnect the battery negative cable. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (run-acc) circuit cavity of the instrument panel wire harness connector for the right multi-function switch. If OK, go to Step 7. If not OK, repair the open fused ignition switch output

(run-acc) circuit between the right multi-function switch and the JB as required.

(7) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Test the right multi-function switch. (Refer to 8 - ELECTRICAL/FRONT WIPERS/WASHERS/RIGHT MULTI-FUNCTION SWITCH - DIAGNOSIS AND TESTING). If the right multi-function switch tests OK, reconnect the instrument panel wire harness connector for the right multi-function switch to the switch connector receptacle and go to Step 8. If the right multi-function switch does not test OK, replace the faulty switch.

(8) Remove the liftgate inner trim panel. Disconnect the liftgate wire harness connector for the rear wiper module from the module connector receptacle. Check for continuity between the ground circuit cavity of the liftgate wire harness connector for the rear wiper module and a good ground. There should be continuity. If OK, go to Step 9. If not OK, repair the open ground circuit to ground (G301) as required.

(9) Check for continuity between the liftgate flip-up glass ajar switch sense circuit cavity of the liftgate wire harness connector for the rear wiper module and a good ground. There should be continuity with the liftgate flip-up glass open, and no continuity with the liftgate flip-up glass closed. If OK, go to Step 10. If not OK, repair the liftgate flip-up glass ajar circuit as required.

(10) Reconnect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the liftgate wire harness connector for the rear wiper module. If OK, go to Step 11. If not OK, repair the open fused B(+) circuit between the rear wiper module and the JB as required.

(11) Turn the ignition switch to the On position. Turn the right multi-function switch control sleeve to the Delay position. Check for battery voltage at the rear washer switch output circuit cavity of the liftgate wire harness connector for the rear wiper module. If OK, go to Step 12. If not OK, repair the open rear washer switch output circuit between the rear wiper module and the right multi-function switch as required.

(12) Turn the right multi-function switch control sleeve to the On position. Check for battery voltage at the rear wiper motor control circuit cavity of the liftgate wire harness connector for the rear wiper module. If OK, replace the faulty rear wiper module. If not OK, repair the open rear wiper motor control circuit between the rear wiper module and the right multi-function switch as required.

WASHER SYSTEM

The diagnosis found here addresses an electrically inoperative rear washer system. If the rear washer pump/motor operates, but no washer fluid is emitted from the rear washer nozzle, be certain to check the fluid level in the reservoir. Also inspect the washer system components as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - INSPECTION). Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices and grounds.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Turn the ignition switch to the On position. Turn the right multi-function switch control sleeve to the On position. Check whether the rear wiper system is operating. If OK, go to Step 2. If not OK, test and repair the rear wiper system before continuing with these tests. Refer to WIPER SYSTEM .

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Disconnect the left headlamp and dash wire harness connector for the rear washer pump/motor unit from the pump/motor unit connector receptacle. Check for continuity between the ground circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump/motor unit and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit to ground (G106) as required.

(3) Reconnect the battery negative cable. Turn the ignition switch to the On position. Push the right multi-function switch control stalk toward the instrument panel to actuate the rear washer switch. With the rear washer switch actuated, check for battery voltage at the rear washer switch output circuit cavity of the left headlamp and dash wire harness connector for the rear washer pump/motor unit. If OK, replace the faulty rear washer pump/motor unit. If not OK, repair the open rear washer switch output circuit between the rear washer pump/motor unit and the right multi-function switch as required.

CLEANING - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The squeegee of a wiper blade exposed to the elements for a long time tends to lose its wiping effectiveness. Periodic cleaning of the squeegee is suggested to remove any deposits of salt or road film. The wiper blade, arm, and liftgate glass should only be cleaned using a sponge or soft cloth and windshield washer fluid, a mild detergent, or a non-abrasive cleaner. If the wiper blade continues to leave streaks, smears, hazing, or beading on the glass after thorough cleaning of the squeegees and the glass, the entire wiper blade assembly must be replaced.

CAUTION: Protect the rubber squeegee of the wiper blade from any petroleum-based cleaners, solvents, or contaminants. These products can rapidly deteriorate the rubber squeegee.

WASHER SYSTEM

If the washer system is contaminated with foreign material, drain the washer reservoir by removing the front washer pump/motor from the reservoir. Clean foreign material from the inside of the washer reservoir using clean washer fluid, a mild detergent, or a non-abrasive cleaner. Flush foreign material from the washer system plumbing by first disconnecting the washer hose from the washer nozzle, then running the washer pump/motor to run clean washer fluid or water through the system. A plugged or restricted washer nozzle should be carefully back-flushed using compressed air. If the washer nozzle obstruction cannot be cleared, replace the washer nozzle.

CAUTION: Never introduce petroleum-based cleaners, solvents, or contaminants into the washer system. These products can rapidly deteriorate the rubber seals and hoses of the washer system, as well as the rubber squeegee of the wiper blade.

CAUTION: Never use compressed air to flush the washer system plumbing. Compressed air pressures are too great for the washer system plumbing components and will result in further system damage. Never use sharp instruments to clear a plugged washer nozzle or damage to the nozzle orifice and improper nozzle spray patterns will result.

INSPECTION - REAR WIPER & WASHER SYSTEM

WIPER SYSTEM

The rear wiper blade and wiper arm should be inspected periodically, not just when wiper performance problems are experienced. This inspection should include the following points:

(1) Inspect the wiper arm for any indications of damage, or contamination. If the wiper arm is contaminated with any foreign material, clean as required. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS - CLEANING). If a wiper arm is damaged or corrosion is evident, replace the wiper arm with a new unit. Do not attempt to repair a wiper arm that is damaged or corroded.

(2) Carefully lift the wiper arm off of the ramp. Note the action of the wiper arm hinge. The wiper arm should pivot freely at the hinge, but with no lateral looseness evident. If there is any binding evident in the wiper arm hinge, or there is evident lateral play in the wiper arm hinge, replace the wiper arm.

CAUTION: Do not allow the wiper arm to spring back against the glass without the wiper blade in place or the glass may be damaged.

(3) Once proper hinge action of the wiper arm is confirmed, check the hinge for proper spring tension. The spring tension of the wiper arm should be sufficient to cause the rubber squeegee to conform to the curvature of the glass. Replace a wiper arm if it has low or no spring tension.

(4) Inspect the wiper blade and squeegee for any indications of damage, contamination, or rubber deterioration (Fig. 1). If the wiper blade or squeegee is contaminated with any foreign material, clean them and the glass as required. (Refer to 8 - ELECTRI-

REAR WIPERS/WASHERS (Continued)

CAL/REAR WIPERS/WASHERS - CLEANING). If after cleaning the wiper blade and the glass, the wiper blade fails to clear the glass without smearing, streaking, chattering, hazing, or beading, replace the wiper blade. Also, if a wiper blade is damaged or if the squeegee rubber is damaged or deteriorated, replace the wiper blade with a new unit. Do not attempt to repair a wiper blade that is damaged.

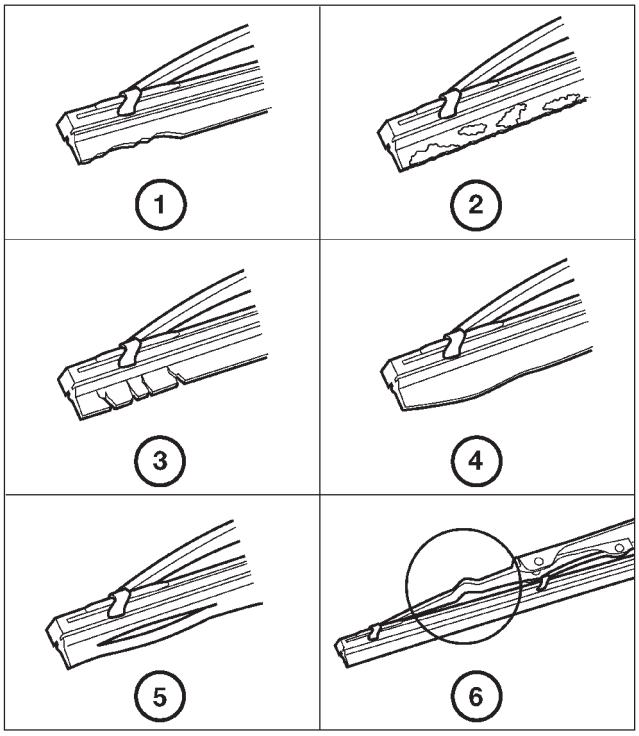


Fig. 1 Wiper Blade Inspection

1 - WORN OR UNEVEN EDGES
2 - ROAD FILM OR FOREIGN MATERIAL DEPOSITS
3 - HARD, BRITTLE, OR CRACKED
4 - DEFORMED OR FATIGUED
5 - SPLIT
6 - DAMAGED SUPPORT COMPONENTS

WASHER SYSTEM

The washer system components should be inspected periodically, not just when washer performance problems are experienced. This inspection should include the following points:

(1) Check for ice or other foreign material in the washer reservoir. If contaminated, clean and flush the washer system. (Refer to 8 - ELECTRICAL/ REAR WIPERS/WASHERS - CLEANING).

(2) Inspect the washer plumbing for pinched, leaking, deteriorated, or incorrectly routed hoses and damaged or disconnected hose fittings. Replace damaged or deteriorated hoses and hose fittings. Leaking washer hoses can sometimes be repaired by cutting the hose at the leak and splicing it back together using an in-line connector fitting. Similarly, sections of deteriorated hose can be cut out and replaced by splicing in new sections of hose using in-line connector fittings. Whenever routing a washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts. Also, sharp bends that might pinch the washer hose must be avoided.

REAR WASHER HOSES/TUBES

DESCRIPTION

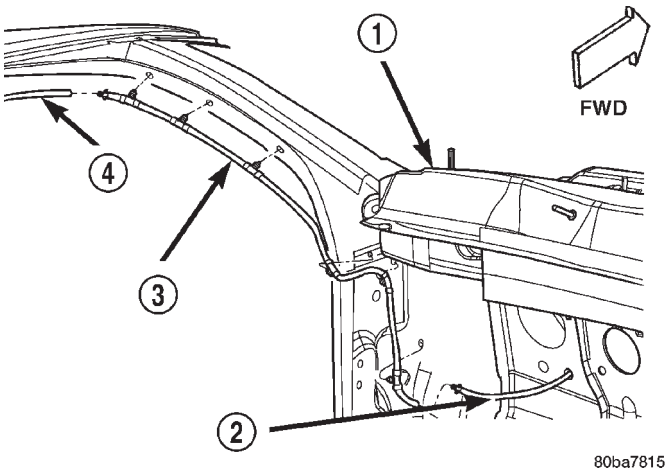


Fig. 2 Rear Washer Plumbing

1 - UPPER COWL PLENUM PANEL
2 - WASHER HOSE FROM ENGINE COMPARTMENT
3 - A-PILLAR WASHER HOSE
4 - HEADLINER WASHER HOSE

The rear washer plumbing consists of small diameter rubber hoses and molded plastic inline connector fittings (Fig. 2). The washer reservoir hose is connected to the barbed outlet nipple of the rear washer pump/motor unit below the left front wheel house extension and routed up the washer reservoir filler neck to the engine compartment. Just rearward of the washer reservoir filler neck in the engine compartment, an inline connector with barbed nipples joins the reservoir hose to the engine compartment hose. The engine compartment hose is routed along the top of the left front fender wheel house to the dash panel. The engine compartment hose passes through a hole with a rubber grommet in the dash panel into the passenger compartment. Below the instrument panel in the passenger compartment near the left cowl side inner panel, another inline connector joins the engine compartment hose to the A-pillar hose. The A-pillar hose is routed up the left A-pillar to the headliner. At the headliner, an inline connector joins the A-pillar hose to the headliner hose. The headliner hose is routed above the headliner and

REAR WASHER HOSES/TUBES (Continued)

along the left roof side rail to the rear of the vehicle. At the rear of the vehicle, the headliner hose is routed above the headliner and along the upper liftgate opening panel toward the right side of the vehicle. The headliner hose then passes through a hole with a rubber grommet in the upper liftgate opening panel and through another hole with a rubber grommet into the upper inner liftgate panel to the rear washer nozzle.

Washer hose is available for service only as roll stock, which must then be cut to length. The headliner washer hose is integral to the headliner unit and, if faulty or damaged, the headliner unit must be replaced. The molded plastic washer hose fittings cannot be repaired. If these fittings are faulty or damaged, they must be replaced.

OPERATION

Washer fluid in the washer reservoir is pressurized and fed by the rear washer pump/motor through the rear washer system plumbing and fittings to the rear washer nozzle on the liftgate outer panel above the liftgate glass. Whenever routing the washer hose or a wire harness containing a washer hose, it must be routed away from hot, sharp, or moving parts; and, sharp bends that might pinch the hose must be avoided.

REAR WASHER NOZZLE

DESCRIPTION

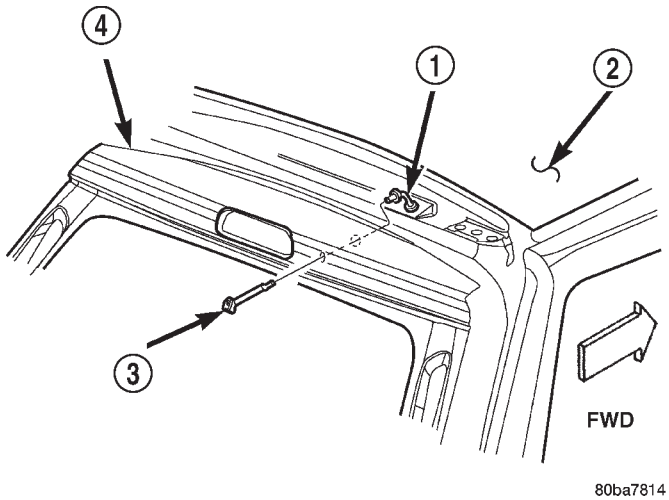


Fig. 3 Rear Washer Nozzle

1 - HEADLINER WASHER HOSE
2 - ROOF PANEL
3 - REAR WASHER NOZZLE
4 - LIFTGATE

The rear washer nozzle is a fluidic type unit that includes an integral check valve (Fig. 3). The nozzle is constructed of molded plastic and has a rubber seal and integral snap features on the back of it. The nozzle is secured by a snap fit in a dedicated mounting hole in the liftgate outer panel above the liftgate flip-up glass. Within the rear nozzle body, a small check ball is held against an integral valve seat at the inlet end of the nozzle by a small coiled spring. The rear washer nozzle and check valve unit cannot be adjusted or repaired. If faulty or damaged, the entire nozzle and check valve unit must be replaced.

OPERATION

The rear washer nozzle is designed to dispense washer fluid into the wiper pattern area on the outside of the liftgate glass. Pressurized washer fluid is fed to the nozzle from the washer reservoir by the rear washer pump/motor through a single hose, which is attached to a barbed nipple on the back of the rear washer nozzle. The rear washer nozzle incorporates a fluidic design, which causes the nozzle to emit the pressurized washer fluid as an oscillating stream to more effectively cover a larger area of the glass area to be cleaned. The integral rear nozzle check valve prevents washer fluid from draining out of the rear washer supply hoses back to the washer reservoir. This drain-back would result in a lengthy delay from when the rear washer switch is actuated until washer fluid was dispensed through the rear washer nozzle, because the rear washer pump would have to refill the rear washer plumbing from the reservoir to the nozzle. The check valve also prevents washer fluid from siphoning through the rear washer nozzle after the rear washer system is turned Off. When the rear washer pump pressurizes and pumps washer fluid from the reservoir through the rear washer plumbing, the fluid pressure overrides the spring pressure applied to the check ball within the valve and unseats the check ball, allowing washer fluid to flow to the rear washer nozzle. When the rear washer pump stops operating, spring pressure seats the check ball in the valve and fluid flow in either direction within the rear washer plumbing is prevented.

REMOVAL

The check valve for the rear washer nozzle is integral to the nozzle.

(1) Using a trim stick or another suitable wide flat-bladed tool, gently pry at the sides of the rear washer nozzle to release the snap features that secure it in the mounting hole of the liftgate outer panel.

REAR WASHER NOZZLE (Continued)

(2) Pull the rear washer nozzle out from the liftgate outer panel far enough to access the washer supply hose (Fig. 4).

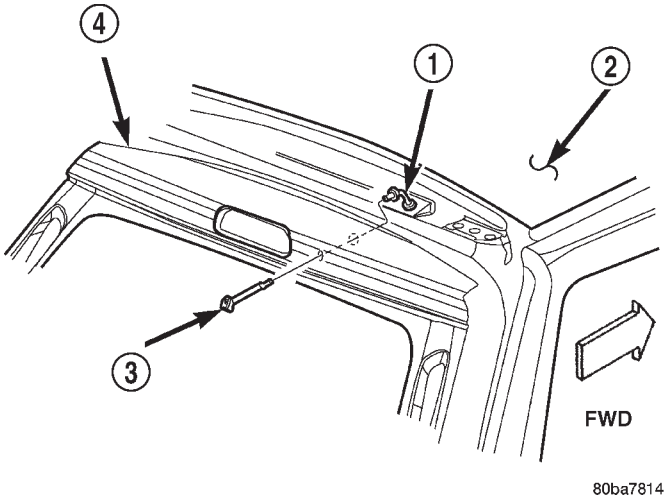


Fig. 4 Rear Washer Nozzle Remove/Install

1 - HEADLINER WASHER HOSE
2 - ROOF PANEL
3 - REAR WASHER NOZZLE
4 - LIFTGATE

(3) Disconnect the washer supply hose from the barbed nipple of the rear washer nozzle.

(4) Remove the rear washer nozzle from the liftgate.

INSTALLATION

(1) Position the rear washer nozzle to the liftgate (Fig. 4).

(2) Reconnect the washer supply hose to the barbed nipple of the rear washer nozzle.

(3) Insert the rear washer nozzle supply hose and nipple into the mounting hole in the liftgate outer panel.

(4) Using hand pressure, push firmly and evenly on the rear washer nozzle until the snap features lock into place on the inside of the liftgate outer panel mounting hole.

REAR WASHER PUMP/MOTOR

DESCRIPTION

The rear washer pump/motor unit is located on the outboard side and near the rear of the washer reservoir, between the left front inner and outer fender panels (Fig. 5). A small permanently lubricated and sealed electric motor is coupled to the rotor-type washer pump. A seal flange with a large barbed inlet nipple on the pump housing passes through a rubber grommet seal installed in one of two dedicated

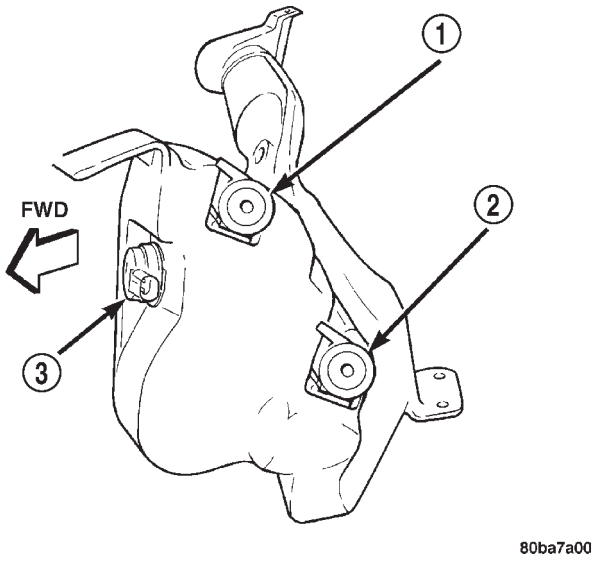


Fig. 5 Washer Pumps (Viewed from Bottom of Reservoir)

1 - REAR WASHER PUMP/MOTOR
2 - FRONT WASHER PUMP/MOTOR
3 - WASHER FLUID LEVEL SWITCH

mounting holes near the bottom of the washer reservoir. The rear washer pump/motor unit is always mounted in the higher pump mounting hole of the reservoir. A smaller barbed outlet nipple on the pump housing connects the unit to the rear washer hose. The washer pump/motor unit is retained on the reservoir by the interference fit between the barbed pump inlet nipple and the grommet seal, which is a light press fit. An integral electrical connector receptacle is located on the top of the motor housing. The rear washer pump/motor unit cannot be repaired. If faulty or damaged, the entire washer pump/motor unit must be replaced.

OPERATION

The rear washer pump/motor unit is connected to the vehicle electrical system through a single take out and two-cavity connector of the left headlamp and dash wire harness. The washer pump/motor is grounded at all times through a take out of the left headlamp and dash wire harness with a single eyelet terminal connector that is secured under a ground screw to the top of the left inner fender shield in the engine compartment. The rear washer pump/motor receives battery current on a fused ignition switch output (run-acc) circuit through the closed contacts of the momentary rear washer switch within the right multi-function switch only when the switch control stalk is pushed towards the instrument panel. Washer fluid is gravity-fed from the washer reservoir to the inlet side of the washer pump. When the pump motor is energized, the rotor-type pump pressurizes

REAR WASHER PUMP/MOTOR (Continued)

the washer fluid and forces it through the pump outlet nipple, the rear washer plumbing, and the rear washer nozzle onto the liftgate glass.

REMOVAL

(1) Disconnect and isolate the battery negative cable.
(2) Raise and support the vehicle.
(3) Remove the liner from the left front fender wheel house.
(4) Disconnect the left headlamp and dash wire harness connector for the rear washer pump/motor from the motor connector receptacle (Fig. 6).

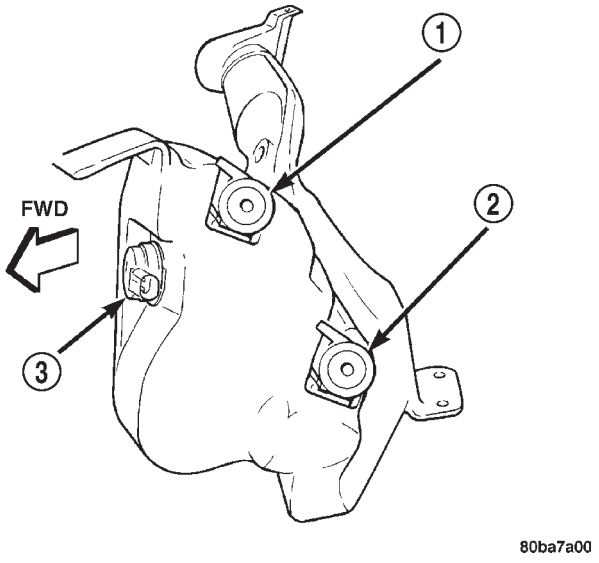


Fig. 6 Washer Pumps (Viewed from Bottom of Reservoir)

1 - REAR WASHER PUMP/MOTOR
2 - FRONT WASHER PUMP/MOTOR
3 - WASHER FLUID LEVEL SWITCH

(5) Disconnect the washer hose from the barbed outlet nipple of the rear washer pump/motor and allow the washer fluid to drain into a clean container for reuse.
(6) Using a trim stick or another suitable wide flat-bladed tool, gently pry the barbed inlet nipple of the washer pump out of the rubber grommet seal in the reservoir. Care must be taken not to damage the reservoir.
(7) Remove the rubber grommet seal from the washer pump mounting hole in the washer reservoir and discard.

INSTALLATION

(1) Install a new rubber grommet seal into the washer pump mounting hole in the washer reservoir. Always use a new rubber grommet seal on the reservoir.
(2) Position the barbed inlet nipple of the washer pump to the rubber grommet seal in the reservoir (Fig. 6).
(3) Press firmly and evenly on the washer pump until the barbed inlet nipple is fully seated in the rubber grommet seal in the washer reservoir mounting hole.
(4) Reconnect the washer hose to the barbed outlet nipple of the washer pump.
(5) Reconnect the left headlamp and dash wire harness connector for the rear washer pump/motor unit to the motor connector receptacle.
(6) Reinstall the liner into the left front fender wheel house.
(7) Lower the vehicle.
(8) Refill the washer reservoir with the washer fluid drained from the reservoir during the removal procedure.
(9) Reconnect the battery negative cable.

REAR WIPER ARM

DESCRIPTION

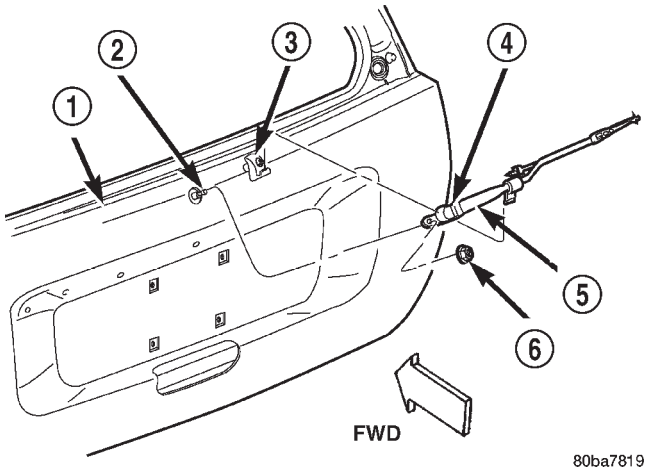


Fig. 7 Rear Wiper Arm

1 - LIFTGATE
2 - REAR WIPER MOTOR OUTPUT SHAFT
3 - PARK RAMP
4 - PIVOT COVER
5 - REAR WIPER ARM
6 - NUT

The rear wiper arm is the rigid member located between the rear wiper motor output shaft that protrudes from the outer liftgate panel near the base of the liftgate glass opening and the rear wiper blade (Fig. 7). This wiper arm features an over-center hinge that allows easy access to the liftgate and liftgate glass for cleaning. The wiper arm has a die cast metal pivot end. This pivot end has a hole in it with internal serrations and a plastic pivot cover is

REAR WIPER ARM (Continued)

secured loosely to and pivots on the wiper arm hinge pin to conceal the wiper arm retaining nut. The wide end of a tapered, stamped steel channel is secured with a hinge pin to the pivot end of the wiper arm. One end of a long, rigid, stamped steel strap, with a small hole near its pivot end, is riveted and crimped within the narrow end of the stamped steel channel. The tip of the wiper blade end of this strap is bent back under itself to form a small hook. Concealed within the stamped steel channel, one end of a long spring is engaged with a wire hook on the underside of the die cast pivot end, while the other end of the spring is hooked through the small hole in the steel strap. A molded plastic wiper arm support is snapped onto the wiper arm strap where it exits the channel. The entire wiper arm has a satin black finish applied to all of its visible surfaces.

A wiper arm cannot be adjusted or repaired. If damaged or faulty, the entire wiper arm unit must be replaced.

OPERATION

The rear wiper arm is designed to mechanically transmit the motion from the rear wiper motor output shaft to the rear wiper blade. The wiper arm must be properly indexed to the motor output shaft in order to maintain the proper wiper blade travel on the glass. The wiper arm support is designed to lift and support the rear wiper arm and blade off of the glass when the rear wiper blade is parked. This support and the park ramp on the liftgate outer panel below the glass also provide an alignment reference to ensure accurate rear wiper arm and blade installation. The hole with internal serrations in the wiper arm pivot end interlocks with the serrations on the outer circumference of the motor output shaft, allowing positive engagement and finite adjustment of this connection. A hex nut secures the wiper arm pivot end to the threads on the motor output shaft and the pivot cover hinges and snaps over this connection for a neat appearance. The spring-loaded wiper arm hinge controls the down-force applied through the tip of the wiper arm to the wiper blade on the glass. The hook formation on the tip of the wiper arm provides a cradle for securing and latching the wiper blade pivot block to the wiper arm.

REMOVAL

(1) Lift the rear wiper arm pivot cover by lifting it at the rear wiper motor output shaft end of the arm (Fig. 8).

(2) Remove the nut that secures the rear wiper arm to the rear wiper motor output shaft.

(3) Lift the rear wiper arm far enough to engage the over-center arm hinge in its upright position to hold the wiper blade off of the liftgate.

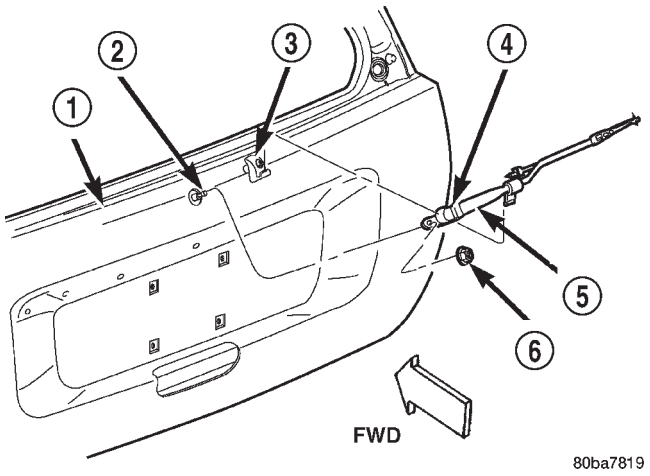


Fig. 8 Rear Wiper Arm Remove/Install

1 - LIFTGATE
2 - REAR WIPER MOTOR OUTPUT SHAFT
3 - PARK RAMP
4 - PIVOT COVER
5 - REAR WIPER ARM
6 - NUT

(4) Use a battery terminal puller to disengage the wiper arm from the rear wiper motor output shaft splines (Fig. 9).

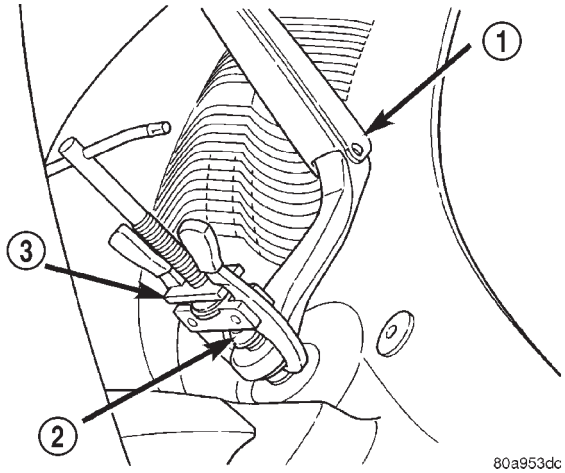


Fig. 9 Wiper Arm Puller - Typical

1 - WIPER ARM
2 - WIPER PIVOT
3 - BATTERY TERMINAL PULLER

(5) Remove the rear wiper arm pivot end from the motor output shaft.

INSTALLATION

NOTE: Always install the wiper arm and blade with the wiper motor in the Park position.

REAR WIPER ARM (Continued)

(1) The rear wiper arm must be indexed to the motor output shaft with the rear wiper motor in the park position to be properly installed. Place the wiper arm onto the liftgate with the wiper arm support positioned on the park ramp and the pivot hole on the end of the arm positioned over the rear wiper motor output shaft.

(2) Position the ridge of the wiper arm support on the liftgate park ramp in the Installation Position (Fig. 10).

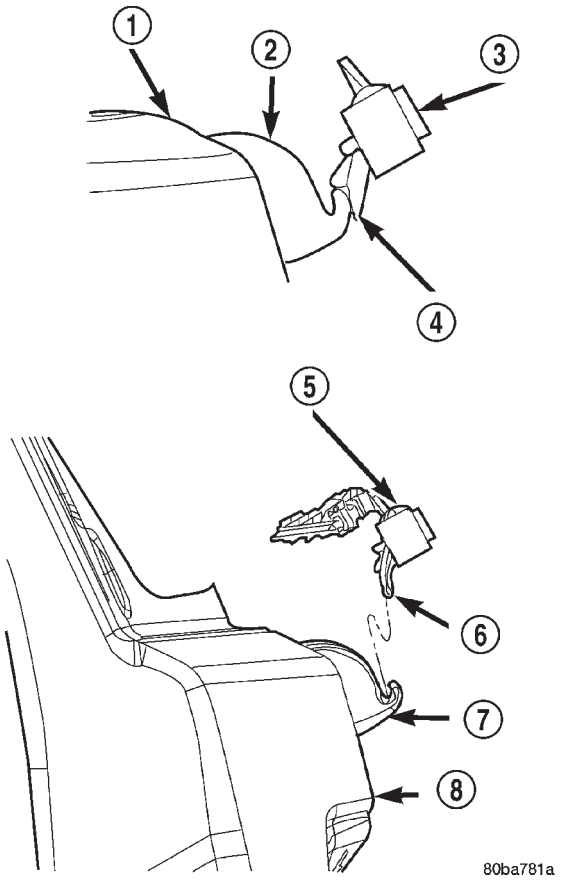


Fig. 10 Rear Wiper Arm Installation

1 - LIFTGATE
2 - PARK RAMP
3 - REAR WIPER ARM
4 - INSTALLATION POSITION
5 - REAR WIPER ARM AND BLADE
6 - PARK POSITION
7 - PARK RAMP
8 - LIFTGATE

(3) With the wiper arm in the Installation Position, push the pivot hole on the end of the wiper arm down over the rear wiper motor output shaft.

(4) Install and tighten the nut that secures the rear wiper arm to the rear wiper motor output shaft. Tighten the nut to 18 N·m (160 in. lbs.).

(5) Close the rear wiper arm pivot cover.

(6) Lift the rear wiper arm support away from the park ramp, then place the wiper arm support in the park ramp in the Park Position (Fig. 10).

REAR WIPER BLADE

DESCRIPTION

The rear wiper blade is secured by an integral latching pivot block to the hook formation on the tip of the rear wiper arm, and rests off the glass near the base of the liftgate glass opening when the wiper is not in operation. The wiper blade consists of the following components:

- **Superstructure** - The superstructure includes a stamped steel bridge and plastic links with claw formations that grip the wiper blade element. Also included in this unit is the latching, molded plastic pivot block that secures the superstructure to the wiper arm. All of the metal components of the wiper blade have a satin black finish applied.
- **Element** - The wiper element or squeegee is the resilient rubber member of the wiper blade that contacts the glass.
- **Flexor** - The flexor is a rigid metal component running along the length of each side of the wiper element where it is gripped by the claws of the superstructure.

All Grand Cherokee models have a single 31.00 centimeter (12.20 inch) rear wiper blade with a non-replaceable rubber element (squeegee). The wiper blade cannot be adjusted or repaired. If faulty, worn, or damaged the entire wiper blade unit must be replaced.

OPERATION

The wiper blade is moved back and forth across the glass by the wiper arm when the wiper system is in operation. The wiper blade superstructure is the flexible frame that grips the wiper blade element and evenly distributes the force of the spring-loaded wiper arm along the length of the element. The combination of the wiper arm force and the flexibility of the superstructure makes the element conform to and maintain proper contact with the glass, even as the blade is moved over the varied curvature found across the glass surface. The wiper element flexor provides the claws of the blade superstructure with a rigid, yet flexible component on the element which can be gripped. The rubber element is designed to be stiff enough to maintain an even cleaning edge as it is drawn across the glass, but resilient enough to conform to the glass surface and flip from one cleaning edge to the other each time the wiper blade changes directions.

REAR WIPER BLADE (Continued)

REMOVAL

NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the wiper motor output shaft.

(1) Disengage the rear wiper arm support from the rubber rear wiper arm park ramp on the right side of the liftgate just below the liftgate glass.

(2) Lift the rear wiper arm to engage the arm hinge in its over-center position with the wiper blade and element off of the liftgate and the glass.

(3) To remove the wiper blade from the wiper arm, push the pivot block latch release tab under the tip of the arm and slide the blade away from the tip towards the pivot end of the arm far enough to disengage the pivot block from the hook (Fig. 11).

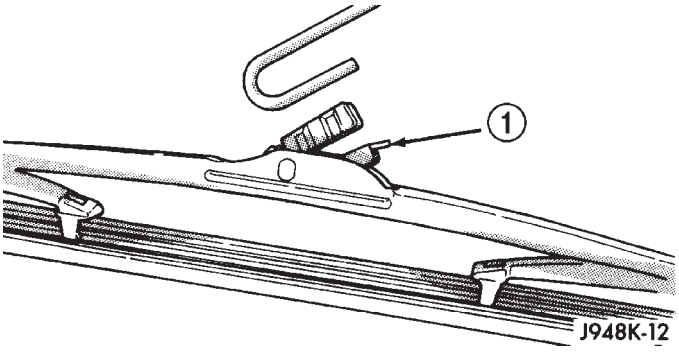


Fig. 11 Wiper Blade Remove/Install - Typical

1 - PIVOT BLOCK LATCH RELEASE TAB

(4) Extract the hook formation on the tip of the wiper arm from the opening in the wiper blade superstructure ahead of the wiper blade pivot block/latch unit.

CAUTION: Do not allow the wiper arm to spring back against the liftgate or the glass without the wiper blade in place or they may be damaged.

(5) Gently lower the wiper arm and place the arm support in the park ramp.

INSTALLATION

NOTE: The notched retainer end of the wiper element should always be oriented towards the end of the wiper blade that is nearest to the wiper motor output shaft.

(1) Lift the rear wiper arm off of the liftgate park ramp.

(2) Position the rear wiper blade near the hook formation on the tip of the arm with the notched retainer for the wiper element oriented towards the end of the wiper arm that is nearest to the wiper motor output shaft.

(3) Insert the hook formation on the tip of the wiper arm through the opening in the wiper blade superstructure ahead of the wiper blade pivot block/latch unit far enough to engage the pivot block with the hook (Fig. 11).

(4) Slide the wiper blade pivot block/latch up into the hook formation on the tip of the wiper arm until the latch release tab snaps into its locked position.

(5) Gently lower the wiper arm and place the arm support in the park ramp.

REAR WIPER MODULE

DESCRIPTION

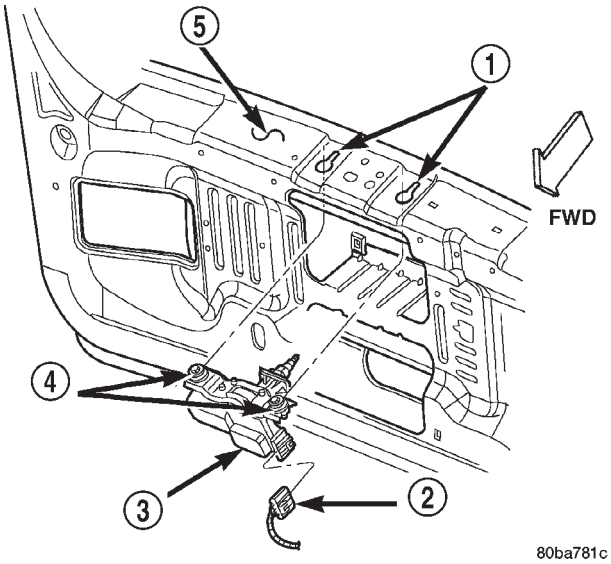


Fig. 12 Rear Wiper Module

1 - KEYED SLOTS
2 - LIFTGATE WIRE HARNESS CONNECTOR
3 - REAR WIPER MODULE
4 - NUT (2)
5 - LIFTGATE INNER PANEL

The rear wiper module is concealed within the liftgate, below the liftgate glass and behind the liftgate trim panel (Fig. 12). The end of the motor output shaft that protrudes through the liftgate outer panel to drive the rear wiper arm and blade is the only visible component of the rear wiper module. A rubber gasket, a bezel, and a nut seal and secure the motor output shaft to the liftgate outer panel. A molded plastic nut cover snaps onto the bezel to conceal the nut and improve appearance. The rear wiper module consists of the following major components:

- **Bracket** - The rear wiper module bracket consists of a stamped steel mounting plate for the wiper

REAR WIPER MODULE (Continued)

motor that is secured with screws to the wiper motor and to the liftgate inner panel.

- **Electronic Controls** - The rear wiper module electronic controls include the rear wiper system electronic logic and rear wiper motor electronic controls. The electronic controls for the motor include an electronic speed control that speeds the wiper blade near the center of the glass, but slows the wiper blade during directional reversals at each end of the wipe pattern and during wiper blade off-the-glass parking for quieter operation.
- **Motor** - The permanent magnet rear wiper motor is secured with screws to the rear wiper module bracket. The wiper motor includes an integral transmission, and the motor output shaft.

The rear wiper module cannot be adjusted or repaired. If any component of the module is faulty or damaged, the entire rear wiper module unit must be replaced. The motor output shaft gasket, bezel, nut, and nut cover are available for service replacement.

OPERATION

The rear wiper module receives non-switched battery current through a fuse in the Junction Block (JB) and is grounded at all times. The rear wiper module operation is controlled by the vehicle operator through battery current signal inputs received by the rear wiper module electronic controls from the right multi-function switch on the steering column. The module also receives an external control input from the liftgate flip-up glass ajar switch circuit. The rear wiper module electronic control logic uses these inputs, its internal inputs, and its programming to provide continuous wipe, delay wipe, wipe-after-wash and off-the-glass wiper blade parking. The wiper blade cycling is controlled by the rear wiper module electronic controls, which control current flow to the wiper motor brushes. The wiper motor transmission converts the rotary output of the wiper motor to the back and forth wiping motion of the rear wiper arm and blade on the liftgate glass.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the rear wiper arm from the rear wiper motor output shaft. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER ARM - REMOVAL).

(3) Use a door trim panel removal tool to gently pry at the base of the nut cover where it meets the wiper motor output shaft bezel and gasket on the outer liftgate panel until it unsnaps from the bezel (Fig. 13). Be certain to use proper caution to protect the outer liftgate panel and its paint finish from damage during this procedure.

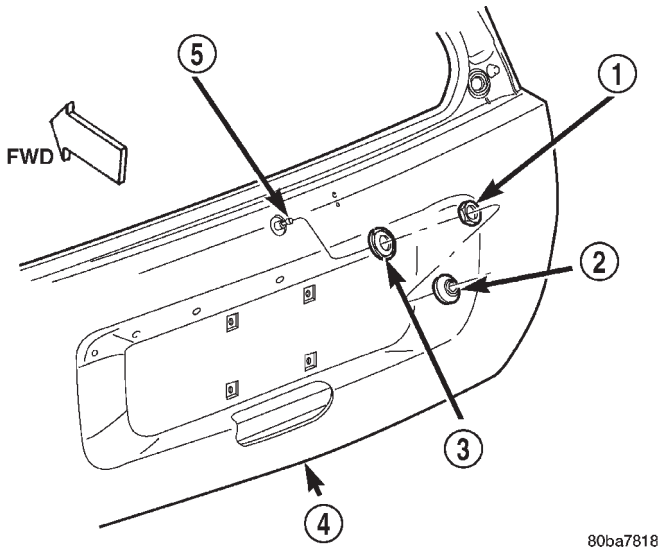


Fig. 13 Rear Wiper Motor Output Shaft Remove/ Install

1 - NUT
2 - NUT COVER
3 - BEZEL AND GASKET
4 - LIFTGATE OUTER PANEL
5 - REAR WIPER MOTOR OUTPUT SHAFT

(4) Remove the nut that secures the rear wiper motor output shaft to the outer liftgate panel.

(5) Remove the bezel and gasket from the rear wiper motor output shaft.

(6) Remove the trim panel from the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(7) Disconnect the liftgate wire harness connector for the rear wiper module from the module connector receptacle (Fig. 14).

(8) Loosen the two nuts that secure the rear wiper module mounting bracket to the liftgate inner panel.

(9) Slide the rear wiper module and mounting bracket forward far enough to disengage the mounting nuts from the keyed holes in the liftgate inner panel.

(10) Remove the rear wiper module and mounting bracket from the liftgate as a unit.

INSTALLATION

(1) Position the rear wiper module and bracket to the liftgate as a unit (Fig. 14).

(2) Insert the rear wiper motor output shaft through the hole in the liftgate outer panel and engage the mounting nuts in the keyed holes in the liftgate inner panel.

(3) From the outside of the liftgate, center the rear wiper motor output shaft in the liftgate outer panel mounting hole and install the gasket and bezel over the centered shaft (Fig. 13).

REAR WIPER MODULE (Continued)

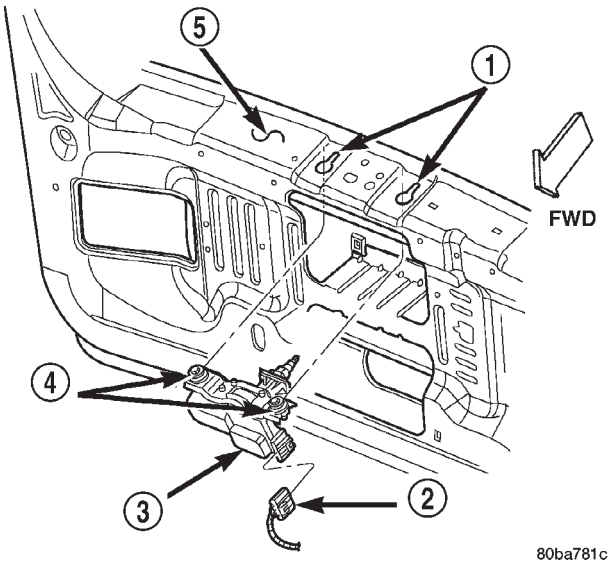


Fig. 14 Rear Wiper Module Remove/Install

1 - KEYED SLOTS
2 - LIFTGATE WIRE HARNESS CONNECTOR
3 - REAR WIPER MODULE
4 - NUT (2)
5 - LIFTGATE INNER PANEL

(4) Install and tighten the nut that secures the rear wiper motor output shaft to the outer liftgate panel. Tighten the nut to 4.8 N·m (43 in. lbs.).

(5) From the inside of the liftgate, install and tighten the two nuts that secure the rear wiper module mounting bracket to the liftgate inner panel. Tighten the nuts to 5.3 N·m (47 in. lbs.).

(6) Reconnect the liftgate wire harness connector for the rear wiper module to the module connector receptacle.

(7) Reinstall the trim panel onto the inside of the liftgate. (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

(8) From the outside of the liftgate, press the nut cover firmly and evenly over the rear wiper motor output shaft bezel using thumb pressure until it snaps into place.

(9) Reinstall the rear wiper arm onto the rear wiper motor output shaft. (Refer to 8 - ELECTRICAL/REAR WIPERS/WASHERS/REAR WIPER ARM - INSTALLATION).

(10) Reconnect the battery negative cable.

WIPER ARM PARK RAMP

REMOVAL

(1) Disengage the rear wiper arm support from the wiper arm park ramp on the right side of the liftgate just below the liftgate glass.

(2) Lift the wiper arm and blade away from the liftgate until the wiper arm hinge is in its over-center position.

(3) Remove the screw that secures the wiper arm park ramp to the liftgate outer panel (Fig. 15).

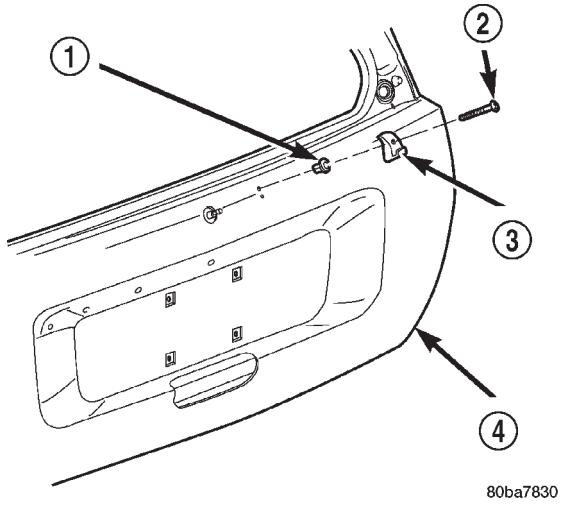


Fig. 15 Wiper Arm Park Ramp Remove/Install

1 - RIVET NUT
2 - SCREW
3 - PARK RAMP
4 - LIFTGATE

(4) Remove the wiper arm park ramp from the liftgate outer panel.

INSTALLATION

(1) Position the wiper arm park ramp onto the liftgate outer panel (Fig. 15).

(2) Install and tighten the screw that secures the wiper arm park ramp to the liftgate outer panel. Tighten the screw to 6.8 N·m (60 in. lbs.).

(3) Lower the rear wiper arm and blade and gently place the wiper arm support onto the wiper arm park ramp.

WIRING

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8W-01 WIRING DIAGRAM INFORMATION

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WIRING DIAGRAM INFORMATION

DESCRIPTION

DESCRIPTION - HOW TO USE WIRING DIAGRAMS

DaimlerChrysler Corporation wiring diagrams are designed to provide information regarding the vehicles wiring content. In order to effectively use the wiring diagrams to diagnose and repair DaimlerChrysler Corporation vehicles, it is important to understand all of their features and characteristics.

Diagrams are arranged such that the power (B+) side of the circuit is placed near the top of the page, and the ground (B-) side of the circuit is placed near the bottom of the page (Fig. 1).

All switches, components, and modules are shown in the at rest position with the doors closed and the key removed from the ignition (Fig. 2).

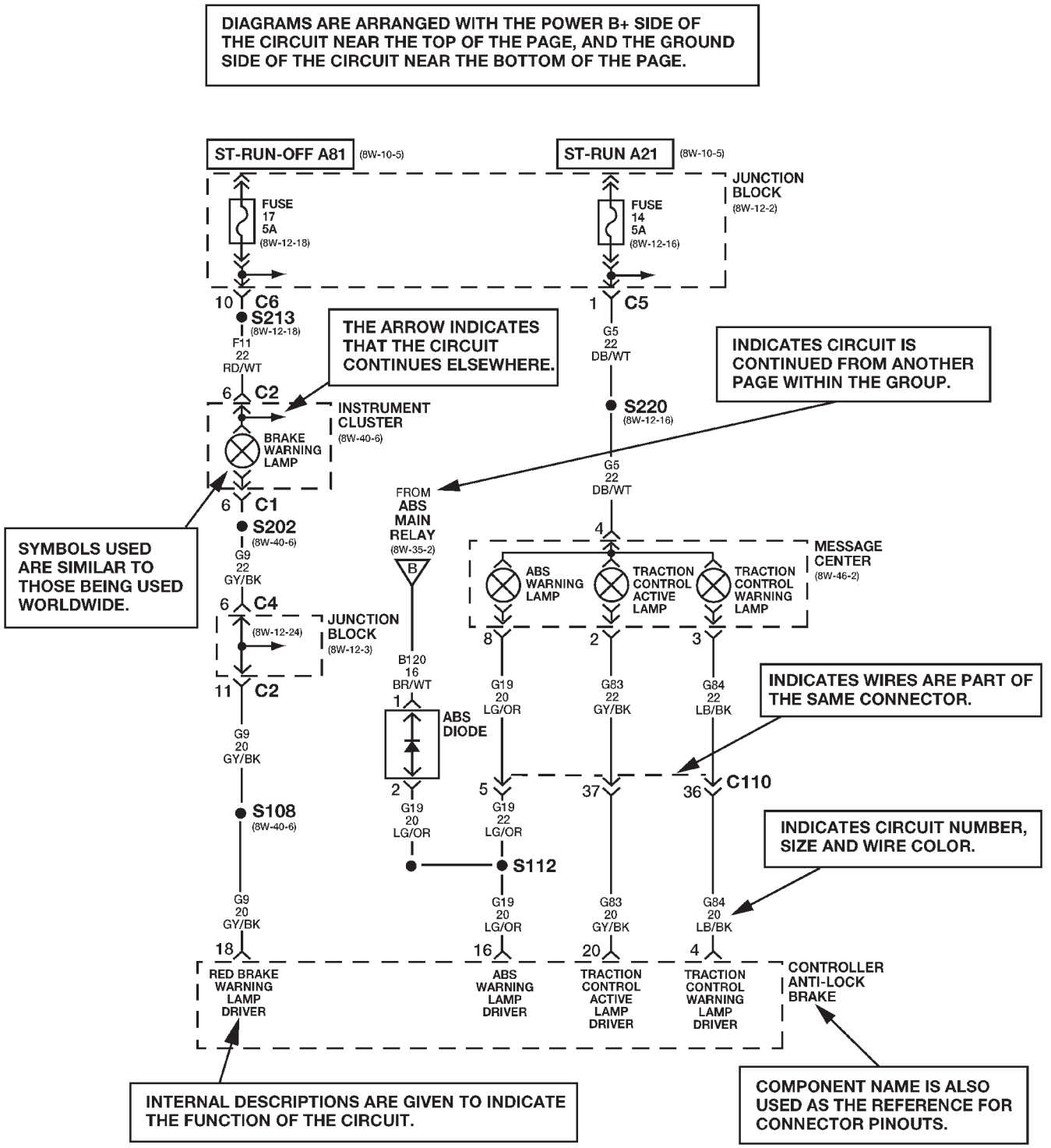
Components are shown two ways. A solid line around a component indicates that the component is complete. A dashed line around the component indicates that the component is being shown is not complete. Incomplete components have a reference number to indicate the page where the component is shown complete.

It is important to realize that no attempt is made on the diagrams to represent components and wiring as they appear on the vehicle. For example, a short piece of wire is treated the same as a long one. In addition, switches and other components are shown as simply as possible, with regard to function only.

SYMBOLS

International symbols are used throughout the wiring diagrams. These symbols are consistent with those being used around the world (Fig. 3).

WIRING DIAGRAM INFORMATION (Continued)

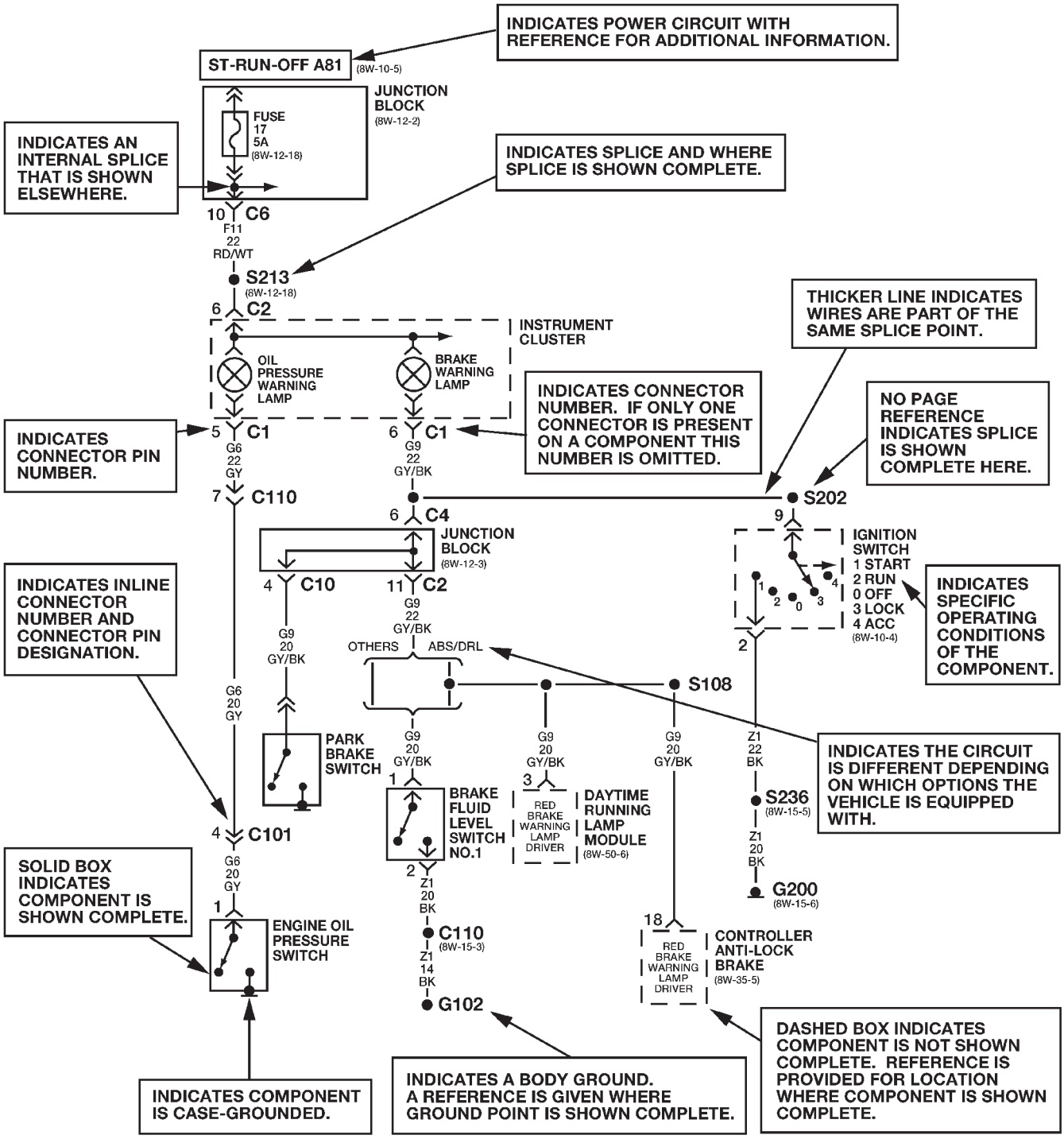


The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

80c06d01

Fig. 1 WIRING DIAGRAM EXAMPLE 1

WIRING DIAGRAM INFORMATION (Continued)

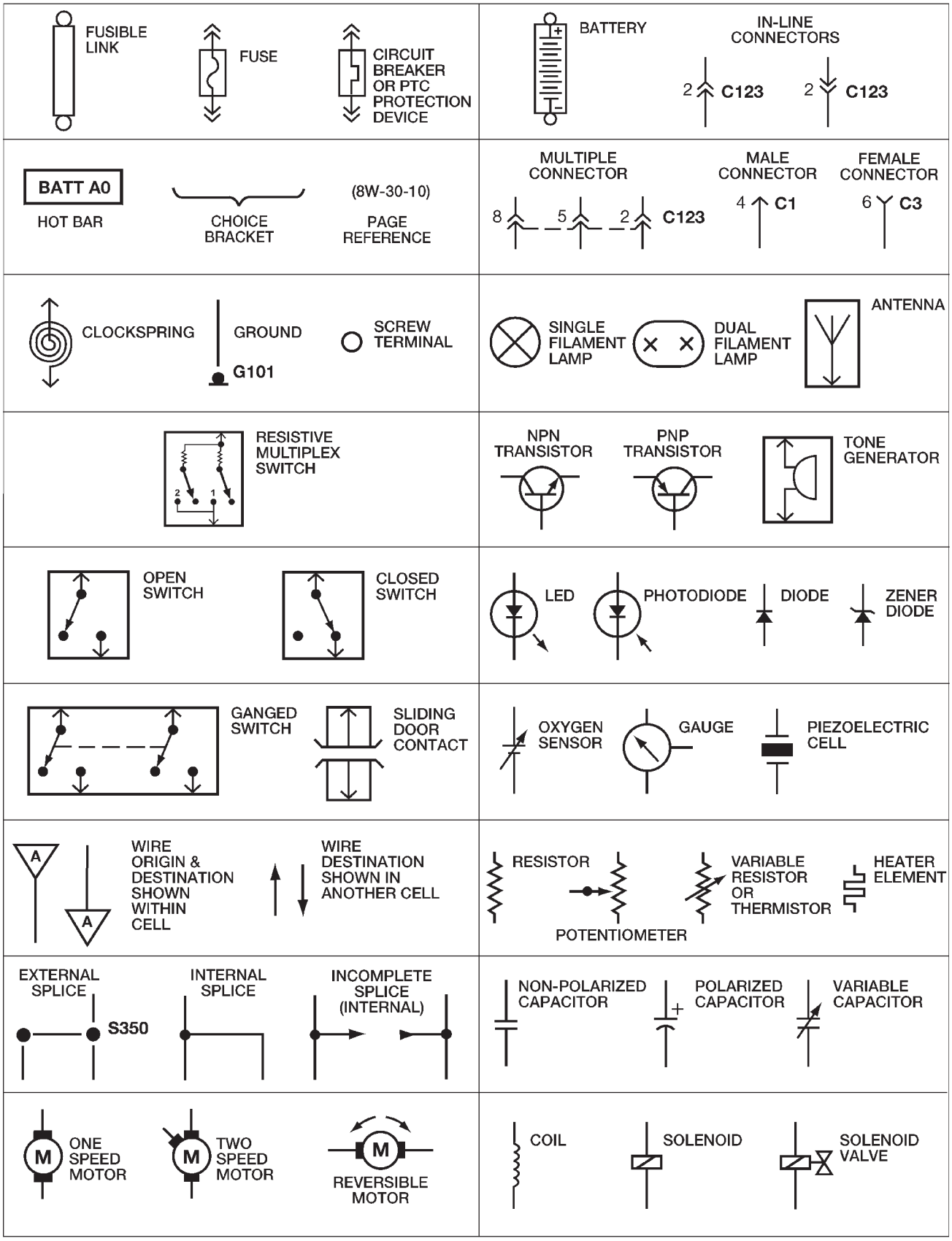


The System shown here is an EXAMPLE ONLY. It does not represent the actual circuit shown in the WIRING DIAGRAM SECTION.

80c06d02

Fig. 2 WIRING DIAGRAM EXAMPLE 2

WIRING DIAGRAM INFORMATION (Continued)



80910c6b

Fig. 3 WIRING DIAGRAM SYMBOLS

WIRING DIAGRAM INFORMATION (Continued)

TERMINOLOGY

This is a list of terms and definitions used in the wiring diagrams.

LHD . . . . . Left Hand Drive Vehicles
RHD . . . . . Right Hand Drive Vehicles
ATX . . Automatic Transmissions-Front Wheel Drive
MTX . . . . Manual Transmissions-Front Wheel Drive
AT . . . . Automatic Transmissions-Rear Wheel Drive
MT . . . . . Manual Transmissions-Rear Wheel Drive
SOHC . . . . . Single Over Head Cam Engine
DOHC . . . . . Double Over Head Cam Engine
Built-Up-Export . . . . . Vehicles Built For Sale In Markets Other Than North America
Except Built-Up-Export . . Vehicles Built For Sale In North America

DESCRIPTION - CIRCUIT INFORMATION

Each wire shown in the diagrams contains a code which identifies the main circuit, part of the main circuit, gage of wire, and color (Fig. 4).

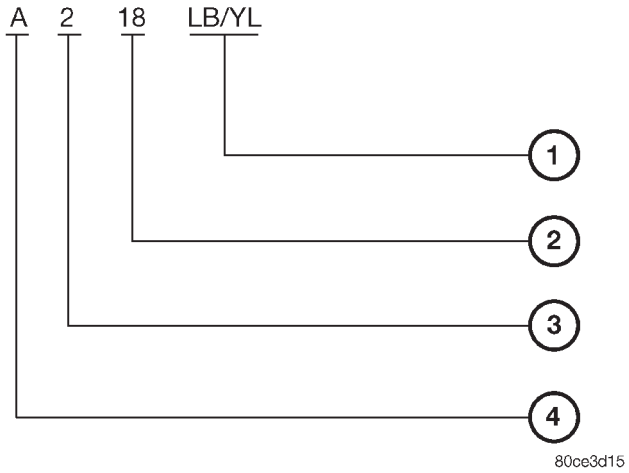


Fig. 4 WIRE CODE IDENTIFICATION

1 - COLOR OF WIRE (LIGHT BLUE WITH YELLOW TRACER
2 - GAGE OF WIRE (18 GAGE)
3 - PART OF MAIN CIRCUIT (VARIES DEPENDING ON EQUIPMENT)
4 - MAIN CIRCUIT IDENTIFICATION

WIRE COLOR CODE CHART

COLOR CODE	COLOR
BL	BLUE
BK	BLACK
BR	BROWN
DB	DARK BLUE
DG	DARK GREEN
GY	GRAY
LB	LIGHT BLUE
LG	LIGHT GREEN
OR	ORANGE
PK	PINK
RD	RED
TN	TAN
VT	VIOLET
WT	WHITE
YL	YELLOW
*	WITH TRACER

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CIRCUIT FUNCTIONS

All circuits in the diagrams use an alpha/numeric code to identify the wire and it's function. To identify which circuit code applies to a system, refer to the Circuit Identification Code Chart. This chart shows the main circuits only and does not show the secondary codes that may apply to some models.

CIRCUIT IDENTIFICATION CODE CHART

CIRCUIT	FUNCTION
A	BATTERY FEED
B	BRAKE CONTROLS
C	CLIMATE CONTROLS
D	DIAGNOSTIC CIRCUITS
E	DIMMING ILLUMINATION CIRCUITS
F	FUSED CIRCUITS
G	MONITORING CIRCUITS (GAUGES)
H	OPEN
I	NOT USED
J	OPEN
K	POWERTRAIN CONTROL MODULE
L	EXTERIOR LIGHTING
M	INTERIOR LIGHTING
N	NOT USED
O	NOT USED
P	POWER OPTION (BATTERY FEED)
Q	POWER OPTIONS (IGNITION FEED)
R	PASSIVE RESTRAINT
S	SUSPENSION/STEERING
T	TRANSMISSION/TRANSAXLE/ TRANSFER CASE
U	OPEN
V	SPEED CONTROL, WIPER/ WASHER
W	OPEN
X	AUDIO SYSTEMS
Y	OPEN
Z	GROUNDS

DESCRIPTION - SECTION IDENTIFICATION AND INFORMATION

The wiring diagrams are grouped into individual sections. If a component is most likely found in a particular group, it will be shown complete (all wires, connectors, and pins) within that group. For example, the Auto Shutdown Relay is most likely to be found in Group 30, so it is shown there complete. It can, however, be shown partially in another group if it contains some associated wiring.

Splice diagrams in Section 8W-70 show the entire splice and provide references to other sections the splices serves. Section 8W-70 only contains splice diagrams that are not shown in their entirety somewhere else in the wiring diagrams.

Section 8W-80 shows each connector and the circuits involved with that connector. The connectors are identified using the name/number on the diagram pages.

WIRING SECTION CHART

GROUP	TOPIC
8W-01 thru 8W-09	General information and Diagram Overview
8W-10 thru 8W-19	Main Sources of Power and Vehicle Grounding
8W-20 thru 8W-29	Starting and Charging
8W-30 thru 8W-39	Powertrain/Drivetrain Systems
8W-40 thru 8W-49	Body Electrical items and A/C
8W-50 thru 8W-59	Exterior Lighting, Wipers and Trailer Tow
8W-60 thru 8W-69	Power Accessories
8W-70	Splice Information
8W-80	Connector Pin Outs
8W-91	Connector, Ground and Splice Locations

WIRING DIAGRAM INFORMATION (Continued)

DESCRIPTION - CONNECTOR, GROUND AND SPLICE INFORMATION

CAUTION: Not all connectors are serviced. Some connectors are serviced only with a harness. A typical example might be the Supplemental Restraint System connectors. Always check parts availability before attempting a repair.

IDENTIFICATION

In-line connectors are identified by a number, as follows:

- In-line connectors located in the engine compartment are C100 series numbers
- In-line connectors located in the Instrument Panel area are C200 series numbers.
- In-line connectors located in the body are C300 series numbers.
- Jumper harness connectors are C400 series numbers.
- Grounds and ground connectors are identified with a "G" and follow the same series numbering as the in-line connectors.
- Splices are identified with an "S" and follow the same series numbering as the in-line connectors.
- Component connectors are identified by the component name instead of a number. Multiple connectors on a component use a C1, C2, etc. identifier.

LOCATIONS

Section 8W-91 contains connector/ground/splice location illustrations. The illustrations contain the connector name (or number)/ground number/splice number and component identification. Connector/ground/splice location charts in section 8W-91 reference the figure numbers of the illustrations.

The abbreviation T/O is used in the component location section to indicate a point in which the wiring harness branches out to a component. The abbreviation N/S means Not Shown in the illustrations

WARNING

WARNINGS - GENERAL

WARNINGS provide information to prevent personal injury and vehicle damage. Below is a list of general warnings that should be followed any time a vehicle is being serviced.

WARNING: ALWAYS WEAR SAFETY GLASSES FOR EYE PROTECTION.

WARNING: USE SAFETY STANDS ANYTIME A PROCEDURE REQUIRES BEING UNDER A VEHICLE.

WARNING: BE SURE THAT THE IGNITION SWITCH ALWAYS IS IN THE OFF POSITION, UNLESS THE PROCEDURE REQUIRES IT TO BE ON.

WARNING: SET THE PARKING BRAKE WHEN WORKING ON ANY VEHICLE. AN AUTOMATIC TRANSMISSION SHOULD BE IN PARK. A MANUAL TRANSMISSION SHOULD BE IN NEUTRAL.

WARNING: OPERATE THE ENGINE ONLY IN A WELL-VENTILATED AREA.

WARNING: KEEP AWAY FROM MOVING PARTS WHEN THE ENGINE IS RUNNING, ESPECIALLY THE FAN AND BELTS.

WARNING: TO PREVENT SERIOUS BURNS, AVOID CONTACT WITH HOT PARTS SUCH AS THE RADIATOR, EXHAUST MANIFOLD(S), TAIL PIPE, CATALYTIC CONVERTER AND MUFFLER.

WARNING: DO NOT ALLOW FLAME OR SPARKS NEAR THE BATTERY. GASES ARE ALWAYS PRESENT IN AND AROUND THE BATTERY.

WARNING: ALWAYS REMOVE RINGS, WATCHES, LOOSE HANGING JEWELRY AND AVOID LOOSE CLOTHING.

DIAGNOSIS AND TESTING - WIRING HARNESS

TROUBLESHOOTING TOOLS

When diagnosing a problem in an electrical circuit there are several common tools necessary. These tools are listed and explained below.

- Jumper Wire - This is a test wire used to connect two points of a circuit. It can be used to bypass an open in a circuit.

WARNING: NEVER USE A JUMPER WIRE ACROSS A LOAD, SUCH AS A MOTOR, CONNECTED BETWEEN A BATTERY FEED AND GROUND.

- Voltmeter - Used to check for voltage on a circuit. Always connect the black lead to a known good ground and the red lead to the positive side of the circuit.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking voltages in these circuits, use a meter with a 10 - megohm or greater impedance rating.

WIRING DIAGRAM INFORMATION (Continued)

• Ohmmeter - Used to check the resistance between two points of a circuit. Low or no resistance in a circuit means good continuity.

CAUTION: Most of the electrical components used in today's vehicles are Solid State. When checking resistance in these circuits use a meter with a 10 - megohm or greater impedance rating. In addition, make sure the power is disconnected from the circuit. Circuits that are powered up by the vehicle's electrical system can cause damage to the equipment and provide false readings.

• Probing Tools - These tools are used for probing terminals in connectors (Fig. 5). Select the proper size tool from Special Tool Package 6807, and insert it into the terminal being tested. Use the other end of the tool to insert the meter probe.

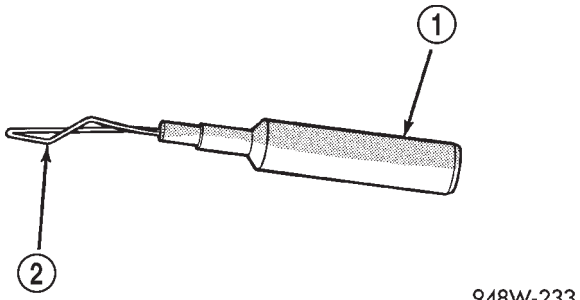


Fig. 5 PROBING TOOL

1 - SPECIAL TOOL 6801
2 - PROBING END

INTERMITTENT AND POOR CONNECTIONS

Most intermittent electrical problems are caused by faulty electrical connections or wiring. It is also possible for a sticking component or relay to cause a problem. Before condemning a component or wiring assembly, check the following items.

- Connectors are fully seated
- Spread terminals, or terminal push out
- Terminals in the wiring assembly are fully seated into the connector/component and locked into position
- Dirt or corrosion on the terminals. Any amount of corrosion or dirt could cause an intermittent problem
- Damaged connector/component casing exposing the item to dirt or moisture
- Wire insulation that has rubbed through causing a short to ground
- Some or all of the wiring strands broken inside of the insulation
- Wiring broken inside of the insulation

TROUBLESHOOTING WIRING PROBLEMS

When troubleshooting wiring problems there are six steps which can aid in the procedure. The steps are listed and explained below. Always check for non-factory items added to the vehicle before doing any diagnosis. If the vehicle is equipped with these items, disconnect them to verify these add-on items are not the cause of the problem.

(1) Verify the problem.

(2) Verify any related symptoms. Do this by performing operational checks on components that are in the same circuit. Refer to the wiring diagrams.

(3) Analyze the symptoms. Use the wiring diagrams to determine what the circuit is doing, where the problem most likely is occurring and where the diagnosis will continue.

(4) Isolate the problem area.

(5) Repair the problem area.

(6) Verify the proper operation. For this step, check for proper operation of all items on the repaired circuit. Refer to the wiring diagrams.

STANDARD PROCEDURE

STANDARD PROCEDURE - ELECTROSTATIC DISCHARGE (ESD) SENSITIVE DEVICES

All ESD sensitive components are solid state and a symbol (Fig. 6) is used to indicate this. When handling any component with this symbol, comply with the following procedures to reduce the possibility of electrostatic charge build up on the body and inadvertent discharge into the component. If it is not known whether the part is ESD sensitive, assume that it is.

(1) Always touch a known good ground before handling the part. This should be repeated while handling the part and more frequently after sliding across a seat, sitting down from a standing position, or walking a distance.

(2) Avoid touching electrical terminals of the part, unless instructed to do so by a written procedure.

(3) When using a voltmeter, be sure to connect the ground lead first.

(4) Do not remove the part form it's protective packing until it is time to install the part.

(5) Before removing the part from it's pakage, ground the pakage to a known good ground on the vehicle.

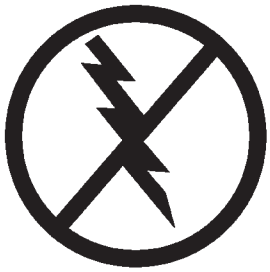


Fig. 6 ELECTROSTATIC DISCHARGE SYMBOL

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - TESTING OF VOLTAGE POTENTIAL

(1) Connect the ground lead of a voltmeter to a known good ground (Fig. 7).

(2) Connect the other lead of the voltmeter to the selected test point. The vehicle ignition may need to be turned ON to check voltage. Refer to the appropriate test procedure.

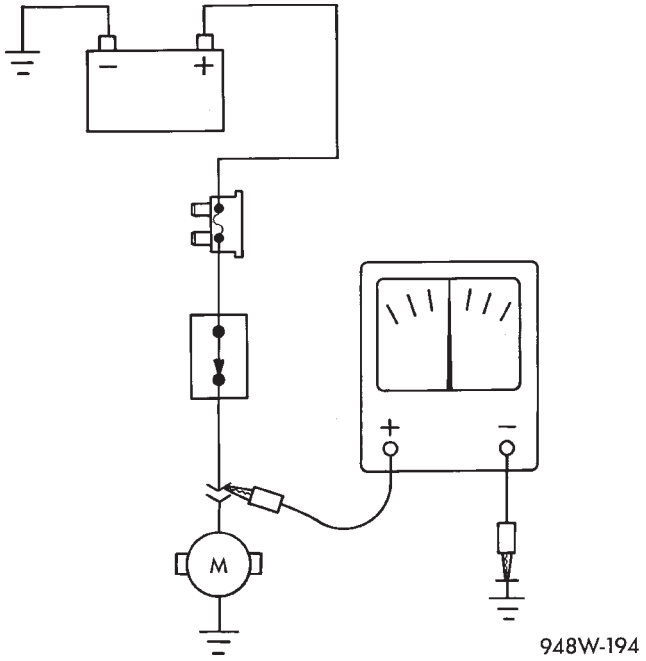


Fig. 7 TESTING FOR VOLTAGE POTENTIAL

STANDARD PROCEDURE - TESTING FOR CONTINUITY

(1) Remove the fuse for the circuit being checked or, disconnect the battery.

(2) Connect one lead of the ohmmeter to one side of the circuit being tested (Fig. 8).

(3) Connect the other lead to the other end of the circuit being tested. Low or no resistance means good continuity.

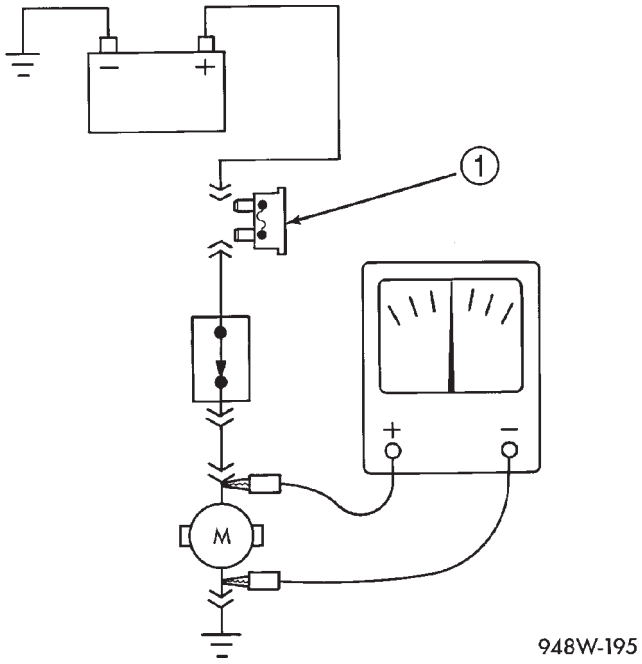


Fig. 8 TESTING FOR CONTINUITY

1 - FUSE REMOVED FROM CIRCUIT

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND

(1) Remove the fuse and disconnect all items involved with the fuse.

(2) Connect a test light or a voltmeter across the terminals of the fuse.

(3) Starting at the fuse block, wiggle the wiring harness about six to eight inches apart and watch the voltmeter/test lamp.

(4) If the voltmeter registers voltage or the test lamp glows, there is a short to ground in that general area of the wiring harness.

WIRING DIAGRAM INFORMATION (Continued)

STANDARD PROCEDURE - TESTING FOR A SHORT TO GROUND ON FUSES POWERING SEVERAL LOADS

(1) Refer to the wiring diagrams and disconnect or isolate all items on the suspected fused circuits.
(2) Replace the blown fuse.
(3) Supply power to the fuse by turning ON the ignition switch or re-connecting the battery.
(4) Start connecting or energizing the items in the fuse circuit one at a time. When the fuse blows the circuit with the short to ground has been isolated.

STANDARD PROCEDURE - TESTING FOR A VOLTAGE DROP

(1) Connect the positive lead of the voltmeter to the side of the circuit closest to the battery (Fig. 9).
(2) Connect the other lead of the voltmeter to the other side of the switch, component or circuit.
(3) Operate the item.
(4) The voltmeter will show the difference in voltage between the two points.

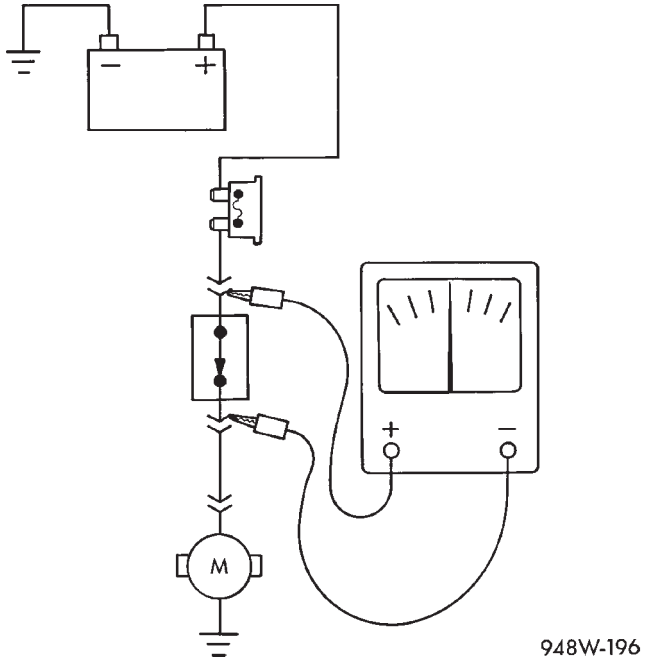
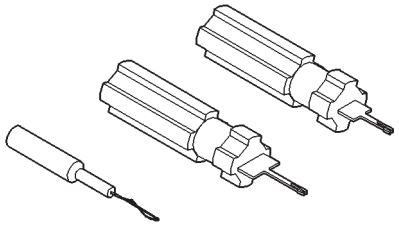


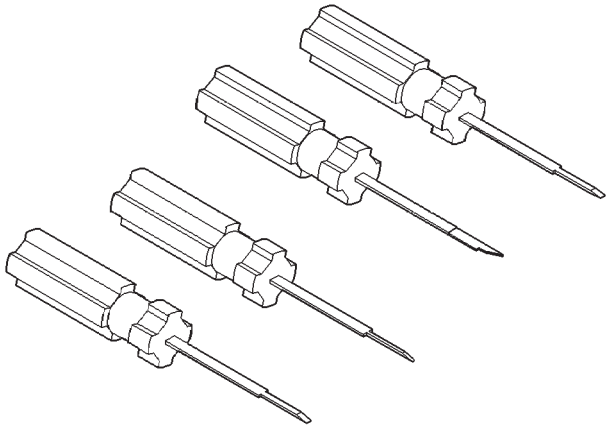
Fig. 9 TESTING FOR VOLTAGE DROP

SPECIAL TOOLS

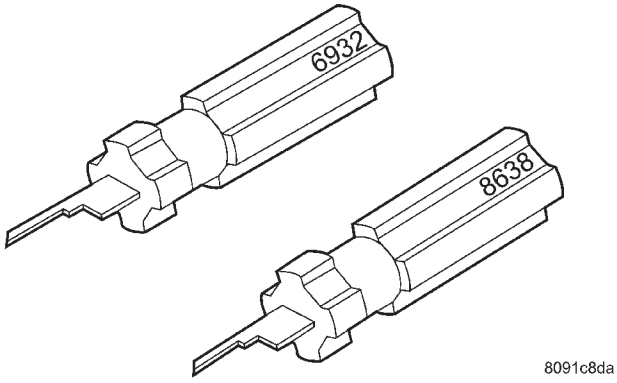
WIRING/TERMINAL



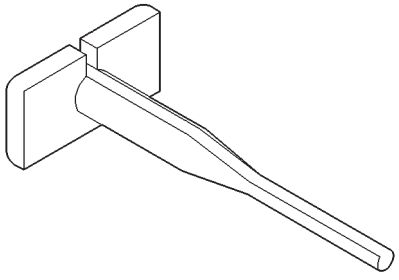
PROBING TOOL PACKAGE 6807



TERMINAL PICK TOOL SET 6680



TERMINAL REMOVING TOOLS 6932 AND 8638



TERMINAL REMOVING TOOL 6934

CONNECTOR

REMOVAL

(1) Disconnect battery.
(2) Release Connector Lock (Fig. 10).
(3) Disconnect the connector being repaired from its mating half/component.
(4) Remove the dress cover (if applicable) (Fig. 10).

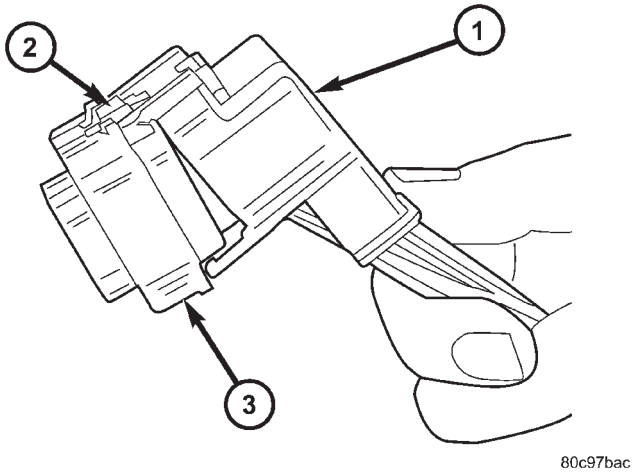


Fig. 10 REMOVAL OF DRESS COVER

1 - DRESS COVER
2 - CONNECTOR LOCK
3 - CONNECTOR

(5) Release the Secondary Terminal Lock, if required (Fig. 11).
(6) Position the connector locking finger away from the terminal using the proper special tool. Pull on the wire to remove the terminal from the connector (Fig. 12).

INSTALLATION

(1) Insert the removed terminal in the same cavity on the repair connector.
(2) Repeat steps for each terminal in the connector, being sure that all wires are inserted into the proper cavities. For additional connector pin-out identification, refer to the wiring diagrams.
(3) When the connector is re-assembled, the secondary terminal lock must be placed in the locked position to prevent terminal push out.
(4) Replace dress cover (if applicable).
(5) Connect connector to its mating half/component.
(6) Connect battery and test all affected systems.

CONNECTOR (Continued)

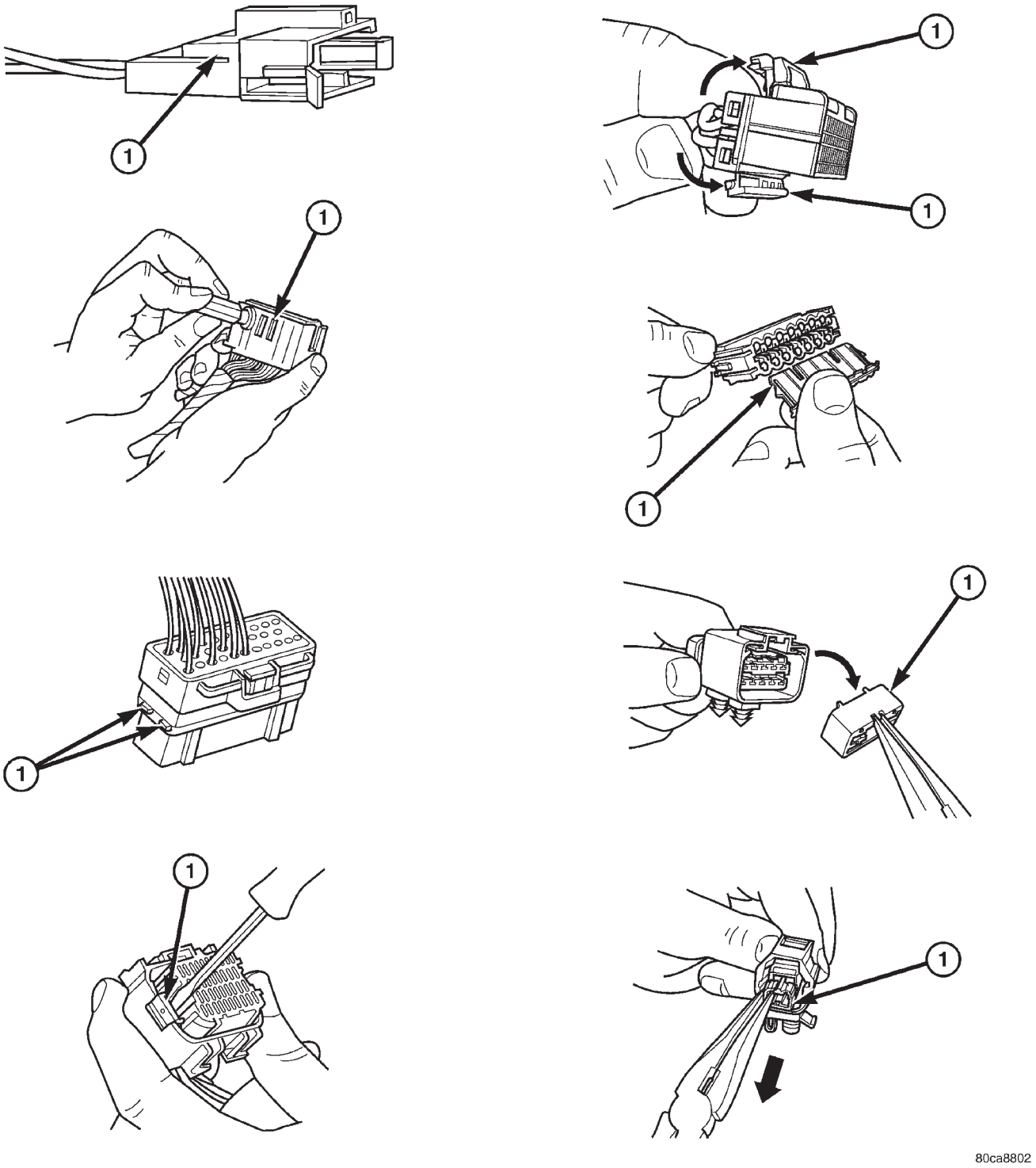


Fig. 11 EXAMPLES OF CONNECTOR SECONDARY TERMINAL LOCKS

1 - Secondary Terminal Lock

CONNECTOR (Continued)

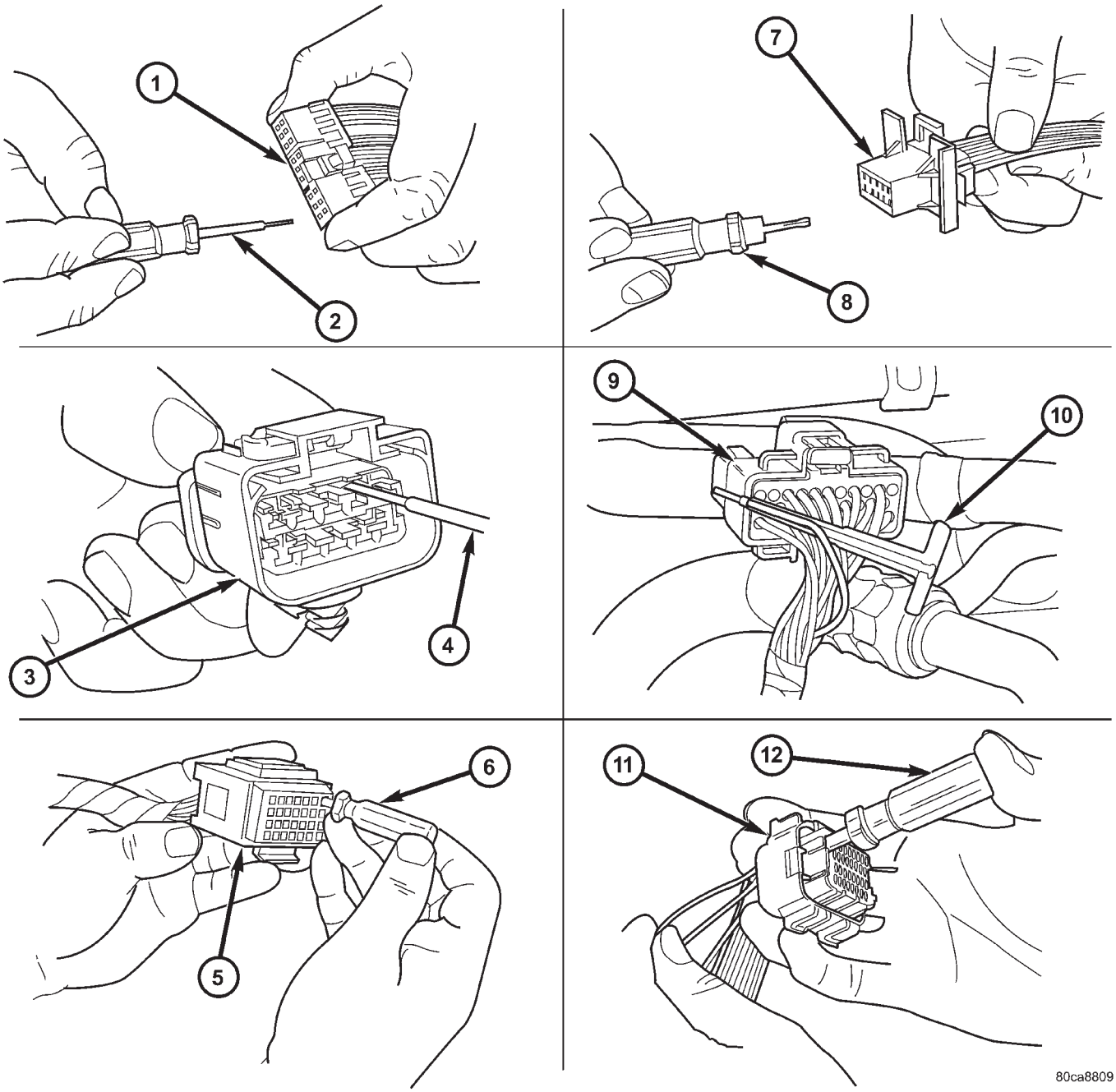


Fig. 12 TERMINAL REMOVAL

1 - TYPICAL CONNECTOR
2 - PICK FROM SPECIAL TOOL KIT 6680
3 - APEX CONNECTOR
4 - PICK FROM SPECIAL TOOL KIT 6680
5 - AUGAT CONNECTOR
6 - SPECIAL TOOL 6932
7 - MOLEX CONNECTOR
8 - SPECIAL TOOL 6742
9 - THOMAS AND BETTS CONNECTOR
10 - SPECIAL TOOL 6934
11 - TYCO CONNECTOR
12 - SPECIAL TOOL 8638

DIODE

REMOVAL

(1) Disconnect the battery.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 13).

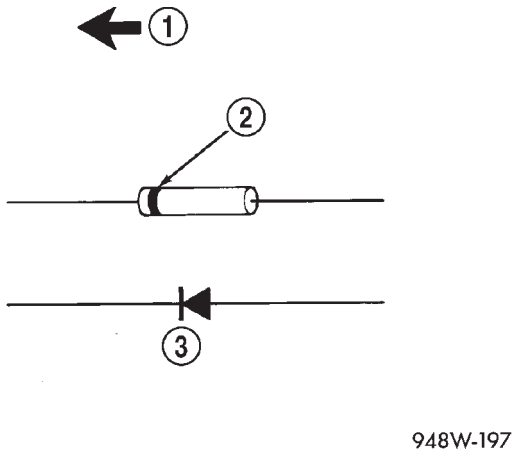


Fig. 13 DIODE IDENTIFICATION

1 - CURRENT FLOW
2 - BAND AROUND DIODE INDICATES CURRENT FLOW
3 - DIODE AS SHOWN IN THE DIAGRAMS

INSTALLATION

(1) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(2) Install the new diode in the harness, making sure current flow is correct. If necessary, refer to the appropriate wiring diagram for current flow (Fig. 13).

(3) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(4) Tape the diode to the harness using electrical tape. Make sure the diode is completely sealed from the elements.

(5) Re-connect the battery and test affected systems.

TERMINAL

REMOVAL

(1) Follow steps for removing terminals described in the connector removal section.

(2) Cut the wire 6 inches from the back of the connector.

INSTALLATION

(1) Select a wire from the terminal repair kit that best matches the color and gage of the wire being repaired.

(2) Cut the repair wire to the proper length and remove one–half (1/2) inch of insulation.

(3) Splice the repair wire to the wire harness (see wire splicing procedure).

(4) Insert the repaired wire into the connector.

(5) Install the connector locking wedge, if required, and reconnect the connector to its mating half/component.

(6) Re-tape the wire harness starting at 1–1/2 inches behind the connector and 2 inches past the repair.

(7) Connect battery and test all affected systems.

WIRE

STANDARD PROCEDURE - WIRE SPLICING

When splicing a wire, it is important that the correct gage be used as shown in the wiring diagrams.

(1) Remove one-half (1/2) inch of insulation from each wire that needs to be spliced.

(2) Place a piece of adhesive lined heat shrink tubing on one side of the wire. Make sure the tubing will be long enough to cover and seal the entire repair area.

(3) Place the strands of wire overlapping each other inside of the splice clip (Fig. 14).

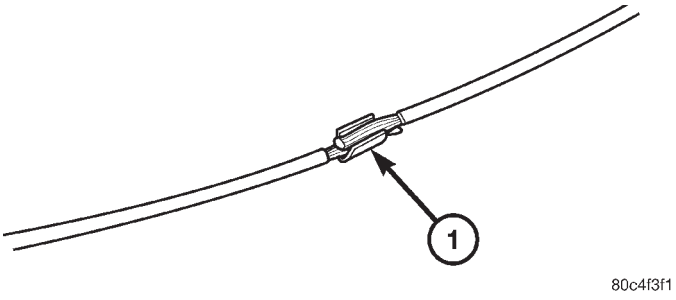


Fig. 14 SPLICE BAND

1 - SPLICE BAND

(4) Using crimping tool, Mopar p/n 05019912AA, crimp the splice clip and wires together (Fig. 15).

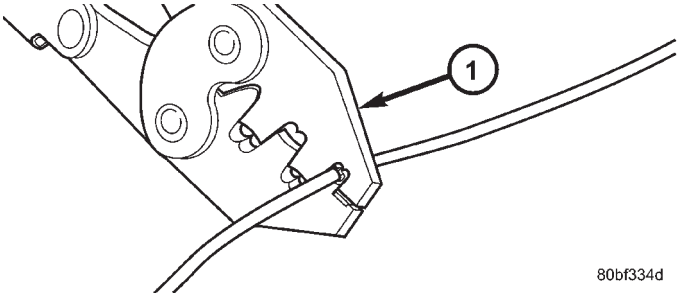


Fig. 15 CRIMPING TOOL

1 - CRIMPING TOOL

(5) Solder the connection together using rosin core type solder only (Fig. 16).

CAUTION: DO NOT USE ACID CORE SOLDER.

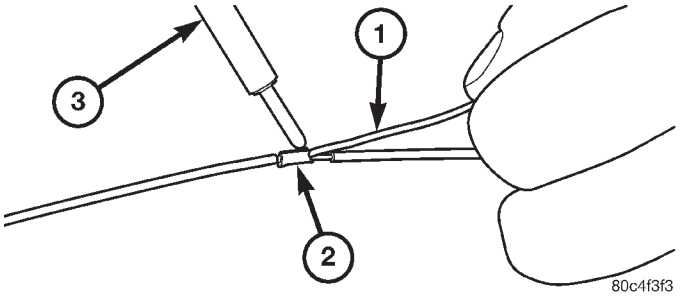


Fig. 16 SOLDER SPLICE

1 - SOLDER
2 - SPLICE BAND
3 - SOLDERING IRON

(6) Center the heat shrink tubing over the joint and heat using a heat gun. Heat the joint until the tubing is tightly sealed and sealant comes out of both ends of the tubing (Fig. 17).

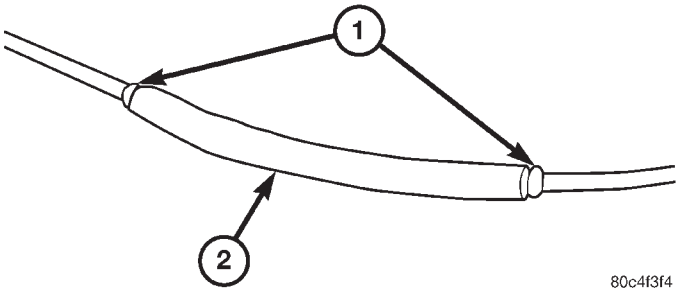


Fig. 17 HEAT SHRINK TUBE

1 - SEALANT
2 - HEAT SHRINK TUBE

8W-02 COMPONENT INDEX

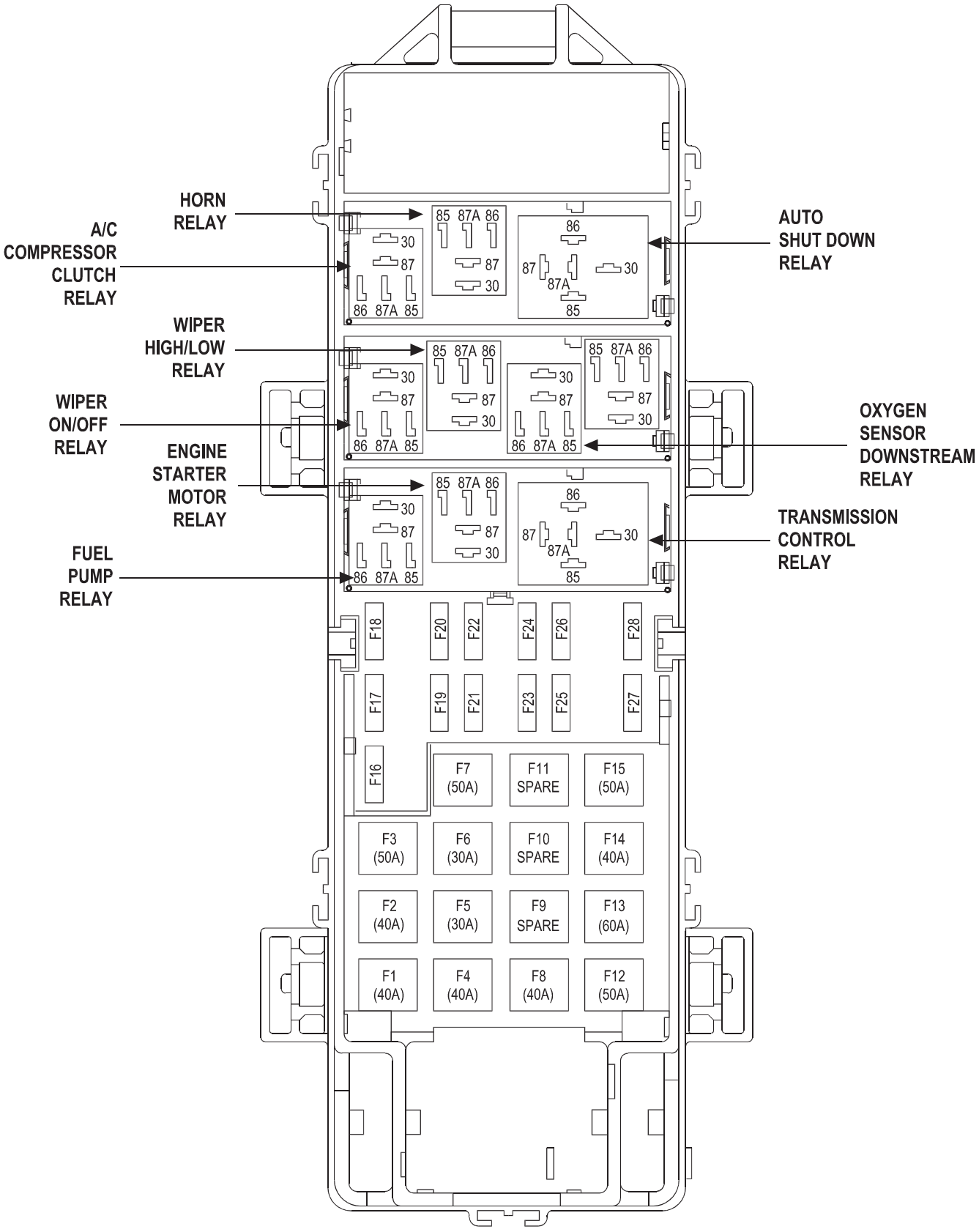
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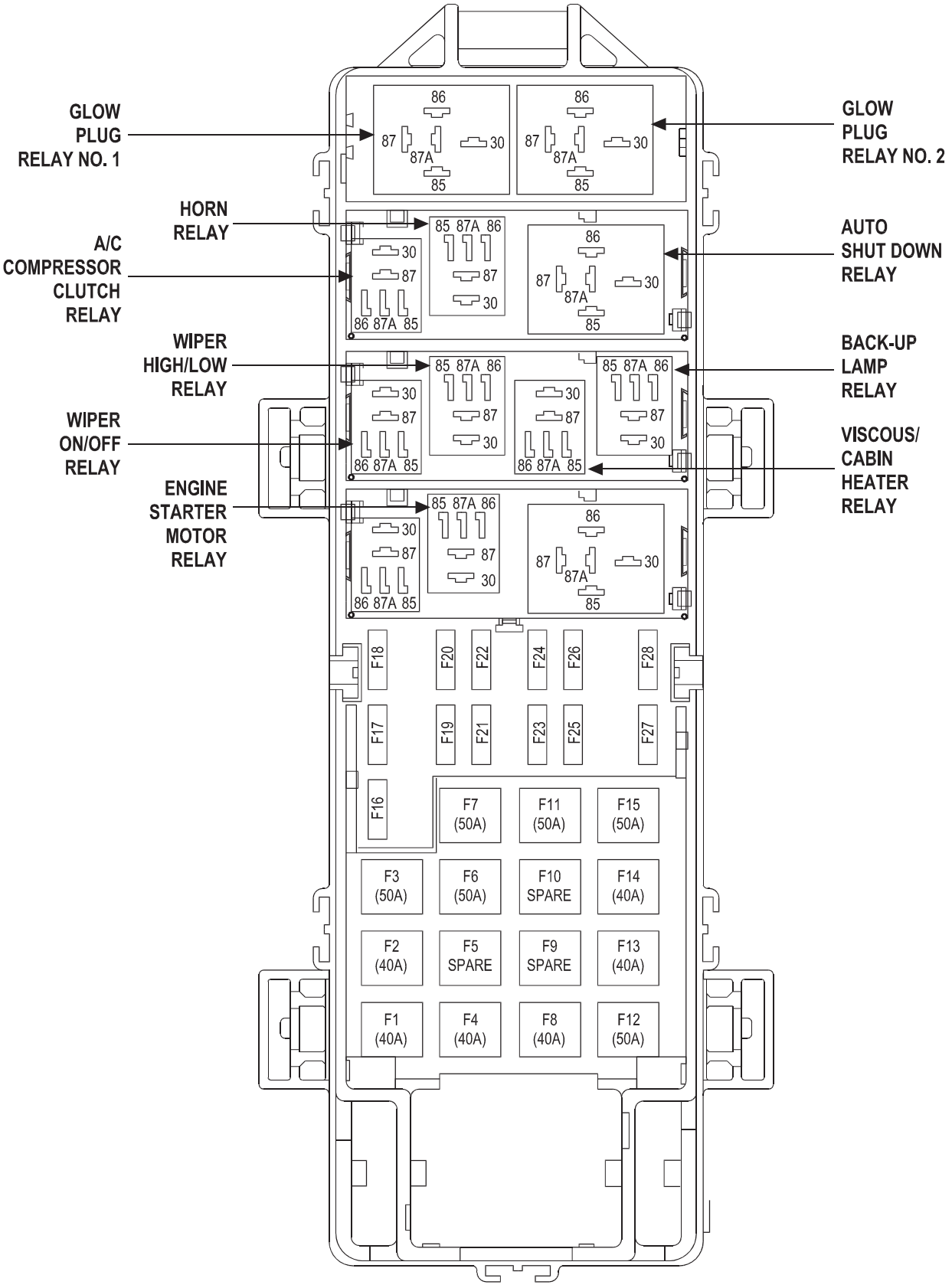
8W-10 POWER DISTRIBUTION

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Water In Fuel Sensor	8W-10-26

POWER DISTRIBUTION CENTER



POWER DISTRIBUTION CENTER



FUSES (GAS)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	C1 12DG	FUSED B(+)
2	40A	A149 12RD/TN	FUSED B(+)
3	50A	A145 10WT/RD	FUSED B(+)
4	40A	A10 12RD/DG	FUSED B(+)
5	30A	A30 14RD/WT A30 14RD/WT ◇◇	FUSED B(+)
6	30A	A14 14RD/DG	FUSED B(+)
7	50A	A147 10RD/GY	FUSED B(+)
8	40A	A1 12RD	FUSED B(+)
9	-	-	-
10	-	-	-
11	-	-	-
12	50A	A146 10OR/WT	FUSED B(+)
13	60A	A80 10RD/LG	FUSED B(+)
14	40A	A2 12PK/BK	FUSED B(+)
15	50A	A148 10PK/WT	FUSED B(+)
16	15A	F142 18OR/DG F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	15A	F62 18RD F62 18RD	FUSED B(+)
19	10A	A7 14RD/BK	FUSED B(+)
20	20A	A110 16VT/RD	FUSED B(+)
21	15A	A17 18RD/BK	FUSED B(+)
22	-	-	-
23	-	-	-
24	20A	A62 16VT/LB ●	FUSED B(+)
24	20A	A62 16VT/WT ●●	FUSED B(+)
25	20A	A20 12RD/DB	FUSED B(+)
26	15A	F42 18DG/LG F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	20A	A148 16LG/RD	FUSED B(+)
28	15A	T15 18YL/BR ◇	FUSED TRANSMISSION CONTROL RELAY OUTPUT

◇ 4.0L ● LHD
◇◇ 4.7L ●● RHD

FUSES (DIESEL)

FUSE NO.	AMPS	FUSED CIRCUIT	FUNCTION
1	40A	C1 12DG	FUSED B(+)
2	40A	A149 12RD/TN	FUSED B(+)
3	50A	A145 10WT/RD	FUSED B(+)
4	40A	A10 12RD/DG	FUSED B(+)
5	-	-	-
6	50A	A105 10DB/RD	FUSED B(+)
7	50A	A147 10RD/GY	FUSED B(+)
8	40A	A1 12RD	FUSED B(+)
9	-	-	-
10	-	-	-
11	50A	A110 10VT/RD	FUSED B(+)
12	50A	A146 10OR/WT	FUSED B(+)
13	40A	A14 14RD/WT	FUSED B(+)
14	40A	A2 12PK/BK	FUSED B(+)
15	50A	A148 10PK/WT	FUSED B(+)
16	20A	F15 18DB/WT F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
17	-	-	-
18	15A	F62 18RD F62 18RD	FUSED B(+)
19	-	-	-
20	-	-	-
21	15A	A17 14RD/BK	FUSED B(+)
22	10A	F300 18RD/BK	FUSED B(+)
23	15A	A80 18RD/LG	FUSED B(+)
24	-	-	-
25	20A	A20 12RD/DB	FUSED B(+)
26	20A	F142 14OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
27	20A	A148 16LG/RD	FUSED B(+)
28	-	-	-

RELAYS

A/C COMPRESSOR CLUTCH RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A17 14RD/BK	FUSED B(+)
85	C13 18DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
86	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	C2 18DB/BK	A/C COMPRESSOR CLUTCH RELAY OUTPUT
87A	-	-

A/C COMPRESSOR CLUTCH RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A17 18RD/BK	FUSED B(+)
85	C13 18DB/OR ●	A/C COMPRESSOR CLUTCH RELAY CONTROL
	C13 20DB/OR ●●	A/C COMPRESSOR CLUTCH RELAY CONTROL
86	F12 18DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	C2 18DB/YL	A/C COMPRESSOR CLUTCH RELAY OUTPUT
87A	-	-

AUTO SHUT DOWN RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A14 14RD/WT	FUSED B(+)
85	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
86	A14 14RD/WT	FUSED B(+)
87	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
87A	-	-

● LHD
●● RHD

AUTO SHUT DOWN RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A14 14RD/DG	FUSED B(+)
85	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
86	F991 18OR/DB •	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F991 20OR/DB ••	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
87A	-	-

BACK-UP LAMP RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	F22 18WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
85	F22 18WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
	F22 18WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
86	T2 18TN/BK	TRS T2 SENSE
87	L1 18VT/BK	BACK-UP LAMP FEED
87A	-	-

ENGINE STARTER MOTOR RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A1 12RD	FUSED B(+)
85	T752 18DG/OR	ENGINE STARTER MOTOR RELAY CONTROL
86	F45 18YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
87	T40 12BR	ENGINE STARTER MOTOR RELAY OUTPUT
87A	-	-

• LHD
•• RHD

ENGINE STARTER MOTOR RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A1 12RD	FUSED B(+)
85	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE
	T41 18BK/WT ●●	PARK/NEUTRAL POSITION SWITCH SENSE
86	F45 18YL/RD ✳	FUSED IGNITION SWITCH OUTPUT (START)
	F45 18YL/RD ◇◇	FUSED IGNITION SWITCH OUTPUT (START)
86	F45 20YL/RD ✳✳	FUSED IGNITION SWITCH OUTPUT (START)
87	T40 12LG	ENGINE STARTER MOTOR RELAY OUTPUT
87A	-	-

FUEL PUMP RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A62 16VT/LB ●	FUSED B(+)
30	A62 16VT/WT ●●	FUSED B(+)
85	K31 18BR	FUEL PUMP RELAY CONTROL
86	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F991 20OR/DB ●●	FUSED IGNITION SWITCH OUTPUT (RUN-START)
	F991 18OR/DB ●	FUSED IGNITION SWITCH OUTPUT (RUN-START)
87	A141 16DG/WT ●	FUEL PUMP RELAY OUTPUT
87	A141 16DG/BK ●●	FUEL PUMP RELAY OUTPUT
87A	-	-

GLOW PLUG RELAY NO. 1 (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A105 10DB/RD	FUSED B(+)
85	K152 18WT	GLOW PLUG RELAY NO. 1 CONTROL
86	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	K154 10GY	GLOW PLUG RELAY NO. 1 OUTPUT
87A	-	-

● LHD
●● RHD
✳ EXCEPT 4.0L RHD
✳✳ 4.0L RHD
◇◇ 4.7L

GLOW PLUG RELAY NO. 2 (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A110 10VT/RD	FUSED B(+)
85	K236 18GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
86	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	K254 10GY/YL	GLOW PLUG RELAY NO. 2 OUTPUT
87A	-	-

HORN RELAY

CAVITY	CIRCUIT	FUNCTION
30	F62 18RD	FUSED B(+)
85	X3 20BK/RD	HORN RELAY CONTROL
86	F62 18RD	FUSED B(+)
87	X2 18DG/RD	HORN RELAY OUTPUT
	X2 18DG/RD ▽	HORN RELAY OUTPUT
87A	-	-

OXYGEN SENSOR DOWNSTREAM RELAY

CAVITY	CIRCUIT	FUNCTION
30	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
85	K512 18RD/YL	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
86	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	K200 18VT/OR	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
87A	-	-

TRANSMISSION CONTROL RELAY (GAS)

CAVITY	CIRCUIT	FUNCTION
30	A30 14RD/WT	FUSED B(+)
85	K125 18WT/DB ◇	GENERATOR SOURCE
85	Z307 18BK ◇◇	GROUND
86	K30 20PK/YL ●	TRANSMISSION CONTROL RELAY CONTROL
86	K30 20PK ●●	TRANSMISSION CONTROL RELAY CONTROL
87	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
87A	-	-

● LHD ▽ GAS
●● RHD ◇ 4.0L
◇◇ 4.7L

VISCOUS/ CABIN HEATER RELAY (DIESEL)

CAVITY	CIRCUIT	FUNCTION
30	A80 18RD/LG	FUSED B(+)
85	K132 18BR/BK	VISCOUS/CABIN HEATER RELAY CONTROL
86	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
87	A82 18PK/LG	VISCOUS/CABIN HEATER RELAY OUTPUT
87A	-	-

WIPER HIGH/LOW RELAY

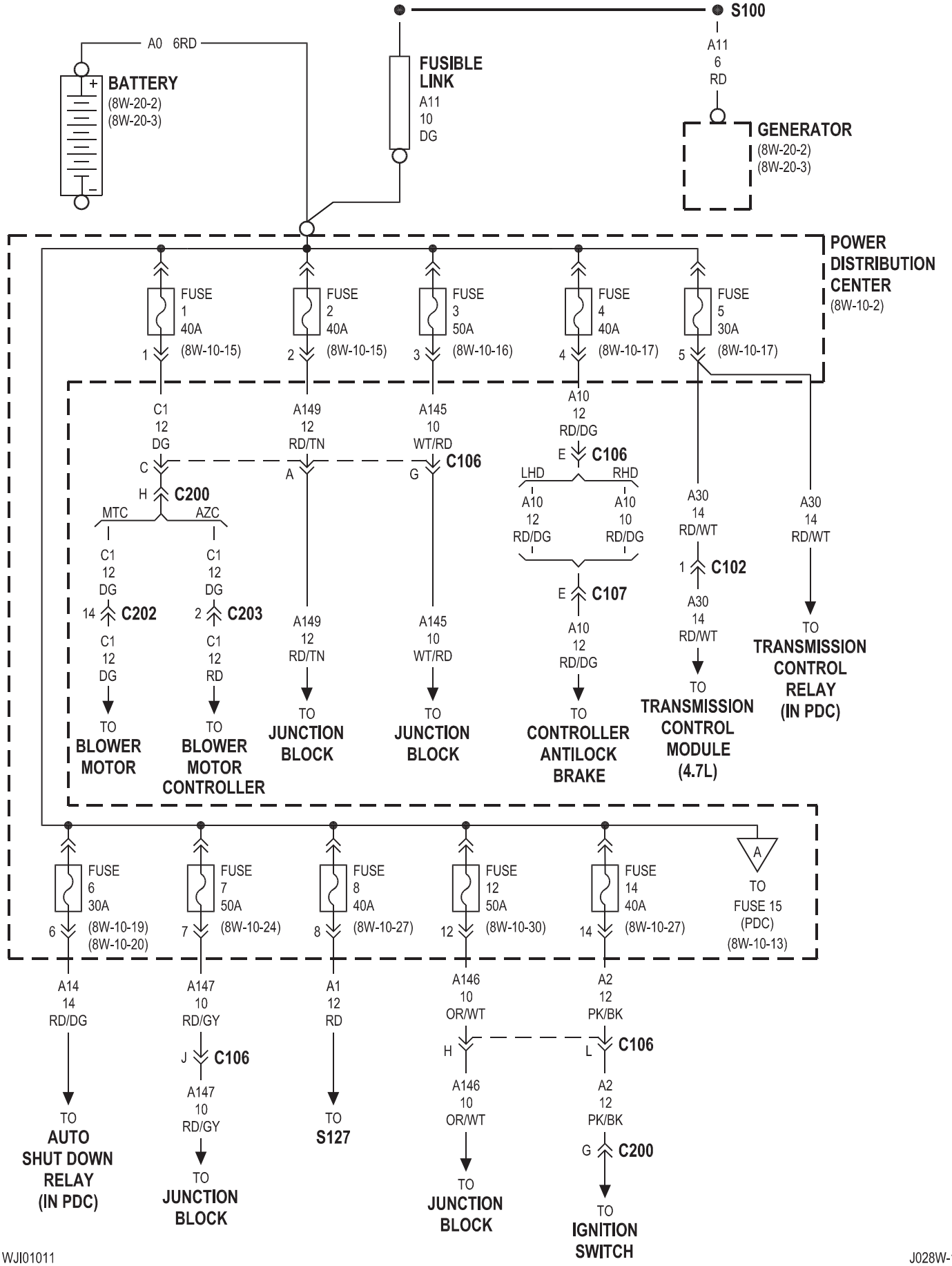
CAVITY	CIRCUIT	FUNCTION
30	V60 16YL/DG ▽	WIPER ON/OFF RELAY OUTPUT
30	V60 16TN/RD ▽▽	WIPER ON/OFF RELAY OUTPUT
85	V16 20VT	WIPER HIGH/LOW RELAY CONTROL
86	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB ▽▽	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87	V4 16RD/YL	WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT
87A	V3 16BR/WT	WIPER HIGH/LOW RELAY LOW SPEED OUTPUT

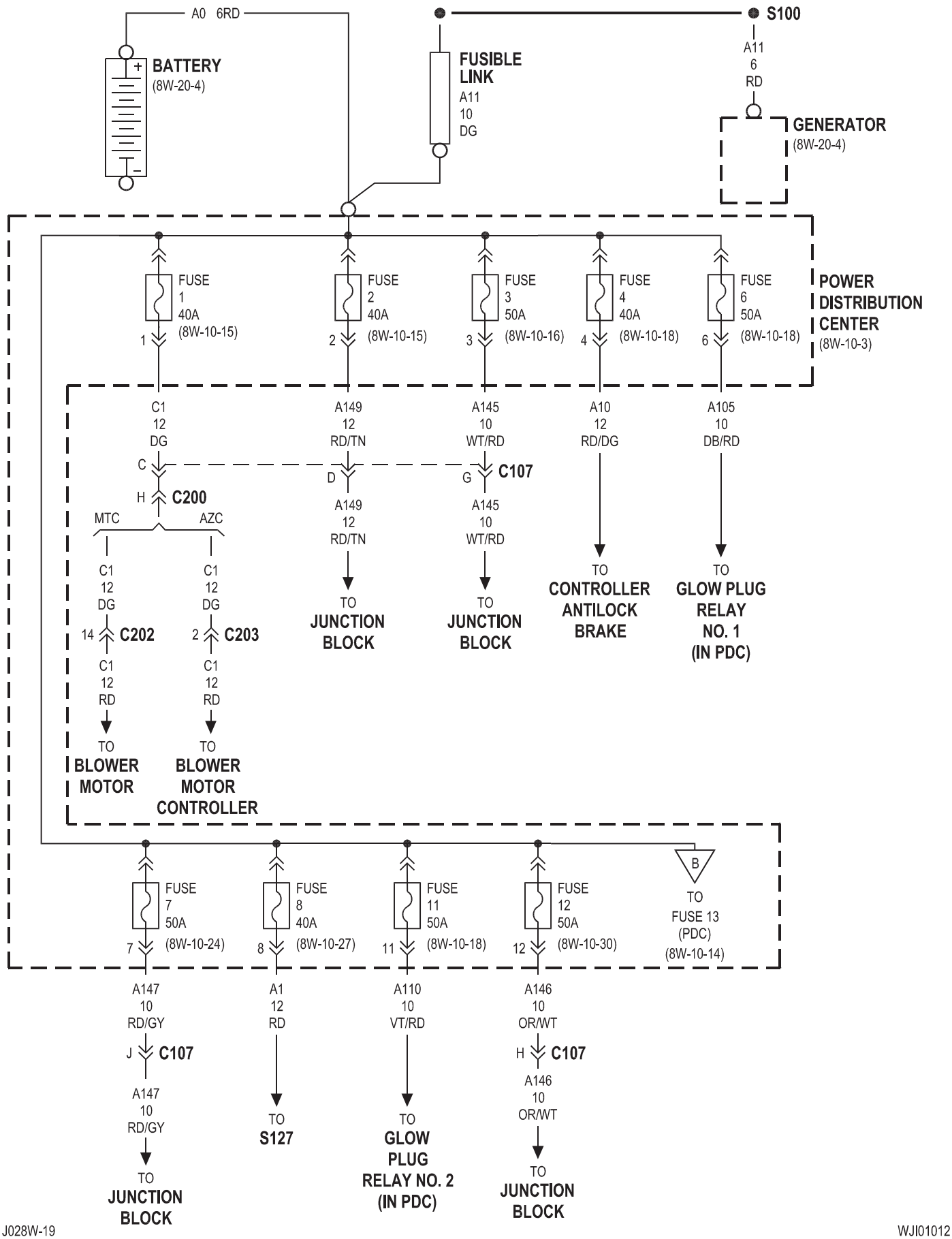
WIPER ON/OFF RELAY

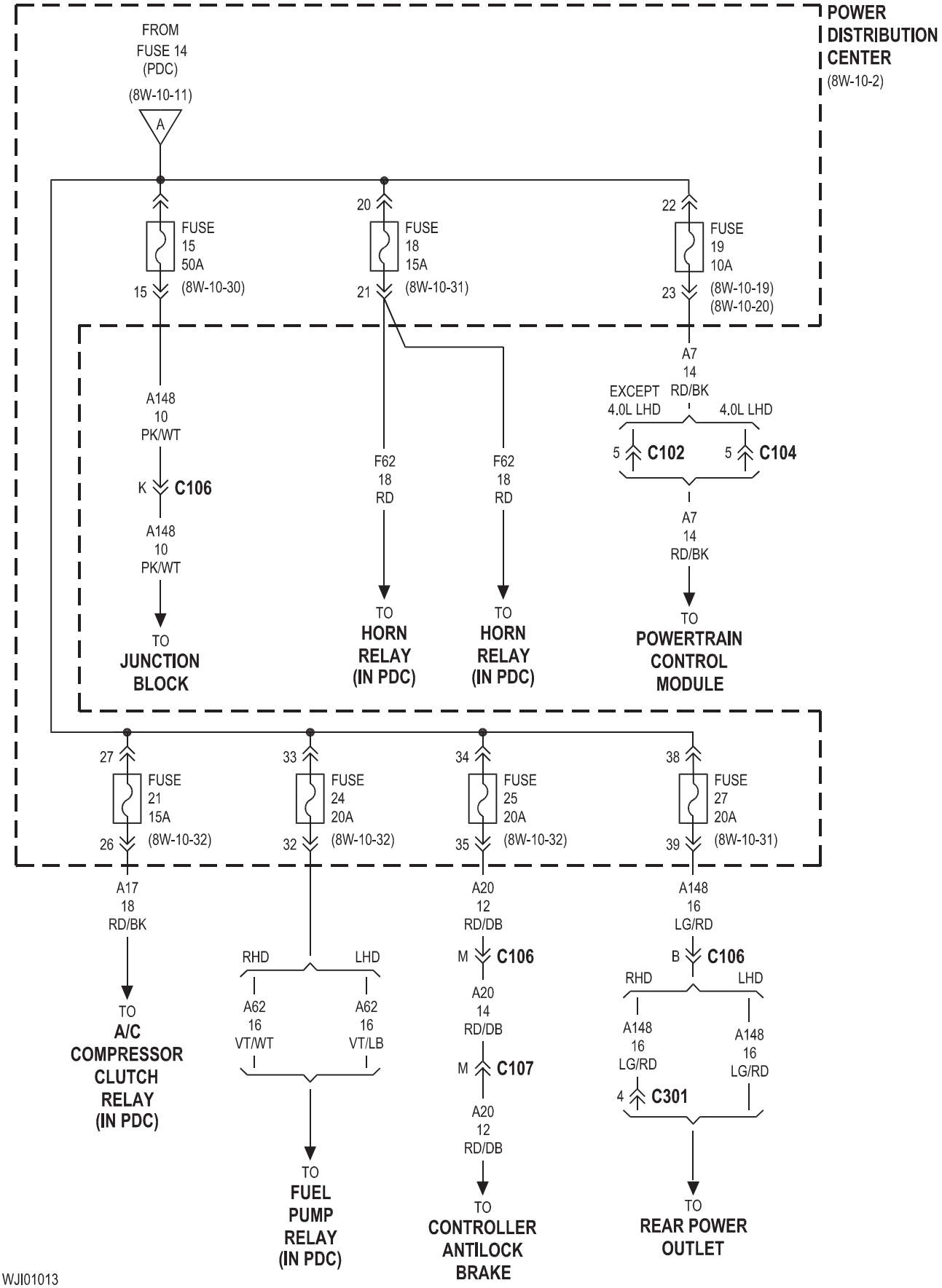
CAVITY	CIRCUIT	FUNCTION
30	V60 16YL/DG ▽	WIPER ON/OFF RELAY OUTPUT
30	V60 16TN/RD ▽▽	WIPER ON/OFF RELAY OUTPUT
85	V14 20RD/VT	WIPER ON/OFF RELAY CONTROL
86	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
87A	V55 16TN/RD	WIPER PARK SWITCH SENSE
	V55 16TN/RD ▽▽	WIPER PARK SWITCH SENSE

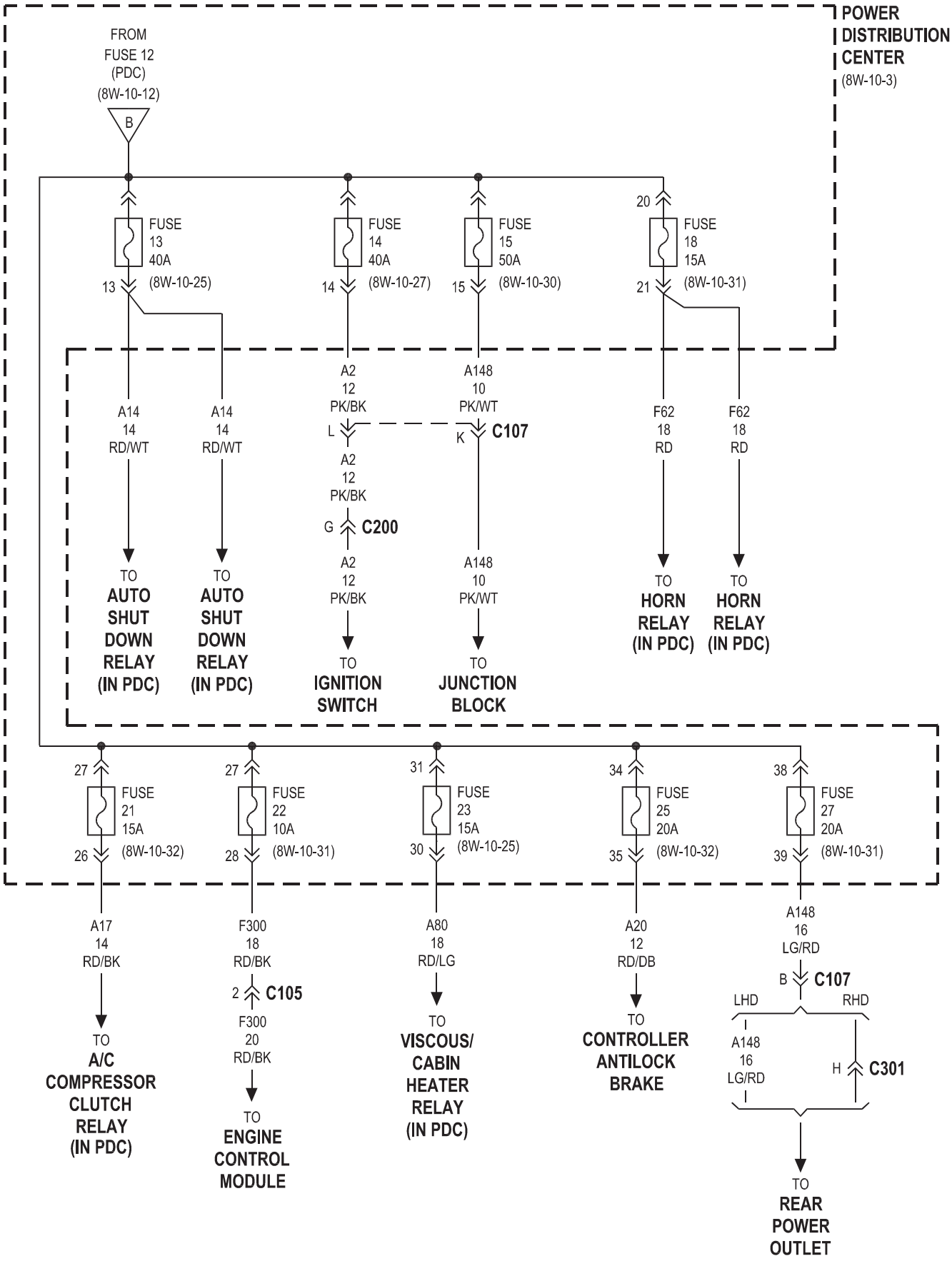
▽ GAS
▽▽ DIESEL

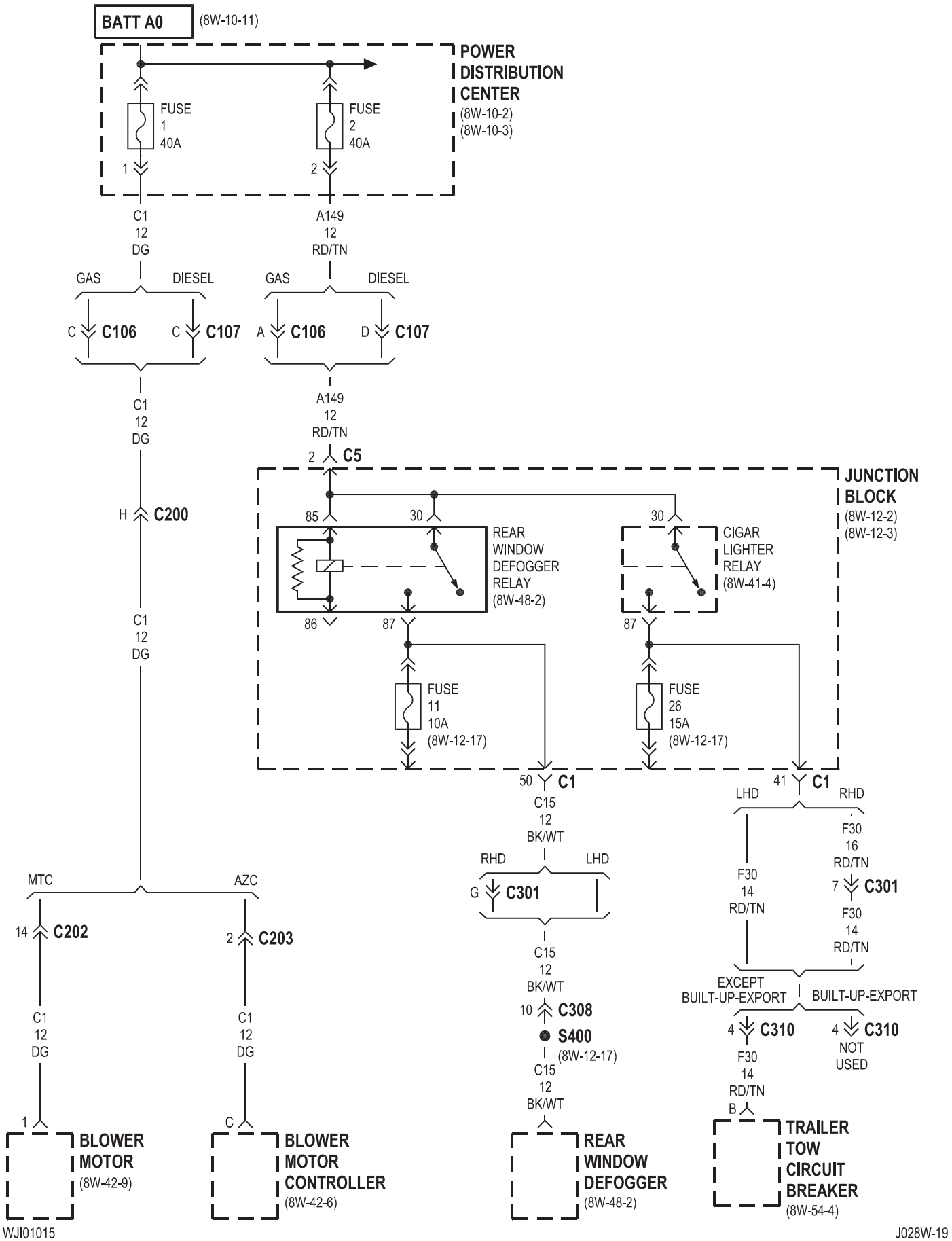
GAS


S100
A11
6
RD
A0 6RD
BATTERY
(8W-20-2)
(8W-20-3)
FUSIBLE
LINK
A11
10
DG
GENERATOR
(8W-20-2)
(8W-20-3)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
1
40A
(8W-10-15)
FUSE
2
40A
(8W-10-15)
FUSE
3
50A
(8W-10-16)
FUSE
4
40A
(8W-10-17)
FUSE
5
30A
(8W-10-17)
C1
12
DG
A149
12
RD/TN
A145
10
WT/RD
C106
A10
12
RD/DG
C106
LHD
RHD
A10
12
RD/DG
A10
10
RD/DG
A30
14
RD/WT
A30
14
RD/WT
C200
MTC
AZC
C202
C203
C107
C102
TO
BLOWER
MOTOR
TO
BLOWER
MOTOR
CONTROLLER
TO
JUNCTION
BLOCK
TO
JUNCTION
BLOCK
TO
CONTROLLER
ANTILOCK
BRAKE
TO
TRANSMISSION
CONTROL
MODULE
(4.7L)
TO
TRANSMISSION
CONTROL
RELAY
(IN PDC)
FUSE
6
30A
(8W-10-19)
(8W-10-20)
FUSE
7
50A
(8W-10-24)
FUSE
8
40A
(8W-10-27)
FUSE
12
50A
(8W-10-30)
FUSE
14
40A
(8W-10-27)
A
TO
FUSE 15
(PDC)
(8W-10-13)
A14
14
RD/DG
A147
10
RD/GY
A1
12
RD
A146
10
OR/WT
A2
12
PK/BK
C106
C106
C200
TO
AUTO
SHUT DOWN
RELAY
(IN PDC)
TO
JUNCTION
BLOCK
TO
S127
TO
JUNCTION
BLOCK
TO
IGNITION
SWITCH


A0 6RD
BATTERY
(8W-20-4)
FUSIBLE LINK
A11
10
DG
S100
A11
6
RD
GENERATOR
(8W-20-4)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 1 40A (8W-10-15)
FUSE 2 40A (8W-10-15)
FUSE 3 50A (8W-10-16)
FUSE 4 40A (8W-10-18)
FUSE 6 50A (8W-10-18)
C1 12 DG
A149 12 RD/TN
A145 10 WT/RD
A10 12 RD/DG
A105 10 DB/RD
C200
C107
MTC
AZC
C202
C203
C1 12 RD
TO BLOWER MOTOR
TO BLOWER MOTOR CONTROLLER
TO JUNCTION BLOCK
TO JUNCTION BLOCK
TO CONTROLLER ANTILOCK BRAKE
TO GLOW PLUG RELAY NO. 1 (IN PDC)
FUSE 7 50A (8W-10-24)
FUSE 8 40A (8W-10-27)
FUSE 11 50A (8W-10-18)
FUSE 12 50A (8W-10-30)
TO FUSE 13 (PDC) (8W-10-14)
A147 10 RD/GY
A1 12 RD
A110 10 VT/RD
A146 10 OR/WT
TO S127
TO GLOW PLUG RELAY NO. 2 (IN PDC)
TO JUNCTION BLOCK

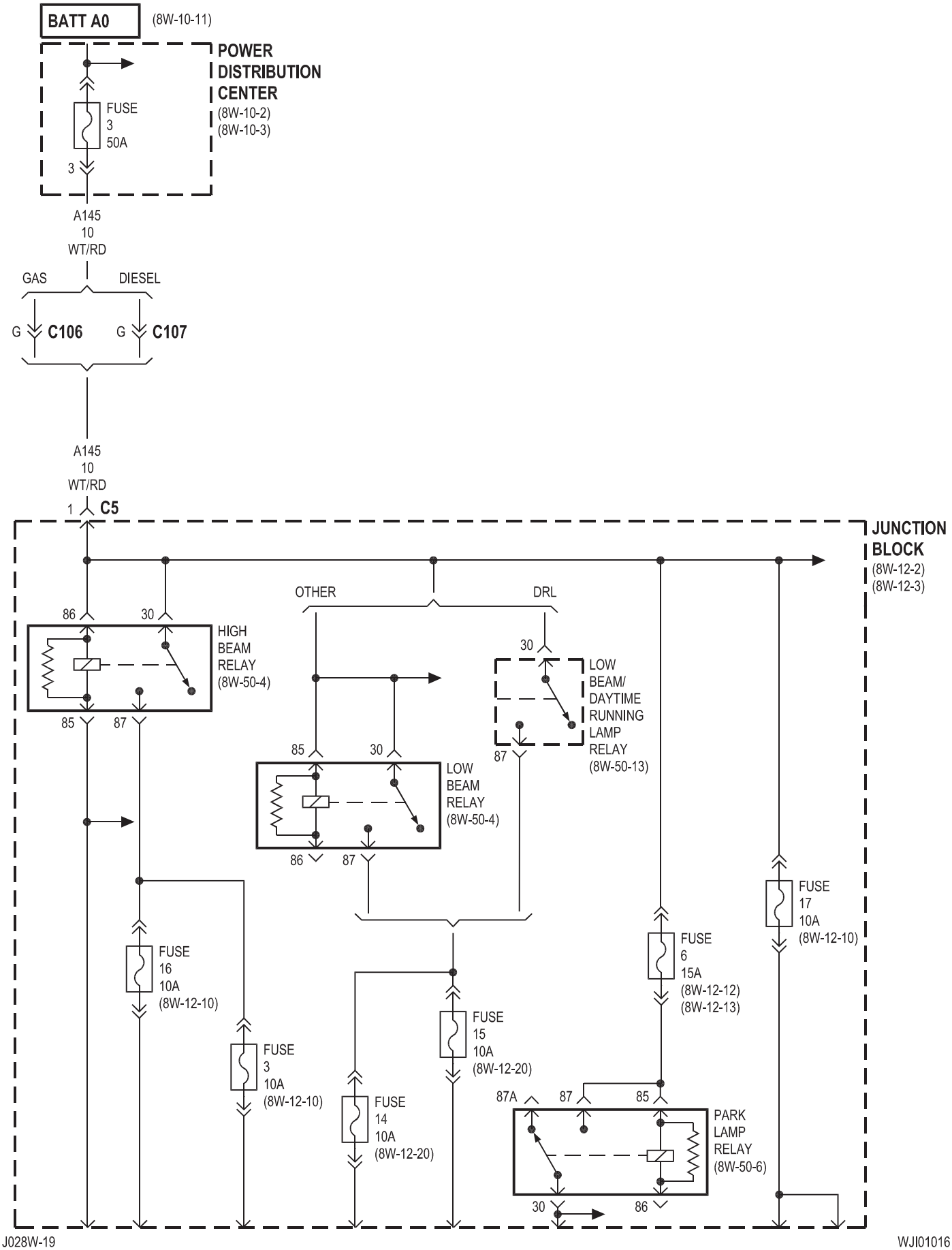

POWER DISTRIBUTION CENTER
(8W-10-2)
FROM FUSE 14 (PDC)
(8W-10-11)
A
FUSE 15 50A
15
(8W-10-30)
20
FUSE 18 15A
21
(8W-10-31)
22
FUSE 19 10A
23
(8W-10-19)
(8W-10-20)
A148 10 PK/WT
K C106
A148 10 PK/WT
TO JUNCTION BLOCK
F62 18 RD
TO HORN RELAY (IN PDC)
F62 18 RD
TO HORN RELAY (IN PDC)
A7 14 RD/BK
EXCEPT 4.0L LHD
4.0L LHD
5 C102
5 C104
A7 14 RD/BK
TO POWERTRAIN CONTROL MODULE
27
FUSE 21 15A
26
(8W-10-32)
33
FUSE 24 20A
32
(8W-10-32)
34
FUSE 25 20A
35
(8W-10-32)
38
FUSE 27 20A
39
(8W-10-31)
A17 18 RD/BK
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
RHD
LHD
A62 16 VT/WT
A62 16 VT/LB
TO FUEL PUMP RELAY (IN PDC)
A20 12 RD/DB
M C106
A20 14 RD/DB
M C107
A20 12 RD/DB
TO CONTROLLER ANTILOCK BRAKE
A148 16 LG/RD
B C106
RHD
LHD
A148 16 LG/RD
A148 16 LG/RD
4 C301
TO REAR POWER OUTLET


POWER DISTRIBUTION CENTER
(8W-10-3)
FROM FUSE 12 (PDC) (8W-10-12)
B
FUSE 13 40A
13
(8W-10-25)
FUSE 14 40A
14
(8W-10-27)
FUSE 15 50A
15
(8W-10-30)
20
FUSE 18 15A
21
(8W-10-31)
A14 14 RD/WT
A14 14 RD/WT
A2 12 PK/BK
L
A148 10 PK/WT
K
C107
A2 12 PK/BK
G
C200
A2 12 PK/BK
A148 10 PK/WT
F62 18 RD
F62 18 RD
TO AUTO SHUT DOWN RELAY (IN PDC)
TO AUTO SHUT DOWN RELAY (IN PDC)
TO IGNITION SWITCH
TO JUNCTION BLOCK
TO HORN RELAY (IN PDC)
TO HORN RELAY (IN PDC)
27
FUSE 21 15A
26
(8W-10-32)
27
FUSE 22 10A
28
(8W-10-31)
31
FUSE 23 15A
30
(8W-10-25)
34
FUSE 25 20A
35
(8W-10-32)
38
FUSE 27 20A
39
(8W-10-31)
A17 14 RD/BK
F300 18 RD/BK
2
C105
F300 20 RD/BK
A80 18 RD/LG
A20 12 RD/DB
A148 16 LG/RD
B
C107
LHD
RHD
A148 16 LG/RD
H
C301
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
TO ENGINE CONTROL MODULE
TO VISCOUS/ CABIN HEATER RELAY (IN PDC)
TO CONTROLLER ANTILOCK BRAKE
TO REAR POWER OUTLET



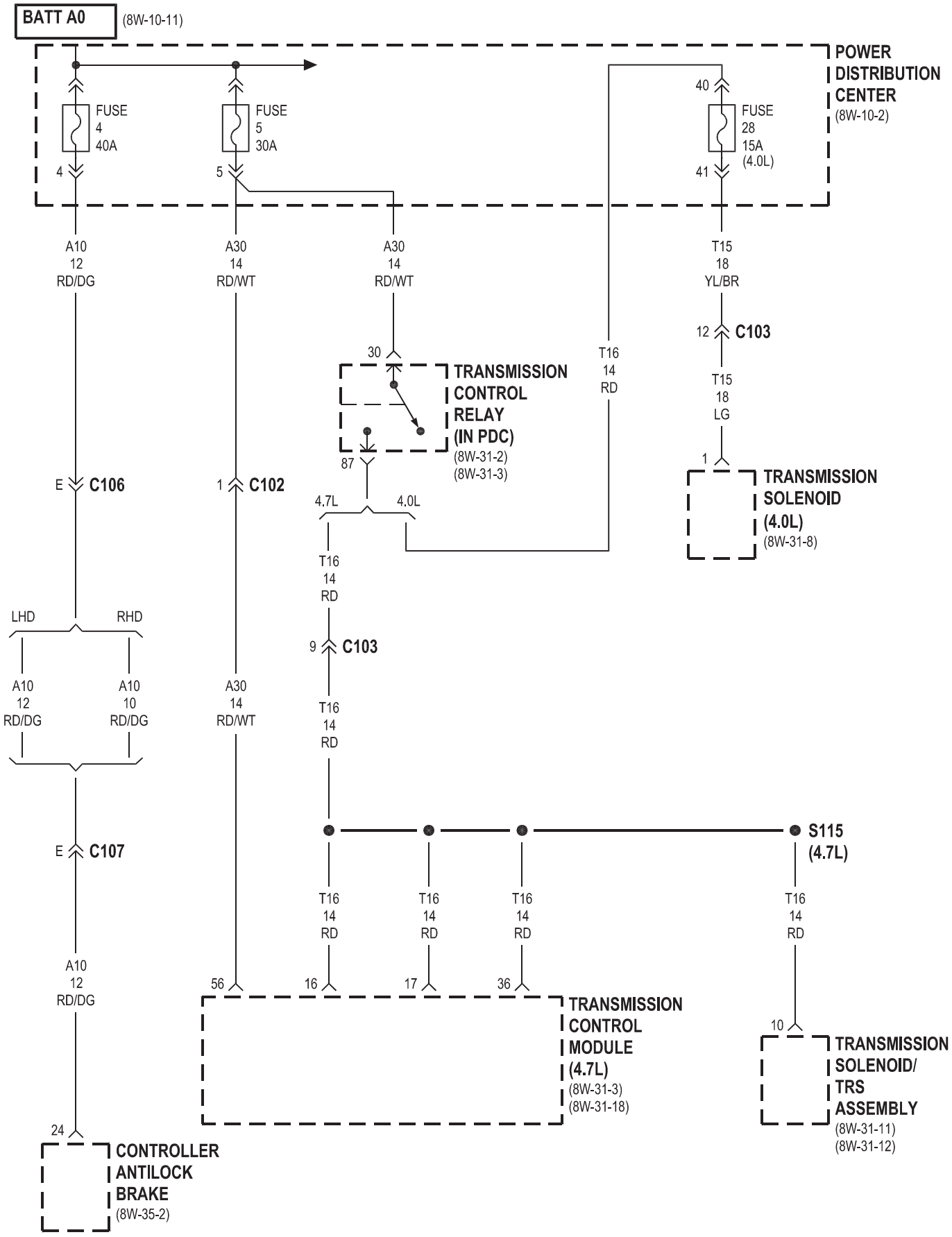
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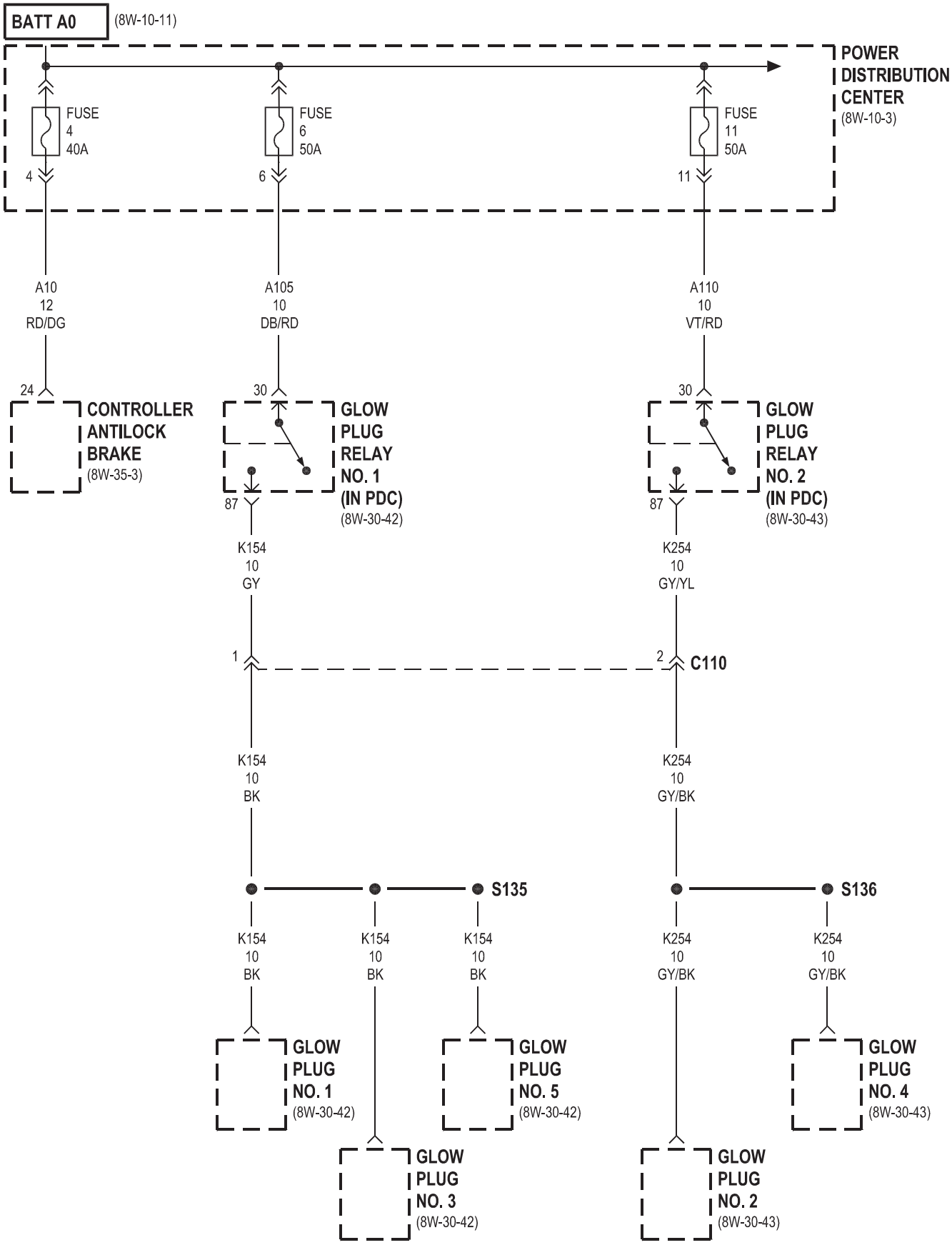
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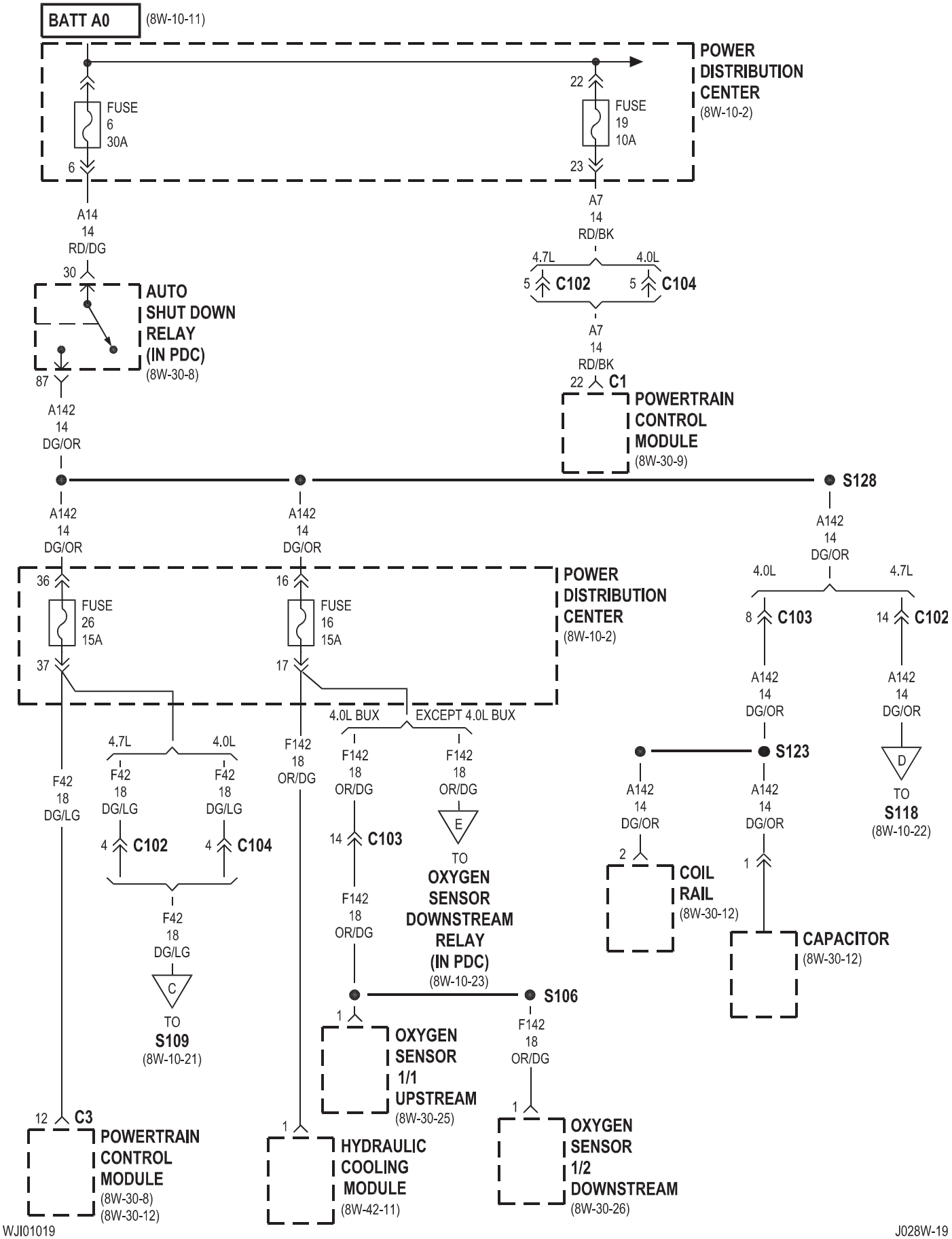


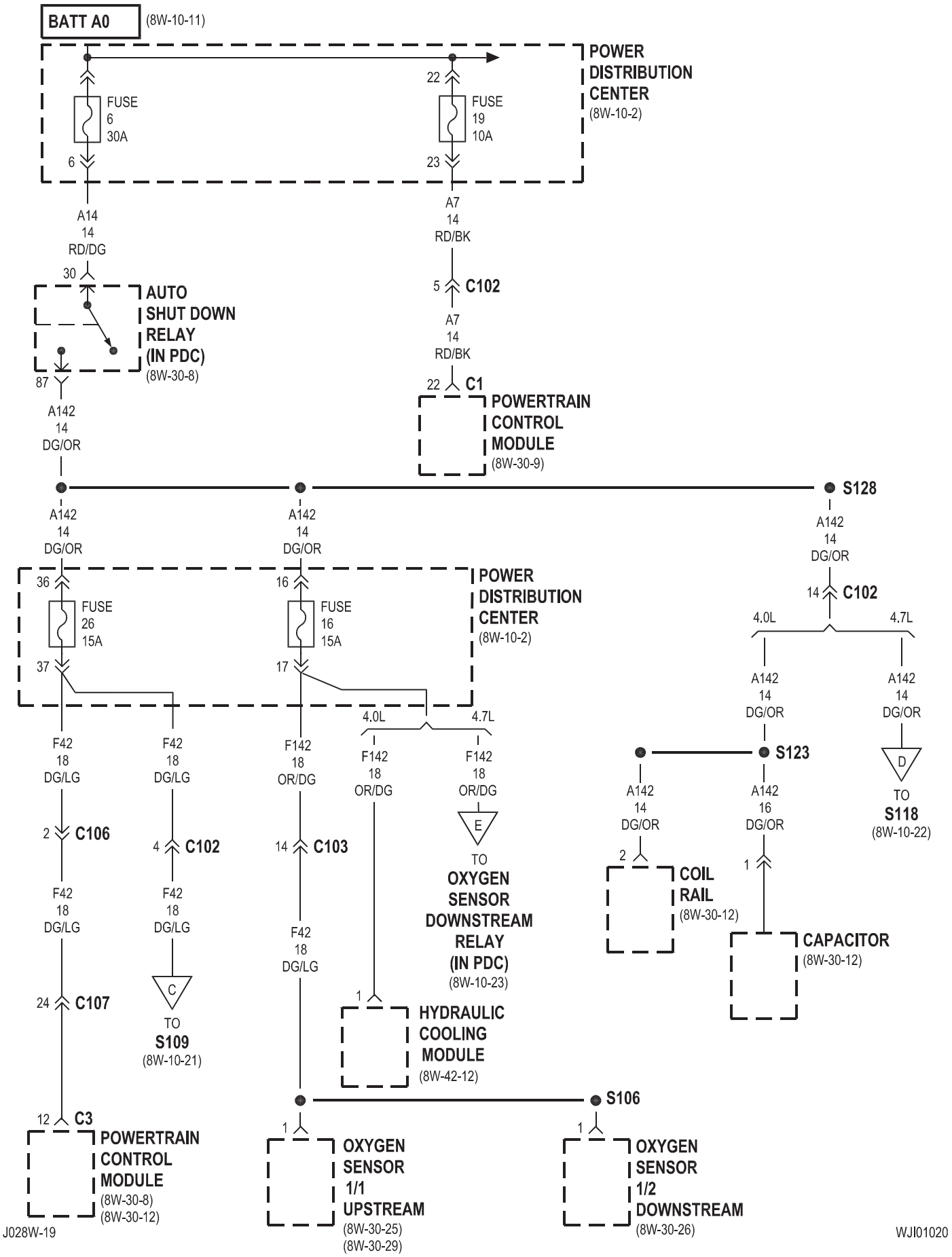
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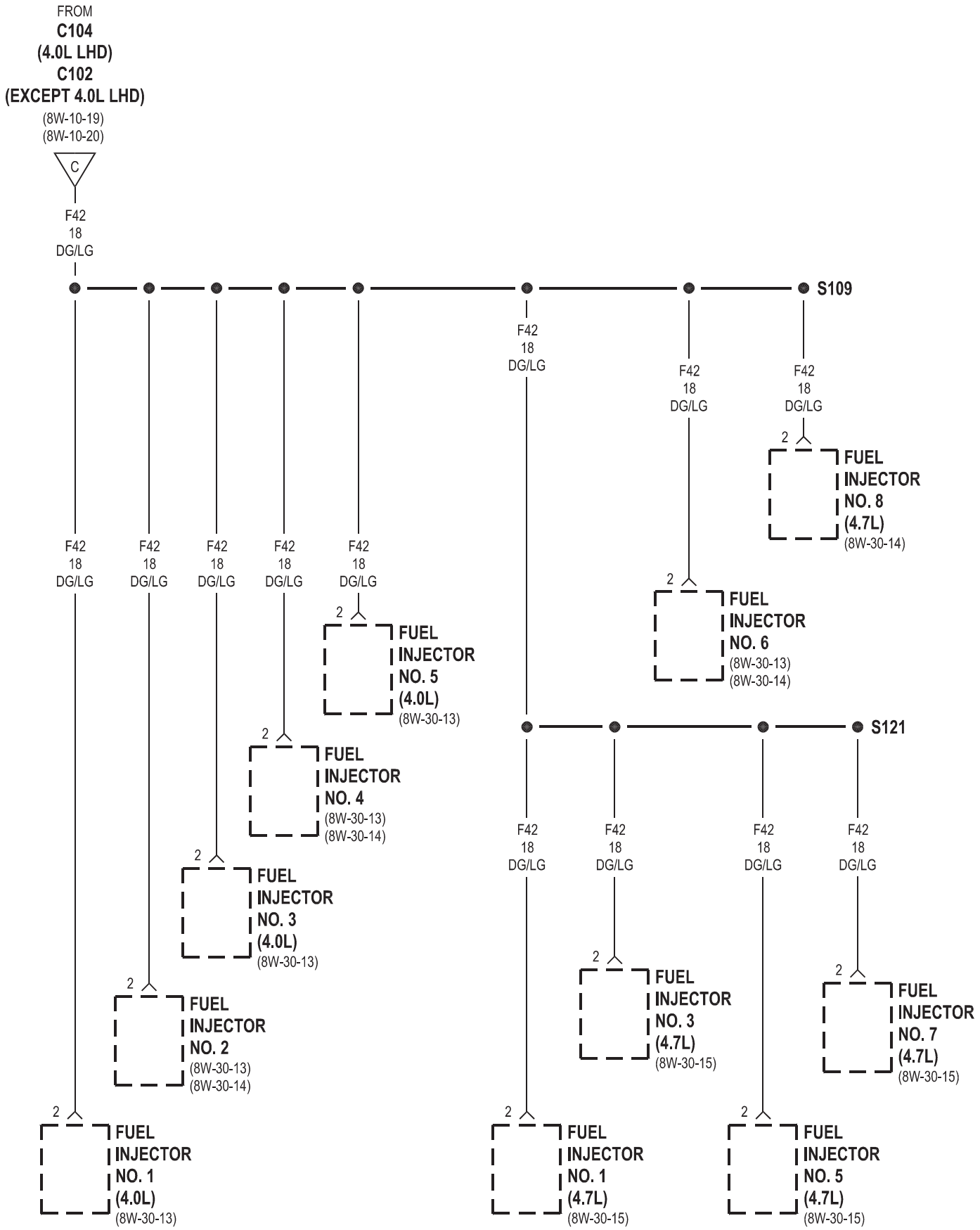
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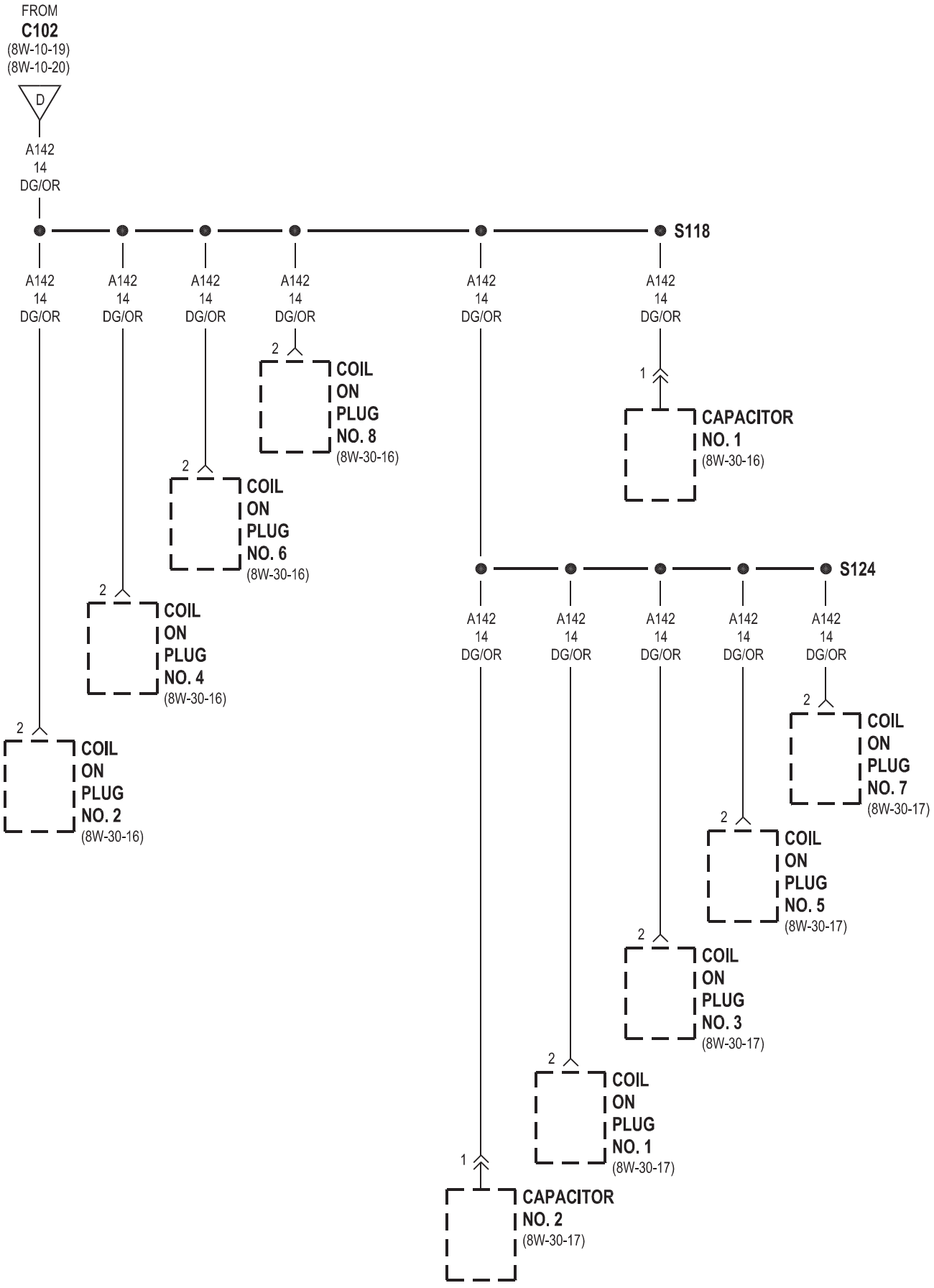

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 4 40A
FUSE 5 30A
FUSE 28 15A (4.0L)
4
5
40
41
A10 12 RD/DG
A30 14 RD/WT
A30 14 RD/WT
T15 18 YL/BR
12 C103
T16 14 RD
30
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
(8W-31-3)
87
T15 18 LG
1
TRANSMISSION SOLENOID (4.0L)
(8W-31-8)
E C106
1 C102
4.7L
4.0L
T16 14 RD
9 C103
LHD
RHD
A10 12 RD/DG
A10 10 RD/DG
A30 14 RD/WT
T16 14 RD
E C107
S115 (4.7L)
T16 14 RD
T16 14 RD
T16 14 RD
T16 14 RD
A10 12 RD/DG
56
16
17
36
10
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-3)
(8W-31-18)
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-11)
(8W-31-12)
24
CONTROLLER ANTILOCK BRAKE
(8W-35-2)

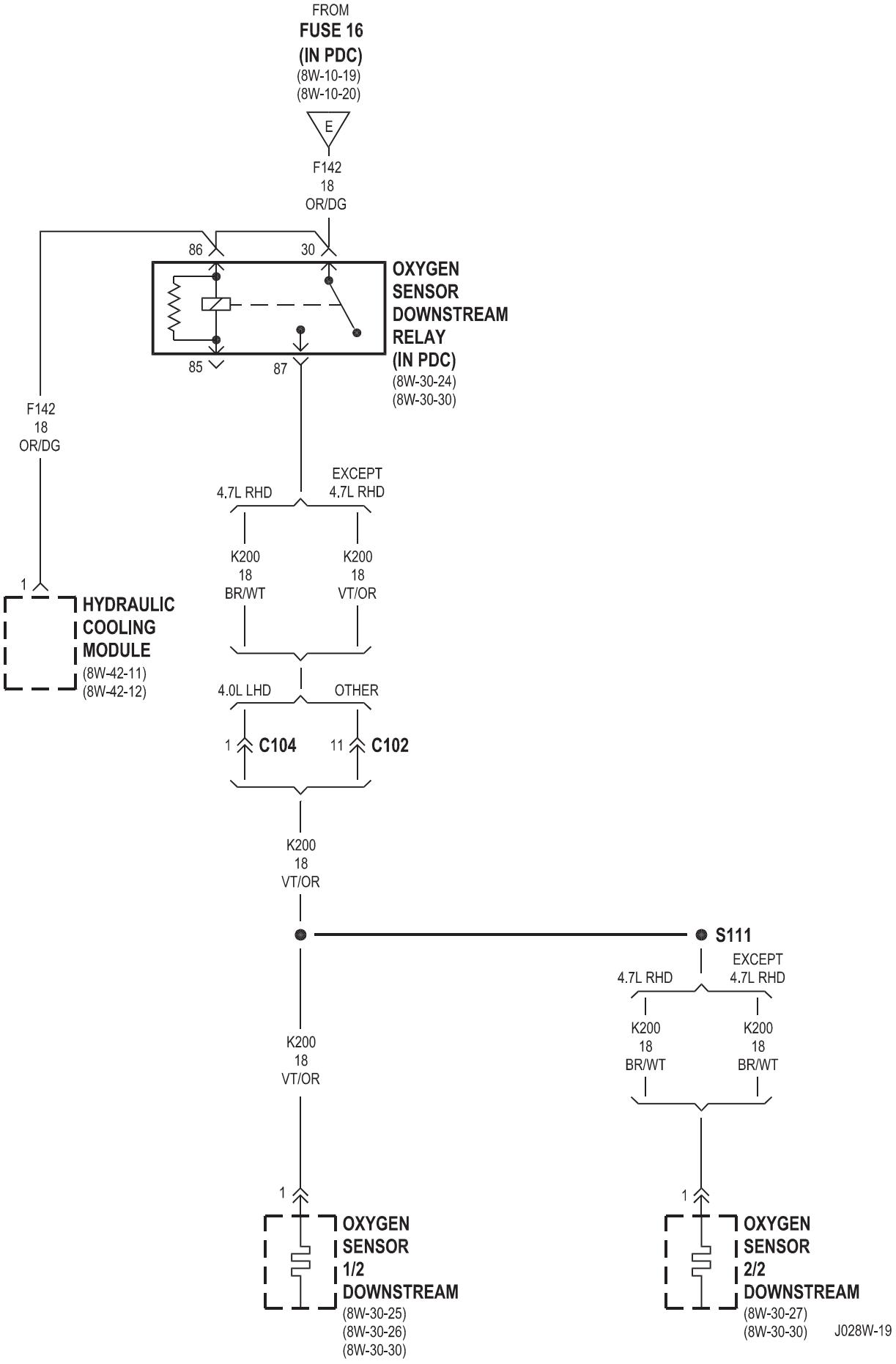

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 4 40A
FUSE 6 50A
FUSE 11 50A
4
6
11
A10 12 RD/DG
A105 10 DB/RD
A110 10 VT/RD
24
30
30
CONTROLLER ANTILOCK BRAKE
(8W-35-3)
GLOW PLUG RELAY NO. 1 (IN PDC)
(8W-30-42)
GLOW PLUG RELAY NO. 2 (IN PDC)
(8W-30-43)
87
87
K154 10 GY
K254 10 GY/YL
1
2
C110
K154 10 BK
K254 10 GY/BK
S135
S136
K154 10 BK
K154 10 BK
K154 10 BK
K254 10 GY/BK
K254 10 GY/BK
GLOW PLUG NO. 1
(8W-30-42)
GLOW PLUG NO. 5
(8W-30-42)
GLOW PLUG NO. 4
(8W-30-43)
GLOW PLUG NO. 3
(8W-30-42)
GLOW PLUG NO. 2
(8W-30-43)

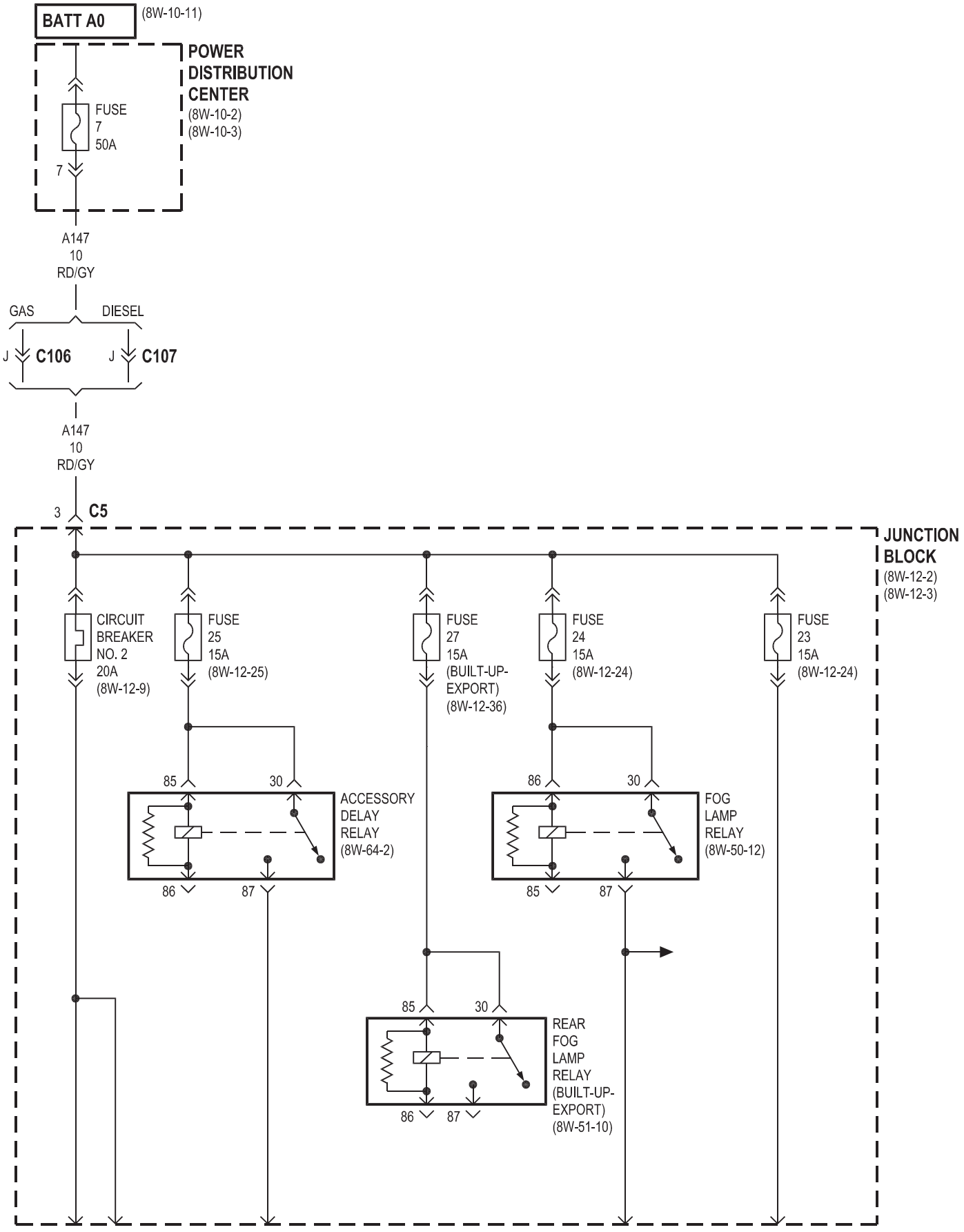

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A
FUSE 19 10A
A14 14 RD/DG
A7 14 RD/BK
4.7L
4.0L
C102
C104
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-8)
A142 14 DG/OR
POWERTRAIN CONTROL MODULE
(8W-30-9)
C1
S128
FUSE 26 15A
FUSE 16 15A
POWER DISTRIBUTION CENTER
(8W-10-2)
4.0L BUX
EXCEPT 4.0L BUX
F42 18 DG/LG
F142 18 OR/DG
C103
C102
C104
TO OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-10-23)
TO S109
(8W-10-21)
S106
S123
COIL RAIL
(8W-30-12)
CAPACITOR
(8W-30-12)
TO S118
(8W-10-22)
C3
POWERTRAIN CONTROL MODULE
(8W-30-8)
(8W-30-12)
HYDRAULIC COOLING MODULE
(8W-42-11)
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-25)
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-26)

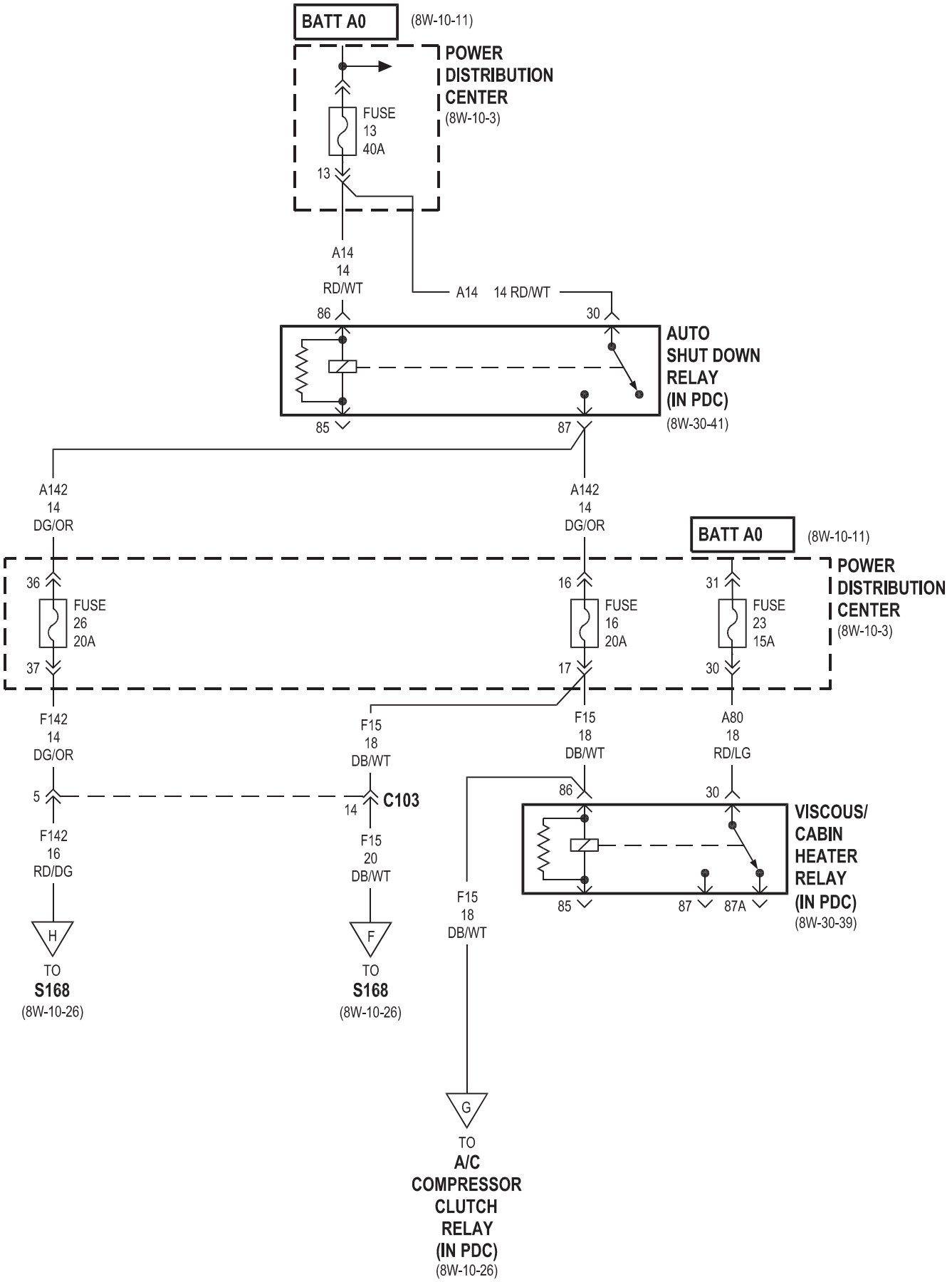

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A
FUSE 19 10A
A14 14 RD/DG
A7 14 RD/BK
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-8)
C102
C1
POWERTRAIN CONTROL MODULE
(8W-30-9)
A142 14 DG/OR
S128
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 26 15A
FUSE 16 15A
4.0L
4.7L
F42 18 DG/LG
F142 18 OR/DG
C106
C102
C103
C107
C3
POWERTRAIN CONTROL MODULE
(8W-30-8)
(8W-30-12)
TO S109
(8W-10-21)
TO OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-10-23)
HYDRAULIC COOLING MODULE
(8W-42-12)
S123
S106
COIL RAIL
(8W-30-12)
CAPACITOR
(8W-30-12)
TO S118
(8W-10-22)
OXYGEN SENSOR 1/1 UPSTREAM
(8W-30-25)
(8W-30-29)
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-26)

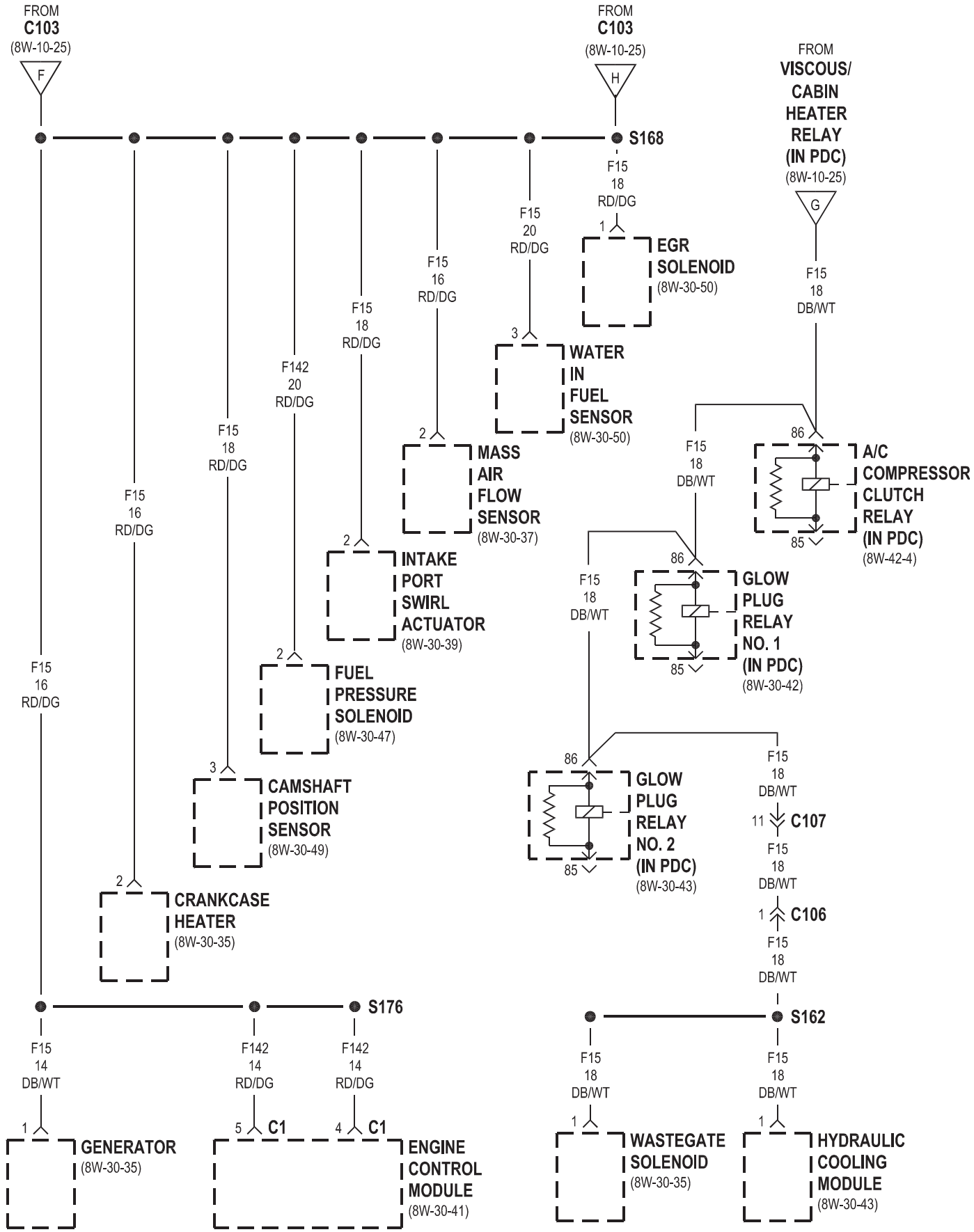

FROM
C104
(4.0L LHD)
C102
(EXCEPT 4.0L LHD)
(8W-10-19)
(8W-10-20)
C
F42
18
DG/LG
S109
S121
2
FUEL
INJECTOR
NO. 1
(4.0L)
(8W-30-13)
FUEL
INJECTOR
NO. 2
(8W-30-13)
(8W-30-14)
FUEL
INJECTOR
NO. 3
(4.0L)
(8W-30-13)
FUEL
INJECTOR
NO. 4
(8W-30-13)
(8W-30-14)
FUEL
INJECTOR
NO. 5
(4.0L)
(8W-30-13)
FUEL
INJECTOR
NO. 6
(8W-30-13)
(8W-30-14)
FUEL
INJECTOR
NO. 8
(4.7L)
(8W-30-14)
FUEL
INJECTOR
NO. 1
(4.7L)
(8W-30-15)
FUEL
INJECTOR
NO. 3
(4.7L)
(8W-30-15)
FUEL
INJECTOR
NO. 5
(4.7L)
(8W-30-15)
FUEL
INJECTOR
NO. 7
(4.7L)
(8W-30-15)

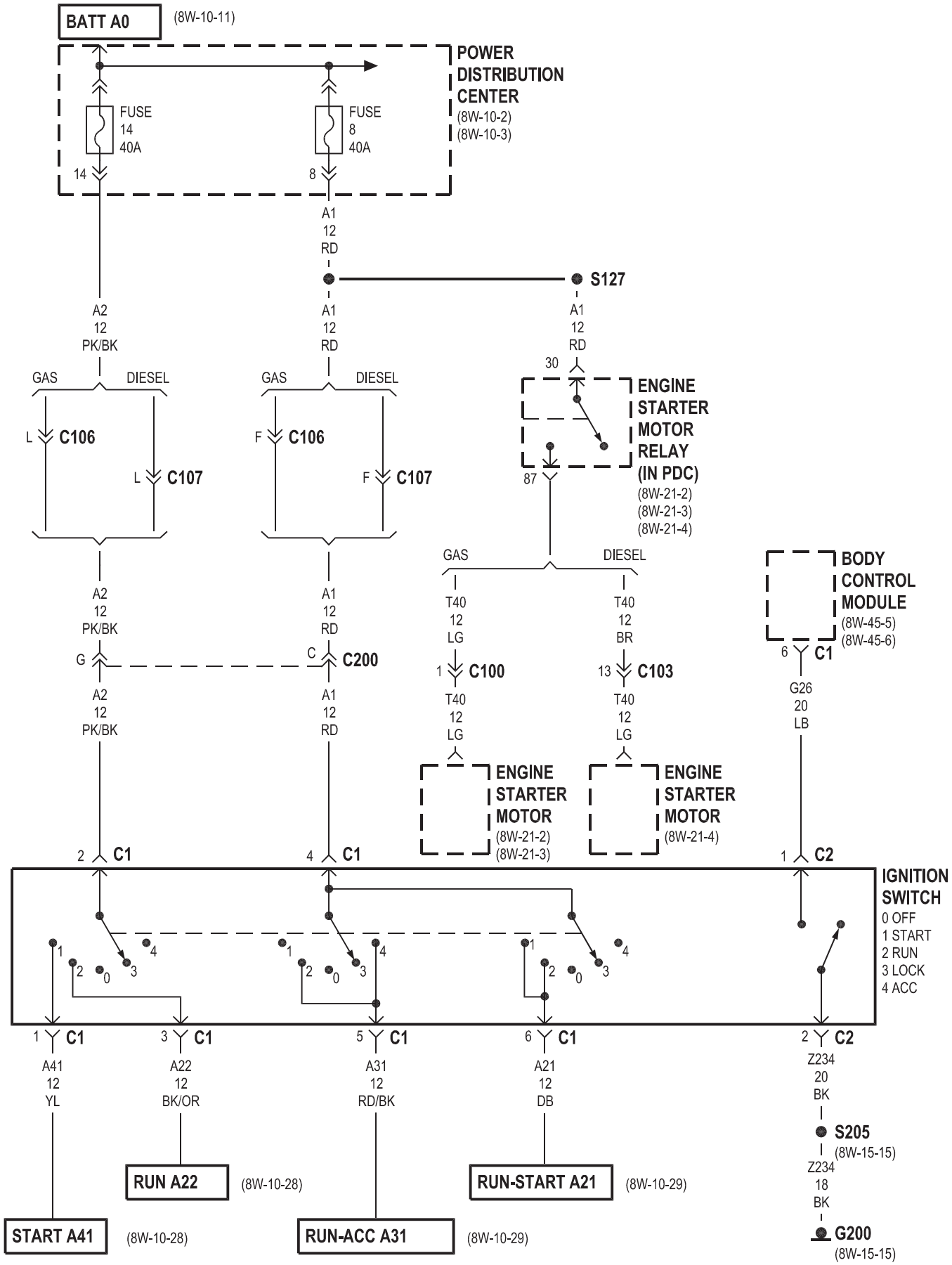

FROM
C102
(8W-10-19)
(8W-10-20)
D
A142
14
DG/OR
S118
A142
14
DG/OR
2
COIL
ON
PLUG
NO. 8
(8W-30-16)
2
COIL
ON
PLUG
NO. 6
(8W-30-16)
2
COIL
ON
PLUG
NO. 4
(8W-30-16)
2
COIL
ON
PLUG
NO. 2
(8W-30-16)
1
CAPACITOR
NO. 1
(8W-30-16)
S124
2
COIL
ON
PLUG
NO. 7
(8W-30-17)
2
COIL
ON
PLUG
NO. 5
(8W-30-17)
2
COIL
ON
PLUG
NO. 3
(8W-30-17)
2
COIL
ON
PLUG
NO. 1
(8W-30-17)
1
CAPACITOR
NO. 2
(8W-30-17)

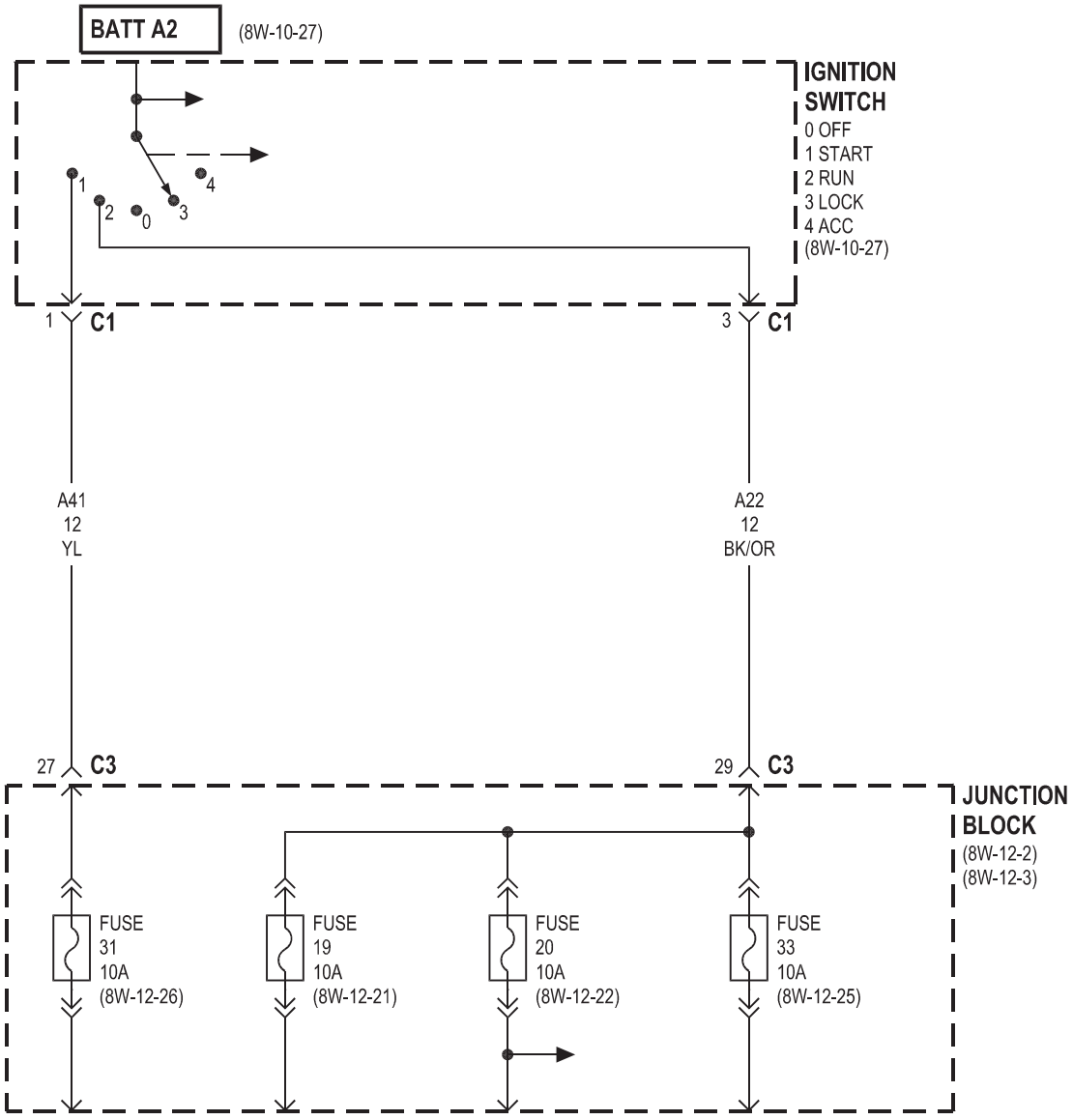

FROM
FUSE 16
(IN PDC)
(8W-10-19)
(8W-10-20)
E
F142
18
OR/DG
86
30
85
87
OXYGEN
SENSOR
DOWNSTREAM
RELAY
(IN PDC)
(8W-30-24)
(8W-30-30)
F142
18
OR/DG
1
HYDRAULIC
COOLING
MODULE
(8W-42-11)
(8W-42-12)
4.7L RHD
EXCEPT
4.7L RHD
K200
18
BR/WT
K200
18
VT/OR
4.0L LHD
OTHER
1
C104
11
C102
K200
18
VT/OR
S111
4.7L RHD
EXCEPT
4.7L RHD
K200
18
BR/WT
K200
18
BR/WT
K200
18
VT/OR
1
OXYGEN
SENSOR
1/2
DOWNSTREAM
(8W-30-25)
(8W-30-26)
(8W-30-30)
1
OXYGEN
SENSOR
2/2
DOWNSTREAM
(8W-30-27)
(8W-30-30)

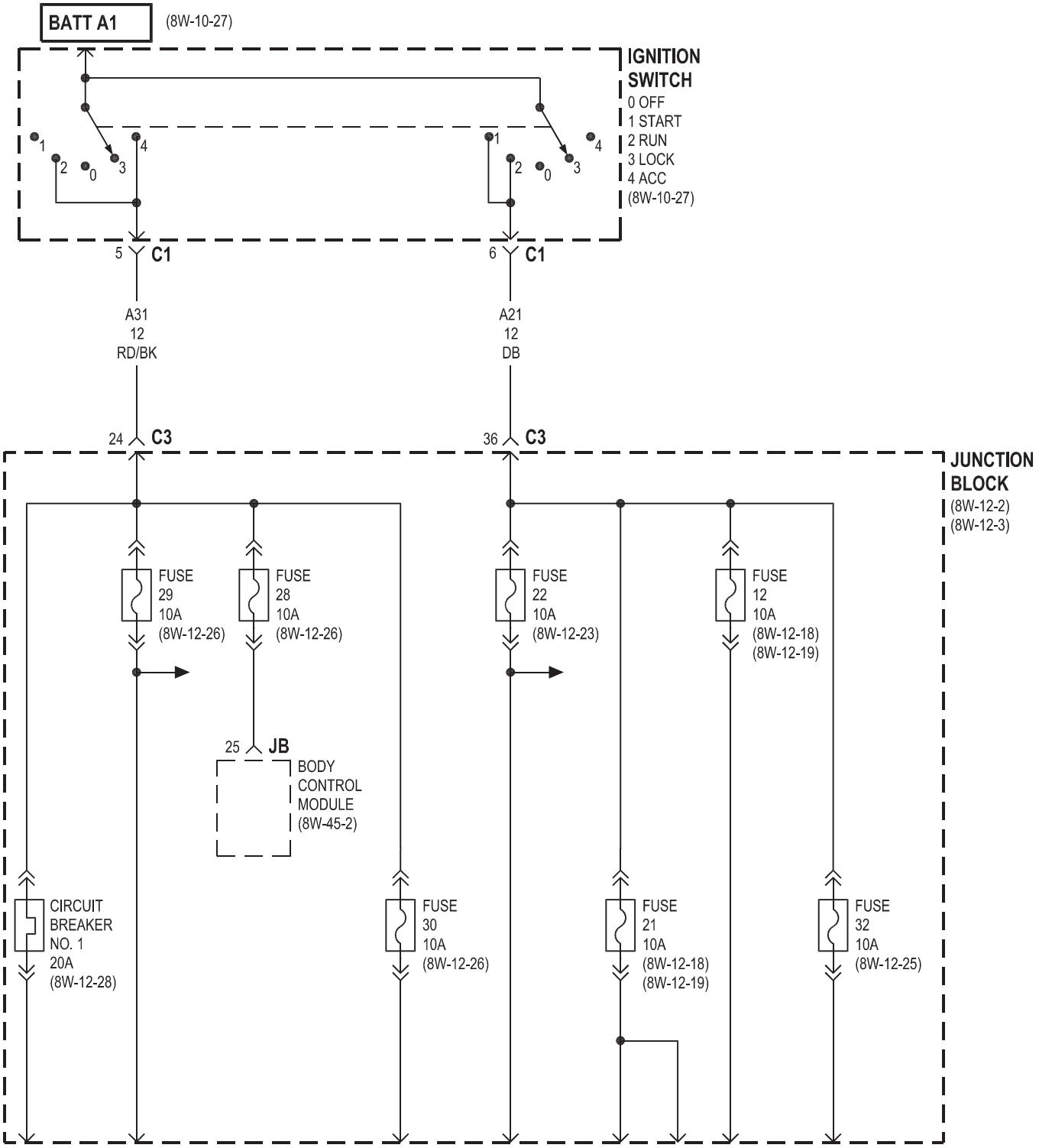

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 7 50A
7
A147 10 RD/GY
GAS
DIESEL
J C106
J C107
A147 10 RD/GY
3 C5
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
FUSE 25 15A
(8W-12-25)
FUSE 27 15A (BUILT-UP-EXPORT)
(8W-12-36)
FUSE 24 15A
(8W-12-24)
FUSE 23 15A
(8W-12-24)
85
30
86
87
ACCESSORY DELAY RELAY
(8W-64-2)
86
30
85
87
FOG LAMP RELAY
(8W-50-12)
85
30
86
87
REAR FOG LAMP RELAY (BUILT-UP-EXPORT)
(8W-51-10)

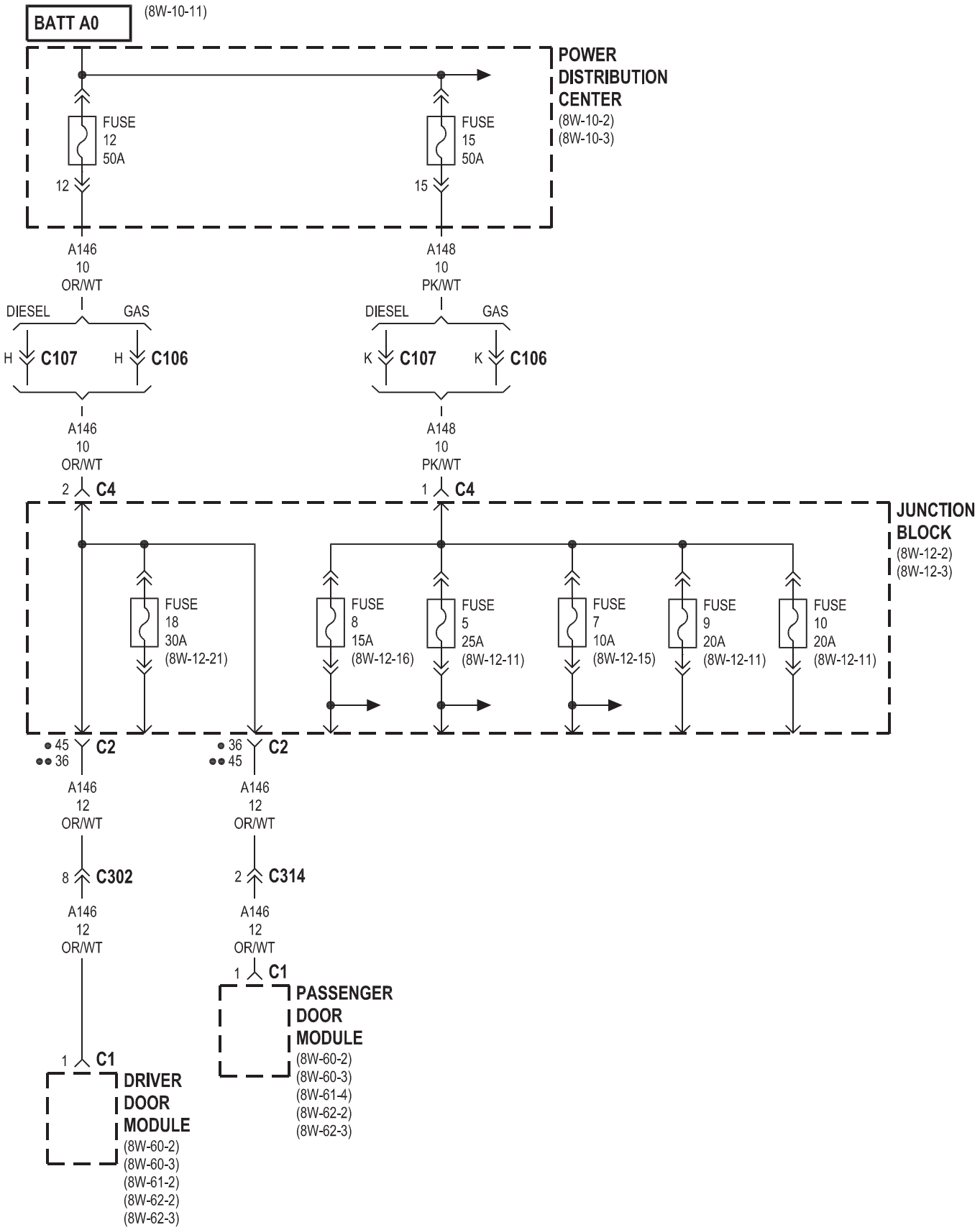

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 13 40A
13
A14 14 RD/WT
A14 14 RD/WT
86
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-41)
85
87
A142 14 DG/OR
A142 14 DG/OR
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
36
FUSE 26 20A
37
16
FUSE 16 20A
17
31
FUSE 23 15A
30
F142 14 DG/OR
F15 18 DB/WT
F15 18 DB/WT
A80 18 RD/LG
5
C103
14
86
30
VISCOUS/ CABIN HEATER RELAY (IN PDC)
(8W-30-39)
F142 16 RD/DG
F15 20 DB/WT
F15 18 DB/WT
85
87
87A
H
F
TO S168
(8W-10-26)
TO S168
(8W-10-26)
G
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-10-26)


FROM C103 (8W-10-25) F
FROM C103 (8W-10-25) H
FROM VISCOUS/ CABIN HEATER RELAY (IN PDC) (8W-10-25) G
S168
F15 18 RD/DG
1 EGR SOLENOID (8W-30-50)
F15 20 RD/DG
3 WATER IN FUEL SENSOR (8W-30-50)
F15 16 RD/DG
2 MASS AIR FLOW SENSOR (8W-30-37)
F15 18 RD/DG
2 INTAKE PORT SWIRL ACTUATOR (8W-30-39)
F142 20 RD/DG
2 FUEL PRESSURE SOLENOID (8W-30-47)
F15 18 RD/DG
3 CAMSHAFT POSITION SENSOR (8W-30-49)
F15 16 RD/DG
2 CRANKCASE HEATER (8W-30-35)
F15 16 RD/DG
S176
F15 14 DB/WT
1 GENERATOR (8W-30-35)
F142 14 RD/DG
5 C1
F142 14 RD/DG
4 C1
ENGINE CONTROL MODULE (8W-30-41)
F15 18 DB/WT
86 A/C COMPRESSOR CLUTCH RELAY (IN PDC) (8W-42-4)
85
F15 18 DB/WT
86 GLOW PLUG RELAY NO. 1 (IN PDC) (8W-30-42)
85
F15 18 DB/WT
86 GLOW PLUG RELAY NO. 2 (IN PDC) (8W-30-43)
85
F15 18 DB/WT
11 C107
F15 18 DB/WT
1 C106
F15 18 DB/WT
S162
F15 18 DB/WT
1 WASTEGATE SOLENOID (8W-30-35)
F15 18 DB/WT
1 HYDRAULIC COOLING MODULE (8W-30-43)

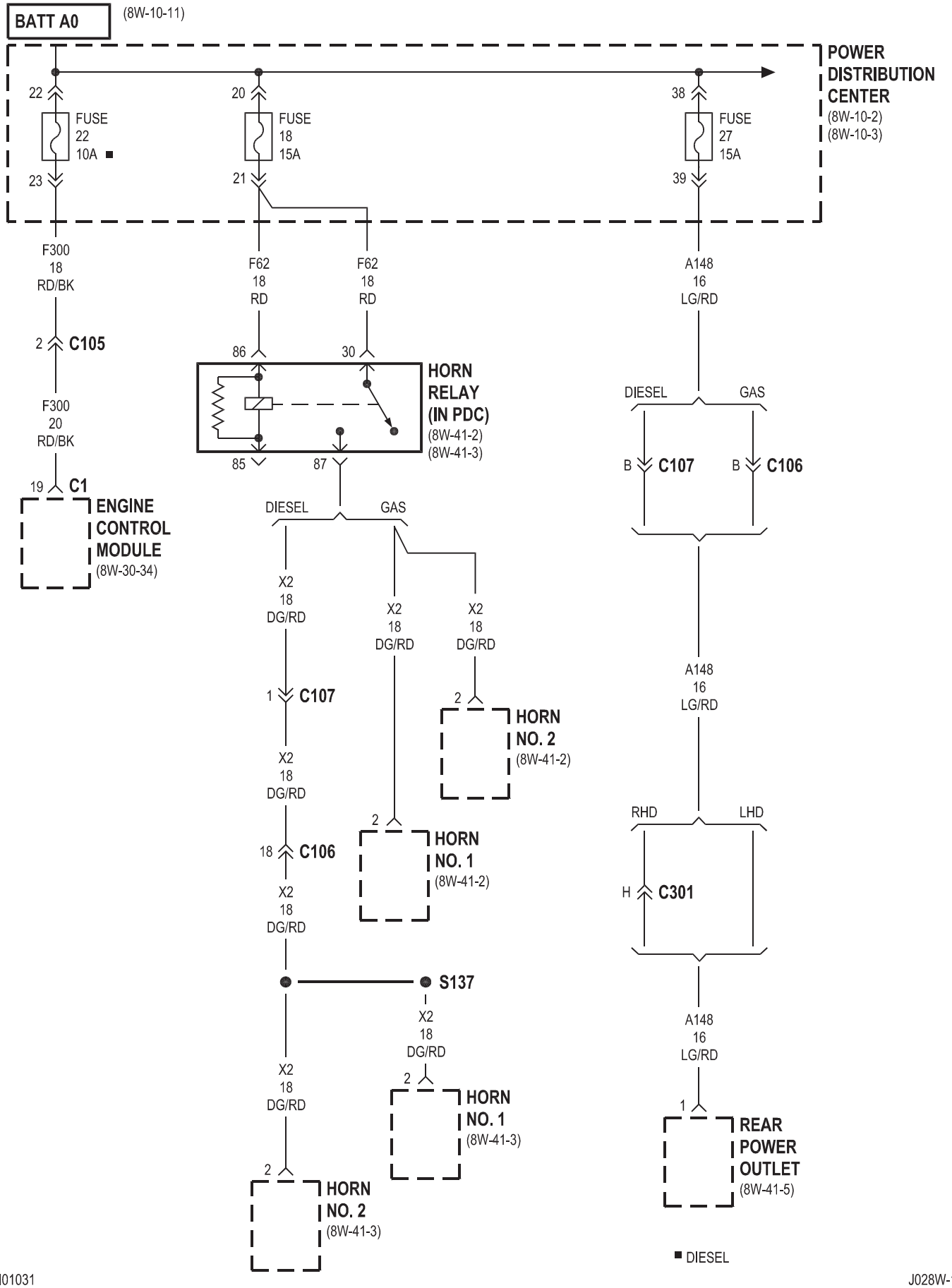

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 14 40A
FUSE 8 40A
14
8
A1 12 RD
S127
A2 12 PK/BK
A1 12 RD
A1 12 RD
30
GAS
DIESEL
L C106
L C107
F C106
F C107
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
(8W-21-4)
87
A2 12 PK/BK
A1 12 RD
G
C
C200
GAS
DIESEL
T40 12 LG
T40 12 BR
1 C100
13 C103
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
6 C1
G26 20 LB
ENGINE STARTER MOTOR
(8W-21-2)
(8W-21-3)
ENGINE STARTER MOTOR
(8W-21-4)
2 C1
4 C1
1 C2
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
1 C1
3 C1
5 C1
6 C1
2 C2
A41 12 YL
A22 12 BK/OR
A31 12 RD/BK
A21 12 DB
Z234 20 BK
S205
(8W-15-15)
Z234 18 BK
G200
(8W-15-15)
RUN A22
(8W-10-28)
RUN-START A21
(8W-10-29)
START A41
(8W-10-28)
RUN-ACC A31
(8W-10-29)

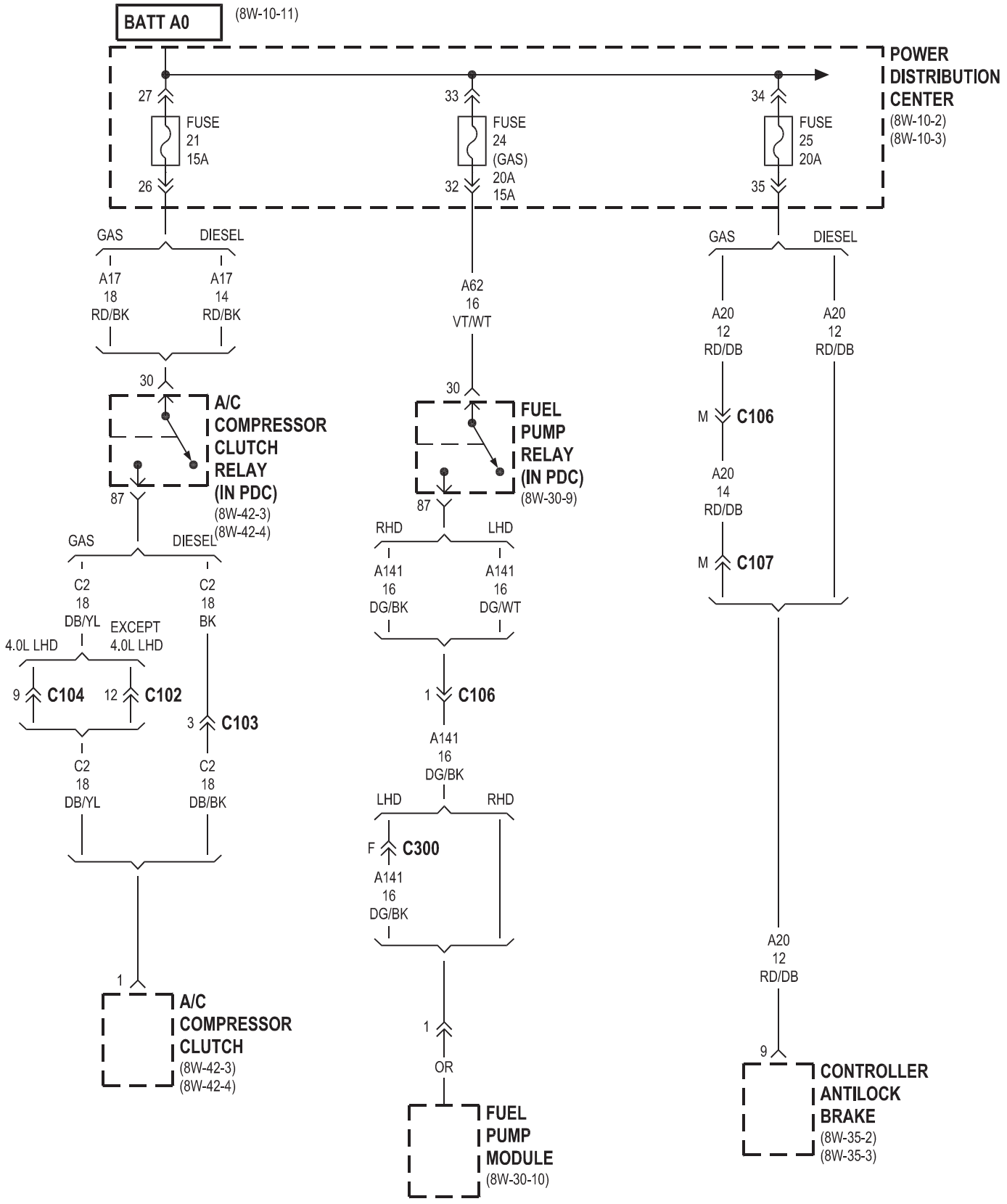

BATT A2
(8W-10-27)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-27)
1
2
0
3
4
1 C1
3 C1
A41
12
YL
A22
12
BK/OR
27 C3
29 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 31 10A (8W-12-26)
FUSE 19 10A (8W-12-21)
FUSE 20 10A (8W-12-22)
FUSE 33 10A (8W-12-25)


BATT A1
(8W-10-27)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-27)
5 C1
6 C1
A31
12
RD/BK
A21
12
DB
24 C3
36 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 29 10A (8W-12-26)
FUSE 28 10A (8W-12-26)
FUSE 22 10A (8W-12-23)
FUSE 12 10A (8W-12-18) (8W-12-19)
25 JB
BODY CONTROL MODULE (8W-45-2)
CIRCUIT BREAKER NO. 1 20A (8W-12-28)
FUSE 30 10A (8W-12-26)
FUSE 21 10A (8W-12-18) (8W-12-19)
FUSE 32 10A (8W-12-25)


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 12 50A
FUSE 15 50A
12
15
A146 10 OR/WT
A148 10 PK/WT
DIESEL
GAS
H C107
H C106
K C107
K C106
2 C4
1 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 18 30A (8W-12-21)
FUSE 8 15A (8W-12-16)
FUSE 5 25A (8W-12-11)
FUSE 7 10A (8W-12-15)
FUSE 9 20A (8W-12-11)
FUSE 10 20A (8W-12-11)
• 45 •• 36 C2
• 36 •• 45 C2
A146 12 OR/WT
8 C302
2 C314
1 C1
DRIVER DOOR MODULE
(8W-60-2)
(8W-60-3)
(8W-61-2)
(8W-62-2)
(8W-62-3)
PASSENGER DOOR MODULE
(8W-60-2)
(8W-60-3)
(8W-61-4)
(8W-62-2)
(8W-62-3)

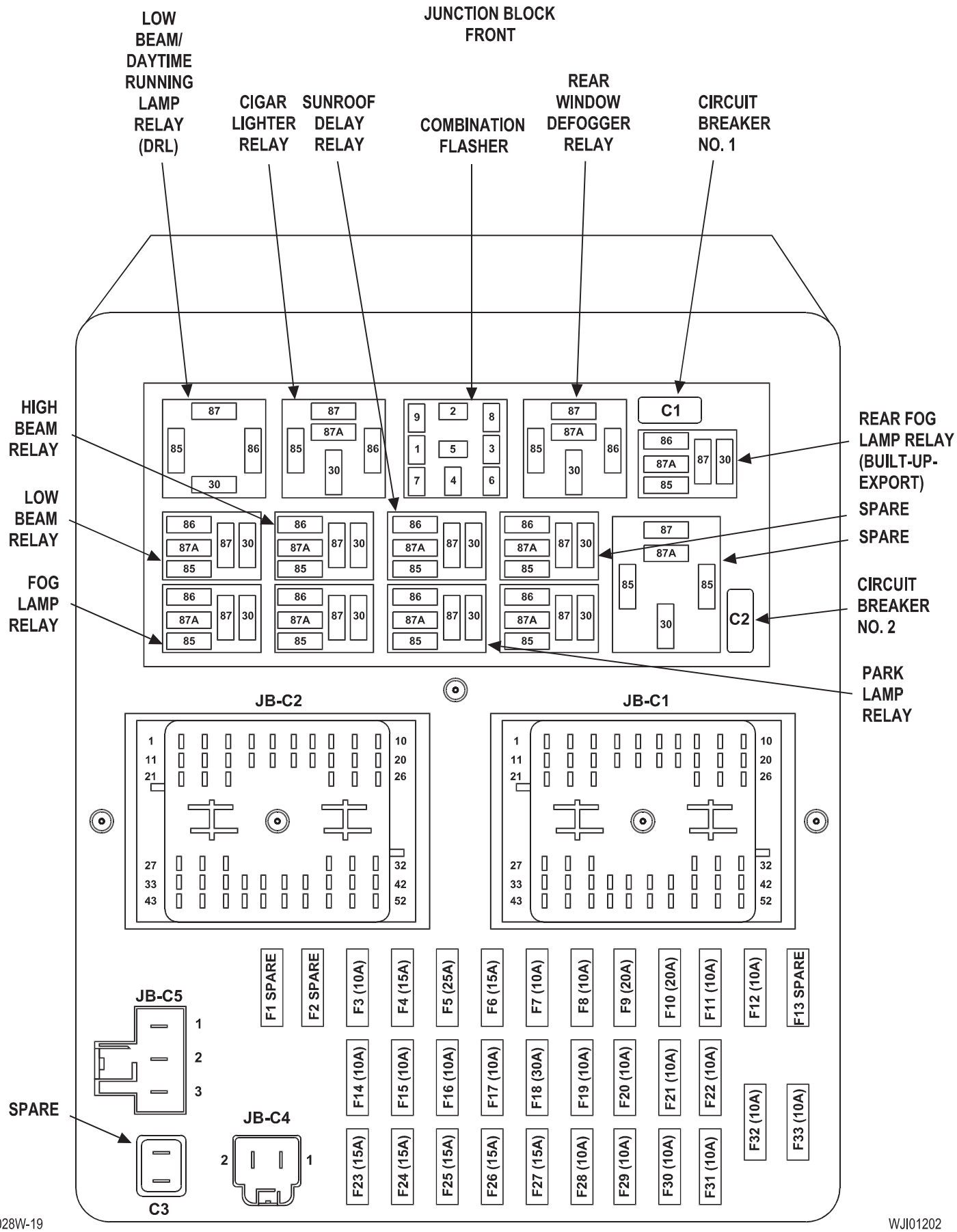
• LHD
•• RHD


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
22
FUSE 22 10A ■
23
20
FUSE 18 15A
21
38
FUSE 27 15A
39
F300 18 RD/BK
2 C105
F300 20 RD/BK
19 C1
ENGINE CONTROL MODULE
(8W-30-34)
F62 18 RD
F62 18 RD
86
30
85
87
HORN RELAY (IN PDC)
(8W-41-2)
(8W-41-3)
A148 16 LG/RD
DIESEL
GAS
B C107
B C106
X2 18 DG/RD
1 C107
X2 18 DG/RD
18 C106
X2 18 DG/RD
X2 18 DG/RD
X2 18 DG/RD
2
HORN NO. 2
(8W-41-2)
2
HORN NO. 1
(8W-41-2)
S137
X2 18 DG/RD
2
HORN NO. 1
(8W-41-3)
X2 18 DG/RD
2
HORN NO. 2
(8W-41-3)
A148 16 LG/RD
RHD
LHD
H C301
A148 16 LG/RD
1
REAR POWER OUTLET
(8W-41-5)
■ DIESEL


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
27
FUSE 21 15A
26
33
FUSE 24 (GAS) 20A 15A
32
34
FUSE 25 20A
35
GAS
DIESEL
A17 18 RD/BK
A17 14 RD/BK
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-3)
(8W-42-4)
87
GAS
DIESEL
C2 18 DB/YL
EXCEPT 4.0L LHD
4.0L LHD
9 C104
12 C102
C2 18 DB/BK
C2 18 BK
3 C103
C2 18 DB/YL
C2 18 DB/BK
1
A/C COMPRESSOR CLUTCH
(8W-42-3)
(8W-42-4)
A62 16 VT/WT
30
FUEL PUMP RELAY (IN PDC)
(8W-30-9)
87
RHD
LHD
A141 16 DG/BK
A141 16 DG/WT
1 C106
A141 16 DG/BK
LHD
RHD
F C300
A141 16 DG/BK
1
OR
FUEL PUMP MODULE
(8W-30-10)
GAS
DIESEL
A20 12 RD/DB
A20 12 RD/DB
M C106
A20 14 RD/DB
M C107
A20 12 RD/DB
9
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
(8W-35-3)

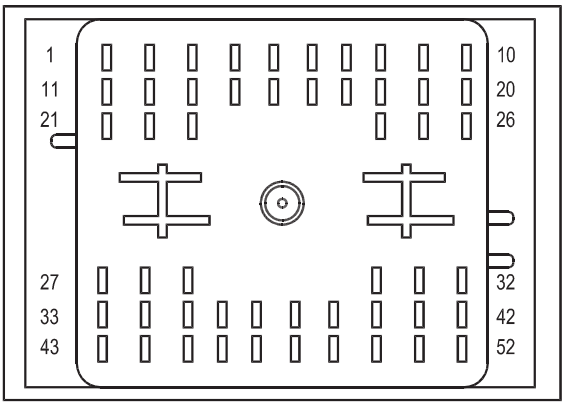
8W-12 JUNCTION BLOCK

Component	Page
A/C Compressor Clutch Relay	8W-12-18
Accessory Delay Relay	8W-12-25
Adjustable Pedals Module	8W-12-11
Airbag Control Module	8W-12-25
Auto Shut Down Relay	8W-12-18
Automatic Day/Night Mirror	8W-12-23
Automatic Headlamp Light Sensor/VTSS LED	8W-12-15
Automatic Zone Control Module	8W-12-15, 17, 22
Back-Up Lamp Relay	8W-12-22
Body Control Module	8W-12-10, 12, 13, 15, 17, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, 35, 36
Brake Lamp Switch	8W-12-24
Cargo Lamp	8W-12-16, 24, 27
Cigar Lighter	8W-12-17
Cigar Lighter Relay	8W-12-17, 26
Circuit Breaker No. 1	8W-12-28, 29
Circuit Breaker No. 2	8W-12-9
Clockspring	8W-12-31
Combination Flasher	8W-12-10, 22, 27, 32, 35
Controller Antilock Brake	8W-12-21
Data Link Connector	8W-12-10
Driver Door Module	8W-12-34
Driver Heated Seat Switch	8W-12-22
Driver Lumbar Switch	8W-12-9
Driver Power Seat Switch	8W-12-9
Electric Brake	8W-12-21
Engine Control Module	8W-12-19
Engine Starter Motor Relay	8W-12-26
EVAP/Purge Solenoid	8W-12-18
Fog Lamp Relay	8W-12-24
Front Power Outlet	8W-12-11
Front Wiper Motor	8W-12-28, 29
Fuel Pump Relay	8W-12-18
Fuse 2	8W-12-17
Fuse 3	8W-12-10, 20
Fuse 4	8W-12-10
Fuse 5	8W-12-11
Fuse 6	8W-12-12, 13
Fuse 7	8W-12-15
Fuse 8	8W-12-16
Fuse 9	8W-12-11
Fuse 10	8W-12-11
Fuse 11	8W-12-17
Fuse 12	8W-12-18, 19, 21, 34
Fuse 14	8W-12-20
Fuse 15	8W-12-11, 15, 20
Fuse 16	8W-12-10
Fuse 17	8W-12-10
Fuse 18	8W-12-21, 34
Fuse 19	8W-12-21
Fuse 20	8W-12-22
Fuse 21	8W-12-18, 19
Fuse 22	8W-12-23
Fuse 23	8W-12-24
Fuse 24	8W-12-24
Fuse 25	8W-12-25
Fuse 26	8W-12-17
Fuse 27	8W-12-36
Fuse 28	8W-12-26
Fuse 29	8W-12-26
Fuse 30	8W-12-26
Fuse 31	8W-12-26
Fuse 32	8W-12-25
Fuse 33	8W-12-25
G200	8W-12-35
Glove Box Lamp	8W-12-16
Headlamp Leveling Switch	8W-12-12, 13
High Beam Relay	8W-12-10
Horn Relay	8W-12-31
Horn Switch	8W-12-31
Instrument Cluster	8W-12-10, 23, 32
Intrusion Transceiver Module	8W-12-16
Junction Block	8W-12-2, 3, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36
Left Courtesy Lamp	8W-12-16
Left Door Handle Courtesy Lamp	8W-12-16, 24, 30
Left Fog Lamp	8W-12-24
Left Front Park Lamp	8W-12-14
Left Front Park/Turn Signal Lamp	8W-12-14, 33
Left Front Side Marker Lamp	8W-12-14, 33
Left Front Turn Signal Lamp	8W-12-33
Left Headlamp Leveling Motor	8W-12-14
Left High Beam Headlamp	8W-12-10
Left Liftgate Ajar Switch	8W-12-30
Left Low Beam Headlamp	8W-12-20
Left Multi-Function Switch	8W-12-10, 35
Left Rear Door Lock Motor/Ajar Switch	8W-12-27
Left Rear Lamp Assembly	8W-12-12, 13, 27, 36
Left Side Repeater Lamp	8W-12-32
Left Visor/Vanity Lamp	8W-12-16, 30
License Lamp No. 1	8W-12-12, 13
License Lamp No. 2	8W-12-12, 13
Liftgate Flip-Up Ajar Switch	8W-12-30
Liftgate Flip-Up Push Button Switch	8W-12-16
Liftgate Power Lock Motor	8W-12-16
Low Beam Relay	8W-12-20
Low Beam/Daytime Running Lamp Relay	8W-12-20
Manual Temperature Control	8W-12-17, 22
Overhead Map/Courtesy Lamp	8W-12-16, 24, 30
Park Lamp Relay	8W-12-12, 13
Park/Neutral Position Switch	8W-12-22
Passenger Door Module	8W-12-34
Passenger Heated Seat Switch	8W-12-22
Passenger Lumbar Switch	8W-12-9
Passenger Power Seat Switch	8W-12-9
Power Amplifier	8W-12-11
Power Connector	8W-12-11
Power Distribution Center	8W-12-10, 11, 15, 17, 20, 21, 34
Powertrain Control Module	8W-12-18
Radio	8W-12-11, 26
Rain Sensor	8W-12-25
Rear Window Defogger	8W-12-17
Rear Window Defogger Relay	8W-12-17
Rear Wiper Motor	8W-12-16, 30
Remote Keyless Module	8W-12-15
Right Courtesy Lamp	8W-12-16
Right Door Handle Courtesy Lamp	8W-12-16, 24, 30
Right Fog Lamp	8W-12-24
Right Front Park Lamp	8W-12-14
Right Front Park/Turn Signal Lamp	8W-12-14, 33
Right Front Side Marker Lamp	8W-12-14, 33
Right Front Turn Signal Lamp	8W-12-33
Right Headlamp Leveling Motor	8W-12-14
Right High Beam Headlamp	8W-12-10
Right Liftgate Ajar Switch	8W-12-30
Right Low Beam Headlamp	8W-12-20
Right Multi-Function Switch	8W-12-26
Right Rear Lamp Assembly	8W-12-12, 13, 32, 36
Right Side Repeater Lamp	8W-12-32
Right Visor/Vanity Lamp	8W-12-16, 30
Seat Module	8W-12-9
Sentry Key Immobilizer Module	8W-12-15, 23
Shifter Assembly	8W-12-18, 19
Siren	8W-12-15
Sunroof Control Module	8W-12-25
Temperature Valve Actuator	8W-12-22
Trailer Tow Brake Lamp Relay	8W-12-21
Trailer Tow Circuit Breaker	8W-12-17
Trailer Tow Connector	8W-12-12
Trailer Tow Left Turn Relay	8W-12-27
Trailer Tow Right Turn Relay	8W-12-32
Transmission Control Module	8W-12-18, 26
Transmission Solenoid/TRS Assembly	8W-12-22
Underhood Lamp	8W-12-15
Vehicle Information Center	8W-12-16, 23
Wiper High/Low Relay	8W-12-28, 29
Wiper On/Off Relay	8W-12-28, 29

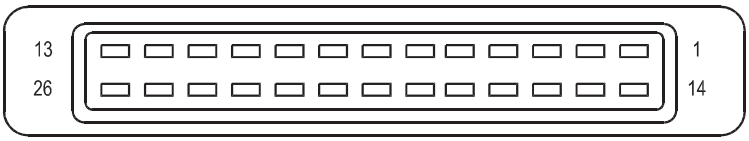

JUNCTION BLOCK FRONT
LOW BEAM/ DAYTIME RUNNING LAMP RELAY (DRL)
CIGAR LIGHTER RELAY
SUNROOF DELAY RELAY
COMBINATION FLASHER
REAR WINDOW DEFOGGER RELAY
CIRCUIT BREAKER NO. 1
HIGH BEAM RELAY
LOW BEAM RELAY
FOG LAMP RELAY
REAR FOG LAMP RELAY (BUILT-UP-EXPORT)
SPARE
SPARE
CIRCUIT BREAKER NO. 2
PARK LAMP RELAY
C1
C2
JB-C2
JB-C1
JB-C5
JB-C4
C3
SPARE
F1 SPARE
F2 SPARE
F3 (10A)
F4 (15A)
F5 (25A)
F6 (15A)
F7 (10A)
F8 (10A)
F9 (20A)
F10 (20A)
F11 (10A)
F12 (10A)
F13 SPARE
F14 (10A)
F15 (10A)
F16 (10A)
F17 (10A)
F18 (30A)
F19 (10A)
F20 (10A)
F21 (10A)
F22 (10A)
F32 (10A)
F33 (10A)
F23 (15A)
F24 (15A)
F25 (15A)
F26 (15A)
F27 (15A)
F28 (10A)
F29 (10A)
F30 (10A)
F31 (10A)

JUNCTION BLOCK
BACK

JB-C3



JUNCTION BLOCK
BODY CONTROL MODULE



FUSES

FUSE	AMPS	FUSED CIRCUIT	FUNCTION
1	-	-	-
2	-	-	-
3	10A	L33 18RD	FUSED HIGH BEAM RELAY OUTPUT
4	15A	INTERNAL	FUSED B(+)
5	25A	INTERNAL	FUSED B(+)
6	15A	INTERNAL	FUSED B(+)
7	10A	INTERNAL	FUSED B(+)
8	15A	INTERNAL	FUSED B(+)
9	20A	INTERNAL	FUSED B(+)
10 *	20A	F72 16RD/YL	FUSED B(+)
11	10A	C15 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
12	10A	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
13	-	-	-
14	10A	L43 18VT	FUSED LOW BEAM RELAY OUTPUT
15	10A	L44 18VT/RD	FUSED LOW BEAM RELAY OUTPUT
16	10A	L34 18RD/OR	FUSED HIGH BEAM RELAY OUTPUT
17	10A	INTERNAL	FUSED B(+)
18	30A	F9 20RD/BK	FUSED B(+)
19	10A	F20 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
20	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
21	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
22	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	15A	F32 20PK/DB	FUSED B(+)
24	15A	INTERNAL	FUSED B(+)
25	15A	INTERNAL	FUSED B(+)
26	15A	F30 18RD	FUSED CIGAR LIGHTER RELAY OUTPUT
27 •	15A	INTERNAL	FUSED B(+)
28	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
29	10A	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
30	10A	X12 18RD/WT ••	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
		X12 16WT/RD ■	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
31	10A	F45 20YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
32	10A	F14 18LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
33	10A	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)

•• RHD ■ LHD • BUILT-UP-EXPORT * EBUX

CIRCUIT BREAKERS

C.B.	AMPS	FUSED CIRCUIT	FUNCTION
1	20A	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	20A	F37 16RD/LB	FUSED B(+)
3	-	-	-

JUNCTION BLOCK
BODY CONTROL MODULE

CAVITY	CIRCUIT	FUNCTION
1	L308	PARK LAMP RELAY CONTROL
2	L26	FOG LAMP RELAY CONTROL
3	Q29	SUNROOF DELAY RELAY CONTROL
4	L307	LOW BEAM RELAY CONTROL
5	G5	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	X3	HORN RELAY CONTROL
7	V16	WIPER HIGH/LOW RELAY CONTROL
8	G80	LIFTGATE FLIP-UP AJAR SWITCH SENSE
9	L309	HIGH BEAM RELAY CONTROL
10	L91	HAZARD SWITCH SENSE
11	C80	REAR WINDOW DEFOGGER RELAY CONTROL
12	Z132	GROUND
13 ▲▲	L96	REAR FOG LAMP RELAY CONTROL
14	L7	PARK LAMP RELAY OUTPUT
15	Z234	GROUND
16	M2	COURTESY LAMPS DRIVER
17	-	-
18	-	-
19	M20	COURTESY LAMPS DRIVER
20	V55	WIPER PARK SWITCH SENSE
21	G78	LIFTGATE AJAR SWITCH SENSE
23	G77	LEFT REAR DOOR AJAR SWITCH SENSE
24	G73	LIFTGATE COURTESY DISABLE
25	V23	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
26	M1	FUSED B(+)

▲▲ BUILT-UP-EXPORT

ACCESSORY DELAY RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	ACCESSORY DELAY RELAY CONTROL
87	Q30 16TN	ACCESSORY DELAY RELAY OUTPUT
87A	-	-

CIGAR LIGHTER RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
86	INTERNAL	GROUND
87	INTERNAL	CIGAR LIGHTER RELAY OUTPUT
87A	-	-

COMBINATION FLASHER

CAVITY	CIRCUIT	FUNCTION
1	INTERNAL	FUSED B(+)
2	INTERNAL	LEFT TURN SIGNAL
3	INTERNAL	RIGHT TURN SIGNAL
4	L63 20DG/RD	LEFT TURN SIGNAL
5	L62 20BR/RD	RIGHT TURN SIGNAL
6	INTERNAL	FUSED IGNITION SWITCH OUTPUT (RUN)
7	L305 20LB/WT	LEFT TURN SWITCH SENSE
8	L302 20LB/YL	RIGHT TURN SWITCH SENSE
9	INTERNAL	HAZARD SWITCH SENSE

FOG LAMP RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FOG LAMP RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	FOG LAMP RELAY OUTPUT
87A	-	-

HIGH BEAM RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	HIGH BEAM RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	HIGH BEAM RELAY OUTPUT
87A	-	-

LOW BEAM/ DAYTIME RUNNING LAMP RELAY (DRL)

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	GROUND
86	INTERNAL	RELAY CONTROL
87	INTERNAL	RELAY OUTPUT
87A	-	-

LOW BEAM RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	LOW BEAM RELAY CONTROL
87	INTERNAL	LOW BEAM RELAY OUTPUT
87A	-	-

PARK LAMP RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	PARK LAMP RELAY OUTPUT
85	INTERNAL	FUSED B(+)
86	INTERNAL	PARK LAMP RELAY CONTROL
87	INTERNAL	FUSED B(+)
87A	INTERNAL	GROUND

REAR FOG LAMP RELAY (BUILT-UP-EXPORT)

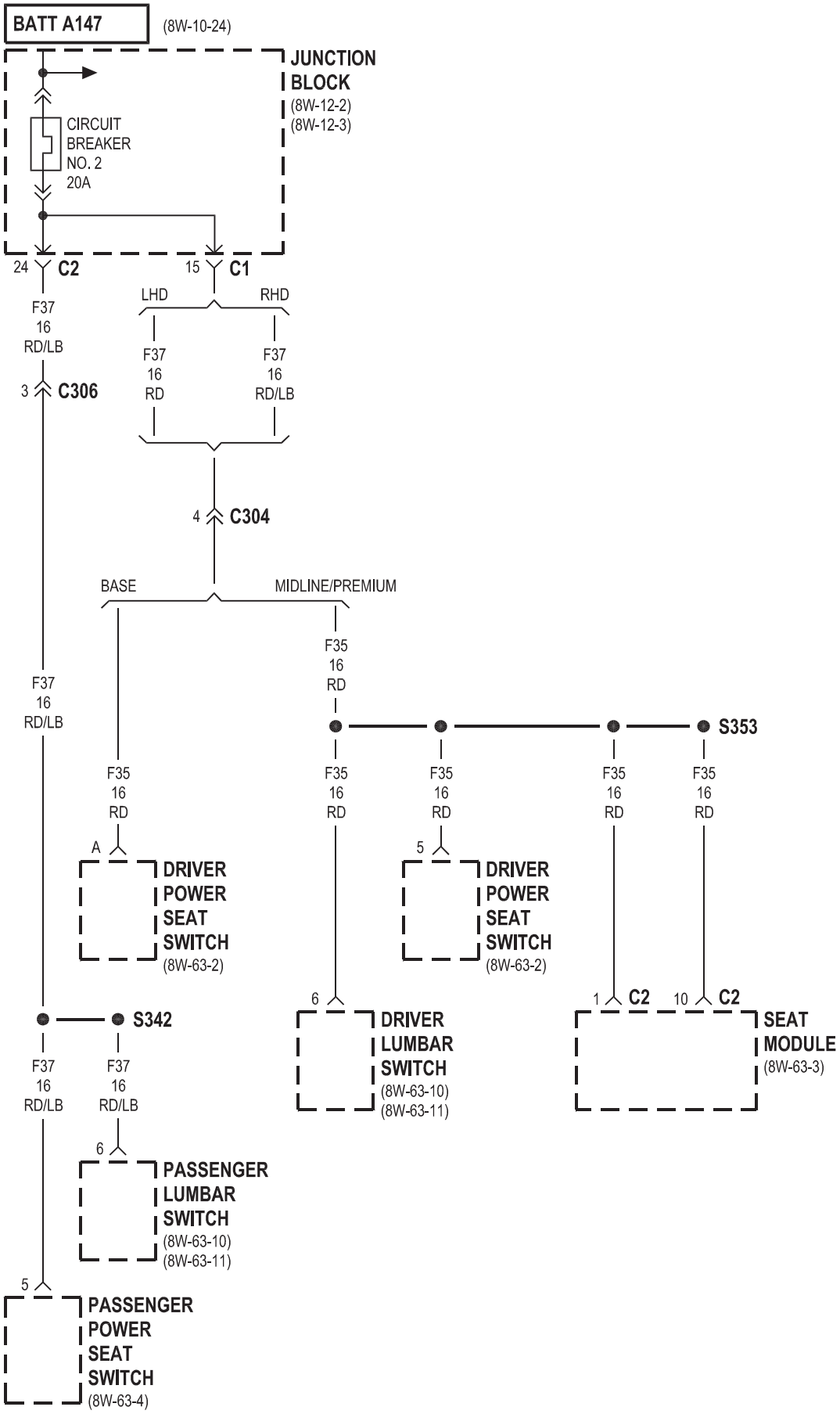
CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	REAR FOG LAMP RELAY CONTROL
87	L95 18DG/YL	REAR FOG LAMP RELAY OUTPUT
87A	-	-

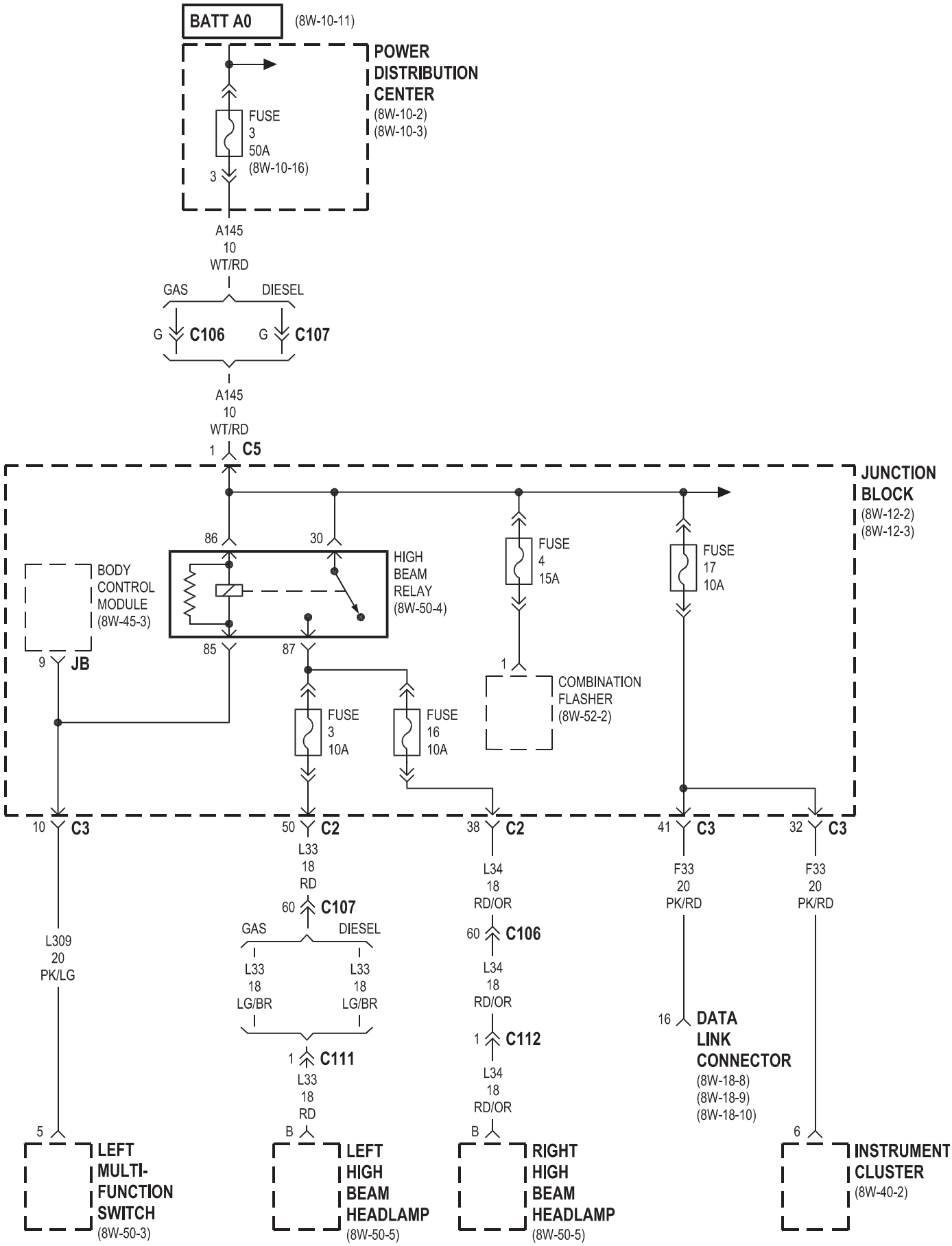
REAR WINDOW DEFOGGER RELAY

CAVITY	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	FUSED B(+)
86	INTERNAL	REAR WINDOW DEFOGGER RELAY CONTROL
87	INTERNAL	REAR WINDOW DEFOGGER RELAY OUTPUT
87A	-	-

• LHD
•• RHD

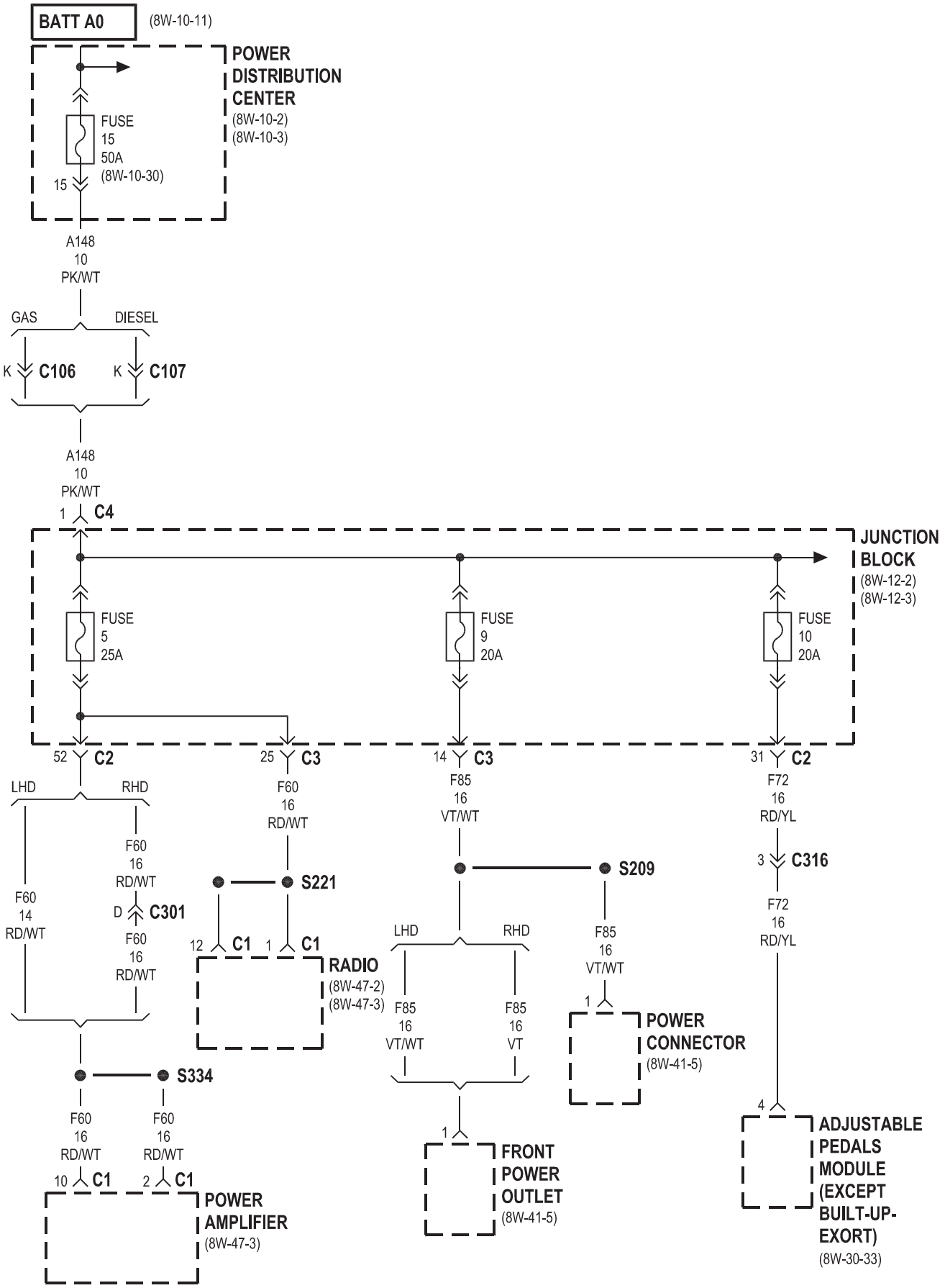
POWER SEATS

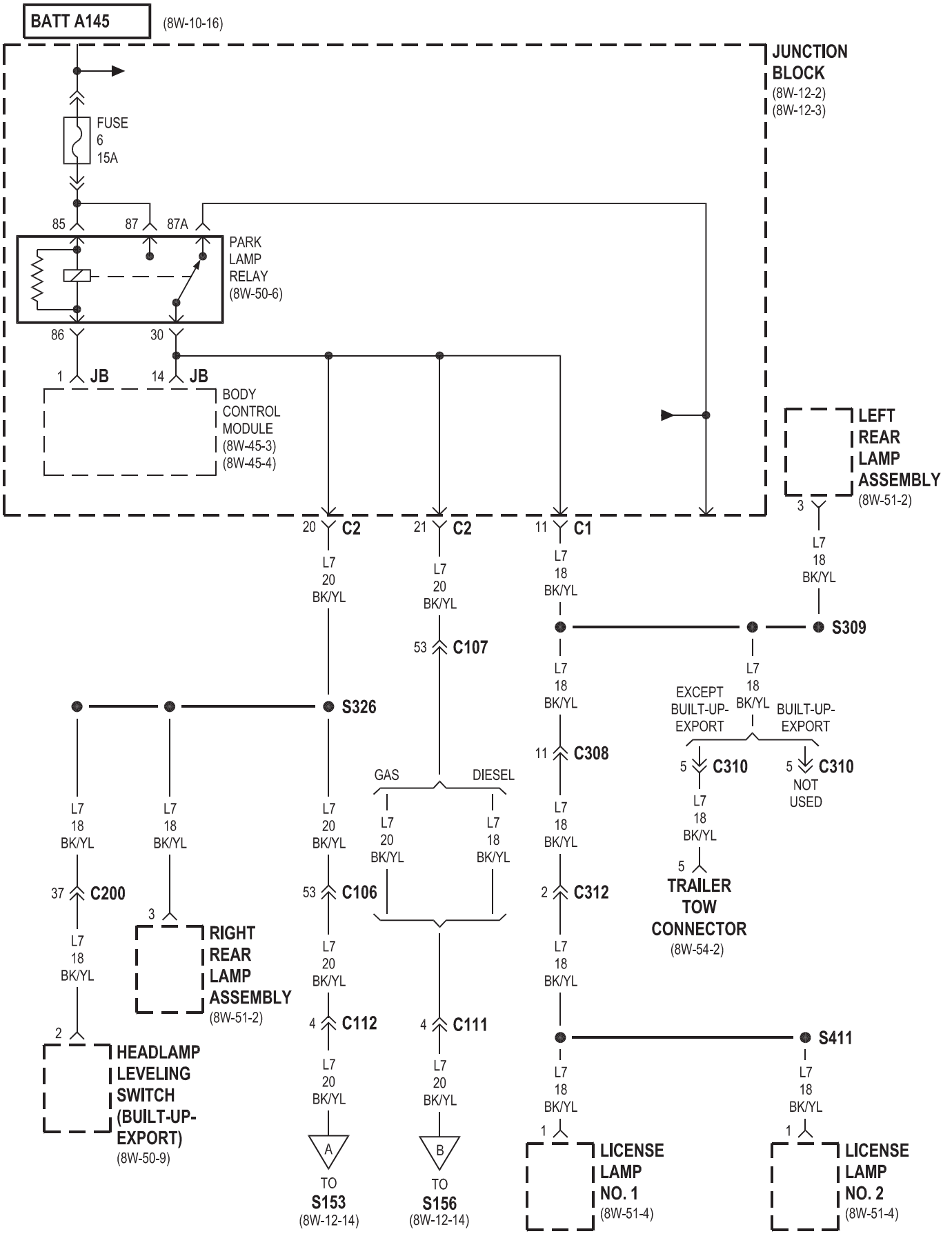

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
24 C2
15 C1
LHD
RHD
F37 16 RD/LB
3 C306
F37 16 RD
F37 16 RD/LB
4 C304
BASE
MIDLINE/PREMIUM
F35 16 RD
S353
A
DRIVER POWER SEAT SWITCH
(8W-63-2)
5
DRIVER POWER SEAT SWITCH
(8W-63-2)
S342
6
DRIVER LUMBAR SWITCH
(8W-63-10)
(8W-63-11)
1 C2
10 C2
SEAT MODULE
(8W-63-3)
6
PASSENGER LUMBAR SWITCH
(8W-63-10)
(8W-63-11)
5
PASSENGER POWER SEAT SWITCH
(8W-63-4)



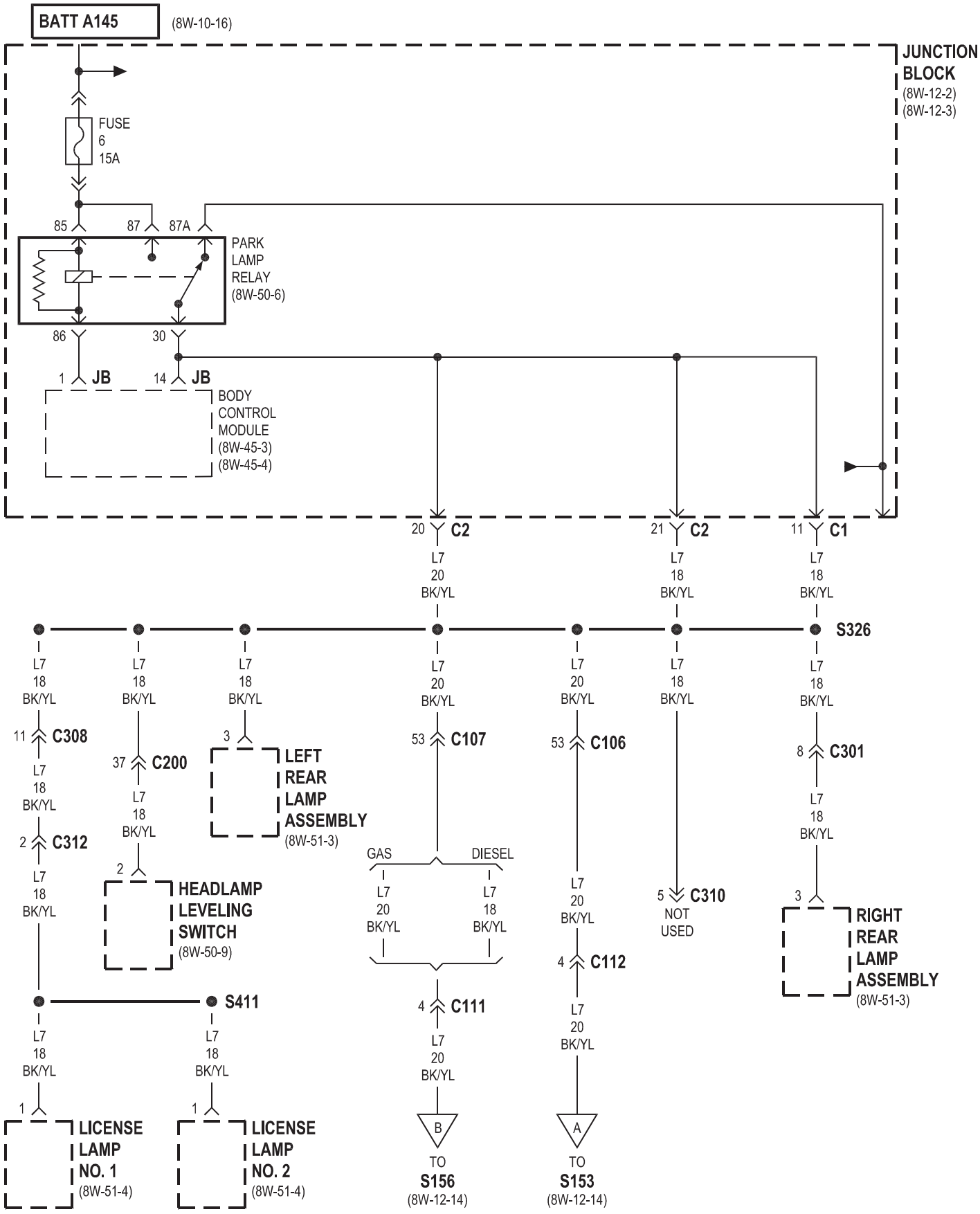
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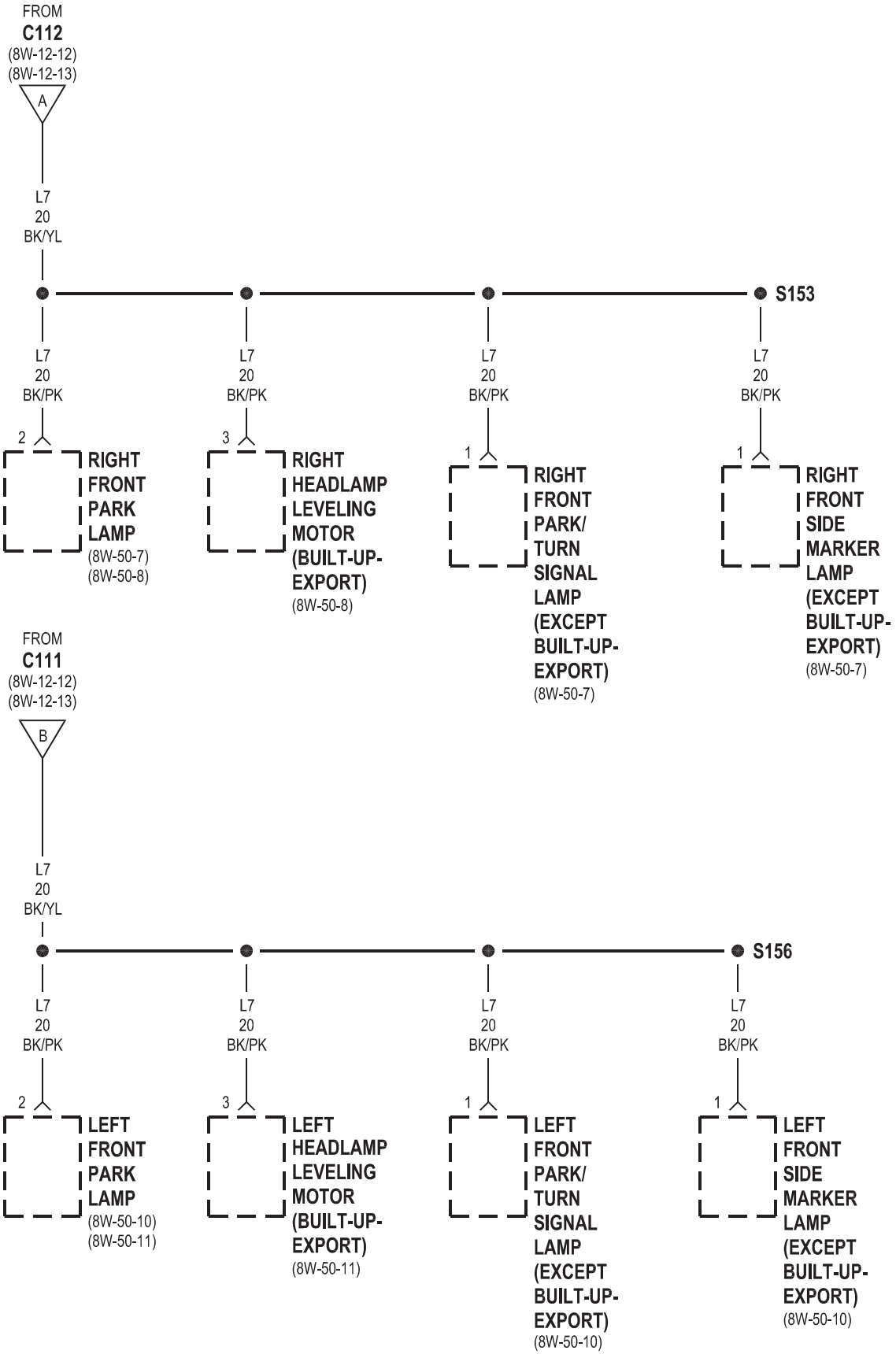
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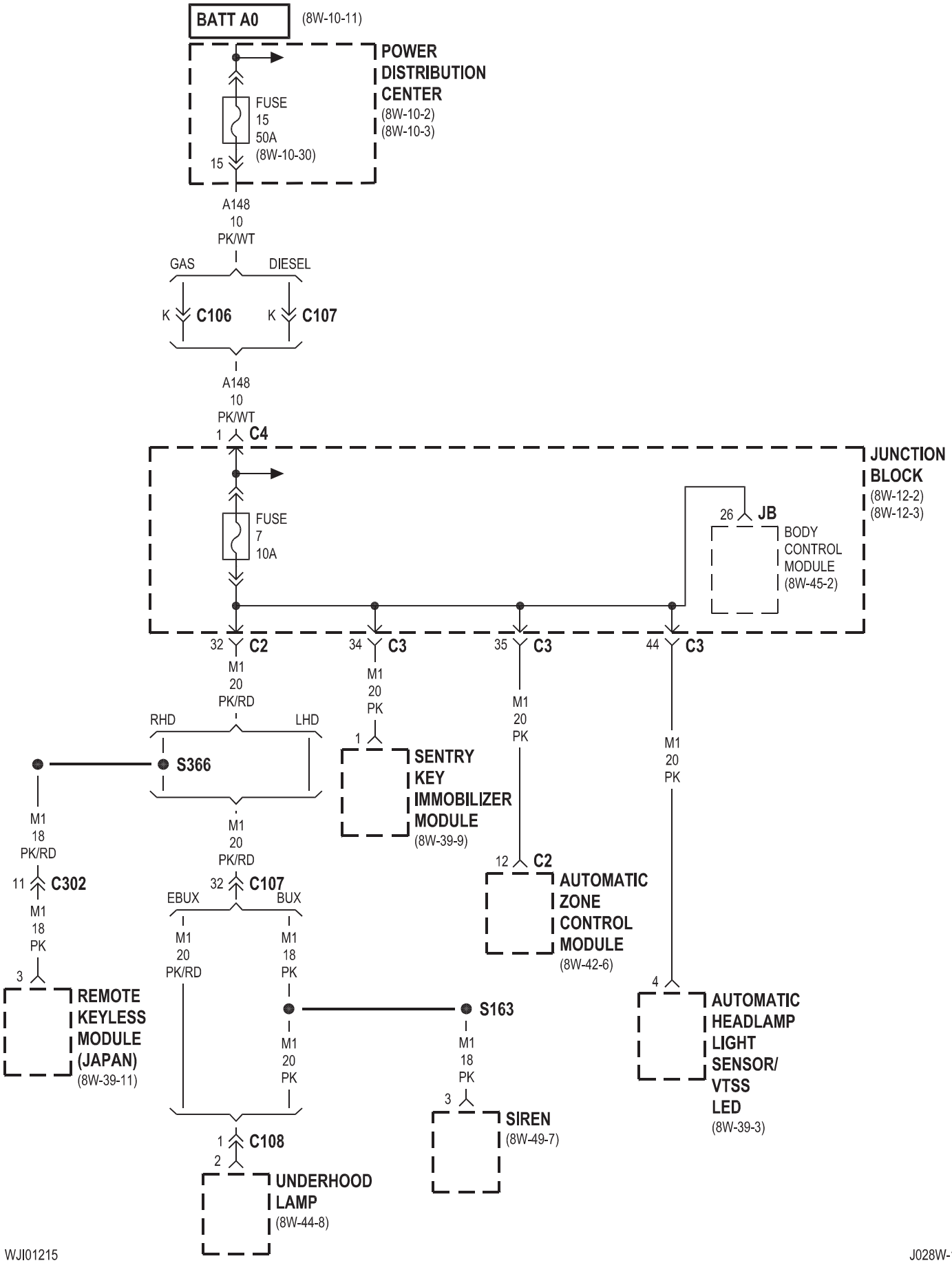

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 15 50A
(8W-10-30)
15
A148 10 PK/WT
GAS
DIESEL
K C106
K C107
A148 10 PK/WT
1 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 5 25A
FUSE 9 20A
FUSE 10 20A
52 C2
25 C3
14 C3
31 C2
LHD
RHD
F60 14 RD/WT
F60 16 RD/WT
D C301
F60 16 RD/WT
F60 16 RD/WT
S221
12 C1
1 C1
RADIO
(8W-47-2)
(8W-47-3)
F85 16 VT/WT
S209
LHD
RHD
F85 16 VT/WT
F85 16 VT
1
POWER CONNECTOR
(8W-41-5)
F72 16 RD/YL
3 C316
F72 16 RD/YL
4
ADJUSTABLE PEDALS MODULE (EXCEPT BUILT-UP-EXORT)
(8W-30-33)
S334
F60 16 RD/WT
F60 16 RD/WT
10 C1
2 C1
POWER AMPLIFIER
(8W-47-3)
1
FRONT POWER OUTLET
(8W-41-5)

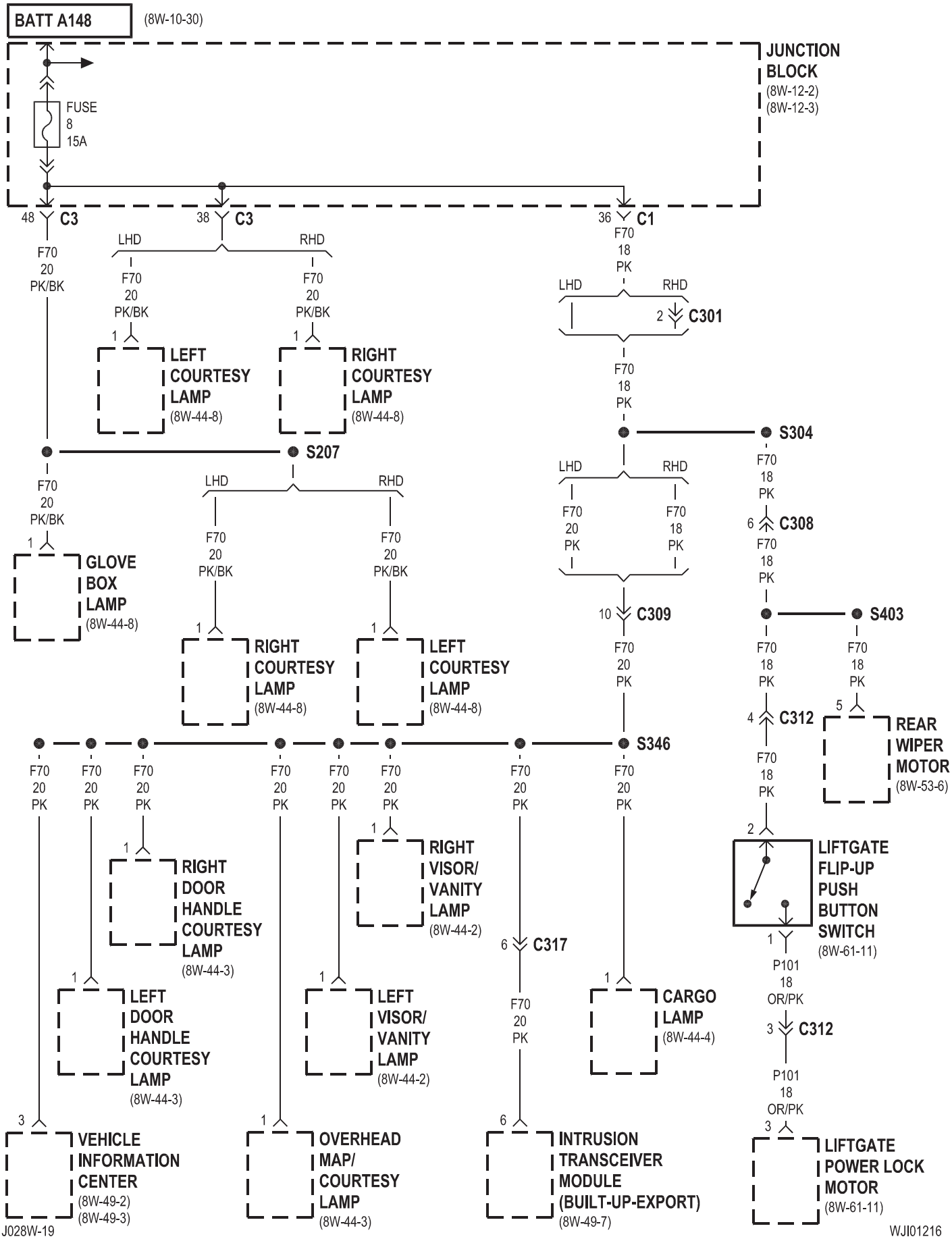

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 6 15A
85
87
87A
PARK LAMP RELAY
(8W-50-6)
86
30
1 JB
14 JB
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
LEFT REAR LAMP ASSEMBLY
(8W-51-2)
3
L7 18 BK/YL
20 C2
21 C2
11 C1
L7 20 BK/YL
L7 18 BK/YL
53 C107
S309
S326
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
5 C310
5 C310
NOT USED
TRAILER TOW CONNECTOR
(8W-54-2)
11 C308
GAS
DIESEL
37 C200
53 C106
2 C312
3
RIGHT REAR LAMP ASSEMBLY
(8W-51-2)
4 C112
4 C111
2
HEADLAMP LEVELING SWITCH (BUILT-UP-EXPORT)
(8W-50-9)
A
B
TO S153
(8W-12-14)
TO S156
(8W-12-14)
S411
1
LICENSE LAMP NO. 1
(8W-51-4)
LICENSE LAMP NO. 2
(8W-51-4)

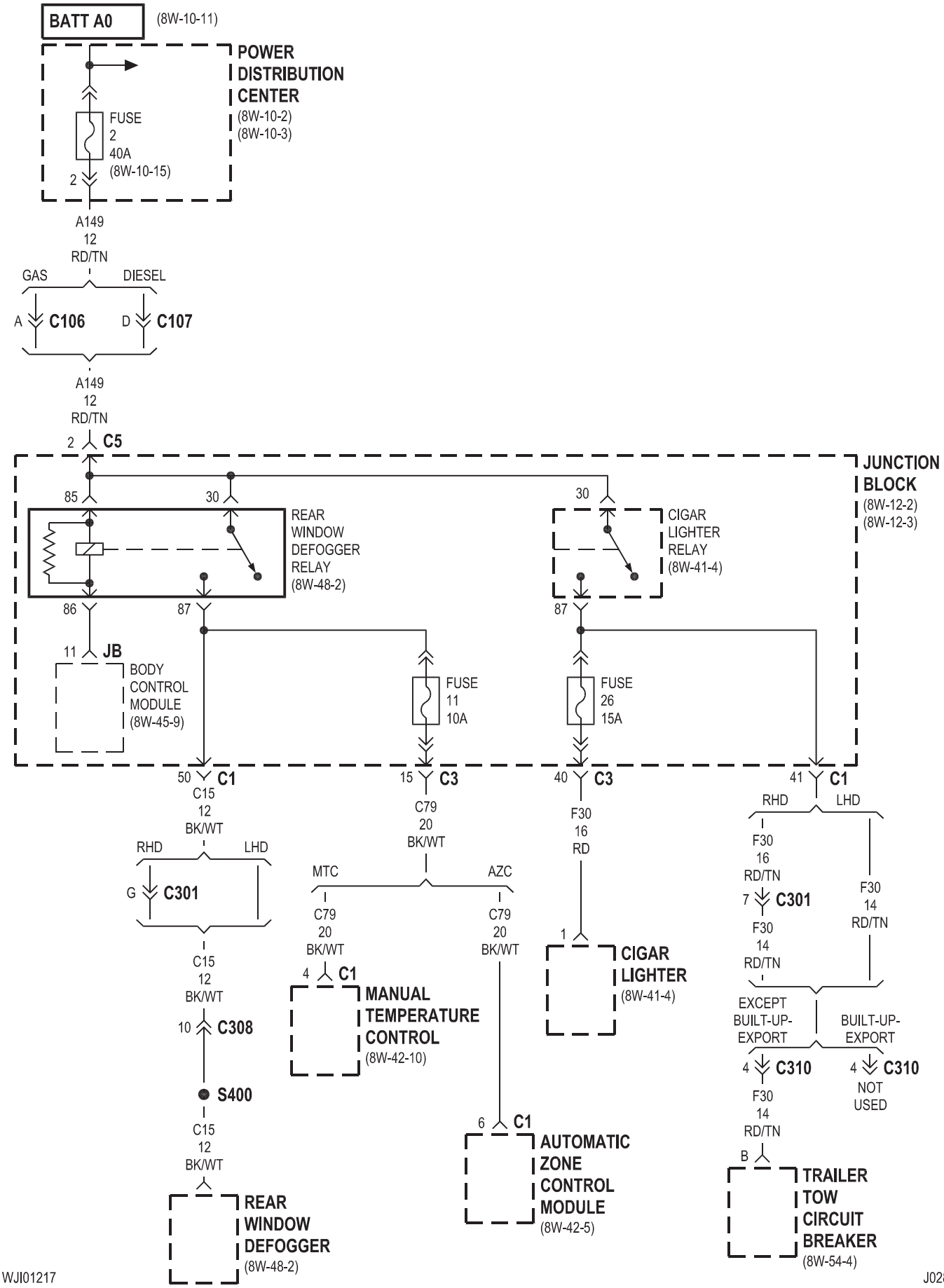
RHD


BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
85
87
87A
PARK LAMP RELAY
(8W-50-6)
86
30
1 JB
14 JB
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
20 C2
21 C2
11 C1
L7 20 BK/YL
L7 18 BK/YL
S326
11 C308
37 C200
3
LEFT REAR LAMP ASSEMBLY
(8W-51-3)
2 C312
2
HEADLAMP LEVELING SWITCH
(8W-50-9)
53 C107
GAS
DIESEL
4 C111
B
TO S156
(8W-12-14)
53 C106
4 C112
A
TO S153
(8W-12-14)
5 C310
NOT USED
8 C301
3
RIGHT REAR LAMP ASSEMBLY
(8W-51-3)
S411
1
LICENSE LAMP NO. 1
(8W-51-4)
1
LICENSE LAMP NO. 2
(8W-51-4)


FROM
C112
(8W-12-12)
(8W-12-13)
A
L7
20
BK/YL
S153
L7
20
BK/PK
2
RIGHT FRONT PARK LAMP
(8W-50-7)
(8W-50-8)
3
RIGHT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)
(8W-50-8)
1
RIGHT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-7)
1
RIGHT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-7)
FROM
C111
(8W-12-12)
(8W-12-13)
B
S156
2
LEFT FRONT PARK LAMP
(8W-50-10)
(8W-50-11)
3
LEFT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)
(8W-50-11)
1
LEFT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-10)
1
LEFT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-10)

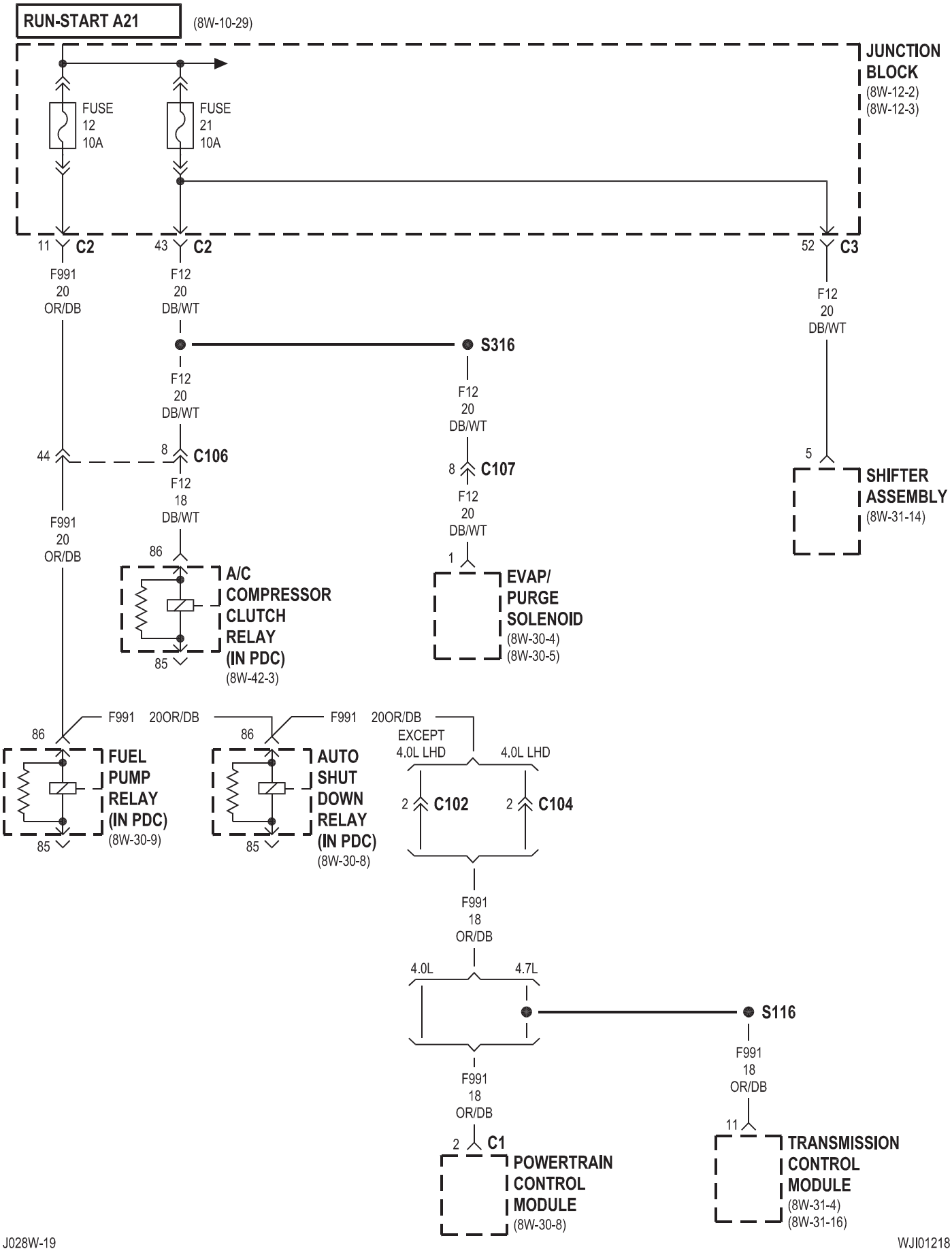

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 15 50A
(8W-10-30)
15
A148 10 PK/WT
GAS
DIESEL
K C106
K C107
A148 10 PK/WT
1 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 7 10A
26 JB
BODY CONTROL MODULE
(8W-45-2)
32 C2
34 C3
35 C3
44 C3
M1 20 PK/RD
M1 20 PK
M1 20 PK
M1 20 PK
RHD
LHD
S366
1
SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
M1 18 PK/RD
11 C302
M1 18 PK
3
REMOTE KEYLESS MODULE (JAPAN)
(8W-39-11)
M1 20 PK/RD
32 C107
EBUX
BUX
M1 20 PK/RD
M1 18 PK
12 C2
AUTOMATIC ZONE CONTROL MODULE
(8W-42-6)
4
AUTOMATIC HEADLAMP LIGHT SENSOR/ VTSS LED
(8W-39-3)
S163
M1 20 PK
M1 18 PK
3
SIREN
(8W-49-7)
1 C108
2
UNDERHOOD LAMP
(8W-44-8)

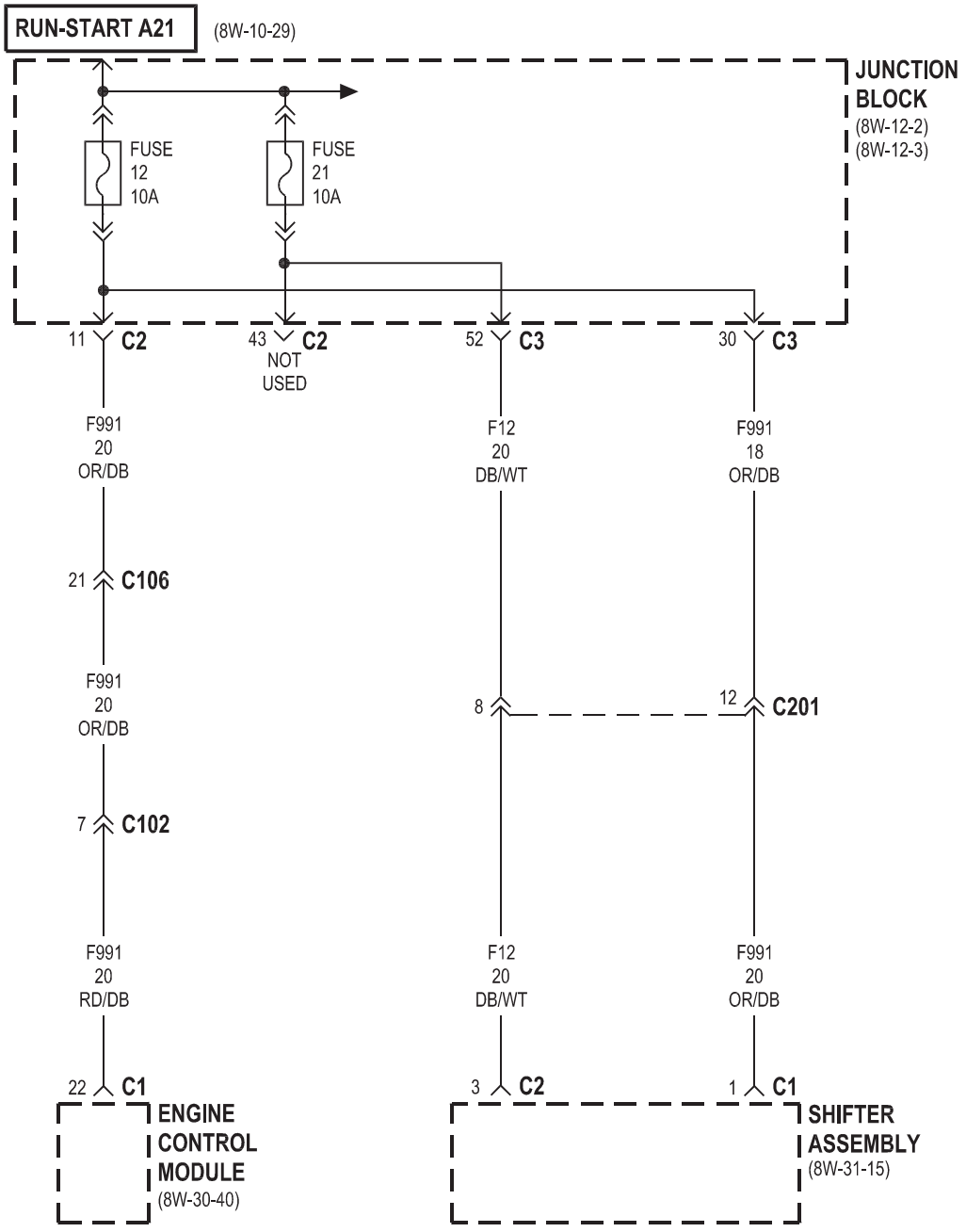

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 8 15A
48 C3
38 C3
36 C1
F70 20 PK/BK
LHD
RHD
F70 20 PK/BK
1
LEFT COURTESY LAMP
(8W-44-8)
RIGHT COURTESY LAMP
(8W-44-8)
F70 18 PK
2 C301
S207
S304
F70 18 PK
6 C308
GLOVE BOX LAMP
(8W-44-8)
F70 20 PK
10 C309
S403
RIGHT COURTESY LAMP
(8W-44-8)
LEFT COURTESY LAMP
(8W-44-8)
S346
4 C312
5
REAR WIPER MOTOR
(8W-53-6)
RIGHT DOOR HANDLE COURTESY LAMP
(8W-44-3)
RIGHT VISOR/ VANITY LAMP
(8W-44-2)
LIFTGATE FLIP-UP PUSH BUTTON SWITCH
(8W-61-11)
P101 18 OR/PK
3 C312
LEFT DOOR HANDLE COURTESY LAMP
(8W-44-3)
LEFT VISOR/ VANITY LAMP
(8W-44-2)
6 C317
CARGO LAMP
(8W-44-4)
VEHICLE INFORMATION CENTER
(8W-49-2)
(8W-49-3)
OVERHEAD MAP/ COURTESY LAMP
(8W-44-3)
INTRUSION TRANSCEIVER MODULE (BUILT-UP-EXPORT)
(8W-49-7)
LIFTGATE POWER LOCK MOTOR
(8W-61-11)
J028W-19
WJI01216

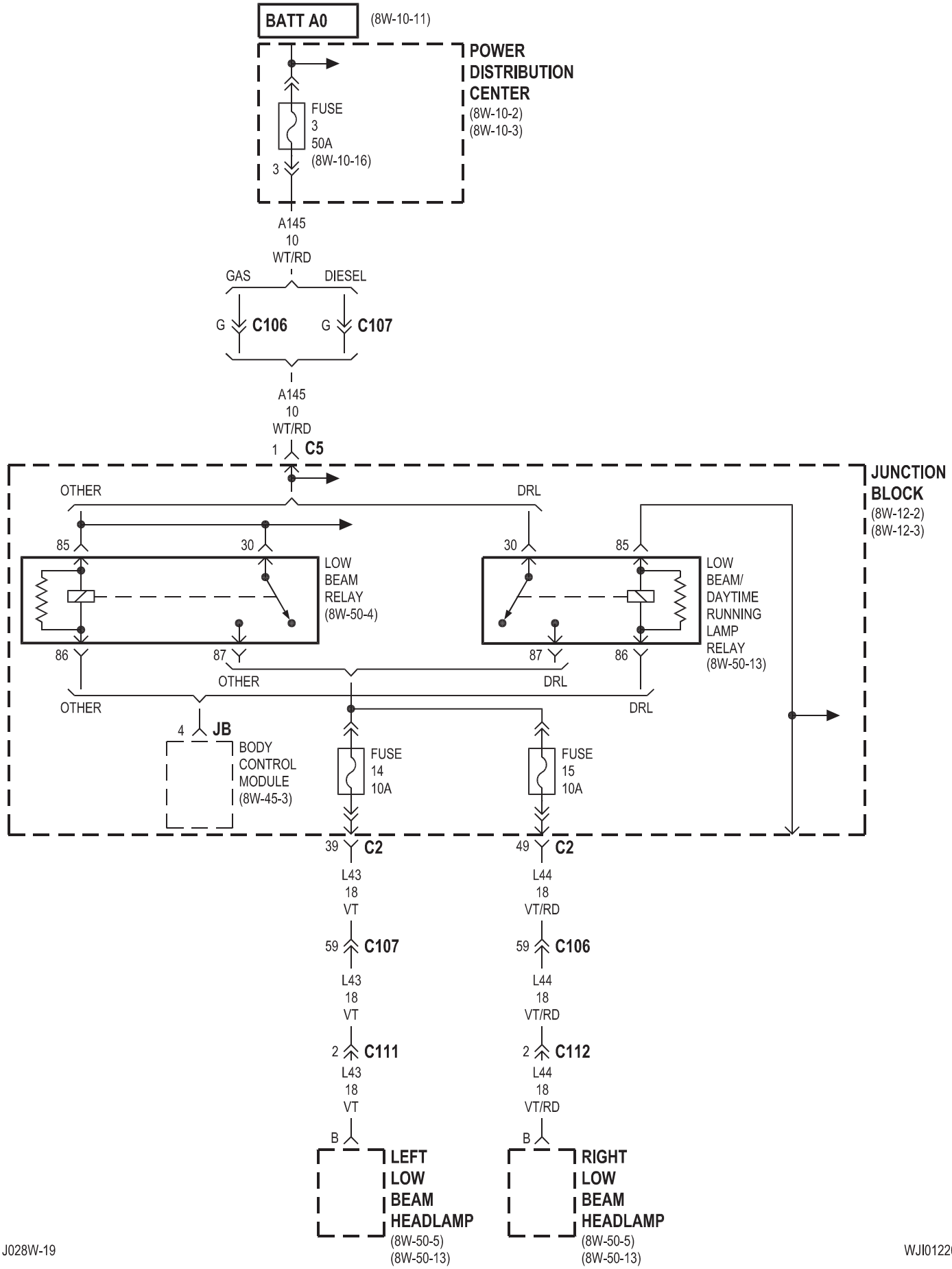


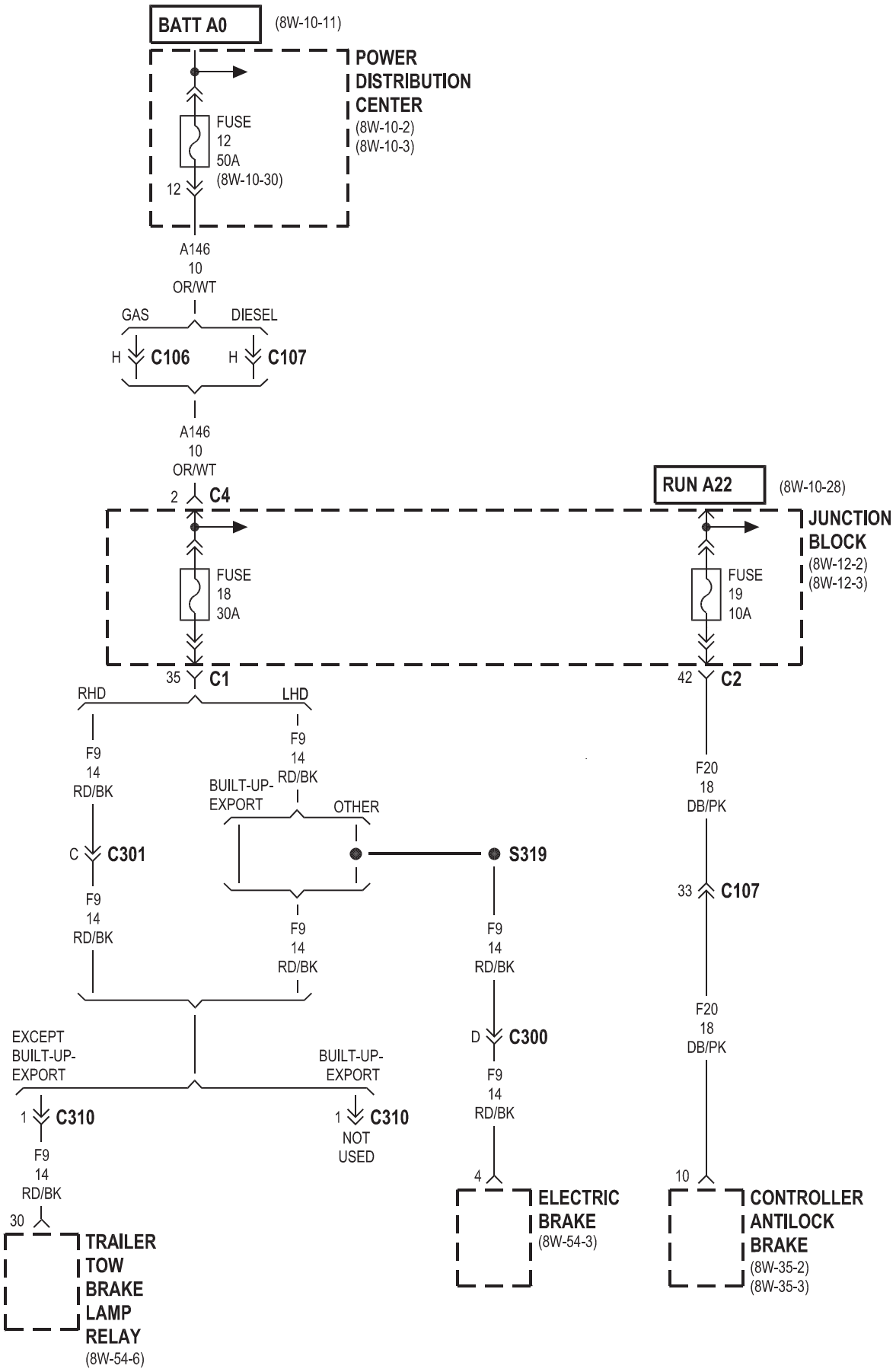
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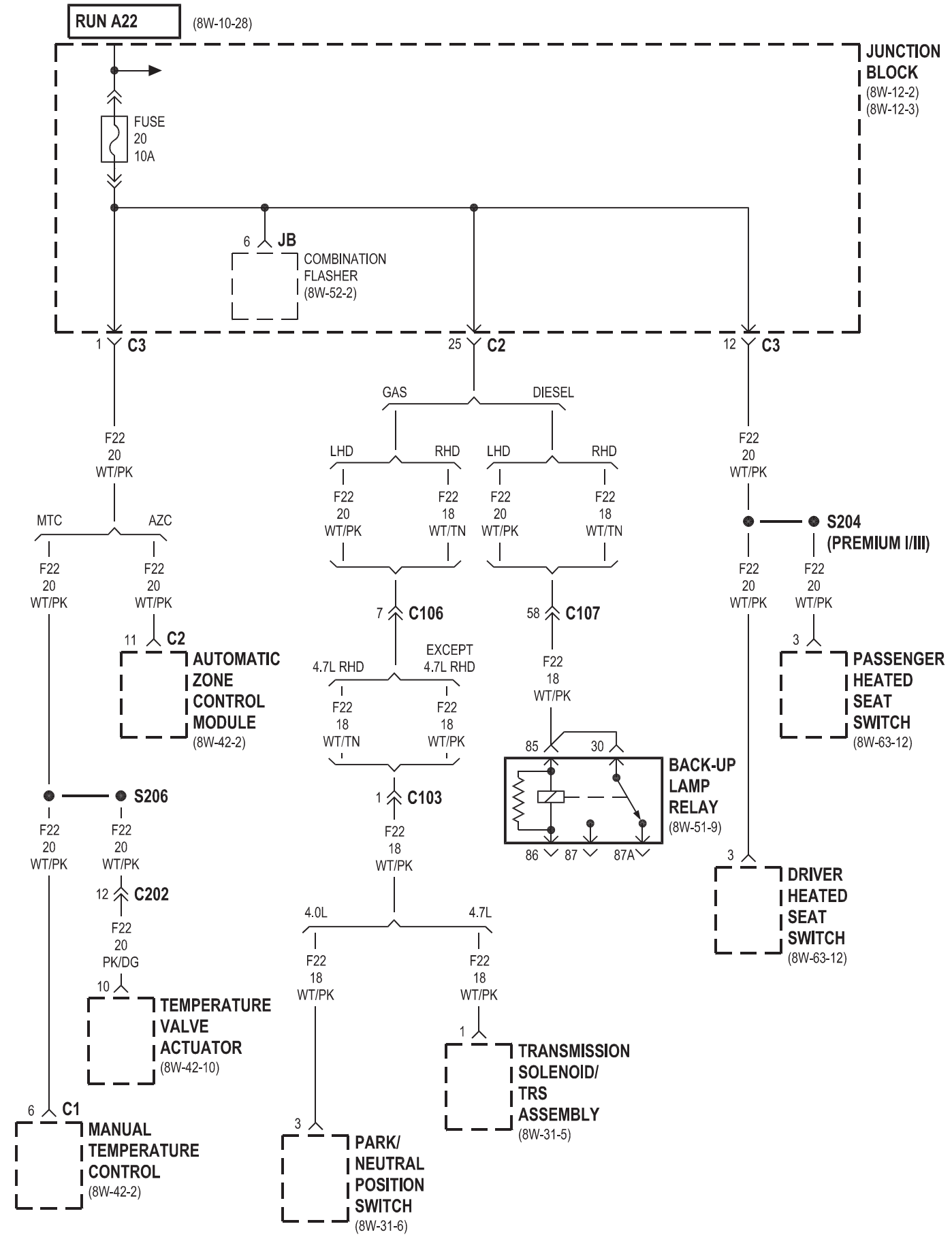
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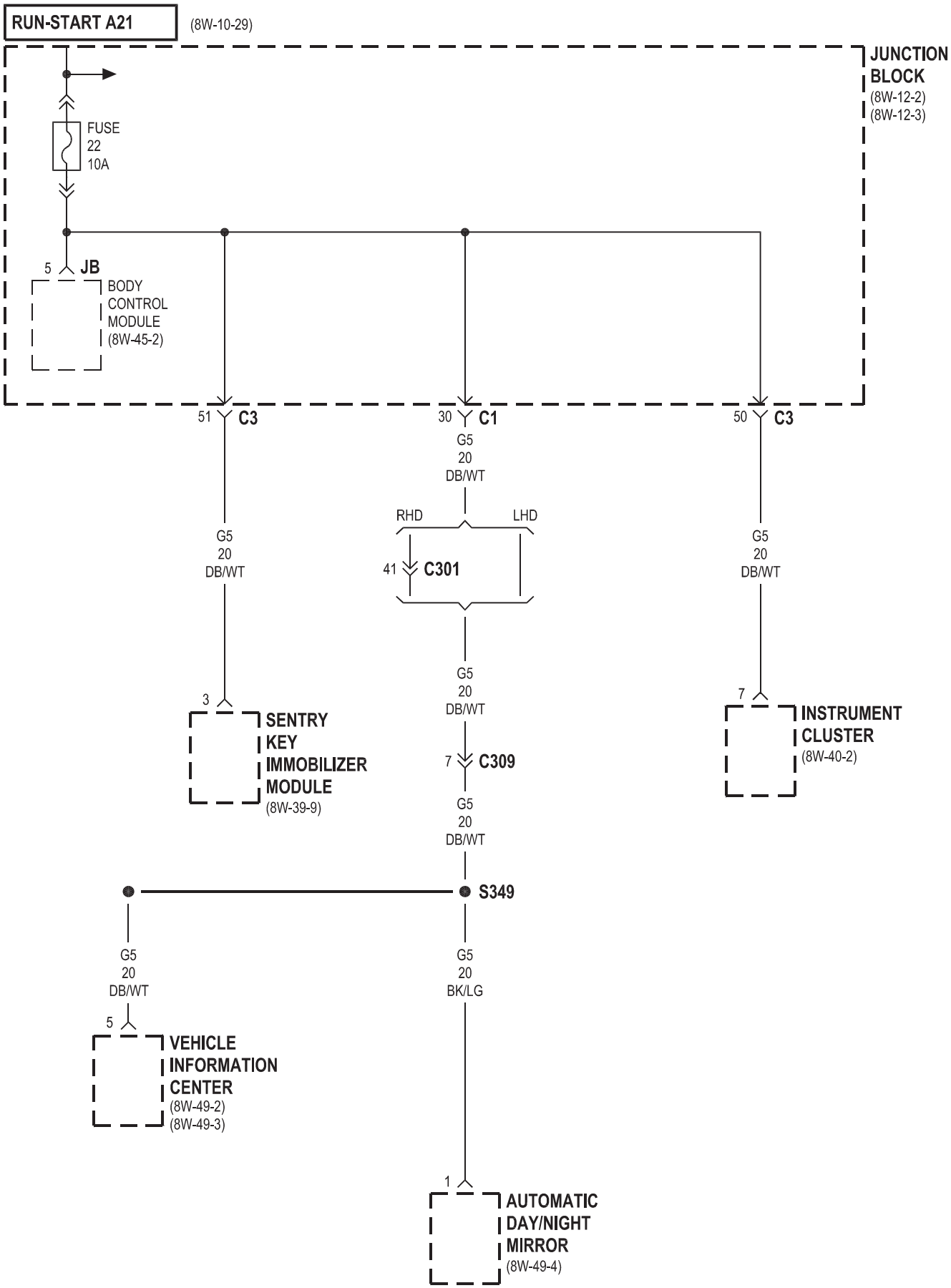

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
FUSE 21 10A
11 C2
43 C2
52 C3
F991 20 OR/DB
F12 20 DB/WT
S316
44
8 C106
F12 18 DB/WT
8 C107
5
SHIFTER ASSEMBLY
(8W-31-14)
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-3)
85
1
EVAP/ PURGE SOLENOID
(8W-30-4)
(8W-30-5)
F991 20OR/DB
FUEL PUMP RELAY (IN PDC)
(8W-30-9)
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-8)
EXCEPT 4.0L LHD
4.0L LHD
2 C102
2 C104
F991 18 OR/DB
4.0L
4.7L
S116
2 C1
POWERTRAIN CONTROL MODULE
(8W-30-8)
11
TRANSMISSION CONTROL MODULE
(8W-31-4)
(8W-31-16)

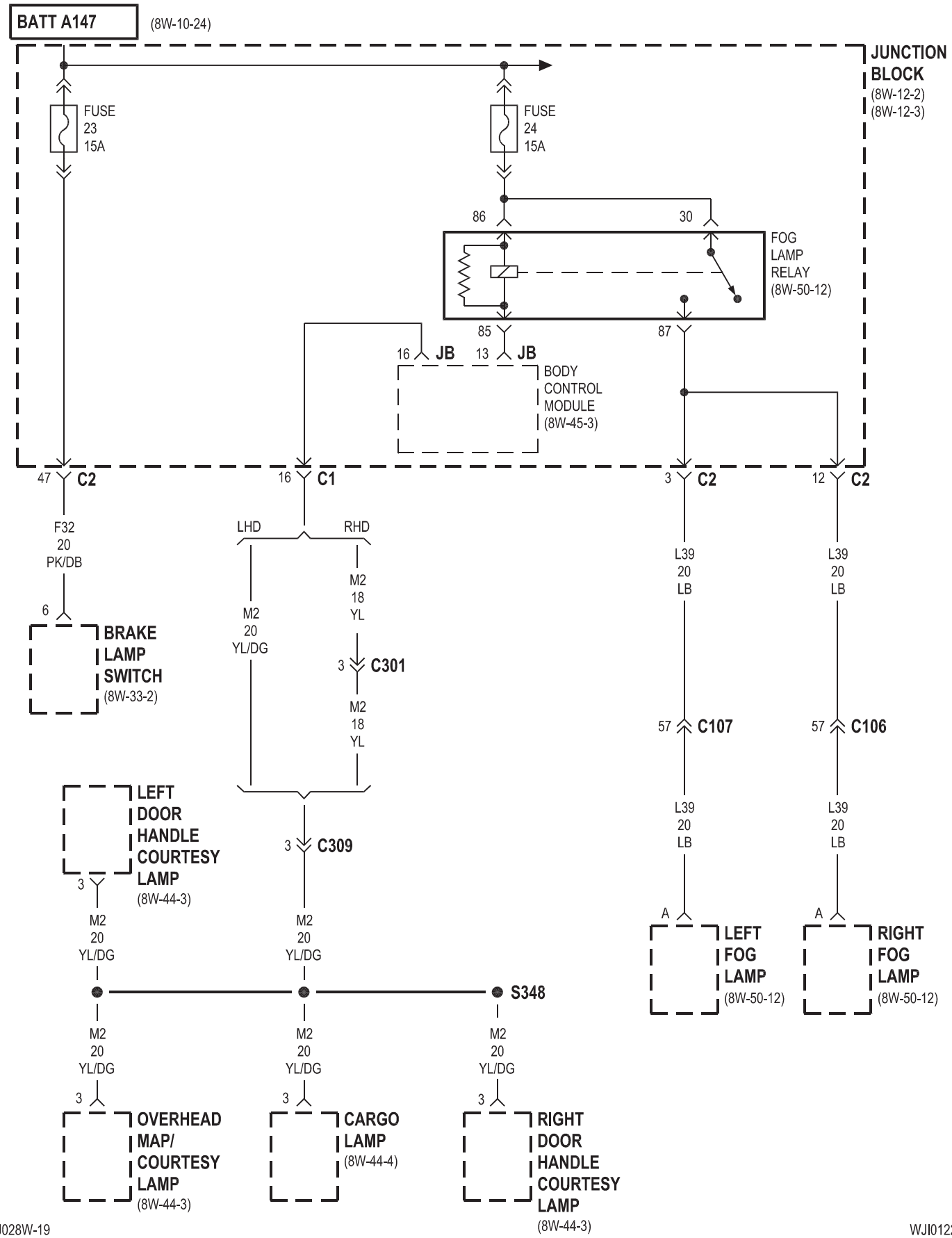

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
FUSE 21 10A
11 C2
43 C2
NOT USED
52 C3
30 C3
F991 20 OR/DB
F12 20 DB/WT
F991 18 OR/DB
21 C106
F991 20 OR/DB
8
12 C201
7 C102
F991 20 RD/DB
F12 20 DB/WT
F991 20 OR/DB
22 C1
3 C2
1 C1
ENGINE CONTROL MODULE
(8W-30-40)
SHIFTER ASSEMBLY
(8W-31-15)

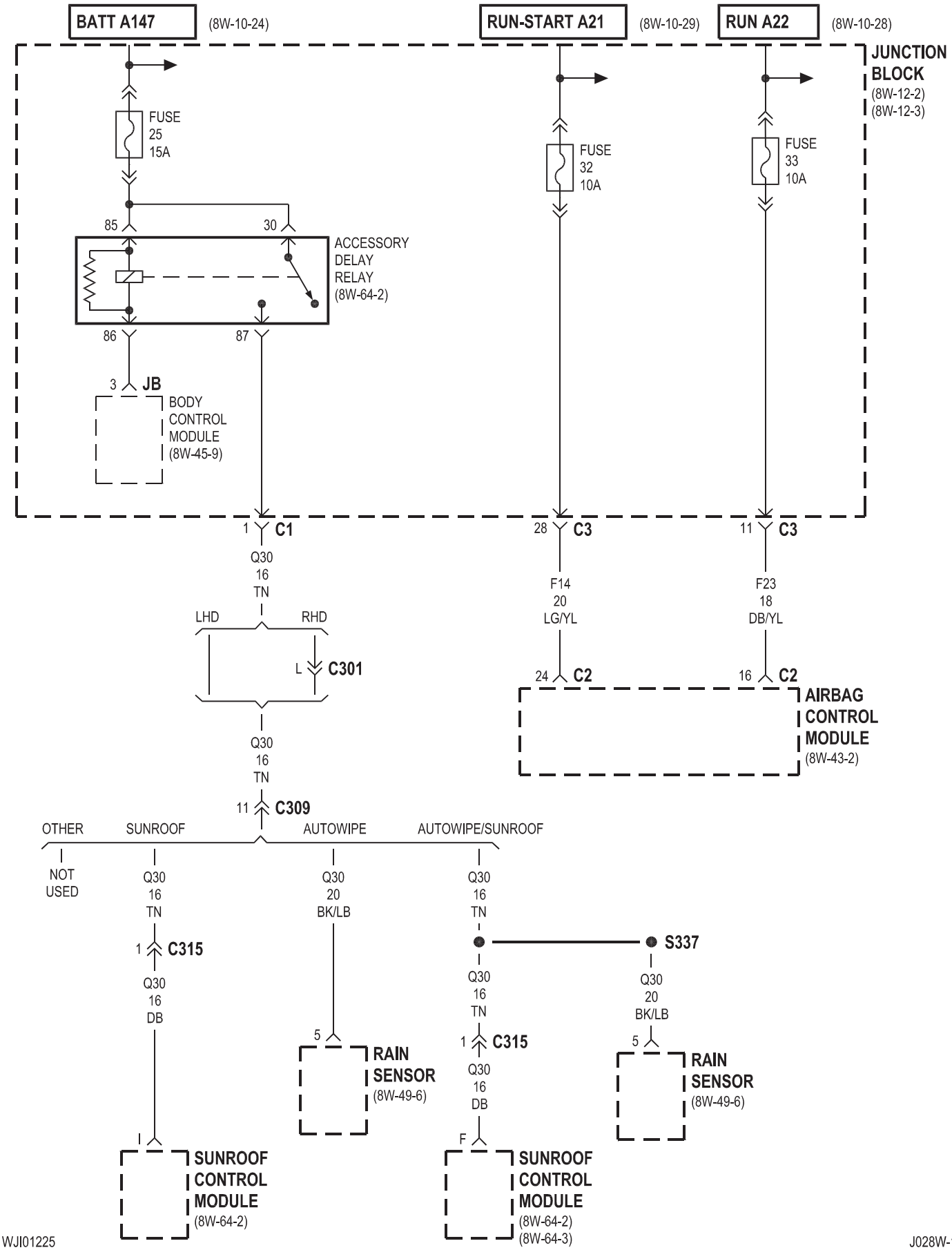

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 3 50A
(8W-10-16)
3
A145 10 WT/RD
GAS
DIESEL
G C106
G C107
A145 10 WT/RD
1 C5
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
OTHER
DRL
85
30
LOW BEAM RELAY
(8W-50-4)
30
85
LOW BEAM/ DAYTIME RUNNING LAMP RELAY
(8W-50-13)
86
87
87
86
OTHER
DRL
OTHER
DRL
4 JB
BODY CONTROL MODULE
(8W-45-3)
FUSE 14 10A
FUSE 15 10A
39 C2
49 C2
L43 18 VT
L44 18 VT/RD
59 C107
59 C106
L43 18 VT
L44 18 VT/RD
2 C111
2 C112
L43 18 VT
L44 18 VT/RD
B
B
LEFT LOW BEAM HEADLAMP
(8W-50-5)
(8W-50-13)
RIGHT LOW BEAM HEADLAMP
(8W-50-5)
(8W-50-13)


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 12 50A
(8W-10-30)
12
A146 10 OR/WT
GAS
DIESEL
H C106
H C107
A146 10 OR/WT
2 C4
RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 18 30A
FUSE 19 10A
35 C1
42 C2
RHD
LHD
F9 14 RD/BK
BUILT-UP-EXPORT
OTHER
C C301
S319
F20 18 DB/PK
33 C107
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
1 C310
1 C310
NOT USED
D C300
4
ELECTRIC BRAKE
(8W-54-3)
10
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
(8W-35-3)
30
TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)


RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
10A
6 JB
COMBINATION FLASHER
(8W-52-2)
1 C3
25 C2
12 C3
GAS
DIESEL
LHD
RHD
F22
20
WT/PK
F22
18
WT/TN
MTC
AZC
11 C2
AUTOMATIC ZONE CONTROL MODULE
(8W-42-2)
7 C106
58 C107
EXCEPT 4.7L RHD
4.7L RHD
F22
18
WT/PK
1 C103
85
30
86
87
87A
BACK-UP LAMP RELAY
(8W-51-9)
S204
(PREMIUM I/III)
3
PASSENGER HEATED SEAT SWITCH
(8W-63-12)
DRIVER HEATED SEAT SWITCH
(8W-63-12)
S206
12 C202
F22
20
PK/DG
10
TEMPERATURE VALVE ACTUATOR
(8W-42-10)
6 C1
MANUAL TEMPERATURE CONTROL
(8W-42-2)
4.0L
4.7L
3
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
1
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)

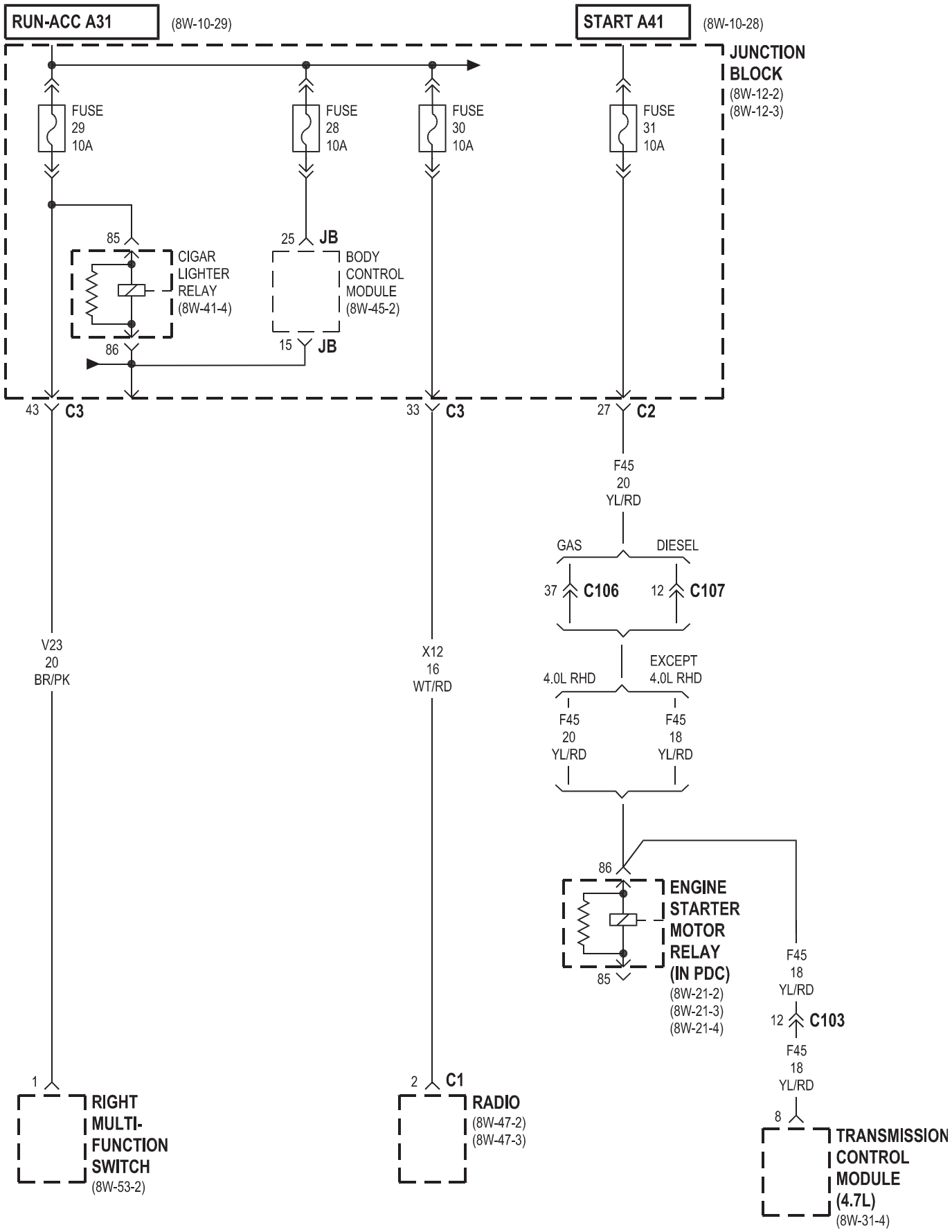

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
22
10A
5
JB
BODY CONTROL MODULE
(8W-45-2)
51
C3
30
C1
50
C3
G5
20
DB/WT
RHD
LHD
41
C301
3
SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
7
C309
7
INSTRUMENT CLUSTER
(8W-40-2)
S349
G5
20
BK/LG
5
VEHICLE INFORMATION CENTER
(8W-49-2)
(8W-49-3)
1
AUTOMATIC DAY/NIGHT MIRROR
(8W-49-4)

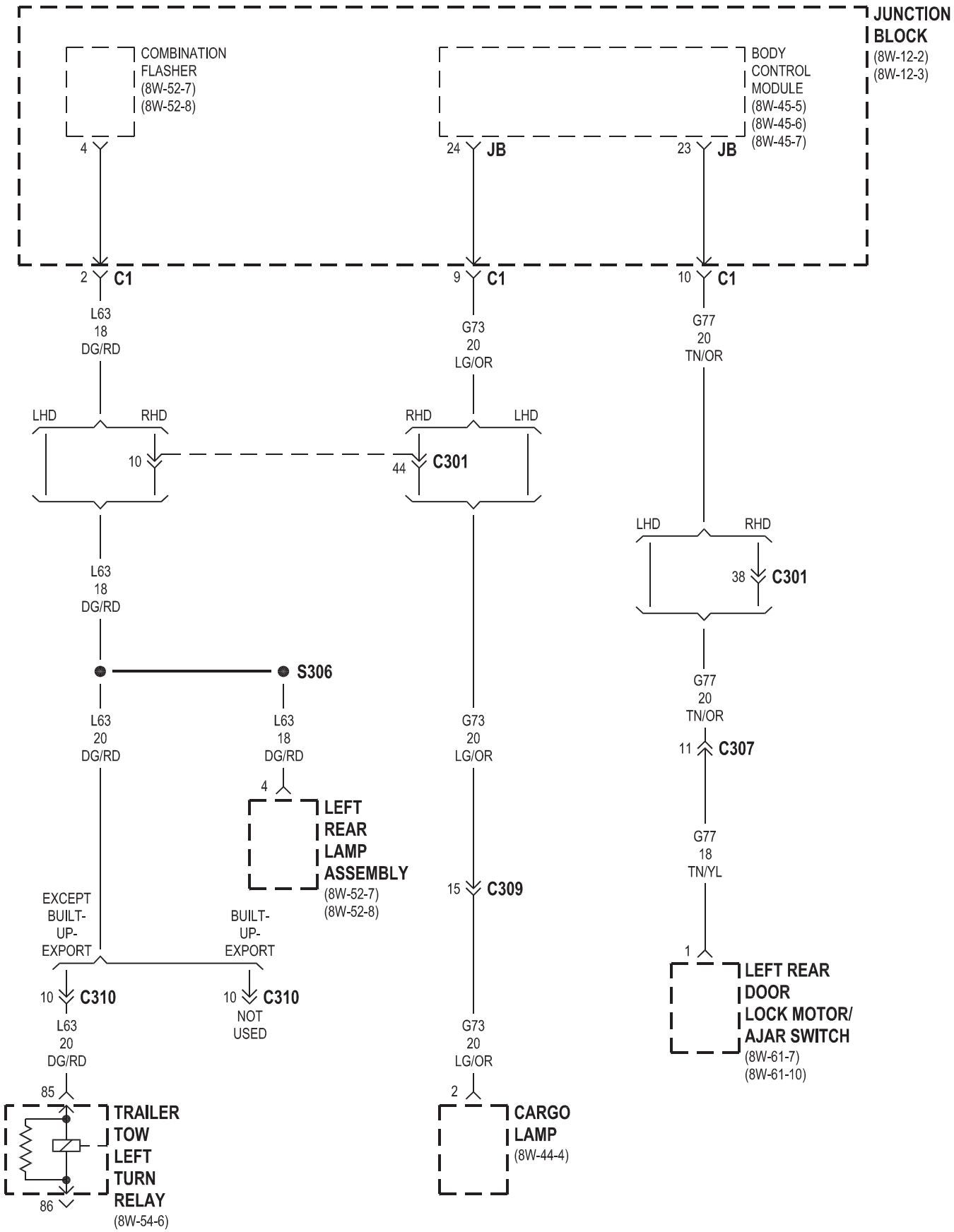

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 23 15A
FUSE 24 15A
86
30
FOG LAMP RELAY
(8W-50-12)
85
87
16 JB
13 JB
BODY CONTROL MODULE
(8W-45-3)
47 C2
16 C1
3 C2
12 C2
F32
20
PK/DB
6
BRAKE LAMP SWITCH
(8W-33-2)
LHD
RHD
M2
20
YL/DG
M2
18
YL
3 C301
M2
18
YL
3 C309
L39
20
LB
57 C107
57 C106
L39
20
LB
L39
20
LB
A
A
LEFT FOG LAMP
(8W-50-12)
RIGHT FOG LAMP
(8W-50-12)
LEFT DOOR HANDLE COURTESY LAMP
(8W-44-3)
3
M2
20
YL/DG
M2
20
YL/DG
S348
M2
20
YL/DG
M2
20
YL/DG
M2
20
YL/DG
3
3
3
OVERHEAD MAP/ COURTESY LAMP
(8W-44-3)
CARGO LAMP
(8W-44-4)
RIGHT DOOR HANDLE COURTESY LAMP
(8W-44-3)

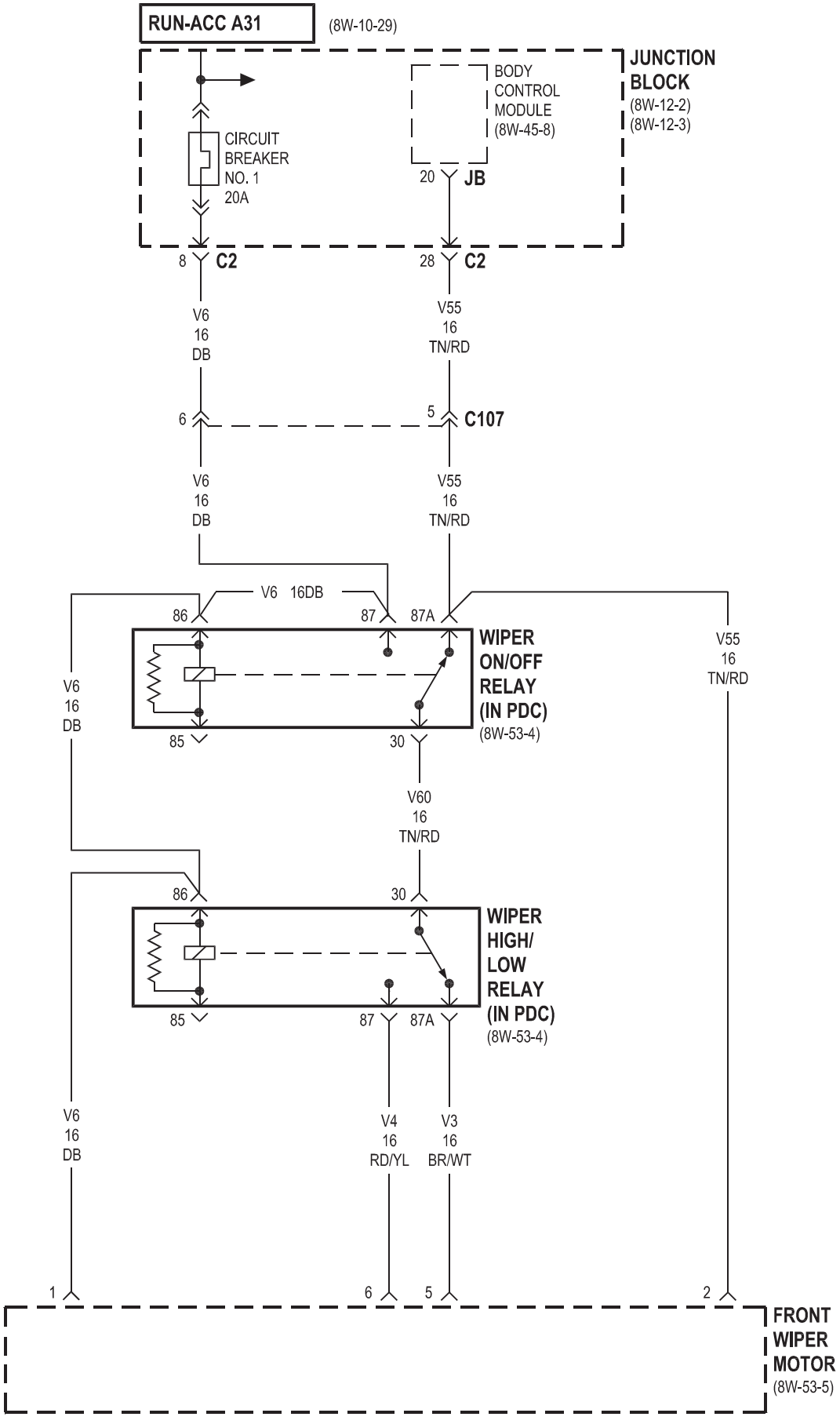


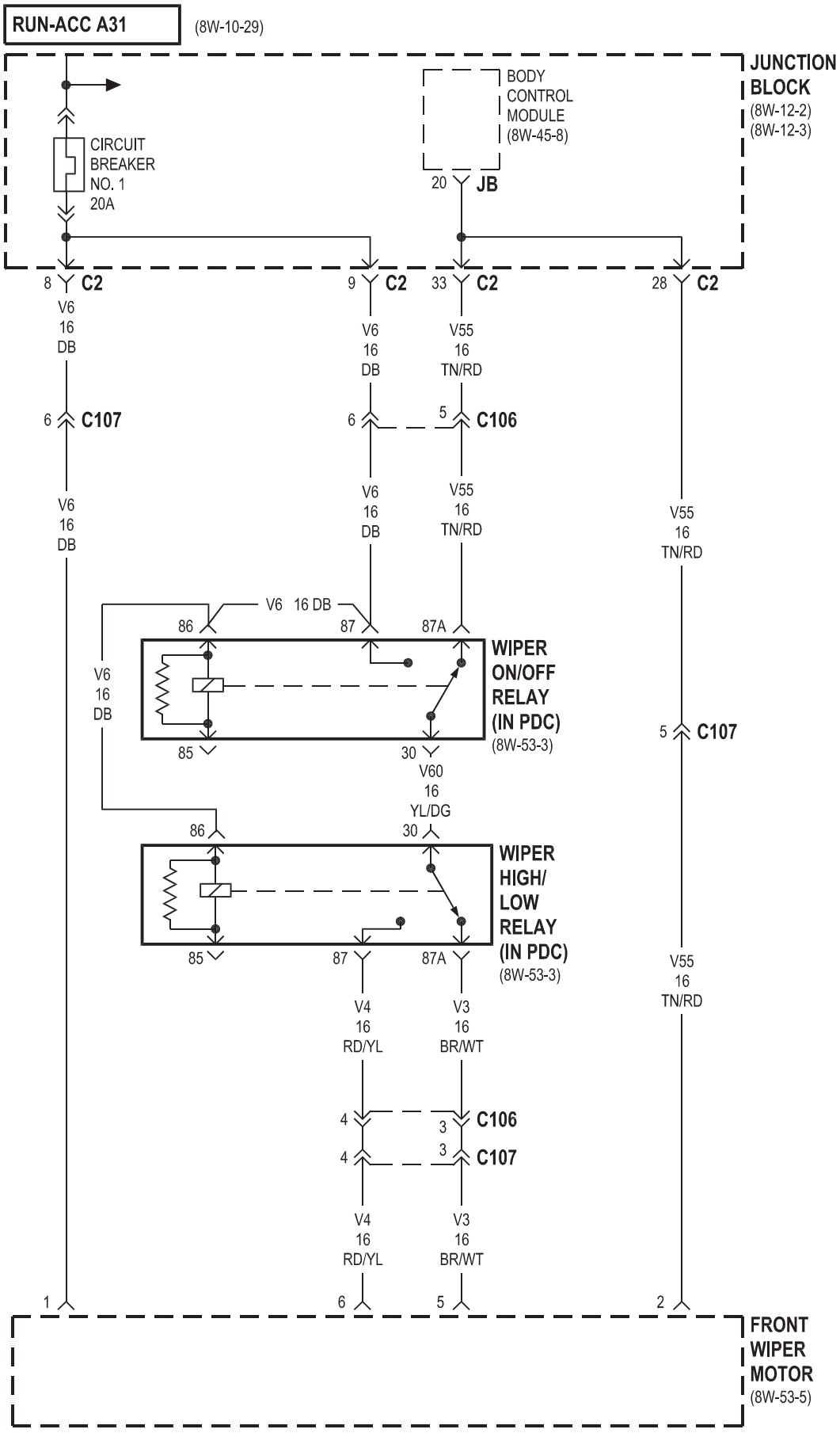
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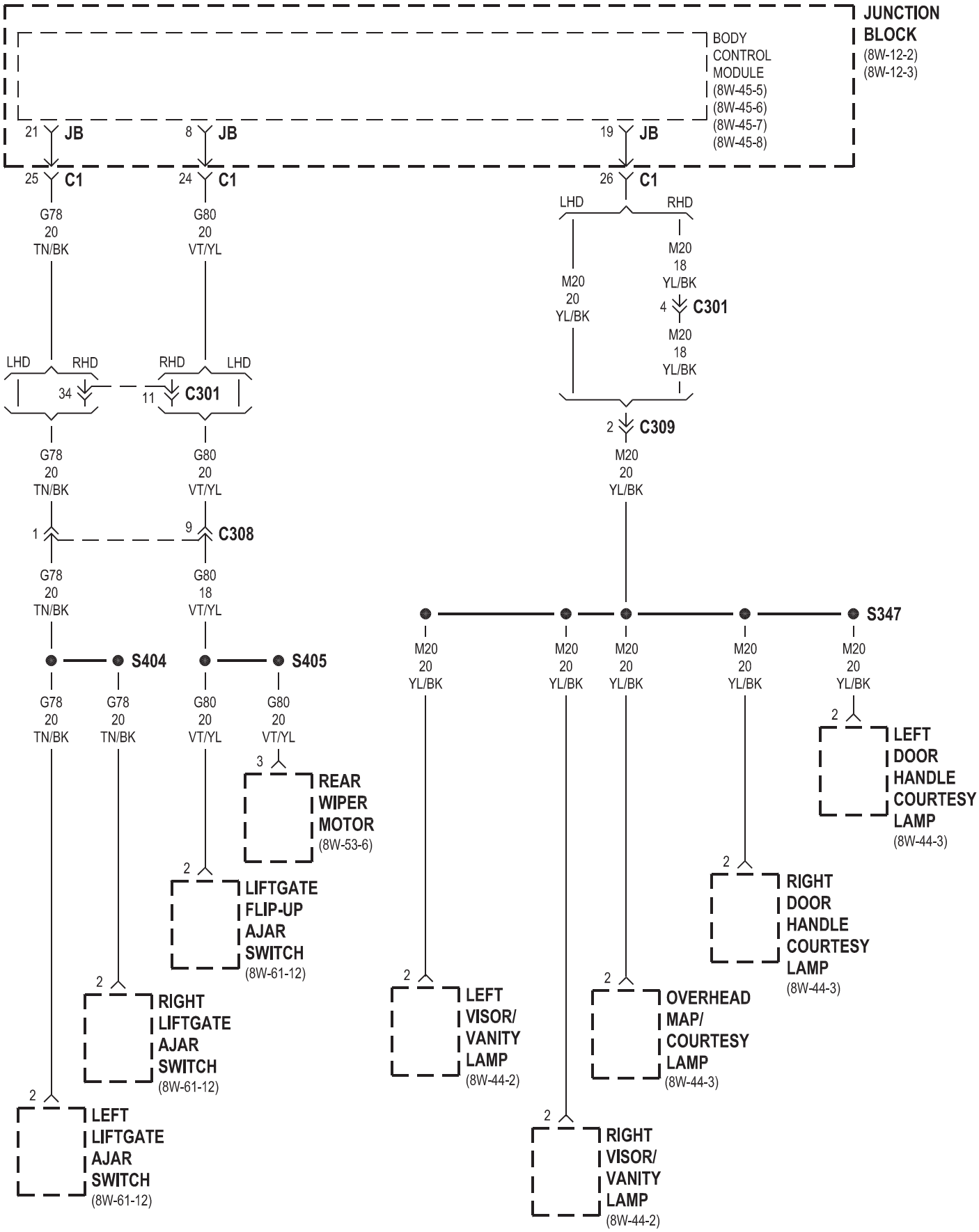
J028W-19

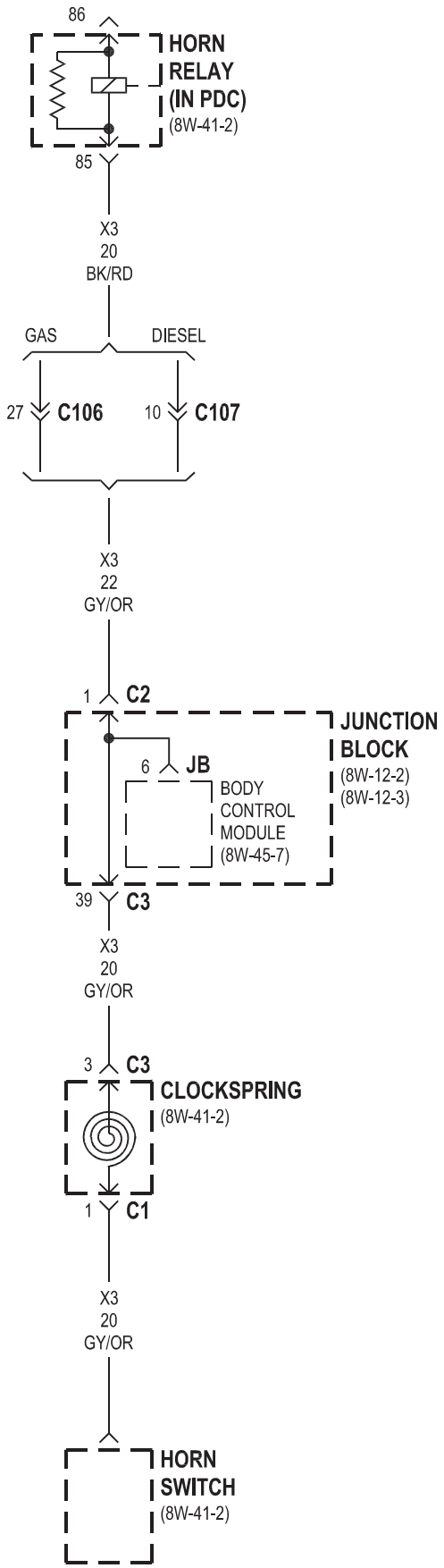

RUN-ACC A31
(8W-10-29)
START A41
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 29 10A
FUSE 28 10A
FUSE 30 10A
FUSE 31 10A
85
CIGAR LIGHTER RELAY
(8W-41-4)
25 JB
BODY CONTROL MODULE
(8W-45-2)
15 JB
86
43 C3
33 C3
27 C2
F45 20 YL/RD
GAS
DIESEL
37 C106
12 C107
V23 20 BR/PK
X12 16 WT/RD
EXCEPT 4.0L RHD
4.0L RHD
F45 20 YL/RD
F45 18 YL/RD
86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
(8W-21-4)
85
F45 18 YL/RD
12 C103
F45 18 YL/RD
8
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-4)
1
RIGHT MULTI-FUNCTION SWITCH
(8W-53-2)
2 C1
RADIO
(8W-47-2)
(8W-47-3)

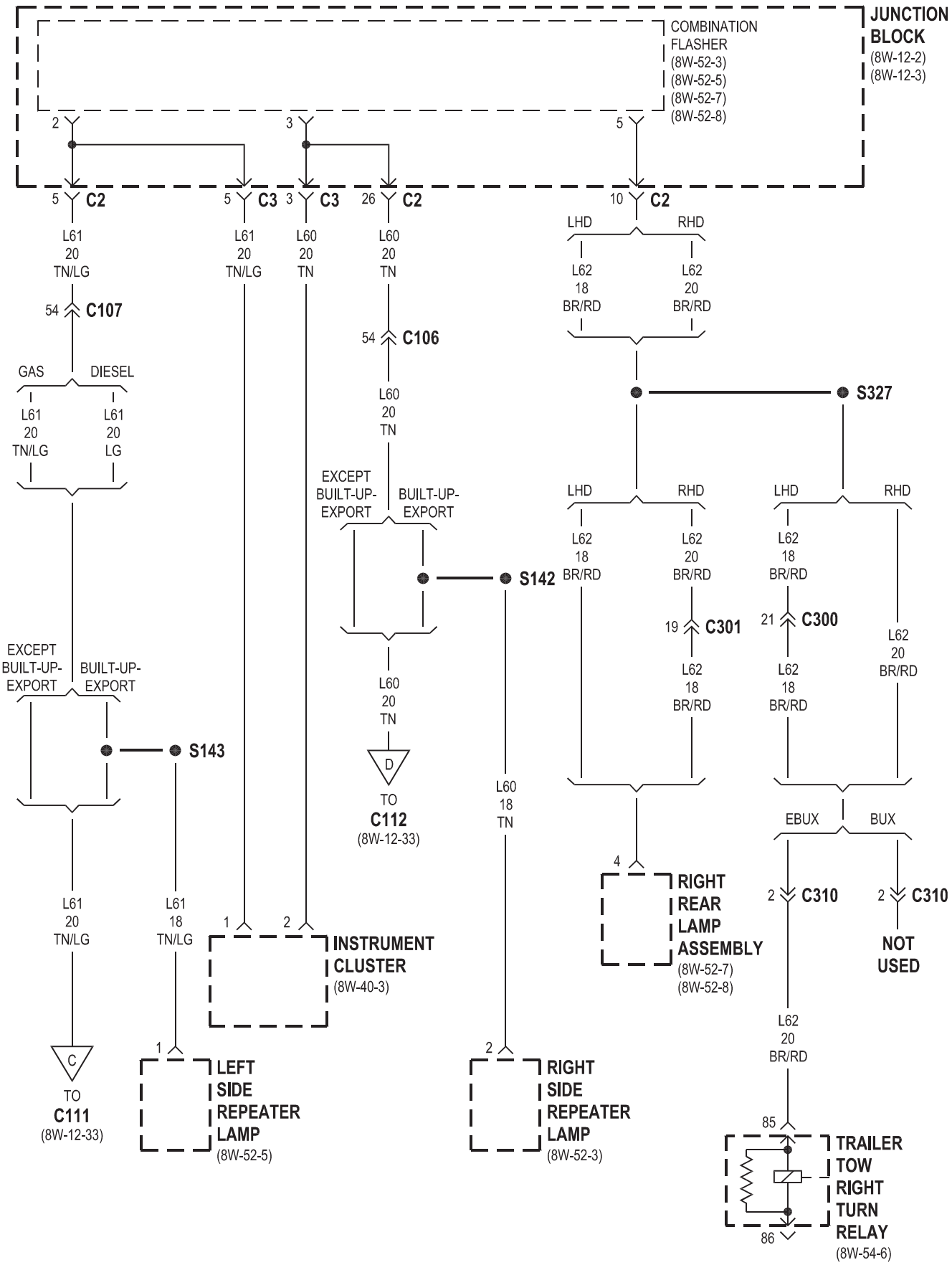

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
(8W-52-7)
(8W-52-8)
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
(8W-45-7)
4
24 JB
23 JB
2 C1
9 C1
10 C1
L63 18 DG/RD
G73 20 LG/OR
G77 20 TN/OR
LHD
RHD
10
44 C301
38 C301
S306
L63 20 DG/RD
L63 18 DG/RD
G73 20 LG/OR
G77 20 TN/OR
11 C307
4
LEFT REAR LAMP ASSEMBLY
(8W-52-7)
(8W-52-8)
15 C309
G77 18 TN/YL
1
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
(8W-61-10)
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
10 C310
10 C310
NOT USED
L63 20 DG/RD
G73 20 LG/OR
85
86
TRAILER TOW LEFT TURN RELAY
(8W-54-6)
2
CARGO LAMP
(8W-44-4)

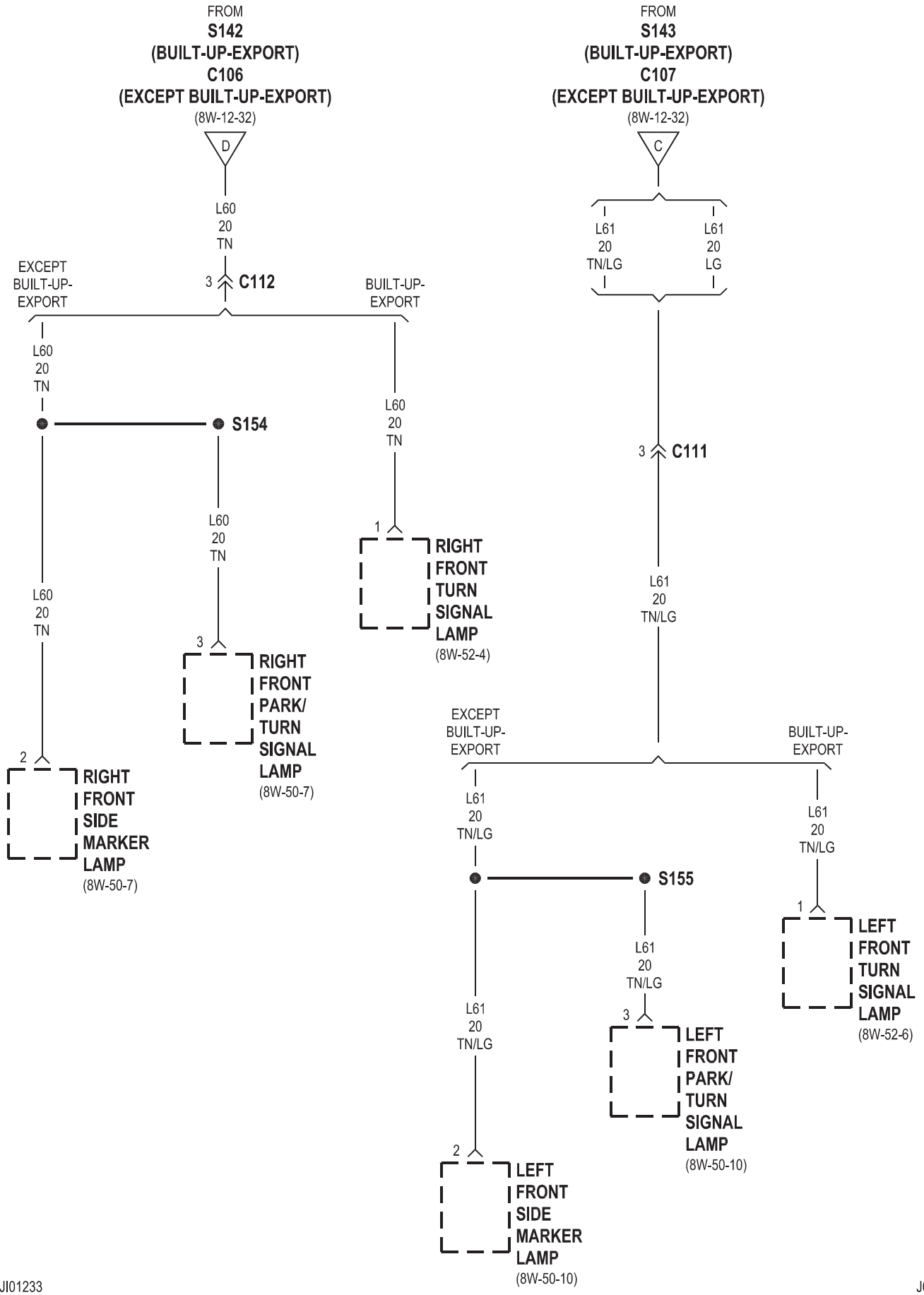

RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-8)
CIRCUIT BREAKER NO. 1 20A
20
JB
8
C2
28
C2
V6 16 DB
V55 16 TN/RD
6
5
C107
V6 16 DB
V55 16 TN/RD
V6 16DB
86
87
87A
WIPER ON/OFF RELAY (IN PDC)
(8W-53-4)
85
30
V60 16 TN/RD
V6 16 DB
V55 16 TN/RD
86
30
WIPER HIGH/ LOW RELAY (IN PDC)
(8W-53-4)
85
87
87A
V6 16 DB
V4 16 RD/YL
V3 16 BR/WT
1
6
5
2
FRONT WIPER MOTOR
(8W-53-5)

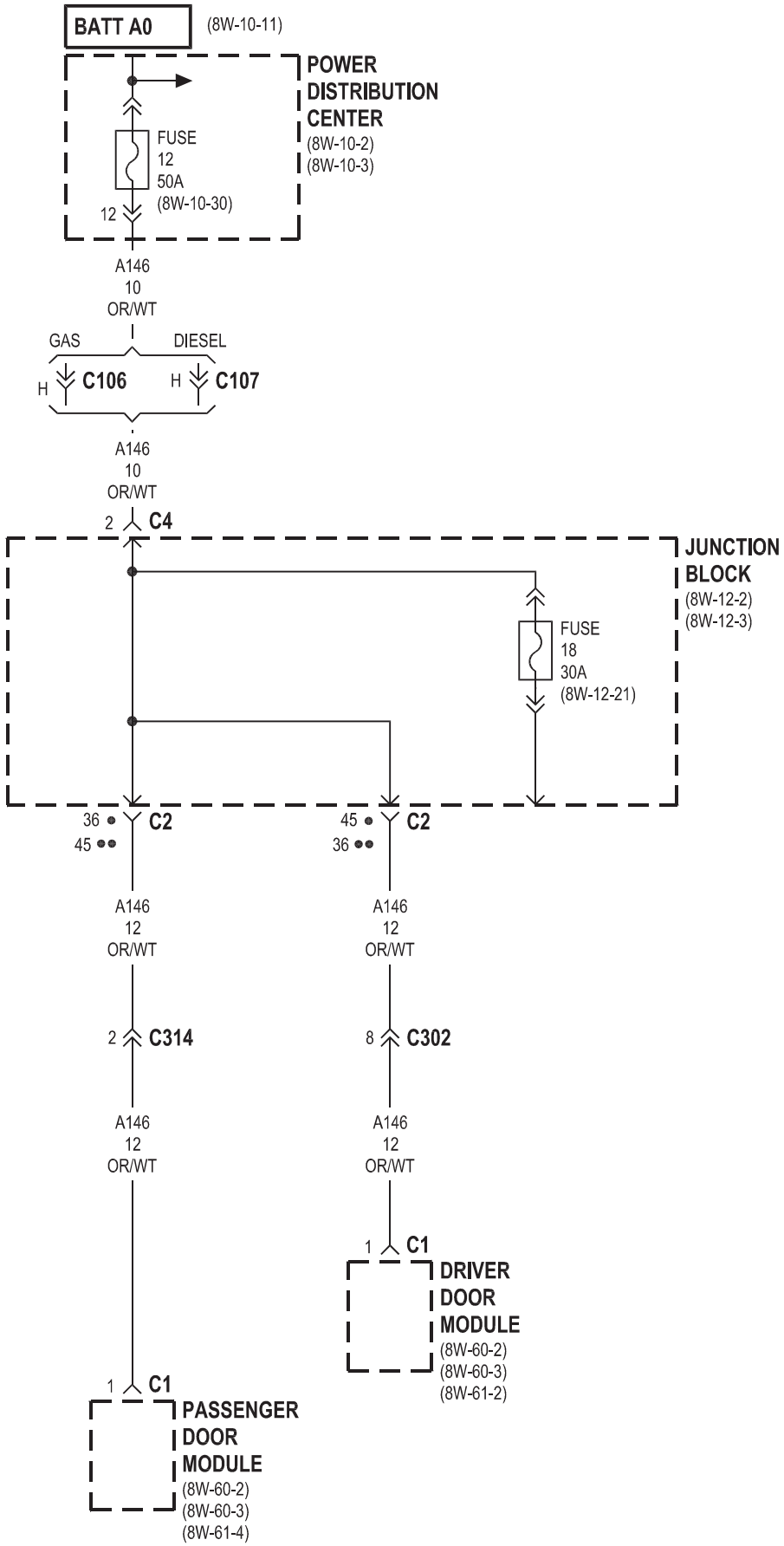

RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 1 20A
BODY CONTROL MODULE
(8W-45-8)
20 JB
8 C2
9 C2
33 C2
28 C2
V6 16 DB
V6 16 DB
V55 16 TN/RD
6 C107
6 C106
5 C106
V6 16 DB
V6 16 DB
V55 16 TN/RD
V55 16 TN/RD
V6 16 DB
86
87
87A
WIPER ON/OFF RELAY (IN PDC)
(8W-53-3)
85
30
V60 16 YL/DG
5 C107
86
30
WIPER HIGH/ LOW RELAY (IN PDC)
(8W-53-3)
85
87
87A
V4 16 RD/YL
V3 16 BR/WT
V55 16 TN/RD
4 C106
3 C106
4 C107
3 C107
V4 16 RD/YL
V3 16 BR/WT
1
6
5
2
FRONT WIPER MOTOR
(8W-53-5)

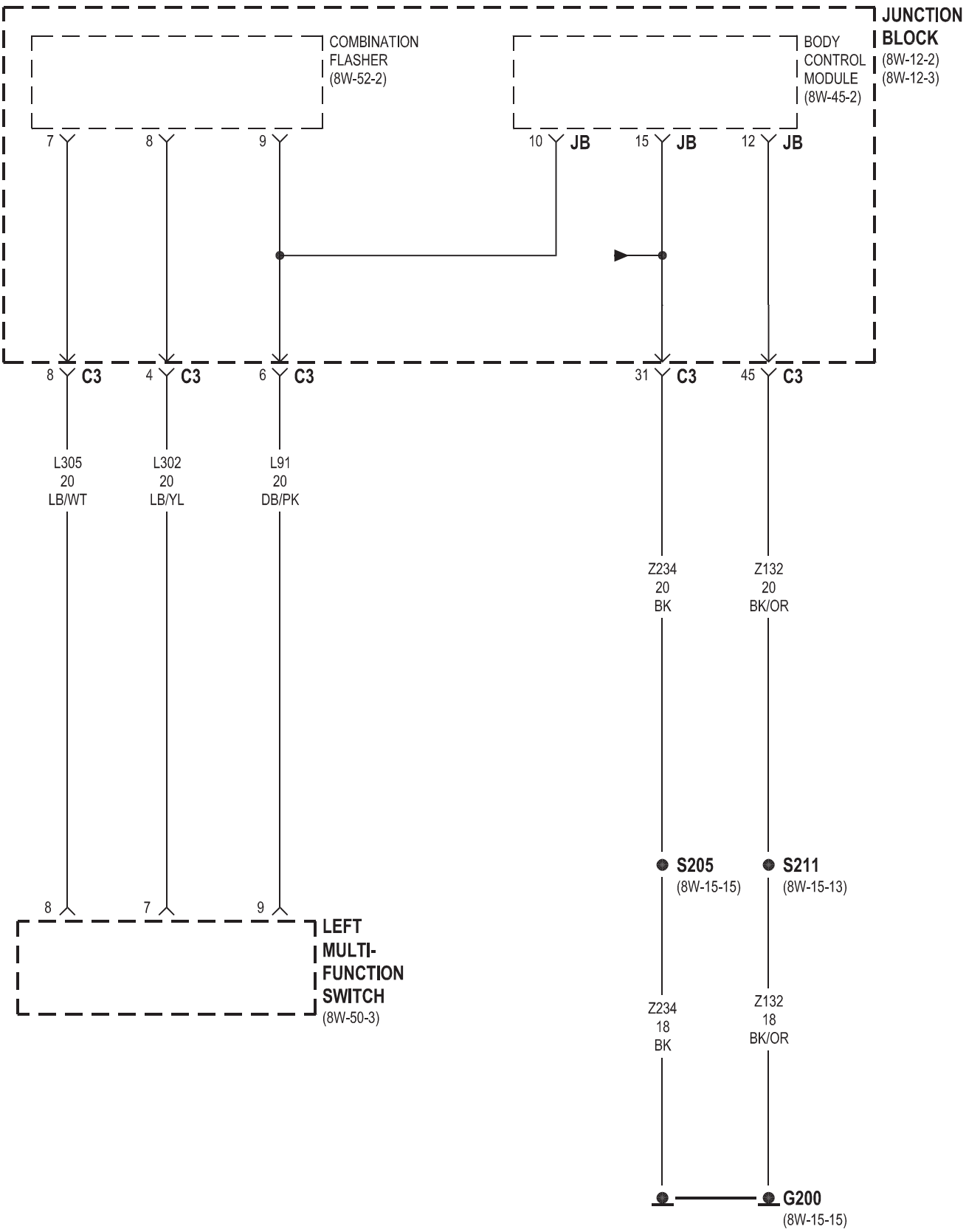

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
(8W-45-7)
(8W-45-8)
21 JB
8 JB
19 JB
25 C1
24 C1
26 C1
G78 20 TN/BK
G80 20 VT/YL
LHD
RHD
M20 18 YL/BK
M20 20 YL/BK
4 C301
34 C301
11 C301
2 C309
1 C308
9 C308
G80 18 VT/YL
M20 20 YL/BK
S404
S405
S347
G78 20 TN/BK
G80 20 VT/YL
3 REAR WIPER MOTOR
(8W-53-6)
2 LIFTGATE FLIP-UP AJAR SWITCH
(8W-61-12)
2 RIGHT LIFTGATE AJAR SWITCH
(8W-61-12)
2 LEFT LIFTGATE AJAR SWITCH
(8W-61-12)
2 LEFT VISOR/ VANITY LAMP
(8W-44-2)
2 OVERHEAD MAP/ COURTESY LAMP
(8W-44-3)
2 RIGHT VISOR/ VANITY LAMP
(8W-44-2)
2 RIGHT DOOR HANDLE COURTESY LAMP
(8W-44-3)
2 LEFT DOOR HANDLE COURTESY LAMP
(8W-44-3)

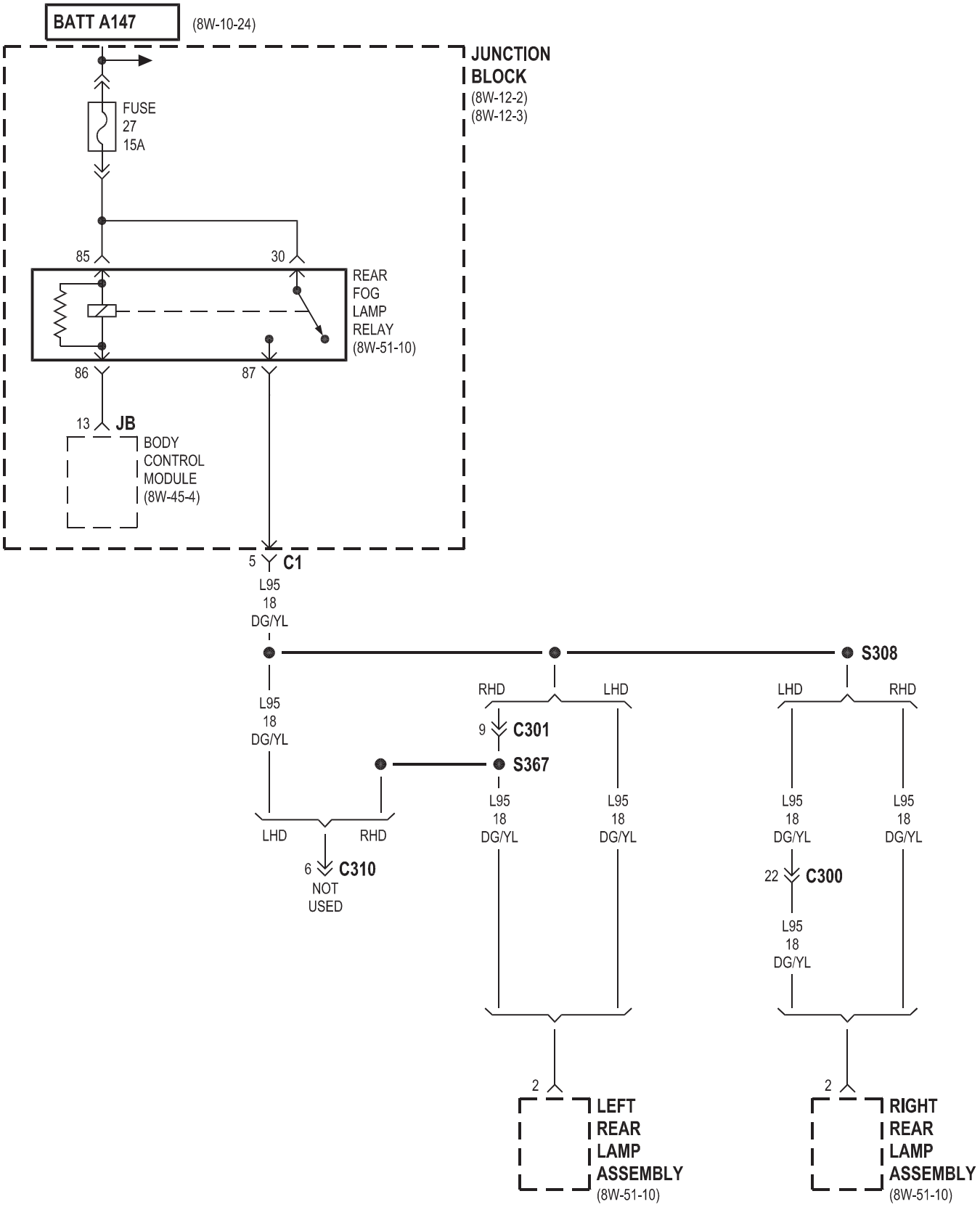

86
HORN
RELAY
(IN PDC)
(8W-41-2)
85
X3
20
BK/RD
GAS
DIESEL
27
C106
10
C107
X3
22
GY/OR
1
C2
JUNCTION
BLOCK
(8W-12-2)
(8W-12-3)
6
JB
BODY
CONTROL
MODULE
(8W-45-7)
39
C3
X3
20
GY/OR
3
C3
CLOCKSPRING
(8W-41-2)
1
C1
X3
20
GY/OR
HORN
SWITCH
(8W-41-2)


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
(8W-52-3)
(8W-52-5)
(8W-52-7)
(8W-52-8)
2
3
5
5 C2
5 C3
3 C3
26 C2
10 C2
L61 20 TN/LG
L61 20 TN/LG
L60 20 TN
L60 20 TN
LHD
RHD
L62 18 BR/RD
L62 20 BR/RD
54 C107
54 C106
GAS
DIESEL
L61 20 TN/LG
L61 20 LG
L60 20 TN
S327
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
S142
L62 18 BR/RD
L62 20 BR/RD
19 C301
21 C300
L62 20 BR/RD
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
S143
L60 20 TN
D
TO C112
(8W-12-33)
L60 18 TN
4
RIGHT REAR LAMP ASSEMBLY
(8W-52-7)
(8W-52-8)
EBUX
BUX
2 C310
2 C310
NOT USED
L61 20 TN/LG
L61 18 TN/LG
1
2
INSTRUMENT CLUSTER
(8W-40-3)
C
TO C111
(8W-12-33)
1
LEFT SIDE REPEATER LAMP
(8W-52-5)
2
RIGHT SIDE REPEATER LAMP
(8W-52-3)
L62 20 BR/RD
85
86
TRAILER TOW RIGHT TURN RELAY
(8W-54-6)


FROM
S142
(BUILT-UP-EXPORT)
C106
(EXCEPT BUILT-UP-EXPORT)
(8W-12-32)
D
L60
20
TN
3
C112
EXCEPT
BUILT-UP-
EXPORT
BUILT-UP-
EXPORT
L60
20
TN
S154
L60
20
TN
1
RIGHT
FRONT
TURN
SIGNAL
LAMP
(8W-52-4)
L60
20
TN
3
RIGHT
FRONT
PARK/
TURN
SIGNAL
LAMP
(8W-50-7)
L60
20
TN
2
RIGHT
FRONT
SIDE
MARKER
LAMP
(8W-50-7)
FROM
S143
(BUILT-UP-EXPORT)
C107
(EXCEPT BUILT-UP-EXPORT)
(8W-12-32)
C
L61
20
TN/LG
L61
20
LG
3
C111
L61
20
TN/LG
EXCEPT
BUILT-UP-
EXPORT
BUILT-UP-
EXPORT
L61
20
TN/LG
S155
L61
20
TN/LG
1
LEFT
FRONT
TURN
SIGNAL
LAMP
(8W-52-6)
L61
20
TN/LG
3
LEFT
FRONT
PARK/
TURN
SIGNAL
LAMP
(8W-50-10)
L61
20
TN/LG
2
LEFT
FRONT
SIDE
MARKER
LAMP
(8W-50-10)

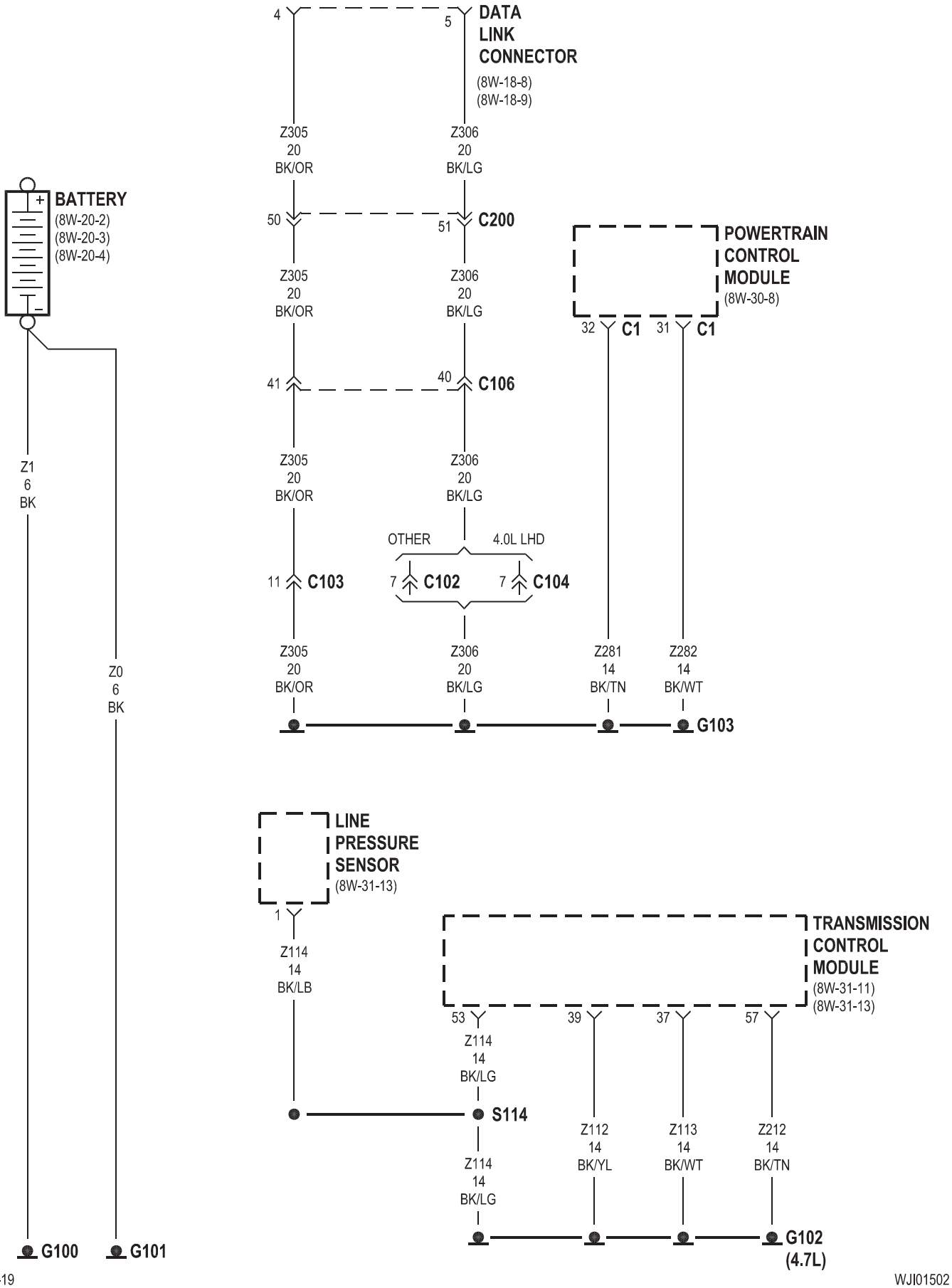

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
12
50A
(8W-10-30)
12
A146
10
OR/WT
GAS
DIESEL
H
C106
H
C107
A146
10
OR/WT
2
C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
18
30A
(8W-12-21)
36
45
C2
45
36
C2
A146
12
OR/WT
A146
12
OR/WT
2
C314
8
C302
A146
12
OR/WT
A146
12
OR/WT
1
C1
DRIVER DOOR MODULE
(8W-60-2)
(8W-60-3)
(8W-61-2)
1
C1
PASSENGER DOOR MODULE
(8W-60-2)
(8W-60-3)
(8W-61-4)
LHD
RHD

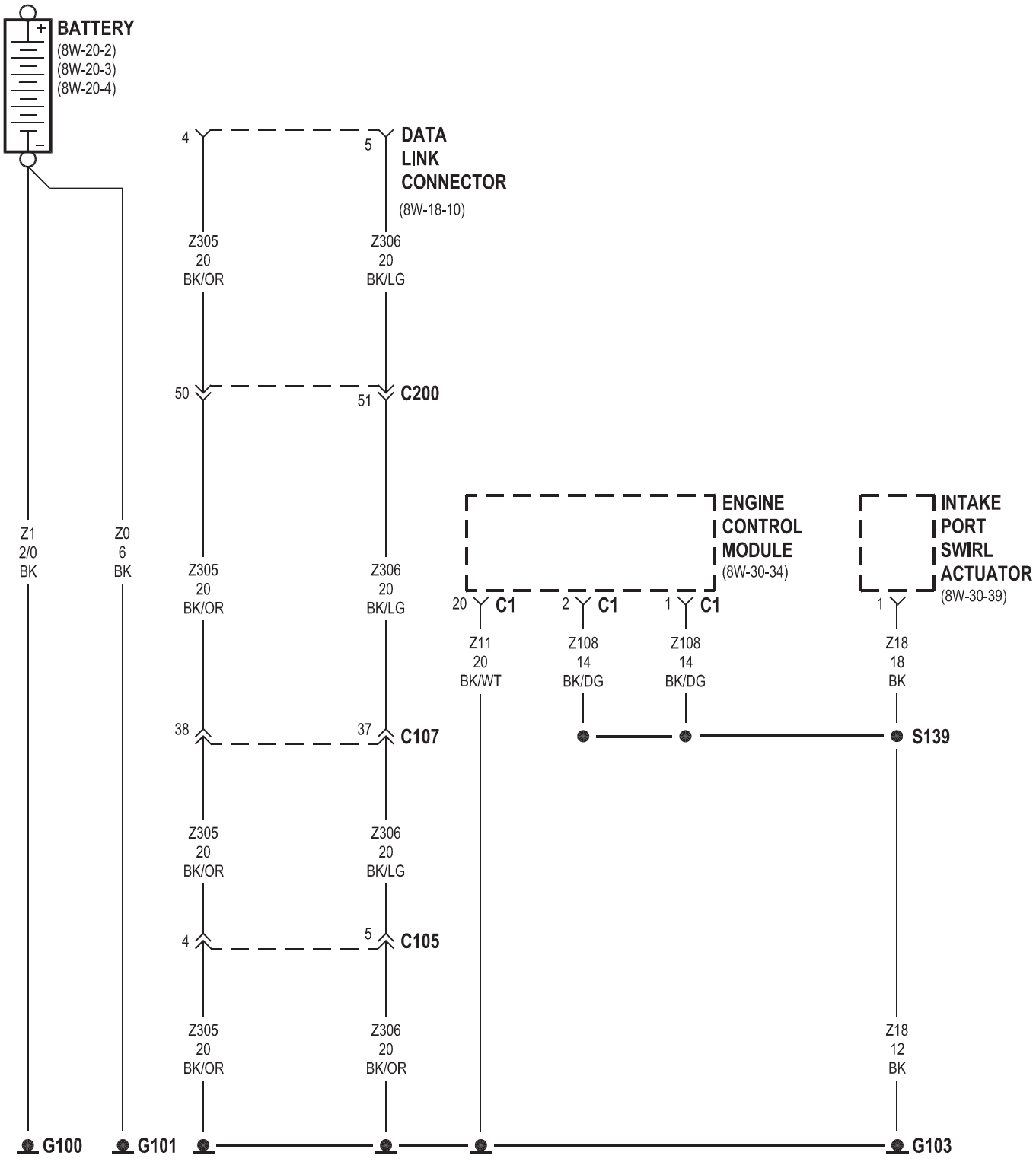

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
(8W-52-2)
BODY CONTROL MODULE
(8W-45-2)
7
8
9
10 JB
15 JB
12 JB
8 C3
4 C3
6 C3
31 C3
45 C3
L305
20
LB/WT
L302
20
LB/YL
L91
20
DB/PK
Z234
20
BK
Z132
20
BK/OR
S205
(8W-15-15)
S211
(8W-15-13)
8
7
9
LEFT MULTI-FUNCTION SWITCH
(8W-50-3)
Z234
18
BK
Z132
18
BK/OR
G200
(8W-15-15)

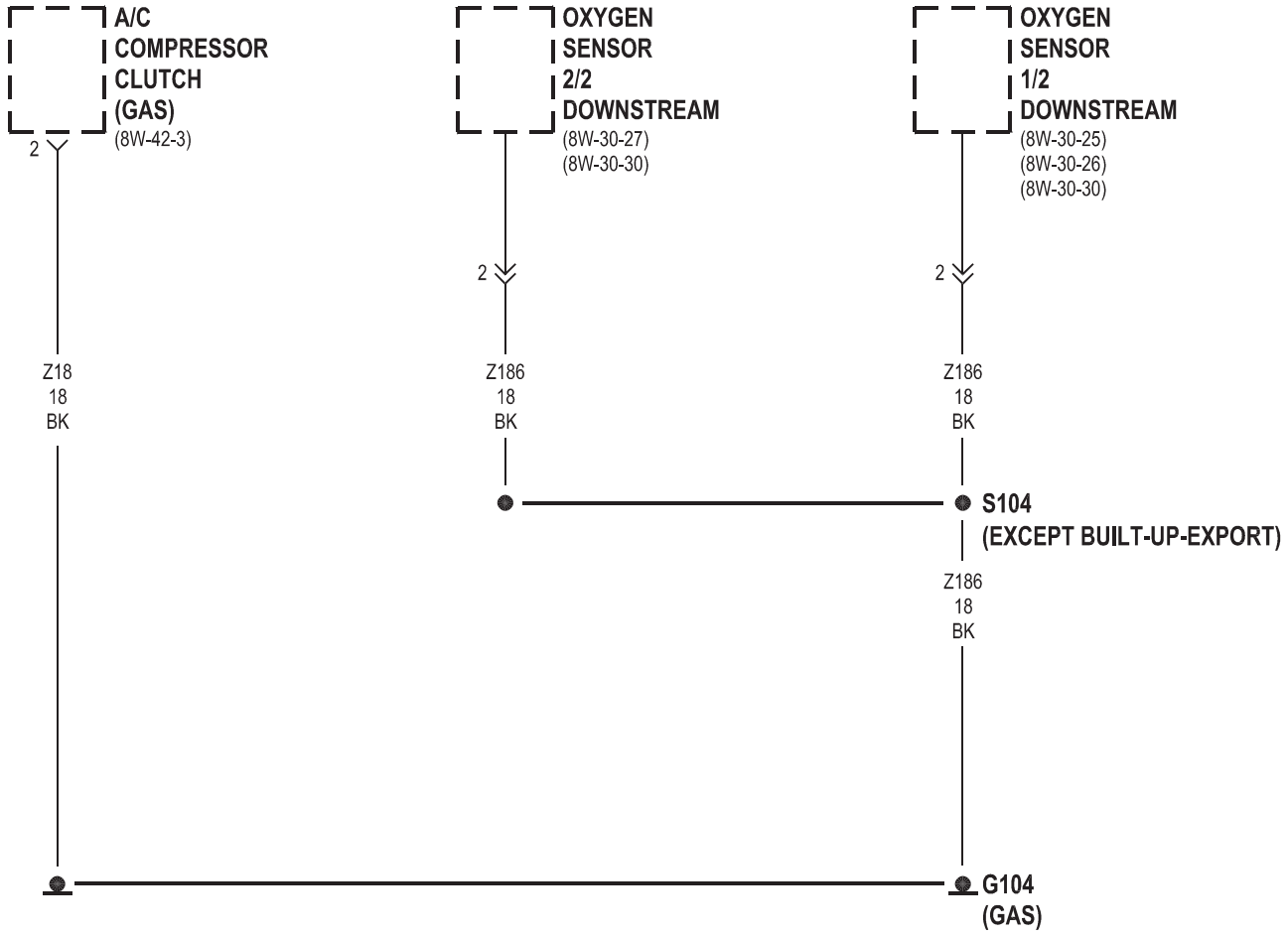

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
27
15A
85
30
REAR FOG LAMP RELAY
(8W-51-10)
86
87
13
JB
BODY CONTROL MODULE
(8W-45-4)
5
C1
L95
18
DG/YL
S308
RHD
LHD
9
C301
S367
LHD
RHD
6
C310
NOT USED
22
C300
2
LEFT REAR LAMP ASSEMBLY
(8W-51-10)
RIGHT REAR LAMP ASSEMBLY
(8W-51-10)

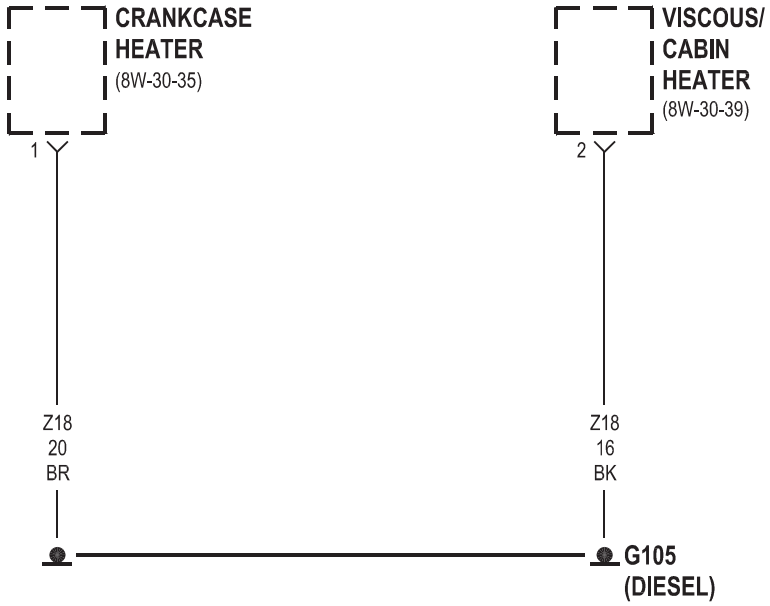
8W-15 GROUND DISTRIBUTION

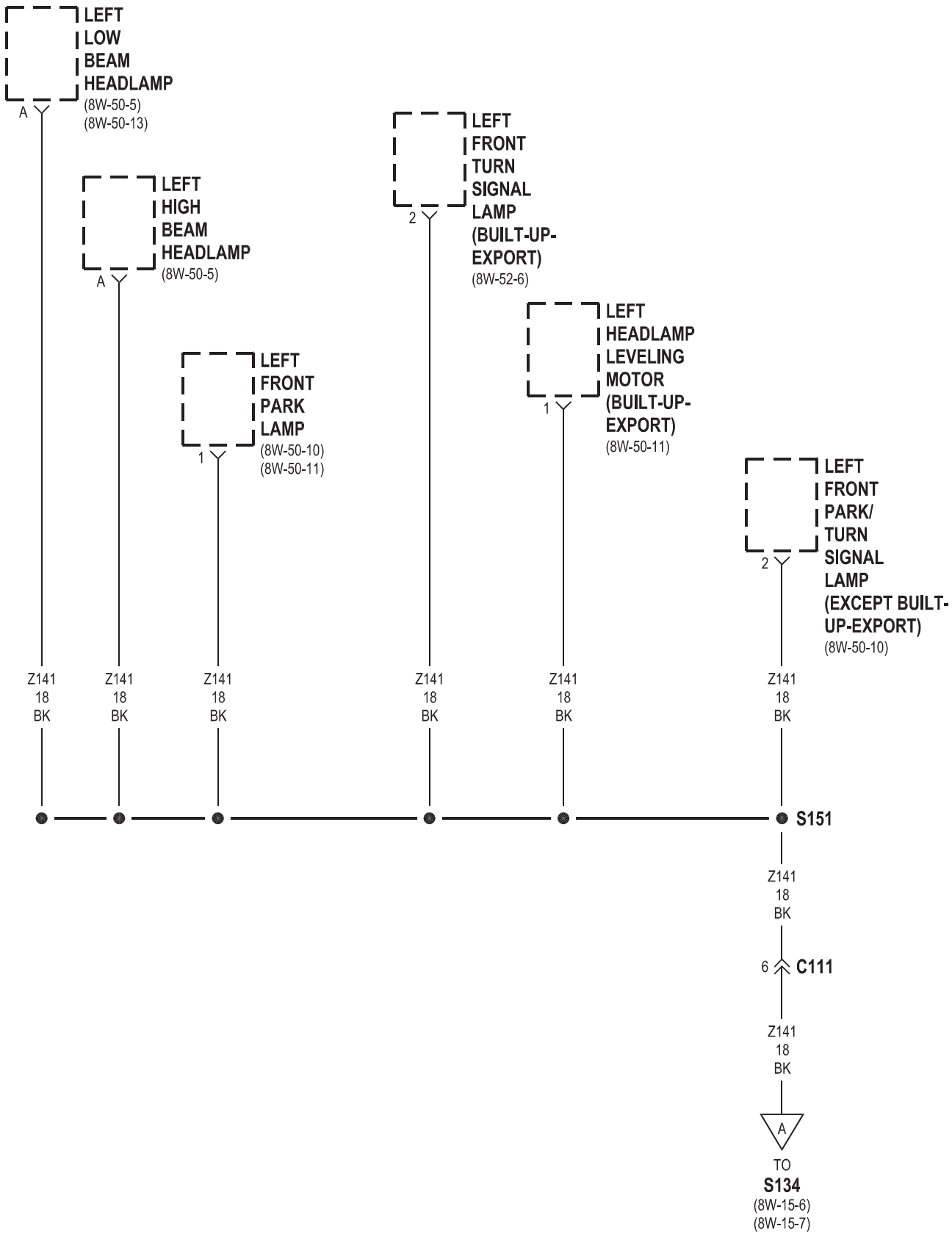
Component	Page
A/C Compressor Clutch	8W-15-4
Adjustable Pedals Module	8W-15-17, 21
Airbag Control Module	8W-15-16
Ash Receiver Lamp	8W-15-14
Automatic Day/Night Mirror	8W-15-19
Automatic Zone Control Module	8W-15-15
Battery	8W-15-2, 3
Blower Motor Controller	8W-15-15
Body Control Module	8W-15-12, 13, 15
Brake Lamp Switch	8W-15-17, 22
Center High Mounted Stop Lamp	8W-15-20
Cigar Lighter	8W-15-14
Cigar Lighter Relay	8W-15-12
Controller Antilock Brake	8W-15-12
Coolant Level Sensor	8W-15-9, 10, 11
Crankcase Heater	8W-15-4
Data Link Connector	8W-15-2, 3
Driver Cylinder Lock Switch	8W-15-16
Driver Door Lock Motor/Ajar Switch	8W-15-16
Driver Door Module	8W-15-16
Driver Heated Seat Switch	8W-15-14
Driver Lumbar Switch	8W-15-18, 21
Driver Power Seat Switch	8W-15-18, 21
Driver Rear Power Window Switch	8W-15-18, 21
Electric Brake	8W-15-17
Electronic Speed Control Servo	8W-15-9, 10
Engine Control Module	8W-15-3
Front Power Outlet	8W-15-14
Front Washer Pump	8W-15-6, 7
Front Wiper Motor	8W-15-6, 7
Fuel Pump Module	8W-15-19
G100	8W-15-2, 3
G101	8W-15-2, 3
G102	8W-15-2
G103	8W-15-2, 3
G104	8W-15-4
G105	8W-15-4
G106	8W-15-6, 7
G107	8W-15-12
G108	8W-15-9, 10, 11
G200	8W-15-13, 14, 15
G201	8W-15-16
G300	8W-15-16, 17, 18
G301	8W-15-19, 21, 22
Headlamp Leveling Switch	8W-15-15
Hood Ajar Switch	8W-15-6, 7
Horn No. 1	8W-15-9, 10, 11
Horn No. 2	8W-15-9, 10, 11
Hydraulic Cooling Module	8W-15-9, 10, 11
Ignition Switch	8W-15-15
Instrument Cluster	8W-15-13, 14
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Intrusion Transceiver Module	8W-15-21, 22
Junction Block	8W-15-12, 13, 15
Left Fog Lamp	8W-15-6, 7
Left Front Park Lamp	8W-15-5
Left Front Park/Turn Signal Lamp	8W-15-5
Left Front Turn Signal Lamp	8W-15-5
Left Headlamp Leveling Motor	8W-15-5
Left High Beam Headlamp	8W-15-5
Left Liftgate Ajar Switch	8W-15-20
Left Low Beam Headlamp	8W-15-5
Left Multi-Function Switch	8W-15-15
Left Rear Door Lock Motor/Ajar Switch	8W-15-21, 22
Left Rear Lamp Assembly	8W-15-19
Left Side Repeater Lamp	8W-15-6, 7
License Lamp No. 1	8W-15-20
License Lamp No. 2	8W-15-20
Liftgate Flip-Up Ajar Switch	8W-15-20
Liftgate Flip-Up Release Solenoid	8W-15-20
Line Pressure Sensor	8W-15-2
Low Beam/Daytime Running Lamp Relay	8W-15-12
Manual Temperature Control	8W-15-13, 15
Oxygen Sensor 1/2 Downstream	8W-15-4
Oxygen Sensor 2/2 Downstream	8W-15-4
Park Lamp Relay	8W-15-12
Passenger Door Lock Motor/Ajar Switch	8W-15-16
Passenger Door Module	8W-15-16
Passenger Heated Seat Switch	8W-15-14
Passenger Lumbar Switch	8W-15-17, 22
Passenger Power Seat Switch	8W-15-17, 22
Passenger Rear Power Window Switch	8W-15-16, 22
Power Amplifier	8W-15-17, 18
Power Connector	8W-15-15
Powertrain Control Module	8W-15-2
Radio	8W-15-17, 18
Rain Sensor	8W-15-21, 22
Rear Power Outlet	8W-15-17, 18
Rear Washer Pump	8W-15-6, 7
Rear Window Defogger	8W-15-20
Rear Wiper Motor	8W-15-20
Remote Keyless Module	8W-15-16
Right Fog Lamp	8W-15-9, 10, 11
Right Front Park Lamp	8W-15-8
Right Front Park/Turn Signal Lamp	8W-15-8
Right Front Turn Signal Lamp	8W-15-8
Right Headlamp Leveling Motor	8W-15-8
Right High Beam Headlamp	8W-15-8
Right Low Beam Headlamp	8W-15-8
Right Rear Door Lock Motor/Ajar Switch	8W-15-16, 18
Right Rear Lamp Assembly	8W-15-17, 18
Right Side Repeater Lamp	8W-15-9, 10, 11
Seat Module	8W-15-18, 21
Sentry Key Immobilizer Module	8W-15-13
Shifter Assembly	8W-15-14, 15
Siren	8W-15-6, 7
Sunroof Control Module	8W-15-19
Sunroof Motor	8W-15-19
Sunroof Switch	8W-15-19
Temperature Valve Actuator	8W-15-13
Trailer Tow Brake Lamp Relay	8W-15-19
Trailer Tow Connector	8W-15-19
Trailer Tow Left Turn Relay	8W-15-19
Trailer Tow Right Turn Relay	8W-15-19
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Transmission Control Relay	8W-15-9, 10
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Vehicle Information Center	8W-15-21, 22
Viscous/Cabin Heater	8W-15-4
Washer Fluid Level Switch	8W-15-6, 7

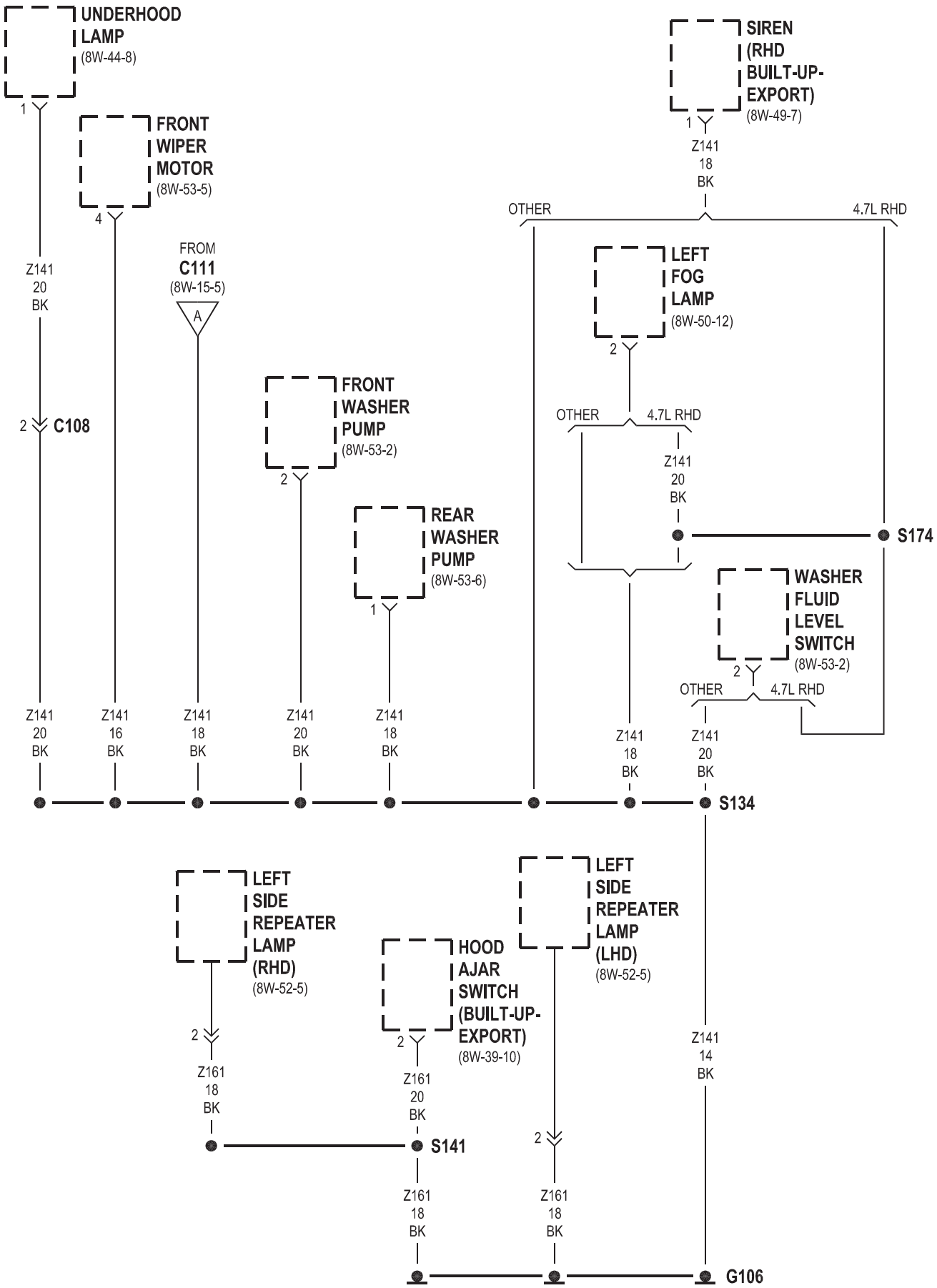

4
5
DATA LINK CONNECTOR
(8W-18-8)
(8W-18-9)
Z305 20 BK/OR
Z306 20 BK/LG
BATTERY
(8W-20-2)
(8W-20-3)
(8W-20-4)
50
51
C200
POWERTRAIN CONTROL MODULE
(8W-30-8)
32
C1
31
C1
Z305 20 BK/OR
Z306 20 BK/LG
41
40
C106
Z1 6 BK
Z305 20 BK/OR
Z306 20 BK/LG
OTHER
4.0L LHD
11
C103
7
C102
7
C104
Z0 6 BK
Z305 20 BK/OR
Z306 20 BK/LG
Z281 14 BK/TN
Z282 14 BK/WT
G103
LINE PRESSURE SENSOR
(8W-31-13)
1
Z114 14 BK/LB
TRANSMISSION CONTROL MODULE
(8W-31-11)
(8W-31-13)
53
39
37
57
Z114 14 BK/LG
S114
Z112 14 BK/YL
Z113 14 BK/WT
Z212 14 BK/TN
Z114 14 BK/LG
G100
G101
G102
(4.7L)

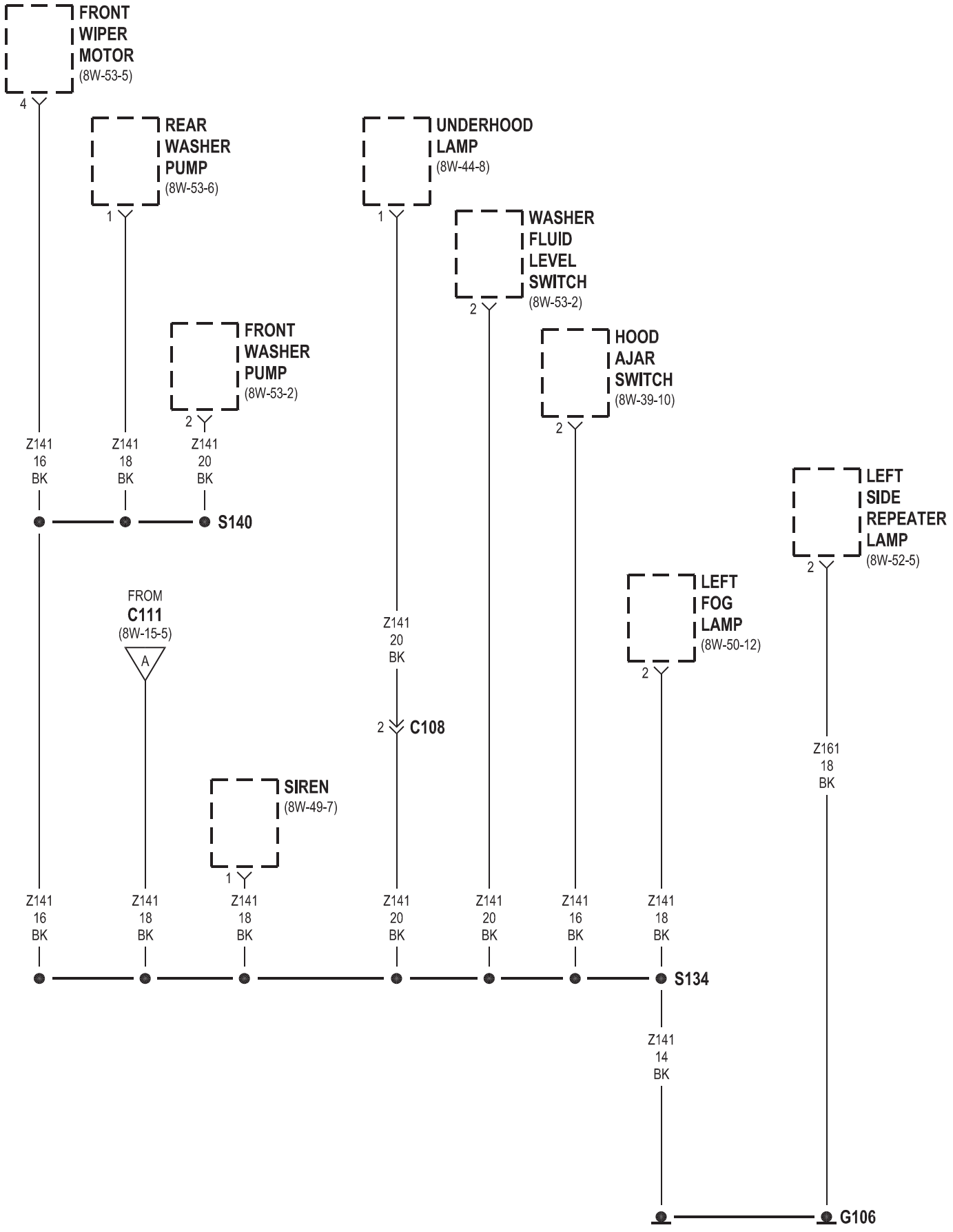

BATTERY
(8W-20-2)
(8W-20-3)
(8W-20-4)
4
5
DATA
LINK
CONNECTOR
(8W-18-10)
Z305
20
BK/OR
Z306
20
BK/LG
50
51
C200
Z1
2/0
BK
Z0
6
BK
Z305
20
BK/OR
Z306
20
BK/LG
ENGINE
CONTROL
MODULE
(8W-30-34)
INTAKE
PORT
SWIRL
ACTUATOR
(8W-30-39)
20
C1
2
C1
1
C1
1
Z11
20
BK/WT
Z108
14
BK/DG
Z108
14
BK/DG
Z18
18
BK
38
37
C107
S139
Z305
20
BK/OR
Z306
20
BK/LG
4
5
C105
Z305
20
BK/OR
Z306
20
BK/OR
Z18
12
BK
G100
G101
G103

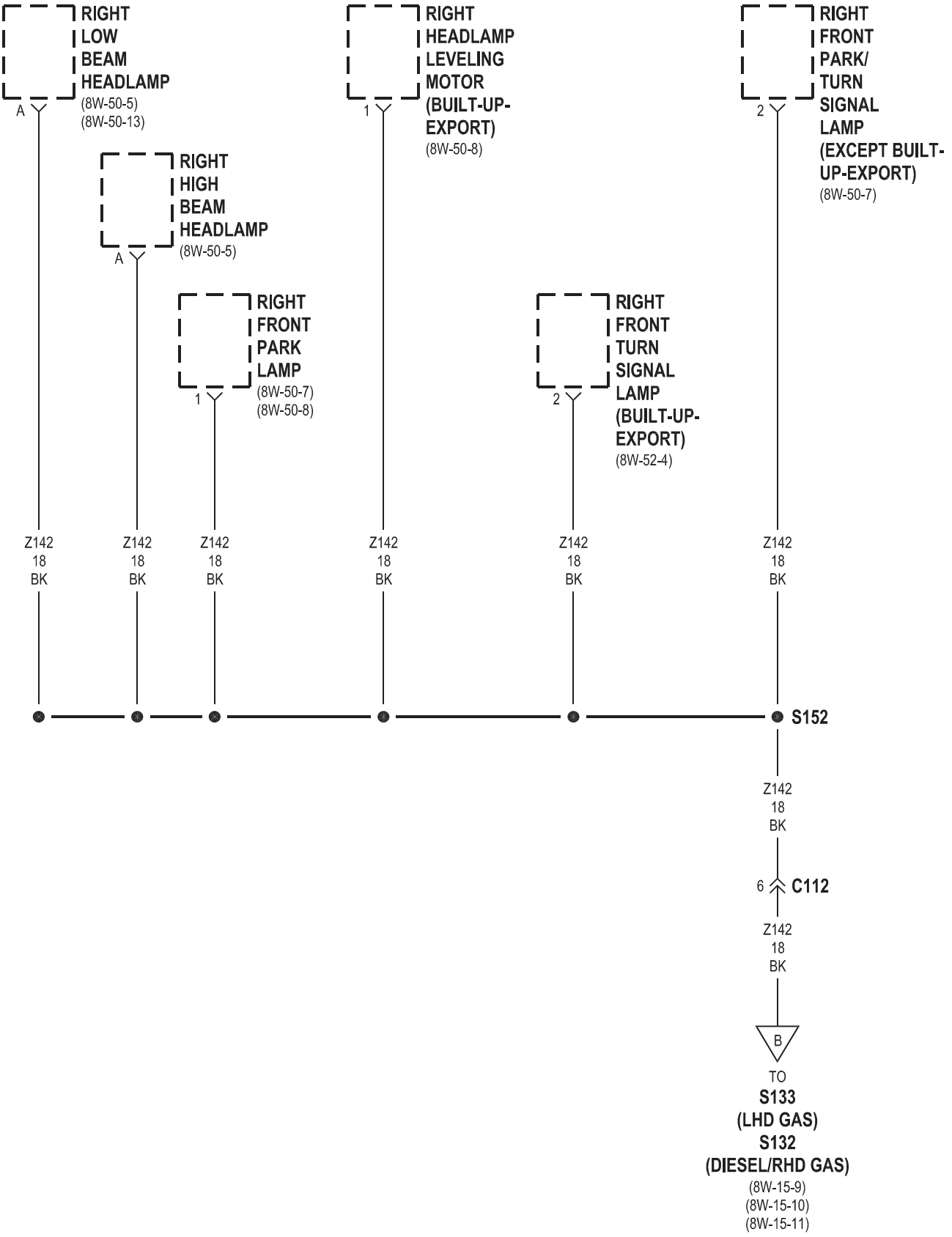

A/C
COMPRESSOR
CLUTCH
(GAS)
(8W-42-3)
2
Z18
18
BK
OXYGEN
SENSOR
2/2
DOWNSTREAM
(8W-30-27)
(8W-30-30)
2
Z186
18
BK
OXYGEN
SENSOR
1/2
DOWNSTREAM
(8W-30-25)
(8W-30-26)
(8W-30-30)
2
Z186
18
BK
S104
(EXCEPT BUILT-UP-EXPORT)
Z186
18
BK
G104
(GAS)

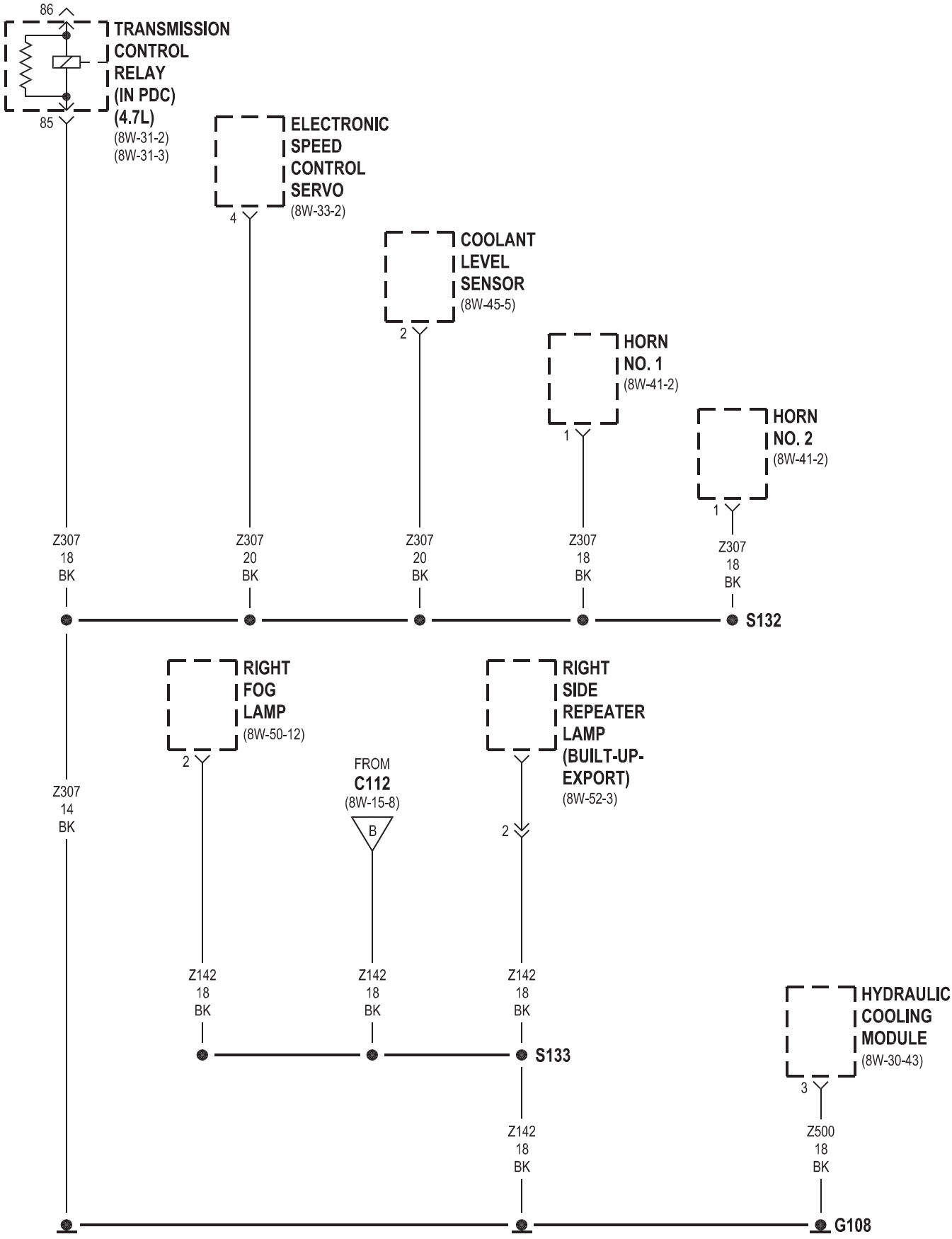

CRANKCASE
HEATER
(8W-30-35)
1
Z18
20
BR
VISCOUS/
CABIN
HEATER
(8W-30-39)
2
Z18
16
BK
G105
(DIESEL)

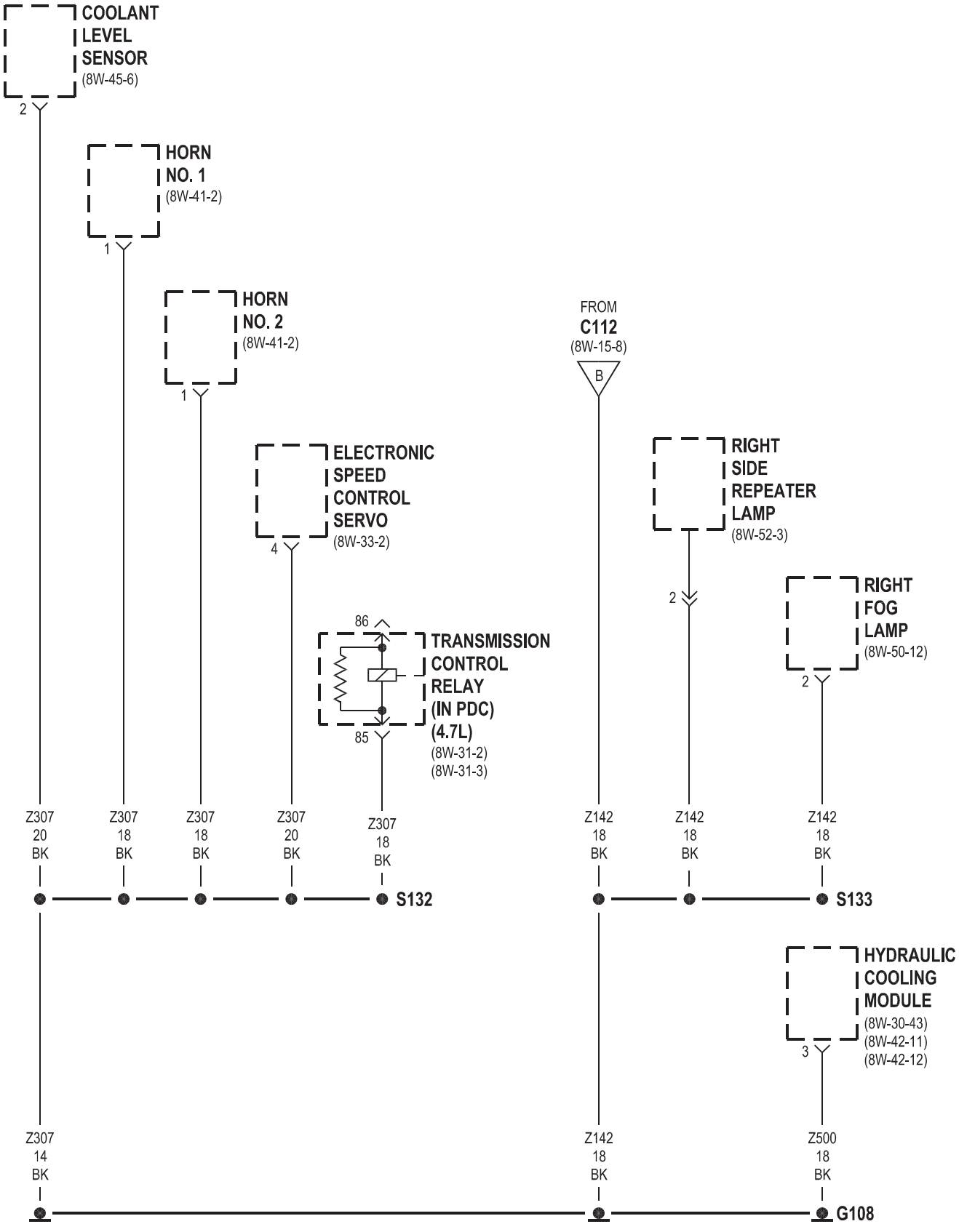

LEFT LOW BEAM HEADLAMP
(8W-50-5)
(8W-50-13)
A
LEFT HIGH BEAM HEADLAMP
(8W-50-5)
A
LEFT FRONT PARK LAMP
(8W-50-10)
(8W-50-11)
1
LEFT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT)
(8W-52-6)
2
LEFT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)
(8W-50-11)
1
LEFT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-10)
2
Z141 18 BK
S151
6 C111
A
TO
S134
(8W-15-6)
(8W-15-7)

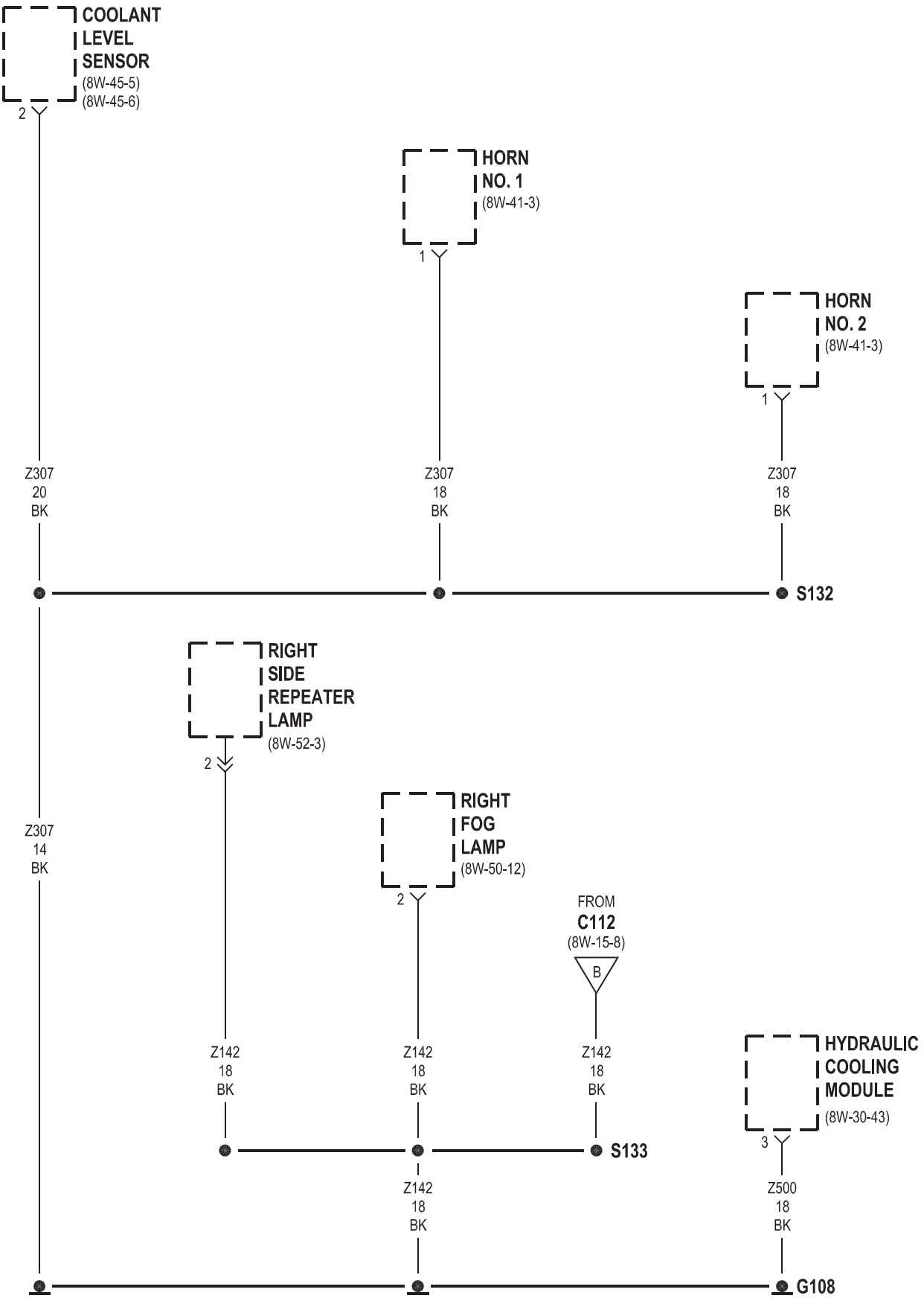

UNDERHOOD LAMP (8W-44-8)
1
FRONT WIPER MOTOR (8W-53-5)
4
Z141 20 BK
2 C108
FROM C111 (8W-15-5)
A
FRONT WASHER PUMP (8W-53-2)
2
REAR WASHER PUMP (8W-53-6)
1
Z141 20 BK
Z141 16 BK
Z141 18 BK
Z141 20 BK
Z141 18 BK
SIREN (RHD BUILT-UP-EXPORT) (8W-49-7)
1
Z141 18 BK
OTHER
4.7L RHD
LEFT FOG LAMP (8W-50-12)
2
OTHER
4.7L RHD
Z141 20 BK
S174
WASHER FLUID LEVEL SWITCH (8W-53-2)
2
OTHER
4.7L RHD
Z141 18 BK
Z141 20 BK
S134
LEFT SIDE REPEATER LAMP (RHD) (8W-52-5)
2
Z161 18 BK
HOOD AJAR SWITCH (BUILT-UP-EXPORT) (8W-39-10)
2
Z161 20 BK
S141
LEFT SIDE REPEATER LAMP (LHD) (8W-52-5)
2
Z161 18 BK
Z141 14 BK
Z161 18 BK
G106

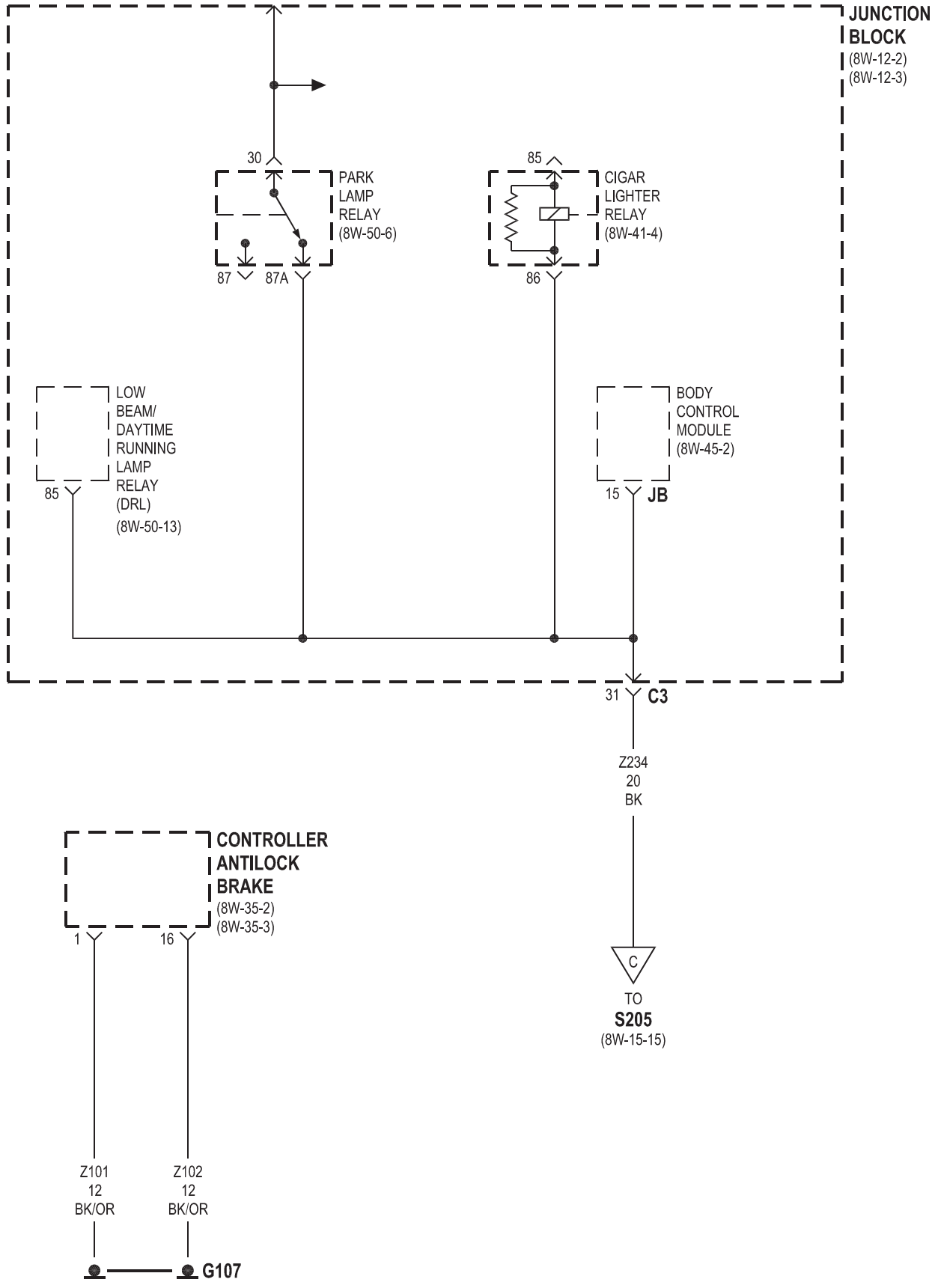

FRONT WIPER MOTOR (8W-53-5)
4
REAR WASHER PUMP (8W-53-6)
1
FRONT WASHER PUMP (8W-53-2)
2
UNDERHOOD LAMP (8W-44-8)
1
WASHER FLUID LEVEL SWITCH (8W-53-2)
2
HOOD AJAR SWITCH (8W-39-10)
2
LEFT SIDE REPEATER LAMP (8W-52-5)
2
LEFT FOG LAMP (8W-50-12)
2
SIREN (8W-49-7)
1
FROM C111 (8W-15-5)
A
Z141 16 BK
Z141 18 BK
Z141 20 BK
S140
Z141 20 BK
2 C108
Z161 18 BK
Z141 16 BK
Z141 18 BK
Z141 18 BK
Z141 20 BK
Z141 20 BK
Z141 16 BK
Z141 18 BK
S134
Z141 14 BK
G106

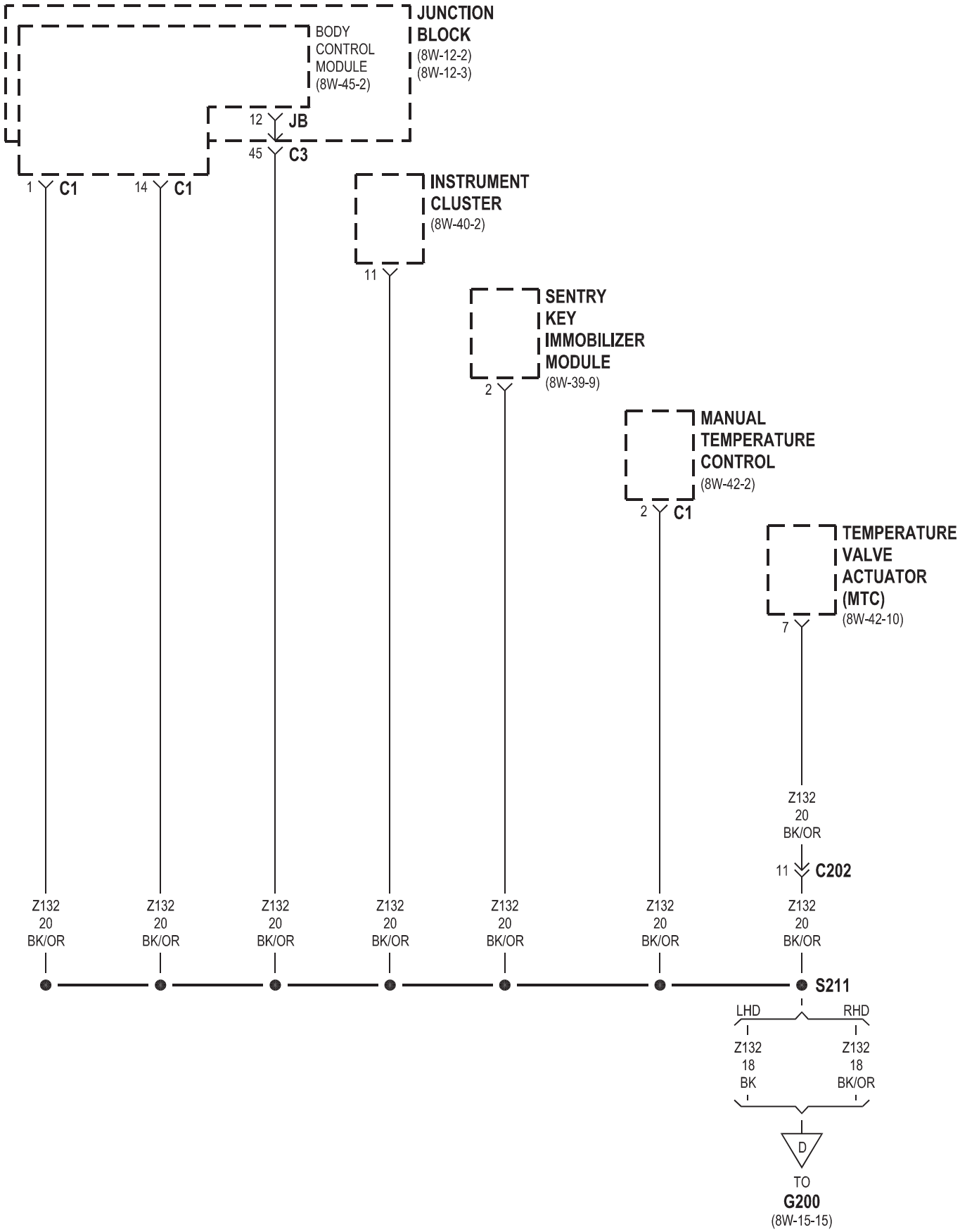

RIGHT LOW BEAM HEADLAMP
(8W-50-5)
(8W-50-13)
A
RIGHT HIGH BEAM HEADLAMP
(8W-50-5)
A
RIGHT FRONT PARK LAMP
(8W-50-7)
(8W-50-8)
1
RIGHT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)
(8W-50-8)
1
RIGHT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT)
(8W-52-4)
2
RIGHT FRONT PARK/ TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)
(8W-50-7)
2
Z142 18 BK
S152
6
C112
B
TO
S133
(LHD GAS)
S132
(DIESEL/RHD GAS)
(8W-15-9)
(8W-15-10)
(8W-15-11)

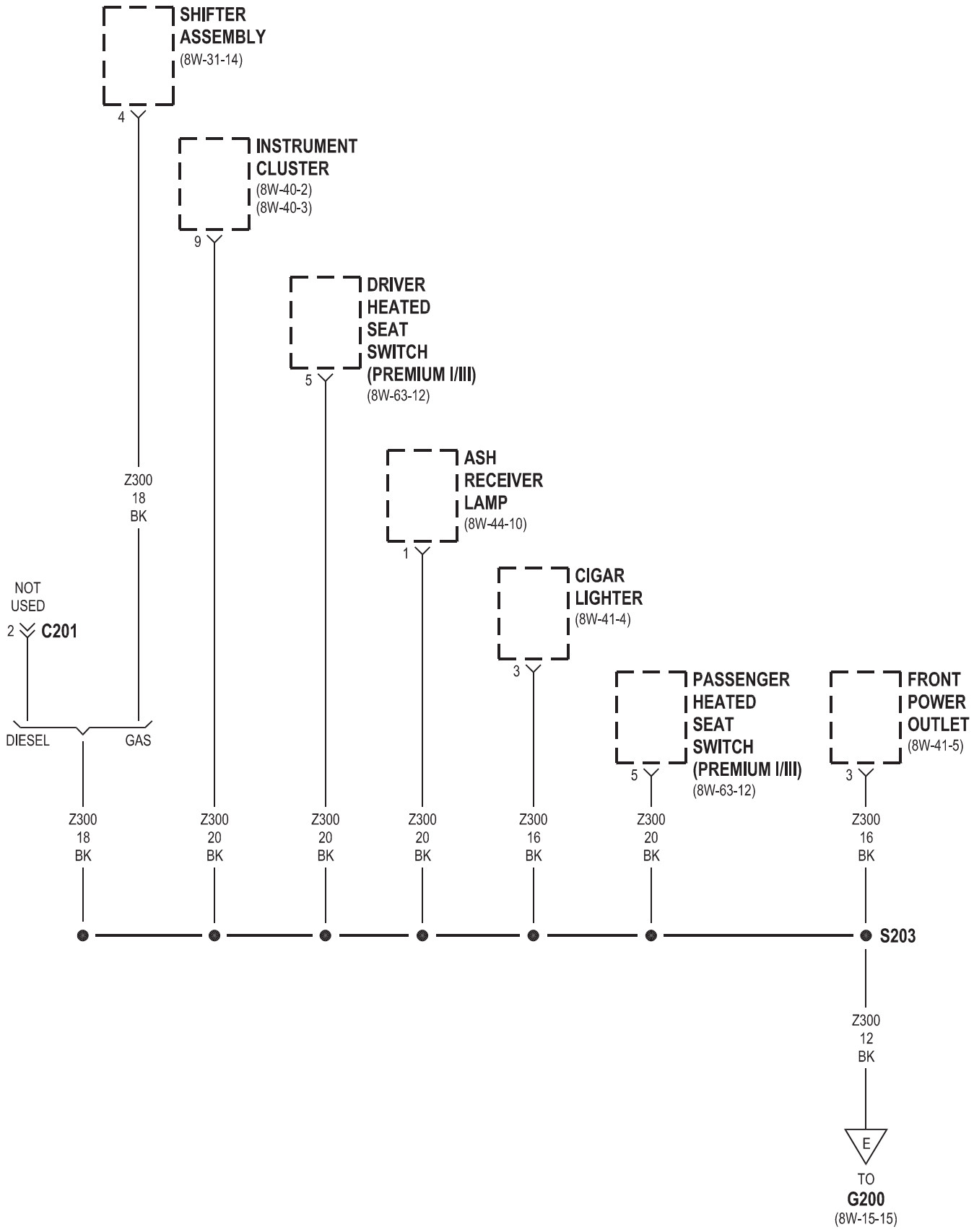

86
TRANSMISSION CONTROL RELAY (IN PDC) (4.7L)
(8W-31-2)
(8W-31-3)
85
ELECTRONIC SPEED CONTROL SERVO
(8W-33-2)
4
COOLANT LEVEL SENSOR
(8W-45-5)
2
HORN NO. 1
(8W-41-2)
1
HORN NO. 2
(8W-41-2)
1
Z307 18 BK
Z307 20 BK
Z307 20 BK
Z307 18 BK
Z307 18 BK
S132
Z307 14 BK
RIGHT FOG LAMP
(8W-50-12)
2
FROM C112
(8W-15-8)
B
RIGHT SIDE REPEATER LAMP (BUILT-UP-EXPORT)
(8W-52-3)
2
Z142 18 BK
Z142 18 BK
Z142 18 BK
S133
Z142 18 BK
HYDRAULIC COOLING MODULE
(8W-30-43)
3
Z500 18 BK
G108

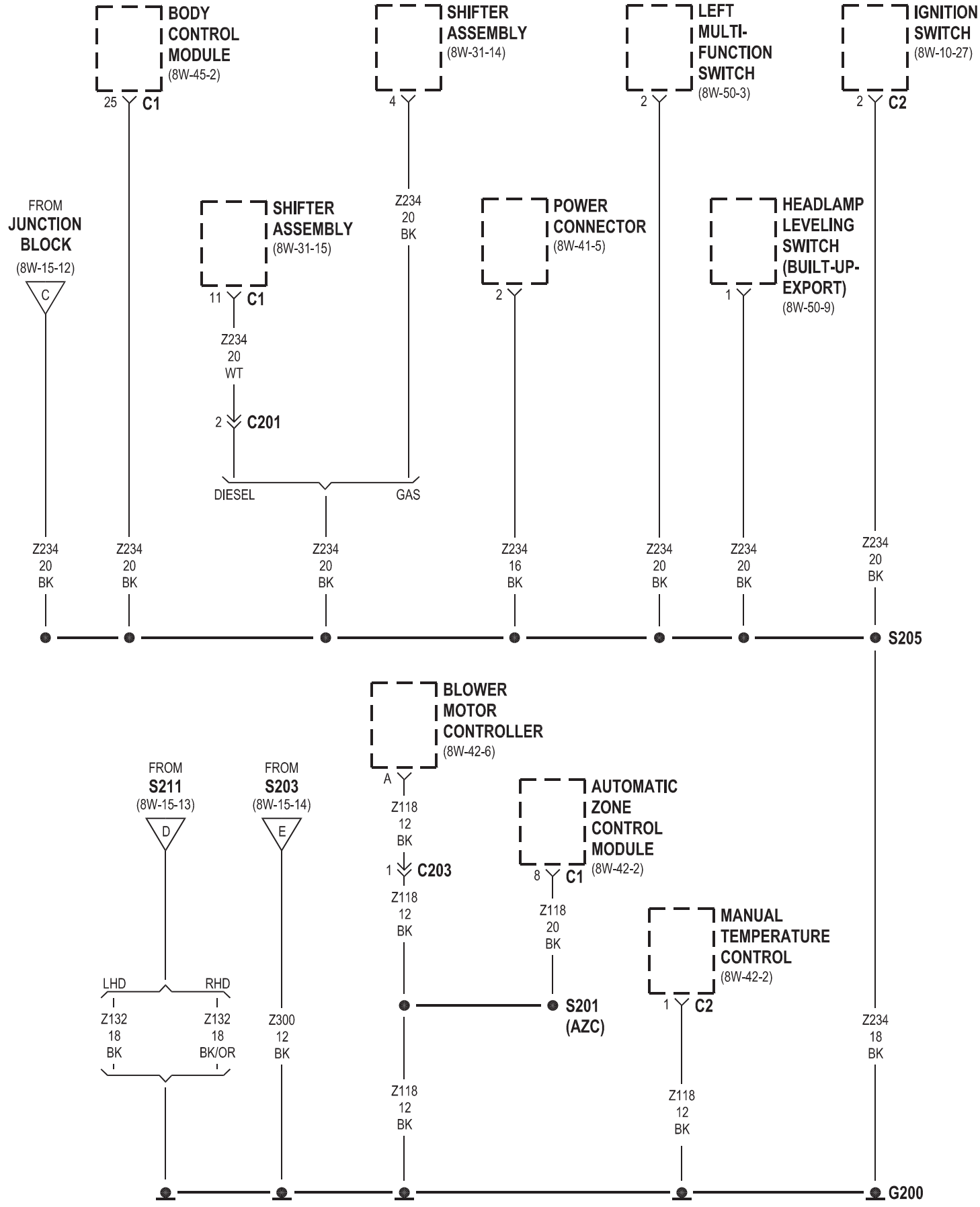

COOLANT LEVEL SENSOR
(8W-45-6)
2
HORN NO. 1
(8W-41-2)
1
HORN NO. 2
(8W-41-2)
1
ELECTRONIC SPEED CONTROL SERVO
(8W-33-2)
4
86
TRANSMISSION CONTROL RELAY (IN PDC) (4.7L)
(8W-31-2)
(8W-31-3)
85
FROM C112
(8W-15-8)
B
RIGHT SIDE REPEATER LAMP
(8W-52-3)
2
RIGHT FOG LAMP
(8W-50-12)
2
HYDRAULIC COOLING MODULE
(8W-30-43)
(8W-42-11)
(8W-42-12)
3
Z307 20 BK
Z307 18 BK
Z307 18 BK
Z307 20 BK
Z307 18 BK
Z307 14 BK
Z142 18 BK
Z142 18 BK
Z142 18 BK
Z142 18 BK
Z500 18 BK
S132
S133
G108

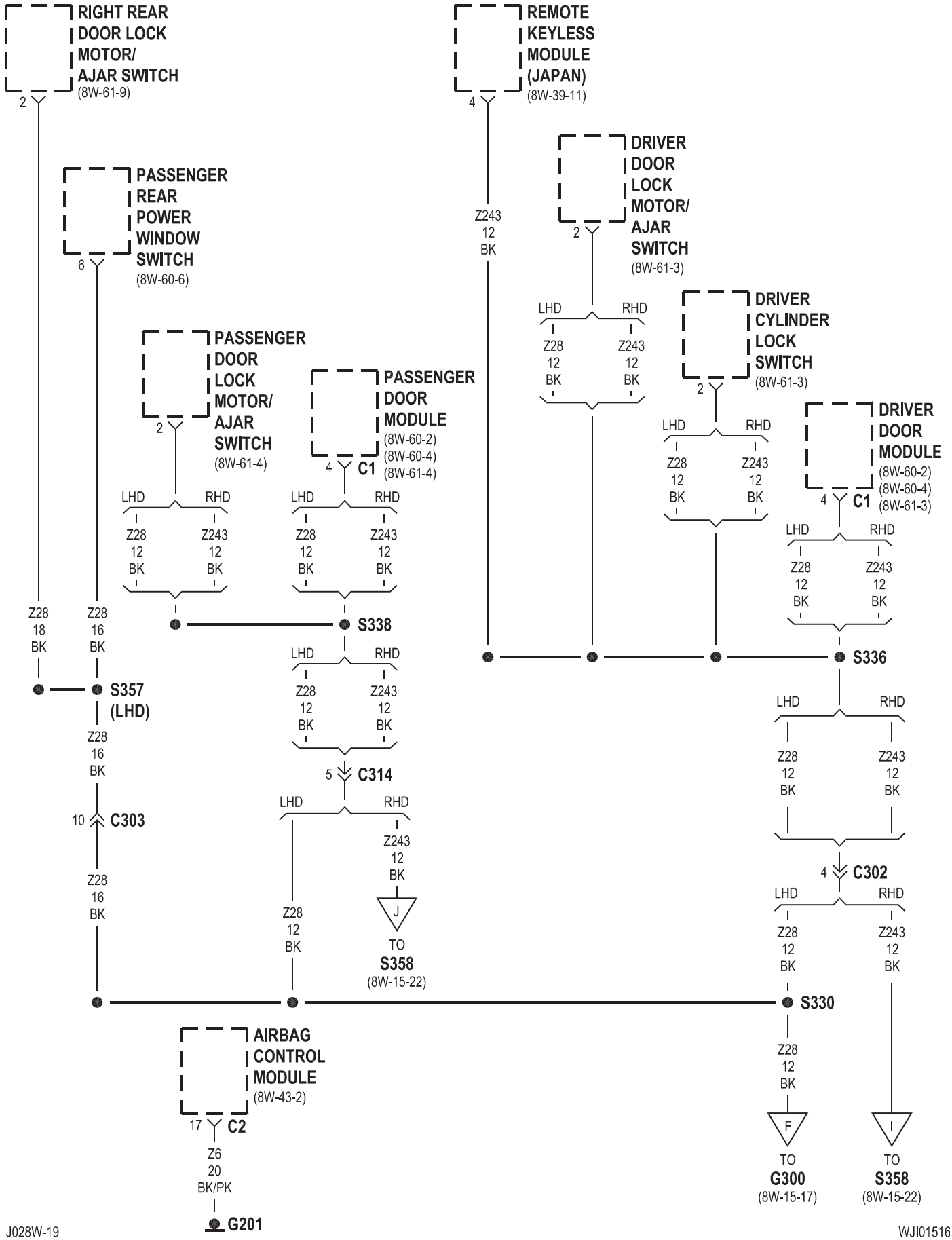

COOLANT LEVEL SENSOR
(8W-45-5)
(8W-45-6)
2
HORN NO. 1
(8W-41-3)
1
HORN NO. 2
(8W-41-3)
1
Z307 20 BK
Z307 18 BK
Z307 18 BK
S132
RIGHT SIDE REPEATER LAMP
(8W-52-3)
2
RIGHT FOG LAMP
(8W-50-12)
2
FROM C112
(8W-15-8)
B
Z307 14 BK
Z142 18 BK
Z142 18 BK
Z142 18 BK
S133
HYDRAULIC COOLING MODULE
(8W-30-43)
3
Z142 18 BK
Z500 18 BK
G108


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
PARK LAMP RELAY
(8W-50-6)
87
87A
85
CIGAR LIGHTER RELAY
(8W-41-4)
86
LOW BEAM/ DAYTIME RUNNING LAMP RELAY (DRL)
(8W-50-13)
85
BODY CONTROL MODULE
(8W-45-2)
15
JB
31
C3
Z234
20
BK
C
TO
S205
(8W-15-15)
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
(8W-35-3)
1
16
Z101
12
BK/OR
Z102
12
BK/OR
G107

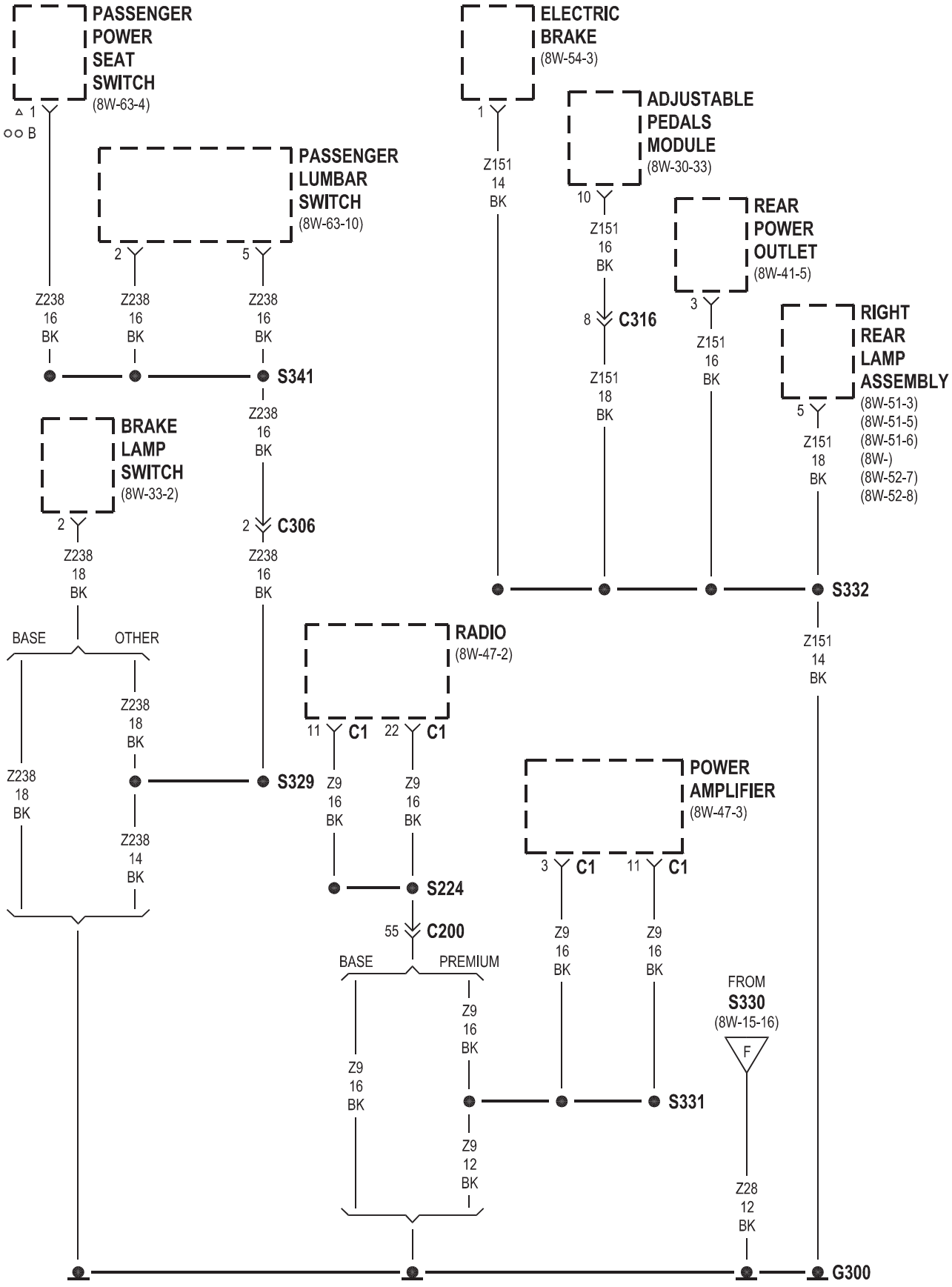

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-2)
12 JB
45 C3
1 C1
14 C1
INSTRUMENT CLUSTER
(8W-40-2)
11
SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
2
MANUAL TEMPERATURE CONTROL
(8W-42-2)
2 C1
TEMPERATURE VALVE ACTUATOR (MTC)
(8W-42-10)
7
Z132 20 BK/OR
11 C202
S211
LHD
RHD
Z132 18 BK
Z132 18 BK/OR
D
TO
G200
(8W-15-15)


SHIFTER ASSEMBLY
(8W-31-14)
4
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-3)
9
DRIVER HEATED SEAT SWITCH (PREMIUM I/III)
(8W-63-12)
5
ASH RECEIVER LAMP
(8W-44-10)
1
CIGAR LIGHTER
(8W-41-4)
3
PASSENGER HEATED SEAT SWITCH (PREMIUM I/III)
(8W-63-12)
5
FRONT POWER OUTLET
(8W-41-5)
3
Z300 18 BK
NOT USED
2
C201
DIESEL
GAS
Z300 18 BK
Z300 20 BK
Z300 20 BK
Z300 20 BK
Z300 16 BK
Z300 20 BK
Z300 16 BK
S203
Z300 12 BK
E
TO G200
(8W-15-15)


BODY CONTROL MODULE
(8W-45-2)
25 C1
SHIFTER ASSEMBLY
(8W-31-14)
4
LEFT MULTI-FUNCTION SWITCH
(8W-50-3)
2
IGNITION SWITCH
(8W-10-27)
2 C2
FROM JUNCTION BLOCK
(8W-15-12)
C
SHIFTER ASSEMBLY
(8W-31-15)
11 C1
Z234 20 WT
2 C201
DIESEL
GAS
Z234 20 BK
POWER CONNECTOR
(8W-41-5)
2
HEADLAMP LEVELING SWITCH (BUILT-UP-EXPORT)
(8W-50-9)
1
Z234 20 BK
Z234 20 BK
Z234 20 BK
Z234 16 BK
Z234 20 BK
Z234 20 BK
Z234 20 BK
S205
BLOWER MOTOR CONTROLLER
(8W-42-6)
A
Z118 12 BK
1 C203
Z118 12 BK
AUTOMATIC ZONE CONTROL MODULE
(8W-42-2)
8 C1
Z118 20 BK
S201 (AZC)
MANUAL TEMPERATURE CONTROL
(8W-42-2)
1 C2
Z118 12 BK
FROM S211
(8W-15-13)
D
FROM S203
(8W-15-14)
E
LHD
RHD
Z132 18 BK
Z132 18 BK/OR
Z300 12 BK
Z234 18 BK
G200

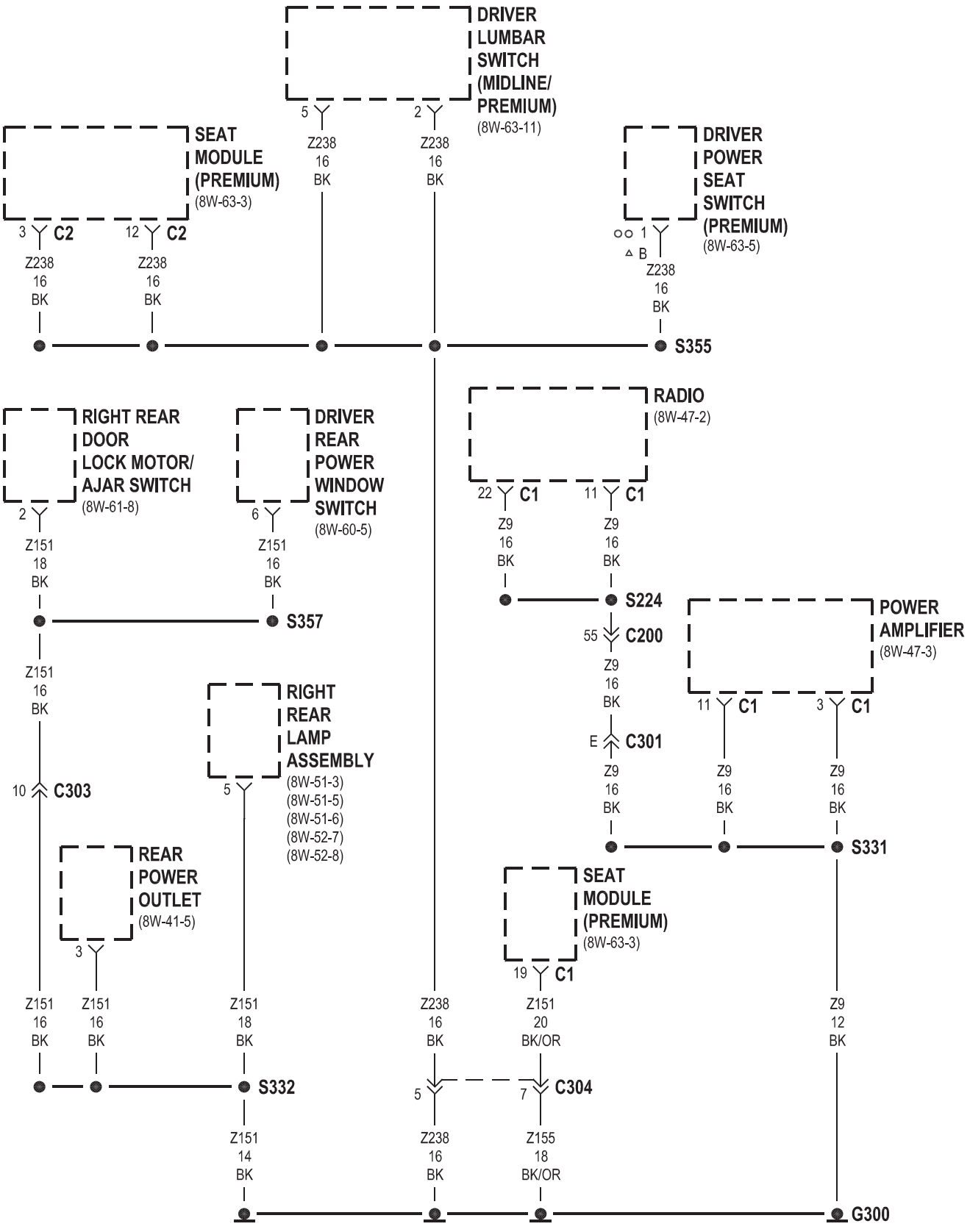

RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH (8W-61-9)
2
PASSENGER REAR POWER WINDOW SWITCH (8W-60-6)
6
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH (8W-61-4)
2
PASSENGER DOOR MODULE (8W-60-2) (8W-60-4) (8W-61-4)
4 C1
REMOTE KEYLESS MODULE (JAPAN) (8W-39-11)
4
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH (8W-61-3)
2
DRIVER CYLINDER LOCK SWITCH (8W-61-3)
2
DRIVER DOOR MODULE (8W-60-2) (8W-60-4) (8W-61-3)
4 C1
LHD RHD
Z28 12 BK
Z243 12 BK
Z28 18 BK
Z28 16 BK
S357 (LHD)
S338
S336
S330
10 C303
5 C314
4 C302
Z28 16 BK
Z28 12 BK
Z243 12 BK
J
TO S358 (8W-15-22)
AIRBAG CONTROL MODULE (8W-43-2)
17 C2
Z6 20 BK/PK
G201
F
TO G300 (8W-15-17)
I
TO S358 (8W-15-22)

LHD



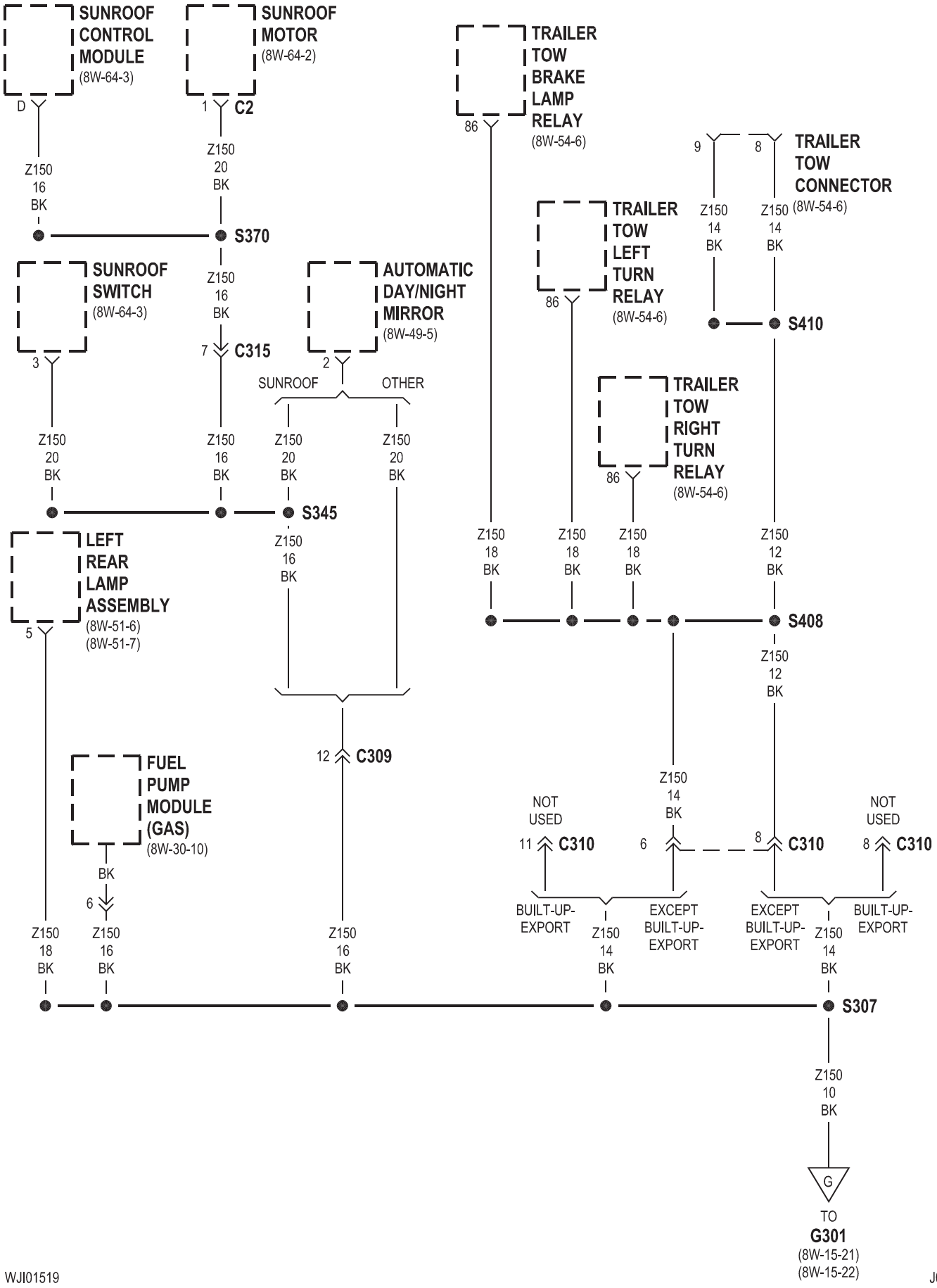
△ BASE
○○ PREMIUM

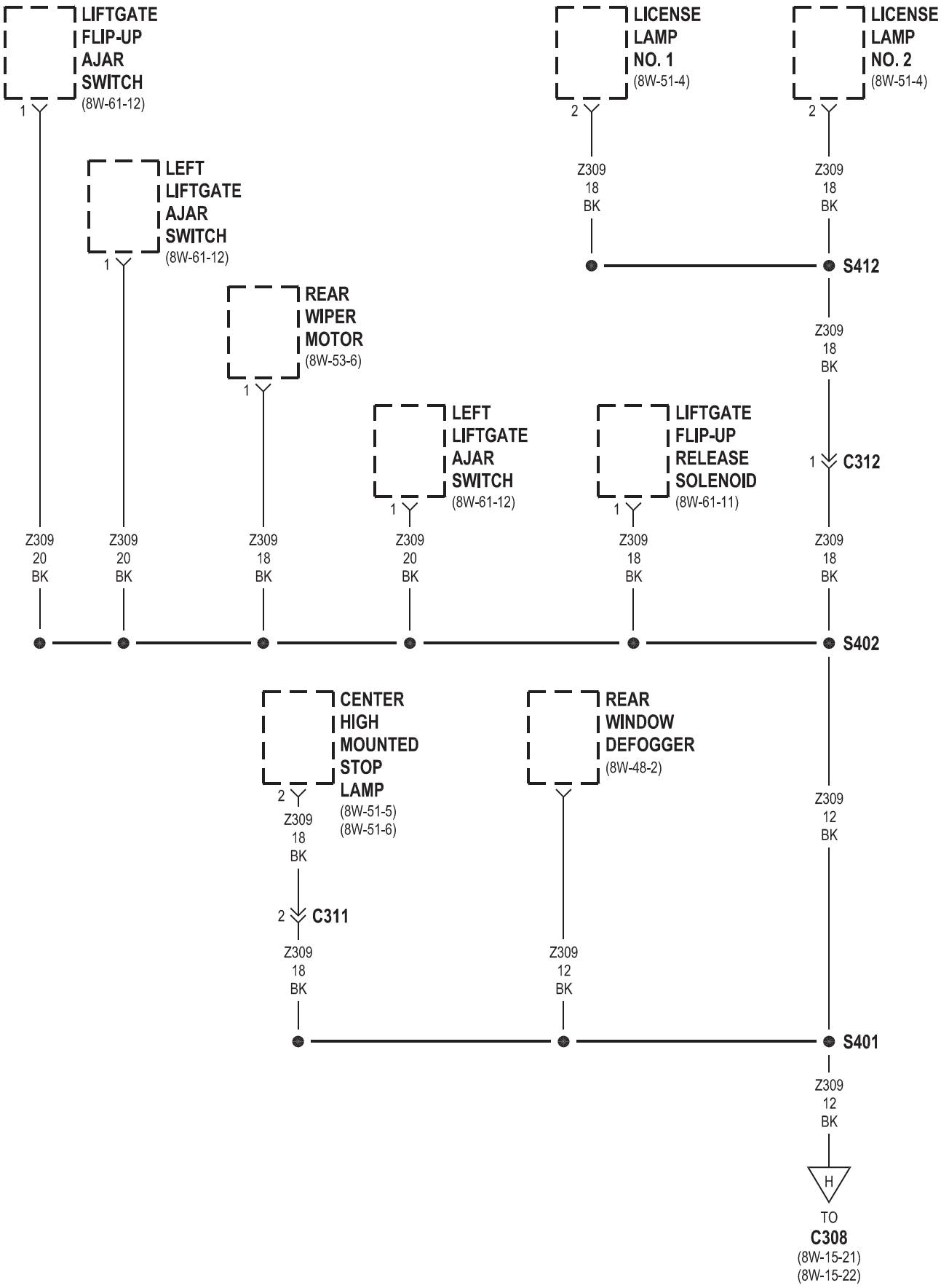
RHD

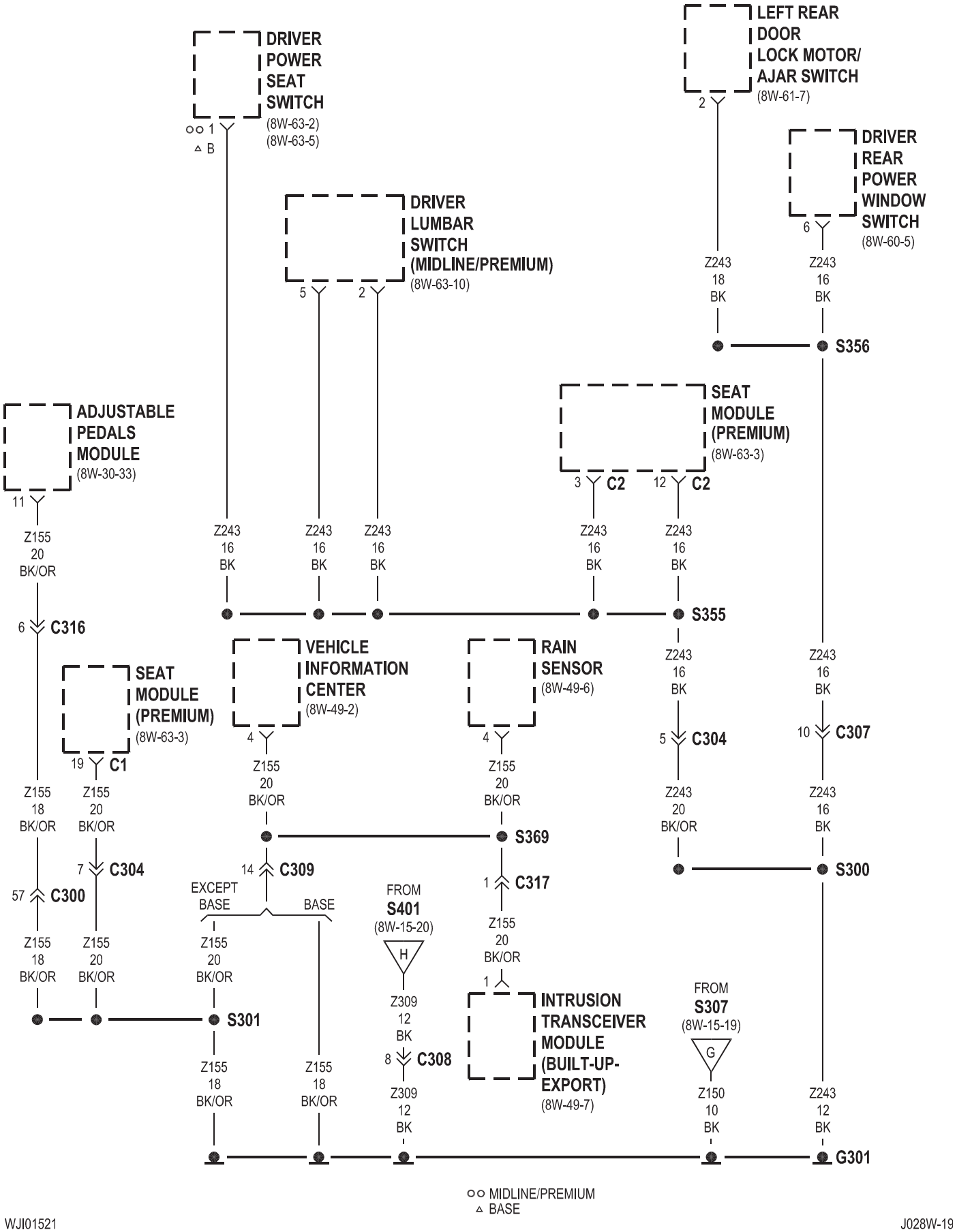


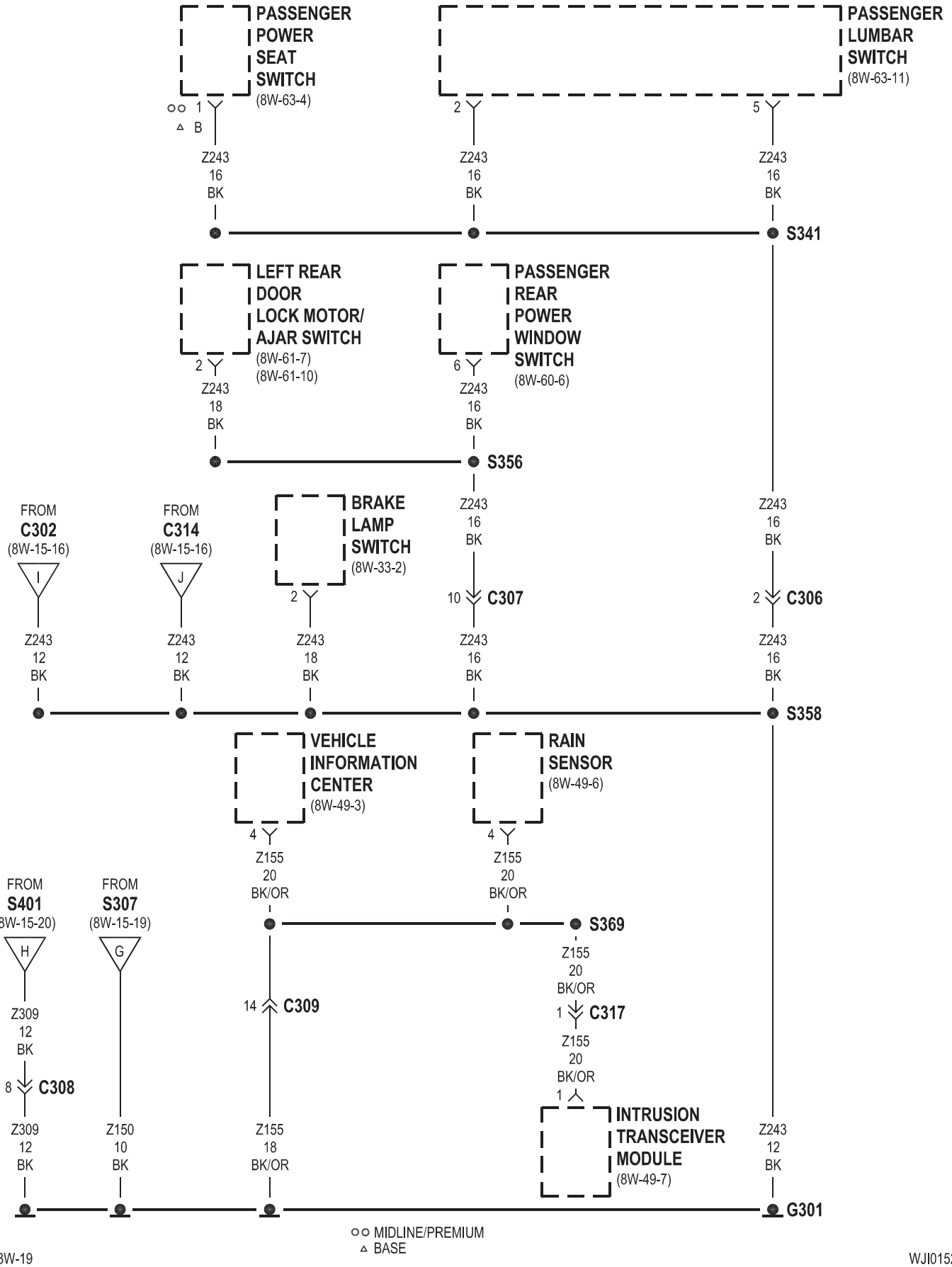
△ BASE

○○ PREMIUM


SUNROOF CONTROL MODULE (8W-64-3)
SUNROOF MOTOR (8W-64-2)
TRAILER TOW BRAKE LAMP RELAY (8W-54-6)
TRAILER TOW CONNECTOR (8W-54-6)
TRAILER TOW LEFT TURN RELAY (8W-54-6)
TRAILER TOW RIGHT TURN RELAY (8W-54-6)
SUNROOF SWITCH (8W-64-3)
AUTOMATIC DAY/NIGHT MIRROR (8W-49-5)
LEFT REAR LAMP ASSEMBLY (8W-51-6) (8W-51-7)
FUEL PUMP MODULE (GAS) (8W-30-10)
C2
C315
C309
C310
S370
S345
S410
S408
S307
SUNROOF
OTHER
NOT USED
BUILT-UP-EXPORT
EXCEPT BUILT-UP-EXPORT
Z150 16 BK
Z150 20 BK
Z150 18 BK
Z150 14 BK
Z150 12 BK
Z150 10 BK
BK
G
TO G301 (8W-15-21) (8W-15-22)

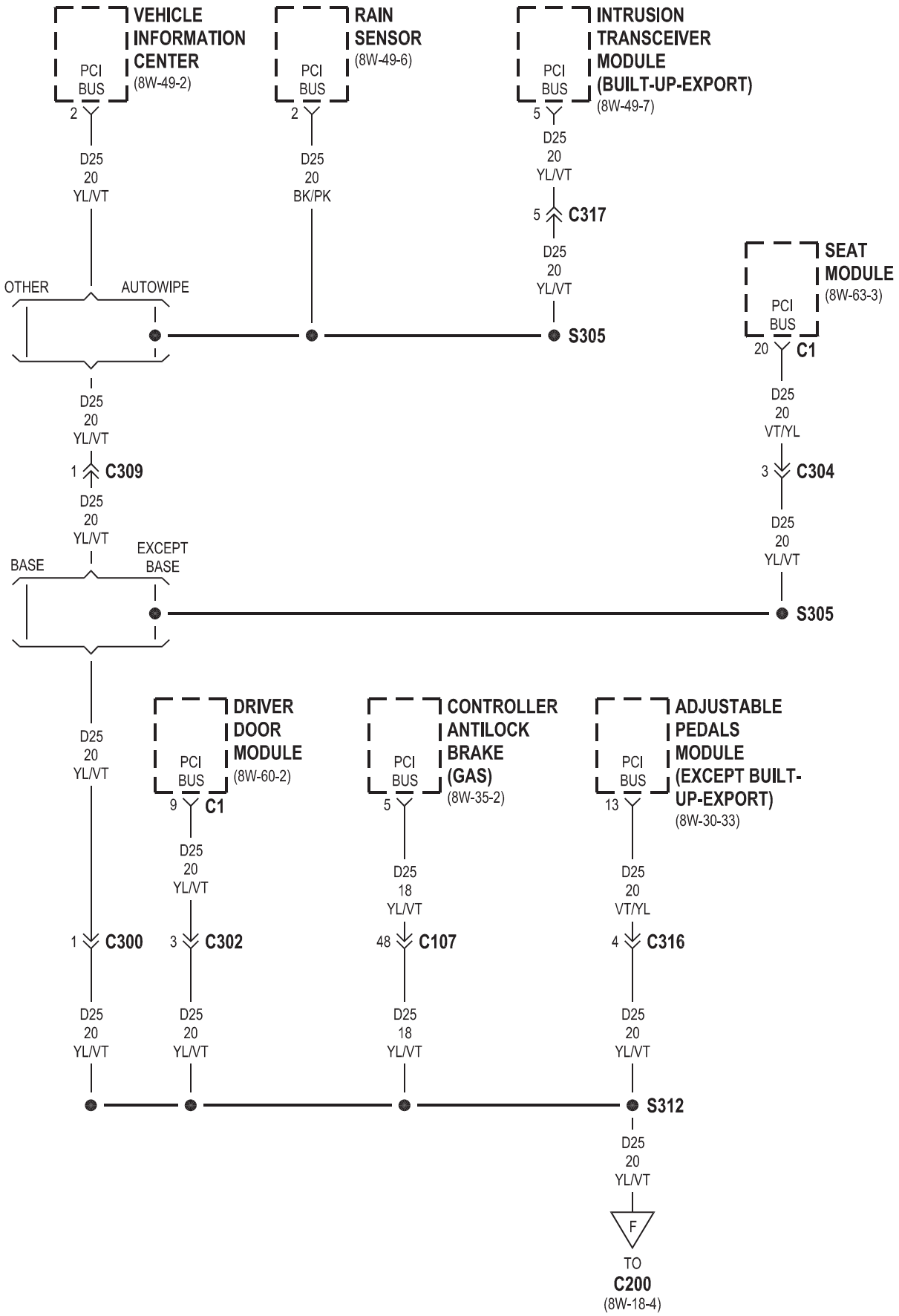

LIFTGATE FLIP-UP AJAR SWITCH (8W-61-12)
1
LEFT LIFTGATE AJAR SWITCH (8W-61-12)
1
REAR WIPER MOTOR (8W-53-6)
1
LEFT LIFTGATE AJAR SWITCH (8W-61-12)
1
LIFTGATE FLIP-UP RELEASE SOLENOID (8W-61-11)
1
LICENSE LAMP NO. 1 (8W-51-4)
2
LICENSE LAMP NO. 2 (8W-51-4)
2
Z309 18 BK
Z309 18 BK
S412
Z309 18 BK
1 C312
Z309 20 BK
Z309 20 BK
Z309 18 BK
Z309 20 BK
Z309 18 BK
Z309 18 BK
S402
CENTER HIGH MOUNTED STOP LAMP (8W-51-5) (8W-51-6)
2
REAR WINDOW DEFOGGER (8W-48-2)
Z309 18 BK
2 C311
Z309 18 BK
Z309 12 BK
Z309 12 BK
S401
Z309 12 BK
H
TO C308 (8W-15-21) (8W-15-22)

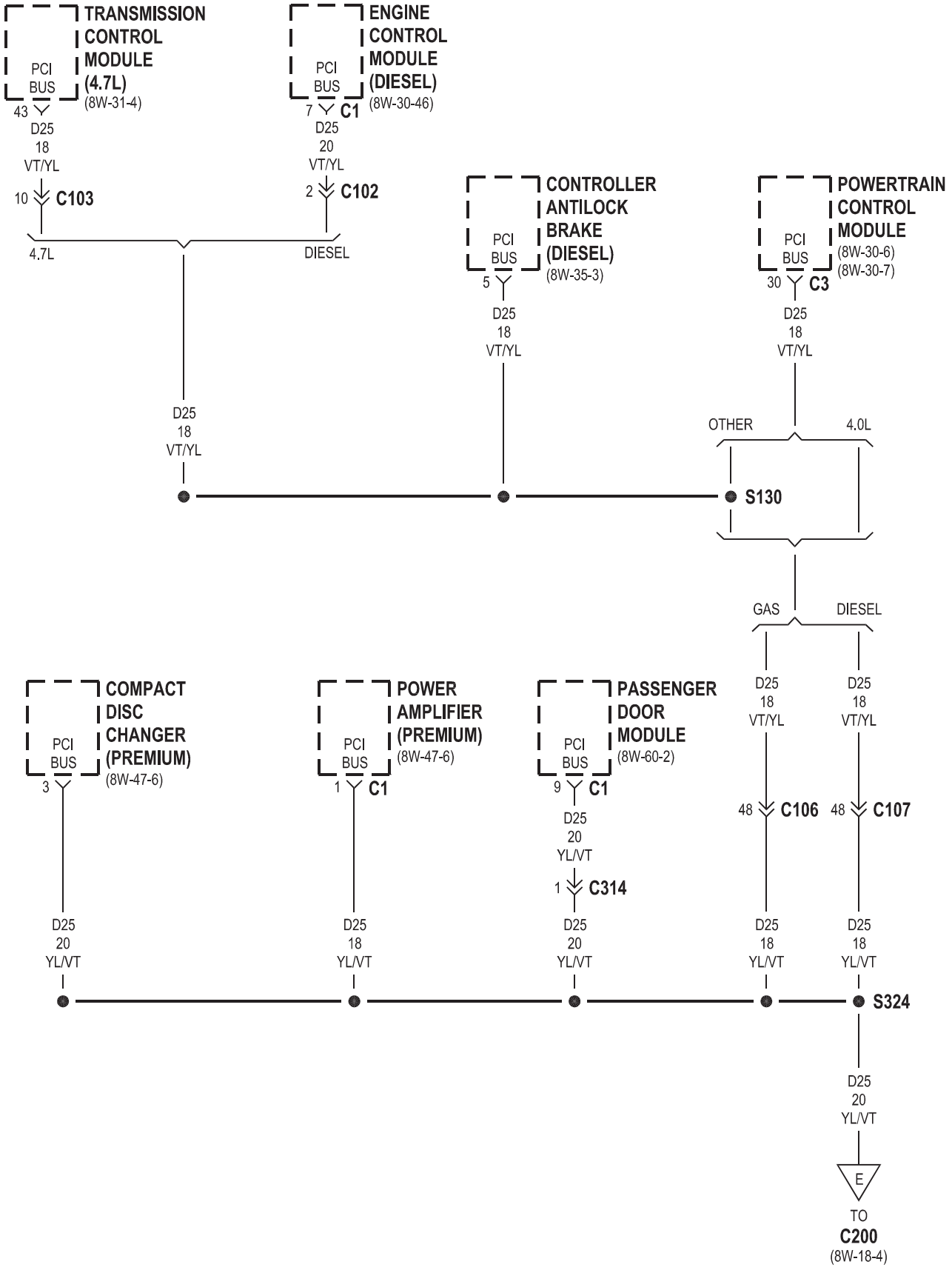

DRIVER POWER SEAT SWITCH
(8W-63-2)
(8W-63-5)
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
DRIVER REAR POWER WINDOW SWITCH
(8W-60-5)
DRIVER LUMBAR SWITCH (MIDLINE/PREMIUM)
(8W-63-10)
ADJUSTABLE PEDALS MODULE
(8W-30-33)
SEAT MODULE (PREMIUM)
(8W-63-3)
VEHICLE INFORMATION CENTER
(8W-49-2)
RAIN SENSOR
(8W-49-6)
INTRUSION TRANSCEIVER MODULE (BUILT-UP-EXPORT)
(8W-49-7)
FROM S401
(8W-15-20)
FROM S307
(8W-15-19)
EXCEPT BASE
BASE
S356
S355
S369
S300
S301
G301
C316
C1
C2
C304
C307
C309
C317
C308
C300
MIDLINE/PREMIUM
BASE

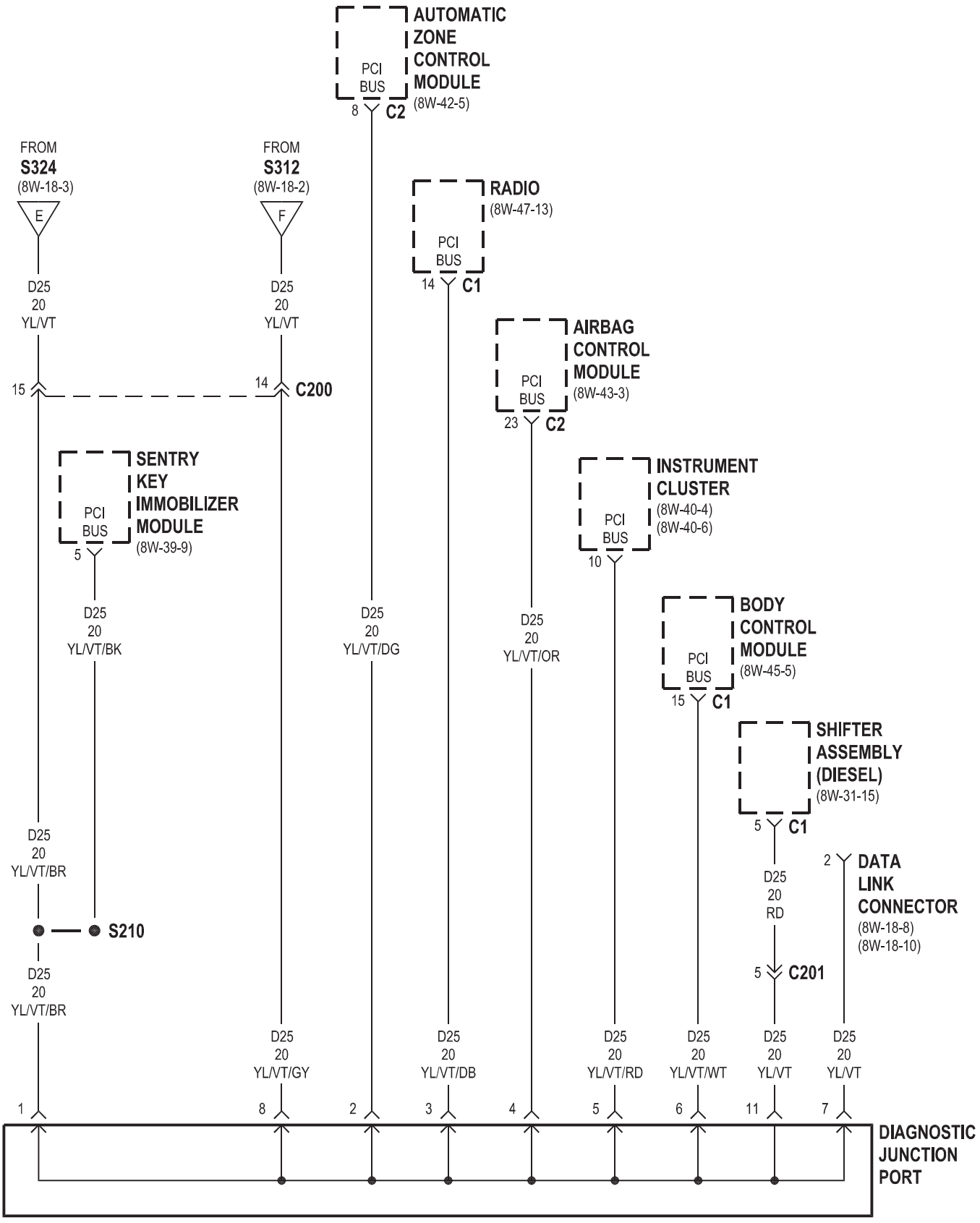

PASSENGER POWER SEAT SWITCH
(8W-63-4)
PASSENGER LUMBAR SWITCH
(8W-63-11)
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
(8W-61-10)
PASSENGER REAR POWER WINDOW SWITCH
(8W-60-6)
BRAKE LAMP SWITCH
(8W-33-2)
VEHICLE INFORMATION CENTER
(8W-49-3)
RAIN SENSOR
(8W-49-6)
INTRUSION TRANSCEIVER MODULE
(8W-49-7)
FROM C302 (8W-15-16)
FROM C314 (8W-15-16)
FROM S401 (8W-15-20)
FROM S307 (8W-15-19)
Z243 16 BK
Z243 18 BK
Z243 12 BK
Z155 20 BK/OR
Z155 18 BK/OR
Z309 12 BK
Z150 10 BK
S341
S356
S358
S369
C306
C307
C308
C309
C317
G301
MIDLINE/PREMIUM
BASE

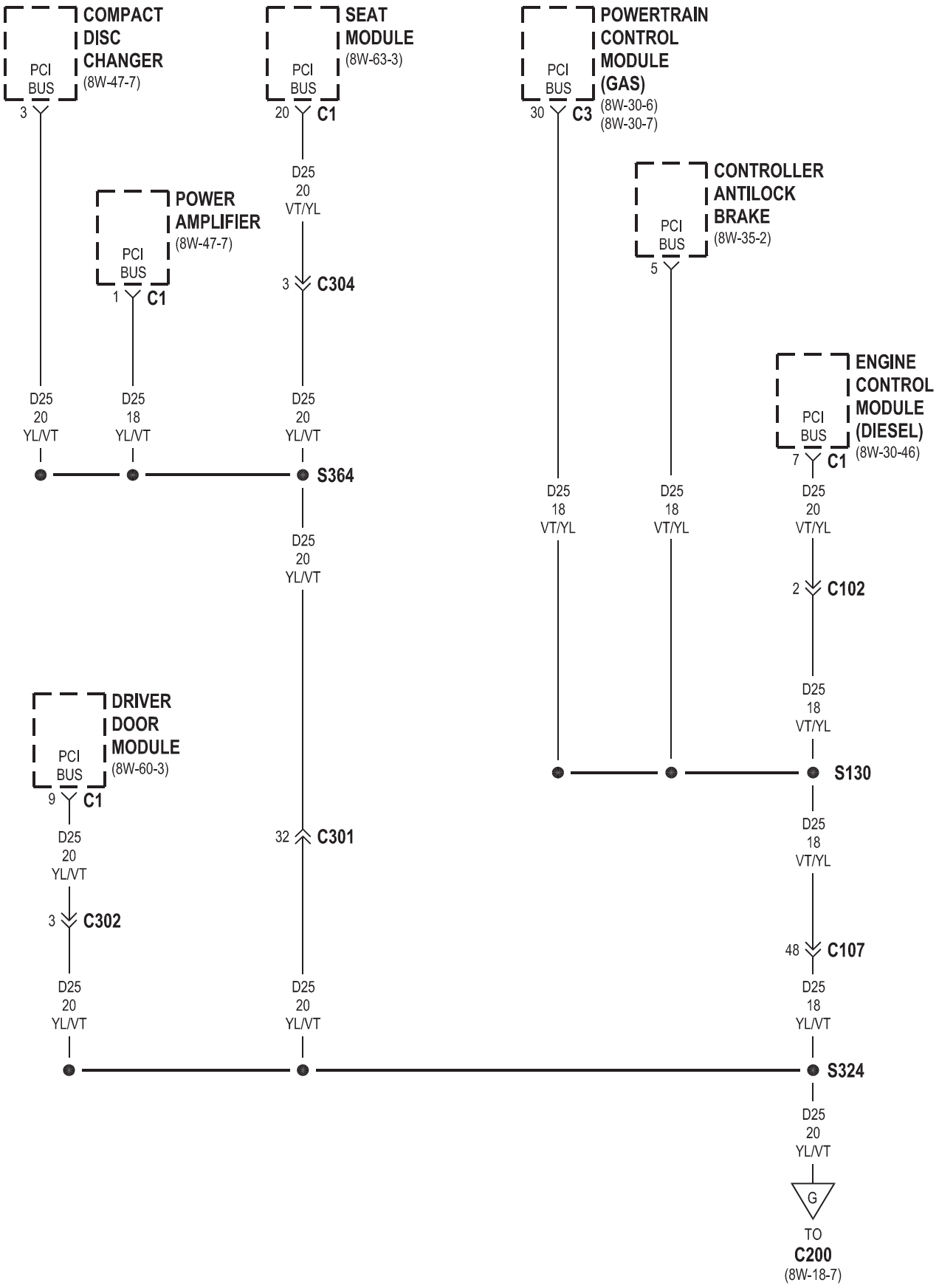
8W-18 BUS COMMUNICATIONS

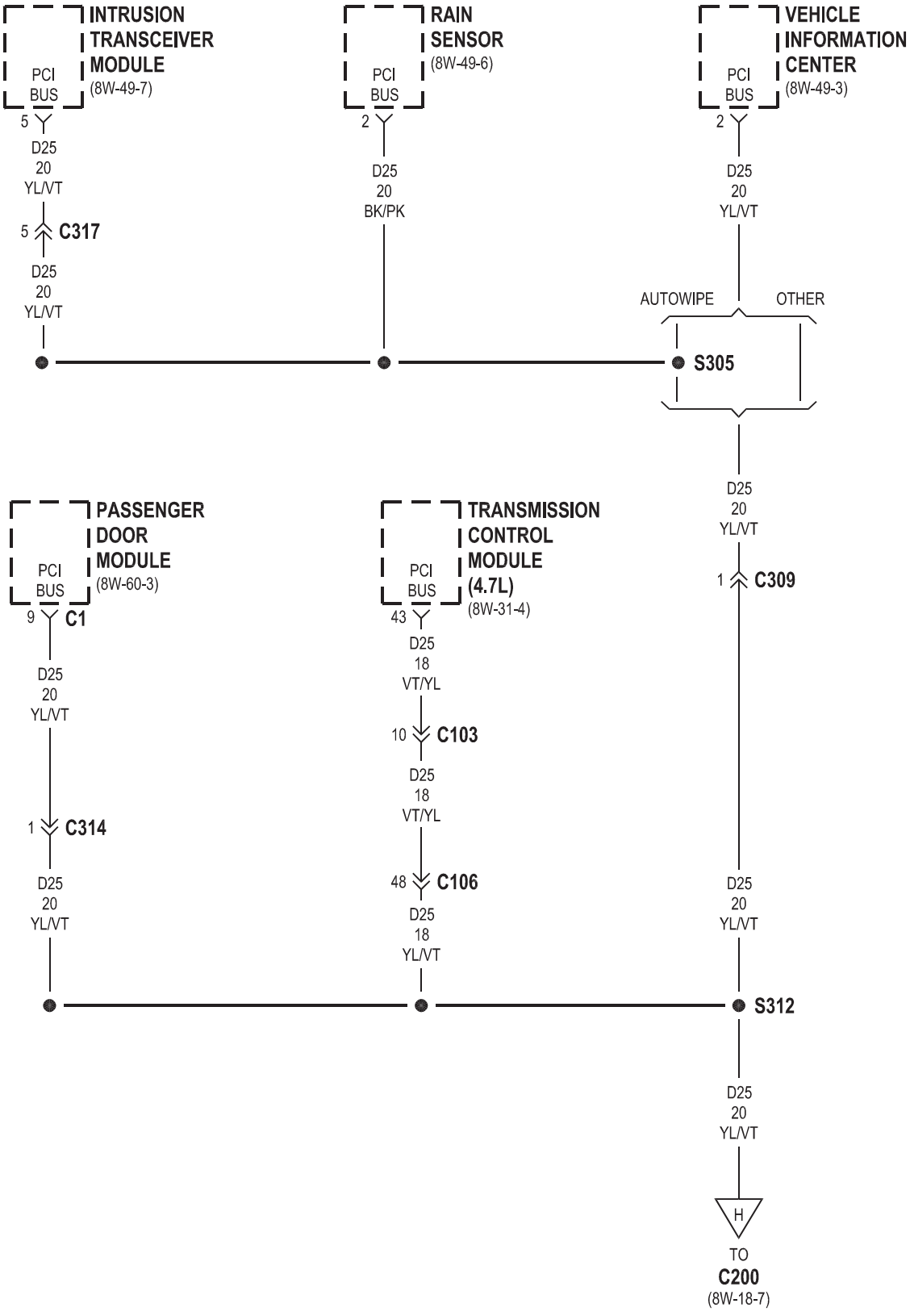
Component	Page
Adjustable Pedals Module	8W-18-2
Airbag Control Module	8W-18-4, 7
Automatic Zone Control Module	8W-18-4, 7
Body Control Module	8W-18-4, 7, 8, 9, 10
Compact Disc Changer	8W-18-3, 5
Controller Antilock Brake	8W-18-2, 3, 5
Data Link Connector	8W-18-4, 7, 8, 9, 10
Diagnostic Junction Port	8W-18-4, 7, 8, 9, 10
Driver Door Module	8W-18-2, 5
Engine Control Module	8W-18-3, 5, 10
Fuse 17	8W-18-8, 9, 10
G103	8W-18-8, 9, 10
Instrument Cluster	8W-18-4, 7, 8, 9, 10
Intrusion Transceiver Module	8W-18-2, 6
Junction Block	8W-18-8, 9, 10
Passenger Door Module	8W-18-3, 6
Power Amplifier	8W-18-3, 5
Powertrain Control Module	8W-18-3, 5, 8, 9
Radio	8W-18-4, 7
Rain Sensor	8W-18-2, 6
Seat Module	8W-18-2, 5
Sentry Key Immobilizer Module	8W-18-4, 7
Shifter Assembly	8W-18-4, 7
Transmission Control Module	8W-18-3, 6, 8, 9, 10
Vehicle Information Center	8W-18-2, 6


VEHICLE INFORMATION CENTER
(8W-49-2)
PCI BUS
2
D25 20 YL/VT
RAIN SENSOR
(8W-49-6)
PCI BUS
2
D25 20 BK/PK
INTRUSION TRANSCEIVER MODULE (BUILT-UP-EXPORT)
(8W-49-7)
PCI BUS
5
D25 20 YL/VT
5 C317
D25 20 YL/VT
S305
SEAT MODULE
(8W-63-3)
PCI BUS
20 C1
D25 20 VT/YL
3 C304
D25 20 YL/VT
S305
OTHER
AUTOWIPE
D25 20 YL/VT
1 C309
D25 20 YL/VT
BASE
EXCEPT BASE
D25 20 YL/VT
1 C300
D25 20 YL/VT
DRIVER DOOR MODULE
(8W-60-2)
PCI BUS
9 C1
D25 20 YL/VT
3 C302
D25 20 YL/VT
CONTROLLER ANTILOCK BRAKE (GAS)
(8W-35-2)
PCI BUS
5
D25 18 YL/VT
48 C107
D25 18 YL/VT
ADJUSTABLE PEDALS MODULE (EXCEPT BUILT-UP-EXPORT)
(8W-30-33)
PCI BUS
13
D25 20 VT/YL
4 C316
D25 20 YL/VT
S312
D25 20 YL/VT
F
TO
C200
(8W-18-4)

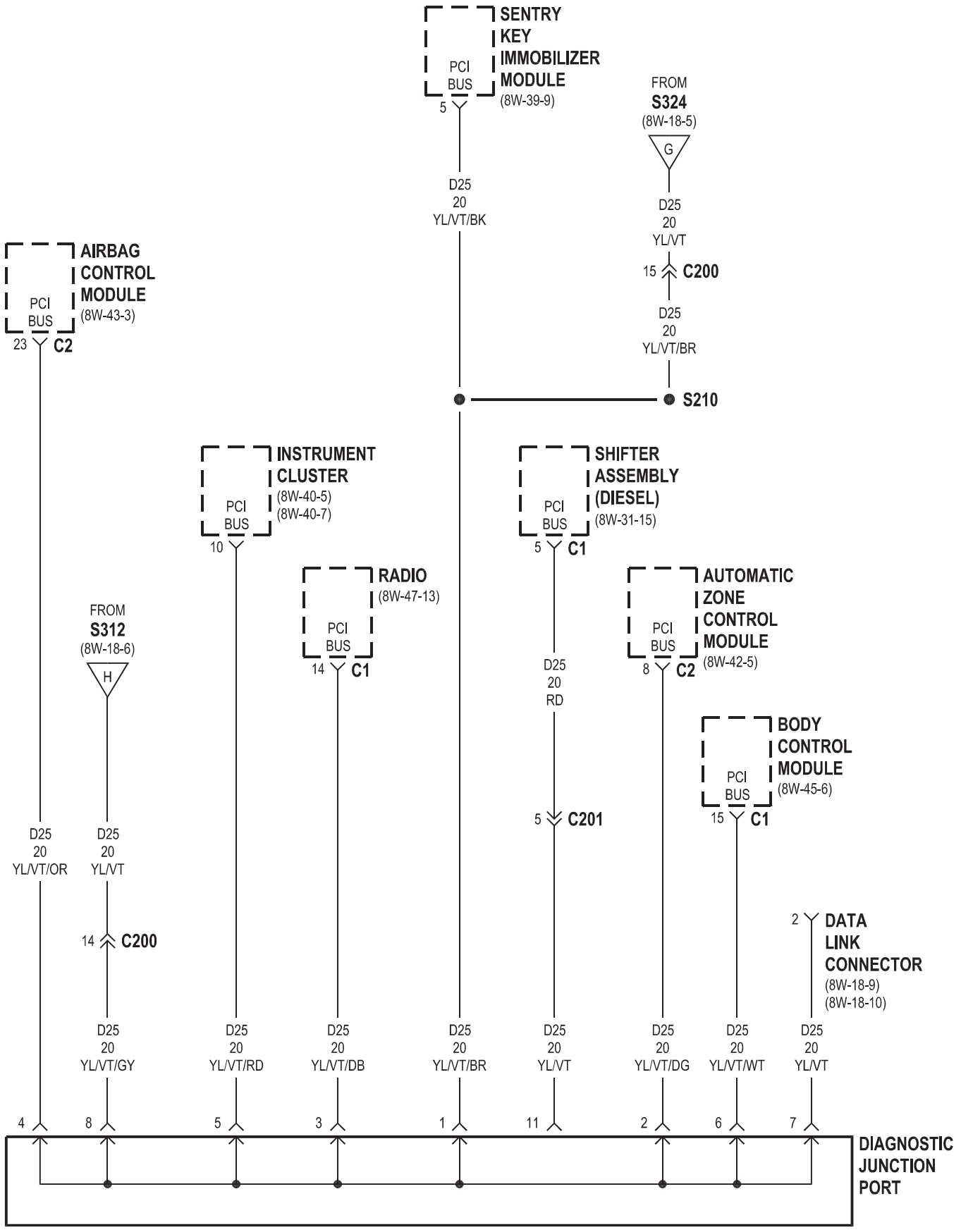

TRANSMISSION CONTROL MODULE (4.7L) (8W-31-4)
PCI BUS
43
D25
18
VT/YL
10 C103
4.7L
ENGINE CONTROL MODULE (DIESEL) (8W-30-46)
PCI BUS
7 C1
D25
20
VT/YL
2 C102
DIESEL
CONTROLLER ANTILOCK BRAKE (DIESEL) (8W-35-3)
PCI BUS
5
D25
18
VT/YL
POWERTRAIN CONTROL MODULE (8W-30-6) (8W-30-7)
PCI BUS
30 C3
D25
18
VT/YL
D25
18
VT/YL
OTHER
4.0L
S130
GAS
DIESEL
COMPACT DISC CHANGER (PREMIUM) (8W-47-6)
PCI BUS
3
D25
20
YL/VT
POWER AMPLIFIER (PREMIUM) (8W-47-6)
PCI BUS
1 C1
D25
18
YL/VT
PASSENGER DOOR MODULE (8W-60-2)
PCI BUS
9 C1
D25
20
YL/VT
1 C314
D25
20
YL/VT
D25
18
VT/YL
48 C106
D25
18
YL/VT
D25
18
VT/YL
48 C107
D25
18
YL/VT
S324
D25
20
YL/VT
E
TO
C200
(8W-18-4)

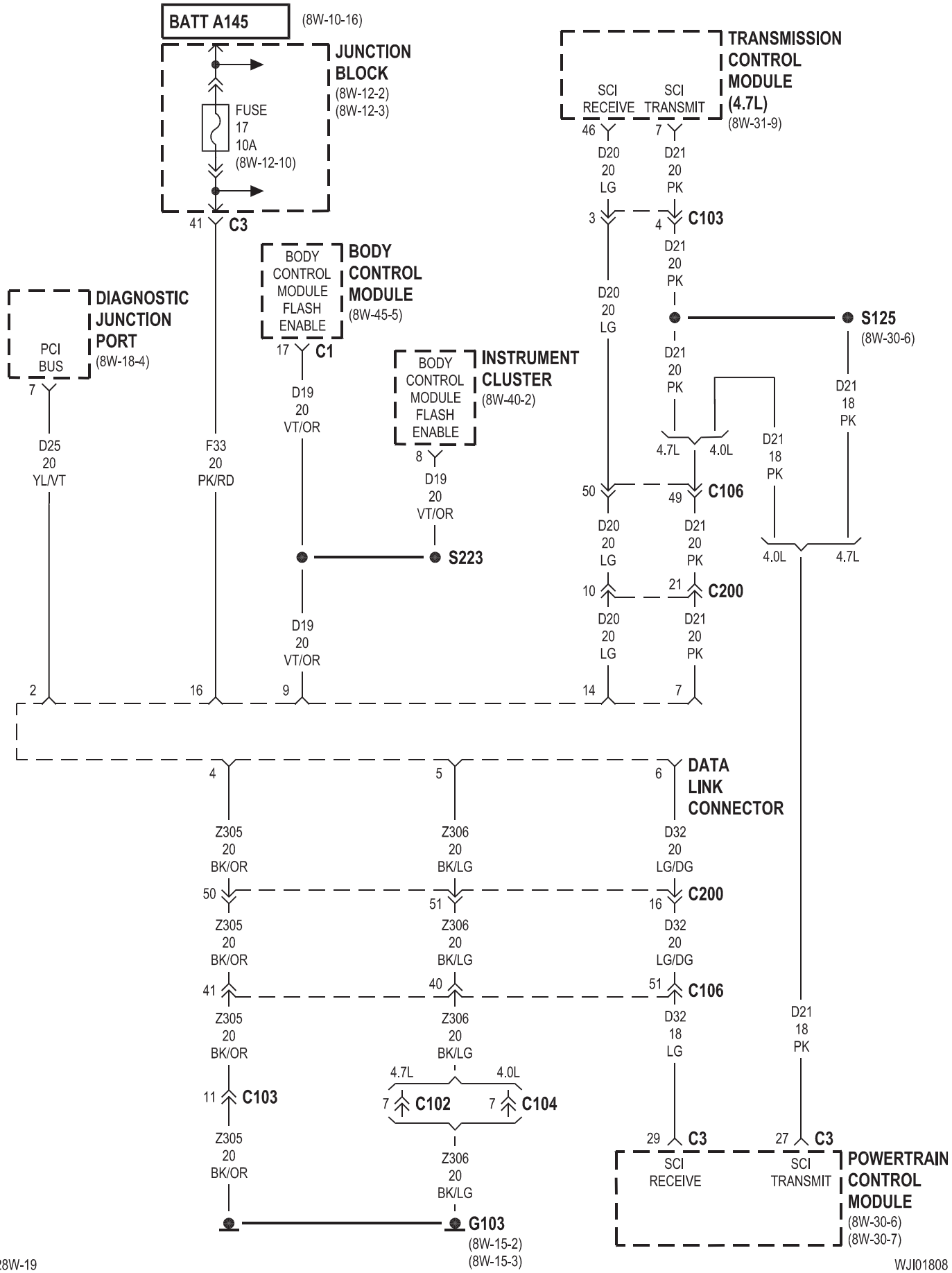

AUTOMATIC ZONE CONTROL MODULE
PCI BUS
8 C2
(8W-42-5)
FROM S324
(8W-18-3)
E
FROM S312
(8W-18-2)
F
RADIO
(8W-47-13)
PCI BUS
14 C1
AIRBAG CONTROL MODULE
(8W-43-3)
PCI BUS
23 C2
INSTRUMENT CLUSTER
(8W-40-4)
(8W-40-6)
PCI BUS
10
SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
PCI BUS
5
BODY CONTROL MODULE
(8W-45-5)
PCI BUS
15 C1
SHIFTER ASSEMBLY (DIESEL)
(8W-31-15)
5 C1
D25 20 YL/VT
15
14 C200
D25 20 YL/VT/BK
D25 20 YL/VT/DG
D25 20 YL/VT/OR
D25 20 YL/VT/BR
S210
D25 20 YL/VT/BR
D25 20 RD
5 C201
2 DATA LINK CONNECTOR
(8W-18-8)
(8W-18-10)
D25 20 YL/VT/GY
D25 20 YL/VT/DB
D25 20 YL/VT/RD
D25 20 YL/VT/WT
D25 20 YL/VT
D25 20 YL/VT
1
8
2
3
4
5
6
11
7
DIAGNOSTIC JUNCTION PORT


COMPACT DISC CHANGER
(8W-47-7)
PCI BUS
3
SEAT MODULE
(8W-63-3)
PCI BUS
20
C1
POWERTRAIN CONTROL MODULE (GAS)
(8W-30-6)
(8W-30-7)
PCI BUS
30
C3
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
PCI BUS
5
POWER AMPLIFIER
(8W-47-7)
PCI BUS
1
C1
ENGINE CONTROL MODULE (DIESEL)
(8W-30-46)
PCI BUS
7
C1
DRIVER DOOR MODULE
(8W-60-3)
PCI BUS
9
C1
D25 20 VT/YL
3
C304
D25 20 YL/VT
D25 18 YL/VT
D25 20 YL/VT
S364
D25 20 YL/VT
32
C301
D25 18 VT/YL
D25 18 VT/YL
D25 20 VT/YL
2
C102
D25 18 VT/YL
S130
D25 18 VT/YL
48
C107
D25 18 YL/VT
D25 20 YL/VT
3
C302
D25 20 YL/VT
D25 20 YL/VT
S324
D25 20 YL/VT
G
TO
C200
(8W-18-7)

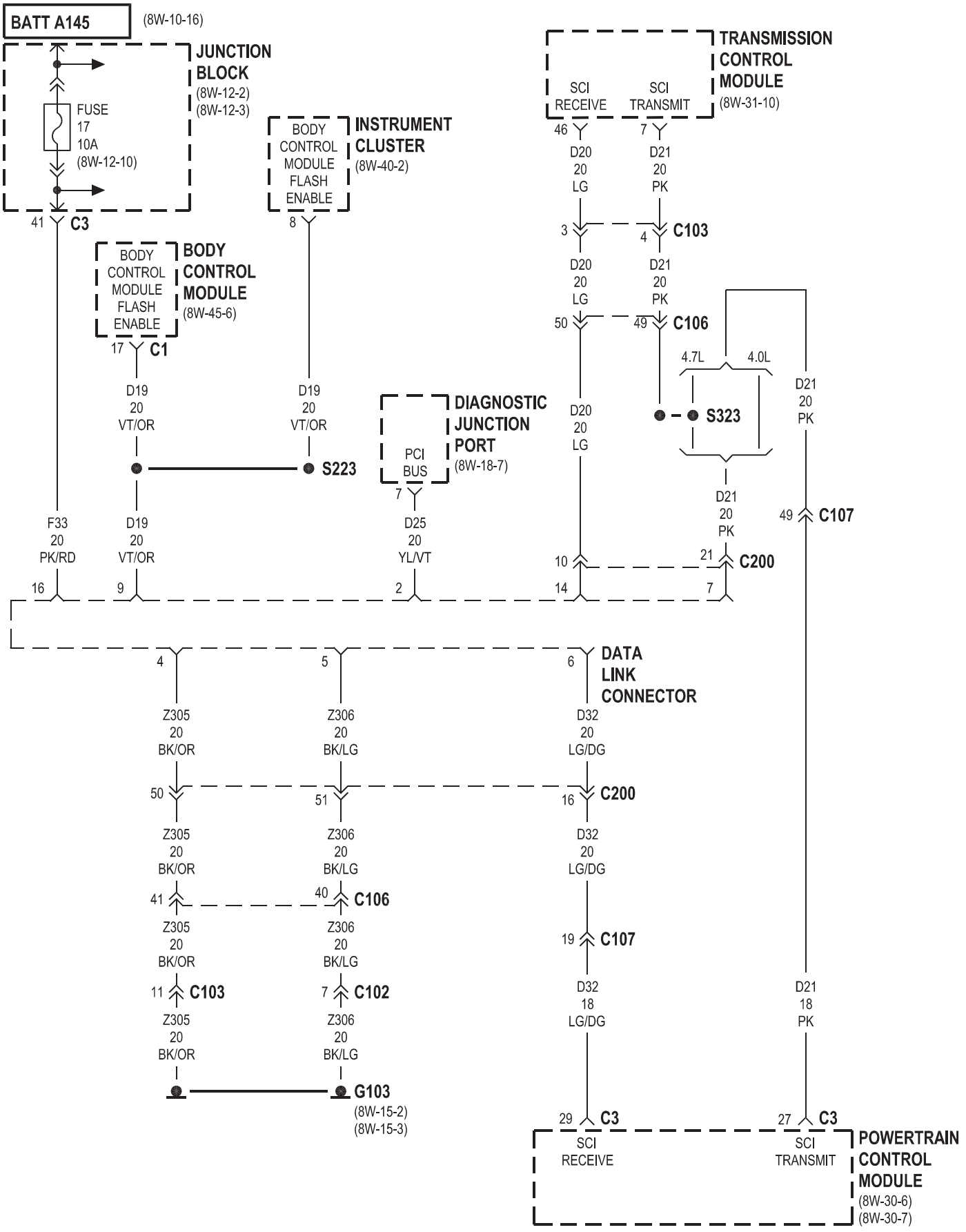

INTRUSION TRANSCEIVER MODULE
(8W-49-7)
PCI BUS
5
D25
20
YL/VT
5
C317
D25
20
YL/VT
RAIN SENSOR
(8W-49-6)
PCI BUS
2
D25
20
BK/PK
VEHICLE INFORMATION CENTER
(8W-49-3)
PCI BUS
2
D25
20
YL/VT
AUTOWIPE
OTHER
S305
D25
20
YL/VT
1
C309
PASSENGER DOOR MODULE
(8W-60-3)
PCI BUS
9
C1
D25
20
YL/VT
1
C314
D25
20
YL/VT
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-4)
PCI BUS
43
D25
18
VT/YL
10
C103
D25
18
VT/YL
48
C106
D25
18
YL/VT
D25
20
YL/VT
S312
D25
20
YL/VT
H
TO
C200
(8W-18-7)

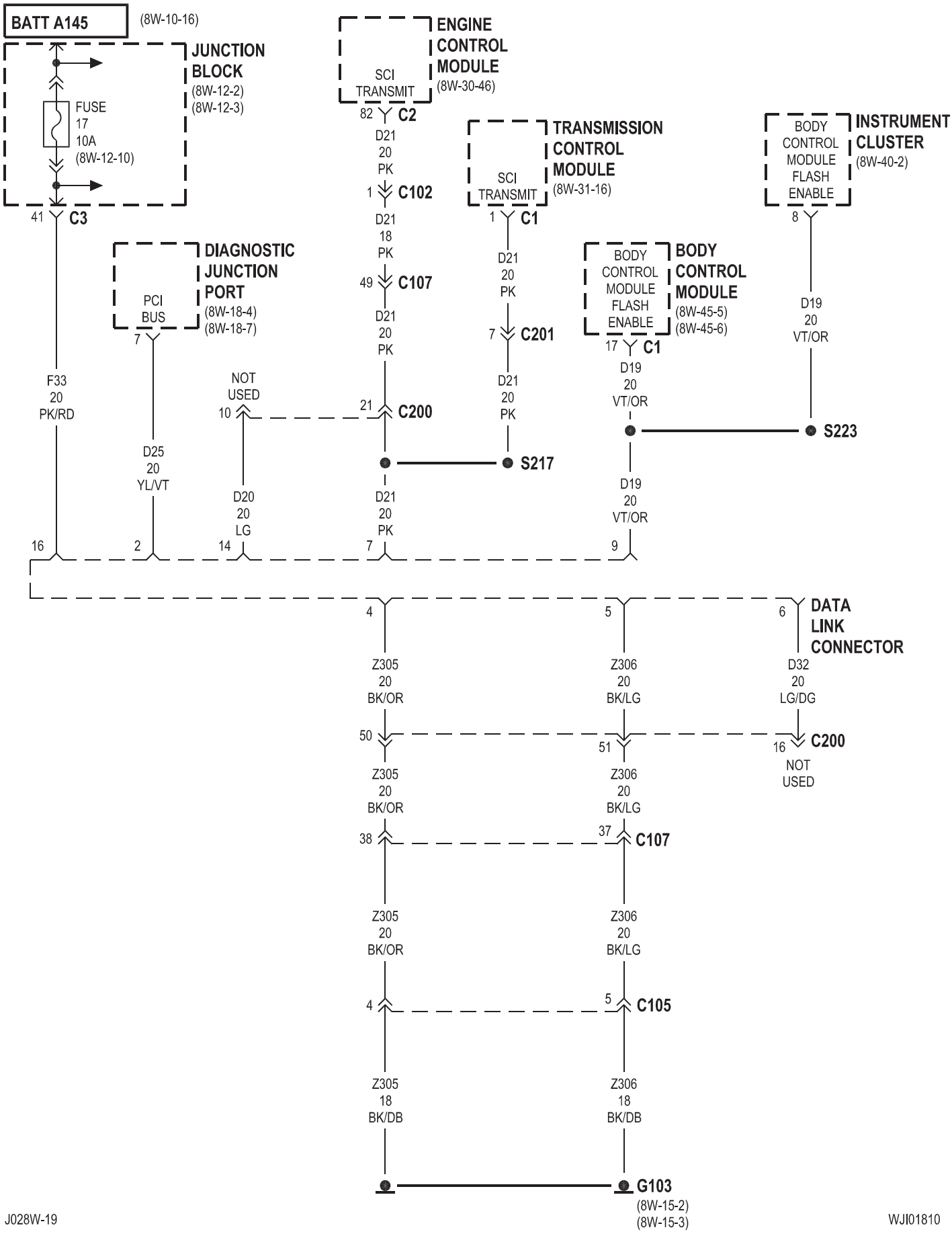
RHD


SENTRY KEY IMMOBILIZER MODULE
(8W-39-9)
PCI BUS
5
D25
20
YL/VT/BK
FROM
S324
(8W-18-5)
G
D25
20
YL/VT
15
C200
D25
20
YL/VT/BR
S210
AIRBAG CONTROL MODULE
(8W-43-3)
PCI BUS
23
C2
INSTRUMENT CLUSTER
(8W-40-5)
(8W-40-7)
PCI BUS
10
RADIO
(8W-47-13)
PCI BUS
14
C1
SHIFTER ASSEMBLY (DIESEL)
(8W-31-15)
PCI BUS
5
C1
AUTOMATIC ZONE CONTROL MODULE
(8W-42-5)
PCI BUS
8
C2
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15
C1
FROM
S312
(8W-18-6)
H
D25
20
RD
5
C201
D25
20
YL/VT/OR
D25
20
YL/VT
14
C200
2
DATA LINK CONNECTOR
(8W-18-9)
(8W-18-10)
D25
20
YL/VT/GY
D25
20
YL/VT/RD
D25
20
YL/VT/DB
D25
20
YL/VT/BR
D25
20
YL/VT
D25
20
YL/VT/DG
D25
20
YL/VT/WT
D25
20
YL/VT
4
8
5
3
1
11
2
6
7
DIAGNOSTIC JUNCTION PORT


BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 17 10A
(8W-12-10)
41 C3
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-9)
SCI RECEIVE
SCI TRANSMIT
46
7
D20 20 LG
D21 20 PK
3
4 C103
D21 20 PK
S125
(8W-30-6)
D21 18 PK
4.7L
4.0L
50
49 C106
10
21 C200
BODY CONTROL MODULE FLASH ENABLE
(8W-45-5)
17 C1
D19 20 VT/OR
S223
BODY CONTROL MODULE FLASH ENABLE
INSTRUMENT CLUSTER
(8W-40-2)
8
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
PCI BUS
7
D25 20 YL/VT
F33 20 PK/RD
2
16
9
14
7
DATA LINK CONNECTOR
4
5
6
Z305 20 BK/OR
Z306 20 BK/LG
D32 20 LG/DG
50
51
16 C200
41
40
51 C106
D32 18 LG
11 C103
7 C102
7 C104
29 C3
27 C3
SCI RECEIVE
SCI TRANSMIT
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)
G103
(8W-15-2)
(8W-15-3)

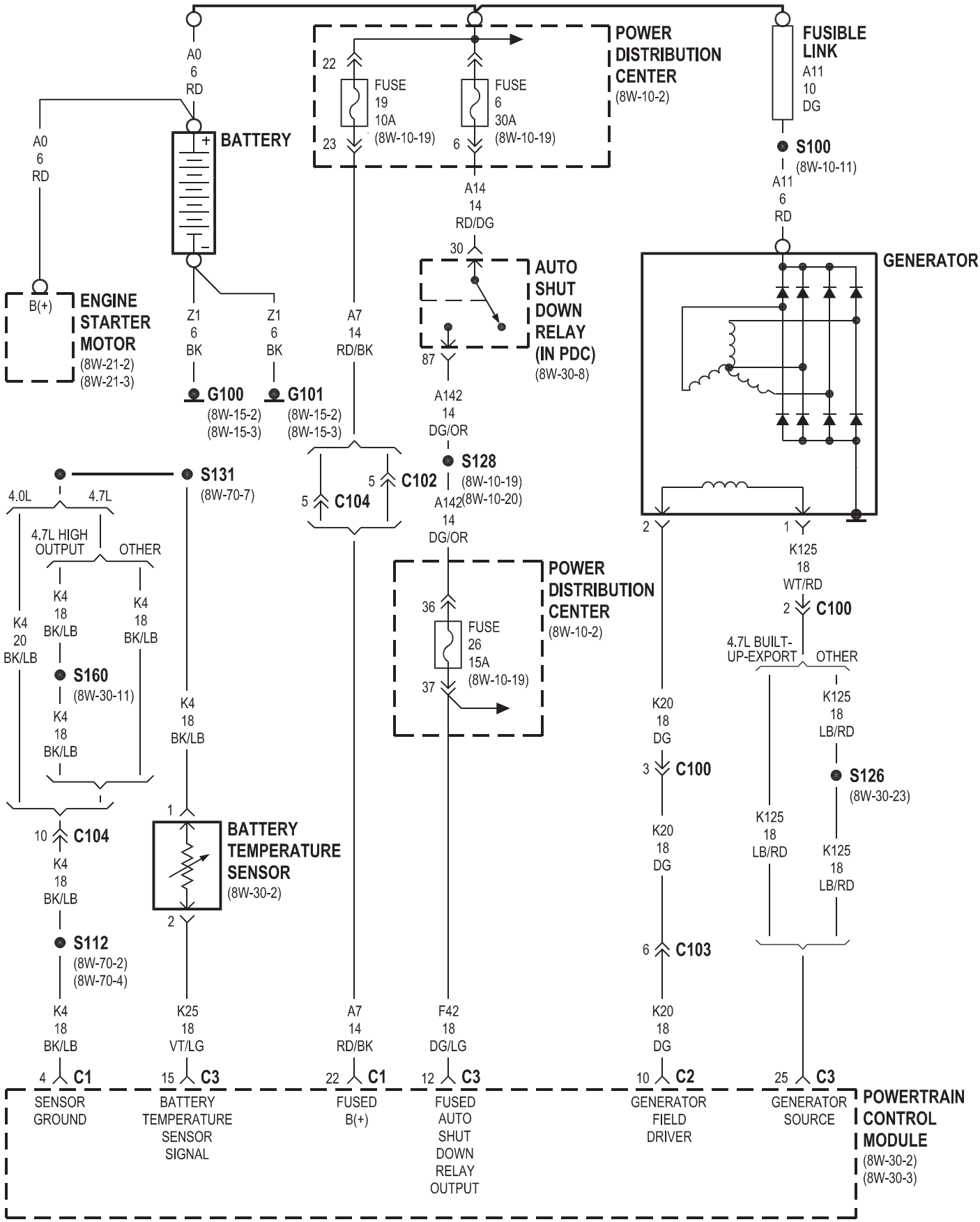
RHD GAS

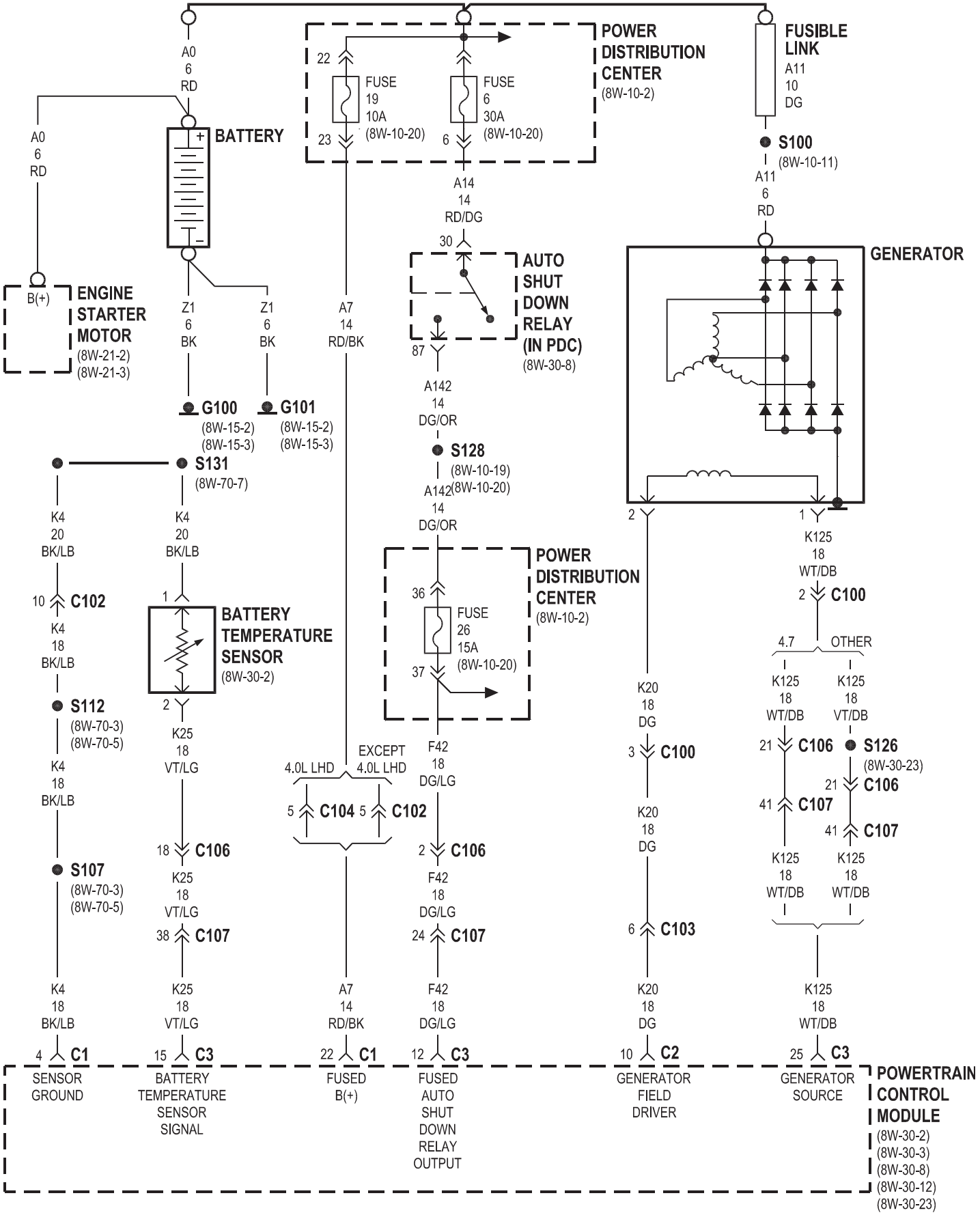

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 17 10A
(8W-12-10)
41 C3
BODY CONTROL MODULE FLASH ENABLE
INSTRUMENT CLUSTER
(8W-40-2)
8
BODY CONTROL MODULE FLASH ENABLE
BODY CONTROL MODULE
(8W-45-6)
17 C1
TRANSMISSION CONTROL MODULE
(8W-31-10)
SCI RECEIVE
SCI TRANSMIT
46
7
D20 20 LG
D21 20 PK
3
4
C103
50
49
C106
4.7L
4.0L
S323
D19 20 VT/OR
S223
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
PCI BUS
7
F33 20 PK/RD
16
9
2
10
14
21
7
C200
49
C107
4
5
6
DATA LINK CONNECTOR
Z305 20 BK/OR
Z306 20 BK/LG
D32 20 LG/DG
51
40
41
11
C102
19
D32 18 LG/DG
D21 18 PK
G103
(8W-15-2)
(8W-15-3)
29
27
C3
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)

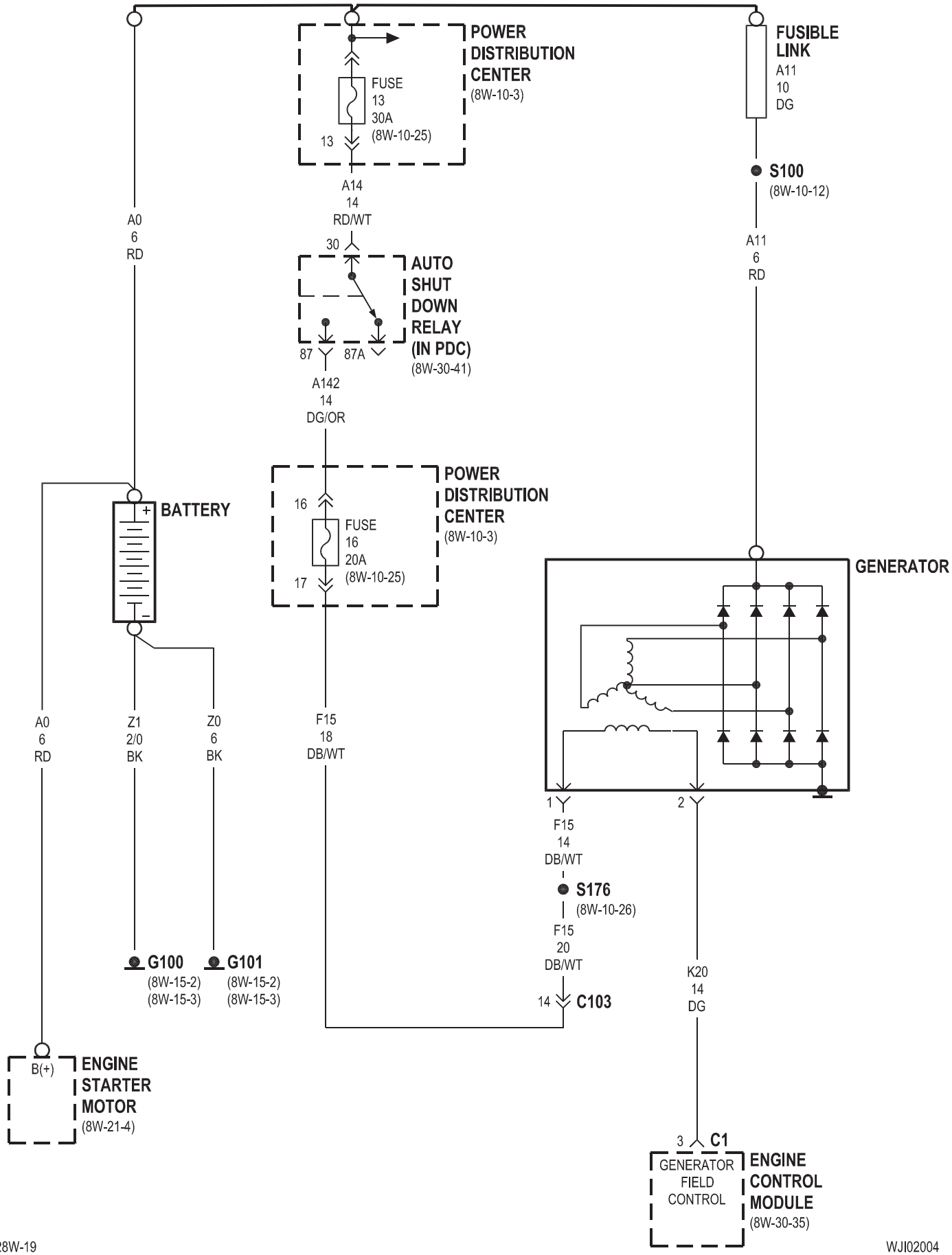

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
17
10A
(8W-12-10)
41 C3
F33
20
PK/RD
16
ENGINE CONTROL MODULE
(8W-30-46)
SCI TRANSMIT
82 C2
D21
20
PK
1 C102
D21
18
PK
49 C107
D21
20
PK
21 C200
TRANSMISSION CONTROL MODULE
(8W-31-16)
SCI TRANSMIT
1 C1
D21
20
PK
7 C201
D21
20
PK
S217
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
PCI BUS
7
D25
20
YL/VT
2
NOT USED
10
D20
20
LG
14
BODY CONTROL MODULE FLASH ENABLE
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
17 C1
D19
20
VT/OR
D19
20
VT/OR
9
INSTRUMENT CLUSTER
(8W-40-2)
BODY CONTROL MODULE FLASH ENABLE
8
D19
20
VT/OR
S223
DATA LINK CONNECTOR
4
5
6
Z305
20
BK/OR
Z306
20
BK/LG
D32
20
LG/DG
50
51
16 C200
NOT USED
Z305
20
BK/OR
Z306
20
BK/LG
38
37 C107
Z305
20
BK/OR
Z306
20
BK/LG
4
5 C105
Z305
18
BK/DB
Z306
18
BK/DB
G103
(8W-15-2)
(8W-15-3)

8W-20 CHARGING SYSTEM

Component	Page
Auto Shut Down Relay	8W-20-2, 3, 4
Battery	8W-20-2, 3, 4
Battery Temperature Sensor	8W-20-2, 3
Engine Control Module	8W-20-4
Engine Starter Motor	8W-20-2, 3, 4
Fuse 6	8W-20-2, 3
Fuse 13	8W-20-4
Fuse 16	8W-20-4
Fuse 19	8W-20-2, 3
Fuse 26	8W-20-2, 3
Fusible Link	8W-20-2, 3, 4
G100	8W-20-2, 3, 4
G101	8W-20-2, 3, 4
Generator	8W-20-2, 3, 4
Power Distribution Center	8W-20-2, 3, 4
Powertrain Control Module	8W-20-2, 3

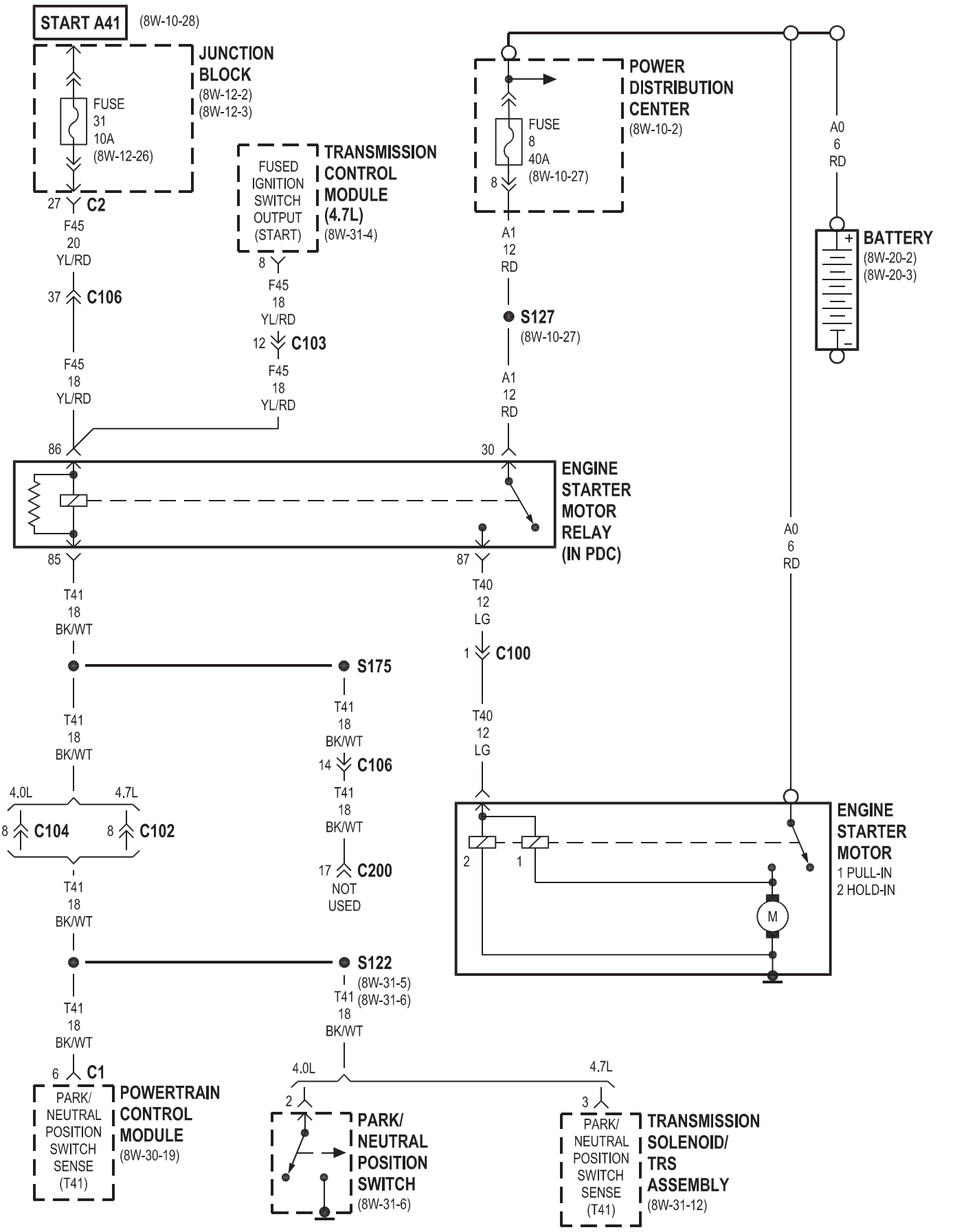

A0
6
RD
BATTERY
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
19
10A
(8W-10-19)
FUSE
6
30A
(8W-10-19)
22
23
6
FUSIBLE
LINK
A11
10
DG
S100
(8W-10-11)
A11
6
RD
A14
14
RD/DG
30
AUTO
SHUT
DOWN
RELAY
(IN PDC)
(8W-30-8)
87
GENERATOR
B(+)
ENGINE
STARTER
MOTOR
(8W-21-2)
(8W-21-3)
Z1
6
BK
G100
(8W-15-2)
(8W-15-3)
G101
(8W-15-2)
(8W-15-3)
A7
14
RD/BK
A142
14
DG/OR
S128
(8W-10-19)
(8W-10-20)
C102
C104
5
S131
(8W-70-7)
4.0L
4.7L
4.7L HIGH
OUTPUT
OTHER
K4
18
BK/LB
K4
20
BK/LB
S160
(8W-30-11)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
36
37
FUSE
26
15A
(8W-10-19)
2
1
K125
18
WT/RD
C100
4.7L BUILT-
UP-EXPORT
OTHER
K125
18
LB/RD
S126
(8W-30-23)
K20
18
DG
C100
C103
10
C104
BATTERY
TEMPERATURE
SENSOR
(8W-30-2)
S112
(8W-70-2)
(8W-70-4)
K25
18
VT/LG
F42
18
DG/LG
4
15
22
12
10
25
C1
C3
C2
SENSOR
GROUND
BATTERY
TEMPERATURE
SENSOR
SIGNAL
FUSED
B(+)
FUSED
AUTO
SHUT
DOWN
RELAY
OUTPUT
GENERATOR
FIELD
DRIVER
GENERATOR
SOURCE
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
(8W-30-3)


A0
6
RD
BATTERY
POWER
DISTRIBUTION
CENTER
(8W-10-2)
FUSE
19
10A
(8W-10-20)
FUSE
6
30A
(8W-10-20)
22
23
6
FUSIBLE
LINK
A11
10
DG
S100
(8W-10-11)
A11
6
RD
A14
14
RD/DG
30
AUTO
SHUT
DOWN
RELAY
(IN PDC)
(8W-30-8)
87
GENERATOR
B(+)
ENGINE
STARTER
MOTOR
(8W-21-2)
(8W-21-3)
Z1
6
BK
Z1
6
BK
A7
14
RD/BK
G100
(8W-15-2)
(8W-15-3)
G101
(8W-15-2)
(8W-15-3)
A142
14
DG/OR
S128
(8W-10-19)
(8W-10-20)
S131
(8W-70-7)
K4
20
BK/LB
K4
20
BK/LB
2
1
K125
18
WT/DB
POWER
DISTRIBUTION
CENTER
(8W-10-2)
36
37
FUSE
26
15A
(8W-10-20)
10
C102
K4
18
BK/LB
1
BATTERY
TEMPERATURE
SENSOR
(8W-30-2)
2
C100
4.7
OTHER
S112
(8W-70-3)
(8W-70-5)
K4
18
BK/LB
K25
18
VT/LG
EXCEPT
4.0L LHD
4.0L LHD
F42
18
DG/LG
K20
18
DG
K125
18
WT/DB
K125
18
VT/DB
21
C106
S126
(8W-30-23)
21
C106
41
C107
41
C107
5
C104
5
C102
18
C106
2
C106
3
C100
S107
(8W-70-3)
(8W-70-5)
K25
18
VT/LG
F42
18
DG/LG
K20
18
DG
K125
18
WT/DB
K125
18
WT/DB
38
C107
24
C107
6
C103
K4
18
BK/LB
K25
18
VT/LG
A7
14
RD/BK
F42
18
DG/LG
K20
18
DG
K125
18
WT/DB
4
C1
15
C3
22
C1
12
C3
10
C2
25
C3
SENSOR
GROUND
BATTERY
TEMPERATURE
SENSOR
SIGNAL
FUSED
B(+)
FUSED
AUTO
SHUT
DOWN
RELAY
OUTPUT
GENERATOR
FIELD
DRIVER
GENERATOR
SOURCE
POWERTRAIN
CONTROL
MODULE
(8W-30-2)
(8W-30-3)
(8W-30-8)
(8W-30-12)
(8W-30-23)

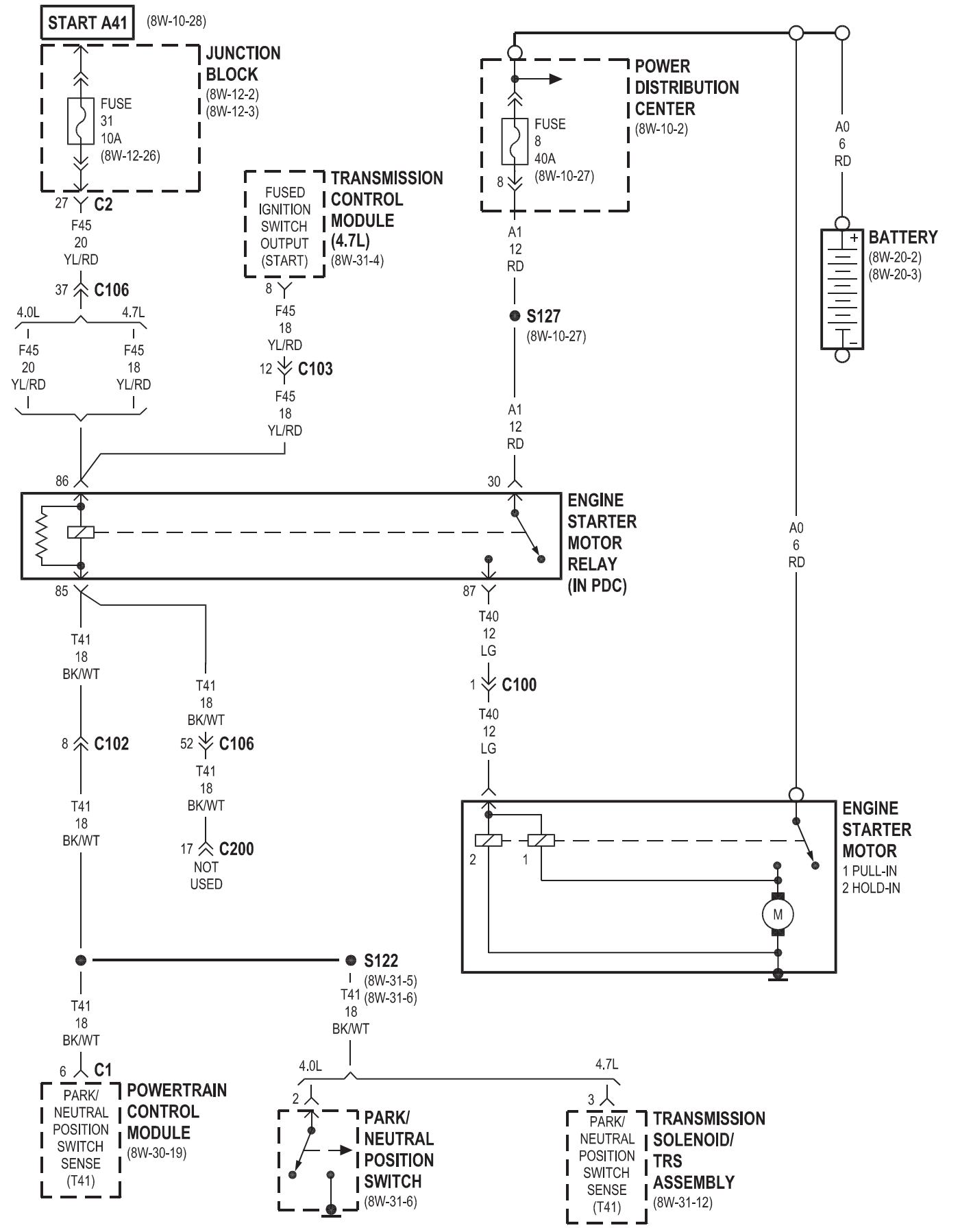

POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 13 30A
(8W-10-25)
13
A14 14 RD/WT
30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-41)
87
87A
A142 14 DG/OR
FUSIBLE LINK A11 10 DG
S100
(8W-10-12)
A11 6 RD
A0 6 RD
BATTERY
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE 16 20A
(8W-10-25)
17
F15 18 DB/WT
GENERATOR
A0 6 RD
Z1 2/0 BK
Z0 6 BK
1
2
F15 14 DB/WT
S176
(8W-10-26)
F15 20 DB/WT
14
C103
K20 14 DG
G100
(8W-15-2)
(8W-15-3)
G101
(8W-15-2)
(8W-15-3)
B(+)
ENGINE STARTER MOTOR
(8W-21-4)
3
C1
GENERATOR FIELD CONTROL
ENGINE CONTROL MODULE
(8W-30-35)

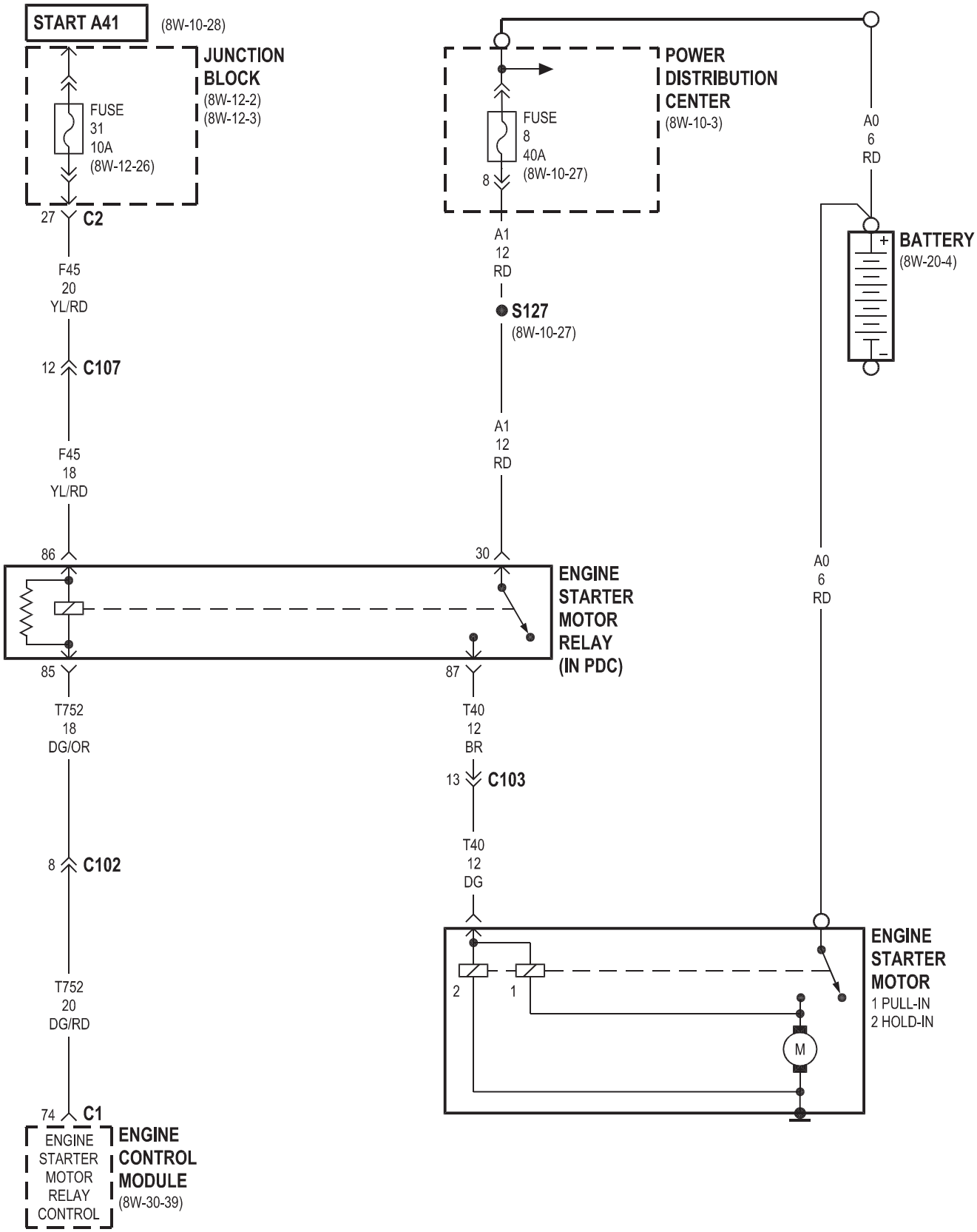
8W-21 STARTING SYSTEM

Component	Page
Battery	8W-21-2, 3, 4
Engine Control Module	8W-21-4
Engine Starter Motor	8W-21-2, 3, 4
Engine Starter Motor Relay	8W-21-2, 3, 4
Fuse 8	8W-21-2, 3, 4
Fuse 31	8W-21-2, 3, 4
Junction Block	8W-21-2, 3, 4
Park/Neutral Position Switch	8W-21-2, 3
Power Distribution Center	8W-21-2, 3, 4
Powertrain Control Module	8W-21-2, 3
Transmission Control Module	8W-21-2, 3
Transmission Solenoid/TRS Assembly	8W-21-2, 3


START A41
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 31 10A
(8W-12-26)
27 C2
F45 20 YL/RD
37 C106
F45 18 YL/RD
FUSED IGNITION SWITCH OUTPUT (START)
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-4)
8
F45 18 YL/RD
12 C103
F45 18 YL/RD
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 8 40A
(8W-10-27)
8
A1 12 RD
S127
(8W-10-27)
A1 12 RD
A0 6 RD
BATTERY
(8W-20-2)
(8W-20-3)
86
30
ENGINE STARTER MOTOR RELAY (IN PDC)
85
87
T41 18 BK/WT
T40 12 LG
1 C100
S175
T41 18 BK/WT
14 C106
T41 18 BK/WT
17 C200
NOT USED
T40 12 LG
4.0L
4.7L
8 C104
8 C102
T41 18 BK/WT
S122
(8W-31-5)
T41 (8W-31-6)
18 BK/WT
6 C1
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
POWERTRAIN CONTROL MODULE
(8W-30-19)
4.0L
4.7L
2
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
3
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-12)
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN

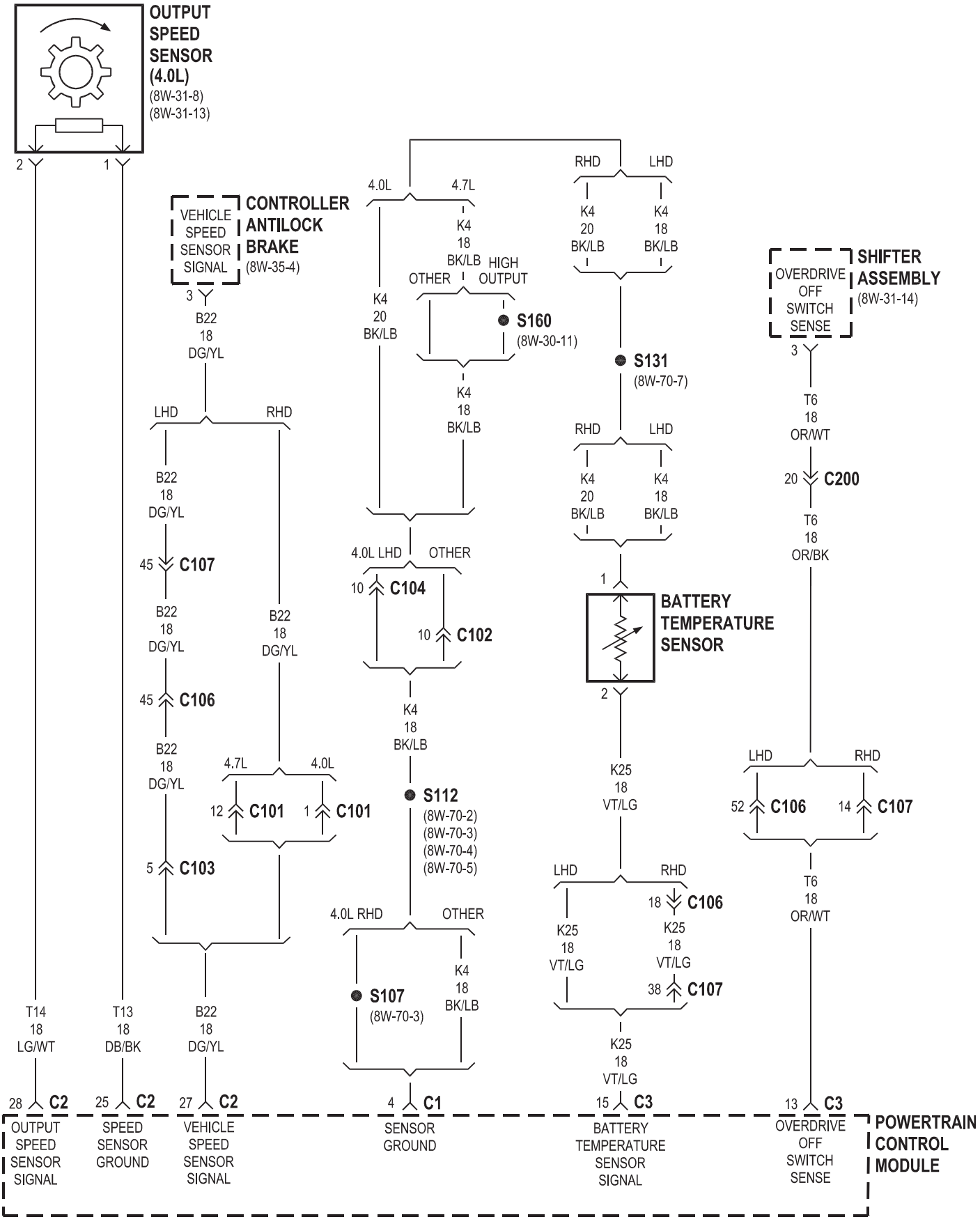
GAS RHD

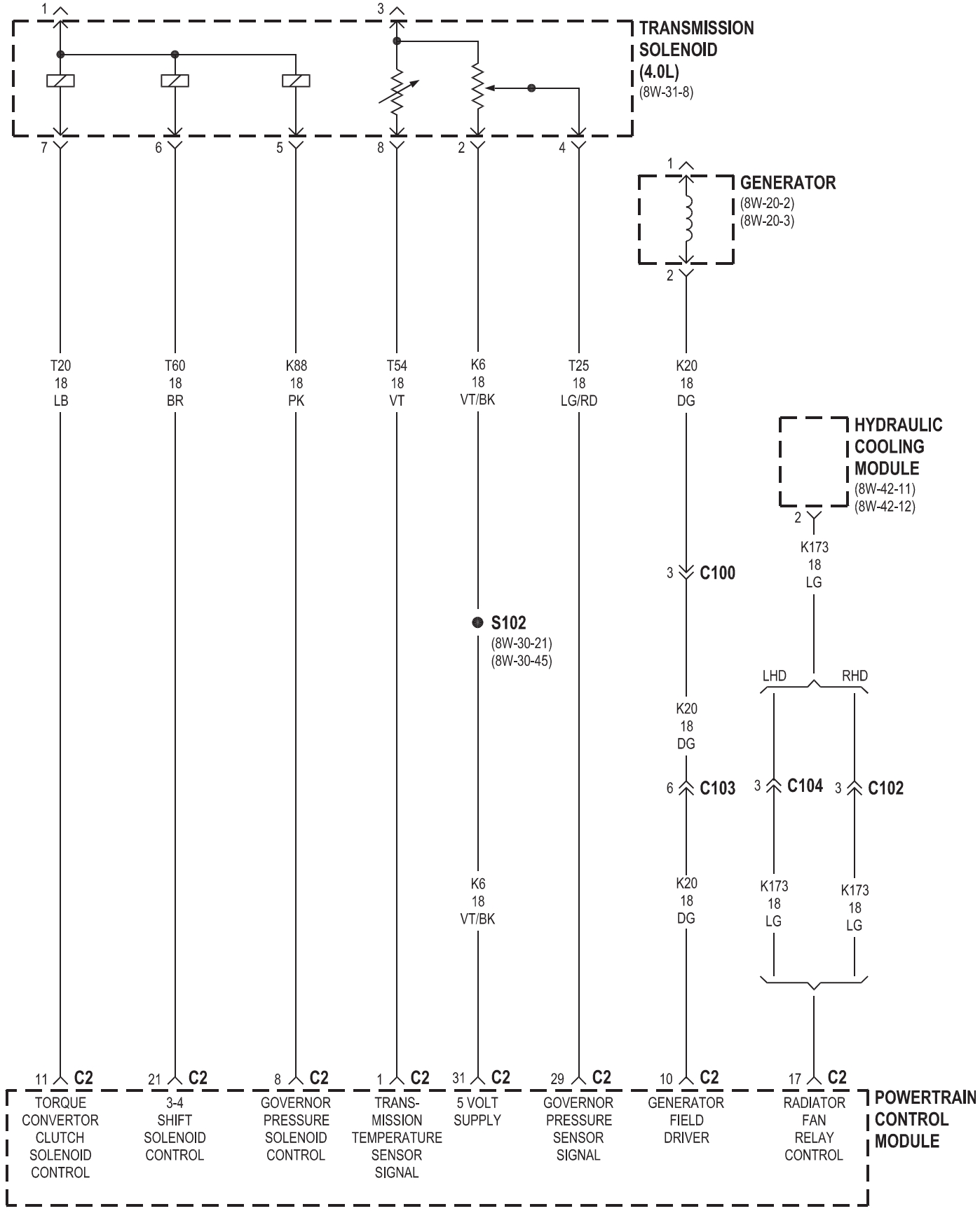

START A41
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 31 10A
(8W-12-26)
27 C2
F45 20 YL/RD
37 C106
4.0L
4.7L
F45 20 YL/RD
F45 18 YL/RD
FUSED IGNITION SWITCH OUTPUT (START)
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-4)
8
F45 18 YL/RD
12 C103
F45 18 YL/RD
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 8 40A
(8W-10-27)
8
A1 12 RD
S127
(8W-10-27)
A1 12 RD
A0 6 RD
BATTERY
(8W-20-2)
(8W-20-3)
86
30
85
87
ENGINE STARTER MOTOR RELAY (IN PDC)
A0 6 RD
T41 18 BK/WT
T41 18 BK/WT
8 C102
52 C106
T41 18 BK/WT
T41 18 BK/WT
17 C200
NOT USED
T40 12 LG
1 C100
T40 12 LG
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN
S122
(8W-31-5)
T41 (8W-31-6)
18 BK/WT
T41 18 BK/WT
6 C1
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
POWERTRAIN CONTROL MODULE
(8W-30-19)
4.0L
4.7L
2
3
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-12)

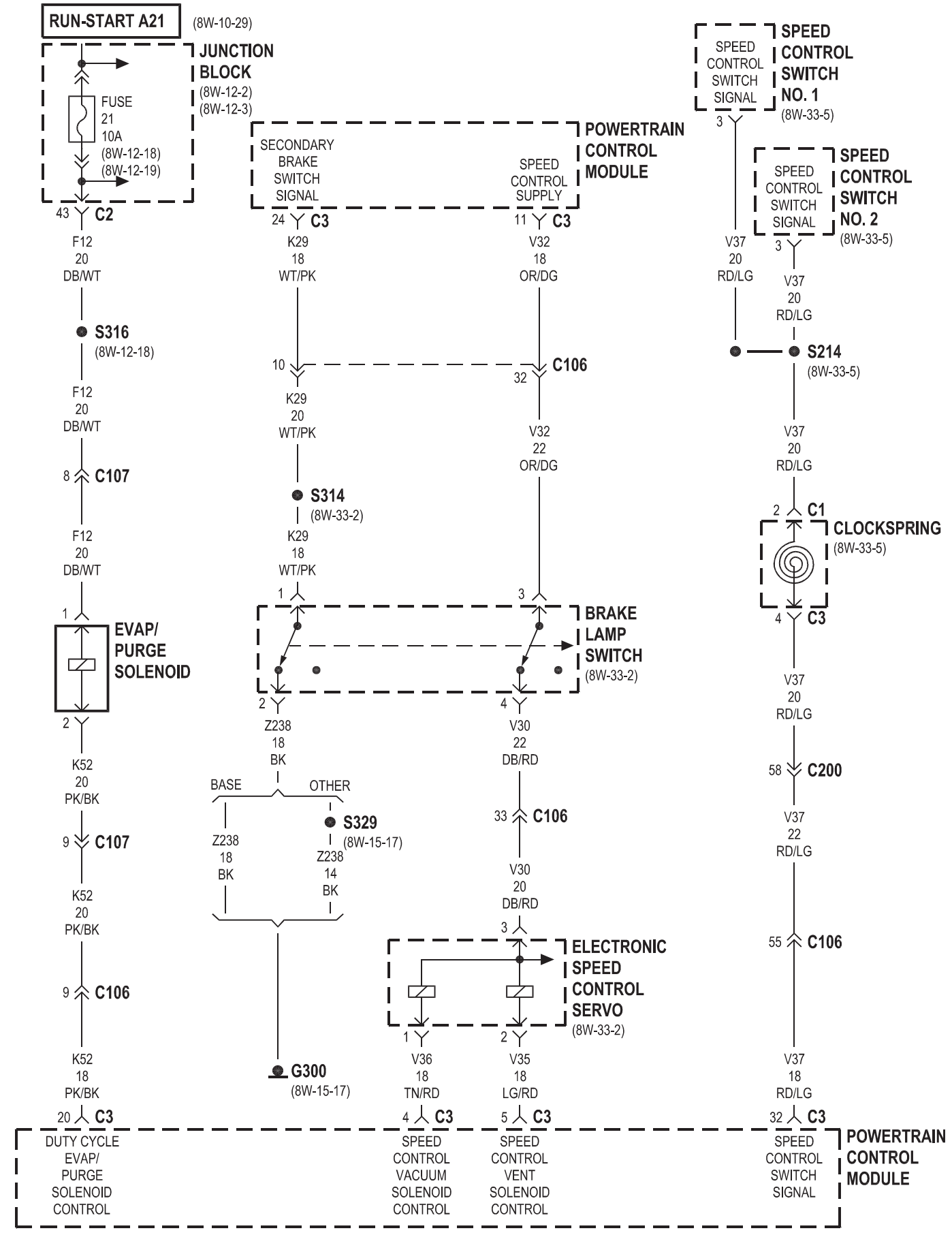

START A41
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 31 10A
(8W-12-26)
27
C2
F45 20 YL/RD
12
C107
F45 18 YL/RD
86
85
T752 18 DG/OR
8
C102
T752 20 DG/RD
74
C1
ENGINE STARTER MOTOR RELAY CONTROL
ENGINE CONTROL MODULE
(8W-30-39)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 8 40A
(8W-10-27)
8
A1 12 RD
S127
(8W-10-27)
A1 12 RD
30
87
ENGINE STARTER MOTOR RELAY (IN PDC)
T40 12 BR
13
C103
T40 12 DG
A0 6 RD
BATTERY
(8W-20-4)
A0 6 RD
2
1
M
ENGINE STARTER MOTOR
1 PULL-IN
2 HOLD-IN

8W-30 FUEL/IGNITION SYSTEM

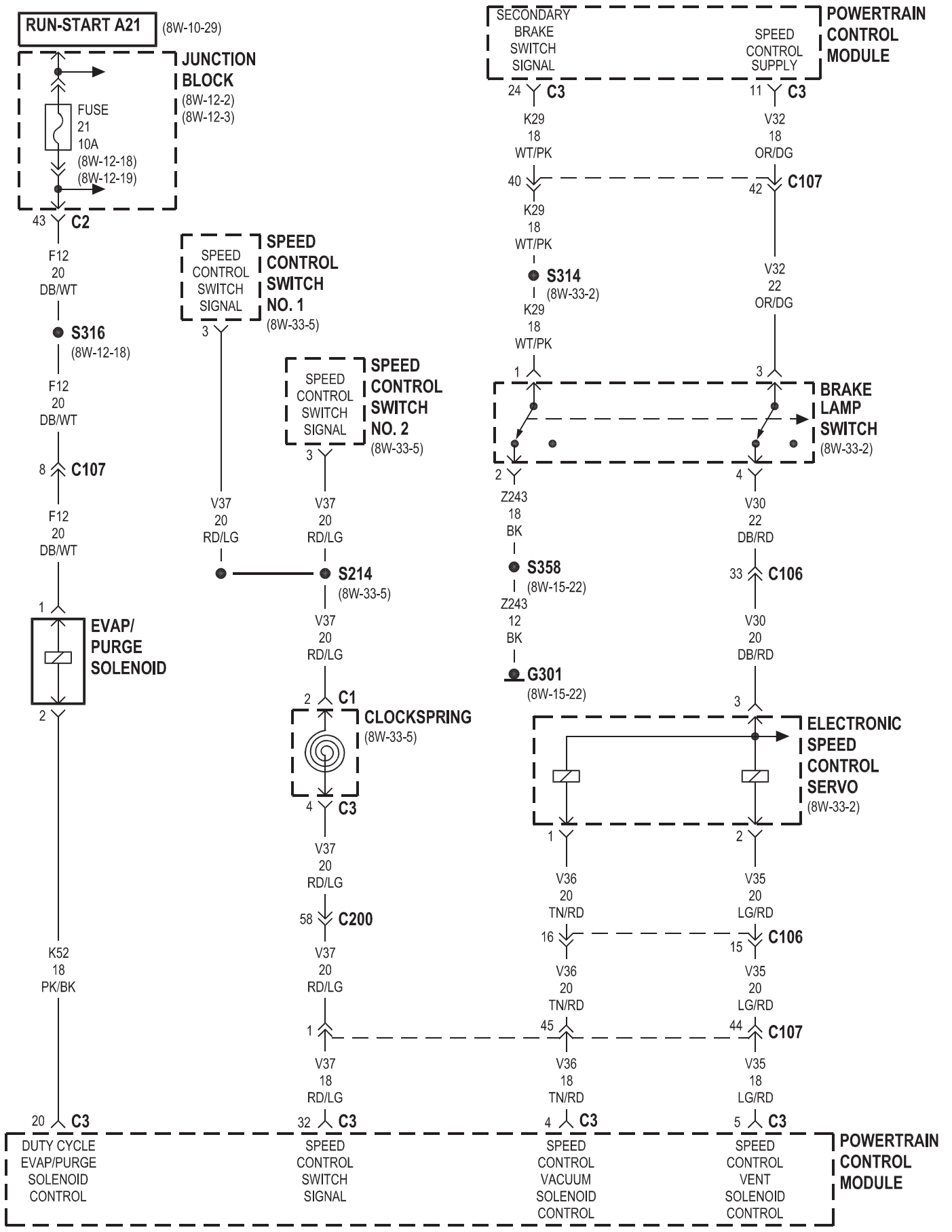
Component	Page
A/C Compressor Clutch Relay	8W-30-23, 35, 39, 41, 42
A/C Pressure Transducer	8W-30-21, 42, 45, 31
Accelerator Pedal Position Sensor	8W-30-37, 48
Adjustable Pedals Module	8W-30-33
Adjustable Pedals Motor/Sensor Assembly	8W-30-33
Adjustable Pedals Switch	8W-30-33
Auto Shut Down Relay	8W-30-8, 9, 12, 24, 25, 26, 27, 28, 29, 30, 35, 39, 41
Battery Temperature Sensor	8W-30-2, 11, 50
Body Control Module	8W-30-46
Boost Pressure Sensor	8W-30-45
Brake Lamp Switch	8W-30-4, 5, 32, 51
Camshaft Position Sensor	8W-30-18, 19, 20, 49
Capacitor	8W-30-12
Capacitor No. 1	8W-30-16
Capacitor No. 2	8W-30-17
Clockspring	8W-30-4, 5, 38
Coil On Plug No. 1	8W-30-17
Coil On Plug No. 2	8W-30-16
Coil On Plug No. 3	8W-30-17
Coil On Plug No. 4	8W-30-16
Coil On Plug No. 5	8W-30-17
Coil On Plug No. 6	8W-30-16
Coil On Plug No. 7	8W-30-17
Coil On Plug No. 8	8W-30-16
Coil Rail	8W-30-12
Controller Antilock Brake	8W-30-2, 36, 51
Crankcase Heater	8W-30-35
Crankshaft Position Sensor	8W-30-18, 19, 20, 49
Data Link Connector	8W-30-6, 7, 46
Diagnostic Junction Port	8W-30-6, 7, 33, 46
EGR Solenoid	8W-30-50
Electronic Speed Control Servo	8W-30-4, 5
Engine Control Module	8W-30-34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51
Engine Coolant Temperature Sensor	8W-30-21, 22, 47
Engine Oil Pressure Sensor	8W-30-21, 22, 45
Engine Starter Motor Relay	8W-30-18, 19, 39
EVAP/Purge Solenoid	8W-30-4, 5
Fuel Injector No. 1	8W-30-13, 15, 44
Fuel Injector No. 2	8W-30-13, 14, 44
Fuel Injector No. 3	8W-30-13, 15, 44
Fuel Injector No. 4	8W-30-13, 14, 44
Fuel Injector No. 5	8W-30-13, 15, 44
Fuel Injector No. 6	8W-30-13, 14
Fuel Injector No. 7	8W-30-15
Fuel Injector No. 8	8W-30-14
Fuel Pressure Sensor	8W-30-37
Fuel Pressure Solenoid	8W-30-47
Fuel Pump Module	8W-30-10
Fuel Pump Relay	8W-30-8, 9, 10
Fuel Tank Module	8W-30-45
Fuse 6	8W-30-8, 42
Fuse 10	8W-30-33
Fuse 11	8W-30-43
Fuse 12	8W-30-8, 9, 40
Fuse 13	8W-30-41
Fuse 16	8W-30-24, 25, 26, 27, 28, 29, 30, 35, 37, 39, 41
Fuse 19	8W-30-9
Fuse 21	8W-30-4, 5, 32
Fuse 22	8W-30-34
Fuse 23	8W-30-39
Fuse 24	8W-30-9
Fuse 26	8W-30-8, 12, 41, 47
Fuse 31	8W-30-39
G103	8W-30-8, 34, 39, 46
G104	8W-30-26, 27, 30
G105	8W-30-35, 39
G108	8W-30-23, 43
G123	8W-30-50
G300	8W-30-4, 33
G301	8W-30-5, 10
Generator	8W-30-3, 23, 35
Glow Plug No. 1	8W-30-42
Glow Plug No. 2	8W-30-43
Glow Plug No. 3	8W-30-42
Glow Plug No. 4	8W-30-43
Glow Plug No. 5	8W-30-42
Glow Plug Relay No. 1	8W-30-35, 42, 43
Glow Plug Relay No. 2	8W-30-35, 42, 43
Hydraulic Cooling Module	8W-30-3, 24, 25, 30, 31, 43
Idle Air Control Motor	8W-30-20
Intake Air Temperature Sensor	8W-30-21, 22, 38
Intake Port Swirl Actuator	8W-30-39
Junction Block	8W-30-4, 5, 8, 9, 32, 33, 39, 40
Knock Sensor	8W-30-11
Leak Detection Pump	8W-30-23
Manifold Absolute Pressure Sensor	8W-30-20, 21, 22
Mass Air Flow Sensor	8W-30-37
Output Speed Sensor	8W-30-2
Oxygen Sensor 1/1 Upstream	8W-30-25, 26, 28, 29
Oxygen Sensor 1/2 Downstream	8W-30-24, 25, 26, 30
Oxygen Sensor 2/1 Upstream	8W-30-27, 28, 29
Oxygen Sensor 2/2 Downstream	8W-30-24, 27, 30
Oxygen Sensor Downstream Relay	8W-30-24, 26, 27, 30
Park/Neutral Position Switch	8W-30-33
Power Distribution Center	8W-30-8, 9, 12, 24, 25, 26, 27, 28, 29, 30, 34, 35, 37, 39, 41, 42, 43, 47
Powertrain Control Module	8W-30-2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32
Shifter Assembly	8W-30-2, 32, 38, 40
Speed Control Switch No. 1	8W-30-4, 5, 38
Speed Control Switch No. 2	8W-30-4, 5, 38
Throttle Position Sensor	8W-30-20
Transfer Case Position Sensor	8W-30-8, 51
Transmission Control Module	8W-30-6, 7, 20, 23, 32, 36, 40
Transmission Control Relay	8W-30-23
Transmission Solenoid	8W-30-3, 21
Transmission Solenoid/TRS Assembly	8W-30-33
Viscous/Cabin Heater	8W-30-39
Viscous/Cabin Heater Relay	8W-30-35, 39, 41, 42
Wastegate Solenoid	8W-30-35
Water In Fuel Sensor	8W-30-50

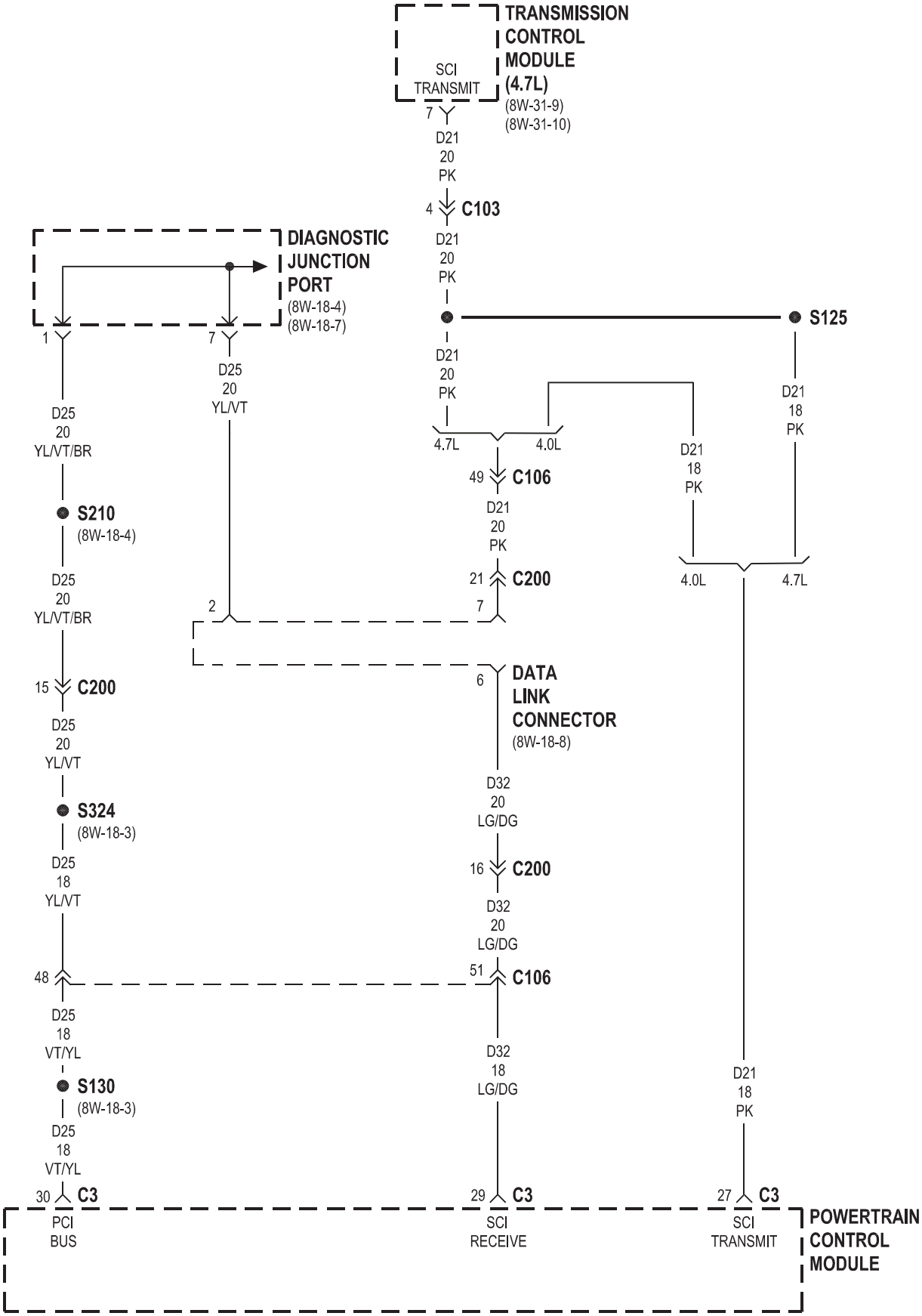

OUTPUT SPEED SENSOR (4.0L)
(8W-31-8)
(8W-31-13)
2
1
VEHICLE SPEED SENSOR SIGNAL
CONTROLLER ANTILOCK BRAKE
(8W-35-4)
3
B22 18 DG/YL
LHD
RHD
B22 18 DG/YL
45 C107
B22 18 DG/YL
45 C106
B22 18 DG/YL
5 C103
B22 18 DG/YL
4.7L
4.0L
12 C101
1 C101
4.0L
4.7L
K4 18 BK/LB
OTHER
HIGH OUTPUT
S160
(8W-30-11)
K4 18 BK/LB
K4 20 BK/LB
4.0L LHD
OTHER
10 C104
10 C102
K4 18 BK/LB
S112
(8W-70-2)
(8W-70-3)
(8W-70-4)
(8W-70-5)
4.0L RHD
OTHER
S107
(8W-70-3)
K4 18 BK/LB
RHD
LHD
K4 20 BK/LB
K4 18 BK/LB
S131
(8W-70-7)
RHD
LHD
K4 20 BK/LB
K4 18 BK/LB
1
BATTERY TEMPERATURE SENSOR
2
K25 18 VT/LG
LHD
RHD
K25 18 VT/LG
18 C106
K25 18 VT/LG
38 C107
K25 18 VT/LG
OVERDRIVE OFF SWITCH SENSE
SHIFTER ASSEMBLY
(8W-31-14)
3
T6 18 OR/WT
20 C200
T6 18 OR/BK
LHD
RHD
52 C106
14 C107
T6 18 OR/WT
T14 18 LG/WT
T13 18 DB/BK
B22 18 DG/YL
28 C2
25 C2
27 C2
4 C1
15 C3
13 C3
OUTPUT SPEED SENSOR SIGNAL
SPEED SENSOR GROUND
VEHICLE SPEED SENSOR SIGNAL
SENSOR GROUND
BATTERY TEMPERATURE SENSOR SIGNAL
OVERDRIVE OFF SWITCH SENSE
POWERTRAIN CONTROL MODULE


TRANSMISSION SOLENOID (4.0L)
(8W-31-8)
GENERATOR
(8W-20-2)
(8W-20-3)
HYDRAULIC COOLING MODULE
(8W-42-11)
(8W-42-12)
T20 18 LB
T60 18 BR
K88 18 PK
T54 18 VT
K6 18 VT/BK
T25 18 LG/RD
K20 18 DG
K173 18 LG
C100
S102
(8W-30-21)
(8W-30-45)
LHD
RHD
K20 18 DG
C103
C104
C102
K6 18 VT/BK
K173 18 LG
K173 18 LG
K20 18 DG
11 C2
21 C2
8 C2
1 C2
31 C2
29 C2
10 C2
17 C2
TORQUE CONVERTOR CLUTCH SOLENOID CONTROL
3-4 SHIFT SOLENOID CONTROL
GOVERNOR PRESSURE SOLENOID CONTROL
TRANS-MISSION TEMPERATURE SENSOR SIGNAL
5 VOLT SUPPLY
GOVERNOR PRESSURE SENSOR SIGNAL
GENERATOR FIELD DRIVER
RADIATOR FAN RELAY CONTROL
POWERTRAIN CONTROL MODULE

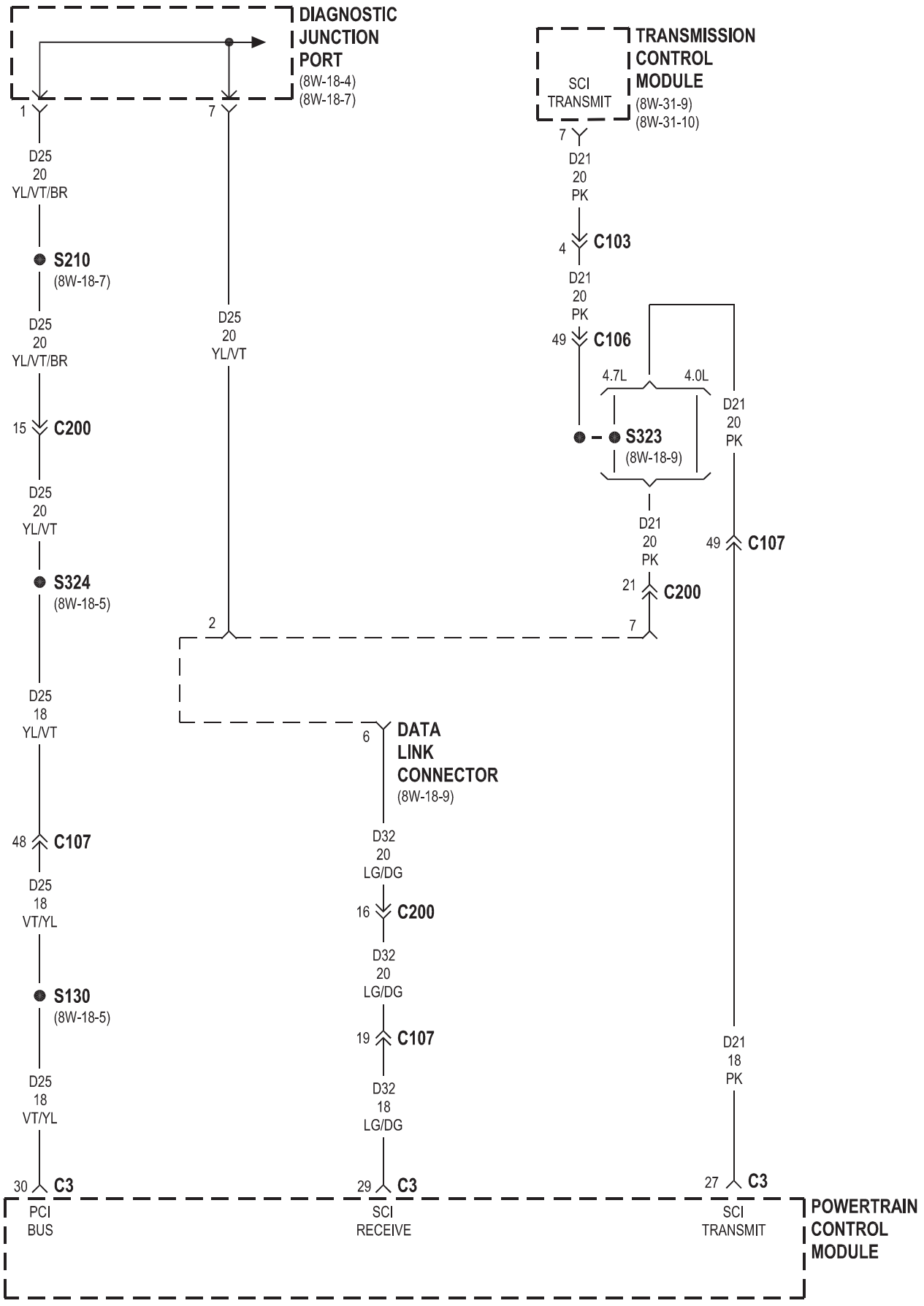

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 21 10A
(8W-12-18)
(8W-12-19)
43 C2
F12 20 DB/WT
S316
(8W-12-18)
F12 20 DB/WT
8 C107
F12 20 DB/WT
1
EVAP/ PURGE SOLENOID
2
K52 20 PK/BK
9 C107
K52 20 PK/BK
9 C106
K52 18 PK/BK
20 C3
DUTY CYCLE EVAP/ PURGE SOLENOID CONTROL
POWERTRAIN CONTROL MODULE
SECONDARY BRAKE SWITCH SIGNAL
SPEED CONTROL SUPPLY
24 C3
11 C3
K29 18 WT/PK
V32 18 OR/DG
10
32 C106
K29 20 WT/PK
V32 22 OR/DG
S314
(8W-33-2)
K29 18 WT/PK
1
3
BRAKE LAMP SWITCH
(8W-33-2)
2
4
Z238 18 BK
V30 22 DB/RD
BASE
OTHER
S329
(8W-15-17)
Z238 18 BK
Z238 14 BK
33 C106
V30 20 DB/RD
3
ELECTRONIC SPEED CONTROL SERVO
(8W-33-2)
1
2
G300
(8W-15-17)
V36 18 TN/RD
V35 18 LG/RD
4 C3
5 C3
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL VENT SOLENOID CONTROL
SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 1
(8W-33-5)
3
V37 20 RD/LG
SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 2
(8W-33-5)
3
V37 20 RD/LG
S214
(8W-33-5)
V37 20 RD/LG
2 C1
CLOCKSPRING
(8W-33-5)
4 C3
V37 20 RD/LG
58 C200
V37 22 RD/LG
55 C106
V37 18 RD/LG
32 C3
SPEED CONTROL SWITCH SIGNAL

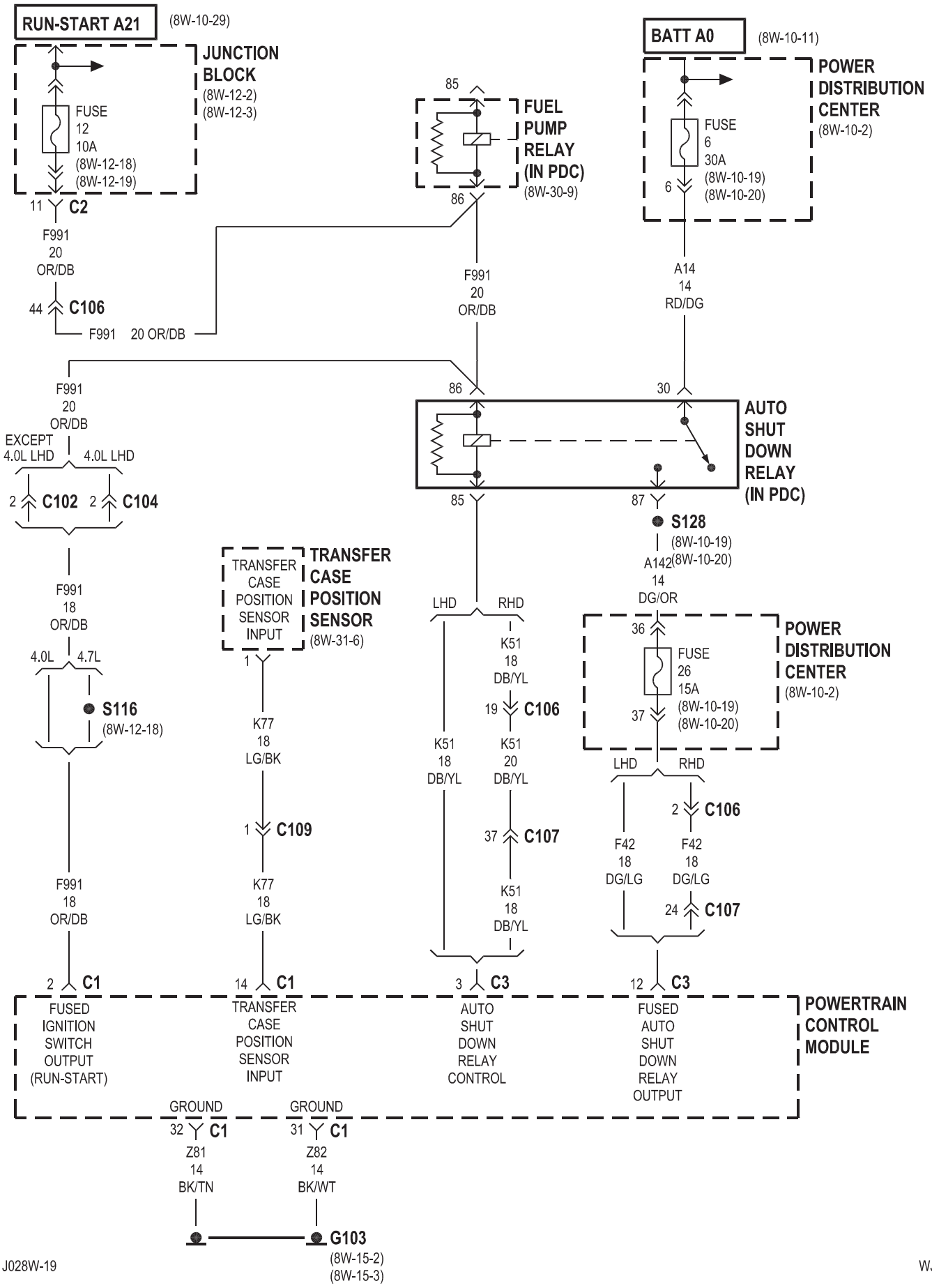
RHD

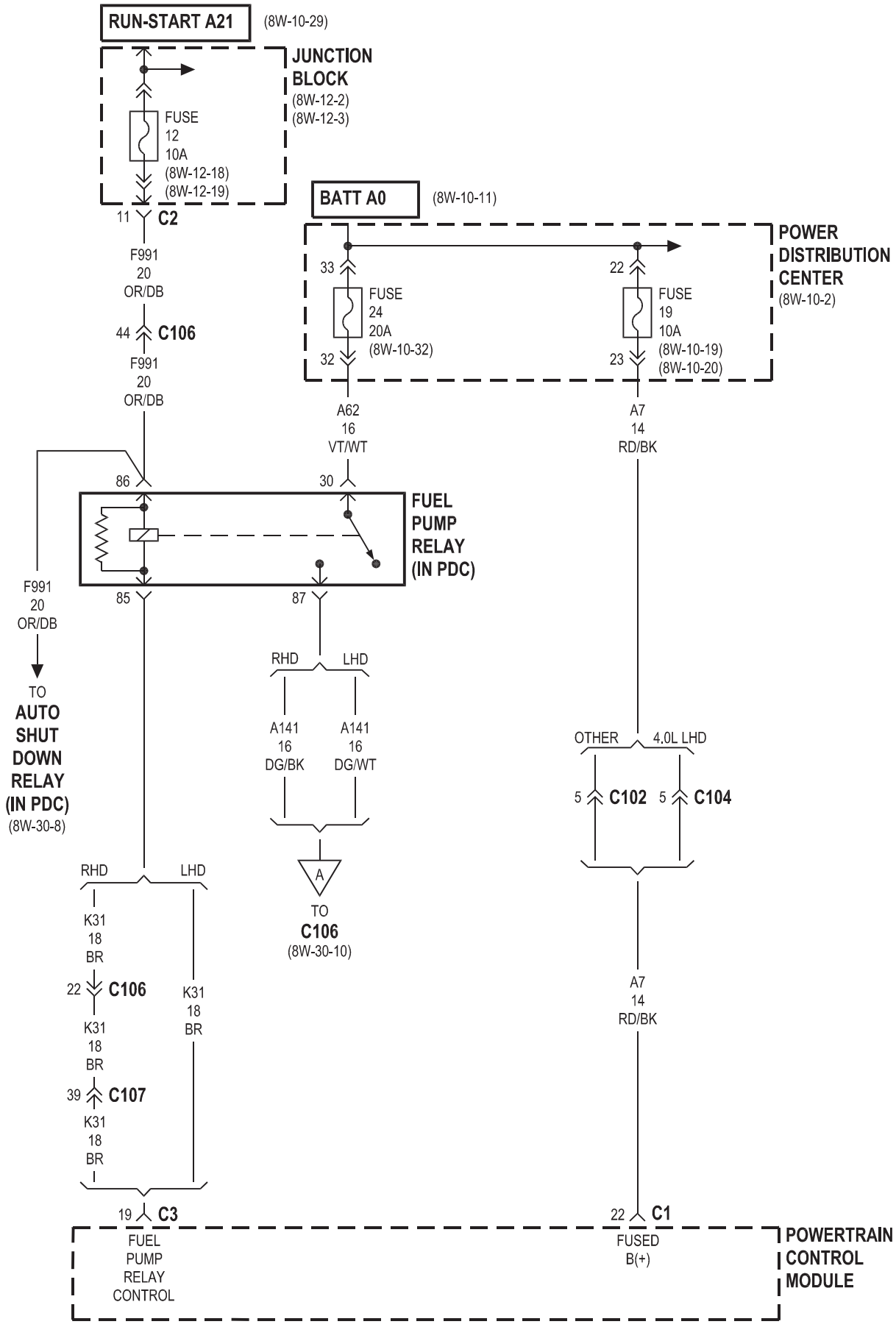

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 21 10A
(8W-12-18)
(8W-12-19)
43 C2
F12 20 DB/WT
S316
(8W-12-18)
F12 20 DB/WT
8 C107
F12 20 DB/WT
1
EVAP/ PURGE SOLENOID
2
K52 18 PK/BK
20 C3
DUTY CYCLE EVAP/PURGE SOLENOID CONTROL
SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 1
(8W-33-5)
3
V37 20 RD/LG
SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 2
(8W-33-5)
3
V37 20 RD/LG
S214
(8W-33-5)
V37 20 RD/LG
2 C1
CLOCKSPRING
(8W-33-5)
4 C3
V37 20 RD/LG
58 C200
V37 20 RD/LG
1
V37 18 RD/LG
32 C3
SECONDARY BRAKE SWITCH SIGNAL
SPEED CONTROL SUPPLY
POWERTRAIN CONTROL MODULE
24 C3
11 C3
K29 18 WT/PK
V32 18 OR/DG
40
42 C107
K29 18 WT/PK
S314
(8W-33-2)
K29 18 WT/PK
V32 22 OR/DG
1
3
BRAKE LAMP SWITCH
(8W-33-2)
2
4
Z243 18 BK
V30 22 DB/RD
S358
(8W-15-22)
33 C106
Z243 12 BK
V30 20 DB/RD
G301
(8W-15-22)
3
ELECTRONIC SPEED CONTROL SERVO
(8W-33-2)
1
2
V36 20 TN/RD
V35 20 LG/RD
16
15 C106
V36 20 TN/RD
V35 20 LG/RD
45
44 C107
V36 18 TN/RD
V35 18 LG/RD
4 C3
5 C3
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL VENT SOLENOID CONTROL
POWERTRAIN CONTROL MODULE

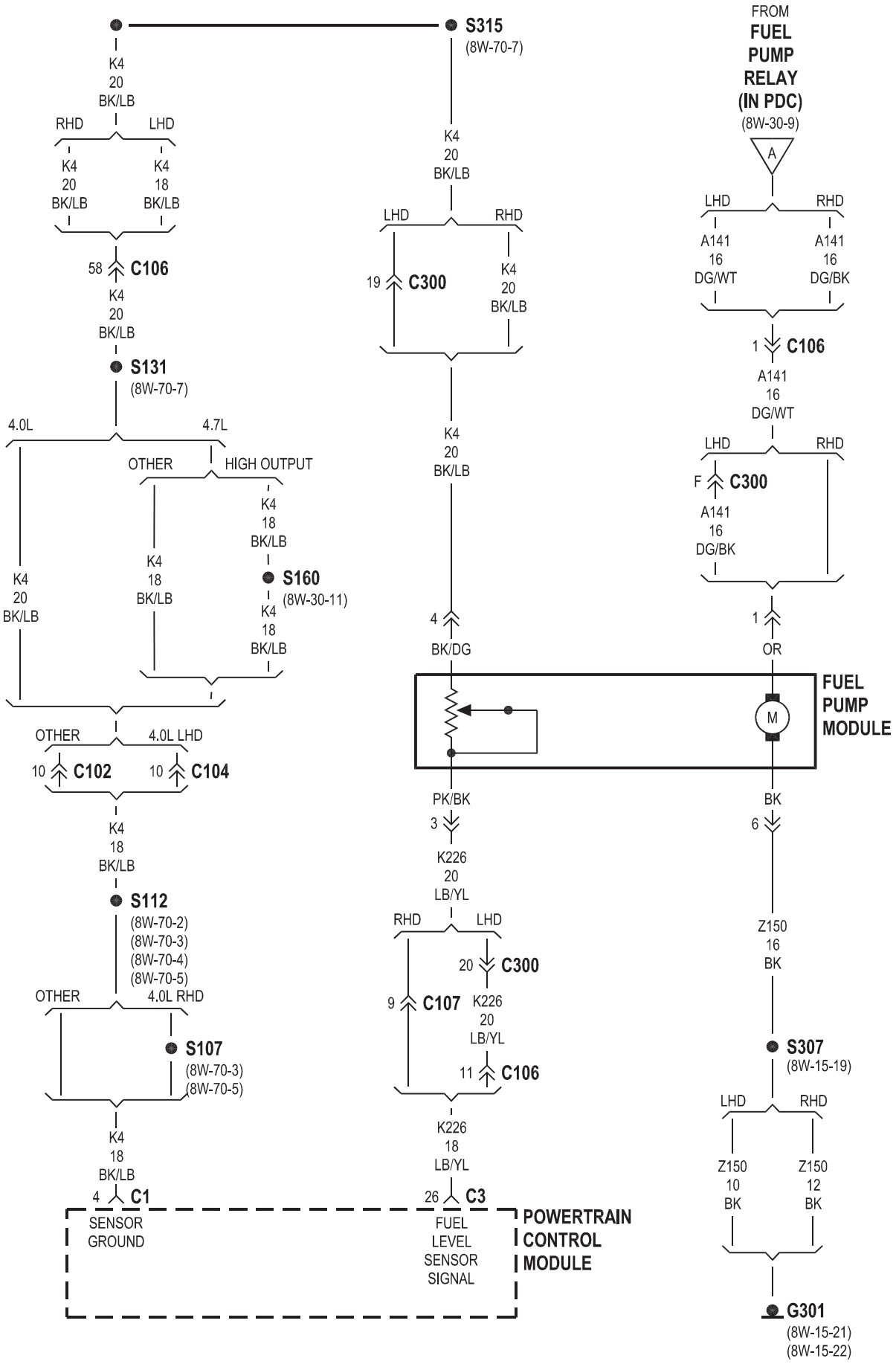

TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-9)
(8W-31-10)
SCI TRANSMIT
7
D21 20 PK
4
C103
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
1
7
D25 20 YL/VT/BR
D25 20 YL/VT
S125
D21 20 PK
D21 18 PK
4.7L
4.0L
49
C106
S210
(8W-18-4)
D25 20 YL/VT/BR
21
C200
2
7
15
C200
6
DATA LINK CONNECTOR
(8W-18-8)
D25 20 YL/VT
D32 20 LG/DG
S324
(8W-18-3)
D25 18 YL/VT
16
C200
48
51
C106
D25 18 VT/YL
D32 18 LG/DG
S130
(8W-18-3)
30
C3
29
C3
27
C3
PCI BUS
SCI RECEIVE
SCI TRANSMIT
POWERTRAIN CONTROL MODULE

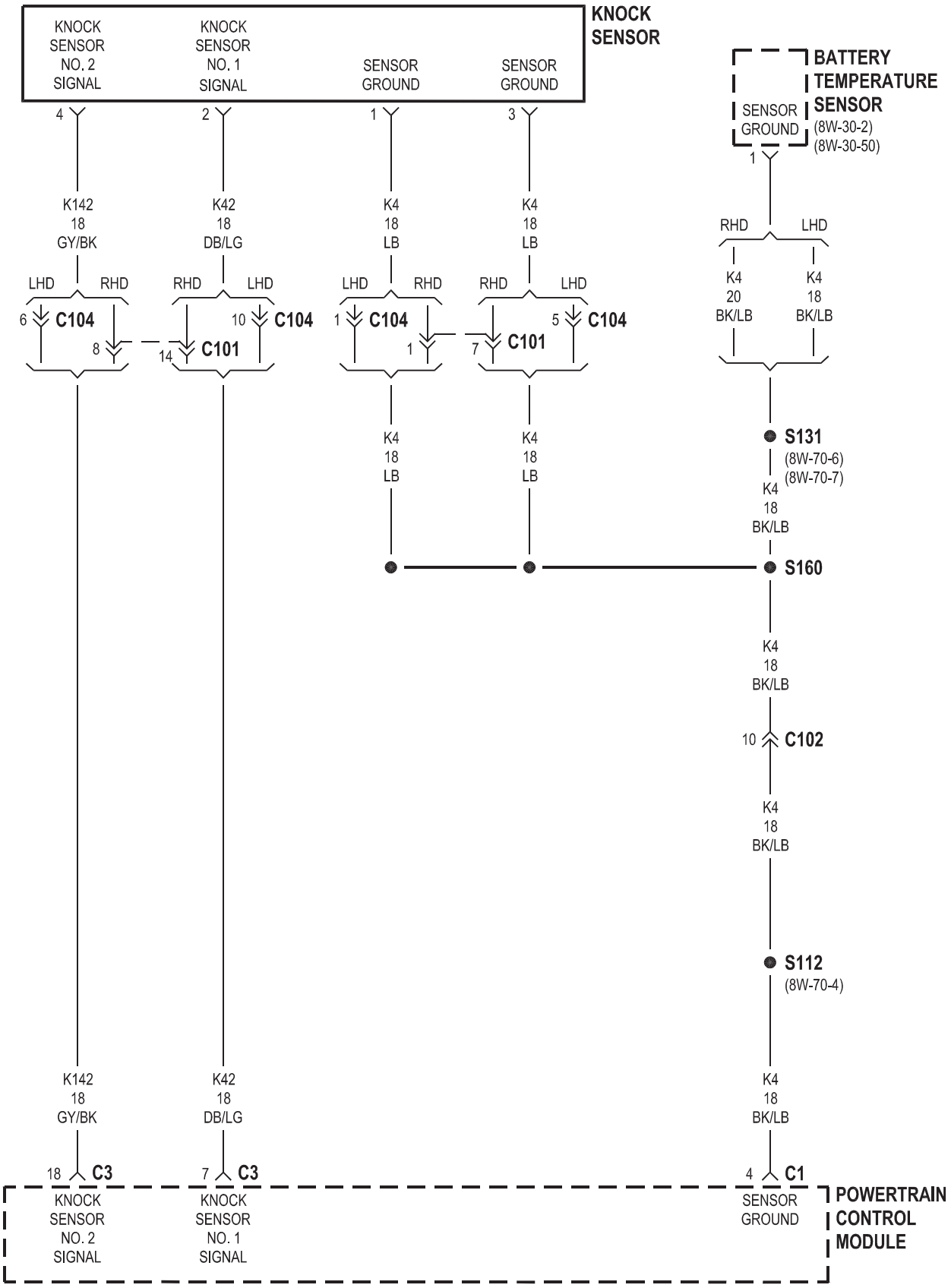
RHD GAS

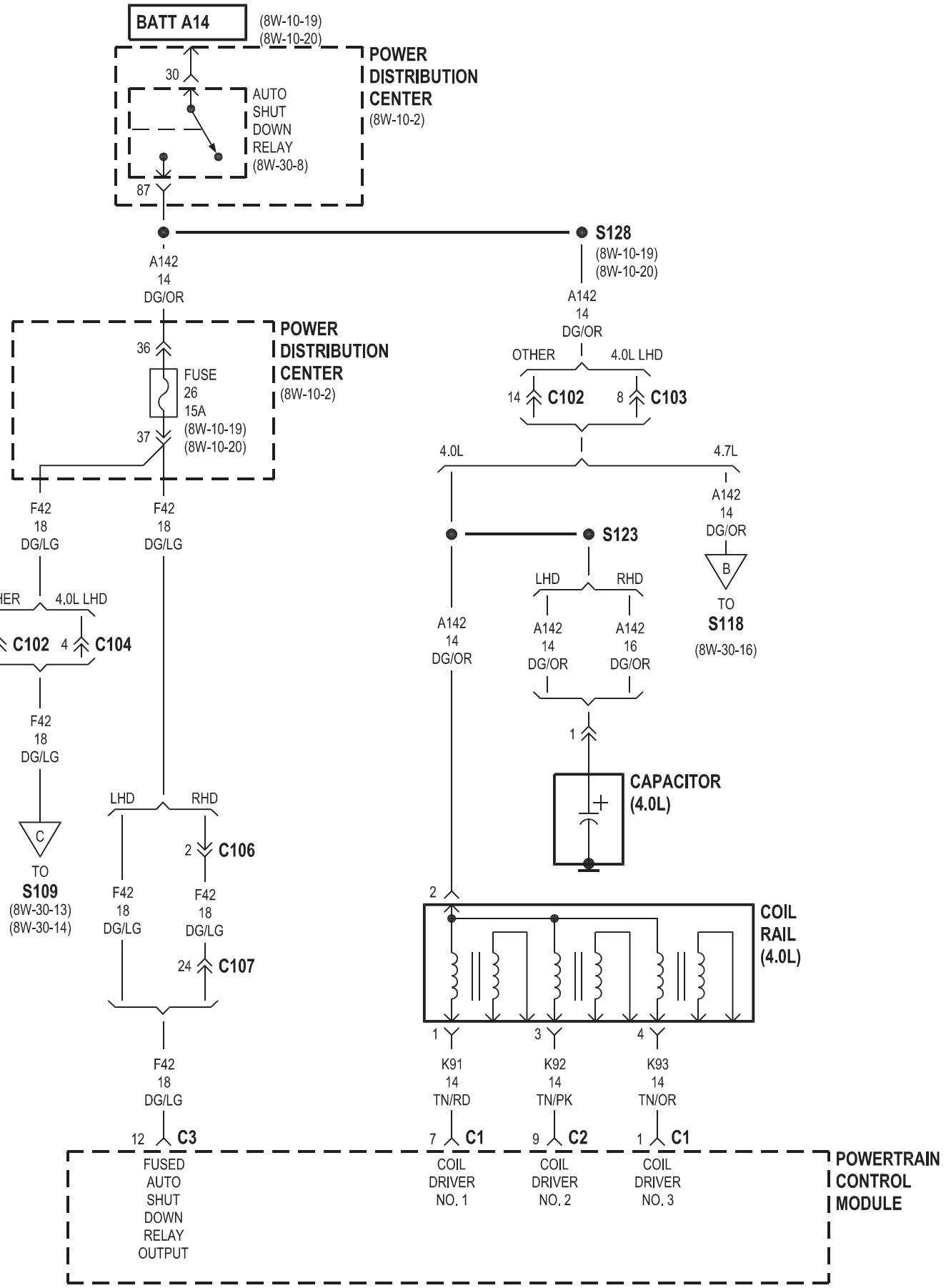

DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
1
7
D25
20
YL/VT/BR
S210
(8W-18-7)
D25
20
YL/VT/BR
15 C200
D25
20
YL/VT
S324
(8W-18-5)
D25
18
YL/VT
48 C107
D25
18
VT/YL
S130
(8W-18-5)
D25
18
VT/YL
30 C3
PCI
BUS
D25
20
YL/VT
2
TRANSMISSION CONTROL MODULE
(8W-31-9)
(8W-31-10)
SCI
TRANSMIT
7
D21
20
PK
4 C103
D21
20
PK
49 C106
4.7L
4.0L
S323
(8W-18-9)
D21
20
PK
21 C200
7
D21
20
PK
49 C107
6
DATA LINK CONNECTOR
(8W-18-9)
D32
20
LG/DG
16 C200
D32
20
LG/DG
19 C107
D32
18
LG/DG
29 C3
SCI
RECEIVE
D21
18
PK
27 C3
SCI
TRANSMIT
POWERTRAIN CONTROL MODULE

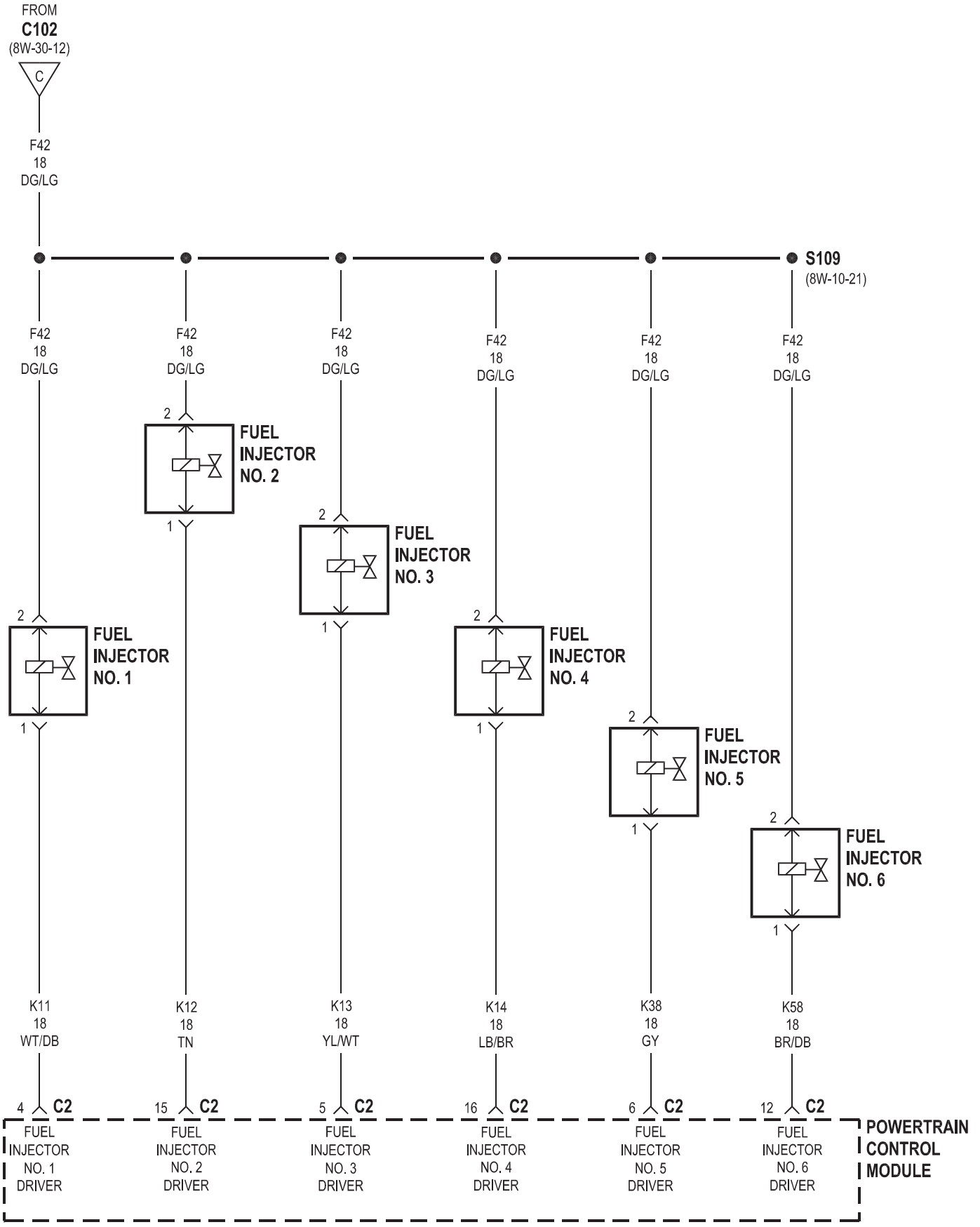

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
(8W-12-18)
(8W-12-19)
11 C2
F991 20 OR/DB
44 C106
F991 20 OR/DB
85
FUEL PUMP RELAY (IN PDC)
(8W-30-9)
86
F991 20 OR/DB
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 6 30A
(8W-10-19)
(8W-10-20)
6
A14 14 RD/DG
F991 20 OR/DB
EXCEPT 4.0L LHD
4.0L LHD
2 C102
2 C104
86
30
AUTO SHUT DOWN RELAY (IN PDC)
85
87
S128
(8W-10-19)(8W-10-20)
A142 14 DG/OR
F991 18 OR/DB
4.0L
4.7L
S116
(8W-12-18)
TRANSFER CASE POSITION SENSOR INPUT
TRANSFER CASE POSITION SENSOR
(8W-31-6)
1
K77 18 LG/BK
1 C109
K77 18 LG/BK
LHD
RHD
K51 18 DB/YL
19 C106
K51 18 DB/YL
K51 20 DB/YL
37 C107
K51 18 DB/YL
36
FUSE 26 15A
(8W-10-19)
(8W-10-20)
37
POWER DISTRIBUTION CENTER
(8W-10-2)
LHD
RHD
2 C106
F42 18 DG/LG
F42 18 DG/LG
24 C107
F991 18 OR/DB
2 C1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
14 C1
TRANSFER CASE POSITION SENSOR INPUT
3 C3
AUTO SHUT DOWN RELAY CONTROL
12 C3
FUSED AUTO SHUT DOWN RELAY OUTPUT
POWERTRAIN CONTROL MODULE
GROUND
32 C1
Z81 14 BK/TN
GROUND
31 C1
Z82 14 BK/WT
G103
(8W-15-2)
(8W-15-3)

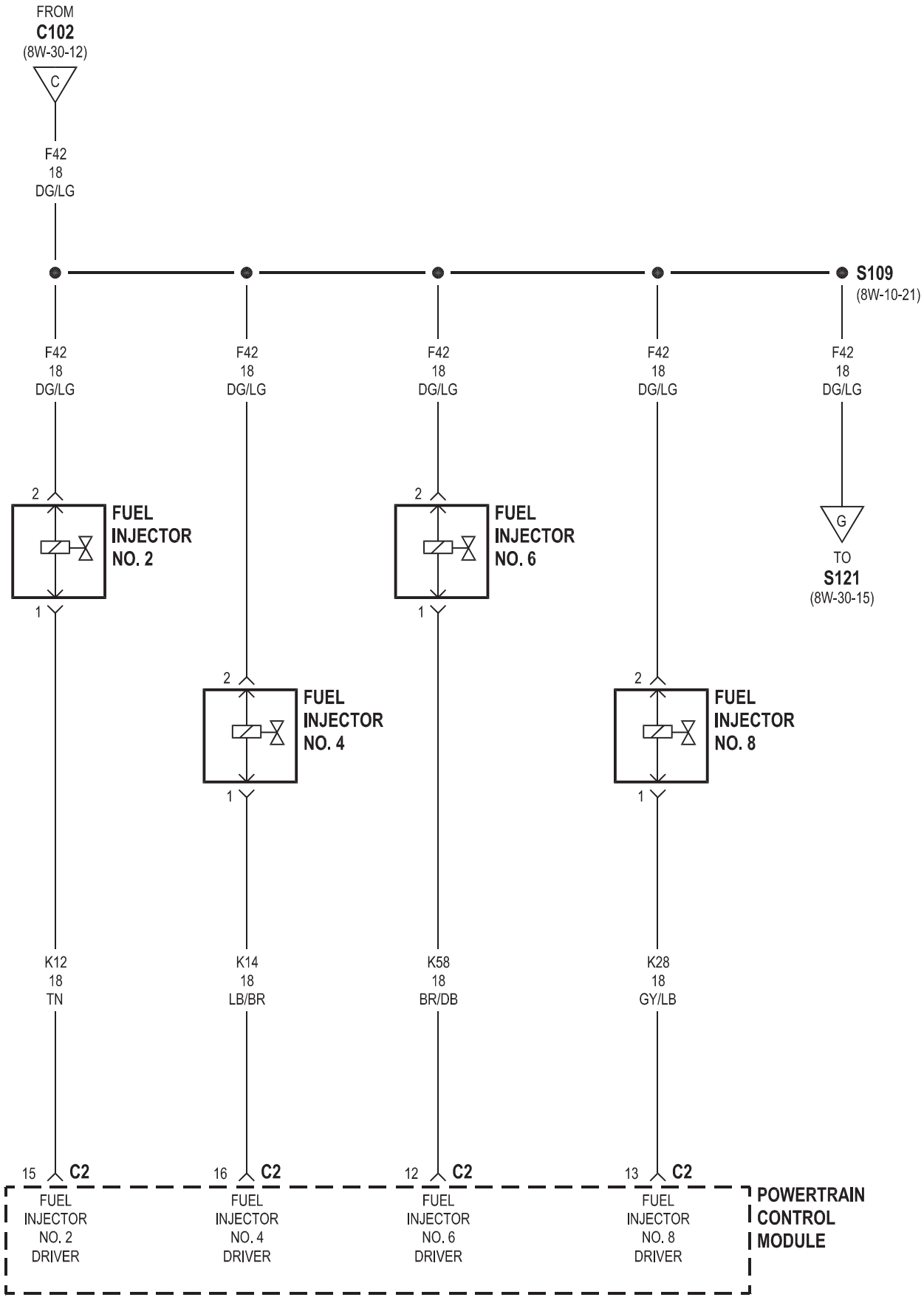

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
(8W-12-18)
(8W-12-19)
11 C2
F991 20 OR/DB
44 C106
F991 20 OR/DB
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
33
FUSE 24 20A
(8W-10-32)
32
22
FUSE 19 10A
(8W-10-19)
(8W-10-20)
23
A62 16 VT/WT
A7 14 RD/BK
86
30
FUEL PUMP RELAY (IN PDC)
85
87
F991 20 OR/DB
TO AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-8)
RHD
LHD
A141 16 DG/BK
A141 16 DG/WT
A
TO C106
(8W-30-10)
OTHER
4.0L LHD
5 C102
5 C104
RHD
LHD
K31 18 BR
22 C106
K31 18 BR
39 C107
K31 18 BR
K31 18 BR
A7 14 RD/BK
19 C3
22 C1
FUEL PUMP RELAY CONTROL
FUSED B(+)
POWERTRAIN CONTROL MODULE

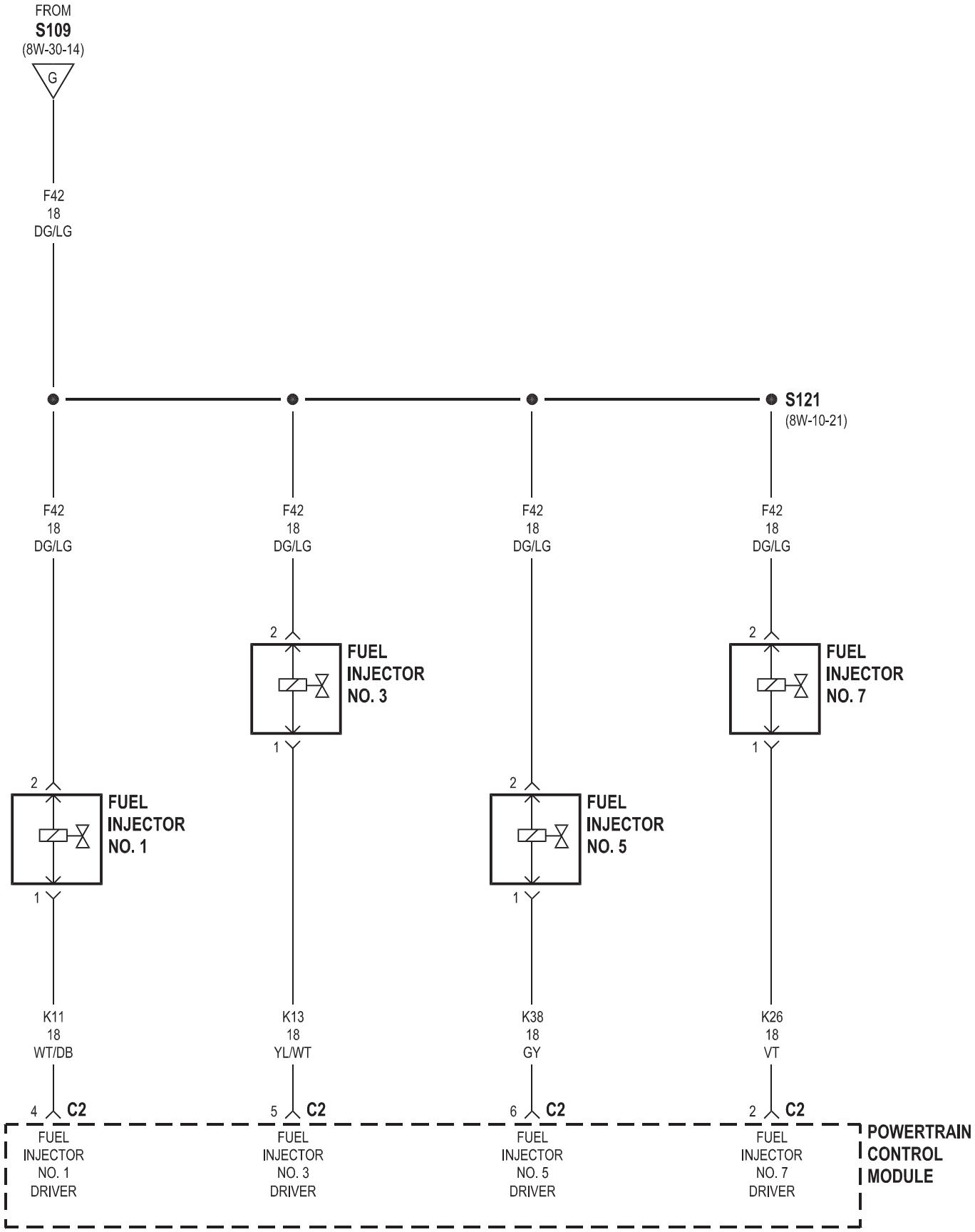

S315
(8W-70-7)
K4
20
BK/LB
RHD
LHD
K4
20
BK/LB
K4
18
BK/LB
58
C106
K4
20
BK/LB
S131
(8W-70-7)
4.0L
4.7L
OTHER
HIGH OUTPUT
K4
18
BK/LB
S160
(8W-30-11)
K4
18
BK/LB
K4
20
BK/LB
K4
18
BK/LB
OTHER
4.0L LHD
10
C102
10
C104
K4
18
BK/LB
S112
(8W-70-2)
(8W-70-3)
(8W-70-4)
(8W-70-5)
OTHER
4.0L RHD
S107
(8W-70-3)
(8W-70-5)
K4
18
BK/LB
4
C1
SENSOR
GROUND
LHD
RHD
19
C300
K4
20
BK/LB
K4
20
BK/LB
4
BK/DG
PK/BK
3
K226
20
LB/YL
RHD
LHD
20
C300
9
C107
K226
20
LB/YL
11
C106
K226
18
LB/YL
26
C3
FUEL
LEVEL
SENSOR
SIGNAL
POWERTRAIN
CONTROL
MODULE
FROM
FUEL
PUMP
RELAY
(IN PDC)
(8W-30-9)
A
LHD
RHD
A141
16
DG/WT
A141
16
DG/BK
1
C106
A141
16
DG/WT
LHD
RHD
F
C300
A141
16
DG/BK
1
OR
M
FUEL
PUMP
MODULE
BK
6
Z150
16
BK
S307
(8W-15-19)
LHD
RHD
Z150
10
BK
Z150
12
BK
G301
(8W-15-21)
(8W-15-22)

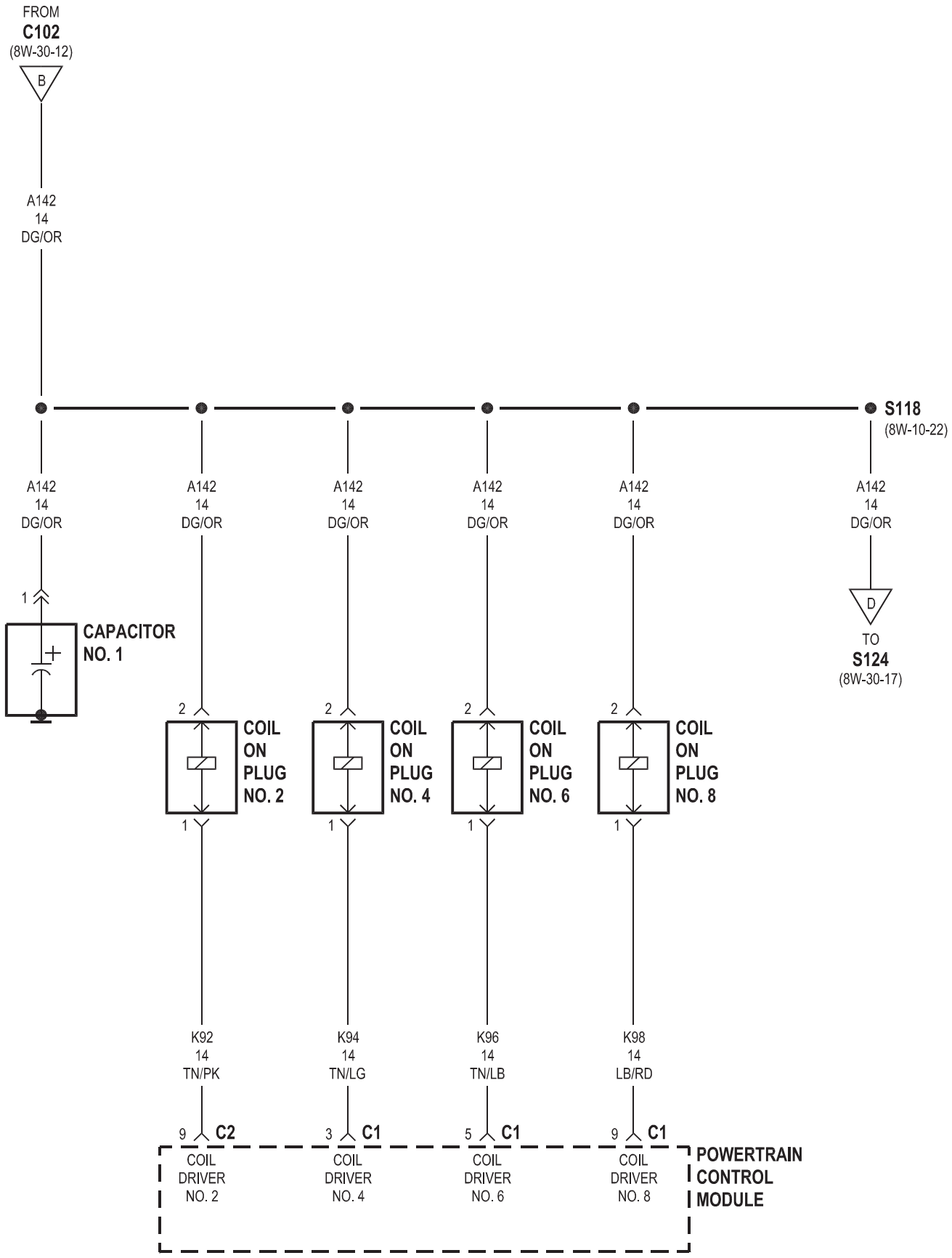

KNOCK SENSOR
KNOCK SENSOR NO. 2 SIGNAL
KNOCK SENSOR NO. 1 SIGNAL
SENSOR GROUND
SENSOR GROUND
4
2
1
3
K142 18 GY/BK
K42 18 DB/LG
K4 18 LB
K4 18 LB
LHD RHD
RHD LHD
LHD RHD
RHD LHD
6 C104
8
14 C101
10 C104
1 C104
1
7 C101
5 C104
BATTERY TEMPERATURE SENSOR
SENSOR GROUND
(8W-30-2)
(8W-30-50)
1
RHD LHD
K4 20 BK/LB
K4 18 BK/LB
S131
(8W-70-6)
(8W-70-7)
K4 18 BK/LB
S160
K4 18 BK/LB
10 C102
K4 18 BK/LB
S112
(8W-70-4)
K142 18 GY/BK
K42 18 DB/LG
K4 18 BK/LB
18 C3
7 C3
4 C1
KNOCK SENSOR NO. 2 SIGNAL
KNOCK SENSOR NO. 1 SIGNAL
SENSOR GROUND
POWERTRAIN CONTROL MODULE

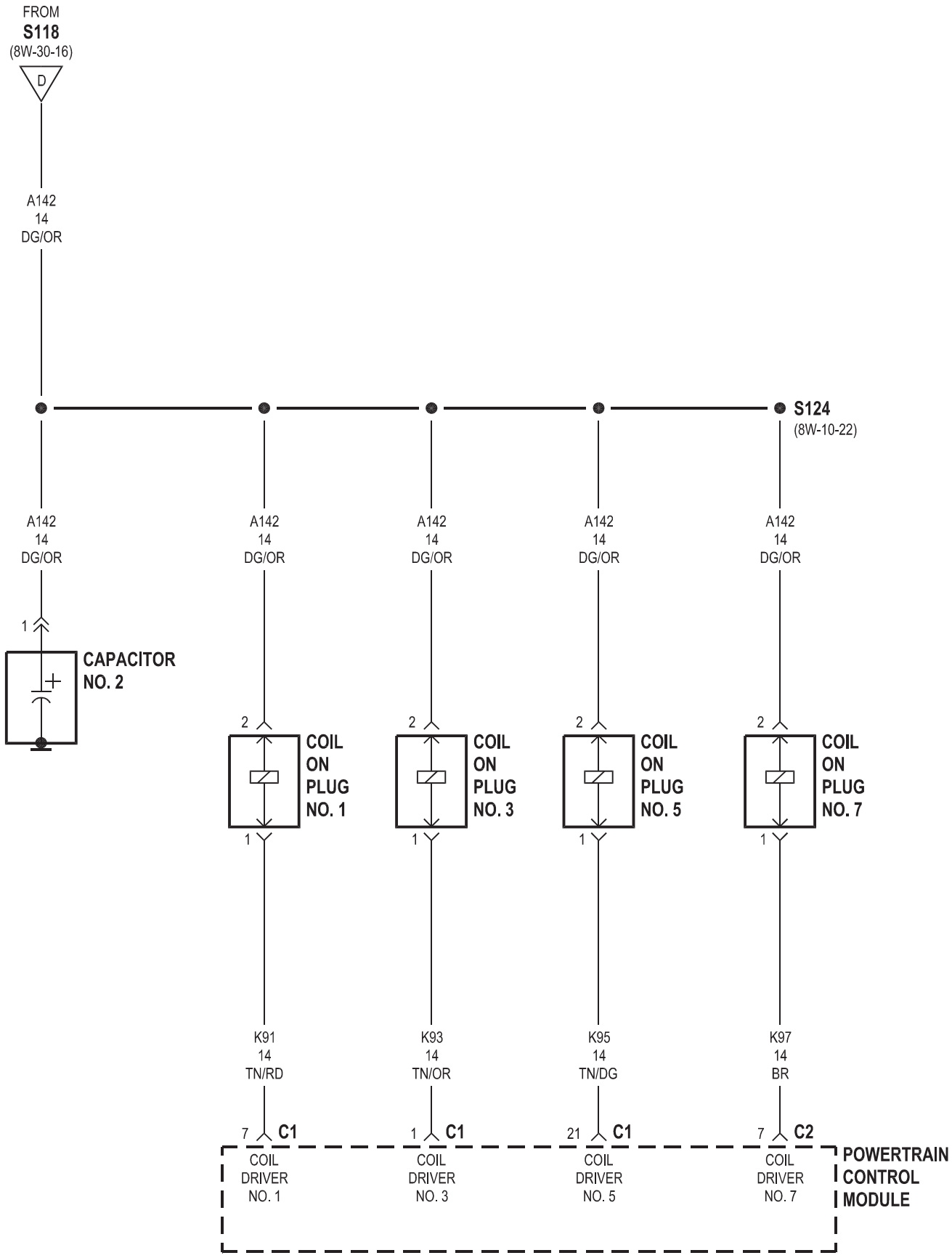

BATT A14
(8W-10-19)
(8W-10-20)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
S128
(8W-10-19)
(8W-10-20)
A142
14
DG/OR
POWER DISTRIBUTION CENTER
(8W-10-2)
36
FUSE
26
15A
37
(8W-10-19)
(8W-10-20)
OTHER
4.0L LHD
14 C102
8 C103
4.0L
4.7L
F42
18
DG/LG
S123
LHD
RHD
A142
14
DG/OR
A142
16
DG/OR
B
TO
S118
(8W-30-16)
4 C102
4 C104
C
TO
S109
(8W-30-13)
(8W-30-14)
2 C106
24 C107
1
CAPACITOR
(4.0L)
2
COIL RAIL
(4.0L)
1
3
4
K91
14
TN/RD
K92
14
TN/PK
K93
14
TN/OR
12 C3
7 C1
9 C2
1 C1
FUSED AUTO SHUT DOWN RELAY OUTPUT
COIL DRIVER NO. 1
COIL DRIVER NO. 2
COIL DRIVER NO. 3
POWERTRAIN CONTROL MODULE

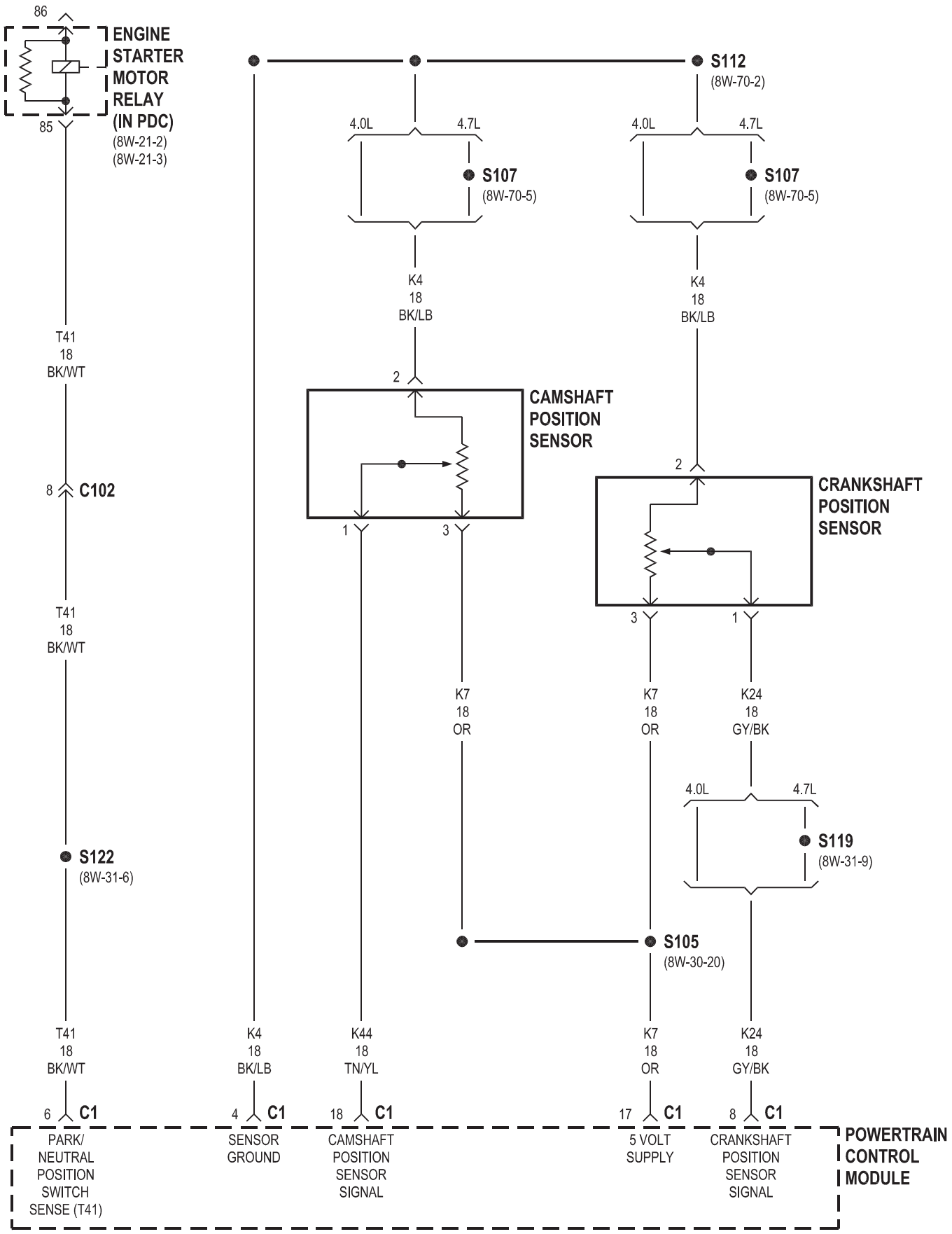

FROM
C102
(8W-30-12)
C
F42
18
DG/LG
S109
(8W-10-21)
F42
18
DG/LG
FUEL
INJECTOR
NO. 1
FUEL
INJECTOR
NO. 2
FUEL
INJECTOR
NO. 3
FUEL
INJECTOR
NO. 4
FUEL
INJECTOR
NO. 5
FUEL
INJECTOR
NO. 6
K11
18
WT/DB
K12
18
TN
K13
18
YL/WT
K14
18
LB/BR
K38
18
GY
K58
18
BR/DB
4 C2
15 C2
5 C2
16 C2
6 C2
12 C2
FUEL
INJECTOR
NO. 1
DRIVER
FUEL
INJECTOR
NO. 2
DRIVER
FUEL
INJECTOR
NO. 3
DRIVER
FUEL
INJECTOR
NO. 4
DRIVER
FUEL
INJECTOR
NO. 5
DRIVER
FUEL
INJECTOR
NO. 6
DRIVER
POWERTRAIN
CONTROL
MODULE

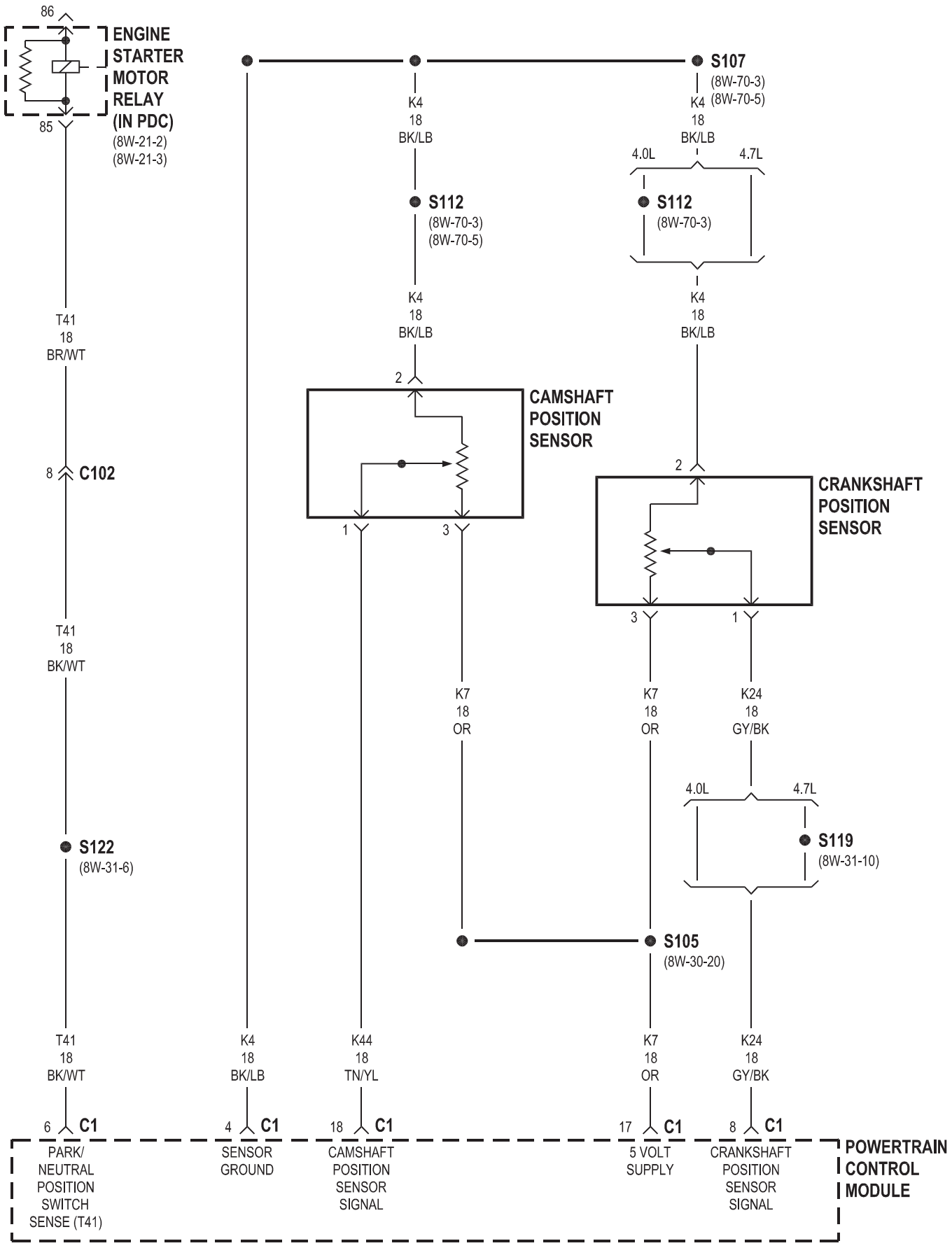

FROM
C102
(8W-30-12)
C
F42
18
DG/LG
S109
(8W-10-21)
F42
18
DG/LG
F42
18
DG/LG
F42
18
DG/LG
F42
18
DG/LG
F42
18
DG/LG
2
FUEL
INJECTOR
NO. 2
1
2
FUEL
INJECTOR
NO. 6
1
G
TO
S121
(8W-30-15)
2
FUEL
INJECTOR
NO. 4
1
2
FUEL
INJECTOR
NO. 8
1
K12
18
TN
K14
18
LB/BR
K58
18
BR/DB
K28
18
GY/LB
15 C2
16 C2
12 C2
13 C2
FUEL
INJECTOR
NO. 2
DRIVER
FUEL
INJECTOR
NO. 4
DRIVER
FUEL
INJECTOR
NO. 6
DRIVER
FUEL
INJECTOR
NO. 8
DRIVER
POWERTRAIN
CONTROL
MODULE

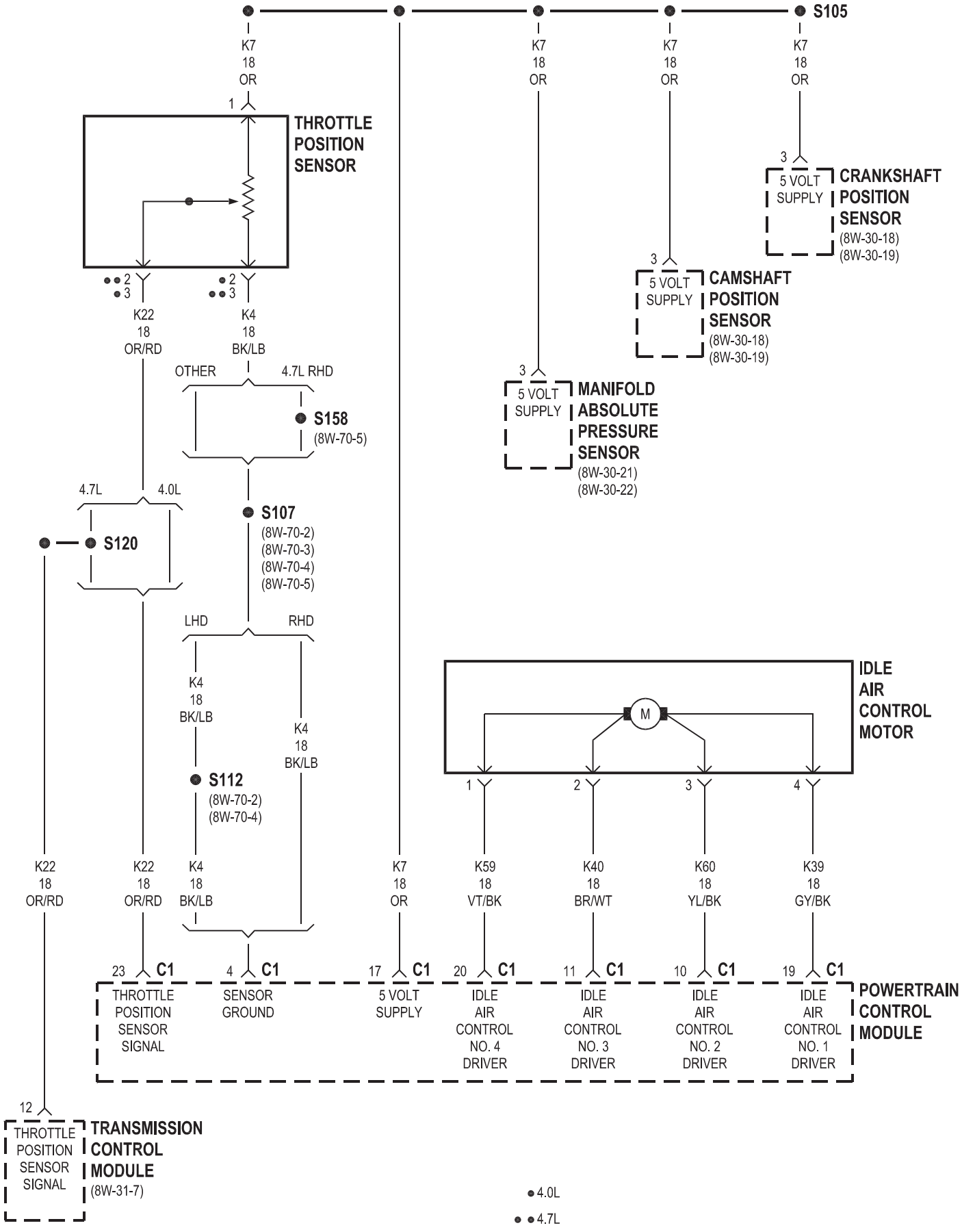

FROM
S109
(8W-30-14)
G
F42
18
DG/LG
S121
(8W-10-21)
F42
18
DG/LG
F42
18
DG/LG
F42
18
DG/LG
F42
18
DG/LG
2
FUEL
INJECTOR
NO. 3
1
2
FUEL
INJECTOR
NO. 7
1
2
FUEL
INJECTOR
NO. 1
1
2
FUEL
INJECTOR
NO. 5
1
K11
18
WT/DB
K13
18
YL/WT
K38
18
GY
K26
18
VT
4 C2
5 C2
6 C2
2 C2
FUEL
INJECTOR
NO. 1
DRIVER
FUEL
INJECTOR
NO. 3
DRIVER
FUEL
INJECTOR
NO. 5
DRIVER
FUEL
INJECTOR
NO. 7
DRIVER
POWERTRAIN
CONTROL
MODULE

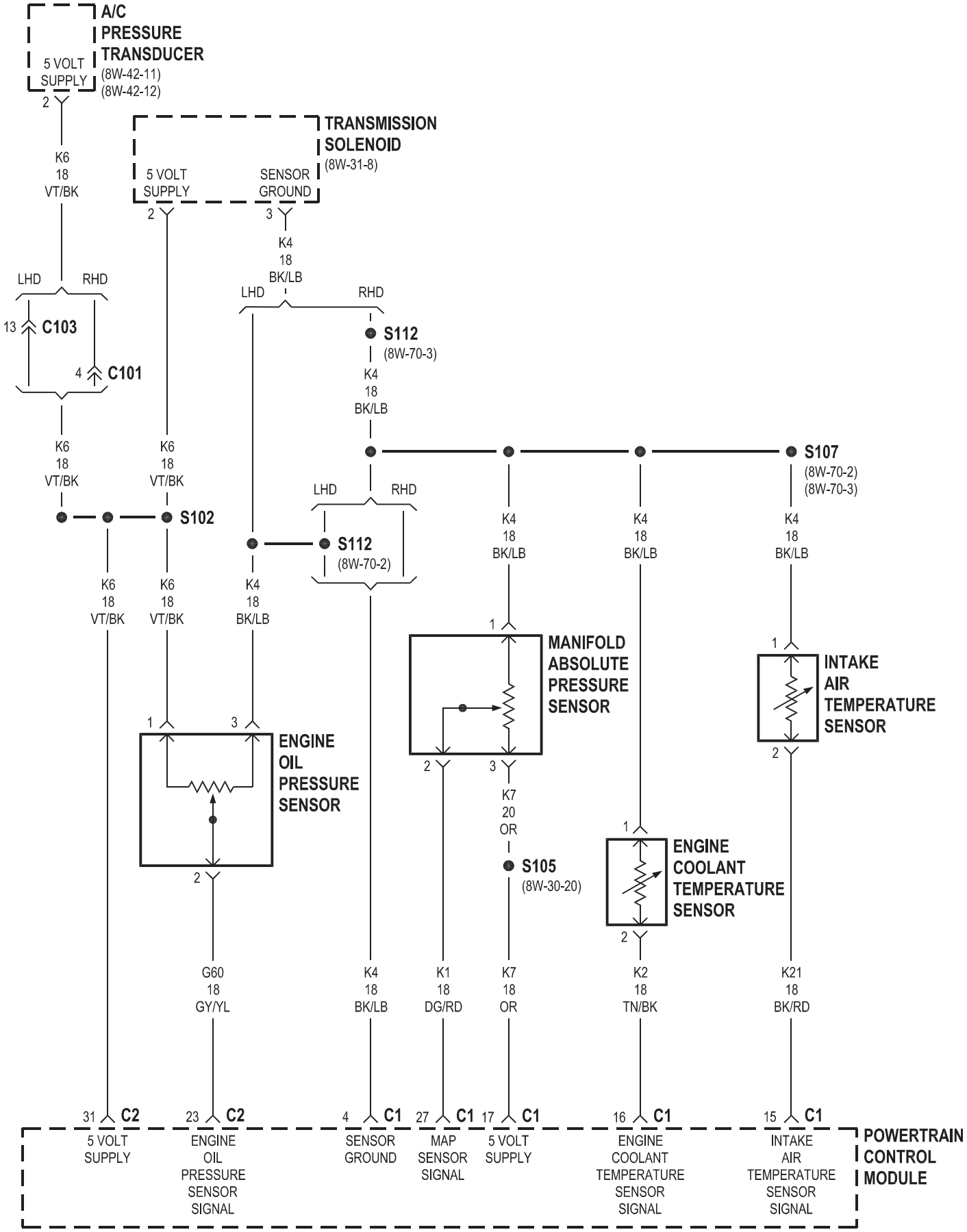

FROM
C102
(8W-30-12)
B
A142
14
DG/OR
S118
(8W-10-22)
A142
14
DG/OR
1
CAPACITOR
NO. 1
2
COIL
ON
PLUG
NO. 2
1
2
COIL
ON
PLUG
NO. 4
1
2
COIL
ON
PLUG
NO. 6
1
2
COIL
ON
PLUG
NO. 8
1
D
TO
S124
(8W-30-17)
K92
14
TN/PK
K94
14
TN/LG
K96
14
TN/LB
K98
14
LB/RD
9
C2
COIL
DRIVER
NO. 2
3
C1
COIL
DRIVER
NO. 4
5
C1
COIL
DRIVER
NO. 6
9
C1
COIL
DRIVER
NO. 8
POWERTRAIN
CONTROL
MODULE

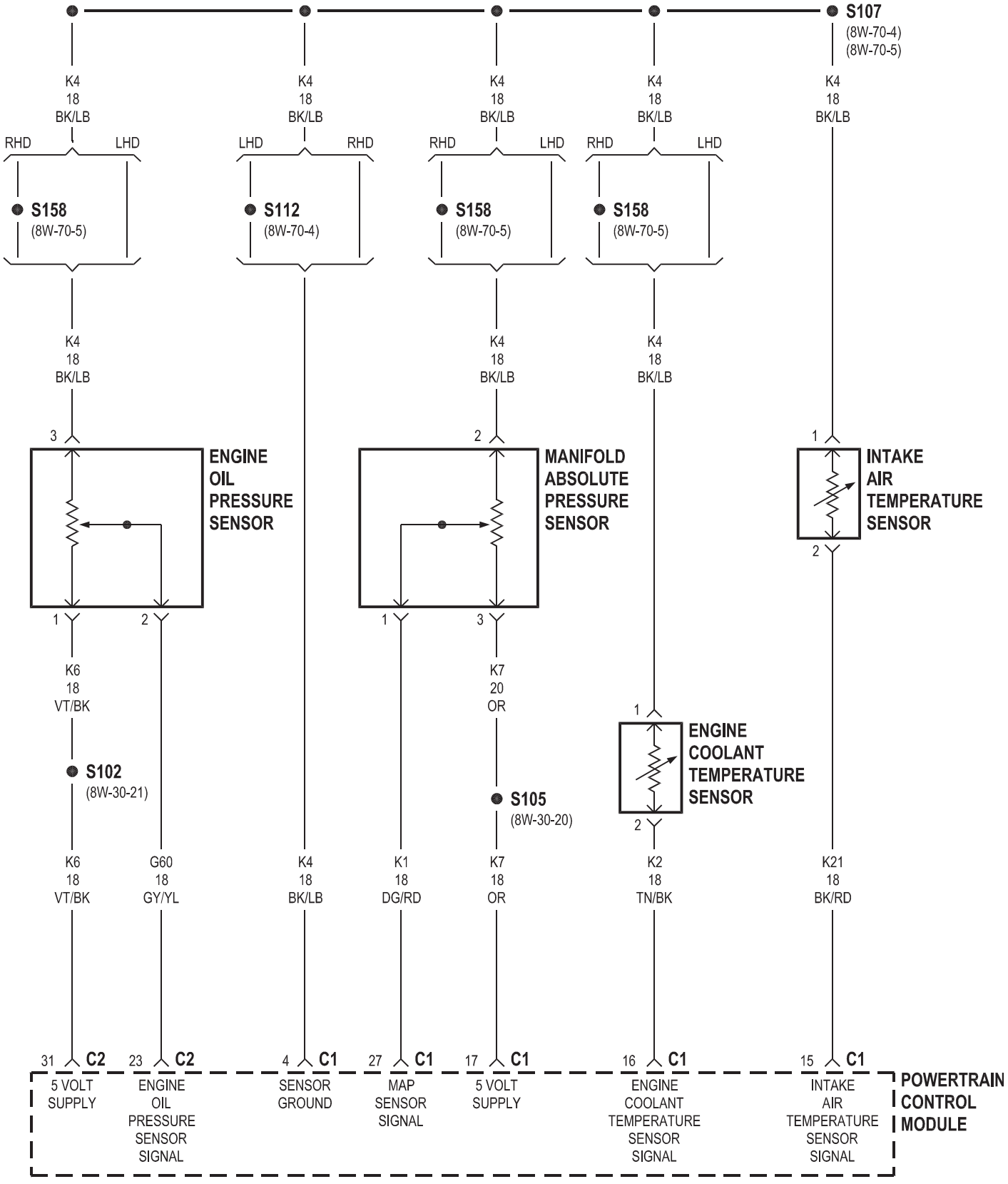

FROM
S118
(8W-30-16)
D
A142
14
DG/OR
S124
(8W-10-22)
A142
14
DG/OR
1
CAPACITOR
NO. 2
2
COIL
ON
PLUG
NO. 1
COIL
ON
PLUG
NO. 3
COIL
ON
PLUG
NO. 5
COIL
ON
PLUG
NO. 7
K91
14
TN/RD
K93
14
TN/OR
K95
14
TN/DG
K97
14
BR
7
C1
1
C1
21
C1
7
C2
COIL
DRIVER
NO. 1
COIL
DRIVER
NO. 3
COIL
DRIVER
NO. 5
COIL
DRIVER
NO. 7
POWERTRAIN
CONTROL
MODULE

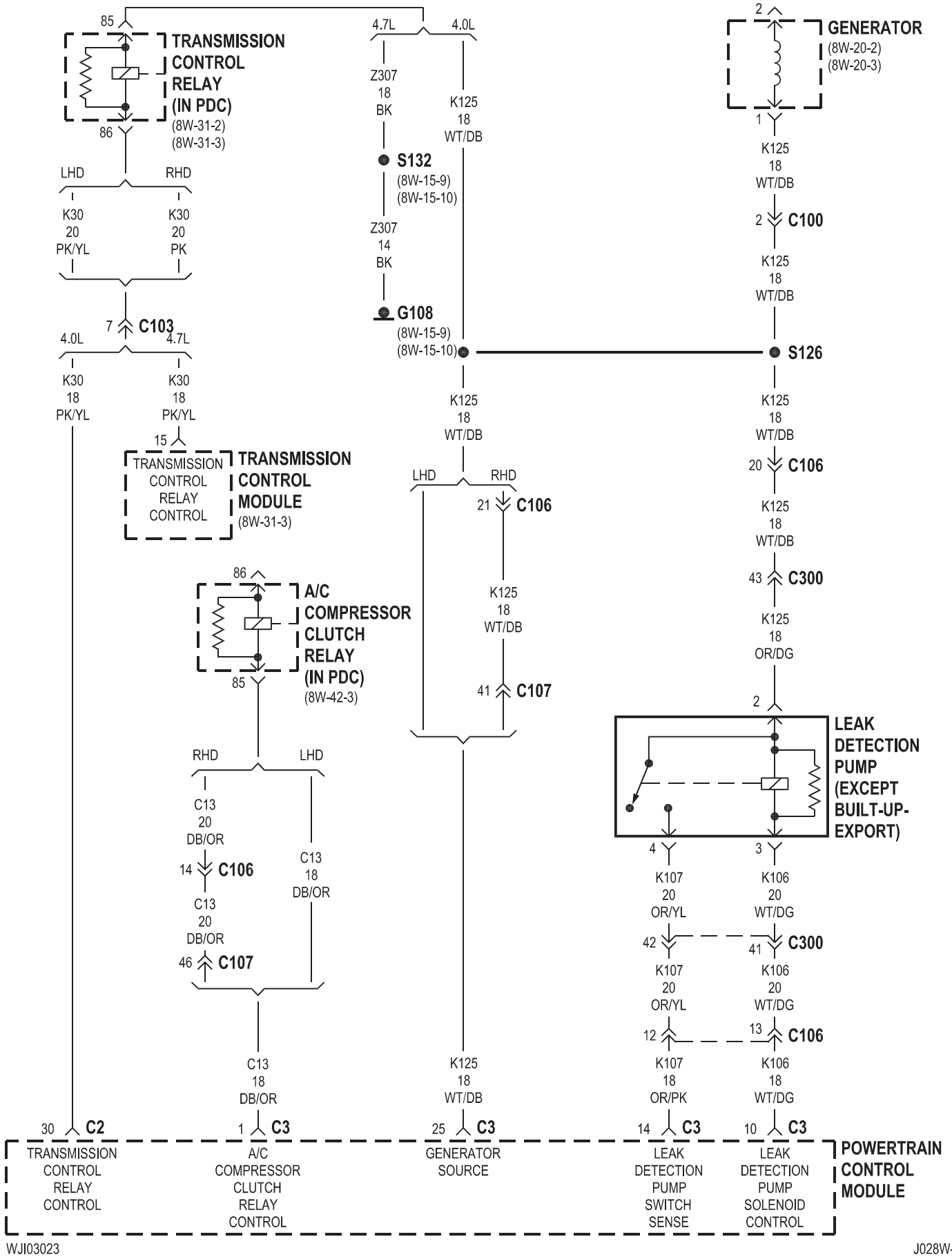

86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
85
S112
(8W-70-2)
4.0L
4.7L
S107
(8W-70-5)
K4
18
BK/LB
T41
18
BK/WT
2
CAMSHAFT POSITION SENSOR
1
3
8
C102
CRANKSHAFT POSITION SENSOR
K7
18
OR
K24
18
GY/BK
S119
(8W-31-9)
S122
(8W-31-6)
S105
(8W-30-20)
K44
18
TN/YL
6
C1
4
C1
18
C1
17
C1
8
C1
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
SENSOR GROUND
CAMSHAFT POSITION SENSOR SIGNAL
5 VOLT SUPPLY
CRANKSHAFT POSITION SENSOR SIGNAL
POWERTRAIN CONTROL MODULE

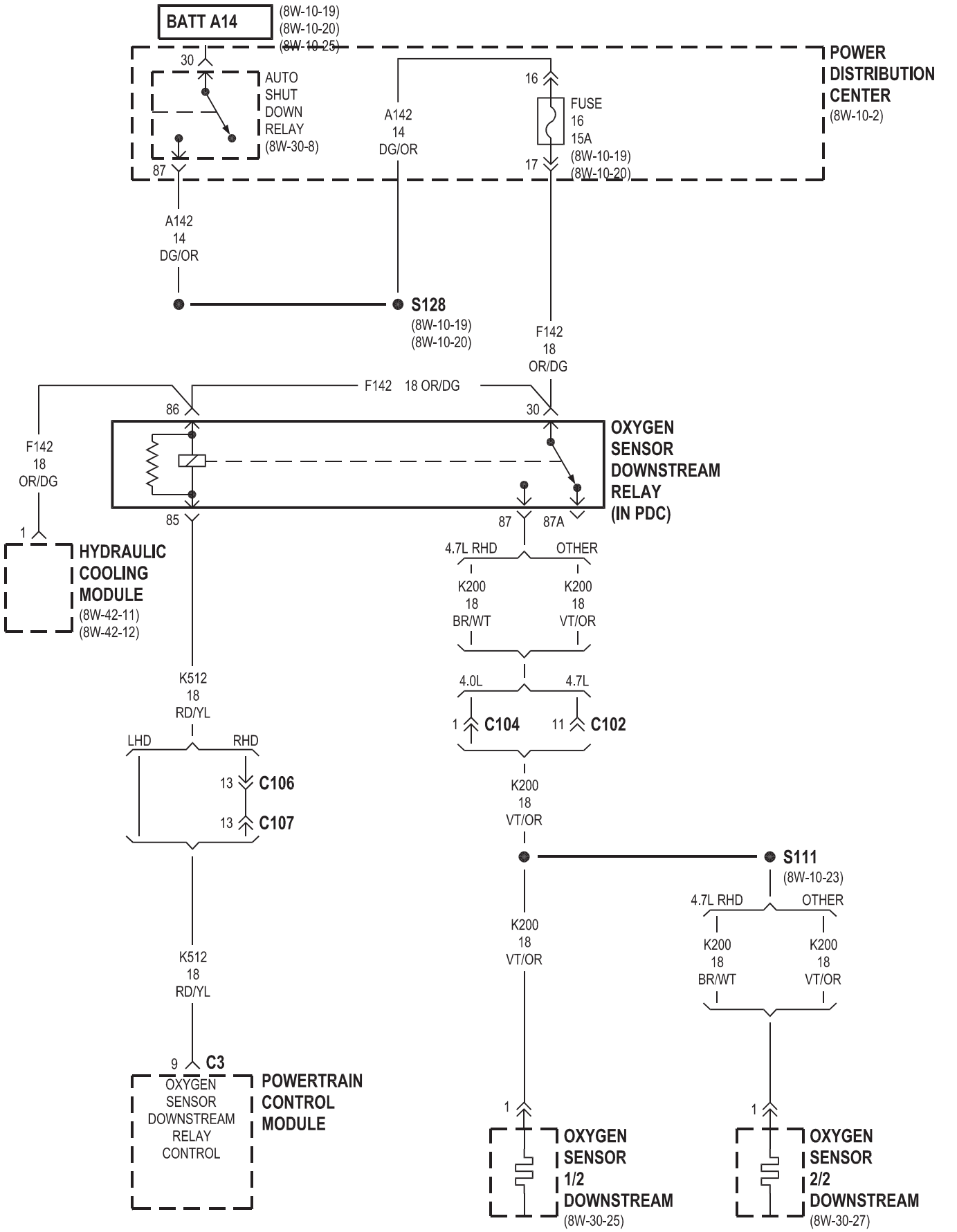

86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
85
S107
(8W-70-3)
(8W-70-5)
K4 18 BK/LB
4.0L
4.7L
S112
(8W-70-3)
(8W-70-5)
S112
(8W-70-3)
T41 18 BR/WT
2
CAMSHAFT POSITION SENSOR
1
3
8 C102
2
CRANKSHAFT POSITION SENSOR
3
1
T41 18 BK/WT
K7 18 OR
K24 18 GY/BK
S119
(8W-31-10)
S122
(8W-31-6)
S105
(8W-30-20)
T41 18 BK/WT
K4 18 BK/LB
K44 18 TN/YL
K7 18 OR
K24 18 GY/BK
6 C1
4 C1
18 C1
17 C1
8 C1
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
SENSOR GROUND
CAMSHAFT POSITION SENSOR SIGNAL
5 VOLT SUPPLY
CRANKSHAFT POSITION SENSOR SIGNAL
POWERTRAIN CONTROL MODULE


S105
K7 18 OR
K7 18 OR
K7 18 OR
K7 18 OR
1
THROTTLE POSITION SENSOR
3
5 VOLT SUPPLY
CRANKSHAFT POSITION SENSOR
(8W-30-18)
(8W-30-19)
3
5 VOLT SUPPLY
CAMSHAFT POSITION SENSOR
(8W-30-18)
(8W-30-19)
3
5 VOLT SUPPLY
MANIFOLD ABSOLUTE PRESSURE SENSOR
(8W-30-21)
(8W-30-22)
2
3
2
3
K22 18 OR/RD
K4 18 BK/LB
OTHER
4.7L RHD
S158
(8W-70-5)
4.7L
4.0L
S120
S107
(8W-70-2)
(8W-70-3)
(8W-70-4)
(8W-70-5)
LHD
RHD
K4 18 BK/LB
K4 18 BK/LB
S112
(8W-70-2)
(8W-70-4)
IDLE AIR CONTROL MOTOR
M
1
2
3
4
K22 18 OR/RD
K22 18 OR/RD
K4 18 BK/LB
K7 18 OR
K59 18 VT/BK
K40 18 BR/WT
K60 18 YL/BK
K39 18 GY/BK
23 C1
4 C1
17 C1
20 C1
11 C1
10 C1
19 C1
THROTTLE POSITION SENSOR SIGNAL
SENSOR GROUND
5 VOLT SUPPLY
IDLE AIR CONTROL NO. 4 DRIVER
IDLE AIR CONTROL NO. 3 DRIVER
IDLE AIR CONTROL NO. 2 DRIVER
IDLE AIR CONTROL NO. 1 DRIVER
POWERTRAIN CONTROL MODULE
12
THROTTLE POSITION SENSOR SIGNAL
TRANSMISSION CONTROL MODULE
(8W-31-7)
4.0L
4.7L

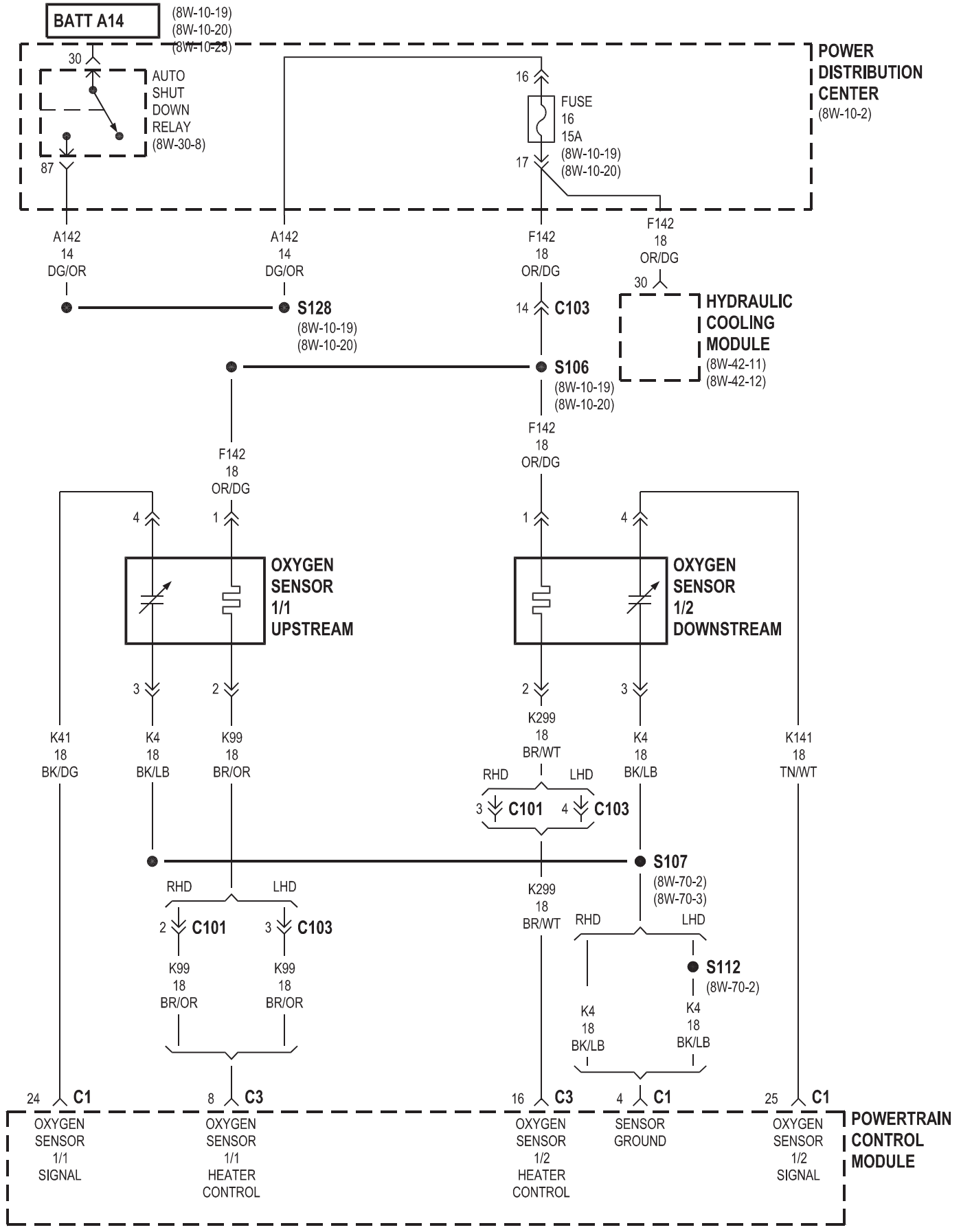

A/C PRESSURE TRANSDUCER
5 VOLT SUPPLY
(8W-42-11)
(8W-42-12)
2
K6 18 VT/BK
TRANSMISSION SOLENOID
(8W-31-8)
5 VOLT SUPPLY
SENSOR GROUND
2
3
K4 18 BK/LB
LHD
RHD
13 C103
4 C101
S112
(8W-70-3)
K4 18 BK/LB
S107
(8W-70-2)
(8W-70-3)
K6 18 VT/BK
K6 18 VT/BK
S102
S112
(8W-70-2)
K4 18 BK/LB
K4 18 BK/LB
K4 18 BK/LB
K6 18 VT/BK
K6 18 VT/BK
K4 18 BK/LB
1
3
ENGINE OIL PRESSURE SENSOR
2
MANIFOLD ABSOLUTE PRESSURE SENSOR
1
2
3
INTAKE AIR TEMPERATURE SENSOR
1
2
K7 20 OR
S105
(8W-30-20)
ENGINE COOLANT TEMPERATURE SENSOR
1
2
G60 18 GY/YL
K4 18 BK/LB
K1 18 DG/RD
K7 18 OR
K2 18 TN/BK
K21 18 BK/RD
31 C2
23 C2
4 C1
27 C1
17 C1
16 C1
15 C1
5 VOLT SUPPLY
ENGINE OIL PRESSURE SENSOR SIGNAL
SENSOR GROUND
MAP SENSOR SIGNAL
5 VOLT SUPPLY
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
INTAKE AIR TEMPERATURE SENSOR SIGNAL
POWERTRAIN CONTROL MODULE

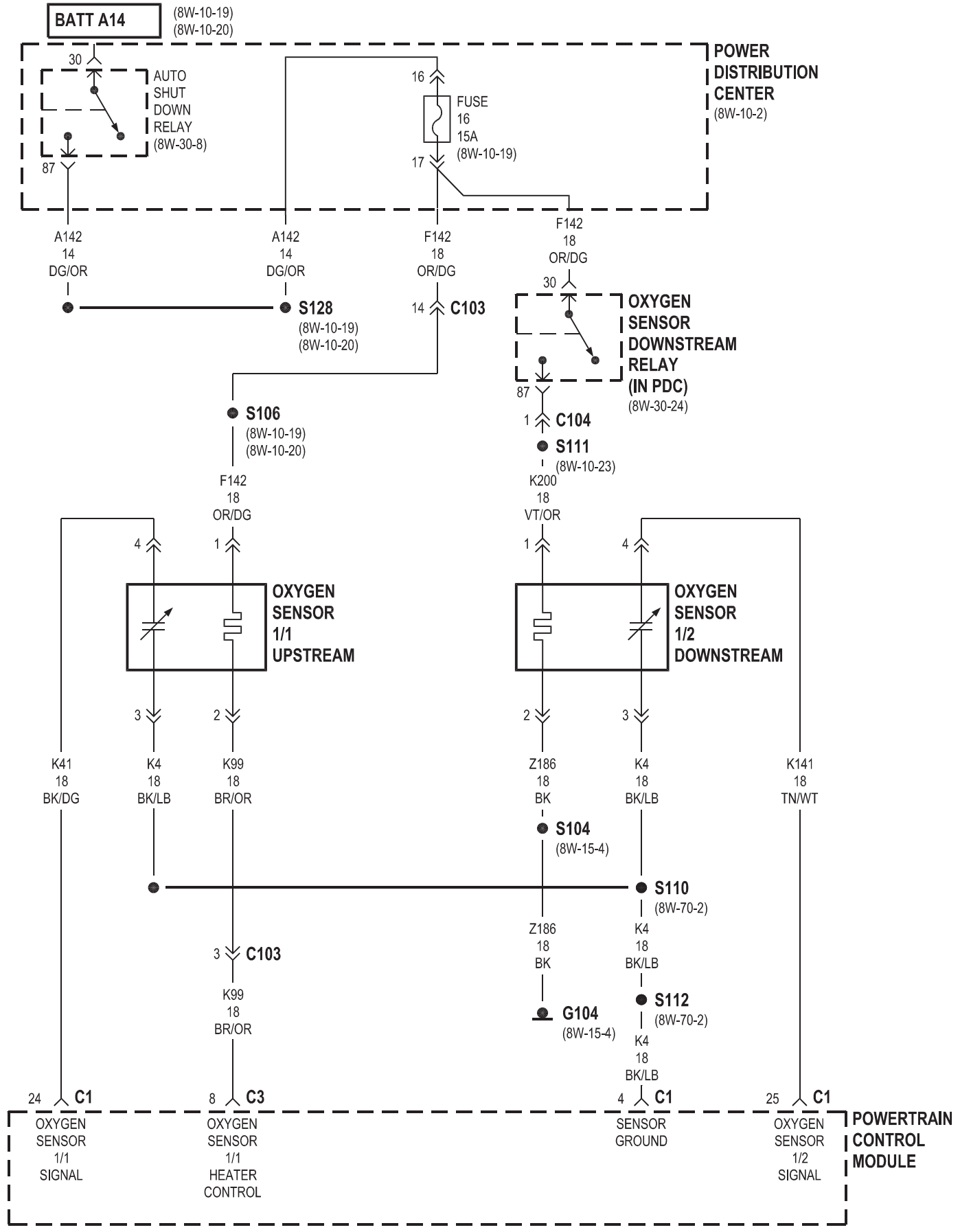

S107
(8W-70-4)
(8W-70-5)
K4
18
BK/LB
RHD
LHD
S158
(8W-70-5)
S112
(8W-70-4)
S158
(8W-70-5)
S158
(8W-70-5)
3
ENGINE
OIL
PRESSURE
SENSOR
2
MANIFOLD
ABSOLUTE
PRESSURE
SENSOR
1
INTAKE
AIR
TEMPERATURE
SENSOR
K6
18
VT/BK
K7
20
OR
S102
(8W-30-21)
S105
(8W-30-20)
ENGINE
COOLANT
TEMPERATURE
SENSOR
G60
18
GY/YL
K1
18
DG/RD
K2
18
TN/BK
K21
18
BK/RD
31 C2
23 C2
4 C1
27 C1
17 C1
16 C1
15 C1
5 VOLT
SUPPLY
ENGINE
OIL
PRESSURE
SENSOR
SIGNAL
SENSOR
GROUND
MAP
SENSOR
SIGNAL
5 VOLT
SUPPLY
ENGINE
COOLANT
TEMPERATURE
SENSOR
SIGNAL
INTAKE
AIR
TEMPERATURE
SENSOR
SIGNAL
POWERTRAIN
CONTROL
MODULE


85
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
(8W-31-3)
86
LHD
RHD
K30 20 PK/YL
K30 20 PK
7 C103
4.0L
4.7L
K30 18 PK/YL
K30 18 PK/YL
15
TRANSMISSION CONTROL RELAY CONTROL
TRANSMISSION CONTROL MODULE
(8W-31-3)
4.7L
4.0L
Z307 18 BK
K125 18 WT/DB
S132
(8W-15-9)
(8W-15-10)
Z307 14 BK
G108
(8W-15-9)
(8W-15-10)
K125 18 WT/DB
LHD
RHD
21 C106
K125 18 WT/DB
41 C107
2
GENERATOR
(8W-20-2)
(8W-20-3)
1
K125 18 WT/DB
2 C100
K125 18 WT/DB
S126
K125 18 WT/DB
20 C106
K125 18 WT/DB
43 C300
K125 18 OR/DG
2
LEAK DETECTION PUMP (EXCEPT BUILT-UP-EXPORT)
4
3
K107 20 OR/YL
K106 20 WT/DG
42
41 C300
K107 20 OR/YL
K106 20 WT/DG
12
13 C106
K107 18 OR/PK
K106 18 WT/DG
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-3)
85
RHD
LHD
C13 20 DB/OR
14 C106
C13 20 DB/OR
46 C107
C13 18 DB/OR
C13 18 DB/OR
C13 18 DB/OR
K125 18 WT/DB
30 C2
1 C3
25 C3
14 C3
10 C3
TRANSMISSION CONTROL RELAY CONTROL
A/C COMPRESSOR CLUTCH RELAY CONTROL
GENERATOR SOURCE
LEAK DETECTION PUMP SWITCH SENSE
LEAK DETECTION PUMP SOLENOID CONTROL
POWERTRAIN CONTROL MODULE

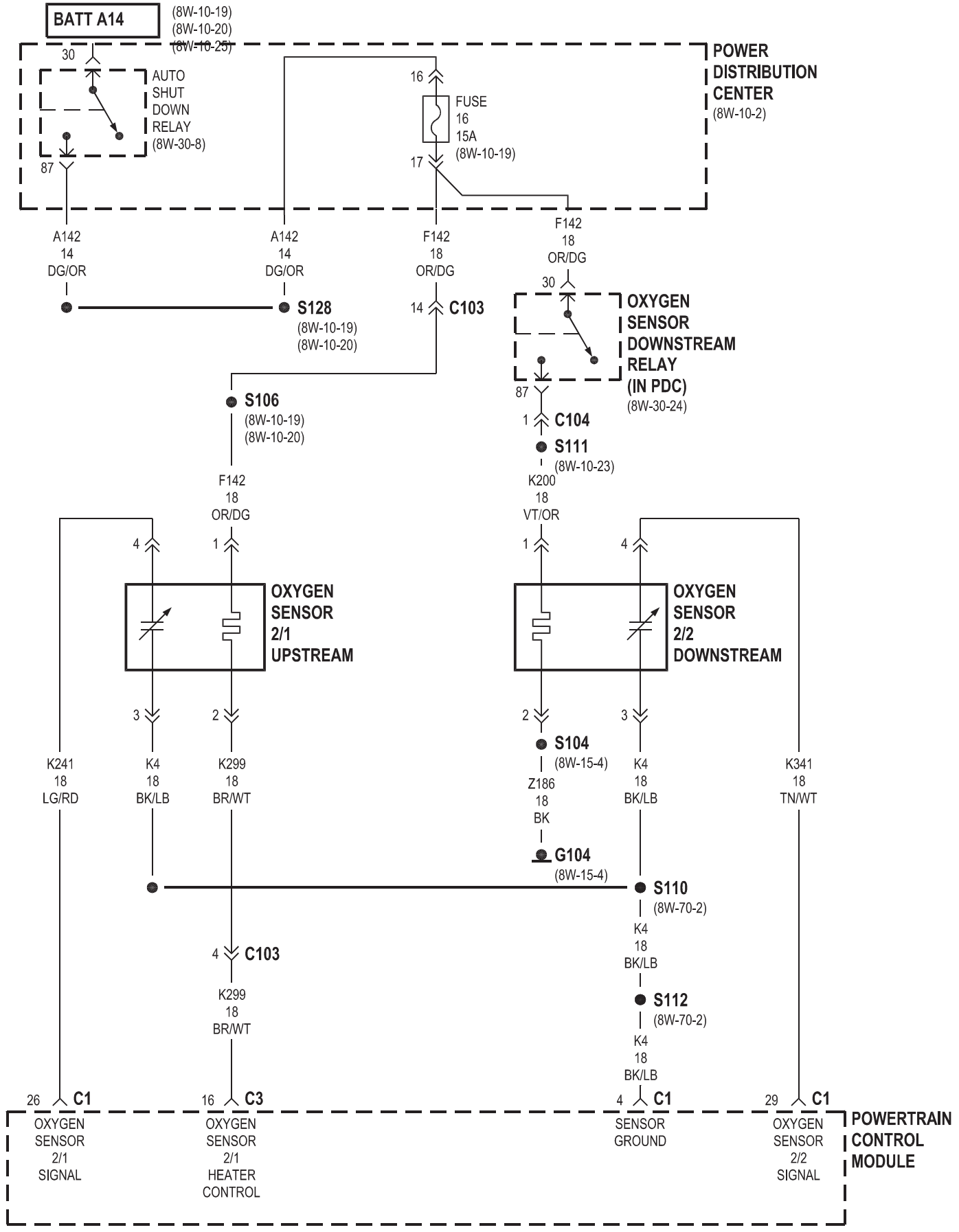

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-25)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
A142
14
DG/OR
16
FUSE
16
15A
(8W-10-19)
(8W-10-20)
17
POWER DISTRIBUTION CENTER
(8W-10-2)
A142
14
DG/OR
S128
(8W-10-19)
(8W-10-20)
F142
18
OR/DG
F142 18 OR/DG
86
30
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
F142
18
OR/DG
1
HYDRAULIC COOLING MODULE
(8W-42-11)
(8W-42-12)
85
87
87A
4.7L RHD
OTHER
K200
18
BR/WT
K200
18
VT/OR
4.0L
4.7L
1
C104
11
C102
K512
18
RD/YL
LHD
RHD
13
C106
13
C107
K200
18
VT/OR
S111
(8W-10-23)
4.7L RHD
OTHER
K200
18
BR/WT
K200
18
VT/OR
K512
18
RD/YL
9
C3
OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
POWERTRAIN CONTROL MODULE
1
OXYGEN SENSOR 1/2 DOWNSTREAM
(8W-30-25)
1
OXYGEN SENSOR 2/2 DOWNSTREAM
(8W-30-27)

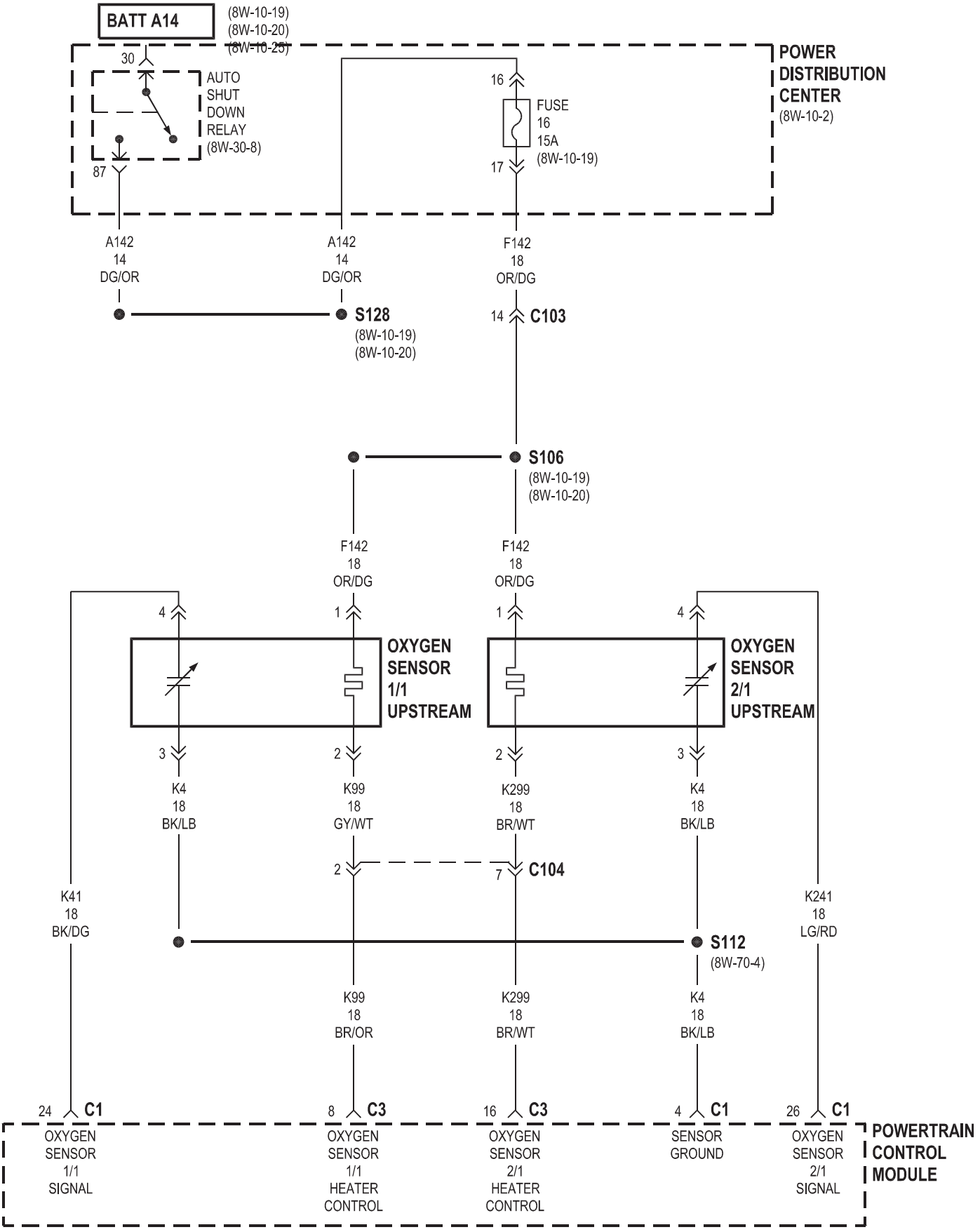
4.0L BUILT-UP-EXPORT



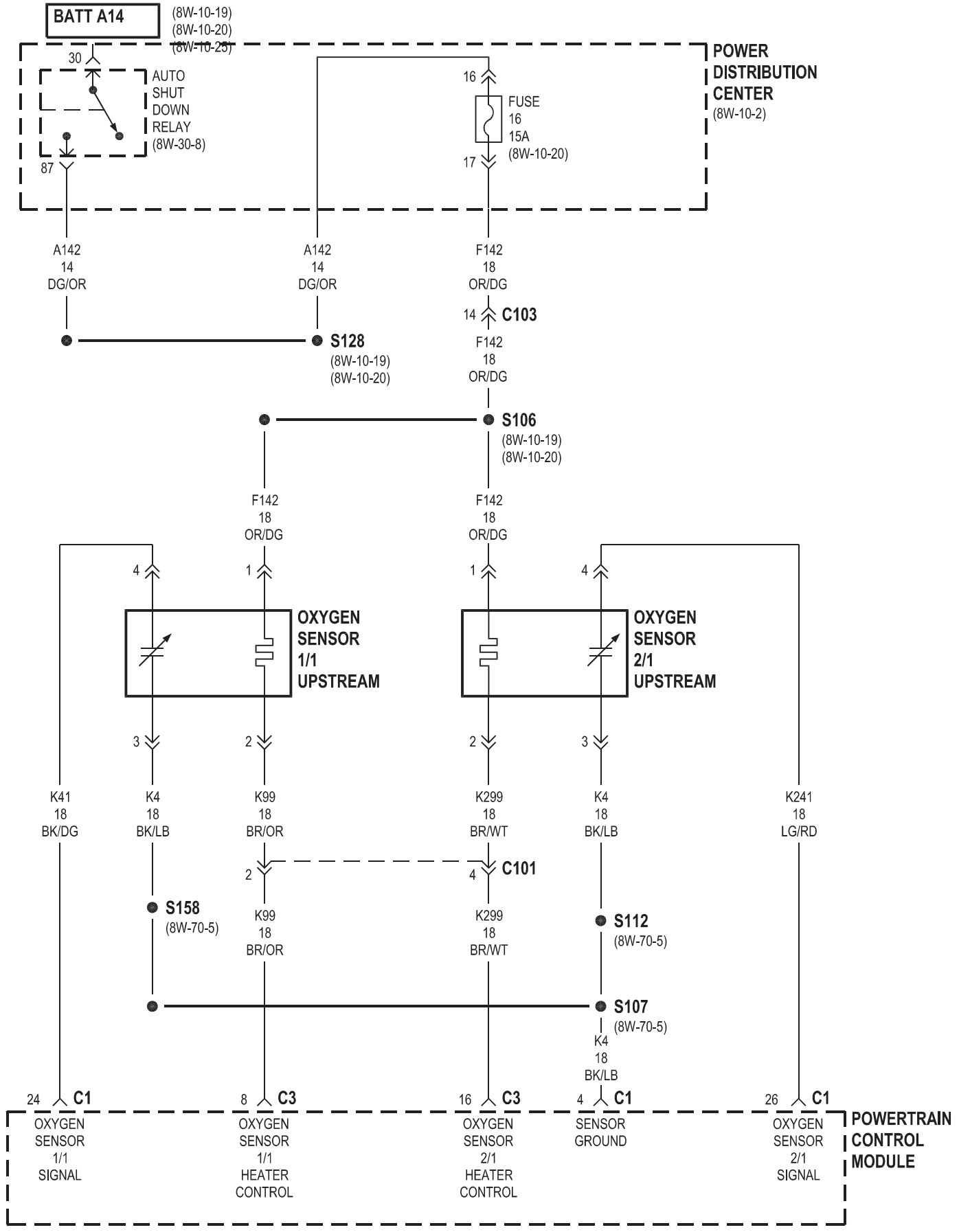

BATT A14
(8W-10-19)
(8W-10-20)
POWER DISTRIBUTION CENTER
(8W-10-2)
AUTO SHUT DOWN RELAY
(8W-30-8)
FUSE 16 15A
(8W-10-19)
A142 14 DG/OR
A142 14 DG/OR
F142 18 OR/DG
F142 18 OR/DG
S128
(8W-10-19)
(8W-10-20)
C103
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-24)
C104
S106
(8W-10-19)
(8W-10-20)
S111
(8W-10-23)
F142 18 OR/DG
K200 18 VT/OR
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 1/2 DOWNSTREAM
K41 18 BK/DG
K4 18 BK/LB
K99 18 BR/OR
Z186 18 BK
K4 18 BK/LB
K141 18 TN/WT
S104
(8W-15-4)
S110
(8W-70-2)
C103
K99 18 BR/OR
Z186 18 BK
K4 18 BK/LB
G104
(8W-15-4)
S112
(8W-70-2)
K4 18 BK/LB
C1
C3
C1
C1
OXYGEN SENSOR 1/1 SIGNAL
OXYGEN SENSOR 1/1 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 1/2 SIGNAL
POWERTRAIN CONTROL MODULE

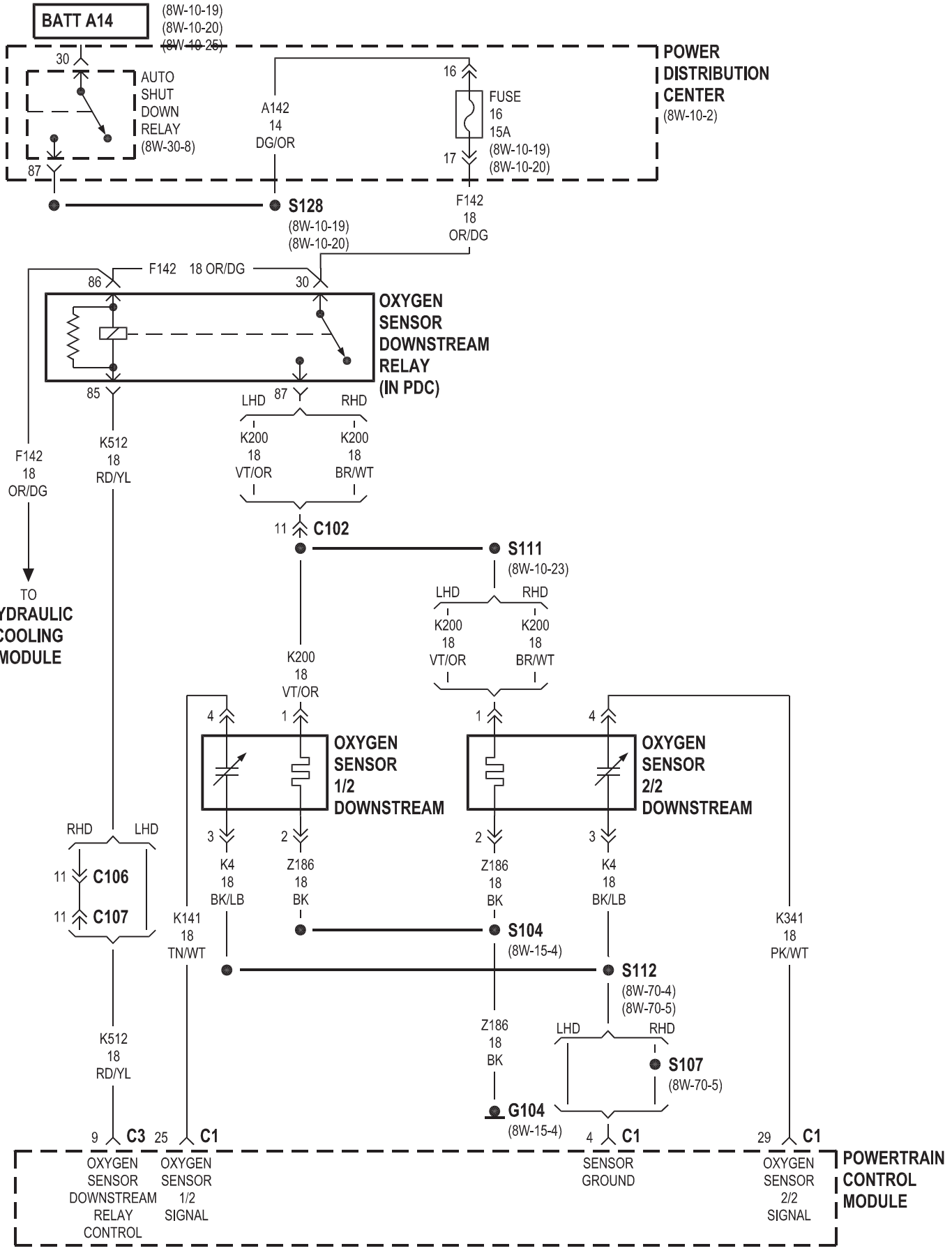
4.0L EXCEPT BUILT-UP-EXPORT

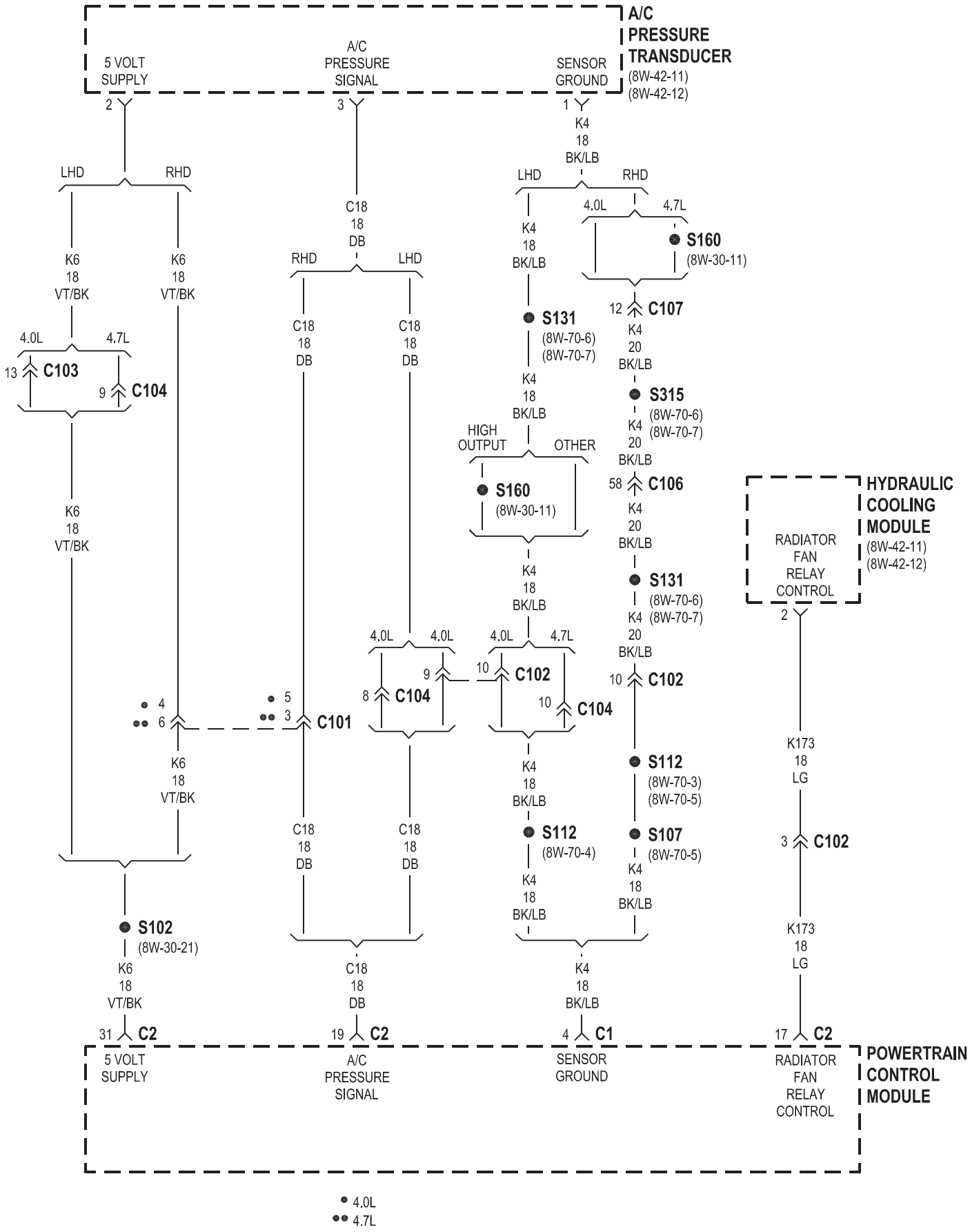


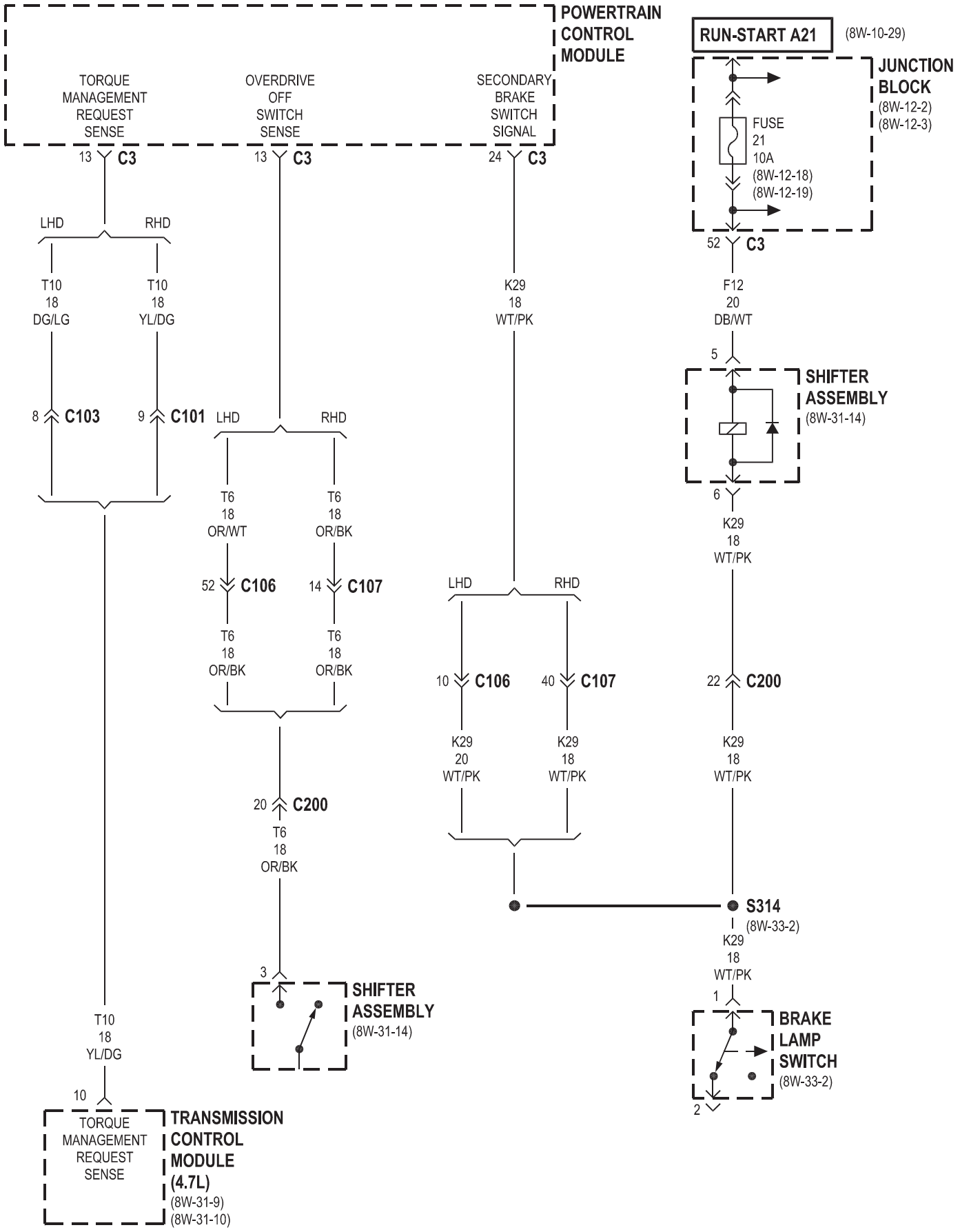

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-25)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
16
FUSE 16 15A
(8W-10-19)
17
POWER DISTRIBUTION CENTER
(8W-10-2)
A142 14 DG/OR
A142 14 DG/OR
F142 18 OR/DG
S128
(8W-10-19)
(8W-10-20)
14 C103
S106
(8W-10-19)
(8W-10-20)
F142 18 OR/DG
F142 18 OR/DG
4
1
1
4
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 2/1 UPSTREAM
3
2
2
3
K4 18 BK/LB
K99 18 GY/WT
K299 18 BR/WT
K4 18 BK/LB
2
7 C104
K41 18 BK/DG
K241 18 LG/RD
S112
(8W-70-4)
K99 18 BR/OR
K299 18 BR/WT
K4 18 BK/LB
24 C1
8 C3
16 C3
4 C1
26 C1
OXYGEN SENSOR 1/1 SIGNAL
OXYGEN SENSOR 1/1 HEATER CONTROL
OXYGEN SENSOR 2/1 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 2/1 SIGNAL
POWERTRAIN CONTROL MODULE

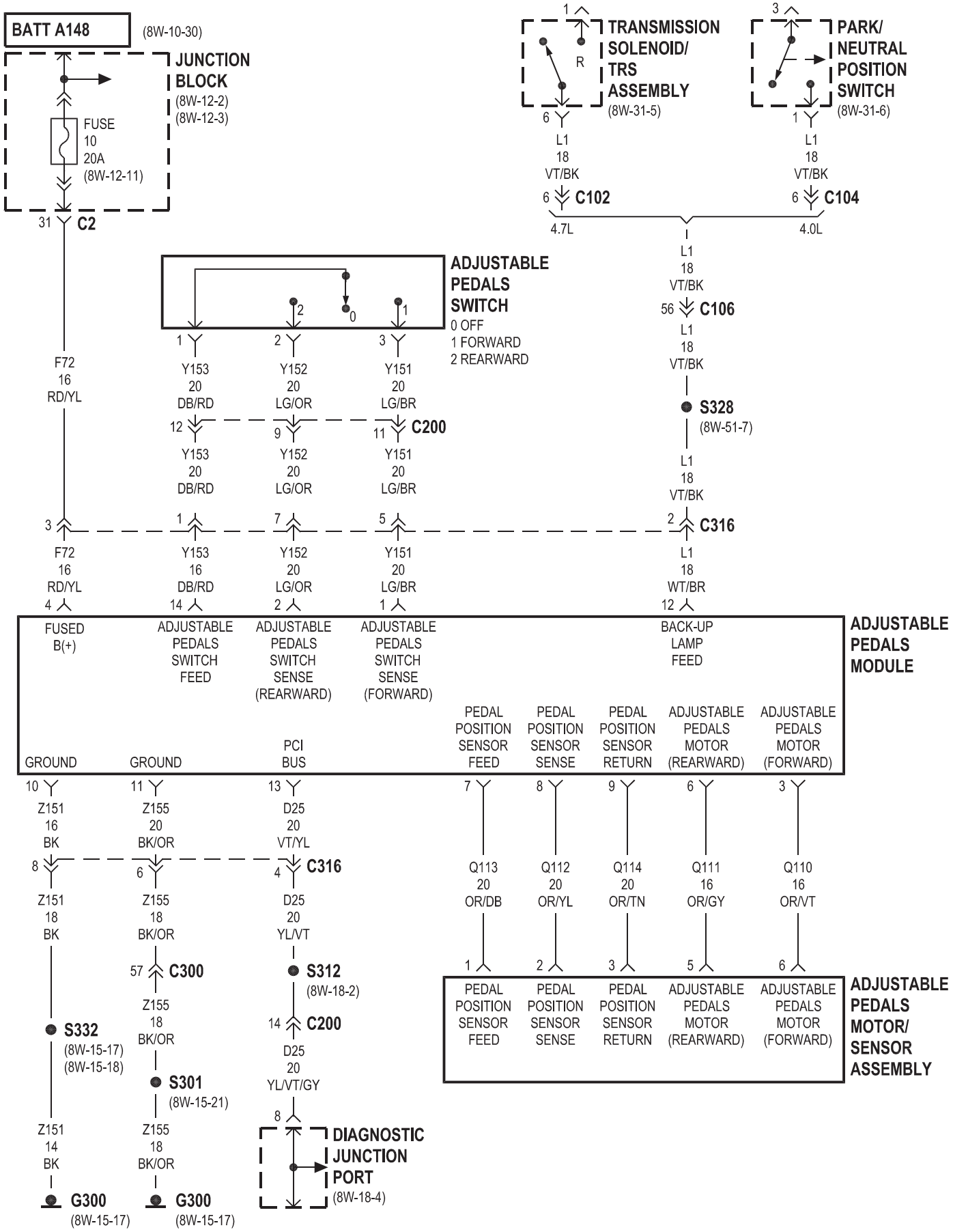
4.7L RHD

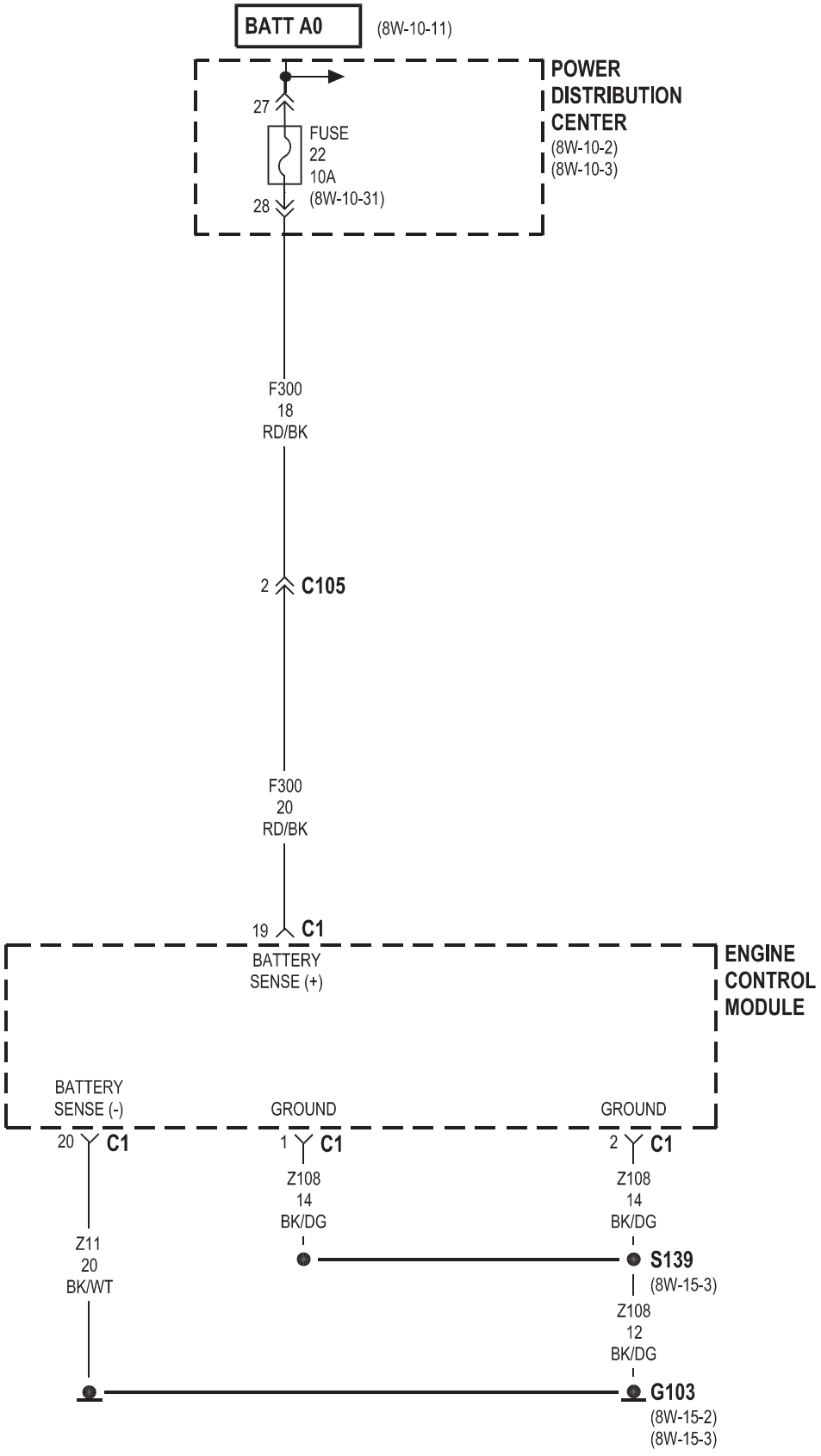

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-25)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
16
FUSE 16 15A
(8W-10-20)
17
POWER DISTRIBUTION CENTER
(8W-10-2)
A142 14 DG/OR
A142 14 DG/OR
F142 18 OR/DG
14 C103
S128
(8W-10-19)
(8W-10-20)
F142 18 OR/DG
S106
(8W-10-19)
(8W-10-20)
F142 18 OR/DG
F142 18 OR/DG
4
1
1
4
OXYGEN SENSOR 1/1 UPSTREAM
OXYGEN SENSOR 2/1 UPSTREAM
3
2
2
3
K41 18 BK/DG
K4 18 BK/LB
K99 18 BR/OR
K299 18 BR/WT
K4 18 BK/LB
K241 18 LG/RD
2
4 C101
S158
(8W-70-5)
K99 18 BR/OR
K299 18 BR/WT
S112
(8W-70-5)
S107
(8W-70-5)
K4 18 BK/LB
24 C1
8 C3
16 C3
4 C1
26 C1
OXYGEN SENSOR 1/1 SIGNAL
OXYGEN SENSOR 1/1 HEATER CONTROL
OXYGEN SENSOR 2/1 HEATER CONTROL
SENSOR GROUND
OXYGEN SENSOR 2/1 SIGNAL
POWERTRAIN CONTROL MODULE

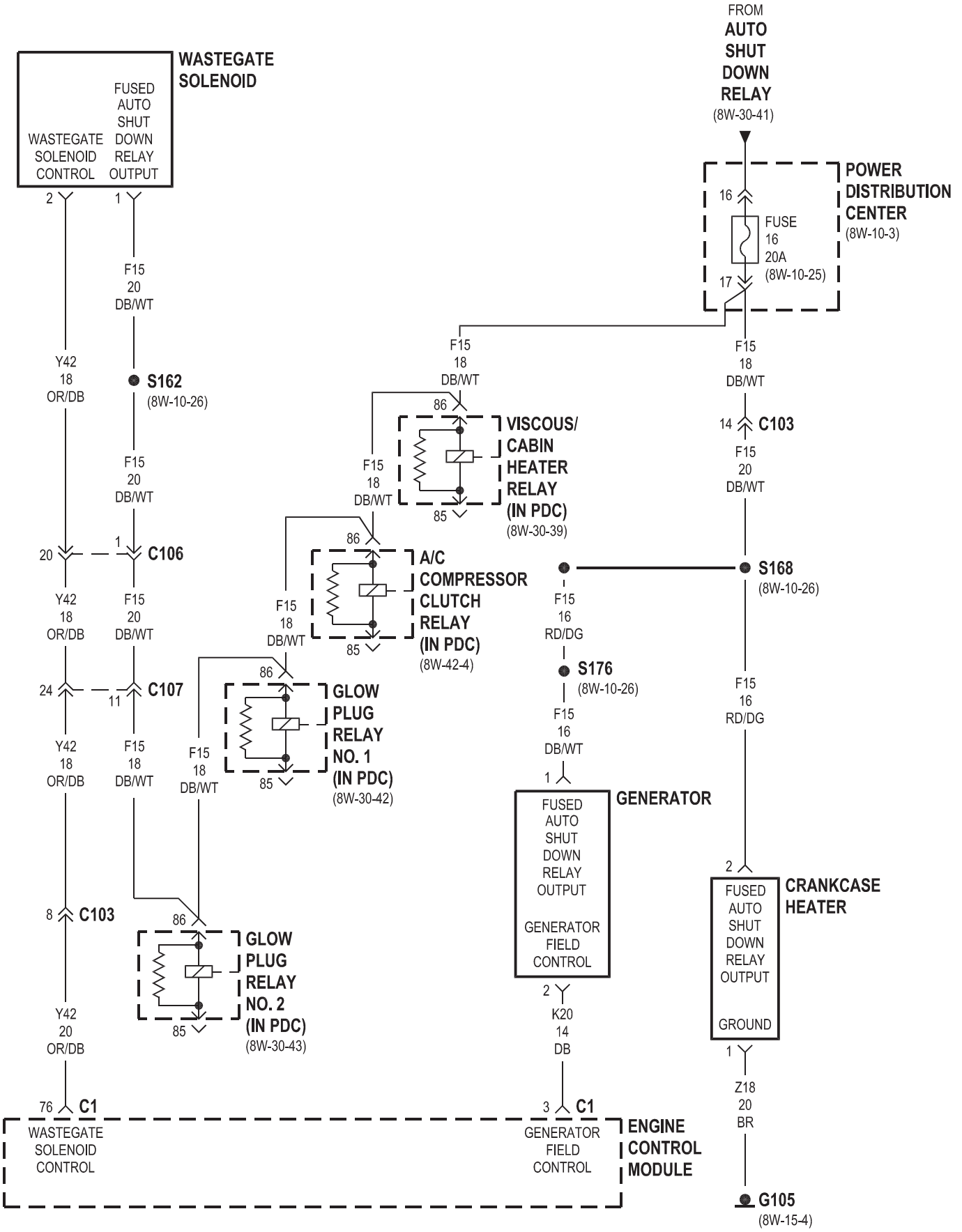

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-26)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
A142
14
DG/OR
16
FUSE
16
15A
17
(8W-10-19)
(8W-10-20)
S128
(8W-10-19)
(8W-10-20)
F142
18
OR/DG
F142 18 OR/DG
86
30
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
85
87
LHD
RHD
K200
18
VT/OR
K200
18
BR/WT
F142
18
OR/DG
K512
18
RD/YL
11
C102
S111
(8W-10-23)
TO HYDRAULIC COOLING MODULE
K200
18
VT/OR
4
1
OXYGEN SENSOR 1/2 DOWNSTREAM
1
4
OXYGEN SENSOR 2/2 DOWNSTREAM
3
2
K4
18
BK/LB
Z186
18
BK
Z186
18
BK
K4
18
BK/LB
RHD
LHD
11
C106
11
C107
K141
18
TN/WT
S104
(8W-15-4)
S112
(8W-70-4)
(8W-70-5)
K341
18
PK/WT
K512
18
RD/YL
Z186
18
BK
LHD
RHD
S107
(8W-70-5)
G104
(8W-15-4)
9
C3
25
C1
4
C1
29
C1
OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
OXYGEN SENSOR 1/2 SIGNAL
SENSOR GROUND
OXYGEN SENSOR 2/2 SIGNAL
POWERTRAIN CONTROL MODULE

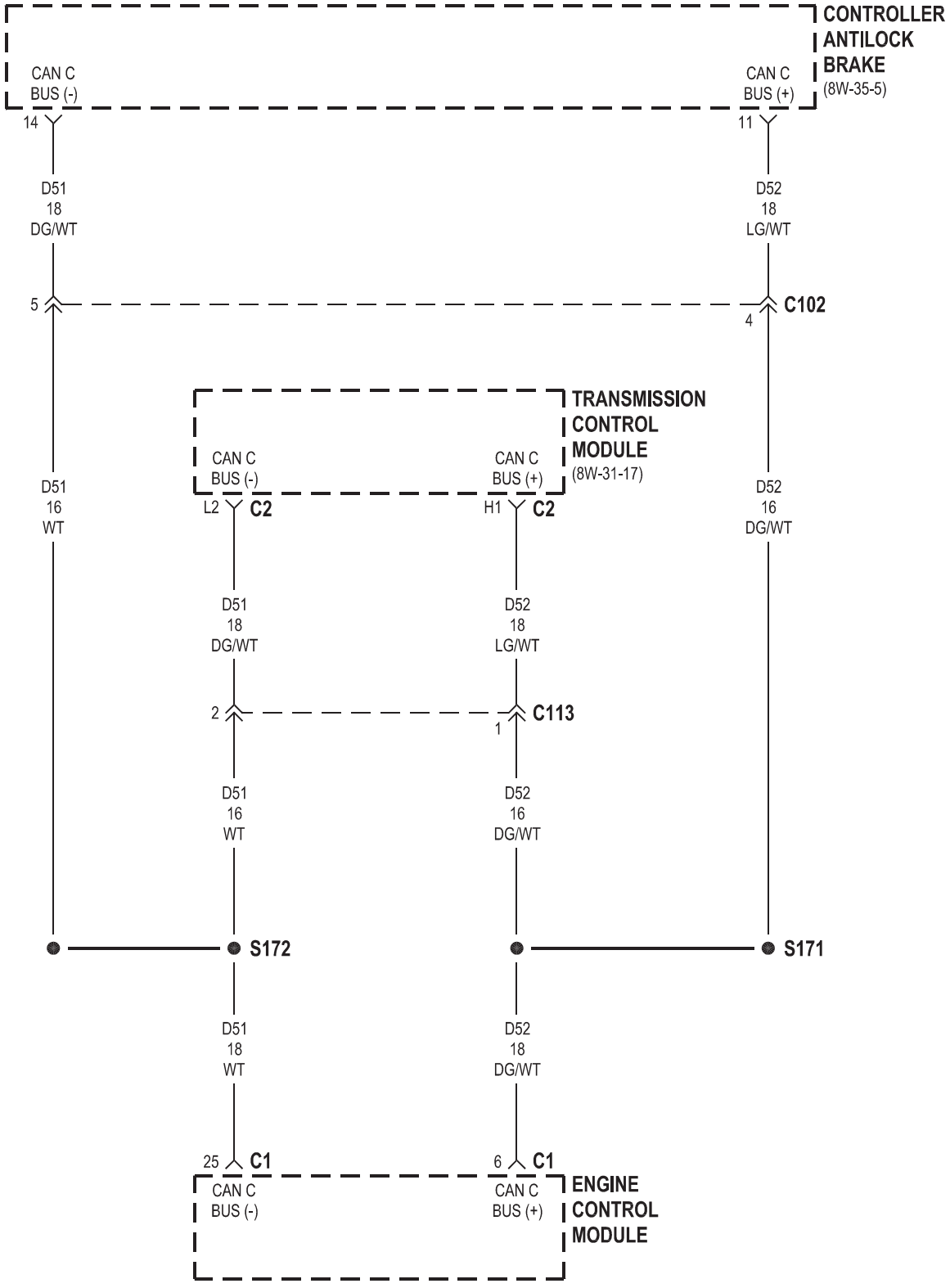

A/C PRESSURE TRANSDUCER
(8W-42-11)
(8W-42-12)
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
SENSOR GROUND
2
3
1
K4 18 BK/LB
LHD
RHD
4.0L
4.7L
S160
(8W-30-11)
K6 18 VT/BK
C18 18 DB
S131
(8W-70-6)
(8W-70-7)
12 C107
K4 20 BK/LB
S315
(8W-70-6)
(8W-70-7)
HIGH OUTPUT
OTHER
58 C106
13 C103
9 C104
10 C102
8 C104
10 C104
S112
(8W-70-3)
(8W-70-5)
S107
(8W-70-5)
S112
(8W-70-4)
HYDRAULIC COOLING MODULE
(8W-42-11)
(8W-42-12)
RADIATOR FAN RELAY CONTROL
K173 18 LG
3 C102
4
6
5
3
C101
S102
(8W-30-21)
31 C2
19 C2
4 C1
17 C2
POWERTRAIN CONTROL MODULE
4.0L
4.7L

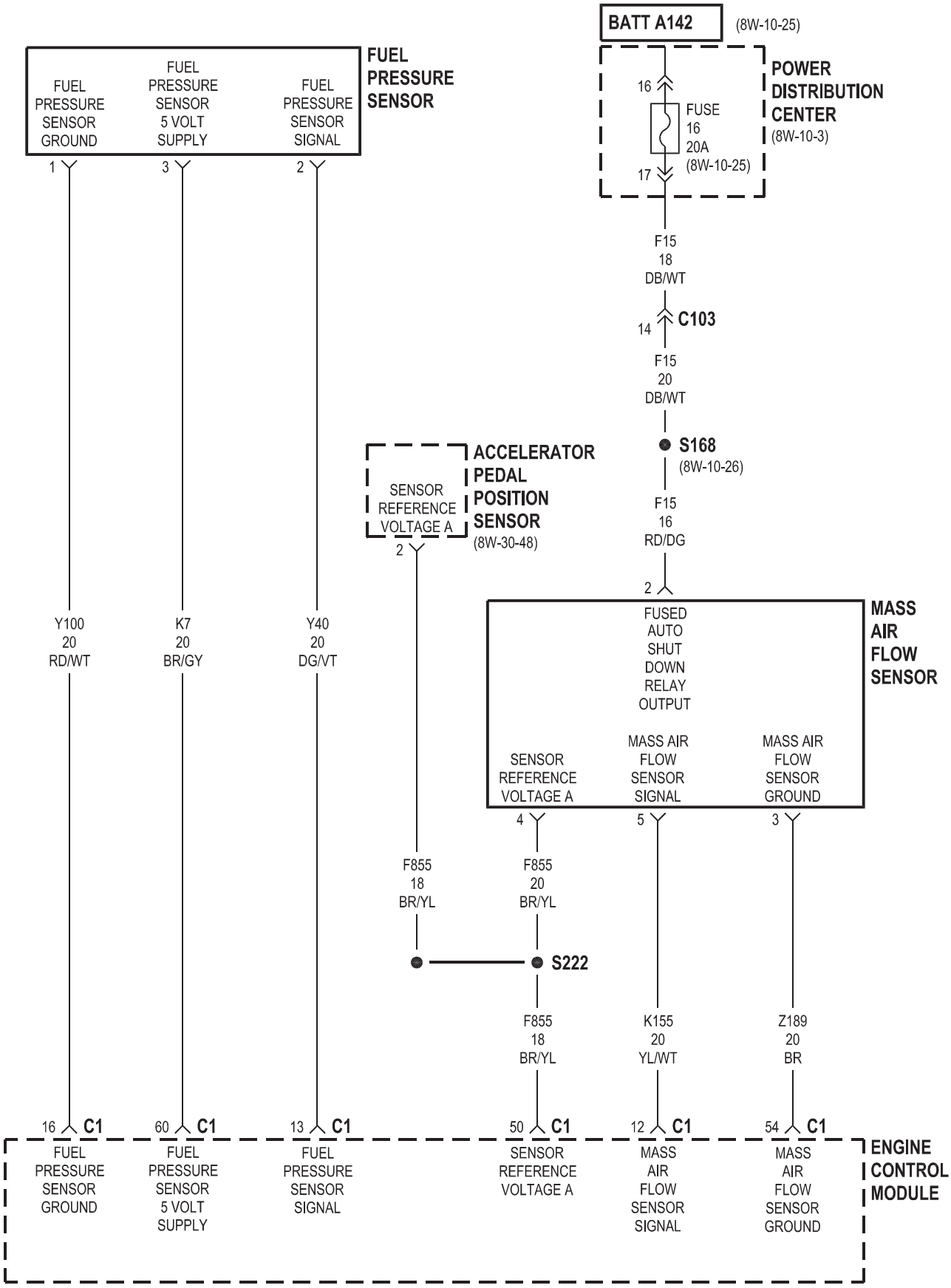

POWERTRAIN CONTROL MODULE
TORQUE MANAGEMENT REQUEST SENSE
OVERDRIVE OFF SWITCH SENSE
SECONDARY BRAKE SWITCH SIGNAL
13 C3
13 C3
24 C3
RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 21 10A
(8W-12-18)
(8W-12-19)
52 C3
LHD
RHD
T10 18 DG/LG
T10 18 YL/DG
K29 18 WT/PK
F12 20 DB/WT
5
SHIFTER ASSEMBLY
(8W-31-14)
8 C103
9 C101
LHD
RHD
T6 18 OR/WT
T6 18 OR/BK
6
K29 18 WT/PK
52 C106
14 C107
LHD
RHD
T6 18 OR/BK
T6 18 OR/BK
10 C106
40 C107
22 C200
K29 20 WT/PK
K29 18 WT/PK
K29 18 WT/PK
20 C200
T6 18 OR/BK
S314
(8W-33-2)
K29 18 WT/PK
3
1
SHIFTER ASSEMBLY
(8W-31-14)
BRAKE LAMP SWITCH
(8W-33-2)
2
T10 18 YL/DG
10
TORQUE MANAGEMENT REQUEST SENSE
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-9)
(8W-31-10)

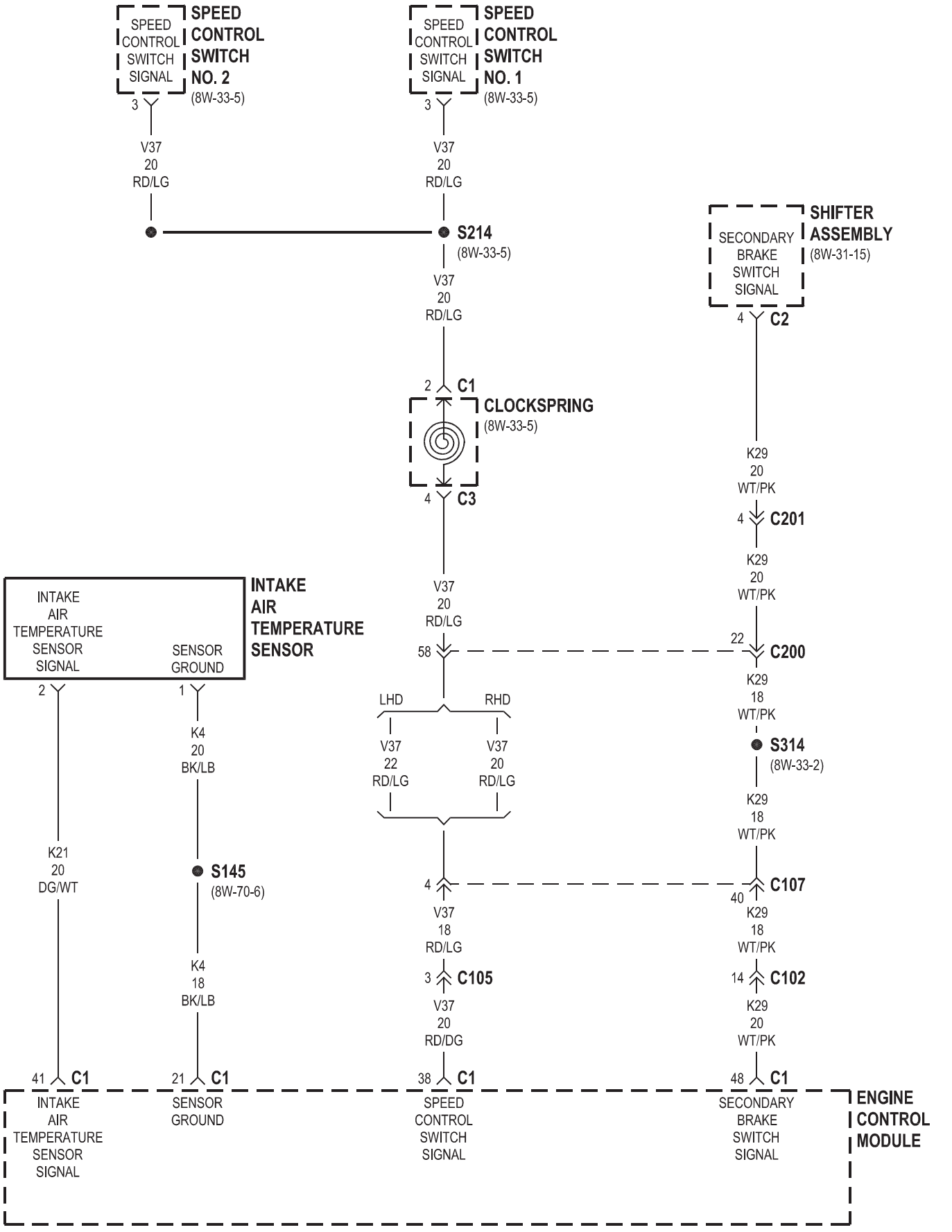

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 10 20A
(8W-12-11)
31 C2
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
L1 18 VT/BK
6 C102
4.7L
6 C104
4.0L
ADJUSTABLE PEDALS SWITCH
0 OFF
1 FORWARD
2 REARWARD
F72 16 RD/YL
Y153 20 DB/RD
Y152 20 LG/OR
Y151 20 LG/BR
C200
56 C106
S328
(8W-51-7)
C316
Y153 16 DB/RD
WT/BR
FUSED B(+)
ADJUSTABLE PEDALS SWITCH FEED
ADJUSTABLE PEDALS SWITCH SENSE (REARWARD)
ADJUSTABLE PEDALS SWITCH SENSE (FORWARD)
BACK-UP LAMP FEED
ADJUSTABLE PEDALS MODULE
GROUND
GROUND
PCI BUS
PEDAL POSITION SENSOR FEED
PEDAL POSITION SENSOR SENSE
PEDAL POSITION SENSOR RETURN
ADJUSTABLE PEDALS MOTOR (REARWARD)
ADJUSTABLE PEDALS MOTOR (FORWARD)
Z151 16 BK
Z155 20 BK/OR
D25 20 VT/YL
Q113 20 OR/DB
Q112 20 OR/YL
Q114 20 OR/TN
Q111 16 OR/GY
Q110 16 OR/VT
Z151 18 BK
Z155 18 BK/OR
D25 20 YL/VT
C300
S312
(8W-18-2)
S332
(8W-15-17)
(8W-15-18)
S301
(8W-15-21)
Z151 14 BK
Z155 18 BK/OR
D25 20 YL/VT/GY
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
G300
(8W-15-17)
G300
(8W-15-17)
ADJUSTABLE PEDALS MOTOR/ SENSOR ASSEMBLY

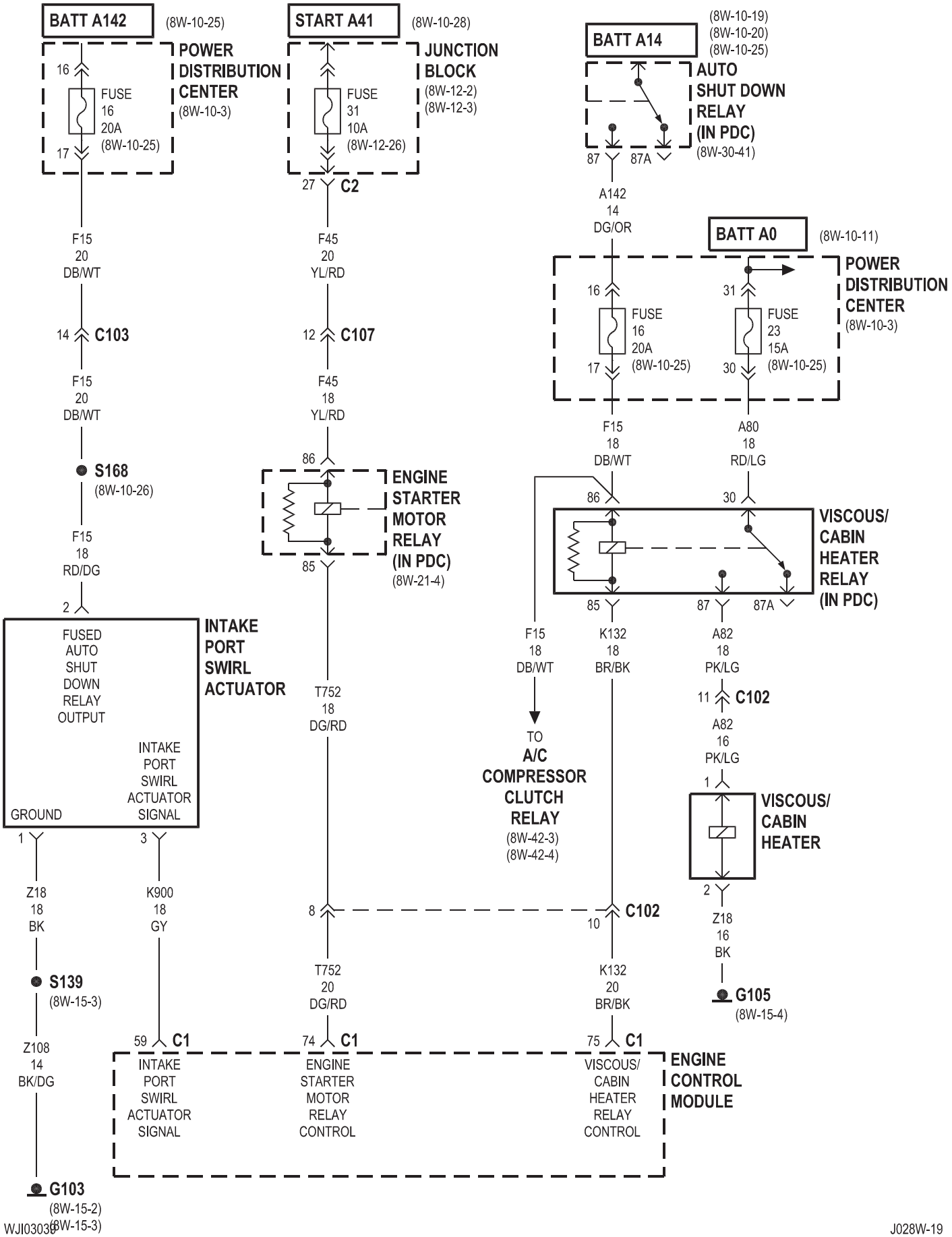

BATT A0
(8W-10-11)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
(8W-10-3)
27
FUSE
22
10A
(8W-10-31)
28
F300
18
RD/BK
2 C105
F300
20
RD/BK
19 C1
BATTERY
SENSE (+)
ENGINE
CONTROL
MODULE
BATTERY
SENSE (-)
20 C1
GROUND
1 C1
GROUND
2 C1
Z108
14
BK/DG
Z108
14
BK/DG
Z11
20
BK/WT
S139
(8W-15-3)
Z108
12
BK/DG
G103
(8W-15-2)
(8W-15-3)


WASTEGATE SOLENOID
WASTEGATE SOLENOID CONTROL
FUSED AUTO SHUT DOWN RELAY OUTPUT
2
1
F15 20 DB/WT
Y42 18 OR/DB
S162
(8W-10-26)
F15 20 DB/WT
20
1
C106
Y42 18 OR/DB
F15 20 DB/WT
24
11
C107
Y42 18 OR/DB
F15 18 DB/WT
8
C103
Y42 20 OR/DB
76
C1
WASTEGATE SOLENOID CONTROL
FROM AUTO SHUT DOWN RELAY
(8W-30-41)
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE 16 20A
(8W-10-25)
17
F15 18 DB/WT
F15 18 DB/WT
14
C103
F15 20 DB/WT
F15 18 DB/WT
86
VISCOUS/ CABIN HEATER RELAY (IN PDC)
(8W-30-39)
85
F15 18 DB/WT
86
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-4)
85
F15 18 DB/WT
86
GLOW PLUG RELAY NO. 1 (IN PDC)
(8W-30-42)
85
F15 18 DB/WT
86
GLOW PLUG RELAY NO. 2 (IN PDC)
(8W-30-43)
85
S168
(8W-10-26)
F15 16 RD/DG
S176
(8W-10-26)
F15 16 DB/WT
F15 16 RD/DG
1
GENERATOR
FUSED AUTO SHUT DOWN RELAY OUTPUT
GENERATOR FIELD CONTROL
2
K20 14 DB
3
C1
GENERATOR FIELD CONTROL
2
CRANKCASE HEATER
FUSED AUTO SHUT DOWN RELAY OUTPUT
GROUND
1
Z18 20 BR
G105
(8W-15-4)
ENGINE CONTROL MODULE


CONTROLLER ANTILOCK BRAKE
(8W-35-5)
CAN C BUS (-)
CAN C BUS (+)
14
11
D51 18 DG/WT
D52 18 LG/WT
5
C102
4
TRANSMISSION CONTROL MODULE
(8W-31-17)
CAN C BUS (-)
CAN C BUS (+)
L2
C2
H1
C2
D51 16 WT
D52 16 DG/WT
D51 18 DG/WT
D52 18 LG/WT
2
C113
1
D51 16 WT
D52 16 DG/WT
S172
S171
D51 18 WT
D52 18 DG/WT
25
C1
6
C1
CAN C BUS (-)
CAN C BUS (+)
ENGINE CONTROL MODULE

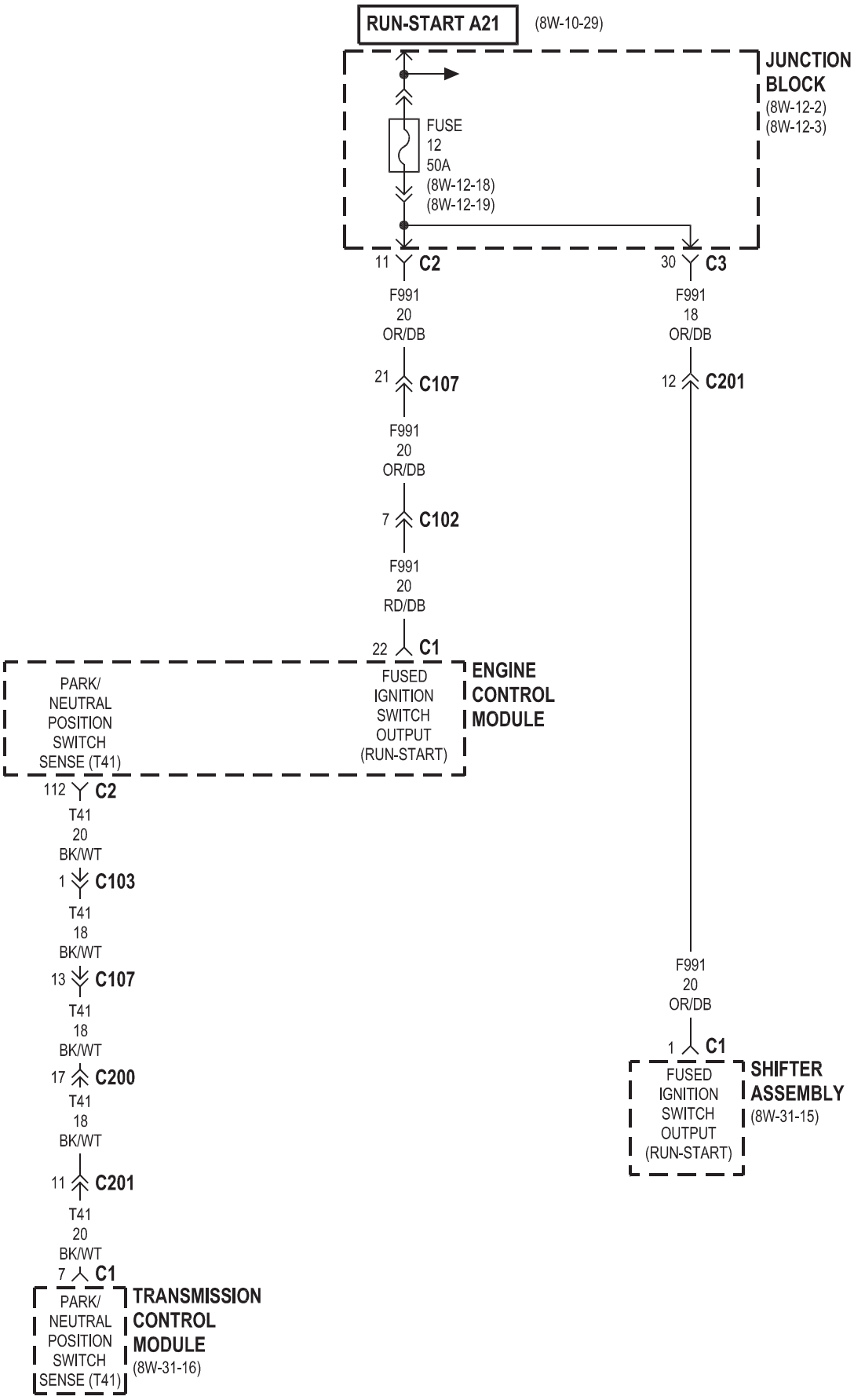

BATT A142
(8W-10-25)
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE 16 20A
(8W-10-25)
17
FUEL PRESSURE SENSOR
FUEL PRESSURE SENSOR GROUND
FUEL PRESSURE SENSOR 5 VOLT SUPPLY
FUEL PRESSURE SENSOR SIGNAL
1
3
2
F15 18 DB/WT
14
C103
F15 20 DB/WT
S168
(8W-10-26)
F15 16 RD/DG
2
ACCELERATOR PEDAL POSITION SENSOR
(8W-30-48)
SENSOR REFERENCE VOLTAGE A
2
MASS AIR FLOW SENSOR
FUSED AUTO SHUT DOWN RELAY OUTPUT
SENSOR REFERENCE VOLTAGE A
MASS AIR FLOW SENSOR SIGNAL
MASS AIR FLOW SENSOR GROUND
4
5
3
Y100 20 RD/WT
K7 20 BR/GY
Y40 20 DG/VT
F855 18 BR/YL
F855 20 BR/YL
S222
F855 18 BR/YL
K155 20 YL/WT
Z189 20 BR
16 C1
60 C1
13 C1
50 C1
12 C1
54 C1
ENGINE CONTROL MODULE
FUEL PRESSURE SENSOR GROUND
FUEL PRESSURE SENSOR 5 VOLT SUPPLY
FUEL PRESSURE SENSOR SIGNAL
SENSOR REFERENCE VOLTAGE A
MASS AIR FLOW SENSOR SIGNAL
MASS AIR FLOW SENSOR GROUND

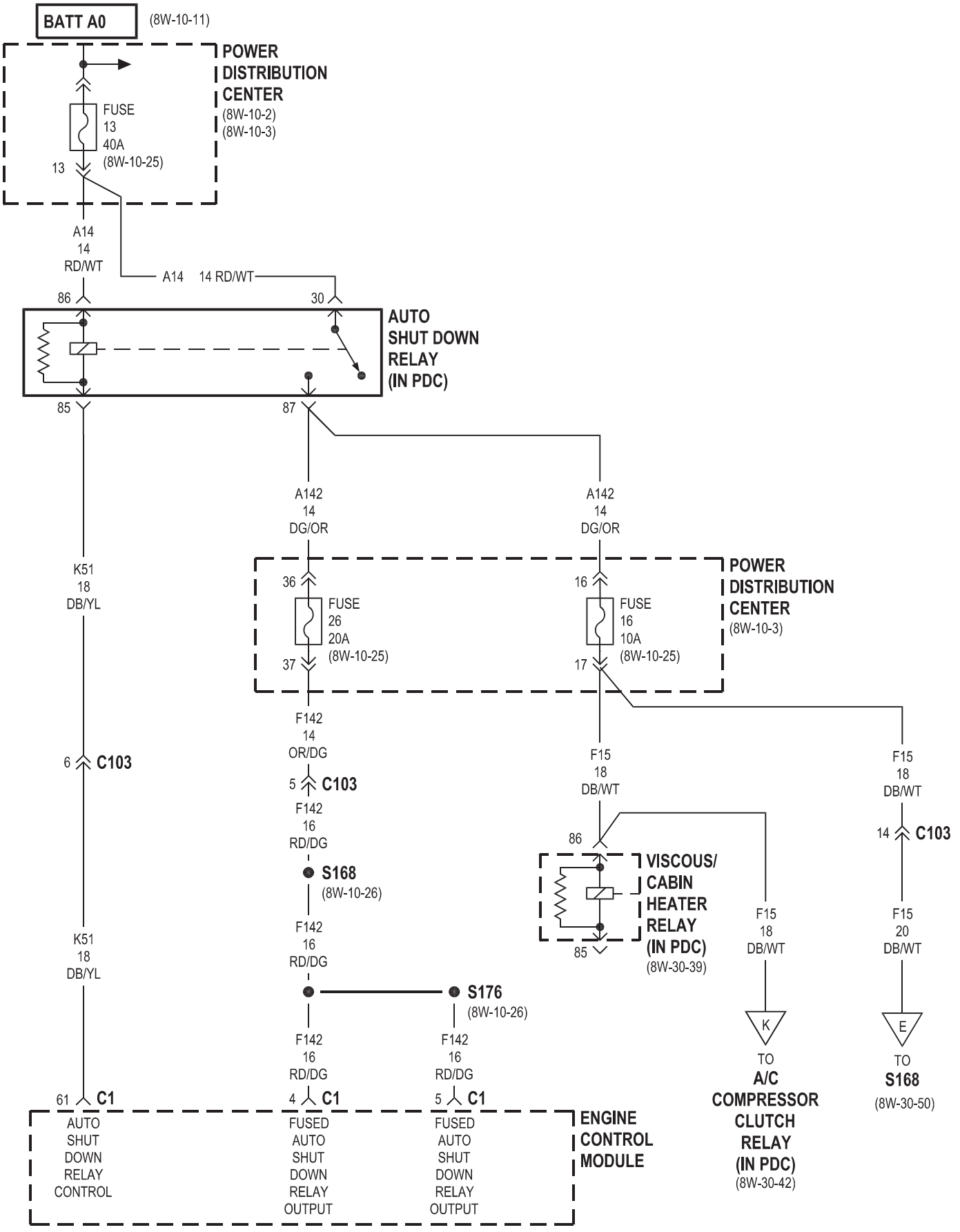

SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 2
(8W-33-5)
3
V37
20
RD/LG
SPEED CONTROL SWITCH SIGNAL
SPEED CONTROL SWITCH NO. 1
(8W-33-5)
3
V37
20
RD/LG
S214
(8W-33-5)
V37
20
RD/LG
SECONDARY BRAKE SWITCH SIGNAL
SHIFTER ASSEMBLY
(8W-31-15)
4
C2
2
C1
CLOCKSPRING
(8W-33-5)
4
C3
K29
20
WT/PK
4
C201
K29
20
WT/PK
INTAKE AIR TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
INTAKE AIR TEMPERATURE SENSOR
2
1
V37
20
RD/LG
58
22
C200
K29
18
WT/PK
LHD
RHD
V37
22
RD/LG
V37
20
RD/LG
S314
(8W-33-2)
K4
20
BK/LB
K29
18
WT/PK
K21
20
DG/WT
S145
(8W-70-6)
4
40
C107
V37
18
RD/LG
K29
18
WT/PK
K4
18
BK/LB
3
C105
14
C102
V37
20
RD/DG
K29
20
WT/PK
41
C1
21
C1
38
C1
48
C1
INTAKE AIR TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
SPEED CONTROL SWITCH SIGNAL
SECONDARY BRAKE SWITCH SIGNAL
ENGINE CONTROL MODULE

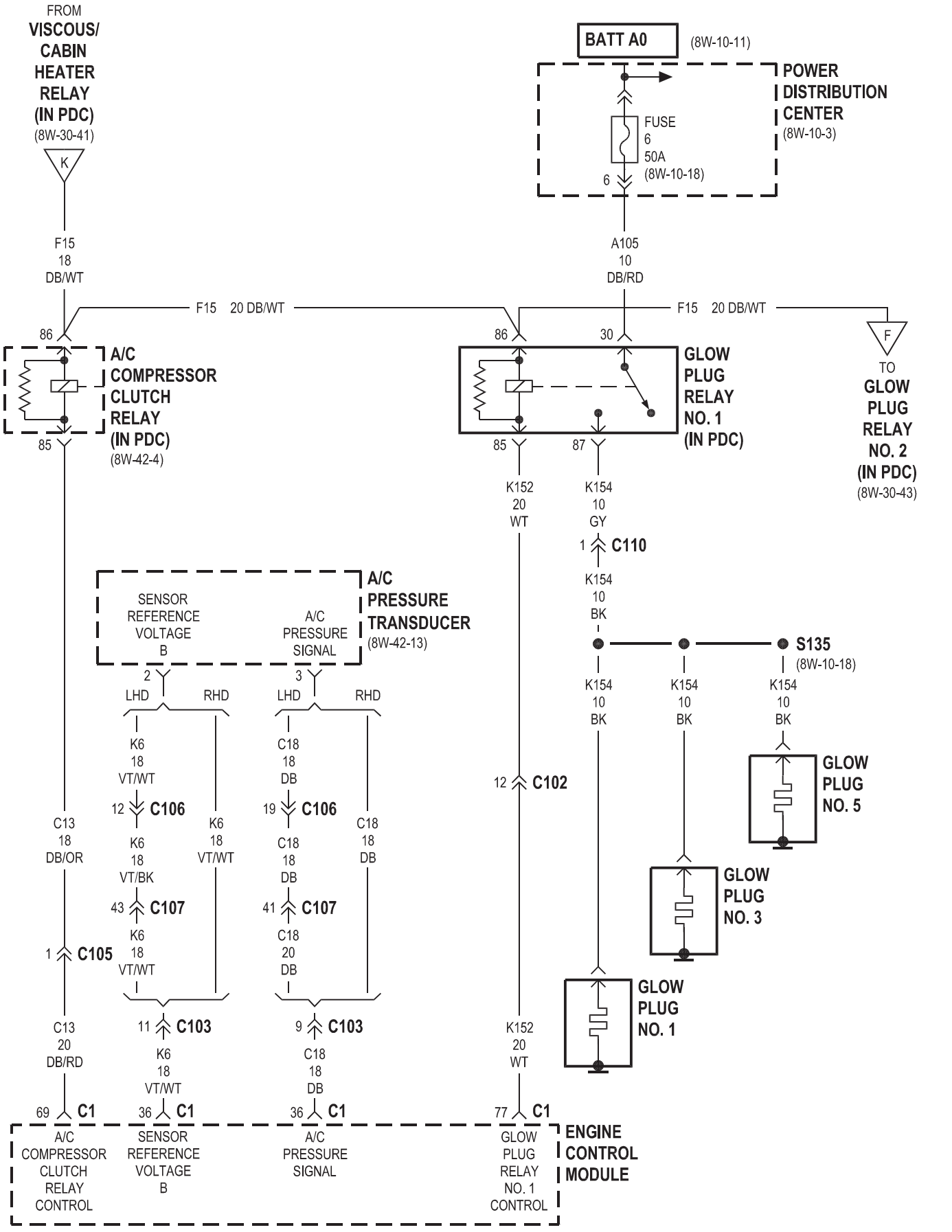


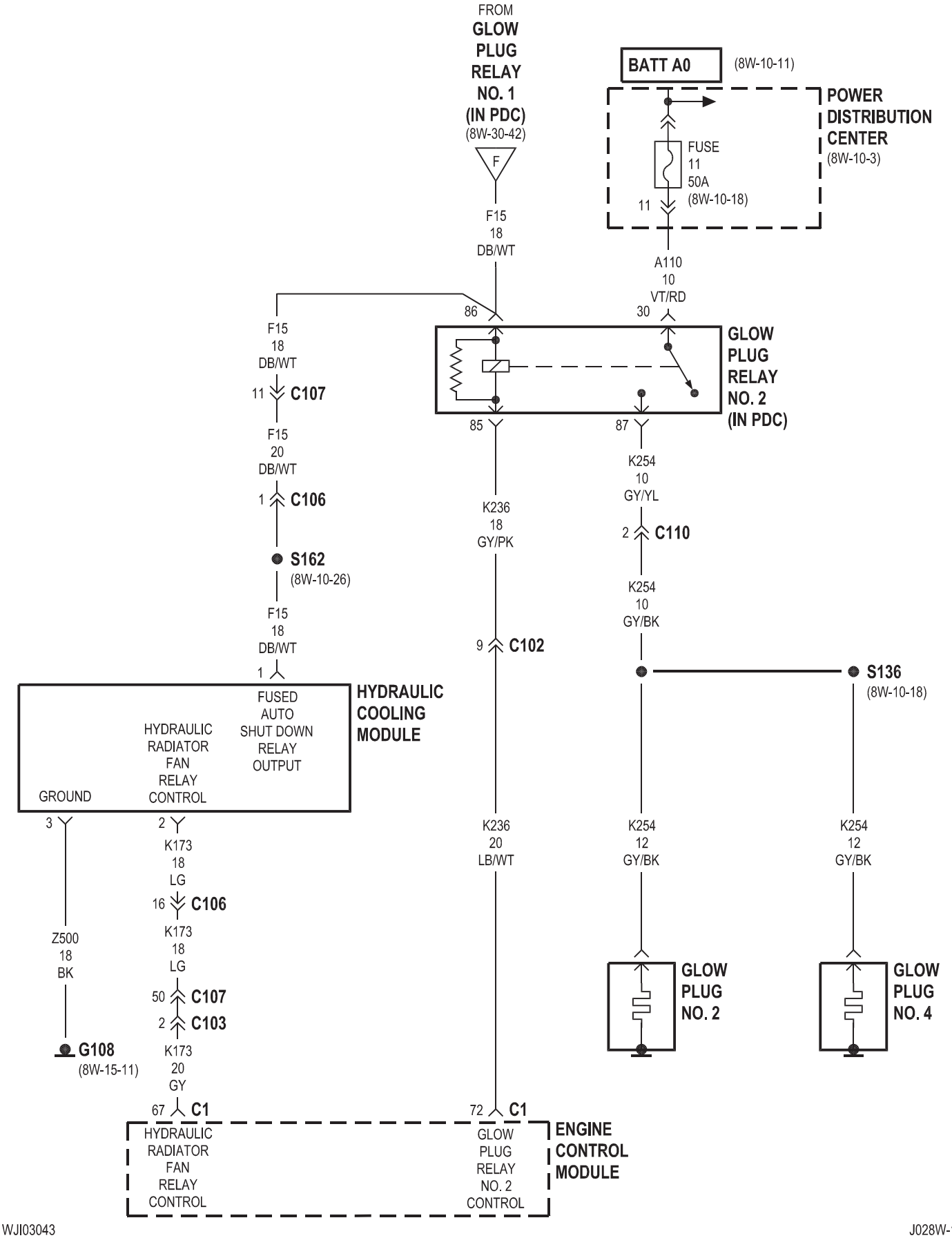
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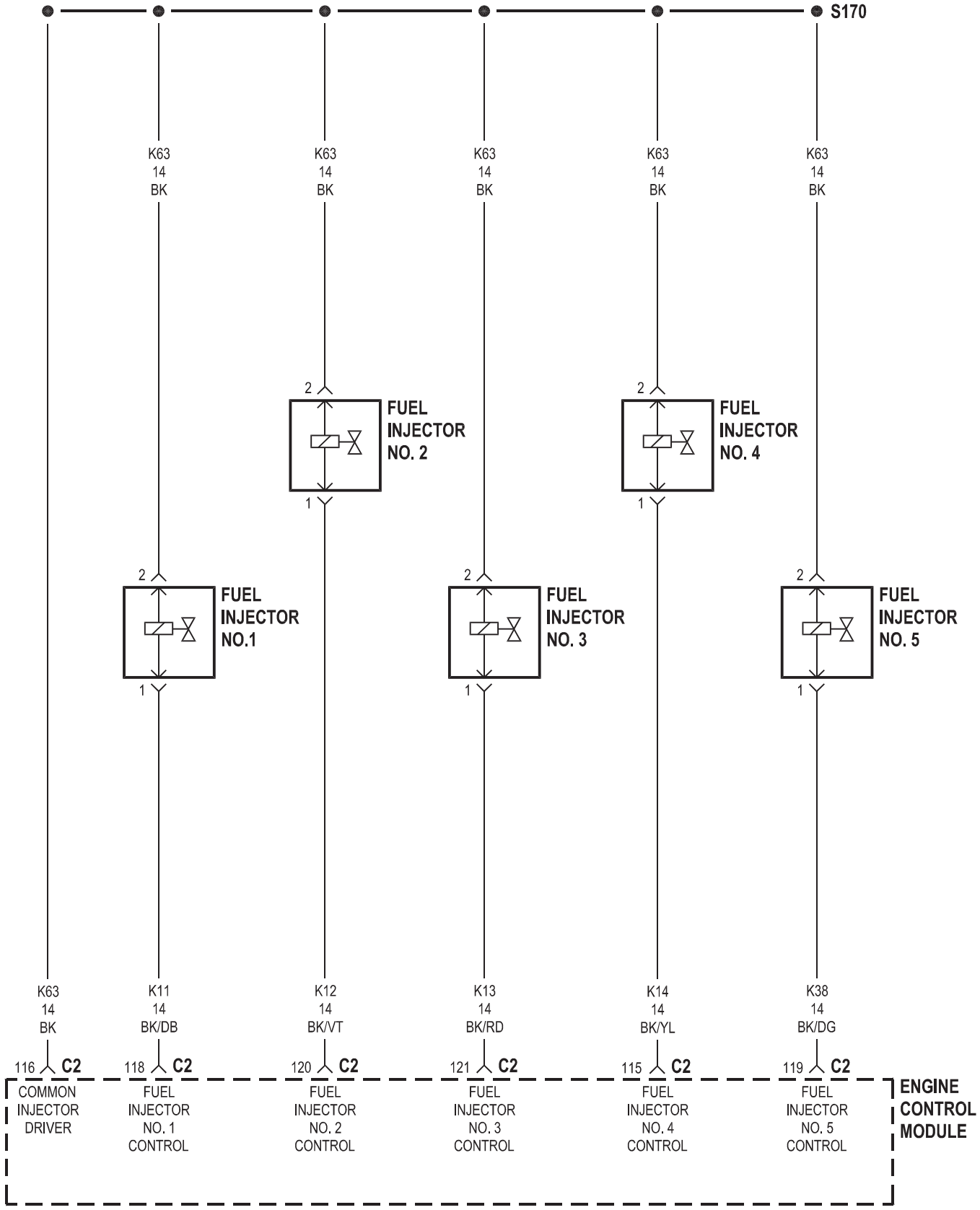
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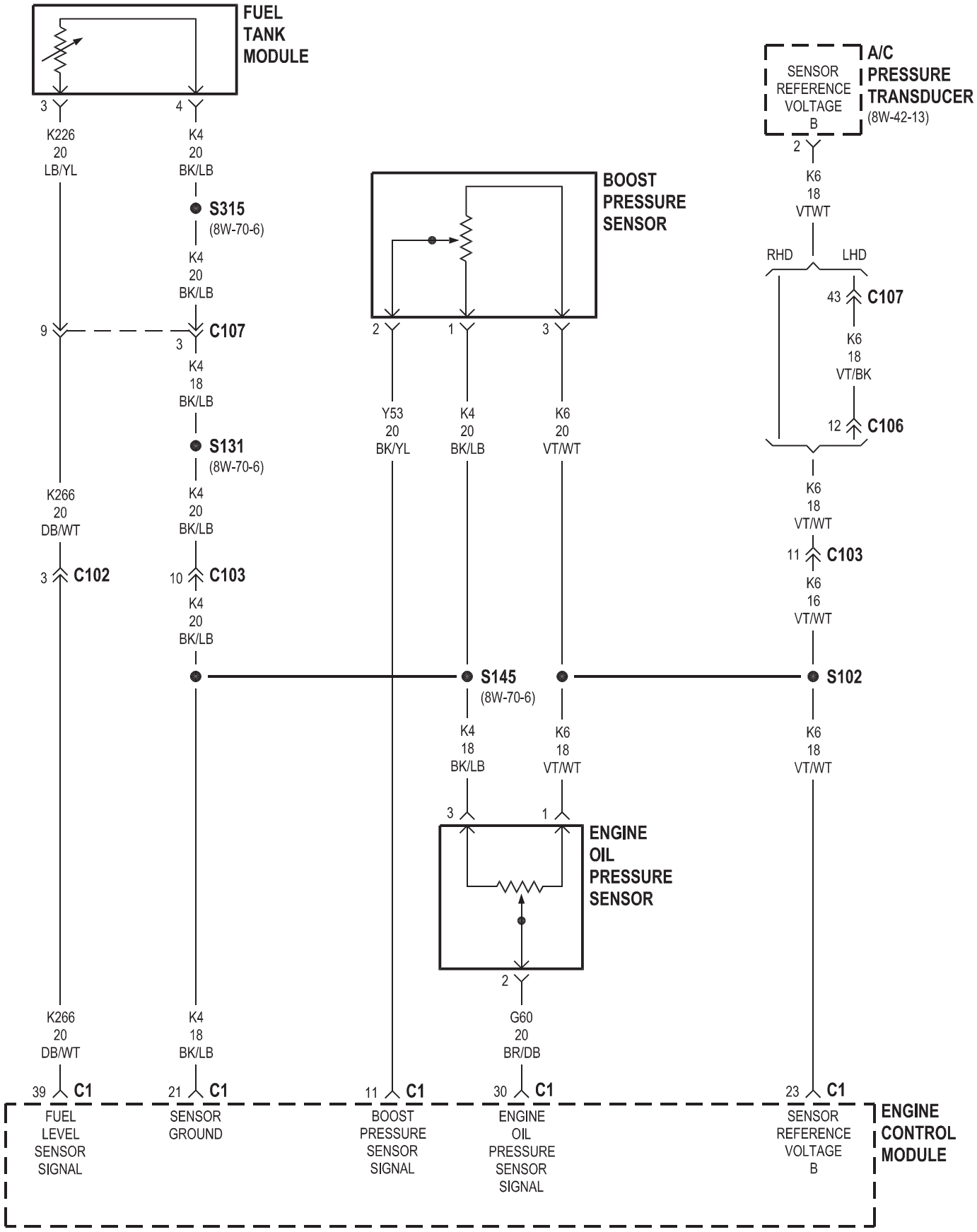

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
12
50A
(8W-12-18)
(8W-12-19)
11 C2
30 C3
F991
20
OR/DB
F991
18
OR/DB
21 C107
12 C201
F991
20
OR/DB
7 C102
F991
20
RD/DB
22 C1
PARK/
NEUTRAL
POSITION
SWITCH
SENSE (T41)
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
ENGINE
CONTROL
MODULE
112 C2
T41
20
BK/WT
1 C103
T41
18
BK/WT
13 C107
T41
18
BK/WT
17 C200
T41
18
BK/WT
11 C201
T41
20
BK/WT
7 C1
PARK/
NEUTRAL
POSITION
SWITCH
SENSE (T41)
TRANSMISSION
CONTROL
MODULE
(8W-31-16)
F991
20
OR/DB
1 C1
FUSED
IGNITION
SWITCH
OUTPUT
(RUN-START)
SHIFTER
ASSEMBLY
(8W-31-15)

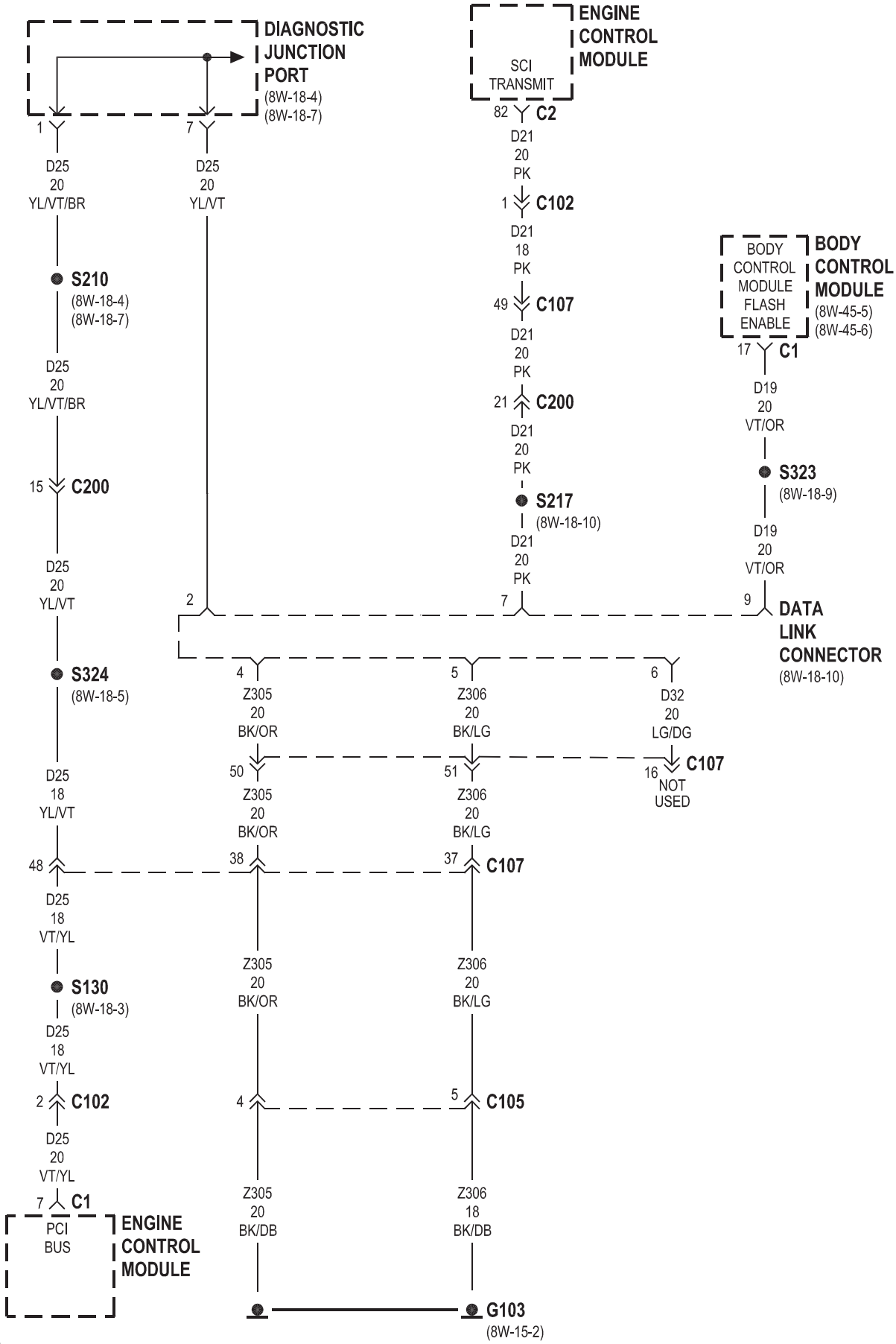

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 13 40A
(8W-10-25)
13
A14 14 RD/WT
A14 14 RD/WT
86
30
AUTO SHUT DOWN RELAY (IN PDC)
85
87
A142 14 DG/OR
A142 14 DG/OR
K51 18 DB/YL
36
FUSE 26 20A
(8W-10-25)
37
16
FUSE 16 10A
(8W-10-25)
17
POWER DISTRIBUTION CENTER
(8W-10-3)
F142 14 OR/DG
F15 18 DB/WT
F15 18 DB/WT
6 C103
5 C103
14 C103
F142 16 RD/DG
86
VISCOUS/ CABIN HEATER RELAY (IN PDC)
(8W-30-39)
85
S168
(8W-10-26)
F15 18 DB/WT
F15 20 DB/WT
K51 18 DB/YL
F142 16 RD/DG
S176
(8W-10-26)
K
E
TO A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-30-42)
TO S168
(8W-30-50)
F142 16 RD/DG
F142 16 RD/DG
61 C1
4 C1
5 C1
AUTO SHUT DOWN RELAY CONTROL
FUSED AUTO SHUT DOWN RELAY OUTPUT
FUSED AUTO SHUT DOWN RELAY OUTPUT
ENGINE CONTROL MODULE

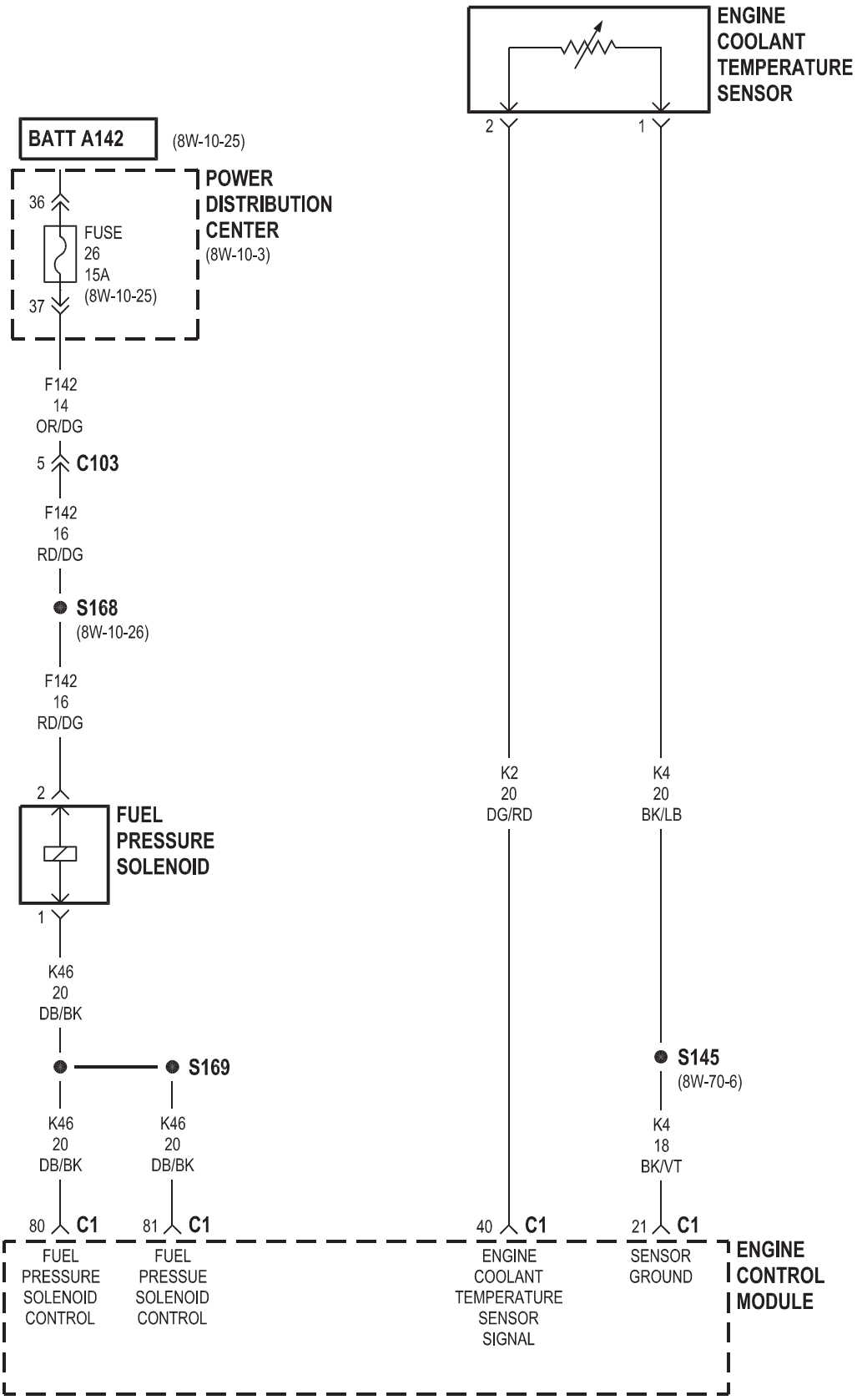

FROM VISCOUS/ CABIN HEATER RELAY (IN PDC) (8W-30-41)
K
F15 18 DB/WT
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
FUSE 6 50A
(8W-10-18)
6
A105 10 DB/RD
F15 20 DB/WT
F15 20 DB/WT
F
TO GLOW PLUG RELAY NO. 2 (IN PDC)
(8W-30-43)
86
85
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
(8W-42-4)
86
30
85
87
GLOW PLUG RELAY NO. 1 (IN PDC)
K152 20 WT
K154 10 GY
1 C110
K154 10 BK
S135
(8W-10-18)
A/C PRESSURE TRANSDUCER
(8W-42-13)
SENSOR REFERENCE VOLTAGE B
A/C PRESSURE SIGNAL
2
3
LHD
RHD
K6 18 VT/WT
K6 18 VT/BK
C18 18 DB
C18 20 DB
12 C106
19 C106
43 C107
41 C107
12 C102
K154 10 BK
GLOW PLUG NO. 5
GLOW PLUG NO. 3
GLOW PLUG NO. 1
C13 18 DB/OR
1 C105
C13 20 DB/RD
11 C103
9 C103
K152 20 WT
69 C1
36 C1
36 C1
77 C1
A/C COMPRESSOR CLUTCH RELAY CONTROL
SENSOR REFERENCE VOLTAGE B
A/C PRESSURE SIGNAL
GLOW PLUG RELAY NO. 1 CONTROL
ENGINE CONTROL MODULE

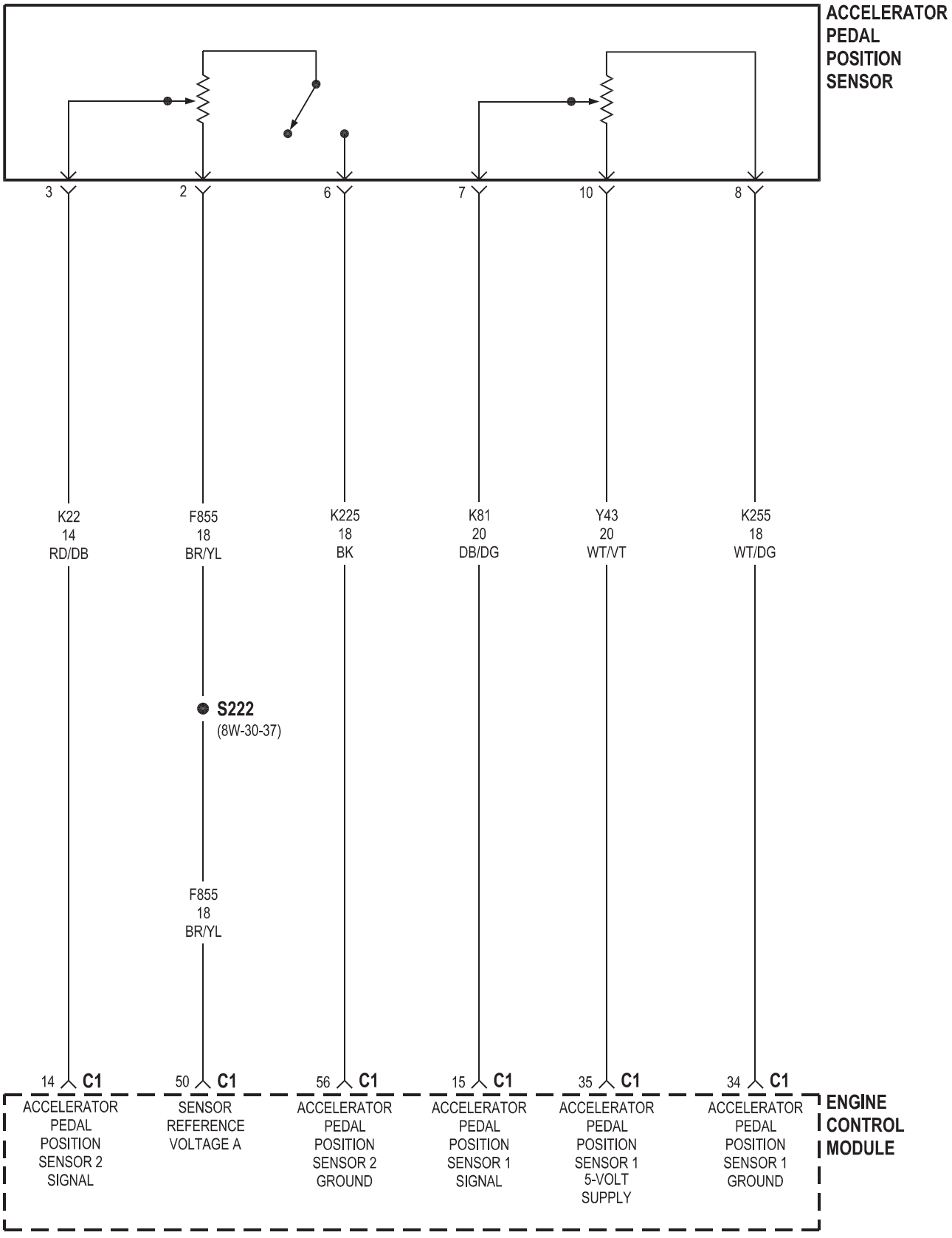

FROM GLOW PLUG RELAY NO. 1 (IN PDC) (8W-30-42)
F
F15 18 DB/WT
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER (8W-10-3)
FUSE 11 50A (8W-10-18)
11
A110 10 VT/RD
30
86
85
87
GLOW PLUG RELAY NO. 2 (IN PDC)
F15 18 DB/WT
11 C107
F15 20 DB/WT
1 C106
S162 (8W-10-26)
F15 18 DB/WT
1
K236 18 GY/PK
9 C102
K254 10 GY/YL
2 C110
K254 10 GY/BK
S136 (8W-10-18)
HYDRAULIC COOLING MODULE
FUSED AUTO SHUT DOWN RELAY OUTPUT
HYDRAULIC RADIATOR FAN RELAY CONTROL
GROUND
3
2
K173 18 LG
16 C106
K173 18 LG
50 C107
2 C103
K173 20 GY
67 C1
Z500 18 BK
G108 (8W-15-11)
K236 20 LB/WT
72 C1
K254 12 GY/BK
K254 12 GY/BK
GLOW PLUG NO. 2
GLOW PLUG NO. 4
HYDRAULIC RADIATOR FAN RELAY CONTROL
GLOW PLUG RELAY NO. 2 CONTROL
ENGINE CONTROL MODULE

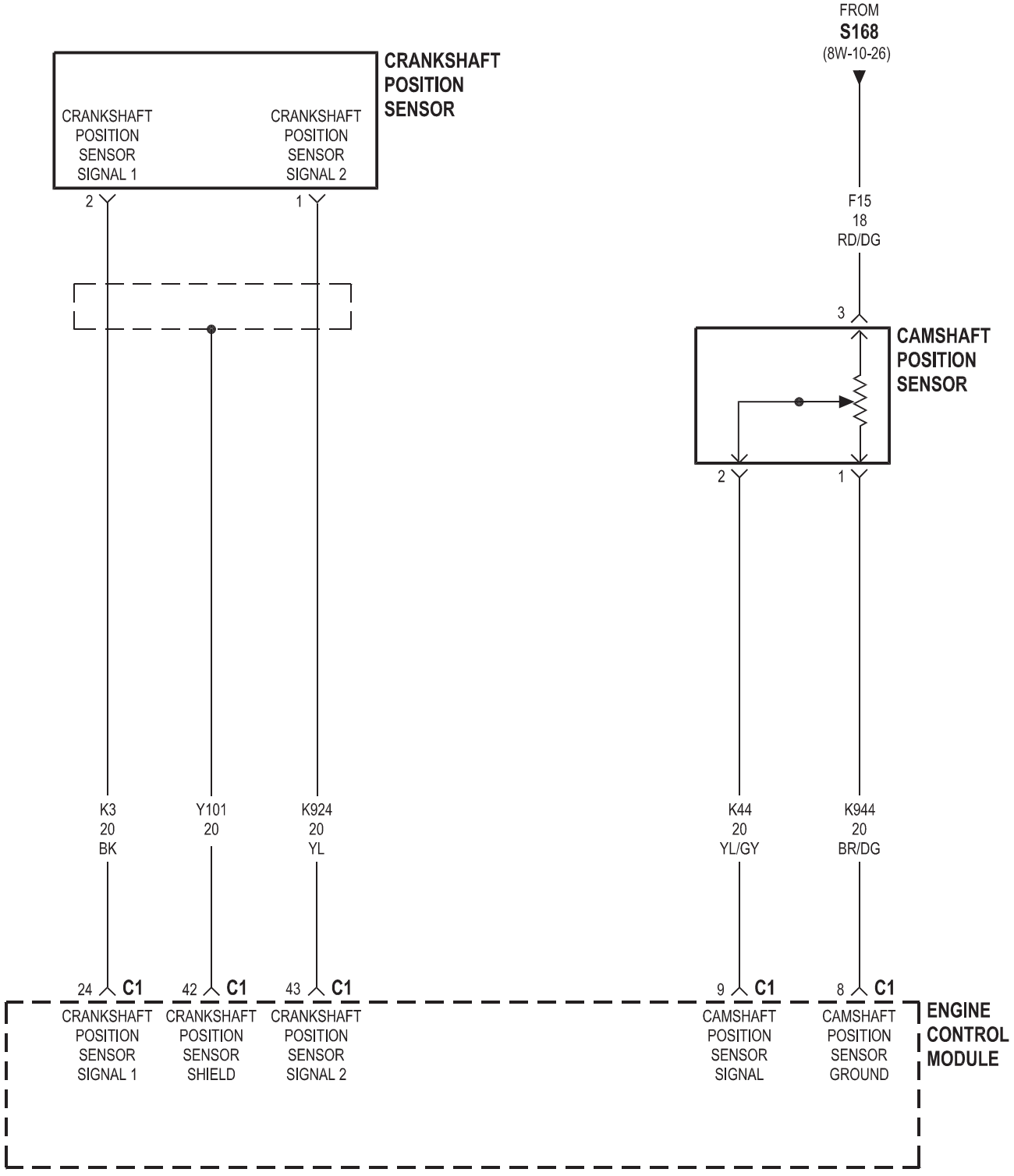

S170
K63
14
BK
K63
14
BK
K63
14
BK
K63
14
BK
K63
14
BK
2
FUEL
INJECTOR
NO. 2
1
2
FUEL
INJECTOR
NO. 4
1
2
FUEL
INJECTOR
NO.1
1
2
FUEL
INJECTOR
NO. 3
1
2
FUEL
INJECTOR
NO. 5
1
K63
14
BK
K11
14
BK/DB
K12
14
BK/VT
K13
14
BK/RD
K14
14
BK/YL
K38
14
BK/DG
116 C2
118 C2
120 C2
121 C2
115 C2
119 C2
COMMON
INJECTOR
DRIVER
FUEL
INJECTOR
NO. 1
CONTROL
FUEL
INJECTOR
NO. 2
CONTROL
FUEL
INJECTOR
NO. 3
CONTROL
FUEL
INJECTOR
NO. 4
CONTROL
FUEL
INJECTOR
NO. 5
CONTROL
ENGINE
CONTROL
MODULE

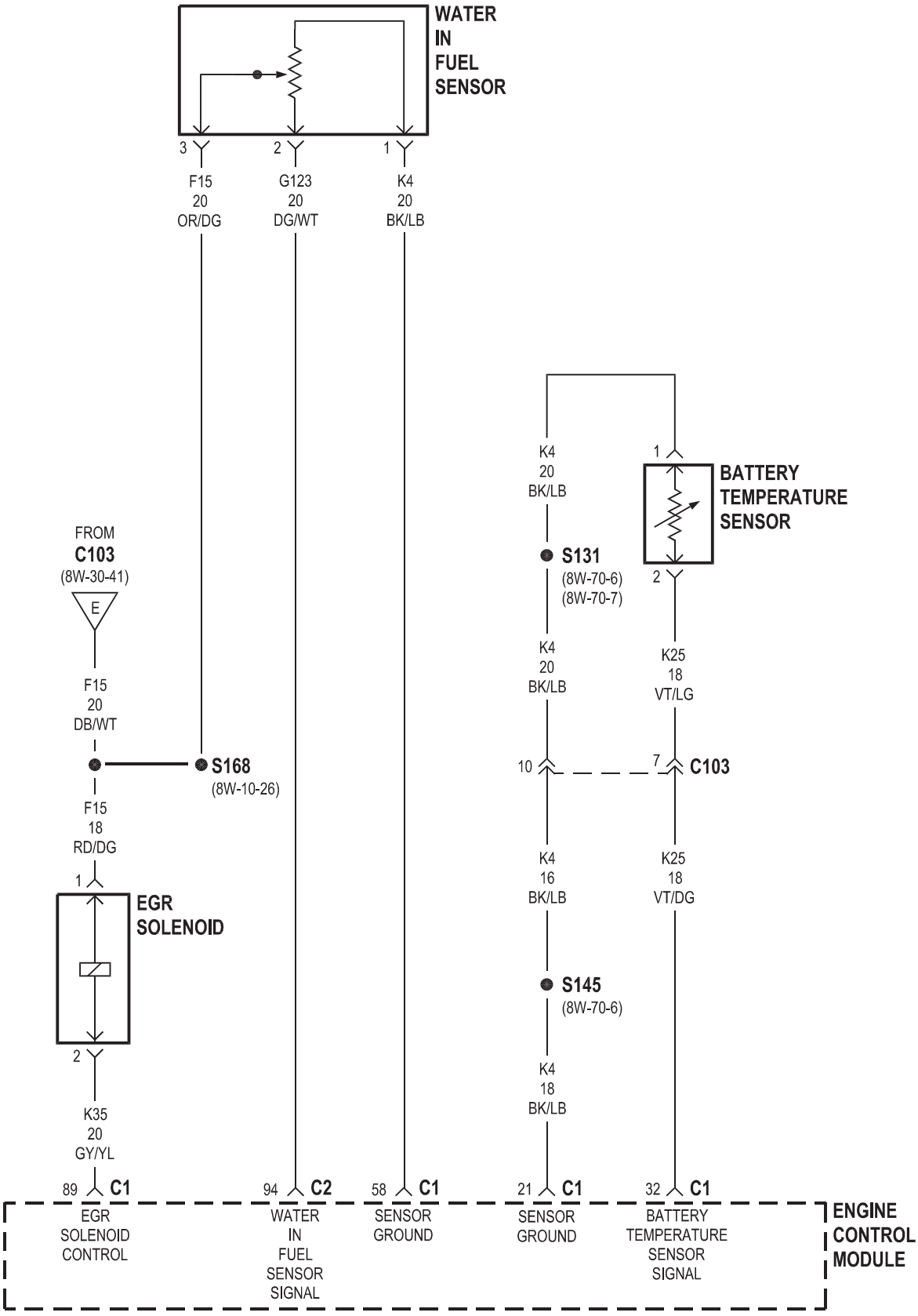

FUEL TANK MODULE
3
4
K226 20 LB/YL
K4 20 BK/LB
S315
(8W-70-6)
K4 20 BK/LB
9
C107
3
K4 18 BK/LB
S131
(8W-70-6)
K4 20 BK/LB
K266 20 DB/WT
3
C102
10
C103
K4 20 BK/LB
BOOST PRESSURE SENSOR
2
1
3
Y53 20 BK/YL
K4 20 BK/LB
K6 20 VT/WT
A/C PRESSURE TRANSDUCER
(8W-42-13)
SENSOR REFERENCE VOLTAGE B
2
K6 18 VTWT
RHD
LHD
43
C107
K6 18 VT/BK
12
C106
K6 18 VT/WT
11
C103
K6 16 VT/WT
S145
(8W-70-6)
S102
K4 18 BK/LB
K6 18 VT/WT
K6 18 VT/WT
3
1
ENGINE OIL PRESSURE SENSOR
2
K266 20 DB/WT
K4 18 BK/LB
G60 20 BR/DB
39
C1
21
C1
11
C1
30
C1
23
C1
FUEL LEVEL SENSOR SIGNAL
SENSOR GROUND
BOOST PRESSURE SENSOR SIGNAL
ENGINE OIL PRESSURE SENSOR SIGNAL
SENSOR REFERENCE VOLTAGE B
ENGINE CONTROL MODULE

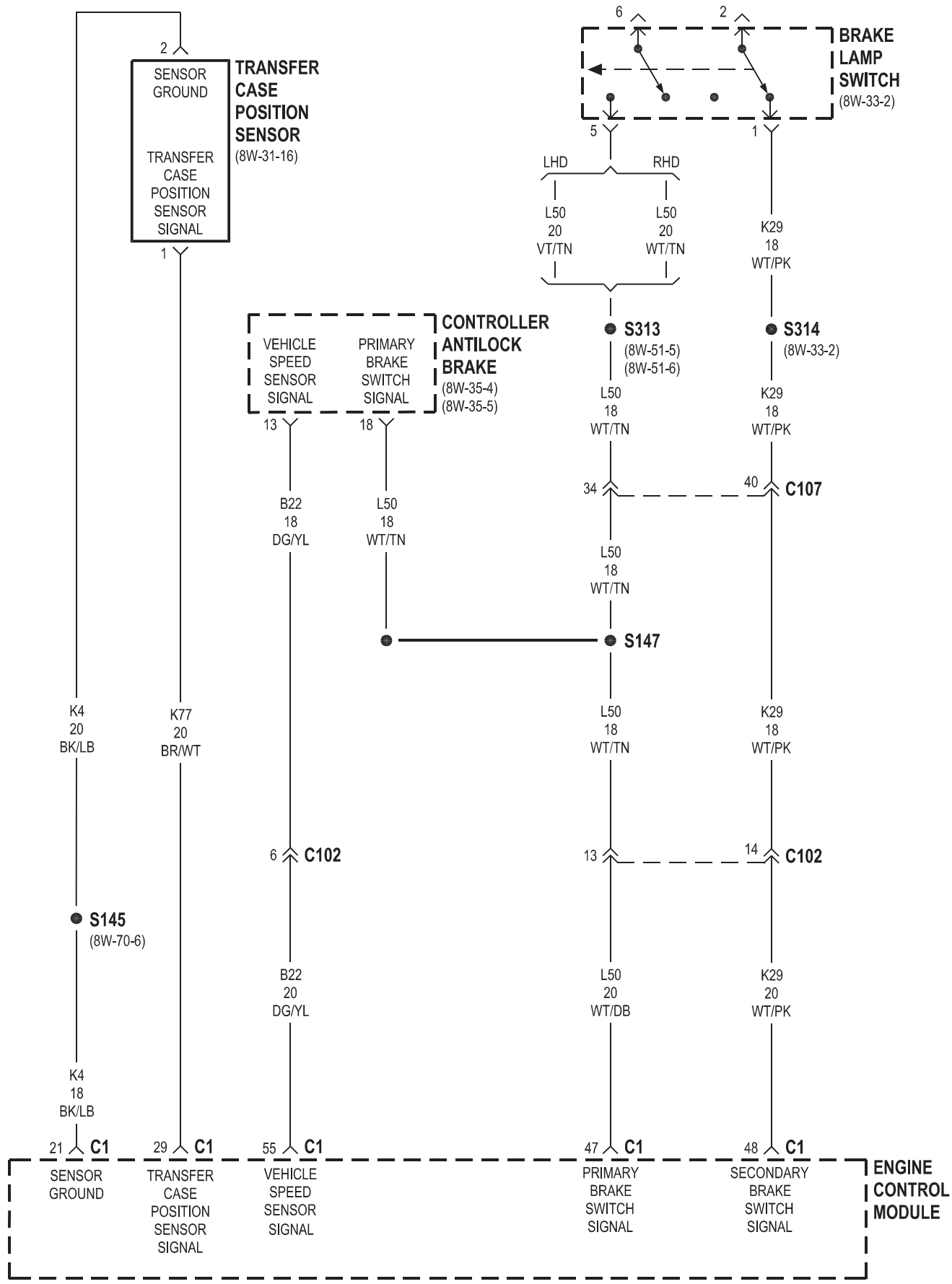

DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
1
7
D25
20
YL/VT/BR
D25
20
YL/VT
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-5)
D25
18
YL/VT
48
D25
18
VT/YL
S130
(8W-18-3)
D25
18
VT/YL
2
C102
D25
20
VT/YL
7
C1
PCI
BUS
ENGINE
CONTROL
MODULE
ENGINE
CONTROL
MODULE
SCI
TRANSMIT
82
C2
D21
20
PK
1
C102
D21
18
PK
49
C107
D21
20
PK
21
C200
D21
20
PK
S217
(8W-18-10)
D21
20
PK
7
BODY
CONTROL
MODULE
FLASH
ENABLE
BODY
CONTROL
MODULE
(8W-45-5)
(8W-45-6)
17
C1
D19
20
VT/OR
S323
(8W-18-9)
D19
20
VT/OR
9
DATA
LINK
CONNECTOR
(8W-18-10)
2
4
Z305
20
BK/OR
5
Z306
20
BK/LG
6
D32
20
LG/DG
50
Z305
20
BK/OR
51
Z306
20
BK/LG
16
C107
NOT
USED
38
37
C107
Z305
20
BK/OR
Z306
20
BK/LG
4
5
C105
Z305
20
BK/DB
Z306
18
BK/DB
G103
(8W-15-2)
(8W-15-3)


ENGINE COOLANT TEMPERATURE SENSOR
2
1
BATT A142
(8W-10-25)
POWER DISTRIBUTION CENTER
(8W-10-3)
36
FUSE 26 15A
(8W-10-25)
37
F142 14 OR/DG
5 C103
F142 16 RD/DG
S168
(8W-10-26)
F142 16 RD/DG
2
FUEL PRESSURE SOLENOID
1
K46 20 DB/BK
S169
K46 20 DB/BK
K46 20 DB/BK
80 C1
81 C1
FUEL PRESSURE SOLENOID CONTROL
FUEL PRESSUE SOLENOID CONTROL
K2 20 DG/RD
K4 20 BK/LB
S145
(8W-70-6)
K4 18 BK/VT
40 C1
21 C1
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
ENGINE CONTROL MODULE


ACCELERATOR PEDAL POSITION SENSOR
3
2
6
7
10
8
K22 14 RD/DB
F855 18 BR/YL
K225 18 BK
K81 20 DB/DG
Y43 20 WT/VT
K255 18 WT/DG
S222
(8W-30-37)
F855 18 BR/YL
14 C1
50 C1
56 C1
15 C1
35 C1
34 C1
ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL
SENSOR REFERENCE VOLTAGE A
ACCELERATOR PEDAL POSITION SENSOR 2 GROUND
ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL
ACCELERATOR PEDAL POSITION SENSOR 1 5-VOLT SUPPLY
ACCELERATOR PEDAL POSITION SENSOR 1 GROUND
ENGINE CONTROL MODULE

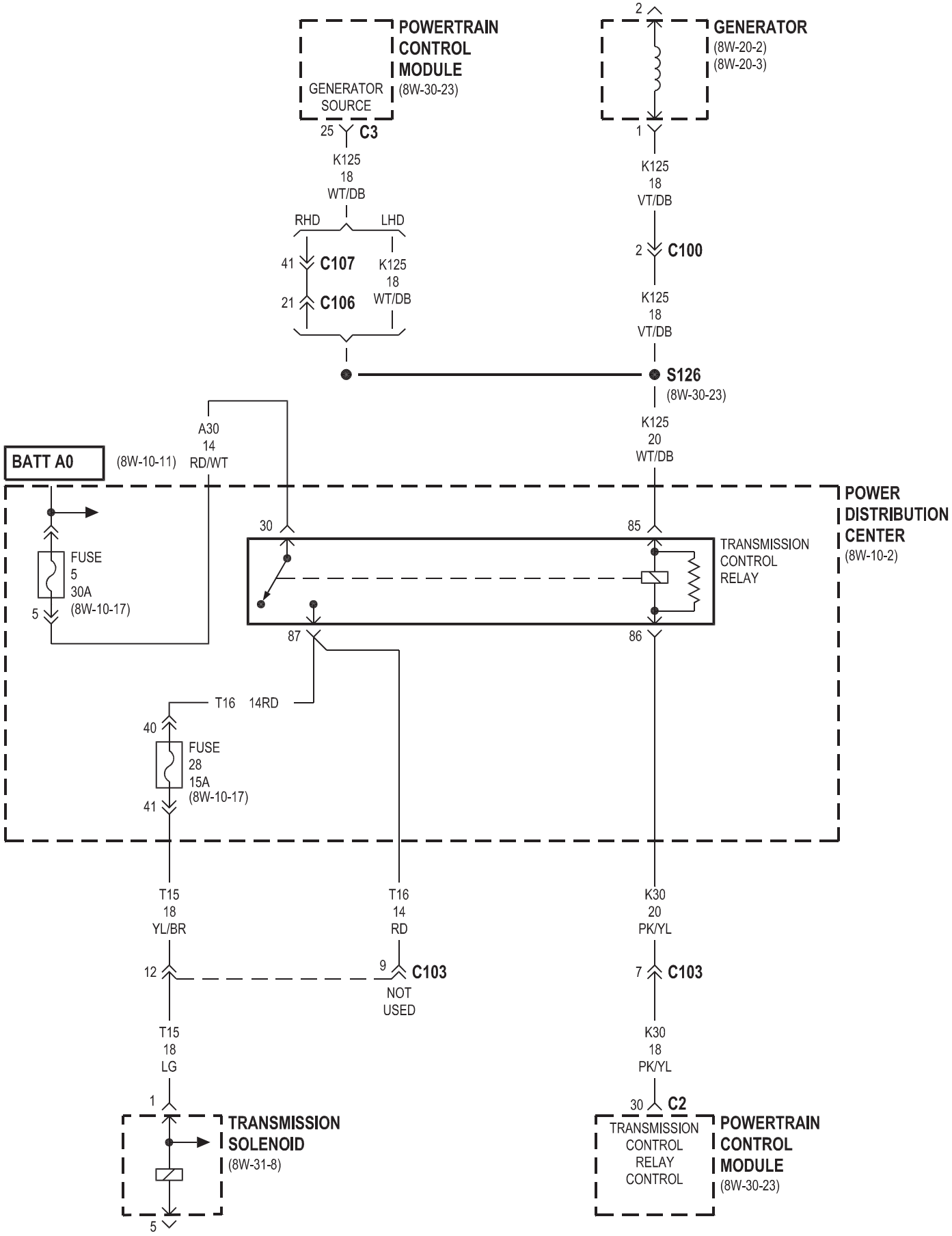

FROM
S168
(8W-10-26)
CRANKSHAFT
POSITION
SENSOR
CRANKSHAFT
POSITION
SENSOR
SIGNAL 1
CRANKSHAFT
POSITION
SENSOR
SIGNAL 2
2
1
F15
18
RD/DG
3
CAMSHAFT
POSITION
SENSOR
2
1
K3
20
BK
Y101
20
K924
20
YL
K44
20
YL/GY
K944
20
BR/DG
24 C1
42 C1
43 C1
9 C1
8 C1
CRANKSHAFT
POSITION
SENSOR
SIGNAL 1
CRANKSHAFT
POSITION
SENSOR
SHIELD
CRANKSHAFT
POSITION
SENSOR
SIGNAL 2
CAMSHAFT
POSITION
SENSOR
SIGNAL
CAMSHAFT
POSITION
SENSOR
GROUND
ENGINE
CONTROL
MODULE

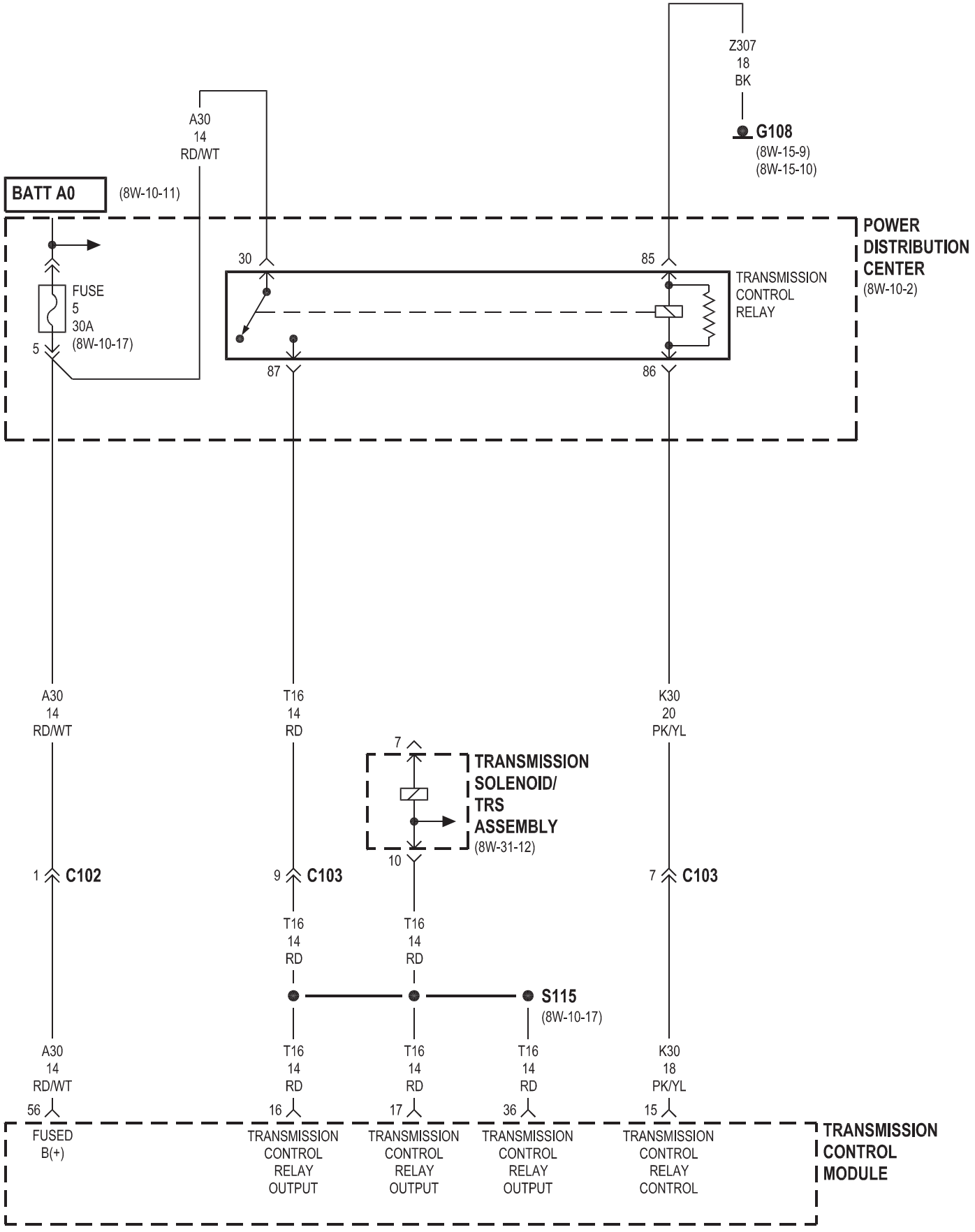

WATER IN FUEL SENSOR
3
2
1
F15 20 OR/DG
G123 20 DG/WT
K4 20 BK/LB
FROM C103 (8W-30-41)
E
F15 20 DB/WT
S168 (8W-10-26)
F15 18 RD/DG
1
EGR SOLENOID
2
K35 20 GY/YL
89 C1
94 C2
58 C1
21 C1
32 C1
EGR SOLENOID CONTROL
WATER IN FUEL SENSOR SIGNAL
SENSOR GROUND
SENSOR GROUND
BATTERY TEMPERATURE SENSOR SIGNAL
ENGINE CONTROL MODULE
K4 20 BK/LB
1
BATTERY TEMPERATURE SENSOR
S131 (8W-70-6) (8W-70-7)
2
K4 20 BK/LB
K25 18 VT/LG
10
7
C103
K4 16 BK/LB
K25 18 VT/DG
S145 (8W-70-6)
K4 18 BK/LB

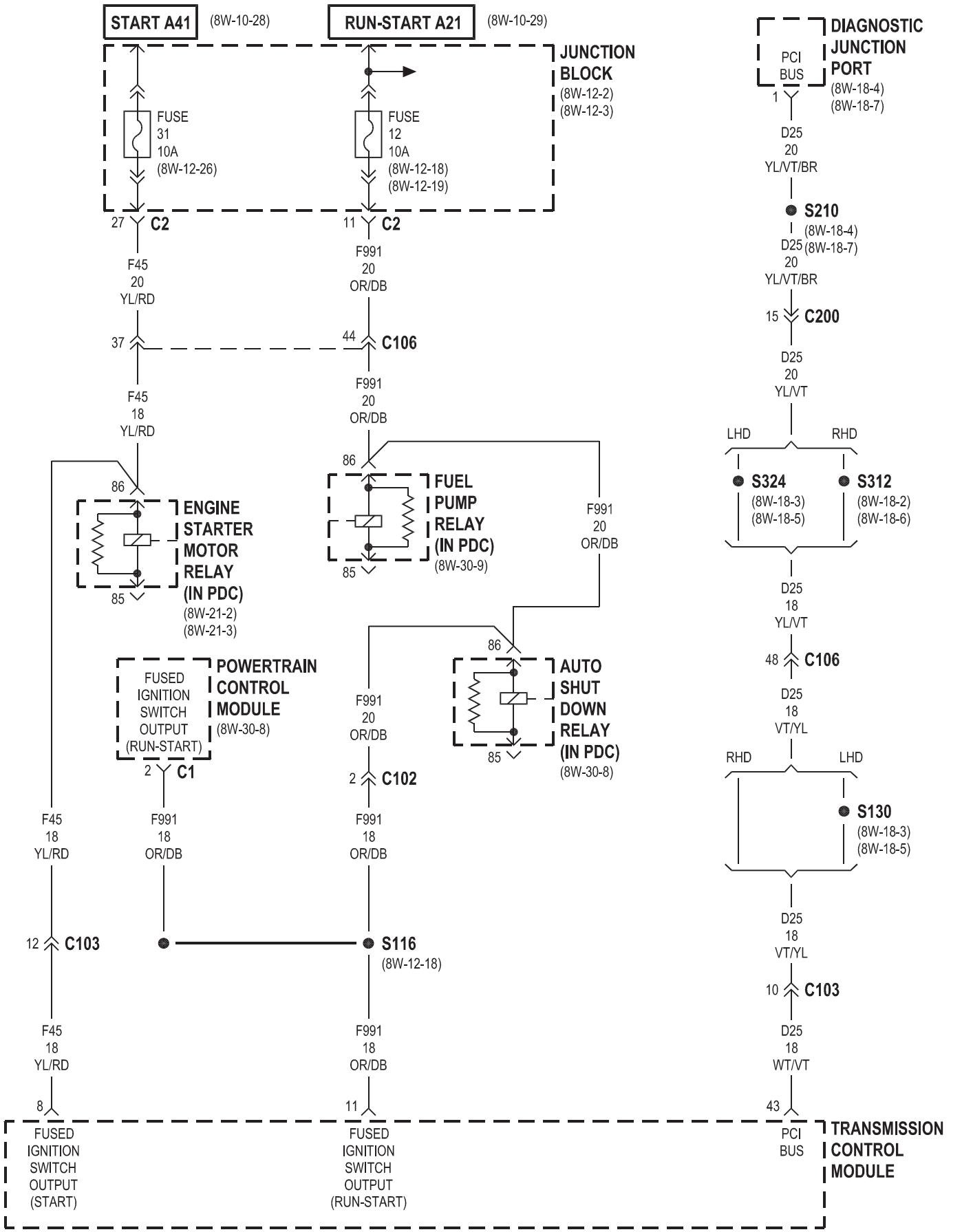

2
SENSOR GROUND
TRANSFER CASE POSITION SENSOR SIGNAL
1
TRANSFER CASE POSITION SENSOR
(8W-31-16)
6
2
BRAKE LAMP SWITCH
(8W-33-2)
5
1
LHD
RHD
L50 20 VT/TN
L50 20 WT/TN
K29 18 WT/PK
CONTROLLER ANTILOCK BRAKE
(8W-35-4)
(8W-35-5)
VEHICLE SPEED SENSOR SIGNAL
PRIMARY BRAKE SWITCH SIGNAL
13
18
S313
(8W-51-5)
(8W-51-6)
S314
(8W-33-2)
L50 18 WT/TN
K29 18 WT/PK
34
40
C107
B22 18 DG/YL
L50 18 WT/TN
L50 18 WT/TN
S147
K4 20 BK/LB
K77 20 BR/WT
L50 18 WT/TN
K29 18 WT/PK
6
C102
13
14
C102
S145
(8W-70-6)
B22 20 DG/YL
L50 20 WT/DB
K29 20 WT/PK
K4 18 BK/LB
21
C1
29
C1
55
C1
47
C1
48
C1
SENSOR GROUND
TRANSFER CASE POSITION SENSOR SIGNAL
VEHICLE SPEED SENSOR SIGNAL
PRIMARY BRAKE SWITCH SIGNAL
SECONDARY BRAKE SWITCH SIGNAL
ENGINE CONTROL MODULE

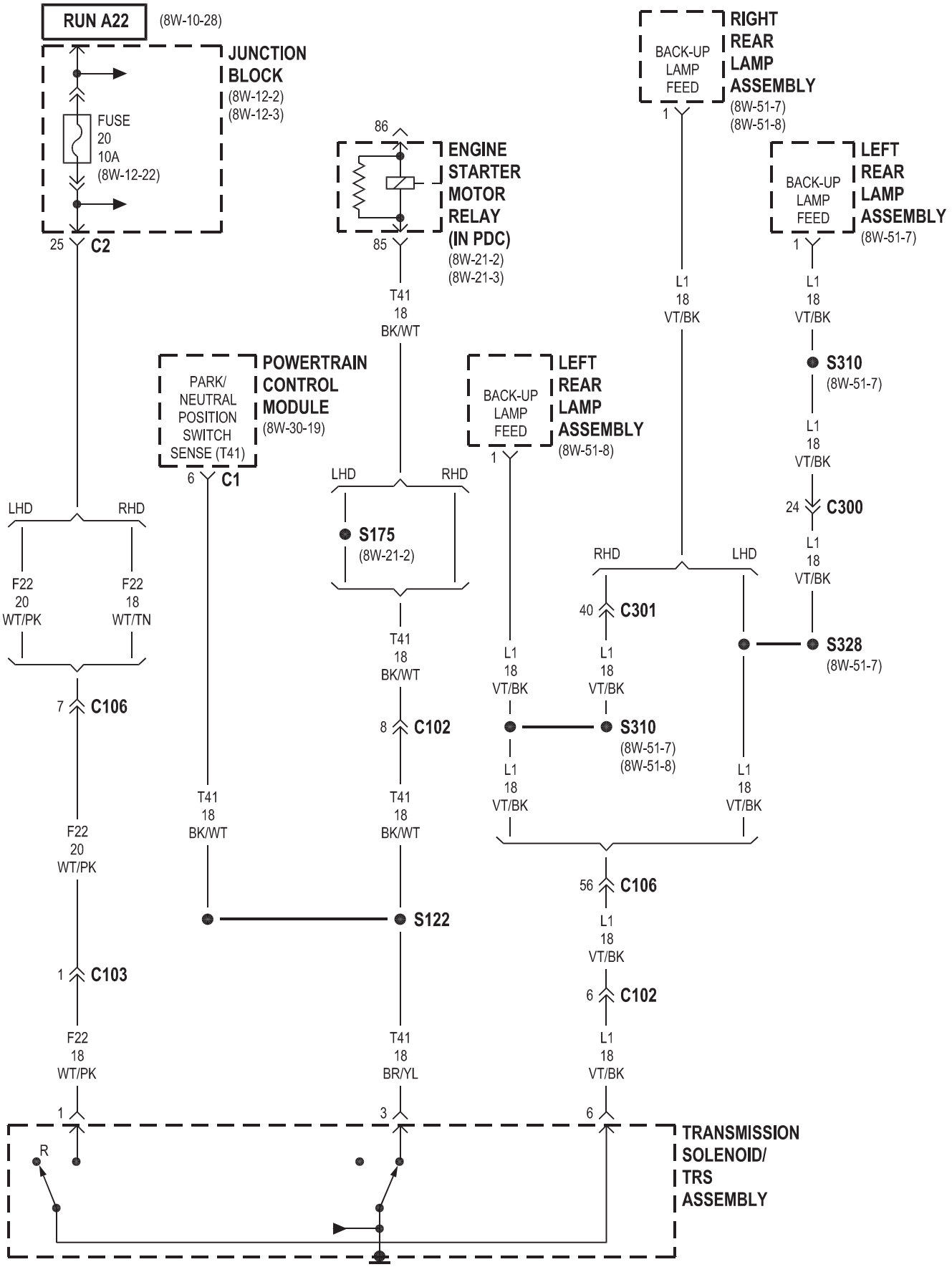
8W-31 TRANSMISSION CONTROL SYSTEM

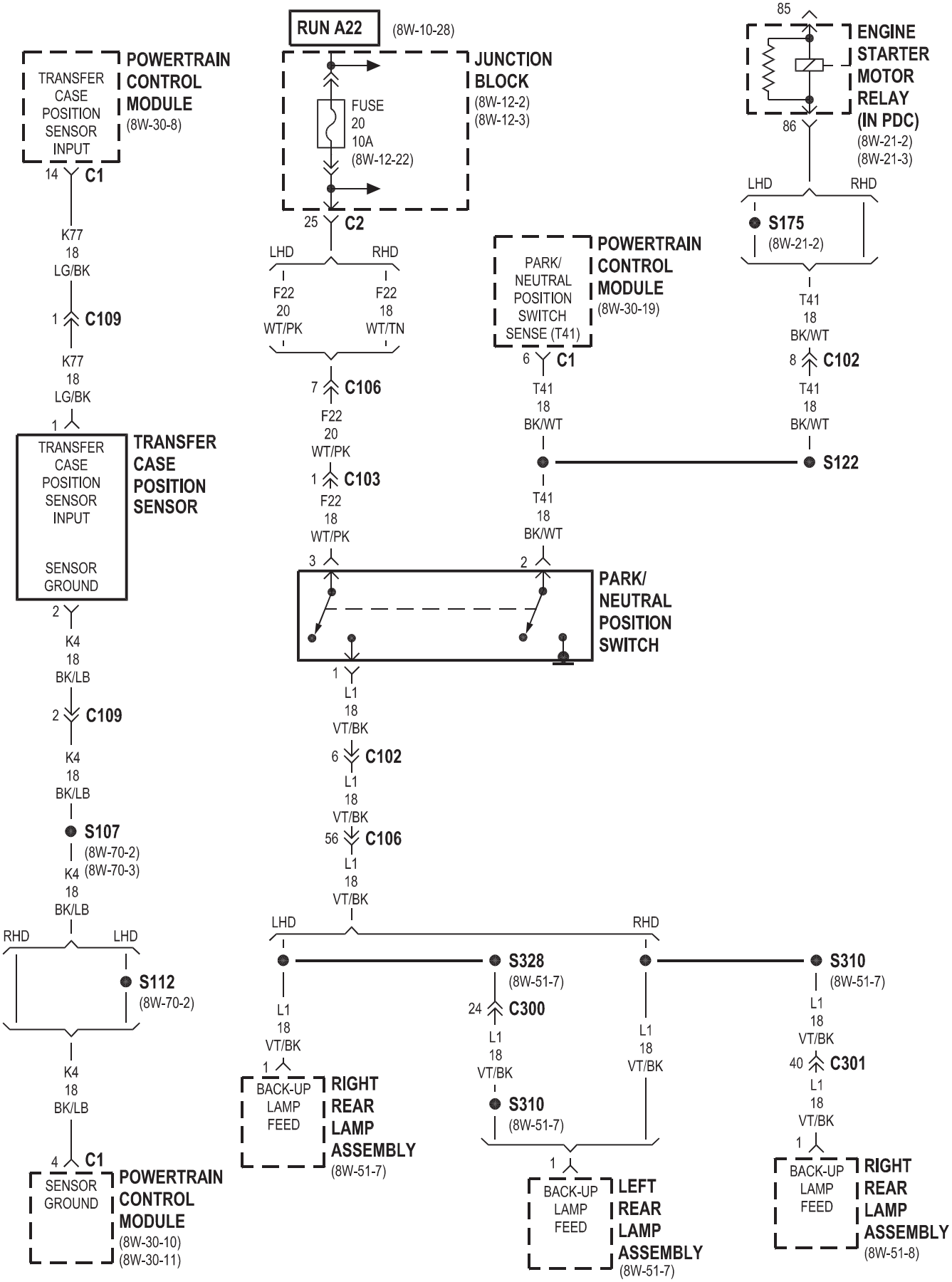
Component	Page
Auto Shut Down Relay	8W-31-4
Back-Up Lamp Relay	8W-31-15
Body Control Module	8W-31-14
Brake Lamp Switch	8W-31-14, 15
Controller Antilock Brake	8W-31-17
Crankshaft Position Sensor	8W-31-9, 10
Data Link Connector	8W-31-9, 10, 16
Diagnostic Junction Port	8W-31-4, 15
Engine Control Module	8W-31-16, 17
Engine Starter Motor Relay	8W-31-4, 5, 6, 12
Fuel Pump Relay	8W-31-4
Fuse 5	8W-31-2, 3
Fuse 12	8W-31-4, 15
Fuse 20	8W-31-5, 6
Fuse 21	8W-31-14, 15
Fuse 28	8W-31-2, 8
Fuse 31	8W-31-4
G102	8W-31-11, 13
G108	8W-31-3
G200	8W-31-14, 15
G300	8W-31-15
G301	8W-31-15
Generator	8W-31-2
Input Speed Sensor	8W-31-13
Junction Block	8W-31-4, 5, 6, 14, 15
Left Rear Lamp Assembly	8W-31-5, 6
Line Pressure Sensor	8W-31-13
Output Speed Sensor	8W-31-8, 13
Park/Neutral Position Switch	8W-31-6
Power Distribution Center	8W-31-2, 3, 8
Powertrain Control Module	8W-31-2, 4, 5, 6, 7, 8, 9, 10, 14
Right Rear Lamp Assembly	8W-31-5, 6
Shifter Assembly	8W-31-14, 15, 16
Throttle Position Sensor	8W-31-7
Transfer Case Position Sensor	8W-31-6, 16
Transmission Control Module	8W-31-3, 4, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18
Transmission Control Relay	8W-31-2, 3, 8, 11, 12
Transmission Solenoid	8W-31-2, 8
Transmission Solenoid Assembly	8W-31-18
Transmission Solenoid/TRS Assembly	8W-31-3, 5, 11, 12, 13

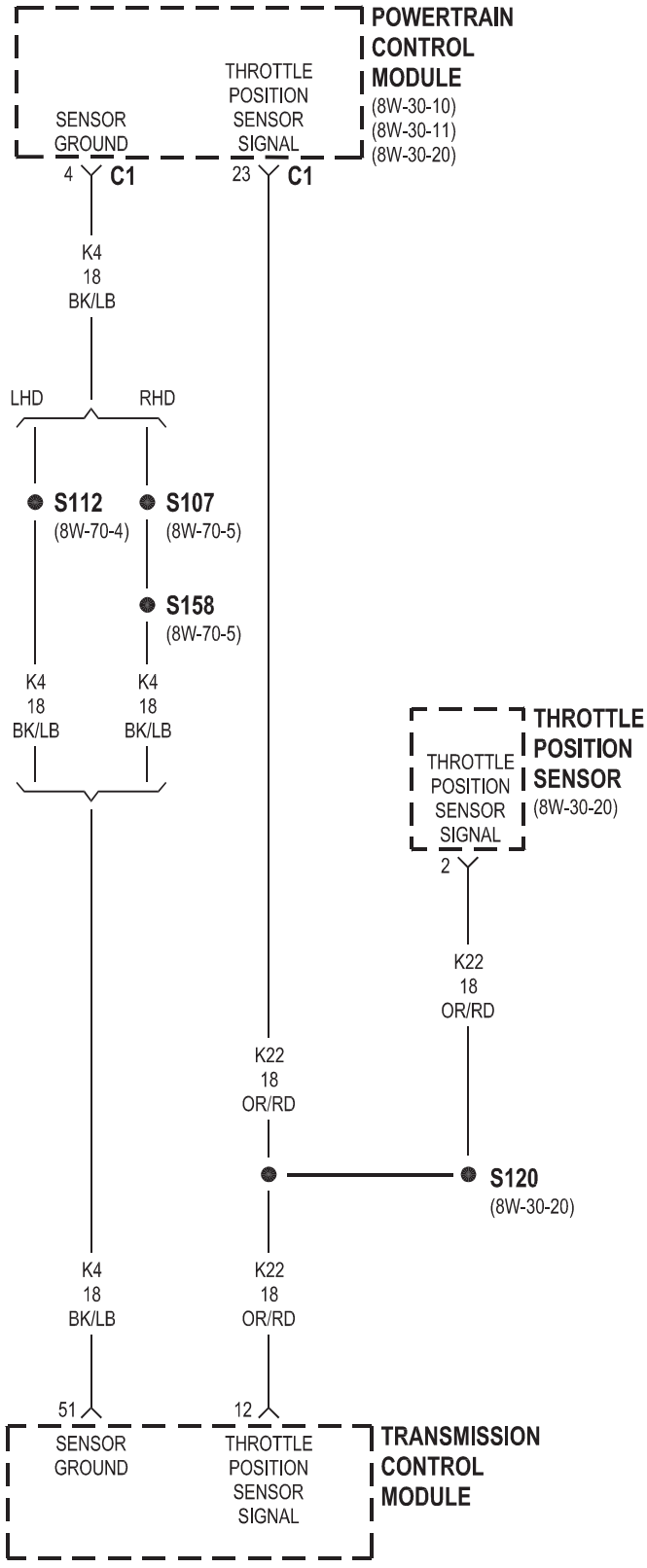

POWERTRAIN CONTROL MODULE
(8W-30-23)
GENERATOR SOURCE
25
C3
K125
18
WT/DB
RHD
LHD
41
C107
21
C106
K125
18
WT/DB
2
GENERATOR
(8W-20-2)
(8W-20-3)
1
K125
18
VT/DB
2
C100
K125
18
VT/DB
S126
(8W-30-23)
K125
20
WT/DB
BATT A0
(8W-10-11)
A30
14
RD/WT
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE
5
30A
(8W-10-17)
5
30
85
TRANSMISSION CONTROL RELAY
87
86
T16
14RD
40
FUSE
28
15A
(8W-10-17)
41
T15
18
YL/BR
12
T16
14
RD
9
C103
NOT USED
K30
20
PK/YL
7
C103
T15
18
LG
1
TRANSMISSION SOLENOID
(8W-31-8)
5
K30
18
PK/YL
30
C2
TRANSMISSION CONTROL RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-23)

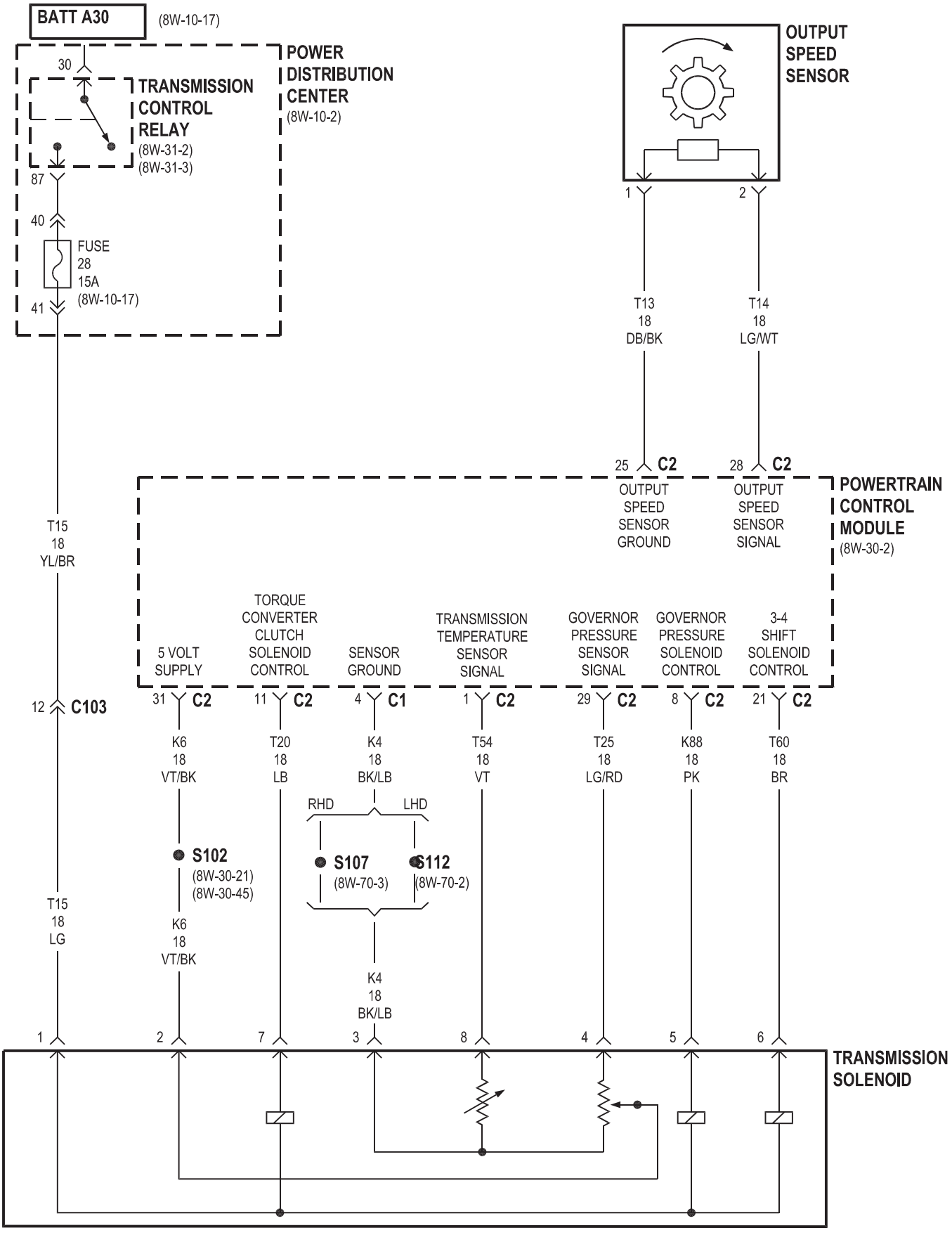

Z307
18
BK
G108
(8W-15-9)
(8W-15-10)
A30
14
RD/WT
BATT A0
(8W-10-11)
POWER
DISTRIBUTION
CENTER
(8W-10-2)
30
85
TRANSMISSION
CONTROL
RELAY
FUSE
5
30A
(8W-10-17)
5
87
86
A30
14
RD/WT
T16
14
RD
K30
20
PK/YL
7
TRANSMISSION
SOLENOID/
TRS
ASSEMBLY
(8W-31-12)
10
1
C102
9
C103
7
C103
T16
14
RD
T16
14
RD
S115
(8W-10-17)
A30
14
RD/WT
T16
14
RD
T16
14
RD
T16
14
RD
K30
18
PK/YL
56
16
17
36
15
FUSED
B(+)
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
OUTPUT
TRANSMISSION
CONTROL
RELAY
CONTROL
TRANSMISSION
CONTROL
MODULE

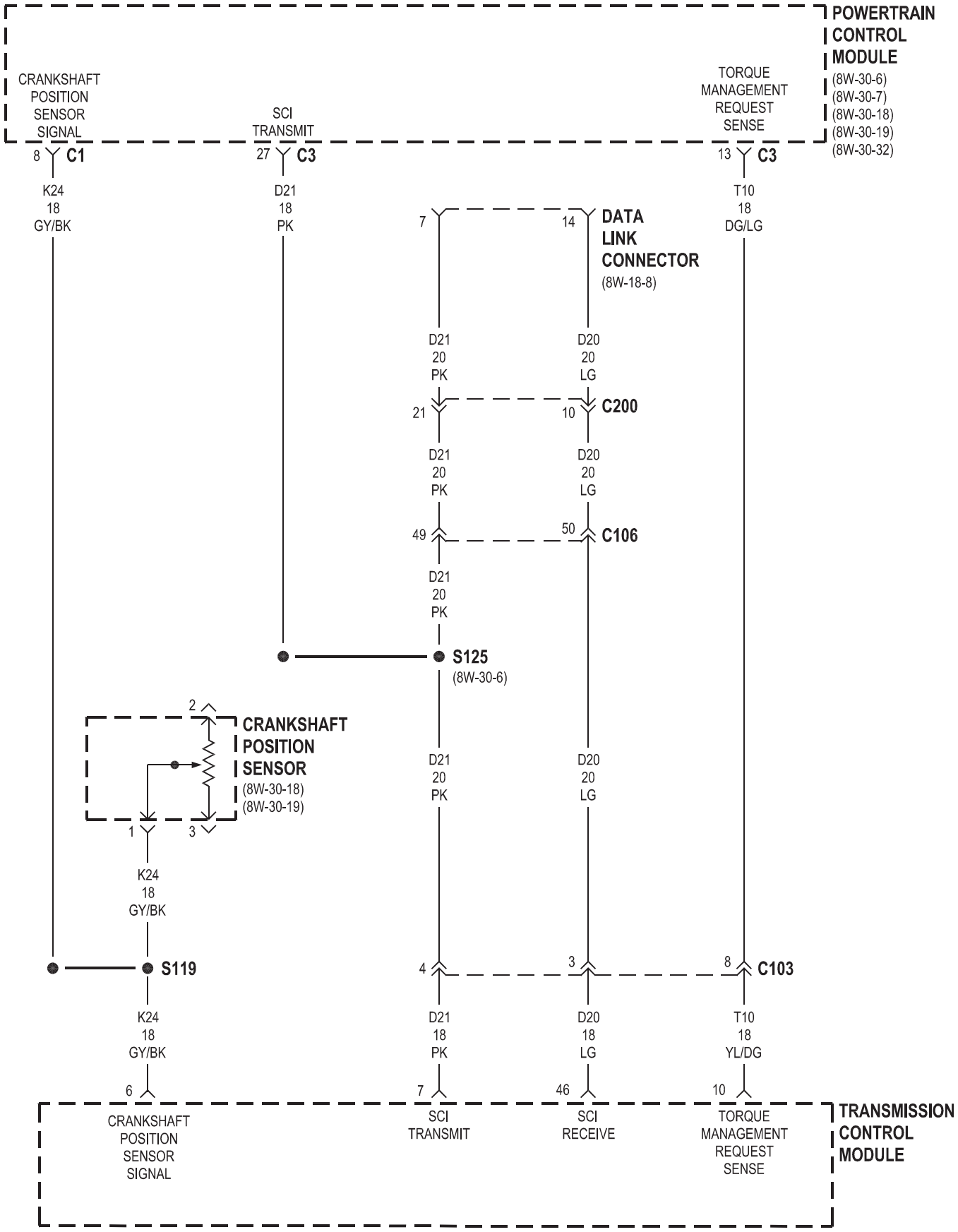

START A41
(8W-10-28)
RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 31 10A
(8W-12-26)
FUSE 12 10A
(8W-12-18)
(8W-12-19)
27 C2
11 C2
F45 20 YL/RD
F991 20 OR/DB
37
44 C106
F45 18 YL/RD
F991 20 OR/DB
86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
85
FUEL PUMP RELAY (IN PDC)
(8W-30-9)
F991 20 OR/DB
POWERTRAIN CONTROL MODULE
(8W-30-8)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
2 C1
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-8)
2 C102
F45 18 YL/RD
F991 18 OR/DB
F991 18 OR/DB
12 C103
S116
(8W-12-18)
F45 18 YL/RD
F991 18 OR/DB
8
11
FUSED IGNITION SWITCH OUTPUT (START)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
PCI BUS
1
D25 20 YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25 20 YL/VT/BR
15 C200
D25 20 YL/VT
LHD
RHD
S324
(8W-18-3)
(8W-18-5)
S312
(8W-18-2)
(8W-18-6)
D25 18 YL/VT
48 C106
D25 18 VT/YL
RHD
LHD
S130
(8W-18-3)
(8W-18-5)
D25 18 VT/YL
10 C103
D25 18 WT/VT
43
PCI BUS
TRANSMISSION CONTROL MODULE

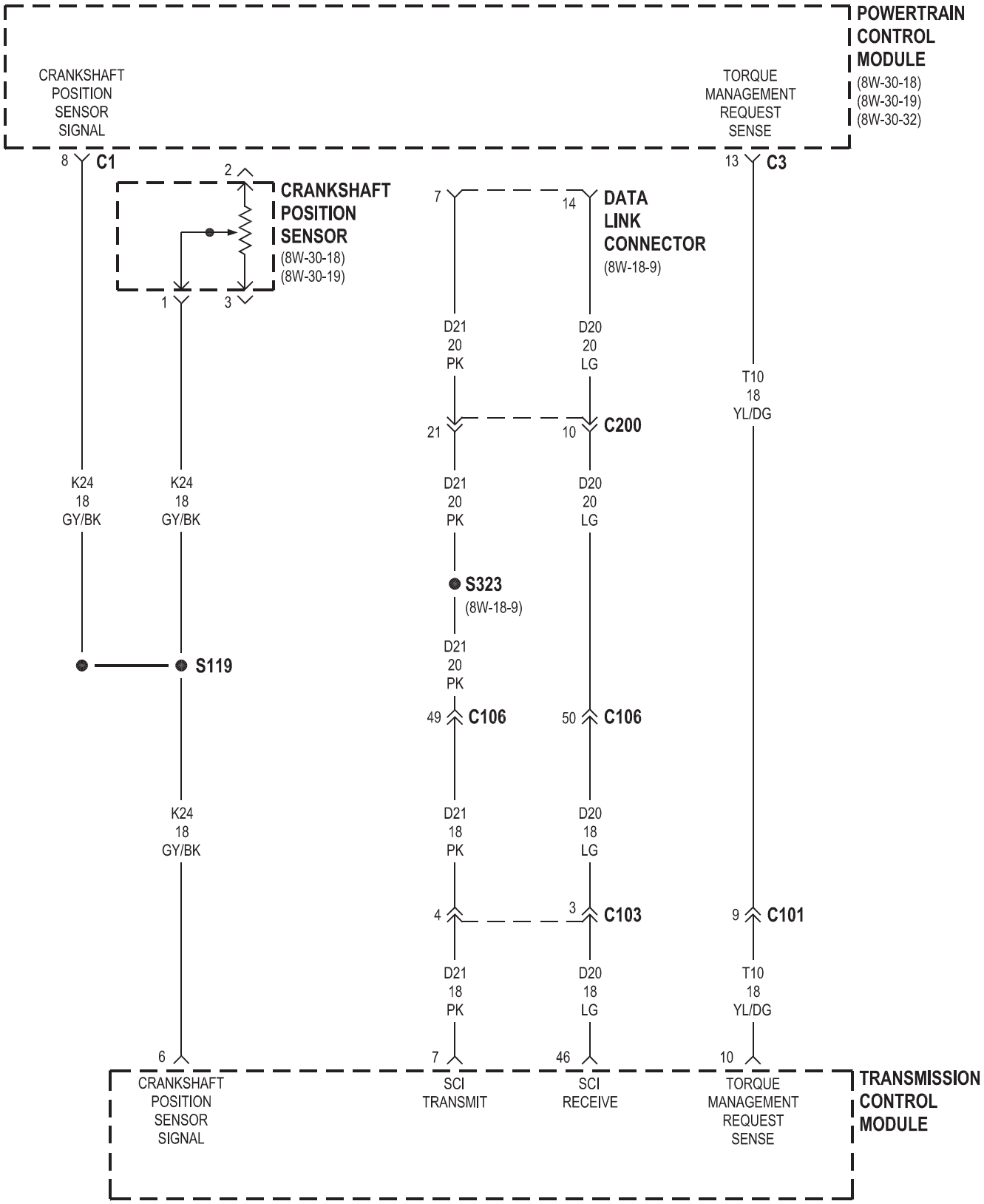

RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 20 10A
(8W-12-22)
25 C2
86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
85
T41 18 BK/WT
BACK-UP LAMP FEED
RIGHT REAR LAMP ASSEMBLY
(8W-51-7)
(8W-51-8)
1
L1 18 VT/BK
BACK-UP LAMP FEED
LEFT REAR LAMP ASSEMBLY
(8W-51-7)
1
L1 18 VT/BK
S310
(8W-51-7)
L1 18 VT/BK
24 C300
L1 18 VT/BK
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
POWERTRAIN CONTROL MODULE
(8W-30-19)
6 C1
BACK-UP LAMP FEED
LEFT REAR LAMP ASSEMBLY
(8W-51-8)
1
LHD
RHD
S175
(8W-21-2)
LHD
RHD
F22 20 WT/PK
F22 18 WT/TN
7 C106
T41 18 BK/WT
8 C102
RHD
LHD
40 C301
S328
(8W-51-7)
L1 18 VT/BK
L1 18 VT/BK
S310
(8W-51-7)
(8W-51-8)
L1 18 VT/BK
L1 18 VT/BK
T41 18 BK/WT
T41 18 BK/WT
F22 20 WT/PK
S122
56 C106
L1 18 VT/BK
1 C103
6 C102
F22 18 WT/PK
T41 18 BR/YL
L1 18 VT/BK
1
3
6
R
TRANSMISSION SOLENOID/ TRS ASSEMBLY

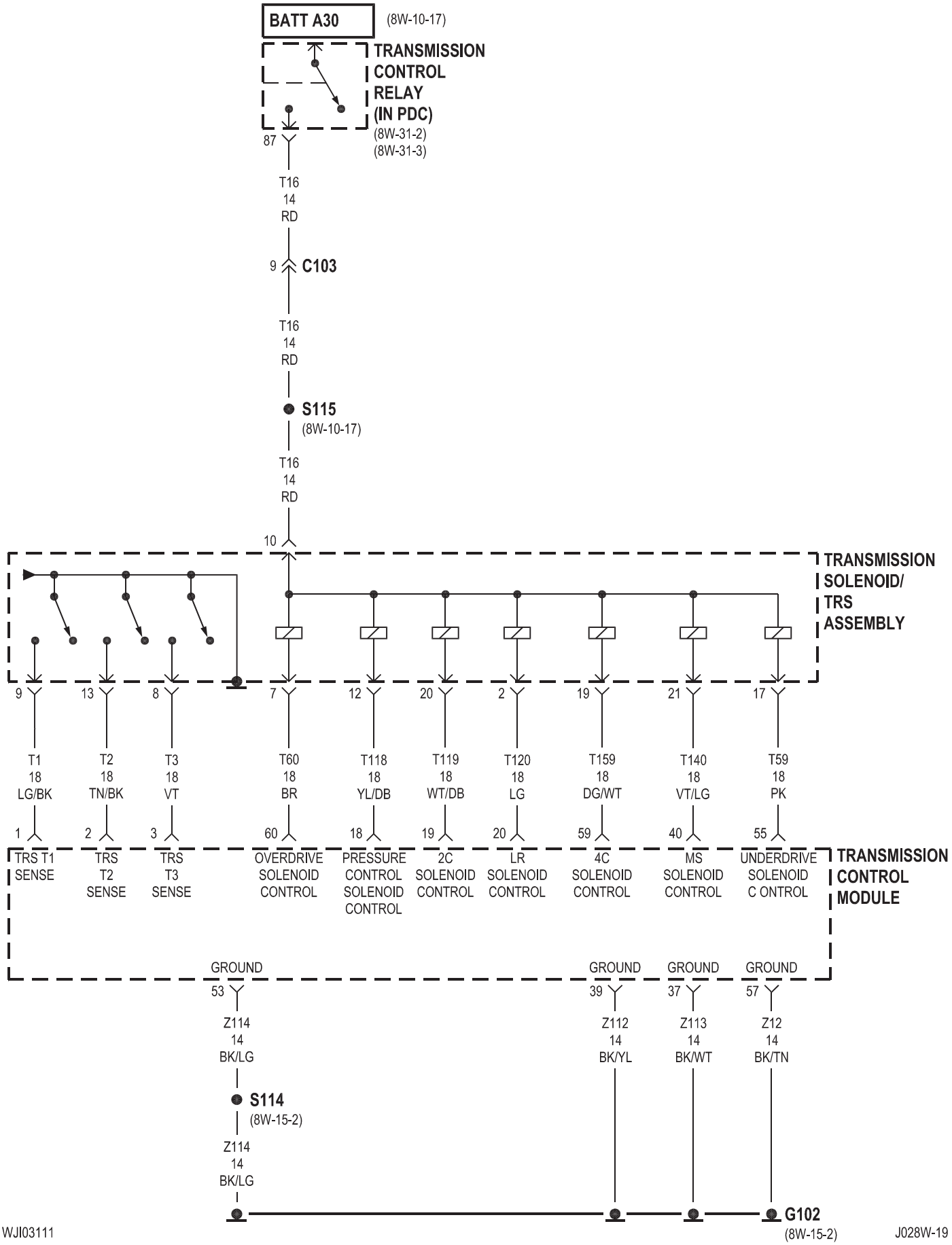

RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
10A
(8W-12-22)
25
C2
TRANSFER CASE POSITION SENSOR INPUT
14
C1
POWERTRAIN CONTROL MODULE
(8W-30-8)
K77
18
LG/BK
1
C109
K77
18
LG/BK
1
TRANSFER CASE POSITION SENSOR INPUT
SENSOR GROUND
TRANSFER CASE POSITION SENSOR
2
K4
18
BK/LB
2
C109
K4
18
BK/LB
S107
(8W-70-2)
(8W-70-3)
K4
18
BK/LB
RHD
LHD
S112
(8W-70-2)
K4
18
BK/LB
4
C1
SENSOR GROUND
POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-11)
LHD
RHD
F22
20
WT/PK
F22
18
WT/TN
7
C106
F22
20
WT/PK
1
C103
F22
18
WT/PK
3
1
L1
18
VT/BK
6
C102
L1
18
VT/BK
56
C106
L1
18
VT/BK
LHD
RHD
L1
18
VT/BK
1
BACK-UP LAMP FEED
RIGHT REAR LAMP ASSEMBLY
(8W-51-7)
S328
(8W-51-7)
24
C300
L1
18
VT/BK
S310
(8W-51-7)
1
BACK-UP LAMP FEED
LEFT REAR LAMP ASSEMBLY
(8W-51-7)
L1
18
VT/BK
S310
(8W-51-7)
L1
18
VT/BK
40
C301
L1
18
VT/BK
1
BACK-UP LAMP FEED
RIGHT REAR LAMP ASSEMBLY
(8W-51-8)
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
6
C1
POWERTRAIN CONTROL MODULE
(8W-30-19)
T41
18
BK/WT
T41
18
BK/WT
2
PARK/ NEUTRAL POSITION SWITCH
85
86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
LHD
RHD
S175
(8W-21-2)
T41
18
BK/WT
8
C102
T41
18
BK/WT
S122


POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-11)
(8W-30-20)
SENSOR GROUND
4 C1
THROTTLE POSITION SENSOR SIGNAL
23 C1
K4
18
BK/LB
LHD
RHD
S112
(8W-70-4)
S107
(8W-70-5)
S158
(8W-70-5)
K4
18
BK/LB
K4
18
BK/LB
THROTTLE POSITION SENSOR
(8W-30-20)
THROTTLE POSITION SENSOR SIGNAL
2
K22
18
OR/RD
K22
18
OR/RD
S120
(8W-30-20)
K4
18
BK/LB
K22
18
OR/RD
51
12
SENSOR GROUND
THROTTLE POSITION SENSOR SIGNAL
TRANSMISSION CONTROL MODULE


BATT A30
(8W-10-17)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
TRANSMISSION CONTROL RELAY
(8W-31-2)
(8W-31-3)
87
40
FUSE 28 15A
(8W-10-17)
41
OUTPUT SPEED SENSOR
1
2
T13 18 DB/BK
T14 18 LG/WT
25 C2
28 C2
OUTPUT SPEED SENSOR GROUND
OUTPUT SPEED SENSOR SIGNAL
POWERTRAIN CONTROL MODULE
(8W-30-2)
T15 18 YL/BR
12 C103
5 VOLT SUPPLY
TORQUE CONVERTER CLUTCH SOLENOID CONTROL
SENSOR GROUND
TRANSMISSION TEMPERATURE SENSOR SIGNAL
GOVERNOR PRESSURE SENSOR SIGNAL
GOVERNOR PRESSURE SOLENOID CONTROL
3-4 SHIFT SOLENOID CONTROL
31 C2
11 C2
4 C1
1 C2
29 C2
8 C2
21 C2
K6 18 VT/BK
T20 18 LB
K4 18 BK/LB
T54 18 VT
T25 18 LG/RD
K88 18 PK
T60 18 BR
RHD
LHD
S102
(8W-30-21)
(8W-30-45)
S107
(8W-70-3)
S112
(8W-70-2)
T15 18 LG
K6 18 VT/BK
K4 18 BK/LB
1
2
7
3
8
4
5
6
TRANSMISSION SOLENOID

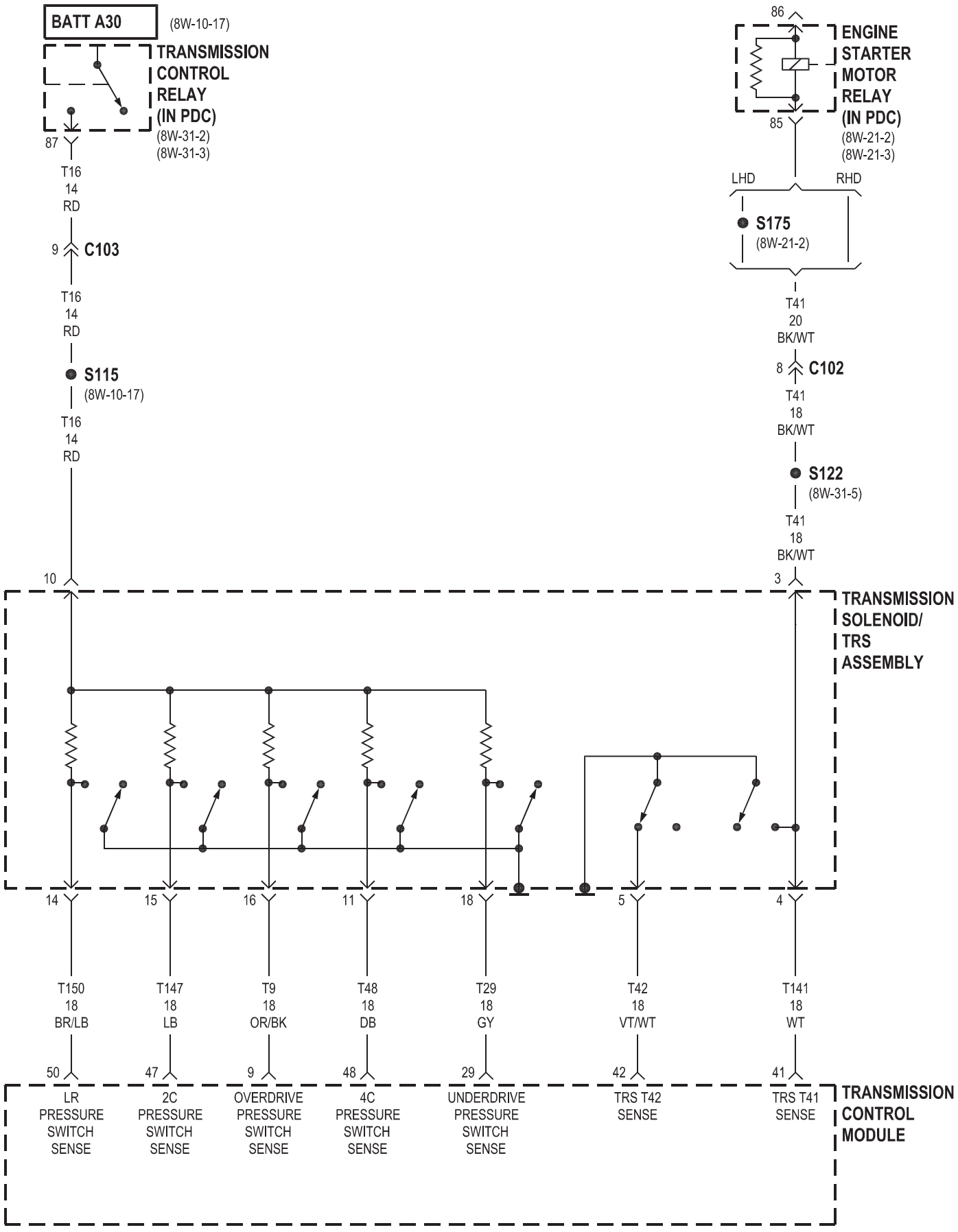

POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)
(8W-30-18)
(8W-30-19)
(8W-30-32)
CRANKSHAFT POSITION SENSOR SIGNAL
SCI TRANSMIT
TORQUE MANAGEMENT REQUEST SENSE
8 C1
27 C3
13 C3
K24 18 GY/BK
D21 18 PK
T10 18 DG/LG
7
14
DATA LINK CONNECTOR
(8W-18-8)
D21 20 PK
D20 20 LG
21
10
C200
D21 20 PK
D20 20 LG
49
50
C106
D21 20 PK
S125
(8W-30-6)
2
CRANKSHAFT POSITION SENSOR
(8W-30-18)
(8W-30-19)
D21 20 PK
D20 20 LG
1
3
K24 18 GY/BK
S119
4
3
8
C103
K24 18 GY/BK
D21 18 PK
D20 18 LG
T10 18 YL/DG
6
7
46
10
CRANKSHAFT POSITION SENSOR SIGNAL
SCI TRANSMIT
SCI RECEIVE
TORQUE MANAGEMENT REQUEST SENSE
TRANSMISSION CONTROL MODULE

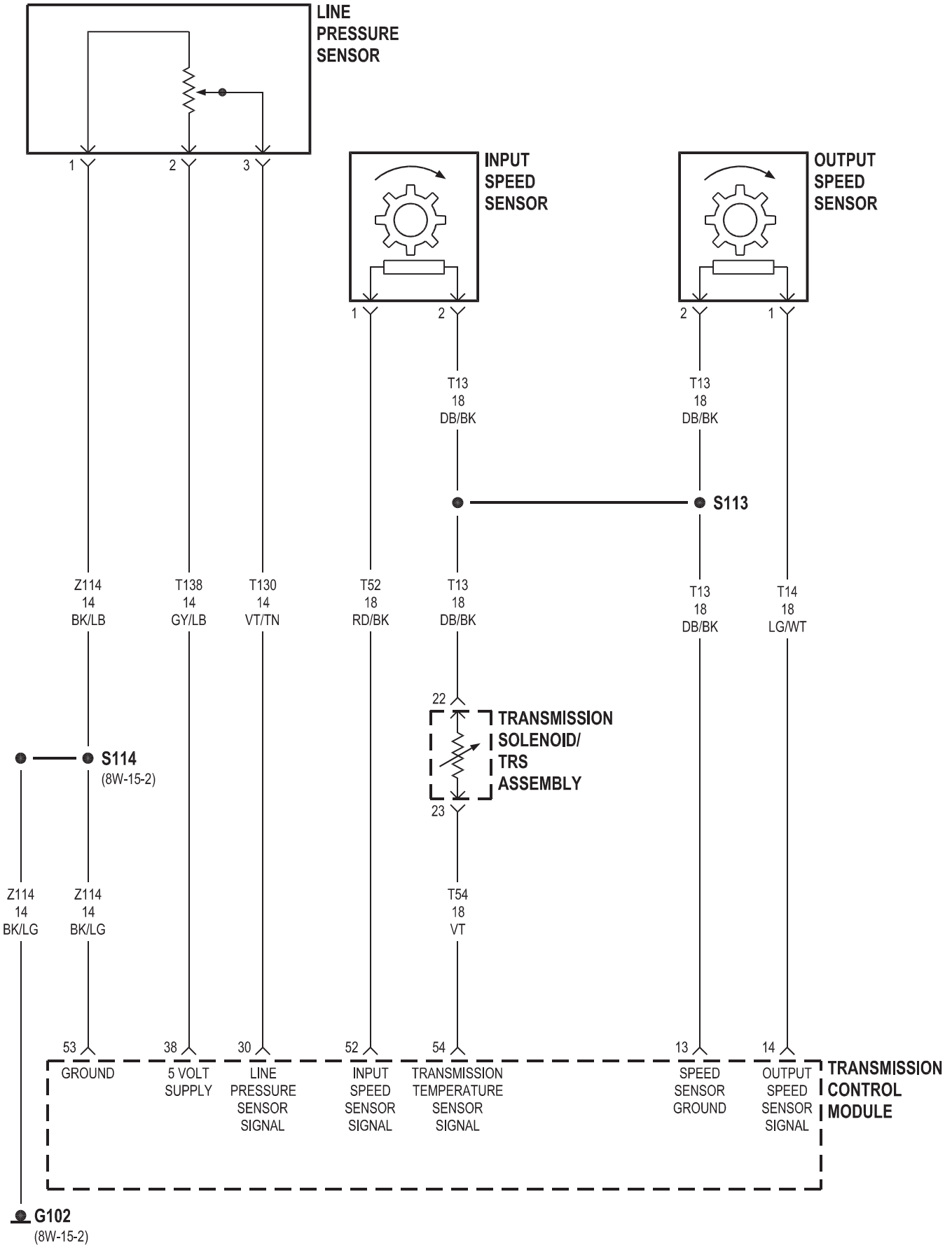

POWERTRAIN CONTROL MODULE
(8W-30-18)
(8W-30-19)
(8W-30-32)
CRANKSHAFT POSITION SENSOR SIGNAL
TORQUE MANAGEMENT REQUEST SENSE
8 C1
13 C3
2
CRANKSHAFT POSITION SENSOR
(8W-30-18)
(8W-30-19)
1
3
7
14
DATA LINK CONNECTOR
(8W-18-9)
D21 20 PK
D20 20 LG
T10 18 YL/DG
21
10
C200
K24 18 GY/BK
K24 18 GY/BK
D21 20 PK
D20 20 LG
S323
(8W-18-9)
S119
D21 20 PK
49 C106
50 C106
K24 18 GY/BK
D21 18 PK
D20 18 LG
4
3
C103
9 C101
D21 18 PK
D20 18 LG
T10 18 YL/DG
6
7
46
10
CRANKSHAFT POSITION SENSOR SIGNAL
SCI TRANSMIT
SCI RECEIVE
TORQUE MANAGEMENT REQUEST SENSE
TRANSMISSION CONTROL MODULE

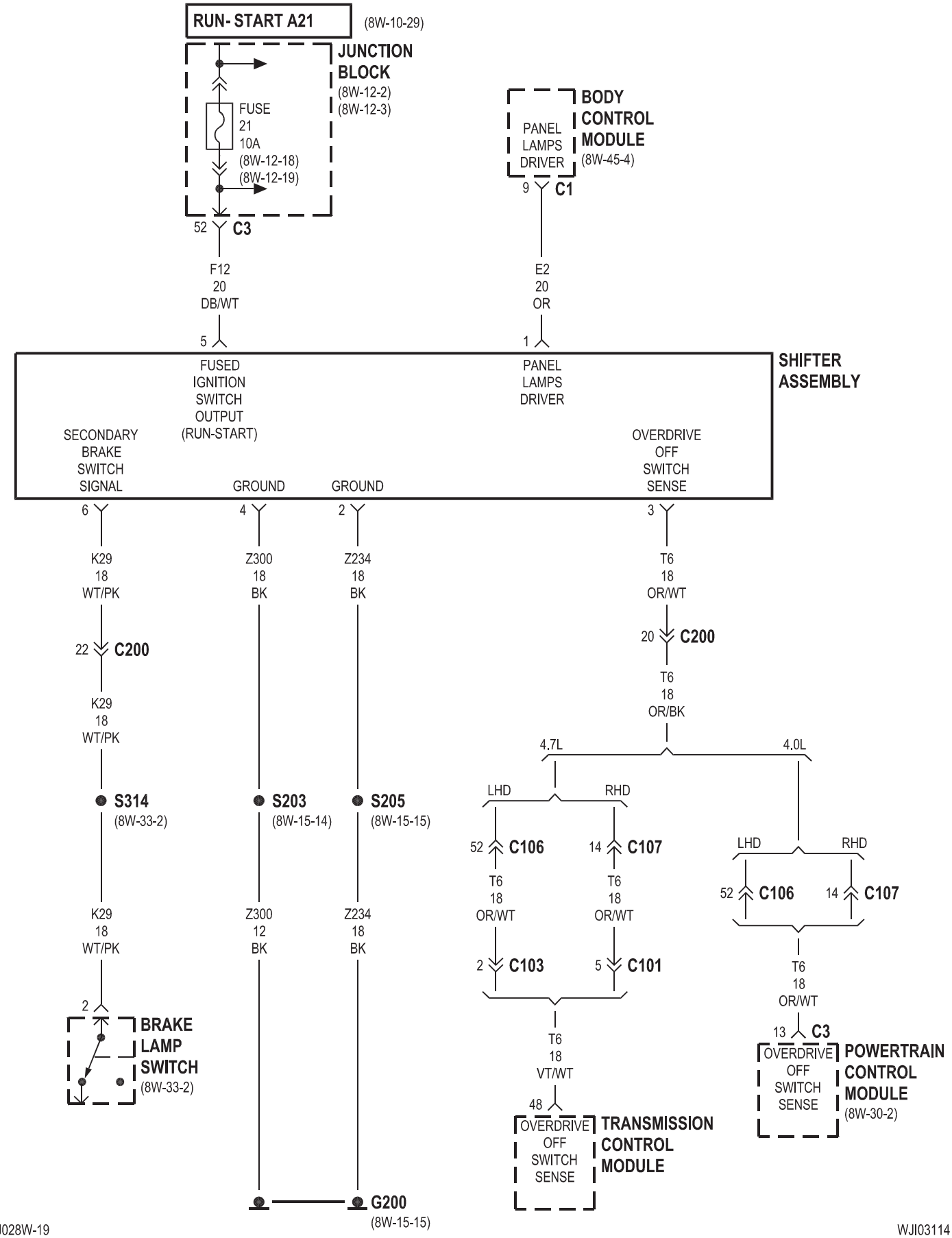


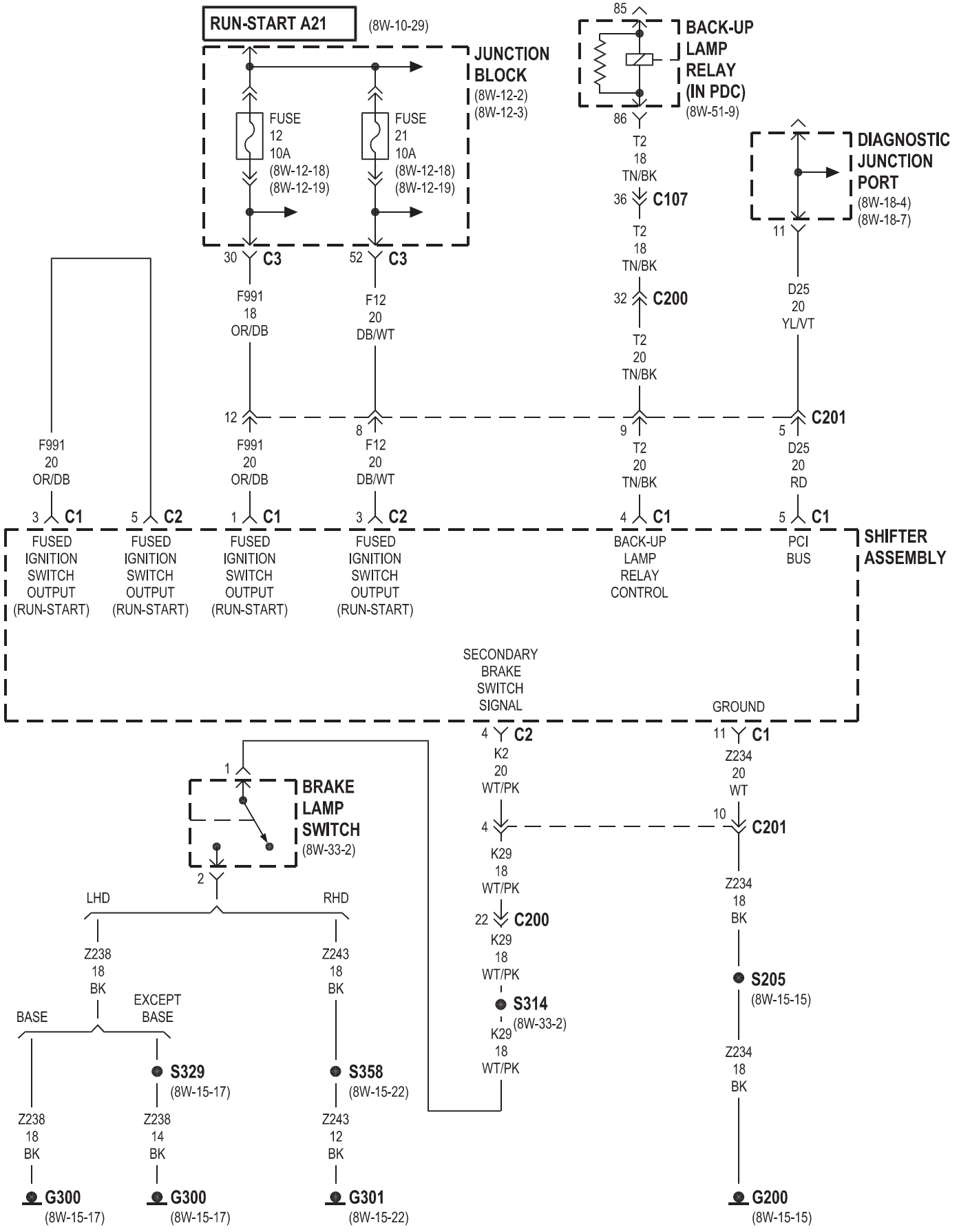
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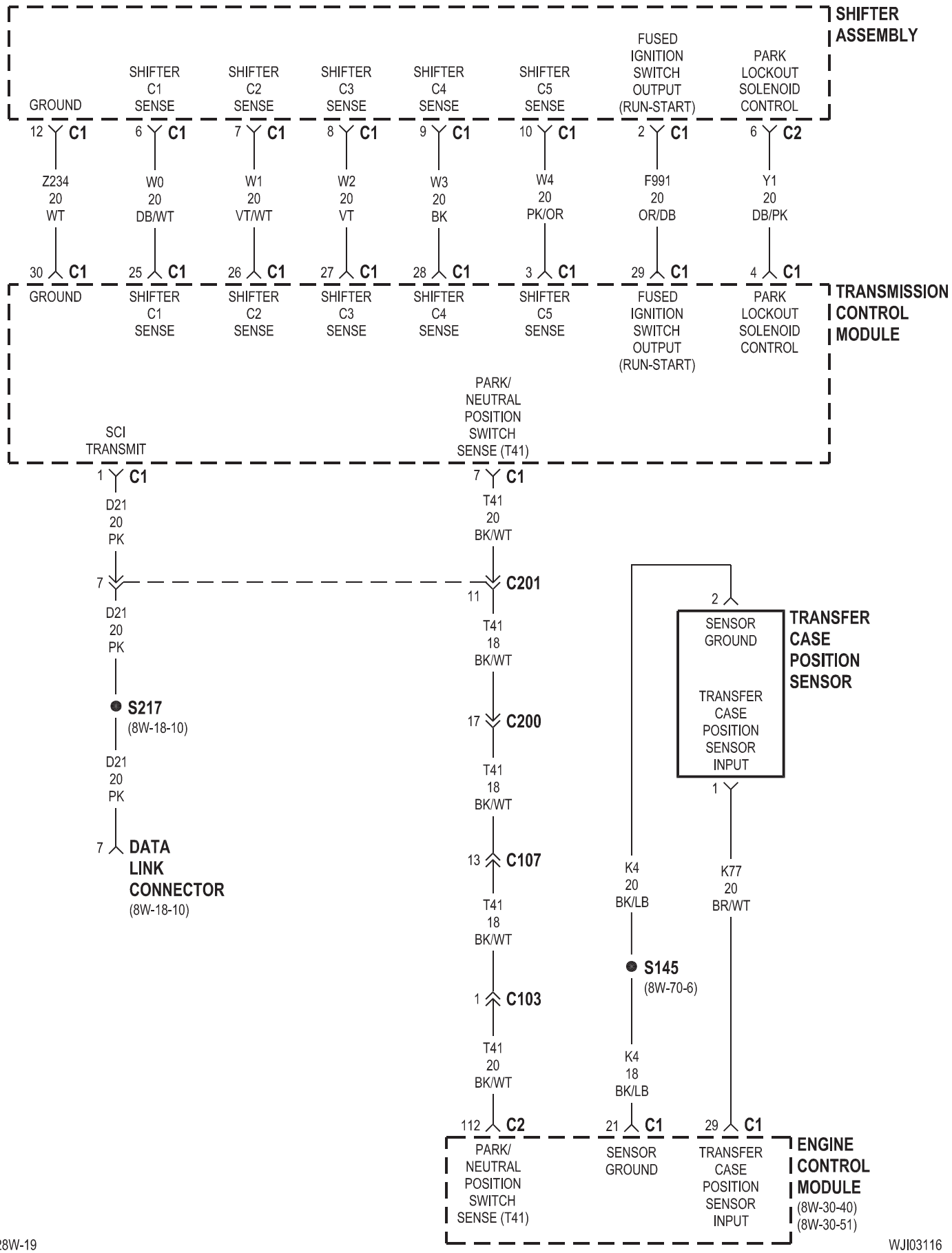
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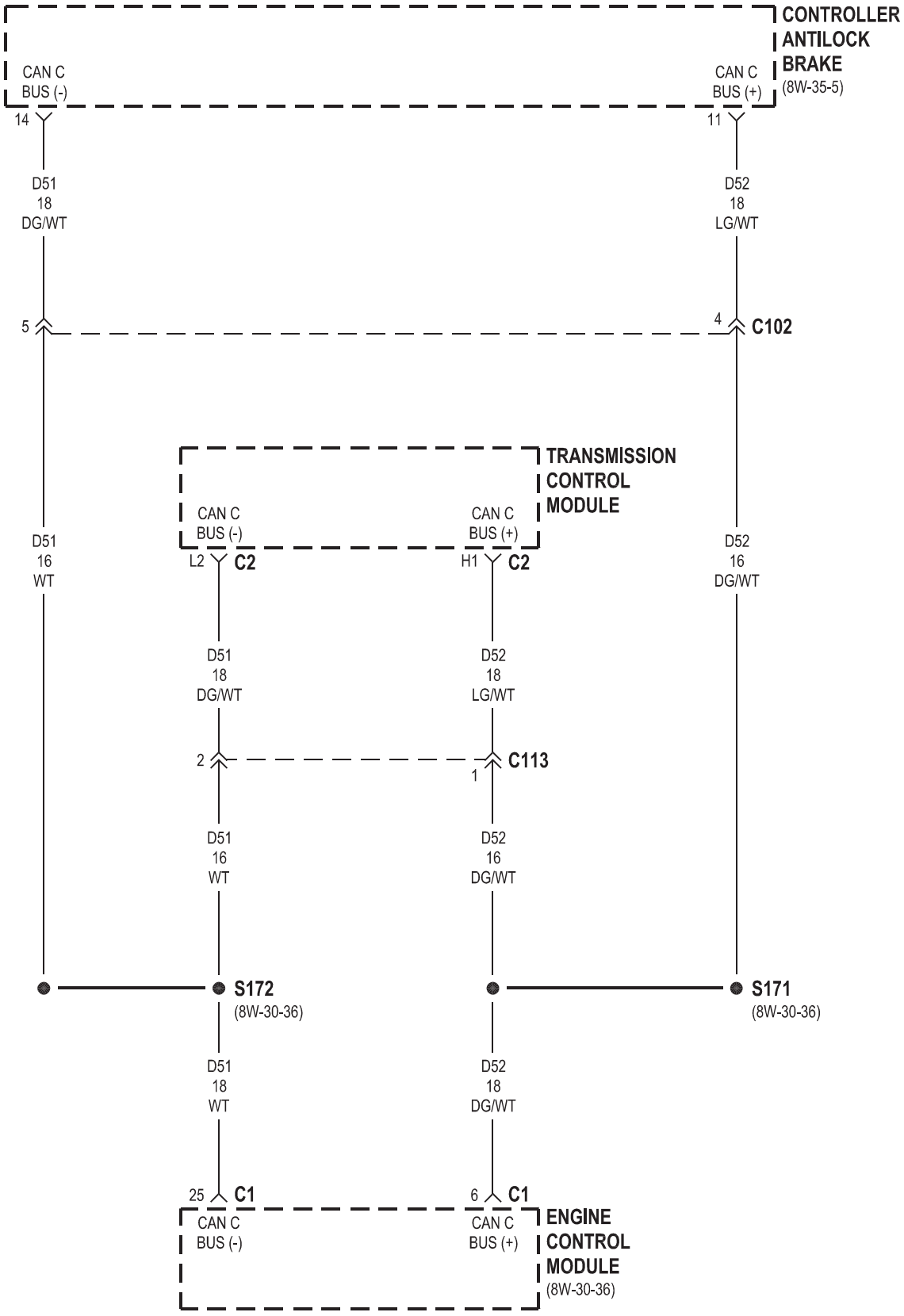

BATT A30
(8W-10-17)
TRANSMISSION CONTROL RELAY (IN PDC)
(8W-31-2)
(8W-31-3)
87
T16
14
RD
9
C103
T16
14
RD
S115
(8W-10-17)
T16
14
RD
10
86
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
85
LHD
RHD
S175
(8W-21-2)
T41
20
BK/WT
8
C102
T41
18
BK/WT
S122
(8W-31-5)
T41
18
BK/WT
3
TRANSMISSION SOLENOID/ TRS ASSEMBLY
14
15
16
11
18
5
4
T150
18
BR/LB
T147
18
LB
T9
18
OR/BK
T48
18
DB
T29
18
GY
T42
18
VT/WT
T141
18
WT
50
47
9
48
29
42
41
LR PRESSURE SWITCH SENSE
2C PRESSURE SWITCH SENSE
OVERDRIVE PRESSURE SWITCH SENSE
4C PRESSURE SWITCH SENSE
UNDERDRIVE PRESSURE SWITCH SENSE
TRS T42 SENSE
TRS T41 SENSE
TRANSMISSION CONTROL MODULE

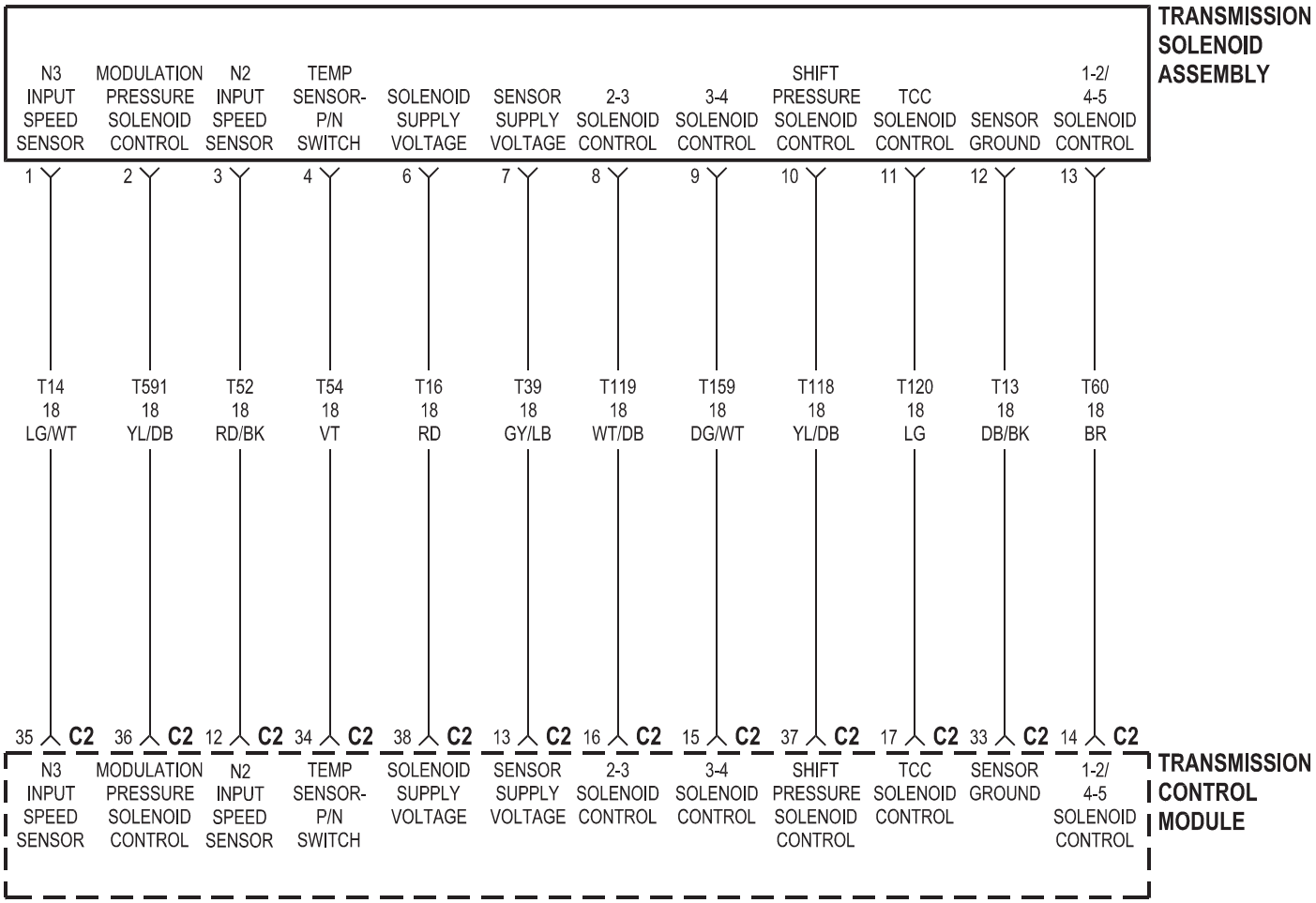

LINE PRESSURE SENSOR
1
2
3
INPUT SPEED SENSOR
1
2
OUTPUT SPEED SENSOR
2
1
T13
18
DB/BK
T13
18
DB/BK
S113
Z114
14
BK/LB
T138
14
GY/LB
T130
14
VT/TN
T52
18
RD/BK
T13
18
DB/BK
T13
18
DB/BK
T14
18
LG/WT
22
TRANSMISSION SOLENOID/ TRS ASSEMBLY
23
S114
(8W-15-2)
Z114
14
BK/LG
Z114
14
BK/LG
T54
18
VT
53
38
30
52
54
13
14
GROUND
5 VOLT SUPPLY
LINE PRESSURE SENSOR SIGNAL
INPUT SPEED SENSOR SIGNAL
TRANSMISSION TEMPERATURE SENSOR SIGNAL
SPEED SENSOR GROUND
OUTPUT SPEED SENSOR SIGNAL
TRANSMISSION CONTROL MODULE
G102
(8W-15-2)


RUN- START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
21
10A
(8W-12-18)
(8W-12-19)
52
C3
F12
20
DB/WT
5
FUSED IGNITION SWITCH OUTPUT (RUN-START)
BODY CONTROL MODULE
(8W-45-4)
PANEL LAMPS DRIVER
9
C1
E2
20
OR
1
PANEL LAMPS DRIVER
SHIFTER ASSEMBLY
SECONDARY BRAKE SWITCH SIGNAL
GROUND
GROUND
OVERDRIVE OFF SWITCH SENSE
6
4
2
3
K29
18
WT/PK
Z300
18
BK
Z234
18
BK
T6
18
OR/WT
22
C200
20
C200
K29
18
WT/PK
T6
18
OR/BK
4.7L
4.0L
LHD
RHD
S314
(8W-33-2)
S203
(8W-15-14)
S205
(8W-15-15)
52
C106
14
C107
T6
18
OR/WT
T6
18
OR/WT
LHD
RHD
52
C106
14
C107
K29
18
WT/PK
Z300
12
BK
Z234
18
BK
2
C103
5
C101
T6
18
OR/WT
2
BRAKE LAMP SWITCH
(8W-33-2)
T6
18
VT/WT
13
C3
OVERDRIVE OFF SWITCH SENSE
POWERTRAIN CONTROL MODULE
(8W-30-2)
48
OVERDRIVE OFF SWITCH SENSE
TRANSMISSION CONTROL MODULE
G200
(8W-15-15)


RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 12 10A
(8W-12-18)
(8W-12-19)
FUSE 21 10A
(8W-12-18)
(8W-12-19)
BACK-UP LAMP RELAY (IN PDC)
(8W-51-9)
85
86
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
T2 18 TN/BK
36 C107
T2 18 TN/BK
32 C200
T2 20 TN/BK
D25 20 YL/VT
11
C201
30 C3
52 C3
F991 18 OR/DB
F12 20 DB/WT
12
8
9
5
F991 20 OR/DB
F12 20 DB/WT
D25 20 RD
3 C1
5 C2
1 C1
3 C2
4 C1
5 C1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
BACK-UP LAMP RELAY CONTROL
PCI BUS
SHIFTER ASSEMBLY
SECONDARY BRAKE SWITCH SIGNAL
GROUND
4 C2
11 C1
K2 20 WT/PK
Z234 20 WT
10 C201
K29 18 WT/PK
22 C200
Z234 18 BK
S205
(8W-15-15)
S314
(8W-33-2)
BRAKE LAMP SWITCH
(8W-33-2)
LHD
RHD
Z238 18 BK
Z243 18 BK
BASE
EXCEPT BASE
S329
(8W-15-17)
S358
(8W-15-22)
Z238 18 BK
Z238 14 BK
Z243 12 BK
G300
(8W-15-17)
G300
(8W-15-17)
G301
(8W-15-22)
G200
(8W-15-15)

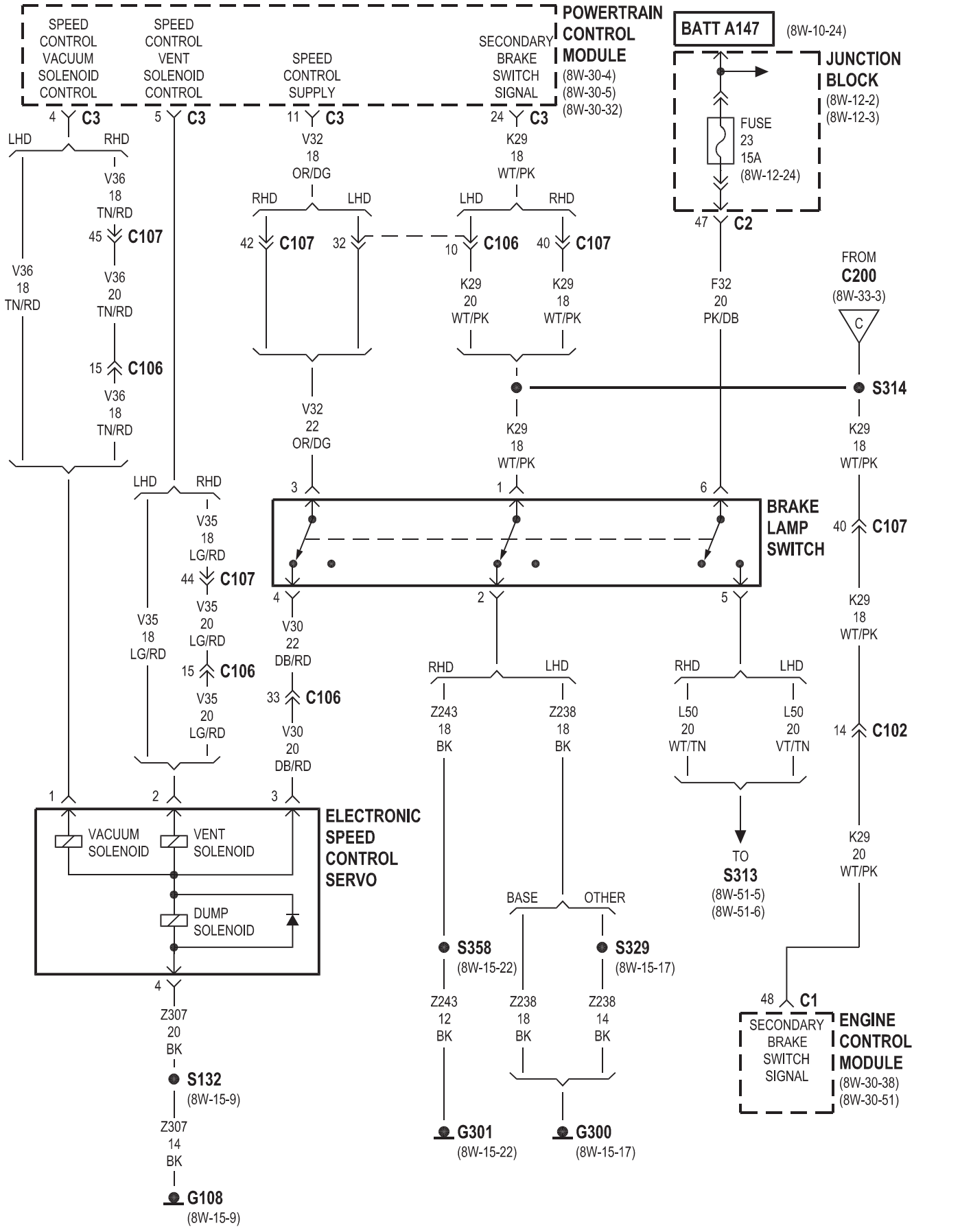

SHIFTER ASSEMBLY
GROUND
SHIFTER C1 SENSE
SHIFTER C2 SENSE
SHIFTER C3 SENSE
SHIFTER C4 SENSE
SHIFTER C5 SENSE
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PARK LOCKOUT SOLENOID CONTROL
12 C1
6 C1
7 C1
8 C1
9 C1
10 C1
2 C1
6 C2
Z234 20 WT
W0 20 DB/WT
W1 20 VT/WT
W2 20 VT
W3 20 BK
W4 20 PK/OR
F991 20 OR/DB
Y1 20 DB/PK
30 C1
25 C1
26 C1
27 C1
28 C1
3 C1
29 C1
4 C1
GROUND
SHIFTER C1 SENSE
SHIFTER C2 SENSE
SHIFTER C3 SENSE
SHIFTER C4 SENSE
SHIFTER C5 SENSE
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PARK LOCKOUT SOLENOID CONTROL
TRANSMISSION CONTROL MODULE
SCI TRANSMIT
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
1 C1
7 C1
D21 20 PK
T41 20 BK/WT
7
C201
11
D21 20 PK
T41 18 BK/WT
S217
(8W-18-10)
17 C200
D21 20 PK
T41 18 BK/WT
7 DATA LINK CONNECTOR
(8W-18-10)
13 C107
T41 18 BK/WT
1 C103
T41 20 BK/WT
112 C2
PARK/ NEUTRAL POSITION SWITCH SENSE (T41)
2
SENSOR GROUND
TRANSFER CASE POSITION SENSOR INPUT
TRANSFER CASE POSITION SENSOR
1
K4 20 BK/LB
K77 20 BR/WT
S145
(8W-70-6)
K4 18 BK/LB
21 C1
29 C1
SENSOR GROUND
TRANSFER CASE POSITION SENSOR INPUT
ENGINE CONTROL MODULE
(8W-30-40)
(8W-30-51)


CONTROLLER ANTILOCK BRAKE
(8W-35-5)
CAN C BUS (-)
CAN C BUS (+)
14
11
D51 18 DG/WT
D52 18 LG/WT
5
4
C102
TRANSMISSION CONTROL MODULE
CAN C BUS (-)
CAN C BUS (+)
L2
C2
H1
C2
D51 16 WT
D52 16 DG/WT
D51 18 DG/WT
D52 18 LG/WT
2
C113
1
D51 16 WT
D52 16 DG/WT
S172
(8W-30-36)
S171
(8W-30-36)
D51 18 WT
D52 18 DG/WT
25
C1
6
C1
CAN C BUS (-)
CAN C BUS (+)
ENGINE CONTROL MODULE
(8W-30-36)

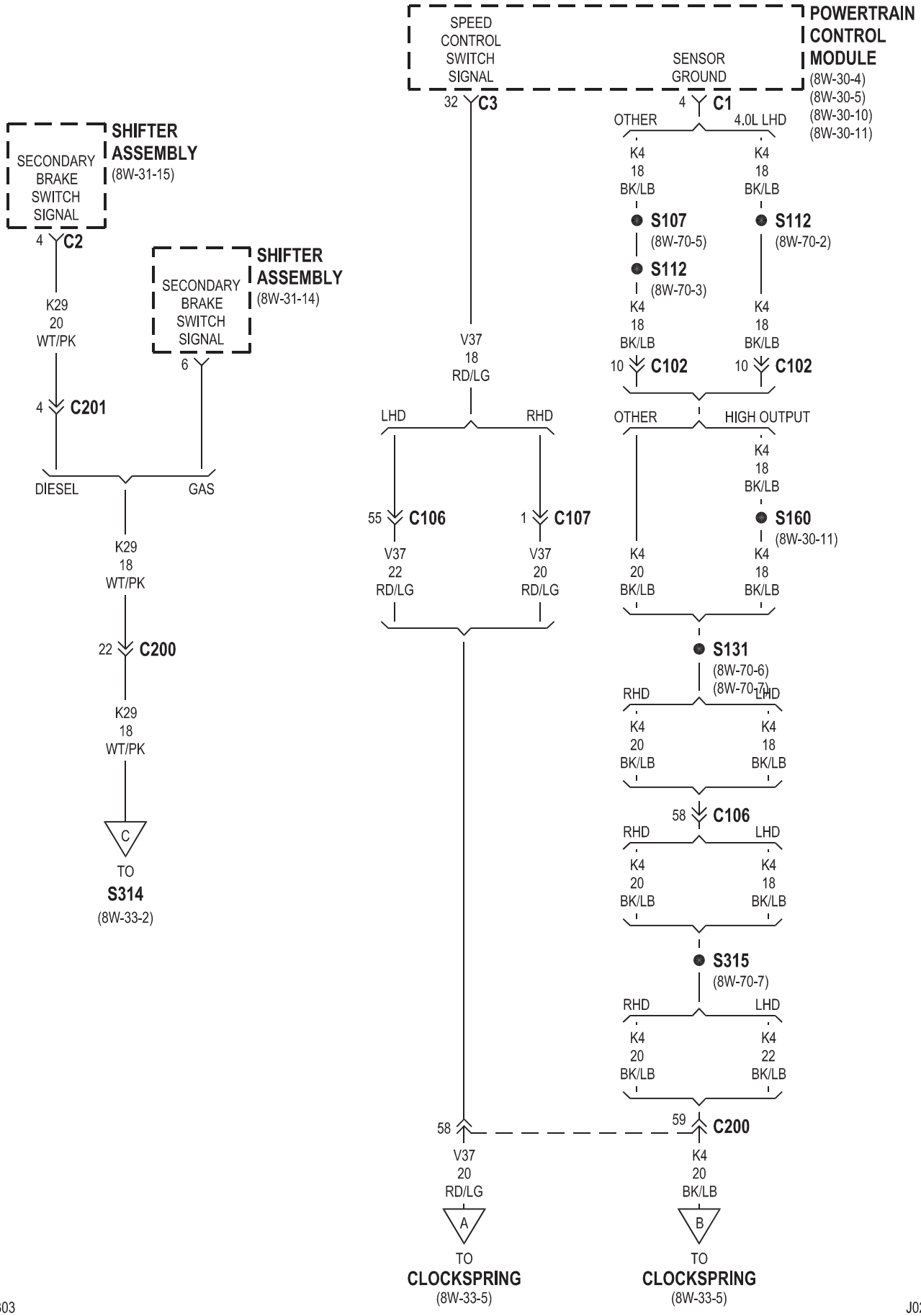

TRANSMISSION SOLENOID ASSEMBLY
N3 INPUT SPEED SENSOR
MODULATION PRESSURE SOLENOID CONTROL
N2 INPUT SPEED SENSOR
TEMP SENSOR-P/N SWITCH
SOLENOID SUPPLY VOLTAGE
SENSOR SUPPLY VOLTAGE
2-3 SOLENOID CONTROL
3-4 SOLENOID CONTROL
SHIFT PRESSURE SOLENOID CONTROL
TCC SOLENOID CONTROL
SENSOR GROUND
1-2/4-5 SOLENOID CONTROL
1 2 3 4 6 7 8 9 10 11 12 13
T14 18 LG/WT
T591 18 YL/DB
T52 18 RD/BK
T54 18 VT
T16 18 RD
T39 18 GY/LB
T119 18 WT/DB
T159 18 DG/WT
T118 18 YL/DB
T120 18 LG
T13 18 DB/BK
T60 18 BR
35 C2 36 C2 12 C2 34 C2 38 C2 13 C2 16 C2 15 C2 37 C2 17 C2 33 C2 14 C2
TRANSMISSION CONTROL MODULE

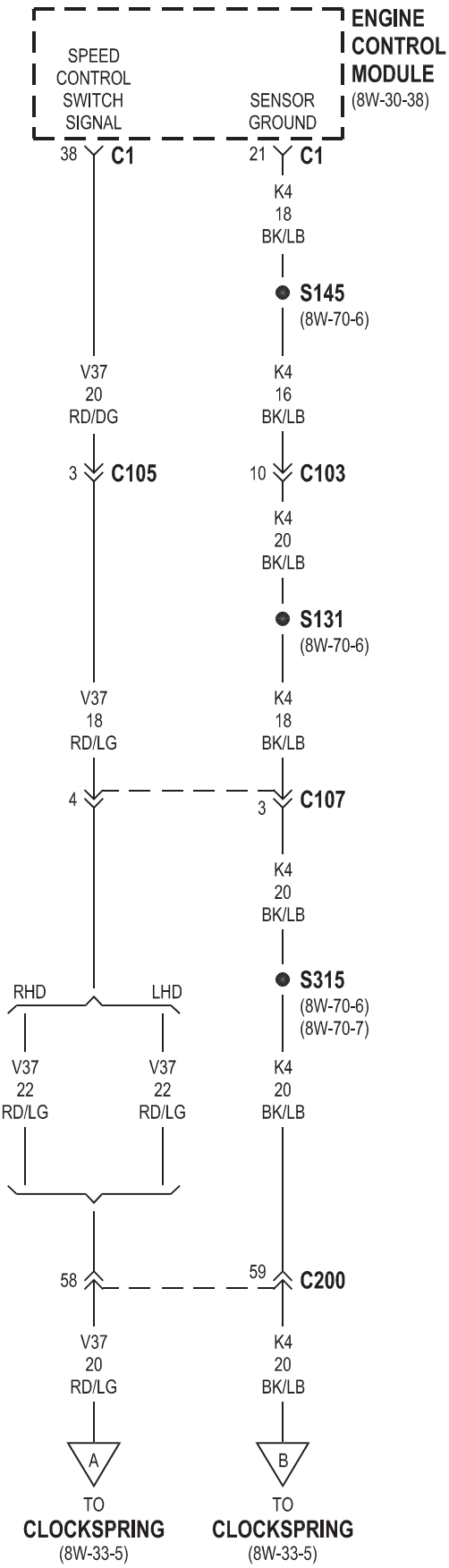
8W-33 VEHICLE SPEED CONTROL

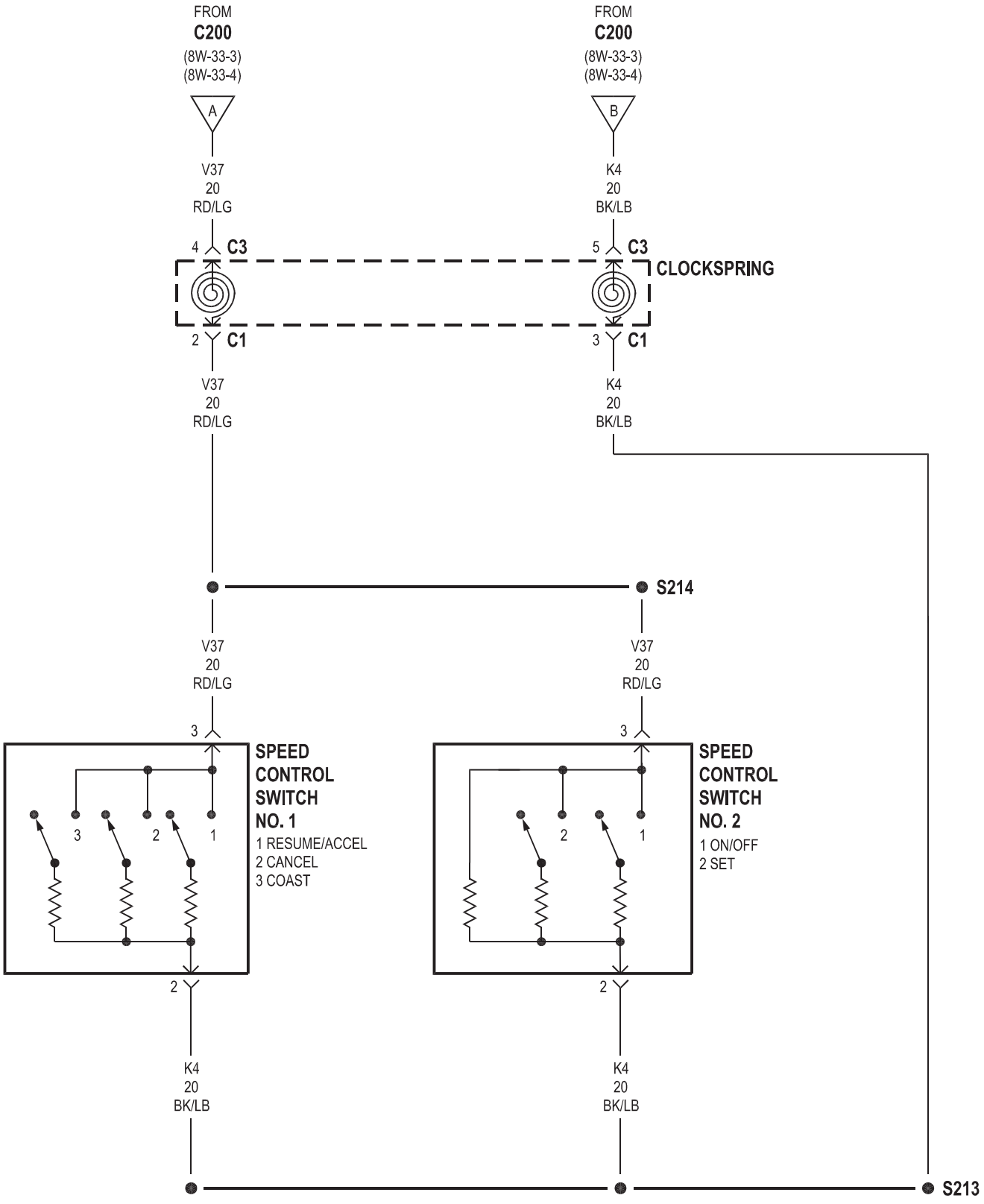
Component	Page
Brake Lamp Switch	8W-33-2
Clockspring	8W-33-3, 4, 5
Electronic Speed Control Servo	8W-33-2
Engine Control Module	8W-33-2, 4
Fuse 23	8W-33-2
G108	8W-33-2
G300	8W-33-2
G301	8W-33-2
Junction Block	8W-33-2
Powertrain Control Module	8W-33-2, 3
Shifter Assembly	8W-33-3
Speed Control Switch No. 1	8W-33-5
Speed Control Switch No. 2	8W-33-5


POWERTRAIN CONTROL MODULE
(8W-30-4)
(8W-30-5)
(8W-30-32)
SPEED CONTROL VACUUM SOLENOID CONTROL
SPEED CONTROL VENT SOLENOID CONTROL
SPEED CONTROL SUPPLY
SECONDARY BRAKE SWITCH SIGNAL
4 C3
5 C3
11 C3
24 C3
BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 23 15A
(8W-12-24)
47 C2
FROM C200
(8W-33-3)
C
S314
LHD
RHD
V36 18 TN/RD
45 C107
V36 20 TN/RD
15 C106
V36 18 TN/RD
V32 18 OR/DG
42 C107
32
V32 22 OR/DG
10 C106
40 C107
K29 20 WT/PK
K29 18 WT/PK
K29 18 WT/PK
F32 20 PK/DB
K29 18 WT/PK
40 C107
K29 18 WT/PK
14 C102
K29 20 WT/PK
V35 18 LG/RD
44 C107
V35 20 LG/RD
15 C106
V35 20 LG/RD
V35 18 LG/RD
3
1
6
BRAKE LAMP SWITCH
4
2
5
V30 22 DB/RD
33 C106
V30 20 DB/RD
Z243 18 BK
Z238 18 BK
L50 20 WT/TN
L50 20 VT/TN
TO S313
(8W-51-5)
(8W-51-6)
1
2
3
ELECTRONIC SPEED CONTROL SERVO
VACUUM SOLENOID
VENT SOLENOID
DUMP SOLENOID
4
Z307 20 BK
S132
(8W-15-9)
Z307 14 BK
G108
(8W-15-9)
BASE
OTHER
S358
(8W-15-22)
S329
(8W-15-17)
Z243 12 BK
Z238 18 BK
Z238 14 BK
G301
(8W-15-22)
G300
(8W-15-17)
48 C1
SECONDARY BRAKE SWITCH SIGNAL
ENGINE CONTROL MODULE
(8W-30-38)
(8W-30-51)

GAS

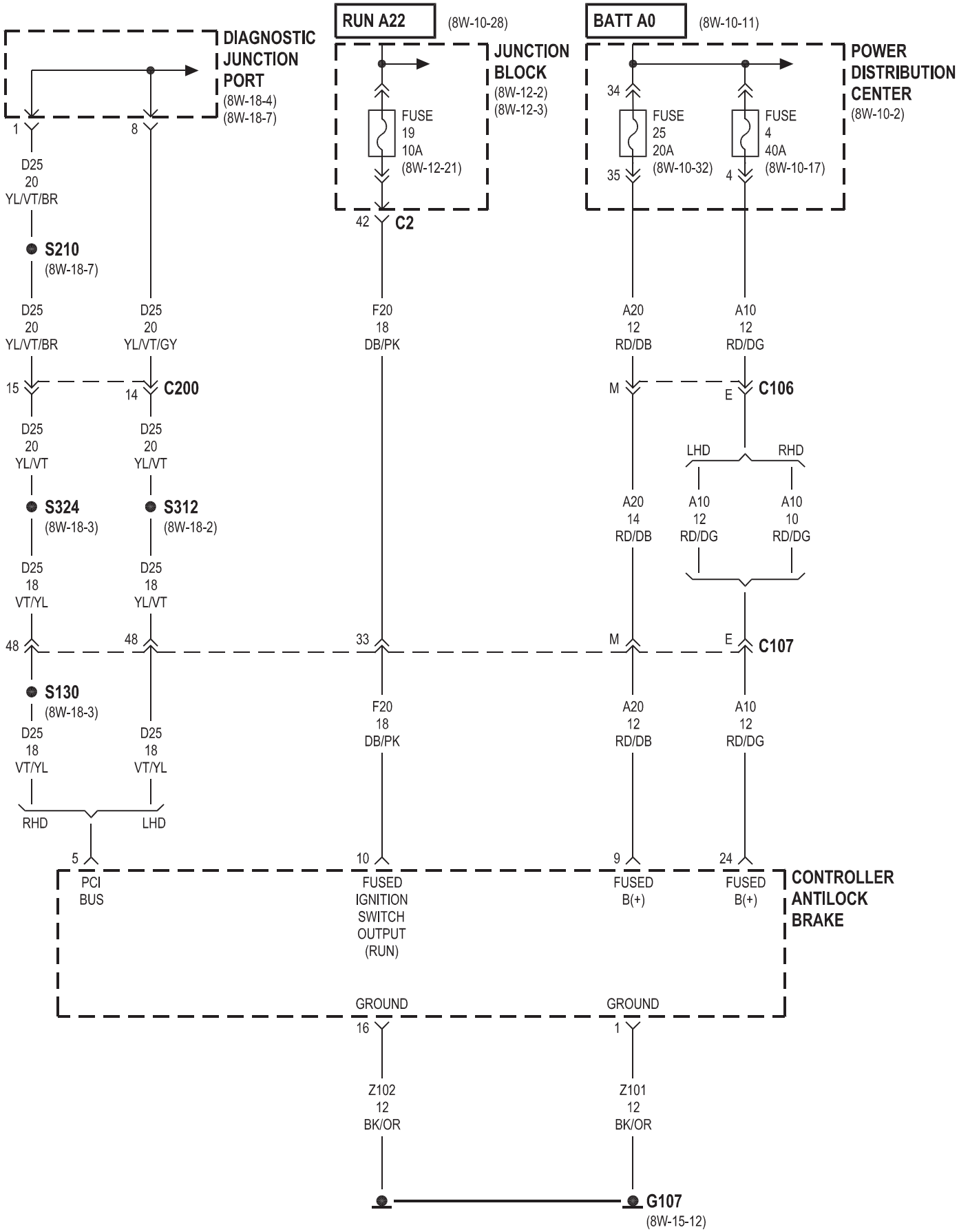

SHIFTER ASSEMBLY
(8W-31-15)
SECONDARY BRAKE SWITCH SIGNAL
4 C2
K29
20
WT/PK
4 C201
SHIFTER ASSEMBLY
(8W-31-14)
SECONDARY BRAKE SWITCH SIGNAL
6
DIESEL
GAS
K29
18
WT/PK
22 C200
K29
18
WT/PK
C
TO
S314
(8W-33-2)
POWERTRAIN CONTROL MODULE
(8W-30-4)
(8W-30-5)
(8W-30-10)
(8W-30-11)
SPEED CONTROL SWITCH SIGNAL
32 C3
SENSOR GROUND
4 C1
OTHER
4.0L LHD
K4
18
BK/LB
S107
(8W-70-5)
S112
(8W-70-3)
S112
(8W-70-2)
10 C102
10 C102
V37
18
RD/LG
LHD
RHD
OTHER
HIGH OUTPUT
S160
(8W-30-11)
55 C106
1 C107
V37
22
RD/LG
V37
20
RD/LG
K4
20
BK/LB
K4
18
BK/LB
S131
(8W-70-6)
(8W-70-7)
RHD
LHD
58 C106
S315
(8W-70-7)
K4
22
BK/LB
58
59 C200
V37
20
RD/LG
A
TO
CLOCKSPRING
(8W-33-5)
B
TO
CLOCKSPRING
(8W-33-5)

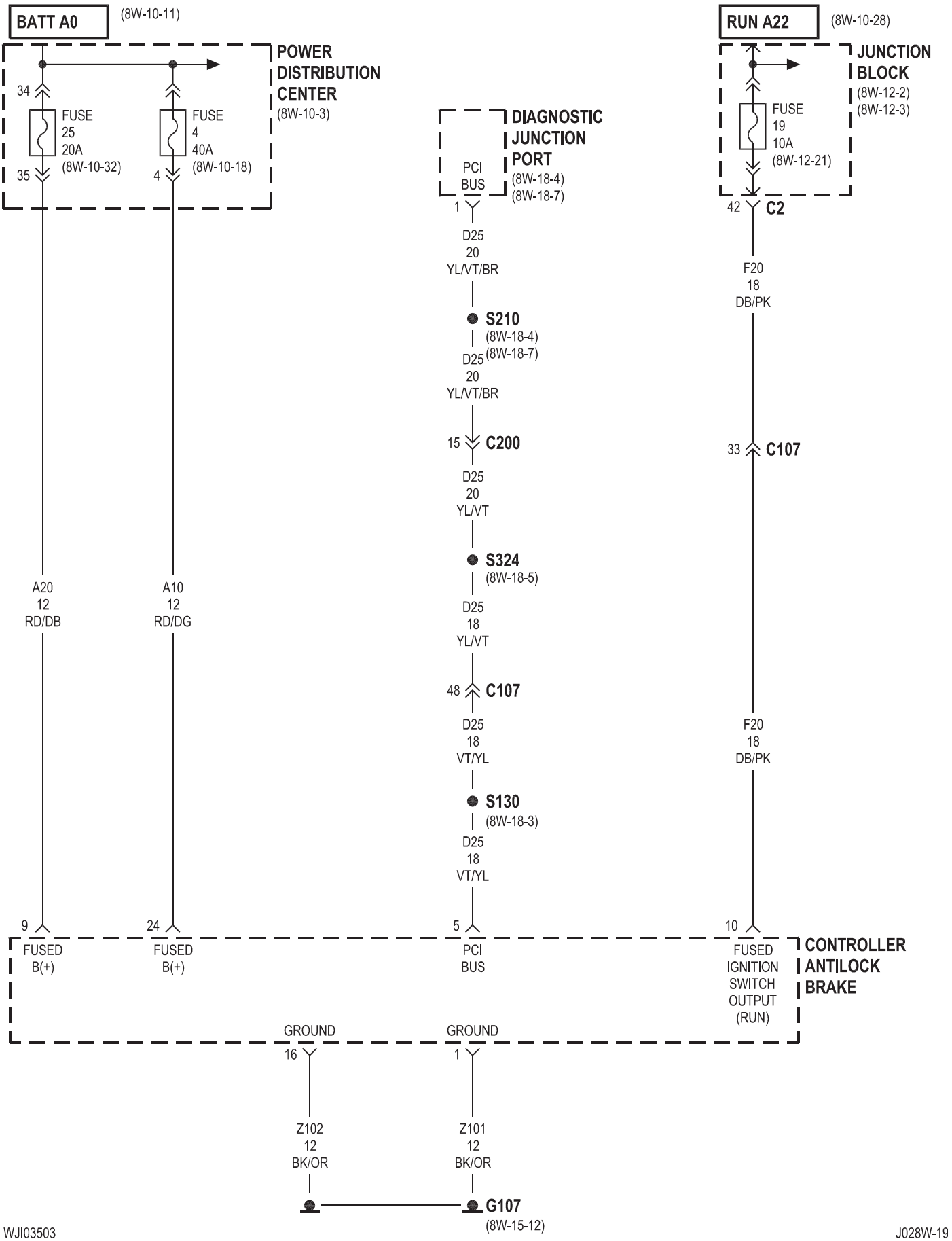

ENGINE CONTROL MODULE
(8W-30-38)
SPEED CONTROL SWITCH SIGNAL
SENSOR GROUND
38 C1
21 C1
K4 18 BK/LB
S145
(8W-70-6)
V37 20 RD/DG
K4 16 BK/LB
3 C105
10 C103
K4 20 BK/LB
S131
(8W-70-6)
V37 18 RD/LG
K4 18 BK/LB
4
3 C107
K4 20 BK/LB
S315
(8W-70-6)
(8W-70-7)
RHD
LHD
V37 22 RD/LG
V37 22 RD/LG
K4 20 BK/LB
58
59 C200
V37 20 RD/LG
K4 20 BK/LB
A
B
TO CLOCKSPRING
(8W-33-5)
TO CLOCKSPRING
(8W-33-5)

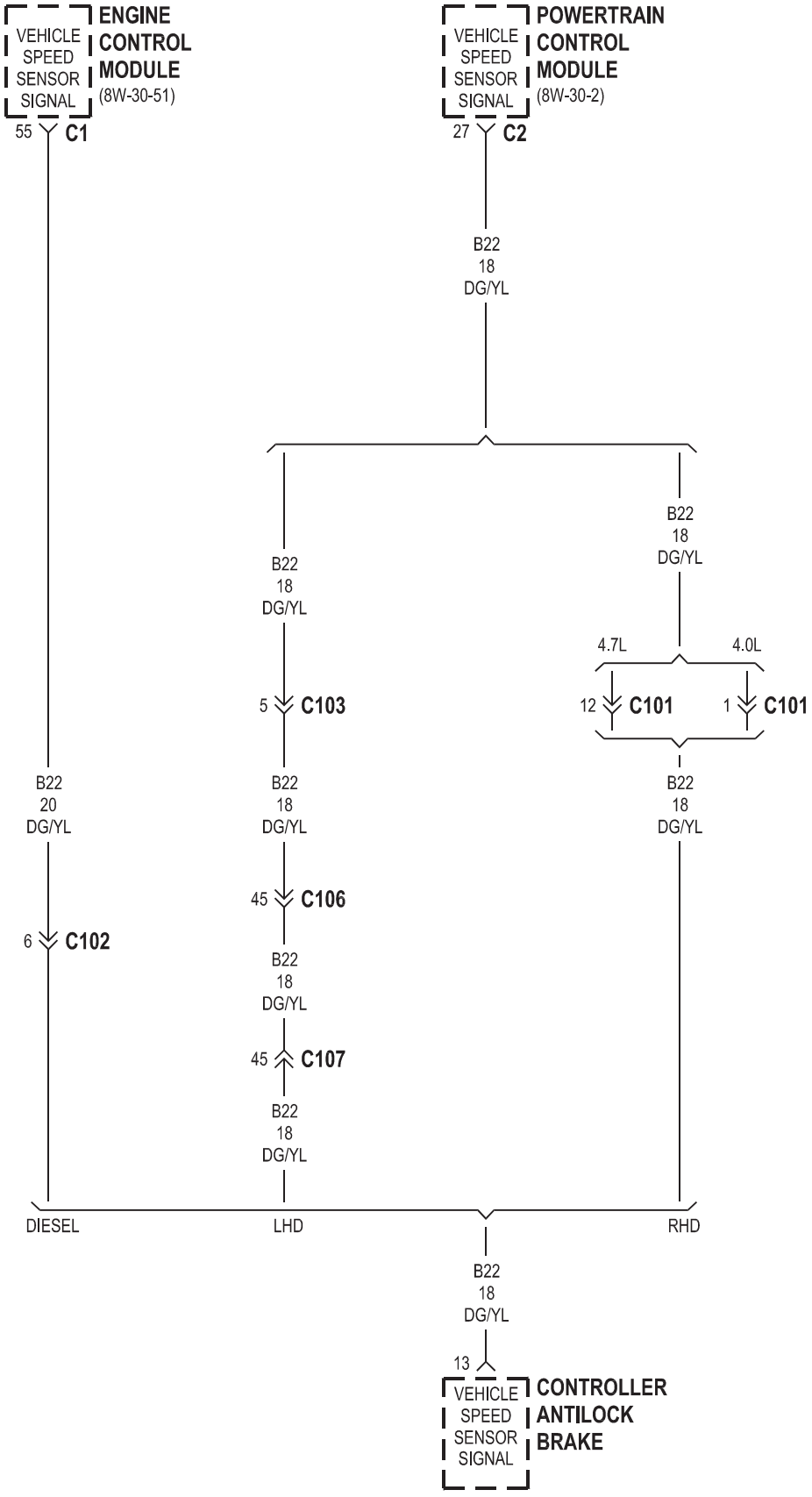

FROM
C200
(8W-33-3)
(8W-33-4)
A
V37
20
RD/LG
4
C3
2
C1
V37
20
RD/LG
FROM
C200
(8W-33-3)
(8W-33-4)
B
K4
20
BK/LB
5
C3
3
C1
K4
20
BK/LB
CLOCKSPRING
S214
V37
20
RD/LG
3
V37
20
RD/LG
3
SPEED
CONTROL
SWITCH
NO. 1
1 RESUME/ACCEL
2 CANCEL
3 COAST
3
2
1
2
K4
20
BK/LB
SPEED
CONTROL
SWITCH
NO. 2
1 ON/OFF
2 SET
2
1
2
K4
20
BK/LB
S213

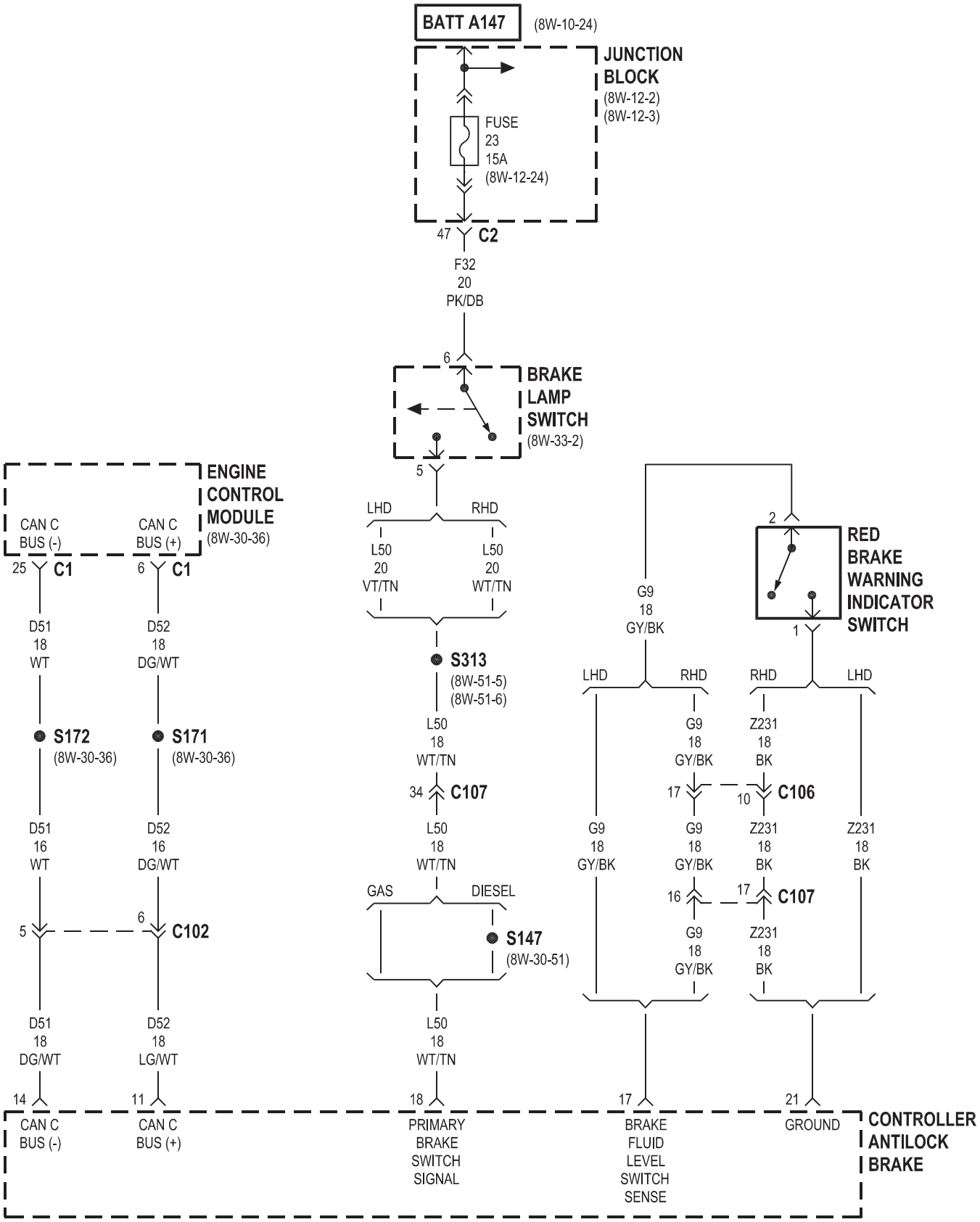
8W-35 ANTILOCK BRAKES

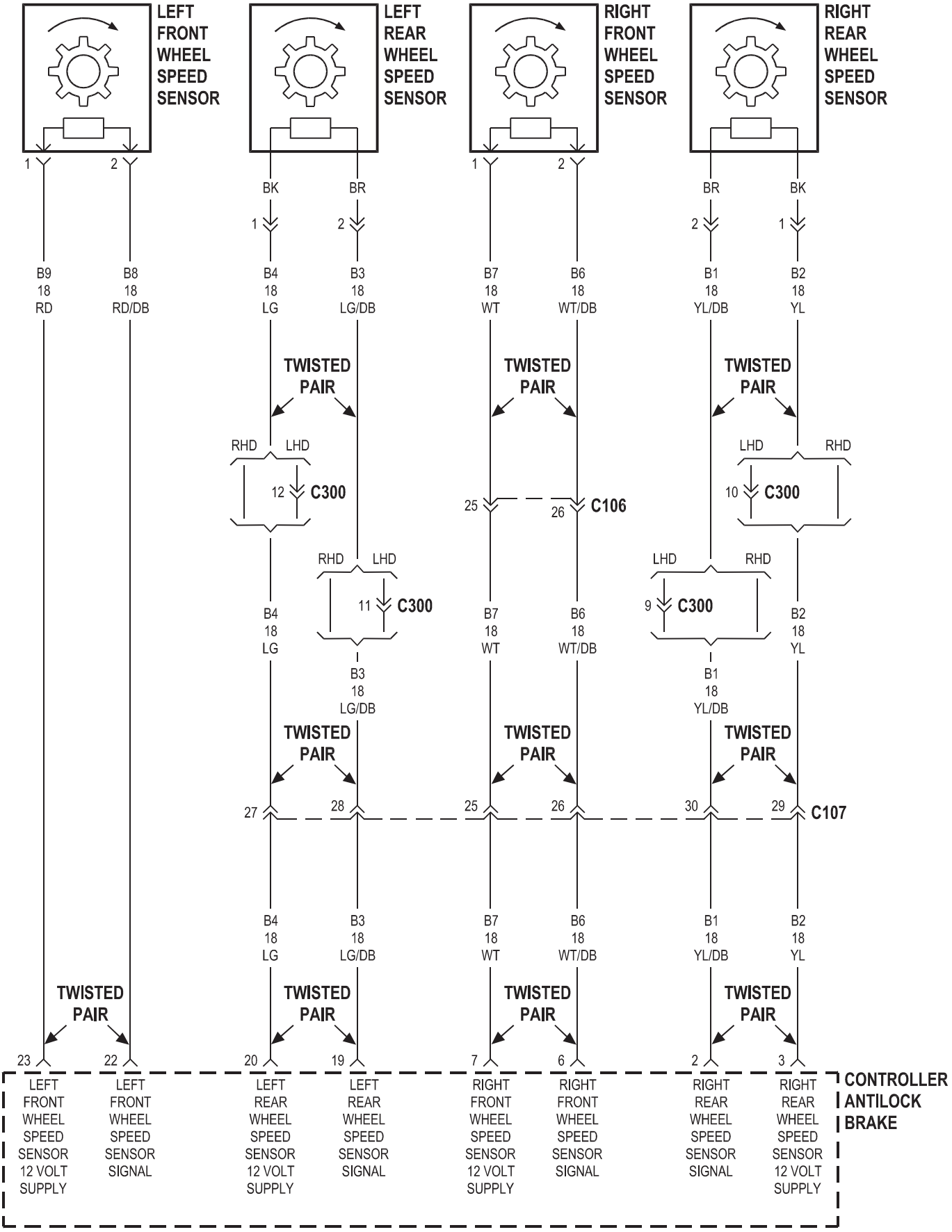
Component	Page
Brake Lamp Switch	8W-35-5
Controller Antilock Brake	8W-35-2, 3, 4, 5, 6
Diagnostic Junction Port	8W-35-2, 3
Engine Control Module	8W-35-4, 5
Fuse 4	8W-35-2, 3
Fuse 19	8W-35-2, 3
Fuse 23	8W-35-5
Fuse 25	8W-35-2, 3
G107	8W-35-2, 3
Junction Block	8W-35-2, 3, 5
Left Front Wheel Speed Sensor	8W-35-6
Left Rear Wheel Speed Sensor	8W-35-6
Power Distribution Center	8W-35-2, 3
Powertrain Control Module	8W-35-4
Red Brake Warning Indicator Switch	8W-35-5
Right Front Wheel Speed Sensor	8W-35-6
Right Rear Wheel Speed Sensor	8W-35-6


RUN A22
(8W-10-28)
BATT A0
(8W-10-11)
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
POWER DISTRIBUTION CENTER
(8W-10-2)
FUSE 19 10A (8W-12-21)
FUSE 25 20A (8W-10-32)
FUSE 4 40A (8W-10-17)
1
8
34
35
4
42
C2
D25 20 YL/VT/BR
S210
(8W-18-7)
D25 20 YL/VT/GY
F20 18 DB/PK
A20 12 RD/DB
A10 12 RD/DG
15
14
C200
M
E
C106
LHD
RHD
D25 20 YL/VT
S324
(8W-18-3)
S312
(8W-18-2)
A20 14 RD/DB
A10 12 RD/DG
A10 10 RD/DG
D25 18 VT/YL
D25 18 YL/VT
48
48
33
M
E
C107
S130
(8W-18-3)
D25 18 VT/YL
F20 18 DB/PK
A20 12 RD/DB
A10 12 RD/DG
RHD
LHD
5
10
9
24
CONTROLLER ANTILOCK BRAKE
PCI BUS
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED B(+)
FUSED B(+)
GROUND
GROUND
16
1
Z102 12 BK/OR
Z101 12 BK/OR
G107
(8W-15-12)


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
34
FUSE 25 20A
(8W-10-32)
35
FUSE 4 40A
(8W-10-18)
4
A20 12 RD/DB
A10 12 RD/DG
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
PCI BUS
1
D25 20 YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25 20 YL/VT/BR
15
C200
D25 20 YL/VT
S324
(8W-18-5)
D25 18 YL/VT
48
C107
D25 18 VT/YL
S130
(8W-18-3)
D25 18 VT/YL
RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 19 10A
(8W-12-21)
42
C2
F20 18 DB/PK
33
C107
F20 18 DB/PK
9
FUSED B(+)
24
FUSED B(+)
5
PCI BUS
10
FUSED IGNITION SWITCH OUTPUT (RUN)
CONTROLLER ANTILOCK BRAKE
GROUND
16
Z102 12 BK/OR
GROUND
1
Z101 12 BK/OR
G107
(8W-15-12)

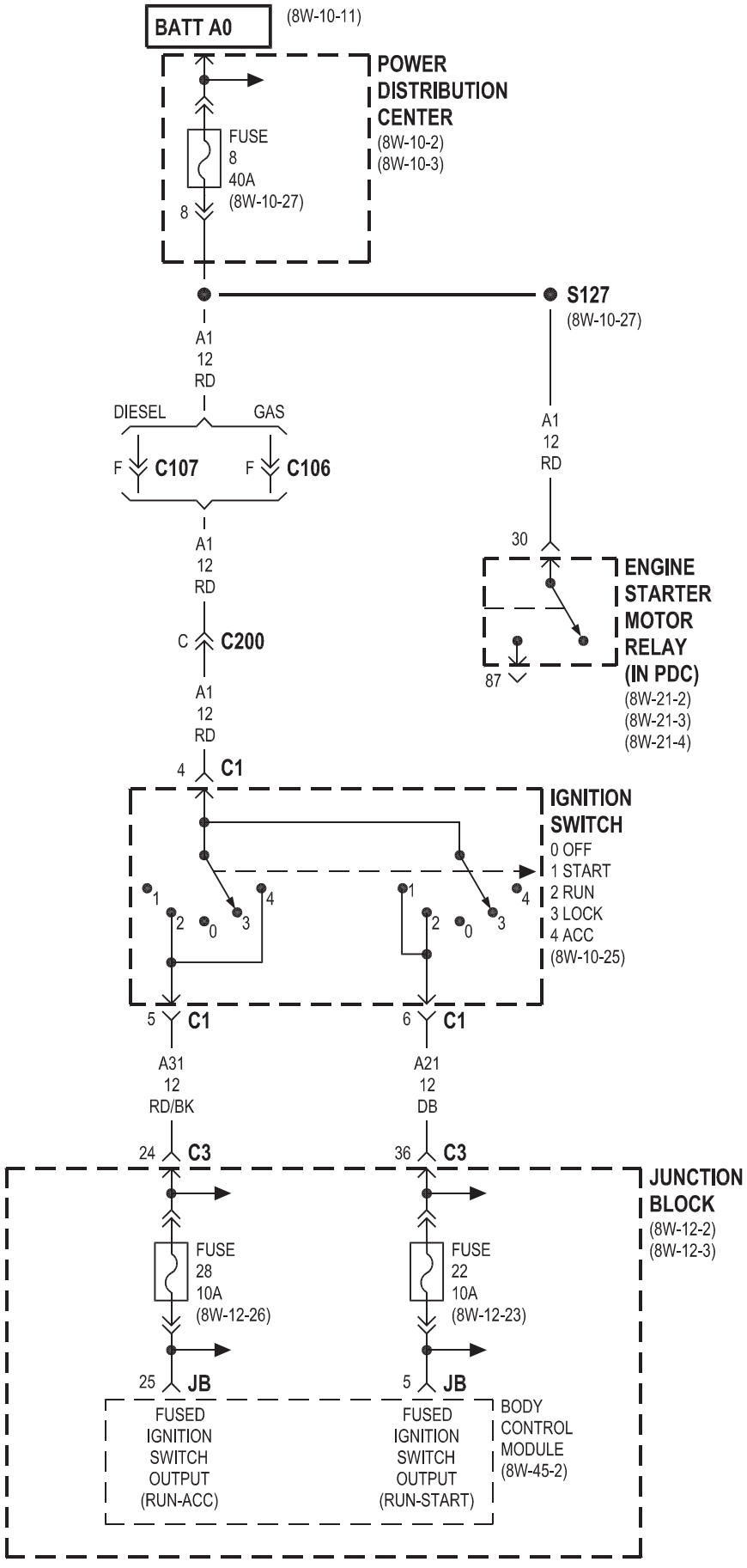

VEHICLE SPEED SENSOR SIGNAL
ENGINE CONTROL MODULE
(8W-30-51)
55 C1
VEHICLE SPEED SENSOR SIGNAL
POWERTRAIN CONTROL MODULE
(8W-30-2)
27 C2
B22 18 DG/YL
B22 18 DG/YL
B22 18 DG/YL
4.7L
4.0L
5 C103
12 C101
1 C101
B22 20 DG/YL
B22 18 DG/YL
B22 18 DG/YL
6 C102
45 C106
B22 18 DG/YL
45 C107
B22 18 DG/YL
DIESEL
LHD
RHD
B22 18 DG/YL
13
VEHICLE SPEED SENSOR SIGNAL
CONTROLLER ANTILOCK BRAKE

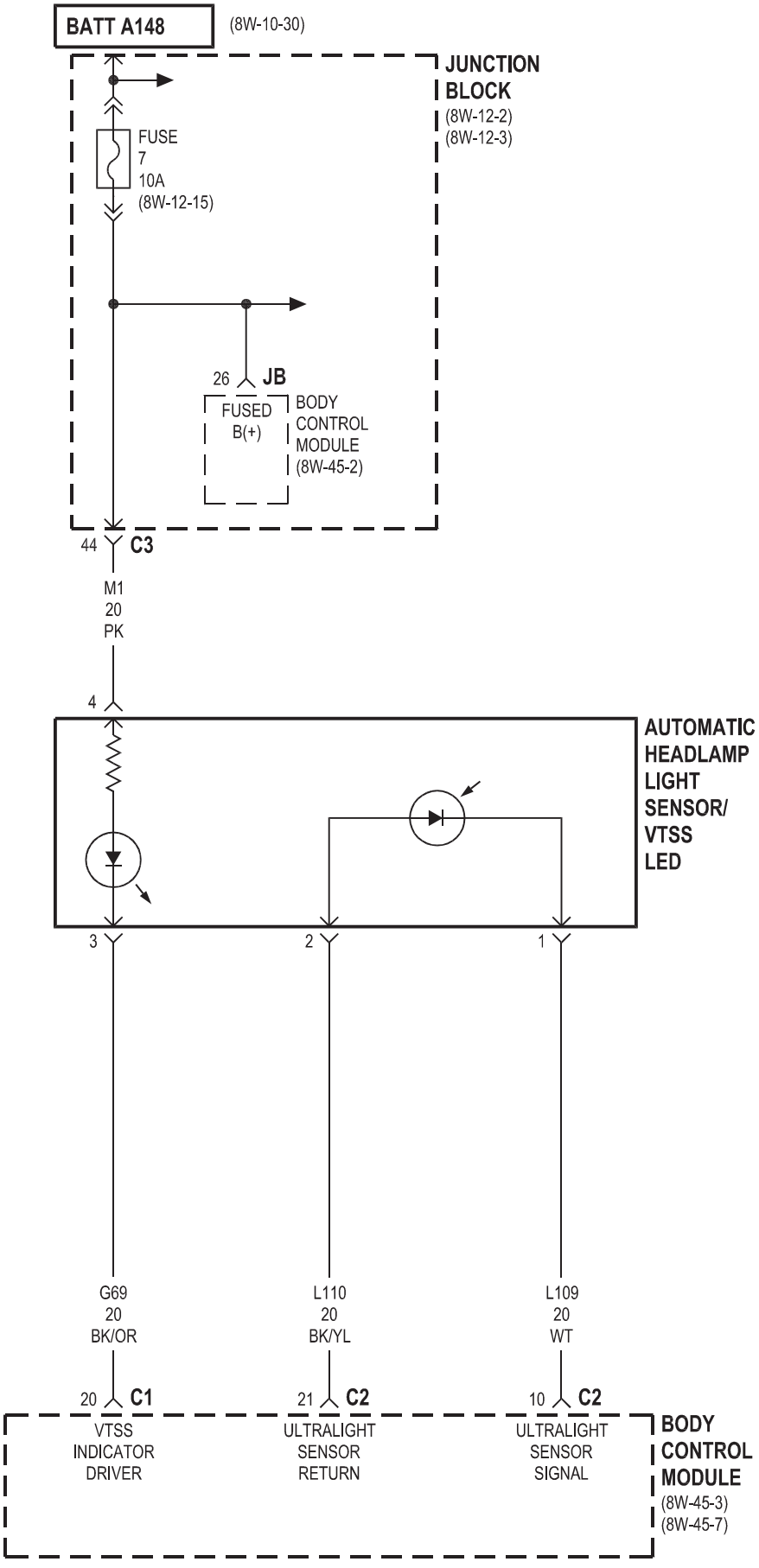

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 23 15A
(8W-12-24)
47 C2
F32 20 PK/DB
6
BRAKE LAMP SWITCH
(8W-33-2)
5
LHD
RHD
L50 20 VT/TN
L50 20 WT/TN
S313
(8W-51-5)
(8W-51-6)
L50 18 WT/TN
34 C107
L50 18 WT/TN
GAS
DIESEL
S147
(8W-30-51)
L50 18 WT/TN
ENGINE CONTROL MODULE
(8W-30-36)
CAN C BUS (-)
CAN C BUS (+)
25 C1
6 C1
D51 18 WT
D52 18 DG/WT
S172
(8W-30-36)
S171
(8W-30-36)
D51 16 WT
D52 16 DG/WT
5
6 C102
D51 18 DG/WT
D52 18 LG/WT
14
11
CAN C BUS (-)
CAN C BUS (+)
18
PRIMARY BRAKE SWITCH SIGNAL
G9 18 GY/BK
LHD
RHD
G9 18 GY/BK
17
BRAKE FLUID LEVEL SWITCH SENSE
2
RED BRAKE WARNING INDICATOR SWITCH
1
RHD
LHD
Z231 18 BK
17
10 C106
G9 18 GY/BK
Z231 18 BK
16
17 C107
G9 18 GY/BK
Z231 18 BK
Z231 18 BK
21
GROUND
CONTROLLER ANTILOCK BRAKE

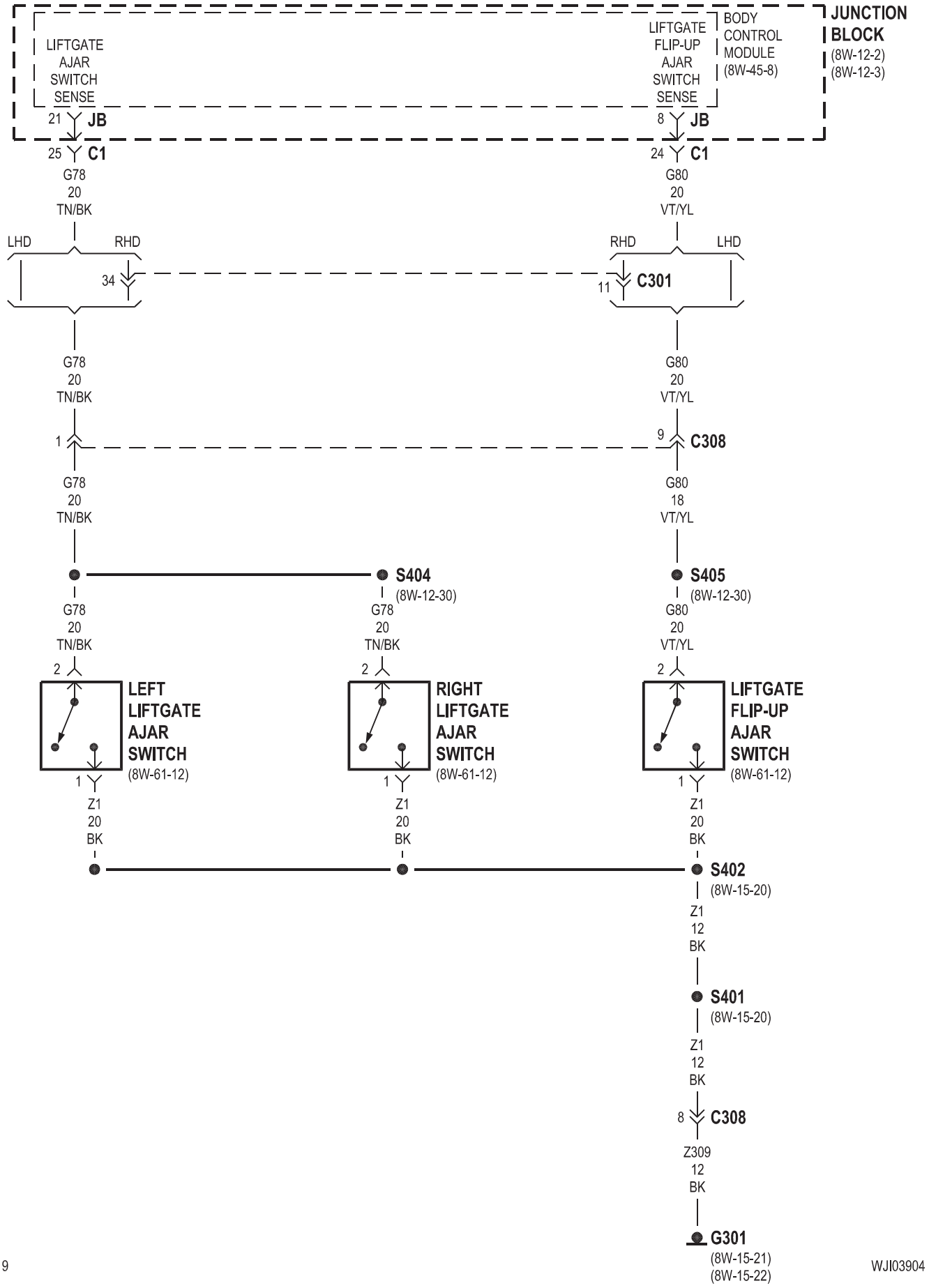

LEFT FRONT WHEEL SPEED SENSOR
LEFT REAR WHEEL SPEED SENSOR
RIGHT FRONT WHEEL SPEED SENSOR
RIGHT REAR WHEEL SPEED SENSOR
1
2
BK
BR
B9 18 RD
B8 18 RD/DB
B4 18 LG
B3 18 LG/DB
B7 18 WT
B6 18 WT/DB
B1 18 YL/DB
B2 18 YL
TWISTED PAIR
RHD
LHD
12 C300
10 C300
25
26 C106
11 C300
9 C300
27
28
30
29 C107
23
22
20
19
7
6
2
3
LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
LEFT FRONT WHEEL SPEED SENSOR SIGNAL
LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
LEFT REAR WHEEL SPEED SENSOR SIGNAL
RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
RIGHT REAR WHEEL SPEED SENSOR SIGNAL
RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
CONTROLLER ANTILOCK BRAKE

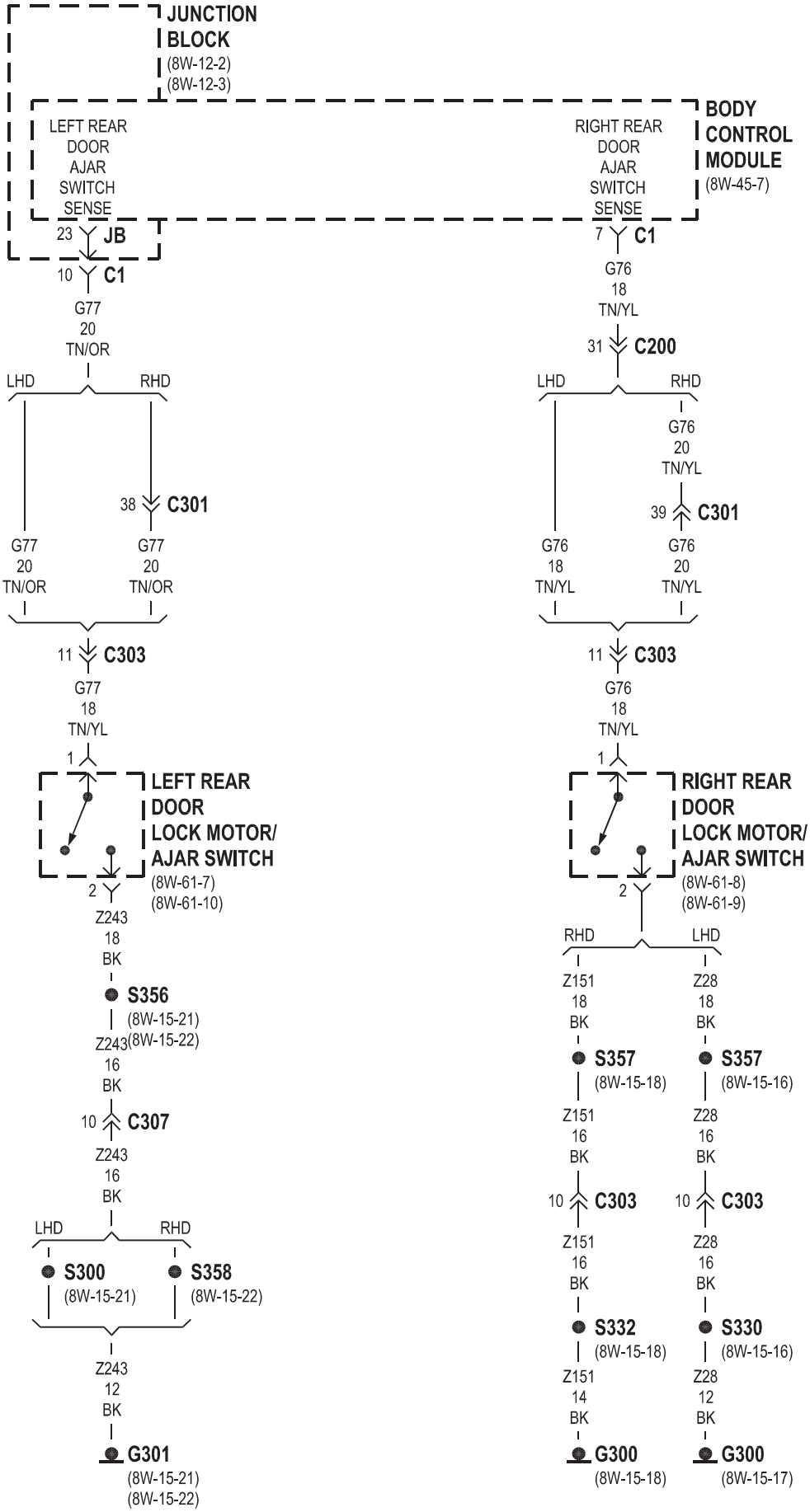
8W-39 VEHICLE THEFT SECURITY SYSTEM

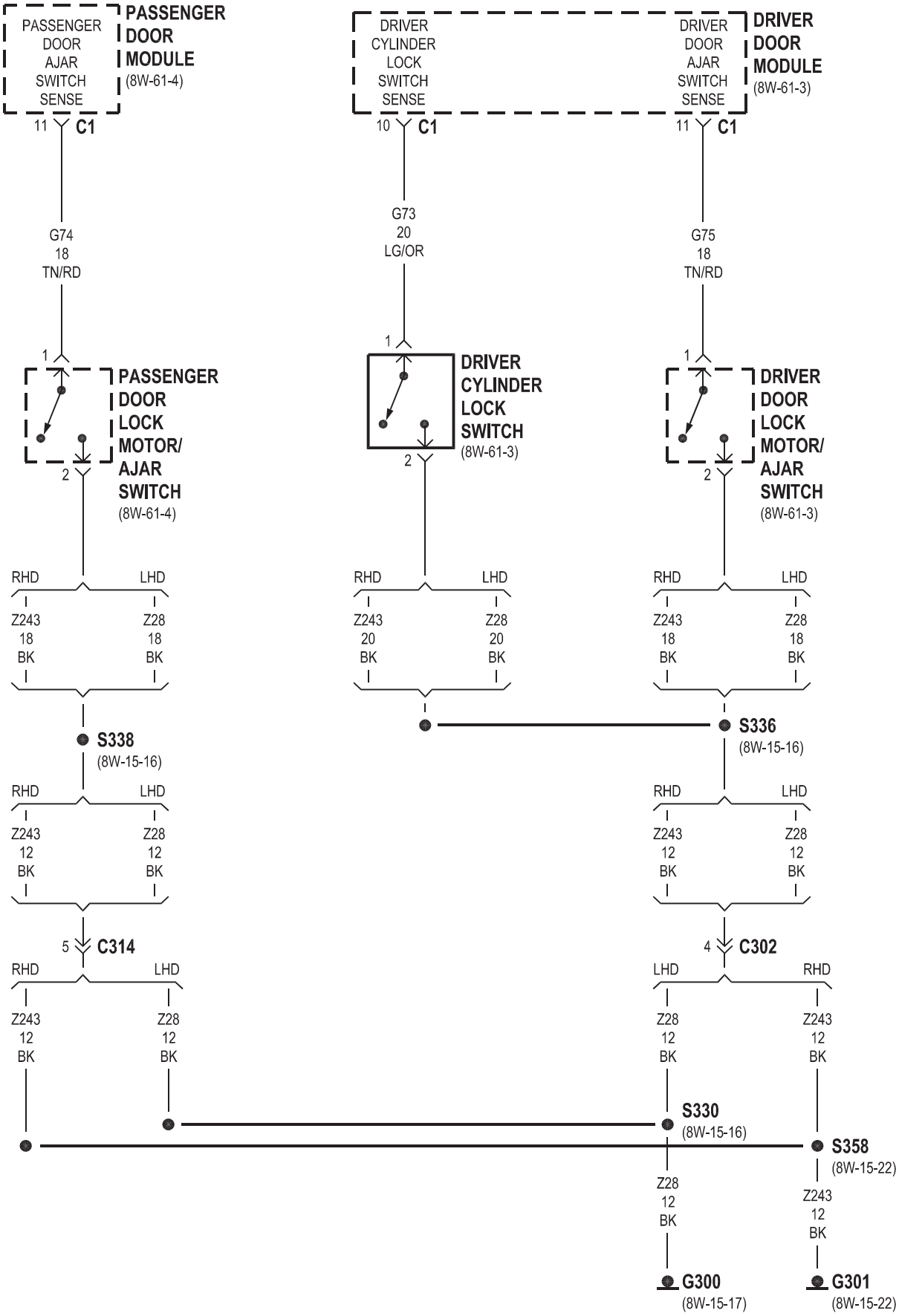
Component	Page
Automatic Headlamp Light Sensor/VTSS LED	8W-39-3
Body Control Module	8W-39-2, 3, 4, 5, 7, 8, 9, 10
Clockspring	8W-39-7, 8
Diagnostic Junction Port	8W-39-9
Driver Cylinder Lock Switch	8W-39-6
Driver Door Lock Motor/Ajar Switch	8W-39-6
Driver Door Module	8W-39-6, 11
Engine Starter Motor Relay	8W-39-2
Fuse 7	8W-39-3, 9, 11
Fuse 8	8W-39-2
Fuse 18	8W-39-7, 8
Fuse 22	8W-39-2, 9
Fuse 28	8W-39-2
G106	8W-39-10
G108	8W-39-7, 8
G200	8W-39-9
G300	8W-39-5, 6
G301	8W-39-4, 5, 6, 11
Hood Ajar Switch	8W-39-10
Horn No. 1	8W-39-7, 8
Horn No. 2	8W-39-7, 8
Horn Relay	8W-39-7, 8
Horn Switch	8W-39-7, 8
Ignition Switch	8W-39-2
Junction Block	8W-39-2, 3, 4, 5, 7, 8, 9, 11
Left Liftgate Ajar Switch	8W-39-4
Left Rear Door Lock Motor/Ajar Switch	8W-39-5
Liftgate Flip-Up Ajar Switch	8W-39-4
Passenger Door Lock Motor/Ajar Switch	8W-39-6
Passenger Door Module	8W-39-6
Power Distribution Center	8W-39-2, 7, 8
Remote Keyless Module	8W-39-11
Right Liftgate Ajar Switch	8W-39-4
Right Rear Door Lock Motor/Ajar Switch	8W-39-5
Sentry Key Immobilizer Module	8W-39-9

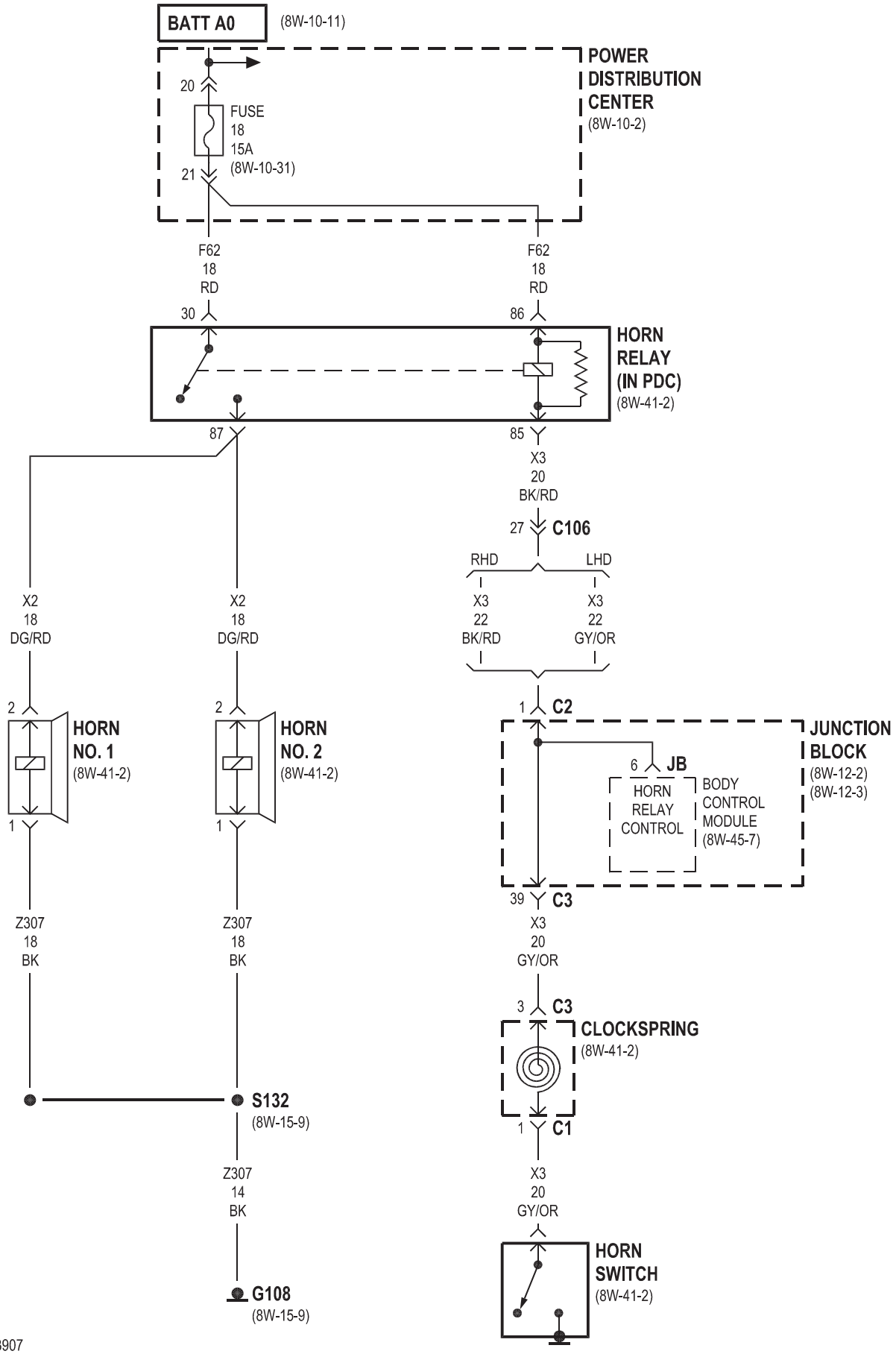

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 8 40A
(8W-10-27)
8
S127
(8W-10-27)
A1 12 RD
DIESEL
GAS
F C107
F C106
A1 12 RD
C C200
A1 12 RD
4 C1
30
87
ENGINE STARTER MOTOR RELAY (IN PDC)
(8W-21-2)
(8W-21-3)
(8W-21-4)
IGNITION SWITCH
0 OFF
1 START
2 RUN
3 LOCK
4 ACC
(8W-10-25)
5 C1
6 C1
A31 12 RD/BK
A21 12 DB
24 C3
36 C3
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 28 10A
(8W-12-26)
FUSE 22 10A
(8W-12-23)
25 JB
5 JB
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
BODY CONTROL MODULE
(8W-45-2)

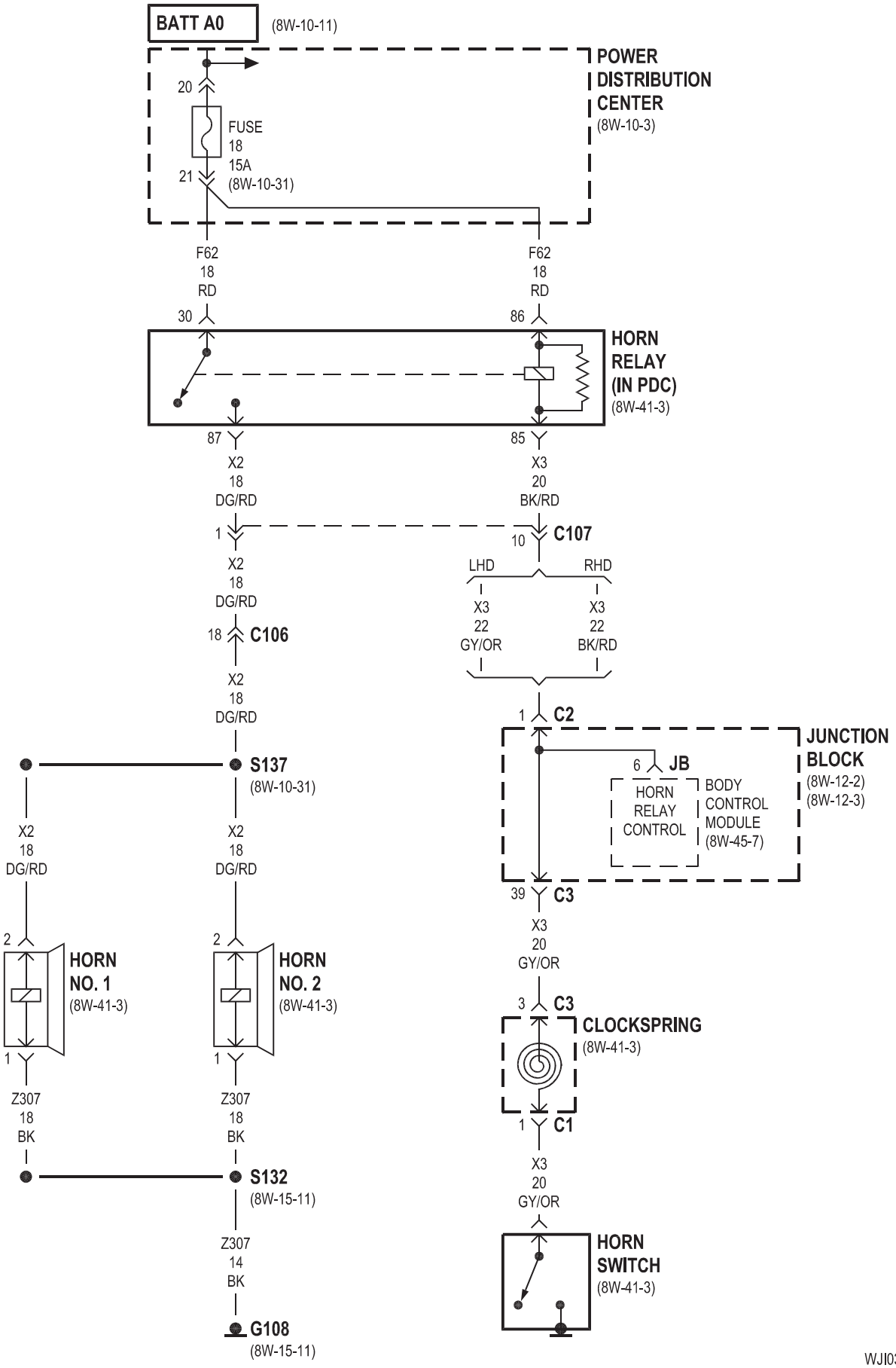

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
7
10A
(8W-12-15)
26 JB
FUSED B(+)
BODY CONTROL MODULE
(8W-45-2)
44 C3
M1
20
PK
4
AUTOMATIC HEADLAMP LIGHT SENSOR/ VTSS LED
3
2
1
G69
20
BK/OR
L110
20
BK/YL
L109
20
WT
20 C1
21 C2
10 C2
VTSS INDICATOR DRIVER
ULTRALIGHT SENSOR RETURN
ULTRALIGHT SENSOR SIGNAL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-7)

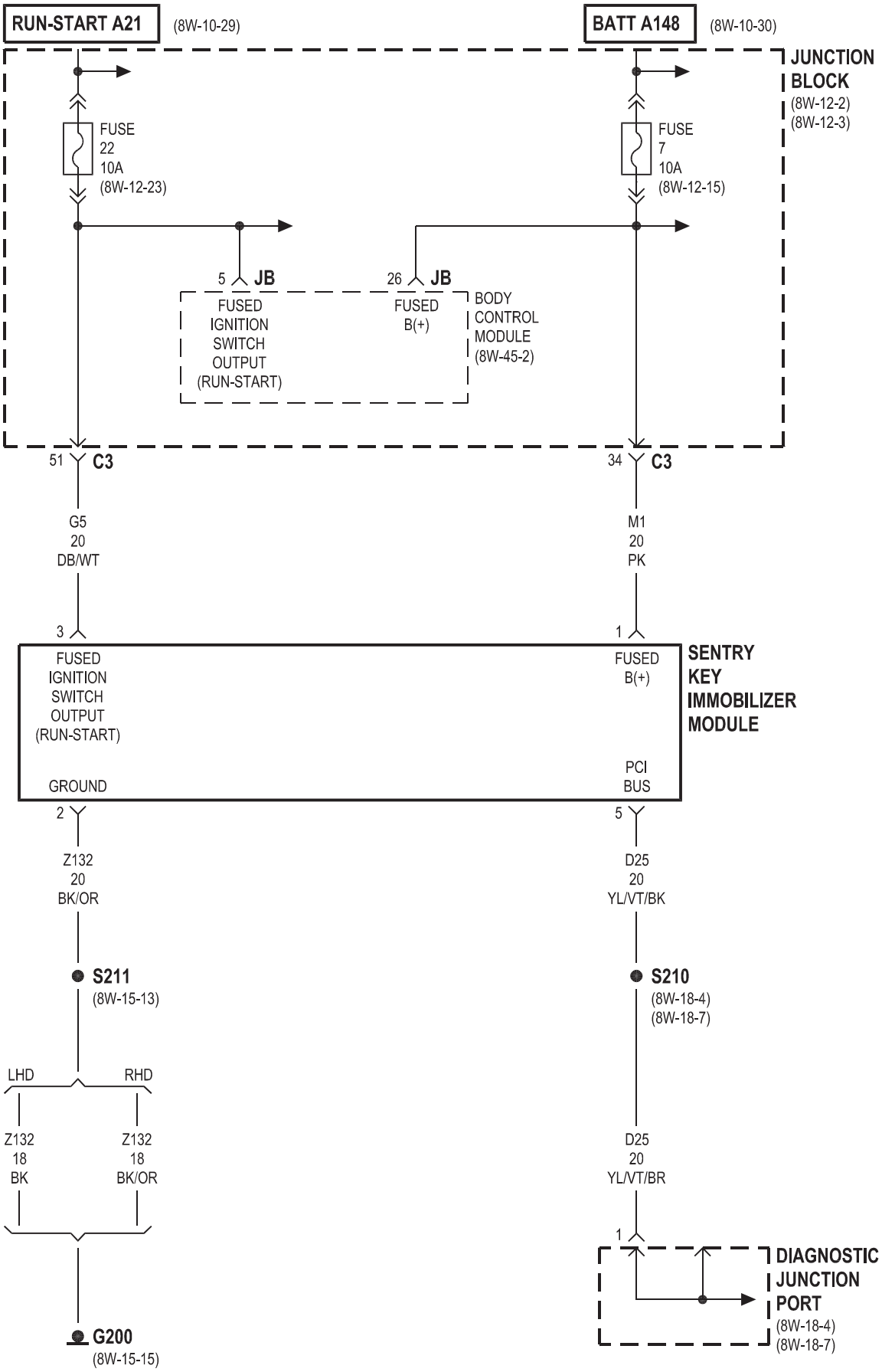

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
LIFTGATE AJAR SWITCH SENSE
21 JB
25 C1
G78
20
TN/BK
LIFTGATE FLIP-UP AJAR SWITCH SENSE
BODY CONTROL MODULE
(8W-45-8)
8 JB
24 C1
G80
20
VT/YL
LHD
RHD
34
RHD
LHD
11 C301
G78
20
TN/BK
1
G80
20
VT/YL
9 C308
G78
20
TN/BK
G80
18
VT/YL
S404
(8W-12-30)
S405
(8W-12-30)
G78
20
TN/BK
2
G78
20
TN/BK
2
G80
20
VT/YL
2
LEFT LIFTGATE AJAR SWITCH
(8W-61-12)
RIGHT LIFTGATE AJAR SWITCH
(8W-61-12)
LIFTGATE FLIP-UP AJAR SWITCH
(8W-61-12)
1
Z1
20
BK
1
Z1
20
BK
1
Z1
20
BK
S402
(8W-15-20)
Z1
12
BK
S401
(8W-15-20)
Z1
12
BK
8 C308
Z309
12
BK
G301
(8W-15-21)
(8W-15-22)

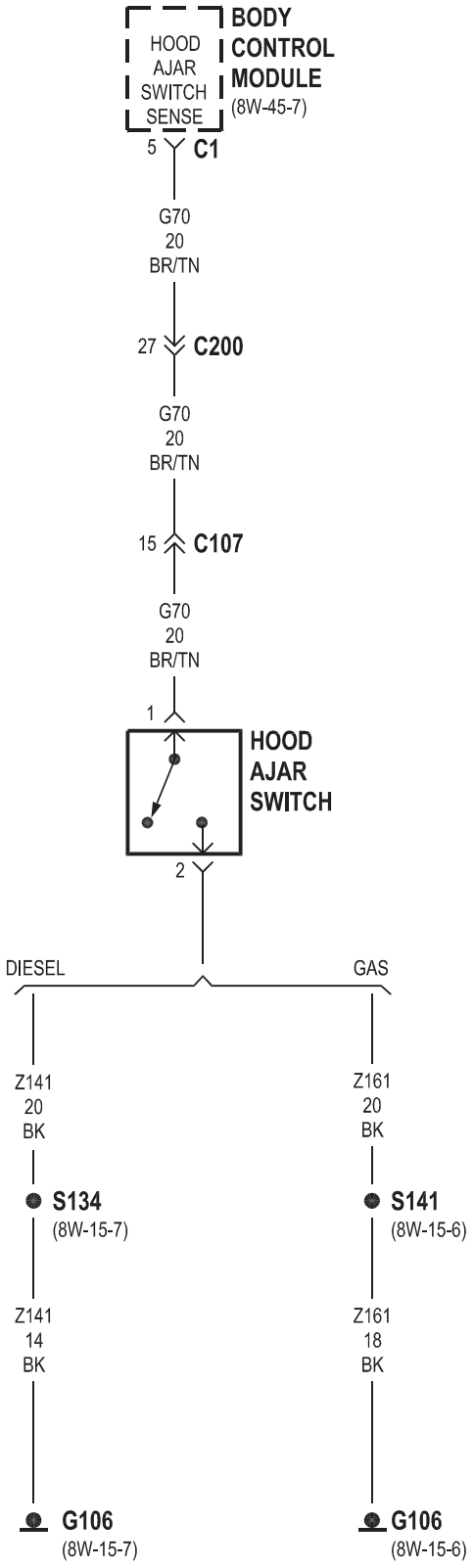

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-7)
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
23 JB
10 C1
7 C1
G77 20 TN/OR
G76 18 TN/YL
31 C200
LHD
RHD
G76 20 TN/YL
38 C301
39 C301
G77 20 TN/OR
G76 18 TN/YL
11 C303
G77 18 TN/YL
G76 18 TN/YL
1
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
(8W-61-10)
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-8)
(8W-61-9)
2
Z243 18 BK
S356
(8W-15-21)
(8W-15-22)
Z243 16 BK
10 C307
Z243 16 BK
Z151 18 BK
Z28 18 BK
S357
(8W-15-18)
(8W-15-16)
Z151 16 BK
Z28 16 BK
10 C303
S300
(8W-15-21)
S358
(8W-15-22)
Z151 16 BK
Z28 16 BK
S332
(8W-15-18)
S330
(8W-15-16)
Z243 12 BK
Z151 14 BK
Z28 12 BK
G301
(8W-15-21)
(8W-15-22)
G300
(8W-15-18)
G300
(8W-15-17)

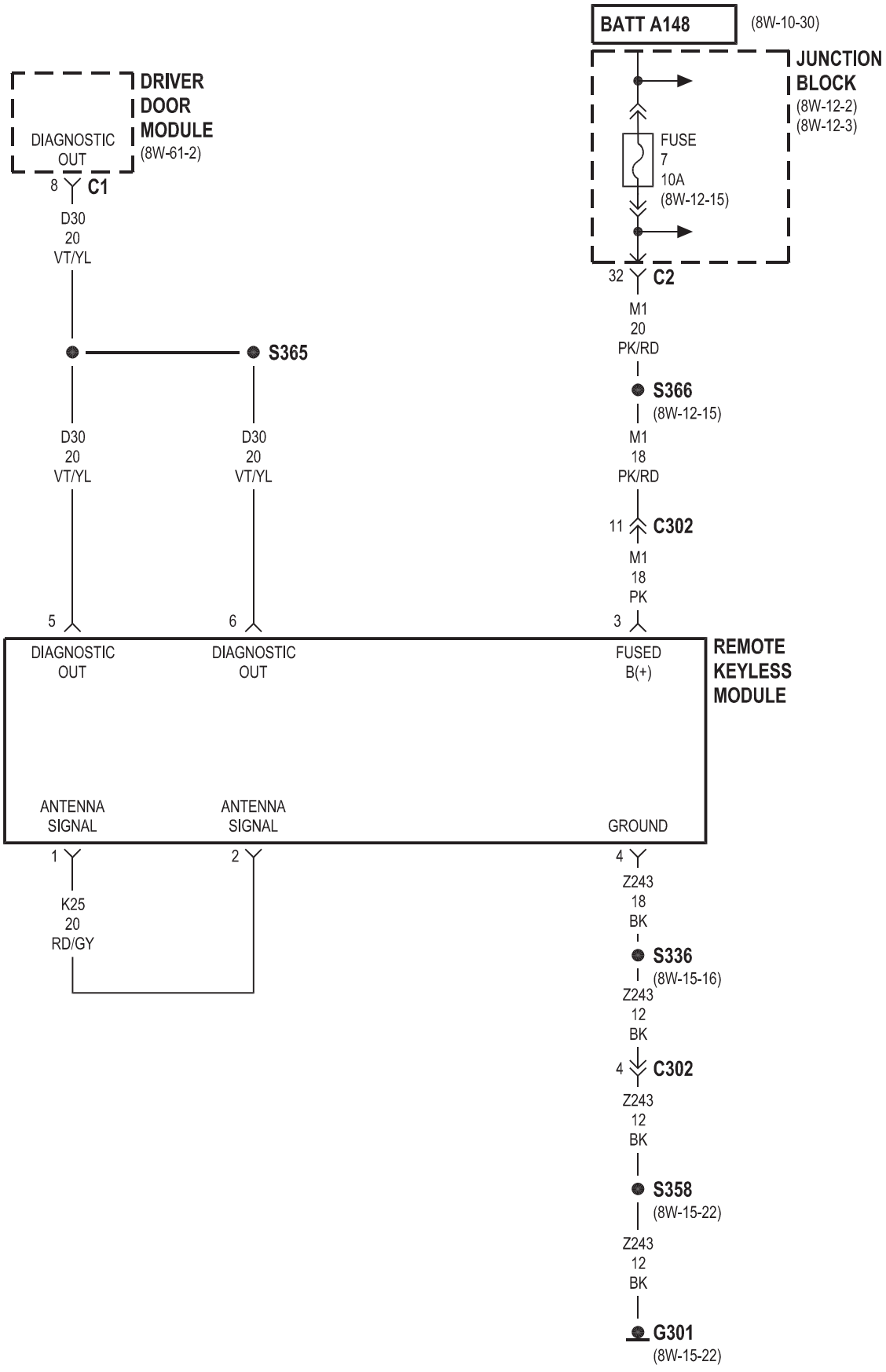

PASSENGER DOOR AJAR SWITCH SENSE
PASSENGER DOOR MODULE
(8W-61-4)
11 C1
G74
18
TN/RD
1
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-4)
2
RHD LHD
Z243 18 BK
Z28 18 BK
S338
(8W-15-16)
RHD LHD
Z243 12 BK
Z28 12 BK
5 C314
RHD LHD
Z243 12 BK
Z28 12 BK
DRIVER CYLINDER LOCK SWITCH SENSE
10 C1
G73
20
LG/OR
1
DRIVER CYLINDER LOCK SWITCH
(8W-61-3)
2
RHD LHD
Z243 20 BK
Z28 20 BK
DRIVER DOOR AJAR SWITCH SENSE
DRIVER DOOR MODULE
(8W-61-3)
11 C1
G75
18
TN/RD
1
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-3)
2
RHD LHD
Z243 18 BK
Z28 18 BK
S336
(8W-15-16)
RHD LHD
Z243 12 BK
Z28 12 BK
4 C302
LHD RHD
Z28 12 BK
Z243 12 BK
S330
(8W-15-16)
S358
(8W-15-22)
Z28 12 BK
Z243 12 BK
G300
(8W-15-17)
G301
(8W-15-22)


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
20
FUSE 18 15A
(8W-10-31)
21
F62 18 RD
30
F62 18 RD
86
HORN RELAY (IN PDC)
(8W-41-2)
87
85
X3 20 BK/RD
27 C106
RHD
LHD
X3 22 BK/RD
X3 22 GY/OR
1 C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
6 JB
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
39 C3
X3 20 GY/OR
3 C3
CLOCKSPRING
(8W-41-2)
1 C1
X3 20 GY/OR
HORN SWITCH
(8W-41-2)
X2 18 DG/RD
X2 18 DG/RD
2
HORN NO. 1
(8W-41-2)
1
2
HORN NO. 2
(8W-41-2)
1
Z307 18 BK
Z307 18 BK
S132
(8W-15-9)
Z307 14 BK
G108
(8W-15-9)


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
20
FUSE 18 15A
21
(8W-10-31)
F62 18 RD
30
F62 18 RD
86
HORN RELAY (IN PDC)
(8W-41-3)
87
85
X2 18 DG/RD
X3 20 BK/RD
1
10
C107
LHD
RHD
X3 22 GY/OR
X3 22 BK/RD
X2 18 DG/RD
18
C106
X2 18 DG/RD
1
C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
6
JB
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
S137
(8W-10-31)
X2 18 DG/RD
X2 18 DG/RD
39
C3
X3 20 GY/OR
2
2
HORN NO. 1
(8W-41-3)
HORN NO. 2
(8W-41-3)
3
C3
CLOCKSPRING
(8W-41-3)
1
1
1
C1
Z307 18 BK
Z307 18 BK
X3 20 GY/OR
S132
(8W-15-11)
HORN SWITCH
(8W-41-3)
Z307 14 BK
G108
(8W-15-11)

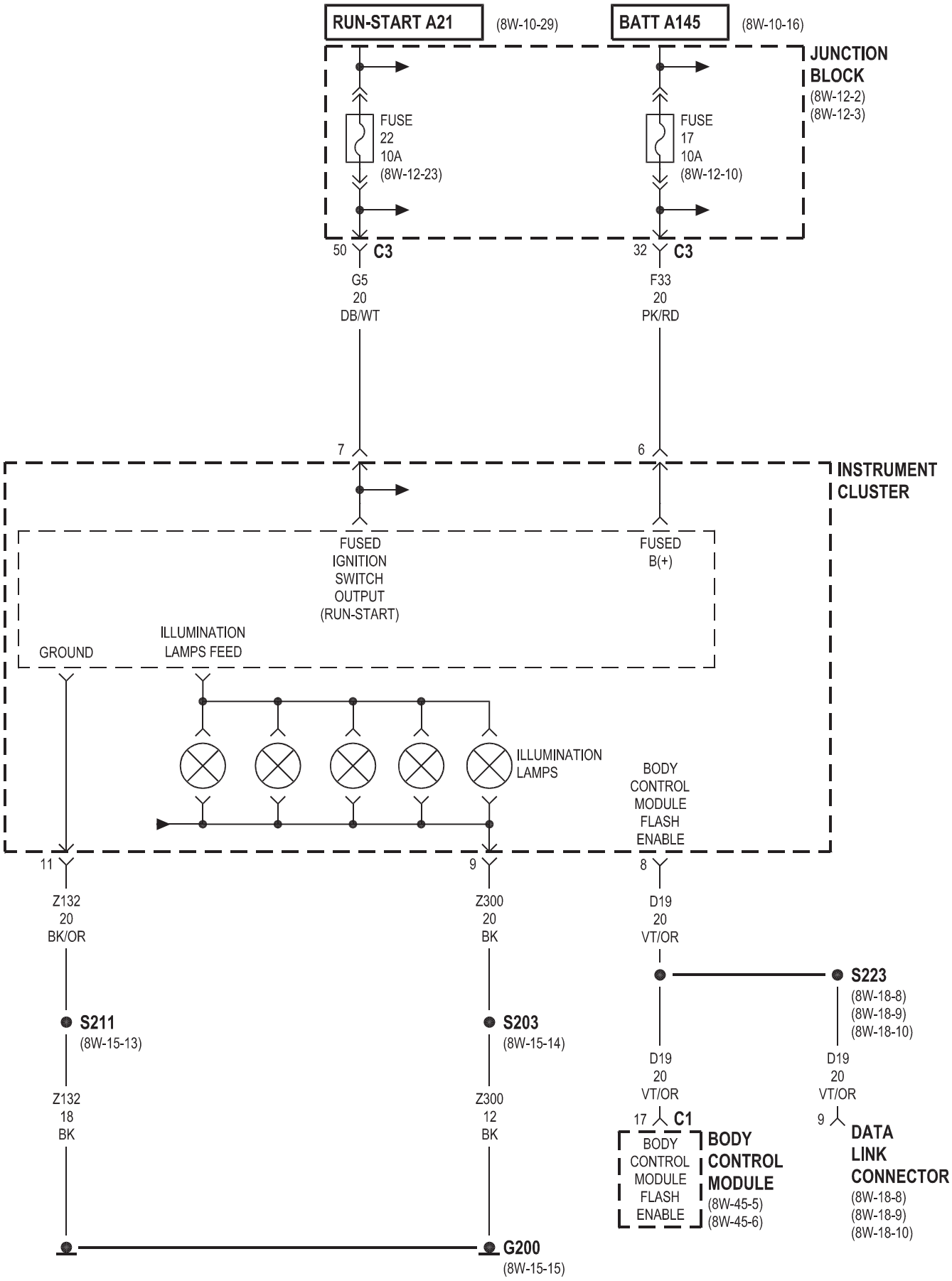

RUN-START A21
(8W-10-29)
BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 22 10A (8W-12-23)
FUSE 7 10A (8W-12-15)
5 JB
FUSED IGNITION SWITCH OUTPUT (RUN-START)
26 JB
FUSED B(+)
BODY CONTROL MODULE (8W-45-2)
51 C3
34 C3
G5 20 DB/WT
M1 20 PK
3
1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED B(+)
SENTRY KEY IMMOBILIZER MODULE
GROUND
PCI BUS
2
5
Z132 20 BK/OR
D25 20 YL/VT/BK
S211
(8W-15-13)
S210
(8W-18-4)
(8W-18-7)
LHD
RHD
Z132 18 BK
Z132 18 BK/OR
D25 20 YL/VT/BR
1
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
G200
(8W-15-15)

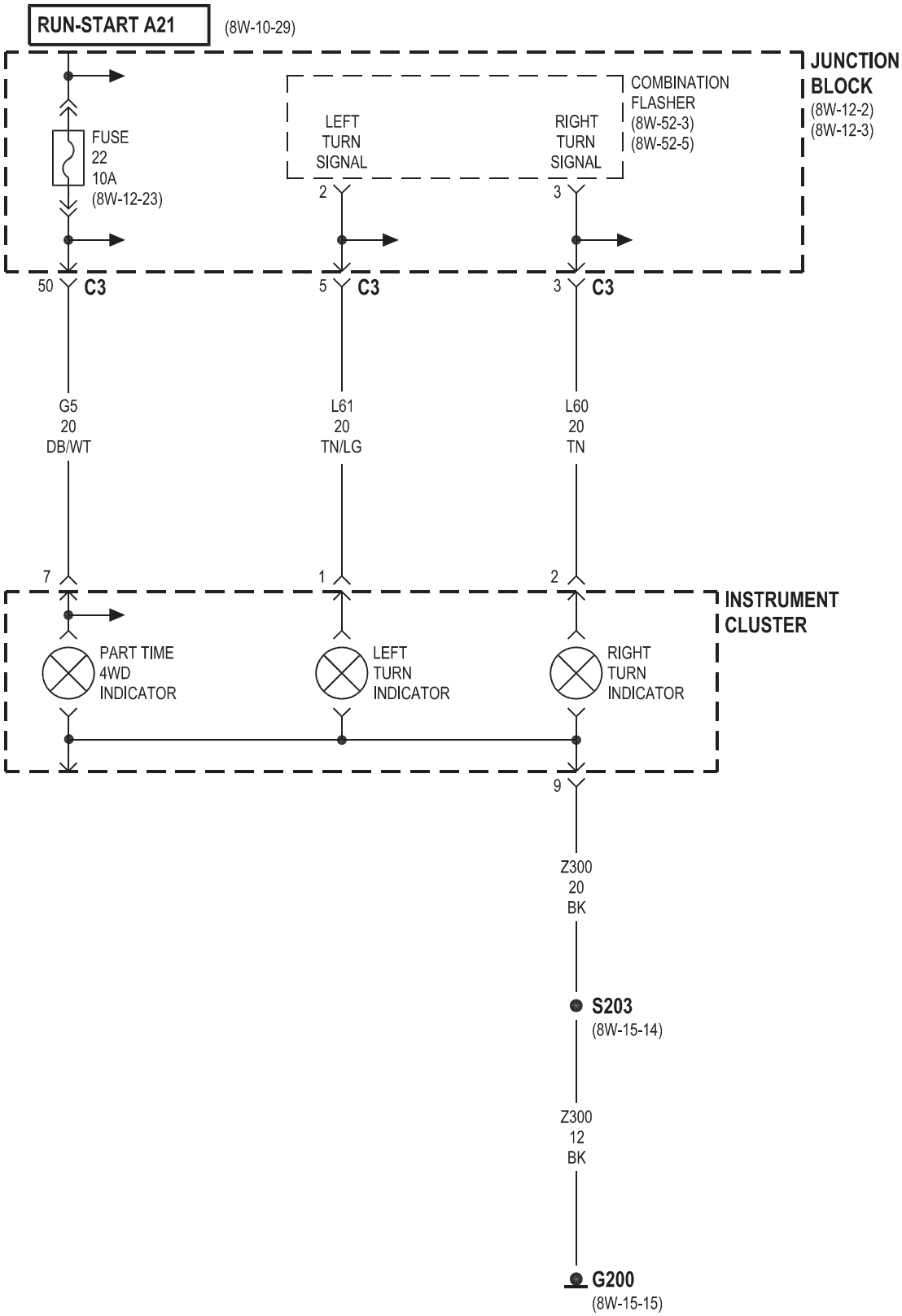

HOOD AJAR SWITCH SENSE
BODY CONTROL MODULE
(8W-45-7)
5
C1
G70
20
BR/TN
27
C200
G70
20
BR/TN
15
C107
G70
20
BR/TN
1
HOOD AJAR SWITCH
2
DIESEL
GAS
Z141
20
BK
Z161
20
BK
S134
(8W-15-7)
S141
(8W-15-6)
Z141
14
BK
Z161
18
BK
G106
(8W-15-7)
G106
(8W-15-6)

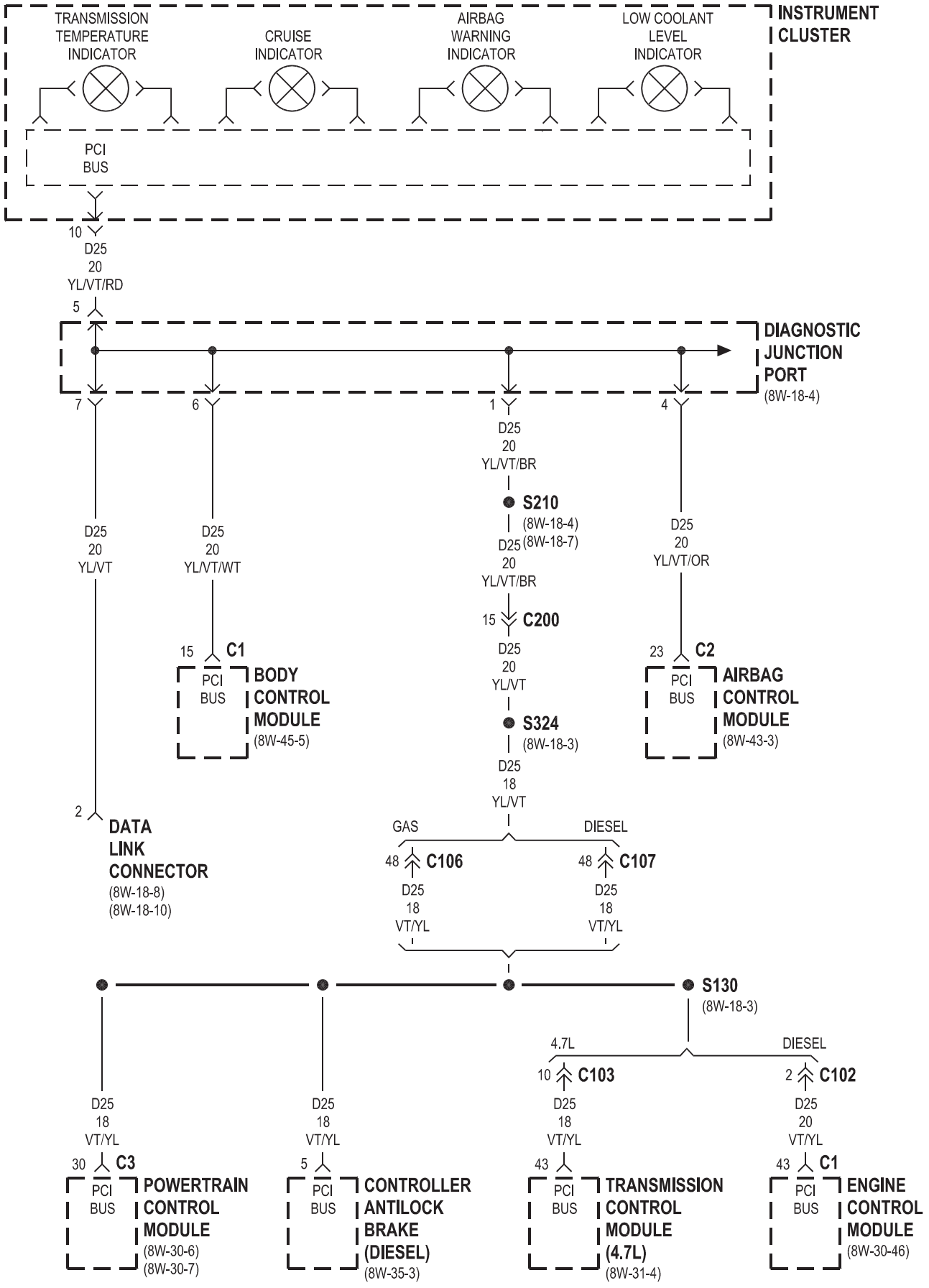

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 7 10A
(8W-12-15)
32 C2
M1 20 PK/RD
S366
(8W-12-15)
M1 18 PK/RD
11 C302
M1 18 PK
3
FUSED B(+)
REMOTE KEYLESS MODULE
GROUND
4
Z243 18 BK
S336
(8W-15-16)
Z243 12 BK
4 C302
Z243 12 BK
S358
(8W-15-22)
Z243 12 BK
G301
(8W-15-22)
DRIVER DOOR MODULE
(8W-61-2)
DIAGNOSTIC OUT
8 C1
D30 20 VT/YL
S365
D30 20 VT/YL
D30 20 VT/YL
5
DIAGNOSTIC OUT
6
DIAGNOSTIC OUT
ANTENNA SIGNAL
1
K25 20 RD/GY
ANTENNA SIGNAL
2

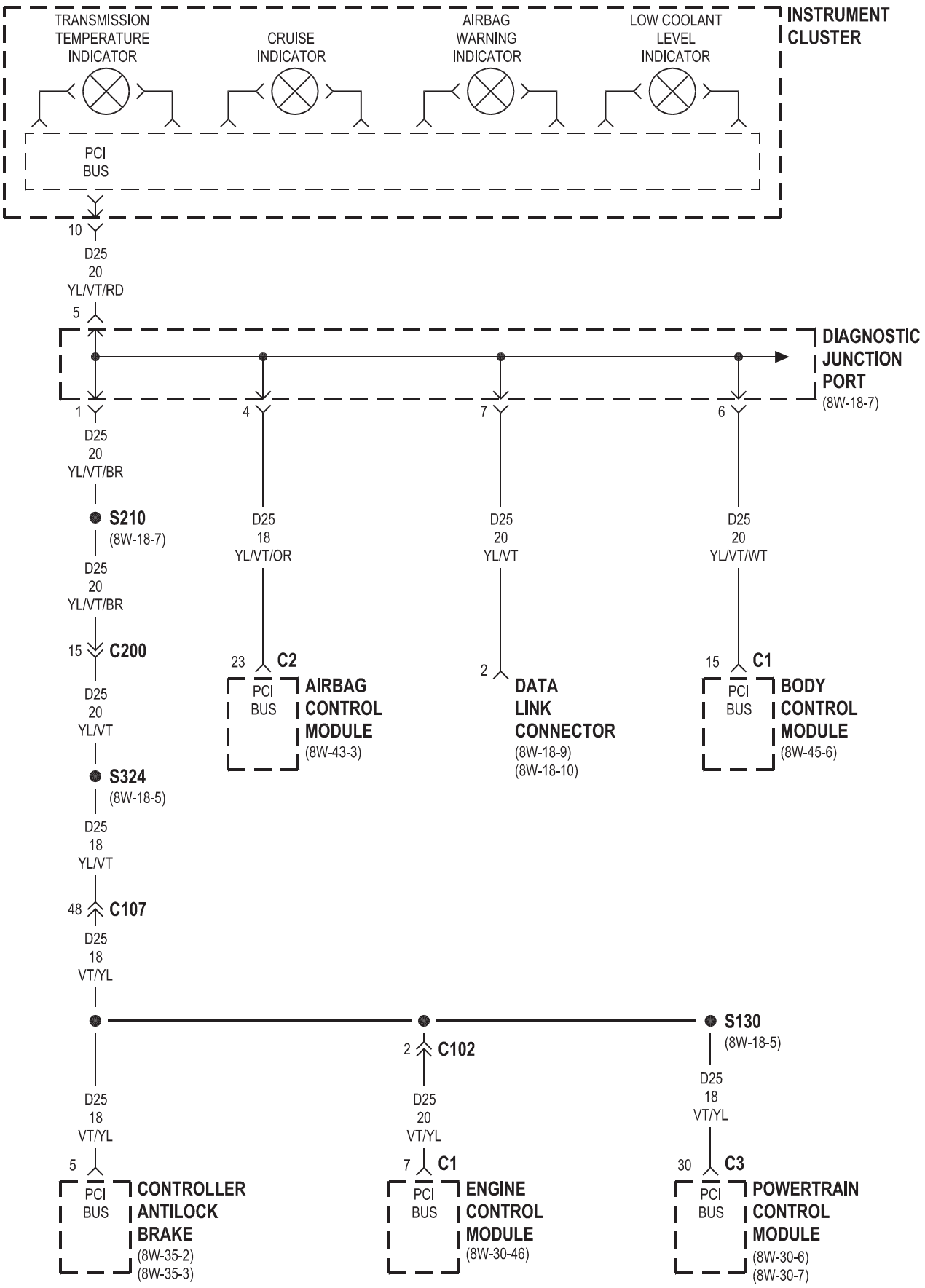
8W-40 INSTRUMENT CLUSTER

Component	Page
Airbag Control Module	8W-40-4, 5
Body Control Module	8W-40-2, 4, 5, 6, 7, 10
Combination Flasher	8W-40-3
Controller Antilock Brake	8W-40-4, 5, 6, 7, 9
Data Link Connector	8W-40-2, 4, 5
Diagnostic Junction Port	8W-40-4, 5, 6, 7, 8, 9, 10
Engine Control Module	8W-40-4, 5, 9, 10
Fuse 17	8W-40-2
Fuse 22	8W-40-2, 3
G200	8W-40-2, 3
Instrument Cluster	8W-40-2, 3, 4, 5, 6, 7, 8, 9, 10
Junction Block	8W-40-2, 3
Park Brake Switch	8W-40-6, 7
Powertrain Control Module	8W-40-4, 5, 6, 7, 8, 10
Transmission Control Module	8W-40-4
Vehicle Information Center	8W-40-7

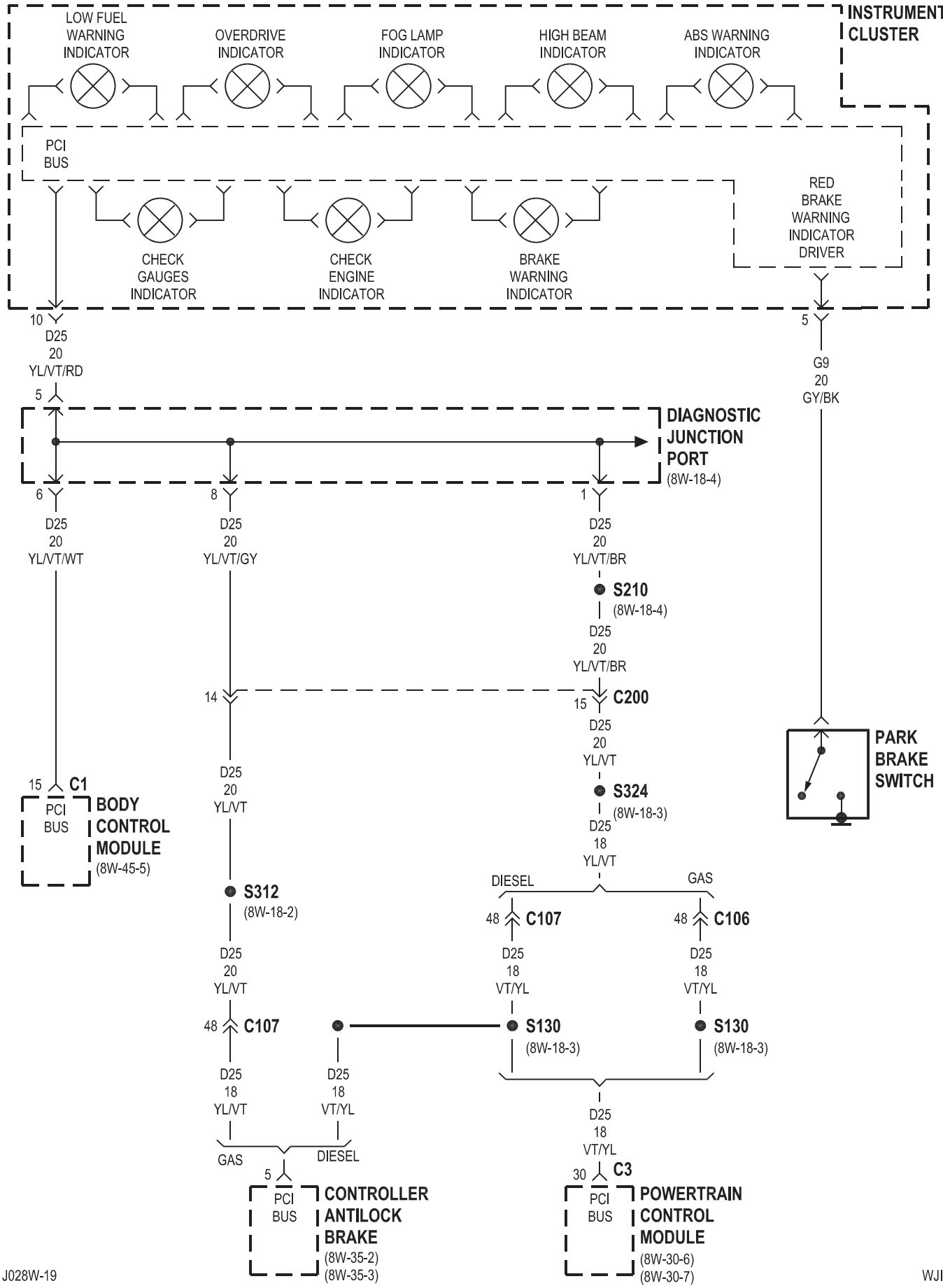

RUN-START A21
(8W-10-29)
BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 22 10A (8W-12-23)
FUSE 17 10A (8W-12-10)
50 C3
32 C3
G5 20 DB/WT
F33 20 PK/RD
7
6
INSTRUMENT CLUSTER
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED B(+)
GROUND
ILLUMINATION LAMPS FEED
ILLUMINATION LAMPS
BODY CONTROL MODULE FLASH ENABLE
11
9
8
Z132 20 BK/OR
Z300 20 BK
D19 20 VT/OR
S223
(8W-18-8)
(8W-18-9)
(8W-18-10)
S211
(8W-15-13)
S203
(8W-15-14)
Z132 18 BK
Z300 12 BK
D19 20 VT/OR
D19 20 VT/OR
17 C1
9
BODY CONTROL MODULE FLASH ENABLE
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
DATA LINK CONNECTOR
(8W-18-8)
(8W-18-9)
(8W-18-10)
G200
(8W-15-15)

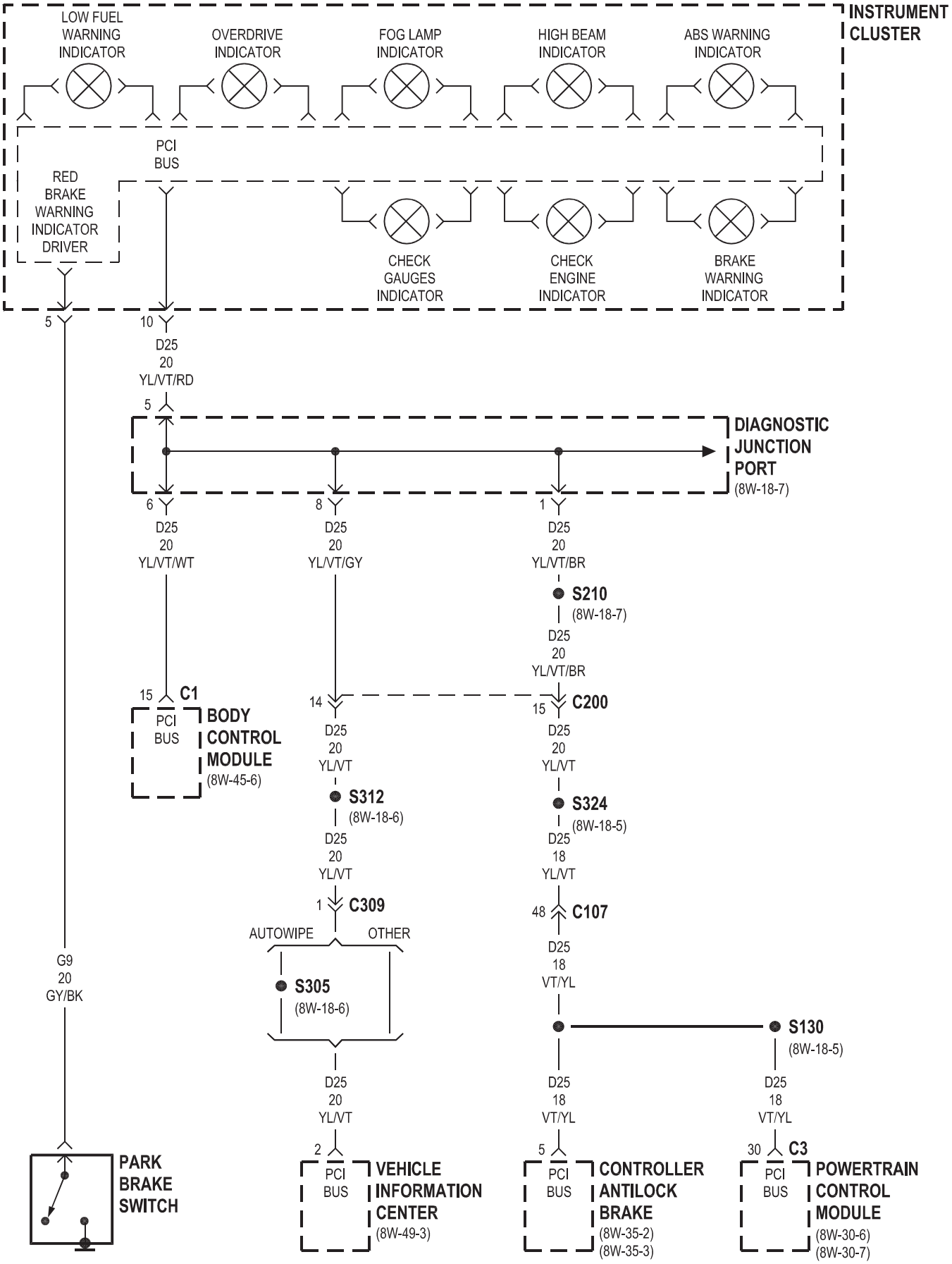

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
(8W-52-3)
(8W-52-5)
FUSE
22
10A
(8W-12-23)
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
2
3
50
C3
5
C3
3
C3
G5
20
DB/WT
L61
20
TN/LG
L60
20
TN
7
1
2
INSTRUMENT CLUSTER
PART TIME 4WD INDICATOR
LEFT TURN INDICATOR
RIGHT TURN INDICATOR
9
Z300
20
BK
S203
(8W-15-14)
Z300
12
BK
G200
(8W-15-15)

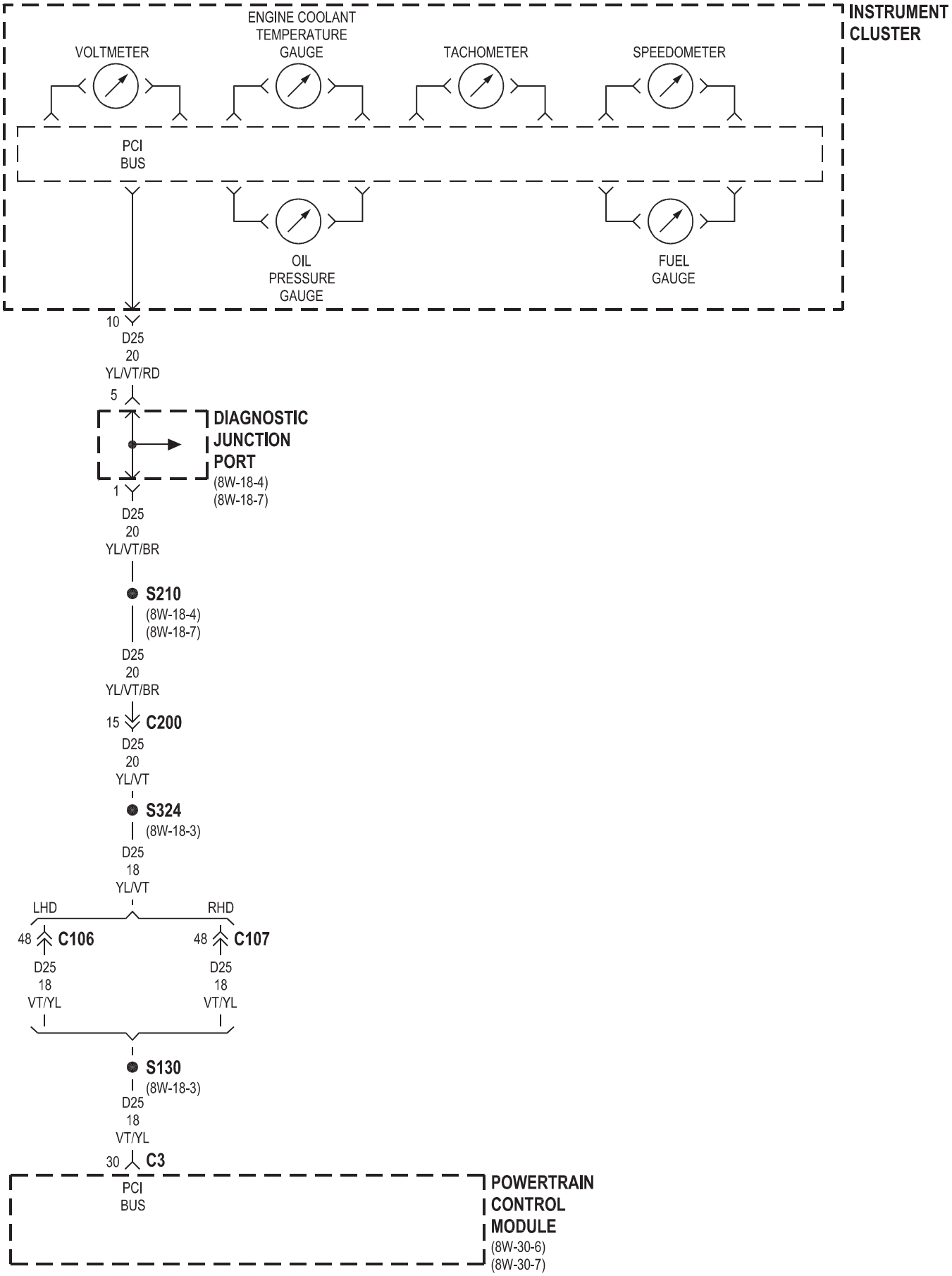

INSTRUMENT CLUSTER
TRANSMISSION TEMPERATURE INDICATOR
CRUISE INDICATOR
AIRBAG WARNING INDICATOR
LOW COOLANT LEVEL INDICATOR
PCI BUS
10
D25
20
YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
7
6
1
4
D25
20
YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-3)
D25
18
YL/VT
D25
20
YL/VT
D25
20
YL/VT/WT
D25
20
YL/VT/OR
15
C1
PCI BUS
BODY CONTROL MODULE
(8W-45-5)
23
C2
PCI BUS
AIRBAG CONTROL MODULE
(8W-43-3)
2
DATA LINK CONNECTOR
(8W-18-8)
(8W-18-10)
GAS
DIESEL
48
C106
48
C107
D25
18
VT/YL
D25
18
VT/YL
S130
(8W-18-3)
4.7L
DIESEL
10
C103
2
C102
D25
18
VT/YL
D25
20
VT/YL
30
C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)
5
PCI BUS
CONTROLLER ANTILOCK BRAKE (DIESEL)
(8W-35-3)
43
PCI BUS
TRANSMISSION CONTROL MODULE (4.7L)
(8W-31-4)
43
C1
PCI BUS
ENGINE CONTROL MODULE
(8W-30-46)

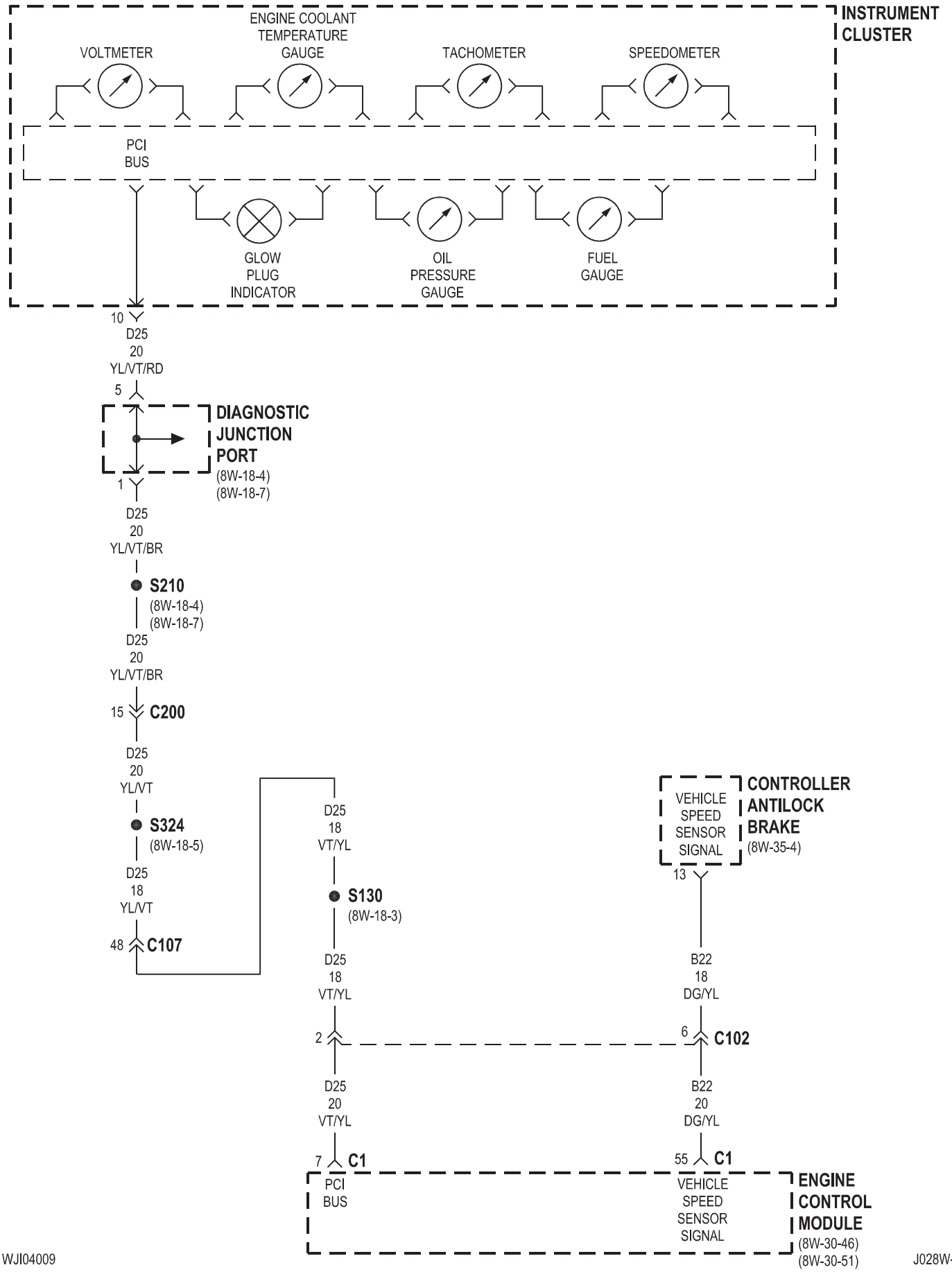

TRANSMISSION TEMPERATURE INDICATOR
CRUISE INDICATOR
AIRBAG WARNING INDICATOR
LOW COOLANT LEVEL INDICATOR
INSTRUMENT CLUSTER
PCI BUS
10
D25
20
YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
1
4
7
6
D25
20
YL/VT/BR
S210
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-5)
D25
18
YL/VT
48
C107
D25
18
VT/YL
D25
18
YL/VT/OR
23
C2
PCI BUS
AIRBAG CONTROL MODULE
(8W-43-3)
D25
20
YL/VT
2
DATA LINK CONNECTOR
(8W-18-9)
(8W-18-10)
D25
20
YL/VT/WT
15
C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
2
C102
D25
20
VT/YL
7
C1
PCI BUS
ENGINE CONTROL MODULE
(8W-30-46)
S130
(8W-18-5)
D25
18
VT/YL
30
C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)
D25
18
VT/YL
5
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
(8W-35-3)

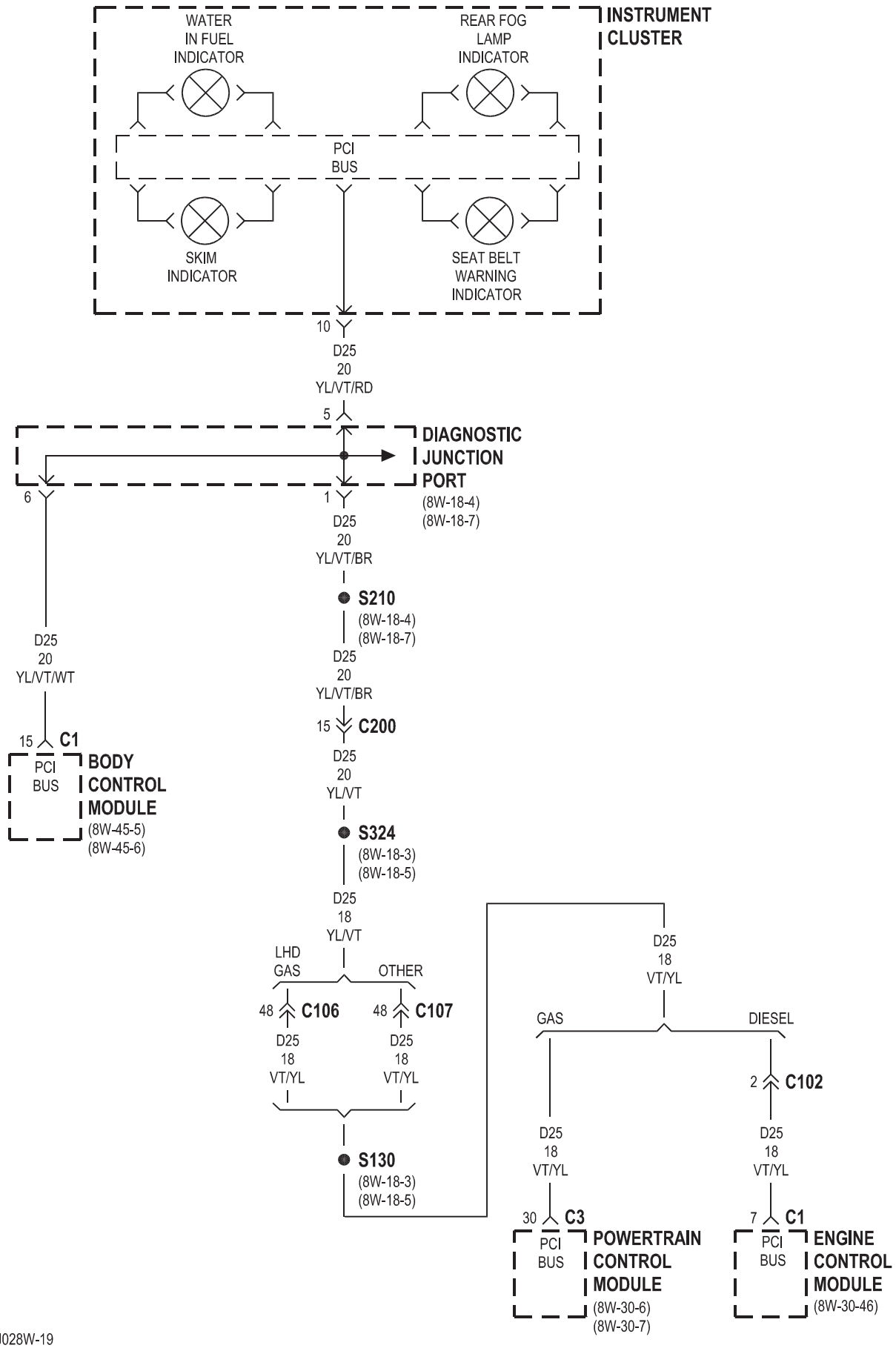
LHD


INSTRUMENT CLUSTER
LOW FUEL WARNING INDICATOR
OVERDRIVE INDICATOR
FOG LAMP INDICATOR
HIGH BEAM INDICATOR
ABS WARNING INDICATOR
PCI BUS
CHECK GAUGES INDICATOR
CHECK ENGINE INDICATOR
BRAKE WARNING INDICATOR
RED BRAKE WARNING INDICATOR DRIVER
10
D25
20
YL/VT/RD
5
5
G9
20
GY/BK
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
6
8
1
D25
20
YL/VT/WT
D25
20
YL/VT/GY
D25
20
YL/VT/BR
S210
(8W-18-4)
D25
20
YL/VT/BR
14
15
C200
D25
20
YL/VT
S324
(8W-18-3)
D25
18
YL/VT
15
C1
PCI BUS
BODY CONTROL MODULE
(8W-45-5)
D25
20
YL/VT
S312
(8W-18-2)
PARK BRAKE SWITCH
DIESEL
GAS
48
C107
48
C106
D25
18
VT/YL
D25
18
VT/YL
D25
20
YL/VT
48
C107
S130
(8W-18-3)
S130
(8W-18-3)
D25
18
YL/VT
D25
18
VT/YL
D25
18
VT/YL
GAS
DIESEL
5
30
C3
PCI BUS
CONTROLLER ANTILOCK BRAKE
(8W-35-2)
(8W-35-3)
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)


INSTRUMENT CLUSTER
LOW FUEL WARNING INDICATOR
OVERDRIVE INDICATOR
FOG LAMP INDICATOR
HIGH BEAM INDICATOR
ABS WARNING INDICATOR
PCI BUS
RED BRAKE WARNING INDICATOR DRIVER
CHECK GAUGES INDICATOR
CHECK ENGINE INDICATOR
BRAKE WARNING INDICATOR
5
10
D25 20 YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT (8W-18-7)
6
8
1
D25 20 YL/VT/WT
D25 20 YL/VT/GY
D25 20 YL/VT/BR
S210 (8W-18-7)
D25 20 YL/VT/BR
15 C1
PCI BUS
BODY CONTROL MODULE (8W-45-6)
14
15 C200
D25 20 YL/VT
D25 20 YL/VT
S312 (8W-18-6)
S324 (8W-18-5)
D25 20 YL/VT
D25 18 YL/VT
1 C309
48 C107
AUTOWIPE
OTHER
D25 18 VT/YL
G9 20 GY/BK
S305 (8W-18-6)
S130 (8W-18-5)
D25 20 YL/VT
D25 18 VT/YL
D25 18 VT/YL
2
5
30 C3
PCI BUS
VEHICLE INFORMATION CENTER (8W-49-3)
CONTROLLER ANTILOCK BRAKE (8W-35-2) (8W-35-3)
POWERTRAIN CONTROL MODULE (8W-30-6) (8W-30-7)
PARK BRAKE SWITCH

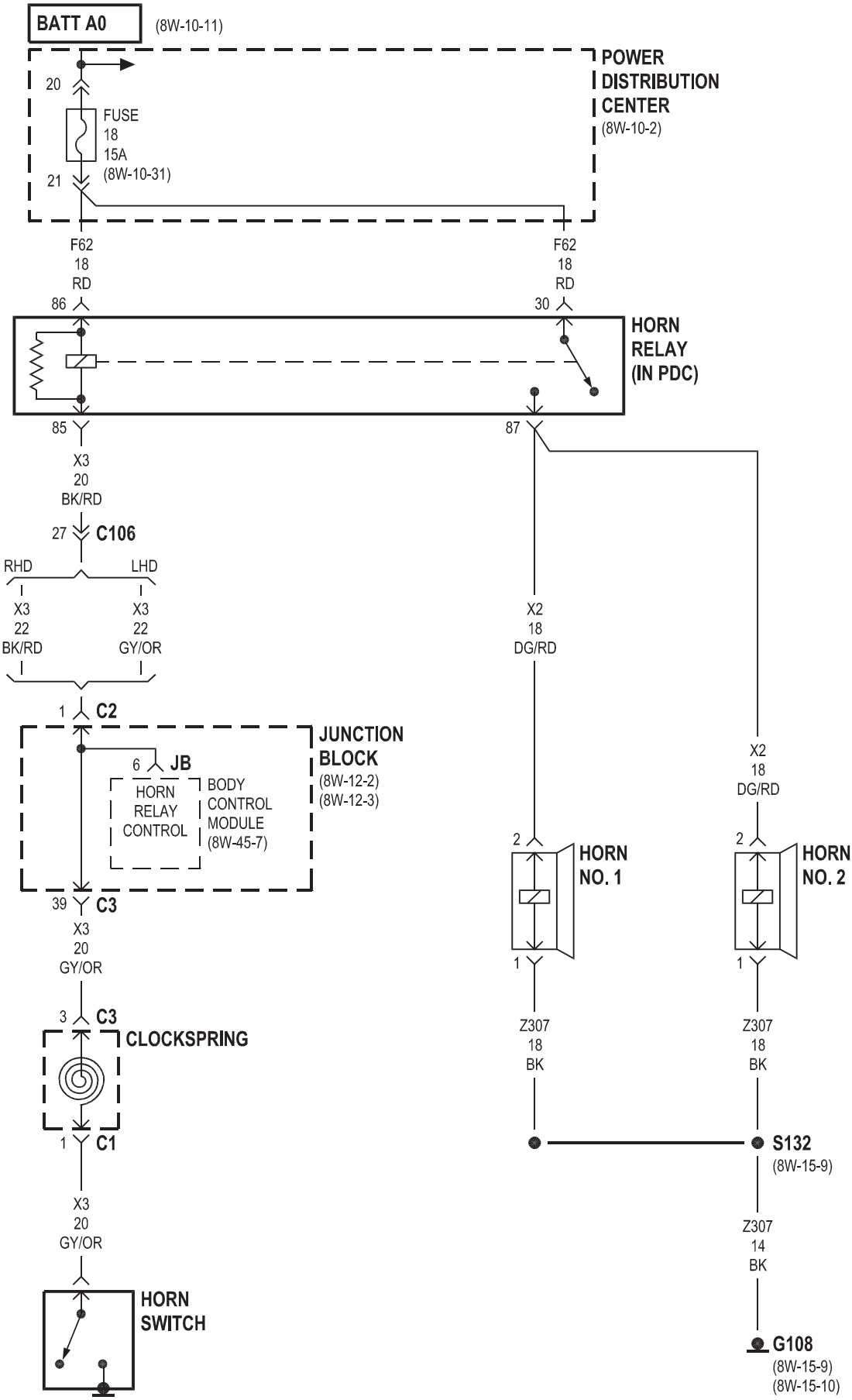

INSTRUMENT CLUSTER
VOLTMETER
ENGINE COOLANT TEMPERATURE GAUGE
TACHOMETER
SPEEDOMETER
PCI BUS
OIL PRESSURE GAUGE
FUEL GAUGE
10
D25
20
YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
1
D25
20
YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-3)
D25
18
YL/VT
LHD
RHD
48
C106
48
C107
D25
18
VT/YL
D25
18
VT/YL
S130
(8W-18-3)
D25
18
VT/YL
30
C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)

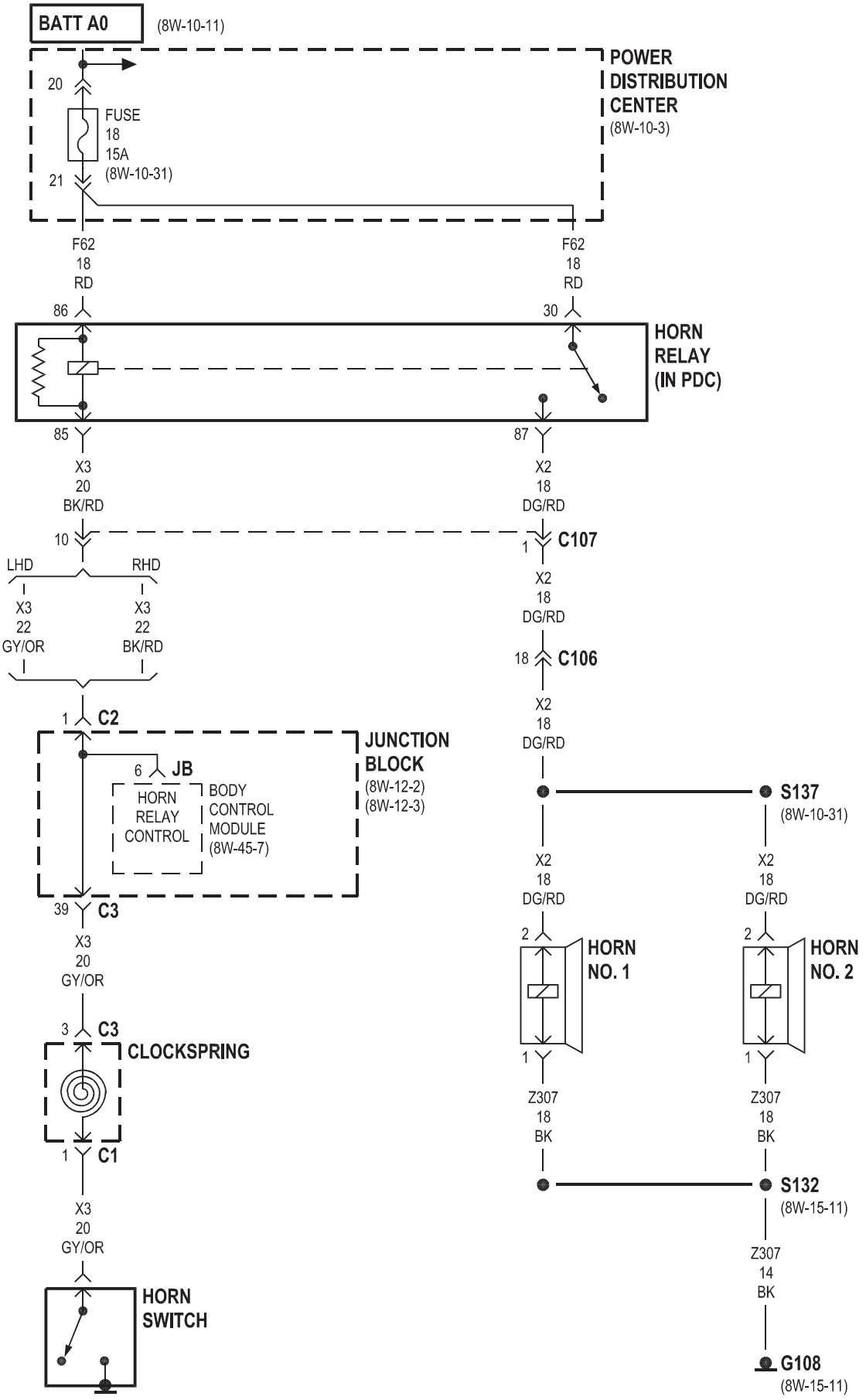

INSTRUMENT CLUSTER
VOLTMETER
ENGINE COOLANT TEMPERATURE GAUGE
TACHOMETER
SPEEDOMETER
PCI BUS
GLOW PLUG INDICATOR
OIL PRESSURE GAUGE
FUEL GAUGE
10
D25
20
YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
1
D25
20
YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-5)
D25
18
YL/VT
48
C107
D25
18
VT/YL
S130
(8W-18-3)
D25
18
VT/YL
2
D25
20
VT/YL
7
C1
PCI BUS
VEHICLE SPEED SENSOR SIGNAL
CONTROLLER ANTILOCK BRAKE
(8W-35-4)
13
B22
18
DG/YL
6
C102
B22
20
DG/YL
55
C1
VEHICLE SPEED SENSOR SIGNAL
ENGINE CONTROL MODULE
(8W-30-46)
(8W-30-51)

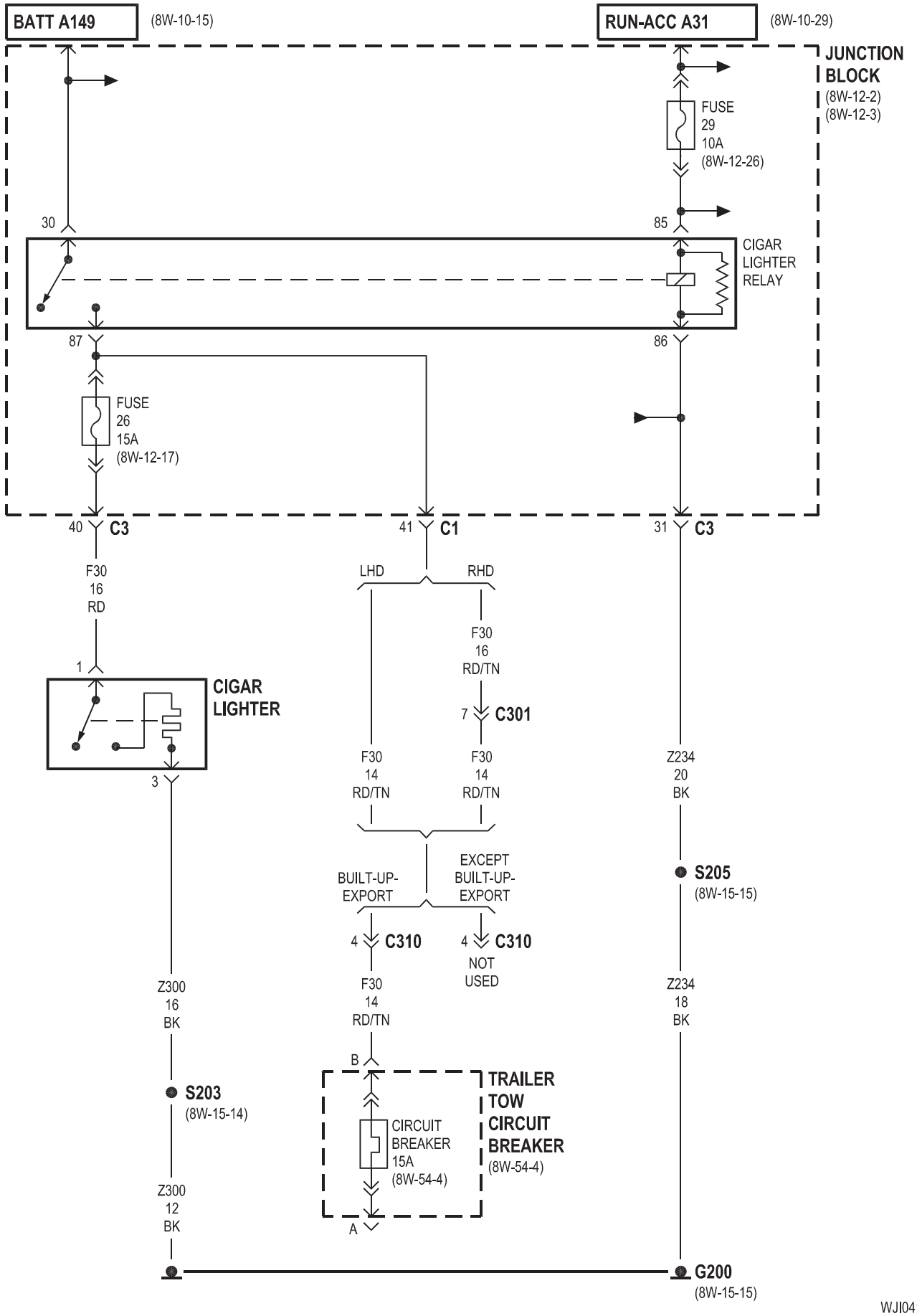

INSTRUMENT CLUSTER
WATER IN FUEL INDICATOR
REAR FOG LAMP INDICATOR
PCI BUS
SKIM INDICATOR
SEAT BELT WARNING INDICATOR
10
D25
20
YL/VT/RD
5
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
6
1
D25
20
YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
15
C200
D25
20
YL/VT
S324
(8W-18-3)
(8W-18-5)
D25
18
YL/VT
LHD
GAS
OTHER
48
C106
48
C107
D25
18
VT/YL
D25
18
VT/YL
S130
(8W-18-3)
(8W-18-5)
D25
20
YL/VT/WT
15
C1
PCI BUS
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
D25
18
VT/YL
GAS
DIESEL
2
C102
D25
18
VT/YL
D25
18
VT/YL
30
C3
PCI BUS
POWERTRAIN CONTROL MODULE
(8W-30-6)
(8W-30-7)
7
C1
PCI BUS
ENGINE CONTROL MODULE
(8W-30-46)

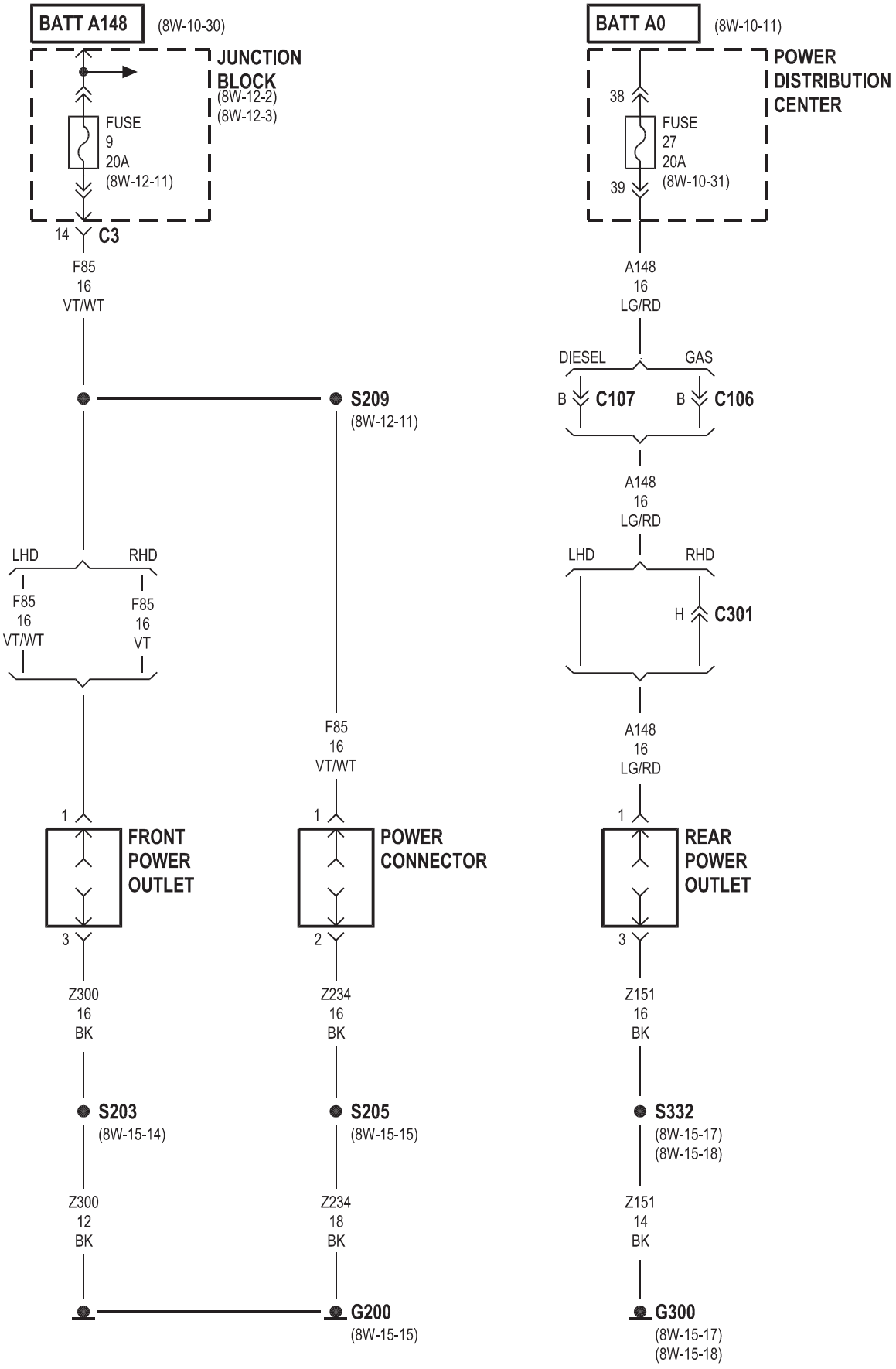
8W-41 HORN/CIGAR LIGHTER/POWER OUTLET

Component	Page
Body Control Module	8W-41-2, 3
Cigar Lighter	8W-41-4
Cigar Lighter Relay	8W-41-4
Circuit Breaker	8W-41-4
Clockspring	8W-41-2, 3
Front Power Outlet	8W-41-5
Fuse 9	8W-41-5
Fuse 18	8W-41-2, 3
Fuse 26	8W-41-4
Fuse 27	8W-41-5
Fuse 29	8W-41-4
G108	8W-41-2, 3
G200	8W-41-4, 5
G300	8W-41-5
Horn No. 1	8W-41-2, 3
Horn No. 2	8W-41-2, 3
Horn Relay	8W-41-2, 3
Horn Switch	8W-41-2, 3
Junction Block	8W-41-2, 3, 4, 5
Power Connector	8W-41-5
Power Distribution Center	8W-41-2, 3, 5
Rear Power Outlet	8W-41-5
Trailer Tow Circuit Breaker	8W-41-4


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
20
FUSE 18 15A
(8W-10-31)
21
F62 18 RD
86
F62 18 RD
30
HORN RELAY (IN PDC)
85
87
X3 20 BK/RD
27 C106
RHD
LHD
X3 22 BK/RD
X3 22 GY/OR
1 C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
6 JB
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
39 C3
X3 20 GY/OR
3 C3
CLOCKSPRING
1 C1
X3 20 GY/OR
HORN SWITCH
X2 18 DG/RD
2
HORN NO. 1
1
Z307 18 BK
X2 18 DG/RD
2
HORN NO. 2
1
Z307 18 BK
S132
(8W-15-9)
Z307 14 BK
G108
(8W-15-9)
(8W-15-10)

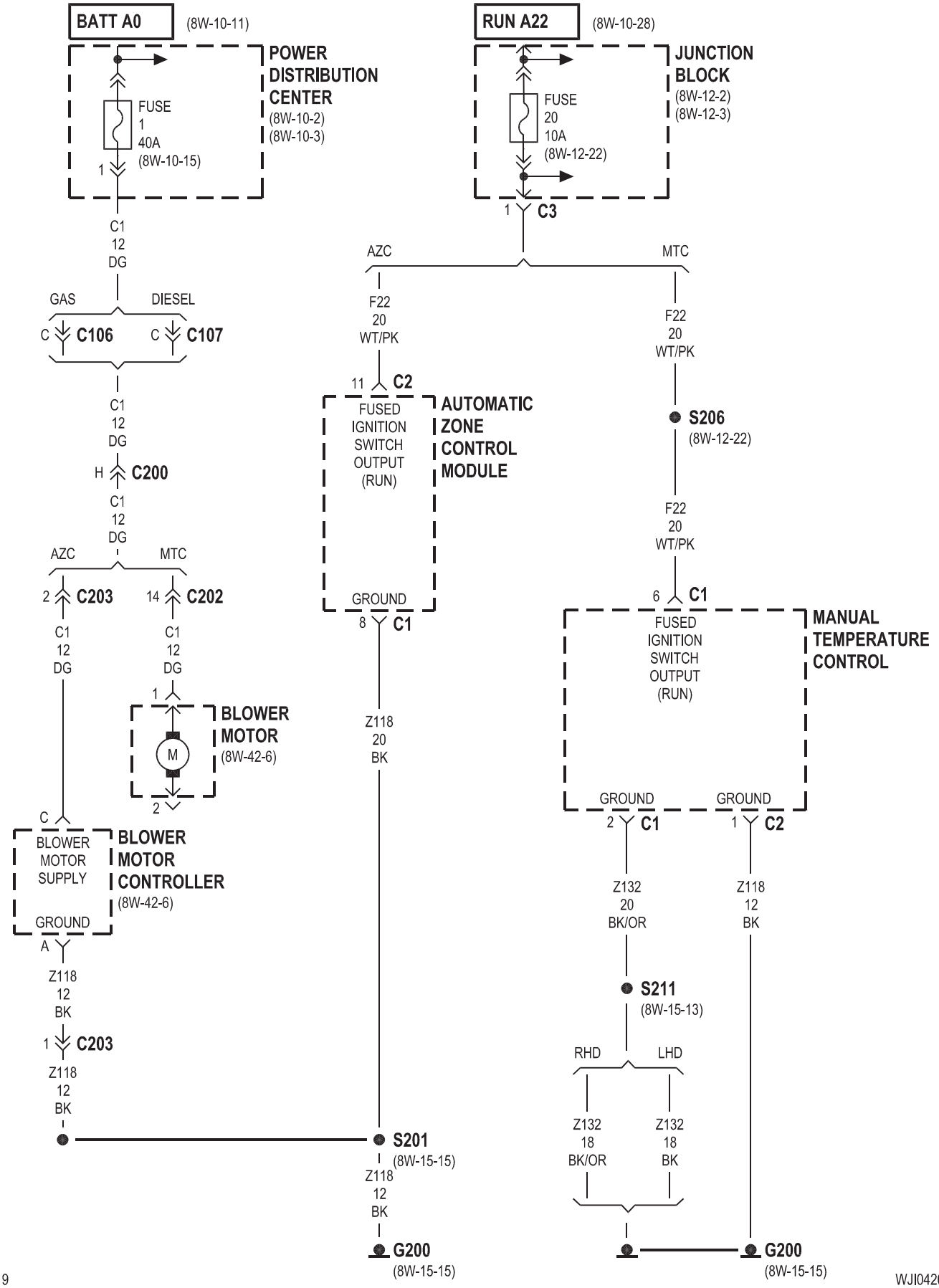

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
20
FUSE 18 15A
(8W-10-31)
21
F62 18 RD
F62 18 RD
86
30
HORN RELAY (IN PDC)
85
87
X3 20 BK/RD
X2 18 DG/RD
10
1
C107
LHD
RHD
X3 22 GY/OR
X3 22 BK/RD
X2 18 DG/RD
18
C106
X2 18 DG/RD
1
C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
6
JB
HORN RELAY CONTROL
BODY CONTROL MODULE
(8W-45-7)
S137
(8W-10-31)
39
C3
X3 20 GY/OR
X2 18 DG/RD
X2 18 DG/RD
2
2
HORN NO. 1
HORN NO. 2
3
C3
CLOCKSPRING
1
1
Z307 18 BK
Z307 18 BK
1
C1
S132
(8W-15-11)
X3 20 GY/OR
Z307 14 BK
HORN SWITCH
G108
(8W-15-11)

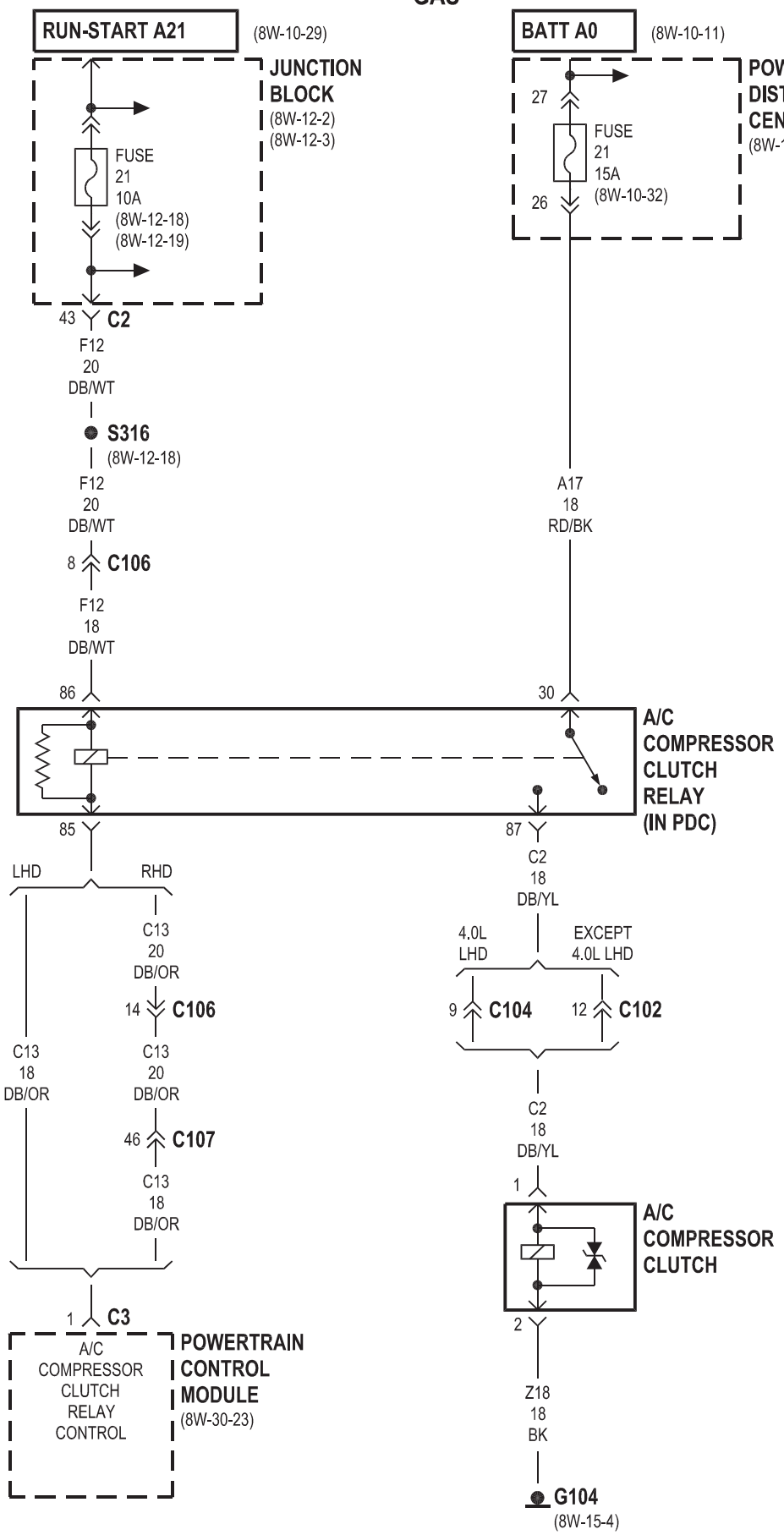

BATT A149
(8W-10-15)
RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 29 10A (8W-12-26)
30
85
CIGAR LIGHTER RELAY
87
86
FUSE 26 15A (8W-12-17)
40 C3
41 C1
31 C3
F30 16 RD
LHD
RHD
F30 16 RD/TN
7 C301
1
CIGAR LIGHTER
3
F30 14 RD/TN
F30 14 RD/TN
Z234 20 BK
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
S205
(8W-15-15)
4 C310
4 C310
NOT USED
Z300 16 BK
F30 14 RD/TN
Z234 18 BK
B
S203
(8W-15-14)
TRAILER TOW CIRCUIT BREAKER
(8W-54-4)
CIRCUIT BREAKER 15A (8W-54-4)
A
Z300 12 BK
G200
(8W-15-15)

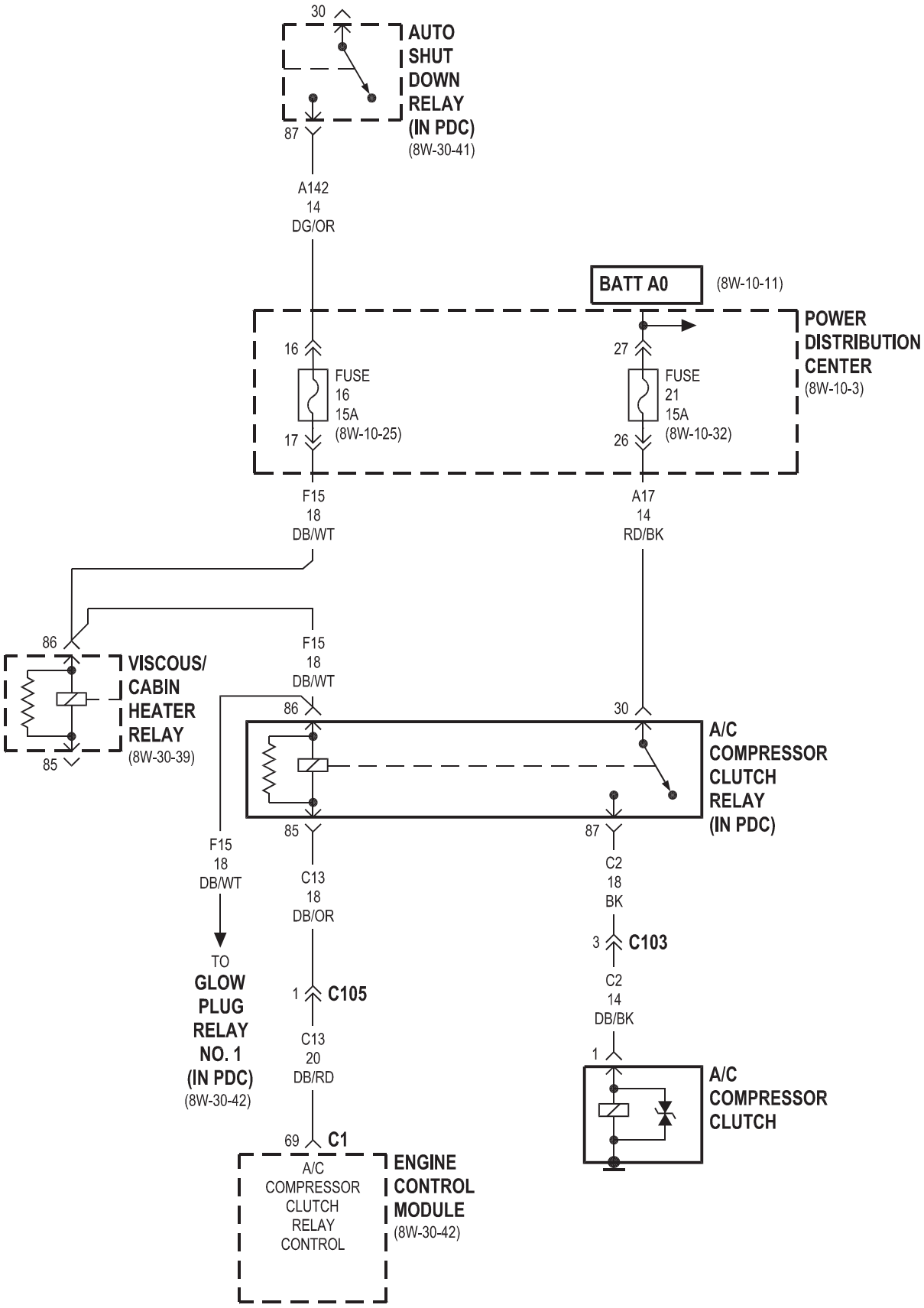

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
9
20A
(8W-12-11)
14
C3
F85
16
VT/WT
S209
(8W-12-11)
LHD
RHD
F85
16
VT/WT
F85
16
VT
1
FRONT POWER OUTLET
3
Z300
16
BK
S203
(8W-15-14)
Z300
12
BK
F85
16
VT/WT
1
POWER CONNECTOR
2
Z234
16
BK
S205
(8W-15-15)
Z234
18
BK
G200
(8W-15-15)
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
38
FUSE
27
20A
(8W-10-31)
39
A148
16
LG/RD
DIESEL
GAS
B
C107
B
C106
A148
16
LG/RD
LHD
RHD
H
C301
A148
16
LG/RD
1
REAR POWER OUTLET
3
Z151
16
BK
S332
(8W-15-17)
(8W-15-18)
Z151
14
BK
G300
(8W-15-17)
(8W-15-18)

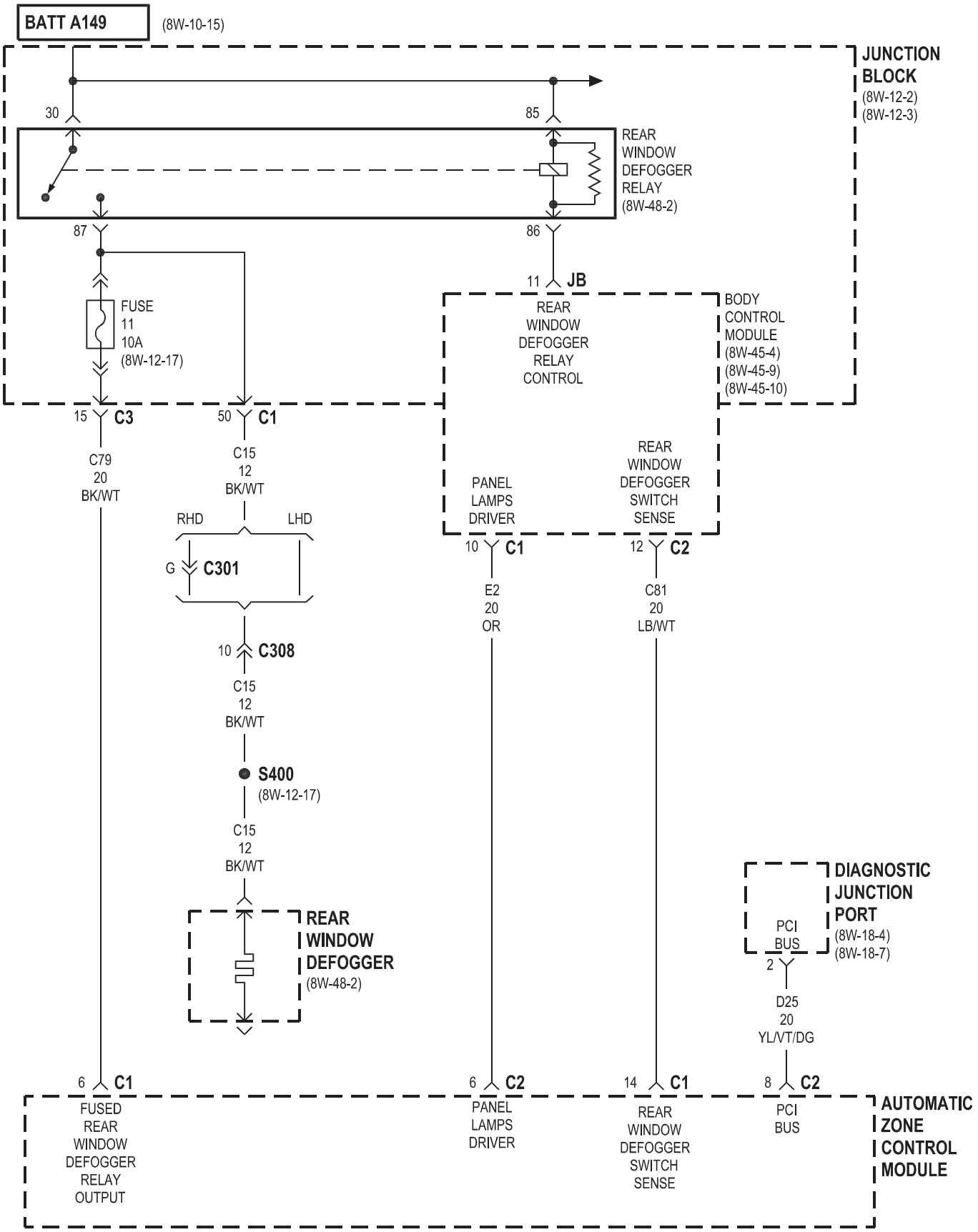
8W-42 AIR CONDITIONING-HEATER

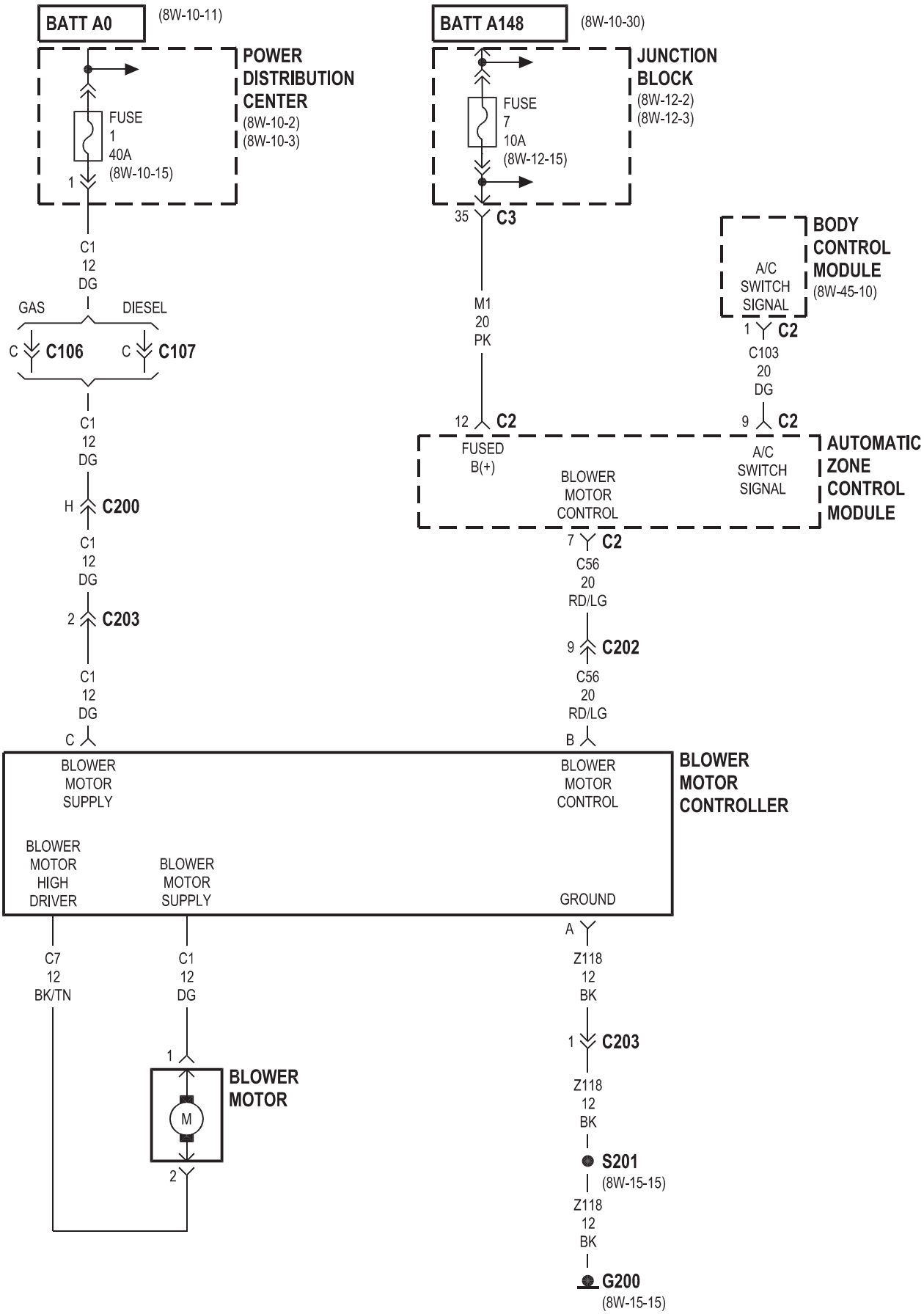
Component	Page
A/C Compressor Clutch	8W-42-3, 4
A/C Compressor Clutch Relay	8W-42-3, 4
A/C Pressure Transducer	8W-42-11, 12, 13
Auto Shut Down Relay	8W-42-4, 11, 12
Automatic Zone Control Module	8W-42-2, 5, 6, 7, 8
Blower Motor	8W-42-2, 6, 9
Blower Motor Controller	8W-42-2, 6
Blower Motor Resistor Block	8W-42-9
Body Control Module	8W-42-5, 6, 9, 10
Diagnostic Junction Port	8W-42-5
Driver Blend Door Motor/Actuator	8W-42-7, 8
Engine Control Module	8W-42-4, 13
Fuse 1	8W-42-2, 6, 9
Fuse 7	8W-42-6
Fuse 11	8W-42-5, 10
Fuse 16	8W-42-4, 11, 12
Fuse 20	8W-42-2, 10
Fuse 21	8W-42-3, 4
G104	8W-42-3
G108	8W-42-11, 12
G200	8W-42-2, 6, 10
Glow Plug Relay No. 1	8W-42-4
Hydraulic Cooling Module	8W-42-11, 12
Junction Block	8W-42-2, 3, 5, 6, 10
Manual Temperature Control	8W-42-2, 9, 10
Mode Door Motor/Actuator	8W-42-7, 8
Oxygen Sensor Downstream Relay	8W-42-11, 12
Passenger Blend Door Motor/Actuator	8W-42-7, 8
Power Distribution Center	8W-42-2, 3, 4, 6, 9, 11, 12
Powertrain Control Module	8W-42-3, 11, 12
Rear Window Defogger	8W-42-5, 10
Rear Window Defogger Relay	8W-42-5, 10
Recirculation Door Motor/Actuator	8W-42-7, 8
Temperature Valve Actuator	8W-42-10
Viscous/Cabin Heater Relay	8W-42-4

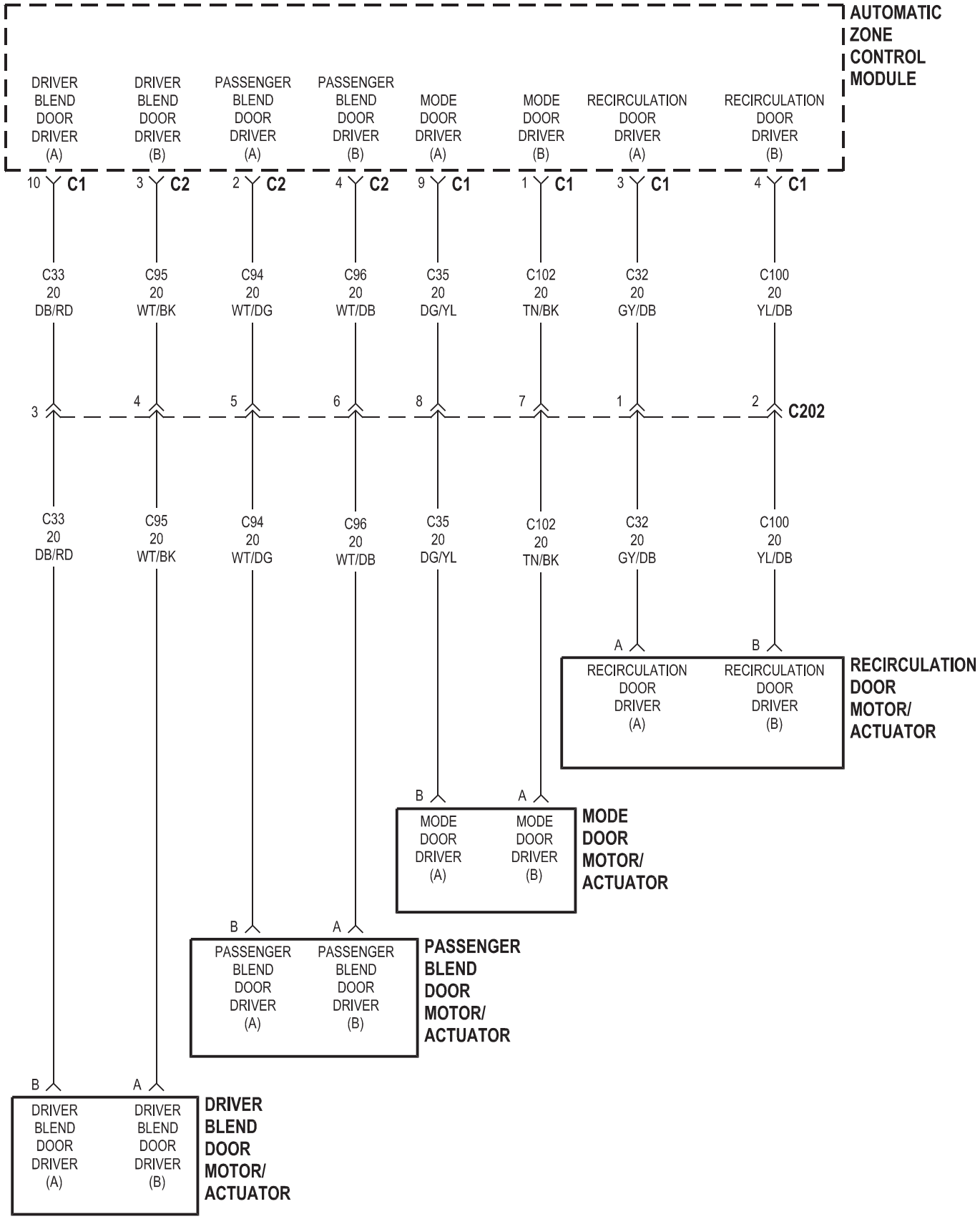

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 1 40A
(8W-10-15)
1
C1 12 DG
GAS
DIESEL
C C106
C C107
C1 12 DG
H C200
C1 12 DG
AZC
MTC
2 C203
14 C202
C1 12 DG
C1 12 DG
1
BLOWER MOTOR
(8W-42-6)
M
2
C
BLOWER MOTOR SUPPLY
BLOWER MOTOR CONTROLLER
(8W-42-6)
GROUND
A
Z118 12 BK
1 C203
Z118 12 BK
RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 20 10A
(8W-12-22)
1 C3
AZC
MTC
F22 20 WT/PK
11 C2
FUSED IGNITION SWITCH OUTPUT (RUN)
AUTOMATIC ZONE CONTROL MODULE
GROUND
8 C1
Z118 20 BK
S201
(8W-15-15)
Z118 12 BK
G200
(8W-15-15)
F22 20 WT/PK
S206
(8W-12-22)
F22 20 WT/PK
6 C1
FUSED IGNITION SWITCH OUTPUT (RUN)
MANUAL TEMPERATURE CONTROL
GROUND
2 C1
GROUND
1 C2
Z132 20 BK/OR
Z118 12 BK
S211
(8W-15-13)
RHD
LHD
Z132 18 BK/OR
Z132 18 BK
G200
(8W-15-15)

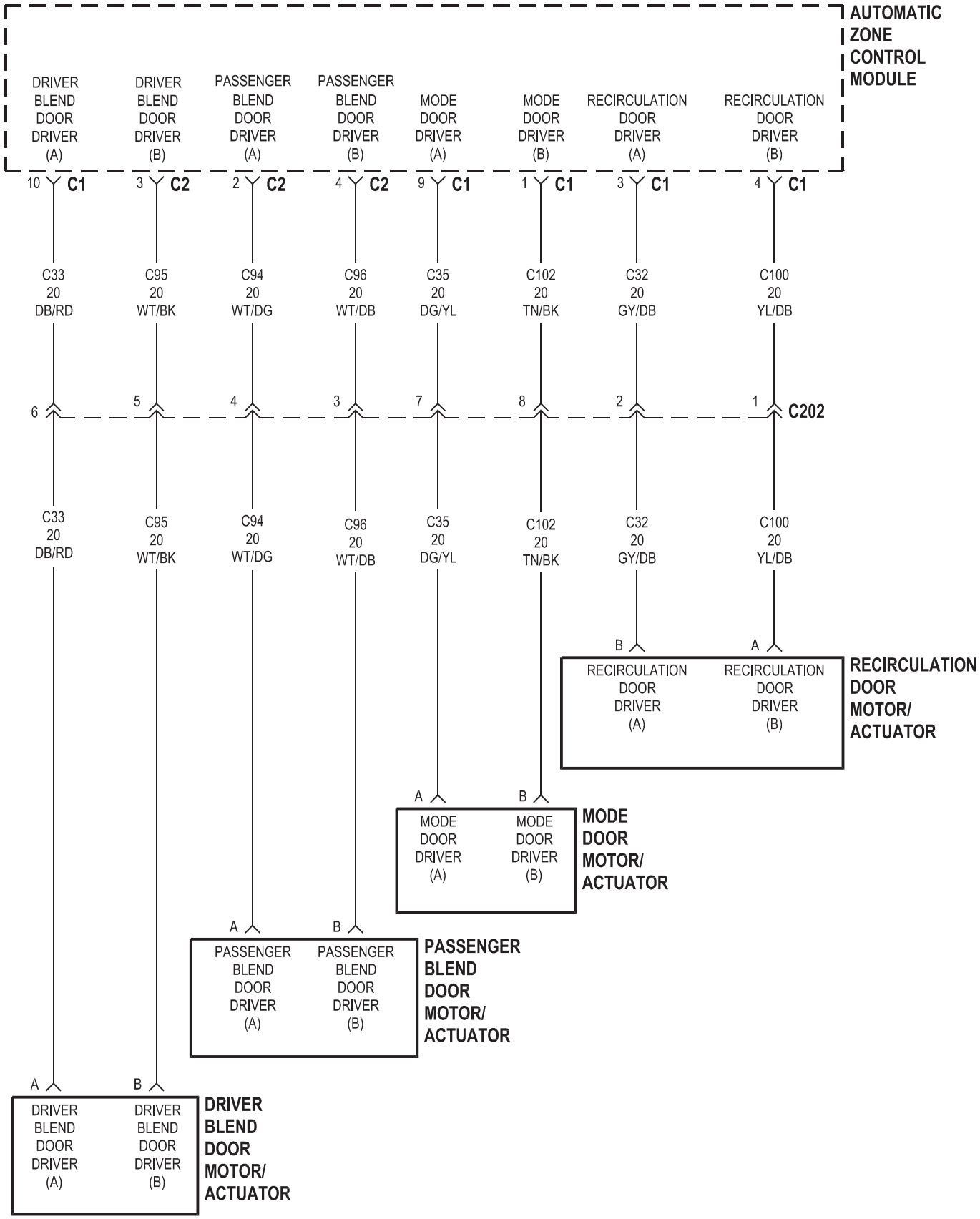

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
21
10A
(8W-12-18)
(8W-12-19)
43
C2
F12
20
DB/WT
S316
(8W-12-18)
F12
20
DB/WT
8
C106
F12
18
DB/WT
86
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
27
FUSE
21
15A
(8W-10-32)
26
A17
18
RD/BK
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
85
87
LHD
RHD
C13
20
DB/OR
14
C106
C13
18
DB/OR
C13
20
DB/OR
46
C107
C13
18
DB/OR
1
C3
A/C COMPRESSOR CLUTCH RELAY CONTROL
POWERTRAIN CONTROL MODULE
(8W-30-23)
C2
18
DB/YL
4.0L LHD
EXCEPT 4.0L LHD
9
C104
12
C102
C2
18
DB/YL
1
A/C COMPRESSOR CLUTCH
2
Z18
18
BK
G104
(8W-15-4)

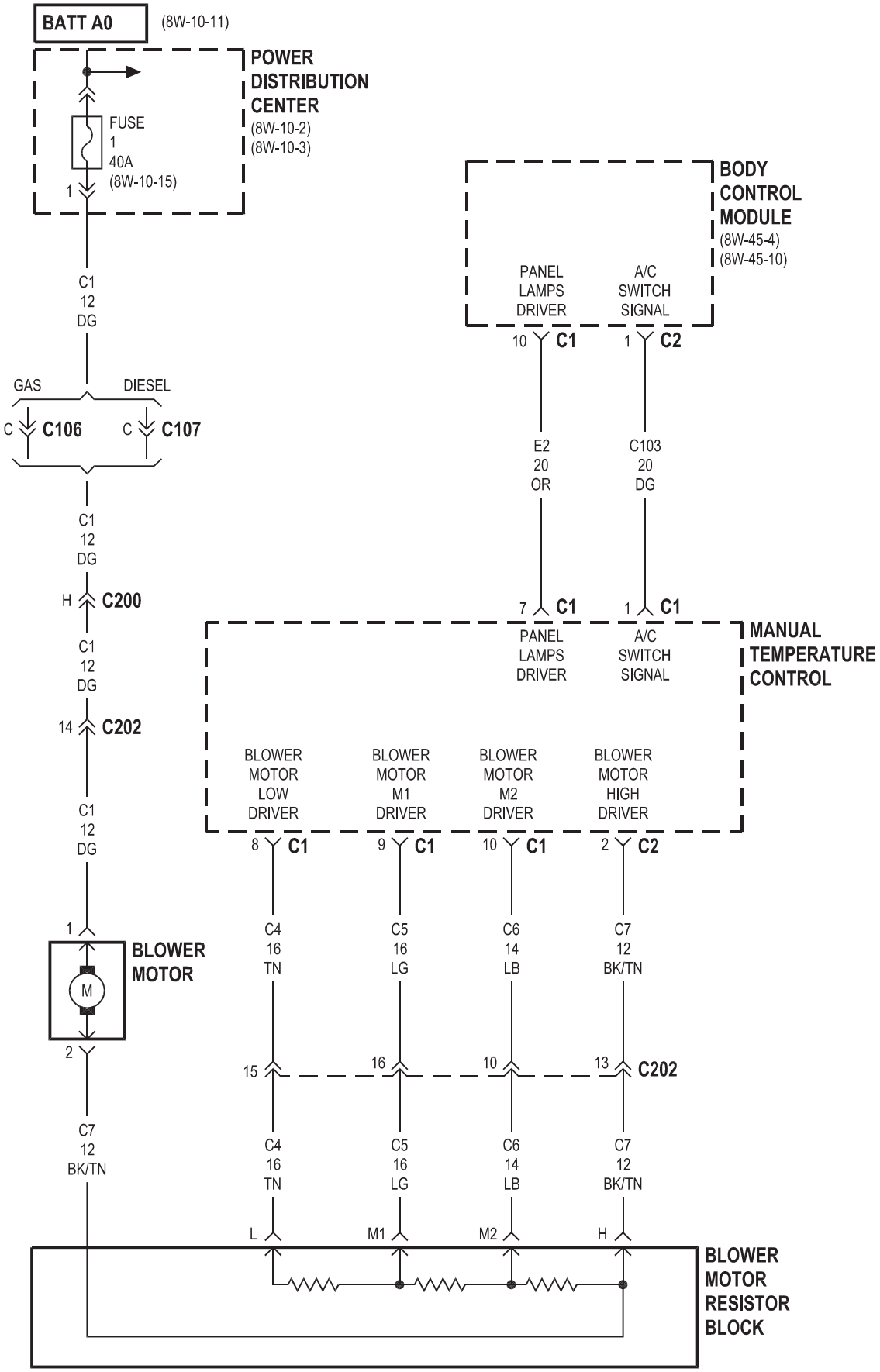

30
AUTO SHUT DOWN RELAY (IN PDC)
(8W-30-41)
87
A142
14
DG/OR
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-3)
16
FUSE 16 15A
(8W-10-25)
17
27
FUSE 21 15A
(8W-10-32)
26
F15
18
DB/WT
A17
14
RD/BK
86
VISCOUS/ CABIN HEATER RELAY
(8W-30-39)
85
F15
18
DB/WT
86
30
A/C COMPRESSOR CLUTCH RELAY (IN PDC)
85
87
F15
18
DB/WT
C13
18
DB/OR
C2
18
BK
3
C103
TO GLOW PLUG RELAY NO. 1 (IN PDC)
(8W-30-42)
1
C105
C2
14
DB/BK
C13
20
DB/RD
1
A/C COMPRESSOR CLUTCH
69
C1
A/C COMPRESSOR CLUTCH RELAY CONTROL
ENGINE CONTROL MODULE
(8W-30-42)

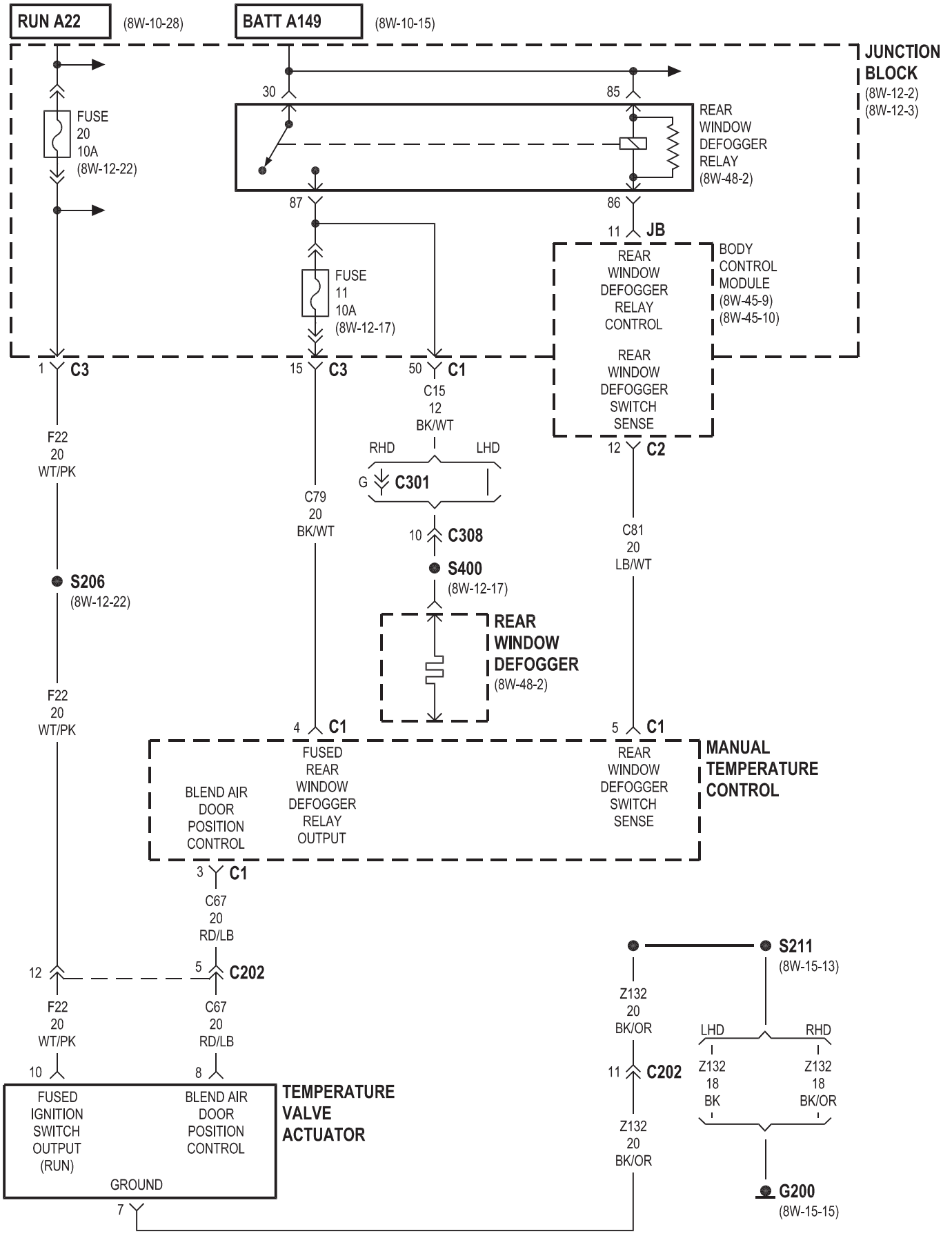

BATT A149
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
85
REAR WINDOW DEFOGGER RELAY
(8W-48-2)
87
86
11 JB
FUSE 11 10A
(8W-12-17)
REAR WINDOW DEFOGGER RELAY CONTROL
BODY CONTROL MODULE
(8W-45-4)
(8W-45-9)
(8W-45-10)
15 C3
50 C1
C79 20 BK/WT
C15 12 BK/WT
RHD
LHD
G C301
10 C308
C15 12 BK/WT
S400
(8W-12-17)
C15 12 BK/WT
REAR WINDOW DEFOGGER
(8W-48-2)
PANEL LAMPS DRIVER
REAR WINDOW DEFOGGER SWITCH SENSE
10 C1
12 C2
E2 20 OR
C81 20 LB/WT
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
PCI BUS
2
D25 20 YL/VT/DG
6 C1
6 C2
14 C1
8 C2
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
PANEL LAMPS DRIVER
REAR WINDOW DEFOGGER SWITCH SENSE
PCI BUS
AUTOMATIC ZONE CONTROL MODULE

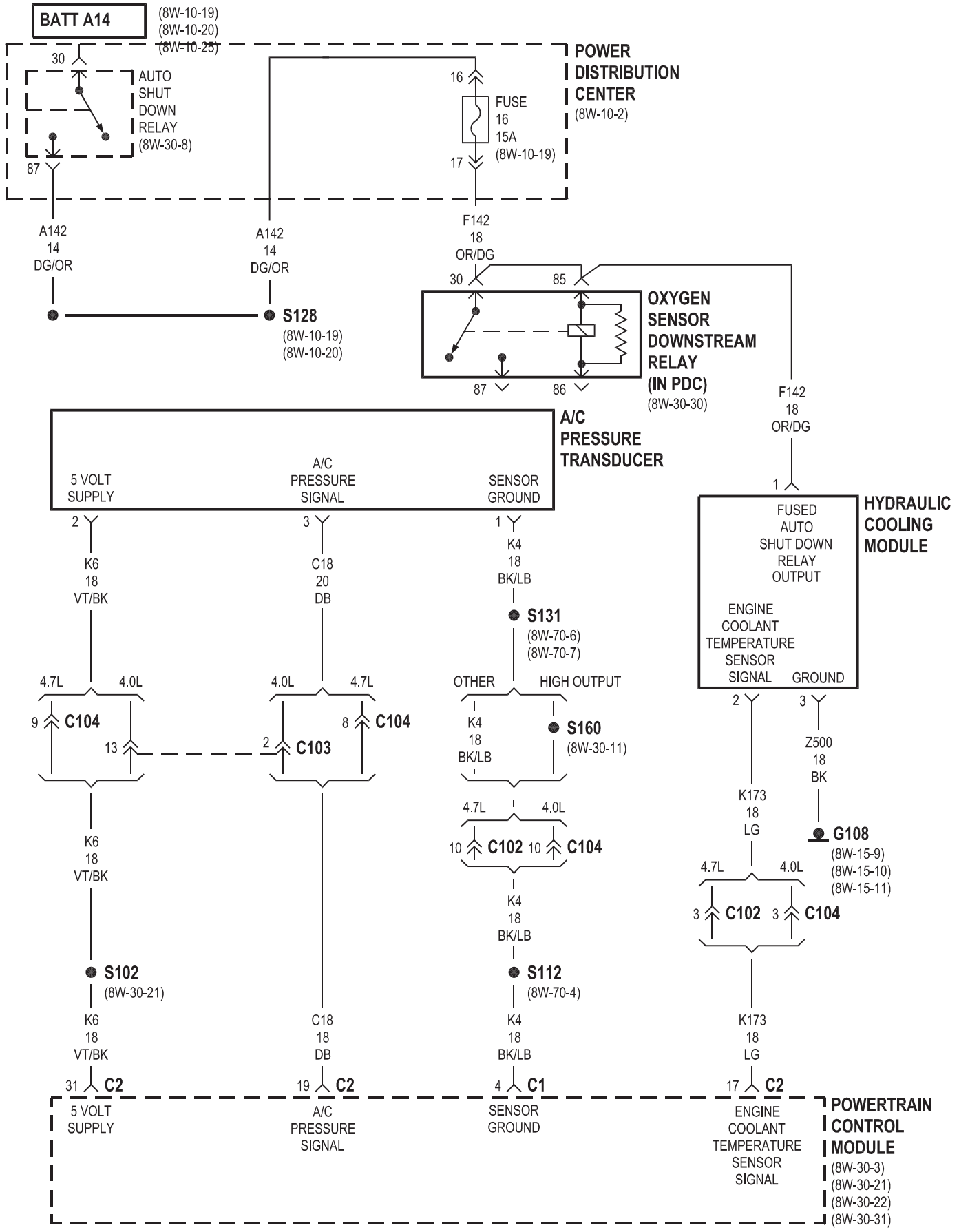

BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 1 40A (8W-10-15)
1
C1 12 DG
GAS
DIESEL
C C106
C C107
C1 12 DG
H C200
C1 12 DG
2 C203
C1 12 DG
C
BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 7 10A (8W-12-15)
35 C3
M1 20 PK
12 C2
FUSED B(+)
BODY CONTROL MODULE
(8W-45-10)
A/C SWITCH SIGNAL
1 C2
C103 20 DG
9 C2
A/C SWITCH SIGNAL
AUTOMATIC ZONE CONTROL MODULE
BLOWER MOTOR CONTROL
7 C2
C56 20 RD/LG
9 C202
C56 20 RD/LG
B
BLOWER MOTOR CONTROLLER
BLOWER MOTOR SUPPLY
BLOWER MOTOR CONTROL
BLOWER MOTOR HIGH DRIVER
BLOWER MOTOR SUPPLY
GROUND
A
C7 12 BK/TN
C1 12 DG
Z118 12 BK
1 C203
Z118 12 BK
S201
(8W-15-15)
Z118 12 BK
G200
(8W-15-15)
1
BLOWER MOTOR
M
2

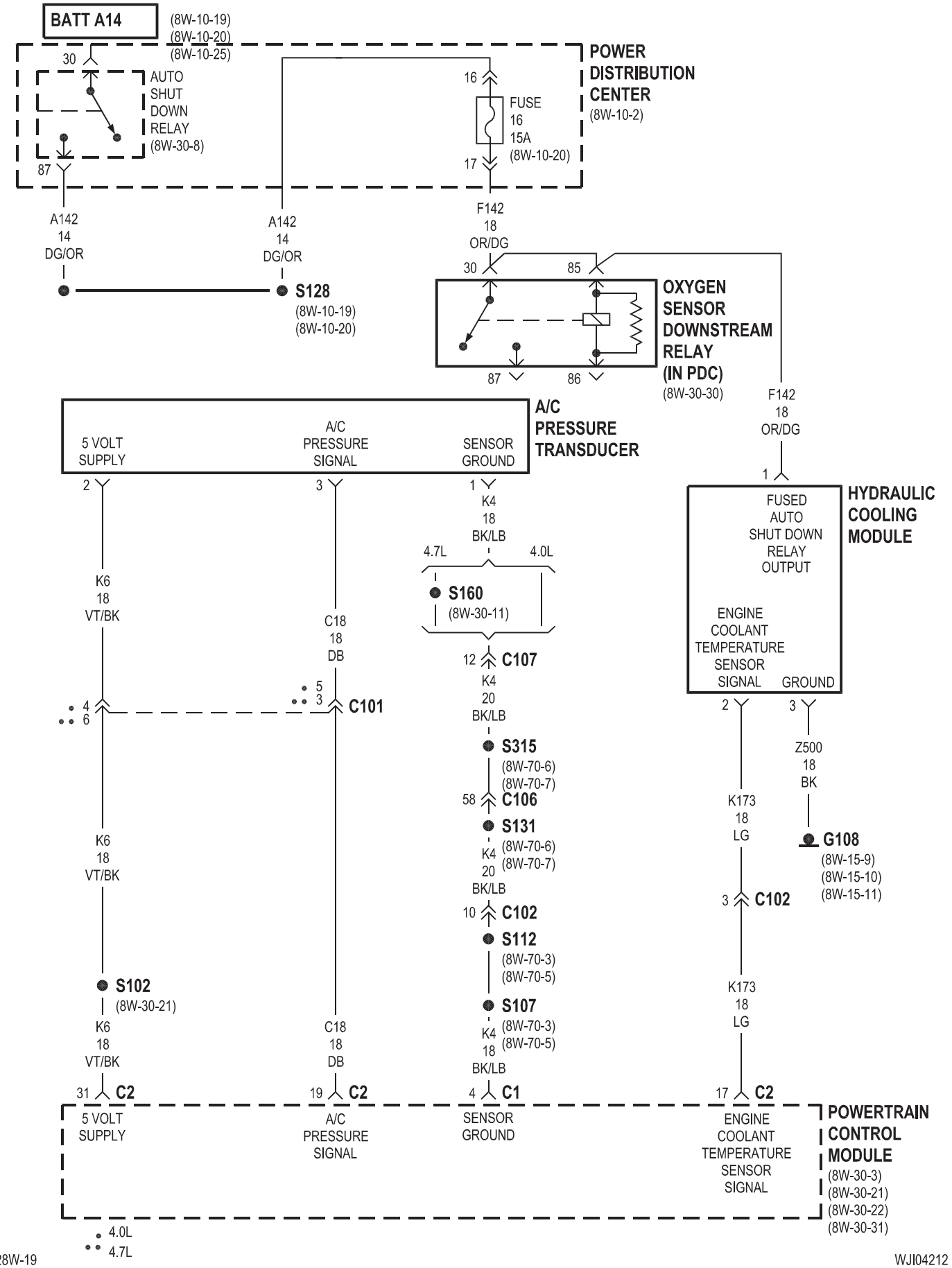

AUTOMATIC ZONE CONTROL MODULE
DRIVER BLEND DOOR DRIVER (A)
DRIVER BLEND DOOR DRIVER (B)
PASSENGER BLEND DOOR DRIVER (A)
PASSENGER BLEND DOOR DRIVER (B)
MODE DOOR DRIVER (A)
MODE DOOR DRIVER (B)
RECIRCULATION DOOR DRIVER (A)
RECIRCULATION DOOR DRIVER (B)
10 C1
3 C2
2 C2
4 C2
9 C1
1 C1
3 C1
4 C1
C33 20 DB/RD
C95 20 WT/BK
C94 20 WT/DG
C96 20 WT/DB
C35 20 DG/YL
C102 20 TN/BK
C32 20 GY/DB
C100 20 YL/DB
3
4
5
6
8
7
1
2
C202
C33 20 DB/RD
C95 20 WT/BK
C94 20 WT/DG
C96 20 WT/DB
C35 20 DG/YL
C102 20 TN/BK
C32 20 GY/DB
C100 20 YL/DB
A
B
RECIRCULATION DOOR DRIVER (A)
RECIRCULATION DOOR DRIVER (B)
RECIRCULATION DOOR MOTOR/ ACTUATOR
B
A
MODE DOOR DRIVER (A)
MODE DOOR DRIVER (B)
MODE DOOR MOTOR/ ACTUATOR
B
A
PASSENGER BLEND DOOR DRIVER (A)
PASSENGER BLEND DOOR DRIVER (B)
PASSENGER BLEND DOOR MOTOR/ ACTUATOR
B
A
DRIVER BLEND DOOR DRIVER (A)
DRIVER BLEND DOOR DRIVER (B)
DRIVER BLEND DOOR MOTOR/ ACTUATOR

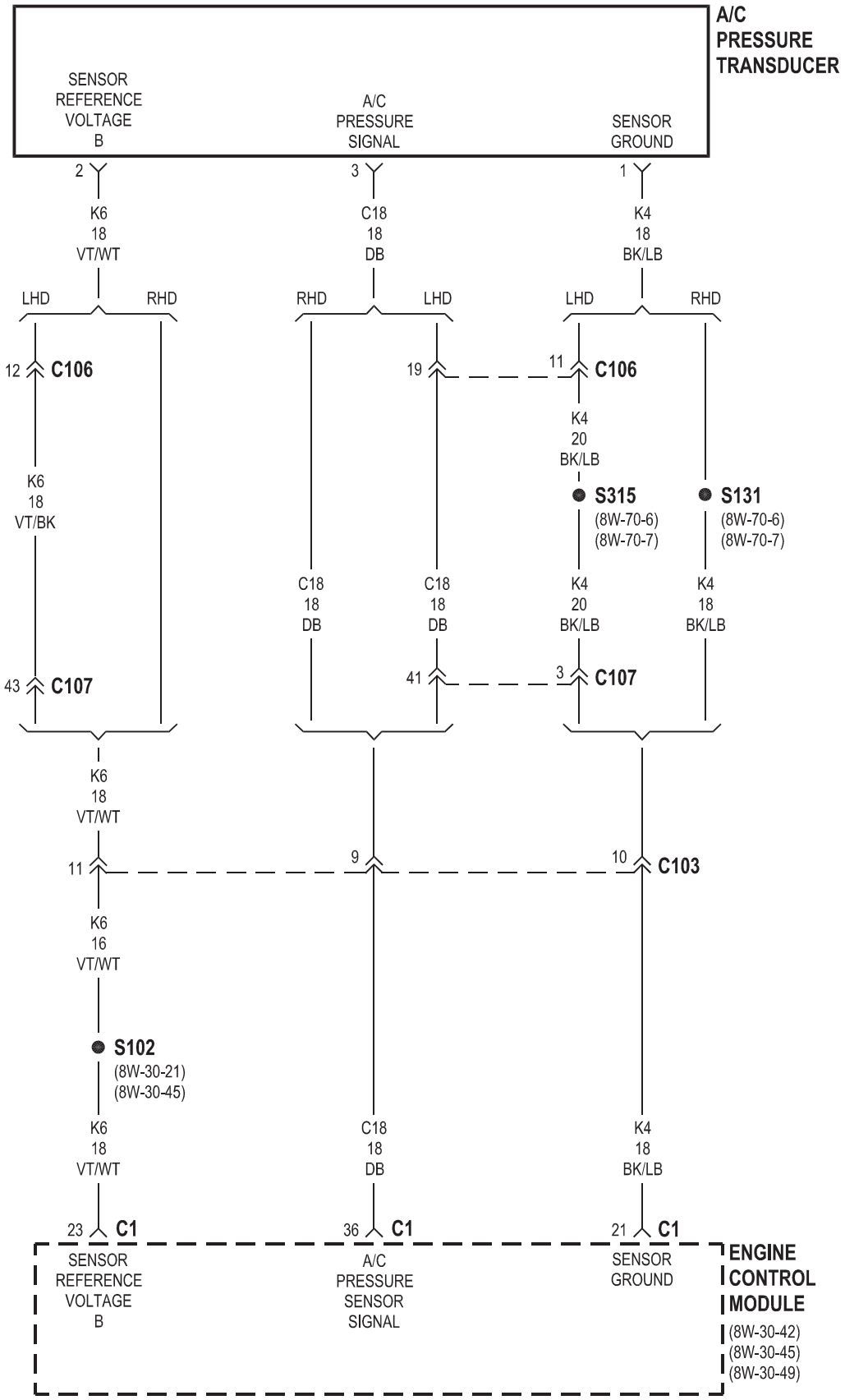

AUTOMATIC ZONE CONTROL MODULE
DRIVER BLEND DOOR DRIVER (A)
DRIVER BLEND DOOR DRIVER (B)
PASSENGER BLEND DOOR DRIVER (A)
PASSENGER BLEND DOOR DRIVER (B)
MODE DOOR DRIVER (A)
MODE DOOR DRIVER (B)
RECIRCULATION DOOR DRIVER (A)
RECIRCULATION DOOR DRIVER (B)
10 C1
3 C2
2 C2
4 C2
9 C1
1 C1
3 C1
4 C1
C33 20 DB/RD
C95 20 WT/BK
C94 20 WT/DG
C96 20 WT/DB
C35 20 DG/YL
C102 20 TN/BK
C32 20 GY/DB
C100 20 YL/DB
6
5
4
3
7
8
2
1
C202
RECIRCULATION DOOR MOTOR/ ACTUATOR
MODE DOOR MOTOR/ ACTUATOR
PASSENGER BLEND DOOR MOTOR/ ACTUATOR
DRIVER BLEND DOOR MOTOR/ ACTUATOR


BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE
1
40A
(8W-10-15)
1
C1
12
DG
GAS
DIESEL
C
C106
C
C107
C1
12
DG
H
C200
C1
12
DG
14
C202
C1
12
DG
1
BLOWER MOTOR
M
2
C7
12
BK/TN
BODY CONTROL MODULE
(8W-45-4)
(8W-45-10)
PANEL LAMPS DRIVER
A/C SWITCH SIGNAL
10
C1
1
C2
E2
20
OR
C103
20
DG
7
C1
1
C1
MANUAL TEMPERATURE CONTROL
PANEL LAMPS DRIVER
A/C SWITCH SIGNAL
BLOWER MOTOR LOW DRIVER
BLOWER MOTOR M1 DRIVER
BLOWER MOTOR M2 DRIVER
BLOWER MOTOR HIGH DRIVER
8
C1
9
C1
10
C1
2
C2
C4
16
TN
C5
16
LG
C6
14
LB
C7
12
BK/TN
15
16
10
13
C202
C4
16
TN
C5
16
LG
C6
14
LB
C7
12
BK/TN
L
M1
M2
H
BLOWER MOTOR RESISTOR BLOCK


RUN A22
(8W-10-28)
BATT A149
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
10A
(8W-12-22)
30
85
REAR WINDOW DEFOGGER RELAY
(8W-48-2)
87
86
11 JB
FUSE
11
10A
(8W-12-17)
REAR WINDOW DEFOGGER RELAY CONTROL
BODY CONTROL MODULE
(8W-45-9)
(8W-45-10)
REAR WINDOW DEFOGGER SWITCH SENSE
1 C3
15 C3
50 C1
C15
12
BK/WT
12 C2
F22
20
WT/PK
RHD
LHD
G C301
C79
20
BK/WT
10 C308
C81
20
LB/WT
S206
(8W-12-22)
S400
(8W-12-17)
REAR WINDOW DEFOGGER
(8W-48-2)
F22
20
WT/PK
4 C1
5 C1
MANUAL TEMPERATURE CONTROL
BLEND AIR DOOR POSITION CONTROL
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
REAR WINDOW DEFOGGER SWITCH SENSE
3 C1
C67
20
RD/LB
S211
(8W-15-13)
12
5 C202
Z132
20
BK/OR
LHD
RHD
F22
20
WT/PK
C67
20
RD/LB
11 C202
Z132
18
BK
Z132
18
BK/OR
10
8
FUSED IGNITION SWITCH OUTPUT (RUN)
BLEND AIR DOOR POSITION CONTROL
GROUND
TEMPERATURE VALVE ACTUATOR
Z132
20
BK/OR
G200
(8W-15-15)
7

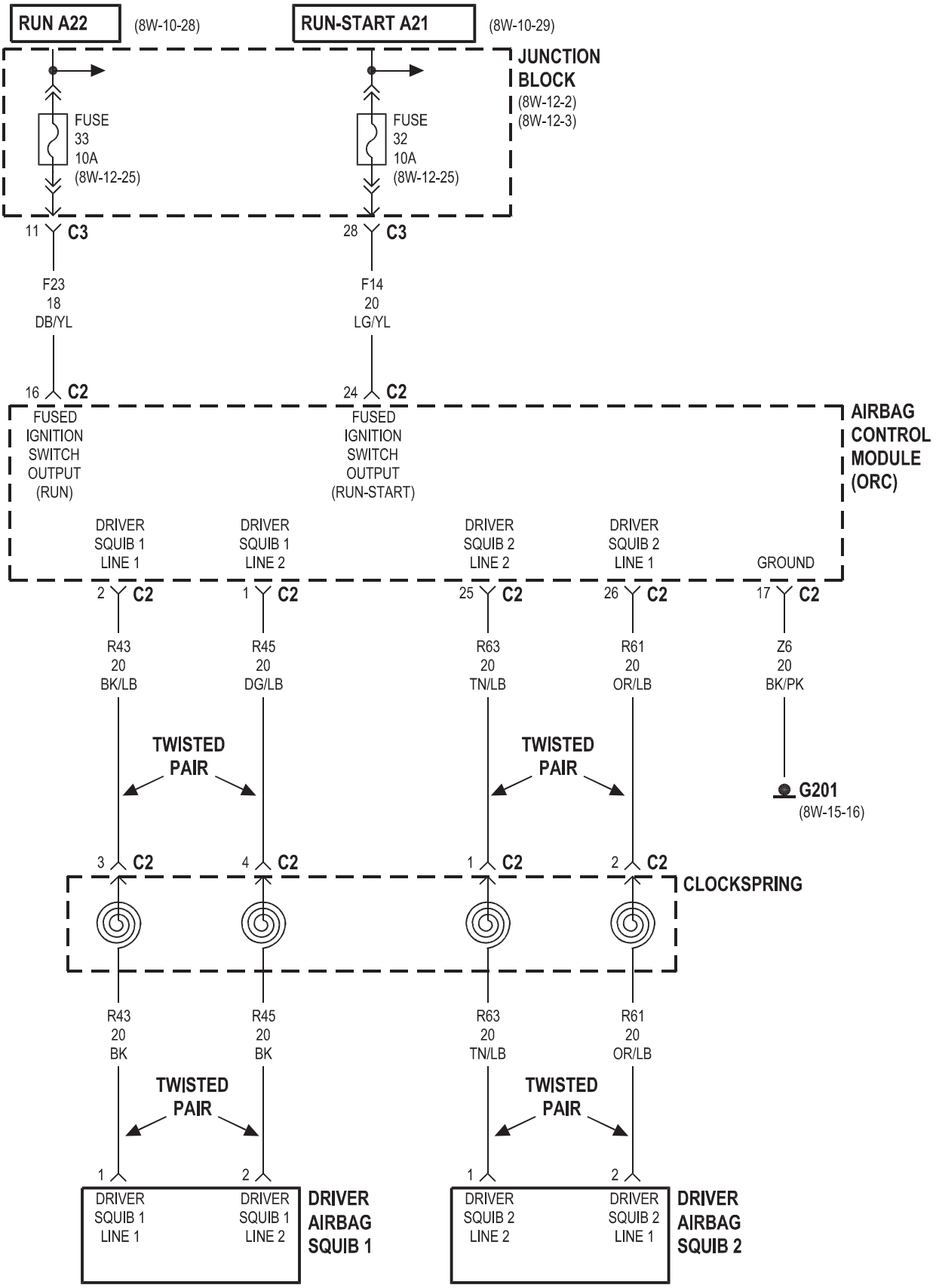

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-23)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
16
FUSE 16 15A
(8W-10-19)
17
A142 14 DG/OR
A142 14 DG/OR
S128
(8W-10-19)
(8W-10-20)
F142 18 OR/DG
30
85
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-30)
87
86
F142 18 OR/DG
A/C PRESSURE TRANSDUCER
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
SENSOR GROUND
1
HYDRAULIC COOLING MODULE
FUSED AUTO SHUT DOWN RELAY OUTPUT
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
GROUND
2
K6 18 VT/BK
3
C18 20 DB
1
K4 18 BK/LB
S131
(8W-70-6)
(8W-70-7)
4.7L
4.0L
9 C104
13
2 C103
4.0L
4.7L
8 C104
OTHER
HIGH OUTPUT
K4 18 BK/LB
S160
(8W-30-11)
2
3
Z500 18 BK
K173 18 LG
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)
4.7L
4.0L
10 C102
10 C104
4.7L
4.0L
3 C102
3 C104
K6 18 VT/BK
K4 18 BK/LB
S102
(8W-30-21)
S112
(8W-70-4)
K6 18 VT/BK
C18 18 DB
K4 18 BK/LB
K173 18 LG
31 C2
19 C2
4 C1
17 C2
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
SENSOR GROUND
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
POWERTRAIN CONTROL MODULE
(8W-30-3)
(8W-30-21)
(8W-30-22)
(8W-30-31)

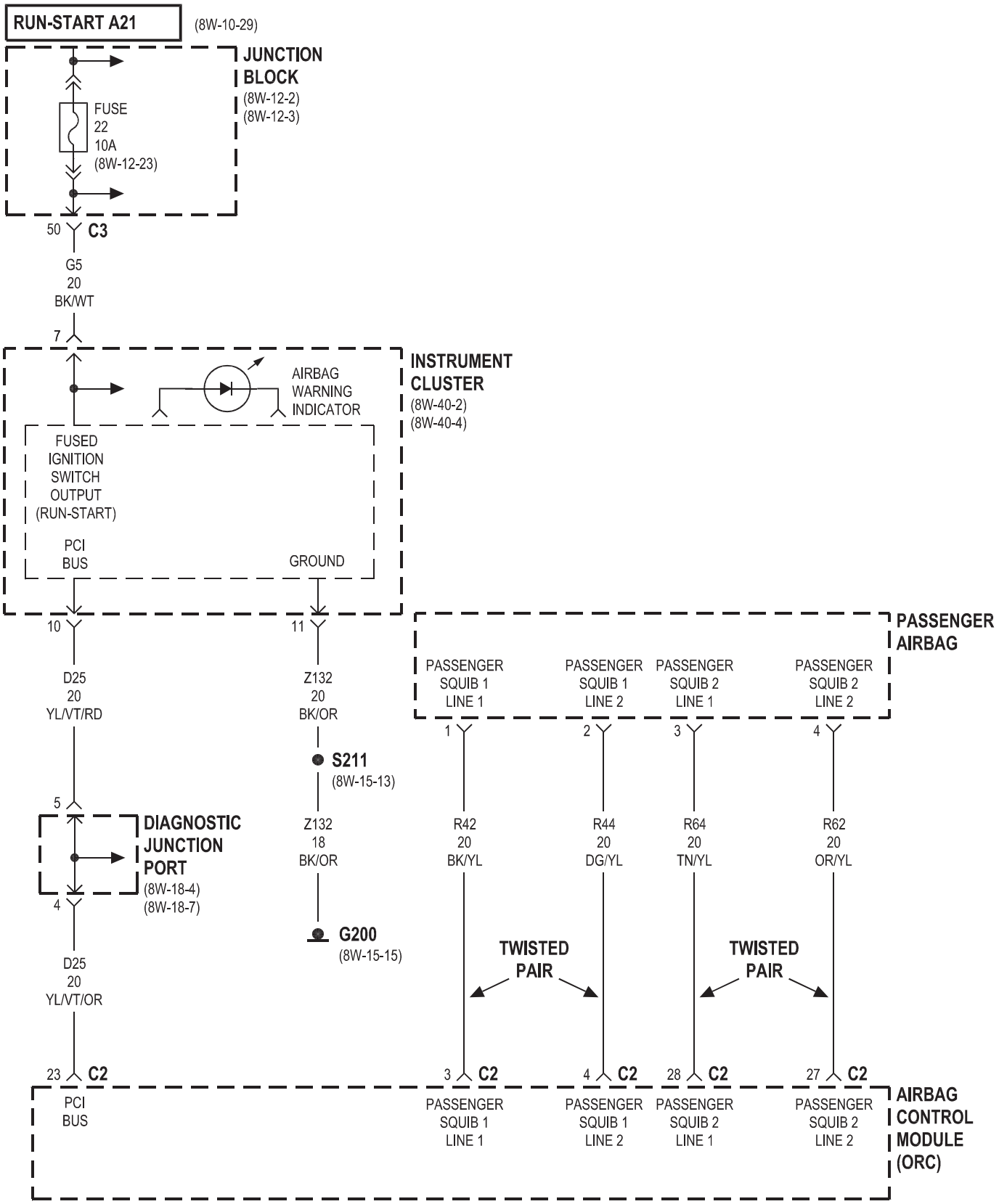

BATT A14
(8W-10-19)
(8W-10-20)
(8W-10-25)
POWER DISTRIBUTION CENTER
(8W-10-2)
30
AUTO SHUT DOWN RELAY
(8W-30-8)
87
16
FUSE 16 15A
(8W-10-20)
17
A142 14 DG/OR
A142 14 DG/OR
S128
(8W-10-19)
(8W-10-20)
F142 18 OR/DG
30
85
OXYGEN SENSOR DOWNSTREAM RELAY (IN PDC)
(8W-30-30)
87
86
F142 18 OR/DG
A/C PRESSURE TRANSDUCER
5 VOLT SUPPLY
A/C PRESSURE SIGNAL
SENSOR GROUND
2
3
1
K4 18 BK/LB
4.7L
4.0L
S160
(8W-30-11)
12 C107
K4 20 BK/LB
S315
(8W-70-6)
(8W-70-7)
58 C106
S131
K4 20 BK/LB
(8W-70-6)
(8W-70-7)
10 C102
S112
(8W-70-3)
(8W-70-5)
S107
K4 18 BK/LB
(8W-70-3)
(8W-70-5)
4 C1
SENSOR GROUND
K6 18 VT/BK
C18 18 DB
4
6
5
3
C101
K6 18 VT/BK
S102
(8W-30-21)
K6 18 VT/BK
31 C2
5 VOLT SUPPLY
C18 18 DB
19 C2
A/C PRESSURE SIGNAL
HYDRAULIC COOLING MODULE
FUSED AUTO SHUT DOWN RELAY OUTPUT
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
GROUND
1
2
3
K173 18 LG
3 C102
K173 18 LG
17 C2
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
Z500 18 BK
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)
POWERTRAIN CONTROL MODULE
(8W-30-3)
(8W-30-21)
(8W-30-22)
(8W-30-31)
4.0L
4.7L

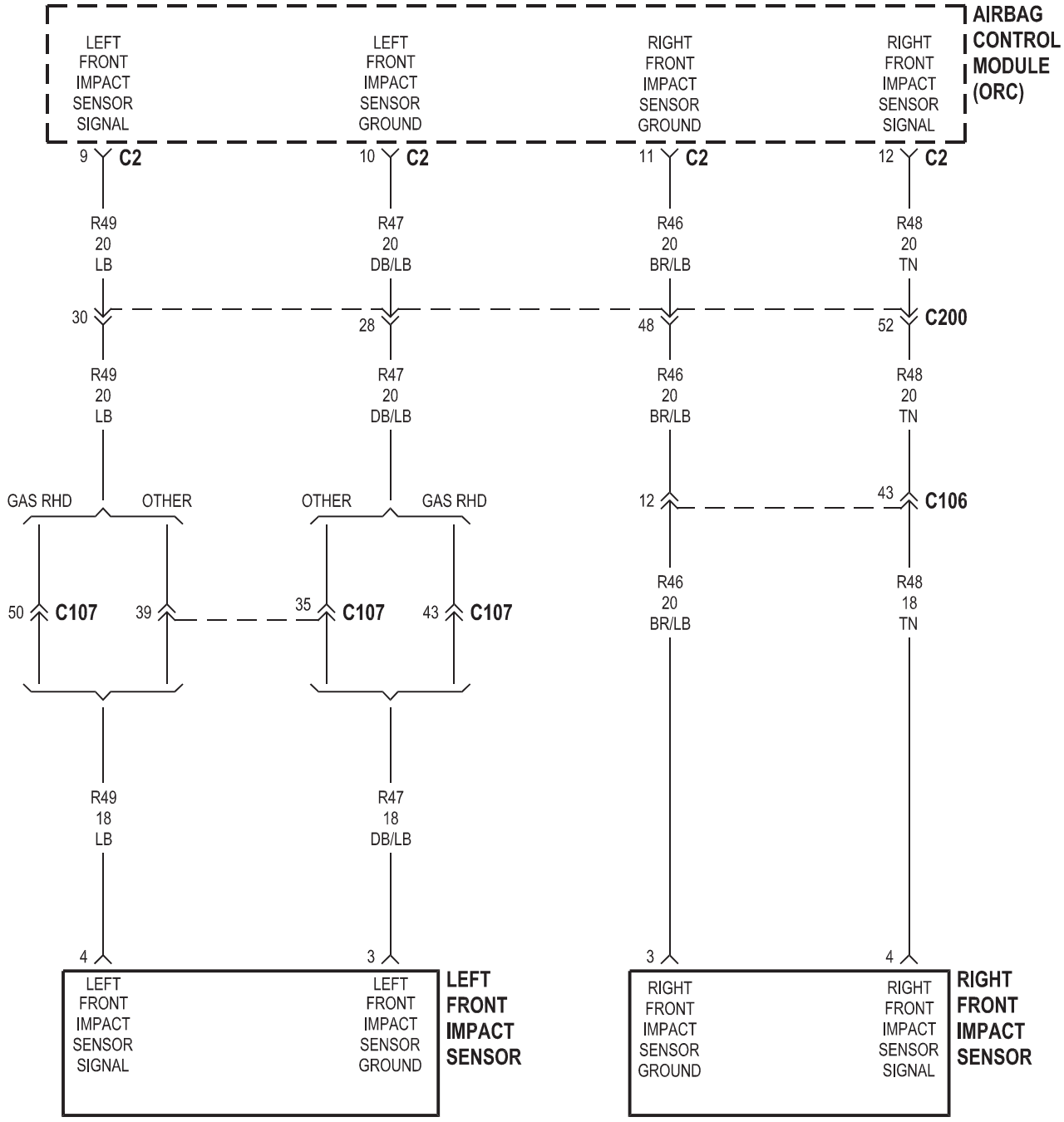

A/C PRESSURE TRANSDUCER
SENSOR REFERENCE VOLTAGE B
A/C PRESSURE SIGNAL
SENSOR GROUND
2
3
1
K6 18 VT/WT
C18 18 DB
K4 18 BK/LB
LHD
RHD
RHD
LHD
LHD
RHD
12 C106
19
11 C106
K4 20 BK/LB
K6 18 VT/BK
S315 (8W-70-6) (8W-70-7)
S131 (8W-70-6) (8W-70-7)
C18 18 DB
C18 18 DB
K4 20 BK/LB
K4 18 BK/LB
43 C107
41
3 C107
K6 18 VT/WT
11
9
10 C103
K6 16 VT/WT
S102 (8W-30-21) (8W-30-45)
K6 18 VT/WT
C18 18 DB
K4 18 BK/LB
23 C1
36 C1
21 C1
SENSOR REFERENCE VOLTAGE B
A/C PRESSURE SENSOR SIGNAL
SENSOR GROUND
ENGINE CONTROL MODULE
(8W-30-42)
(8W-30-45)
(8W-30-49)

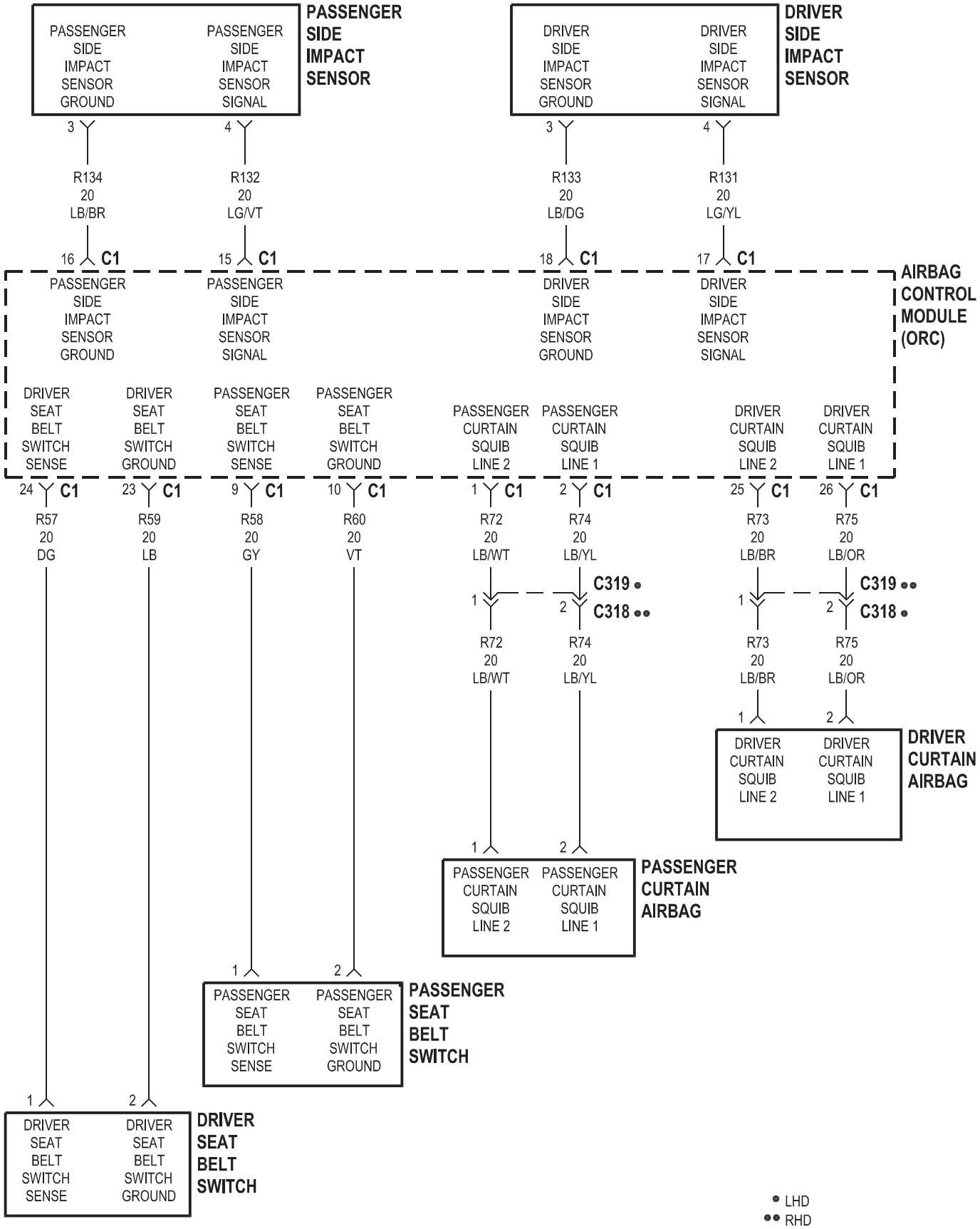
8W-43 AIRBAG SYSTEM

Component	Page
Airbag Control Module	8W-43-2, 3, 4, 5
Clockspring	8W-43-2
Diagnostic Junction Port	8W-43-3
Driver Airbag Squib 1	8W-43-2
Driver Airbag Squib 2	8W-43-2
Driver Curtain Squib	8W-43-5
Driver Seat Belt Switch	8W-43-5
Driver Side Impact Sensor	8W-43-5
Fuse 22	8W-43-3
Fuse 32	8W-43-2
Fuse 33	8W-43-2
G200	8W-43-3
G201	8W-43-2
Instrument Cluster	8W-43-3
Junction Block	8W-43-2, 3
Left Front Impact Sensor	8W-43-4
Passenger Airbag	8W-43-3
Passenger Curtain Airbag	8W-43-5
Passenger Seat Belt Switch	8W-43-5
Passenger Side Impact Sensor	8W-43-5
Right Front Impact Sensor	8W-43-4


RUN A22
(8W-10-28)
RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 33 10A (8W-12-25)
FUSE 32 10A (8W-12-25)
11 C3
28 C3
F23 18 DB/YL
F14 20 LG/YL
16 C2
24 C2
FUSED IGNITION SWITCH OUTPUT (RUN)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
AIRBAG CONTROL MODULE (ORC)
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
DRIVER SQUIB 2 LINE 2
DRIVER SQUIB 2 LINE 1
GROUND
2 C2
1 C2
25 C2
26 C2
17 C2
R43 20 BK/LB
R45 20 DG/LB
R63 20 TN/LB
R61 20 OR/LB
Z6 20 BK/PK
TWISTED PAIR
TWISTED PAIR
G201
(8W-15-16)
3 C2
4 C2
1 C2
2 C2
CLOCKSPRING
R43 20 BK
R45 20 BK
R63 20 TN/LB
R61 20 OR/LB
TWISTED PAIR
TWISTED PAIR
1
2
1
2
DRIVER SQUIB 1 LINE 1
DRIVER SQUIB 1 LINE 2
DRIVER AIRBAG SQUIB 1
DRIVER SQUIB 2 LINE 2
DRIVER SQUIB 2 LINE 1
DRIVER AIRBAG SQUIB 2

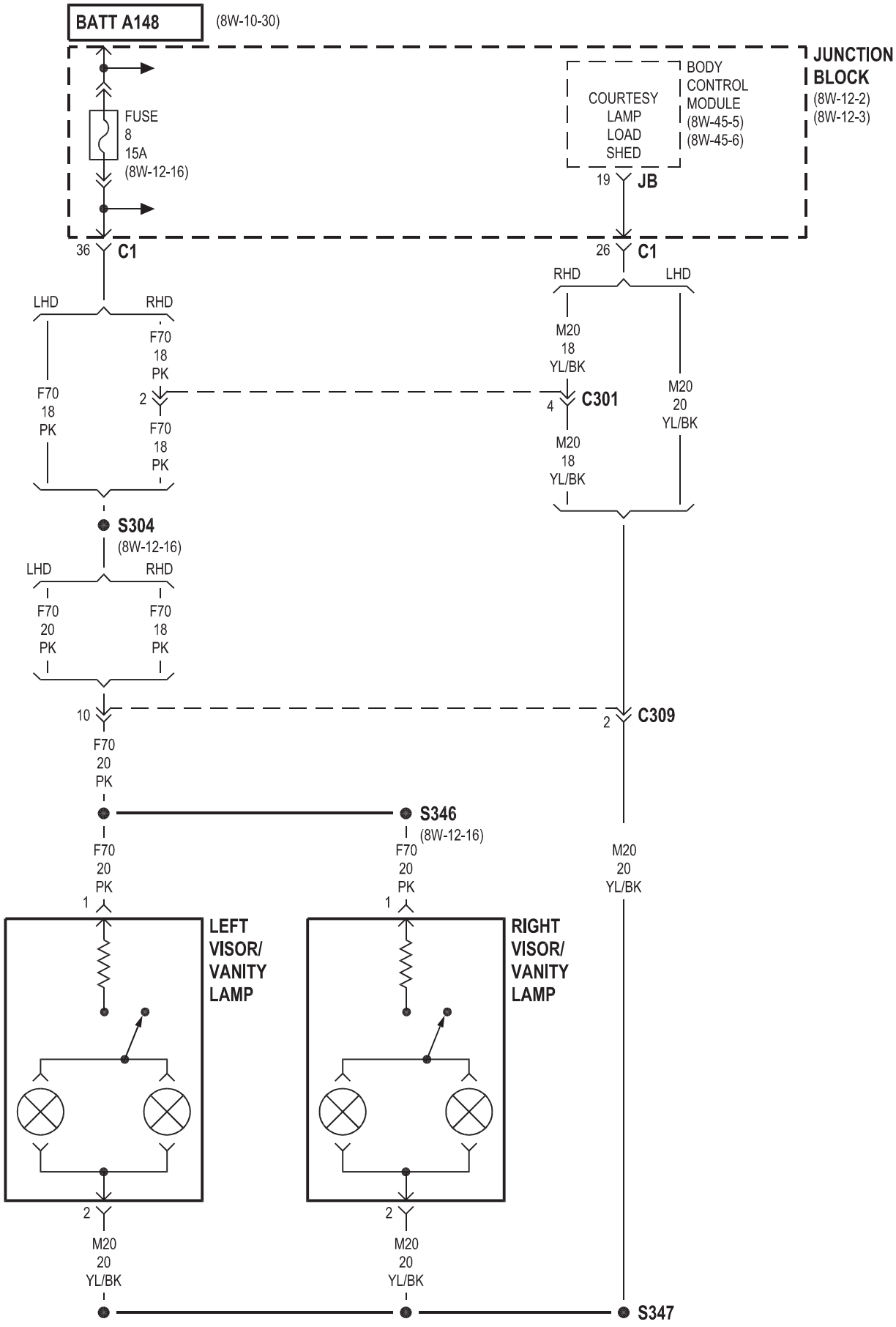

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
22
10A
(8W-12-23)
50
C3
G5
20
BK/WT
7
INSTRUMENT CLUSTER
(8W-40-2)
(8W-40-4)
AIRBAG WARNING INDICATOR
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
GROUND
10
11
D25
20
YL/VT/RD
Z132
20
BK/OR
S211
(8W-15-13)
PASSENGER AIRBAG
PASSENGER SQUIB 1 LINE 1
PASSENGER SQUIB 1 LINE 2
PASSENGER SQUIB 2 LINE 1
PASSENGER SQUIB 2 LINE 2
1
2
3
4
5
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
Z132
18
BK/OR
R42
20
BK/YL
R44
20
DG/YL
R64
20
TN/YL
R62
20
OR/YL
G200
(8W-15-15)
TWISTED PAIR
TWISTED PAIR
4
D25
20
YL/VT/OR
23
C2
3
C2
4
C2
28
C2
27
C2
PCI BUS
PASSENGER SQUIB 1 LINE 1
PASSENGER SQUIB 1 LINE 2
PASSENGER SQUIB 2 LINE 1
PASSENGER SQUIB 2 LINE 2
AIRBAG CONTROL MODULE (ORC)

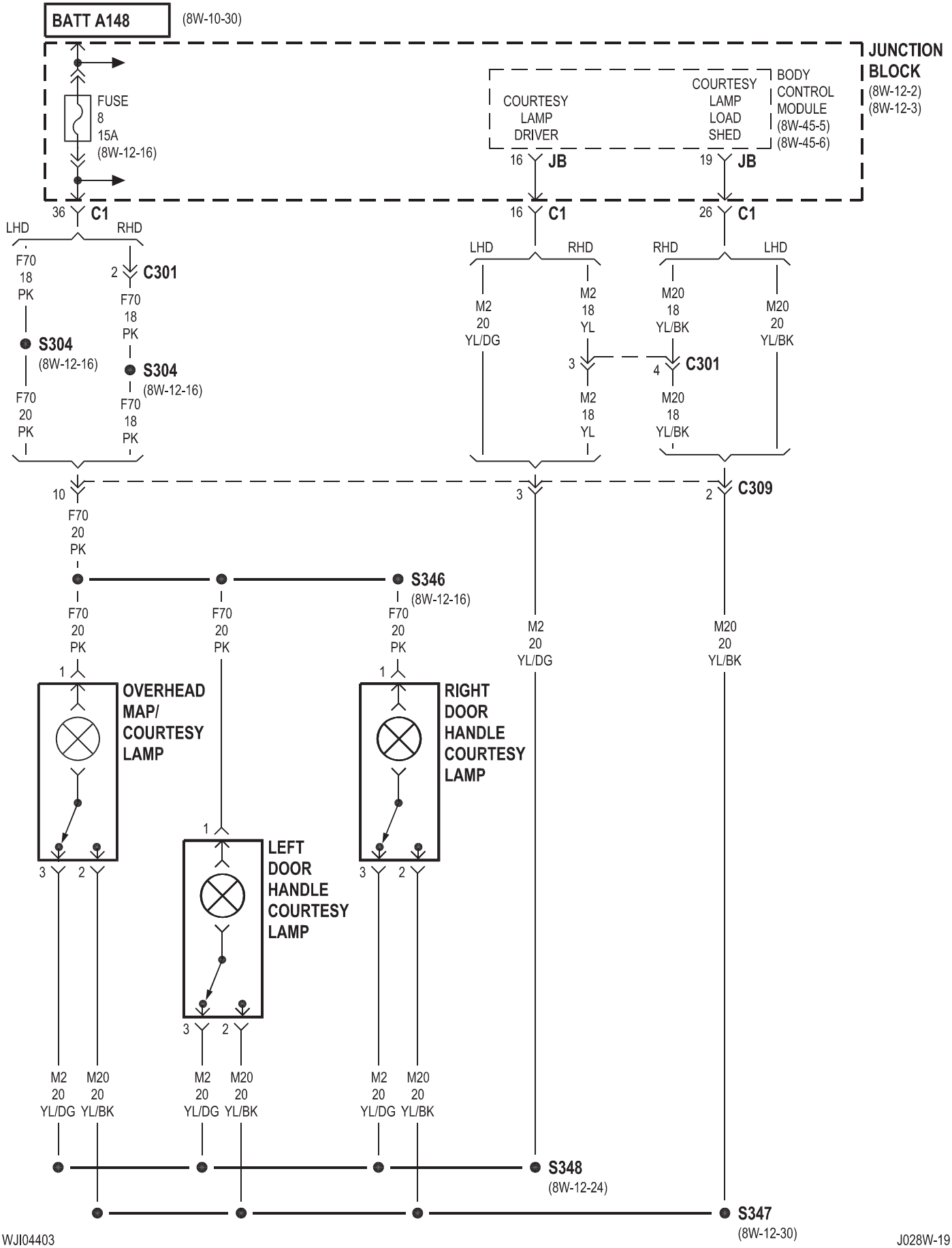

AIRBAG CONTROL MODULE (ORC)
LEFT FRONT IMPACT SENSOR SIGNAL
LEFT FRONT IMPACT SENSOR GROUND
RIGHT FRONT IMPACT SENSOR GROUND
RIGHT FRONT IMPACT SENSOR SIGNAL
9 C2
10 C2
11 C2
12 C2
R49 20 LB
R47 20 DB/LB
R46 20 BR/LB
R48 20 TN
30
28
48
52 C200
GAS RHD
OTHER
OTHER
GAS RHD
12
43 C106
50 C107
39
35 C107
43 C107
R46 20 BR/LB
R48 18 TN
R49 18 LB
R47 18 DB/LB
4
3
3
4
LEFT FRONT IMPACT SENSOR SIGNAL
LEFT FRONT IMPACT SENSOR GROUND
LEFT FRONT IMPACT SENSOR
RIGHT FRONT IMPACT SENSOR GROUND
RIGHT FRONT IMPACT SENSOR SIGNAL
RIGHT FRONT IMPACT SENSOR

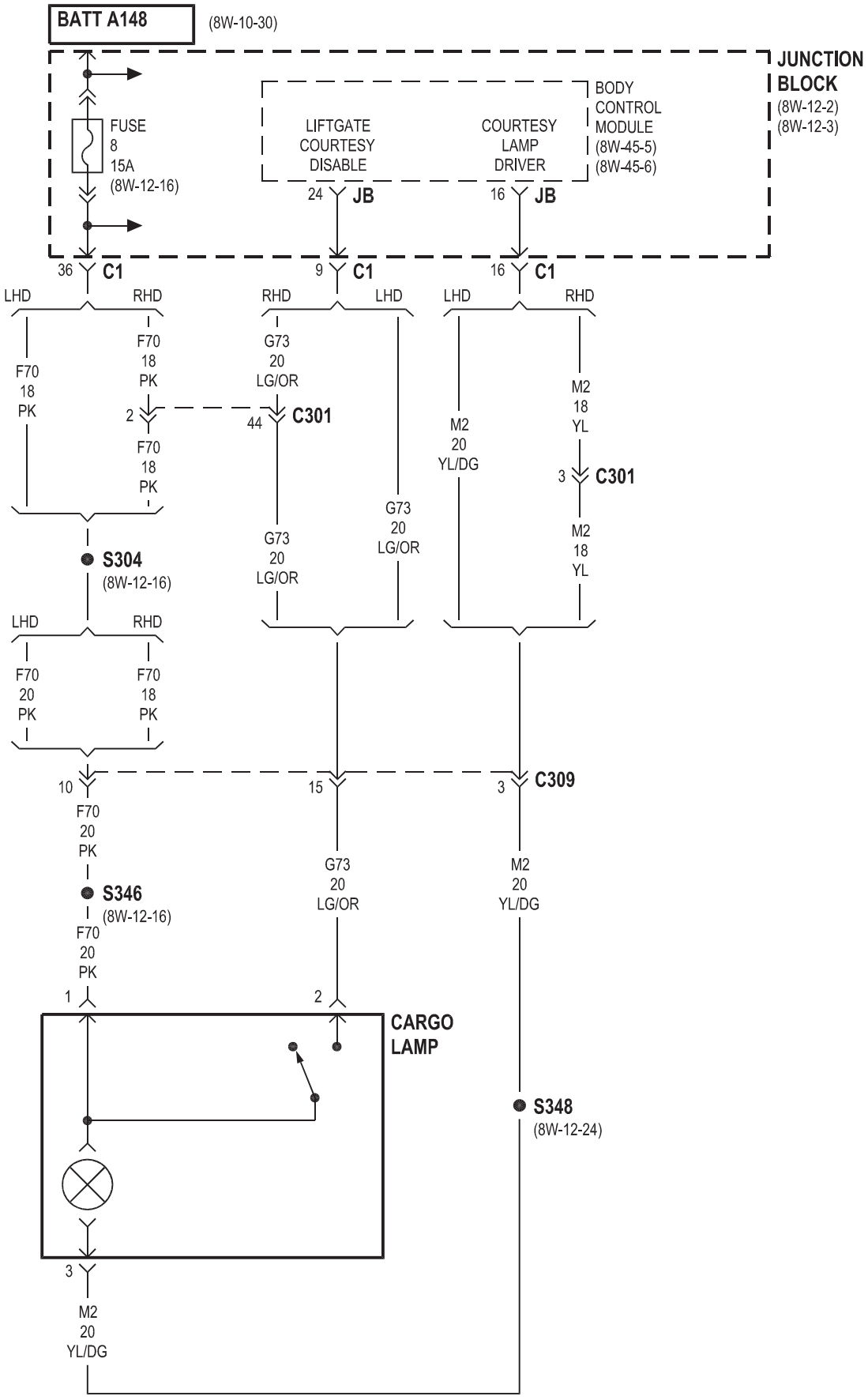

PASSENGER SIDE IMPACT SENSOR
PASSENGER SIDE IMPACT SENSOR GROUND
PASSENGER SIDE IMPACT SENSOR SIGNAL
DRIVER SIDE IMPACT SENSOR
DRIVER SIDE IMPACT SENSOR GROUND
DRIVER SIDE IMPACT SENSOR SIGNAL
AIRBAG CONTROL MODULE (ORC)
DRIVER SEAT BELT SWITCH SENSE
DRIVER SEAT BELT SWITCH GROUND
PASSENGER SEAT BELT SWITCH SENSE
PASSENGER SEAT BELT SWITCH GROUND
PASSENGER CURTAIN SQUIB LINE 2
PASSENGER CURTAIN SQUIB LINE 1
DRIVER CURTAIN SQUIB LINE 2
DRIVER CURTAIN SQUIB LINE 1
R134 20 LB/BR
R132 20 LG/VT
R133 20 LB/DG
R131 20 LG/YL
R57 20 DG
R59 20 LB
R58 20 GY
R60 20 VT
R72 20 LB/WT
R74 20 LB/YL
R73 20 LB/BR
R75 20 LB/OR
C319 • C318 ••
C319 •• C318 •
DRIVER SEAT BELT SWITCH SENSE
DRIVER SEAT BELT SWITCH GROUND
PASSENGER SEAT BELT SWITCH SENSE
PASSENGER SEAT BELT SWITCH GROUND
PASSENGER CURTAIN SQUIB LINE 2
PASSENGER CURTAIN SQUIB LINE 1
DRIVER CURTAIN SQUIB LINE 2
DRIVER CURTAIN SQUIB LINE 1
DRIVER SEAT BELT SWITCH
PASSENGER SEAT BELT SWITCH
PASSENGER CURTAIN AIRBAG
DRIVER CURTAIN AIRBAG
• LHD
•• RHD

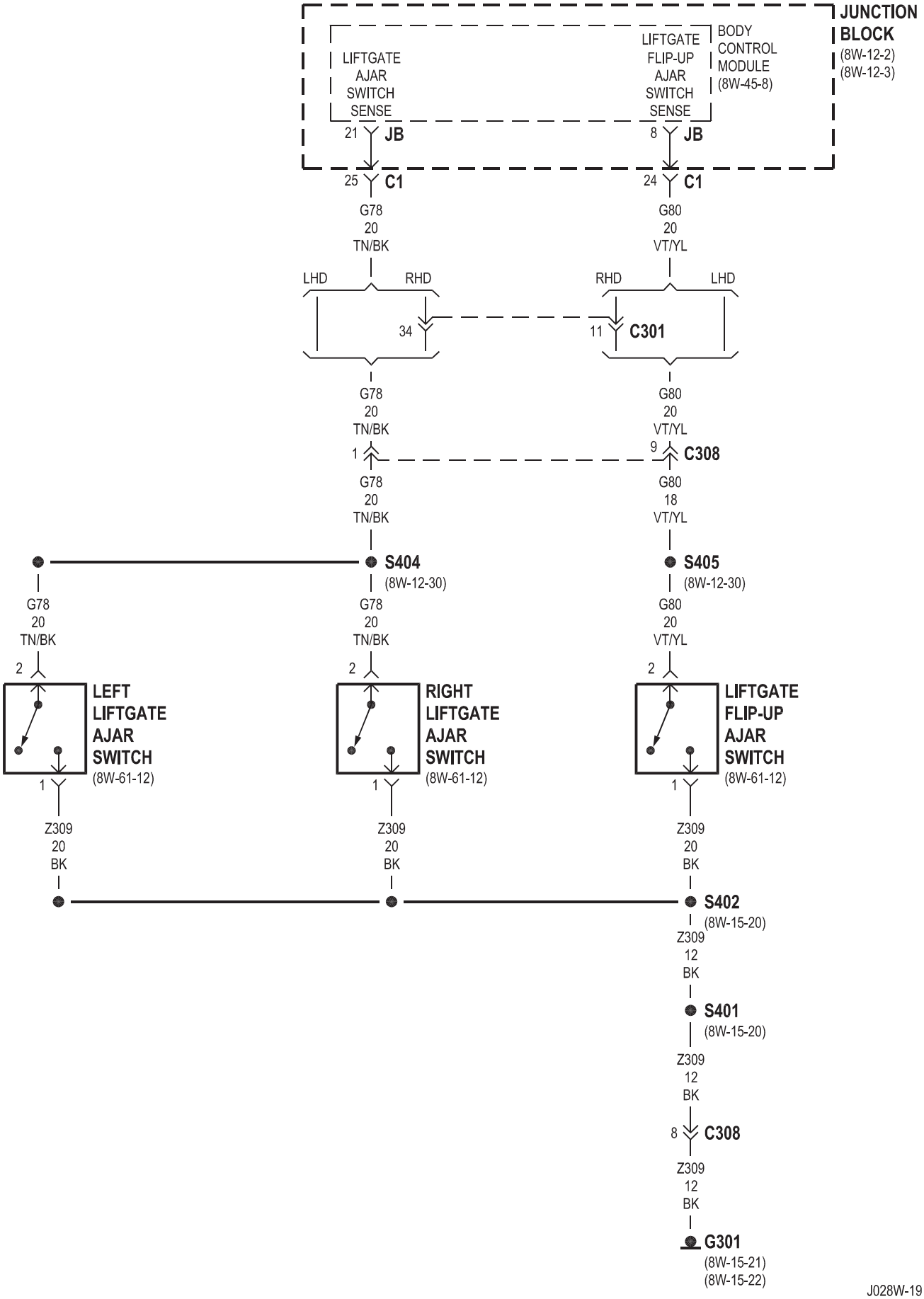
8W-44 INTERIOR LIGHTING

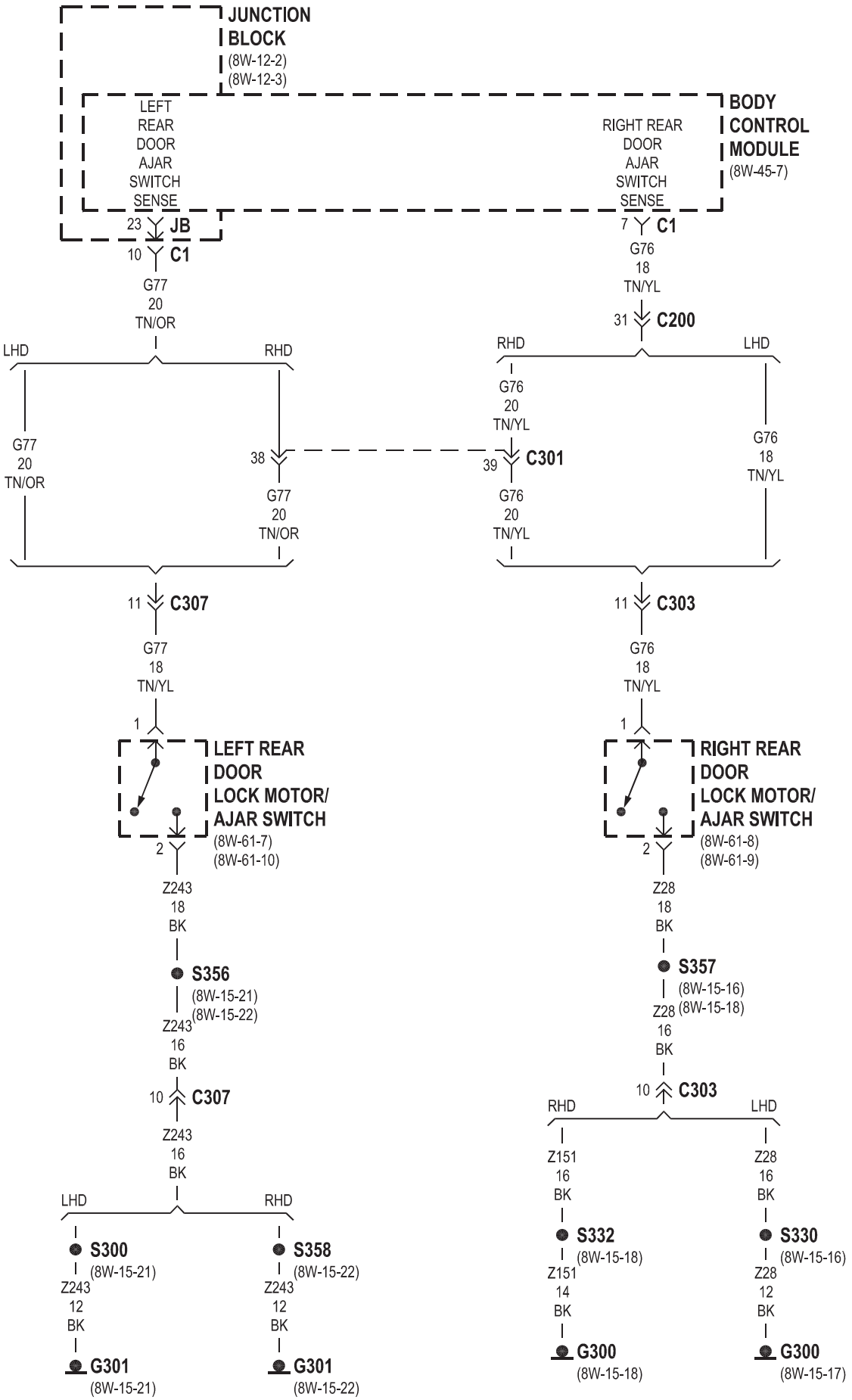
Component	Page
Ash Receiver Lamp	8W-44-10
Automatic Zone Control Module	8W-44-10
Body Control Module	8W-44-2, 3, 4, 5, 6, 8, 10
Cargo Lamp	8W-44-4
Driver Door Lock Motor/Ajar Switch	8W-44-7
Driver Door Module	8W-44-7, 9
Driver Front Door Courtesy Lamp	8W-44-9
Driver Heated Seat Switch	8W-44-10
Fuse 7	8W-44-8
Fuse 8	8W-44-2, 3, 4, 8
G106	8W-44-8
G200	8W-44-10
G300	8W-44-6, 7
G301	8W-44-5, 6, 7
Glove Box Lamp	8W-44-8
Junction Block	8W-44-2, 3, 4, 5, 6, 8
Left Courtesy Lamp	8W-44-8
Left Door Handle Courtesy Lamp	8W-44-3
Left Liftgate Ajar Switch	8W-44-5
Left Multi-Function Switch	8W-44-10
Left Rear Door Lock Motor/Ajar Switch	8W-44-6
Left Visor/Vanity Lamp	8W-44-2
Liftgate Flip-Up Ajar Switch	8W-44-5
Manual Temperature Control	8W-44-10
Overhead Map/Courtesy Lamp	8W-44-3
Passenger Door Lock Motor/Ajar Switch	8W-44-7
Passenger Door Module	8W-44-7, 9
Passenger Front Door Courtesy Lamp	8W-44-9
Passenger Heated Seat Switch	8W-44-10
Radio	8W-44-10
Right Courtesy Lamp	8W-44-8
Right Door Handle Courtesy Lamp	8W-44-3
Right Liftgate Ajar Switch	8W-44-5
Right Rear Door Lock Motor/Ajar Switch	8W-44-6
Right Visor/Vanity Lamp	8W-44-2
Shifter Assembly	8W-44-10
Underhood Lamp	8W-44-8

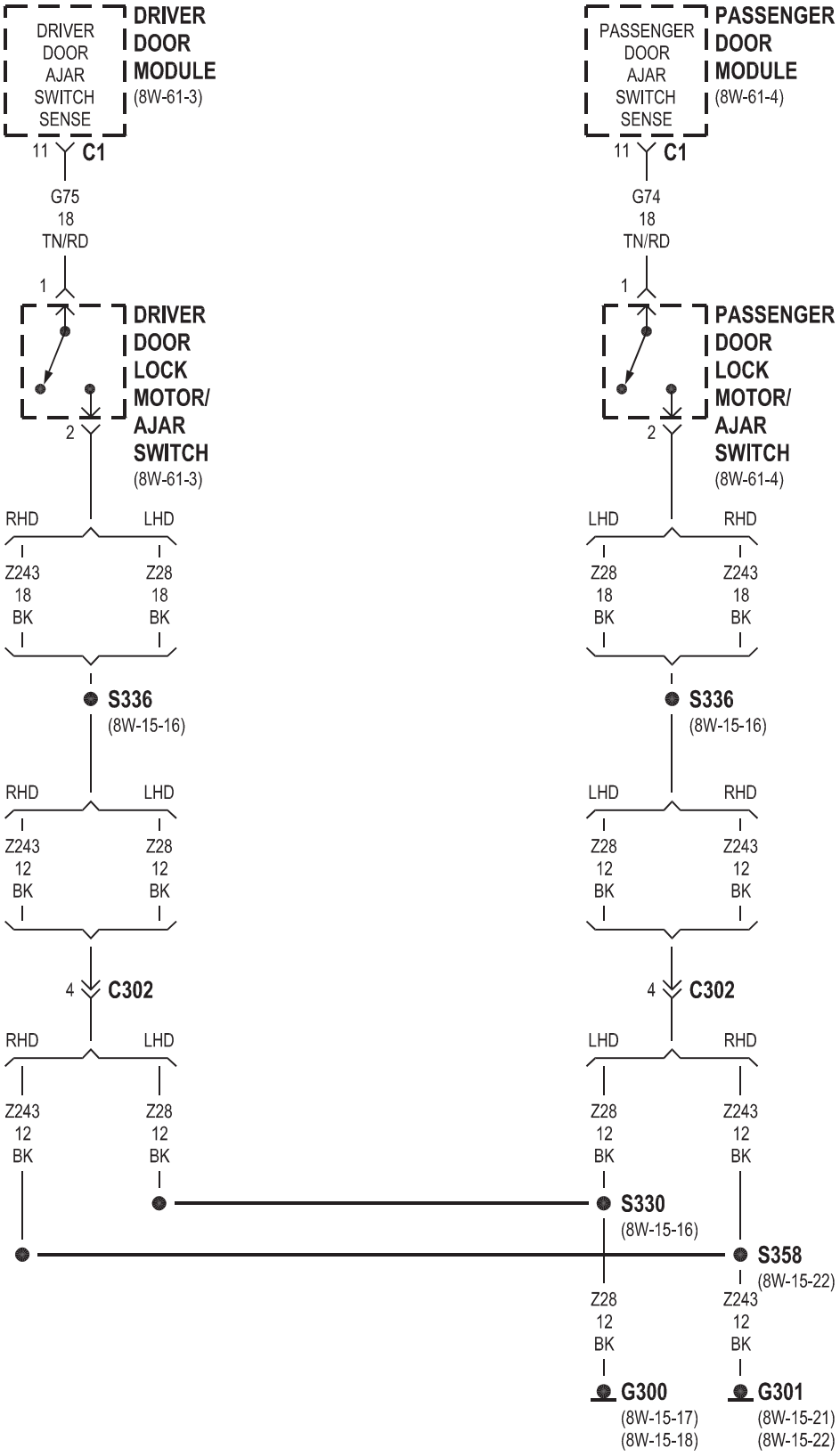

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
8
15A
(8W-12-16)
COURTESY LAMP LOAD SHED
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
19 JB
36 C1
26 C1
RHD
LHD
LHD
RHD
F70
18
PK
M20
18
YL/BK
F70
18
PK
2
4 C301
M20
20
YL/BK
M20
18
YL/BK
S304
(8W-12-16)
LHD
RHD
F70
20
PK
F70
18
PK
10
2 C309
F70
20
PK
S346
(8W-12-16)
F70
20
PK
1
1
M20
20
YL/BK
LEFT VISOR/ VANITY LAMP
RIGHT VISOR/ VANITY LAMP
2
2
M20
20
YL/BK
M20
20
YL/BK
S347
(8W-12-30)

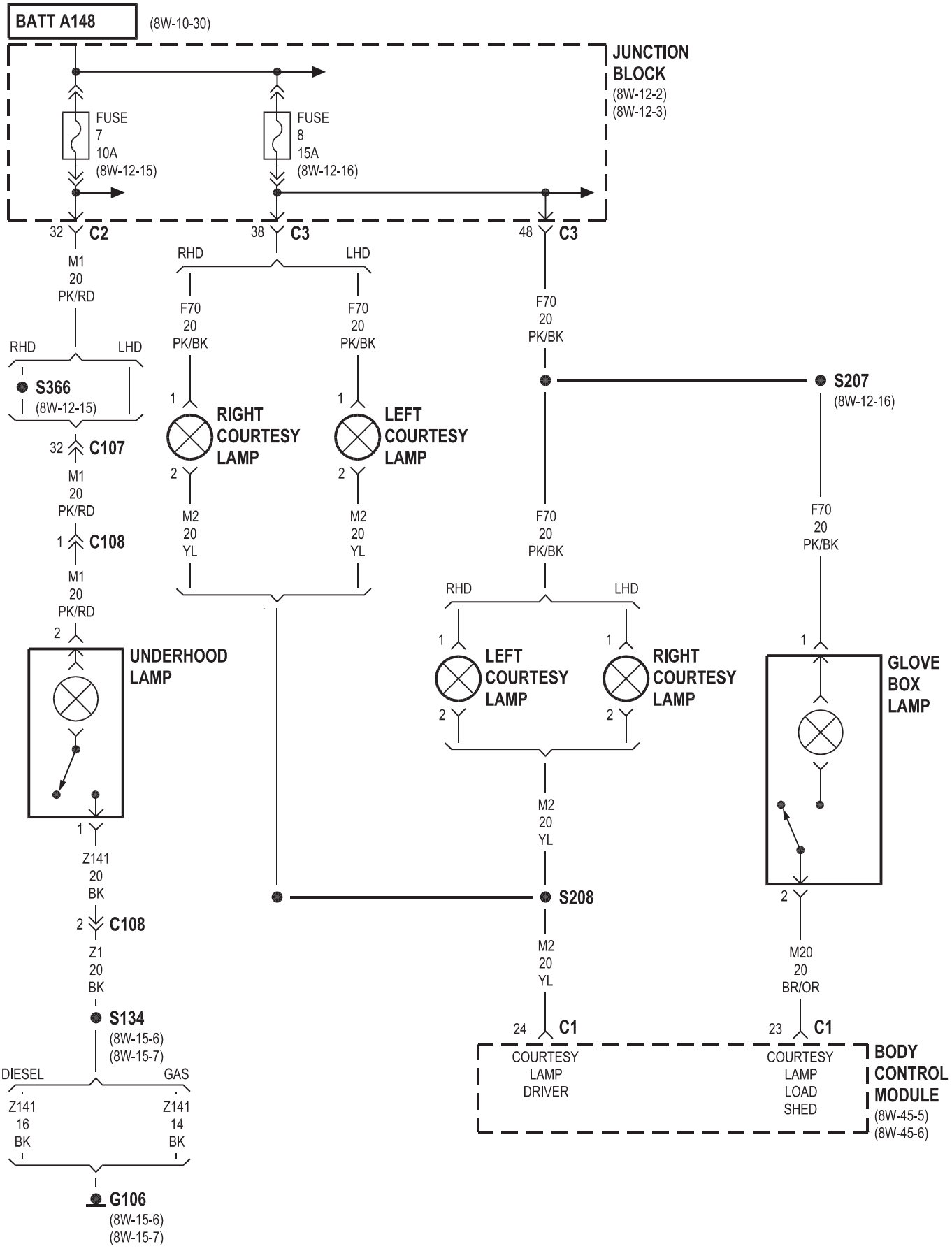

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 8 15A
(8W-12-16)
COURTESY LAMP DRIVER
COURTESY LAMP LOAD SHED
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
16 JB
19 JB
36 C1
16 C1
26 C1
LHD
RHD
F70 18 PK
2 C301
S304
(8W-12-16)
F70 20 PK
M2 20 YL/DG
M2 18 YL
M20 18 YL/BK
M20 20 YL/BK
3 C301
4 C301
10 C309
3 C309
2 C309
S346
(8W-12-16)
OVERHEAD MAP/ COURTESY LAMP
LEFT DOOR HANDLE COURTESY LAMP
RIGHT DOOR HANDLE COURTESY LAMP
S348
(8W-12-24)
S347
(8W-12-30)

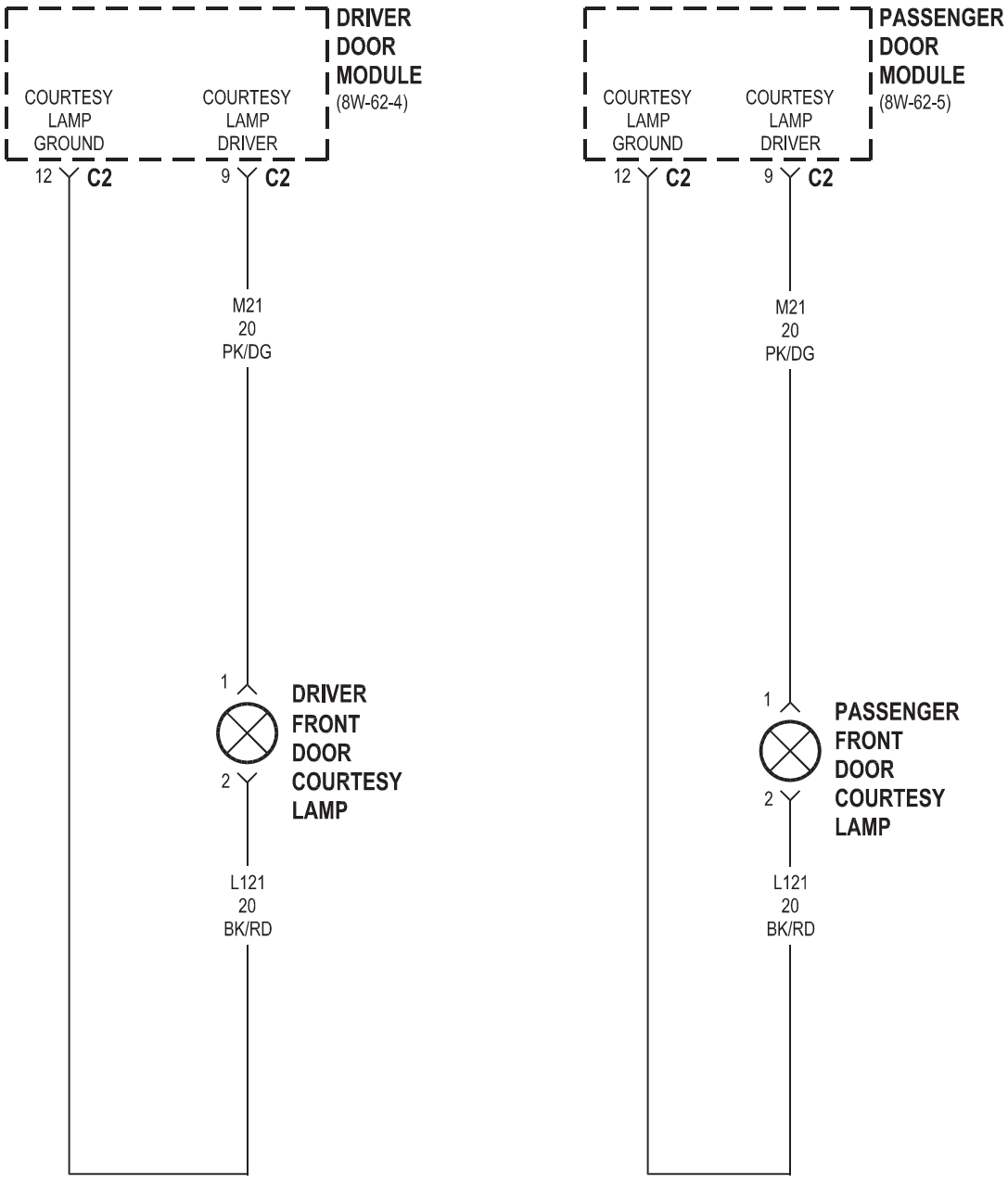

BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
8
15A
(8W-12-16)
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
LIFTGATE COURTESY DISABLE
COURTESY LAMP DRIVER
24 JB
16 JB
36 C1
9 C1
16 C1
LHD
RHD
F70
18
PK
G73
20
LG/OR
M2
18
YL
M2
20
YL/DG
2
44 C301
3 C301
S304
(8W-12-16)
F70
20
PK
10
15
3 C309
S346
(8W-12-16)
S348
(8W-12-24)
1
2
CARGO LAMP
3

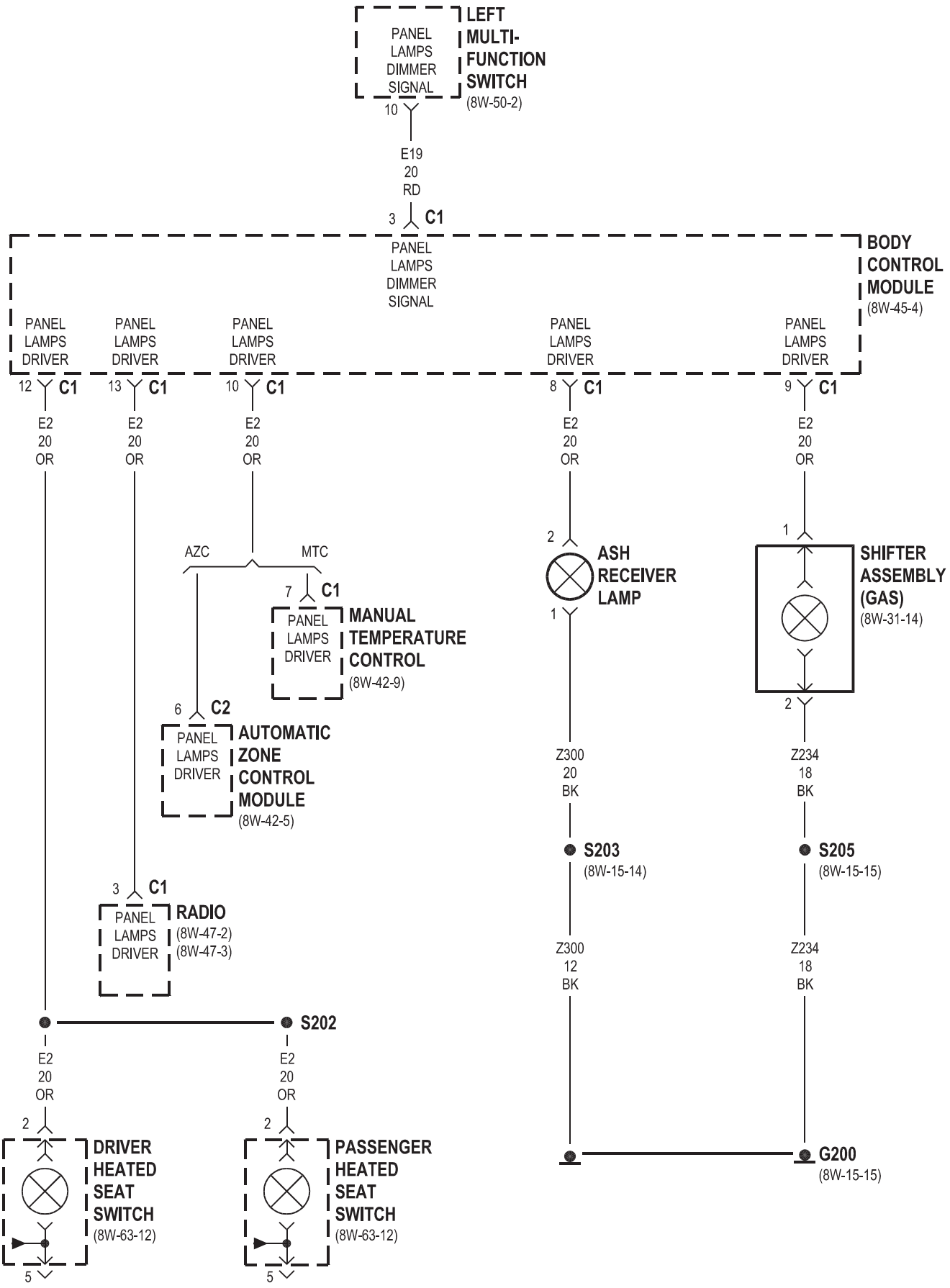

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
LIFTGATE AJAR SWITCH SENSE
LIFTGATE FLIP-UP AJAR SWITCH SENSE
BODY CONTROL MODULE
(8W-45-8)
21 JB
8 JB
25 C1
24 C1
G78 20 TN/BK
G80 20 VT/YL
LHD
RHD
RHD
LHD
34
11 C301
G78 20 TN/BK
G80 20 VT/YL
1
9 C308
G78 20 TN/BK
G80 18 VT/YL
S404
(8W-12-30)
S405
(8W-12-30)
G78 20 TN/BK
G78 20 TN/BK
G80 20 VT/YL
2
2
2
LEFT LIFTGATE AJAR SWITCH
(8W-61-12)
RIGHT LIFTGATE AJAR SWITCH
(8W-61-12)
LIFTGATE FLIP-UP AJAR SWITCH
(8W-61-12)
1
1
1
Z309 20 BK
Z309 20 BK
Z309 20 BK
S402
(8W-15-20)
Z309 12 BK
S401
(8W-15-20)
Z309 12 BK
8 C308
Z309 12 BK
G301
(8W-15-21)
(8W-15-22)


JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-7)
LEFT REAR DOOR AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
23 JB
10 C1
7 C1
G77 20 TN/OR
G76 18 TN/YL
31 C200
LHD
RHD
G76 20 TN/YL
38
39 C301
11 C307
11 C303
G77 18 TN/YL
G76 18 TN/YL
1
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
(8W-61-10)
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-8)
(8W-61-9)
2
Z243 18 BK
Z28 18 BK
S356
(8W-15-21)
(8W-15-22)
S357
(8W-15-16)
(8W-15-18)
Z243 16 BK
Z28 16 BK
10 C307
10 C303
Z151 16 BK
Z28 16 BK
S300
(8W-15-21)
S358
(8W-15-22)
S332
(8W-15-18)
S330
(8W-15-16)
Z243 12 BK
Z151 14 BK
Z28 12 BK
G301
(8W-15-21)
G301
(8W-15-22)
G300
(8W-15-18)
G300
(8W-15-17)


DRIVER DOOR AJAR SWITCH SENSE
DRIVER DOOR MODULE
(8W-61-3)
11
C1
G75
18
TN/RD
1
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-3)
2
RHD
LHD
Z243
18
BK
Z28
18
BK
S336
(8W-15-16)
RHD
LHD
Z243
12
BK
Z28
12
BK
4
C302
RHD
LHD
Z243
12
BK
Z28
12
BK
PASSENGER DOOR AJAR SWITCH SENSE
PASSENGER DOOR MODULE
(8W-61-4)
11
C1
G74
18
TN/RD
1
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-4)
2
LHD
RHD
Z28
18
BK
Z243
18
BK
S336
(8W-15-16)
LHD
RHD
Z28
12
BK
Z243
12
BK
4
C302
LHD
RHD
Z28
12
BK
Z243
12
BK
S330
(8W-15-16)
S358
(8W-15-22)
Z28
12
BK
Z243
12
BK
G300
(8W-15-17)
(8W-15-18)
G301
(8W-15-21)
(8W-15-22)


BATT A148
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 7 10A (8W-12-15)
FUSE 8 15A (8W-12-16)
32 C2
38 C3
48 C3
M1 20 PK/RD
RHD
LHD
F70 20 PK/BK
S366
(8W-12-15)
S207
(8W-12-16)
32 C107
RIGHT COURTESY LAMP
LEFT COURTESY LAMP
M2 20 YL
1 C108
UNDERHOOD LAMP
GLOVE BOX LAMP
Z141 20 BK
2 C108
Z1 20 BK
S134
(8W-15-6)
(8W-15-7)
S208
DIESEL
GAS
Z141 16 BK
Z141 14 BK
G106
(8W-15-6)
(8W-15-7)
M20 20 BR/OR
24 C1
23 C1
COURTESY LAMP DRIVER
COURTESY LAMP LOAD SHED
BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)


DRIVER DOOR MODULE
(8W-62-4)
COURTESY LAMP GROUND
COURTESY LAMP DRIVER
12 C2
9 C2
M21
20
PK/DG
1
2
DRIVER FRONT DOOR COURTESY LAMP
L121
20
BK/RD
PASSENGER DOOR MODULE
(8W-62-5)
COURTESY LAMP GROUND
COURTESY LAMP DRIVER
12 C2
9 C2
M21
20
PK/DG
1
2
PASSENGER FRONT DOOR COURTESY LAMP
L121
20
BK/RD

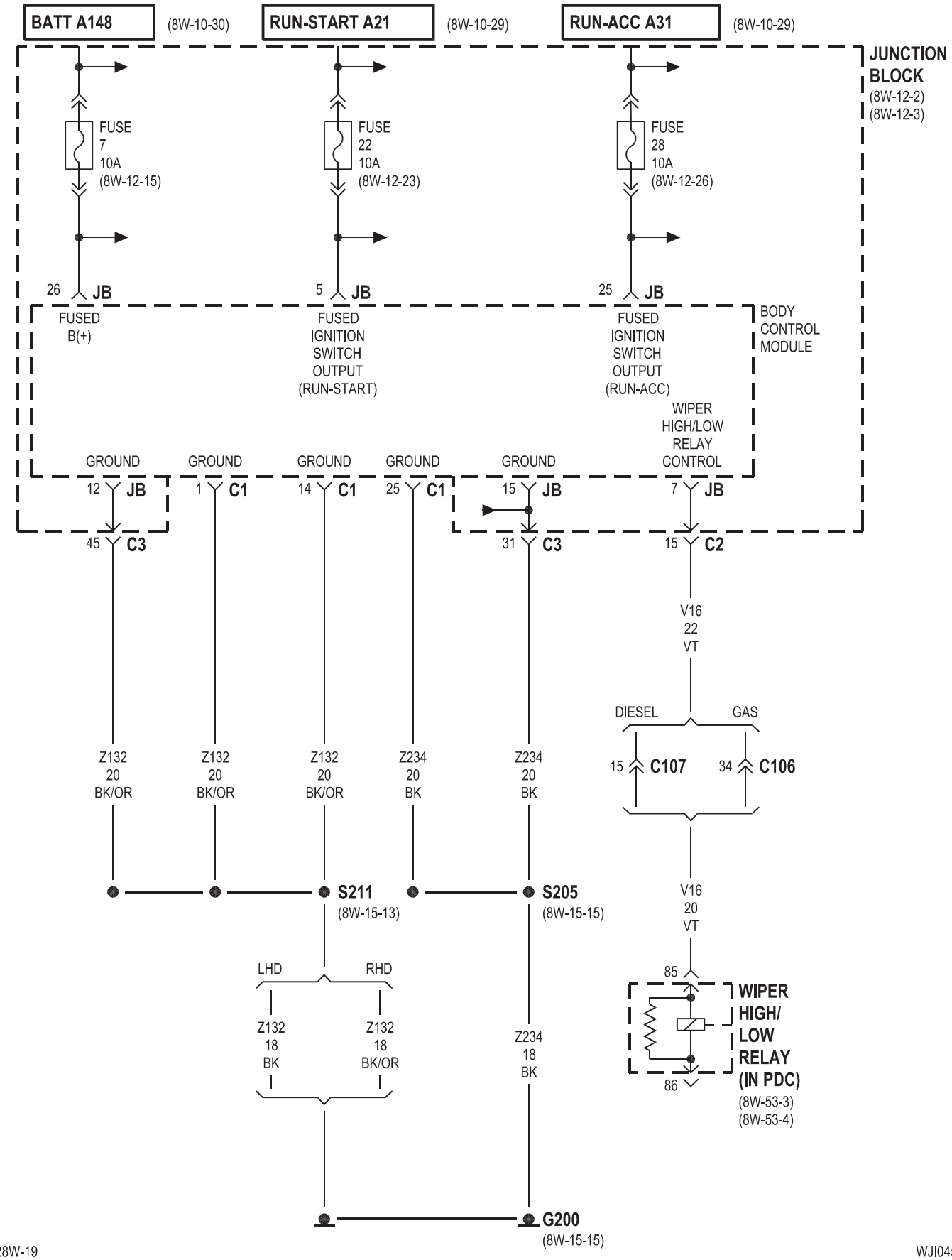


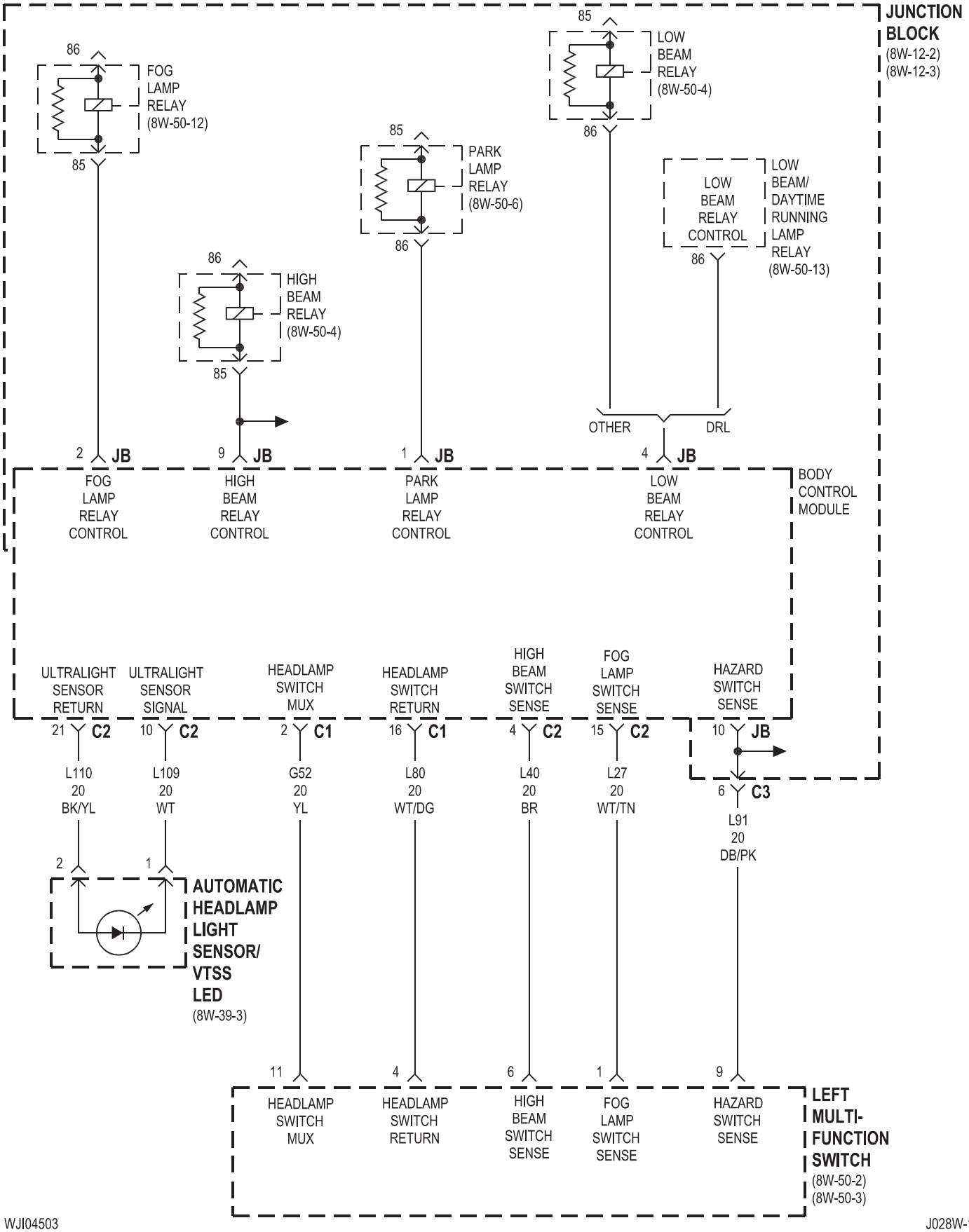
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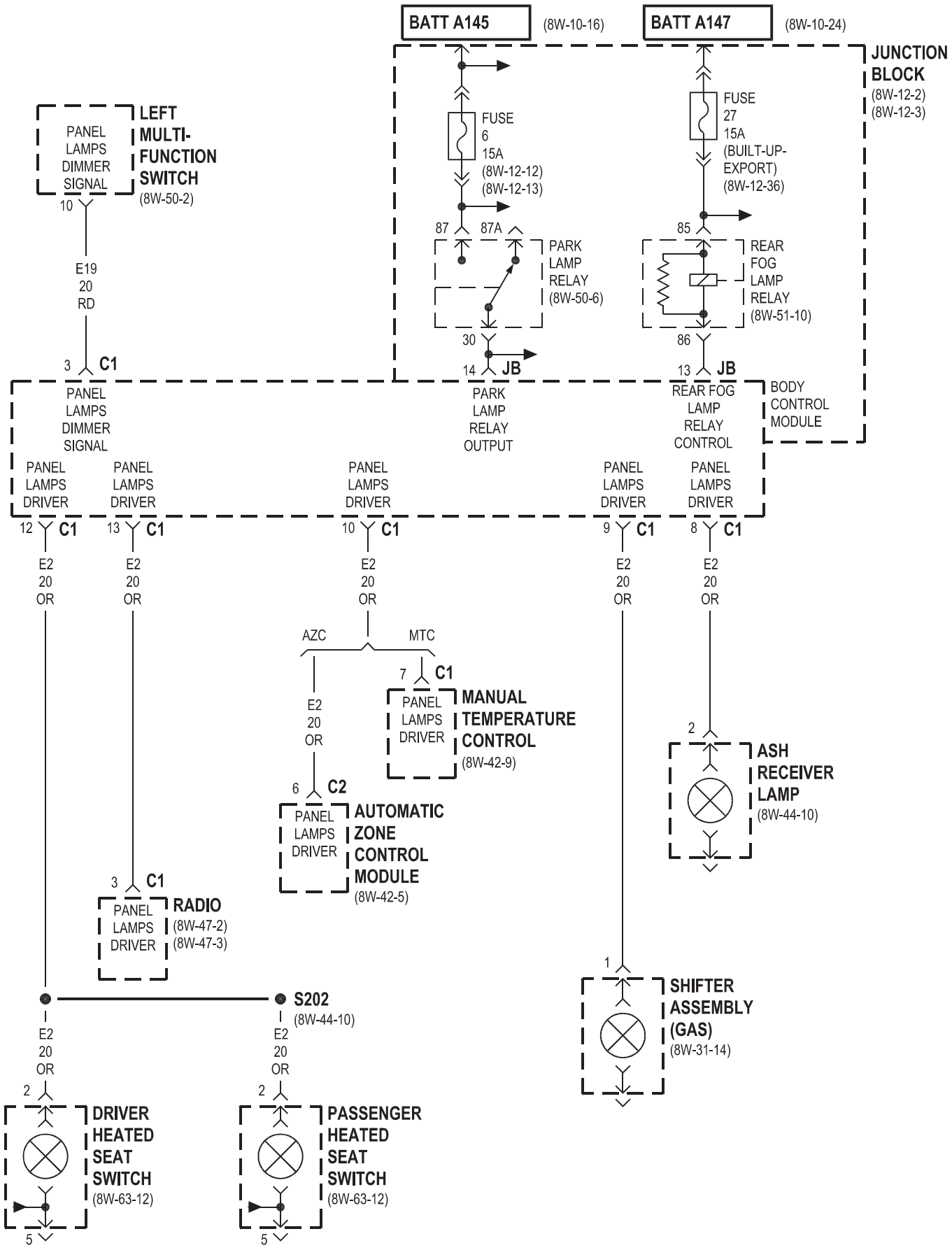
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8W-45 BODY CONTROL MODULE

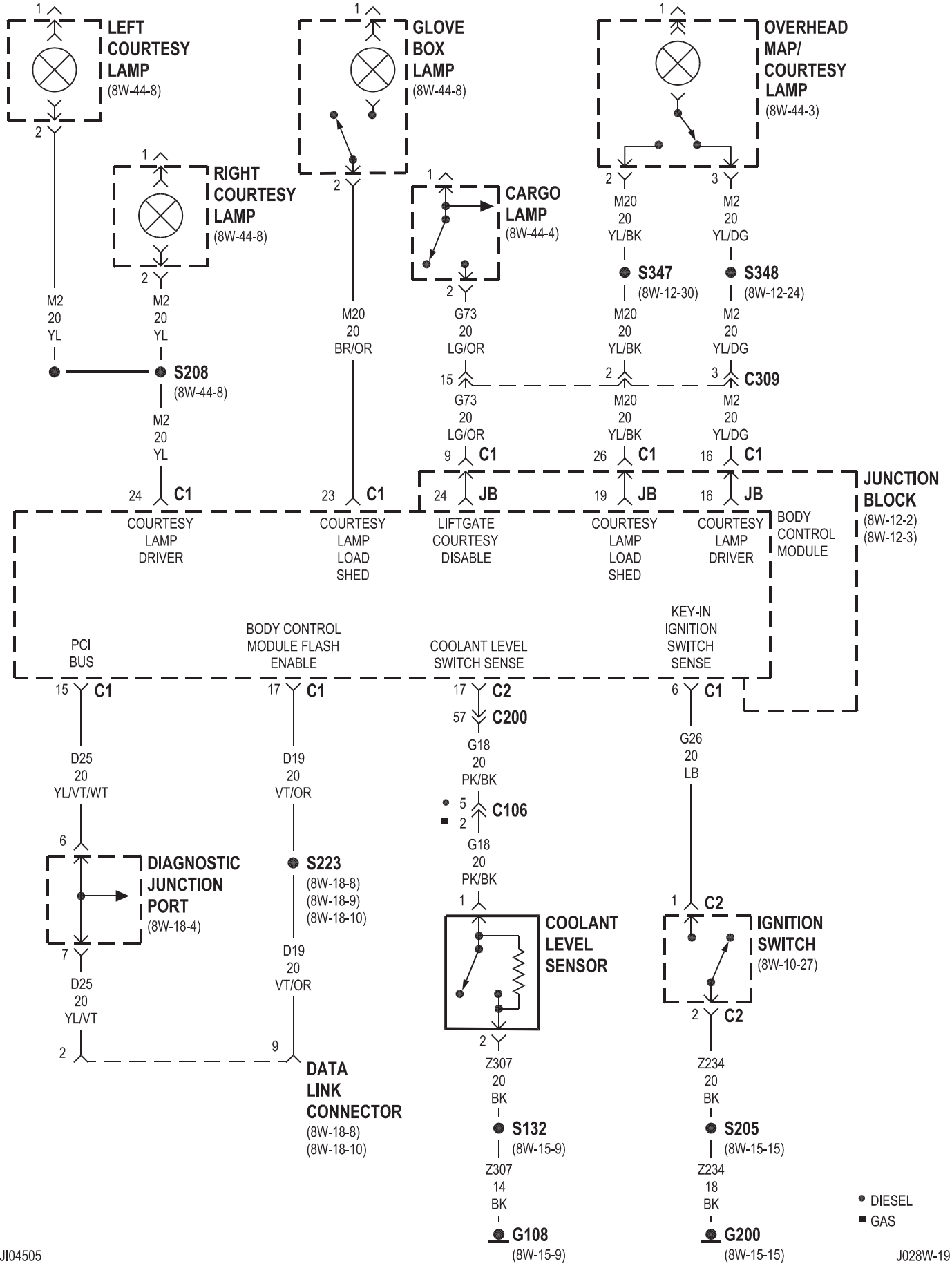
Component	Page
Accessory Delay Relay	8W-45-9
Ambient Temperature Sensor	8W-45-7
Ash Receiver Lamp	8W-45-4
Automatic Headlamp Light Sensor/VTSS LED	8W-45-3, 7
Automatic Zone Control Module	8W-45-4, 10
Body Control Module	8W-45-2, 3, 4, 5, 6, 7, 8, 9, 10
Cargo Lamp	8W-45-5, 6
Clockspring	8W-45-9
Coolant Level Sensor	8W-45-5, 6
Data Link Connector	8W-45-5, 6
Diagnostic Junction Port	8W-45-5, 6
Driver Heated Seat Switch	8W-45-4, 10
Fog Lamp Relay	8W-45-3
Front Washer Pump	8W-45-8
Front Wiper Motor	8W-45-8
Fuse 6	8W-45-4
Fuse 7	8W-45-2
Fuse 22	8W-45-2
Fuse 25	8W-45-9
Fuse 27	8W-45-4
Fuse 28	8W-45-2
G108	8W-45-5, 6
G200	8W-45-2, 5, 6
Glove Box Lamp	8W-45-5, 6
High Beam Relay	8W-45-3
Hood Ajar Switch	8W-45-7
Horn Relay	8W-45-7
Ignition Switch	8W-45-5, 6
Junction Block	8W-45-2, 3, 4, 5, 6, 7, 8, 9
Left Courtesy Lamp	8W-45-5, 6
Left Liftgate Ajar Switch	8W-45-8
Left Multi-Function Switch	8W-45-3, 4
Left Rear Door Lock Motor/Ajar Switch	8W-45-7
Left Remote Radio Switch	8W-45-9
Liftgate Flip-Up Ajar Switch	8W-45-8
Low Beam Relay	8W-45-3
Low Beam/Daytime Running Lamp Relay	8W-45-3
Manual Temperature Control	8W-45-4, 10
Overhead Map/Courtesy Lamp	8W-45-5, 6
Park Lamp Relay	8W-45-3, 4
Passenger Heated Seat Switch	8W-45-4, 10
Radio	8W-45-4
Rear Window Defogger Relay	8W-45-4, 9
Rear Wiper Motor	8W-45-8
Right Courtesy Lamp	8W-45-5, 6
Right Liftgate Ajar Switch	8W-45-8
Right Multi-Function Switch	8W-45-8
Right Rear Door Lock Motor/Ajar Switch	8W-45-7
Right Remote Radio Switch	8W-45-9
Shifter Assembly	8W-45-4
Washer Fluid Level Switch	8W-45-8
Wiper High/Low Relay	8W-45-2
Wiper On/Off Relay	8W-45-8

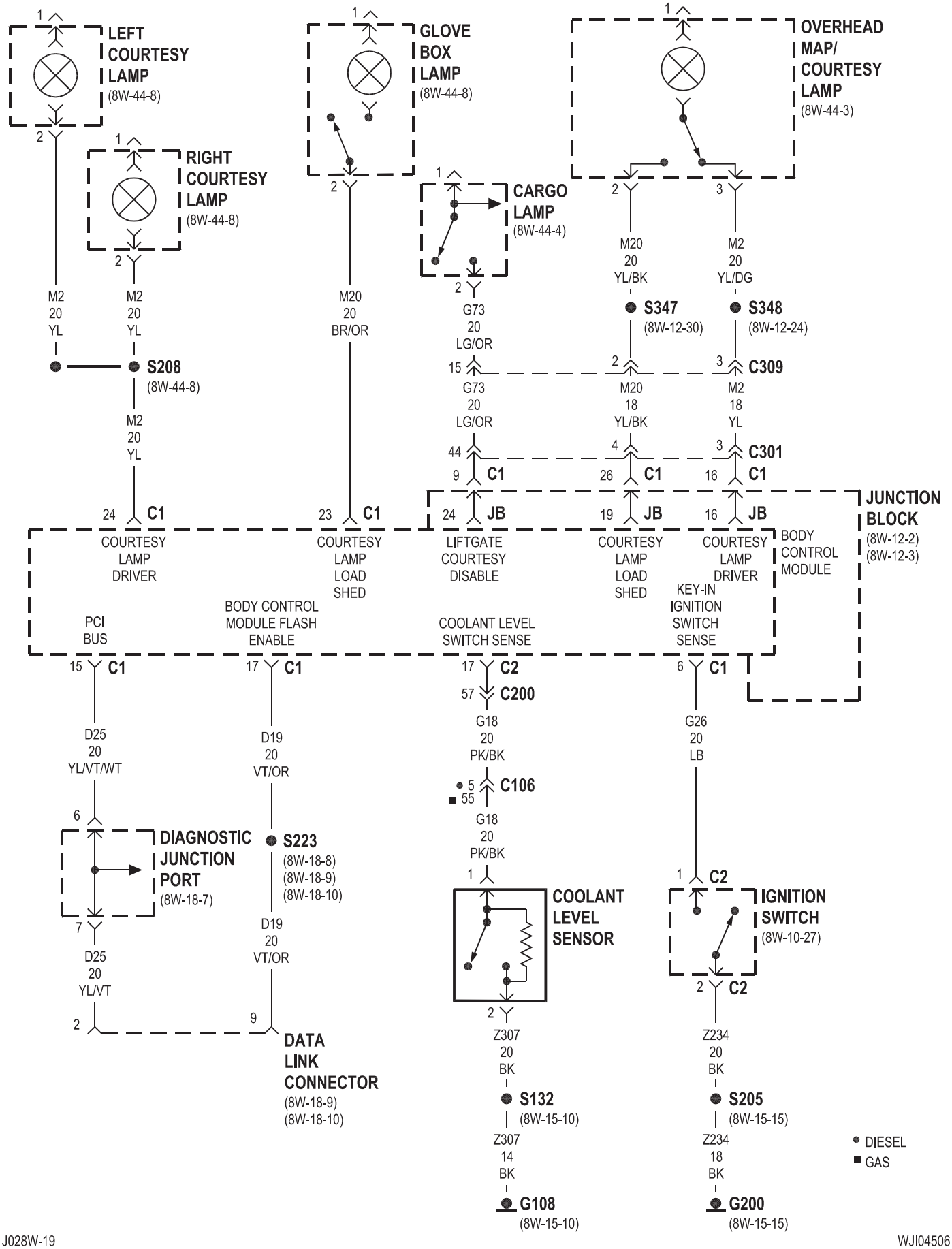

BATT A148
(8W-10-30)
RUN-START A21
(8W-10-29)
RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 7 10A (8W-12-15)
FUSE 22 10A (8W-12-23)
FUSE 28 10A (8W-12-26)
26 JB
5 JB
25 JB
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
BODY CONTROL MODULE
WIPER HIGH/LOW RELAY CONTROL
GROUND
12 JB
45 C3
1 C1
14 C1
25 C1
15 JB
31 C3
7 JB
15 C2
V16 22 VT
DIESEL
GAS
15 C107
34 C106
Z132 20 BK/OR
Z132 20 BK/OR
Z132 20 BK/OR
Z234 20 BK
Z234 20 BK
S211
(8W-15-13)
S205
(8W-15-15)
V16 20 VT
LHD
RHD
Z132 18 BK
Z132 18 BK/OR
Z234 18 BK
85
86
WIPER HIGH/ LOW RELAY (IN PDC)
(8W-53-3)
(8W-53-4)
G200
(8W-15-15)

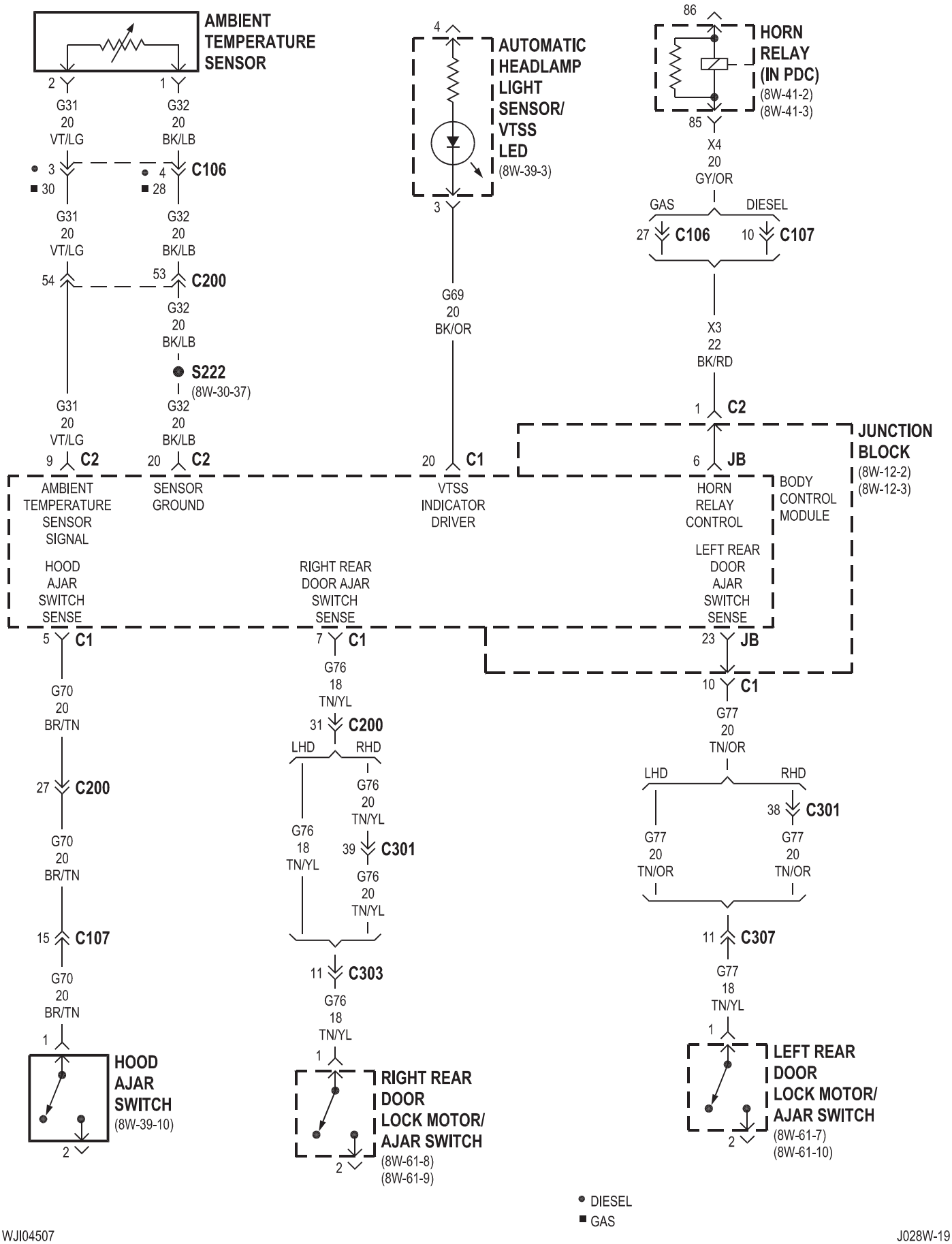

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
FOG LAMP RELAY
(8W-50-12)
85
2 JB
FOG LAMP RELAY CONTROL
86
HIGH BEAM RELAY
(8W-50-4)
85
9 JB
HIGH BEAM RELAY CONTROL
85
PARK LAMP RELAY
(8W-50-6)
86
1 JB
PARK LAMP RELAY CONTROL
85
LOW BEAM RELAY
(8W-50-4)
86
LOW BEAM RELAY CONTROL
86
LOW BEAM/ DAYTIME RUNNING LAMP RELAY
(8W-50-13)
OTHER
DRL
4 JB
LOW BEAM RELAY CONTROL
BODY CONTROL MODULE
ULTRALIGHT SENSOR RETURN
21 C2
L110
20
BK/YL
2
ULTRALIGHT SENSOR SIGNAL
10 C2
L109
20
WT
1
AUTOMATIC HEADLAMP LIGHT SENSOR/ VTSS LED
(8W-39-3)
HEADLAMP SWITCH MUX
2 C1
G52
20
YL
11
HEADLAMP SWITCH MUX
HEADLAMP SWITCH RETURN
16 C1
L80
20
WT/DG
4
HEADLAMP SWITCH RETURN
HIGH BEAM SWITCH SENSE
4 C2
L40
20
BR
6
HIGH BEAM SWITCH SENSE
FOG LAMP SWITCH SENSE
15 C2
L27
20
WT/TN
1
FOG LAMP SWITCH SENSE
HAZARD SWITCH SENSE
10 JB
6 C3
L91
20
DB/PK
9
HAZARD SWITCH SENSE
LEFT MULTI-FUNCTION SWITCH
(8W-50-2)
(8W-50-3)

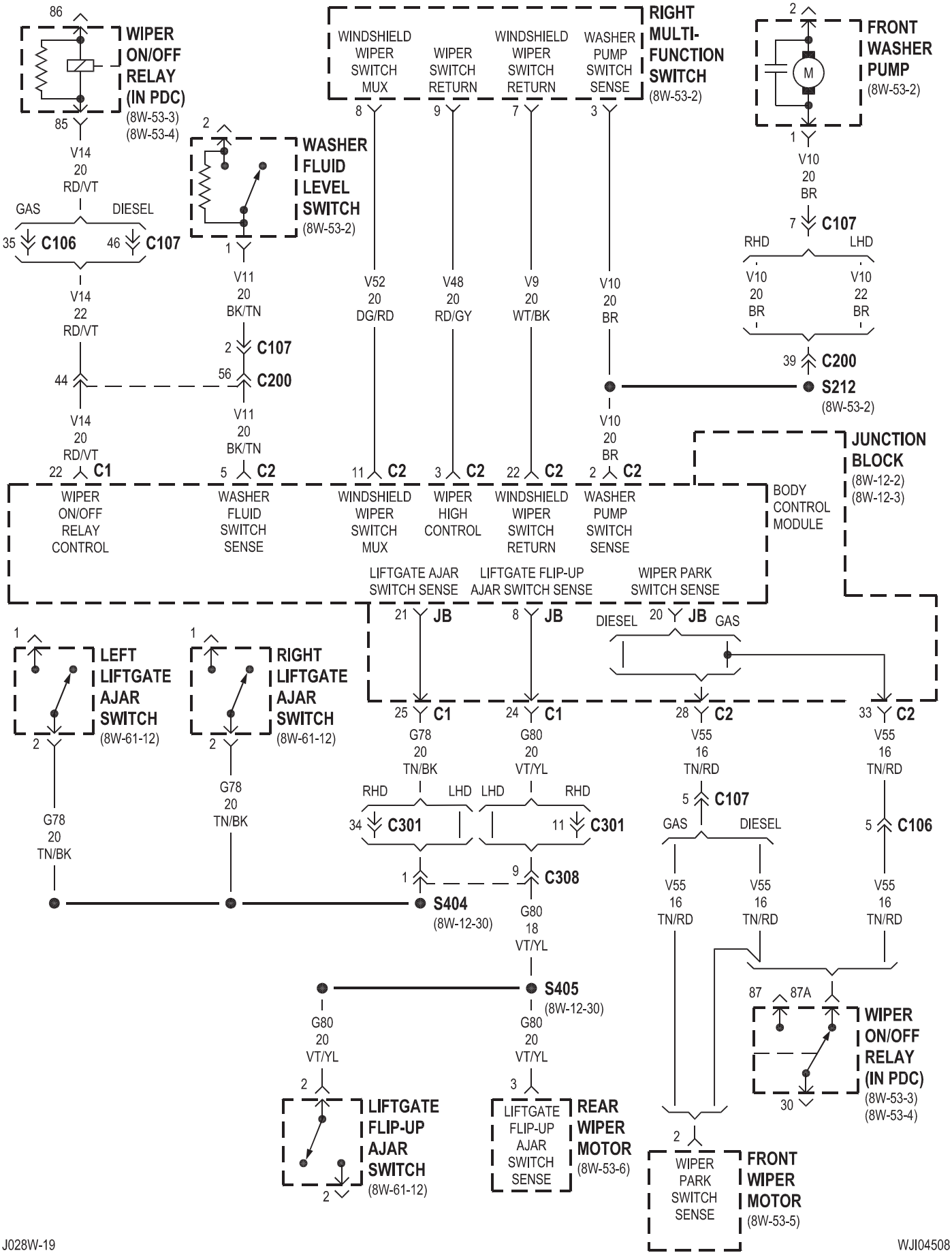

BATT A145
(8W-10-16)
BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 6 15A
(8W-12-12)
(8W-12-13)
FUSE 27 15A
(BUILT-UP-EXPORT)
(8W-12-36)
87
87A
85
PARK LAMP RELAY
(8W-50-6)
REAR FOG LAMP RELAY
(8W-51-10)
30
86
14 JB
13 JB
PARK LAMP RELAY OUTPUT
REAR FOG LAMP RELAY CONTROL
BODY CONTROL MODULE
PANEL LAMPS DIMMER SIGNAL
LEFT MULTI-FUNCTION SWITCH
(8W-50-2)
10
E19
20
RD
3 C1
PANEL LAMPS DIMMER SIGNAL
PANEL LAMPS DRIVER
12 C1
13 C1
10 C1
9 C1
8 C1
E2
20
OR
AZC
MTC
7 C1
MANUAL TEMPERATURE CONTROL
(8W-42-9)
6 C2
AUTOMATIC ZONE CONTROL MODULE
(8W-42-5)
2
ASH RECEIVER LAMP
(8W-44-10)
3 C1
RADIO
(8W-47-2)
(8W-47-3)
1
SHIFTER ASSEMBLY (GAS)
(8W-31-14)
S202
(8W-44-10)
DRIVER HEATED SEAT SWITCH
(8W-63-12)
PASSENGER HEATED SEAT SWITCH
(8W-63-12)
5

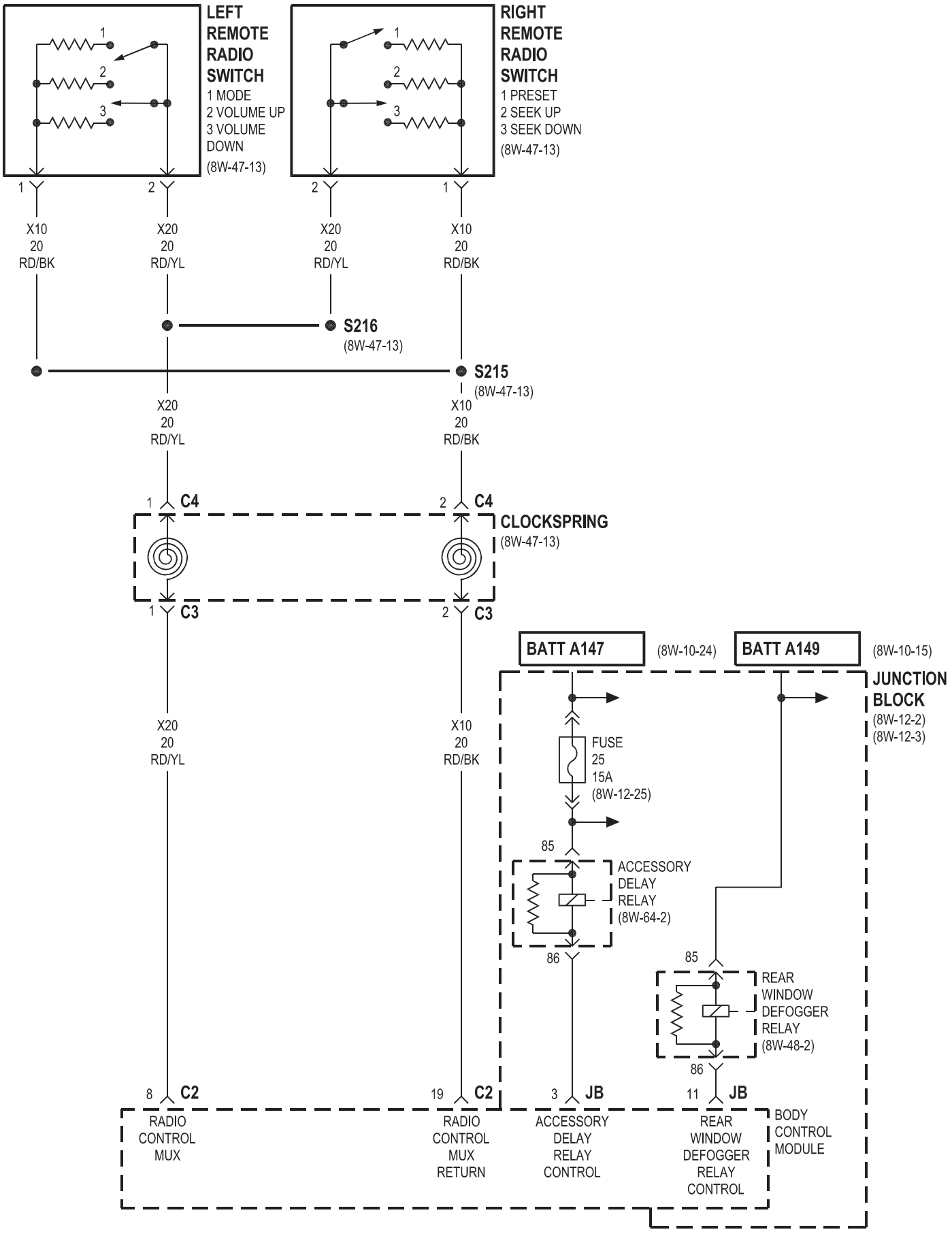
LHD

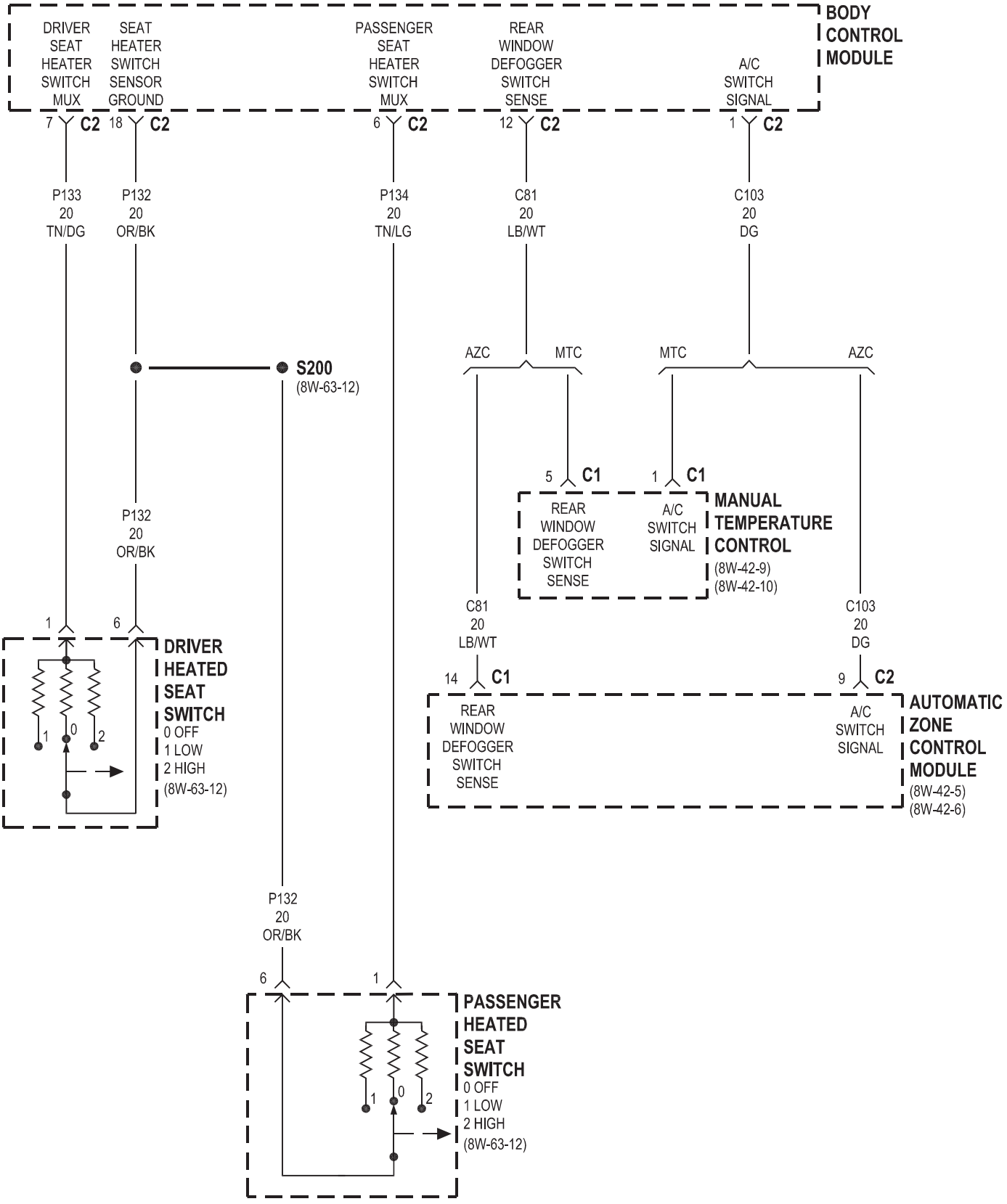

LEFT COURTESY LAMP (8W-44-8)
RIGHT COURTESY LAMP (8W-44-8)
GLOVE BOX LAMP (8W-44-8)
CARGO LAMP (8W-44-4)
OVERHEAD MAP/ COURTESY LAMP (8W-44-3)
M2 20 YL
M2 20 YL
S208 (8W-44-8)
M20 20 BR/OR
G73 20 LG/OR
M20 20 YL/BK
M2 20 YL/DG
S347 (8W-12-30)
S348 (8W-12-24)
C309
JUNCTION BLOCK (8W-12-2) (8W-12-3)
C1
JB
COURTESY LAMP DRIVER
COURTESY LAMP LOAD SHED
LIFTGATE COURTESY DISABLE
BODY CONTROL MODULE
PCI BUS
BODY CONTROL MODULE FLASH ENABLE
COOLANT LEVEL SWITCH SENSE
KEY-IN IGNITION SWITCH SENSE
C2
C200
C106
D25 20 YL/VT/WT
D19 20 VT/OR
G18 20 PK/BK
G26 20 LB
DIAGNOSTIC JUNCTION PORT (8W-18-4)
S223 (8W-18-8) (8W-18-9) (8W-18-10)
D25 20 YL/VT
DATA LINK CONNECTOR (8W-18-8) (8W-18-10)
COOLANT LEVEL SENSOR
IGNITION SWITCH (8W-10-27)
Z307 20 BK
Z234 20 BK
S132 (8W-15-9)
S205 (8W-15-15)
Z307 14 BK
Z234 18 BK
G108 (8W-15-9)
G200 (8W-15-15)
DIESEL
GAS


LEFT COURTESY LAMP (8W-44-8)
RIGHT COURTESY LAMP (8W-44-8)
GLOVE BOX LAMP (8W-44-8)
CARGO LAMP (8W-44-4)
OVERHEAD MAP/ COURTESY LAMP (8W-44-3)
M2 20 YL
M2 20 YL
S208 (8W-44-8)
M20 20 BR/OR
G73 20 LG/OR
M20 20 YL/BK
M2 20 YL/DG
S347 (8W-12-30)
S348 (8W-12-24)
C309
G73 20 LG/OR
M20 18 YL/BK
M2 18 YL
C301
JUNCTION BLOCK (8W-12-2) (8W-12-3)
BODY CONTROL MODULE
COURTESY LAMP DRIVER
COURTESY LAMP LOAD SHED
LIFTGATE COURTESY DISABLE
COURTESY LAMP LOAD SHED
COURTESY LAMP DRIVER
KEY-IN IGNITION SWITCH SENSE
PCI BUS
BODY CONTROL MODULE FLASH ENABLE
COOLANT LEVEL SWITCH SENSE
D25 20 YL/VT/WT
D19 20 VT/OR
G18 20 PK/BK
G26 20 LB
C106
DIAGNOSTIC JUNCTION PORT (8W-18-7)
S223 (8W-18-8) (8W-18-9) (8W-18-10)
D25 20 YL/VT
D19 20 VT/OR
DATA LINK CONNECTOR (8W-18-9) (8W-18-10)
COOLANT LEVEL SENSOR
IGNITION SWITCH (8W-10-27)
Z307 20 BK
Z234 20 BK
S132 (8W-15-10)
S205 (8W-15-15)
Z307 14 BK
Z234 18 BK
G108 (8W-15-10)
G200 (8W-15-15)
DIESEL
GAS


AMBIENT TEMPERATURE SENSOR
2
1
G31
20
VT/LG
G32
20
BK/LB
3
30
4
28
C106
G31
20
VT/LG
G32
20
BK/LB
54
53
C200
G32
20
BK/LB
S222
(8W-30-37)
G31
20
VT/LG
G32
20
BK/LB
9
C2
20
C2
AMBIENT TEMPERATURE SENSOR SIGNAL
SENSOR GROUND
4
AUTOMATIC HEADLAMP LIGHT SENSOR/ VTSS LED
(8W-39-3)
3
G69
20
BK/OR
20
C1
VTSS INDICATOR DRIVER
86
HORN RELAY (IN PDC)
(8W-41-2)
(8W-41-3)
85
X4
20
GY/OR
GAS
DIESEL
27
C106
10
C107
X3
22
BK/RD
1
C2
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
6
JB
HORN RELAY CONTROL
BODY CONTROL MODULE
LEFT REAR DOOR AJAR SWITCH SENSE
HOOD AJAR SWITCH SENSE
RIGHT REAR DOOR AJAR SWITCH SENSE
5
C1
7
C1
23
JB
10
C1
G70
20
BR/TN
G76
18
TN/YL
G77
20
TN/OR
27
C200
31
C200
LHD
RHD
LHD
RHD
38
C301
G70
20
BR/TN
G76
18
TN/YL
G76
20
TN/YL
G77
20
TN/OR
G77
20
TN/OR
39
C301
G76
20
TN/YL
15
C107
11
C303
11
C307
G70
20
BR/TN
G76
18
TN/YL
G77
18
TN/YL
1
1
1
HOOD AJAR SWITCH
(8W-39-10)
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-8)
(8W-61-9)
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
(8W-61-10)
2
2
2
DIESEL
GAS

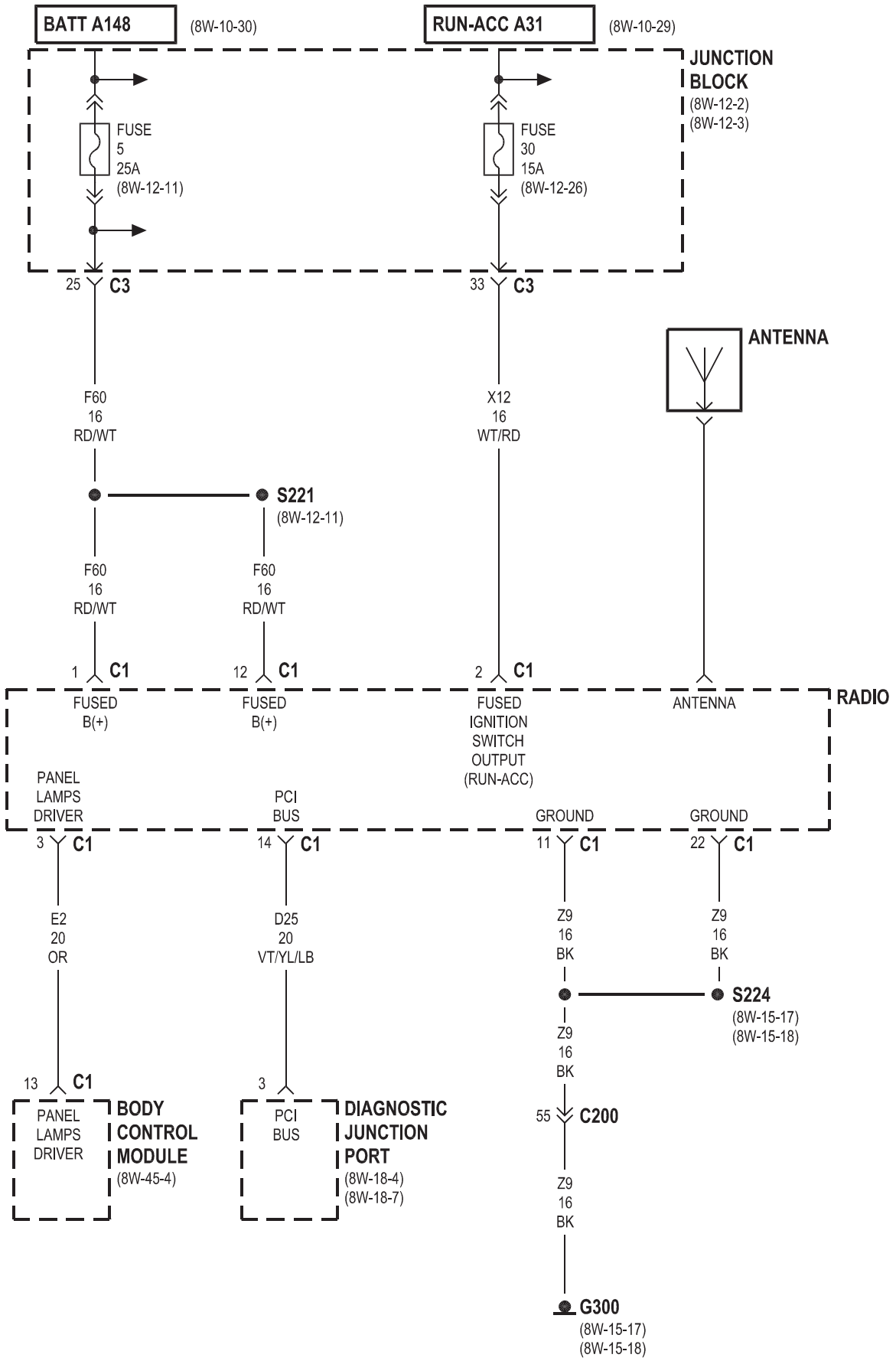

WIPER ON/OFF RELAY (IN PDC) (8W-53-3) (8W-53-4)
WASHER FLUID LEVEL SWITCH (8W-53-2)
RIGHT MULTI-FUNCTION SWITCH (8W-53-2)
WINDSHIELD WIPER SWITCH MUX
WIPER SWITCH RETURN
WINDSHIELD WIPER SWITCH RETURN
WASHER PUMP SWITCH SENSE
FRONT WASHER PUMP (8W-53-2)
GAS
DIESEL
RHD
LHD
C106
C107
C200
S212 (8W-53-2)
JUNCTION BLOCK (8W-12-2) (8W-12-3)
BODY CONTROL MODULE
WIPER ON/OFF RELAY CONTROL
WASHER FLUID SWITCH SENSE
WINDSHIELD WIPER SWITCH MUX
WIPER HIGH CONTROL
WINDSHIELD WIPER SWITCH RETURN
WASHER PUMP SWITCH SENSE
LIFTGATE AJAR SWITCH SENSE
LIFTGATE FLIP-UP AJAR SWITCH SENSE
WIPER PARK SWITCH SENSE
JB
LEFT LIFTGATE AJAR SWITCH (8W-61-12)
RIGHT LIFTGATE AJAR SWITCH (8W-61-12)
C301
S404 (8W-12-30)
C308
S405 (8W-12-30)
LIFTGATE FLIP-UP AJAR SWITCH (8W-61-12)
LIFTGATE FLIP-UP AJAR SWITCH SENSE
REAR WIPER MOTOR (8W-53-6)
WIPER PARK SWITCH SENSE
FRONT WIPER MOTOR (8W-53-5)
WIPER ON/OFF RELAY (IN PDC) (8W-53-3) (8W-53-4)


LEFT REMOTE RADIO SWITCH
1 MODE
2 VOLUME UP
3 VOLUME DOWN
(8W-47-13)
RIGHT REMOTE RADIO SWITCH
1 PRESET
2 SEEK UP
3 SEEK DOWN
(8W-47-13)
X10 20 RD/BK
X20 20 RD/YL
S216
(8W-47-13)
S215
(8W-47-13)
C4
CLOCKSPRING
(8W-47-13)
C3
BATT A147
(8W-10-24)
BATT A149
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 25 15A
(8W-12-25)
ACCESSORY DELAY RELAY
(8W-64-2)
REAR WINDOW DEFOGGER RELAY
(8W-48-2)
C2
JB
RADIO CONTROL MUX
RADIO CONTROL MUX RETURN
ACCESSORY DELAY RELAY CONTROL
REAR WINDOW DEFOGGER RELAY CONTROL
BODY CONTROL MODULE

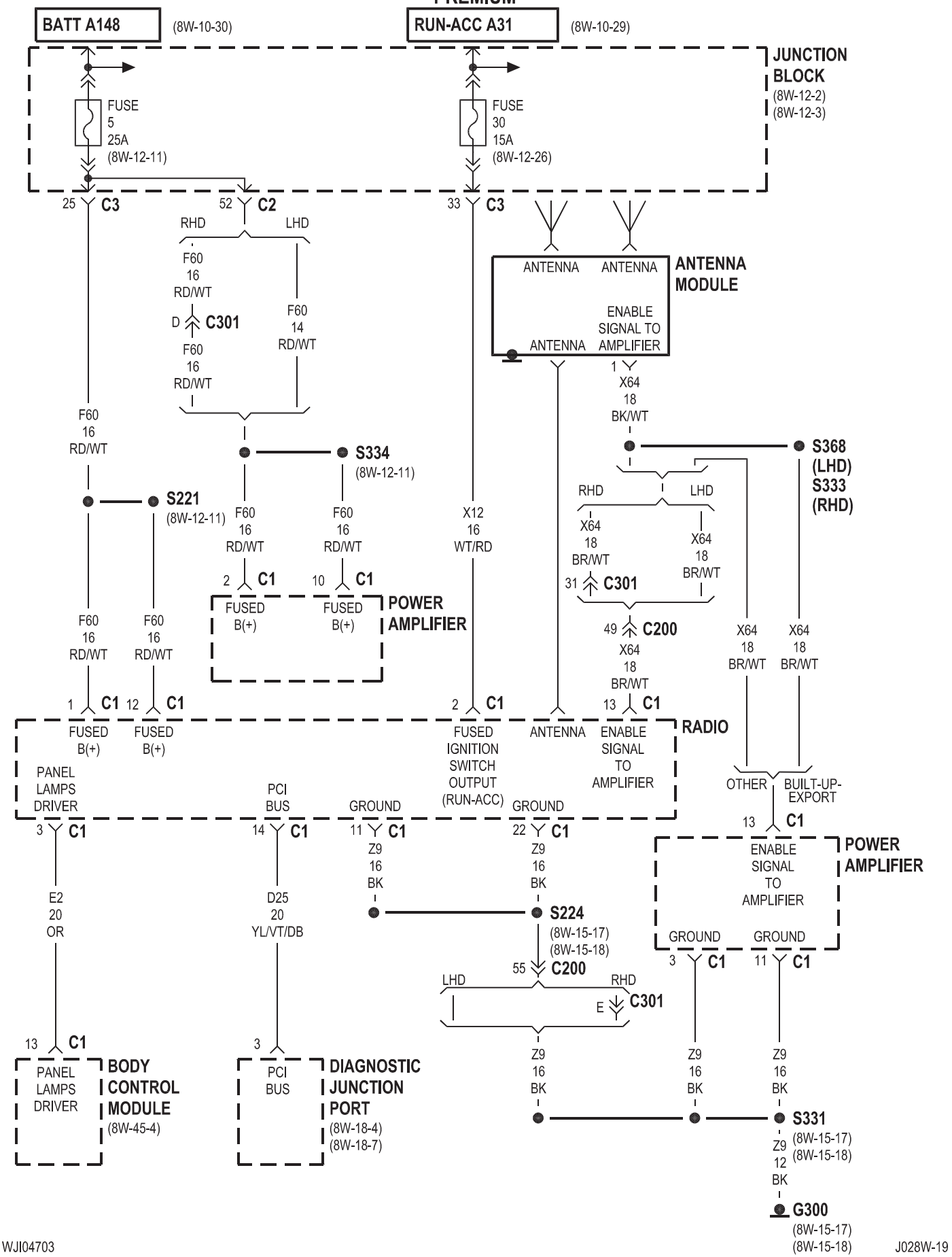

BODY CONTROL MODULE
DRIVER SEAT HEATER SWITCH MUX
SEAT HEATER SWITCH SENSOR GROUND
PASSENGER SEAT HEATER SWITCH MUX
REAR WINDOW DEFOGGER SWITCH SENSE
A/C SWITCH SIGNAL
7 C2
18 C2
6 C2
12 C2
1 C2
P133 20 TN/DG
P132 20 OR/BK
P134 20 TN/LG
C81 20 LB/WT
C103 20 DG
S200 (8W-63-12)
AZC
MTC
MTC
AZC
5 C1
1 C1
REAR WINDOW DEFOGGER SWITCH SENSE
A/C SWITCH SIGNAL
MANUAL TEMPERATURE CONTROL
(8W-42-9)
(8W-42-10)
P132 20 OR/BK
C81 20 LB/WT
C103 20 DG
1
6
14 C1
9 C2
DRIVER HEATED SEAT SWITCH
0 OFF
1 LOW
2 HIGH
(8W-63-12)
REAR WINDOW DEFOGGER SWITCH SENSE
A/C SWITCH SIGNAL
AUTOMATIC ZONE CONTROL MODULE
(8W-42-5)
(8W-42-6)
P132 20 OR/BK
6
1
PASSENGER HEATED SEAT SWITCH
0 OFF
1 LOW
2 HIGH
(8W-63-12)

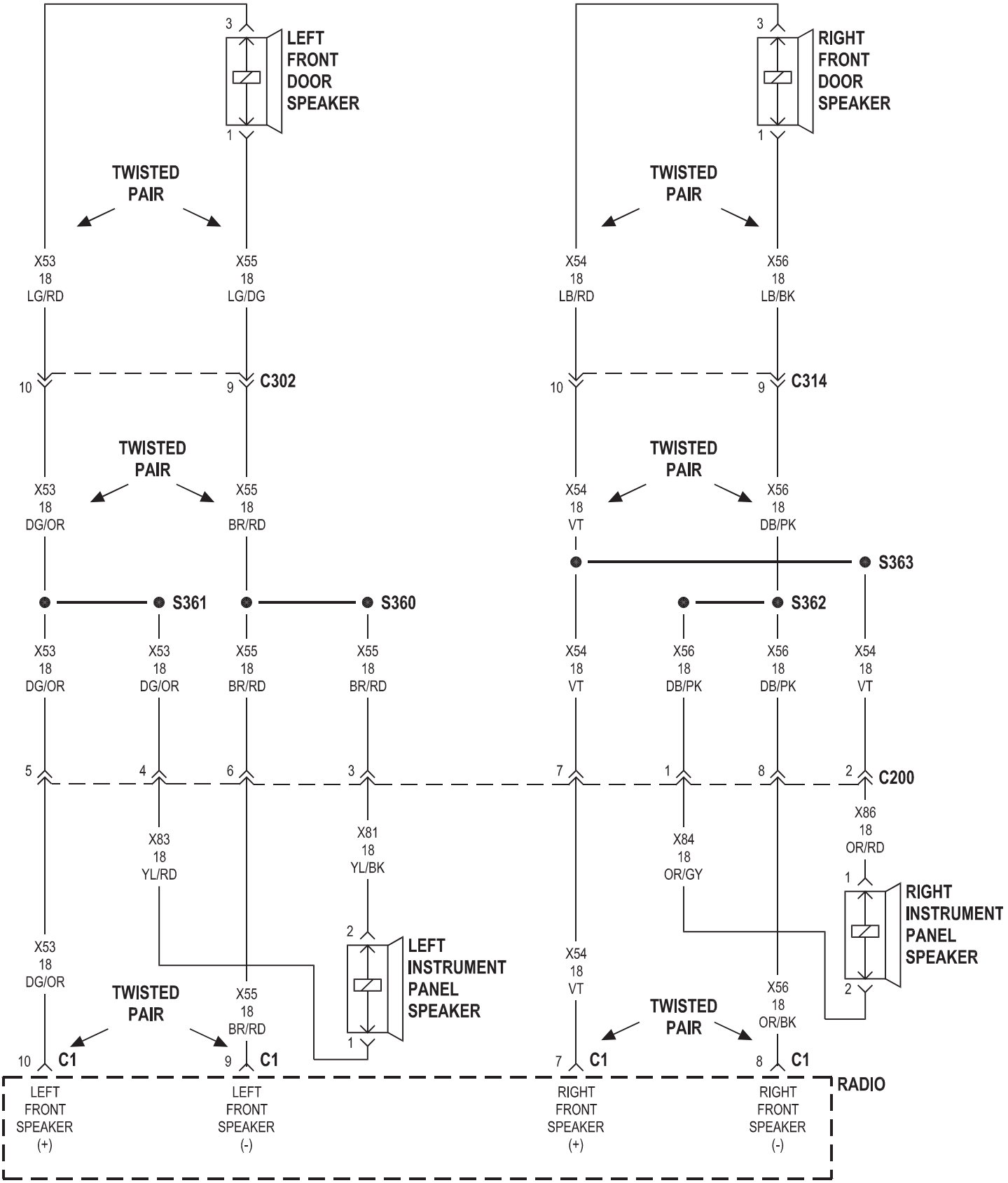
8W-47 AUDIO SYSTEM

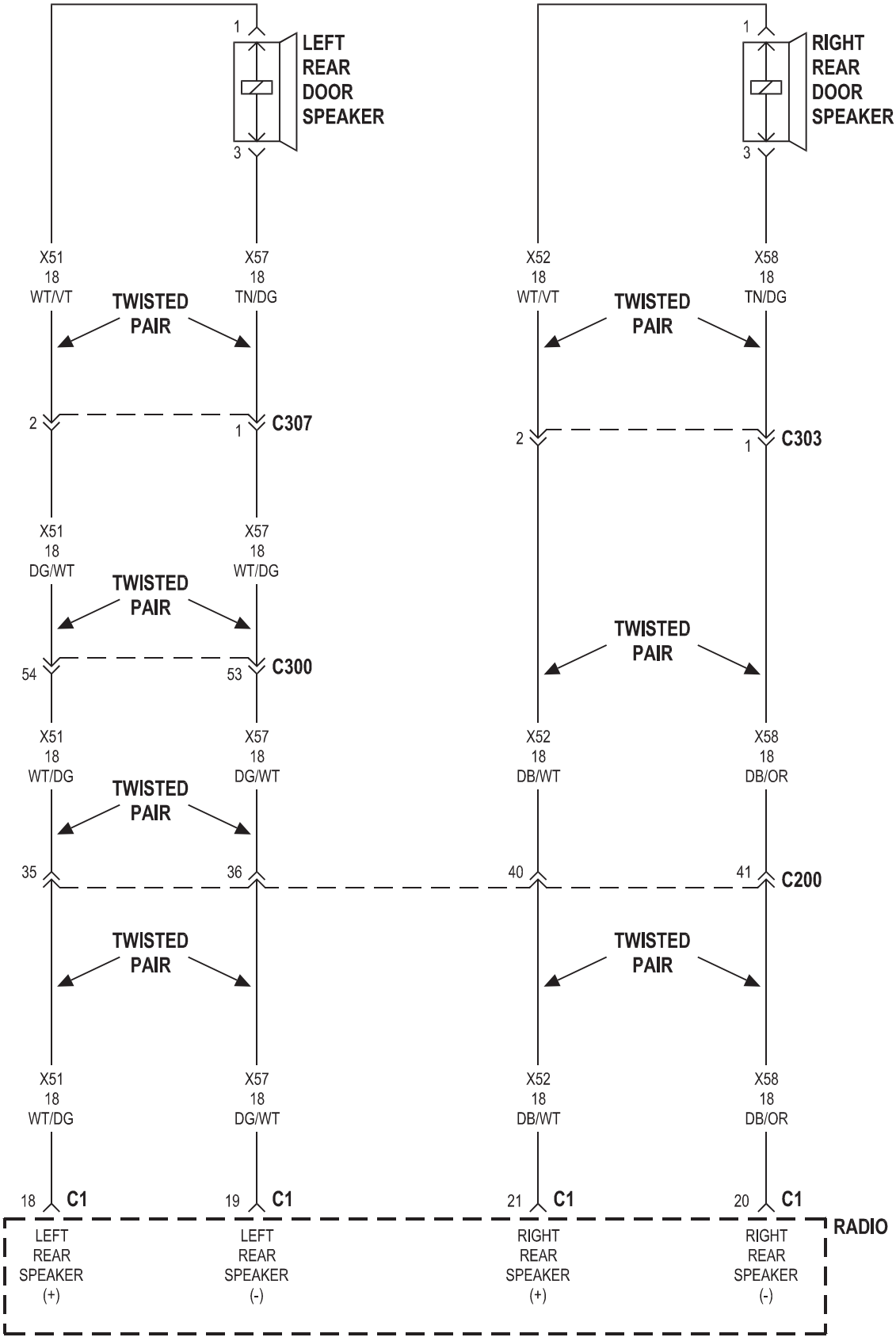
Component	Page
Antenna	8W-47-2
Antenna Module	8W-47-3
Body Control Module	8W-47-2, 3, 13
Clockspring	8W-47-13
Compact Disc Changer	8W-47-6, 7
Diagnostic Junction Port	8W-47-2, 3, 6, 7, 13
Fuse 5	8W-47-2, 3
Fuse 30	8W-47-2, 3
G300	8W-47-2, 3
Junction Block	8W-47-2, 3
Left Front Door Speaker	8W-47-4, 10, 11
Left Instrument Panel Speaker	8W-47-4, 12
Left Rear Door Speaker	8W-47-5, 10, 11
Left Remote Radio Switch	8W-47-13
Power Amplifier	8W-47-3, 6, 7, 8, 9, 10, 11, 12
Radio	8W-47-2, 3, 4, 5, 6, 7, 8, 9, 13
Right Front Door Speaker	8W-47-4, 10, 11
Right Instrument Panel Speaker	8W-47-4, 12
Right Rear Door Speaker	8W-47-5, 10, 11
Right Remote Radio Switch	8W-47-13

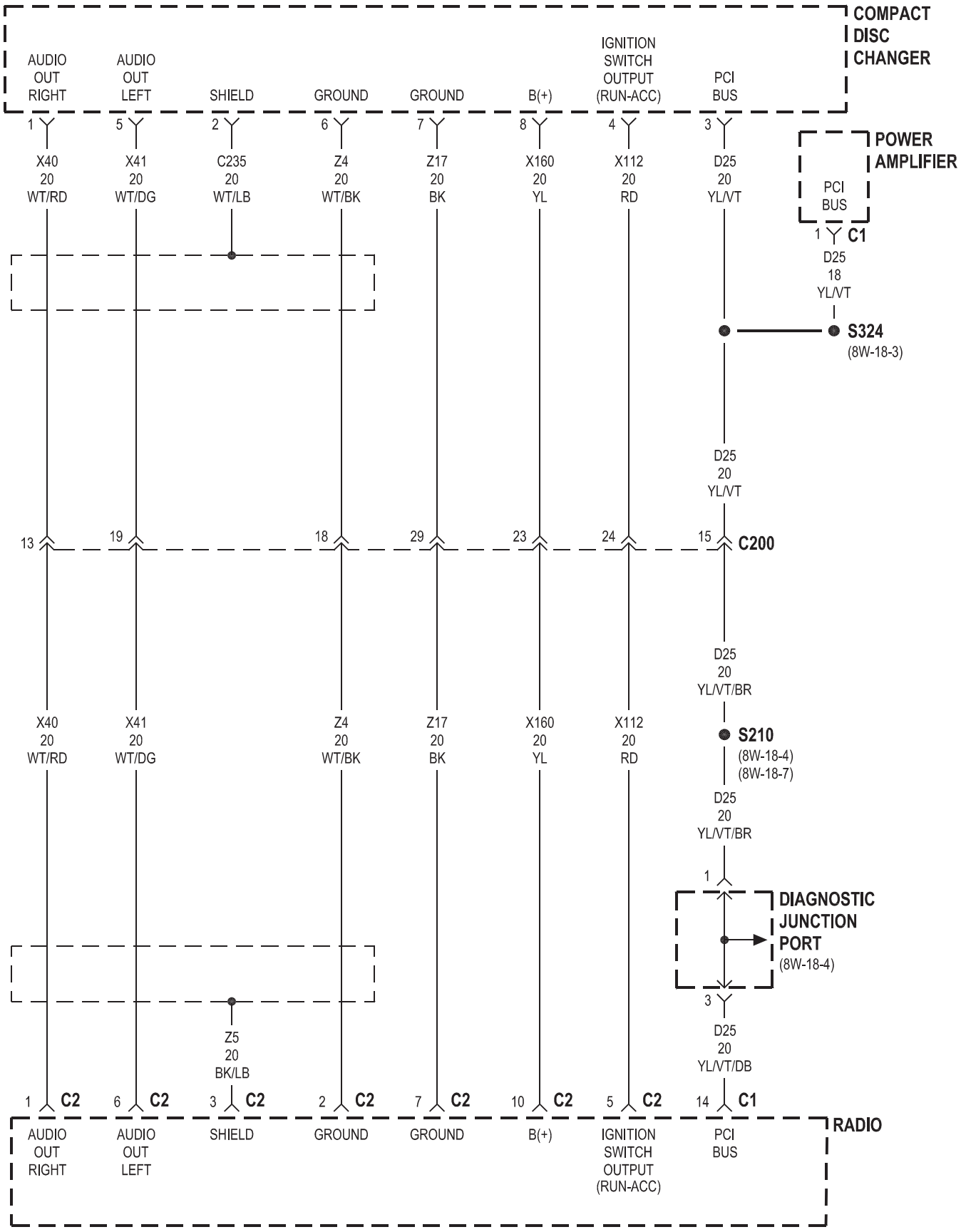

BATT A148
(8W-10-30)
RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 5 25A (8W-12-11)
FUSE 30 15A (8W-12-26)
25 C3
33 C3
ANTENNA
F60 16 RD/WT
X12 16 WT/RD
S221
(8W-12-11)
F60 16 RD/WT
F60 16 RD/WT
1 C1
12 C1
2 C1
FUSED B(+)
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
ANTENNA
RADIO
PANEL LAMPS DRIVER
PCI BUS
GROUND
GROUND
3 C1
14 C1
11 C1
22 C1
E2 20 OR
D25 20 VT/YL/LB
Z9 16 BK
Z9 16 BK
S224
(8W-15-17)
(8W-15-18)
Z9 16 BK
13 C1
3
55 C200
PANEL LAMPS DRIVER
BODY CONTROL MODULE
(8W-45-4)
PCI BUS
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
Z9 16 BK
G300
(8W-15-17)
(8W-15-18)

PREMIUM

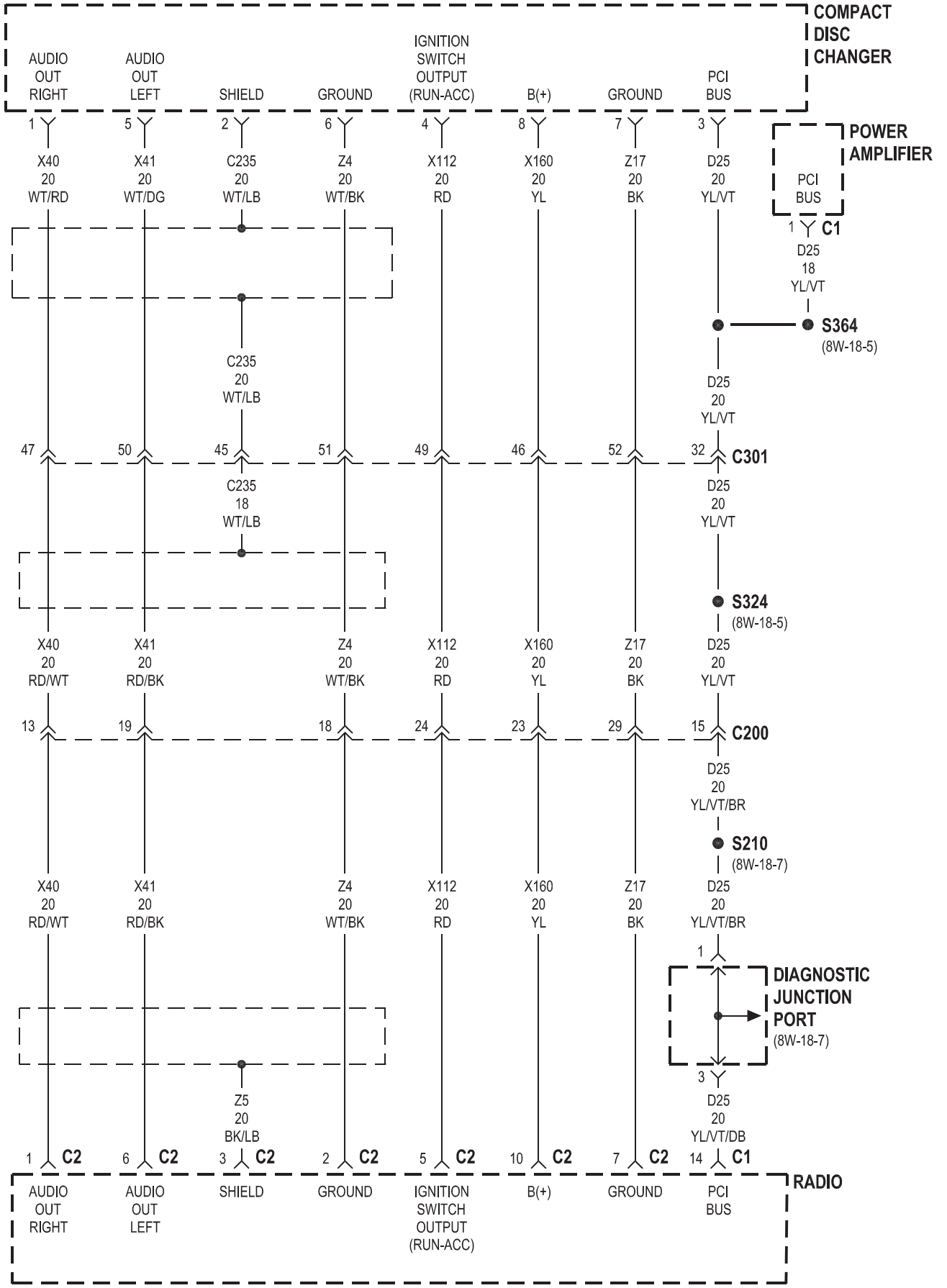

BATT A148
(8W-10-30)
RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 5 25A (8W-12-11)
FUSE 30 15A (8W-12-26)
25 C3
52 C2
33 C3
RHD
LHD
F60 16 RD/WT
D C301
F60 14 RD/WT
ANTENNA
ANTENNA
ANTENNA MODULE
ENABLE SIGNAL TO AMPLIFIER
ANTENNA
1 X64 18 BK/WT
S368 (LHD) S333 (RHD)
S334
(8W-12-11)
S221
(8W-12-11)
X12 16 WT/RD
X64 18 BR/WT
31 C301
49 C200
2 C1
10 C1
FUSED B(+)
POWER AMPLIFIER
1 C1
12 C1
FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
ENABLE SIGNAL TO AMPLIFIER
RADIO
OTHER
BUILT-UP-EXPORT
13 C1
PANEL LAMPS DRIVER
PCI BUS
GROUND
3 C1
14 C1
11 C1
22 C1
E2 20 OR
D25 20 YL/VT/DB
Z9 16 BK
S224
(8W-15-17)
(8W-15-18)
55 C200
E C301
3 C1
11 C1
13 C1
3
BODY CONTROL MODULE
(8W-45-4)
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
S331
Z9 12 BK
G300
(8W-15-17)
(8W-15-18)

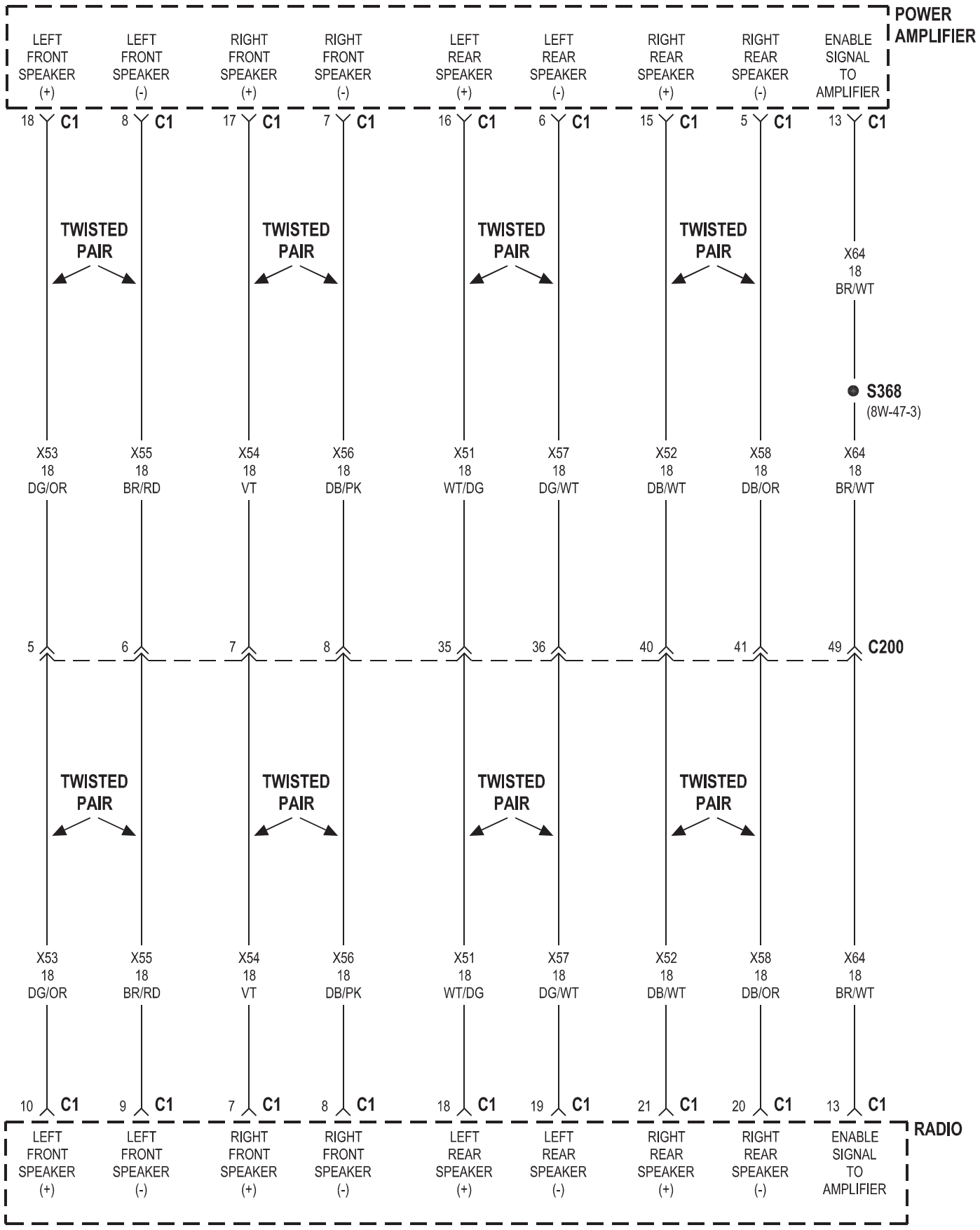

LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
TWISTED PAIR
X53 18 LG/RD
X55 18 LG/DG
X54 18 LB/RD
X56 18 LB/BK
C302
C314
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
S361
S360
S363
S362
X53 18 DG/OR
X53 18 DG/OR
X55 18 BR/RD
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
X56 18 DB/PK
X54 18 VT
C200
X83 18 YL/RD
X81 18 YL/BK
X84 18 OR/GY
X86 18 OR/RD
LEFT INSTRUMENT PANEL SPEAKER
RIGHT INSTRUMENT PANEL SPEAKER
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 OR/BK
C1
RADIO
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)


1
LEFT REAR DOOR SPEAKER
3
1
RIGHT REAR DOOR SPEAKER
3
X51 18 WT/VT
X57 18 TN/DG
X52 18 WT/VT
X58 18 TN/DG
TWISTED PAIR
2
C307
1
2
C303
1
X51 18 DG/WT
X57 18 WT/DG
TWISTED PAIR
54
C300
53
TWISTED PAIR
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
TWISTED PAIR
35
36
40
41
C200
TWISTED PAIR
TWISTED PAIR
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
18
C1
19
C1
21
C1
20
C1
RADIO
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)

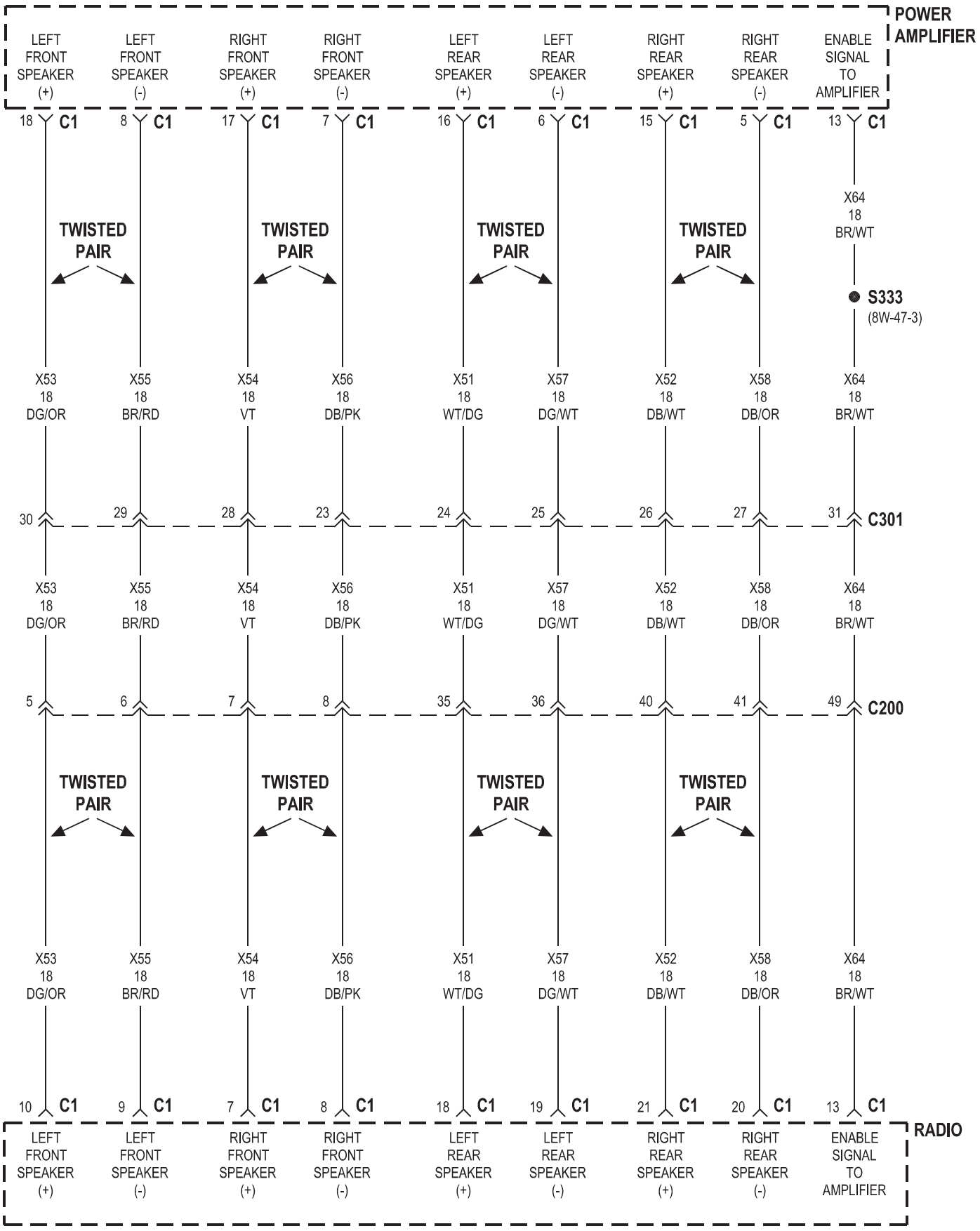

COMPACT DISC CHANGER
AUDIO OUT RIGHT
AUDIO OUT LEFT
SHIELD
GROUND
GROUND
B(+)
IGNITION SWITCH OUTPUT (RUN-ACC)
PCI BUS
1
5
2
6
7
8
4
3
X40 20 WT/RD
X41 20 WT/DG
C235 20 WT/LB
Z4 20 WT/BK
Z17 20 BK
X160 20 YL
X112 20 RD
D25 20 YL/VT
POWER AMPLIFIER
PCI BUS
1 C1
D25 18 YL/VT
S324
(8W-18-3)
D25 20 YL/VT
13
19
18
29
23
24
15
C200
D25 20 YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25 20 YL/VT/BR
1
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
3
D25 20 YL/VT/DB
Z5 20 BK/LB
1 C2
6 C2
3 C2
2 C2
7 C2
10 C2
5 C2
14 C1
AUDIO OUT RIGHT
AUDIO OUT LEFT
SHIELD
GROUND
GROUND
B(+)
IGNITION SWITCH OUTPUT (RUN-ACC)
PCI BUS
RADIO

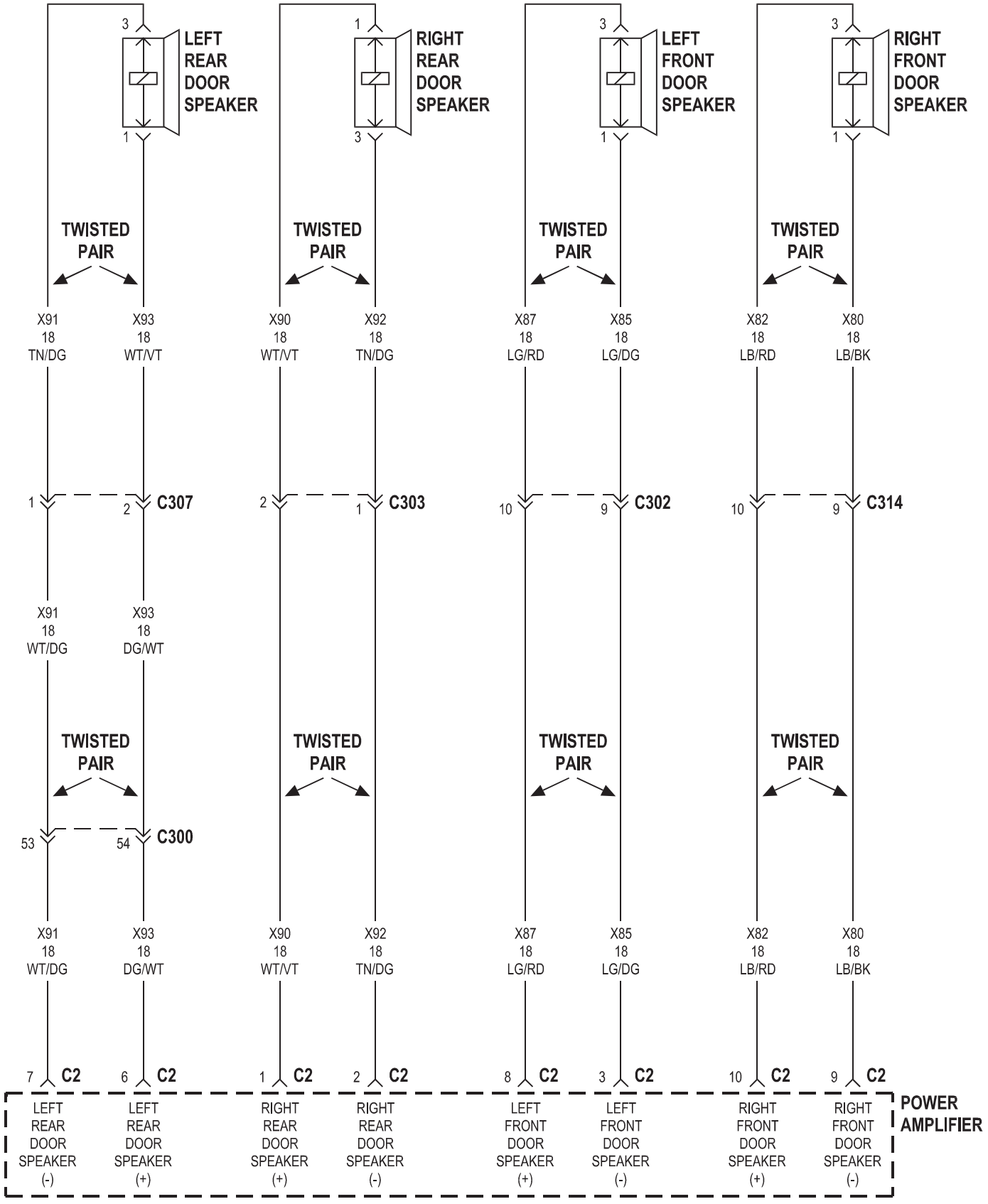
RHD PREMIUM


COMPACT DISC CHANGER
AUDIO OUT RIGHT
AUDIO OUT LEFT
SHIELD
GROUND
IGNITION SWITCH OUTPUT (RUN-ACC)
B(+)
GROUND
PCI BUS
1
5
2
6
4
8
7
3
X40 20 WT/RD
X41 20 WT/DG
C235 20 WT/LB
Z4 20 WT/BK
X112 20 RD
X160 20 YL
Z17 20 BK
D25 20 YL/VT
POWER AMPLIFIER
PCI BUS
1 C1
D25 18 YL/VT
S364
(8W-18-5)
C235 20 WT/LB
D25 20 YL/VT
47
50
45
51
49
46
52
32 C301
C235 18 WT/LB
D25 20 YL/VT
S324
(8W-18-5)
X40 20 RD/WT
X41 20 RD/BK
Z4 20 WT/BK
X112 20 RD
X160 20 YL
Z17 20 BK
D25 20 YL/VT
13
19
18
24
23
29
15 C200
D25 20 YL/VT/BR
S210
(8W-18-7)
X40 20 RD/WT
X41 20 RD/BK
Z4 20 WT/BK
X112 20 RD
X160 20 YL
Z17 20 BK
D25 20 YL/VT/BR
1
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
3
Z5 20 BK/LB
D25 20 YL/VT/DB
1 C2
6 C2
3 C2
2 C2
5 C2
10 C2
7 C2
14 C1
AUDIO OUT RIGHT
AUDIO OUT LEFT
SHIELD
GROUND
IGNITION SWITCH OUTPUT (RUN-ACC)
B(+)
GROUND
PCI BUS
RADIO

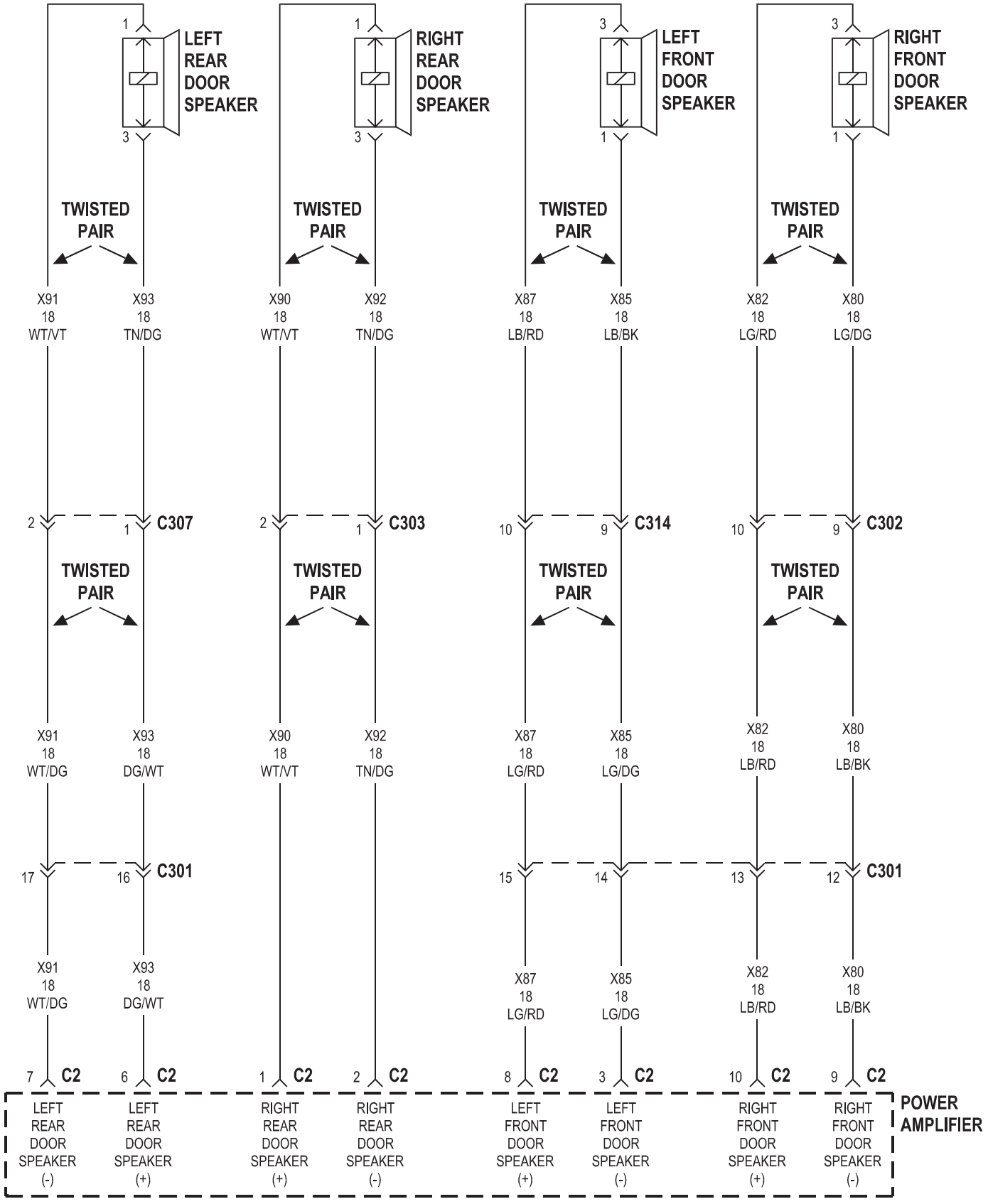

POWER AMPLIFIER
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)
ENABLE SIGNAL TO AMPLIFIER
18 C1
8 C1
17 C1
7 C1
16 C1
6 C1
15 C1
5 C1
13 C1
TWISTED PAIR
X64 18 BR/WT
S368
(8W-47-3)
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
X64 18 BR/WT
5
6
7
8
35
36
40
41
49
C200
10 C1
9 C1
7 C1
8 C1
18 C1
19 C1
21 C1
20 C1
13 C1
RADIO

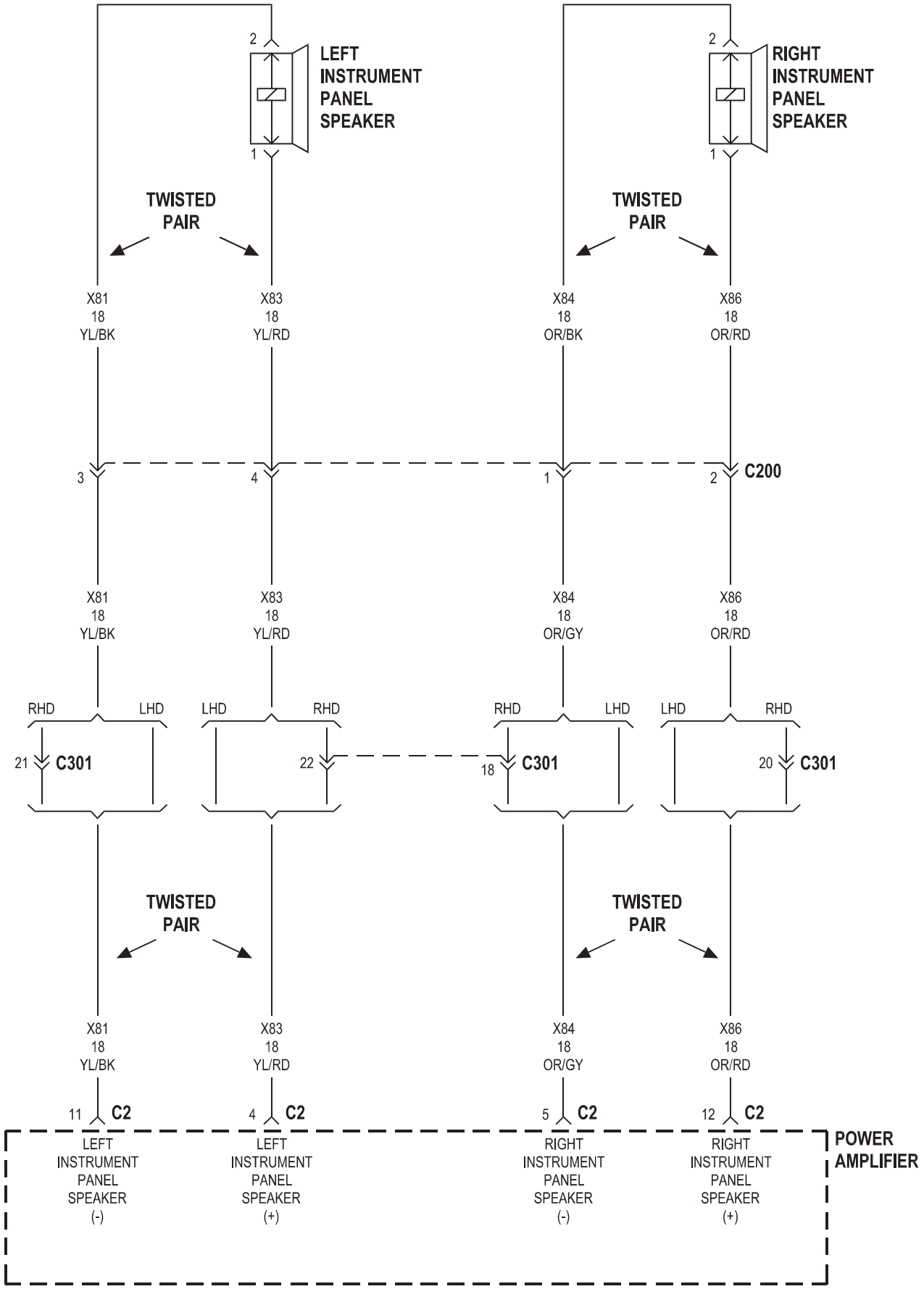
RHD PREMIUM

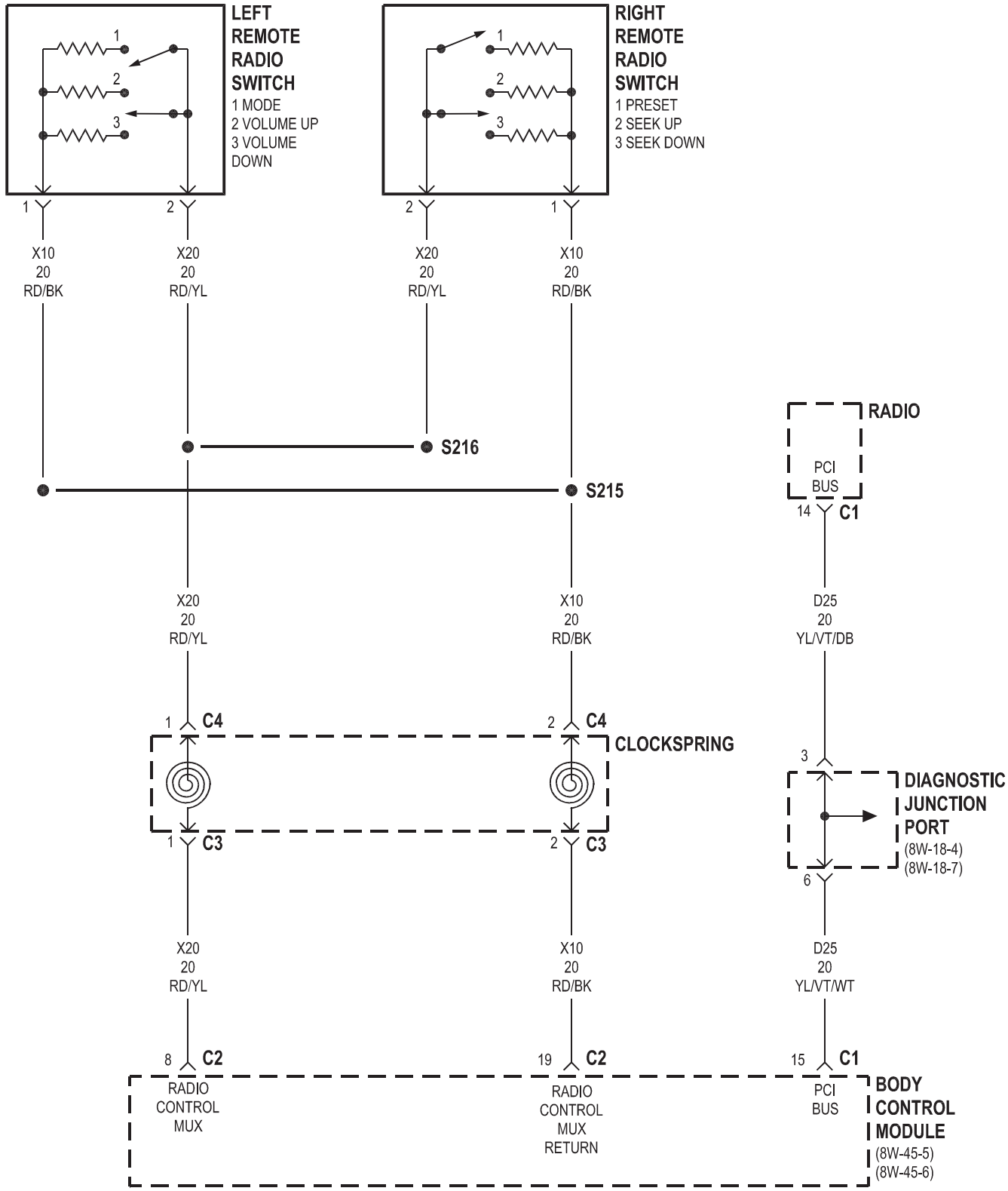

POWER AMPLIFIER
LEFT FRONT SPEAKER (+)
LEFT FRONT SPEAKER (-)
RIGHT FRONT SPEAKER (+)
RIGHT FRONT SPEAKER (-)
LEFT REAR SPEAKER (+)
LEFT REAR SPEAKER (-)
RIGHT REAR SPEAKER (+)
RIGHT REAR SPEAKER (-)
ENABLE SIGNAL TO AMPLIFIER
18 C1
8 C1
17 C1
7 C1
16 C1
6 C1
15 C1
5 C1
13 C1
TWISTED PAIR
X64 18 BR/WT
S333 (8W-47-3)
X53 18 DG/OR
X55 18 BR/RD
X54 18 VT
X56 18 DB/PK
X51 18 WT/DG
X57 18 DG/WT
X52 18 DB/WT
X58 18 DB/OR
X64 18 BR/WT
30
29
28
23
24
25
26
27
31
C301
5
6
7
8
35
36
40
41
49
C200
10 C1
9 C1
7 C1
8 C1
18 C1
19 C1
21 C1
20 C1
13 C1
RADIO


LEFT REAR DOOR SPEAKER
RIGHT REAR DOOR SPEAKER
LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
TWISTED PAIR
X91 18 TN/DG
X93 18 WT/VT
X90 18 WT/VT
X92 18 TN/DG
X87 18 LG/RD
X85 18 LG/DG
X82 18 LB/RD
X80 18 LB/BK
C307
C303
C302
C314
X91 18 WT/DG
X93 18 DG/WT
C300
C2
LEFT REAR DOOR SPEAKER (-)
LEFT REAR DOOR SPEAKER (+)
RIGHT REAR DOOR SPEAKER (+)
RIGHT REAR DOOR SPEAKER (-)
LEFT FRONT DOOR SPEAKER (+)
LEFT FRONT DOOR SPEAKER (-)
RIGHT FRONT DOOR SPEAKER (+)
RIGHT FRONT DOOR SPEAKER (-)
POWER AMPLIFIER

RHD PREMIUM

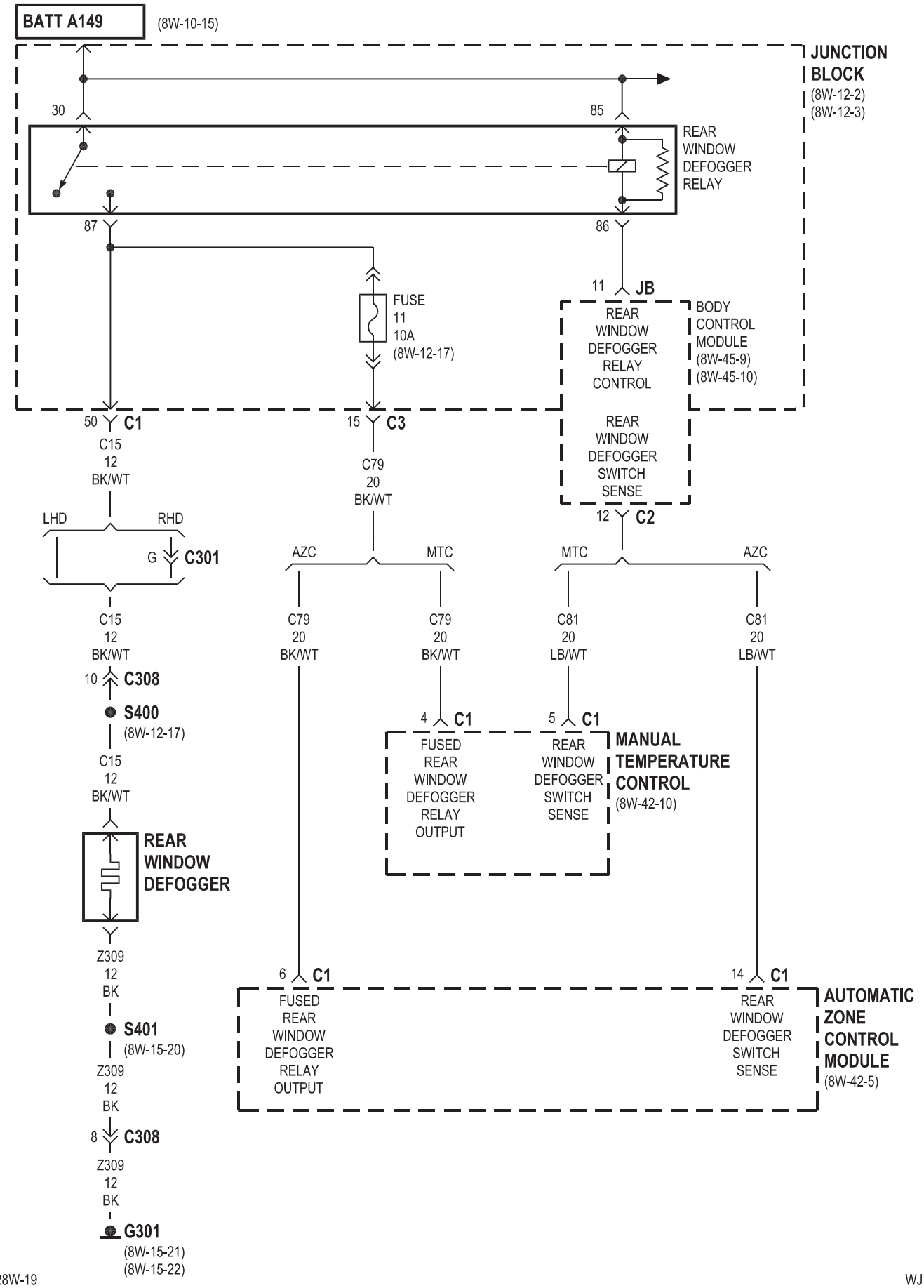

LEFT REAR DOOR SPEAKER
RIGHT REAR DOOR SPEAKER
LEFT FRONT DOOR SPEAKER
RIGHT FRONT DOOR SPEAKER
TWISTED PAIR
X91 18 WT/VT
X93 18 TN/DG
X90 18 WT/VT
X92 18 TN/DG
X87 18 LB/RD
X85 18 LB/BK
X82 18 LG/RD
X80 18 LG/DG
C307
C303
C314
C302
X91 18 WT/DG
X93 18 DG/WT
X90 18 WT/VT
X92 18 TN/DG
X87 18 LG/RD
X85 18 LG/DG
X82 18 LB/RD
X80 18 LB/BK
C301
C301
C2
LEFT REAR DOOR SPEAKER (-)
LEFT REAR DOOR SPEAKER (+)
RIGHT REAR DOOR SPEAKER (+)
RIGHT REAR DOOR SPEAKER (-)
LEFT FRONT DOOR SPEAKER (+)
LEFT FRONT DOOR SPEAKER (-)
RIGHT FRONT DOOR SPEAKER (+)
RIGHT FRONT DOOR SPEAKER (-)
POWER AMPLIFIER


2
LEFT INSTRUMENT PANEL SPEAKER
1
2
RIGHT INSTRUMENT PANEL SPEAKER
1
TWISTED PAIR
TWISTED PAIR
X81 18 YL/BK
X83 18 YL/RD
X84 18 OR/BK
X86 18 OR/RD
3
4
1
2
C200
X81 18 YL/BK
X83 18 YL/RD
X84 18 OR/GY
X86 18 OR/RD
RHD
LHD
LHD
RHD
RHD
LHD
LHD
RHD
21
C301
22
18
C301
20
C301
TWISTED PAIR
TWISTED PAIR
X81 18 YL/BK
X83 18 YL/RD
X84 18 OR/GY
X86 18 OR/RD
11
C2
4
C2
5
C2
12
C2
LEFT INSTRUMENT PANEL SPEAKER (-)
LEFT INSTRUMENT PANEL SPEAKER (+)
RIGHT INSTRUMENT PANEL SPEAKER (-)
RIGHT INSTRUMENT PANEL SPEAKER (+)
POWER AMPLIFIER


LEFT
REMOTE
RADIO
SWITCH
1 MODE
2 VOLUME UP
3 VOLUME
DOWN
RIGHT
REMOTE
RADIO
SWITCH
1 PRESET
2 SEEK UP
3 SEEK DOWN
X10
20
RD/BK
X20
20
RD/YL
S216
S215
RADIO
PCI
BUS
C1
D25
20
YL/VT/DB
C4
CLOCKSPRING
C3
DIAGNOSTIC
JUNCTION
PORT
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/WT
C2
RADIO
CONTROL
MUX
RADIO
CONTROL
MUX
RETURN
BODY
CONTROL
MODULE
(8W-45-5)
(8W-45-6)

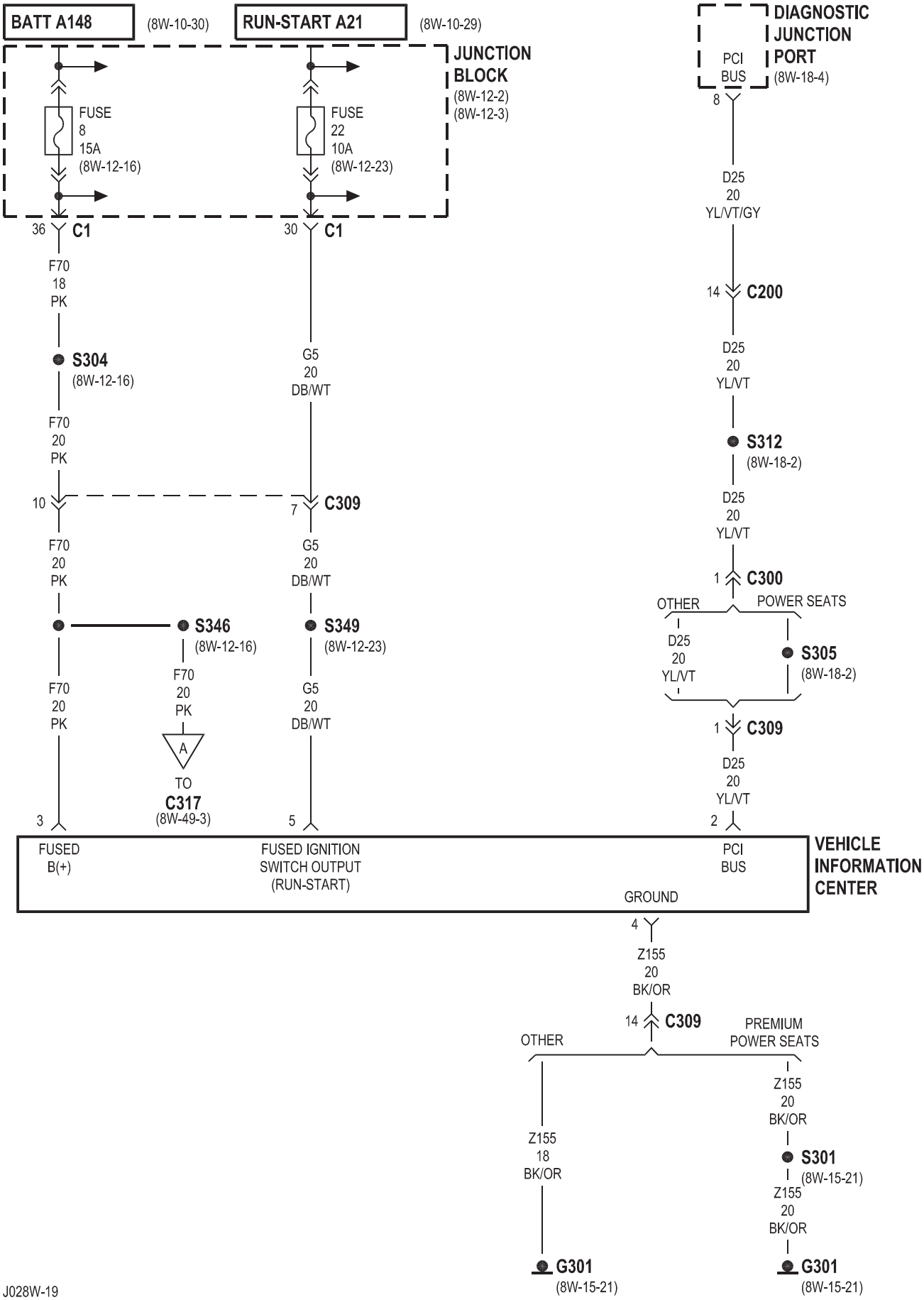
8W-48 REAR WINDOW DEFOGGER

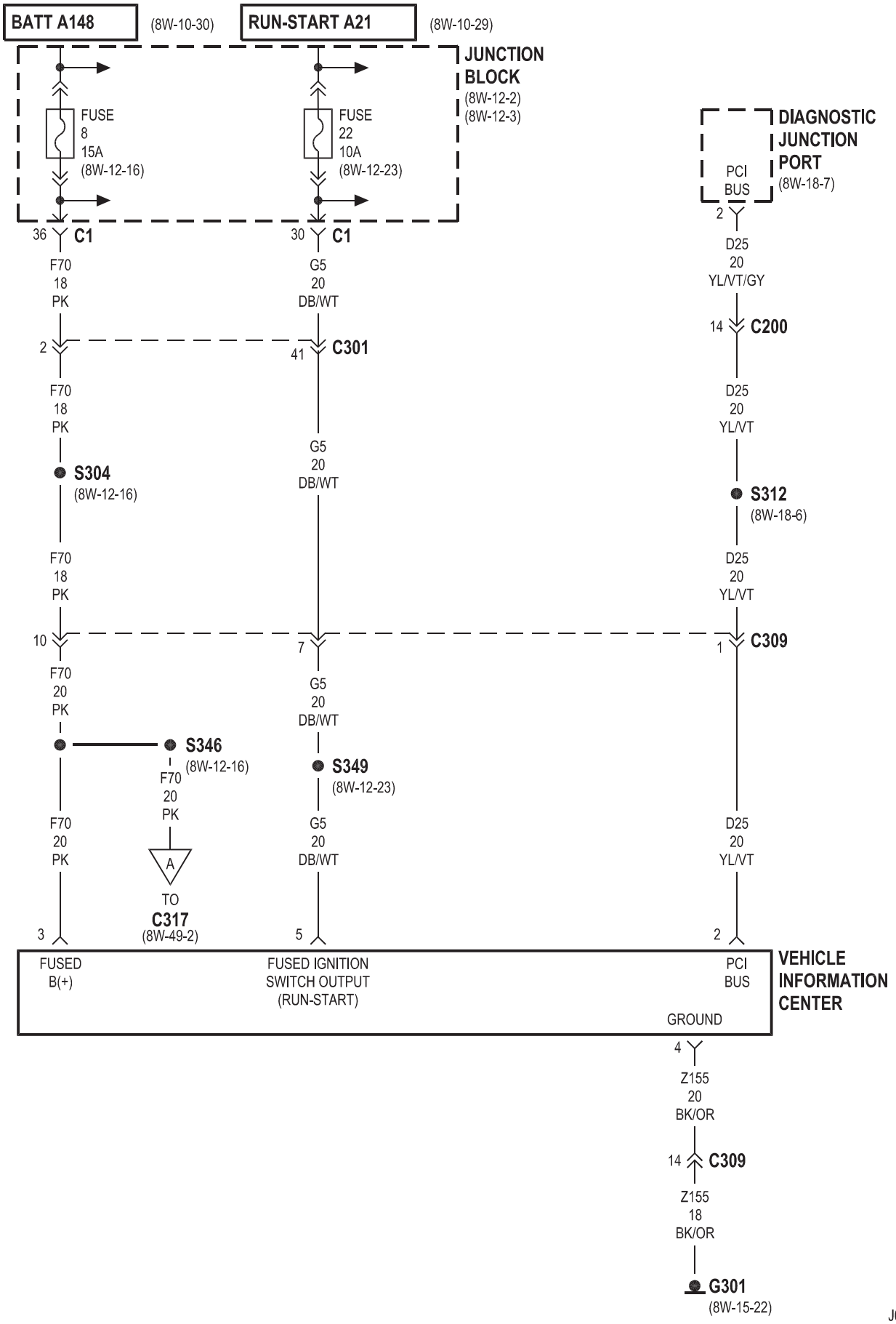
Component	Page
Automatic Zone Control Module	8W-48-2
Body Control Module	8W-48-2
Fuse 11	8W-48-2
G301	8W-48-2
Junction Block	8W-48-2
Manual Temperature Control	8W-48-2
Rear Window Defogger	8W-48-2
Rear Window Defogger Relay	8W-48-2

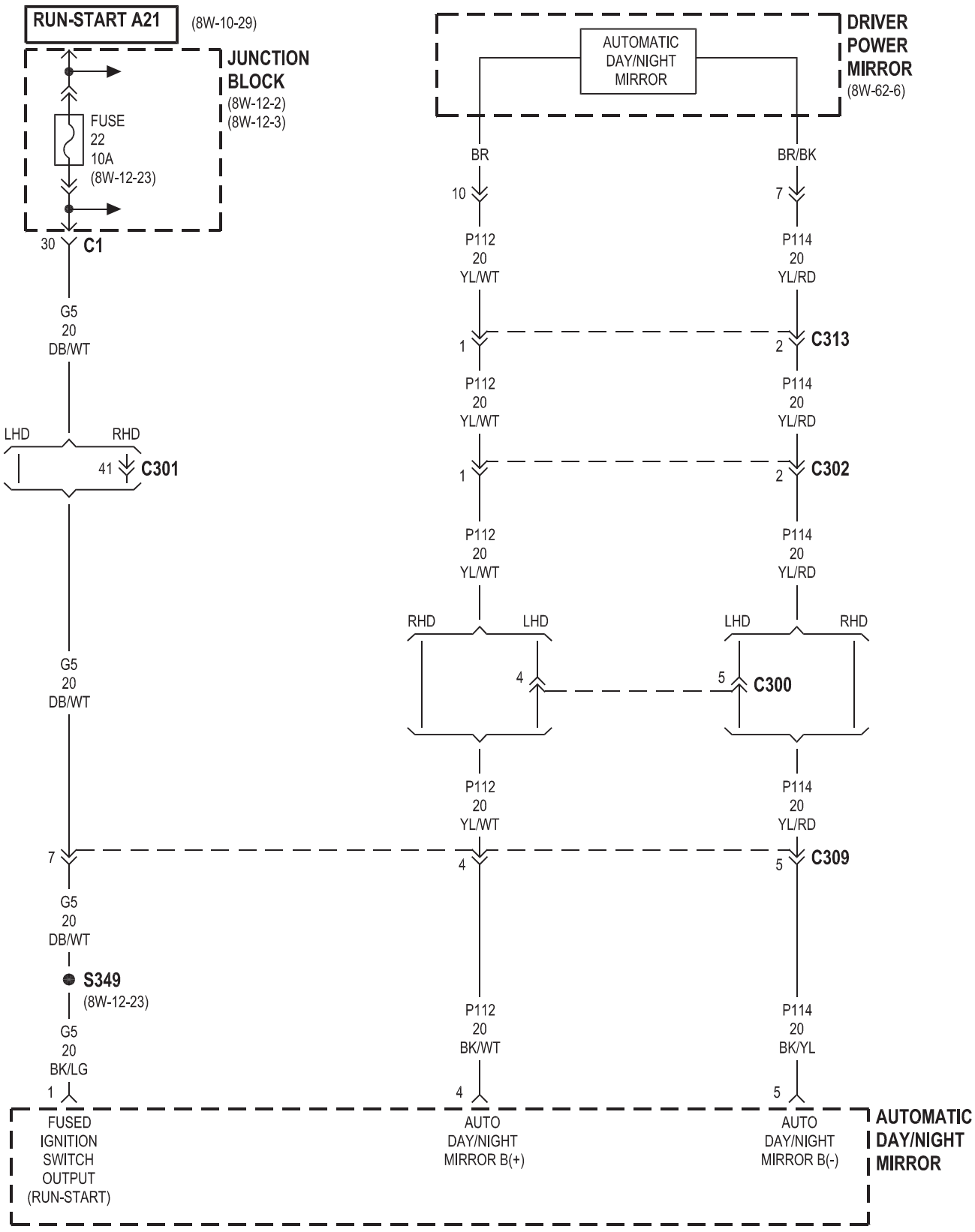

BATT A149
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
85
REAR WINDOW DEFOGGER RELAY
87
86
FUSE 11 10A
(8W-12-17)
11 JB
REAR WINDOW DEFOGGER RELAY CONTROL
BODY CONTROL MODULE
(8W-45-9)
(8W-45-10)
REAR WINDOW DEFOGGER SWITCH SENSE
50 C1
C15 12 BK/WT
15 C3
C79 20 BK/WT
12 C2
LHD
RHD
G C301
AZC
MTC
MTC
AZC
C15 12 BK/WT
C79 20 BK/WT
C79 20 BK/WT
C81 20 LB/WT
C81 20 LB/WT
10 C308
S400
(8W-12-17)
4 C1
5 C1
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
REAR WINDOW DEFOGGER SWITCH SENSE
MANUAL TEMPERATURE CONTROL
(8W-42-10)
C15 12 BK/WT
REAR WINDOW DEFOGGER
Z309 12 BK
6 C1
14 C1
FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
REAR WINDOW DEFOGGER SWITCH SENSE
AUTOMATIC ZONE CONTROL MODULE
(8W-42-5)
S401
(8W-15-20)
Z309 12 BK
8 C308
Z309 12 BK
G301
(8W-15-21)
(8W-15-22)

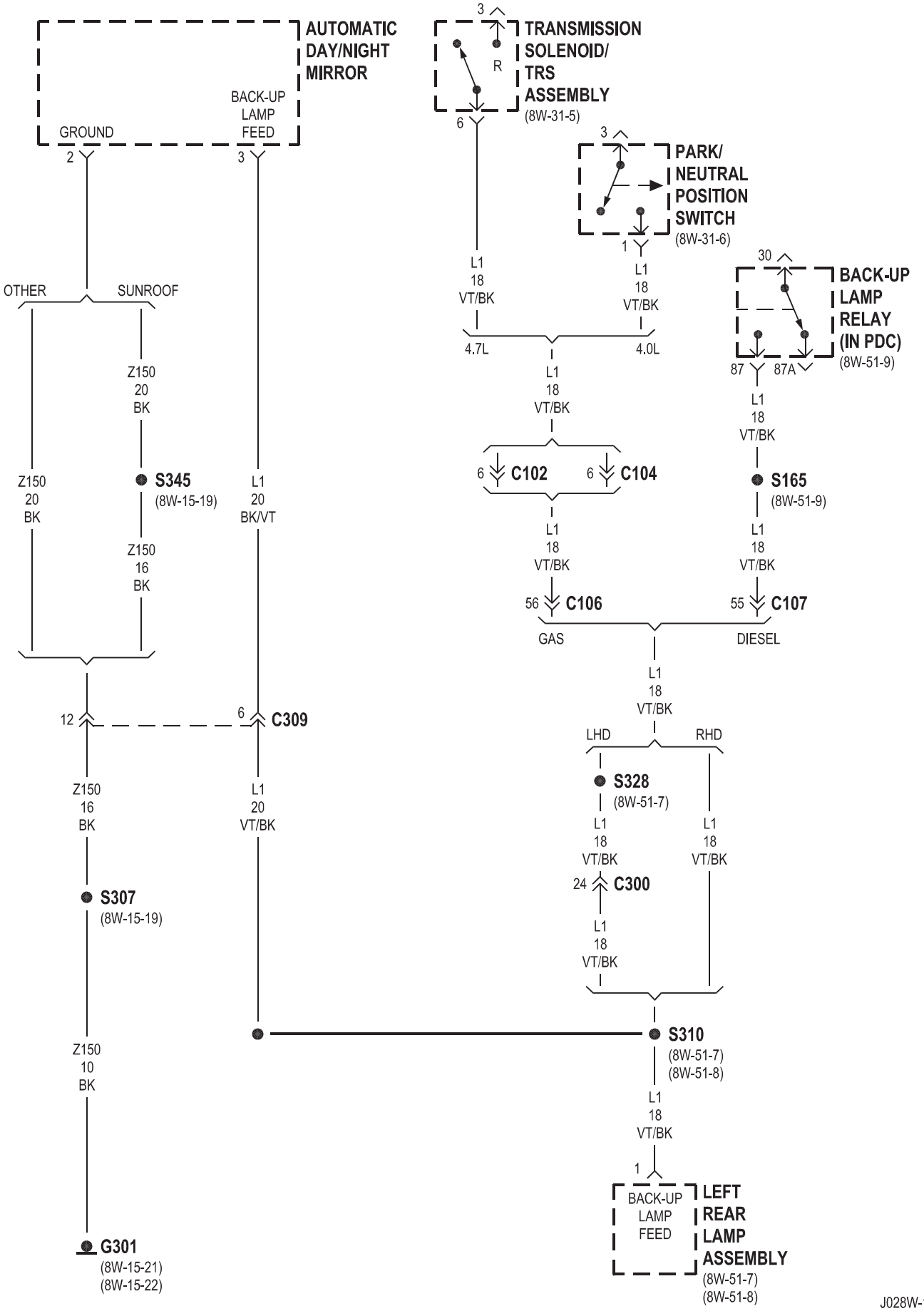
8W-49 OVERHEAD CONSOLE

Component	Page
Accessory Delay Relay	8W-49-6
Automatic Day/Night Mirror	8W-49-4, 5
Back-Up Lamp Relay	8W-49-5
Diagnostic Junction Port	8W-49-2, 3, 6
Driver Power Mirror	8W-49-4
Fuse 7	8W-49-7
Fuse 8	8W-49-2, 3
Fuse 22	8W-49-2, 3, 4
Fuse 25	8W-49-6
G106	8W-49-7
G301	8W-49-2, 3, 5, 6
Intrusion Transceiver Module	8W-49-7
Junction Block	8W-49-2, 3, 4, 6, 7
Left Rear Lamp Assembly	8W-49-5
Park/Neutral Position Switch	8W-49-5
Rain Sensor	8W-49-6
Siren	8W-49-7
Transmission Solenoid/TRS Assembly	8W-49-5
Vehicle Information Center	8W-49-2, 3


BATT A148
(8W-10-30)
RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 8 15A (8W-12-16)
FUSE 22 10A (8W-12-23)
36 C1
30 C1
F70 18 PK
S304
(8W-12-16)
F70 20 PK
10 C309
7 C309
G5 20 DB/WT
F70 20 PK
S346
(8W-12-16)
S349
(8W-12-23)
F70 20 PK
A
TO C317
(8W-49-3)
G5 20 DB/WT
3
5
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
VEHICLE INFORMATION CENTER
GROUND
4
Z155 20 BK/OR
14 C309
OTHER
PREMIUM POWER SEATS
Z155 18 BK/OR
Z155 20 BK/OR
S301
(8W-15-21)
Z155 20 BK/OR
G301
(8W-15-21)
G301
(8W-15-21)
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
PCI BUS
8
D25 20 YL/VT/GY
14 C200
D25 20 YL/VT
S312
(8W-18-2)
D25 20 YL/VT
1 C300
OTHER
POWER SEATS
D25 20 YL/VT
S305
(8W-18-2)
1 C309
D25 20 YL/VT
2

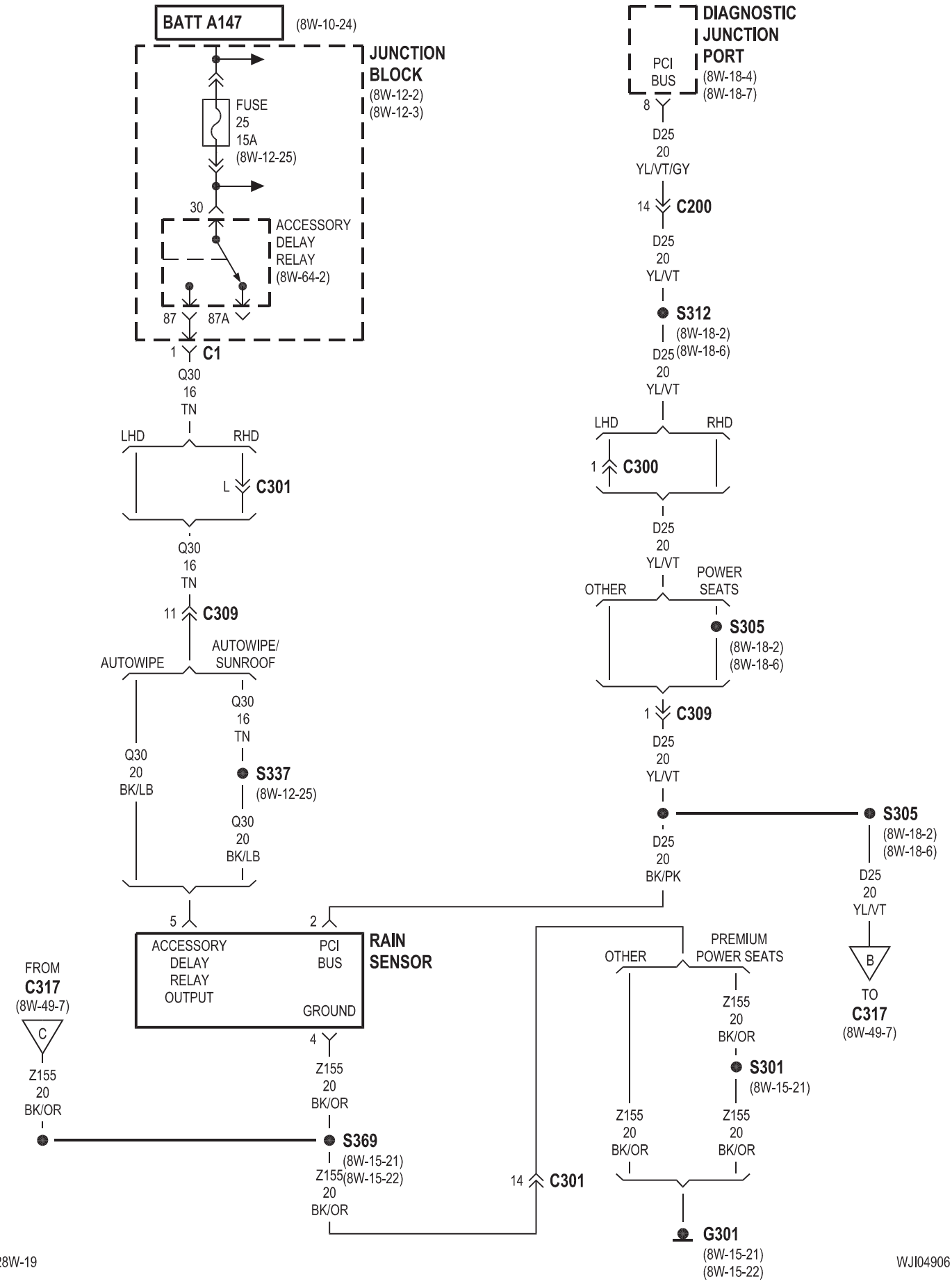

BATT A148
(8W-10-30)
RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 8 15A (8W-12-16)
FUSE 22 10A (8W-12-23)
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
PCI BUS
36 C1
30 C1
2
F70 18 PK
G5 20 DB/WT
D25 20 YL/VT/GY
14 C200
41 C301
S304
(8W-12-16)
S312
(8W-18-6)
10
7
1 C309
F70 20 PK
S346
(8W-12-16)
S349
(8W-12-23)
A
TO C317
(8W-49-2)
3
5
2
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN-START)
PCI BUS
VEHICLE INFORMATION CENTER
GROUND
4
Z155 20 BK/OR
14 C309
Z155 18 BK/OR
G301
(8W-15-22)

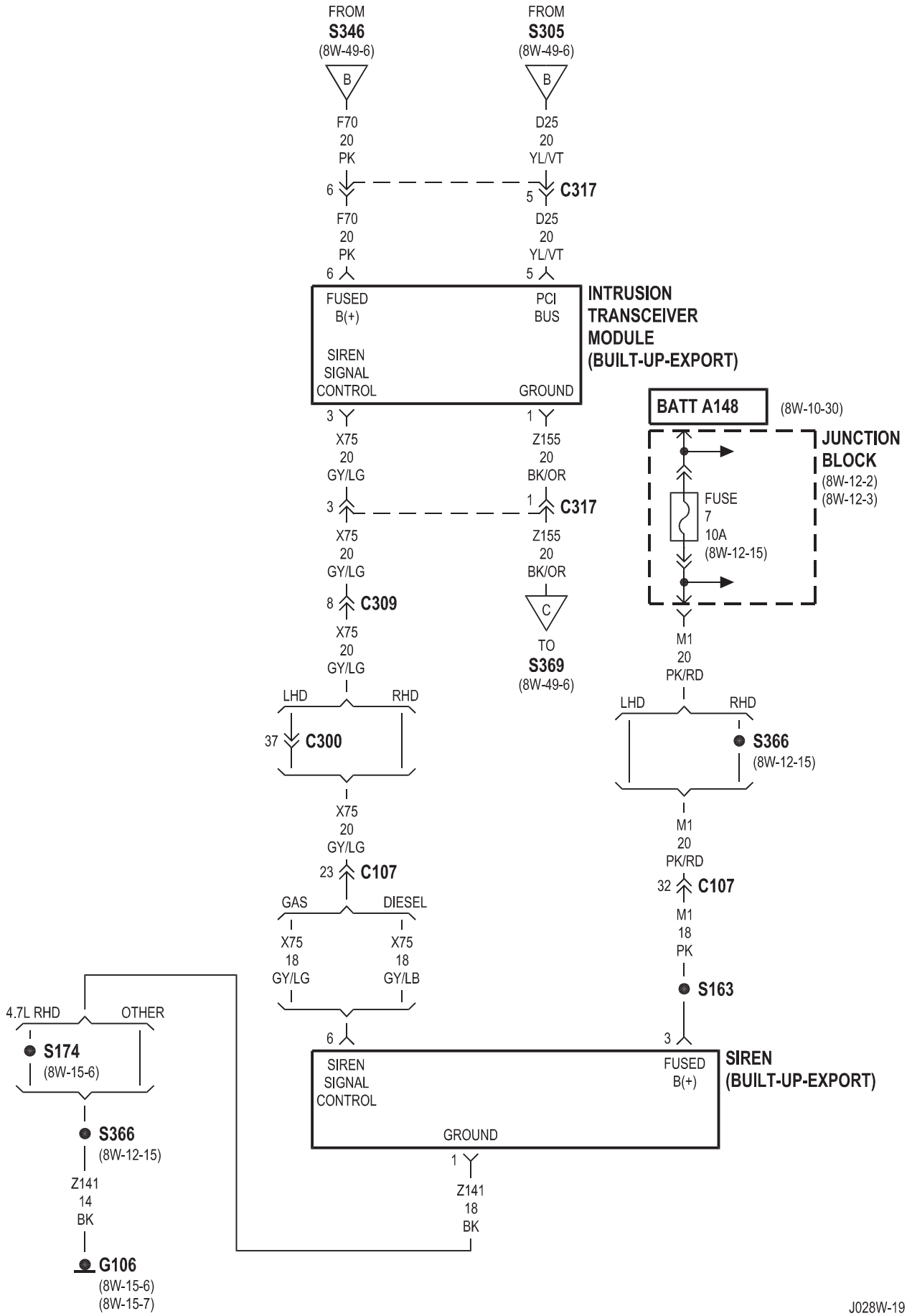

RUN-START A21
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
22
10A
(8W-12-23)
30
C1
G5
20
DB/WT
LHD
RHD
41
C301
G5
20
DB/WT
7
G5
20
DB/WT
S349
(8W-12-23)
G5
20
BK/LG
1
FUSED IGNITION SWITCH OUTPUT (RUN-START)
DRIVER POWER MIRROR
(8W-62-6)
AUTOMATIC DAY/NIGHT MIRROR
BR
10
P112
20
YL/WT
1
P112
20
YL/WT
1
P112
20
YL/WT
RHD
LHD
4
P112
20
YL/WT
4
P112
20
BK/WT
4
AUTO DAY/NIGHT MIRROR B(+)
BR/BK
7
P114
20
YL/RD
2
C313
P114
20
YL/RD
2
C302
P114
20
YL/RD
LHD
RHD
5
C300
P114
20
YL/RD
5
C309
P114
20
BK/YL
5
AUTO DAY/NIGHT MIRROR B(-)
AUTOMATIC DAY/NIGHT MIRROR



WJI04905

J028W-19


BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 25 15A
(8W-12-25)
30
ACCESSORY DELAY RELAY
(8W-64-2)
87
87A
1
C1
Q30 16 TN
LHD
RHD
L
C301
Q30 16 TN
11
C309
AUTOWIPE
AUTOWIPE/ SUNROOF
Q30 20 BK/LB
Q30 16 TN
S337
(8W-12-25)
Q30 20 BK/LB
5
2
RAIN SENSOR
ACCESSORY DELAY RELAY OUTPUT
PCI BUS
GROUND
4
Z155 20 BK/OR
FROM C317
(8W-49-7)
C
Z155 20 BK/OR
S369
(8W-15-21)
(8W-15-22)
Z155 20 BK/OR
14
C301
DIAGNOSTIC JUNCTION PORT
PCI BUS
(8W-18-4)
(8W-18-7)
8
D25 20 YL/VT/GY
14
C200
D25 20 YL/VT
S312
(8W-18-2)
(8W-18-6)
D25 20 YL/VT
LHD
RHD
1
C300
D25 20 YL/VT
OTHER
POWER SEATS
S305
(8W-18-2)
(8W-18-6)
1
C309
D25 20 YL/VT
D25 20 BK/PK
S305
(8W-18-2)
(8W-18-6)
D25 20 YL/VT
B
TO C317
(8W-49-7)
OTHER
PREMIUM POWER SEATS
Z155 20 BK/OR
S301
(8W-15-21)
Z155 20 BK/OR
Z155 20 BK/OR
G301
(8W-15-21)
(8W-15-22)

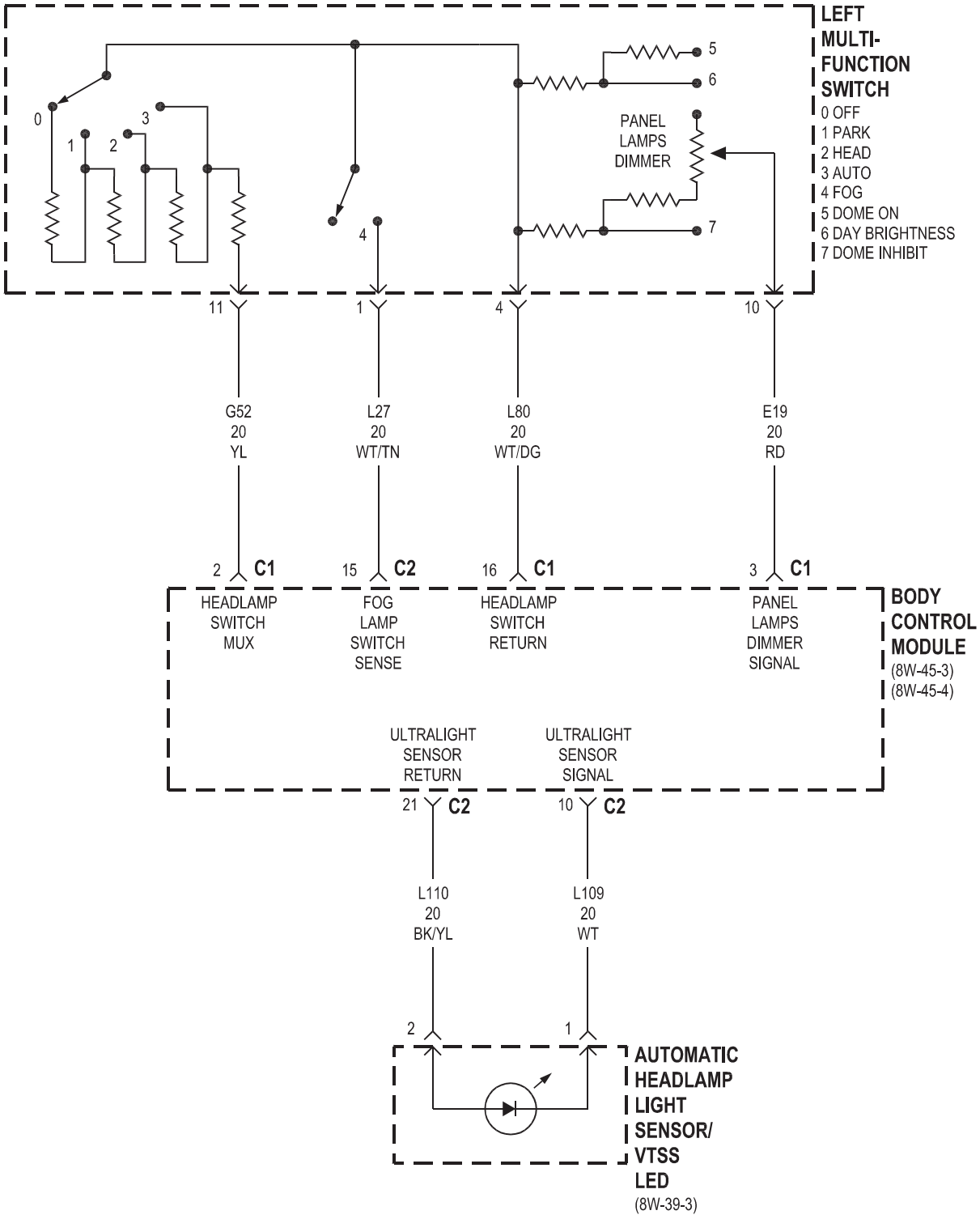


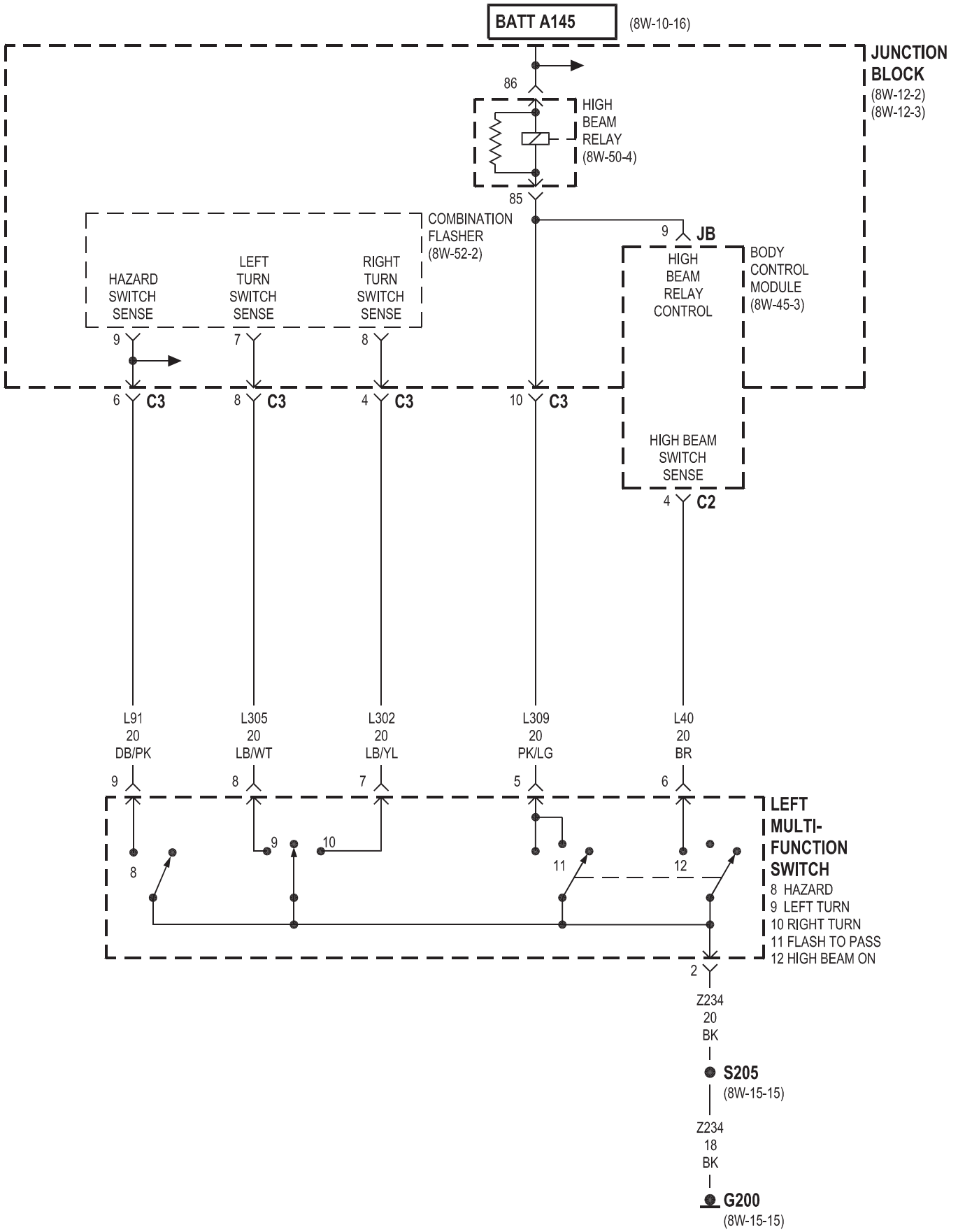
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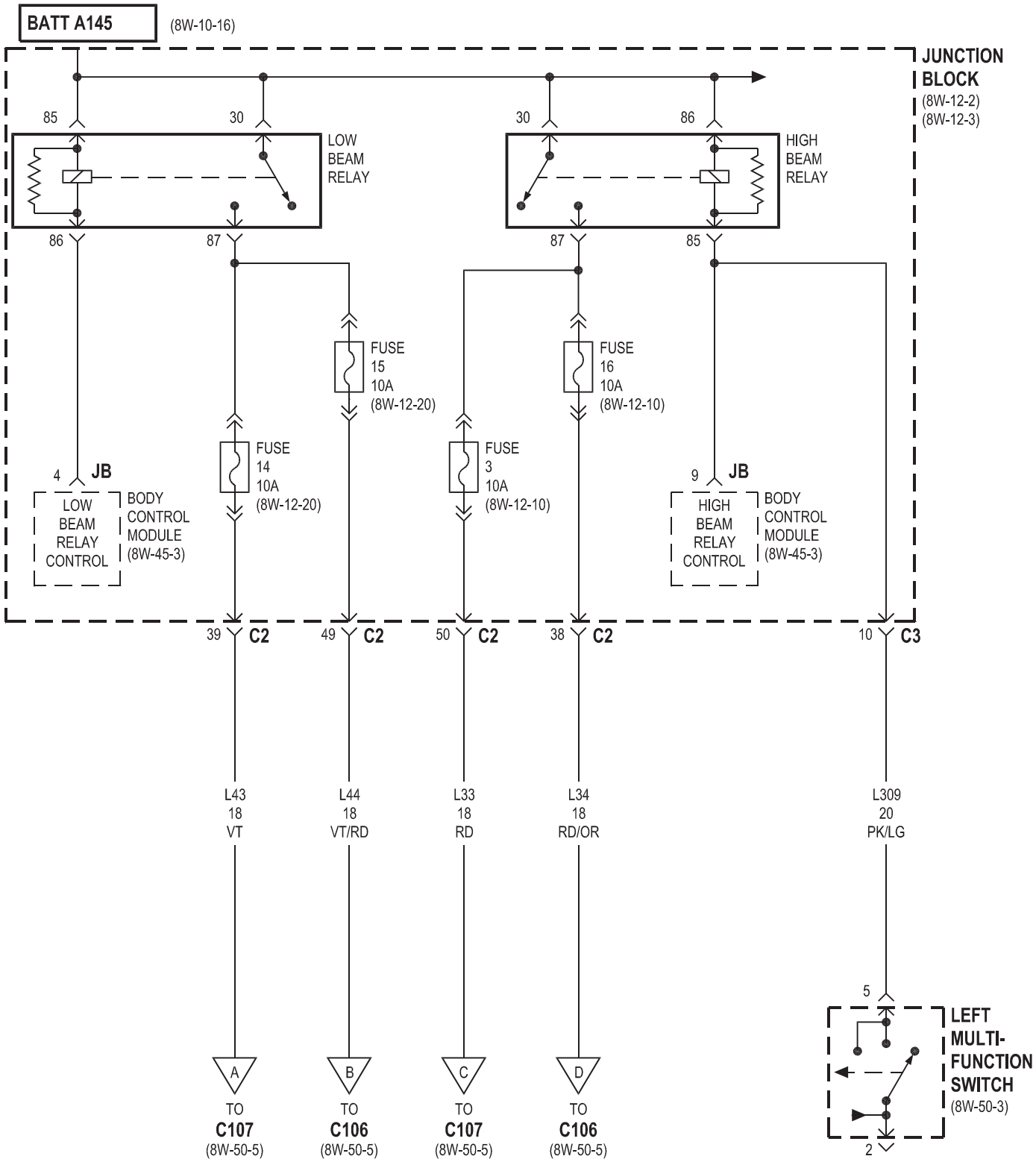
J028W-19

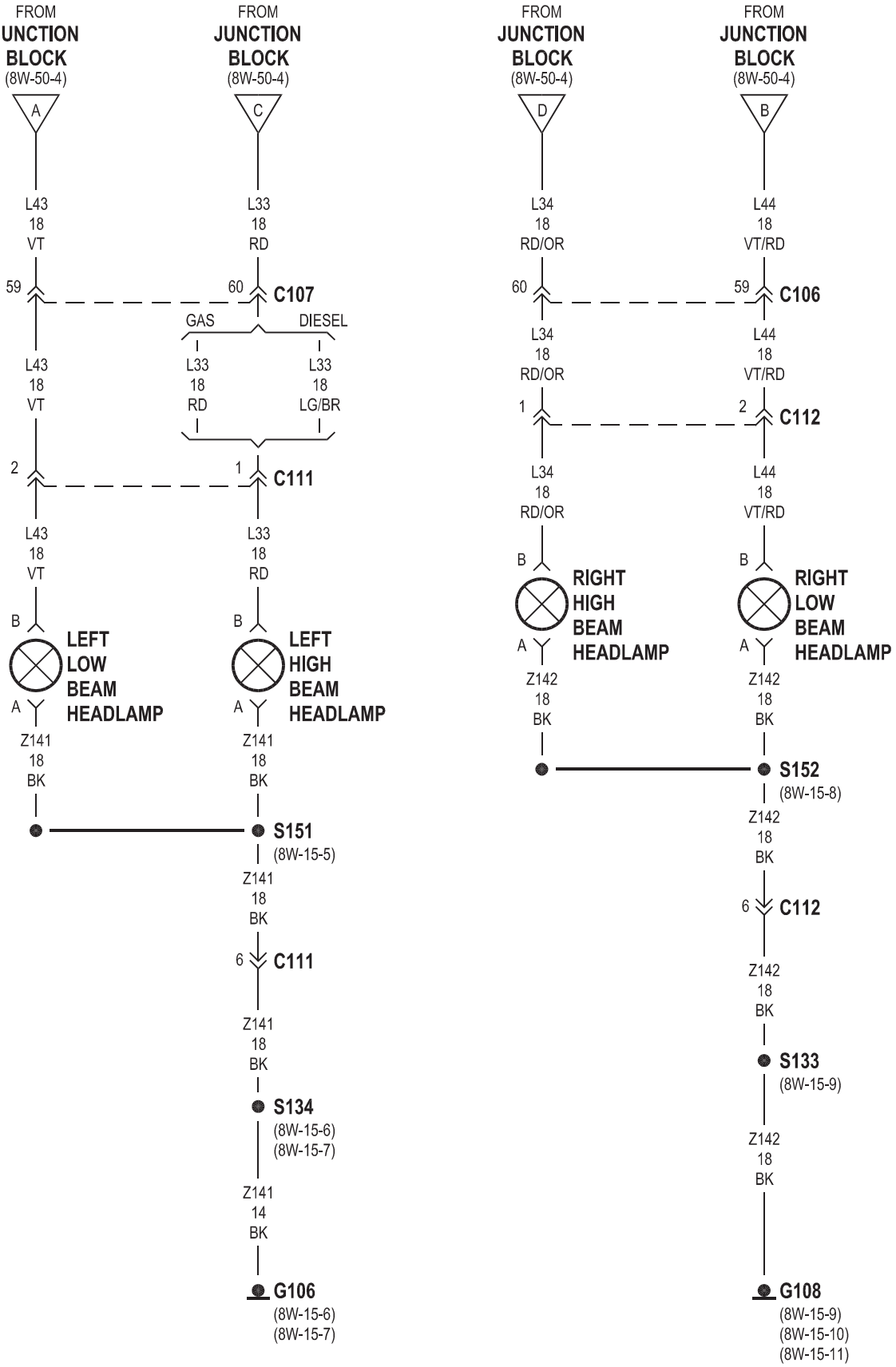
8W-50 FRONT LIGHTING

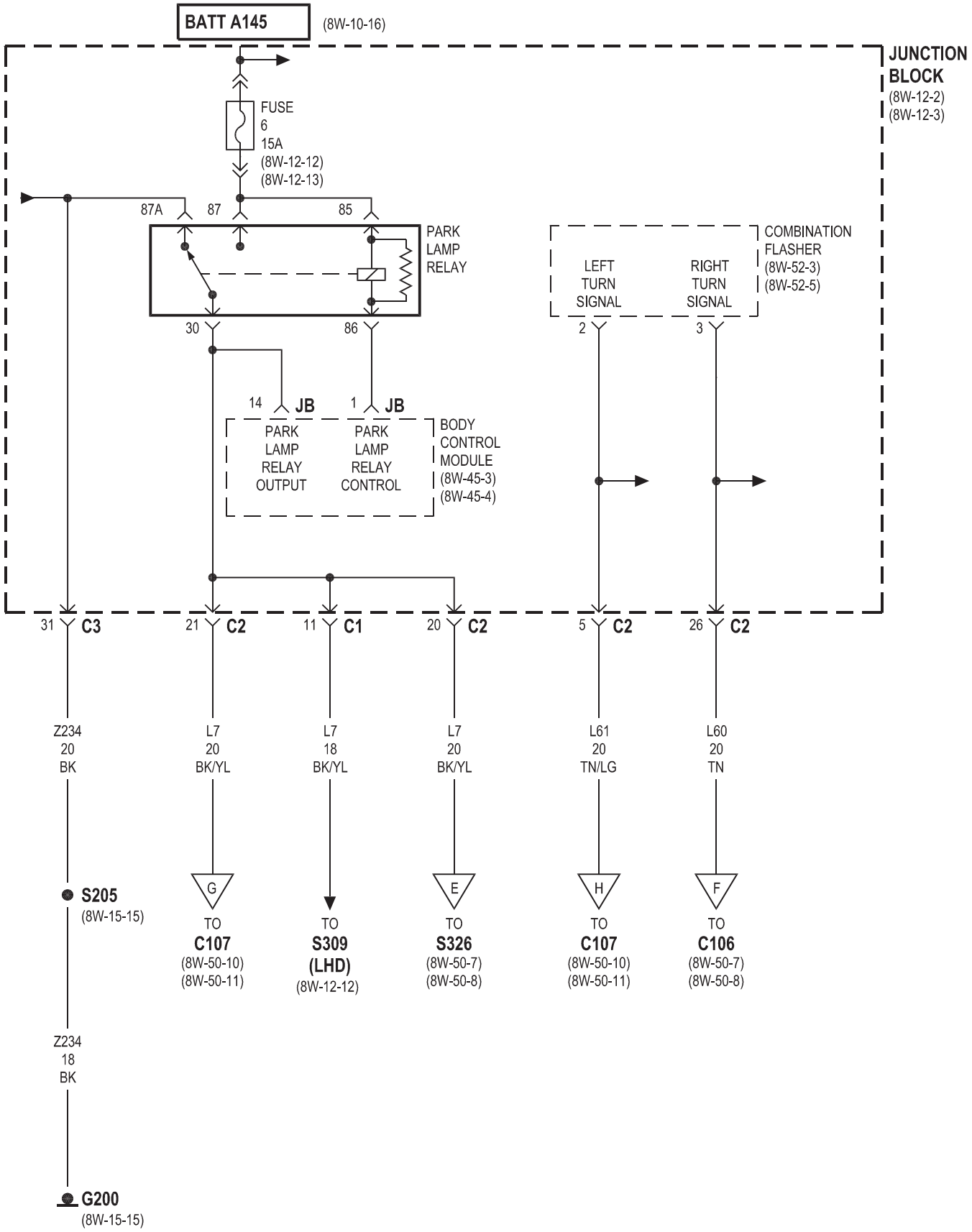
Component	Page
Automatic Headlamp Light Sensor/VTSS LED	8W-50-2
Body Control Module	8W-50-2, 3, 4, 6, 12, 13
Combination Flasher	8W-50-3, 6
Fog Lamp Relay	8W-50-12
Fuse 3	8W-50-4
Fuse 6	8W-50-6
Fuse 14	8W-50-4, 13
Fuse 15	8W-50-4, 13
Fuse 16	8W-50-4
Fuse 24	8W-50-12
G106	8W-50-5, 10, 11, 12, 13
G108	8W-50-5, 7, 8, 12, 13
G200	8W-50-3, 6, 9, 13
Headlamp Leveling Switch	8W-50-9
High Beam Relay	8W-50-3, 4
Junction Block	8W-50-3, 4, 5, 6, 7, 8, 10, 11, 12, 13
Left Fog Lamp	8W-50-12
Left Front Park Lamp	8W-50-10, 11
Left Front Park/Turn Signal Lamp	8W-50-10
Left Front Side Marker Lamp	8W-50-10
Left Front Turn Signal Lamp	8W-50-11
Left Headlamp Leveling Motor	8W-50-11
Left High Beam Headlamp	8W-50-5
Left Low Beam Headlamp	8W-50-5, 13
Left Multi-Function Switch	8W-50-2, 3, 4
Left Side Repeater Lamp	8W-50-11
Low Beam Relay	8W-50-4
Low Beam/Daytime Running Lamp Relay	8W-50-13
Park Lamp Relay	8W-50-6
Right Fog Lamp	8W-50-12
Right Front Park Lamp	8W-50-7, 8
Right Front Park/Turn Signal Lamp	8W-50-7
Right Front Side Marker Lamp	8W-50-7
Right Front Turn Signal Lamp	8W-50-8
Right Headlamp Leveling Motor	8W-50-8
Right High Beam Headlamp	8W-50-5
Right Low Beam Headlamp	8W-50-5, 13
Right Rear Lamp Assembly	8W-50-7, 8
Right Side Repeater Lamp	8W-50-8


LEFT
MULTI-
FUNCTION
SWITCH
0 OFF
1 PARK
2 HEAD
3 AUTO
4 FOG
5 DOME ON
6 DAY BRIGHTNESS
7 DOME INHIBIT
PANEL
LAMPS
DIMMER
0
1
2
3
4
5
6
7
11
1
4
10
G52
20
YL
L27
20
WT/TN
L80
20
WT/DG
E19
20
RD
2 C1
15 C2
16 C1
3 C1
HEADLAMP
SWITCH
MUX
FOG
LAMP
SWITCH
SENSE
HEADLAMP
SWITCH
RETURN
PANEL
LAMPS
DIMMER
SIGNAL
BODY
CONTROL
MODULE
(8W-45-3)
(8W-45-4)
ULTRALIGHT
SENSOR
RETURN
ULTRALIGHT
SENSOR
SIGNAL
21 C2
10 C2
L110
20
BK/YL
L109
20
WT
2
1
AUTOMATIC
HEADLAMP
LIGHT
SENSOR/
VTSS
LED
(8W-39-3)

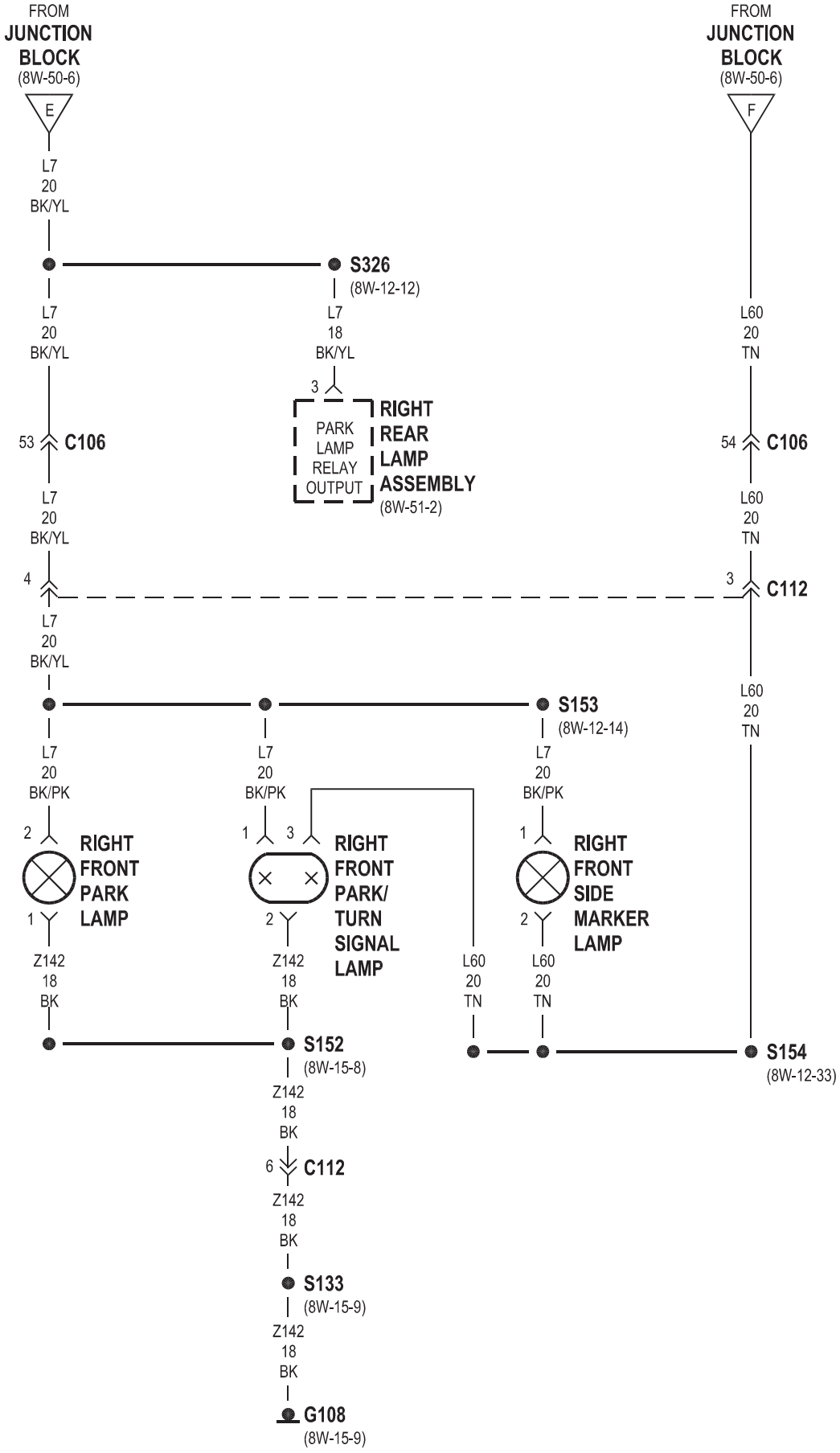

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
86
HIGH BEAM RELAY
(8W-50-4)
85
COMBINATION FLASHER
(8W-52-2)
HAZARD SWITCH SENSE
LEFT TURN SWITCH SENSE
RIGHT TURN SWITCH SENSE
9
7
8
6 C3
8 C3
4 C3
9 JB
HIGH BEAM RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
10 C3
HIGH BEAM SWITCH SENSE
4 C2
L91
20
DB/PK
L305
20
LB/WT
L302
20
LB/YL
L309
20
PK/LG
L40
20
BR
9
8
7
5
6
LEFT MULTI-FUNCTION SWITCH
8 HAZARD
9 LEFT TURN
10 RIGHT TURN
11 FLASH TO PASS
12 HIGH BEAM ON
2
Z234
20
BK
S205
(8W-15-15)
Z234
18
BK
G200
(8W-15-15)

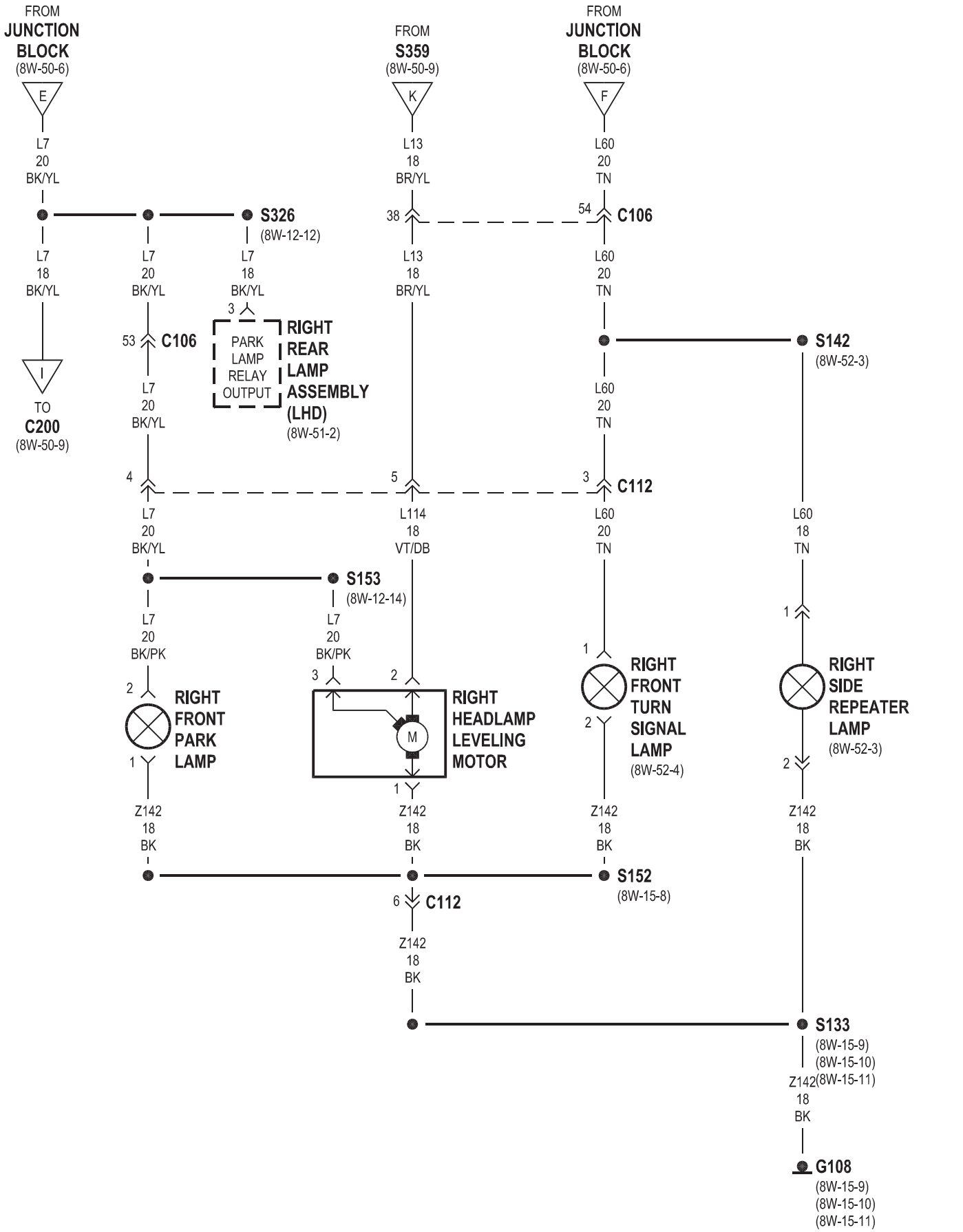

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
85
30
LOW BEAM RELAY
86
87
30
86
HIGH BEAM RELAY
87
85
FUSE 15 10A (8W-12-20)
FUSE 16 10A (8W-12-10)
FUSE 14 10A (8W-12-20)
FUSE 3 10A (8W-12-10)
4 JB
LOW BEAM RELAY CONTROL
BODY CONTROL MODULE (8W-45-3)
9 JB
HIGH BEAM RELAY CONTROL
BODY CONTROL MODULE (8W-45-3)
39 C2
49 C2
50 C2
38 C2
10 C3
L43 18 VT
L44 18 VT/RD
L33 18 RD
L34 18 RD/OR
L309 20 PK/LG
A
B
C
D
TO C107 (8W-50-5)
TO C106 (8W-50-5)
TO C107 (8W-50-5)
TO C106 (8W-50-5)
5
2
LEFT MULTI-FUNCTION SWITCH
(8W-50-3)

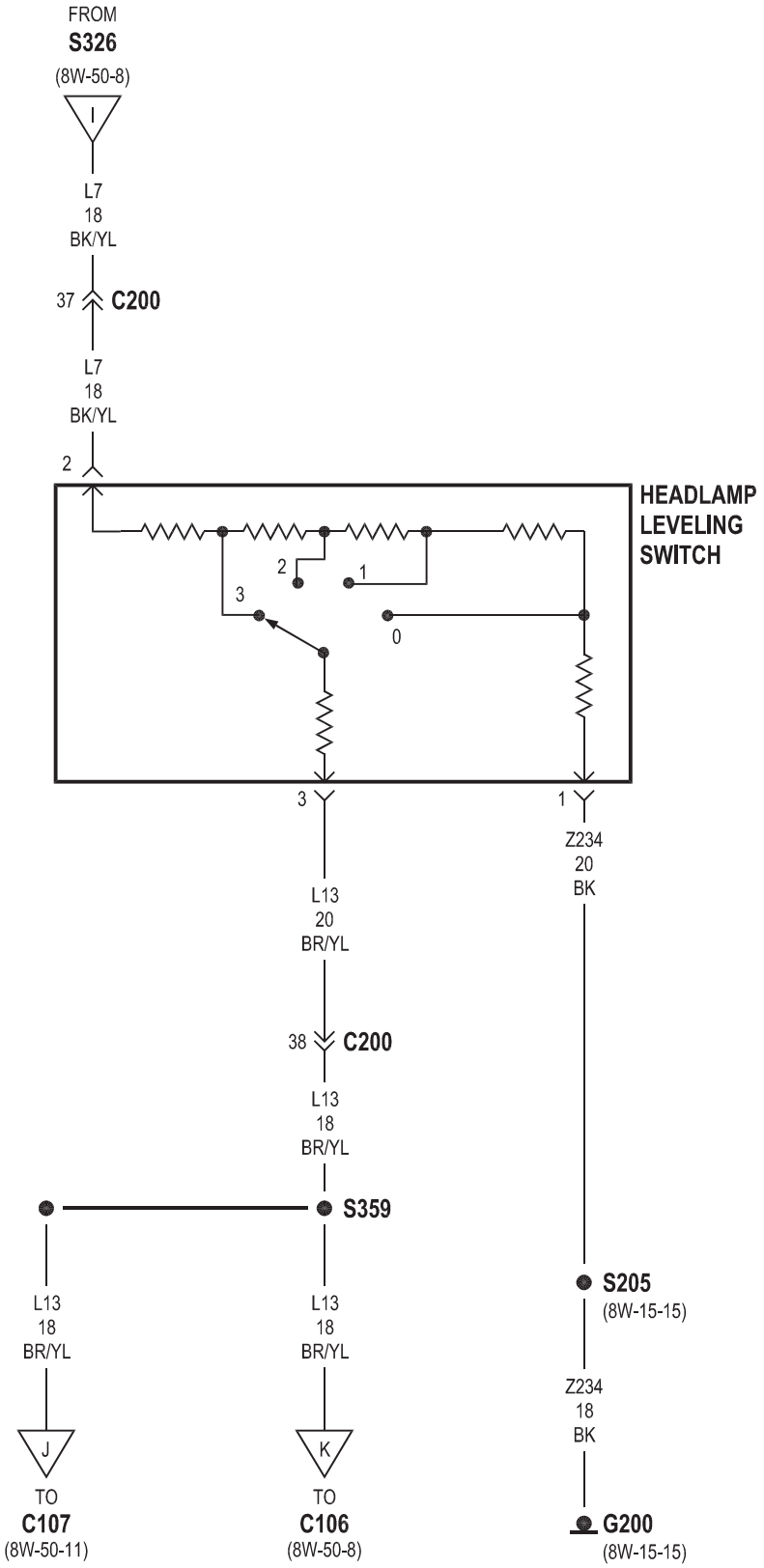

FROM JUNCTION BLOCK (8W-50-4)
A
C
D
B
L43 18 VT
L33 18 RD
L34 18 RD/OR
L44 18 VT/RD
59
60
C107
C106
GAS
DIESEL
L33 18 LG/BR
2
1
C111
C112
B
LEFT LOW BEAM HEADLAMP
LEFT HIGH BEAM HEADLAMP
RIGHT HIGH BEAM HEADLAMP
RIGHT LOW BEAM HEADLAMP
Z141 18 BK
Z142 18 BK
S151
(8W-15-5)
S152
(8W-15-8)
6
S134
(8W-15-6)
(8W-15-7)
Z141 14 BK
S133
(8W-15-9)
G106
(8W-15-6)
(8W-15-7)
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)


BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
87A
87
85
PARK LAMP RELAY
30
86
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
COMBINATION FLASHER
(8W-52-3)
(8W-52-5)
2
3
14 JB
1 JB
PARK LAMP RELAY OUTPUT
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
31 C3
21 C2
11 C1
20 C2
5 C2
26 C2
Z234 20 BK
L7 20 BK/YL
L7 18 BK/YL
L7 20 BK/YL
L61 20 TN/LG
L60 20 TN
S205
(8W-15-15)
G
E
H
F
TO C107
(8W-50-10)
(8W-50-11)
TO S309 (LHD)
(8W-12-12)
TO S326
(8W-50-7)
(8W-50-8)
TO C107
(8W-50-10)
(8W-50-11)
TO C106
(8W-50-7)
(8W-50-8)
Z234 18 BK
G200
(8W-15-15)

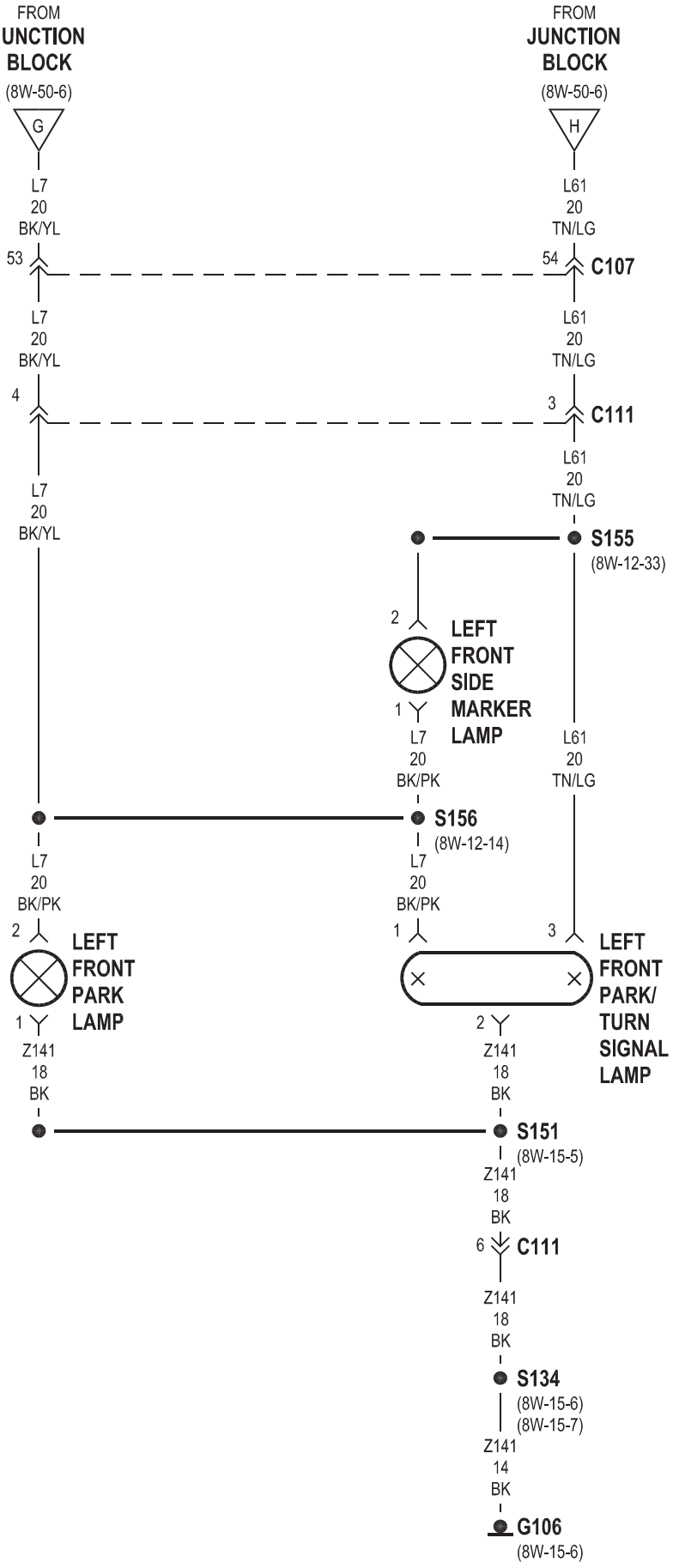
EXCEPT BUILT-UP-EXPORT



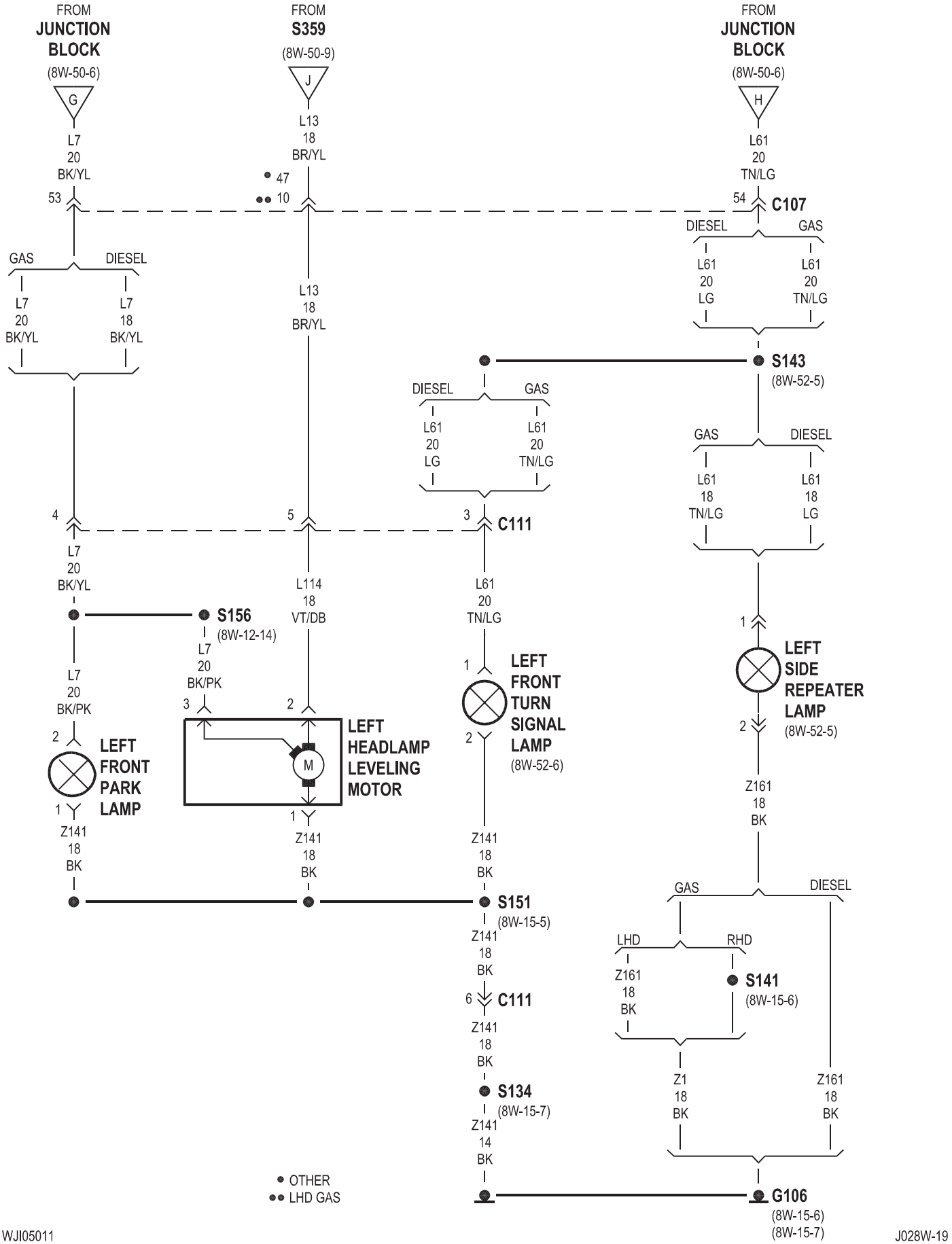

FROM JUNCTION BLOCK (8W-50-6)
E
L7 20 BK/YL
L7 18 BK/YL
I
TO C200 (8W-50-9)
S326 (8W-12-12)
L7 20 BK/YL
L7 18 BK/YL
3
PARK LAMP RELAY OUTPUT
RIGHT REAR LAMP ASSEMBLY (LHD) (8W-51-2)
53 C106
L7 20 BK/YL
4
L7 20 BK/YL
S153 (8W-12-14)
L7 20 BK/PK
2
RIGHT FRONT PARK LAMP
1
Z142 18 BK
FROM S359 (8W-50-9)
K
L13 18 BR/YL
38 C106
L13 18 BR/YL
5
L114 18 VT/DB
3 2
RIGHT HEADLAMP LEVELING MOTOR
M
1
Z142 18 BK
6 C112
Z142 18 BK
FROM JUNCTION BLOCK (8W-50-6)
F
L60 20 TN
54 C106
L60 20 TN
S142 (8W-52-3)
L60 20 TN
3 C112
L60 20 TN
1
RIGHT FRONT TURN SIGNAL LAMP (8W-52-4)
2
Z142 18 BK
S152 (8W-15-8)
L60 18 TN
1
RIGHT SIDE REPEATER LAMP (8W-52-3)
2
Z142 18 BK
S133 (8W-15-9) (8W-15-10) (8W-15-11)
Z142 18 BK
G108 (8W-15-9) (8W-15-10) (8W-15-11)


FROM
S326
(8W-50-8)
I
L7
18
BK/YL
37
C200
L7
18
BK/YL
2
HEADLAMP
LEVELING
SWITCH
2
1
3
0
3
1
Z234
20
BK
L13
20
BR/YL
38
C200
L13
18
BR/YL
S359
L13
18
BR/YL
L13
18
BR/YL
S205
(8W-15-15)
Z234
18
BK
J
K
TO
C107
(8W-50-11)
TO
C106
(8W-50-8)
G200
(8W-15-15)

EXCEPT BUILT-UP-EXPORT

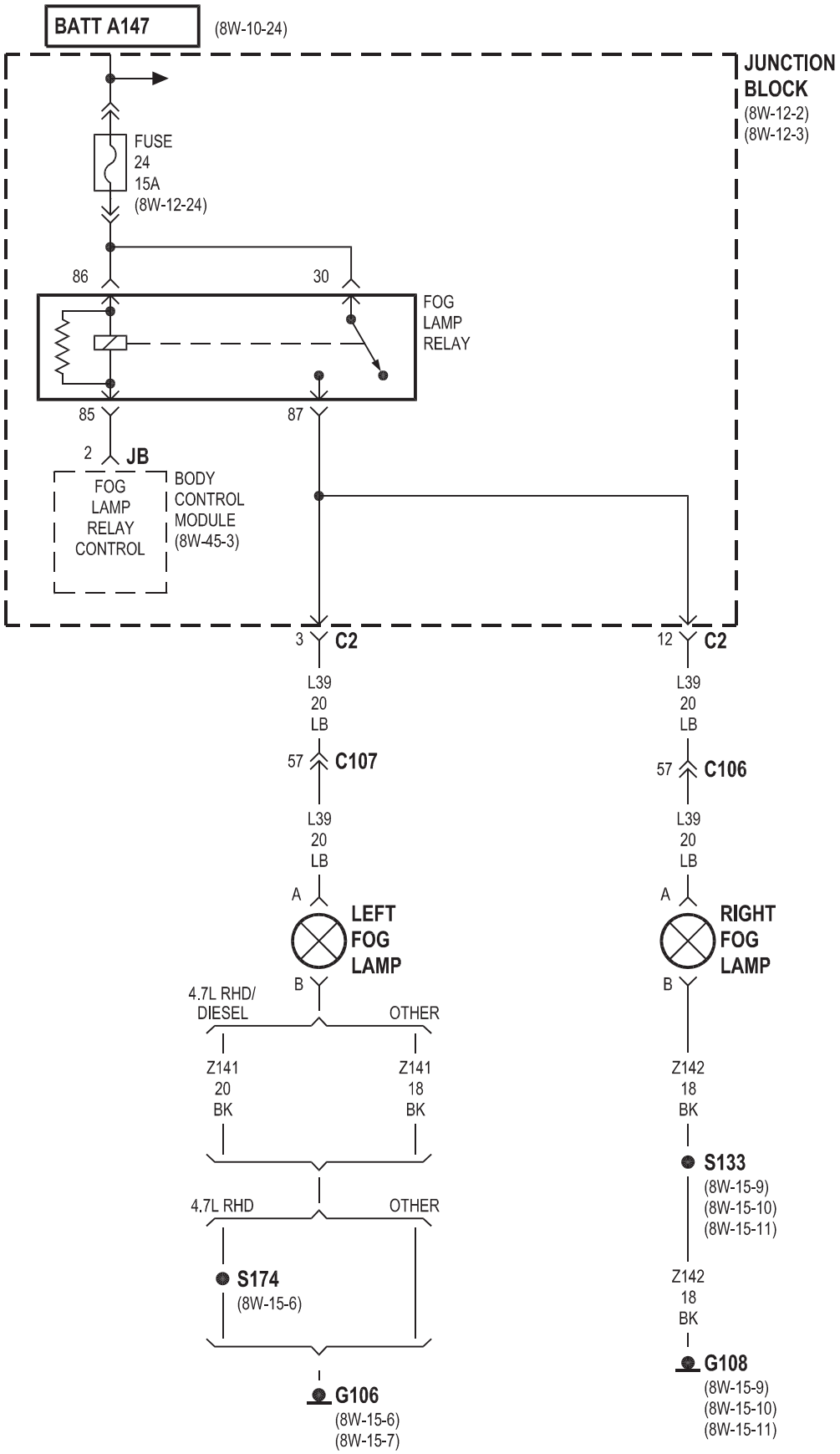


BUILT-UP-EXPORT

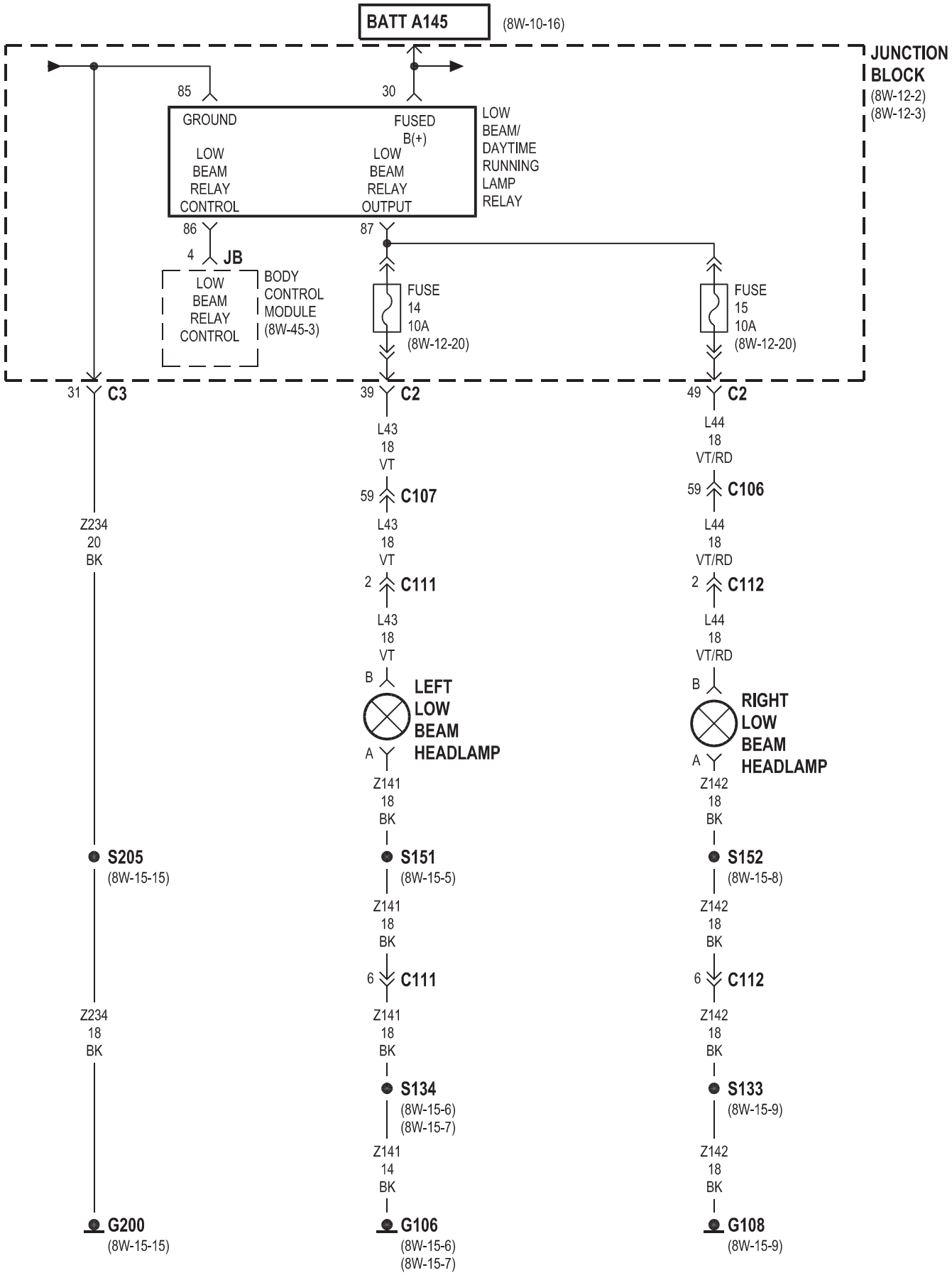


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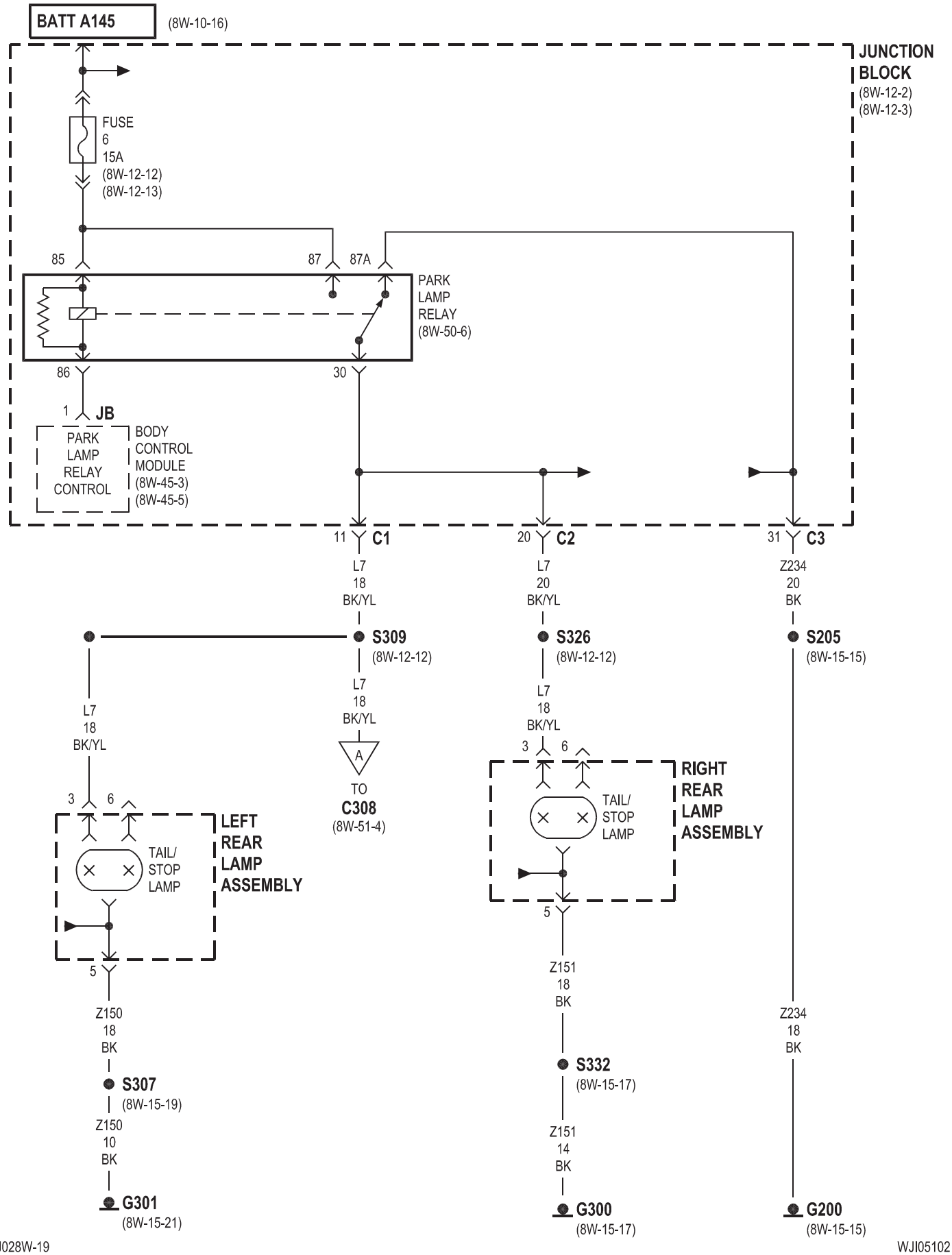

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 24 15A
(8W-12-24)
86
30
FOG LAMP RELAY
85
87
2
JB
FOG LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
3
C2
12
C2
L39 20 LB
57
C107
C106
A
LEFT FOG LAMP
RIGHT FOG LAMP
B
4.7L RHD/ DIESEL
OTHER
Z141 20 BK
Z141 18 BK
Z142 18 BK
S133
(8W-15-9)
(8W-15-10)
(8W-15-11)
4.7L RHD
S174
(8W-15-6)
G106
(8W-15-6)
(8W-15-7)
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)

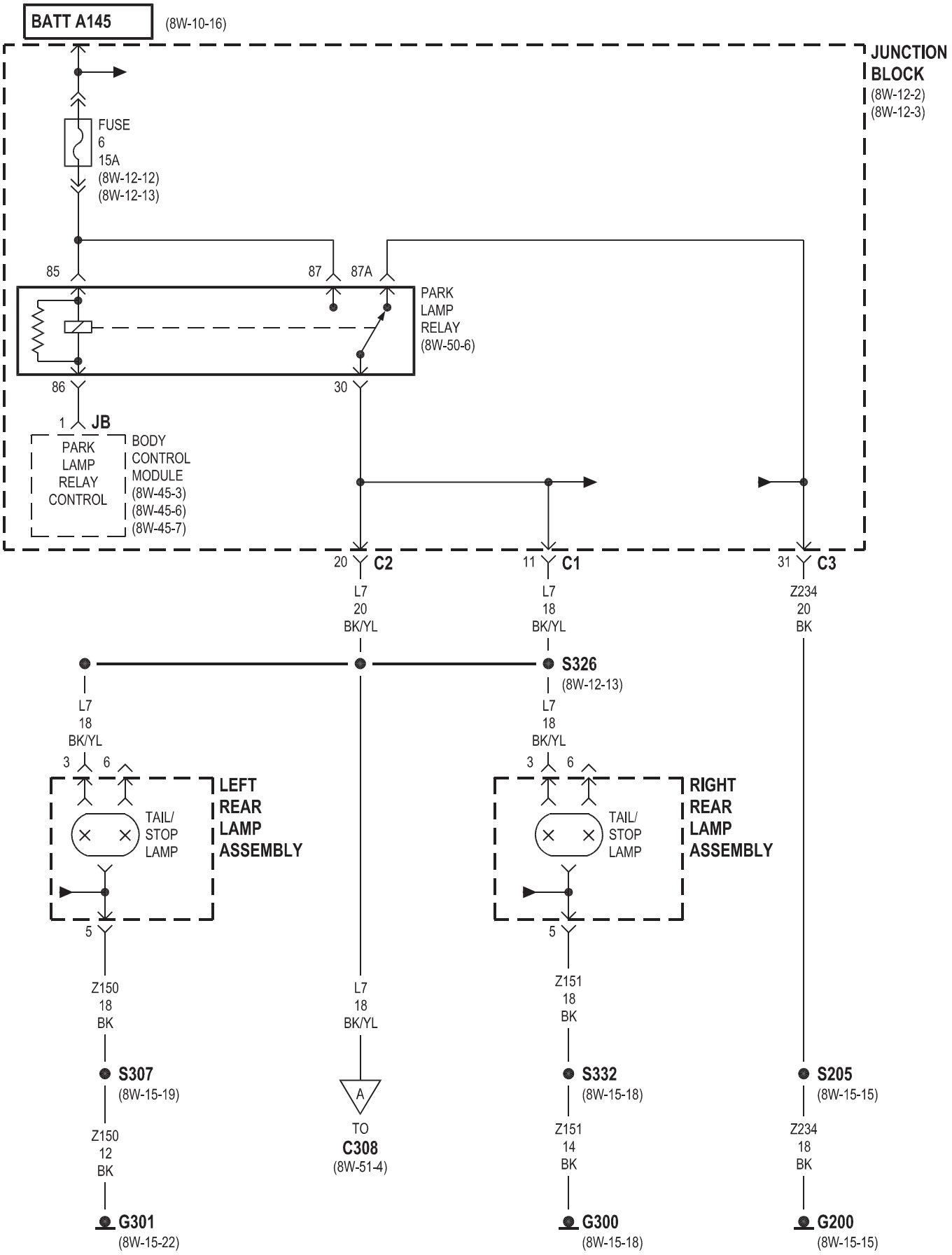
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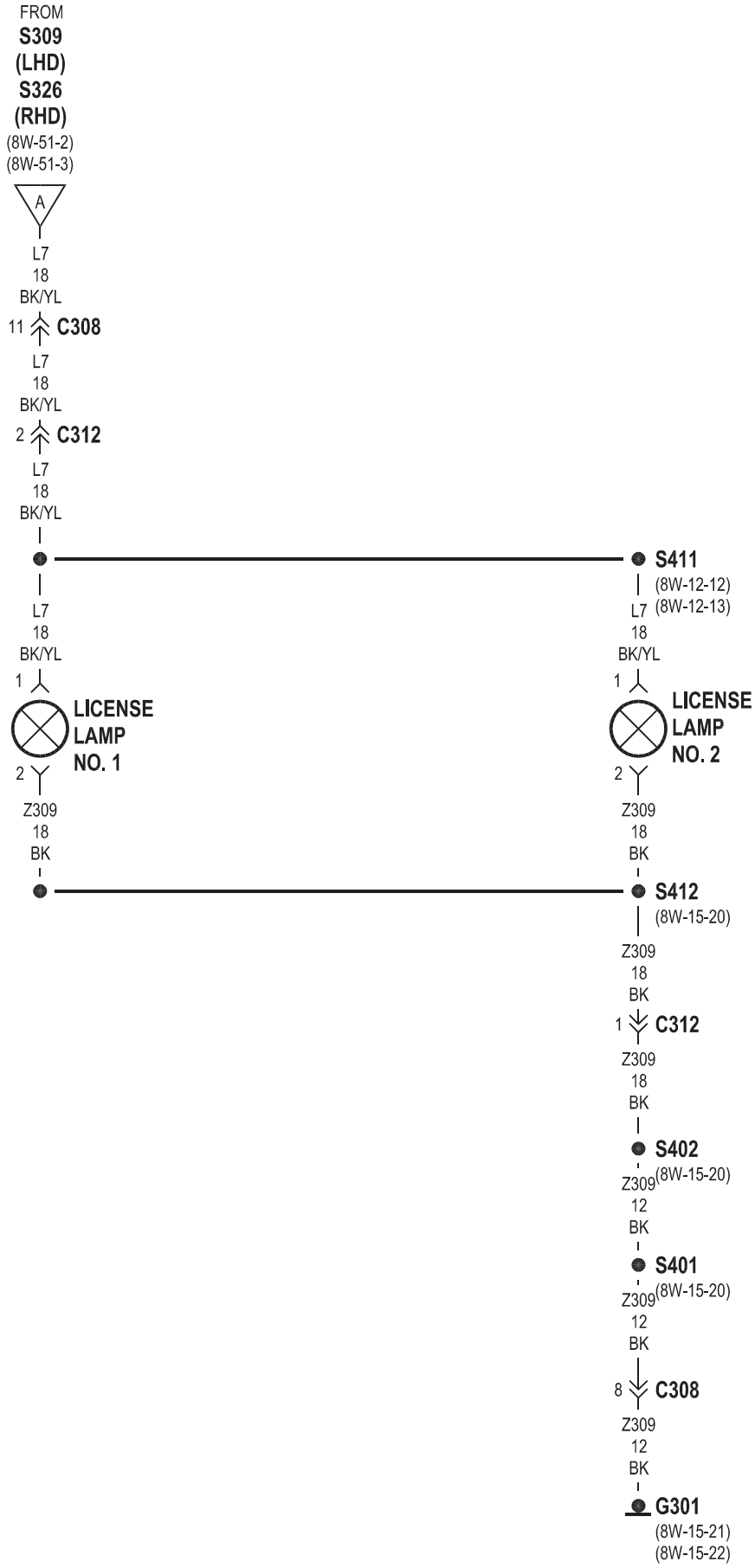

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
85
30
GROUND
LOW BEAM RELAY CONTROL
FUSED B(+)
LOW BEAM RELAY OUTPUT
LOW BEAM/ DAYTIME RUNNING LAMP RELAY
86
87
4
JB
LOW BEAM RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
FUSE 14 10A
(8W-12-20)
FUSE 15 10A
(8W-12-20)
31
C3
39
C2
49
C2
Z234 20 BK
L43 18 VT
L44 18 VT/RD
59
C107
59
C106
L43 18 VT
L44 18 VT/RD
2
C111
2
C112
L43 18 VT
L44 18 VT/RD
B
A
LEFT LOW BEAM HEADLAMP
RIGHT LOW BEAM HEADLAMP
Z141 18 BK
Z142 18 BK
S205
(8W-15-15)
S151
(8W-15-5)
S152
(8W-15-8)
Z141 18 BK
Z142 18 BK
6
C111
6
C112
Z234 18 BK
Z141 18 BK
Z142 18 BK
S134
(8W-15-6)
(8W-15-7)
S133
(8W-15-9)
Z141 14 BK
Z142 18 BK
G200
(8W-15-15)
G106
(8W-15-6)
(8W-15-7)
G108
(8W-15-9)

8W-51 REAR LIGHTING

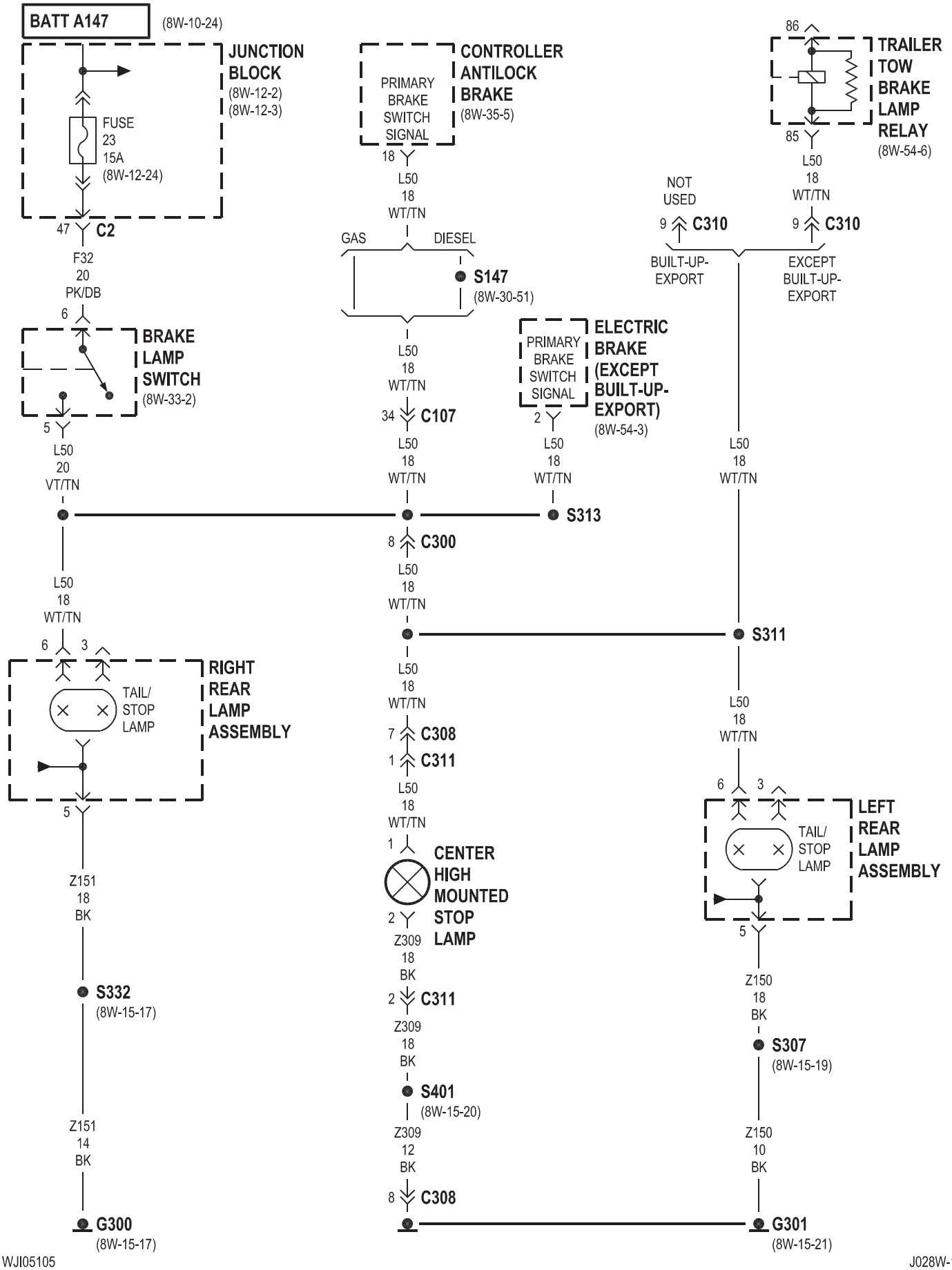
Component	Page
Adjustable Pedals Module	8W-51-7
Automatic Day/Night Mirror	8W-51-7, 8
Back-Up Lamp Relay	8W-51-9
Body Control Module	8W-51-2, 3, 10
Brake Lamp Switch	8W-51-5, 6
Center High Mounted Stop Lamp	8W-51-5, 6
Controller Antilock Brake	8W-51-5, 6
Electric Brake	8W-51-5
Fuse 6	8W-51-2, 3
Fuse 20	8W-51-9
Fuse 23	8W-51-5, 6
Fuse 27	8W-51-10
G200	8W-51-2, 3
G300	8W-51-2, 3, 5, 6, 7, 8, 10
G301	8W-51-2, 3, 4, 5, 6, 7, 8, 10
Junction Block	8W-51-2, 3, 5, 6, 9, 10
Left Rear Lamp Assembly	8W-51-2, 3, 5, 6, 7, 8, 10
License Lamp No. 1	8W-51-4
License Lamp No. 2	8W-51-4
Park Lamp Relay	8W-51-2, 3
Park/Neutral Position Switch	8W-51-7, 8
Rear Fog Lamp Relay	8W-51-10
Right Rear Lamp Assembly	8W-51-2, 3, 5, 6, 7, 8, 10
Shifter Assembly	8W-51-9
Trailer Tow Brake Lamp Relay	8W-51-5
Trailer Tow Connector	8W-51-7
Transmission Solenoid/TRS Assembly	8W-51-7, 8

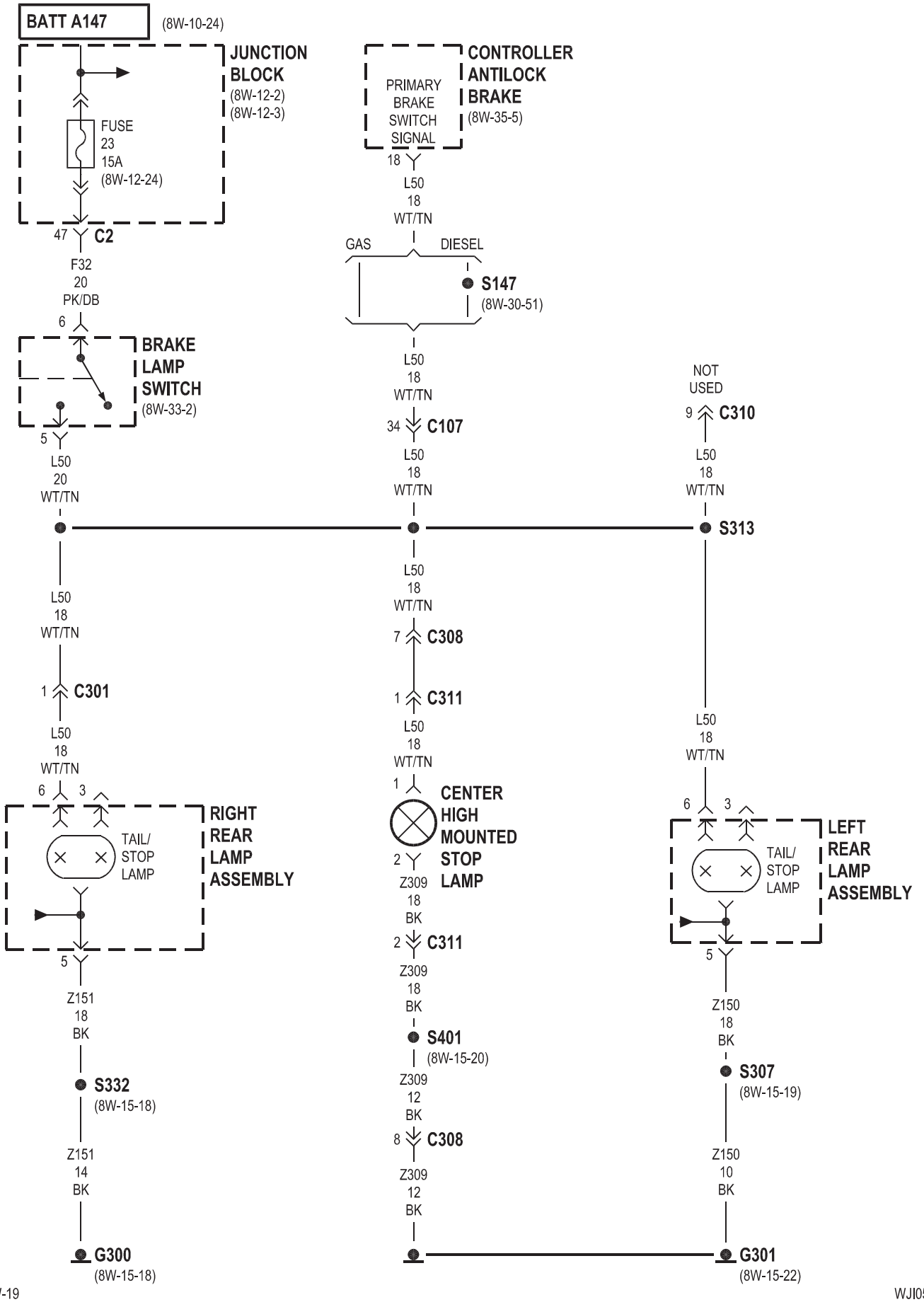

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
85
87
87A
PARK LAMP RELAY
(8W-50-6)
86
30
1
JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-5)
11
C1
20
C2
31
C3
L7
18
BK/YL
L7
20
BK/YL
Z234
20
BK
S309
(8W-12-12)
S326
(8W-12-12)
S205
(8W-15-15)
L7
18
BK/YL
A
TO
C308
(8W-51-4)
L7
18
BK/YL
3
6
TAIL/ STOP LAMP
LEFT REAR LAMP ASSEMBLY
5
Z150
18
BK
S307
(8W-15-19)
Z150
10
BK
G301
(8W-15-21)
L7
18
BK/YL
3
6
TAIL/ STOP LAMP
RIGHT REAR LAMP ASSEMBLY
5
Z151
18
BK
S332
(8W-15-17)
Z151
14
BK
G300
(8W-15-17)
Z234
18
BK
G200
(8W-15-15)

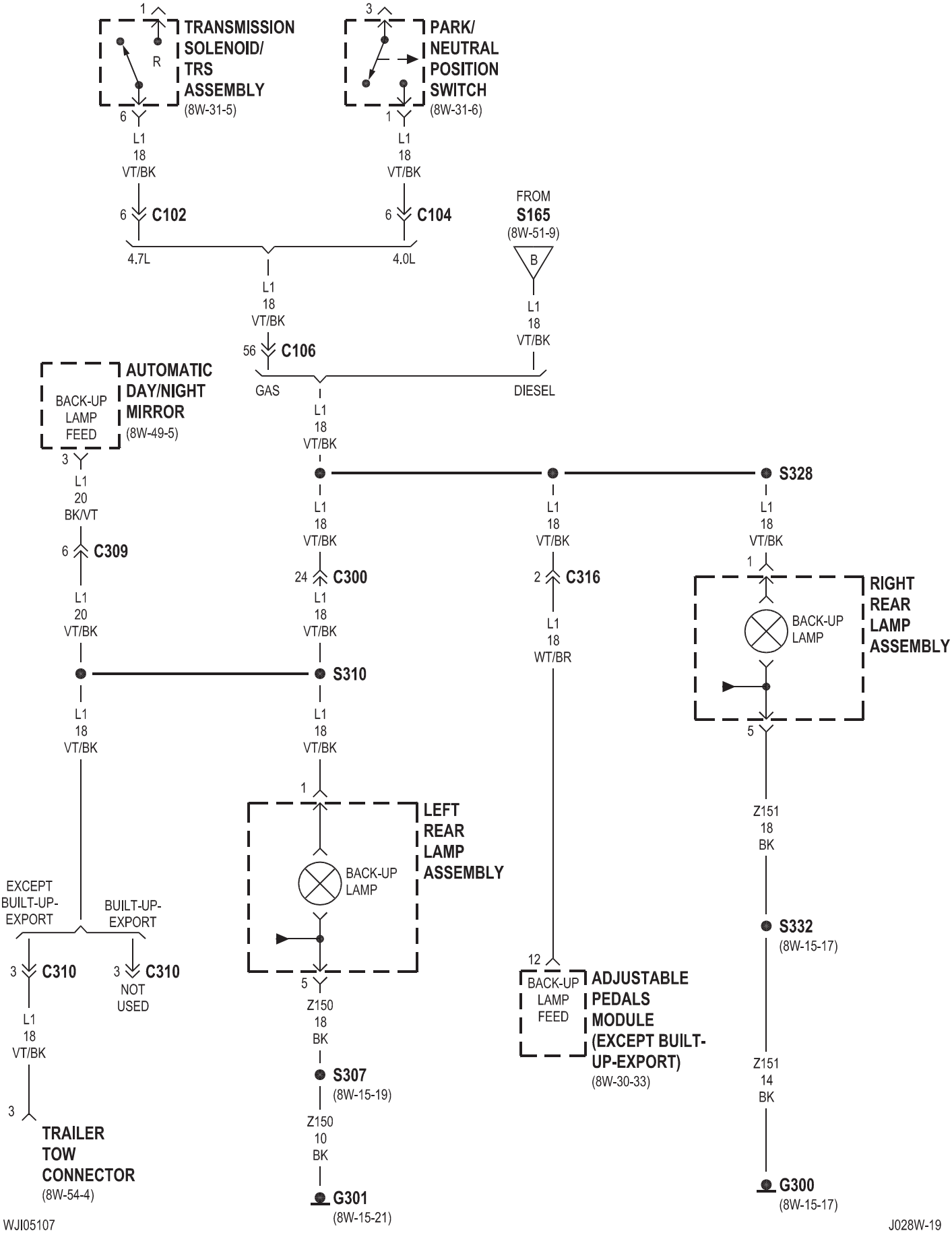

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
85
87
87A
PARK LAMP RELAY
(8W-50-6)
86
30
1
JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-6)
(8W-45-7)
20
C2
11
C1
31
C3
L7
20
BK/YL
L7
18
BK/YL
Z234
20
BK
S326
(8W-12-13)
L7
18
BK/YL
3
6
LEFT REAR LAMP ASSEMBLY
TAIL/ STOP LAMP
5
L7
18
BK/YL
3
6
RIGHT REAR LAMP ASSEMBLY
TAIL/ STOP LAMP
5
Z150
18
BK
S307
(8W-15-19)
Z150
12
BK
G301
(8W-15-22)
L7
18
BK/YL
A
TO
C308
(8W-51-4)
Z151
18
BK
S332
(8W-15-18)
Z151
14
BK
G300
(8W-15-18)
S205
(8W-15-15)
Z234
18
BK
G200
(8W-15-15)


FROM
S309
(LHD)
S326
(RHD)
(8W-51-2)
(8W-51-3)
A
L7
18
BK/YL
11
C308
L7
18
BK/YL
2
C312
L7
18
BK/YL
S411
(8W-12-12)
(8W-12-13)
L7
18
BK/YL
1
LICENSE
LAMP
NO. 1
2
Z309
18
BK
1
LICENSE
LAMP
NO. 2
2
Z309
18
BK
S412
(8W-15-20)
Z309
18
BK
1
C312
Z309
18
BK
S402
Z309
(8W-15-20)
12
BK
S401
Z309
(8W-15-20)
12
BK
8
C308
Z309
12
BK
G301
(8W-15-21)
(8W-15-22)

LHD

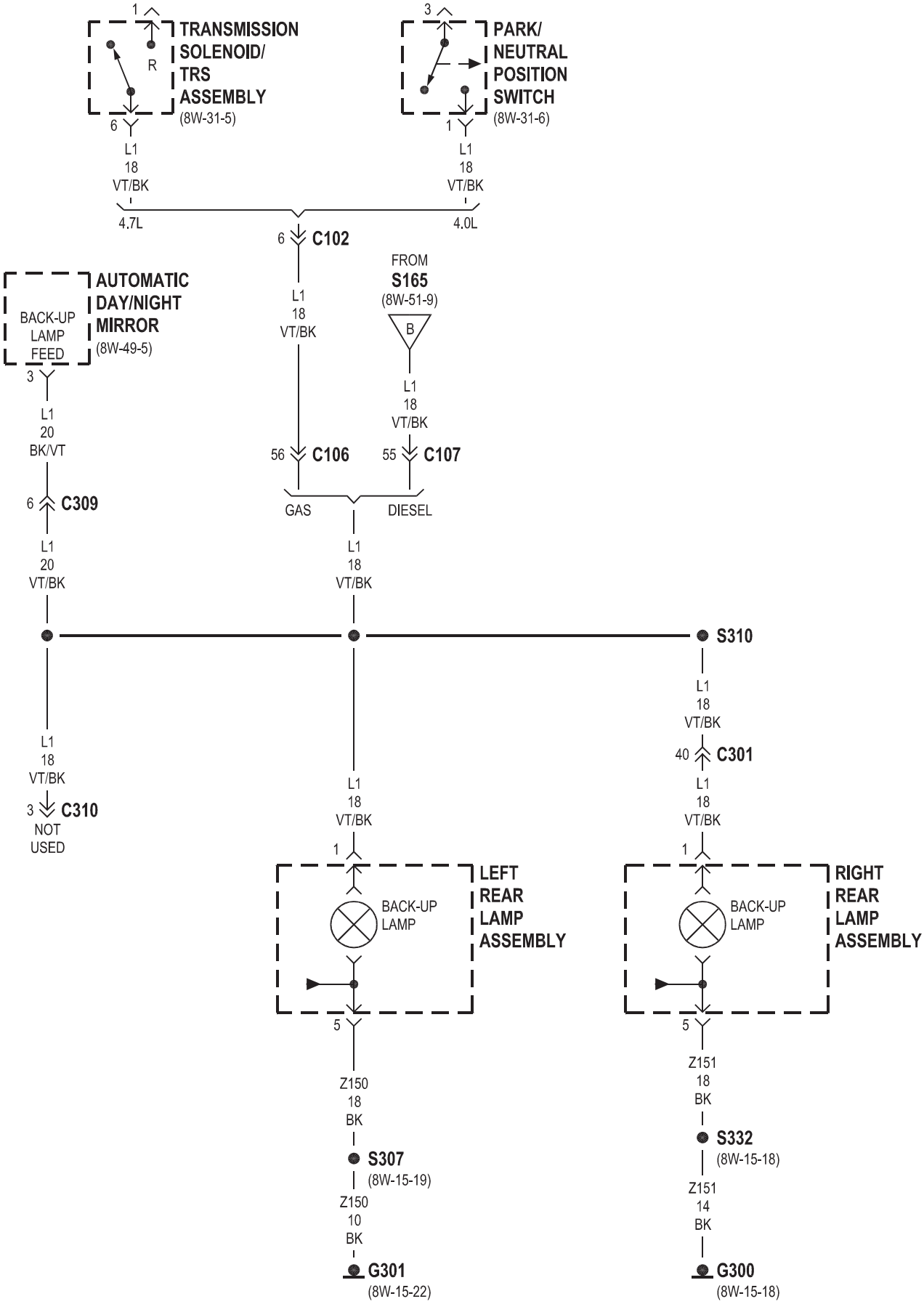

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
23
15A
(8W-12-24)
47
C2
F32
20
PK/DB
6
BRAKE LAMP SWITCH
(8W-33-2)
5
L50
20
VT/TN
CONTROLLER ANTILOCK BRAKE
(8W-35-5)
PRIMARY BRAKE SWITCH SIGNAL
18
L50
18
WT/TN
GAS
DIESEL
S147
(8W-30-51)
L50
18
WT/TN
34
C107
L50
18
WT/TN
PRIMARY BRAKE SWITCH SIGNAL
ELECTRIC BRAKE (EXCEPT BUILT-UP-EXPORT)
(8W-54-3)
2
L50
18
WT/TN
S313
8
C300
L50
18
WT/TN
TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)
86
85
L50
18
WT/TN
NOT USED
9
C310
BUILT-UP-EXPORT
9
C310
EXCEPT BUILT-UP-EXPORT
L50
18
WT/TN
S311
L50
18
WT/TN
6
3
TAIL/ STOP LAMP
RIGHT REAR LAMP ASSEMBLY
5
Z151
18
BK
S332
(8W-15-17)
Z151
14
BK
G300
(8W-15-17)
L50
18
WT/TN
7
C308
1
C311
L50
18
WT/TN
1
CENTER HIGH MOUNTED STOP LAMP
2
Z309
18
BK
2
C311
Z309
18
BK
S401
(8W-15-20)
Z309
12
BK
8
C308
6
3
TAIL/ STOP LAMP
LEFT REAR LAMP ASSEMBLY
5
Z150
18
BK
S307
(8W-15-19)
Z150
10
BK
G301
(8W-15-21)

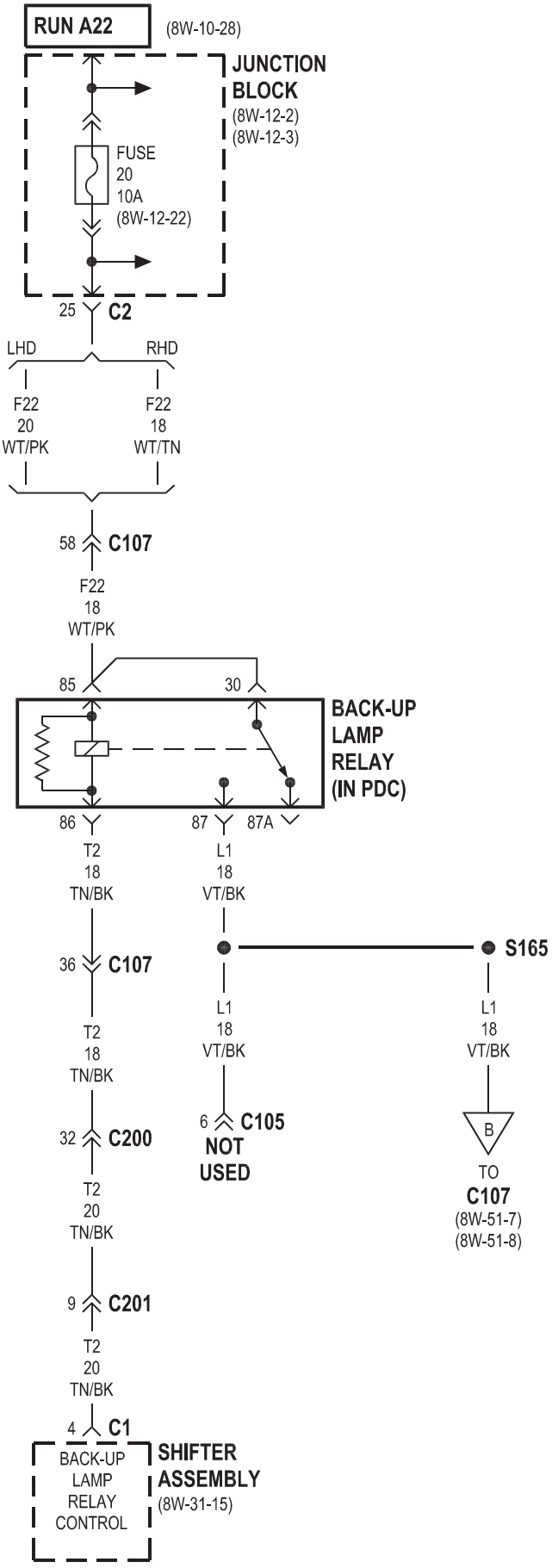

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 23 15A
(8W-12-24)
47 C2
F32 20 PK/DB
6
BRAKE LAMP SWITCH
(8W-33-2)
5
L50 20 WT/TN
CONTROLLER ANTILOCK BRAKE
(8W-35-5)
PRIMARY BRAKE SWITCH SIGNAL
18
L50 18 WT/TN
GAS
DIESEL
S147
(8W-30-51)
L50 18 WT/TN
34 C107
L50 18 WT/TN
NOT USED
9 C310
L50 18 WT/TN
S313
L50 18 WT/TN
7 C308
1 C311
L50 18 WT/TN
1
CENTER HIGH MOUNTED STOP LAMP
2
Z309 18 BK
2 C311
Z309 18 BK
S401
(8W-15-20)
Z309 12 BK
8 C308
Z309 12 BK
G301
(8W-15-22)
L50 18 WT/TN
1 C301
L50 18 WT/TN
6 3
RIGHT REAR LAMP ASSEMBLY
TAIL/ STOP LAMP
5
Z151 18 BK
S332
(8W-15-18)
Z151 14 BK
G300
(8W-15-18)
L50 18 WT/TN
6 3
LEFT REAR LAMP ASSEMBLY
TAIL/ STOP LAMP
5
Z150 18 BK
S307
(8W-15-19)
Z150 10 BK

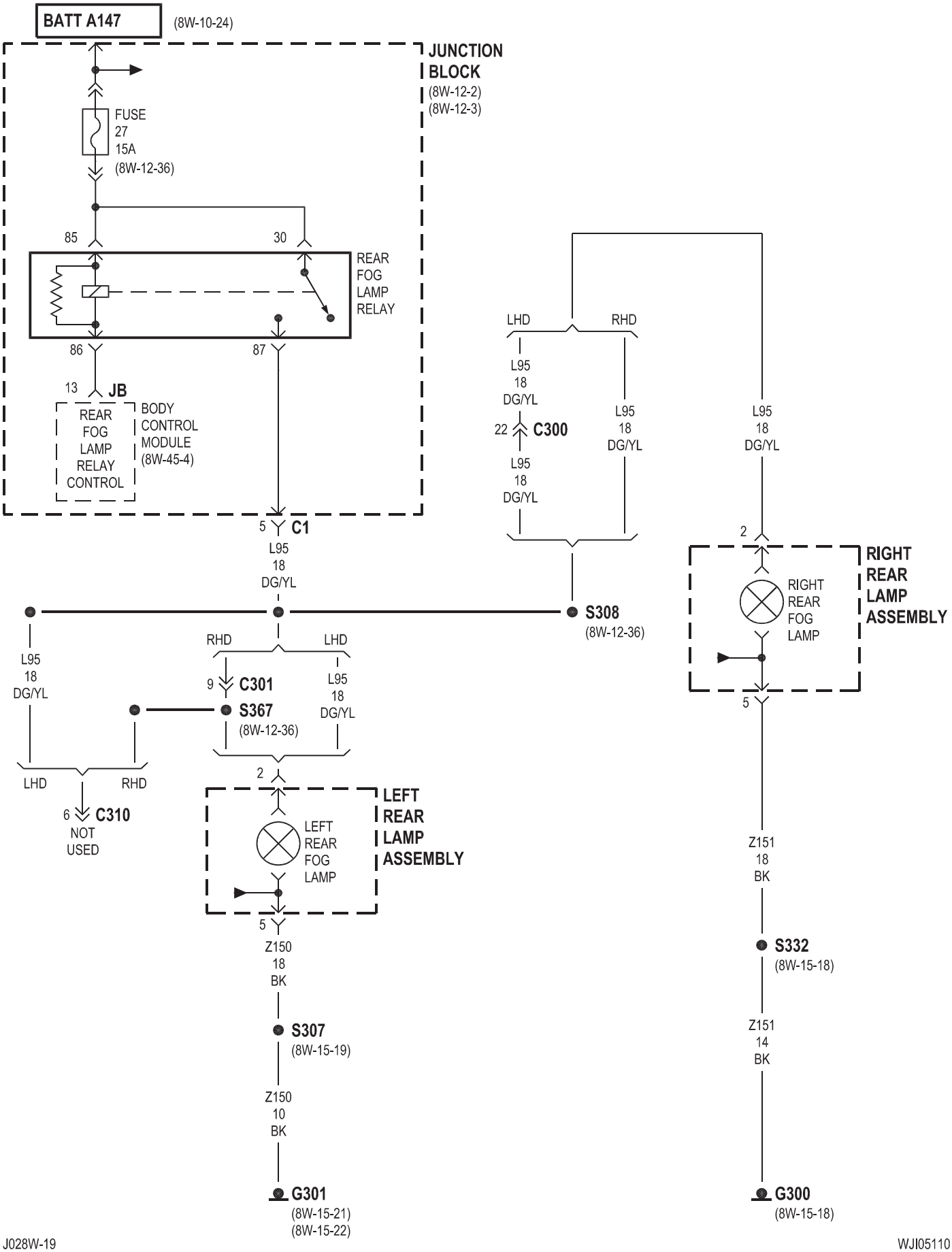


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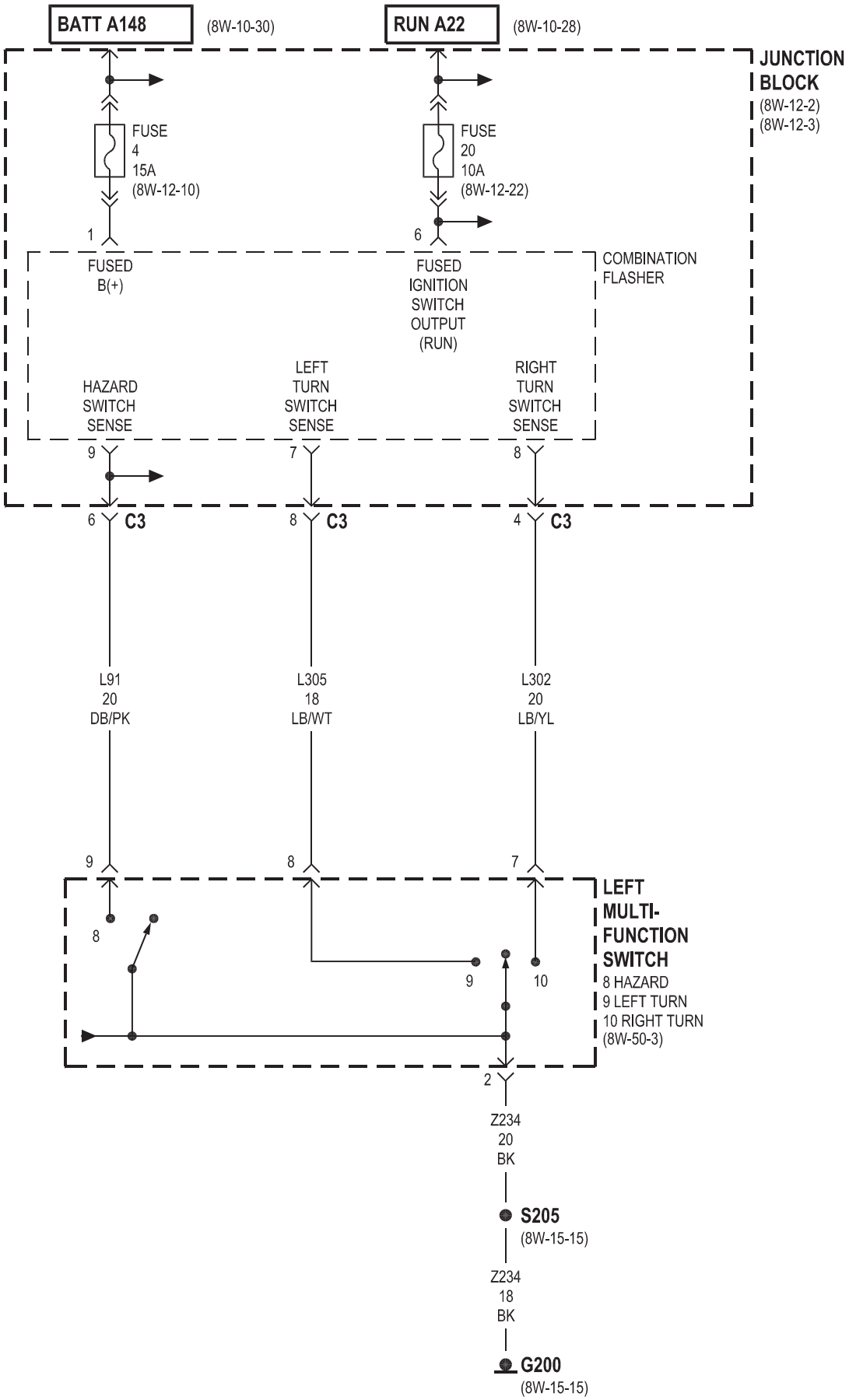

1
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)
R
6
L1
18
VT/BK
4.7L
3
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
1
L1
18
VT/BK
4.0L
6 C102
L1
18
VT/BK
FROM
S165
(8W-51-9)
B
L1
18
VT/BK
AUTOMATIC DAY/NIGHT MIRROR
(8W-49-5)
BACK-UP LAMP FEED
3
L1
20
BK/VT
6 C309
L1
20
VT/BK
56 C106
55 C107
GAS
DIESEL
L1
18
VT/BK
S310
L1
18
VT/BK
40 C301
L1
18
VT/BK
3 C310
NOT USED
L1
18
VT/BK
1
LEFT REAR LAMP ASSEMBLY
BACK-UP LAMP
5
Z150
18
BK
S307
(8W-15-19)
Z150
10
BK
G301
(8W-15-22)
L1
18
VT/BK
1
RIGHT REAR LAMP ASSEMBLY
BACK-UP LAMP
5
Z151
18
BK
S332
(8W-15-18)
Z151
14
BK
G300
(8W-15-18)

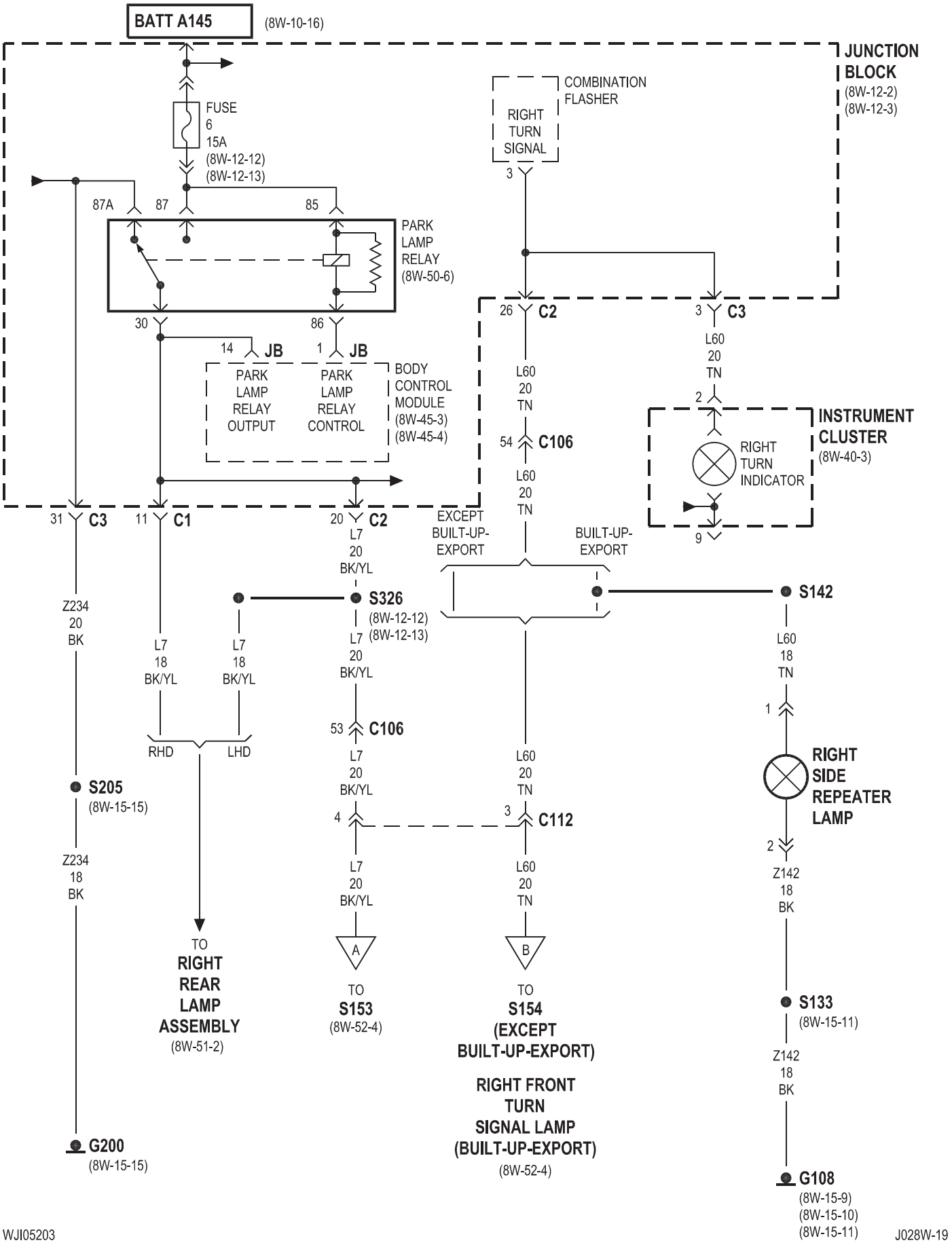

RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
10A
(8W-12-22)
25
C2
LHD
RHD
F22
20
WT/PK
F22
18
WT/TN
58
C107
F22
18
WT/PK
85
30
BACK-UP LAMP RELAY (IN PDC)
86
87
87A
T2
18
TN/BK
L1
18
VT/BK
36
C107
T2
18
TN/BK
S165
L1
18
VT/BK
L1
18
VT/BK
32
C200
T2
20
TN/BK
6
C105
NOT USED
B
TO
C107
(8W-51-7)
(8W-51-8)
9
C201
T2
20
TN/BK
4
C1
BACK-UP LAMP RELAY CONTROL
SHIFTER ASSEMBLY
(8W-31-15)

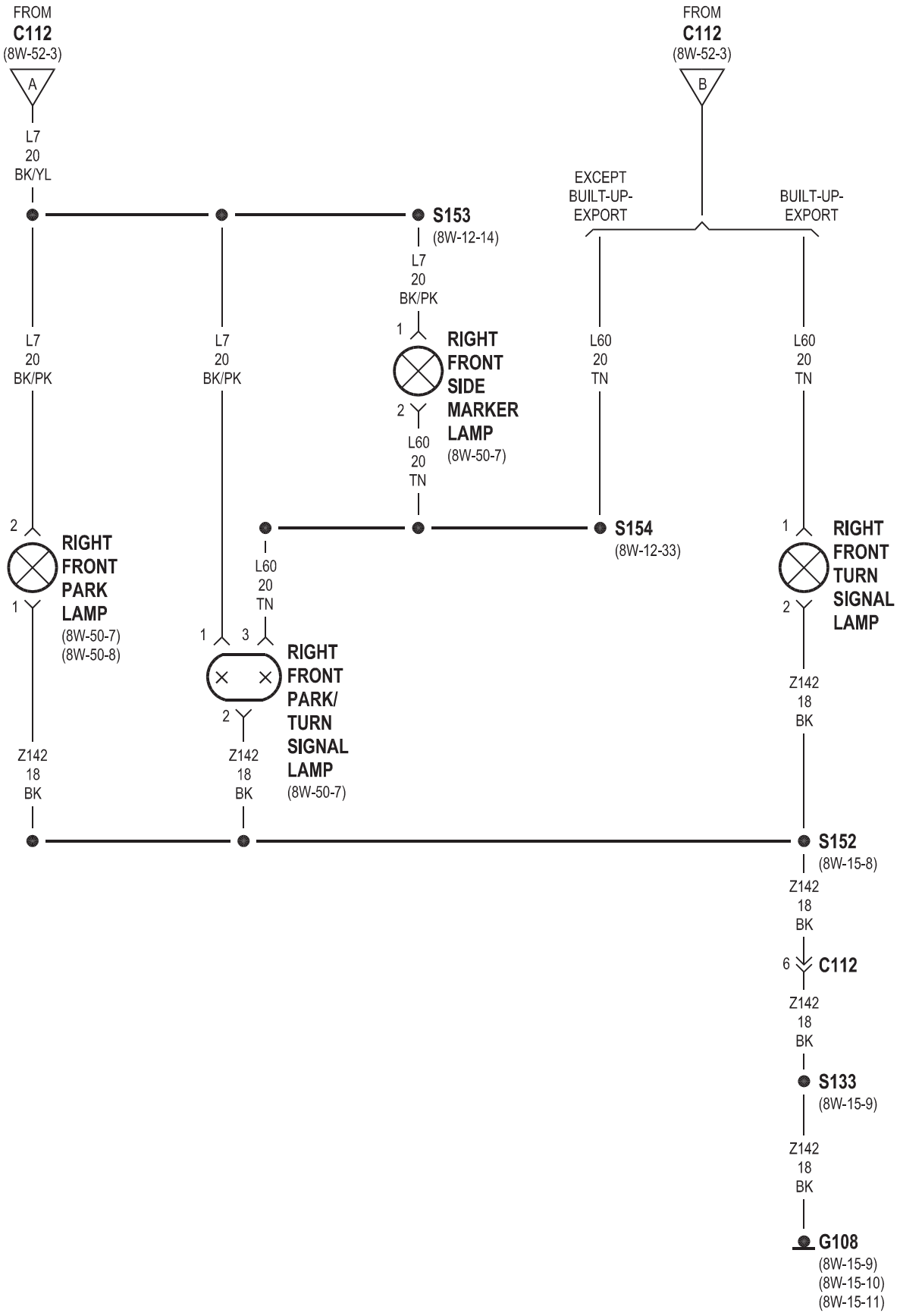

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE 27 15A
(8W-12-36)
85
30
REAR FOG LAMP RELAY
86
87
13
JB
REAR FOG LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-4)
5
C1
L95 18 DG/YL
LHD
RHD
L95 18 DG/YL
22
C300
L95 18 DG/YL
L95 18 DG/YL
L95 18 DG/YL
S308
(8W-12-36)
2
RIGHT REAR LAMP ASSEMBLY
RIGHT REAR FOG LAMP
5
L95 18 DG/YL
RHD
LHD
9
C301
S367
(8W-12-36)
L95 18 DG/YL
LHD
RHD
6
C310
NOT USED
2
LEFT REAR LAMP ASSEMBLY
LEFT REAR FOG LAMP
5
Z150 18 BK
S307
(8W-15-19)
Z150 10 BK
G301
(8W-15-21)
(8W-15-22)
Z151 18 BK
S332
(8W-15-18)
Z151 14 BK
G300
(8W-15-18)

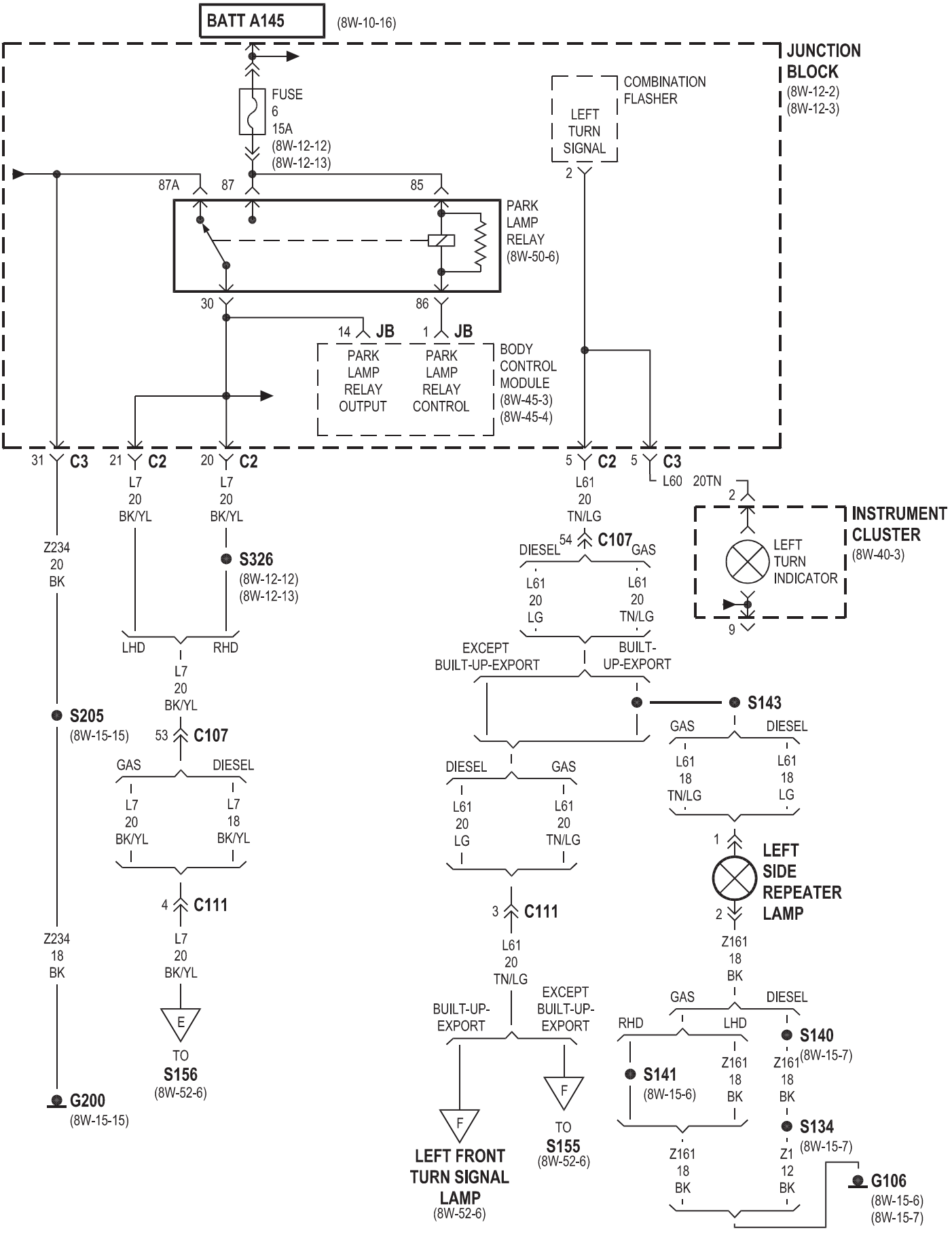
8W-52 TURN SIGNALS

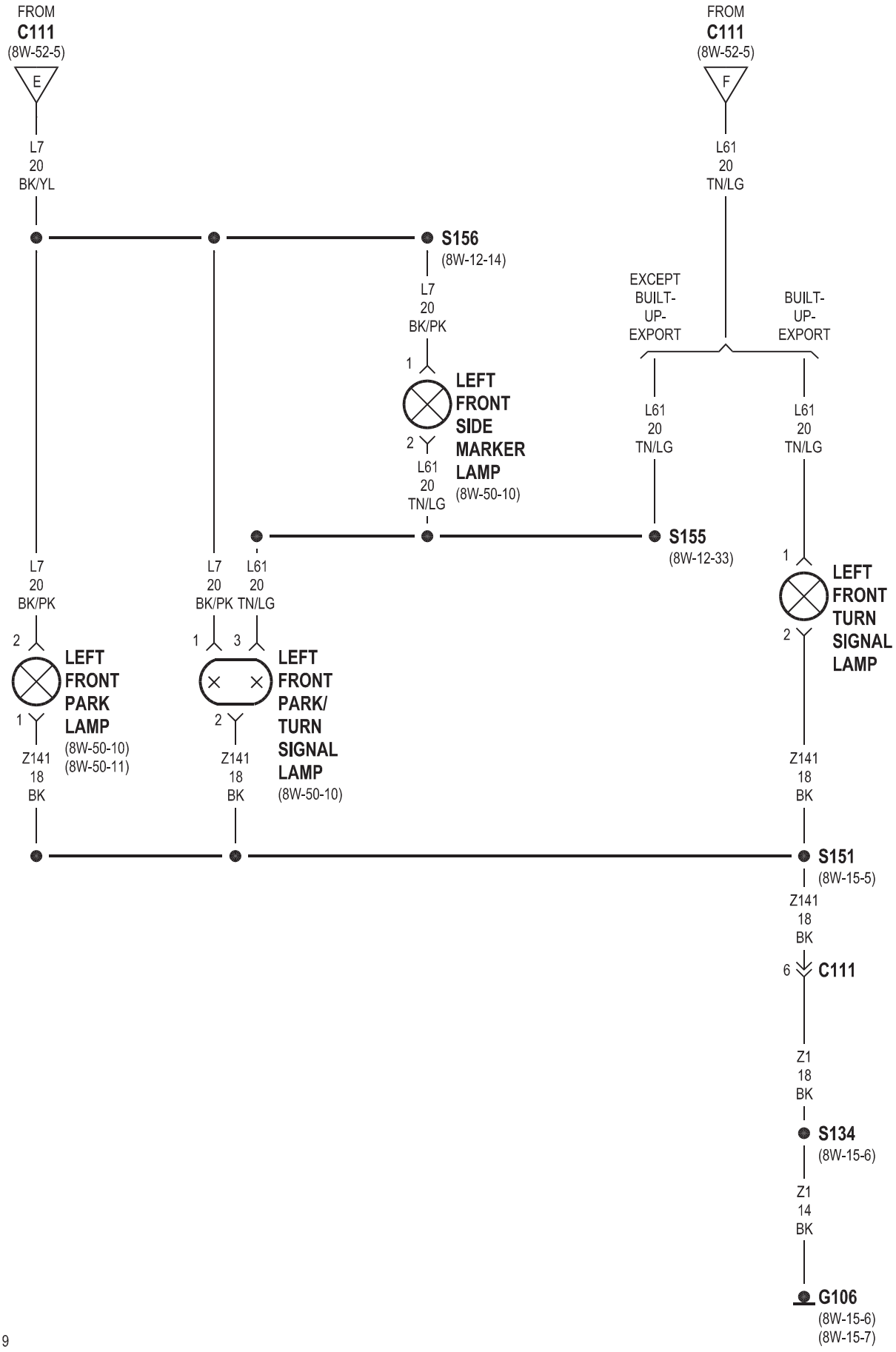
Component	Page
Body Control Module	8W-52-3, 5
Combination Flasher	8W-52-2, 3, 5, 7, 8
Fuse 4	8W-52-2
Fuse 6	8W-52-3, 5
Fuse 20	8W-52-2
G106	8W-52-5, 6
G108	8W-52-3, 4
G200	8W-52-2, 3, 5
G300	8W-52-7, 8
G301	8W-52-7, 8
Instrument Cluster	8W-52-3, 5
Junction Block	8W-52-2, 3, 5, 7, 8
Left Front Park Lamp	8W-52-6
Left Front Park/Turn Signal Lamp	8W-52-6
Left Front Side Marker Lamp	8W-52-6
Left Front Turn Signal Lamp	8W-52-5, 6
Left Multi-Function Switch	8W-52-2
Left Rear Lamp Assembly	8W-52-7, 8
Left Side Repeater Lamp	8W-52-5
Park Lamp Relay	8W-52-3, 5
Right Front Park Lamp	8W-52-4
Right Front Park/Turn Signal Lamp	8W-52-4
Right Front Side Marker Lamp	8W-52-4
Right Front Turn Signal Lamp	8W-52-3, 4
Right Rear Lamp Assembly	8W-52-3, 7, 8
Right Side Repeater Lamp	8W-52-3
Trailer Tow Left Turn Relay	8W-52-7
Trailer Tow Right Turn Relay	8W-52-7

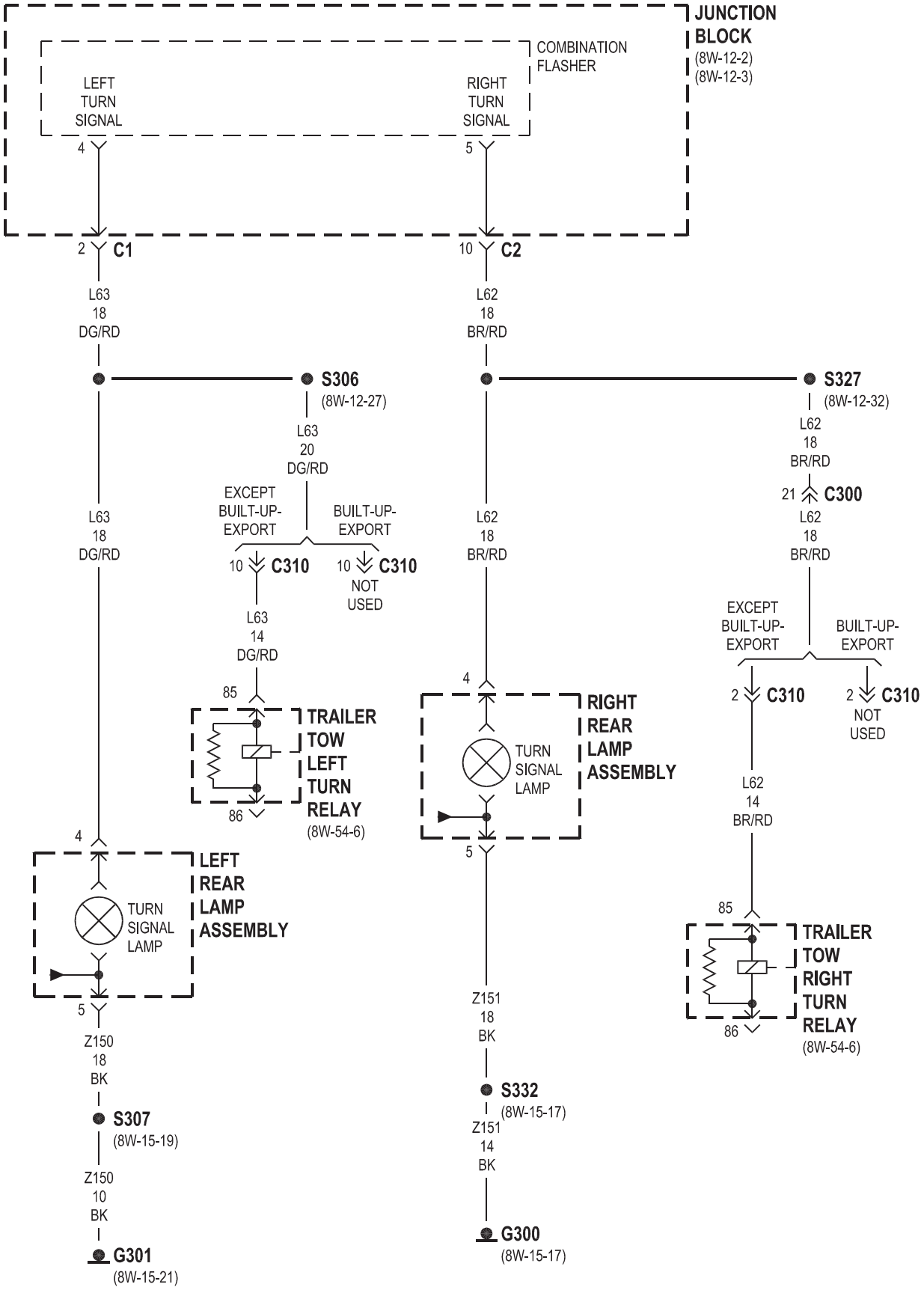

BATT A148
(8W-10-30)
RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
4
15A
(8W-12-10)
FUSE
20
10A
(8W-12-22)
1
6
FUSED B(+)
FUSED IGNITION SWITCH OUTPUT (RUN)
COMBINATION FLASHER
HAZARD SWITCH SENSE
LEFT TURN SWITCH SENSE
RIGHT TURN SWITCH SENSE
9
7
8
6 C3
8 C3
4 C3
L91
20
DB/PK
L305
18
LB/WT
L302
20
LB/YL
9
8
7
8
9
10
LEFT MULTI-FUNCTION SWITCH
8 HAZARD
9 LEFT TURN
10 RIGHT TURN
(8W-50-3)
2
Z234
20
BK
S205
(8W-15-15)
Z234
18
BK
G200
(8W-15-15)

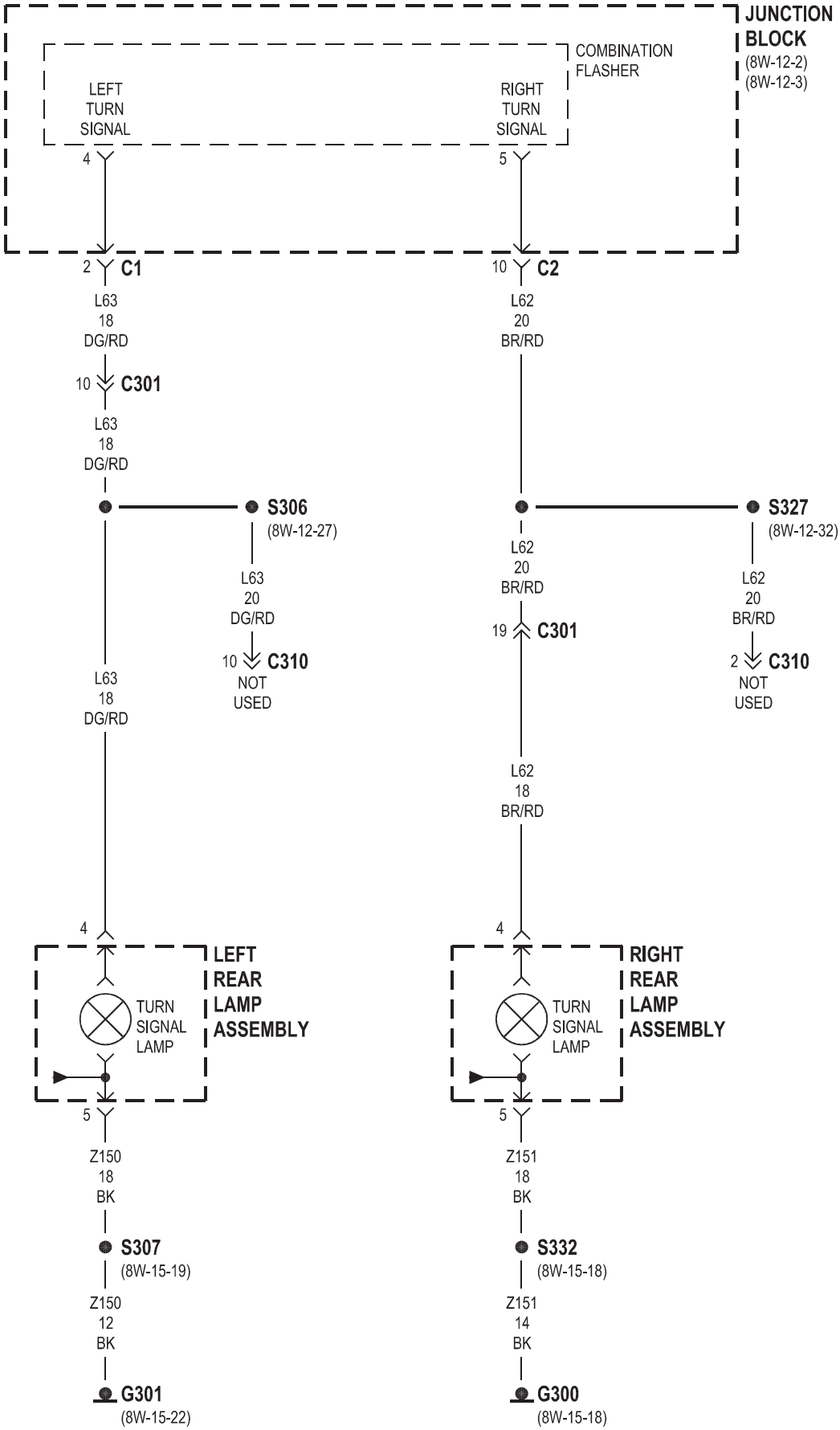

BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
COMBINATION FLASHER
RIGHT TURN SIGNAL
3
87A
87
85
PARK LAMP RELAY
(8W-50-6)
30
86
14 JB
1 JB
PARK LAMP RELAY OUTPUT
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
26 C2
3 C3
L60
20
TN
54 C106
2
INSTRUMENT CLUSTER
(8W-40-3)
RIGHT TURN INDICATOR
9
31 C3
11 C1
20 C2
L7
20
BK/YL
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
S326
(8W-12-12)
(8W-12-13)
S142
Z234
20
BK
L7
18
BK/YL
L7
18
BK/YL
L7
20
BK/YL
L60
18
TN
1
53 C106
RHD
LHD
RIGHT SIDE REPEATER LAMP
S205
(8W-15-15)
4
3 C112
2
Z234
18
BK
Z142
18
BK
TO
RIGHT REAR LAMP ASSEMBLY
(8W-51-2)
A
B
TO
S153
(8W-52-4)
TO
S154
(EXCEPT BUILT-UP-EXPORT)
RIGHT FRONT TURN SIGNAL LAMP
(BUILT-UP-EXPORT)
(8W-52-4)
S133
(8W-15-11)
G200
(8W-15-15)
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)


FROM
C112
(8W-52-3)
A
L7
20
BK/YL
L7
20
BK/PK
2
RIGHT
FRONT
PARK
LAMP
(8W-50-7)
(8W-50-8)
1
Z142
18
BK
L7
20
BK/PK
1
3
2
RIGHT
FRONT
PARK/
TURN
SIGNAL
LAMP
(8W-50-7)
Z142
18
BK
S153
(8W-12-14)
L7
20
BK/PK
1
RIGHT
FRONT
SIDE
MARKER
LAMP
(8W-50-7)
2
L60
20
TN
L60
20
TN
S154
(8W-12-33)
FROM
C112
(8W-52-3)
B
EXCEPT
BUILT-UP-
EXPORT
L60
20
TN
BUILT-UP-
EXPORT
L60
20
TN
1
RIGHT
FRONT
TURN
SIGNAL
LAMP
2
Z142
18
BK
S152
(8W-15-8)
Z142
18
BK
6
C112
Z142
18
BK
S133
(8W-15-9)
Z142
18
BK
G108
(8W-15-9)
(8W-15-10)
(8W-15-11)


BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
COMBINATION FLASHER
LEFT TURN SIGNAL
87A
87
85
PARK LAMP RELAY
(8W-50-6)
30
86
14 JB
1 JB
PARK LAMP RELAY OUTPUT
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
(8W-45-4)
31 C3
21 C2
20 C2
5 C2
5 C3
L60 20TN
INSTRUMENT CLUSTER
(8W-40-3)
LEFT TURN INDICATOR
Z234 20 BK
L7 20 BK/YL
L61 20 TN/LG
S326
(8W-12-12)
(8W-12-13)
DIESEL
54 C107
GAS
L61 20 LG
L61 20 TN/LG
LHD
RHD
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
S143
S205
(8W-15-15)
53 C107
GAS
DIESEL
L7 20 BK/YL
L7 18 BK/YL
L61 18 TN/LG
L61 18 LG
LEFT SIDE REPEATER LAMP
4 C111
3 C111
Z234 18 BK
Z161 18 BK
E
TO S156
(8W-52-6)
BUILT-UP-EXPORT
EXCEPT BUILT-UP-EXPORT
RHD
LHD
S140
(8W-15-7)
S141
(8W-15-6)
F
TO S155
(8W-52-6)
S134
(8W-15-7)
G106
(8W-15-6)
(8W-15-7)
G200
(8W-15-15)
LEFT FRONT TURN SIGNAL LAMP
(8W-52-6)

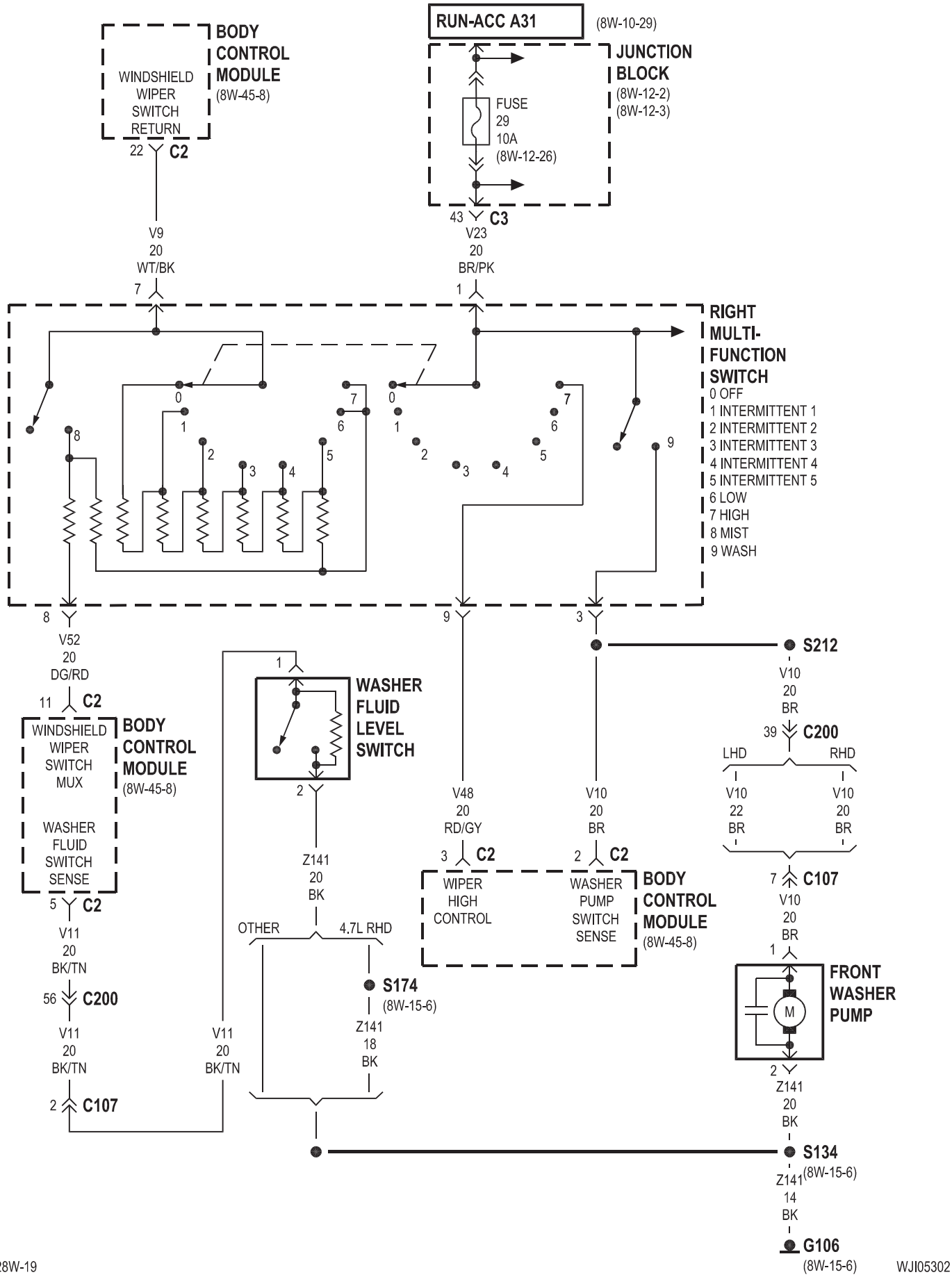

FROM
C111
(8W-52-5)
E
L7
20
BK/YL
S156
(8W-12-14)
L7
20
BK/PK
1
LEFT
FRONT
SIDE
MARKER
LAMP
(8W-50-10)
2
L61
20
TN/LG
FROM
C111
(8W-52-5)
F
L61
20
TN/LG
EXCEPT
BUILT-
UP-
EXPORT
BUILT-
UP-
EXPORT
L61
20
TN/LG
L61
20
TN/LG
S155
(8W-12-33)
L7
20
BK/PK
2
LEFT
FRONT
PARK
LAMP
(8W-50-10)
(8W-50-11)
1
Z141
18
BK
L7
20
BK/PK
L61
20
TN/LG
1
3
LEFT
FRONT
PARK/
TURN
SIGNAL
LAMP
(8W-50-10)
2
Z141
18
BK
1
LEFT
FRONT
TURN
SIGNAL
LAMP
2
Z141
18
BK
S151
(8W-15-5)
Z141
18
BK
6
C111
Z1
18
BK
S134
(8W-15-6)
Z1
14
BK
G106
(8W-15-6)
(8W-15-7)

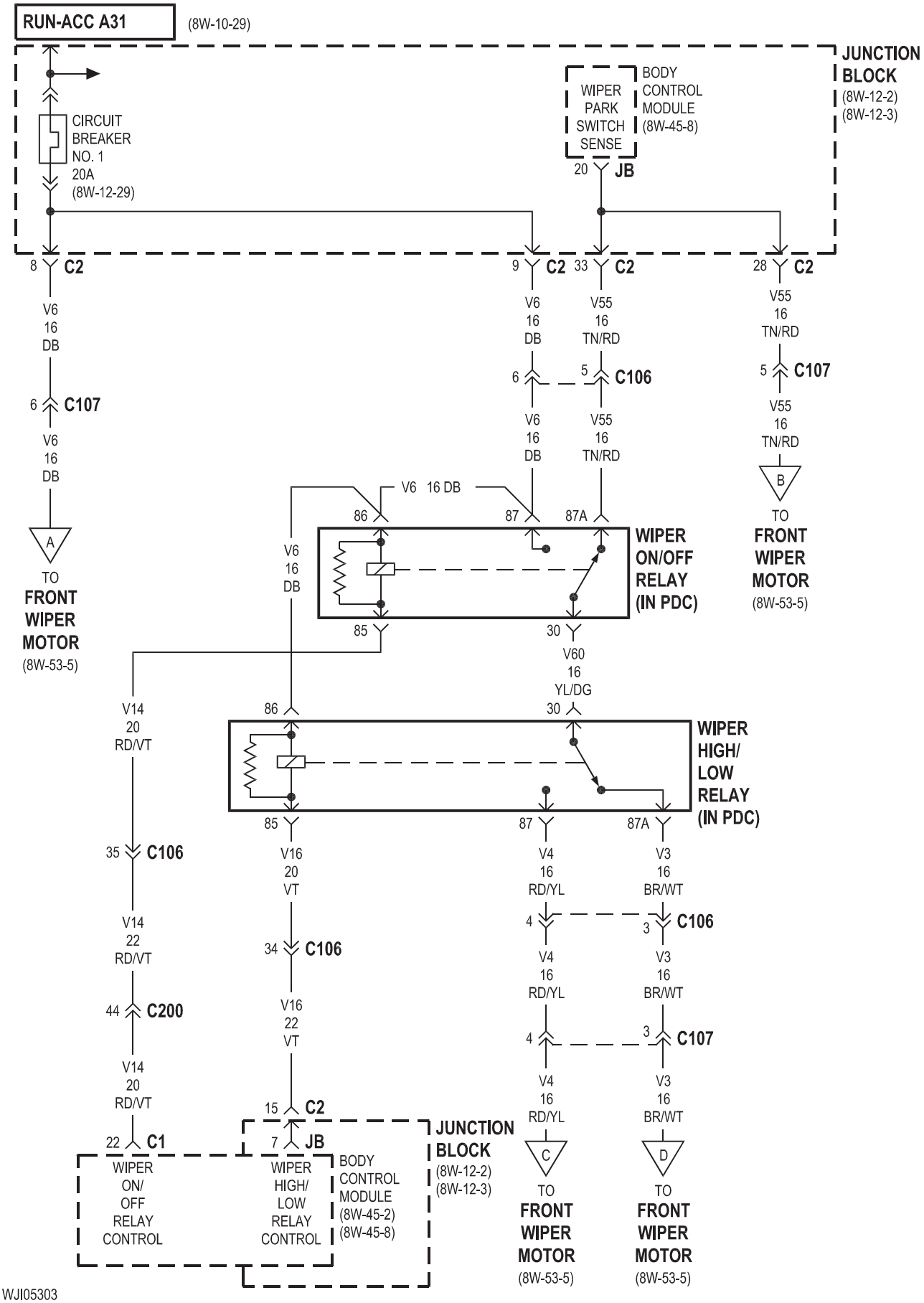

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
4
5
2 C1
10 C2
L63 18 DG/RD
L62 18 BR/RD
S306
(8W-12-27)
S327
(8W-12-32)
L63 20 DG/RD
L62 18 BR/RD
21 C300
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
10 C310
10 C310 NOT USED
L63 14 DG/RD
L62 14 BR/RD
2 C310
2 C310 NOT USED
85
86
TRAILER TOW LEFT TURN RELAY
(8W-54-6)
TRAILER TOW RIGHT TURN RELAY
(8W-54-6)
TURN SIGNAL LAMP
LEFT REAR LAMP ASSEMBLY
RIGHT REAR LAMP ASSEMBLY
Z150 18 BK
Z150 10 BK
Z151 18 BK
Z151 14 BK
S307
(8W-15-19)
S332
(8W-15-17)
G301
(8W-15-21)
G300
(8W-15-17)

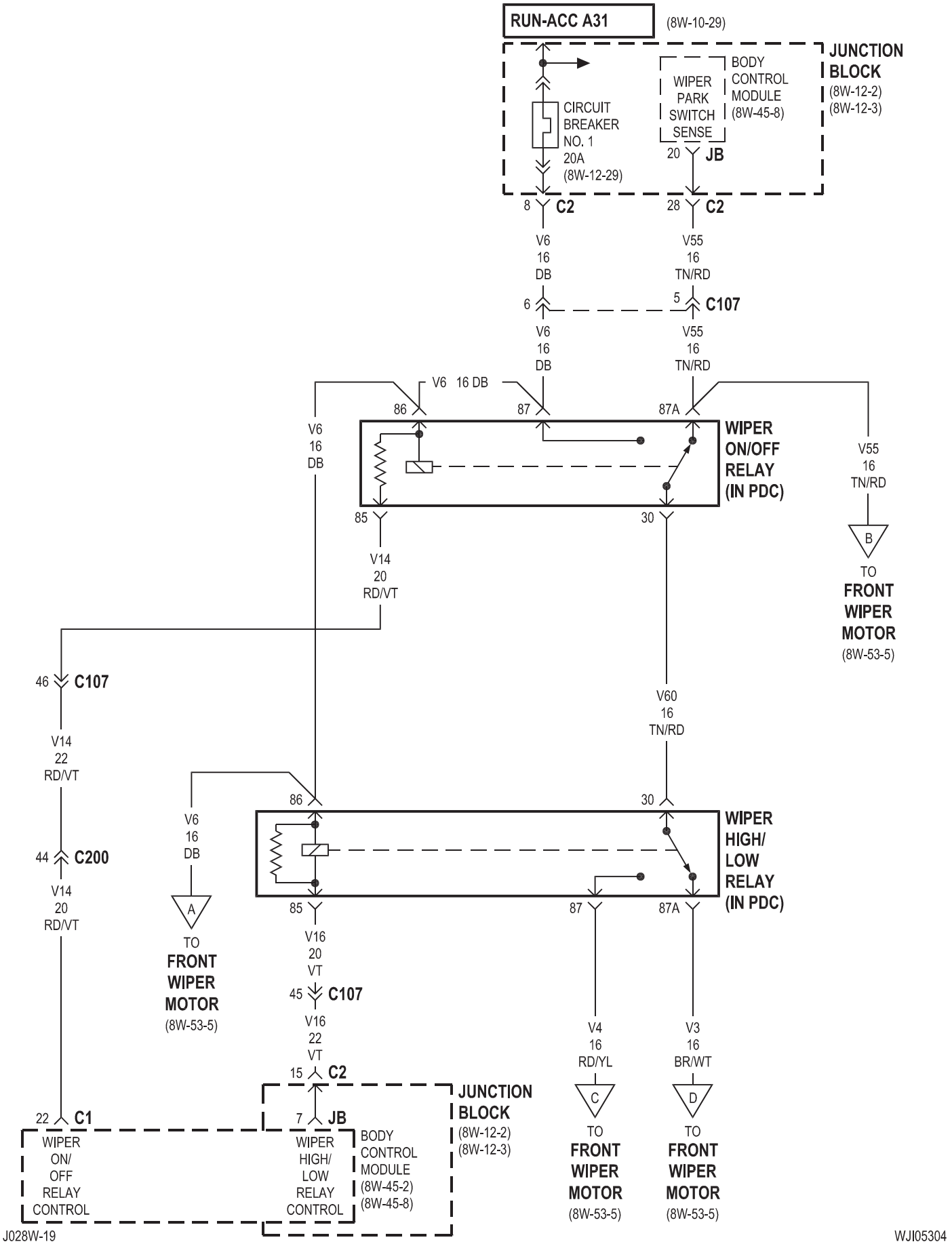

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
4
5
2 C1
10 C2
L63 18 DG/RD
L62 20 BR/RD
10 C301
L63 18 DG/RD
S306
(8W-12-27)
L63 20 DG/RD
10 C310
NOT USED
S327
(8W-12-32)
L62 20 BR/RD
L62 20 BR/RD
19 C301
L62 20 BR/RD
2 C310
NOT USED
L63 18 DG/RD
L62 18 BR/RD
4
4
LEFT REAR LAMP ASSEMBLY
TURN SIGNAL LAMP
RIGHT REAR LAMP ASSEMBLY
TURN SIGNAL LAMP
5
5
Z150 18 BK
Z151 18 BK
S307
(8W-15-19)
S332
(8W-15-18)
Z150 12 BK
Z151 14 BK
G301
(8W-15-22)
G300
(8W-15-18)

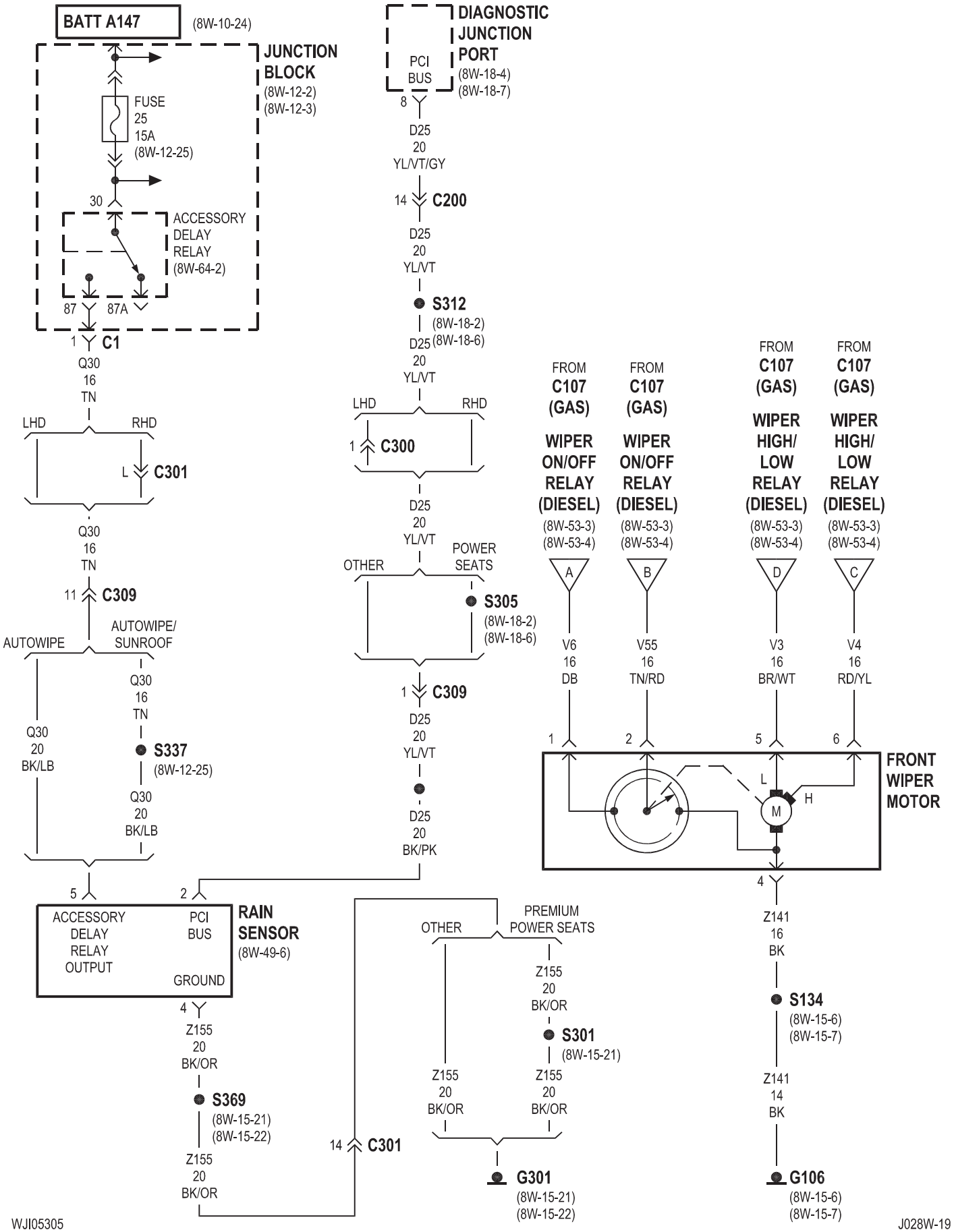
8W-53 WIPERS

Component	Page
Accessory Delay Relay	8W-53-5
Body Control Module	8W-53-2, 3, 4, 6
Circuit Breaker No. 1	8W-53-3, 4
Diagnostic Junction Port	8W-53-5
Front Washer Pump	8W-53-2
Front Wiper Motor	8W-53-3, 4, 5
Fuse 8	8W-53-6
Fuse 25	8W-53-5
Fuse 29	8W-53-2
G106	8W-53-2, 5, 6
G301	8W-53-5, 6
Junction Block	8W-53-2, 3, 4, 5, 6
Liftgate Flip-Up Ajar Switch	8W-53-6
Rain Sensor	8W-53-5
Rear Washer Pump	8W-53-6
Rear Wiper Motor	8W-53-6
Right Multi-Function Switch	8W-53-2, 6
Washer Fluid Level Switch	8W-53-2
Wiper High/Low Relay	8W-53-3, 4, 5
Wiper On/Off Relay	8W-53-3, 4, 5


BODY CONTROL MODULE
(8W-45-8)
WINDSHIELD WIPER SWITCH RETURN
22 C2
V9
20
WT/BK
7
RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
29
10A
(8W-12-26)
43 C3
V23
20
BR/PK
1
RIGHT MULTI-FUNCTION SWITCH
0 OFF
1 INTERMITTENT 1
2 INTERMITTENT 2
3 INTERMITTENT 3
4 INTERMITTENT 4
5 INTERMITTENT 5
6 LOW
7 HIGH
8 MIST
9 WASH
8
V52
20
DG/RD
11 C2
WINDSHIELD WIPER SWITCH MUX
WASHER FLUID SWITCH SENSE
5 C2
V11
20
BK/TN
56 C200
V11
20
BK/TN
2 C107
BODY CONTROL MODULE
(8W-45-8)
1
WASHER FLUID LEVEL SWITCH
2
Z141
20
BK
OTHER
4.7L RHD
S174
(8W-15-6)
Z141
18
BK
V11
20
BK/TN
9
V48
20
RD/GY
3 C2
WIPER HIGH CONTROL
3
V10
20
BR
2 C2
WASHER PUMP SWITCH SENSE
BODY CONTROL MODULE
(8W-45-8)
S212
V10
20
BR
39 C200
LHD
RHD
V10
22
BR
V10
20
BR
7 C107
V10
20
BR
1
FRONT WASHER PUMP
M
2
Z141
20
BK
S134
(8W-15-6)
Z141
14
BK
G106
(8W-15-6)

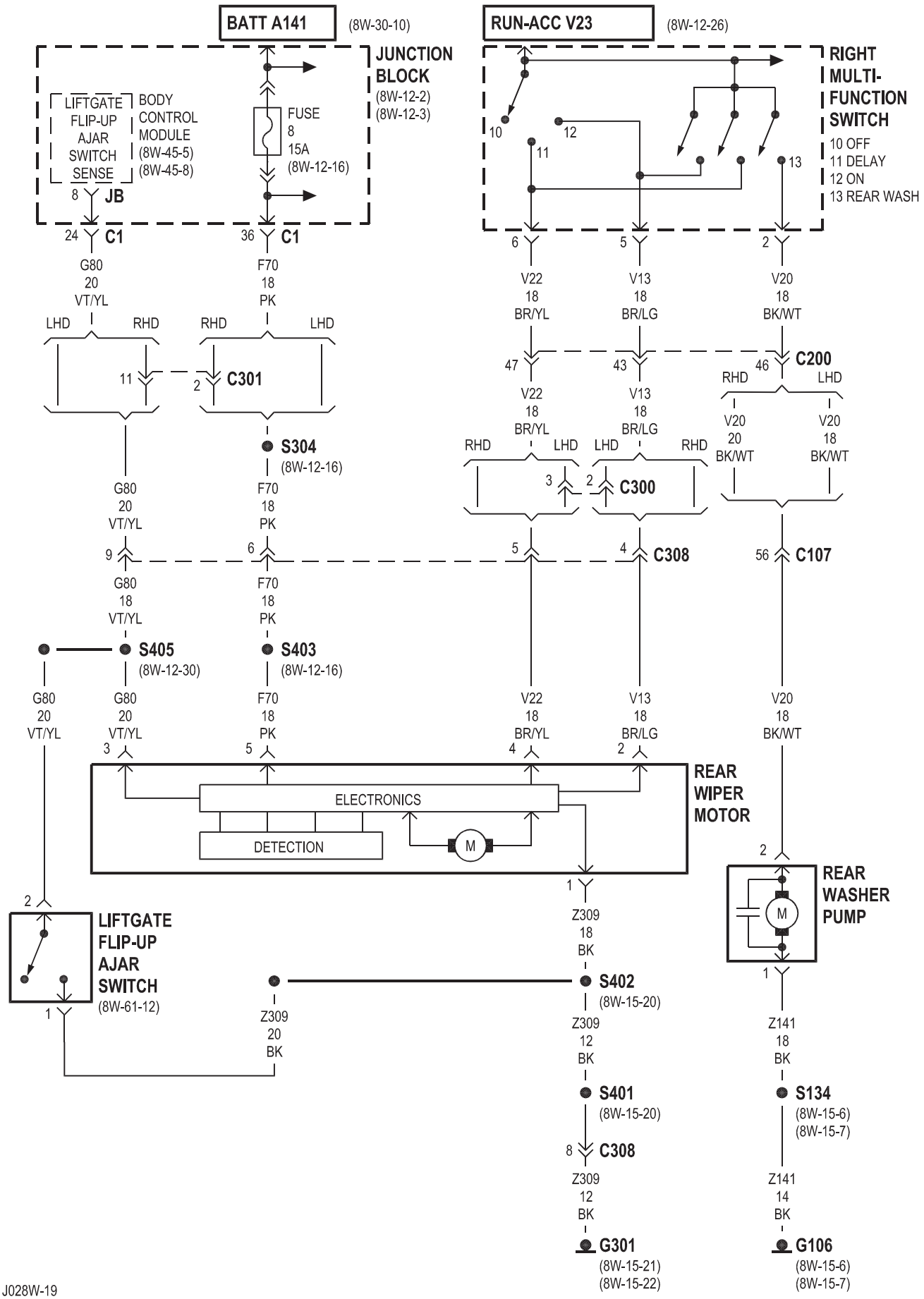

RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 1 20A
(8W-12-29)
WIPER PARK SWITCH SENSE
BODY CONTROL MODULE
(8W-45-8)
20 JB
8 C2
9 C2
33 C2
28 C2
V6 16 DB
V55 16 TN/RD
6 C107
6 C106
5 C106
5 C107
A
TO FRONT WIPER MOTOR
(8W-53-5)
B
TO FRONT WIPER MOTOR
(8W-53-5)
86
87
87A
85
30
WIPER ON/OFF RELAY (IN PDC)
V60 16 YL/DG
V14 20 RD/VT
V14 22 RD/VT
V16 20 VT
V16 22 VT
V4 16 RD/YL
V3 16 BR/WT
35 C106
34 C106
4 C106
3 C106
44 C200
4 C107
3 C107
15 C2
22 C1
7 JB
WIPER ON/ OFF RELAY CONTROL
WIPER HIGH/ LOW RELAY CONTROL
BODY CONTROL MODULE
(8W-45-2)
(8W-45-8)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
WIPER HIGH/ LOW RELAY (IN PDC)
C
D
TO FRONT WIPER MOTOR
(8W-53-5)
TO FRONT WIPER MOTOR
(8W-53-5)


RUN-ACC A31
(8W-10-29)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 1 20A
(8W-12-29)
WIPER PARK SWITCH SENSE
BODY CONTROL MODULE
(8W-45-8)
20 JB
8 C2
28 C2
V6 16 DB
V55 16 TN/RD
6 C107
5 C107
V6 16 DB
V55 16 TN/RD
V6 16 DB
86
87
87A
WIPER ON/OFF RELAY (IN PDC)
85
30
V14 20 RD/VT
V55 16 TN/RD
B
TO FRONT WIPER MOTOR
(8W-53-5)
46 C107
V14 22 RD/VT
44 C200
V14 20 RD/VT
V60 16 TN/RD
V6 16 DB
A
TO FRONT WIPER MOTOR
(8W-53-5)
86
30
WIPER HIGH/ LOW RELAY (IN PDC)
85
87
87A
V16 20 VT
45 C107
V16 22 VT
15 C2
V4 16 RD/YL
V3 16 BR/WT
C
D
TO FRONT WIPER MOTOR
(8W-53-5)
TO FRONT WIPER MOTOR
(8W-53-5)
22 C1
7 JB
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
WIPER ON/ OFF RELAY CONTROL
WIPER HIGH/ LOW RELAY CONTROL
BODY CONTROL MODULE
(8W-45-2)
(8W-45-8)



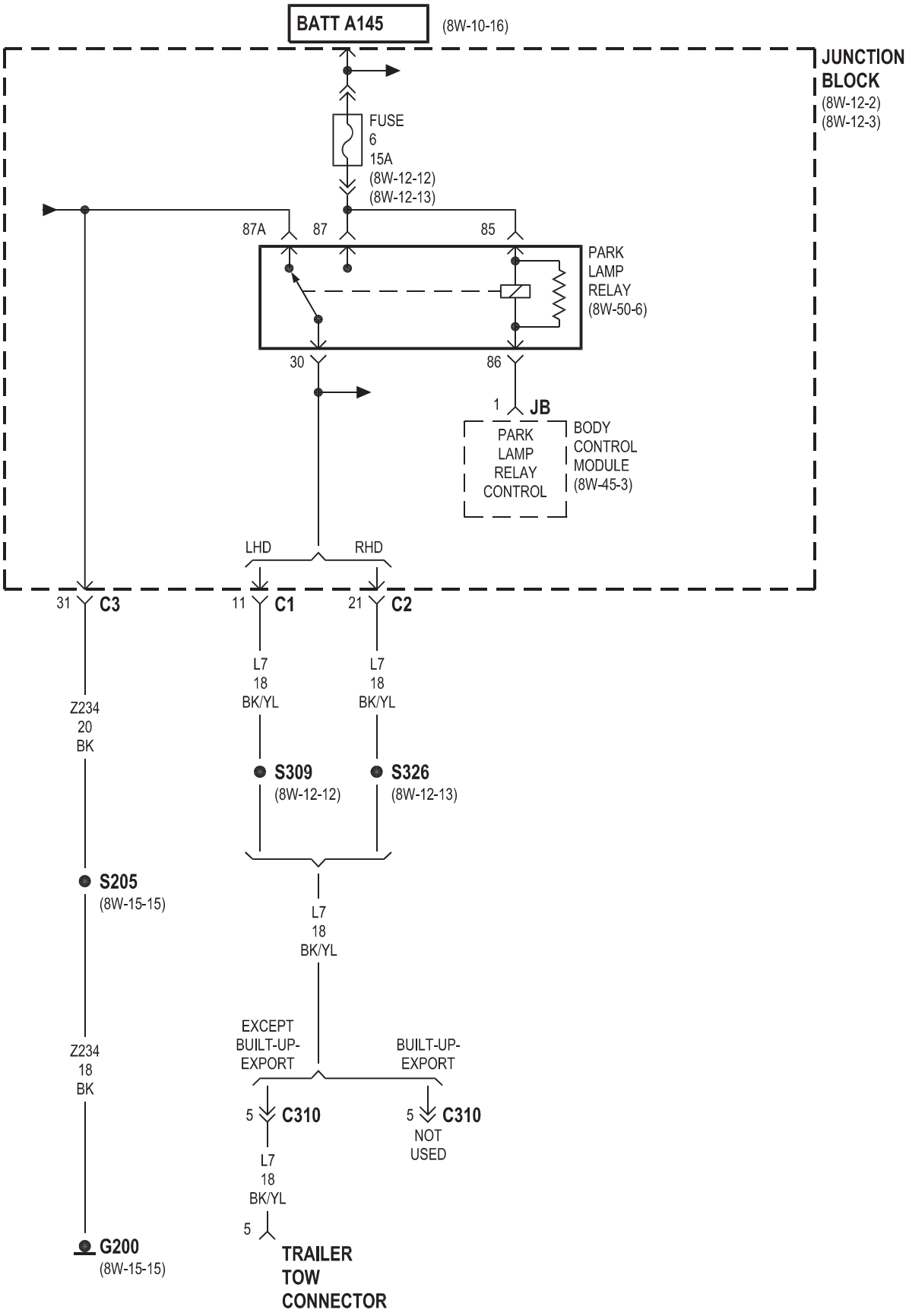
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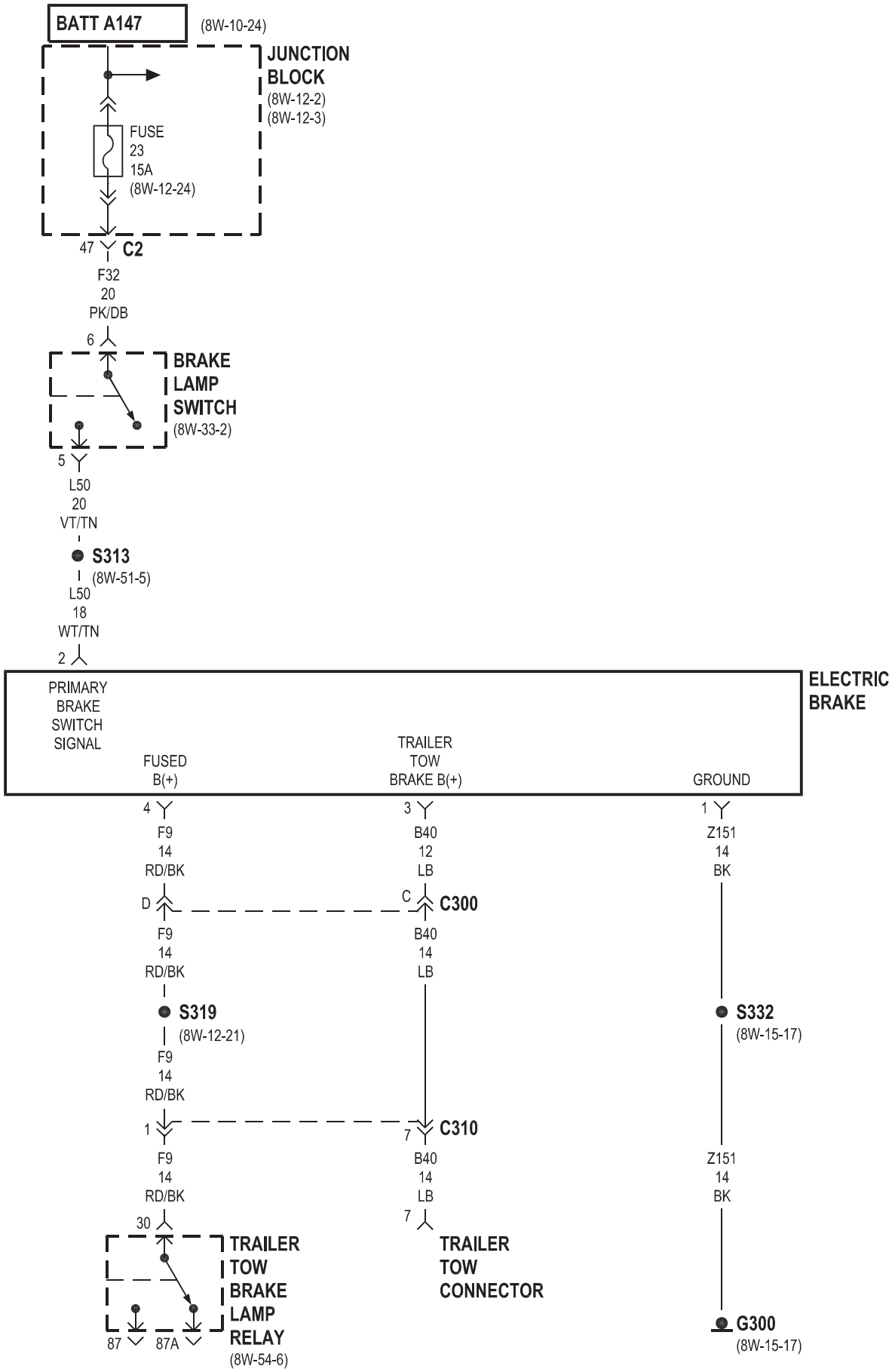
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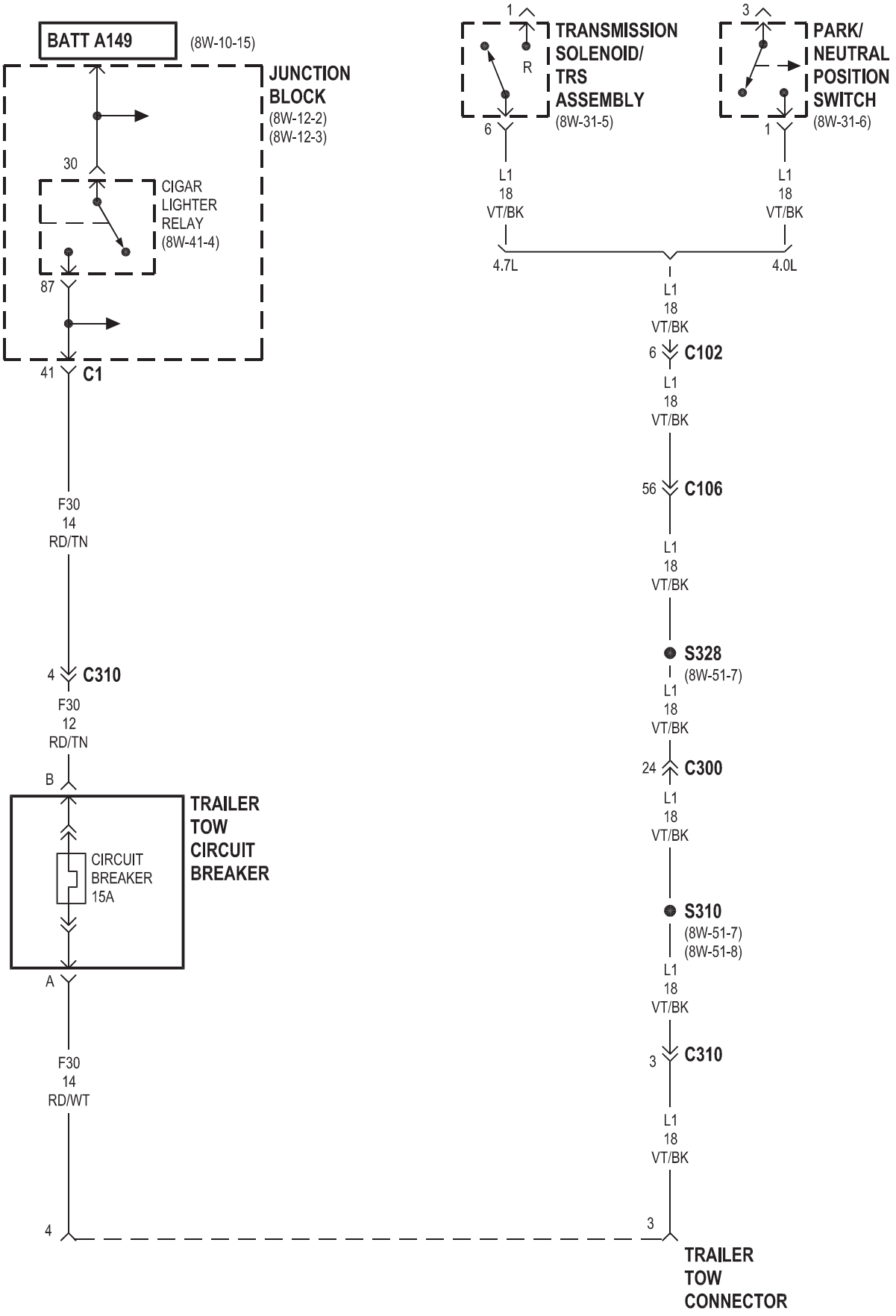

BATT A141
(8W-30-10)
RUN-ACC V23
(8W-12-26)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
LIFTGATE FLIP-UP AJAR SWITCH SENSE
BODY CONTROL MODULE
(8W-45-5)
(8W-45-8)
FUSE 8 15A
(8W-12-16)
8 JB
24 C1
36 C1
RIGHT MULTI-FUNCTION SWITCH
10 OFF
11 DELAY
12 ON
13 REAR WASH
10
12
11
13
6
5
2
G80 20 VT/YL
F70 18 PK
V22 18 BR/YL
V13 18 BR/LG
V20 18 BK/WT
LHD
RHD
11
2 C301
47
43
46 C200
V20 20 BK/WT
V20 18 BK/WT
S304
(8W-12-16)
3
2 C300
9
6
5
4 C308
56 C107
G80 18 VT/YL
F70 18 PK
S405
(8W-12-30)
S403
(8W-12-16)
3
5
4
2
REAR WIPER MOTOR
ELECTRONICS
DETECTION
M
1
2
LIFTGATE FLIP-UP AJAR SWITCH
(8W-61-12)
Z309 18 BK
Z309 20 BK
S402
(8W-15-20)
Z309 12 BK
S401
(8W-15-20)
8 C308
Z309 12 BK
G301
(8W-15-21)
(8W-15-22)
REAR WASHER PUMP
Z141 18 BK
S134
(8W-15-6)
(8W-15-7)
Z141 14 BK
G106
(8W-15-6)
(8W-15-7)

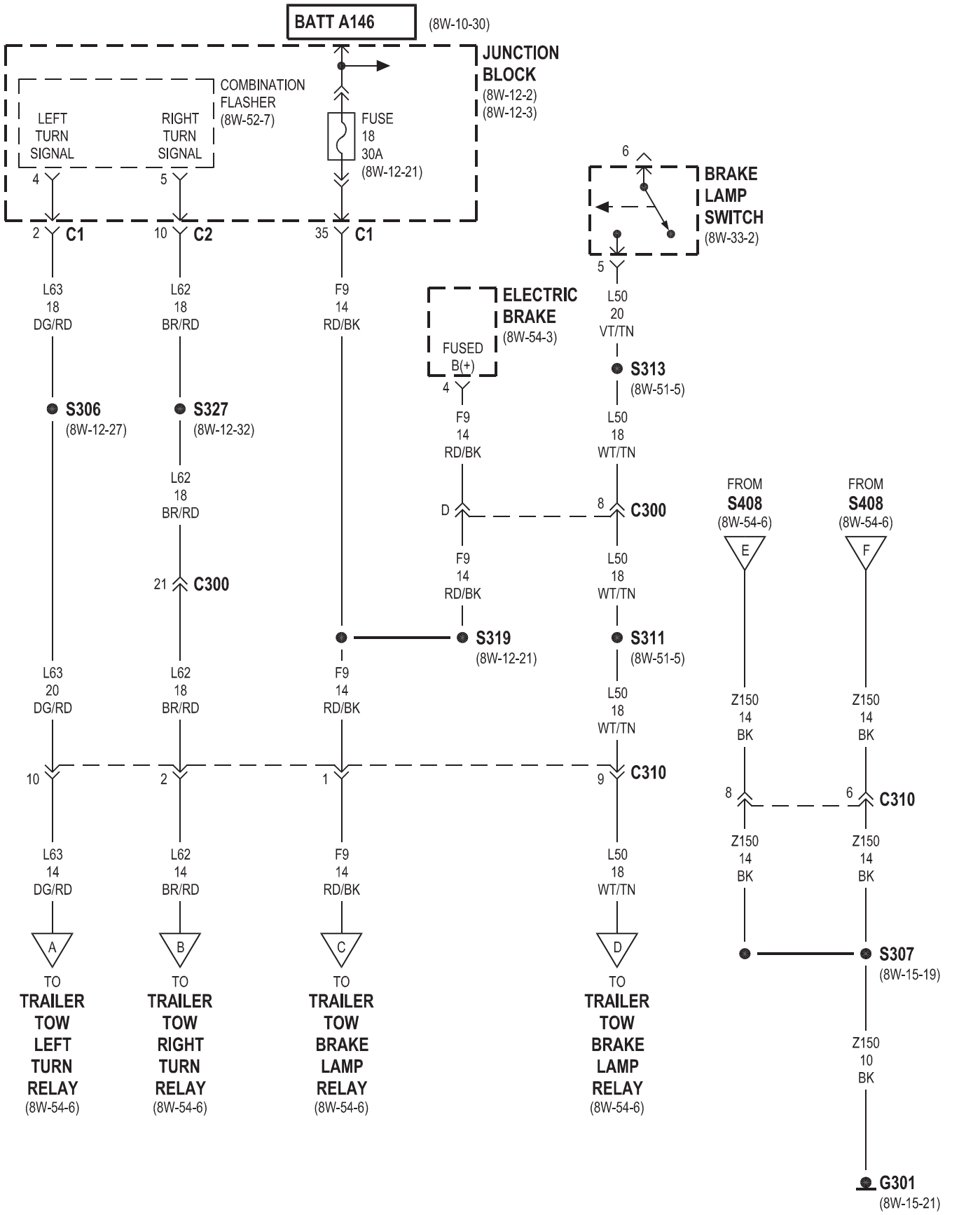
8W-54 TRAILER TOW

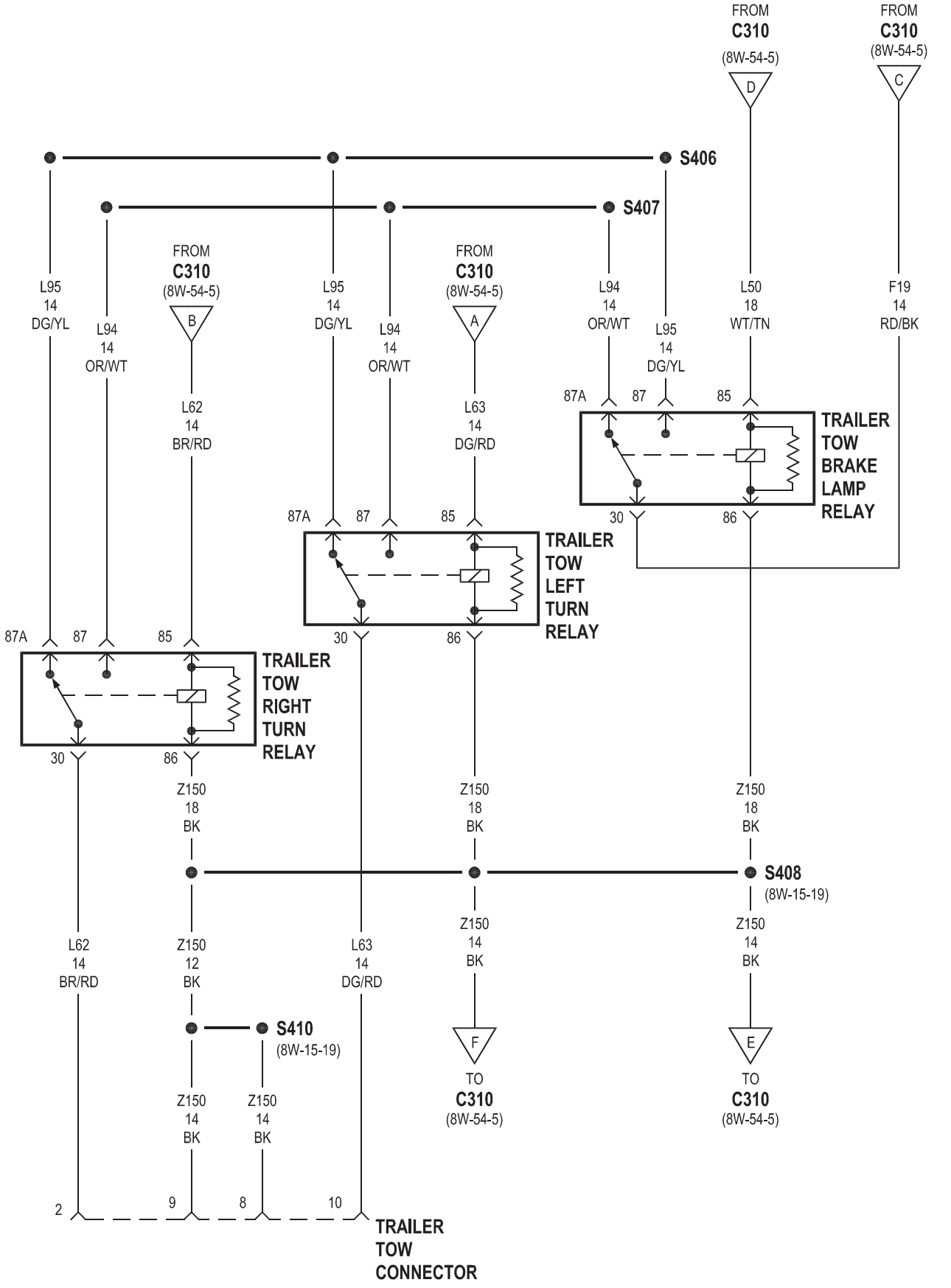
Component	Page
Body Control Module	8W-54-2
Brake Lamp Switch	8W-54-3, 5
Cigar Lighter Relay	8W-54-4
Circuit Breaker	8W-54-4
Combination Flasher	8W-54-5
Electric Brake	8W-54-3, 5
Fuse 6	8W-54-2
Fuse 18	8W-54-5
Fuse 23	8W-54-3
G200	8W-54-2
G300	8W-54-3
G301	8W-54-5
Junction Block	8W-54-2, 3, 4, 5
Park Lamp Relay	8W-54-2
Park/Neutral Position Switch	8W-54-4
Trailer Tow Brake Lamp Relay	8W-54-3, 5, 6
Trailer Tow Circuit Breaker	8W-54-4
Trailer Tow Connector	8W-54-2, 3, 4, 6
Trailer Tow Left Turn Relay	8W-54-5, 6
Trailer Tow Right Turn Relay	8W-54-5, 6
Transmission Solenoid/TRS Assembly	8W-54-4


BATT A145
(8W-10-16)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
6
15A
(8W-12-12)
(8W-12-13)
87A
87
85
PARK LAMP RELAY
(8W-50-6)
30
86
1
JB
PARK LAMP RELAY CONTROL
BODY CONTROL MODULE
(8W-45-3)
LHD
RHD
31
C3
11
C1
21
C2
L7
18
BK/YL
L7
18
BK/YL
Z234
20
BK
S309
(8W-12-12)
S326
(8W-12-13)
S205
(8W-15-15)
L7
18
BK/YL
EXCEPT BUILT-UP-EXPORT
BUILT-UP-EXPORT
Z234
18
BK
5
C310
5
C310
NOT USED
L7
18
BK/YL
5
G200
(8W-15-15)
TRAILER TOW CONNECTOR


BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
23
15A
(8W-12-24)
47
C2
F32
20
PK/DB
6
BRAKE LAMP SWITCH
(8W-33-2)
5
L50
20
VT/TN
S313
(8W-51-5)
L50
18
WT/TN
2
ELECTRIC BRAKE
PRIMARY BRAKE SWITCH SIGNAL
FUSED B(+)
TRAILER TOW BRAKE B(+)
GROUND
4
F9
14
RD/BK
3
B40
12
LB
1
Z151
14
BK
D
C
C300
F9
14
RD/BK
B40
14
LB
S319
(8W-12-21)
S332
(8W-15-17)
F9
14
RD/BK
1
7
C310
F9
14
RD/BK
B40
14
LB
Z151
14
BK
30
7
TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)
87
87A
TRAILER TOW CONNECTOR
G300
(8W-15-17)

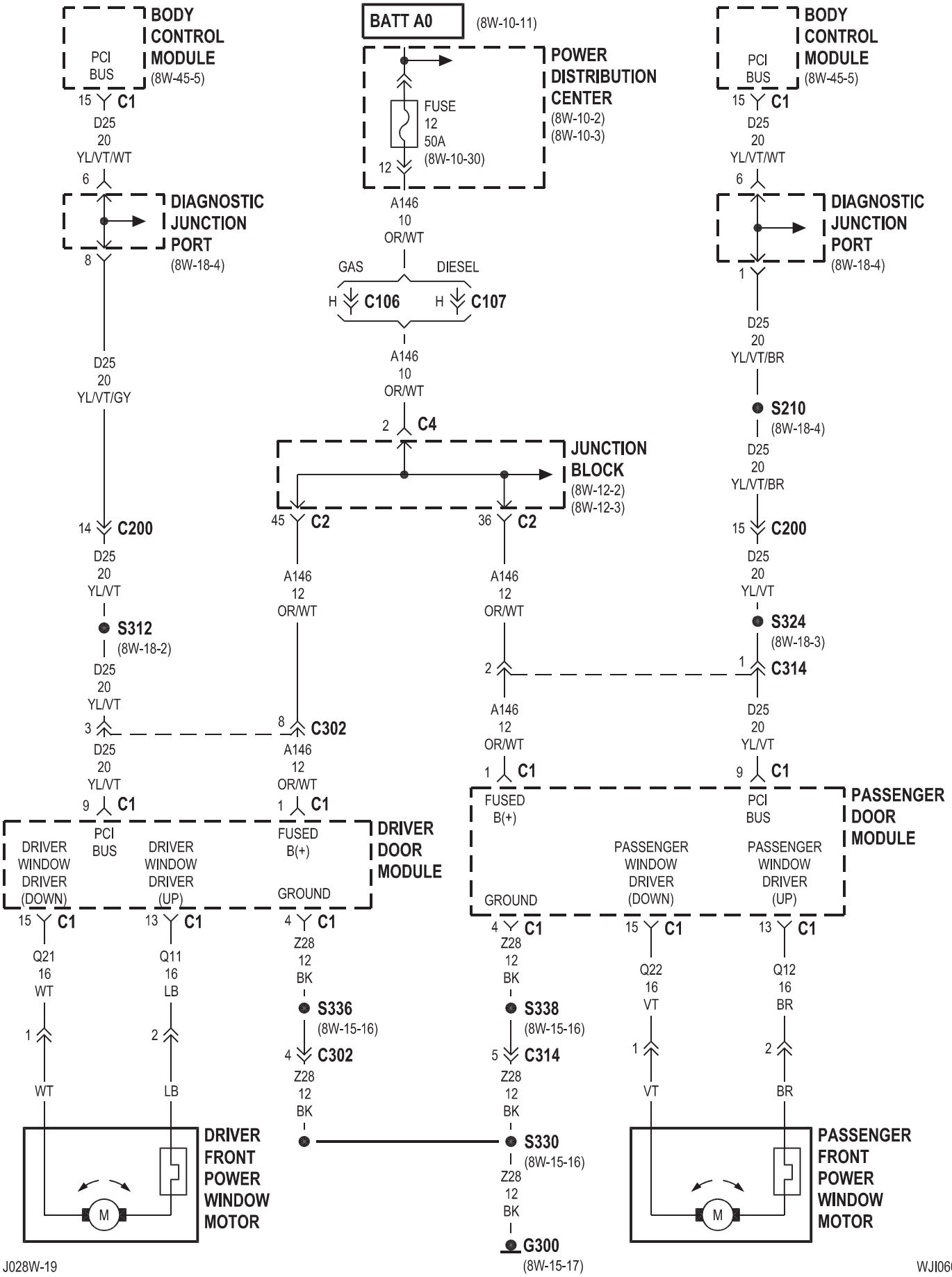

BATT A149
(8W-10-15)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
30
CIGAR LIGHTER RELAY
(8W-41-4)
87
41 C1
F30
14
RD/TN
4 C310
F30
12
RD/TN
B
CIRCUIT BREAKER 15A
TRAILER TOW CIRCUIT BREAKER
A
F30
14
RD/WT
4
1
R
6
TRANSMISSION SOLENOID/ TRS ASSEMBLY
(8W-31-5)
3
1
PARK/ NEUTRAL POSITION SWITCH
(8W-31-6)
L1
18
VT/BK
4.7L
4.0L
L1
18
VT/BK
6 C102
L1
18
VT/BK
56 C106
L1
18
VT/BK
S328
(8W-51-7)
L1
18
VT/BK
24 C300
L1
18
VT/BK
S310
(8W-51-7)
(8W-51-8)
L1
18
VT/BK
3 C310
L1
18
VT/BK
3
TRAILER TOW CONNECTOR


BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
COMBINATION FLASHER
(8W-52-7)
LEFT TURN SIGNAL
RIGHT TURN SIGNAL
FUSE 18 30A
(8W-12-21)
4
5
2 C1
10 C2
35 C1
6
BRAKE LAMP SWITCH
(8W-33-2)
5
L63 18 DG/RD
L62 18 BR/RD
F9 14 RD/BK
ELECTRIC BRAKE
(8W-54-3)
FUSED B(+)
4
L50 20 VT/TN
S313
(8W-51-5)
S306
(8W-12-27)
S327
(8W-12-32)
F9 14 RD/BK
L50 18 WT/TN
L62 18 BR/RD
D
8 C300
21 C300
F9 14 RD/BK
L50 18 WT/TN
S319
(8W-12-21)
S311
(8W-51-5)
FROM S408
(8W-54-6)
FROM S408
(8W-54-6)
E
F
L63 20 DG/RD
L62 18 BR/RD
F9 14 RD/BK
L50 18 WT/TN
Z150 14 BK
Z150 14 BK
10
2
1
9 C310
8
6 C310
L63 14 DG/RD
L62 14 BR/RD
F9 14 RD/BK
L50 18 WT/TN
Z150 14 BK
Z150 14 BK
A
B
C
D
S307
(8W-15-19)
TO TRAILER TOW LEFT TURN RELAY
(8W-54-6)
TO TRAILER TOW RIGHT TURN RELAY
(8W-54-6)
TO TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)
TO TRAILER TOW BRAKE LAMP RELAY
(8W-54-6)
Z150 10 BK
G301
(8W-15-21)

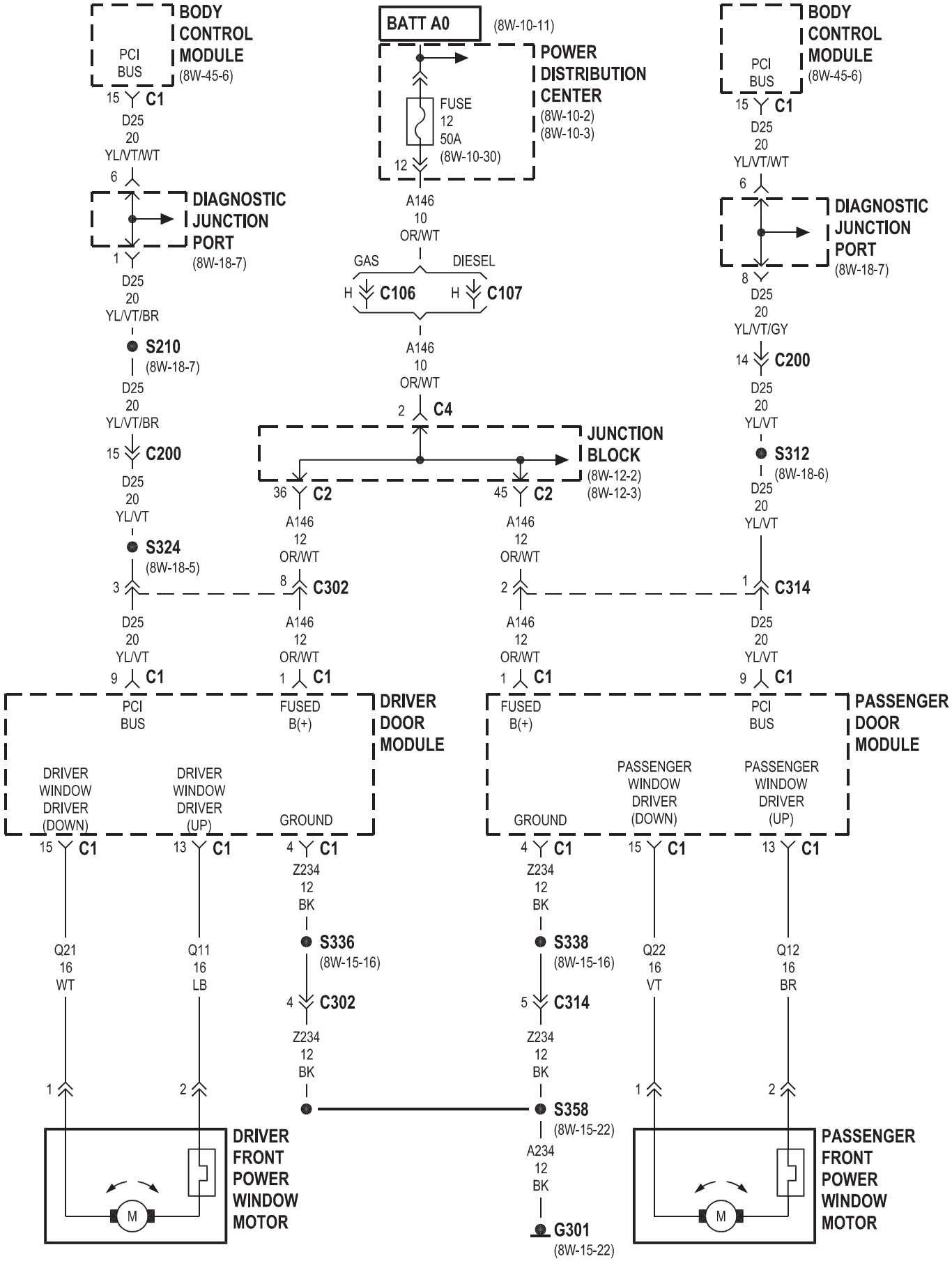

FROM C310 (8W-54-5) D
FROM C310 (8W-54-5) C
S406
S407
FROM C310 (8W-54-5) B
FROM C310 (8W-54-5) A
L95 14 DG/YL
L94 14 OR/WT
L62 14 BR/RD
L95 14 DG/YL
L94 14 OR/WT
L63 14 DG/RD
L94 14 OR/WT
L95 14 DG/YL
L50 18 WT/TN
F19 14 RD/BK
87A 87 85
30 86
TRAILER TOW BRAKE LAMP RELAY
TRAILER TOW LEFT TURN RELAY
TRAILER TOW RIGHT TURN RELAY
Z150 18 BK
S408 (8W-15-19)
L62 14 BR/RD
Z150 12 BK
L63 14 DG/RD
Z150 14 BK
S410 (8W-15-19)
F
TO C310 (8W-54-5)
E
TO C310 (8W-54-5)
2 9 8 10
TRAILER TOW CONNECTOR

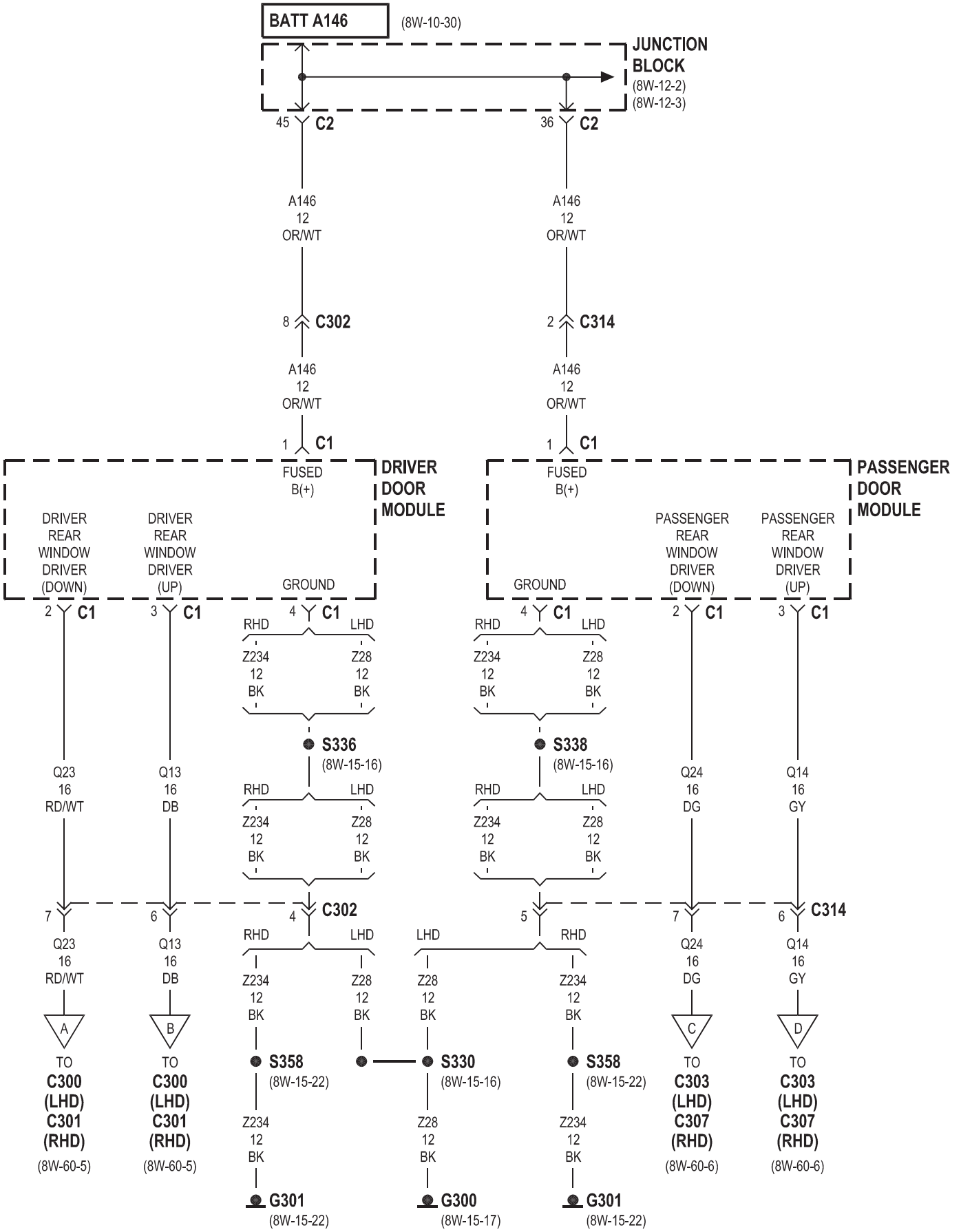
8W-60 POWER WINDOWS

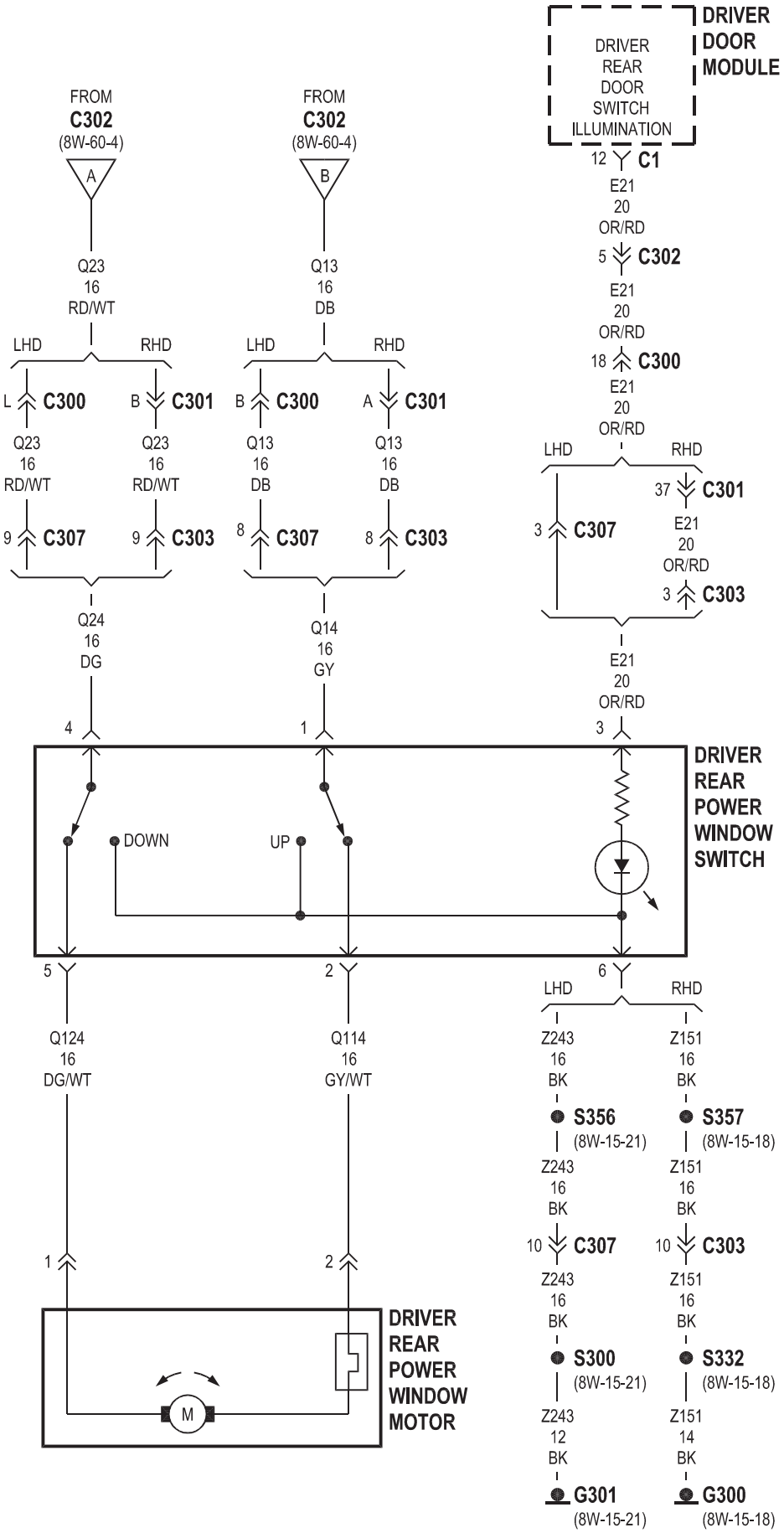
Component	Page
Body Control Module	8W-60-2, 3
Diagnostic Junction Port	8W-60-2, 3
Driver Door Module	8W-60-2, 3, 4, 5
Driver Front Power Window Motor	8W-60-2, 3
Driver Rear Power Window Motor	8W-60-5
Driver Rear Power Window Switch	8W-60-5
Fuse 12	8W-60-2, 3
G300	8W-60-2, 4, 5, 6
G301	8W-60-3, 4, 5, 6
Junction Block	8W-60-2, 3, 4
Passenger Door Module	8W-60-2, 3, 4, 6
Passenger Front Power Window Motor	8W-60-2, 3
Passenger Rear Power Window Motor	8W-60-6
Passenger Rear Power Window Switch	8W-60-6
Power Distribution Center	8W-60-2, 3

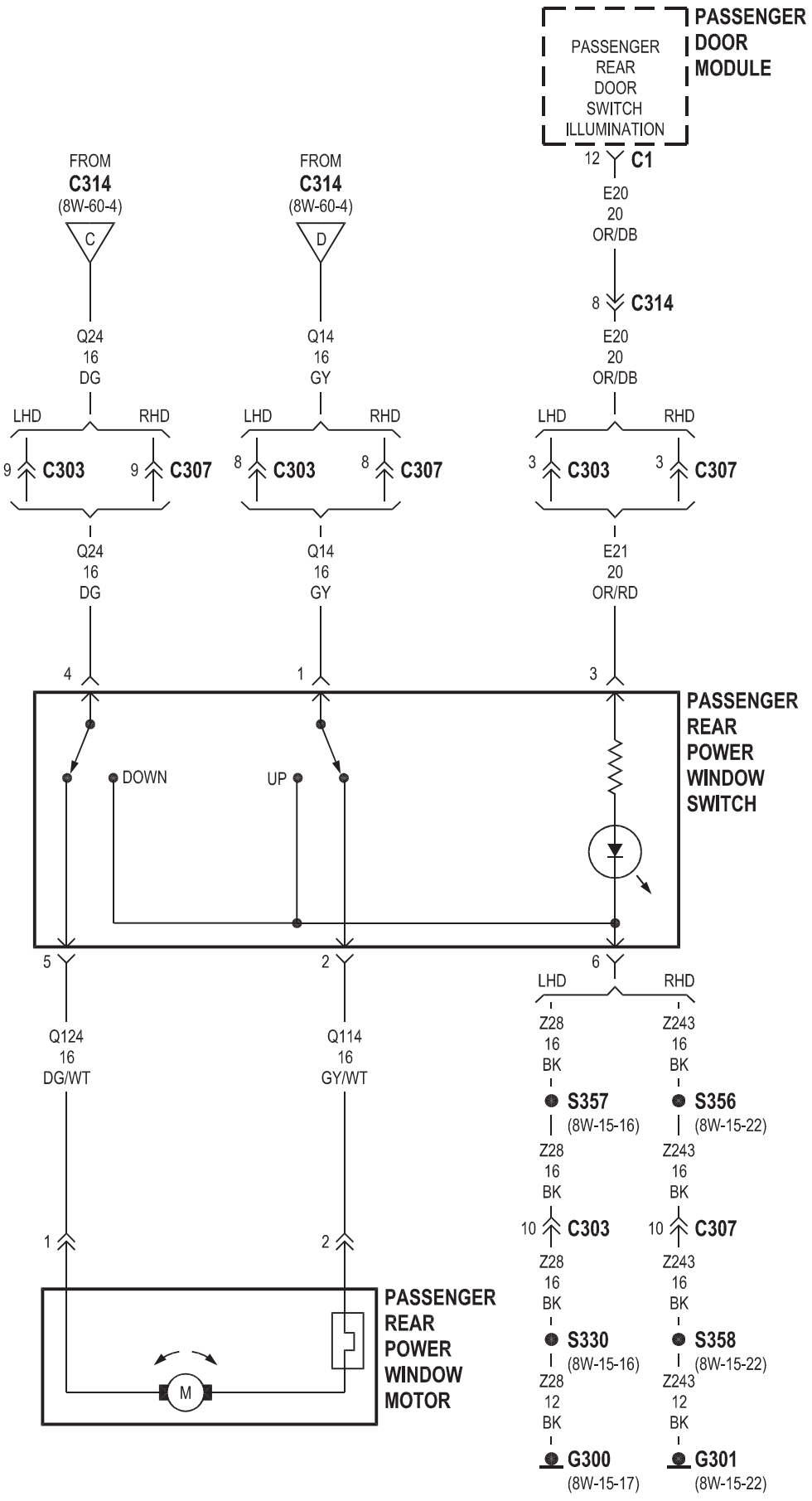

BODY CONTROL MODULE
(8W-45-5)
PCI BUS
15 C1
D25 20 YL/VT/WT
6
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
8
D25 20 YL/VT/GY
14 C200
D25 20 YL/VT
S312
(8W-18-2)
D25 20 YL/VT
3
D25 20 YL/VT
9 C1
PCI BUS
DRIVER WINDOW DRIVER (DOWN)
DRIVER WINDOW DRIVER (UP)
15 C1
13 C1
Q21 16 WT
Q11 16 LB
1
2
WT
LB
DRIVER FRONT POWER WINDOW MOTOR
M
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 12 50A
(8W-10-30)
12
A146 10 OR/WT
GAS
DIESEL
H C106
H C107
A146 10 OR/WT
2 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
45 C2
36 C2
A146 12 OR/WT
A146 12 OR/WT
8 C302
A146 12 OR/WT
1 C1
FUSED B(+)
GROUND
DRIVER DOOR MODULE
4 C1
Z28 12 BK
S336
(8W-15-16)
4 C302
Z28 12 BK
S338
(8W-15-16)
5 C314
Z28 12 BK
S330
(8W-15-16)
Z28 12 BK
G300
(8W-15-17)
BODY CONTROL MODULE
(8W-45-5)
PCI BUS
15 C1
D25 20 YL/VT/WT
6
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
1
D25 20 YL/VT/BR
S210
(8W-18-4)
D25 20 YL/VT/BR
15 C200
D25 20 YL/VT
S324
(8W-18-3)
1 C314
2
A146 12 OR/WT
1 C1
FUSED B(+)
GROUND
D25 20 YL/VT
9 C1
PCI BUS
PASSENGER DOOR MODULE
PASSENGER WINDOW DRIVER (DOWN)
PASSENGER WINDOW DRIVER (UP)
4 C1
15 C1
13 C1
Z28 12 BK
Q22 16 VT
Q12 16 BR
1
2
VT
BR
PASSENGER FRONT POWER WINDOW MOTOR
M

RHD


BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
D25 20 YL/VT/WT
6
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
1
D25 20 YL/VT/BR
S210
(8W-18-7)
D25 20 YL/VT/BR
15 C200
D25 20 YL/VT
S324
(8W-18-5)
3
D25 20 YL/VT
9 C1
PCI BUS
DRIVER DOOR MODULE
DRIVER WINDOW DRIVER (DOWN)
15 C1
Q21 16 WT
1
DRIVER WINDOW DRIVER (UP)
13 C1
Q11 16 LB
2
DRIVER FRONT POWER WINDOW MOTOR
M
FUSED B(+)
1 C1
A146 12 OR/WT
8 C302
A146 12 OR/WT
GROUND
4 C1
Z234 12 BK
S336
(8W-15-16)
4 C302
Z234 12 BK
BATT A0
(8W-10-11)
POWER DISTRIBUTION CENTER
(8W-10-2)
(8W-10-3)
FUSE 12 50A
(8W-10-30)
12
A146 10 OR/WT
GAS
DIESEL
H C106
H C107
A146 10 OR/WT
2 C4
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
36 C2
45 C2
A146 12 OR/WT
A146 12 OR/WT
FUSED B(+)
1 C1
A146 12 OR/WT
2
PASSENGER DOOR MODULE
GROUND
4 C1
Z234 12 BK
S338
(8W-15-16)
5 C314
Z234 12 BK
S358
(8W-15-22)
A234 12 BK
G301
(8W-15-22)
PASSENGER WINDOW DRIVER (DOWN)
15 C1
Q22 16 VT
1
PASSENGER WINDOW DRIVER (UP)
13 C1
Q12 16 BR
2
PASSENGER FRONT POWER WINDOW MOTOR
M
BODY CONTROL MODULE
(8W-45-6)
PCI BUS
15 C1
D25 20 YL/VT/WT
6
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
8
D25 20 YL/VT/GY
14 C200
D25 20 YL/VT
S312
(8W-18-6)
D25 20 YL/VT
1 C314
D25 20 YL/VT
9 C1
PCI BUS

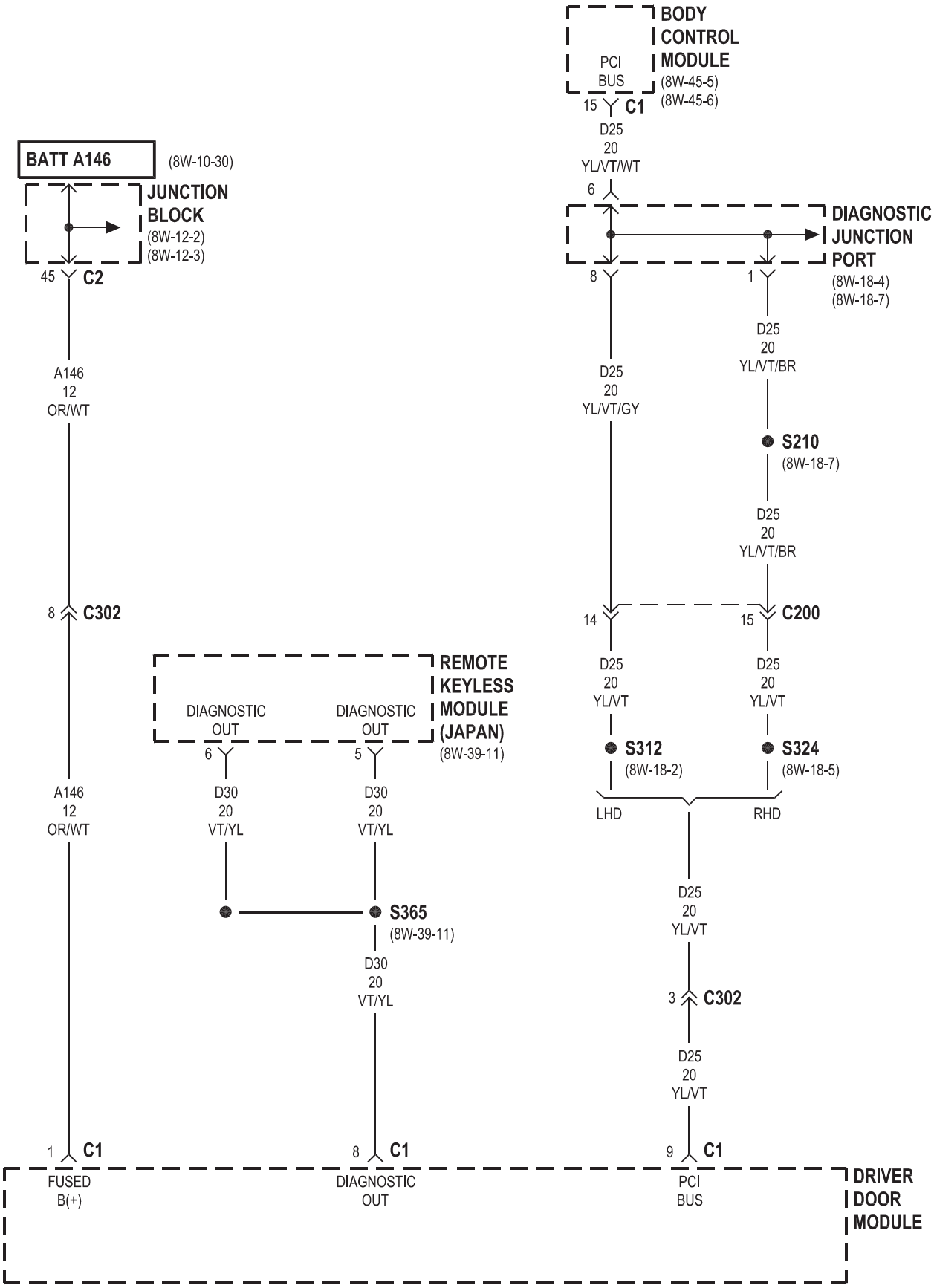

BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
45 C2
36 C2
A146 12 OR/WT
A146 12 OR/WT
8 C302
2 C314
A146 12 OR/WT
A146 12 OR/WT
1 C1
1 C1
FUSED B(+)
FUSED B(+)
DRIVER DOOR MODULE
PASSENGER DOOR MODULE
DRIVER REAR WINDOW DRIVER (DOWN)
DRIVER REAR WINDOW DRIVER (UP)
GROUND
GROUND
PASSENGER REAR WINDOW DRIVER (DOWN)
PASSENGER REAR WINDOW DRIVER (UP)
2 C1
3 C1
4 C1
4 C1
2 C1
3 C1
RHD
LHD
Z234 12 BK
Z28 12 BK
S336
(8W-15-16)
S338
(8W-15-16)
Q23 16 RD/WT
Q13 16 DB
Q24 16 DG
Q14 16 GY
7
6
4 C302
5
7
6 C314
A
B
C
D
S358
(8W-15-22)
S330
(8W-15-16)
S358
(8W-15-22)
TO C300 (LHD) C301 (RHD)
(8W-60-5)
TO C300 (LHD) C301 (RHD)
(8W-60-5)
TO C303 (LHD) C307 (RHD)
(8W-60-6)
TO C303 (LHD) C307 (RHD)
(8W-60-6)
G301
(8W-15-22)
G300
(8W-15-17)
G301
(8W-15-22)

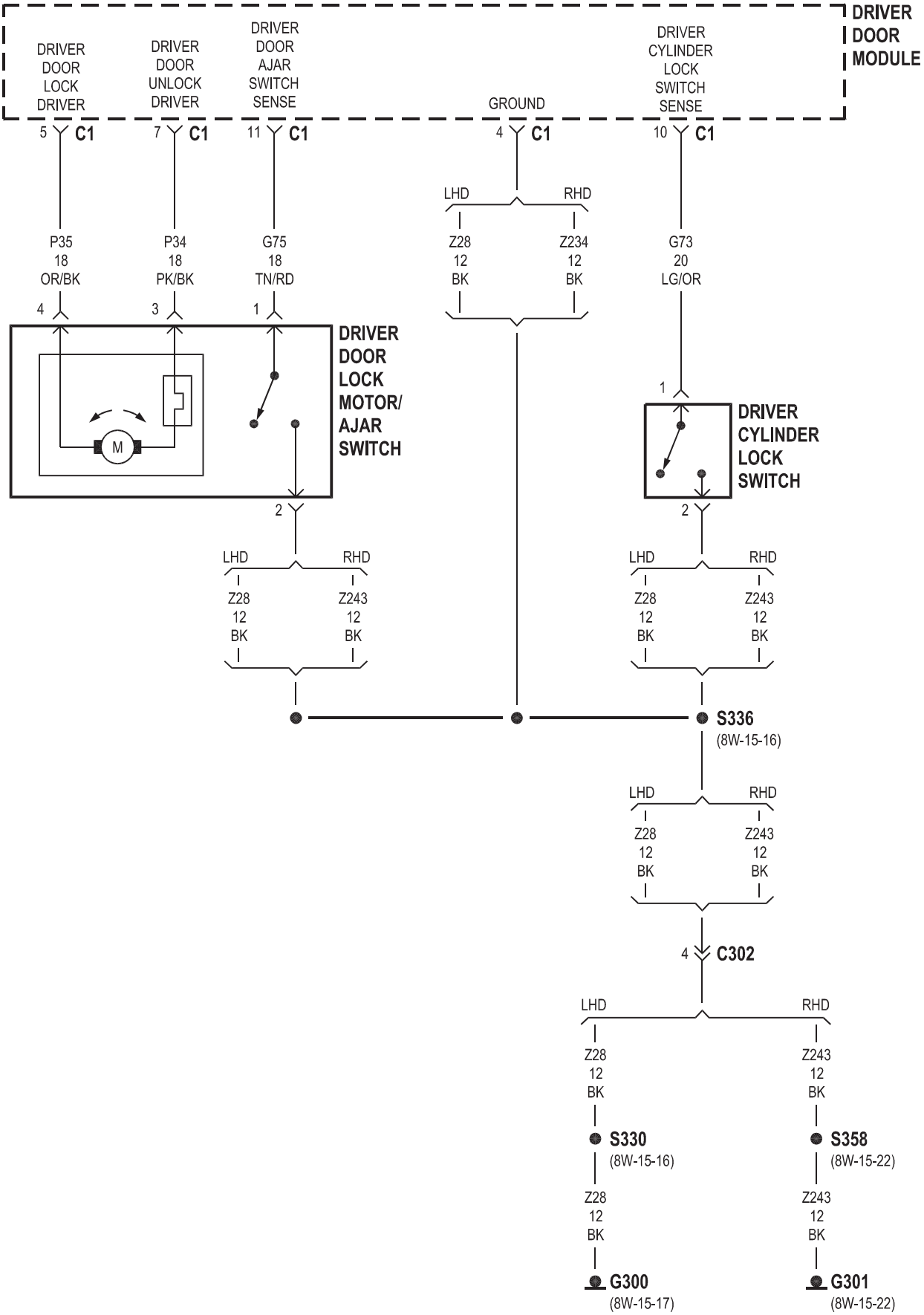

DRIVER DOOR MODULE
DRIVER REAR DOOR SWITCH ILLUMINATION
12 C1
E21
20
OR/RD
5 C302
E21
20
OR/RD
18 C300
E21
20
OR/RD
LHD
RHD
37 C301
3 C307
E21
20
OR/RD
3 C303
E21
20
OR/RD
3
FROM C302 (8W-60-4)
A
Q23
16
RD/WT
LHD
RHD
L C300
B C301
Q23
16
RD/WT
Q23
16
RD/WT
9 C307
9 C303
Q24
16
DG
4
FROM C302 (8W-60-4)
B
Q13
16
DB
LHD
RHD
B C300
A C301
Q13
16
DB
Q13
16
DB
8 C307
8 C303
Q14
16
GY
1
DRIVER REAR POWER WINDOW SWITCH
DOWN
UP
5
2
6
LHD
RHD
Q124
16
DG/WT
Q114
16
GY/WT
Z243
16
BK
Z151
16
BK
S356 (8W-15-21)
S357 (8W-15-18)
Z243
16
BK
Z151
16
BK
10 C307
10 C303
Z243
16
BK
Z151
16
BK
S300 (8W-15-21)
S332 (8W-15-18)
Z243
12
BK
Z151
14
BK
G301 (8W-15-21)
G300 (8W-15-18)
1
2
M
DRIVER REAR POWER WINDOW MOTOR

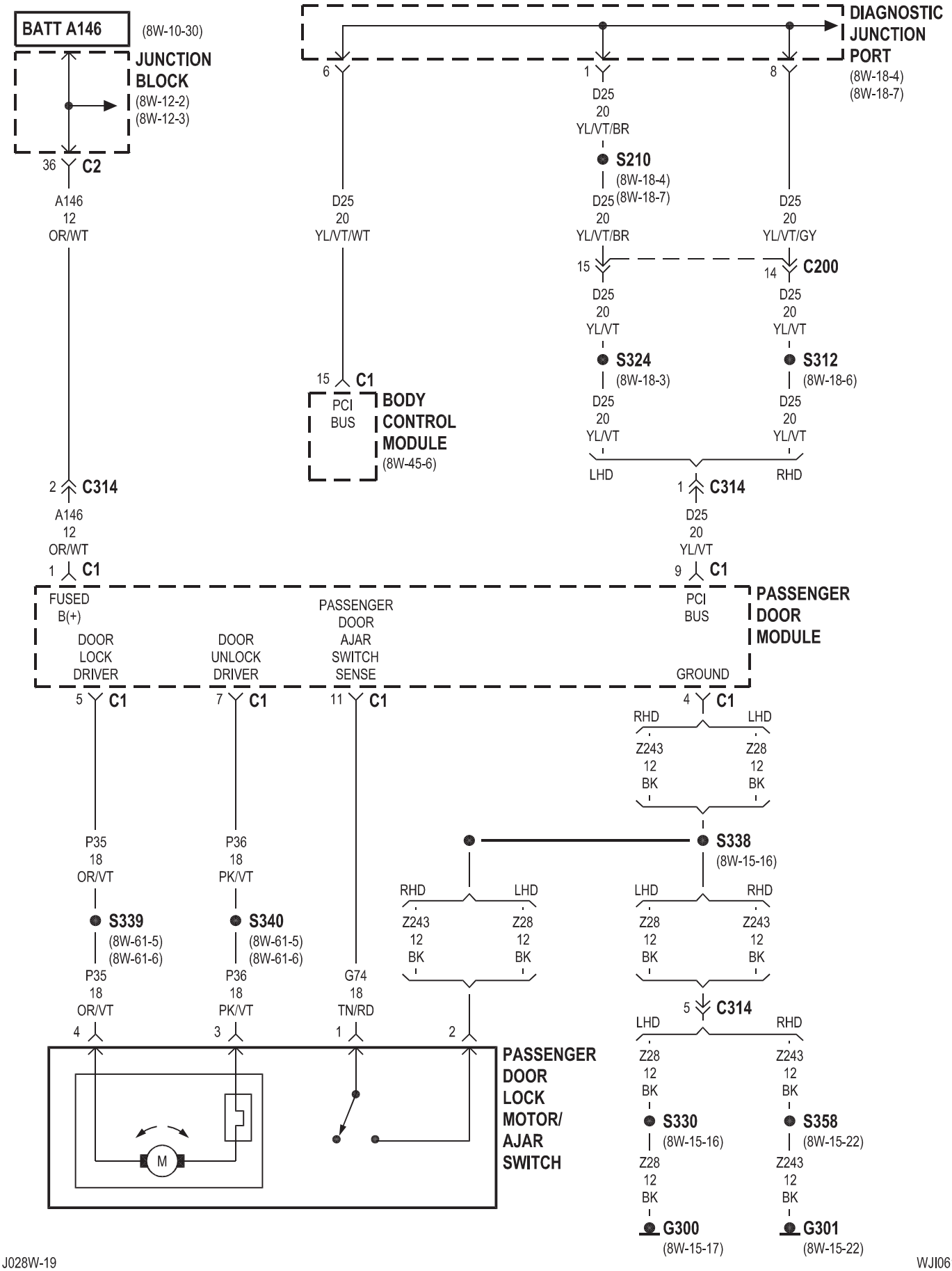

PASSENGER DOOR MODULE
PASSENGER REAR DOOR SWITCH ILLUMINATION
12 C1
E20
20
OR/DB
8 C314
FROM C314 (8W-60-4)
C
D
Q24
16
DG
Q14
16
GY
E20
20
OR/DB
LHD
RHD
9 C303
9 C307
8 C303
8 C307
3 C303
3 C307
Q24
16
DG
Q14
16
GY
E21
20
OR/RD
4
1
3
PASSENGER REAR POWER WINDOW SWITCH
DOWN
UP
5
2
6
Q124
16
DG/WT
Q114
16
GY/WT
Z28
16
BK
Z243
16
BK
S357 (8W-15-16)
S356 (8W-15-22)
10 C303
10 C307
S330 (8W-15-16)
S358 (8W-15-22)
Z28
12
BK
Z243
12
BK
G300 (8W-15-17)
G301 (8W-15-22)
1
2
M
PASSENGER REAR POWER WINDOW MOTOR

8W-61 POWER DOOR LOCKS

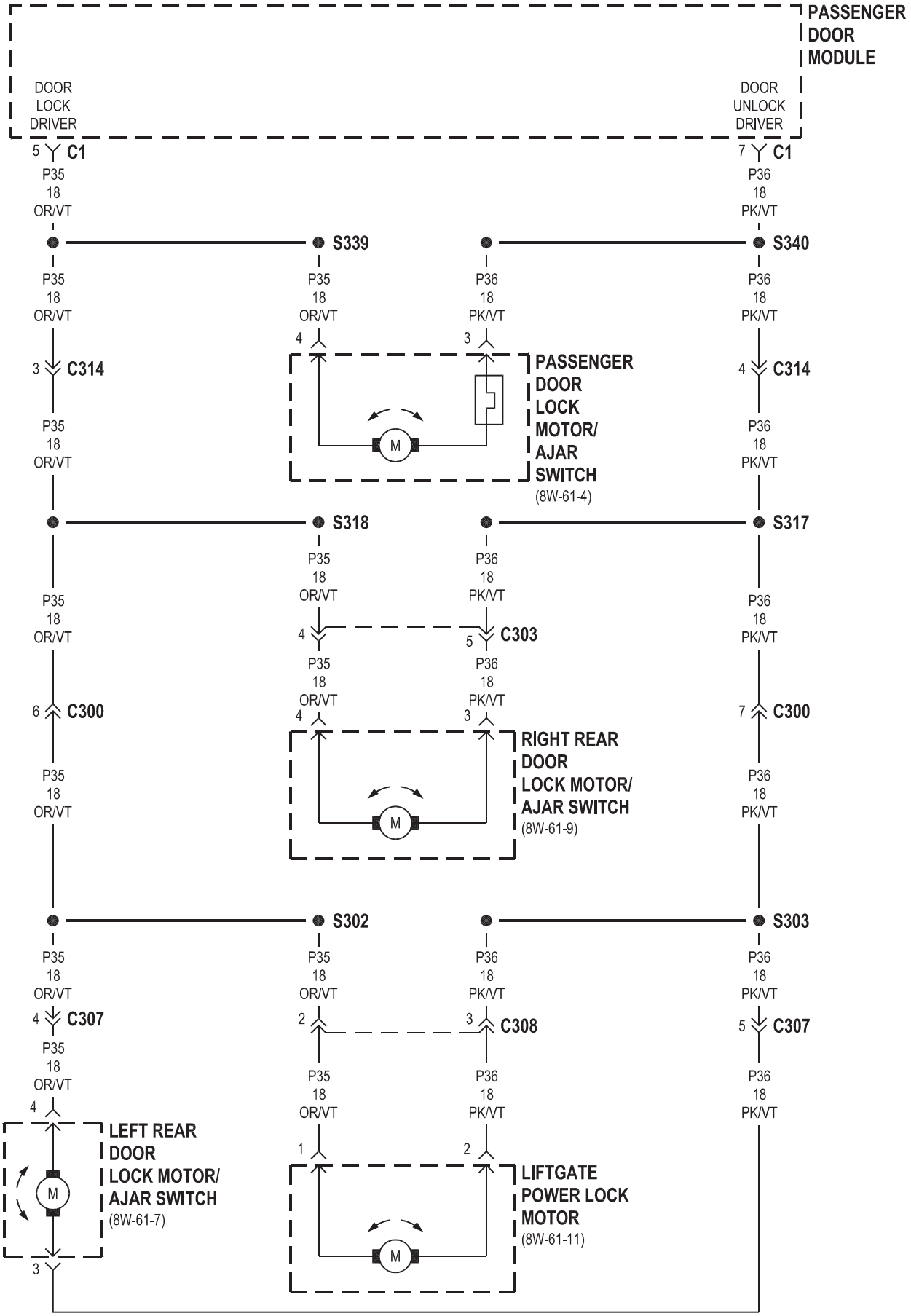
Component	Page
Body Control Module	8W-61-2, 4, 7, 8, 9, 10, 12
Diagnostic Junction Port	8W-61-2, 4
Driver Cylinder Lock Switch	8W-61-3
Driver Door Lock Motor/Ajar Switch	8W-61-3
Driver Door Module	8W-61-2, 3
Fuse 8	8W-61-11
G300	8W-61-3, 4, 8, 9
G301	8W-61-3, 4, 7, 10, 11, 12
Junction Block	8W-61-2, 4, 7, 10, 11, 12
Left Liftgate Ajar Switch	8W-61-12
Left Rear Door Lock Motor/Ajar Switch	8W-61-5, 6, 7, 10
Liftgate Flip-Up Ajar Switch	8W-61-12
Liftgate Flip-Up Push Button Switch	8W-61-11
Liftgate Flip-Up Release Solenoid	8W-61-11
Liftgate Power Lock Motor	8W-61-5, 6, 11
Passenger Door Lock Motor/Ajar Switch	8W-61-4, 5, 6
Passenger Door Module	8W-61-4, 5, 6, 7, 8, 9, 10, 11
Rear Wiper Motor	8W-61-12
Remote Keyless Module	8W-61-2
Right Liftgate Ajar Switch	8W-61-12
Right Rear Door Lock Motor/Ajar Switch	8W-61-5, 6, 8, 9

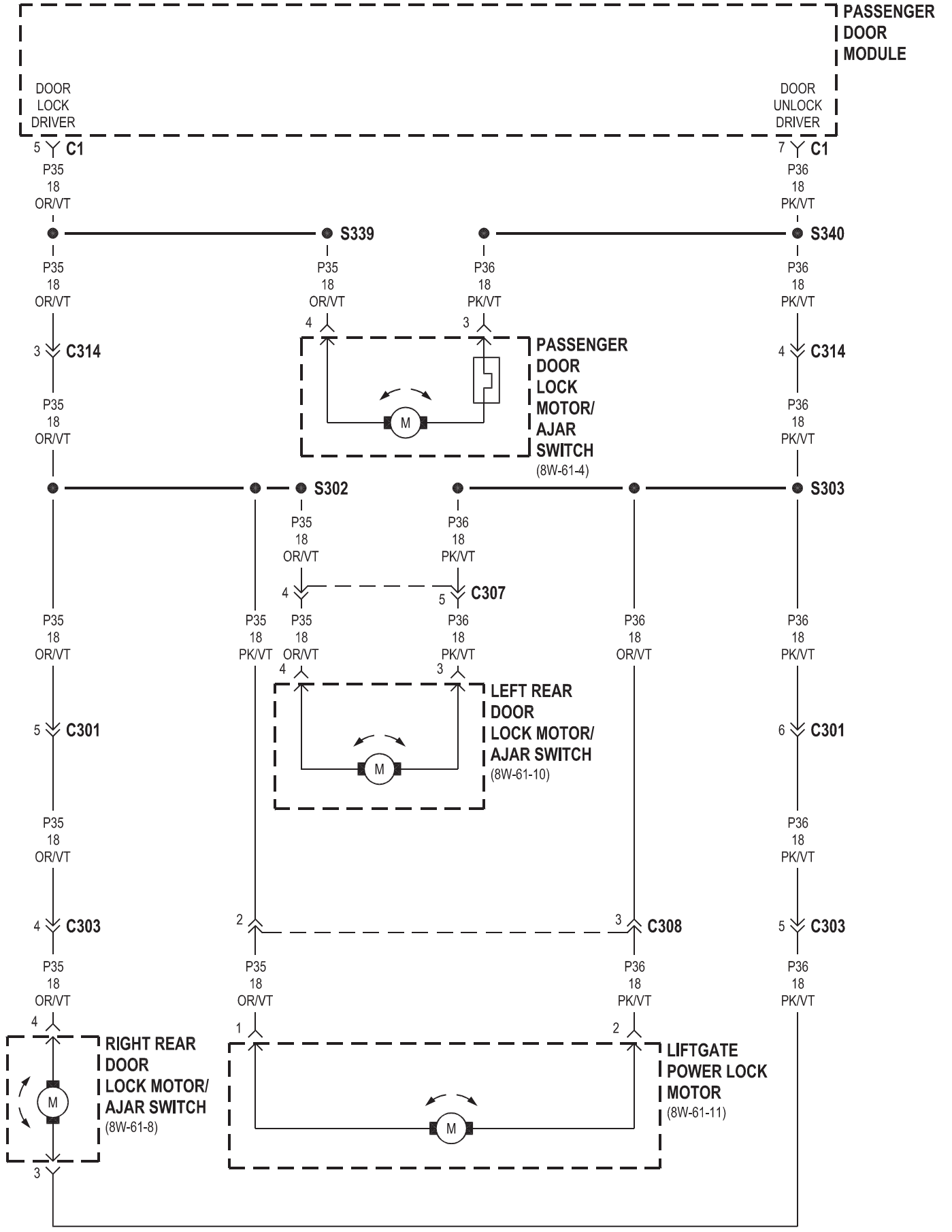

BODY CONTROL MODULE
(8W-45-5)
(8W-45-6)
PCI BUS
15 C1
D25
20
YL/VT/WT
6
BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
45 C2
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
8
1
A146
12
OR/WT
D25
20
YL/VT/GY
D25
20
YL/VT/BR
S210
(8W-18-7)
D25
20
YL/VT/BR
8 C302
14
15 C200
REMOTE KEYLESS MODULE (JAPAN)
(8W-39-11)
DIAGNOSTIC OUT
DIAGNOSTIC OUT
6
5
D25
20
YL/VT
D25
20
YL/VT
S312
(8W-18-2)
S324
(8W-18-5)
A146
12
OR/WT
D30
20
VT/YL
D30
20
VT/YL
LHD
RHD
S365
(8W-39-11)
D30
20
VT/YL
D25
20
YL/VT
3 C302
D25
20
YL/VT
1 C1
FUSED B(+)
8 C1
DIAGNOSTIC OUT
9 C1
PCI BUS
DRIVER DOOR MODULE

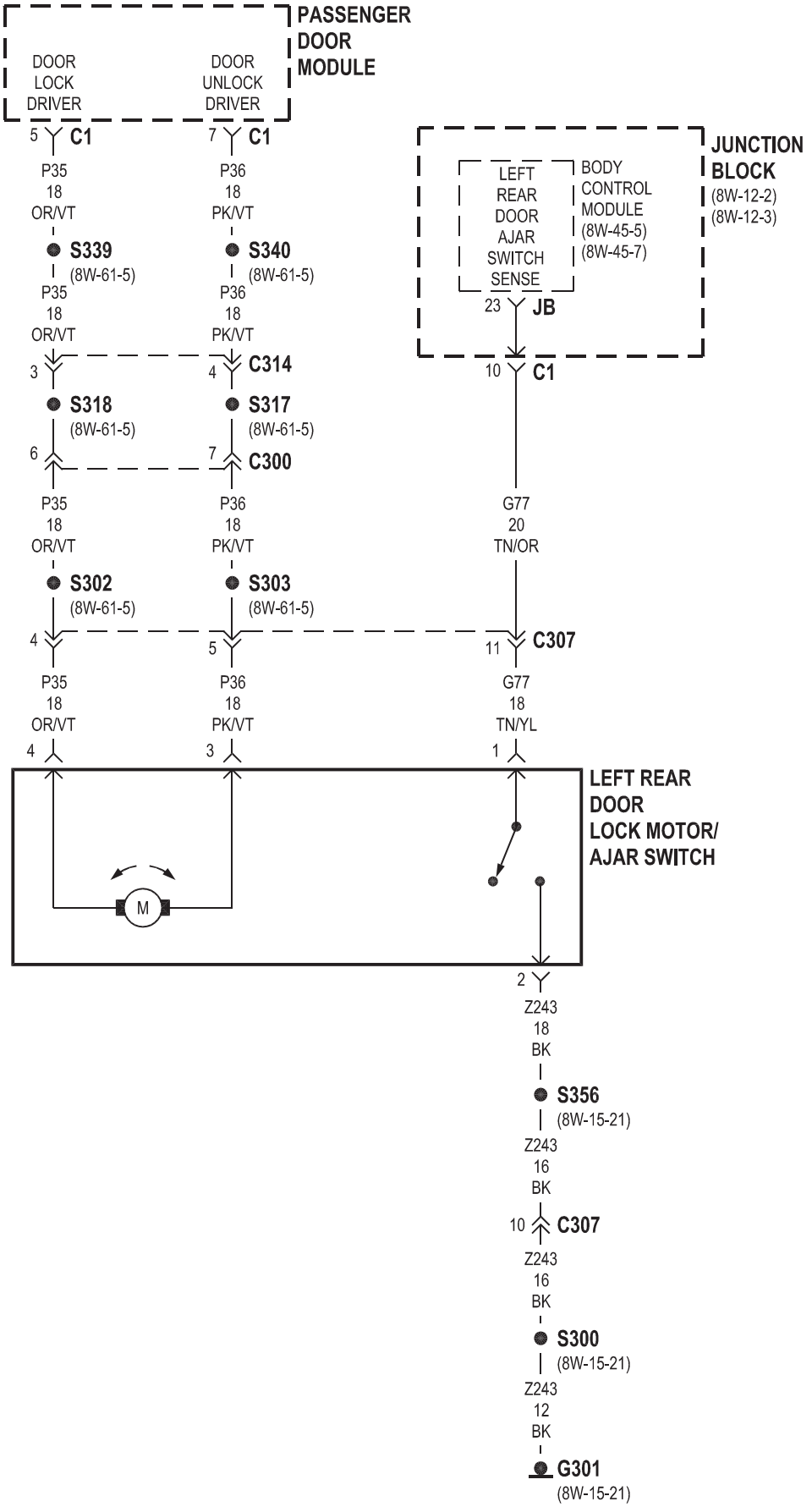

DRIVER DOOR MODULE
DRIVER DOOR LOCK DRIVER
DRIVER DOOR UNLOCK DRIVER
DRIVER DOOR AJAR SWITCH SENSE
GROUND
DRIVER CYLINDER LOCK SWITCH SENSE
5 C1
7 C1
11 C1
4 C1
10 C1
LHD
RHD
P35 18 OR/BK
P34 18 PK/BK
G75 18 TN/RD
Z28 12 BK
Z234 12 BK
G73 20 LG/OR
4
3
1
DRIVER DOOR LOCK MOTOR/ AJAR SWITCH
M
1
DRIVER CYLINDER LOCK SWITCH
2
2
Z28 12 BK
Z243 12 BK
S336
(8W-15-16)
4 C302
S330
(8W-15-16)
S358
(8W-15-22)
G300
(8W-15-17)
G301
(8W-15-22)

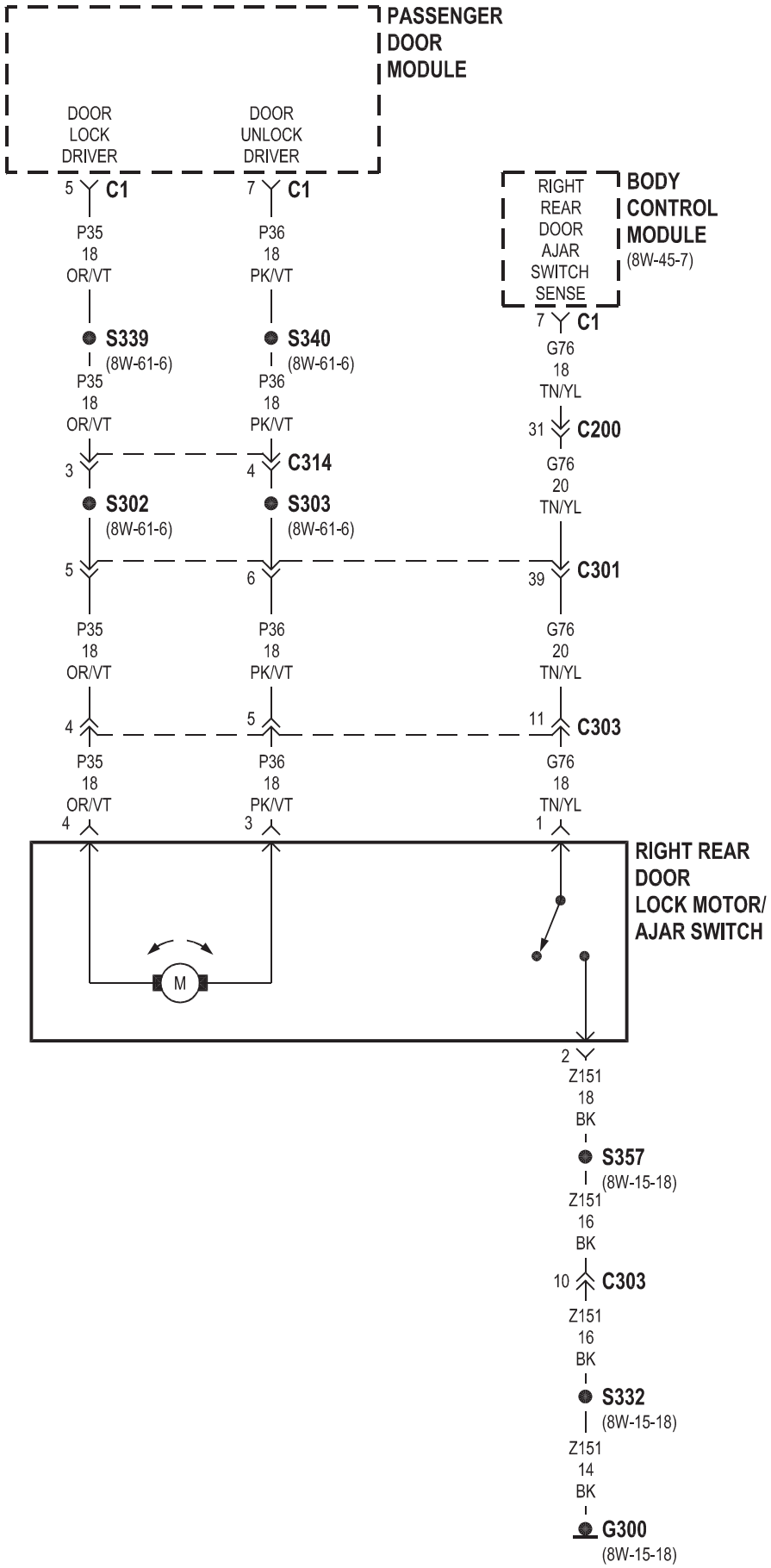

BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
36 C2
A146 12 OR/WT
2 C314
A146 12 OR/WT
1 C1
FUSED B(+)
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
PASSENGER DOOR AJAR SWITCH SENSE
PCI BUS
GROUND
PASSENGER DOOR MODULE
5 C1
7 C1
11 C1
4 C1
P35 18 OR/VT
P36 18 PK/VT
S339
(8W-61-5)
(8W-61-6)
S340
(8W-61-5)
(8W-61-6)
P35 18 OR/VT
P36 18 PK/VT
G74 18 TN/RD
4
3
1
2
M
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
6
1
8
DIAGNOSTIC JUNCTION PORT
(8W-18-4)
(8W-18-7)
D25 20 YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25 20 YL/VT/WT
D25 20 YL/VT/BR
D25 20 YL/VT/GY
15
14
C200
D25 20 YL/VT
S324
(8W-18-3)
S312
(8W-18-6)
15 C1
PCI BUS
BODY CONTROL MODULE
(8W-45-6)
LHD
RHD
1 C314
D25 20 YL/VT
9 C1
RHD
LHD
Z243 12 BK
Z28 12 BK
S338
(8W-15-16)
RHD
LHD
LHD
RHD
Z243 12 BK
Z28 12 BK
5 C314
LHD
RHD
Z28 12 BK
Z243 12 BK
S330
(8W-15-16)
S358
(8W-15-22)
Z28 12 BK
Z243 12 BK
G300
(8W-15-17)
G301
(8W-15-22)

LHD

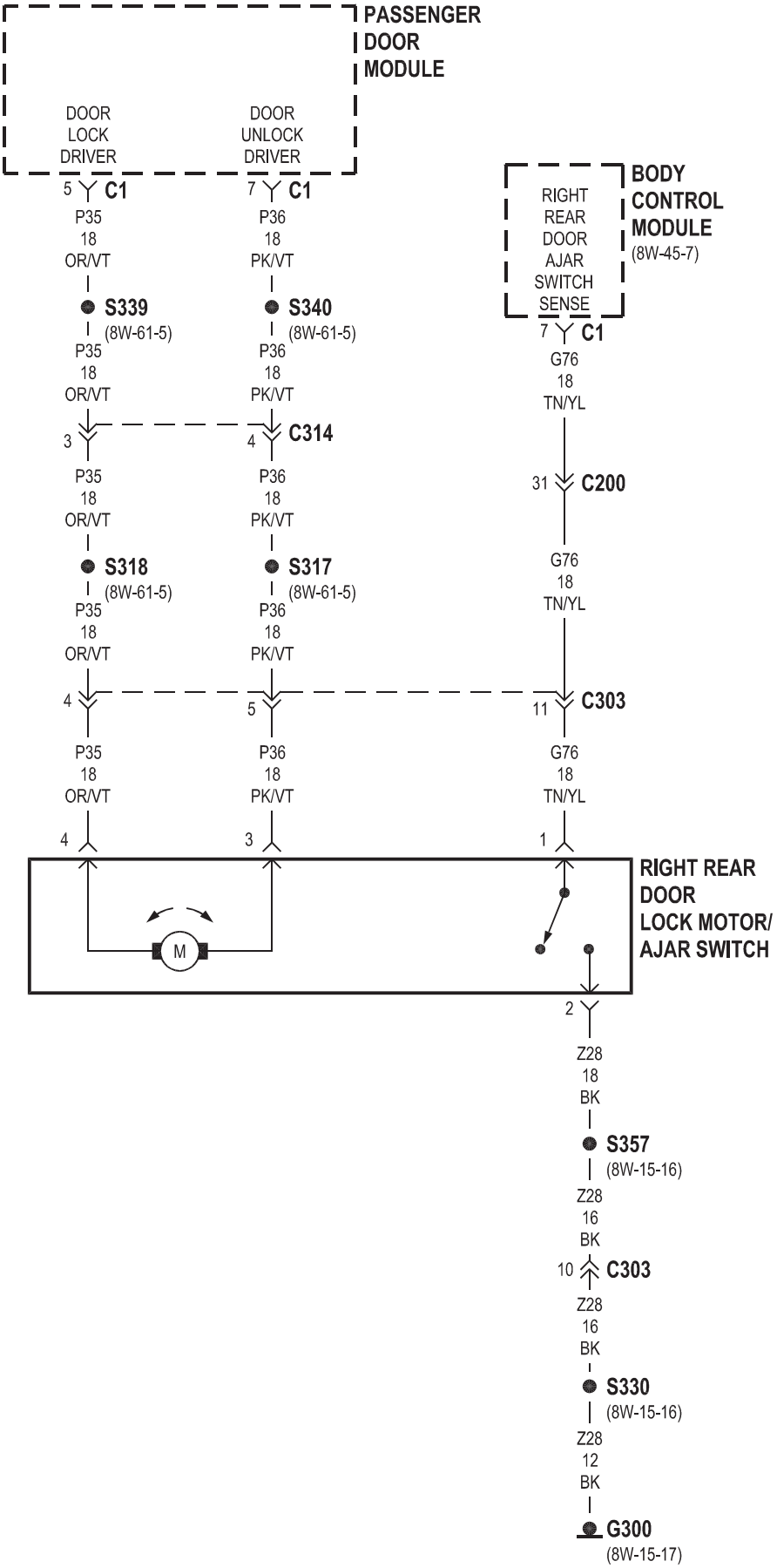

PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
7 C1
P35 18 OR/VT
P36 18 PK/VT
S339
S340
3 C314
4 C314
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-4)
S318
S317
C303
6 C300
7 C300
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-9)
S302
S303
4 C307
5 C307
C308
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-7)
LIFTGATE POWER LOCK MOTOR
(8W-61-11)
M

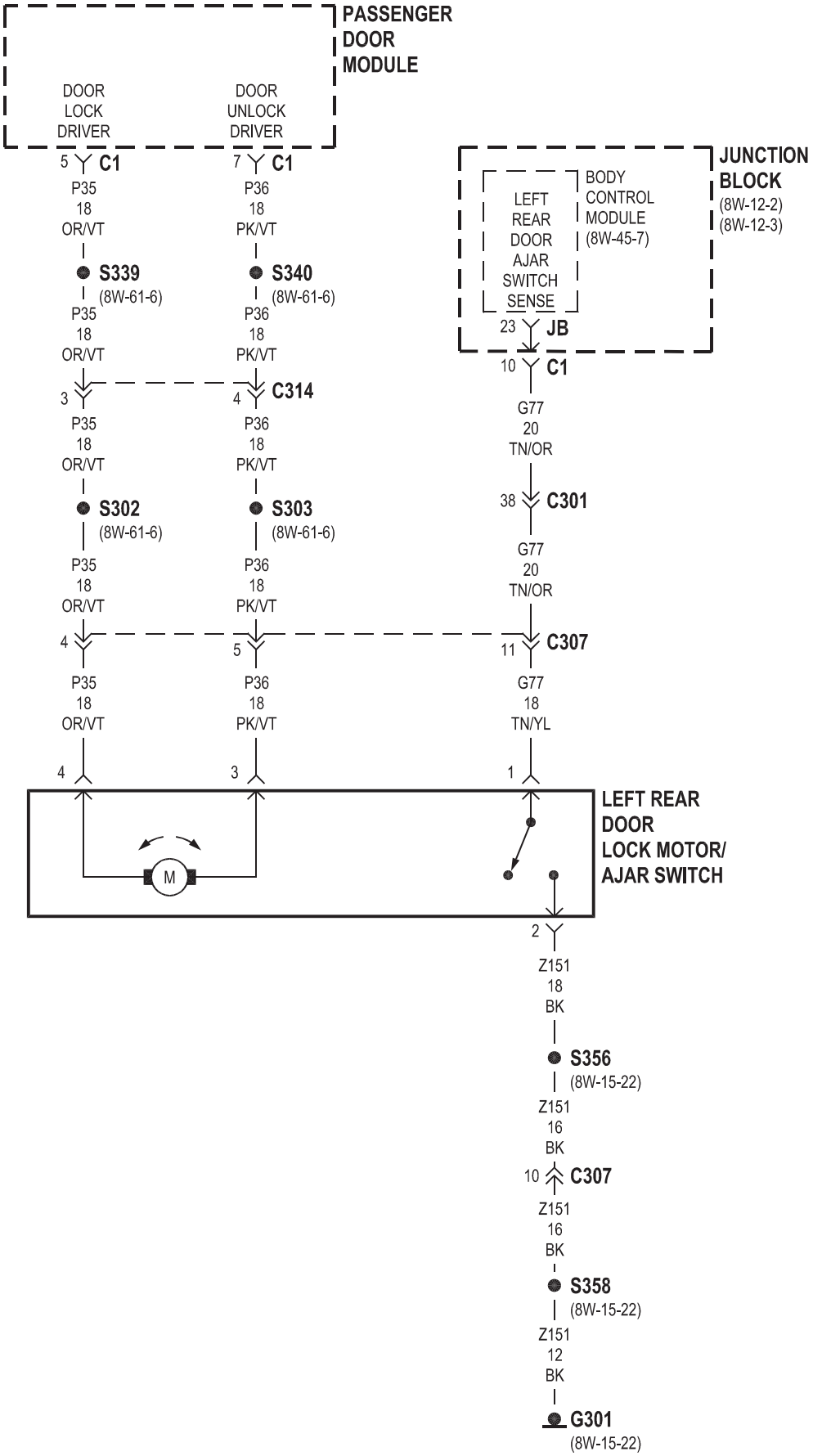

PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
P35 18 OR/VT
7 C1
P36 18 PK/VT
S339
S340
P35 18 OR/VT
P36 18 PK/VT
3 C314
4 C314
PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-4)
S302
S303
P35 18 PK/VT
5 C301
6 C301
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-10)
4 C303
2
3 C308
5 C303
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
(8W-61-8)
LIFTGATE POWER LOCK MOTOR
(8W-61-11)
M

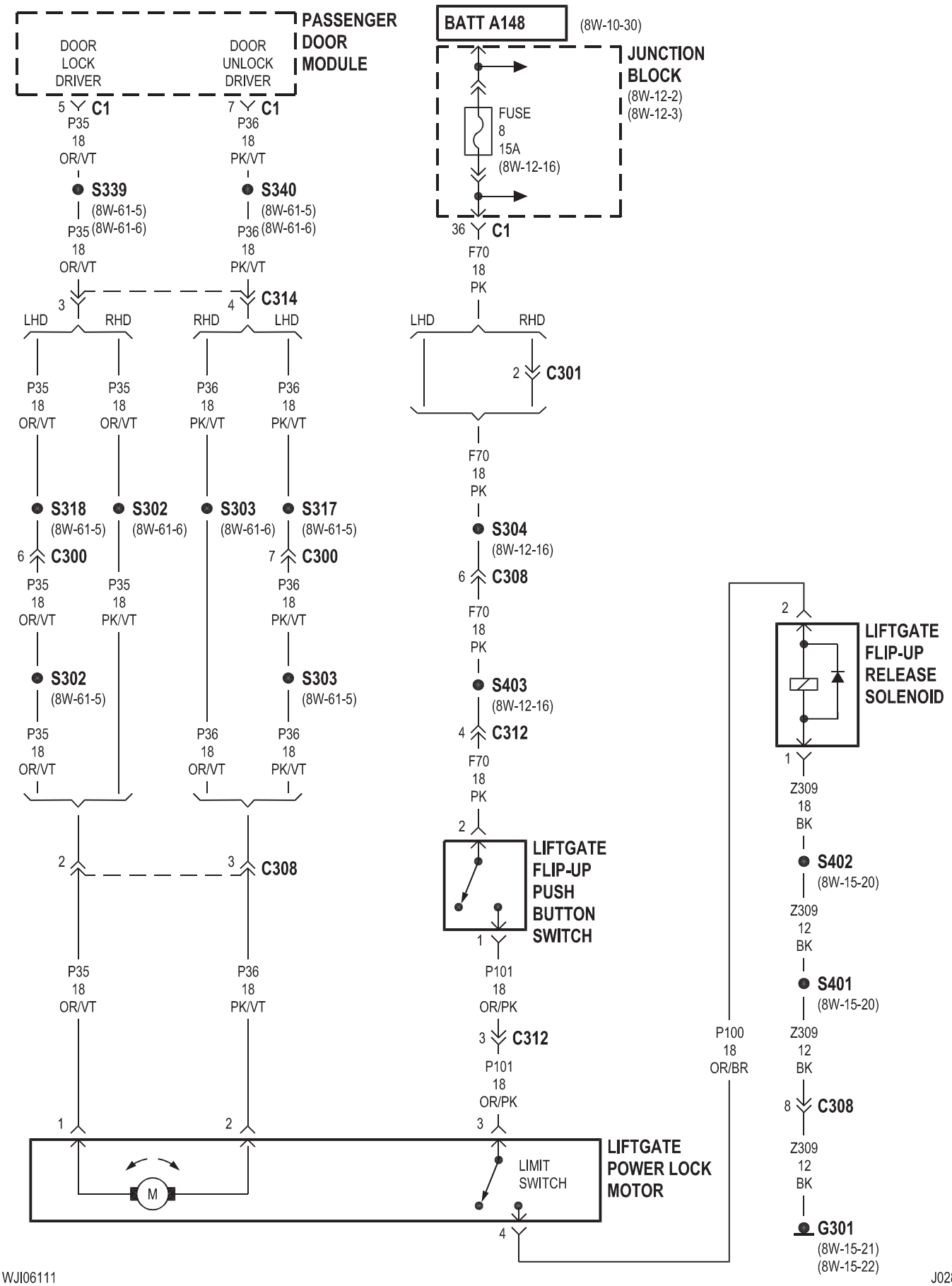

PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
7 C1
P35 18 OR/VT
P36 18 PK/VT
S339 (8W-61-5)
S340 (8W-61-5)
P35 18 OR/VT
P36 18 PK/VT
3
4 C314
S318 (8W-61-5)
S317 (8W-61-5)
6
7 C300
P35 18 OR/VT
P36 18 PK/VT
S302 (8W-61-5)
S303 (8W-61-5)
4
5
P35 18 OR/VT
P36 18 PK/VT
4
3
JUNCTION BLOCK (8W-12-2) (8W-12-3)
LEFT REAR DOOR AJAR SWITCH SENSE
BODY CONTROL MODULE (8W-45-5) (8W-45-7)
23 JB
10 C1
G77 20 TN/OR
11 C307
G77 18 TN/YL
1
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
M
2
Z243 18 BK
S356 (8W-15-21)
Z243 16 BK
10 C307
Z243 16 BK
S300 (8W-15-21)
Z243 12 BK
G301 (8W-15-21)


PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
7 C1
P35 18 OR/VT
P36 18 PK/VT
S339 (8W-61-6)
S340 (8W-61-6)
P35 18 OR/VT
P36 18 PK/VT
3 C314 4
S302 (8W-61-6)
S303 (8W-61-6)
5 6
P35 18 OR/VT
P36 18 PK/VT
4 5
P35 18 OR/VT
P36 18 PK/VT
4 3
M
RIGHT REAR DOOR AJAR SWITCH SENSE
BODY CONTROL MODULE (8W-45-7)
7 C1
G76 18 TN/YL
31 C200
G76 20 TN/YL
39 C301
G76 20 TN/YL
11 C303
G76 18 TN/YL
1
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
2
Z151 18 BK
S357 (8W-15-18)
Z151 16 BK
10 C303
Z151 16 BK
S332 (8W-15-18)
Z151 14 BK
G300 (8W-15-18)

LHD

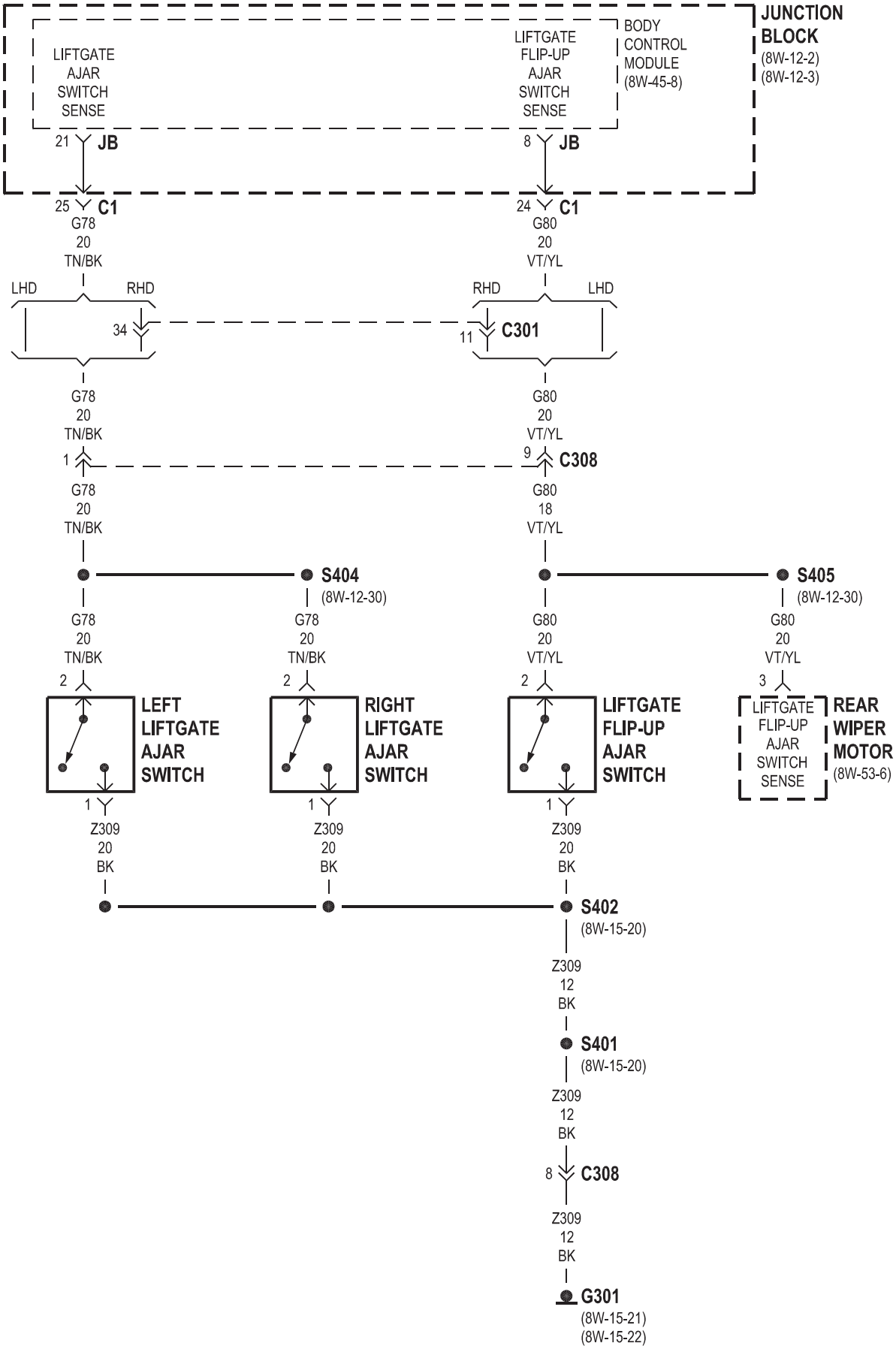

PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
7 C1
P35 18 OR/VT
P36 18 PK/VT
S339
S340
(8W-61-5)
3 C314
4 C314
S318
S317
4 C303
5 C303
11 C303
M
BODY CONTROL MODULE
(8W-45-7)
RIGHT REAR DOOR AJAR SWITCH SENSE
7 C1
G76 18 TN/YL
31 C200
RIGHT REAR DOOR LOCK MOTOR/ AJAR SWITCH
2
Z28 18 BK
S357
(8W-15-16)
Z28 16 BK
10 C303
Z28 16 BK
S330
(8W-15-16)
Z28 12 BK
G300
(8W-15-17)


PASSENGER DOOR MODULE
DOOR LOCK DRIVER
DOOR UNLOCK DRIVER
5 C1
7 C1
P35 18 OR/VT
P36 18 PK/VT
S339
S340
(8W-61-6)
C314
S302
S303
C307
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
LEFT REAR DOOR AJAR SWITCH SENSE
BODY CONTROL MODULE
(8W-45-7)
23 JB
10 C1
G77 20 TN/OR
38 C301
G77 18 TN/YL
LEFT REAR DOOR LOCK MOTOR/ AJAR SWITCH
M
Z151 18 BK
Z151 16 BK
Z151 12 BK
S356
S358
G301
(8W-15-22)



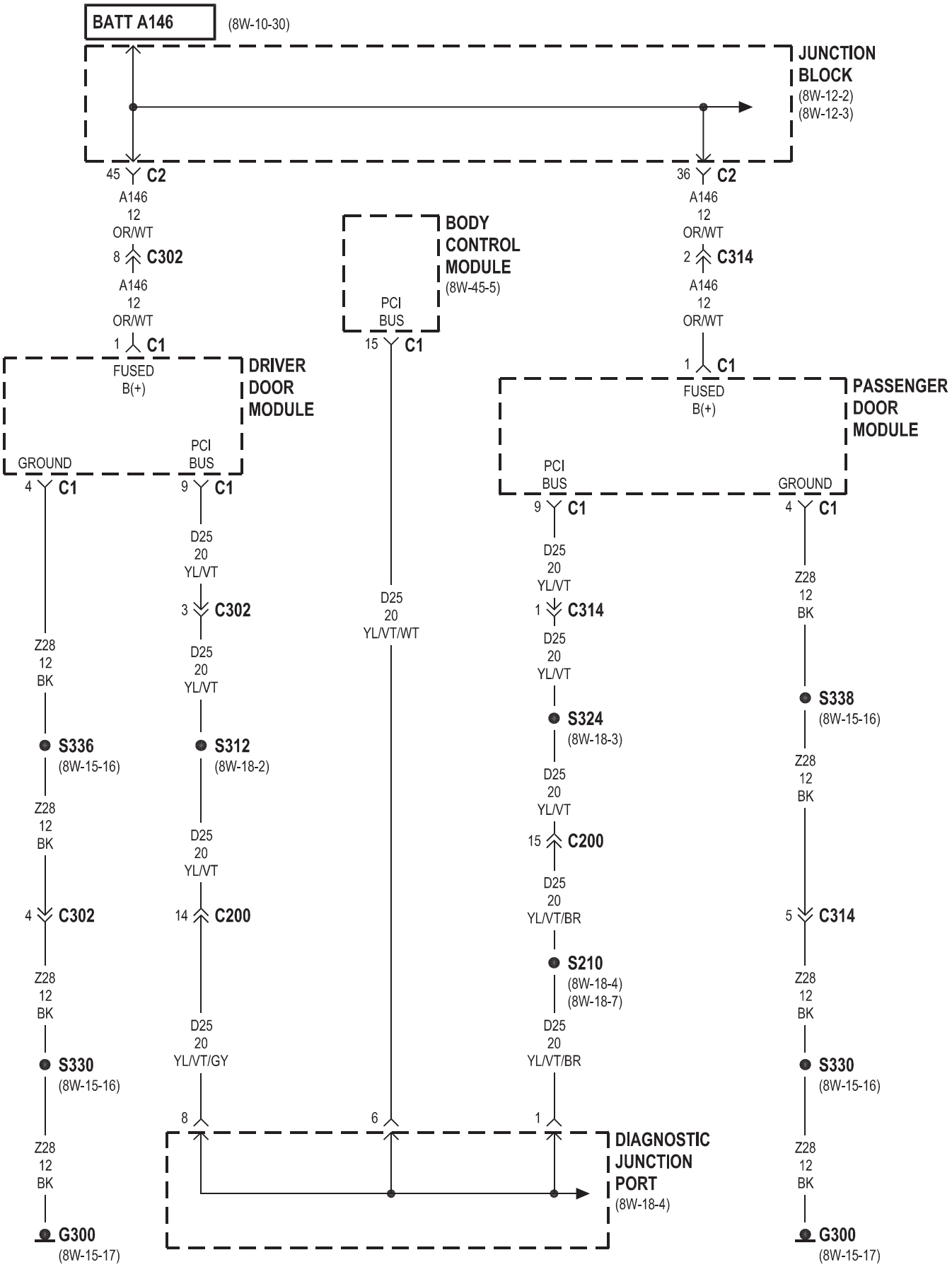
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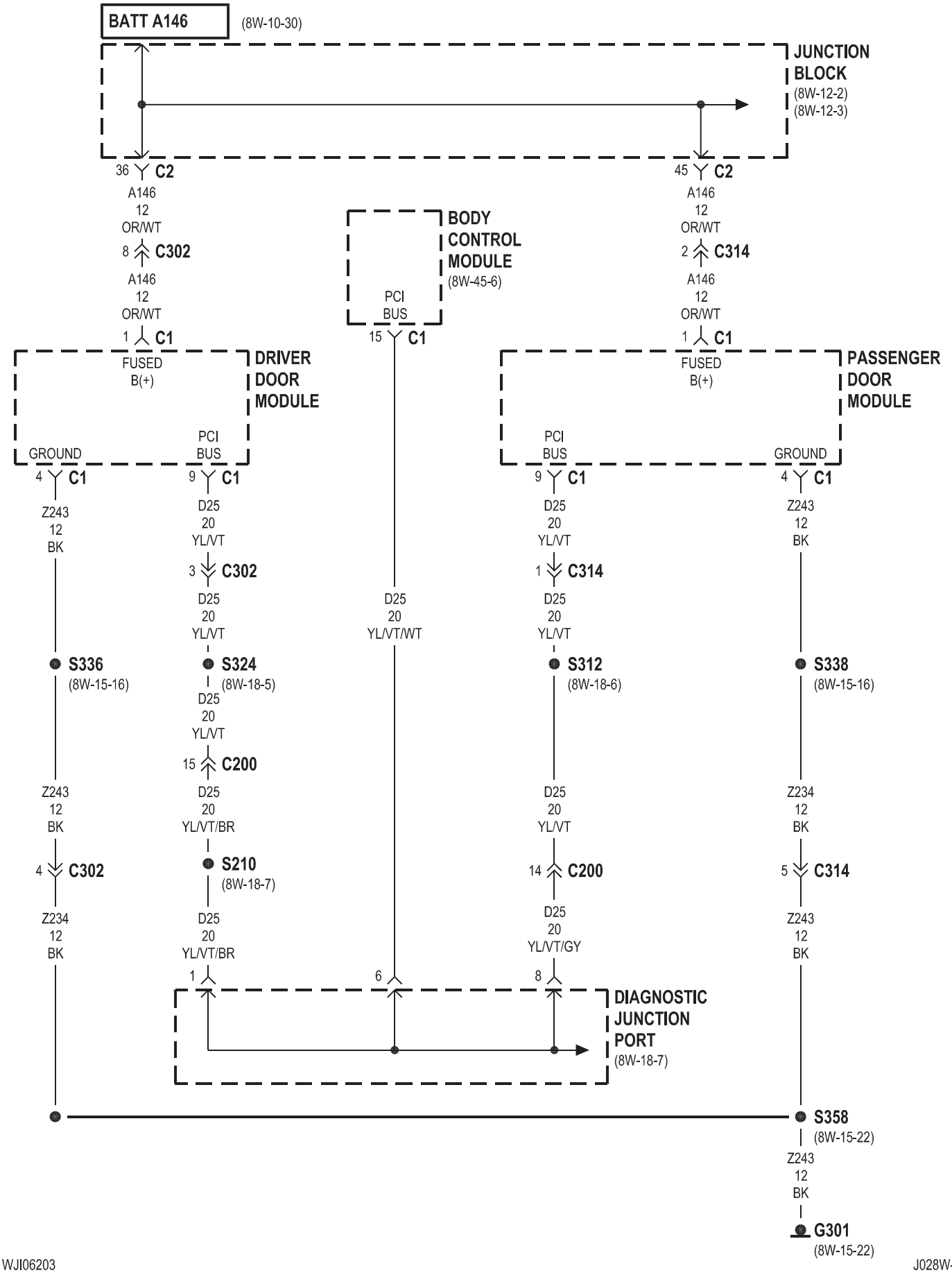
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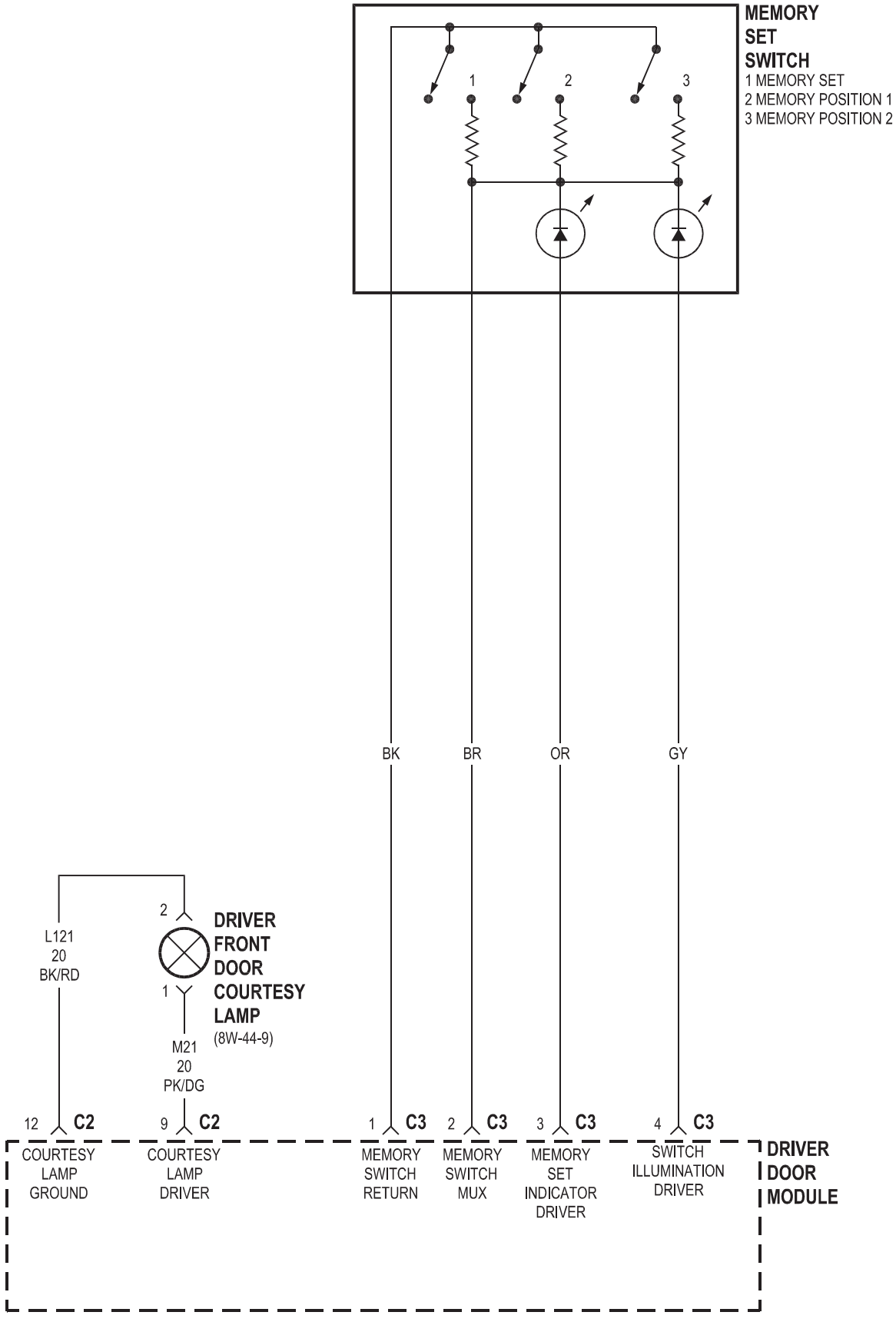

JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
BODY CONTROL MODULE
(8W-45-8)
LIFTGATE AJAR SWITCH SENSE
LIFTGATE FLIP-UP AJAR SWITCH SENSE
21 JB
8 JB
25 C1
24 C1
G78 20 TN/BK
G80 20 VT/YL
LHD
RHD
34
11 C301
1
9 C308
G78 18 VT/YL
S404
(8W-12-30)
S405
(8W-12-30)
2
3
LEFT LIFTGATE AJAR SWITCH
RIGHT LIFTGATE AJAR SWITCH
LIFTGATE FLIP-UP AJAR SWITCH
REAR WIPER MOTOR
(8W-53-6)
Z309 20 BK
S402
(8W-15-20)
Z309 12 BK
S401
(8W-15-20)
8 C308
G301
(8W-15-21)
(8W-15-22)

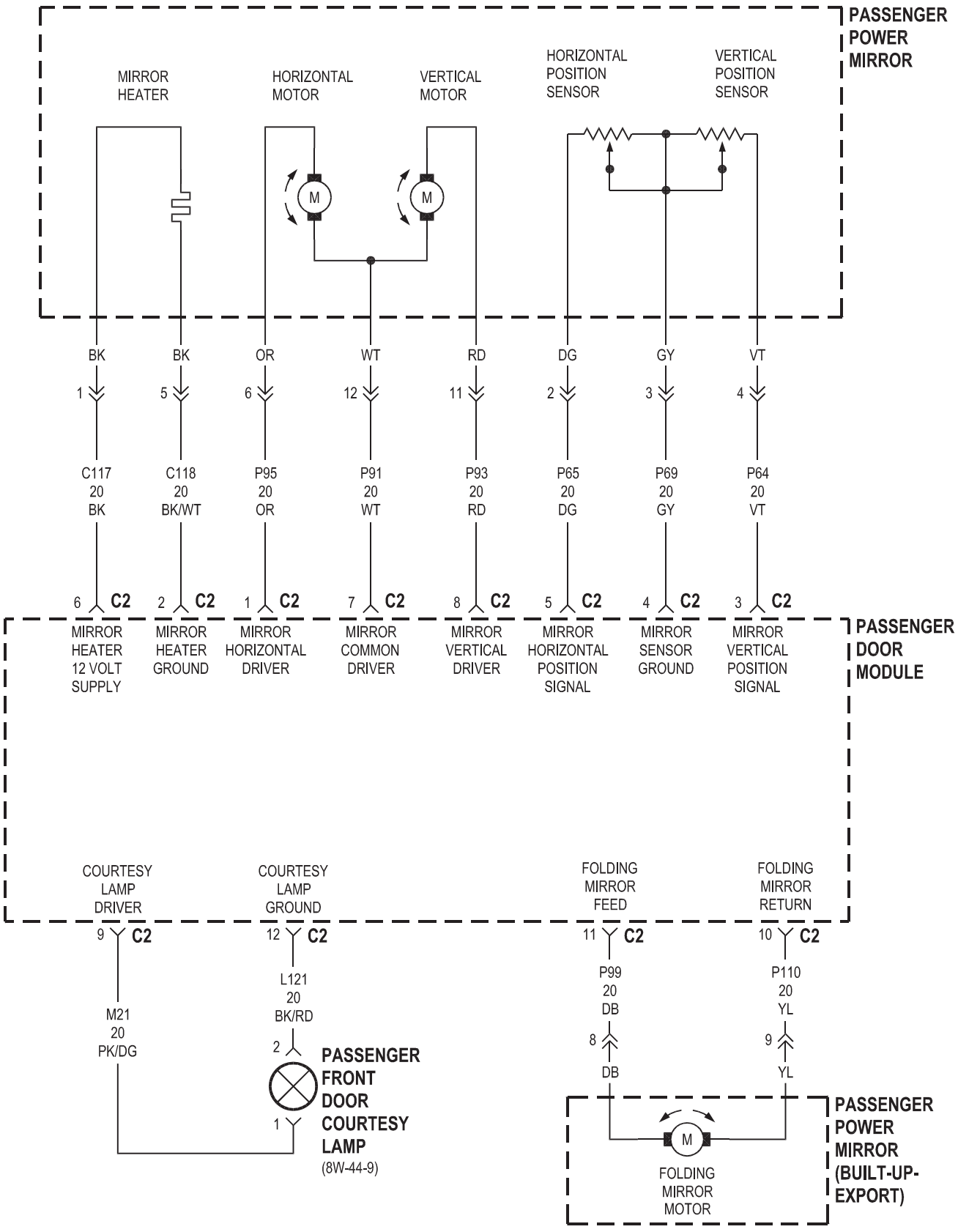
8W-62 POWER MIRRORS

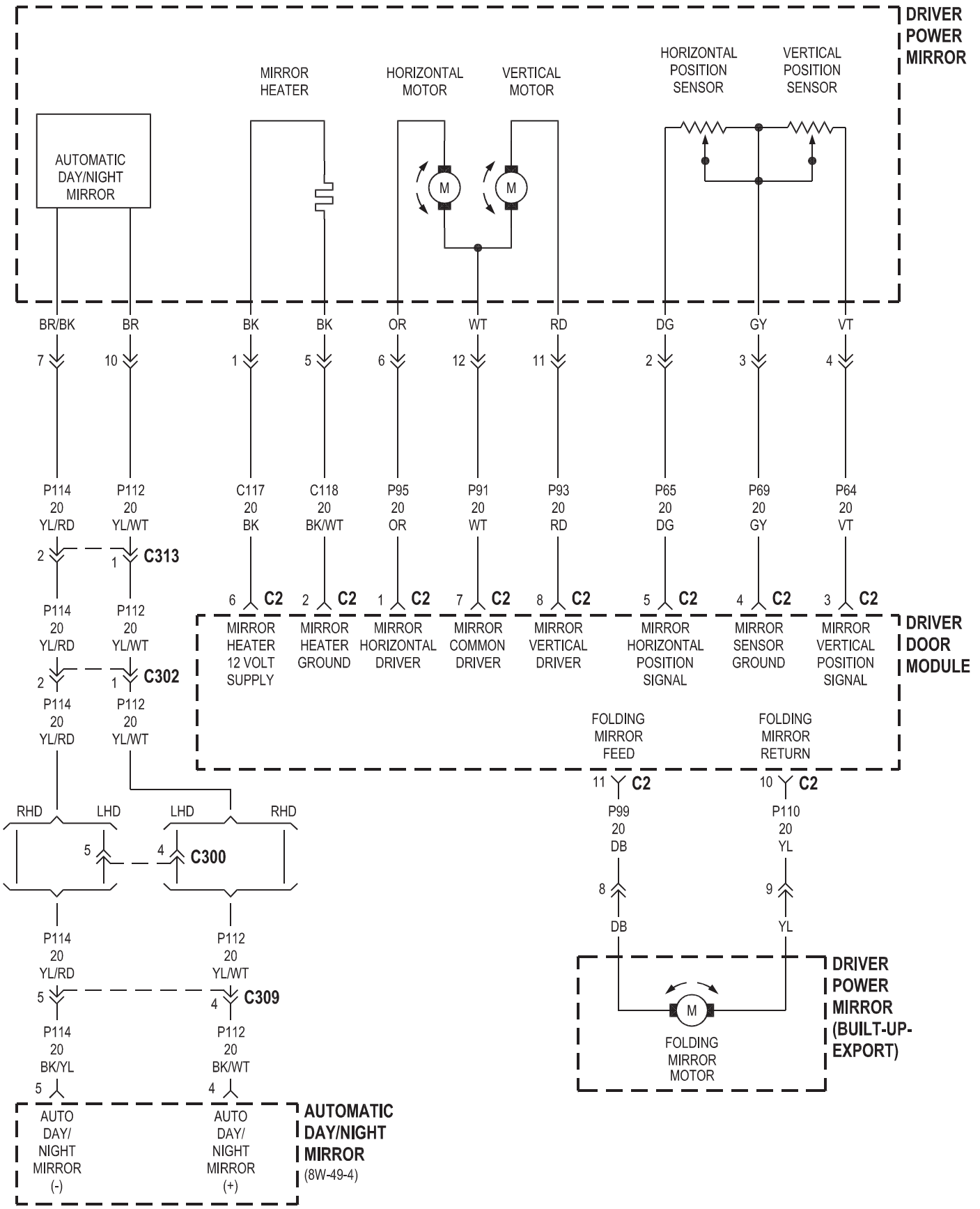
Component	Page
Automatic Day/Night Mirror	8W-62-6
Body Control Module	8W-62-2, 3
Diagnostic Junction Port	8W-62-2, 3
Driver Door Module	8W-62-2, 3, 4, 6
Driver Front Door Courtesy Lamp	8W-62-4
Driver Power Mirror	8W-62-6
G300	8W-62-2
G301	8W-62-3
Junction Block	8W-62-2, 3
Memory Set Switch	8W-62-4
Passenger Door Module	8W-62-2, 3, 5
Passenger Front Door Courtesy Lamp	8W-62-5
Passenger Power Mirror	8W-62-5


BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
45 C2
A146
12
OR/WT
8 C302
A146
12
OR/WT
1 C1
FUSED
B(+)
DRIVER DOOR MODULE
GROUND
4 C1
PCI BUS
9 C1
BODY CONTROL MODULE
(8W-45-5)
PCI BUS
15 C1
36 C2
A146
12
OR/WT
2 C314
A146
12
OR/WT
1 C1
FUSED
B(+)
PASSENGER DOOR MODULE
PCI BUS
9 C1
GROUND
4 C1
Z28
12
BK
S336
(8W-15-16)
Z28
12
BK
4 C302
Z28
12
BK
S330
(8W-15-16)
Z28
12
BK
G300
(8W-15-17)
D25
20
YL/VT
3 C302
D25
20
YL/VT
S312
(8W-18-2)
D25
20
YL/VT
14 C200
D25
20
YL/VT/GY
8
D25
20
YL/VT/WT
6
D25
20
YL/VT
1 C314
D25
20
YL/VT
S324
(8W-18-3)
D25
20
YL/VT
15 C200
D25
20
YL/VT/BR
S210
(8W-18-4)
(8W-18-7)
D25
20
YL/VT/BR
1
Z28
12
BK
S338
(8W-15-16)
Z28
12
BK
5 C314
Z28
12
BK
S330
(8W-15-16)
Z28
12
BK
G300
(8W-15-17)
DIAGNOSTIC JUNCTION PORT
(8W-18-4)


BATT A146
(8W-10-30)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
36 C2
A146
12
OR/WT
45 C2
A146
12
OR/WT
BODY CONTROL MODULE
(8W-45-6)
8 C302
A146
12
OR/WT
2 C314
A146
12
OR/WT
PCI BUS
15 C1
1 C1
FUSED B(+)
1 C1
FUSED B(+)
DRIVER DOOR MODULE
PASSENGER DOOR MODULE
GROUND
PCI BUS
PCI BUS
GROUND
4 C1
9 C1
9 C1
4 C1
Z243
12
BK
D25
20
YL/VT
D25
20
YL/VT
Z243
12
BK
3 C302
1 C314
D25
20
YL/VT
D25
20
YL/VT/WT
D25
20
YL/VT
S336
(8W-15-16)
S324
(8W-18-5)
S312
(8W-18-6)
S338
(8W-15-16)
D25
20
YL/VT
15 C200
D25
20
YL/VT
Z243
12
BK
D25
20
YL/VT/BR
D25
20
YL/VT
Z234
12
BK
4 C302
S210
(8W-18-7)
14 C200
5 C314
Z234
12
BK
D25
20
YL/VT/BR
D25
20
YL/VT/GY
Z243
12
BK
1
6
8
DIAGNOSTIC JUNCTION PORT
(8W-18-7)
S358
(8W-15-22)
Z243
12
BK
G301
(8W-15-22)

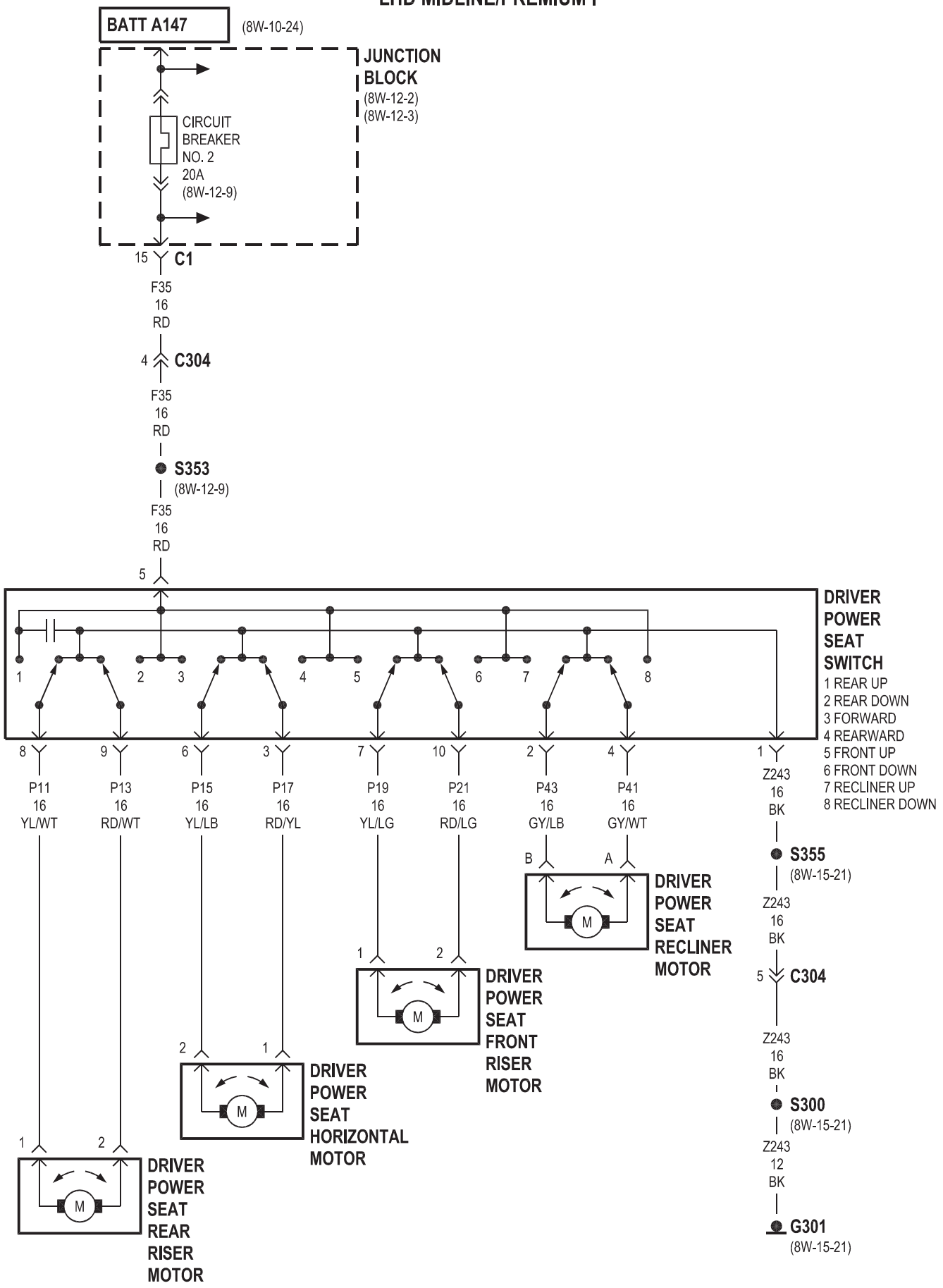

MEMORY
SET
SWITCH
1 MEMORY SET
2 MEMORY POSITION 1
3 MEMORY POSITION 2
1
2
3
BK
BR
OR
GY
L121
20
BK/RD
2
1
DRIVER
FRONT
DOOR
COURTESY
LAMP
(8W-44-9)
M21
20
PK/DG
12 C2
COURTESY
LAMP
GROUND
9 C2
COURTESY
LAMP
DRIVER
1 C3
MEMORY
SWITCH
RETURN
2 C3
MEMORY
SWITCH
MUX
3 C3
MEMORY
SET
INDICATOR
DRIVER
4 C3
SWITCH
ILLUMINATION
DRIVER
DRIVER
DOOR
MODULE

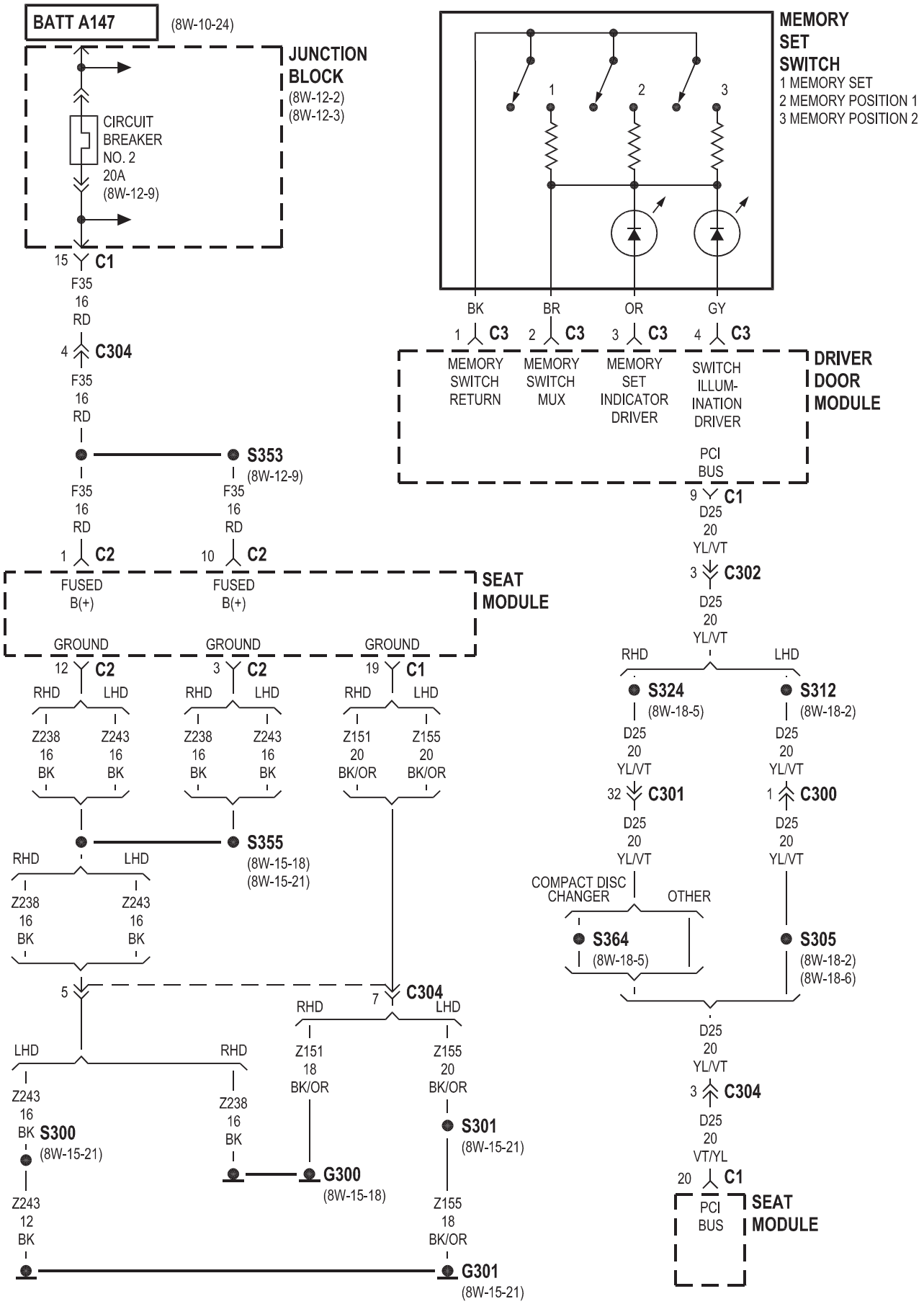

PASSENGER POWER MIRROR
MIRROR HEATER
HORIZONTAL MOTOR
VERTICAL MOTOR
HORIZONTAL POSITION SENSOR
VERTICAL POSITION SENSOR
M
M
BK
BK
OR
WT
RD
DG
GY
VT
1
5
6
12
11
2
3
4
C117 20 BK
C118 20 BK/WT
P95 20 OR
P91 20 WT
P93 20 RD
P65 20 DG
P69 20 GY
P64 20 VT
6 C2
2 C2
1 C2
7 C2
8 C2
5 C2
4 C2
3 C2
MIRROR HEATER 12 VOLT SUPPLY
MIRROR HEATER GROUND
MIRROR HORIZONTAL DRIVER
MIRROR COMMON DRIVER
MIRROR VERTICAL DRIVER
MIRROR HORIZONTAL POSITION SIGNAL
MIRROR SENSOR GROUND
MIRROR VERTICAL POSITION SIGNAL
PASSENGER DOOR MODULE
COURTESY LAMP DRIVER
COURTESY LAMP GROUND
FOLDING MIRROR FEED
FOLDING MIRROR RETURN
9 C2
12 C2
11 C2
10 C2
M21 20 PK/DG
L121 20 BK/RD
P99 20 DB
P110 20 YL
2
8
9
DB
YL
PASSENGER FRONT DOOR COURTESY LAMP
(8W-44-9)
1
M
FOLDING MIRROR MOTOR
PASSENGER POWER MIRROR (BUILT-UP-EXPORT)

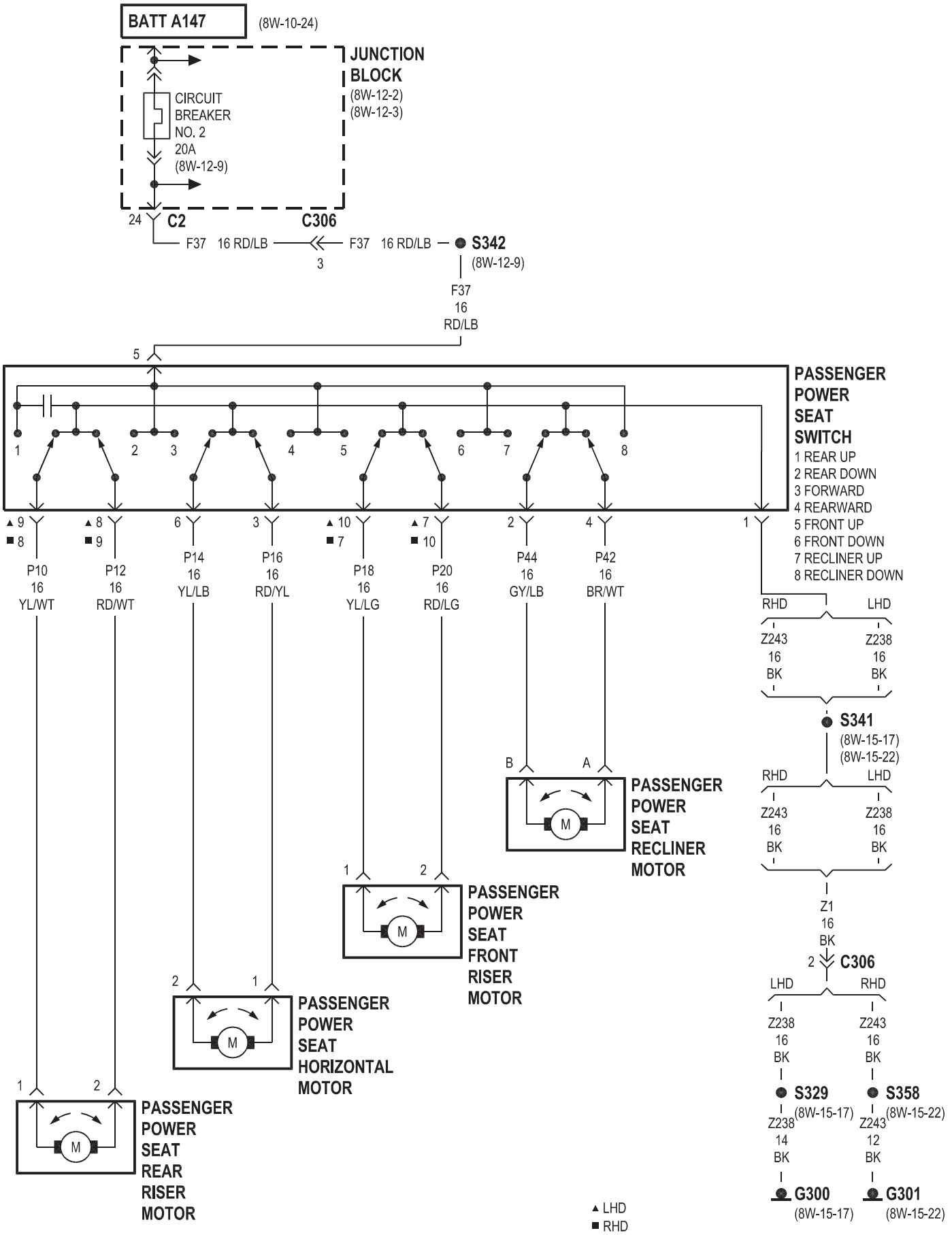

DRIVER POWER MIRROR
AUTOMATIC DAY/NIGHT MIRROR
MIRROR HEATER
HORIZONTAL MOTOR
VERTICAL MOTOR
HORIZONTAL POSITION SENSOR
VERTICAL POSITION SENSOR
M
M
BR/BK
BR
BK
BK
OR
WT
RD
DG
GY
VT
7
10
1
5
6
12
11
2
3
4
P114 20 YL/RD
P112 20 YL/WT
C117 20 BK
C118 20 BK/WT
P95 20 OR
P91 20 WT
P93 20 RD
P65 20 DG
P69 20 GY
P64 20 VT
C313
C302
C300
C309
C2
MIRROR HEATER 12 VOLT SUPPLY
MIRROR HEATER GROUND
MIRROR HORIZONTAL DRIVER
MIRROR COMMON DRIVER
MIRROR VERTICAL DRIVER
MIRROR HORIZONTAL POSITION SIGNAL
MIRROR SENSOR GROUND
MIRROR VERTICAL POSITION SIGNAL
DRIVER DOOR MODULE
FOLDING MIRROR FEED
FOLDING MIRROR RETURN
RHD
LHD
LHD
RHD
P99 20 DB
P110 20 YL
DB
YL
P114 20 BK/YL
P112 20 BK/WT
AUTO DAY/ NIGHT MIRROR (-)
AUTO DAY/ NIGHT MIRROR (+)
AUTOMATIC DAY/NIGHT MIRROR
(8W-49-4)
FOLDING MIRROR MOTOR
DRIVER POWER MIRROR (BUILT-UP-EXPORT)

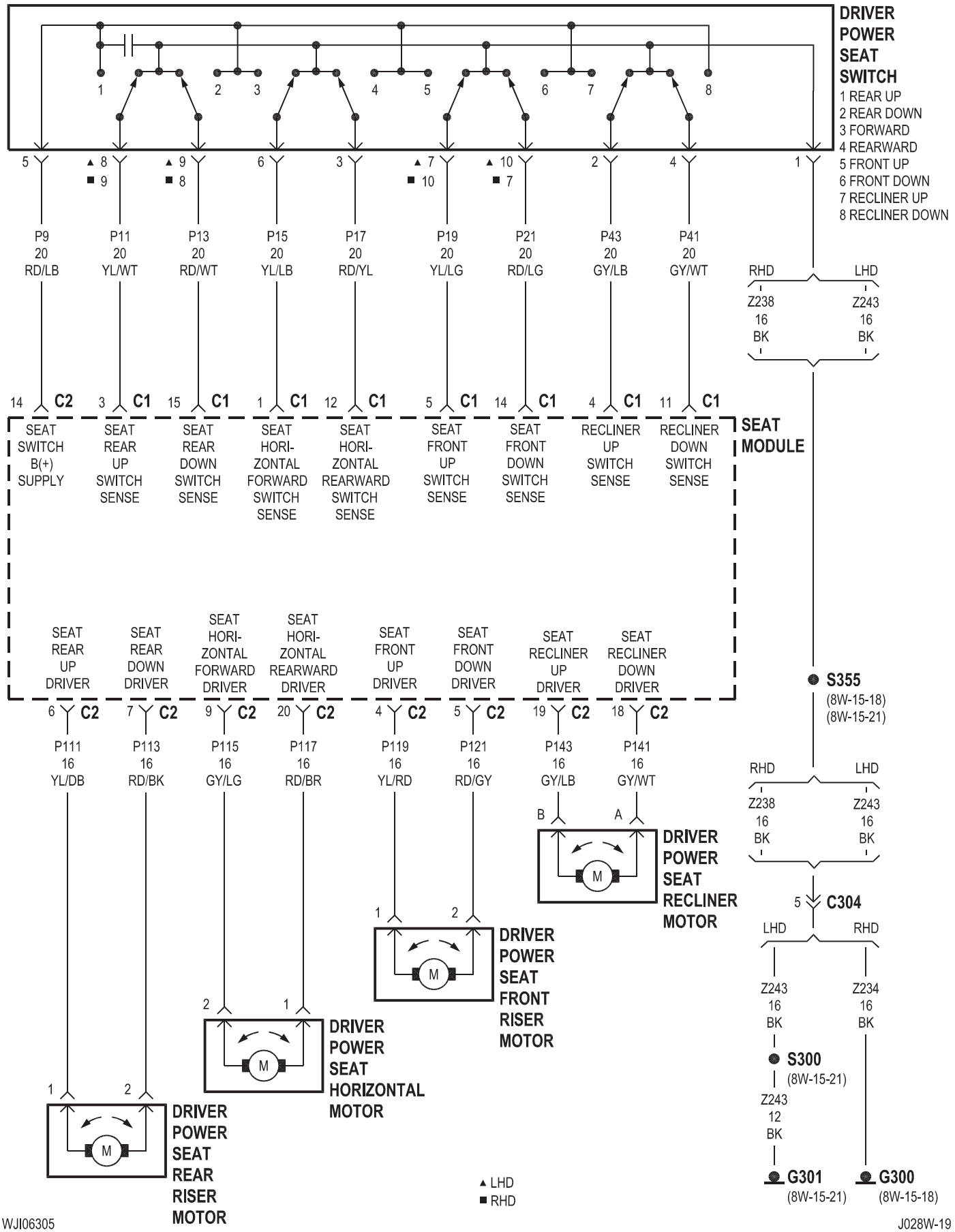
8W-63 POWER SEATS

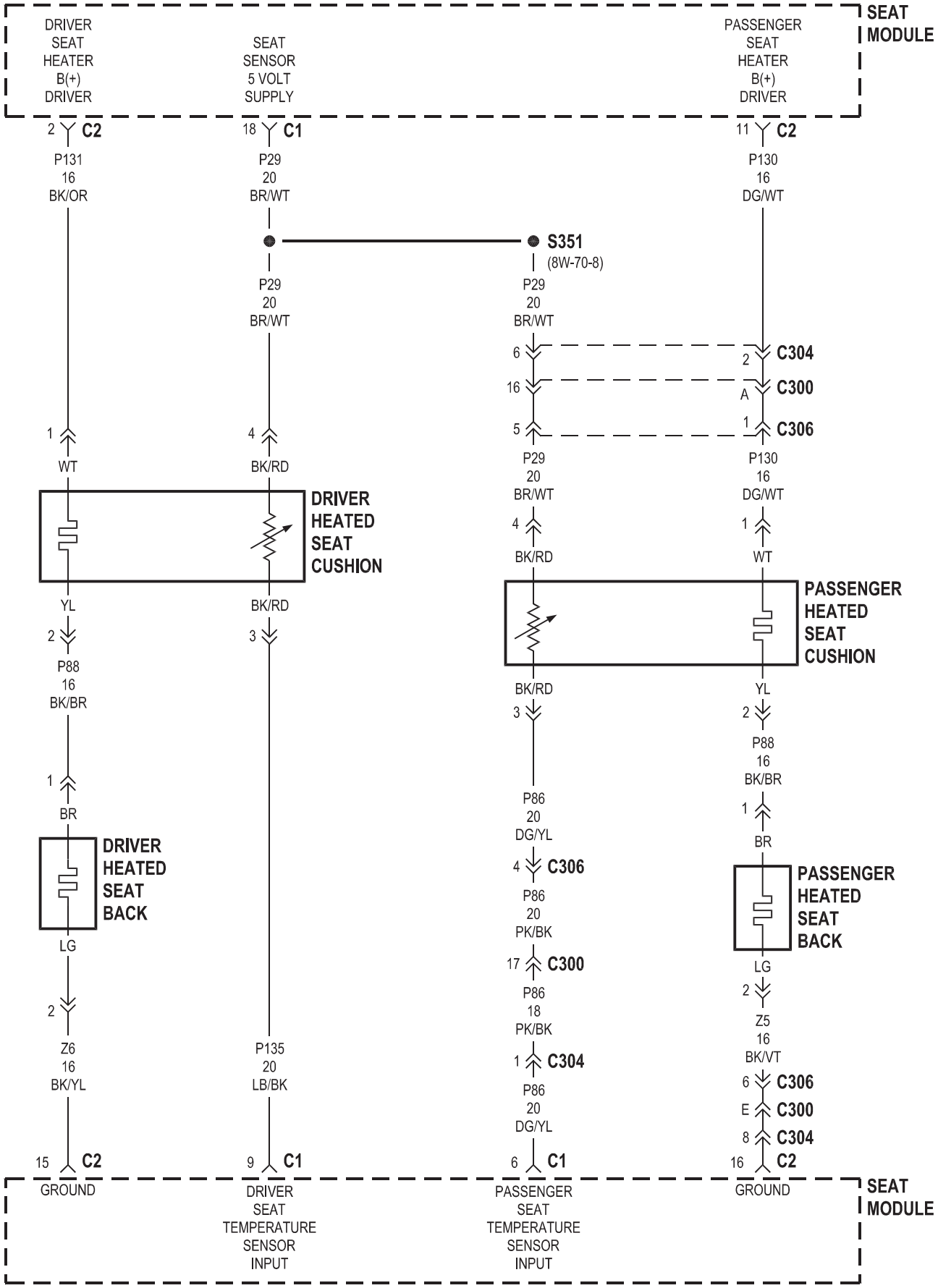
Component	Page
Body Control Module	8W-63-12
Circuit Breaker No. 2 (JB)	8W-63-2, 3, 4, 10, 11
Driver Door Module	8W-63-3
Driver Heated Seat Back	8W-63-6, 7
Driver Heated Seat Cushion	8W-63-6, 7
Driver Heated Seat Switch	8W-63-12
Driver Lumbar Motor	8W-63-10, 11
Driver Lumbar Switch	8W-63-10, 11
Driver Power Seat Front Riser Motor	8W-63-2, 5
Driver Power Seat Front Riser Motor Sensor	8W-63-8
Driver Power Seat Horizontal Motor	8W-63-2, 5
Driver Power Seat Horizontal Motor Sensor	8W-63-8, 9
Driver Power Seat Rear Riser Motor	8W-63-2, 5
Driver Power Seat Rear Riser Motor Sensor	8W-63-8
Driver Power Seat Recliner Motor	8W-63-2, 5
Driver Power Seat Recliner Motor Sensor	8W-63-8, 9
Driver Power Seat Switch	8W-63-2, 5
Fuse 20	8W-63-12
G200	8W-63-12
G300	8W-63-3, 4, 5, 10, 11
G301	8W-63-2, 3, 4, 5, 10, 11
Junction Block	8W-63-2, 3, 4, 10, 11, 12
Memory Set Switch	8W-63-3
Passenger Heated Seat Back	8W-63-6, 7
Passenger Heated Seat Cushion	8W-63-6, 7
Passenger Heated Seat Switch	8W-63-12
Passenger Lumbar Motor	8W-63-10, 11
Passenger Lumbar Switch	8W-63-10, 11
Passenger Power Seat Front Riser Motor	8W-63-4
Passenger Power Seat Horizontal Motor	8W-63-4
Passenger Power Seat Rear Riser Motor	8W-63-4
Passenger Power Seat Recliner Motor	8W-63-4
Passenger Power Seat Switch	8W-63-4
Seat Module	8W-63-3, 5, 6, 7, 8, 9


BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
15 C1
F35 16 RD
4 C304
F35 16 RD
S353
(8W-12-9)
F35 16 RD
5
DRIVER POWER SEAT SWITCH
1 REAR UP
2 REAR DOWN
3 FORWARD
4 REARWARD
5 FRONT UP
6 FRONT DOWN
7 RECLINER UP
8 RECLINER DOWN
8 P11 16 YL/WT
9 P13 16 RD/WT
6 P15 16 YL/LB
3 P17 16 RD/YL
7 P19 16 YL/LG
10 P21 16 RD/LG
2 P43 16 GY/LB
4 P41 16 GY/WT
1 Z243 16 BK
S355
(8W-15-21)
Z243 16 BK
5 C304
Z243 16 BK
S300
(8W-15-21)
Z243 12 BK
G301
(8W-15-21)
B
A
DRIVER POWER SEAT RECLINER MOTOR
1
2
DRIVER POWER SEAT FRONT RISER MOTOR
2
1
DRIVER POWER SEAT HORIZONTAL MOTOR
1
2
DRIVER POWER SEAT REAR RISER MOTOR
M

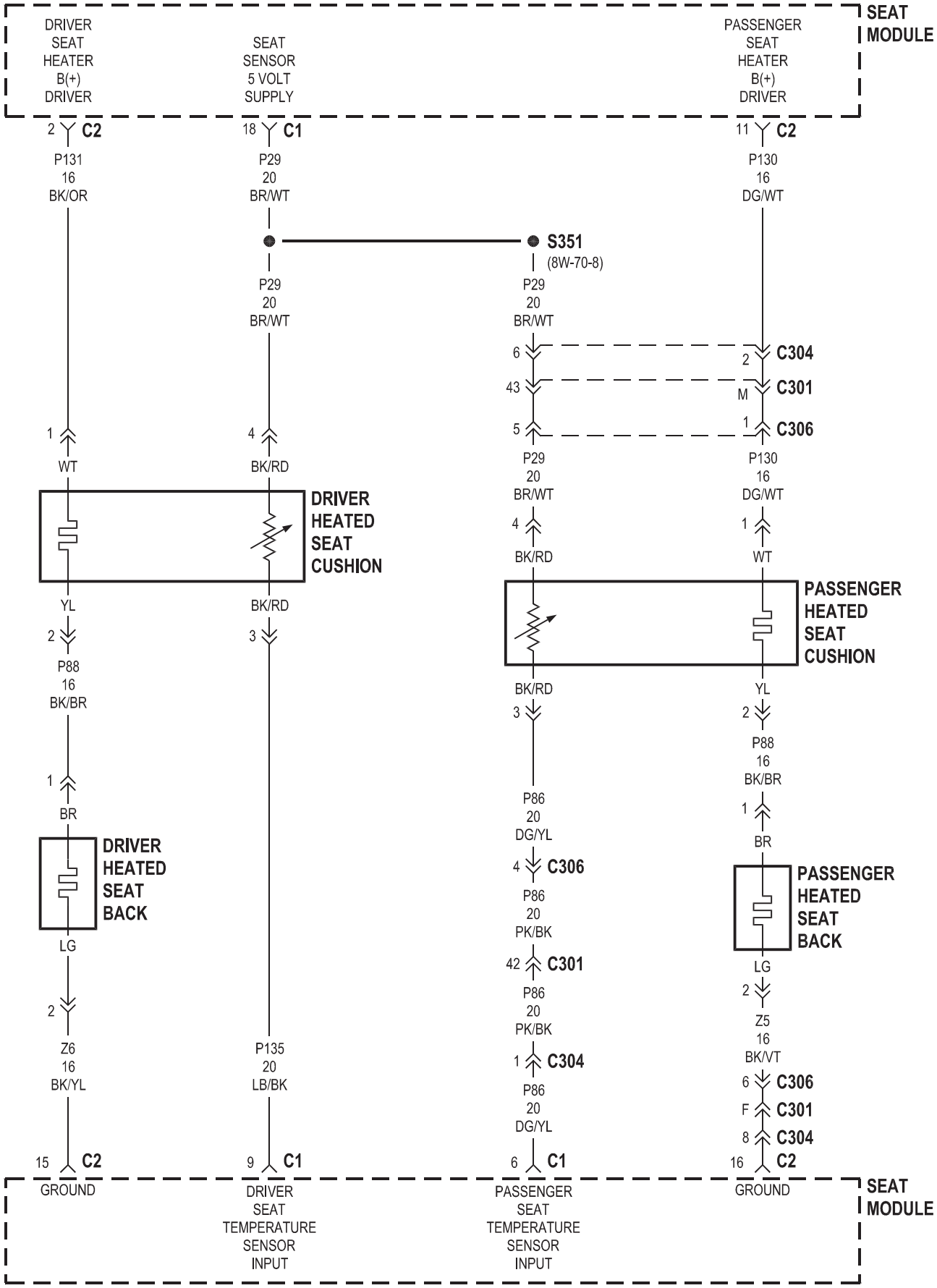

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
15 C1
F35 16 RD
4 C304
F35 16 RD
S353
(8W-12-9)
F35 16 RD
1 C2
FUSED B(+)
F35 16 RD
10 C2
FUSED B(+)
SEAT MODULE
MEMORY SET SWITCH
1 MEMORY SET
2 MEMORY POSITION 1
3 MEMORY POSITION 2
BK BR OR GY
1 C3 2 C3 3 C3 4 C3
MEMORY SWITCH RETURN
MEMORY SWITCH MUX
MEMORY SET INDICATOR DRIVER
SWITCH ILLUM-INATION DRIVER
DRIVER DOOR MODULE
PCI BUS
9 C1
D25 20 YL/VT
3 C302
D25 20 YL/VT
RHD LHD
S324
(8W-18-5)
S312
(8W-18-2)
D25 20 YL/VT
32 C301
D25 20 YL/VT
1 C300
D25 20 YL/VT
COMPACT DISC CHANGER
OTHER
S364
(8W-18-5)
S305
(8W-18-2)
(8W-18-6)
D25 20 YL/VT
3 C304
D25 20 VT/YL
20 C1
PCI BUS
SEAT MODULE
GROUND
12 C2
RHD LHD
Z238 16 BK
Z243 16 BK
GROUND
3 C2
RHD LHD
Z238 16 BK
Z243 16 BK
GROUND
19 C1
RHD LHD
Z151 20 BK/OR
Z155 20 BK/OR
S355
(8W-15-18)
(8W-15-21)
RHD LHD
Z238 16 BK
Z243 16 BK
5 C304
7 C304
LHD RHD
Z243 16 BK
S300
(8W-15-21)
Z238 16 BK
RHD LHD
Z151 18 BK/OR
Z155 20 BK/OR
G300
(8W-15-18)
S301
(8W-15-21)
Z243 12 BK
Z155 18 BK/OR
G301
(8W-15-21)

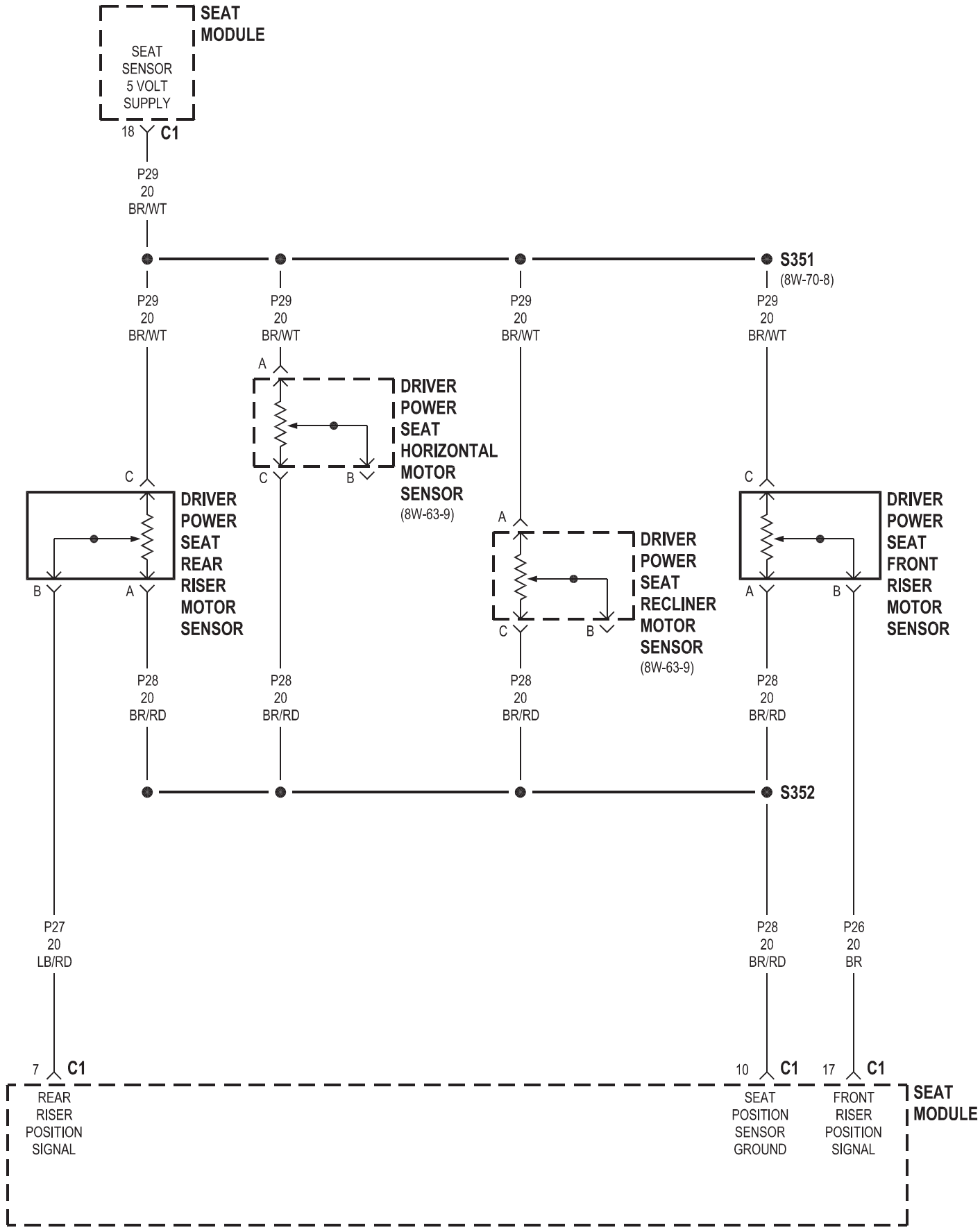

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
24
C2
C306
F37 16 RD/LB
3
F37 16 RD/LB
S342
(8W-12-9)
F37
16
RD/LB
5
PASSENGER POWER SEAT SWITCH
1 REAR UP
2 REAR DOWN
3 FORWARD
4 REARWARD
5 FRONT UP
6 FRONT DOWN
7 RECLINER UP
8 RECLINER DOWN
▲ 9
■ 8
P10
16
YL/WT
▲ 8
■ 9
P12
16
RD/WT
6
P14
16
YL/LB
3
P16
16
RD/YL
▲ 10
■ 7
P18
16
YL/LG
▲ 7
■ 10
P20
16
RD/LG
2
P44
16
GY/LB
4
P42
16
BR/WT
1
RHD
LHD
Z243
16
BK
Z238
16
BK
S341
(8W-15-17)
(8W-15-22)
B
A
PASSENGER POWER SEAT RECLINER MOTOR
M
1
2
PASSENGER POWER SEAT FRONT RISER MOTOR
2
1
PASSENGER POWER SEAT HORIZONTAL MOTOR
1
2
PASSENGER POWER SEAT REAR RISER MOTOR
Z1
16
BK
2
C306
Z238
16
BK
Z243
16
BK
S329
(8W-15-17)
S358
(8W-15-22)
Z238
14
BK
Z243
12
BK
G300
(8W-15-17)
G301
(8W-15-22)
▲ LHD
■ RHD

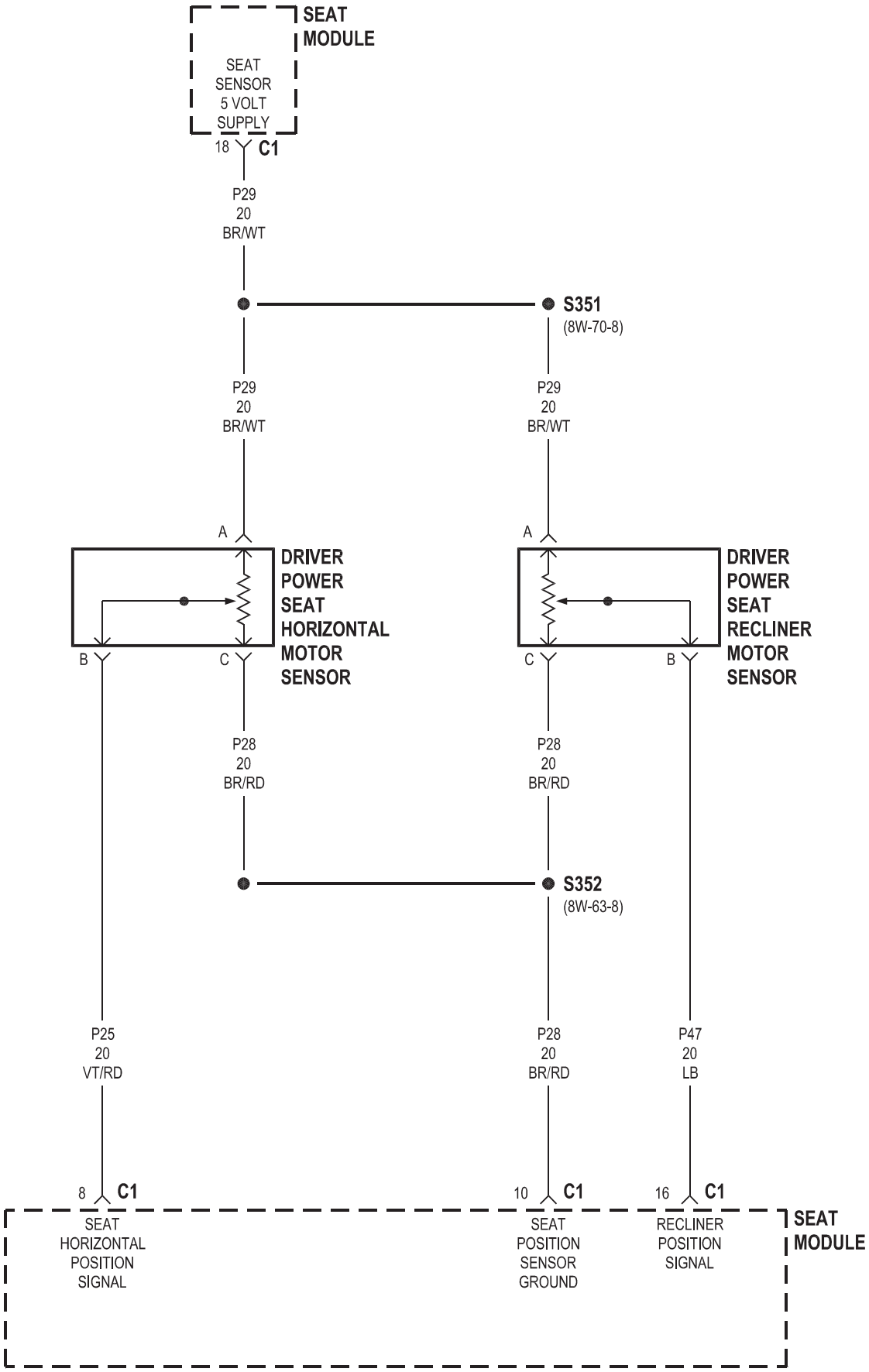

DRIVER POWER SEAT SWITCH
1 REAR UP
2 REAR DOWN
3 FORWARD
4 REARWARD
5 FRONT UP
6 FRONT DOWN
7 RECLINER UP
8 RECLINER DOWN
P9 20 RD/LB
P11 20 YL/WT
P13 20 RD/WT
P15 20 YL/LB
P17 20 RD/YL
P19 20 YL/LG
P21 20 RD/LG
P43 20 GY/LB
P41 20 GY/WT
RHD
LHD
Z238 16 BK
Z243 16 BK
SEAT MODULE
SEAT SWITCH B(+) SUPPLY
SEAT REAR UP SWITCH SENSE
SEAT REAR DOWN SWITCH SENSE
SEAT HORI-ZONTAL FORWARD SWITCH SENSE
SEAT HORI-ZONTAL REARWARD SWITCH SENSE
SEAT FRONT UP SWITCH SENSE
SEAT FRONT DOWN SWITCH SENSE
RECLINER UP SWITCH SENSE
RECLINER DOWN SWITCH SENSE
SEAT REAR UP DRIVER
SEAT REAR DOWN DRIVER
SEAT HORI-ZONTAL FORWARD DRIVER
SEAT HORI-ZONTAL REARWARD DRIVER
SEAT FRONT UP DRIVER
SEAT FRONT DOWN DRIVER
SEAT RECLINER UP DRIVER
SEAT RECLINER DOWN DRIVER
P111 16 YL/DB
P113 16 RD/BK
P115 16 GY/LG
P117 16 RD/BR
P119 16 YL/RD
P121 16 RD/GY
P143 16 GY/LB
P141 16 GY/WT
DRIVER POWER SEAT REAR RISER MOTOR
DRIVER POWER SEAT HORIZONTAL MOTOR
DRIVER POWER SEAT FRONT RISER MOTOR
DRIVER POWER SEAT RECLINER MOTOR
S355 (8W-15-18) (8W-15-21)
C304
Z243 16 BK
Z234 16 BK
S300 (8W-15-21)
Z243 12 BK
G301 (8W-15-21)
G300 (8W-15-18)
▲ LHD
■ RHD

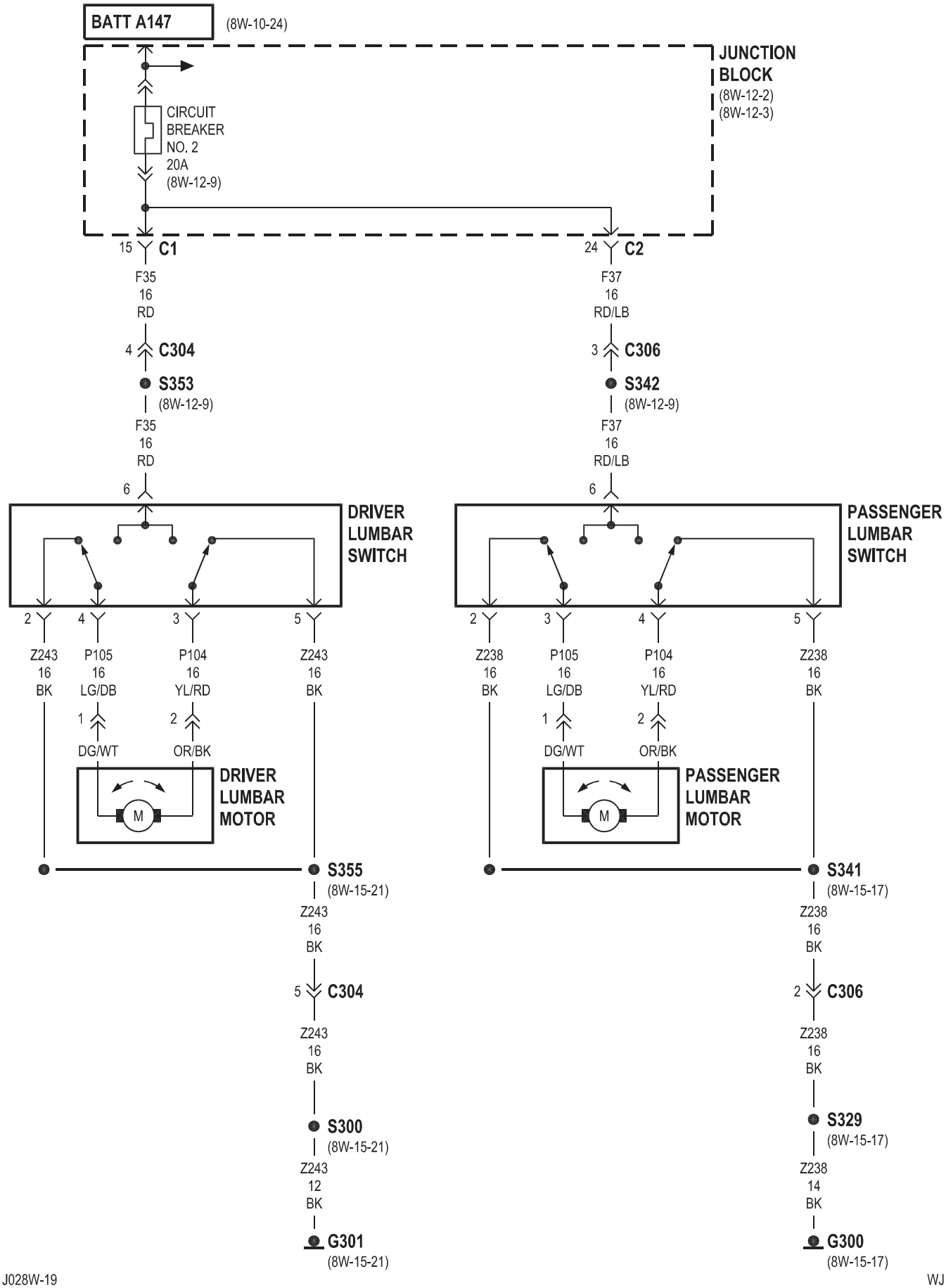

SEAT MODULE
DRIVER SEAT HEATER B(+) DRIVER
SEAT SENSOR 5 VOLT SUPPLY
PASSENGER SEAT HEATER B(+) DRIVER
2 C2
18 C1
11 C2
P131 16 BK/OR
P29 20 BR/WT
P130 16 DG/WT
S351 (8W-70-8)
P29 20 BR/WT
6
16
5
2 C304
A C300
1 C306
P130 16 DG/WT
1 WT
4 BK/RD
DRIVER HEATED SEAT CUSHION
PASSENGER HEATED SEAT CUSHION
YL
BK/RD
2
3
P88 16 BK/BR
P86 20 DG/YL
P86 20 PK/BK
P86 18 PK/BK
P86 20 DG/YL
1 BR
DRIVER HEATED SEAT BACK
PASSENGER HEATED SEAT BACK
LG
4 C306
17 C300
1 C304
6 C1
2
Z6 16 BK/YL
P135 20 LB/BK
Z5 16 BK/VT
6 C306
E C300
8 C304
15 C2
9 C1
16 C2
GROUND
DRIVER SEAT TEMPERATURE SENSOR INPUT
PASSENGER SEAT TEMPERATURE SENSOR INPUT
GROUND
SEAT MODULE

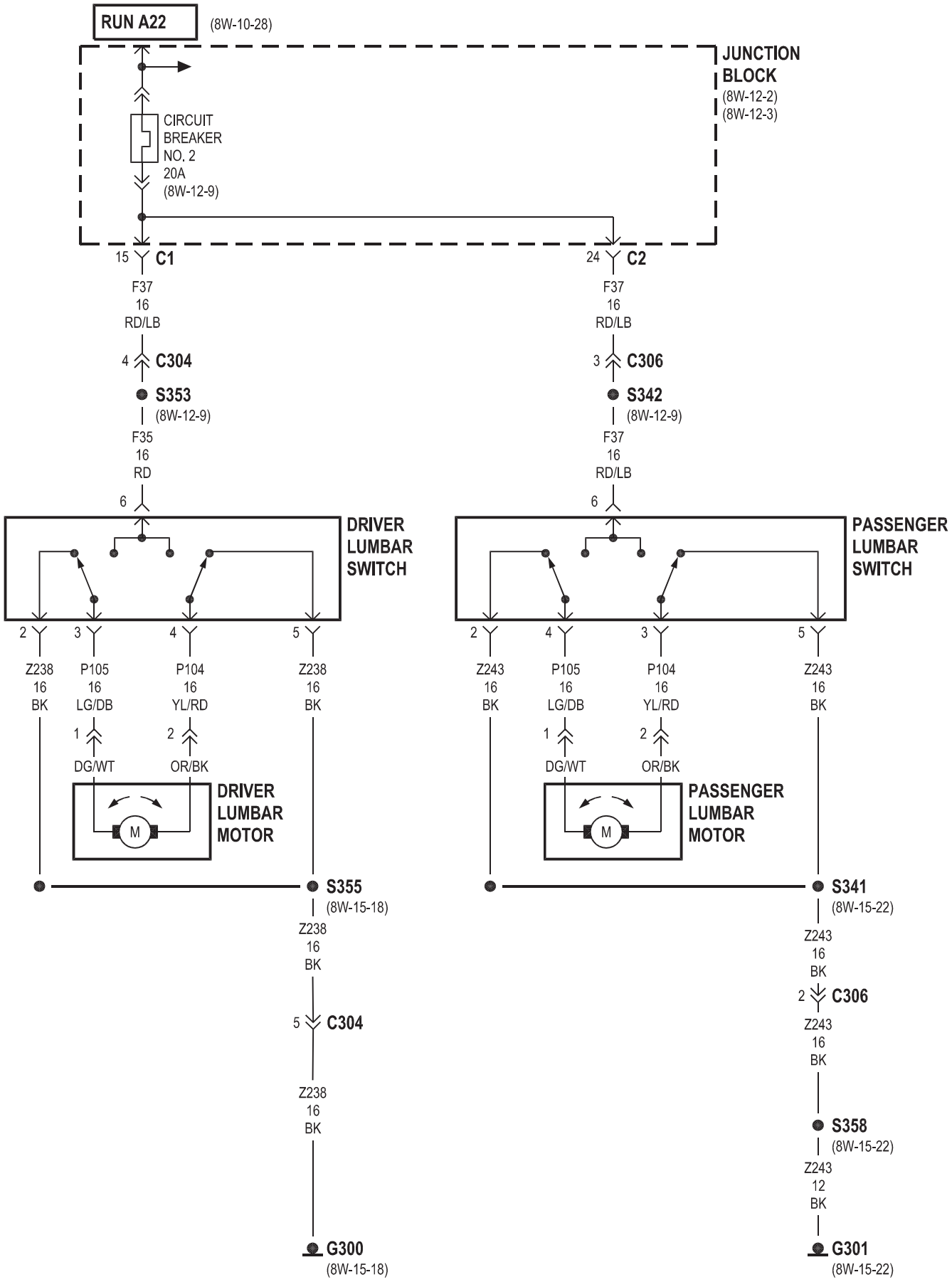
RHD PREMIUM I/III

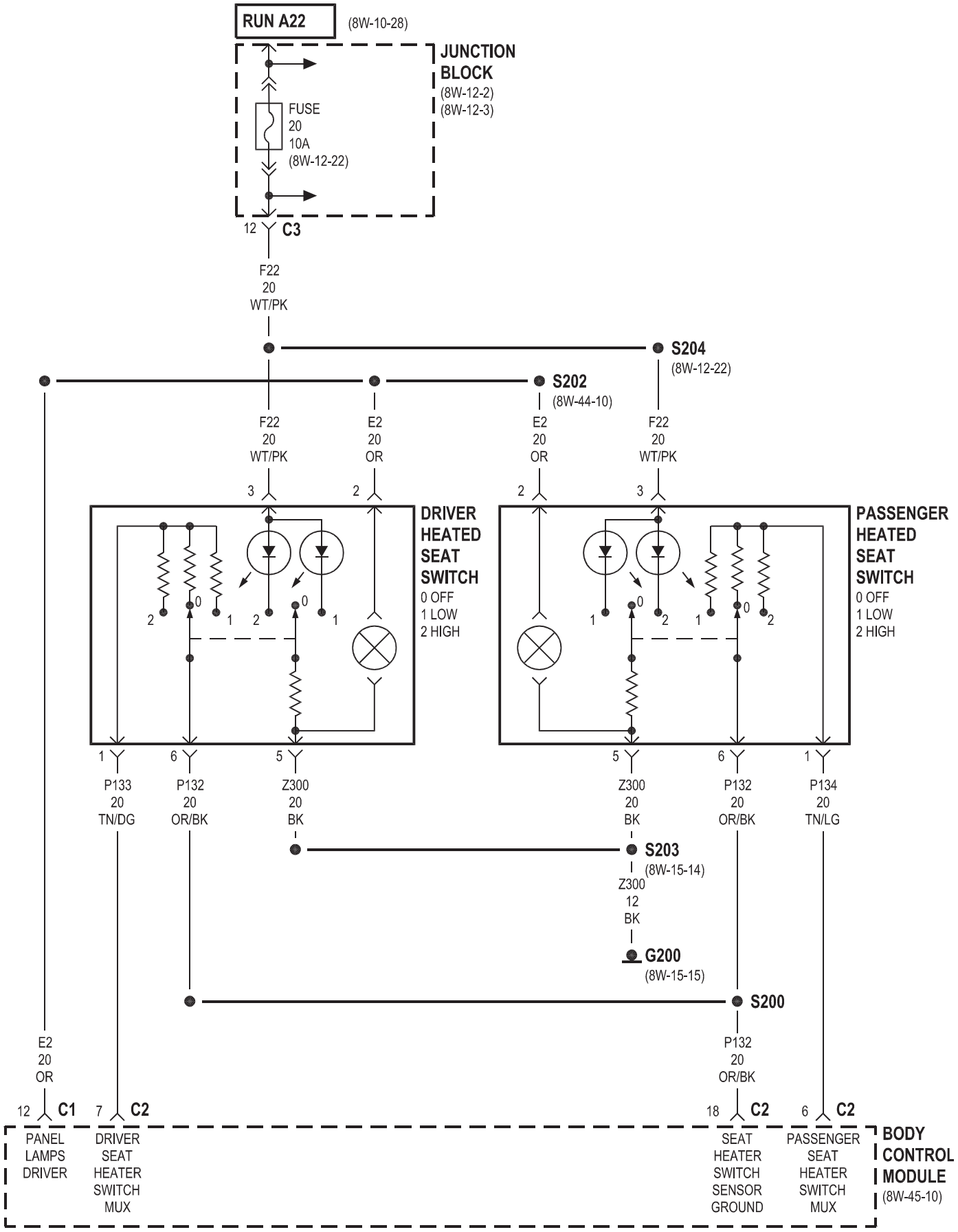



SEAT MODULE
SEAT SENSOR 5 VOLT SUPPLY
18 C1
P29 20 BR/WT
S351
(8W-70-8)
P29 20 BR/WT
P29 20 BR/WT
P29 20 BR/WT
P29 20 BR/WT
A
DRIVER POWER SEAT HORIZONTAL MOTOR SENSOR
(8W-63-9)
C
B
C
DRIVER POWER SEAT REAR RISER MOTOR SENSOR
B
A
A
DRIVER POWER SEAT RECLINER MOTOR SENSOR
(8W-63-9)
C
B
C
DRIVER POWER SEAT FRONT RISER MOTOR SENSOR
A
B
P28 20 BR/RD
P28 20 BR/RD
P28 20 BR/RD
P28 20 BR/RD
S352
P27 20 LB/RD
P28 20 BR/RD
P26 20 BR
7 C1
10 C1
17 C1
REAR RISER POSITION SIGNAL
SEAT POSITION SENSOR GROUND
FRONT RISER POSITION SIGNAL
SEAT MODULE


SEAT MODULE
SEAT SENSOR 5 VOLT SUPPLY
18
C1
P29
20
BR/WT
S351
(8W-70-8)
P29
20
BR/WT
P29
20
BR/WT
A
A
DRIVER POWER SEAT HORIZONTAL MOTOR SENSOR
DRIVER POWER SEAT RECLINER MOTOR SENSOR
B
C
C
B
P28
20
BR/RD
P28
20
BR/RD
S352
(8W-63-8)
P25
20
VT/RD
P28
20
BR/RD
P47
20
LB
8
C1
10
C1
16
C1
SEAT HORIZONTAL POSITION SIGNAL
SEAT POSITION SENSOR GROUND
RECLINER POSITION SIGNAL
SEAT MODULE

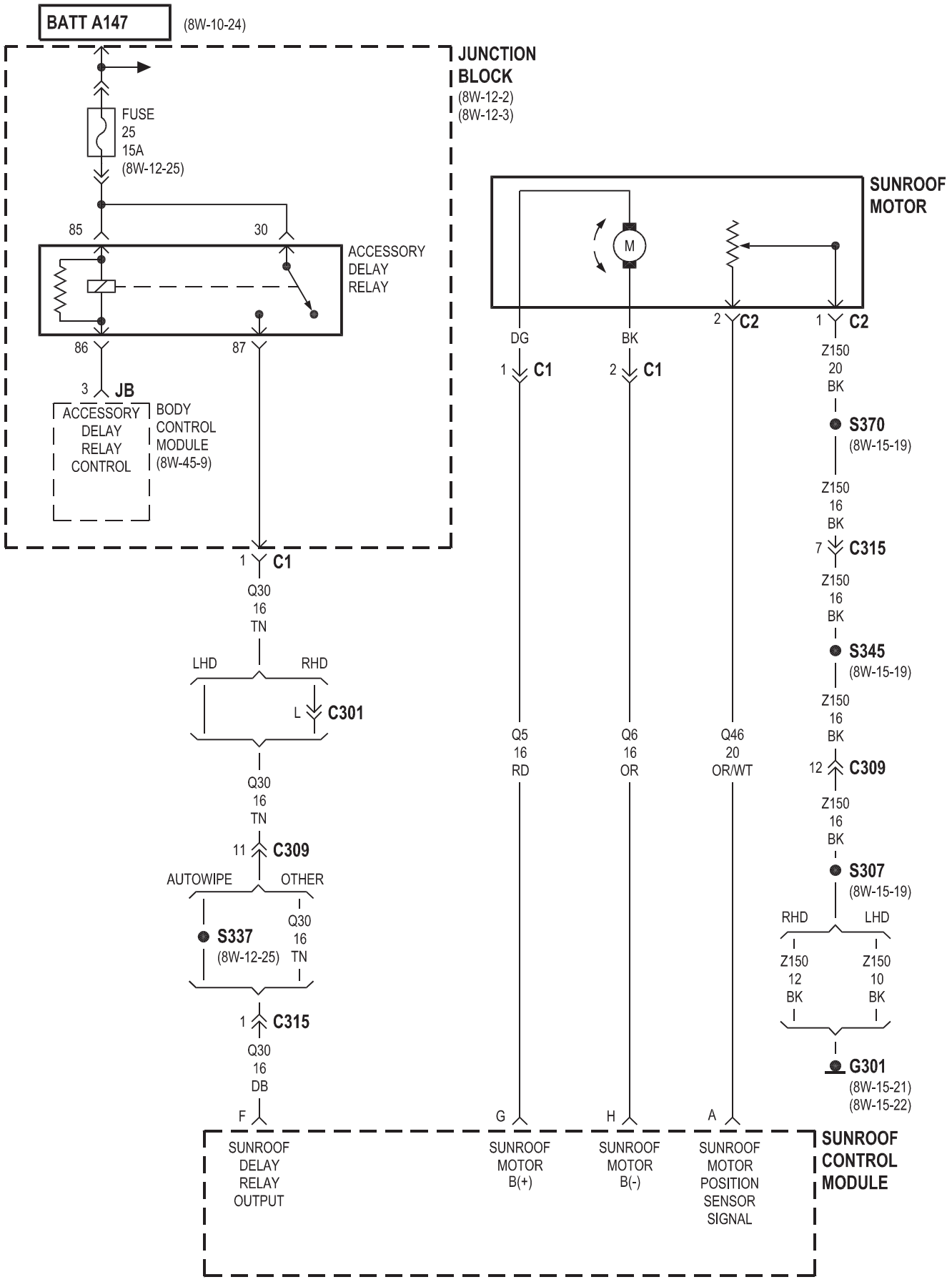

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
15 C1
24 C2
F35 16 RD
F37 16 RD/LB
4 C304
3 C306
S353
(8W-12-9)
S342
(8W-12-9)
F35 16 RD
F37 16 RD/LB
6
6
DRIVER LUMBAR SWITCH
PASSENGER LUMBAR SWITCH
2 4 3 5
2 3 4 5
Z243 16 BK
P105 16 LG/DB
P104 16 YL/RD
Z243 16 BK
Z238 16 BK
P105 16 LG/DB
P104 16 YL/RD
Z238 16 BK
1 2
1 2
DG/WT
OR/BK
DG/WT
OR/BK
M
DRIVER LUMBAR MOTOR
M
PASSENGER LUMBAR MOTOR
S355
(8W-15-21)
S341
(8W-15-17)
Z243 16 BK
Z238 16 BK
5 C304
2 C306
Z243 16 BK
Z238 16 BK
S300
(8W-15-21)
S329
(8W-15-17)
Z243 12 BK
Z238 14 BK
G301
(8W-15-21)
G300
(8W-15-17)

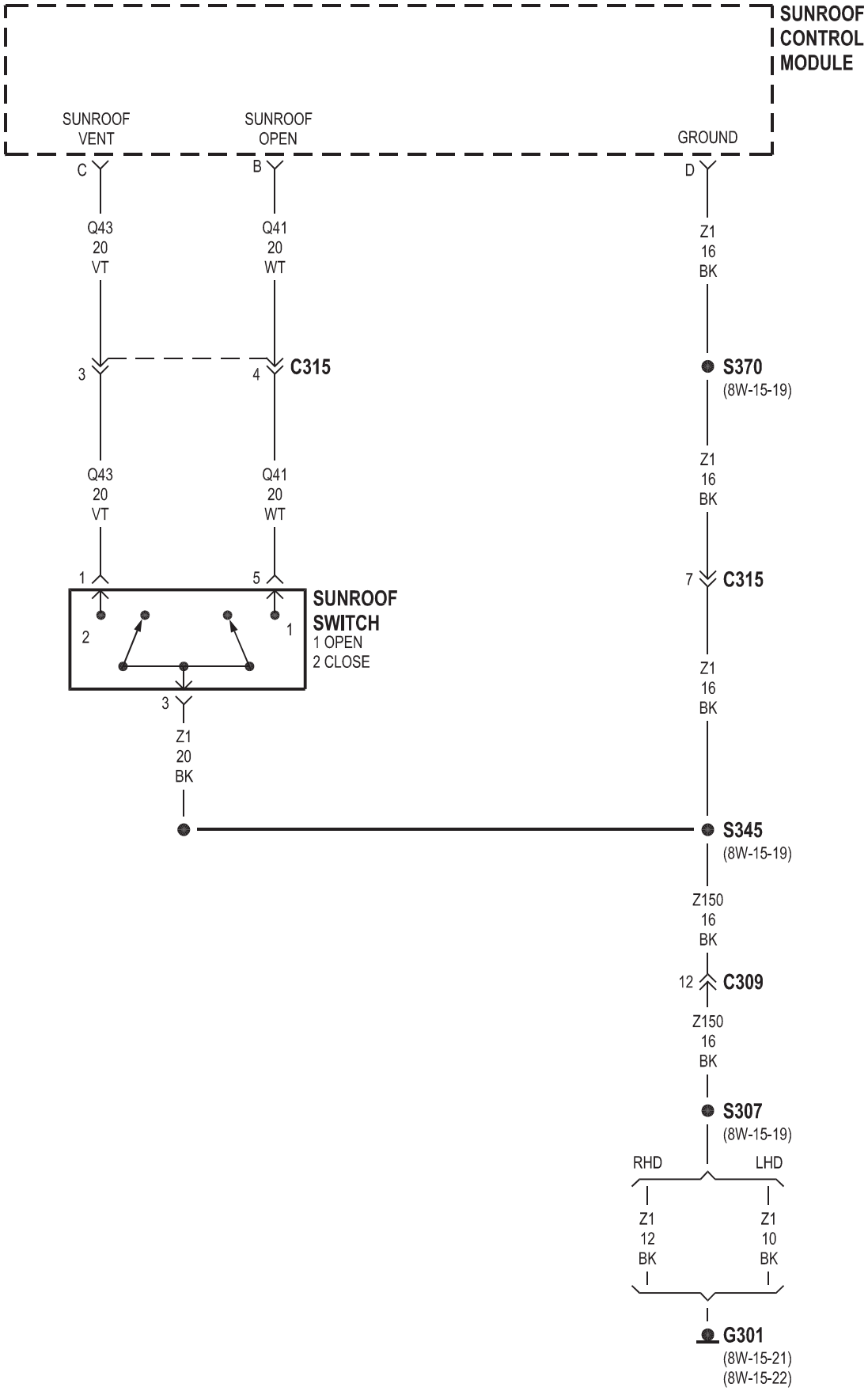

RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
CIRCUIT BREAKER NO. 2 20A
(8W-12-9)
15 C1
24 C2
F37 16 RD/LB
4 C304
S353
(8W-12-9)
F35 16 RD
6
DRIVER LUMBAR SWITCH
2 3 4 5
Z238 16 BK
P105 16 LG/DB
P104 16 YL/RD
Z238 16 BK
1 2
DG/WT
OR/BK
DRIVER LUMBAR MOTOR
M
S355
(8W-15-18)
Z238 16 BK
5 C304
Z238 16 BK
G300
(8W-15-18)
F37 16 RD/LB
3 C306
S342
(8W-12-9)
F37 16 RD/LB
6
PASSENGER LUMBAR SWITCH
2 4 3 5
Z243 16 BK
P105 16 LG/DB
P104 16 YL/RD
Z243 16 BK
1 2
DG/WT
OR/BK
PASSENGER LUMBAR MOTOR
M
S341
(8W-15-22)
Z243 16 BK
2 C306
Z243 16 BK
S358
(8W-15-22)
Z243 12 BK
G301
(8W-15-22)


RUN A22
(8W-10-28)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
20
10A
(8W-12-22)
12
C3
F22
20
WT/PK
S204
(8W-12-22)
S202
(8W-44-10)
F22
20
WT/PK
E2
20
OR
E2
20
OR
F22
20
WT/PK
3
2
2
3
DRIVER HEATED SEAT SWITCH
0 OFF
1 LOW
2 HIGH
PASSENGER HEATED SEAT SWITCH
0 OFF
1 LOW
2 HIGH
1
6
5
5
6
1
P133
20
TN/DG
P132
20
OR/BK
Z300
20
BK
Z300
20
BK
P132
20
OR/BK
P134
20
TN/LG
S203
(8W-15-14)
Z300
12
BK
G200
(8W-15-15)
S200
P132
20
OR/BK
E2
20
OR
12
C1
7
C2
18
C2
6
C2
PANEL LAMPS DRIVER
DRIVER SEAT HEATER SWITCH MUX
SEAT HEATER SWITCH SENSOR GROUND
PASSENGER SEAT HEATER SWITCH MUX
BODY CONTROL MODULE
(8W-45-10)

8W-64 POWER SUNROOF

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Junction Block	8W-64-2
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Sunroof Motor	8W-64-2
Sunroof Switch	8W-64-3

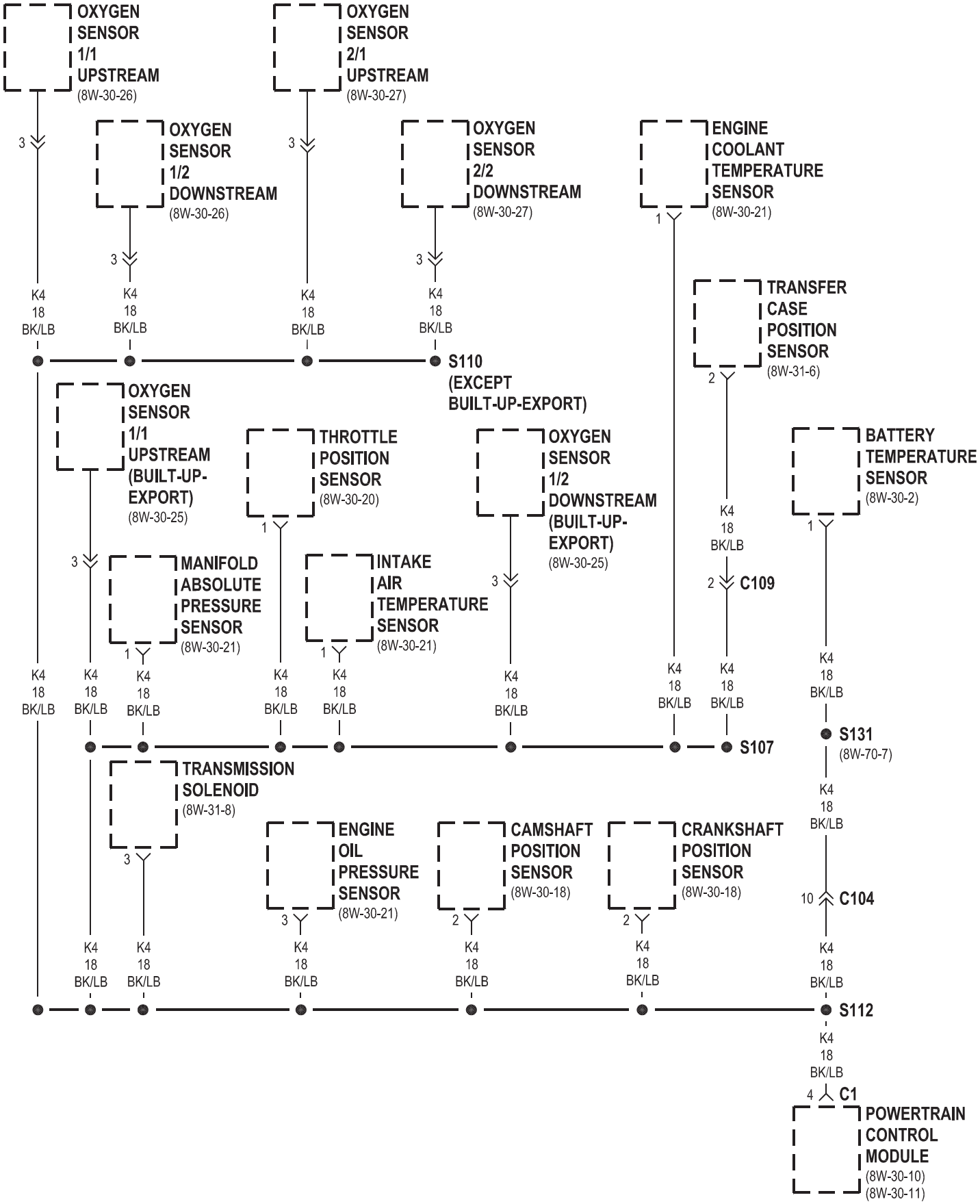

BATT A147
(8W-10-24)
JUNCTION BLOCK
(8W-12-2)
(8W-12-3)
FUSE
25
15A
(8W-12-25)
85
30
ACCESSORY DELAY RELAY
86
87
3 JB
ACCESSORY DELAY RELAY CONTROL
BODY CONTROL MODULE
(8W-45-9)
1 C1
Q30
16
TN
LHD
RHD
L C301
Q30
16
TN
11 C309
AUTOWIPE
OTHER
S337
(8W-12-25)
Q30
16
TN
1 C315
Q30
16
DB
F
SUNROOF DELAY RELAY OUTPUT
SUNROOF MOTOR
M
DG
BK
1 C1
2 C1
2 C2
1 C2
Z150
20
BK
S370
(8W-15-19)
Z150
16
BK
7 C315
Z150
16
BK
S345
(8W-15-19)
Z150
16
BK
12 C309
Z150
16
BK
S307
(8W-15-19)
RHD
LHD
Z150
12
BK
Z150
10
BK
G301
(8W-15-21)
(8W-15-22)
Q5
16
RD
Q6
16
OR
Q46
20
OR/WT
G
H
A
SUNROOF MOTOR B(+)
SUNROOF MOTOR B(-)
SUNROOF MOTOR POSITION SENSOR SIGNAL
SUNROOF CONTROL MODULE


SUNROOF CONTROL MODULE
SUNROOF VENT
SUNROOF OPEN
GROUND
C
B
D
Q43 20 VT
Q41 20 WT
Z1 16 BK
3
4
C315
S370
(8W-15-19)
Q43 20 VT
Q41 20 WT
Z1 16 BK
1
5
7
C315
SUNROOF SWITCH
1 OPEN
2 CLOSE
2
1
3
Z1 20 BK
Z1 16 BK
S345
(8W-15-19)
Z150 16 BK
12
C309
Z150 16 BK
S307
(8W-15-19)
RHD
LHD
Z1 12 BK
Z1 10 BK
G301
(8W-15-21)
(8W-15-22)

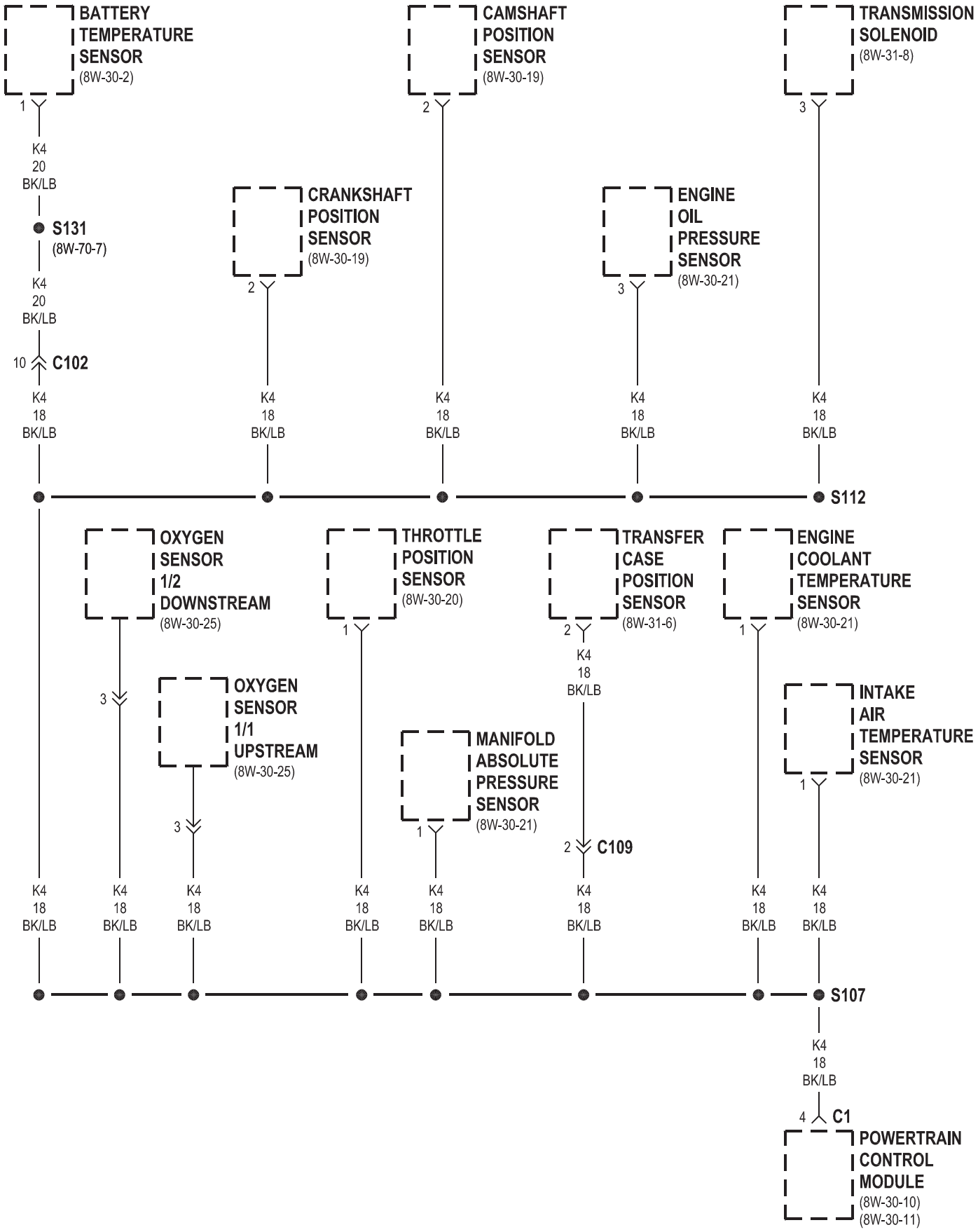
8W-70 SPLICE INFORMATION

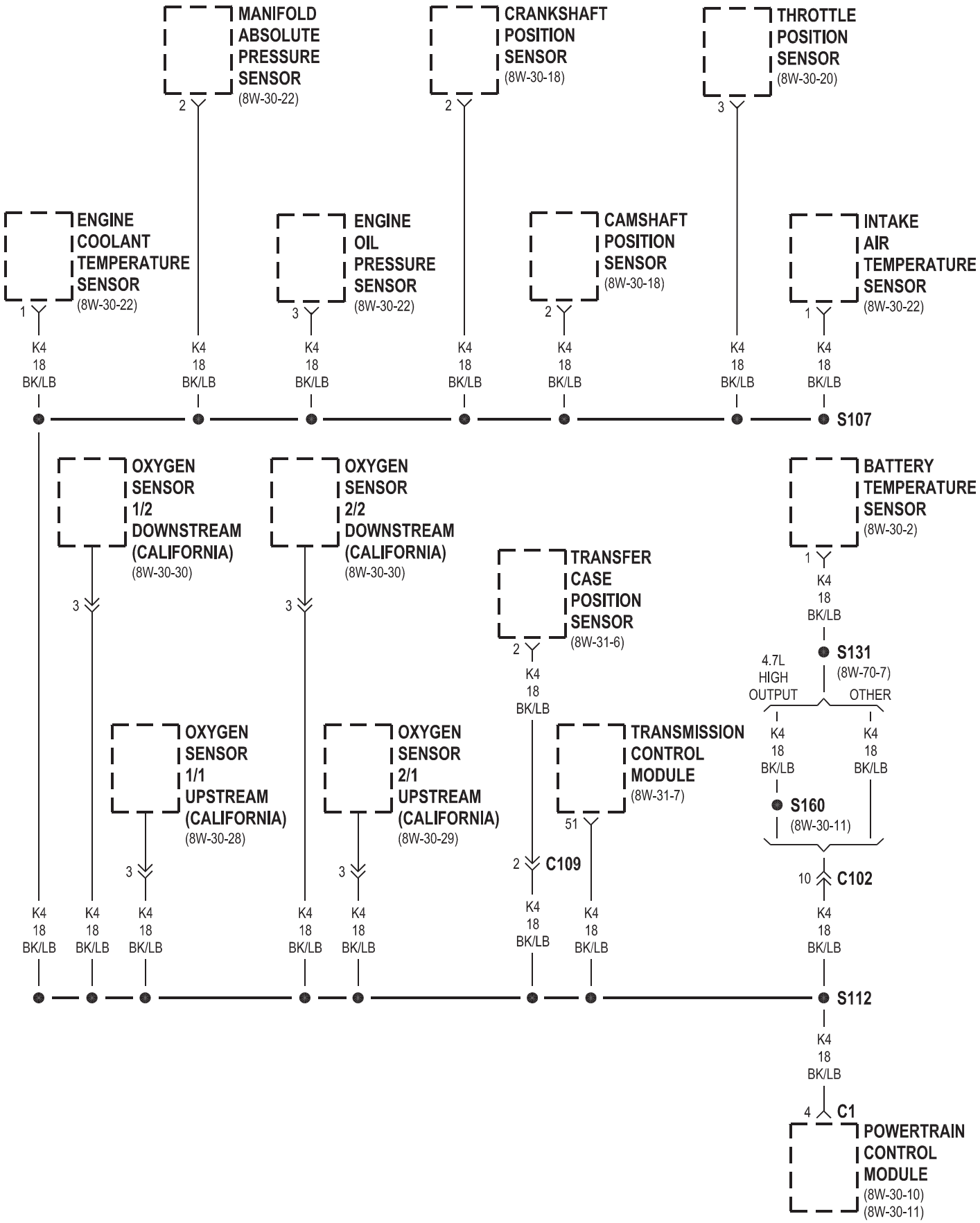
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S175	8W-21-2
S176	8W-10-26
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S201	8W-15-15
S202	8W-44-10
S203	8W-15-14
S204	8W-12-22
S205	8W-15-15
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S306	8W-12-27
S307	8W-15-19
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S309	8W-12-12
S310	8W-51-7, 8
S311	8W-51-5
S312	8W-18-2, 6
S313	8W-51-5, 6
S314	8W-33-2
S315	8W-70-6, 7
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S332	8W-15-17, 18
S333	8W-47-3
S334	8W-12-11
S336	8W-15-16
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S338	8W-15-16
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S349	8W-12-23
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S358	8W-15-22
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S363	8W-47-4
S364	8W-18-5
S365	8W-39-11
S366	8W-12-15
S367	8W-12-36
S368	8W-47-3
S369	8W-15-21, 22
S370	8W-15-19
S400	8W-12-17
S401	8W-15-20
S402	8W-15-20
S403	8W-12-16
S404	8W-12-30
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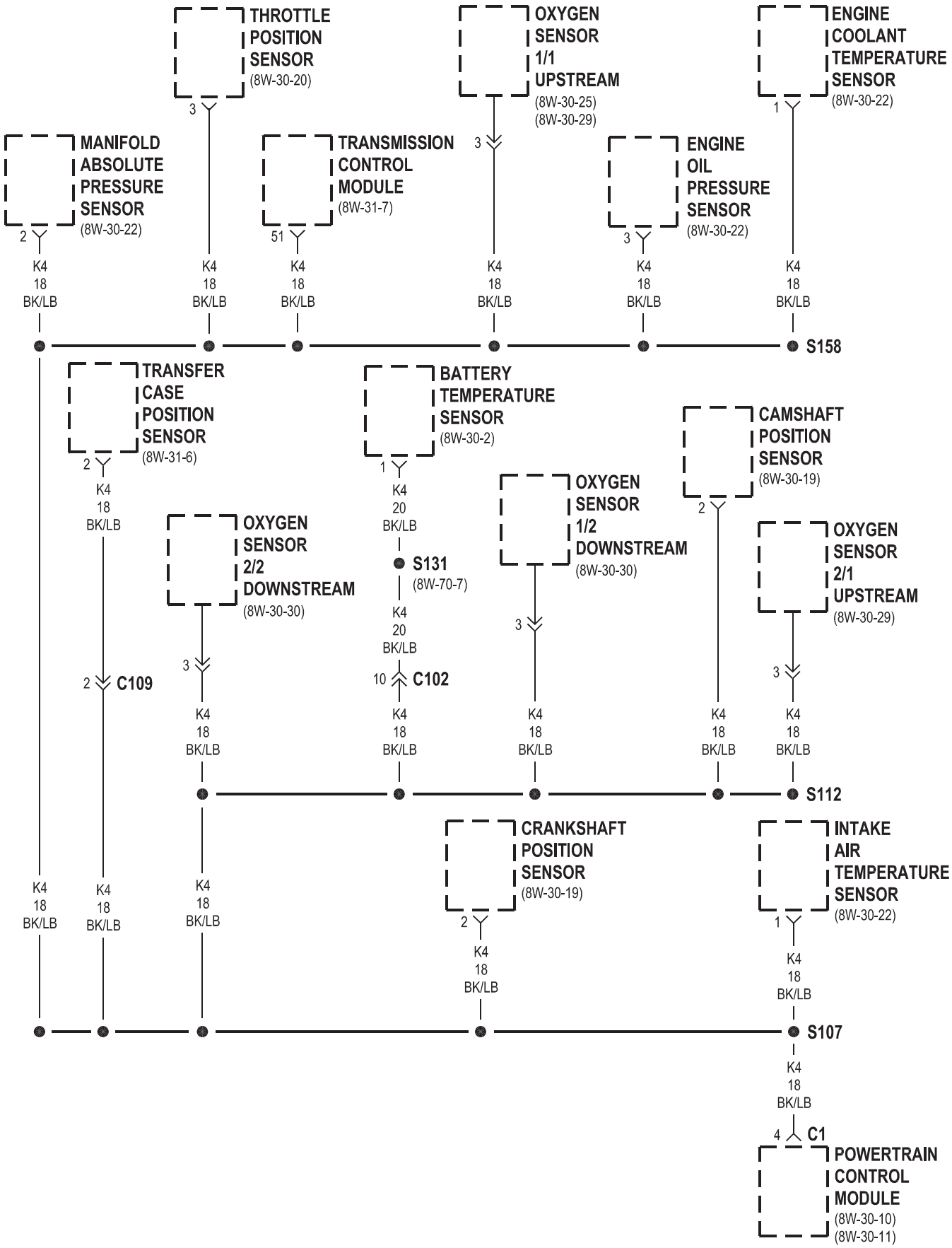

OXYGEN SENSOR 1/1 UPSTREAM (8W-30-26)
OXYGEN SENSOR 2/1 UPSTREAM (8W-30-27)
OXYGEN SENSOR 1/2 DOWNSTREAM (8W-30-26)
OXYGEN SENSOR 2/2 DOWNSTREAM (8W-30-27)
ENGINE COOLANT TEMPERATURE SENSOR (8W-30-21)
TRANSFER CASE POSITION SENSOR (8W-31-6)
S110 (EXCEPT BUILT-UP-EXPORT)
OXYGEN SENSOR 1/1 UPSTREAM (BUILT-UP-EXPORT) (8W-30-25)
THROTTLE POSITION SENSOR (8W-30-20)
OXYGEN SENSOR 1/2 DOWNSTREAM (BUILT-UP-EXPORT) (8W-30-25)
BATTERY TEMPERATURE SENSOR (8W-30-2)
MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-21)
INTAKE AIR TEMPERATURE SENSOR (8W-30-21)
C109
S107
S131 (8W-70-7)
TRANSMISSION SOLENOID (8W-31-8)
ENGINE OIL PRESSURE SENSOR (8W-30-21)
CAMSHAFT POSITION SENSOR (8W-30-18)
CRANKSHAFT POSITION SENSOR (8W-30-18)
C104
S112
C1
POWERTRAIN CONTROL MODULE (8W-30-10) (8W-30-11)
K4 18 BK/LB

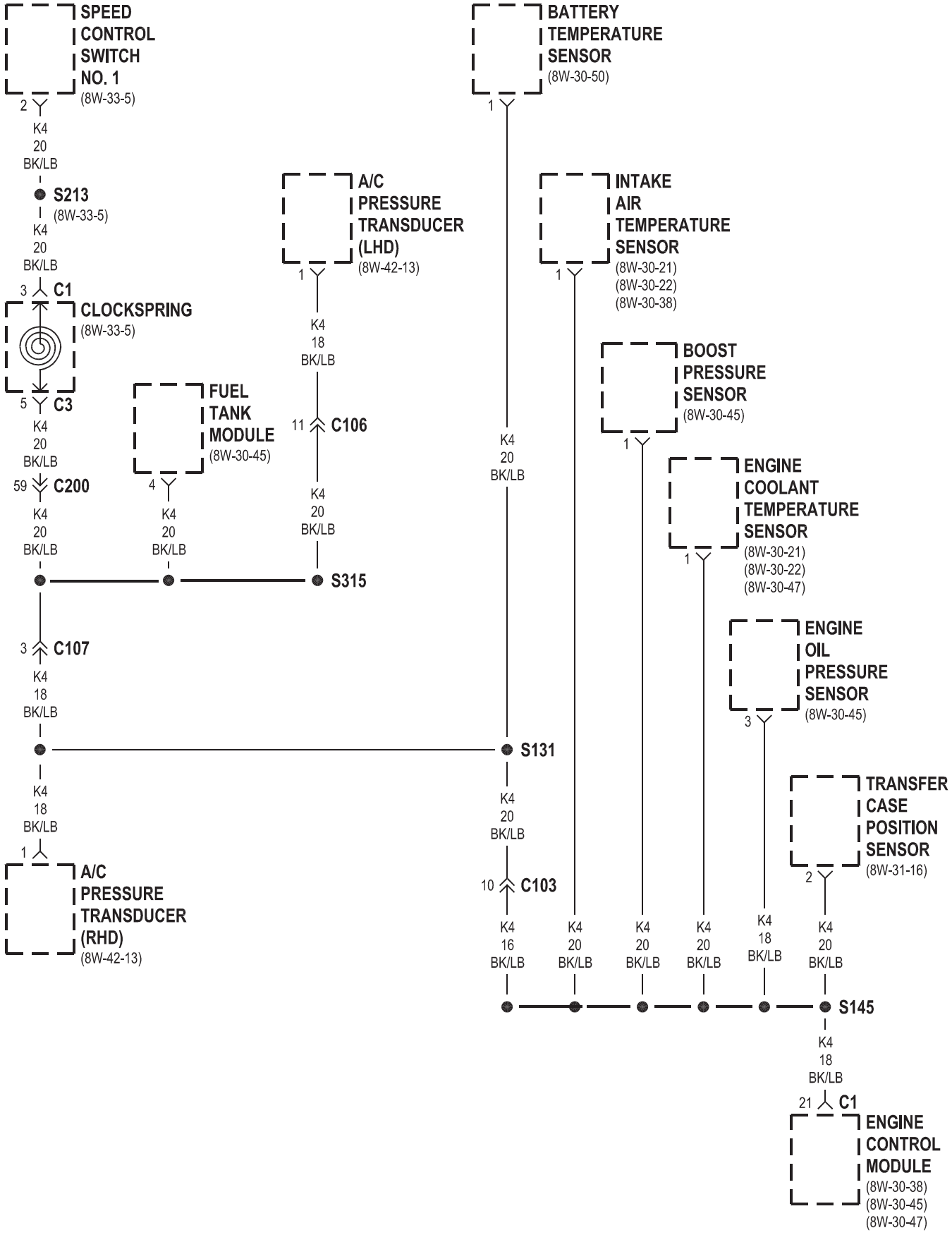
4.0L RHD

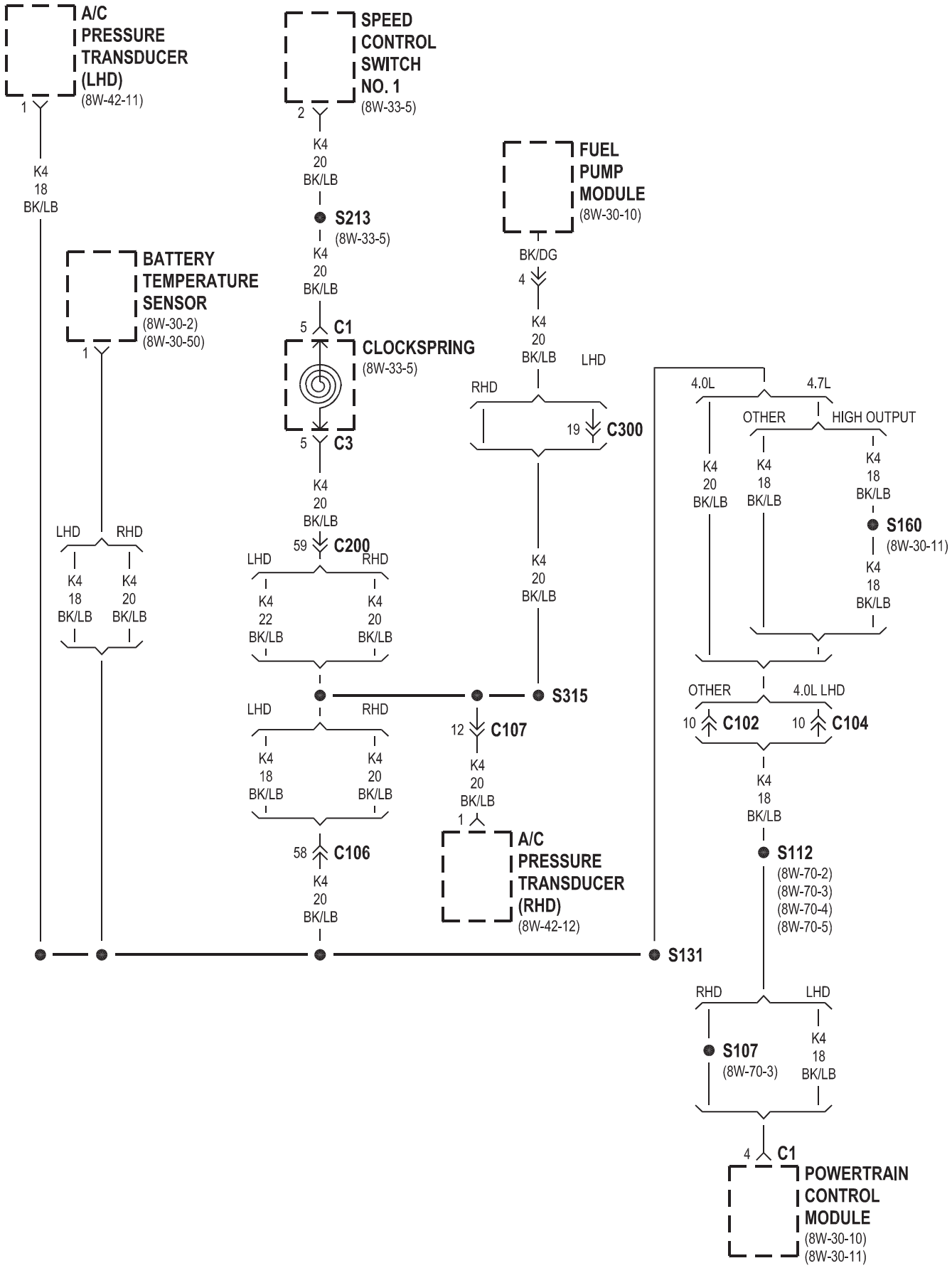

BATTERY TEMPERATURE SENSOR (8W-30-2)
1
K4 20 BK/LB
S131 (8W-70-7)
K4 20 BK/LB
10 C102
K4 18 BK/LB
CRANKSHAFT POSITION SENSOR (8W-30-19)
2
K4 18 BK/LB
CAMSHAFT POSITION SENSOR (8W-30-19)
2
K4 18 BK/LB
ENGINE OIL PRESSURE SENSOR (8W-30-21)
3
K4 18 BK/LB
TRANSMISSION SOLENOID (8W-31-8)
3
K4 18 BK/LB
S112
OXYGEN SENSOR 1/2 DOWNSTREAM (8W-30-25)
3
K4 18 BK/LB
OXYGEN SENSOR 1/1 UPSTREAM (8W-30-25)
3
K4 18 BK/LB
THROTTLE POSITION SENSOR (8W-30-20)
1
K4 18 BK/LB
MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-21)
1
K4 18 BK/LB
TRANSFER CASE POSITION SENSOR (8W-31-6)
2
K4 18 BK/LB
2 C109
K4 18 BK/LB
ENGINE COOLANT TEMPERATURE SENSOR (8W-30-21)
1
K4 18 BK/LB
INTAKE AIR TEMPERATURE SENSOR (8W-30-21)
1
K4 18 BK/LB
S107
K4 18 BK/LB
4 C1
POWERTRAIN CONTROL MODULE (8W-30-10) (8W-30-11)

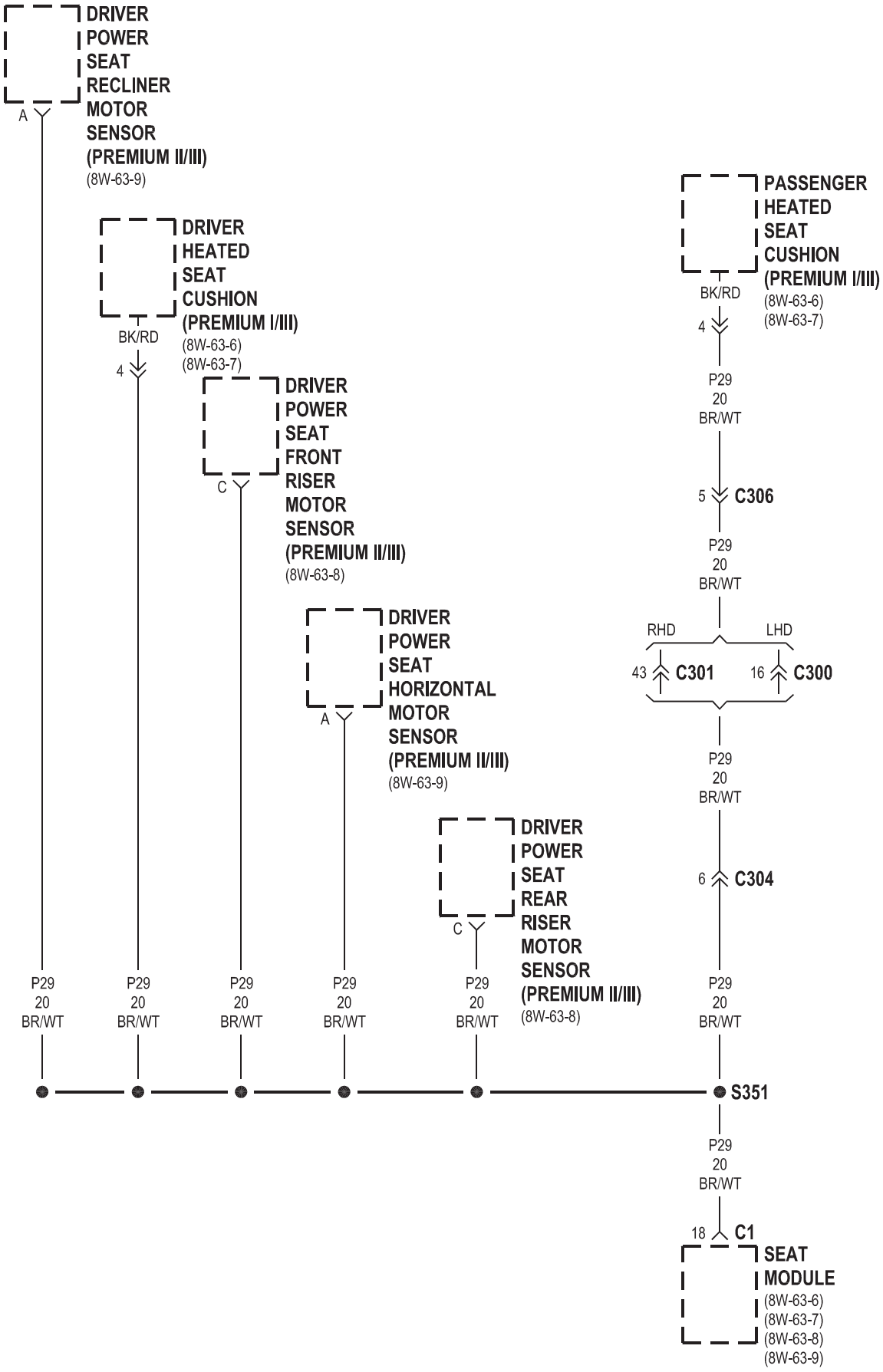

MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-22)
CRANKSHAFT POSITION SENSOR (8W-30-18)
THROTTLE POSITION SENSOR (8W-30-20)
ENGINE COOLANT TEMPERATURE SENSOR (8W-30-22)
ENGINE OIL PRESSURE SENSOR (8W-30-22)
CAMSHAFT POSITION SENSOR (8W-30-18)
INTAKE AIR TEMPERATURE SENSOR (8W-30-22)
K4 18 BK/LB
S107
OXYGEN SENSOR 1/2 DOWNSTREAM (CALIFORNIA) (8W-30-30)
OXYGEN SENSOR 2/2 DOWNSTREAM (CALIFORNIA) (8W-30-30)
TRANSFER CASE POSITION SENSOR (8W-31-6)
BATTERY TEMPERATURE SENSOR (8W-30-2)
S131 (8W-70-7)
4.7L HIGH OUTPUT
OTHER
OXYGEN SENSOR 1/1 UPSTREAM (CALIFORNIA) (8W-30-28)
OXYGEN SENSOR 2/1 UPSTREAM (CALIFORNIA) (8W-30-29)
TRANSMISSION CONTROL MODULE (8W-31-7)
S160 (8W-30-11)
C109
C102
S112
C1
POWERTRAIN CONTROL MODULE (8W-30-10) (8W-30-11)

4.7L RHD


THROTTLE POSITION SENSOR (8W-30-20)
OXYGEN SENSOR 1/1 UPSTREAM (8W-30-25) (8W-30-29)
ENGINE COOLANT TEMPERATURE SENSOR (8W-30-22)
MANIFOLD ABSOLUTE PRESSURE SENSOR (8W-30-22)
TRANSMISSION CONTROL MODULE (8W-31-7)
ENGINE OIL PRESSURE SENSOR (8W-30-22)
K4 18 BK/LB
S158
TRANSFER CASE POSITION SENSOR (8W-31-6)
BATTERY TEMPERATURE SENSOR (8W-30-2)
CAMSHAFT POSITION SENSOR (8W-30-19)
K4 20 BK/LB
S131 (8W-70-7)
OXYGEN SENSOR 1/2 DOWNSTREAM (8W-30-30)
OXYGEN SENSOR 2/1 UPSTREAM (8W-30-29)
OXYGEN SENSOR 2/2 DOWNSTREAM (8W-30-30)
C109
C102
S112
CRANKSHAFT POSITION SENSOR (8W-30-19)
INTAKE AIR TEMPERATURE SENSOR (8W-30-22)
S107
C1
POWERTRAIN CONTROL MODULE (8W-30-10) (8W-30-11)


SPEED CONTROL SWITCH NO. 1
(8W-33-5)
2
K4
20
BK/LB
S213
(8W-33-5)
K4
20
BK/LB
3
C1
CLOCKSPRING
(8W-33-5)
5
C3
K4
20
BK/LB
59
C200
K4
20
BK/LB
A/C PRESSURE TRANSDUCER (LHD)
(8W-42-13)
1
K4
18
BK/LB
11
C106
K4
20
BK/LB
FUEL TANK MODULE
(8W-30-45)
4
K4
20
BK/LB
S315
3
C107
K4
18
BK/LB
S131
K4
18
BK/LB
1
A/C PRESSURE TRANSDUCER (RHD)
(8W-42-13)
BATTERY TEMPERATURE SENSOR
(8W-30-50)
1
K4
20
BK/LB
INTAKE AIR TEMPERATURE SENSOR
(8W-30-21)
(8W-30-22)
(8W-30-38)
1
BOOST PRESSURE SENSOR
(8W-30-45)
1
ENGINE COOLANT TEMPERATURE SENSOR
(8W-30-21)
(8W-30-22)
(8W-30-47)
1
ENGINE OIL PRESSURE SENSOR
(8W-30-45)
3
TRANSFER CASE POSITION SENSOR
(8W-31-16)
2
K4
20
BK/LB
K4
18
BK/LB
K4
20
BK/LB
K4
20
BK/LB
K4
20
BK/LB
K4
16
BK/LB
10
C103
S145
K4
18
BK/LB
21
C1
ENGINE CONTROL MODULE
(8W-30-38)
(8W-30-45)
(8W-30-47)


A/C PRESSURE TRANSDUCER (LHD)
(8W-42-11)
1
K4 18 BK/LB
SPEED CONTROL SWITCH NO. 1
(8W-33-5)
2
K4 20 BK/LB
S213
(8W-33-5)
K4 20 BK/LB
5 C1
CLOCKSPRING
(8W-33-5)
5 C3
K4 20 BK/LB
FUEL PUMP MODULE
(8W-30-10)
BK/DG
4
K4 20 BK/LB
LHD
RHD
19 C300
K4 20 BK/LB
BATTERY TEMPERATURE SENSOR
(8W-30-2)
(8W-30-50)
1
LHD RHD
K4 18 BK/LB
K4 20 BK/LB
59 C200
LHD RHD
K4 22 BK/LB
K4 20 BK/LB
S315
LHD RHD
K4 18 BK/LB
K4 20 BK/LB
58 C106
K4 20 BK/LB
12 C107
K4 20 BK/LB
1
A/C PRESSURE TRANSDUCER (RHD)
(8W-42-12)
4.0L
4.7L
OTHER
HIGH OUTPUT
K4 20 BK/LB
K4 18 BK/LB
K4 18 BK/LB
S160
(8W-30-11)
K4 18 BK/LB
OTHER
4.0L LHD
10 C102
10 C104
K4 18 BK/LB
S112
(8W-70-2)
(8W-70-3)
(8W-70-4)
(8W-70-5)
S131
RHD
LHD
S107
(8W-70-3)
K4 18 BK/LB
4 C1
POWERTRAIN CONTROL MODULE
(8W-30-10)
(8W-30-11)


DRIVER POWER SEAT RECLINER MOTOR SENSOR (PREMIUM II/III)
(8W-63-9)
A
DRIVER HEATED SEAT CUSHION (PREMIUM I/III)
(8W-63-6)
(8W-63-7)
BK/RD
4
DRIVER POWER SEAT FRONT RISER MOTOR SENSOR (PREMIUM II/III)
(8W-63-8)
C
DRIVER POWER SEAT HORIZONTAL MOTOR SENSOR (PREMIUM II/III)
(8W-63-9)
A
DRIVER POWER SEAT REAR RISER MOTOR SENSOR (PREMIUM II/III)
(8W-63-8)
C
PASSENGER HEATED SEAT CUSHION (PREMIUM I/III)
(8W-63-6)
(8W-63-7)
BK/RD
4
P29
20
BR/WT
5 C306
RHD
LHD
43 C301
16 C300
6 C304
S351
18 C1
SEAT MODULE
(8W-63-6)
(8W-63-7)
(8W-63-8)
(8W-63-9)

8W-80 CONNECTOR PIN-OUT

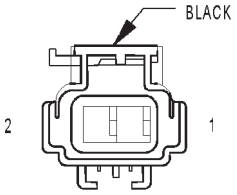
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ACCELERATOR PEDAL POSITION SENSOR (DIESEL)	8W-80-6
ADJUSTABLE PEDALS MODULE (EXCEPT BUILT-UP-EXPORT)	8W-80-6
ADJUSTABLE PEDALS MOTOR/SENSOR ASSEMBLY (EXCEPT BUILT-UP-EXPORT)	8W-80-7
ADJUSTABLE PEDALS SWITCH (EXCEPT BUILT-UP-EXPORT)	8W-80-7
AIRBAG CONTROL MODULE C1 (ORC C1)	8W-80-7
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AMBIENT TEMPERATURE SENSOR	8W-80-8
ANTENNA MODULE (BUILT-UP-EXPORT)	8W-80-8
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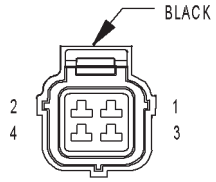
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A/C COMPRESSOR CLUTCH

A/C COMPRESSOR CLUTCH - BLACK 2 WAY

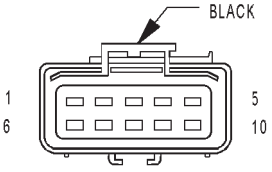
CAV	CIRCUIT	FUNCTION
1	C2 18DB/YL	A/C COMPRESSOR CLUTCH RELAY OUTPUT
2	Z18 18BK	GROUND



A/C PRESSURE TRANSDUCER

A/C PRESSURE TRANSDUCER - BLACK 4 WAY

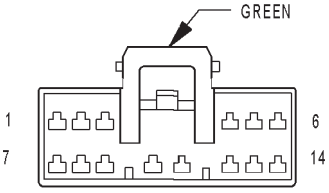
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K6 18VT/WT (DIESEL)	SENSOR REFERENCE VOLTAGE B
2	K6 18VT/BK (GAS)	5 VOLT SUPPLY
3	C18 18DB	A/C PRESSURE SIGNAL
4	-	-



ACCELERATOR PEDAL POSITION SENSOR (DIESEL)

ACCELERATOR PEDAL POSITION SENSOR (DIESEL) - BLACK 10 WAY

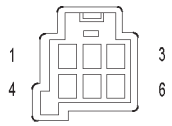
CAV	CIRCUIT	FUNCTION
1	-	-
2	F855 18BR/YL	SENSOR REFERENCE VOLTAGE A
3	K22 14RD/DB	ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL
4	-	-
5	-	-
6	K225 18BK	ACCELERATOR PEDAL POSITION SENSOR 2 GROUND
7	K81 20DB/DG	ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL
8	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR 1 GROUND
9	-	-
10	Y43 20WT/VT	ACCELERATOR PEDAL POSITION SENSOR 1 5-VOLT SUPPLY



ADJUSTABLE PEDALS MODULE (EXCEPT BUILT-UP-EXPORT)

ADJUSTABLE PEDALS MODULE (EXCEPT BUILT-UP-EXPORT) - GREEN 14 WAY

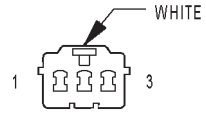
CAV	CIRCUIT	FUNCTION
1	Y151 20LG/BR	ADJUSTABLE PEDALS SWITCH SENSE (FORWARD)
2	Y152 20LG/OR	ADJUSTABLE PEDALS SWITCH SENSE (REARWARD)
3	Q110 16OR/VT	ADJUSTABLE PEDALS MOTOR (FORWARD)
4	F72 16RD/YL	FUSED B(+)
5	-	-
6	Q111 16OR/GY	ADJUSTABLE PEDALS MOTOR (REARWARD)
7	Q113 20OR/DB (MEMORY)	PEDAL POSITION SENSOR FEED
8	Q112 20OR/YL (MEMORY)	PEDAL POSITION SENSOR SENSE
9	Q114 20OR/TN (MEMORY)	PEDAL POSITION SENSOR RETURN
10	Z151 16BK	GROUND
11	Z155 20BK/OR	GROUND
12	L1 18WT/BR	BACK-UP LAMP FEED
13	D25 20VT/YL	PCI BUS
14	Y153 16DB/RD	ADJUSTABLE PEDALS SWITCH FEED



ADJUSTABLE PEDALS MOTOR/SENSOR ASSEMBLY (EXCEPT BUILT-UP-EXPORT)

ADJUSTABLE PEDALS MOTOR/SENSOR ASSEMBLY (EXCEPT BUILT-UP-EXPORT) - 6 WAY

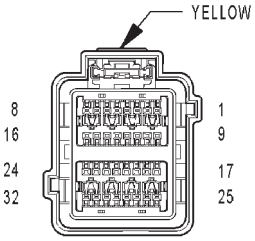
CAV	CIRCUIT	FUNCTION
1	Q113 20OR/DB	PEDAL POSITION SENSOR FEED
2	Q112 20OR/YL	PEDAL POSITION SENSOR SENSE
3	Q114 20OR/TN	PEDAL POSITION SENSOR RETURN
4	-	-
5	Q111 16OR/GY	AJDUSTABLE PEDALS MOTOR (REARWARD)
6	Q110 16OR/VT	ADJUSTABLE PEDALS MOTOR (FORWARD)



ADJUSTABLE PEDALS SWITCH (EXCEPT BUILT-UP-EXPORT)

ADJUSTABLE PEDALS SWITCH (EXCEPT BUILT-UP-EXPORT) - WHITE 3 WAY

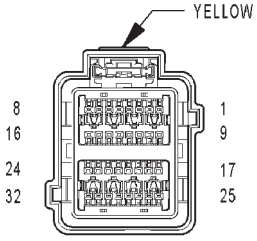
CAV	CIRCUIT	FUNCTION
1	Y153 20BD/RD	ADJUSTABLE PEDALS SWITCH FEED
2	Y152 20LG/OR	ADJUSTABLE PEDALS SWITCH SENSE (REARWARD)
3	Y151 20LG/BR	ADJUSTABLE PEDALS SWITCH SENSE (FORWARD)



AIRBAG CONTROL MODULE C1 (ORC C1)

AIRBAG CONTROL MODULE C1 (ORC C1) - YELLOW 32 WAY

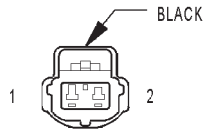
CAV	CIRCUIT	FUNCTION
1	R72 20LB/WT (SIDE AIRBAGS)	PASSENGER CURTAIN SQUIB LINE 2
2	R74 20LB/YL (SIDE AIRBAGS)	PASSENGER CURTAIN SQUIB LINE 1
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-
8	-	-
9	R58 20GY	PASSENGER SEAT BELT SWITCH SENSE
10	R60 20VT	PASSENGER SEAT BELT SWITCH GROUND
11	-	-
12	-	-
13	-	-
14	-	-
15	R132 20LG/VT (SIDE AIRBAGS)	PASSENGER SIDE IMPACT SENSOR SIGNAL
16	R134 20LB/BR (SIDE AIRBAGS)	PASSENGER SIDE IMPACT SENSOR GROUND
17	R131 20LG/YL (SIDE AIRBAGS)	DRIVER SIDE IMPACT SENSOR SIGNAL
18	R133 20LB/DG (SIDE AIRBAGS)	DRIVER SIDE IMPACT SENSOR GROUND
19	-	-
20	-	-
21	-	-
22	-	-
23	R59 20LB	DRIVER SEAT BELT SWITCH GROUND
24	R57 20DG	DRIVER SEAT BELT SWITCH SENSE
25	R73 20LB/BR (SIDE AIRBAGS)	DRIVER CURTAIN SQUIB LINE 2
26	R75 20LB/OR (SIDE AIRBAGS)	DRIVER CURTAIN SQUIB LINE 1
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-



AIRBAG CONTROL MODULE C2 (ORC C2)

AIRBAG CONTROL MODULE C2 (ORC C2) - YELLOW 32 WAY

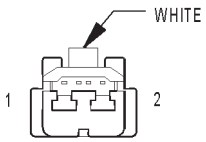
CAV	CIRCUIT	FUNCTION
1	R45 20DG/LB	DRIVER SQUIB 1 LINE 2
2	R43 20BK/LB	DRIVER SQUIB 1 LINE 1
3	R42 20BK/YL	PASSENGER SQUIB 1 LINE 1
4	R44 20DG/YL	PASSENGER SQUIB 1 LINE 2
5	-	-
6	-	-
7	-	-
8	-	-
9	R49 20LB	LEFT FRONT IMPACT SENSOR SIGNAL
10	R47 20DB/LB	LEFT FRONT IMPACT SENSOR GROUND
11	R46 20BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
12	R48 20TN	RIGHT FRONT IMPACT SENSOR SIGNAL
13	-	-
14	-	-
15	-	-
16	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
17	Z6 20BK/PK	GROUND
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	D25 20YL/VT/OR	PCI BUS
24	F14 20LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
25	R63 20TN/LB	DRIVER SQUIB 2 LINE 2
26	R61 20OR/LB	DRIVER SQUIB 2 LINE 1
27	R62 20OR/YL	PASSENGER SQUIB 2 LINE 2
28	R64 20TN/YL	PASSENGER SQUIB 2 LINE 1
29	-	-
30	-	-
31	-	-
32	-	-



AMBIENT TEMPERATURE SENSOR

AMBIENT TEMPERATURE SENSOR - BLACK 2 WAY

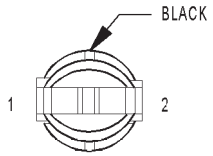
CAV	CIRCUIT	FUNCTION
1	G32 20BK/LB	SENSOR GROUND
2	G31 20VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL



ANTENNA MODULE (BUILT-UP-EXPORT)

ANTENNA MODULE (BUILT-UP-EXPORT) - WHITE 2 WAY

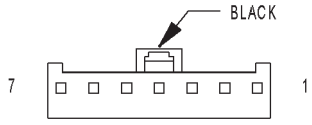
CAV	CIRCUIT	FUNCTION
1	X64 18BK/WT	ENABLE SIGNAL TO AMPLIFIER
2	-	-



ASH
RECEIVER
LAMP

ASH RECEIVER LAMP - BLACK 2 WAY

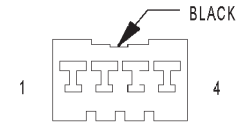
CAV	CIRCUIT	FUNCTION
1	Z300 20BK	GROUND
2	E2 20OR	PANEL LAMPS DRIVER



AUTOMATIC DAY/
NIGHT MIRROR

AUTOMATIC DAY/NIGHT MIRROR - BLACK 7 WAY

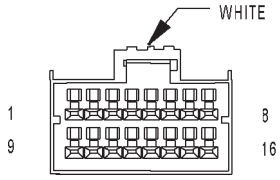
CAV	CIRCUIT	FUNCTION
1	G5 20BK/LG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	Z150 20BK	GROUND
3	L1 20BK/VT	BACK-UP LAMP FEED
4	P112 20BK/WT	AUTO DAY/NIGHT MIRROR (+)
5	P114 20BK/YL	AUTO DAY/NIGHT MIRROR (-)
6	-	-
7	-	-



AUTOMATIC
HEADLAMP LIGHT
SENSOR/VTSS LED

AUTOMATIC HEADLAMP LIGHT SENSOR/VTSS LED - BLACK 4 WAY

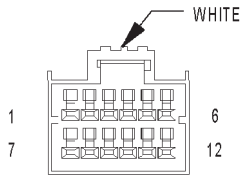
CAV	CIRCUIT	FUNCTION
1	L109 20WT	ULTRALIGHT SENSOR SIGNAL
2	L110 20BK/YL	ULTRALIGHT SENSOR RETURN
3	G69 20BK/OR	VTSS INDICATOR DRIVER
4	M1 20PK	FUSED B(+)



AUTOMATIC
ZONE CONTROL
MODULE C1
(AZC)

AUTOMATIC ZONE CONTROL MODULE C1 (AZC) - WHITE 16 WAY

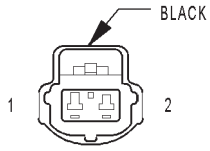
CAV	CIRCUIT	FUNCTION
1	C102 20TN/BK	MODE DOOR DRIVER (B)
2	-	-
3	C32 20GY/DB	RECIRCULATION DOOR DRIVER (A)
4	C100 20YL/DB	RECIRCULATION DOOR DRIVER (B)
5	-	-
6	C79 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
7	-	-
8	Z118 20BK	GROUND
9	C35 20DG/YL	MODE DOOR DRIVER (A)
10	C33 20DB/RD	DRIVER BLEND DOOR DRIVER (A)
11	-	-
12	-	-
13	-	-
14	C81 20LB/WT	REAR WINDOW DEFOGGER SWITCH SENSE
15	-	-
16	-	-



AUTOMATIC ZONE CONTROL MODULE C2 (AZC)

AUTOMATIC ZONE CONTROL MODULE C2 (AZC) - WHITE 12 WAY

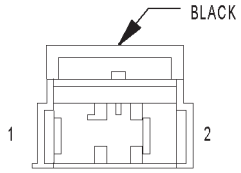
CAV	CIRCUIT	FUNCTION
1	-	-
2	C94 20WT/DG	PASSENGER BLEND DOOR DRIVER (A)
3	C95 20WT/BK	DRIVER BLEND DOOR DRIVER (B)
4	C96 20WT/DB	PASSENGER BLEND DOOR DRIVER (B)
5	-	-
6	E2 20OR	PANEL LAMPS DRIVER
7	C56 20RD/LG	BLOWER MOTOR CONTROL
8	D25 20YL/VT/DG	PCI BUS
9	C103 20DG	A/C SWITCH SIGNAL
10	-	-
11	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
12	M1 20PK	FUSED B(+)



BATTERY TEMPERATURE SENSOR

BATTERY TEMPERATURE SENSOR - BLACK 2 WAY

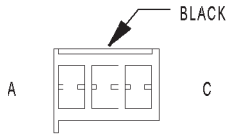
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB (GAS LHD)	SENSOR GROUND
1	K4 20BK/LB (DIESEL/RHD)	SENSOR GROUND
2	K25 18VT/LG	BATTERY TEMPERATURE SENSOR SIGNAL



BLOWER MOTOR

BLOWER MOTOR - BLACK 2 WAY

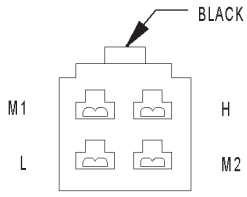
CAV	CIRCUIT	FUNCTION
1	C1 12DG	BLOWER MOTOR SUPPLY
2	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER



BLOWER MOTOR CONTROLLER (AZC)

BLOWER MOTOR CONTROLLER (AZC) - BLACK 3 WAY

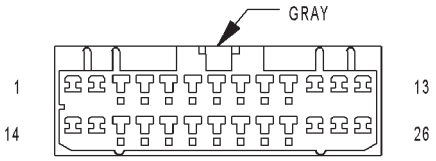
CAV	CIRCUIT	FUNCTION
A	Z118 12BK	GROUND
B	C56 20RD/LG	BLOWER MOTOR CONTROL
C	C1 12DG	BLOWER MOTOR SUPPLY



BLOWER MOTOR RESISTOR BLOCK (MTC)

BLOWER MOTOR RESISTOR BLOCK (MTC) - BLACK 4 WAY

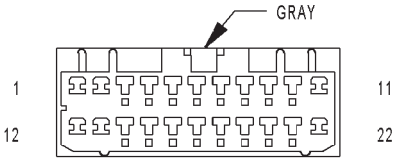
CAV	CIRCUIT	FUNCTION
H	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER
L	C4 16TN	BLOWER MOTOR LOW DRIVER
M1	C5 16LG	BLOWER MOTOR M1 DRIVER
M2	C6 14LB	BLOWER MOTOR M2 DRIVER



BODY
CONTROL
MODULE C1

BODY CONTROL MODULE C1 - GRAY 26 WAY

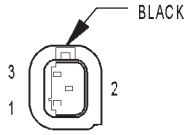
CAV	CIRCUIT	FUNCTION
1	Z132 20BK/OR	GROUND
2	G52 20YL	HEADLAMP SWITCH MUX
3	E19 20RD	PANEL LAMPS DIMMER SIGNAL
4	-	-
5	G70 20BR/TN (BUILT-UP-EXPORT LHD RHD)	HOOD AJAR SWITCH SENSE
6	G26 20LB	KEY-IN IGNITION SWITCH SENSE
7	G76 18TN/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
8	E2 20OR	PANEL LAMPS DRIVER
9	E2 20OR	PANEL LAMPS DRIVER
10	E2 20OR	PANEL LAMPS DRIVER
11	-	-
12	E2 20OR	PANEL LAMPS DRIVER
13	E2 20OR	PANEL LAMPS DRIVER
14	Z132 20BK/OR	GROUND
15	D25 20YL/VT/WT	PCI BUS
16	L80 20WT/DG	HEADLAMP SWITCH RETURN
17	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
18	-	-
19	-	-
20	G69 20BK/OR	VTSS INDICATOR DRIVER
21	-	-
22	V14 20RD/VT	WIPER ON/OFF RELAY CONTROL
23	M20 20BR/OR	COURTESY LAMP LOAD SHED
24	M2 20YL	COURTESY LAMP DRIVER
25	Z234 20BK	GROUND
26	-	-



BODY
CONTROL
MODULE C2

BODY CONTROL MODULE C2 - GRAY 22 WAY

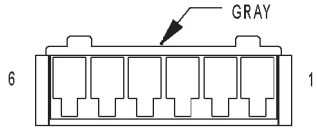
CAV	CIRCUIT	FUNCTION
1	C103 20DG	A/C SWITCH SIGNAL
2	V10 20BR	WASHER PUMP SWITCH SENSE
3	V48 20RD/GY	WIPER HIGH CONTROL
4	L40 20BR	HIGH BEAM SWITCH SENSE
5	V11 20BK/TN	WASHER FLUID SWITCH SENSE
6	P134 20TN/LG	PASSENGER SEAT HEATER SWITCH MUX
7	P133 20TN/DG	DRIVER SEAT HEATER SWITCH MUX
8	X20 20RD/YL	RADIO CONTROL MUX
9	G31 20VT/LG	AMBIENT TEMPERATURE SENSOR SIGNAL
10	L109 20WT	ULTRALIGHT SENSOR SIGNAL
11	V52 20DG/RD	WINDSHIELD WIPER SWITCH MUX
12	C81 20LB/WT	REAR WINDOW DEFOGGER SWITCH SENSE
13	-	-
14	-	-
15	L27 20WT/TN	FOG LAMP SWITCH SENSE
16	C201 20LB/YL	EVAPORATOR TEMPERATURE SENSOR SIGNAL
17	G18 20PK/BK	COOLANT LEVEL SWITCH SENSE
18	P132 20OR/BK	SEAT HEATER SWITCH SENSOR GROUND
19	X10 20RD/BK	RADIO CONTROL MUX RETURN
20	G32 20BK/LB	SENSOR GROUND
21	L110 20BK/YL	ULTRALIGHT SENSOR RETURN
22	V9 20WT/BK	WINDSHIELD WIPER SWITCH RETURN



BOOST PRESSURE SENSOR (DIESEL)

BOOST PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

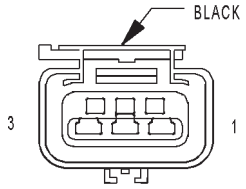
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	Y53 20BK/YL	BOOST PRESSURE SENSOR SIGNAL
3	K6 20VT/WT	SENSOR REFERENCE VOLTAGE B



BRAKE LAMP SWITCH

BRAKE LAMP SWITCH - GRAY 6 WAY

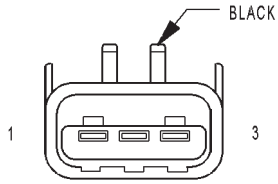
CAV	CIRCUIT	FUNCTION
1	K29 18WT/PK	SECONDARY BRAKE SWITCH SIGNAL
2	Z238 18BK (LHD)	GROUND
2	Z243 18BK (RHD)	GROUND
3	V32 22OR/DG (GAS)	SPEED CONTROL POWER SUPPLY
4	V30 22DB/RD (GAS)	SPEED CONTROL BRAKE SWITCH OUTPUT
5	L50 20VT/TN (LHD)	PRIMARY BRAKE SWITCH SIGNAL
5	L50 20WT/TN (RHD)	PRIMARY BRAKE SWITCH SIGNAL
6	F32 20PK/DB	FUSED B(+)



C100

C100 - BLACK (RIGHT HEADLAMP AND DASH SIDE)

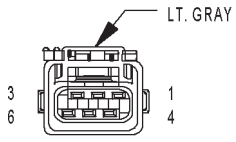
CAV	CIRCUIT
1	T40 12LG
2	K125 18WT/DB
3	K20 18DG



C100

C100 - BLACK (BATTERY SIDE)

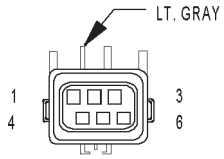
CAV	CIRCUIT
1	T40 12LG
2	K125 18WT/DB
3	K20 18DG



C101 (4.0L RHD)

C101 (4.0L RHD) - LT. GRAY (ENGINE SIDE)

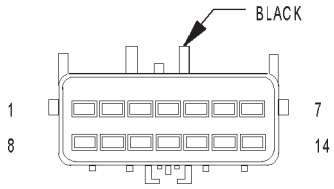
CAV	CIRCUIT
1	B22 18DG/YL
2	K99 18BR/OR
3	K299 18BR/WT
4	K6 18VT/BK
5	C18 18DB
6	-



C101
(4.0L RHD)

C101 (4.0L RHD) - LT. GRAY (HEADLAMP AND DASH SIDE)

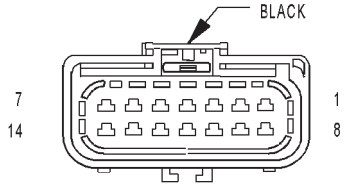
CAV	CIRCUIT
1	B22 18DG/YL
2	K99 18LB/OR
3	K299 18BR/WT
4	K6 18VT/BK
5	C18 18DB
6	-



C101
(4.7L RHD)

C101 (4.7L RHD) - BLACK (ENGINE SIDE)

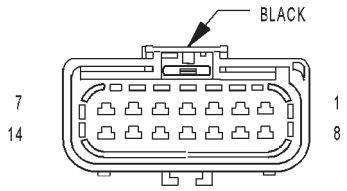
CAV	CIRCUIT
1	K4 18BK/LB (HIGH OUTPUT)
2	K99 18BR/OR
3	C18 18DB
4	K299 18BR/WT
5	T6 18VT/WT
6	K6 18VT/BK
7	K4 18BK/LB (HIGH OUTPUT)
8	K142 18GY/BK (HIGH OUTPUT)
9	T10 18YL/DG
10	-
11	-
12	B22 18DG/YL
13	-
14	K42 18DB/LG (HIGH OUTPUT)



C101
(4.7L RHD)

C101 (4.7L RHD) - BLACK (LEFT HEADLAMP AND DASH SIDE)

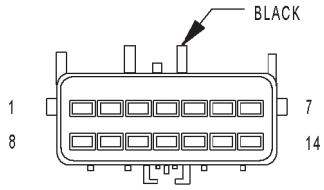
CAV	CIRCUIT
1	K4 18BK/LB
2	K99 18BR/OR
3	C18 18DB
4	K299 18BR/WT
5	T6 18OR/WT
6	K6 18VT/BK
7	K4 18BK/LB
8	K142 18GY/BK
9	T10 18YL/DG
10	-
11	-
12	B22 18DG/YL
13	-
14	K42 18DB/LG



C102
(DIESEL)

C102 (DIESEL) - BLACK (LEFT HEADLAMP AND DASH SIDE)

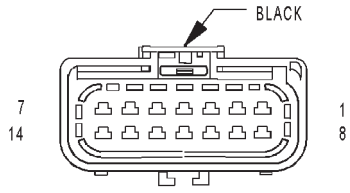
CAV	CIRCUIT
1	D21 18PK
2	D25 18VT/YL
3	K226 18DB/WT
4	D52 18LG/VT
5	D51 18DG/WT
6	B22 18DG/YL
7	F991 20OR/DB
8	T752 18DG/OR
9	K236 18GY/PK
10	K132 18BR/PK
11	A82 18PK/LG
12	K152 18WT
13	L50 18WT/TN
14	K29 18WT/PK



C102
(DIESEL)

C102 (DIESEL) - BLACK (ENGINE SIDE)

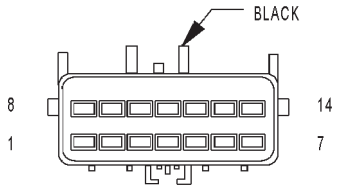
CAV	CIRCUIT
1	D21 20PK
2	D25 20VT/YL
3	K226 20DB/WT
4	D52 16DG/WT
5	D51 16WT
6	B22 20DG/YL
7	F991 20RD/DB
8	T752 20DG/RD
9	K236 20GY/PK
10	K132 20BR/PK
11	A82 16PK/DG
12	K152 20WT
13	L50 20WT/DB
14	K29 20WT/PK



C102
(GAS RHD)

C102 (GAS RHD) - BLACK (RIGHT HEADLAMP AND DASH SIDE)

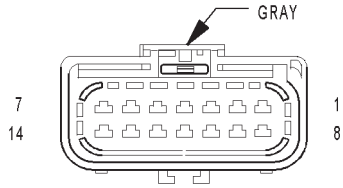
CAV	CIRCUIT
1	A30 14RD/WT (4.7L)
2	F991 20OR/DB
3	K173 18LG
4	F42 18DG/LG
5	A7 14RD/BK
6	L1 18VT/BK
7	Z306 20BK/LG
8	T41 18BK/WT
9	-
10	K4 20BK/LB
11	K200 18VT/OR (4.7L)
12	C2 18DB/YL
13	-
14	A142 14DG/OR



C102
(GAS RHD)

C102 (GAS RHD) - BLACK (ENGINE SIDE)

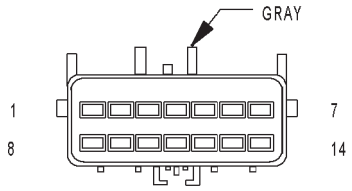
CAV	CIRCUIT
1	A30 14RD/WT (4.7L)
2	F991 18OR/DB
3	K173 18LG
4	F42 18DG/LG
5	A7 14RD/BK
6	L1 18VT/BK
7	Z306 20BK/LG
8	T41 18BK/WT
9	-
10	K4 18BK/LB
11	K200 18VT/OR (4.7L)
12	C2 18DB/YL
13	-
14	A142 14DG/OR



C103
(DIESEL)

C103 (DIESEL) - GRAY (LEFT HEADLAMP AND DASH SIDE)

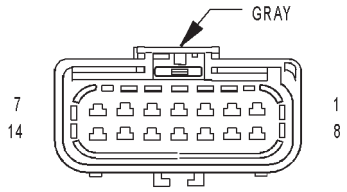
CAV	CIRCUIT
1	T41 18BK/WT
2	K173 18LG
3	C2 18DB/PK
4	-
5	F142 14OR/DG
6	K51 18DB/YL
7	K25 18VT/LG
8	Y42 18OR/DB
9	C18 18DB
10	K4 20BK/LB
11	K6 18VT/WT
12	-
13	T40 12BR
14	F15 18DB/WT



C103
(DIESEL)

C103 (DIESEL) - GRAY (ENGINE SIDE)

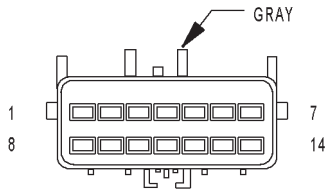
CAV	CIRCUIT
1	T41 20BK/WT
2	K173 20GY
3	C3 14DB/BK
4	-
5	F142 16RD/DG
6	K51 20DB/YL
7	K25 20VT/DG
8	Y42 20RD/DB
9	C18 20DB
10	K4 16BK/LB
11	K6 16VT/WT
12	-
13	T40 12DG
14	F15 20DB/WT



C103
(GAS)

C103 (GAS) - GRAY (RIGHT HEADLAMP AND DASH SIDE)

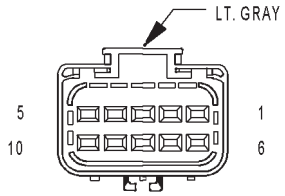
CAV	CIRCUIT
1	F22 20WT/PK (EXCEPT 4.7L RHD)
1	F22 18WT/TN (4.7L RHD)
2	T6 18OR/WT (4.7L LHD)
2	C18 20DB (4.0L LHD BUILT-UP-EXPORT)
2	C18 18DB (4.0L EXCEPT BUILT-UP-EXPORT)
3	D20 20LG (4.7L LHD)
3	D20 18LG (4.7L RHD)
4	D21 20PK (4.7L LHD)
4	K299 18BR/WT (4.0L LHD)
4	D21 18PK (4.7L RHD)
5	B22 18DG/YL (LHD)
6	K20 18DG
7	K30 20PK (4.0L RHD)
7	K30 18PK/YL (4.7L RHD)
7	K30 20PK/YL (LHD)
8	A142 14DG/OR (4.0L LHD)
8	T10 18DG/LG (4.7L LHD)
9	T16 14RD (4.7L LHD)
10	D25 18VT/YL (4.7L RHD)
10	D25 18VT/YL (4.7L EXCEPT BUILT-UP-EXPORT)
10	D25 20VT/YL (4.7L LHD BUILT-UP-EXPORT)
11	Z305 20BK/OR
12	F45 18YL/RD (4.7L RHD)
12	T15 18YL/BR (4.0L)
12	F45 18YL/RD (4.7L EXCEPT BUILT-UP-EXPORT)
12	F45 20YL/RD (4.7L LHD BUILT-UP-EXPORT)
13	K6 18VT/BK (4.0L LHD)
14	F142 18OR/DG



C103
(GAS)

C103 (GAS) - GRAY (ENGINE SIDE)

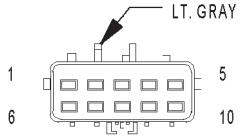
CAV	CIRCUIT
1	F22 18WT/PK
2	C18 18DB (4.0L LHD)
2	K200 18VT/OR (4.7L RHD)
3	K99 18BR/OR (4.0L LHD)
3	D20 18LG (4.7L RHD)
4	K299 18BR/WT (4.0L BUILT-UP-EXPORT)
4	D21 18PK (4.7L RHD)
5	B22 18DG/YL (4.0L LHD)
6	K20 18DG
7	K30 18PK/YL
8	A142 14DG/OR (4.0L LHD)
9	T16 14RD (4.7L)
10	D25 18WT/VT (4.7L)
11	Z305 20BK/OR
12	T15 18LG (4.0L LHD)
12	F45 18YL/RD (4.7L)
13	K6 18VT/BK (4.0L LHD)
13	K199 18DB/WT (4.7L LHD)
14	F142 18OR/DG



C104

C104 - LT. GRAY (RIGHT HEADLAMP AND DASH SIDE)

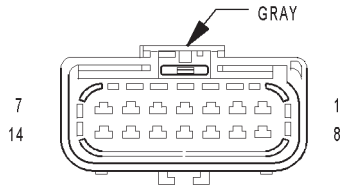
CAV	CIRCUIT
1	K200 18VT/OR (4.0L EXCEPT BUILT-UP-EXPORT)
1	K4 18BK/LB (4.7L HIGH OUTPUT)
2	K99 18BR/OR (4.7L)
2	F991 20OR/DB (4.0L)
3	K173 18LG (4.0L)
4	F42 18DG/LG (4.0L)
5	A7 14RD/BK (4.0L)
5	K4 18BK/LB (4.7L HIGH OUTPUT)
6	L1 18VT/BK (4.0L)
6	K142 18GY/BK (4.7L HIGH OUTPUT)
7	Z306 20BK/LG (4.0L)
7	K299 18BR/WT (4.7L)
8	C18 18DB (4.7L)
8	T41 18BK/WT (4.0L)
9	K6 18VT/BK (4.7L)
9	C2 18DB/YL (4.0L)
10	K4 18BK/LB (4.0L)
10	K42 18DB/LG (4.7L HIGH OUTPUT)



C104

C104 - LT. GRAY (ENGINE SIDE)

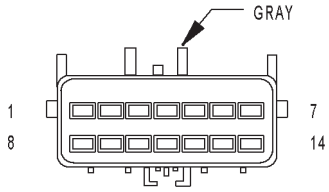
CAV	CIRCUIT
1	K200 18VT/OR (EXCEPT 4.0L BUILT-UP-EXPORT)
2	F991 18OR/DB
3	K173 18LG
4	F42 18DG/LG
5	A7 14RD/BK
6	L1 18VT/BK
7	Z306 20BK/LG
8	T41 18BK/WT
9	C2 18DB/YL
10	K4 18BK/LB



C105
(DIESEL)

C105 (DIESEL) - GRAY (LEFT HEADLAMP AND DASH SIDE)

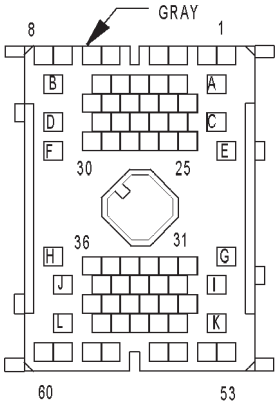
CAV	CIRCUIT
1	C13 18DB/OR
2	F300 18RD/BK
3	V37 18RD/LG
4	Z305 20BK/OR
5	Z306 20BK/LG
6	L1 18VT/BK
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-



C105
(DIESEL)

C105 (DIESEL) - GRAY (ENGINE SIDE)

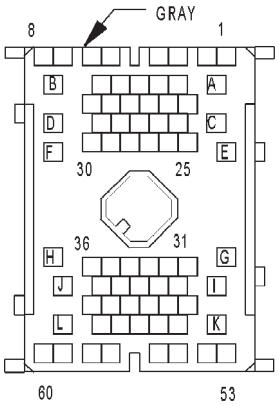
CAV	CIRCUIT
1	C13 20DB/RD
2	F300 20RD/BK
3	V37 20RD/DG
4	Z305 18BK/DB
5	Z306 18BK/DB
6	-
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-



C106
(RHD)
(DIESEL)

C106 (DIESEL) - GRAY (BODY SIDE)

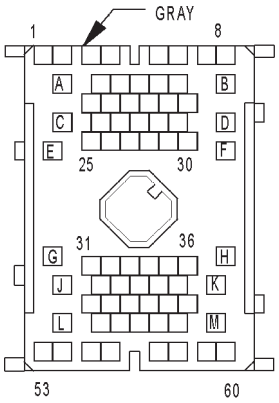
CAV	CIRCUIT
A	B10 14BR/WT (LHD)
B	-
C	-
D	-
E	-
F	-
G	-
H	-
J	-
K	-
L	-
M	B29 14DG/OR
1	F15 20DB/WT
2	-
3	G31 20VT/LG
4	G32 20DB/OR (RHD)
4	G32 20BK/LB (LHD)
5	G18 20PK/BK
6	-
7	-
8	F12 20DB/WT (LHD)
9	-
10	Z231 18BK (RHD)
11	K4 20BK/LB (LHD)
11	G9 18GY/BK (RHD)
12	K6 18VT/WT (LHD)
13	-
14	-
15	-
16	K173 18LG
17	-
18	X2 18DG/RD
19	C18 18DB (LHD)
20	Y42 18OR/DB
21	-



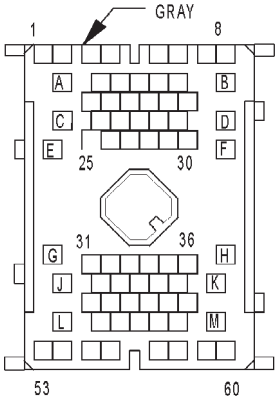
C106
(LHD)
(DIESEL)

C106 (DIESEL) - GRAY (BODY SIDE)

CAV	CIRCUIT
22	-
23	-
24	-
25	B7 18WT
26	B6 18WT/DB
27	-
28	-
29	-
30	-
31	-
32	-
33	-
34	-
35	-
36	-
37	-
38	L13 18BR/YL (BUILT-UP-EXPORT)
39	-
40	-
41	-
42	R46 20BR/LB
43	R48 20TN
44	-
45	-
46	-
47	-
48	-
49	-
50	-
51	-
52	-
53	L7 20BK/YL
54	L60 20TN
55	-
56	-
57	L39 20LB
58	-
59	L44 18VT/RD
60	L34 18RD/OR



C106
(RHD)
(DIESEL)



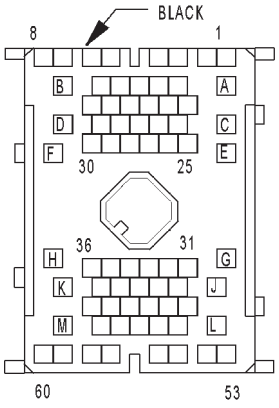
C106
(LHD)
(DIESEL)

C106 (DIESEL) - GRAY (RIGHT HEADLAMP AND DASH SIDE)

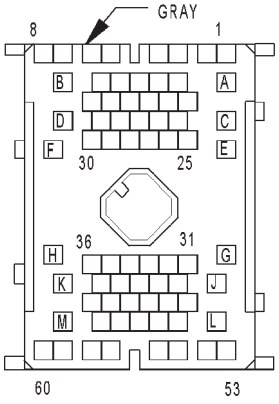
CAV	CIRCUIT
A	-
B	-
C	-
D	-
E	-
F	-
G	-
H	-
J	-
K	-
L	-
M	-
1	F15 18DB/WT
2	-
3	G31 20VT/LG
4	G32 20BK/LB
5	G18 20PK/BK
6	-
7	-
8	-
9	-
10	Z231 18BK (RHD)
11	K4 18BK/LB (LHD)
11	G9 18GY/BK (RHD)
12	K6 18VT/WT (LHD)
13	-
14	-
15	-
16	K173 18LG
17	-
18	X2 18DG/RD
19	C18 18DB (LHD)
20	Y42 18OR/DB
21	-
22	-
23	-
24	-
25	B7 18WT
26	B6 18WT/DB
27	-
28	-
29	-
30	-
31	-

C106 (DIESEL) - GRAY (RIGHT HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
32	-
33	-
34	-
35	-
36	-
37	-
38	L13 18BR/YL
39	-
40	-
41	-
42	R46 18BR/LB
43	R47 18TN
44	-
45	-
46	-
47	-
48	-
49	-
50	-
51	-
52	-
53	L7 20BK/YL
54	L60 20TN
55	-
56	-
57	L39 20LB
58	-
59	L44 18VT/RD
60	L34 18RD/OR



C106
(LHD GAS)



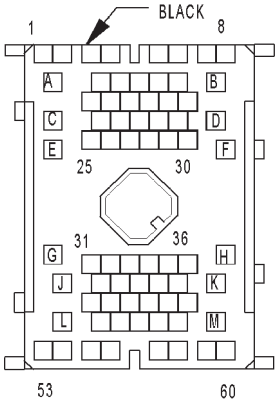
C106
(RHD GAS)

C106 (GAS) - GRAY/RHD BLACK/LHD (BODY SIDE)

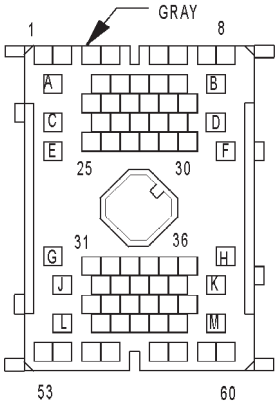
CAV	CIRCUIT
A	A149 12RD/TN
B	A148 16LG/RD
C	C1 12DG
D	-
E	A10 12RD/DG (LHD)
E	A10 10RD/DG (RHD)
F	A1 12RD
G	A145 10WT/RD
H	A146 10OR/WT
J	A147 10RD/GY
K	A148 10PK/WT
L	A2 12PK/BK
M	A20 14RD/DB
1	A141 16DG/BK
2	G18 20PK/BK (LHD)
2	F42 18DG/LG (RHD)
3	V3 16BR/WT
4	V4 16RD/YL
5	V55 16TN/RD
6	V6 16DB
7	F22 18WT/TN (RHD)
7	F22 20WT/PK (LHD)
8	F12 20DB/WT
9	K52 20PK/BK (LHD)
10	K29 20WT/PK (LHD)
10	Z231 18BK (RHD)
11	K512 18LB (RHD)
11	K226 20LB/YL (LHD)
12	K107 20OR/YL (LHD)
13	K251 18LB (RHD)
13	K106 20WT/DG (LHD)
14	T41 18BK/WT (LHD)
14	C13 20DB/OR (RHD)
15	V35 20LG/RD (RHD)
16	V36 20TN/RD (RHD)
17	G9 18GY/BK (RHD)
18	K25 18VT/LG (RHD)
19	K51 20DB/YL (RHD)
20	K125 18WT/DB (LHD)
21	K125 18WT/DB (RHD)
22	K31 18BR (RHD)
23	-
24	-
25	B7 18WT
26	B6 18WT/DB
27	X3 22GY/OR (LHD)
27	X3 22BK/RD (RHD)
28	G32 20BK/LB (LHD)
28	G32 20DB/OR (RHD)
29	-
30	G31 20VT/LG
31	-
32	V32 22OR/DG (LHD)
33	V30 22DB/RD
34	V16 22VT

C106 (GAS) - GRAY/RHD BLACK/LHD (BODY SIDE)

CAV	CIRCUIT
35	V14 22RD/VT
36	-
37	F45 20YL/RD
38	L13 18BR/YL (BUILT-UP-EXPORT)
39	-
40	Z306 20BK/LG
41	Z305 20BK/OR
42	R46 20BR/LB
43	R48 20TN
44	F991 20OR/DB
45	B22 18DG/YL (LHD)
46	-
47	-
48	D25 18YL/VT
49	D21 20PK
50	D20 20LG
51	D32 20LG/DG (LHD)
52	T41 18BK/WT (RHD)
52	T6 18OR/BK (LHD)
53	L7 20BK/YL
54	L60 20TN
55	G18 20PK/BK (RHD)
55	V37 22RD/LG (LHD)
56	L1 18VT/BK
57	L39 20LB
58	K4 18BK/LB (LHD)
58	K4 20BK/LB (RHD)
59	L44 18VT/RD
60	L34 18RD/OR



C106
(LHD GAS)



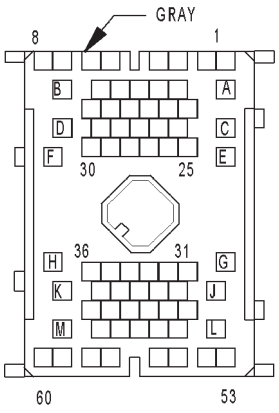
C106
(RHD GAS)

C106 (GAS) - GRAY/RHD BLACK/LHD (RIGHT HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
A	A149 12RD/TN
B	A148 16LG/RD
C	C1 12DG
D	-
E	A10 12RD/DG
F	A1 12RD
G	A145 10WT/RD
H	A146 10OR/WT
J	A147 10RD/GY
L	A2 12PK/BK
K	A148 10PK/WT
M	A20 12RD/DB
1	A141 16DG/BK (RHD)
1	A141 16DG/WT (LHD)
2	F42 18DG/LG (RHD)
2	G18 18PK/BK (LHD)
3	V3 16BR/WT
4	V4 16RD/YL
5	V55 16TN/RD
6	V6 16DB
7	F22 18WT/TN (4.7L RHD)
7	F22 20WT/PK (EXCEPT 4.7L RHD)
8	F12 18DB/WT
9	K52 18PK/BK (LHD)
10	K29 18WT/PK (LHD)
10	Z231 18BK (RHD)
11	K226 18LB/YL (LHD)
11	K512 18RD/YL (4.7L RHD)
12	K107 18OR/PK (EXCEPT BUILT-UP-EXPORT)
13	K106 18WT/DG (EXCEPT BUILT-UP-EXPORT)
14	C13 18DB/OR (RHD)
14	T41 18BK/WT (LHD)
15	V35 20LG/RD (RHD)
16	V36 20TN/RD (RHD)
17	G9 18GY/BK (RHD)
18	K25 18VT/LG (RHD)
19	K51 18DB/YL (RHD)
20	K125 18WT/DB (EXCEPT BUILT-UP-EXPORT)
21	K125 18WT/DB (RHD)
22	K31 18BR (RHD)
23	-
24	-
25	B7 18WT
26	B6 18WT/DB
27	X3 20BK/RD
28	G32 20BK/LB
29	-
30	G31 20VT/LG
31	-
32	V32 18OR/DG (LHD)
33	V30 20DB/RD
34	V16 20VT

C106 (GAS) - GRAY/RHD BLACK/LHD (RIGHT HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
35	V14 20RD/VT
36	-
37	F45 18YL/RD (LHD/4.7L RHD)
37	F45 20YL/RD (RHD)
38	L13 18BR/YL (BUILT-UP-EXPORT)
39	-
40	Z306 20BK/LG
41	Z305 20BK/OR
42	R46 18BR/LB
43	R48 18TN
44	F991 20OR/DB
45	B22 18DG/YL (LHD)
46	-
47	-
48	D25 18VT/YL (LHD/4.7L RHD)
49	D21 18PK (4.0L LHD/4.7L RHD)
49	D21 20PK (4.7L LHD)
50	D20 20LG (4.7L LHD)
50	D20 18LG (4.7L RHD)
51	D32 18LG (EXCEPT BUILT-UP-EXPORT)
51	D32 18LG/DG (LHD BUILT-UP-EXPORT)
52	T41 18BK/WT (RHD)
52	T6 18OR/WT (LHD)
53	L7 20BK/YL
54	L60 20TN
55	G18 20PK/BK (RHD)
55	V37 18RD/LG (LHD)
56	L1 18VT/BK
57	L39 20LB
58	K4 18BK/LB (LHD)
58	K4 20BK/LB (RHD)
59	L44 18VT/RD
60	L34 18RD/OR



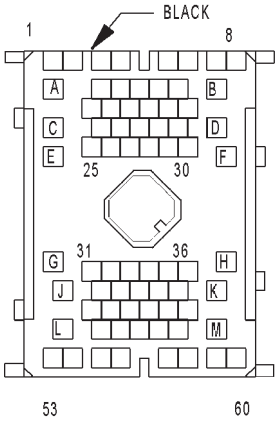
C107
(DIESEL)

C107 (DIESEL) - GRAY (BODY SIDE)

CAV	CIRCUIT
A	B10 14BR/WT
B	A148 16LG/RD
C	C1 12DG
D	A149 12RD/TN
E	-
F	A1 12RD
G	A145 10WT/RD
H	A146 10OR/WT
J	A147 10RD/GY
K	A148 10PK/WT
L	A2 12PK/BK
M	B29 14DG/OR
1	X2 18DG/RD
2	V11 20BK/TN
3	K4 20BK/LB
4	V37 22RD/LG (LHD)
4	V37 20RD/LG (RHD)
5	V55 16TN/RD
6	V6 16DB
7	V10 22BR (LHD)
7	V10 20BR (RHD)
8	-
9	K226 18LB/YL (LHD)
9	K226 20LB/YL (RHD)
10	X3 22GY/OR (LHD)
10	X3 22BK/RD (RHD)
11	F15 20DB/WT
12	F45 20YL/RD
13	T41 18BK/WT
14	-
15	G70 20BR/TN
16	G9 18GY/BK (RHD)
17	Z231 18BK (RHD)
18	-
19	-
20	-
21	F991 20OR/DB
22	-
23	X75 20GY/LG
24	Y42 18OR/DB
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL

C107 (DIESEL) - GRAY (BODY SIDE)

CAV	CIRCUIT
30	B1 18YL/DB
31	-
32	M1 20PK/RD
33	F20 18DB/PK
34	L50 18WT/TN (RHD)
34	L50 18VT/TN (LHD)
35	R47 20DB/LB
36	T2 18TN/BK
37	Z305 20BK/OR
38	Z306 20BK/LG
39	R49 20LB
40	K29 18WT/PK
41	C18 20DB (LHD)
42	-
43	K6 18VT/WT (LHD)
44	-
45	V16 22VT
46	V14 22RD/VT
47	L13 18BR/YL
48	D25 18YL/VT
49	D21 20PK
50	K173 18LG
51	-
52	-
53	L7 20BK/YL
54	L61 20TN/LG
55	L1 18VT/BK
56	V20 18BK/WT (LHD)
56	V20 20BK/WT (RHD)
57	L39 20LB
58	F22 20WT/PK (LHD)
58	F22 18WT/TN (RHD)
59	L43 18VT
60	L33 18RD



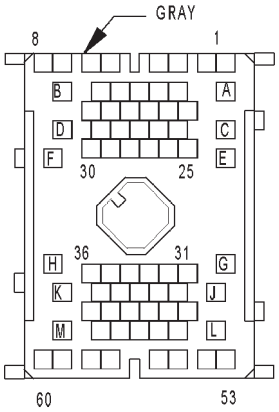
C107
(DIESEL)

C107 (DIESEL) - GRAY (LEFT HEADLAMP AND DASH SIDE)

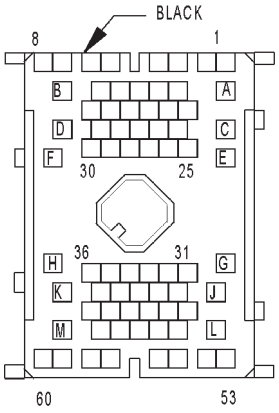
CAV	CIRCUIT
A	-
B	A148 16LG/RD
C	C1 12DG
D	A149 12RD/TN
E	-
F	A1 12RD
G	A145 10WT/RD
H	A146 10OR/WT
J	A147 10RD/GY
K	A148 10PK/WT
L	A2 12PK/BK
M	-
1	X2 18DG/RD
2	V11 20BK/TN
3	K4 18BK/LB
4	V37 18RD/LG
5	V55 16TN/RD
6	V6 16DB
7	V10 20BR
8	-
9	K226 18DB/WT
10	X3 20BK/RD
11	F15 18DB/WT
12	F45 18YL/RD
13	T41 18BK/WT
14	-
15	G70 20BR/TN
16	G9 18GY/BK (RHD)
17	Z231 18BK (RHD)
18	-
19	-
20	-
21	F991 20OR/DB
22	-
23	X75 18GY/LB
24	Y42 18OR/DB
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL
30	B1 18YL/DB
31	-
32	M1 18PK

C107 (DIESEL) - GRAY (LEFT HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
33	F20 18DB/PK
34	L50 18WT/TN
35	R47 18DB/LB
36	T2 18TN/BK
37	Z305 20BK/OR
38	Z306 20BK/LG
39	R49 18LB
40	K29 18WT/PK
41	C18 18DB (RHD)
42	-
43	K6 18VT/WT (RHD)
44	-
45	V16 20VT
46	V14 20RD/VT
47	L13 18BR/YL
48	D25 18VT/YL
49	D21 18PK
50	K173 18LG
51	-
52	-
53	L7 18BK/YL
54	L61 20LG
55	L1 18VT/BK
56	V20 18BK/WT
57	L39 20LB
58	F22 18WT/PK
59	L43 18VT
60	L33 18LG/BR



C107
(RHD)
(GAS)



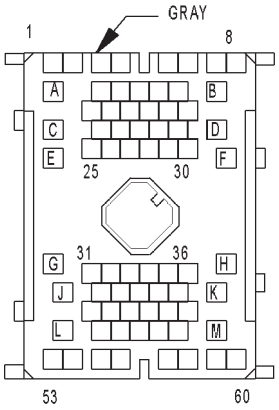
C107
(LHD)
(GAS)

C107 (GAS) - GRAY/RHD BLACK/LHD (BODY SIDE)

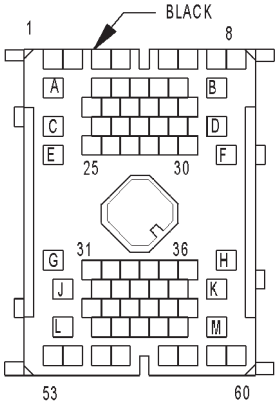
CAV	CIRCUIT
A	-
B	-
C	-
D	-
E	A10 12RD/DG (LHD)
E	A10 10RD/DG (RHD)
F	-
G	-
H	-
J	-
K	-
L	-
M	A20 14RD/DB
1	V37 20RD/LG (RHD)
2	V11 20BK/TN
3	V3 16BR/WT (GAS)
4	V4 16RD/YL (GAS)
5	V55 16TN/RD
6	V6 16DB
7	V10 20BR (RHD)
7	V10 22BR (LHD)
8	F12 20DB/WT
9	K226 20LB/YL (RHD)
9	K52 20PK/BK (LHD)
10	L13 18BR/YL (BUILT-UP-EXPORT)
11	K512 18LB
12	K4 20BK/LB
13	-
14	T6 18OR/BK (RHD)
15	G70 20BR/TN (BUILT-UP-EXPORT)
16	G9 18GY/BK (RHD)
17	Z231 18BK (RHD)
18	-
19	D32 20LG/DG (RHD)
20	-
21	-
22	-
23	X75 20GY/LG (BUILT-UP-EXPORT)
24	F42 18DG/LG (RHD)
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL
30	B1 18YL/DB
31	-
32	M1 20PK/RD
33	F20 18DB/PK
34	L50 18VT/TN (LHD)
34	L50 18WT/TN (RHD)
35	R47 20DB/LB (LHD)
36	-
37	K51 20DB/YL (RHD)
38	K25 18VT/LG (RHD)

C107 (GAS) - GRAY/RHD BLACK/LHD (BODY SIDE)

CAV	CIRCUIT
39	K31 18BR (RHD)
39	R49 20DB (LHD)
40	K29 18WT/PK (RHD)
41	K125 18WT/DB (RHD)
42	V32 22OR/DG (RHD)
43	R47 20DB/LB (RHD)
44	V35 20LG/RD (RHD)
45	B22 18DG/YL (LHD)
45	V36 20TN/RD (RHD)
46	C13 20DB/OR (RHD)
47	L13 18BR/YL (RHD)
48	D25 18YL/VT
49	D21 20PK (RHD)
50	R49 20LB (RHD)
51	-
52	-
53	L7 20BK/YL
54	L61 20TN/LG
55	-
56	V20 18BK/WT (LHD)
56	V20 20BK/WT (RHD)
57	L39 20LB
58	-
59	L43 18VT
60	L33 18RD



C107
(RHD)
(GAS)



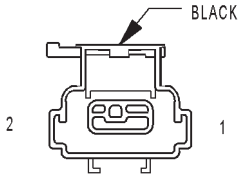
C107
(LHD)
(GAS)

C107 (GAS) - GRAY/RHD BLACK/LHD (LEFT HEADLAMP AND DASH SIDE)

CAV	CIRCUIT
A	-
B	-
C	-
D	-
E	A10 12RD/DG
F	-
G	-
H	-
J	-
K	-
L	-
M	A20 12RD/DB
1	V37 18RD/LG (RHD)
2	V11 20BK/TN
3	V3 16BR/WT
4	V4 16RD/YL
5	V55 16TN/RD
6	V6 16DB
7	V10 20BR
8	F12 20DB/WT
9	K52 20PK/BK (LHD)
9	K226 18LB/YL (RHD)
10	-
11	K512 18RD/YL (4.7L RHD)
12	K4 18BK/LB (RHD)
13	-
14	T6 18OR/BK (4.0L RHD)
14	T6 18OR/WT (4.7L RHD)
15	G70 20BR/TN (RHD)
16	G9 18GY/BK (RHD)
17	Z231 18BK (RHD)
18	-
19	D32 18LG/DG (RHD)
20	-
21	-
22	-
23	X75 18GY/LG (RHD)
24	F42 18DG/LG (RHD)
25	B7 18WT
26	B6 18WT/DB
27	B4 18LG
28	B3 18LG/DB
29	B2 18YL
30	B1 18YL/DB
31	-
32	M1 20PK/RD (LHD)
32	M1 18PK (RHD)
33	F20 18DB/PK
34	L50 18WT/TN
35	R47 18DB/LB (LHD)
36	-
37	K51 18DB/YL (RHD)
38	K25 18VT/LG (RHD)
39	R49 18LB (LHD)

C107 (GAS) - GRAY/RHD BLACK/LHD (LEFT HEADLAMP AND DASH SIDE)

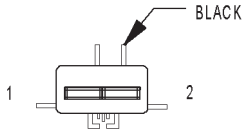
CAV	CIRCUIT
39	K31 18BR (RHD)
40	K29 18WT/PK (RHD)
41	K125 18WT/DB (RHD)
42	V32 18OR/DG (RHD)
43	R47 18DB/LB (RHD)
44	V35 18LG/RD (RHD)
45	B22 18DG/YL (LHD)
45	V36 18TN/RD (RHD)
46	C13 18DB/OR (RHD)
47	L13 18BR/YL (RHD)
48	D25 18VT/YL
49	D21 18PK (RHD)
50	R49 18LB (RHD)
51	-
52	-
53	L7 20BK/YL
54	L61 20TN/LG
55	-
56	V20 18BK/WT
57	L39 20LB
58	-
59	L43 18VT
60	L33 18RD



C108

C108 - BLACK (LEFT HEADLAMP AND DASH SIDE)

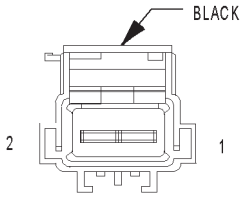
CAV	CIRCUIT
1	M1 20PK (BUILT-UP-EXPORT)
1	M1 20PK/RD (EXCEPT BUILT-UP-EXPORT)
2	Z141 20BK



C108

C108 - BLACK (UNDERHOOD LAMP SIDE)

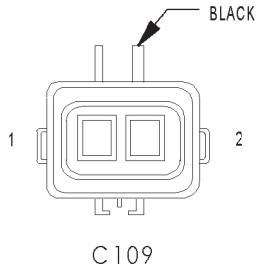
CAV	CIRCUIT
1	M1 20PK/RD
2	Z141 20BK



C109

C109 - BLACK (ENGINE SIDE)

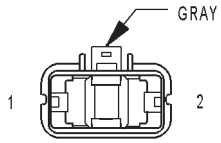
CAV	CIRCUIT
1	K77 18LG/BK
2	K4 18BK/LB



C109

C109 - BLACK (TRANSFER CASE JUMPER SIDE)

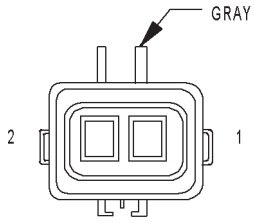
CAV	CIRCUIT
1	K77 18LG/BK
2	K4 18BK/LB



C110
(DIESEL)

C110 (DIESEL) - GRAY (LEFT HEADLAMP AND DASH SIDE)

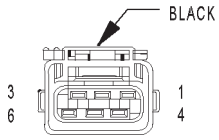
CAV	CIRCUIT
1	K154 10GY
2	K254 10GY/YL



C110
(DIESEL)

C110 (DIESEL) - GRAY (GLOW PLUG SIDE)

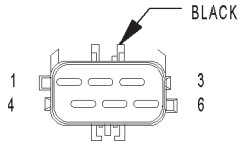
CAV	CIRCUIT
1	K154 10GY
2	K254 10GY/YL



C111

C111 - BLACK (LEFT FRONT LIGHTING MODULE SIDE)

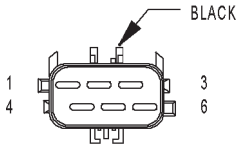
CAV	CIRCUIT
1	L33 18RD
2	L43 18VT
3	L61 20TN/LG
4	L7 20BK/YL
5	L114 18BR/YL (BUILT-UP-EXPORT)
6	Z141 18BK



C111

C111 - BLACK (LEFT HEADLAMP AND DASH SIDE)

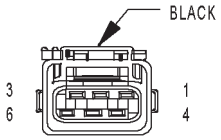
CAV	CIRCUIT
1	L33 18LG/BR (DIESEL)
1	L33 18RD (GAS)
2	L43 18VT
3	L61 20LG (DIESEL)
3	L61 20TN/LG (GAS)
4	L7 18BK/YL (DIESEL)
4	L7 20BK/YL (GAS)
5	L13 18BR/YL (BUILT-UP-EXPORT)
6	Z141 18BK



C112

C112 - BLACK (RIGHT HEADLAMP AND DASH SIDE)

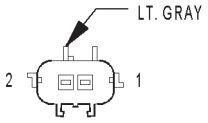
CAV	CIRCUIT
1	L34 18RD/OR
2	L44 18VT/RD
3	L60 20TN
4	L7 20BK/YL
5	L13 18BR/YL (BUILT-UP-EXPORT)
6	Z142 18BK



C112

C112 - BLACK (RIGHT FRONT LIGHTING MODULE SIDE)

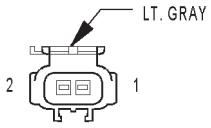
CAV	CIRCUIT
1	L34 18RD/OR
2	L44 18VT/RD
3	L60 20TN
4	L7 20BK/YL
5	L13 18BR/YL (BUILT-UP-EXPORT)
6	Z142 18BK



C113
(DIESEL)

C113 (DIESEL) - LT. GRAY (ENGINE SIDE)

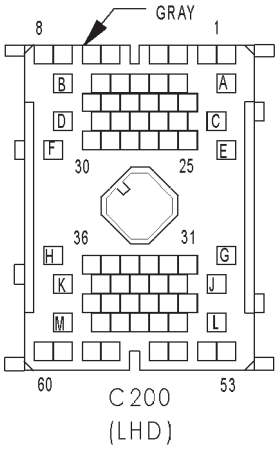
CAV	CIRCUIT
1	D51 16WT
2	D52 16DG/WT

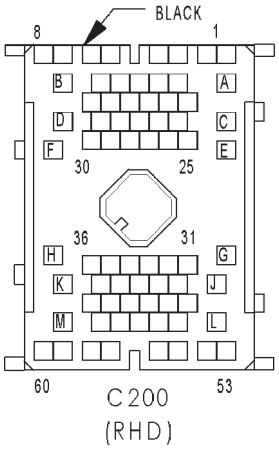


C113
(DIESEL)

C113 (DIESEL) - LT. GRAY (TRANSMISSION SIDE)

CAV	CIRCUIT
1	D52 18LG/WT
2	D51 18DG/WT



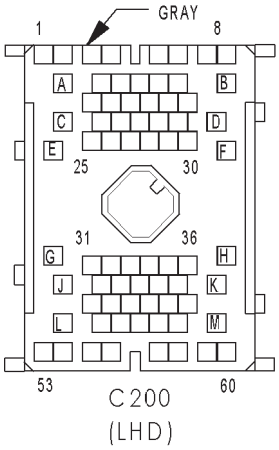


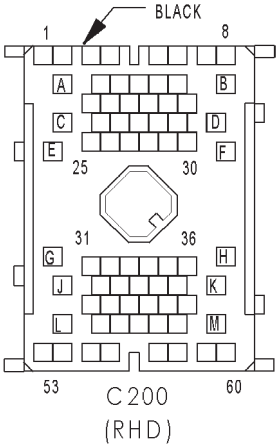
C200 - GRAY/LHD BLACK/RHD (LEFT BODY SIDE)

CAV	CIRCUIT
A	-
B	-
C	A1 12RD
D	-
E	-
F	-
G	A2 12PK/BK
H	C1 12DG
J	-
K	-
M	-
L	-
1	X56 18DB/PK (BASE)
1	X84 18OR/GY (EXCEPT BASE)
2	X86 18OR/RD (EXCEPT BASE)
2	X54 18VT (BASE)
3	X81 18YL/BK (EXCEPT BASE)
3	X55 18BR/RD (BASE)
4	X53 18DG/OR (BASE)
4	X83 18YL/RD (EXCEPT BASE)
5	X53 18DG/OR
6	X55 18BR/RD
7	X54 18VT
8	X56 18DB/PK
9	Y152 20LG/OR (EXCEPT BUILT-UP-EXPORT)
10	D20 20LG (GAS)
11	Y151 20LG/BR (EXCEPT BUILT-UP-EXPORT)
12	Y153 20DB/RD (EXCEPT BUILT-UP-EXPORT)
13	X40 20RD/WT (CD)
14	D25 20YL/VT
15	D25 20YL/VT
16	D32 20LG/DG (GAS)
17	T41 18BK/WT
18	Z4 20WT/BK (CD)
19	X41 20WT/DG (CD)
20	T6 18OR/BK (GAS)
21	D21 20PK (GAS)
22	K29 18WT/PK
23	X160 20YL (CD)
24	X112 20RD (CD)
25	-
26	-
27	G70 20BR/TN (BUILT-UP-EXPORT)
28	R47 20DB/LB
29	Z17 20BK (CD)
30	R49 20LB
31	G76 20TN/YL (RHD)
31	G76 18TN/YL (LHD)
32	T2 18TN/BK (DIESEL)
33	-
34	-

C200 - GRAY/LHD BLACK/RHD (LEFT BODY SIDE)

CAV	CIRCUIT
35	X51 18WT/DG
36	X57 18DG/WT
37	L7 18BK/YL (BUILT-UP-EXPORT)
38	L13 18BR/YL (BUILT-UP-EXPORT)
39	V10 22BR (LHD)
39	V10 20BR (RHD)
40	X52 18DB/WT
41	X58 18DB/OR
42	-
43	V13 18BR/LG
44	V14 22RD/VT
45	-
46	V20 20BK/WT (RHD)
46	V20 18BK/WT (LHD)
47	V22 18BR/YL
48	R46 20BR/LB (RHD)
48	R46 18BK/LB (LHD)
49	X64 18BR/WT
50	Z305 20BK/OR
51	Z306 20BK/LG
52	R48 20TN
53	G32 20BK/LG (LHD)
53	G32 20DB/OR (RHD)
54	G31 20VT/LG
55	Z9 16BK
56	V11 20BK/TN
57	G18 20PK/BK
58	V37 22RD/LG (LHD)
58	V37 20RD/LG (RHD)
59	K4 20BK/LB
60	-



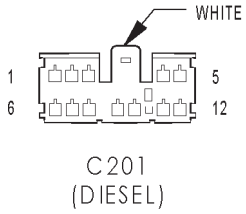


C200 - GRAY/LHD BLACK/RHD (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
A	-
B	-
C	A1 12RD
D	-
E	-
F	-
G	A2 12PK/BK
H	C1 12DG
J	-
K	-
L	-
M	-
1	X84 18OR/BK
2	X86 18OR/RD
3	X81 18YL/BK
4	X83 18YL/RD
5	X53 18DG/OR
6	X55 18BR/RD
7	X54 18VT
8	X56 18DB/PK
9	Y152 20LG/BR (EXCEPT BUILT-UP-EXPORT)
10	D20 20LG
11	Y151 20LG/BR (EXCEPT BUILT-UP-EXPORT)
12	Y153 20DB/RD (EXCEPT BUILT-UP-EXPORT)
13	X40 20WT/RD
14	D25 20YL/VT/GY
15	D25 20YL/VT/BR
16	D32 20LG/DG
17	T41 18BK/WT (DIESEL)
18	Z4 20WT/BK
19	X41 20WT/DG
20	T6 18OR/WT (GAS)
21	D21 20PK
22	K29 18WT/PK
23	X160 20YL
24	X112 20RD
25	-
26	-
27	G70 20BR/TN (BUILT-UP-EXPORT)
28	R47 20DB/LB
29	Z17 20BK
30	R49 20LB
31	G76 18TN/YL
32	T2 20TN/BK (DIESEL)
33	-
34	-
35	X51 18WT/DG
36	X57 18DG/WT
37	L7 18BK/YL (BUILT-UP-EXPORT)
38	L13 20BR/YL (BUILT-UP-EXPORT)
39	V10 20BR
40	X52 18DB/WT

C200 - GRAY/LHD BLACK/RHD (INSTRUMENT PANEL SIDE)

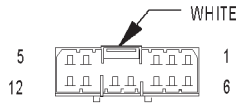
CAV	CIRCUIT
41	X58 18DB/OR
42	-
43	V13 18BR/LG
44	V14 20RD/VT
45	-
46	V20 18BK/WT
47	V22 18BR/YL
48	R46 20BR/LB
49	X64 18BR/WT
50	Z305 20BK/OR
51	Z306 20BK/LG
52	R48 20TN
53	G32 20BK/LB
54	G31 20VT/LG
55	Z9 16BK
56	V11 20BK/TN
57	G18 20PK/BK
58	V37 20RD/LG
59	K4 20BK/LB
60	-



C201
(DIESEL)

C201 (DIESEL) - WHITE (INSTRUMENT PANEL SIDE)

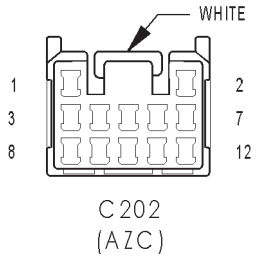
CAV	CIRCUIT
1	-
2	Z300 18BK
3	E2 20OR
4	K29 18WT/PK
5	D25 20YL/VT
6	D19 20VT/OR
7	D21 20PK
8	F12 20DB/WT
9	T2 20TN/BK
10	Z234 18BK
11	T41 18BK/WT
12	F991 18OR/DB



C201
(DIESEL)

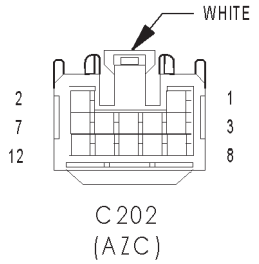
C201 (DIESEL) - WHITE (SHIFTER ASSEMBLY SIDE)

CAV	CIRCUIT
1	-
2	-
3	-
4	K2 20WT/PK
5	D25 20RD
6	-
7	D21 20PK
8	F12 20DB/WT
9	T2 20TN/BK
10	Z234 20WT
11	T41 20BK/WT
12	F991 20OR/DB



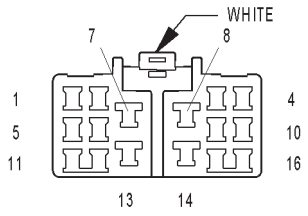
C202 (AZC) - WHITE (INSTRUMENT PANEL SIDE)

CAV	CIRCUIT
1	C100 20YL/DB (RHD)
1	C32 20GY/DB (LHD)
2	C100 20YL/DB (LHD)
2	C32 20GY/DB (RHD)
3	C96 20WT/DB (RHD)
3	C33 20DB/RD (LHD)
4	C94 20WT/DG (RHD)
4	C95 20WT/BK (LHD)
5	C95 20WT/BK (RHD)
5	C94 20WT/DG (LHD)
6	C33 20DB/RD (RHD)
6	C96 20WT/DB (LHD)
7	C35 20DG/YL (RHD)
7	C102 20TN/BK (LHD)
8	C35 20DG/YL (LHD)
8	C102 20TN/BK (RHD)
9	C56 20RD/LG
10	-
11	C201 20LB/YL
12	G32 20BK/LB



C202 (AZC) - WHITE (A/C SIDE)

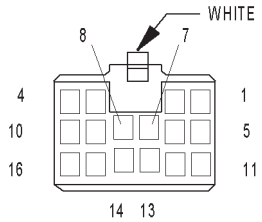
CAV	CIRCUIT
1	C100 20YL/DB (RHD)
1	C32 20GY/DB (LHD)
2	C100 20YL/DB (LHD)
2	C32 20GY/DB (RHD)
3	C96 20WT/DB (RHD)
3	C33 20DB/RD (LHD)
4	C94 20WT/DG (RHD)
4	C95 20WT/BK (LHD)
5	C95 20WT/BK (RHD)
5	C94 20WT/DG (LHD)
6	C33 20DB/RD (RHD)
6	C96 20WT/DB (LHD)
7	C35 20DG/YL (RHD)
7	C102 20TN/BK (LHD)
8	C35 20DG/YL (LHD)
8	C102 20TN/BK (RHD)
9	C56 20RD/LG
10	-
11	C201 20LB/YL
12	G32 20BK/LB



C202
(MTC)

C202 (MTC) - WHITE (INSTRUMENT PANEL SIDE)

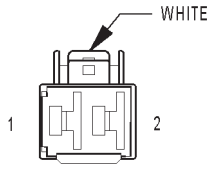
CAV	CIRCUIT
1	-
2	C201 20LB/YL
3	G32 20BK/LB
4	-
5	C67 20RD/LB
6	-
7	-
8	-
9	-
10	C6 14LB
11	Z132 20BK/OR
12	F22 20WT/PK
13	C7 12BK/TN
14	C1 12DG
15	C4 16TN
16	C5 16LG



C202
(MTC)

C202 (MTC) - WHITE (A/C SIDE)

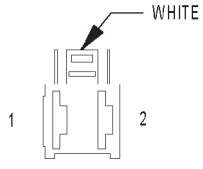
CAV	CIRCUIT
1	-
2	C101 20LB/YL
3	G32 20BK/LB
4	-
5	C67 20RD/LB
6	-
7	-
8	-
9	-
10	C6 14LB
11	Z132 20BK/OR
12	F22 20WT/PK
13	C7 12BK/TN
14	C1 12DG
15	C4 16TN
16	C5 16LG



C203
(AZC)

C203 (AZC) - WHITE (INSTRUMENT PANEL SIDE)

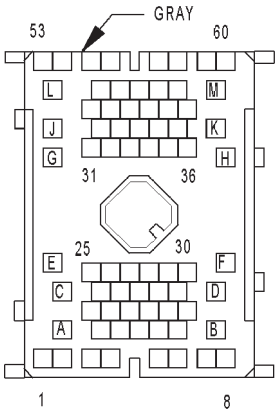
CAV	CIRCUIT
1	Z118 12BK
2	C1 12DG



C203
(AZC)

C203 (AZC) - WHITE (A/C SIDE)

CAV	CIRCUIT
1	Z118 12BK
2	C1 12DG



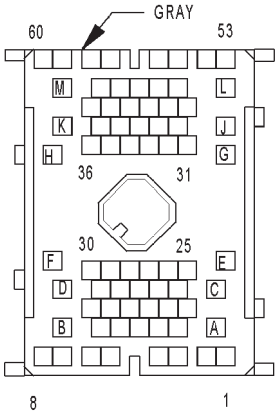
C300
(LHD)

C300 (LHD) - GRAY (RIGHT BODY SIDE)

CAV	CIRCUIT
A	P130 16DG/WT (EXCEPT BASE)
B	Q13 16DB
C	B40 12LB
D	F9 14RD/BK (EXCEPT BUILT-UP-EXPORT)
E	P144 16BK/LG (EXCEPT BASE)
F	A141 16DG/BK (GAS)
G	-
H	-
J	-
K	-
L	Q23 16RD/WT
M	-
1	D25 20YL/VT
2	V13 18BR/LG
3	V22 18BR/YL
4	P112 20YL/WT
5	P114 20YL/RD
6	P35 18OR/VT
7	P36 18PK/VT
8	L50 18WT/TN
9	B1 18YL/DB
10	B2 18YL
11	B3 18LG/DB
12	B4 18LG
13	-
14	-
15	-
16	P29 20BR/WT (EXCEPT BASE)
17	P86 20PK/BK (EXCEPT BASE)
18	E21 20OR/RD
19	K4 20BK/LB
20	K226 18LB/YL (DIESEL)
20	K226 20LB/YL (GAS)
21	L62 18BR/RD
22	L95 18DG/YL (BUILT-UP-EXPORT)
23	-
24	L1 18VT/BK
25	-
26	-
27	-
28	-
29	-
30	-
31	-

C300 (LHD) - GRAY (RIGHT BODY SIDE)

CAV	CIRCUIT
32	-
33	-
34	-
35	-
36	-
37	X75 20GY/LG (BUILT-UP-EXPORT)
38	-
39	-
40	-
41	K106 20WT/DG (EXCEPT BUILT-UP-EXPORT)
42	K107 20OR/YL (EXCEPT BUILT-UP-EXPORT)
43	K125 18WT/DB (EXCEPT BUILT-UP-EXPORT)
44	-
45	-
46	-
47	-
48	-
49	-
50	-
51	-
52	-
53	X57 18DG/WT (BASE)
53	X91 18WT/DG (EXCEPT BASE)
54	X51 18WT/DG (BASE)
54	X93 18DG/WT (EXCEPT BASE)
55	-
56	-
57	Z155 18BK/OR
58	-
59	-
60	-



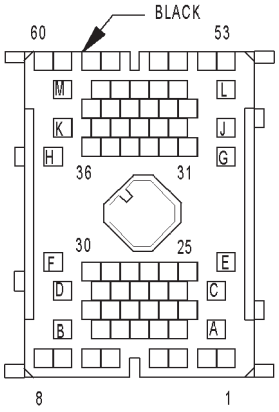
C300
(LHD)

C300 (LHD) - GRAY (LEFT BODY SIDE)

CAV	CIRCUIT
A	P130 16DG/WT (HEATED SEATS)
B	Q13 16DB
C	B40 14LB
D	F9 14RD/BK (EXCEPT BASE))
E	P144 16BK/VT (HEATED SEATS)
F	A141 16DG/BK (EXCEPT DIESEL)
G	-
H	-
J	-
K	-
L	Q23 16RD/WT
M	-
1	D25 20YL/VT
2	V13 18BR/LG
3	V22 18BR/YL
4	P112 20YL/WT
5	P114 20YL/RD
6	P35 18OR/VT
7	P36 18PK/VT
8	L50 18WT/TN
9	B1 18YL/DB
10	B2 18YL
11	B3 18LG/DB
12	B4 18LG
13	-
14	-
15	-
16	P29 20BR/WT (HEATED SEATS)
17	P86 18PK/BK (HEATED SEATS)
18	E21 20OR/RD
19	K4 20BK/LB
20	K226 20LB/YL
21	L62 18BR/RD
22	L95 18DG/YL (BUILT-UP-EXPORT)
23	-
24	L1 18VT/BK
25	-
26	-
27	-
28	-
29	-
30	-
31	-
32	-

C300 (LHD) - GRAY (LEFT BODY SIDE)

CAV	CIRCUIT
33	-
34	-
35	-
36	-
37	X75 20GY/LG (BUILT-UP-EXPORT)
38	-
39	-
40	-
41	K106 20WT/DG (EXCEPT BUILT-UP-EXPORT)
42	K107 20OR/YL (EXCEPT BUILT-UP-EXPORT)
43	K125 18OR/DG (EXCEPT BUILT-UP-EXPORT)
44	-
45	-
46	-
47	-
48	-
49	-
50	-
51	-
52	-
53	X91 18WT/DG (PREMIUM)
53	X57 18WT/DG (BASE)
54	X51 18DG/WT (BASE)
54	X93 18DG/WT (PREMIUM)
55	-
56	-
57	Z155 18BK/OR (EXCEPT BASE)
58	-
59	-
60	-



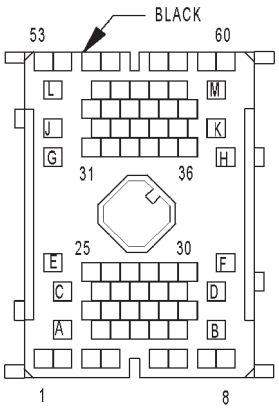
C301
(RHD)

C301 (RHD) - BLACK (LEFT BODY SIDE)

CAV	CIRCUIT
A	Q13 16DB
B	Q23 16RD/WT
C	F9 14RD/BK
D	F60 16RD/WT
E	Z9 16BK
F	Z5 16BK/VT
G	C15 12BK/WT
H	A148 16LG/RD
J	-
K	-
L	Q30 16TN
M	P130 16DG/WT
1	L50 18W/TTN
2	F70 18PK
3	M2 18YL
4	M20 18YL/BK
5	P35 18 OR/VT
6	P36 18PK/VT
7	F30 14RD/TN
8	L7 18BK/YL
9	L95 18DG/YL
10	L63 18DG/RD
11	G80 20VT/YL
12	X80 18LB/BK
13	X82 18LB/RD
14	X85 18LG/DG
15	X87 18LG/RD
16	X93 18DG/WT
17	X91 18WT/DG
18	X84 18OR/GY
19	L62 20BR/RD
20	X86 18OR/RD
21	X81 18YL/BK
22	X83 18YL/RD
23	X56 18DB/PK
24	X51 18WT/DG
25	X57 18DG/WT
26	X52 18DB/WT
27	X58 18DB/OR
28	X54 18VT
29	X55 18BR/RD
30	X53 18DG/OR
31	X64 18BR/WT
32	D25 20YL/VT

C301 (RHD) - BLACK (LEFT BODY SIDE)

CAV	CIRCUIT
33	-
34	G78 20TN/BK
35	-
36	-
37	E21 20OR/RD
38	G77 20TN/OR
39	G76 20TN/YL
40	L1 18VT/BK
41	G5 20DB/WT
42	P86 20PK/BK
43	P29 20BR/WT
44	G73 20LG/OR
45	C235 18WT/LB (CD)
46	X160 20YL (CD)
47	X40 20RD/WT (CD)
48	-
49	X112 20RD (CD)
50	X41 20RD/BK (CD)
51	Z4 20WT/BK (CD)
52	Z17 20BK (CD)
53	-
54	-
55	-
56	-
57	-
58	-
59	-
60	-



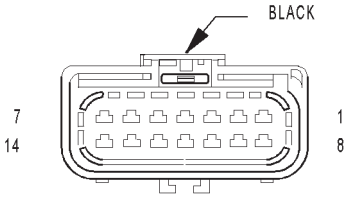
C301
(RHD)

C301 (RHD) - BLACK (RIGHT BODY SIDE)

CAV	CIRCUIT
A	Q13 16DB
B	Q23 16RD/WT
C	F9 14RD/BK
D	F60 16RD/WT
E	Z9 16BK
F	Z5 16BK/VT
G	C15 12BK/WT
H	A148 16LG/RD
J	-
K	-
L	Q30 16TN
M	P130 16DG/WT
1	L50 18WT/TN
2	F70 18PK
3	M2 18YL
4	M20 18YL/BK
5	P35 18OR/VT
6	P36 18PK/VT
7	F30 16RD/TN
8	L7 18BK/YL
9	L95 18DG/YL
10	L63 18DG/RD
11	G80 20VT/YL
12	X80 18LB/BK
13	X82 18LB/RD
14	X85 18LG/DG
15	X87 18LG/RD
16	X93 18DG/WT
17	X91 18WT/DG
18	X84 18OR/GY
19	L62 18BR/RD
20	X86 18OR/RD
21	X81 18YL/BK
22	X83 18YL/RD
23	X56 18DB/BK
24	X51 18WT/DG
25	X57 18DG/WT
26	X52 18DB/WT
27	X58 18DB/OR
28	X54 18VT
29	X55 18BR/RD
30	X53 18DG/OR
31	X64 18BR/WT
32	D25 20YL/VT
33	F22 20WT/PK
34	G78 20TN/BK
35	M1 18PK/RD
36	-
37	E21 20OR/RD
38	G77 20TN/OR
39	G76 20TN/YL
40	L1 18VT/BK
41	G5 20DB/WT
42	P86 20PK/BK
43	P29 20BR/WT

C301 (RHD) - BLACK (RIGHT BODY SIDE)

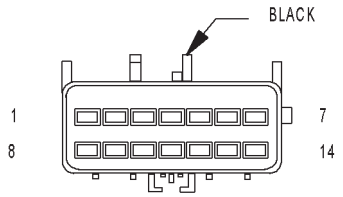
CAV	CIRCUIT
44	G73 20LG/OR
45	C235 20WT/LB (CD)
46	X160 20YL (CD)
47	X40 20WT/RD (CD)
48	-
49	X112 20RD (CD)
50	X41 20WT/DG (CD)
51	Z4 20WT/BK (CD)
52	Z17 20BK (CD)
53	-
54	-
55	-
56	-
57	-
58	-
59	-
60	-



C302

C302 - BLACK (BODY SIDE)

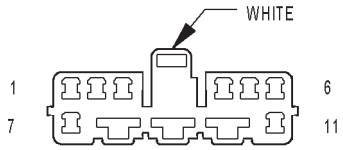
CAV	CIRCUIT
1	P112 20YL/WT
2	P114 20YL/RD
3	D25 20YL/VT
4	Z243 12BK (RHD)
4	Z28 12BK (LHD)
5	E21 20OR/RD
6	Q13 16DB
7	Q23 16RD/WT
8	A146 12OR/WT
9	X55 18BR/RD (LHD BASE)
9	X85 18LG/DG (LHD PREMIUM)
9	X80 18LB/BK (RHD PREMIUM)
10	X82 18LB/RD (RHD PREMIUM)
10	X53 18DG/OR (LHD BASE)
10	X87 18LG/RD (LHD PREMIUM)
11	M1 18PK/RD (JAPAN)
12	-
13	-
14	-



C302

C302 - BLACK (FRONT DRIVER DOOR SIDE)

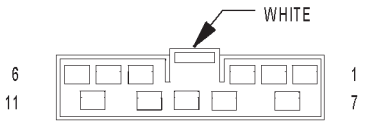
CAV	CIRCUIT
1	P112 20YL/WT
2	P114 20YL/RD
3	D25 20YL/VT
4	Z1 12BK
5	E21 20OR/RD
6	Q13 16DB
7	Q23 16RD/WT
8	A146 12OR/WT
9	X85 18LG/DG (LHD PREMIUM)
9	X80 18LG/DG (RHD PREMIUM)
9	X55 18LG/DG (BASE)
10	X53 18LG/RD (BASE)
10	X82 18LG/RD (RHD PREMIUM)
10	X87 18LG/RD (LHD PREMIUM)
11	M1 18PK (JAPAN)
12	-
13	-
14	-



C303

C303 - WHITE (RIGHT BODY SIDE)

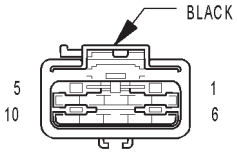
CAV	CIRCUIT
1	X58 18DB/OR (BASE AUDIO)
1	X92 18TN/DG (PREMIUM AUDIO)
2	X52 18DB/WT (BASE AUDIO)
2	X90 18WT/VT (PREMIUM AUDIO)
3	E21 20OR/DB (RHD)
3	E20 20OR/DB (LHD)
4	P35 18OR/VT
5	P36 18PK/VT
6	-
7	-
8	Q13 16DB (RHD)
8	Q14 16GY (LHD)
9	Q24 16DG (LHD)
9	Q23 16RD/WT (RHD)
10	Z151 16BK (RHD)
10	Z28 16BK (LHD)
11	G76 18TN/YL (LHD)
11	G76 20TN/YL (RHD)



C303

C303 - WHITE (REAR DOOR SIDE)

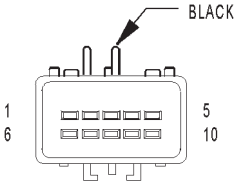
CAV	CIRCUIT
1	X58 18TN/DG (BASE)
1	X55
1	X92 18TN/DG (PREMIUM)
2	X52 18WT/VT (BASE)
2	X90 18WT/VT (PREMIUM)
3	E21 20OR/RD
4	P35 18OR/VT
5	P36 18PK/VT
6	-
7	-
8	Q14 16GY
9	Q24 16DG
10	Z1 16BK
11	G76 18TN/YL



C304

C304 - BLACK (BODY SIDE)

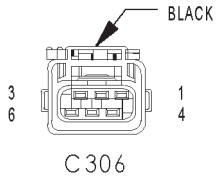
CAV	CIRCUIT
1	P86 20PK/BK (RHD)
1	P86 18PK/BK (LHD)
2	P130 16DG/WT
3	D25 20YL/VT
4	F37 16RD/LB (RHD)
4	F37 16RD (LHD)
5	Z238 16BK (RHD)
5	Z243 16BK (LHD)
6	P29 20BR/WT
7	Z155 18BK/OR (RHD)
7	Z155 20BK/OR (LHD)
8	Z5 16BK/VT (RHD)
8	P144 16BK/VT (LHD)
9	-
10	-



C304

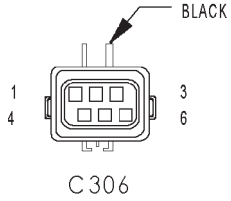
C304 - BLACK (POWER SEAT SIDE)

CAV	CIRCUIT
1	P86 20DG/YL (HEATED SEATS)
2	P130 16DG/WT (HEATED SEATS)
3	D25 20VT/YL (PREMIUM POWER SEATS)
4	F35 16RD
5	Z1 16BK
6	P29 20BR/WT (HEATED SEATS)
7	Z2 20BK/OR (PREMIUM POWER SEATS)
8	Z5 16BK/VT (HEATED SEATS)
9	-
10	-



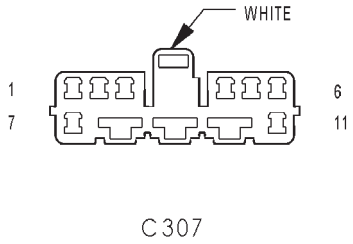
C306 - BLACK (BODY SIDE)

CAV	CIRCUIT
1	P130 16DG/WT
2	Z238 16BK
3	F37 16RD/LB
4	P86 20PK/BK
5	P29 20BR/WT
6	P144 16BK/LG



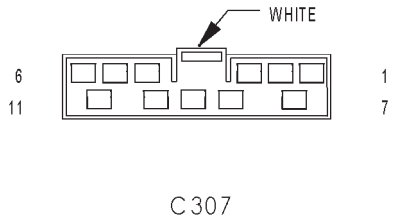
C306 - BLACK (POWER SEAT SIDE)

CAV	CIRCUIT
1	P130 16DG/WT (HEATED SEATS)
2	Z1 16BK
3	F37 16RD/LB
4	P86 20DG/YL (HEATED SEATS)
5	P29 20BR/WT (HEATED SEATS)
6	Z5 16BK/VT (HEATED SEATS)



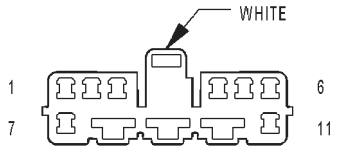
C307 - WHITE (BODY SIDE)

CAV	CIRCUIT
1	X93 18DG/WT (RHD)
1	X91 18WT/DG (LHD)
2	X93 18DG/WT (LHD)
2	X91 18WT/DG (RHD)
3	E20 20OR/DB (RHD)
3	E21 20OR/RD (LHD)
4	P35 18OR/VT
5	P36 18PK/VT
6	-
7	-
8	Q13 16DB (LHD)
8	Q14 16GY (RHD)
9	Q24 16DG (RHD)
9	Q23 16RD/TN (LHD)
10	Z243 16BK
11	G77 20TN/OR



C307 - WHITE (REAR DOOR SIDE)

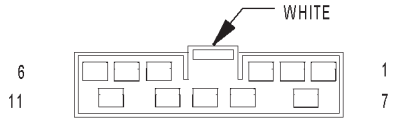
CAV	CIRCUIT
1	X57 18TN/DG (BASE)
1	X93 18TN/DG (PREMIUM)
2	X51 18WT/VT (BASE)
2	X91 18WT/VT (PREMIUM)
3	E21 20OR/RD
4	P35 18OR/VT
5	P36 18PK/VT
6	-
7	-
8	Q14 16GY
9	Q24 16DG
10	Z1 16BK
11	G76 18TN/YL



C308

C308 - WHITE (LEFT BODY SIDE)

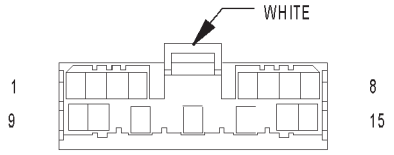
CAV	CIRCUIT
1	G78 20TN/BK
2	P35 18PK/VT (RHD)
2	P35 18OR/VT (LHD)
3	P36 18OR/VT (RHD)
3	P36 18PK/VT (LHD)
4	V13 18BR/LG
5	V22 18BR/YL
6	F70 18PK
7	L50 18WT/TN
8	Z309 12BK
9	G80 20VT/YL
10	C15 12BK/WT
11	L7 18BK/YL



C308

C308 - WHITE (LIFTGATE SIDE)

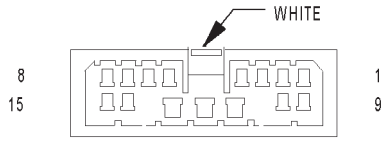
CAV	CIRCUIT
1	G78 20TN/BK
2	P35 18OR/VT
3	P36 18PK/VT
4	V13 18BR/LG
5	V22 18BR/YL
6	F70 18PK
7	L50 18WT/TN
8	Z1 12BK
9	G80 18VT/YL
10	C15 12BK/WT
11	L7 18BK/YL



C309

C309 - WHITE (OVERHEAD SIDE)

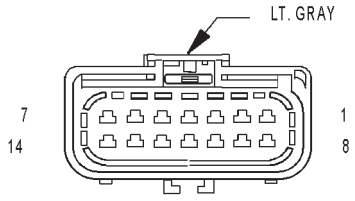
CAV	CIRCUIT
1	D25 20YL/VT
2	M20 20YL/BK
3	M2 20YL/DG
4	P112 20BK/WT
5	P114 20BK/YL
6	L1 20BK/VT
7	G5 20DB/WT
8	X75 20GY/LG (ALARM)
9	-
10	F70 20PK
11	Q30 20BK/LB (AUTOWIPE)
11	Q30 16TN (SUNROOF)
12	Z150 20BK (EXCEPT SUNROOF)
12	Z150 16BK (SUNROOF)
13	-
14	Z155 20BK/OR
15	G73 20LG/OR



C309

C309 - WHITE (LEFT BODY SIDE)

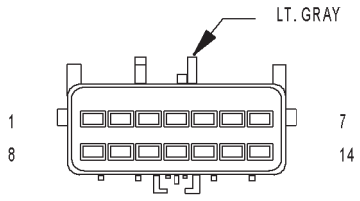
CAV	CIRCUIT
1	D25 20YL/VT
2	M20 18YL/BK (RHD)
2	M20 20YL/BK (LHD)
3	M2 18YL (RHD)
3	M2 20YL/DG (LHD)
4	P112 20YL/WT
5	P114 20YL/RD
6	L1 20VT/BK
7	G5 20DB/WT
8	X75 20GY/LG (BUILT-UP-EXPORT)
9	-
10	F70 20PK (LHD)
10	F70 18PK (RHD)
11	Q30 16TN
12	Z150 16BK
13	-
14	Z155 20BK/OR (EXCEPT LHD BASE)
14	Z155 18BK/OR (RHD/LHD BASE)
15	G73 20LG/OR



C310
(BUILT-
UP-EXPORT)

C310 (BUILT-UP-EXPORT) - LT.GRAY (TRAILER TOW SIDE)

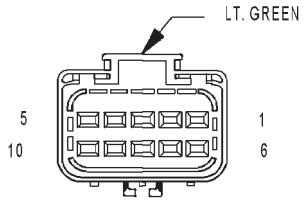
CAV	CIRCUIT
1	F9 14RD/BK
2	L62 20BR/RD
3	L1 18VT/BK
4	F30 14RD/TN
5	L7 18BK/YL
6	Z150 14RD/BK
7	B40 14LB
8	Z150 14BK
9	L50 18WT/TN
10	L63 20DG/RD
11	Z1 14BK
12	-
13	-
14	-



C310
(BUILT-
UP-EXPORT)

C310 (BUILT-UP-EXPORT) - LT.GRAY (BODY SIDE)

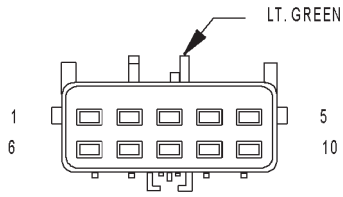
CAV	CIRCUIT
1	F9 14RD/BK
2	L62 18BR/RD (LHD)
2	L62 20BR/RD (RHD)
3	L1 18VT/BK
4	F30 14RD/TN
5	L7 18BK/YL
6	L95 18DG/YL
7	B40 14LB
8	Z150 14BK
9	L50 16WT/TN (RHD)
9	L50 18WT/TN (LHD)
10	L63 20DG/RD
11	Z150 14BK
12	-
13	-
14	-



C310
(EXCEPT BUILT-UP-EXPORT)

C310 (EXCEPT BUILT-UP-EXPORT) - LT. GREEN
(TRAILER TOW SIDE)

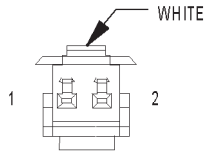
CAV	CIRCUIT
1	F9 14RD/BK
2	L62 20BR/RD
3	L1 18VT/BK
4	F30 14RD/TN
5	L7 18BK/YL
6	Z150 14RD/BK
7	B40 14LB
8	Z150 14BK
9	L50 18WT/TN
10	L63 20DG/RD



C310
(EXCEPT BUILT-UP-EXPORT)

C310 (EXCEPT BUILT-UP-EXPORT) - LT. GREEN
(LEFT BODY SIDE)

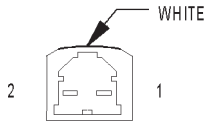
CAV	CIRCUIT
1	F9 14RD/BK
2	L62 18BR/RD
3	L1 18VT/BK
4	F30 14RD/TN
5	L7 18BK/YL
6	Z150 14BK
7	B40 14LB
8	Z150 14BK
9	L50 18WT/TN
10	L63 20DG/RD



C311

C311 - WHITE (LIFTGATE SIDE)

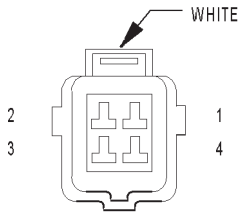
CAV	CIRCUIT
1	L50 18WT/TN
2	Z1 18BK



C311

C311 - WHITE (CHMSL SIDE)

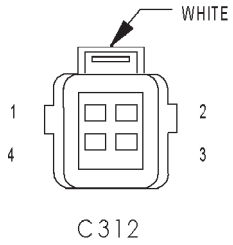
CAV	CIRCUIT
1	L50 18WT/TN
2	Z1 18BK



C312

C312 - WHTE (LIFTGATE SIDE)

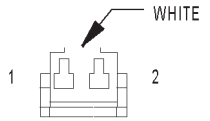
CAV	CIRCUIT
1	Z1 18BK
2	L7 18BK/YL
3	P101 18OR/PK
4	F70 18PK



C312

C312 - WHITE (LICENSE PLATE LAMP SIDE)

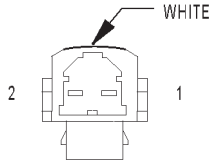
CAV	CIRCUIT
1	Z1 18BK
2	L7 18BK/YL
3	P101 18OR/PK
4	F70 18PK



C313

C313 - WHITE (FRONT DRIVER DOOR SIDE)

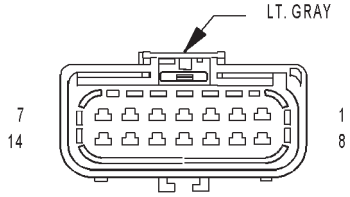
CAV	CIRCUIT
1	P112 20YL/WT
2	P114 20YL/RD



C313

C313 - WHITE (MUX JUMPER SIDE)

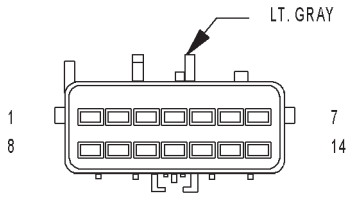
CAV	CIRCUIT
1	P112 20YL/WT
2	P114 20YL/RD



C314

C314 - LT. GRAY (BODY SIDE)

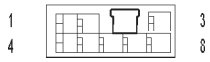
CAV	CIRCUIT
1	D25 20YL/VT
2	A146 12OR/WT
3	P35 18OR/VT
4	P36 18PK/VT
5	Z28 12BK (LHD)
5	Z243 12BK (RHD)
6	Q14 16GY
7	Q24 16DG
8	E20 20OR/DB
9	X56 18DB/PK (BASE LHD)
9	X80 18LB/BK (PREMIUM LHD)
9	X85 18LG/DG (RHD)
10	X54 18VT (BASE)
10	X87 18LG/RD (RHD)
10	X82 18LB/RD (PREMIUM)
11	-
12	-
13	-
14	-



C314

C314 - LT. GRAY (FRONT PASSENGER DOOR SIDE)

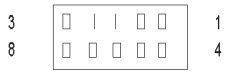
CAV	CIRCUIT
1	D25 20YL/VT
2	A146 12OR/WT
3	P35 18OR/VT
4	P36 18PK/VT
5	Z1 12BK
6	Q14 16GY
7	Q24 16DG
8	E20 20OR/DB
9	X80 18LB/BK (LHD PREMIUM)
9	X85 18LB/BK (RHD PREMIUM)
9	X56 18LB/BK (BASE)
10	X54 18LB/RD (BASE)
10	X87 18LB/RD (RHD PREMIUM)
10	X82 18LB/RD (LHD PREMIUM)
11	-
12	-
13	-
14	-



C315

C315 - (OVERHEAD SIDE)

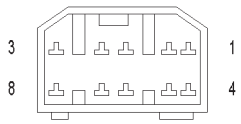
CAV	CIRCUIT
1	Q30 16TN
2	-
3	Q43 20VT
4	Q41 20WT
5	-
6	-
7	Z150 16BK
8	-



C315

C315 - (SUN ROOF MODULE SIDE)

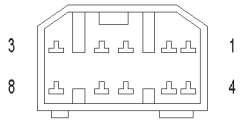
CAV	CIRCUIT
1	Q30 16DB
2	-
3	Q43 20VT
4	Q41 20WT
5	-
6	-
7	Z150 16BK
8	-



C316
(EXCEPT BUILT-
UP-EXPORT)

C316 (EXCEPT BUILT-UP-EXPORT) - (PEDAL SIDE)

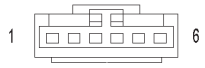
CAV	CIRCUIT
1	Y153 16DB/RD
2	L1 18WT/BR
3	F72 16RD/YL
4	D25 20VT/YL
5	Y151 20LG/BR
6	Z155 20BK/OR
7	Y152 20LG/OR
8	Z151 16BK



C316
(EXCEPT BUILT-
UP-EXPORT)

C316 (EXCEPT BUILT-UP-EXPORT) - (BODY SIDE)

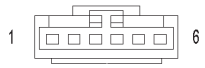
CAV	CIRCUIT
1	Y153 20DB/RD
2	L1 18VT/BK
3	F72 16RD/YL
4	D25 20YL/VT
5	Y151 20LG/BR
6	Z155 18BK/OR
7	Y152 20LG/OR
8	Z151 18BK



C317

C317 - (OVERHEAD SIDE)

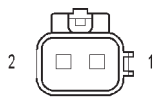
CAV	CIRCUIT
1	Z155 20BK/OR
2	-
3	X75 20GY/LG
4	-
5	D25 20YL/VT
6	F70 20PK



C317

C317 - (INTRUSION TRANSCEIVER MODULE SIDE)

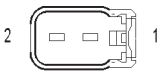
CAV	CIRCUIT
1	Z155 20BK
2	-
3	X75 20GY/LG
4	-
5	D25 20YL/VT
6	F70 20PK



C318

C318 - (LEFT BODY SIDE (LHD)/ RIGHT BODY SIDE (RHD))

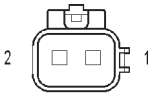
CAV	CIRCUIT
1	R73 20LB/BR
2	R75 20LB/OR



C318

C318 - (OVERLAY SIDE)

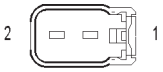
CAV	CIRCUIT
1	R72 20LB/WT (RHD)
1	R73 20LB/BR (LHD)
2	R74 20LB/YL (RHD)
2	R75 20LB/OR (LHD)



C319

C319 - (RIGHT BODY SIDE (LHD)/ LEFT BODY SIDE (RHD))

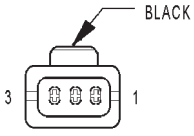
CAV	CIRCUIT
1	R72 20LB/WT (LHD)
2	R74 20LB/YL (LHD)



C319

C319 - (OVERLAY SIDE)

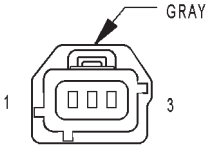
CAV	CIRCUIT
1	R73 20LB/BR (RHD)
1	R72 20LB/WT (LHD)
2	R75 20LB/OR (RHD)
2	R74 20LB/YL (LHD)



CAMSHAFT POSITION SENSOR (DIESEL)

CAMSHAFT POSITION SENSOR (DIESEL) - BLACK 3 WAY

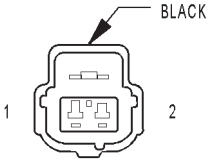
CAV	CIRCUIT	FUNCTION
1	K944 20BR/DG	CAMSHAFT POSITION SENSOR GROUND
2	K44 20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
3	F15 18RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT



CAMSHAFT POSITION SENSOR (GAS)

CAMSHAFT POSITION SENSOR (GAS) - GRAY 3 WAY

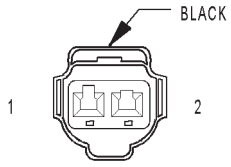
CAV	CIRCUIT	FUNCTION
1	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



CAPACITOR (4.0L)

CAPACITOR (4.0L) - BLACK 2 WAY

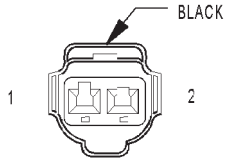
CAV	CIRCUIT	FUNCTION
1	A142 16DG/OR (RHD)	AUTO SHUT DOWN RELAY OUTPUT
1	A142 14DG/OR (LHD)	AUTO SHUT DOWN RELAY OUTPUT
2	-	-



CAPACITOR NO. 1 (4.7L)

CAPACITOR NO. 1 (4.7L) - BLACK 2 WAY

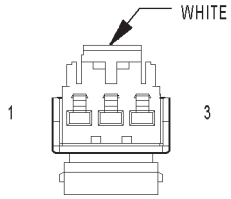
CAV	CIRCUIT	FUNCTION
1	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
2	-	-



CAPACITOR NO. 2 (4.7L)

CAPACITOR NO. 2 (4.7L) - BLACK 2 WAY

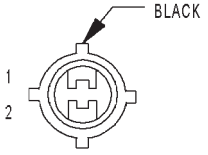
CAV	CIRCUIT	FUNCTION
1	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
2	-	-



CARGO LAMP

CARGO LAMP - WHITE 3 WAY

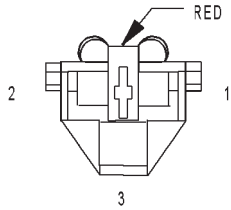
CAV	CIRCUIT	FUNCTION
1	F70 20PK	FUSED B(+)
2	G73 20LG/OR	LIFTGATE COURTESY DISABLE
3	M2 20YL/DG	COURTESY LAMP DRIVER



CENTER HIGH MOUNTED STOP LAMP

CENTER HIGH MOUNTED STOP LAMP - BLACK 2 WAY

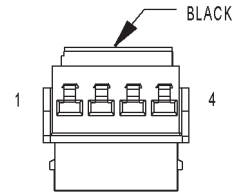
CAV	CIRCUIT	FUNCTION
1	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
2	Z309 18BK	GROUND



CIGAR LIGHTER

CIGAR LIGHTER - RED 3 WAY

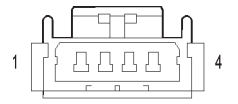
CAV	CIRCUIT	FUNCTION
1	F30 16RD	FUSED CIGAR LIGHTER RELAY OUTPUT
2	-	-
3	Z300 16BK	GROUND



CLOCKSPRING C1

CLOCKSPRING C1 - BLACK 4 WAY

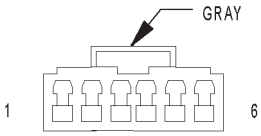
CAV	CIRCUIT	FUNCTION
1	X3 20GY/OR	HORN RELAY CONTROL
2	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
3	K4 20BK/LB	SENSOR GROUND
4	-	-



CLOCKSPRING C2

CLOCKSPRING C2 - 4 WAY

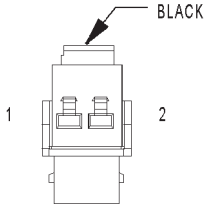
CAV	CIRCUIT	FUNCTION
1	R63 20TN/LB	DRIVER SQUIB 2 LINE 2
2	R61 20OR/LB	DRIVER SQUIB 2 LINE 1
3	R43 20BK/LB	DRIVER SQUIB 1 LINE 1
4	R45 20DG/LB	DRIVER SQUIB 1 LINE 2



CLOCKSPRING C3

CLOCKSPRING C3 - GRAY 6 WAY

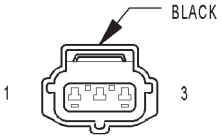
CAV	CIRCUIT	FUNCTION
1	X20 20RD/YL	RADIO CONTROL MUX
2	X10 20RD/BK	RADIO CONTROL MUX RETURN
3	X3 20GY/OR	HORN RELAY CONTROL
4	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
5	K4 20BK/LB	SENSOR GROUND
6	-	-



CLOCKSPRING C4

CLOCKSPRING C4 - BLACK 2 WAY

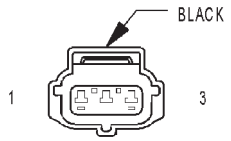
CAV	CIRCUIT	FUNCTION
1	X20 20RD/YL	RADIO CONTROL MUX
2	X10 20RD/BK	RADIO CONTROL MUX RETURN



COIL ON PLUG NO. 1 (4.7L)

COIL ON PLUG NO. 1 (4.7L) - BLACK 3 WAY

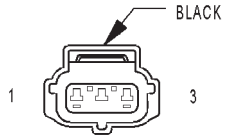
CAV	CIRCUIT	FUNCTION
1	K91 14TN/RD	COIL DRIVER NO. 1
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 2
(4.7L)

COIL ON PLUG NO. 2 (4.7L) - BLACK 3 WAY

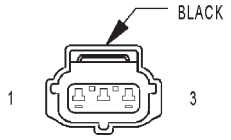
CAV	CIRCUIT	FUNCTION
1	K92 14TN/PK	COIL DRIVER NO. 2
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 3
(4.7L)

COIL ON PLUG NO. 3 (4.7L) - BLACK 3 WAY

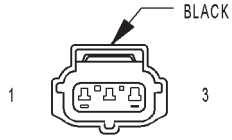
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL DRIVER NO. 3
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 4
(4.7L)

COIL ON PLUG NO. 4 (4.7L) - BLACK 3 WAY

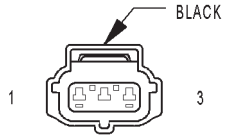
CAV	CIRCUIT	FUNCTION
1	K94 14TN/LG	COIL DRIVER NO. 4
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 5
(4.7L)

COIL ON PLUG NO. 5 (4.7L) - BLACK 3 WAY

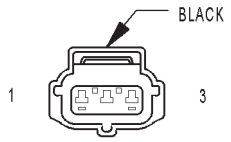
CAV	CIRCUIT	FUNCTION
1	K95 14TN/DG	COIL DRIVER NO. 5
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 6
(4.7L)

COIL ON PLUG NO. 6 (4.7L) - BLACK 3 WAY

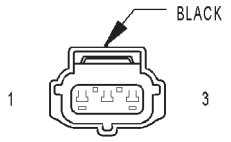
CAV	CIRCUIT	FUNCTION
1	K96 14TN/LB	COIL DRIVER NO. 6
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 7
(4.7L)

COIL ON PLUG NO. 7 (4.7L) - BLACK 3 WAY

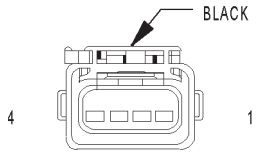
CAV	CIRCUIT	FUNCTION
1	K97 14BR	COIL DRIVER NO. 7
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL ON
PLUG NO. 8
(4.7L)

COIL ON PLUG NO. 8 (4.7L) - BLACK 3 WAY

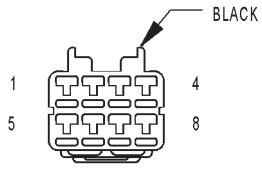
CAV	CIRCUIT	FUNCTION
1	K98 14LB/RD	COIL DRIVER NO. 8
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	-	-



COIL
RAIL
(4.0L)

COIL RAIL (4.0L) - BLACK 4 WAY

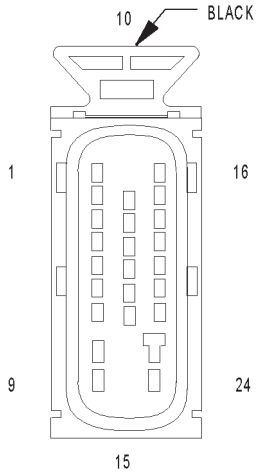
CAV	CIRCUIT	FUNCTION
1	K91 14TN/RD	COIL DRIVER NO. 1
2	A142 14DG/OR	AUTO SHUT DOWN RELAY OUTPUT
3	K92 14TN/PK	COIL DRIVER NO. 2
4	K93 14TN/OR	COIL DRIVER NO. 3



COMPACT
DISC
CHANGER
(PREMIUM RADIO)

COMPACT DISC CHANGER (PREMIUM RADIO) - BLACK 8 WAY

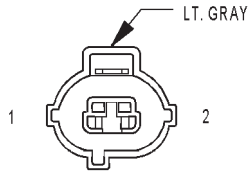
CAV	CIRCUIT	FUNCTION
1	X40 20WT/RD	AUDIO OUT RIGHT
2	C235 20WT/LB	SHIELD
3	D25 20YL/VT	PCI BUS
4	X112 20RD	IGNITION SWITCH OUTPUT (RUN-ACC)
5	X41 20WT/DG	AUDIO OUT LEFT
6	Z4 20WT/BK	GROUND
7	Z17 20BK	GROUND
8	X160 20YL	B(+)



CONTROLLER ANTILOCK BRAKE

CONTROLLER ANTILOCK BRAKE - BLACK 24 WAY

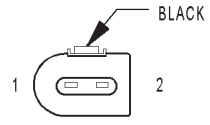
CAV	CIRCUIT	FUNCTION
1	Z101 12BK/OR	GROUND
2	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL
3	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
4	-	-
5	D25 18VT/YL	PCI BUS
6	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL
7	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
8	-	-
9	A20 12RD/DB	FUSED B(+)
10	F20 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
11	D52 18LG/WT (DIESEL)	CAN C BUS(+)
12	-	-
13	B22 18DG/YL	VEHICLE SPEED SENSOR SIGNAL
14	D51 18DG/WT (DIESEL)	CAN C BUS(-)
15	-	-
16	Z102 12BK/OR	GROUND
17	G9 18GY/BK	BRAKE FLUID LEVEL SWITCH SENSE
18	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
19	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL
20	B4 18LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
21	Z231 18BK	GROUND
22	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL
23	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
24	A10 12RD/DG	FUSED B(+)



COOLANT LEVEL SENSOR

COOLANT LEVEL SENSOR - LT. GRAY 2 WAY

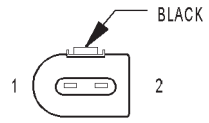
CAV	CIRCUIT	FUNCTION
1	G18 20PK/BK (EXCEPT LHD GAS)	COOLANT LEVEL SWITCH SENSE
1	G18 18PK/BK (LHD GAS)	COOLANT LEVEL SWITCH SENSE
2	Z307 20BK	GROUND



CRANKCASE HEATER (DIESEL)

CRANKCASE HEATER (DIESEL) - BLACK 2 WAY

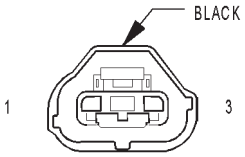
CAV	CIRCUIT	FUNCTION
1	Z18 20BR	GROUND
2	F15 20RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT



CRANKSHAFT POSITION SENSOR (DIESEL)

CRANKSHAFT POSITION SENSOR (DIESEL) - BLACK 2 WAY

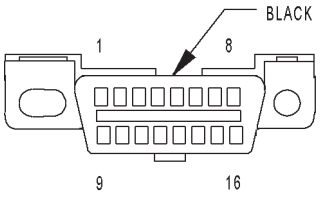
CAV	CIRCUIT	FUNCTION
1	K924 20YL	CRANKSHAFT POSITION SENSOR SIGNAL 2
2	K3 20BK	CRANKSHAFT POSITION SENSOR SIGNAL 1



CRANKSHAFT POSITION SENSOR (GAS)

CRANKSHAFT POSITION SENSOR (GAS) - BLACK 3 WAY

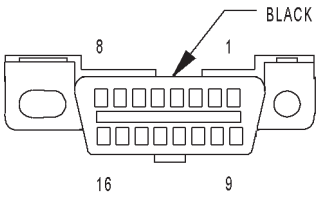
CAV	CIRCUIT	FUNCTION
1	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK 16 WAY

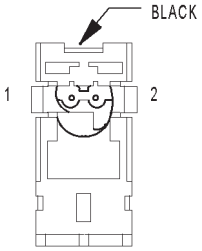
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20YL/VT	PCI BUS
3	-	-
4	Z305 20BK/OR	GROUND
5	Z306 20BK/LG	GROUND
6	D32 20LG/DG	SCI RECEIVE
7	D21 20PK	SCI TRANSMIT
8	-	-
9	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
10	-	-
11	-	-
12	-	-
13	-	-
14	D20 20LG	SCI RECEIVE
15	-	-
16	F33 20PK/RD	FUSED B(+)



DIAGNOSTIC
JUNCTION PORT

DIAGNOSTIC JUNCTION PORT - BLACK 16 WAY

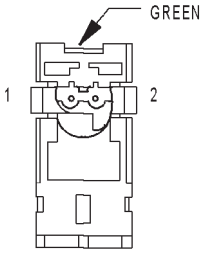
CAV	CIRCUIT	FUNCTION
1	D25 20YL/VT/BR	PCI BUS (PCM/ECM TCM PDM CD SKIM)
2	D25 20YL/VT/DG (AZC)	PCI BUS (AZC)
3	D25 20YL/VT/DB	PCI BUS (RADIO)
4	D25 20YL/VT/OR	PCI BUS (ACM)
5	D25 20YL/VT/RD	PCI BUS (MIC)
6	D25 20YL/VT/WT	PCI BUS (BCM)
7	D25 20YL/VT	PCI BUS (DLC)
8	D25 20YL/VT/GY	PCI BUS (DDM ABS MEM EVIC APM ITM RAIN SENSOR)
9	-	-
10	-	-
11	D25 20YL/VT (DIESEL)	PCI BUS (SHIFTER ASSEMBLY)
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-



DRIVER
AIRBAG
SQUIB 1

DRIVER AIRBAG SQUIB 1 - BLACK 2 WAY

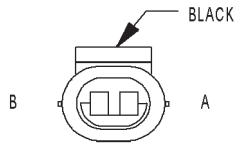
CAV	CIRCUIT	FUNCTION
1	R43 20BK	DRIVER SQUIB 1 LINE 1
2	R45 20BK	DRIVER SQUIB 1 LINE 2



DRIVER
AIRBAG
SQUIB 2

DRIVER AIRBAG SQUIB 2 - GREEN 2 WAY

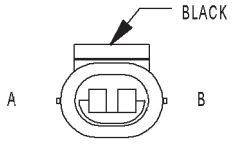
CAV	CIRCUIT	FUNCTION
1	R63 20TN/LB	DRIVER SQUIB 2 LINE 2
2	R61 20OR/LB	DRIVER SQUIB 2 LINE 1



DRIVER
BLEND DOOR
MOTOR/ACTUATOR
(LHD) (AZC)

DRIVER BLEND DOOR MOTOR/ACTUATOR (LHD) (AZC) - BLACK 2 WAY

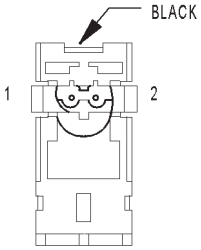
CAV	CIRCUIT	FUNCTION
A	C95 20WT/BK (LHD)	DRIVER BLEND DOOR DRIVER (B)
B	C33 20DB/RD (LHD)	DRIVER BLEND DOOR DRIVER (A)



DRIVER
BLEND DOOR MOTOR/
ACTUATOR
(RHD)(AZC)

DRIVER BLEND DOOR MOTOR/ACTUATOR (RHD) (AZC)- BLACK 2 WAY

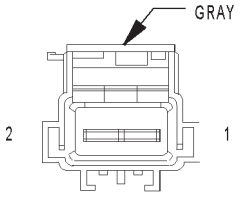
CAV	CIRCUIT	FUNCTION
A	C33 20DB/RD (RHD)	DRIVER BLEND DOOR DRIVER (A)
B	C95 20WT/BK (RHD)	DRIVER BLEND DOOR DRIVER (B)



DRIVER
CURTAIN
AIRBAG

DRIVER CURTAIN AIRBAG - BLACK 2 WAY

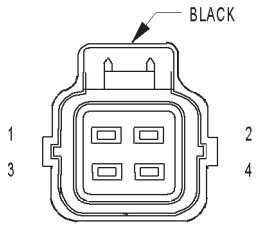
CAV	CIRCUIT	FUNCTION
1	R73 20LB/BR	DRIVER CURTAIN SQUIB LINE 2
2	R75 20LB/OR	DRIVER CURTAIN SQUIB LINE 1



DRIVER
CYLINDER
LOCK SWITCH

DRIVER CYLINDER LOCK SWITCH - GRAY 2 WAY

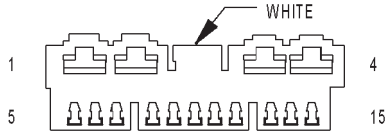
CAV	CIRCUIT	FUNCTION
1	G73 20LG/OR	DRIVER CYLINDER LOCK SWITCH SENSE
2	Z243 12BK (RHD)	GROUND
2	Z28 12BK (LHD)	GROUND



DRIVER DOOR LOCK MOTOR/ AJAR SWITCH

DRIVER DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

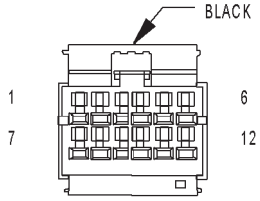
CAV	CIRCUIT	FUNCTION
1	G75 18TN/RD	DRIVER DOOR AJAR SWITCH SENSE
2	Z243 12BK (RHD)	GROUND
2	Z28 12BK (LHD)	GROUND
3	P34 18PK/BK	DRIVER DOOR UNLOCK DRIVER
4	P35 18OR/BK	DRIVER DOOR LOCK DRIVER



DRIVER DOOR MODULE C1

DRIVER DOOR MODULE C1 - WHITE 15 WAY

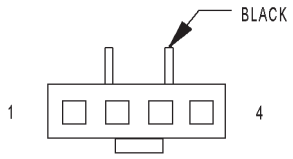
CAV	CIRCUIT	FUNCTION
1	A146 12OR/WT	FUSED B(+)
2	Q23 16RD/WT	DRIVER REAR WINDOW DRIVER (DOWN)
3	Q13 16DB	DRIVER REAR WINDOW DRIVER (UP)
4	Z28 12BK (LHD)	GROUND
4	Z234 12BK (RHD)	GROUND
5	P35 18OR/BK	DRIVER DOOR LOCK DRIVER
6	-	-
7	P34 18PK/BK	DRIVER DOOR UNLOCK DRIVER
8	D30 20VT/YL (JAPAN)	DIAGNOSTIC OUT
9	D25 20YL/VT	PCI BUS
10	G73 20LG/OR	DRIVER CYLINDER LOCK SWITCH SENSE
11	G75 18TN/RD	DRIVER DOOR AJAR SWITCH SENSE
12	E21 20OR/RD	DRIVER REAR DOOR SWITCH ILLUMINATION
13	Q11 16LB	DRIVER WINDOW DRIVER (UP)
14	-	-
15	Q21 16WT	DRIVER WINDOW DRIVER (DOWN)



DRIVER DOOR MODULE C2

DRIVER DOOR MODULE C2 - BLACK 12 WAY

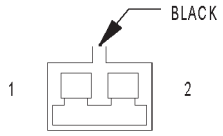
CAV	CIRCUIT	FUNCTION
1	P95 20OR	MIRROR HORIZONTAL DRIVER
2	C118 20BK/WT	MIRROR HEATER GROUND
3	P64 20VT	MIRROR VERTICAL POSITION SIGNAL
4	P69 20GY	MIRROR SENSOR GROUND
5	P65 20DG	MIRROR HORIZONTAL POSITION SIGNAL
6	C117 20BK	MIRROR HEATER 12 VOLT SUPPLY
7	P91 20WT	MIRROR COMMON DRIVER
8	P93 20RD	MIRROR VERTICAL DRIVER
9	M21 20PK/DG	COURTESY LAMP DRIVER
10	P110 20YL (BUILT-UP-EXPORT)	FOLDING MIRROR RETURN
11	P99 20DB (BUILT-UP-EXPORT)	FOLDING MIRROR FEED
12	L121 20BK/RD	COURTESY LAMP GROUND



DRIVER DOOR MODULE C3

DRIVER DOOR MODULE C3 - BLACK 4 WAY

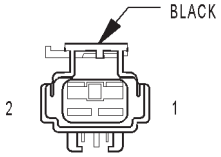
CAV	CIRCUIT	FUNCTION
1	BK	MEMORY SWITCH RETURN
2	BR	MEMORY SWITCH MUX
3	OR	MEMORY SET INDICATOR DRIVER
4	GY	SWITCH ILLUMINATION DRIVER



DRIVER FRONT DOOR COURTESY LAMP

DRIVER FRONT DOOR COURTESY LAMP - BLACK 2 WAY

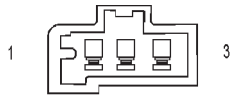
CAV	CIRCUIT	FUNCTION
1	M21 20PK/DG	COURTESY LAMP DRIVER
2	L121 20BK/RD	COURTESY LAMP GROUND



DRIVER FRONT POWER WINDOW MOTOR

DRIVER FRONT POWER WINDOW MOTOR - BLACK 2 WAY

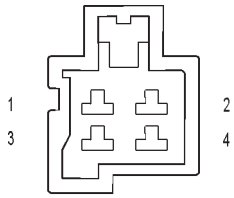
CAV	CIRCUIT	FUNCTION
1	Q21 16WT	DRIVER WINDOW DRIVER (DOWN)
2	Q11 16LB	DRIVER WINDOW DRIVER (UP)



DRIVER HEATED SEAT BACK (PREMIUM I/III)

DRIVER HEATED SEAT BACK (PREMIUM I/III) - 3 WAY

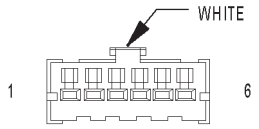
CAV	CIRCUIT	FUNCTION
1	P88 16BK/BR	HEATED SEAT DRIVER
2	Z6 16BK/YL	GROUND
3	-	-



DRIVER HEATED SEAT CUSHION (PREMIUM I/III)

DRIVER HEATED SEAT CUSHION (PREMIUM I/III) - 4 WAY

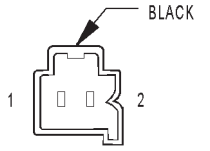
CAV	CIRCUIT	FUNCTION
1	P131 16BK/OR	DRIVER SEAT HEATER B(+) DRIVER
2	P88 16BK/BR	HEATED SEAT DRIVER
3	P135 20LB/BK	DRIVER SEAT TEMPERATURE SENSOR INPUT
4	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY



DRIVER
HEATED SEAT
SWITCH

DRIVER HEATED SEAT SWITCH - WHITE 6 WAY

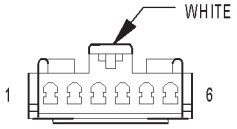
CAV	CIRCUIT	FUNCTION
1	P133 20TN/DG	DRIVER SEAT HEATER SWITCH MUX
2	E2 20OR	PANEL LAMPS DRIVER
3	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
4	-	-
5	Z300 20BK	GROUND
6	P132 20OR/BK	SEAT HEATER SWITCH SENSOR GROUND



DRIVER
LUMBAR
MOTOR
(MIDLINE/PREMIUM)

DRIVER LUMBAR MOTOR (MIDLINE/PREMIUM) - BLACK 2 WAY

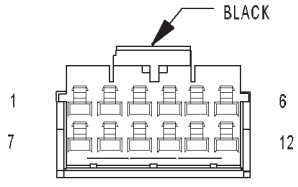
CAV	CIRCUIT	FUNCTION
1	P105 16LG/DB	LUMBAR FORWARD SWITCH SENSE
2	P104 16YL/RD	LUMBAR REARWARD SWITCH SENSE



DRIVER
LUMBAR
SWITCH
(MIDLINE/PREMIUM)

DRIVER LUMBAR SWITCH (MIDLINE/PREMIUM) - WHITE 6 WAY

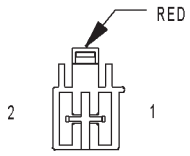
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z238 16BK (RHD)	GROUND
2	Z243 16BK (LHD)	GROUND
3	P105 16LG/DB (RHD)	LUMBAR FORWARD SWITCH SENSE
3	P104 16YL/RD (LHD)	LUMBAR REAR WARD SWITCH SENSE
4	P104 16YL/RD (RHD)	LUMBAR REAR WARD SWITCH SENSE
4	P105 16LG/DB (LHD)	LUMBAR FORWARD SWITCH SENSE
5	Z238 16BK (RHD)	GROUND
5	Z243 16BK (LHD)	GROUND
6	F35 16RD	FUSED B(+)



DRIVER
POWER
MIRROR

DRIVER POWER MIRROR - BLACK 12 WAY

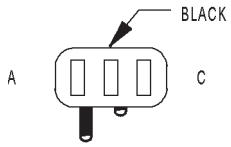
CAV	CIRCUIT	FUNCTION
1	C117 20BK	MIRROR HEATER 12 VOLT SUPPLY
2	P65 20DG	MIRROR HORIZONTAL POSITION SIGNAL
3	P69 20GY	MIRROR SENSOR GROUND
4	P64 20VT	MIRROR VERTICAL POSITION SIGNAL
5	C118 20BK/WT	MIRROR HEATER GROUND
6	P95 20OR	MIRROR HORIZONTAL DRIVER
7	P114 20YL/RD	AUTO DAY/NIGHT MIRROR(-)
8	P99 20DB (BUILT-UP-EXPORT)	FOLDING MIRROR FEED
9	P110 20YL (BUILT-UP-EXPORT)	FOLDING MIRROR RETURN
10	P112 20YL/WT	AUTO DAY/NIGHT MIRROR(+)
11	P93 20RD	MIRROR VERTICAL DRIVER
12	P91 20WT	MIRROR COMMON DRIVER



DRIVER POWER SEAT FRONT RISER MOTOR

DRIVER POWER SEAT FRONT RISER MOTOR - RED 2 WAY

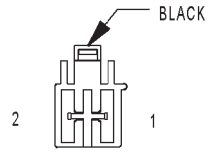
CAV	CIRCUIT	FUNCTION
1	P119 16YL/RD (PREMIUM II/III)	SEAT FRONT UP DRIVER
1	P19 16YL/LG (EXCEPT PREMIUM II/III)	DRIVER SEAT FRONT UP DRIVER
2	P121 16RD/GY (PREMIUM II/III)	SEAT FRONT DOWN DRIVER
2	P21 16RD/LG (EXCEPT PREMIUM II/III)	DRIVER SEAT FRONT DOWN DRIVER



DRIVER POWER SEAT FRONT RISER MOTOR SENSOR (PREMIUM II/III)

DRIVER POWER SEAT FRONT RISER MOTOR SENSOR (PREMIUM II/III) - 3 WAY

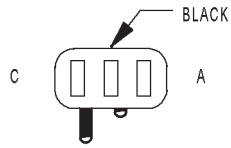
CAV	CIRCUIT	FUNCTION
A	P28 20BR/RD	SEAT POSITION SENSOR GROUND
B	P26 20BR	FRONT RISER POSITION SIGNAL
C	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY



DRIVER POWER SEAT HORIZONTAL MOTOR

DRIVER POWER SEAT HORIZONTAL MOTOR - BLACK 2 WAY

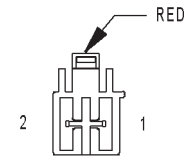
CAV	CIRCUIT	FUNCTION
1	P17 16RD/YL (EXCEPT PREMIUM II/III)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
1	P117 16RD/BR (PREMIUM II/III)	SEAT HORIZONTAL REARWARD DRIVER
2	P15 16YL/LB (EXCEPT PREMIUM II/III)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
2	P115 16GY/LG (PREMIUM II/III)	SEAT HORIZONTAL FORWARD DRIVER



DRIVER POWER SEAT HORIZONTAL MOTOR SENSOR (PREMIUM II/III)

DRIVER POWER SEAT HORIZONTAL MOTOR SENSOR (PREMIUM II/III) - BLACK 3 WAY

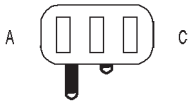
CAV	CIRCUIT	FUNCTION
A	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY
B	P25 20VT/RD	SEAT HORIZONTAL POSITION SIGNAL
C	P28 20BR/RD	SEAT POSITION SENSOR GROUND



DRIVER POWER SEAT REAR RISER MOTOR

DRIVER POWER SEAT REAR RISER MOTOR - RED 2 WAY

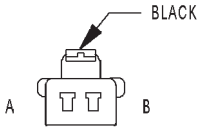
CAV	CIRCUIT	FUNCTION
1	P11 16YL/WT (EXCEPT PREMIUM II/III)	DRIVER SEAT REAR UP DRIVER
1	P111 16YL/DB (PREMIUM II/III)	SEAT REAR UP DRIVER
2	P13 16RD/WT (EXCEPT PREMIUM II/III)	DRIVER SEAT REAR DOWN DRIVER
2	P113 16RD/BK (PREMIUM II/III)	SEAT REAR DOWN DRIVER



DRIVER POWER SEAT REAR RISER MOTOR SENSOR (PREMIUM II/III)

DRIVER POWER SEAT REAR RISER MOTOR SENSOR - 3 WAY

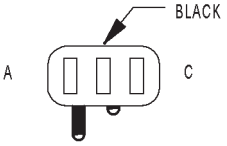
CAV	CIRCUIT	FUNCTION
A	P28 20BR/RD	SEAT POSITION SENSOR GROUND
B	P27 20LB/RD	REAR RISER POSITION SIGNAL
C	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY



DRIVER POWER SEAT RECLINER MOTOR

DRIVER POWER SEAT RECLINER MOTOR - BLACK 2 WAY

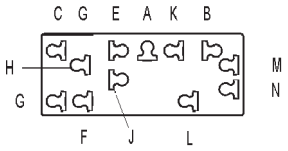
CAV	CIRCUIT	FUNCTION
A	P41 16GY/WT (MIDLINE/PREMIUM I)	DRIVER SEAT RECLINER DOWN DRIVER
A	P141 16GY/WT (PREMIUM II/III)	SEAT RECLINER DOWN DRIVER
B	P43 16GY/LB (MIDLINE/PREMIUM I)	DRIVER SEAT RECLINER UP DRIVER
B	P143 16GY/LB (PREMIUM II/III)	SEAT RECLINER UP DRIVER



DRIVER POWER SEAT RECLINER MOTOR SENSOR (PREMIUM II/III)

DRIVER POWER SEAT RECLINER MOTOR SENSOR (PREMIUM II/III) - BLACK 3 WAY

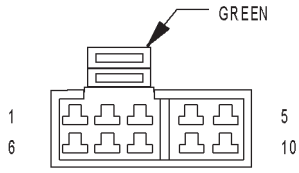
CAV	CIRCUIT	FUNCTION
A	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY
B	P47 20LB	RECLINER POSITION SIGNAL
C	P28 20BR/RD	SEAT POSITION SENSOR GROUND



DRIVER POWER SEAT SWITCH (EXCEPT MIDLINE/PREMIUM)

DRIVER POWER SEAT SWITCH (EXCEPT MIDLINE/PREMIUM) - 12 WAY

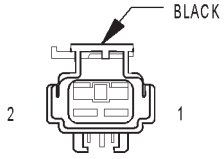
CAV	CIRCUIT	FUNCTION
A	F35 16RD	FUSED B(+)
B	Z1 16BK	GROUND
C	-	-
E	P21 16RD/LG (LHD)	DRIVER SEAT FRONT DOWN DRIVER
E	P19 16YL/LG (RHD)	DRIVER SEAT FRONT UP DRIVER
F	-	-
G	-	-
H	-	-
J	P19 16YL/LG (LHD)	DRIVER SEAT FRONT UP DRIVER
J	P21 16RD/LG (RHD)	DRIVER SEAT FRONT DOWN DRIVER
K	P15 16YL/LB	DRIVER SEAT HORIZONTAL FORWARD DRIVER
L	P17 16RD/YL	DRIVER SEAT HORIZONTAL REARWARD DRIVER
M	P13 16RD/WT (LHD)	DRIVER SEAT REAR DOWN DRIVER
M	P11 16YL/WT (RHD)	DRIVER SEAT REAR UP DRIVER
N	P11 16YL/WT (LHD)	DRIVER SEAT REAR UP DRIVER
N	P13 16RD/WT (RHD)	DRIVER SEAT REAR DOWN DRIVER



DRIVER POWER SEAT SWITCH (MIDLINE/ PREMIUM)

DRIVER POWER SEAT SWITCH (MIDLINE/PREMIUM) - GREEN 10 WAY

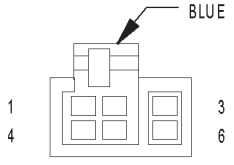
CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	P43 16GY/LB (MIDLINE/PREMIUM I)	DRIVER SEAT RECLINER UP DRIVER
2	P43 20GY/LB (PREMIUM II/III)	RECLINER UP SWITCH SENSE
3	P17 16RD/YL (MIDLINE/PREMIUM I)	DRIVER SEAT HORIZONTAL REARWARD DRIVER
3	P17 20RD/YL (PREMIUM II/III)	DRIVER SEAT HORIZONTAL REARWARD SWITCH SENSE
4	P41 16GY/WT (MIDLINE/PREMIUM I)	DRIVER SEAT RECLINER DOWN DRIVER
4	P41 20GY/WT (PREMIUM II/III)	RECLINER DOWN SWITCH SENSE
5	F35 16RD (MIDLINE/PREMIUM I)	FUSED B(+)
5	P9 20RD/LB (PREMIUM II/III)	SEAT SWITCH B(+) SUPPLY
6	P15 16YL/LB (MIDLINE/PREMIUM I)	DRIVER SEAT HORIZONTAL FORWARD DRIVER
6	P15 20YL/LB (PREMIUM II/III)	DRIVER SEAT HORIZONTAL FORWARD SWITCH SENSE
7	P19 16YL/LG (MIDLINE/PREMIUM I)	SEAT FRONT UP SWITCH SENSE
7	P21 20RD/LG (RHD PREMIUM II/III)	SEAT FRONT DOWN SWITCH SENSE
7	P19 20YL/LG (PREMIUM II/III)	SEAT FRONT UP SWITCH SENSE
8	P13 20RD/WT (RHD PREMIUM II/III)	DRIVER SEAT REAR DOWN DRIVER
8	P11 20YL/WT (PREMIUM II/III)	SEAT REAR UP SWITCH SENSE
8	P11 16YL/WT (MIDLINE/PREMIUM I)	DRIVER SEAT REAR UP DRIVER
9	P13 20RD/WT (PREMIUM II/III)	SEAT REAR DOWN SWITCH SENSE
9	P13 16RD/WT (MIDLINE/PREMIUM I)	DRIVER SEAT REAR DOWN DRIVER
9	P11 20YL/WT (RHD PREMIUM II/III)	DRIVER SEAT REAR UP DRIVER
10	P21 16RD/LG (MIDLINE/PREMIUM I)	SEAT FRONT DOWN SWITCH SENSE
10	P21 20RD/LG (PREMIUM II/III)	SEAT FRONT DOWN SWITCH SENSE
10	P19 20YL/LG (RHD PREMIUM II/III)	SEAT FRONT UP SWITCH SENSE



DRIVER REAR POWER WINDOW MOTOR

DRIVER REAR POWER WINDOW MOTOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q124 16DG/WT	WINDOW DRIVER (DOWN)
2	Q114 16GY/WT	WINDOW DRIVER (UP)



DRIVER REAR POWER WINDOW SWITCH

DRIVER REAR POWER WINDOW SWITCH - BLUE 6 WAY

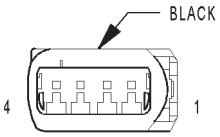
CAV	CIRCUIT	FUNCTION
1	Q14 16GY	DRIVER REAR WINDOW DRIVER (UP)
2	Q114 16GY/WT	WINDOW DRIVER (UP)
3	E21 20OR/RD	DRIVER REAR DOOR SWITCH ILLUMINATION
4	Q24 16DG	DRIVER REAR WINDOW DRIVER (DOWN)
5	Q124 16DG/WT	WINDOW DRIVER (DOWN)
6	Z1 16BK	GROUND



DRIVER SEAT BELT SWITCH

DRIVER SEAT BELT SWITCH - 2 WAY

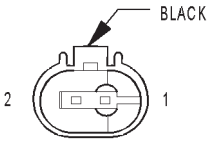
CAV	CIRCUIT	FUNCTION
1	R57 20DG	DRIVER SEAT BELT SWITCH SENSE
2	R59 20LB	DRIVER SEAT BELT SWITCH GROUND



DRIVER SIDE IMPACT SENSOR

DRIVER SIDE IMPACT SENSOR - BLACK 4 WAY

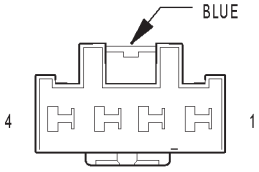
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R133 20LB/DG	DRIVER SIDE IMPACT SENSOR GROUND
4	R131 20LG/YL	DRIVER SIDE IMPACT SENSOR SIGNAL



EGR SOLENOID (DIESEL)

EGR SOLENOID (DIESEL) - BLACK 2 WAY

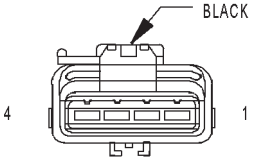
CAV	CIRCUIT	FUNCTION
1	F15 18RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K35 20GY/YL	EGR SOLENOID CONTROL



ELECTRIC BRAKE (EXCEPT BUILT-UP-EXPORT)

ELECTRIC BRAKE (EXCEPT BUILT-UP-EXPORT) - BLUE 4 WAY

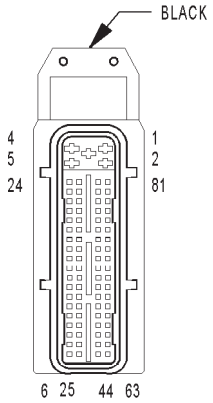
CAV	CIRCUIT	FUNCTION
1	Z151 14BK	GROUND
2	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
3	B40 12LB	TRAILER TOW BRAKE B(+)
4	F9 14RD/BK	FUSED B(+)



ELECTRONIC SPEED CONTROL SERVO

ELECTRONIC SPEED CONTROL SERVO - BLACK 4 WAY

CAV	CIRCUIT	FUNCTION
1	V36 20TN/RD (RHD/GAS)	SPEED CONTROL VACUUM SOLENOID CONTROL
1	V36 18TN/RD (LHD GAS)	SPEED CONTROL VACUUM SOLENOID CONTROL
2	V35 20LG/RD (RHD/GAS)	SPEED CONTROL VENT SOLENOID CONTROL
2	V35 18LG/RD (LHD GAS)	SPEED CONTROL VENT SOLENOID CONTROL
3	V30 20DB/RD	SPEED CONTROL BRAKE SWITCH OUTPUT
4	Z307 20BK	GROUND



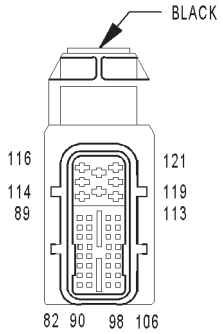
ENGINE CONTROL MODULE C1 (DIESEL)

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

CAV	CIRCUIT	FUNCTION
1	Z108 14BK/DG	GROUND
2	Z108 14BK/DG	GROUND
3	K20 14DB	GENERATOR FIELD CONTROL
4	F142 14RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
5	F142 14RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
6	D52 18DG/WT	CAN C BUS(+)
7	D25 20VT/YL	PCI BUS
8	K944 20BR/DG	CAMSHAFT POSITION SENSOR GROUND
9	K44 20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
10	-	-
11	Y53 20BK/YL	BOOST PRESSURE SENSOR SIGNAL
12	K155 20YL/WT	MASS AIR FLOW SENSOR SIGNAL
13	Y40 20DG/VT	FUEL PRESSURE SENSOR SIGNAL
14	K22 20RD/DB	ACCELERATOR PEDAL POSITION SENSOR 2 SIGNAL
15	K81 20DB/DG	ACCELERATOR PEDAL POSITION SENSOR 1 SIGNAL
16	Y100 20BR/GY	FUEL PRESSURE SENSOR GROUND
17	-	-
18	-	-
19	F300 20RD/BK	BATTERY SENSE (+)
20	Z11 20BK/WT	BATTERY SENSE (-)
21	K4 18BK/LB	SENSOR GROUND
22	F991 20RD/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
23	K6 18VT/WT	SENSOR REFERENCE VOLTAGE B
24	K3 20BK	CRANKSHAFT POSITION SENSOR SIGNAL 1
25	D51 18WT	CAN C BUS(-)
26	-	-
27	-	-
28	-	-
29	K77 20BR/WT	TRANSFER CASE POSITION SENSOR INPUT
30	G60 20BR/DB	ENGINE OIL PRESSURE SENSOR SIGNAL
31	-	-
32	K25 20VT/DG	BATTERY TEMPERATURE SENSOR SIGNAL
33	-	-
34	K255 20WT/DG	ACCELERATOR PEDAL POSITION SENSOR 1 GROUND
35	Y43 20WT/VT	ACCELERATOR PEDAL POSITION SENSOR 1 5-VOLT SUPPLY
36	C18 20DB	A/C PRESSURE SENSOR SIGNAL
37	-	-
38	V37 20RD/DG	SPEED CONTROL SWITCH SIGNAL
39	K226 20DB/WT	FUEL LEVEL SENSOR SIGNAL
40	K2 20DG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
41	K21 20DG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL
42	Y101 20	CRANKSHAFT POSITION SENSOR SHIELD
43	K924 20YL	CRANKSHAFT POSITION SENSOR SIGNAL 2
44	-	-
45	-	-
46	-	-
47	L50 20WT/DB	PRIMARY BRAKE SWITCH SIGNAL
48	K29 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
49	-	-
50	F855 18BR/YL	SENSOR REFERENCE VOLTAGE A
51	-	-
52	-	-
53	-	-
54	Z189 20BR	MASS AIR FLOW SENSOR GROUND

ENGINE CONTROL MODULE C1 (DIESEL) - BLACK 81 WAY

CAV	CIRCUIT	FUNCTION
55	B22 20DG/YL	VEHICLE SPEED SENSOR SIGNAL
56	K225 18BK	ACCELERATOR PEDAL POSITION SENSOR 2 GROUND
57	-	-
58	K4 20BK/LB	WATER IN FUEL SENSOR GROUND
59	K900 18GY	INTAKE PORT SWIRL ACTUATOR SIGNAL
60	K7 20RD/WT	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
61	K51 20DB/YL	AUTO SHUT DOWN RELAY CONTROL
62	-	-
63	-	-
64	-	-
65	-	-
66	-	-
67	K173 20GY	HYDRAULIC RADIATOR FAN SOLENOID CONTROL
68	-	-
69	C13 20DB/RD	A/C COMPRESSOR CLUTCH RELAY CONTROL
70	-	-
71	-	-
72	K236 20GY/PK	GLOW PLUG RELAY NO. 2 CONTROL
73	-	-
74	T752 20DG/RD	ENGINE STARTER MOTOR RELAY CONTROL
75	K132 20BR/BK	VISCOUS/CABIN HEATER RELAY CONTROL
76	Y42 20BR/BK	WASTEGATE SOLENOID CONTROL
77	K152 20WT	GLOW PLUG RELAY NO. 1 CONTROL
78	-	-
79	-	-
80	K46 20DB/BK	FUEL PRESSURE SOLENOID CONTROL
81	K46 20DB/BK	FUEL PRESSURE SOLENOID CONTROL



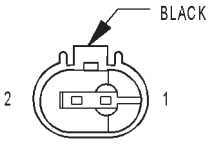
ENGINE CONTROL MODULE C2 (DIESEL)

ENGINE CONTROL MODULE C2 (DIESEL) - BLACK 40 WAY

CAV	CIRCUIT	FUNCTION
82	D21 20PK	SCI TRANSMIT
83	-	-
84	-	-
85	-	-
86	-	-
87	-	-
88	-	-
89	K35 20GY/YL	EGR SOLENOID CONTROL
90	-	-
91	-	-
92	-	-
93	-	-
94	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
95	-	-
96	-	-
97	-	-
98	-	-
99	-	-
100	-	-
101	-	-
102	-	-
103	-	-
104	-	-

ENGINE CONTROL MODULE C2 (DIESEL) - BLACK 40 WAY

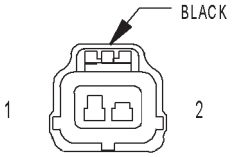
CAV	CIRCUIT	FUNCTION
105	-	-
106	-	-
107	-	-
108	-	-
109	-	-
110	-	-
111	-	-
112	T41 20BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
113	-	-
114	-	-
115	K14 14BK/YL	FUEL INJECTOR NO. 4 CONTROL
116	K63 14BK	COMMON INJECTOR DRIVER
117	-	-
118	K11 14BK/DB	FUEL INJECTOR NO. 1 CONTROL
119	K38 14BK/DG	FUEL INJECTOR NO. 5 CONTROL
120	K12 14BK/VT	FUEL INJECTOR NO. 2 CONTROL
121	K13 14BK/RD	FUEL INJECTOR NO. 3 CONTROL



ENGINE COOLANT TEMPERATURE SENSOR (DIESEL)

ENGINE COOLANT TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

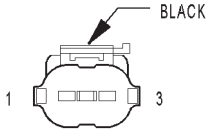
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K2 20DG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE COOLANT TEMPERATURE SENSOR (GAS)

ENGINE COOLANT TEMPERATURE SENSOR (GAS) - BLACK 2 WAY

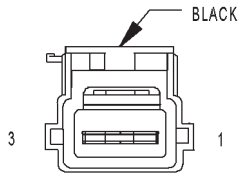
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE OIL PRESSURE SENSOR (DIESEL)

ENGINE OIL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

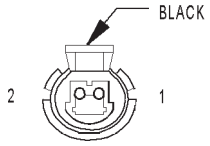
CAV	CIRCUIT	FUNCTION
1	K6 18VT/WT	SENSOR REFERENCE VOLTAGE B
2	G60 20BR/DB	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



ENGINE OIL PRESSURE SENSOR (GAS)

ENGINE OIL PRESSURE SENSOR (GAS) - BLACK 3 WAY

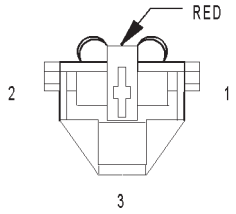
CAV	CIRCUIT	FUNCTION
1	K6 18VT/BK	5 VOLT SUPPLY
2	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



EVAP/PURGE SOLENOID (GAS)

EVAP/PURGE SOLENOID (GAS) - BLACK 2 WAY

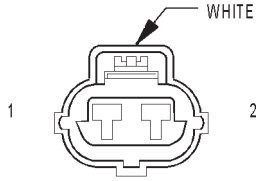
CAV	CIRCUIT	FUNCTION
1	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	K52 18PK/BK (RHD)	DUTY CYCLE EVAP/PURGE SOLENOID CONTROL
2	K52 20PK/BK (LHD)	DUTY CYCLE EVAP/PURGE SOLENOID CONTROL



FRONT POWER OUTLET

FRONT POWER OUTLET - RED 3 WAY

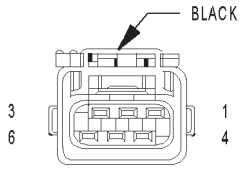
CAV	CIRCUIT	FUNCTION
1	F85 16VT (RHD)	FUSED B(+)
1	F85 16VT/WT (LHD)	FUSED B(+)
2	-	-
3	Z300 16BK	GROUND



FRONT WASHER PUMP

FRONT WASHER PUMP - WHITE 2 WAY

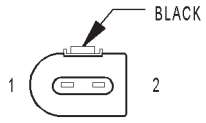
CAV	CIRCUIT	FUNCTION
1	V10 20BR	WASHER PUMP SWITCH SENSE
2	Z141 20BK	GROUND



FRONT WIPER MOTOR

FRONT WIPER MOTOR - BLACK 6 WAY

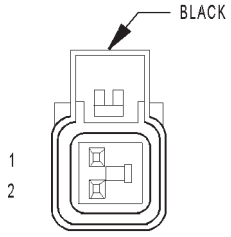
CAV	CIRCUIT	FUNCTION
1	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	V55 16TN/RD	WIPER PARK SWITCH SENSE
3	-	-
4	Z141 16BK	GROUND
5	V3 16BR/WT	WIPER HIGH/LOW RELAY LOW SPEED OUTPUT
6	V4 16RD/YL	WIPER HIGH/LOW RELAY HIGH SPEED OUTPUT



FUEL INJECTOR NO. 1 (DIESEL)

FUEL INJECTOR NO. 1 (DIESEL) - BLACK 2 WAY

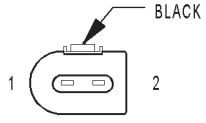
CAV	CIRCUIT	FUNCTION
1	K11 14BK/DB	FUEL INJECTOR NO. 1 CONTROL
2	K63 14BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 1 (GAS)

FUEL INJECTOR NO. 1 (GAS) - BLACK 2 WAY

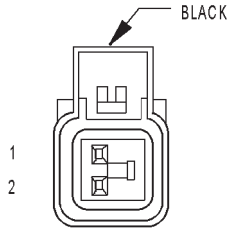
CAV	CIRCUIT	FUNCTION
1	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 2 (DIESEL)

FUEL INJECTOR NO. 2 (DIESEL) - BLACK 2 WAY

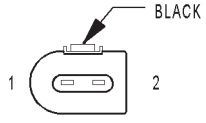
CAV	CIRCUIT	FUNCTION
1	K12 14BK/VT	FUEL INJECTOR NO. 2 CONTROL
2	K63 14BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 2 (GAS)

FUEL INJECTOR NO. 2 (GAS) - BLACK 2 WAY

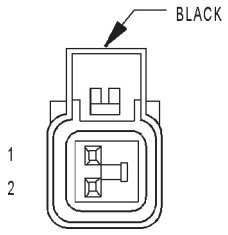
CAV	CIRCUIT	FUNCTION
1	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 3 (DIESEL)

FUEL INJECTOR NO. 3 (DIESEL) - BLACK 2 WAY

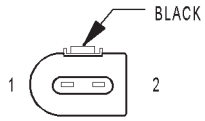
CAV	CIRCUIT	FUNCTION
1	K13 14BK/RD	FUEL INJECTOR NO. 3 CONTROL
2	K63 14BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 3 (GAS)

FUEL INJECTOR NO. 3 (GAS) - BLACK 2 WAY

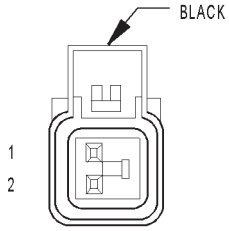
CAV	CIRCUIT	FUNCTION
1	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 4 (DIESEL)

FUEL INJECTOR NO. 4 (DIESEL) - BLACK 2 WAY

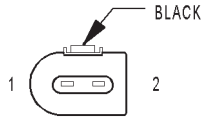
CAV	CIRCUIT	FUNCTION
1	K14 14BK/YL	FUEL INJECTOR NO. 4 CONTROL
2	K63 14BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 4 (GAS)

FUEL INJECTOR NO. 4 (GAS) - BLACK 2 WAY

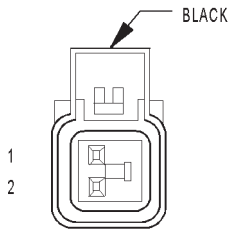
CAV	CIRCUIT	FUNCTION
1	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 5 (DIESEL)

FUEL INJECTOR NO. 5 (DIESEL) - BLACK 2 WAY

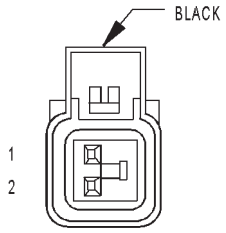
CAV	CIRCUIT	FUNCTION
1	K38 14BK/DG	FUEL INJECTOR NO. 5 CONTROL
2	K63 14BK	COMMON INJECTOR DRIVER



FUEL INJECTOR NO. 5 (GAS)

FUEL INJECTOR NO. 5 (GAS) - BLACK 2 WAY

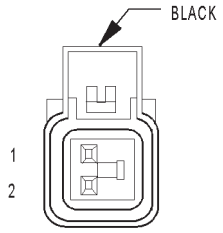
CAV	CIRCUIT	FUNCTION
1	K38 18GY	FUEL INJECTOR NO. 5 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 6 (GAS)

FUEL INJECTOR NO. 6 (GAS) - BLACK 2 WAY

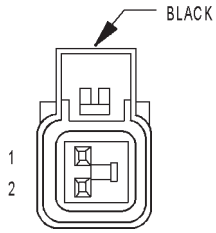
CAV	CIRCUIT	FUNCTION
1	K58 18BR/DB	FUEL INJECTOR NO. 6 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 7 (4.7L)

FUEL INJECTOR NO. 7 (4.7L) - BLACK 2 WAY

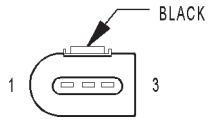
CAV	CIRCUIT	FUNCTION
1	K26 18VT	FUEL INJECTOR NO. 7 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL INJECTOR NO. 8 (4.7L)

FUEL INJECTOR NO. 8 (4.7L) - BLACK 2 WAY

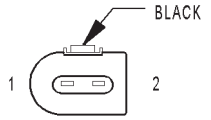
CAV	CIRCUIT	FUNCTION
1	K28 18GY/LB	FUEL INJECTOR NO. 8 DRIVER
2	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL PRESSURE SENSOR (DIESEL)

FUEL PRESSURE SENSOR (DIESEL) - BLACK 3 WAY

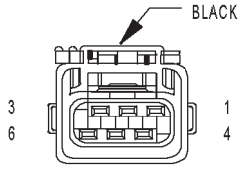
CAV	CIRCUIT	FUNCTION
1	Y100 20BR/GY	FUEL PRESSURE SENSOR GROUND
2	Y40 20DG/VT	FUEL PRESSURE SENSOR SIGNAL
3	K7 20RD/WT	FUEL PRESSURE SENSOR 5 VOLT SUPPLY



FUEL PRESSURE SOLENOID (DIESEL)

FUEL PRESSURE SOLENOID (DIESEL) - BLACK 2 WAY

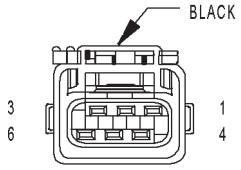
CAV	CIRCUIT	FUNCTION
1	K46 20DB/BK	FUEL PRESSURE SOLENOID CONTROL
2	F142 16RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT



FUEL PUMP MODULE (GAS)

FUEL PUMP MODULE (GAS) - BLACK 6 WAY

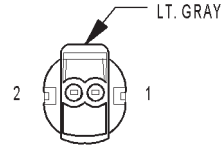
CAV	CIRCUIT	FUNCTION
1	A141 16DG/BK	FUEL PUMP RELAY OUTPUT
2	-	-
3	K226 20LB/YL	FUEL LEVEL SENSOR SIGNAL
4	K4 20BK/LB	SENSOR GROUND
5	-	-
6	Z150 16BK	GROUND



FUEL TANK MODULE (DIESEL)

FUEL TANK MODULE (DIESEL) - BLACK 6 WAY

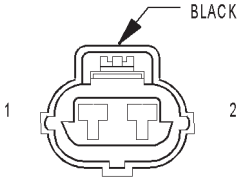
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	K226 20LB/YL	FUEL LEVEL SENSOR SIGNAL
4	K4 20BK/LB	SENSOR GROUND
5	-	-
6	-	-



GENERATOR (DIESEL)

GENERATOR (DIESEL) - LT. GRAY 2 WAY

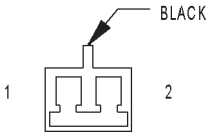
CAV	CIRCUIT	FUNCTION
1	F15 14DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K20 14DB	GENERATOR FIELD CONTROL



GENERATOR (GAS)

GENERATOR (GAS) - BLACK 2 WAY

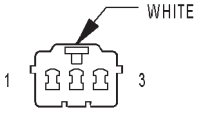
CAV	CIRCUIT	FUNCTION
1	K125 18WT/DB	GENERATOR SOURCE
2	K20 18DG	GENERATOR FIELD DRIVER



GLOVE BOX LAMP

GLOVE BOX LAMP - BLACK 2 WAY

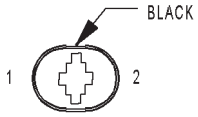
CAV	CIRCUIT	FUNCTION
1	F70 20PK/BK	FUSED B(+)
2	M20 20BR/OR	COURTESY LAMP LOAD SHED



HEADLAMP LEVELING SWITCH (BUILT-UP-EXPORT)

HEADLAMP LEVELING SWITCH - WHITE 3 WAY

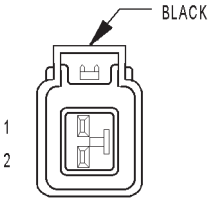
CAV	CIRCUIT	FUNCTION
1	Z234 20BK	GROUND
2	L7 18BK/YL	PARK LAMP RELAY OUTPUT
3	L13 20BR/YL	HEADLAMP ADJUST SIGNAL



HOOD AJAR SWITCH (BUILT-UP-EXPORT)

HOOD AJAR SWITCH (BUILT-UP-EXPORT) - BLACK 2 WAY

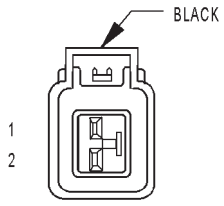
CAV	CIRCUIT	FUNCTION
1	G70 20BR/TN	HOOD AJAR SWITCH SENSE
2	Z141 20BK (DIESEL)	GROUND
2	Z161 20BK (GAS)	GROUND



HORN NO. 1

HORN NO. 1 - BLACK 2 WAY

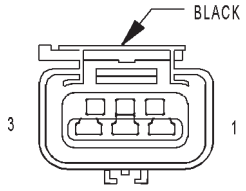
CAV	CIRCUIT	FUNCTION
1	Z307 18BK	GROUND
2	X2 18DG/RD	HORN RELAY OUTPUT



HORN NO. 2

HORN NO. 2 - BLACK 2 WAY

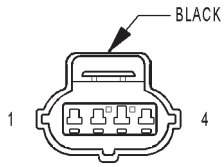
CAV	CIRCUIT	FUNCTION
1	Z307 18BK	GROUND
2	X2 18DG/RD	HORN RELAY OUTPUT



HYDRAULIC COOLING MODULE

HYDRAULIC COOLING MODULE - BLACK 3 WAY

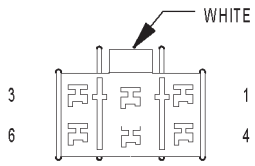
CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT (DIESEL)	FUSED AUTO SHUT DOWN RELAY OUTPUT
1	F142 18OR/DG (GAS)	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K173 18LG (DIESEL)	HYDRAULIC RADIATOR FAN RELAY CONTROL
2	K173 18LG (GAS)	RADIATOR FAN RELAY CONTROL
3	Z500 18BK	GROUND



IDLE AIR CONTROL MOTOR

IDLE AIR CONTROL MOTOR - BLACK 4 WAY

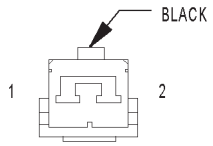
CAV	CIRCUIT	FUNCTION
1	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
2	K40 18BR/WT	IDLE AIR CONTROL NO. 3 DRIVER
3	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
4	K39 18GY/BK	IDLE AIR CONTROL NO. 1 DRIVER



IGNITION SWITCH C1

IGNITION SWITCH C1 - WHITE 6 WAY

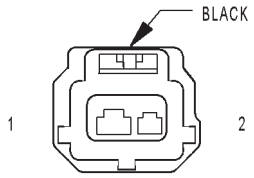
CAV	CIRCUIT	FUNCTION
1	A41 12YL	IGNITION SWITCH OUTPUT (START)
2	A2 12PK/BK	FUSED B(+)
3	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
4	A1 12RD	FUSED B(+)
5	A31 12RD/BK	IGNITION SWITCH OUTPUT (RUN-ACC)
6	A21 12DB	IGNITION SWITCH OUTPUT (RUN-START)



IGNITION SWITCH C2

IGNITION SWITCH C2 - BLACK 2 WAY

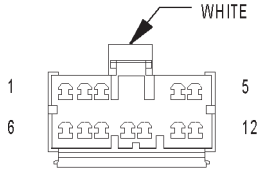
CAV	CIRCUIT	FUNCTION
1	G26 20LB	KEY-IN IGNITION SWITCH SENSE
2	Z234 20BK	GROUND



INPUT SPEED SENSOR (4.7L)

INPUT SPEED SENSOR (4.7L) - BLACK 2 WAY

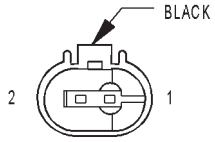
CAV	CIRCUIT	FUNCTION
1	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND



INSTRUMENT CLUSTER

INSTRUMENT CLUSTER - WHITE 12 WAY

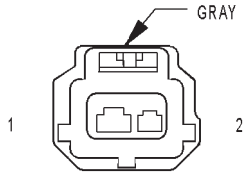
CAV	CIRCUIT	FUNCTION
1	L61 20TN/LG	LEFT TURN SIGNAL
2	L60 20TN	RIGHT TURN SIGNAL
3	-	-
4	-	-
5	G9 20GY/BK	RED BRAKE WARNING INDICATOR DRIVER
6	F33 20PK/RD	FUSED B(+)
7	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
8	D19 20VT/OR	BODY CONTROL MODULE FLASH ENABLE
9	Z300 20BK	GROUND
10	D25 20YL/VT/RD	PCI BUS
11	Z132 20BK/OR	GROUND
12	-	-



INTAKE AIR TEMPERATURE SENSOR (DIESEL)

INTAKE AIR TEMPERATURE SENSOR (DIESEL) - BLACK 2 WAY

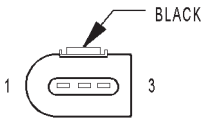
CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	K21 20DG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL



INTAKE AIR TEMPERATURE SENSOR (GAS)

INTAKE AIR TEMPERATURE SENSOR (GAS) - GRAY 2 WAY

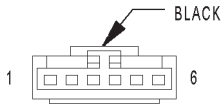
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL



INTAKE PORT SWIRL ACTUATOR (DIESEL)

INTAKE PORT SWIRL ACTUATOR (DIESEL) - BLACK 3 WAY

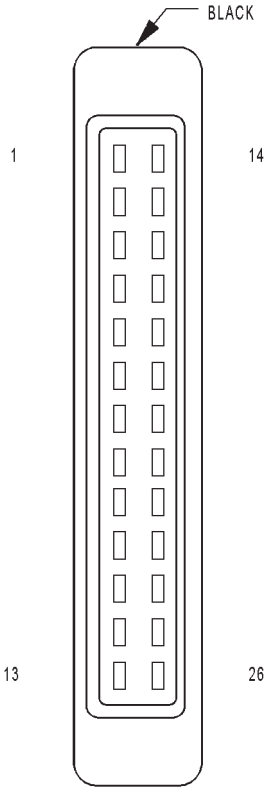
CAV	CIRCUIT	FUNCTION
1	Z18 18BK	GROUND
2	F15 18RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
3	K900 18GY	INTAKE PORT SWIRL ACTUATOR SIGNAL



INTRUSION TRANSCEIVER MODULE (BUILT-UP-EXPORT)

INTRUSION TRANSCEIVER MODULE (BUILT-UP-EXPORT) - BLACK 6 WAY

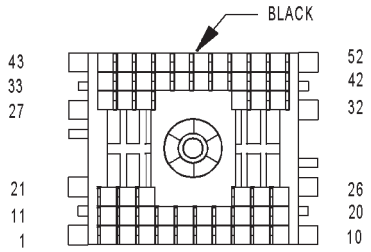
CAV	CIRCUIT	FUNCTION
1	Z155 20BK	GROUND
2	-	-
3	X75 20GY/LG	SIREN SIGNAL CONTROL
4	-	-
5	D25 20YL/VT	PCI BUS
6	F70 20PK	FUSED B(+)



JUNCTION BLOCK BODY CONTROL MODULE

JUNCTION BLOCK BODY CONTROL MODULE - BLACK 26 WAY

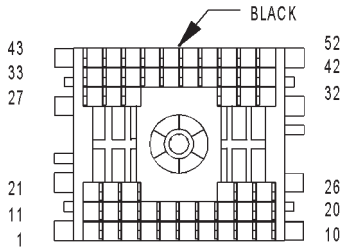
CAV	CIRCUIT	FUNCTION
1	L308	PARK LAMP RELAY CONTROL
2	L26	FOG LAMP RELAY CONTROL
3	Q29	ACCESSORY DELAY RELAY CONTROL
4	L307	LOW BEAM RELAY CONTROL
5	G5	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	X4	HORN RELAY CONTROL
7	V16	WIPER HIGH/LOW RELAY CONTROL
8	G80	LIFTGATE FLIP-UP AJAR SWITCH SENSE
9	L11	HIGH BEAM RELAY CONTROL
10	L91	HAZARD SWITCH SENSE
11	C80	REAR WINDOW DEFOGGER RELAY CONTROL
12	Z2	GROUND
13	L96 (BUILT-UP-EXPORT)	REAR FOG LAMP RELAY CONTROL
14	L7	PARK LAMP RELAY OUTPUT
15	Z1	GROUND
16	M2	COURTESY LAMP DRIVER
17	-	-
18	-	-
19	M20	COURTESY LAMP LOAD SHED
20	V55	WIPER PARK SWITCH SENSE
21	G78	LIFTGATE AJAR SWITCH SENSE
22	G10	SEAT BELT SWITCH SENSE
23	G77	LEFT REAR DOOR AJAR SWITCH SENSE
24	G73	LIFTGATE COURTESY DISABLE
25	V23	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
26	M1	FUSED B(+)



JUNCTION
BLOCK C1

JUNCTION BLOCK C1 - BLACK 52 WAY

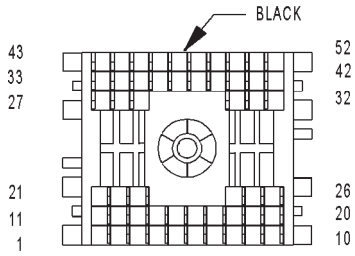
CAV	CIRCUIT	FUNCTION
1	Q30 16TN	ACCESSORY DELAY RELAY OUTPUT
2	L63 18DG/RD	LEFT TURN SIGNAL
3	-	-
4	-	-
5	L95 18DG/YL (BUILT-UP-EXPORT)	REAR FOG LAMP RELAY OUTPUT
6	-	-
7	-	-
8	-	-
9	G73 20LG/OR	LIFTGATE COURTESY DISABLE
10	G77 20TN/OR	LEFT REAR DOOR AJAR SWITCH SENSE
11	L7 18BK/YL	PARK LAMP RELAY OUTPUT
12	-	-
13	-	-
14	-	-
15	F37 16RD (LHD EXCEPT BASE)	FUSED B(+)
15	F37 16RD/LB (RHD)	FUSED B(+)
16	M2 18YL (RHD)	COURTESY LAMP DRIVER
16	M2 20YL/DG (LHD)	COURTESY LAMP DRIVER
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	F22 20WT/PK (RHD)	FUSED IGNITION SWITCH OUTPUT (RUN)
23	-	-
24	G80 20VT/YL	LIFTGATE FLIP-UP AJAR SWITCH SENSE
25	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE
26	M20 18YL/BK (RHD)	COURTESY LAMP LOAD SHED
26	M20 20YL/BK (LHD)	COURTESY LAMP LOAD SHED
27	-	-
28	-	-
29	-	-
30	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
31	-	-
32	M1 18PK/RD (RHD)	FUSED B(+)
33	-	-
34	-	-
35	F9 14RD/BK	FUSED B(+)
36	F70 18PK	FUSED B(+)
37	-	-
38	-	-
39	-	-
40	-	-
41	F30 14RD/TN (LHD)	CIGAR LIGHTER RELAY OUTPUT
41	F30 16RD/TN (RHD)	CIGAR LIGHTER RELAY OUTPUT
42	-	-
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	-	-
49	-	-
50	C15 12BK/WT	REAR WINDOW DEFOGGER RELAY OUTPUT
51	-	-
52	-	-



JUNCTION BLOCK C2 (LHD)

JUNCTION BLOCK C2 (LHD) - BLACK 52 WAY

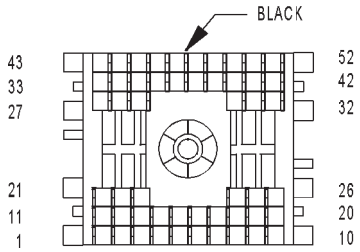
CAV	CIRCUIT	FUNCTION
1	X3 22GY/OR	HORN RELAY CONTROL
2	-	-
3	L39 20LB	FOG LAMP RELAY OUTPUT
4	-	-
5	L61 20TN/LG	LEFT TURN SIGNAL
6	-	-
7	-	-
8	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	V6 16DB (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	L62 18BR/RD	RIGHT TURN SIGNAL
11	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	L39 20LB	FOG LAMP RELAY OUTPUT
13	-	-
14	-	-
15	V16 22VT	WIPER HIGH/LOW RELAY CONTROL
16	-	-
17	-	-
18	-	-
19	-	-
20	L7 20BK/YL	PARK LAMP RELAY OUTPUT
21	L7 20BK/YL	PARK LAMP RELAY OUTPUT
22	-	-
23	-	-
24	F37 16RD/LB (EXCEPT BASE)	FUSED B(+)
25	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
26	L60 20TN	RIGHT TURN SIGNAL
27	F45 20YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
28	V55 16TN/RD	WIPER PARK SWITCH SENSE
29	-	-
30	-	-
31	F72 16RD/YL	FUSED B(+)
32	M1 20PK/RD	FUSED B(+)
33	V55 16TN/RD (GAS)	WIPER PARK SWITCH SENSE
34	-	-
35	-	-
36	A146 12OR/WT	FUSED B(+)
37	-	-
38	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
39	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
40	-	-
41	-	-
42	F20 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
43	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
44	-	-
45	A146 12OR/WT	FUSED B(+)
46	-	-
47	F32 20PK/DB	FUSED B(+)
48	-	-
49	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
50	L33 18RD	FUSED LEFT HIGH BEAM OUTPUT
51	-	-
52	F60 14RD/WT (EXCEPT BASE)	FUSED B(+)



JUNCTION BLOCK C2 (RHD)

JUNCTION BLOCK C2 (RHD) - BLACK 52 WAY

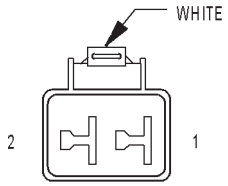
CAV	CIRCUIT	FUNCTION
1	X3 22BK/RD	HORN RELAY CONTROL
2	-	-
3	L39 20LB	FOG LAMP RELAY OUTPUT
4	-	-
5	L61 20TN/LG	LEFT TURN SIGNAL
6	-	-
7	-	-
8	V6 16DB	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
9	V6 16DB (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
10	L62 20BR/RD	RIGHT TURN SIGNAL
11	F991 20OR/DB (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	L39 20LB	FOG LAMP RELAY OUTPUT
13	-	-
14	-	-
15	V16 22VT	-
16	-	-
17	-	-
18	-	-
19	-	-
20	L7 20BK/YL	PARK LAMP RELAY OUTPUT
21	L7 18BK/YL	PARK LAMP RELAY OUTPUT
22	-	-
23	-	-
24	F37 16RD/LB	FUSED B(+)
25	F22 18WT/TN	FUSED IGNITION SWITCH OUTPUT (RUN)
26	L60 20TN	RIGHT TURN SIGNAL
27	F45 20YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
28	V55 16TN/RD	WIPER PARK SWITCH SENSE
29	-	-
30	-	-
31	-	-
32	M1 20PK/RD	FUSED B(+)
33	V55 16TN/RD (GAS)	WIPER PARK SWITCH SENSE
34	-	-
35	-	-
36	A146 12OR/WT	FUSED B(+)
37	-	-
38	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT
39	L43 18VT	FUSED LEFT LOW BEAM OUTPUT
40	-	-
41	-	-
42	F20 18DB/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
43	F12 20DB/WT (GAS)	FUSED IGNITION SWITCH OUTPUT (RUN-START)
44	-	-
45	A146 12OR/WT	FUSED B(+)
46	-	-
47	F32 20PK/DB	FUSED B(+)
48	-	-
49	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT
50	L33 18RD	FUSED LEFT HIGH BEAM OUTPUT
51	-	-
52	F60 16RD/WT	FUSED B(+)



JUNCTION
BLOCK C3

JUNCTION BLOCK C3 - BLACK 52 WAY

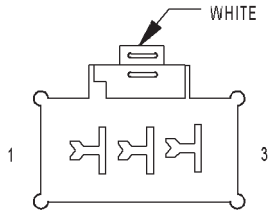
CAV	CIRCUIT	FUNCTION
1	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	-	-
3	L60 20TN	RIGHT TURN SIGNAL
4	L302 20LB/YL	RIGHT TURN SWITCH SENSE
5	L61 20TN/LG	LEFT TURN SIGNAL
6	L91 20DB/PK	HAZARD SWITCH SENSE
7	-	-
8	L305 20LB/WT	LEFT TURN SWITCH SENSE
9	-	-
10	L309 20PK/LG	HIGH BEAM RELAY CONTROL
11	F23 18DB/YL	FUSED IGNITION SWITCH OUTPUT (RUN)
12	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
13	-	-
14	F85 16VT/WT	FUSED B(+)
15	C79 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	A31 12RD/BK	IGNITION SWITCH OUTPUT (RUN-ACC)
25	F60 16RD/WT	FUSED B(+)
26	-	-
27	A41 12YL	IGNITION SWITCH OUTPUT (START)
28	F14 20LG/YL	FUSED IGNITION SWITCH OUTPUT (RUN-START)
29	A22 12BK/OR	IGNITION SWITCH OUTPUT (RUN)
30	F991 18OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
31	Z234 20BK	GROUND
32	F33 20PK/RD	FUSED B(+)
33	X12 16WT/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
34	M1 20PK	FUSED B(+)
35	M1 20PK (AZC)	FUSED B(+)
36	A21 12DB	IGNITION SWITCH OUTPUT (RUN-START)
37	-	-
38	F70 20PK/BK	FUSED B(+)
39	X3 20GY/OR	HORN RELAY CONTROL
40	F30 16RD	FUSED CIGAR LIGHTER RELAY OUTPUT
41	F33 20PK/RD	FUSED B(+)
42	-	-
43	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
44	M1 20PK	FUSED B(+)
45	Z132 20BK/OR	GROUND
46	-	-
47	-	-
48	F70 20PK/BK	FUSED B(+)
49	-	-
50	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
51	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
52	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)



JUNCTION BLOCK C4

JUNCTION BLOCK C4 - WHITE 2 WAY

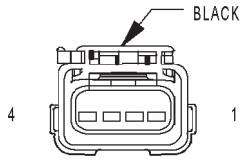
CAV	CIRCUIT	FUNCTION
1	A148 10PK/WT	FUSED B(+)
2	A148 10OR/WT	FUSED B(+)



JUNCTION BLOCK C5

JUNCTION BLOCK C5 - WHITE 3 WAY

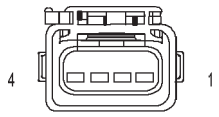
CAV	CIRCUIT	FUNCTION
1	A145 10WT/RD	FUSED B(+)
2	A149 12RD/TN	FUSED B(+)
3	A147 10RD/GY	FUSED B(+)



KNOCK SENSOR

KNOCK SENSOR - BLACK 4 WAY

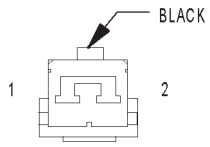
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K42 18DB/LG	KNOCK SENSOR NO. 1 SIGNAL
3	K4 18BK/LB	SENSOR GROUND
4	K142 18GY/BK	KNOCK SENSOR NO. 2 SIGNAL



LEAK DETECTION PUMP (EXCEPT BUILT-UP-EXPORT)

LEAK DETECTION PUMP (EXCEPT BUILT-UP-EXPORT) - 4 WAY

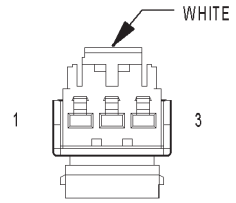
CAV	CIRCUIT	FUNCTION
1	-	-
2	K125 18OR/DG	GENERATOR SOURCE
3	K106 20WT/DG	LEAK DETECTION PUMP SOLENOID CONTROL
4	K107 20OR/YL	LEAK DETECTION PUMP SWITCH SENSE



LEFT COURTESY LAMP

LEFT COURTESY LAMP - BLACK 2 WAY

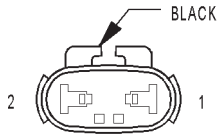
CAV	CIRCUIT	FUNCTION
1	F70 20PK/BK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



LEFT DOOR HANDLE COURTESY LAMP

LEFT DOOR HANDLE COURTESY LAMP - WHITE 3 WAY

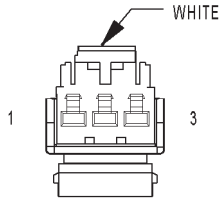
CAV	CIRCUIT	FUNCTION
1	F70 20PK/BK	FUSED B(+)
2	M20 20YL/BK	COURTESY LAMP LOAD SHED
3	M2 20YL/DG	COURTESY LAMP DRIVER



LEFT FOG LAMP

LEFT FOG LAMP - BLACK 2 WAY

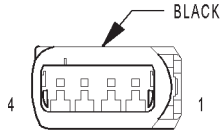
CAV	CIRCUIT	FUNCTION
1	L39 20LB	FOG LAMP RELAY OUTPUT
2	Z141 20BK (DIESEL/4.7L RHD)	GROUND
2	Z141 18BK (EXCEPT DIESEL/4.7L RHD)	GROUND



LEFT FRONT DOOR SPEAKER

LEFT FRONT DOOR SPEAKER - WHITE 3 WAY

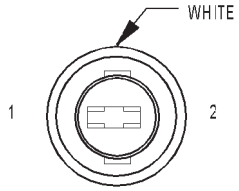
CAV	CIRCUIT	FUNCTION
1	X55 18LG/DG (BASE)	LEFT FRONT DOOR SPEAKER (-)
1	X85 18LB/BK (RHD PREMIUM)	LEFT FRONT DOOR SPEAKER (-)
1	X85 18LG/DG (LHD PREMIUM)	LEFT FRONT DOOR SPEAKER (-)
2	-	-
3	X53 18LG/RD (BASE)	LEFT FRONT DOOR SPEAKER (+)
3	X87 18LB/RD (RHD PREMIUM)	LEFT FRONT DOOR SPEAKER (+)
3	X87 18LG/RD (LHD PREMIUM)	LEFT FRONT DOOR SPEAKER (+)



LEFT FRONT IMPACT SENSOR

LEFT FRONT IMPACT SENSOR - BLACK 4 WAY

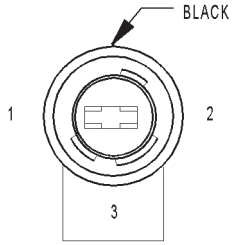
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R47 18DB/LB	LEFT FRONT IMPACT SENSOR GROUND
4	R49 18LB	LEFT FRONT IMPACT SENSOR SIGNAL



LEFT FRONT PARK LAMP

LEFT FRONT PARK LAMP - WHITE 2 WAY

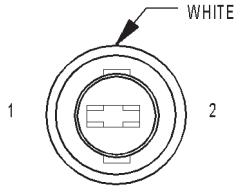
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L7 20BK/PK	PARK LAMP RELAY OUTPUT



LEFT FRONT PARK/TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)

LEFT FRONT PARK/TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT) - BLACK 3 WAY

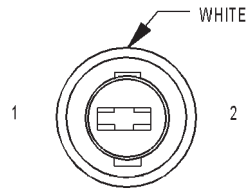
CAV	CIRCUIT	FUNCTION
1	L7 20BK/PK	PARK LAMP RELAY CONTROL
2	Z1 18BK	GROUND
3	L61 20TN/LG	LEFT TURN SIGNAL



LEFT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT)

LEFT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT) - WHITE 2 WAY

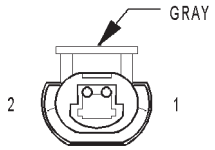
CAV	CIRCUIT	FUNCTION
1	L7 20BK/PK	PARK LAMP RELAY OUTPUT
2	L61 20TN/LG	LEFT TURN SIGNAL



LEFT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT)

LEFT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT) - WHITE 2 WAY

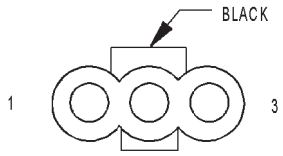
CAV	CIRCUIT	FUNCTION
1	L61 20TN/LG	LEFT TURN SIGNAL
2	Z1 18BK	GROUND



LEFT FRONT WHEEL SPEED SENSOR

LEFT FRONT WHEEL SPEED SENSOR - GRAY 2 WAY

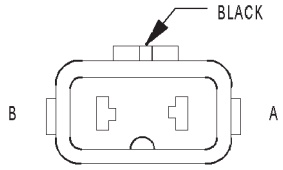
CAV	CIRCUIT	FUNCTION
1	B9 18RD	LEFT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B8 18RD/DB	LEFT FRONT WHEEL SPEED SENSOR SIGNAL



LEFT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)

LEFT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT) - BLACK 3 WAY

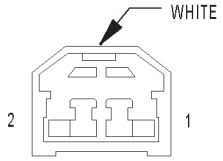
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L114 18VT/DB	HEADLAMP ADJUST SIGNAL
3	L7 20BK/PK	PARK LAMP RELAY OUTPUT



LEFT HIGH BEAM HEADLAMP

LEFT HIGH BEAM HEADLAMP - BLACK 2 WAY

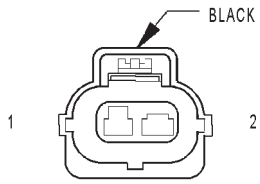
CAV	CIRCUIT	FUNCTION
A	Z1 18BK	GROUND
B	L33 18RD	FUSED LEFT HIGH BEAM OUTPUT



LEFT INSTRUMENT PANEL SPEAKER

LEFT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

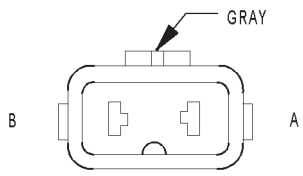
CAV	CIRCUIT	FUNCTION
1	X83 18YL/RD	LEFT INSTRUMENT PANEL SPEAKER (+)
2	X81 18YL/BK	LEFT INSTRUMENT PANEL SPEAKER (-)



LEFT LIFTGATE AJAR SWITCH

LEFT LIFTGATE AJAR SWITCH - BLACK 2 WAY

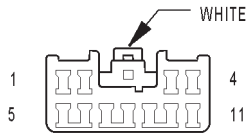
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE



LEFT LOW BEAM HEADLAMP

LEFT LOW BEAM HEADLAMP - GRAY 2 WAY

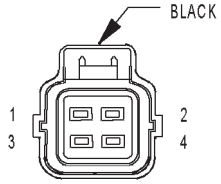
CAV	CIRCUIT	FUNCTION
A	Z1 18BK	GROUND
B	L43 18VT	FUSED LEFT LOW BEAM OUTPUT



LEFT MULTI-FUNCTION SWITCH

LEFT MULTI-FUNCTION SWITCH - WHITE 11 WAY

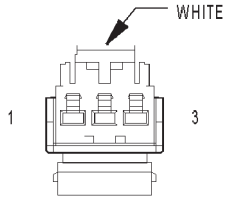
CAV	CIRCUIT	FUNCTION
1	L27 20WT/TN	FOG LAMP SWITCH SENSE
2	Z234 20BK	GROUND
3	-	-
4	L80 20WT/DG	HEADLAMP SWITCH RETURN
5	L309 20PK/LG	HIGH BEAM RELAY CONTROL
6	L40 20BR	HIGH BEAM SWITCH SENSE
7	L302 20LB/YL	RIGHT TURN SWITCH SENSE
8	L305 20LB/WT	LEFT TURN SWITCH SENSE
9	L91 20DB/PK	HAZARD SWITCH SENSE
10	E19 20RD	PANEL LAMPS DIMMER SIGNAL
11	G52 20YL	HEADLAMP SWITCH MUX



LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH

LEFT REAR DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

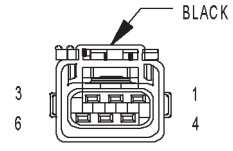
CAV	CIRCUIT	FUNCTION
1	G77 18TN/YL	LEFT REAR DOOR AJAR SWITCH SENSE
2	Z1 18BK	GROUND
3	P36 18PK/VT	DOOR UNLOCK DRIVER
4	P35 18OR/VT	DOOR LOCK DRIVER



LEFT REAR DOOR SPEAKER

LEFT REAR DOOR SPEAKER - WHITE 3 WAY

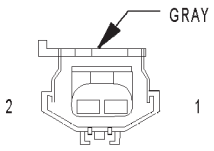
CAV	CIRCUIT	FUNCTION
1	X51 18WT/VT (BASE)	LEFT REAR DOOR SPEAKER (+)
1	X91 18WT/VT (PREMIUM)	LEFT REAR DOOR SPEAKER (+)
2	-	-
3	X57 18TN/DG (BASE)	LEFT REAR DOOR SPEAKER (-)
3	X93 18TN/DG (PREMIUM)	LEFT REAR DOOR SPEAKER (-)



LEFT REAR LAMP ASSEMBLY

LEFT REAR LAMP ASSEMBLY - BLACK 6 WAY

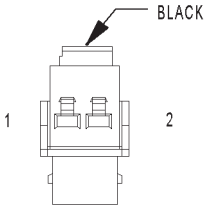
CAV	CIRCUIT	FUNCTION
1	L1 18VT/BK	BACK-UP LAMP FEED
2	L95 18DG/YL (BUILT-UP-EXPORT)	REAR FOG LAMP RELAY OUTPUT
3	L7 18BK/YL	PARK LAMP RELAY OUTPUT
4	L63 18DG/RD	LEFT TURN SIGNAL
5	Z150 18BK	GROUND
6	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL



LEFT REAR WHEEL SPEED SENSOR

LEFT REAR WHEEL SPEED SENSOR - GRAY 2 WAY

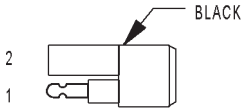
CAV	CIRCUIT	FUNCTION
1	B4 18LG	LEFT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B3 18LG/DB	LEFT REAR WHEEL SPEED SENSOR SIGNAL



LEFT REMOTE RADIO SWITCH

LEFT REMOTE RADIO SWITCH - BLACK 2 WAY

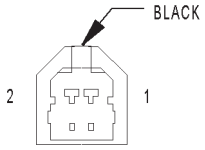
CAV	CIRCUIT	FUNCTION
1	X10 20RD/BK	RADIO CONTROL MUX RETURN
2	X20 20RD/YL	RADIO CONTROL MUX



LEFT SIDE REPEATER LAMP (BUILT-UP-EXPORT)

LEFT SIDE REPEATER LAMP (BUILT-UP-EXPORT) - BLACK 2 WAY

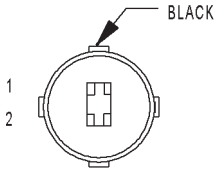
CAV	CIRCUIT	FUNCTION
1	L61 18LG (DIESEL)	LEFT TURN SIGNAL
1	L61 18TN/LG (GAS)	LEFT TURN SIGNAL
2	Z161 18BK	GROUND



LEFT VISOR/ VANITY LAMP

LEFT VISOR/VANITY LAMP - BLACK 2 WAY

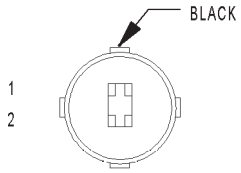
CAV	CIRCUIT	FUNCTION
1	F70 20PK	FUSED B(+)
2	M20 20YL/BK	COURTESY LAMP LOAD SHED



LICENSE LAMP NO. 1

LICENSE LAMP NO. 1 - BLACK 2 WAY

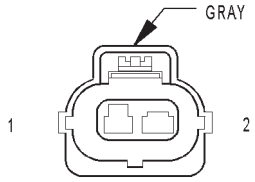
CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	PARK LAMP RELAY OUTPUT
2	Z1 18BK	GROUND



LICENSE
LAMP NO. 2

LICENSE LAMP NO. 2 - BLACK 2 WAY

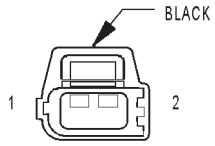
CAV	CIRCUIT	FUNCTION
1	L7 18BK/YL	PARK LAMP RELAY OUTPUT
2	Z1 18BK	GROUND



LIFTGATE
FLIP-UP
AJAR SWITCH

LIFTGATE FLIP-UP AJAR SWITCH - GRAY 2 WAY

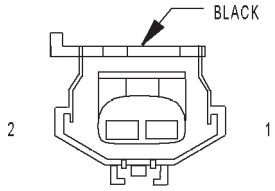
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G80 20VT/YL	LIFTGATE FLIP-UP AJAR SWITCH SENSE



LIFTGATE
FLIP-UP
PUSH BUTTON
SWITCH

LIFTGATE FLIP-UP PUSH BUTTON SWITCH - BLACK 2 WAY

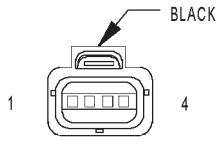
CAV	CIRCUIT	FUNCTION
1	P101 18OR/PK	LIFTGATE FLIP-UP SWITCH OUTPUT
2	F70 18PK	FUSED B(+)



LIFTGATE
FLIP-UP
RELEASE
SOLENOID

LIFTGATE FLIP-UP RELEASE SOLENOID - BLACK 2 WAY

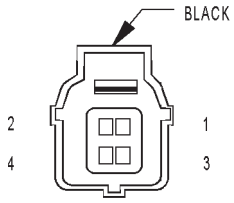
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	P100 18OR/BR	LIFTGATE GLASS LIMIT SWITCH OUTPUT



LIFTGATE
POWER LOCK
MOTOR

LIFTGATE POWER LOCK MOTOR - BLACK 4 WAY

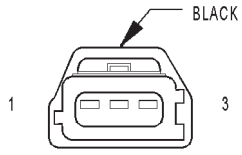
CAV	CIRCUIT	FUNCTION
1	P35 18OR/VT	DOOR LOCK DRIVER
2	P36 18PK/VT	DOOR UNLOCK DRIVER
3	P101 18OR/PK	LIFTGATE FLIP-UP SWITCH OUTPUT
4	P100 18OR/BR	LIFTGATE GLASS LIMIT SWITCH OUTPUT



LINE PRESSURE SENSOR (4.7L)

LINE PRESSURE SENSOR (4.7L) - BLACK 4 WAY

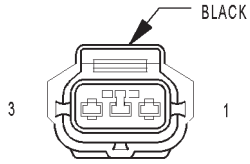
CAV	CIRCUIT	FUNCTION
1	Z114 14BK/LB	GROUND
2	T138 14GY/LB	5 VOLT SUPPLY
3	T130 14VT/TN	LINE PRESSURE SENSOR SIGNAL
4	-	-



MANIFOLD ABSOLUTE PRESSURE SENSOR (4.0L)

MANIFOLD ABSOLUTE PRESSURE SENSOR (4.0L) - BLACK 3 WAY

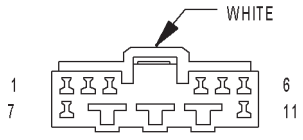
CAV	CIRCUIT	FUNCTION
1	K4 18BK/LB	SENSOR GROUND
2	K1 18DG/RD	MAP SENSOR SIGNAL
3	K7 18OR	5 VOLT SUPPLY



MANIFOLD ABSOLUTE PRESSURE SENSOR (4.7L)

MANIFOLD ABSOLUTE PRESSURE SENSOR (4.7L) - BLACK 3 WAY

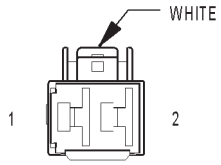
CAV	CIRCUIT	FUNCTION
1	K1 18DG/RD	MAP SENSOR SIGNAL
2	K4 18BK/LB	SENSOR GROUND
3	K7 18OR	5 VOLT SUPPLY



MANUAL TEMPERATURE CONTROL C1 (MTC)

MANUAL TEMPERATURE CONTROL C1 (MTC) - WHITE 11 WAY

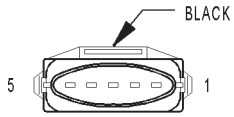
CAV	CIRCUIT	FUNCTION
1	C103 20DG	A/C SWITCH SIGNAL
2	Z123 20BK/OR	GROUND
3	C67 20RD/LB	BLEND AIR DOOR POSITION CONTROL
4	C79 20BK/WT	FUSED REAR WINDOW DEFOGGER RELAY OUTPUT
5	C81 20LB/WT	REAR WINDOW DEFOGGER SWITCH SENSE
6	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
7	E2 20OR	PANEL LAMPS DRIVER
8	C4 16TN	BLOWER MOTOR LOW DRIVER
9	C5 16LG	BLOWER MOTOR M1 DRIVER
10	C6 14LB	BLOWER MOTOR M2 DRIVER
11	-	-



MANUAL TEMPERATURE CONTROL C2 (MTC)

MANUAL TEMPERATURE CONTROL C2 (MTC) - WHITE 2 WAY

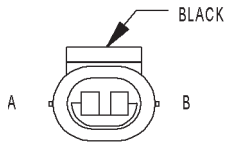
CAV	CIRCUIT	FUNCTION
1	Z118 12BK	GROUND
2	C7 12BK/TN	BLOWER MOTOR HIGH DRIVER



MASS AIR FLOW SENSOR (DIESEL)

MASS AIR FLOW SENSOR (DIESEL) - BLACK 5 WAY

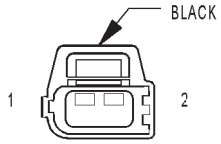
CAV	CIRCUIT	FUNCTION
1	-	-
2	F15 16RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
3	Z189 20BR	MASS AIR FLOW SENSOR GROUND
4	F855 20BR/YL	SENSOR REFERENCE VOLTAGE A
5	K155 20YL/WT	MASS AIR FLOW SENSOR SIGNAL



MODE DOOR MOTOR/ACTUATOR (AZC)

MODE DOOR MOTOR/ACTUATOR (AZC) - BLACK 2 WAY

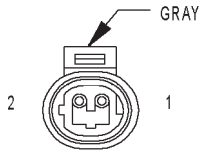
CAV	CIRCUIT	FUNCTION
A	C102 20TN/BK (LHD)	MODE DOOR DRIVER (B)
A	C35 20DG/YL (RHD)	MODE DOOR DRIVER (A)
B	C35 20DG/YL (LHD)	MODE DOOR DRIVER (A)
B	C102 20TN/BK (RHD)	MODE DOOR DRIVER (B)



NEEDLE MOVEMENT SENSOR (DIESEL)

NEEDLE MOVEMENT SENSOR (DIESEL) - BLACK 2 WAY

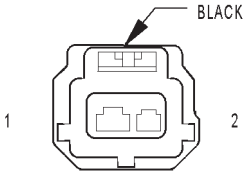
CAV	CIRCUIT	FUNCTION
1	K67 18BR/BK	NEEDLE MOVEMENT SENSOR SIGNAL
2	K68 18LG/YL	NEEDLE MOVEMENT SENSOR GROUND



OUTPUT SPEED SENSOR (4.0L)

OUTPUT SPEED SENSOR (4.0L) - GRAY 2 WAY

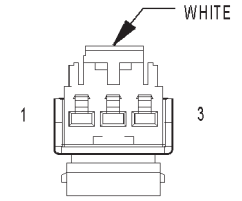
CAV	CIRCUIT	FUNCTION
1	T13 18DB/BK	SPEED SENSOR GROUND
2	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL



OUTPUT SPEED SENSOR (4.7L)

OUTPUT SPEED SENSOR (4.7L) - BLACK 2 WAY

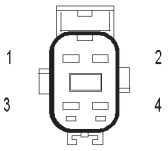
CAV	CIRCUIT	FUNCTION
1	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
2	T13 18DB/BK	SPEED SENSOR GROUND



OVERHEAD MAP/ COURTESY LAMP

OVERHEAD MAP/COURTESY LAMP - WHITE 3 WAY

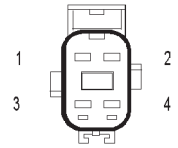
CAV	CIRCUIT	FUNCTION
1	F70 20PK	FUSED B(+)
2	M20 20YL/BK	COURTESY LAMP LOAD SHED
3	M2 20YL/DG	COURTESY LAMP DRIVER



OXYGEN SENSOR 1/1 UPSTREAM

OXYGEN SENSOR 1/1 UPSTREAM - 4 WAY

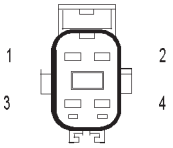
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL



OXYGEN SENSOR 1/2 DOWNSTREAM

OXYGEN SENSOR 1/2 DOWNSTREAM - 4 WAY

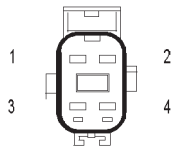
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG (4.0L BUILT-UP-EXPORT)	FUSED AUTO SHUT DOWN RELAY OUTPUT
1	K200 18VT/OR (EXCEPT 4.0L BUILT-UP-EXPORT)	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	K299 18BR/WT (4.0L BUILT-UP-EXPORT)	OXYGEN SENSOR 1/2 HEATER CONTROL
2	Z186 18BK (EXCEPT 4.0L BUILT-UP-EXPORT)	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL



OXYGEN SENSOR 2/1 UPSTREAM

OXYGEN SENSOR 2/1 UPSTREAM - 4 WAY

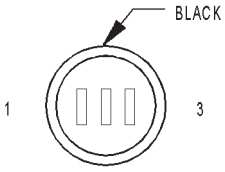
CAV	CIRCUIT	FUNCTION
1	F142 18OR/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	K299 18BR/WT	OXYGEN SENSOR 2/1 HEATER CONTROL
3	K4 18BK/LB	SENSOR GROUND
4	K241 18LG/RD	OXYGEN SENSOR 2/1 SIGNAL



OXYGEN SENSOR 2/2 DOWNSTREAM

OXYGEN SENSOR 2/2 DOWNSTREAM - 4 WAY

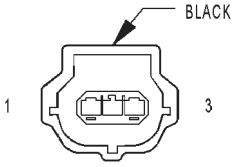
CAV	CIRCUIT	FUNCTION
1	K200 18VT/OR (4.0L)	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
1	K200 18BR/WT (4.7L)	OXYGEN SENSOR DOWNSTREAM RELAY OUTPUT
2	Z186 18BK	GROUND
3	K4 18BK/LB	SENSOR GROUND
4	K341 18TN/WT (4.0L)	OXYGEN SENSOR 2/2 SIGNAL
4	K341 18PK/WT (4.7L)	OXYGEN SENSOR 2/2 SIGNAL



PARK/NEUTRAL POSITION SWITCH (4.0L)

PARK/NEUTRAL POSITION SWITCH (4.0L) - BLACK 3 WAY

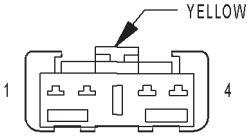
CAV	CIRCUIT	FUNCTION
1	L1 18VT/BK	BACK-UP LAMP FEED
2	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
3	F22 18WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)



PARK/NEUTRAL POSITION SWITCH (DIESEL)

PARK/NEUTRAL POSITION SWITCH (DIESEL) - BLACK 3 WAY

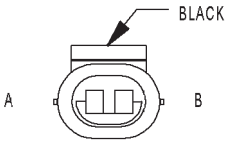
CAV	CIRCUIT	FUNCTION
1	L1 18VT/BK	BACK-UP LAMP FEED
2	T41 18BR/YL	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
3	F22 18WT/TN	FUSED IGNITION SWITCH OUTPUT (RUN)



PASSENGER AIRBAG

PASSENGER AIRBAG - YELLOW 4 WAY

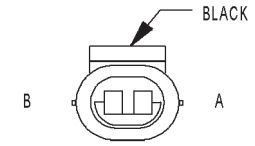
CAV	CIRCUIT	FUNCTION
1	R42 20BK/YL	PASSENGER SQUIB 1 LINE 1
2	R44 20DG/YL	PASSENGER SQUIB 1 LINE 2
3	R64 20TN/YL	PASSENGER SQUIB 2 LINE 1
4	R62 20OR/YL	PASSENGER SQUIB 2 LINE 2



PASSENGER BLEND DOOR MOTOR/ACTUATOR (LHD)(AZC)

PASSENGER BLEND DOOR MOTOR/ACTUATOR (LHD) (AZC) - BLACK 2 WAY

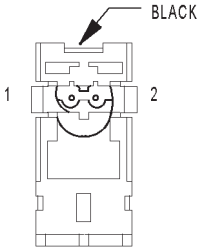
CAV	CIRCUIT	FUNCTION
A	C96 20WT/DB (LHD)	PASSENGER BLEND DOOR DRIVER (B)
B	C94 20WT/DG (LHD)	PASSENGER BLEND DOOR DRIVER (A)



PASSENGER BLEND DOOR MOTOR/ACTUATOR (RHD) (AZC)

PASSENGER BLEND DOOR MOTOR/ACTUATOR (RHD) (AZC) - BLACK 2 WAY

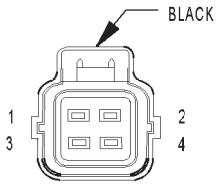
CAV	CIRCUIT	FUNCTION
A	C94 20WT/DG (RHD)	PASSENGER BLEND DOOR DRIVER (A)
B	C96 20WT/DB (RHD)	PASSENGER BLEND DOOR DRIVER (B)



PASSENGER CURTAIN AIRBAG

PASSENGER CURTAIN AIRBAG - BLACK 2 WAY

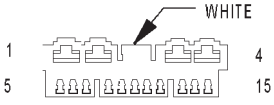
CAV	CIRCUIT	FUNCTION
1	R72 20LB/WT	PASSENGER CURTAIN SQUIB LINE 2
2	R74 20LB/YL	PASSENGER CURTAIN SQUIB LINE 1



PASSENGER DOOR LOCK MOTOR/ AJAR SWITCH

PASSENGER DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

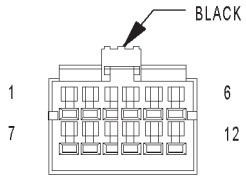
CAV	CIRCUIT	FUNCTION
1	G74 18TN/RD	PASSENGER DOOR AJAR SWITCH SENSE
2	Z1 18BK	GROUND
3	P36 18PK/VT	DOOR UNLOCK DRIVER
4	P35 18OR/VT	DOOR LOCK DRIVER



PASSENGER DOOR MODULE C1

PASSENGER DOOR MODULE C1 - WHITE 15 WAY

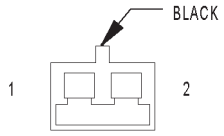
CAV	CIRCUIT	FUNCTION
1	A146 12OR/WT	FUSED B(+)
2	Q24 16DG	PASSENGER REAR WINDOW DRIVER (DOWN)
3	Q14 16GY	PASSENGER REAR WINDOW DRIVER (UP)
4	Z1 12BK	GROUND
5	P35 18OR/VT	DOOR LOCK DRIVER
6	-	-
7	P36 18PK/VT	DOOR UNLOCK DRIVER
8	-	-
9	D25 20YL/VT	PCI BUS
10	-	-
11	G74 18TN/RD	PASSENGER DOOR AJAR SWITCH SENSE
12	E20 20OR/DB	PASSENGER REAR DOOR SWITCH ILLUMINATION
13	Q12 16BR	PASSENGER WINDOW DRIVER (UP)
14	-	-
15	Q22 16VT	PASSENGER WINDOW DRIVER (DOWN)



PASSENGER DOOR MODULE C2

PASSENGER DOOR MODULE C2 - BLACK 12 WAY

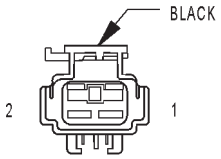
CAV	CIRCUIT	FUNCTION
1	P95 20OR	MIRROR HORIZONTAL DRIVER
2	C118 20BK/WT	MIRROR HEATER GROUND
3	P64 20VT	MIRROR VERTICAL POSITION SIGNAL
4	P69 20GY	MIRROR SENSOR GROUND
5	P65 20DG	MIRROR HORIZONTAL POSITION SIGNAL
6	C117 20BK	MIRROR HEATER 12 VOLT SUPPLY
7	P91 20WT	MIRROR COMMON DRIVER
8	P93 20RD	MIRROR VERTICAL DRIVER
9	M21 20PK/DG	COURTESY LAMP DRIVER
10	P110 20YL (BUILT-UP-EXPORT)	FOLDING MIRROR RETURN
11	P99 20DB (BUILT-UP-EXPORT)	FOLDING MIRROR FEED
12	L121 20BK/RD	COURTESY LAMP GROUND



PASSENGER FRONT DOOR COURTESY LAMP

PASSENGER FRONT DOOR COURTESY LAMP - BLACK 2 WAY

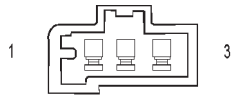
CAV	CIRCUIT	FUNCTION
1	M21 20PK/DG	COURTESY LAMP DRIVER
2	L121 20BK/RD	COURTESY LAMP GROUND



PASSENGER FRONT POWER WINDOW MOTOR

PASSENGER FRONT POWER WINDOW MOTOR - BLACK 2 WAY

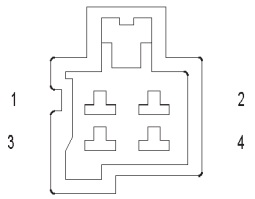
CAV	CIRCUIT	FUNCTION
1	Q22 16VT	PASSENGER WINDOW DRIVER (DOWN)
2	Q12 16BR	PASSENGER WINDOW DRIVER (UP)



PASSENGER HEATED SEAT BACK (PREMIUM I/III)

PASSENGER HEATED SEAT BACK (PREMIUM I/III) - 3 WAY

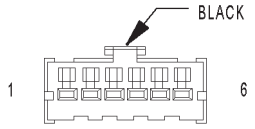
CAV	CIRCUIT	FUNCTION
1	P88 16BK/BR	HEATED SEAT DRIVER
2	Z5 16BK/VT	GROUND
3	-	-



PASSENGER HEATED SEAT CUSHION (PREMIUM I/III)

PASSENGER HEATED SEAT CUSHION (PREMIUM I/III) - 4 WAY

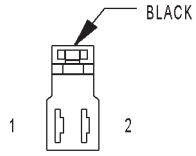
CAV	CIRCUIT	FUNCTION
1	P130 16DG/WT	PASSENGER SEAT HEATER B(+) DRIVER
2	P88 16BK/BR	HEATED SEAT DRIVER
3	P86 20DG/YL	PASSENGER SEAT TEMPERATURE SENSOR INPUT
4	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY



PASSENGER HEATED SEAT SWITCH

PASSENGER HEATED SEAT SWITCH - BLACK 6 WAY

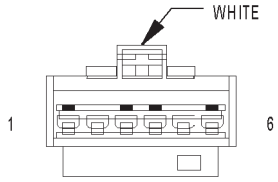
CAV	CIRCUIT	FUNCTION
1	P134 20TN/LG	PASSENGER SEAT HEATER SWITCH MUX
2	E2 20OR	PANEL LAMPS DRIVER
3	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
4	-	-
5	Z300 20BK	GROUND
6	P132 20OR/BK	SEAT HEATER SWITCH SENSOR GROUND



PASSENGER LUMBAR MOTOR (MIDLINE/PREMIUM)

PASSENGER LUMBAR MOTOR (MIDLINE/PREMIUM) - BLACK 2 WAY

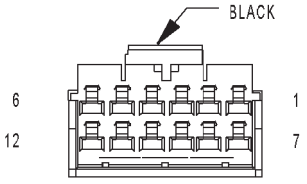
CAV	CIRCUIT	FUNCTION
1	P105 16LG/DG	LUMBAR FORWARD SWITCH SENSE
2	P104 16YL/RD	LUMBAR REARWARD SWITCH SENSE



PASSENGER LUMBAR SWITCH (MIDLINE/PREMIUM)

PASSENGER LUMBAR SWITCH (MIDLINE/PREMIUM) - WHITE 6 WAY

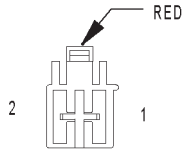
CAV	CIRCUIT	FUNCTION
1	-	-
2	Z1 16BK	GROUND
3	P104 16YL/RD (RHD)	LUMBAR REARWARD SWITCH SENSE
3	P105 16LG/DB (LHD)	LUMBAR FORWARD SWITCH SENSE
4	P105 16LG/DB (RHD)	LUMBAR FORWARD SWITCH SENSE
4	P104 16YL/RD (LHD)	LUMBAR REARWARD SWITCH SENSE
5	Z1 16BK	GROUND
6	F37 16RD/LB	FUSED B(+)



PASSENGER POWER MIRROR

PASSENGER POWER MIRROR - BLACK 12 WAY

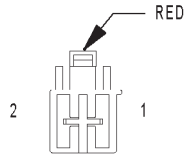
CAV	CIRCUIT	FUNCTION
1	C117 20BK	MIRROR HEATER 12 VOLT SUPPLY
2	P65 20DG	MIRROR HORIZONTAL POSITION SIGNAL
3	P69 2GY	MIRROR SENSOR GROUND
4	P64 20VT	MIRROR VERTICAL POSITION SIGNAL
5	C118 20BK/WT	MIRROR HEATER GROUND
6	P95 20OR	MIRROR HORIZONTAL DRIVER
7	-	-
8	P99 20DB (BUILT-UP-EXPORT)	FOLDING MIRROR FEED
9	P110 20YL (BUILT-UP-EXPORT)	FOLDING MIRROR RETURN
10	-	-
11	P93 20RD	MIRROR VERTICAL DRIVER
12	P91 20WT	MIRROR COMMON DRIVER



PASSENGER POWER SEAT FRONT RISER MOTOR

PASSENGER POWER SEAT FRONT RISER MOTOR - RED 2 WAY

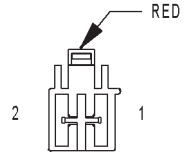
CAV	CIRCUIT	FUNCTION
1	P18 16YL/LG	PASSENGER SEAT FRONT UP DRIVER
2	P20 16RD/LG	PASSENGER SEAT FRONT DOWN DRIVER



PASSENGER POWER SEAT HORIZONTAL MOTOR

PASSENGER POWER SEAT HORIZONTAL MOTOR - RED 2 WAY

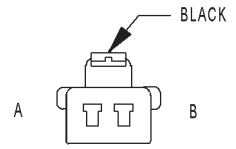
CAV	CIRCUIT	FUNCTION
1	P16 16RD/YL	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
2	P14 16YL/LB	PASSENGER SEAT HORIZONTAL FORWARD DRIVER



PASSENGER POWER SEAT REAR RISER MOTOR

PASSENGER POWER SEAT REAR RISER MOTOR - RED 2 WAY

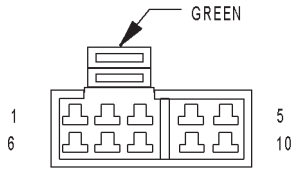
CAV	CIRCUIT	FUNCTION
1	P10 16YL/WT	PASSENGER SEAT REAR UP DRIVER
2	P12 16RD/WT	PASSENGER SEAT REAR DOWN DRIVER



PASSENGER POWER SEAT RECLINER MOTOR (MIDLINE/PREMIUM)

PASSENGER POWER SEAT RECLINER MOTOR (MIDLINE/PREMIUM) - BLACK 2 WAY

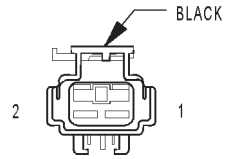
CAV	CIRCUIT	FUNCTION
A	P42 16BR/WT	PASSENGER SEAT RECLINER DOWN DRIVER
B	P44 16GY/LB	PASSENGER SEAT RECLINER UP DRIVER



PASSENGER POWER SEAT SWITCH (MIDLINE/PREMIUM)

PASSENGER POWER SEAT SWITCH - GREEN 10 WAY

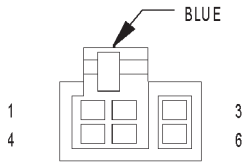
CAV	CIRCUIT	FUNCTION
1	Z1 16BK	GROUND
2	P44 16GY/LB	PASSENGER SEAT RECLINER UP DRIVER
3	P16 16RD/YL	PASSENGER SEAT HORIZONTAL REARWARD DRIVER
4	P42 16BR/WT	PASSENGER SEAT RECLINER DOWN DRIVER
5	F37 16RD/LB	FUSED B(+)
6	P14 16YL/LB	PASSENGER SEAT HORIZONTAL FORWARD DRIVER
7	P18 16YL/LG (RHD)	PASSENGER SEAT FRONT UP DRIVER
7	P20 16RD/LG (LHD)	PASSENGER SEAT FRONT DOWN DRIVER
8	P10 16YL/WT (RHD)	PASSENGER SEAT REAR UP DRIVER
8	P12 16RD/WT (LHD)	PASSENGER SEAT REAR DOWN DRIVER
9	P12 16RD/WT (RHD)	PASSENGER SEAT REAR DOWN DRIVER
9	P10 16YL/WT (LHD)	PASSENGER SEAT REAR UP DRIVER
10	P20 16RD/LG (RHD)	PASSENGER SEAT FRONT DOWN DRIVER
10	P18 16YL/LG (LHD)	PASSENGER SEAT FRONT UP DRIVER



PASSENGER REAR POWER WINDOW MOTOR

PASSENGER REAR POWER WINDOW MOTOR - BLACK 2 WAY

CAV	CIRCUIT	FUNCTION
1	Q124 16DG/WT	WINDOW DRIVER (DOWN)
2	Q114 16GY/WT	WINDOW DRIVER (UP)



PASSENGER REAR POWER WINDOW SWITCH

PASSENGER REAR POWER WINDOW SWITCH - BLUE 6 WAY

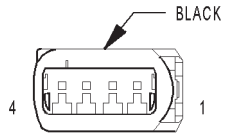
CAV	CIRCUIT	FUNCTION
1	Q14 16GY	PASSENGER REAR WINDOW DRIVER (UP)
2	Q114 16GY/WT	WINDOW DRIVER (UP)
3	E21 20OR/RD	PASSENGER REAR DOOR SWITCH ILLUMINATION
4	Q24 16DG	PASSENGER REAR WINDOW DRIVER (DOWN)
5	Q124 16DG/WT	WINDOW DRIVER (DOWN)
6	Z1 16BK	GROUND



PASSENGER SEAT BELT SWITCH

PASSENGER SEAT BELT SWITCH - 2 WAY

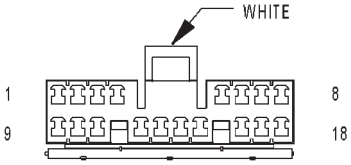
CAV	CIRCUIT	FUNCTION
1	R58 20GY	PASSENGER SEAT BELT SWITCH SENSE
2	R60 20VT	PASSENGER SEAT BELT SWITCH GROUND



PASSENGER SIDE IMPACT SENSOR

PASSENGER SIDE IMPACT SENSOR - BLACK 4 WAY

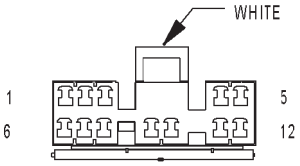
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R134 20LB/BR	PASSENGER SIDE IMPACT SENSOR GROUND
4	R132 20LG/VT	PASSENGER SIDE IMPACT SENSOR SIGNAL



POWER AMPLIFIER C1 (PREMIUM RADIO)

POWER AMPLIFIER C1 (PREMIUM RADIO) - WHITE 18 WAY

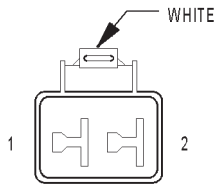
CAV	CIRCUIT	FUNCTION
1	D25 18YL/VT	PCI BUS
2	F60 16RD/WT	FUSED B(+)
3	Z9 16BK	GROUND
4	-	-
5	X58 18DB/OR	RIGHT REAR SPEAKER (-)
6	X57 18DG/WT	LEFT REAR SPEAKER (-)
7	X56 18DB/PK	RIGHT FRONT SPEAKER (-)
8	X55 18BR/RD	LEFT FRONT SPEAKER (-)
9	-	-
10	F60 16RD/WT	FUSED B(+)
11	Z9 16BK	GROUND
12	-	-
13	X64 18BR/WT	ENABLE SIGNAL TO AMPLIFIER
14	-	-
15	X52 18DB/WT	RIGHT REAR SPEAKER (+)
16	X51 18WT/DG	LEFT REAR SPEAKER (+)
17	X54 18VT	RIGHT FRONT SPEAKER (+)
18	X53 18DG/OR	LEFT FRONT SPEAKER (+)



POWER AMPLIFIER C2 (PREMIUM RADIO)

POWER AMPLIFIER C2 (PREMIUM RADIO) - WHITE 12 WAY

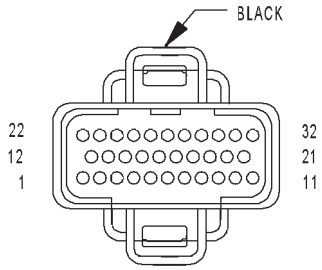
CAV	CIRCUIT	FUNCTION
1	X90 18WT/VT	RIGHT REAR DOOR SPEAKER (+)
2	X92 18TN/DG	RIGHT REAR DOOR SPEAKER (-)
3	X85 18LG/DG	LEFT FRONT DOOR SPEAKER (-)
4	X83 18YL/RD	LEFT INSTRUMENT PANEL SPEAKER (+)
5	X84 18OR/GY	RIGHT INSTRUMENT PANEL SPEAKER (-)
6	X93 18DG/WT	LEFT REAR DOOR SPEAKER (+)
7	X91 18WT/DG	LEFT REAR DOOR SPEAKER (-)
8	X87 18LG/RD	LEFT FRONT DOOR SPEAKER (+)
9	X80 18LB/BK	RIGHT FRONT DOOR SPEAKER (-)
10	X82 18LB/RD	RIGHT FRONT DOOR SPEAKER (+)
11	X81 18YL/BK	LEFT INSTRUMENT PANEL SPEAKER (-)
12	X86 18OR/RD	RIGHT INSTRUMENT PANEL SPEAKER (+)



POWER
CONNECTOR

POWER CONNECTOR - WHITE 2 WAY

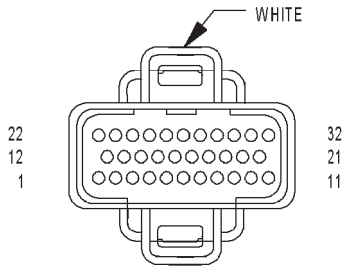
CAV	CIRCUIT	FUNCTION
1	F85 16VT/WT	FUSED B(+)
2	Z234 16BK	GROUND



POWERTRAIN
CONTROL
MODULE C1
(GAS)

POWERTRAIN CONTROL MODULE C1 (GAS) - BLACK 32 WAY

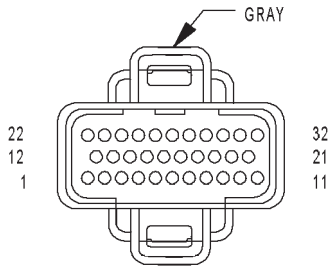
CAV	CIRCUIT	FUNCTION
1	K93 14TN/OR	COIL DRIVER NO. 3
2	F991 18OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	K94 14TN/LG (4.7L)	COIL DRIVER NO. 4
4	K4 18BK/LB	SENSOR GROUND
5	K96 14TN/LB (4.7L)	COIL DRIVER NO. 6
6	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
7	K91 14TN/RD	COIL DRIVER NO. 1
8	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
9	K98 14LB/RD (4.7L)	COIL DRIVER NO. 8
10	K60 18YL/BK	IDLE AIR CONTROL NO. 2 DRIVER
11	K40 18BR/WT	IDLE AIR CONTROL NO. 3 DRIVER
12	-	-
13	-	-
14	K77 18LG/BK	TRANSFER CASE POSITION SENSOR INPUT
15	K21 18BK/RD	INTAKE AIR TEMPERATURE SENSOR SIGNAL
16	K2 18TN/BK	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
17	K7 18OR	5 VOLT SUPPLY
18	K44 18TN/YL	CAMSHAFT POSITION SENSOR SIGNAL
19	K39 18GY/BK	IDLE AIR CONTROL NO. 1 DRIVER
20	K59 18VT/BK	IDLE AIR CONTROL NO. 4 DRIVER
21	K95 14TN/DG (4.7L)	COIL DRIVER NO. 5
22	A7 14RD/BK	FUSED B(+)
23	K22 18OR/RD	THROTTLE POSITION SENSOR SIGNAL
24	K41 18BK/DG	OXYGEN SENSOR 1/1 SIGNAL
25	K141 18TN/WT	OXYGEN SENSOR 1/2 SIGNAL
26	K241 18LG/RD (EXCEPT 4.0L BUILT-UP-EXPORT)	OXYGEN SENSOR 2/1 SIGNAL
27	K1 18DG/RD	MAP SENSOR SIGNAL
28	-	-
29	K341 18TN/WT (4.0L EXCEPT BUILT-UP-EXPORT)	OXYGEN SENSOR 2/2 SIGNAL
29	K341 18PK/WT (4.7L)	OXYGEN SENSOR 2/2 SIGNAL
30	-	-
31	Z82 14BK/WT	GROUND
32	Z81 14BK/TN	GROUND



POWERTRAIN CONTROL MODULE C2 (GAS)

POWERTRAIN CONTROL MODULE C2 (GAS) - WHITE 32 WAY

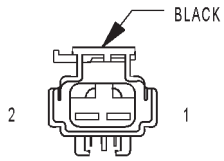
CAV	CIRCUIT	FUNCTION
1	T54 18VT (4.0L)	TRANSMISSION TEMPERATURE SENSOR SIGNAL
2	K26 18VT (4.7L)	FUEL INJECTOR NO. 7 DRIVER
3	-	-
4	K11 18WT/DB	FUEL INJECTOR NO. 1 DRIVER
5	K13 18YL/WT	FUEL INJECTOR NO. 3 DRIVER
6	K38 18GY	FUEL INJECTOR NO. 5 DRIVER
7	K97 14BR (4.7L)	COIL DRIVER NO. 7
8	K88 18PK (4.0L)	GOVERNOR PRESSURE SOLENOID CONTROL
9	K92 14TN/PK	COIL DRIVER NO. 2
10	K20 18DG	GENERATOR FIELD DRIVER
11	T20 18LB (4.0L)	TORQUE CONVERTER CLUTCH SOLENOID CONTROL
12	K58 18BR/DB	FUEL INJECTOR NO. 6 DRIVER
13	K28 18GY/LB (4.7L)	FUEL INJECTOR NO. 8 DRIVER
14	-	-
15	K12 18TN	FUEL INJECTOR NO. 2 DRIVER
16	K14 18LB/BR	FUEL INJECTOR NO. 4 DRIVER
17	K173 18LG	RADIATOR FAN RELAY CONTROL
18	-	-
19	C18 18DB	A/C PRESSURE SIGNAL
20	-	-
21	T60 18BR (4.0L)	3-4 SHIFT SOLENOID CONTROL
22	-	-
23	G60 18GY/YL	ENGINE OIL PRESSURE SENSOR SIGNAL
24	-	-
25	T13 18DB/BK (4.0L)	SPEED SENSOR GROUND
26	-	-
27	B22 18DG/YL	VEHICLE SPEED SENSOR SIGNAL
28	T14 18LG/WT (4.0L)	OUTPUT SPEED SENSOR SIGNAL
29	T25 18LG/RD (4.0L)	GOVERNOR PRESSURE SENSOR SIGNAL
30	K30 18PK/YL (4.0L)	TRANSMISSION CONTROL RELAY CONTROL
31	K6 18VT/BK	5 VOLT SUPPLY
32	-	-



POWERTRAIN CONTROL MODULE C3 (GAS)

POWERTRAIN CONTROL MODULE C3 (GAS) - GRAY 32 WAY

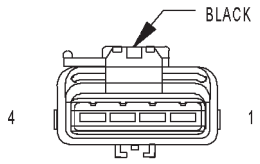
CAV	CIRCUIT	FUNCTION
1	C13 18DB/OR	A/C COMPRESSOR CLUTCH RELAY CONTROL
2	-	-
3	K51 18DB/YL	AUTO SHUT DOWN RELAY CONTROL
4	V36 18TN/RD	SPEED CONTROL VACUUM SOLENOID CONTROL
5	V35 18LG/RD	SPEED CONTROL VENT SOLENOID CONTROL
6	-	-
7	K42 18DB/LG (4.7L HIGH OUTPUT)	KNOCK SENSOR NO. 1 SIGNAL
8	K99 18BR/OR	OXYGEN SENSOR 1/1 HEATER CONTROL
9	K512 18RD/YL (EXCEPT 4.0L BUILT-UP-EXPORT)	OXYGEN SENSOR DOWNSTREAM RELAY CONTROL
10	K106 18WT/DG (EXCEPT BUILT-UP-EXPORT)	LEAK DETECTION PUMP SOLENOID CONTROL
11	V32 18OR/DG	SPEED CONTROL SUPPLY
12	F42 18DG/LG	FUSED AUTO SHUT DOWN RELAY OUTPUT
13	T10 18YL/DG (4.7L RHD)	TORQUE MANAGEMENT REQUEST SENSE
13	T6 18OR/WT (4.0L LHD)	OVERDRIVE OFF SWITCH SENSE
13	T10 18DG/LG (4.7L LHD)	TORQUE MANAGEMENT REQUEST SENSE
13	T6 18OR/BK (4.0L RHD)	OVERDRIVE OFF SWITCH SENSE
14	K107 18OR/PK (EXCEPT BUILT-UP-EXPORT)	LEAK DETECTION PUMP SWITCH SENSE
15	K25 18VT/LG	BATTERY TEMPERATURE SENSOR SIGNAL
16	K299 18BR/WT	OXYGEN SENSOR 1/2 HEATER CONTROL
17	-	-
18	K142 18GY/BK (4.7L HIGH OUTPUT)	KNOCK SENSOR NO. 2 SIGNAL
19	K31 18BR	FUEL PUMP RELAY CONTROL
20	K52 18PK/BK	DUTY CYCLE EVAP/PURGE SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	K29 18WT/PK	SECONDARY BRAKE SWITCH SIGNAL
25	K125 18WT/DB	GENERATOR SOURCE
26	K226 18LB/YL	FUEL LEVEL SENSOR SIGNAL
27	D21 18PK	SCI TRANSMIT
28	-	-
29	D32 18LG (LHD)	SCI RECEIVE
29	D32 18LG/DG (RHD)	SCI RECEIVE
30	D25 18VT/YL	PCI BUS
31	-	-
32	V37 18RD/LG	SPEED CONTROL SWITCH SIGNAL



RADIATOR FAN MOTOR

RADIATOR FAN MOTOR - BLACK 2 WAY

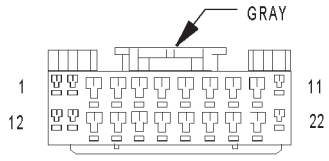
CAV	CIRCUIT	FUNCTION
1	C23 12DG	RADIATOR FAN RELAY OUTPUT
2	Z4 12BK/PK	GROUND



RADIATOR FAN RELAY

RADIATOR FAN RELAY - BLACK 4 WAY

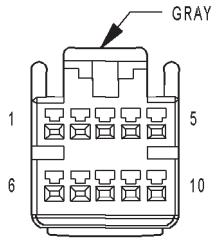
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	C24 20DB/PK	RADIATOR FAN RELAY CONTROL
3	C23 12DG	RADIATOR FAN RELAY OUTPUT
4	A16 12GY	FUSED B(+)



RADIO C1

RADIO C1 - GRAY 22 WAY

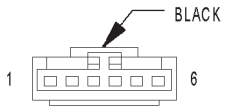
CAV	CIRCUIT	FUNCTION
1	F60 16RD/WT	FUSED B(+)
2	X12 16WT/RD	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
3	E2 20OR	PANEL LAMPS DRIVER
4	-	-
5	-	-
6	-	-
7	X54 18VT	RIGHT FRONT SPEAKER (+)
8	X56 18DB/PK	RIGHT FRONT SPEAKER (-)
9	X55 18BR/RD	LEFT FRONT SPEAKER (-)
10	X53 18DG/OR	LEFT FRONT SPEAKER (+)
11	Z9 16BK	GROUND
12	F60 16RD/WT	FUSED B(+)
13	X64 18BR/WT	ENABLE SIGNAL TO AMPLIFIER
14	D25 20YL/VT/DB	PCI BUS
15	-	-
16	-	-
17	-	-
18	X51 18WT/DG	LEFT REAR SPEAKER (+)
19	X57 18DG/WT	LEFT REAR SPEAKER (-)
20	X58 18DB/OR	RIGHT REAR SPEAKER (-)
21	X52 18DB/WT	RIGHT REAR SPEAKER (+)
22	Z9 16BK	GROUND



RADIO C2

RADIO C2 - GRAY 10 WAY

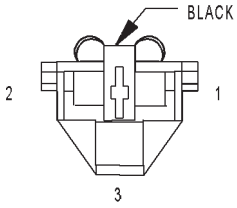
CAV	CIRCUIT	FUNCTION
1	X40 20WT/RD	AUDIO OUT RIGHT
2	Z4 20WT/BK	GROUND
3	Z5 20BK/LB	SHIELD
4	-	-
5	X112 20RD	IGNITION SWITCH OUTPUT (RUN-ACC)
6	X41 20WT/DG	AUDIO OUT LEFT
7	Z17 20BK	GROUND
8	-	-
9	-	-
10	X160 20YL	FUSED B(+)



RAIN SENSOR (AUTOWIPE)

RAIN SENSOR (AUTOWIPE) - BLACK 6 WAY

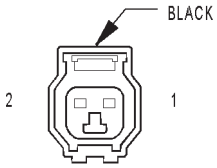
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20BK/PK	PCI BUS
3	-	-
4	Z155 20BK/OR	GROUND
5	Q30 20BK/LB	ACCESSORY DELAY RELAY OUTPUT
6	-	-



REAR POWER OUTLET (EXCEPT BASE)

REAR POWER OUTLET - BLACK 3 WAY

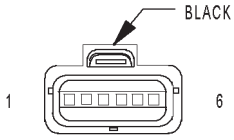
CAV	CIRCUIT	FUNCTION
1	A148 16LG/RD	FUSED B(+)
2	-	-
3	Z151 16BK	GROUND



REAR WASHER PUMP

REAR WASHER PUMP - BLACK 2 WAY

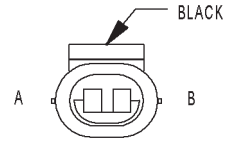
CAV	CIRCUIT	FUNCTION
1	Z141 18BK	GROUND
2	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL



REAR WIPER MOTOR

REAR WIPER MOTOR - BLACK 6 WAY

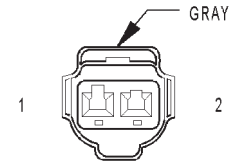
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	V13 18BR/LG	REAR WIPER MOTOR CONTROL
3	G80 20VT/YL	LIFTGATE FLIP-UP AJAR SWITCH SENSE
4	V22 18BR/YL	REAR WIPER MOTOR DELAY CONTROL
5	F70 18BK	FUSED B(+)
6	-	-



RECIRCULATION DOOR MOTOR/ ACTUATOR (AZC)

RECIRCULATION DOOR MOTOR/ACTUATOR (AZC) - BLACK 2 WAY

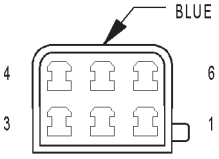
CAV	CIRCUIT	FUNCTION
A	C32 20GY/DB (LHD)	RECIRCULATION DOOR DRIVER (A)
A	C100 20YL/DB (RHD)	RECIRCULATION DOOR DRIVER (B)
B	C100 20YL/DB (LHD)	RECIRCULATION DOOR DRIVER (B)
B	C32 20GY/DB (RHD)	RECIRCULATION DOOR DRIVER (A)



RED BRAKE WARNING INDICATOR SWITCH

RED BRAKE WARNING INDICATOR SWITCH - GRAY 2 WAY

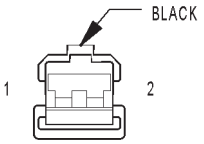
CAV	CIRCUIT	FUNCTION
1	Z231 18BK	GROUND
2	G9 18GY/BK	RED BRAKE WARNING INDICATOR DRIVER



REMOTE KEYLESS MODULE (JAPAN)

REMOTE KEYLESS MODULE (JAPAN) - BLUE 6 WAY

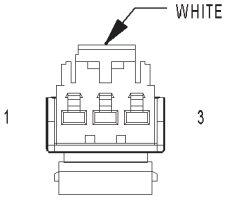
CAV	CIRCUIT	FUNCTION
1	K25 20RD/GY	ANTENNA SIGNAL
2	K25 20RD/GY	ANTENNA SIGNAL
3	M1 18PK	FUSED B(+)
4	Z1 18BK	GROUND
5	D30 20VT/YL	DIAGNOSTIC OUT
6	D30 20VT/YL	DIAGNOSTIC OUT



RIGHT COURTESY LAMP

RIGHT COURTESY LAMP - BLACK 2 WAY

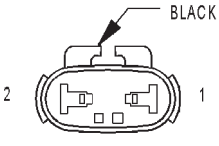
CAV	CIRCUIT	FUNCTION
1	F70 20PK/BK	FUSED B(+)
2	M2 20YL	COURTESY LAMP DRIVER



RIGHT DOOR HANDLE COURTESY LAMP

RIGHT DOOR HANDLE COURTESY LAMP - WHITE 3 WAY

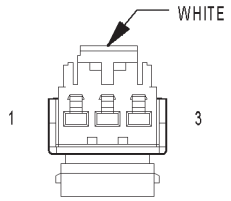
CAV	CIRCUIT	FUNCTION
1	F70 20PK	FUSED B(+)
2	M20 20YL/BK	COURTESY LAMP LOAD SHED
3	M2 20YL/DG	COURTESY LAMP DRIVER



RIGHT FOG LAMP

RIGHT FOG LAMP - BLACK 2 WAY

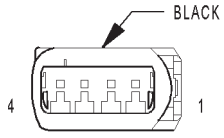
CAV	CIRCUIT	FUNCTION
1	L39 20LB	FOG LAMP RELAY OUTPUT
2	Z142 18BK	GROUND



RIGHT FRONT DOOR SPEAKER

RIGHT FRONT DOOR SPEAKER - WHITE 3 WAY

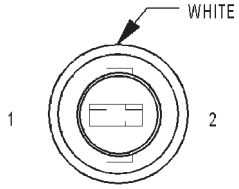
CAV	CIRCUIT	FUNCTION
1	X56 18LB/BK (BASE)	RIGHT FRONT DOOR SPEAKER (-)
1	X80 18LG/DG (RHD PREMIUM)	RIGHT FRONT DOOR SPEAKER (-)
1	X80 18LB/BK (LHD PREMIUM)	RIGHT FRONT DOOR SPEAKER (-)
2	-	-
3	X54 18LB/RD (BASE)	RIGHT FRONT DOOR SPEAKER (+)
3	X82 18LG/RD (RHD PREMIUM)	RIGHT FRONT DOOR SPEAKER (+)
3	X82 18LB/RD (LHD PREMIUM)	RIGHT FRONT DOOR SPEAKER (+)



RIGHT FRONT IMPACT SENSOR

RIGHT FRONT IMPACT SENSOR - BLACK 4 WAY

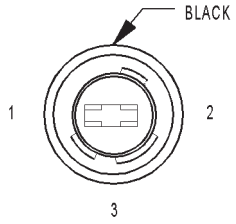
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	R46 18BR/LB	RIGHT FRONT IMPACT SENSOR GROUND
4	R48 18TN	RIGHT FRONT IMPACT SENSOR SIGNAL



RIGHT FRONT PARK LAMP

RIGHT FRONT PARK LAMP - WHITE 2 WAY

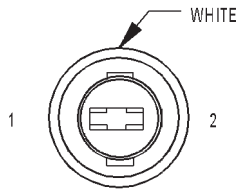
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L7 20BK/PK	PARK LAMP RELAY OUTPUT



RIGHT FRONT PARK/TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT)

RIGHT FRONT PARK/TURN SIGNAL LAMP (EXCEPT BUILT-UP-EXPORT) - BLACK 3 WAY

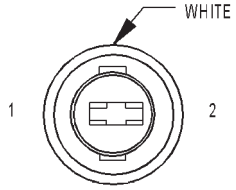
CAV	CIRCUIT	FUNCTION
1	L7 20BK/PK	PARK LAMP RELAY OUTPUT
2	Z1 18BK	GROUND
3	L60 20TN	RIGHT TURN SIGNAL



RIGHT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT)

RIGHT FRONT SIDE MARKER LAMP (EXCEPT BUILT-UP-EXPORT) - WHITE 2 WAY

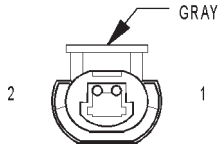
CAV	CIRCUIT	FUNCTION
1	L7 20BK/PK	PARK LAMP RELAY OUTPUT
2	L60 20TN	RIGHT TURN SIGNAL



RIGHT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT)

RIGHT FRONT TURN SIGNAL LAMP (BUILT-UP-EXPORT) - WHITE 2 WAY

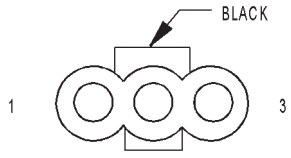
CAV	CIRCUIT	FUNCTION
1	L60 20TN	RIGHT TURN SIGNAL
2	Z1 18BK	GROUND



RIGHT FRONT WHEEL SPEED SENSOR

RIGHT FRONT WHEEL SPEED SENSOR - GRAY 2 WAY

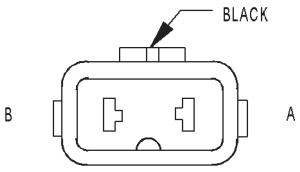
CAV	CIRCUIT	FUNCTION
1	B7 18WT	RIGHT FRONT WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B6 18WT/DB	RIGHT FRONT WHEEL SPEED SENSOR SIGNAL



RIGHT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT)

RIGHT HEADLAMP LEVELING MOTOR (BUILT-UP-EXPORT) - BLACK 3 WAY

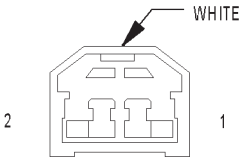
CAV	CIRCUIT	FUNCTION
1	Z1 18BK	GROUND
2	L114 18VT/DB	HEADLAMP ADJUST SIGNAL
3	L7 20BK/PK	PARK LAMP RELAY OUTPUT



RIGHT HIGH BEAM HEADLAMP

RIGHT HIGH BEAM HEADLAMP - BLACK 2 WAY

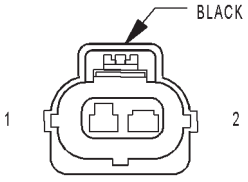
CAV	CIRCUIT	FUNCTION
A	Z1 18BK	GROUND
B	L34 18RD/OR	FUSED RIGHT HIGH BEAM OUTPUT



RIGHT INSTRUMENT PANEL SPEAKER

RIGHT INSTRUMENT PANEL SPEAKER - WHITE 2 WAY

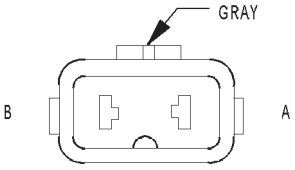
CAV	CIRCUIT	FUNCTION
1	X86 18OR/RD	RIGHT INSTRUMENT PANEL SPEAKER (+)
2	X84 18OR/BK	RIGHT INSTRUMENT PANEL SPEAKER (-)



RIGHT LIFTGATE AJAR SWITCH

RIGHT LIFTGATE AJAR SWITCH - BLACK 2 WAY

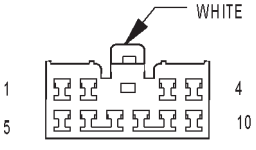
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	G78 20TN/BK	LIFTGATE AJAR SWITCH SENSE



RIGHT LOW BEAM HEADLAMP

RIGHT LOW BEAM HEADLAMP - GRAY 2 WAY

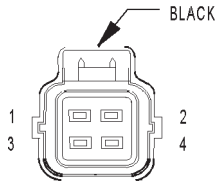
CAV	CIRCUIT	FUNCTION
A	Z1 18BK	GROUND
B	L44 18VT/RD	FUSED RIGHT LOW BEAM OUTPUT



RIGHT MULTI-FUNCTION SWITCH

RIGHT MULTI-FUNCTION SWITCH - WHITE 10 WAY

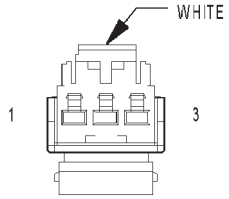
CAV	CIRCUIT	FUNCTION
1	V23 20BR/PK	FUSED IGNITION SWITCH OUTPUT (RUN-ACC)
2	V20 18BK/WT	REAR WASHER PUMP MOTOR CONTROL
3	V10 20BR	WASHER PUMP SWITCH SENSE
4	-	-
5	V13 18BR/LG	REAR WIPER MOTOR CONTROL
6	V22 18BR/YL	REAR WIPER MOTOR DELAY CONTROL
7	V9 20WT/BK	WINDSHIELD WIPER SWITCH RETURN
8	V52 20DG/RD	WINDSHIELD WIPER SWITCH MUX
9	V48 20RD/GY	WIPER HIGH CONTROL
10	-	-



RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH

RIGHT REAR DOOR LOCK MOTOR/AJAR SWITCH - BLACK 4 WAY

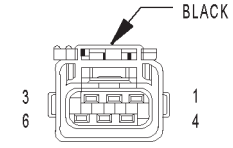
CAV	CIRCUIT	FUNCTION
1	G76 18TN/YL	RIGHT REAR DOOR AJAR SWITCH SENSE
2	Z1 18BK	GROUND
3	P36 18PK/VT	DOOR UNLOCK DRIVER
4	P35 18OR/VT	DOOR LOCK DRIVER



RIGHT REAR DOOR SPEAKER

RIGHT REAR DOOR SPEAKER - WHITE 3 WAY

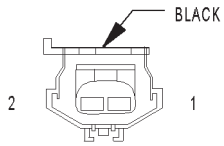
CAV	CIRCUIT	FUNCTION
1	X52 18WT/VT (BASE)	RIGHT REAR DOOR SPEAKER (+)
1	X90 18WT/VT (PREMIUM)	RIGHT REAR DOOR SPEAKER (+)
2	-	-
3	X58 18TN/DG (BASE)	RIGHT REAR DOOR SPEAKER (-)
3	X92 18TN/DG (PREMIUM)	RIGHT REAR DOOR SPEAKER (-)



RIGHT REAR LAMP ASSEMBLY

RIGHT REAR LAMP ASSEMBLY - BLACK 6 WAY

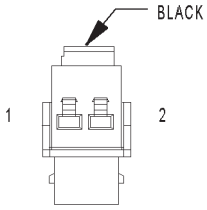
CAV	CIRCUIT	FUNCTION
1	L1 18VT/BK	BACK-UP LAMP FEED
2	L95 18DG/YL (BUILT-UP-EXPORT)	REAR FOG LAMP RELAY OUTPUT
3	L7 18BK/YL	PARK LAMP RELAY OUTPUT
4	L62 18BR/RD	RIGHT TURN SIGNAL
5	Z151 18BK	GROUND
6	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL



RIGHT REAR WHEEL SPEED SENSOR

RIGHT REAR WHEEL SPEED SENSOR - BLACK 2 WAY

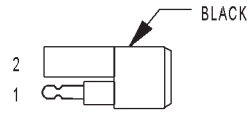
CAV	CIRCUIT	FUNCTION
1	B2 18YL	RIGHT REAR WHEEL SPEED SENSOR 12 VOLT SUPPLY
2	B1 18YL/DB	RIGHT REAR WHEEL SPEED SENSOR SIGNAL



RIGHT REMOTE RADIO SWITCH

RIGHT REMOTE RADIO SWITCH - BLACK 2 WAY

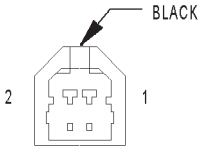
CAV	CIRCUIT	FUNCTION
1	X10 20RD/BK	RADIO CONTROL MUX RETURN
2	X20 20RD/YL	RADIO CONTROL MUX



RIGHT SIDE
REPEATER
LAMP
(BUILT-UP-EXPORT)

RIGHT SIDE REPEATER LAMP (BUILT-UP-EXPORT) - BLACK 2 WAY

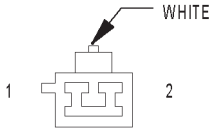
CAV	CIRCUIT	FUNCTION
1	L60 18TN	RIGHT TURN SIGNAL
2	Z142 18BK	GROUND



RIGHT VISOR/
VANITY LAMP

RIGHT VISOR/VANITY LAMP - BLACK 2 WAY

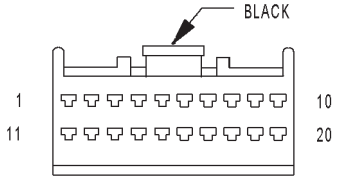
CAV	CIRCUIT	FUNCTION
1	F70 20PK	FUSED B(+)
2	M20 20YL/BK	COURTESY LAMP LOAD SHED



SEAT
BELT
SWITCH

SEAT BELT SWITCH - WHITE 2 WAY

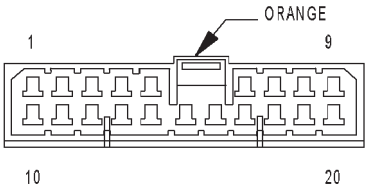
CAV	CIRCUIT	FUNCTION
1	G10 20LG/RD	SEAT BELT SWITCH SENSE
2	Z1 20BK	GROUND



SEAT
MODULE C1
(PREMIUM)

SEAT MODULE C1 (PREMIUM) - BLACK 20 WAY

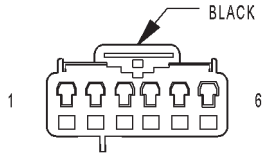
CAV	CIRCUIT	FUNCTION
1	P15 20YL/LB (PREMIUM II/III)	SEAT HORIZONTAL FORWARD SWITCH SENSE
2	-	-
3	P11 20YL/WT(PREMIUM II/III)	SEAT REAR UP SWITCH SENSE
4	P43 20GY/LB (PREMIUM II/III)	RECLINER UP SWITCH SENSE
5	P19 20YL/LG (PREMIUM II/III)	SEAT FRONT UP SWITCH SENSE
6	P86 20DG/YL (PREMIUM I/III)	PASSENGER SEAT TEMPERATURE SENSOR INPUT
7	P27 20LB/RD (PREMIUM II/III)	REAR RISER POSITION SIGNAL
8	P25 20VT/RD (PREMIUM II/III)	SEAT HORIZONTAL POSITION SIGNAL
9	P135 20LB/BK (PREMIUM I/III)	DRIVER SEAT TEMPERATURE SENSOR INPUT
10	P28 20BR/RD (PREMIUM II/III)	SEAT POSITION SENSOR GROUND
11	P41 20GY/WT (PREMIUM II/III)	RECLINER DOWN SWITCH SENSE
12	P17 20RD/YL (PREMIUM II/III)	SEAT HORIZONTAL REARWARD SWITCH SENSE
13	-	-
14	P21 20RD/LG (PREMIUM II/III)	SEAT FRONT DOWN SWITCH SENSE
15	P13 20RD/WT (PREMIUM II/III)	SEAT REAR DOWN SWITCH SENSE
16	P47 20LB (PREMIUM II/III)	RECLINER POSITION SIGNAL
17	P26 20BR (PREMIUM II/III)	FRONT RISER POSITION SIGNAL
18	P29 20BR/WT	SEAT SENSOR 5 VOLT SUPPLY
19	Z2 20BK/OR	GROUND
20	D25 20VT/YL	PCI BUS



SEAT
MODULE C2
(PREMIUM)

SEAT MODULE C2 (PREMIUM) - ORANGE 20 WAY

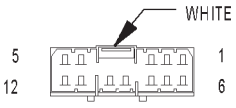
CAV	CIRCUIT	FUNCTION
1	F35 16RD	FUSED B(+)
2	P131 16BK/OR (PREMIUM I/III)	DRIVER SEAT HEATER B(+) DRIVER
3	Z1 16BK	GROUND
4	P119 16YL/RD (PREMIUM II/III)	SEAT FRONT UP DRIVER
5	P121 16RD/GY (PREMIUM II/III)	SEAT FRONT DOWN DRIVER
6	P111 16YL/DB (PREMIUM II/III)	SEAT REAR UP DRIVER
7	P113 16RD/BK (PREMIUM II/III)	SEAT REAR DOWN DRIVER
8	-	-
9	P115 16GY/LG (PREMIUM II/III)	SEAT HORIZONTAL FORWARD DRIVER
10	F35 16RD	FUSED B(+)
11	P130 16DG/WT (PREMIUM I/III)	PASSENGER SEAT HEATER B(+) DRIVER
12	Z1 16BK	GROUND
13	-	-
14	P9 20RD/LB (PREMIUM II/III)	SEAT SWITCH B(+) SUPPLY
15	Z6 16BK/YL (PREMIUM I/III)	GROUND
16	Z5 16BK/VT (PREMIUM I/III)	GROUND
17	-	-
18	P141 16GY/WT (PREMIUM II/III)	SEAT RECLINER DOWN DRIVER
19	P143 16GY/LB (PREMIUM II/III)	SEAT RECLINER UP DRIVER
20	P117 16RD/BR (PREMIUM II/III)	SEAT HORIZONTAL REARWARD DRIVER



SENTRY KEY
IMMOBILIZER
MODULE

SENTRY KEY IMMOBILIZER MODULE - BLACK 6 WAY

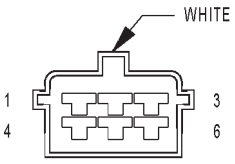
CAV	CIRCUIT	FUNCTION
1	M1 20PK	FUSED B(+)
2	Z132 20BK/OR	GROUND
3	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	-	-
5	D25 20YL/VT/BK	PCI BUS
6	-	-



SHIFTER
ASSEMBLY
(C201 DIESEL)

SHIFTER ASSEMBLY (C201 DIESEL) - WHITE 12 WAY

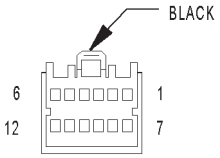
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	-	-
4	K2 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
5	D25 20RD	PCI BUS
6	-	-
7	D21 20PK	SCI TRANSMIT
8	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
9	T2 20TN/BK	BACK-UP LAMP RELAY CONTROL
10	Z234 20WT	GROUND
11	T41 20BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
12	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)



SHIFTER ASSEMBLY (GAS)

SHIFTER ASSEMBLY (GAS) - WHITE 6 WAY

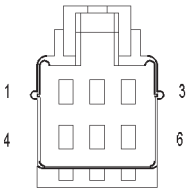
CAV	CIRCUIT	FUNCTION
1	E2 20OR	PANEL LAMPS DRIVER
2	Z234 18BK	GROUND
3	T6 18OR/WT	OVERDRIVE OFF SWITCH SENSE
4	Z300 18BK	GROUND
5	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	K29 18WT/PK	SECONDARY BRAKE SWITCH SIGNAL



SHIFTER ASSEMBLY C1 (DIESEL)

SHIFTER ASSEMBLY C1 (DIESEL) - BLACK 12 WAY

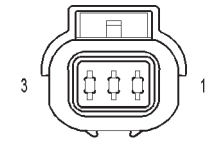
CAV	CIRCUIT	FUNCTION
1	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
2	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
3	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	T2 20TN/BK	BACK-UP LAMP RELAY CONTROL
5	D25 20OR	PCI BUS
6	W0 20DB/WT	SHIFTER C1 SENSE
7	W1 20VT/WT	SHIFTER C2 SENSE
8	W2 20VT	SHIFTER C3 SENSE
9	W3 20BK	SHIFTER C4 SENSE
10	W4 20PK/OR	SHIFTER C5 SENSE
11	Z234 20WT	GROUND
12	Z234 20WT	GROUND



SHIFTER ASSEMBLY C2 (DIESEL)

SHIFTER ASSEMBLY C2 (DIESEL) - 6 WAY

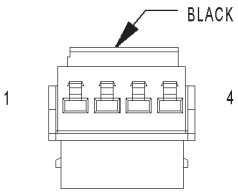
CAV	CIRCUIT	FUNCTION
1	-	-
2	-	-
3	F12 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
4	K2 20WT/PK	SECONDARY BRAKE SWITCH SIGNAL
5	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	Y1 20DB/PK	PARK LOCKOUT SOLENOID CONTROL



SIREN (BUILT-UP-EXPORT)

SIREN (BUILT-UP-EXPORT) - 3 WAY

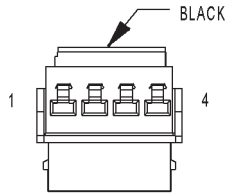
CAV	CIRCUIT	FUNCTION
1	Z141 18BK	GROUND
2	X75 18GY/LB (DIESEL)	SIREN SIGNAL CONTROL
2	X75 18GY/LG (GAS)	SIREN SIGNAL CONTROL
3	M1 18PK	FUSED B(+)



SPEED CONTROL SWITCH NO. 1

SPEED CONTROL SWITCH NO. 1 - BLACK 4 WAY

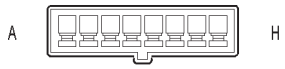
CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



SPEED CONTROL SWITCH NO. 2

SPEED CONTROL SWITCH NO. 2 - BLACK 4 WAY

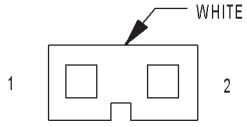
CAV	CIRCUIT	FUNCTION
1	-	-
2	K4 20BK/LB	SENSOR GROUND
3	V37 20RD/LG	SPEED CONTROL SWITCH SIGNAL
4	-	-



SUNROOF CONTROL MODULE

SUNROOF CONTROL MODULE - 8 WAY

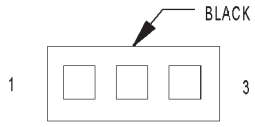
CAV	CIRCUIT	FUNCTION
A	Q46 20OR/WT	SUNROOF MOTOR POSITION SENSOR SIGNAL
B	Q41 20WT	SUNROOF OPEN
C	Q43 20VT	SUNROOF VENT
D	Z1 16BK	GROUND
E	-	-
F	Q30 16DB	ACCESSORY DELAY RELAY OUTPUT
G	Q5 16RD	SUNROOF MOTOR B(+)
H	Q6 16OR	SUNROOF MOTOR B(-)



SUNROOF MOTOR C1

SUNROOF MOTOR C1 - WHITE 2 WAY

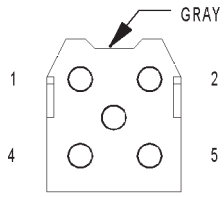
CAV	CIRCUIT	FUNCTION
1	Q5 16RD	SUNROOF MOTOR B(+)
2	Q6 16OR	SUNROOF MOTOR B(-)



SUNROOF MOTOR C2

SUNROOF MOTOR C2 - BLACK 3 WAY

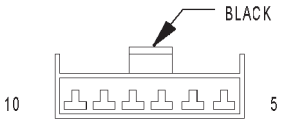
CAV	CIRCUIT	FUNCTION
1	Z1 20BK	GROUND
2	Q46 20OR/WT	SUNROOF MOTOR POSITION SENSOR SIGNAL
3	-	-



SUNROOF SWITCH

SUNROOF SWITCH - GRAY 5 WAY

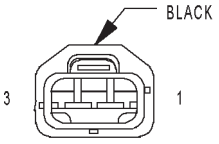
CAV	CIRCUIT	FUNCTION
1	Q43 20VT	SUNROOF VENT
2	-	-
3	Z150 20BK	GROUND
4	-	-
5	Q41 20WT	SUNROOF OPEN



TEMPERATURE VALVE ACTUATOR (MTC)

TEMPERATURE VALVE ACTUATOR (MTC) - BLACK 6 WAY

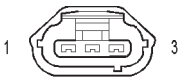
CAV	CIRCUIT	FUNCTION
5	-	-
6	-	-
7	Z132 20BK/OR	GROUND
8	C67 20RD/LB	BLEND AIR DOOR POSITION CONTROL
9	-	-
10	F22 20WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)



THROTTLE POSITION SENSOR (4.0L)

THROTTLE POSITION SENSOR (4.0L) - BLACK 3 WAY

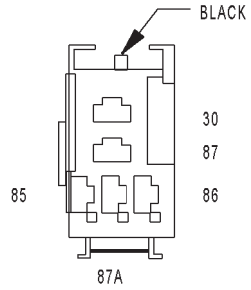
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K4 18BK/LB	SENSOR GROUND
3	K22 18OR/RD	THROTTLE POSITION SENSOR SIGNAL



THROTTLE POSITION SENSOR (4.7L)

THROTTLE POSITION SENSOR (4.7L) - 3 WAY

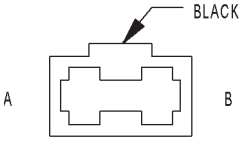
CAV	CIRCUIT	FUNCTION
1	K7 18OR	5 VOLT SUPPLY
2	K22 18OR/RD	THROTTLE POSITION SENSOR SIGNAL
3	K4 18BK/LB	SENSOR GROUND



TRAILER TOW BRAKE LAMP RELAY

TRAILER TOW BRAKE LAMP RELAY - BLACK 5 WAY

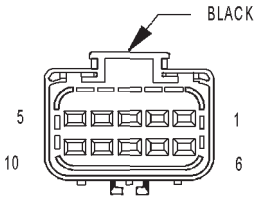
CAV	CIRCUIT	FUNCTION
30 (3)	F9 14RD/BK	FUSED B(+)
85 (2)	L50 18WT/TN	PRIMARY BRAKE SWITCH SIGNAL
86 (1)	Z150 18BK	GROUND
87 (5)	L95 14DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A (4)	L94 14OR/WT	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRAILER TOW CIRCUIT BREAKER

TRAILER TOW CIRCUIT BREAKER - BLACK 2 WAY

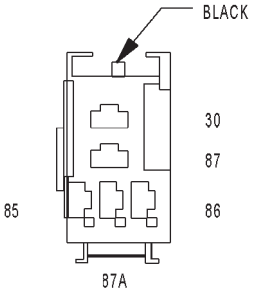
CAV	CIRCUIT	FUNCTION
A	F30 14RD/WT	FUSED CIGAR LIGHTER RELAY OUTPUT
B	F30 14RD/TN	CIGAR LIGHTER RELAY OUTPUT



TRAILER TOW CONNECTOR

TRAILER TOW CONNECTOR - BLACK 10 WAY

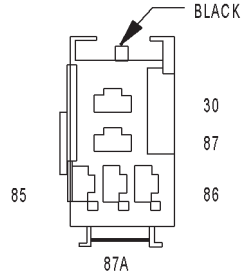
CAV	CIRCUIT	FUNCTION
1	-	-
2	L62 14BR/RD	RIGHT TURN SIGNAL
3	L1 18VT/BK	BACK-UP LAMP FEED
4	F30 14RD/WT	FUSED CIGAR LIGHTER RELAY OUTPUT
5	L7 18BK/YL	PARK LAMP RELAY OUTPUT
6	-	-
7	B40 14LB	TRAILER TOW BRAKE B(+)
8	Z150 14BK	GROUND
9	Z150 14BK	GROUND
10	L63 14DG/RD	LEFT TURN SIGNAL



TRAILER TOW LEFT TURN RELAY

TRAILER TOW LEFT TURN RELAY - BLACK 5 WAY

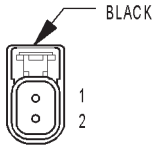
CAV	CIRCUIT	FUNCTION
30 (3)	L63 16DG/RD	LEFT TURN SIGNAL
85 (2)	L63 14DG/RD	LEFT TURN SIGNAL
86 (1)	Z150 18BK	GROUND
87 (5)	L94 14OR/WT	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A (4)	L95 14DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRAILER TOW RIGHT TURN RELAY

TRAILER TOW RIGHT TURN RELAY - BLACK 5 WAY

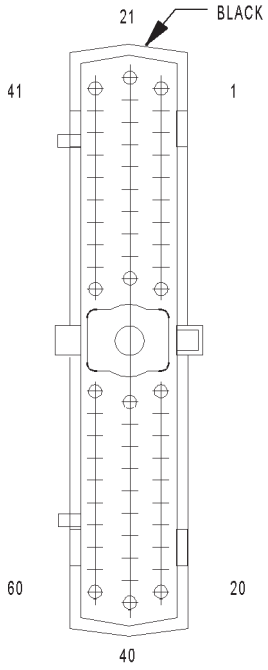
CAV	CIRCUIT	FUNCTION
30 (3)	L62 14BR/RD	RIGHT TURN SIGNAL
85 (2)	L62 20BR/RD	RIGHT TURN SIGNAL
86 (1)	Z150 18BK	GROUND
87 (5)	L94 14OR/WT	TRAILER TOW BRAKE LAMP RELAY OUTPUT
87A (4)	L95 14DG/YL	TRAILER TOW BRAKE LAMP RELAY OUTPUT



TRANSFER CASE POSITION SENSOR

TRANSFER CASE POSITION SENSOR - BLACK 2 WAY

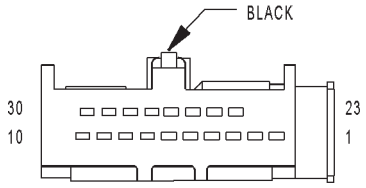
CAV	CIRCUIT	FUNCTION
1	K77 20BR/WT (DIESEL)	TRANSFER CASE POSITION SENSOR SIGNAL
1	K77 18LG/BK (GAS)	TRANSFER CASE POSITION SENSOR INPUT
2	K4 20BK/LB (DIESEL)	SENSOR GROUND
2	K4 18BK/LB (GAS)	SENSOR GROUND



TRANSMISSION CONTROL MODULE (4.7L)

TRANSMISSION CONTROL MODULE (4.7L) - BLACK 60 WAY

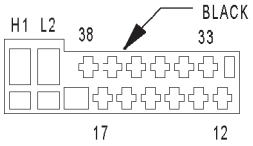
CAV	CIRCUIT	FUNCTION
1	T1 18LG/BK	TRS T1 SENSE
2	T2 18TN/BK	TRS T2 SENSE
3	T3 18VT	TRS T3 SENSE
4	-	-
5	-	-
6	K24 18GY/BK	CRANKSHAFT POSITION SENSOR SIGNAL
7	D21 18PK	SCI TRANSMIT
8	F45 18YL/RD	FUSED IGNITION SWITCH OUTPUT (START)
9	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
10	T10 18YL/DG	TORQUE MANAGEMENT REQUEST SENSE
11	F991 18OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
12	K22 18OR/RD	THROTTLE POSITION SENSOR SIGNAL
13	T13 18DB/BK	SPEED SENSOR GROUND
14	T14 18LG/WT	OUTPUT SPEED SENSOR SIGNAL
15	K30 18PK/YL	TRANSMISSION CONTROL RELAY CONTROL
16	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
17	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
18	T118 18YL/DB	PRESSURE CONTROL SOLENOID CONTROL
19	T119 18WT/DB	2C SOLENOID CONTROL
20	T120 18LG	LR SOLENOID CONTROL
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	T29 18GY	UNDERDRIVE PRESSURE SWITCH SENSE
30	T130 14VT/TN	LINE PRESSURE SENSOR SIGNAL
31	-	-
32	-	-
33	-	-
34	-	-
35	-	-
36	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
37	Z113 14BK/WT	GROUND
38	T138 14GY/LB	5 VOLT SUPPLY
39	Z112 14BK/YL	GROUND
40	T140 18VT/LG	MS SOLENOID CONTROL
41	T41 18WT	TRS T41 SENSE
42	T42 18VT/WT	TRS T42 SENSE
43	D25 18YL/VT	PCI BUS
44	-	-
45	-	-
46	D20 18LG	SCI RECEIVE
47	T147 18LB	2C PRESSURE SWITCH SENSE
48	T48 18DB	4C PRESSURE SWITCH SENSE
49	T6 18VT/WT	OVERDRIVE OFF SWITCH SENSE
50	T150 18BR/LB	LR PRESSURE SWITCH SENSE
51	K4 18BK/LB	SENSOR GROUND
52	T52 18RD/BK	INPUT SPEED SENSOR SIGNAL
53	Z114 14BK/LG	GROUND
54	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL
55	T59 18PK	UNDERDRIVE SOLENOID CONTROL
56	A30 14RD/WT	FUSED B(+)
57	Z12 14BK/TN	GROUND
58	-	-
59	T159 18DG/WT	4C SOLENOID CONTROL
60	T60 18BR	OVERDRIVE SOLENOID CONTROL



TRANSMISSION CONTROL MODULE C1 (DIESEL)

TRANSMISSION CONTROL MODULE C1 (DIESEL) - BLACK 18 WAY

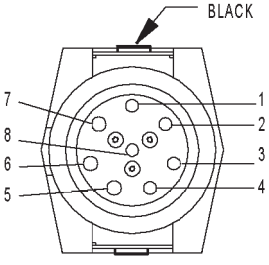
CAV	CIRCUIT	FUNCTION
1	D21 20PK	SCI TRANSMIT
2	-	-
3	W4 20PK/OR	SHIFTER C5 SENSE
4	Y1 20DB/PK	PARK LOCKOUT SOLENOID CONTROL
5	-	-
6	-	-
7	T41 20BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
8	-	-
9	-	-
10	-	-
23	-	-
24	-	-
25	W0 20DB/WT	SHIFTER C1 SENSE
26	W1 20VT/WT	SHIFTER C2 SENSE
27	W2 20VT	SHIFTER C3 SENSE
28	W3 20BK	SHIFTER C4 SENSE
29	F991 20OR/DB	FUSED IGNITION SWITCH OUTPUT (RUN-START)
30	Z234 20WT	GROUND



TRANSMISSION CONTROL MODULE C2 (DIESEL)

TRANSMISSION CONTROL MODULE C2 (DIESEL) - BLACK 14 WAY

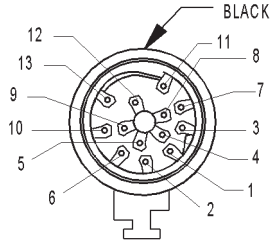
CAV	CIRCUIT	FUNCTION
12	T52 18RD/BK	N2 INPUT SPEED SENSOR
13	T39 18GY/LB	SENSOR SUPPLY VOLTAGE
14	T60 18BR	1-2/4-5 SOLENOID CONTROL
15	T159 18DG/WT	3-4 SOLENOID CONTROL
16	T119 18WT/DB	2-3 SOLENOID CONTROL
17	T120 18LG	TCC SOLENOID CONTROL
33	T13 18DB/BK	SENSOR GROUND
34	T54 18VT	TEMP SENSOR - P/N SWITCH
35	T14 18LG/WT	N3 INPUT SPEED SENSOR
36	T591 18YL/DB	MODULATION PRESSURE SOLENOID CONTROL
37	T118 18YL/DB	SHIFT PRESSURE SOLENOID CONTROL
38	T16 18RD	SOLENOID SUPPLY VOLTAGE
H1	D52 18LG/WT	CAN C BUS(+)
L2	D51 18DG/WT	CAN C BUS(-)



TRANSMISSION SOLENOID (4.0L)

TRANSMISSION SOLENOID (4.0L) - BLACK 8 WAY

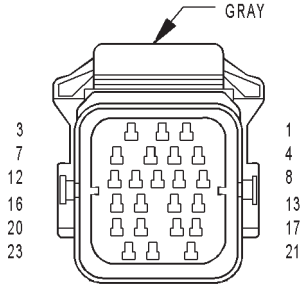
CAV	CIRCUIT	FUNCTION
1	T15 18LG	FUSED TRANSMISSION CONTROL RELAY OUTPUT
2	K6 18VT/BK	5 VOLT SUPPLY
3	K4 18BK/LB	SENSOR GROUND
4	T25 18LG/RD	GOVERNOR PRESSURE SENSOR SIGNAL
5	K88 18PK	GOVERNOR PRESSURE SOLENOID CONTROL
6	T60 18BR	3-4 SHIFT SOLENOID CONTROL
7	T20 18LB	TORQUE CONVERTER CLUTCH SOLENOID CONTROL
8	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL



TRANSMISSION SOLENOID ASSEMBLY (DIESEL)

TRANSMISSION SOLENOID ASSEMBLY (DIESEL) - BLACK 13 WAY

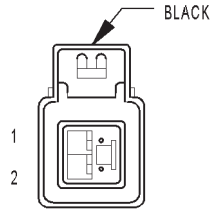
CAV	CIRCUIT	FUNCTION
1	T14 18LG/WT	N3 INPUT SPED SENSOR
2	T591 18YL/DB	MODULATION PRESSURE SOLENOID CONTROL
3	T52 18RD/BK	N2 INPUT SPEED SENSOR
4	T54 18VT	TEMP SENSOR - P/N SWITCH
5	-	-
6	T16 18RD	SOLENOID SUPPLY VOLTAGE
7	T39 18GY/LB	SENSOR SUPPLY VOLTAGE
8	T119 18WT/DB	2-3 SOLENOID CONTROL
9	T159 18DG/WT	3-4 SOLENOID CONTROL
10	T118 18YL/DB	SHIFT PRESSURE SOLENOID CONTROL
11	T120 18LG	TCC SOLENOID CONTROL
12	T13 18DB/BK	SENSOR GROUND
13	T60 18BR	1-2/4-5 SOLENOID CONTROL



TRANSMISSION SOLENOID/TRS ASSEMBLY (4.7L)

TRANSMISSION SOLENOID/TRS ASSEMBLY (4.7L) - GRAY 23 WAY

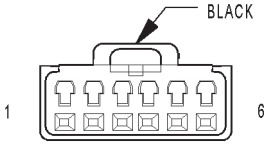
CAV	CIRCUIT	FUNCTION
1	F22 18WT/PK	FUSED IGNITION SWITCH OUTPUT (RUN)
2	T120 18LG	LR SOLENOID CONTROL
3	T41 18BK/WT	PARK/NEUTRAL POSITION SWITCH SENSE (T41)
4	T141 18WT	TRS T41 SENSE
5	T42 18VT/WT	TRS T42 SENSE
6	L1 18VT/BK	BACK-UP LAMP FEED
7	T60 18BR	OVERDRIVE SOLENOID CONTROL
8	T3 18VT	TRS T3 SENSE
9	T1 18LG/BK	TRS T1 SENSE
10	T16 14RD	TRANSMISSION CONTROL RELAY OUTPUT
11	T48 18DB	4C PRESSURE SWITCH SENSE
12	T118 18YL/DB	PRESSURE CONTROL SOLENOID CONTROL
13	T2 18TN/BK	TRS T2 SENSE
14	T150 18BR/LB	LR PRESSURE SWITCH SENSE
15	T147 18LB	2C PRESSURE SWITCH SENSE
16	T9 18OR/BK	OVERDRIVE PRESSURE SWITCH SENSE
17	T59 18PK	UNDERDRIVE SOLENOID CONTROL
18	T29 18GY	UNDERDRIVE PRESSURE SWITCH SENSE
19	T159 18DG/WT	4C SOLENOID CONTROL
20	T119 18WT/DB	2C SOLENOID CONTROL
21	T140 18VT/LG	MS SOLENOID CONTROL
22	T13 18DB/BK	SPEED SENSOR GROUND
23	T54 18VT	TRANSMISSION TEMPERATURE SENSOR SIGNAL



UNDERHOOD LAMP

UNDERHOOD LAMP - BLACK 2 WAY

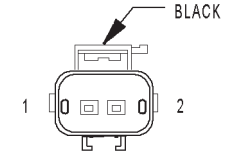
CAV	CIRCUIT	FUNCTION
1	Z141 20BK	GROUND
2	M1 20PK/RD	FUSED B(+)



VEHICLE INFORMATION CENTER

VEHICLE INFORMATION CENTER - BLACK 6 WAY

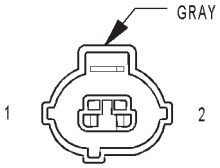
CAV	CIRCUIT	FUNCTION
1	-	-
2	D25 20YL/VT	PCI BUS
3	F70 20PK	FUSED B(+)
4	Z155 20BK/OR	GROUND
5	G5 20DB/WT	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	-	-



VISCOUS/CABIN HEATER (DIESEL)

VISCOUS/CABIN HEATER (DIESEL) - BLACK 2 WAY

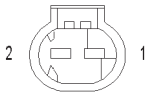
CAV	CIRCUIT	FUNCTION
1	A82 16PK/LG	VISCOUS/CABIN HEATER RELAY OUTPUT
2	Z18 16BK	GROUND



WASHER FLUID LEVEL SWITCH

WASHER FLUID LEVEL SWITCH - GRAY 2 WAY

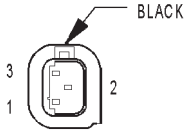
CAV	CIRCUIT	FUNCTION
1	V11 20BK/TN	WASHER FLUID SWITCH SENSE
2	Z141 20BK	GROUND



WASTEGATE SOLENOID (DIESEL)

WASTEGATE SOLENOID (DIESEL) - 2 WAY

CAV	CIRCUIT	FUNCTION
1	F15 18DB/WT	FUSED AUTO SHUT DOWN RELAY OUTPUT
2	Y42 18OR/DB	WASTEGATE SOLENOID CONTROL



WATER IN FUEL SENSOR (DIESEL)

WATER IN FUEL SENSOR (DIESEL) - BLACK 3 WAY

CAV	CIRCUIT	FUNCTION
1	K4 20BK/LB	SENSOR GROUND
2	G123 20DG/WT	WATER IN FUEL SENSOR SIGNAL
3	F15 20RD/DG	FUSED AUTO SHUT DOWN RELAY OUTPUT

8W-91 CONNECTOR/GROUND/SPLICE LOCATION

TABLE OF CONTENTS

page

CONNECTOR/GROUND/SPLICE LOCATION
DESCRIPTION 1

CONNECTOR/GROUND/SPLICE LOCATION

DESCRIPTION

This section provides illustrations identifying connector, ground, and splice locations in the vehicle. Connector, ground, and splice indexes are provided. Use the wiring diagrams in each section for connector, ground, and splice identification. Refer to the appropriate index for the proper figure number. For items that are not shown in this section N/S is placed in the Fig. column.

CONNECTORS

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
A/C Compressor Clutch	BK	At A/C Compressor	9, 13
A/C Pressure Transducer	BK	Right Front of Engine Compartment	3, 4, 5
Accelerator Pedal Position Sensor (Diesel)	BK	Rear of Engine Compartment Near Fuel/Water Seperator	7
Adjustable Pedals Module (Except Built-up Export)	GN	Above Drivers Control Pedals	N/S
Adjustable Pedals Motor/ Sensor Assembly (Except Built-up Export)		Above Drivers Control Pedals	N/S
Adjustable Pedals Switch	WT	Drivers Lower Kick Panel	21
Airbag Control Module (ORC) C1	YL	Below Center Floor Console, Near Park Brake	19, 20, 21, 22
Airbag Control Module (ORC) C2	YL	Below Center Floor Console, Near Park Brake	19, 20, 21, 22
Ambient Temperature Sensor	BK	On Radiator Center Support	5
Antenna Module (Built-up-export)	WT	Above Right Quarter Window	N/S
Ash Receiver Lamp	BK	Below Cigarette Lighter	19, 20
Automatic Day/Night Mirror	BK	In Front of Rear View Mirror	N/S
Automatic Headlamp Light Sensor/VTSS LED	BK	Near Left Instrument Panel Speaker	19, 20
Automatic Zone Control Module - C1 (AZC)	WT	Left Side of HVAC Housing	N/S
Automatic Zone Control Module - C2 (AZC)	WT	Left Side of HVAC Housing	N/S
Battery Temperature Sensor	BK	Below Battery Tray	4, 5
Blower Motor	BK	Behind Right Hand Side of Instrument Panel	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Blower Motor Controller (AZC)	BK	Behind Right Hand Side of Instrument Panel	N/S
Blower Motor Resistor Block (MTC)	BK	Behind Right Hand Side of Instrument Panel	N/S
Body Control Module - C1	GY	Lower Left Side of Instrument Panel	21, 22
Body Control Module-C2 -LHD	WT	Lower Left Side of Instrument Panel	21
Body Control Module-C2 - RHD	GY	Lower Left Side of Instrument Panel	22
Boost Pressure Sensor (Diesel)	BK	Top Front of Engine	N/S
Brake Lamp Switch	GY	Brake Pedal Arm	31
C100	BK	Right Front Engine Compartment	2, 5
C101 (4.0L RHD)	LTGY	Rear of Engine Compartment	15
C101 (4.7L RHD)	BK	Rear of Engine Compartment	N/S
C102 (Diesel)	BK	Left Rear Engine Compartment	4, 7
C102 (Gas)	BK	Right Rear Engine Compartment	5, 10, 11, 14, 15, 18
C103 (Diesel)	LTGY	Rear of Engine	4, 7
C103 (Gas)	GY	Right Rear Engine Compartment	5, 10 11, 14, 15
C104	LTGY	Right Rear Engine Compartment	14 18
C105 (Diesel)	GY	Right Rear Engine Compartment	4, 7, 8
C106 (Diesel)	GY	Lower Right Instrument Panel	N/S
C106 (Gas RHD)	GY	Lower Right Instrument Panel	N/S
C107 (Diesel)	GY	Left Rear Engine Compartment	4
C107 (LHD)	BK	Passenger Side Near Kick Panel	3, 30, 35
C107 (RHD)	GY	Passenger Side Near Kick Panel	3, 31
C108	BK	Left Cowl	3, 4
C109	BK	Near Transfer Case switch	12
C110 (Diesel)	GY	Top of Engine Near Glow Plugs	4, 7
C111	BK	Left Front Frame Near Windshield Washer Pump	1, 3, 4
C112	BK	Right Front Frame Near Horns	1, 5
C113 (Diesel)	LTGY	Rear of Engine	7, 8
C200 - LHD	GY	Passenger Side Near Kick Panel	19, 21, 35
C200 - RHD	BK	Passenger Side Near Kick Panel	20, 22
C201)	WT	Below Center Floor Console, Near Park Brake	19, 20, 21, 22
C202	WT	HVAC Unit, Right Side of Instrument Panel	19, 20, 21, 22
C203 (AZC)	WT	HVAC Unit, Right Side of Instrument Panel	19, 20, 21, 22
C300 (LHD)	GY	Near Junction Block	30, 33
C301 (RHD)	BK	Near Junction Block	31
C302	BK	At Driver Door	24, 25, 30, 31

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
C303	WT	Right Rear Door	29, 34, 36
C304	BK	Under Driver Seat	33, 36
C306	BK	Under Passenger Seat	34, 35
C307	WT	Left Rear Door	28, 33 35
C308	WT	Top of Liftgate	37, 38
C309	WT	Left Rear Quarter Pillar	37
C310 (Built-Up-Export)	LT GY	Above Left Quarter Wheel Housing	37, 39
C310 (Except Built-Up-Export)	LT GN	Above Left Quarter Wheel Housing	39
C311	WT	Top of Liftgate	38
C312		Center of Liftgate	38
C313	WT	In Driver Door	24, 25
C314	LT GY	At Passenger Door	26, 27, 31
C315		To Rear of Right Quarter Window	32
C318		At C Post	33, 36
Camshaft Position Sensor (Diesel)	BK	Top of Engine	N/S
Camshaft Position Sensor (Gas)	GY	Right Side of Engine	10, 11, 14, 15
Capacitor (4.0L)	BK	Right Rear of Engine	10
Capacitor NO. 1 (4.7L)	BK	Right Side of Engine	14, 15
Capacitor NO. 2 (4.7L)	BK	Left Side of Engine	13
Cargo Lamp	WT	In Headliner Near Liftgate	N/S
Center High Mounted Stop Lamp	BK	Top of Liftgate	N/S
Cigar Lighter	RD	Center of Instrument Panel	19, 20
Clockspring - C1	BK	At Steering Column	23
Clockspring - C2		At Steering Column	23
Clockspring - C3	GY	At Steering Column	23
Clockspring - C4	BK	At Steering Column	N/S
Coil On Plug NO. 1 (4.7L)	BK	Left Side of Engine Near Fuel Injector No.1	13
Coil On Plug NO. 2 (4.7L)	BK	Right Side of Engine Near Fuel Injector No.2	14, 15
Coil On Plug NO. 3 (4.7L)	BK	Left Side of Engine Near Fuel Injector No.3	13
Coil On Plug NO. 4 (4.7L)	BK	Right Side of Engine Near Fuel Injector No.4	14, 15
Coil On Plug NO. 5 (4.7L)	BK	Left Side of Engine Near Fuel Injector No.5	13
Coil On Plug NO. 6 (4.7L)	BK	Right Side of Engine Near Fuel Injector No.6	14, 15
Coil On Plug NO. 7 (4.7L)	BK	Left Side of Engine Near Fuel Injector No.7	13

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Coil On Plug NO. 8 (4.7L)	BK	Right Side of Engine Near Fuel Injector No.8	14, 15
Coil Rail (4.0L)	BK	Right Rear of Engine	10, 11
Compact Disc Changer	BK	Near Radio	N/S
Compact Disc Changer	BK	Right Rear Quarter Panel	37
Controller Antilock Brake	BK	Left Front Engine Compartment	3, 4
Coolant Level Sensor	LT GY	Right Rear of Engine	5
Crankcase Heater (Diesel)	BK	Near T/O for G105	8
Crankshaft Position Sensor (Diesel)	BK	Rear of Engine Near Transmission Bell Housing	N/S
Crankshaft Position Sensor (Gas)	BK	Rear of Engine Near Transmission Bell Housing	10, 11, 14, 15, 17
Data Link Connector	BK	Under Lower Driver's Side of Instrument Panel	20, 21, 22
Diagnostic Junction Port	BK	At Steering Column	23
Driver Airbag Squib 1	BK	In Steering Wheel	N/S
Driver Airbag Squib 2	BK	In Steering Wheel	N/S
Driver Blend Door Motor/ Actuator (AZC)	BK	On HVAC Housing	N/S
Driver Cylinder Lock Switch	GY	In Driver Door	24, 25
Driver Door Lock Motor/Ajar Switch	BK	In Driver Door	24, 25
Driver Door Module - C1	WT	In Driver Door	24, 25
Driver Door Module - C2	BK	In Driver Door	N/S
Driver Door Module - C3	BK	In Driver Door	N/S
Driver Front Door Courtesy Lamp	BK	In Driver Door	N/S
Driver Front Power Window Motor	BK	In Driver Door	24, 25
Driver Heated Seat Back (Premium I/III)	GN	At Driver Seat	N/S
Driver Heated Seat Cushion (Premium I/III)	BK	At Driver Seat	N/S
Driver Heated Seat Switch	WT	Center of Instrument Panel	19 20, 21
Driver Lumbar Motor (Midline/Premium)	BK	At Driver Seat	N/S
Driver Lumbar Switch (Midline/Premium)	WT	At Driver Seat	N/S
Driver Power Mirror	BK	At Driver Door	N/S
Driver Power Seat Front Riser Motor	RD	At Driver Seat	N/S
Driver Power Seat Front Riser Motor Sensor (Premium II/III)	BK	At Driver Seat	N/S
Driver Power Seat Horizontal Motor	BK	At Driver Seat	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Driver Power Seat Horizontal Motor Sensor (Premium II/III)	BK	At Driver Seat	N/S
Driver Power Seat Rear Riser Motor	RD	At Driver Seat	N/S
Driver Power Seat Rear Riser Motor Sensor (Premium II/III)	BK	At Driver Seat	N/S
Driver Power Seat Recliner Motor	BK	At Driver Seat	N/S
Driver Power Seat Recliner Motor Sensor (Premium II/III)	BK	At Driver Seat	N/S
Driver Power Seat Switch (Midline/Premium)	GN	At Driver Seat	N/S
Driver Rear Power Window Motor	BK	In Left Rear Door	28
Driver Rear Power Window Switch	BL	In Left Rear Door	28
Driver Seat Belt Switch		At Switch	N/S
EGR Solenoid (Diesel)	BK	Left Front Fender	7, 8
Electric Brake	BL	Near Junction Block	N/S
Electronic Speed Control Servo	BK	Right Front of Engine Compartment	5
Engine Control Module C1 (Diesel)	BK	Left Front of Engine	7, 8
Engine Control Module C2 (Diesel)	BK	Left Front of Engine	7, 8
Engine Coolant Temperature Sensor (Diesel)	BK	Top of Engine	N/S
Engine Coolant Temperature Sensor (GAS)	BK	Front of Engine	9, 13
Engine Oil Pressure Sensor	BK	Side of Engine	10, 11, 13
EVAP/Purge Solenoid	BK	Left Front Fender Near Controller Antilock Brake	3
Front Power Outlet	RD	Center of Instrument Panel	19, 20
Front Washer Pump	WT	Left Front of Engine Compartment	3, 4
Front Wiper Motor	BK	Left Side of Cowl	3, 4
Fuel Injector No.1	BK	At Injector	7, 9, 13
Fuel Injector No.2	BK	At Injector	7, 9, 14, 15
Fuel Injector No.3	BK	At Injector	7, 9, 13
Fuel Injector No.4	BK	At Injector	7, 9, 14, 15
Fuel Injector No.5	BK	At Injector	9, 13
Fuel Injector No.6	BK	At Injector	9, 14, 15
Fuel Injector No.7 (4.7L)	BK	At Injector	13
Fuel Injector No.8 (4.7L)	BK	At Injector	14, 15
Fuel Pressure Sensor (Diesel)	BK	Right Front of Engine	N/S
Fuel Pressure Solenoid (Diesel)	BK	Top of Engine	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Fuel Pump Module (Gas)	BK	Near Fuel Tank	33, 35
Fuel Tank Module Diesel)	BK	Near Fuel Tank	33, 35
Generator (Diesel)	LTGY	At Generator	8
Generator (Gas)	BK	At Generator	N/S
Glove Box Lamp	BK	Inside Glove Box	19, 20, 22
Headlamp Leveling Switch (Built-Up-Export)	WT	Driver Side of Instrument Panel	20
Hood Ajar Switch	BK	Left Side of Engine Compartment	3, 4
Horn No.1	BK	Right Front Fascia	5
Horn No.2	BK	Right Front Fascia	5
Hydraulic Cooling Module	BK	Right Front of Engine Compartment	5
Idle Air Control Motor	BK	Left Side of Engine Near Throttle Body	13
Ignition Switch - C1	WT	On Steering Column	23
Ignition Switch - C2	BK	On Steering Column	23
Input Speed Sensor (4.7L)	BK	Left Side of Transmission	16
Instrument Cluster	WT	At Instrument Cluster	19, 20
Intake Air Temperature Sensor (Gas)	GY	Left Side of Engine	9, 13
Intake Air Temperature Sensor (Diesel)	BK	Near T/O for Crankcase Heater	8
Intake Port Swirl Actuator (Diesel)	BK	Right Rear of Engine Compartment	N/S
Intrusion Transceiver Module (Built-up-Export)	BK	In The Overhead	N/S
Junction Block - C1	BK	At Junction Block	30, 31, 33
Junction Block - C2	BK	At Junction Block	30, 31
Junction Block - C3	BK	At Junction Block	21, 22, 30
Junction Block - C4	WT	At Junction Block	30, 31
Junction Block - C5	WT	At Junction Block	30, 31
Knock Sensor (4.7L High Output)	BK	Right Rear Side of Engine, Near Coil on Plug No.8	N/S
Leak Detection Pump (Except Built-Up-Export)		Left Front Wheel Opening	3
Left Courtesy Lamp	BK	Left Side of Instrument Panel	21 22, 23
Left Curtain Airbag	BK	Near Left C Pillar	37
Left Door Handle Courtesy Lamp	BK	At Lamp	N/S
Left Fog Lamp	BK	At Lamp	3, 4
Left Front Door Speaker	WT	In Left Front Door	24, 27
Left Front Impact Sensor	BK	Left Front Frame Near Windshield Washer Pump	3, 4
Left Front Park Lamp	WT	At Lamp	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Left Front Park/Turn Signal Lamp (Except Built-Up-Export)	BK	At Lamp	N/S
Left Front Side Marker Lamp (Except Built-Up-Export)	WT	At Lamp	N/S
Left Front Turn Signal Lamp (Built-Up-Export)	WT	At Lamp	N/S
Left Front Wheel Speed Sensor	GY	At Left Front Wheel Opening	4
Left Headlamp Leveling Motor (Built-Up-Export)	BK	At Motor	N/S
Left High Beam Headlamp	BK	At Lamp	N/S
Left Instrument Panel Speaker	WT	At Speaker	19, 20
Left Liftgate Ajar Switch	BK	In Liftgate	38
Left Low Beam Headlamp	GY	At Lamp	N/S
Left Multi-Function Switch	WT	On Steering Column	23
Left Rear Door Lock Motor/Ajar Switch	BK	In Left Rear Door	28
Left Rear Door Speaker	WT	In Left Rear Door	28
Left Rear Lamp Assembly	BK	At Lamp Assembly	37
Left Rear Wheel Speed Sensor	GY	Near Left Rear Wheel	33, 35
Left Remote Radio Switch	BK	At Switch in Steering Wheel	N/S
Left Side Impact Sensor	BK	Left Body	N/S
Left Side Repeater Lamp (Built-Up-Export)	BK	On Left Front Fender	3, 4
Left Visor/Vanity Lamp	BK	At Lamp	N/S
License Lamp No.1	BK	At Lamp	N/S
License Lamp No.2	BK	At Lamp	N/S
Liftgate Flip-Up Ajar Switch	GY	In Liftgate	38
Liftgate Flip-Up Push Button Switch	BK	In Liftgate	N/S
Liftgate Flip-Up Release Solenoid	BK	In Liftgate	38
Liftgate Lock Motor	BK	In Liftgate	38
Line Pressure Sensor (4.7L)	BK	Rear of Transmission	N/S
Manifold Absolute Pressure Sensor (4.0L)	BK	At Throttle Body	9
Manifold Absolute Pressure Sensor (4.7L)	BK	Right Side of Engine	13
Manual Temperature Control - C1 (MTC)	WT	Center of Instrument Panel	N/S
Manual Temperature Control - C2 (MTC)	WT	Center of Instrument Panel	N/S
Mass Air Flow sensor (Diesel)	BK	Near T/O for G105	8
Mode Door Motor/Actuator (AZC)	BK	Right Center of Instrument Panel	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Output Speed Sensor (4.0L)	GY	Left Side of Transmission	12
Output Speed Sensor (4.7L)	BK	Left Side of Transmission	16
Overhead Map/Courtesy Lamp	WT	At Overhead Console	N/S
Oxygen Sensor 1/1 Upstream (4.0L)	GY	Left Side of Engine at Exhaust	9, 12
Oxygen Sensor 1/1 Upstream (4.7L)	GY	Left Side of Engine at Exhaust	17
Oxygen Sensor 1/2 Downstream (4.0L)	BK	Rear of Transmission	9, 12
Oxygen Sensor 1/2 Downstream (4.7L)	BK	Rear of Transmission	17
Oxygen Sensor 2/1 Upstream		Rear of Transmission	N/S
Oxygen Sensor 2/2 Downstream		Rear of Transmission	N/S
Park Brake Switch		Center Console Area, Near Airbag Control Module	20, 21, 22
Park/Neutral Position Switch (4.0L)	BK	Left Side of Transmission	12
Park/Neutral Position Switch (Diesel)	BK	Left Side of Transmission	N/S
Passenger Airbag	YL	Passenger Side of Instrument Panel	19, 20
Passenger Blend Door Motor/Actuator (AZC)	BK	Passenger Side of Instrument Panel	N/S
Passenger Door Lock Motor/Ajar Switch	BK	In Passenger Door	26, 27
Passenger Door Module - C1	WT	In Passenger Door	26, 27
Passenger Door Module - C2	BK	In Passenger Door	N/S
Passenger Front Door Courtesy Lamp	BK	In Passenger Door	N/S
Passenger Front Power Window Motor	BK	In Passenger Door	26, 27
Passenger Heated Seat Back (Premium I/III)	GN	At Passenger Seat	N/S
Passenger Heated Seat Cushion (Premium I/III)	BK	At Passenger Seat	N/S
Passenger Heated Seat Switch	BK	Center of Instrument Panel	19, 20, 21
Passenger Lumbar Motor (Midline/Premium)	BK	At Passenger Seat	N/S
Passenger Lumbar Switch (Midline/Premium)	WT	At Passenger Seat	N/S
Passenger Power Mirror	BK	In Passenger Door	N/S
Passenger Power Seat Front Riser Motor	RD	At Passenger Seat	N/S
Passenger Power Seat Horizontal Motor	RD	At Passenger Seat	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Passenger Power Seat Rear Riser Motor	RD	At Passenger Seat	N/S
Passenger Power Seat Recliner Motor (Midline/ Premium)	BK	At Passenger Seat	N/S
Passenger Power Seat Switch (Midline/Premium)	GN	At Passenger Seat	N/S
Passenger Rear Power Window Motor	BK	In Right Rear Door	29
Passenger Rear Power Window Switch	BL	In Right Rear Door	29
Passenger Seat Belt Switch		t Switch	N/S
Power Amplifier - C1	WT	Under Rear Seat	34, 36
Power Amplifier - C2	WT	Under Rear Seat	34, 36
Power Connector	WT	Center of Instrument Panel	21, 22
Powertrain Control Module - C1 (Gas)	BK	Rear of Engine Compartment	5, 10, 11, 14, 15, 18
Powertrain Control Module - C2 (Gas)	WT	Rear of Engine Compartment	5, 10, 11, 14, 15, 18
Powertrain Control Module - C3 (Gas)	WT	Rear of Engine Compartment	N/S
Radiator Fan Motor	BK	At Radiator	5
Radiator Fan Relay	BK	Right Side of Engine Compartment	5
Radio - C1	GY	Center of Instrument Panel	19, 20
Radio - C2	BK	Center of Instrument Panel	19, 20
Rain Sensor	BK	Front Center Overhead	N/S
Rear Power Outlet	RD	Right Rear Quarter Panel	37
Rear Washer Pump	BK	Left Front of Engine Compartment	3, 4
Rear Window Defogger	BK	Right Upper Coner of Liftgate	38
Rear Wiper Motor	BK	In Liftgate	38
Recirculation Door Motor/ Actuator (AZC)	BK	Center of Instrument Panel	N/S
Red Brake Warning Indicator Switch	GY	At Master Cylinder	4
Remote Keyless Module (Japan)	BL	In Driver Door	25
Right Courtesy Lamp	BK	At Lamp	20 21, 22
Right Curtain Airbag	BK	Near Right C Pillar	37
Right Door Handle Courtesy Lamp	BK	At Lamp	N/S
Right Fog Lamp	BK	At Right Front Fascia	5
Right Front Door Speaker	WT	In Right Front Door	25, 26
Right Front Impact Sensor	BK	Near Right Verticle Radiator Support	N/S
Right Front Park Lamp	WT	At Lamp	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Right Front Park/Turn Signal Lamp (Except Built-Up-Export)	BK	At Lamp	N/S
Right Front Side Marker Lamp (Except Built-Up-Export)	WT	At Lamp	N/S
Right Front Turn Signal Lamp (Built-Up-Export)	WT	At Lamp	N/S
Right Front Wheel Speed Sensor	GY	In Right Front Wheel Opening	N/S
Right Headlamp Leveling Motor (Built-Up-Export)	BK	At Motor	N/S
Right High Beam Headlamp	BK	At Lamp	N/S
Right Instrument Panel Speaker	WT	At Speaker	19, 20
Right Liftgate Ajar Switch	BK	In Liftgate	38
Right Low Beam Headlamp	GY	At Lamp	N/S
Right Multi-Function Switch	WT	On Steering Column	23
Right Rear Door Lock Motor/Ajar Switch	BK	In Right Rear Door	29
Right Rear Door Speaker	WT	In Right Rear Door	29
Right Rear Lamp Assembly	BK	At Lamp Assembly	37
Right Rear Wheel Speed Sensor	BK	Near Right Rear Wheel	33, 35
Right Remote Radio Switch	BK	At Switch in Steering Wheel	N/S
Right Side Repeater Lamp (Built-Up-Export)	BK	On Right Front Fender	5
Right Visor/Vanity Lamp	BK	At Lamp	N/S
Seat Belt Switch	WT	At Driver Seat	N/S
Seat Module - C1 (Premium)	BK	Under Driver Seat	N/S
Seat Module - C2 (Premium)	OR	Under Driver Seat	N/S
Sentry Key Immobilizer Module	BK	On Steering Column	23
Shifter Assembly (Gas)	WT	Between Front Seats	23
Shifter Assembly C1 (Diesel)		Between Front Seats	N/S
Shifter Assembly C2 (Diesel)		Between Front Seats	N/S
Siren (Built-up-export)		Left Front Fender	3, 4
Speed Control Switch NO. 1	BK	On Steering Wheel	N/S
Speed Control Switch NO. 2	BK	On Steering Wheel	N/S
Sunroof Control Module		At Sunroof	32
Sunroof Motor C1	WT	At Sunroof	N/S
Sunroof Motor C2	BK	In Overhead	N/S
Sunroof Switch	GY	At Switch	N/S
Temperature Valve Actuator (MTC)	BK	On HVAC Housing	N/S
Throttle Position Sensor (4.0L)	BK	Left Side of Engine	9
Throttle Position Sensor (4.7L)	WT	Left Side of Engine	13

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

CONNECTOR NAME/ NUMBER	COLOR	LOCATION	FIG.
Trailer Tow Brake Lamp Relay	BK	Left Quarter Panel	N/S
Trailer Tow Circuit Breaker	BK	Left Quarter Panel	N/S
Trailer Tow Connector	BK	In Rear Bumper	39
Trailer Tow Left Turn Relay	BK	Left Quarter Panel	N/S
Trailer Tow Right Turn Relay	BK	Left Quarter Panel	N/S
Transfer Case Position Sensor	BK	On Transfer Case	7
Transmission Control Module (4.7L)	BK	Rear of Engine Compartment	14, 15, 18
Transmission Control Module C1 (Diesel)	BK	Right Rear Side of Engine Compartment	N/S
Transmission Control Module C2 (Diesel)	BK	Right Rear Side of Engine Compartment	8
Transmission Solenoid (4.0L Gas)	BK	Left Side of Transmission	12
Transmission Solenoid Assembly (Diesel)	BK	On Transmission	8
Transmission Solenoid/TRS Assembly (4.7L)	GY	Left Side of Transmission	16
Underhood Lamp	BK	At Lamp	6
Vehicle Information Center	BK	In Overhead Console	N/S
Viscous/Cabin Heater (Diesel)	BK	Left Rear of Engine Compartment	N/S
Washer Fluid Level Switch	GY	Left Front of Engine Compartment	3, 4
Wastegate Solenoid (Diesel)		Near Power Distribution Center	N/S
Water In Fuel Sensor (Diesel)	BK	Left Rear of Engine Compartment	N/S

GROUNDS

GROUND NUMBER	LOCATION	FIG.
G100 (4.0L and Diesel)	Near Starter	N/S
G100 (4.7L)	Near Intake Plenum	N/S
G101	Near Battery	2
G102	Right Side of Engine	14, 15
G103	Right Side of Engine	7, 8, 10, 11, 14, 15
G104 (4.0L)	Right Rear of Engine	10, 11
G104 (4.7L)	Left Side of Engine	13
G105	Right Side of Engine	8
G106	Left Side of Engine Compartment	3, 4
G107	Left Side of Engine Compartment	3, 4
G108	Near Power Distribution Center	5
G200	Near Airbag Control Module	19, 20, 21, 22
G201	Near Airbag Control Module	19, 20, 21, 22
G300	Near Right Front Seat	34, 36
G301	Near Left Front Seat	33, 35

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICES

SPLICE NUMBER	LOCATION	FIG.
S100	Near T/O for Power Distribution Center Eyelet	2
S102 (4.0L)	Near T/O for G103	10, 11
102 (4.7L)	Near T/O for Fuel Injector No. 1	13
S102 (Diesel)	Near T/O for C110	7, 8
S103 (4.7L)	Near T/O for Engine Oil Pressure Sensor	13
S104 (4.0L)	Near T/O for A/C Compressor Clutch	N/S
S104 (4.7L)	Near T/O for Oxygen Sensor 2/2 Downstream	N/S
S105 (4.0L)	Near T/O for Capacitor	10 11
S105 (4.7L)	Near T/O for Fuel Injector NO. 7	13
S106 (4.0L)	In T/O for Oxygen Sensors	11, 12
S106 (4.7L)	Near T/O for C103	14
S106 (4.7L) RHD	Near T/O for Fuel Injector No.4	15
S107 (4.0L)	Near T/O for Fuel Injector No.5	9
S107 (4.7L)	Near T/O for Fuel Injector No.7	13
S109 (4.0L)	Near T/O for Fuel Injector No.2	9
S109 (4.7L)	Near T/O for Coil On Plug No. 6	14, 15
S110 (4.0L Except Built-Up-Export)	Near T/O for Oxygen Sensor	N/S
S111 (4.7L)	In T/O for Oxygen Sensor	N/S
S111 (4.0L Except Built-Up-Export)	Near T/O for Oxygen Sensor	N/S
S112 (4.0L)	Near T/O for C102, C103 and C104	10, 11
S112 (4.7L)	Near T/O for Coil On Plug No.8	15
S112 (Diesel)	Near T/O for Accelerator Pedal Position Sensor	N/S
S113 (4.7L)	Near T/O for Transmission Control Module	15, 18
S114 (4.0L)	Near T/O for Transmission Control Module	18
S114 (4.7L)	Near T/O for Transmission Control Module	15, 18
S115 (4.0L)	Near T/O for Transmission Control Module	18
S115 (4.7L)	Near T/O for Transmission Control Module	15, 18
S116 (4.0L)	Near Powertrain Control Module C1 and C2	18
S116 (4.7L) LHD	Near T/O for C102, C103 and C104	14
S116 (4.7L) RHD	In T/O for Powertrain Control Module	15
S117 (4.7L) LHD	Neat T/O for C102, C103 and C104	14
S118 (4.7L)	Near T/O for Coil On PlugNo.4	14, 15
S118 (Diesel)	Near T/O for Fuel Sender Unit	N/S
S119 (4.7L) LHD	In T/O for Crankshaft Position Sensor	18
S119 (4.7L) RHD	In T/O for Powertrain Control Module	15
S120 (4.7L)	Near T/O for Powertrain Control Module	15, 18
S121 (4.7L)	Near T/O for Idle Air Control Motor	13

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S122 (4.0L)	Near T/O for G103	10, 11
S122 (4.7L) LHD	Near T/O for Input Speed Sensor	15
S122 (4.7L) RHD	Near T/O for Powertrain Control Module	16
S122 (Diesel)	Near T/O for Generator	N/S
S123 (4.0L)	Near T/O for Capacitor	10, 11
S124 (4.7L)	In Trough Near T/O for Capacitor No.2	13
S125 (Diesel)	In T/O for C103 and C105 Left Rear of Engine Compartment	N/S
S125 (Gas)	Near T/O for Powertrain Control Module - C3	N/S
S126 (4.0L) LHD	Near T/O for Battery Temperature Sensor	N/S
S126 (4.0L) RHD	In Trough Near T/O for Powertrain Control Module - C3	N/S
S127 (LHD) Gas	In Trough Near T/O for Powertrain Control Module - C3	N/S
S127 (RHD) Gas	In T/O for Power Distribution Center	5
S127 (Diesel)	Near T/O for Power Distribution Center	4
S128 (Diesel)	In T/O for C102 Left Rear of Engine Compartment	N/S
S128 (LHD) Gas	In Trough Near T/O for Powertrain Control Module - C3	N/S
S128 (RHD) Gas	In T/O for C102	5
S130 (LHD) Gas	In T/O for C102	N/S
S130 (RHD) Gas	In T/O for Controller Antilock Brake	3
S130 (Diesel)	In T/O for Controller Anti-Lock Brake	4
S131	In Trough Near T/O for Power Distribution Center	5
S131 (Diesel)	Near T/O for Power Distribution Center	4
S132 (Diesel)	Near T/O for EGR Solenoid	N/S
S132 (Gas)	Near T/O for Battery Temperature Sensor	5
S133 (Diesel)	In Trough Near T/O for EGR Solenoid	N/S
S133 (Gas)	Near T/O for Battery Temperature Sensor	5
S134 (Diesel)	In Trough Near T/O for G106/G107	4
S134 (Gas)	In Trough Near T/O for Controller Anti-Lock Brake	3
S135 (Diesel)	Near T/O for Engine Control Module C1	7, 8
S136 (Diesel)	Near T/O for Engine Control Module C1	7, 8
S137 (Diesel)	In Trough Near T/O for Coolant Level Sensor	N/S
S139 (Diesel)	Near T/O for Engine Control Module C1	7, 8
S140 (Diesel)	Near T/O for Power Distribution Center	4
S140 (Gas)	Near T/O for Controller Antilock Brake	N/S
S141 (Gas)	Near T/O for Controller Antilock Brake	3
S142 (Diesel)	In Trough Near T/O for Coolant Level Sensor	N/S
S142 Gas	In T/O for C102	5
S143 (Diesel)	In Trough Near T/O for Hood Ajar Switch	4
S143 (Gas, Built-Up-Export) LHD	In Trough Near T/O for Controller Antilock Brake	3
S143 Gas RHD	Near T/O for Evap/Purge Solenoid	N/S
S145 (Diesel)	Near T/O for Engine Control Module C1	7, 8

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S147 (Diesel)	In T/O for Controller Anti-Lock Brake	4
S151	In Headlamp Assembly	N/S
S152	In Headlamp Assembly	N/S
S153	In Headlamp Assembly	N/S
S154	In Headlamp Assembly	N/S
S155	In Headlamp Assembly	N/S
S156	In Headlamp Assembly	N/S
S158 4.7L RHD	Near T/O for Fuel Injector No. 1	13
S159	In T/O for C101	N/S
S160 (4.7L High Output)	In T/O for C102	N/S
S162 (Diesel)	In T/O for Wastegate Solenoid	4, 8
S163	Near T/O for Leak Detection Pump	3
S165 (Diesel)	Near T/O for Left Front Wheel Speed Sensor	4
S168	Near T/O for Intake Air Temperature Sensor	7, 8
S169	Near T/O for Engine Control Module C1	7, 8
S170	Near T/O for Engine Control Module C2	7, 8
S171	Near T/O for C113	7
S172	Near T/O for C113	7
S174	Near Washer Fluid Level Switch Connector	3
S176	Near T/O for Intake Air Temperature Sensor	7
S200	In Trough Near T/O for Passenger Heated Seat Switch	21
S200 (RHD)	Upper Center Instrument Panel	22
S201	In Trough Near T/O for Front Power Outlet	21
S201 (RHD)	Near T/O for Power Connector	22
S202	In Trough Near T/O for Passenger Heated Seat Switch	21
S202 (RHD)	Upper Center Instrument Panel	22
S203	In Trough Near T/O for Cigar Lighter	21
S203 (RHD)	Lower Center Instrument Panel	22
S204	In Trough Near T/O for Power Connector	21
S204 (RHD)	Right Center Instrument Panel	22
S205	Near T/O for Adjustable Pedal Switch	21
S205 (RHD)	Upper Center Instrument Panel	22
S206	Near T/O for Adjustable Pedals Switch	N/S
S206 (RHD)	Upper Center Instrument Panel	22
S207	In Trough Near T/O for Radio Connectors	21
S207 (RHD)	Upper Center Instrument Panel	22
S208	In Trough Near T/O for Radio Connectors	21
S208 (RHD)	Upper Center Instrument Panel	22
S209	In Trough Near T/O for Left Courtesy Lamp	21
S209 (RHD)	Lower Center Instrument Panel	22
S210	In Trough Near T/O for Left Courtesy Lamp	21

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S210 (RHD)	Lower Center Instrument Panel	22
S211	In Trough Near T/O for Left Courtesy Lamp	N/S
S211 (RHD)	Right Side of Instrument Panel	22
S212	In Trough Near T/O for Left Courtesy Lamp	21
S212 (RHD)	Right Center Instrument Panel	22
S213	Near T/O for Cruise Switch No.1	N/S
S214	Near T/O for Cruise Switch No.1	N/S
S215	Near T/O for Horn Switch	N/S
S216	Near T/O for Remote Radio Switch No.2	N/S
S217	In Trough Near T/O for Power Connector	21
S217 (RHD)	Lower Center Instrument Panel	22
S221	Right Center of Instrument Panel	21
S221 (RHD)	Left Center of Instrument Panel	22
S222	Right Center of Instrument Panel	21
S222 (RHD)	Near T/O for Front Power Outlet	22
S223	Near T/O for Adjustable Pedals Switch	21
S223 (RHD)	Lower Left Side of Instrument Panel	22
S224	Right Center of Instrument Panel	21
S224 (RHD)	Upper Center of Instrument Panel	22
S300	Near T/O for G304	33
S301	In T/O for C304	33
S302	In Sill Trough Near T/O for C307	33, 35
S303	In Sill Trough Near T/O for C307	33, 35
S304	In Sill Trough Near T/O for C307	35
S305	In Sill Trough Near T/O for C307	N/S
S306	Near T/O for C310	37
S307	Near T/O for C310	37
S308	Between T/O's for C310 and Left Rear Lamp Assembly	36, 37
S309	Between T/O's for C310 and Left Rear Lamp Assembly	37
S310	Between T/O's for C310 and Left Rear Lamp Assembly	35, 37
S311	Near T/O for Left Rear Lamp Assembly	37
S312	Near T/O for C200	35
S313	Near T/O for G301	35
S314	Near T/O for C314	N/S
S315 (Gas)	In Center Spline Near T/O for G301	35
S316 (Gas)	Near T/O for Junction Block C2, C4, C5	N/S
S317	Between Troughs Near T/O for C314	N/S
S318	Between Troughs Near T/O for C314	N/S
S319	In Trough Near T/O for C304	33
S323	Near T/O for C314	N/S
S324	In T/O for C200	34

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S326	Near T/O for C200	34, 35
S327	Near T/O for c307	34, 35
S328	In Sill Trough Near T/O for G300	34
S329	In Sill Trough Near T/O for G300	34
S330	Near T/O for G300	34
S331	In Sill Trough Near T/O for C303	34, 36
S332	In Sill Trough Near T/O for C303	34, 36
S333	Near T/O for Power Amplifiers	36
S334	In T/O for Power Amplifier - C2	34
S335	Near T/O for C314	36
S336	Near T/O for Driver Power Window Motor	24, 25
S338	Near T/O for Passenger Power Window Motor	26, 27
S339	Near T/O for Passenger Power Window Motor	26 27
S340	In T/O for Passenger Door Module - C1	26, 27
S341	Near T/O for C306	N/S
S345	Near T/O for Sunroof Switch	32
S346	Near T/O for Left Visor/Vanity Lamp	32
S347	Near T/O for Left Visor/Vanity Lamp	32
S348	Near T/O for Automatic Day/Night Mirror	32
S349	Near T/O for Automatic Day/Night Mirror	32
S351	Near T/O for Seat Belt Switch	N/S
S352	Near T/O for Seat Belt Switch	N/S
S353	Near T/O for Driver Lumbar Switch	N/S
S355	Near T/O for C304 and C306	N/S
S356	In T/O for Left Rear Door Lock Motor/Ajar Switch	28
S357	In T/O for Right Rear Door Lock Motor/Ajar Switch	29
S358	Near Left B Pillar Sill Trough	35
S359	Near T/O for C302	34
S360	In T/O for C302	N/S
S362	In T/O for C200	34
S363	In T/O for C200	34
S364	Near B Pillar Sill Trough	36
S365 Japan	Near T/O for Remote Keyless Entry Module	24, 25
S366	Near T/O for Junction Block C1	N/S
S367 (RHD)	Near T/O for C310	N/S
S368	Near T/O for Power Amplifier - C1	34
S369	Near T/O for Left Visor Vanity Lamp	N/S
S370	Near T/O for Sunroof Module	32
S400	Near Rear Window Defogger Ground Connector	38
S401	Near Rear Window Defogger Ground Connector	38
S402	Near T/O for Liftgate Flip-Up Ajar Switch	38

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

SPLICE NUMBER	LOCATION	FIG.
S403	Near T/O for Rear Wiper Motor	38
S404	Near T/O for Liftgate Lock Motor	38
S405	In T/O for Rear Wiper Motor	38
S406 (Except Built-Up-Export)	In T/O for Trailer Tow Right Turn Relay	N/S
S407 (Except Built-Up-Export)	Near T/O for Trailer Tow Left Turn Relay	N/S
S408	Near T/O for Trailer Tow Circuit Breaker	N/S
S410	In T/O for Trailer Tow Connector	39
S411	Near T/O for License Lamp No.1	N/S
S412	In T/O for C312	N/S

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

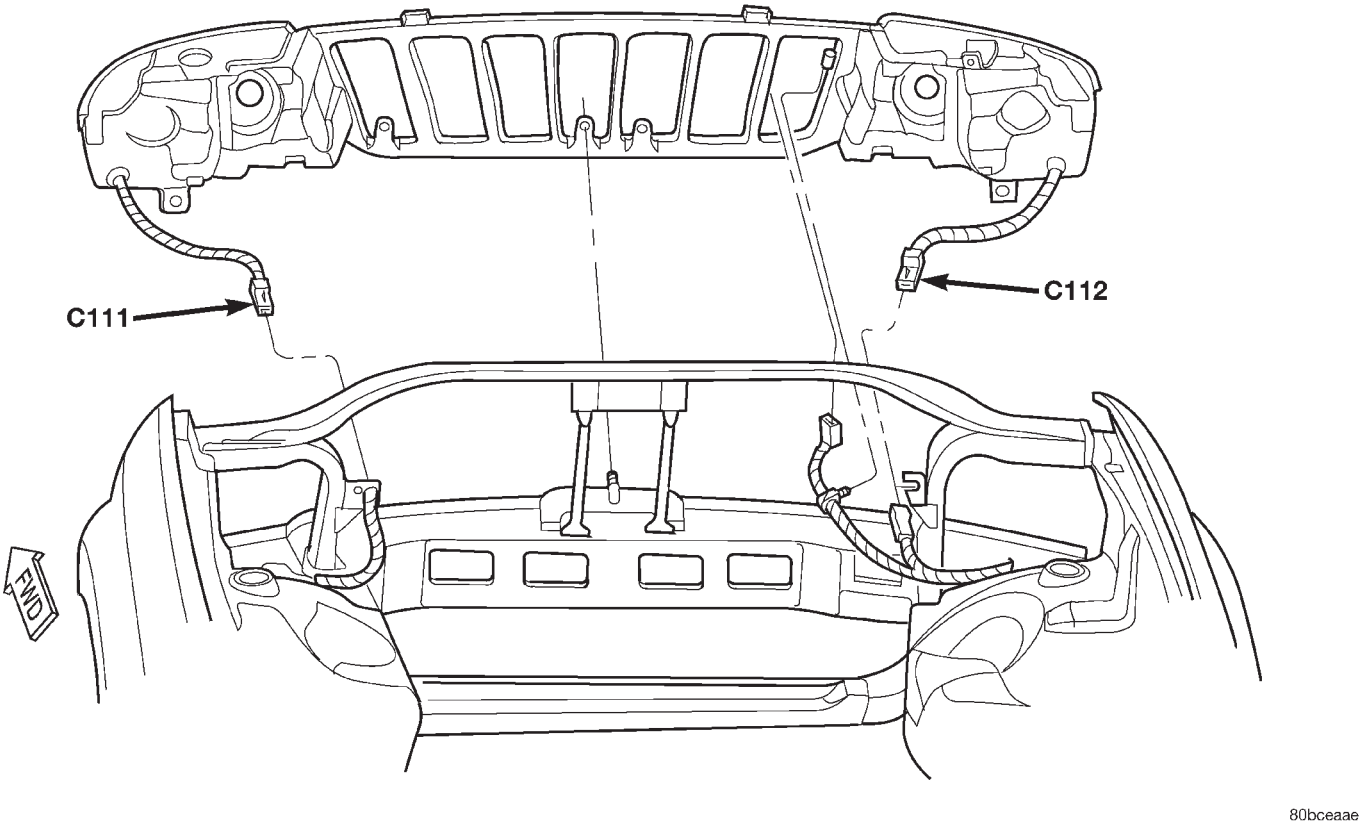


Fig. 1 ENGINE COMPARTMENT (FRONT CLIP)

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

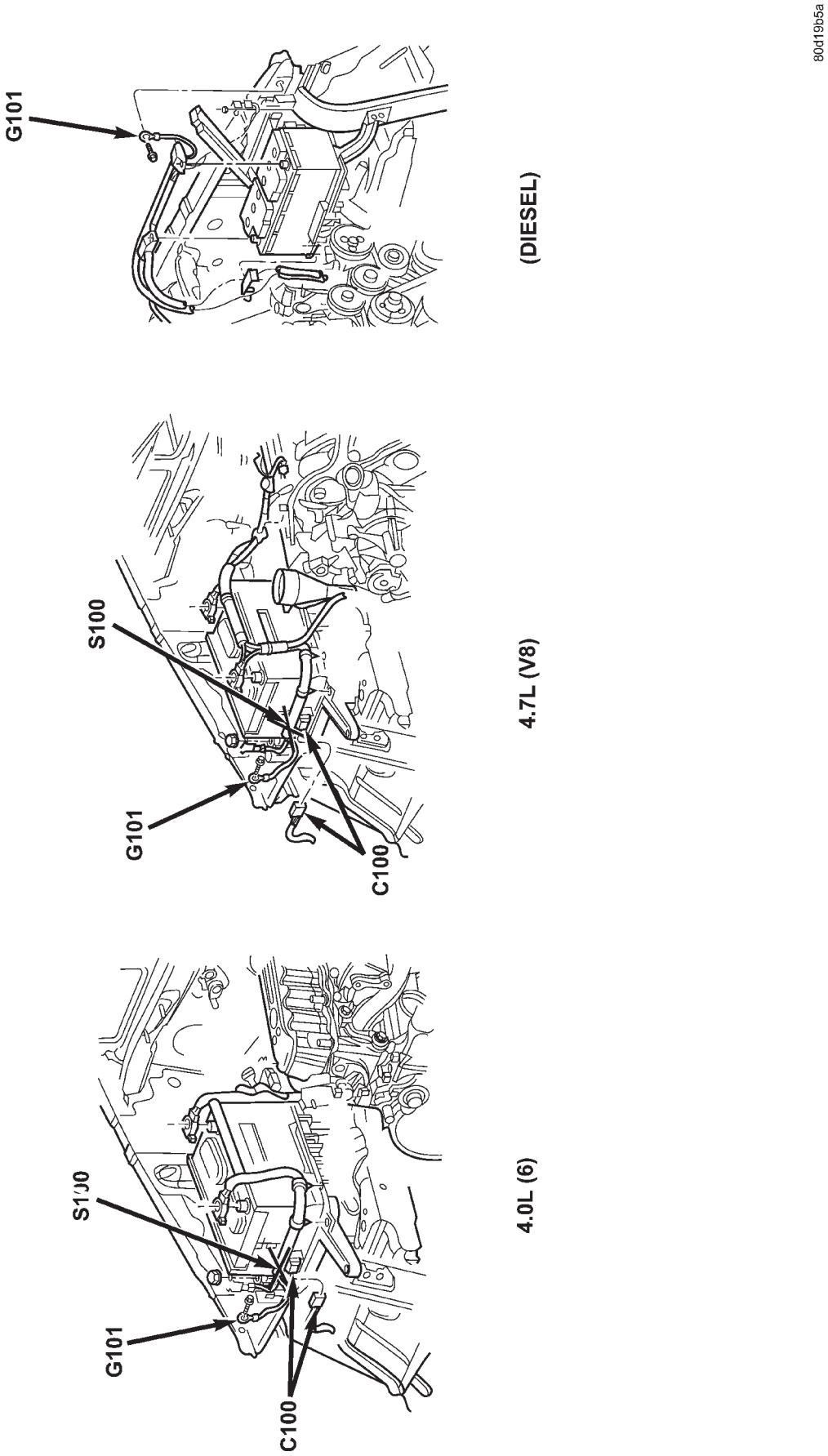


Fig. 2 ENGINE COMPARTMENT (BATTERY)

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

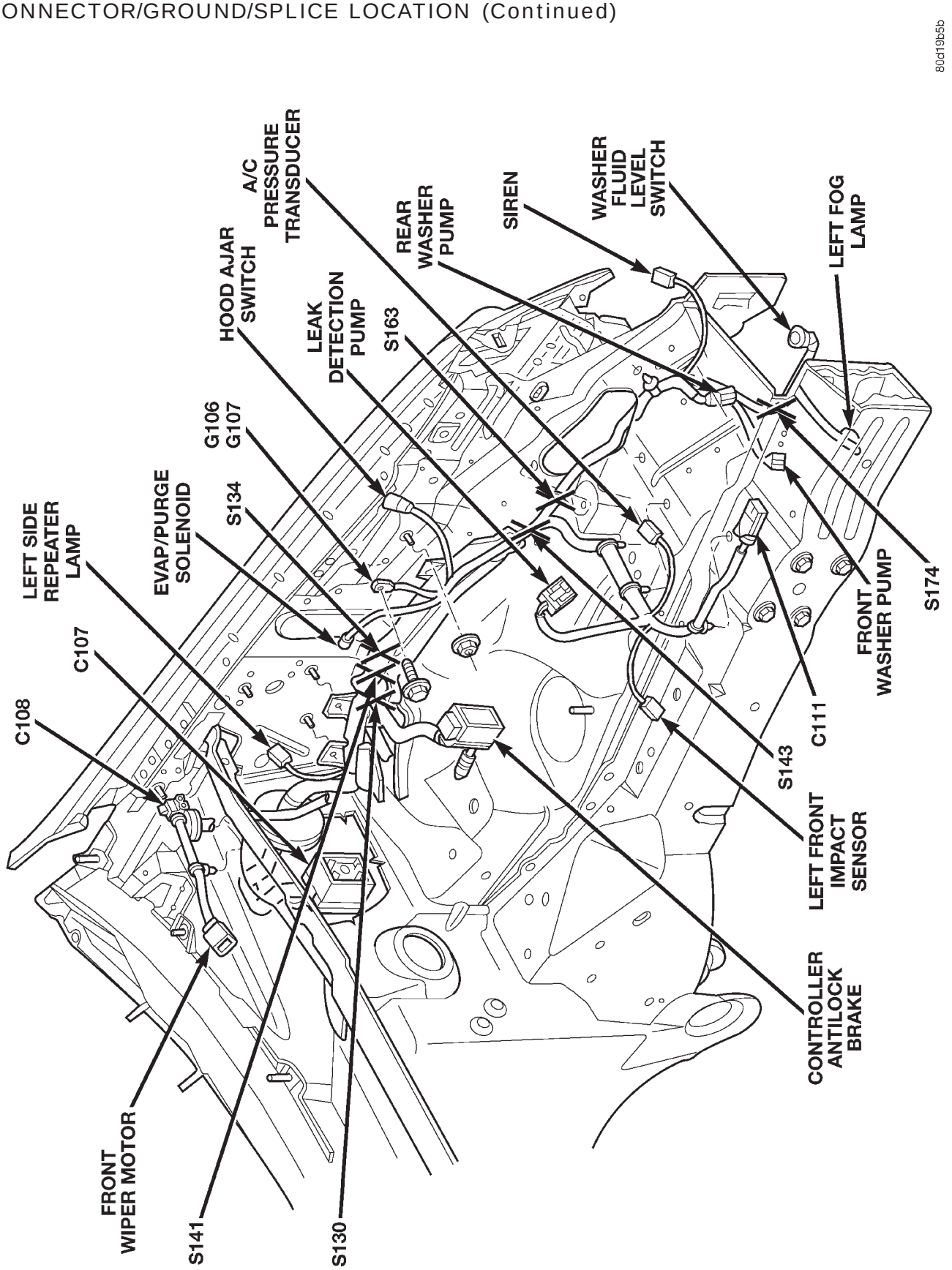


Fig. 3 ENGINE COMPARTMENT LEFT SIDE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

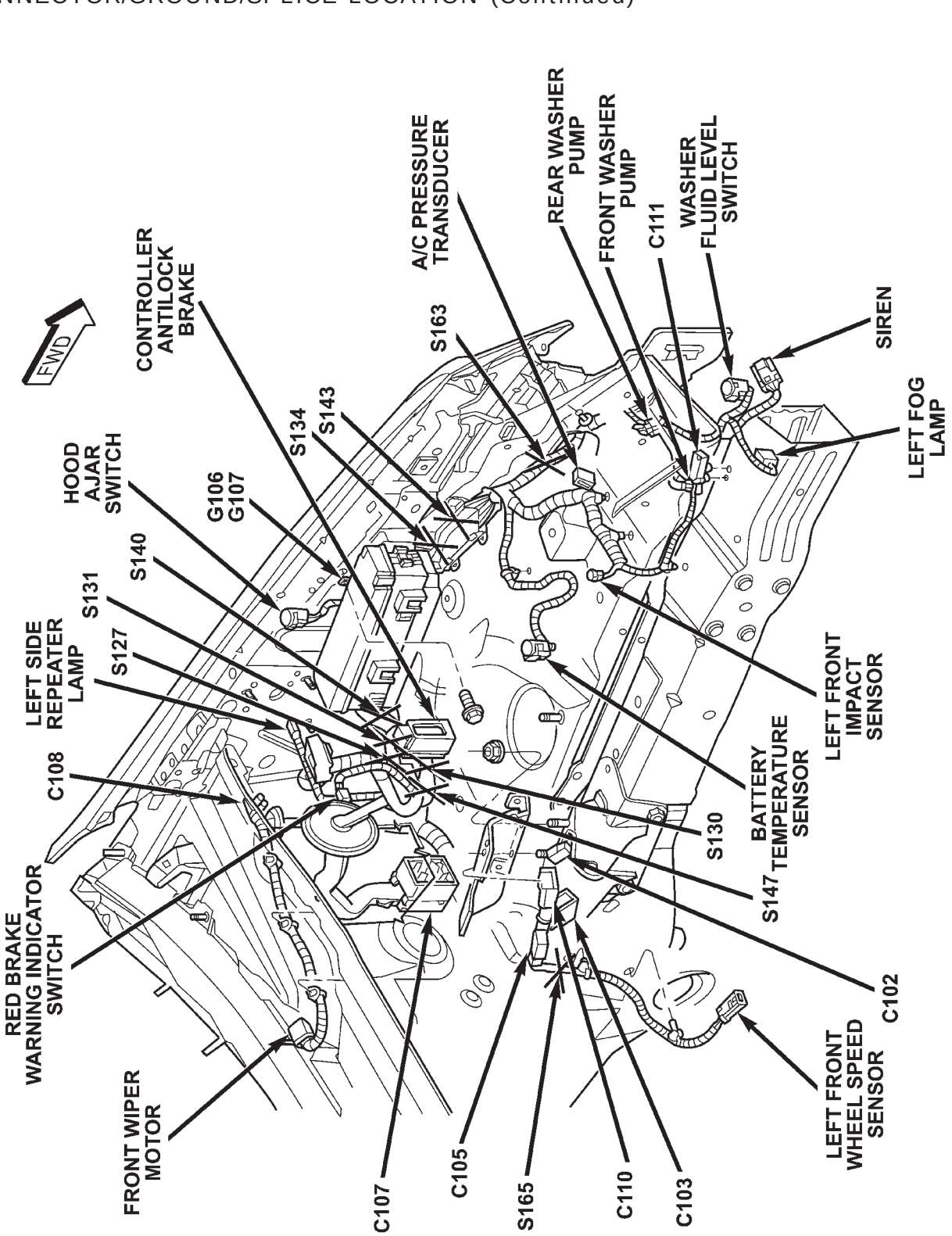


Fig. 4 ENGINE COMPARTMENT LEFT SIDE DIESEL

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

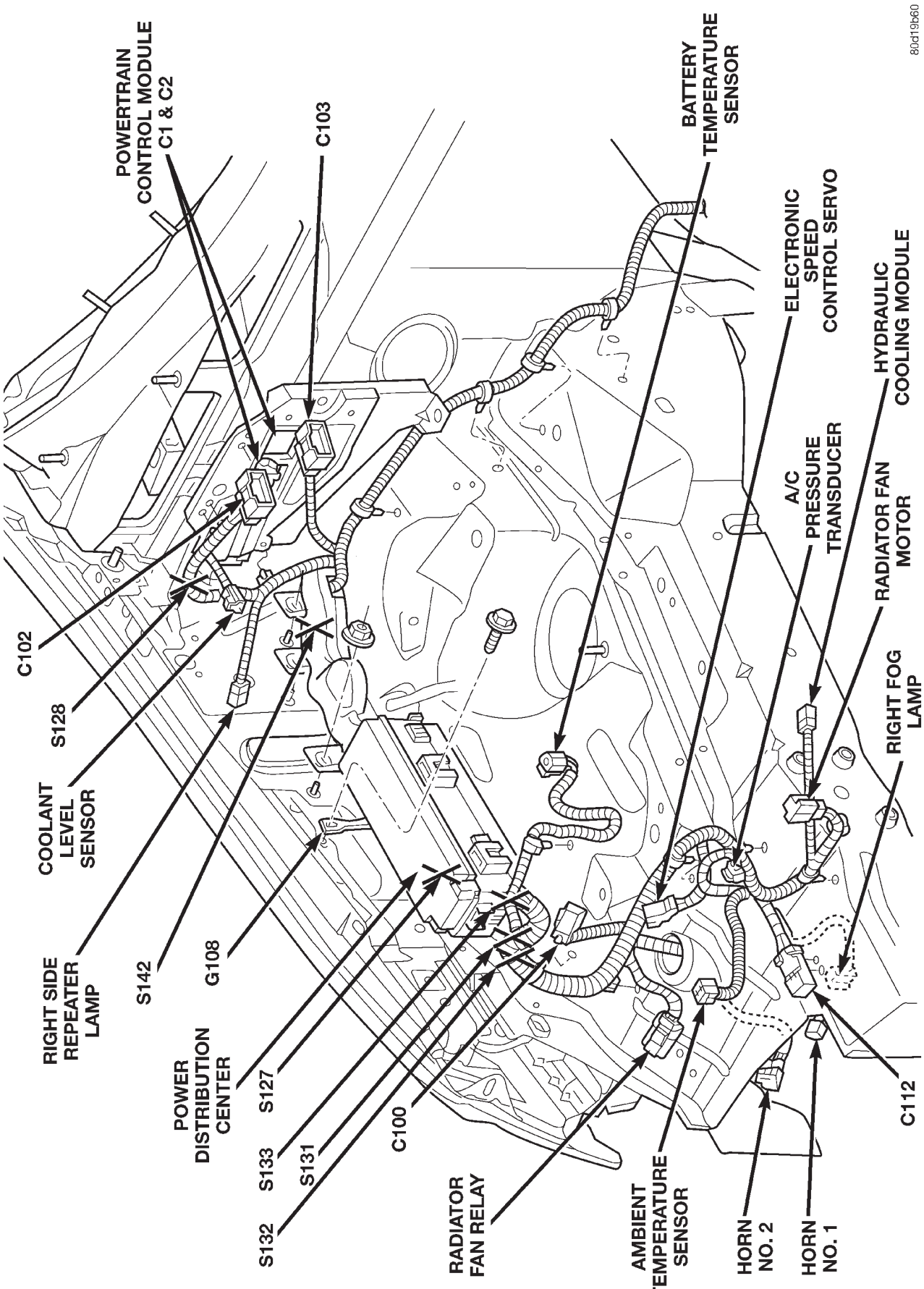


Fig. 5 ENGINE COMPARTMENT RIGHT SIDE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

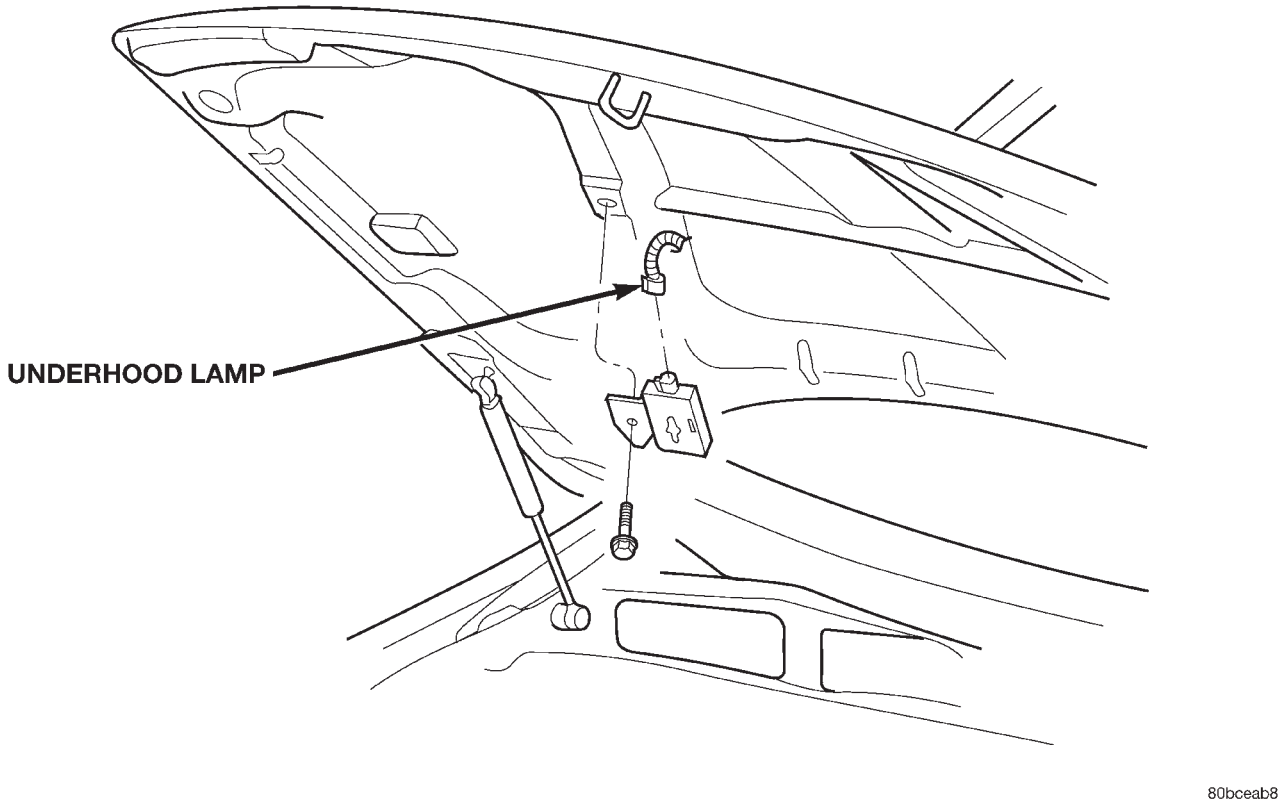


Fig. 6 UNDERHOOD LAMP

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

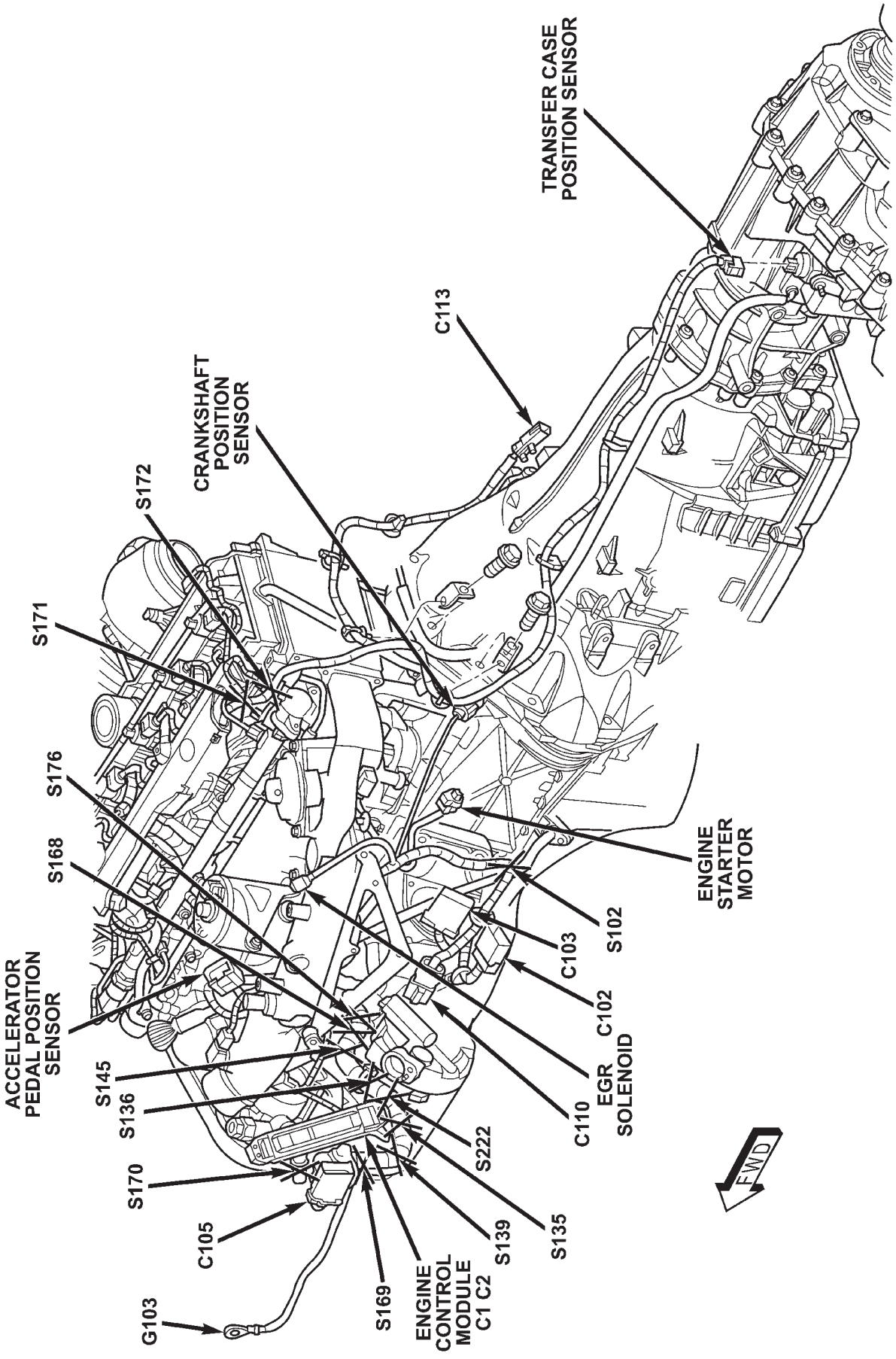


Fig. 7 2.7 LITER DIESEL ENGINE LEFT SIDE

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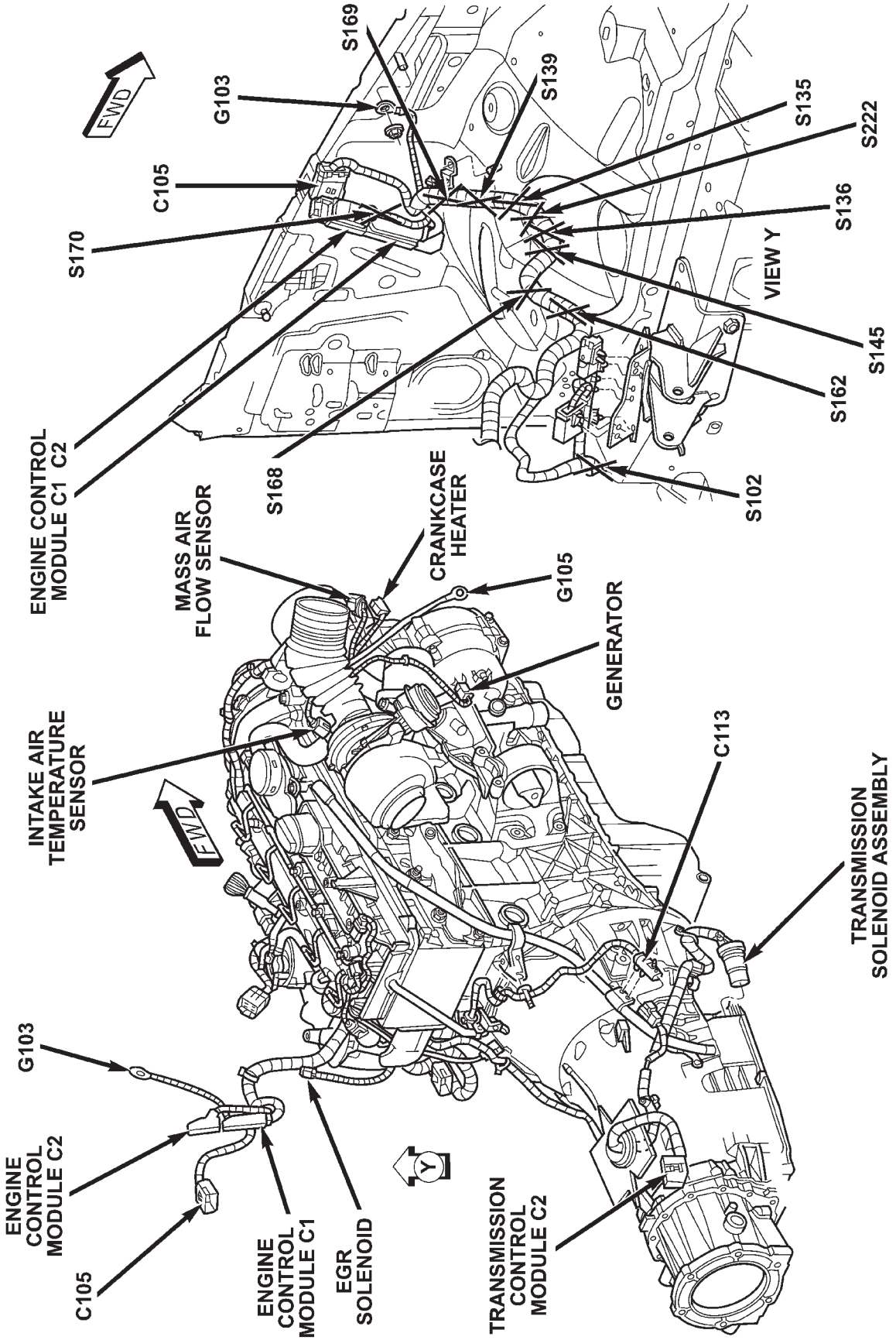


Fig. 8 2.7 LITER DIESEL ENGINE RIGHT SIDE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

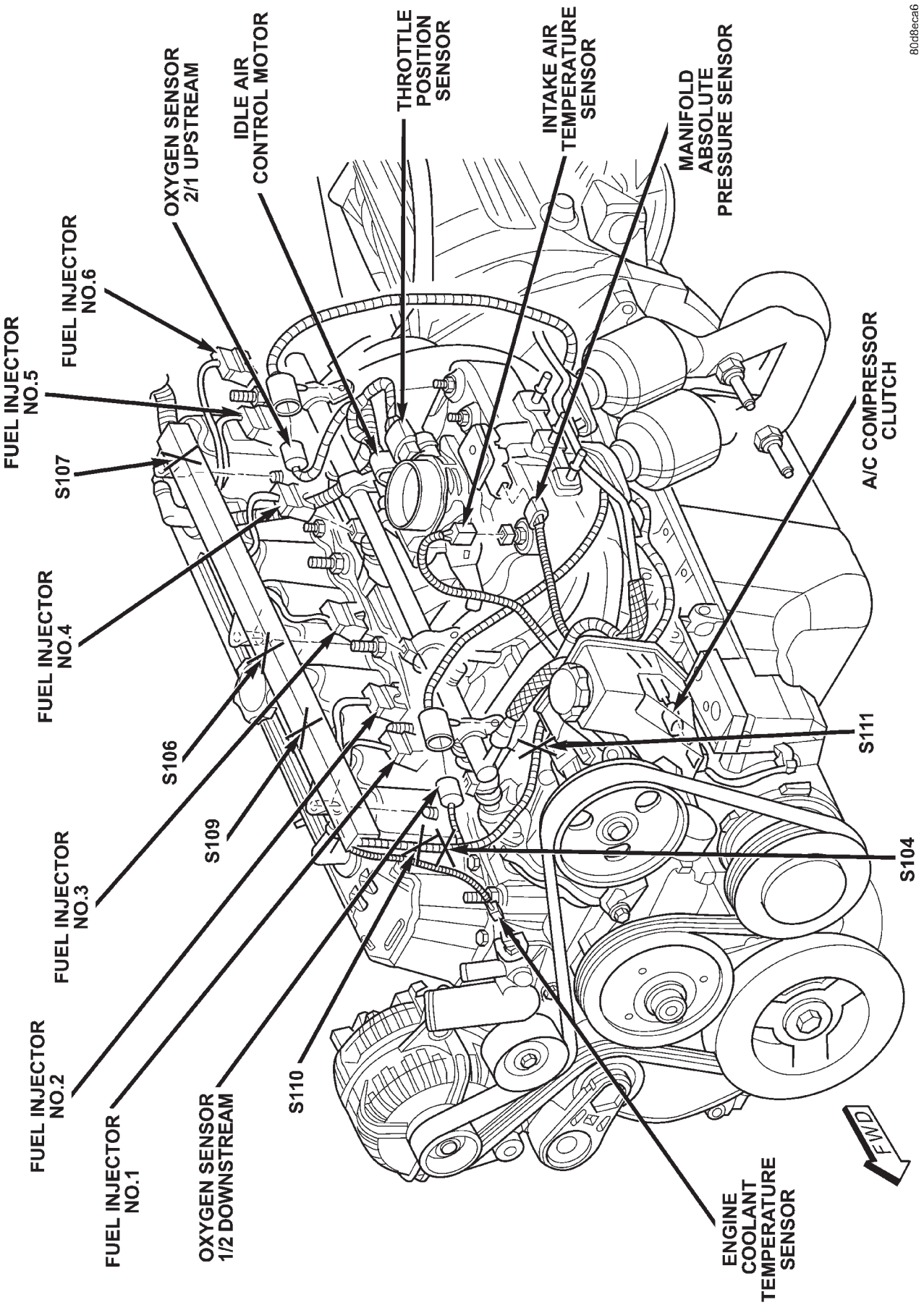


Fig. 9 4.0 LITER ENGINE LEFT SIDE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

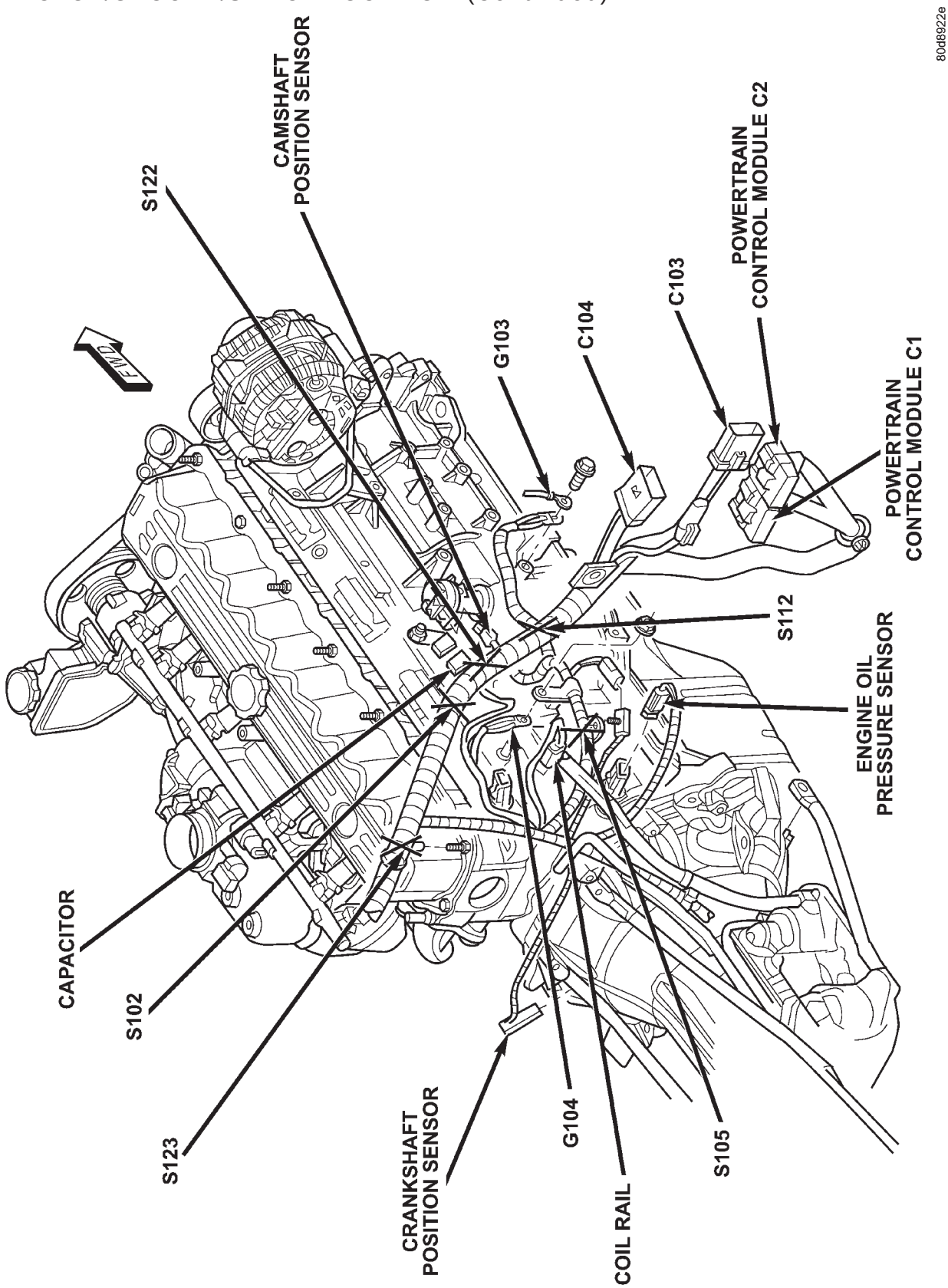


Fig. 10 4.0 LITER ENGINE RIGHT REAR LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

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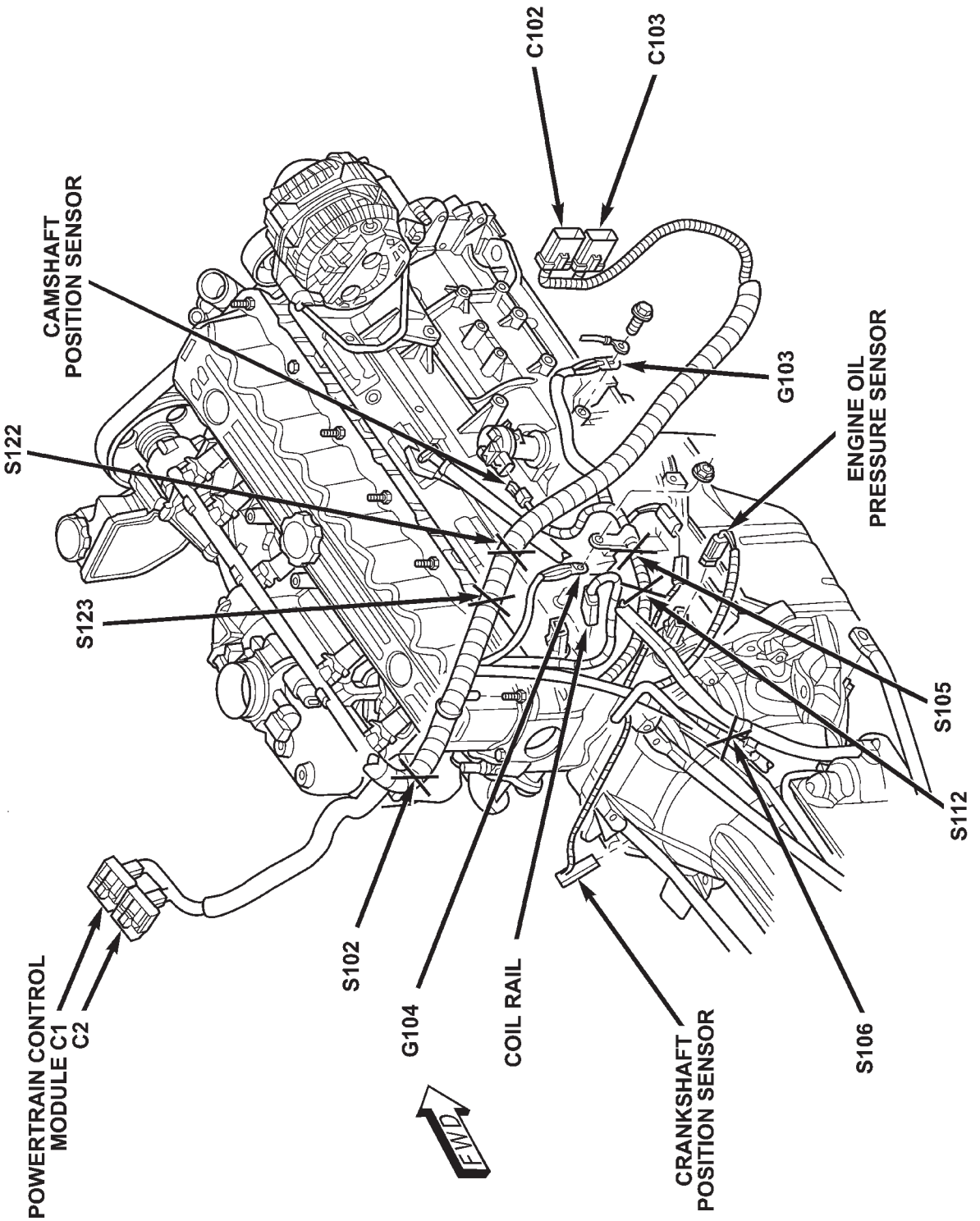


Fig. 11 4.0 LITER ENGINE RIGHT REAR RHD

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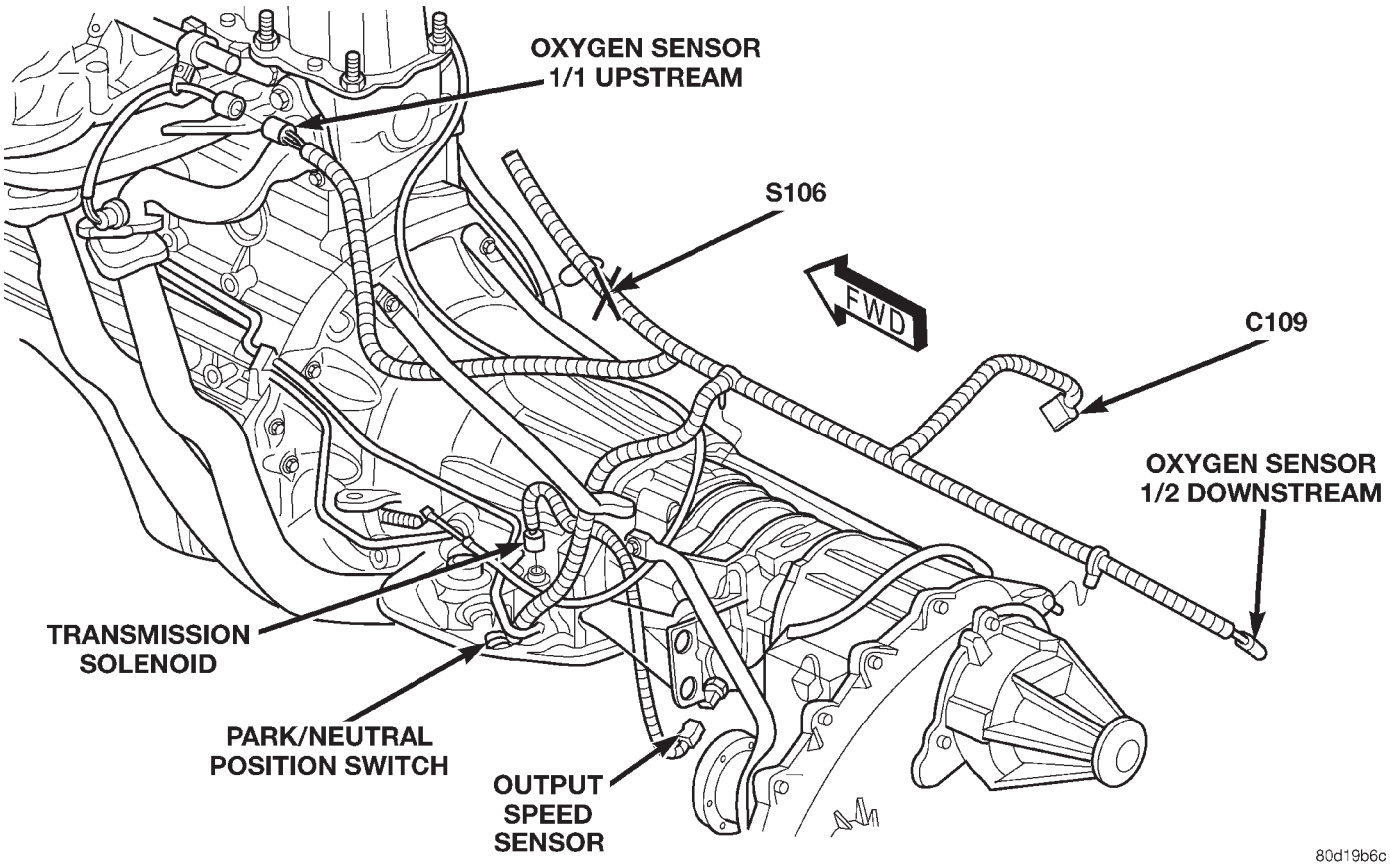


Fig. 12 TRANSMISSION 4.0 LITER ENGINE

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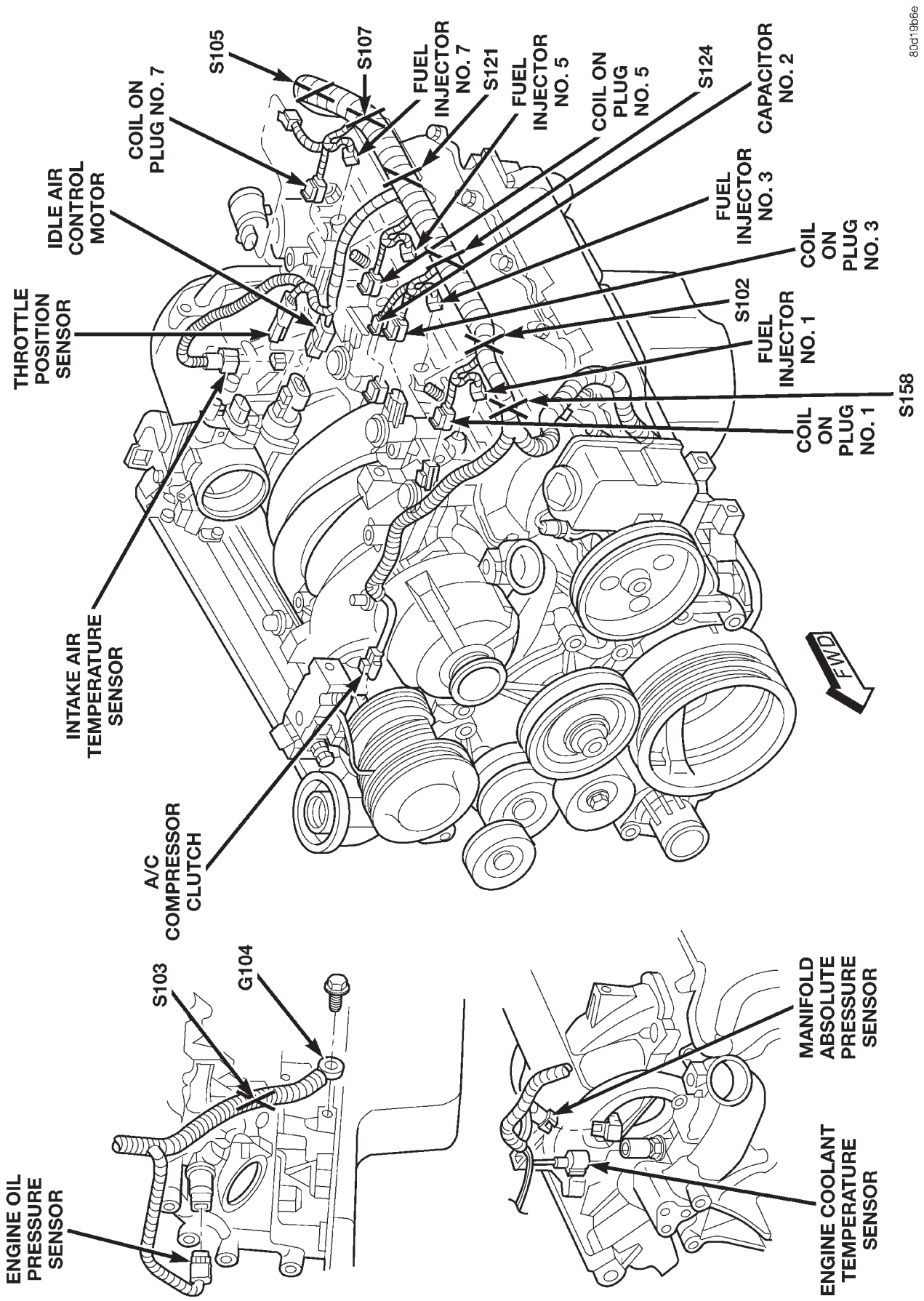


Fig. 13 4.7 LITER ENGINE LEFT FRONT

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

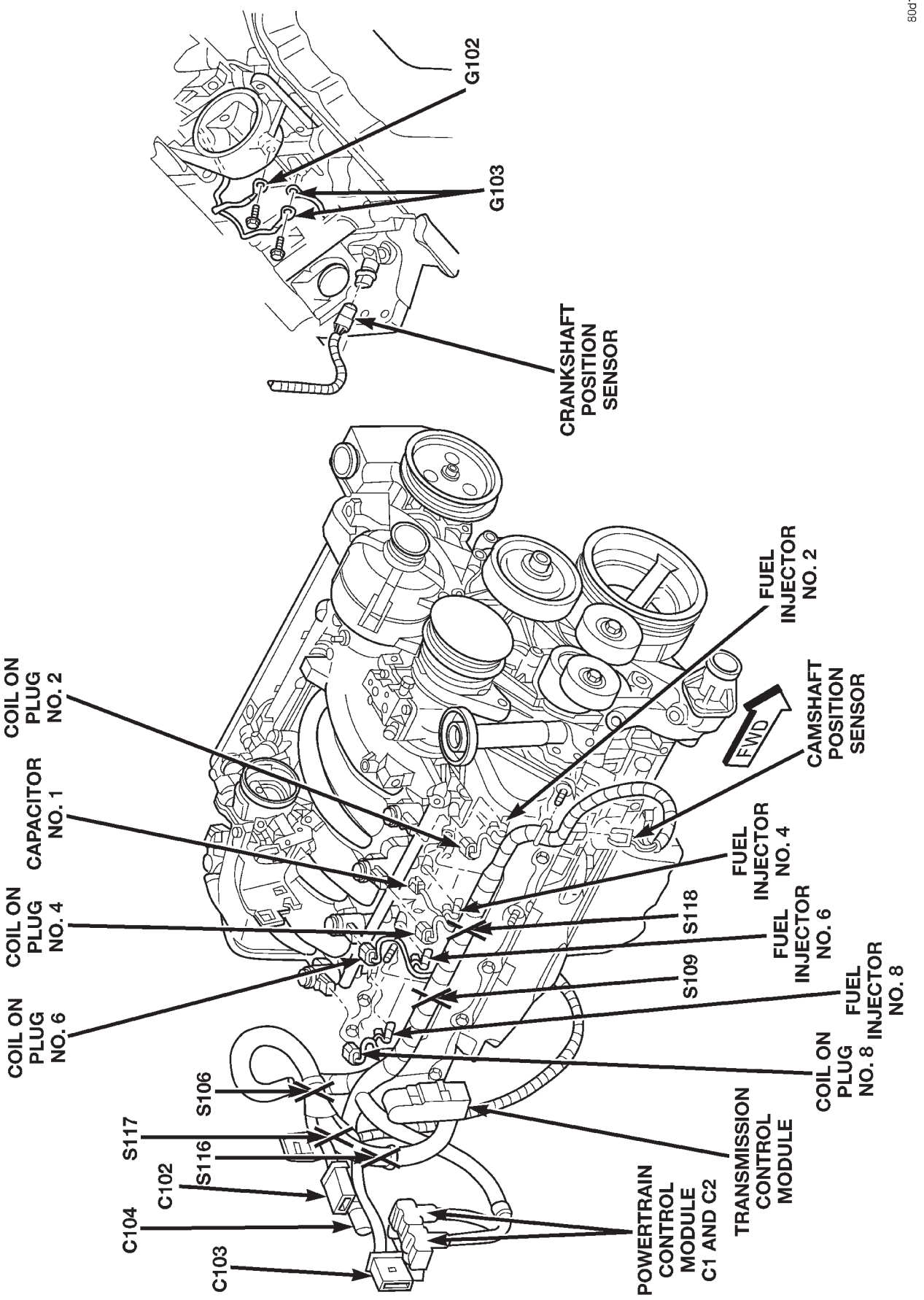


Fig. 14 4.7 LITER ENGINE RIGHT FRONT LHD

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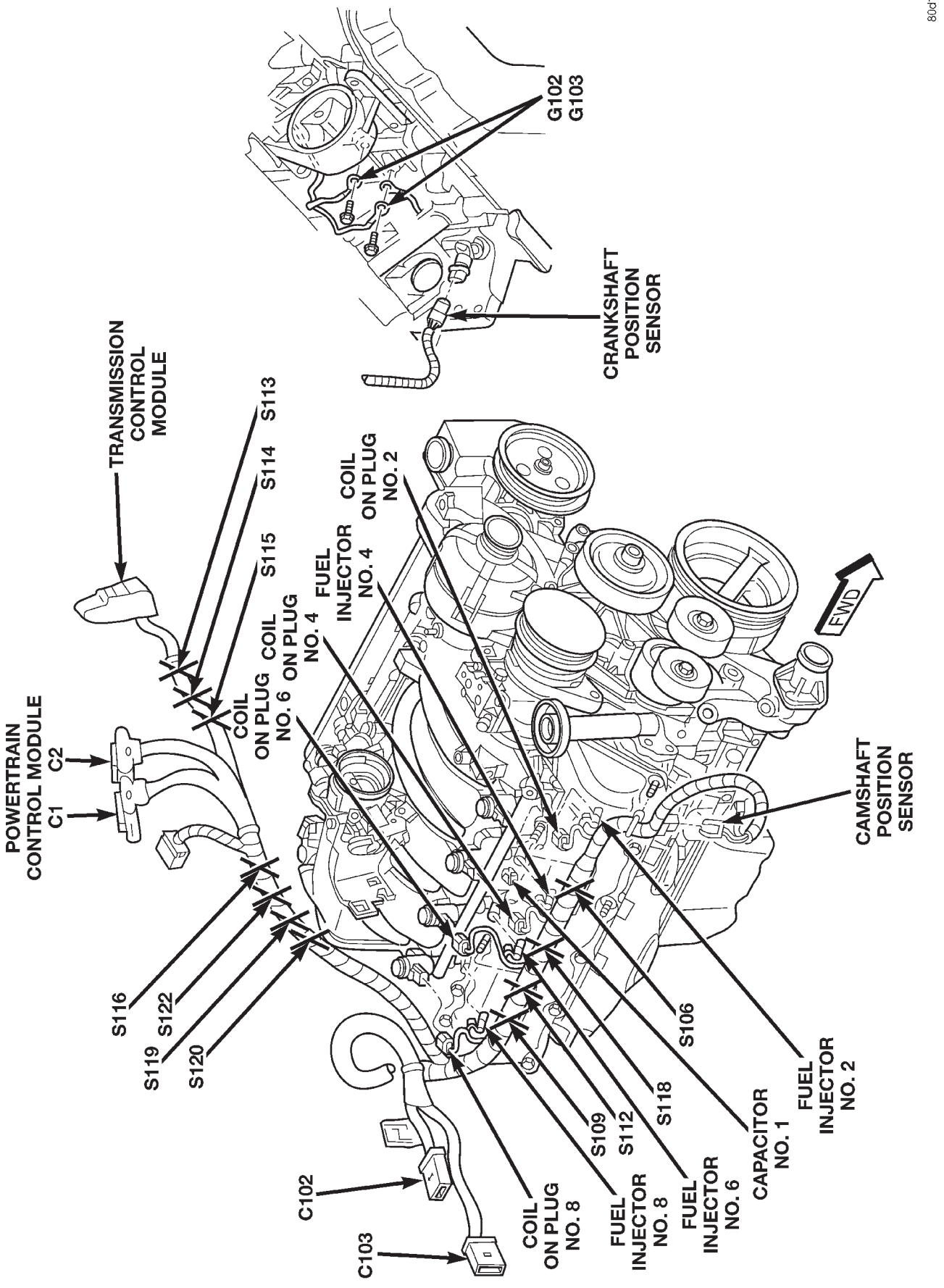


Fig. 15 4.7 LITER ENGINERIGHT FRONT RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

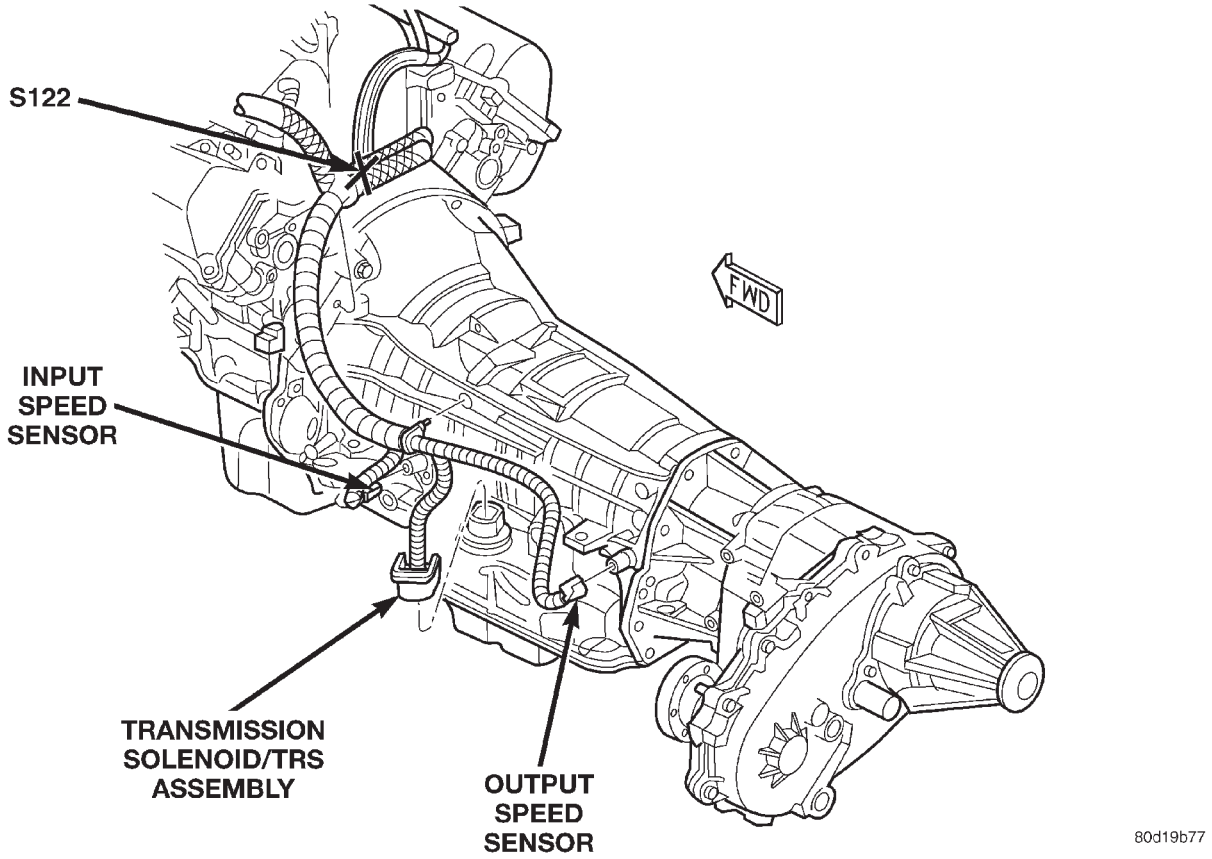


Fig. 16 TRANSMISSION 4.7 LITER ENGINE LEFT SIDE

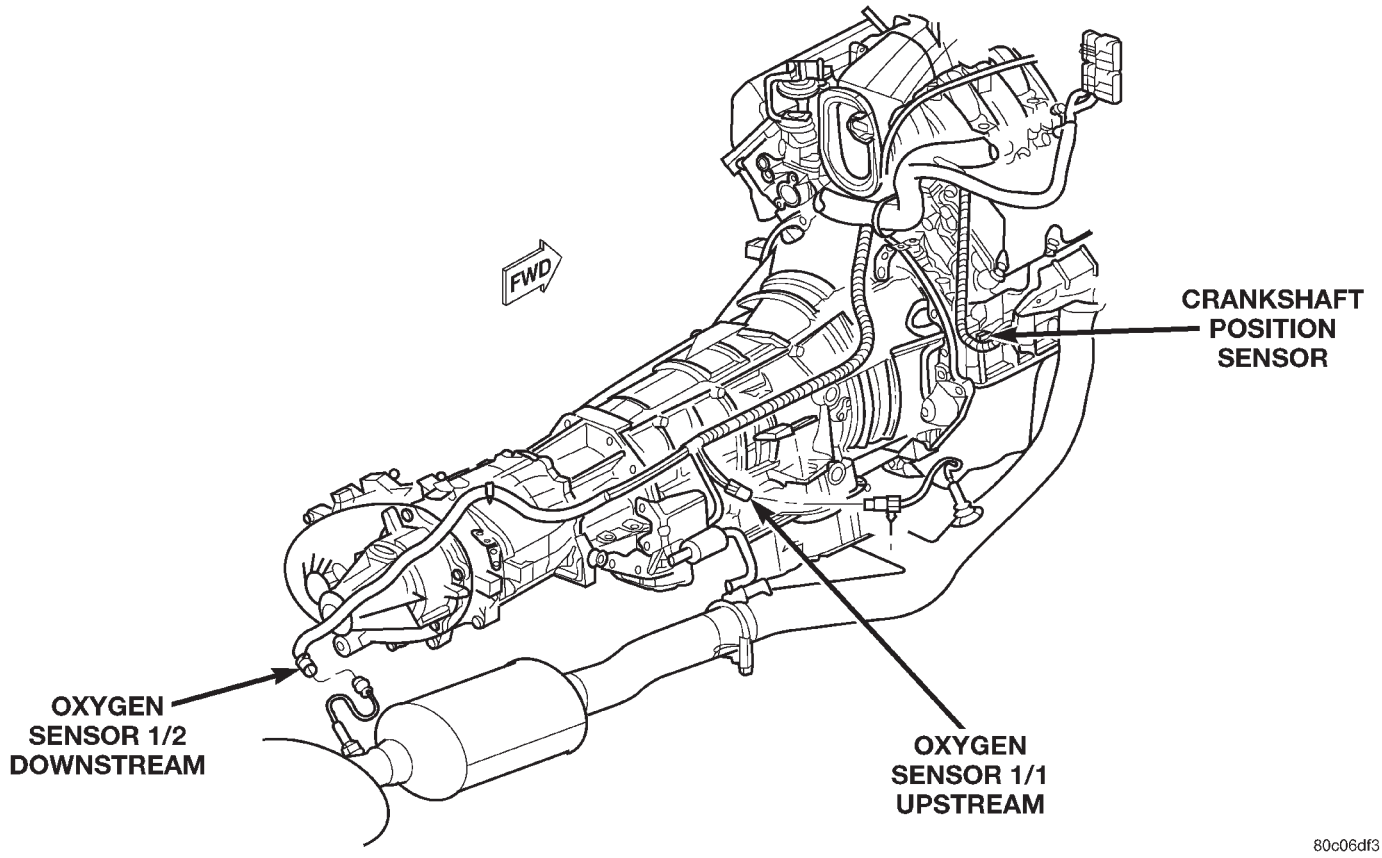


Fig. 17 TRANSMISSION 4.7 LITER ENGINE RIGHT SIDE

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

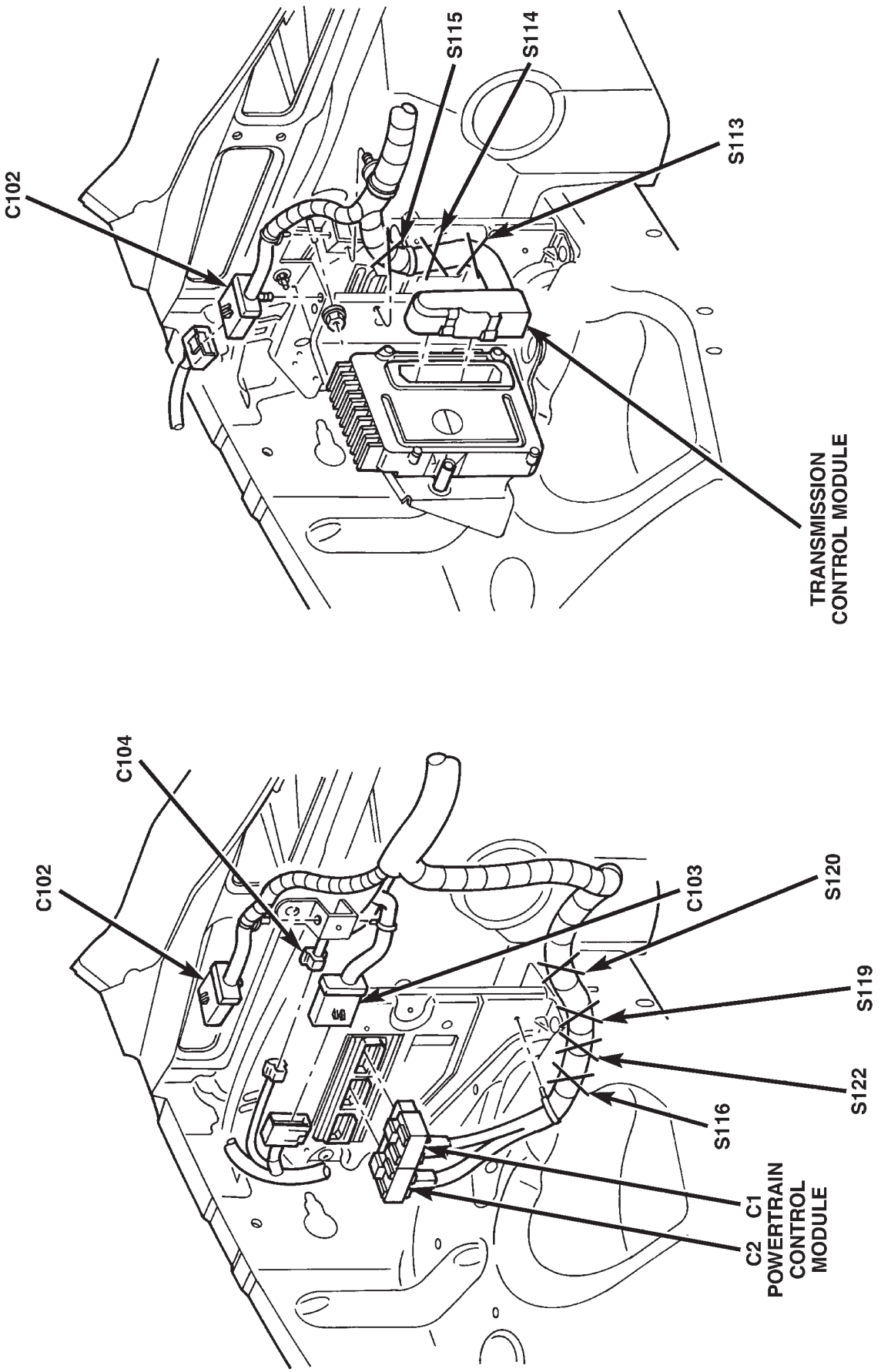


Fig. 18 REAR ENGINE COMPARTMENT LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

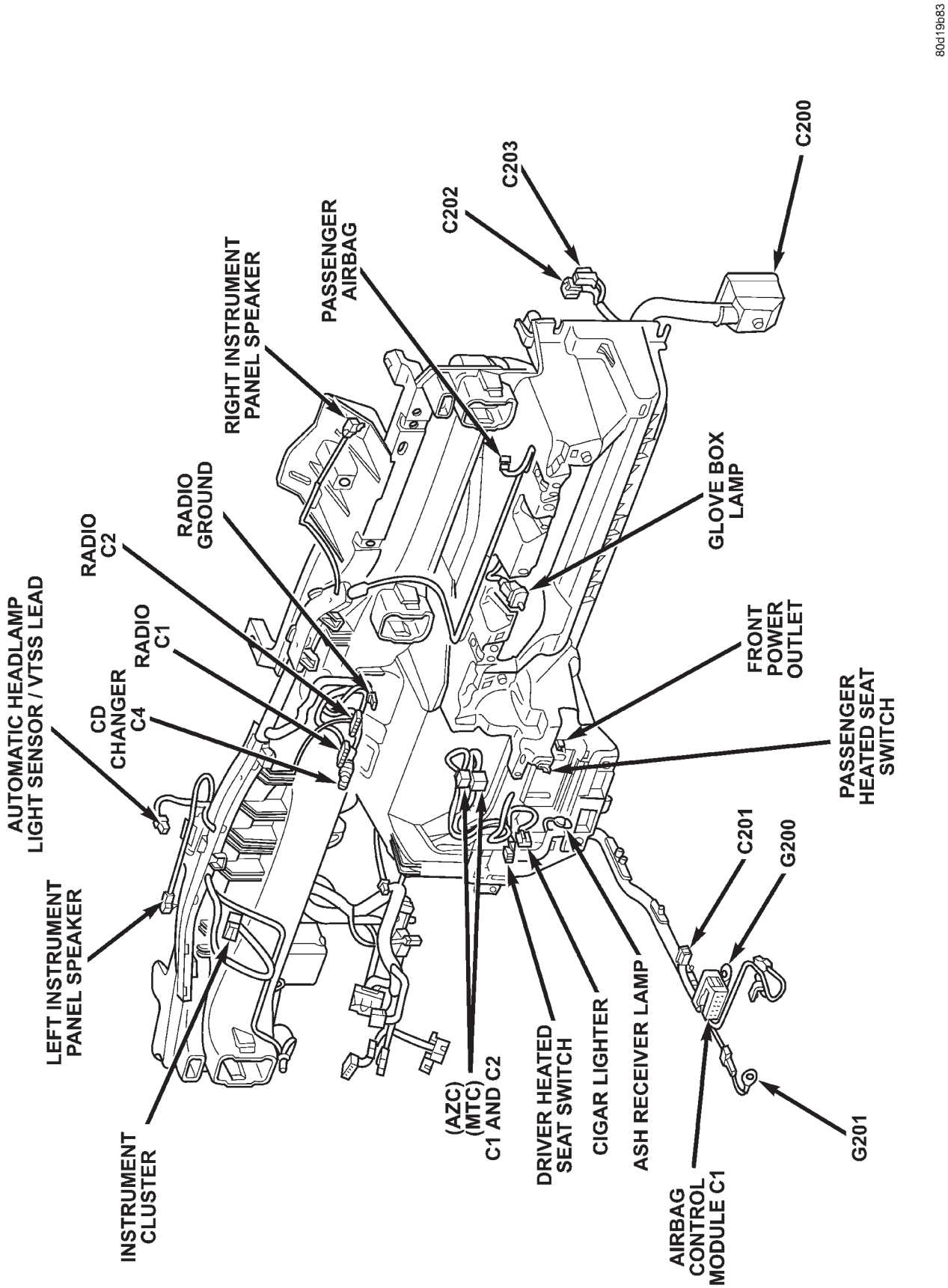


Fig. 19 INSTRUMENT PANEL FRONT LHD

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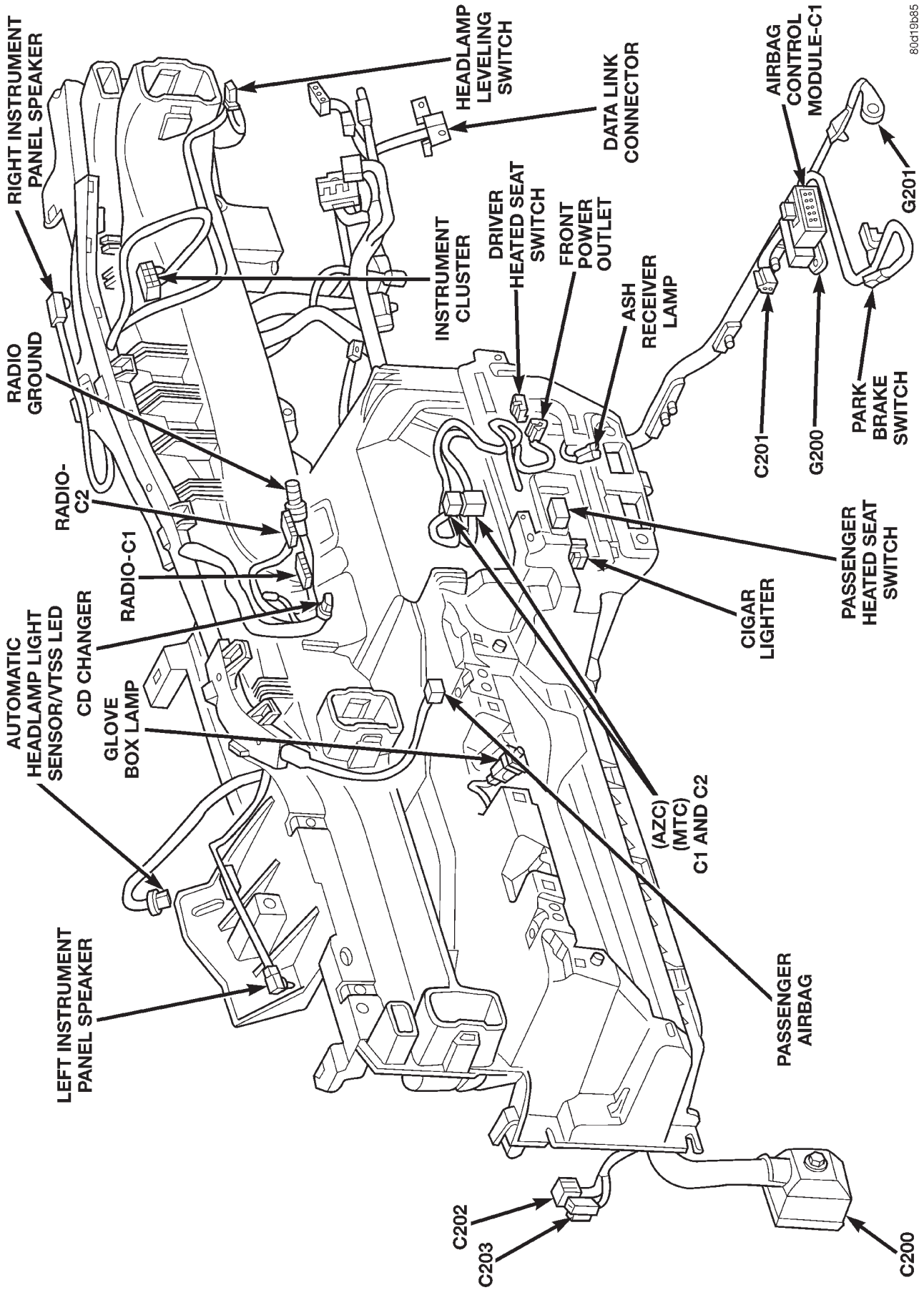


Fig. 20 INSTRUMENT PANEL FRONT RHD

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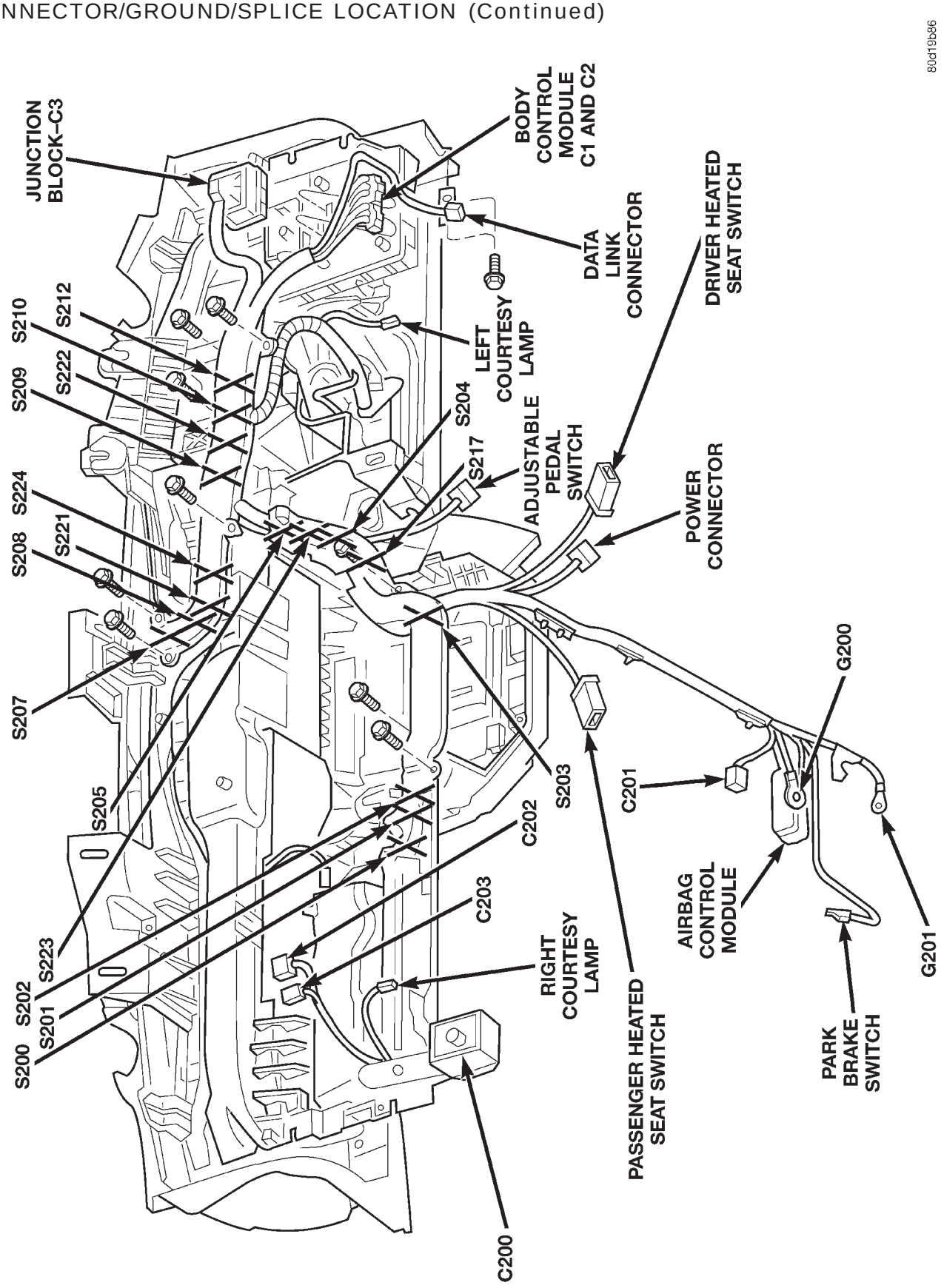


Fig. 21 INSTRUMENT PANEL REAR LHD

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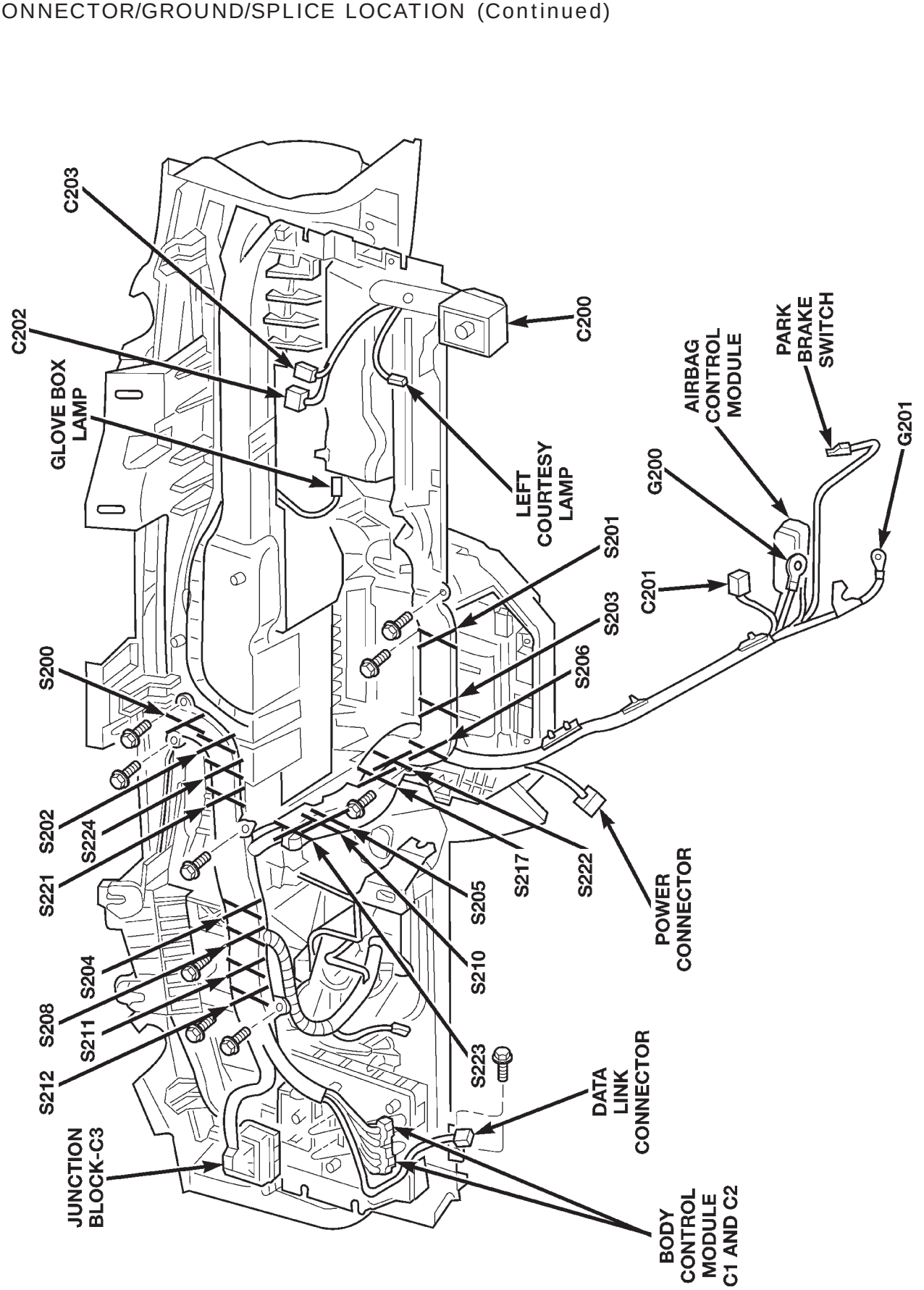


Fig. 22 INSTRUMENT PANEL REAR RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

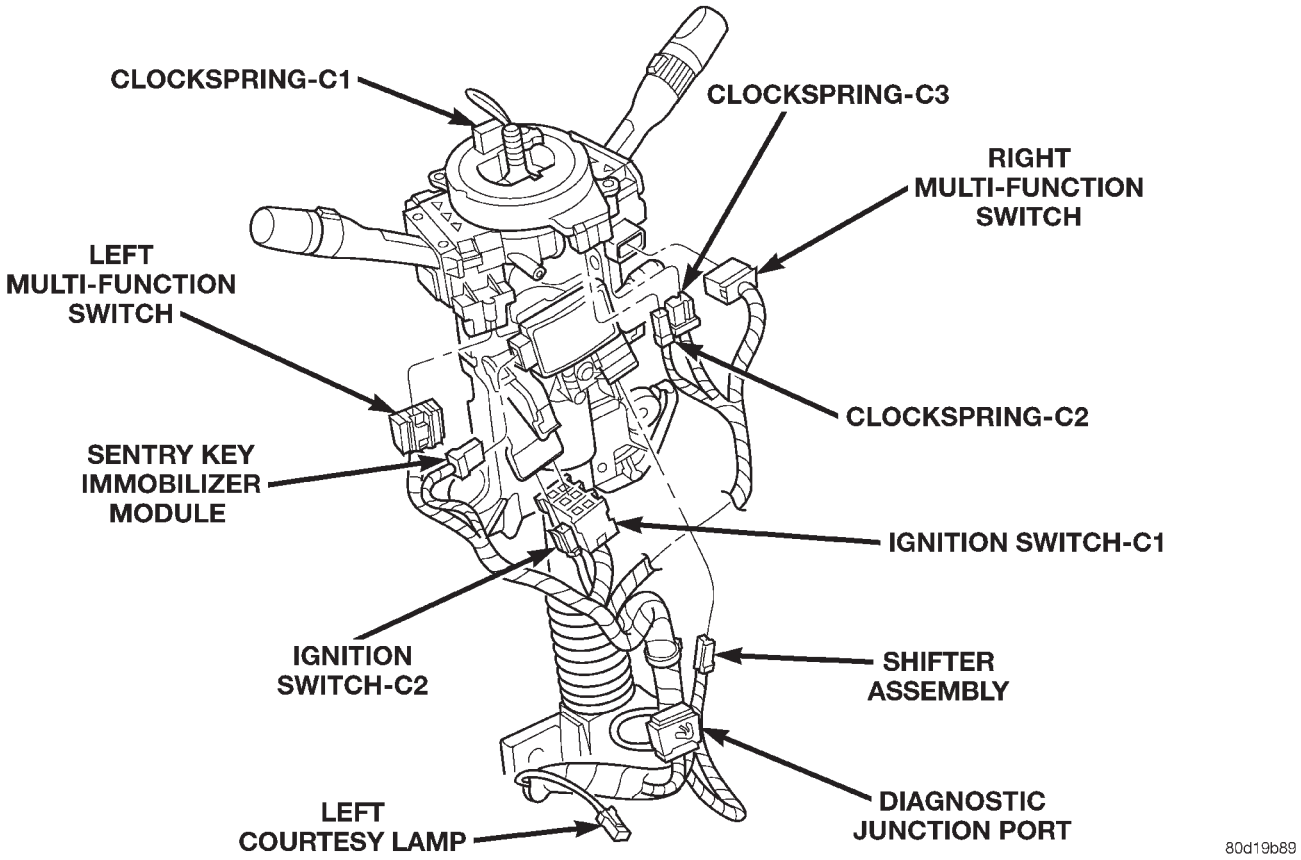


Fig. 23 STEERING COLUMN

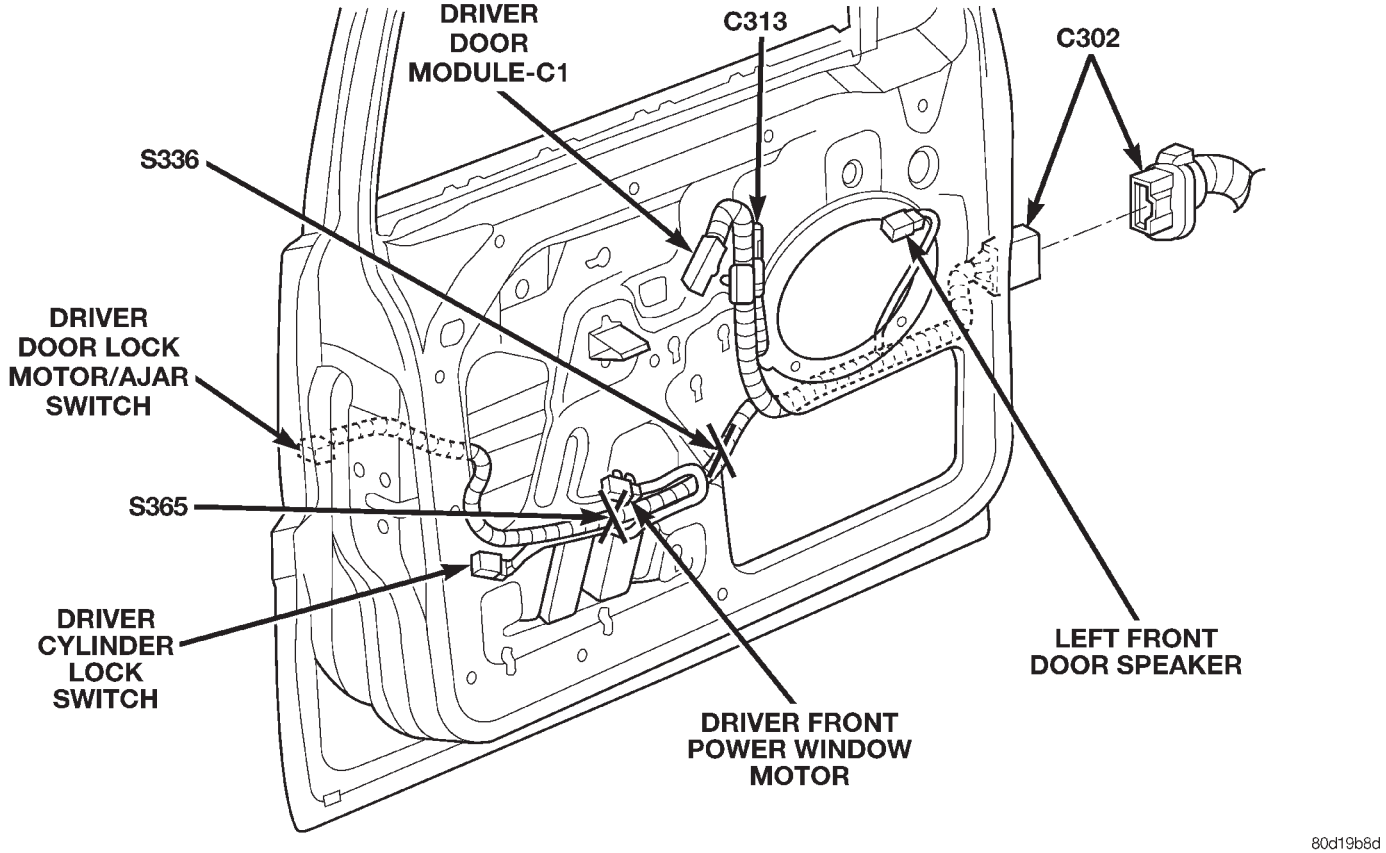


Fig. 24 DRIVER DOOR LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

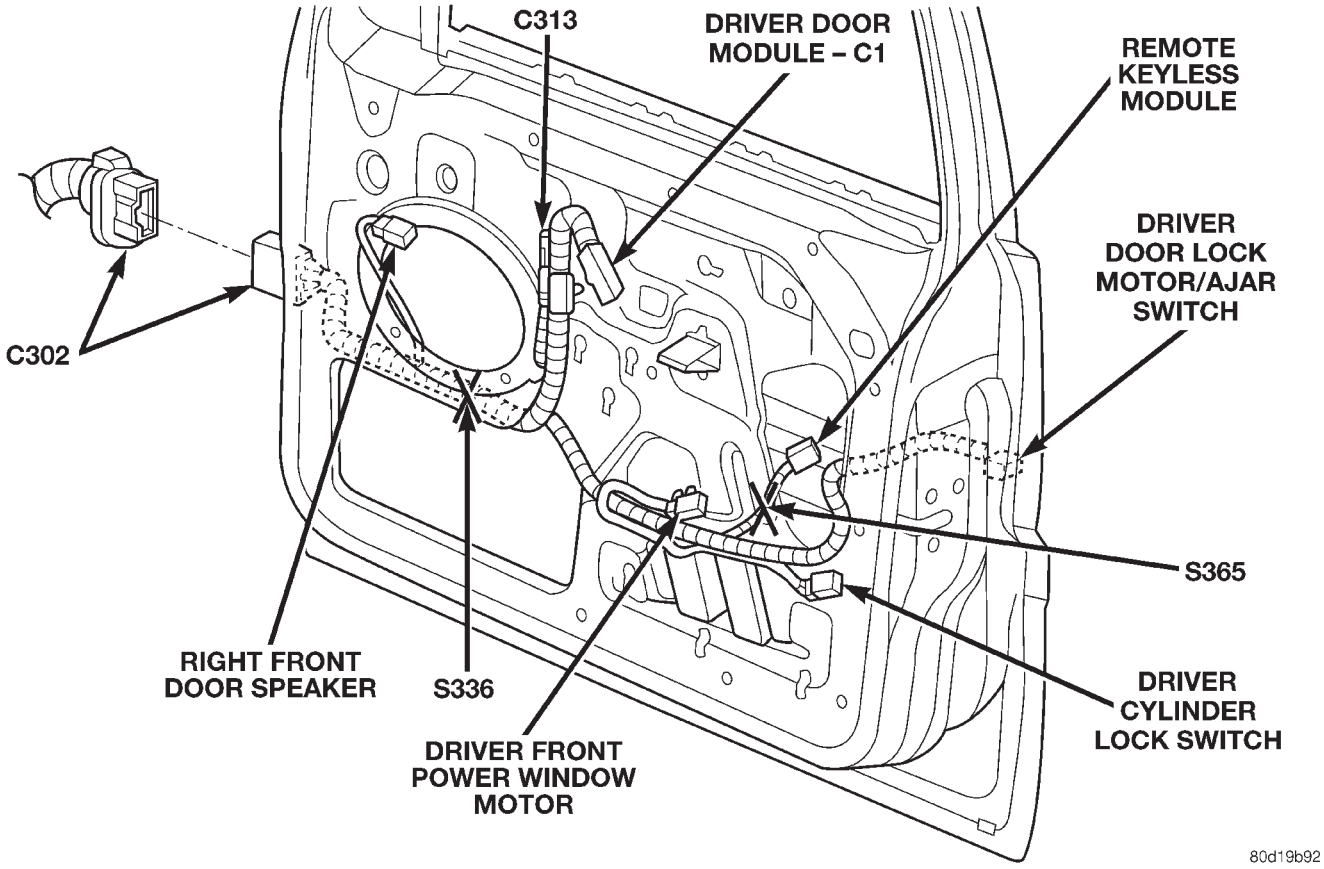


Fig. 25 DRIVER DOOR RHD

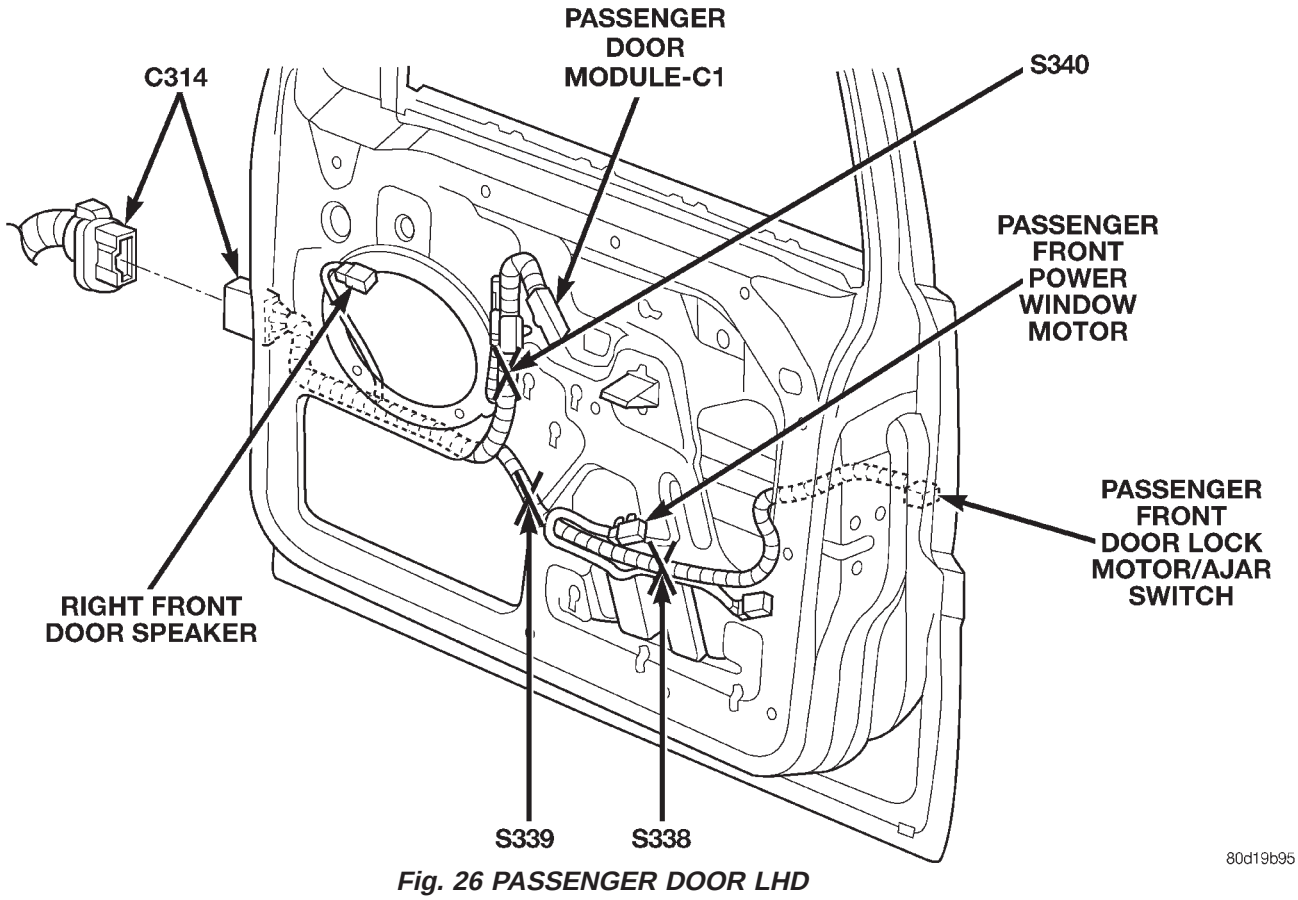


Fig. 26 PASSENGER DOOR LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

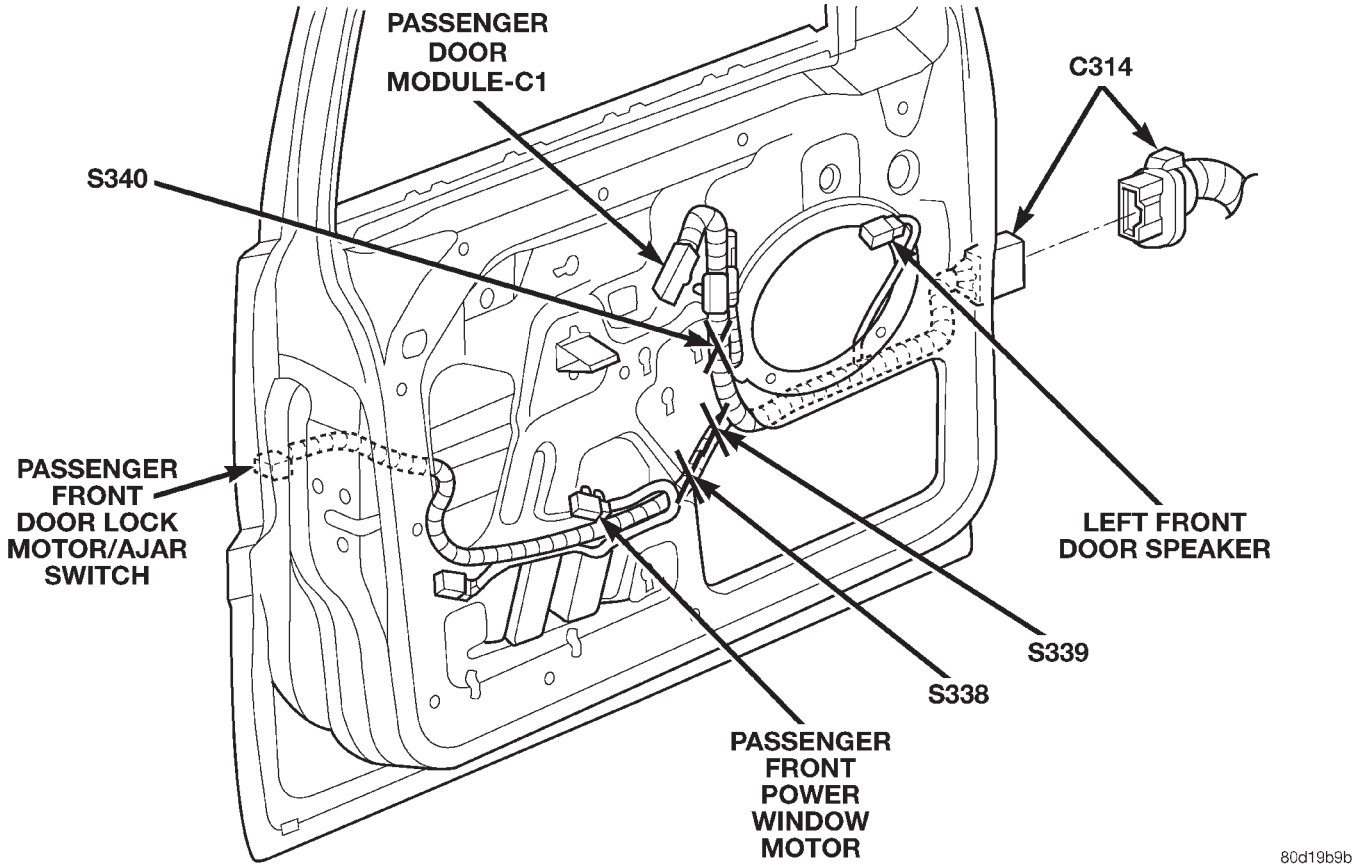


Fig. 27 PASSENGER DOOR RHD

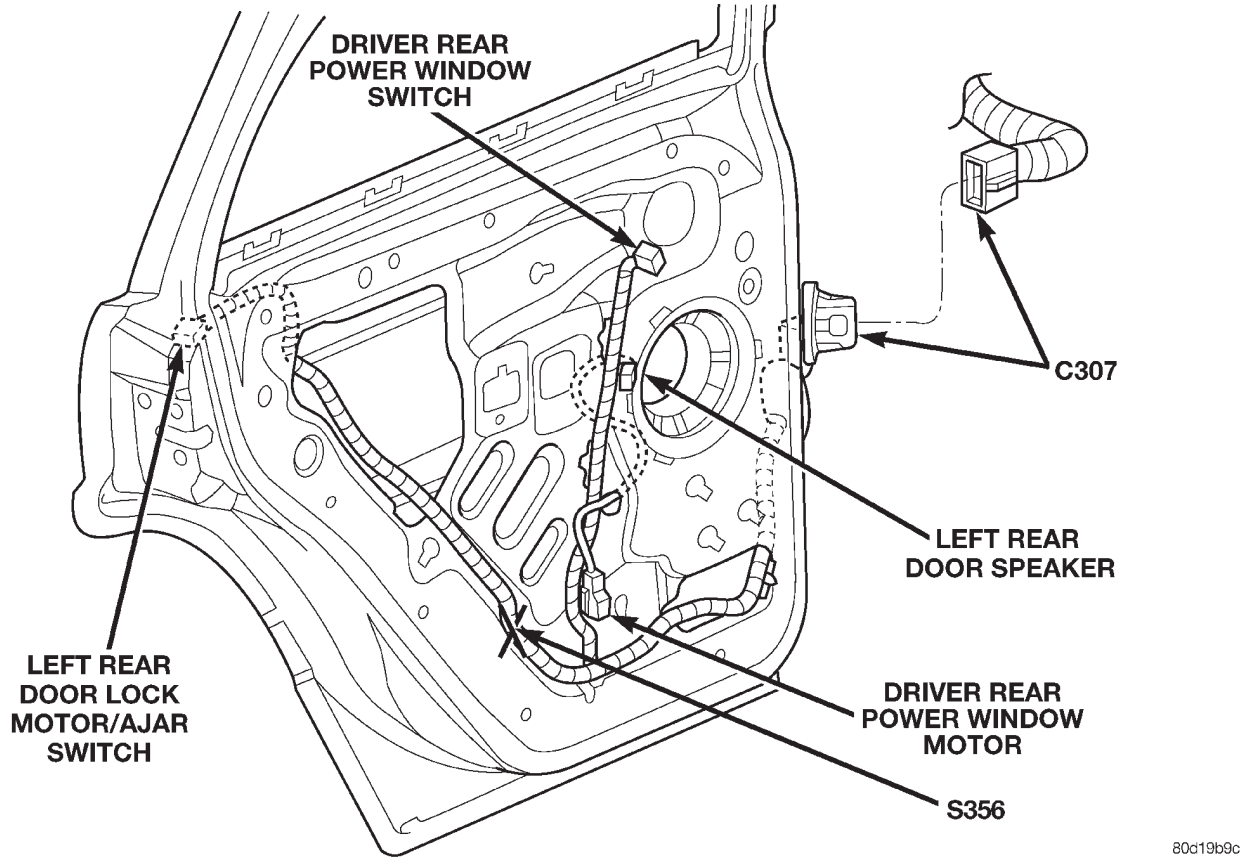


Fig. 28 LEFT REAR DOOR

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

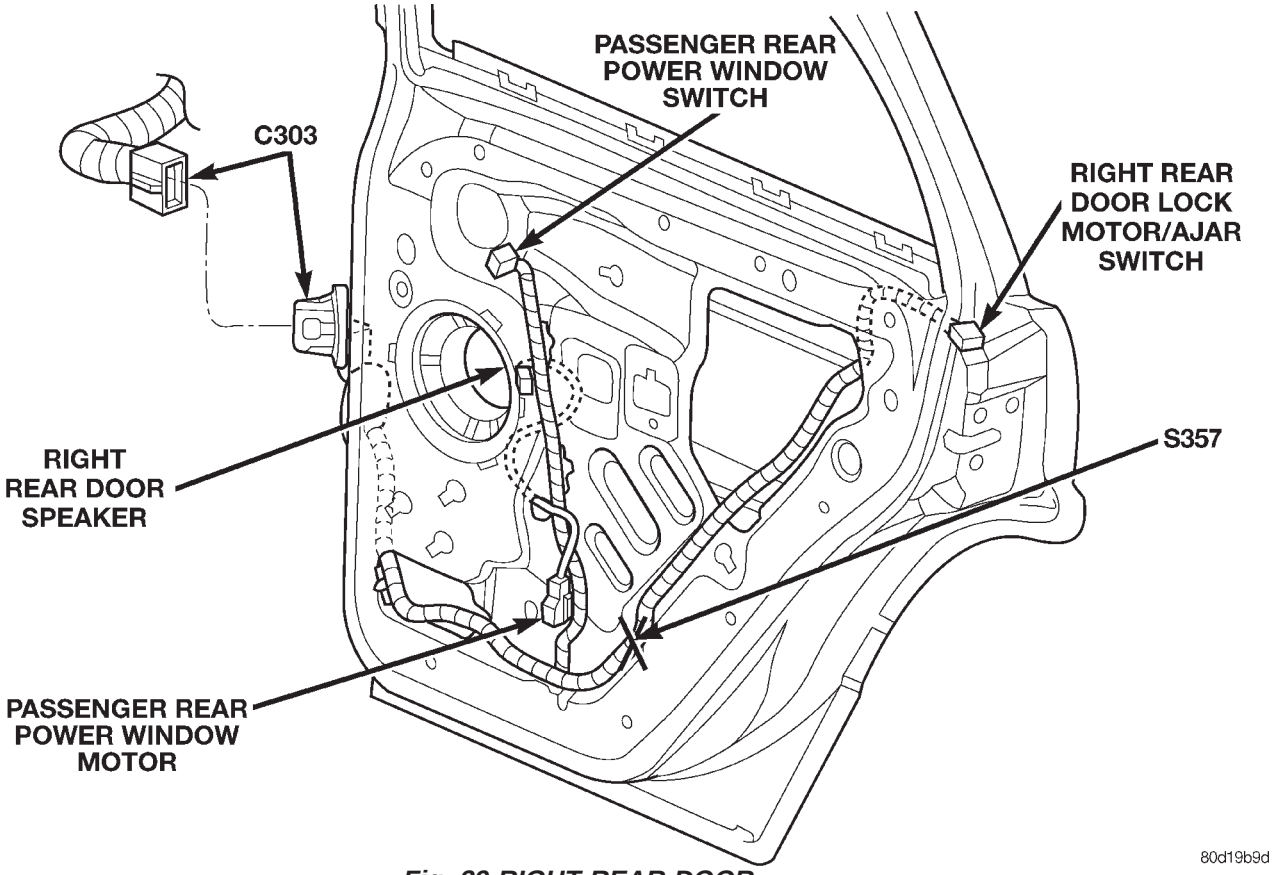


Fig. 29 RIGHT REAR DOOR

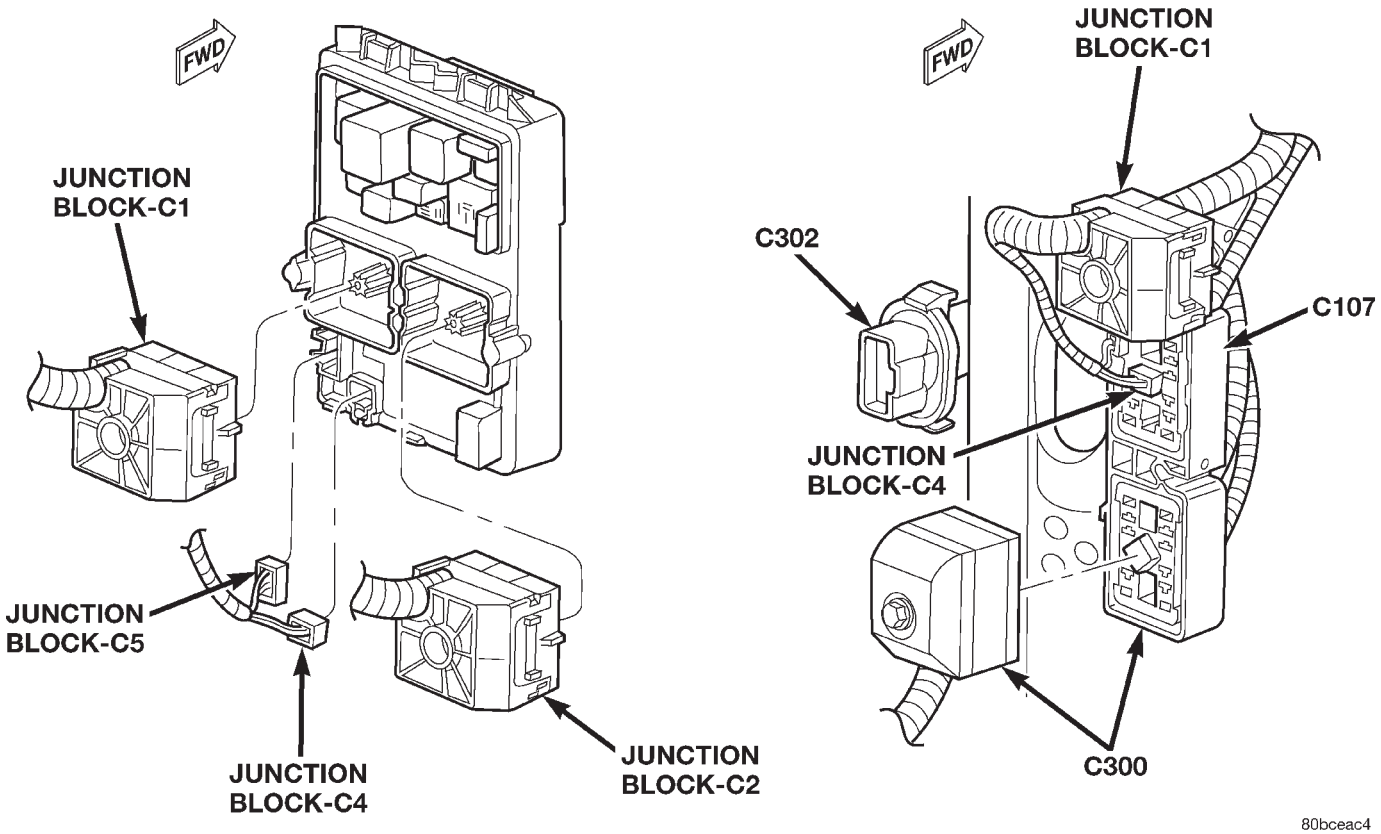


Fig. 30 KICK PANEL AREA LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

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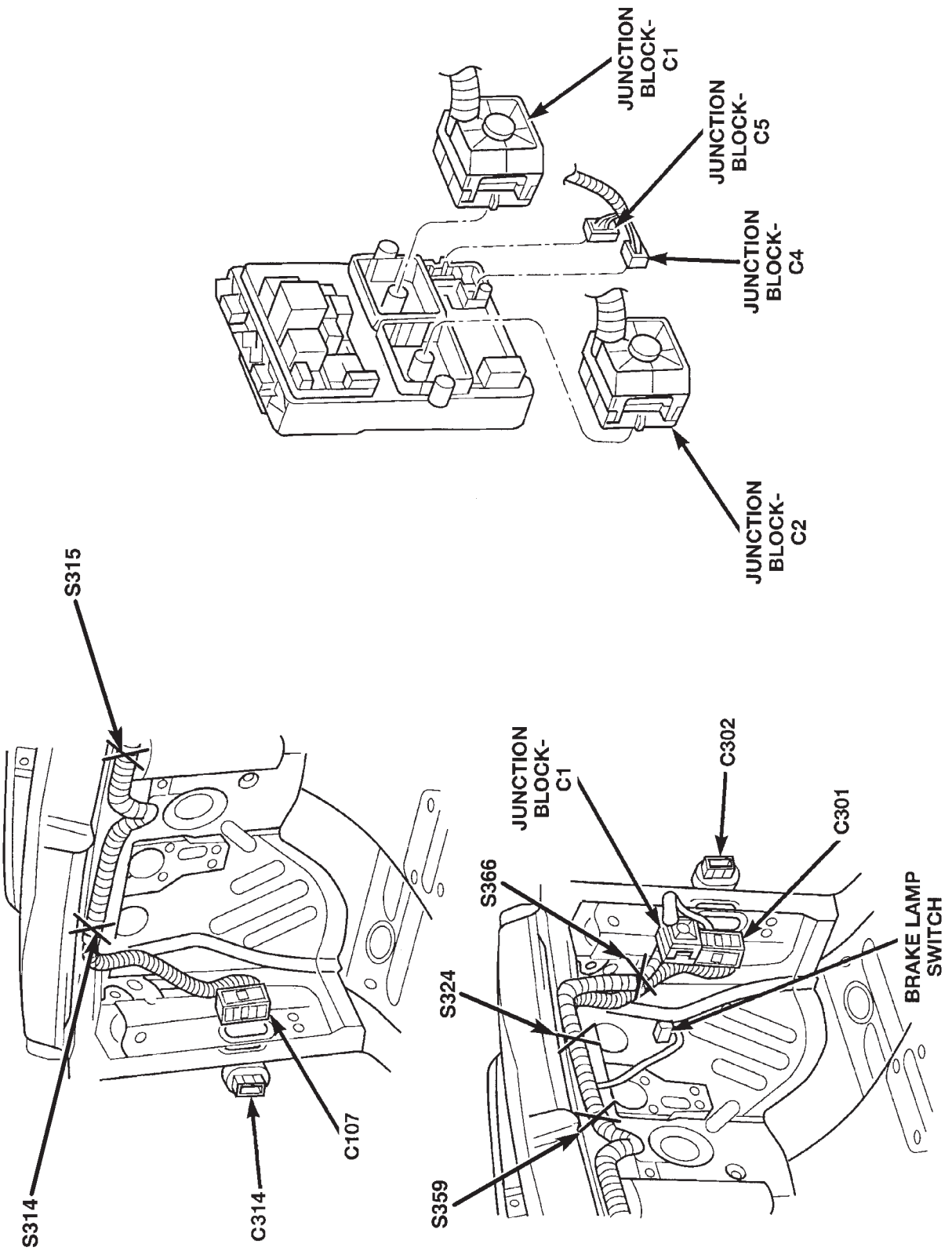


Fig. 31 KICK PANEL AREA RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

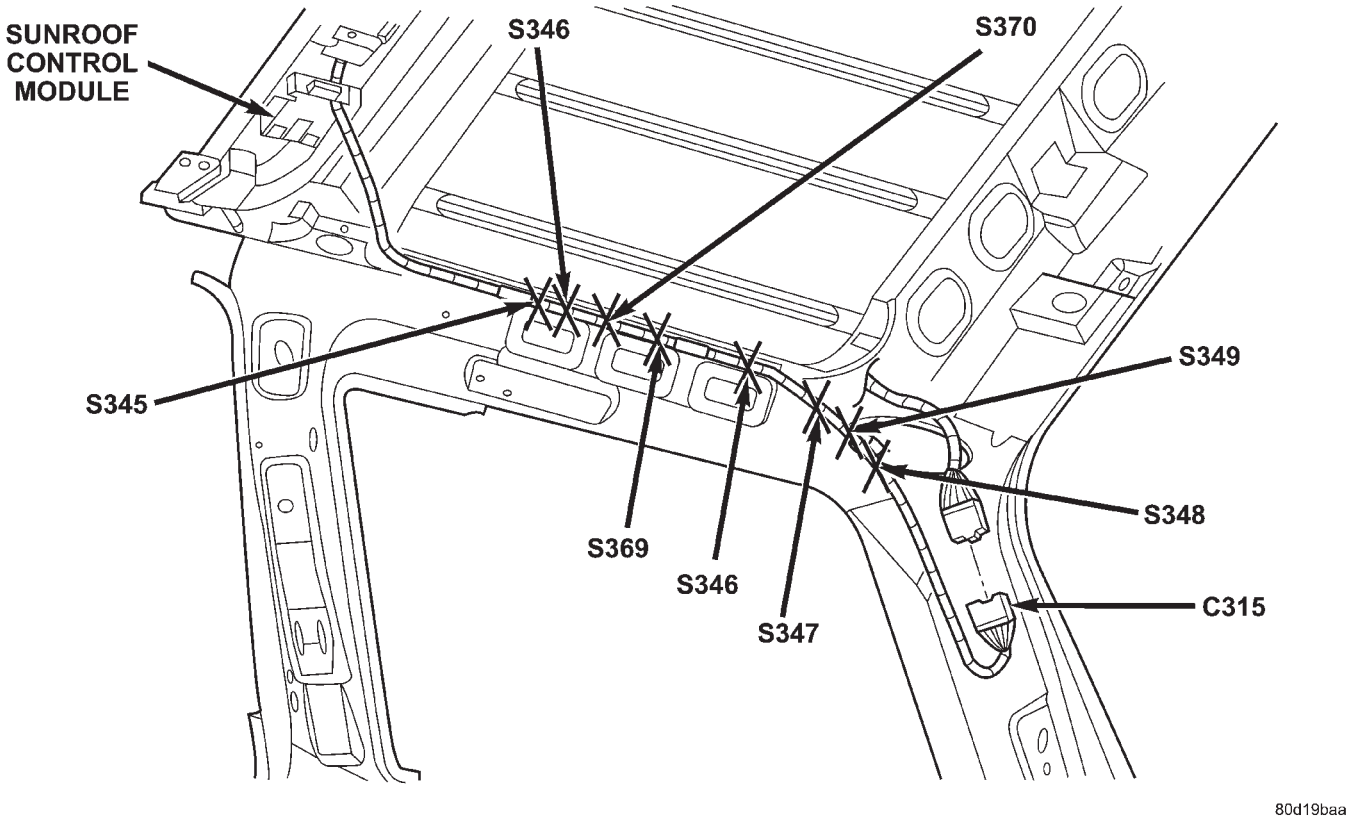


Fig. 32 ROOF AREA

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

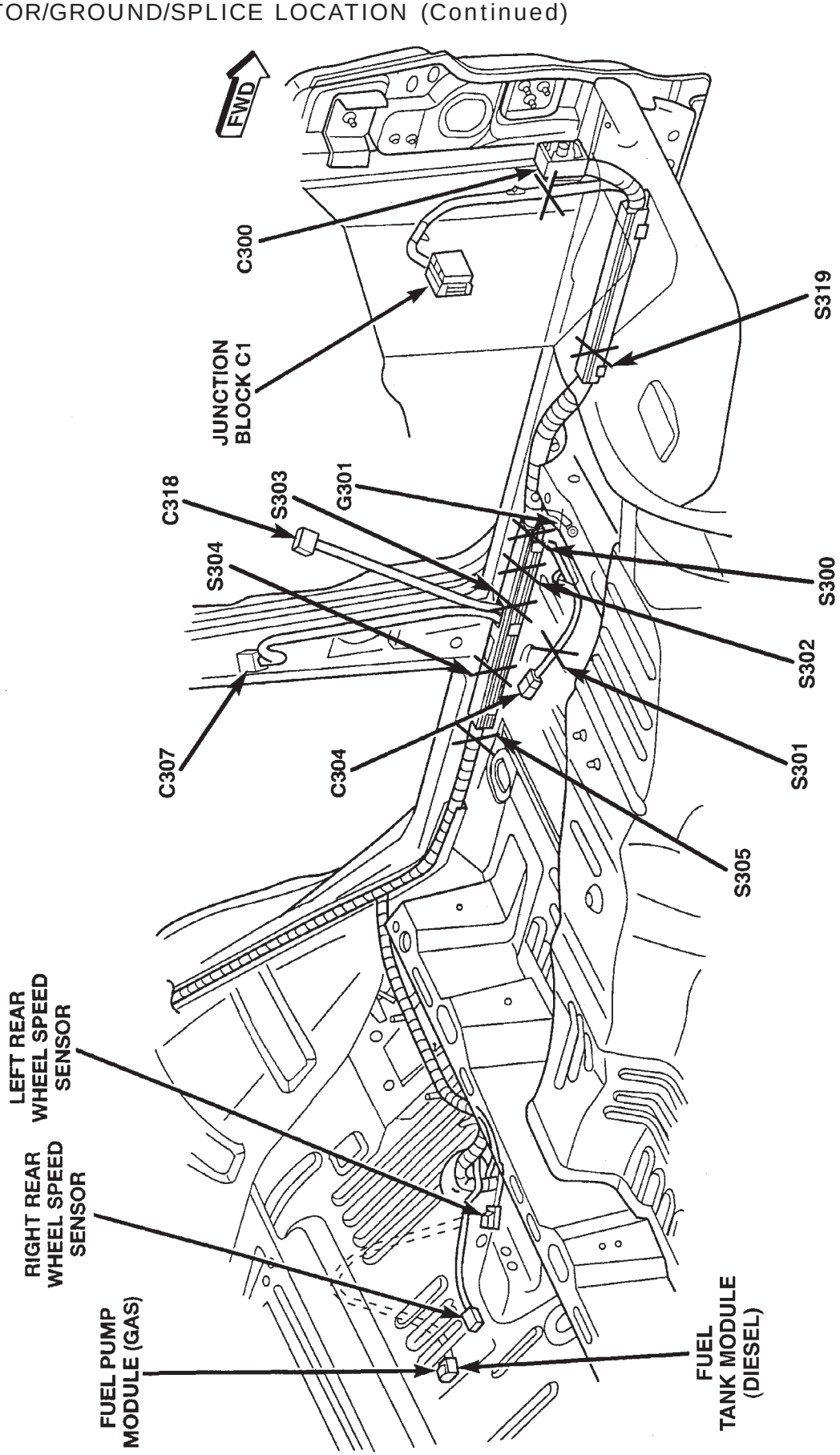


Fig. 33 BODY LEFT SIDE LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

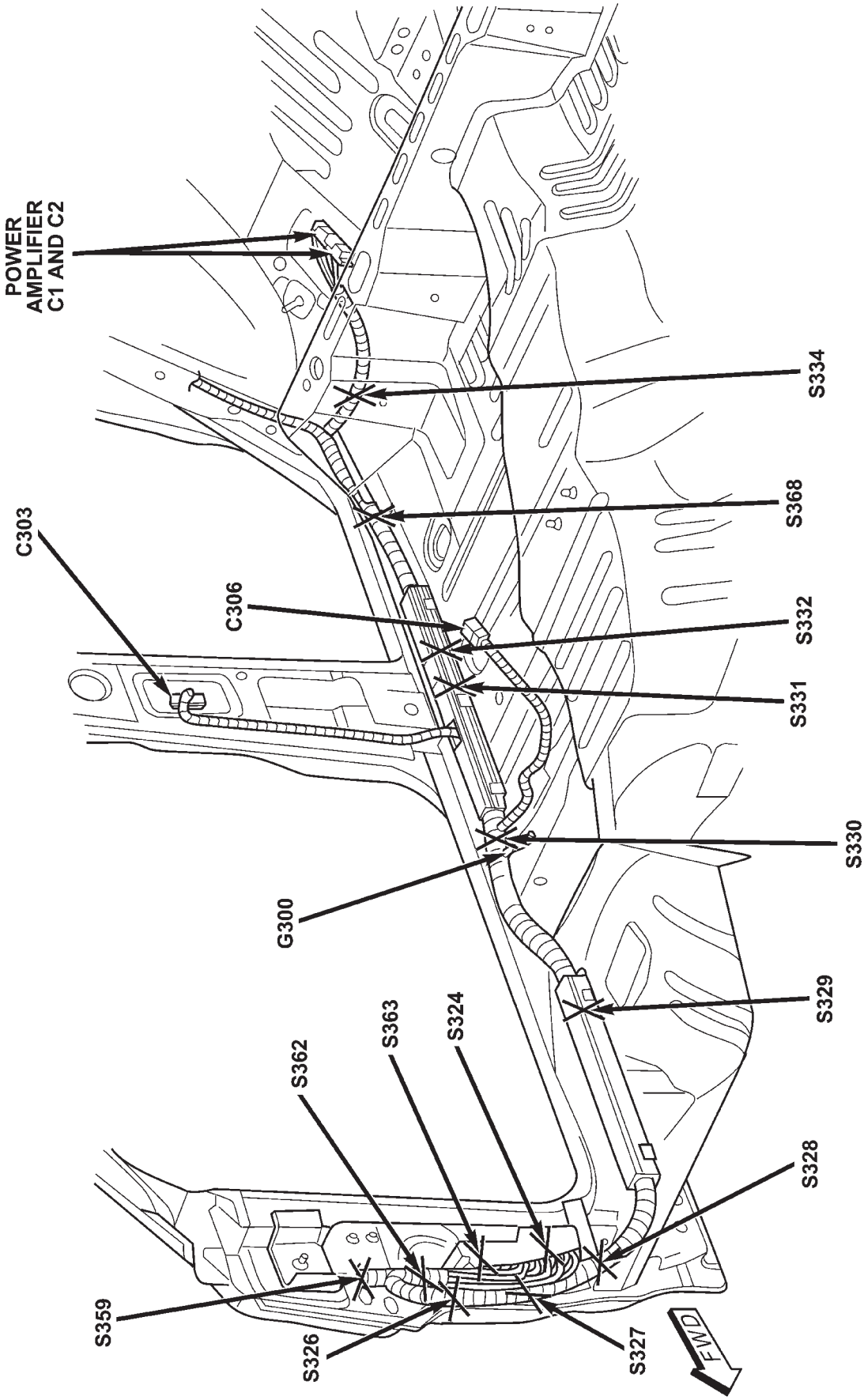


Fig. 34 BODY RIGHT SIDE LHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

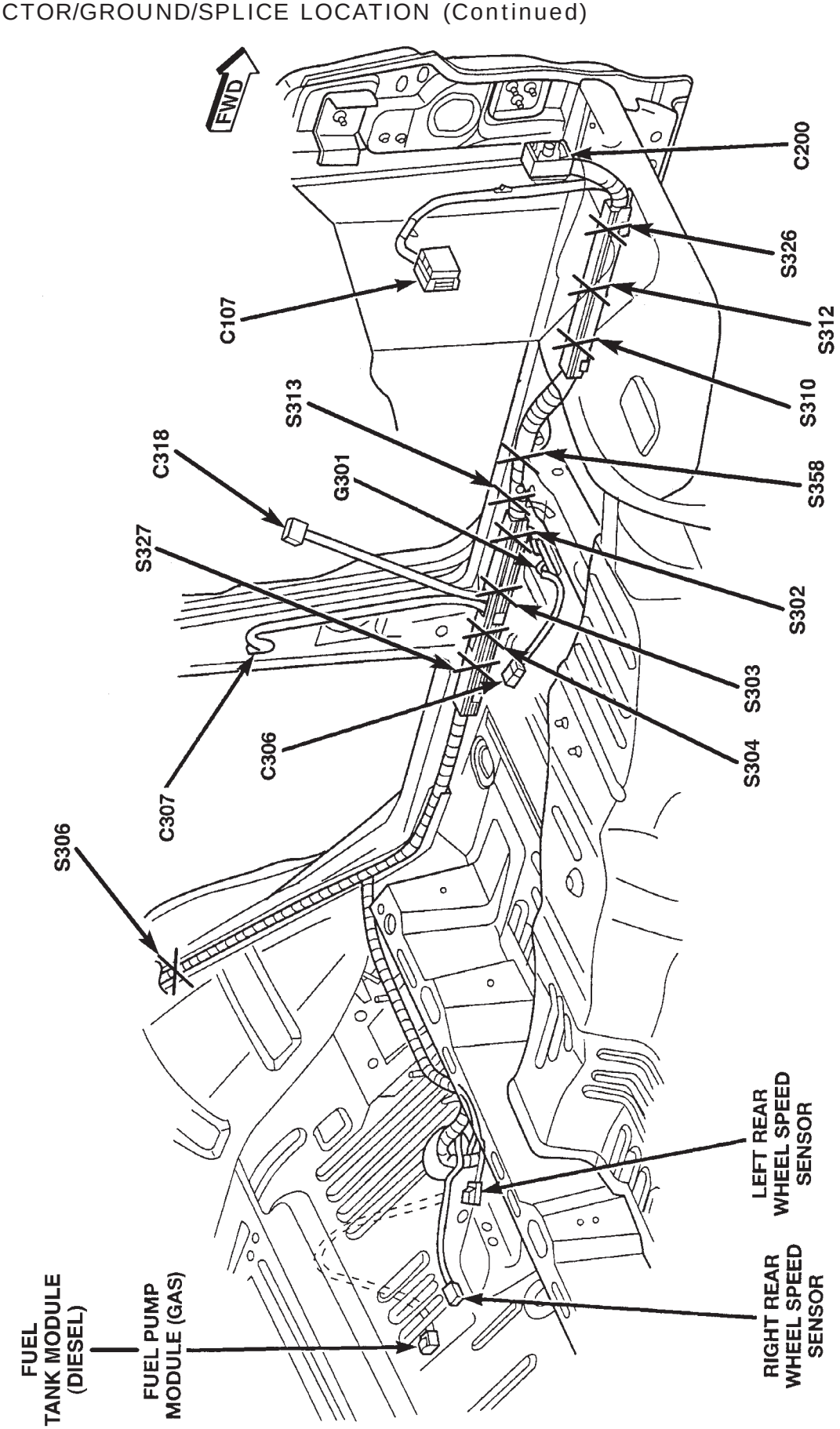


Fig. 35 BODY LEFT SIDE RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

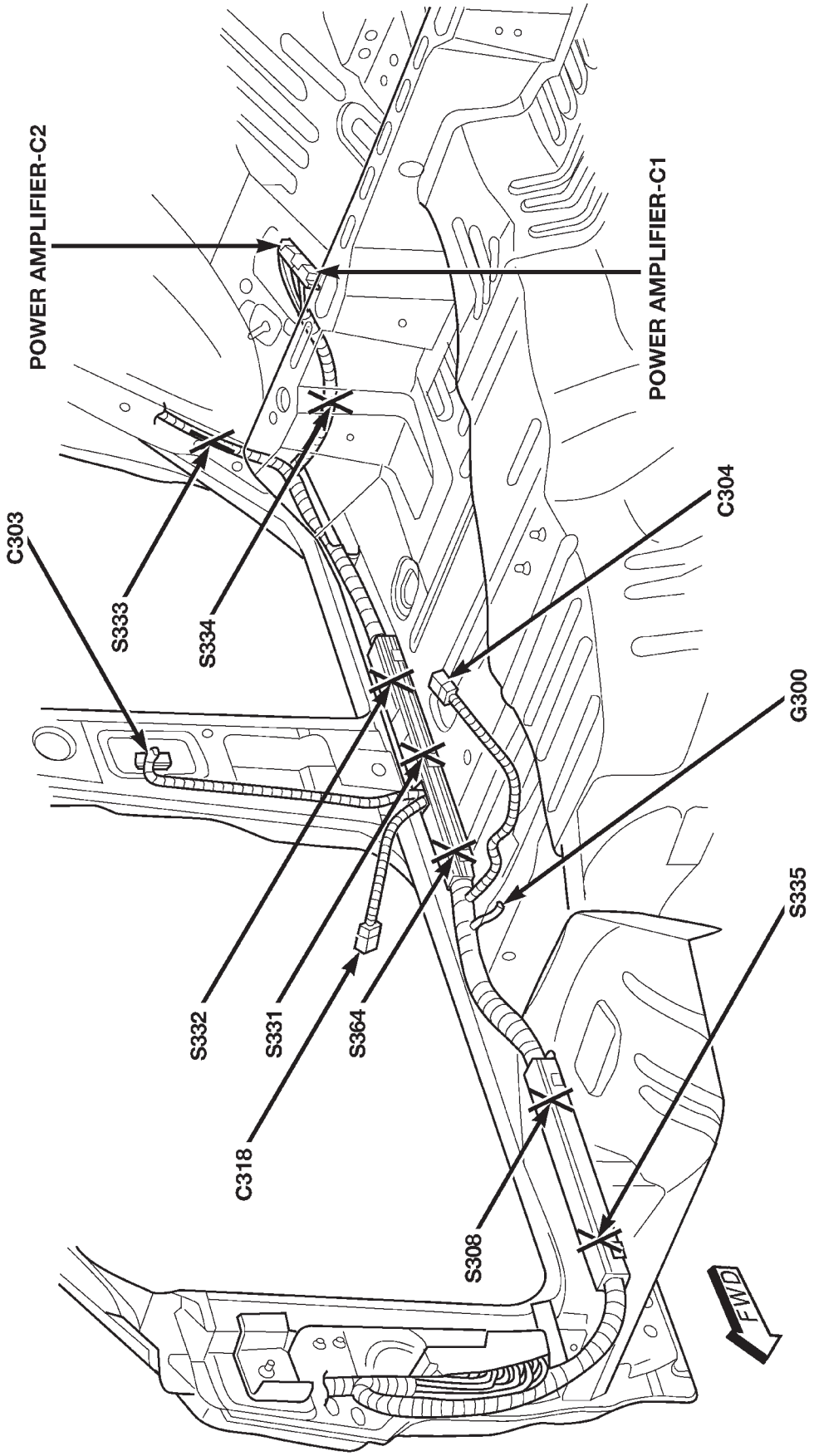
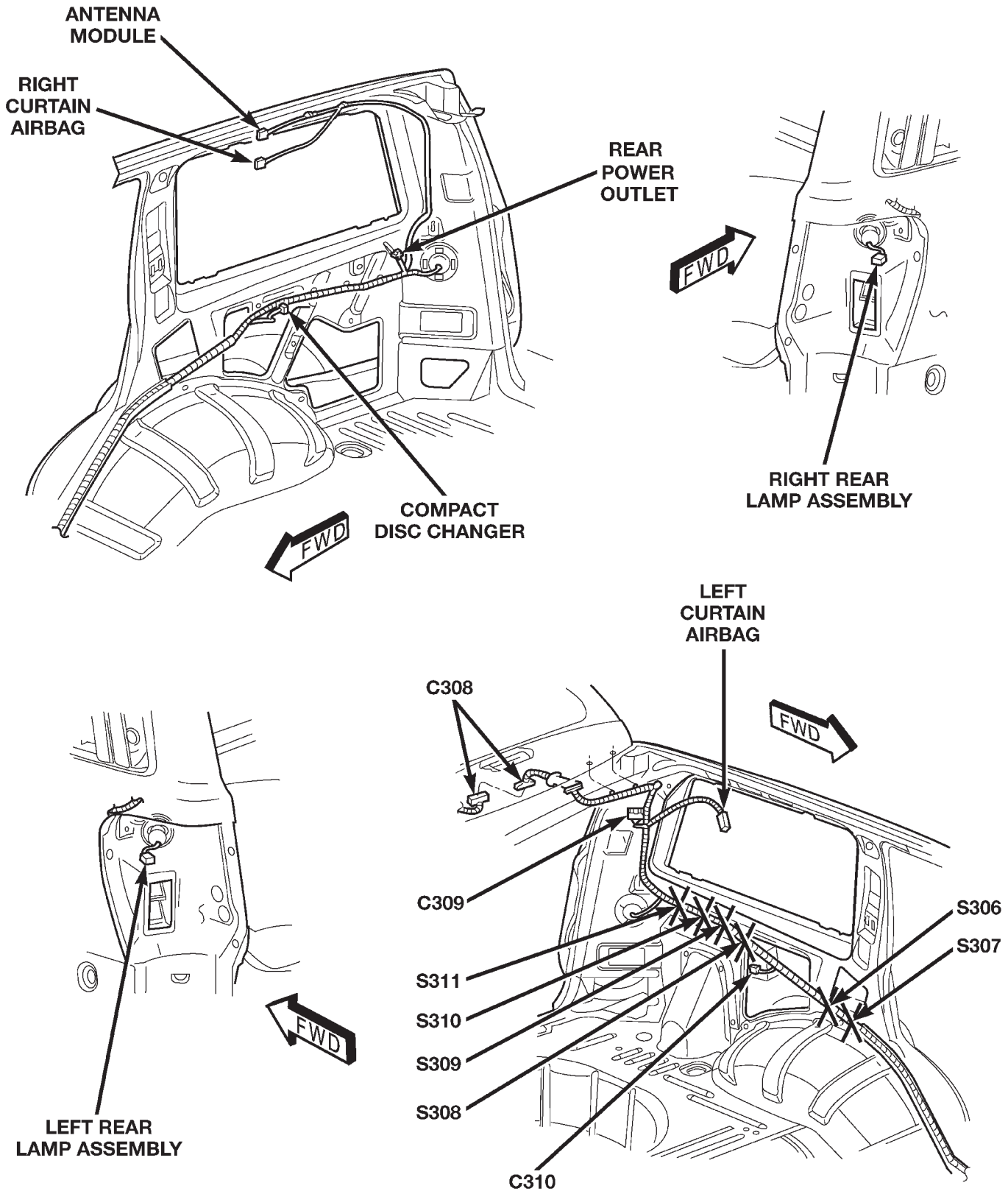


Fig. 36 BODY RIGHT SIDE RHD

CONNECTOR/GROUND/SPLICE LOCATION (Continued)



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Fig. 37 BODY QUARTER PANELS

CONNECTOR/GROUND/SPLICE LOCATION (Continued)

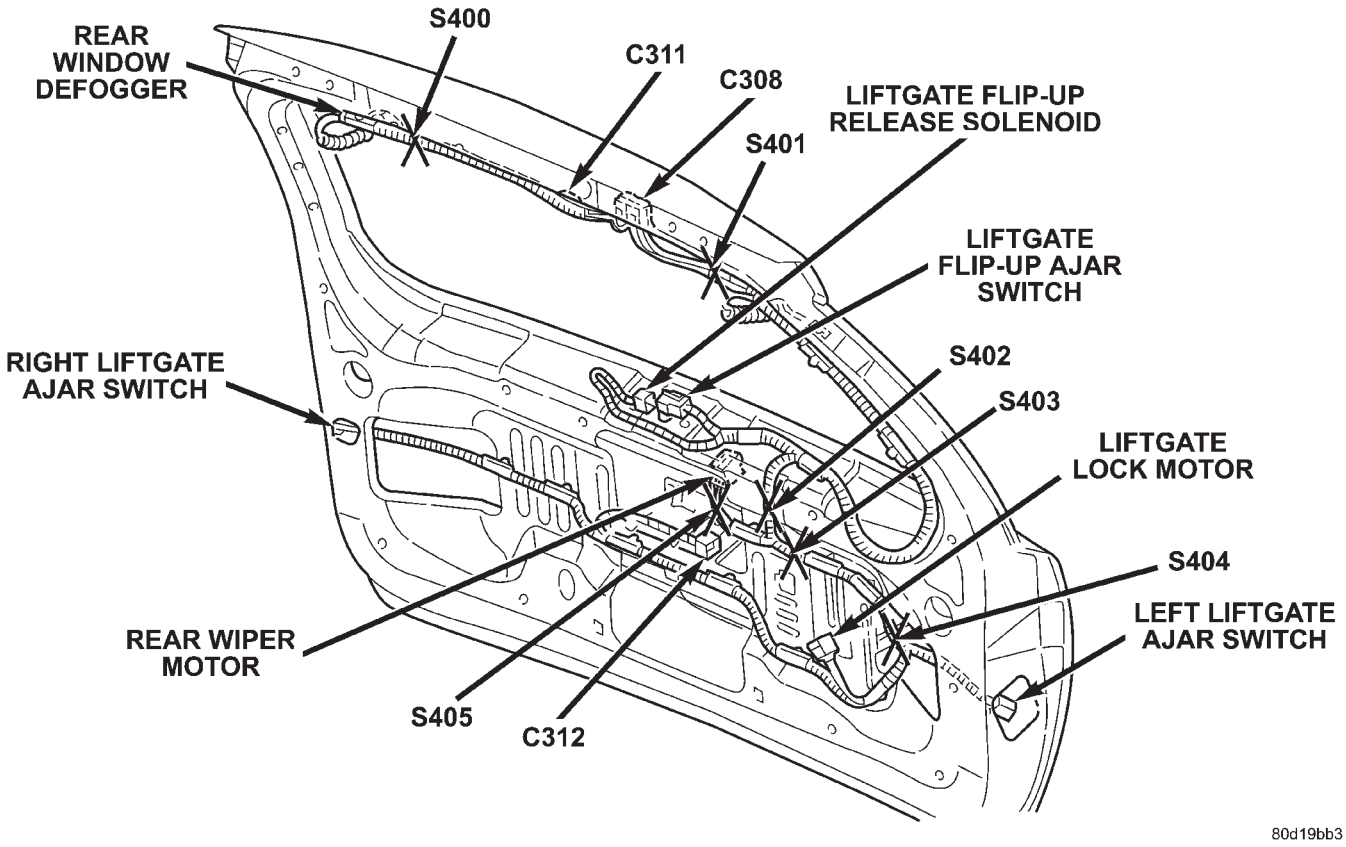


Fig. 38 LIFTGATE

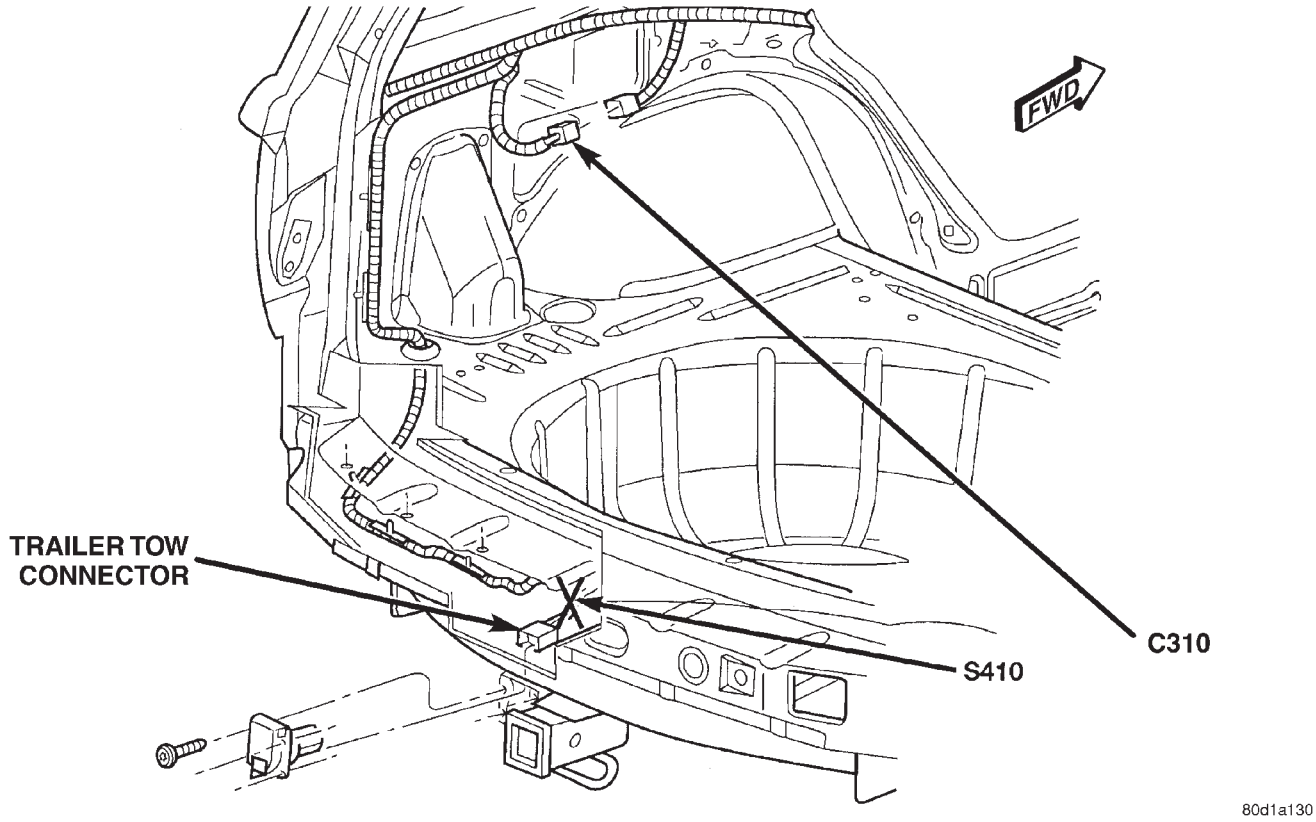


Fig. 39 TRAILER TOW

8W-97 POWER DISTRIBUTION

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POWER DISTRIBUTION

DESCRIPTION

This group covers the various standard and optional power distribution components used on this model. The power distribution system for this vehicle consists of the following components:

- Power Distribution Center (PDC)
- Junction Block (JB)
- Power Outlets

The power distribution system also incorporates various types of circuit control and protection features, including:

- Automatic resetting circuit breakers
- Blade-type fuses
- Bus bars
- Cartridge fuses
- Circuit splice blocks
- Flashers
- Fusible links
- Standard and Micro-Relays

Following are general descriptions of the major components in the power distribution system. See the owner's manual in the vehicle glove box for more information on the features and use of all of the power distribution system components. Refer to Wiring Diagrams for complete circuit diagrams.

OPERATION

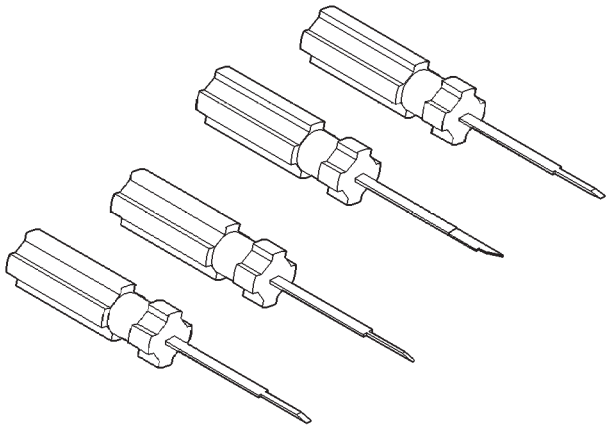
The power distribution system for this vehicle is designed to provide safe, reliable, and centralized distribution points for the electrical current required to operate all of the standard and optional factory-installed electrical and electronic powertrain, chassis, safety, security, comfort and convenience systems. At

the same time, the power distribution system was designed to provide ready access to these electrical distribution points for the vehicle technician to use when conducting diagnosis and repair of faulty circuits. The power distribution system can also prove useful for the sourcing of additional electrical circuits that may be required to provide the electrical current needed to operate accessories that the vehicle owner may choose to have installed in the aftermarket.

NOTE: DO NOT ATTEMPT TO SWAP POWER DISTRIBUTION CENTERS FROM ONE VEHICLE TO ANOTHER. MOST OF THESE ASSEMBLIES ARE VEHICLE FEATURE SPECIFIC AND THEREFORE NOT INTERCHANGEABLE. ALWAYS USE THE CORRECT PART NUMBERED ASSEMBLY WHEN DIAGNOSING OR REPLACING A POWER DISTRIBUTION CENTER.

SPECIAL TOOLS

POWER DISTRIBUTION SYSTEMS



Terminal Pick Kit 6680

CIGAR LIGHTER OUTLET

DESCRIPTION

A cigar lighter outlet is standard equipment on this model. On models equipped with the optional Smoker's Package, the cigar lighter knob and heating element are included. On models without the Smoker's Package, the cigar lighter outlet is equipped with a snap fit plastic cap and is treated as an extra accessory power outlet. The cigar lighter outlet is installed in the instrument panel center lower bezel, which is located near the bottom of the instrument panel center stack area, below the heater and air conditioner controls. The cigar lighter outlet is secured by a snap fit within the center lower bezel.

The cigar lighter outlet, plastic cap and the knob and heating element unit are available for service replacement. These components cannot be repaired and, if faulty or damaged, they must be replaced.

OPERATION

The cigar lighter consists of two major components: a knob and heating element unit, and the cigar lighter base or outlet shell. The receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The cigar lighter receives battery voltage from a fuse in the junction block when the ignition switch is in the Accessory or On positions.

The cigar lighter knob and heating element are encased within a spring-loaded housing, which also features a sliding protective heat shield. When the knob and heating element are inserted in the outlet shell, the heating element resistor coil is grounded through its housing to the outlet shell. If the cigar lighter knob is pushed inward, the heat shield slides up toward the knob exposing the heating element, and the heating element extends from the housing toward the insulated contact in the bottom of the outlet shell.

Two small spring-clip retainers are located on either side of the insulated contact inside the bottom of the outlet shell. These clips engage and hold the heating element against the insulated contact long enough for the resistor coil to heat up. When the heating element is engaged with the contact, battery current can flow through the resistor coil to ground, causing the resistor coil to heat.

When the resistor coil becomes sufficiently heated, excess heat radiates from the heating element causing the spring-clips to expand. Once the spring-clips expand far enough to release the heating element, the spring-loaded housing forces the knob and heating element to pop back outward to their relaxed position. When the cigar lighter knob and element are pulled out of the outlet shell, the protective heat shield slides downward on the housing so that the heating element is recessed and shielded around its circumference for safety.

DIAGNOSIS AND TESTING - CIGAR LIGHTER OUTLET

For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the On position. Check for battery voltage at the fused B(+) fuse in

CIGAR LIGHTER OUTLET (Continued)

the junction block. If OK, go to Step 3. If not OK, repair the open or short as required.

(3) Remove the cigar lighter knob and element from the cigar lighter outlet shell. Check for continuity between the inside circumference of the cigar lighter outlet shell and a good ground. there should be continuity. If OK, go to Step 4. If not OK, go to Step 5.

(4) Turn the ignition switch to the On position. Check for battery voltage at the insulated contact located at the back of the cigar lighter outlet shell. If OK, replace the faulty cigar lighter knob and element. If not OK, go to Step 5.

(5) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the instrument panel center lower bezel. Check for continuity between the ground circuit cavity of the cigar lighter wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Turn the ignition switch to the Accessory or On positions. Check for battery voltage at the fused B(+) circuit cavity of the cigar lighter wire harness connector. If OK, replace the faulty cigar lighter outlet. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

CIGAR LIGHTER OUTLET DOOR SPRING

REMOVAL

(1) Disconnect and isolate the negative battery cable.

(2) Remove the instrument panel center lower bezel from the I.P. Refer to Body for the procedure.

(3) Remove the cigar lighter outlet door spring from its locating holes (Fig. 1).

INSTALLATION

(1) Install the cigar outlet door spring in its locating holes.

(2) Install the instrument panel center lower bezel on the I.P. Refer to Body for the procedure.

(3) Connect the negative battery cable.

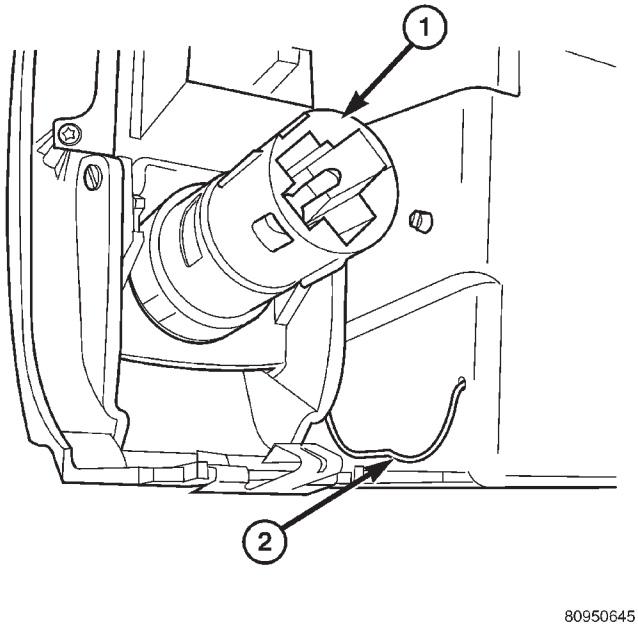


Fig. 1 Cigar Lighter Outlet Door Spring

1 - CIGAR LIGHTER OUTLET
2 - CIGAR LIGHTER OUTLET DOOR SPRING

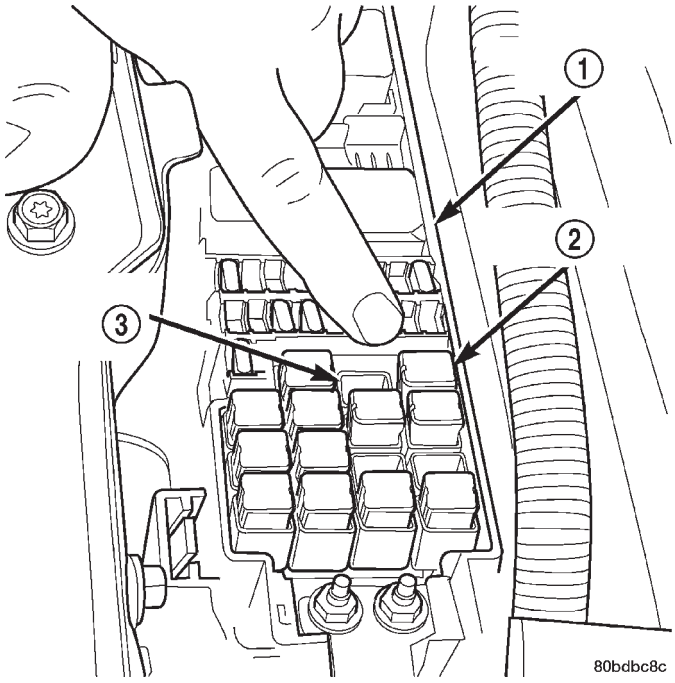


Fig. 2 Ignition-Off Draw Fuse

1 - POWER DISTRIBUTION CENTER
2 - IGNITION-OFF DRAW FUSE
3 - IOD FUSE STORAGE CAVITY

IOD FUSE

DESCRIPTION

All vehicles are equipped with an Ignition-Off Draw (IOD) fuse (Fig. 2) that is removed from its cavity in the Power Distribution Center (PDC) when the vehicle is shipped from the factory. Dealer personnel are to remove the IOD fuse from the storage location and install it into PDC fuse cavity 15 as part

IOD FUSE (Continued)

of the preparation procedures performed just prior to new vehicle delivery.

The PDC has a molded plastic cover that can be removed to provide service access to all of the fuses and relays in the PDC. An integral latch and hinges are molded into the PDC cover for easy removal. A fuse layout map is integral to the underside of the PDC cover to ensure proper fuse and relay identification. The IOD fuse is a 50 ampere maxi-type cartridge fuse and, when removed, it is stored in a spare fuse cavity within the PDC.

OPERATION

The term ignition-off draw identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. The IOD fuse feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the Off position, including the clock. The only reason the IOD fuse is removed is to reduce the normal IOD of the vehicle electrical system during new vehicle transportation and pre-delivery storage to reduce battery depletion, while still allowing vehicle operation so that the vehicle can be loaded, unloaded and moved as needed by both vehicle transportation company and dealer personnel.

The IOD fuse is removed from PDC fuse cavity 15 when the vehicle is shipped from the assembly plant. Dealer personnel must install the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation. Once the vehicle is prepared for delivery, the IOD function of this fuse becomes transparent and the fuse that has been assigned the IOD designation becomes only another Fused B(+) circuit fuse. The IOD fuse serves no useful purpose to the dealer technician in the service or diagnosis of any vehicle system or condition, other than the same purpose as that of any other standard circuit protection device.

The IOD fuse can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about thirty days. However, it must be remembered that removing the IOD fuse will not eliminate IOD, but only reduce this normal condition. If a vehicle will be stored for more than about thirty days, the battery negative cable should be disconnected to eliminate normal IOD; and, the battery should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged. Refer to **Battery System** for additional service information.

REMOVAL

The Ignition-Off Draw (IOD) fuses normal installation location is cavity 15 in the power distribution center. When the vehicle is shipped from the assembly plant the fuse is removed to maintain proper battery voltage during vehicle storage (in some cases). Dealer personnel must install the IOD fuse when the vehicle is being prepared for customer delivery in order to restore full electrical system operation.

(1) Turn the ignition switch to the Off position.

(2) Unlatch and open the cover of the power distribution center.

(3) Remove the IOD fuse from fuse **cavity 15** of the power distribution center (Fig. 2).

(4) Store the removed IOD fuse by installing it in the unused fuse storage **cavity 11** of the PDC (Fig. 2).

(5) Close and latch the power distribution center cover.

INSTALLATION

(1) Be certain the ignition switch is in the Off position.

(2) Unlatch and open the cover of the power distribution center.

(3) Remove the stored IOD fuse from fuse storage **cavity 11** of the power distribution center.

(4) Use a thumb to press the IOD fuse firmly down into power distribution center fuse **cavity 15**.

(5) Close and latch the power distribution center cover.

JUNCTION BLOCK

DESCRIPTION

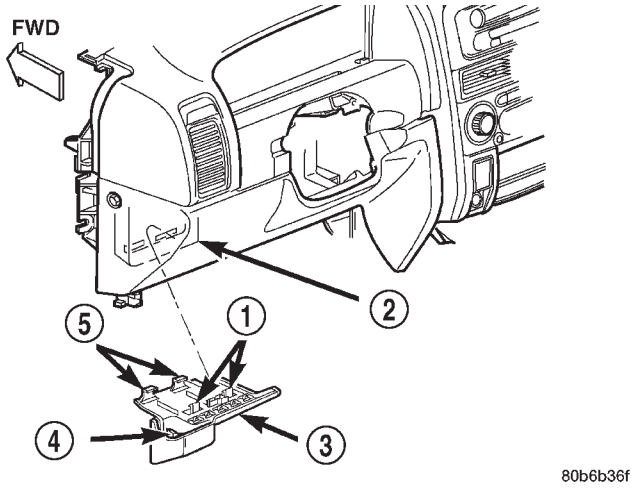


Fig. 3 Junction Block Location

1 - REAR LATCHES
2 - JUNCTION BLOCK AND BODY CONTROL MODULE UNIT
3 - INSTRUMENT PANEL FUSE COVER
4 - SIDE LATCH
5 - FRONT LATCHES

An electrical Junction Block (JB) is concealed beneath the driver side of the instrument panel in the passenger compartment of the vehicle (Fig. 3). The JB combines the functions previously provided by a separate fuseblock module and relay center. The JB serves to simplify and centralize numerous electrical components, as well as to distribute electrical current to many of the accessory systems in the vehicle. It also eliminates the need for numerous splice connections. The JB houses up to thirty-three blade-type mini fuses, up to two blade-type automatic resetting circuit breakers, the electronic combination flasher, the Daytime Running Lamp (DRL) module (Canada only) and up to twelve International Standards Organization (ISO) relays (three standard-type and nine micro-type). The JB also incorporates an integral connector and mounting for the Body Control Module (BCM). The BCM is secured with four screws directly to the dash panel side of the JB. Refer to **Body Control Module** in Electronic Control Modules for additional information covering the BCM.

The molded plastic JB housing has integral mounts that are secured with two screws and two snap retainers to the instrument panel steering column support bracket behind the instrument panel steering column opening cover. The JB is concealed above the molded plastic instrument panel fuse cover. Integral latches molded into the fuse cover secure it the JB, the BCM and the 16-way data link connector tab of the instrument panel steering column support bracket. The fuse cover can be pulled downward to disengage the latches and provide service access to all of the fuses, relays and wire harness connectors of the JB. The fuse cover has a fuse puller and spare fuses secured to its upper surface. Refer to **Instrument Panel Fuse Cover** in Body for additional service information.

The JB unit cannot be repaired and is only serviced as an assembly. If any internal circuit or the JB housing is faulty or damaged, the entire JB unit must be replaced. The BCM is available for separate service replacement.

OPERATION

All of the circuits entering and leaving the Junction Block (JB) do so through up to five wire harness connectors, which are connected to the JB through integral connector receptacles molded into the JB housing. Internal connection of all of the JB circuits is accomplished by a printed circuit board. There are also two separate wire harness connections to connector receptacles that are integral to the BCM. Refer to **Junction Block** in Wiring Diagrams for additional information and the location of complete JB circuit diagrams.

REMOVAL

WARNING: DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

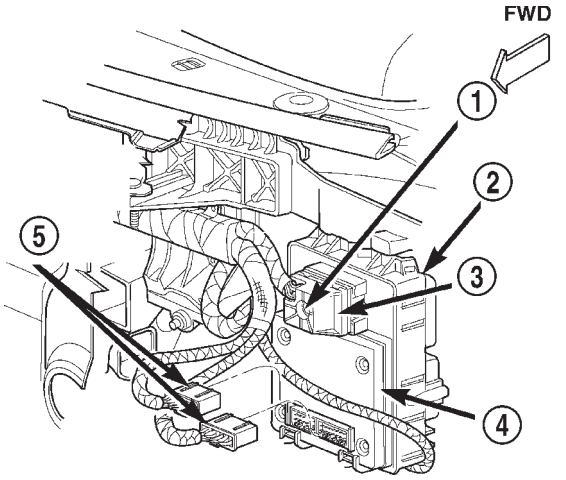
(1) Disconnect and isolate the battery negative cable.

(2) Remove the fuse cover from the bottom of the Junction Block (JB).

(3) Remove the steering column opening cover from the instrument panel. Refer to **Steering Column Opening Cover** in Body for the location of steering column opening cover removal procedures.

JUNCTION BLOCK (Continued)

(4) Reach behind the JB to disconnect the two instrument panel wire harness connectors from the Body Control Module (BCM) connector receptacles located near the bottom of the JB (Fig. 4).



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Fig. 4 Junction Block Connections

1 - SCREW
2 - JUNCTION BLOCK
3 - BULKHEAD CONNECTOR
4 - BODY CONTROL MODULE
5 - INSTRUMENT PANEL WIRE HARNESS CONNECTORS

(5) Reach behind the JB to remove the screw that secures the instrument panel wire harness bulkhead connector to the connector receptacle located near the top of the JB and disconnect the connector.

(6) Disconnect the fused B(+) and the IOD wire harness connectors from the connector receptacles located near the bottom of the JB (Fig. 5).

(7) Remove the screws that secure the right and left body wire harness bulkhead connectors to the connector receptacles located near the center of the JB and disconnect the connectors.

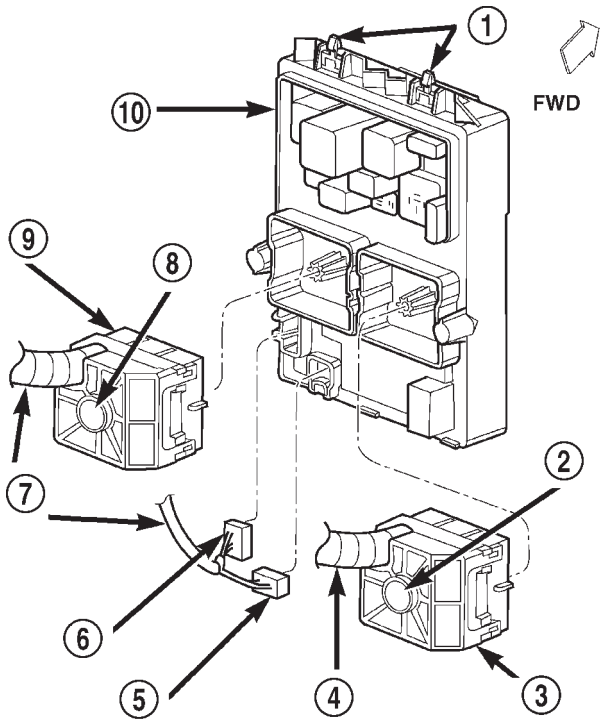
(8) Remove the two screws that secure the JB to the instrument panel steering column support bracket (Fig. 6).

(9) To disengage the two snap clips that secure the top of the JB to the instrument panel steering column support bracket, grasp the bottom of the junction block firmly with both hands and pull it downward sharply.

(10) Remove the JB from the instrument panel steering column support bracket.

INSTALLATION

NOTE: If the Junction Block (JB) is being replaced with a new unit, be certain to transfer each of the optional fuses, circuit breakers and relays from the faulty JB to the proper cavities of the replacement JB. Refer to Junction Block in Wiring Diagrams for the location of complete circuit diagrams and cavity assignments for the JB. The Body Control Module (BCM) must also be transferred to the new JB. Refer to Body Control Module in Electronic Control Modules for the location of the BCM removal and installation procedures.



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Fig. 5 Junction Block Connections

1 - SNAP CLIPS
2 - SCREW
3 - CONNECTOR
4 - LEFT BODY WIRE HARNESS
5 - IOD CONNECTOR
6 - FUSED B+ CONNECTOR
7 - RIGHT BODY WIRE HARNESS
8 - SCREW
9 - CONNECTOR
10 - JUNCTION BLOCK

(1) Position the JB into its mounting location on the instrument panel steering column support bracket.

(2) Align the snap clips at the top of the JB with the mounting holes in the instrument panel steering column support bracket.

(3) Grasp the bottom of the JB firmly with both hands and push it upward sharply to engage the two snap clips that secure the top of the JB to the instrument panel steering column support bracket.

(4) Install and tighten the two screws that secure the JB to the instrument panel steering column support bracket. Tighten the screws to 2.2 N·m (20 in. lbs.).

JUNCTION BLOCK (Continued)

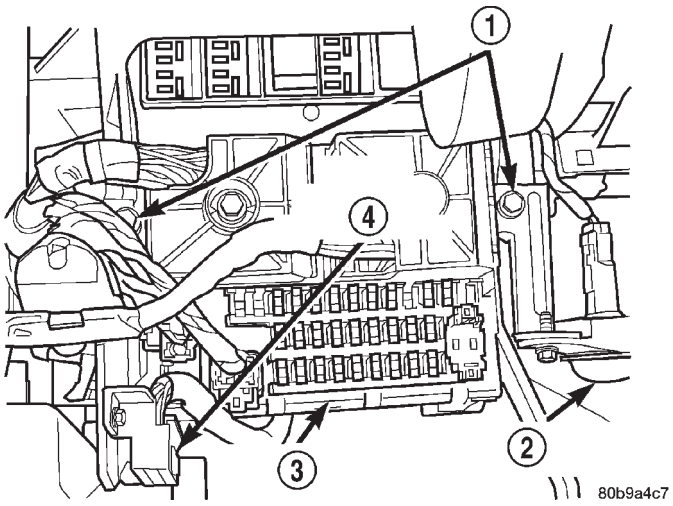


Fig. 6 Junction Block

1 - SCREW (2)
2 - DRIVER SIDE COURTESY LAMP
3 - JUNCTION BLOCK
4 - 16 WAY DATA LINK CONNECTOR

(5) Reconnect the right and left body wire harness bulkhead connectors to the connector receptacles located near the center of the JB.

(6) Install and tighten the screws that secure the right and left body wire harness bulkhead connectors to the connector receptacles located near the center of the JB. Tighten the screws to 2.2 N·m (20 in. lbs.).

(7) Reconnect the fused B(+) and the IOD wire harness connectors to the connector receptacles located near the bottom of the JB.

(8) Reach behind the JB to reconnect the instrument panel wire harness bulkhead connector to the connector receptacle located near the top of the JB.

(9) Install and tighten the screw that secures the instrument panel wire harness bulkhead connector to the connector receptacle located near the top of the JB. Tighten the screw to 2.2 N·m (20 in. lbs.).

(10) Reach behind the JB to reconnect the two instrument panel wire harness connectors to the BCM connector receptacles located near the bottom of the JB.

(11) Install the steering column opening cover onto the instrument panel. Refer to **Steering Column Opening Cover** in Body for the location of the steering column opening cover installation procedures.

(12) Install the fuse cover onto the bottom of the JB.

(13) Reconnect the battery negative cable.

POWER DISTRIBUTION CENTER

DESCRIPTION

All of the electrical current distributed throughout this vehicle is directed through the standard equipment Power Distribution Center (PDC) (Fig. 7). The molded plastic PDC housing is located in the right front corner of the engine compartment, between the battery and the right front inner fender shield. The PDC houses up to fifteen maxi-type cartridge fuses, which replace all in-line fusible links. The PDC also houses up to thirteen blade-type mini fuses, and up to ten International Standards Organization (ISO) relays (two standard-type and eight micro-type).

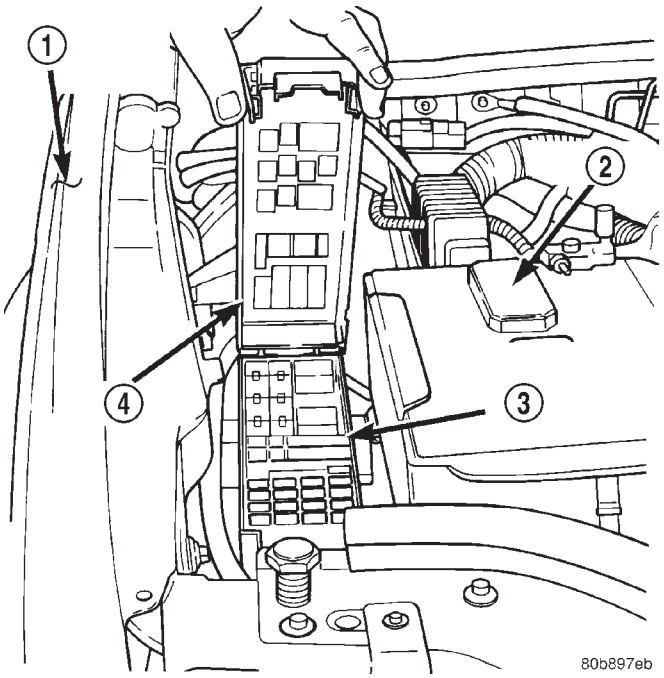


Fig. 7 Power Distribution Center Location

1 - RIGHT FENDER
2 - BATTERY
3 - POWER DISTRIBUTION CENTER
4 - COVER

The PDC housing is secured in the engine compartment at three points. Integral mounts on both sides of the PDC housing engage and latch to stanchions that are integral to the molded plastic battery support. The PDC is integral to the right headlamp and dash wire harness, which exits from the bottom of the PDC housing. The PDC housing has a molded plastic cover that includes two integral latches at the front and pivot hooks at the back that snap over a hinge pin on the rear of the PDC housing. The PDC cover is easily opened or removed for service access and has a convenient fuse and relay layout map integral to the inside surface of the cover to ensure proper component identification. A fuse puller is also stored on the inside of the PDC cover.

The PDC cover, the PDC housing lower cover, the PDC relay wedges, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC main housing unit, the fuse wedges and the bus bars cannot be repaired and

POWER DISTRIBUTION CENTER (Continued)

are only serviced as a unit with the right headlamp and dash wire harness. If the PDC main housing unit, fuse wedges or the bus bars are faulty or damaged, the right headlamp and dash wire harness unit must be replaced.

OPERATION

All of the current from the battery and the generator output enters the PDC through two cables and a single two-holed eyelet that is secured with nuts to the two PDC B(+) terminal studs just inside the front end of the PDC housing. The PDC cover is unlatched and opened to access the battery and generator output connection B(+) terminal studs, the fuses or the relays. Internal connection of all of the PDC circuits is accomplished by an intricate combination of hard wiring and bus bars. Refer to **Power Distribution** in Wiring Diagrams for the location of complete PDC circuit diagrams.

REMOVAL

The Power Distribution Center (PDC) main housing unit, the PDC fuse wedges and the PDC bus bars cannot be repaired and are only serviced as a unit with the right headlamp and dash wire harness. If the PDC main housing unit, the fuse wedges or the bus bars are faulty or damaged, the entire PDC and right headlamp and dash wire harness unit must be replaced.

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect each of the right headlamp and dash wire harness connectors. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the right headlamp and dash wire harness connector locations.

(3) Remove all of the fasteners that secure each of the right headlamp and dash wire harness ground eyelets to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the ground eyelet locations.

(4) Disengage each of the retainers that secure the right headlamp and dash wire harness to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the right headlamp and dash wire harness retainer locations.

(5) Unlatch and open the PDC cover.

(6) Remove the two nuts that secure the two-holed eyelet of the battery wire harness PDC take outs to the PDC B(+) terminal studs (Fig. 8).

(7) Remove the battery wire harness PDC take out eyelet from the B(+) terminal studs.

(8) Disengage the latches on the PDC housing mounts from the tabs on the PDC mounting stanchions of the battery support, and pull the PDC housing upward to disengage the mounts from the stanchions (Fig. 9).

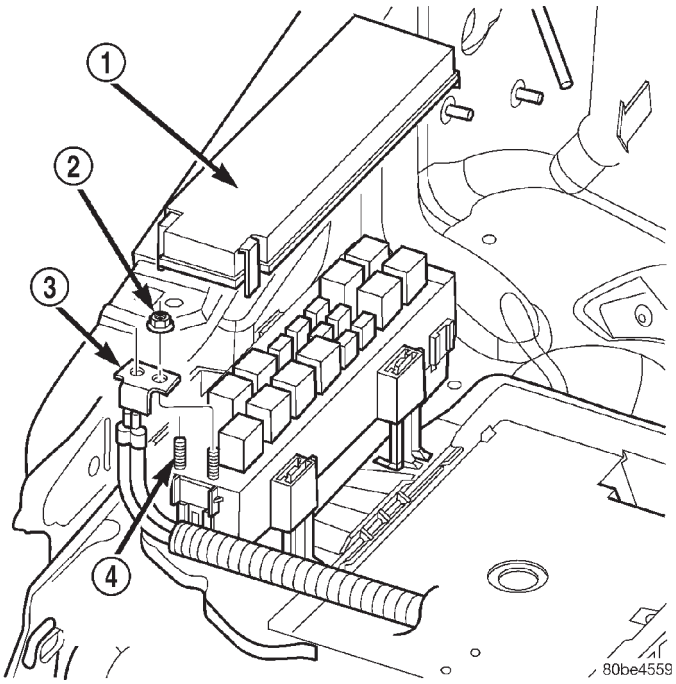


Fig. 8 Power Distribution Center Connections

1 - PDC COVER
2 - NUT (2)
3 - EYELET
4 - B(+) TERMINAL STUDS

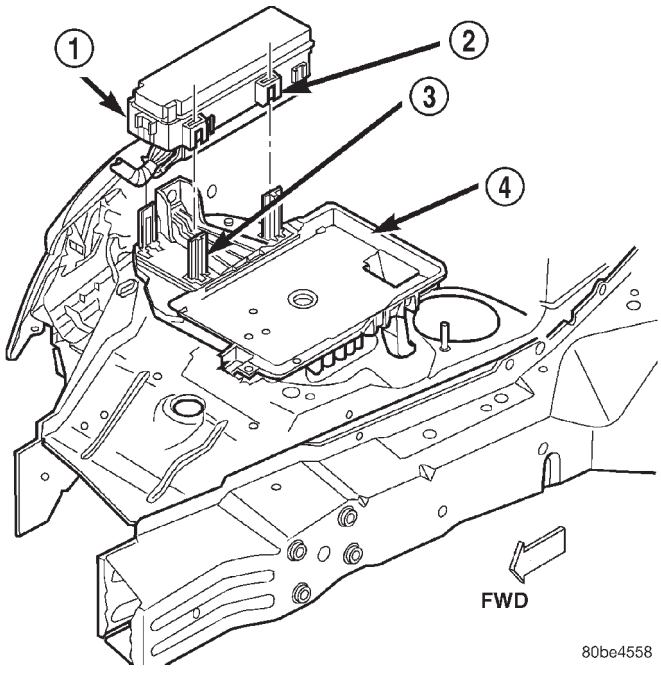


Fig. 9 Power Distribution Center Remove/Install

1 - POWER DISTRIBUTION CENTER
2 - MOUNTS
3 - STANCHIONS (3)
4 - BATTERY SUPPORT

POWER DISTRIBUTION CENTER (Continued)

(9) Remove the PDC and the right headlamp and dash wire harness from the engine compartment as a unit.

DISASSEMBLY

POWER DISTRIBUTION CENTER DISASSEMBLY

PDC HOUSING LOWER COVER REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Remove the battery from the battery support. Refer to **Battery System** for the location of the battery removal procedures.

(2) Unlatch and remove the cover from the PDC.

(3) Remove the two nuts that secure the two-holed eyelet of the battery wire harness PDC take out to the B(+) terminal studs near the front of the PDC.

(4) Remove the battery wire harness PDC take out eyelet from the two PDC B(+) terminal studs.

(5) Disengage the latches on the PDC housing mounts from the tabs on the PDC mounting stanchions on the battery support, and pull the PDC housing upward to disengage the mounts from the stanchions.

(6) Where the right headlamp and dash wire harness exits the PDC, remove the tape that secures the wire harness to the trough formation on the PDC housing lower cover.

(7) Using a trim stick or another suitable wide flat-bladed tool, gently pry the latches on each side and the front of the PDC housing that secure the housing lower cover to the PDC and remove the housing lower cover (Fig. 10).

PDC B+ TERMINAL MODULE REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

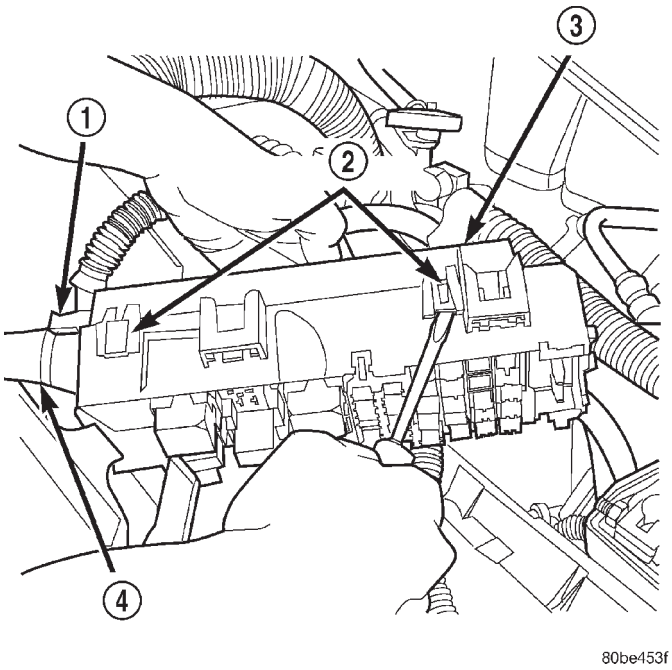


Fig. 10 PDC Housing Lower Cover Remove/Install - Typical

1 - TROUGH FORMATION
2 - LATCHES (5)
3 - PDC HOUSING LOWER COVER
4 - WIRE HARNESS

(1) Remove the PDC housing lower cover.

(2) From the top of the PDC housing, use a small screwdriver or a terminal pick tool (Special Tool Kit 6680) to release the two latches that secure the B(+) terminal module in the PDC.

(3) Gently and evenly press the two B(+) terminal studs down through the bus bar in the PDC.

(4) From the bottom of the PDC housing, remove the B(+) terminal module from the PDC.

PDC RELAY WEDGE REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Remove the PDC housing lower cover.

(2) Remove each of the relays from the PDC relay wedge to be removed.

(3) From the bottom of the PDC housing, use a small screwdriver or a terminal pick tool (Special

POWER DISTRIBUTION CENTER (Continued)

Tool Kit 6680) to release the two latches (yellow) that secure the relay wedge to the PDC relay cassette.

(4) From the top of the PDC housing, remove the relay wedge from the PDC relay cassette (Fig. 11).

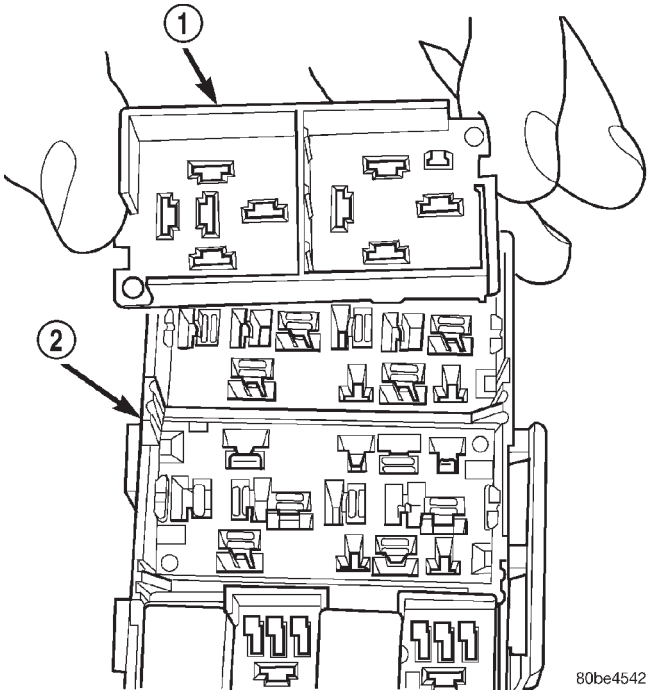


Fig. 11 PDC Relay Wedge Remove/Install - Typical

1 - RELAY WEDGE (TYPICAL)
2 - PDC HOUSING

PDC RELAY CASSETTE REMOVAL

The Power Distribution Center (PDC) cover, the PDC housing lower cover, the PDC relay wedges, the PDC relay cassettes and the PDC B(+) terminal stud module are available for service replacement. The PDC cover can be simply unlatched and removed from the PDC housing without the PDC being removed or disassembled. Service of the remaining PDC components requires that the PDC be removed from its mounting and disassembled. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(1) Remove the relay wedge from the PDC relay cassette to be removed.

NOTE: It may be necessary to remove relay cassettes that are not being serviced from the PDC housing in order to obtain sufficient clearance to access the faulty relay cassette. The same service procedure is repeated as necessary to remove each of the interfering relay wedges and relay cassettes from the PDC housing.

(2) From the top of the PDC housing, use a small screwdriver or a terminal pick tool (Special Tool Kit 6680) to release the two latches that secure the relay cassette in the PDC (Fig. 12).

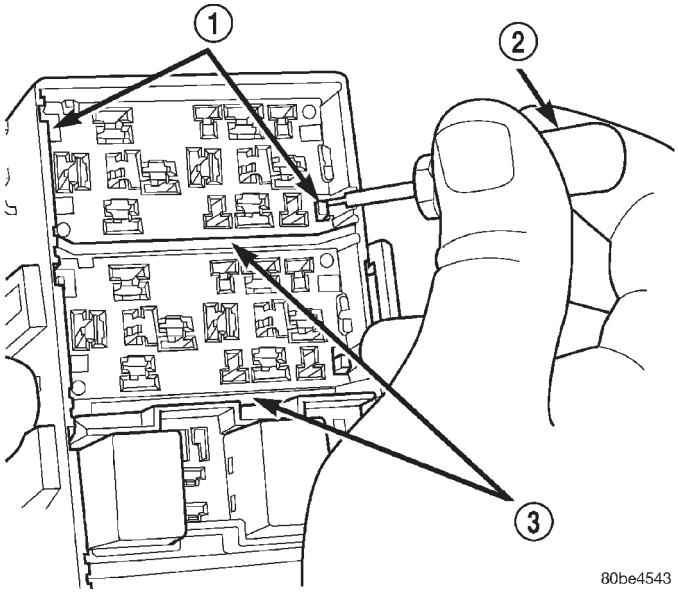


Fig. 12 PDC Relay Cassette Latches - Typical

1 - LATCHES
2 - FROM SPECIAL TOOL KIT 6680
3 - PDC RELAY CASSETTES (TYPICAL)

(3) Gently and evenly press the relay cassette down through the PDC housing.

(4) From the bottom of the PDC housing, remove the relay cassette from the PDC (Fig. 13).

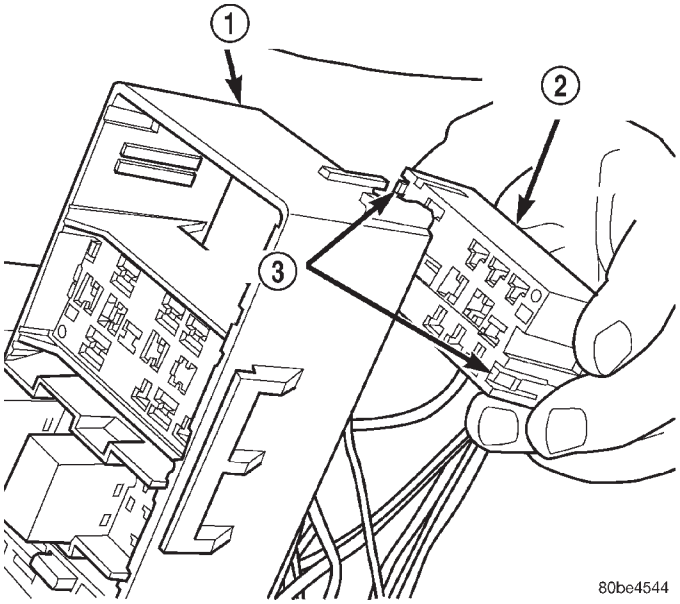


Fig. 13 PDC Relay - Typical

1 - PDC HOUSING
2 - PDC RELAY CASSETTE (TYPICAL)
3 - LATCHES

POWER DISTRIBUTION CENTER (Continued)

CAUTION: Do not remove the wiring and terminals from the terminal cavities of the faulty PDC relay cassette at this time. Refer to the Assembly procedure that follows for the proper procedures for transferring the wiring and terminals to the replacement PDC relay cassette.

ASSEMBLY

POWER DISTRIBUTION CENTER ASSEMBLY

PDC B(+) TERMINAL MODULE INSTALLATION

(1) From the bottom of the PDC housing, align and insert the B(+) terminal module into the PDC.

(2) From the bottom of the PDC housing, align and insert the two studs of the PDC B(+) terminal module through the bus bar in the PDC.

(3) From the bottom of the PDC housing, press the B(+) terminal module gently and evenly into the PDC until both of the latches are fully engaged.

(4) Install the PDC housing lower cover.

RELAY WEDGE INSTALLATION

(1) From the top of the PDC housing, align and insert the PDC relay wedge latch arms into the correct cavities in the relay cassette.

(2) Gently and evenly press the PDC relay wedge down into the relay cassette until both of the latches are fully engaged.

(3) Install each of the removed relays into the proper cavities of the PDC relay wedge.

(4) Install the PDC housing lower cover.

RELAY CASSETTE INSTALLATION

(1) Move the faulty PDC relay cassette with its wiring away from the bottom of the PDC housing far enough to allow the replacement relay cassette to be installed into the PDC.

(2) Using the faulty relay cassette as a guide, be certain that the replacement relay cassette is correctly oriented before installing it into the PDC housing.

(3) From the bottom of the PDC housing, align and insert the replacement relay cassette into the PDC. Press the relay cassette up into the PDC until both of the latches are fully engaged.

CAUTION: Proper care must be taken to be certain that the wiring and terminals from the faulty PDC relay cassette are installed in the correct terminal cavities of the replacement relay cassette. To prevent mistakes it is recommended that the wiring and terminals be removed from the faulty relay cassette one cavity at a time, repaired or spliced as necessary, then installed securely into the correct cavity of the replacement relay cassette. If you are not absolutely certain into which cavity a terminal should be installed, refer to Power Distribution in the index of this service manual for the location of complete circuit diagrams covering the PDC.

(4) While pulling gently on the wire from the bottom of the faulty PDC relay cassette, use a terminal pick tool (Special Tool Kit 6680) from the top of the relay cassette to release the latch that secures the terminal in the relay cassette terminal cavity (Fig. 14).

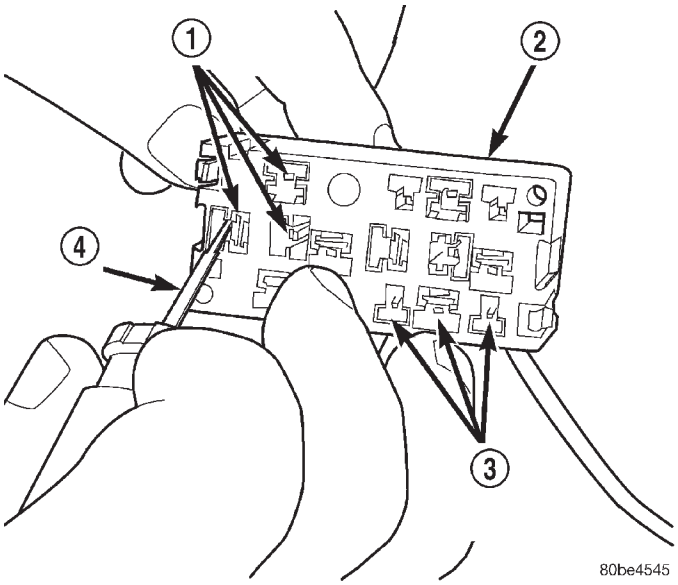


Fig. 14 PDC Relay Cassette Terminal Remove/Install - Typical

1 - TERMINAL CAVITIES (TYPICAL)
2 - PDC RELAY CASSETTE (TYPICAL)
3 - TERMINAL LATCHES (TYPICAL)
4 - FROM SPECIAL TOOL KIT 6680

(5) From the bottom of the faulty PDC relay cassette, remove the wire and terminal from the relay cassette terminal cavity.

(6) Make all necessary repairs and splices to the wire for the removed terminal. Refer to **Wiring Repair** in Wiring Diagrams for the location of the wiring repair procedures.

(7) From the bottom of the PDC housing, align and insert the removed wire and terminal into the correct terminal cavity of the replacement relay cassette. Push the wire and terminal up into the relay cassette terminal cavity until it is fully engaged by the latch.

(8) Repeat Step 4, Step 5, Step 6 and Step 7 one wire and terminal at a time until each of the wires and terminals have been transferred from the faulty PDC relay cassette into the replacement relay cassette.

(9) Install the PDC relay wedge into the replacement PDC relay cassette.

POWER DISTRIBUTION CENTER (Continued)

PDC LOWER COVER INSTALLATION

(1) Align the PDC housing lower cover on the bottom of the PDC.

(2) Evenly press the lower cover into place until latches are fully engaged.

(3) Where the right headlamp and dash harness enters the PDC, tape the harness securely to the trough formation on the PDC lower cover.

(4) Install the PDC in its mounting location on the battery support.

(5) Install the battery wire harness over the two PDC B+ terminal studs. Torque the nuts to 11.3 N·m (100 in. lbs.).

(6) Install the battery. Refer to Battery System for the procedure.

(7) Install the PDC cover.

INSTALLATION

The Power Distribution Center (PDC) main housing unit, the PDC fuse wedges and the PDC bus bars cannot be repaired and are only serviced as a unit with the right headlamp and dash wire harness. If the PDC main housing unit, the fuse wedges or the bus bars are faulty or damaged, the entire PDC and right headlamp and dash wire harness unit must be replaced.

(1) Position the PDC and the right headlamp and dash wire harness unit in the engine compartment.

(2) Engage the PDC housing mounts with the stanchions of the battery support and push the unit downward until the mount latches fully engage the mounting tabs on the stanchions.

(3) Install the two-holed eyelet of the battery wire harness PDC take outs onto the two PDC B(+) terminal studs.

(4) Install and tighten the nuts that secure the eyelet of the battery wire harness PDC take outs to the B(+) terminal studs. Tighten the nuts to 11.3 N·m (100 in. lbs.).

(5) Engage each of the retainers that secure the right headlamp and dash wire harness to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the right headlamp and dash wire harness retainer locations.

(6) Install all of the fasteners that secure each of the right headlamp and dash wire harness ground eyelets to the vehicle body and chassis components. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the ground eyelet locations.

(7) Reconnect each of the right headlamp and dash wire harness connectors. Refer to **Connector Locations** in Wiring Diagrams for the location of more information on the right headlamp and dash wire harness connector locations. For connectors secured with screws, tighten the screws to 4.3 N·m (38 in. lbs.).

(8) Reconnect the battery negative cable.

POWER OUTLET

DESCRIPTION - FRONT POWER OUTLET

An accessory power outlet is standard equipment on this model. The power outlet is installed in the instrument panel center lower bezel, which is located near the bottom of the instrument panel center stack area, below the heater and air conditioner controls. The power outlet base is secured by a snap fit within the center lower bezel. A hinged door with an over-center spring flips closed to conceal and protect the power outlet base when the power outlet is not being used, and flips open below the center lower bezel while the power outlet is in use.

The power outlet receptacle unit and the power outlet door are each available for service replacement.

OPERATION - FRONT POWER OUTLET

The power outlet base or receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The power outlet receives battery voltage from a fuse in the junction block at all times.

While the power outlet is very similar to a cigar lighter base unit, it does not include the two small spring-clip retainers inside the bottom of the receptacle shell that are used to secure the cigar lighter heating element to the insulated contact.

DIAGNOSIS AND TESTING - POWER OUTLET

For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams.

WARNING: REFER TO RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check the fused B(+) fuse in the junction block. If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the junction block. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(3) Open the power outlet door. Check for continuity between the inside circumference of the power

POWER OUTLET (Continued)

outlet receptacle and a good ground. There should be continuity. If OK, go to Step 4. If not OK, go to Step 5.

(4) Check for battery voltage at the insulated contact located at the back of the power outlet receptacle. If not OK, go to Step 5.

(5) Disconnect and isolate the battery negative cable. Remove the instrument panel center lower bezel. Check for continuity between the ground circuit cavity of the power outlet wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the power outlet wire harness connector. If OK, replace the faulty power outlet receptacle. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center lower bezel from the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in Body for the procedure.

(3) Pull the cigar lighter knob and element or the protective cap out of the cigar lighter receptacle base, or open the power outlet door in the instrument panel center lower bezel.

(4) Look inside the cigar lighter or power outlet receptacle base and note the position of the rectangular retaining bosses of the mount that secures the receptacle base to the instrument panel center lower bezel (Fig. 15).

(5) Insert a pair of external snap ring pliers into the cigar lighter or power outlet receptacle base and engage the tips of the pliers with the retaining bosses of the mount.

(6) Squeeze the pliers to disengage the mount retaining bosses from the receptacle base and, using a gentle rocking motion, pull the pliers and the receptacle base out of the mount.

(7) Remove the cigar lighter or power outlet mount from the instrument panel center lower bezel.

INSTALLATION

(1) Install the cigar lighter or power outlet mount into the instrument panel center lower bezel.

(2) Align the splines on the outside of the cigar lighter or power outlet receptacle base connector receptacle with the grooves on the inside of the mount.

(3) Press firmly on the cigar lighter or power outlet receptacle base until the retaining bosses of the mount are fully engaged in their receptacles.

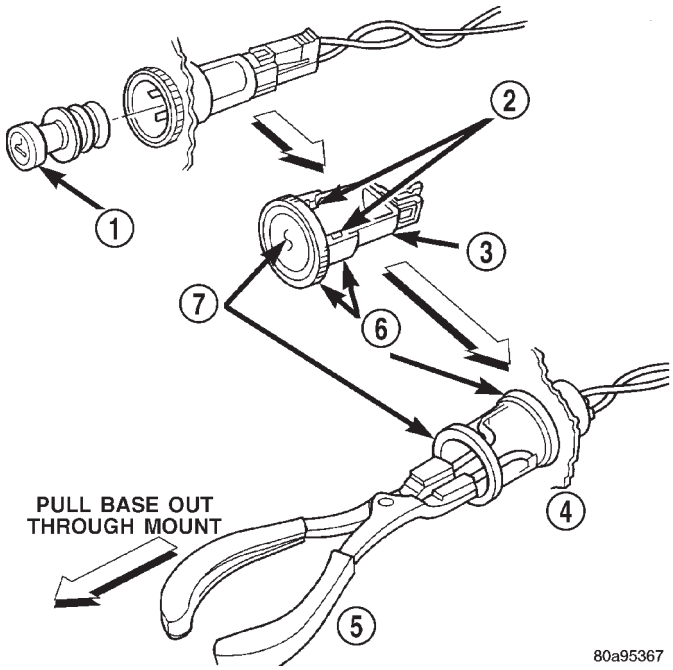


Fig. 15 Cigar Lighter and Power Outlet Remove/ Install - Typical

1 - KNOB AND ELEMENT
2 - RETAINING BOSSES-ENGAGE PLIERS HERE
3 - BASE
4 - PARTIALLY REMOVED
5 - EXTERNAL SNAP-RING PLIERS
6 - MOUNT
7 - BASE

(4) Install the cigar lighter knob and element or the protective cap into the cigar lighter receptacle base, or close the power outlet door in the instrument panel center lower bezel.

(5) Install the center lower bezel onto the instrument panel. Refer to **Instrument Panel Center Lower Bezel** in Body for the procedure.

(6) Reconnect the battery negative cable.

POWER OUTLET RELAY

DESCRIPTION

The power outlet / cigar lighter relay is an electromechanical device that switches fused battery current to the cigar lighter or power outlet when the ignition switch is turned to the Accessory or On positions. The power outlet / cigar lighter relay is located in the junction block, below the driver side of the instrument panel in the passenger compartment.

The cigar lighter relay is a International Standards Organization (ISO) relay. Relays conforming to the ISO specifications have common physical dimensions, current capacities, terminal patterns, and terminal functions.

POWER OUTLET RELAY (Continued)

The cigar lighter relay cannot be repaired or adjusted and, if faulty or damaged, it must be replaced.

OPERATION

The ISO relay consists of an electromagnetic coil, a resistor or diode, and three (two fixed and one movable) electrical contacts. The movable (common feed) relay contact is held against one of the fixed contacts (normally closed) by spring pressure. When the electromagnetic coil is energized, it draws the movable contact away from the normally closed fixed contact, and holds it against the other (normally open) fixed contact.

When the electromagnetic coil is de-energized, spring pressure returns the movable contact to the normally closed position. The resistor or diode is connected in parallel with the electromagnetic coil in the relay, and helps to dissipate voltage spikes that are produced when the coil is de-energized.

DIAGNOSIS AND TESTING - POWER OUTLET RELAY

The power outlet / cigar lighter relay (Fig. 16) is located in the junction block, below the driver side end of the instrument panel in the passenger compartment. For complete circuit diagrams, refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams.

WARNING: REFER TO RESTRAINTS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the power outlet / cigar lighter relay from the junction block. Refer to the procedure in this group.

(2) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 4. If not OK, replace the faulty relay.

(4) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, perform the Relay Circuit Test that follows. If not OK, replace the faulty relay.

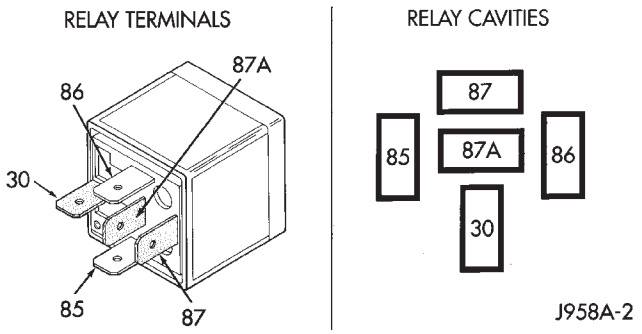


Fig. 16 Accessory Relay

TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

DIAGNOSIS AND TESTING - RELAY CIRCUIT TEST

(1) The relay common feed terminal cavity (30) of the junction block is connected to battery voltage and should be hot at all times. Check for battery voltage at the fused B(+) circuit cavity in the junction block receptacle for the cigar lighter relay. If OK, go to Step 2. If not OK, repair the fused B(+) circuit to the Power Distribution Center (PDC) fuse as required.

(2) The relay normally closed terminal (87A) is connected to terminal 30 in the de-energized position, but is not used for this application. Go to Step 3.

(3) The relay normally open terminal (87) is connected to the common feed terminal (30) in the energized position. This terminal supplies battery voltage to the fused B(+) fuse in the junction block that feeds the cigar lighter when the relay is energized by the ignition switch. There should be continuity between the junction block cavity for relay terminal 87 and the fused B(+) fuse in the junction block at all times. If OK, go to Step 4. If not OK, repair the open fused B(+) circuit to the junction block fuse as required.

(4) The coil ground terminal (85) is connected to the electromagnet in the relay. It receives battery feed to energize the cigar lighter relay when the ignition switch is in the Accessory or On positions. Turn the ignition switch to the On position. Check for battery voltage at the fused ignition switch output (acc/run) circuit cavity for relay terminal 85 in the junction block receptacle for the cigar lighter relay. If OK, go to Step 5. If not OK, repair the open fused ignition switch output (acc/run) circuit to the ignition switch as required.

(5) The coil battery terminal (86) is connected to the electromagnet in the relay. The junction block cavity for this terminal should have continuity to

POWER OUTLET RELAY (Continued)

ground at all times. If not OK, repair the open ground circuit to ground as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. Refer to **Steering Column Opening Cover** in Body for the procedure.

(3) The power outlet / cigar lighter relay is located on the left side of the combination flasher in the junction block.

(4) Remove the power outlet / cigar lighter relay from the junction block.

INSTALLATION

(1) Position the power outlet / cigar lighter relay in the proper receptacle in the junction block.

(2) Align the power outlet / cigar lighter relay terminals with the terminal cavities in the junction block receptacle.

(3) Push in firmly on the power outlet / cigar lighter relay until the terminals are fully seated in the terminal cavities in the junction block receptacle.

(4) Install the steering column opening cover onto the instrument panel. Refer to **Steering Column Opening Cover** in Body for the procedure.

(5) Reconnect the battery negative cable.

IOD WIRE HARNESS CONNECTOR

DESCRIPTION

All vehicles are equipped with an Ignition-Off Draw (IOD) connector that is located in a molded connector receptacle on the lower rear surface of the Junction Block (JB) housing (Fig. 17). The JB is concealed above the molded plastic instrument panel fuse cover. Integral latches molded into the fuse cover secure it the JB, the Body Control Module (BCM) and the 16-way data link connector tab of the instrument panel steering column support bracket. The fuse cover can be pulled downward to disengage the latches and provide service access to all of the fuses, relays and wire harness connectors of the JB. Refer to **Instrument Panel Fuse Cover** in the index of this service manual for the location of additional service information covering the fuse cover.

OPERATION

The term ignition-off draw identifies a normal condition where power is being drained from the battery with the ignition switch in the Off position. The IOD connector feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the Off position, including the clock.

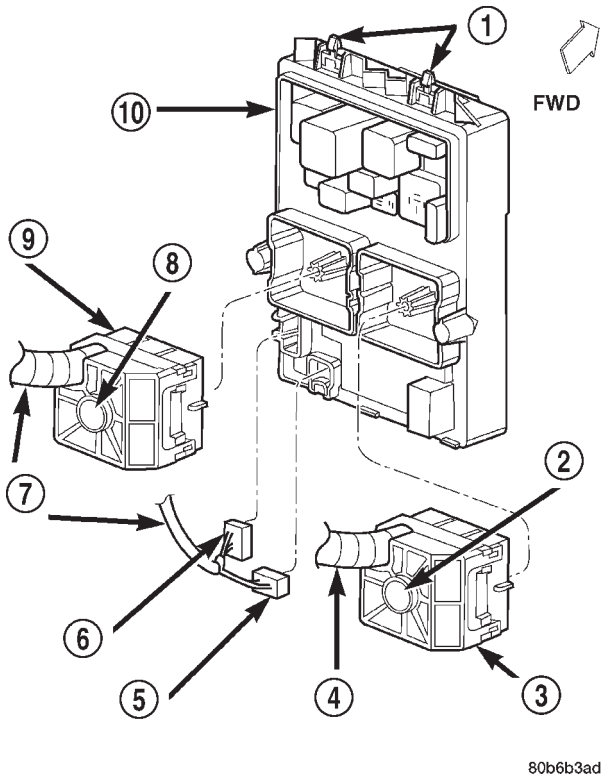


Fig. 17 Ignition-Off Draw Connector

1 - SNAP CLIPS
2 - SCREW
3 - CONNECTOR
4 - LEFT BODY WIRE HARNESS
5 - IOD CONNECTOR
6 - FUSED B+ CONNECTOR
7 - RIGHT BODY WIRE HARNESS
8 - SCREW
9 - CONNECTOR
10 - JUNCTION BLOCK

The IOD connector can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about twenty days (short-term storage). Simply disconnect the IOD connector from the JB receptacle. However, it must be remembered that disconnecting the IOD connector will not eliminate IOD, but only reduce this normal condition. When a vehicle will not be used for more than twenty days, but less than thirty days, remove the IOD fuse from the Power Distribution Center (PDC). If a vehicle will be stored for more than about thirty days, the battery negative cable should be disconnected to eliminate normal IOD; and, the battery should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged. Refer to **Ignition-Off Draw**

IOD WIRE HARNESS CONNECTOR (Continued)

Fuse and **Battery** in the index in this service manual for the location of additional service information covering the ignition-off draw fuse and the battery.

FUSE COVER

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Pull down on the rear edge (nearest the rear of the vehicle) of the instrument panel fuse cover until the rear latches unsnap from the tabs on the lower junction block housing and the side latch unsnaps from the tab on the instrument panel steering column support bracket outboard of the 16-way data link connector (Fig. 18).

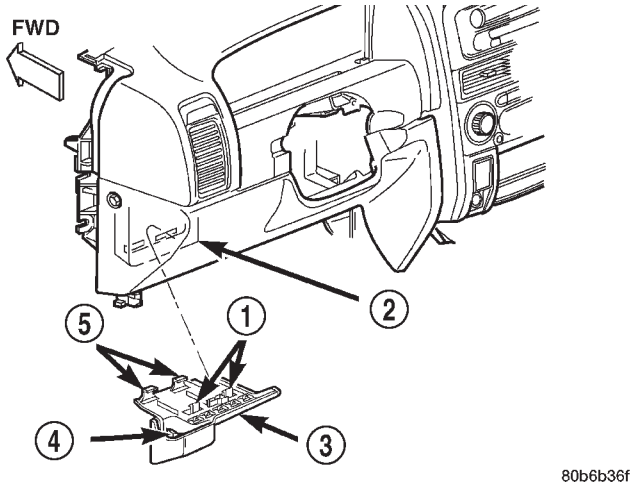


Fig. 18 Instrument Panel Fuse Cover Remove/Install

1 - REAR LATCHES
2 - JUNCTION BLOCK AND BODY CONTROL MODULE UNIT
3 - INSTRUMENT PANEL FUSE COVER
4 - SIDE LATCH
5 - FRONT LATCHES

(3) Move the instrument panel fuse cover towards the front of the vehicle to disengage the front latches from the mounting slots in the lower housing of the body control module.

(4) Remove the fuse cover from under the instrument panel.

INSTALLATION

(1) Position the two front latches of the instrument panel fuse cover within the two locator channel formations on the bottom of the body control module housing (Fig. 19).

(2) While applying a slight upward pressure to the instrument panel fuse cover over the front latches, slowly slide the front latches through the locator channels toward the front of the vehicle until the latches exit the front of the locator channels. This will locate the front latches at the mounting slots in the lower housing of the body control module.

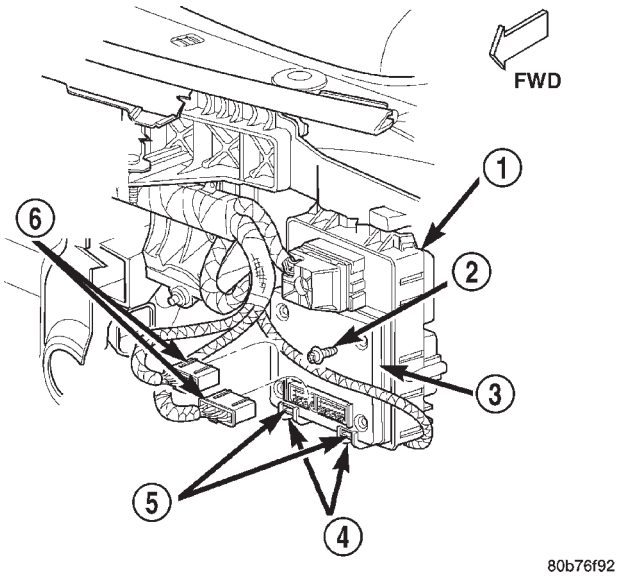


Fig. 19 Instrument Panel Fuse Cover Locator Channels

1 - JUNCTION BLOCK
2 - SCREWS (4)
3 - BODY CONTROL MODULE
4 - FUSE COVER LOCATOR CHANNELS
5 - FUSE COVER MOUNTING SLOTS
6 - INSTRUMENT PANEL WIRE HARNESS CONNECTORS

(3) Apply a slight rearward pressure on the instrument panel fuse cover to engage the front latches in the mounting slots in the lower housing of the body control module.

(4) Swing the rear edge (nearest the rear of the vehicle) of the instrument panel fuse cover up toward the junction block.

(5) Press firmly upward on the instrument panel fuse cover over the rear latches until the latches snap into place over the tabs on the lower edge of the junction block housing.

(6) Press firmly upward on the 16-way data link connector cover formation of the instrument panel fuse cover until the side latch snaps into place over the tab on the outboard side of the instrument panel steering column support bracket.

(7) Reconnect the battery negative cable.

REAR POWER OUTLET

DESCRIPTION - REAR POWER OUTLET

A rear accessory power outlet is optional equipment on this model. The rear power outlet is installed in the lower right quarter trim panel near the right liftgate opening pillar in the cargo area of

REAR POWER OUTLET (Continued)

the vehicle. The power outlet base and mount are secured by a snap fit within the quarter trim panel. A plastic protective cap snaps into the power outlet base when the power outlet is not being used, and hangs from the power outlet base mount by an integral bail strap while the power outlet is in use. While the power outlet is very similar to a cigar lighter base unit, it does not include the two small spring-clip retainers inside the bottom of the receptacle shell that are used to secure the cigar lighter heating element to the insulated contact.

The power outlet receptacle unit and the accessory power outlet protective cap are available for service. The power outlet receptacle cannot be repaired and, if faulty or damaged, it must be replaced.

OPERATION - REAR POWER OUTLET

The power outlet base or receptacle shell is connected to ground, and an insulated contact in the bottom of the shell is connected to battery current. The power outlet receives battery voltage from a fuse in the Power Distribution Center (PDC) through a fuse in the Junction Block (JB) at all times. Refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams for the location of complete rear power outlet circuit diagrams.

DIAGNOSIS AND TESTING - REAR POWER OUTLET

Refer to **Horn/Cigar Lighter/Power Outlet** in Wiring Diagrams for the location of complete rear power outlet circuit diagrams.

(1) Check the fused B(+) fuse in the Junction Block (JB). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Check for battery voltage at the fused B(+) fuse in the JB. If OK, go to Step 3. If not OK, repair the open fused B(+) circuit to the Power Distribution Center (PDC) as required.

(3) Remove the plastic protective cap from the rear power outlet receptacle. Check for continuity between the inside circumference of the rear power outlet receptacle and a good ground. There should be continuity. If OK, go to Step 4. If not OK, go to Step 5.

(4) Check for battery voltage at the insulated contact located at the back of the rear power outlet receptacle. If not OK, go to Step 5.

(5) Disconnect and isolate the battery negative cable. Remove the rear power outlet from the right quarter trim panel. Check for continuity between the ground circuit cavity of the rear power outlet wire harness connector and a good ground. There should be continuity. If OK, go to Step 6. If not OK, repair the open ground circuit to ground as required.

(6) Connect the battery negative cable. Check for battery voltage at the fused B(+) circuit cavity of the rear power outlet wire harness connector. If OK, replace the faulty rear power outlet receptacle base. If not OK, repair the open fused B(+) circuit to the JB fuse as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Pull the protective cap out of the rear power outlet receptacle base (Fig. 20).

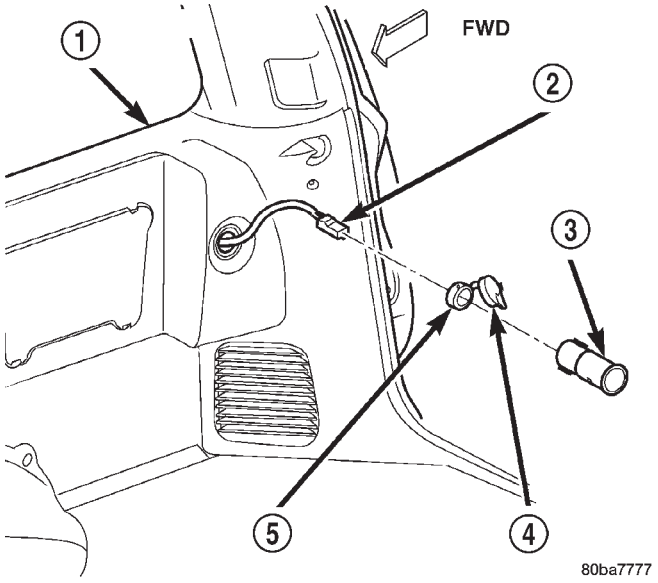


Fig. 20 Rear Power Outlet Remove/Install

1 - RIGHT QUARTER TRIM PANEL
2 - RIGHT BODY WIRE HARNESS CONNECTOR
3 - RECEPTACLE BASE
4 - PROTECTIVE CAP
5 - MOUNT

REAR POWER OUTLET (Continued)

(3) Look inside the rear power outlet receptacle base and note the position of the rectangular retaining bosses of the mount that secures the receptacle base to the right quarter trim panel (Fig. 21).

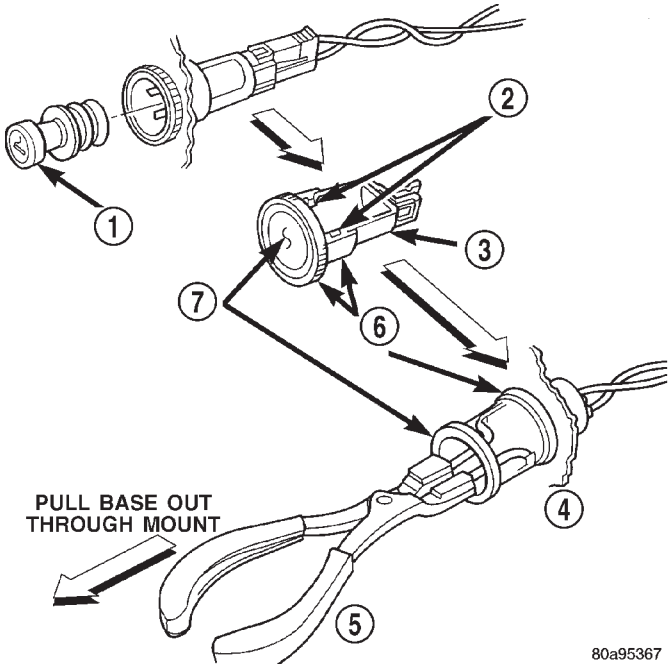


Fig. 21 Power Outlet Remove/Install - Typical

1 - KNOB AND ELEMENT
2 - RETAINING BOSSES-ENGAGE PLIERS HERE
3 - BASE
4 - PARTIALLY REMOVED
5 - EXTERNAL SNAP-RING PLIERS
6 - MOUNT
7 - BASE

(4) Insert a pair of external snap ring pliers into the rear power outlet receptacle base and engage the tips of the pliers with the retaining bosses of the mount.

(5) Squeeze the pliers to disengage the mount retaining bosses from the receptacle base and, using a gentle rocking motion, pull the pliers and the receptacle base out of the mount.

(6) Pull the rear power outlet receptacle base away from the right quarter trim panel far enough to access the wire harness connector.

(7) Disconnect the right body wire harness connector from the rear power outlet receptacle base connector receptacle.

(8) Remove the rear power outlet mount from the right quarter trim panel.

INSTALLATION

(1) Align the splines on the outside of the rear power outlet receptacle base connector receptacle with the grooves on the inside of the mount.

(2) Insert the rear power outlet receptacle base about half way through the mount.

(3) Reconnect the right body wire harness connector to the rear power outlet receptacle base connector receptacle.

(4) Insert the rear power outlet receptacle base and mount into the right quarter trim panel as a unit until the mount is seated flush against the trim panel.

(5) Press firmly on the rear power outlet receptacle base until the retaining bosses of the mount are fully engaged in their receptacles.

(6) Install the protective cap into the rear power outlet receptacle base.

(7) Reconnect the battery negative cable.

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ENGINE - 4.0L

DESCRIPTION

The 4.0 Liter (242 CID) six-cylinder engine is an In-line, lightweight, overhead valve engine. This engine is designed for unleaded fuel.

The engine cylinder head has dual quench-type combustion chambers that create turbulence and fast burning of the air/fuel mixture. This results in better fuel economy.

The cylinders are numbered 1 through 6 from front to rear. The firing order is 1-5-3-6-2-4 (Fig. 1).

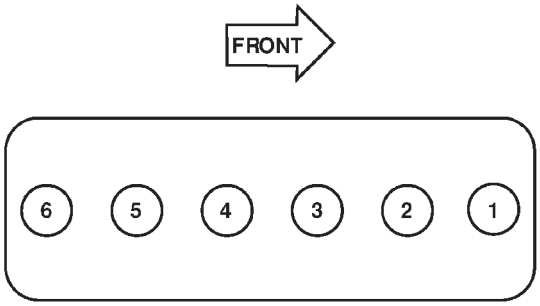
The crankshaft rotation is clockwise, when viewed from the front of the engine. The crankshaft rotates within seven main bearings. The camshaft rotates within four bearings.

The engine Build Date Code is located on a machined surface on the right side of the cylinder block between the No.2 and No.3 cylinders (Fig. 2).

The digits of the code identify:

- 1st Digit—The year (8 = 1998).
- 2nd & 3rd Digits—The month (01 - 12).
- 4th & 5th Digits—The engine type/fuel system/compression ratio (MX = A 4.0 Liter (242 CID) 8.7:1 compression ratio engine with a multi-point fuel injection system).

ENGINE - 4.0L (Continued)



FIRING ORDER:
1 5 3 6 2 4

80b770a2

Fig. 1 Engine Firing Order

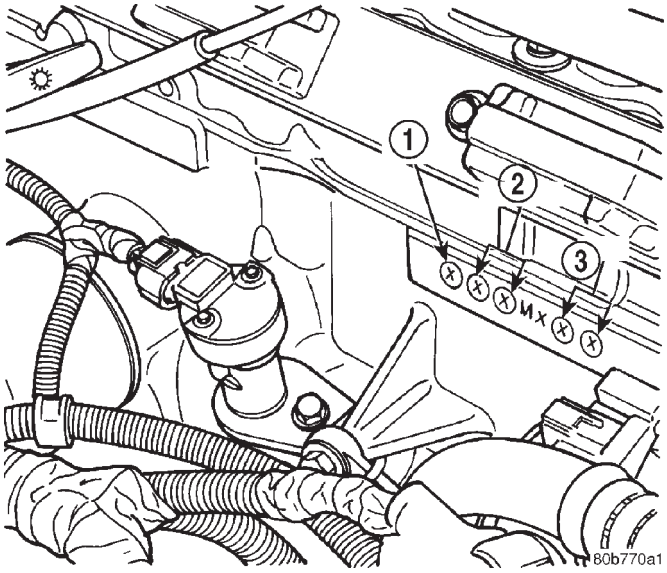


Fig. 2 Build Date Code Location

1 - YEAR
2 - MONTH
3 - DAY

- 6th & 7th Digits—The day of engine build (01 - 31).

(1) **FOR EXAMPLE:** Code * 801MX12 * identifies a 4.0 Liter (242 CID) engine with a multi-point fuel injection system, 8.7:1 compression ratio and built on January 12, 1998.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE

DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either mechanical (e.g., a strange noise), or performance (e.g., engine idles rough and stalls).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - Preformance) or (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING - Mechanical). Refer to 14 - FUEL SYSTEM for fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that cannot be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)
- Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING)
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING)
- Lash Adjuster (Tappet) Noise Diagnosis (Refer to 9 - ENGINE/ENGINE BLOCK/HYDRAULIC LIFTERS (CAM IN BLOCK) - DIAGNOSIS AND TESTING)
- Engine Oil Leak Inspection (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING)

ENGINE - 4.0L (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

ENGINE PERFORMANCE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
ENGINE WILL NOT CRANK	1. Weak or dead battery	1. Charge/Replace Battery. (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - STANDARD PROCEDURE), for correct procedures. Check charging system. (Refer to 8 - ELECTRICAL/ CHARGING - DIAGNOSIS AND TESTING), for correct procedures.
	2. Corroded or loose battery connections	2. Clean/tighten suspect battery/ starter connections
	3. Faulty starter or related circuit(s)	3. Check starting system. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING), for correct diagnostics/procedures
	4. Siezed accessory drive component	4. Remove accessory drive belt and attempt to start engine. If engine starts, repair/replace siezed component.
	5. Engine internal mechanical failure or hydro-static lock	5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), for correct diagnostics/procedures
ENGINE CRANKS BUT WILL NOT START	1. No spark	1. Check for spark. (Refer to 8 - ELECTRICAL/IGNITION CONTROL - SPECIFICATIONS), for correct procedures.
	2. No fuel	2. Perform fuel pressure test (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL PUMP - DIAGNOSIS AND TESTING), and if necessary, inspect fuel injector(s) and driver circuits. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/FUEL INJECTOR - DIAGNOSIS AND TESTING), for correct procedures.
	3. Low or no engine compression	3. Perform cylinder compression pressure test. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
ENGINE LOSS OF POWER	1. Worn or burned distributor rotor	1. Install new distributor rotor
	2. Worn camshaft position sensor shaft	2. Remove and repair camshaft position sensor.(Refer to 8 - ELECTRICAL/IGNITION CONTROL/ CAMSHAFT POSITION SENSOR - REMOVAL).

ENGINE - 4.0L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Worn or incorrect gapped spark plugs	3. Clean plugs and set gap. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - CLEANING).
	4. Dirt or water in fuel system	4. Clean system and replace fuel filter
	5. Faulty fuel pump	5. Install new fuel pump
	6. Incorrect valve timing	6. Correct valve timing
	7. Blown cylinder head gasket	7. Install new cylinder head gasket
	8. Low compression	8. Test cylinder compression. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
	9. Burned, warped, or pitted valves	9. Install/Reface valves as necessary
	10. Plugged or restricted exhaust system	10. Install new parts as necessary
	11. Faulty ignition coil rail	11. Test and replace, as necessary. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/COIL RAIL - REMOVAL).
ENGINE STALLS OR ROUGH IDLE	1. Carbon build-up on throttle plate	1. Remove throttle body and de-carbon. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/ THROTTLE BODY - REMOVAL) for correct procedure.
	2. Engine idle speed too low	2. Check Idle Air Control circuit.
	3. Worn or incorrectly gapped spark plugs	3. Replace or clean and re-gap spark plugs. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING)
	4. Faulty coil rail	4. Test and replace, if necessary. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/COIL RAIL - REMOVAL)
	5. Intake manifold vacuum leak	5. Inspect intake manifold gasket and vacuum hoses. Replace if necessary. (Refer to 9 - ENGINE/MANIFOLDS/ INTAKE MANIFOLD - DIAGNOSIS AND TESTING).
ENGINE MISSES ON ACCELERATION	1. Worn or incorrectly gapped spark plugs	1. Replace spark plugs or clean and set gap.
	2. Spark plug cables defective or crossed	2. Replace spark plug cables.
	3. Dirt in fuel system	3. Clean fuel system
	4. Burned, warped or pitted valves	4. Install new valves
	5. Faulty coil rail	5. Test and replace as necessary. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/COIL RAIL - REMOVAL)

ENGINE - 4.0L (Continued)

DIAGNOSIS AND TESTING— ENGINE DIAGNOSIS - MECHANICAL

ENGINE MECHANICAL DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	1. High or low oil level in crankcase	1. Check for correct oil level. Adjust oil level by draining or adding as needed
	2. Thin or diluted oil	2. Change oil. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE)
	3. Low oil pressure	3. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) for engine oil pressure test/specifications
	4. Dirt in tappets/lash adjusters	4. Clean/replace hydraulic tappets/ lash adjusters
	5. Bent push rod(s)	5. Install new push rods
	6. Worn rocker arms	6. Inspect oil supply to rocker arms and replace worn arms as needed
	7. Worn tappets/lash adjusters	7. Install new hydraulic tappets/lash adjusters
	8. Worn valve guides	8. Inspect all valve guides and replace as necessary
	9. Excessive runout of valve seats or valve faces	9. Grind valves and seats
CONNECTING ROD NOISE	1. Insufficient oil supply	1. Check engine oil level.
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) engine oil pressure test/specifications
	3. Thin or diluted oil	3. Change oil to correct viscosity. (Refer to 9 - ENGINE/LUBRICATION/ OIL - STANDARD PROCEDURE) for correct procedure/engine oil specifications
	4. Excessive connecting rod bearing clearance	Measure bearings for correct clearance with plasti-gage. Repair as necessary
	5. Connecting rod journal out of round	5. Replace crankshaft or grind journals
	6. Misaligned connecting rods	6. Replace bent connecting rods
MAIN BEARING NOISE	1. Insufficient oil supply	1. Check engine oil level.
	2. Low oil pressure	2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING)

ENGINE - 4.0L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
	3. Thin or diluted oil	3. Change oil to correct viscosity.
	4. Excessive main bearing clearance	4. Measure bearings for correct clearance. Repair as necessary
	5. Excessive end play	5. Check crankshaft thrust bearing for excessive wear on flanges
	6. Crankshaft main journal out of round or worn	6. Grind journals or replace crankshaft
	7. Loose flywheel or torque converter	7. Inspect crankshaft, flexplate/ flywheel and bolts for damage. Tighten to correct torque
LOW OIL PRESSURE	1. Low oil level	1. Check oil level and fill if necessary
	2. Faulty oil pressure sending unit	2. Install new sending unit
	3. Clogged oil filter	3. Install new oil filter
	4. Worn oil pump	4. Replace oil pump assembly.
	5. Thin or diluted oil	5. Change oil to correct viscosity.
	6. Excessive bearing clearance	6. Measure bearings for correct clearance
	7. Oil pump relief valve stuck	7. Remove valve to inspect, clean and reinstall
	8. Oil pump suction tube loose, broken, bent or clogged	8. Inspect suction tube and clean or replace if necessary
	9. Oil pump cover warped or cracked	9. Install new oil pump
OIL LEAKS	1. Misaligned or deteriorated gaskets	1. Replace gasket
	2. Loose fastener, broken or porous metal part	2. Tighten, repair or replace the part
	3. Front or rear crankshaft oil seal leaking	3. Replace seal
	4. Leaking oil gallery plug or cup plug	4. Remove and reseal threaded plug. Replace cup style plug
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. CCV System malfunction	1. (Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS - DESCRIPTION) for correct operation
	2. Defective valve stem seal(s)	2. Repair or replace seal(s)
	3. Worn or broken piston rings	3. Hone cylinder bores. Install new rings
	4. Scuffed pistons/cylinder walls	4. Hone cylinder bores and replace pistons as required
	5. Carbon in oil control ring groove	5. Remove rings and de-carbon piston
	6. Worn valve guides	6. Inspect/replace valve guides as necessary
	7. Piston rings fitted too tightly in grooves	7. Remove rings and check ring end gap and side clearance. Replace if necessary

ENGINE - 4.0L (Continued)

DIAGNOSIS AND TESTING—CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise, the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.

(2) Remove the spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - REMOVAL).

(3) Secure the throttle in the wide-open position.

(4) Disconnect the ignition coil.

(5) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(6) Record the compression pressure on the third revolution. Continue the test for the remaining cylinders.

(Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating)
- Leaks between adjacent cylinders or into water jacket
- Any causes for combustion/compression pressure loss

WARNING: DO NOT REMOVE THE RADIATOR CAP WITH THE SYSTEM HOT AND UNDER PRESSURE. SERIOUS BURNS FROM HOT COOLANT CAN OCCUR.

Check the coolant level and fill as required. DO NOT install the radiator cap.

Start and operate the engine until it attains normal operating temperature, then turn OFF the engine.

Remove the spark plugs.

Remove the oil filler cap.

Remove the air cleaner.

Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

Perform the test procedure on each cylinder according to the tester manufacturer's instructions. While testing, listen for pressurized air escaping through the throttle body, tailpipe or oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

DIAGNOSIS AND TESTING—REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurized the crankcase as outlined in (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. Refer to the service Diagnosis—Mechanical, under the Oil Leak row, for components inspections on possible causes and corrections.

(7) After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL), for proper replacement procedures.

STANDARD PROCEDURE

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier then using precut gaskets.

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE—HYDROSTATIC LOCK

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

(1) Perform the Fuel Pressure Release Procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(2) Disconnect the negative cable(s) from the battery.

(3) Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign material.

(4) Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the spark plugs.

(5) With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.

(6) Identify the fluid in the cylinders (coolant, fuel, oil, etc.).

(7) Be sure all fluid has been removed from the cylinders.

(8) Repair engine or components as necessary to prevent this problem from occurring again.

(9) Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.

(10) Install new spark plugs. Tighten the spark plugs to 41 N·m (30 ft. lbs.) torque.

(11) Drain engine oil. Remove and discard the oil filter.

(12) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(13) Install a new oil filter.

(14) Fill engine crankcase with the specified amount and grade of oil. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).

(15) Connect the negative cable(s) to the battery.

(16) Start the engine and check for any leaks.

STANDARD PROCEDURE - CYLINDER BORE HONING

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880, or a light honing oil, available from major oil distributors.

ENGINE - 4.0L (Continued)

CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 40° to 60° for proper seating of rings (Fig. 3).

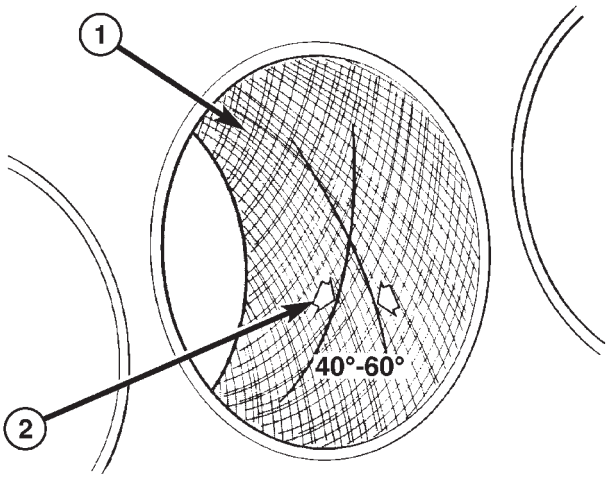


Fig. 3 Cylinder Bore Crosshatch Pattern

1 - CROSSHATCH PATTERN
2 - INTERSECT ANGLE

(4) A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 40° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 4).

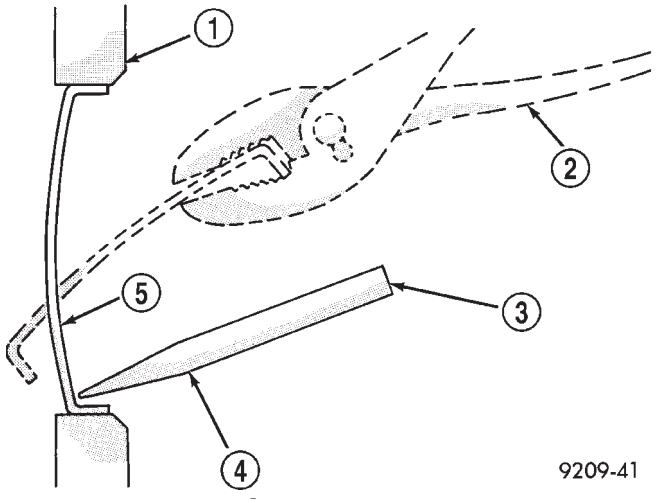


Fig. 4 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Mark the hinge locations on the hood panel for alignment reference during installation. Remove the engine compartment lamp. Remove the hood.

(3) Remove the radiator drain cock and radiator cap to drain the coolant. DO NOT waste usable coolant. If the solution is clean, drain the coolant into a clean container for reuse.

(4) Remove the upper radiator hose and coolant recovery hose.

(5) Remove the lower radiator hose.

(6) Remove upper radiator support retaining bolts and remove radiator support.

ENGINE - 4.0L (Continued)

(7) Remove the fan assembly from the water pump (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(8) Remove the fan shroud.

(9) Disconnect the transmission fluid cooler lines (automatic transmission).

(10) Discharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(11) Remove the service valves and cap the compressor ports.

(12) Remove the radiator or radiator/condenser (if equipped with A/C).

(13) Disconnect the heater hoses at the engine thermostat housing and water pump.

(14) Disconnect the accelerator cable, transmission line pressure cable and speed control cable (if equipped) from the throttle body.

(15) Remove cables from the bracket and secure out of the way.

(16) Disconnect the body ground at the engine.

(17) Disconnect the following connectors and secure their harness out of the way.

- Power steering pressure switch
- Coolant temperature sensor
- Six (6) fuel injector connectors
- Intake air temperature sensor
- Throttle position sensor
- Map sensor
- Crankshaft position sensor
- Oxygen sensor
- Camshaft position sensor
- Generator connector and B+ terminal wire

(18) Disconnect the coil rail electrical connections and the oil pressure switch connector.

(19) Perform the fuel pressure release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(20) Disconnect the fuel supply line at the injector rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/ QUICK CONNECT FITTING - STANDARD PROCEDURE).

(21) Remove the fuel line bracket from the intake manifold.

(22) Remove the air cleaner assembly (Fig. 5).

(23) Disconnect the hoses from the fittings at the steering gear.

(24) Drain the pump reservoir.

(25) Cap the fittings on the hoses and steering gear to prevent foreign objects from entering the system.

(26) Raise and support the vehicle.

(27) Disconnect the wires from the engine starter motor solenoid.

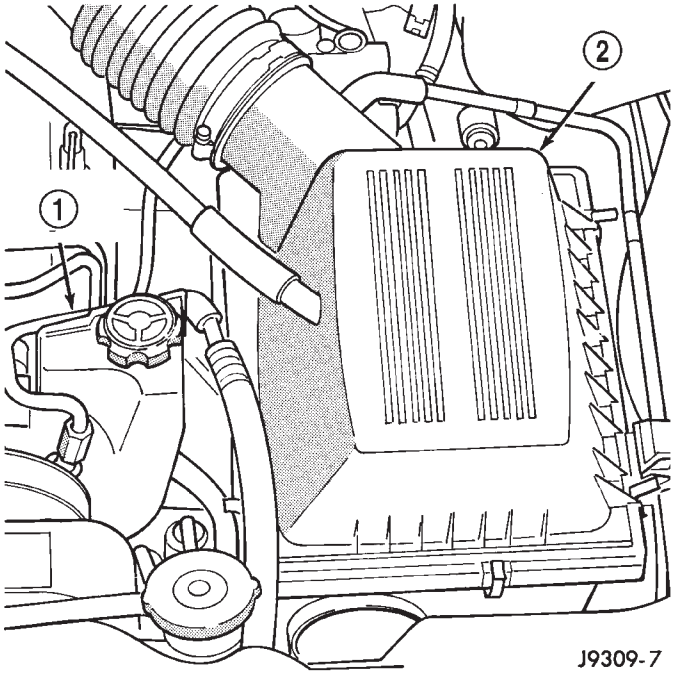


Fig. 5 Air Cleaner Assembly

1 - POWER STEERING PUMP
2 - AIR CLEANER ASSEMBLY

(28) Remove the engine starter motor (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).

(29) Disconnect the oxygen sensor from the exhaust pipe.

(30) Disconnect the exhaust pipe from the manifold.

(31) Remove the exhaust pipe support.

(32) Remove the bending brace (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCT SUPPORT - REMOVAL).

(33) Remove the engine flywheel/converter housing access cover.

(34) Mark the converter and drive plate location.

(35) Remove the converter-to-drive plate bolts.

(36) Remove the upper engine flywheel/converter housing bolts and loosen the bottom bolts.

(37) Remove the engine mount cushion-to-engine compartment bracket bolts.

(38) Lower the vehicle.

(39) Attach a lifting device to the engine.

(40) Raise the engine off the front supports.

(41) Place a support or floor jack under the converter (or engine flywheel) housing.

(42) Remove the remaining converter (or engine flywheel) housing bolts.

(43) Lift the engine out of the engine compartment.

ENGINE - 4.0L (Continued)

INSTALLATION

CAUTION: When installing the engine into a vehicle equipped with an automatic transmission, be careful not to damage the trigger wheel on the engine flywheel.

(1) Attach a lifting device to the engine and lower the engine into the engine compartment. For easier installation, it may be necessary to remove the engine mount bracket as an aid in alignment of the engine to the transmission.

(2) Align the transmission torque converter housing with the engine.

(3) Loosely install the converter housing lower bolts and install the next higher bolt and nut on each side.

(4) Tighten all 4 bolts finger tight.

(5) Install the engine mount brackets (if removed).

(6) Lower the engine and engine mount brackets onto the engine compartment cushions. Install the bolts and finger tighten the nuts.

(7) Remove the engine lifting device.

(8) Raise and support the vehicle.

(9) Install the remaining engine flywheel/converter housing bolts. Tighten all bolts to 38 N·m (28 ft. lbs.) torque.

(10) Install the converter-to-drive plate bolts.

(11) Ensure the installation reference marks are aligned.

(12) Install the engine flywheel/converter housing access cover.

(13) Install the exhaust pipe support and tighten the screw.

(14) Install the engine bending brace (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCT SUPPORT - INSTALLATION).

(15) Tighten the engine mount-to-bracket bolts.

(16) Connect the vehicle speed sensor wire connections and tighten the screws.

(17) Connect the exhaust pipe to the manifold.

(18) Install the engine starter motor (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).

(19) Connect the wires to the engine starter motor solenoid.

(20) Lower the vehicle.

(21) Connect all the vacuum hoses and wire connectors identified during engine removal.

(22) Remove protective caps from the power steering hoses.

(23) Connect the hoses to the fittings at the steering gear. Tighten the nut to 52 N·m (38 ft. lbs.) torque.

(24) Fill the pump reservoir with fluid.

(25) Inspect the fuel supply line o-ring(s) and replace if necessary. Connect fuel supply line to injectior rail and verify connection by pulling outward on the line.

(26) Install the fuel line bracket to the intake manifold.

(27) Connect the coil rail electrical connectors and oil pressure switch connector.

(28) Connect the following electrical connectors:

- Power steering pressure switch
- Coolant temperature sensor
- Six (6) fuel injector connectors
- Intake air temperature sensor
- Throttle position sensor
- Map sensor
- Crankshaft position sensor
- Oxygen sensor
- Camshaft position sensor
- Generator connector and B+ terminal wire

(29) Connect all previously removed vacuum hoses.

(30) Connect the body ground strap.

(31) Install the throttle, transmission line pressure, and speed control cables to their mounting bracket and connect them to the throttle body.

(32) Connect the heater hoses at the engine thermostat housing and water pump.

(33) Install the fan assembly (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(34) Place the fan shroud in position over the fan.

(35) Install the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).

(36) Connect the service valves to the A/C compressor ports, if equipped with A/C.

(37) Charge the air conditioner system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(38) Connect the radiator hoses and automatic transmission fluid cooler pipes, if equipped.

(39) Install the fan shroud to the radiator or radiator/condenser (if equipped with A/C).

(40) Install upper radiator support.

(41) Connect the upper radiator hose and tighten the clamp.

(42) Connect the lower radiator hose and tighten the clamp.

(43) Fill crankcase with engine oil. (Refer to LUBRICATION & MAINTENANCE/FLUID CAPACITIES - SPECIFICATIONS) for correct capacities.

(44) Fill the cooling system with reusable coolant or new coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).

(45) Align the hood to the scribe marks. Install the hood.

(46) Install the air cleaner assembly.

(47) Install the battery and connect the battery cable.

ENGINE - 4.0L (Continued)

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(48) Start the engine, inspect for leaks and correct the fluid levels, as necessary.

SPECIFICATIONS

ENGINE - 4.0L

DESCRIPTION	SPECIFICATION
Engine Type	In-line 6 Cylinder
Bore and Stroke	98.4 x 86.69 mm (3.88 x 3.413 in.)
Displacement	4.0L (242 cu. in.)
Compression Ratio	8.8:1
Firing Order	1–5–3–6–2–4
Lubrication	Pressure Feed–Full Flow Filtration
Cooling System	Liquid Cooled–Forced Circulation
Cylinder Block	Cast Iron
Crankshaft	Cast Nodular Iron
Cylinder Head	Cast Iron
Camshaft	Cast Iron
Pistons	Aluminum Alloy
Combustion Chamber	Dual-Quench
Connecting Rods	Cast Malleable Iron
CAMSHAFT	
Hydraulic Tappet Clearance	Zero Lash
Bearing Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)

DESCRIPTION	SPECIFICATION
Bearing Journal Diameter	
No. 1	51.54 to 51.56 mm (2.029 to 2.030 in.)
No. 2	51.28 to 51.31 mm (2.019 to 2.020 in.)
No. 3	51.03 to 51.05 mm (2.009 to 2.010 in.)
No. 4	50.78 to 50.80 mm (1.999 to 2.000 in.)
Base Circle Runout (MAX)	0.03 mm (0.001 in.)
Valve Lift	
Intake	10.350 mm (0.4075 in.)
Exhaust	10.528 mm (0.4145 in.)
Valve Timing	
Intake	
Opens	12.4° BTDC
Closes	60.9° ABDC
Exhaust	
Opens	49.8 BBDC
Closes	29.2° ATDC
Valve Overlap	41.6°
Intake Duration	253.3°
Exhaust Duration	259.°
CRANKSHAFT	
End Play	0.038 to 0.165 mm (0.0015 to 0.0065 in.)
Main Bearing Journal Diameter	
No. 1-6	63.489 to 63.502 mm (2.4996 to 2.5001 in.)
No. 7	63.449 to 63.487 mm (2.4980 to 2.4995 in.)

ENGINE - 4.0L (Continued)

DESCRIPTION	SPECIFICATION
Main Bearing Journal Width	
No. 1	27.58 to 27.89 mm (1.086 to 1.098 in.)
No. 3	32.28 to 32.33 mm (1.271 to 1.273 in.)
No. 2-4-5-6-7	30.02 to 30.18 mm (1.182 to 1.188 in.)
Main Bearing Clearance	0.03 to 0.06 mm (0.001 to 0.0025 in.)
Preferred	0.051 mm (0.002 in.)
Connecting Rod Journal Diameter	53.17 to 53.23 mm (2.0934 to 2.0955 in.)
Connecting Rod Journal Width	27.18 to 27.33 mm (1.070 to 1.076 in.)
Out-of-Round (MAX)	0.013 mm (0.0005 in.)
Taper (MAX)	0.013 mm (0.0005 in.)
CYLINDER BLOCK	
Deck Height	240.03 to 240.18 mm (9.450 to 9.456 in.)
Deck Clearance (Below Block)	0.546 mm (0.0215 in.)
Cylinder Bore Diameter	
Standard	98.45 to 98.48 mm (3.8759 to 3.8775 in.)
Taper	0.025 mm (0.001 in.)
Out-ofRound	0.025 mm (0.001 in.)
Tappet Bore Diameter	23.000 to 23.025 mm (0.9055 to 0.9065 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max.	0.20 mm max. for total length (0.008 in. max. for total length)
Main Bearing Bore Diameter	68.3514 to 68.3768 mm (2.691 to 2.692 in.)
CONNECTING ROD	
Total Weight (Less Bearing)	663 to 671 grams (23.39 to 23.67 oz.)
Length (Center-to-Center)	155.52 to 155.62 mm (6.123 to 6.127 in.)
Piston Pin Bore Diameter	23.59 to 23.62 mm (0.9288 to 0.9298 in.)
Bore (Less Bearings)	56.08 to 56.09 mm (2.2080 to 2.2085 in.)
Bearing Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Preferred	0.044 to 0.050 mm (0.0015 to 0.0020 in.)
Side Clearance	0.25 to 0.48 mm (0.010 to 0.019 in.)
Twist (Max.)	0.002 mm per mm (0.002 in. per inch)
Bend (Max.)	0.002 mm per mm (0.002 in. per inch.)
CYLINDER COMPRESSION PRESSURE	
Pressure Range	827 to 1,034 kPa (120 to 150 psi)
Max. Variation Between Cylinders	206 kPa (30 psi)
CYLINDER HEAD	
Combustion Chamber	55.22 to 58.22 cc (3.37 to 3.55 cu. in.)
Valve Guide I.D. (Integral)	7.95 to 7.97 mm (0.313 to 0.314 in.)

ENGINE - 4.0L (Continued)

DESCRIPTION	SPECIFICATION
Valve Stem-to-Guide Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)
Valve Seat Angle	
Intake	44.5°
Exhaust	44.5°
Valve Seat Width	1.02 to 1.52 mm (0.040 to 0.060 in.)
Valve Seat Runout	0.064 mm (0.0025 in.)
Flatness	0.03 mm per 25 mm (0.001 in. per 1 in.) 0.05 mm per 152 mm (0.002 in. per 6 in.)
Flatness Max.	0.20 mm - max. for total length (0.008 in. max. for total length)
ROCKER ARMS, PUSH RODS & TAPPETS	
Rocker Arm Ratio	1.6:1
Push Rod Length (Pink)	244.856 to 245.364 mm (9.640 to 9.660 in.)
Push Rod Diameter	7.92 to 8.00 mm (0.312 to 0.315 in.)
Hydraulic Tappet Diameter	22.962 to 22.974 mm (0.904 to 0.9045 in.)
Tappet-to-Bore Clearance	0.025 to 0.063 mm (0.001 to 0.0025 in.)
VALVES	
Valve Length (Overall)	
Intake	122.479 to 122.860 mm (4.822 to 4.837 in.)
Exhaust	122.860 to 123.241 mm (4.837 to 4.852 in.)
Valve Stem Diameter	7.899 to 7.925 mm (0.311 to 0.312 in.)
Stem-to-Guide Clearance	0.025 to 0.076 mm (0.001 to 0.003 in.)

DESCRIPTION	SPECIFICATION
Valve Head Diameter	
Intake	48.387 to 48.641 mm (1.905 to 1.915 in.)
Exhaust	37.973 to 38.227 mm (1.495 to 1.505 in.)
Valve Face Angle	
Intake	46.5°
Exhaust	46.5°
Tip Refinishing (Max. Allowable)	0.25 mm (0.010 in.)
VALVE SPRINGS	
Free Length (Approx.)	47.65 mm (1.876 in.)
Spring Load	
Valve Closed	316 to 351 N @ 41.656 mm (71 to 79 lbf. @ 1.64 in.)
Valve Open	898.6 to 969.7 N @ 30.89 mm (202 to 218 lbf @ 1.216 in.)
Inside Diameter	21.0 mm to 21.51 mm (0.827 to 0.847 in.)
Installed Height	41.656 mm (1.64 in.)
PISTONS	
Weight (Less Pin)	417 to 429 grams (14.7 to 15.1 oz.)
Piston Pin Bore (Centerline to Piston Top)	40.61 to 40.72 mm (1.599 to 1.603 in.)
Piston-to-Bore Clearance	0.018 to 0.038 mm (0.0008 to 0.0015 in.)
Ring Gap Clearance	
Top Compression Ring	0.229 to 0.610 mm (0.0090 to 0.0240 in.)
2nd Compression Ring	0.483 to 0.965 mm (0.0190 to 0.0380 in.)
Oil Control Steel Rails	0.254 to 1.500 mm (0.010 to 0.060 in.)

ENGINE - 4.0L (Continued)

DESCRIPTION	SPECIFICATION
Ring Side Clearance	
Compression Rings	0.042 to 0.084 mm (0.0017 to 0.0033 in.)
Oil Control Rings	0.06 to 0.21 mm (0.0024 to 0.0083 in.)
Piston Ring Groove Height	
Compression Rings	1.530 to 1.555 mm (0.0602 to 0.0612 in.)
Oil Control Ring	4.035 to 4.060 mm (0.1589 to 0.1598 in.)
Piston Ring Groove Diameter	
No.1 Compression Ring	88.39 to 88.65 mm (3.48 to 3.49 in.)
No.2 Compression Ring	87.63 to 87.88 mm (3.45 to 3.46 in.)
Oil Control Ring	89.66 to 89.92 mm (3.53 to 3.54 in.)
Piston Pin Bore Diameter	23.650 to 23.658 mm (0.9312 to 0.9315 in.)
Piston Pin Diameter	23.637 to 23.640 mm (0.9306 to 0.9307 in.)
Piston-to-Pin Clearance	0.0102 to 0.0208 mm (0.0005 to 0.0009 in.)
Piston-to-Pin Connecting Rod (Press Fit)	8.9 kN (2000 lbf.)
OIL PUMP	
Gear-to-Body Clearance (Radial)	0.051 to 0.102 mm (0.002 to 0.004 in.)
Gear-to-Body Clearance (Radial) Preferred	0.051 mm (0.002 in.)
Gear End Clearance Plastigage	0.051 to 0.152 mm (0.002 to 0.006 in.)
Gear End Clearance Plastigage (Preferred)	0.051 mm (0.002 in.)
Gear End Clearance Feeler Gauge	0.1016 to 0.2032 mm (0.004 to 0.008 in.)
Gear End Clearance Feeler Gauge (Preferred)	0.1778 mm (0.007 in.)
Oil Pressure	
At Idle Speed	89.6 kPa (13 psi)
At 1600 rpm & Higher	255 to 517 kPa (37 to 75 psi)
Oil Pressure Relief	517 kPa (75 psi)

TORQUE - 4.0L ENGINE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
A/C Compressor—Bolts	28	—	250
Block Heater—Nut	2	—	16
Camshaft Sprocket—Bolt	68	50	—
Camshaft Thrust Plate to Cylinder Block—Screws	24	18	—
Clutch Cover to Flywheel—Bolts	54	40	—
Coil Bracket to Block—Bolts	22	—	192
Connecting Rod—Nuts	45	33	—
Cylinder Block—Drain Plugs	34	25	—
Cylinder Head—Bolts	135	100	—
Cylinder Head Cover—Bolts	10	—	85
Distributor Clamp—Bolts	23	—	204
Engine Mounts—Front			
Support Bracket Bolts	61	45	—
Support Cushion Bolts/Nuts	41	30	—
Support Cushion Bracket Bolts	54	40	—
Support Cushion Bracket Stud Nuts	41	30	—
Support Cushion Thru-Bolt	65	48	—
Engine Mounts—Rear			
Crossmember to Sill Bolts—(Automatic)	41	30	—
Insulator Stud Assembly—Nut	41	30	—
Support Cushion/Crossmember—Nuts	22	—	192
Support Cushion/Bracket—Nuts (Manual)	75	55	—

ENGINE - 4.0L (Continued)

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Transmission Support Bracket —Bolt (Manual)	46	34	—
Transmission Support Bracket/ Cushion—Bolt (4WD Auto)	75	55	—
Transmission Support Adaptor Bracket—Bolts (2WD Auto)	75	55	—
Exhaust Manifold/Pipe—Nuts	27	20	—
Intake/Exhaust Manifold			
Fasteners #1-5	33	24	—
Fasteners #6 and 7	14	—	126
Fasteners #8-11	33	24	—
Flywheel to Converter Housing—Bolts	38	28	—
Flywheel to Crankshaft—Bolts	143	105	—
Front Cover to Block—Bolts			
1/4-20	7	—	60
5/16-18	22	—	192
Fuel Rail—Bolts/Stud	12	—	108
Generator—Bolts	57	42	—
Generator Bracket to Engine—Bolts	47	35	—
Idler Pulley to Cylinder Head—Bolt	47	35	—
Main Bearing Cap—Bolts	108	80	—
Oil Filter	18	—	156
Oil Filter Connector to			
Adaptor	47	35	—
Block	68	50	—
Adaptor Bolts	102	50	—
Oil Galley—Plug	41	30	—
Oil Pan—Bolts			
1/4-20	9.5	—	84
5/16-18	15	—	132
Oil Pan—Drain Plug	34	25	—
Oil Pump			
Mounting Bolts	23	—	204
Cover Bolts	8	—	70
Rocker Arm Assembly to Cylinder Head—Capscrews	30	21	—
Spark Plugs	37	27	—
Starter Motor—Mounting Bolts	45	33	—
Thermostat Housing—Bolts	18	—	156
Throttle Body—Bolts	10	—	90
Vibration Damper—Bolt	108	80	—
Water Pump to Block—Bolts	23	17	—

AIR CLEANER ELEMENT

REMOVAL - 4.0L

(1) Unlatch four clips retaining air cleaner cover to air cleaner housing (Fig. 6).

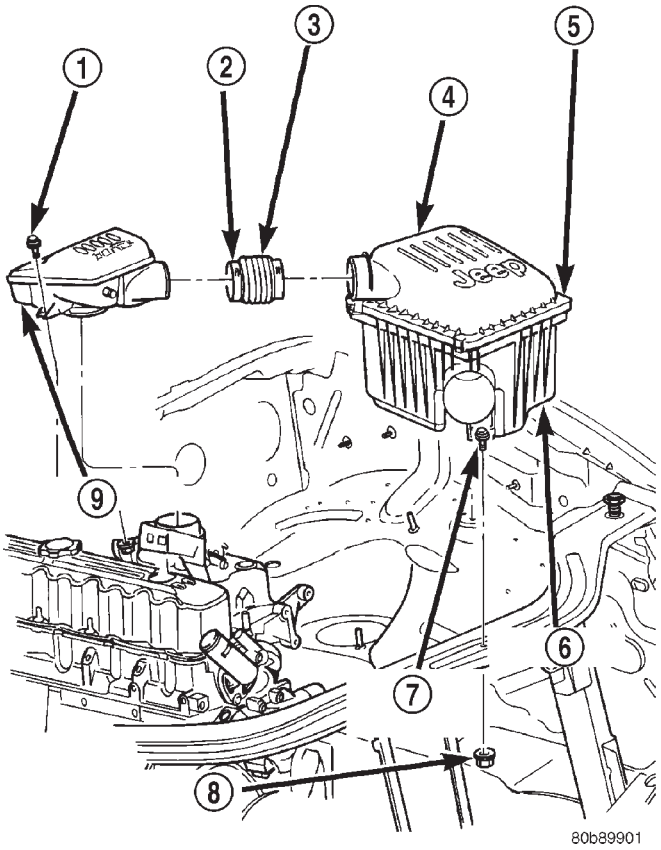


Fig. 6 Air Cleaner Assembly —4.0L Engine

1 - RESONATOR BOLTS
2 - CLAMPS
3 - AIR DUCT
4 - AIR CLEANER COVER
5 - CLIPS
6 - HOUSING
7 - HOUSING BOLTS (3)
8 - LOWER HOUSING NUTS (3)
9 - RESONATOR

AIR CLEANER ELEMENT (Continued)

(2) Lift cover up and position to the side.
(3) Remove air cleaner element.

INSTALLATION - 4.0L

(1) Clean inside of air cleaner housing before installing new element.
(2) Install air cleaner element into housing.
(3) Latch clips and clamp cover down to secure. Be sure air cleaner cover is properly seated to air cleaner housing.

AIR CLEANER HOUSING

REMOVAL - 4.0L

(1) Disconnect air cleaner cover-to-air duct clamp (Fig. 6).
(2) Disconnect air duct at housing.
(3) **Each of the 3 air cleaner housing mounting bolts is attached with 2 nuts (an upper nut and lower nut). DO NOT REMOVE BOLTS. To prevent stripping bolts, only remove lower nuts. The lower housing nuts are located under left front inner fender (Fig. 6).**
(a) To gain access to lower nuts, raise vehicle.
(b) Remove clips retaining rubber inner fender shield.
(c) Pry back shield enough to gain access to lower nuts.
(d) Remove 3 nuts.
(e) Remove air cleaner assembly from vehicle.
(4) If resonator is to be removed, disconnect breather tube at resonator, disconnect air duct clamp at resonator (Fig. 6)and remove 1 resonator mounting bolt. Remove resonator from throttle body by loosening clamp (Fig. 7).

INSTALLATION - 4.0L

(1) Position air cleaner assembly to body and install 3 nuts. Tighten nuts to 10 N·m (93 in. lbs.) torque. **To prevent excessive vibration transmitted through housing, the nuts must be properly torqued. Do not overtighten nuts.**
(2) If resonator was removed: Install resonator and bolts. Tighten bolts to 4 N·m (35 in. lbs.) torque. Tighten clamp at throttle body to 4 N·m (35 in. lbs.) torque.
(3) Position fender liner and install clips.
(4) Connect air duct at housing (Fig. 6).
(5) Tighten air duct clamp.

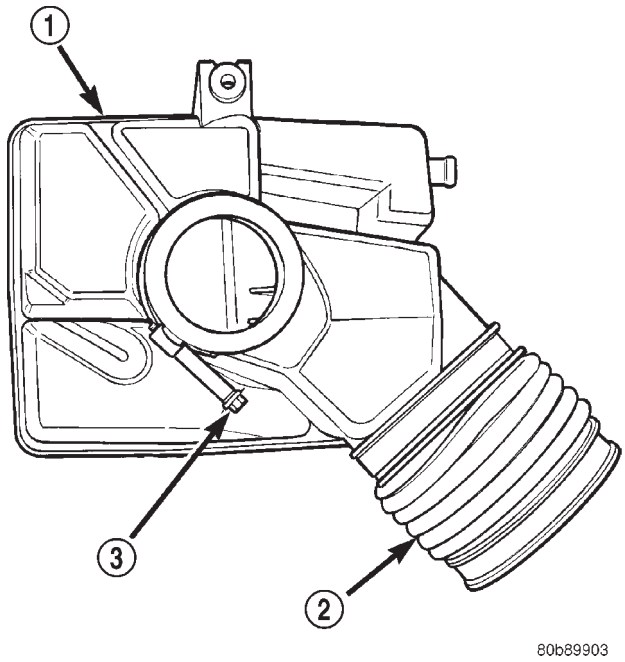


Fig. 7 RESONATOR CLAMP - 4.0L

1 - RESONATOR
2 - AIR DUCT
3 - CLAMP

CYLINDER HEAD

DESCRIPTION

The cylinder head is made of cast iron containing twelve valves made of chrome plated heat resistant steel, valve stem seals, springs, retainers and keepers. The cylinder head and valve seats can be resurfaced for service purposes.

The valve guides are integral to the cylinder head, They are not replaceable. However, they are serviceable.

The cylinder head uses dual quench-type design combustion chambers which cause turbulence in the cylinders allowing faster burning of the air/fuel mixture, resulting in better fuel economy (Fig. 8).

REMOVAL

NOTE: This procedure can be done with the engine in or out of the vehicle.

(1) Disconnect the battery negative cable.

WARNING: DO NOT REMOVE THE CYLINDER BLOCK DRAIN PLUGS OR LOOSEN THE RADIATOR DRAIN COCK WITH THE SYSTEM HOT AND PRESSURIZED BECAUSE SERIOUS BURNS FROM THE COOLANT CAN OCCUR.

CYLINDER HEAD (Continued)

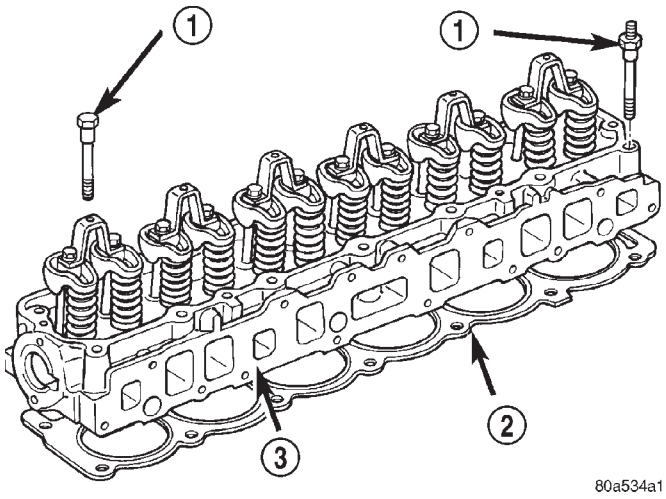


Fig. 8 Cylinder Head 4.0L Engine

1 - CYLINDER HEAD BOLTS
2 - CYLINDER HEAD GASKET
3 - CYLINDER HEAD

(2) Drain the coolant (Refer to 7 - COOLING - STANDARD PROCEDURE) and disconnect the hoses at the engine thermostat housing and the water pump inlet. DO NOT waste reusable coolant. If the solution is clean and is being drained only to service the engine or cooling system, drain the coolant into a clean container for reuse.

(3) Remove the air cleaner assembly (Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(4) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(5) Remove the capscrews, bridge and pivot assemblies and rocker arms (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).

(6) Remove the push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order as removed.**

(7) Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(8) Remove the A/C compressor mounting bolts and secure the compressor to the side.

(9) Remove the power steering pump and bracket from the intake manifold and water pump. Set the pump and bracket aside. DO NOT disconnect the hoses.

(10) Perform the Fuel System Pressure Release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(11) Disconnect the fuel supply line at the fuel rail.

(12) Remove the intake and exhaust manifolds from the engine cylinder head (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

(13) Remove the coil rail (Refer to 8 - ELECTRICAL/IGNITION CONTROL/COIL RAIL - REMOVAL).

(14) Remove spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - REMOVAL).

(15) Disconnect the temperature sending unit wire connector.

(16) Remove the engine cylinder head bolts. Bolt No.14 cannot be removed until the head is moved forward (Fig. 9). Pull bolt No.14 out as far as it will go and then suspend the bolt in this position (tape around the bolt).

(17) Remove the engine cylinder head and gasket (Fig. 9).

(18) If this was the first time the bolts were removed, put a paint dab on the top of the bolt. If the bolts have a paint dab on the top of the bolt or it isn't known if they were used before, discard the bolts.

(19) Stuff clean lint free shop towels into the cylinder bores.

NOTE: If the valves, springs, or seals are to be inspected/replaced at this time, (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE) for proper inspection procedures.

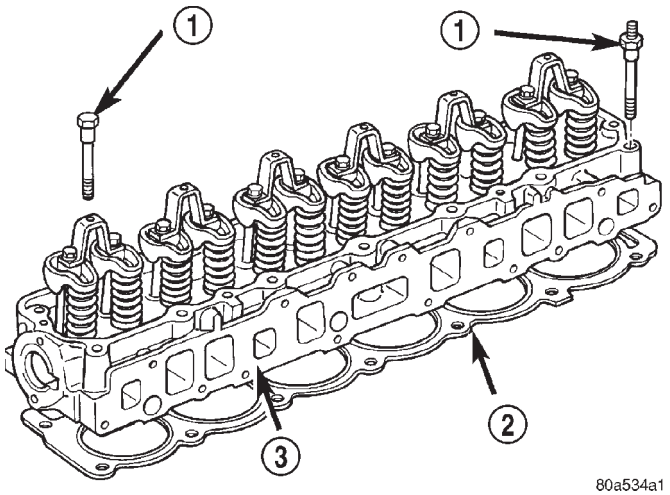


Fig. 9 Engine Cylinder

1 - CYLINDER HEAD BOLTS
2 - CYLINDER HEAD GASKET
3 - CYLINDER HEAD

CYLINDER HEAD (Continued)

CLEANING

Thoroughly clean the engine cylinder head and cylinder block mating surfaces. Clean the intake and engine exhaust manifold and engine cylinder head mating surfaces. Remove all gasket material and carbon.

Check to ensure that no coolant or foreign material has fallen into the tappet bore area.

Remove the carbon deposits from the combustion chambers and top of the pistons.

INSPECTION

Use a straightedge and feeler gauge to check the flatness of the engine cylinder head and block mating surfaces.

INSTALLATION

NOTE: This procedure can be done with the engine in or out of the vehicle.

The engine cylinder head gasket is a composition gasket. The gasket is to be installed DRY. **DO NOT use a gasket sealing compound on the gasket.**

If the engine cylinder head is to be replaced and the original valves used, measure the valve stem diameter. Only standard size valves can be used with a service replacement engine cylinder head unless the replacement head valve stem guide bores are reamed to accommodate oversize valve stems. Remove all carbon buildup and reface the valves.

(1) Remove the shop towels from the cylinder bores. Coat the bores with clean engine oil.

(2) Position the engine cylinder head gasket (with the numbers facing up) using the alignment dowels in the cylinder block, to position the gasket.

CAUTION: Engine cylinder head bolts should be reused only once. Replace the head bolts if they were used before or if they have a paint dab on the top of the bolt.

(3) With bolt No.14 held in place (tape around bolt), install the engine cylinder head over the same dowels used to locate the gasket. Remove the tape from bolt No.14.

(4) Coat the threads of stud bolt No.11 with Loctite 592 sealant, or equivalent.

(5) Tighten the engine cylinder head bolts in sequence according to the following procedure (Fig. 10).

CAUTION: During the final tightening sequence, bolt No.11 will be tightened to a lower torque than the rest of the bolts. DO NOT overtighten bolt No.11.

(a) Tighten all bolts in sequence (1 through 14) to 30 N·m (22 ft. lbs.) torque.

(b) Tighten all bolts in sequence (1 through 14) to 61 N·m (45 ft. lbs.) torque.

(c) Check all bolts to verify they are set to 61 N·m (45 ft. lbs.) torque.

(d) Tighten bolts in sequence:

- Bolts 1 through 10 to 149 N·m (110 ft. lbs.) torque.
- Bolt 11 to 135 N·m (100 ft. lbs.) torque.
- Bolts 12 through 14 to 149 N·m (110 ft. lbs.) torque.

CYLINDER HEAD BOLTS

POSITION	DESCRIPTION
1,4,5,12,13	1/2 in.-13 BOLT
8,9	1/2 in.-13 BOLT WITH DOWEL POINT
2,3,6,7,10,11,14	1/2 in.-13 WITH 7/16 in.-14 STUD END
All bolts are 12 point drives for rocker cover clearance	

(e) Check all bolts in sequence to verify the correct torque.

(f) If not already done, clean and mark each bolt with a dab of paint after tightening. Should you encounter bolts which were painted in an earlier service operation, replace them.

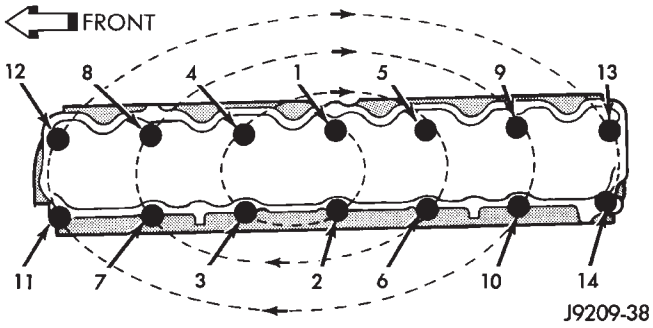


Fig. 10 Engine Cylinder Head Bolt Tightening Sequence

(6) Install the spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - INSTALLATION).

(7) Connect the temperature sending unit wire connector.

(8) Install the ignition coil rail (Refer to 8 - ELECTRICAL/IGNITION CONTROL/COIL RAIL - INSTALLATION).

(9) Install the intake and exhaust manifolds (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(10) Install the fuel line.

(11) Attach the power steering pump and bracket.

CYLINDER HEAD (Continued)

(12) Install the push rods, rocker arms, pivots and bridges in the order they were removed (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).

(13) Install the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(14) Attach the air conditioner compressor mounting bracket to the engine cylinder head and block. Tighten the bolts to 40 N·m (30 ft. lbs.) torque.

(15) Attach the air conditioning compressor to the bracket. Tighten the bolts to 27 N·m (20 ft. lbs.) torque.

CAUTION: The serpentine drive belt must be routed correctly. Incorrect routing can cause the water pump to turn in the opposite direction causing the engine to overheat.

(16) Install the serpentine drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(17) Install the air cleaner and ducting.

(18) Connect the hoses to the engine thermostat housing and fill the cooling system to the specified level (Refer to 7 - COOLING - STANDARD PROCEDURE).

(19) The automatic transmission throttle linkage and cable must be adjusted after completing the engine cylinder head installation (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - AW4/ THROTTLE VALVE CABLE - ADJUSTMENTS).

(20) Install the temperature sending unit and connect the wire connector.

(21) If equipped with air conditioning, install A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION) and charge A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(22) Connect negative cable to battery.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN DIRECT LINE WITH THE FAN. DO NOT PUT HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(23) Operate the engine with the radiator cap off. Inspect for leaks and continue operating the engine until the engine thermostat opens. Add coolant, if required.

CYLINDER HEAD COVER(S)

DESCRIPTION

The cylinder head cover (Fig. 11) is made of stamped steel and incorporates the Crankcase Ventilation (CCV) Hoses and the oil fill opening.

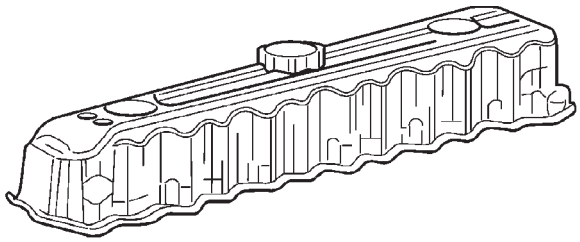


Fig. 11 Cylinder Head Cover

REMOVAL

The cylinder head cover is isolated from the cylinder head via grommets and a reusable molded rubber gasket. The grommet and limiter are retained in the cylinder head cover.

(1) Disconnect negative cable from battery.

(2) Disconnect the Crankcase Ventilation (CCV) vacuum hose from engine cylinder head cover.

(3) Disconnect the fresh air inlet hose from the engine cylinder head cover.

(4) Disconnect the accelerator, transmission, and speed (if equipped) control cables from the throttle body (Fig. 12).

(5) Remove the three bolts that fasten the control cable bracket to the intake manifold.

(6) Remove control cables from cylinder head cover clip.

(7) Position control cables and bracket away from cylinder head cover secure with tie straps.

(8) Remove the engine cylinder head cover mounting bolts.

(9) Remove the engine cylinder head cover and gasket.

CYLINDER HEAD COVER(S) (Continued)

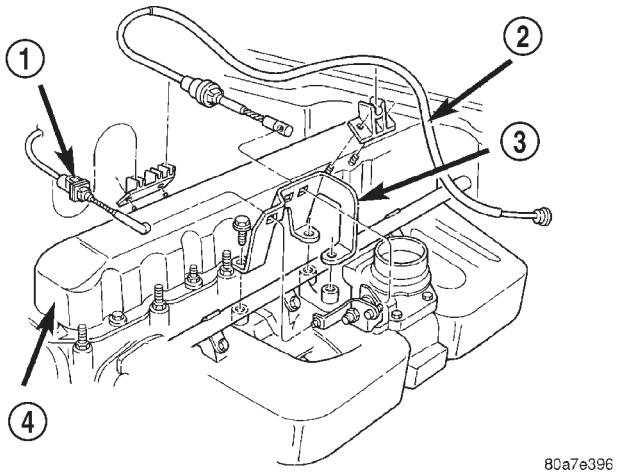


Fig. 12 Engine Cylinder Head Cover

1 - TRANS CONTROL CABLE
2 - ACCELERATOR CABLE
3 - CONTROL CABLE BRACKET
4 - CYLINDER HEAD COVER

CLEANING

Remove any original sealer from the cover sealing surface of the engine cylinder head and clean the surface using a fabric cleaner.

Remove all residue from the sealing surface using a clean, dry cloth.

INSPECTION

Inspect the engine cylinder head cover for cracks. Replace the cover, if cracked.

The original dark grey gasket material should NOT be removed. If sections of the gasket material are missing or are compressed, replace the engine cylinder head cover. However, sections with minor damage such as small cracks, cuts or chips may be repaired with a hand held applicator. The new material must be smoothed over to maintain gasket height. Allow the gasket material to cure prior to engine cylinder head cover installation.

INSTALLATION

The cylinder head cover is isolated from the cylinder head via grommets and a reusable molded rubber gasket. The grommet and limiter are retained in the cylinder head cover.

(1) If a replacement cover is installed, transfer the CCV valve grommet and oil filler cap from the original cover to the replacement cover.

(2) Install cylinder head cover and gasket (Fig. 13). Tighten the mounting bolts to 10 N·m (85 in. lbs.) torque.

(3) Connect the CCV hoses.

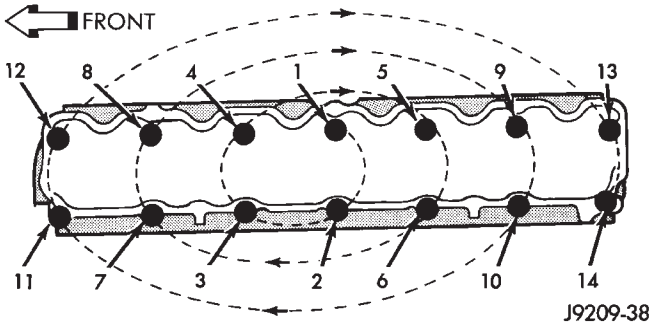


Fig. 13 Cylinder Head Cover Gasket Locator Pins at #8 & #9

(4) Install control cables and bracket on intake manifold and tighten bolts to 8.7 N·m (77 in. lbs.) torque.

(5) Connect control cables to throttle body linkage.

(6) Snap control cables into cylinder head cover clip.

(7) Connect negative cable to battery.

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. All valves use three bead locks to promote valve rotation (Fig. 14).

STANDARD PROCEDURE - VALVE SERVICE

VALVE REFACING

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

(1) Use a valve refacing machine to reface the intake and exhaust valves to the specified angle.

(2) After refacing, a margin of at least 0.787 mm (0.031 inch) must remain (Fig. 15). If the margin is less than 0.787 mm (0.031 inch), the valve must be replaced.

VALVE SEAT REFACING

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

(1) Install a pilot of the correct size in the valve guide bore. Reface the valve seat to the specified angle with a good dressing stone. Remove only enough metal to provide a smooth finish.

(2) Use tapered stones to obtain the specified seat width when required.

INTAKE/EXHAUST VALVES & SEATS (Continued)

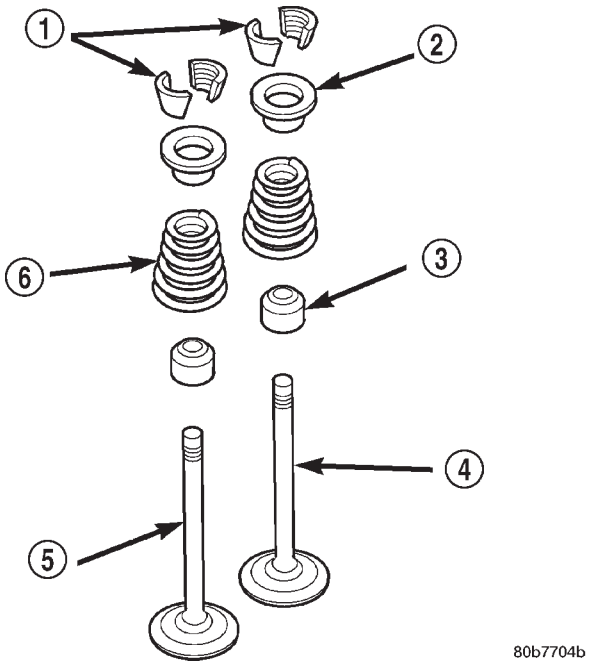


Fig. 14 VALVE AND KEEPER CONFIGURATION 4.0L

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

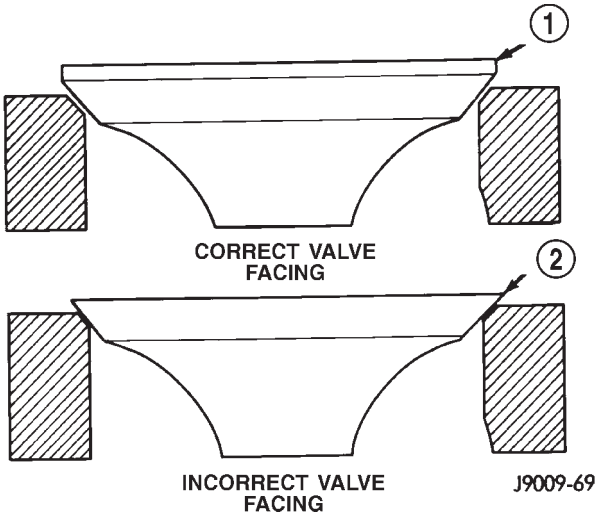


Fig. 15 Valve Facing

1 - VALVE MARGIN
2 - NO MARGIN

(3) Control valve seat runout to a maximum of 0.0635 mm (0.0025 in.) (Fig. 16).

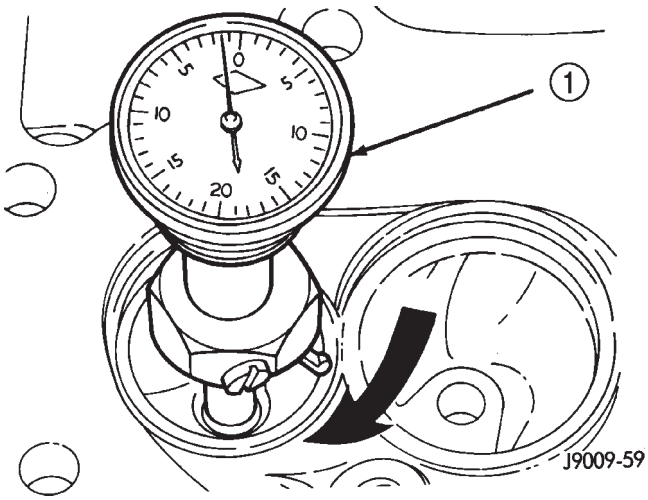


Fig. 16 Measurement of Valve Seat Runout

1 - DIAL INDICATOR

VALVE STEM-TO-GUIDE CLEARANCE MEASUREMENT

PREFERRED METHOD

(1) Remove the valve from the head.

(2) Clean the valve stem guide bore with solvent and a bristle brush.

(3) Insert a telescoping gauge into the valve stem guide bore approximately 9.525 mm (.375 inch) from the valve spring side of the head (Fig. 17).

(4) Remove and measure telescoping gauge with a micrometer.

(5) Repeat the measurement with contacts lengthwise to engine cylinder head.

(6) Compare the crosswise to lengthwise measurements to determine out-of-roundness. If the measurements differ by more than 0.0635 mm (0.0025 in.), ream the guide bore to accommodate an oversize valve stem.

(7) Compare the measured valve guide bore diameter with specifications (7.95-7.97 mm or 0.313-0.314 inch). If the measurement differs from specification by more than 0.076 mm (0.003 inch), ream the guide bore to accommodate an oversize valve stem.

ALTERNATIVE METHOD

(1) Use a dial indicator to measure the lateral movement of the valve stem (stem-to-guide clearance). This must be done with the valve installed in its guide and just off the valve seat (Fig. 18).

(2) Correct clearance is 0.025-0.0762 mm (0.001-0.003 inch). If indicated movement exceeds the specification ream the valve guide to accommodate an oversize valve stem.

INTAKE/EXHAUST VALVES & SEATS (Continued)

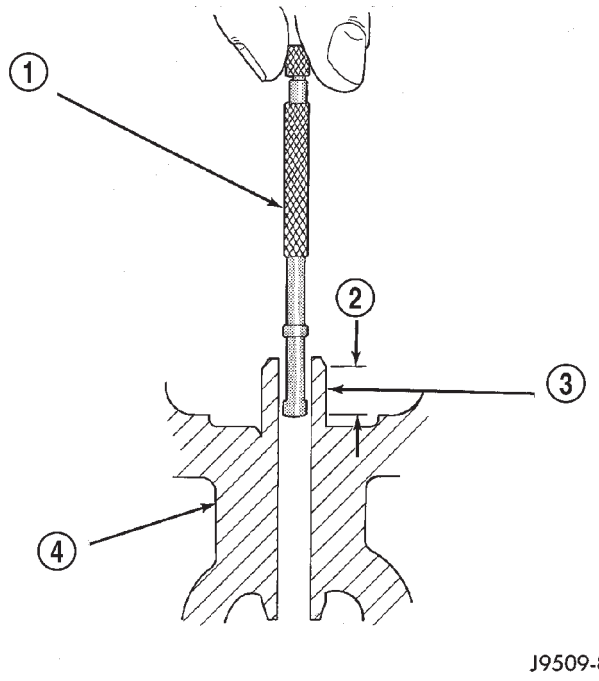


Fig. 17 Measurement of Valve Guide Bore Diameter

1 - GAUGE
2 - 9.525 MM (3/8 INCH)
3 - VALVE STEM GUIDE
4 - CYLINDER HEAD

NOTE: Valve seats must be ground after reaming the valve guides to ensure that the valve seat is concentric to the valve guide.

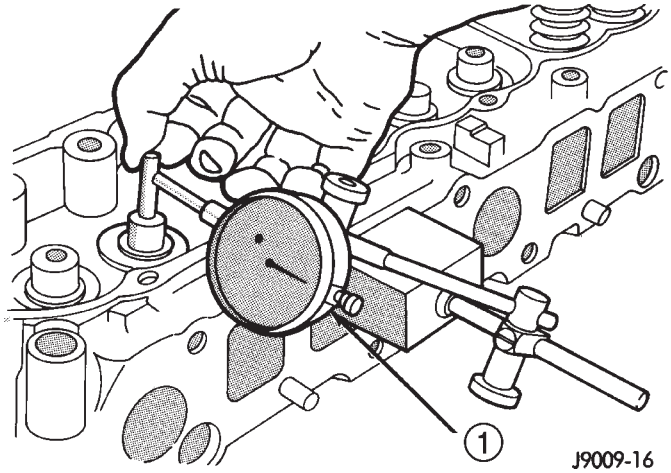


Fig. 18 Measurement of Lateral Movement Of Valve Stem

1 - DIAL INDICATOR

REMOVAL

NOTE: This procedure is done with the engine cylinder head removed from the block.

(1) Remove the engine cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) from the cylinder block.

(2) Use Valve Spring Compressor Tool MD-998772A and compress each valve spring.

(3) Remove the valve locks, retainers, springs and valve stem oil seals. Discard the oil seals (Fig. 19).

(4) Use a smooth stone or a jewelers file to remove any burrs on the top of the valve stem, especially around the groove for the locks.

(5) Remove the valves, and place them in a rack in the same order as removed.

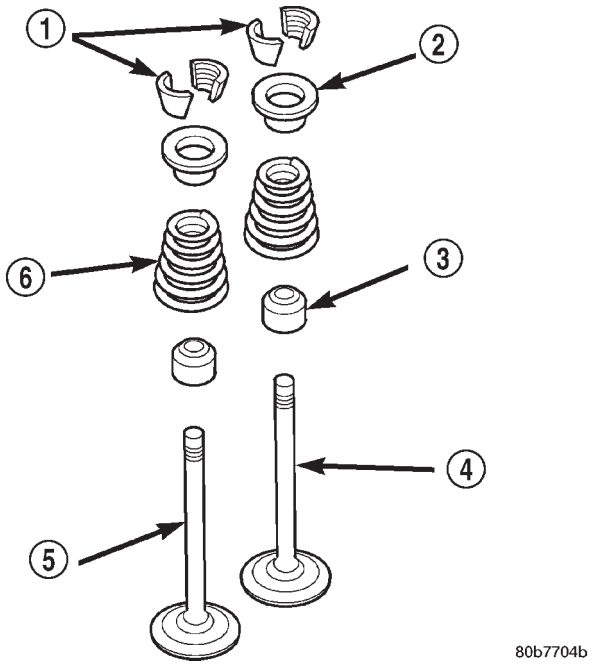


Fig. 19 Valve and Valve Components

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

INSTALLATION

NOTE: This procedure is done with the engine cylinder head removed from the block.

(1) Thoroughly clean the valve stems and the valve guide bores.

(2) Lightly lubricate the stem.

(3) Install the valve in the original valve guide bore.

(4) Install the replacement valve stem oil seals on the valve stems (Fig. 20). If the 0.381 mm (0.015 inch) oversize valve stems are used, oversize oil seals are required.

INTAKE/EXHAUST VALVES & SEATS (Continued)

(5) Position the valve spring and retainer on the engine cylinder head and compress the valve spring with Valve Spring Compressor Tool MD-998772A.

(6) Install the valve locks and release the tool.

(7) Tap the valve spring from side to side with a hammer to ensure that the spring is properly seated at the engine cylinder head. Also tap the top of the retainer to seat the valve locks.

(8) Install the engine cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

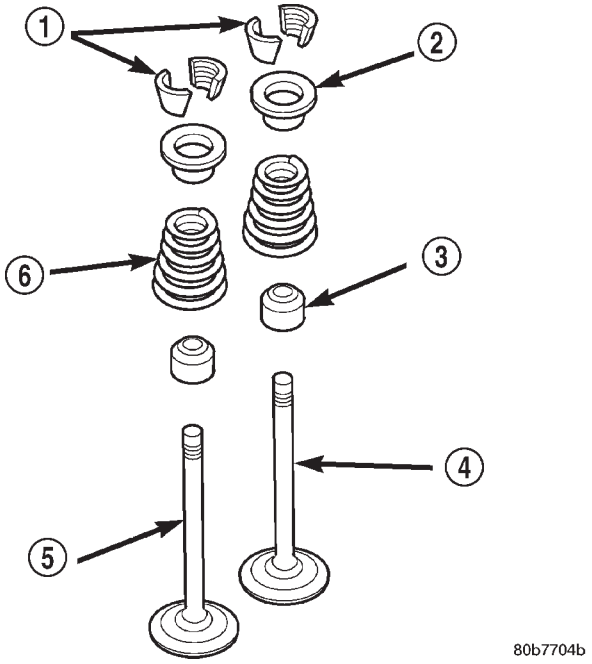


Fig. 20 Valve and Valve Components

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

ROCKER ARM / ADJUSTER ASSEMBLY

DESCRIPTION

The rocker arms are made of stamped steel and have a operational ratio of 1.6:1 (Fig. 21).

OPERATION

When the push rods are forced upward by the camshaft lobes the push rod presses upward on the rocker arms, the rocker arms pivot, forcing downward pressure on the valves forcing the valves to move downward and off from their seats.

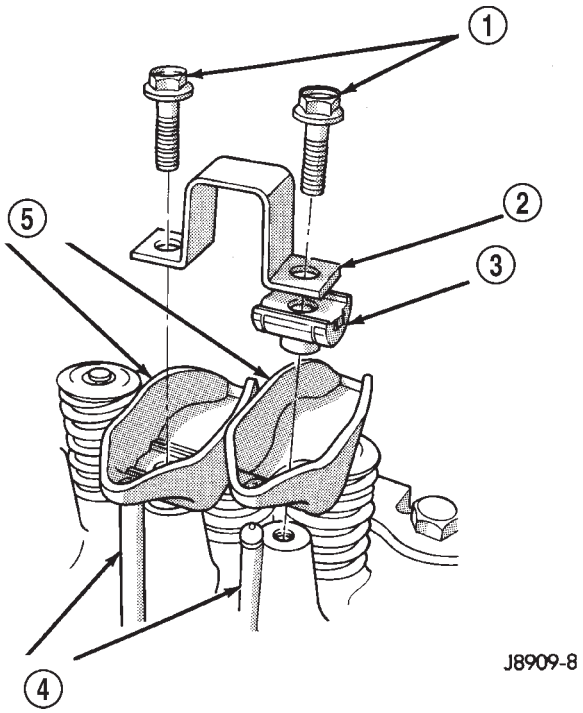


Fig. 21 Rocker Arms—Typical

1 - CAPSCREWS
2 - BRIDGE
3 - PIVOT ASSEMBLY
4 - PUSH RODS
5 - ROCKER ARMS

REMOVAL

NOTE: This procedure can be done with the engine in or out of the vehicle.

(1) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Check for rocker arm bridges which are causing misalignment of the rocker arm to valve tip area.

(3) Remove the capscrews at each bridge and pivot assembly (Fig. 22). Alternately loosen the capscrews one turn at a time to avoid damaging the bridges.

(4) Remove the bridges, pivots and corresponding pairs of rocker arms (Fig. 22). Place them on a bench in the same order as removed.

(5) Remove the push rods and place them on a bench in the same order as removed.

CLEANING

Clean all the components with cleaning solvent.

Use compressed air to blow out the oil passages in the rocker arms and push rods.

ROCKER ARM / ADJUSTER ASSEMBLY (Continued)

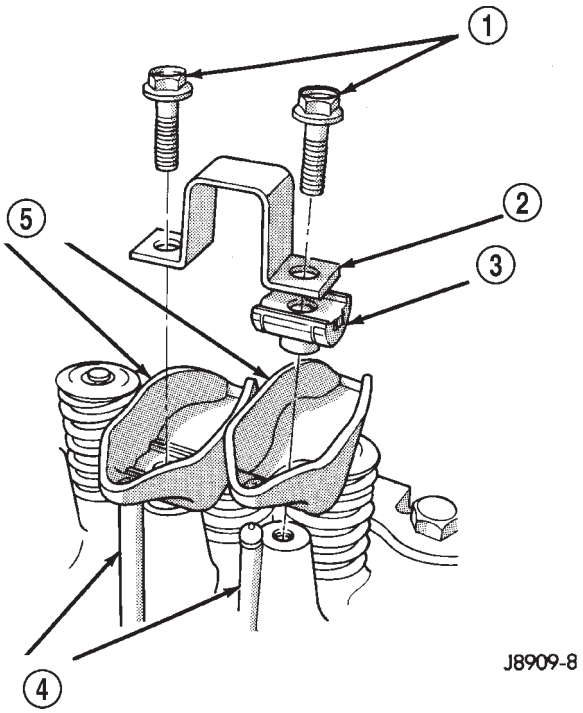


Fig. 22 Rocker Arm

1 - CAPSCREWS
2 - BRIDGE
3 - PIVOT ASSEMBLY
4 - PUSH RODS
5 - ROCKER ARMS

INSPECTION

Inspect the pivot surface area of each rocker arm. Replace any that are scuffed, pitted, cracked or excessively worn.

Inspect the valve stem tip contact surface of each rocker arm and replace any rocker arm that is deeply pitted.

Inspect each push rod end for excessive wear and replace as required. If any push rod is excessively worn because of lack of oil, replace it and inspect the corresponding hydraulic tappet for excessive wear.

Inspect the push rods for straightness by rolling them on a flat surface or by shining a light between the push rod and the flat surface.

A wear pattern along the length of the push rod is not normal. Inspect the engine cylinder head for obstruction if this condition exists.

INSTALLATION

NOTE: This procedure can be done with the engine in or out of the vehicle.

(1) Lubricate the ball ends of the push rods with Mopar® Engine Oil Supplement, or equivalent and install push rods in their original locations. Ensure that the bottom end of each push rod is centered in the tappet plunger cap seat.

(2) Using Mopar® Engine Oil Supplement, or equivalent, lubricate the area of the rocker arm that the pivot contacts. Install rocker arms, pivots and bridge above each cylinder in their originally position (Fig. 23).

(3) Loosely install the capscrews through each bridge.

(4) At each bridge, tighten the capscrews alternately, one turn at a time, to avoid damaging the bridge. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

(5) Install the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

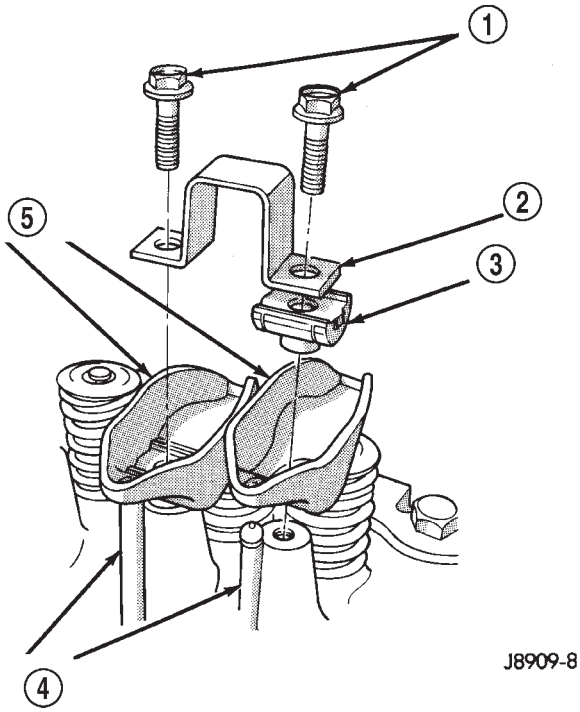


Fig. 23 Rocker Arm

1 - CAPSCREWS
2 - BRIDGE
3 - PIVOT ASSEMBLY
4 - PUSH RODS
5 - ROCKER ARMS

VALVE STEM SEALS

DESCRIPTION

The valve stem seals (Fig. 24) are made of rubber and incorporate a garter spring to maintain consistent lubrication control.

VALVE STEM SEALS (Continued)

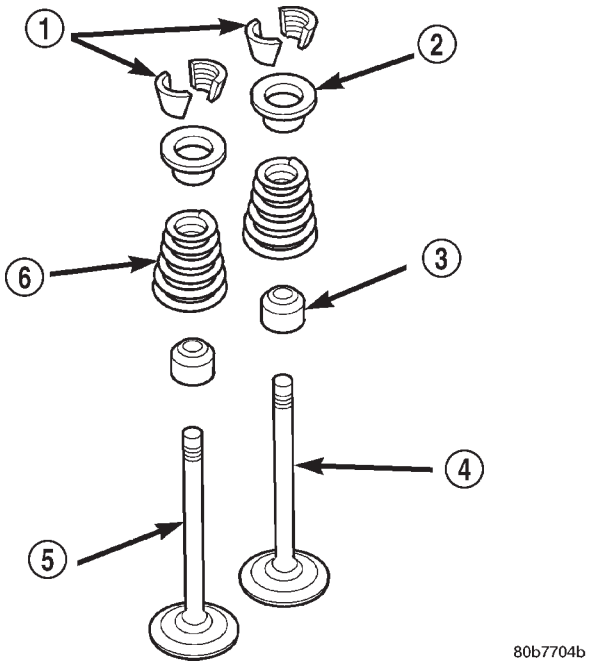


Fig. 24 Valve

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

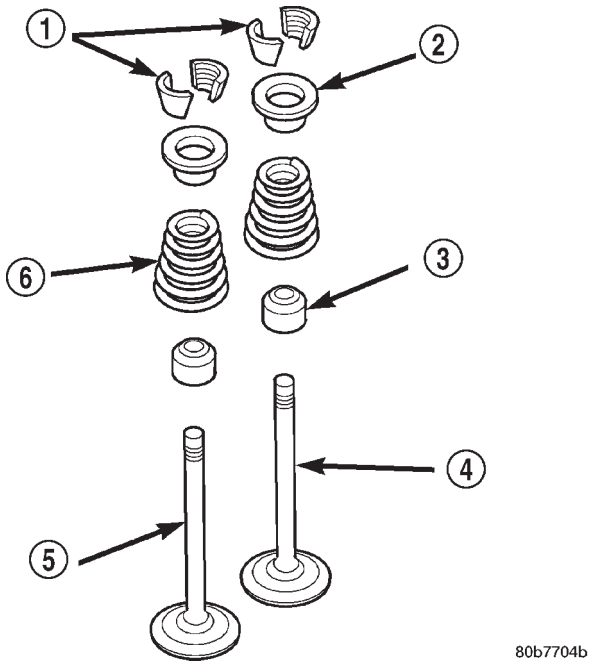


Fig. 25 VALVE AND KEEPER CONFIGURATION 4.0L

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

VALVE SPRINGS

DESCRIPTION

The valve springs (Fig. 25) are made of high strength silicon chrome spring steel. The springs are common for both intake and exhaust valves.

STANDARD PROCEDURE - VALVE SPRING TENSION TEST

Clean all carbon deposits from the combustion chambers, valve ports, valve stems, valve stem guides and head.

Use a universal Valve Spring Tester and a torque wrench to test each valve spring for the specified tension value (Fig. 26).

Replace valve springs that are not within specifications.

REMOVAL

NOTE: This procedure can be done with the engine cylinder head installed on the block.

Inspect the valve stems, especially the grooves. An Arkansas smooth stone should be used to remove nicks and high spots.

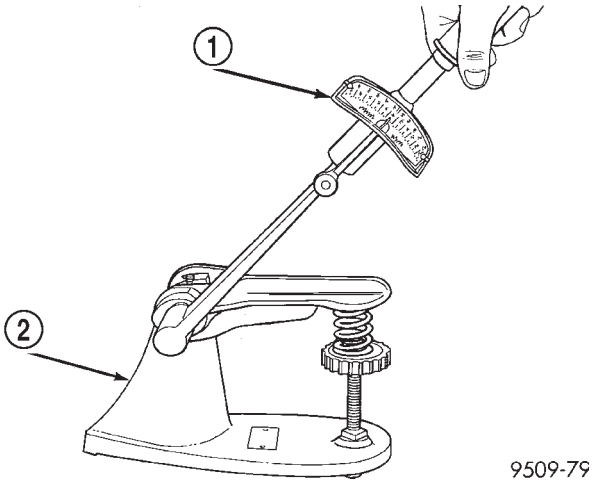


Fig. 26 Valve Spring Tester

1 - TORQUE WRENCH
2 - VALVE SPRING TESTER

Each valve spring is held in place by a retainer and a set of conical valve locks. The locks can be removed only by compressing the valve spring.

(1) Remove the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

VALVE SPRINGS (Continued)

(2) Remove cap screws, bridge and pivot assemblies and rocker arms (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL) for access to each valve spring to be removed.

(3) Remove push rods. **Retain the push rods, bridges, pivots and rocker arms in the same order and position as removed.**

(4) Inspect the springs and retainer for cracks and possible signs of weakening.

(5) Remove the spark plug(s) adjacent to the cylinder(s) below the valve springs to be removed.

(6) Connect an air hose to the adapter and apply air pressure slowly. Maintain at least 621 kPa (90 psi) of air pressure in the cylinder to hold the valves against their seats. For vehicles equipped with an air conditioner, use a flexible air adaptor when servicing the No.1 cylinder.

(7) Tap the retainer or tip with a rawhide hammer to loosen the lock from the retainer. Use Valve Spring Compressor Tool MD-998772A to compress the spring and remove the locks (Fig. 27).

(8) Remove valve spring and retainer (Fig. 27).

(9) Remove valve stem oil seals (Fig. 27). Note the valve seals are different for intake and exhaust valves. The top of each seal is marked either INT (intake/black in color) or EXH (exhaust/brown in color). DO NOT mix the seals.

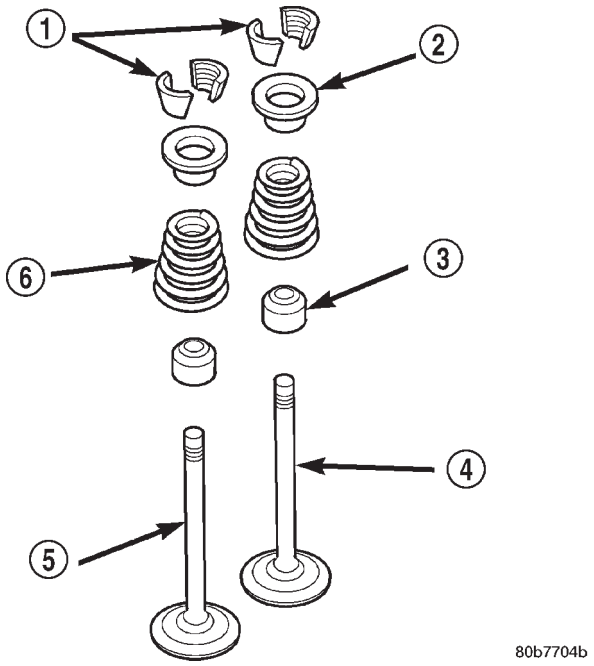


Fig. 27 Valve and Valve Components

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

INSTALLATION

NOTE: This procedure can be done with the engine cylinder head installed on the block.

CAUTION: Install oil seals carefully to prevent damage from the sharp edges of the valve spring lock grove.

(1) Lightly push the valve seal over the valve stem and valve guide boss. Be sure the seal is completely seated on the valve guide boss.

(2) Install valve spring and retainer (Fig. 28).

(3) Compress the valve spring with Valve Spring Compressor Tool MD-998772A and insert the valve locks. Release the spring tension and remove the tool. Tap the spring from side-to-side to ensure that the spring is seated properly on the engine cylinder head.

(4) Release air pressure and disconnect the air hose. Remove the adaptor from the spark plug hole and install the spark plug.

(5) Repeat the procedures for each remaining valve spring to be removed.

(6) Install the push rods. Ensure the bottom end of each rod is centered in the plunger cap seat of the hydraulic valve tappet.

(7) Install the rocker arms, pivots and bridge (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION) at their original location.

(8) Install the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVE SPRINGS (Continued)

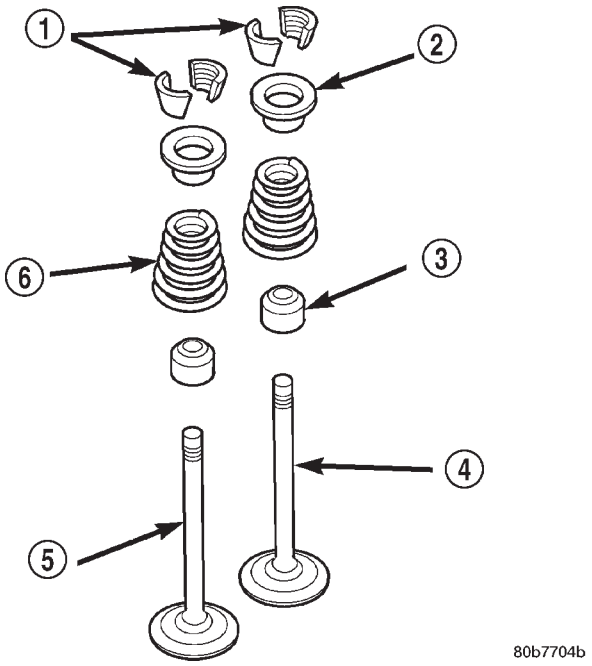


Fig. 28 Valve and Valve

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

ENGINE BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 34 N·m (25 ft. lbs.) torque.

INSPECTION

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter (Fig. 29). To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

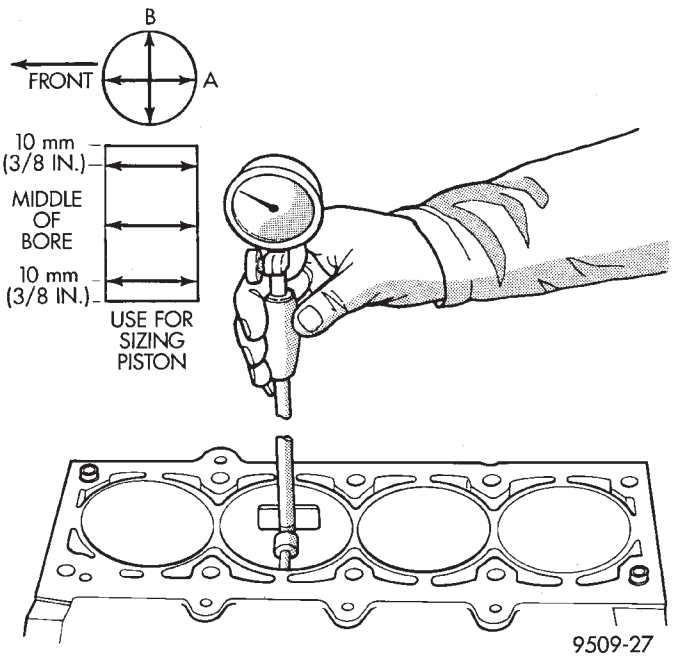


Fig. 29 Cylinder Bore Measurement

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

(6) Determine out-of-roundness by comparing the difference between each measurement.

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder must be bored and then honed to accept an oversize piston. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

CAMSHAFT & BEARINGS

DESCRIPTION

The camshaft is made of gray cast iron with twelve machined lobes and four bearing journals (Fig. 30). When the camshaft rotates the lobes actuate the tappets and push rods, forcing upward on the rocker arms which applies downward force on the valves.

CAMSHAFT & BEARINGS (Continued)

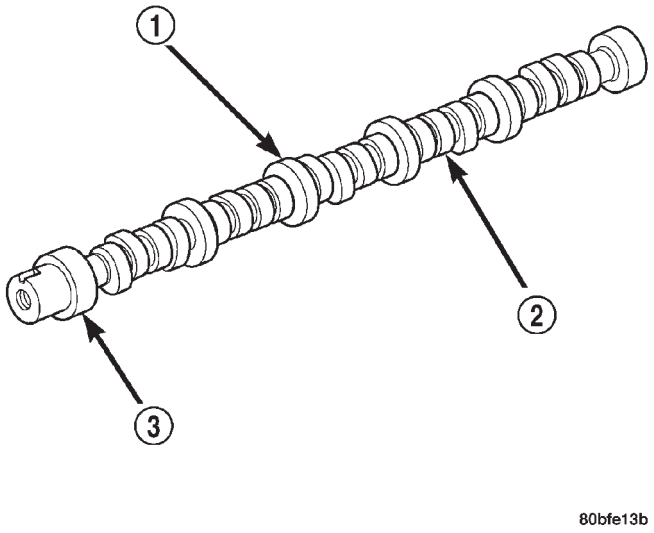


Fig. 30 Camshaft—Typical

1 - CAMSHAFT
2 - LOBES
3 - BEARING JOURNAL

REMOVAL

REMOVAL - CAMSHAFT BEARINGS

The camshaft rotates within four steel-shelled, babbitt-lined bearings that are pressed into the cylinder block and then line reamed. The camshaft bearing bores and bearing diameters are not the same size. They are stepped down in 0.254 mm (0.010 inch) increments from the front bearing (largest) to the rear bearing (smallest). This permits easier removal and installation of the camshaft. The camshaft bearings are pressure lubricated. Camshaft end play is maintained by the thrust plate.

(1) Remove the camshaft (Refer to 9 - ENGINE/ENGINE BLOCK/CAMSHAFT & BEARINGS (IN BLOCK) - REMOVAL).

NOTE: It is not advisable to attempt to replace camshaft bearings unless special removal and installation tools are available, such as recommended tool 8544 Camshaft Bushing Remover Installer.

(2) Using Special tool 8544 Camshaft Bushing Remover Installer, remove the camshaft bearings.

REMOVAL - CAMSHAFT

WARNING: THE COOLANT IN A RECENTLY OPERATED ENGINE IS HOT AND PRESSURIZED. RELEASE THE PRESSURE BEFORE REMOVING THE DRAIN COCK, CAP AND DRAIN PLUGS.

(1) Disconnect negative cable from battery.

(2) Drain the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL) and condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL), if equipped with A/C.

(4) Remove the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(5) Remove the rocker arms, bridges and pivots (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL).

(6) Remove the push rods.

(7) Remove the engine cylinder head and gasket (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(8) Remove the hydraulic valve tappets from the engine cylinder block (Refer to 9 - ENGINE/ENGINE BLOCK/HYDRAULIC LIFTERS (CAM IN BLOCK) - REMOVAL).

(9) Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(10) Remove the timing case cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(11) Rotate the crankshaft until the crankshaft sprocket timing mark is aligned on centerline with the camshaft sprocket timing mark (Fig. 32).

(12) Remove the timing chain and sprockets (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(13) Remove the front bumper and/or grille, as required.

(14) Remove the two thrust plate retaining screws, thrust plate and camshaft (Fig. 31).

INSPECTION

INSPECTION - CAMSHAFT BEARINGS

(1) Inspect the bearing journals for uneven wear pattern or finish.

(2) Inspect the bearings for wear.

INSPECTION - CAMSHAFT

(1) Inspect the cam lobes for wear.

(2) Inspect the camshaft position sensor drive gear for wear.

(3) If the camshaft appears to have been rubbing against the thrust washer, examine the oil pressure

CAMSHAFT & BEARINGS (Continued)

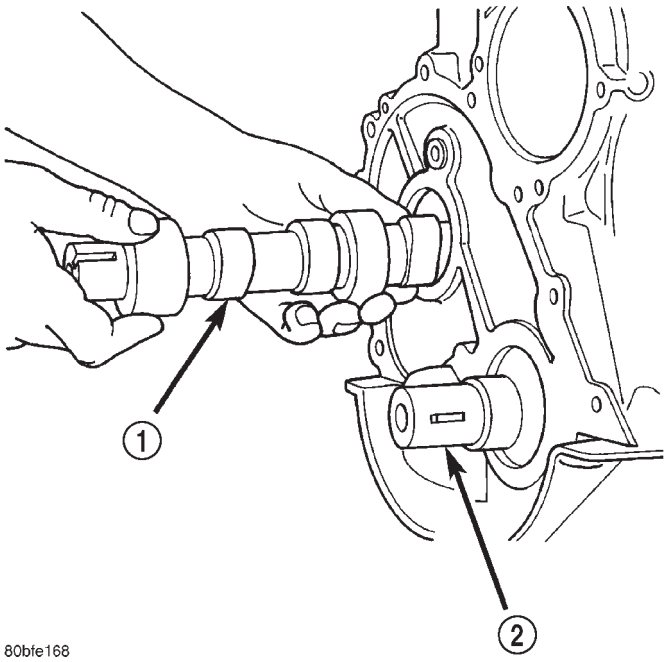


Fig. 31 Camshaft Removal

1 - CAMSHAFT
2 - CRANKSHAFT

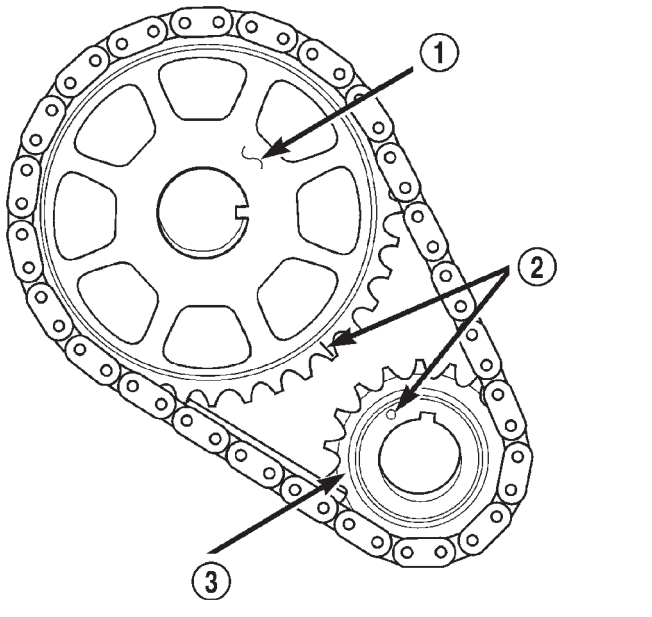


Fig. 32 Crankshaft / Camshaft Sprocket Timing Mark Alignment

1 - CAMSHAFT SPROCKET
2 - TIMING MARKS
3 - CRANKSHAFT SPROCKET

relief holes in the rear cam journal. The oil pressure relief holes must be free of debris.

INSTALLATION

INSTALLATION - CAMSHAFT BEARINGS

CAUTION: Make sure outside diameter of number 1 bearing is clean. Make sure that the bearing is properly installed in the engine block, align the oil hole in the bearing with the oil gallery in the bearing bore. Failure to do so will cause inadequate oil supply for the sprockets and timing chain.

(1) Using recommended special tool 8544 Camshaft Bearing Remover/Installer, install new camshaft bearings.

INSTALLATION - CAMSHAFT

(1) Lubricate the camshaft with Mopar® Engine Oil Supplement, or equivalent.

(2) Carefully install the camshaft to prevent damage to the camshaft bearings.

(3) Position thrust plate and install retaining screws. Tighten screws to 24 N·m (18 ft. lbs.).

(4) Lubricate the camshaft with Mopar® engine oil supplement, or equivalent.

(5) Install the camshaft sprocket, crankshaft sprocket and timing chain (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(6) Tighten the camshaft sprocket bolt and washer to 68 N·m (50 ft. lbs.).

(7) To verify correct installation of the timing chain, turn the crankshaft two full revolutions then position the camshaft sprocket timing mark as shown in (Fig. 33).

(8) Install the timing case cover with a replacement oil seal (Fig. 34). (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(9) Install the vibration damper (Fig. 34) (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(10) Install the hydraulic valve tappets (Refer to 9 - ENGINE/ENGINE BLOCK/HYDRAULIC LIFTERS (CAM IN BLOCK) - INSTALLATION).

(11) Install the cylinder head gasket with the numbers facing up.

(12) Install the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

(13) Install the push rods.

(14) Install the rocker arms and pivot and bridge assemblies (Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).

(15) Install the engine cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

CAMSHAFT & BEARINGS (Continued)

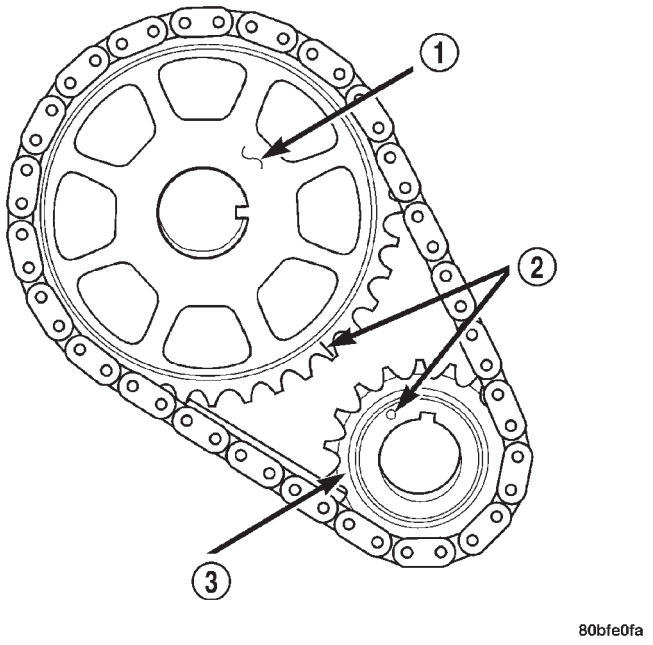


Fig. 33 Crankshaft / Camshaft Chain Drive Installation—Typical

1 - CAMSHAFT SPROCKET
2 - TIMING MARKS
3 - CRANKSHAFT SPROCKET

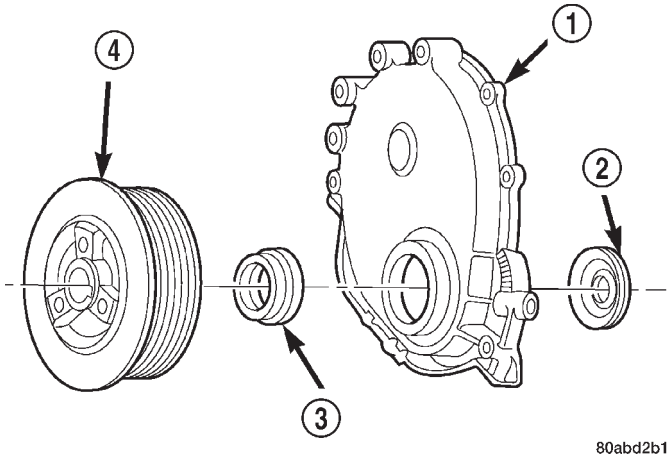


Fig. 34 Timing Case Cover Components

1 - TIMING CASE COVER
2 - OIL SLINGER
3 - CRANKSHAFT OIL SEAL
4 - VIBRATION DAMPER PULLEY

(16) Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

NOTE: During installation, lubricate the hydraulic valve tappets and all valve components with Mopar® Engine Oil Supplement, or equivalent. The Mopar® Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(17) Install the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).

(18) Check the ignition timing and adjust as necessary.

(19) Install the grille and bumper, if removed.

(20) Connect negative cable to battery.

CONNECTING ROD BEARINGS

STANDARD PROCEDURE - FITTING CONNECTING ROD BEARINGS

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 35) (Fig. 36). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 37). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

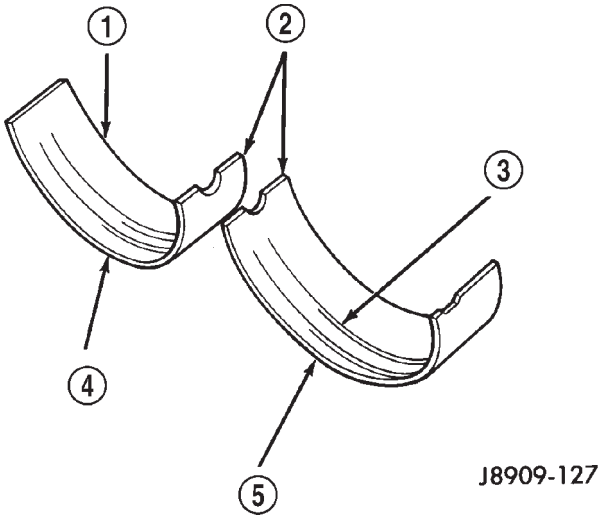


Fig. 35 Connecting Rod Bearing Inspection

1 - UPPER BEARING HALF
2 - MATING EDGES
3 - GROOVES CAUSED BY ROD BOLTS SCRATCHING JOURNAL DURING INSTALLATION
4 - WEAR PATTERN - ALWAYS GREATER ON UPPER BEARING
5 - LOWER BEARING HALF

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

CONNECTING ROD BEARINGS (Continued)

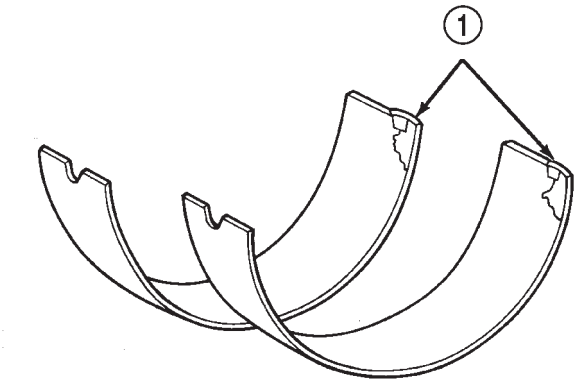


Fig. 36 Locking Tab Inspection

1 - ABNORMAL CONTACT AREA CAUSED BY LOCKING TABS NOT FULLY SEATED OR BEING BENT

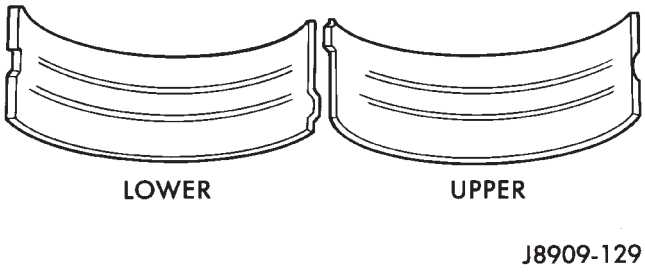


Fig. 37 Scoring Caused by Insufficient Lubrication or Damaged Crankshaft Journal

BEARING-TO-JOURNAL CLEARANCE

(1) Wipe the oil from the connecting rod journal.

(2) Use short rubber hose sections over rod bolts during installation.

(3) Lubricate the upper bearing insert and install in connecting rod.

(4) Use piston ring compressor to install the rod and piston assemblies. The oil squirt holes in the rods must face the camshaft. The arrow on the piston crown should point to the front of the engine (Fig. 38). Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(5) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(6) Install bearing cap and connecting rod on the journal and tighten nuts to 45 N·m (33 ft. lbs.) torque. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

(7) Remove the bearing cap and determine amount of bearing-to- journal clearance by measuring the width of compressed Plastigage (Fig. 39). **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

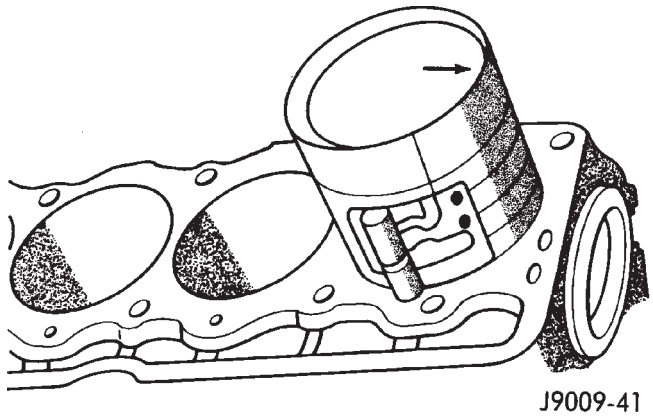


Fig. 38 Rod and Piston Assembly Installation

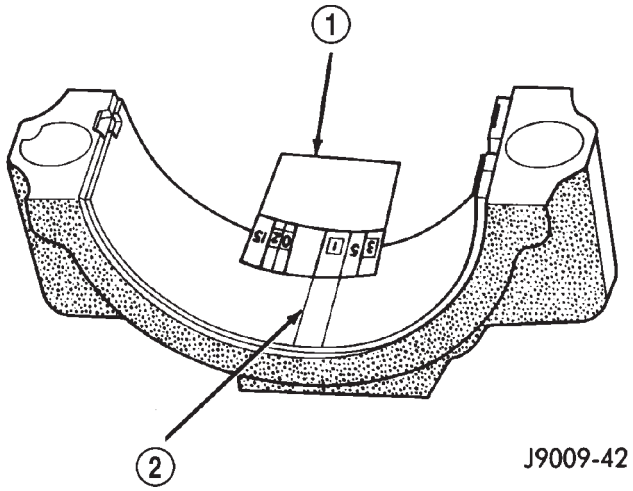


Fig. 39 Measuring Bearing Clearance with Plastigage

1 - PLASTIGAGE SCALE
2 - COMPRESSED PLASTIGAGE

(8) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

(9) If bearing-to-journal clearance exceeds the specification, install a pair of 0.0254 mm (0.001 inch) undersize bearing inserts. All the odd size inserts must be on the bottom. The sizes of the service replacement bearing inserts are stamped on the backs of the inserts. Measure the clearance as described in the previous steps.

(10) The clearance is measured with a pair of 0.0254 mm (0.001 inch) undersize bearing inserts installed. This will determine if two 0.0254 mm (0.001 inch) undersize inserts or another combination

CONNECTING ROD BEARINGS (Continued)

is needed to provide the correct clearance. Refer to CONNECTING ROD BEARING FITTING CHART .

CONNECTING ROD BEARING FITTING CHART

CRANKSHAFT JOURNAL		CORRESPONDING ROD BEARING INSERT	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	53.2257 - 53.2079 mm (2.0955 - 2.0948 in.)	Yellow - Standard	Yellow - Standard
Orange	53.2079 - 53.1901 mm (2.0948 - 2.0941 in.) 0.0178 mm (0.0007 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	53.1901 - 53.1724 mm (2.0941 - 2.0934 in.) 0.0356 mm (0.0014 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Red	52.9717 - 52.9539 mm (2.0855 - 2.0848 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

(11) **FOR EXAMPLE:** If the initial clearance was 0.0762 mm (0.003 inch), 0.025 mm (0.001 inch) undersize inserts would reduce the clearance by 0.025 mm (0.001 inch). The clearance would be 0.002 inch and within specification. A 0.051 mm (0.002 inch) undersize insert would reduce the initial clearance an additional 0.013 mm (0.0005 inch). The clearance would then be 0.038 mm (0.0015 inch).

(12) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(13) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 45 N·m (33 ft. lbs.) torque.

SIDE CLEARANCE MEASUREMENT

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange (Fig. 40). (Refer to 9 - ENGINE - SPECIFICATIONS). Replace the connecting rod if the side clearance is not within specification.

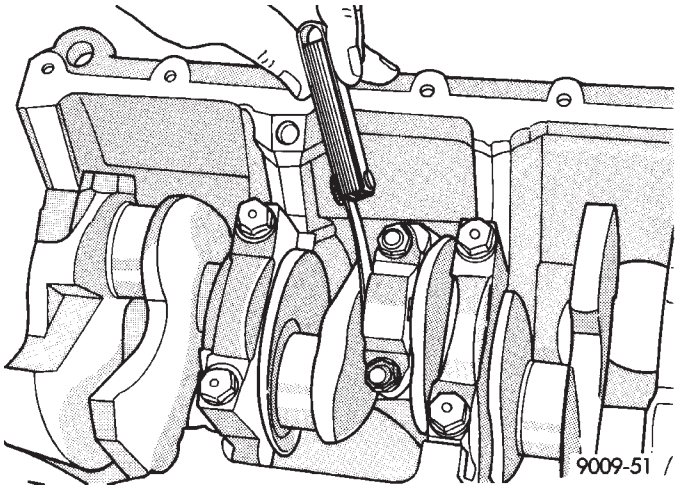


Fig. 40 Checking Connecting Rod Side Clearance - Typical

CRANKSHAFT

DESCRIPTION

The crankshaft is constructed of nodular cast iron. The crankshaft is a crosshaped four throw design with eight counterweights for balancing purposes. The crankshaft is supported by seven select main bearings with the number three serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The select fit main bearing markings are located on the crankshaft counter weights. The crankshaft rear oil seal is a two piece design. The front oil seal is a one piece design retained in the timing chain cover (Fig. 41).

CRANKSHAFT (Continued)

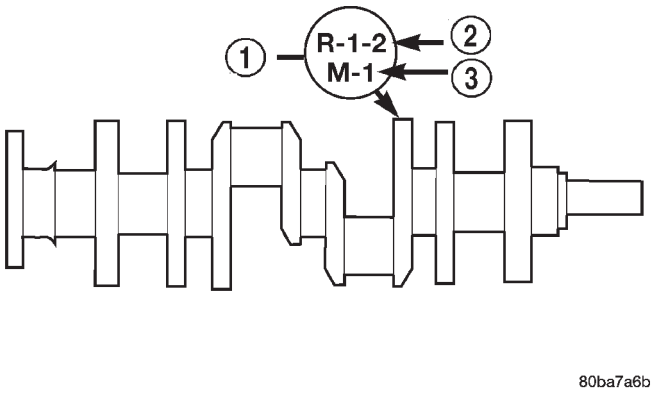


Fig. 41 Crankshaft with Select Fit Marking Location

1 - 1/4" LETTERS
2 - (ROD)
3 - (MAIN)

CRANKSHAFT MAIN BEARINGS

STANDARD PROCEDURE - FITTING CRANKSHAFT MAIN BEARINGS

FITTING BEARINGS (CRANKSHAFT INSTALLED)

The main bearing caps, numbered (front to rear) from 1 through 7 have an arrow to indicate the forward position. The upper main bearing inserts are grooved to provide oil channels while the lower inserts are smooth.

Each bearing insert pair is selectively fitted to its respective journal to obtain the specified operating clearance. In production, the select fit is obtained by using various-sized color-coded bearing insert pairs as listed in the Main Bearing Fitting Chart. The bearing color code appears on the edge of the insert. **The size is not stamped on bearing inserts used for engine production.**

The main bearing journal size (diameter) is identified by a color-coded paint mark (Fig. 42)on the adjacent cheek or counterweight towards the rear of the crankshaft (flange end). The rear main journal, is identified by a color-coded paint mark on the crankshaft rear flange.

When required, upper and lower bearing inserts of different sizes may be used as a pair. A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce the clearance by 0.013 mm (0.0005 inch). **Never use a pair of bearing inserts with greater than a 0.025 mm (0.001 inch) difference in size. Refer to the Bearing Insert Pair Chart.**

NOTE: When replacing inserts, the odd size inserts must be either all on the top (in cylinder block) or all on the bottom (in main bearing cap).

Once the bearings have been properly fitted, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - INSTALLATION).

BEARING-TO-JOURNAL CLEARANCE (CRANKSHAFT INSTALLED)

When using Plastigage, check only one bearing clearance at a time.

Install the grooved main bearings into the cylinder block and the non-grooved bearings into the bearing caps.

Install the crankshaft into the upper bearings dry.

Place a strip of Plastigage across full width of the crankshaft journal to be checked.

Install the bearing cap and tighten the bolts to 108 N·m (80 ft. lbs.) torque.

NOTE: DO NOT rotate the crankshaft. This will cause the Plastigage to shift, resulting in an inaccurate reading. Plastigage must not be permitted to crumble. If brittle, obtain fresh stock.

Remove the bearing cap. Determine the amount of clearance by measuring the width of the compressed Plastigage with the scale on the Plastigage envelope (Fig. 43). (Refer to 9 - ENGINE - SPECIFICATIONS) for the proper clearance.

Plastigage should indicate the same clearance across the entire width of the insert. If clearance varies, it may indicate a tapered journal or foreign material trapped behind the insert.

If the specified clearance is indicated and there are no abnormal wear patterns, replacement of the bearing inserts is not necessary. Remove the Plastigage from the crankshaft journal and bearing insert. Proceed to (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT MAIN BEARINGS - INSTALLATION).

If the clearance exceeds specification, install a pair of 0.025 mm (0.001 inch) undersize bearing inserts and measure the clearance as described in the previous steps.

The clearance indicate with the 0.025 mm (0.001 inch) undersize insert pair installed will determine if this insert size or some other combination will provide the specified clearance. **FOR EXAMPLE:** If the clearance was 0.0762 mm (0.003 inch) originally, a pair of 0.0254 mm (0.001 inch) undersize inserts would reduce the clearance by 0.0254 mm (0.001 inch). The clearance would then be 0.0508 mm (0.002 inch) and within the specification. A 0.051 mm (0.002 inch) undersize bearing insert and a 0.0254 mm (0.001 inch) undersize insert would reduce the origi-

CRANKSHAFT MAIN BEARINGS (Continued)

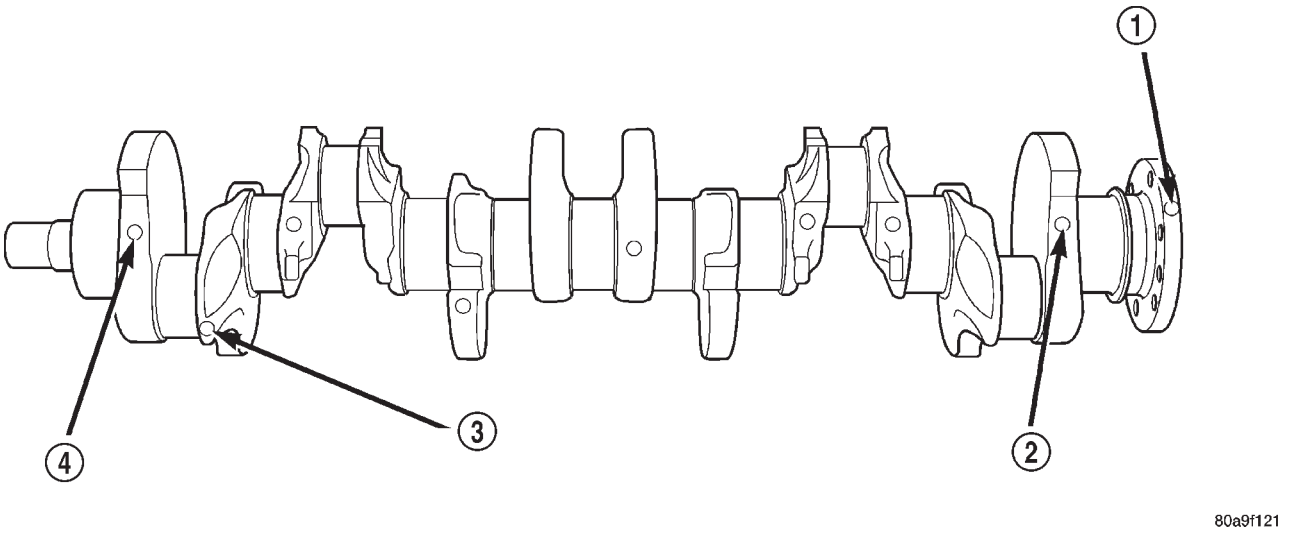


Fig. 42 Crankshaft Journal Size Paint I.D. Location

1 - NO. 7 MAIN JOURNAL SIZE PAINT MARK
2 - NO. 6 CONNECTING ROD JOURNAL SIZE PAINT MARK
3 - NO. 1 CONNECTING ROD JOURNAL SIZE PAINT MARK
4 - NO. 1 MAIN JOURNAL SIZE PAINT MARK

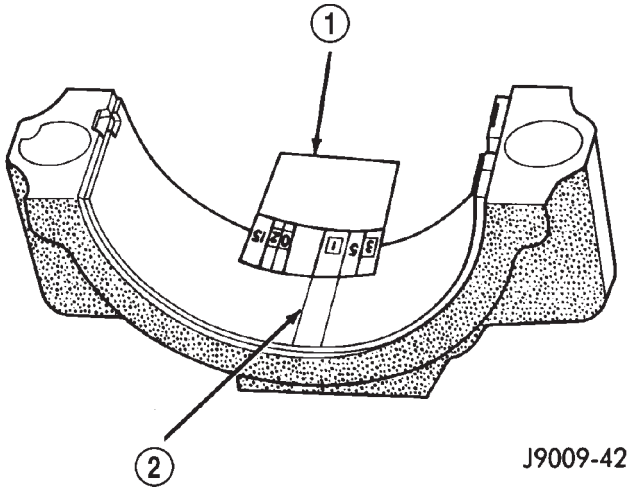


Fig. 43 Measuring Bearing Clearance with Plastigage

1 - PLASTIGAGE SCALE
2 - COMPRESSED PLASTIGAGE

nal clearance an additional 0.0127 mm (0.0005 inch). The clearance would then be 0.0381 mm (0.0015 inch).

CAUTION: Never use a pair of inserts that differ more than one bearing size as a pair.

FOR EXAMPLE: DO NOT use a standard size upper insert and a 0.051 mm (0.002 inch) undersize lower insert.

If the clearance exceeds specification using a pair of 0.051 mm (0.002 inch) undersize bearing inserts, measure crankshaft journal diameter with a micrometer. If the journal diameter is correct, the crankshaft bore in the cylinder block may be misaligned, which requires cylinder block replacement or machining to true bore.

Replace the crankshaft or grind to accept the appropriate undersize bearing inserts if:

- Journal diameters 1 through 6 are less than 63.4517 mm (2.4981 inches)
- Journal 7 diameter is less than 63.4365 mm (2.4975 inches).

Once the proper clearances have been obtained, proceed to (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT MAIN BEARINGS - INSTALLATION).

JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Remove the crankshaft from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper and out of round is 0.013 mm (0.0005 inch). Compare the measured diameter with the journal diameter specification MAIN BEARING FITTING CHART . Select inserts required to obtain the specified bearing-to-journal clearance.

Install the crankshaft into the cylinder block.

CRANKSHAFT MAIN BEARINGS (Continued)

MAIN BEARING FITTING CHART

Crankshaft Journals #1-6		Corresponding Crankshaft Bearing Insert	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	63.5025 -63.4898 mm (2.5001 - 2.4996 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4898 - 63.4771 mm (2.4996 - 2.4991 in.) 0.0127 mm (0.0005 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	63.4771 - 63.4644 mm (2.4991 - 2.4986 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4644 - 63.4517 mm (2.4986 - 2.4981 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2485 - 63.2358 mm (2.4901 - 2.4896 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

Crankshaft Journal #7 Only		Corresponding Bearing Insert	
Color Code	**Diameter**	**Upper Insert Size**	**Lower Insert Size**
Yellow	63.4873 - 63.4746 mm (2.4995 - 2.4990 in.)	Yellow - Standard	Yellow - Standard
Orange	63.4746 - 63.4619 mm (2.4990 - 2.4985 in.) 0.0127 mm (0.0005 in.) Undersize	Yellow - Standard	Blue - Undersize 0.025 mm (0.001 in.)
Blue	63.4619 - 63.4492 mm (2.4985 - 2.4980 in.) 0.0254 mm (0.001 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Blue - Undersize 0.025 mm (0.001 in.)
Green	63.4492 - 63.4365 mm (2.4980 - 2.4975 in.) 0.0381 mm (0.0015 in.) Undersize	Blue - Undersize 0.025 mm (0.001 in.)	Green - Undersize 0.051 mm (0.002 in.)
Red	63.2333 - 63.2206 mm (2.4895 - 2.4890 in.) 0.254 mm (0.010 in.) Undersize	Red - Undersize 0.254 mm (0.010 in.)	Red - Undersize 0.254 mm (0.010 in.)

CRANKSHAFT MAIN BEARINGS (Continued)

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove the spark plugs (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - REMOVAL).
(3) Raise the vehicle.
(4) Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL) and oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
(5) Remove main bearing cap brace (Fig. 44).

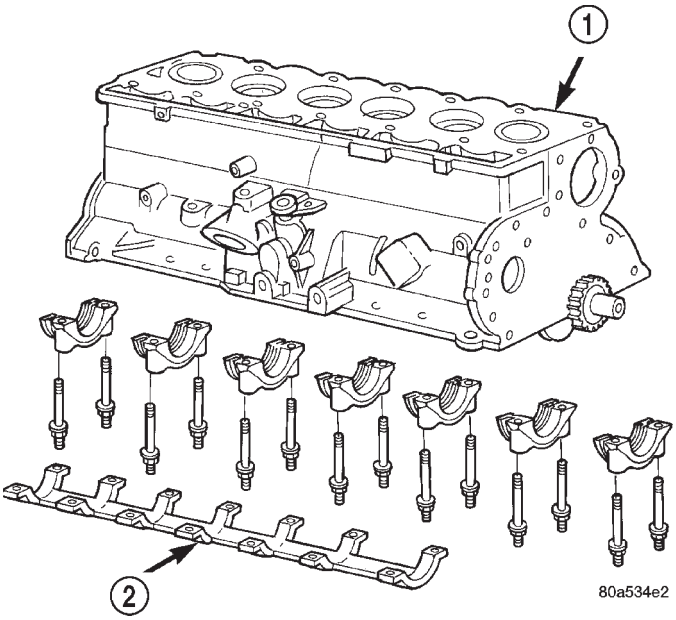


Fig. 44 Main Bearing Caps and Brace.

1 - BLOCK
2 - MAIN BEARING CAP BRACE

(6) Remove only one main bearing cap and lower insert at a time (Fig. 45).
(7) Remove the lower insert from the bearing cap.
(8) Remove the upper insert by LOOSENING (DO NOT REMOVE) all of the other bearing caps. Now insert a small cotter pin tool in the crankshaft journal oil hole. Bend the cotter pin as illustrated to fabricate the tool (Fig. 46). With the cotter pin tool in place, rotate the crankshaft so that the upper bearing insert will rotate in the direction of its locking tab. Because there is no hole in the No.3 main journal, use a tongue depressor or similar soft-faced tool to remove the bearing insert (Fig. 46). After moving the insert approximately 25 mm (1 inch), it can be removed by applying pressure under the tab.
(9) Using the same procedure described above, remove the remaining bearing inserts one at a time for inspection.

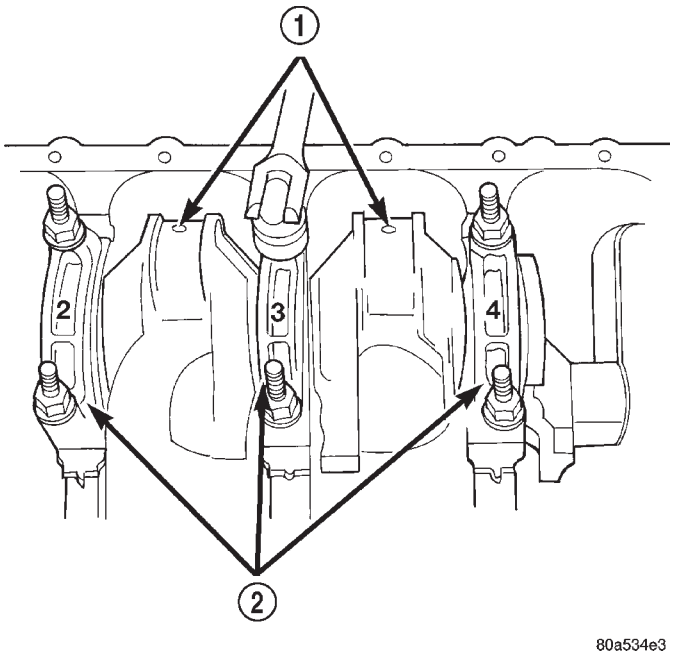


Fig. 45 Removing Main Bearing Caps and Lower Inserts

1 - CONNECTING ROD JOURNAL
2 - MAIN BEARING CAPS

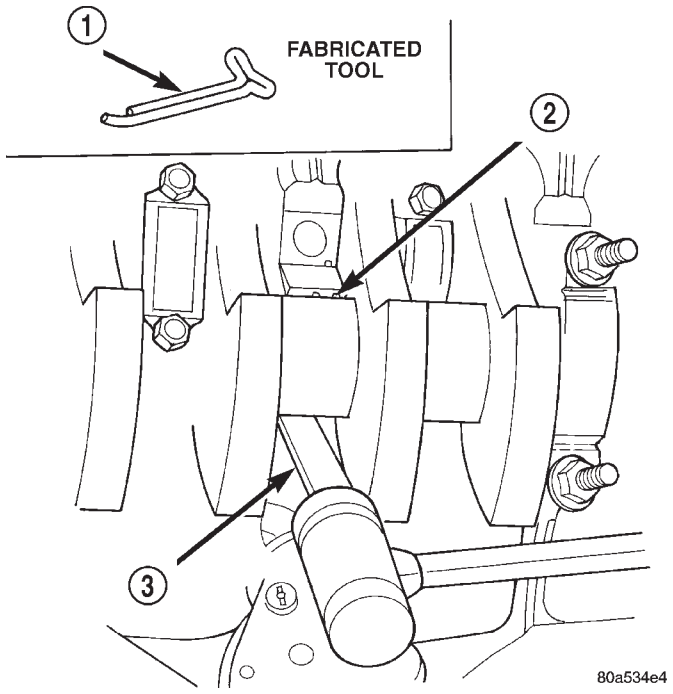


Fig. 46 Removing Upper Inserts

1 - COTTER PIN
2 - BEARING INSERT
3 - TONGUE DEPRESSOR

CRANKSHAFT MAIN BEARINGS (Continued)

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 47). In general the lower bearing half will have a heaver wear pattern.

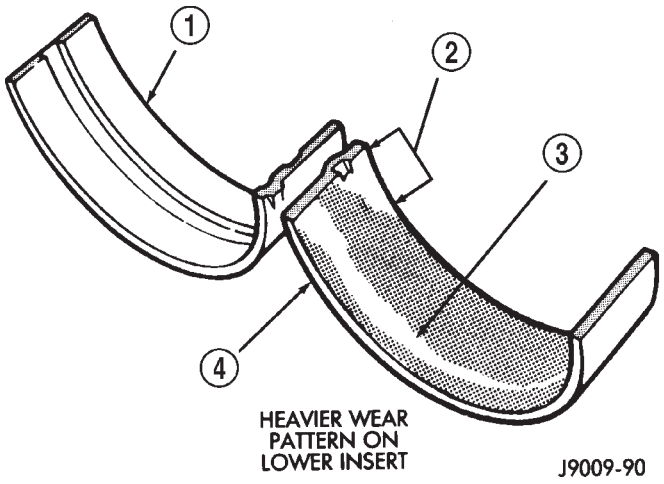


Fig. 47 Main Bearing Wear Patterns

1 - UPPER INSERT
2 - NO WEAR IN THIS AREA
3 - LOW AREA IN BEARING LINING
4 - LOWER INSERT

NOTE: If any of the crankshaft journals are scored, remove the engine for crankshaft repair.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

INSTALLATION

(1) Lubricate the bearing surface of each insert with engine oil.

(2) Loosen all the main bearing caps. Install the main bearing upper inserts.

(3) Install the lower bearing inserts into the main bearing caps.

(4) On the rear main cap, apply Mopar® Gasket Maker sealer on both sides of cylinder block as shown in (Fig. 48). The dab of sealer should be 3 mm (0.125 in.) in diameter.

(5) Apply Mopar® Gasket Maker on the rear bearing cap. The bead should be 2.3 mm (0.09 in.) in diameter. DO NOT apply sealer to the lip of the seal.

(6) Install the main bearing cap(s) and lower insert(s).

(7) Tighten the bolts of caps 1, 2, 4, 5, 6, and 7 to 54 N·m (40 ft. lbs.) torque. Now tighten these bolts to 95 N·m (70 ft. lbs.) torque. Finally, tighten these bolts to 108 N·m (80 ft. lbs.) torque.

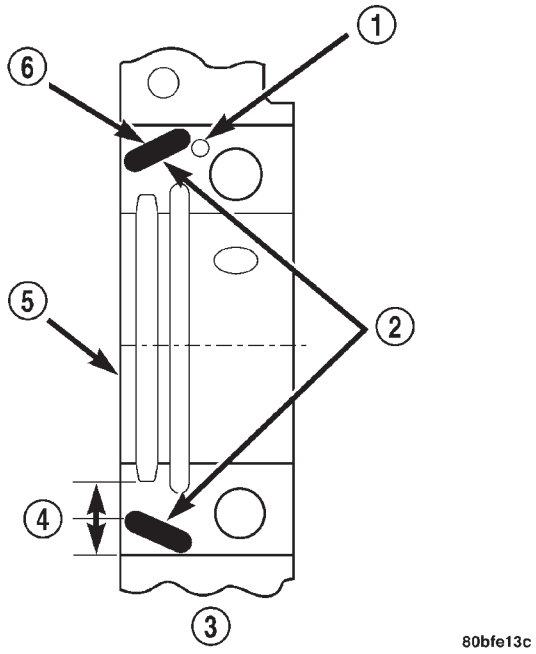


Fig. 48 Location of Sealer

1 - **DOWEL**
2 - **SEALER LOCATIONS**
3 - **CYLINDER BLOCK**
4 - **HALFWAY BETWEEN**
5 - **REAR FACE OF CYLINDER BLOCK**
6 - **3mm (0.125 in.)**

(8) Push the crankshaft forward and backward. Load the crankshaft front or rear and tighten cap bolt No.3 to 54 N·m (40 ft. lbs.) torque. Then tighten to 95 N·m (70 ft. lbs.) torque and finally tighten to 108 N·m (80 ft. lbs.) torque.

(9) Rotate the crankshaft after tightening each main bearing cap to ensure the crankshaft rotates freely.

(10) Check crankshaft end play. Crankshaft end play is controlled by the thrust bearing which is flange and installed at the No.2 main bearing position.

(a) Attach a magnetic base dial indicator to the cylinder block at either the front or rear of the engine.

(b) Position the dial indicator rod so that it is parallel to the center line of the crankshaft.

(c) Pry the crankshaft forward, position the dial indicator to zero.

(d) Pry the crankshaft forward and backward. Note the dial indicator readings. End play is the difference between the high and low measurements (Fig. 49). Correct end play is 0.038-0.165 mm (0.0015-0.0065 inch). The desired specifications are 0.051-0.064 mm (0.002-0.0025 inch).

CRANKSHAFT MAIN BEARINGS (Continued)

(e) If end play is not within specification, inspect crankshaft thrust faces for wear. If no wear is apparent, replace the thrust bearing and measure end play. If end play is still not within specification, replace the crankshaft.

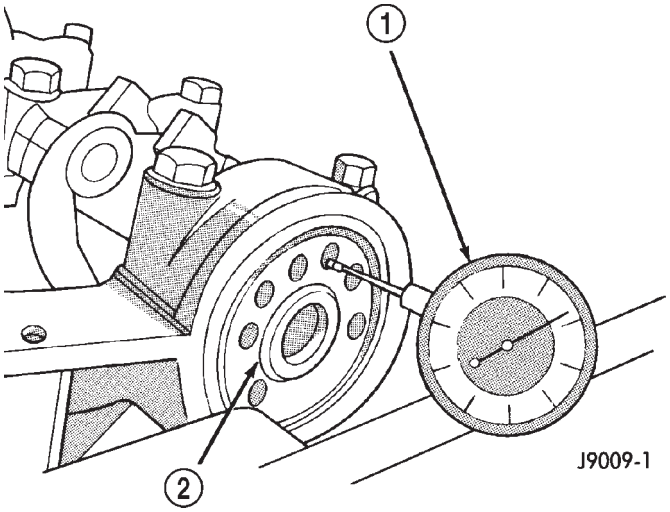


Fig. 49 Crankshaft End Play Measurement

1 - DIAL INDICATOR
2 - CRANKSHAFT

(11) If the crankshaft was removed, install the crankshaft into the cylinder block.

(12) Install main bearing cap brace tighten nuts to 47 N·m (35 ft. lbs.) torque.

(13) Install oil pump assy. and tighten attaching bolts to 23 N·m (17 ft. lbs.)

(14) Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(15) Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(16) Lower the vehicle.

(17) Install the spark plugs. Tighten the plugs to 37 N·m (27 ft. lbs.) torque.

(18) Fill the oil pan with engine oil to the full mark on the dipstick level.

(19) Connect negative cable to battery.

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

This procedure is done with the timing case cover installed.

(1) Disconnect negative cable from battery.

(2) Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(4) Remove the radiator shroud.

(5) Carefully remove the oil seal. Make sure seal bore is clean.

INSTALLATION

This procedure is done with the timing case cover installed.

(1) Position the replacement oil seal on Timing Case Cover Alignment and Seal Installation Tool 6139 with seal open end facing inward. Apply a light film of Perfect Seal, or equivalent, on the outside diameter of the seal. Lightly coat the crankshaft with engine oil.

(2) Position the tool and seal over the end of the crankshaft and insert a draw screw tool into Seal Installation Tool 6139 (Fig. 50). Tighten the nut against the tool until it contacts the cover.

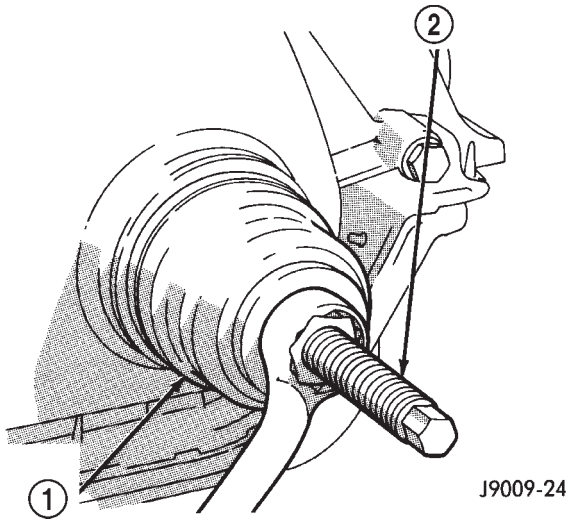


Fig. 50 Timing Case Cover Oil Seal Installation

1 - SEAL INSTALLATION TOOL
2 - DRAW SCREW TOOL

(3) Remove the tools. Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(4) Apply Mopar® Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(5) Install the serpentine belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(6) Install the radiator shroud.

(7) Connect negative cable to battery.

CRANKSHAFT OIL SEAL - REAR

REMOVAL

The crankshaft rear main bearing oil seal consists of two half pieces of viton with a single lip that effectively seals the rear of the crankshaft. Replace the upper and lower seal halves as a unit to ensure leak-free operation.

(1) Remove transmission inspection cover.

(2) Remove oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL)

(3) Remove main bearing cap brace.

(4) Remove rear main bearing cap (No.7).

(5) Push upper seal out of the groove. Ensure that the crankshaft and seal groove are not damaged.

(6) Remove lower half of the seal from the bearing cap.

INSTALLATION

The crankshaft rear main bearing oil seal consists of two half pieces of viton with a single lip that effectively seals the rear of the crankshaft. Replace the upper and lower seal halves as a unit to ensure leak-free operation.

(1) Wipe the seal surface area of the crankshaft until it is clean.

(2) Apply a thin coat of engine oil.

(3) Coat lip of the seal with engine oil.

(4) Carefully position the upper seal into the groove in the cylinder block. The lip of the seal faces toward the front of the engine.

(5) Apply Mopar® Gasket Maker sealer on both sides of cylinder block as shown in (Fig. 51). The dab of sealer should be 3 mm (0.125 in.) in diameter.

(6) Apply Mopar® Gasket Maker on the rear bearing cap (Fig. 51). The bead should be 2.3 mm (0.09 in.) in diameter. DO NOT apply sealer to the lip of the seal.

(7) Position the lower seal into the bearing cap recess and seat it firmly. Be sure the seal is flush with the cylinder block pan rail.

(8) Coat the outer curved surface of the lower seal with soap and the lip of the seal with engine oil.

(9) Install the rear main bearing cap. DO NOT strike the cap more than twice for proper engagement.

(10) Tighten all main bearing bolts to 108 N·m (80 ft. lbs.) torque.

(11) Install the main bearing cap brace. Tighten nuts to 47 N·m (35 ft. lbs.).

(12) Install the oil pan gasket and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

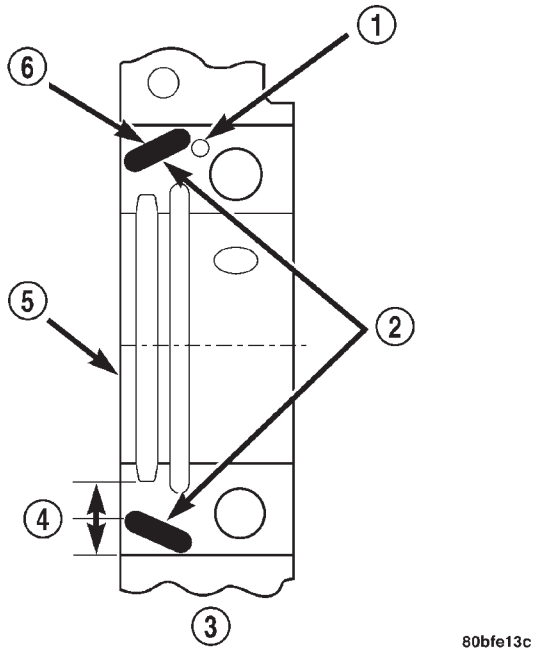


Fig. 51 Location of Sealer

1 - **DOWEL**
2 - **SEALER LOCATIONS**
3 - **CYLINDER BLOCK**
4 - **HALFWAY BETWEEN**
5 - **REAR FACE OF CYLINDER BLOCK**
6 - **3mm (0.125 in.)**

(13) Apply Mopar® Silicone Rubber Adhesive Sealant on cylinder block to rear main bearing cap corners and cylinder block to front cover joints (four places) (Fig. 52)

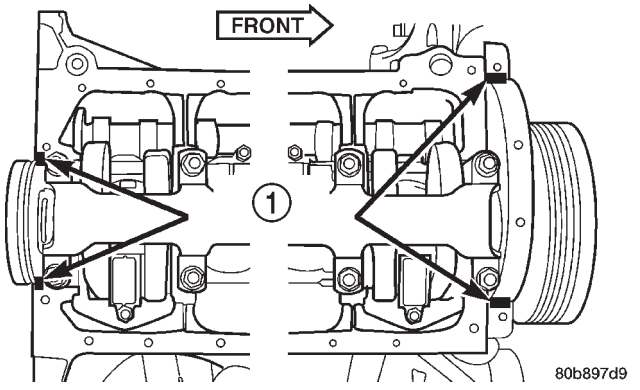


Fig. 52 Oil Pan

1 - SEALER LOCATIONS

(14) Install transmission inspection cover.

HYDRAULIC LIFTERS

DESCRIPTION

Valve lash is controlled by hydraulic tappets located inside the cylinder block, in tappet bores above the camshaft.

REMOVAL

NOTE: Retain all the components in the same order as removed.

(1) Remove the engine cylinder head(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
(2) Remove the push rods.
(3) Remove the tappets through the push rod openings in the cylinder block with a Hydraulic Valve Tappet Removal/Installation Tool (Fig. 53).

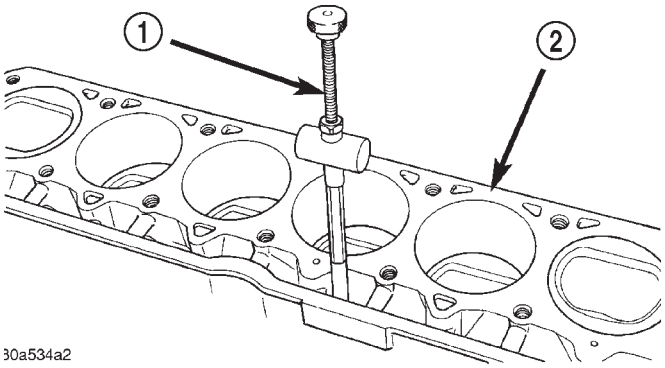


Fig. 53 HYDRAULIC VALVE TAPPET REMOVAL - 4.0L

1 - HYDRAULIC TAPPET REMOVAL TOOL
2 - CYLINDER BLOCK

CLEANING

Clean each tappet assembly in cleaning solvent to remove all varnish, gum and sludge deposits.

INSPECTION

Inspect for indications of scuffing on the side and base of each tappet body.

Inspect each tappet base for concave wear with a straightedge positioned across the base. If the base is concave, the corresponding lobe on the camshaft is also worn. Replace the camshaft and tappets.

After cleaning and inspection, test each tappet for specified leak-down rate tolerance to ensure zero-lash operation (Fig. 54).

Swing the weighted arm of the hydraulic valve tappet tester away from the ram of the Leak-Down Tester.

(1) Place a 7.925-7.950 mm (0.312-0.313 inch) diameter ball bearing on the plunger cap of the tappet.
(2) Lift the ram and position the tappet (with the ball bearing) inside the tester cup.
(3) Lower the ram, then adjust the nose of the ram until it contacts the ball bearing. DO NOT tighten the hex nut on the ram.
(4) Fill the tester cup with hydraulic valve tappet test oil until the tappet is completely submerged.
(5) Swing the weighted arm onto the push rod and pump the tappet plunger up and down to remove air. When the air bubbles cease, swing the weighted arm away and allow the plunger to rise to the normal position.
(6) Adjust the nose of the ram to align the pointer with the SET mark on the scale of the tester and tighten the hex nut.
(7) Slowly swing the weighted arm onto the push rod.
(8) Rotate the cup by turning the handle at the base of the tester clockwise one revolution every 2 seconds.
(9) Observe the leak-down time interval from the instant the pointer aligns with the START mark on the scale until the pointer aligns with the 0.125 mark. A normally functioning tappet will require 20-110 seconds to leak-down. Discard tappets with leak-down time interval not within this specification.

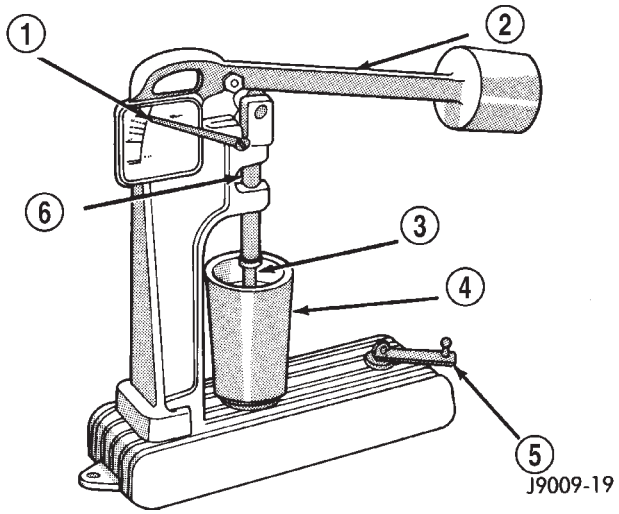


Fig. 54 Leak-Down Tester

1 - POINTER
2 - WEIGHTED ARM
3 - RAM
4 - CUP
5 - HANDLE
6 - PUSH ROD

INSTALLATION

Retain all the components in the same order as removed.

HYDRAULIC LIFTERS (Continued)

It is not necessary to charge the tappets with engine oil. They will charge themselves within a very short period of engine operation.

(1) Dip each tappet in Mopar® Engine Oil Supplement, or equivalent.

(2) Use Hydraulic Valve Tappet Removal/Installation Tool to install each tappet in the same bore from where it was originally removed.

(3) Install the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

(4) Install the push rods in their original locations.

(5) Install the rocker arms and bridge and pivot assemblies at their original locations. Loosely install the capscrews at each bridge.

(6) Tighten the capscrews alternately, one turn at a time, to avoid damaging the bridges. Tighten the capscrews to 28 N·m (21 ft. lbs.) torque.

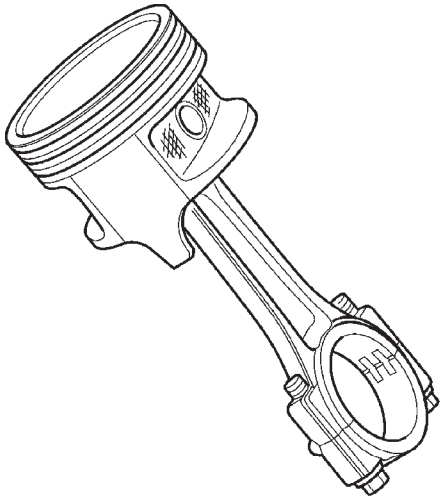
(7) Pour the remaining Mopar® Engine Oil Supplement, or equivalent over the entire valve actuating assembly. The Mopar® Engine Oil Supplement, or equivalent must remain with the engine oil for at least 1 609 km (1,000 miles). The oil supplement need not be drained until the next scheduled oil change.

(8) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

PISTON & CONNECTING ROD

DESCRIPTION

The pistons (Fig. 55) are made of a high strength aluminum alloy, the piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The connecting rods are made of cast iron.



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Fig. 55 Piston and Connecting Rod Assembly

STANDARD PROCEDURE - PISTON FITTING

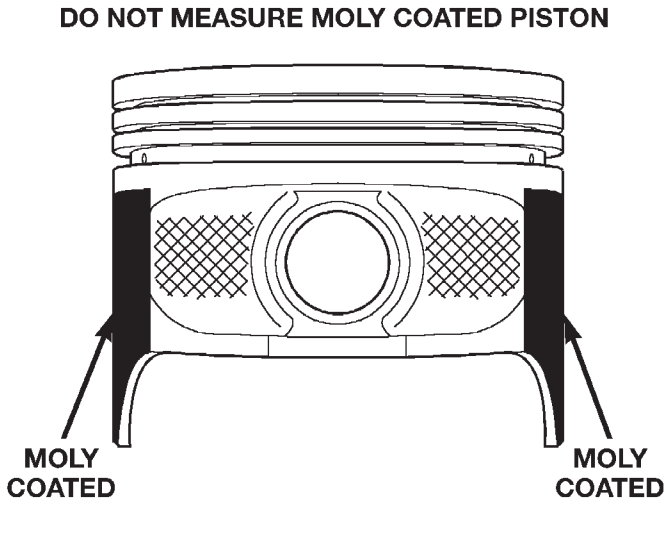
(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.

(2) Measure the inside diameter of the cylinder bore at a point 49.5 mm (1-15/16 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 57).

(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. **The coated piston connecting rod assembly can be used to service previous built engines and MUST be replaced as complete sets.** Tin coated pistons should not be used as replacements for coated pistons.

(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results (Fig. 56). Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.

(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.



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Fig. 56 Moly Coated Piston

1 - MOLY COATED
2 - MOLY COATED

PISTON & CONNECTING ROD (Continued)

PISTON SIZE CHART

CYLINDER BORE SIZE	PISTON LETTER SIZE
98.438 - 98.448 mm (3.8755 - 3.8759 in.)	A
98.448 - 98.458 mm (3.8759 - 3.8763 in.)	B
98.458 - 98.468 mm (3.8763 - 3.8767 in.)	C
98.468 - 98.478 mm (3.8767 - 3.8771 in.)	D
98.478 - 98.488 mm (3.8771 - 3.8775 in.)	E
98.488 - 98.498 mm (3.8775 - 3.8779 in.)	F

REMOVAL

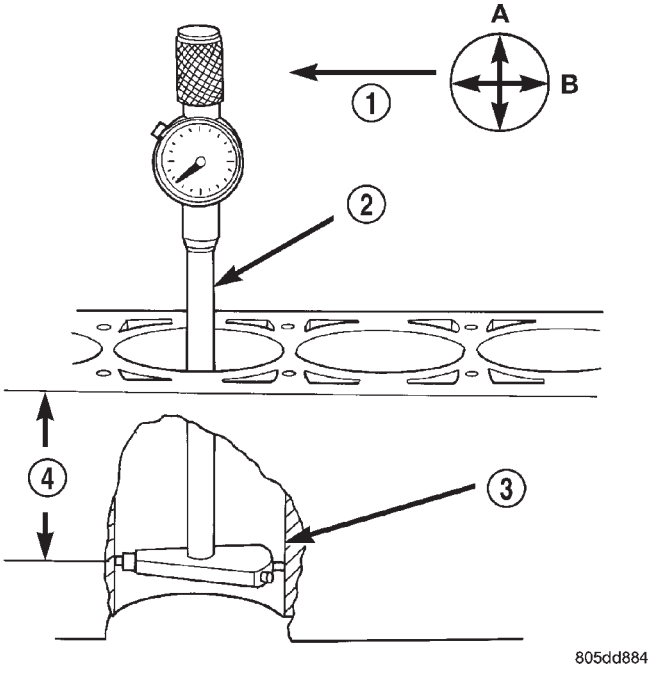


Fig. 57 Bore Gauge

1 - FRONT
2 - BORE GAUGE
3 - CYLINDER BORE
4 - 49.5 MM (1-15/16 in.)

(1) Remove the engine cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Remove the rocker arms, bridges and pivots.

(3) Remove the push rods.

(4) Remove the engine cylinder head. (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(5) Position the pistons one at a time near the bottom of the stroke. Use a ridge reamer to remove the ridge from the top end of the cylinder walls. Use a protective cloth to collect the cuttings.

(6) Raise the vehicle.

(7) Drain the engine oil.

(8) Remove the oil pan and gasket. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(9) Remove main bearing cap brace (Fig. 58).

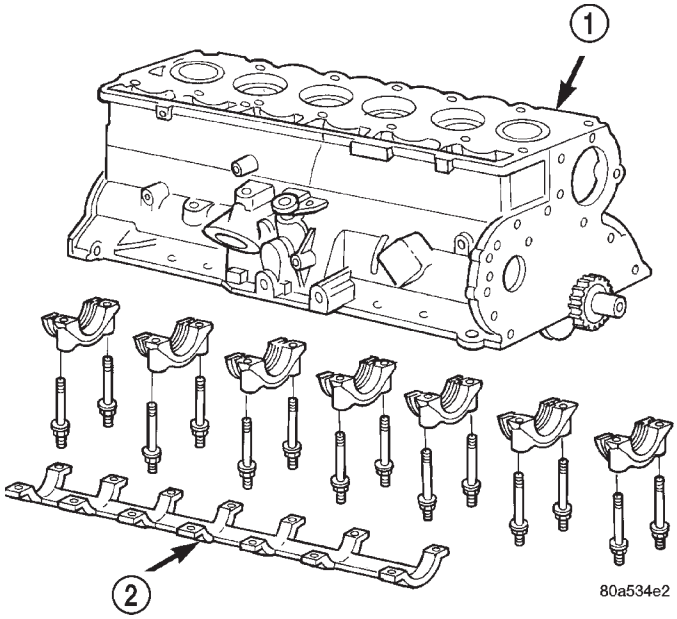


Fig. 58 Main Bearings Caps and Brace

1 - BLOCK
2 - MAIN BEARING CAP BRACE

(10) Remove the connecting rod bearing caps and inserts. Mark the caps and rods with the cylinder bore location. The connecting rods and caps are stamped with a two letter combination (Fig. 59).

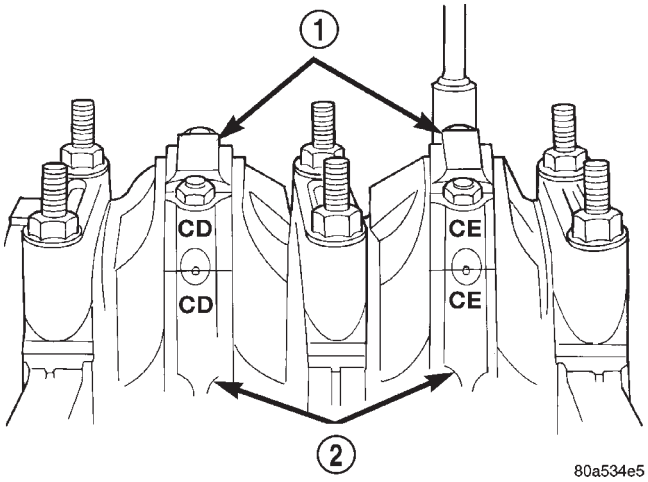


Fig. 59 Stamped Connecting Rods and Caps

1 - CONNECTING ROD CAP
2 - CONNECTING ROD

PISTON & CONNECTING ROD (Continued)

(11) Lower the vehicle until it is about 2 feet from the floor.

CAUTION: Ensure that the connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose, slipped over the rod bolts will provide protection during removal.

(12) Have an assistant push the piston and connecting rod assemblies up and through the top of the cylinder bores (Fig. 60).

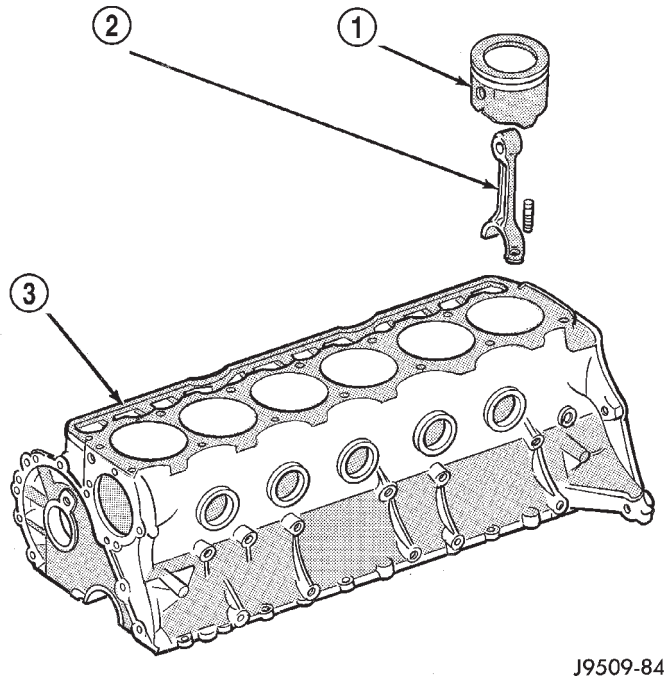


Fig. 60 Removal of Connecting Rod and Piston Assembly

1 - PISTON
2 - CONNECTING ROD
3 - BLOCK

INSTALLATION

(1) Clean the cylinder bores thoroughly. Apply a light film of clean engine oil to the bores with a clean lint-free cloth.

(2) Install the piston rings on the pistons if removed (Refer to 9 - ENGINE/ENGINE BLOCK/ PISTON RINGS - STANDARD PROCEDURE).

(3) Lubricate the piston and rings with clean engine oil.

CAUTION: Ensure that connecting rod bolts DO NOT scratch the crankshaft journals or cylinder walls. Short pieces of rubber hose slipped over the connecting rod bolts will provide protection during installation.

(4) Use a piston ring compressor to install the connecting rod and piston assemblies through the top of the cylinder bores (Fig. 61).

(5) Ensure the arrow on the piston top points to the front of the engine (Fig. 61).

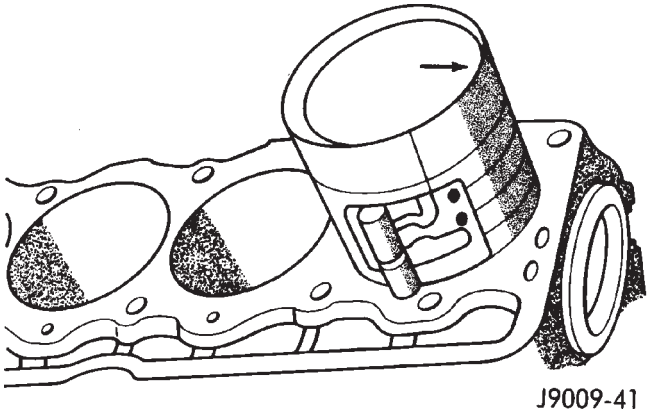


Fig. 61 Rod and Piston Assembly Installation

(6) Raise the vehicle.

(7) Each bearing insert is fitted to its respective journal to obtain the specified clearance between the bearing and the journal. In production, the select fit is obtained by using various-sized, color-coded bearing inserts as listed in the Connecting Rod Bearing Fitting Chart. The color code appears on the edge of the bearing insert. The size is not stamped on inserts used for production of engines.

(8) The rod journal is identified during the engine production by a color-coded paint mark on the adjacent cheek or counterweight toward the flange (rear) end of the crankshaft. The color codes used to indicate journal sizes are listed in the Connecting Rod Bearing Fitting Chart.

(9) When required, upper and lower bearing inserts of different sizes may be used as a pair (refer to Connecting Rod Bearing Fitting Chart). A standard size insert is sometimes used in combination with a 0.025 mm (0.001 inch) undersize insert to reduce clearance 0.013 mm (0.0005 inch).

CAUTION: DO NOT intermix bearing caps. Each connecting rod and bearing cap are stamped with the cylinder number. The stamp is located on a machined surface adjacent to the oil squirt hole that faces the camshaft side of the cylinder block.

(10) Install the connecting rod bearing caps and inserts in the same positions as removed.

CAUTION: Verify that the oil squirt holes in the rods face the camshaft and that the arrows on the pistons face the front of the engine.

(11) Install main bearing cap brace (Fig. 58). Tighten nuts to 47 N·m (35 ft. lbs.).

PISTON & CONNECTING ROD (Continued)

(12) Install the oil pan and gasket (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(13) Lower the vehicle.

(14) Install the engine cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION), push rods, rocker arms, bridges, pivots and engine cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(15) Fill the crankcase with engine oil.

PISTON RINGS

STANDARD PROCEDURE - PISTON RING FITTING

(1) Carefully clean the carbon from all ring grooves. Oil drain openings in the oil ring groove and pin boss must be clear. DO NOT remove metal from the grooves or lands. This will change ring-to-groove clearances and will damage the ring-to-land seating.

(2) Be sure the piston ring grooves are free of nicks and burrs.

(3) Measure the ring side clearance with a feeler gauge fitted snugly between the ring land and ring (Fig. 62) (Fig. 63). Rotate the ring in the groove. It must move freely around circumference of the groove.

GROOVE HEIGHT

A 1.530-1.555 mm (0.0602-0.0612 in)
B 4.035-4.060 mm (0.1589-0.1598 in)

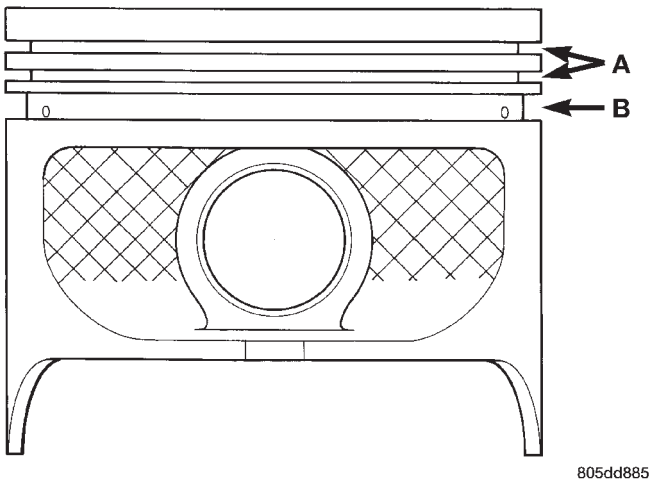


Fig. 62 Piston Dimensions

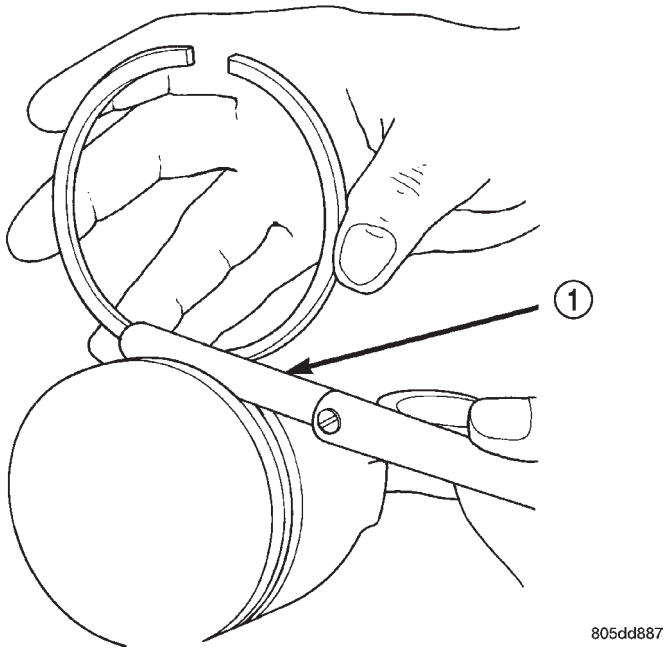


Fig. 63 Ring Side Clearance Measurement

1 - FEELER GAUGE

RING SIDE CLEARANCE CHART

ITEM	SPECIFICATION
Top Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Second Compression Ring	0.042 - 0.084 mm (0.0017 - 0.0033 in.)
Oil Control Ring	0.06 - 0.21 mm (0.0024 - 0.0083 in.)

(4) Place ring in the cylinder bore and push down with inverted piston to position near lower end of the ring travel. Measure ring gap with a feeler gauge fitting snugly between ring ends (Fig. 64).

RING GAP MEASUREMENT CHART

ITEM	SPECIFICATION
Top Compression Ring	0.229 - 0.610 mm (0.0090 - 0.0240 in.)
Second Compression Ring	0.483 - 0.965 mm (0.0190 - 0.080 in.)
Oil Control Ring	0.254 - 1.500 mm (0.010 - 0.060 in.)

PISTON RINGS (Continued)

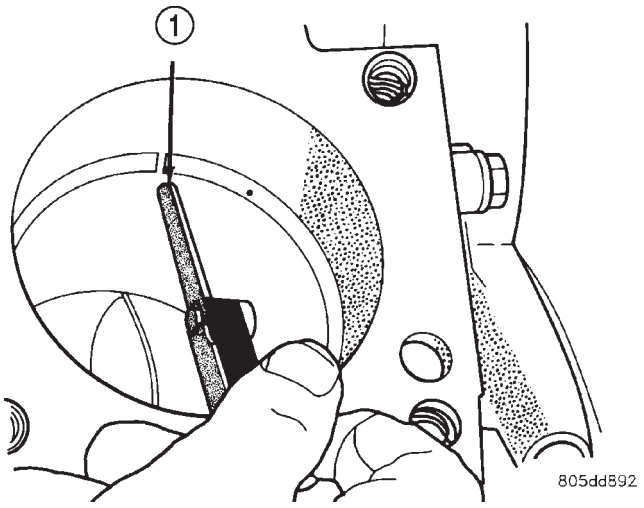


Fig. 64 Gap Measurement

1 - FEELER GAUGE

(5) The oil control rings are symmetrical, and can be installed with either side up. It is not necessary to use a tool to install the upper and lower rails. Insert oil rail spacer first, then side rails.

(6) The two compression rings are different and cannot be interchanged. The top compression ring can be identified by the shiny coating on the outer sealing surface and can be installed with either side up. (Fig. 65).

(7) The second compression ring has a slight chamfer on the bottom of the inside edge and a dot on the top for correct installation (Fig. 66) and (Fig. 67).

(8) Using a ring installer, install the second compression ring with the dot facing up (Fig. 66) (Fig. 68).

(9) Using a ring installer, install the top compression ring (either side up).

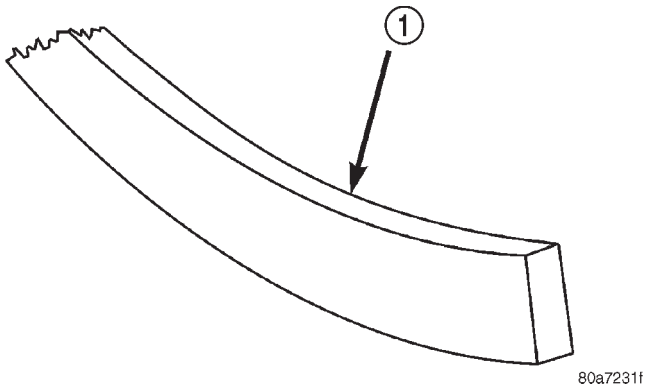


Fig. 65 Top Compression ring identification

1 - TOP COMPRESSION RING

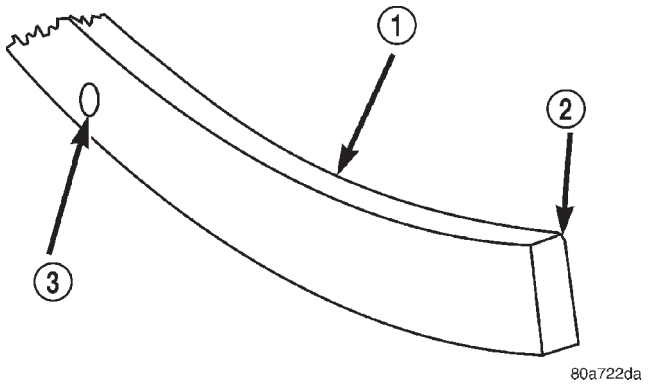


Fig. 66 Second Compression Ring Identification

1 - SECOND COMPRESSION RING
2 - CHAMFER
3 - ONE DOT

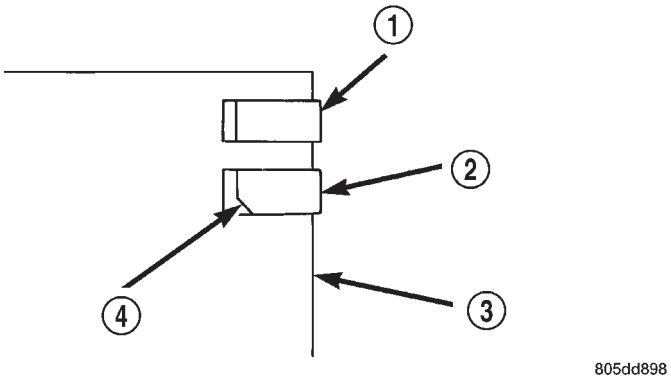


Fig. 67 Compression Ring Chamfer Location

1 - TOP COMPRESSION RING
2 - SECOND COMPRESSION RING
3 - PISTON
4 - CHAMFER

Ring Gap Orientation

- Position the gaps on the piston as shown (Fig. 69).
- Oil spacer - Gap on center line of piston skirt.
- Oil rails - gap 180° apart on centerline of piston pin bore.
- No. 2 Compression ring - Gap 180° from top oil rail gap.
- No. 1 Compression ring - Gap 180° from No. 2 compression ring gap.

PISTON RINGS (Continued)

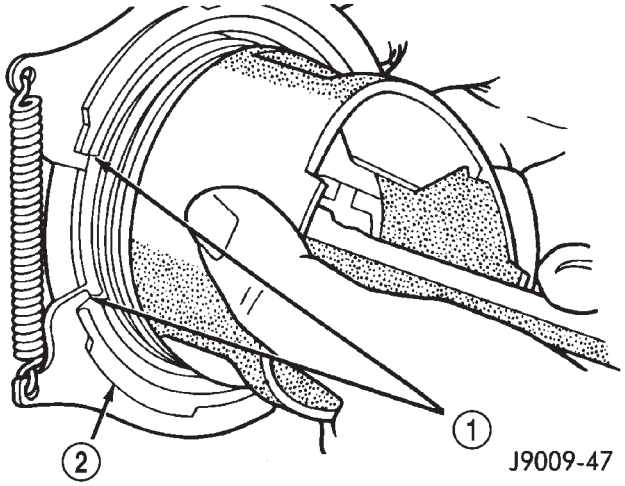


Fig. 68 Compression Ring Installation

1 - COMPRESSION RING
2 - RING EXPANDER RECOMMENDED

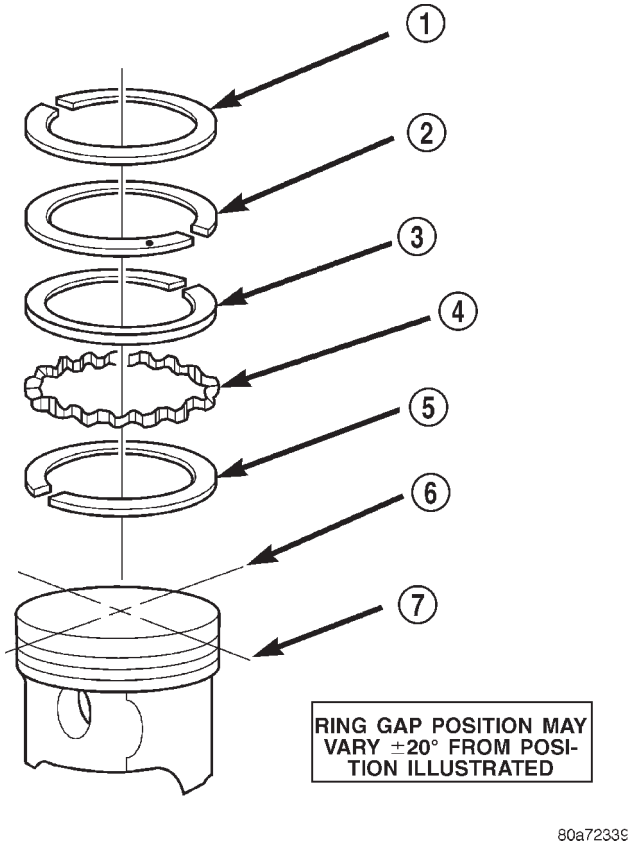


Fig. 69 Ring Gap Orientation

1 - TOP COMPRESSION RING
2 - BOTTOM COMPRESSION RING
3 - TOP OIL CONTROL RAIL
4 - OIL RAIL SPACER
5 - BOTTOM OIL CONTROL RAIL
6 - IMAGINARY LINE PARALLEL TO PISTON PIN
7 - IMAGINARY LINE THROUGH CENTER OF PISTON SKIRT

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL) and fan shroud.
(3) Remove the vibration damper retaining bolt and washer.
(4) Use Vibration Damper Removal Tool 7697 to remove the damper from the crankshaft (Fig. 70).

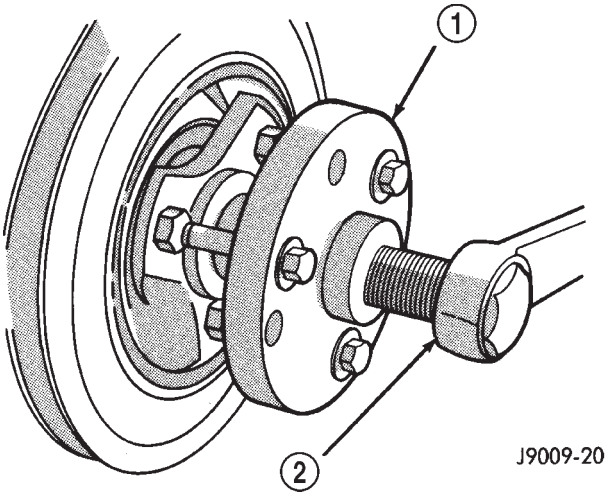


Fig. 70 Vibration Damper Removal Tool 7697

1 - VIBRATION DAMPER REMOVAL TOOL
2 - WRENCH

INSTALLATION

(1) Apply Mopar® Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in position, align the keyway on the vibration damper hub with the crankshaft key and tap the damper onto the crankshaft.
(2) Install the vibration damper retaining bolt and washer.
(3) Tighten the damper retaining bolt to 108 N·m (80 ft. lbs.) torque.
(4) Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION) and fan shroud.
(5) Connect negative cable to battery.

STRUCTURAL SUPPORT

REMOVAL

The engine bending braces are used to add strength to the powertrain and to address some minor NVH concerns.

STRUCTURAL SUPPORT (Continued)

NOTE: Before the engine or the transmission can be removed the engine bending braces must be removed.

(1) Raise and support vehicle.

NOTE: Both left and right side bending braces are removed the sameway. Only the right side is shown.

NOTE: The exhaust does not require removal to preform this procedure.

(2) Remove the exhaust hanger bracket retaining bolt.
(3) Remove locknut and transmission bending brace bar.
(4) Remove engine-to-bending brace retaining bolt, bending brace bar and cross bar.

INSTALLATION

NOTE: DO NOT tighten the retaining hardware until all bending braces are in place.

(1) Position the cross brace into the engine-to-transmission brace, then position the engine-to-transmission brace and install retaining bolt.
(2) Position the transmission bending brace onto through brace and install new locknut.
(3) Position exhaust hanger and transmission brace, install retaining bolt (Fig. 72).
(4) Tighten engine-to-transmission brace retaining bolt (Fig. 71)to 40 N·m (30 ft. lbs.).
(5) Tighten transmission brace retaining bolts (Fig. 72)to 40 N·m (30 ft. lbs.), then tighten transmission brace retaining lock nuts (Fig. 72) to 108 N·m (80 ft. lbs.).

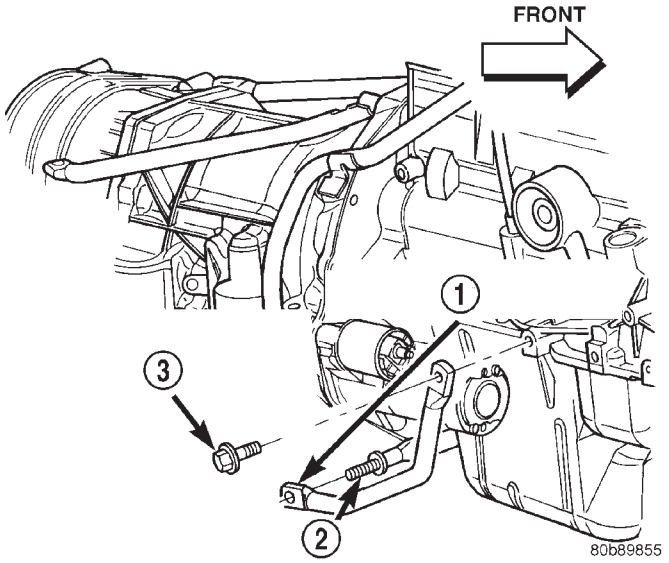


Fig. 71 Engine-to-Transmission Bending Braces

1 - ENGINE-TO-TRANSMISSION BENDING BRACE
2 - CROSS BRACE
3 - ENGINE-TO-TRANSMISSION BENDING BRACE RETAINING BOLT

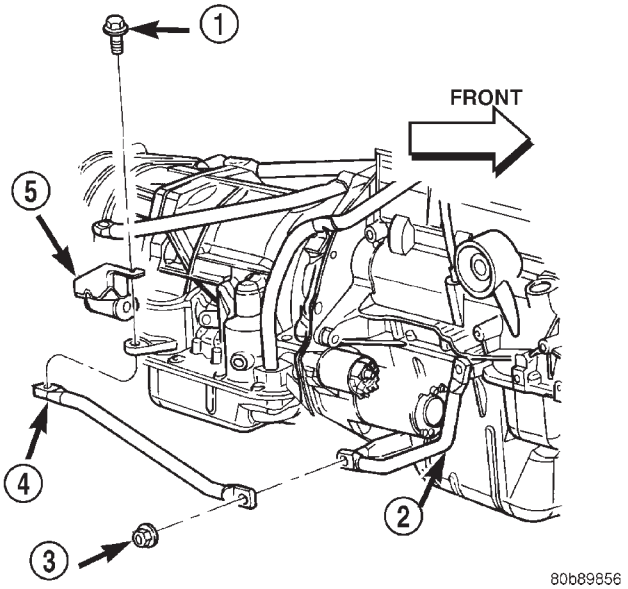


Fig. 72 Transmission Bending Braces and Exhaust Hanger

1 - TRANSMISSION BENDING BRACE RETAINING BOLT
2 - ENGINE-TO-TRANSMISSION BENDING BRACE
3 - LOCKNUT
4 - TRANSMISSION BRACE
5 - EXHAUST HANGER

LUBRICATION

DESCRIPTION

A gear—type positive displacement pump is mounted at the underside of the block opposite the No. 4 main bearing.

OPERATION

The pump draws oil through the screen and inlet tube from the sump at the rear of the oil pan. The oil is driven between the drive and idler gears and pump body, then forced through the outlet to the block. An oil gallery in the block channels the oil to the inlet side of the full flow oil filter. After passing through the filter element, the oil passes from the center outlet of the filter through an oil gallery that channels the oil up to the main gallery which extends the entire length of the block.

Galleries extend downward from the main oil gallery to the upper shell of each main bearing. The

LUBRICATION (Continued)

crankshaft is drilled internally to pass oil from the main bearing journals (except number 4 main bearing journal) to the connecting rod journals. Each connecting rod bearing cap has a small squirt hole, oil passes through the squirt hole and is thrown off as the rod rotates. This oil throwoff lubricates the camshaft lobes, distributor drive gear, cylinder walls, and piston pins.

The hydraulic valve tappets receive oil directly from the main oil gallery. Oil is provided to the camshaft bearing through galleries. The front camshaft bearing journal passes oil through the camshaft sprocket to the timing chain. Oil drains back to the oil pan under the number one main bearing cap.

The oil supply for the rocker arms and bridged pivot assemblies is provided by the hydraulic valve tappets which pass oil through hollow push rods to a hole in the corresponding rocker arm. Oil from the rocker arm lubricates the valve train components, then passes down through the push rod guide holes in the cylinder head past the valve tappet area, and returns to the oil pan (Fig. 73).

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE OIL PRESSURE

(1) Disconnect connector and remove oil pressure sending unit.

(2) Install Oil Pressure Line and Gauge Tool C-3292 or equivalent. Start engine and record pressure. (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct pressures.

DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.**If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the CCV valve from the cylinder head cover. Cap or plug the CCV valve grommet.

(3) Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service information procedures.

(5) If the leakage occurs at the rear oil seal area, INSPECTION FOR REAR SEAL AREA LEAKS .

(6) If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the CCV valve and breather cap hose.

(7) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.

(2) Raise the vehicle.

(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:

(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.

(b) Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.

(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

LUBRICATION (Continued)

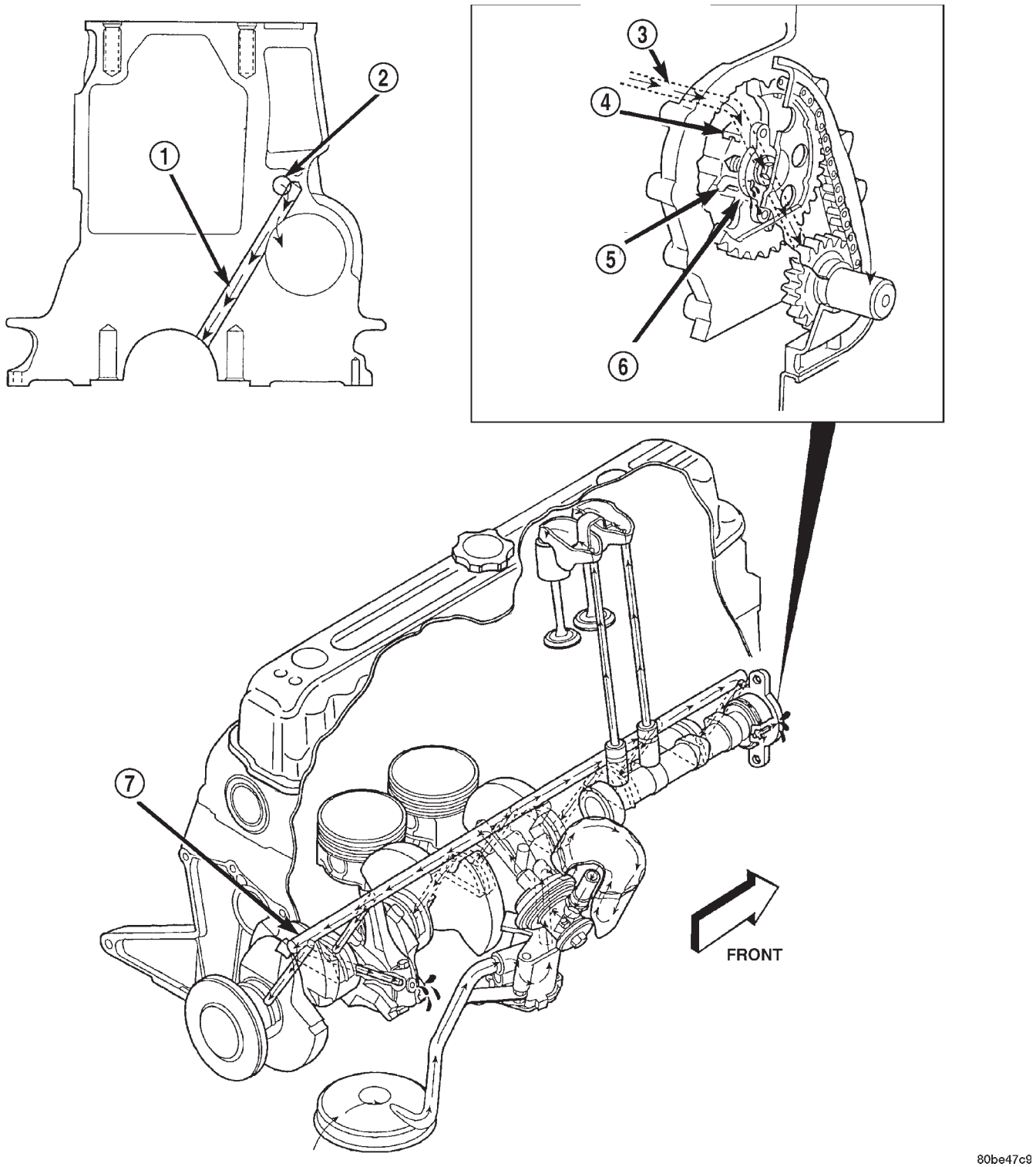


Fig. 73 Oil Lubrication System—4.0L Engine

1 - CAM/CRANK MAIN GALLERY (7)
2 - TAPPET GALLERY
3 - TAPPET GALLERY
4 - CAMSHAFT BEARING
5 - NUMBER 1 CAMSHFT BEARING JOURNAL
6 - CAMSHAFT SPROCKET
7 - TAPPET GALLERY

LUBRICATION (Continued)

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

OIL

STANDARD PROCEDURE - ENGINE OIL SERVICE

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Hoist and support vehicle on safety stands.

(3) Remove oil fill cap.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Replace engine oil filter. (Refer to 9 - ENGINE/ LUBRICATION/OIL FILTER - REMOVAL).

(8) Lower vehicle and fill crankcase with specified type of engine oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - DESCRIPTION) and amount of engine oil (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).

(9) Install oil fill cap.

(10) Start engine and inspect for leaks.

(11) Stop engine and inspect oil level. Refer to CRANKCASE OIL LEVEL INSPECTION .

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine.

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, oil foaming and oil pressure loss can result.

The engine oil level indicator (Dipstick) is located at the right rear of the 4.0L engine. Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick (Fig. 74).

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, take oil level reading (Fig. 74).

(6) Add oil only if level is below the ADD mark on dipstick.

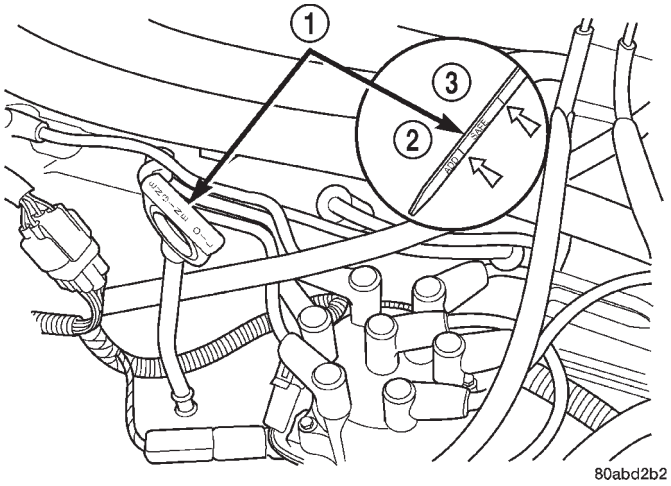


Fig. 74 Engine Oil Dipstick—4.0L Engine

1 - DIPSTICK
2 - ADD
3 - SAFE

OIL FILTER

REMOVAL

CAUTION: Do not use oil filter with metric threads. The proper oil filter has SAE type 3/4 X 16 threads. An oil filter with metric threads can result in oil leaks and engine failure.

OIL FILTER (Continued)

All Jeep engines are equipped with a high quality full-flow, throw-away type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

(1) Position a drain pan under the oil filter.

(2) Using a suitable oil filter wrench loosen filter.

(3) Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss or filter adapter housing (Fig. 75).

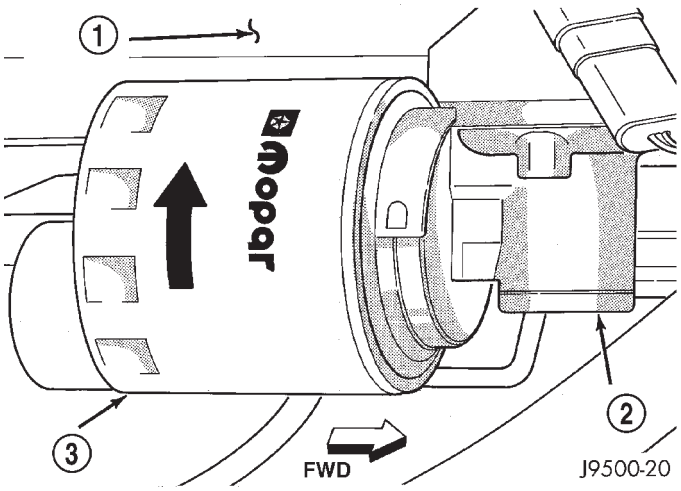


Fig. 75 Oil Filter—4.0L Engine

1 - CYLINDER BLOCK
2 - ADAPTER
3 - OIL FILTER

(4) When filter separates from adapter nipple, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

(5) Make sure old gasket comes off with oil filter. With a wiping cloth, clean the gasket sealing surface (Fig. 76) of oil and grime.

INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil or chassis grease.

(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 76) hand tighten filter one full turn, do not over tighten.

(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

OIL PAN

DESCRIPTION

The oil pan is made of stamped steel. The oil pan gasket is a one piece steel backbone silicone coated gasket (Fig. 77).

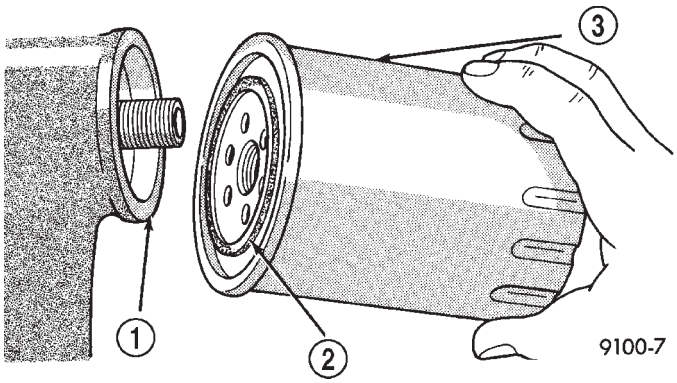


Fig. 76 Oil Filter Sealing Surface—Typical

1 - SEALING SURFACE
2 - RUBBER GASKET
3 - OIL FILTER

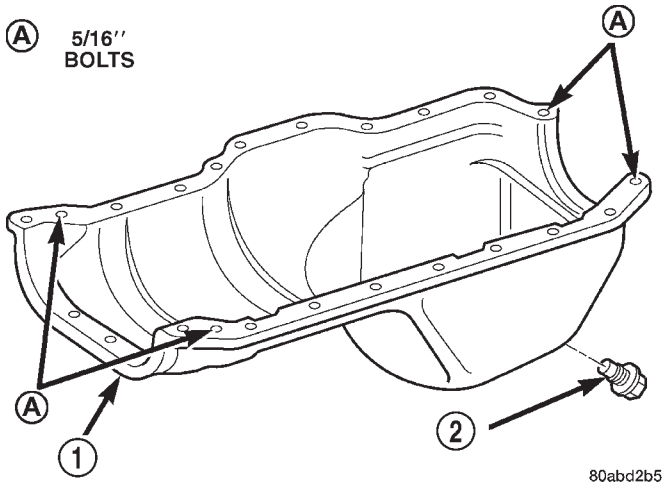


Fig. 77 Oil Pan

1 - OIL PAN
2 - OIL PAN DRAIN PLUG

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise the vehicle.

(3) Remove the oil pan drain plug and drain the engine oil.

(4) Disconnect the exhaust pipe at the exhaust manifold.

(5) Disconnect the exhaust hanger at the catalytic converter and lower the pipe.

(6) Remove the starter motor. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).

(7) Remove the engine flywheel and transmission torque converter housing access cover.

(8) If equipped with an oil level sensor, disconnect the sensor.

(9) Position a jack stand directly under the engine vibration damper.

OIL PAN (Continued)

(10) Place a piece of wood (2 x 2) between the jack stand and the engine vibration damper.

(11) Remove the engine mount through bolts.

(12) Using the jack stand, raise the engine until adequate clearance is obtained to remove the oil pan.

(13) Remove transmission oil cooling lines (if equipped) and oxygen sensor wiring supports that are attached to the oil pan studs.

(14) Remove the oil pan bolts and studs. Carefully slide the oil pan and gasket to the rear. If equipped with an oil level sensor, take care not to damage the sensor.

INSTALLATION

(1) Clean the block and pan gasket surfaces.

(2) Fabricate 4 alignment dowels from 1 1/2 x 1/4 inch bolts. Cut the head off the bolts and cut a slot into the top of the dowel. This will allow easier installation and removal with a screwdriver (Fig. 78).

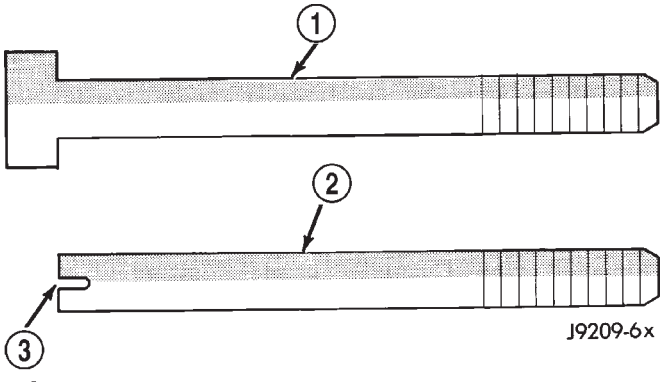


Fig. 78 Fabrication of Alignment Dowels

1 - 1/4'' × 1 1/2'' BOLT
2 - DOWEL
3 - SLOT

(3) Install two dowels in the timing case cover. Install the other two dowels in the cylinder block (Fig. 79).

(4) Apply Mopar® Silicone Rubber Adhesive Sealant on cylinder block to rear main bearing cap corners and cylinder block to front cover joints (four places) (Fig. 80).

(5) Slide the one-piece gasket over the dowels and onto the block and timing case cover.

(6) Position the oil pan over the dowels and onto the gasket. If equipped with an oil level sensor, take care not to damage the sensor.

(7) Install the 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque. Install the 5/16 inch oil pan bolts (Fig. 81). Tighten these bolts to 15 N·m (132 in. lbs.) torque.

(8) Remove the dowels. Install the remaining 1/4 inch oil pan bolts. Tighten these bolts to 9.5 N·m (84 in. lbs.) torque.

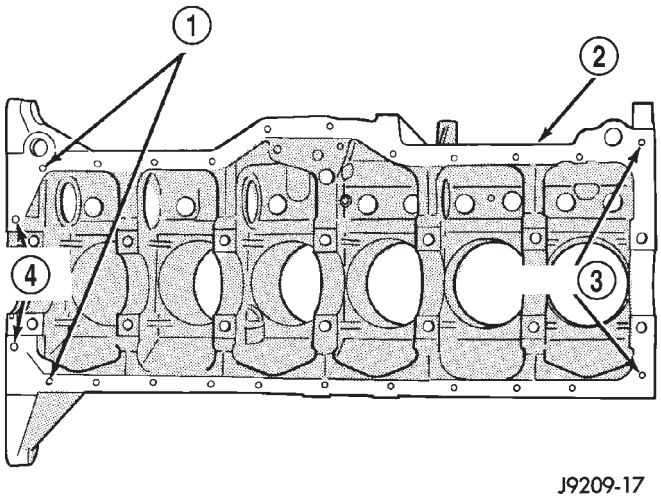


Fig. 79 Position of Dowels in Cylinder Block

1 - DOWEL HOLES
2 - CYLINDER BLOCK
3 - 5/16'' HOLES
4 - 5/16'' HOLES

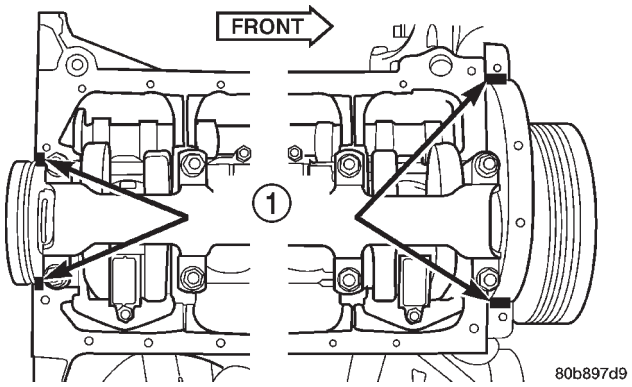


Fig. 80 Oil Pan Sealer Location

1 - SEALER LOCATIONS

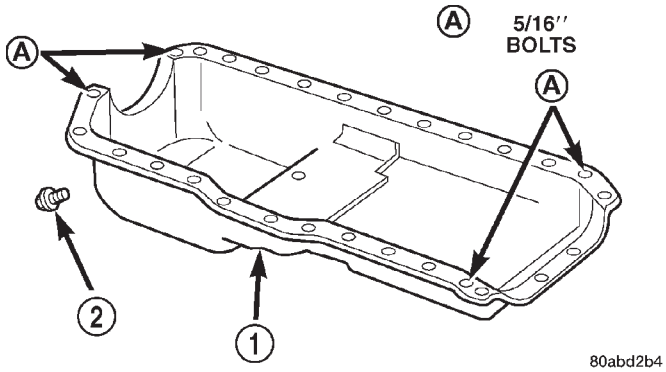


Fig. 81 Position of 5/16 inch Oil Pan Bolts

1 - OIL PAN
2 - OIL PAN DRAIN PLUG

OIL PAN (Continued)

(9) Lower the engine until it is properly located on the engine mounts.

(10) Install the through bolts and tighten the nuts.

(11) Lower the jack stand and remove the piece of wood.

(12) Install the engine flywheel and transmission torque converter housing access cover.

(13) Install the engine starter motor. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).

(14) Connect the exhaust pipe to the hanger and to the engine exhaust manifold.

(15) Install transmission oil cooling lines (if equipped) and oxygen sensor wiring supports that attach to the oil pan studs.

(16) Install the oil pan drain plug (Fig. 81). Tighten the plug to 34 N·m (25 ft. lbs.) torque.

(17) Lower the vehicle.

(18) Connect negative cable to battery.

(19) Fill the oil pan with engine oil to the specified level.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.

(20) Start the engine and inspect for leaks.

ENGINE OIL PRESSURE SENSOR

DESCRIPTION

The 3–wire, solid-state engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

The oil pressure sensor uses three circuits. They are:

- A 5–volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3–wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5–volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

OIL PUMP

REMOVAL

A gear-type oil pump is mounted at the underside of the cylinder block opposite the No.4 main bearing.

(1) Drain the engine oil.

(2) Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(3) Remove the pump-to-cylinder block attaching bolts. Remove the pump assembly with gasket (Fig. 82).

CAUTION: If the oil pump is not to be serviced, DO NOT disturb position of oil inlet tube and strainer assembly in pump body. If the tube is moved within the pump body, a replacement tube and strainer assembly must be installed to assure an airtight seal.

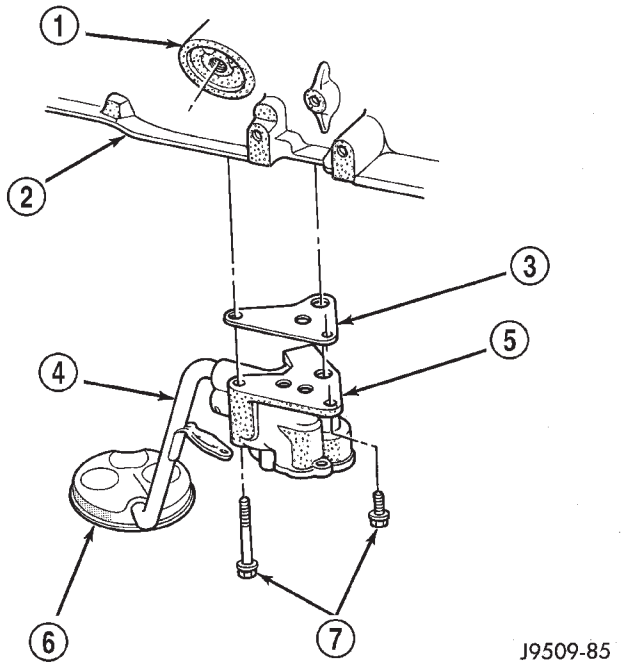


Fig. 82 Oil Pump Assembly

1 - OIL FILTER ADAPTOR
2 - BLOCK
3 - GASKET
4 - OIL INLET TUBE
5 - OIL PUMP
6 - STRAINER ASSEMBLY
7 - ATTACHING BOLTS

OIL PUMP (Continued)

INSTALLATION

A gear-type oil pump is mounted at the underside of the cylinder block opposite the No.4 main bearing.

(1) Install the oil pump on the cylinder block using a replacement gasket. Tighten the bolts to 23 N·m (17 ft. lbs.) torque.

(2) Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(3) Fill the oil pan with oil to the specified level.

INTAKE MANIFOLD

DESCRIPTION

The intake manifold (Fig. 83) is made of cast aluminum and uses eleven bolts to mount to the cylinder head. This mounting style improves sealing and reduces the chance of leaks.

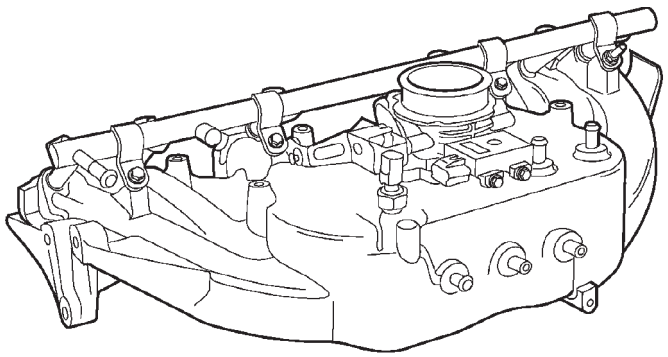


Fig. 83 Intake Manifold 4.0L Engine

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.

(2) Spray a small stream of water at the suspected leak area.

(3) If a change in RPM is observed the area of the suspected leak has been found.

(4) Repair as required.

REMOVAL

NOTE: THE ENGINE INTAKE AND EXHAUST MANIFOLD MUST BE REMOVED AND INSTALLED TOGETHER. THE MANIFOLDS USE A COMMON GASKET AT THE CYLINDER HEAD.

(1) Disconnect the battery negative cable.

(2) Remove air cleaner inlet hose from the resonator assembly.

(3) Remove the air cleaner assembly.

(4) Remove the throttle cable, vehicle speed control cable (if equipped) and the transmission line pressure cable (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - AW4/THROTTLE VALVE CABLE - REMOVAL).

(5) Disconnect the following electrical connections and secure their harness out of the way:

- Throttle Position Sensor
- Idle Air Control Motor
- Coolant Temperature Sensor (at thermostat housing)
- Intake Air Temperature Sensor
- Oxygen Sensor
- Crank Position Sensor
- Six (6) Fuel Injector Connectors
- Manifold Absolute Pressure (MAP) Sensor.

(6) Disconnect HVAC, and Brake Booster vacuum supply hoses at the intake manifold.

(7) Perform the fuel pressure release procedure. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).

(8) Disconnect and remove the fuel system supply line from the fuel rail assembly.

(9) Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(10) Remove the power steering pump from the intake manifold and set aside.

(11) Raise the vehicle.

(12) Disconnect the exhaust pipes from the engine exhaust manifolds.

(13) Lower the vehicle.

(14) Remove the intake manifold and exhaust manifold bolts and manifolds (Fig. 84).

INSTALLATION

If the manifold is being replaced, ensure all the fitting, etc. are transferred to the replacement manifold.

(1) Install a new engine exhaust/intake manifold gasket over the alignment dowels on the cylinder head.

(2) Position the engine exhaust manifolds to the cylinder head. Install fastener Number 3 and finger tighten at this time (Fig. 84).

INTAKE MANIFOLD (Continued)

(3) Install intake manifold on the cylinder head dowels.

(4) Install washer and fastener Numbers 1, 2, 4, 5, 8, 9, 10 and 11 (Fig. 84).

(5) Install washer and fastener Numbers 6 and 7 (Fig. 84).

(6) Tighten the fasteners in sequence and to the specified torque (Fig. 84).

- Fastener Numbers 1 through 5—Tighten to 33 N·m (24 ft. lbs.) torque.
- Fastener Numbers 6 and 7—Tighten to 31 N·m (23 ft. lbs.) torque.
- Fastener Numbers 8 through 11—Tighten to 33 N·m (24 ft. lbs.) torque.

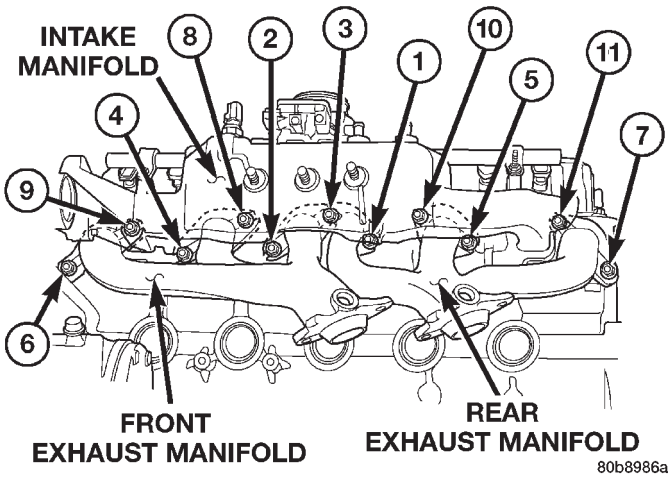


Fig. 84 Intake and Exhaust Manifolds Installation

(7) Install the power steering pump to the intake manifold.

(8) Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(9) Install the fuel system supply line to the fuel rail assembly.

(10) Connect all electrical connections on the intake manifold.

(11) Connect the vacuum hoses previously removed.

(12) Install throttle cable, vehicle speed control cable (if equipped).

(13) Install the transmission line pressure cable (if equipped) (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - AW4/THROTTLE VALVE CABLE - INSTALLATION).

(14) Install air cleaner assembly.

(15) Connect air inlet hose to the resonator assembly.

(16) Raise the vehicle.

(17) Connect the exhaust pipes to the engine exhaust manifolds. Tighten the bolts to 31 N·m (23 ft. lbs.)

(18) Lower the vehicle.

(19) Connect the battery negative cable.

(20) Start the engine and check for leaks.

EXHAUST MANIFOLD

DESCRIPTION

The two exhaust manifolds (Fig. 85) are log style and are made of high silicon molybdenum cast iron. The exhaust manifolds share a common gasket with the intake manifold. The exhaust manifolds also incorporate ball flange outlets for improved sealing and strain free connections.

REMOVAL

The intake and engine exhaust manifolds on the 4.0L engine must be removed together. The manifolds use a common gasket at the cylinder head.

(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

INSTALLATION

(1) The exhaust manifold and the intake manifold must be installed together using a common gasket.

(2) (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

TIMING BELT / CHAIN COVER(S)

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(3) Remove the fan, hub assembly and fan shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(4) Remove the accessory drive brackets that are attached to the timing case cover.

(5) Remove the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL) (if equipped) and generator bracket assembly from the engine cylinder head and move to one side.

(6) Remove the oil pan-to-timing case cover bolts and timing case cover-to-cylinder block bolts.

(7) Remove the timing case cover and gasket from the engine.

(8) Pry the crankshaft oil seal from the front of the timing case cover (Fig. 86).

INSTALLATION

Clean the timing case cover, oil pan and cylinder block gasket surfaces.

TIMING BELT / CHAIN COVER(S) (Continued)

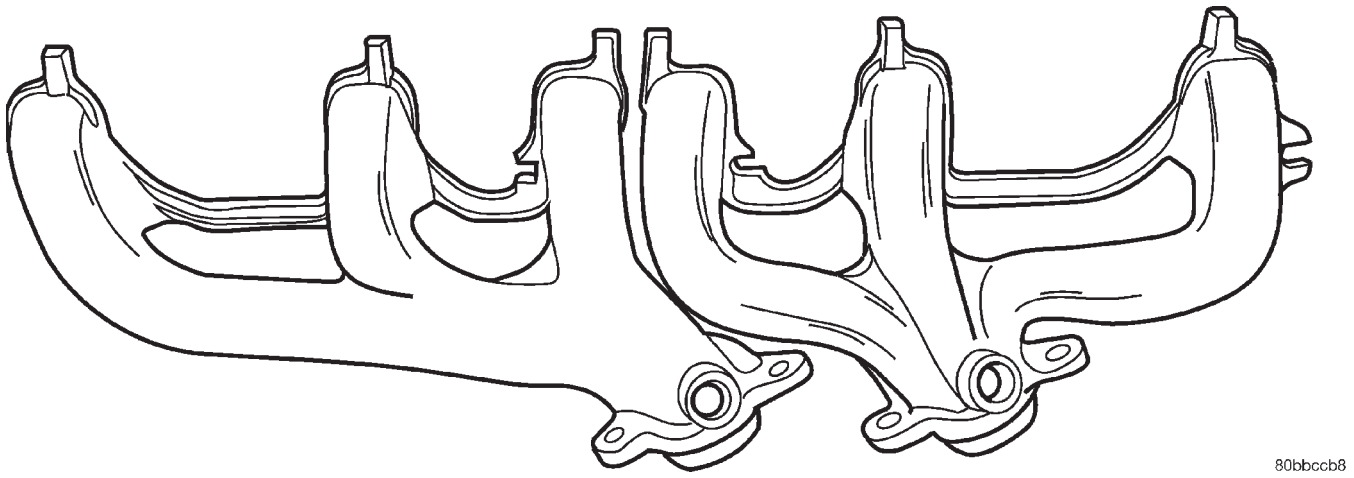


Fig. 85 EXHAUST MANIFOLDS 4.0L ENGINE

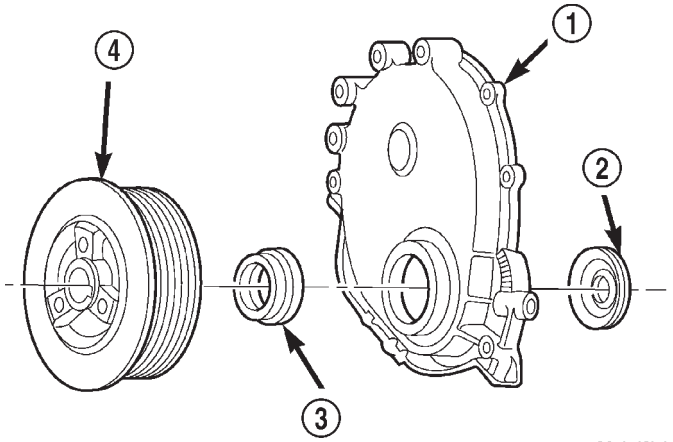


Fig. 86 Timing Case Cover Components

1 - TIMING CASE COVER
2 - OIL SLINGER
3 - CRANKSHAFT OIL SEAL
4 - VIBRATION DAMPER PULLEY

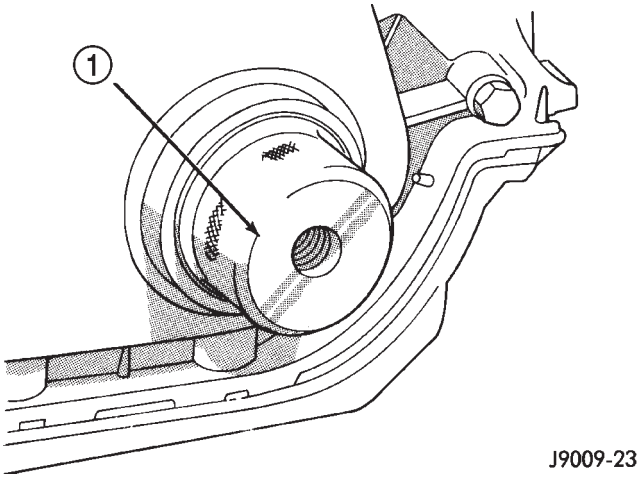


Fig. 87 Timing Case Cover Alignment

1 - TIMING CASE COVER ALIGNMENT AND SEAL INSTALLATION TOOL

(1) Install a new crankshaft oil seal in the timing case cover. The open end of the seal should be toward the inside of the cover. Support the cover at the seal area while installing the seal. Force it into position with Seal Installation Tool 6139.

(2) Position the gasket on the cylinder block.

(3) Position the timing case cover on the oil pan gasket and the cylinder block.

(4) Insert Timing Case Cover Alignment and Seal Installation Tool 6139 in the crankshaft opening in the cover (Fig. 87).

(5) Install the timing case cover-to-cylinder block and the oil pan-to-timing case cover bolts.

(6) Tighten the 1/4 inch cover-to-block bolts to 7 N·m (60 in. lbs.) torque. Tighten the 5/16 inch front cover-to-block bolts to 22 N·m (192 in. lbs.) torque. Tighten the oil pan-to-cover 1/4 inch bolts to 9.5 N·m (84 in. lbs.) torque.

(7) Remove the cover alignment tool.

(8) Apply a light film of engine oil on the vibration damper hub contact surface of the seal.

(9) Apply Mopar® Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key inserted in the keyway in the crankshaft, install the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(10) Install the A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION) (if equipped) and generator bracket assembly.

(11) Install the engine fan, hub assembly and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(12) Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(13) Connect negative cable to battery.

TIMING BELT/CHAIN AND SPROCKETS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove the fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(3) Remove the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(4) Remove the crankshaft vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(5) Remove the timing case cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(6) Rotate crankshaft until the “0” timing mark is closest to and on the center line with camshaft sprocket timing mark (Fig. 88).

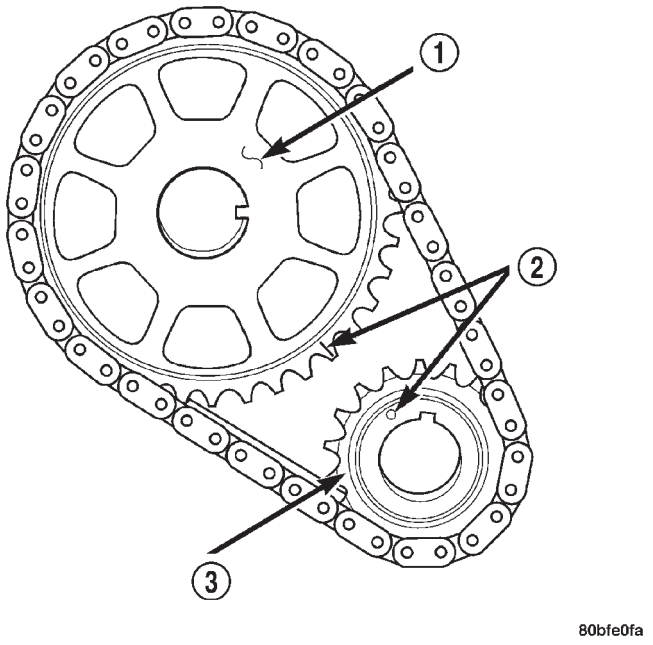


Fig. 88 Crankshaft—Camshaft Alignment

1 - CAMSHAFT SPROCKET
2 - TIMING MARKS
3 - CRANKSHAFT SPROCKET

(7) Remove the oil slinger from the crankshaft.

(8) Remove the camshaft sprocket bolt and washer (Fig. 89).

(9) Remove the crankshaft sprocket, camshaft sprocket and timing chain as an assembly.

(10) Installation of the timing chain with the timing marks on the crankshaft and camshaft sprockets properly aligned ensures correct valve timing. A worn or stretched timing chain will adversely affect valve timing. If the timing chain deflects more than 12.7 mm (1/2 inch) replace it.

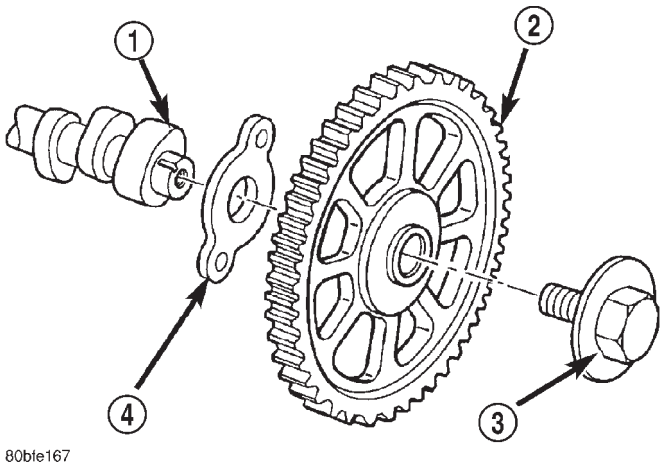


Fig. 89 Camshaft Sprocket and Thrust Plate

1 - CAMSHAFT
2 - CAMSHAFT SPROCKET W/INTEGRAL KEY
3 - BOLT AND WASHER
4 - THRUST PLATE

INSTALLATION

Assemble the timing chain, crankshaft sprocket and camshaft sprocket with the timing marks aligned (Fig. 88).

(1) Apply Mopar® Silicone Rubber Adhesive Sealant to the keyway in the crankshaft and insert the key. With the key in the keyway on the crankshaft, install the assembly on the crankshaft and camshaft.

(2) Install the camshaft sprocket bolt and washer (Fig. 89). Tighten the bolt to 68 N·m (50 ft. lbs.) torque.

(3) To verify correct installation of the timing chain, rotate the crankshaft 2 revolutions. The camshaft and crankshaft sprocket timing mark should align (Fig. 88).

(4) Install the crankshaft oil slinger.

(5) Replace the oil seal in the timing case cover (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - FRONT - REMOVAL).

(6) Install the timing case cover and gasket (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(7) With the key installed in the crankshaft keyway, install the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(8) Install the serpentine drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(9) Install the fan, hub assembly and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(10) Connect negative cable to battery.

ENGINE - 4.7L

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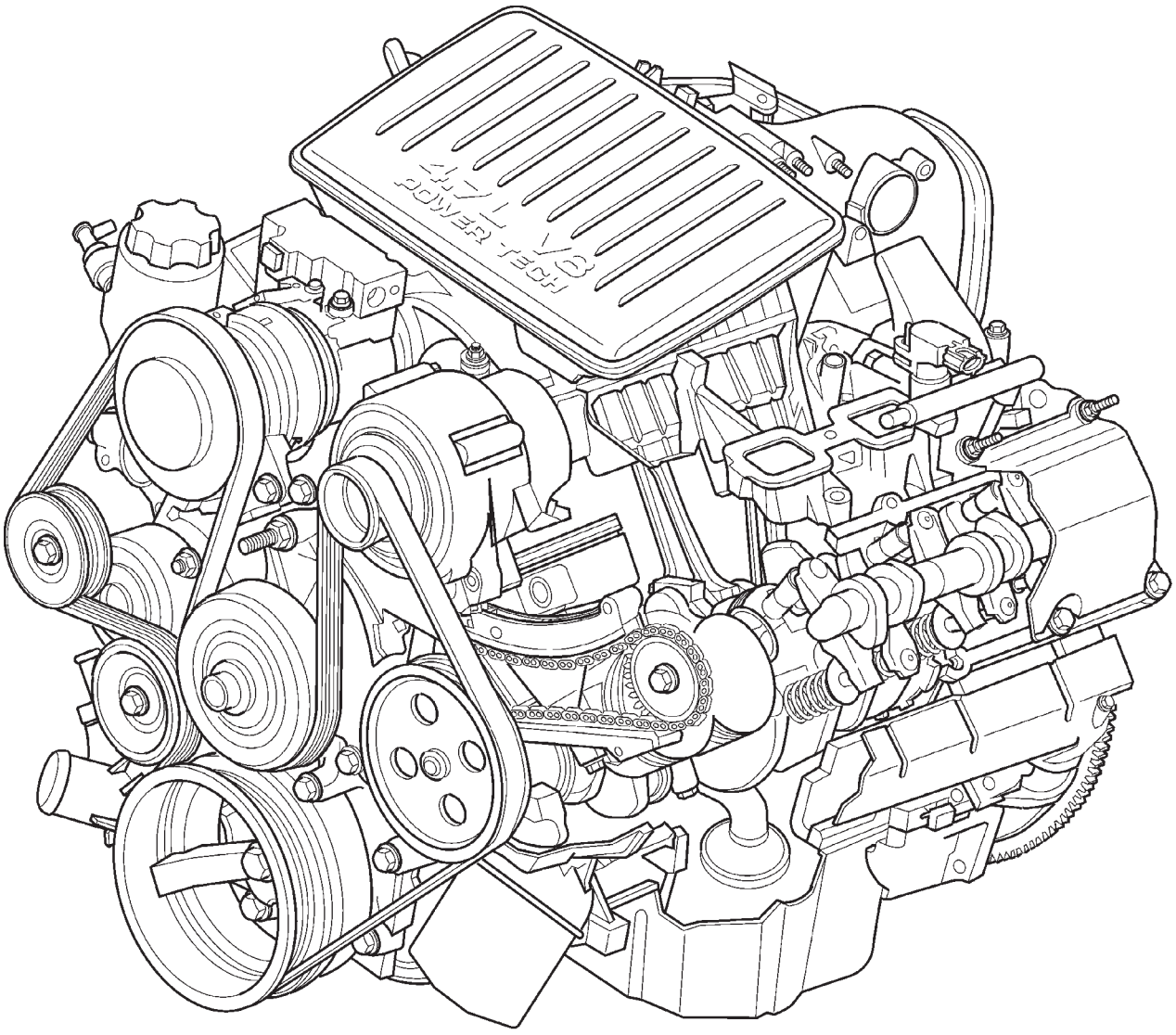
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ENGINE - 4.7L

DESCRIPTION—4.7L ENGINE



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The 4.7 liter (287 CID) eight-cylinder engine is an 90° single overhead camshaft engine. The cast iron cylinder block is made up of two different components; the first component is the cylinder bore and upper block, the second component is the bedplate that comprises the lower portion of the cylinder block and houses the lower half of the crankshaft main bearings. The cylinders are numbered from front to rear with the left bank being numbered 1,3,5 and 7, and the right bank being numbered 2,4,6 and 8. The firing order is 1–8–4–3–6–5–7–2. The engine serial number is located at the right front side of the engine block (Fig. 1)

ENGINE - 4.7L (Continued)

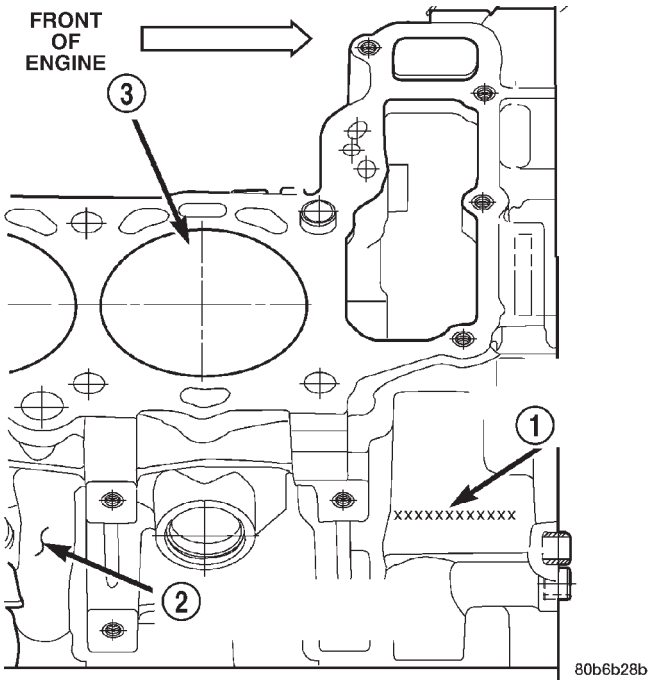


Fig. 1 Engine Identification Location

1 - VEHICLE VIN NUMBER LOCATION
2 - CYLINDER BLOCK RIGHT HAND SIDE
3 - CYLINDER BORE #2

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE

DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

ENGINE - 4.7L (Continued)

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery	1. Charge or replace as necessary.
	2. Corroded or loose battery connections.	2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals.
	3. Faulty starter.	3. (Refer to 8 - ELECTRICAL/ STARTING - DIAGNOSIS AND TESTING).
	4. Faulty coil or control unit.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect spark plug gap.	5. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	6. Dirt or water in fuel system.	6. Clean system and replace fuel filter.
	7. Faulty fuel pump, relay or wiring.	7. Repair or replace as necessary.
ENGINE STALLS OR ROUGH IDLE	1. Idle speed set to low.	1. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/IDLE AIR CONTROL MOTOR - REMOVAL).
	2. Idle mixture to lean or to rich.	2. Refer to Powertrain Diagnosis Information.
	3. Vacuum leak.	3. Inspect intake manifold and vacuum hoses, repair or replace as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	5. Incorrect engine timing.	5. (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).
1. ENGINE LOSS OF POWER	1. Dirty or incorrectly gapped spark plugs.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt or water in fuel system.	2. Clean system and replace fuel filter.
	3. Faulty fuel pump.	3. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL PUMP - DIAGNOSIS AND TESTING).
	4. Blown cylinder head gasket.	4. Replace cylinder head gasket.
	5. Low compression.	5. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), repair as necessary.
	6. Burned, warped or pitted valves.	6. Replace as necessary.
	7. Plugged or restricted exhaust system.	7. Inspect and replace as necessary.
	8. Faulty coil.	8. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).

ENGINE - 4.7L (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
1. ENGINE MISSES ON ACCELERATION	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Dirt in fuel system.	2. Clean fuel system.
	3. Burned, warped or pitted valves.	3. Replcae as necessary.
	4. Faulty coil.	4. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
1. ENGINE MISSES AT HIGH SPEED	1. Spark plugs dirty or incorrectly gapped.	1. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING).
	2. Faulty coil.	2. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
	3. Dirt or water in fuel system.	3. Clean system and replace fuel filter.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Thin or diluted oil.	2. Change oil and filter.
	3. Low oil pressure.	3. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	4. Dirt in lash adjusters.	4. Replace as necessary.
	5. Worn rocker arms.	5. Replace as necessary.
	6. Worn lash adjusters	6. Replace as necessary.
	7. Worn valve guides.	7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
	8. Excessive runout of valve seats on valve faces.	8. Service valves and valve seats. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
CONNECTING ROD NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Connecting rod journal out-of-round.	5. Service or replace crankshaft.
	6. Misaligned connecting rods.	6. Replace bent connecting rods.

ENGINE - 4.7L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTIONS
MAIN BEARING NOISE	1. Insufficient oil supply.	1. (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
	2. Low oil pressure.	2. Check oil pump, if Ok, check rod and main bearings for excessive wear.
	3. Thin or diluted oil.	3. Change oil and filter.
	4. Excessive bearing clearance.	4. Replace as necessary.
	5. Excessive end play.	5. Check thrust washers for wear.
	6. Crankshaft journal out-of round.	6. Service or replace crankshaft.
	7. Loose flywheel or torque converter.	7. Tighten to correct torque

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	1. Gaskets and O-Rings.	1.
	(a) Misaligned or damaged.	(a) Replace as necessary.
	(b) Loose fasteners, broken or porous metal parts.	(b) Tighten fasteners, Repair or replace metal parts.
	2. Crankshaft rear seal	2. Replace as necessary (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - REAR - REMOVAL).
	3. Crankshaft seal flange. Scratched, nicked or grooved.	3. Polish or replace crankshaft.
	4. Oil pan flange cracked.	4. Replace oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
	5. Timing chain cover seal, damaged or misaligned.	5. Replace seal (Refer to 9 - ENGINE/ENGINE BLOCK/ CRANKSHAFT OIL SEAL - FRONT - REMOVAL).
	6. Scratched or damaged vibration damper hub.	6. Polish or replace damper.

ENGINE - 4.7L (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PRESSURE DROP	1. Low oil level.	1. Check and correct oil level.
	2. Faulty oil pressure sending unit.	2. Replace sending unit (Refer to 9 - ENGINE/LUBRICATION/OIL PRESSURE SENSOR/SWITCH - REMOVAL).
	3. Low oil pressure.	3. Check oil pump and bearing clearance.
	4. Clogged oil filter.	4. Replace oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).
	5. Worn oil pump.	5. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	6. Thin or diluted oil.	6. Change oil and filter.
	7. Excessive bearing clearance.	7. Replace as necessary.
	8. Oil pump relief valve stuck.	8. Replace oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
	9. Oil pick up tube loose, damaged or clogged.	9. Replace as necessary.
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings.	1. Hone cylinder bores and replace rings.
	2. Carbon in oil ring slots.	2. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	3. Incorrect ring size installed.	3. Replace rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
	4. Worn valve guides.	4. Ream guides and replace valves (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE).
	5. Leaking valve guide seals.	5. Replace valve guide seals.

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

(1) Clean the spark plug recesses with compressed air.

(2) Remove the spark plugs.

(3) Secure the throttle in the wide-open position.

(4) Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).

(5) Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).

(6) Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.

(7) Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.

(8) (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

ENGINE - 4.7L (Continued)

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

(1) Check the coolant level and fill as required. DO NOT install the radiator cap.

(2) Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.

(3) Remove the spark plugs.

(4) Remove the oil filler cap.

(5) Remove the air cleaner.

(6) Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.

(7) Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression,While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

ENGINE - 4.7L (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE - FORM-IN-PLACE GASKETS AND SEALERS

There are numerous places where form-in-place gaskets are used on the engine. Care must be taken when applying form-in-place gaskets to assure obtaining the desired results. **Do not use form-in-place gasket material unless specified.** Bead size, continuity, and location are of great importance. Too thin a bead can result in leakage while too much can result in spill-over which can break off and obstruct fluid feed lines. A continuous bead of the proper width is essential to obtain a leak-free gasket.

There are numerous types of form-in-place gasket materials that are used in the engine area. Mopar® Engine RTV GEN II, Mopar® ATF-RTV, and Mopar® Gasket Maker gasket materials, each have different properties and can not be used in place of the other.

MOPAR® ENGINE RTV GEN II

Mopar® Engine RTV GEN II is used to seal components exposed to engine oil. This material is a specially designed black silicone rubber RTV that retains adhesion and sealing properties when exposed to engine oil. Moisture in the air causes the material to cure. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® ATF RTV

Mopar® ATF RTV is a specifically designed black silicone rubber RTV that retains adhesion and sealing properties to seal components exposed to automatic transmission fluid, engine coolants, and moisture. This material is available in three ounce tubes and has a shelf life of one year. After one year this material will not properly cure. Always inspect the package for the expiration date before use.

MOPAR® GASKET MAKER

Mopar® Gasket Maker is an anaerobic type gasket material. The material cures in the absence of air when squeezed between two metallic surfaces. It will not cure if left in the uncovered tube. The anaerobic material is for use between two machined surfaces. Do not use on flexible metal flanges.

MOPAR® GASKET SEALANT

Mopar® Gasket Sealant is a slow drying, permanently soft sealer. This material is recommended for sealing threaded fittings and gaskets against leakage of oil and coolant. Can be used on threaded and machined parts under all temperatures. This material is used on engines with multi-layer steel (MLS) cylinder head gaskets. This material also will prevent corrosion. Mopar® Gasket Sealant is available in a 13 oz. aerosol can or 4oz./16 oz. can w/applicator.

FORM-IN-PLACE GASKET AND SEALER APPLICATION

Assembling parts using a form-in-place gasket requires care but it's easier then using precut gaskets.

Mopar® Gasket Maker material should be applied sparingly 1 mm (0.040 in.) diameter or less of sealant to one gasket surface. Be certain the material surrounds each mounting hole. Excess material can easily be wiped off. Components should be torqued in place within 15 minutes. The use of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Engine RTV GEN II or ATF RTV gasket material should be applied in a continuous bead approximately 3 mm (0.120 in.) in diameter. All mounting holes must be circled. For corner sealing, a 3.17 or 6.35 mm (1/8 or 1/4 in.) drop is placed in the center of the gasket contact area. Uncured sealant may be removed with a shop towel. Components should be torqued in place while the sealant is still wet to the touch (within 10 minutes). The usage of a locating dowel is recommended during assembly to prevent smearing material off the location.

Mopar® Gasket Sealant in an aerosol can should be applied using a thin, even coat sprayed completely over both surfaces to be joined, and both sides of a gasket. Then proceed with assembly. Material in a can w/applicator can be brushed on evenly over the sealing surfaces. Material in an aerosol can should be used on engines with multi-layer steel gaskets.

STANDARD PROCEDURE - ENGINE GASKET SURFACE PREPARATION

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components and multi-layer steel cylinder head gaskets.

Never use the following to clean gasket surfaces:

- Metal scraper

ENGINE - 4.7L (Continued)

- Abrasive pad or paper to clean cylinder block and head
- High speed power tool with an abrasive pad or a wire brush (Fig. 2)

NOTE: Multi-Layer Steel (MLS) head gaskets require a scratch free sealing surface.

Only use the following for cleaning gasket surfaces:
- Solvent or a commercially available gasket remover
- Plastic or wood scraper (Fig. 2)
- Drill motor with 3M Roloc™ Bristle Disc (white or yellow) (Fig. 2)

CAUTION: Excessive pressure or high RPM (beyond the recommended speed), can damage the sealing surfaces. The mild (white, 120 grit) bristle disc is recommended. If necessary, the medium (yellow, 80 grit) bristle disc may be used on cast iron surfaces with care.

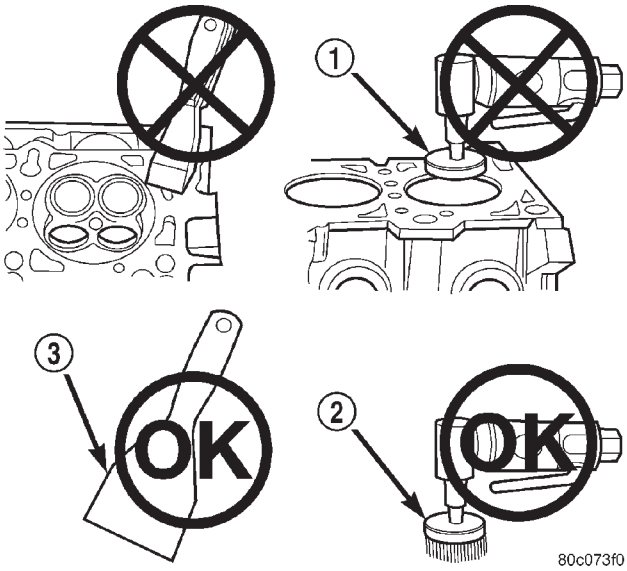


Fig. 2 Proper Tool Usage For Surface Preparation

1 - ABRASIVE PAD
2 - 3M ROLOC™ BRISTLE DISC
3 - PLASTIC/WOOD SCRAPER

STANDARD PROCEDURE - ENGINE CORE AND OIL GALLERY PLUGS

Using a blunt tool such as a drift and a hammer, strike the bottom edge of the cup plug. With the cup plug rotated, grasp firmly with pliers or other suitable tool and remove plug (Fig. 3).

CAUTION: Do not drive cup plug into the casting as restricted cooling can result and cause serious engine problems.

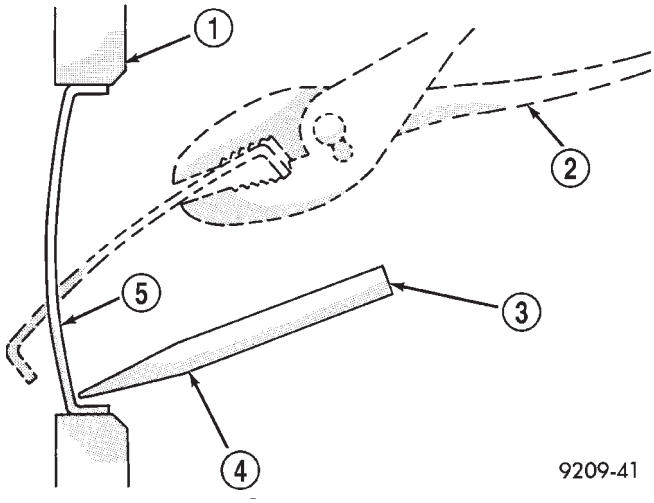


Fig. 3 Core Hole Plug Removal

1 - CYLINDER BLOCK
2 - REMOVE PLUG WITH PLIERS
3 - STRIKE HERE WITH HAMMER
4 - DRIFT PUNCH
5 - CUP PLUG

Thoroughly clean inside of cup plug hole in cylinder block or head. Be sure to remove old sealer. Lightly coat inside of cup plug hole with Mopar® Stud and Bearing Mount. Make certain the new plug is cleaned of all oil or grease. Using proper drive plug, drive plug into hole so that the sharp edge of the plug is at least 0.5 mm (0.020 in.) inside the lead-in chamfer.

It is not necessary to wait for curing of the sealant. The cooling system can be refilled and the vehicle placed in service immediately.

REMOVAL

(1) Disconnect the battery negative cable.
(2) Remove the front fascia.
(3) Raise vehicle on hoist.
(4) Remove exhaust crossover pipe from exhaust manifolds.
(5) Disconnect two ground straps from the lower left hand side and one ground strap from the lower right hand side of the engine.
(6) Disconnect crankshaft position sensor. (Fig. 4)
(7) Remove structural cover (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).
(8) Remove starter. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).
(9) Remove rubber splash shield.
(10) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(11) Remove torque converter bolts.
(12) Remove transmission to engine mounting bolts.

ENGINE - 4.7L (Continued)

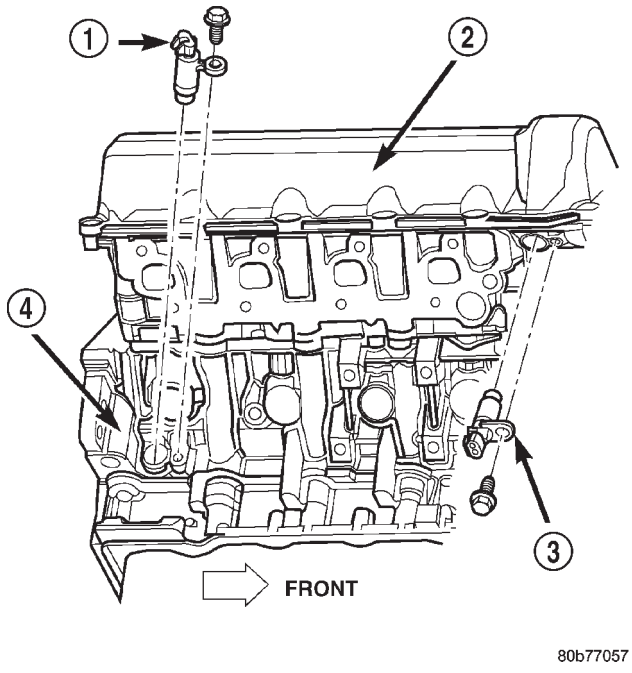


Fig. 4 Crankshaft Position Sensor

1 - CRANKSHAFT POSITION SENSOR
2 - CYLINDER HEAD COVER
3 - CAMSHAFT POSITION SENSOR
4 - RIGHT SIDE CYLINDER BLOCK

(13) Disconnect the engine block heater power cable from the block heater.

(14) Lower vehicle.

(15) Remove throttle body resonator assembly and inlet hose.

(16) Disconnect throttle and speed control cables.

(17) Disconnect tube from both the left and right side crankcase breathers, then remove the breathers (Fig. 5).

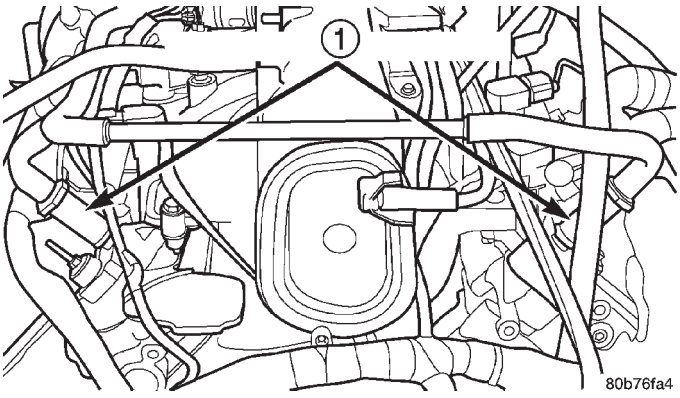


Fig. 5 Crankcase Breather Connection Points

1 - CRANKCASE BREATHERS

(18) Discharge A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(19) Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL) and accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(20) Remove A/C compressor (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL).

(21) Disconnect transmission oil cooler lines at the radiator.

(22) Disconnect radiator lower hose at the thermostat housing.

(23) Remove A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL).

(24) Remove radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).

(25) Remove generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).

(26) Disconnect the two heater hoses from the timing chain cover.

(27) Disconnect engine harness at the following points :

- Intake air temperature (IAT) sensor (Fig. 6)
- Fuel Injectors
- Throttle Position (TPS) Switch
- Idle Air Control (IAC) Motor
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold absolute pressure (MAP) Sensor
- Camshaft Position (CMP) Sensor
- Coil Over Plugs

(28) Release fuel rail pressure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE) then disconnect the fuel supply quick connect fitting at the fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).

(29) Remove power steering pump and position out of the way.

(30) Disconnect ground straps from the left side of the engine.

(31) Install Engine Lifting Fixture Special Tool 8347 (Fig. 7)following these steps.

- Holding the lifting fixture at a slight angle, slide the large bore in the front plate over the hex portion of the lifting stud.
- Position the two remaining fixture arms onto the two lifting studs in the cylinder heads.
- Pull foward and upward on the lifting fixture so that the lifting stud rest in the slotted area below the large bore.
- Secure the lifting fixture to the three studs using three 7/16 – 14 N/C locknuts.
- Make sure the lifting loop in the lifting fixture is in the last hole (closest to the throttle body) to minimize the angle of engine during removal.

ENGINE - 4.7L (Continued)

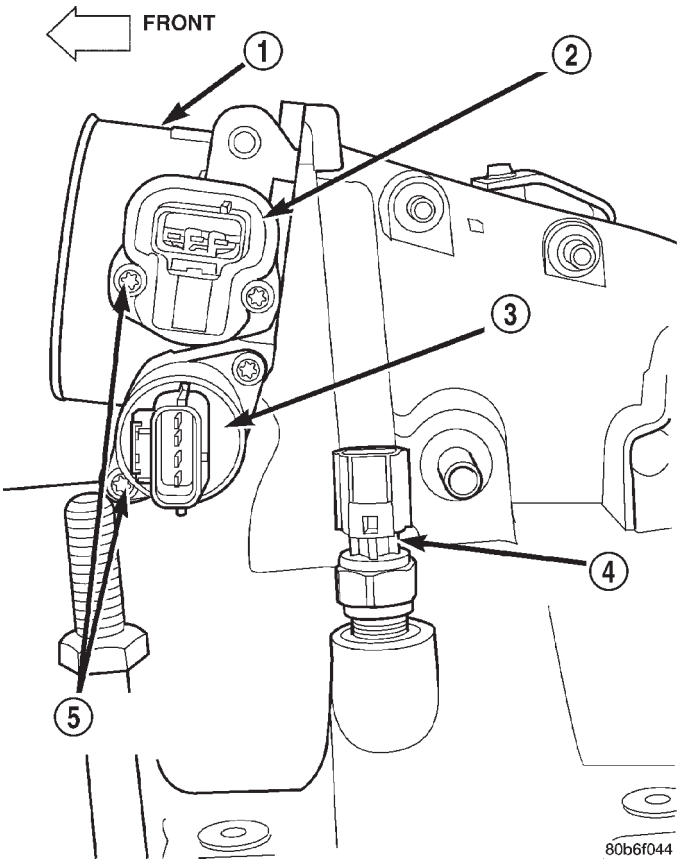


Fig. 6 Throttle Body Connection Points

1 - THROTTLE BODY
2 - TPS
3 - IAC MOTOR
4 - IAT SENSOR (THREADED TYPE)
5 - MOUNTING SCREWS

(32) Disconnect body ground strap at the right side cowl.

NOTE: It will be necessary to support the transmission in order to remove the engine.

(33) Position a suitable jack under the transmission.
(34) Remove the engine mount through bolts.
(35) Raise engine slightly, then remove both left and right side engine mounts from engine. (Refer to 9 - ENGINE/ENGINE MOUNTING/FRONT MOUNT - REMOVAL).
(36) Remove engine from the vehicle.

INSTALLATION

(1) Position engine in the vehicle.
(2) Install both left and right side engine mounts onto engine (Refer to 9 - ENGINE/ENGINE MOUNTING/FRONT MOUNT - INSTALLATION).
(3) Install transmission to engine mounting bolts. Tighten the bolts to 41 N·m (30 ft. lbs.).

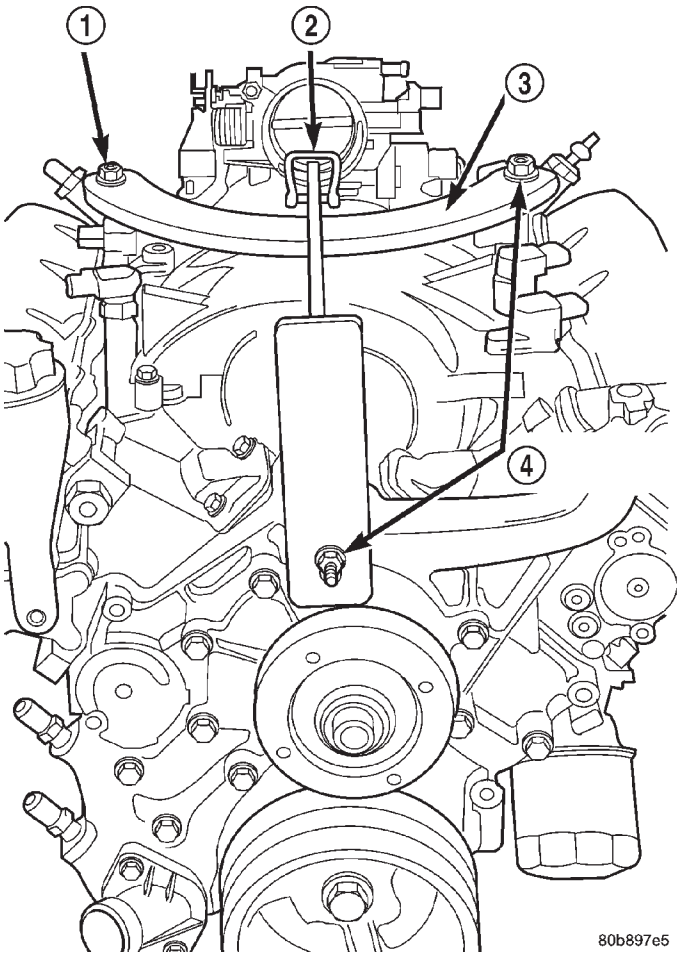


Fig. 7 Engine Lifting Fixture Attachment Locations

1 - ATTACHING LOCATION
2 - ADJUSTABLE HOOK
3 - SPECIAL TOOL 8347 ENGINE LIFT FIXTURE
4 - ATTACHING LOCATIONS

(4) Remove jack from under the transmission.
(5) Remove engine lifting fixture special tool 8347 (Fig. 7).
(6) Connect ground straps on the left side of the engine.
(7) Install power steering pump (Refer to 19 - STEERING/PUMP - INSTALLATION).
(8) Connect fuel supply line quick connect fitting (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/ QUICK CONNECT FITTING - STANDARD PROCEDURE).
(9) Connect engine harness at the following points (Fig. 6):

- Intake Air Temperature (IAT) Sensor
- Idle Air Control (IAC) Motor
- Fuel Injectors
- Throttle Position (TPS) Switch
- Engine Oil Pressure Switch
- Engine Coolant Temperature (ECT) Sensor
- Manifold Absolute Pressure (MAP) Sensor

ENGINE - 4.7L (Continued)

- Camshaft Position (CMP) Sensor
- Coil Over Plugs

(10) Install generator (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).

(11) Install radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).

(12) Install A/C condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - INSTALLATION).

(13) Connect radiator lower hose at the thermostat housing.

(14) Connect the transmission oil cooler lines to the radiator.

(15) Install A/C compressor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).

(16) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION) and radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(17) Install breathers, then connect tube to both crankcase breathers (Fig. 5).

(18) Connect throttle and speed control cables.

(19) Install throttle body resonator assembly and inlet hose.

(20) Raise vehicle.

(21) Connect two ground straps on the lower left hand side of the engine and one ground strap on the lower right side.

(22) Install torque converter bolts.

(23) Connect crankshaft position sensor (Fig. 4).

(24) Install starter.

(25) Install rubber splash shield.

CAUTION: The structural cover requires a specific torque sequence. Failure to follow this sequence may cause severe damage to the cover.

(26) Install structural cover (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).

(27) Install exhaust crossover pipe.

(28) Install engine block heater power cable, If equipped.

(29) Lower vehicle.

(30) Check and fill engine oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).

(31) Recharge the A/C system (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(32) Refill the engine cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(33) Connect the battery negative cable.

(34) Start engine and check for leaks.

SPECIFICATIONS

4.7L ENGINE

DESCRIPTION	SPECIFICATION
GENERAL SPECIFICATIONS	
Engine Type	90° SOHC V-8 16-Valve
Displacement	4.7 Liters / 4701cc (287 Cubic Inches)
Bore	93.0 mm (3.66 in.)
Stroke	86.5 mm (3.40 in.)
Compression Ratio	9.0:1
Horsepower	235 BHP @ 4800 RPM
Torque	295 LB-FT @ 3200 RPM
Lead Cylinder	#1 Left Bank
Firing Order	1-8-4-3-6-5-7-2
CYLINDER BLOCK	
Cylinder Block	Cast Iron
Bore Diameter	93.010 ± .0075 mm (3.6619 ± 0.0003 in.)
Out of Round (MAX)	0.076 mm (0.003 in.)
Taper (MAX)	0.051 mm (0.002 in.)
PISTONS	
Material	Aluminum Alloy
Diameter	92.975 mm (3.6605 in.)
Weight	367.5 grams (12.96 oz)
Ring Groove Diameter	
No. 1	83.73 - 83.97 mm (3.296 - 3.269 in.)
No. 2	82.833 - 83.033 mm (3.261 - 3.310 in.)
No. 3	83.88 - 84.08 mm (3.302 - 3.310 in.)
PISTON PINS	
Type	Pressed Fit
Clearance In Piston	0.010 - 0.019 mm (0.0004 - 0.0008 in.)
Diameter	24.013 - 24.016 mm (0.9454 - 0.9456 in.)

ENGINE - 4.7L (Continued)

DESCRIPTION	SPECIFICATION
PISTON RINGS	
Ring Gap	
Top Compression Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)
Second Compression Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)
Oil Control (Steel Rails)	0.25 - 0.76 mm (0.0099 - 0.30 in.)
Side Clearance	
Top Compression Ring	.051 - .094 mm (0.0020 - 0.0037 in.)
Second Compression Ring	0.040 - 0.080 mm (0.0016 - 0.0031 in.)
Oil Ring (Steel Ring)	.019 - .229 mm (.0007 - .0091 in.)
Ring Width	
Top Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Second Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Oil Ring (Steel Rails)	0.445 - 0.470 mm (0.017 - 0.018 in.)
CONNECTING RODS	
Bearing Clearance	0.010 - 0.048 mm (0.0004 - 0.0019 in.)
Side Clearance	0.10 - 0.35 mm (0.004 - 0.0138 in.)
Piston Pin Bore Diameter (Interference Fit)	.022 - .045 mm (0.0009 - 0.0018 in.)
Bearing Bore Out of Round (MAX)	0.004 mm (0.0002 in.)
Total Weight (Less Bearing)	555 grams (19.5771 ounces)
CRANKSHAFT	
Main BearingJournal	
Diameter	63.488 - 63.512 mm (2.4996 - 2.5005 in.)
Bearing Clearance	0.018 - 0.052 mm (0.0008 - 0.0021 in.)
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.008 mm (0.0004 in.)
End Play	0.052 - 0.282 mm (0.0021 - 0.0112 in.)
End Play (MAX)	0.282 mm (0.0112 in)
Connecting Rod Journal	
Diameter	50.992 - 51.008 mm (2.0076 - 2.0082 in.)
Bearing Clearance	0.015 - 0.055 mm (0.0006 -0.0022 in.)
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.008 mm (0.0004 in.)
CAMSHAFT	
Bore Diameter	26.02 - 26.04 mm (1.0245 - 1.0252 in.)
Bearing Journal Diameter	25.975 - 25.995 mm (1.0227 - 1.0235 in.)
Bearing Clearance	0.025 - 0.065 mm (0.001 - 0.0026 in.)
Bearing Clearance (MAX)	0.065 mm (0.0026 in.)
End Play	.075 - .200 mm (0.003 - 0.0079 in.)
End Play (MAX)	.200 mm (0.0079 in.)
VALVE TIMING	
Intake	
Opens (ATDC)	3.6°
Closes (ATDC)	247.1°
Duration	243.5°
Exhaust	
Opens (BTDC)	232.5°
Closes (ATDC)	21.2°
Duration	253.70°
Valve Overlap	17.6°
VALVES	
Face Angle	45° - 45.5°
Head Diameter	
Intake	48.52 - 48.78 mm (1.9103 - 1.9205 in.)

ENGINE - 4.7L (Continued)

DESCRIPTION	SPECIFICATION
Exhaust	36.87 - 37.13 mm 1.4516 - 1.4618 in.)
Length (Overall)	
Intake	113.45 - 114.21 mm (4.4666 - 4.4965)
Exhaust	114.92 - 115.68 mm (4.5244 - 4.5543 in.)
Stem Diameter	
Intake	6.931 - 6.957 mm (0.2729 - 0.2739 in.)
Exhaust	6.902 - 6.928 mm (0.2717 - 0.2728 in.)
Stem - to - Guide Clearance	
Intake	.018 - .069 mm (0.0008 - 0.0028 in.)
Exhaust	.047 - .098 mm (0.0019 - 0.0039 in.)
Max. Allowable Stem - to - Guide Clearance (Rocking Method)	
Intake	0.069 mm (0.0028 in.)
Exhaust	0.098 mm (0.0039 in.)
Valve Lift (Zero Lash)	
Intake	11.25 mm (0.443 in.)
Exhaust	10.90 mm (0.4292 in.)
VALVE SPRING	
Free Length (Approx)	
Intake and Exhaust	48.6 mm (1.9134 in.)
Spring Force (Valve Closed)	
Intake and Exhaust	315.5 - 352.5 N @ 40.89 mm (70.92722 - 79.24515 lbs. @ 1.6099 in.)

DESCRIPTION	SPECIFICATION
Spring Force (Valve Open)	
Intake and Exhaust	786.0 - 860.0 N @ 29.64 mm 176.6998 - 193.3357 lbs. @ 1.167 in.)
Number of Coils	
Intake and Exhaust	6.69
Wire Diameter	
Intake and Exhaust	4.2799 - 4.3561 mm (0.1685 - 0.1715 in.)
Installed Height (Spring Seat to Bottom of Retainer)	
Nominal	
Intake	40.97 mm (1.613 in.)
Exhaust	40.81 mm (1.606 in.)
CYLINDER HEAD	
Gasket Thickness (Compressed)	.7 mm (0.0276 in.)
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.051 mm (0.002 in.)
Valve Seat Width	
Intake	1.75 - 2.36 mm (0.0698 - 0.0928 in.)
Exhaust	1.71 - 2.32 mm (0.0673 - 0.0911 in.)
Guide Bore Diameter (Std.)	6.975 - 7.00 mm (0.2747 - 0.2756 in.)
Cylinder Head Warpage (Flatness)	0.0508 mm (0.002 in.)
OIL PUMP	
Clearance Over Rotors / End Face (MAX)	.035 - .095 mm (0.0014 - 0.0038 in.)
Cover Out - of -Flat (MAX)	.025 mm (0.001 in.)
Inner and Outer Rotor Thickness	12.02 mm (0.4731 in.)

ENGINE - 4.7L (Continued)

DESCRIPTION	SPECIFICATION
Outer Rotor Clearance (MAX)	.235 mm (.0093 in.)
Outer Rotor Diameter (MIN)	85.925 mm (0.400 in.)
Tip Clearance Between Rotors (MAX)	.150 mm (0.006 in.)
OIL PRESSURE	
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 rpm.**	

SPECIFICATIONS - 4.7L H.O. ENGINE

DESCRIPTION	SPECIFICATION
GENERAL SPECIFICATIONS	
Engine Type	90° SOHC V-8 16-Valve
Displacement	4.7 Liters / 4701cc (287 Cubic Inches)
Bore	93.0 mm (3.66 in.)
Stroke	86.5 mm (3.40 in.)
Compression Ratio	9.7:1
Horsepower	270 BHP @ 5100 RPM
Torque	330 LB-FT @ 3600 RPM
Lead Cylinder	#1 Left Bank
Firing Order	1-8-4-3-6-5-7-2
CYLINDER BLOCK	
Cylinder Block	Cast Iron
Bore Diameter	93.010 ± .0075 mm (3.6619 ± 0.0003 in.)
Out of Round (MAX)	0.076 mm (0.003 in.)
Taper (MAX)	0.051 mm (0.002 in.)
PISTONS	
Material	Aluminum Alloy
Diameter	92.975 mm (3.6605 in.)
Weight	383.5 grams (13.52 oz)
Ring Groove Diameter	
No. 1	83.37 - 83.13 mm (3.296 - 3.269 in.)
No. 2	82.833 - 83.033 mm (3.261 - 3.310 in.)
No. 3	83.88 - 84.08 mm (3.302 - 3.310 in.)
PISTON PINS	
Type	Full Floating
Clearance In Piston	0.010 - 0.019 mm (0.0004 - 0.0008 in.)
Clearance in Rod	0.006 - 0.015 mm (0.0002 - 0.0005 in.)
Diameter	24.017 - 24.020 mm (0.9455 - 0.9456 in.)
PISTON RINGS	
Ring Gap	
Top Compression Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)
Second Compression Ring	0.37 - 0.63 mm (0.0146 - 0.0249 in.)
Oil Control (Steel Rails)	0.25 - 0.76 mm (0.0099 - 0.30 in.)
Side Clearance	
Top Compression Ring	.051 - .094 mm (0.0020 - 0.0037 in.)
Second Compression Ring	0.040 - 0.080 mm (0.0016 - 0.0031 in.)
Oil Ring (Steel Ring)	.019 - .229 mm (.0007 - .0091 in.)
Ring Width	
Top Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Second Compression Ring	1.472 - 1.490 mm (0.057 - 0.058 in.)
Oil Ring (Steel Rails)	0.445 - 0.470 mm (0.017 - 0.018 in.)
CONNECTING RODS	
Bearing Clearance	0.010 - 0.048 mm (0.0004 - 0.0019 in.)

ENGINE - 4.7L (Continued)

DESCRIPTION	SPECIFICATION
Side Clearance	0.10 - 0.35 mm (0.004 - 0.0138 in.)
Piston Pin Bore Diameter	24.045 - 24.035 mm (0.94665 - 0.94625 in.)
Bearing Bore Out of Round (MAX)	0.004 mm (0.0002 in.)
Total Weight (Less Bearing)	555 grams (19.5771 ounces)
CRANKSHAFT	
Main BearingJournal	
Diameter	63.488 - 63.512 mm (2.4996 - 2.5005 in.)
Bearing Clearance	0.018 - 0.052 mm (0.0008 - 0.0021 in.)
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.008 mm (0.0004 in.)
End Play	0.052 - 0.282 mm (0.0021 - 0.0112 in.)
End Play (MAX)	0.282 mm (0.0112 in)
Connecting Rod Journal	
Diameter	50.992 - 51.008 mm (2.0076 - 2.0082 in.)
Bearing Clearance	0.015 - 0.055 mm (0.0006 -0.0022 in.)
Out of Round (MAX)	0.005 mm (0.0002 in.)
Taper (MAX)	0.008 mm (0.0004 in.)
CAMSHAFT	
Bore Diameter	26.02 - 26.04 mm
	(1.0245 - 1.0252 in.)
Bearing Journal Diameter	25.975 - 25.995 mm (1.0227 - 1.0235 in.)
Bearing Clearance	0.025 - 0.065 mm (0.001 - 0.0026 in.)
Bearing Clearance (MAX)	0.065 mm (0.0026 in.)
End Play	.075 - .200 mm (0.003 - 0.0079 in.)
End Play (MAX)	.200 mm (0.0079 in.)

DESCRIPTION	SPECIFICATION
VALVE TIMING	
Intake	
Opens (BTDC)	3.0°
Closes (ATDC)	233.0°
Duration	236.0°
Exhaust	
Opens (BTDC)	235.0°
Closes (ATDC)	15.0°
Duration	250.0°
Valve Overlap	18.0°
VALVES	
Face Angle	45° - 45.5°
Head Diameter	
Intake	48.52 - 48.78 mm (1.9103 - 1.9205 in.)
Exhaust	36.87 - 37.13 mm 1.4516 - 1.4618 in.)
Length (Overall)	
Intake	113.45 - 114.21 mm (4.4666 - 4.4965)
Exhaust	114.92 - 115.68 mm (4.5244 - 4.5543 in.)
Stem Diameter	
Intake	6.931 - 6.957 mm (0.2729 - 0.2739 in.)
Exhaust	6.902 - 6.928 mm (0.2717 - 0.2728 in.)
Stem - to - Guide Clearance	
Intake	.018 - .069 mm (0.0008 - 0.0028 in.)
Exhaust	.047 - .098 mm (0.0019 - 0.0039 in.)
Max. Allowable Stem - to - Guide Clearance (Rocking Method)	
Intake	0.069 mm (0.0028 in.)
Exhaust	0.098 mm (0.0039 in.)

ENGINE - 4.7L (Continued)

DESCRIPTION	SPECIFICATION
Valve Lift (Zero Lash)	
Intake	12.00 mm (0.4724 in.)
Exhaust	10.90 mm (0.4292 in.)
VALVE SPRING	
Free Length (Approx)	
Intake and Exhaust	48.92 mm (1.9259 in.)
Spring Force (Valve Closed)	
Intake and Exhaust	380.0 +/- 19.0 N @ 40.12 mm (85.4274 lbs. @ 1.5795 in.)
Spring Force (Valve Open)	
Intake and Exhaust	1030.0 +/- 46.0 N @ 28.12 mm 231.5532 lbs. @ 1.107 in.)
Number of Coils	
Intake and Exhaust	7.30
Wire Diameter	
Intake and Exhaust	4.77 +/- 0.03 mm x 3.80+/- .03mm
Installed Height (Spring Seat to Bottom of Retainer)	
Nominal	
Intake	40.97 mm (1.613 in.)
Exhaust	40.81 mm (1.606 in.)
CYLINDER HEAD	
Gasket Thickness (Compressed)	.7 mm (0.0276 in.)
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.051 mm (0.002 in.)
Valve Seat Width	
Intake	1.75 - 2.36 mm (0.0698 - 0.0928 in.)
Exhaust	1.71 - 2.32 mm (0.0673 - 0.0911 in.)
Guide Bore Diameter (Std.)	6.975 - 7.00 mm (0.2747 - 0.2756 in.)
Cylinder Head Warpage (Flatness)	0.0508 mm (0.002 in.)
OIL PUMP	
Clearance Over Rotors / End Face (MAX)	.035 - .095 mm (0.0014 - 0.0038 in.)
Cover Out - of -Flat (MAX)	.025 mm (0.001 in.)
Inner and Outer Rotor Thickness	12.02 mm (0.4731 in.)
Outer Rotor Clearance (MAX)	.235 mm (.0093 in.)
Outer Rotor Diameter (MIN)	85.925 mm (0.400 in.)
Tip Clearance Between Rotors (MAX)	.150 mm (0.006 in.)
OIL PRESSURE	
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
*** CAUTION: If pressure is zero at curb idle, DO NOT run engine at 3000 rpm.**	

TORQUE

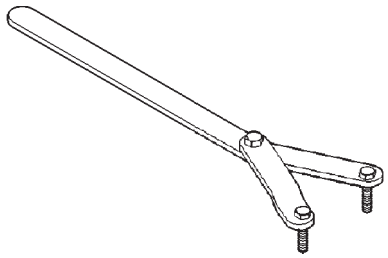
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Camshaft			
Non - Oiled Sprocket Bolt	122	90	—
Bearing Cap Bolts	11	—	100
Timing Chain Cover—Bolts	54	40	—
Connecting Rod Cap—Bolts	27	20	—
	PLUS 90° TURN		
Bed Plate—Bolts	Refer to Procedure		
Crankshaft Damper—Bolt	175	130	—
Cylinder Head—Bolts			
M11 Bolts	81	60	—
M8 Bolts	26	19	—
Cylinder Head Cover—Bolts	12	—	105
Exhaust Manifold—Bolts	25	18	—

ENGINE - 4.7L (Continued)

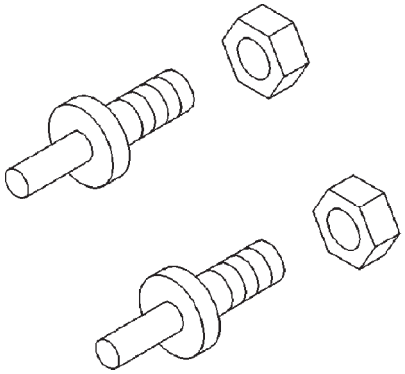
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Exhaust Manifold Heat Shield—Nuts	8	—	72
	Then loosen 45°		
Flexplate—Bolts	60	45	—
Engine Mount Bracket to Block—Bolts	61	45	—
Rear Mount to Transmission—Bolts	46	34	—
Generator Mounting—Bolts			
M10 Bolts	54	40	—
M8 Bolts	28	—	250
Intake Manifold—Bolts	12	—	105
	Refer to Procedure for Tightening Sequence		
Oil Pan—Bolts	15	—	130
Oil Pan—Drain Plug	34	25	—
Oil Pump—Bolts	28	—	250
Oil Pump Cover—Bolts	12	—	105
Oil Pickup Tube—Bolt and Nut	28	—	250
Oil Dipstick Tube to Engine Block—Bolt	15	—	130
Oil Fill Tube—Bolts	12	—	105
Timing Chain Guide—Bolts	28	—	250
Timing Chain Tensioner Arm—Special Pin Bolt	17	—	150
Hydraulic Tensioner—Bolts	28	—	250
Timing Chain Primary Tensioner—Bolts	28	—	250
Timing Drive Idler Sprocket—Bolt	34	25	—
Thermostat Housing—Bolts	13	—	115
Water Pump—Bolts	54	40	—

SPECIAL TOOLS

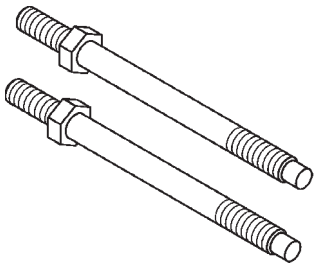
4.7L ENGINE



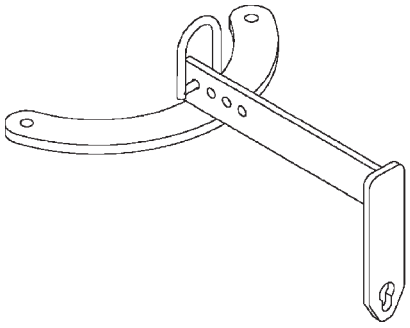
Spanner Wrench 6958



Adapter Pins 8346

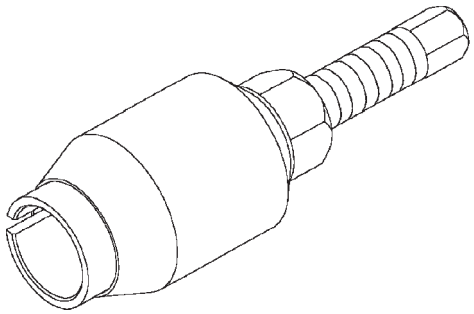


Engine Lifting Studs 8400

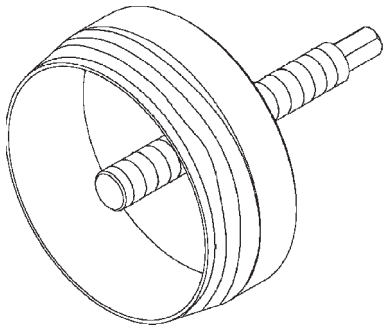


Engine Lift Fixture 8347

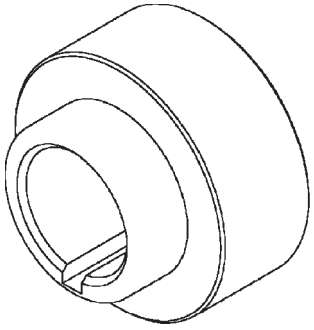
ENGINE - 4.7L (Continued)



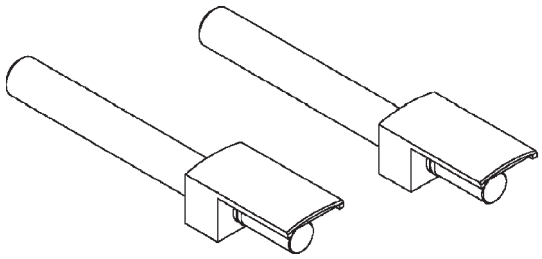
Front Crankshaft Seal Remover 8511



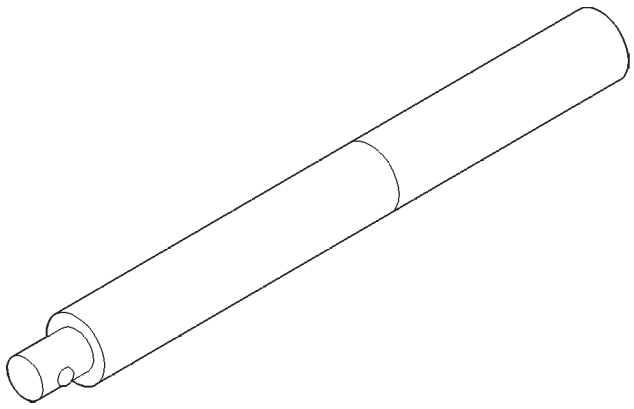
Rear Crankshaft Seal Remover 8506



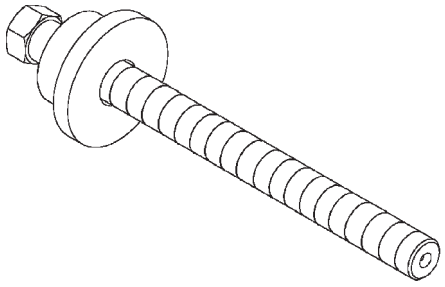
Front Crankshaft Seal Installer 8348



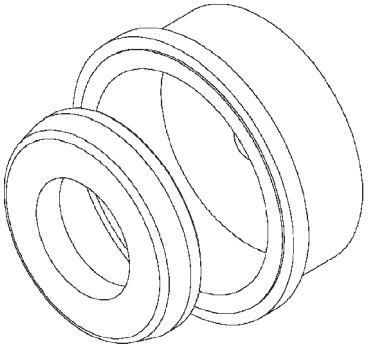
Connecting Rod Guides 8507



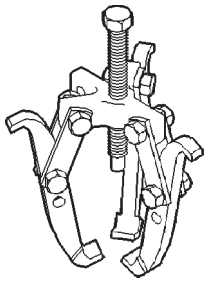
Handle C-4171



Crankshaft Damper Installer 8512

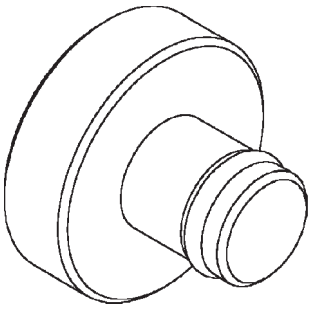


Rear Crankshaft Seal Installer 8349

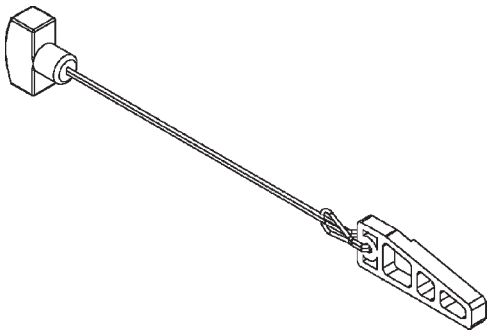


Puller 1026

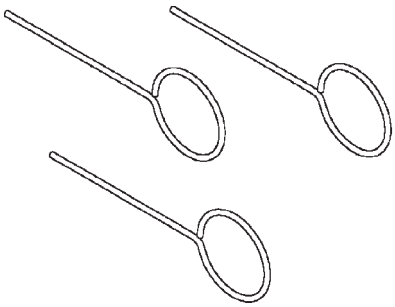
ENGINE - 4.7L (Continued)



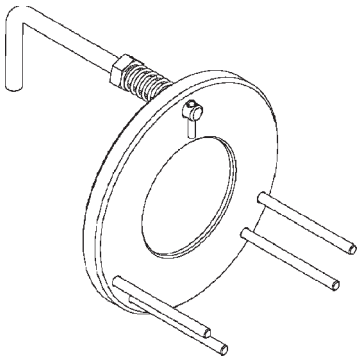
Crankshaft Damper Removal Insert 8513



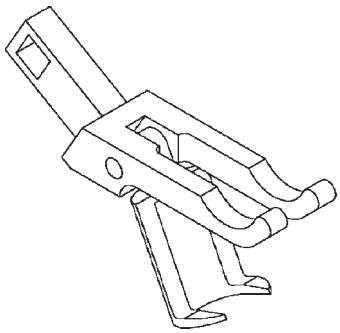
Chain Tensioner Wedge 8379



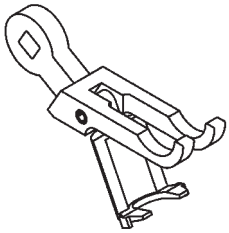
Chain Tensioner Pins 8514



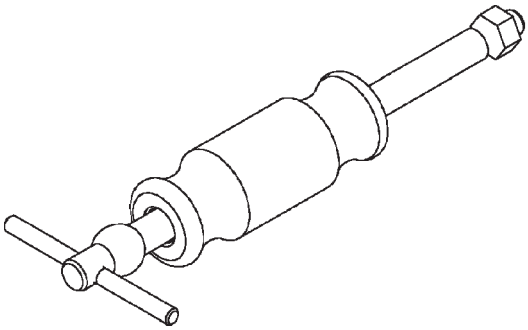
Secondary Chain Holder 8429



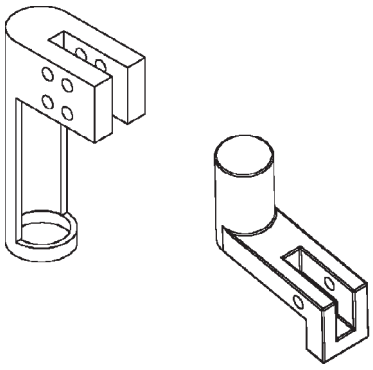
Remover, Rocker Arm 8516



Valve Spring Compressor 8387

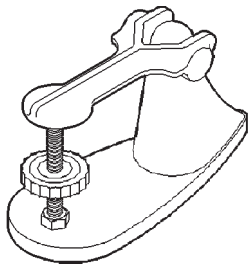


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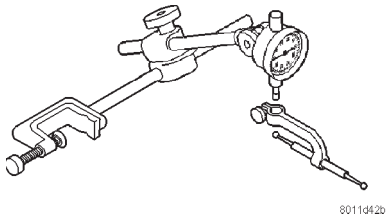


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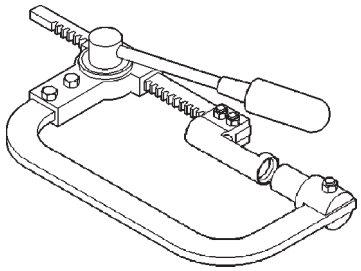
ENGINE - 4.7L (Continued)



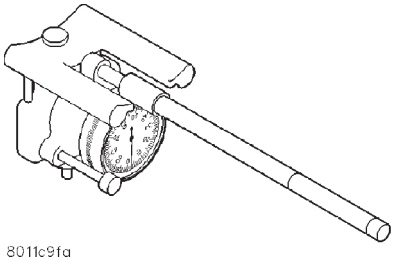
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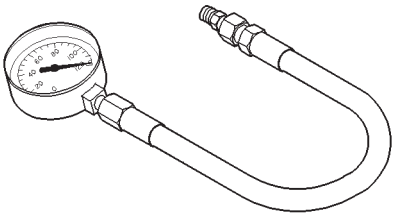
Dial Indicator C-3339



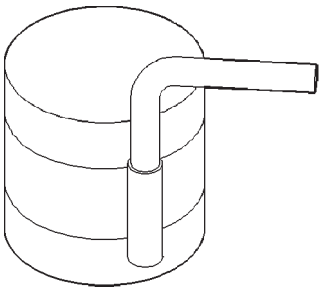
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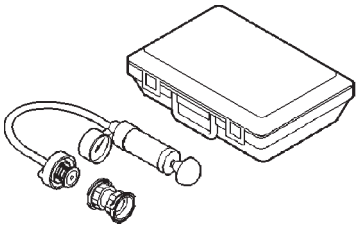
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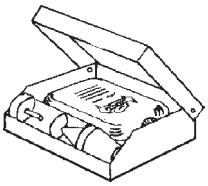
Oil Pressure Gauge C-3292



Piston Ring Compressor C-385



Pressure Tester Kit 7700



Bloc–Chek–Kit C-3685–A

AIR CLEANER ELEMENT

REMOVAL - 4.7L

(1) Unlatch four clips retaining air cleaner cover to air cleaner housing (Fig. 8).
(2) Lift cover up and position to the side.
(3) Remove air cleaner element.

INSTALLATION - 4.7L

(1) Clean inside of air cleaner housing before installing new element.
(2) Install air cleaner element into housing.
(3) Latch clips and clamp cover down to secure. Be sure air cleaner cover is properly seated to air cleaner housing.

AIR CLEANER ELEMENT (Continued)

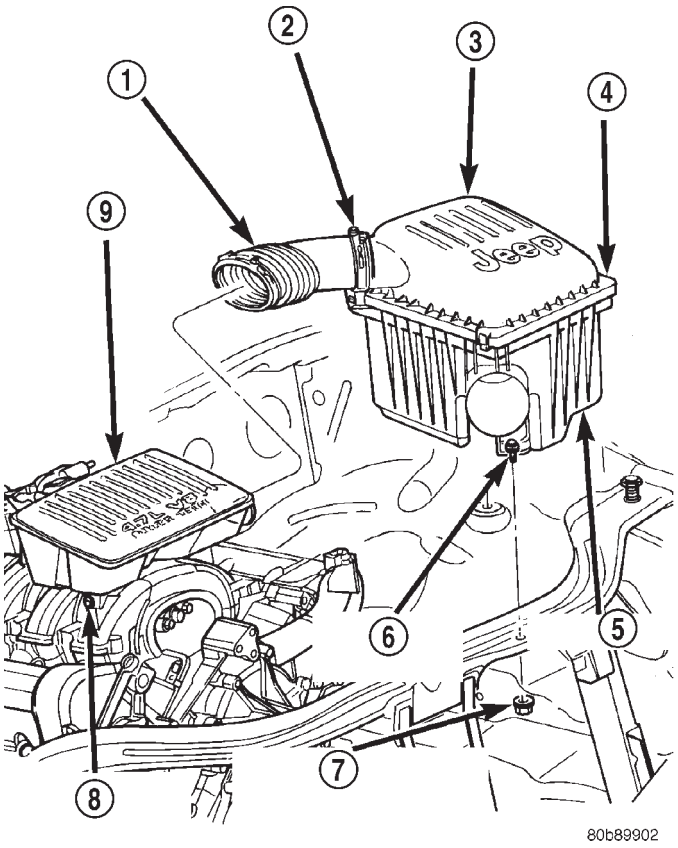


Fig. 8 Air Cleaner Assembly - 4.7L

1 - AIR DUCT
2 - CLAMPS
3 - AIR CLEANER COVER
4 - CLIPS
5 - HOUSING
6 - HOUSING BOLTS (3)
7 - LOWER HOUSING NUTS (3)
8 - RESONATOR BOLTS
9 - RESONATOR

AIR CLEANER HOUSING

REMOVAL - 4.7L

(1) Disconnect air cleaner cover-to-air duct clamp (Fig. 8).

(2) Disconnect air duct at housing.

(3) **Each of the 3 air cleaner housing mounting bolts is attached with 2 nuts (an upper nut and lower nut). DO NOT REMOVE BOLTS. To prevent stripping bolts, only remove lower nuts. The lower housing nuts are located under left front inner fender (Fig. 8).**

(a) To gain access to lower nuts, raise vehicle.

(b) Remove clips retaining rubber inner fender shield.

(c) Pry back shield enough to gain access to lower nuts.

(d) Remove 3 nuts.

(e) Remove air cleaner assembly from vehicle.

(4) If resonator is to be removed, disconnect breather tube at resonator, disconnect air duct clamp at resonator (Fig. 8)and remove 2 resonator mounting bolts (at sides of resonator). Remove resonator from throttle body by loosening clamp at throttle body.

INSTALLATION - 4.7L

(1) Position air cleaner assembly to body and install 3 nuts. Tighten nuts to 10 N·m (93 in. lbs.) torque. **To prevent excessive vibration transmitted through housing, the nuts must be properly torqued. Do not overtighten nuts.**

(2) If resonator was removed: Install resonator and bolts. Tighten bolts to 4 N·m (35 in. lbs.) torque. Tighten clamp at throttle body to 4 N·m (35 in. lbs.) torque.

(3) Position fender liner and install clips.

(4) Connect air duct at housing (Fig. 8).

(5) Tighten air duct clamp.

CYLINDER HEAD - LEFT

DESCRIPTION

DESCRIPTION - CYLINDER HEAD

The cylinder heads are made of an aluminum alloy. The cylinder head features two valves per cylinder with pressed in powdered metal valve guides. The cylinder heads also provide enclosures for the timing chain drain, necessitating unique left and right cylinder heads.

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

CYLINDER HEAD - LEFT (Continued)

(3) Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Oil leak or excessive cam bore wear in cylinder head.

(11) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and replace.

c. Before installation, make sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.

DIAGNOSIS AND TESTING—CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

(1) Disconnect the negative cable from the battery.

(2) Raise the vehicle on a hoist.

(3) Disconnect the exhaust pipe at the left side exhaust manifold.

(4) Drain the engine coolant. (Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Lower the vehicle.

(6) Remove the intake manifold. (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

(7) Remove the cylinder head cover. (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(8) Remove accessory drive belt. (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(9) Remove the power steering pump and set aside.

(10) Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (Fig. 9).

CYLINDER HEAD - LEFT (Continued)

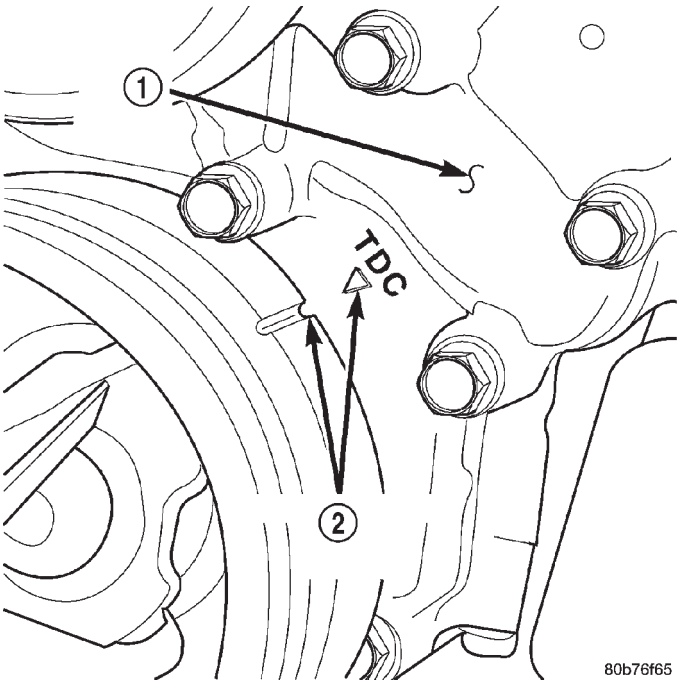


Fig. 9 Engine Top Dead Center

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

(11) Verify the V8 mark on the camshaft sprocket is at the 12 o'clock position (Fig. 11). Rotate the crankshaft one turn if necessary.

(12) Remove the crankshaft damper. (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(13) Remove the timing chain cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(14) Lock the secondary timing chains to the idler sprocket using Special Tool 8515 (Fig. 10).

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

(15) Mark the secondary timing chain, one link on each side of the V8 mark on the camshaft drive gear (Fig. 11).

(16) Remove the left side secondary chain tensioner. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(17) Remove the cylinder head access plug (Fig. 12).

(18) Remove the left side secondary chain guide. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(19) Remove the retaining bolt and the camshaft drive gear.

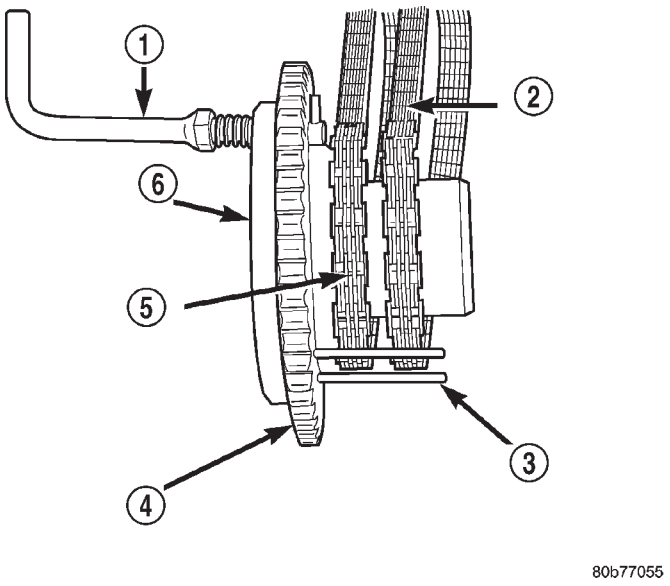


Fig. 10 Using Special Tool 8515 to Hold Chains to Idler Sprocket.

1 - LOCK ARM
2 - RIGHT CAMSHAFT CHAIN
3 - SECONDARY CHAINS RETAINING PINS (4)
4 - IDLER SPROCKET
5 - LEFT CAMSHAFT CHAIN
6 - SPECIAL TOOL 8515

CAUTION: Do not allow the engine to rotate. Severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

NOTE: The cylinder head is attached to the cylinder block with fourteen bolts.

(20) Remove the cylinder head retaining bolts.

(21) Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, due to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

CYLINDER HEAD - LEFT (Continued)

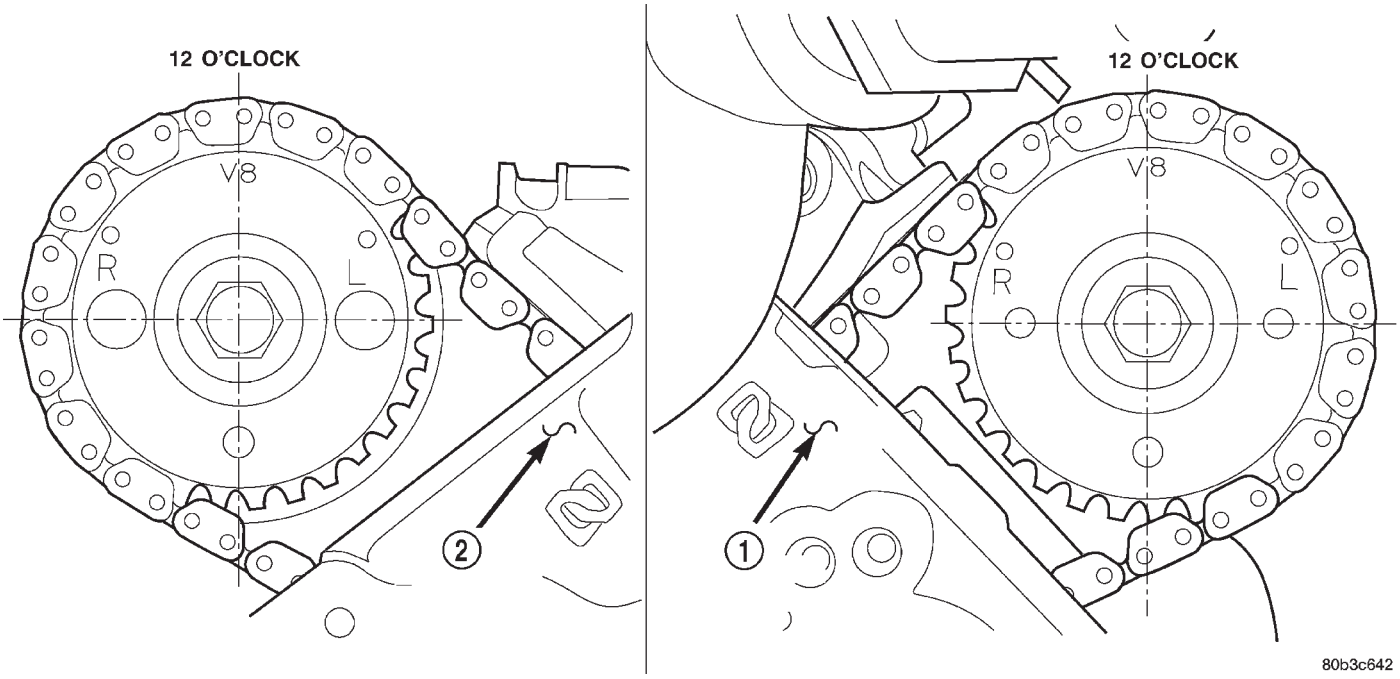


Fig. 11 Camshaft Sprocket V8 Marks

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

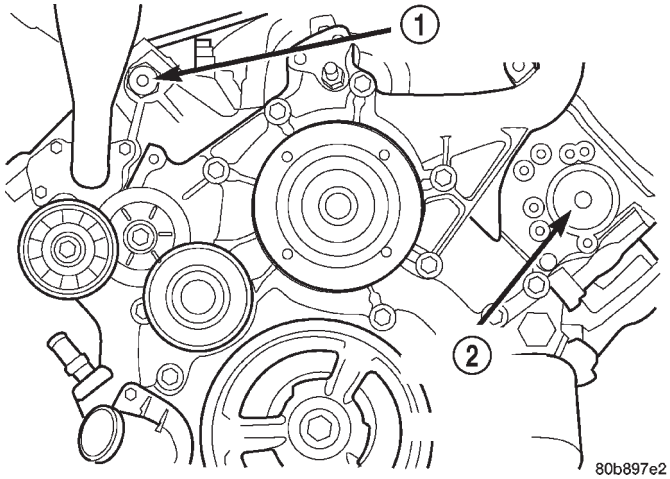


Fig. 12 Cylinder Head Access Plugs

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

INSPECTION

(1) Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.

(2) Inspect the valve seats for damage. Service the valve seats as necessary.

(3) Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.

INSTALLATION

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced (Fig. 13).

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

(1) Clean the cylinder head and cylinder block mating surfaces (Refer to 9 - ENGINE - STANDARD PROCEDURE).

(2) Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

CYLINDER HEAD - LEFT (Continued)

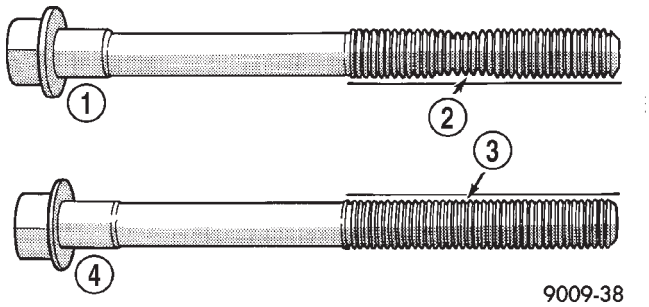


Fig. 13 Checking Cylinder Head Bolts for Stretching (Necking)

1 - STRETCHED BOLT
2 - THREADS ARE NOT STRAIGHT ON LINE
3 - THREADS ARE STRAIGHT ON LINE
4 - UNSTRETCHED BOLT

(3) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

(4) Lubricate the cylinder head bolt threads with clean engine oil and install the ten M11 bolts.

(5) Coat the four M8 cylinder head bolts with **Mopar® Lock and Seal Adhesive** then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

(6) Tighten the bolts in sequence (Fig. 14) using the following steps and torque values:

- Step 1: Tighten bolts 1–10, 27 N·m (20 ft. lbs.).
- Step 2: Verify that bolts 1–10, all reached 27 N·m (20 ft. lbs.), by repeating step-1 without loosening the bolts. Tighten bolts 11 thru 14 to 14 N·m (10 ft. lbs.).
- Step 3: Tighten bolts 1–10, 90 degrees.
- Step 4: Tighten bolts 1–10, 90 degrees, again. Tighten bolts 11–14, 26 N·m (19 ft. lbs.)

(7) Install the secondary chain and secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(8) Install the cylinder head access plug.

(9) Re-set and Install the left side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(10) Remove Special Tool 8515.

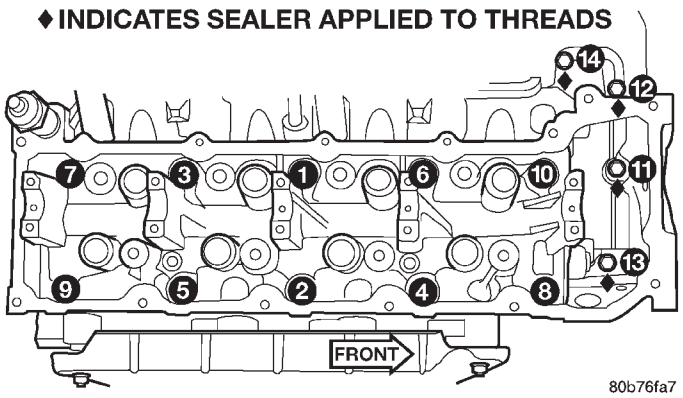


Fig. 14 Cylinder Head Tightening Sequence

(11) Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(12) Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(13) Install the power steering pump.

(14) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(15) Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(16) Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(17) Raise the vehicle.

(18) Install the exhaust pipe onto the left exhaust manifold.

(19) Lower the vehicle.

(20) Connect the negative cable to the battery.

(21) Start the engine and check for leaks.

CAMSHAFT(S) - LEFT

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. A steel post or nose piece is friction-welded to the steel camshaft tube. Five bearing journals are machined into the camshaft, four on the steel tube and one on the steel nose piece. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

CAMSHAFT(S) - LEFT (Continued)

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use Special Tool 8350 will result in hydraulic tensioner ratchet over extension, requiring timing chain cover removal to reset the tensioner ratchet.

(1) Remove cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Set engine to TDC cylinder #1, camshaft sprocket V8 marks at the 12 o'clock position.

(3) Mark one link on the secondary timing chain on both sides of the V8 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel (Located on the right side camshaft sprocket) for any reason, Severe damage will occur to the target wheel resulting in a vehicle no start condition.

(4) Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave the bolt snug against the sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

(5) Position Special Tool 8350 timing chain wedge between the timing chain strands, tap the tool to securely wedge the timing chain against the tensioner arm and guide (Fig. 15).

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

(6) Hold the camshaft with adjustable pliers while removing the camshaft sprocket bolt and sprocket (Fig. 16).

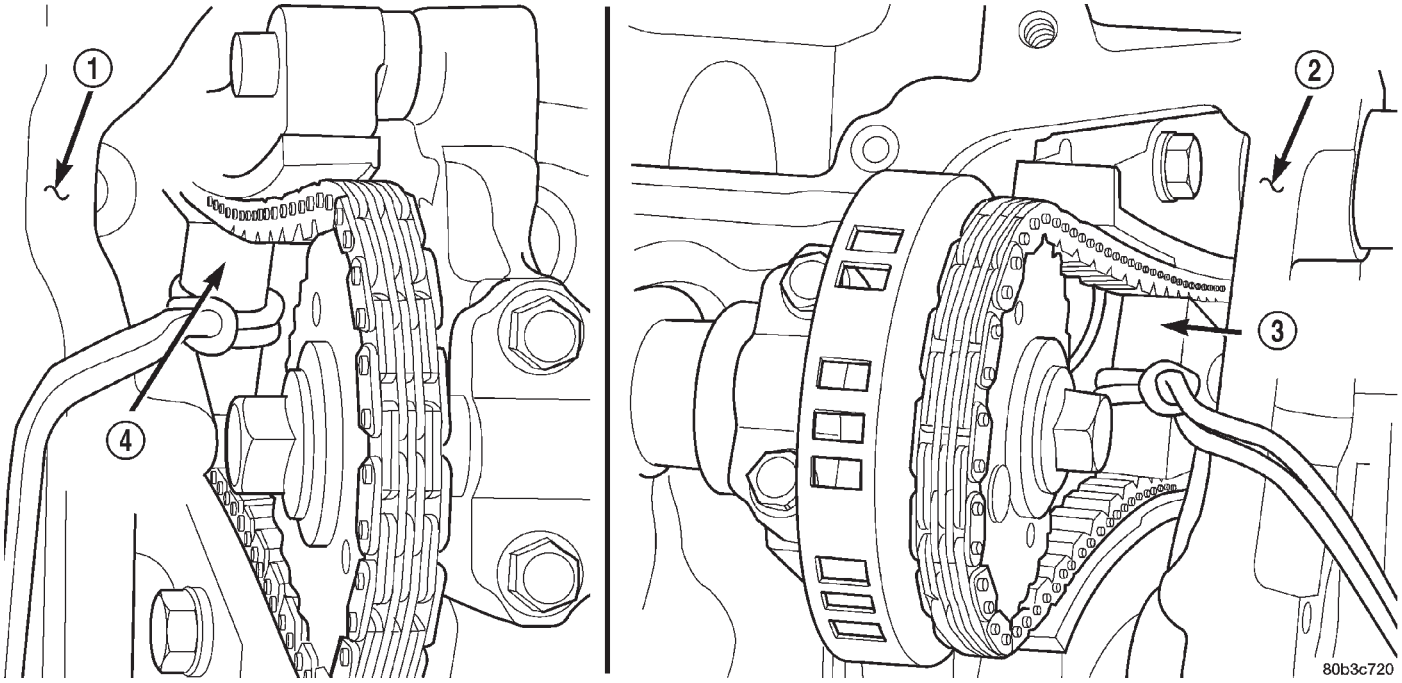


Fig. 15 Securing Timing Chain Tensioners Using Timing Chain Wedge

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD
3 - SPECIAL TOOL 8350 WEDGE
4 - SPECIAL TOOL 8350 WEDGE

CAMSHAFT(S) - LEFT (Continued)

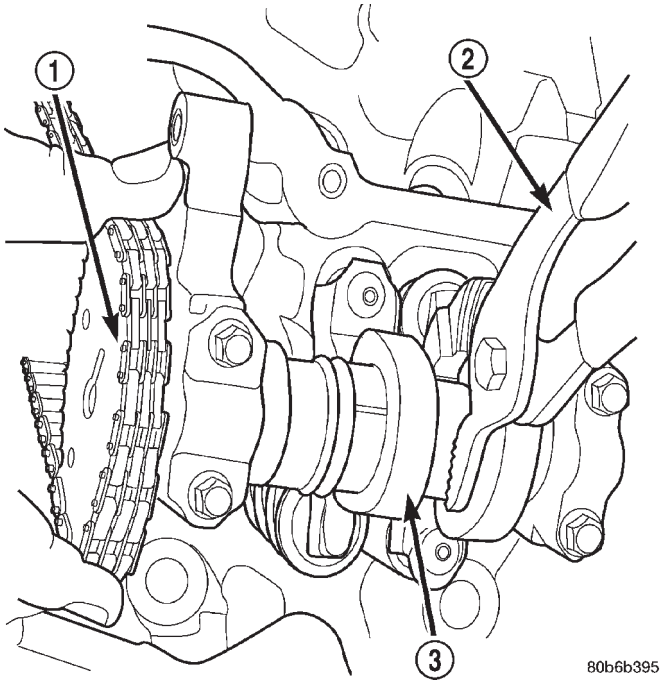


Fig. 16 Camshaft Sprocket and Chain

1 - CAMSHAFT SPROCKET AND CHAIN
2 - ADJUSTABLE PLIERS
3 - CAMSHAFT

(7) Using the pliers, gently allow the camshaft to rotate 15° clockwise until the camshaft is in the neutral position (no valve load).

(8) Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

(9) Remove the camshaft bearing caps and the camshaft.

INSTALLATION

(1) Lubricate camshaft journals with clean engine oil.

NOTE: Position the left side camshaft so that the camshaft sprocket dowel is near the 1 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

(2) Position the camshaft into the cylinder head.

(3) Install the camshaft bearing caps, hand tighten the retaining bolts.

(4) Working in ½ turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward (Fig. 17).

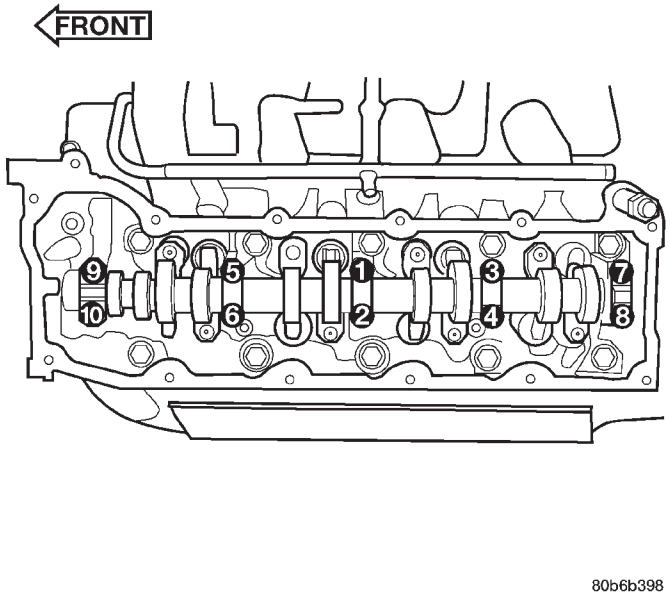


Fig. 17 Camshaft Bearing Caps Tightening Sequence

(5) Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).

(6) Position the camshaft drive gear into the timing chain aligning the V8 mark between the two marked chain links (Two links marked during removal) (Fig. 18).

CAMSHAFT(S) - LEFT (Continued)

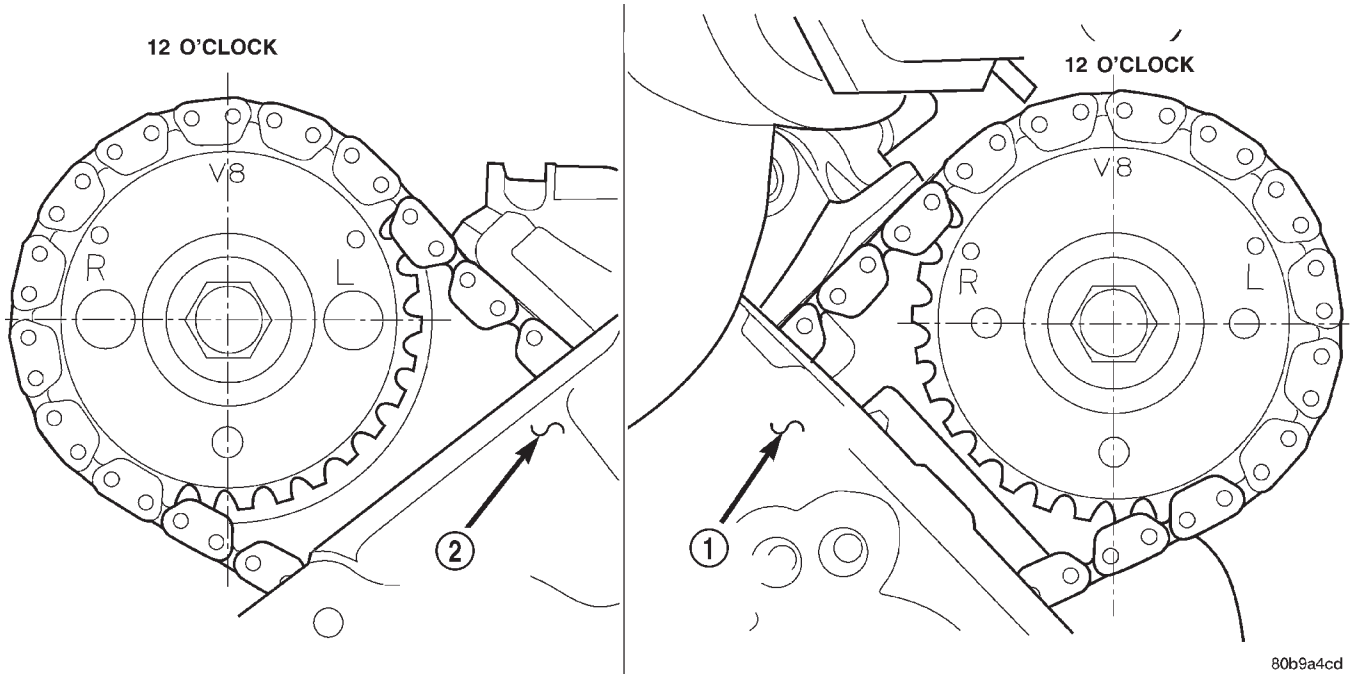


Fig. 18 Timing Chain to Sprocket Alignment

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

(7) Using the adjustable pliers, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft (Fig. 19).

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt overtorque resulting in bolt failure.

(8) Remove excess oil from bolt, then install the camshaft sprocket retaining bolt and hand tighten.
(9) Remove Special Tool 8350 timing chain wedge (Fig. 20).
(10) Using Special Tool 6958 spanner wrench with adapter pins 8346 (Fig. 21), torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).
(11) Install the cylinder head cover.

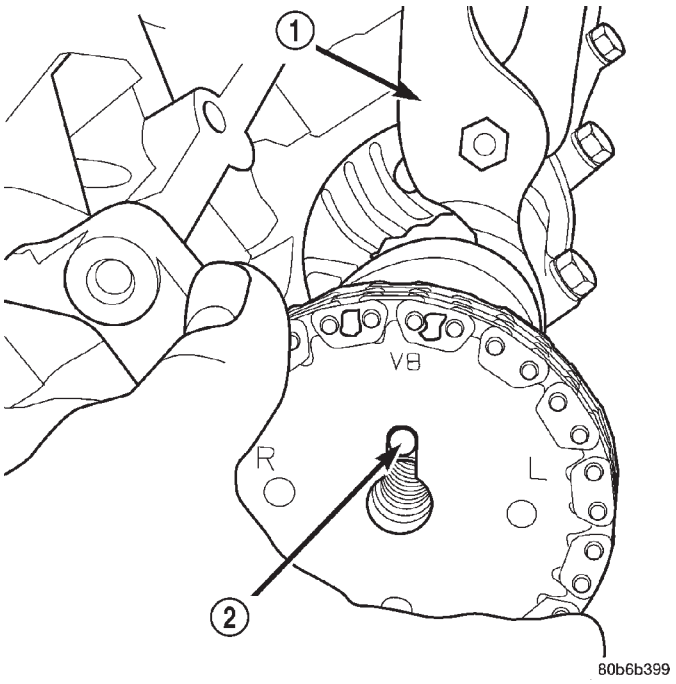


Fig. 19 Camshaft Sprocket Installation

1 - ADJUSTABLE PLIERS
2 - CAMSHAFT DOWEL

CAMSHAFT(S) - LEFT (Continued)

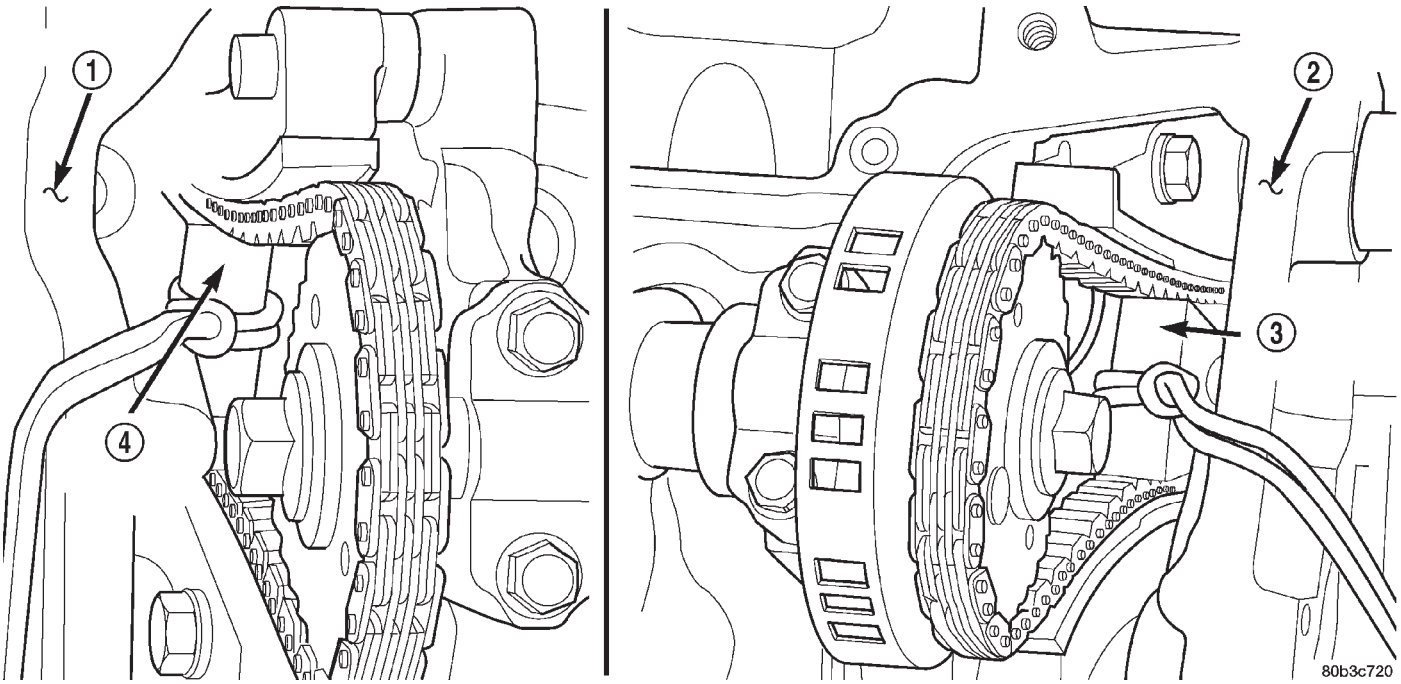


Fig. 20 SPECIAL TOOL 8350

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD
3 - SPECIAL TOOL 8350 WEDGE
4 - SPECIAL TOOL 8350 WEDGE

CAMSHAFT(S) - LEFT (Continued)

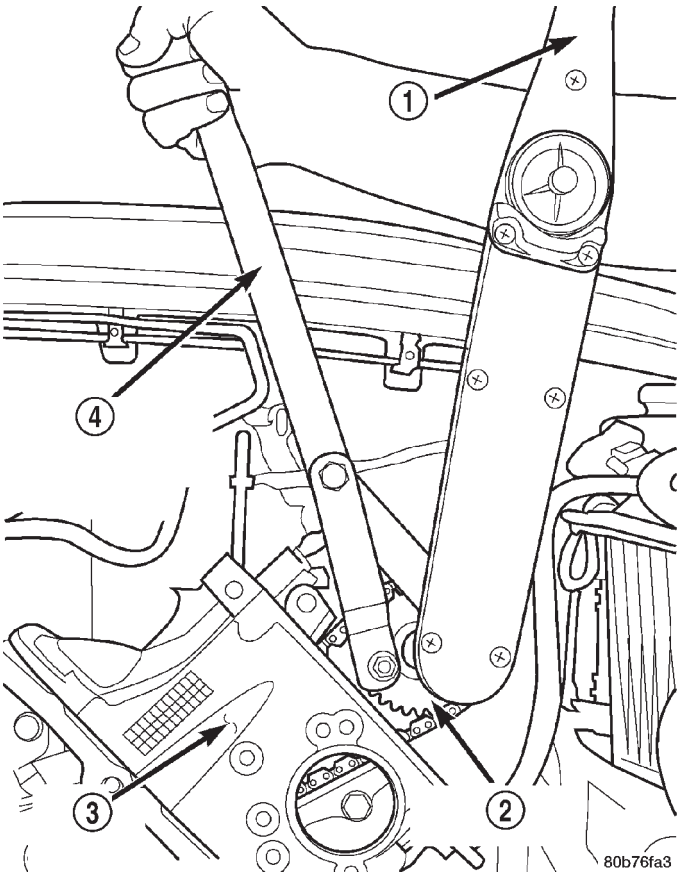


Fig. 21 Tightening Left Side Cam Sprocket Retaining Bolt

1 - TORQUE WRENCH
2 - CAMSHAFT SPROCKET
3 - LEFT CYLINDER HEAD
4 - SPECIAL TOOL 6958 SPANNER WITH ADAPTER PINS 8346

CYLINDER HEAD COVER(S) - LEFT

DESCRIPTION

The cylinder head covers are made of die cast magnesium, and are not interchangeable from side-to-side. It is imperative that nothing rest on the cylinder head covers. Prolonged contact with other items may wear a hole in the cylinder head cover.

REMOVAL - LEFT SIDE

(1) Disconnect negative cable from battery.
(2) Remove the resonator assemble and air inlet hose.
(3) Disconnect injector connectors and un-clip the injector harness.
(4) Route injector harness in front of cylinder head cover.
(5) Disconnect the left side breather tube and remove the breather tube.
(6) Remove the cylinder head cover mounting bolts.
(7) Remove cylinder head cover and gasket.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

CLEANING

Clean cylinder head cover gasket surface.
Clean head rail, if necessary.

INSTALLATION—LEFT SIDE

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: DO NOT allow other components including the wire harness to rest on or against the cylinder head cover. Prolonged contact with other objects may wear a hole in the engine cylinder head cover.

(1) Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
(2) Install cylinder head cover and hand start all fasteners. Verify that all studs are in the correct location shown in (Fig. 22).

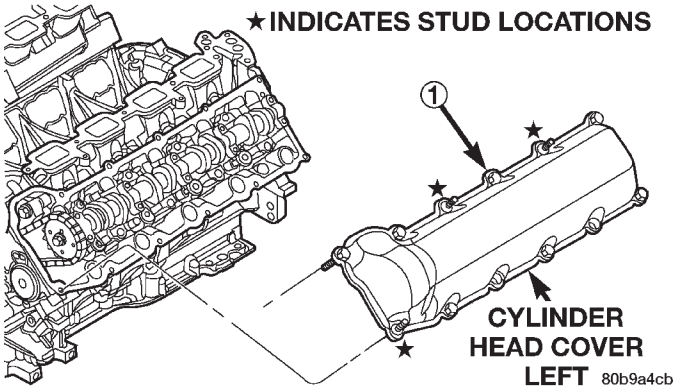


Fig. 22 Cylinder Head Cover—Left

ITEM	DESCRIPTION	TORQUE
1	Cover Fasteners	12 N·m (105 in. lbs.)

(3) Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs.).
(4) Install left side breather and connect breather tube.
(5) Connect injector electrical connectors and injector harness retaining clips.
(6) Install the resonator and air inlet hose.
(7) Connect negative cable to battery.

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE—REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(1) Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).

(2) Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.

(3) When the seat is properly positioned the width of the intake seat must be 1.75 – 2.36 mm (0.0689 – 0.0928 in.) and the exhaust seat must be 1.71 – 2.32 mm (0.0673 – 0.0911 in.).

(4) Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 41.44 mm (1.6315 in.).

(5) The valve seat and valve face must maintain a face angle of 44.5 – 45 degrees angle (Fig. 23).

REMOVAL

NOTE: The cylinder heads must be removed in order to preform this procedure.

(1) Remove rocker arms and lash adjusters. Refer to procedures in this section (Fig. 24).

(2) Remove the camshaft bearing caps and the camshaft.

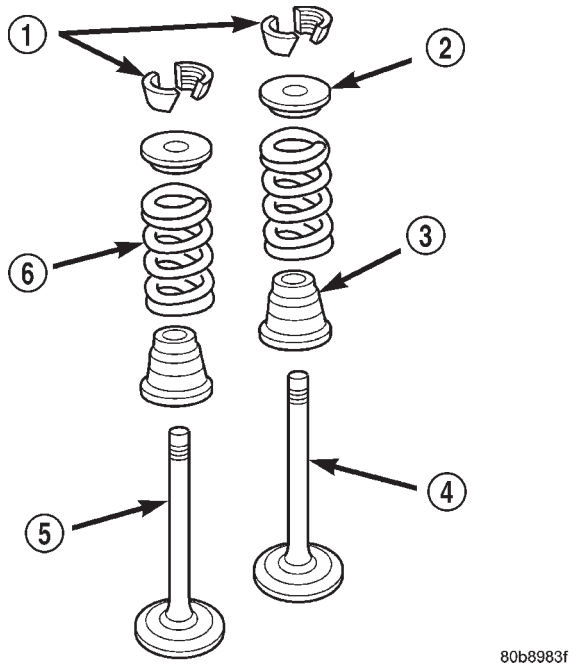


Fig. 23 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

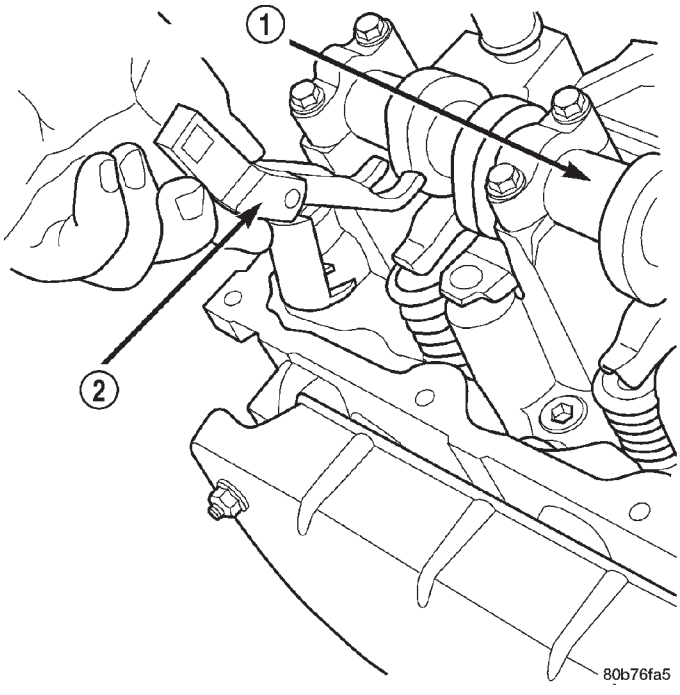


Fig. 24 Rocker Arm Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

INTAKE/EXHAUST VALVES & SEATS (Continued)

NOTE: All eight valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

(3) Using Special Tool C-3422–B or C-3422–C Valve Spring Compressor and Special tool 8519 Adapter, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

(4) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(5) Remove the valve spring compressor.
(6) Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

(7) Remove the valve from the cylinder head.

NOTE: The valve stem seals are common between intake and exhaust.

(8) Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

Inspect the valve springs for physical signs of wear or damage. Turn table of tool C-647 until surface is in line with the 40.69 mm (1.602 in.) mark on the threaded stud and the zero mark on the front. Place spring over the stud on the table and lift compressing lever to set tone device. Pull on torque wrench until Ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Specifications Section to obtain specified height and allowable tensions. Replace any springs that do not meet specifications. (Fig. 25)

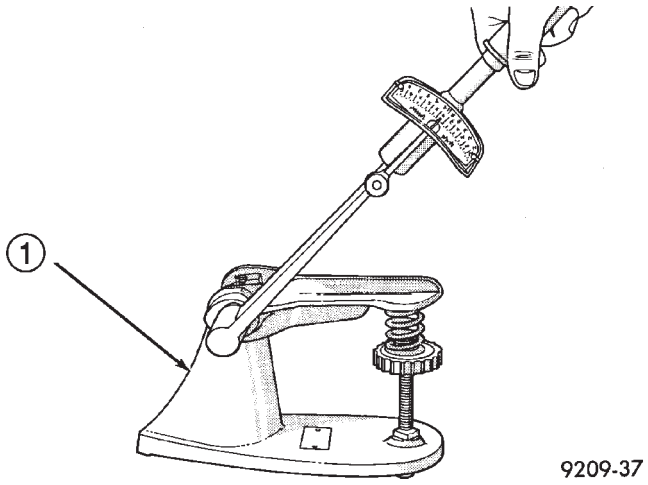


Fig. 25 Testing Valve Springs

1 - SPECIAL TOOL C-647

INSTALLATION

(1) coat the valve stem with clean engine oil and insert it into the cylinder head.
(2) Install the valve stem seal. make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
(3) Install the spring and the spring retainer (Fig. 26).
(4) Using the valve spring compressor, compress the spring and install the two valve spring retainer halves.
(5) Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated.
(6) lubricate the camshaft journal with clean engine oil then Position the camshaft (with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock), then position the camshaft bearing caps.
(7) Install the camshaft bearing cap retaining bolts. Tighten the bolts 9–13 N·m (100 in. lbs.) in ½ turn increments in the sequence shown (Fig. 27).
(8) Position the hydraulic lash adjusters and rocker arms (Fig. 24).

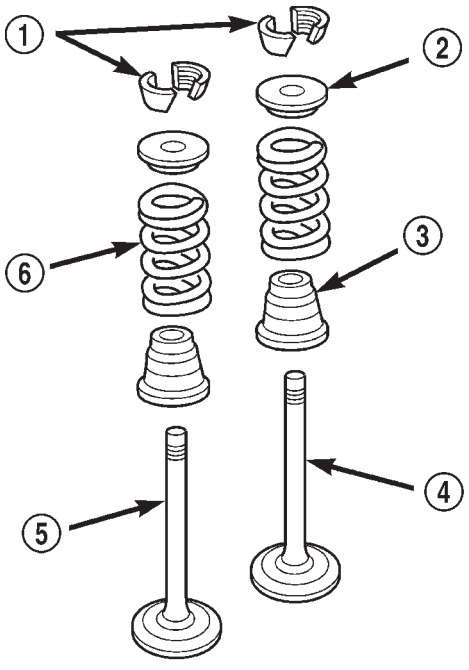


Fig. 26 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

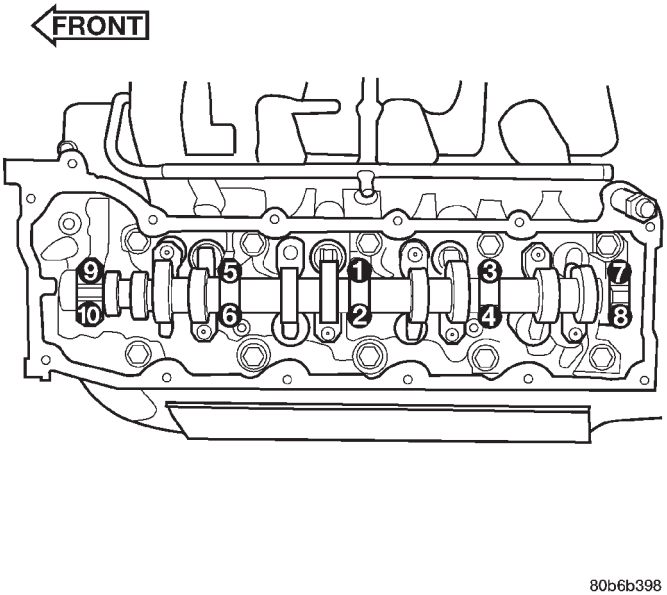


Fig. 27 Camshaft Bearing Caps Tightening Sequence

ROCKER ARM / ADJUSTER ASSEMBLY

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.11 inch) oil hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

(1) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) For rocker arm removal on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(3) For rocker arm removal on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.

(4) For rocker arm removal on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.

(5) For rocker arm removal on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.

(6) Using special tool 8516 Rocker Arm Remover, press downward on the valve spring, remove rocker arm (Fig. 28).

INSTALLATION

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

(1) For rocker arm installation on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(2) For rocker arm installation on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.

(3) For rocker arm installation on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.

(4) For rocker arm installation on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.

ROCKER ARM / ADJUSTER ASSEMBLY (Continued)

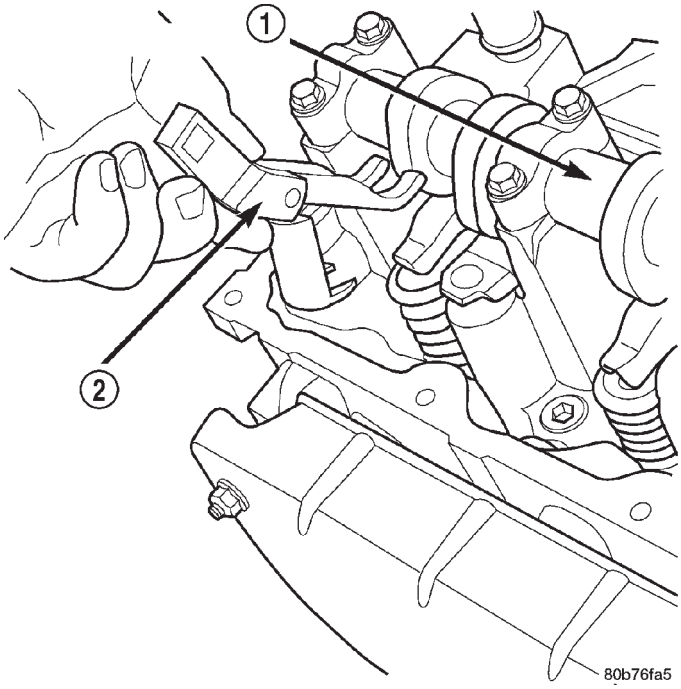


Fig. 28 Rocker Arm—Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

(5) Using special tool 8516 press downward on the valve spring, install rocker arm (Fig. 28).

(6) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVE SPRINGS

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

VALVE STEM SEALS

DESCRIPTION

The valve stem seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

CYLINDER HEAD - RIGHT

DESCRIPTION

DESCRIPTION - CYLINDER HEAD

The cylinder heads are made of an aluminum alloy. The cylinder head features two valves per cylinder with pressed in powdered metal valve guides. The cylinder heads also provide enclosures for the timing chain drain, necessitating unique left and right cylinder heads.

DESCRIPTION - VALVE GUIDES

The valve guides are made of powered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING—CYLINDER HEAD GASKET

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

Possible indications of the cylinder head gasket leaking between adjacent cylinders are:

- Loss of engine power
- Engine misfiring
- Poor fuel economy

Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:

- Engine overheating
- Loss of coolant
- Excessive steam (white smoke) emitting from exhaust
- Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

CYLINDER HEAD - RIGHT (Continued)

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

DIAGNOSIS AND TESTING - HYDRAULIC LASH ADJUSTER

A tappet-like noise may be produced from several items. Check the following items.

(1) Engine oil level too high or too low. This may cause aerated oil to enter the adjusters and cause them to be spongy.

(2) Insufficient running time after rebuilding cylinder head. Low speed running up to 1 hour may be required.

(3) Turn engine off and let set for a few minutes before restarting. Repeat this several times after engine has reached normal operating temperature.

(4) Low oil pressure.

(5) The oil restrictor in cylinder head gasket or the oil passage to the cylinder head is plugged with debris.

(6) Air ingested into oil due to broken or cracked oil pump pick up.

(7) Worn valve guides.

(8) Rocker arm ears contacting valve spring retainer.

(9) Rocker arm loose, adjuster stuck or at maximum extension and still leaves lash in the system.

(10) Oil leak or excessive cam bore wear in cylinder head.

(11) Faulty lash adjuster.

a. Check lash adjusters for sponginess while installed in cylinder head and cam on camshaft at base circle. Depress part of rocker arm over adjuster. Normal adjusters should feel very firm. Spongy adjusters can be bottomed out easily.

b. Remove suspected lash adjusters, and replace.

c. Before installation, make sure adjusters are at least partially full of oil. This can be verified by little or no plunger travel when lash adjuster is depressed.

REMOVAL

(1) Disconnect battery negitive cable.

(2) Raise the vehicle on a hoist.

(3) Disconnect the exhaust pipe at the right side exhaust manifold.

(4) Drain the engine coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Lower the vehicle.

(6) Remove the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).

(7) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(8) Remove oil fill housing from cylinder head.

(9) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(10) Rotate the crankshaft until the damper timing mark is aligned with TDC indicator mark (Fig. 9).

(11) Verify the V8 mark on the camshaft sprocket is at the 12 o'clock position (Fig. 11). Rotate the crankshaft one turn if necessary.

(12) Remove the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

(13) Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(14) Lock the secondary timing chains to the idler sprocket using Special Tool 8515 (Fig. 10).

NOTE: Mark the secondary timing chain prior to removal to aid in installation.

(15) Mark the secondary timing chain, one link on each side of the V8 mark on the camshaft drive gear (Fig. 11).

(16) Remove the right side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(17) Remove the cylinder head access plug (Fig. 29).

(18) Remove the right side secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

CYLINDER HEAD - RIGHT (Continued)

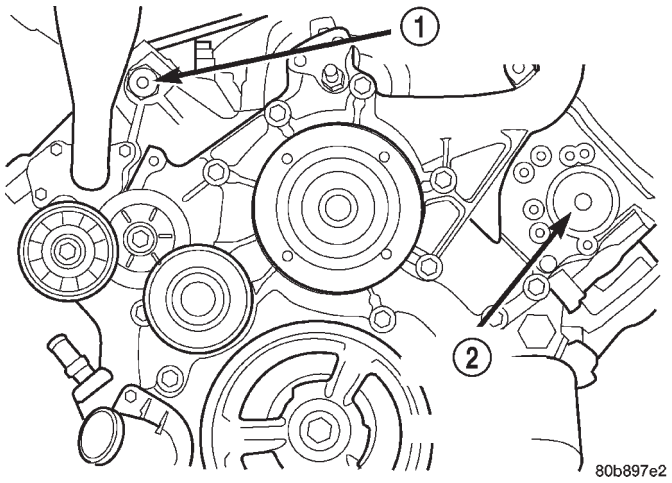


Fig. 29 Cylinder Head Access Plugs

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

(19) Remove the retaining bolt and the camshaft drive gear.

CAUTION: Do not allow the engine to rotate. severe damage to the valve train can occur.

CAUTION: Do not overlook the four smaller bolts at the front of the cylinder head. Do not attempt to remove the cylinder head without removing these four bolts.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason. A damaged target wheel can result in a vehicle no start condition.

NOTE: The cylinder head is attached to the cylinder block with fourteen bolts.

(20) Remove the cylinder head retaining bolts.
(21) Remove the cylinder head and gasket. Discard the gasket.

CAUTION: Do not lay the cylinder head on its gasket sealing surface, do to the design of the cylinder head gasket any distortion to the cylinder head sealing surface may prevent the gasket from properly sealing resulting in leaks.

CLEANING

To ensure engine gasket sealing, proper surface preparation must be performed, especially with the use of aluminum engine components. (Refer to 9 - ENGINE - STANDARD PROCEDURE)

INSPECTION

(1) Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
(2) Inspect the valve seats for damage. Service the valve seats as necessary.
(3) Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.

INSTALLATION

NOTE: The cylinder head bolts are tightened using a torque plus angle procedure. The bolts must be examined BEFORE reuse. If the threads are necked down the bolts should be replaced.

Necking can be checked by holding a straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced (Fig. 13).

CAUTION: When cleaning cylinder head and cylinder block surfaces, DO NOT use a metal scraper because the surfaces could be cut or ground. Use only a wooden or plastic scraper.

(1) Clean the cylinder head and cylinder block mating surfaces (Refer to 9 - ENGINE - STANDARD PROCEDURE).
(2) Position the new cylinder head gasket on the locating dowels.

CAUTION: When installing cylinder head, use care not damage the tensioner arm or the guide arm.

(3) Position the cylinder head onto the cylinder block. Make sure the cylinder head seats fully over the locating dowels.

NOTE: The four smaller cylinder head mounting bolts require sealant to be added to them before installing. Failure to do so may cause leaks.

(4) Lubricate the cylinder head bolt threads with clean engine oil and install the ten M10 bolts.
(5) Coat the four M8 cylinder head bolts with **Mopar Lock and Seal Adhesive**then install the bolts.

NOTE: The cylinder head bolts are tightened using an angle torque procedure, however, the bolts are not a torque-to-yield design.

(6) Tighten the bolts in sequence (Fig. 30) using the following steps and torque values:

- Step 1: Tighten bolts 1–10, 27 N·m (20 ft. lbs.).

CYLINDER HEAD - RIGHT (Continued)

- Step 2: Verify that bolts 1–10, all reached 27 N·m (20 ft. lbs.), by repeating step-1 without loosening the bolts. Tighten bolts 11 thru 14 to 14 N·m (10 ft. lbs.).
- Step 3: Tighten bolts 1–10, 90 degrees.
- Step 4: Tighten bolts 1–10, 90 degrees, again. Tighten bolts 11–14, 26 N·m (19 ft. lbs.)

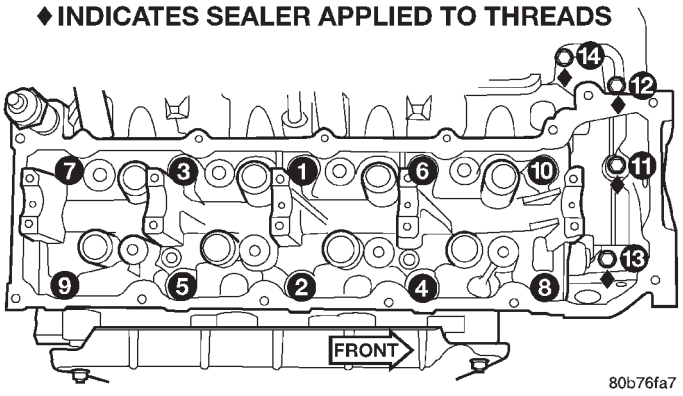


Fig. 30 Cylinder Head Tightening Sequence

(7) Install the secondary chain and secondary chain guide (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(8) Install the cylinder head access plug.

(9) Re-set and install the right side secondary chain tensioner (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(10) Remove Special Tool 8515.

(11) Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(12) Install the crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(13) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(14) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

(15) Install the intake manifold (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

(16) Install oil fill housing onto cylinder head.

(17) Refill the cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(18) Raise the vehicle.

(19) Install the exhaust pipe onto the right exhaust manifold.

(20) Lower the vehicle.

(21) Reconnect battery negitive cable.

(22) Start the engine and check for leaks.

CAMSHAFT(S) - RIGHT

DESCRIPTION

The camshafts consist of powdered metal steel lobes which are sinter-bonded to a steel tube. A steel post or nose piece is friction-welded to the steel camshaft tube. Five bearing journals are machined into the camshaft, four on the steel tube and one on the steel nose piece. Camshaft end play is controlled by two thrust walls that border the nose piece journal. Engine oil enters the hollow camshafts at the third journal and lubricates every intake lobe rocker through a drilled passage in the intake lobe.

REMOVAL

CAUTION: When the timing chain is removed and the cylinder heads are still installed, DO NOT forcefully rotate the camshafts or crankshaft independently of each other. Severe valve and/or piston damage can occur.

CAUTION: When removing the cam sprocket, timing chains or camshaft, Failure to use special tool 8350 will result in hydraulic tensioner ratchet over extension, Requiring timing chain cover removal to re-set the tensioner ratchet.

(1) Remove the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Set engine to TDC cylinder #1, camshaft sprocket V8 marks at the 12 o'clock position.

(3) Mark one link on the secondary timing chain on both sides of the V8 mark on the camshaft sprocket to aid in installation.

CAUTION: Do not hold or pry on the camshaft target wheel for any reason, Severe damage will occur to the target wheel. A damaged target wheel could cause a vehicle no start condition.

(4) Loosen but **DO NOT** remove the camshaft sprocket retaining bolt. Leave bolt snug against sprocket.

NOTE: The timing chain tensioners must be secured prior to removing the camshaft sprockets. Failure to secure tensioners will allow the tensioners to extend, requiring timing chain cover removal in order to reset tensioners.

CAUTION: Do not force wedge past the narrowest point between the chain strands. Damage to the tensioners may occur.

CAMSHAFT(S) - RIGHT (Continued)

(5) Position Special Tool 8350 timing chain wedge between the timing chain strands. Tap the tool to securely wedge the timing chain against the tensioner arm and guide (Fig. 31).

(6) Remove the camshaft position sensor (Fig. 32).

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

(7) Hold the camshaft with adjustable pliers while removing the camshaft sprocket bolt and sprocket (Fig. 33).

(8) Using the pliers, gently allow the camshaft to rotate 45° counter-clockwise until the camshaft is in the neutral position (no valve load).

(9) Starting at the outside working inward, loosen the camshaft bearing cap retaining bolts 1/2 turn at a time. Repeat until all load is off the bearing caps.

CAUTION: DO NOT STAMP OR STRIKE THE CAMSHAFT BEARING CAPS. SEVERE DAMAGE WILL OCCUR TO THE BEARING CAPS.

NOTE: When the camshaft is removed the rocker arms may slide downward, mark the rocker arms before removing camshaft.

(10) Remove the camshaft bearing caps and the camshaft.

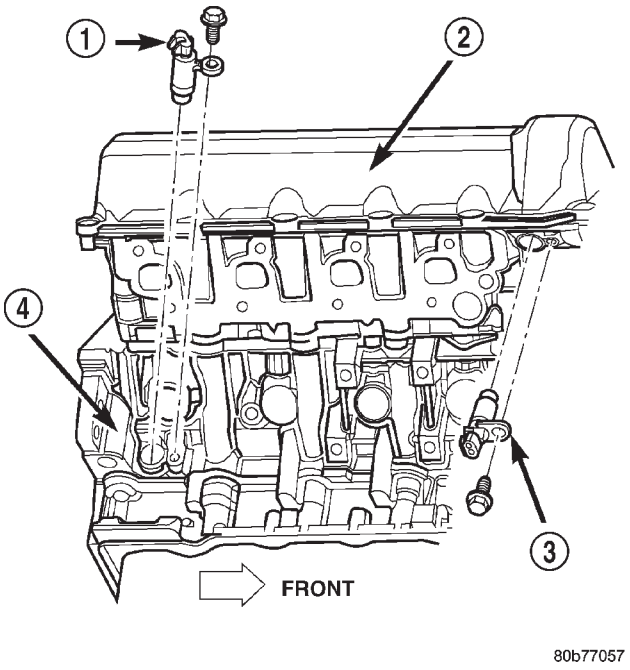


Fig. 32 Camshaft Position Sensor

1 - CRANKSHAFT POSITION SENSOR
2 - CYLINDER HEAD COVER
3 - CAMSHAFT POSITION SENSOR
4 - RIGHT SIDE CYLINDER BLOCK

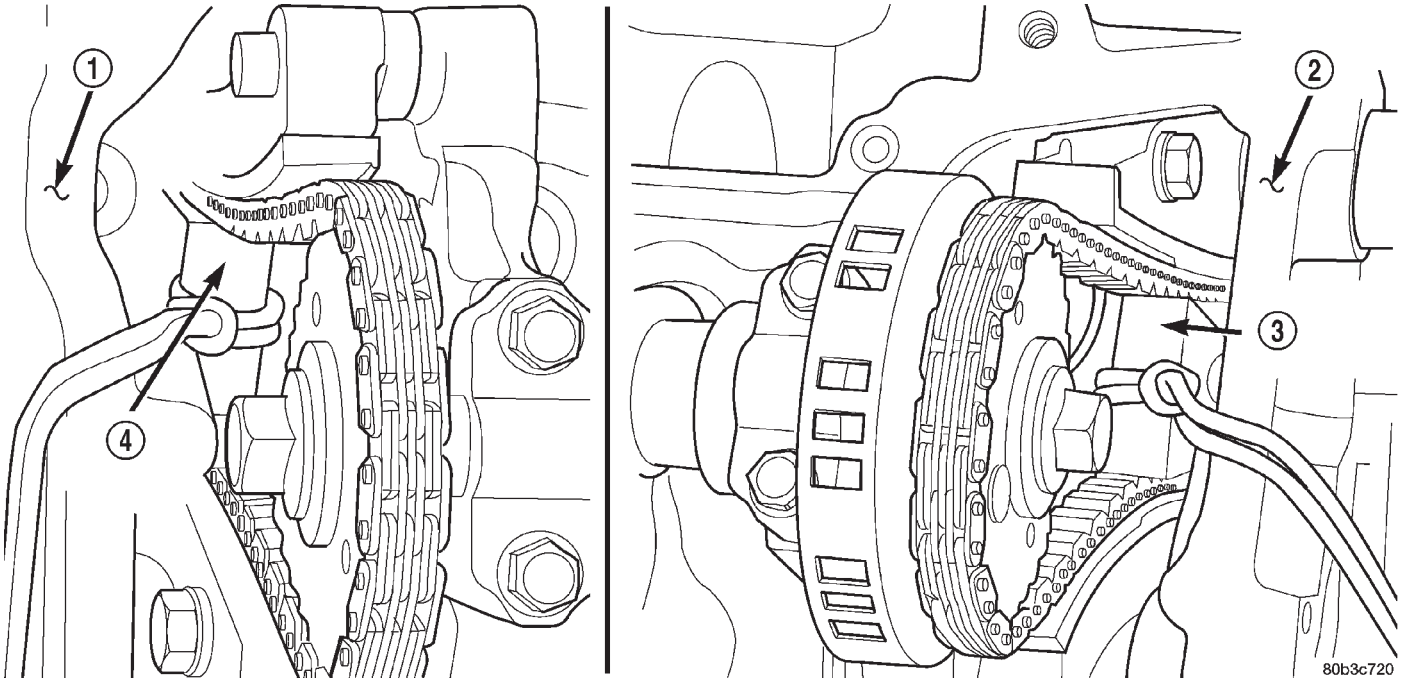


Fig. 31 Securing Timing Chain Tensioners Using Timing Chain Wedge

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD
3 - SPECIAL TOOL 8350 WEDGE
4 - SPECIAL TOOL 8350 WEDGE

CAMSHAFT(S) - RIGHT (Continued)

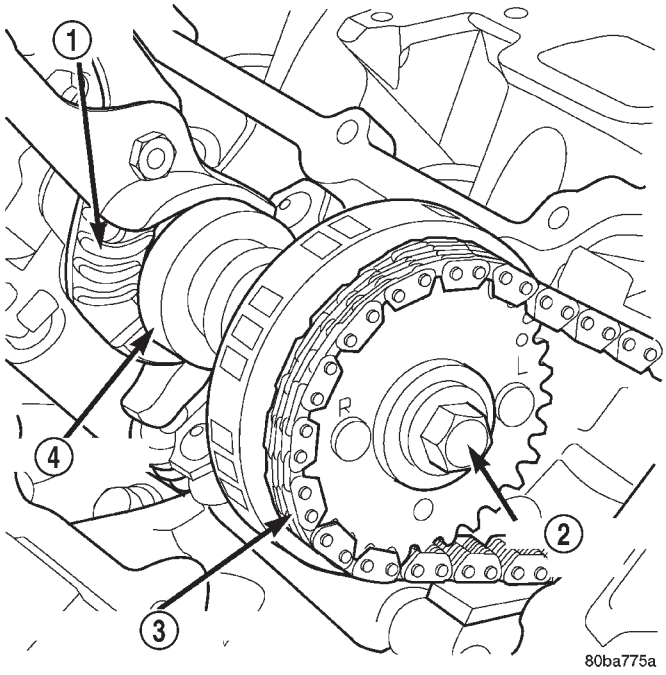


Fig. 33 Camshaft Sprocket and Chain

1 - ADJUSTABLE PLIERS
2 - SPROCKET BOLT
3 - CAMSHAFT SPROCKET AND CHAIN
4 - CAMSHAFT

INSTALLATION

(1) Lubricate camshaft journals with clean engine oil.

NOTE: Position the right side camshaft so that the camshaft sprocket dowel is near the 10 o'clock position, This will place the camshaft at the neutral position easing the installation of the camshaft bearing caps.

(2) Position the camshaft into the cylinder head.

(3) Install the camshaft bearing caps, hand tighten the retaining bolts.

(4) Working in 1/2 turn increments, tighten the bearing cap retaining bolts starting with the middle cap working outward (Fig. 34).

(5) Torque the camshaft bearing cap retaining bolts to 11 N·m (100 in. lbs.).

(6) Position the camshaft drive gear into the timing chain aligning the V8 mark between the two marked chain links (Two links marked during removal) (Fig. 35).

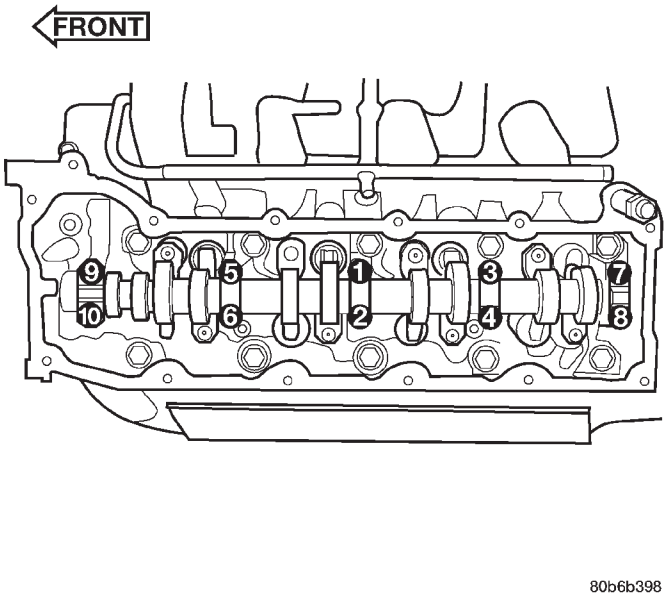


Fig. 34 Camshaft Bearing Caps Tightening Sequence

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

(7) Using the adjustable pliers, rotate the camshaft until the camshaft sprocket dowel is aligned with the slot in the camshaft sprocket. Install the sprocket onto the camshaft (Fig. 36).

CAUTION: Remove excess oil from camshaft sprocket bolt. Failure to do so can cause bolt overtorque resulting in bolt failure.

(8) Remove excess oil from camshaft sprocket bolt, then install the camshaft sprocket retaining bolt and hand tighten.

(9) Remove timing chain wedge special tool 8350 (Fig. 31).

(10) Using Special Tool 6958 spanner wrench with adapter pins 8346 (Fig. 37), torque the camshaft sprocket retaining bolt to 122 N·m (90 ft. lbs.).

(11) Install the camshaft position sensor (Fig. 32).

(12) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

CAMSHAFT(S) - RIGHT (Continued)

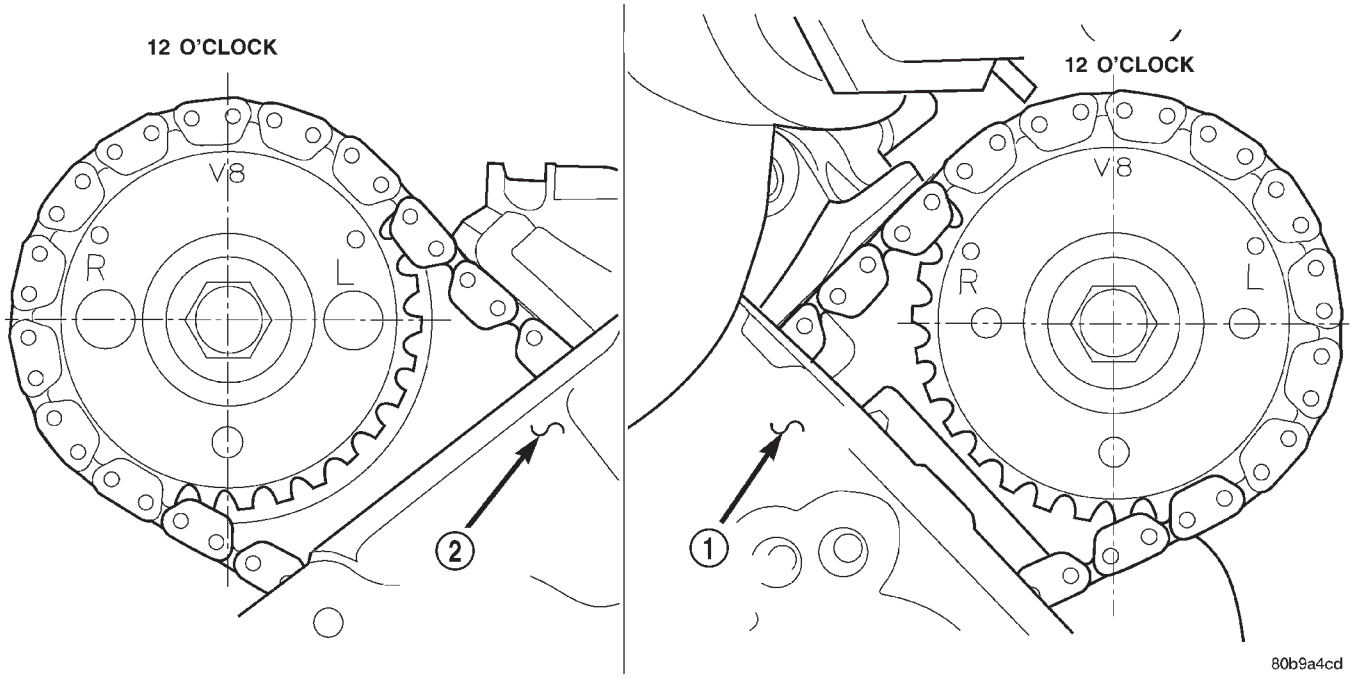


Fig. 35 Timing Chain to Sprocket Alignment

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

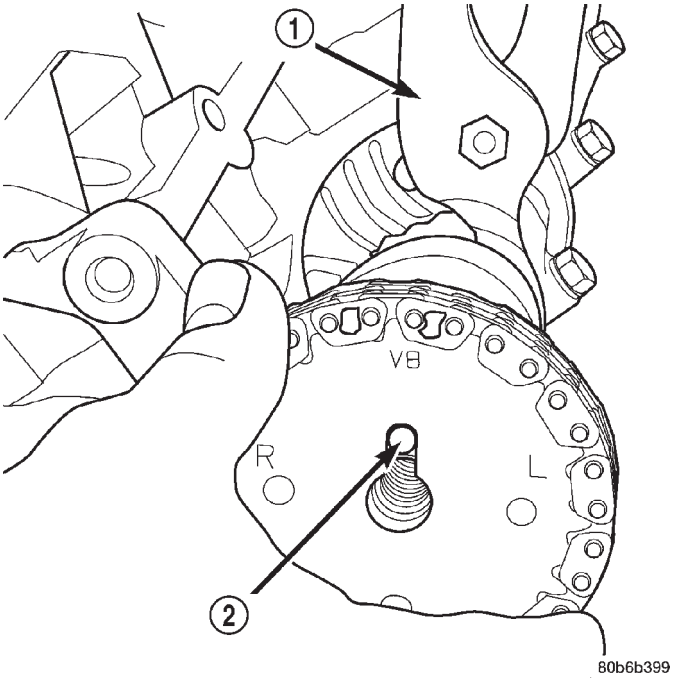


Fig. 36 Camshaft Sprocket Installation

1 - ADJUSTABLE PLIERS
2 - CAMSHAFT DOWEL

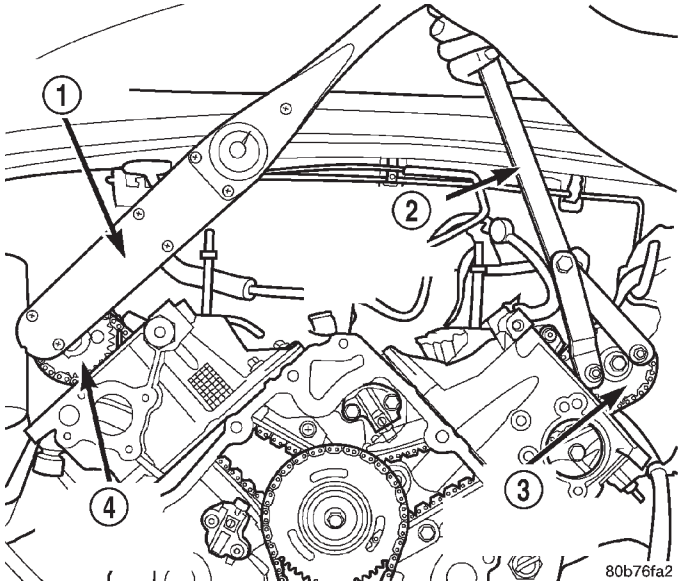


Fig. 37 Tightening Right Side Cam Sprocket Retaining Bolt

1 - TORQUE WRENCH
2 - SPECIAL TOOL 6958 WITH ADAPTER PINS 8346
3 - LEFT CAMSHAFT SPROCKET
4 - RIGHT CAMSHAFT SPROCKET

CYLINDER HEAD COVER(S) - RIGHT

DESCRIPTION

The cylinder head covers are made of die cast magnesium, and are not interchangeable from side-to-side. It is imperative that nothing rest on the cylinder head covers. Prolonged contact with other items may wear a hole in the cylinder head cover.

REMOVAL - RIGHT SIDE

(1) Disconnect battery negative cable.
(2) Remove air cleaner assembly, resonator assembly and air inlet hose.
(3) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(4) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(5) Remove air conditioning compressor retaining bolts and move compressor to the left.
(6) Remove heater hoses.
(7) Disconnect injector and ignition coil connectors.
(8) Disconnect and remove positive crankcase ventilation (PCV) hose.
(9) Remove oil fill tube.
(10) Un-clip injector and ignition coil harness and move away from cylinder head cover.
(11) Remove right rear breather tube and filter assembly.
(12) Remove cylinder head cover retaining bolts.
(13) Remove cylinder head cover.

NOTE: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

CLEANING

Clean cylinder head cover gasket surface.
Clean head rail, if necessary.

INSTALLATION - RIGHT SIDE

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: DO NOT allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

(1) Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
(2) Install cylinder head cover and hand start all fasteners. Verify that all double ended studs are in the correct location shown in (Fig. 38).

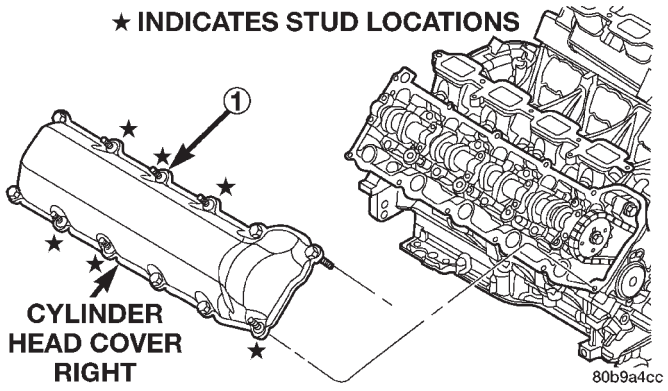


Fig. 38 Cylinder Head Cover—Right

ITEM	DESCRIPTION	TORQUE
1	Cover Fasteners	12 N·m (105 in. lbs.)

(3) Tighten cylinder head cover bolts and double ended studs to 12 N·m (105 in. lbs).
(4) Install right rear breather tube and filter assembly.
(5) Connect injector, ignition coil electrical connectors and harness retaining clips.
(6) Install the oil fill tube.
(7) Install PCV hose.
(8) Install heater hoses.
(9) Install air conditioning compressor retaining bolts.
(10) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(11) Fill Cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(12) Install air cleaner assembly, resonator assembly and air inlet hose.
(13) Connect battery negative cable.

INTAKE/EXHAUST VALVES & SEATS

DESCRIPTION

The valves are made of heat resistant steel and have chrome plated stems to prevent scuffing. Each valve is actuated by a roller rocker arm which pivots on a stationary lash adjuster. All valves use three bead lock keepers to retain the springs and promote valve rotation.

INTAKE/EXHAUST VALVES & SEATS (Continued)

STANDARD PROCEDURE—REFACING

NOTE: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

NOTE: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

(1) Using a suitable dial indicator measure the center of the valve seat Total run out must not exceed 0.051 mm (0.002 in).

(2) Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.

(3) When the seat is properly positioned the width of the intake seat must be 1.75 – 2.36 mm (0.0689 – 0.0928 in.) and the exhaust seat must be 1.71 – 2.32 mm (0.0673 – 0.0911 in.).

(4) Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 41.44 mm (1.6315 in.).

(5) The valve seat and valve face must maintain a face angle of 44.5 – 45 degrees angle (Fig. 39).

REMOVAL

NOTE: The cylinder heads must be removed in order to preform this procedure.

(1) Remove rocker arms and lash adjusters. Refer to procedures in this section (Fig. 40).

(2) Remove the camshaft bearing caps and the camshaft.

NOTE: All eight valve springs and valves are removed in the same manner; this procedure only covers one valve and valve spring.

(3) Using Special Tool C-3422–B or C-3422–C Valve Spring Compressor and Special tool 8519 Adapter, compress the valve spring.

NOTE: It may be necessary to tap the top of the valve spring to loosen the spring retainers locks enough to be removed.

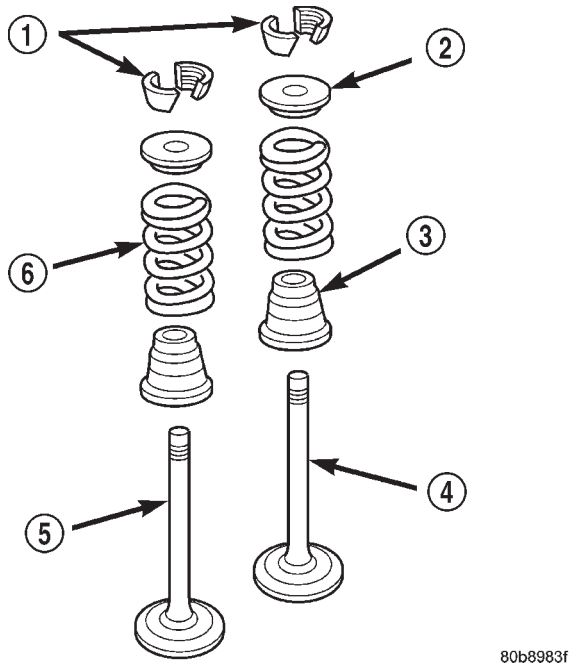


Fig. 39 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

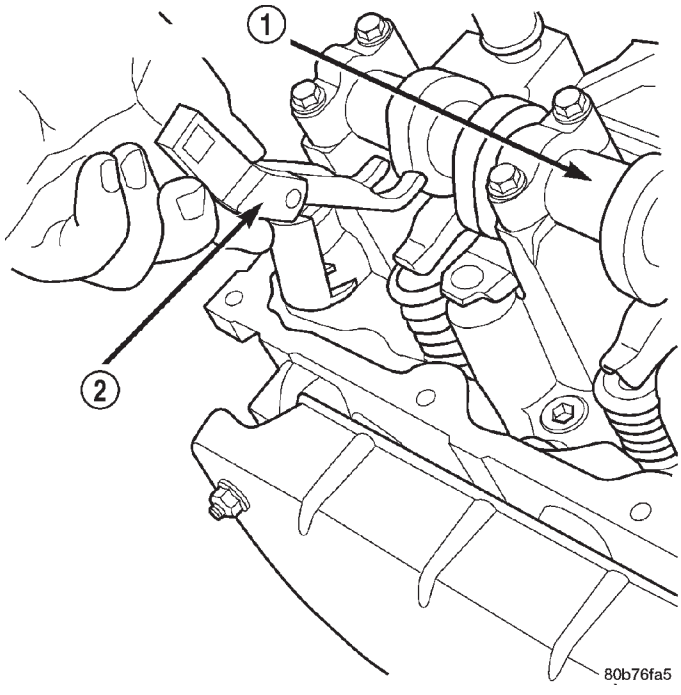


Fig. 40 Rocker Arm Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

INTAKE/EXHAUST VALVES & SEATS (Continued)

(4) Remove the two spring retainer lock halves.

NOTE: the valve spring is under tension use care when releasing the valve spring compressor.

(5) Remove the valve spring compressor.
(6) Remove the spring retainer, and the spring.

NOTE: Check for sharp edges on the keeper grooves. Remove any burrs from the valve stem before removing the valve from the cylinder head.

(7) Remove the valve from the cylinder head.

NOTE: The valve stem seals are common between intake and exhaust.

(8) Remove the valve stem seal. Mark the valve for proper installation.

TESTING VALVE SPRINGS

NOTE: Whenever the valves are removed from the cylinder head it is recommended that the valve springs be inspected and tested for reuse.

Inspect the valve springs for physical signs of wear or damage. Turn table of tool C-647 until surface is in line with the 40.69 mm (1.602 in.) mark on the threaded stud and the zero mark on the front. Place spring over the stud on the table and lift compressing lever to set tone device. Pull on torque wrench until Ping is heard. Take reading on torque wrench at this instant. Multiply this reading by two. This will give the spring load at test length. Fractional measurements are indicated on the table for finer adjustments. Refer to Specifications Section to obtain specified height and allowable tensions. Replace any springs that do not meet specifications. (Fig. 41)

INSTALLATION

(1) coat the valve stem with clean engine oil and insert it into the cylinder head.
(2) Install the valve stem seal. make sure the seal is fully seated and that the garter spring at the top of the seal is intact.
(3) Install the spring and the spring retainer (Fig. 42).
(4) Using the valve spring compressor, compress the spring and install the two valve spring retainer halves.
(5) Release the valve spring compressor and make sure the two spring retainer halves and the spring retainer are fully seated.

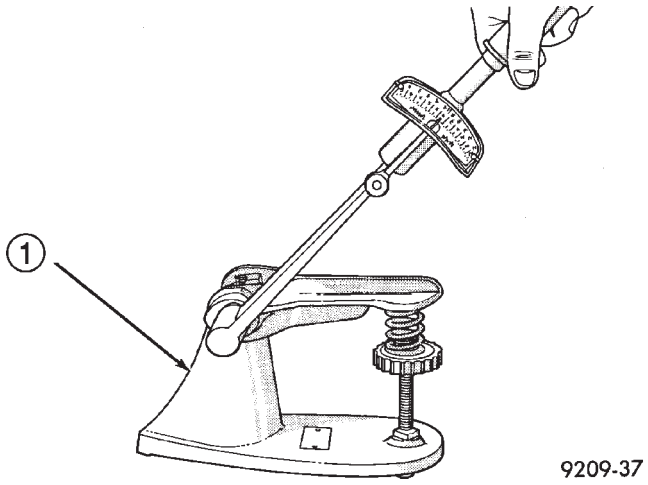


Fig. 41 Testing Valve Springs

1 - SPECIAL TOOL C-647

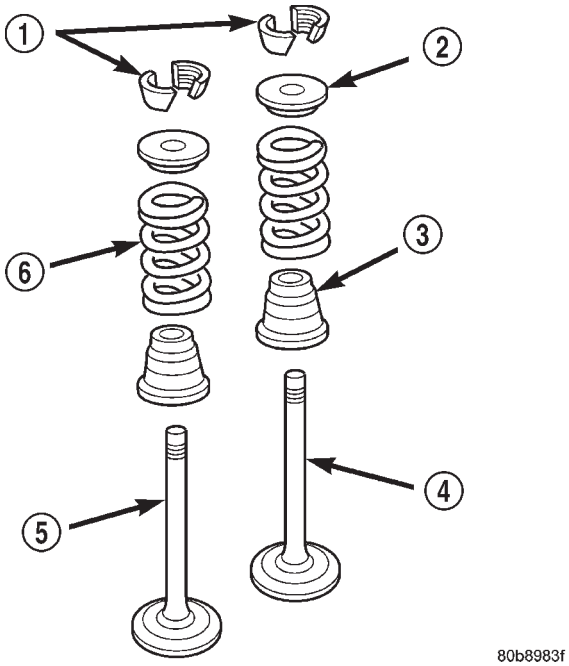


Fig. 42 Valve Assembly Configuration

1 - VALVE LOCKS (3–BEAD)
2 - RETAINER
3 - VALVE STEM OIL SEAL
4 - INTAKE VALVE
5 - EXHAUST VALVE
6 - VALVE SPRING

(6) lubricate the camshaft journal with clean engine oil then Position the camshaft (with the sprocket dowel on the left camshaft at 11 o'clock and the right camshaft at 12 o'clock), then position the camshaft bearing caps.

(7) Install the camshaft bearing cap retaining bolts. Tighten the bolts 9–13 N·m (100 in. lbs.) in ½ turn increments in the sequence shown (Fig. 43).

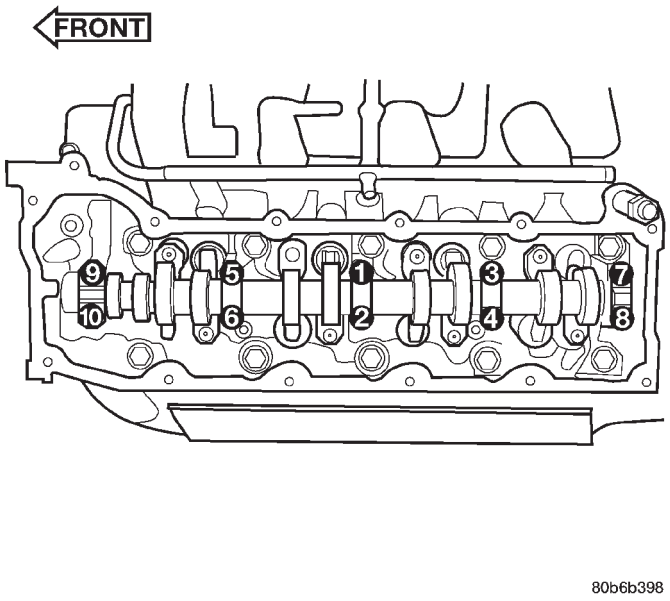


Fig. 43 Camshaft Bearing Caps Tightening Sequence

(8) Position the hydraulic lash adjusters and rocker arms (Fig. 40).

ROCKER ARM / ADJUSTER ASSEMBLY

DESCRIPTION

The rocker arms are steel stampings with an integral roller bearing. The rocker arms incorporate a 2.8 mm (0.11 inch) oil hole in the lash adjuster socket for roller and camshaft lubrication.

REMOVAL

NOTE: Disconnect the battery negative cable to prevent accidental starter engagement.

(1) Remove the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) For rocker arm removal on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(3) For rocker arm removal on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.

(4) For rocker arm removal on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.

(5) For rocker arm removal on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.

(6) Using special tool 8516 Rocker Arm Remover, press downward on the valve spring, remove rocker arm (Fig. 44).

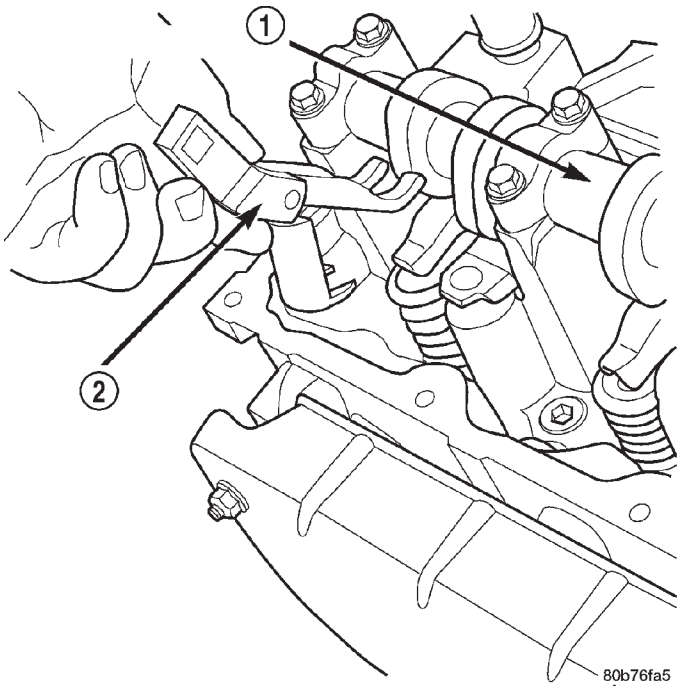


Fig. 44 Rocker Arm—Removal

1 - CAMSHAFT
2 - SPECIAL TOOL 8516

INSTALLATION

CAUTION: Make sure the rocker arms are installed with the concave pocket over the lash adjusters. Failure to do so may cause severe damage to the rocker arms and/or lash adjusters.

NOTE: Coat the rocker arms with clean engine oil prior to installation.

(1) For rocker arm installation on cylinders 3 and 5 Rotate the crankshaft until cylinder #1 is at TDC exhaust stroke.

(2) For rocker arm installation on cylinders 2 and 8 Rotate the crankshaft until cylinder #1 is at TDC compression stroke.

(3) For rocker arm installation on cylinders 4 and 6 Rotate the crankshaft until cylinder #3 is at TDC compression stroke.

ROCKER ARM / ADJUSTER ASSEMBLY (Continued)

(4) For rocker arm installation on cylinders 1 and 7 Rotate the crankshaft until cylinder #2 is at TDC compression stroke.

(5) Using special tool 8516 press downward on the valve spring, install rocker arm (Fig. 44).

(6) Install the cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

VALVE SPRINGS

DESCRIPTION

The valve springs are made from high strength chrome silicon steel. The springs are common for intake and exhaust applications. The valve spring seat is integral with the valve stem seal, which is a positive type seal to control lubrication.

VALVE STEM SEALS

DESCRIPTION

The valve stem seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

ENGINE BLOCK

DESCRIPTION

The cylinder block is made of cast iron. The block is a closed deck design with the left bank forward. To provide high rigidity and improved NVH an enhanced compacted graphite bedplate is bolted to the block. The block design allows coolant flow between the cylinders bores, and an internal coolant bypass to a single poppet inlet thermostat is included in the cast aluminum front cover.

STANDARD PROCEDURE—CYLINDER BORE HONING

Before honing, stuff plenty of clean shop towels under the bores and over the crankshaft to keep abrasive materials from entering the crankshaft area.

(1) Used carefully, the Cylinder Bore Sizing Hone C-823, equipped with 220 grit stones, is the best tool for this job. In addition to deglazing, it will reduce taper and out-of-round, as well as removing light scuffing, scoring and scratches. Usually, a few strokes will clean up a bore and maintain the required limits.

CAUTION: DO NOT use rigid type hones to remove cylinder wall glaze.

(2) Deglazing of the cylinder walls may be done if the cylinder bore is straight and round. Use a cylinder surfacing hone, Honing Tool C-3501, equipped with 280 grit stones (C-3501-3810). about 20-60 strokes, depending on the bore condition, will be sufficient to provide a satisfactory surface. Using honing oil C-3501-3880, or a light honing oil, available from major oil distributors.

CAUTION: DO NOT use engine or transmission oil, mineral spirits, or kerosene.

(3) Honing should be done by moving the hone up and down fast enough to get a crosshatch pattern. The hone marks should INTERSECT at 50° to 60° for proper seating of rings (Fig. 45).

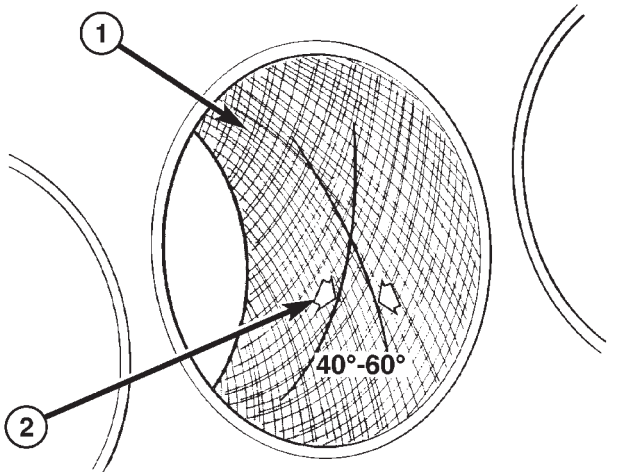


Fig. 45 Cylinder Bore Crosshatch Pattern

1 - CROSSHATCH PATTERN
2 - INTERSECT ANGLE

(4) A controlled hone motor speed between 200 and 300 RPM is necessary to obtain the proper crosshatch angle. The number of up and down strokes per minute can be regulated to get the desired 50° to 60° angle. Faster up and down strokes increase the crosshatch angle.

(5) After honing, it is necessary that the block be cleaned to remove all traces of abrasive. Use a brush to wash parts with a solution of hot water and detergent. Dry parts thoroughly. Use a clean, white, lint-

ENGINE BLOCK (Continued)

free cloth to check that the bore is clean. Oil the bores after cleaning to prevent rusting.

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the plugs to 34 N·m (25 ft. lbs.) torque.

INSPECTION

(1) It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer (Fig. 46).

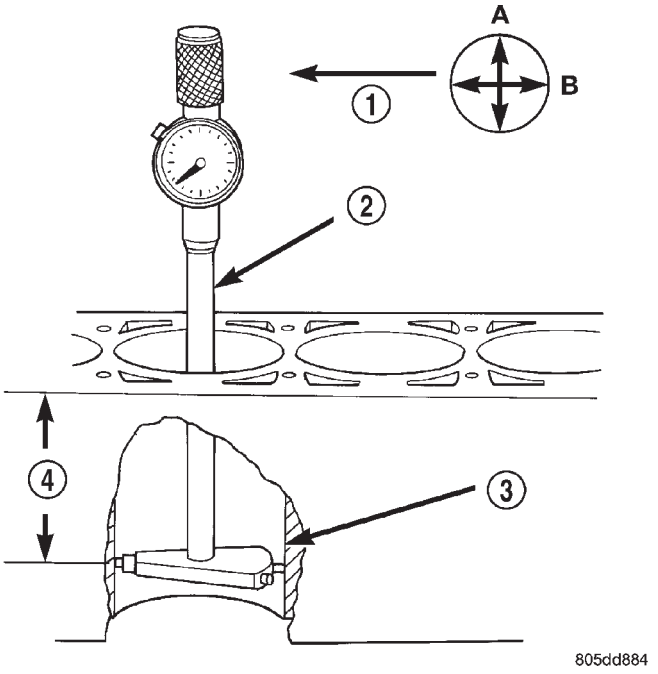


Fig. 46 Bore Gauge—Typical

1 - FRONT
2 - BORE GAUGE
3 - CYLINDER BORE
4 - 38 MM (1.5 in)

(2) Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.

(3) Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.

(4) Determine taper by subtracting the smaller diameter from the larger diameter.

(5) Rotate measuring device 90° and repeat steps above.

(6) Determine out-of-roundness by comparing the difference between each measurement.

(7) If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out- of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.

CONNECTING ROD BEARINGS

STANDARD PROCEDURE - CONNECTING ROD BEARING FITTING

Inspect the connecting rod bearings for scoring and bent alignment tabs (Fig. 47) (Fig. 48). Check the bearings for normal wear patterns, scoring, grooving, fatigue and pitting (Fig. 49). Replace any bearing that shows abnormal wear.

Inspect the connecting rod journals for signs of scoring, nicks and burrs.

Misaligned or bent connecting rods can cause abnormal wear on pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft connecting rod journals. If wear patterns or damage to any of these components indicate the probability of a misaligned connecting rod, inspect it for correct rod alignment. Replace misaligned, bent or twisted connecting rods.

(1) Wipe the oil from the connecting rod journal.

(2) Lubricate the upper bearing insert and install in connecting rod.

(3) Use piston ring compressor and Guide Pins Special Tool 8507 (Fig. 50) to install the rod and piston assemblies. The oil slinger slots in the rods must face front of the engine. The “F”’s near the piston wrist pin bore should point to the front of the engine.

(4) Install the lower bearing insert in the bearing cap. The lower insert must be dry. Place strip of Plastigage across full width of the lower insert at the center of bearing cap. Plastigage must not crumble in use. If brittle, obtain fresh stock.

(5) Install bearing cap and connecting rod on the journal and tighten bolts to 27 N·m (20 ft. lbs.) plus a 90° turn. DO NOT rotate crankshaft. Plastigage will smear, resulting in inaccurate indication.

CONNECTING ROD BEARINGS (Continued)

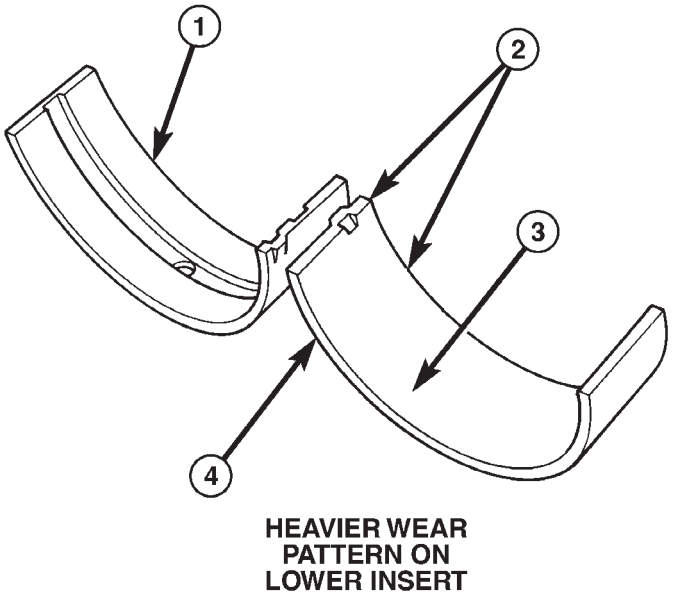


Fig. 47 Connecting Rod Bearing Inspection

1 - UPPER BEARING HALF
2 - MATING EDGES
3 - GROOVES CAUSED BY ROD BOLTS SCRATCHING JOURNAL DURING INSTALLATION
4 - WEAR PATTERN — ALWAYS GREATER ON UPPER BEARING

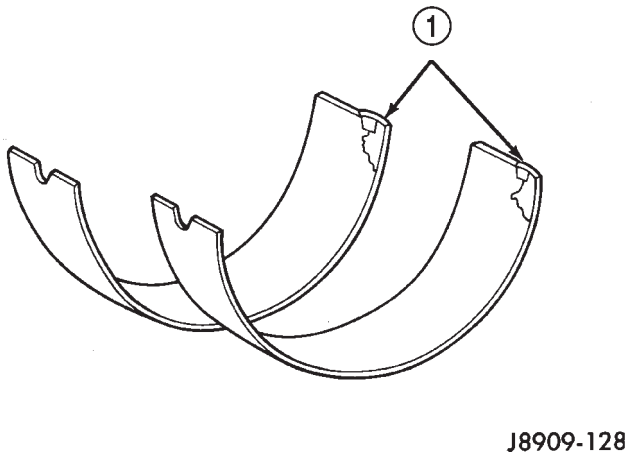


Fig. 48 Locking Tab Inspection

1 - ABNORMAL CONTACT AREA CAUSED BY LOCKING TABS NOT FULLY SEATED OR BEING BENT

(6) Remove the bearing cap and determine amount of bearing-to-journal clearance by measuring the width of compressed Plastigage (Fig. 51). Refer to Engine Specifications for the proper clearance. **Plastigage should indicate the same clearance across the entire width of the insert. If the clearance varies, it may be caused by either a tapered journal, bent connecting rod or foreign material trapped between the insert and cap or rod.**

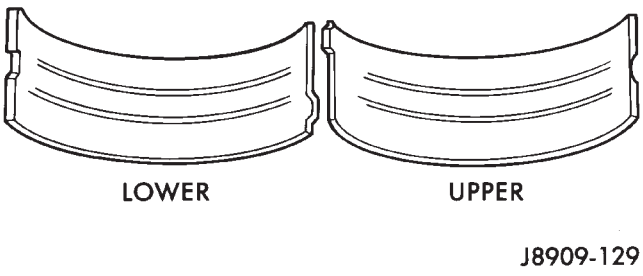


Fig. 49 Scoring Caused by Insufficient Lubrication or Damaged Crankshaft Journal

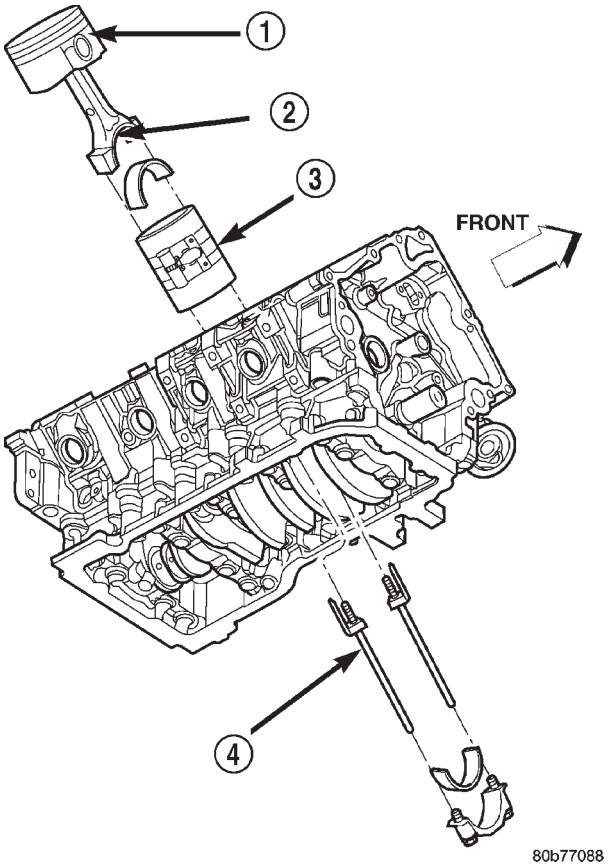


Fig. 50 Piston and Connecting Rod - Installation

1 - "F" TOWARD FRONT OF ENGINE
2 - OIL SLINGER SLOT
3 - RING COMPRESSOR
4 - SPECIAL TOOL 8507

(7) If the correct clearance is indicated, replacement of the bearing inserts is not necessary. Remove the Plastigage from crankshaft journal and bearing insert. Proceed with installation.

(8) If bearing-to-journal clearance exceeds the specification, determin which services bearing set to use the bearing sizes are as follows:

CONNECTING ROD BEARINGS (Continued)

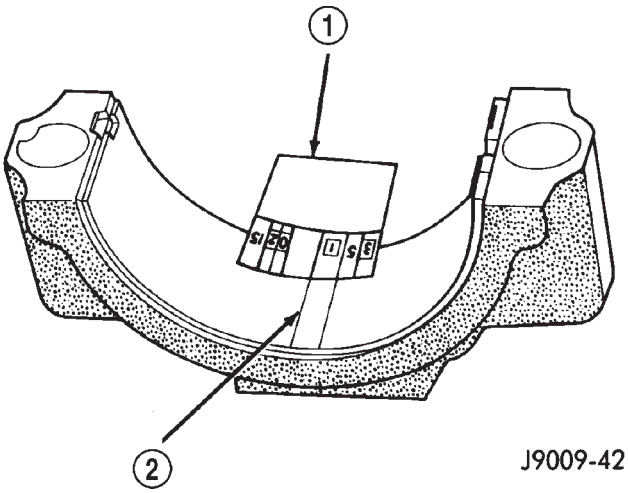


Fig. 51 Measuring Bearing Clearance with Plastigage

1 - PLASTIGAGE SCALE
2 - COMPRESSED PLASTIGAGE

Bearing Mark	SIZE	USED WITH JOURNAL SIZE
.025 US	.025 mm (.001 in.)	50.983-50.967 mm (2.0073-2.0066 in.)
Std.	STANDARD	50.992-51.008 mm (2.0076-2.0082 in.)
.250 US	.250 mm (.010 in.)	50.758-50.742 mm (1.9984-1.9978 in.)

(9) Repeat the Plastigage measurement to verify your bearing selection prior to final assembly.

(10) Once you have selected the proper insert, install the insert and cap. Tighten the connecting rod bolts to 27 N·m (20 ft. lbs.) plus a 90° turn.

Slide snug-fitting feeler gauge between the connecting rod and crankshaft journal flange (Fig. 52). Refer to Engine Specifications for the proper clearance. Replace the connecting rod if the side clearance is not within specification.

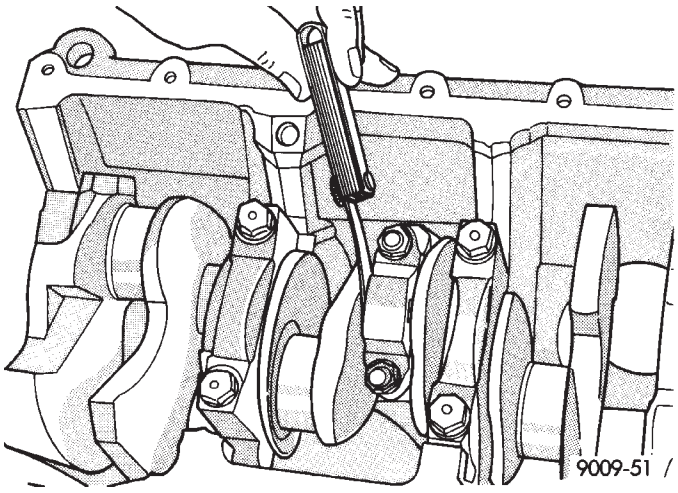


Fig. 52 Checking Connecting Rod Side Clearance - Typical

CRANKSHAFT

DESCRIPTION

The 4.7L crankshaft is constructed of nodular cast iron. The crankshaft for the 4.7L H.O. is constructed of **forged steel.** The crankshaft is a cross shaped four throw design with eight counterweights for balancing purposes. The crankshaft is supported by five select fit main bearings with the number three serving as the thrust washer location. The main journals of the crankshaft are cross drilled to improve rod bearing lubrication. The number eight counterweight has provisions for crankshaft position sensor target wheel mounting. The select fit main bearing markings are located on the rear side of the target wheel. The crankshaft oil seals are one piece design. The front oil seal is retained in the timing chain cover, and the rear seal is pressed in to a bore formed by the cylinder block and the bedplate assembly.

STANDARD PROCEDURE - MEASURING CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine with the locating probe on nose of crankshaft (Fig. 53).

(2) Move crankshaft all the way to the rear of its travel.

(3) Zero the dial indicator.

(4) Move crankshaft all the way to the front and read the dial indicator. (Refer to 9 - ENGINE - SPECIFICATIONS) for end play specification.

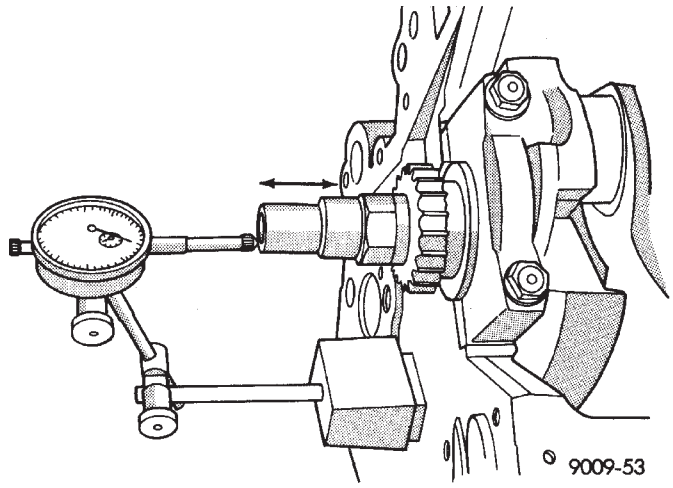


Fig. 53 Checking Crankshaft End Play—Typical

CRANKSHAFT (Continued)

REMOVAL

NOTE: To remove the crankshaft from the engine, the engine must be removed from the vehicle.

(1) Remove the engine. (Refer to 9 - ENGINE - REMOVAL).
(2) Remove the engine oil pump.(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).

CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when removing oil pan. Gasket can not be removed with oil pan.

(3) Remove oil pan. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
(4) Remove the oil pump pickup tube and oil pan gasket /windage tray.
(5) Remove the bedplate mounting bolts. Note the location of the three stud bolts for installation.
(6) Remove the connecting rods from the crankshaft.

CAUTION: The bedplate to cylinder block mating surface is a critical sealing surface. Do not pry on or damage this surface in anyway.

NOTE: The bedplate contains the lower main bearing halves. Use care when handling bedplate as not to drop or damage bearing halves. Installing main bearing halves in the wrong position will cause sever damage to the crankshaft.

NOTE: The bedplate has pry points cast into it. Use these points only. The pry points are on both the left and right sides, only the left side is shown.

(7) Carefully pry on the pry points (Fig. 54) to loosen the bedplate then remove the bedplate.

CAUTION: When removing the crankshaft, use care not to damage bearing surfaces on the crankshaft.

(8) Remove the crankshaft.
(9) Remove the crankshaft target wheel.

INSPECTION

NOTE: Thoroughly inspect the connecting rod bearing bores and main bearing bores for scoring, blueing or severe scratches. Further disassembly may be required.

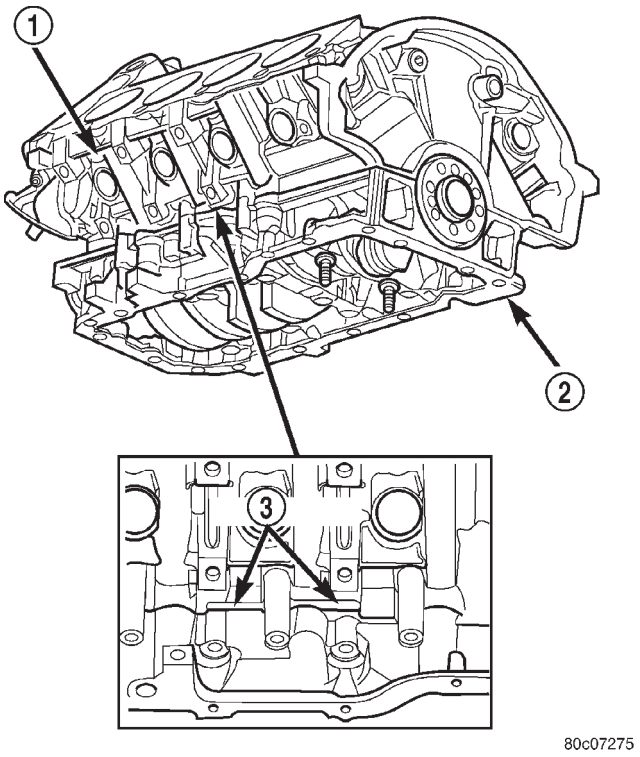


Fig. 54 Bedplate Pry Point Location

1 - CYLINDER BLOCK
2 - BEDPLATE
3 - PRY POINT

If connecting rod bearing bores show damage, the cylinder heads must be removed to service the piston and rod assemblies. If the bedplate or the cylinder block main bearing bores show damage the engine must be replaced.
(1) If required, remove the main bearing halves from the cylinder block and bedplate.
(2) Thoroughly clean the bedplate to cylinder block sealing surfaces and main bearing bores. Remove all oil and sealant residue.
(3) Inspect the bedplate main bearing bores for cracks, scoring or severe blueing. If either condition exists the engine must be replaced.
(4) Inspect the crankshaft thrust washers for scoring, scratches, wear or blueing. If either condition exist replace the thrust washer.
(5) Inspect the oil pan gasket/windage tray for splits, tears or cracks in the gasket sealing surfaces. Replace gasket as necessary.

INSTALLATION

CAUTION: Main bearings are select fit. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE) for proper bearing selections.

CRANKSHAFT (Continued)

(1) Lubricate upper main bearing halves with clean engine oil.

CAUTION: When installing crankshaft, use care not to damage bearing surfaces on the crankshaft.

NOTE: Apply sealant to the target wheel retaining screws prior to installation.

(2) Install the crankshaft target wheel. Torque the mounting screws to 22 N·m (21 ft. lbs.).
(3) Position crankshaft in cylinder block.
(4) Install the thrust washers (Fig. 55).

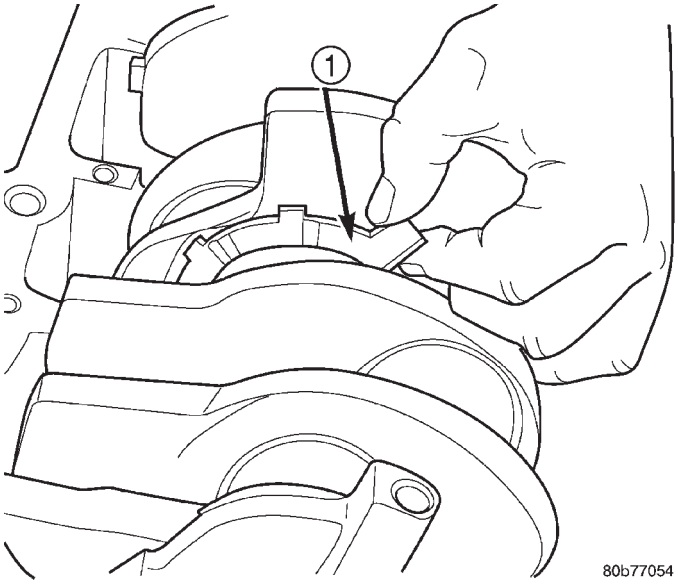


Fig. 55 Crankshaft Thrust Washer Installation

1 - CRANKSHAFT THRUST WASHER

CAUTION: The bedplate to cylinder block mateing surface must be coated with sealant prior to installation. Failure to do so will cause severe oil leaks.

NOTE: The installation time to install the bedplate after the sealant has been applied is critical.

NOTE: Make sure that the bedplate and cylinder block sealing surfaces are clean and free of oil or other contaminants. Contaminants on the sealing surfaces may cause main bearing distortion and/or oil leaks.

(5) Apply a 2.5mm (0.100 inch) (Fig. 56) bead of Mopar® Gen II Silicone Rubber Adhesive sealant to the cylinder block-to-bedplate mating surface as shown (Fig. 57).

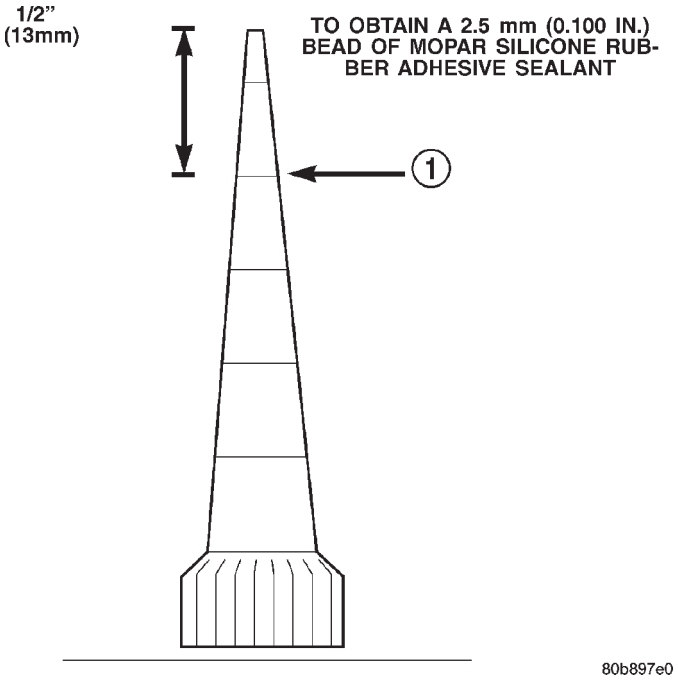


Fig. 56 Cutting Aplicator to Achieve 2.5mm (0.100 in.) Bead

1 - CUT HERE

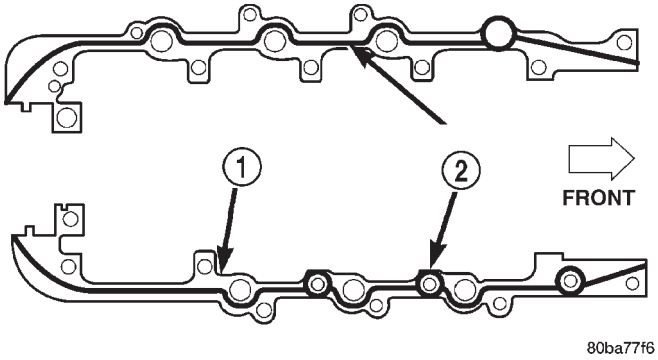


Fig. 57 Cylinder Block-to-Bedplate Sealent Bead Location

1 - CYLINDER BLOCK
2 - SEALANT BEAD LOCATION

(6) Coat the crankshaft main bearing journals with clean engine oil and position the bedplate onto the cylinder block.

NOTE: Lubricate the bedplate retaining bolts with clean engine oil prior to installation.

(7) Install the bedplate retaining bolts, making sure to place the stud bolts in the correct location, Torque the bolts in the sequence shown (Fig. 58).

- Tighten bolts **A – L** to 54 N·m (40 ft. lbs.)
- Tighten bolts **1–10** to 2.8 N·m (25 in. lbs.)
- Turn bolts **1–10** an additional 90°.

CRANKSHAFT (Continued)

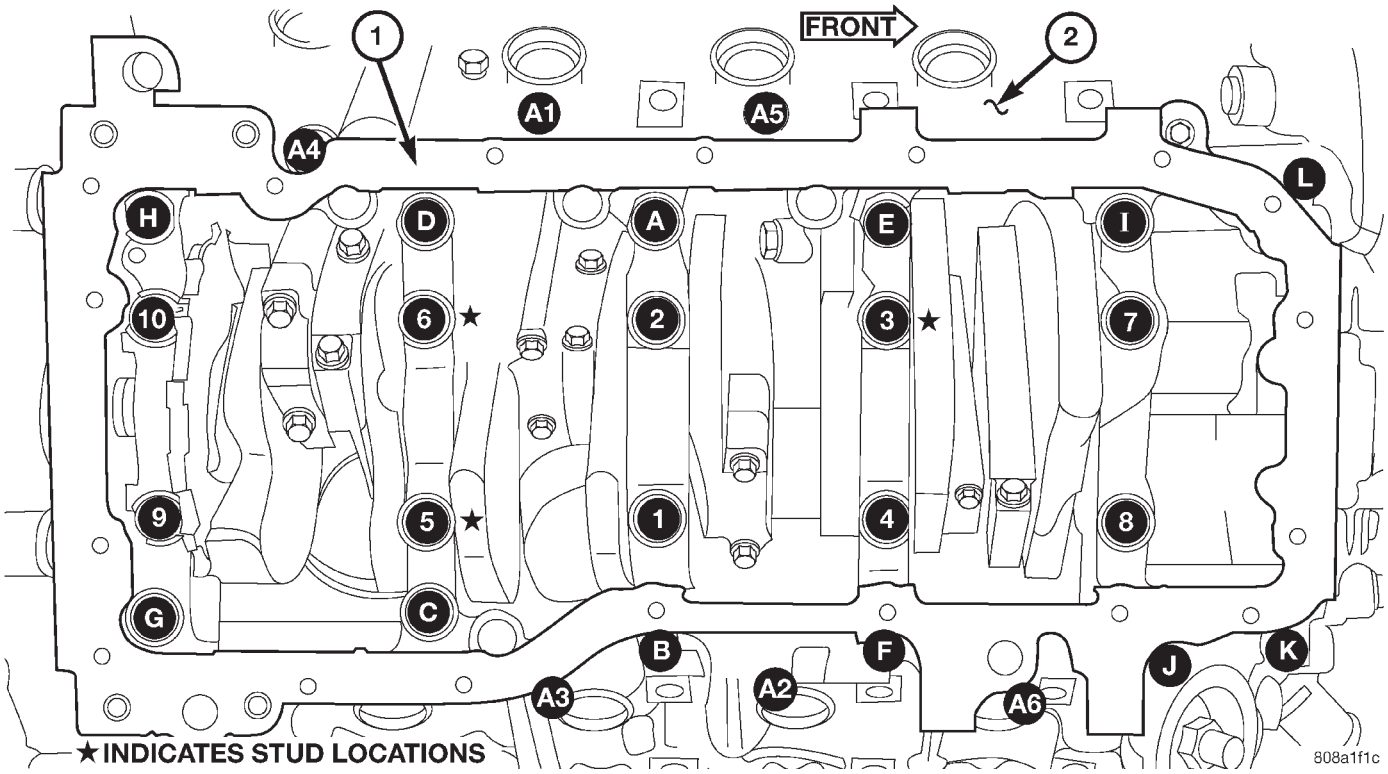


Fig. 58 Bedplate Tightening Sequence

1 - BEDPLATE
2 - CYLINDER BLOCK

• Tighten bolts **A1– A6** to 27 N·m (20 ft. lbs.)

(8) Measure crankshaft end play. (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT - STANDARD PROCEDURE).

(9) Install the connecting rods and measure side clearance. (Refer to 9 - ENGINE/ENGINE BLOCK/ CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

(10) Position the oil pan gasket/windage tray, using a new o-ring, install the oil pickup tube. Torque the bolt to 28N·n (20 ft. lbs.) torque the nuts to 28N·m (20 ft. lbs.).

(11) Install the oil pan. Torque the retaining bolts to 15 N·m (11 ft. lbs.) in the sequence shown (Fig. 59).

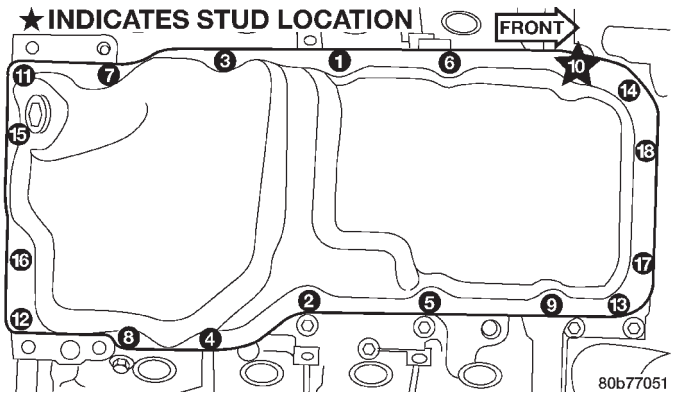


Fig. 59 Oil Pan Tightening Sequence

(12) Install the engine (Refer to 9 - ENGINE - INSTALLATION).

CRANKSHAFT MAIN BEARINGS

STANDARD PROCEDURE—CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Crankshaft removed from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

CRANKSHAFT MAIN BEARINGS (Continued)

CRANKSHAFT MAIN BEARING SELECTION

The main bearings are “select fit” to achieve proper oil clearances. For main bearing selection, the crankshaft position sensor target wheel has grade identification marks stamped into it (Fig. 60). These marks are read from left to right, corresponding with journal number 1, 2, 3, 4 and 5. The crankshaft position sensor target wheel is mounted to the number 8 counter weight on the crankshaft.

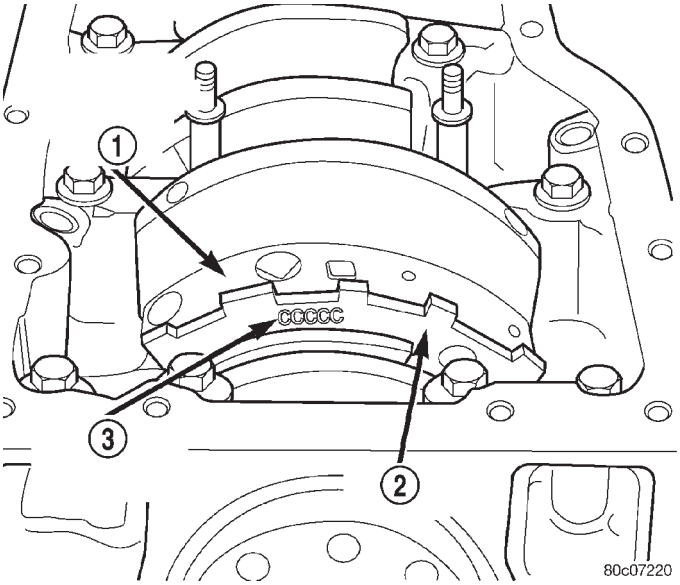


Fig. 60 Main Bearing Markings on Target Wheel

1 - REARMOST CRANKSHAFT COUNTER WEIGHT
2 - TARGET WHEEL
3 - MAIN BEARING SELECT FIT MARKINGS

NOTE: Service main bearings are coded. These codes identify what size (grade) the bearing is.

MAIN BEARING SELECTION CHART—4.7L

GRADE MARKING	SIZE mm (in.)	FOR USE WITH JOURNAL SIZE
A	0.008 mm U/S (0.0004 in.) U/S	63.488–63.496 mm (2.4996–2.4999 in.)
B	NOMINAL	63.496–63.504 mm (2.4999–2.5002 in.)
C	0.008 mm O/S (0.0004 in.) O/S	63.504–63.512 mm (2.5002–2.5005 in.)

INSPECTION

Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated (Fig. 61).

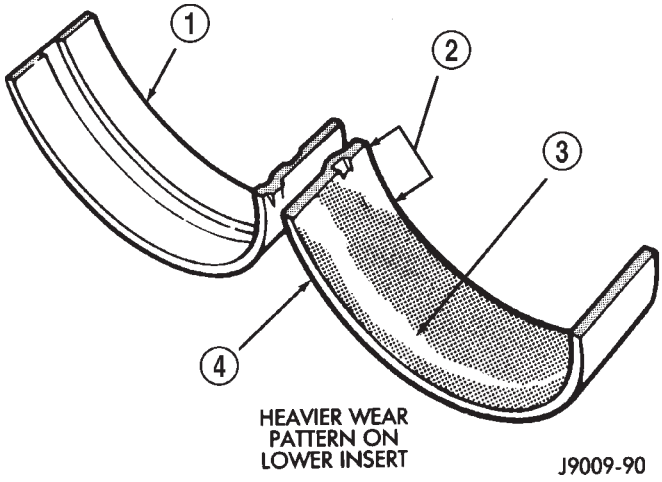


Fig. 61 Main Bearing Wear Patterns

1 - UPPER INSERT
2 - NO WEAR IN THIS AREA
3 - LOW AREA IN BEARING LINING
4 - LOWER INSERT

NOTE: If any of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.

CRANKSHAFT OIL SEAL - FRONT

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove A/C compressor mouning fasteners and set aside.

(4) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(5) Remove upper radiator hose.

(6) Disconnect electrical connector for fan mounted inside radiator shroud.

(7) Remove radiator shroud attaching fasteners.

NOTE: Transmission cooler line snaps into shroud lower right hand corner.

CRANKSHAFT OIL SEAL - FRONT (Continued)

(8) Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(9) Remove crankshaft damper bolt.

(10) Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (Fig. 62).

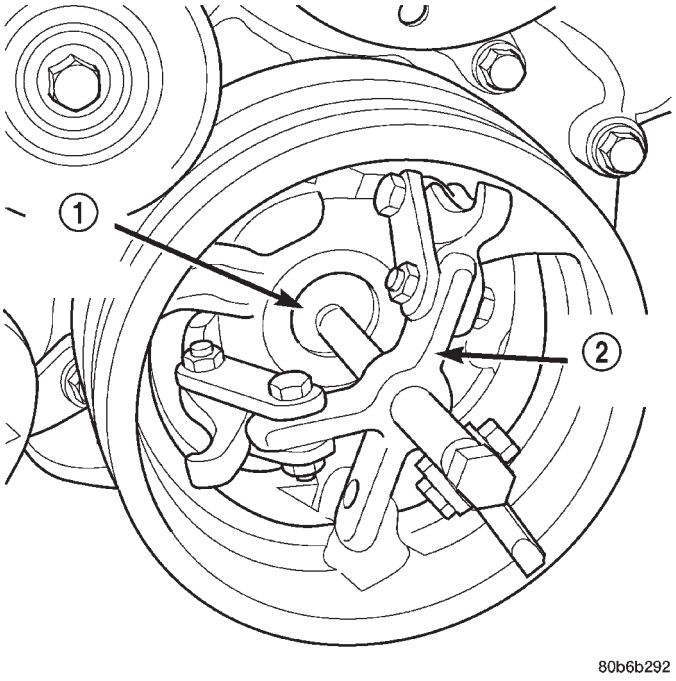


Fig. 62 Crankshaft Damper—Removal

1 - SPECIAL TOOL 8513 INSERT
2 - SPECIAL TOOL 1026

(11) Using Special Tool 8511, remove crankshaft front seal (Fig. 63).

INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

(1) Using Special Tool 8348 and 8512, install crankshaft front seal (Fig. 64).

(2) Install vibration damper (Refer to 9 - ENGINE/ ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(3) Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(4) Install upper radiator hose.

(5) Install A/C compressor and tighten fasteners to 54 N·m (40 ft. lbs.).

(6) Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

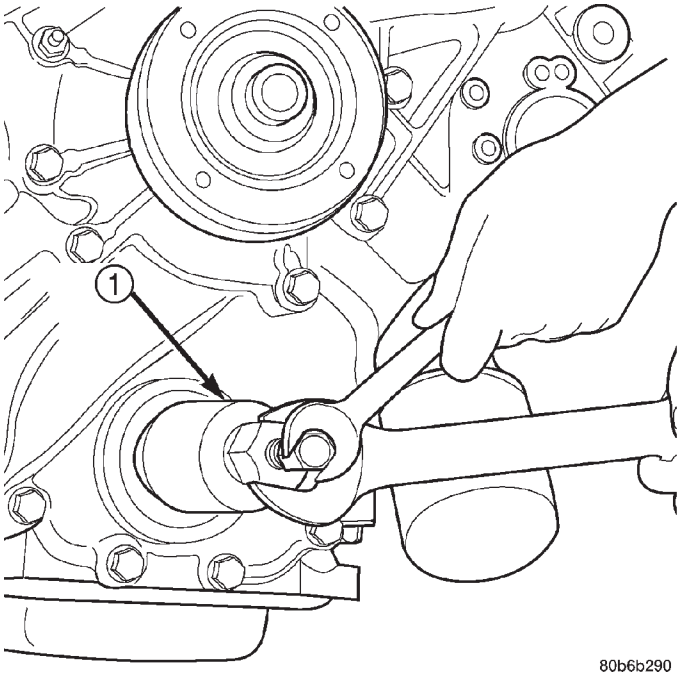


Fig. 63 Crankshaft Front Seal—Removal

1 - SPECIAL TOOL 8511

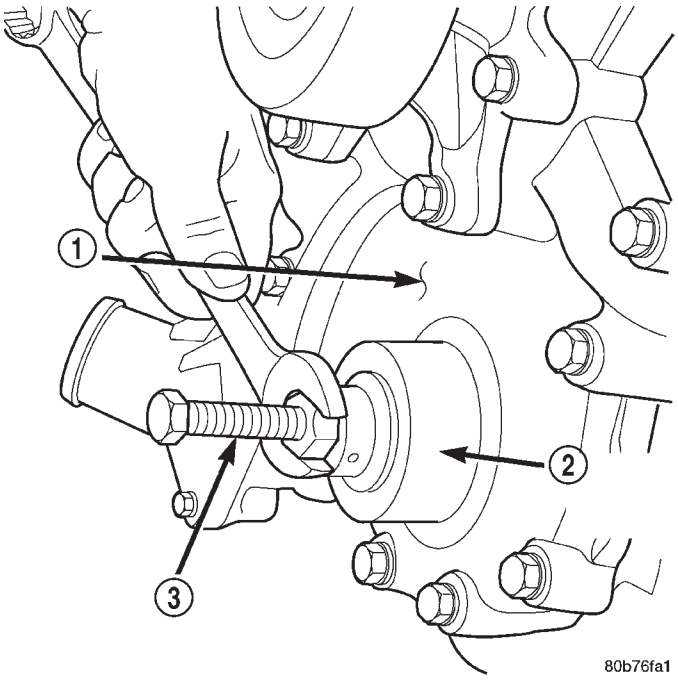


Fig. 64 Crankshaft Front Seal—Installation

1 - TIMING CHAIN COVER
2 - SPECIAL TOOL 8348
3 - SPECIAL TOOL 8512

(7) Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(8) Connect negative cable to battery.

CRANKSHAFT OIL SEAL - REAR

REMOVAL

NOTE: This procedure can be performed in vehicle.

(1) If being preformed in vehicle, remove the transmission.
(2) Remove the flexplate (Refer to 9 - ENGINE/ ENGINE BLOCK/FLEX PLATE - REMOVAL).

NOTE: The crankshaft oil seal CAN NOT be reused after removal.

NOTE: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.

(3) Using Special Tool 8506 (Fig. 65), remove the crankshaft rear oil seal.

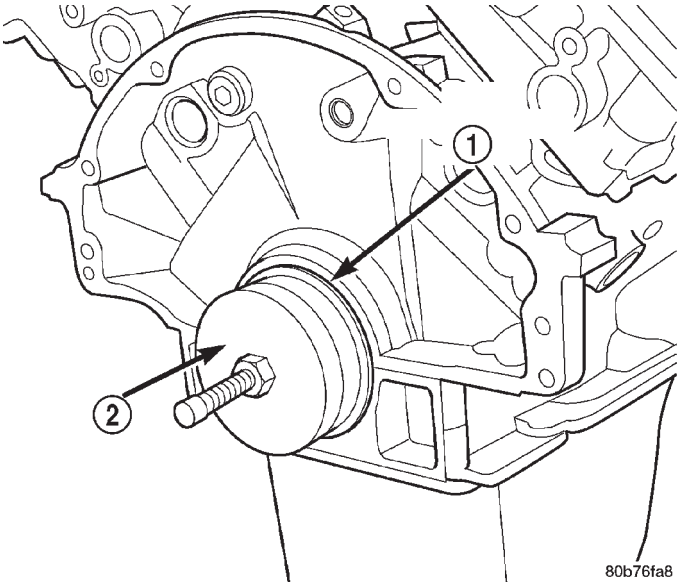


Fig. 65 Crankshaft Rear Oil Seal Removal

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8506

INSTALLATION

(1) Position the magnetic seal guide Special Tool 8349–2 (Fig. 66) onto the crankshaft rear face. Then position the crankshaft rear oil seal onto the guide.
(2) Using Special Tools 8349 Crankshaft Rear Oil Seal Installer and C-4171 Driver Handle (Fig. 67), with a hammer, tap the seal into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.

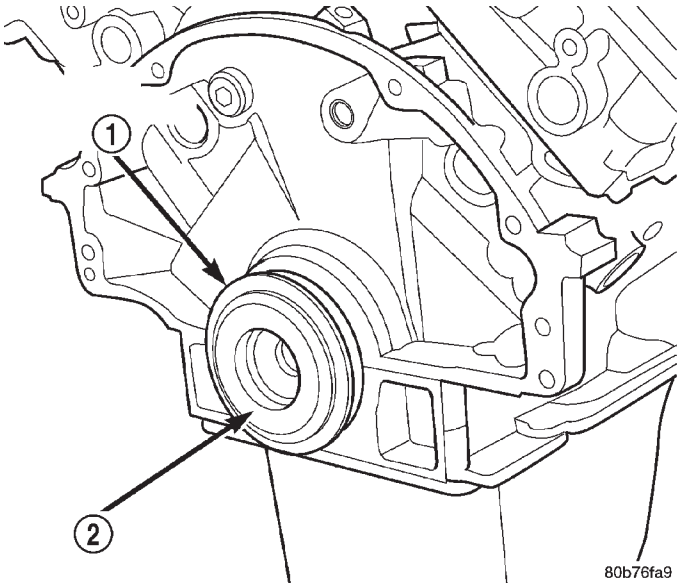


Fig. 66 Crankshaft Rear Oil Seal Guide Special Tool 8349–2 and Oil

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349–2 GUIDE

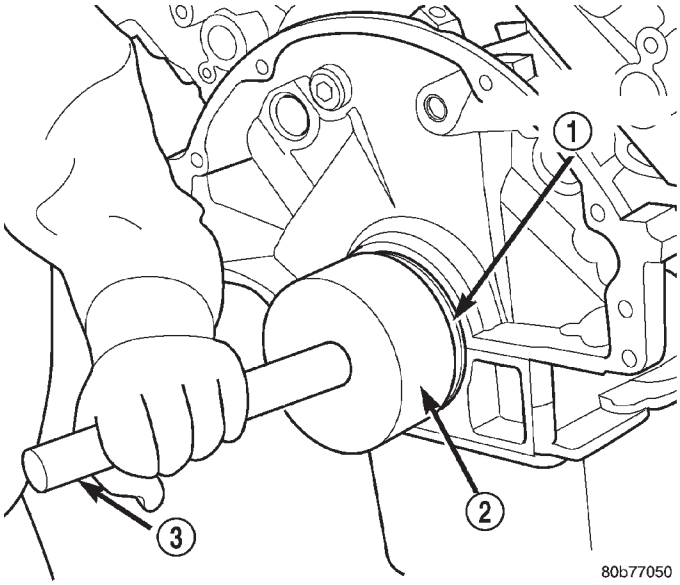


Fig. 67 Crankshaft Rear Oil Seal Installation

1 - REAR CRANKSHAFT SEAL
2 - SPECIAL TOOL 8349–1 INSTALLER
3 - SPECIAL TOOL C-4171 HANDLE

(3) Install the flexplate.
(4) Install the transmission.

FLEX PLATE

REMOVAL

(1) Remove the transmission.
(2) Remove the bolts and flexplate.

INSTALLATION

(1) Position the flexplate onto the crankshaft and install the bolts hand tight.
(2) Tighten the flexplate retaining bolts to 60 N·m (45 ft. lbs.) in the sequence shown (Fig. 68).
(3) Install the transmission.

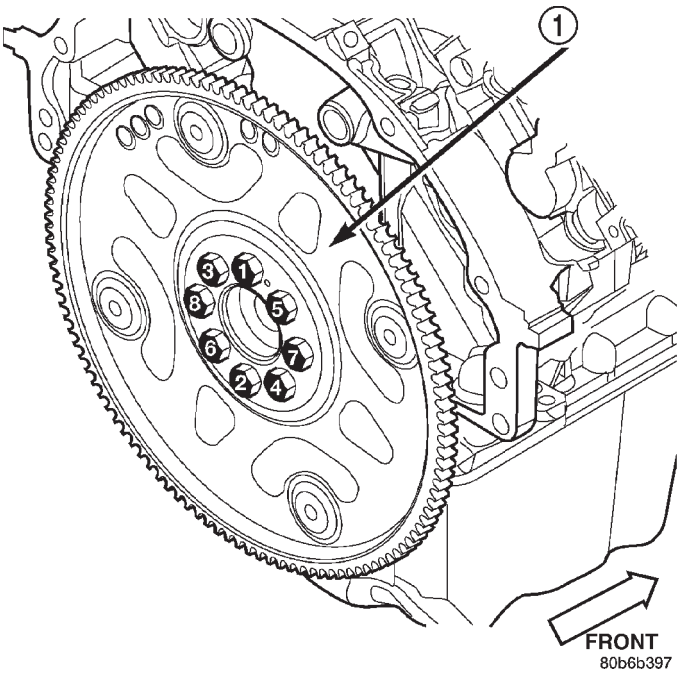


Fig. 68 Flexplate Tightening Sequence

1 - FLEXPLATE

PISTON & CONNECTING ROD

DESCRIPTION

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

The pistons are made of a high strength aluminum alloy. The anodized top ring groove and crown has been replaced with a coated top ring that is blue in color on the bottom surface. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The connecting rods are made of forged powdered metal, with a “fractured cap” design. A pressed fit piston pin is used to attach the piston and connecting rod on the 4.7L. The 4.7L HO uses a full floating piston pin.

STANDARD PROCEDURE—PISTON FITTING

(1) To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
(2) Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B (Fig. 70).
(3) The coated pistons will be serviced with the piston pin and connecting rod pre-assembled.
(4) The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results (Fig. 69). Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
(5) Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.

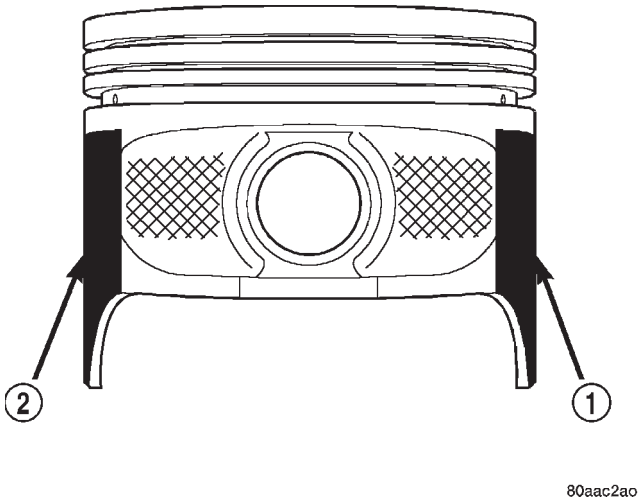


Fig. 69 Moly Coated Piston—Typical

1 - MOLY COATED
2 - MOLY COATED

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove the following components:
• Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
• Cylinder head covers (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) -

PISTON & CONNECTING ROD (Continued)

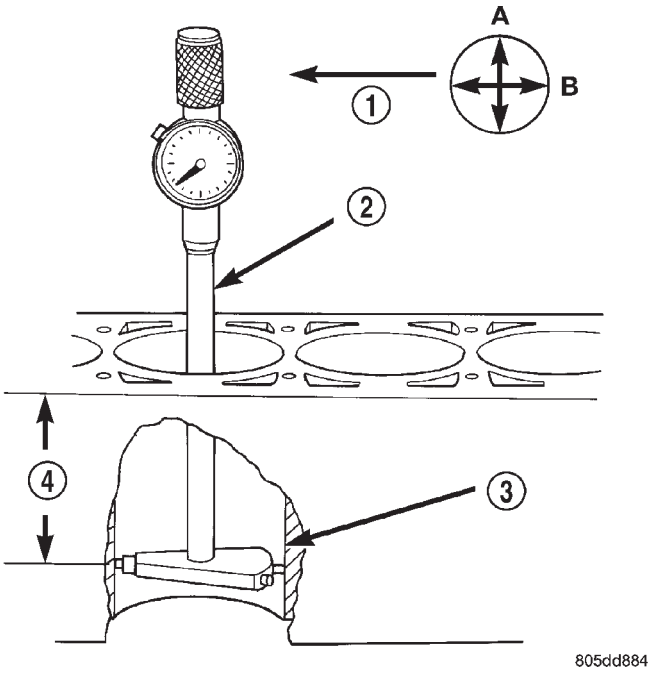


Fig. 70 Bore Gauge—Typical

1 - FRONT
2 - BORE GAUGE
3 - CYLINDER BORE
4 - 38 MM (1.5 in)

REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

- Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
- Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

(3) If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

NOTE: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

(4) Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool (Fig. 71).

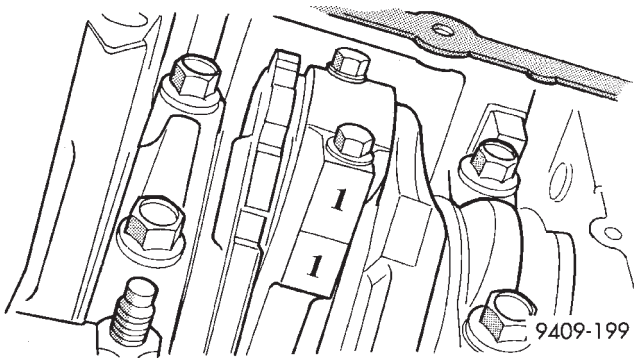


Fig. 71 Identify Connecting Rod to Cylinder Position—Typical

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.

(5) Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

(6) Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.

(7) Carefully remove piston rings from piston(s), starting from the top ring down.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning devise to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

(1) Using a suitable cleaning solvent clean the pistons in warm water and towel dry.

(2) Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

PISTON & CONNECTING ROD (Continued)

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

(1) Before installing piston and connecting rod assemblies into the bore, install the piston rings.

(2) Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**

(3) Position bearing onto connecting rod. Ensure that hole in bearing shell aligns with hole in connecting rod. Lubricate bearing surface with clean engine oil.

(4) Install Special Tool 8507 Connecting Rod Guides into connecting rod bolt threads (Fig. 72).

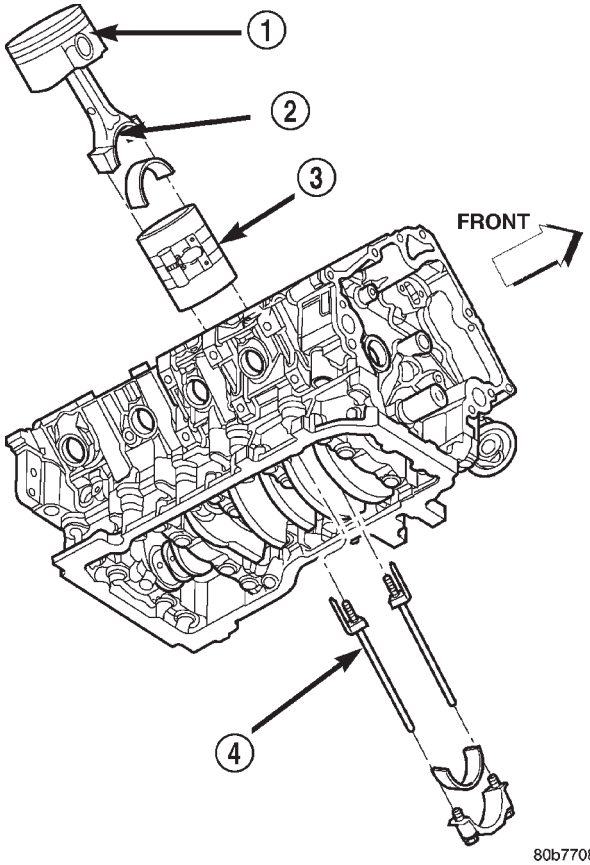


Fig. 72 Piston and Connecting Rod—Installation

1 - "F" TOWARD FRONT OF ENGINE
2 - OIL SLINGER SLOT
3 - RING COMPRESSOR
4 - SPECIAL TOOL 8507

(5) The pistons are marked on the piston pin bore surface with an raised "F" indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks. The connecting rod oil slinger slot faces the front of the engine (Fig. 73).

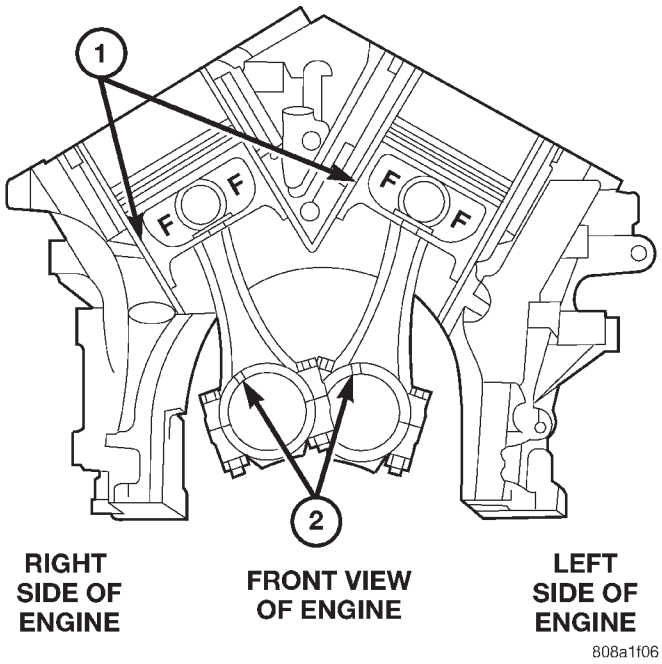


Fig. 73 Piston and Connecting Rod Orientation

1 - MAJOR THRUST SIDE OF PISTON
2 - OIL SLINGER SLOT

(6) Wipe cylinder bore clean and lubricate with engine oil.

(7) Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.

(8) Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

(9) Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 27 N·m (20 ft. lbs.) plus 90°.

(10) Install the following components:

- Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
- Timing chain and cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

PISTON & CONNECTING ROD (Continued)

- Cylinder head covers (Refer to 9 - ENGINE/ CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
- Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

(11) Fill crankcase with proper engine oil to correct level.

(12) Connect negative cable to battery.

PISTON RINGS

STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

(1) Wipe the cylinder bore clean.

(2) Insert the ring in the cylinder bore.

NOTE: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

(3) Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.

(4) Using a feeler gauge check the ring end gap (Fig. 74). Replace any rings not within specification.

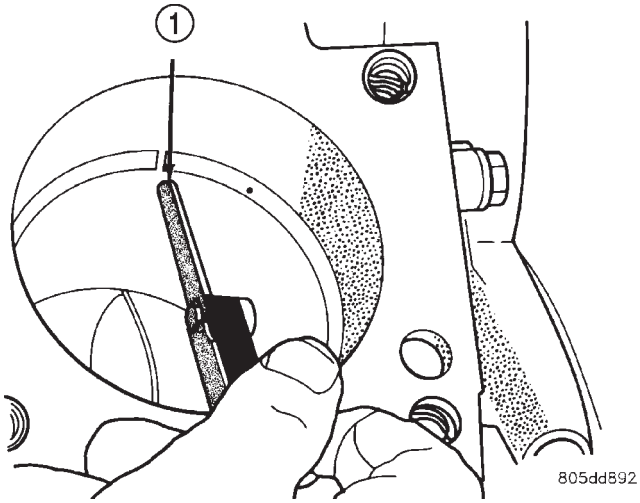


Fig. 74 Ring End Gap Measurement - Typical

1 - FEELER GAUGE

PISTON RING SIDE CLEARANCE

NOTE: Make sure the piston ring grooves are clean and free of nicks and burrs.

(5) Measure the ring side clearance as shown (Fig. 75)make sure the feeler gauge fits snugly between the ring land and the ring. Replace any ring not within specification.

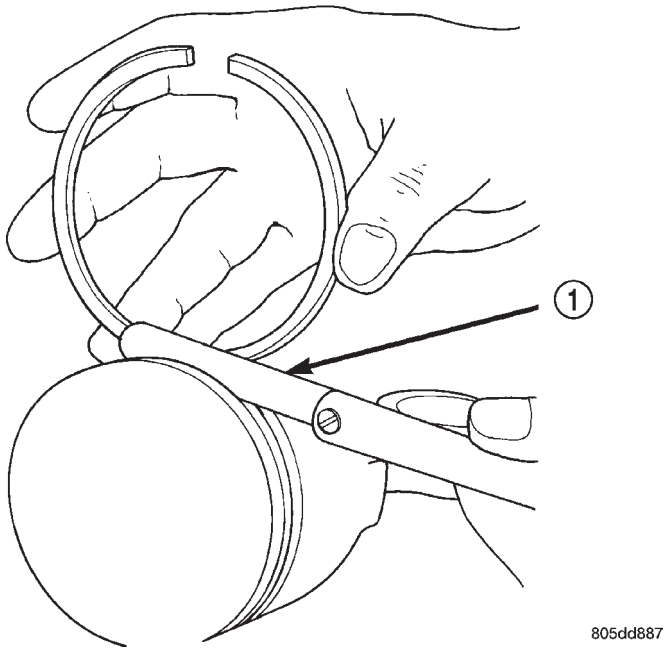


Fig. 75 Measuring Piston Ring Side Clearance

1 - FEELER GAUGE

(6) Rotate the ring around the piston, the ring must rotate in the groove with out binding.

PISTON RING SPECIFICATION CHART

Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	.051-.094mm (0.0020- .0037 in.)	0.11mm (0.004 in.)
Intermediate Ring	0.04-0.08mm (0.0016-0.0031 in.)	0.10mm (0.004 in.)
Oil Control Ring (Steel Rails)	.019-.229mm (.0007-.0090 in.)	.25mm (0.010 in.)
Ring Position	**Ring Gap**	**Wear Limit**
Upper Ring	0.23-0.39mm (0.009-0.015 in.)	0.43mm (0.0017 in.)
Intermediate Ring	0.40-0.66mm (0.015-0.026 in.)	0.74mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.028-0.79mm (0.011- 0.031 in.)	1.55mm (0.061 in.)

PISTON RINGS (Continued)

(7) The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

NOTE: Piston rings are installed in the following order:

- **Oil ring expander.**
- **Upper oil ring side rail.**
- **Lower oil ring side rail.**
- **No. 2 Intermediate piston ring.**
- **No. 1 Upper piston ring.**

(8) Install the oil ring expander.

(9) Install upper side rail (Fig. 76) by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.

(10) Install No. 2 intermediate piston ring using a piston ring installer (Fig. 77).

(11) Install No. 1 upper piston ring using a piston ring installer (Fig. 77).

(12) Position piston ring end gaps as shown in (Fig. 78). It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.

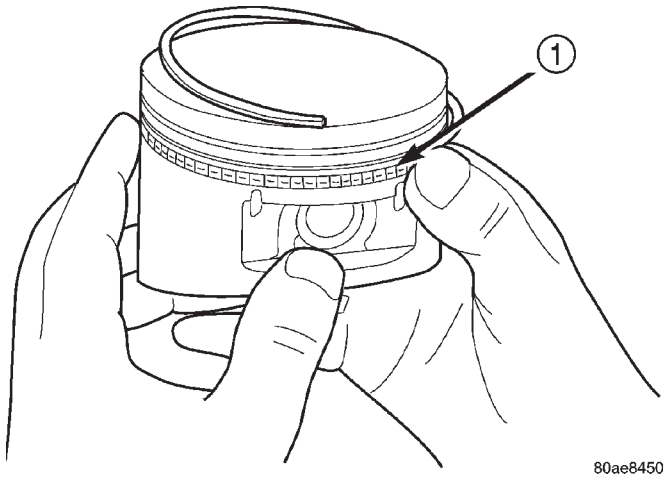


Fig. 76 Side Rail—Installation

1 - SIDE RAIL END

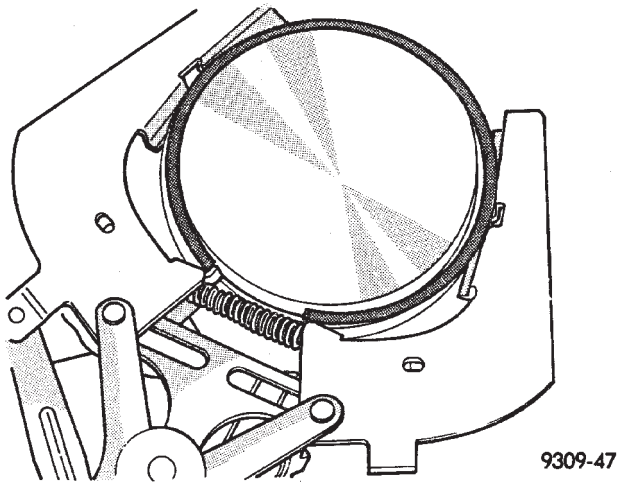


Fig. 77 Upper and Intermediate Rings—Installation

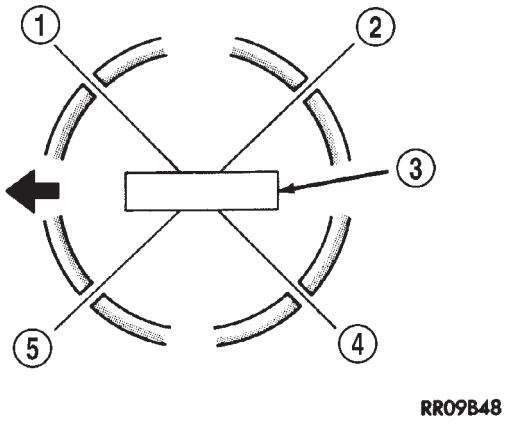


Fig. 78 Piston Ring End Gap Position

1 - SIDE RAIL UPPER
2 - NO. 1 RING GAP
3 - PISTON PIN
4 - SIDE RAIL LOWER
5 - NO. 2 RING GAP AND SPACER EXPANDER GAP

VIBRATION DAMPER

REMOVAL

(1) Disconnect negative cable from battery.

(2) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

NOTE: Transmission cooler line snaps into shroud lower right hand corner.

VIBRATION DAMPER (Continued)

(3) Remove crankshaft damper bolt.
(4) Remove damper using Special Tools 8513 Insert and 1026 Three Jaw Puller (Fig. 79).

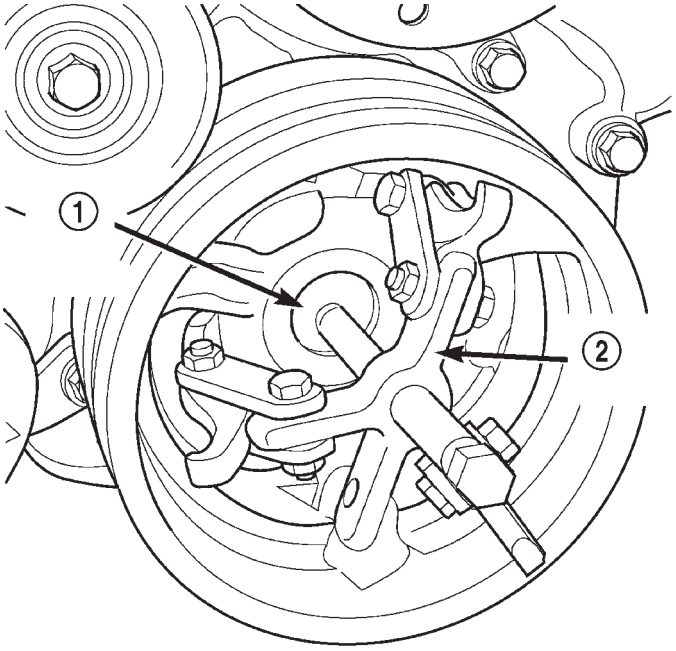


Fig. 79 Crankshaft Damper—Removal

1 - SPECIAL TOOL 8513 INSERT
2 - SPECIAL TOOL 1026

INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

(1) Align crankshaft damper slot with key in crankshaft. Slide damper onto crankshaft slightly.

CAUTION: Special Tool 8512A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

(2) Assemble Special Tool 8512–A as follows, The nut is threaded onto the shaft first. Then the roller bearing is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST**face the nut). Then the hardened washer slides onto the threaded rod (Fig. 80). Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or (Loctite No. 771).
(3) Using Special Tool 8512A, press damper onto crankshaft (Fig. 81).
(4) Install then tighten crankshaft damper bolt to 175 N·m (130 ft. lbs.).

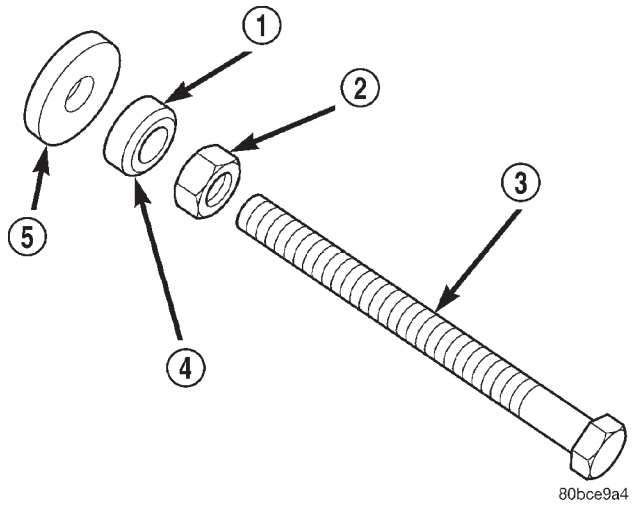


Fig. 80 Proper Assembly Method for Special Tool 8512–A

1 - BEARING
2 - NUT
3 - THREADED ROD
4 - BEARING HARDENED SURFACE (FACING NUT)
5 - HARDENED WASHER

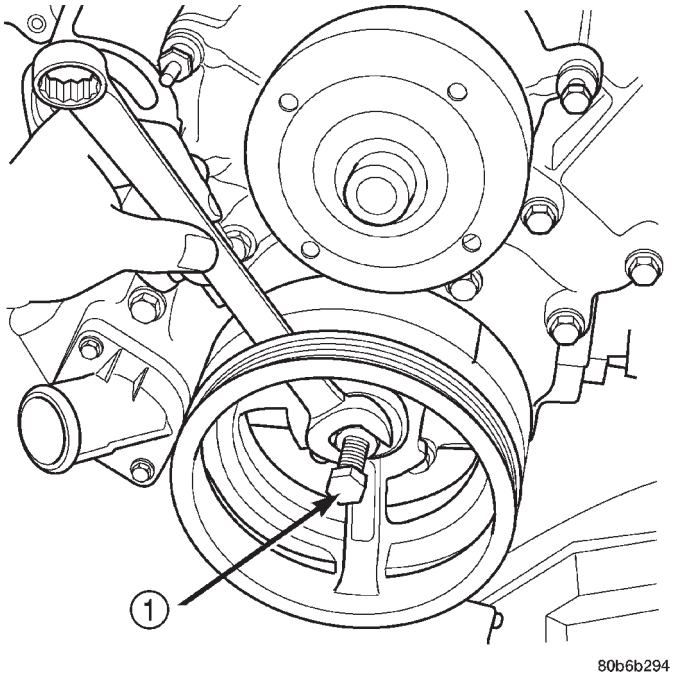


Fig. 81 Crankshaft Damper Installation

1 - SPECIAL TOOL 8512A

(5) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
(6) Connect negative cable to battery.

STRUCTURAL COVER

DESCRIPTION

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine bedplate.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

REMOVAL

(1) Raise vehicle on hoist.
(2) Remove the left hand exhaust pipe from exhaust manifold.
(3) Loosen the right hand exhaust manifold-to-exhaust pipe retaining bolts.
(4) Remove the eight bolts retaining structural cover (Fig. 82) in the sequence shown.
(5) Pivot the exhaust pipe downward and remove the structural cover.

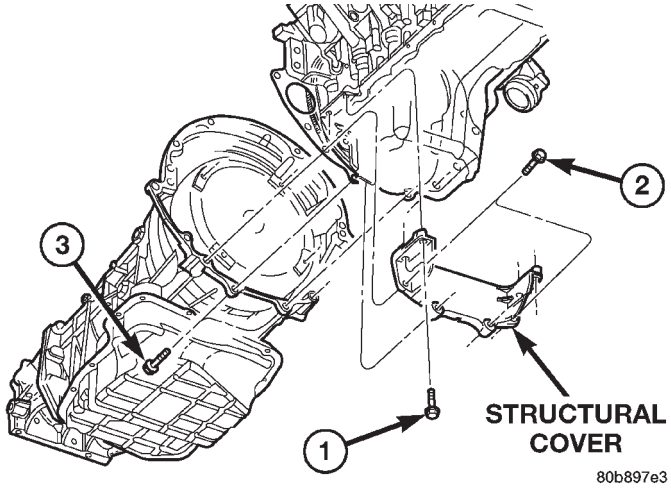


Fig. 82 Structural Cover

INSTALLATION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.

(1) Position the structural cover in the vehicle.
(2) Install all four bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.
(3) Install the four cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

(4) Starting with the two rear cover-to-engine bolts, tighten bolts (1) (Fig. 83) to 54 N·m (40 ft. lbs.), then tighten bolts (2) (Fig. 83) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.

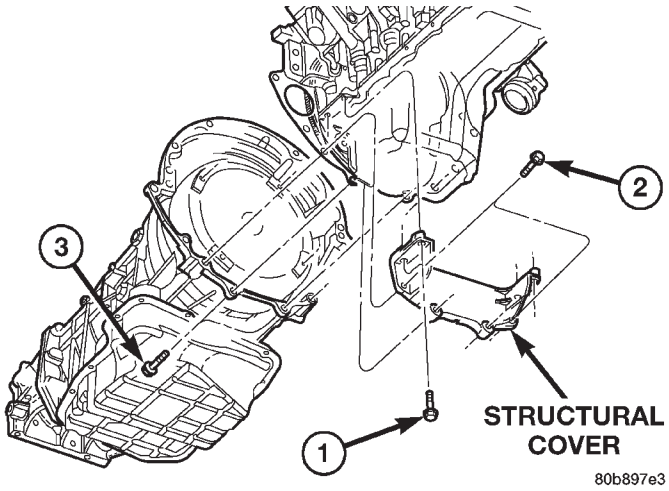


Fig. 83 Structural Cover

(5) Install the exhaust pipe on left hand exhaust manifold.
(6) Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20–26 N·m (15–20 ft. lbs.).

FRONT MOUNT

REMOVAL

(1) Disconnect the negative cable from the battery.

CAUTION: Remove the fan blade, fan clutch and fan shroud before raising engine. Failure to do so may cause damage to the fan blade, fan clutch and fan shroud.

(2) Remove the engine oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).
(3) Support the engine with a suitable jack and a block of wood across the full width of the engine oil pan.

FRONT MOUNT (Continued)

(4) Remove the four cylinder block-to-insulator mount bolts and the nut form the engine insulator mount through bolt (Fig. 84) (Fig. 85)

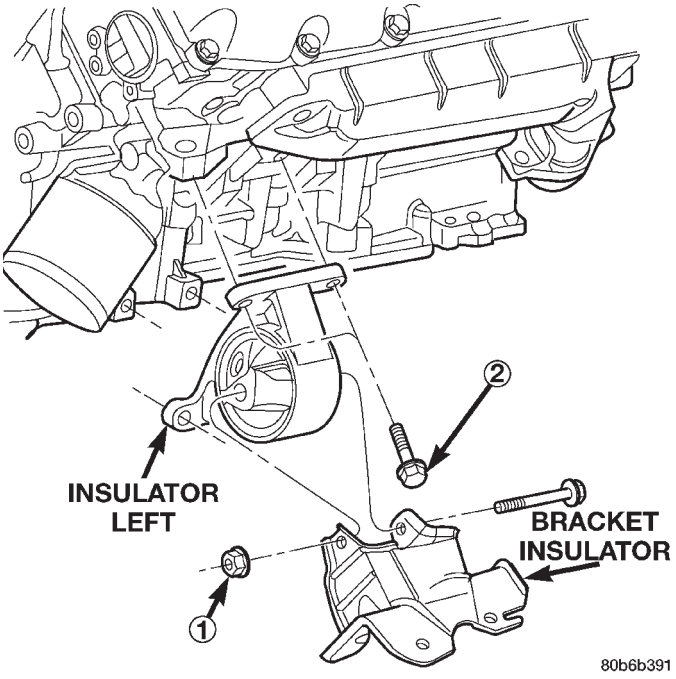


Fig. 84 Engine Insulator Mount 4.7 LEFT

1 - NUT
2 - BOLT

(5) Using the jack, raise the engine high enough to remove the engine insulator mount through bolt and the insulator mount.

INSTALLATION

(1) Position the insulator mount and install the insulator mount through bolt.

(2) Lower the engine until the four cylinder block-to-insulator mount bolts can be installed.

(3) Remove the jack and block of wood.

(4) Torque the cylinder block-to-insulator mount bolts to 61N·m (45 ft. lbs.).

(5) Install and torque the through bolt retaining nut to 61N·m (45 ft. lbs.).

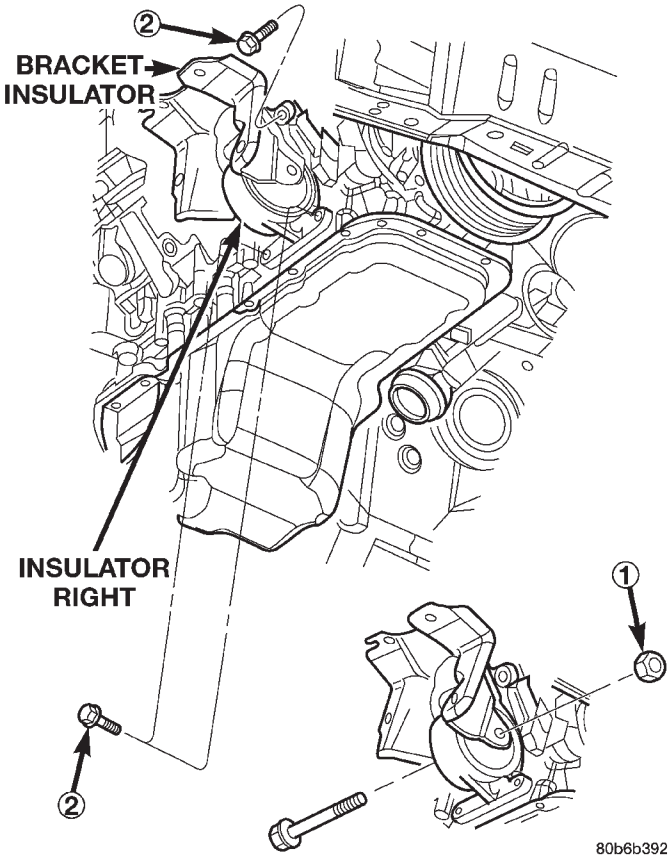


Fig. 85 Engine Insulator Mount 4.7 Right

1 - NUT
2 - BOLT

REAR MOUNT

REMOVAL

(1) Raise vehicle on hoist.

(2) Using a suitable jack, support transmission.

(3) Remove the lock nut from the insulator mount through bolt and the four insulator-to-transmission mounting bolts.

(4) Raise the transmission enough to remove the through bolt and insulator mount (Fig. 86) (Fig. 87).

REAR MOUNT (Continued)

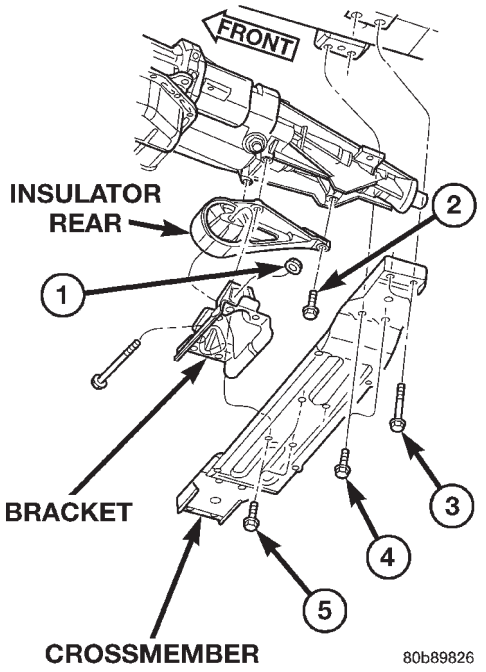


Fig. 86 Engine Rear Mount—4X2

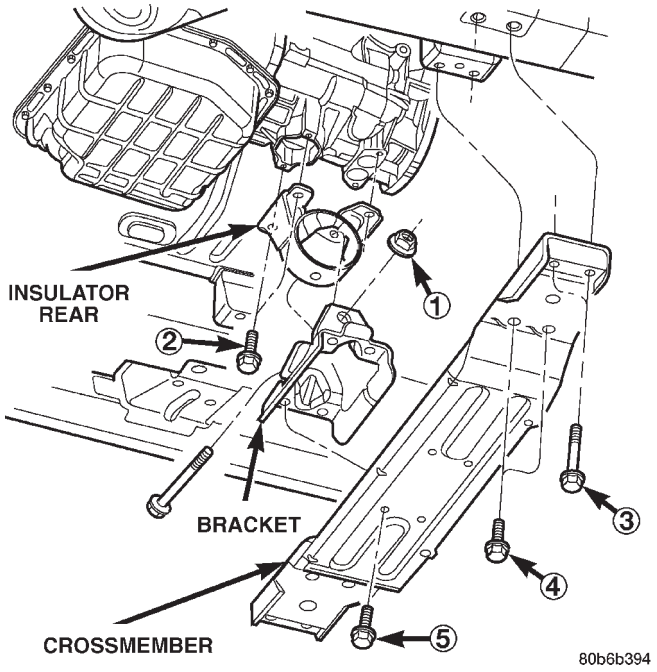


Fig. 87 Engine Rear Mount—4X4

ITEM	DESCRIPTION	TORQUE
1	NUT (Qty 1)	45 N·m (33 ft. lbs)
2	BOLT (Qty 4)	46 N·m (34 ft. lbs.)
3	BOLT (Qty 2 Per Side)	68 N·m (50 ft. lbs.)
4	BOLT (Qty 2 Per Side)	46 N·m (34 ft. lbs.)
5	BOLT (Qty 4)	46 N·m (34 ft. lbs.)

INSTALLATION

(1) Position the insulator mount and install the through bolt.

(2) Lower the transmission enough to install the four insulator-to-transmission mounting bolts. Torque the bolts to 46N·m (34 ft. lbs.).

(3) Install the through bolt lock nut. Torque nut to 68N·m (50 ft. lbs.).

(4) Remove jack, lower vehicle.

LUBRICATION

DESCRIPTION

The lubrication system (Fig. 88) is a full flow filtration pressure feed type.

OPERATION

Oil from the oil pan is pumped by a gerotor type oil pump directly mounted to the crankshaft nose. Oil pressure is controlled by a relief valve mounted inside the oil pump housing. For lubrication flow refer to (Fig. 88).

The camshaft exhaust valve lobes and rocker arms are lubricated through a small hole in the rocker arm; oil flows through the lash adjuster then through the rocker arm and onto the camshaft lobe. Due to the orentation of the rocker arm, the camshaft intake lobes are not lubed in the same manner as the exhaust lobes. The intake lobes are lubed through internal passages in the camshaft. Oil flows through a bore in the number 3 camshaft bearing bore, and as the camshaft turns, a hole in the camshaft aligns with the hole in the camshaft bore allowing engine oil to enter the camshaft tube. The oil then exits through 1.6mm (0.063 in.) holes drilled into the intake lobes, lubricating the lobes and the rocker arms.

LUBRICATION (Continued)

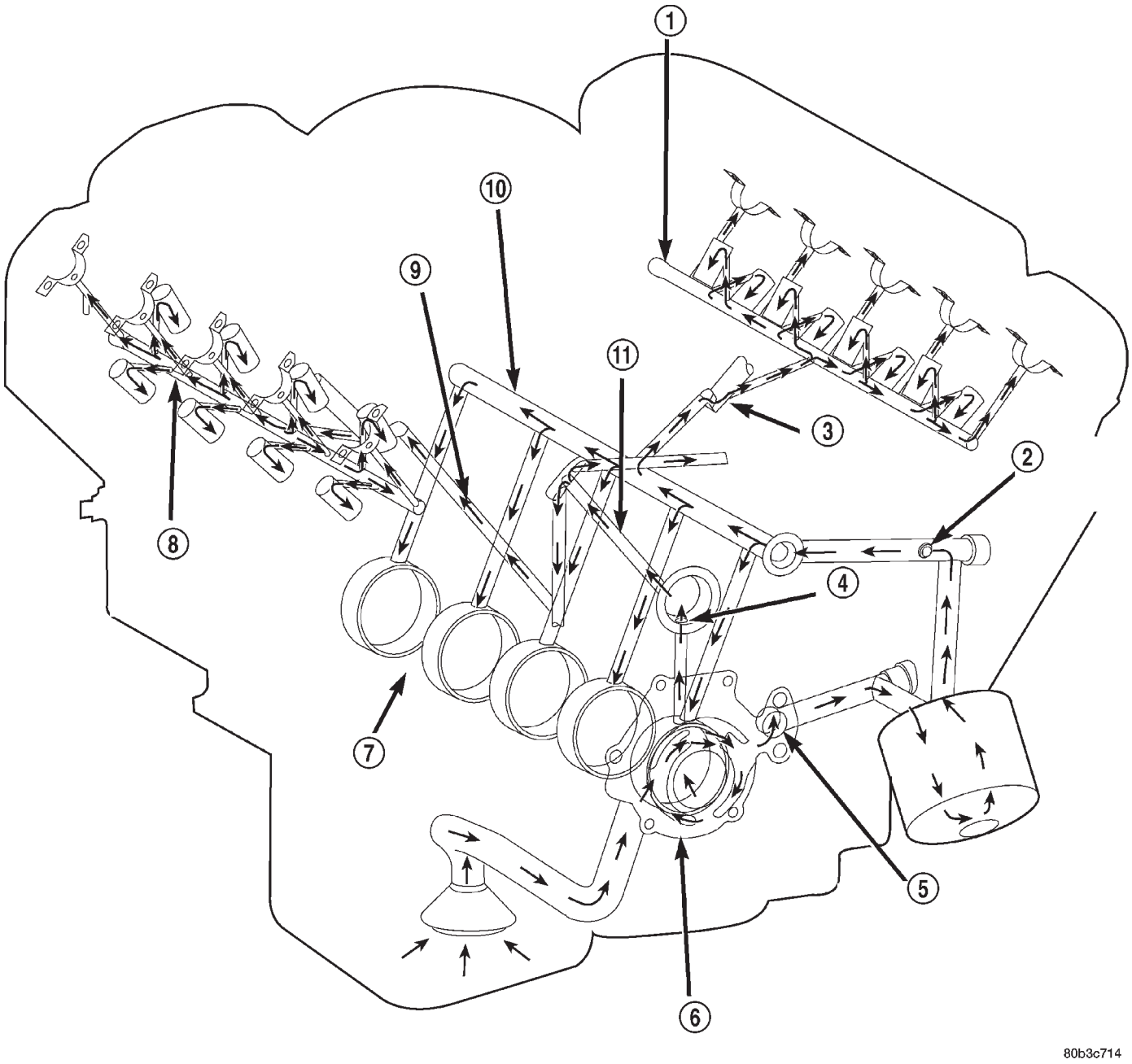


Fig. 88 Engine Oil Lubrication System

1 - LEFT CYLINDER HEAD OIL GALLERY
2 - OIL PRESSURE SENSOR LOCATION
3 - TO LEFT CYLINDER HEAD
4 - OIL FEED TO IDLER SHAFT
5 - OIL PUMP OUTLET TO BLOCK
6 - OIL PUMP
7 - TO CRANKSHAFT MAIN JOURNALS
8 - RIGHT CYLINDER HEAD OIL GALLERY
9 - TO RIGHT CYLINDER HEAD
10 - CYLINDER BLOCK MAIN GALLERY
11 - OIL FEED TO BOTH SECONDARY TENSIONERS

LUBRICATION (Continued)

ENGINE LUBRICATION FLOW CHART—BLOCK: TABLE 1

FROM	TO
Oil Pickup Tube	Oil Pump
Oil Pump	Oil Filter
Oil Filter	Block Main Oil Gallery
Block Main Oil Gallery	1. Crankshaft Main Journal 2. Left Cylinder Head* 3. Right Cylinder Head*
Crankshaft Main Journals	Crankshaft Rod Journals
Crankshaft Number One Main Journal	1.Front Timing Chain Idler Shaft 2.Both Secondary Chain Tensioners
Left Cylinder Head	See Table 2
Right Cylinder Head	See Table 2
* The cylinder head gaskets have an oil restricter to control oil flow to the cylinder heads.	

ENGINE LUBRICATION FLOW CHART—CYLINDER HEADS: TABLE 2

FROM	TO
Cylinder Head Oil Port (in bolt hole)	Diagonal Cross Drilling to Main Oil Gallery
Main Oil Gallery (drilled through head from rear to front)	1. Base of Camshaft Towers 2. Lash Adjuster Towers
Base of Camshaft Towers	Vertical Drilling Through Tower to Camshaft Bearings**
Lash Adjuster Towers	Diagonal Drillings to Hydraulic Lash Adjuster Pockets
** The number three camshaft bearing journal feeds oil into the hollow camshaft tubes. Oil is routed to the intake lobes, which have oil passages drilled into them to lubricate the rocker arms.	

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING—ENGINE OIL PRESSURE

(1) Remove oil pressure sending unit (Fig. 89)and install gauge assembly C-3292.
(2) Run engine until thermostat opens.
(3) Oil Pressure:
- Curb Idle—25 Kpa (4 psi) minimum
- 3000 rpm—170 - 550 KPa (25 - 80 psi)

(4) If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

DIAGNOSIS AND TESTING—REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:
(1) Disconnect the battery.
(2) Raise the vehicle.
(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.
(b) Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.
(4) If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

LUBRICATION (Continued)

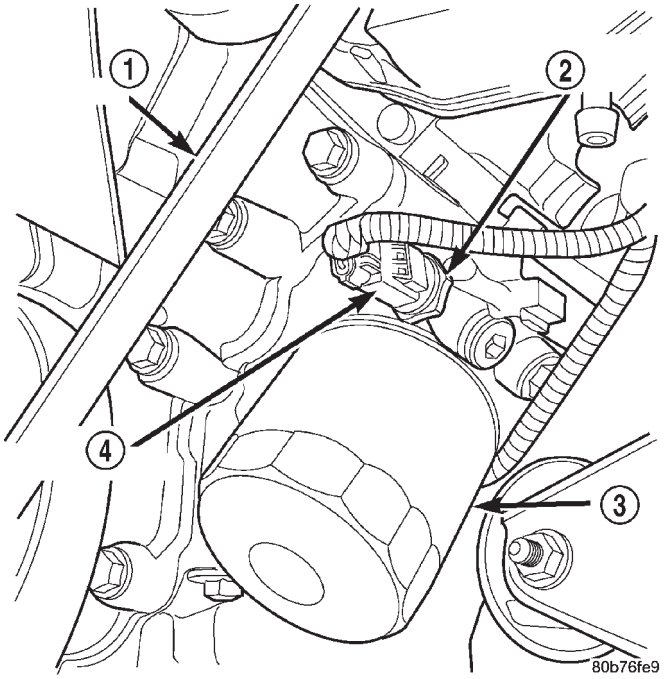


Fig. 89 Oil Pressure Sending Unit

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.

(7) After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

DIAGNOSIS AND TESTING—ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

(1) Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.

(2) Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.

(3) Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.

(4) If dye is not observed, drive the vehicle at various speeds for approximately 24km (15 miles), and repeat inspection.**If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

(1) Disconnect the breather cap to air cleaner hose at the breather cap end. Cap or plug breather cap nipple.

(2) Remove the PCV valve from the cylinder head cover. Cap or plug the PCV valve grommet.

(3) Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kpa (3 PSI) of test pressure.

(4) Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.

(5) If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.

(6) If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve and breather cap hose.

(7) Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

LUBRICATION (Continued)

If the leakage occurs at the crankshaft rear oil seal area:

(1) Disconnect the battery.
(2) Raise the vehicle.
(3) Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
(a) Circular spray pattern generally indicates seal leakage or crankshaft damage.
(b) Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
(4) If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

(5) If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

(6) For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

OIL

STANDARD PROCEDURE - ENGINE OIL

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR® provides engine oils that conform to this service grade.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 or 10W-30 in the 4.7L engines. **The 4.7L H.O. uses 10W-30 oil only.**These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation (Fig. 90).

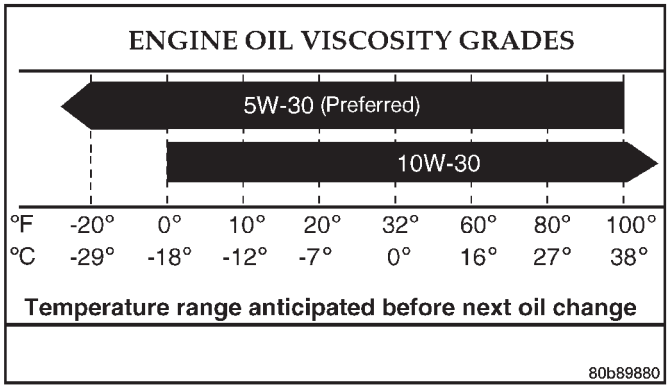


Fig. 90 Temperature/Engine Oil Viscosity - 4.7L Engine

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans (Fig. 91).

OIL LEVEL INDICATOR (DIPSTICK)

The engine oil level indicator is located on the right side of the the 4.7L engine. (Fig. 92).

OIL (Continued)



9400-9

Fig. 91 Engine Oil Container Standard Notations

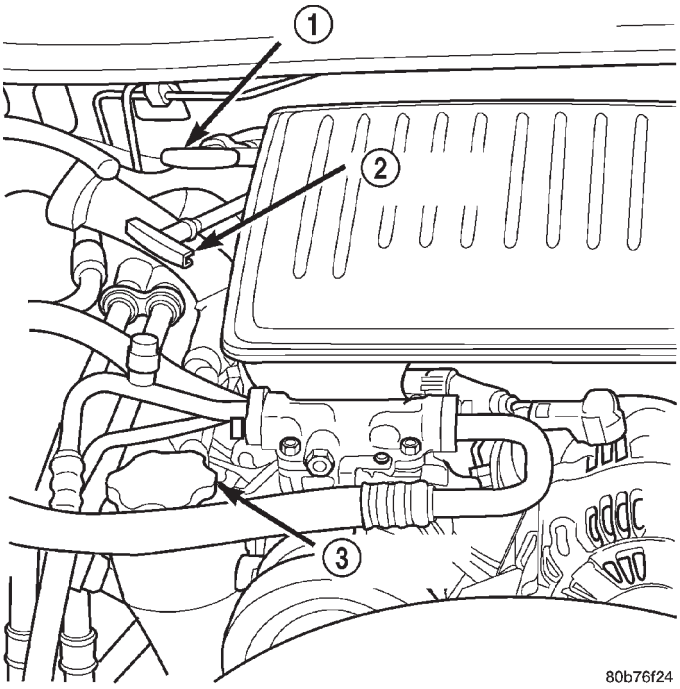


Fig. 92 Engine Oil Dipstick 4.7L Engine

1 - TRANSMISSION DIPSTICK
2 - ENGINE OIL DIPSTICK
3 - ENGINE OIL FILL CAP

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about five minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

(1) Position vehicle on level surface.

(2) With engine OFF, allow approximately ten minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.

(3) Wipe dipstick clean.

(4) Install dipstick and verify it is seated in the tube.

(5) Remove dipstick, with handle held above the tip, take oil level reading.

(6) Add oil if level is below the SAFE ZONE on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules.

Run engine until achieving normal operating temperature.

(1) Position the vehicle on a level surface and turn engine off.

(2) Remove oil fill cap.

(3) Hoist and support vehicle on safety stands.

(4) Place a suitable drain pan under crankcase drain.

(5) Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.

(6) Install drain plug in crankcase.

(7) Remove oil filter (Refer to 9 - ENGINE/LUBRICATION/OIL FILTER - REMOVAL).

(8) Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.

(9) Install oil fill cap.

(10) Start engine and inspect for leaks.

(11) Stop engine and inspect oil level.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

OIL FILTER

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

(1) Position a drain pan under the oil filter.

(2) Using a suitable oil filter wrench loosen filter.

(3) Rotate the oil filter counterclockwise (Fig. 93)to remove it from the cylinder block oil filter boss.

(4) When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

NOTE: Make sure filter gasket was removed with filter.

OIL FILTER (Continued)

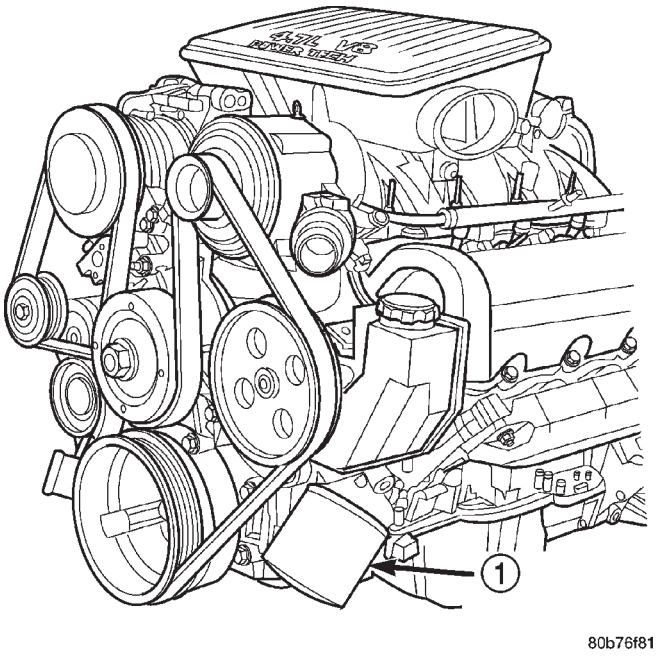


Fig. 93 Oil Filter - 4.7L Engine

1 - ENGINE OIL FILTER

(5) With a wiping cloth, clean the gasket sealing surface of oil and grime.

INSTALLATION

(1) Lightly lubricate oil filter gasket with engine oil.

(2) Thread filter onto adapter nipple. When gasket makes contact with sealing surface, (Fig. 94)hand tighten filter one full turn, do not over tighten.

(3) Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

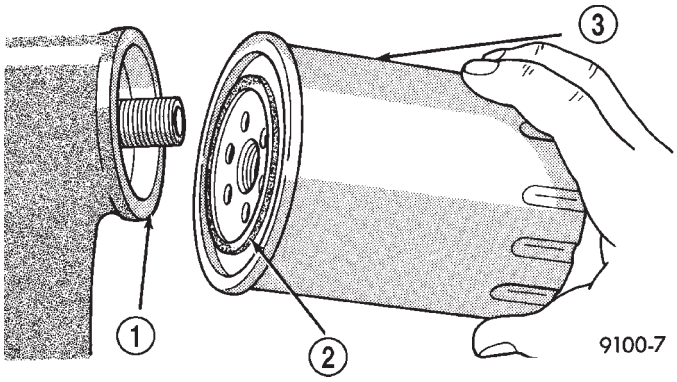


Fig. 94 Oil Filter Sealing Surface—Typical

1 - SEALING SURFACE
2 - RUBBER GASKET
3 - OIL FILTER

OIL PAN

DESCRIPTION

The engine oil pan is made of laminated steel and has a single plane sealing surface. The sandwich style oil pan gasket has an integrated windage tray and steel carrier. The sealing area of the gasket is molded with rubber and is designed to be reused as long as the gasket is not cut, torn or ripped.

REMOVAL

(1) Disconnect negative cable from battery.

(2) Raise vehicle on hoist.

(3) Remove structural cover (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).

(4) Remove exhaust system Y-pipe.

(5) Remove starter (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).

(6) Drain engine oil.

(7) Un-clip transmission lines from support on oil pan stud. Move lines for oil pan clearance.

CAUTION: DO NOT pry on the oil pan gasket when removing the oil pan, The oil pan gasket is mounted to the cylinder block in three locations and will remain attached to block when lowering oil pan. Gasket can not be removed with oil pan.

(8) Remove oil pan bolts and oil pan.

(9) Remove oil pump pickup tube.

(10) Remove oil pan gasket.

CLEANING

(1) Clean oil pan in solvent and wipe dry with a clean cloth.

(2) Clean the oil pan gasket surface. **DO NOT** use a grinder wheel or other abrasive tool to clean sealing surface.

(3) Clean oil screen and tube thoroughly in clean solvent.

INSPECTION

(1) Inspect oil drain plug and plug hole for stripped or damaged threads. Repair as necessary.

(2) Inspect the oil pan mounting flange for bends or distortion. Straighten flange, if necessary.

INSTALLATION

(1) Clean oil pan and all sealing surfaces. Inspect oil pan gasket and replace as necessary.

(2) Install oil pan gasket.

OIL PAN (Continued)

NOTE: When installing oil pan gasket/windage tray, start four pan bolts at each corner before tightening oil pickup tube. This will keep pan gasket in alignment.

(3) Install oil pump pick-up tube using a new O-ring. First tighten bolt at O-ring end of tube to 28 N·m (20 ft. lbs.). Tighten remain tube support fasteners to 28 N·m (20 ft. lbs.).

(4) Install oil pan and tighten fasteners to 15 N·m (11 ft. lbs.) (Fig. 95).

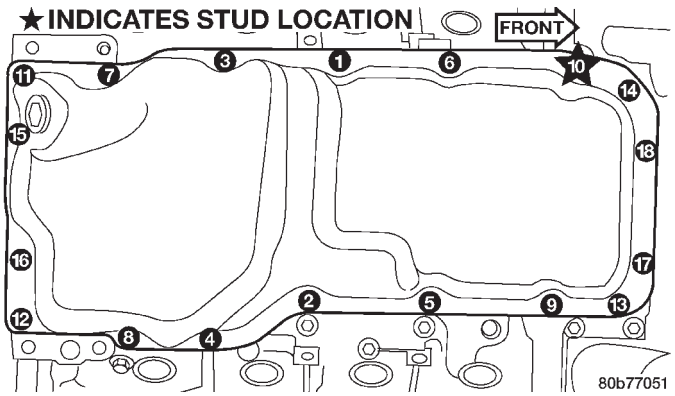


Fig. 95 Oil Pan Tightening Sequence

(5) Reconnect transmission oil cooler lines to oil pan stud bolt.

(6) Install starter (Refer to 8 - ELECTRICAL/ STARTING/STARTER MOTOR - INSTALLATION).

(7) Install exhaust system Y-pipe.

(8) Install structural cover (Refer to 9 - ENGINE/ ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).

(9) Lower vehicle.

(10) Fill engine with proper amount of oil (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).

(11) Connect negative cable to battery.

OIL PRESSURE SENSOR/ SWITCH

DESCRIPTION

The 3–wire, solid-state engine oil pressure sensor (sending unit) is located in an engine oil pressure gallery.

OPERATION

The oil pressure sensor uses three circuits. They are:

- A 5–volt power supply from the Powertrain Control Module (PCM)
- A sensor ground through the PCM's sensor return
- A signal to the PCM relating to engine oil pressure

The oil pressure sensor has a 3–wire electrical function very much like the Manifold Absolute Pressure (MAP) sensor. Meaning different pressures relate to different output voltages.

A 5–volt supply is sent to the sensor from the PCM to power up the sensor. The sensor returns a voltage signal back to the PCM relating to engine oil pressure. This signal is then transferred (bussed) to the instrument panel on either a CCD or PCI bus circuit (depending on vehicle line) to operate the oil pressure gauge and the check gauges lamp. Ground for the sensor is provided by the PCM through a low-noise sensor return.

REMOVAL

(1) Disconnect the negative cable from the battery.
(2) Raise vehicle on hoist.
(3) Remove front splash shield.
(4) Disconnect oil pressure sender wire (Fig. 96).
(5) Remove the pressure sender (Fig. 96).

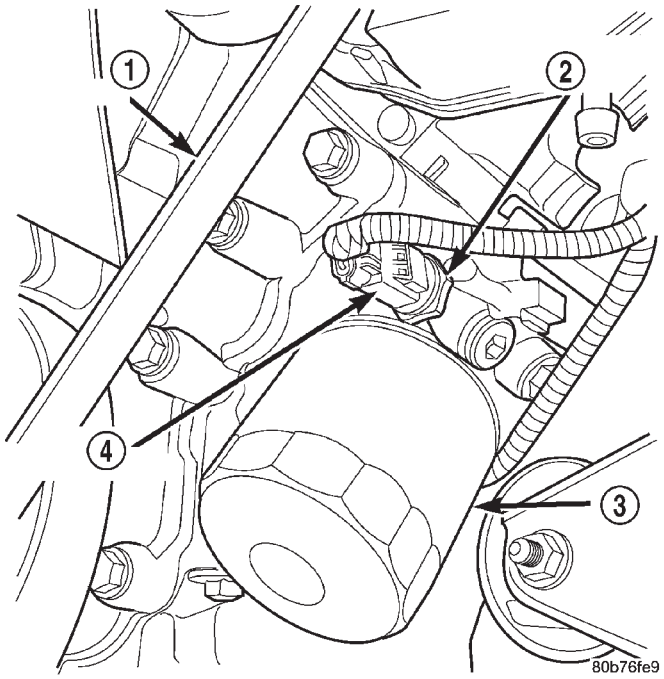


Fig. 96 Oil Pressure Sending Unit

1 - BELT
2 - OIL PRESSURE SENSOR
3 - OIL FILTER
4 - ELEC. CONNECTOR

INSTALLATION

(1) Install oil pressure sender.
(2) Connect oil pressure sender wire.
(3) Install front splash shield.
(4) Lower vehicle.
(5) Connect the negative battery cable.

OIL PUMP

REMOVAL

(1) Remove the oil pan and pick-up tube (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

(2) Remove the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(3) Remove the timing chains and tensioners (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

(4) Remove the four bolts, primary timing chain tensioner and the oil pump.

DISASSEMBLY

(1) Remove oil pump cover screws and lift off cover plate.

(2) Remove pump inner and outer rotors.

NOTE: Once the oil pressure relief valve, cup plug, and pin are removed, the pump assembly must be replaced.

(3) If it is necessary to remove the pressure relief valve, drive the roll pin from pump housing and remove cup plug, spring and valve.

CLEANING

(1) Wash all parts in a suitable solvent.

INSPECTION

CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

(1) Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.

(2) Lay a straight edge across the pump cover surface (Fig. 97). If a 0.025 mm (0.001 in.) feeler gauge can be inserted between the cover and the straight edge the oil pump assembly should be replaced.

(3) Measure the thickness of the outer rotor (Fig. 98). If the outer rotor thickness measures at 12.005 mm (0.472 in.) or less the oil pump assembly must be replaced.

(4) Measure the diameter of the outer rotor. If the outer rotor diameter measures at 85.925 mm (3.382 in.) or less the oil pump assembly must be replaced.

(5) Measure the thickness of the inner rotor (Fig. 99). If the inner rotor thickness measures at 12.005 mm (0.472 in.) or less then the oil pump assembly must be replaced.

(6) Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body (Fig. 100). If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.

(7) Install the inner rotor in the into the oil pump body. Measure the clearance between the inner and outer rotors (Fig. 101). If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.

(8) Place a straight edge across the body of the oil pump (between the bolt holes), if a feeler gauge of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced (Fig. 102).

NOTE: The 4.7 Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

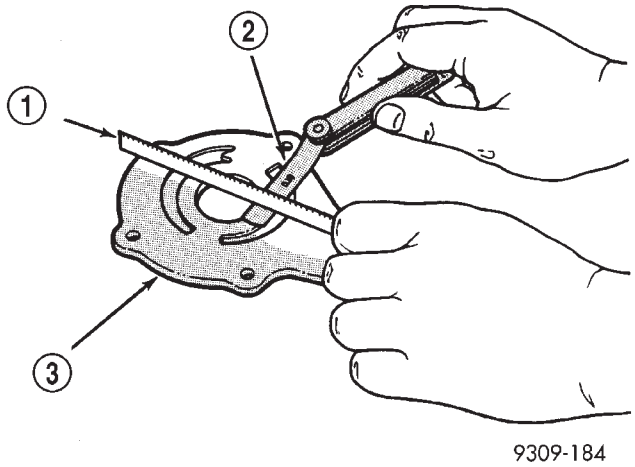


Fig. 97 Checking Oil Pump Cover Flatness

1 - STRAIGHT EDGE
2 - FEELER GAUGE
3 - OIL PUMP COVER

OIL PUMP (Continued)

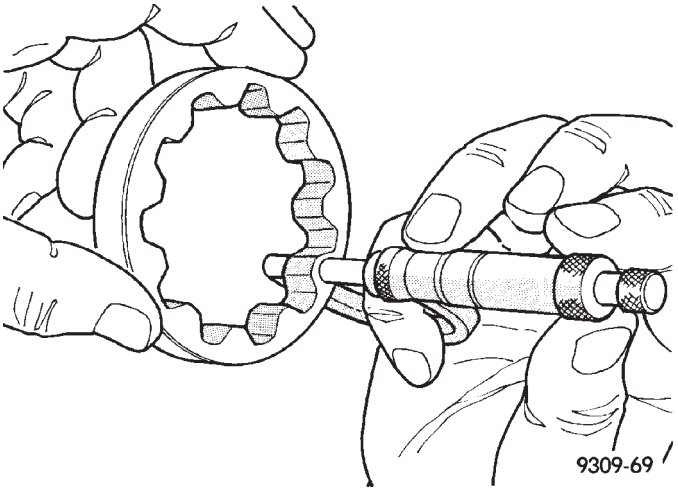


Fig. 98 Measuring Outer Rotor Thickness

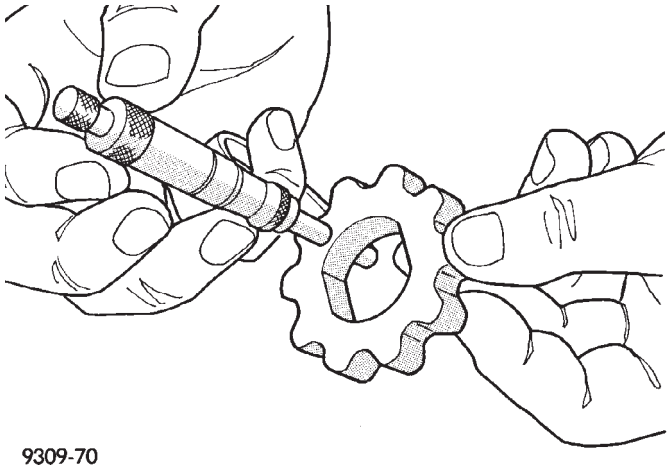


Fig. 99 Measuring Inner Rotor Thickness

ASSEMBLY

(1) Wash all parts in a suitable solvent and inspect carefully for damage or wear.

(2) Install inner and outer rotors

(3) Install oil pump cover plate and install cover bolts and tighten them to 12 N·m (105 in. lbs.).

(4) Prime oil pump before installation by filling rotor cavity with engine oil.

(5) If oil pressure is low and pump is within specifications, inspect for worn engine bearings or other causes for oil pressure loss.

INSTALLATION

(1) Position the oil pump onto the crankshaft and install two oil pump retaining bolts.

(2) Position the primary timing chain tensioner and install the two retaining bolts.

(3) Tighten the oil pump and primary timing chain tensioner retaining bolts to 28 N·m (250 in. lbs.) in the sequence shown (Fig. 103).

(4) Install the secondary timing chain tensioners and timing chains (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).

(5) Install the timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).

(6) Install the pick-up tube and oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

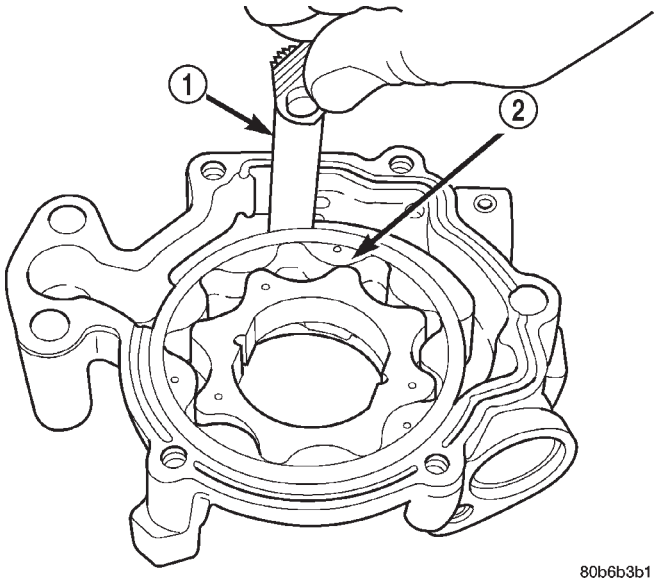


Fig. 100 Measuring Outer Rotor Clearance in

1 - FEELER GAUGE
2 - OUTER ROTOR

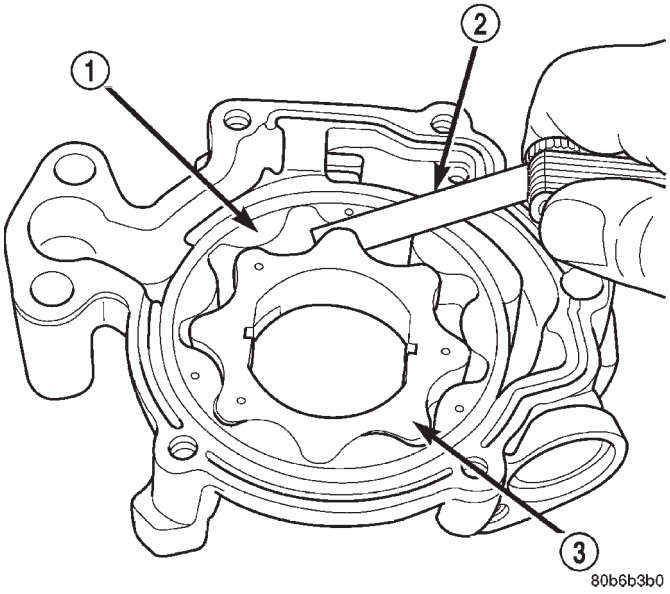


Fig. 101 Measuring Clearance Between Rotors

1 - OUTER ROTOR
2 - FEELER GAUGE
3 - INNER ROTOR

OIL PUMP (Continued)

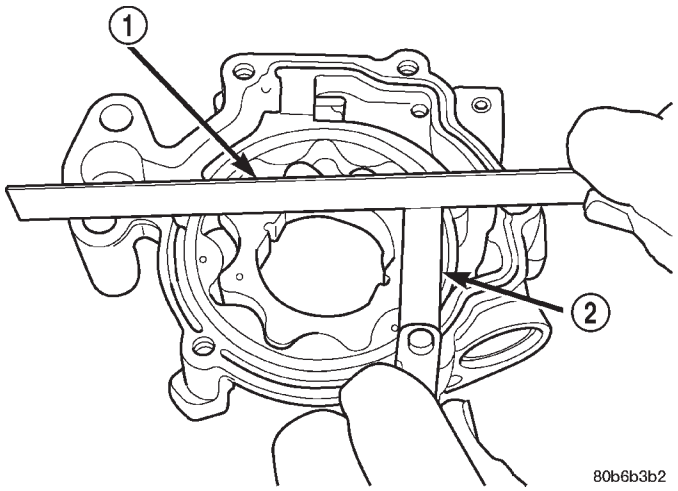


Fig. 102 Measuring Clearance Over Rotors

1 - STRAIGHT EDGE
2 - FEELER GAUGE

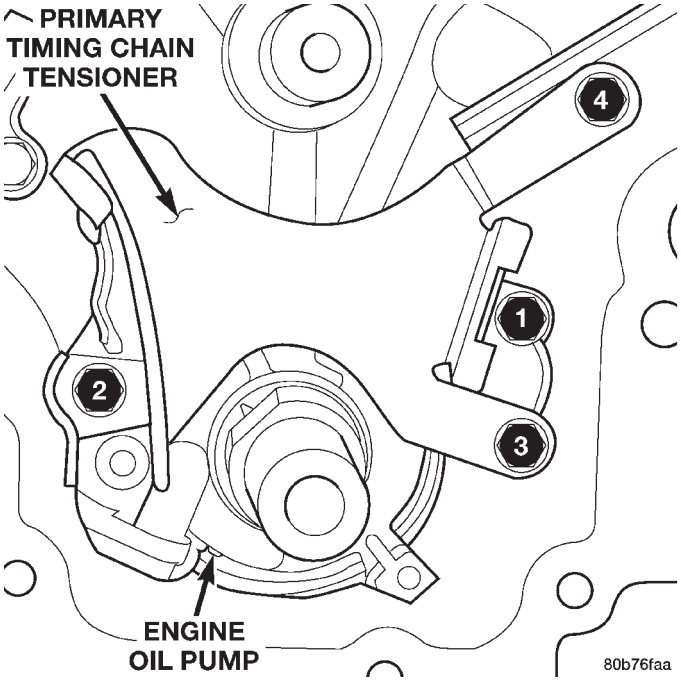


Fig. 103 Oil Pump and Primary Timing Chain Tensioner Tightening Sequence

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks. Eight studs and two bolts are used to fasten the intake to the head.

DIAGNOSIS AND TESTING—INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

(1) Start the engine.
(2) Spray a small stream of water at the suspected leak area.
(3) If a change in RPM is observed the area of the suspected leak has been found.
(4) Repair as required.

REMOVAL

(1) Disconnect negative cable from battery.
(2) Remove air cleaner housing and throttle body resonator (Fig. 104).

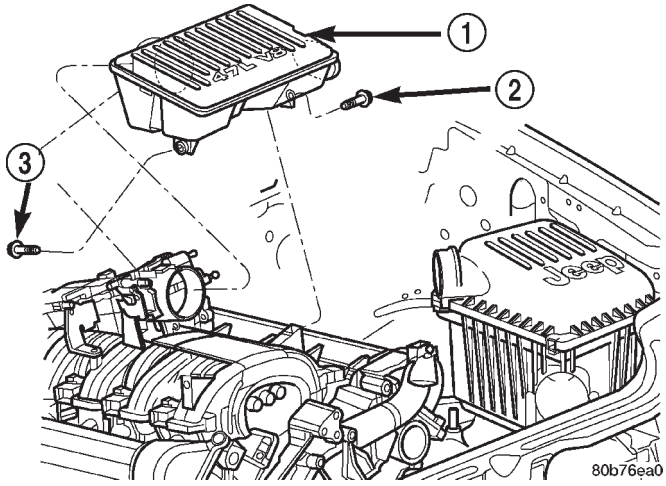


Fig. 104 Throttle Body Resonator

1 - THROTTLE BODY RESONATOR
2 - BOLT
3 - BOLT

(3) Disconnect throttle and speed control cables.
(4) Disconnect electrical connectors for the following components:

- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Coolant Temperature (CTS) Sensor
- Idle Air Control (IAC) Motor

(5) Disconnect vapor purge hose, brake booster hose, speed control servo hose, positive crankcase ventilation (PCV) hose.

INTAKE MANIFOLD (Continued)

(6) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
(7) Disconnect generator electrical connections.
(8) Unbolt the generator and move it away from the intake manifold for clearance.
(9) Disconnect air conditioning compressor electrical connections.
(10) Unbolt the air conditioning compressor and move it away from the intake manifold for clearance.
(11) Disconnect left and right radio suppressor straps.
(12) Disconnect and remove ignition coil towers (Refer to 8 - ELECTRICAL/IGNITION CONTROL/ IGNITION COIL - REMOVAL).
(13) Remove top oil dipstick tube retaining bolt and ground strap.
(14) Bleed pressure from fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
(15) Remove fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - REMOVAL).
(16) Remove throttle body assembly and mounting bracket.
(17) Drain cooling system below coolant temperature level (Refer to 7 - COOLING - STANDARD PROCEDURE).
(18) Remove coolant temperature sensor (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMP SENSOR - REMOVAL).
(19) Remove cowl to hood seal. (Refer to 23 - BODY/WEATHERSTRIP/SEALS/COWL WEATHERSTRIP - REMOVAL).
(20) Remove right side engine lifting stud.
(21) Remove intake manifold retaining fasteners, in reverse order of tightening sequence (Fig. 105).

NOTE: Intake must be lifted upward and level in the front and rear to clear the cowl. Interference with the cowl will occur during removal.

(22) Remove intake manifold.

CLEANING

NOTE: There is NO approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

INSPECTION

(1) Inspect the intake sealing surface for cracks, nicks and distortion.

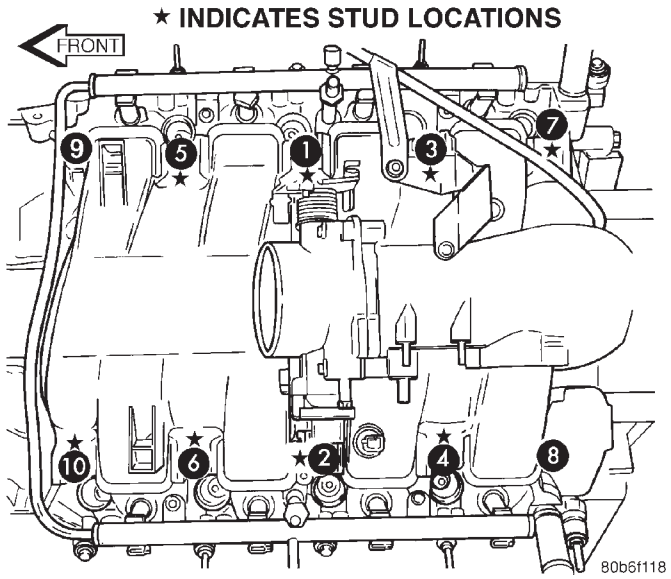


Fig. 105 Intake Manifold Tightening Sequence

(2) Inspect the intake manifold vacuum hose fittings for looseness or blockage.
(3) Inspect the manifold to throttle body mating surface for cracks, nicks and distortion.

INSTALLATION

(1) Install intake manifold gaskets.
(2) Install intake manifold.
(3) Install intake manifold retaining bolts and tighten in sequence shown in (Fig. 106) to 12 N·m (105 in. lbs.).

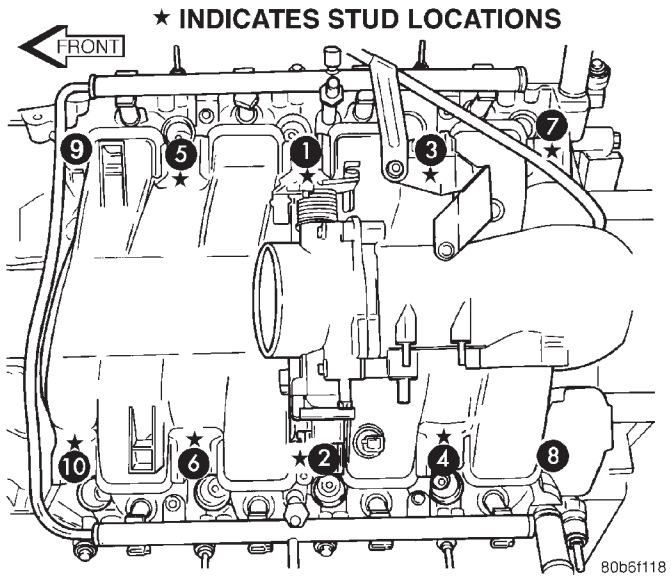


Fig. 106 Intake Manifold Tightening Sequence

(4) Install left and right radio suppressor straps.
(5) Install throttle body assembly.
(6) Install throttle cable bracket.

(7) Connect throttle cable and speed control cable to throttle body.

(8) Install fuel rail (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/FUEL RAIL - INSTALLATION).

(9) Install ignition coil towers (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION COIL - INSTALLATION).

(10) Install coolant temperature sensor (Refer to 7 - COOLING/ENGINE/ENGINE COOLANT TEMP SENSOR - INSTALLATION).

(11) Connect electrical connectors for the following components:

- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature (IAT) Sensor
- Throttle Position (TPS) Sensor
- Coolant Temperature (CTS) Sensor
- Idle Air Control (IAC) Motor
- Ignition coil towers
- Fuel injectors

(12) Install top oil dipstick tube retaining bolt and ground strap.

(13) Install right side engine lifting stud.

(14) Install generator including electrical connections (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).

(15) Connect Vapor purge hose, Brake booster hose, Speed control servo hose, Positive crankcase ventilation (PCV) hose.

(16) Install air conditioning compressor including electrical connections.

(17) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(18) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(19) Install cowl to hood seal (Refer to 23 - BODY/WEATHERSTRIP/SEALS/COWL WEATHERSTRIP - INSTALLATION).

(20) Install air cleaner housing and throttle body resonator. Tighten resonator bolts 4.5 N·m (40 in. lbs.).

(21) Connect negative cable to battery.

EXHAUST MANIFOLD - LEFT

DESCRIPTION

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

REMOVAL

(1) Disconnect negative cable for battery.

(2) Hoist vehicle.

(3) Disconnect exhaust pipe at manifold.

(4) Lower vehicle.

(5) Remove air cleaner housing and tube.

(6) Remove the front two exhaust heat shield retaining fasteners. Raise vehicle and remove the fasteners at rear of heat shield.

(7) Remove heat shield (Fig. 107).

(8) Lower vehicle and remove the upper exhaust manifold retaining bolts (Fig. 107).

(9) Raise vehicle and remove the lower exhaust manifold retaining bolts (Fig. 107).

(10) Remove exhaust manifold and gasket (Fig. 107). Manifold is removed from below the engine compartment.

CLEANING

(1) Clean the exhaust manifold using a suitable cleaning solvent, then allow to air dry.

(2) Clean all gasket residue from the manifold mating surface.

INSPECTION

(1) Inspect the exhaust manifold for cracks in the mating surface and at every mounting bolt hole.

(2) Using a straight edge and a feeler gauge, check the mating surface for warp and twist.

(3) Inspect the manifold to exhaust pipe mating surface for cracks, gouges, or other damage that would prevent sealing.

INSTALLATION

(1) Install exhaust manifold and gasket from below engine compartment.

(2) Install lower exhaust manifold fasteners (Fig. 107). DO NOT tighten until all fasteners are in place.

(3) Lower vehicle and install upper exhaust manifold fasteners (Fig. 107). Tighten all manifold bolts starting at center and working outward to 25 N·m (18 ft. lbs.).

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

(4) Install exhaust manifold heat shield (Fig. 107). Tighten fasteners to 8 N·m (72 in. lbs.), then loosen 45 degrees.

(5) Install air cleaner housing and tube.

(6) Connect exhaust pipe to manifold.

(7) Connect negative cable to battery.

EXHAUST MANIFOLD - LEFT (Continued)

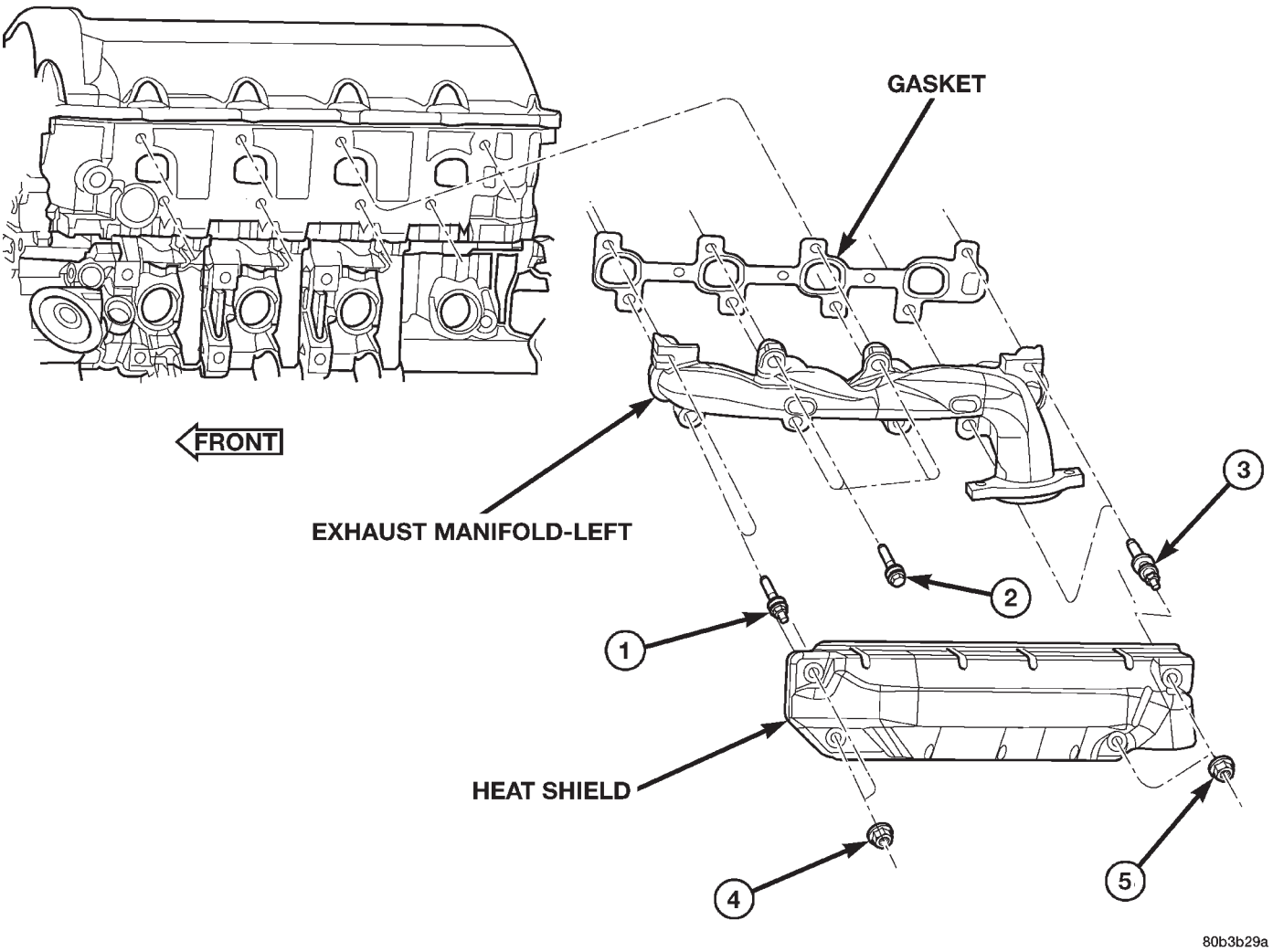


Fig. 107 Exhaust Manifold—Left

ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
1	Stud (Qty 2)		4	Nut (Qty 2)	8 N·m (72 in. lbs.), then loosen 45 degrees
2	Bolt (Qty 4)	25 N·m (18 ft. lbs.)	5	Nut (Qty 2)	
3	Stud (Qty 2)				

EXHAUST MANIFOLD - RIGHT

DESCRIPTION

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

REMOVAL

(1) Disconnect negative cable for battery.
(2) Remove battery from vehicle.
(3) Remove Power Distribution Center (PDC) fasteners and set aside.
(4) Remove battery tray assembly.
(5) Remove washer bottle assembly
(6) Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

EXHAUST MANIFOLD - RIGHT (Continued)

(7) Remove A/C compressor from mounting and set aside.

(8) Remove A/C accumulator support bracket fastener.

(9) Drain coolant (Refer to 7 - COOLING - STANDARD PROCEDURE).

(10) Remove heater hoses at engine.

(11) Remove fasteners attaching exhaust manifold heat shield (Fig. 108).

(12) Remove heat shield (Fig. 108).

(13) Remove upper exhaust manifold attaching fasteners (Fig. 108).

(14) Raise vehicle on hoist.

(15) Disconnect exhaust pipe from manifold.

(16) Remove fasteners attaching starter. Move starter aside.

(17) Remove lower exhaust manifold attaching fasteners.

(18) Remove exhaust manifold and gasket (Fig. 108). Manifold is removed from below the engine compartment.

CLEANING

(1) Clean the exhaust manifold using a suitable cleaning solvent, then allow to air dry.

(2) Clean all gasket residue from the manifold mating surface.

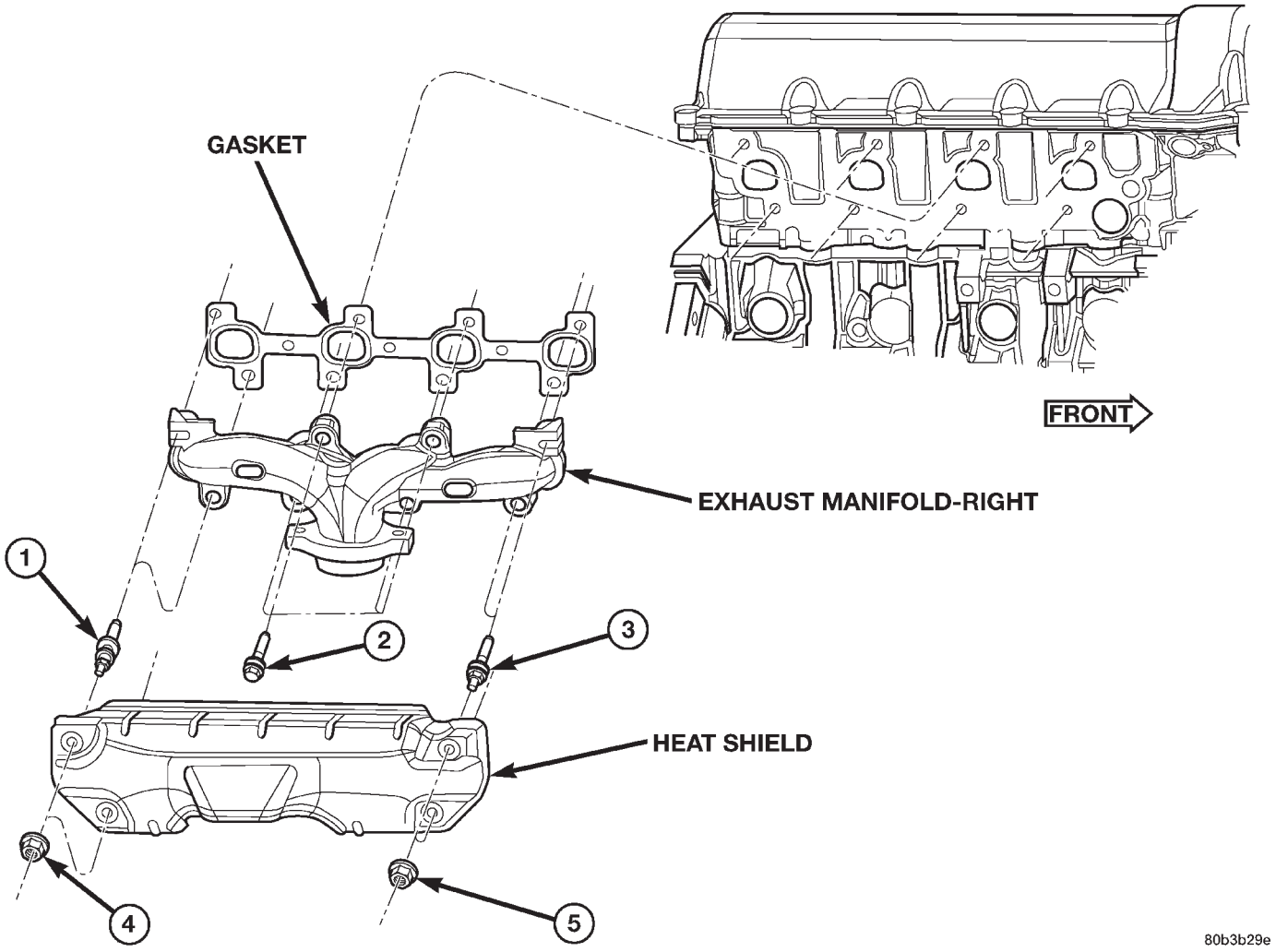


Fig. 108 Exhaust Manifold—Right

ITEM	DESCRIPTION	TORQUE	ITEM	DESCRIPTION	TORQUE
1	Stud (Qty 2)		4	Nut (Qty 2)	8 N·m (72 in. lbs.), then loosen 45 degrees
2	Bolt (Qty 4)	25 N·m (18 ft. lbs.)	5	Nut (Qty 2)	
3	Stud (Qty 2)				

EXHAUST MANIFOLD - RIGHT (Continued)

INSPECTION

(1) Inspect the exhaust manifold for cracks in the mating surface and at every mounting bolt hole.

(2) Using a straight edge and a feeler gauge, check the mating surface for warp and twist.

(3) Inspect the manifold to exhaust pipe mating surface for cracks, gouges, or other damage that would prevent sealing.

INSTALLATION

(1) Install exhaust manifold and gasket from below engine compartment.

(2) Install lower exhaust manifold fasteners. DO NOT tighten until all fasteners are in place.

(3) Lower vehicle and install upper exhaust manifold fasteners. Tighten all manifold bolts starting at center and working outward to 25 N·m (18 ft. lbs.).

CAUTION: Over tightening heat shield fasteners, may cause shield to distort and/or crack.

(4) Install exhaust manifold heat shield. Tighten fasteners to 8 N·m (72 in. lbs.), then loosen 45 degrees.

(5) Install starter and fasteners.

(6) Connect exhaust pipe to manifold.

(7) Connect heater hoses at engine.

(8) Install fastener attaching A/C accumulator.

(9) Install A/C compressor and fasteners.

(10) Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(11) Install washer bottle and battery tray assembly.

(12) Install PDC.

(13) Install battery and connect cables.

(14) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

VALVE TIMING

DESCRIPTION - TIMING DRIVE SYSTEM

The timing drive system has been designed to provide quiet performance and reliability to support a **non-free wheeling** engine. Specifically the intake valves are non-free wheeling and can be easily damaged with forceful engine rotation if camshaft-to-crankshaft timing is incorrect. The timing drive system consists of a primary chain and two secondary timing chain drives (Fig. 109).

OPERATION - TIMING DRIVE SYSTEM

The primary timing chain is a single inverted tooth type. The primary chain drives the large fifty tooth idler sprocket directly from a 25 tooth crankshaft sprocket. Primary chain motion is controlled by a pivoting leaf spring tensioner arm and a fixed guide. The arm and the guide both use nylon plastic wear faces for low friction and long wear. The primary chain receives oil splash lubrication from the secondary chain drive and oil pump leakage. The idler sprocket assembly connects the primary and secondary chain drives. The idler sprocket assembly consists of two integral thirty tooth sprockets and a fifty tooth sprocket that is splined to the assembly. The spline joint is a non – serviceable press fit anti rattle type. A spiral ring is installed on the outboard side of the fifty tooth sprocket to prevent spline disengagement. The idler sprocket assembly spins on a stationary idler shaft. The idler shaft is press-fit into the cylinder block. A large washer on the idler shaft bolt and the rear flange of the idler shaft are used to control sprocket thrust movement. Pressurized oil is routed through the center of the idler shaft to provide lubrication for the two bushings used in the idler sprocket assembly.

There are two secondary drive chains, both are inverted tooth type, one to drive the camshaft in each SOHC cylinder head. There are no shaft speed changes in the secondary chain drive system. Each secondary chain drives a thirty tooth cam sprocket directly from the thirty tooth sprocket on the idler sprocket assembly. A fixed chain guide and a hydraulic oil damped tensioner are used to maintain tension in each secondary chain system. The hydraulic tensioners for the secondary chain systems are fed pressurized oil from oil reservoir pockets in the block. Each tensioner also has a mechanical ratchet system that limits chain slack if the tensioner piston bleeds down after engine shut down. The tensioner arms and guides also utilize nylon wear faces for low friction and long wear. The secondary timing chains receive lubrication from a small orifice in the tensioners. This orifice is protected from clogging by a fine mesh screen which is located on the back of the hydraulic tensioners.

STANDARD PROCEDURE

STANDARD PROCEDURE - ENGINE TIMING - VERIFICATION

CAUTION: The 4.7L is a non free-wheeling design engine. Therefore, correct engine timing is critical.

NOTE: Components referred to as left hand or right hand are as viewed from the drivers position inside the vehicle.

VALVE TIMING (Continued)

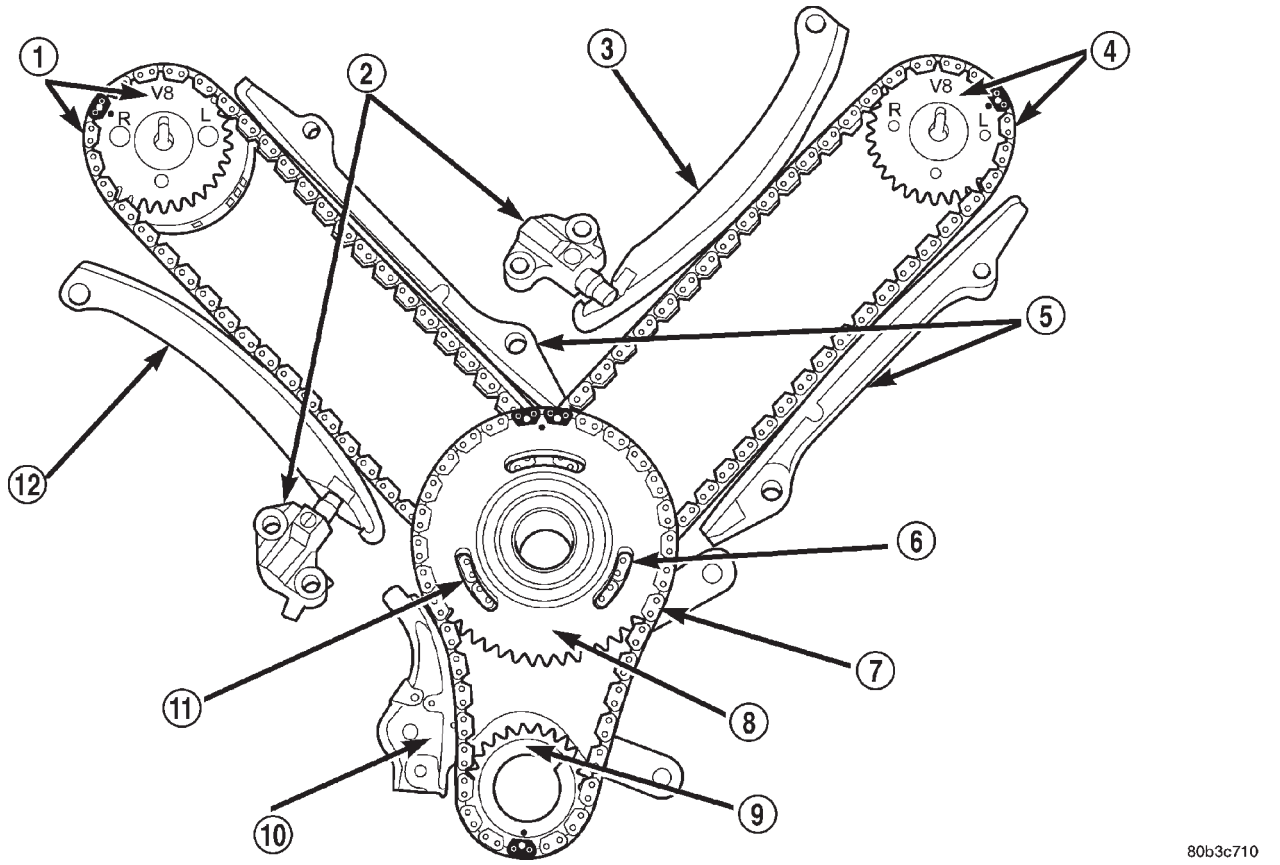


Fig. 109 Timing Drive System

1 - RIGHT CAMSHAFT SPROCKET AND SECONDARY CHAIN
2 - SECONDARY TIMING CHAIN TENSIONER (LEFT AND RIGHT SIDE NOT COMMON)
3 - SECONDARY TENSIONER ARM
4 - LEFT CAMSHAFT SPROCKET AND SECONDARY CHAIN
5 - CHAIN GUIDE
6 - TWO PLATED LINKS ON RIGHT CAMSHAFT CHAIN
7 - PRIMARY CHAIN
8 - IDLER SPROCKET
9 - CRANKSHAFT SPROCKET
10 - PRIMARY CHAIN TENSIONER
11 - TWO PLATED LINKS ON LEFT CAMSHAFT CHAIN
12 - SECONDARY TENSIONER ARM

NOTE: The blue link plates on the chains and the dots on the camshaft drive sprockets may not line up during the timing verification procedure. The blue link plates are lined up with the sprocket dots only when re-timing the complete timing drive. Once the timing drive is rotated blue link-to-dot alignment is no longer valid.

Engine base timing can be verified by the following procedure:

(1) Remove the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(2) Using a mirror, locate the TDC arrow on the front cover (Fig. 110). Rotate the crankshaft until the mark on the crankshaft damper is aligned with the TDC arrow on the front cover. The engine is now at TDC.

(3) Note the location of the V8 mark stamped into the camshaft drive gears (Fig. 111). If the V8 mark on each camshaft drive gear is at the twelve o'clock position, the engine is at TDC (cylinder #1) on the exhaust stroke. If the V8 mark on each gear is at the six o'clock position, the engine is at TDC (cylinder #1) on the compression stroke.

(4) If both of the camshaft drive gears are off in the same or opposite directions, the primary chain or both secondary chains are at fault. Refer to Timing Chain and Sprockets procedure in this section.

(5) If only one of the camshaft drive gears is off and the other is correct, the problem is confined to one secondary chain. Refer to Single camshaft timing, in this procedure.

(6) If both camshaft drive gear V8 marks are at the twelve o'clock or the six o' clock position the engine base timing is correct. Reinstall the cylinder head covers.

VALVE TIMING (Continued)

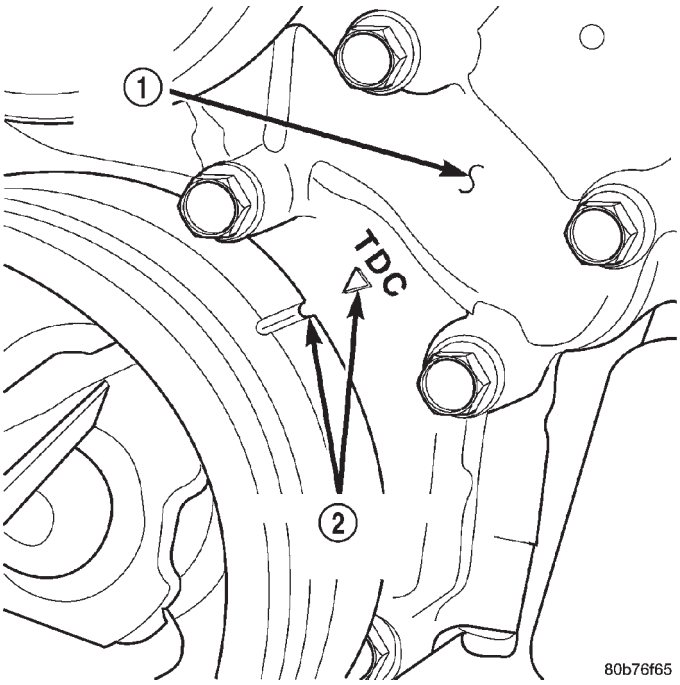


Fig. 110 Engine Top Dead Center (TDC) Indicator Mark

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

SINGLE CAMSHAFT TIMING

NOTE: to adjust the timing on one camshaft, preform the following procedure.

(1) Using Chain Tensioner Wedge, special tool 8350, stabilize the secondary chain drive (Fig. 112). For reference purposes, mark the chain-to-sprocket position (Fig. 112).
(2) Remove the camshaft drive gear retaining bolt.
(3) Carefully remove the camshaft drive gear from the camshaft.
(4) Re-index the camshaft drive gear in the chain until the V8 mark is at the same position as the V8 mark on the opposite camshaft drive gear.

NOTE: When gripping the camshaft, place the pliers on the tube portion of the camshaft only. Do not grip the lobes or the sprocket areas.

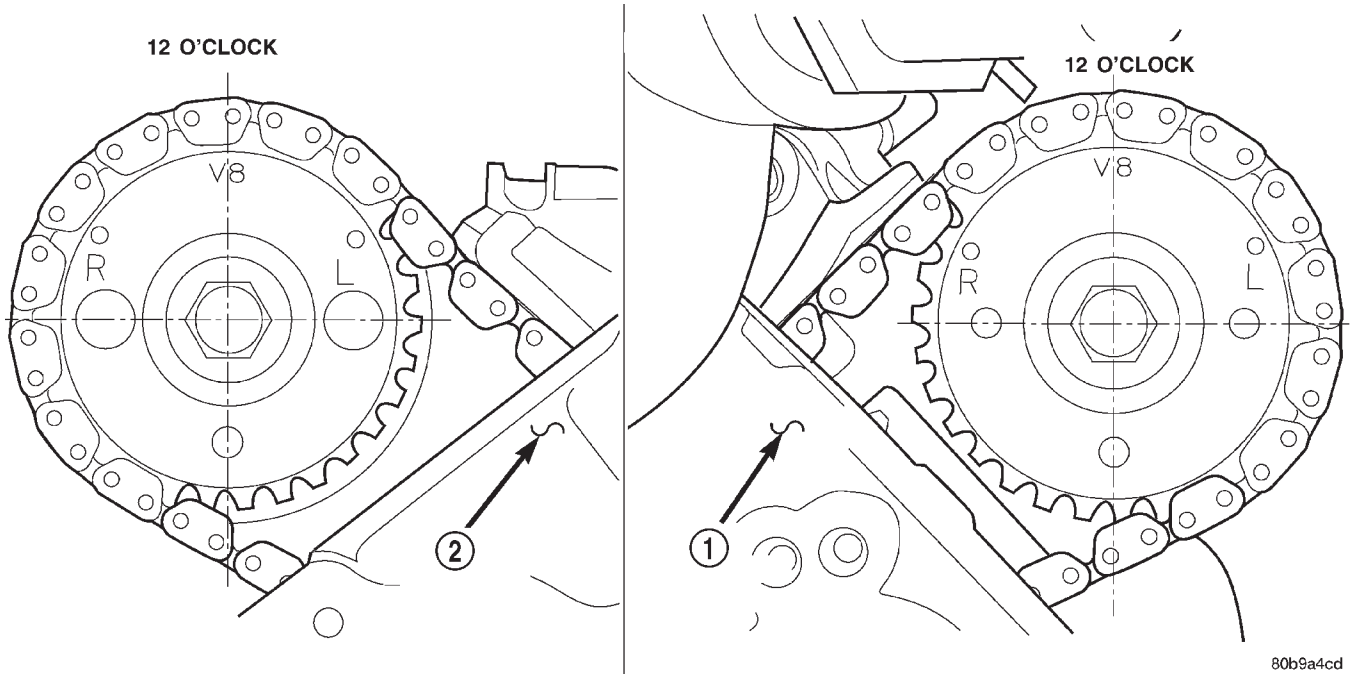


Fig. 111 Camshaft Sprocket V8 Marks

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

VALVE TIMING (Continued)

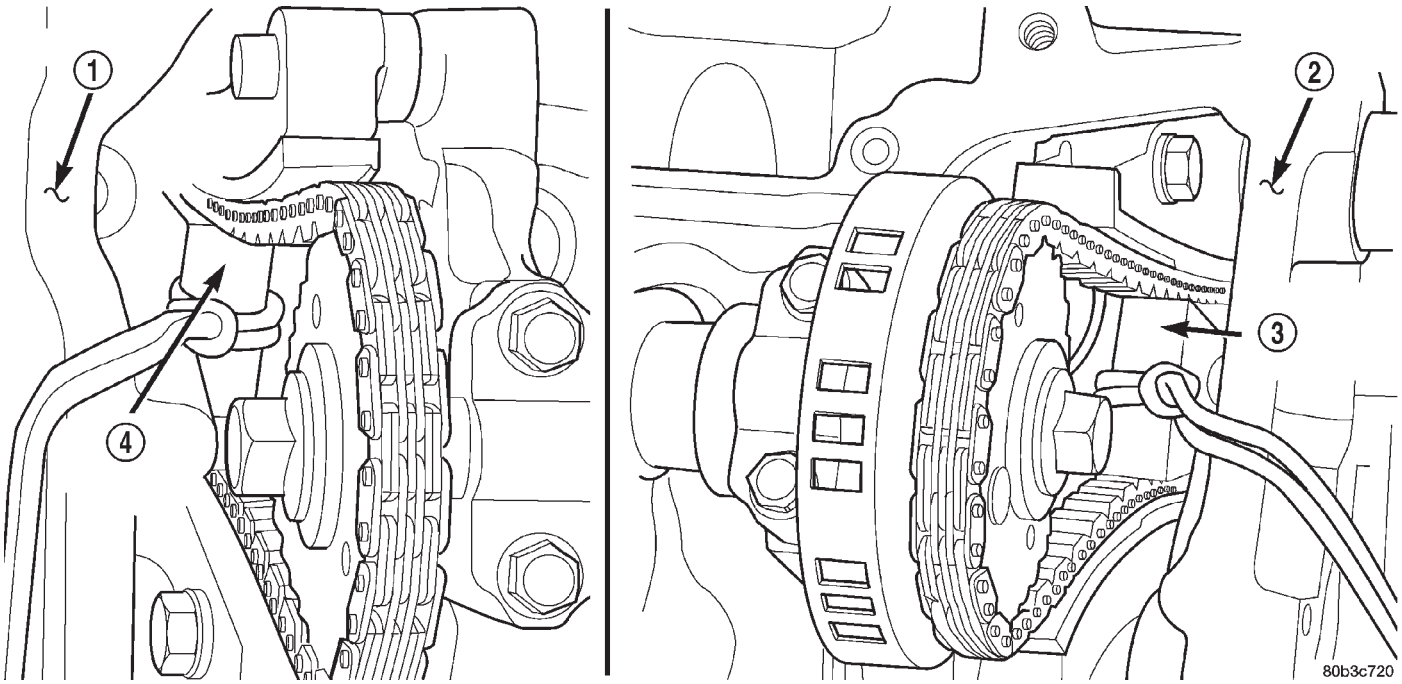


Fig. 112 Securing Timing Chain Tensioners Using Timing Chain Wedge

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD
3 - SPECIAL TOOL 8350 WEDGE
4 - SPECIAL TOOL 8350 WEDGE

(5) Using a suitable pair of adjustable pliers, rotate the camshaft until the alignment dowel on the camshaft is aligned with the slot in the camshaft drive gear (Fig. 113).

CAUTION: Remove excess oil from camshaft sprocket retaining bolt before reinstalling bolt. Failure to do so may cause over-torqueing of bolt resulting in bolt failure.

(6) Position the camshaft drive gear onto the camshaft, remove oil from bolt then install the retaining bolt. Using Special Tools, Spanner Wrench 6958 with Adapter Pins 8346 and a suitable torque wrench, Tighten retaining bolt to 122N·m (90 ft. Lbs.) (Fig. 114) (Fig. 115).

(7) Remove special tool 8350.

(8) Rotate the crankshaft two full revolutions, then reverify that the camshaft drive gear V8 marks are in fact aligned.

(9) Install the cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

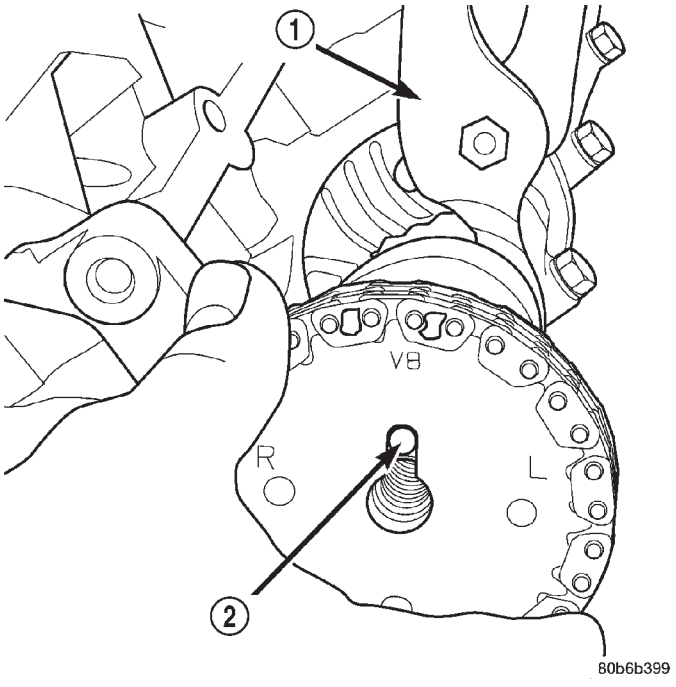


Fig. 113 Camshaft Dowel

1 - ADJUSTABLE PLIERS
2 - CAMSHAFT DOWEL

VALVE TIMING (Continued)

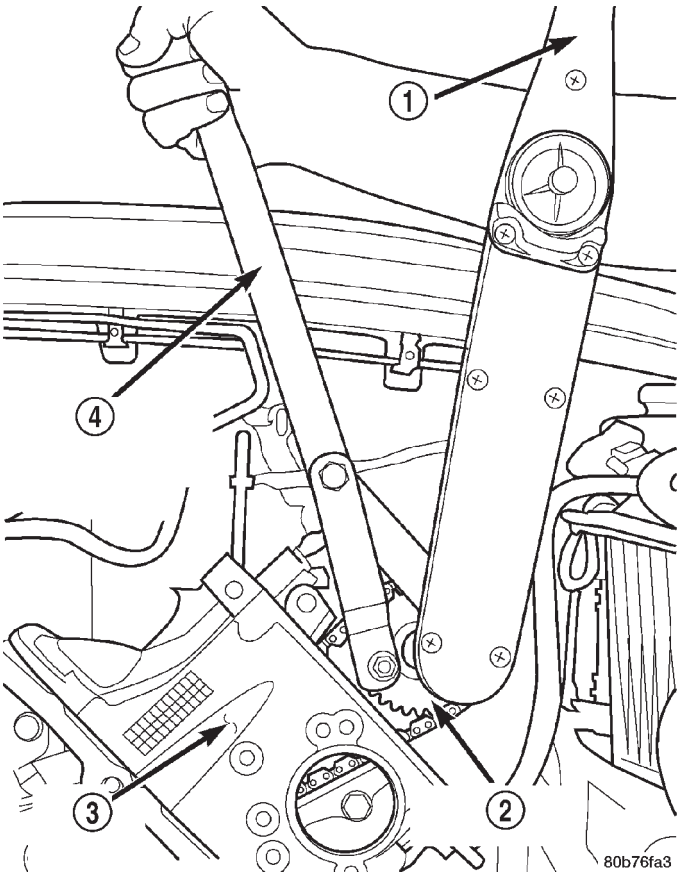


Fig. 114 Camshaft Sprocket Left Cylinder Head

1 - TORQUE WRENCH
2 - CAMSHAFT SPROCKET
3 - LEFT CYLINDER HEAD
4 - SPECIAL TOOL 6958 SPANNER WITH ADAPTER PINS 8346

STANDARD PROCEDURE—MEASURING TIMING CHAIN WEAR

NOTE: This procedure must be performed with the timing chain cover removed.

(1) Remove the timing chain cover. (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(2) To determine if the secondary timing chains are worn, rotate the engine clockwise until maximum tensioner piston extension is obtained. Measure the distance between the secondary timing chain tensioner housing and the step ledge on the piston (Fig. 116). The measurement at point (A) must be less than 15mm (0.5906 inches).

(3) If the measurement exceeds the specification the secondary timing chains are worn and require replacement. (Refer to 9 - ENGINE/VALVE TIMING/ TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).

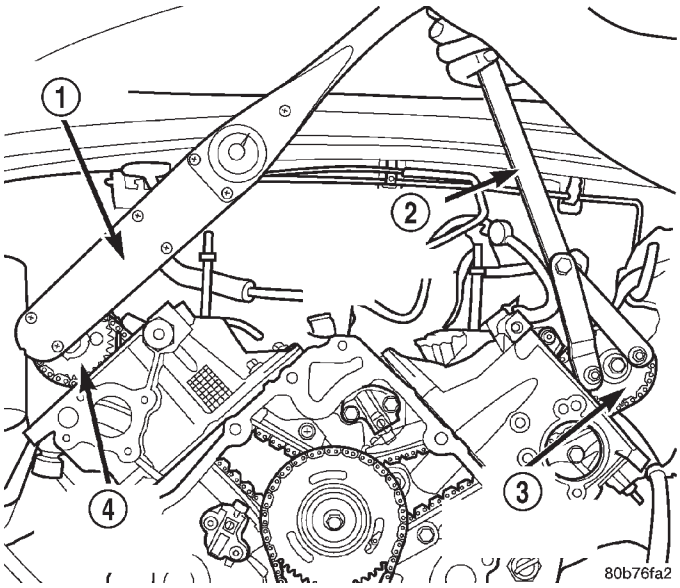


Fig. 115 Camshaft Sprocket Installation—Right Cylinder Head

1 - TORQUE WRENCH
2 - SPECIAL TOOL 6958 WITH ADAPTER PINS 8346
3 - LEFT CAMSHAFT SPROCKET
4 - RIGHT CAMSHAFT SPROCKET

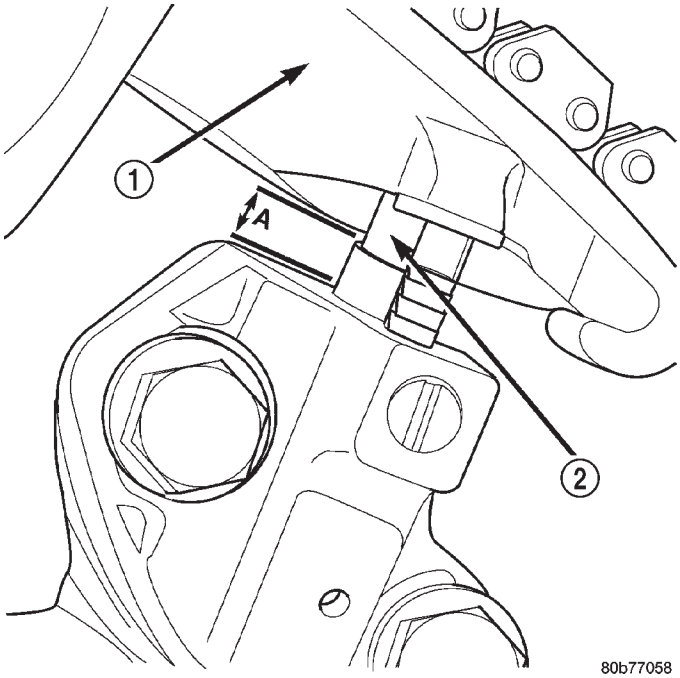


Fig. 116 Measuring Secondary Timing Chains For Wear

1 - SECONDARY TENSIONER ARM
2 - SECONDARY CHAIN TENSIONER PISTON

NOTE: If the secondary chains are to be replaced the primary chain must also be replaced.

TIMING BELT / CHAIN COVER(S)

REMOVAL

(1) Disconnect the battery negative cable.
(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(3) Disconnect both heater hoses at timing cover.
(4) Disconnect lower radiator hose at engine.
(5) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
(6) Remove accessory drive belt tensioner assembly (Fig. 117).

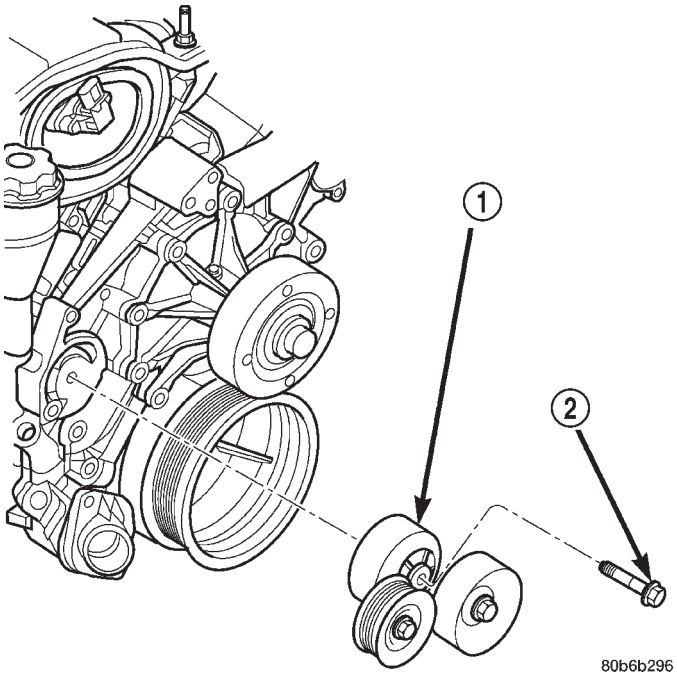


Fig. 117 Accessory Drive Belt Tensioner

1 - TENSIONER ASSEMBLY
2 - FASTENER TENSIONER TO FRONT COVER

(7) Remove the generator and A/C compressor.
(8) Remove cover and gasket (Fig. 118).

INSTALLATION

(1) Clean timing chain cover and block surface. Inspect cover gasket and replace as necessary.
(2) Install cover and gasket. Tighten fasteners in sequence as shown in (Fig. 119) to 54 N·m (40 ft. lbs.).
(3) Install the A/C compressor and generator.

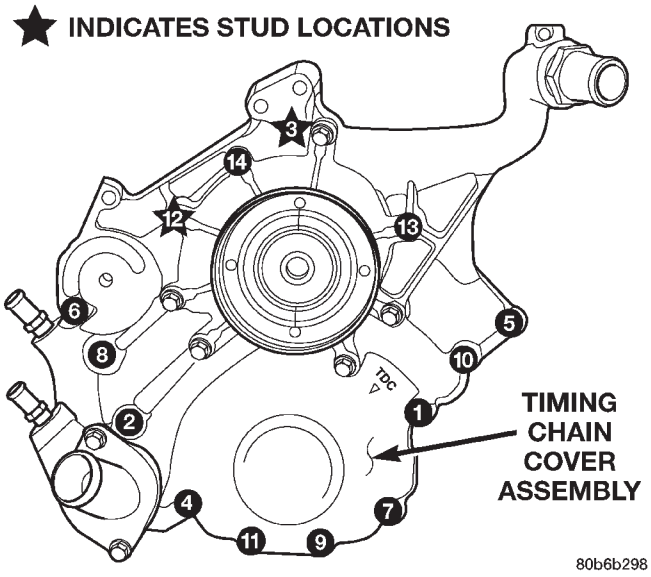


Fig. 118 Timing Chain Cover Fasteners

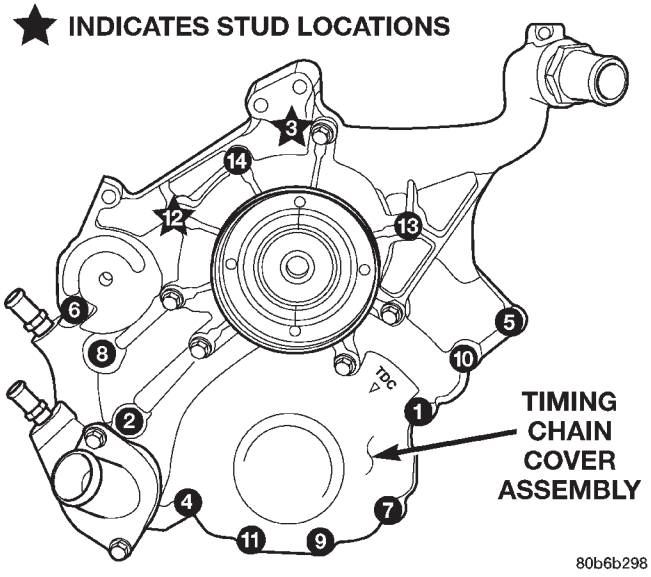


Fig. 119 Timing Chain Cover Fasteners

(4) Install crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
(5) Install accessory drive belt tensioner assembly. Tighten fastener to 54 N·m (40 ft. lbs.).
(6) Install lower radiator hose.
(7) Install both heater hoses.
(8) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
(9) Connect the battery negative cable.

TIMING BELT/CHAIN AND SPROCKETS

REMOVAL

(1) Disconnect negative cable from battery.

(2) Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(3) Remove right and left cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).

(4) Remove radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).

(5) Rotate engine until timing mark on crankshaft damper aligns with TDC mark on timing chain cover (Fig. 120) (#1 cylinder exhaust stroke) and the camshaft sprocket "V8" marks are at the 12 o'clock position (Fig. 121).

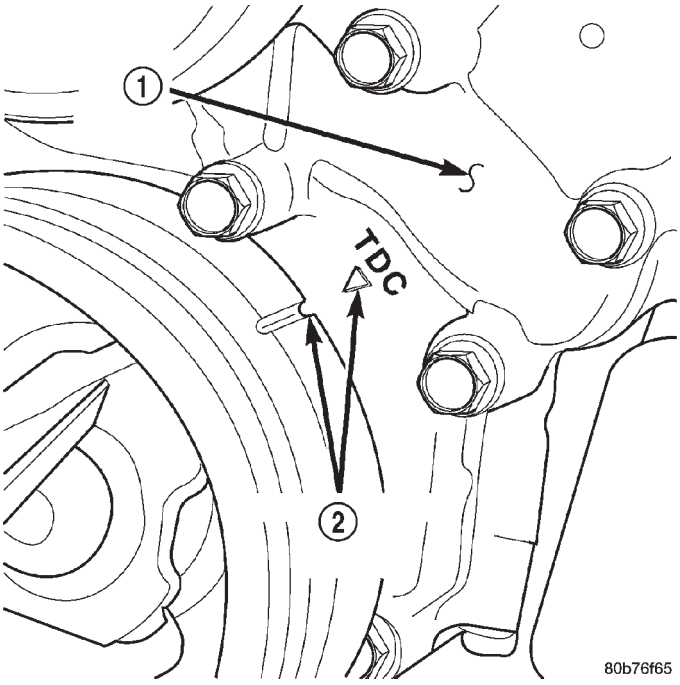


Fig. 120 Engine Top Dead Center (TDC) Indicator Mark

1 - TIMING CHAIN COVER
2 - CRANKSHAFT TIMING MARKS

(6) Remove power steering pump.

(7) Remove access plugs (2) from left and right cylinder heads for access to chain guide fasteners (Fig. 122).

(8) Remove the oil fill housing to gain access to the right side tensioner arm fastener.

(9) Remove crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL) and timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).

(10) Collapse and pin primary chain tensioner (Fig. 123).

CAUTION: Plate behind left secondary chain tensioner could fall into oil pan. Therefore, cover pan opening.

(11) Remove secondary chain tensioners.

(12) Remove camshaft position sensor from right cylinder head (Fig. 124).

CAUTION: Care should be taken not to damage camshaft target wheel. Do not hold target wheel while loosening or tightening camshaft sprocket. Do not place the target wheel near a magnetic source of any kind. A damaged or magnetized target wheel could cause a vehicle no start condition.

CAUTION: Do not forcefully rotate the camshafts or crankshaft independently of each other. Damaging intake valve to piston contact will occur. Ensure negative battery cable is disconnected to guard against accidental starter engagement.

(13) Remove left and right camshaft sprocket bolts.

(14) While holding the left camshaft steel tube with adjustable pliers, (Fig. 125) remove the left camshaft sprocket. Slowly rotate the camshaft approximately 15 degrees clockwise to a neutral position.

(15) While holding the right camshaft steel tube with adjustable pliers, (Fig. 126) remove the right camshaft sprocket. Slowly rotate the camshaft approximately 45 degrees counterclockwise to a neutral position.

TIMING BELT/CHAIN AND SPROCKETS (Continued)

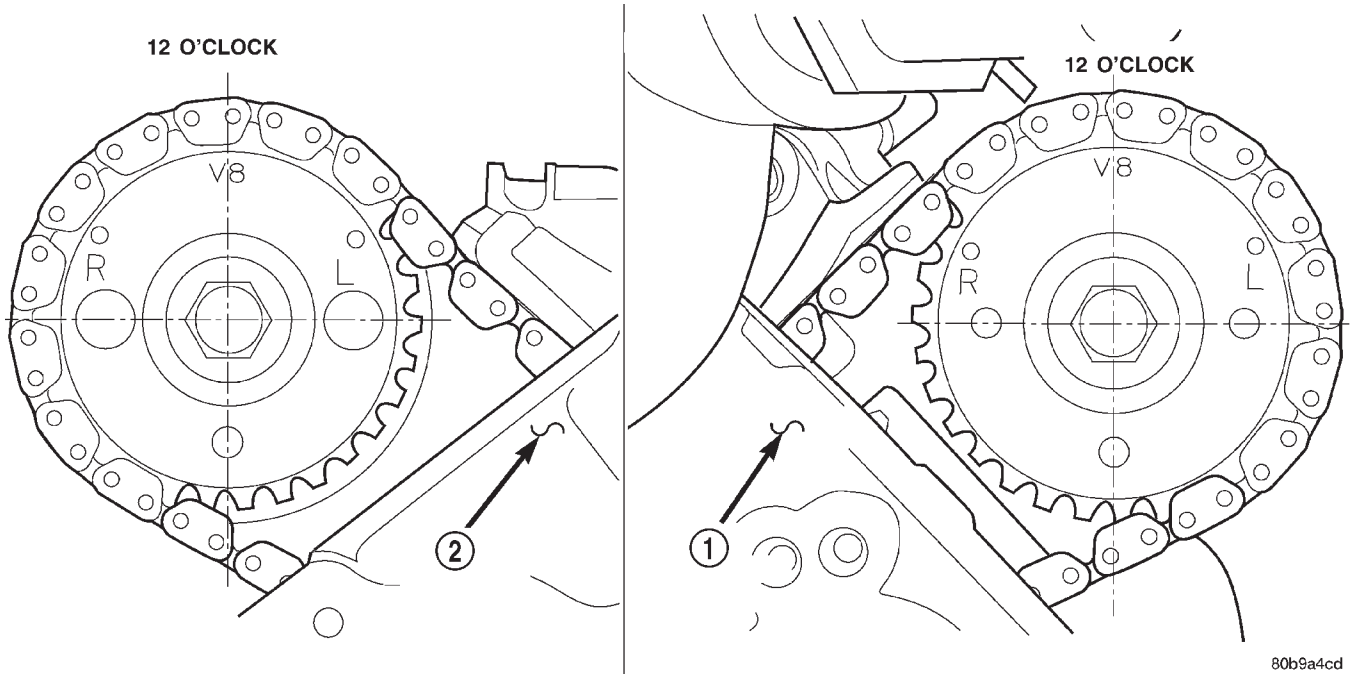


Fig. 121 Camshaft Sprocket V8 Marks

1 - LEFT CYLINDER HEAD
2 - RIGHT CYLINDER HEAD

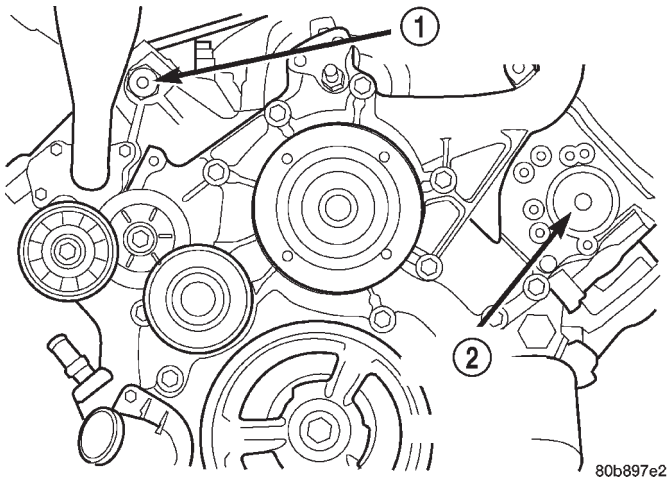


Fig. 122 Cylinder Head Access Plug Location

1 - RIGHT CYLINDER HEAD ACCESS PLUG
2 - LEFT CYLINDER HEAD ACCESS PLUG

(16) Remove idler sprocket assembly bolt.

(17) Slide the idler sprocket assembly and crank sprocket forward simultaneously to remove the primary and secondary chains.

(18) Remove both pivoting tensioner arms and chain guides.

(19) Remove chain tensioner.

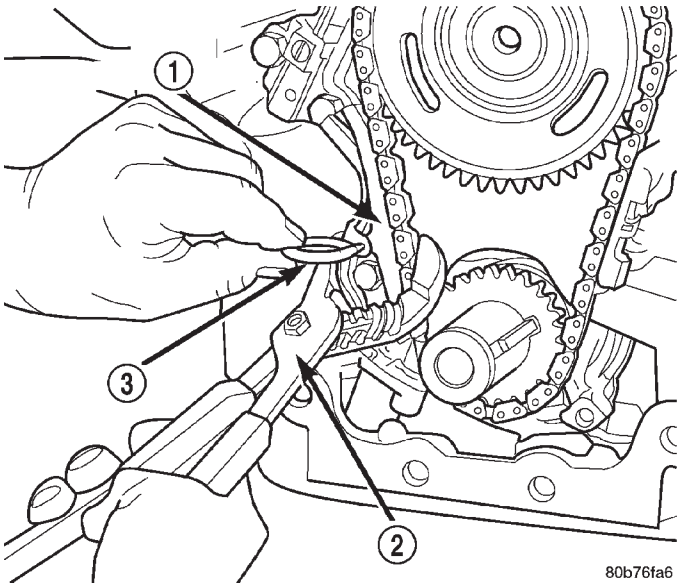


Fig. 123 Collapsing And Pinning Primary Chain Tensioner

1 - PRIMARY CHAIN TENSIONER
2 - ADJUSTABLE PLIERS
3 - SPECIAL TOOL 8514

TIMING BELT/CHAIN AND SPROCKETS (Continued)

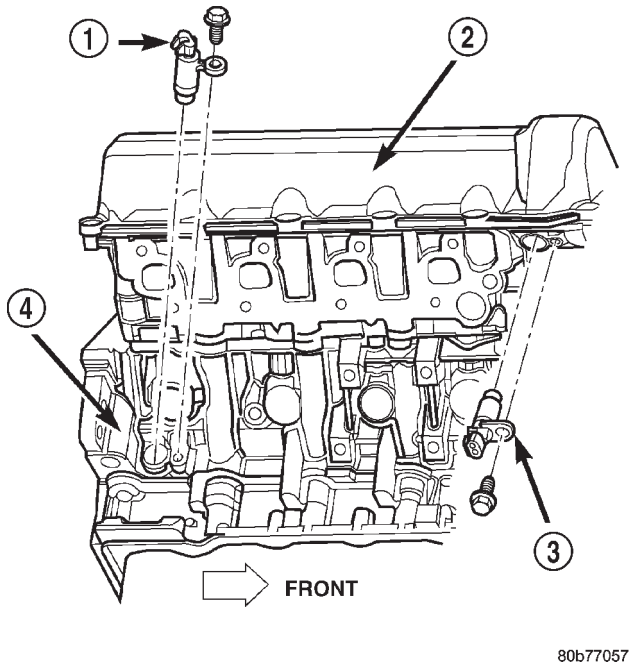


Fig. 124 Camshaft Position Sensor—Removal

1 - CRANKSHAFT POSITION SENSOR
2 - CYLINDER HEAD COVER
3 - CAMSHAFT POSITION SENSOR
4 - RIGHT SIDE CYLINDER BLOCK

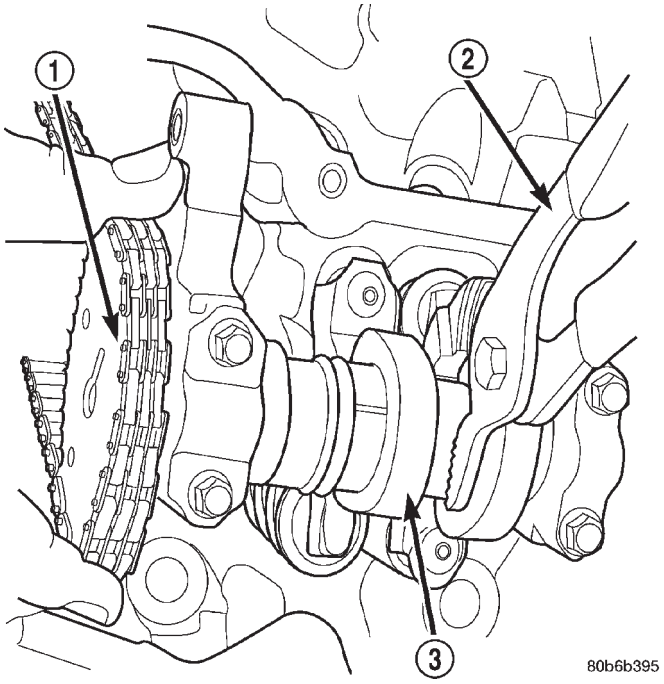


Fig. 125 Camshaft Rotation—Left Side

1 - CAMSHAFT SPROCKET AND CHAIN
2 - ADJUSTABLE PLIERS
3 - CAMSHAFT

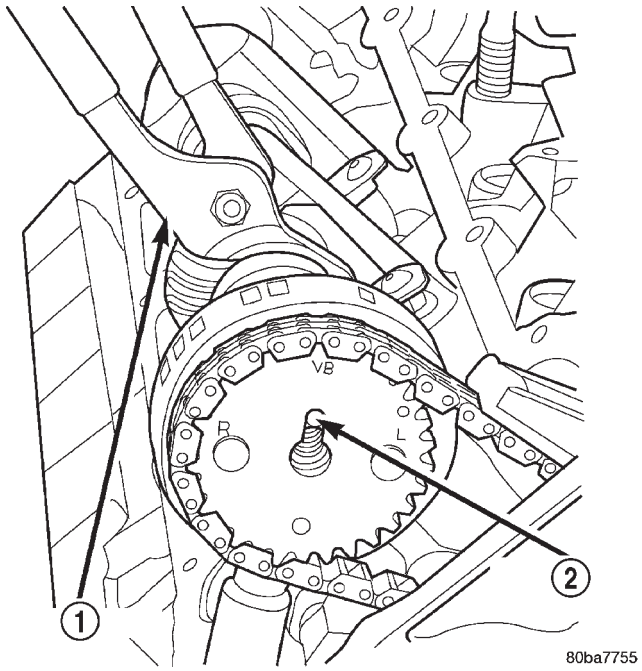


Fig. 126 Camshaft Rotation—Right Side

1 - ADJUSTABLE PLIERS
2 - CAMSHAFT DOWEL

INSPECTION

Inspect the following components:

- Sprockets for excessive tooth wear. Some tooth markings are normal and not a cause for sprocket replacement.
- Idler sprocket assembly bushing and shaft for excessive wear.
- Idler sprocket assembly spline joint. The joint should be tight with no backlash or axial movement.
- Chain guides and tensioner arms. Replace these parts if grooving in plastic face is more than 1 mm (0.039 in.) deep. If plastic face is severely grooved or melted, the tensioner lube jet may be clogged. The tensioner should be replaced.
- secondary chain tensioner piston and ratcheting device. Inspect for evidence of heavy contact between tensioner piston and tensioner arm. If this condition exist the tensioner and tensioner arm should be replaced.
- Primary chain tensioner plastic faces. Replace as required (Fig. 127).

INSTALLATION

(1) Using a vise, lightly compress the secondary chain tensioner piston until the piston step is flush with the tensioner body. Using a pin or suitable tool, release ratchet pawl by pulling pawl back against spring force through access hole on side of tensioner. While continuing to hold pawl back, Push ratchet device to approximately 2 mm from the tensioner

TIMING BELT/CHAIN AND SPROCKETS (Continued)

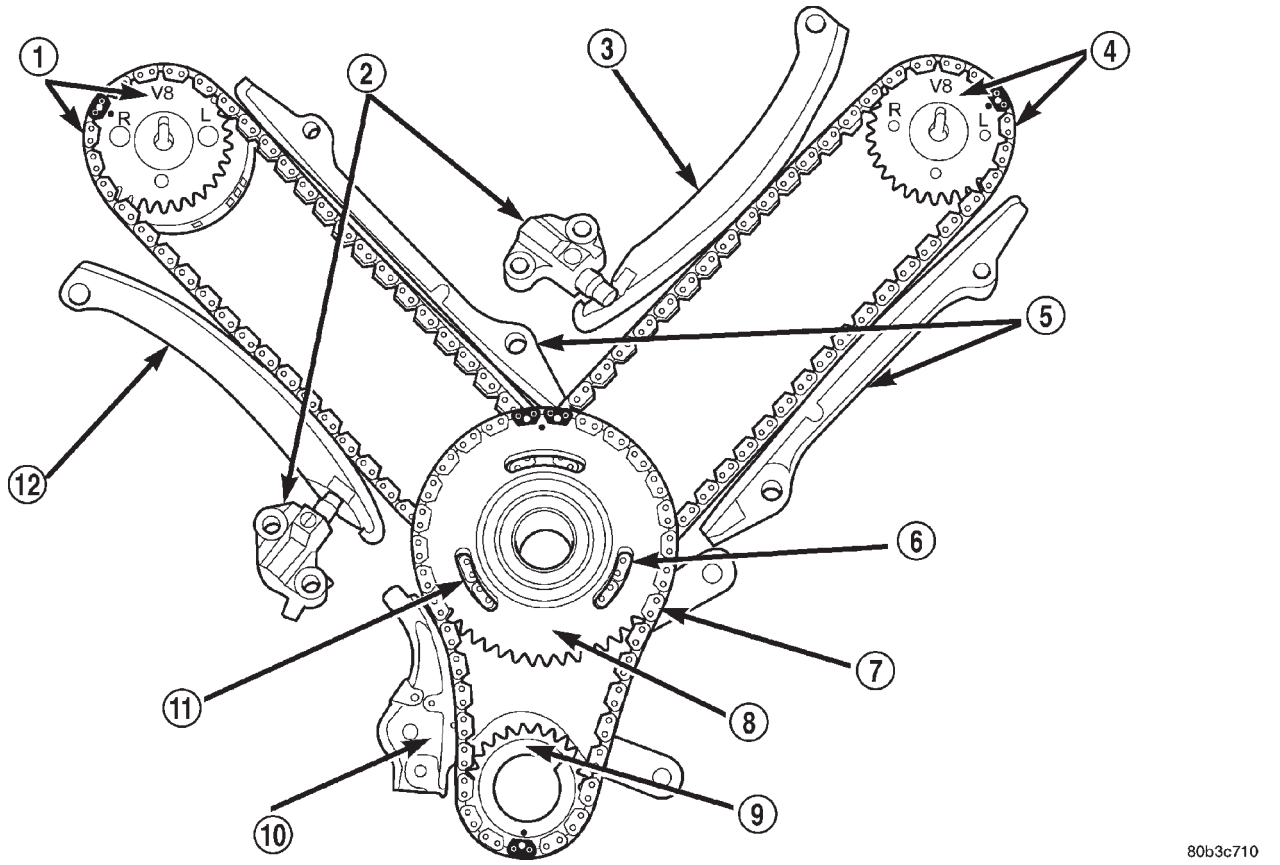


Fig. 127 Timing Chain System

1 - RIGHT CAMSHAFT SPROCKET AND SECONDARY CHAIN
2 - SECONDARY TIMING CHAIN TENSIONER (LEFT AND RIGHT SIDE NOT COMMON)
3 - SECONDARY TENSIONER ARM
4 - LEFT CAMSHAFT SPROCKET AND SECONDARY CHAIN
5 - CHAIN GUIDE
6 - TWO PLATED LINKS ON RIGHT CAMSHAFT CHAIN
7 - PRIMARY CHAIN
8 - IDLER SPROCKET
9 - CRANKSHAFT SPROCKET
10 - PRIMARY CHAIN TENSIONER
11 - TWO PLATED LINKS ON LEFT CAMSHAFT CHAIN
12 - SECONDARY TENSIONER ARM

body. Install Special Tool 8514 lock pin into hole on front of tensioner. Slowly open vise to transfer piston spring force to lock pin (Fig. 128).

(2) Position primary chain tensioner over oil pump and insert bolts into lower two holes on tensioner bracket. Tighten bolts to 28 N·m (250 in. lbs.).

CAUTION: Overtightening the tensioner arm torx® bolt can cause severe damage to the cylinder head. Tighten torx® bolt to specified torque only.

(3) Install right side chain tensioner arm. Apply Mopar® Lock N, Seal to torx® bolt, tighten bolt to 17 N·m (150 in. lbs.).

NOTE: The silver bolts retain the guides to the cylinder heads and the black bolts retain the guides to the engine block.

(4) Install the left side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

CAUTION: Overtightening the tensioner arm torx® bolt can cause severe damage to the cylinder head. Tighten torx® bolt to specified torque only.

(5) Install left side chain tensioner arm. Apply Mopar® Lock N, Seal to torx® bolt, tighten bolt to 17 N·m (150 in. lbs.).

(6) Install the right side chain guide. Tighten the bolts to 28 N·m (250 in. lbs.).

(7) Install both secondary chains onto the idler sprocket. Align two plated links on the secondary chains to be visible through the two lower openings on the idler sprocket (4 o'clock and 8 o'clock). Once the secondary timing chains are installed, position special tool 8515 to hold chains in place for installation (Fig. 129).

TIMING BELT/CHAIN AND SPROCKETS (Continued)

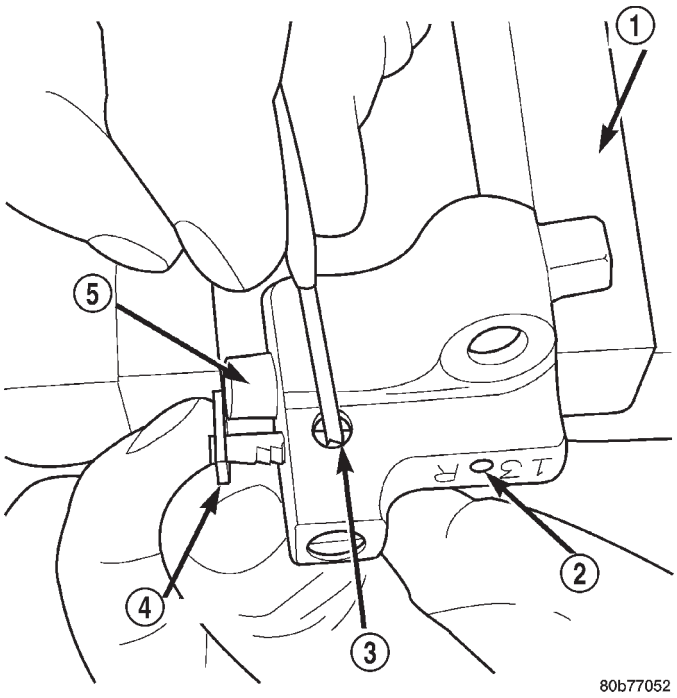


Fig. 128 Resetting Secondary Chain Tensioners

1 - VISE
2 - INSERT LOCK PIN
3 - RATCHET PAWL
4 - RATCHET
5 - PISTON

(8) Align primary chain double plated links with the timing mark at 12 o'clock on the idler sprocket. Align the primary chain single plated link with the timing mark at 6 o'clock on the crankshaft sprocket (Fig. 127).

(9) Lubricate idler shaft and bushings with clean engine oil.

(10) Install all chains, crankshaft sprocket, and idler sprocket as an assembly (Fig. 130). After guiding both secondary chains through the block and cylinder head openings, affix chains with a elastic strap or the equivalent, This will maintain tension on chains to aid in installation.

NOTE: It will be necessary to slightly rotate camshafts for sprocket installation.

(11) Align left camshaft sprocket "L" dot to plated link on chain.

(12) Align right camshaft sprocket "R" dot to plated link on chain.

CAUTION: Remove excess oil from the camshaft sprocket bolt. Failure to do so can result in overtorque of bolt resulting in bolt failure.

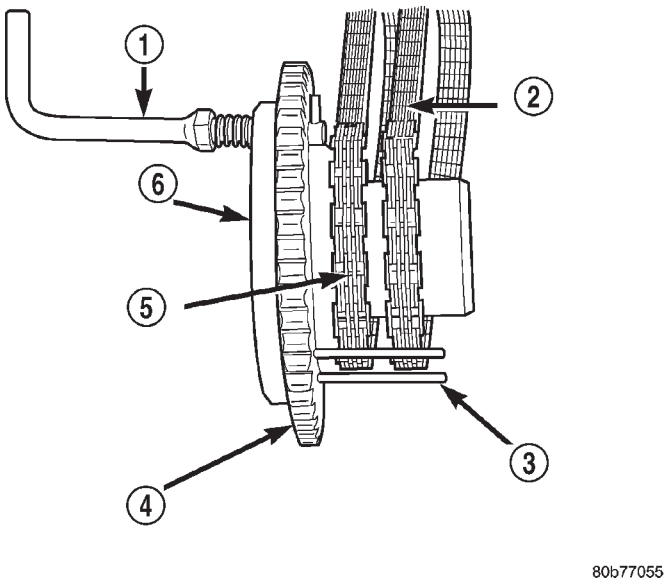


Fig. 129 Installing Secondary Timing Chains on Idler Sprocket

1 - LOCK ARM
2 - RIGHT CAMSHAFT CHAIN
3 - SECONDARY CHAINS RETAINING PINS (4)
4 - IDLER SPROCKET
5 - LEFT CAMSHAFT CHAIN
6 - SPECIAL TOOL 8515

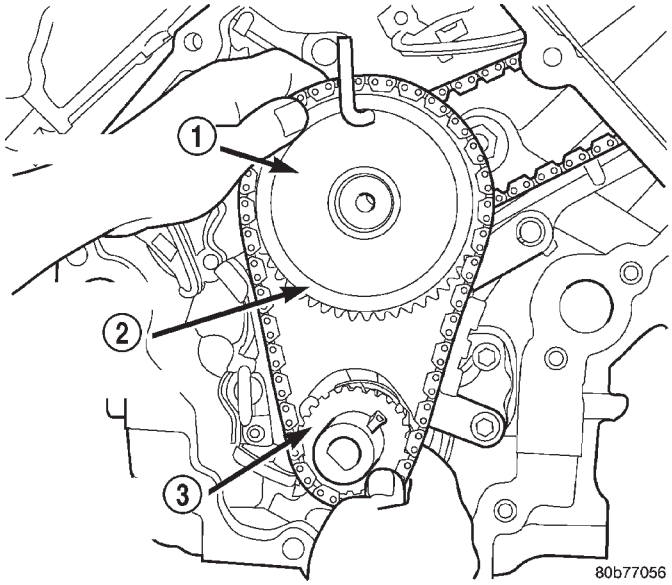


Fig. 130 Installing Idler Gear, Primary and Secondary Timing Chains

1 - SPECIAL TOOL 8515
2 - PRIMARY CHAIN IDLER SPROCKET
3 - CRANKSHAFT SPROCKET

TIMING BELT/CHAIN AND SPROCKETS (Continued)

(13) Remove Special Tool 8515, then attach both sprockets to camshafts. Remove excess oil from bolts, then Install sprocket bolts, but do not tighten at this time.

(14) Verify that all plated links are aligned with the marks on all sprockets and the “V8” marks on camshaft sprockets are at the 12 o'clock position (Fig. 127).

CAUTION: Ensure the plate between the left secondary chain tensioner and block is correctly installed.

(15) Install both secondary chain tensioners. Tighten bolts to 28 N·m (250 in. lbs.).

NOTE: Left and right secondary chain tensioners are not common.

(16) Before installing idler sprocket bolt, lubricate washer with oil, and tighten idler sprocket assembly retaining bolt to 34 N·m (25 ft. lbs.).

(17) Remove all locking pins (3) from tensioners.

CAUTION: After pulling locking pins out of each tensioner, DO NOT manually extend the tensioner(s) ratchet. Doing so will over tension the chains, resulting in noise and/or high timing chain loads.

(18) Using Special Tool 6958, Spanner with Adaptor Pins 8346, tighten left (Fig. 131) and right (Fig. 132). camshaft sprocket bolts to 122 N·m (90 ft. lbs.).

(19) Rotate engine two full revolutions. Verify timing marks are at the follow locations:

- primary chain idler sprocket dot is at 12 o'clock (Fig. 127)
- primary chain crankshaft sprocket dot is at 6 o'clock (Fig. 127)
- secondary chain camshaft sprockets “V8” marks are at 12 o'clock (Fig. 127)

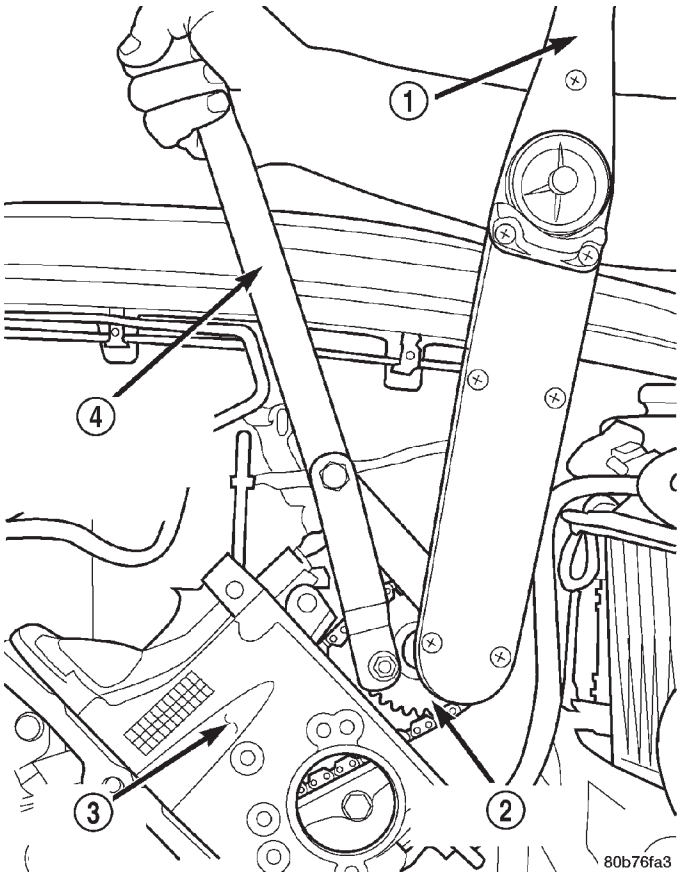


Fig. 131 Tightening Left Side Camshaft Sprocket Bolt

1 - TORQUE WRENCH
2 - CAMSHAFT SPROCKET
3 - LEFT CYLINDER HEAD
4 - SPECIAL TOOL 6958 SPANNER WITH ADAPTER PINS 8346

(20) Lubricate all three chains with engine oil.

(21) After installing all chains, it is recommended that the idler gear end play be checked (Fig. 133). The end play must be within 0.10–0.25 mm (0.004–0.010 in.). If not within specification, the idler gear must be replaced.

TIMING BELT/CHAIN AND SPROCKETS (Continued)

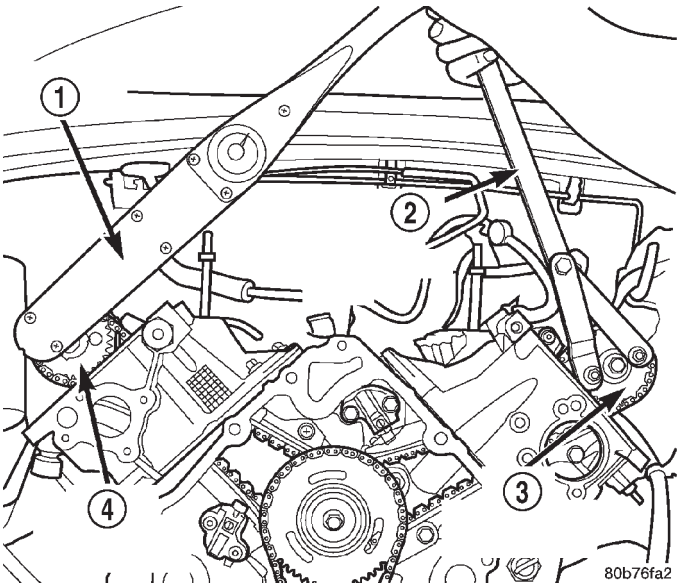


Fig. 132 Tightening Right Side Camshaft Sprocket Bolt

1 - TORQUE WRENCH
2 - SPECIAL TOOL 6958 WITH ADAPTER PINS 8346
3 - LEFT CAMSHAFT SPROCKET
4 - RIGHT CAMSHAFT SPROCKET

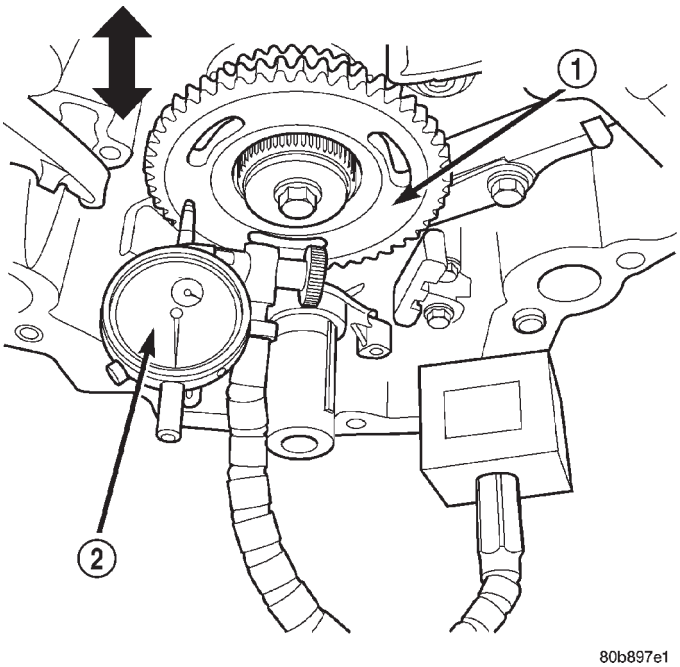


Fig. 133 Measuring Idler Gear End Play

1 - IDLER SPROCKET ASSEMBLY
2 - DIAL INDICATOR

(22) Install timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION) and crankshaft damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).

(23) Install cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

NOTE: Before installing threaded plug in right cylinder head, the plug must be coated with sealant to prevent leaks.

(24) Coat the large threaded access plug with **Mopar® Thread Sealant with Teflon**, then install into the right cylinder head and tighten to 81 N·m (60 ft. lbs.) (Fig. 122).

(25) Install the oil fill housing.

(26) Install access plug in left cylinder head (Fig. 122).

(27) Install power steering pump.

(28) Install radiator fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).

(29) Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).

(30) Connect negative cable to battery.

EXHAUST SYSTEM

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EXHAUST SYSTEM

DESCRIPTION - EXHAUST SYSTEM

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.

The exhaust system uses a single muffler with a welded tailpipe.

The 50 State Emissions vehicles use two mini catalytic converters inline with the exhaust pipe below the exhaust manifolds.

The exhaust manifolds are equipped with ball flange outlets to assure a tight seal and strain free connections.

The exhaust system must be properly aligned to prevent stress, leakage and body contact. If the system contacts any body panel, it may amplify objectionable noises originating from the engine or body.

When inspecting an exhaust system, critically inspect for cracked or loose joints, stripped screw or bolt threads, corrosion damage and worn, cracked or broken hangers. Replace all components that are badly corroded or damaged. DO NOT attempt to repair.

When replacement is required, use original equipment parts (or their equivalent). This will assure proper alignment and provide acceptable exhaust noise levels.

The basic exhaust system consists of exhaust manifold(s), exhaust pipe with oxygen sensors, catalytic converter(s), heat shield(s), muffler and tailpipe (Fig. 1) and (Fig. 2).

EXHAUST SYSTEM (Continued)

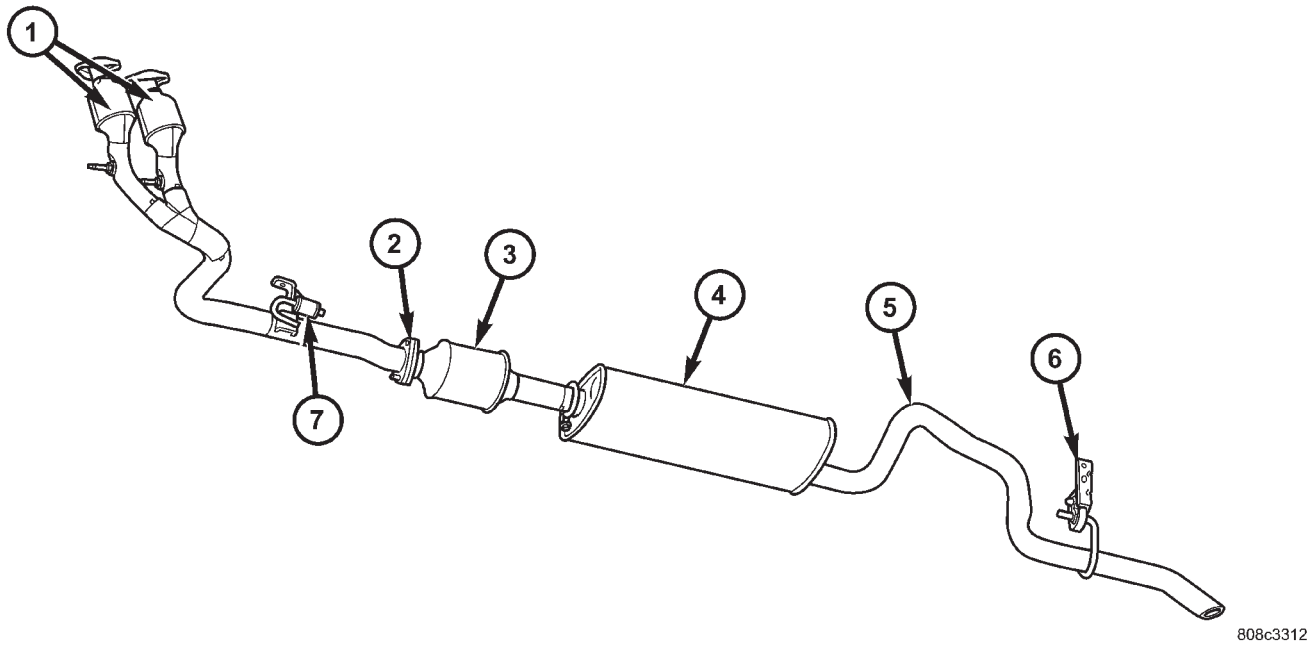


Fig. 1 Exhaust System—4.0L

1 - MINI CONVERTERS (2)
2 - CATALYTIC CONVERTER TO EXHAUST PIPE FLANGE JOINT
3 - CATALYTIC CONVERTER
4 - MUFFLER
5 - TAILPIPE
6 - TAILPIPE HANGER REAR MOUNT INSULATOR
7 - EXHAUST PIPE HANGER AND MOUNT INSULATOR

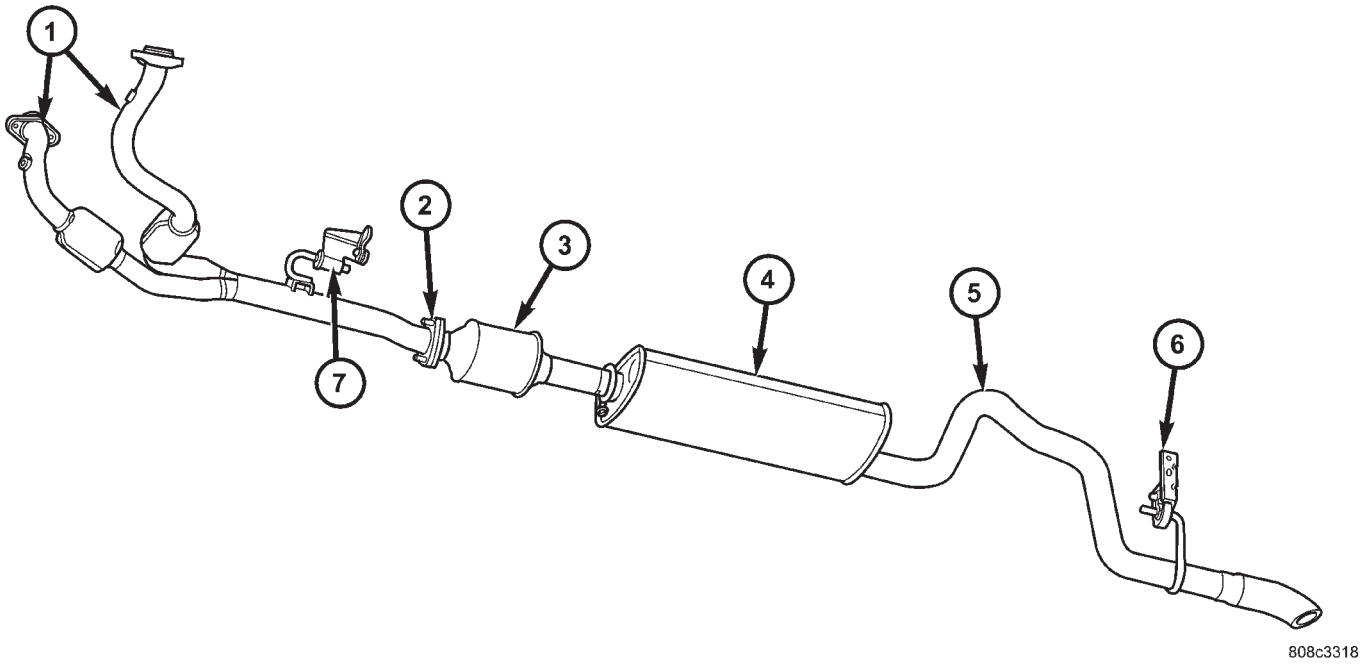


Fig. 2 Exhaust System—4.7L

1 - EXHAUST PIPE WITH CATALYTIC CONVERTERS
2 - EXHAUST PIPE TO CATALYTIC CONVERTER FLANGE JOINT
3 - CATALYTIC CONVERTER
4 - MUFFLER
5 - TAILPIPE
6 - TAILPIPE HANGER REAR MOUNT INSULATOR
7 - EXHAUST PIPE HANGER AND MOUNT INSULATOR

EXHAUST SYSTEM (Continued)

DIAGNOSIS AND TESTING - EXHAUST SYSTEM

EXHAUST SYSTEM DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints.	1. Tighten clamps to specified torque at leaking joints (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).
	2. Burned or blown out muffler.	2. Replace muffler assembly (Refer to 11 - EXHAUST SYSTEM/ MUFFLER - REMOVAL). Check exhaust system.
	3. Burned or rusted-out exhaust pipe.	3. Replace exhaust pipe (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL).
	4. Exhaust pipe leaking at manifold flange.	4. Tighten connection attaching nuts (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).
	5. Exhaust manifold cracked or broken.	5. Replace exhaust manifold (Refer to 9 - ENGINE/MANIFOLDS/ EXHAUST MANIFOLD - REMOVAL).
	6. Leak between exhaust manifold and cylinder head.	6. Tighten exhaust manifold to cylinder head stud nuts or bolts (Refer to 9 - ENGINE - SPECIFICATIONS).
	7. Restriction in muffler or tailpipe.	7. Remove restriction, if possible. Replace muffler or tailpipe, as necessary.
	8. Exhaust system contacting body or chassis.	8. Re-align exhaust system to clear surrounding components.
LEAKING EXHAUST GASES	1. Leaks at pipe joints.	1. Tighten/replace clamps at leaking joints (Refer to 11 - EXHAUST SYSTEM - SPECIFICATIONS).

SPECIFICATIONS

TORQUE

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Catalytic Converter-to-Exhaust Pipe—Nuts	28	—	250
Exhaust Pipe-to-Manifold—Nuts	31	23	—
Heat Shield Retaining—Nuts	2.0	—	20

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Muffler-to-Catalytic Converter			
U-bolt clamp	47	35	—
Rear Tailpipe Hanger—Bolts	22	—	192

CATALYTIC CONVERTER - 4.0L

DESCRIPTION - CATALYTIC CONVERTER 4.0L ENGINE

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

CAUTION: DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

50 State emission vehicles incorporate two mini catalytic converters located after the exhaust manifolds and before the inline catalytic converter (Fig. 3).

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

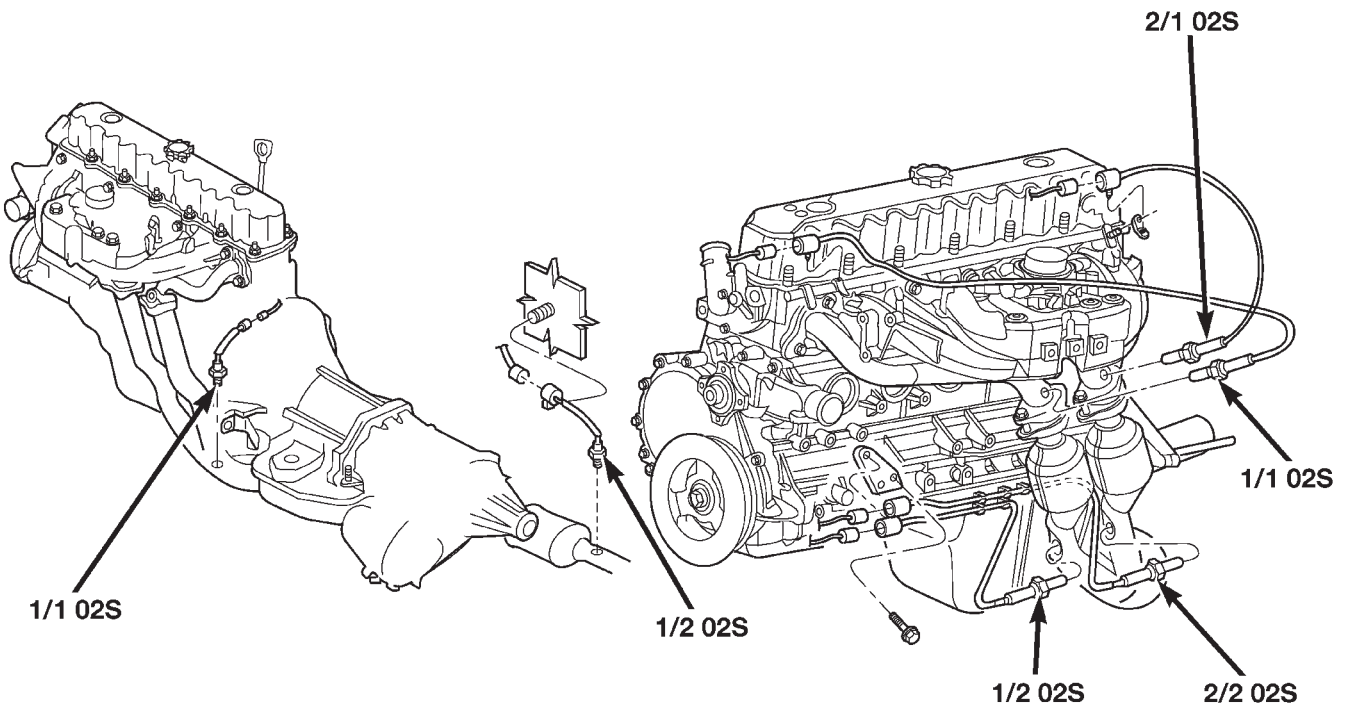


Fig. 3 4.0L Catalytic Converter and O2 Sensor Configuration - 50 State Emissions

CATALYTIC CONVERTER - 4.0L (Continued)

(1) Raise and support the vehicle.
(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
(3) Remove nuts from the catalytic converter and exhaust pipe flange connection (Fig. 4).
(4) Loosen exhaust clamp from the catalytic converter and muffler connection (Fig. 4).
(5) Disconnect oxygen sensor wiring (Fig. 4).

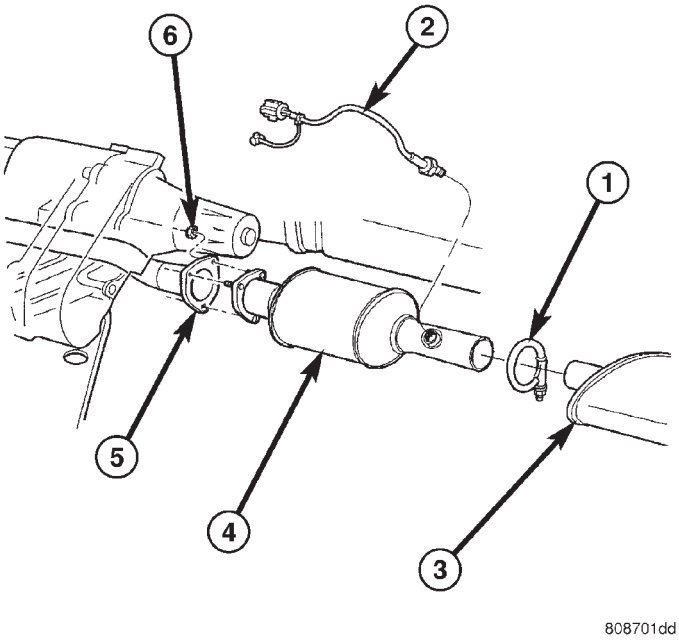


Fig. 4 Exhaust Pipe-to-Catalytic Converter-to-Muffler Connection

1 - EXHAUST CLAMP ASSEMBLY
2 - OXYGEN SENSOR
3 - MUFFLER
4 - CATALYTIC CONVERTER
5 - EXHAUST PIPE WITH FLANGE JOINT
6 - NUTS (3)

(6) Heat the catalytic converter to muffler connection with a torch until the metal becomes cherry red.
(7) While the metal is still cherry red, twist the catalytic converter back and forth to separate it from the exhaust pipe and the muffler (Fig. 5).

INSPECTION

Look at the stainless steel body of the converter, inspect for bulging or other distortion that could be a result of overheating. If the converter has a heat shield attached make sure it is not bent or loose.

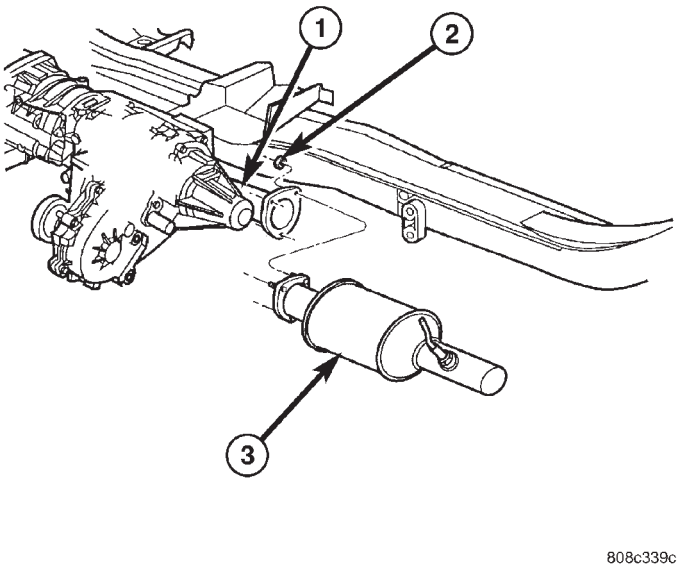


Fig. 5 Catalytic Converter—Removal

1 - EXHAUST PIPE WITH FLANGE
2 - NUTS (3)
3 - CATALYTIC CONVERTER

If you suspect internal damage to the catalyst, tapping the bottom of the catalyst with a rubber mallet may indicate a damaged core.

INSTALLATION

(1) Position the catalytic converter onto the exhaust pipe flange connection (Fig. 4). Tighten the nuts to 28 N·m (250 in. lbs.) torque.
(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.
(3) Install the exhaust clamp at the muffler and catalytic converter connection (Fig. 4). Tighten the clamp nuts to 47 N·m (35 ft. lbs.) torque.
(4) Connect oxygen sensor wiring (Fig. 4).
(5) Lower the vehicle.
(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

CATALYTIC CONVERTER - 4.7L

DESCRIPTION - CATALYTIC CONVERTER

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

CAUTION: DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

50 State emission vehicles incorporate two mini catalytic converters located after the exhaust manifolds and before the inline catalytic converter (Fig. 6).

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

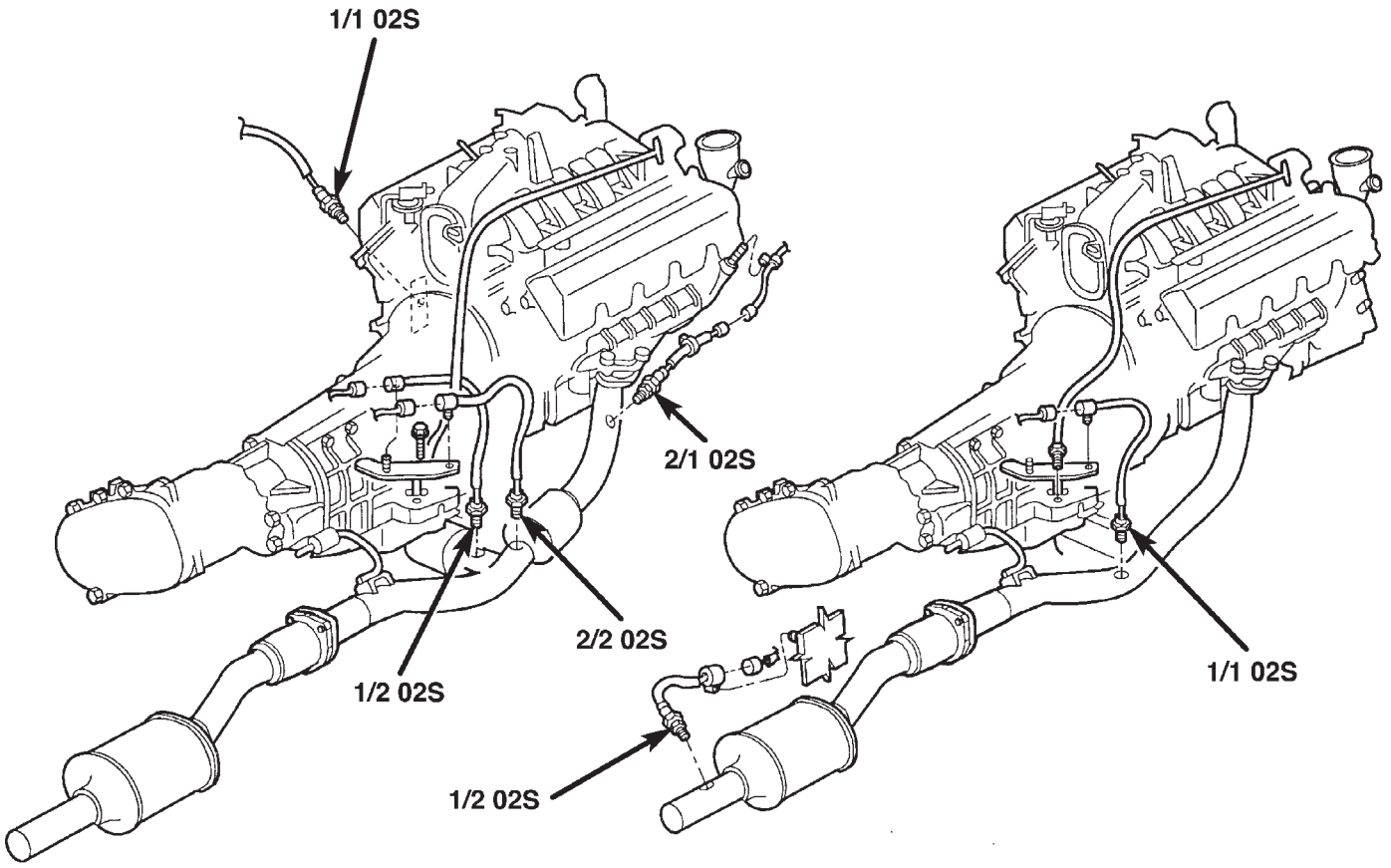


Fig. 6 4.7L Catalytic Converter and O2 Sensor Configuration - 50 State Emissions

CATALYTIC CONVERTER - 4.7L (Continued)

(1) Raise and support the vehicle.
(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.
(3) Remove nuts from the catalytic converter and exhaust pipe flange connection (Fig. 7).
(4) Loosen exhaust clamp from the catalytic converter and muffler connection (Fig. 7).
(5) Disconnect oxygen sensor wiring (Fig. 7).

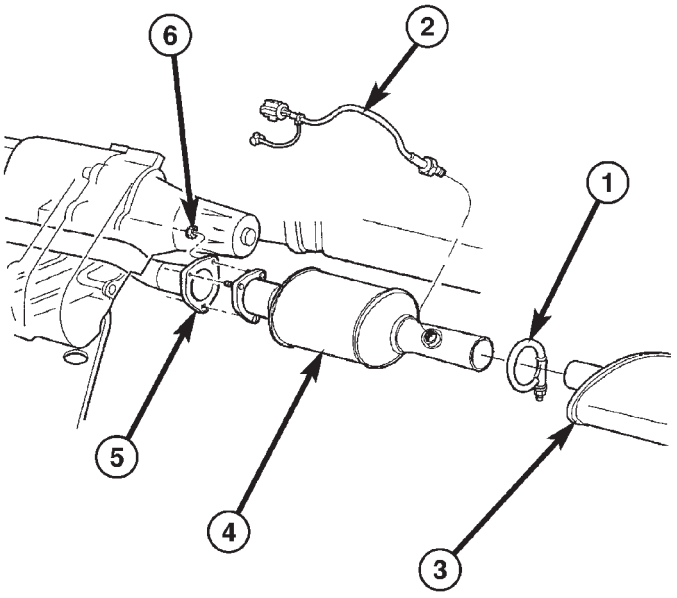


Fig. 7 Exhaust Pipe-to-Catalytic Converter-to-Muffler Connection

1 - EXHAUST CLAMP ASSEMBLY
2 - OXYGEN SENSOR
3 - MUFFLER
4 - CATALYTIC CONVERTER
5 - EXHAUST PIPE WITH FLANGE JOINT
6 - NUTS (3)

(6) Heat the catalytic converter to muffler connection with a torch until the metal becomes cherry red.
(7) While the metal is still cherry red, twist the catalytic converter back and forth to separate it from the muffler (Fig. 8).

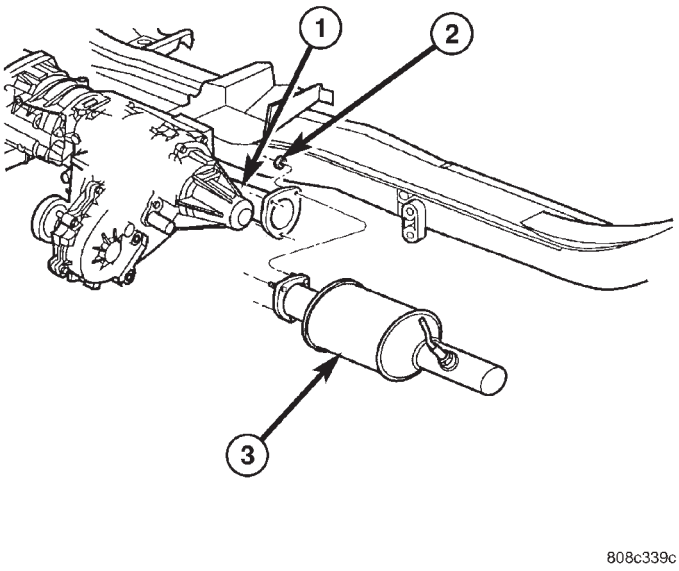


Fig. 8 Catalytic Converter—Removal

1 - EXHAUST PIPE WITH FLANGE
2 - NUTS (3)
3 - CATALYTIC CONVERTER

INSPECTION

Look at the stainless steel body of the converter, inspect for bulging or other distortion that could be a result of overheating. If the converter has a heat shield attached make sure it is not bent or loose.

If you suspect internal damage to the catalyst, tapping the bottom of the catalyst with a rubber mallet may indicate a damaged core.

INSTALLATION

(1) Position the catalytic converter onto the exhaust pipe flange connection (Fig. 7). Tighten the nuts to 28 N·m (250 in. lbs.) torque.
(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.
(3) Install the exhaust clamp at the muffler and catalytic converter connection (Fig. 7). Tighten the clamp nuts to 47 N·m (35 ft. lbs.) torque.
(4) Connect oxygen sensor wiring (Fig. 7).
(5) Lower the vehicle.
(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

EXHAUST PIPE - 4.0L

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.

(3) Remove the oxygen sensor from the exhaust pipe (Fig. 9).

(4) Remove the nuts from the exhaust pipe to catalytic converter flange connection (Fig. 10).

(5) Disconnect the exhaust pipe from the exhaust manifold (Fig. 11).

INSPECTION

Discard rusted clamps, broken or worn supports and attaching parts. Replace a component with original equipment parts, or equivalent. This will assure proper alignment with other parts in the system and provide acceptable exhaust noise levels.

INSTALLATION

(1) Connect the exhaust pipe to the engine exhaust manifold. Tighten the nuts to 31 N·m (23 ft. lbs.) (Fig. 11).

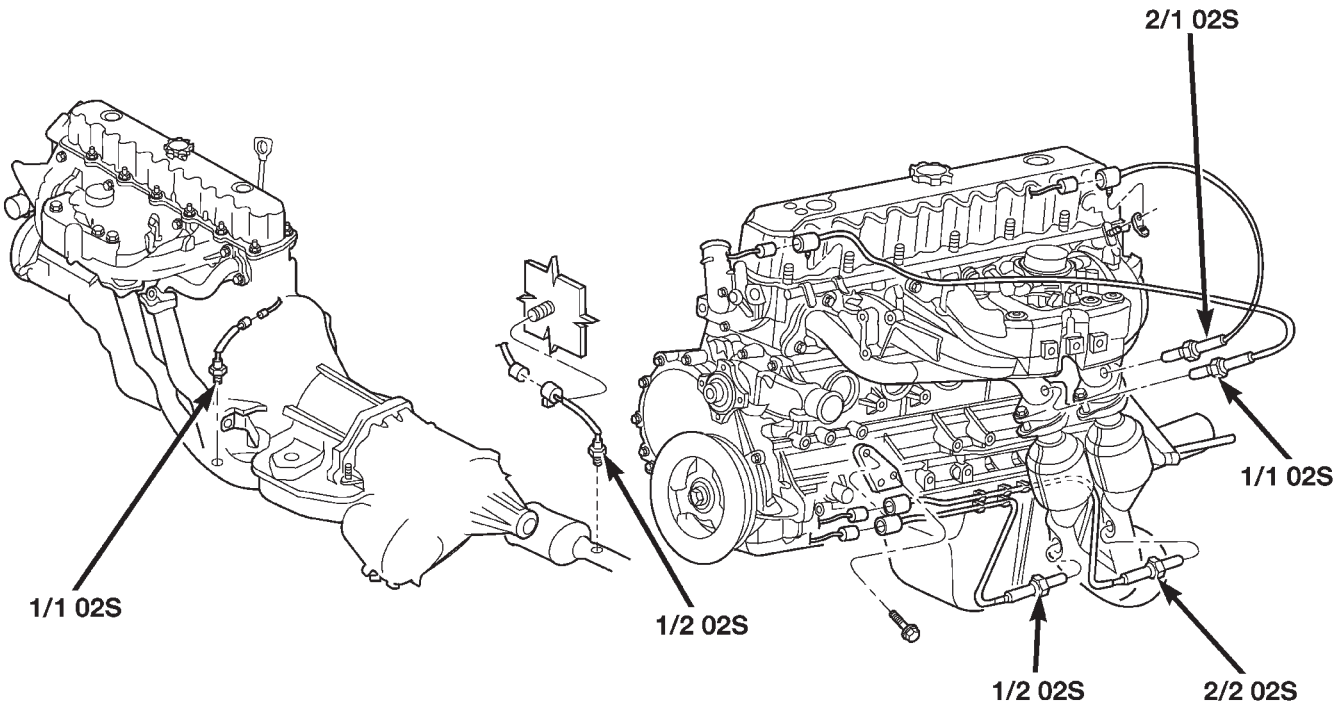


Fig. 9 O2 Sensor Location 4.0L

EXHAUST PIPE - 4.0L (Continued)

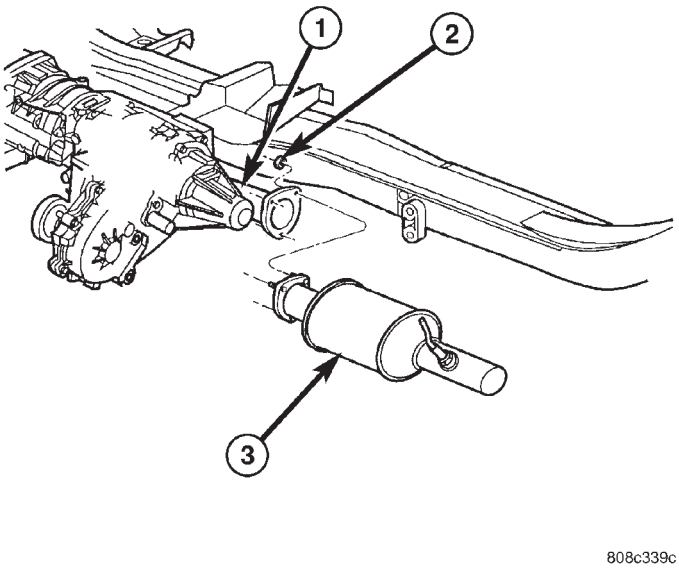


Fig. 10 Catalytic Converter—Removal

1 - EXHAUST PIPE WITH FLANGE
2 - NUTS (3)
3 - CATALYTIC CONVERTER

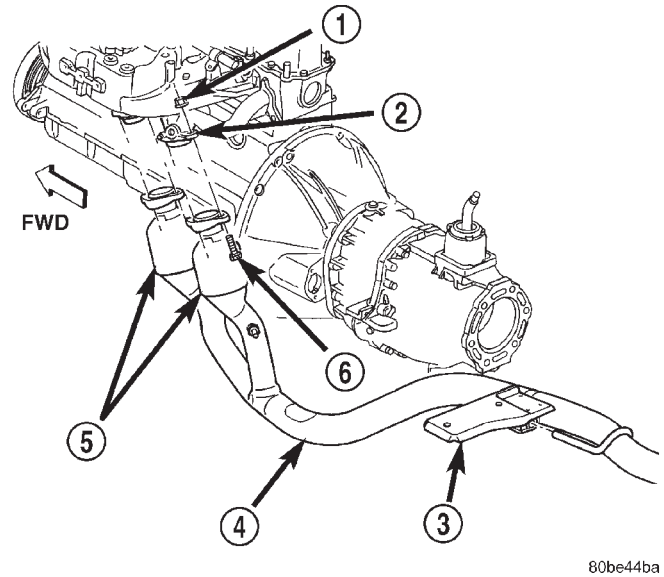


Fig. 11 Exhaust Pipe 4.0L

1 - NUT
2 - EXHAUST MANIFOLD
3 - TRANSMISSION SUPPORT
4 - EXHAUST PIPE
5 - MINI CATALYTIC CONVERTER
6 - BOLT

NOTE: When servicing the exhaust system, replace the factory installed uni-clamp with standard u-bolt clamps.

(2) Position the catalytic converter onto the exhaust pipe flange connection. Tighten retaining nuts to 28 N·m (250 in. lbs.) (Fig. 12).

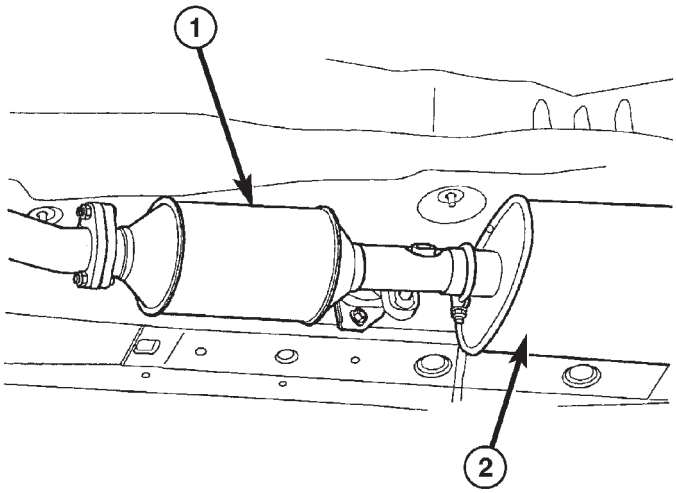


Fig. 12 Installing Exhaust Clamps

1 - CATALYTIC CONVERTER
2 - MUFFLER

(3) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque (Fig. 9).

(4) Lower the vehicle.

(5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

(6) After initial start-up, check the engine exhaust manifold to exhaust pipe nuts for proper torque.

EXHAUST PIPE - 4.7L

REMOVAL

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

WARNING: THE NORMAL OPERATING TEMPERATURE OF THE EXHAUST SYSTEM IS VERY HIGH. THEREFORE, NEVER WORK AROUND OR ATTEMPT TO SERVICE ANY PART OF THE EXHAUST SYSTEM UNTIL IT IS COOLED. SPECIAL CARE SHOULD BE TAKEN WHEN WORKING NEAR THE CATALYTIC CONVERTER. THE TEMPERATURE OF THE CONVERTER RISES TO A HIGH LEVEL AFTER A SHORT PERIOD OF ENGINE OPERATION TIME.

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.

(3) Remove the oxygen sensor from the exhaust pipe (Fig. 13).

(4) Remove the retaining nuts holding catalytic converter to exhaust pipe (Fig. 14).

(5) Disconnect the exhaust pipe from the exhaust manifold. (Fig. 15)

INSPECTION

Discard rusted clamps, broken or worn supports and attaching parts. Replace a component with original equipment parts, or equivalent. This will assure proper alignment with other parts in the system and provide acceptable exhaust noise levels.

INSTALLATION

(1) Connect the exhaust pipe to the engine exhaust manifold. Tighten the nuts (A) to 31 N·m (23 ft. lbs.) (Fig. 15).

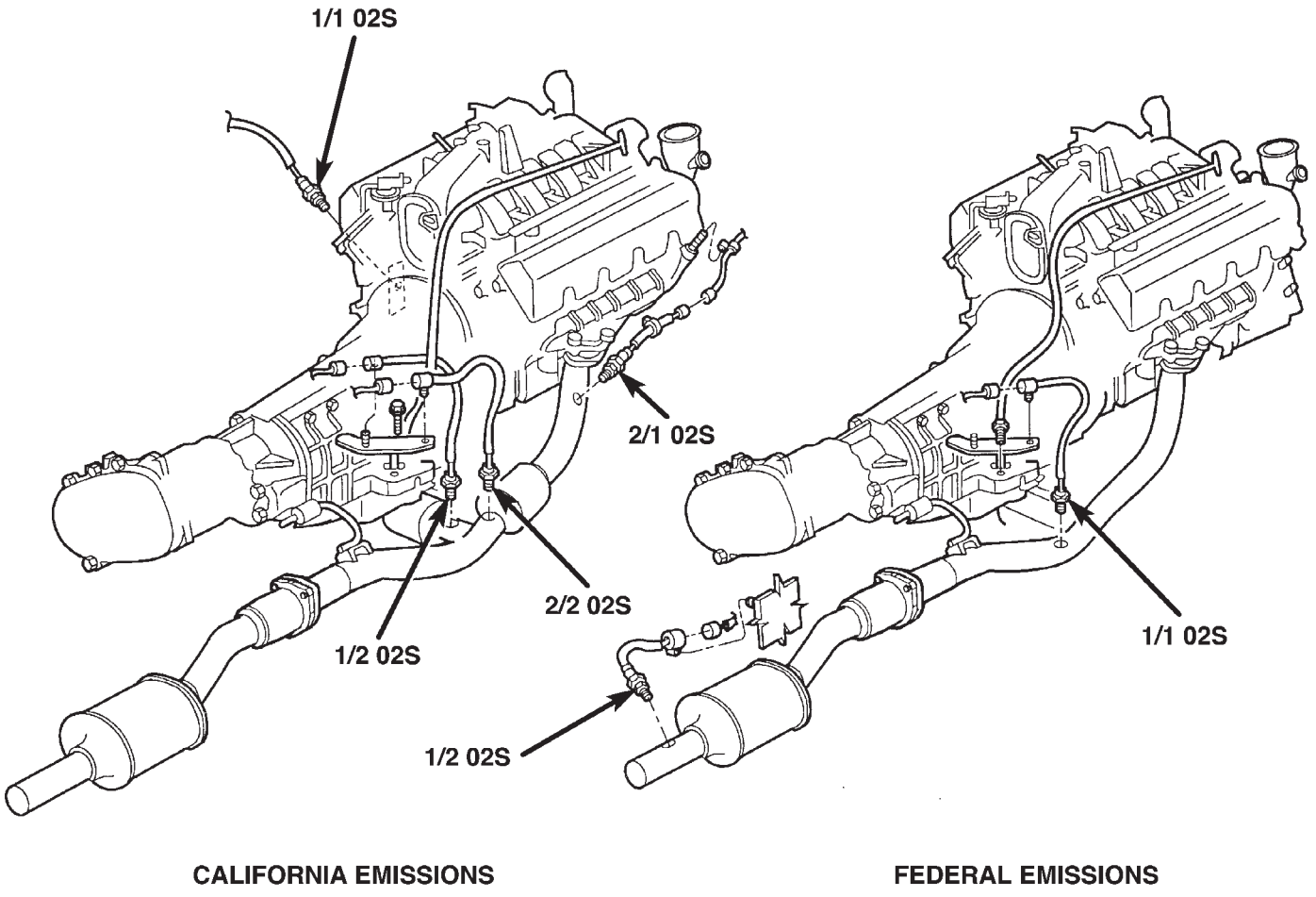


Fig. 13 4.7L Catalytic Converter and O2 Sensor Configuration - 50 State Emissions

EXHAUST PIPE - 4.7L (Continued)

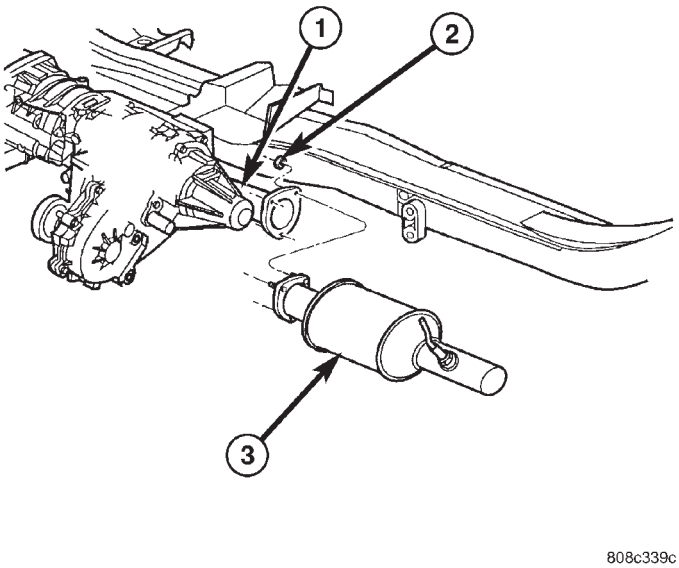


Fig. 14 Catalytic Converter—Removal

1 - EXHAUST PIPE WITH FLANGE
2 - NUTS (3)
3 - CATALYTIC CONVERTER

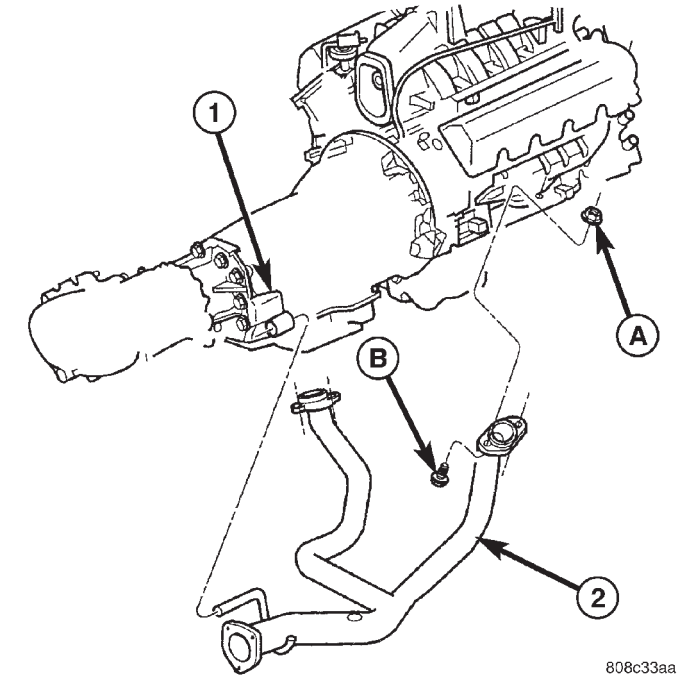


Fig. 15 Exhaust Pipe 4.7L

1 - EXHAUST PIPE HANGER
A - NUTS (4)
3 - EXHAUST PIPE
B - BOLTS (4)

NOTE: When servicing the exhaust system, replace the factory installed uni-clamp with standard u-bolt clamps.

(2) Position the catalytic converter onto the exhaust pipe flange connection. Tighten retaining nuts to 28 N·m (250 in. lbs.). (Fig. 16)

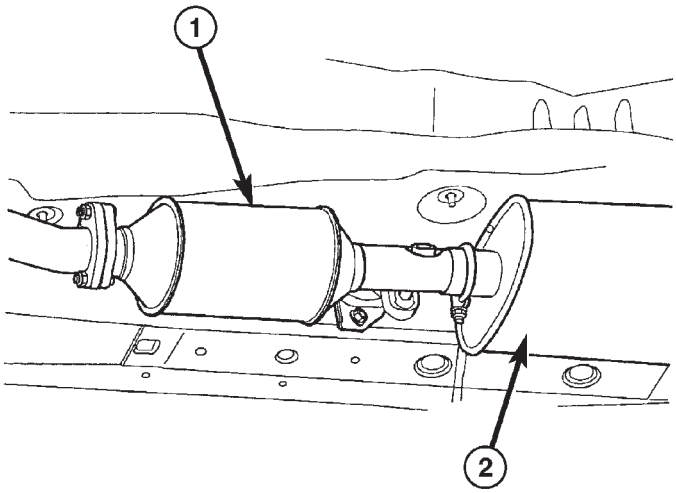


Fig. 16 Installing Exhaust Clamps

1 - CATALYTIC CONVERTER
2 - MUFFLER

(3) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque (Fig. 13).

(4) Lower the vehicle.

(5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

(6) After initial start-up, check the engine exhaust manifold to exhaust pipe nuts for proper torque.

HEAT SHIELDS

DESCRIPTION

Heat shields are needed to protect both the vehicle and the environment from the high temperatures developed by the catalytic converter. The catalytic converter releases additional heat into the exhaust system. Under severe operating conditions, the temperature increases in the area of the converter. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency (Fig. 17).

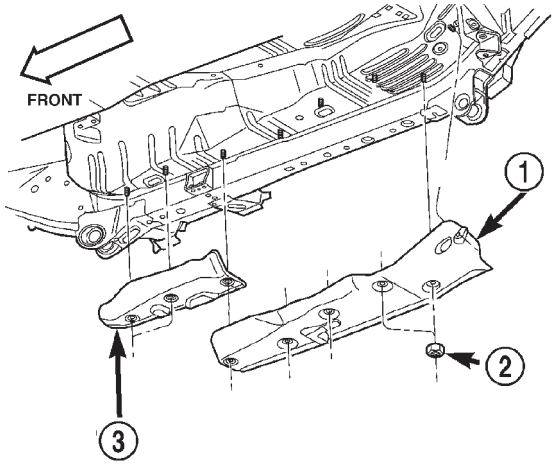


Fig. 17 Front and Rear Floor Pan Heat Shields Typical

1 - REAR FLOOR PAN HEAT SHIELD
2 - HEAT SHIELD RETAINING NUTS (QTY 8)
3 - FRONT FLOOR PAN HEAT SHIELD

MUFFLER

DESCRIPTION

Both the 4.0L and 4.7L engines use a stainless steel muffler to control exhaust noise levels and exhaust back pressure. The muffler and tailpipe are a one piece assembly (Fig. 18).

REMOVAL

All original equipment exhaust systems are manufactured with the tailpipe welded to the muffler. Service replacement mufflers and tailpipes are either clamped together or welded together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

(1) Raise and support the vehicle.
(2) Saturate the bolts and nuts with heat valve lubricant. Allow 5 minutes for penetration.

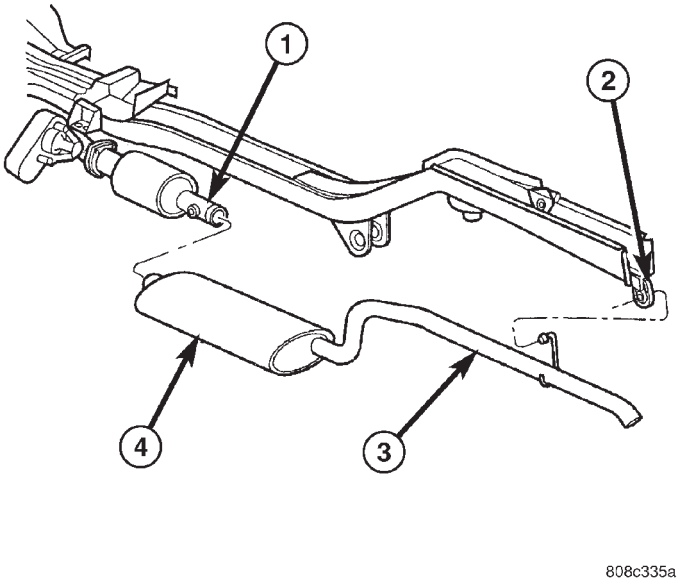


Fig. 18 Muffler and Tailpipe

1 - CATALYTIC CONVERTER
2 - TAILPIPE HANGER
3 - TAILPIPE
4 - MUFFLER

(3) Loosen the exhaust clamp on the catalytic converter to muffler connection (Fig. 19).
(4) Heat the catalytic converter-to-muffler connection with a torch until the metal becomes cherry red.
(5) While the metal is still cherry red, remove the tailpipe/muffler assembly from the catalytic converter.
(6) Remove the tailpipe from the tailpipe hanger (Fig. 20).
(7) Remove the tailpipe/muffler assembly (Fig. 20).

INSTALLATION

(1) If the tailpipe hanger assembly was removed, install the hanger to the frame. Tighten the bolts to 22 N·m (192 in. lbs.) torque.
(2) Position the tailpipe and muffler onto the tailpipe hanger (Fig. 20) .
(3) Install the muffler onto the catalytic converter. Make sure that the tailpipe has sufficient clearance from the floor pan. Install exhaust clamp and tighten the nuts to 47 N·m (35 ft. lbs.) torque (Fig. 19) .
(4) Lower the vehicle.
(5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

MUFFLER (Continued)

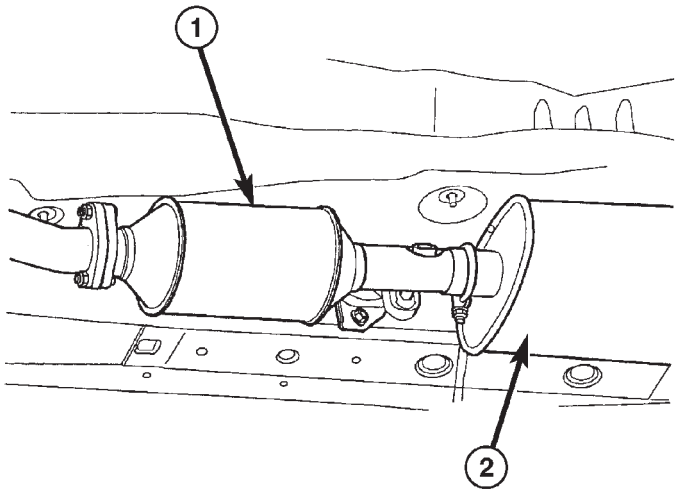


Fig. 19 Installing Exhaust Clamps

1 - CATALYTIC CONVERTER
2 - MUFFLER

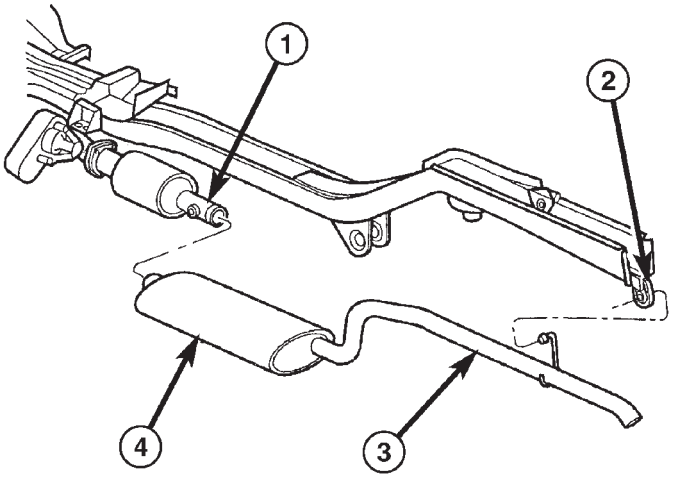


Fig. 20 Muffler and Tailpipe

1 - CATALYTIC CONVERTER
2 - TAILPIPE HANGER
3 - TAILPIPE
4 - MUFFLER

TAILPIPE

DESCRIPTION

The tailpipe is also made of stainless steel. (Fig. 18) .

OPERATION

The Tailpipe channels the exhaust out of the muffler and out from under the vehicle to control noise and prevent exhaust gas fumes from entering the passenger compartment

FRAME & BUMPERS

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FRONT ABSORBER

REMOVAL

(1) Remove front fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(2) Remove the retainer attaching the absorber to the fascia.
(3) Separate the absorber from the fascia.

INSTALLATION

(1) Position the absorber on the fascia.
(2) Install the retainer attaching the absorber to the fascia.
(3) Install front fascia. Refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).

FRONT FASCIA

REMOVAL

(1) Raise and support vehicle.
(2) Turn front wheels to access rivets and remove plastic rivets attaching fascia to wheel liner.
(3) Remove bolts attaching fascia to fender (Fig. 1).
(4) Remove plastic push pin fasteners attaching front fascia to lower radiator crossmember splash shield (Fig. 2).
(5) Disengage fog lamp connectors, if equipped.
(6) Remove screws attaching fascia/grille to upper radiator crossmember (Fig. 3).
(7) Slide fascia forward to separate from vehicle.

INSTALLATION

(1) Slide fascia onto vehicle engaging fascia with tabs on bottom of front fenders.
(2) Install screws attaching fascia/grille to upper radiator crossmember (Fig. 3).
(3) Install bolts attaching fascia to fender (Fig. 1).
(4) Engage fog lamp connectors, if equipped.
(5) Install plastic rivets attaching fascia to wheel liner.
(6) Install plastic push pin fasteners attaching front fascia to lower radiator crossmember splash shield (Fig. 2).
(7) Remove supports and lower vehicle.

FRONT FASCIA (Continued)

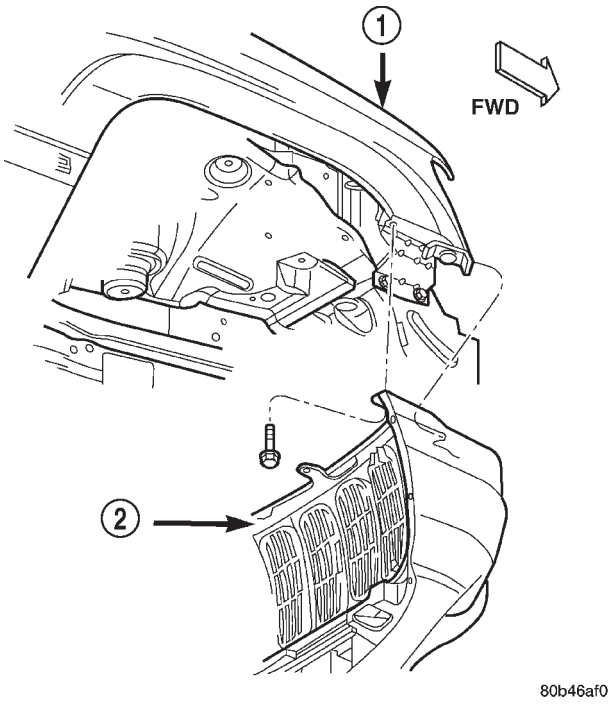


Fig. 1 Front Fascia

1 - BODY
2 - FASCIA

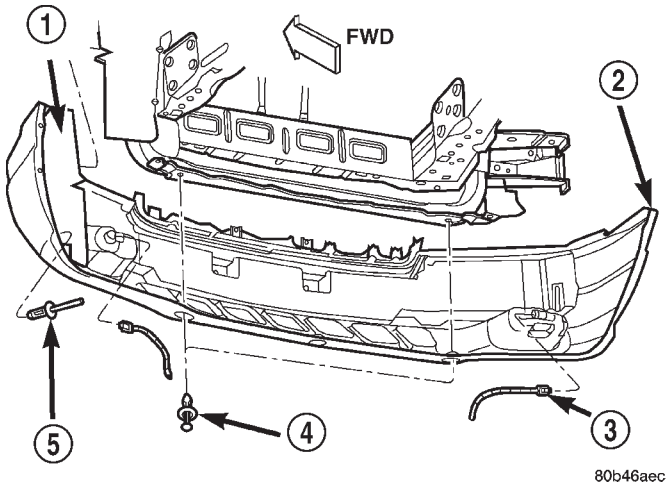


Fig. 2 Front Fascia

1 - WHEEL LINER
2 - FASCIA
3 - FOG LAMP CONNECTOR
4 - PLASTIC PUSH PIN
5 - PLASTIC RIVET

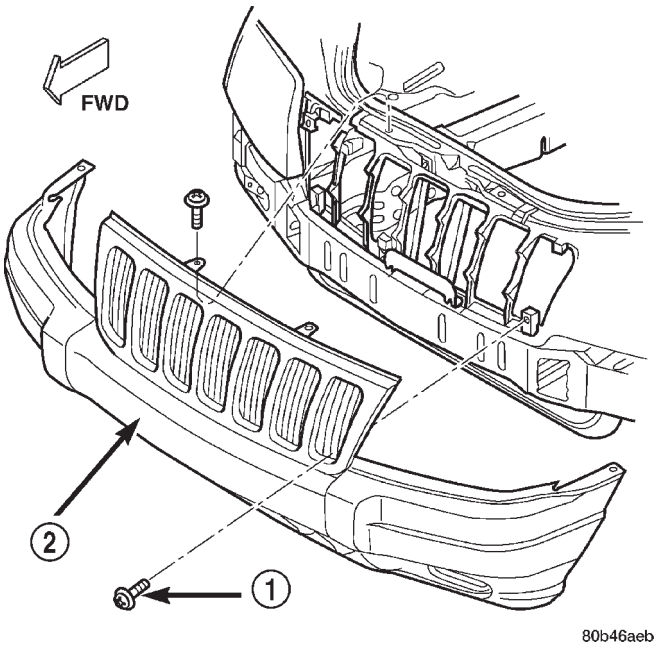


Fig. 3 Front Fascia

1 - SCREW
2 - FASCIA

REAR ABSORBER

REMOVAL

(1) Remove rear fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL).

(2) Remove rivets attaching absorber to rear cross-member (Fig. 5).

(3) Separate absorber from vehicle.

INSTALLATION

(1) Position absorber on vehicle.

(2) Install rivets attaching absorber to rear cross-member (Fig. 2).

(3) Install rear fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION).

REAR FASCIA

REMOVAL

(1) Raise and support vehicle.

(2) Remove wheels.

(3) Remove plastic push pins attaching fascia to fuel tank skid plate.

(4) Remove plastic rivets attaching fascia to wheel liner.

REAR FASCIA (Continued)

(5) Remove nuts attaching upper edge of fascia to quarter panel and wheel liner (Fig. 4).

(6) Remove plastic push pins attaching fascia to liftgate opening (Fig. 5).

(7) Remove screws attaching fascia to liftgate opening.

(8) Remove D pillar trim and scuff plate outboard screws.

(9) Remove the rearward tie down screws and the aperture trim panel.

(10) Carefully peel back the rubber body sealer patch to access the retainer clips.

(11) Release the forward and rearward retainer clips on both sides of the fascia.

(12) Grasp forward edges of fascia and pull outward to disengage retainers attaching fascia to quarter panel (Fig. 6).

(13) Separate fascia from vehicle.

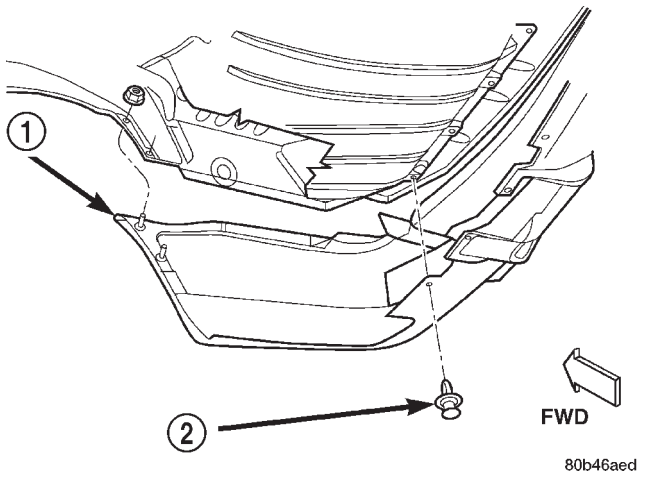


Fig. 4 Rear Fascia Attachment

1 - FASCIA
2 - PLASTIC PUSH PIN

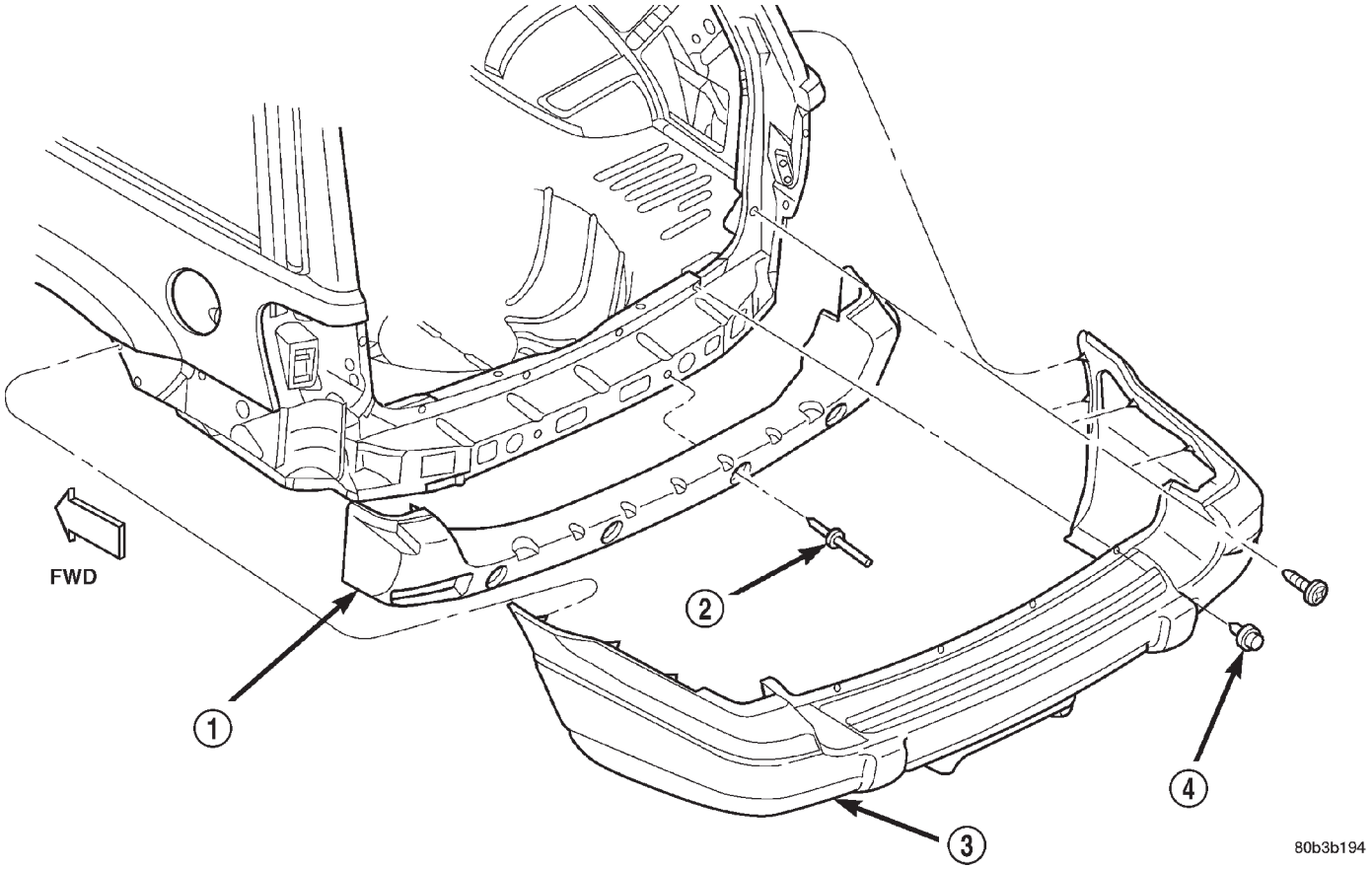


Fig. 5 Rear Fascia

1 - ABSORBER
2 - RIVET
3 - FASCIA
4 - PLASTIC PUSH PIN

REAR FASCIA (Continued)

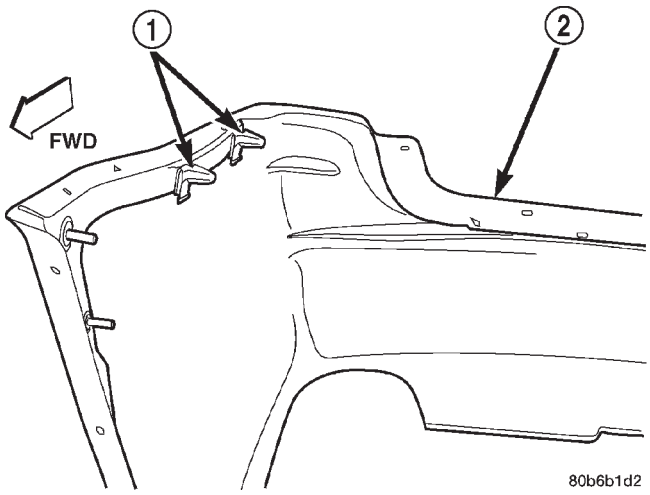


Fig. 6 Rear Fascia Retainers

1 - RETAINER
2 - FASCIA

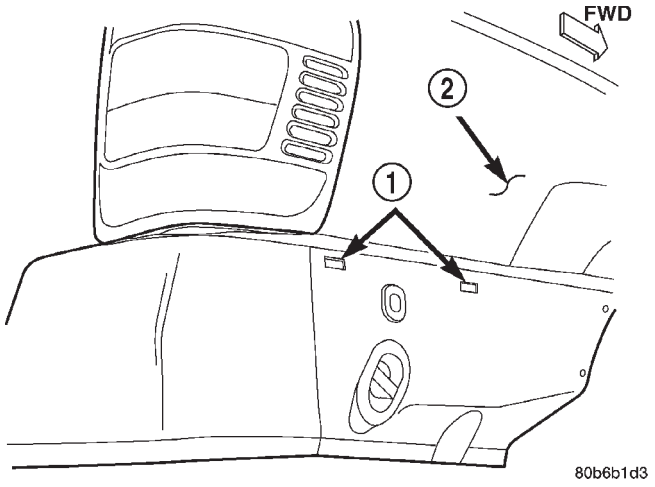


Fig. 7 Fascia Attachment

1 - SLOT
2 - QUARTER PANEL

INSTALLATION

(1) Position fascia on vehicle aligning retainers with slots in quarter panel (Fig. 7).
(2) Press forward edges of fascia inward to engage retainers.
(3) Install screws attaching fascia to liftgate opening.
(4) Install plastic push pins attaching fascia to liftgate opening.
(5) Install nuts attaching upper edge of fascia to quarter panel and wheel liner.
(6) Install plastic rivets attaching fascia to wheel liner.
(7) Install support lower vehicle.
(8) Install plastic push pins attaching fascia to fuel tank skid plate.
(9) Install the interior trim panels removed to access fascia retainers.
(10) Install tie down loop screws.
(11) Install the wheels, refer to section 22 for tightening sequence and torque specifications.

FRAME

SPECIFICATIONS

SPECIFICATIONS - TORQUE

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front Tow Hook Bolt	54	40	—
Front Skid Plate Bolt	54	40	—
Rear Tow Hook Bolt	68	50	—
Trailer Hitch Bolts	68	50	—
Transfer Case Skid Plate Bolts	34	25	—

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FRAME (Continued)

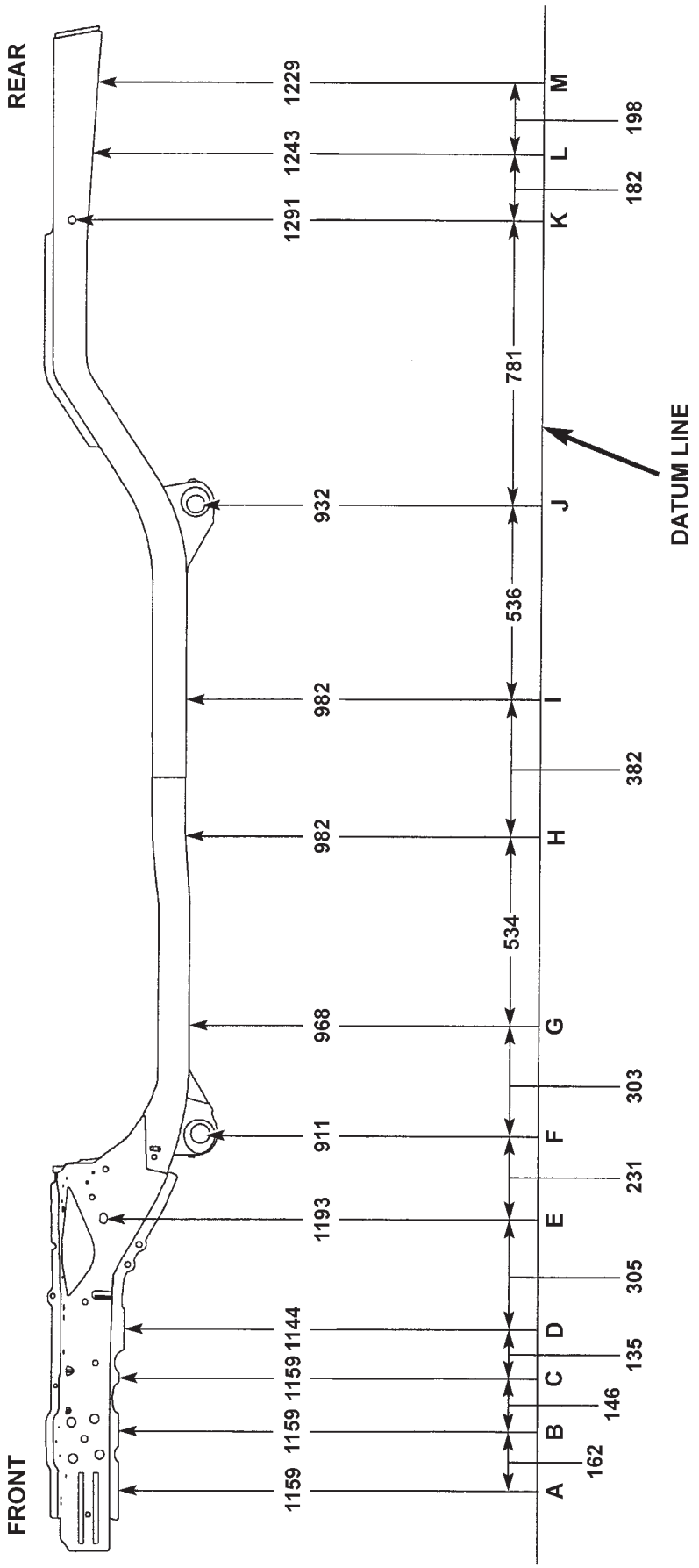
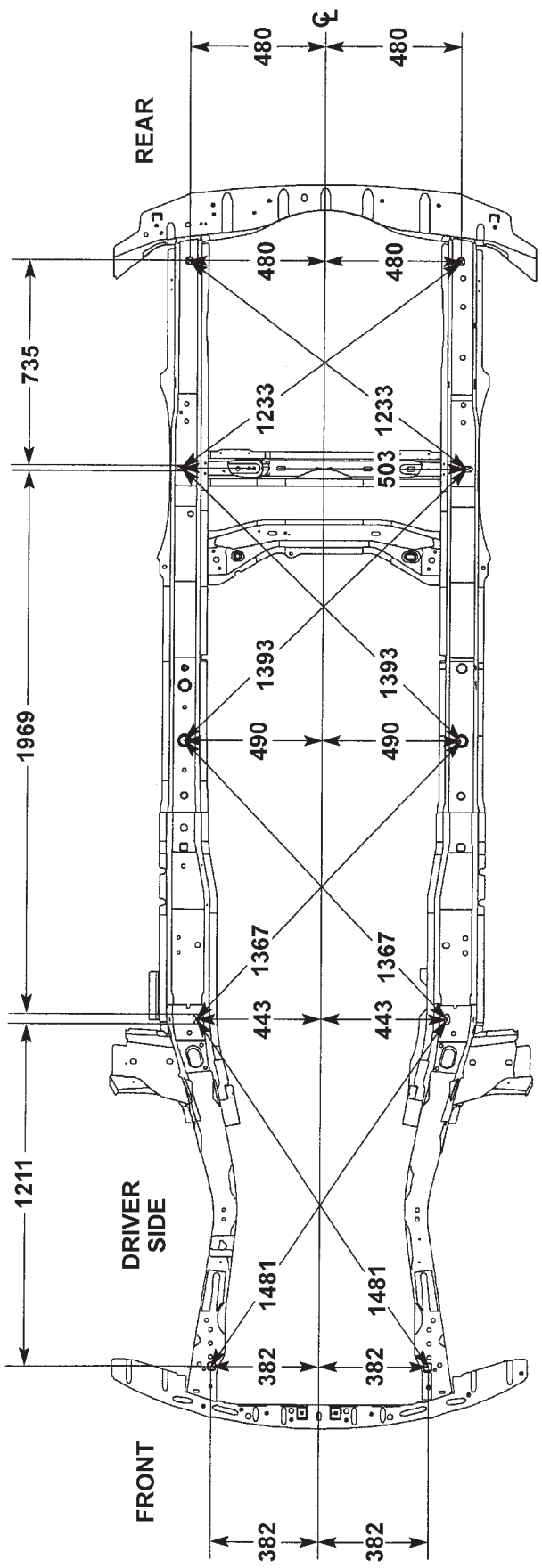


Fig. 8 SIDE VIEW

FRAME (Continued)



BOTTOM VIEW

BOTTOM VIEW POINT-TO-POINT DIMENSIONS ARE TAKEN WITH TRAM BAR POINTERS SET AT EQUAL LENGTHS. BOLTS AND STUDS ARE MEASURED TO CENTER. HOLES ARE MEASURED TO CLOSEST EDGE.

ALL MEASUREMENTS ARE IN MILLIMETERS

Fig. 9 BOTTOM VIEW

FRONT SKID PLATE

REMOVAL

(1) Position a support under skid plate.
(2) Remove bolts attaching skid plate to frame (Fig. 10).
(3) Separate skid plate from frame.

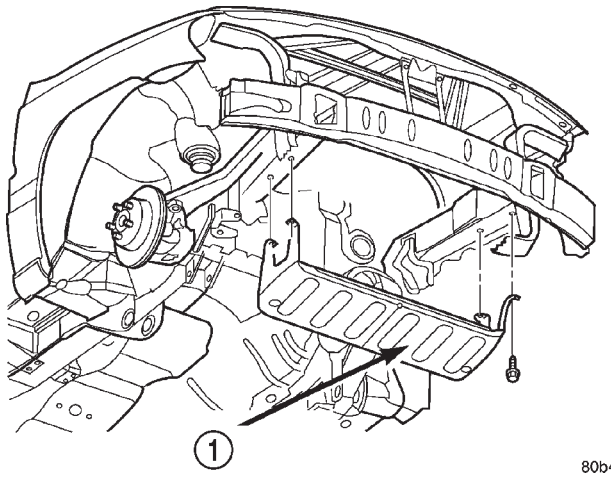


Fig. 10 Front Skid Plate

1 - SKID PLATE

INSTALLATION

(1) Position skid plate on a support.
(2) Raise it into position
(3) Install bolts attaching skid plate to frame. Tighten bolts to 54 N·m (40 ft. lbs.) torque.

FRONT TOW HOOK

REMOVAL

(1) Remove bolts that attach tow hook bracket to the lower crossmember (Fig. 11).
(2) Separate tow hook bracket from lower crossmember.

INSTALLATION

(1) Position tow hook bracket at the lower crossmember.
(2) Install bolts attaching tow hook bracket to crossmember. Tighten bolts to 54 N·m (40 ft. lbs.) torque.

FUEL TANK SKID PLATE

DESCRIPTION

The fuel tank skid plate is integrated with the fuel tank. Refer to Fuel Tank for service procedures

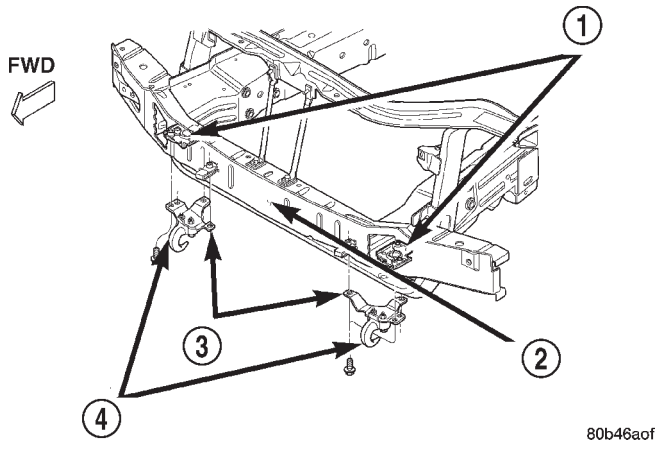


Fig. 11 Front Tow Hook

1 - TAPPING PLATE
2 - CROSSMEMBER
3 - BRACKET
4 - TOW HOOK

REAR TOW HOOK

REMOVAL

(1) Remove rear tow hook to frame brace.
(2) Remove bolts attaching the tow hook bracket to frame (Fig. 12).
(3) Separate tow hook bracket from frame.

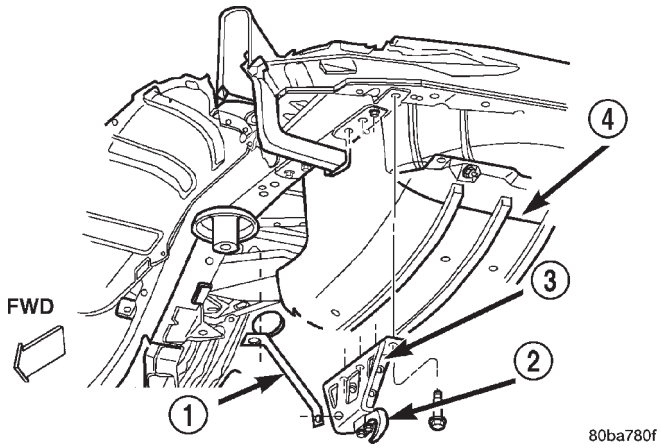


Fig. 12 Rear Tow Hook

1 - TOW HOOK BRACE
2 - TOW HOOK
3 - BRACKET
4 - FUEL TANK

INSTALLATION

(1) position tow hook bracket on frame.
(2) Install bolts attaching tow hook bracket to frame. Tighten bolts to 68 N·m (50 ft. lbs.) torque.
(3) Install rear tow hook to frame brace.

TRAILER HITCH

REMOVAL

(1) Remove rear fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/REAR FASCIA - REMOVAL).

(2) Remove screws attaching trailer harness plug to trailer hitch.

(3) Disconnect harness connector from harness plug.

(4) Position support stands under trailer hitch.

(5) Remove bolts attaching trailer hitch to frame rails (Fig. 13).

(6) Separate trailer hitch from vehicle.

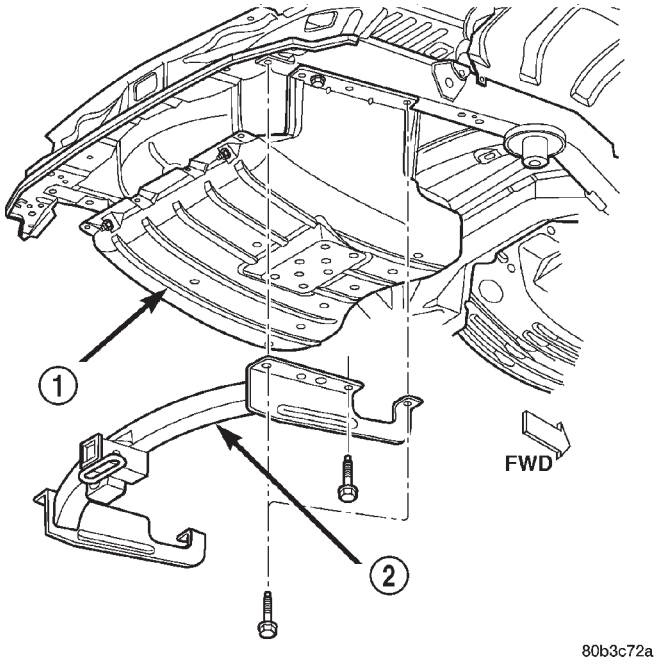


Fig. 13 Trailer Hitch

1 - FUEL TANK
2 - TRAILER HITCH

INSTALLATION

(1) Position trailer hitch on support stands.

(2) Position trailer hitch on vehicle.

(3) Install bolts attaching trailer hitch to frame rails. Tighten bolts to 68 N·m (50 lbs.) torque.

(4) Connect harness connector to harness plug.

(5) Position harness plug in trailer hitch and install screws.

(6) Install rear fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/REAR FASCIA - INSTALLATION).

TRANSFER CASE SKID PLATE

REMOVAL

(1) Support skid plate.

(2) Remove bolts that attach skid plate to transmission support crossmember and frame sill (Fig. 14).

(3) Remove support and skid plate from vehicle.

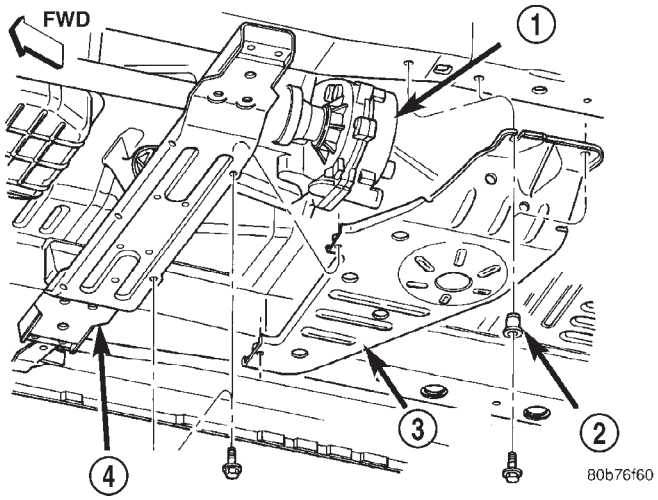


Fig. 14 Transfer Case Skid Plate

1 - TRANSFER CASE
2 - NUTSERT
3 - SKID PLATE
4 - CROSSMEMBER

INSTALLATION

(1) Install nutserts, if removed.

(2) Position and support skid plate at the frame sill and transmission support crossmember.

(3) Attach skid plate to frame sill and crossmember with the bolts. Tighten bolts to 34 N·m (25 ft. lbs) torque.

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FUEL DELIVERY

DESCRIPTION

The fuel delivery system consists of:

- the fuel pump module containing the electric fuel pump, fuel gauge sending unit (fuel level sensor) and a separate fuel filter located at bottom of pump module
- a separate combination fuel filter/fuel pressure regulator
- fuel tubes/lines/hoses
- quick-connect fittings
- fuel injector rail
- fuel injectors
- fuel tank
- fuel tank filler/vent tube assembly
- fuel tank filler tube cap
- accelerator pedal
- throttle cable

OPERATION

The fuel tank assembly consists of: the fuel tank, fuel tank shield, fuel tank straps, fuel pump module assembly, fuel pump module locknut/gasket, and fuel tank check valve (refer to Emission Control System for fuel tank check valve information).

A fuel filler/vent tube assembly using a pressure/vacuum, 1/4 turn fuel filler cap is used. The fuel filler tube contains a flap door located below the fuel fill cap.

Also to be considered part of the fuel system is the evaporation control system. This is designed to reduce the emission of fuel vapors into the atmosphere. The description and function of the Evaporative Control System is found in Emission Control Systems.

Both fuel filters (at bottom of fuel pump module and within fuel pressure regulator) are designed for extended service. They do not require normal scheduled maintenance. Filters should only be replaced if a diagnostic procedure indicates to do so.

DIAGNOSIS AND TESTING

FUEL PRESSURE LEAK DOWN TEST

Use this test in conjunction with the Fuel Pump Pressure Test and Fuel Pump Capacity Test.

Check Valve Operation: The electric fuel pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** When the electric fuel pump is activated, fuel pressure should **immediately** (1–2 seconds) rise to specification.

Abnormally long periods of cranking to restart a **hot** engine that has been shut down for a short period of time may be caused by:

- Fuel pressure bleeding past a fuel injector(s).
- Fuel pressure bleeding past the check valve in the fuel pump module.
- A defective fuel filter/pressure regulator.

Two #6539, 5/16”, Fuel Line Pressure Test Adapter Hose Tools are required for the following tests.

(1) Release fuel system pressure. Refer to Fuel Pressure Release Procedure.

(2) Raise vehicle.

Fuel Line Identification: The fuel filter/pressure regulator is located in front of the fuel tank and above the rear axle. It is transversely mounted to a chassis crossmember (left-to-right). The filter/regulator is equipped with 3 fuel line fittings (2 at one end and 1 at the other end). The single fitting facing the left side of the vehicle is the supply line to the fuel rail (Fig. 1) . The 2 fittings facing the right side of the vehicle are connected to the fuel tank. Of these 2 fittings, the fitting towards the **front** is used for fuel return to the fuel tank. The fitting towards the **rear** is a pressure line. This **rear** fitting must be disconnected for the following step.

(3) See previous step. Disconnect fuel pressure line at **rear** of filter/regulator. This is a 5/16″ quick-connect fitting (Fig. 1) . Refer to Quick-Connect Fittings for procedures.

(4) Obtain correct Fuel Line Pressure Test Adapter Hose Tool # 6539 for 5/16” fuel lines. Connect one end of this Special Tool into the disconnected fuel pressure line. Connect the other end of the Tool into fitting on filter/regulator.

(5) Lower vehicle.

(6) Disconnect the fuel inlet line at fuel rail. Refer to Quick-Connect Fittings for procedures. On some engines, air cleaner housing removal may be necessary before fuel line disconnection.

(7) Obtain a second Fuel Line Pressure Test Adapter Hose Tool # 6539 for 5/16” fuel lines. Connect this tool between disconnected fuel line and fuel rail (Fig. 2) .

(8) Connect the 0-414 kPa (0-60 psi) fuel pressure test gauge (from Gauge Set 5069) to the test port on the appropriate Adaptor Tool. **NOTE: The DRB III Scan Tool along with the PEP module, the 500 psi pressure transducer, and the transducer-to-test port adapter may also be used in place of the fuel pressure gauge.**

FUEL DELIVERY (Continued)

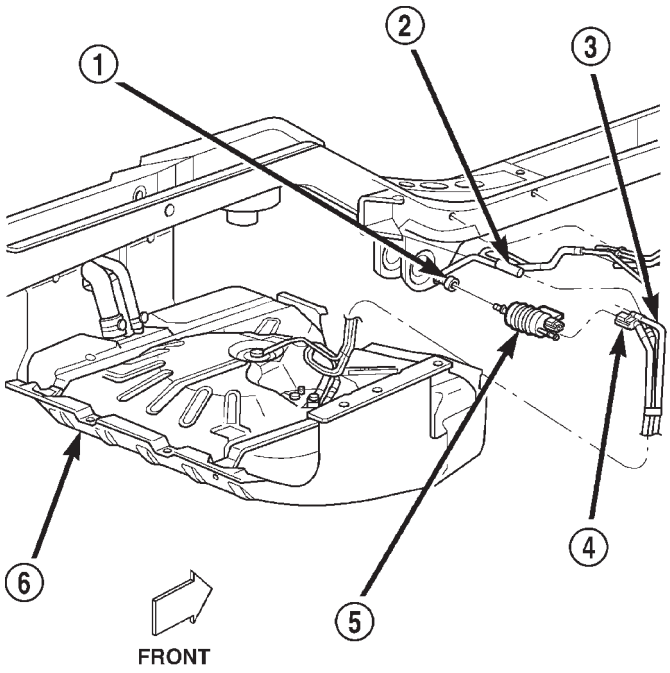


Fig. 1 Disconnect Fuel Pressure Line at Filter/ Regulator

1 - FUEL SUPPLY LINE (TO FUEL RAIL)
2 - EVAP LINE
3 - FUEL RETURN LINE (MALE)
4 - FUEL PRESSURE LINE (FEMALE)
5 - FUEL FILTER/PRESSURE REGULATOR
6 - FUEL TANK

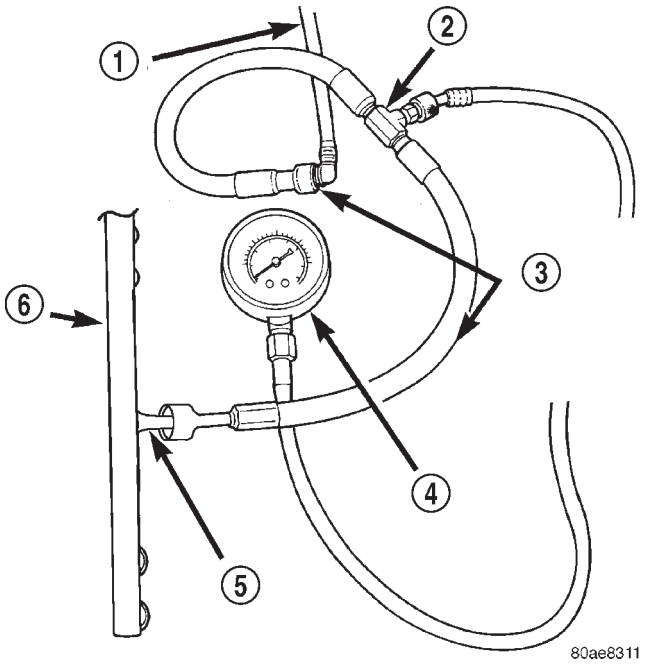


Fig. 2 Connecting Adapter Tool—Typical

1 - VEHICLE FUEL LINE
2 - TEST PORT "T"
3 - SPECIAL TOOL 6923, 6631, 6541 OR 6539
4 - FUEL PRESSURE TEST GAUGE
5 - FUEL LINE CONNECTION AT RAIL
6 - FUEL RAIL

CAUTION: The fittings on both tools must be in good condition and free from any small leaks before performing the proceeding test.

(9) Start engine and bring to normal operating temperature.

(10) Observe fuel pressure test gauge (or DRB screen). Normal operating pressure should be 339 kPa ± 34 kPa (49.2 psi ± 5 psi).

(11) Shut engine off.

(12) Pressure should not fall below **30 psi for five minutes.**

(13) If pressure falls below 30 psi, it must be determined if a fuel injector, the supply check valve within the fuel pump module, the fuel filter/pressure regulator, or a fuel tube/line is leaking.

(14) Again, start engine and bring to normal operating temperature.

(15) Shut engine off.

(16) **Testing for fuel injector or fuel rail leakage:** Clamp off the rubber hose portion of the 6539 Adaptor Tool between the fuel rail and the test port "T" on Adapter Tool (be sure clamping pressure is sufficient). If pressure now holds at or above 30 psi, a fuel injector or the fuel rail is leaking.

(17) Again, start engine and bring to normal operating temperature.

(18) Shut engine off.

(19) Raise vehicle.

(20) **Testing for fuel filter/pressure regulator leakage:** While continuing to securely clamp between the fuel rail and the test port ″T″ on Adaptor Tool 6539, securely clamp off **any** rubber hose portion of the Adaptor Tool 6539 that was installed between the fuel pressure line and the filter/regulator fitting (by restricting the pump module supply line's backflow, you isolate any leakdown originating from the filter/regulator via the tank return line.) If the pressure falls below 30 psi within 5 minutes, the filter/regulator is leaking. If it now holds at or above 30 psi, the electric fuel pump check valve is leaking or a fuel tube/line is leaking. A fuel odor presence would indicate the latter.

The electric fuel pump is not serviced separately. If replacement is necessary, replace the fuel pump module assembly. The filter/regulator may be replaced separately. Refer to Fuel Filter/Fuel Pressure Regulator Removal/Installation for additional information.

FUEL DELIVERY (Continued)

STANDARD PROCEDURE - FUEL SYSTEM PRESSURE RELEASE

Use following procedure if the fuel injector rail is, or is not equipped with a fuel pressure test port.

(1) Remove fuel fill cap.

(2) Remove fuel pump relay from Power Distribution Center (PDC). For location of relay, refer to label on underside of PDC cover.

(3) Start and run engine until it stalls.

(4) Attempt restarting engine until it will no longer run.

(5) Turn ignition key to OFF position.

CAUTION: Steps 1, 2, 3 and 4 must be performed to relieve high pressure fuel from within fuel rail. Do not attempt to use following steps to relieve this pressure as excessive fuel will be forced into a cylinder chamber.

(6) Unplug connector from any fuel injector.

(7) Attach one end of a jumper wire with alligator clips (18 gauge or smaller) to either injector terminal.

(8) Connect other end of jumper wire to positive side of battery.

(9) Connect one end of a second jumper wire to remaining injector terminal.

CAUTION: Powering an injector for more than a few seconds will permanently damage the injector.

(10) Momentarily touch other end of jumper wire to negative terminal of battery for no more than a few seconds.

(11) Place a rag or towel below fuel line quick-connect fitting at fuel rail.

(12) Disconnect quick-connect fitting at fuel rail. Refer to Quick-Connect Fittings.

(13) Return fuel pump relay to PDC.

(14) One or more Diagnostic Trouble Codes (DTC's) may have been stored in PCM memory due to fuel pump relay removal. The DRB® scan tool must be used to erase a DTC.

SPECIFICATIONS

FUEL SYSTEM PRESSURE

339 kPa ± 34 kPa (49.2 psi ± 5 psi).

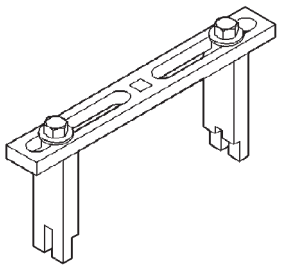
TORQUE - FUEL DELIVERY

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Accelerator Pedal Bracket Mounting Nuts (without adjustable pedals)	12 ±2	-	105 ±20
Fuel Filter/Fuel Press. Reg. Bolts	3	-	26
Fuel Hose Clamps	3	-	26
Fuel Injector Rail Mounting Bolts -4.0L Engine	11	-	100
Fuel Injector Rail Mounting Bolts -4.7L V-8 Engine	11	-	100
Fuel Pump Module Locknut	74	55	-
Fuel Tank Filler Tube-to-Body Mounting Bolts	2	-	15
Fuel Tank-to-Body Mounting Bolts	88	65	-
Fuel Tank Support Bracket Bolts (large brackets)	88	65	-
Fuel Tank Support Bracket Bolts (small bracket)	5	-	45
Fuel Tank Support Bracket Nuts (large brackets)	61	45	-
Fuel Tank Heat Shield Nuts (shield-to-tank)	9	-	85
Fuel Tank Heat Shield Nuts (shield-to-body)	3	-	25

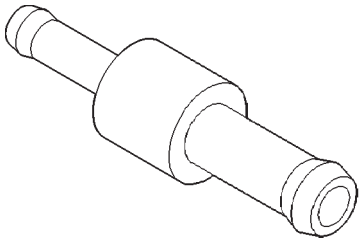
FUEL DELIVERY (Continued)

SPECIAL TOOLS

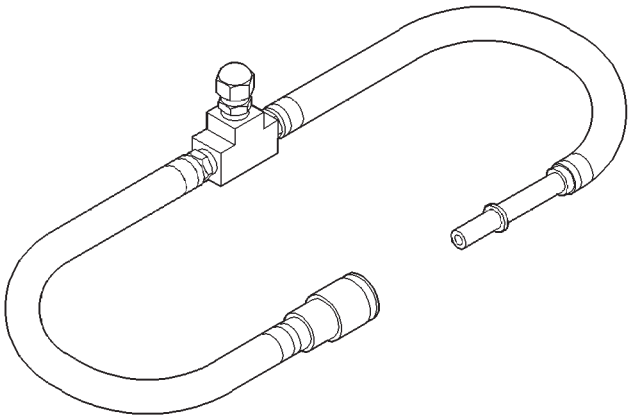
FUEL SYSTEM



Spanner Wrench—6856



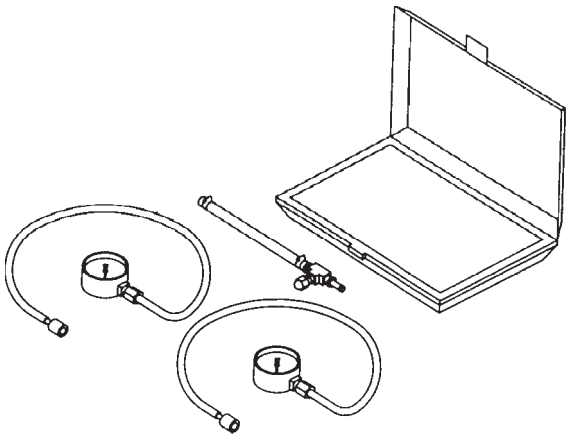
FITTING, AIR METERING - 6714



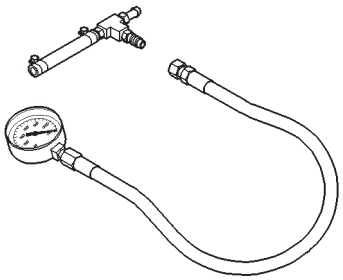
Adapters, Fuel Pressure Test—6539 and/or 6631



O2S (Oxygen Sensor) Remover/Installer—C-4907



Test Kit, Fuel Pressure—5069



Test Kit, Fuel Pressure—C-4799-B



Fuel Line Removal Tool—6782

FUEL FILTER/PRESSURE REGULATOR

DESCRIPTION

The combination fuel filter/pressure regulator is located in front of the fuel tank and above the rear axle (Fig. 3). It is transversely mounted to a chassis crossmember (left-to-right). **Fuel Line Identification:** The filter/regulator is equipped with 3 fuel line fittings (2 at one end and 1 at the other end). The single fitting facing the left side of the vehicle is the supply line to the fuel rail (Fig. 3). The 2 fittings facing the right side of the vehicle are connected to the fuel tank. Of these 2 fittings, the fitting towards the **front** is used for fuel return to the fuel tank. The fitting towards the **rear** is a pressure line.

OPERATION

Fuel Pressure Regulator Operation: The pressure regulator is a mechanical device that is not controlled by engine vacuum or the Powertrain Control Module (PCM).

FUEL FILTER/PRESSURE REGULATOR (Continued)

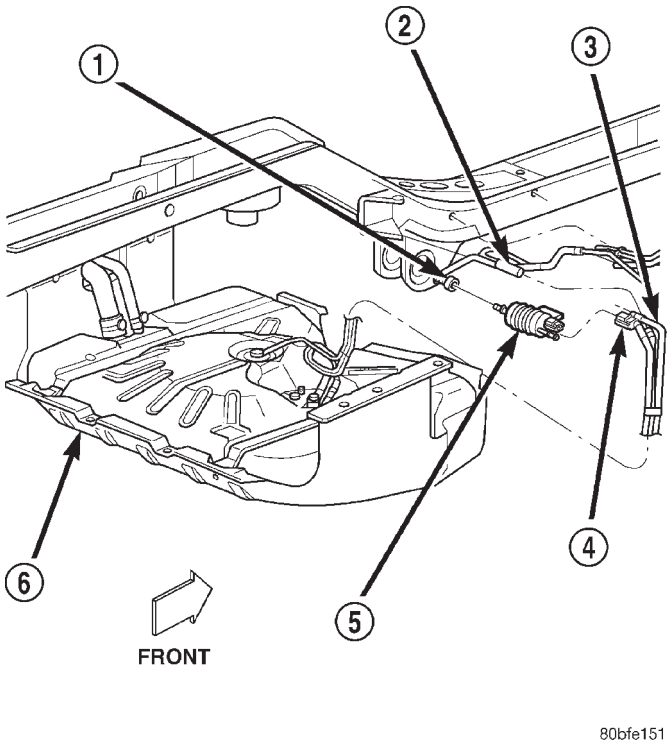


Fig. 3 Fuel Filter/Fuel Pressure Regulator Location

1 - FUEL SUPPLY LINE (TO FUEL RAIL)
2 - EVAP LINE
3 - FUEL RETURN LINE (MALE)
4 - FUEL PRESSURE LINE (FEMALE)
5 - FUEL FILTER/PRESSURE REGULATOR
6 - FUEL TANK

The regulator is calibrated to maintain fuel system operating pressure of approximately 339 kPa ± 34 kPa (49.2 psi ± 5 psi) at the fuel injectors. It contains a diaphragm, calibrated springs and a fuel return valve. The internal fuel filter is also part of the assembly.

Fuel is supplied to the filter/regulator by the electric fuel pump. The regulator acts as a check valve to maintain some fuel pressure when the engine is not operating. This will help to start the engine. A second check valve is located at the outlet end of the electric fuel pump.

If fuel pressure at the pressure regulator exceeds approximately 49 psi, an internal diaphragm closes. Excess fuel is then routed into a separate fuel return line and returned to the fuel tank through the top of the fuel pump module.

Both fuel filters (at bottom of fuel pump module and within fuel pressure regulator) are designed for extended service. They do not require normal scheduled maintenance. Filters should only be replaced if a diagnostic procedure indicates to do so.

REMOVAL

The combination Fuel Filter/Fuel Pressure Regulator is remotely mounted to the vehicle body, above the rear axle and near the front of the fuel tank (Fig. 4) or (Fig. 5).

(1) Perform Fuel System Pressure Release Procedure.

(2) Disconnect negative battery cable at battery.

(3) Raise vehicle.

(4) Clean area around 3 filter/regulator fittings.

(5) Disconnect fuel supply, fuel return and fuel pressure lines at filter/regulator (Fig. 4) . Refer to Quick-Connect Fittings.

(6) Remove 2 mounting bolts (Fig. 5) and remove filter/regulator.

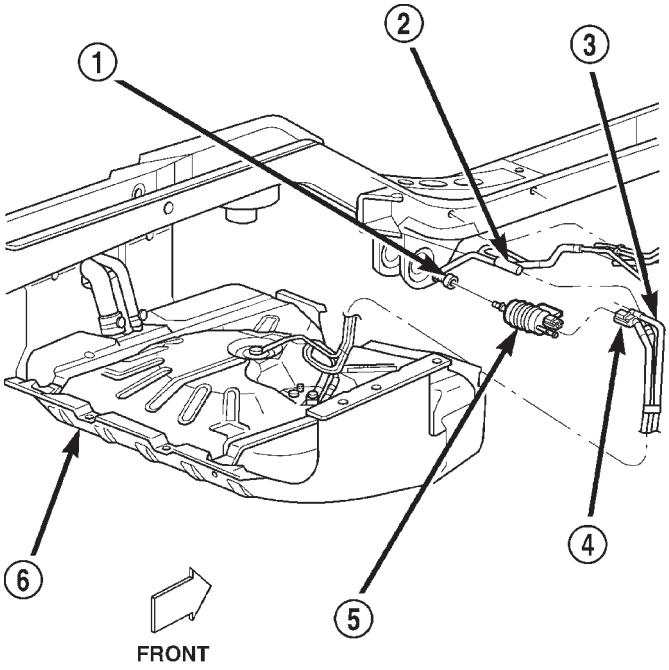


Fig. 4 Fuel Filter/Fuel Pressure Regulator Location

1 - FUEL SUPPLY LINE (TO FUEL RAIL)
2 - EVAP LINE
3 - FUEL RETURN LINE (MALE)
4 - FUEL PRESSURE LINE (FEMALE)
5 - FUEL FILTER/PRESSURE REGULATOR
6 - FUEL TANK

INSTALLATION

The combination Fuel Filter/Fuel Pressure Regulator is remotely mounted to the vehicle body, above the rear axle and near the front of the fuel tank (Fig. 4) or (Fig. 5).

(1) Before installing filter/regulator, be sure all fittings are cleaned of all dirt and contaminants.

(2) Be sure o-ring is positioned into fuel return fitting in filter/regulator.

FUEL FILTER/PRESSURE REGULATOR (Continued)

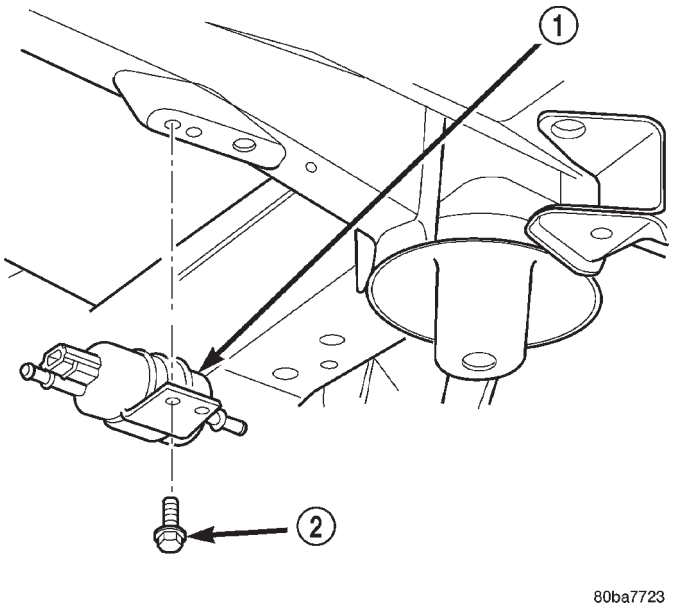


Fig. 5 Fuel Filter/Fuel Pressure Regulator Removal/ Installation

1 - FUEL FILTER/FUEL PRESSURE REGULATOR
2 - MOUNTING BOLTS (2)

(3) Apply a small amount of clean engine oil to o-rings.

(4) Position filter/regulator to body and install 2 bolts. Tighten bolts to 3 N·m (30 in. lbs.) torque.

(5) Connect 3 fittings. Refer to Quick-Connect Fittings.

(6) Connect negative battery cable to battery.

(7) Start engine and check for leaks.

FUEL LEVEL SENDING UNIT / SENSOR

DESCRIPTION

The fuel gauge sending unit (fuel level sensor) is attached to the side of the fuel pump module. The sending unit consists of a float, an arm, and a variable resistor track (card).

OPERATION

The fuel pump module has 4 different circuits (wires). Two of these circuits are used for the fuel gauge sending unit for fuel gauge operation, and for certain OBD II emission requirements. The other 2 wires are used for electric fuel pump operation.

For Fuel Gauge Operation: A constant input voltage source of about 12 volts (battery voltage) is supplied to the resistor track on the fuel gauge sending unit. This is fed directly from the Powertrain Control Module (PCM). **NOTE: For diagnostic purposes, this 12V power source can only be verified with the circuit opened (fuel pump module electrical connector unplugged). With the connectors plugged, output voltages will vary from about 0.6 volts at FULL, to about 8.6 volts at EMPTY (about 8.6 volts at EMPTY for Jeep models, and about 7.0 volts at EMPTY for Dodge Truck models).** The resistor track is used to vary the voltage (resistance) depending on fuel tank float level. As fuel level increases, the float and arm move up, which decreases voltage. As fuel level decreases, the float and arm move down, which increases voltage. The varied voltage signal is returned back to the PCM through the sensor return circuit.

Both of the electrical circuits between the fuel gauge sending unit and the PCM are hard-wired (not multi-plexed). After the voltage signal is sent from the resistor track, and back to the PCM, the PCM will interpret the resistance (voltage) data and send a message across the multi-plex bus circuits to the instrument panel cluster. Here it is translated into the appropriate fuel gauge level reading. Refer to Instrument Panel for additional information.

For OBD II Emission Monitor Requirements: The PCM will monitor the voltage output sent from the resistor track on the sending unit to indicate fuel level. The purpose of this feature is to prevent the OBD II system from recording/setting false misfire and fuel system monitor diagnostic trouble codes. The feature is activated if the fuel level in the tank is less than approximately 15 percent of its rated capacity. If equipped with a Leak Detection Pump (EVAP system monitor), this feature will also be activated if the fuel level in the tank is more than approximately 85 percent of its rated capacity.

DIAGNOSIS AND TESTING - FUEL LEVEL SENDING UNIT

The fuel level sending unit contains a variable resistor (track). As the float moves up or down, electrical resistance will change. Refer to Instrument Panel and Gauges for Fuel Gauge testing. To test the gauge sending unit only, it must be removed from vehicle. The unit is part of the fuel pump module. Refer to Fuel Pump Module Removal/Installation for procedures. Measure the resistance across the sending unit terminals. With float in up position, resistance should be 20 ohms (+/- 5%). With float in down position, resistance should be 270 ohms (+/- 5%).

REMOVAL

The fuel gauge sending unit (fuel level sensor) and float assembly is located on the side of fuel pump module (Fig. 6). The fuel pump module is located within the fuel tank.

FUEL LEVEL SENDING UNIT / SENSOR (Continued)

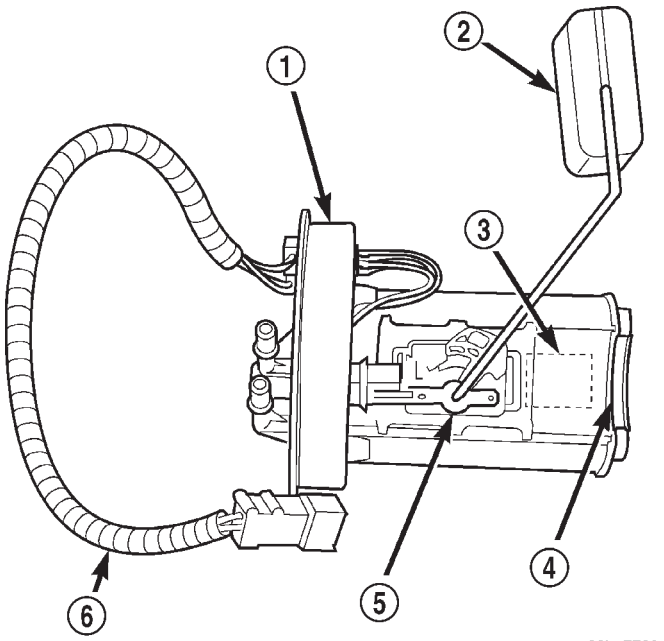


Fig. 6 Fuel Gauge Sending Unit Location

1 - FUEL PUMP MODULE
2 - FUEL GAUGE FLOAT
3 - ELECTRIC FUEL PUMP
4 - INLET FILTER
5 - FUEL GAUGE SENDING UNIT
6 - PIGTAIL HARNESS

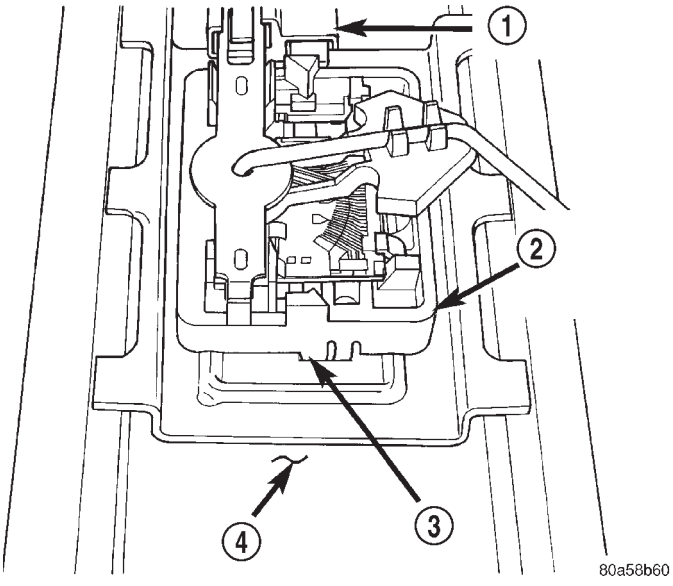


Fig. 7 Fuel Gauge Sending Unit Release Tab

1 - ELECTRICAL CONNECTOR
2 - FUEL GAUGE SENDING UNIT
3 - RELEASE TAB
4 - FUEL PUMP MODULE

(1) Remove fuel tank. Refer to Fuel Tank Removal/Installation.

(2) Remove fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Remove electrical wire connector at sending unit terminals.

(4) Press upward on release tab (Fig. 7) to remove sending unit from pump module.

INSTALLATION

The fuel gauge sending unit (fuel level sensor) and float assembly is located on the side of fuel pump module (Fig. 6). The fuel pump module is located within the fuel tank.

(1) Position sending unit to pump module and snap into place.

(2) Connect electrical connector to terminals.

(3) Install fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(4) Install fuel tank. Refer to Fuel Tank Removal/Installation.

FUEL LINES

DESCRIPTION

Also refer to Quick-Connect Fittings.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS OR LINES, THE FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE IN THIS GROUP.

The lines/tubes/hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines/tubes/hoses, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps.

FUEL PUMP

DESCRIPTION

The electric fuel pump is located inside of the fuel pump module. A 12 volt, permanent magnet, electric motor powers the fuel pump. The electric fuel pump is not a separate, serviceable component.

FUEL PUMP (Continued)

OPERATION

Voltage to operate the electric pump is supplied through the fuel pump relay.

Fuel is drawn in through a filter at the bottom of the module and pushed through the electric motor gearset to the pump outlet.

Check Valve Operation: The pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** Refer to the Fuel Pressure Leak Down Test for more information.

The electric fuel pump is not a separate, serviceable component.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - FUEL PUMP CAPACITY TEST

Before performing this test, verify fuel pump pressure. Refer to Fuel Pump Pressure Test. Use this test in conjunction with the Fuel Pressure Leak Down Test.

(1) Release fuel system pressure. Refer to Fuel Pressure Release Procedure.

(2) Disconnect fuel supply line at fuel rail. Refer to Quick-Connect Fittings. Some engines may require air cleaner housing removal before line disconnection.

(3) Obtain correct Fuel Line Pressure Test Adapter Tool Hose. Tool number 6539 is used for 5/16” fuel lines and tool number 6631 is used for 3/8” fuel lines.

(4) Connect correct Fuel Line Pressure Test Adapter Tool Hose into disconnected fuel supply line. Insert other end of Adaptor Tool Hose into a graduated container.

(5) Remove fuel fill cap.

(6) To activate fuel pump and pressurize system, obtain DRB® scan tool and actuate ASD Fuel System Test.

(7) A good fuel pump will deliver at least 1/4 liter of fuel in 7 seconds. Do not operate fuel pump for longer than 7 seconds with fuel line disconnected as fuel pump module reservoir may run empty.

(a) If capacity is lower than specification, but fuel pump can be heard operating through fuel fill cap opening, check for a kinked/damaged fuel supply line somewhere between fuel rail and fuel pump module.

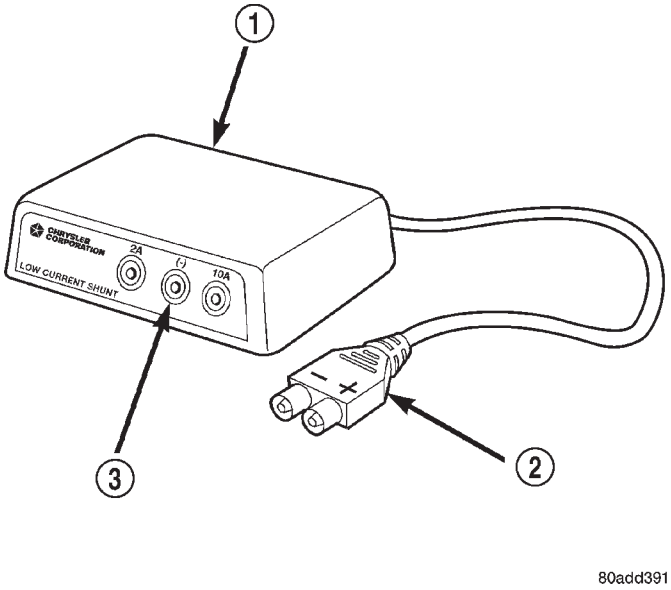
(b) If line is not kinked/damaged, and fuel pressure is OK, but capacity is low, replace fuel filter/fuel pressure regulator. The filter/regulator may be serviced separately on certain applications. Refer to Fuel Filter/Fuel Pressure Regulator Removal/Installation for additional information.

(c) If both fuel pressure and capacity are low, replace fuel pump module assembly. Refer to Fuel Pump Module Removal/Installation.

DIAGNOSIS AND TESTING - FUEL PUMP AMPERAGE TEST

This amperage (current draw) test is to be done in conjunction with the Fuel Pump Pressure Test, Fuel Pump Capacity Test and Fuel Pressure Leak Down Test. Before performing the amperage test, be sure the temperature of the fuel tank is above 50° F (10° C).

The DRB® Scan Tool along with the DRB Low Current Shunt (LCS) adapter (Fig. 8) and its test leads will be used to check fuel pump amperage specifications.



80add391

Fig. 8 LOW CURRENT SHUNT

1 - LOW CURRENT SHUNT ADAPTER
2 - PLUG TO DRB
3 - TEST LEAD RECEPTACLES

(1) Be sure fuel tank contains fuel before starting test. If tank is empty or near empty, amperage readings will be incorrect.

(2) Obtain LCS adapter.

(3) Plug cable from LCS adapter into DRB scan tool at SET 1 receptacle.

(4) Plug DRB into vehicle 16–way connector (data link connector).

FUEL PUMP (Continued)

(5) Connect (-) and (+) test cable leads into LCS adapter receptacles. Use **10 amp (10A +)** receptacle and common (-) receptacles.

(6) Gain access to MAIN MENU on DRB screen.

(7) Press DVOM button on DRB.

(8) Using left/right arrow keys, highlight CHANNEL 1 function on DRB screen.

(9) Press ENTER three times.

(10) Using up/down arrow keys, highlight RANGE on DRB screen (screen will default to 2 amp scale).

(11) Press ENTER to change 2 amp scale to 10 amp scale. **This step must be done to prevent damage to DRB scan tool or LCS adapter (blown fuse).**

(12) Remove cover from Power Distribution Center (PDC).

(13) Remove fuel pump relay from PDC. Refer to label on PDC cover for relay location.

WARNING: BEFORE PROCEEDING TO NEXT STEP, NOTE THE FUEL PUMP WILL BE ACTIVATED AND SYSTEM PRESSURE WILL BE PRESENT. THIS WILL OCCUR AFTER CONNECTING TEST LEADS FROM LCS ADAPTER INTO FUEL PUMP RELAY CAVITIES. THE FUEL PUMP WILL OPERATE EVEN WITH IGNITION KEY IN OFF POSITION. BEFORE ATTACHING TEST LEADS, BE SURE ALL FUEL LINES AND FUEL SYSTEM COMPONENTS ARE CONNECTED.

CAUTION: To prevent possible damage to the vehicle electrical system and LCS adapter, the test leads must be connected into relay cavities exactly as shown in following steps.

Depending upon vehicle model, year or engine configuration, three different types of relays may be used: Type-1, type-2 and type–3.

(14) If equipped with **type–1 relay** (Fig. 9), attach test leads from LCS adapter into PDC relay cavities number 30 and 87. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 9).

(15) If equipped with **type–2 relay** (Fig. 10), attach test leads from LCS adapter into PDC relay cavities number 30 and 87. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 10).

(16) If equipped with **type–3 relay** (Fig. 11), attach test leads from LCS adapter into PDC relay cavities number 3 and 5. For location of these cavities, refer to numbers stamped to bottom of relay (Fig. 11).

(17) When LCS adapter test leads are attached into relay cavities, fuel pump **will be activated.** Determine fuel pump amperage on DRB screen. Amperage should be below 10.0 amps. If amperage is below 10.0 amps, and specifications for the Fuel Pump Pressure, Fuel Pump Capacity and Fuel Pressure Leak Down tests were met, the fuel pump module is OK.

(18) If amperage is more than 10.0 amps, replace fuel pump module assembly. The electric fuel pump is not serviced separately.

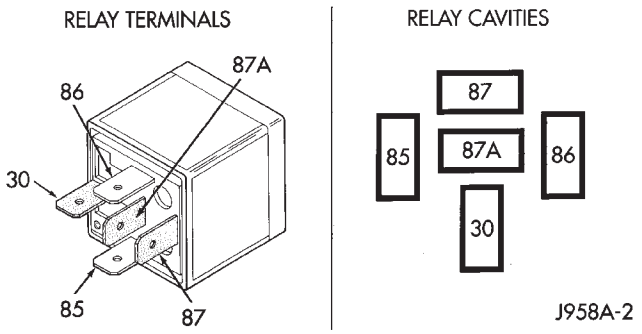


Fig. 9 FUEL PUMP RELAY - TYPE 1

TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

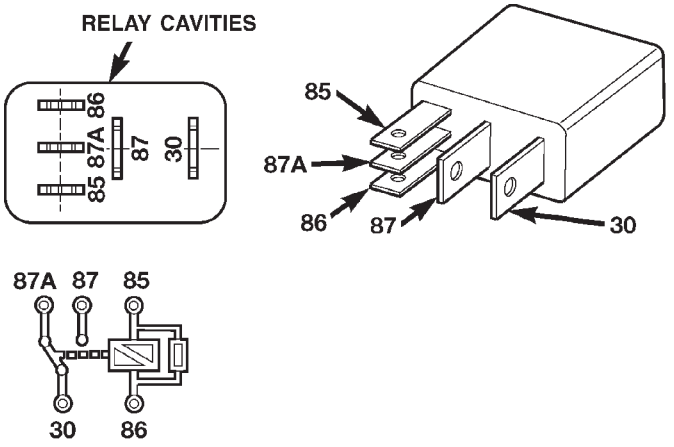


Fig. 10 FUEL PUMP RELAY - TYPE 2

TERMINAL LEGEND

NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

FUEL PUMP (Continued)

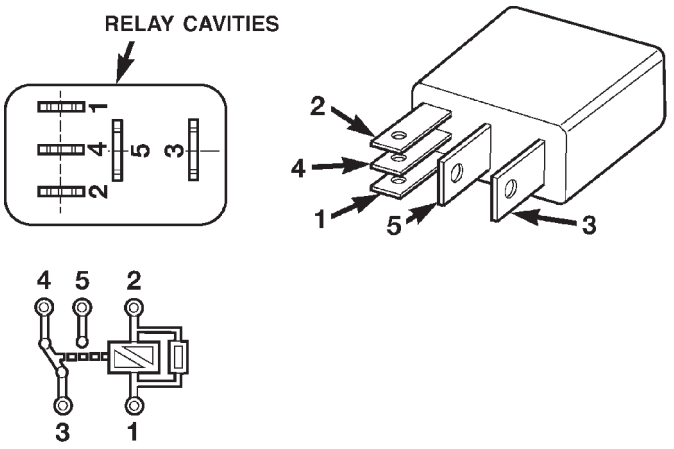


Fig. 11 FUEL PUMP RELAY - TYPE 3

TERMINAL LEGEND

NUMBER	IDENTIFICATION
1	COIL BATTERY
2	COIL GROUND
3	COMMON FEED
4	NORMALLY CLOSED
5	NORMALLY OPEN

(19) Disconnect test leads from relay cavities immediately after testing.

FUEL PUMP PRESSURE TEST

Use this test in conjunction with other fuel system tests. Refer to the Fuel Pump Capacity Test, Fuel Pressure Leak Down Test and Fuel Pump Amperage Test.

Check Valve Operation: The electric fuel pump outlet contains a one-way check valve to prevent fuel flow back into the tank and to maintain fuel supply line pressure (engine warm) when pump is not operational. It is also used to keep the fuel supply line full of gasoline when pump is not operational. After the vehicle has cooled down, fuel pressure may drop to 0 psi (cold fluid contracts), but liquid gasoline will remain in fuel supply line between the check valve and fuel injectors. **Fuel pressure that has dropped to 0 psi on a cooled down vehicle (engine off) is a normal condition.** When the electric fuel pump is activated, fuel pressure should **immediately** (1–2 seconds) rise to specification.

The fuel system is equipped with a combination fuel filter/fuel pressure regulator. The fuel pressure regulator is not controlled by engine vacuum.

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH THE ENGINE OFF. BEFORE DISCONNECTING FUEL LINE AT FUEL RAIL, THIS PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

(1) Remove pressure test port cap at fuel rail test port (Fig. 12) or (Fig. 13) . Connect 0–414 kPa (0-60 psi) fuel pressure gauge (from gauge set 5069) to test port pressure fitting on fuel rail (Fig. 14) . **The DRB III Scan Tool along with the PEP module, the 500 psi pressure transducer, and the transducer-to-test port adapter may also be used in place of the fuel pressure gauge.**

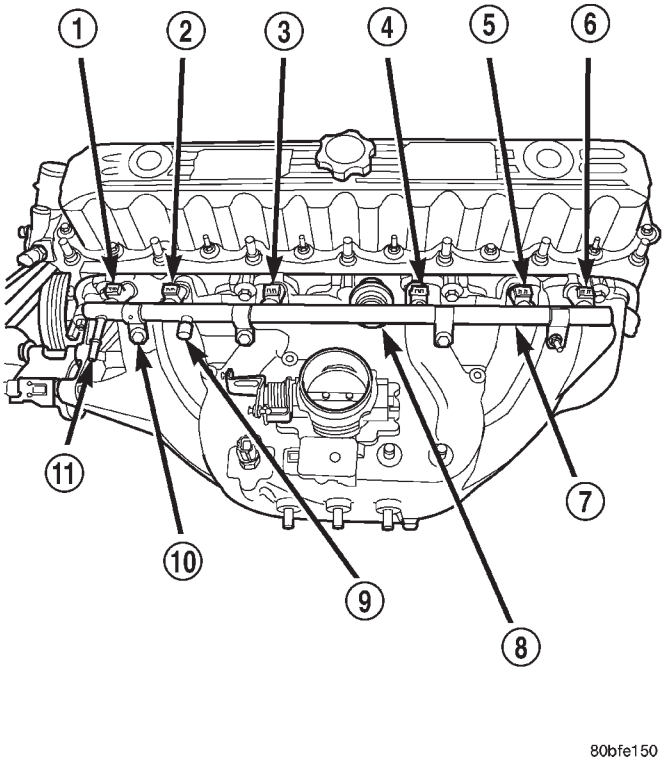


Fig. 12 Test Port Cap Location—4.0L Engine

1 - INJ. #1
2 - INJ. #2
3 - INJ. #3
4 - INJ. #4
5 - INJ. #5
6 - INJ. #6
7 - FUEL INJECTOR RAIL
8 - FUEL DAMPER
9 - PRESSURE TEST PORT CAP
10 - MOUNTING BOLTS (4)
11 - QUICK-CONNECT FITTING

(2) Start and warm engine and note pressure gauge reading. The DRB scan tool may also be used to power fuel pump. Fuel pressure should be 339 kPa ± 34 kPa (49.2 psi ± 5 psi) at idle.

(3) If engine runs, but pressure is below 44.2 psi, determine if fuel pump or filter/regulator is defective. Proceed to next step:

(a) Check for a kinked fuel supply line somewhere between fuel rail and fuel pump module.

FUEL PUMP (Continued)

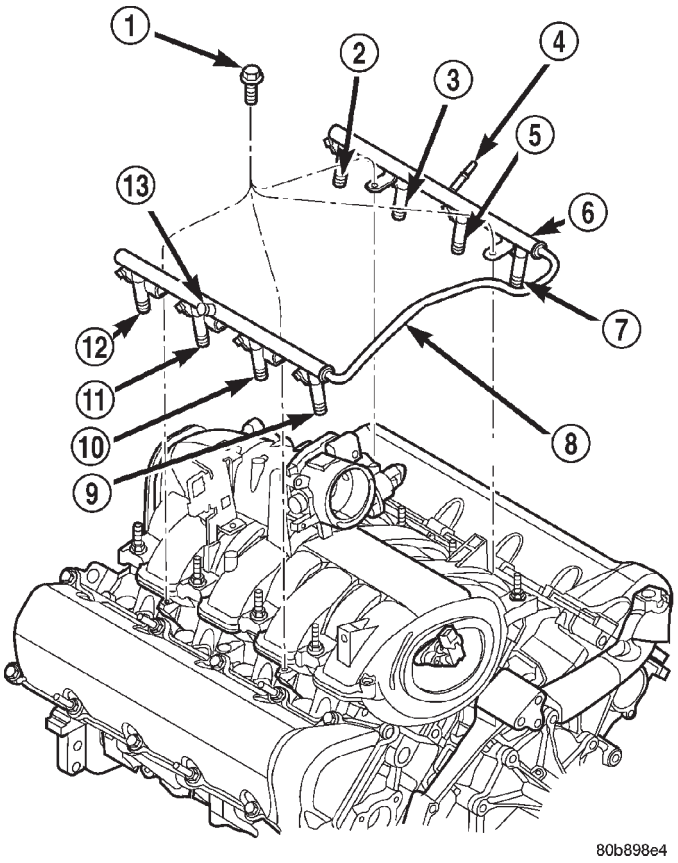


Fig. 13 Test Port Cap Location—4.7L V-8 Engine

1 - MOUNTING BOLTS (4)
2 - INJ.#7
3 - INJ.#5
4 - QUICK-CONNECT FITTING
5 - INJ.#3
6 - FUEL INJECTOR RAIL
7 - INJ.#1
8 - CONNECTOR TUBE
9 - INJ.#2
10 - INJ.#4
11 - INJ.#6
12 - INJ.#8
13 - PRESSURE TEST PORT CAP

(b) If line is not kinked and pressure is low, raise vehicle and disconnect fuel pressure line at fuel filter/fuel pressure regulator (Fig. 15) . Three fuel lines are attached to filter/regulator. The **fuel pressure line** is attached to the right side of filter/regulator. It is also the most rearward of the two (Fig. 15) .

(c) Install Special 5/16” Fuel Line Adapter Tool # 6539 between disconnected fuel line and filter/regulator fitting

(d) Attach 0–60 psi fuel pressure test gauge to “T” fitting on tool 6539.

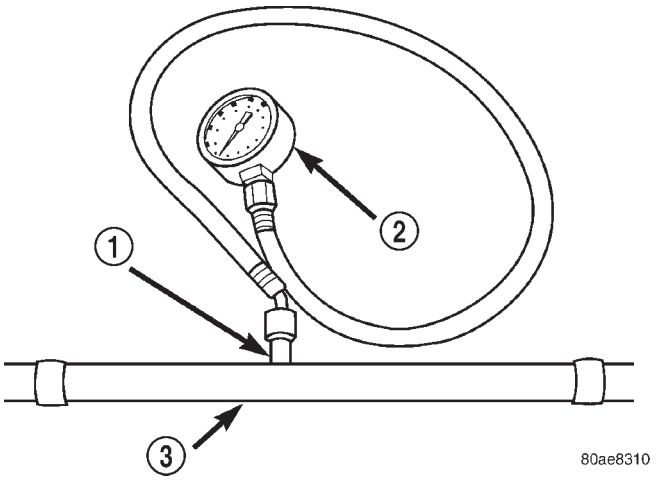


Fig. 14 Fuel Pressure Test Gauge (Typical Gauge Installation at Test Port)

1 - SERVICE (TEST) PORT
2 - FUEL PRESSURE TEST GAUGE
3 - FUEL RAIL

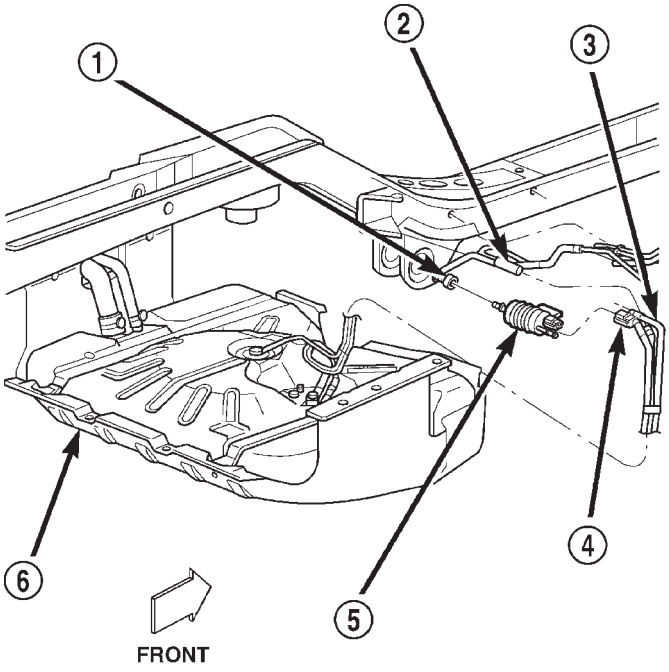


Fig. 15 Fuel Filter/Fuel Pressure Regulator Location

1 - FUEL SUPPLY LINE (TO FUEL RAIL)
2 - EVAP LINE
3 - FUEL RETURN LINE (MALE)
4 - FUEL PRESSURE LINE (FEMALE)
5 - FUEL FILTER/PRESSURE REGULATOR
6 - FUEL TANK

FUEL PUMP (Continued)

(e) Use DRB scan tool to power fuel pump. If pressure is now within specifications, replace fuel filter/fuel pressure regulator.

(f) If pressure is still low, replace fuel pump module.

(4) If operating pressure is above 54.2 psi, electric fuel pump is OK, but fuel pressure regulator is defective. Replace fuel filter/fuel pressure regulator.

(5) Install test port cap to fuel rail test port.

FUEL PUMP MODULE

DESCRIPTION

The fuel pump module is installed in the top of the fuel tank (Fig. 16). The fuel pump module (Fig. 17) contains the following components:

- A separate fuel pick-up filter (strainer)
- An electric fuel pump
- A threaded locknut to retain module to tank
- A gasket between tank flange and module
- Fuel gauge sending unit (fuel level sensor)
- Fuel supply tube (line) connection
- Fuel return tube (line) connection

The fuel gauge sending unit and pick-up filter may be serviced separately. If the electrical fuel pump requires service, the entire fuel pump module must be replaced.

OPERATION

Refer to Fuel Pump, Fuel Filter/Fuel Pressure Regulator and Fuel Gauge Sending Unit.

REMOVAL

Fuel tank removal will be necessary for fuel pump module removal.

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING FUEL PUMP MODULE, FUEL SYSTEM PRESSURE MUST BE RELEASED.

(1) Perform Fuel System Pressure Release Procedure.

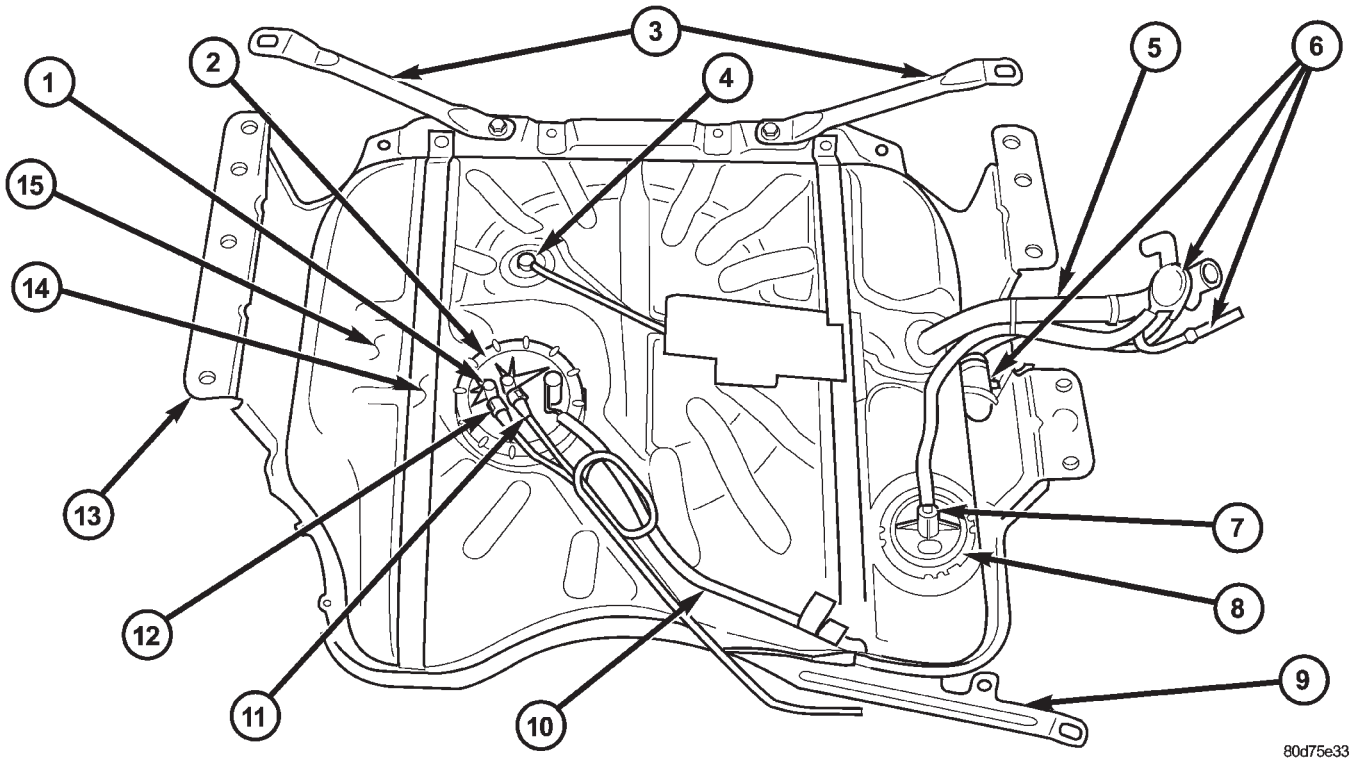


Fig. 16 FUEL TANK AND COMPONENTS

1 - FUEL PUMP MODULE
2 - MODULE LOCK RING
3 - TANK SUPPORT BRACKETS (REAR)
4 - CHECK VALVE
5 - FUEL FILL HOSE
6 - ORVR COMPONENTS
7 - ORVR CONTROL VALVE
8 - CONTROL VALVE LOCK RING
9 - TANK SUPPORT BRACKET (SMALL/FRONT)
10 - MODULE PIGTAIL HARNESS
11 - FUEL SUPPLY (PRESSURE) LINE
12 - FUEL RETURN LINE
13 - SKID PLATE
14 - TANK STRAPS (2)
15 - FUEL TANK

FUEL PUMP MODULE (Continued)

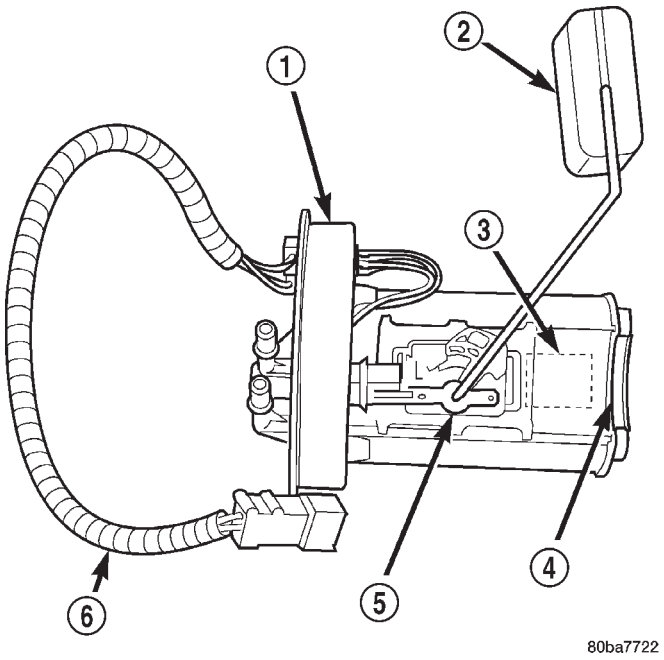


Fig. 17 FUEL PUMP MODULE

1 - FUEL PUMP MODULE
2 - FUEL GAUGE FLOAT
3 - ELECTRIC FUEL PUMP
4 - INLET FILTER
5 - FUEL GAUGE SENDING UNIT
6 - PIGTAIL HARNESS

(2) Drain fuel tank and remove tank. Refer to Fuel Tank Removal/Installation.

(3) Thoroughly wash and clean area around pump module to prevent contaminants from entering tank.

(4) Disconnect fuel return and pressure lines from fuel pump module fittings (Fig. 16). Refer to Quick-Connect Fittings for procedures.

(5) The plastic fuel pump module locknut is threaded onto fuel tank (Fig. 16). Install Special Tool 6856 to fuel pump module locknut and remove locknut (Fig. 18). The fuel pump module will spring up slightly after locknut is removed.

(6) Remove module from fuel tank.

INSTALLATION

Fuel tank removal will be necessary for fuel pump module removal.

CAUTION: Whenever fuel pump module is serviced, module gasket must be replaced.

(1) Thoroughly clean locknut threads and mating fuel tank threads. Use a soap/water solution. Do not use carburetor cleaner to clean threads.

(2) Using new gasket, position fuel pump module into opening in fuel tank.

(3) Apply clean water to locknut threads.

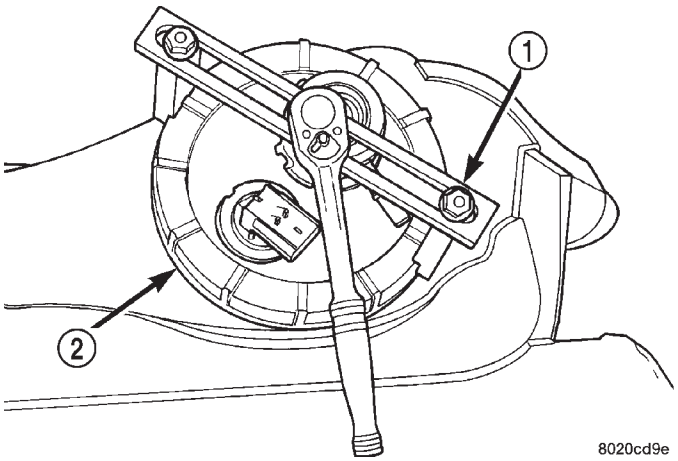


Fig. 18 LOCKNUT REMOVAL/INSTALLATION - TYPICAL

1 - SPECIAL TOOL 6856
2 - LOCKNUT

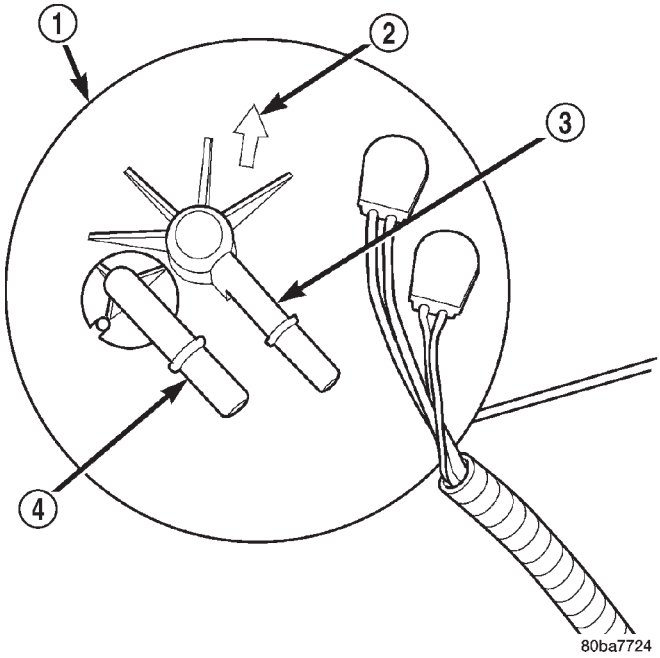


Fig. 19 FUEL PUMP MODULE INDEXING ARROW

1 - FUEL PUMP MODULE
2 - INDEXING ARROW
3 - FUEL SUPPLY (PRESSURE) FITTING
4 - FUEL RETURN FITTING

(4) Position locknut over top of fuel pump module.

(5) Rotate module until indexing arrow at top of module (Fig. 19)is pointed toward rear of vehicle. Align arrow to tick mark on top of fuel tank. **This step must be done to prevent float/float rod assembly from contacting sides of fuel tank.**

(6) Install Special Tool 6856 to locknut.

(7) Tighten locknut to 74 N·m (55 ft. lbs.) torque.

FUEL PUMP MODULE (Continued)

(8) Connect fuel return and pressure lines to fuel pump module fittings (Fig. 16). Refer to Quick-Connect Fittings.

(9) Install fuel tank. Refer to Fuel Tank Installation.

FUEL RAIL

DESCRIPTION

DESCRIPTION - 4.7L

The fuel injector rail is used to mount the fuel injectors to the engine. It is mounted to the intake manifold (Fig. 20).

DESCRIPTION - 4.0L

The fuel injector rail is used to mount the fuel injectors to the engine (Fig. 21). On the 4.0L 6–cylinder engine, a **fuel damper** is located near the center of the fuel rail (Fig. 21).

OPERATION

OPERATION - 4.7L

High pressure fuel from the fuel pump is routed to the fuel rail. The fuel rail then supplies the necessary fuel to each individual fuel injector.

A fuel pressure test port is located on the fuel rail (Fig. 20). A quick-connect fitting with a safety latch is used to attach the fuel line to the fuel rail.

The fuel rail is not repairable.

OPERATION - 4.0L

The fuel injector rail supplies the necessary fuel to each individual fuel injector.

High pressure fuel from the fuel pump is routed to the fuel rail. The fuel rail then supplies the necessary fuel to each individual fuel injector.

The fuel damper is used only to help control fuel pressure pulsations. These pulsations are the result of the firing of the fuel injectors. It is **not used** as a fuel pressure regulator. The fuel pressure regulator is **not mounted** to the fuel rail on any engine. It is located near the front of the fuel tank above the rear axle. Refer to Fuel Filter/Fuel Pressure Regulator in this group for information.

A fuel pressure test port is located on the fuel rail (Fig. 21). A quick-connect fitting with a safety latch is used to attach the fuel line to the fuel rail.

The fuel rail is not repairable.

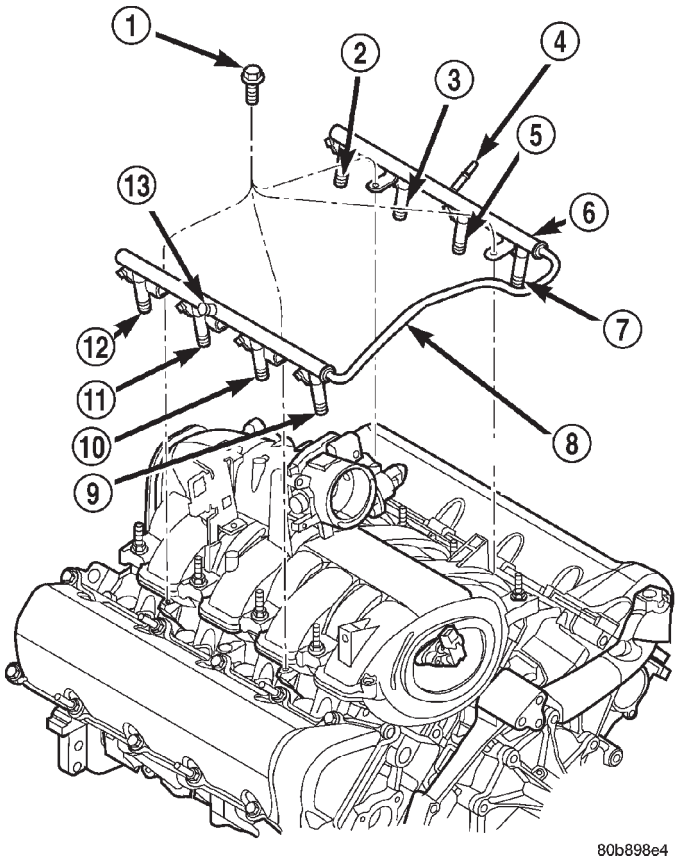


Fig. 20 Fuel Injector Rail—4.7L V-8 Engine

1 - MOUNTING BOLTS (4)
2 - INJ.#7
3 - INJ.#5
4 - QUICK-CONNECT FITTING
5 - INJ.#3
6 - FUEL INJECTOR RAIL
7 - INJ.#1
8 - CONNECTOR TUBE
9 - INJ.#2
10 - INJ.#4
11 - INJ.#6
12 - INJ.#8
13 - PRESSURE TEST PORT CAP

REMOVAL

REMOVAL - 4.7L

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL RAIL, FUEL SYSTEM PRESSURE MUST BE RELEASED.

FUEL RAIL (Continued)

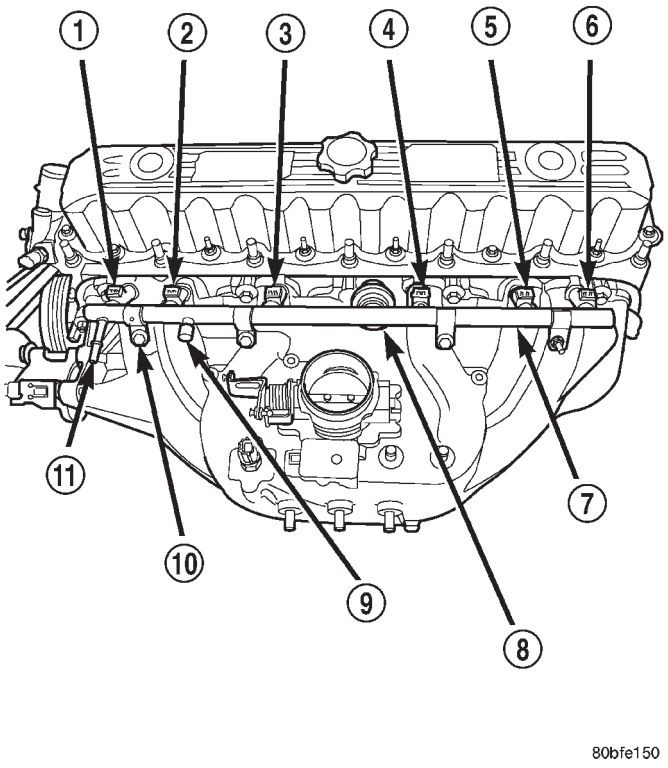


Fig. 21 Fuel Injector Rail/Fuel Damper—4.0L Engine

1 - INJ. #1
2 - INJ. #2
3 - INJ. #3
4 - INJ. #4
5 - INJ. #5
6 - INJ. #6
7 - FUEL INJECTOR RAIL
8 - FUEL DAMPER
9 - PRESSURE TEST PORT CAP
10 - MOUNTING BOLTS (4)
11 - QUICK-CONNECT FITTING

CAUTION: The left and right fuel rails are replaced as an assembly. Do not attempt to separate rail halves at connector tube (Fig. 22). Due to design of tube, it does not use any clamps. Never attempt to install a clamping device of any kind to tube. When removing fuel rail assembly for any reason, be careful not to bend or kink tube.

(1) Remove fuel tank filler tube cap.
(2) Perform Fuel System Pressure Release Procedure.
(3) Remove negative battery cable at battery.
(4) Remove air duct at throttle body air box.
(5) Remove air box at throttle body.
(6) Remove wiring at rear of generator.
(7) Disconnect fuel line latch clip and fuel line at fuel rail. A special tool will be necessary for fuel line disconnection. Refer to Quick-Connect Fittings.
(8) Remove vacuum lines at throttle body.

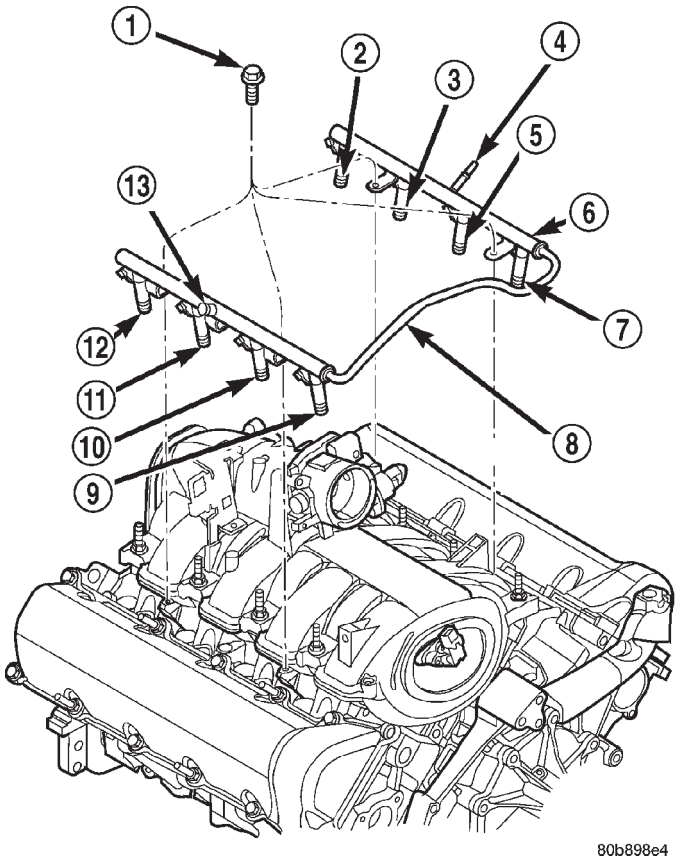


Fig. 22 FUEL INJECTOR RAIL - 4.7L V-8 EN

1 - MOUNTING BOLTS (4)
2 - INJ.#7
3 - INJ.#5
4 - QUICK-CONNECT FITTING
5 - INJ.#3
6 - FUEL INJECTOR RAIL
7 - INJ.#1
8 - CONNECTOR TUBE
9 - INJ.#2
10 - INJ.#4
11 - INJ.#6
12 - INJ.#8
13 - PRESSURE TEST PORT CAP

(9) Disconnect electrical connectors at all 8 fuel injectors. To remove connector refer to (Fig. 23). Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.
(10) Disconnect electrical connectors at throttle body.
(11) Disconnect electrical connectors at MAP and IAT sensors.

FUEL RAIL (Continued)

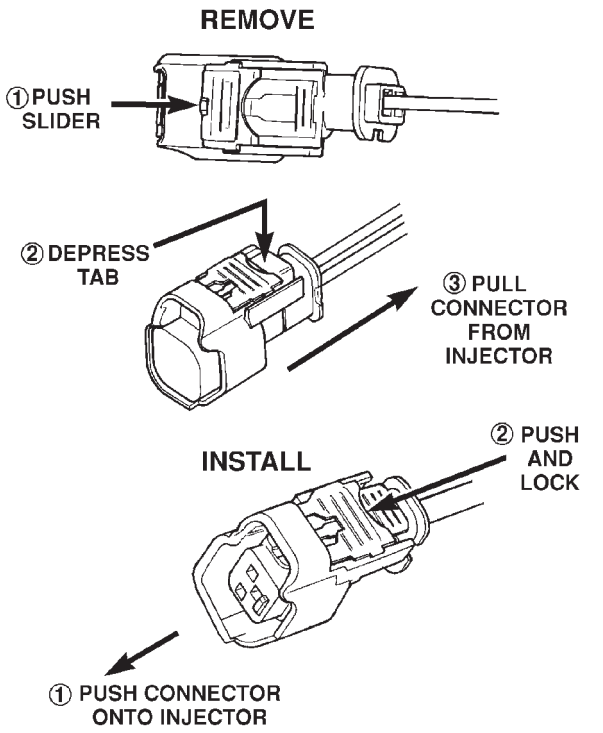


Fig. 23 Remove/Install Injector Connector—4.7L V-8 Engine

(12) Remove first three ignition coils on each bank (cylinders #1, 3, 5, 2, 4 and 6). Refer to Ignition Coil Removal/Installation.

(13) Remove 4 fuel rail mounting bolts (Fig. 22).

(14) Gently rock and pull **left** side of fuel rail until fuel injectors just start to clear machined holes in cylinder head. Gently rock and pull **right** side of rail until injectors just start to clear cylinder head holes. Repeat this procedure (left/right) until all injectors have cleared cylinder head holes.

(15) Remove fuel rail (with injectors attached) from engine.

(16) If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

REMOVAL - 4.0L

The fuel damper is not serviced separately.

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH ENGINE OFF. THIS PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL RAIL.

(1) Remove fuel tank filler tube cap.

(2) Perform Fuel System Pressure Release Procedure.

(3) Disconnect negative battery cable from battery.

(4) Remove air tube at top of throttle body. Note: Some engine/vehicles may require removal of air cleaner ducts at throttle body.

(5) Disconnect electrical connectors at all 6 fuel injectors. To remove connector refer to (Fig. 25). Push red colored slider away from injector (1). While pushing slider, depress tab (2) and remove connector (3) from injector. The factory fuel injection wiring harness is numerically tagged (INJ 1, INJ 2, etc.) for injector position identification. If harness is not tagged, note wiring location before removal.

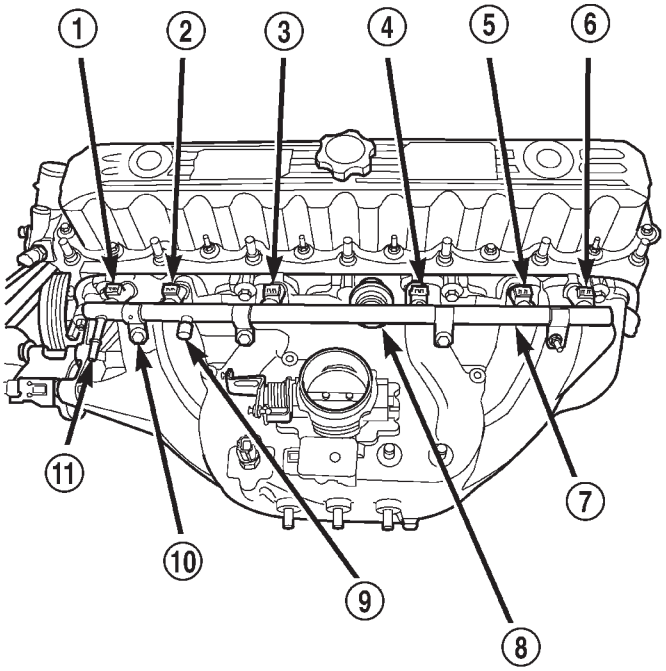


Fig. 24 Fuel Rail Mounting—4.0L Engine

1 - INJ. #1
2 - INJ. #2
3 - INJ. #3
4 - INJ. #4
5 - INJ. #5
6 - INJ. #6
7 - FUEL INJECTOR RAIL
8 - FUEL DAMPER
9 - PRESSURE TEST PORT CAP
10 - MOUNTING BOLTS (4)
11 - QUICK-CONNECT FITTING

(6) Remove oxygen sensor wiring clip nuts at fuel rail mounting studs (certain emissions packages only).

(7) Disconnect fuel supply line latch clip and fuel line at fuel rail. Refer to Quick-Connect Fittings.

(8) Disconnect throttle cable at throttle body. Refer to Throttle Cable Removal/Installation.

FUEL RAIL (Continued)

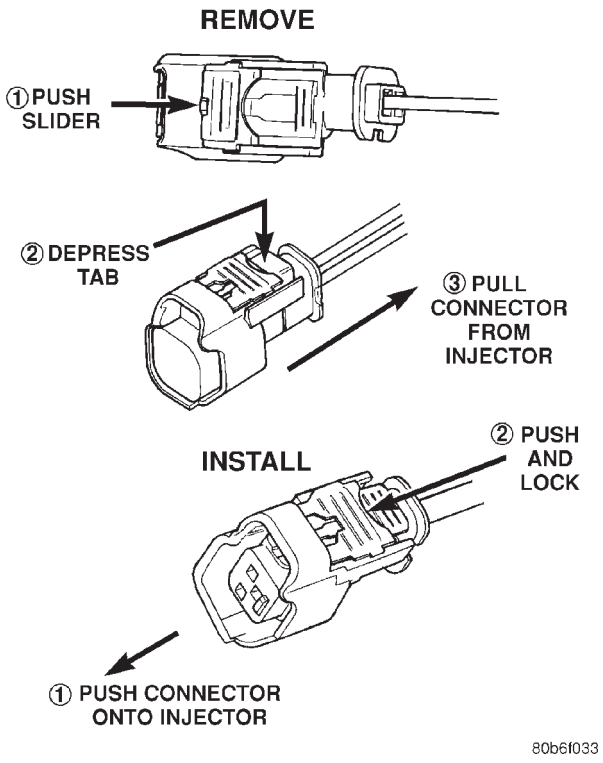


Fig. 25 Remove/Install Injector Connector—4.0L Engine

(9) Disconnect speed control cable at throttle body (if equipped). Refer to Speed Control Cable.

(10) Disconnect automatic transmission cable at throttle body (if equipped).

(11) Remove cable routing bracket at intake manifold.

(12) Clean dirt/debris from each fuel injector at intake manifold.

(13) Remove fuel rail mounting nuts/bolts (Fig. 24).

(14) Remove fuel rail by gently rocking until all fuel injectors have cleared machined holes at intake manifold.

(15) If fuel injectors are to be removed, refer to Fuel Injector Removal/Installation.

INSTALLATION

INSTALLATION - 4.7L

(1) If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.

(2) Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.

(3) Position fuel rail/fuel injector assembly to machined injector openings in cylinder head.

(4) Guide each injector into cylinder head. Be careful not to tear injector o-rings.

(5) Push **right** side of fuel rail down until fuel injectors have bottomed on cylinder head shoulder. Push **left** fuel rail down until injectors have bottomed on cylinder head shoulder.

(6) Install 4 fuel rail mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(7) Install ignition coils. Refer to Ignition Coil Removal/Installation.

(8) Connect electrical connectors to throttle body.

(9) Connect electrical connectors to MAP and IAT sensors.

(10) Connect electrical connectors at all fuel injectors. To install connector, refer to (Fig. 23). Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.

(11) Connect vacuum lines to throttle body.

(12) Connect fuel line latch clip and fuel line to fuel rail. Refer to Quick-Connect Fittings.

(13) Connect wiring to rear of generator.

(14) Install air box to throttle body.

(15) Install air duct to air box.

(16) Connect battery cable to battery.

(17) Start engine and check for leaks.

INSTALLATION - 4.0L

(1) If fuel injectors are to be installed, refer to Fuel Injector Removal/Installation.

(2) Clean each injector bore at intake manifold.

(3) Apply a small amount of clean engine oil to each injector o-ring. This will aid in installation.

(4) Position tips of all fuel injectors into the corresponding injector bore in intake manifold. Seat injectors into manifold.

(5) Install and tighten fuel rail mounting bolts to 11 ±3 N·m (100 ±25 in. lbs.) torque.

(6) Connect electrical connectors at all fuel injectors. To install connector, refer to (Fig. 25). Push connector onto injector (1) and then push and lock red colored slider (2). Verify connector is locked to injector by lightly tugging on connector.

(7) Connect fuel line and fuel line latch clip to fuel rail. Refer Quick-Connect Fittings.

(8) Install protective cap to pressure test port fitting (if equipped).

(9) Install cable routing bracket to intake manifold.

(10) Connect throttle cable at throttle body.

(11) Connect speed control cable at throttle body (if equipped).

(12) Connect automatic transmission cable at throttle body (if equipped).

(13) Install oxygen sensor wiring clip nuts to fuel rail mounting studs (certain emissions packages only).

FUEL RAIL (Continued)

(14) Install air tube (or duct) at top of throttle body.
(15) Install fuel tank cap.
(16) Connect negative battery cable to battery.
(17) Start engine and check for fuel leaks.

FUEL TANK

DESCRIPTION

The fuel tank is constructed of a plastic material. Its main functions are for fuel storage and for placement of the fuel pump module and certain ORVR components.

OPERATION

All models pass a full 360 degree rollover test without fuel leakage. To accomplish this, fuel and vapor flow controls are required for all fuel tank connections.

A fuel tank check valve(s) is mounted into the top of the fuel tank (or pump module). Refer to Fuel Tank Check Valve for additional information.

An evaporation control system is connected to the check valve(s) to reduce emissions of fuel vapors into the atmosphere. When fuel evaporates from the fuel tank, vapors pass through vent hoses or tubes to a charcoal canister where they are temporarily held. When the engine is running, the vapors are drawn into the intake manifold. Certain models are also equipped with a self-diagnosing system using a Leak Detection Pump (LDP). Refer to Emission Control System for additional information.

Refer to ORVR for On-Board Refueling Vapor Recovery system information.

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT FUEL PRESSURE EVEN WITH ENGINE OFF. PRESSURE MUST BE RELEASED BEFORE SERVICING FUEL TANK.

Two different procedures may be used to drain fuel tank (through ORVR control valve opening at top of fuel tank, or using DRB scan tool). The quickest is draining through ORVR control valve opening at top of fuel tank (Fig. 26).

As an alternative procedure, the electric fuel pump may be activated allowing tank to be drained at fuel rail connection. Refer to DRB scan tool for fuel pump activation procedures. Before disconnecting fuel line at fuel rail, release fuel pressure. Refer to the Fuel System Pressure Release Procedure for procedures. Attach end of Special Adapter Hose Tool number 6539 at fuel rail disconnection. Position opposite end of 6539 to an approved gasoline draining station. Activate fuel pump with DRB and drain tank until empty.

If electric fuel pump is not operating, tank **MUST** be drained through ORVR control valve opening at top of fuel tank (Fig. 26).

(1) Release fuel system pressure. Refer to Fuel System Pressure Release Procedure.
(2) Disconnect negative battery cable at battery.
(3) Raise and support vehicle.
(4) Remove left rear wheel/tire.

CAUTION: HANDLE EVAP, LDP AND ORVR VAPOR / VACUUM LINES VERY CAREFULLY. THESE LINES AND HOSES MUST BE FIRMLY CONNECTED. CHECK THE VAPOR/VACUUM LINES AT THE LDP, LDP FILTER, EVAP CANISTER, EVAP CANISTER PURGE SOLENOID AND ORVR COMPONENTS FOR DAMAGE OR LEAKS. IF A LEAK IS PRESENT, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

(5) Clean top of fuel tank at ORVR control valve (Fig. 26) or (Fig. 27).
(6) Press release tab in direction of arrow in (Fig. 27) and remove ORVR control valve lock ring (counter-clockwise). Lift up ORVR control slightly. Using an approved gasoline draining station, drain tank until empty through this opening.
(7) Remove stone shield behind left/rear wheel (Fig. 28). Drill out plastic rivets for removal.
(8) Remove 3 LDP mounting bolts (Fig. 29).
(9) Remove support bracket brace bolt (Fig. 30).
(10) Loosen, but do not remove 2 support bracket nuts at frame rail (Fig. 29).
(11) To separate and lower front section of two-piece support bracket, remove 3 attaching bolts on bottom of support bracket (Fig. 30). While lowering support bracket, disconnect LDP wiring clip (Fig. 31).
(12) Remove hose clamp (Fig. 32) and remove fuel fill hose from fuel fill tube.
(13) Cut and discard tie wrap from axle vent hose (Fig. 32).
(14) Disconnect fuel vent hose from fuel vent tube (Fig. 32).
(15) Disconnect ORVR hose elbow (Fig. 33) at top of EVAP canister.
(16) Place hydraulic jack to bottom of fuel tank.
(17) Remove fuel tank-to-rear bumper fascia clips (Fig. 34).
(18) Remove fuel tank heat shield mounting bolts (Fig. 35).

CAUTION: To protect fuel tank from exhaust heat, shield must re-installed after tank installation.

WARNING: PLACE SHOP TOWEL AROUND FUEL LINES TO CATCH ANY EXCESS FUEL.

FUEL TANK (Continued)

(19) Disconnect fuel return line at fuel filter/fuel pressure regulator (Fig. 36). Refer to Quick-Connect Fittings for procedures.

(20) Disconnect fuel pressure line at fuel filter/fuel pressure regulator (Fig. 36). Refer to Quick-Connect Fittings for procedures.

(21) Disconnect EVAP canister vent line near front of tank (Fig. 36).

(22) Disconnect fuel pump module electrical connector (pigtail harness) near front of tank (Fig. 36). Harness connector is clipped to body.

(23) Remove left / front tank support bracket bolt at frame (Fig. 37).

(24) **WITHOUT TRAILER HITCH:** Remove tank-to-frame mounting bolts (Fig. 39). Remove rear tank support bracket bolts at frame (Fig. 38). Carefully lower tank until clear of vehicle. Place tank on floor.

(25) **WITH TRAILER HITCH:** Remove tank / hitch mounting bolts (Fig. 40). Carefully lower tank until clear of vehicle. Place tank on floor.

(26) If necessary, separate skid plate from fuel tank by removing 2 fuel tank strap nuts (Fig. 39) and remove 2 tank straps.

(27) If fuel pump module removal is necessary, refer to Fuel Pump Module Removal/Installation.

(28) If hoses are to be removed at fuel tank end, note painted alignment (indexing) markings on hoses, and molded indexing tangs on tank before removal. Remove hoses.

(29) If necessary, remove 3 fuel filler tube assembly mounting bolts (Fig. 41) and remove fuel filler tube.

INSTALLATION

CAUTION: HANDLE EVAP, LDP AND ORVR VAPOR / VACUUM LINES VERY CAREFULLY. THESE LINES AND HOSES MUST BE FIRMLY CONNECTED. CHECK THE VAPOR/VACUUM LINES AT THE LDP, LDP FILTER, EVAP CANISTER, EVAP CANISTER PURGE SOLENOID AND ORVR COMPONENTS FOR DAMAGE OR LEAKS. IF A LEAK IS PRESENT, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

(1) If necessary, position fuel filler tube assembly to body. Install 3 bolts and tighten to 2 N·m (15 in. lbs.) torque.

(2) If necessary, connect quick-connect fittings to fuel pump module.

(3) If fuel pump module is being installed, refer to Fuel Pump Module Removal/Installation.

(4) Install fuel fill/vent hoses to tank fittings. To prevent hoses from kinking, rotate each hose until painted indexing mark on hose is aligned to molded indexing tang on tank.

(5) Install hose clamps to hoses. Refer to Torque Specifications.

(6) If necessary, position fuel tank into skid plate. Install 2 tank straps and 2 strap nuts (Fig. 39). Refer to Torque Specifications.

(7) Position fuel tank / skid plate assembly to hydraulic jack.

(8) Raise tank into position to frame.

(9) **WITH TRAILER HITCH:** Position trailer hitch and tow hooks (Fig. 40) to bottom of fuel tank. Install bolts and nuts loosely.

(10) **WITHOUT TRAILER HITCH:** Install 2 rear tank support brackets and bolts (Fig. 38). Install tank-to-frame bolts. Do not tighten bolts / nuts at this time.

(11) Install 1 left / front tank support bracket and bolts / nuts (Fig. 37). Do not tighten bolts / nuts at this time.

(12) Be sure fuel tank is properly aligned to frame and body. Tighten all tank, tow hook and trailer hitch bolts / nuts except for 3 support brackets. Tighten all 3 (2 rear and 1 left / front) support bracket bolts / nuts last. Refer to Torque Specifications.

(13)

(14) Connect fuel pump module pigtail harness electrical connector near front of tank.

(15) Connect both fuel lines to fuel filter/fuel pressure regulator. Refer to Quick-Connect Fittings for procedures.

(16) Connect EVAP hose near front of tank.

(17) Position rear axle vent hose and install new tie strap (Fig. 32).

(18) Install heat shield nuts / bolts (Fig. 35). Refer to Torque Specifications.

(19) Connect ORVR hose elbow (Fig. 33) to top of EVAP canister.

(20) Connect fuel vent hose to fuel vent tube (Fig. 32).

(21) Install fuel fill hose and clamp to fuel fill tube (Fig. 32).

(22) Install 3 LDP mounting bolts (Fig. 29).

(23) While raising support bracket, connect LDP wiring clip (Fig. 31). Install front section of two-piece support bracket to rear section with 3 attaching bolts located on bottom of support bracket (Fig. 30).

(24) Install support bracket brace bolt (Fig. 30).

(25) Tighten 2 support bracket nuts at frame rail (Fig. 29).

(26) Install fuel tank-to-rear bumper fascia clips (Fig. 34).

(27) Using new plastic rivets, install stone shield behind left/rear wheel (Fig. 28).

(28) Install left rear wheel/tire.

(29) Lower vehicle and connect negative battery cable to battery.

(30) Fill tank with fuel and check for leaks.

FUEL TANK (Continued)

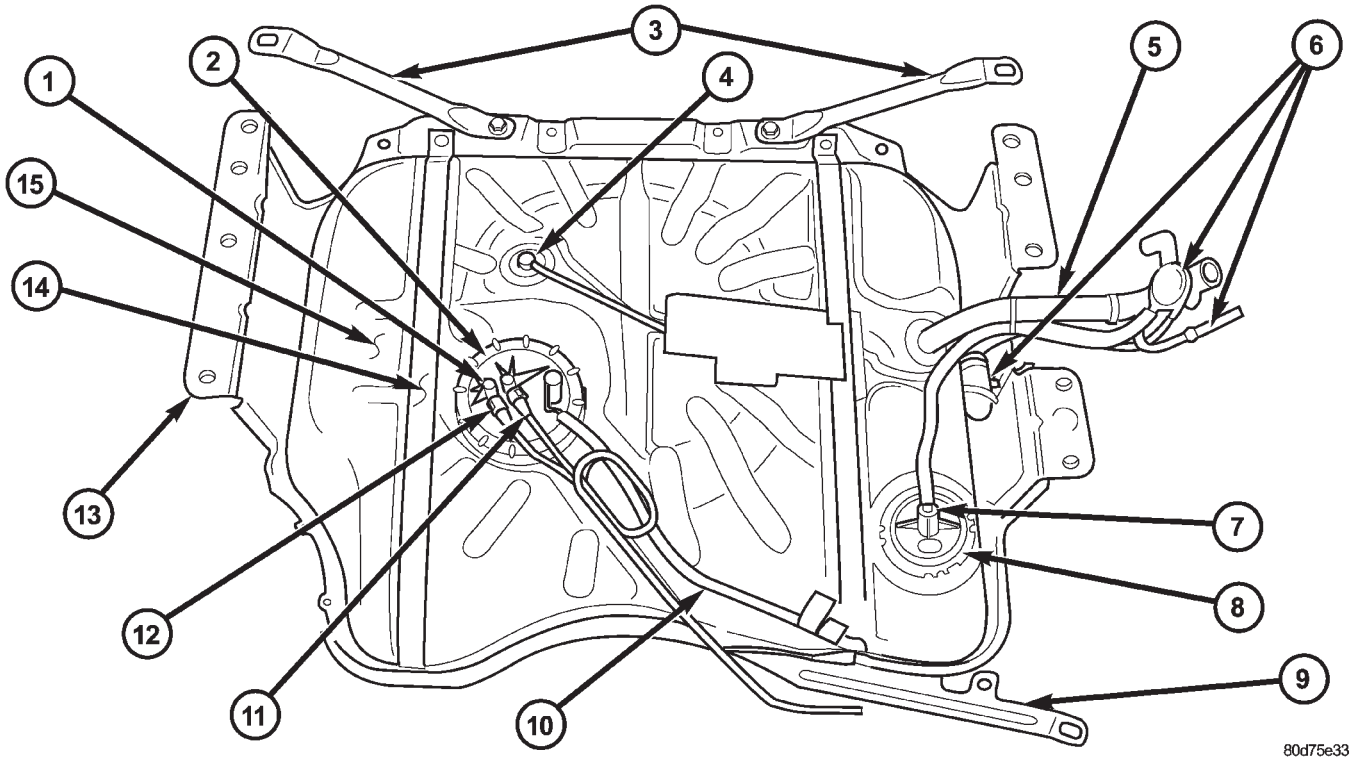


Fig. 26 FUEL TANK AND COMPONENTS

1 - FUEL PUMP MODULE
2 - MODULE LOCK RING
3 - TANK SUPPORT BRACKETS (REAR)
4 - CHECK VALVE
5 - FUEL FILL HOSE
6 - ORVR COMPONENTS
7 - ORVR CONTROL VALVE
8 - CONTROL VALVE LOCK RING
9 - TANK SUPPORT BRACKET (SMALL/FRONT)
10 - MODULE PIGTAIL HARNESS
11 - FUEL SUPPLY (PRESSURE) LINE
12 - FUEL RETURN LINE
13 - SKID PLATE
14 - TANK STRAPS (2)
15 - FUEL TANK

FUEL TANK (Continued)

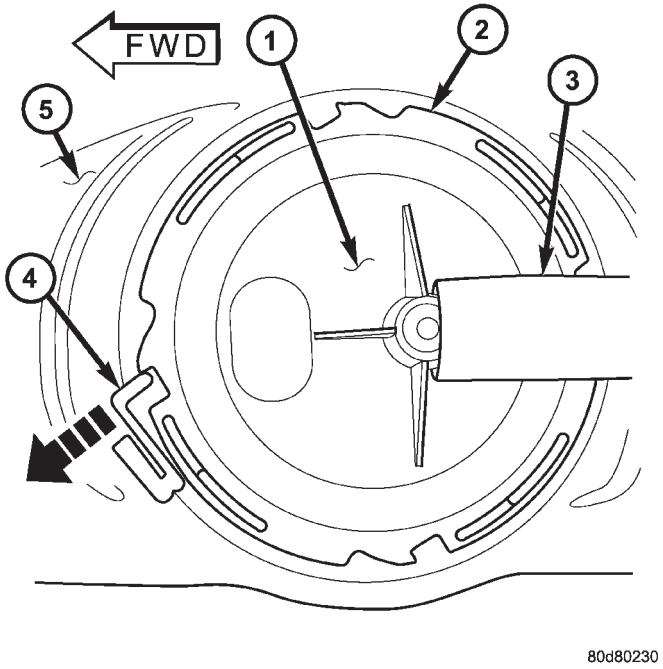


Fig. 27 ORVR CONTROL VALVE / LOCK RING

1 - ORVR CONTROL VALVE
2 - LOCK RING
3 - ORVR HOSE
4 - RELEASE TAB
5 - TOP OF FUEL TANK

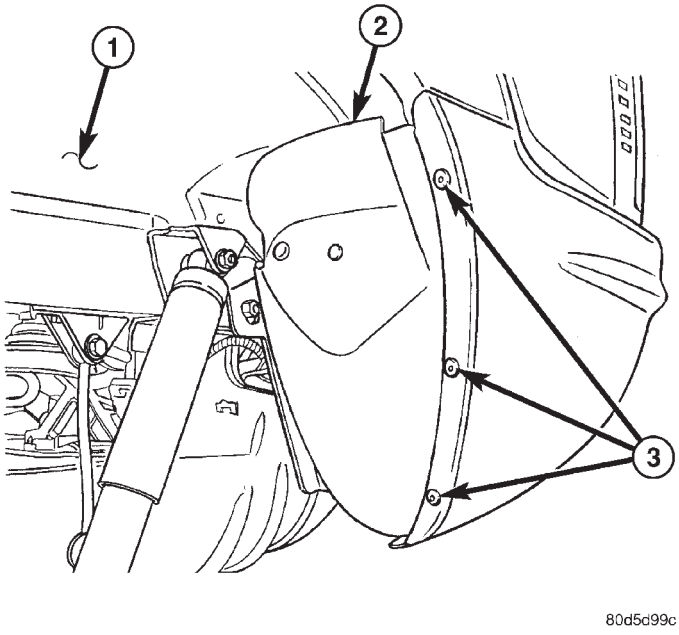


Fig. 28 STONE SHIELD

1 - LEFT-REAR WHEELHOUSE
2 - STONE SHIELD
3 - PLASTIC RIVETS

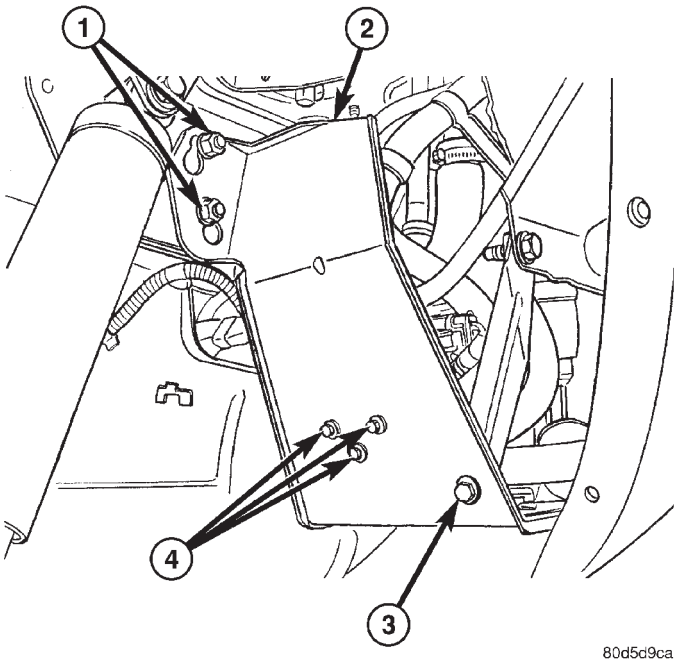


Fig. 29 LDP MOUNTING BOLTS

1 - SUPPORT BRACKET NUTS (2)
2 - SUPPORT BRACKET (FRONT)
3 - SUPPORT BRACKET BRACE BOLT
4 - LDP MOUNTING BOLTS (3)

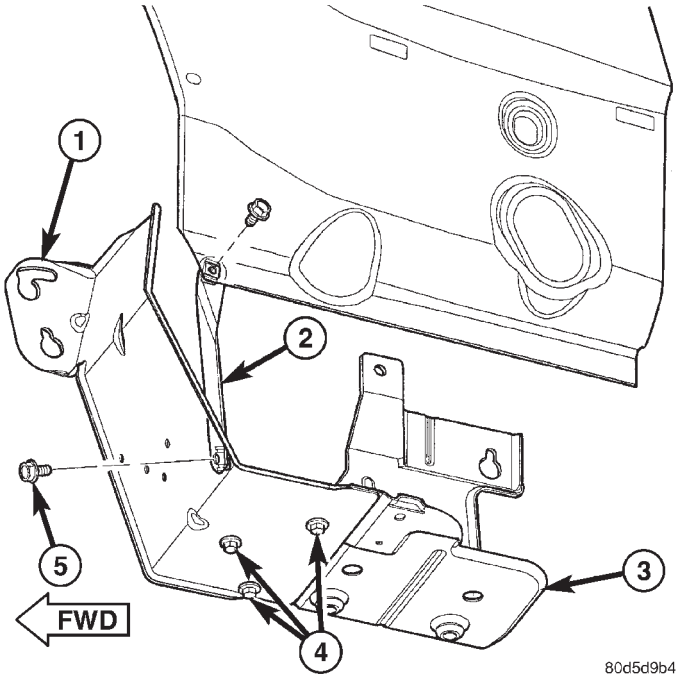


Fig. 30 TWO-PIECE SUPPORT BRACKET

1 - TWO-PIECE SUPPORT BRACKET (FRONT)
2 - SUPPORT BRACKET BRACE
3 - TWO-PIECE SUPPORT BRACKET (REAR)
4 - SUPPORT BRACKET ATTACHING BOLTS (3)
5 - SUPPORT BRACKET BRACE BOLT

FUEL TANK (Continued)

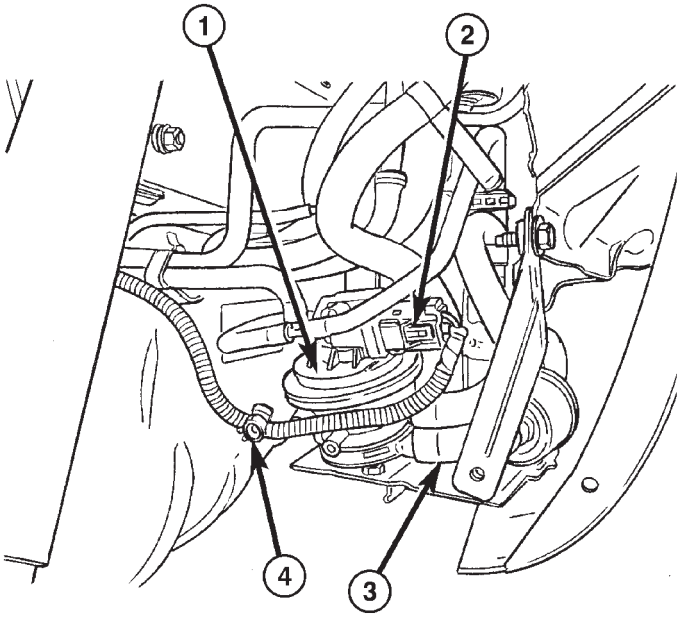


Fig. 31 LDP REMOVAL / INSTALLATION

1 - LDP
2 - ELEC. CONNECT.
3 - VAPOR / VACUUM LINES
4 - WIRING CLIP

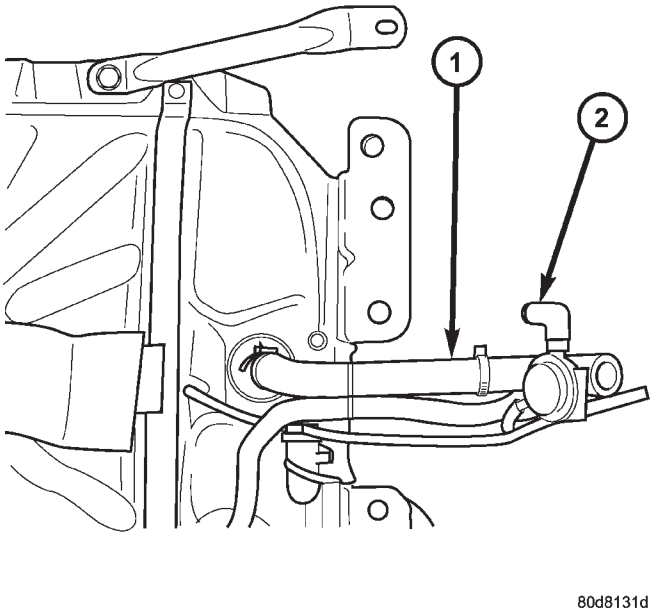


Fig. 33 ORVR HOSE ELBOW

1 - FUEL FILL HOSE
2 - ELBOW (TO TOP OF EVAP CANISTER)

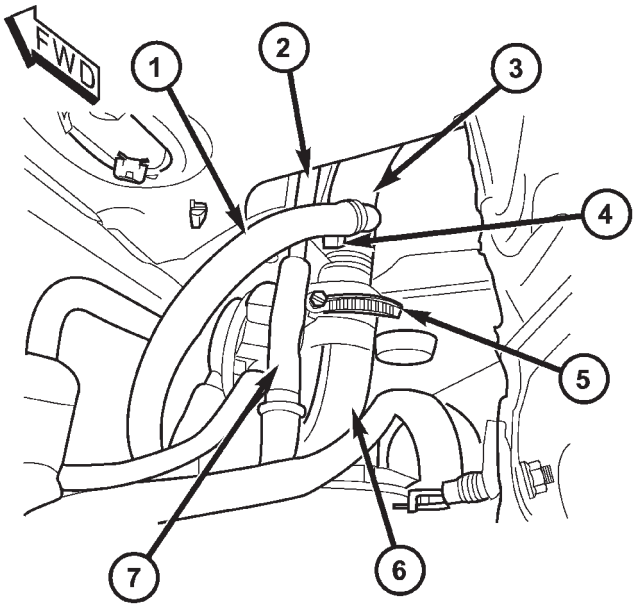


Fig. 32 FUEL FILL TUBE/HOSE/CLAMP

1 - AXLE VENT HOSE
2 - FUEL VENT TUBE
3 - FUEL FILL TUBE
4 - PLASTIC TIE WRAP
5 - HOSE CLAMP
6 - FUEL FILL HOSE
7 - FUEL VENT HOSE

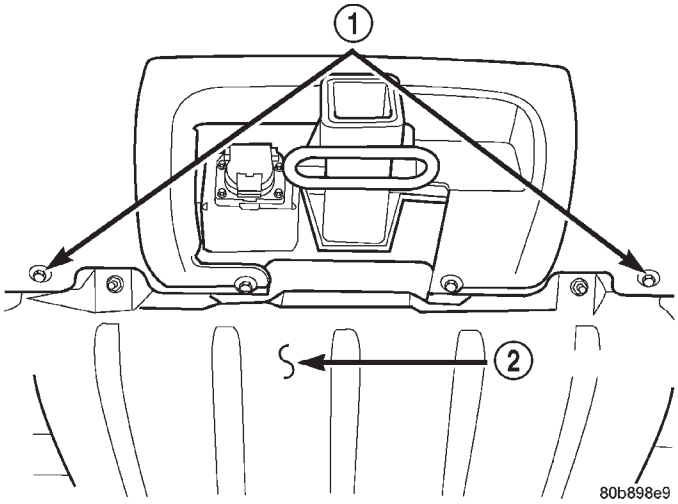


Fig. 34 BUMPER FASCIA CLIPS

1 - CLIPS
2 - FUEL TANK

FUEL TANK (Continued)

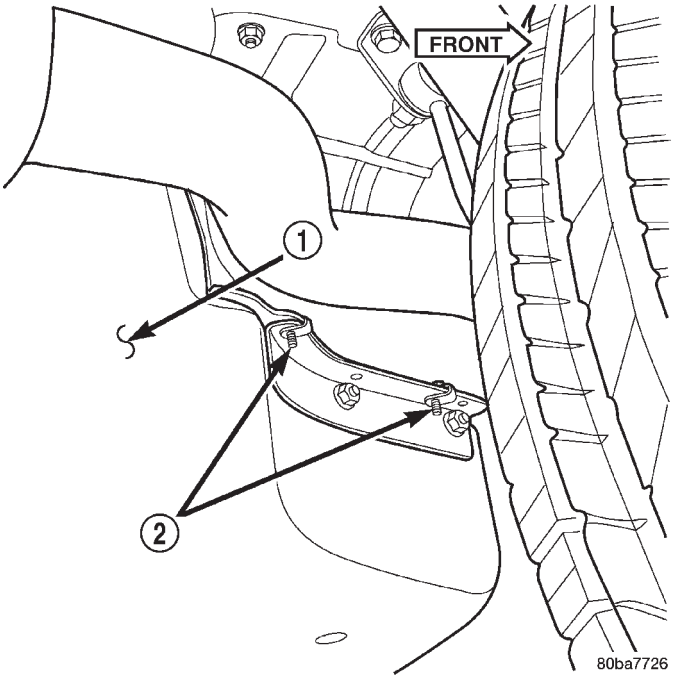


Fig. 35 FUEL TANK HEAT SHIELD BOLTS

1 - FUEL TANK
2 - HEAT SHIELD BOLTS

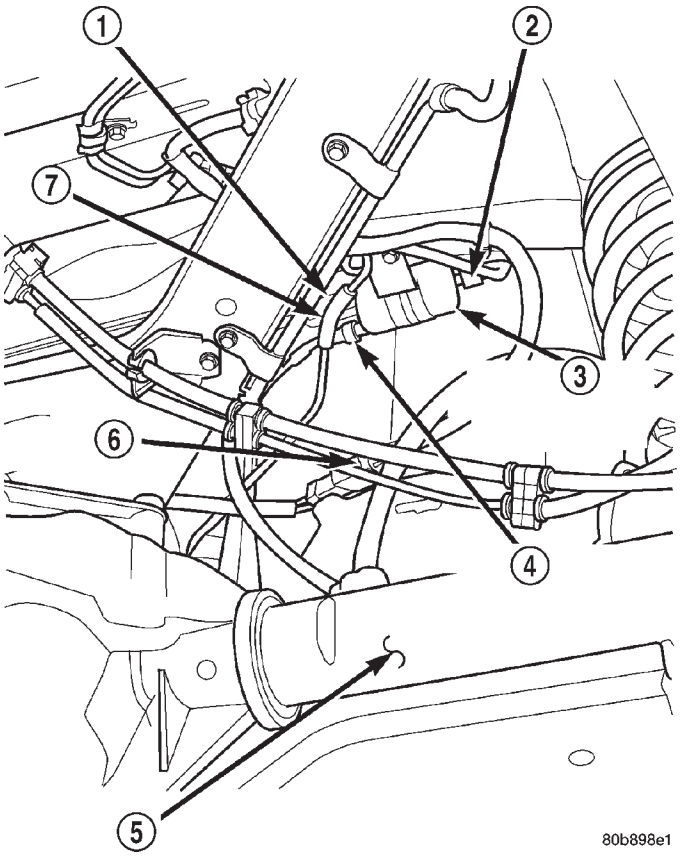


Fig. 36 FUEL FILTER/FUEL PRESSURE REGULATOR

1 - FUEL RETURN LINE
2 - FUEL SUPPLY LINE (TO FUEL RAIL)
3 - FUEL FILTER/FUEL PRESSURE REGULATOR
4 - FUEL PRESSURE LINE
5 - REAR AXLE
6 - ELEC. CONNECTOR
7 - EVAP LINE

FUEL TANK (Continued)

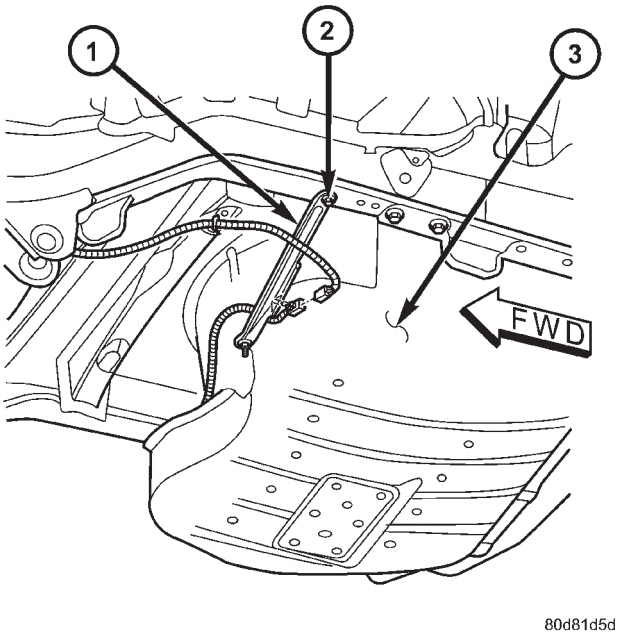


Fig. 37 BRACKET, TANK SUPPORT - FRONT

1 - FUEL TANK SUPPORT BRACKET (LEFT FRONT)
2 - BRACKET BOLT
3 - LEFT SIDE OF TANK

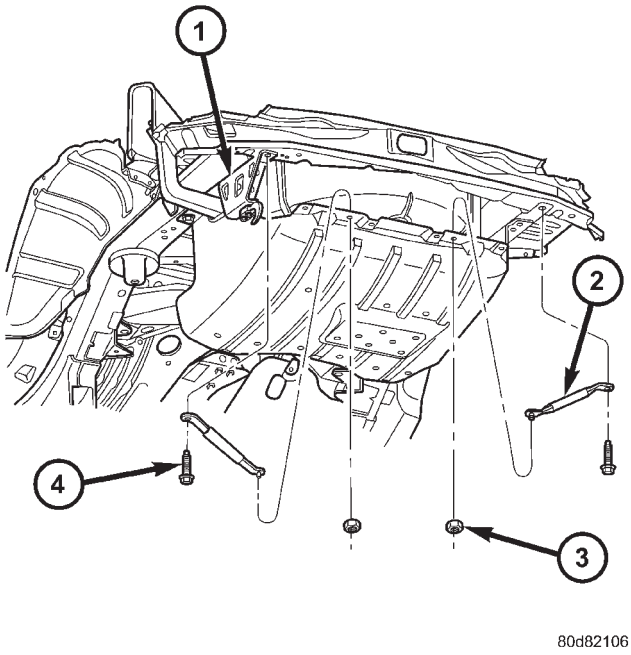


Fig. 38 BRACKETS, TANK SUPPORT - REAR

1 - TOW HOOKS
2 - REAR SUPPORT BRACKETS (2)
3 - TANK SUPPORT BRACKET NUTS
4 - TANK SUPPORT BRACKET BOLTS

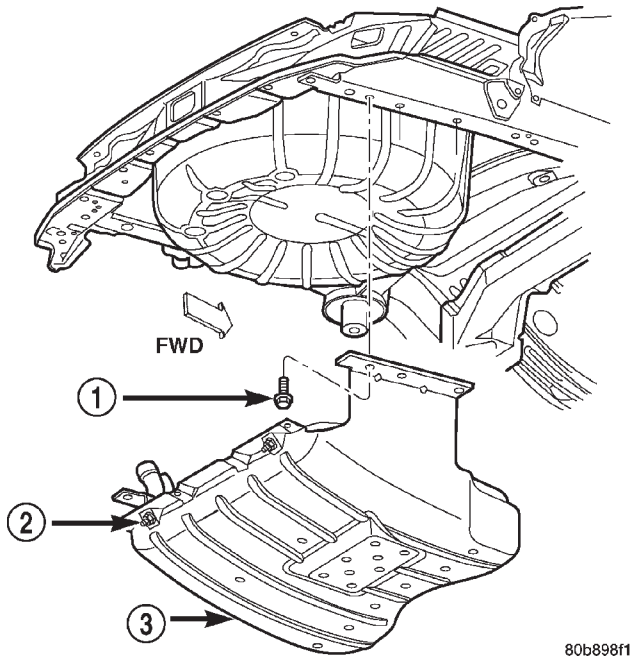


Fig. 39 FUEL TANK MOUNTING - NO TRAILER HITCH

1 - TANK MOUNTING BOLTS
2 - STRAP NUTS
3 - FUEL TANK/SHIELD ASSEMBLY

FUEL TANK (Continued)

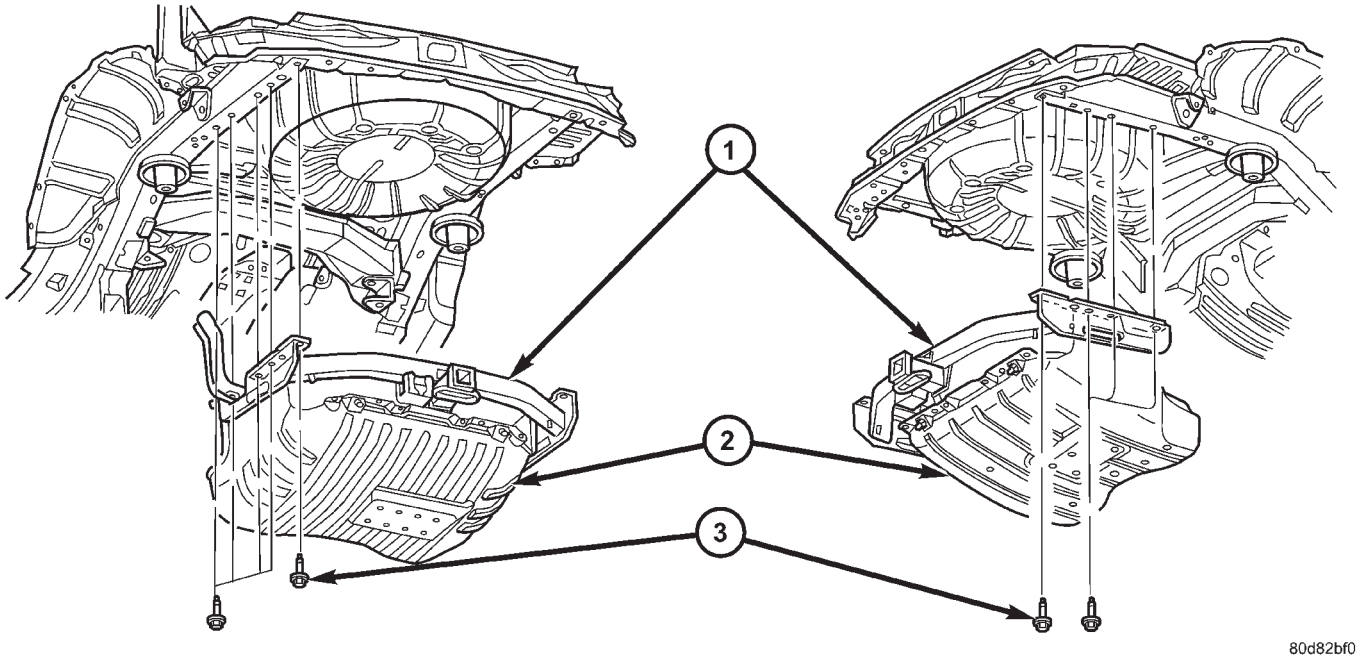


Fig. 40 FUEL TANK MOUNTING - WITH TRAILER HITCH

1 - TRAILER HITCH
2 - FUEL TANK
3 - FUEL TANK / HITCH MOUNTING BOLTS

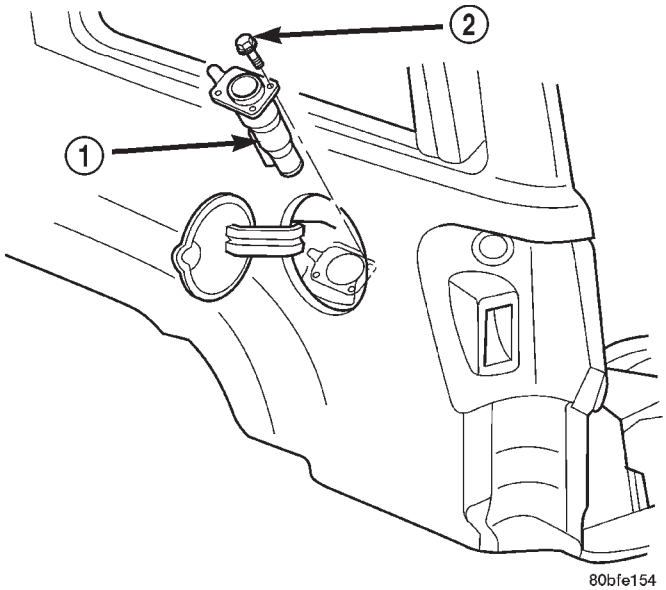


Fig. 41 FUEL FILLER TUBE

1 - FUEL FILLER TUBE
2 - MOUNTING BOLTS (3)

INLET FILTER

REMOVAL

The fuel pump inlet filter (strainer) is located on the bottom of fuel pump module (Fig. 42). The fuel pump module is located on top of fuel tank.

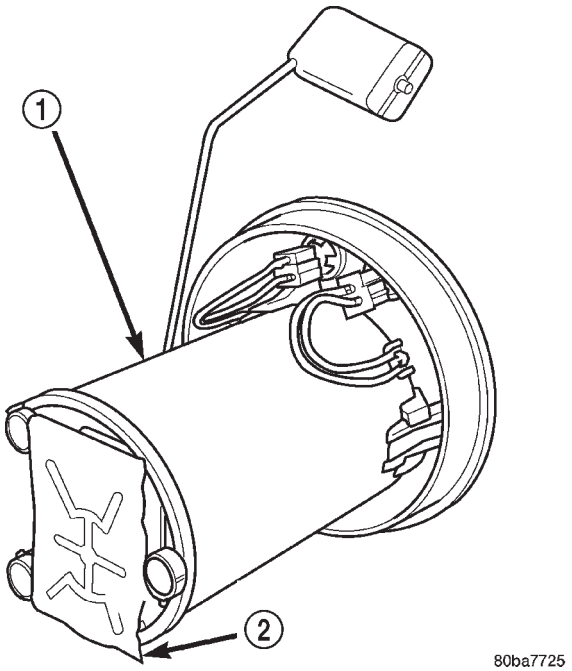


Fig. 42 Fuel Pump Inlet Filter

1 - FUEL PUMP MODULE
2 - FUEL PUMP INLET FILTER

The fuel pump inlet filter (strainer) is located on the bottom of fuel pump module (Fig. 42). The fuel pump module is located on top of fuel tank.

(1) Remove fuel tank. Refer to Fuel Tank Removal/Installation.

(2) Remove fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Remove filter by prying from bottom of module with 2 screwdrivers. Filter is snapped to module.

(4) Clean bottom of pump module.

INSTALLATION

The fuel pump inlet filter (strainer) is located on the bottom of fuel pump module (Fig. 42). The fuel pump module is located on top of fuel tank.

(1) Snap new filter to bottom of module.

(2) Install fuel pump module. Refer to Fuel Pump Module Removal/Installation.

(3) Install fuel tank. Refer to Fuel Tank Removal/Installation.

QUICK CONNECT FITTING

DESCRIPTION

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Some are equipped with safety latch clips. Some may require the use of a special tool for disconnection and removal. Refer to Quick-Connect Fittings Removal/Installation for more information.

CAUTION: The interior components (o-rings, clips) of quick-connect fittings are not serviced separately, but new plastic spacers are available for some types. If service parts are not available, do not attempt to repair the damaged fitting or fuel line (tube). If repair is necessary, replace the complete fuel line (tube) assembly.

STANDARD PROCEDURE - QUICK-CONNECT FITTINGS

Also refer to Fuel Tubes/Lines/Hoses and Clamps.

Different types of quick-connect fittings are used to attach various fuel system components, lines and tubes. These are: a single-tab type, a two-tab type or a plastic retainer ring type. Safety latch clips are used on certain components/lines. Certain fittings may require use of a special tool for disconnection.

DISCONNECTING

WARNING: THE FUEL SYSTEM IS UNDER A CONSTANT PRESSURE (EVEN WITH ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSE, FITTING OR LINE, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

CAUTION: The interior components (o-rings, spacers) of some types of quick-connect fitting are not serviced separately. If service parts are not available, do not attempt to repair a damaged fitting or fuel line. If repair is necessary, replace complete fuel line assembly.

(1) Perform fuel pressure release procedure. Refer to Fuel Pressure Release Procedure.

(2) Disconnect negative battery cable from battery.

(3) Clean fitting of any foreign material before disassembly.

(4) **2–Button Type Fitting:** This type of fitting is equipped with a push-button located on each side of quick-connect fitting (Fig. 43). Press on both buttons simultaneously for removal. Special tools are not required for disconnection.

QUICK CONNECT FITTING (Continued)

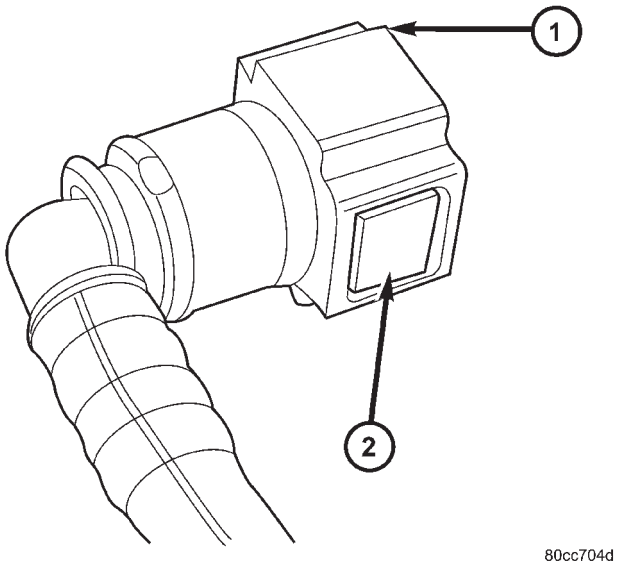


Fig. 43 2-BUTTON TYPE FITTING

1 - QUICK-CONNECT FITTING
2 - PUSH-BUTTONS (2)

(5) **Pinch-Type Fitting:** This fitting is equipped with two finger tabs. Pinch both tabs together while removing fitting (Fig. 44). Special tools are not required for disconnection.

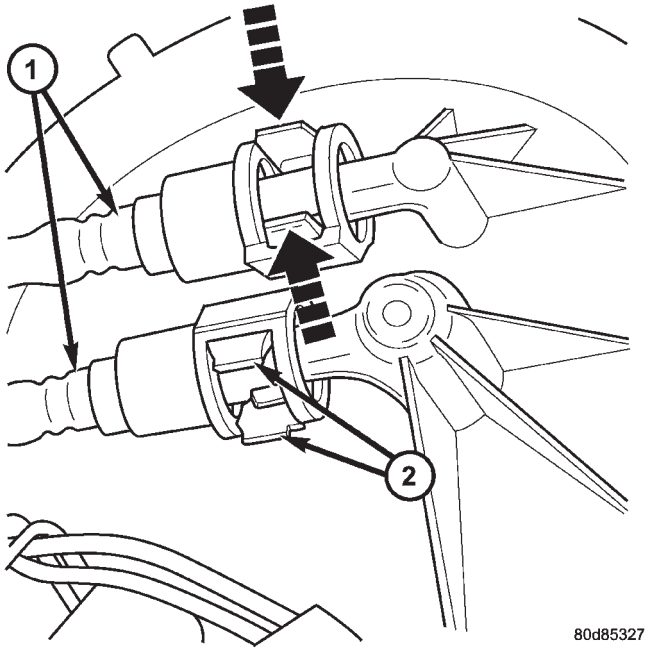


Fig. 44 PINCH TYPE QUICK-CONNECT FITTING

1 - QUICK-CONNECT FITTINGS
2 - PINCH TABS

(6) **Single-Tab Type Fitting:** This type of fitting is equipped with a single pull tab (Fig. 45). The tab is removable. After tab is removed, quick-connect fitting can be separated from fuel system component. Special tools are not required for disconnection.

(a) Press release tab on side of fitting to release pull tab (Fig. 46). **If release tab is not pressed prior to releasing pull tab, pull tab will be damaged.**

(b) While pressing release tab on side of fitting, use screwdriver to pry up pull tab (Fig. 46).

(c) Raise pull tab until it separates from quick-connect fitting (Fig. 47).

(7) **Two-Tab Type Fitting:** This type of fitting is equipped with tabs located on both sides of fitting (Fig. 48). The tabs are supplied for disconnecting quick-connect fitting from component being serviced.

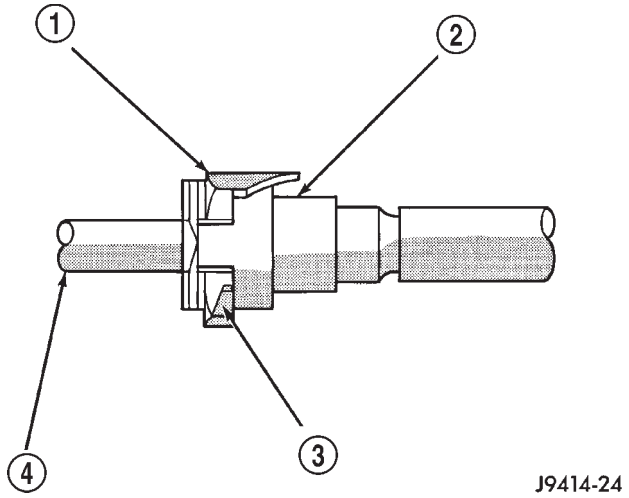


Fig. 45 SINGLE-TAB TYPE FITTING

1 - PULL TAB
2 - QUICK-CONNECT FITTING
3 - PRESS HERE TO REMOVE PULL TAB
4 - INSERTED TUBE END

(a) To disconnect quick-connect fitting, squeeze plastic retainer tabs (Fig. 48) against sides of quick-connect fitting with your fingers. Tool use is not required for removal and may damage plastic retainer.

(b) Pull fitting from fuel system component being serviced.

(c) The plastic retainer will remain on component being serviced after fitting is disconnected. The o-rings and spacer will remain in quick-connect fitting connector body.

(8) **Plastic Retainer Ring Type Fitting:** This type of fitting can be identified by the use of a full-round plastic retainer ring (Fig. 49) usually black in color.

(a) To release fuel system component from quick-connect fitting, firmly push fitting towards component being serviced while firmly pushing plastic retainer ring into fitting (Fig. 49). With plastic ring

QUICK CONNECT FITTING (Continued)

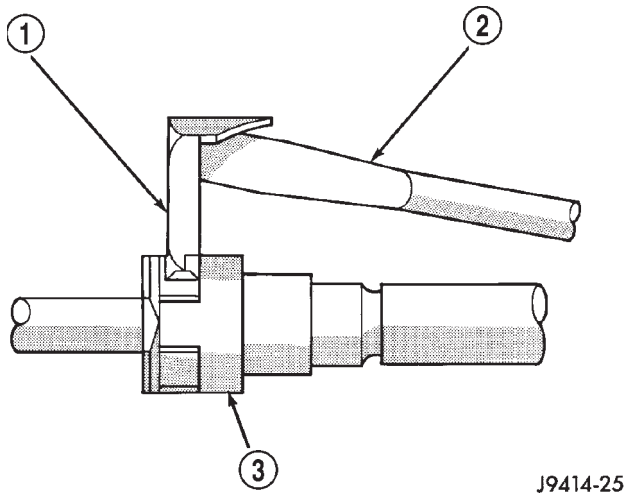


Fig. 46 DISCONNECTING SINGLE-TAB TYPE FITTING

1 - PULL TAB
2 - SCREWDRIVER
3 - QUICK-CONNECT FITTING

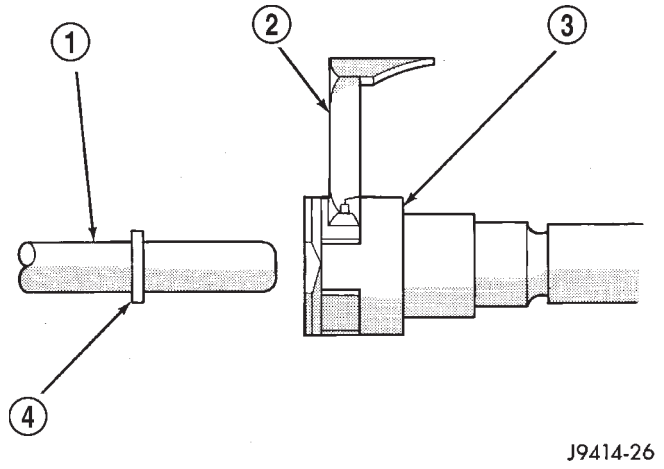


Fig. 47 REMOVING PULL TAB

1 - FUEL TUBE OR FUEL SYSTEM COMPONENT
2 - PULL TAB
3 - QUICK-CONNECT FITTING
4 - FUEL TUBE STOP

depressed, pull fitting from component. **The plastic retainer ring must be pressed squarely into fitting body. If this retainer is cocked during removal, it may be difficult to disconnect fitting. Use an open-end wrench on shoulder of plastic retainer ring to aid in disconnection.**

(b) After disconnection, plastic retainer ring will remain with quick-connect fitting connector body.

(c) Inspect fitting connector body, plastic retainer ring and fuel system component for damage. Replace as necessary.

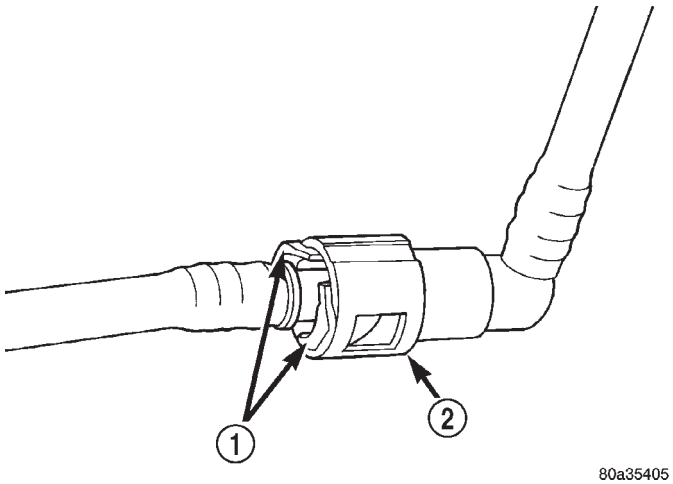


Fig. 48 TYPICAL 2–TAB TYPE FITTING

1 - TAB(S)
2 - QUICK-CONNECT FITTING

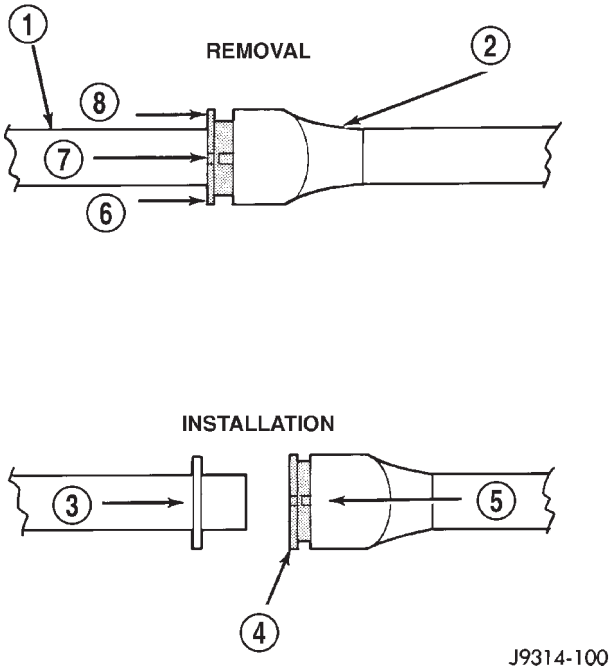


Fig. 49 PLASTIC RETAINER RING TYPE FITTING

1 - FUEL TUBE
2 - QUICK CONNECT FITTING
3 - PUSH
4 - PLASTIC RETAINER
5 - PUSH
6 - PUSH
7 - PUSH
8 - PUSH

(9) **Latch Clips:** Depending on vehicle model and engine, 2 different types of safety latch clips are used (Fig. 50) or (Fig. 51). Type-1 is tethered to fuel line and type-2 is not. A special tool will be necessary to disconnect fuel line after latch clip is removed. The latch clip may be used on certain fuel line/fuel rail connection, or to join fuel lines together.

QUICK CONNECT FITTING (Continued)

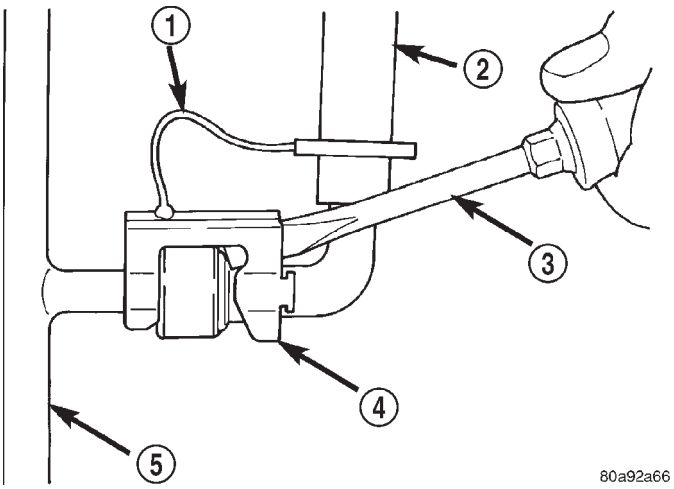


Fig. 50 LATCH CLIP-TYPE 1

1 - TETHER STRAP
2 - FUEL LINE
3 - SCREWDRIVER
4 - LATCH CLIP
5 - FUEL RAIL

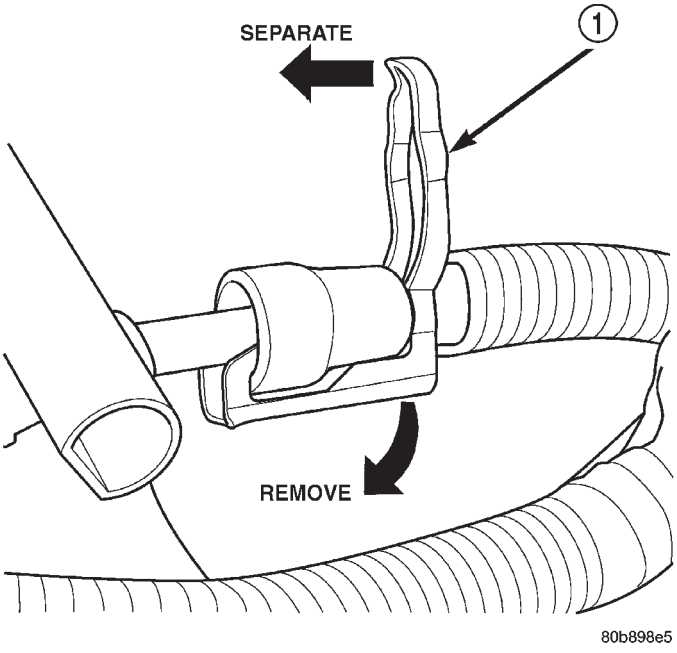


Fig. 51 LATCH CLIP-TYPE 2

1 - LATCH CLIP

(a) Type 1: Pry up on latch clip with a screwdriver (Fig. 50).

(b) Type 2: Separate and unlatch 2 small arms on end of clip (Fig. 51) and swing away from fuel line.

(c) Slide latch clip toward fuel rail while lifting with screwdriver.

(d) Insert special fuel line removal tool (Snap-On number FIH 9055-1 or equivalent) into fuel line (Fig. 52). Use tool to release locking fingers in end of line.

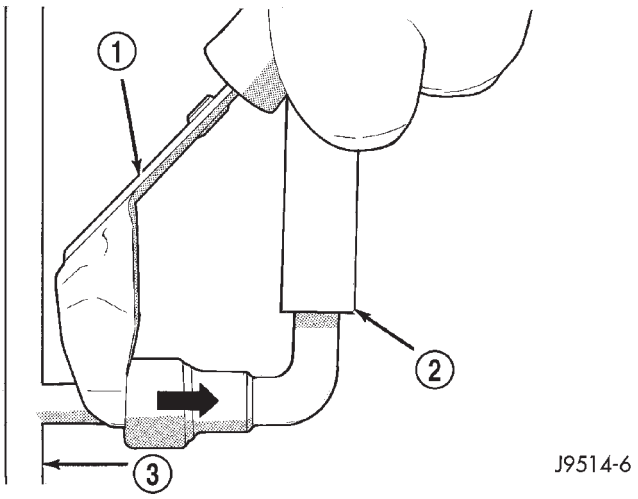


Fig. 52 FUEL LINE DISCONNECTION USING SPECIAL TOOL

1 - SPECIAL FUEL LINE TOOL
2 - FUEL LINE
3 - FUEL RAIL

(e) With special tool still inserted, pull fuel line from fuel rail.

(f) After disconnection, locking fingers will remain within quick-connect fitting at end of fuel line.

(10) Disconnect quick-connect fitting from fuel system component being serviced.

CONNECTING

(1) Inspect quick-connect fitting body and fuel system component for damage. Replace as necessary.

(2) Prior to connecting quick-connect fitting to component being serviced, check condition of fitting and component. Clean parts with a lint-free cloth. Lubricate with clean engine oil.

(3) Insert quick-connect fitting into fuel tube or fuel system component until built-on stop on fuel tube or component rests against back of fitting.

(4) Continue pushing until a click is felt.

(5) Single-tab type fitting: Push new tab down until it locks into place in quick-connect fitting.

(6) Verify a locked condition by firmly pulling on fuel tube and fitting (15-30 lbs.).

(7) Latch Clip Equipped: Install latch clip (snaps into position). **If latch clip will not fit, this indicates fuel line is not properly installed to fuel rail (or other fuel line). Recheck fuel line connection.**

(8) Connect negative cable to battery.

(9) Start engine and check for leaks.

FUEL INJECTION

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FUEL INJECTION

DIAGNOSIS AND TESTING

VISUAL INSPECTION

A visual inspection for loose, disconnected or incorrectly routed wires, vacuum lines and hoses should be made. This should be done before attempting to diagnose or service the fuel injection system. A visual check will help spot these faults and save unnecessary test and diagnostic time. A thorough visual inspection will include the following checks:

(1) Verify three 32–way electrical connectors are fully inserted into connector of Powertrain Control Module (PCM) (Fig. 1).

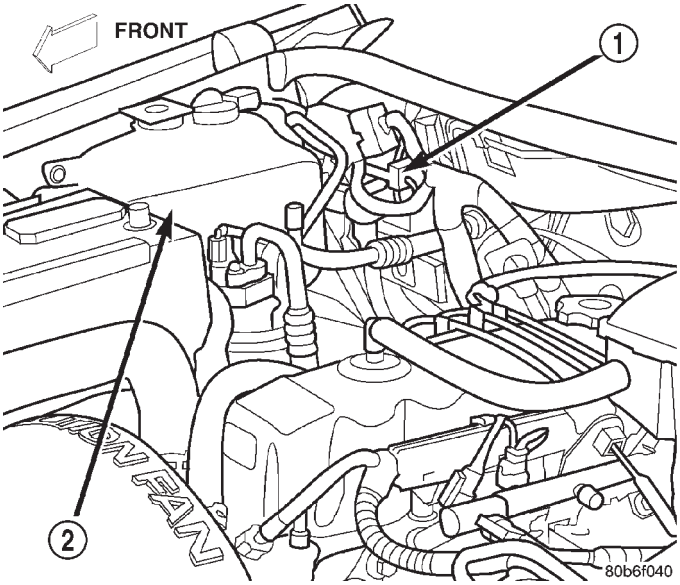


Fig. 1 Powertrain Control Module (PCM) Location

1 - PCM
2 - COOLANT TANK

(2) Inspect battery cable connections. Be sure they are clean and tight.

(3) Inspect fuel pump relay and air conditioning compressor clutch relay (if equipped). Inspect ASD and oxygen sensor heater relay connections. Inspect starter motor relay connections. Inspect relays for signs of physical damage and corrosion. The relays are located in the Power Distribution Center (PDC) (Fig. 2). Refer to label on PDC cover for relay location.

(4) Inspect ignition coil connections (Fig. 3)or (Fig. 4).

(5) Verify camshaft position sensor wire connector is firmly connected (Fig. 5) or (Fig. 6).

(6) Verify crankshaft position sensor wire connector is firmly connected (Fig. 7) or (Fig. 8).

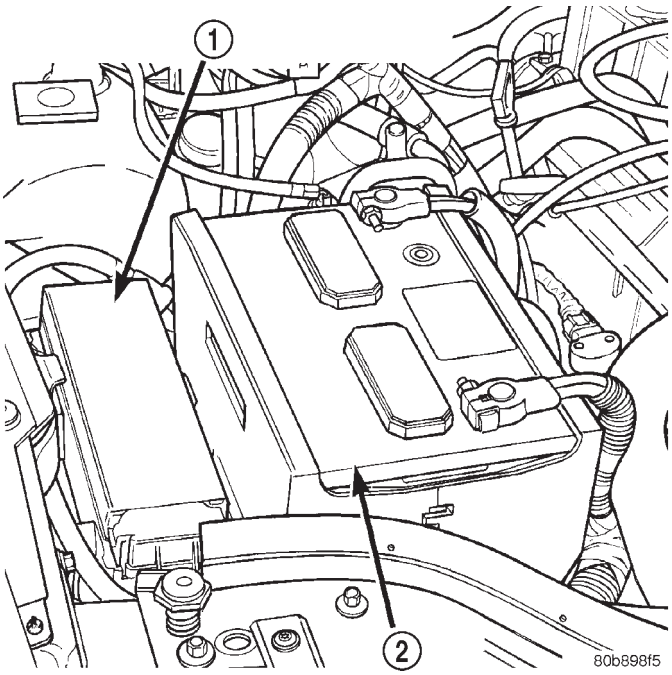


Fig. 2 Power Distribution Center (PDC) Location

1 - POWER DISTRIBUTION CENTER (PDC)
2 - BATTERY

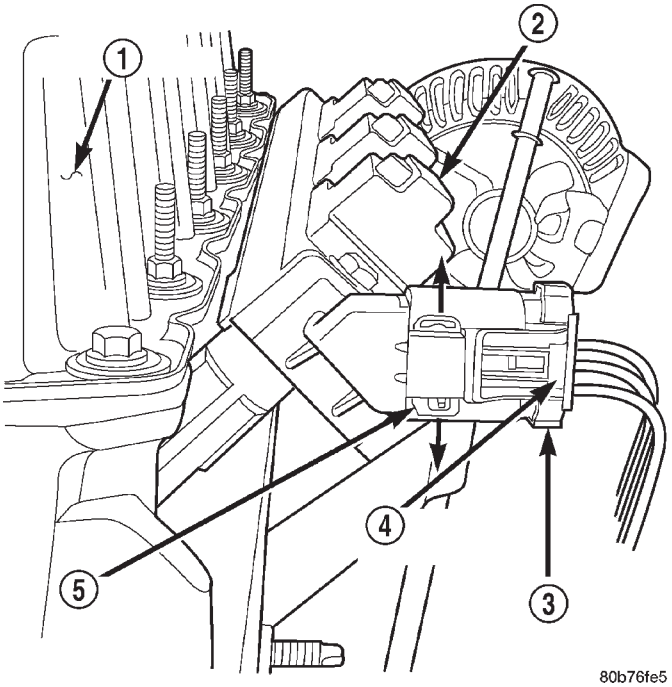


Fig. 3 Ignition Coil Connector—4.0L Engine

1 - REAR OF VALVE COVER
2 - COIL RAIL
3 - COIL CONNECTOR
4 - RELEASE LOCK
5 - SLIDE TAB

FUEL INJECTION (Continued)

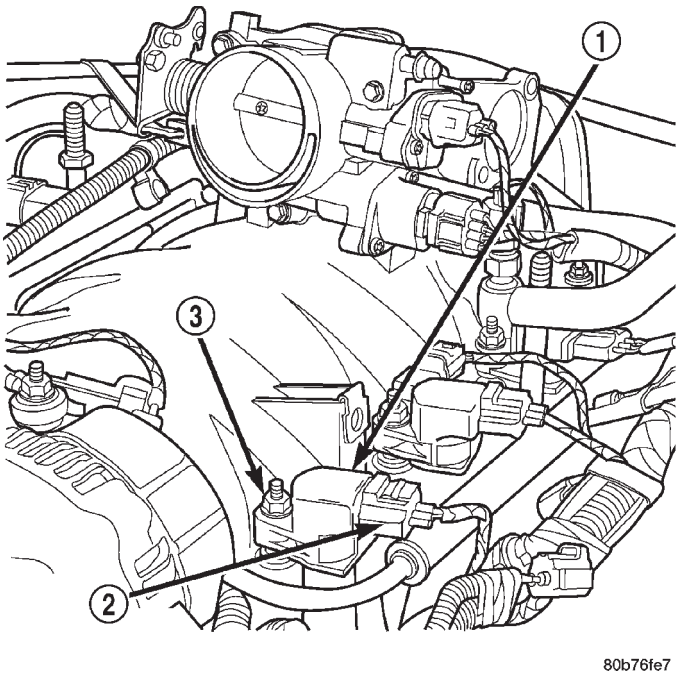


Fig. 4 Ignition Coil Connector—4.7L V-8 Engine

1 - IGNITION COIL
2 - COIL ELECTRICAL CONNECTOR
3 - COIL MOUNTING STUD/NUT

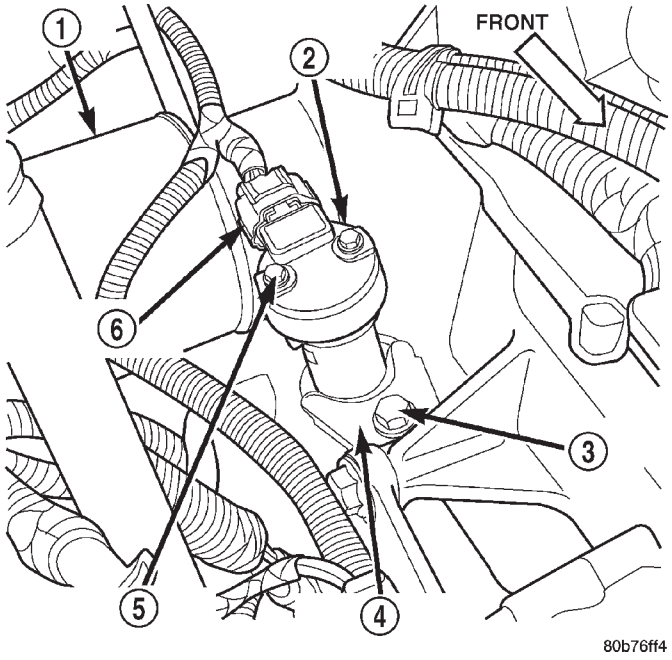


Fig. 5 Camshaft Position Sensor—4.0L Engine

1 - OIL FILTER
2 - CAMSHAFT POSITION SENSOR
3 - CLAMP BOLT
4 - HOLD-DOWN CLAMP
5 - MOUNTING BOLTS (2)
6 - ELEC. CONNECTOR

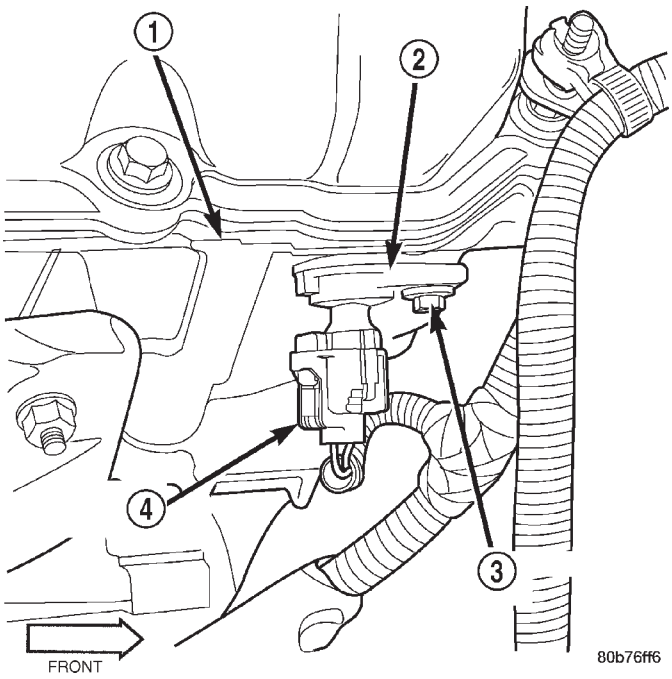


Fig. 6 Camshaft Position Sensor—4.7L V-8 Engine

1 - RIGHT CYLINDER HEAD
2 - CAMSHAFT POSITION SENSOR
3 - MOUNTING BOLT
4 - ELEC. CONNECTOR

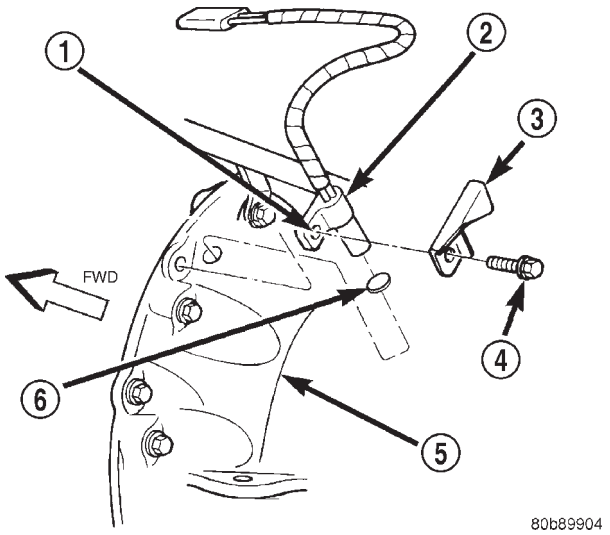


Fig. 7 Crankshaft Position Sensor—4.0L Engine

1 - SLOTTED HOLE
2 - CRANKSHAFT POSITION SENSOR
3 - WIRE SHIELD
4 - MOUNTING BOLT
5 - TRANSMISSION HOUSING
6 - PAPER SPACER

(7) Verify generator output wire (B+ wire) and generator field connector are firmly connected to generator.

FUEL INJECTION (Continued)

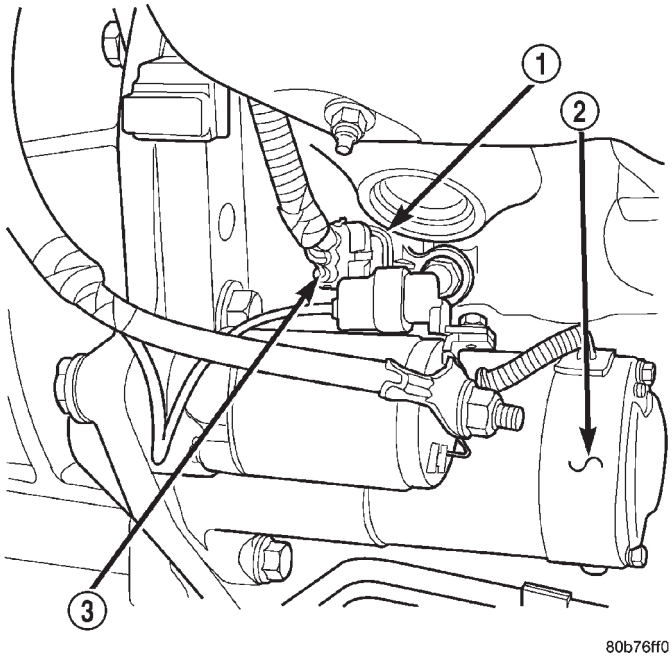


Fig. 8 Crankshaft Position Sensor—4.7L V-8 Engine

1 - CRANKSHAFT POSITION SENSOR
2 - STARTER
3 - ELEC. CONNECTOR

(8) Inspect system body grounds for loose or dirty connections. Refer to Group 8, Wiring for ground locations.

(9) Verify crankcase ventilation (CCV) operation. Refer to Emission Control System for additional information.

(10) Inspect all fuel line quick-connect fittings for damage or leaks.

(11) Verify hose connections to all ports of vacuum fittings on intake manifold, and for emission system are tight and not leaking.

(12) Inspect accelerator cable, transmission throttle cable (if equipped) and speed control cable connections (if equipped). Check their connections to throttle body linkage for any binding or restrictions.

(13) Verify vacuum booster hose is firmly connected to fitting on intake manifold. Also check connection to brake vacuum booster.

(14) Inspect air cleaner inlet and air cleaner element for dirt or restrictions.

(15) Inspect radiator grille area, radiator fins and air conditioning condenser for restrictions.

(16) 4.0L Engine: Verify MAP, Intake Manifold Air Temperature (IAT) sensor, TPS and Idle Air Control (IAC) motor connectors are firmly connected (Fig. 9). Be sure throttle body mounting bolts (Fig. 9)are tight.

(17) 4.7L Engine: Verify Intake Manifold Air Temperature (IAT) sensor, TPS and Idle Air Control (IAC) motor connectors are firmly connected (Fig. 10). Be sure throttle body mounting bolts (Fig. 10)are tight.

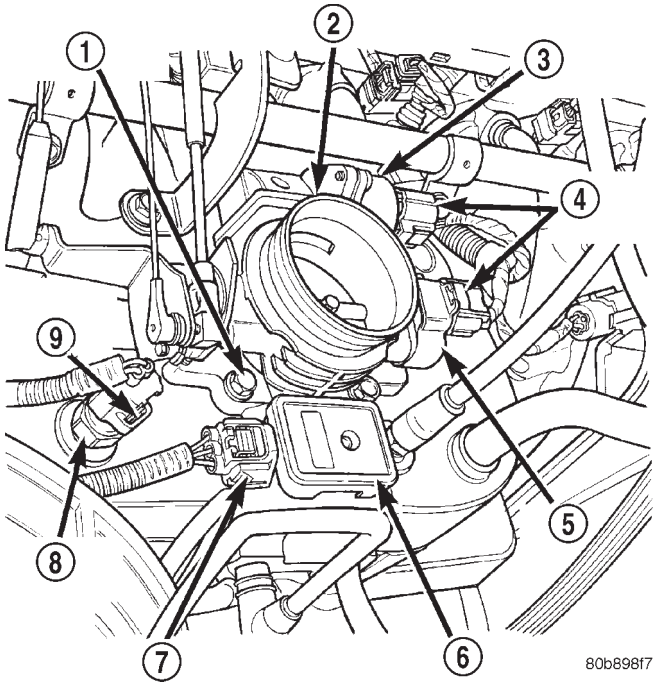


Fig. 9 IAT, MAP, IAC, TPS Sensor Locations—4.0L Engine

1 - MOUNTING BOLTS (4)
2 - THROTTLE BODY
3 - IAC MOTOR
4 - ELEC. CONN.
5 - TPS
6 - MAP SENSOR
7 - ELEC. CONN.
8 - IAT SENSOR
9 - ELEC. CONN.

FUEL INJECTION (Continued)

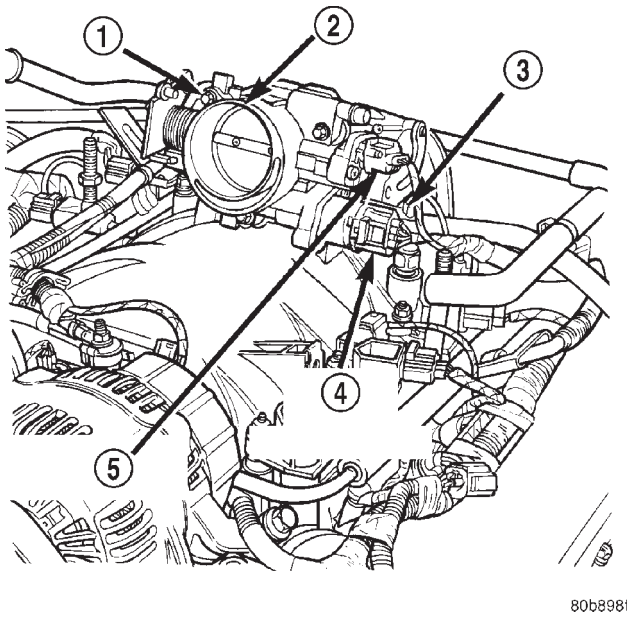


Fig. 10 IAT, IAC, TPS Sensor Locations—4.7L V-8 Engine

1 - MOUNTING BOLTS (3)
2 - THROTTLE BODY
3 - IAT SENSOR CONNECTOR
4 - IAC MOTOR CONNECTOR
5 - TPS CONNECTOR

(18) 4.0L Engine: Verify wire harness connector is firmly connected to Engine Coolant Temperature (ECT) sensor (Fig. 11).

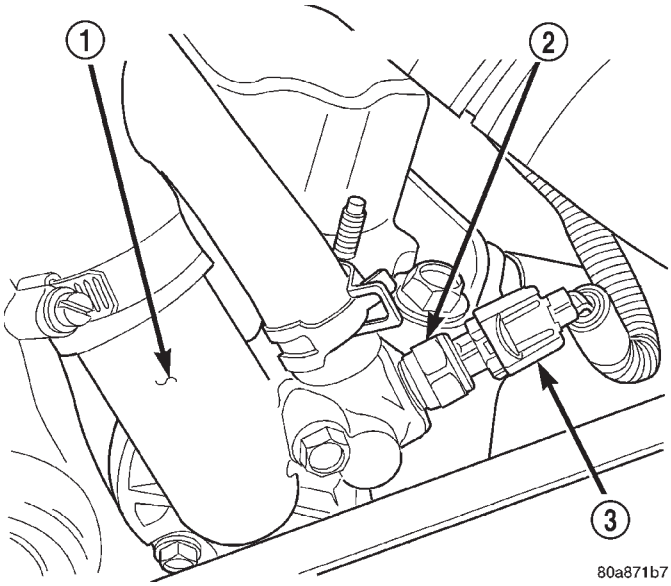


Fig. 11 ECT Sensor Location—4.0L Engine

1 - THERMOSTAT HOUSING
2 - ENGINE COOLANT TEMPERATURE SENSOR
3 - ELECTRICAL CONNECTOR

(19) 4.7L Engine: Verify MAP and Engine Coolant Temperature (ECT) sensor electrical connectors are firmly connected to sensors (Fig. 12).

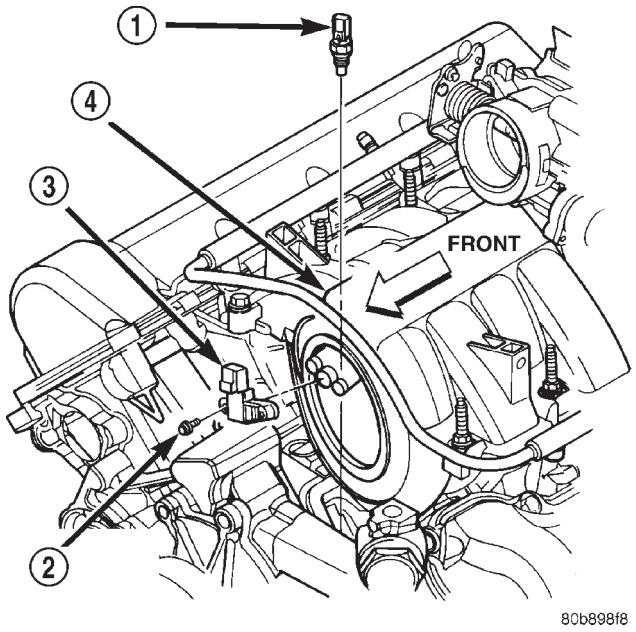


Fig. 12 MAP and ECT Sensor Locations—4.7L V-8 Engine

1 - ECT SENSOR
2 - MOUNTING BOLTS (2)
3 - MAP SENSOR
4 - INTAKE MANIFOLD

(20) Verify fuel injector wire harness connectors are firmly connected to injectors in correct order. Each harness connector is numerically tagged with injector number (INJ 1, INJ 2 etc.) of its corresponding fuel injector and cylinder number.

(21) Raise and support vehicle.

(22) Verify all oxygen sensor wire connectors are firmly connected to sensors. Inspect sensors and connectors for damage (Fig. 13)or (Fig. 14).

FUEL INJECTION (Continued)

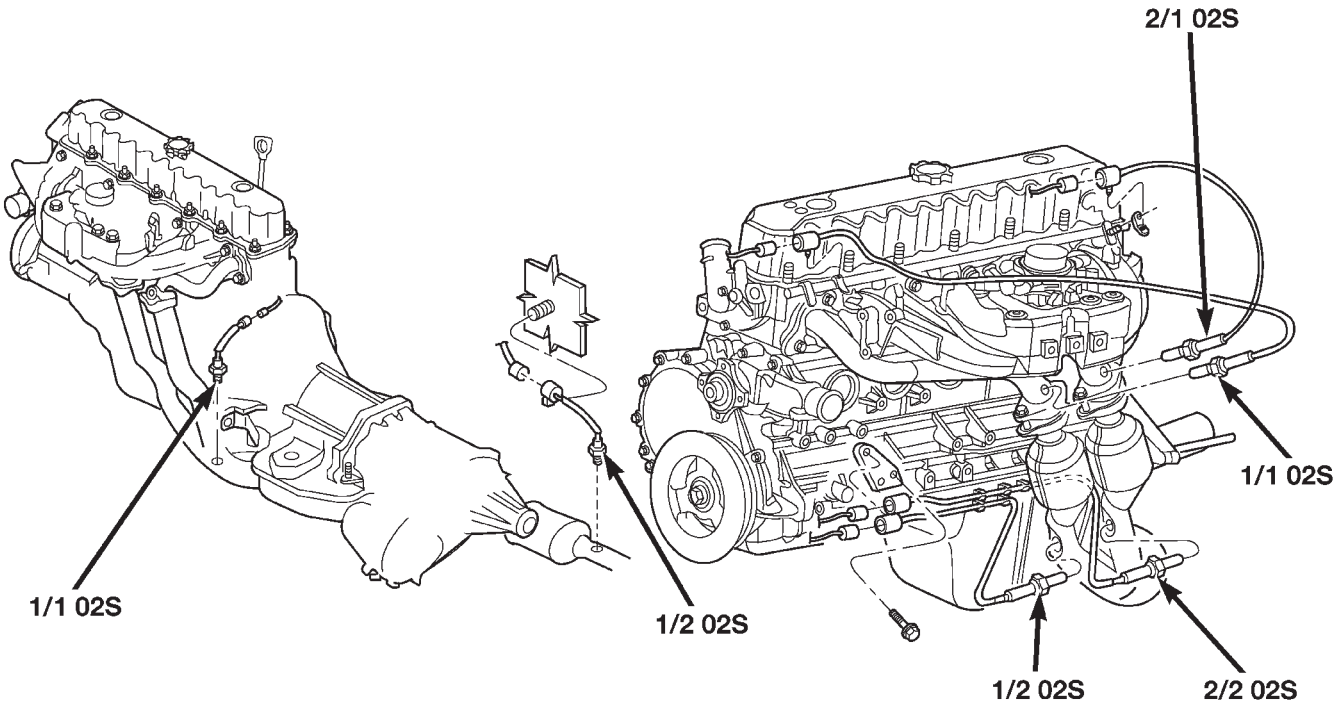


Fig. 13 Oxygen Sensor Locations—4.0L Engine

FUEL INJECTION (Continued)

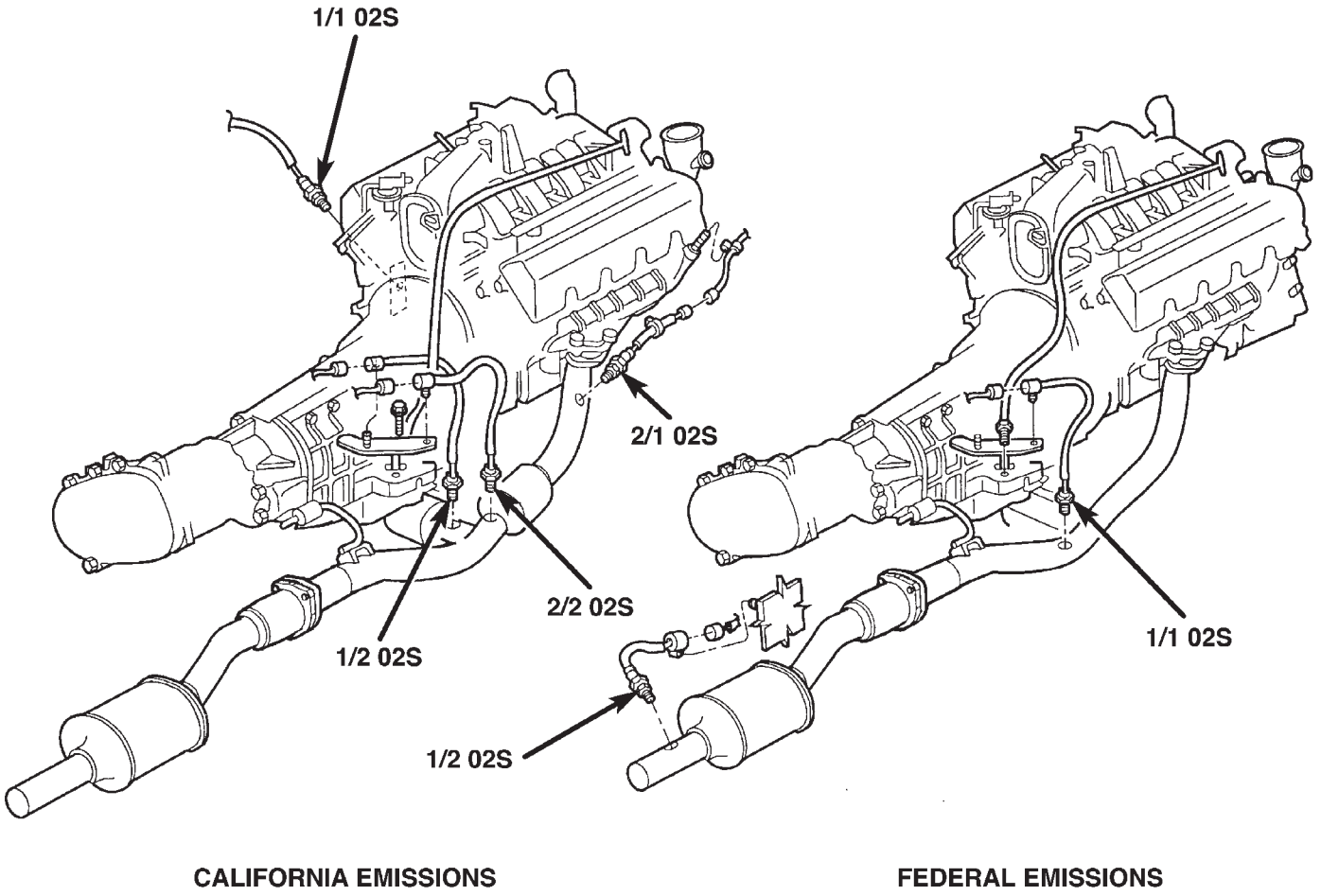


Fig. 14 Oxygen Sensor Locations—4.7L V-8 Engine

FUEL INJECTION (Continued)

(23) Inspect for pinched or leaking fuel tubes/lines. Inspect for pinched, cracked or leaking fuel hoses.

(24) Inspect for exhaust system restrictions such as pinched exhaust pipes, collapsed muffler or plugged catalytic convertor.

(25) If equipped with automatic transmission, verify electrical harness is firmly connected to park/neutral switch and to transmission components.

(26) Verify fuel pump module pigtail harness electrical connector (Fig. 15) is firmly connected to body harness connector.

(27) Inspect fuel line harness (from fuel pump module) at fuel filter/fuel pressure regulator (Fig. 15) for chaffing, cracks or leaks.

(28) Verify battery cable and solenoid feed wire connections to starter solenoid are tight and clean.

(29) Inspect for chaffed wires or wires rubbing up against other components.

(30) Inspect for chaffed vacuum lines or lines rubbing up against other components.

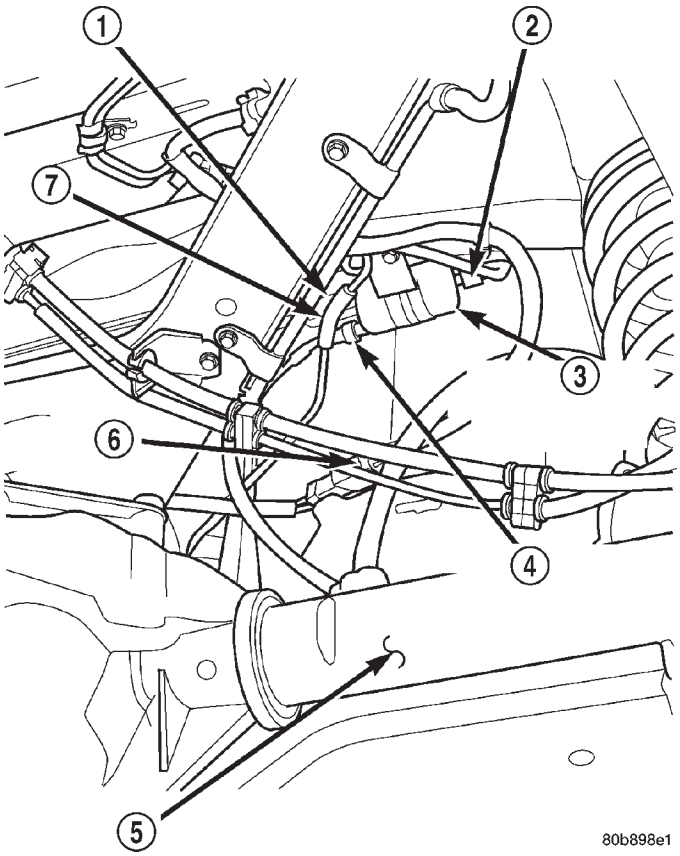


Fig. 15 Fuel Filter/Fuel Pressure Regulator Location

1 - FUEL RETURN LINE
2 - FUEL SUPPLY LINE (TO FUEL RAIL)
3 - FUEL FILTER/FUEL PRESSURE REGULATOR
4 - FUEL PRESSURE LINE
5 - REAR AXLE
6 - ELEC. CONNECTOR
7 - EVAP LINE

SPECIFICATIONS

TORQUE - FUEL INJECTION

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Air Cleaner Housing Mount. Nuts	10		93
Air Cleaner Air Duct Clamps	4		35
Air Cleaner Resonator Bolts	4		35
Engine Coolant Temperature Sensor—4.0L Engine	11		96
Engine Coolant Temperature Sensor—4.7L Engine	11		96
Fuel Hose Clamps	1		10
IAC Motor-To-Throttle Body Bolts—4.0L Engine	7		′60
IAC Motor-To-Throttle Body Bolts—4.7L Engine	7		60
Intake Manifold Air Temp. Sensor—4.0L Engine	28	20	
Intake Manifold Air Temp. Sensor—4.7L Engine	28	20	
MAP Sensor Mounting Screws—4.0L Engine	3		25
MAP Sensor Mounting Screws—4.7L Engine	3		25
Oxygen Sensor—All Engines	30	22	
PCM-to-Mounting Bracket Screws	3		25
PCM-to-Mounting Bracket Screws	9		80
Radiator Cooling Fan Relay Bolts	3		25
Throttle Body Mounting Bolts—4.0L Engine	11		100
Throttle Body Mounting Bolts—4.7L Engine	12		105
TPS Mounting Screws—4.0L Engine	7		60
TPS Mounting Screws—4.7L Engine	7		60

ACCELERATOR PEDAL

REMOVAL

The accelerator pedal is connected to the throttle body linkage by the throttle cable. The cable is protected by a plastic sheathing and is connected to the throttle body linkage by a ball socket. It is connected to the accelerator pedal arm by a plastic retainer (clip) (Fig. 16). This retainer (clip) snaps into the top of the accelerator pedal arm. A retainer clip (Fig. 16) is also used to fasten cable to dash panel.

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing accelerator pedal or throttle cable.

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of pedal arm. Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove accelerator pedal bracket nuts. Remove accelerator pedal assembly.

INSTALLATION

The accelerator pedal is connected to the throttle body linkage by the throttle cable. The cable is protected by a plastic sheathing and is connected to the throttle body linkage by a ball socket. It is connected to the accelerator pedal arm by a plastic retainer (clip) (Fig. 16) . This retainer (clip) snaps into the top of the accelerator pedal arm. A retainer clip (Fig. 16) is also used to fasten cable to dash panel.

(1) Place accelerator pedal assembly over studs protruding from floor pan. Tighten mounting nuts to 12 N·m ± 2 N·m (105 in. lbs. ± 20 in. lbs.) torque.

(2) Slide throttle cable into opening in top of pedal arm. Push plastic cable retainer (clip) into pedal arm opening until it snaps into place.

(3) Before starting engine, operate accelerator pedal to check for any binding.

ACCELERATOR PEDAL (Continued)

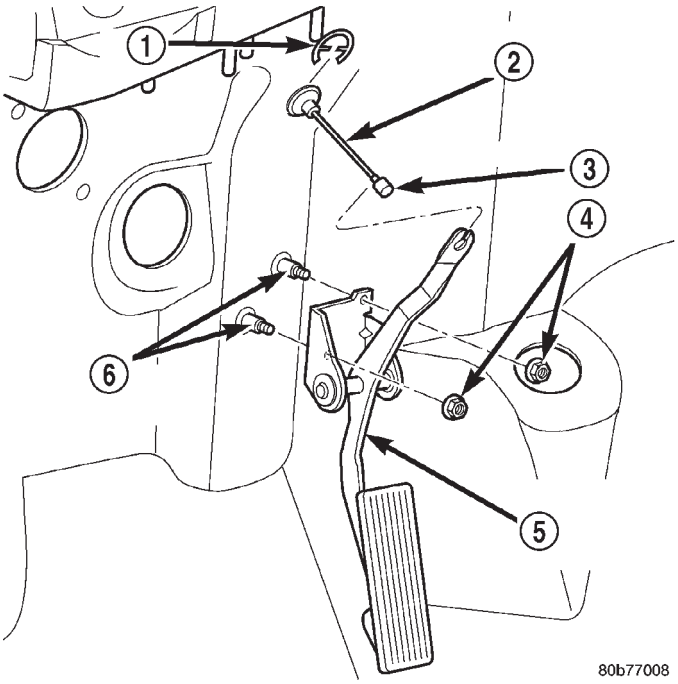


Fig. 16 Accelerator Pedal Mounting

1 - CLIP
2 - ACCELERATOR CABLE
3 - CABLE CONNECTOR
4 - MOUNTING NUTS (2)
5 - PEDAL/BRACKET ASSEMBLY
6 - MOUNTING STUDS (2)

CRANKSHAFT POSITION SENSOR

DESCRIPTION

DESCRIPTION - 4.0L

The Crankshaft Position Sensor (CKP) is mounted to the transmission bellhousing at the left/rear side of the engine block (Fig. 17).

DESCRIPTION - 4.7L

The Crankshaft Position Sensor (CKP) is mounted into the engine block above the starter motor (Fig. 18).

OPERATION

OPERATION - 4.0L

Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

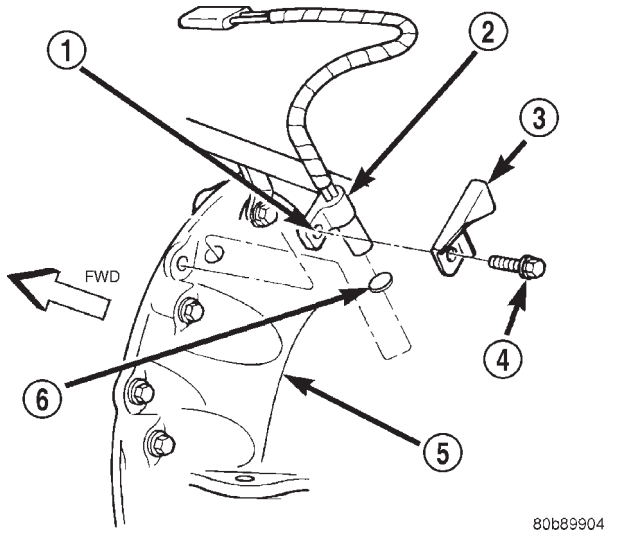


Fig. 17 CKP Sensor Location—4.0L 6-Cyl. Engine

1 - SLOTTED HOLE
2 - CRANKSHAFT POSITION SENSOR
3 - WIRE SHIELD
4 - MOUNTING BOLT
5 - TRANSMISSION HOUSING
6 - PAPER SPACER

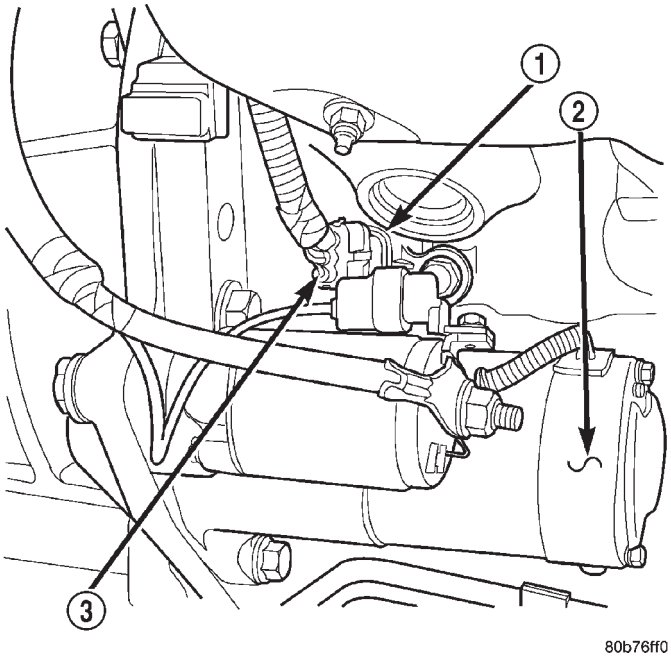


Fig. 18 CKP Sensor Location—4.7L V–8 Engine

1 - CRANKSHAFT POSITION SENSOR
2 - STARTER
3 - ELEC. CONNECTOR

CRANKSHAFT POSITION SENSOR (Continued)

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

On 4.0L 6-cylinder engines, the flywheel/drive plate has 3 sets of four notches at its outer edge (Fig. 19).

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM. For each engine revolution there are 3 sets of four pulses generated.

The trailing edge of the fourth notch, which causes the pulse, is four degrees before top dead center (TDC) of the corresponding piston.

The engine will not operate if the PCM does not receive a crankshaft position sensor input.

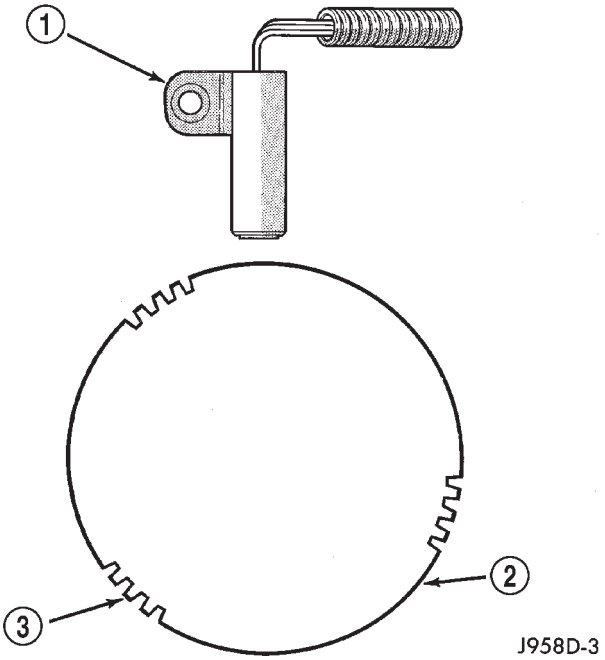


Fig. 19 CKP Sensor Operation—4.0L 6-Cyl. Engine

1 - CRANKSHAFT POSITION SENSOR
2 - FLYWHEEL
3 - FLYWHEEL NOTCHES

OPERATION - 4.7L

Engine speed and crankshaft position are provided through the crankshaft position sensor. The sensor generates pulses that are the input sent to the powertrain control module (PCM). The PCM interprets the sensor input to determine the crankshaft position. The PCM then uses this position, along with other inputs, to determine injector sequence and ignition timing.

The sensor is a hall effect device combined with an internal magnet. It is also sensitive to steel within a certain distance from it.

On the 4.7L V–8 engine, a tonewheel is bolted to the engine crankshaft (Fig. 20). This tonewheel has sets of notches at its outer edge (Fig. 20).

The notches cause a pulse to be generated when they pass under the sensor. The pulses are the input to the PCM.

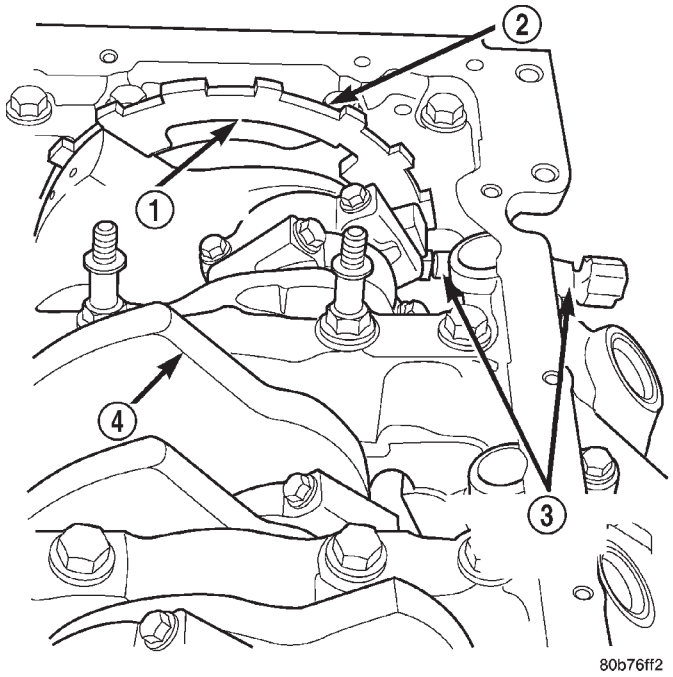


Fig. 20 CKP Sensor Operation and Tonewheel—4.7L V–8 Engine

1 - TONEWHEEL
2 - NOTCHES
3 - CRANKSHAFT POSITION SENSOR
4 - CRANKSHAFT

REMOVAL

REMOVAL - 4.0L

The Crankshaft Position (CKP) sensor is mounted to the transmission bellhousing at the left/rear side of the engine block (Fig. 21). The sensor **is adjustable** and is attached with one bolt. A wire shield/router is attached to the sensor (Fig. 21).

(1) Disconnect sensor pigtail harness (3–way connector) from main engine wiring harness.

(2) Remove sensor mounting bolt.

(3) Remove wire shield and sensor.

REMOVAL - 4.7L

The Crankshaft Position (CKP) sensor is bolted to the side of the engine cylinder block above the starter motor (Fig. 22). It is positioned into a machined hole at the side of the engine block.

(1) Remove starter motor. Refer to Starter Removal/Installation.

CRANKSHAFT POSITION SENSOR (Continued)

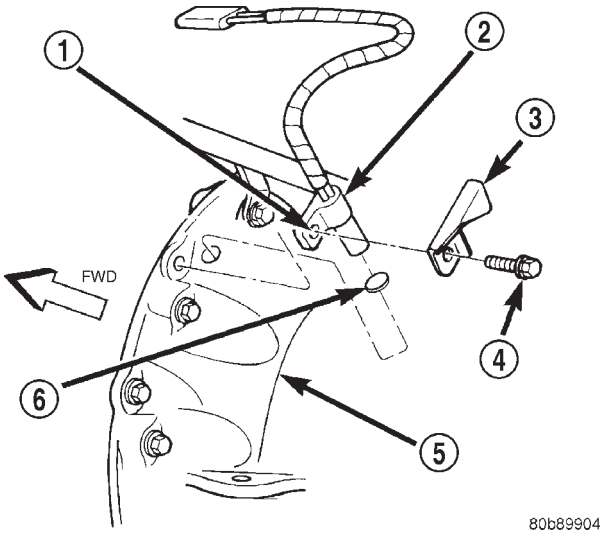


Fig. 21 CKP Sensor—4.0L 6-Cylinder Engine

1 - SLOTTED HOLE
2 - CRANKSHAFT POSITION SENSOR
3 - WIRE SHIELD
4 - MOUNTING BOLT
5 - TRANSMISSION HOUSING
6 - PAPER SPACER

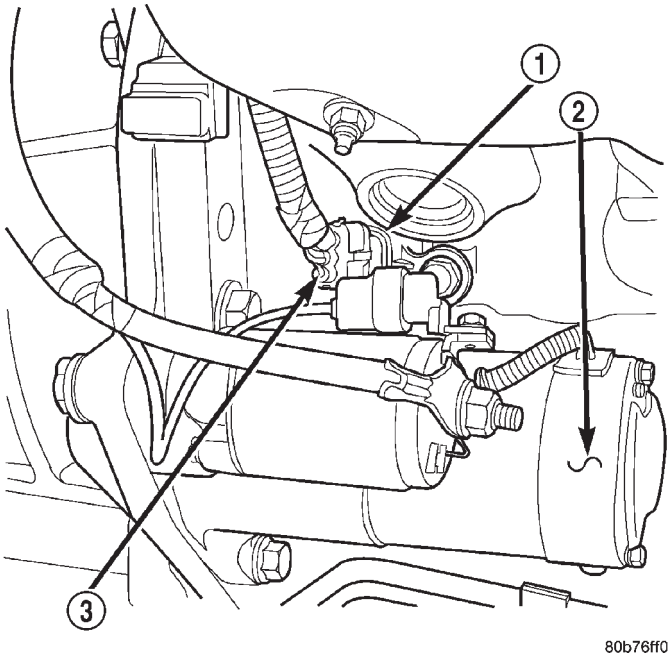


Fig. 22 CKP Sensor Location—4.7L V–8 Engine

1 - CRANKSHAFT POSITION SENSOR
2 - STARTER
3 - ELEC. CONNECTOR

(2) Disconnect CKP electrical connector at sensor (Fig. 22).
(3) Remove CKP mounting bolt (Fig. 23).
(4) Carefully twist sensor from cylinder block.

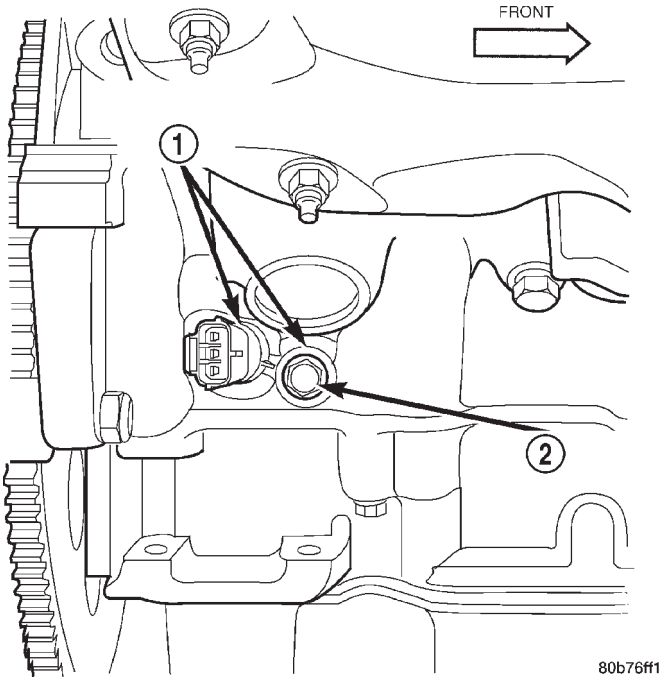


Fig. 23 CKP Sensor Removal/Installation—4.7L V–8 Engine

1 - CRANKSHAFT POSITION SENSOR
2 - MOUNTING BOLT

(5) Remove sensor from vehicle.
(6) Check condition of sensor o-ring.

INSTALLATION

INSTALLATION - 4.0L

The Crankshaft Position (CKP) sensor is mounted to the transmission bellhousing at the left/rear side of the engine block (Fig. 21). The sensor **is adjustable** and is attached with one bolt. A wire shield/router is attached to the sensor (Fig. 21).

New replacement sensors will be equipped with a paper spacer glued to bottom of sensor. If installing (returning) a **used** sensor to vehicle, a new paper spacer must be installed to bottom of sensor. This spacer will be ground off the first time engine is started. If spacer is not used, sensor will be broken the first time engine is started.

(1) New Sensors: Be sure paper spacer is installed to bottom of sensor. If not, obtain spacer PN05252229.
(2) Used Sensors: Clean bottom of sensor and install spacer PN05252229.
(3) Install sensor into transmission bellhousing hole.
(4) Position sensor wire shield to sensor (Fig. 21).

CRANKSHAFT POSITION SENSOR (Continued)

(5) Push sensor against flywheel/drive plate. With sensor pushed against flywheel/drive plate, tighten mounting bolt to 7 N·m (60 in. lbs.) torque.

(6) Route sensor wiring harness into wire shield.

(7) Connect sensor pigtail harness electrical connector to main wiring harness.

INSTALLATION - 4.7L

(1) Clean out machined hole in engine block.

(2) Apply a small amount of engine oil to sensor o-ring.

(3) Install sensor into engine block with a slight rocking action. Do not twist sensor into position as damage to o-ring may result.

CAUTION: Before tightening sensor mounting bolt, be sure sensor is completely flush to cylinder block. If sensor is not flush, damage to sensor mounting tang may result.

(4) Install mounting bolt and tighten to 28 N·m (21 ft. lbs.) torque.

(5) Connect electrical connector to sensor.

(6) Install starter motor. Refer to Starter Removal/ Installation.

FUEL INJECTOR

DESCRIPTION

A separate fuel injector (Fig. 24) is used for each individual cylinder.

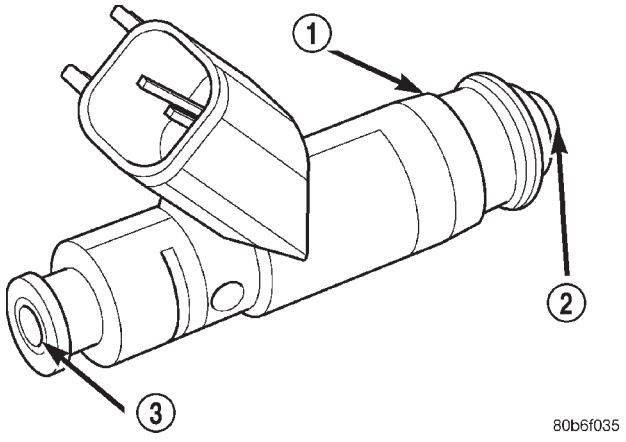


Fig. 24 Fuel Injector—4.0L/4.7L Engines

1 - FUEL INJECTOR
2 - NOZZLE
3 - TOP (FUEL ENTRY)

OPERATION

OPERATION

The fuel injectors are electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

The top (fuel entry) end of the injector (Fig. 24) is attached into an opening on the fuel rail.

The nozzle (outlet) ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector.

The injectors are electrically energized, individually and in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

OPERATION - PCM OUTPUT

The nozzle ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2 etc.). This is used to identify each fuel injector with its respective cylinder number.

The injectors are energized individually in a sequential order by the Powertrain Control Module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage (12 volts +) is supplied to the injectors through the ASD relay. The ASD relay will shutdown the 12 volt power source to the fuel injectors if the PCM senses the ignition is on, but the engine is not running. This occurs after the engine has not been running for approximately 1.8 seconds.

FUEL INJECTOR (Continued)

The PCM determines injector on-time (pulse width) based on various inputs.

DIAGNOSIS AND TESTING - FUEL INJECTOR

To perform a complete test of the fuel injectors and their circuitry, use the DRB scan tool and refer to the appropriate Powertrain Diagnostics Procedures manual. To test the injector only, refer to the following:

Disconnect the fuel injector wire harness connector from the injector. The injector is equipped with 2 electrical terminals (pins). Place an ohmmeter across the terminals. Resistance reading should be approximately 12 ohms ±1.2 ohms at 20°C (68°F).

REMOVAL

WARNING: THE FUEL SYSTEM IS UNDER CONSTANT PRESSURE EVEN WITH ENGINE OFF. BEFORE SERVICING FUEL INJECTOR(S), FUEL SYSTEM PRESSURE MUST BE RELEASED.

To remove one or more fuel injectors, the fuel rail assembly must be removed from engine.

(1) Perform Fuel System Pressure Release Procedure.

(2) Remove fuel injector rail. Refer to Fuel Injector Rail Removal/Installation.

(3) Remove clip(s) retaining injector(s) to fuel rail (Fig. 25).

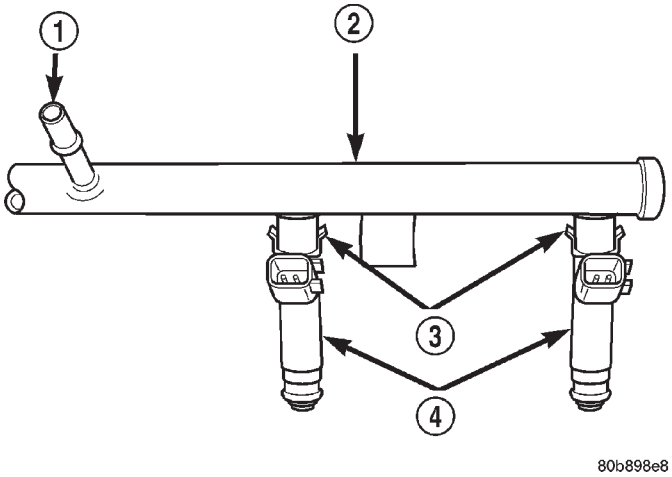


Fig. 25 Fuel Injector Mounting—Typical (4.7L V-8 Engine Shown)

1 - INLET FITTING
2 - FUEL INJECTOR RAIL
3 - CLIP
4 - FUEL INJECTOR

(4) Remove injector(s) from fuel rail.

INSTALLATION

(1) Apply a small amount of engine oil to each fuel injector o-ring. This will help in fuel rail installation.

(2) Install injector(s) and injector clip(s) to fuel rail.

(3) Install fuel rail assembly. Refer to Fuel Injector Rail Removal/Installation.

(4) Start engine and check for leaks.

FUEL PUMP RELAY

DESCRIPTION

The 5–pin, 12–volt, fuel pump relay is located in the Power Distribution Center (PDC). Refer to the label on the PDC cover for relay location.

OPERATION

The Powertrain Control Module (PCM) energizes the electric fuel pump through the fuel pump relay. The fuel pump relay is energized by first applying battery voltage to it when the ignition key is turned ON, and then applying a ground signal to the relay from the PCM.

Whenever the ignition key is turned ON, the electric fuel pump will operate. But, the PCM will shutdown the ground circuit to the fuel pump relay in approximately 1–3 seconds unless the engine is operating or the starter motor is engaged.

IDLE AIR CONTROL MOTOR

DESCRIPTION

The IAC stepper motor is mounted to the throttle body, and regulates the amount of air bypassing the control of the throttle plate. As engine loads and ambient temperatures change, engine rpm changes. A pintle on the IAC stepper motor protrudes into a passage in the throttle body, controlling air flow through the passage. The IAC is controlled by the Powertrain Control Module (PCM) to maintain the target engine idle speed.

OPERATION

At idle, engine speed can be increased by retracting the IAC motor pintle and allowing more air to pass through the port, or it can be decreased by restricting the passage with the pintle and diminishing the amount of air bypassing the throttle plate.

The IAC is called a stepper motor because it is moved (rotated) in steps, or increments. Opening the IAC opens an air passage around the throttle blade which increases RPM.

IDLE AIR CONTROL MOTOR (Continued)

The PCM uses the IAC motor to control idle speed (along with timing) and to reach a desired MAP during decel (keep engine from stalling).

The IAC motor has 4 wires with 4 circuits. Two of the wires are for 12 volts and ground to supply electrical current to the motor windings to operate the stepper motor in one direction. The other 2 wires are also for 12 volts and ground to supply electrical current to operate the stepper motor in the opposite direction.

To make the IAC go in the opposite direction, the PCM just reverses polarity on both windings. If only 1 wire is open, the IAC can only be moved 1 step (increment) in either direction. To keep the IAC motor in position when no movement is needed, the PCM will energize both windings at the same time. This locks the IAC motor in place.

In the IAC motor system, the PCM will count every step that the motor is moved. This allows the PCM to determine the motor pintle position. If the memory is cleared, the PCM no longer knows the position of the pintle. So at the first key ON, the PCM drives the IAC motor closed, regardless of where it was before. This zeros the counter. From this point the PCM will back out the IAC motor and keep track of its position again.

When engine rpm is above idle speed, the IAC is used for the following:

- Off-idle dashpot (throttle blade will close quickly but idle speed will not stop quickly)
- Deceleration air flow control
- A/C compressor load control (also opens the passage slightly before the compressor is engaged so that the engine rpm does not dip down when the compressor engages)
- Power steering load control

The PCM can control polarity of the circuit to control direction of the stepper motor.

IAC Stepper Motor Program: The PCM is also equipped with a memory program that records the number of steps the IAC stepper motor most recently advanced to during a certain set of parameters. For example: The PCM was attempting to maintain a 1000 rpm target during a cold start-up cycle. The last recorded number of steps for that may have been 125. That value would be recorded in the memory cell so that the next time the PCM recognizes the identical conditions, the PCM recalls that 125 steps were required to maintain the target. This program allows for greater customer satisfaction due to greater control of engine idle.

Another function of the memory program, which occurs when the power steering switch (if equipped), or the A/C request circuit, requires that the IAC stepper motor control engine rpm, is the recording of the last targeted steps into the memory cell. The PCM can anticipate A/C compressor loads. This is accomplished by delaying compressor operation for approximately 0.5 seconds until the PCM moves the IAC stepper motor to the recorded steps that were loaded into the memory cell. Using this program helps eliminate idle-quality changes as loads change. Finally, the PCM incorporates a ″No-Load″ engine speed limiter of approximately 1800 - 2000 rpm, when it recognizes that the TPS is indicating an idle signal and IAC motor cannot maintain engine idle.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the IAC motor through the PCM.

REMOVAL

REMOVAL - 4.0L

The IAC motor is located on the throttle body.

(1) Remove air duct and air resonator box at throttle body.

(2) Disconnect electrical connector from IAC motor (Fig. 40).

(3) Remove two mounting bolts (screws) (Fig. 26).

(4) Remove IAC motor from throttle body.

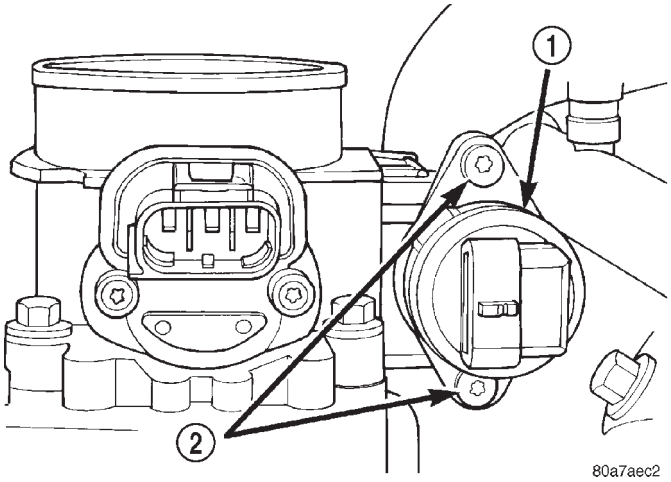


Fig. 26 Mounting Bolts (Screws)—IAC

1 - IDLE AIR CONTROL MOTOR
2 - MOUNTING SCREWS

REMOVAL - 4.7L

(1) Remove air duct and air resonator box at throttle body.

(2) Disconnect electrical connector from IAC motor (Fig. 36).

(3) Remove two mounting bolts (screws) (Fig. 42).

(4) Remove IAC motor from throttle body.

IDLE AIR CONTROL MOTOR (Continued)

INSTALLATION

INSTALLATION - 4.0L

The IAC motor is located on the throttle body.

(1) Install IAC motor to throttle body.

(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.

(3) Install electrical connector.

(4) Install air cleaner duct/air box to throttle body.

INSTALLATION - 4.7L

(1) Install IAC motor to throttle body.

(2) Install and tighten two mounting bolts (screws) to 7 N·m (60 in. lbs.) torque.

(3) Install electrical connector.

(4) Install air duct/air box to throttle body.

INTAKE AIR TEMPERATURE SENSOR

DESCRIPTION

The 2–wire Intake Manifold Air Temperature (IAT) sensor is installed in the intake manifold with the sensor element extending into the air stream.

The IAT sensor is a two-wire Negative Thermal Coefficient (NTC) sensor. Meaning, as intake manifold temperature increases, resistance (voltage) in the sensor decreases. As temperature decreases, resistance (voltage) in the sensor increases.

OPERATION

The IAT sensor provides an input voltage to the Powertrain Control Module (PCM) indicating the density of the air entering the intake manifold based upon intake manifold temperature. At key-on, a 5–volt power circuit is supplied to the sensor from the PCM. The sensor is grounded at the PCM through a low-noise, sensor-return circuit.

The PCM uses this input to calculate the following:

- Injector pulse-width
- Adjustment of spark timing (to help prevent spark knock with high intake manifold air-charge temperatures)

The resistance values of the IAT sensor is the same as for the Engine Coolant Temperature (ECT) sensor.

REMOVAL

REMOVAL - 4.0L

The Intake Manifold Air Temperature (IAT) sensor is installed into the intake manifold plenum near the front of the throttle body (Fig. 27).

(1) Disconnect electrical connector from sensor.

(2) Remove sensor from intake manifold.

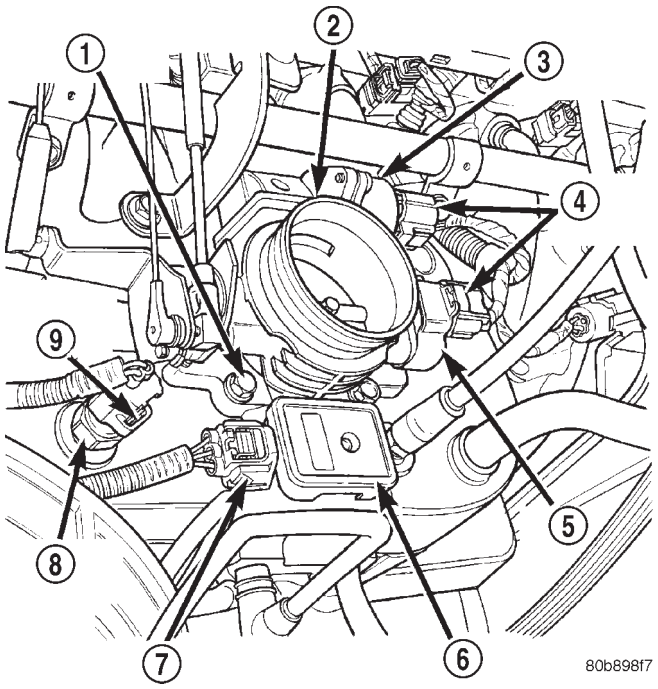


Fig. 27 Intake Manifold Air Sensor Location—4.0L Engine

1 - MOUNTING BOLTS (4)
2 - THROTTLE BODY
3 - IAC MOTOR
4 - ELEC. CONN.
5 - TPS
6 - MAP SENSOR
7 - ELEC. CONN.
8 - IAT SENSOR
9 - ELEC. CONN.

REMOVAL - 4.7L

The Intake Manifold Air Temperature (IAT) sensor is located on the left side of the intake manifold.

Threaded Type Sensor

(1) Disconnect electrical connector from sensor.

(2) Remove sensor from intake manifold (Fig. 28).

Snap-In Type Sensor

(1) Disconnect electrical connector from IAT sensor.

(2) Clean dirt from intake manifold at sensor base.

(3) Gently lift on small plastic release tab (Fig. 30) or (Fig. 29) and rotate sensor about 1/4 turn counterclockwise for removal.

(4) Check condition of sensor o-ring.

INTAKE AIR TEMPERATURE SENSOR (Continued)

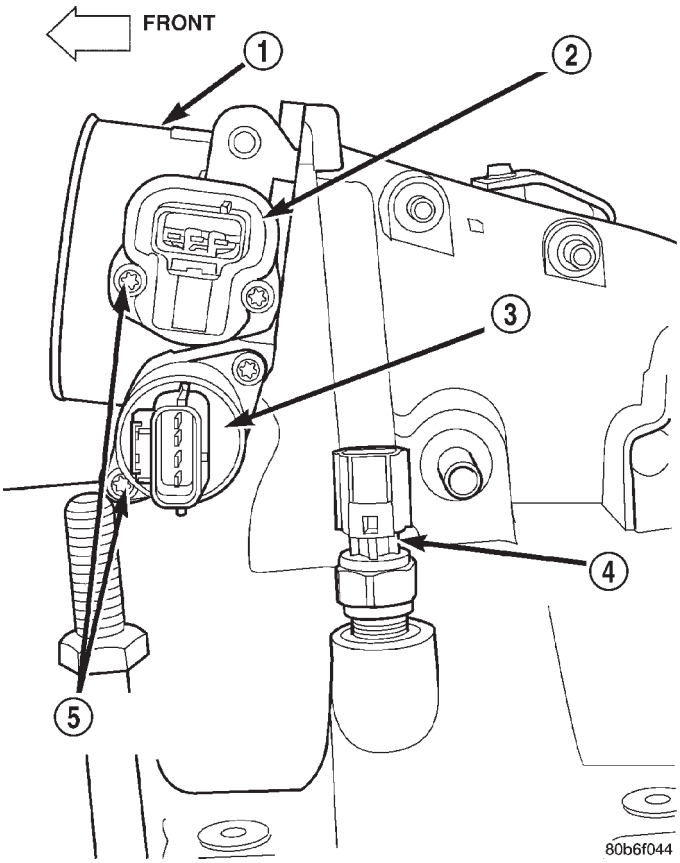


Fig. 28 IAT - 4.7L (THREADED TYPE)

1 - THROTTLE BODY
2 - TPS
3 - IAC MOTOR
4 - IAT SENSOR (THREADED TYPE)
5 - MOUNTING SCREWS

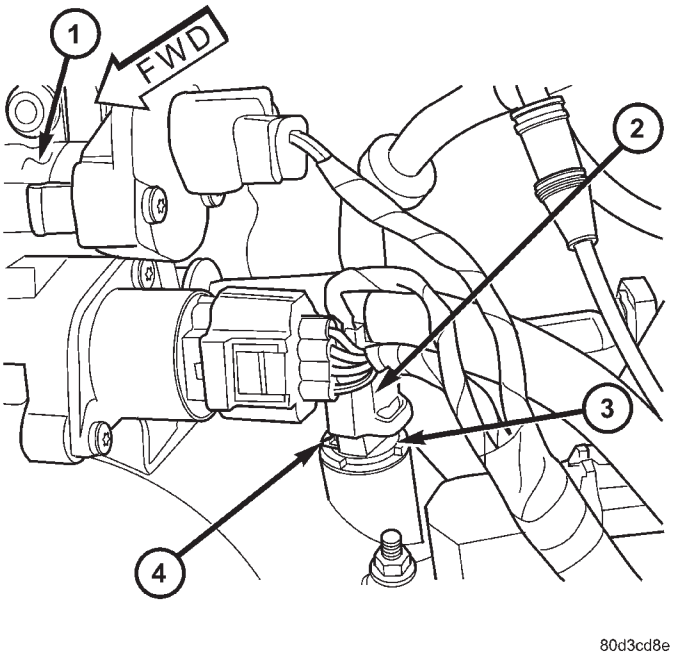


Fig. 29 IAT SENSOR - 4.7L (SNAP-IN TYPE)

1 - LEFT SIDE OF THROTTLE BODY
2 - ELEC. CONNECT.
3 - IAT SENSOR
4 - RELEASE TAB

INSTALLATION

INSTALLATION - 4.0L

The Intake Manifold Air Temperature (IAT) sensor is installed into the intake manifold plenum near the front of the throttle body (Fig. 27).

(1) Install sensor into intake manifold. Tighten sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect electrical connector to sensor.

INSTALLATION - 4.7L

Threaded Type Sensor

(1) Install sensor (Fig. 28) into intake manifold. Tighten sensor to 28 N·m (20 ft. lbs.) torque.

(2) Connect electrical connector to sensor.

Snap-In Type Sensor

(1) Check condition of sensor o-ring (Fig. 30).

(2) Clean sensor mounting hole in intake manifold.

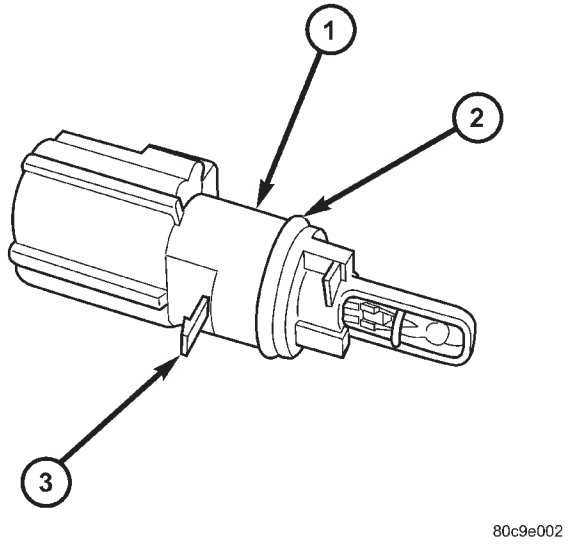


Fig. 30 IAT SENSOR TAB / O-RING - 4.7L (SNAP-IN TYPE)

1 - IAT SENSOR
2 - SENSOR O-RING
3 - RELEASE TAB

(3) Position sensor (Fig. 29) into intake manifold and rotate clockwise until past release tab.

(4) Install electrical connector.

MAP SENSOR

DESCRIPTION

DESCRIPTION

On the 4.0L six-cylinder engine the MAP sensor is mounted to the engine throttle body. On the 4.7L V-8 engine the MAP sensor is mounted to front of the intake manifold.

DESCRIPTION - 4.7L

The MAP sensor is located on the front of the intake manifold. An o-ring seals the sensor to the intake manifold.

OPERATION

The MAP sensor is used as an input to the Powertrain Control Module (PCM). It contains a silicon based sensing unit to provide data on the manifold vacuum that draws the air/fuel mixture into the combustion chamber. The PCM requires this information to determine injector pulse width and spark advance. When manifold absolute pressure (MAP) equals Barometric pressure, the pulse width will be at maximum.

A 5 volt reference is supplied from the PCM and returns a voltage signal to the PCM that reflects manifold pressure. The zero pressure reading is 0.5V and full scale is 4.5V. For a pressure swing of 0–15 psi, the voltage changes 4.0V. To operate the sensor, it is supplied a regulated 4.8 to 5.1 volts. Ground is provided through the low-noise, sensor return circuit at the PCM.

The MAP sensor input is the number one contributor to fuel injector pulse width. The most important function of the MAP sensor is to determine barometric pressure. The PCM needs to know if the vehicle is at sea level or at a higher altitude, because the air density changes with altitude. It will also help to correct for varying barometric pressure. Barometric pressure and altitude have a direct inverse correlation; as altitude goes up, barometric goes down. At key-on, the PCM powers up and looks at MAP voltage, and based upon the voltage it sees, it knows the current barometric pressure (relative to altitude). Once the engine starts, the PCM looks at the voltage again, continuously every 12 milliseconds, and compares the current voltage to what it was at key-on. The difference between current voltage and what it was at key-on, is manifold vacuum.

During key-on (engine not running) the sensor reads (updates) barometric pressure. A normal range can be obtained by monitoring a known good sensor.

As the altitude increases, the air becomes thinner (less oxygen). If a vehicle is started and driven to a very different altitude than where it was at key-on, the barometric pressure needs to be updated. Any time the PCM sees Wide Open Throttle (WOT), based upon Throttle Position Sensor (TPS) angle and RPM, it will update barometric pressure in the MAP memory cell. With periodic updates, the PCM can make its calculations more effectively.

The PCM uses the MAP sensor input to aid in calculating the following:

- Manifold pressure
- Barometric pressure
- Engine load
- Injector pulse-width
- Spark-advance programs
- Shift-point strategies (certain automatic transmissions only)
- Idle speed
- Decel fuel shutoff

The MAP sensor signal is provided from a single piezoresistive element located in the center of a diaphragm. The element and diaphragm are both made of silicone. As manifold pressure changes, the diaphragm moves causing the element to deflect, which stresses the silicone. When silicone is exposed to stress, its resistance changes. As manifold vacuum increases, the MAP sensor input voltage decreases proportionally. The sensor also contains electronics that condition the signal and provide temperature compensation.

The PCM recognizes a decrease in manifold pressure by monitoring a decrease in voltage from the reading stored in the barometric pressure memory cell. The MAP sensor is a linear sensor; meaning as pressure changes, voltage changes proportionately. The range of voltage output from the sensor is usually between 4.6 volts at sea level to as low as 0.3 volts at 26 in. of Hg. Barometric pressure is the pressure exerted by the atmosphere upon an object. At sea level on a standard day, no storm, barometric pressure is approximately 29.92 in Hg. For every 100 feet of altitude, barometric pressure drops .10 in. Hg. If a storm goes through it can change barometric pressure from what should be present for that altitude. You should know what the average pressure and corresponding barometric pressure is for your area.

REMOVAL

REMOVAL - 4.0L

The MAP sensor is mounted to the side of the throttle body (Fig. 40). An L-shaped rubber fitting is used to connect the MAP sensor to throttle body (Fig. 31).

(1) Remove air cleaner duct and air resonator box at throttle body.

MAP SENSOR (Continued)

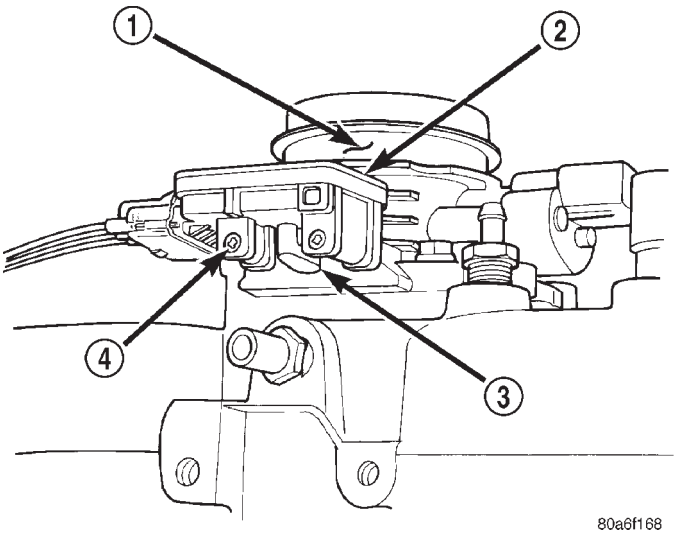


Fig. 31 Rubber L-Shaped Fitting—MAP Sensor-to-Throttle Body—4.0L Engine

1 - THROTTLE BODY
2 - MAP SENSOR
3 - RUBBER FITTING
4 - MOUNTING SCREWS (2)

(2) Remove two MAP sensor mounting bolts (screws) (Fig. 31).

(3) While removing MAP sensor, slide the rubber L-shaped fitting (Fig. 31) from the throttle body.

(4) Remove rubber L-shaped fitting from MAP sensor.

REMOVAL - 4.7L

The MAP sensor is located on the front of the intake manifold (Fig. 32). An o-ring seals the sensor to the intake manifold.

(1) Disconnect electrical connector at sensor.

(2) Clean area around MAP sensor.

(3) Remove 2 sensor mounting bolts (Fig. 32).

(4) Remove MAP sensor from intake manifold.

INSTALLATION

INSTALLATION - 4.0L

The MAP sensor is mounted to the side of the throttle body (Fig. 40). An L-shaped rubber fitting is used to connect the MAP sensor to throttle body (Fig. 31).

(1) Install rubber L-shaped fitting to MAP sensor.

(2) Position sensor to throttle body while guiding rubber fitting over throttle body vacuum nipple.

(3) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.

(4) Install air cleanerduct/air box.

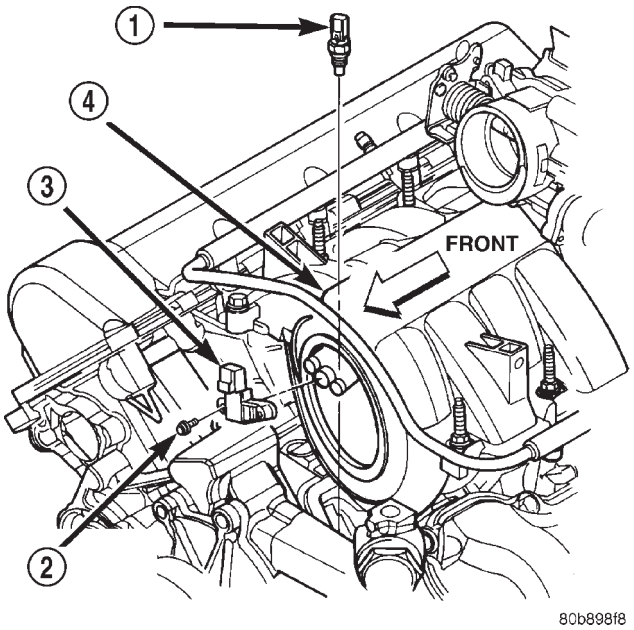


Fig. 32 MAP and ECT Sensor Locations—4.7L V–8 Engine

1 - ECT SENSOR
2 - MOUNTING BOLTS (2)
3 - MAP SENSOR
4 - INTAKE MANIFOLD

INSTALLATION - 4.7L

The MAP sensor is located on the front of the intake manifold (Fig. 32). An o-ring seals the sensor to the intake manifold.

(1) Clean MAP sensor mounting hole at intake manifold.

(2) Check MAP sensor o-ring seal for cuts or tears.

(3) Position sensor into manifold.

(4) Install MAP sensor mounting bolts (screws). Tighten screws to 3 N·m (25 in. lbs.) torque.

(5) Connect electrical connector.

O2S HEATER RELAY

DESCRIPTION

The 2 oxygen (O2) sensor heater relays (upstream and downstream) are located in the Powertrain Distribution Center (PDC).

OPERATION

Engines equipped with the California (NAE) Emissions Package use **four O2 sensors.**

Two of the four sensor heater elements (upstream sensors 1/1 and 2/1) are controlled by the upstream heater relay through output signals from the Powertrain Control Module (PCM).

O2S HEATER RELAY (Continued)

The other two heater elements (downstream sensors 1/2 and 2/2) are controlled by the downstream heater relay through output signals from the PCM.

To avoid a large simultaneous current surge, power is delayed to the 2 downstream heater elements by the PCM for approximately 2 seconds.

REMOVAL

(1) Remove PDC cover.
(2) Remove relay from PDC.
(3) Check condition of relay terminals and PDC connector terminals for damage or corrosion. Repair if necessary before installing relay.
(4) Check for pin height (pin height should be the same for all terminals within the PDC connector). Repair if necessary before installing relay.

INSTALLATION

(1) Install relay to PDC.
(2) Install cover to PDC.

O2S SENSOR

DESCRIPTION

The Oxygen Sensors (O2S) are attached to, and protrude into the vehicle exhaust system. Depending on the emission package, the vehicle may use a total of either 2 or 4 sensors.

Federal Emissions Package: Two sensors are used: upstream (referred to as 1/1) and downstream (referred to as 1/2). With this emission package, the upstream sensor (1/1) is located just before the main catalytic convertor. The downstream sensor (1/2) is located just after the main catalytic convertor.

4.7L V-8 With California Emissions Package: On this emissions package, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2). With this emission package, the right upstream sensor (2/1) is located in the right exhaust downpipe just before the mini-catalytic convertor. The left upstream sensor (1/1) is located in the left exhaust downpipe just before the mini-catalytic convertor. The right downstream sensor (2/2) is located in the right exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor. The left downstream sensor (1/2) is located in the left exhaust downpipe just after the mini-catalytic convertor, and before the main catalytic convertor.

4.0L 6–Cylinder With California Emissions Package: On this emissions package, 4 sensors are used: 2 upstream (referred to as 1/1 and 2/1) and 2 downstream (referred to as 1/2 and 2/2). With this emission package, the rear/upper upstream sensor (2/1) is located in the exhaust downpipe just before the rear mini-catalytic convertor. The front/upper upstream sensor (1/1) is located in the exhaust downpipe just before the front mini-catalytic convertor. The rear/lower downstream sensor (2/2) is located in the exhaust downpipe just after the rear mini-catalytic convertor, and before the main catalytic convertor. The front/lower downstream sensor (1/2) is located in the exhaust downpipe just after the front mini-catalytic convertor, and before the main catalytic convertor.

OPERATION

An O2 sensor is a galvanic battery that provides the PCM with a voltage signal (0-1 volt) inversely proportional to the amount of oxygen in the exhaust. In other words, if the oxygen content is low, the voltage output is high; if the oxygen content is high the output voltage is low. The PCM uses this information to adjust injector pulse-width to achieve the 14.7–to–1 air/fuel ratio necessary for proper engine operation and to control emissions.

The O2 sensor must have a source of oxygen from outside of the exhaust stream for comparison. Current O2 sensors receive their fresh oxygen (outside air) supply through the O2 sensor case housing.

Four wires (circuits) are used on each O2 sensor: a 12–volt feed circuit for the sensor heating element; a ground circuit for the heater element; a low-noise sensor return circuit to the PCM, and an input circuit from the sensor back to the PCM to detect sensor operation.

Oxygen Sensor Heaters/Heater Relays: Depending on the emissions package, the heating elements within the sensors will be supplied voltage from either the ASD relay, or 2 separate oxygen sensor relays. Refer to Wiring Diagrams to determine which relays are used.

The O2 sensor uses a Positive Thermal Co-efficient (PTC) heater element. As temperature increases, resistance increases. At ambient temperatures around 70°F, the resistance of the heating element is approximately 4.5 ohms on 4.0L engines. It is approximately 13.5 ohms on the 4.7L engine. As the sensor's temperature increases, resistance in the heater element increases. This allows the heater to maintain the optimum operating temperature of approximately 930°-1100°F (500°-600° C). Although the sensors operate the same, there are physical differences, due to the environment that they operate in, that keep them from being interchangeable.

Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation sooner. Also, it allows the system to remain in closed loop operation during periods of extended idle.

O2S SENSOR (Continued)

In Closed Loop operation, the PCM monitors certain O2 sensor input(s) along with other inputs, and adjusts the injector pulse width accordingly. During Open Loop operation, the PCM ignores the O2 sensor input. The PCM adjusts injector pulse width based on preprogrammed (fixed) values and inputs from other sensors.

Upstream Sensor (Non-California Emissions): The upstream sensor (1/1) provides an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensor. The PCM will change the air/fuel ratio until the upstream sensor inputs a voltage that the PCM has determined will make the downstream sensor output (oxygen content) correct.

The upstream oxygen sensor also provides an input to determine catalytic convertor efficiency.

Downstream Sensor (Non-California Emissions): The downstream oxygen sensor (1/2) is also used to determine the correct air-fuel ratio. As the oxygen content changes at the downstream sensor, the PCM calculates how much air-fuel ratio change is required. The PCM then looks at the upstream oxygen sensor voltage and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensor also provides an input to determine catalytic convertor efficiency.

Upstream Sensors (California Engines): Two upstream sensors are used (1/1 and 2/1). The 1/1 sensor is the first sensor to receive exhaust gases from the #1 cylinder. They provide an input voltage to the PCM. The input tells the PCM the oxygen content of the exhaust gas. The PCM uses this information to fine tune fuel delivery to maintain the correct oxygen content at the downstream oxygen sensors. The PCM will change the air/fuel ratio until the upstream sensors input a voltage that the PCM has determined will make the downstream sensors output (oxygen content) correct.

The upstream oxygen sensors also provide an input to determine mini-catalyst efficiency. Main catalytic convertor efficiency is not calculated with this package.

Downstream Sensors (California Engines): Two downstream sensors are used (1/2 and 2/2). The downstream sensors are used to determine the correct air-fuel ratio. As the oxygen content changes at the downstream sensor, the PCM calculates how much air-fuel ratio change is required. The PCM then looks at the upstream oxygen sensor voltage, and changes fuel delivery until the upstream sensor voltage changes enough to correct the downstream sensor voltage (oxygen content).

The downstream oxygen sensors also provide an input to determine mini-catalyst efficiency. Main catalytic convertor efficiency is not calculated with this package.

Engines equipped with either a downstream sensor(s), or a post-catalytic sensor, will monitor catalytic convertor efficiency. If efficiency is below emission standards, the Malfunction Indicator Lamp (MIL) will be illuminated and a Diagnostic Trouble Code (DTC) will be set. Refer to Monitored Systems in Emission Control Systems for additional information.

REMOVAL

Never apply any type of grease to the oxygen sensor electrical connector, or attempt any soldering of the sensor wiring harness.

Oxygen sensor (O2S) locations are shown in (Fig. 33) and (Fig. 34).

WARNING: THE EXHAUST MANIFOLD, EXHAUST PIPES AND CATALYTIC CONVERTER(S) BECOME VERY HOT DURING ENGINE OPERATION. ALLOW ENGINE TO COOL BEFORE REMOVING OXYGEN SENSOR.

(1) Raise and support vehicle.

(2) Disconnect O2S pigtail harness from main wiring harness.

(3) If equipped, disconnect sensor wire harness mounting clips from engine or body.

CAUTION: When disconnecting sensor electrical connector, do not pull directly on wire going into sensor.

(4) Remove O2S sensor with an oxygen sensor removal and installation tool.

INSTALLATION

Threads of new oxygen sensors are factory coated with anti-seize compound to aid in removal. **DO NOT add any additional anti-seize compound to threads of a new oxygen sensor.**

(1) Install O2S sensor. Tighten to 30 N·m (22 ft. lbs.) torque.

(2) Connect O2S sensor wire connector to main wiring harness.

(3) If equipped, connect sensor wire harness mounting clips to engine or body. **When Equipped: The O2S pigtail harness must be clipped and/or bolted back to their original positions on engine or body to prevent mechanical damage to wiring.**.

(4) Lower vehicle.

O2S SENSOR (Continued)

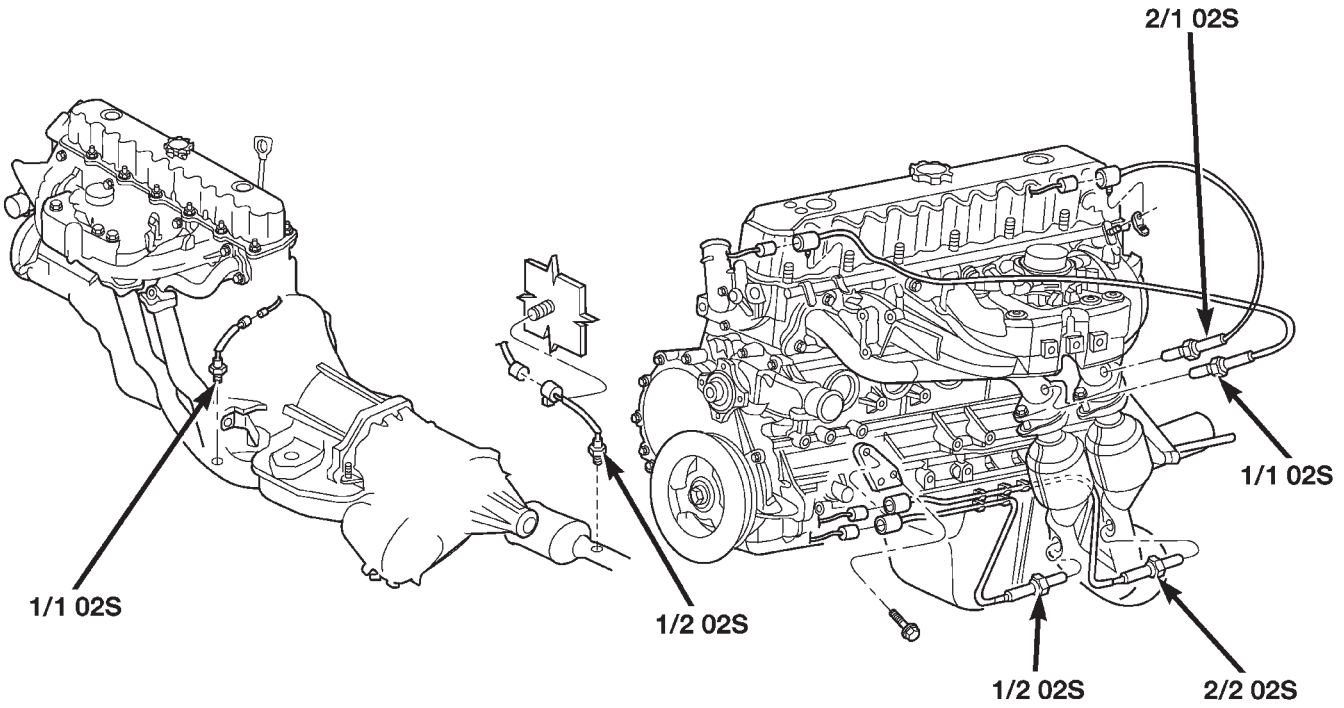


Fig. 33 Oxygen Sensor Locations—4.0L Engine

THROTTLE BODY

DESCRIPTION

The throttle body is located on the intake manifold. Fuel does not enter the intake manifold through the throttle body. Fuel is sprayed into the manifold by the fuel injectors.

OPERATION

Filtered air from the air cleaner enters the intake manifold through the throttle body. The throttle body contains an air control passage controlled by an Idle Air Control (IAC) motor. The air control passage is used to supply air for idle conditions. A throttle valve (plate) is used to supply air for above idle conditions.

Certain sensors are attached to the throttle body. The accelerator pedal cable, speed control cable and transmission control cable (when equipped) are connected to the throttle body linkage arm.

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the PCM.

REMOVAL

REMOVAL - 4.0L

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

(1) Remove air cleaner duct and air resonator box at throttle body.

(2) Disconnect throttle body electrical connectors at MAP sensor, IAC motor and TPS (Fig. 35).

THROTTLE BODY (Continued)

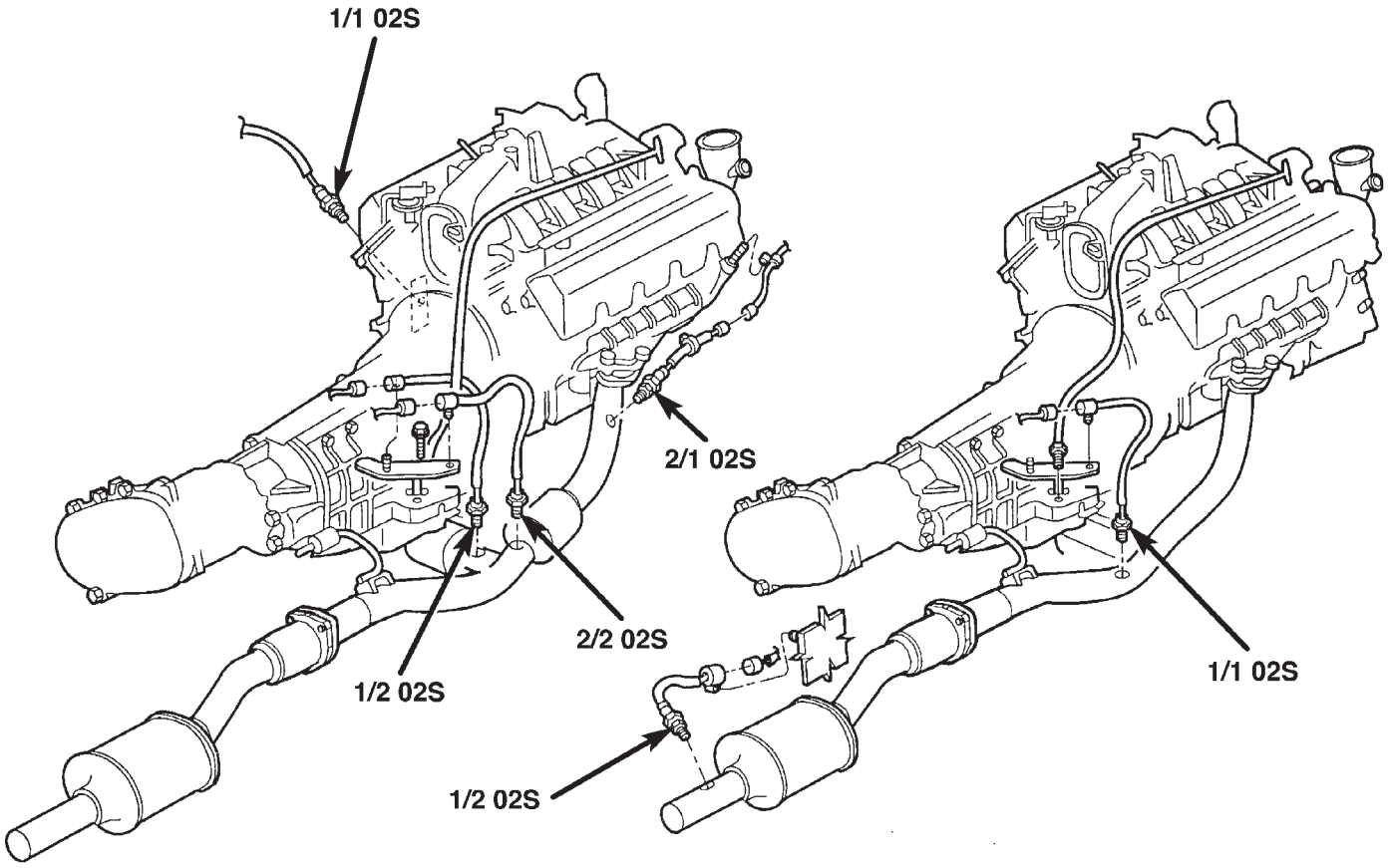


Fig. 34 Oxygen Sensor Locations—4.7L V-8 Engine

(3) Remove all control cables from throttle body (lever) arm. Refer to Accelerator Pedal and Throttle Cable.

(4) Remove four throttle body mounting bolts.

(5) Remove throttle body from intake manifold.

(6) Discard old throttle body-to-intake manifold gasket.

REMOVAL - 4.7L

(1) Remove the air duct and air resonator box at throttle body.

(2) Disconnect throttle body electrical connectors at IAC motor and TPS (Fig. 36).

(3) Remove vacuum line at throttle body.

(4) Remove all control cables from throttle body (lever) arm. Refer to Accelerator Pedal and Throttle Cable.

(5) Remove three throttle body mounting bolts (Fig. 36).

(6) Remove throttle body from intake manifold.

INSTALLATION

INSTALLATION - 4.0L

A (factory adjusted) set screw is used to mechanically limit the position of the throttle body throttle plate. **Never attempt to adjust the engine idle speed using this screw.** All idle speed functions are controlled by the Powertrain Control Module (PCM).

(1) Clean the mating surfaces of the throttle body and the intake manifold.

(2) Install new throttle body-to-intake manifold gasket.

(3) Install throttle body to intake manifold.

(4) Install four mounting bolts. Tighten bolts to 11 N·m (100 in. lbs.) torque.

(5) Install control cables.

(6) Install electrical connectors.

(7) Install air duct and air box at throttle body.

THROTTLE BODY (Continued)

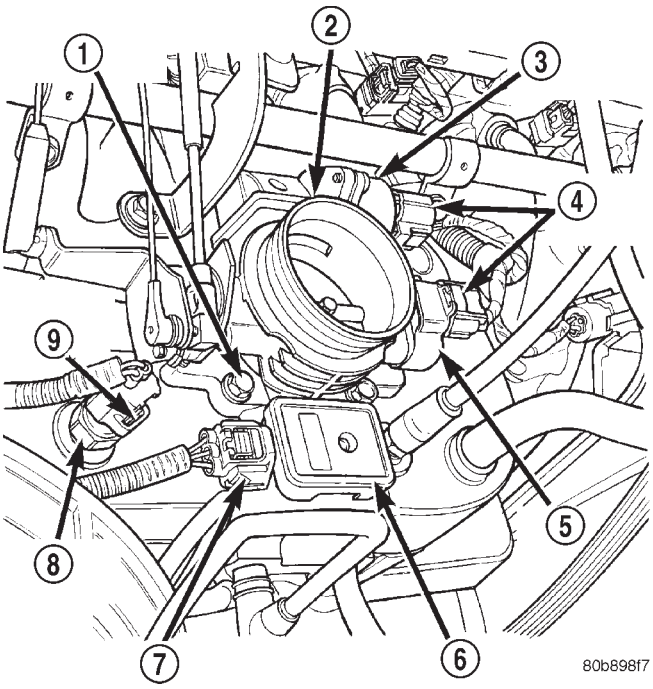


Fig. 35 Throttle Body and Sensor Locations—4.0L Engine

1 - MOUNTING BOLTS (4)
2 - THROTTLE BODY
3 - IAC MOTOR
4 - ELEC. CONN.
5 - TPS
6 - MAP SENSOR
7 - ELEC. CONN.
8 - IAT SENSOR
9 - ELEC. CONN.

INSTALLATION - 4.7L

(1) Clean throttle body-to-intake manifold o-ring.
(2) Clean mating surfaces of throttle body and intake manifold.
(3) Install throttle body to intake manifold by positioning throttle body to manifold alignment pins.
(4) Install three mounting bolts. Tighten bolts to 12 N·m (105 in. lbs.) torque.
(5) Install control cables.
(6) Install vacuum line to throttle body.
(7) Install electrical connectors.
(8) Install air duct/air box at throttle body.

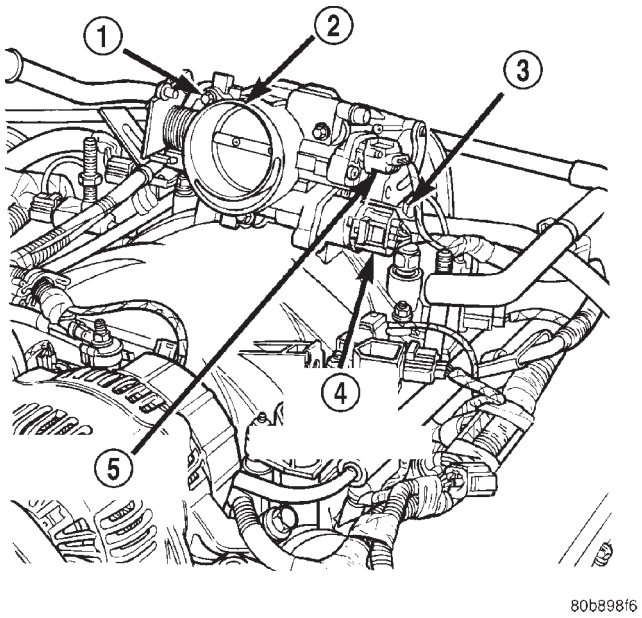


Fig. 36 Throttle Body, Sensors and Electrical Connectors—4.7L V-8 Engine

1 - MOUNTING BOLTS (3)
2 - THROTTLE BODY
3 - IAT SENSOR CONNECTOR
4 - IAC MOTOR CONNECTOR
5 - TPS CONNECTOR

THROTTLE CONTROL CABLE

REMOVAL

REMOVAL - 4.0L

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing accelerator pedal or throttle cable.

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of pedal arm (Fig. 16). Plastic cable retainer (clip) snaps into pedal arm.
(2) Remove cable core wire at pedal arm.
(3) From inside vehicle, remove clip holding cable to dashpanel (Fig. 16).
(4) Remove cable housing from dash panel and pull into engine compartment.
(5) Remove (unsnap) cable from routing clips on engine valve cover.
(6) Remove cable connector at throttle body bellcrank ball by unsnapping rearward (Fig. 37).
(7) Remove throttle cable from bracket by compressing release tabs (Fig. 37) and pushing cable through hole in bracket.
(8) Remove throttle cable from vehicle.

THROTTLE CONTROL CABLE (Continued)

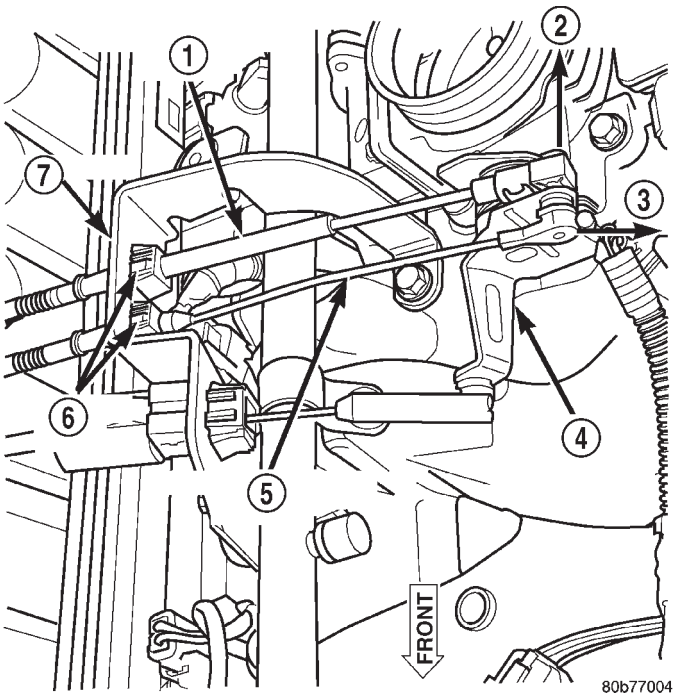


Fig. 37 Throttle (Accelerator) Cable at Throttle Body—4.0L Engine

1 - ACCELERATOR CABLE
2 - OFF
3 - OFF
4 - THROTTLE BODY BELLCRANK
5 - SPEED CONTROL CABLE
6 - RELEASE TABS
7 - BRACKET

REMOVAL - 4.7L

CAUTION: Be careful not to damage or kink the cable core wire (within the cable sheathing) while servicing accelerator pedal or throttle cable.

(1) From inside vehicle, hold up accelerator pedal. Remove plastic cable retainer (clip) and throttle cable core wire from upper end of pedal arm (Fig. 16). Plastic cable retainer (clip) snaps into pedal arm.

(2) Remove cable core wire at pedal arm.

(3) From inside vehicle, remove clip holding cable to dashpanel (Fig. 16).

(4) Remove air box at throttle body.

(5) Unsnap cable from plenum routing clip.

(6) Remove cable housing from dash panel and pull into engine compartment.

(7) Using finger pressure only, disconnect accelerator cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 38). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

(8) Lift accelerator cable from top of cable cam (Fig. 38).

(9) Press tab (Fig. 39) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (Fig. 39) towards passenger side of vehicle to remove cable from bracket.

(10) Remove throttle cable from vehicle.

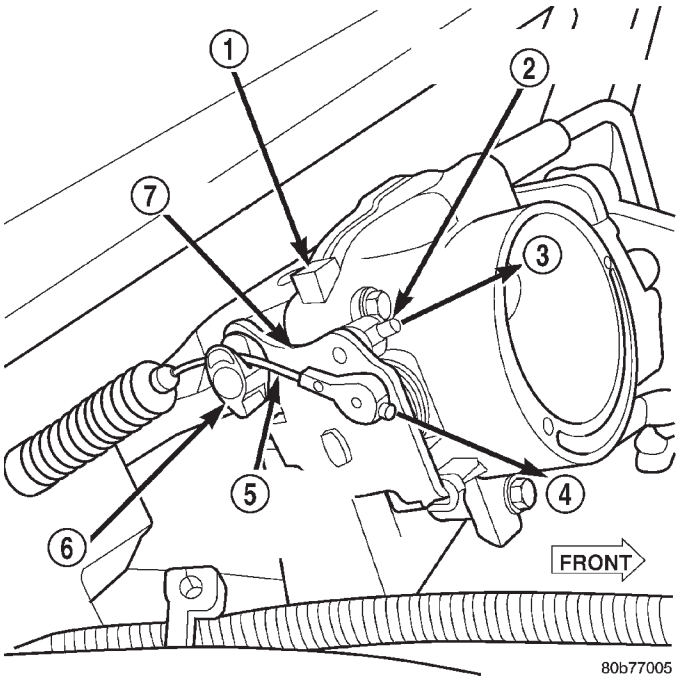


Fig. 38 Accelerator Cable at Bell Crank—4.7L V-8 Engine

1 - THROTTLE BODY
2 - SPEED CONTROL CABLE CONNECTOR
3 - OFF
4 - OFF
5 - ACCELERATOR CABLE CONNECTOR
6 - CABLE CAM
7 - BELLCRANK

INSTALLATION

INSTALLATION – 4.0L

(1) Slide throttle cable through hole in bracket until release tabs lock into bracket.

(2) Connect cable ball end to throttle body bellcrank ball (snaps on).

(3) Snap cable into routing clips on engine valve cover.

(4) Slide rubber grommet away from plastic cable housing.

(5) Install rubber grommet into dash panel until seated.

(6) Push cable housing into rubber grommet and through opening in dash panel.

THROTTLE CONTROL CABLE (Continued)

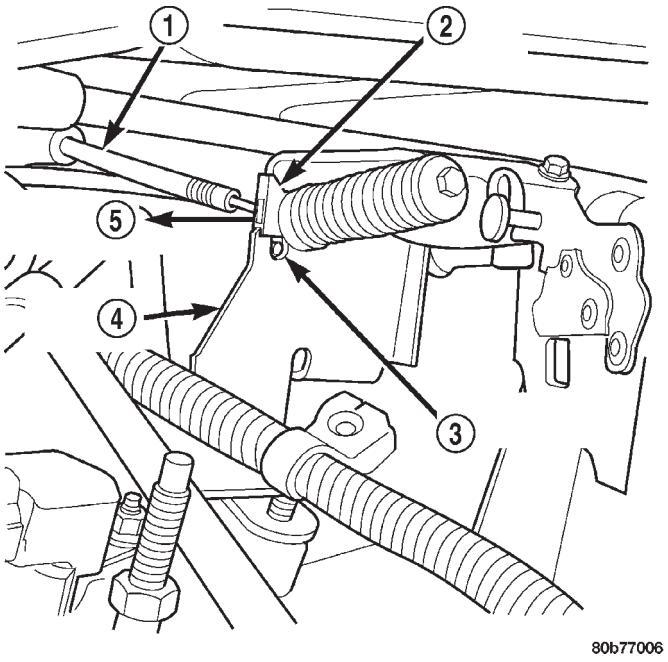


Fig. 39 Accelerator Cable Release Tab—4.7L V-8 Engine

1 - ACCELERATOR CABLE
2 - PLASTIC CABLE MOUNT
3 - PRESS TAB FOR REMOVAL
4 - CABLE BRACKET
5 - SLIDE FOR REMOVAL

(7) From inside vehicle, install clip holding cable to dashpanel (Fig. 16).

(8) From inside vehicle, slide throttle cable core wire into opening in top of pedal arm.

(9) Push cable retainer (clip) into pedal arm opening until it snaps in place.

(10) Before starting engine, operate accelerator pedal to check for any binding.

INSTALLATION - 4.7L

(1) Slide accelerator cable plastic mount into bracket. Continue sliding until tab (Fig. 39) is aligned to hole in mounting bracket.

(2) Route accelerator cable over top of cable cam.

(3) Connect cable end to throttle body bellcrank pin (snaps on rearward).

(4) Slide rubber grommet away from plastic cable housing.

(5) Install rubber grommet into dash panel until seated.

(6) Push cable housing into rubber grommet and through opening in dash panel.

(7) From inside vehicle, install clip holding cable to dashpanel (Fig. 16).

(8) From inside vehicle, slide throttle cable core wire into opening in top of pedal arm.

(9) Push cable retainer (clip) into pedal arm opening until it snaps in place.

(10) Snap cable into plenum routing clip.

(11) Install air box to throttle body.

(12) Before starting engine, operate accelerator pedal to check for any binding.

THROTTLE POSITION SENSOR

DESCRIPTION

The 3–wire Throttle Position Sensor (TPS) is mounted on the throttle body and is connected to the throttle blade.

OPERATION

The TPS is a 3–wire variable resistor that provides the Powertrain Control Module (PCM) with an input signal (voltage) that represents the throttle blade position of the throttle body. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the resistance (output voltage) of the TPS changes.

The PCM supplies approximately 5 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range of from .26 volts at minimum throttle opening (idle), to 4.49 volts at wide open throttle. Along with inputs from other sensors, the PCM uses the TPS input to determine current engine operating conditions. In response to engine operating conditions, the PCM will adjust fuel injector pulse width and ignition timing.

The PCM needs to identify the actions and position of the throttle blade at all times. This information is needed to assist in performing the following calculations:

- Ignition timing advance
- Fuel injection pulse-width
- Idle (learned value or minimum TPS)
- Off-idle (0.06 volt)
- Wide Open Throttle (WOT) open loop (2.608 volts above learned idle voltage)
- Deceleration fuel lean out
- Fuel cutoff during cranking at WOT (2.608 volts above learned idle voltage)
- A/C WOT cutoff (certain automatic transmissions only)

THROTTLE POSITION SENSOR (Continued)

REMOVAL

REMOVAL - 4.0L

The TPS is mounted to the throttle body.

(1) Disconnect TPS electrical connector (Fig. 40).
(2) Remove TPS mounting screws (Fig. 41).
(3) Remove TPS.

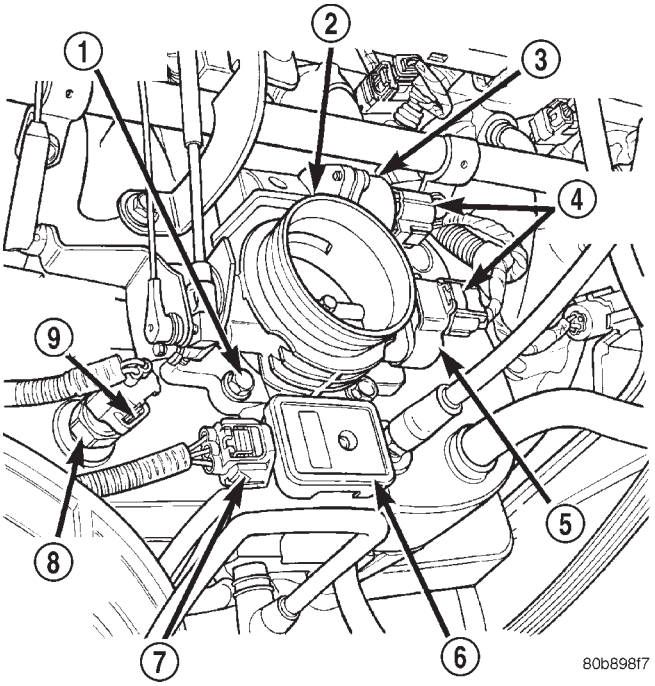


Fig. 40 TPS Electrical Connector—4.0L Engine

1 - MOUNTING BOLTS (4)
2 - THROTTLE BODY
3 - IAC MOTOR
4 - ELEC. CONN.
5 - TPS
6 - MAP SENSOR
7 - ELEC. CONN.
8 - IAT SENSOR
9 - ELEC. CONN.

REMOVAL - 4.7L

The TPS is located on the throttle body.

(1) Remove air duct and air resonator box at throttle body.
(2) Disconnect TPS electrical connector (Fig. 36).
(3) Remove two TPS mounting bolts (screws) (Fig. 42).
(4) Remove TPS from throttle body.

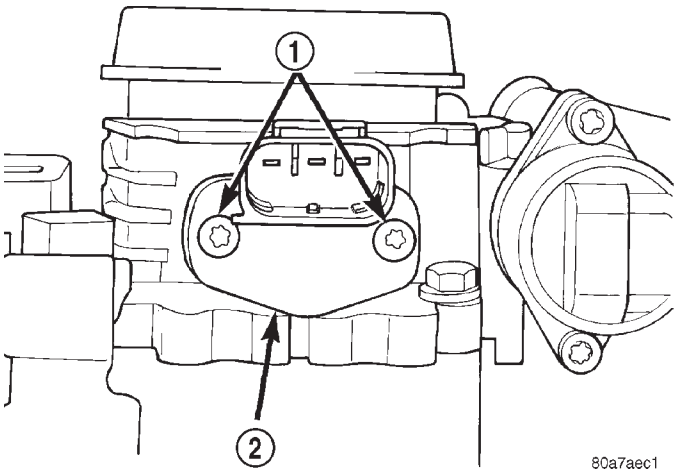


Fig. 41 TPS Mounting Screws—4.0L Engine

1 - MOUNTING SCREWS
2 - TPS

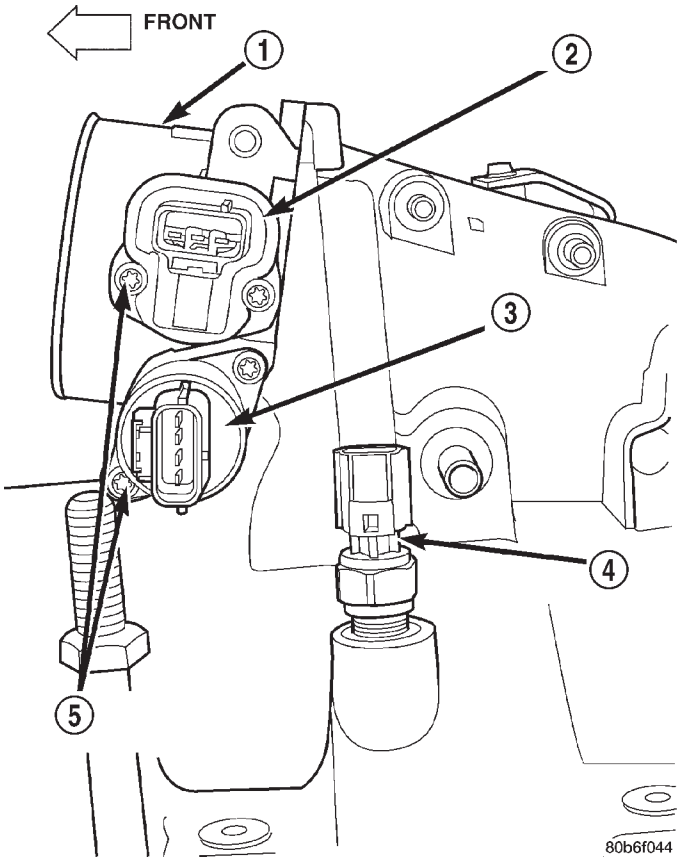


Fig. 42 TPS Mounting Bolts—4.7L V–8

1 - THROTTLE BODY
2 - TPS
3 - IAC MOTOR
4 - IAT SENSOR (THREADED TYPE)
5 - MOUNTING SCREWS

THROTTLE POSITION SENSOR (Continued)

INSTALLATION

INSTALLATION - 4.0L

The TPS is mounted to the throttle body.

The throttle shaft end of throttle body slides into a socket in the TPS (Fig. 43). The TPS must be installed so that it can be rotated a few degrees. (If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs). The TPS will be under slight tension when rotated.

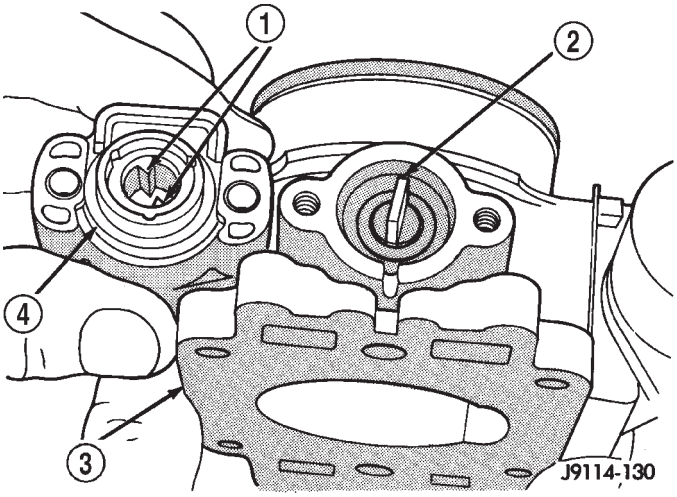


Fig. 43 Throttle Position Sensor Installation—4.0L Engine

1 - TANGS
2 - THROTTLE SHAFT
3 - THROTTLE BODY
4 - TPS

(1) Install TPS and retaining screws.
(2) Tighten screws to 7 N·m (60 in. lbs.) torque.
(3) Connect TPS electrical connector to TPS.
(4) Manually operate throttle (by hand) to check for any TPS binding before starting engine.

INSTALLATION - 4.7L

The throttle shaft end of throttle body slides into a socket in TPS (Fig. 44). The TPS must be installed so that it can be rotated a few degrees. If sensor will not rotate, install sensor with throttle shaft on other side of socket tangs. The TPS will be under slight tension when rotated.

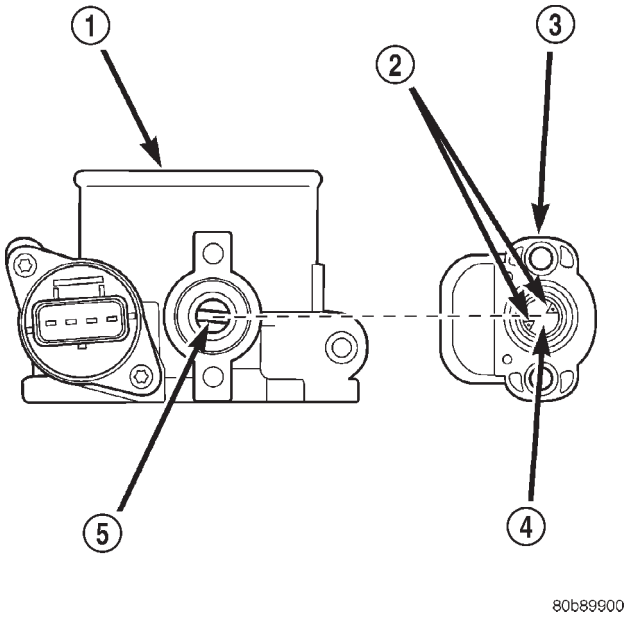


Fig. 44 TPS Installation—4.7L

1 - THROTTLE BODY
2 - LOCATING TANGS
3 - THROTTLE POSITION SENSOR
4 - SOCKET
5 - THROTTLE SHAFT

(1) Install TPS and two retaining bolts.
(2) Tighten bolts to 7 N·m (60 in. lbs.) torque.
(3) Manually operate throttle control lever by hand to check for any binding of TPS.
(4) Connect TPS electrical connector to TPS.
(5) Install air duct/air box to throttle body.

STEERING

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STEERING

DESCRIPTION - POWER STEERING SYSTEM

The power steering pump (Fig. 1) is a constant flow rate and displacement vane type pump. The pump reservoir is attached to the pump body. The pump is connected to the steering by the pressure and return hoses. The steering gear (Fig. 1) used is a recirculating ball type gear. A tilt and non-tilt column provide steering input.

The power steering system consists of:

OPERATION - POWER STEERING SYSTEM

The rack piston balls act as a rolling thread between the worm shaft and rack piston. The worm shaft is supported by a thrust bearing at the lower end and a bearing assembly at the upper end. When the worm shaft is turned from input from the steering column the rack piston moves. The rack piston teeth mesh with the pitman shaft. Turning the worm shaft turns the pitman shaft, which moves the steering linkage.

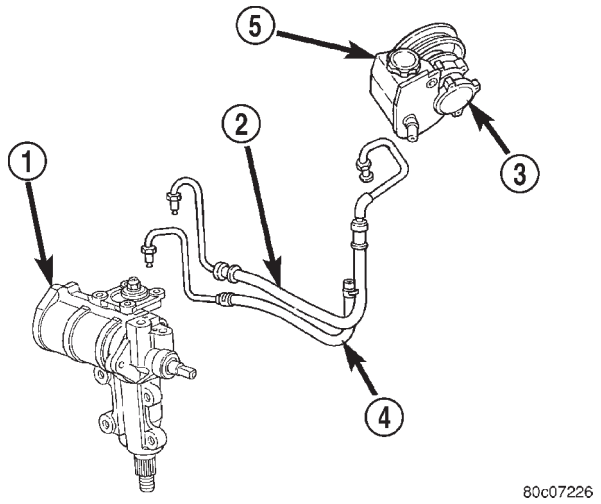


Fig. 1 POWER STEERING GEAR & PUMP 4.0L

1 - STEERING GEAR
2 - PRESSURE HOSE
3 - PUMP
4 - RETURN HOSE
5 - RESERVOIR

STEERING (Continued)

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - POWER STEERING SYSTEM

STEERING NOISE

There is some noise in all power steering systems. One of the most common is a hissing sound evident at a standstill parking. Or when the steering wheel is at the end of it's travel. Hiss is a high frequency noise similar to that of a water tap being closed slowly. The noise is present in all valves that have a high velocity fluid passing through an orifice. There is no relationship between this noise and steering performance.

CONDITION	POSSIBLE CAUSES	CORRECTION
OBJECTIONAL HISS OR WHISTLE	1. Steering intermediate shaft to dash panel seal.	1. Check and repair seal at dash panel.
	2. Noisy valve in power steering gear.	2. Replace steering gear.
RATTLE OR CLUNK	1. Gear mounting bolts loose.	1. Tighten bolts to specification.
	2. Loose or damaged suspension components/track bar.	2. Inspect and repair suspension.
	3. Loose or damaged steering linkage.	3. Inspect and repair steering linkage.
	4. Internal gear noise.	4. Replace gear.
	5. Pressure hose in contact with other components.	5. Reposition hose.
CHIRP OR SQUEAL	1. Loose belt.	1. Adjust or replace.
	2. Belt routing.	2. Verify belt routing is correct.
WHINE OR GROWL	1. Low fluid level.	1. Fill to proper level.
	2. Pressure hose in contact with other components.	2. Reposition hose.
	3. Internal pump noise.	3. Replace pump.
	4. Air in the system.	4. Perform pump initial operation.
SUCKING AIR SOUND	1. Loose return line clamp.	1. Replace clamp.
	2. O-ring missing or damaged on hose fitting.	2. Replace o-ring.
	3. Low fluid level.	3. Fill to proper level.
	4. Air leak between pump and reservoir.	4. Repair as necessary.
SCRUBBING OR KNOCKING	1. Wrong tire size.	1. Verify tire size.
	2. Wrong gear.	2. Verify gear.

STEERING (Continued)

BINDING AND STICKING

CONDITION	POSSIBLE CAUSE	CORRECTION
DIFFICULT TO TURN WHEEL STICKS OR BINDS	1. Low fluid level.	1. Fill to proper level.
	2. Tire pressure.	2. Adjust tire pressure.
	3. Steering component.	3. Inspect and lube.
	4. Loose belt.	4. Adjust or replace.
	5. Low pump pressure.	5. Pressure test and replace if necessary.
	6. Column shaft coupler binding.	6. Replace coupler.
	7. Steering gear worn or out of adjustment.	7. Repair or replace gear.
	8. Ball joints binding.	8. Inspect and repair as necessary.
	9. Belt routing.	9. Verify belt routing is correct.
4.7L	Hydraulic fan motor steering output low	Pressure / Flow test fans steering output flow

INSUFFICIENT ASST. OR POOR RETURN TO CENTER

CONDITION	POSSIBLE CAUSE	CORRECTION
HARD TURNING OR MOMENTARY INCREASE IN TURNING EFFORT	1. Tire pressure.	1. Adjust tire pressure.
	2. Low fluid level.	2. Fill to proper level.
	3. Loose belt.	3. Adjust or replace.
	4. Lack of lubrication.	4. Inspect and lubricate steering and suspension compnents.
	5. Low pump pressure or flow.	5. Pressure and flow test and repair as necessary.
	6. Internal gear leak.	6. Pressure and flow test, and repair as necessary.
	7. Belt routing.	7. Verify belt routing is correct.
4.7L	8. Low flow / pressure from fan motor	8. Pressure and flow test and repair as necessary.
STEERING WHEEL DOES NOT WANT TO RETURN TO CENTER POSITION	1. Tire pressure.	1. Adjust tire pressure.
	2. Wheel alignment.	2. Align front end.
	3. Lack of lubrication.	3. Inspect and lubricate steering and suspension compnents.
	4. High friction in steering gear.	4. Test and adjust as necessary.
	5. Ball joints binding.	5. Inspect and repair as necessary.

NOTE:
Some roads will cause a vehicle to drift, due to the crown in the road.

STEERING (Continued)

LOOSE STEERING AND VEHICLE LEADS/DRIFTS

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE PLAY IN STEERING WHEEL	1. Worn or loose suspension or steering components.	1. Repair as necessary.
	2. Worn or loose wheel bearings.	2. Repair as necessary.
	3. Steering gear mounting.	3. Tighten gear mounting bolts to specification.
	4. Gear out of adjustment.	4. Adjust gear to specification.
	5. Worn or loose steering coupler.	5. Repair as necessary.
VEHICLE PULLS TO ONE SIDE DURING BRAKING	1. Tire Pressure.	1. Adjust tire pressure.
	2. Air in brake hydrauliics system.	2. Bleed brake system.
	3. Worn brake components.	3. Repair as necessary.
VEHICLE LEADS OR DRIFTS FROM STRAIGHT AHEAD DIRECTION ON UNCROWNED ROAD.	1. Tire pressure.	1. Adjust tire pressure.
	2. Radial tire lead.	2. Cross front tires.
	3. Brakes dragging.	3. Repair as necessary.
	4. Wheel alignment.	4. Align vehicle.
	5. Weak or broken spring.	5. Replace spring.
	6. Loose or worn steering/ suspension components.	6. Repair as necessary.
	7. Cross caster out of spec.	7. Adjust or replace axle as necessary.

DIAGNOSIS AND TESTING - STEERING FLOW AND PRESSURE

The following procedure is used to test the operation of the power steering system on the vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with the maximum relief pressure. Perform test any time a power steering system problem is present. This test will determine if the power steering pump or power steering gear is not functioning properly. The following pressure and flow test is performed using Power Steering Analyzer Tool kit 6815 (Fig. 2) and Adapter Kit 6893.

FLOW AND PRESSURE TEST

(1) Check the power steering belt to ensure it is in good condition and adjusted properly.

(2) Connect pressure gauge hose from the Power Steering Analyzer to Tube 6865.

(3) Connect Adapter 6826 to Power Steering Analyzer test valve end.

(4) Disconnect the high pressure hose from the power steering pump.

(5) Connect Tube 6865 to the pump hose fitting.

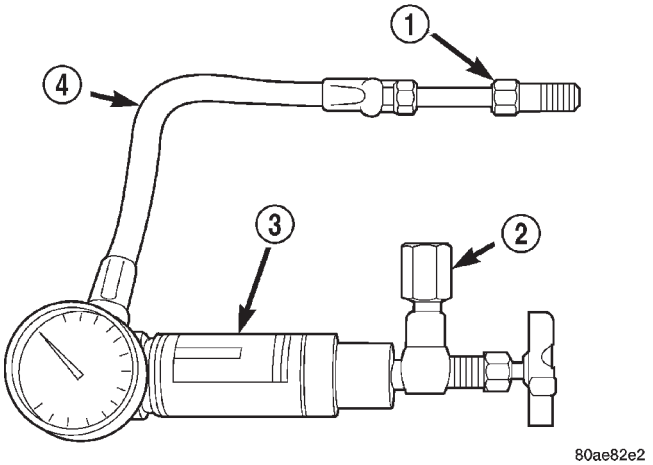


Fig. 2 Power Steering Analyzer

1 - TUBE
2 - ADAPTER FITTINGS
3 - ANALYZER
4 - GAUGE HOSE

(6) Connect the power steering hose from the steering gear to Adapter 6826.

(7) Open the test valve completely.

STEERING (Continued)

(8) Start engine and let idle long enough to circulate power steering fluid through flow/pressure test gauge.

(9) Shut off the engine and check the fluid level, add fluid as necessary. Start engine again and let idle.

(10) The initial pressure reading should be 345-552 kPa (50-80 psi). If pressure is higher inspect the hoses for restrictions and repair as necessary.

(11) Increase the engine speed to 1500 RPM and read the flow meter. The reading should be 2.4 - 2.8 GPM, if the reading is below this specification the pump should be replaced.

CAUTION: This next step involves testing maximum pump pressure output and flow control valve operation. Do not leave valve closed for more than three seconds as the pump could be damaged.

(12) Close valve fully three times for three seconds and record highest pressure indicated each time. **All three readings must be at pump relief pressure specifications and within 345 kPa (50 psi) of each other.**

- Pressures above specifications but not within 345 kPa (50 psi) of each other, replace pump.
- Pressures within 345 kPa (50 psi) of each other but below specifications, replace pump.

CAUTION: Do not force the pump to operate against the stops for more than 2 to 4 seconds at a time because, pump damage will result.

(13) Open the test valve and turn the steering wheel to the extreme left and right positions against the stops. Record the highest pressure reading at each position. Compare readings to the pump specifications chart. If pressures readings are not within 50 psi. of each other, the gear is leaking internally and must be repaired.

GEAR INLET SPECIFICATIONS 4.0L & 4.7L

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM)
4.0L	9653 kPa (1400 psi)	1500 RPM 2.4 - 2.8 GPM
4.7L	9653 kPa (1450 psi)	

PUMP MOTOR SPECIFICATIONS 4.7L

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM)
4.7L	9653 kPa (1900 psi)	1100 RPM 2.4-2.8 GPM Minium @ 200 psi

DIAGNOSIS AND TESTING - 4.7L - HYDRAULIC

The following procedures are used to test the operation of the power steering and hydraulic fan systems on the vehicle. This test will provide the gallons per minute (GPM) or flow rate of the power steering pump along with any maximum relief pressure. Perform test anytime a power steering system problem is present. This test will determine if the power steering pump, hydraulic fan, and power steering gear are not functioning properly. It will also determine if the flow coming out of the hydraulic fan motor is sufficient for the power steering gear. The following pressure and flow test is performed using the Power Steering Analyzer Tool kit 6815 (Fig. 2) and Adapter kit 8630 (Fig. 3).

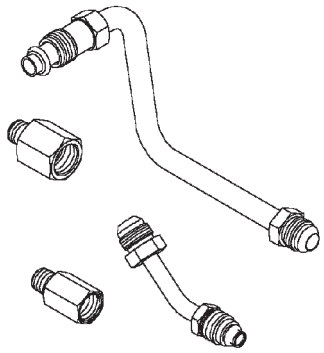


Fig. 3 4.7L HYDRAULIC POWER STEERING TEST ADAPTERS

FLOW TEST - FLOW FROM POWER STEERING PUMP

(1) Check the power steering belt to ensure it is in good condition and adjusted properly.

(2) Connect the pressure gauge hose from the Power Steering Analyzer to Tube 8630-2.

(3) Connect Adapter 8630-3 to Power Steering Analyzer test valve end.

(4) Disconnect the high pressure hose from the power steering pump.

(5) Connect Tube 8630-2 to the pump hose fitting.

(6) Connect the power steering hose from the fan motor to Adapter 8630-3.

(7) Open the test valve completely.

(8) Start engine and let idle long enough to circulate power steering fluid through the flow/pressure test gauge.

(9) Shut off the engine and check the fluid level, add fluid ass necessary. Start engine again and let idle.

(10) The initial pressure reading should be 483 - 690 kPa (70 - 100 psi). If pressure is higher inspect the hoses for restrictions and repair as necessary.

STEERING (Continued)

(11) Increase the engine speed to 1100 rpm and read the flow meter. The reading should be 2.6 GPM minimum, if the reading is below this specification, the pump should be replaced.

FLOW AND PRESSURE TEST - FLOW FROM HYDRAULIC FAN MOTOR TO STEERING GEAR (should be done if necessary after the Pump flow test)

(1) Connect the pressure gauge hose from the Power Steering Analyzer to Fitting 8630-1.

(2) Connect Adapter 8630-4 to Power Steering Analyzer test valve end.

(3) Disconnect the high pressure hose from the power steering gear.

(4) Connect Fitting 8630-1 to the high pressure hose.

(5) Connect Adapter 8630-4 to the power steering gear.

(6) Open the test valve completely.

(7) Start engine and let idle long enough to circulate power steering fluid through the flow/pressure test gauge.

(8) Shut off the engine and check the fluid level, add fluid ass necessary. Start engine again and let idle.

(9) The initial pressure reading should be 345-552 kPa (50-80 psi). If pressure is higher inspect the hoses for restrictions and repair as necessary.

(10) Increase the engine speed to 1500 RPM and read the flow meter. The reading should be 2.4 - 2.8 GPM if the reading is below this specification the fan should be replaced.

CAUTION: This next step involves testing maximum fan motor steering relief pressure. Do not leave the valve closed for more than three seconds.

(11) Close the valve fully three times for three seconds and record highest pressures indicated each time. All three readings must be at fan motor steering relief pressures.

(12) Open the test valve and turn the steering wheel to the extreme left and right positions against the stops. Record the highest pressure readings at each position. If pressure readings are not within 50 psi from each other, the gear is leaking internally and must be repaired.

PUMP MOTOR SPECIFICATIONS 4.7L

ENGINE	RELIEF PRESSURE ± 50	FLOW RATE (GPM)
4.7L	9653 kPa (1900 psi)	1100 RPM 2.4-2.8 GPM Minium @ 200 psi

COLUMN

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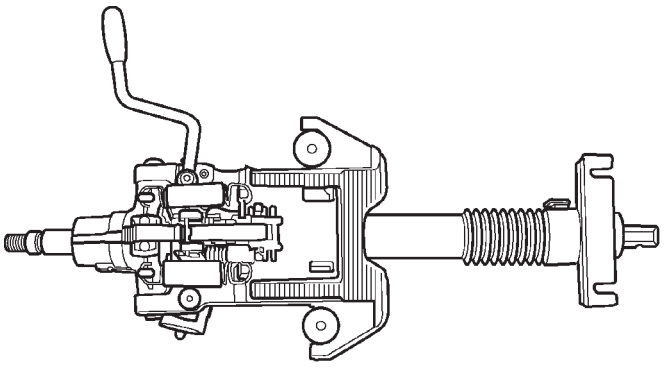
COLUMN

DESCRIPTION

SERVICE WARNINGS AND CAUTIONS

DESCRIPTION

The tilt column (Fig. 1) has been designed to be serviced as an assembly, less the wiring, switches, shrouds, steering wheel, etc. Most steering column components can be serviced without removing the steering column from the vehicle.



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Fig. 1 Steering Column

To service the steering wheel, switches or air-bag,(Refer to 8 - ELECTRICAL/RESTRAINTS - WARNING).

WARNING: THE AIRBAG SYSTEM IS A SENSITIVE, COMPLEX ELECTRO-MECHANICAL UNIT. BEFORE ATTEMPTING TO DIAGNOSE, REMOVE OR INSTALL THE AIRBAG SYSTEM COMPONENTS YOU MUST FIRST DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE. THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE. FAILURE TO DO SO COULD RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. THE FASTENERS, SCREWS, AND BOLTS, ORIGINALLY USED FOR THE AIRBAG COMPONENTS, HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE AIRBAG SYSTEM. THEY MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. ANYTIME A NEW FASTENER IS NEEDED, REPLACE WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR FASTENERS LISTED IN THE PARTS BOOKS.

CAUTION: Safety goggles should be worn at all times when working on steering columns.

COLUMN (Continued)

REMOVAL

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY.(Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).

(1) Position front wheels straight ahead.
(2) Disconnect and isolate the negative (ground) cable from the battery.
(3) Remove the airbag,(Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - REMOVAL).
(4) Remove the steering wheel nut and remove wheel with Puller C-3894-A (Fig. 2).

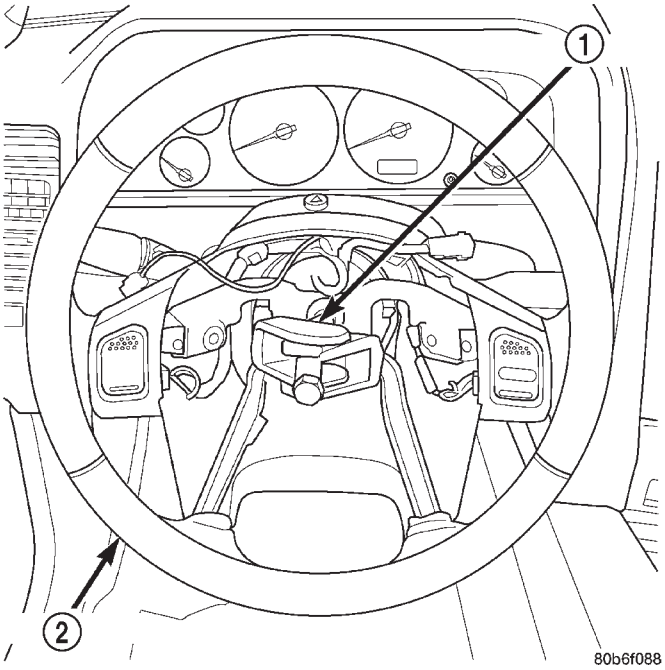


Fig. 2 Steering Wheel Puller

1 - PULLER
2 - STEERING WHEEL

NOTE: Ensure the puller jaws are seated in the pockets (Fig. 3) of the steering wheel armature.

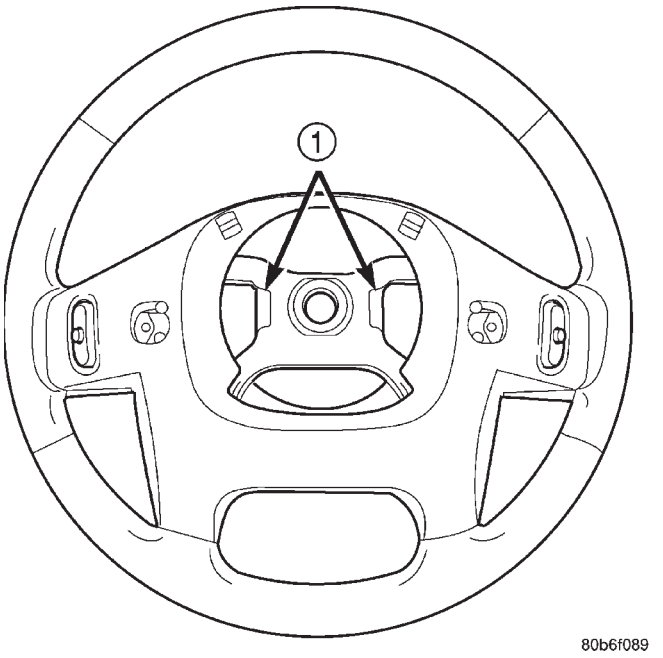


Fig. 3 Steering Wheel Pockets

1 - STEERING WHEEL POCKETS

(5) Remove the cluster bezel by pulling it from the instrument panel (Fig. 4).

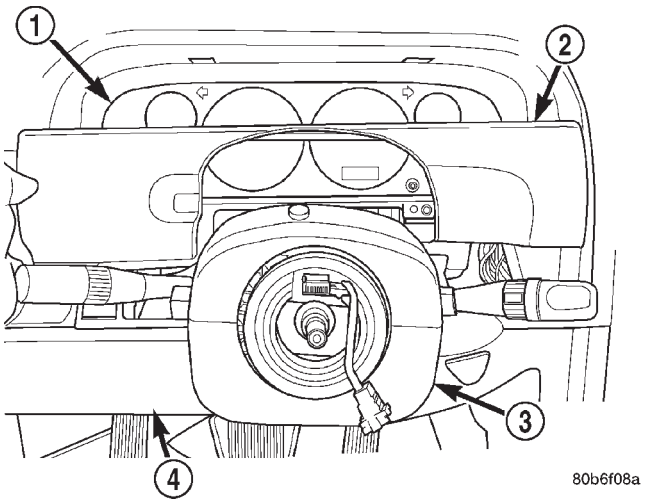


Fig. 4 Cluster Bezel

1 - CLUSTER
2 - CLUSTER BEZEL
3 - STEERING COLUMN
4 - KNEE BLOCKER COVER

COLUMN (Continued)

(6) Remove the knee blocker cover (Fig. 5),(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

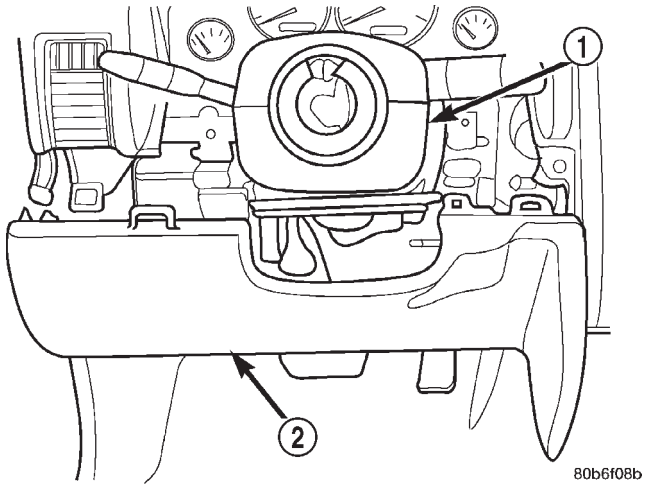


Fig. 5 Knee Blocker Cover

1 - STEERING COLUMN
2 - KNEE BLOCKER COVER

(7) Remove the lower steering column shroud mounting screw (Fig. 6).

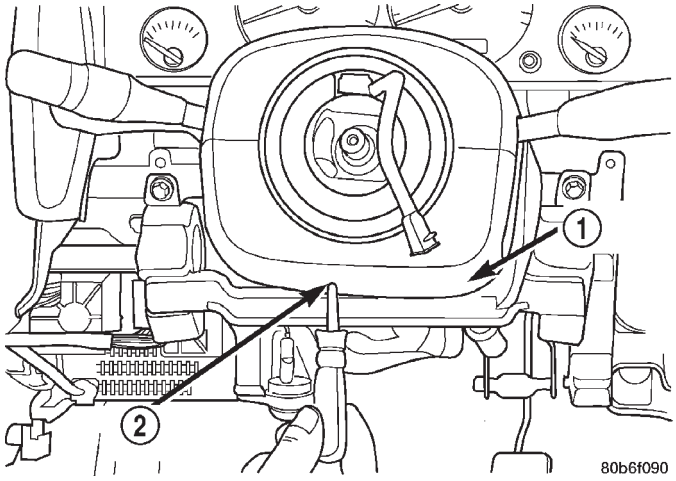


Fig. 6 Column Shroud Mounting Screw

1 - LOWER SHROUD
2 - ACCESS HOLE

(8) Unsnap the two halves of the column shrouds by pressing on the sides of the upper shroud and tilting the rear of the upper shroud up. Remove the shrouds from the steering column (Fig. 7).

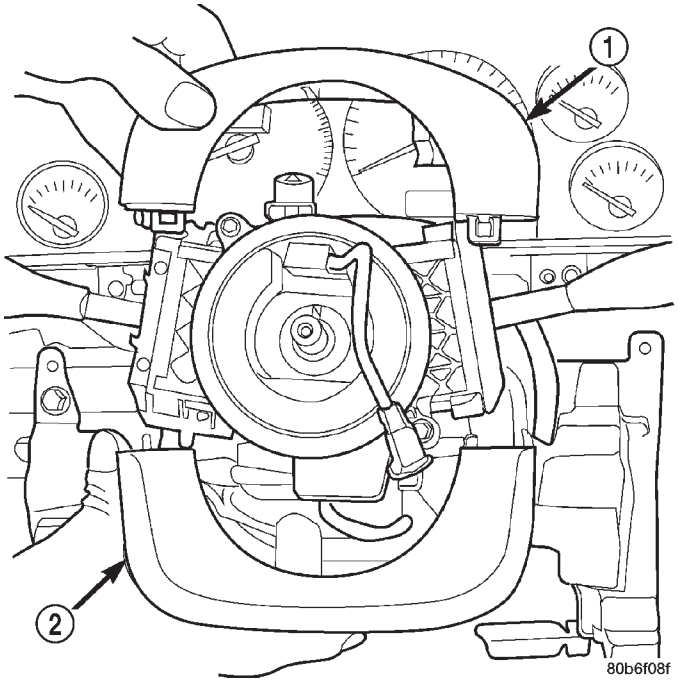


Fig. 7 Column Shrouds

1 - UPPER SHROUD
2 - LOWER SHROUD

(9) Remove the upper fixed shroud mounting screws and remove the shroud (Fig. 8).

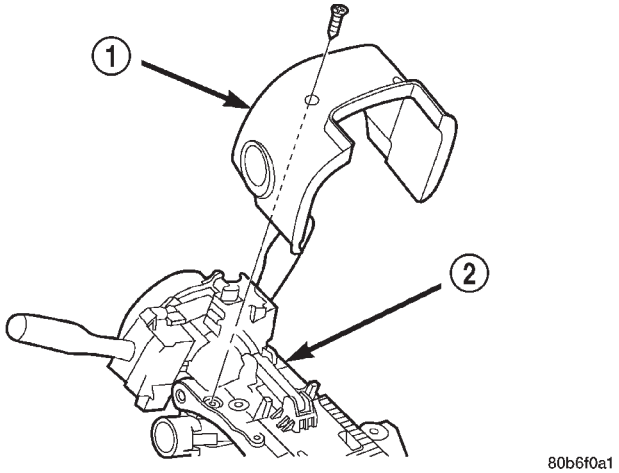


Fig. 8 Upper Fixed Shroud

1 - UPPER FIXED SHROUD
2 - COLUMN

COLUMN (Continued)

(10) Disconnect the multifuction switch (Fig. 9) and ignition switch harness.

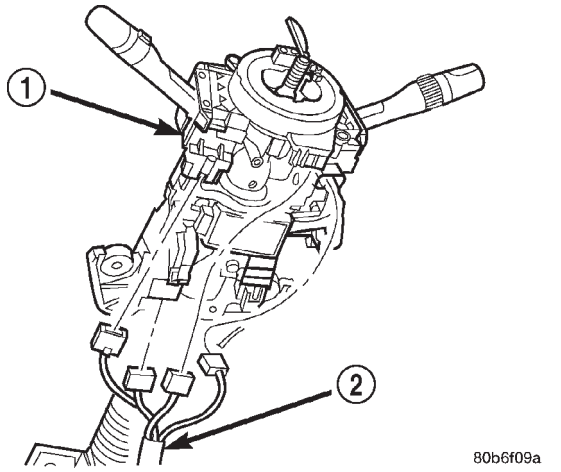


Fig. 9 Multifuction Switch Harness

1 - MULTIFUNCTION SWITCH
2 - MULTIFUNCTION SWITCH HARNESS

(11) Remove the multifuction switch screw from underneath the switch (Fig. 10). Slide the multifuction switch and clock spring off the column as an assembly (Fig. 11).

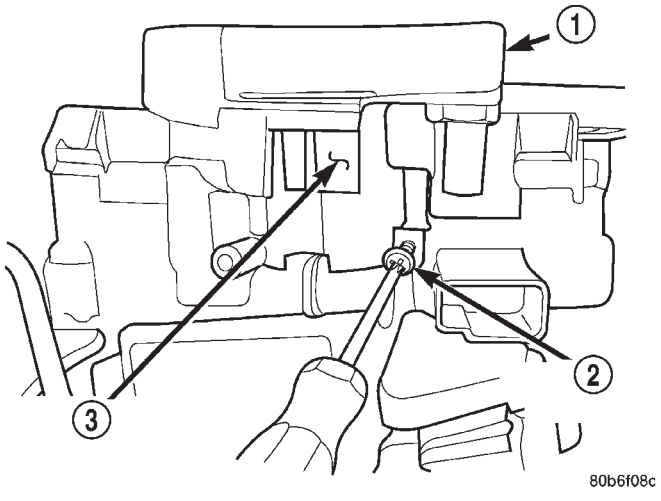


Fig. 10 Multifuction

1 - CLOCK SPRING
2 - SCREW
3 - MULTI-FUNCTION SWITCH MOUNTING HOUSING

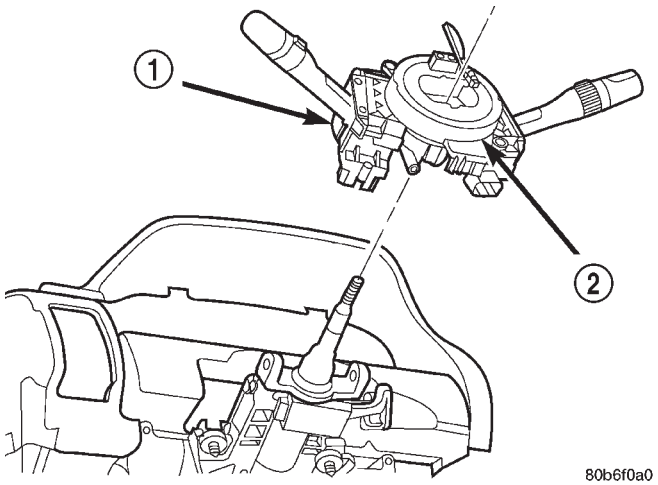


Fig. 11 Multifuction Switch And Clock Spring

1 - MULTI-FUNCTION SWITCH ASSEMBLY
2 - CLOCKSPRING

(12) Turn the ignition key to the on position then release and remove the shifter interlock cable (Fig. 12) from the ignition lock cylinder housing.

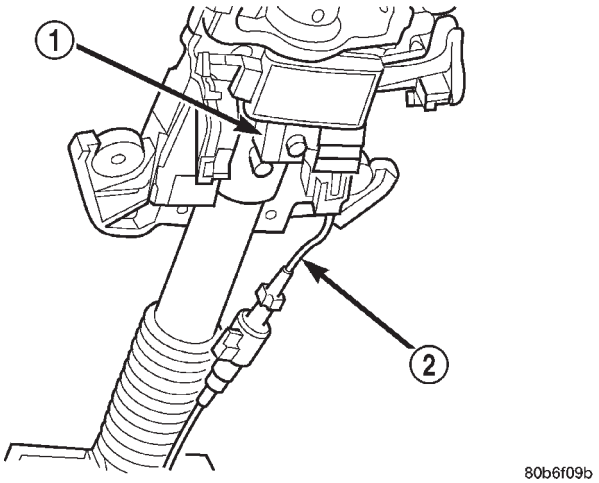


Fig. 12 Shifter Interlock Cable

1 - LOCK CYLINDER HOUSING
2 - INTERLOCK CABLE

COLUMN (Continued)

(13) Remove the column coupler bolt (Fig. 13) and slide the coupler off the column shaft.

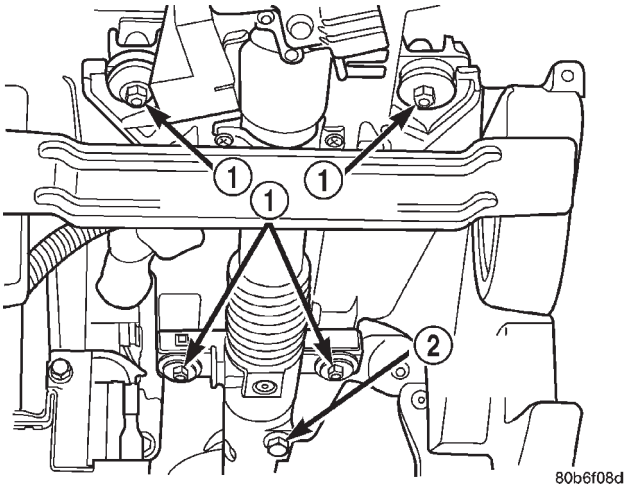


Fig. 13 Column Coupler Bolt And Mounting Nuts

1 - COLUMN MOUNTING NUTS
2 - COUPLER BOLT

(14) Remove the column mounting nuts (Fig. 13) and lower column off mounting studs. Remove the column from the vehicle.

(15) Remove the ignition switch, cylinder and SKIM, (Refer to 19 - STEERING/COLUMN/LOCK CYLINDER HOUSING - REMOVAL). (Fig. 14).

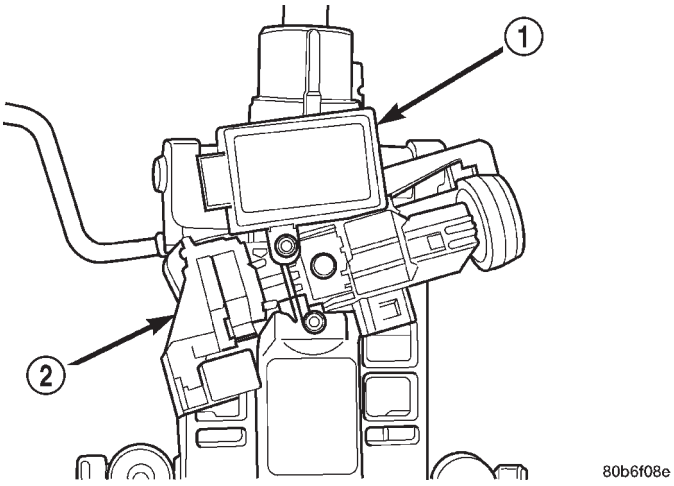


Fig. 14 Ignition Switch And SKIM

1 - SKIM
2 - IGNITION SWITCH

INSTALLATION

WARNING: BEFORE SERVICING THE STEERING COLUMN THE AIRBAG SYSTEM MUST BE DISARMED. FAILURE TO DO SO MAY RESULT IN ACCIDENTAL DEPLOYMENT OF THE AIRBAG AND POSSIBLE PERSONAL INJURY. (Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

(1) Install the ignition switch, cylinder and SKIM-,(Refer to 19 - STEERING/COLUMN/IGNITION SWITCH - INSTALLATION).

(2) Install the column into the vehicle and lift the column up onto the mounting studs. Install the mounting nuts and tighten to 12 N·m (105 in. lbs.).

(3) Slid the coupler onto the column shaft and install the coupler bolt. Tighten the coupler bolt to 49 N·m (36 ft. lbs.).

(4) Turn the ignition key to the on position then release and install the shifter interlock cable (Fig. 12) into ignition lock cylinder housing.

(5) Verify ignition switch and shifter interlock operation.,(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 42RE/GEAR SHIFT CABLE - ADJUSTMENTS).

(6) Slide the multifuction switch and clock spring onto the column as an assembly (Fig. 11).

(7) Install the multifuction switch mounting screw (Fig. 10).

(8) Connect the multifuction switch (Fig. 9) and ignition switch harness.

(9) Install the upper fixed shroud and mounting screws (Fig. 8).

(10) Install the lower steering column shroud to the steering column. Install and tighten the mounting screw.

(11) Install the upper column shroud. Align the upper shroud to the lower shroud and snap the two shroud halves together.

(12) Install the knee blocker cover (Fig. 5),(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(13) Install the cluster bezel by inserting it into the instrument panel (Fig. 4).

(14) Align the steering wheel with the column index spline and install the wheel on the column shaft. Pull the clockspring wire harness through the steering wheel armature spokes.

(15) Install and tighten the steering wheel mounting nut to 61 N·m (45 ft. lbs.).

(16) Connect the steering wheel wire harness connector to the clock spring connector.

(17) Install the airbag,(Refer to 8 - ELECTRICAL/RESTRAINTS/DRIVER AIRBAG - INSTALLATION).

(18) Connect the negative (ground) cable to the battery.

COLUMN (Continued)

SPECIFICATIONS

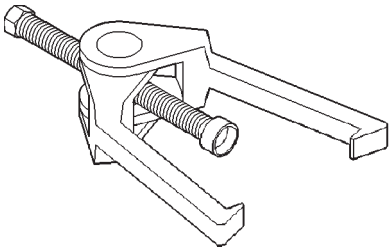
TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Steering Column Steering Wheel Nut	61	45	—
Steering Column Column Bracket Nuts	12	—	105
Steering Column Shaft Coupler Bolts	49	36	—

SPECIAL TOOLS

STEERING COLUMN



Puller C-3894-A

IGNITION SWITCH

DESCRIPTION

The electrical ignition switch is located on the steering column. It is used as the main on/off switching device for most electrical components. The mechanical key lock cylinder is used to engage/disengage the electrical ignition switch.

DIAGNOSIS AND TESTING - IGNITION SWITCH

ELECTRICAL DIAGNOSIS

For ignition switch electrical schematics, refer to Ignition Switch in Wiring Diagrams.

MECHANICAL DIAGNOSIS (KEY DIFFICULT TO ROTATE)

Vehicles equipped with an automatic transmission and a floor mounted shifter: a cable is used to connect the interlock device in the steering column assembly, to the transmission floor shift lever. This interlock device is used to lock the transmission shifter in the PARK position when the key lock cylinder is rotated to the LOCKED or ACCESSORY position. The interlock device within the steering column is not serviceable. If repair is necessary, the steering column assembly must be replaced,(Refer to 19 - STEERING/COLUMN - REMOVAL).

If the ignition key is difficult to rotate to or from the LOCK or ACCESSORY position, it may not be the fault of the key cylinder or the steering column components. The brake transmission shift interlock cable may be out of adjustment,(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 44RE/SHIFT INTERLOCK MECHANISM - ADJUSTMENTS) .

Vehicles equipped with an automatic transmission and a steering column mounted shifter: an interlock device is located within the steering column. This interlock device is used to lock the transmission shifter in the PARK position when the key lock cylinder is in the LOCKED or ACCESSORY position. If it is difficult to rotate the key to or from the LOCK or ACCESSORY position, the interlock device within the steering column may be defective. This device is not serviceable. If repair is necessary, the steering column assembly must be replaced,(Refer to 19 - STEERING/COLUMN - REMOVAL).

Vehicles equipped with a manual transmission and a floor mounted shifter: on certain models, a lever is located on the steering column behind the ignition key lock cylinder. The lever must be manually operated to allow rotation of the ignition key lock cylinder to the LOCK or ACCESSORY position. If it is difficult to rotate the key to the LOCK or ACCESSORY position, the lever mechanism may be defective. This mechanism is not serviceable. If repair is necessary, the steering column assembly must be replaced,(Refer to 19 - STEERING/COLUMN - REMOVAL).

On other models, the ignition key cylinder must be depressed to allow it to be rotated into the LOCK or ACCESSORY position. If it is difficult to rotate the key to the LOCK or ACCESSORY position, the lock mechanism within the steering column may be defective. This mechanism is not serviceable. If repair is

IGNITION SWITCH (Continued)

necessary, the steering column assembly must be replaced,(Refer to 19 - STEERING/COLUMN - REMOVAL).

REMOVAL

IGNITION SWITCH REMOVAL

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

(1) Remove key cylinder. Refer to previous steps.

(2) Remove lower steering column cover screws and remove cover (Fig. 19).

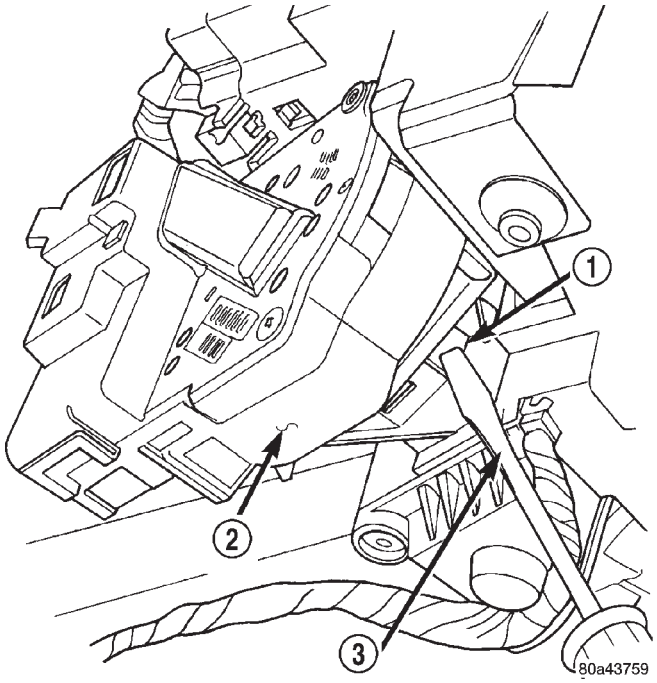


Fig. 15 Ignition Switch Lock Tab

1 - LOCK TAB
2 - IGNITION SWITCH
3 - SCREWDRIVER

(3) Remove ignition switch mounting screw (Fig. 17). Use tamper proof torx bit to remove the screw.

(4) Using a small screwdriver, push on locking tab (Fig. 15) and remove switch from steering column.

(5) Disconnect two electrical connectors at rear of ignition switch (Fig. 17).

INSTALLATION

IGNITION SWITCH INSTALLATION

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

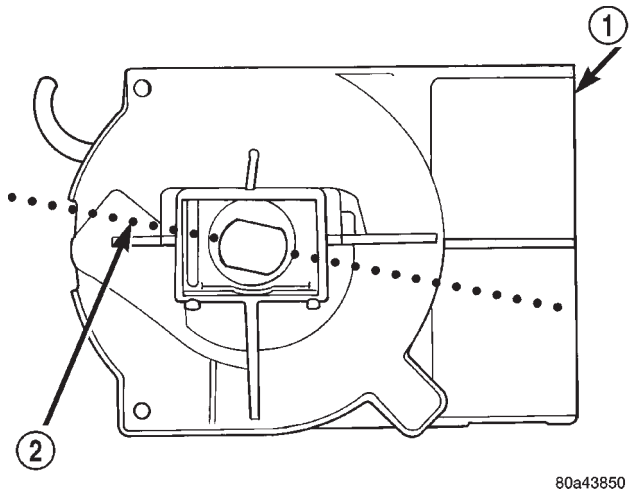


Fig. 16 Switch In ON Position

1 - IGNITION SWITCH
2 - ROTATE TO ON POSITION

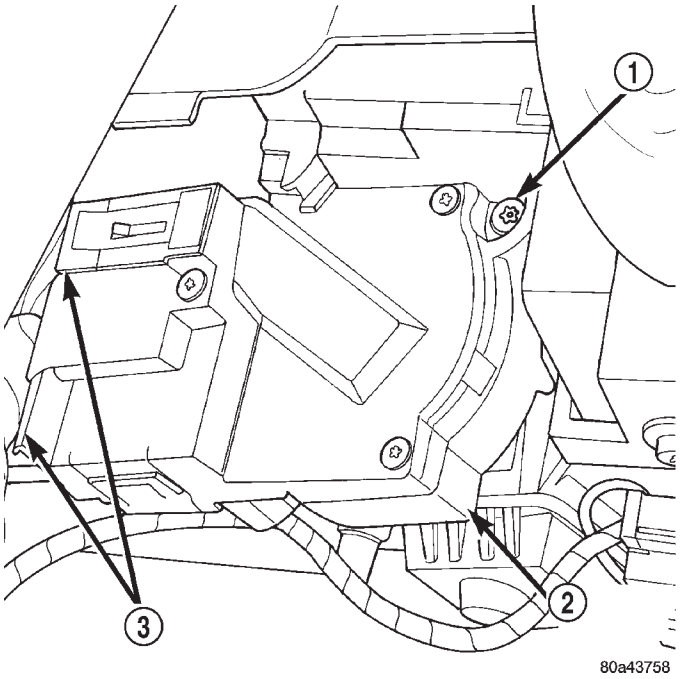


Fig. 17 Ignition Switch Removal/Installation

1 - TAMPER PROOF SCREW
2 - IGNITION SWITCH
3 - ELECTRICAL CONNECTORS

(1) Before installing ignition switch, rotate the slot in the switch to the ON position (Fig. 16).

(2) Connect two electrical connectors to rear of ignition switch. Make sure that locking tabs are fully seated into wiring connectors.

(3) Position switch to column and install tamper proof screw. Tighten screw to 3 N·m (26 in. lbs.).

(4) Install steering column lower cover.

KEY-IN IGNITION SWITCH

DESCRIPTION

The key-in ignition switch is concealed within and integral to the ignition switch, which is mounted on the steering column. The key-in ignition switch is actuated by the ignition lock cylinder mechanism, and is hard wired between a body ground and the Body Control Module (BCM) through the instrument panel wire harness.

The key-in ignition switch cannot be adjusted or repaired and, if faulty or damaged, the entire ignition switch unit must be replaced,(Refer to 19 - STEERING/COLUMN/LOCK CYLINDER HOUSING - REMOVAL). For complete circuit diagrams, refer to **Body Control Module** in the Contents of Wiring Diagrams.

OPERATION

The key-in ignition switch closes a path to ground for the BCM when the ignition key is inserted in the ignition lock cylinder, and opens the ground path when the key is removed from the ignition lock cylinder. The BCM monitors the key-in ignition switch status through an internal pull-up, then sends the proper switch status messages to other electronic modules over the Programmable Communications Interface (PCI) data bus network. The key-in ignition switch status is also used by the BCM as an input for chime warning system operation.

DIAGNOSIS AND TESTING

KEY-IN IGNITION SWITCH

For complete circuit diagrams, refer to **Body Control Module** in the Contents of Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable. Disconnect the instrument panel wire harness connector from the key-in ignition switch connector receptacle on the ignition switch. Check for continuity between the key-in ignition switch sense and ground terminals of the key-in ignition switch connector receptacle. There should be continuity with the key inserted in the ignition lock cylinder, and no continuity with the key removed from the ignition lock cylinder. If OK, go to Step 2. If not OK, replace the faulty ignition switch unit.

(2) Check for continuity between the ground circuit cavity of the instrument panel wire harness connector for the key-in ignition switch and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open ground circuit to ground as required.

(3) Disconnect the gray 26-way instrument panel wire harness connector from the Body Control Module (BCM) connector receptacle. Check for continuity between the key-in ignition switch sense circuit cavity of the instrument panel wire harness connector for the key-in ignition switch and a good ground. There should be no continuity. If OK, go to Step 4. If not OK, repair the shorted key-in ignition switch sense circuit as required.

(4) Check for continuity between the key-in ignition switch sense circuit cavities of the instrument panel wire harness connector for the key-in ignition switch and the gray 26-way instrument panel wire harness connector for the BCM. There should be continuity. If OK, use a DRB scan tool and the proper Diagnostic Procedures manual to test the BCM. If not OK, repair the open key-in ignition switch sense circuit as required.

LOCK CYLINDER

REMOVAL

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

(1) Disconnect negative battery cable at battery.

(2) If equipped with an automatic transmission, place shifter in PARK position.

(3) Rotate key to ON position.

LOCK CYLINDER (Continued)

(4) A release tang is located on bottom of key cylinder (Fig. 18).

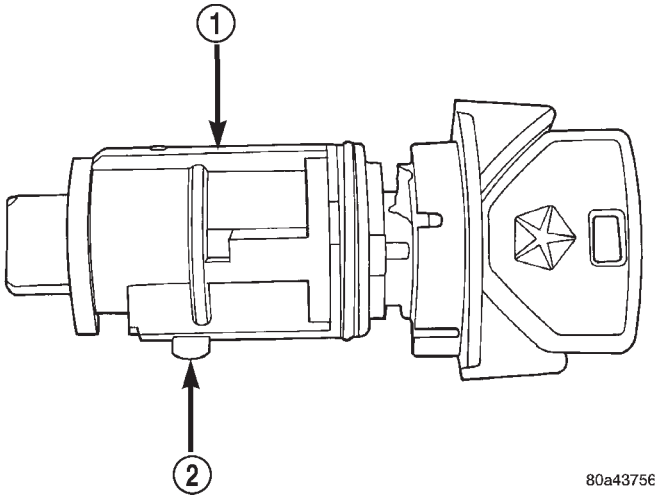


Fig. 18 Key Cylinder Release Tang

1 - KEY CYLINDER
2 - RELEASE TANG

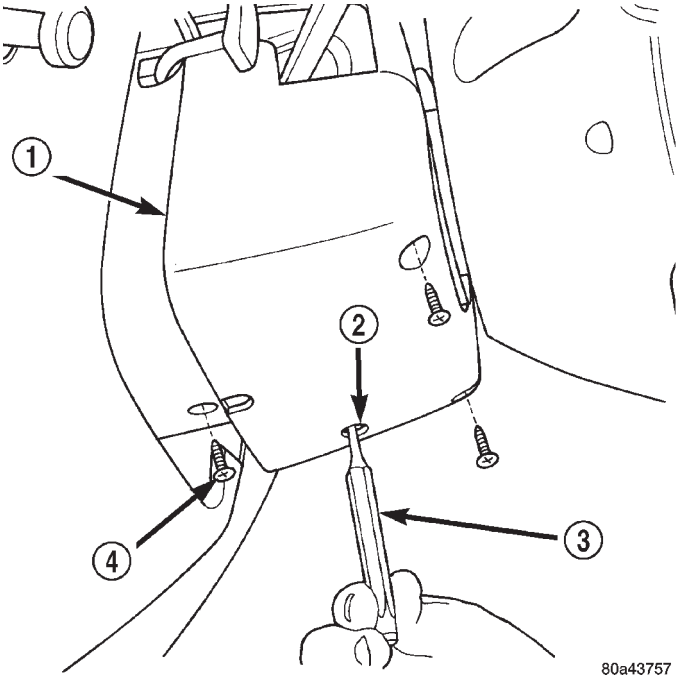


Fig. 19 Key Cylinder and Cover Removal

1 - LOWER COVER
2 - ACCESS HOLE
3 - PIN PUNCH
4 - COVER SCREWS (3)

(5) Position a small screwdriver or pin punch into tang access hole on bottom of steering column lower cover (Fig. 19).

(6) Push the pin punch up while pulling key cylinder from steering column.

INSTALLATION

The ignition key must be in the key cylinder for cylinder removal. The key cylinder must be removed first before removing ignition switch.

(1) If equipped with an automatic transmission, place shifter in PARK position.

(2) Position key cylinder into steering column as it would normally be in the ON position.

(3) Press key cylinder into column until it snaps into position.

(4) Check mechanical operation of switch. **Automatic Transmission:** Be sure transmission lever is locked in PARK position after key removal. If key is difficult to rotate or is difficult to remove, the shift lever-to-steering column cable may be out of adjustment or defective. Refer to Transmission for procedures. **Manual Transmission:** Be sure key cannot be removed until release lever is operated. If key can be removed, release lever mechanism may be defective. Release lever mechanism is not serviced separately. If repair is necessary, the steering column must be replaced,(Refer to 19 - STEERING/COLUMN - REMOVAL).

(5) Connect negative cable to battery.

(6) Check electrical operation of switch.

STEERING WHEEL

REMOVAL

For steering wheel removal procedure,(Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - REMOVAL).

INSTALLATION

For steering wheel installation procedure,(Refer to 8 - ELECTRICAL/RESTRAINTS/CLOCKSPRING - INSTALLATION).

GEAR

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GEAR

DESCRIPTION

The power steering gear is a recirculating ball type gear (Fig. 1) .

The following gear components can be serviced:

- Pitman Shaft and Cover
- Pitman Shaft Bearings
- Pitman Shaft Oil Seal/Dust Seal
- Stud Shaft Housing with Seal
- O-Rings and Teflon Rings

NOTE: If rack piston assembly is damaged the gear must be replaced.

OPERATION

The gear acts as a rolling thread between the worm shaft and rack piston. The worm shaft is supported by a thrust bearing at the lower end and a bearing assembly at the upper end. When the worm shaft is turned the rack piston moves. The rack piston teeth mesh with the pitman shaft. Turning the worm shaft turns the pitman shaft, which turns the steering linkage.

REMOVAL

(1) Place the front wheels in the straight ahead position with the steering wheel centered and locked.

(2) Remove the air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Drain or siphon the power steering system.

(4) Remove the pressure and return lines (Fig. 2)from the steering gear. Refer to hose removal in this section.

(5) Remove the column coupler shaft bolt (Fig. 2)and remove the shaft from the gear.

(6) Raise and support the vehicle.

(7) Remove the left front wheel and tire assembly.

(8) Remove the pitman arm from gear with Puller C-4150A.

(9) Remove the windshield washer reservoir,(Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - REMOVAL).

(10) Remove the steering gear mounting bolts. Remove the steering gear out of the engine compartment (Fig. 3).

INSTALLATION

(1) Position the steering gear on the frame rail and install the bolts. Tighten the bolts to 108 N·m (80 ft. lbs.) torque.

(2) Install the pitman arm and tighten nut to 251 N·m (185 ft. lbs.).

(3) Install windshield washer reservoir,(Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WASHER RESERVOIR - INSTALLATION).

(4) Install the wheel and tire assembly.

(5) Remove the support and lower the vehicle.

(6) Install the pressure and return hoses to the steering gear and tighten to 20-38 N·m (14-28 ft. lbs.).

(7) Install the column coupler shaft.

(8) Install the air cleaner housing,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

GEAR (Continued)

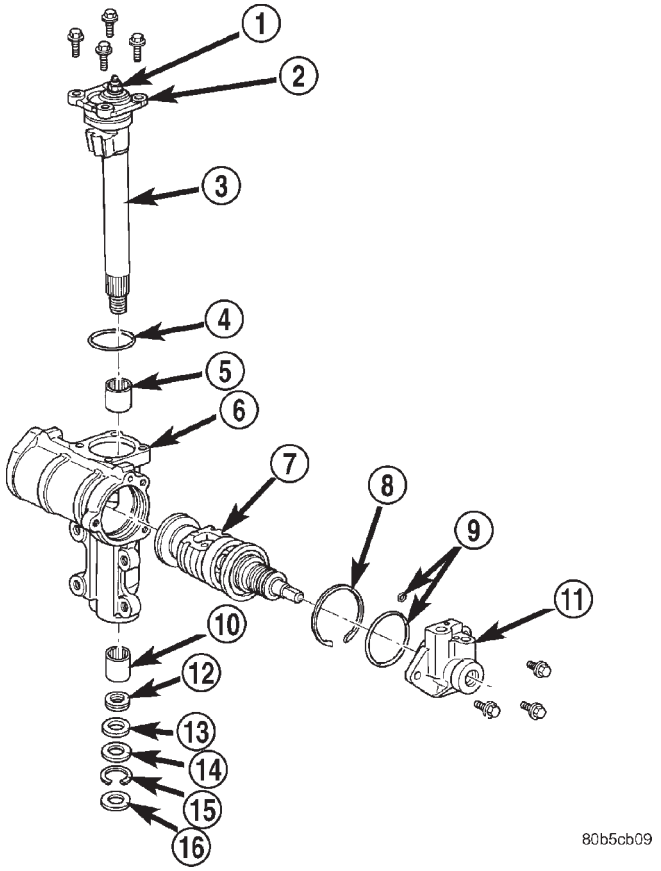


Fig. 1 Recirculating Ball Type Gear

1 - ADJUSTER NUT
2 - COVER
3 - PITMAN SHAFT
4 - O-RING
5 - BEARING
6 - GEAR HOUSING
7 - RACK PISTON
8 - RETAINING RING
9 - O-RING
10 - BEARING
11 - STUB SHAFT HOUSING
12 - PITMAN SHAFT SEAL
13 - PLASTIC BACKUP WASHER
14 - METAL BACKUP WASHER
15 - RETAINING RING
16 - DUST SEAL

(9) Fill the power steering pump (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

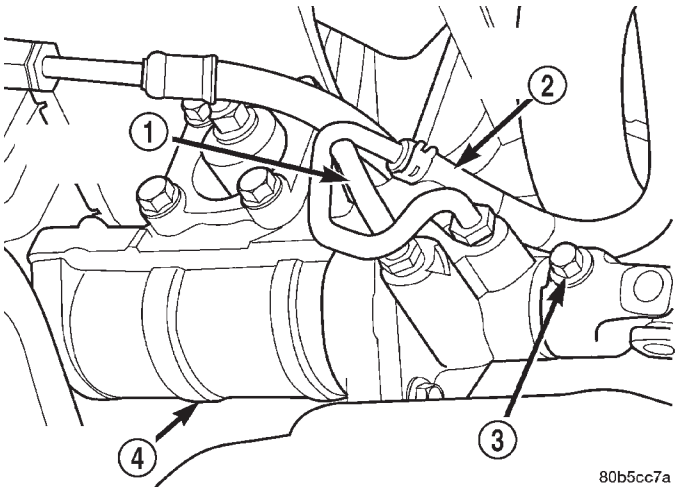


Fig. 2 Pressure And Return Lines

1 - PRESSURE LINE
2 - RETURN LINE
3 - COUPLER BOLT
4 - STEERING GEAR

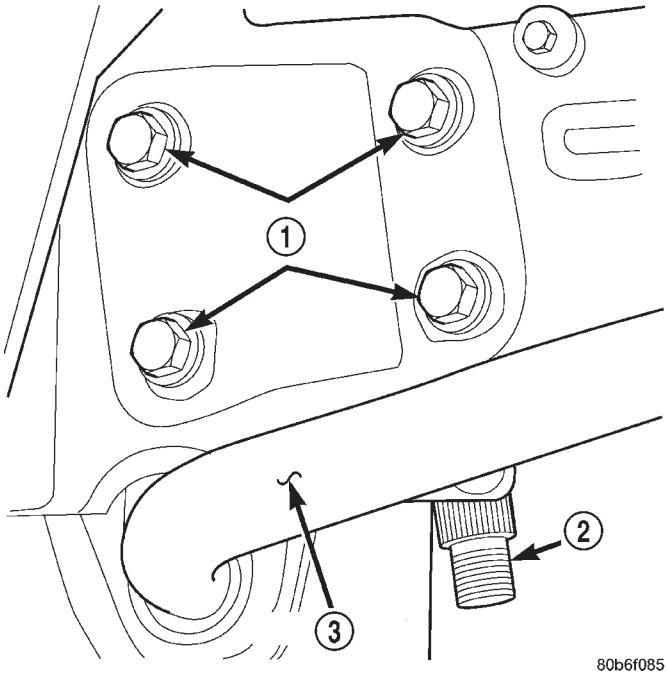


Fig. 3 Steering Gear Mounting

1 - MOUNTING BOLTS
2 - PITMAN SHAFT
3 - STABILIZER BAR

GEAR (Continued)

ADJUSTMENTS

STEERING GEAR

NOTE: Adjusting the steering gear in the vehicle is not recommended. Remove gear from the vehicle and drain the fluid. Then mount gear in a vise to perform adjustments.

OVER-CENTER

(1) Rotate the stub shaft with Socket 8343 from stop to stop and count the number of turns.

(2) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

(3) Place torque wrench and Socket 8343 in a vertical position on the stub shaft. Rotate the wrench 45 degrees each side of the center and record the highest rotational torque in this range (Fig. 4) . This is the Over-Center Rotating Torque.

NOTE: The stub shaft must rotate smoothly without sticking or binding.

(4) Rotate the stub shaft between 90° and 180° to the left of center and record the left off-center preload. Repeat this to the right of center and record the right off-center preload. The average of these two recorded readings is the Preload Rotating Torque.

(5) The Over-Center Rotating Torque should be 0.45-0.80 N·m (4-7 in. lbs.) **higher** than the Preload Rotating Torque.

(6) If an adjustment to the Over-Center Rotating Torque is necessary, first loosen the adjuster lock nut. Then turn the pitman shaft adjuster screw back (COUNTERCLOCKWISE) until fully extended, then turn back in (CLOCKWISE) one full turn.

(7) Remeasure Over-Center Rotating Torque. If necessary turn the adjuster screw and repeat measurement until correct Over-Center Rotating Torque is reached.

NOTE: To increase the Over-Center Rotating Torque turn the screw CLOCKWISE.

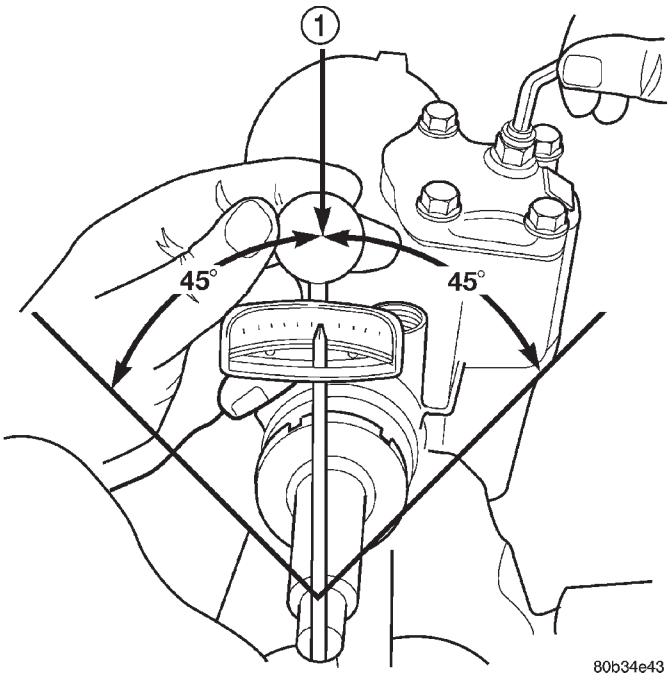


Fig. 4 Checking Over-center Rotation Torque

1 - CENTER

(8) Prevent the adjuster screw from turning while tightening adjuster lock nut. Tighten the adjuster lock nut to 37-52 N·m (27-38 ft. lbs.).

SPECIFICATIONS

POWER STEERING GEAR

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Steering Gear Type	Recirculating Ball
Steering Gear Overall Ratio	12.7:1

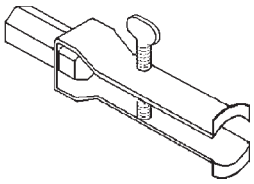
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Pitman Shaft Overcenter Drag New Gear (under 400 miles)	0.45-0.80 + Worm Shaft Preload	—	4-7 + Worm Shaft Preload
Pitman Shaft Overcenter Drag Used Gear (over 400 miles)	0.5-0.6 + Worm Shaft Preload	—	4-5 + Worm Shaft Preload

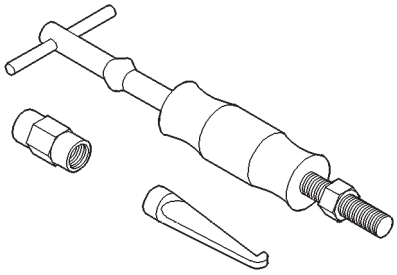
GEAR (Continued)

SPECIAL TOOLS

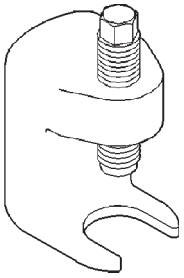
POWER STEERING GEAR



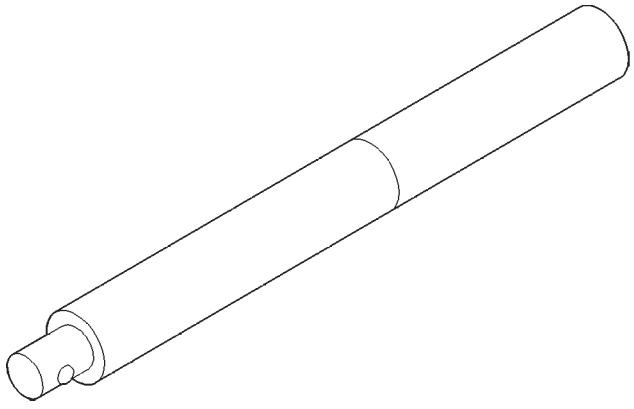
Puller Seal 7794-A



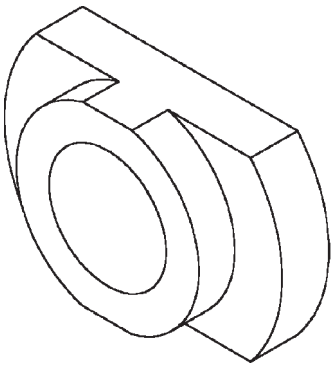
Slide Hammer C-637



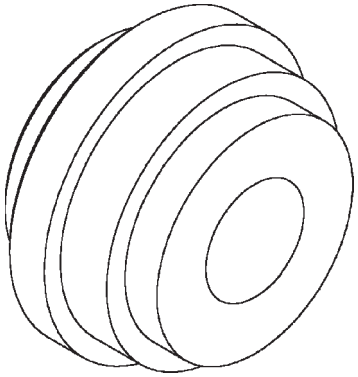
Remover, Pitman Arm C-4150A



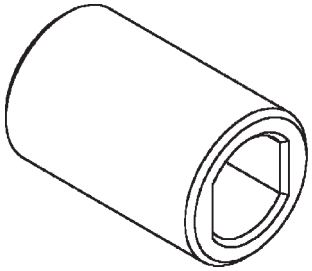
Handle C-4171



Driver 8277



Driver 8294



Scoket 8343

PITMAN SHAFT

REMOVAL

(1) Clean exposed end of pitman shaft and housing with a wire brush.

(2) Rotate the stub shaft with a wrench (Fig. 5)from stop to stop and count the number of turns.

(3) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

NOTE: The pitman shaft will not clear the housing if it is not centered.

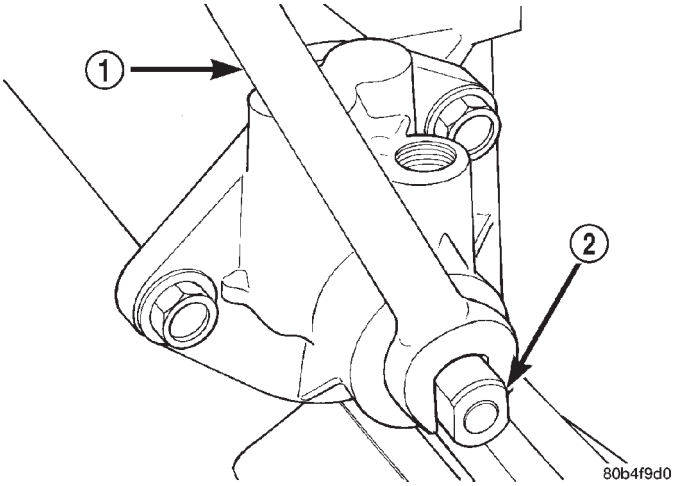


Fig. 5 Center Stub

1 - WRENCH
2 - STUB SHAFT

(4) Remove pitman shaft cover bolts and remove the shaft assembly (Fig. 6).

(5) Remove pitman shaft cover o-ring.

(6) Remove pitman shaft dust seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(7) Remove the pitman shaft oil seal retaining ring with snap ring pliers (Fig. 8).

(8) Remove oil seal metal backup washer then plastic backup washer from the housing.

(9) Remove pitman shaft oil seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(10) Drop Driver 8277 through the top bearing and align the driver up with the lower bearing. (Fig. 9). Install Handle C-4171 into the driver and remove the lower bearing.

(11) Turn the gear over and remover the upper bearing with Driver 8277 and Handle C-4171.

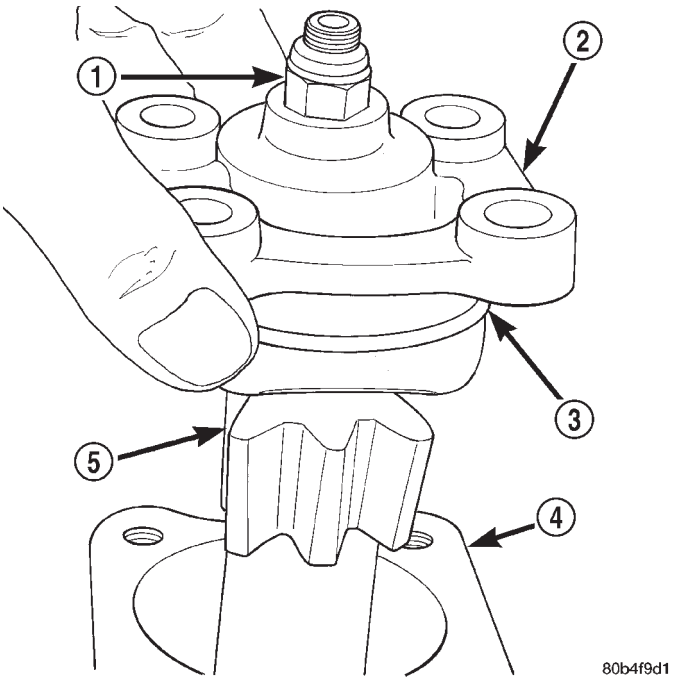


Fig. 6 Cover and Pitman Shaft

1 - ADJUSTER NUT
2 - PITMAN SHAFT COVER
3 - O-RING
4 - GEAR HOUSING
5 - PITMAN SHAFT

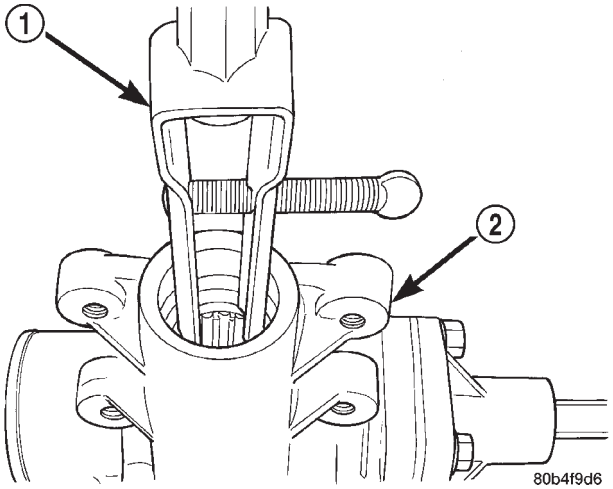


Fig. 7 Oil Seal Removal

1 - PULLER
2 - STEERING GEAR

INSTALLATION

(1) Install upper pitman shaft bearing, with Driver 8294 and Handle C-4171 (Fig. 10). Drive bearing into housing until the driver bottoms out.

NOTE: Install upper pitman shaft bearing with the part number/letters facing the driver.

PITMAN SHAFT (Continued)

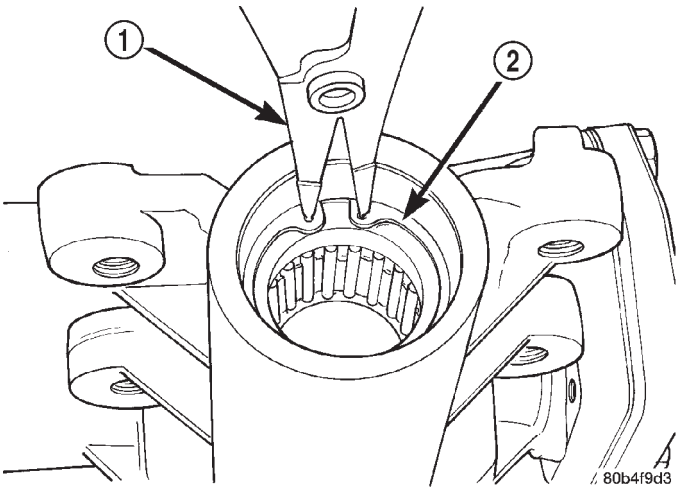


Fig. 8 Oil Seal Retaining Ring

1 - SNAP RING PLIERS
2 - RETAINING RING

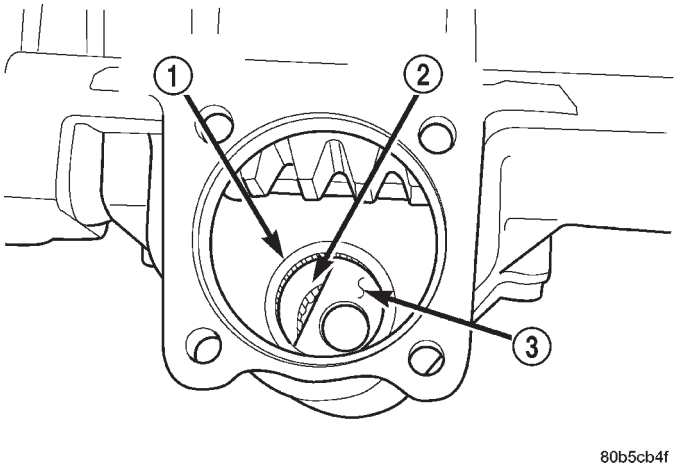


Fig. 9 Bearing Driver

1 - UPPER BEARING
2 - LOWER BEARING
3 - DRIVER

(2) Install lower pitman shaft bearing with the other side Driver 8294 and Handle C-4171 (Fig. 11). Drive bearing into housing until the bearing shoulder is seated against the housing.

(3) Coat the oil seal and backup washers with **special grease**supplied with the new seal.

(4) Install the oil seal with Driver 8294 and Handle C-4171.

(5) Install plastic backup washer.

NOTE: The plastic backup washer has a lip on the inside diameter that faces down towards the oil seal.

(6) Install metal backup washer.

(7) Install the retainer ring with snap ring pliers.

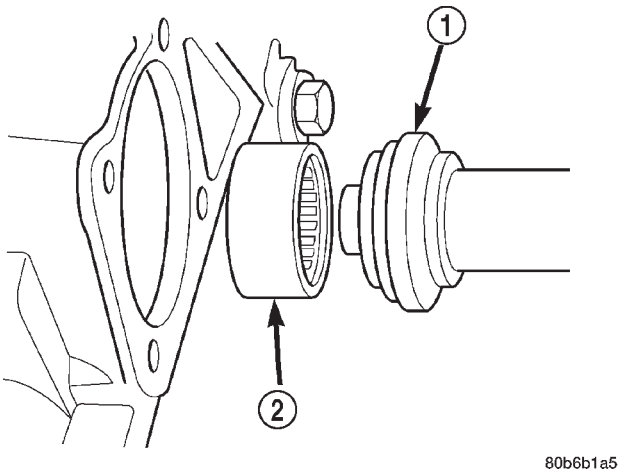


Fig. 10 Upper Pitman Shaft Bearing

1 - DRIVER
2 - UPPER BEARING

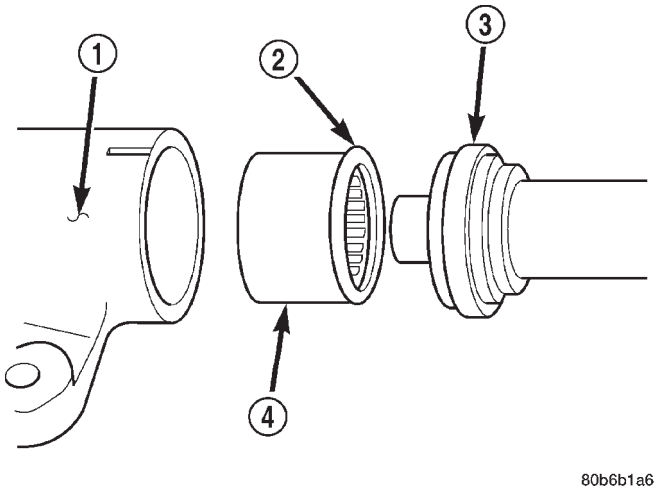


Fig. 11 Lower Pitman Shaft Bearing

1 - STEERING GEAR
2 - BEARING SHOULDER
3 - DRIVER
4 - LOWER BEARING

(8) Coat the dust seal with **special grease** supplied with the new seal.

(9) Install dust seal with Driver 8294 and Handle C-4171.

(10) Install new pitman shaft cover o-ring.

(11) Install pitman shaft assembly into the housing.

(12) Install cover bolts and tighten to 62 N·m (46 ft. lbs.).

(13) Perform over-center rotation torque adjustment.

PITMAN SHAFT BEARING

REMOVAL

(1) Clean exposed end of pitman shaft and housing with a wire brush.

(2) Rotate the stub shaft with a wrench (Fig. 5)from stop to stop and count the number of turns.

(3) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

NOTE: The pitman shaft will not clear the housing if it is not centered.

(4) Remove pitman shaft cover bolts and remove the shaft assembly (Fig. 6).

(5) Remove pitman shaft cover o-ring.

(6) Remove pitman shaft dust seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(7) Remove the pitman shaft oil seal retaining ring with snap ring pliers (Fig. 8).

(8) Remove oil seal metal backup washer then plastic backup washer from the housing (Fig. 12).

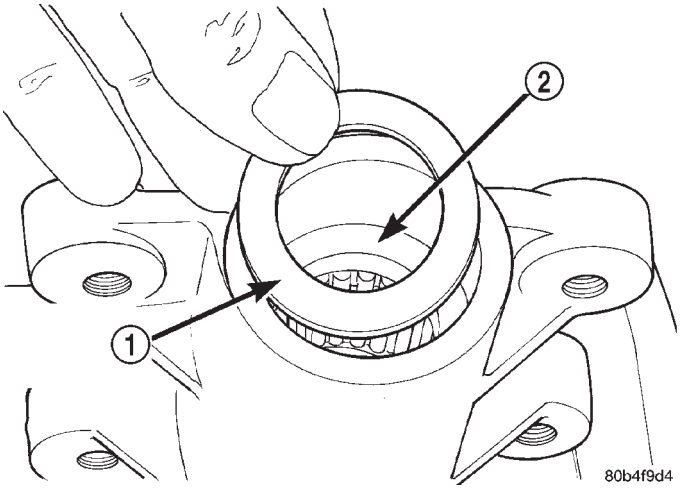


Fig. 12 Backup Washers

1 - METAL BACK UP WASHER
2 - PLASTIC BACK UP WASHER

(9) Remove pitman shaft oil seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(10) Drop Driver 8277 through the top bearing and align the driver up with the lower bearing. (Fig. 9). Install Handle C-4171 into the driver and remove the lower bearing.

(11) Turn the gear over and remover the upper bearing with Driver 8277 and Handle C-4171.

INSTALLATION

(1) Install upper pitman shaft bearing, with Driver 8294 and Handle C-4171 (Fig. 10). Drive bearing into housing until the driver bottoms out.

NOTE: Install upper pitman shaft bearing with the part number/letters facing the driver.

(2) Install lower pitman shaft bearing with the other side Driver 8294 and Handle C-4171 (Fig. 11). Drive bearing into housing until the bearing shoulder is seated against the housing.

(3) Coat the oil seal and backup washers with **special grease**supplied with the new seal.

(4) Install the oil seal with Driver 8294 and Handle C-4171.

(5) Install plastic backup washer.

NOTE: The plastic backup washer has a lip on the inside diameter that faces down towards the oil seal.

(6) Install metal backup washer.

(7) Install the retainer ring with snap ring pliers.

(8) Coat the dust seal with **special grease** supplied with the new seal.

(9) Install dust seal with Driver 8294 and Handle C-4171.

(10) Install new pitman shaft cover o-ring.

(11) Install pitman shaft assembly into the housing.

(12) Install cover bolts and tighten to 62 N·m (46 ft. lbs.).

(13) Perform over-center rotation torque adjustment.

PITMAN SHAFT SEAL

REMOVAL

(1) Clean exposed end of pitman shaft and housing with a wire brush.

(2) Rotate the stub shaft with a wrench (Fig. 5)from stop to stop and count the number of turns.

(3) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

NOTE: The pitman shaft will not clear the housing if it is not centered.

(4) Remove pitman shaft cover bolts and remove the shaft assembly (Fig. 6).

(5) Remove pitman shaft cover o-ring.

(6) Remove pitman shaft dust seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(7) Remove the pitman shaft oil seal retaining ring with snap ring pliers (Fig. 8).

(8) Remove oil seal metal backup washer then plastic backup washer from the housing (Fig. 12).

PITMAN SHAFT SEAL (Continued)

(9) Remove pitman shaft oil seal from the housing with a Puller 7794-A and Slide Hammer C-637 (Fig. 7).

(10) Drop Driver 8277 through the top bearing and align the driver up with the lower bearing. (Fig. 9). Install Handle C-4171 into the driver and remove the lower bearing.

(11) Turn the gear over and remover the upper bearing with Driver 8277 and Handle C-4171.

INSTALLATION

(1) Install upper pitman shaft bearing, with Driver 8294 and Handle C-4171 (Fig. 10). Drive bearing into housing until the driver bottoms out.

NOTE: Install upper pitman shaft bearing with the part number/letters facing the driver.

(2) Install lower pitman shaft bearing with the other side Driver 8294 and Handle C-4171 (Fig. 11). Drive bearing into housing until the bearing shoulder is seated against the housing.

(3) Coat the oil seal and backup washers with **special grease**supplied with the new seal.

(4) Install the oil seal with Driver 8294 and Handle C-4171.

(5) Install plastic backup washer.

NOTE: The plastic backup washer has a lip on the inside diameter that faces down towards the oil seal.

(6) Install metal backup washer.

(7) Install the retainer ring with snap ring pliers.

(8) Coat the dust seal with **special grease** supplied with the new seal.

(9) Install dust seal with Driver 8294 and Handle C-4171.

(10) Install new pitman shaft cover o-ring.

(11) Install pitman shaft assembly into the housing.

(12) Install cover bolts and tighten to 62 N·m (46 ft. lbs.).

(13) Perform over-center rotation torque adjustment.

RACK PISTON/VALVE ASSEMBLY

REMOVAL

(1) Remove the steering gear (Refer to 19 - STEERING/GEAR - REMOVAL).

(2) Clean exposed end of pitman shaft and housing with a wire brush.

(3) Rotate the stub shaft with a wrench (Fig. 5)from stop to stop and count the number of turns.

(4) Center the stub shaft by rotating it from the stop 1/2 of the total amount of turns.

NOTE: The pitman shaft will not clear the housing if it is not centered.

(5) Remove pitman shaft cover bolts and remove the shaft assembly (Fig. 6).

(6) Remove the pitman shaft cover o-ring.

(7) Remove stub shaft housing bolts (Fig. 13).

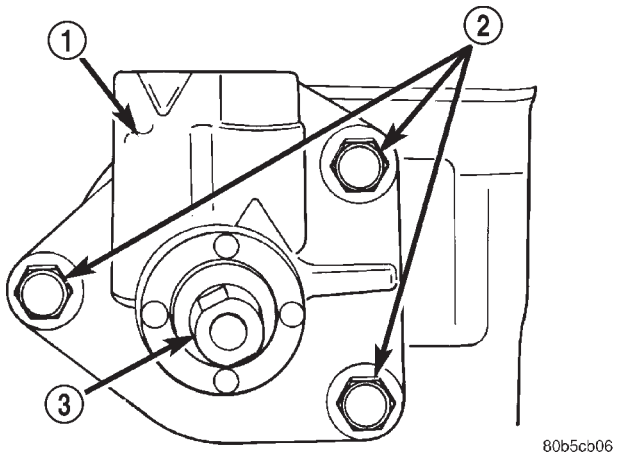


Fig. 13 Stub Shaft Housing

1 - STUB SHAFT HOUSING
2 - BOLTS
3 - STUB SHAFT

(8) Remove the housing from the stub shaft (Fig. 14).

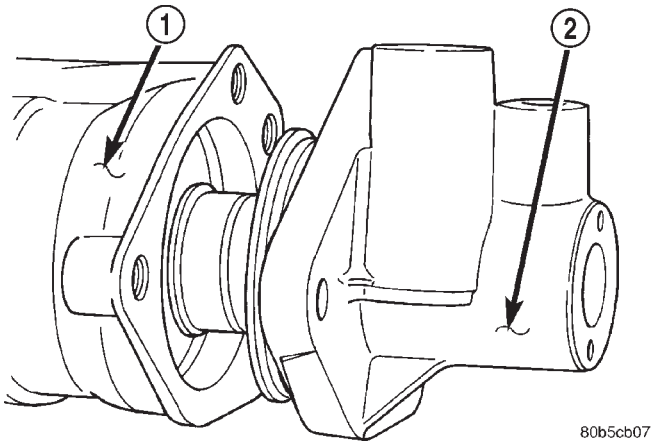


Fig. 14 Housing Removal

1 - STEERING GEAR
2 - STUB SHAFT HOUSING

RACK PISTON/VALVE ASSEMBLY (Continued)

(9) Remove stub shaft housing o-rings (Fig. 15).

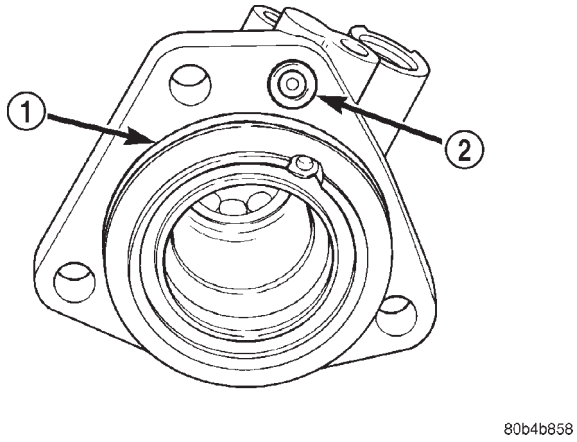


Fig. 15 O-Rings

1 - LARGE O-RING
2 - SMALL O-RING

(10) Remove the rack piston/valve assembly retaining ring with snap ring pliers (Fig. 16).

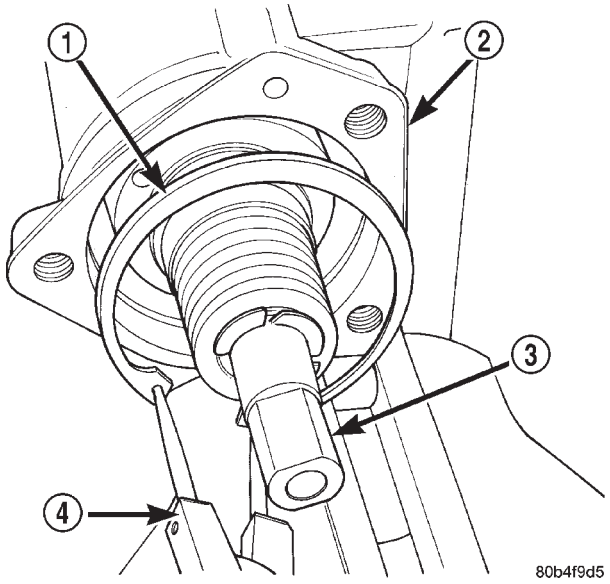


Fig. 16 Retaining Ring

1 - SNAP RING
2 - STUB SHAFT HOUSING
3 - STUB SHAFT
4 - SNAP RING PLIERS

(11) Pull the rack piston/valve assembly out of the gear housing (Fig. 17).

NOTE: If the rack piston is damage the gear assembly must be replaced.

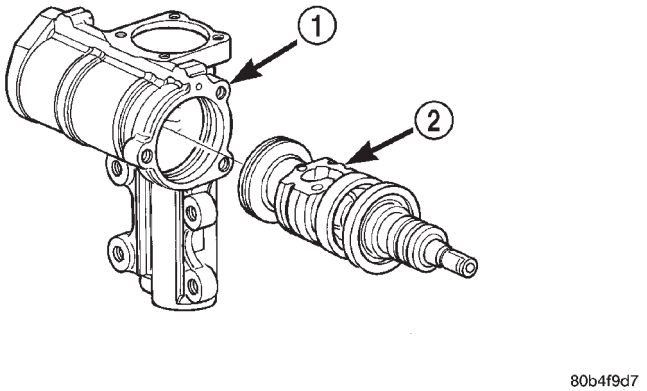


Fig. 17 Rack Piston/Valve Assembly

1 - STEERING GEAR
2 - RACK PISTON/VALVE ASSEMBLY

(12) Remove teflon rings and o-ring (Fig. 18) from the rack piston/valve assembly.

CAUTION: The rack piston teflon ring and o-ring must be replaced whenever the assembly is removed from the housing.

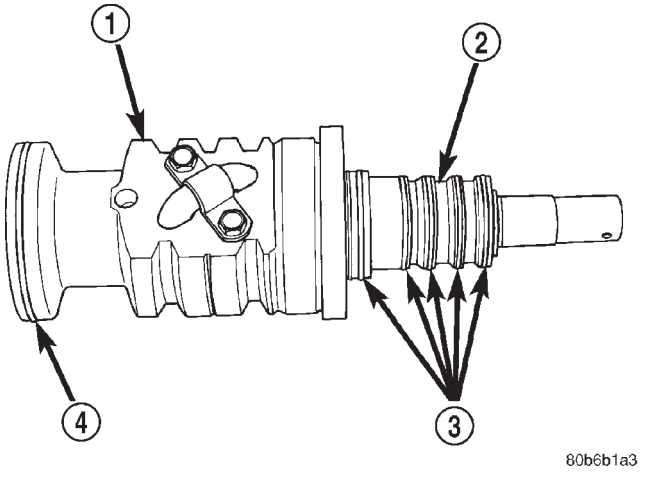


Fig. 18 Teflon Rings And O-Ring

1 - RACK PISTON
2 - VALVE
3 - TEFLON RINGS
4 - TEFLON AND O-RING

RACK PISTON/VALVE ASSEMBLY (Continued)

INSTALLATION

(1) Lubricate new o-ring and teflon rings with power steering fluid and install on the rack piston/valve assembly.
(2) Lubricate the rack piston/valve assembly with power steering fluid.
(3) Slide the assembly into the gear housing.
(4) Install new stub shaft housing o-rings and install the housing. Tighten the housing bolts to 62 N·m (46 ft. lbs.).
(5) Install new o-ring on the pitman shaft cover.
(6) Install the pitman shaft into the gear housing.
(7) Install the pitman shaft cover bolts and tighten to 62 N·m (46 ft. lbs.).
(8) Perform over-center rotation torque adjustment (Refer to 19 - STEERING/GEAR - ADJUSTMENTS)..
(9) Install the steering gear (Refer to 19 - STEERING/GEAR - INSTALLATION).
(10) Fill the power steering pump (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

STUB SHAFT HOUSING

REMOVAL

NOTE: If stub shaft housing, seal or bearing is damaged the housing must be replaced.

(1) Remove the steering gear (Refer to 19 - STEERING/GEAR - REMOVAL).
(2) Remove stub shaft housing bolts (Fig. 19).
(3) Remove housing from the steering gear (Fig. 20).
(4) Remove stub shaft housing o-rings (Fig. 15).

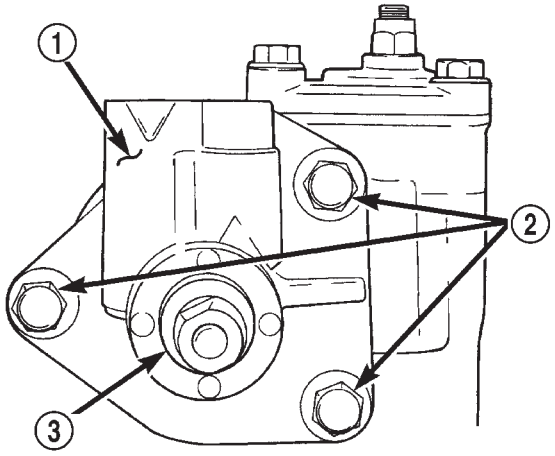


Fig. 19 Stub Shaft Housing

1 - STUB SHAFT HOUSING
2 - BOLTS
3 - STUB SHAFT

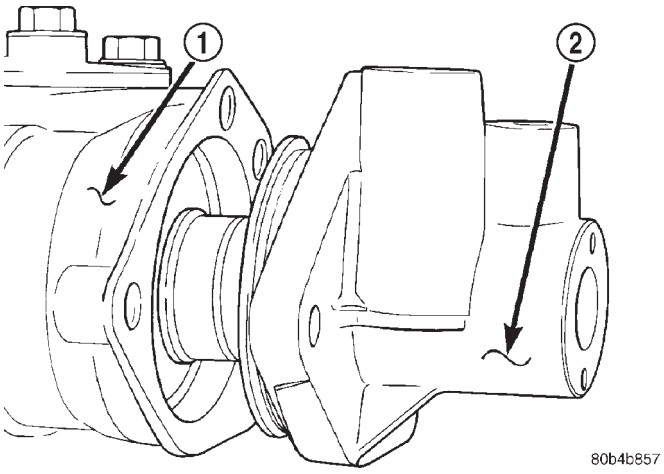


Fig. 20 Housing Removal

1 - STEERING GEAR
2 - HOUSING

INSTALLATION

NOTE: If stub shaft housing, seal or bearing is damaged the housing must be replaced.

(1) Grease stub shaft seal with **special grease**-supplied with new stub shaft housing.
(2) Install new stub shaft housing o-rings.
(3) Install housing on the steering gear.
(4) Install the housing bolts and tighten to 62 N·m (46 ft. lbs.).
(5) Install the steering gear (Refer to 19 - STEERING/GEAR - INSTALLATION).
(6) Fill the power steering pump (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

LINKAGE

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LINKAGE

DESCRIPTION

STEERING LINKAGE – RIGHT HAND DRIVE (RHD) VEHICLES

Vehicles equipped with right hand drive (RHD) steering utilize the same components of left hand drive vehicles. The RHD Steering linkage is designed as a mirror image of left hand drive linkage with the exception of the steering damper (Fig. 1), which is mounted on the same side of the vehicle weather RHD or LHD. See figure below for reference. All specifications are the same as LHD. Refer to Group 19, Steering of the gasoline engine service manual for additional information.

DESCRIPTION

The steering linkage consists of a pitman arm, drag link, tie rod, and steering dampener (Fig. 2) . An adjustment sleeve on the tie rod is used to set wheel toe position. The sleeve on the drag link is used for steering wheel centering.

CAUTION: If any steering components are replaced or serviced an alignment must be performed, to ensure the vehicle meets all alignment specifications.

CAUTION: Components attached with a nut and cotter pin must be torqued to specification. Then if the slot in the nut does not line up with the cotter pin hole, tighten nut until it is aligned. Never loosen the nut to align the cotter pin hole.

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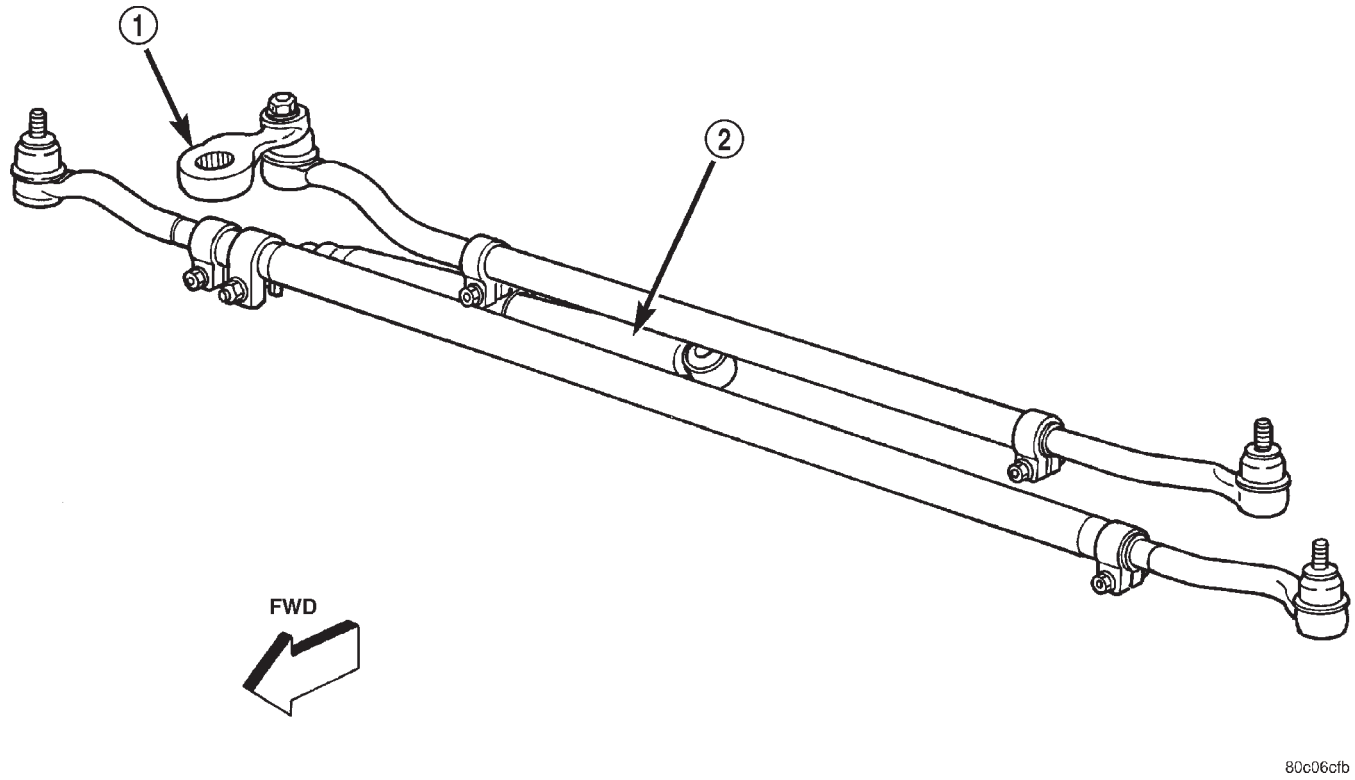


Fig. 1 Right Hand Drive Steering Linkage

1 - PITMAN ARM
2 - STEERING DAMPENER

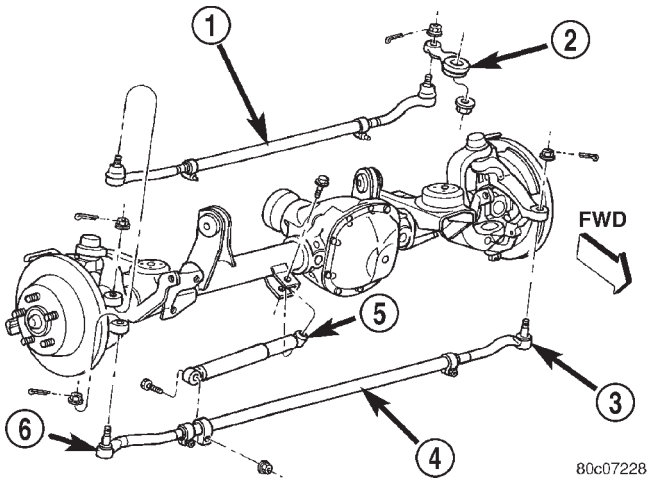


Fig. 2 Steering Linkage

1 - DRAG LINK
2 - PITMAN ARM
3 - TIE ROD END
4 - TIE ROD
5 - DAMPER
6 - TIE ROD END

LINKAGE (Continued)

SPECIFICATIONS

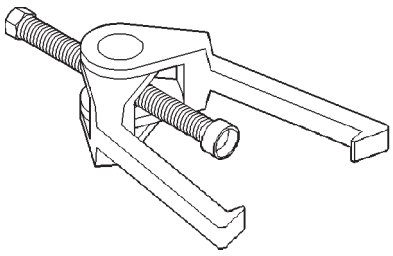
TORQUE CHART

TORQUE SPECIFICATIONS

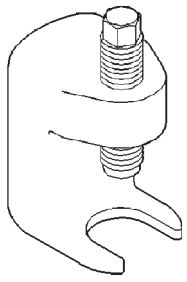
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Pitman Arm Shaft Nut	251	185	—
Drag Link Pitman Arm Nut	88	65	—
Drag Link Knuckle Nut	47	35	—
Drag Link Clamp Nuts	41	30	—
Tie Rod Knuckle Nut	47	35	—
Tie Rod Clamp Nuts	41	30	—
Steering Damper Axle Bolt	88	65	—
Steering Damper Tie Rod Nut	41	30	—

SPECIAL TOOLS

STEERING LINKAGE



Puller C-3894–A



Remover Pitman C-4150A

DAMPER

DESCRIPTION

The damper is mounted to the axle housing and the tie rod end. The damper consists of steel tube shock absorber with a permanent bushed end.

OPERATION

The steering damper provides steering system damping.

REMOVAL

(1) Remove the nut from the ball stud at the tie rod.

(2) Remove the steering damper from the tie rod.

(3) Remove the steering damper nut and bolt from the axle bracket (Fig. 3) .

DAMPER (Continued)

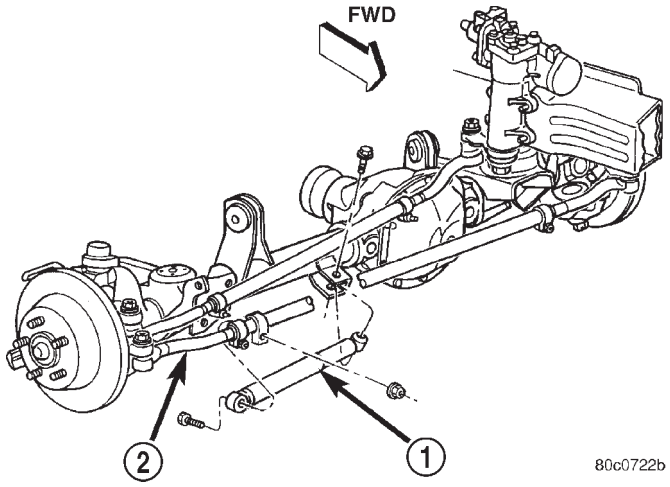


Fig. 3 Steering Damper

1 - DAMPER
2 - TIE ROD

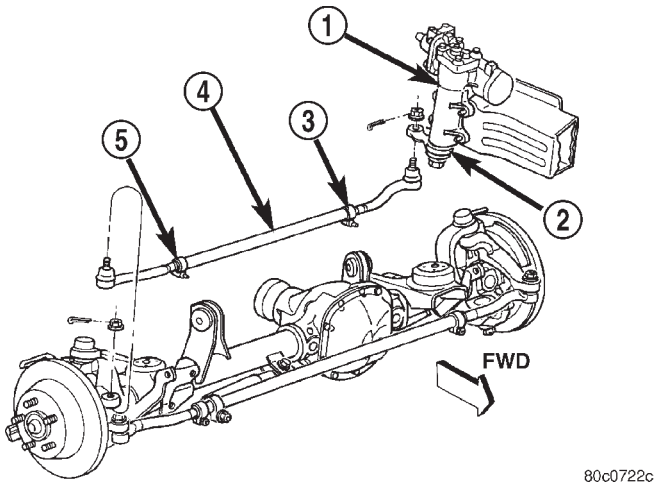


Fig. 4 Drag Link

1 - STEERING GEAR
2 - PITMAN ARM
3 - CLAMP
4 - DRAG LINK
5 - CLAMP

INSTALLATION

(1) Install the steering damper to the axle bracket and tie rod.

(2) Install the steering damper bolt in the axle bracket and tighten bolt to 88 N·m (65 ft. lbs.).

(3) Install the nut at the tie rod and tighten to 41 N·m (30 ft. lbs.).

DRAG LINK

DESCRIPTION

The drag link and ends are comprised of two forged ends connected by a steel adjusting tube. The drag link connects the steering gear pitman arm to the steering knuckle. The larger offset end is attached to the pitman arm.

OPERATION

The sleeve is used for steering wheel centering.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove right wheel and tire assembly.

(3) Remove the cotter pins and nuts at the right steering knuckle and pitman arm (Fig. 4) .

(4) Remove the drag link from the steering knuckle and pitman arm Puller C-3894-A.

(5) Loosen adjustment sleeve clamp bolts and unscrew the tie rod ends from the adjustment sleeve.

INSTALLATION

(1) Screw the tie rod ends into the adjustment sleeve.

(2) Install the drag link onto the right steering knuckle and pitman arm.

(3) Tighten the nut at the steering knuckle to 47 N·m (35 ft. lbs.). Tighten the pitman nut to 88 N·m (65 ft. lbs.). Install new cotter pins.

(4) Position clamp bolts to their original position and tighten to 41 N·m (30 ft. lbs.).

(5) Install right wheel and tire assembly.

(6) Remove support and lower the vehicle.

(7) Center the steering wheel.

PITMAN ARM

DESCRIPTION

The pitman arm is attached at one end of the steering gear's sector shaft. The other end is connected to the drag link.

OPERATION

The pitman arm transfers rotary motion into side to side motion.

REMOVAL

(1) Remove the cotter pin and nut from the drag link at the pitman arm (Fig. 5) .

(2) Remove the drag link ball stud from the pitman arm with a puller.

(3) Remove the nut and washer from the steering gear shaft. Mark the pitman shaft and pitman arm for installation reference. Remove the pitman arm from steering gear with Puller C-4150A.

PITMAN ARM (Continued)

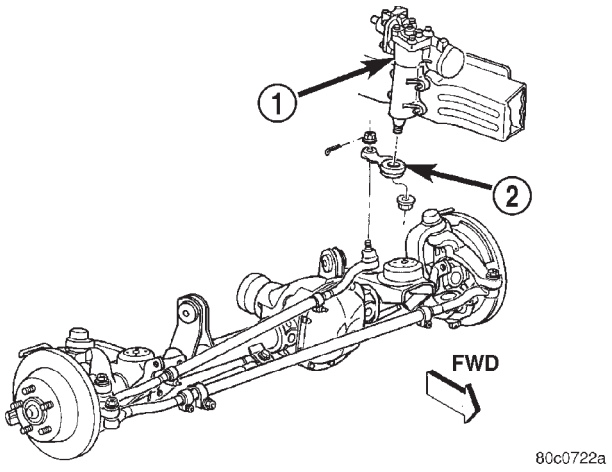


Fig. 5 Pitman Arm

1 - STEERING GEAR
2 - PITMAN ARM

INSTALLATION

(1) Align and install the pitman arm on steering gear shaft.

(2) Install the washer and nut on the shaft and tighten the nut to 251 N·m (185 ft. lbs.).

(3) Install drag link ball stud to pitman arm. Install nut and tighten to 88 N·m (65 ft. lbs.). Install a new cotter pin.

TIE ROD END

DESCRIPTION

The ends are forged, with a lubed for life ball socket.

OPERATION

The tie rod ends connect the drag link to the wheel assembly. The tie rod provides toe alignment and transfers steering input from the drag link to the wheels.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove the damper nut from the tie rod clamp (Fig. 6).

(4) Remove the damper from the tie rod.

(5) Remove the cotter pins and nuts from the tie rod ends at the steering knuckles (Fig. 6).

(6) Remove the tie rod ends from the steering knuckles with Puller C-3894-A..

(7) Loosen the adjustment sleeve clamp bolts and unscrew the tie rod ends from the sleeve.

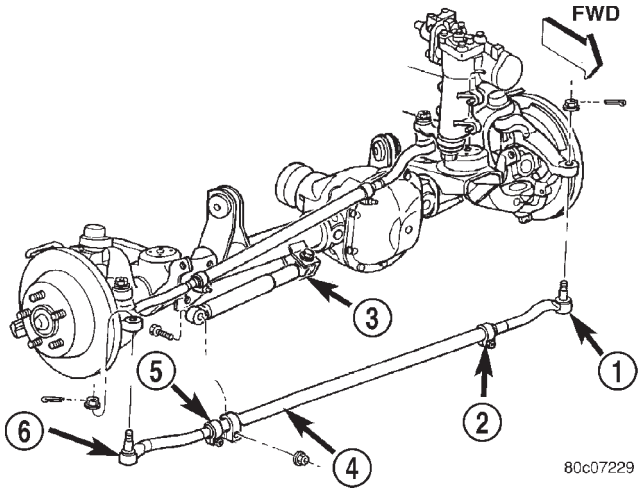


Fig. 6 Tie Rod Assembly

1 - TIE ROD END
2 - CLAMP
3 - DAMPER
4 - TIE ROD
5 - CLAMP
6 - TIE ROD END

INSTALLATION

(1) Screw the tie rod ends into the adjustment sleeve.

(2) Install the tie rod on the steering knuckles and install the nuts.

(3) Tighten the nuts to 47 N·m (35 ft. lbs.). Install new cotter pins and bend end 60°.

(4) Position the adjustment sleeve clamp bolts to their original location and tighten to 41 N·m (30 ft. lbs.).

(5) Install the damper on the tie rod and install the nut.

(6) Tighten the nut to 41 N·m (30 ft. lbs.). Install new cotter pins and bend end 60°.

(7) Install wheel and tire assemblies.

(8) Remove support and lower the vehicle.

(9) Perform toe position adjustment.

PUMP

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PUMP

DESCRIPTION - 4.0L, 4.7L

Hydraulic pressure for the power steering system is provided by a belt driven power steering pump (Fig. 1) and (Fig. 2). The pump shaft has a pressed-on drive pulley that is belt driven by the crankshaft pulley.

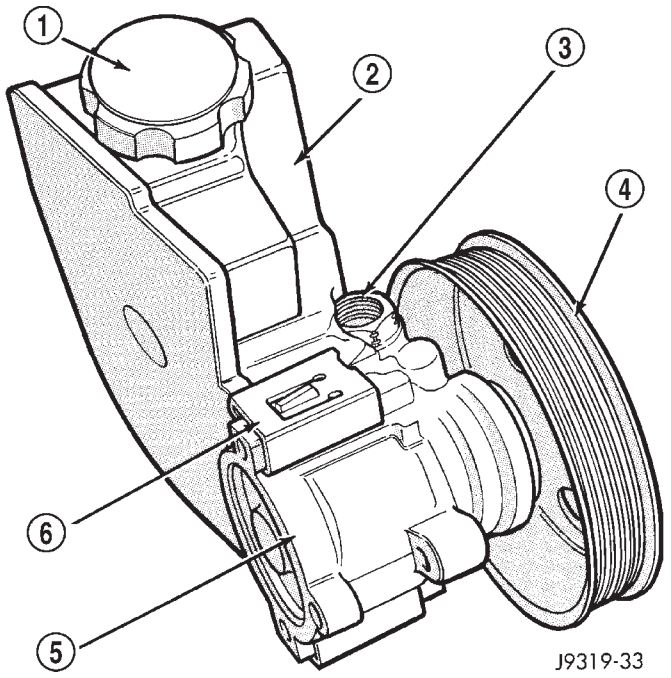


Fig. 1 Pump With Integral Reservoir

1 - CAP
2 - FLUID RESERVOIR (TYPICAL)
3 - HIGH-PRESSURE FITTING
4 - DRIVE PULLEY
5 - PUMP BODY
6 - RESERVOIR CLIP

OPERATION

OPERATION - 4.7L

The power steering pump is a constant flow rate and displacement, vane-type pump. The pump has internal parts that operate submerged in fluid. The flow control orifice and the pressure relief valve, which limits the pump pressure, are internal to the pump. The reservoir is attached to the pump body with spring clips. The power steering pump is used to drive the hydraulic engine cooling fan, which separates the flow to the fan gerotors and the power steering gear. The power steering pump is connected to the engine cooling fan by pressure and return hoses and the pump is connected to the steering gear via a return hose from the steering cooler (Fig. 2).

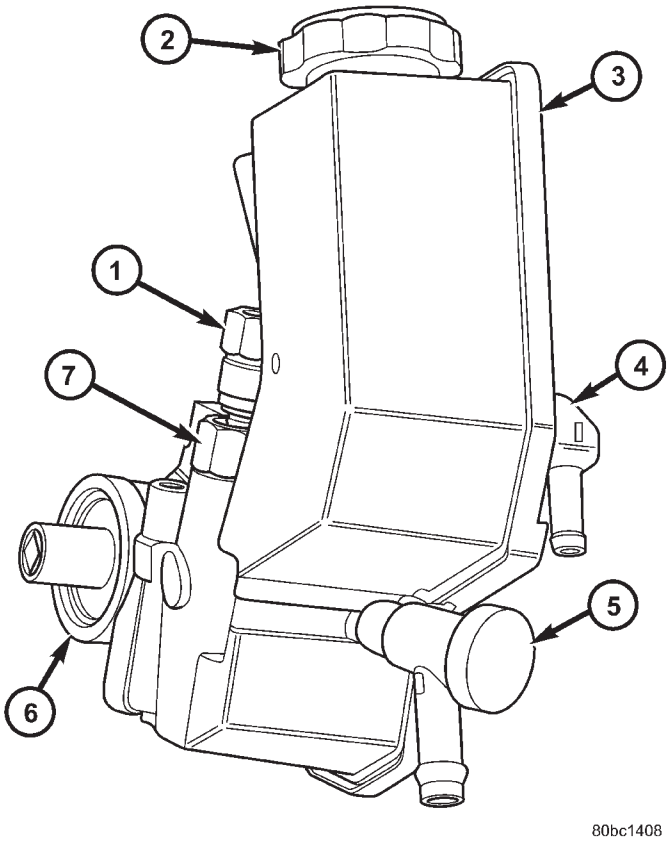


Fig. 2 4.7L POWER STEERING PUMP

1 - PRESSURE HOSE QUICK CONNECT NUT
2 - CAP
3 - FLUID RESERVOIR
4 - LOW-PRESSURE RETURN FROM THE COOLER
5 - LOW-PRESSURE RETURN FROM THE HYDRAULIC FAN DRIVE
6 - PUMP BODY
7 - HIGH PRESSURE FITTING

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

OPERATION - 4.0L

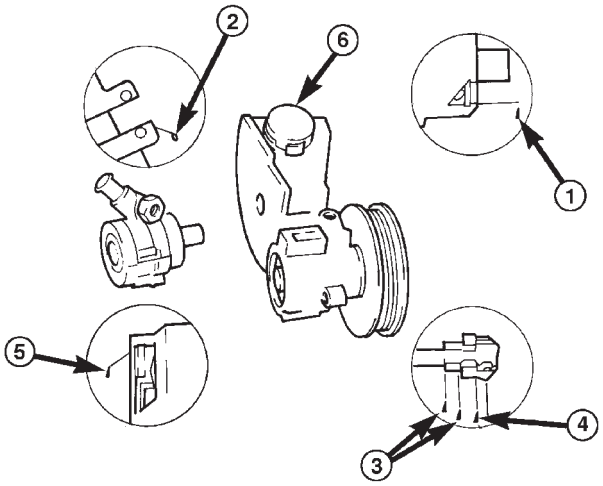
The power steering pump is a constant flow rate and displacement, vane-type pump. The pump internal parts operate submerged in fluid. The flow control orifice is part of the high pressure line fitting. The pressure relief valve inside the flow control valve limits the pump pressure. The reservoir is attached to the pump body with spring clips. The power steering pump is connected to the steering gear by the pressure and return hoses (Fig. 1).

NOTE: Power steering pumps have different pressure rates and are not interchangeable with other pumps.

PUMP (Continued)

DIAGNOSIS AND TESTING - PUMP LEAKAGE

(1) Possible areas of pump leakage (Fig. 3).



1. BUSHING (BEARING) WORN, SEAL WORN. REPLACE PUMP.
2. REPLACE RESERVOIR O-RING SEAL.
3. TORQUE HOSE FITTING NUT TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
4. TORQUE FITTING TO SPECIFICATIONS. IF LEAKAGE PERSISTS, REPLACE O-RING SEAL.
5. REPLACE PUMP.
6. CHECK OIL LEVEL: IF LEAKAGE PERSISTS WITH THE LEVEL CORRECT AND CAP TIGHT, REPLACE THE CAP.

80a1c3c3

Fig. 3 4.0L Power Steering Pump

STANDARD PROCEDURE

STANDARD PROCEDURE - INITIAL OPERATION - 4.0L

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

CAUTION: Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal ambient temperature.

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two minutes.

(2) Start the engine and let run for a few seconds then turn engine off.

(3) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(4) Raise the front wheels off the ground.

(5) Slowly turn the steering wheel right and left, lightly contacting the wheel stops at least 20 times.

(6) Check the fluid level add if necessary.

(7) Lower the vehicle, start the engine and turn the steering wheel slowly from lock to lock.

(8) Stop the engine and check the fluid level and refill as required.

(9) If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

STANDARD PROCEDURE - INITIAL OPERATION - 4.7L

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

NOTE: Remove as much of the old fluid out of the system as possible with a suction tool or by removing a hose, When a component has failed. Then refill it with fresh fluid until it is clean. This may have to be done more than once.

CAUTION: Use MOPAR Power Steering Fluid or equivalent. Do not use automatic transmission fluid and do not overfill.

Wipe filler cap clean, then check the fluid level. The dipstick should indicate **COLD** when the fluid is at normal ambient temperature.

(1) Fill the pump fluid reservoir to the proper level and let the fluid settle for at least two minutes.

(2) Start the engine and let run for a few seconds then turn engine off.

(3) Add fluid if necessary. Repeat the above procedure until the fluid level remains constant after running the engine.

(4) Raise the front wheels off the ground.

(5) Slowly turn the steering wheel right and left, lightly contacting the wheel stops at least 20 times.

(6) Check the fluid level add if necessary.

(7) Lower the vehicle, start the engine, and use the DRB III to activate the hydraulic fan on full fan operation.

(8) Turn the steering wheel slowly from lock to lock.

(9) Stop the engine, check the fluid level and refill as required and repeat the process

CAUTION: Do not run a vehicle with foamy fluid for an extended period. This may cause pump damage.

(10) If the fluid is extremely foamy or milky looking, allow the vehicle to stand a few minutes and repeat the procedure.

PUMP (Continued)

(11) While the vehicle is in park, use the DRB III to activate the hydraulic fan to full fan operation and briefly rev the engine up to 3000 rpm to fully engage the hydraulic fan.

(12) Check the fluid level add if necessary.

REMOVAL

REMOVAL - 4.0L ENGINE

(1) Remove serpentine drive belt,(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove pressure and return hoses from pump and drain the pump.

(3) Loosen the pump bracket bolt at the engine block.

(4) Remove 3 pump mounting bolts (Fig. 4) through pulley access holes.

(5) Tilt pump downward and remove from engine.

(6) Remove pulley from pump.

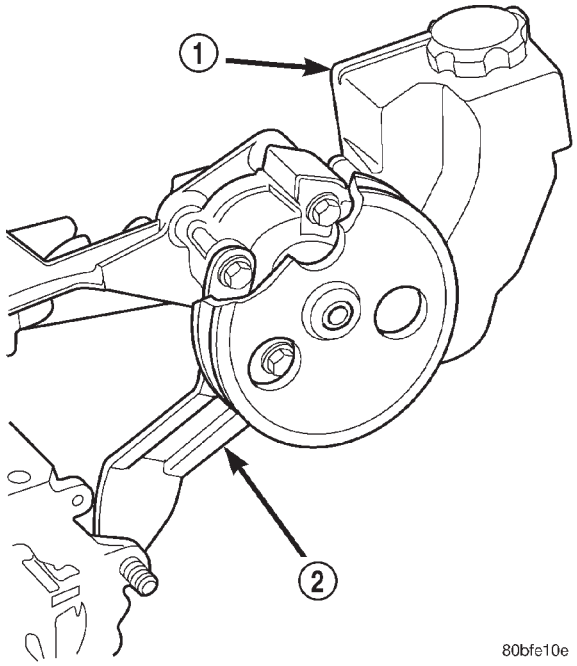


Fig. 4 PUMP MOUNTING – 4.0L

1 - PUMP ASSEMBLY
2 - PUMP BRACKET

REMOVAL - 4.7L ENGINE

(1) Remove the serpentine drive belt,(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(2) Remove the pressure and return hoses from pump and drain pump.

(3) Remove 3 pump mounting bolts through pulley access holes (Fig. 5).

(4) Remove the pump from the vehicle.

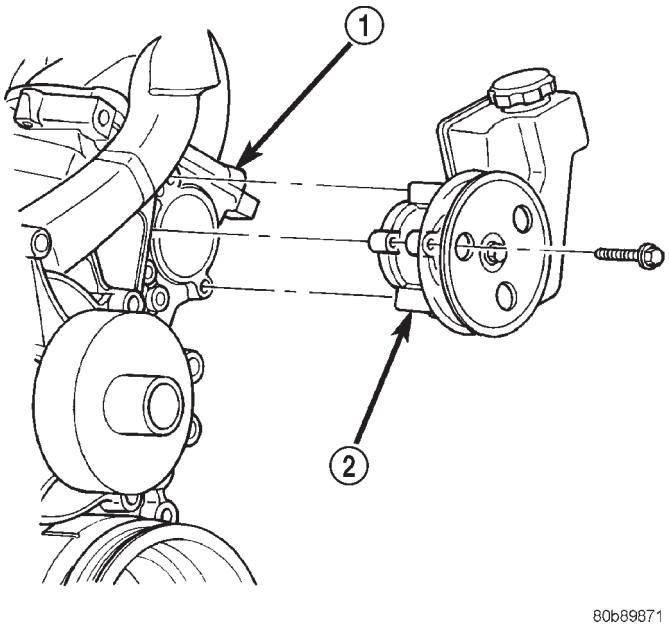


Fig. 5 Pump Mounting

1 - LEFT CYLINDER HEAD
2 - PUMP

INSTALLATION

INSTALLATION - 4.0L ENGINE

(1) Install pulley on pump.

(2) Install pump on the engine mounting bracket.

(3) Install 3 pump mounting bolts and tighten to 27 N·m (20 ft. lbs.).

(4) Tighten pump bracket bolt to 57 N·m (42 ft. lbs.).

(5) Install the pressure line on the pump and tighten to 28 N·m (21 ft. lbs.).

(6) Install the return hoses on pump.

(7) Install the drive belt,(Refer to 7 - COOLING/ ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(8) Add power steering fluid,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 4.7L ENGINE

(1) Position the pump on the left cylinder head and install bolts through pulley access holes. Tighten bolts to 28 N·m (21 ft. lbs.).

(2) Install the pressure and return hoses to pump.

(3) Install serpentine drive belt,(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(4) Add power steering fluid,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

PUMP (Continued)

SPECIFICATIONS

TORQUE CHART

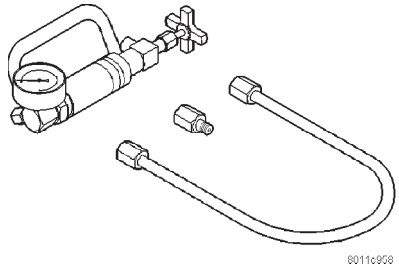
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Power Steering Pump Bracket Bolt-4.0L	57	42	—
Power Steering Pump Pump Bolts-4.0L	28	21	250
Power Steering Pump Pump Bolts-4.7L	28	21	250
Power Steering Pump Flow Control Valve	75	55	—
Power Steering Pump Pressure Line 4.0L	20-38	14-28	—
Power Steering Pump Pressure Line 4.7L	47	35	416
Power Steering Pump Return Line 4.0L & 4.7L	20-38	14-28	—
High Pressure Inlet Hose to Hydraulic Fan Drive—1/2 inch Fitting	49	36	—
High Pressure Outlet Hose to Steering Gear—3/8 inch Fitting	29	21.5	—
Power Steering Cooler Lines at the Cooler	22.5	17	200

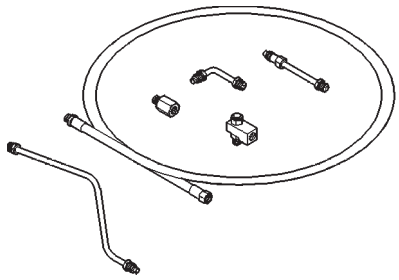
PUMP (Continued)

SPECIAL TOOLS

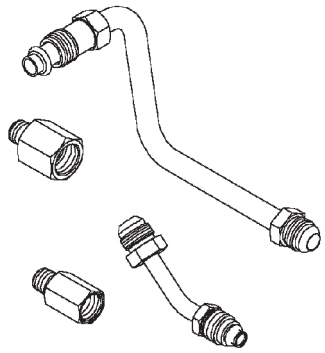
POWER STEERING PUMP



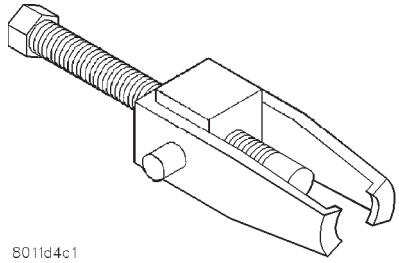
Analyzer Set, Power Steering Flow/Pressure 6815



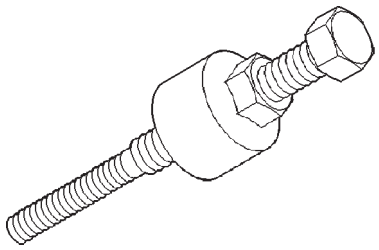
Adapters, Power Steering Flow/Pressure Tester 6893



4.7L HYDRAULIC POWER STEERING TEST ADAPTER KIT - 8630



Puller C-4333



Installer, Power Steering Pulley C-4063B

FLUID COOLER

DESCRIPTION

4.7L models of this vehicle are equipped with a cooler for the power steering system fluid. The power steering fluid cooler is located at the front of the vehicle. It is mounted to the radiator support just forward of the air-conditioning condenser and just rearward of the front fascia (Fig. 6). The cooler is positioned so it is in the air flow through the front fascia of the vehicle.

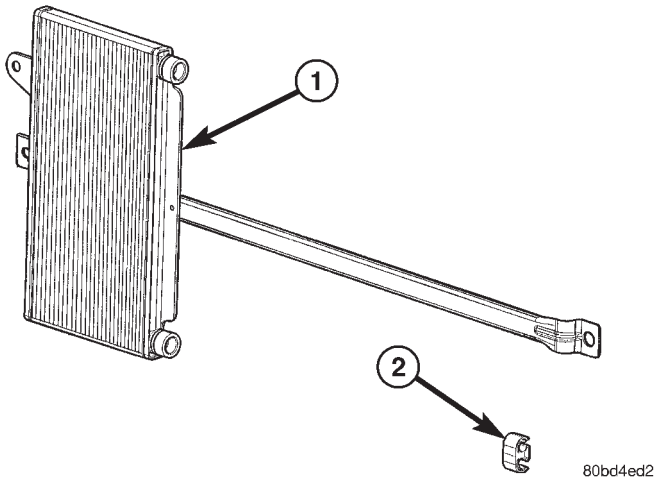


Fig. 6 POWER STEERING FLUID COOLER

1 - POWER STEERING COOLER
2 - POWER STEERING COOLER LINES CLIP

REMOVAL

(1) Disconnect negative battery cable at battery.
(2) Drain the power steering fluid out of the reservoir.
(3) Remove the front fascia grille assembly,(Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(4) Remove the grille opening reinforcement panel
(5) Place a drain pan under the cooler.
(6) Disconnect the lower hose at cooler (Fig. 6).
(7) Disconnect the upper hose at cooler (Fig. 6).
(8) Remove the three cooler mounting bolts (Fig. 6).
(9) Remove the cooler from the vehicle.

FLUID COOLER (Continued)

INSTALLATION

(1) Position and install the power steering cooler to the vehicle.

(2) Install the three mounting bracket bolts (Fig. 6).

(3) Reconnect the upper hose at cooler (Fig. 6).

(4) Reconnect the lower hose at cooler (Fig. 6).

(5) Connect negative battery cable to battery.

(6) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

(7) Start engine and check for leaks.

(8) Install the grille opening reinforcement panel

(9) Install the front fascia grille,(Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).

HOSES - 4.0L

DESCRIPTION

DESCRIPTION - PRESSURE LINE

The hose consists of two metal ends and rubber center section that contains a tuning cable. The pump end uses a quick connect fitting. Lubircation must be used on the quick connect nut and o-ring when installing.

DESCRIPTION - RETURN LINE

Power steering return line is a hose which is clamped at the pump and the gear.

OPERATION

OPERATION - PRESSURE LINE

Power steering pressure line, is used to transfer high pressure power steering fluid, from the power steering pump to the power steering gear on the 4.0L. The 4.7L power steering pressure line, is used to transfer high pressure power steering fluid, from the power steering pump to the engine cooling fan and the steering gear.

OPERATION - RETURN LINE

Power steering return line, is used to transfer low pressure power steering fluid, from the power steering gear to the power steering pump.

REMOVAL

(1) Drain the power steering fluid from the reservoir.

(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).

(3) Disconnect the power steering pressure hose from the power steering pump and then the power steering gear (Fig. 7).

(4) Disconnect the power steering return hose from the power steering cooler and the reservoir.

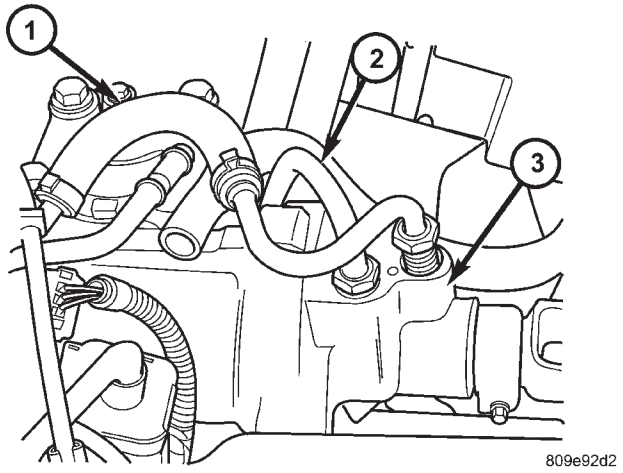


Fig. 7 POWER STEERING HOSES

1 - RETURN HOSE
2 - HIGH PRESSURE HOSE
3 - STEERING GEAR

(5) Remove the hoses from the vehicle.

INSTALLATION

(1) Install the hoses to the vehicle.

(2) Reconnect the power steering return hose to the power steering cooler and the reservoir.

(3) Reconnect the power steering pressure hose to the power steering pump and then the power steering gear.

(4) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).

(5) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

HOSES - 4.7L

DESCRIPTION

DESCRIPTION - 1/2" PRESSURE HOSE

The hose consists of two metal ends and a rubber center with quick connect nuts at both ends. The hose connects the power steering pump to the hydraulic fan motor and is clipped to the fan shroud (Fig. 8). Lubrication must be used on the quick connect nuts and o-rings when installing.

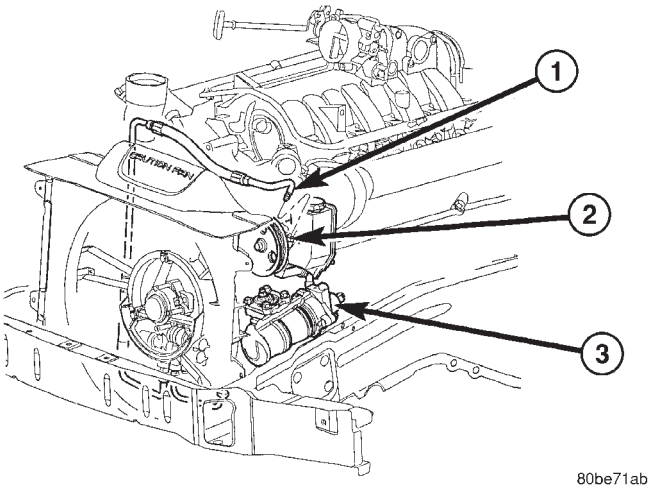


Fig. 8 1/2" PRESSURE HOSE

1 - 1/2" PRESSURE HOSE
2 - POWER STEERING PUMP
3 - STEERING GEAR

DESCRIPTION - 1/2" RETURN HOSE

The fan motor return line is a molded rubber hose that is clamped at the hydraulic motor and the power steering reservoir (Fig. 9).

DESCRIPTION - 3/8" PRESSURE HOSE

The hose consists of two metal ends and two rubber sections one of which contains a tuning cable (Fig. 10). The hose is clipped in two places to the fan shroud. Lubrication must be used on the o-rings when installing.

DESCRIPTION - 3/8" GEAR OUTLET HOSE

The gear outlet line consists of a metal section that connects to the gear and a rubber section that clamps to the steering cooler inlet tube (Fig. 11).

DESCRIPTION - 3/8" RETURN HOSE

The return hose is a formed rubber hose that connects the steering cooler outlet tube to the power steering reservoir (Fig. 12). It is clamped at both ends.

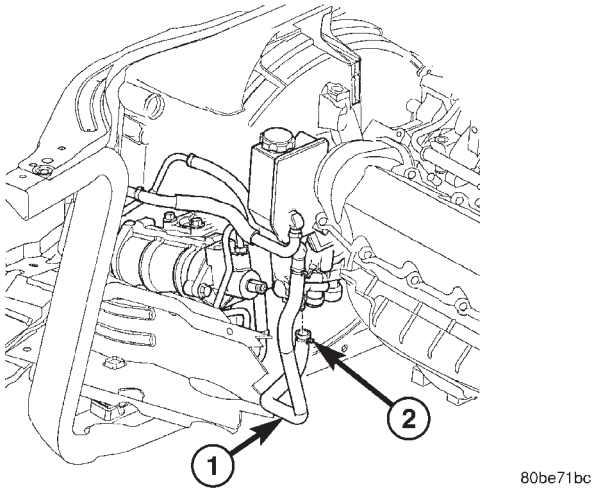


Fig. 9 1/2" RETURN HOSE

1 - 1/2" RETURN HOSE
2 - HOSE CLAMP

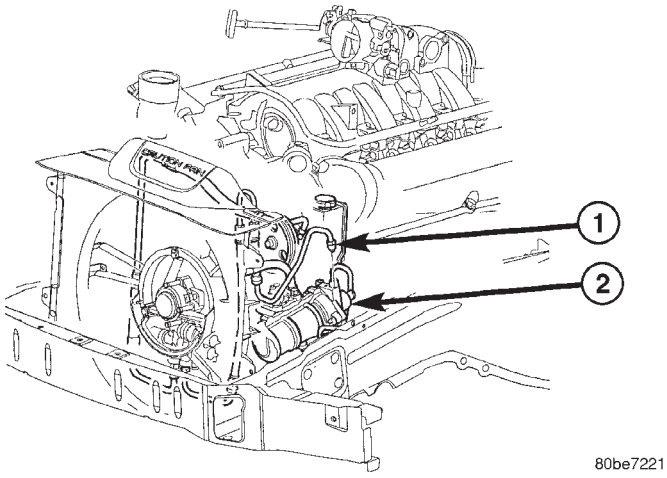


Fig. 10 3/8" PRESSURE HOSE

1 - 3/8" PRESSURE HOSE
2 - STEERING GEAR

OPERATION

OPERATION - 1/2" PRESSURE HOSE

The 1/2" pressure hose is used to transfer high pressure power steering fluid from the power steering pump to the engine cooling fan motor (Fig. 8).

OPERATION - 1/2" RETURN HOSE

The power steering return line returns low pressure excess flow from the hydraulic fan motor back to the power steering pump (Fig. 9).

HOSES - 4.7L (Continued)

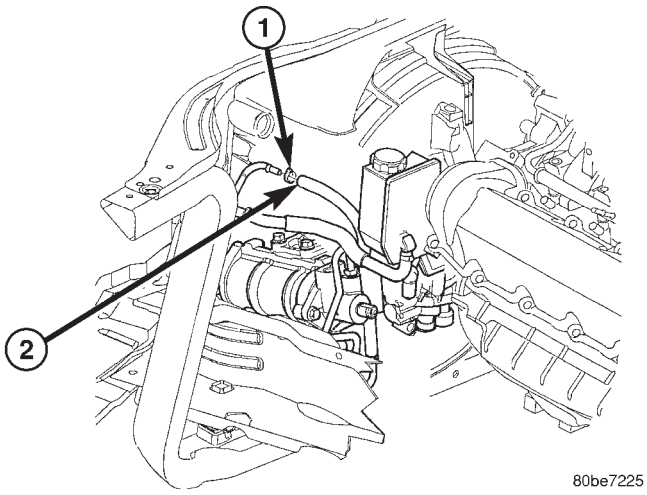


Fig. 11 3/8″ GEAR OUTLET HOSE

1 - HOSE CLAMP
2 - 3/8″ GEARR OUTLET HOSE

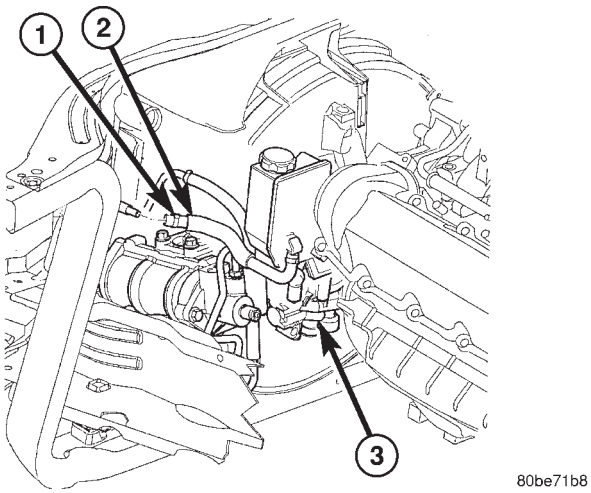


Fig. 12 3/8″ RETURN HOSE

1 - HOSE CLAMP
2 - 3/8″ RETURN HOSE
3 - HYDRAULIC COOLING FAN MOTOR

OPERATION - 3/8” PRESSURE HOSE

High pressure power steering fluid is transmitted from the hydraulic fan motor to the steering gear by the 3/8” steering line.

OPERATION - 3/8” GEAR OUTLET HOSE

The gear outlet hose transmits power steering fluid under moderate low pressure to the power steering cooler inlet tube.

OPERATION - 3/8”RETURN HOSE

Low pressure power steering fluid is transmitted from the steering cooler back to the power steering pump by the 3/8” return hose.

REMOVAL

REMOVAL - 1/2″ PRESSURE HOSE

(1) Drain the power steering fluid from the reservoir.
(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(3) Raise and support the vehicle.
(4) Remove the metal skid plate.
(5) Disconnect the high pressure hose from the hydraulic fan motor (Fig. 8).
(6) Disconnect the high pressure hose from the power steering pump (Fig. 8).
(7) Remove the hose from the clipped position on the fan shroud.
(8) Remove the hose from the vehicle.

REMOVAL - 1/2″ RETURN HOSE

(1) Drain the power steering fluid from the reservoir.
(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(3) Raise and support the vehicle.
(4) Remove the metal skid plate.
(5) Disconnect the rubber return hose from the hydraulic fan motor (Fig. 9).
(6) Disconnect the rubber return hose from the power steering reservoir .
(7) Remove the hose from the vehicle.

REMOVAL - 3/8″ PRESSURE HOSE

(1) Drain the power steering fluid from the reservoir.
(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(3) Raise and support the vehicle.
(4) Remove the metal skid plate.
(5) Disconnect the high pressure hose from the hydraulic fan motor (Fig. 10).
(6) Disconnect the high pressure hose from the power steering gear (Fig. 10).
(7) Remove the hose from the clipped position on the fan shroud.
(8) Remove the hose from the vehicle.

REMOVAL - 3/8″ RETURN HOSE

(1) Drain the power steering fluid from the reservoir.
(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(3) Raise and support the vehicle.
(4) Disconnect the rubber hose from the steering cooler outlet tube (Fig. 12).

HOSES - 4.7L (Continued)

(5) Disconnect the rubber hose from the power steering reservoir (Fig. 12).
(6) Remove the hose from the vehicle.

REMOVAL - 3/8″ GEAR OUTLET HOSE

(1) Drain the power steering fluid from the reservoir.
(2) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(3) Raise and support the vehicle.
(4) Disconnect the rubber hose from the steering cooler inlet tube (Fig. 11).
(5) Disconnect the metal tube from the power steering gear (Fig. 11).
(6) Remove the hose from the vehicle.

REMOVAL - INLET COOLER HOSE

(1) Disconnect negative battery cable at battery.
(2) Drain the power steering fluid out of the reservoir.
(3) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(4) Remove the front fascia grille assembly,(Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(5) Remove the grille opening reinforcement panel
(6) Place a drain pan under the cooler.
(7) Disconnect the lower hose at cooler (Fig. 6).
(8) Disconnect the cooler hose at the gear.
(9) Remove the bracket holding the cooler hoses (Fig. 13).
(10) Remove the cooler hose from the vehicle.

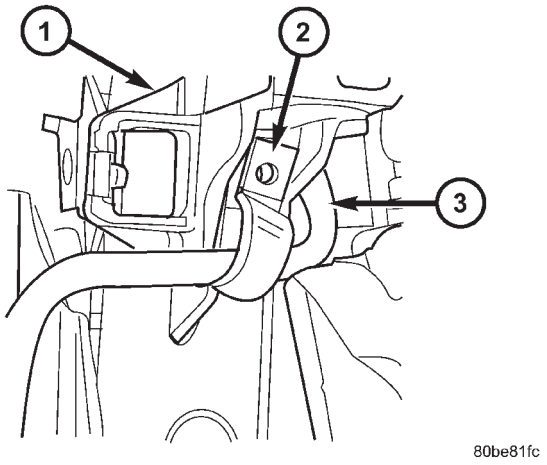


Fig. 13 COOLER HOSES MOUNTING BRACKET

1 - RADIATOR
2 - COOLER HOSES MOUNTING BRACKET
2 - COOLER HOSE

REMOVAL - OUTLET COOLER HOSE

(1) Disconnect negative battery cable at battery.
(2) Drain the power steering fluid out of the reservoir.
(3) Remove the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - REMOVAL).
(4) Remove the front fascia grille assembly,(Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(5) Remove the grille opening reinforcement panel
(6) Place a drain pan under the cooler.
(7) Disconnect the upper hose at cooler (Fig. 6).
(8) Disconnect the cooler hose at the reservoir.
(9) Remove the bracket holding the cooler hoses (Fig. 13).
(10) Remove the cooler hose from the vehicle.

INSTALLATION

INSTALLATION - 1/2″ PRESSURE HOSE

NOTE: Lubrication and a new o-ring must be used when reinstalling.

(1) Install the hoses to the vehicle.
(2) Reconnect the high pressure hose to the power steering pump (Fig. 8) Tighten the hose to 22.5 N·m (17 ft.lbs.).
(3) Reconnect the high pressure hose to the hydraulic fan motor (Fig. 8) Tighten the hose to 22.5 N·m (17 ft.lbs.).
(4) Install the hose to the clipped position on the fan shroud.
(5) Install the metal skid plate.
(6) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(7) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 1/2″ RETURN HOSE

(1) Install the hoses to the vehicle.
(2) Reconnect the rubber return hose to the power steering reservoir (Fig. 9) Tighten the hose clamp.
(3) Reconnect the rubber return hose to the hydraulic fan motor (Fig. 9) Tighten the hose.
(4) Install the metal skid plate.
(5) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(6) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

HOSES - 4.7L (Continued)

INSTALLATION - 3/8″ PRESSURE HOSE

NOTE: Lubrication and a new o-ring must be used when reinstalling.

(1) Install the hoses to the vehicle.
(2) Reconnect the high pressure hose to the hydraulic fan motor (Fig. 10) Tighten the hose to 22.5 N·m (17 ft.lbs.).
(3) Reconnect the high pressure hose to the power steering gear (Fig. 10) Tighten the hose to 22.5 N·m (17 ft.lbs.).
(4) Install the hose to the clipped position on the fan shroud.
(5) Install the metal skid plate.
(6) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(7) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 3/8″ RETURN HOSE

(1) Install the hoses to the vehicle.
(2) Reconnect the rubber hose to the steering cooler outlet tube (Fig. 12) Tighten the hose clamp.
(3) Reconnect the rubber hose to the power steering reservoir (Fig. 12) Tighten the hose clamp.
(4) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(5) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - 3/8″ GEAR OUTLET HOSE

NOTE: Lubrication and a new o-ring must be used when reinstalling.

(1) Install the hoses to the vehicle.
(2) Reconnect the rubber hose to the steering cooler inlet tube (Fig. 11) Tighten the hose clamp.
(3) Reconnect the metal tube to the power steering gear (Fig. 11) Tighten the hose to 22.5 N·m (17 ft.lbs.).
(4) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(5) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - INLET COOLER HOSE

(1) Install the cooler hose to the vehicle.
(2) Reconnect the cooler hose at the gear.
(3) Reconnect the lower hose at cooler (Fig. 6). Tighten the hose to 22.5 N·m (17 ft.lbs.)
(4) Install the bracket holding the cooler hoses (Fig. 13).
(5) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(6) Install the grille opening reinforcement panel
(7) Install the front fascia grille assembly, (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
(8) Reconnect negative battery cable at battery.
(9) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

INSTALLATION - OUTLET COOLER HOSE

(1) Install the cooler hose to the vehicle.
(2) Reconnect the cooler hose at the reservoir.
(3) Reconnect the upper hose at the cooler (Fig. 6). Tighten the hose to 22.5 N·m (17 ft. lbs.)
(4) Install the bracket holding the cooler hoses (Fig. 13). Tighten the bracket to 22.5 N·m (17 ft. lbs.)
(5) Install the air box,(Refer to 9 - ENGINE/AIR INTAKE SYSTEM/AIR CLEANER HOUSING - INSTALLATION).
(6) Install the grille opening reinforcement panel
(7) Install the front fascia grille assembly, (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).
(8) Reconnect negative battery cable at battery.
(9) Refill the power steering fluid and bleed the system,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

PULLEY

DESCRIPTION

POWER STEERING PUMP PULLEY - 3.1L DIESEL

To service the power steering pump pulley on the 3.1L turbo diesel engine. Refer to the power steering pump removal and installation procedure in this group. The pulley must be removed to service the pump assembly. Detailed instructions are provided in the pump procedure.

REMOVAL

CAUTION: On vehicles equipped with the 4.0L or 4.7L, Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

(1) Remove pump assembly.
(2) Remove pulley from pump with Puller C-4333 or equivalent puller (Fig. 14).

PULLEY (Continued)

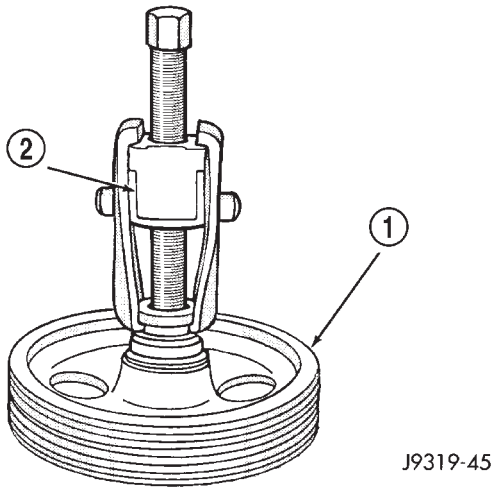


Fig. 14 Pulley Removal

1 - POWER STEERING PUMP DRIVE PULLEY
2 - SPECIAL TOOL C-4333

INSTALLATION

NOTE: The pulley is marked front for installation.

CAUTION: On vehicles equipped with the 4.0L or 4.7L, Do not reuse the old power steering pump pulley it is not intended for reuse. A new pulley must be installed if removed.

(1) Replace pulley if bent, cracked, or loose.
(2) Install pulley on pump with Installer C-4063-B or equivalent installer (Fig. 15). The front edge of the pulley hub must be flush with the end of the shaft. Ensure the tool and pulley are aligned with the pump shaft.

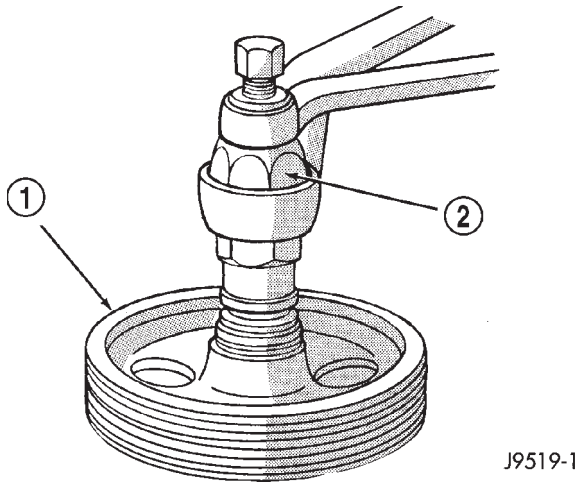


Fig. 15 Pulley Installation

1 - POWER STEERING PUMP DRIVE PULLEY
2 - SPECIAL TOOL C-4063–B

(3) Install pump assembly.
(4) With Serpentine Belt, run engine until warm (5 min.) and note any belt chirp. If chirp exists, move pulley outward approximately 0.5 mm (0.020 in.). If noise increases, press on 1.0 mm (0.040 in.). **Be careful that pulley does not contact mounting bolts.**

RESERVOIR

REMOVAL

(1) Remove power steering pump.
(2) Clean exterior of pump.
(3) Clamp the pump body in a soft jaw vice.

NOTE: Use new retaining clips for installation.

(4) Pry up tab and slide the retaining clips off (Fig. 16).

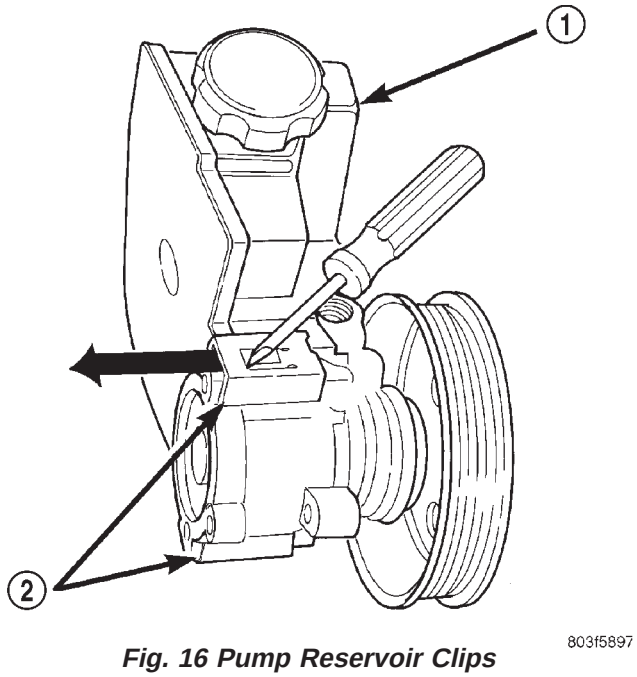


Fig. 16 Pump Reservoir Clips

1 - RESERVOIR
2 - RETAINING CLIPS

(5) Remove fluid reservoir from pump body. Remove and discard O-ring seal.

INSTALLATION

(1) Lubricate new O-ring Seal with Mopar Power Steering Fluid or equivalent.
(2) Install O-ring seal in housing.
(3) Install reservoir onto housing.
(4) Slide and tap in **new** reservoir retainer clips until tab locks to housing.
(5) Install power steering pump.
(6) Add power steering fluid,(Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

TRANSMISSION AND TRANSFER CASE

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AUTOMATIC TRANSMISSION - 42RE

DESCRIPTION

The 42RE is a four speed fully automatic transmission (Fig. 1) with an electronic governor. The 42RE is equipped with a lock-up clutch in the torque converter. First through third gear ranges are provided by the clutches, bands, overrunning clutch, and planetary gear sets in the transmission. Fourth gear range is provided by the overdrive unit that contains an overdrive clutch, direct clutch, planetary gear set, and overrunning clutch.

The transmission contains a front, rear, and direct clutch which function as the input driving components. It also contains the kickdown (front) and the low/reverse (rear) bands which, along with the overrunning clutch and overdrive clutch, serve as the holding components. The driving and holding components combine to select the necessary planetary gear components, in the front, rear, or overdrive planetary gear set, transfer the engine power from the input shaft through to the output shaft.

The valve body is mounted to the lower side of the transmission and contains the valves to control pressure regulation, fluid flow control, and clutch/band application. The oil pump is mounted at the front of the transmission and is driven by the torque converter hub. The pump supplies the oil pressure necessary for clutch/band actuation and transmission lubrication.

AUTOMATIC TRANSMISSION - 42RE (Continued)

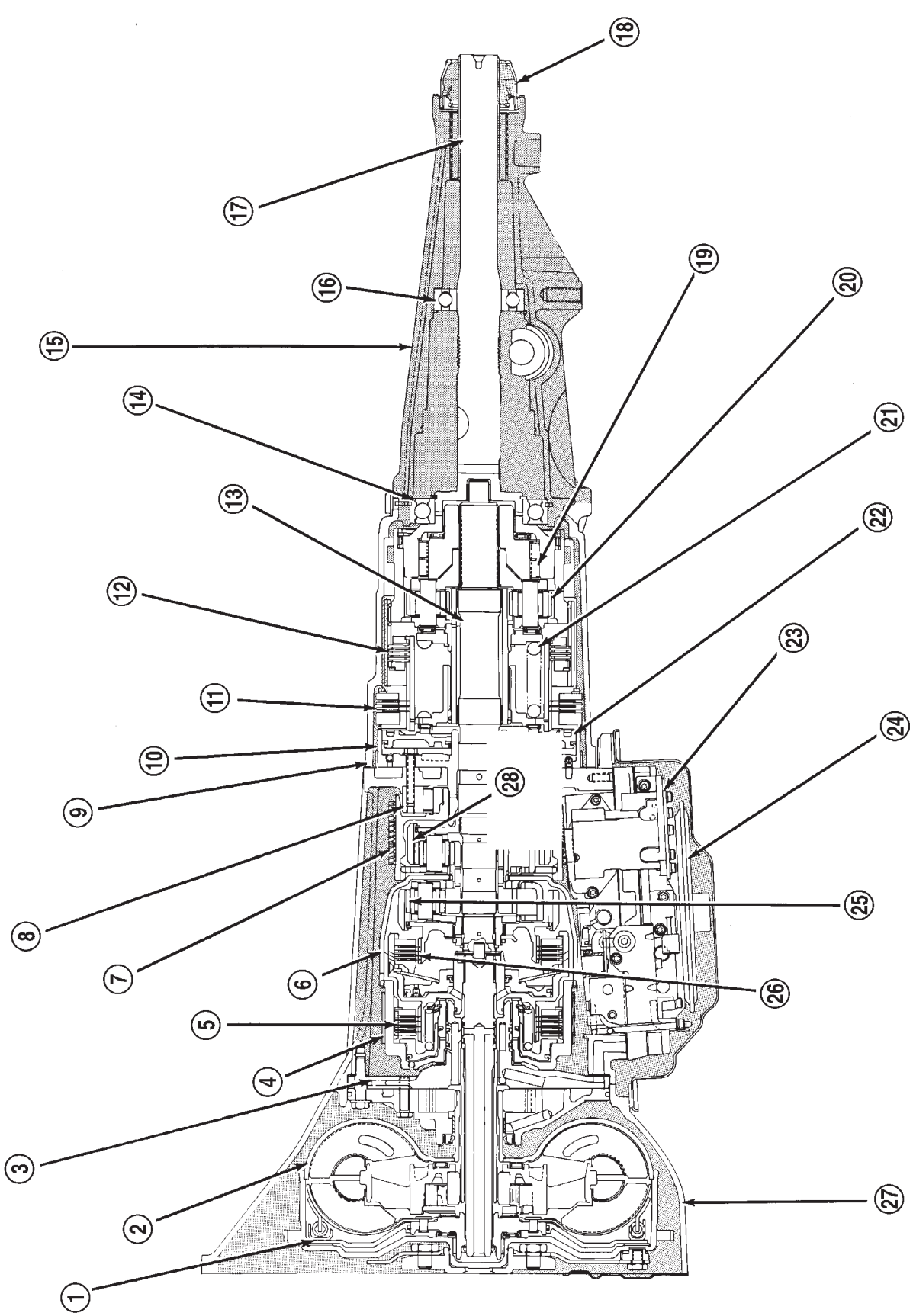


Fig. 1 42RE Transmission

AUTOMATIC TRANSMISSION - 42RE (Continued)

1 - CONVERTER CLUTCH
2 - TORQUE CONVERTER
3 - OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLY
4 - FRONT BAND
5 - FRONT CLUTCH
6 - DRIVING SHELL
7 - REAR BAND
8 - TRANSMISSION OVERRUNNING CLUTCH
9 - OVERDRIVE UNIT
10 - PISTON RETAINER
11 - OVERDRIVE CLUTCH
12 - DIRECT CLUTCH
13 - INTERMEDIATE SHAFT
14 - FRONT BEARING
15 - HOUSING
16 - REAR BEARING
17 - OUTPUT SHAFT
18 - SEAL
19 - OVERDRIVE OVERRUNNING CLUTCH
20 - OVERDRIVE PLANETARY GEAR
21 - DIRECT CLUTCH SPRING
22 - OVERDRIVE CLUTCH PISTON
23 - VALVE BODY ASSEMBLY
24 - FILTER
25 - FRONT PLANETARY GEAR
26 - REAR CLUTCH
27 - TRANSMISSION
28 - REAR PLANETARY GEAR

IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan gasket surface (Fig. 2). Refer to this information when ordering replacement parts.

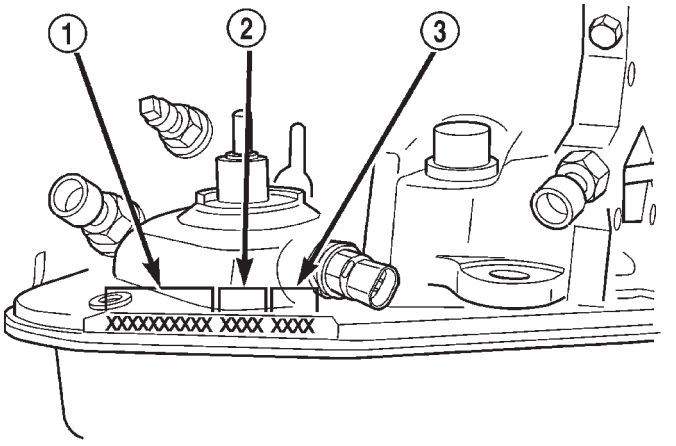


Fig. 2 Transmission Part And Serial Number Location

1 - PART NUMBER
2 - BUILD DATE
3 - SERIAL NUMBER

GEAR RATIOS The 42RE gear ratios are:

1st	2.74:1
2nd	1.54:1
3rd	1.00:1
4th	0.69:1
Rev.	2.21:1

OPERATION

The application of each driving or holding component is controlled by the valve body based upon the manual lever position, throttle pressure, and governor pressure. The governor pressure is a variable pressure input to the valve body and is one of the signals that a shift is necessary. First through fourth gear are obtained by selectively applying and releasing the different clutches and bands. Engine power is thereby routed to the various planetary gear assemblies which combine with the overrunning clutch assemblies to generate the different gear ratios. The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in fourth gear, and in third gear under various conditions, such as when the O/D switch is OFF, when the vehicle is cruising on a level surface after the vehicle has warmed up. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased. The torque converter clutch feature increases fuel economy and reduces the transmission fluid temperature.

Since the overdrive clutch is applied in fourth gear only and the direct clutch is applied in all ranges except fourth gear, the transmission operation for park, neutral, and first through third gear will be described first. Once these powerflows are described, the third to fourth shift sequence will be described.

PARK POWERFLOW

As the engine is running and the crankshaft is rotating, the flexplate and torque converter, which are also bolted to it, are all rotating in a clockwise direction as viewed from the front of the engine. The notched hub of the torque converter is connected to the oil pump's internal gear, supplying the transmission with oil pressure. As the converter turns, it turns the input shaft in a clockwise direction. As the input shaft is rotating, the front clutch hub-rear clutch retainer and all their associated parts are also rotating, all being directly connected to the input shaft. The power flow from the engine through the front clutch hub and rear clutch retainer stops at the rear clutch retainer. Therefore, no power flow to the output shaft occurs because no clutches are applied. The only mechanism in use at this time is the parking sprag (Fig. 3), which locks the parking gear on the output shaft to the transmission case.

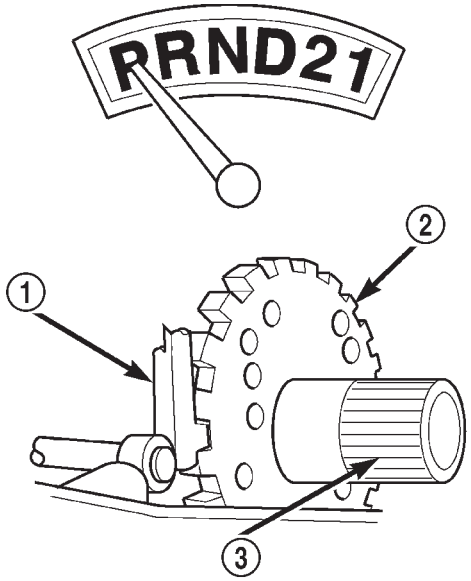


Fig. 3 Park Powerflow

1 - LEVER ENGAGED FOR PARK
2 - PARK SPRAG
3 - OUTPUT SHAFT

NEUTRAL POWERFLOW

With the gear selector in the NEUTRAL position (Fig. 4), the power flow of the transmission is essentially the same as in the park position. The only operational difference is that the parking sprag has been disengaged, unlocking the output shaft from the transmission case and allowing it to move freely.

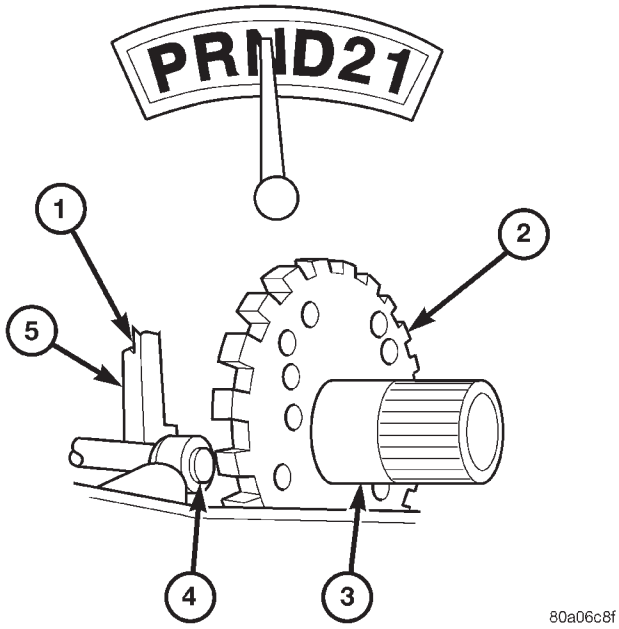


Fig. 4 Neutral Powerflow

1 - PAWL DISENGAGED FOR NEUTRAL
2 - PARK SPRAG
3 - OUTPUT SHAFT
4 - CAM
5 - PAWL

AUTOMATIC TRANSMISSION - 42RE (Continued)

REVERSE POWERFLOW

When the gear selector is moved into the REVERSE position (Fig. 5), the front clutch and the rear band are applied. With the application of the front clutch, engine torque is applied to the sun gear, turning it in a clockwise direction. The clockwise rotation of the sun gear causes the rear planet pinions to rotate against engine rotation in a counterclockwise direction. The rear band is holding the low reverse drum, which is splined to the rear carrier. Since the rear carrier is being held, the torque from the planet pinions is transferred to the rear annulus gear, which is splined to the output shaft. The output shaft in turn rotates with the annulus gear in a counterclockwise direction giving a reverse gear output. The entire transmission of torque is applied to the rear planetary gearset only. Although there is torque input to the front gearset through the sun gear, no other member of the gearset is being held. During the entire reverse stage of operation, the front planetary gears are in an idling condition.

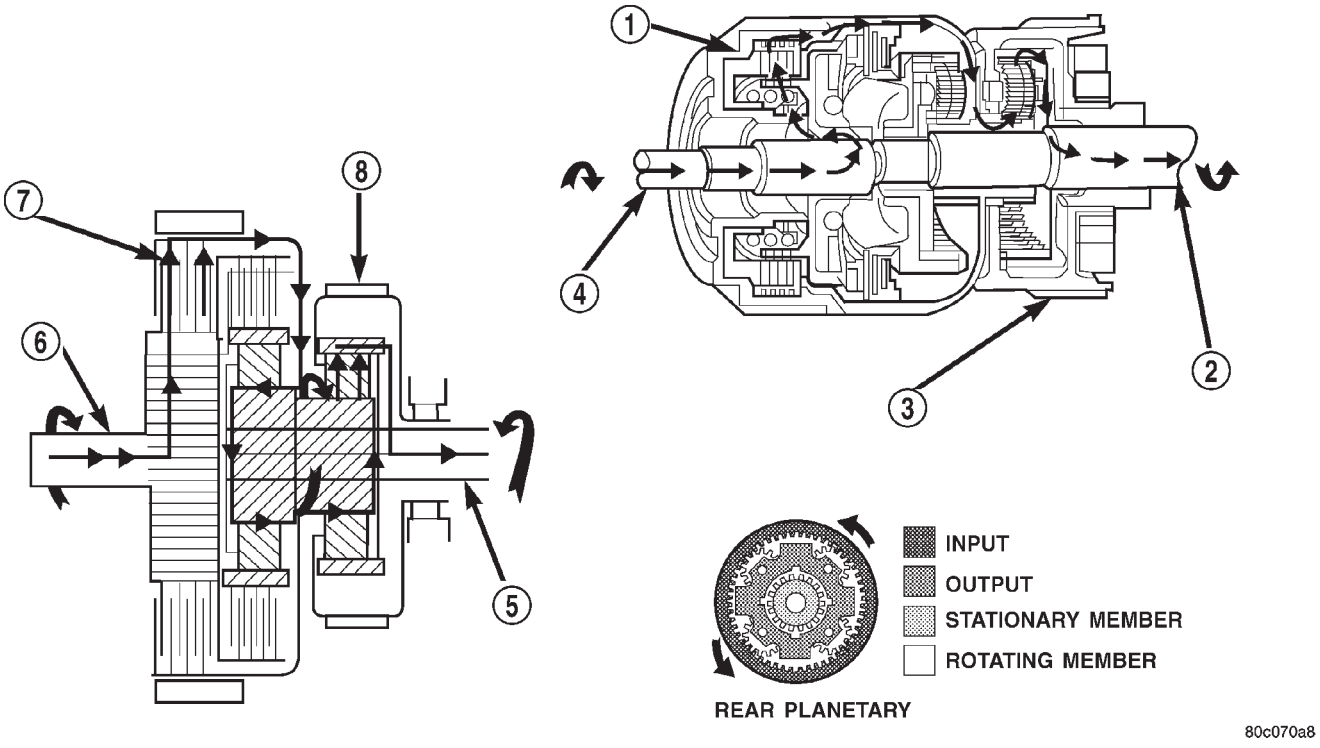


Fig. 5 Reverse Powerflow

1 - FRONT CLUTCH ENGAGED
2 - OUTPUT SHAFT
3 - LOW/REVERSE BAND APPLIED
4 - INPUT SHAFT
5 - OUTPUT SHAFT
6 - INPUT SHAFT
7 - FRONT CLUTCH ENGAGED
8 - LOW/REVERSE BAND APPLIED

FIRST GEAR POWERFLOW

When the gearshift lever is moved into the DRIVE position the transmission goes into first gear (Fig. 6). As soon as the transmission is shifted from PARK or NEUTRAL to DRIVE, the rear clutch applies, applying the rear clutch pack to the front annulus gear. Engine torque is now applied to the front annulus gear turning it in a clockwise direction. With the front annulus gear turning in a clockwise direction, it causes the front planets to turn in a clockwise direction. The rotation of the front planets cause the sun to revolve in a counterclockwise direction. The sun gear now transfers its counterclockwise rotation to the rear planets which rotate back in a clockwise direction. With the rear annulus gear stationary, the rear planet rotation on the annulus gear causes the rear planet carrier to revolve in a counterclockwise direction. The rear planet carrier is splined into the low-reverse drum, and the low reverse drum is splined to the inner race of the over-running clutch. With the over-running clutch locked, the planet carrier is held, and the resulting torque provided by the planet pinions is transferred to the rear annulus gear. The rear annulus gear is splined to the output shaft and rotated along with it (clockwise) in an underdrive gear reduction mode.

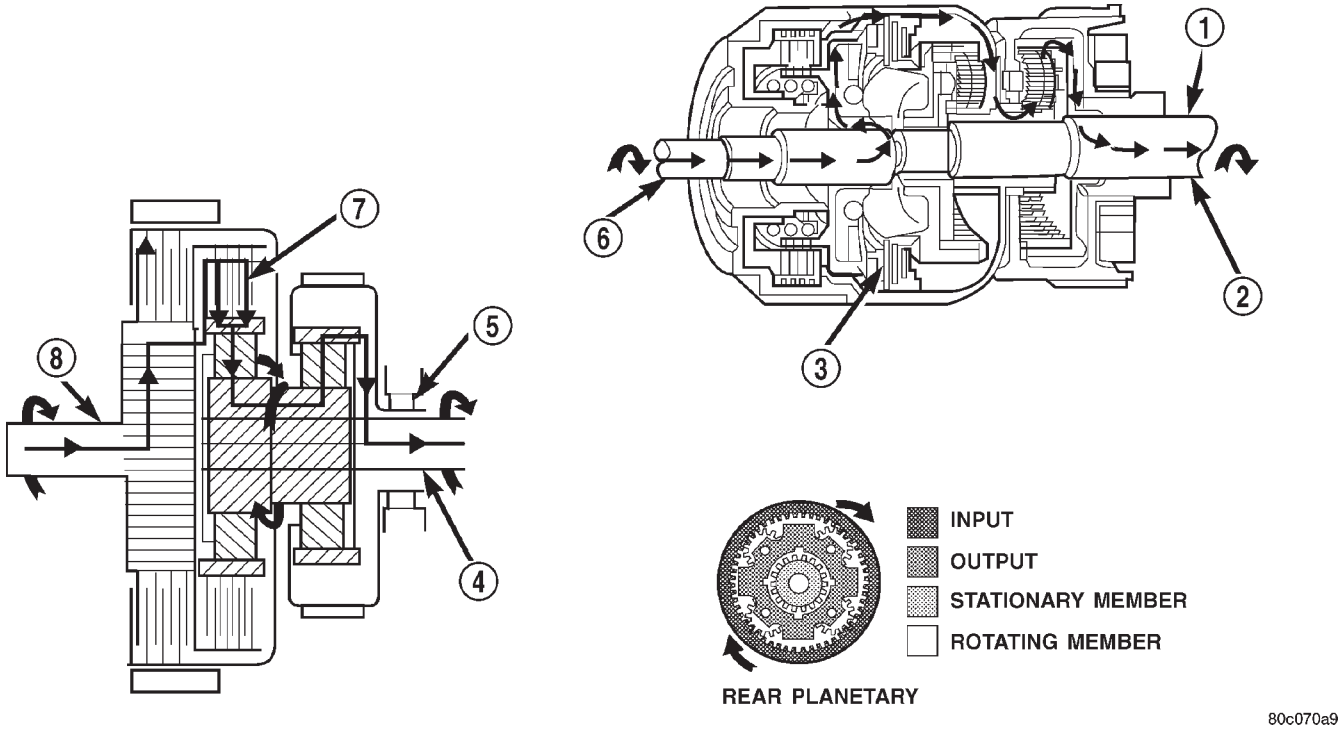


Fig. 6 First Gear Powerflow

1 - OUTPUT SHAFT
2 - OVER-RUNNING CLUTCH HOLDING
3 - REAR CLUTCH APPLIED
4 - OUTPUT SHAFT
5 - OVER-RUNNING CLUTCH HOLDING
6 - INPUT SHAFT
7 - REAR CLUTCH APPLIED
8 - INPUT SHAFT

AUTOMATIC TRANSMISSION - 42RE (Continued)

SECOND GEAR POWERFLOW

In DRIVE-SECOND (Fig. 7), the same elements are applied as in MANUAL-SECOND. Therefore, the power flow will be the same, and both gears will be discussed as one in the same. In DRIVE-SECOND, the transmission has proceeded from first gear to its shift point, and is shifting from first gear to second. The second gear shift is obtained by keeping the rear clutch applied and applying the front (kickdown) band. The front band holds the front clutch retainer that is locked to the sun gear driving shell. With the rear clutch still applied, the input is still on the front annulus gear turning it clockwise at engine speed. Now that the front band is holding the sun gear stationary, the annulus rotation causes the front planets to rotate in a clockwise direction. The front carrier is then also made to rotate in a clockwise direction but at a reduced speed. This will transmit the torque to the output shaft, which is directly connected to the front planet carrier. The rear planetary annulus gear will also be turning because it is directly splined to the output shaft. All power flow has occurred in the front planetary gear set during the drive-second stage of operation, and now the over-running clutch, in the rear of the transmission, is disengaged and freewheeling on its hub.

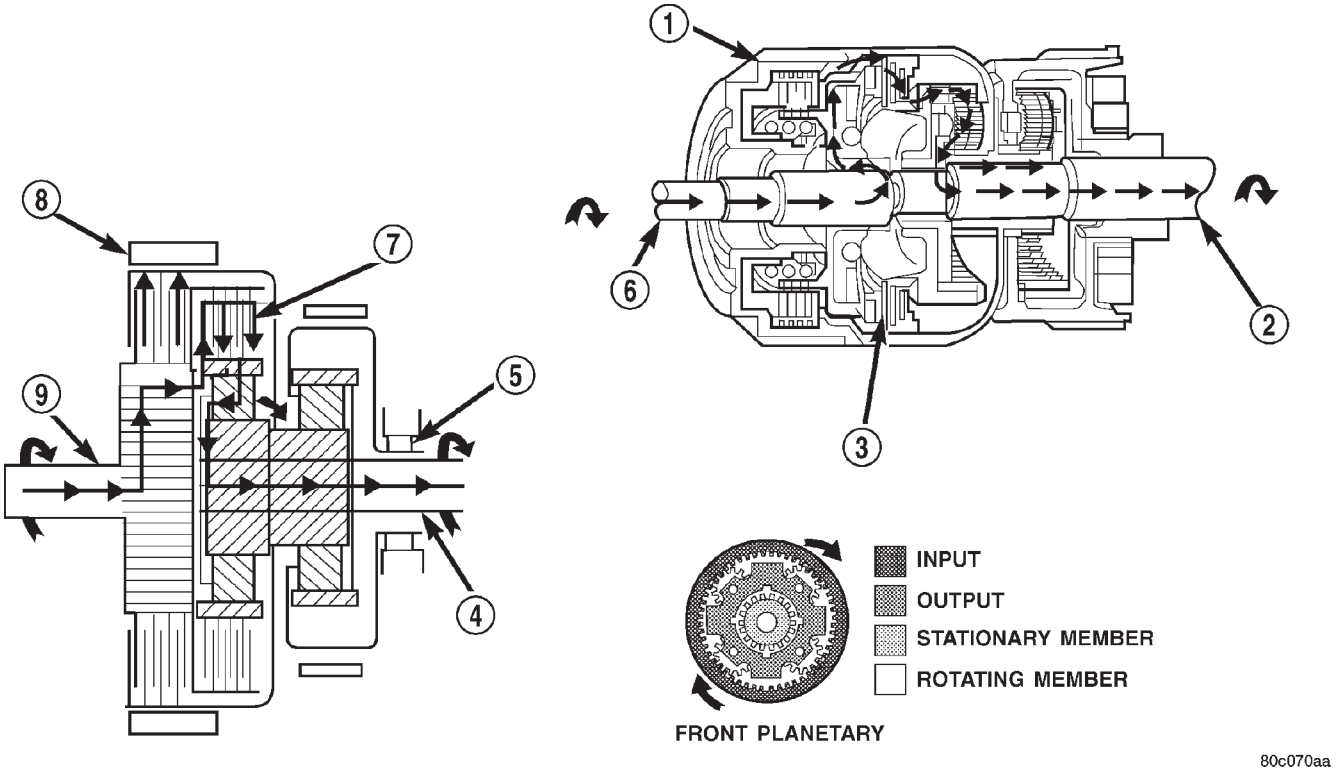


Fig. 7 Second Gear Powerflow

1 - KICKDOWN BAND APPLIED
2 - OUTPUT SHAFT
3 - REAR CLUTCH ENGAGED
4 - OUTPUT SHAFT
5 - OVER-RUNNING CLUTCH FREE-WHEELING
6 - INPUT SHAFT
7 - REAR CLUTCH APPLIED
8 - KICKDOWN BAND APPLIED
9 - INPUT SHAFT

DIRECT DRIVE POWERFLOW

The vehicle has accelerated and reached the shift point for the 2-3 upshift into direct drive (Fig. 8). When the shift takes place, the front band is released, and the front clutch is applied. The rear clutch stays applied as it has been in all the forward gears. With the front clutch now applied, engine torque is now on the front clutch retainer, which is locked to the sun gear driving shell. This means that the sun gear is now turning in engine rotation (clockwise) and at engine speed. The rear clutch is still applied so engine torque is also still on the front annulus gear. If two members of the same planetary set are driven, direct drive results. Therefore, when two members are rotating at the same speed and in the same direction, it is the same as being locked up. The rear planetary set is also locked up, given the sun gear is still the input, and the rear annulus gear must turn with the output shaft. Both gears are turning in the same direction and at the same speed. The front and rear planet pinions do not turn at all in direct drive. The only rotation is the input from the engine to the connected parts, which are acting as one common unit, to the output shaft.

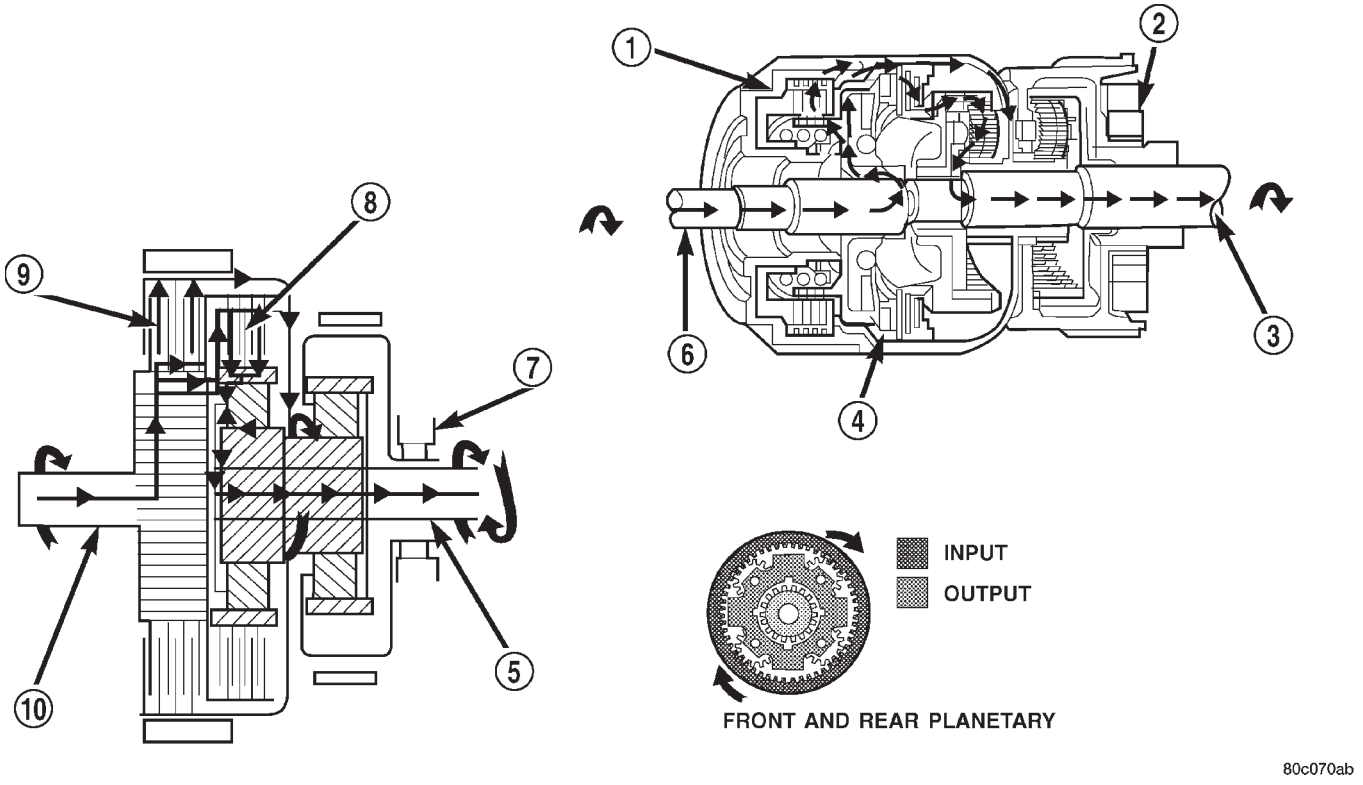


Fig. 8 Direct Drive Powerflow

1 - FRONT CLUTCH APPLIED
2 - OVER-RUNNING CLUTCH FREE-WHEELING
3 - OUTPUT SHAFT
4 - REAR CLUTCH APPLIED
5 - OUTPUT SHAFT
6 - INPUT SHAFT
7 - OVER-RUNNING CLUTCH FREE-WHEELING
8 - REAR CLUTCH APPLIED
9 - FRONT CLUTCH APPLIED
10 - INPUT SHAFT

FOURTH GEAR POWERFLOW

Fourth gear overdrive range is electronically controlled and hydraulically activated. Various sensor inputs are supplied to the powertrain control module to operate the overdrive solenoid on the valve body. The solenoid contains a check ball that opens and closes a vent port in the 3-4 shift valve feed passage. The overdrive solenoid (and check ball) are not energized in first, second, third, or reverse gear. The vent port remains open, diverting line pressure from the 2-3 shift valve away from the 3-4 shift valve. The overdrive control switch must be in the ON position to transmit overdrive status to the PCM. A 3-4 upshift occurs only when the overdrive solenoid is energized by the PCM. The PCM energizes the overdrive solenoid during the 3-4 upshift. This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve. Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position. This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive piston. Line pressure through the timing valve moves the overdrive piston into contact with the overdrive clutch. The direct clutch is disengaged before the overdrive clutch is engaged. The boost valve provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts, and when accelerating in fourth gear. The 3-4 accumulator cushions overdrive clutch engagement to smooth 3-4 upshifts. The accumulator is charged at the same time as apply pressure acts against the overdrive piston.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUTOMATIC TRANSMISSION

Automatic transmission problems can be a result of poor engine performance, incorrect fluid level, incorrect linkage or cable adjustment, band or hydraulic control pressure adjustments, hydraulic system malfunctions or electrical/mechanical component malfunctions. Begin diagnosis by checking the easily accessible items such as: fluid level and condition, linkage adjustments and electrical connections. A road test will determine if further diagnosis is necessary.

DIAGNOSIS AND TESTING - PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVEABLE

(1) Check for transmission fault codes using DRB® scan tool.

(2) Check fluid level and condition.

(3) Adjust throttle and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform hydraulic pressure test if shift problems were noted during road test.

(6) Perform air-pressure test to check clutch-band operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift or throttle linkage.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged drive plate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

DIAGNOSIS AND TESTING - ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul will be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart provides a basis for analyzing road test results.

CLUTCH AND BAND APPLICATION CHART

SHIFT LEVER POSITION	TRANSMISSION CLUTCHES AND BANDS					OVERDRIVE CLUTCHES		
	FRONT CLUTCH	FRONT BAND	REAR CLUTCH	REAR BAND	OVER-RUNNING CLUTCH	OVER-DRIVE CLUTCH	DIRECT CLUTCH	OVER-RUNNING CLUTCH
Reverse	X			X			X	
Drive - First			X		X		X	X
Drive - Second		X	X				X	X
Drive - Third	X		X				X	X
Drive - Fourth	X		X			X		
Manual Second		X	X		X		X	X
Manual First			X	X	X		X	X

Note that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Note that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear.

For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

Applying the same method of analysis, note that the front and rear clutches are applied simultaneously only in D range third and fourth gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping.

If the transmission slips in fourth gear but not in third gear, the overdrive clutch is slipping. By selecting another gear which does not use these clutches, the slipping unit can be determined. For example, if the transmission also slips in Reverse, the front clutch is slipping. If the transmission does not slip in Reverse, the rear clutch is slipping.

If slippage occurs during the 3-4 shift or only in fourth gear, the overdrive clutch is slipping. Similarly, if the direct clutch were to fail, the transmission would lose both reverse gear and overrun braking in 2 position (manual second gear).

If the transmission will not shift to fourth gear, the control switch, overdrive solenoid or related wiring may also be the problem cause.

This process of elimination can be used to identify a slipping unit and check operation. Proper use of the Clutch and Band Application Chart is the key.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction usually cannot be determined until hydraulic and air pressure tests are performed. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Unless a malfunction is obvious, such as no drive in D range first gear, do not disassemble the transmission. Perform the hydraulic and air pressure tests to help determine the probable cause.

DIAGNOSIS AND TESTING - HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068 kPa) at the rear servo pressure port in reverse.

An accurate tachometer and pressure test gauges are required. Test Gauge C-3292 has a 100 psi range and is used at the accumulator, governor, and front servo ports. Test Gauge C-3293-SP has a 300 psi range and is used at the rear servo and overdrive ports where pressures exceed 100 psi.

Pressure Test Port Locations

Test ports are located at both sides of the transmission case (Fig. 9).

Line pressure is checked at the accumulator port on the right side of the case. The front servo pressure port is at the right side of the case just behind the filler tube opening.

AUTOMATIC TRANSMISSION - 42RE (Continued)

The rear servo and governor pressure ports are at the right rear of the transmission case. The overdrive clutch pressure port is at the left rear of the case.

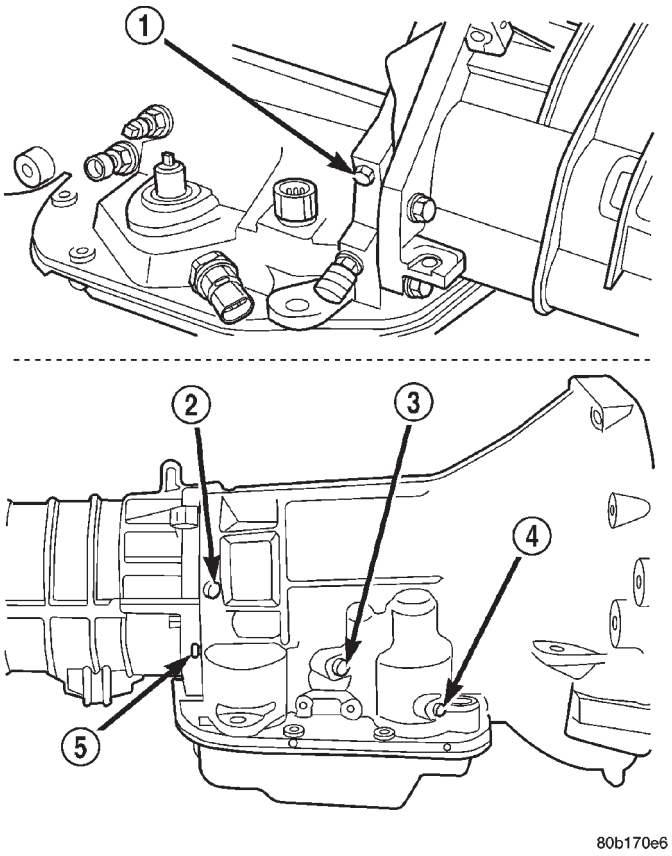


Fig. 9 Pressure Test Port Locations

1 - OVERDRIVE CLUTCH TEST PORT
2 - GOVERNOR TEST PORT
3 - ACCUMULATOR TEST PORT
4 - FRONT SERVO TEST PORT
5 - REAR SERVO TEST PORT

Test One - Transmission In Manual Low

NOTE: This test checks pump output, pressure regulation, and condition of the rear clutch and servo circuit. Both test gauges are required for this test.

(1) Connect tachometer to engine. Position tachometer so it can be observed from driver seat if helper will be operating engine. Raise vehicle on hoist that will allow rear wheels to rotate freely.

(2) Connect 100 psi Gauge C-3292 to accumulator port. Then connect 300 psi Gauge C-3293-SP to rear servo port.

(3) Disconnect throttle and gearshift cables from levers on transmission valve body manual shaft.

(4) Have helper start and run engine at 1000 rpm.

(5) Move transmission shift lever fully forward into 1 range.

(6) Gradually move transmission throttle lever from full forward to full rearward position and note pressures on both gauges:

- Line pressure at accumulator port should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as throttle lever is moved rearward.
- Rear servo pressure should be same as line pressure within 3 psi (20.68 kPa).

Test Two - Transmission In 2 Range

NOTE: This test checks pump output, line pressure and pressure regulation. Use 100 psi Test Gauge C-3292 for this test.

(1) Leave vehicle in place on hoist and leave Test Gauge C-3292 connected to accumulator port.

(2) Have helper start and run engine at 1000 rpm.

(3) Move transmission shift lever one detent rearward from full forward position. This is 2 range.

(4) Move transmission throttle lever from full forward to full rearward position and read pressure on gauge.

(5) Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

Test Three - Transmission In D Range Third Gear

NOTE: This test checks pressure regulation and condition of the clutch circuits. Both test gauges are required for this test.

(1) Turn OD switch off.

(2) Leave vehicle on hoist and leave Gauge C-3292 in place at accumulator port.

(3) Move Gauge C-3293-SP over to front servo port for this test.

(4) Have helper start and run engine at 1600 rpm for this test.

(5) Move transmission shift lever two detents rearward from full forward position. This is D range.

(6) Read pressures on both gauges as transmission throttle lever is gradually moved from full forward to full rearward position:

- Line pressure at accumulator in D range third gear, should be 54-60 psi (372-414 kPa) with throttle lever forward and increase as lever is moved rearward.
- Front servo pressure in D range third gear, should be within 3 psi (21 kPa) of line pressure up to kickdown point.

AUTOMATIC TRANSMISSION - 42RE (Continued)

Test Four - Transmission In Reverse

NOTE: This test checks pump output, pressure regulation and the front clutch and rear servo circuits. Use 300 psi Test Gauge C-3293-SP for this test.

(1) Leave vehicle on hoist and leave gauge C-3292 in place at accumulator port.
(2) Move 300 psi Gauge C-3293-SP back to rear servo port.
(3) Have helper start and run engine at 1600 rpm for test.
(4) Move transmission shift lever four detents rearward from full forward position. This is Reverse range.
(5) Move transmission throttle lever fully forward then fully rearward and note reading at Gauge C-3293-SP.
(6) Pressure should be 145 - 175 psi (1000-1207 kPa) with throttle lever forward and increase to 230 - 280 psi (1586-1931 kPa) as lever is gradually moved rearward.

Test Five - Governor Pressure

NOTE: This test checks governor operation by measuring governor pressure response to changes in vehicle speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not downshift. The test should be performed on the road or on a hoist that will allow the rear wheels to rotate freely.

(1) Move 100 psi Test Gauge C-3292 to governor pressure port.
(2) Move transmission shift lever two detents rearward from full forward position. This is D range.
(3) Have helper start and run engine at curb idle speed. Then firmly apply service brakes so wheels will not rotate.
(4) Note governor pressure:
- Governor pressure should be no more than 20.6 kPa (3 psi) at curb idle speed and wheels not rotating.
- If pressure exceeds 20.6 kPa (3 psi), a fault exists in governor pressure control system.

(5) Release brakes, slowly increase engine speed, and observe speedometer and pressure test gauge (do not exceed 30 mph on speedometer). Governor pressure should increase in proportion to vehicle speed. Or approximately 6.89 kPa (1 psi) for every 1 mph.
(6) Governor pressure rise should be smooth and drop back to no more than 20.6 kPa (3 psi), after engine returns to curb idle and brakes are applied to prevent wheels from rotating.
(7) Compare results of pressure test with analysis chart.

Test Six - Transmission In Overdrive Fourth Gear

NOTE: This test checks line pressure at the overdrive clutch in fourth gear range. Use 300 psi Test Gauge C-3293-SP for this test. The test should be performed on the road or on a chassis dyno.

(1) Remove tachometer; it is not needed for this test.
(2) Move 300 psi Gauge to overdrive clutch pressure test port. Then remove other gauge and reinstall test port plug.
(3) Lower vehicle.
(4) Turn OD switch on.
(5) Secure test gauge so it can be viewed from drivers seat.
(6) Start engine and shift into D range.
(7) Increase vehicle speed gradually until 3-4 shift occurs and note gauge pressure.
(8) Pressure should be 469-496 kPa (68-72 psi) with closed throttle and increase to 620-827 kPa (90-120 psi) at 1/2 to 3/4 throttle. Note that pressure can increase to around 896 kPa (130 psi) at full throttle.
(9) Return to shop or move vehicle off chassis dyno.

PRESSURE TEST ANALYSIS CHART

TEST CONDITION	INDICATION
Line pressure OK during any one test	Pump and regulator valve OK
Line pressure OK in R but low in D, 2, 1	Leakage in rear clutch area (seal rings, clutch seals)
Pressure low in D Fourth Gear Range	Overdrive clutch piston seal, or check ball problem
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure in 2	Leakage in servo; broken servo ring or cracked servo piston
Pressure low in all positions	Clogged filter, stuck regulator valve, worn or faulty pump, low oil level
Governor pressure too high at idle speed	Governor pressure solenoid valve system fault. Refer to diagnostic book.

AUTOMATIC TRANSMISSION - 42RE (Continued)

TEST CONDITION	INDICATION
Governor pressure low at all mph figures	Faulty governor pressure solenoid, transmission control module, or governor pressure sensor
Lubrication pressure low at all throttle positions	Clogged fluid cooler or lines, seal rings leaking, worn pump bushings, pump, clutch retainer, or clogged filter.
Line pressure high	Output shaft plugged, sticky regulator valve
Line pressure low	Sticky regulator valve, clogged filter, worn pump

DIAGNOSIS AND TESTING - AIR CHECKING TRANSMISSION CLUTCH AND BAND OPERATION

Air-pressure testing can be used to check transmission front/rear clutch and band operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check, after overhaul.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The servo and clutch apply passages are shown (Fig. 10).

Front Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Rear Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Front Servo Apply Air Test

Apply air pressure to the front servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

Rear Servo Air Test

Apply air pressure to the rear servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

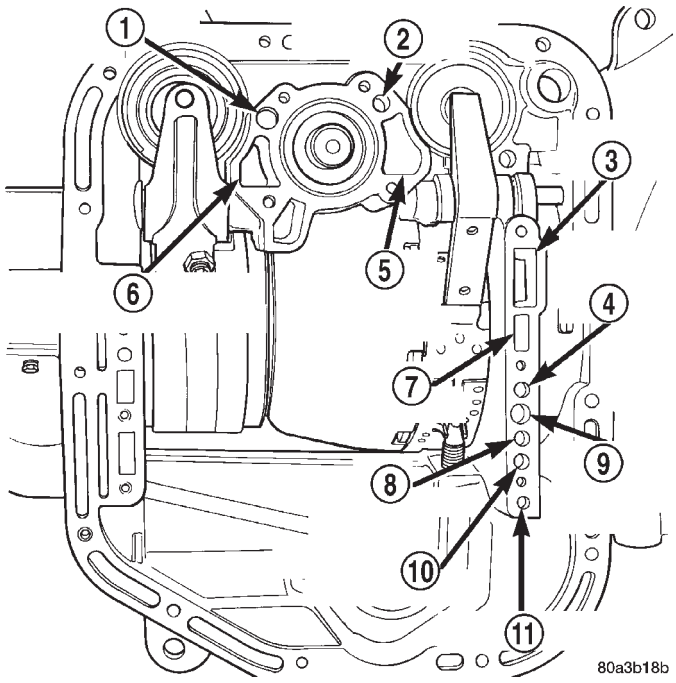


Fig. 10 Air Pressure Test Passages

1 - REAR SERVO APPLY
2 - FRONT SERVO APPLY
3 - PUMP SUCTION
4 - FRONT CLUTCH APPLY
5 - FRONT SERVO RELEASE
6 - LINE PRESSURE TO ACCUMULATOR
7 - PUMP PRESSURE
8 - TO CONVERTER
9 - REAR CLUTCH APPLY
10 - FROM CONVERTER
11 - TO COOLER

DIAGNOSIS AND TESTING - CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.
(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Pump seal leaks tend to move along the drive hub and onto the rear of the converter. Pump body leaks follow the same path as a seal leak (Fig. 11). Pump vent or pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself (Fig. 11). Pump o-ring or gasket leaks usually travel down the inside of the converter housing. Front band lever pin plug

leaks are generally deposited on the housing and not on the converter.

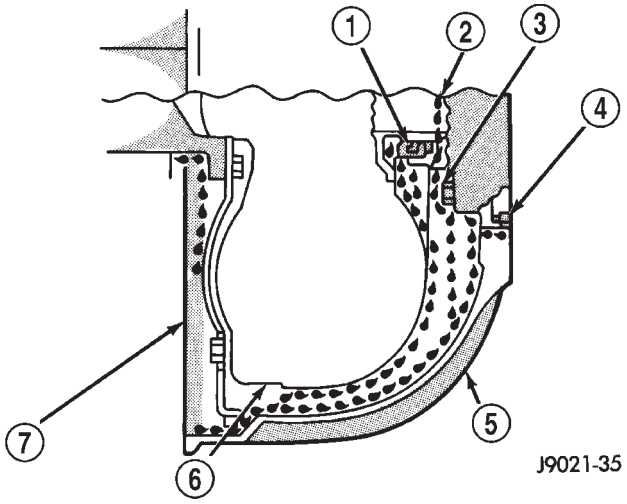


Fig. 11 Converter Housing Leak Paths

1 - PUMP SEAL
2 - PUMP VENT
3 - PUMP BOLT
4 - PUMP GASKET
5 - CONVERTER HOUSING
6 - CONVERTER
7 - REAR MAIN SEAL LEAK

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 12).

(2) Leaks at the converter hub weld (Fig. 12).

CONVERTER HOUSING AREA LEAK CORRECTION

(1) Remove converter.

(2) Tighten front band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out when oil pump is removed.

(3) Remove oil pump and remove pump seal. Inspect pump housing drainback and vent holes for obstructions. Clear holes with solvent and wire.

(4) Inspect pump bushing and converter hub. If bushing is scored, replace it. If converter hub is scored, either polish it with crocus cloth or replace converter.

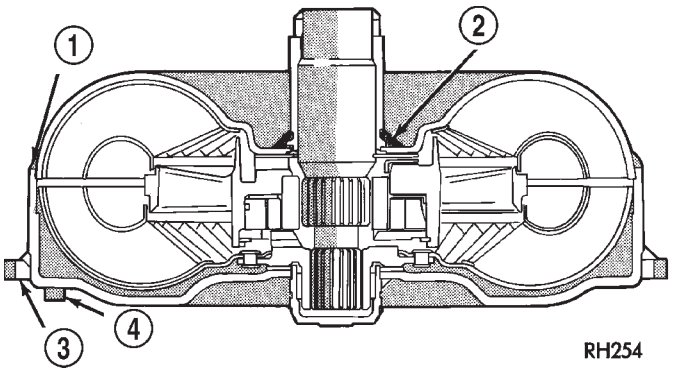


Fig. 12 Converter Leak Points - Typical

1 - OUTSIDE DIAMETER WELD
2 - TORQUE CONVERTER HUB WELD
3 - STARTER RING GEAR
4 - LUG

(5) Install new pump seal, O-ring, and gasket. Replace oil pump if cracked, porous or damaged in any way. Be sure to loosen the front band before installing the oil pump, damage to the oil pump seal may occur if the band is still tightened to the front clutch retainer.

(6) Loosen kickdown lever pin access plug three turns. Apply Loctite™ 592, or Permatex® No. 2 to plug threads and tighten plug to 17 N·m (150 in. lbs.) torque.

(7) Adjust front band.

(8) Lubricate pump seal and converter hub with transmission fluid or petroleum jelly and install converter.

(9) Install transmission and converter housing dust shield.

(10) Lower vehicle.

DIAGNOSIS AND TESTING - DIAGNOSIS CHARTS

The diagnosis charts provide additional reference when diagnosing a transmission fault. The charts provide general information on a variety of transmission, overdrive unit and converter clutch fault conditions.

The hydraulic flow charts in the Schematics and Diagrams section of this group, outline fluid flow and hydraulic circuitry. Circuit operation is provided for PARK, NEUTRAL, FIRST, SECOND, THIRD, FOURTH, MANUAL FIRST, MANUAL SECOND, and REVERSE gear ranges. Normal working pressures are also supplied for each of the gear ranges.

AUTOMATIC TRANSMISSION - 42RE (Continued)

DIAGNOSIS CHARTS

CONDITION	POSSIBLE CAUSES	CORRECTION
HARSH ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low.	1. Add Fluid
	2. Throttle Linkage Mis-adjusted.	2. Adjust linkage - setting may be too long.
	3. Mount and Driveline Bolts Loose.	3. Check engine mount, transmission mount, propeller shaft, rear spring to body bolts, rear control arms, crossmember and axle bolt torque. Tighten loose bolts and replace missing bolts.
	4. U-Joint Worn/Broken.	4. Remove propeller shaft and replace U-Joint.
	5. Axle Backlash Incorrect.	5. Check per Service Manual. Correct as needed.
	6. Hydraulic Pressure Incorrect.	6. Check pressure. Remove, overhaul or adjust valve body as needed.
	7. Band Mis-adjusted.	7. Adjust rear band.
	8. Valve Body Check Balls Missing.	8. Inspect valve body for proper check ball installation.
	9. Axle Pinion Flange Loose.	9. Replace nut and check pinion threads before installing new nut. Replace pinion gear if threads are damaged.
	10. Clutch, band or planetary component damaged.	10. Remove, disassemble and repair transmission as necessary.
	11. Converter Clutch Faulty.	11. Replace converter and flush cooler and line before installing new converter.
DELAYED ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low.	1. Correct level and check for leaks.
	2. Filter Clogged.	2. Change filter.
	3. Gearshift Linkage Mis-adjusted.	3. Adjust linkage and repair linkage if worn or damaged.
	4. Torque Converter Drain Back (Oil drains from torque converter into transmission sump).	4. If vehicle moves normally after 5 seconds after shifting into gear, no repair is necessary. If longer, inspect pump bushing for wear. Replace pump house.
	5. Rear Band Mis-adjusted.	5. Adjust band.
	6. Valve Body Filter Plugged.	6. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary.
	7. Oil Pump Gears Worn/Damaged.	7. Remove transmission and replace oil pump.
	8. Governor Circuit and Solenoid Valve Electrical Fault.	8. Test with DRB® scan tool and repair as required.
	9. Hydraulic Pressure Incorrect.	9. Perform pressure test, remove transmission and repair as needed.
	10. Reaction Shaft Seal Rings Worn/Broken.	10. Remove transmission, remove oil pump and replace seal rings.
	11. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged.	11. Remove and disassemble transmission and repair as necessary.
	12. Regulator Valve Stuck.	12. Clean.
	13. Cooler Plugged.	13. Transfer case failure can plug cooler.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO DRIVE RANGE (REVERSE OK)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Repair or replace linkage components.
	3. Rear Clutch Burnt.	3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed.
	4. Valve Body Malfunction.	4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged.
	5. Transmission Overrunning Clutch Broken.	5. Remove and disassemble transmission. Replace overrunning clutch.
	6. Input Shaft Seal Rings Worn/Damaged.	6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts.
	7. Front Planetary Failed Broken.	7. Remove and repair.
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/Misadjusted.	2. Inspect, adjust and reassemble linkage as needed. Replace worn/damaged parts.
	3. U-Joint/Axle/Transfer Case Broken.	3. Perform preliminary inspection procedure for vehicle that will not move. Refer to procedure in diagnosis section.
	4. Filter Plugged.	4. Remove and disassemble transmission. Repair or replace failed components as needed. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test. Flush oil. Replace cooler as necessary.
	5. Oil Pump Damaged.	5. Perform pressure test to confirm low pressure. Replace pump body assembly if necessary.
	6. Valve Body Malfunctioned.	6. Check and inspect valve body. Replace valve body (as assembly) if any valve or bore is damaged. Clean and reassemble correctly if all parts are in good condition.
	7. Transmission Internal Component Damaged.	7. Remove and disassemble transmission. Repair or replace failed components as needed.
	8. Park Sprag not Releasing - Check Stall Speed, Worn/ Damaged/Stuck.	8. Remove, disassemble, repair.
	9. Torque Converter Damage.	9. Inspect and replace as required.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	1. Fluid Level Low/High.	1. Correct fluid level and check for leaks if low.
	2. Fluid Filter Clogged.	2. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test.
	3. Throttle Linkage Mis-adjusted.	3. Adjust linkage as described in service section.
	4. Throttle Linkage Binding.	4. Check cable for binding. Check for return to closed throttle at transmission.
	5. Gearshift Linkage/Cable Mis-adjusted.	5. Adjust linkage/cable as described in service section.
	6. Clutch or Servo Failure.	6. Remove valve body and air test clutch, and band servo operation. Disassemble and repair transmission as needed.
	7. Governor Circuit Electrical Fault.	7. Test using DRB® scan tool and repair as required.
	8. Front Band Mis-adjusted.	8. Adjust band.
	9. Pump Suction Passage Leak.	9. Check for excessive foam on dipstick after normal driving. Check for loose pump bolts, defective gasket. Replace pump assembly if needed.
NO REVERSE (D RANGES OK)	1. Gearshift Linkage/Cable Mis-adjusted/Damaged.	1. Repair or replace linkage parts as needed.
	2. Park Sprag Sticking.	2. Replace overdrive annulus gear.
	3. Rear Band Mis-adjusted/Worn.	3. Adjust band; replace.
	4. Valve Body Malfunction.	4. Remove and service valve body. Replace valve body if any valves or valve bores are worn or damaged.
	5. Rear Servo Malfunction.	5. Remove and disassemble transmission. Replace worn/damaged servo parts as necessary.
	6. Direct Clutch in Overdrive Worn.	6. Disassemble overdrive. Replace worn or damaged parts.
	7. Front Clutch Burnt.	7. Remove and disassemble transmission. Replace worn, damaged clutch parts as required.
HAS FIRST/REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	1. Governor Circuit Electrical Fault.	1. Test using DRB® scan tool and repair as required.
	2. Valve Body Malfunction.	2. Repair stuck 1-2 shift valve or governor plug.
	3. Front Servo/Kickdown Band Damaged/Burned.	3. Repair/replace.
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Valve Body Malfunction.	1. Remove, clean and inspect. Look for stuck 1-2 valve or governor plug.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	1. Governor Circuit Electrical Fault.	1. Test with DRB® scan tool and repair as required.
	2. Valve Body Malfunction.	2. Remove, clean and inspect. Look for sticking 1-2 shift valve, 2-3 shift valve, governor plug or broken springs.
	3. Front Servo Piston Cocked in Bore.	3. Inspect servo and repair as required.
	4. Front Band Linkage Malfunction	4. Inspect linkage and look for bind in linkage.
NO KICKDOWN OR NORMAL DOWNSHIFT	1. Throttle Linkage Mis-adjusted.	1. Adjust linkage.
	2. Accelerator Pedal Travel Restricted.	2. Verify floor mat is not under pedal, repair worn accelerator cable or bent brackets.
	3. Valve Body Hydraulic Pressures Too High or Too Low Due to Valve Body Malfunction or Incorrect Hydraulic Control Pressure Adjustments.	3. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	4. Governor Circuit Electrical Fault.	4. Test with DRB® scan tool and repair as required.
	5. Valve Body Malfunction.	5. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	6. TPS Malfunction.	6. Replace sensor, check with DRB® scan tool.
	7. PCM Malfunction.	7. Check with DRB® scan tool and replace if required.
	8. Valve Body Malfunction.	8. Repair sticking 1-2, 2-3 shift valves, governor plugs, 3-4 solenoid, 3-4 shift valve, 3-4 timing valve.
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	1. Throttle Linkage Mis-adjusted/ Stuck.	1. Adjust linkage and repair linkage if worn or damaged. Check for binding cable or missing return spring.
	2. Gearshift Linkage Mis-adjusted.	2. Adjust linkage and repair linkage if worn or damaged.
	3. Governor Component Electrical Fault.	3. Check operating pressures and test with DRB® scan tool, repair faulty component.
	4. Front Band Out of Adjustment.	4. Adjust Band.
	5. Clutch or Servo Malfunction.	5. Air pressure check operation of clutches and bands. Repair faulty component.
CREEPS IN NEUTRAL	1. Gearshift Linkage Mis-adjusted.	1. Adjust linkage.
	2. Rear Clutch Dragging/Warped.	2. Disassemble and repair.
	3. Valve Body Malfunction.	3. Perform hydraulic pressure test to determine cause and repair as required.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
BUZZING NOISE	1. Fluid Level Low	1. Add fluid and check for leaks.
	2. Shift Cable Mis-assembled.	2. Route cable away from engine and bell housing.
	3. Valve Body Mis-assembled.	3. Remove, disassemble, inspect valve body. Reassemble correctly if necessary. Replace assembly if valves or springs are damaged. Check for loose bolts or screws.
	4. Pump Passages Leaking.	4. Check pump for porous casting, scores on mating surfaces and excess rotor clearance. Repair as required. Loose pump bolts.
	5. Cooling System Cooler Plugged.	5. Flow check cooler circuit. Repair as needed.
	6. Overrunning Clutch Damaged.	6. Replace clutch.
SLIPS IN REVERSE ONLY	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Gearshift Linkage Mis-adjusted.	2. Adjust linkage.
	3. Rear Band Mis-adjusted.	3. Adjust band.
	4. Rear Band Worn.	4. Replace as required.
	5. Overdrive Direct Clutch Worn.	5. Disassemble overdrive. Repair as needed.
	6. Hydraulic Pressure Too Low.	6. Perform hydraulic pressure tests to determine cause.
	7. Rear Servo Leaking.	7. Air pressure check clutch-servo operation and repair as required.
	8. Band Linkage Binding.	8. Inspect and repair as required.
SLIPS IN FORWARD DRIVE RANGES	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Fluid Foaming.	2. Check for high oil level, bad pump gasket or seals, dirt between pump halves and loose pump bolts. Replace pump if necessary.
	3. Throttle Linkage Mis-adjusted.	3. Adjust linkage.
	4. Gearshift Linkage Mis-adjusted.	4. Adjust linkage.
	5. Rear Clutch Worn.	5. Inspect and replace as needed.
	6. Low Hydraulic Pressure Due to Worn Pump, Incorrect Control Pressure Adjustments, Valve Body Warpage or Malfunction, Sticking, Leaking Seal Rings, Clutch Seals Leaking, Servo Leaks, Clogged Filter or Cooler Lines.	6. Perform hydraulic and air pressure tests to determine cause.
	7. Rear Clutch Malfunction, Leaking Seals or Worn Plates.	7. Air pressure check clutch-servo operation and repair as required.
	8. Overrunning Clutch Worn, Not Holding (Slips in 1 Only).	8. Replace Clutch.
SLIPS IN LOW GEAR ″D″ ONLY, BUT NOT IN MANUAL 1 POSITION	Overrunning Clutch Faulty.	Replace overrunning clutch.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
GROWLING, GRATING OR SCRAPING NOISES	1. Drive Plate Broken.	1. Replace.
	2. Torque Converter Bolts Hitting Dust Shield.	2. Dust shield bent. Replace or repair.
	3. Planetary Gear Set Broken/ Seized.	3. Check for debris in oil pan and repair as required.
	4. Overrunning Clutch Worn/ Broken.	4. Inspect and check for debris in oil pan. Repair as required.
	5. Oil Pump Components Scored/Binding.	5. Remove, inspect and repair as required.
	6. Output Shaft Bearing or Bushing Damaged.	6. Remove, inspect and repair as required.
	7. Clutch Operation Faulty.	7. Perform air pressure check and repair as required.
	8. Front and Rear Bands Mis-adjusted.	8. Adjust bands.
DRAGS OR LOCKS UP	1. Fluid Level Low.	1. Check and adjust level.
	2. Clutch Dragging/Failed	2. Air pressure check clutch operation and repair as required.
	3. Front or Rear Band Mis-adjusted.	3. Adjust bands.
	4. Case Leaks Internally.	4. Check for leakage between passages in case.
	5. Servo Band or Linkage Malfunction.	5. Air pressure check servo operation and repair as required.
	6. Overrunning Clutch Worn.	6. Remove and inspect clutch. Repair as required.
	7. Planetary Gears Broken.	7. Remove, inspect and repair as required (look for debris in oil pan).
	8. Converter Clutch Dragging.	8. Check for plugged cooler. Perform flow check. Inspect pump for excessive side clearance. Replace pump as required.
NO 4-3 DOWNSHIFT	1. Circuit Wiring and/or Connectors Shorted.	1. Test wiring and connectors with test lamp and volt/ohmmeter. Repair wiring as necessary. Replace connectors and/or harnesses as required.
	2. PCM Malfunction.	2. Check PCM operation with DRB® scan tool. Replace PCM only if faulty.
	3. TPS Malfunction	3. Check TPS with DRB® scan tool at PCM.
	4. Lockup Solenoid Not Venting.	4. Remove valve body and replace solenoid assembly if plugged or shorted.
	5. Overdrive Solenoid Not Venting.	5. Remove valve body and replace solenoid if plugged or shorted.
	6. Valve Body Valve Sticking.	6. Repair stuck 3-4 shift valve or lockup timing valve.
NO 4-3 DOWNSHIFT WHEN CONTROL SWITCH IS TURNED OFF	1. Control Switch Open/Shorted.	1. Test and replace switch if faulty.
	2. Overdrive Solenoid Connector Shorted.	2. Test solenoids and replace if seized or shorted.
	3. PCM Malfunction.	3. Test with DRB® scan tool. Replace PCM if faulty.
	4. Valve Body Stuck Valves.	4. Repair stuck 3-4, lockup or lockup timing valve.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
CLUNK NOISE FROM DRIVELINE ON CLOSED THROTTLE 4-3 DOWNSHIFT	1. Transmission Fluid Low.	1. Add Fluid.
	2. Throttle Cable Mis-adjusted.	2. Adjust cable.
	3. Overdrive Clutch Select Spacer Wrong Spacer.	3. Replace overdrive piston thrust plate spacer.
3-4 UPSHIFT OCCURS IMMEDIATELY AFTER 2-3 SHIFT	1. Overdrive Solenoid Connector or Wiring Shorted.	1. Test connector and wiring for loose connections, shorts or ground and repair as needed.
	2. TPS Malfunction.	2. Test TPS and replace as necessary. Check with DRB® scan tool.
	3. PCM Malfunction.	3. Test PCM with DRB® scan tool and replace controller if faulty.
	4. Overdrive Solenoid Malfunction.	4. Replace solenoid.
	5. Valve Body Malfunction.	5. Remove, disassemble, clean and inspect valve body components. Make sure all valves and plugs slide freely in bores. Polish valves with crocus cloth if needed.
WHINE/NOISE RELATED TO ENGINE SPEED	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Incorrect Routing.	2. Check shift cable for correct routing. Should not touch engine or bell housing.
NO 3-4 UPSHIFT	1. O/D Switch In OFF Position.	1. Turn control switch to ON position.
	2. Overdrive Circuit Fuse Blown.	2. Replace fuse. Determine why fuse failed and repair as necessary (i.e., shorts or grounds in circuit).
	3. O/D Switch Wire Shorted/Open Cut.	3. Check wires/connections with 12V test lamp and voltmeter. Repair damaged or loose wire/connection as necessary.
	4. Distance or Coolant Sensor Malfunction.	4. Check with DRB® scan tool and repair or replace as necessary.
	5. TPS Malfunction.	5. Check with DRB® scan tool and replace if necessary.
	6. Neutral Sense to PCM Wire Shorted/Cut.	6. Test switch/sensor as described in service section and replace if necessary. Engine no start.
	7. PCM Malfunction.	7. Check with DRB® scan tool and replace if necessary.
	8. Overdrive Solenoid Shorted/ Open.	8. Replace solenoid if shorted or open and repair loose or damaged wires (DRB® scan tool).
	9. Solenoid Feed Orifice in Valve Body Blocked.	9. Remove, disassemble, and clean valve body thoroughly. Check feed orifice.
	10. Overdrive Clutch Failed.	10. Disassemble overdrive and repair as needed.
	11. Hydraulic Pressure Low.	11. Pressure test transmission to determine cause.
	12. Valve Body Valve Stuck.	12. Repair stuck 3-4 shift valve, 3-4 timing valve.
	13. O/D Piston Incorrect Spacer.	13. Remove unit, check end play and install correct spacer.
	14. Overdrive Piston Seal Failure.	14. Replace both seals.
	15. O/D Check Valve/Orifice Failed.	15. Check for free movement and secure assembly (in piston retainer). Check ball bleed orifice.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN OVERDRIVE FOURTH GEAR	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Overdrive Clutch Pack Worn.	2. Remove overdrive unit and rebuild clutch pack.
	3. Overdrive Piston Retainer Bleed Orifice Blown Out.	3. Disassemble transmission, remove retainer and replace orifice.
	4. Overdrive Piston or Seal Malfunction.	4. Remove overdrive unit. Replace seals if worn. Replace piston if damaged. If piston retainer is damaged, remove and disassemble the transmission.
	5. 3-4 Shift Valve, Timing Valve or Accumulator Malfunction.	5. Remove and overhaul valve body. Replace accumulator seals. Make sure all valves operate freely in bores and do not bind or stick. Make sure valve body screws are correctly tightened and separator plates are properly positioned.
	6. Overdrive Unit Thrust Bearing Failure.	6. Disassemble overdrive unit and replace thrust bearing (NO. 1 thrust bearing is between overdrive piston and clutch hub; NO. 2 thrust bearing is between the planetary gear and the direct clutch spring plate; NO. 3 thrust bearing is between overrunning clutch hub and output shaft).
	7. O/D Check Valve/Bleed Orifice Failure.	7. Check for function/secure orifice insert in O/D piston retainer.
DELAYED 3-4 UPSHIFT (SLOW TO ENGAGE)	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Throttle Valve Cable Mis-adjusted.	2. Adjust throttle valve cable.
	3. Overdrive Clutch Pack Worn/Burnt.	3. Remove unit and rebuild clutch pack.
	4. TPS Faulty.	4. Test with DRB® scan tool and replace as necessary
	5. Overdrive Clutch Bleed Orifice Plugged.	5. Disassemble transmission and replace orifice.
	6. Overdrive Solenoid or Wiring Shorted/Open.	6. Test solenoid and check wiring for loose/ corroded connections or shorts/grounds. Replace solenoid if faulty and repair wiring if necessary.
	7. Overdrive Excess Clearance.	7. Remove unit. Measure end play and select proper spacer.
	8. O/D Check Valve Missing or Stuck.	8. Check for presence of check valve. Repair or replace as required.
TORQUE CONVERTER LOCKS UP IN SECOND AND/OR THIRD GEAR	Lockup Solenoid, Relay or Wiring Shorted/Open.	Test solenoid, relay and wiring for continuity, shorts or grounds. Replace solenoid and relay if faulty. Repair wiring and connectors as necessary.
HARSH 1-2, 2-3, 3-4 OR 3-2 SHIFTS	Lockup Solenoid Malfunction.	Remove valve body and replace solenoid assembly.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
NO START IN PARK OR NEUTRAL	1. Gearshift Linkage/Cable Mis-adjusted.	1. Adjust linkage/cable.
	2. Neutral Sense Wire Open/Cut.	2. Check continuity with test lamp. Repair as required.
	3. Park/Neutral Switch, or Transmission Range Sensor Faulty.	3. Refer to service section for test and replacement procedure.
	4. Park/Neutral Switch, or Transmission Range Sensor Connection Faulty.	4. Connectors spread open. Repair.
	5. Valve Body Manual Lever Assembly Bent/Worn/Broken.	5. Inspect lever assembly and replace if damaged.
NO REVERSE (OR SLIPS IN REVERSE)	1. Direct Clutch Pack (front clutch) Worn.	1. Disassemble unit and rebuild clutch pack.
	2. Rear Band Mis-adjusted.	2. Adjust band.
	3. Front Clutch Malfunctioned/ Burned.	3. Air-pressure test clutch operation. Remove and rebuild if necessary.
	4. Overdrive Thrust Bearing Failure.	4. Disassemble geartrain and replace bearings.
	5. Direct Clutch Spring Collapsed/ Broken.	5. Remove and disassemble unit. Check clutch position and replace spring.

AUTOMATIC TRANSMISSION - 42RE (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS.	1. Fluid Lines and Fittings Loose/Leaks/Damaged.	1. Tighten fittings. If leaks persist, replace fittings and lines if necessary.
	2. Fill Tube (where tube enters case) Leaks/Damaged.	2. Replace tube seal. Inspect tube for cracks in fill tube.
	3. Pressure Port Plug Loose Loose/Damaged.	3. Tighten to correct torque. Replace plug or reseal if leak persists.
	4. Pan Gasket Leaks.	4. Tighten pan screws (150 in. lbs.). If leaks persist, replace gasket.
	5. Valve Body Manual Lever Shaft Seal Leaks/Worn.	5. Replace shaft seal.
	6. Rear Bearing Access Plate Leaks.	6. Replace gasket. Tighten screws.
	7. Gasket Damaged or Bolts are Loose.	7. Replace bolts or gasket or tighten both.
	8. Adapter/Extension Gasket Damaged Leaks/Damaged.	8. Replace gasket.
	9. Park/Neutral Switch, or Transmission Range Sensor Leaks/Damaged.	9. Replace switch and gasket.
	10. Converter Housing Area Leaks.	10. Check for leaks at seal caused by worn seal or burr on converter hub (cutting seal), worn bushing, missing oil return, oil in front pump housing or hole plugged. Check for leaks past O-ring seal on pump or past pump-to-case bolts; pump housing porous, oil coming out vent due to overfill or leak past front band shaft access plug.
	11. Pump Seal Leaks/Worn/ Damaged.	11. Replace seal.
	12. Torque Converter Weld Leak/Cracked Hub.	12. Replace converter.
	13. Case Porosity Leaks.	13. Replace case.
NOISY OPERATION IN FOURTH GEAR ONLY	1. Overdrive Clutch Discs, Plates or Snap Rings Damaged.	1. Remove unit and rebuild clutch pack.
	2. Overdrive Piston or Planetary Thrust Bearing Damaged.	2. Remove and disassemble unit. Replace either thrust bearing if damaged.
	3. Output Shaft Bearings Scored/Damaged.	3. Remove and disassemble unit. Replace either bearing if damaged.
	4. Planetary Gears Worn/Chipped.	4. Remove and overhaul overdrive unit.
	5. Overdrive Unit Overrunning Clutch Rollers Worn/Scored.	5. Remove and overhaul overdrive unit.

STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

AUTOMATIC TRANSMISSION - 42RE (Continued)

REMOVAL

The overdrive unit can be removed and serviced separately. It is not necessary to remove the entire transmission assembly to perform overdrive unit repairs.

If only the overdrive unit requires service, refer to Overdrive Removal for proper procedures.

CAUTION: The transmission and torque converter must be removed as an assembly to avoid component damage. The converter driveplate, pump bushing, or oil seal can be damaged if the converter is left attached to the driveplate during removal. Be sure to remove the transmission and converter as an assembly.

(1) Disconnect battery negative cable.

(2) Disconnect and lower or remove necessary exhaust components.

(3) Disconnect fluid cooler lines at transmission.

(4) Remove starter motor. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL)

(5) Disconnect and remove crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - REMOVAL) Retain sensor attaching bolts.

CAUTION: The crankshaft position sensor will be damaged if the transmission is removed, or installed, while the sensor is still bolted to the engine block, or transmission (4.0L only). To avoid damage, be sure to remove the sensor before removing the transmission.

(6) Remove the bolts holding the bell housing brace to the transmission.

(7) Remove nut holding the bell housing brace to the engine to transmission bending brace.

(8) Remove the bell housing brace from the transmission (Fig. 13).

(9) Remove the bolt holding the torque converter cover to the transmission.

(10) Remove the torque converter cover from the transmission.

(11) If transmission is being removed for overhaul, remove transmission oil pan, drain fluid and reinstall pan.

(12) Remove fill tube bracket bolts and pull tube out of transmission. Retain fill tube seal. On 4 x 4 models, it will also be necessary to remove bolt attaching transfer case vent tube to converter housing.

(13) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

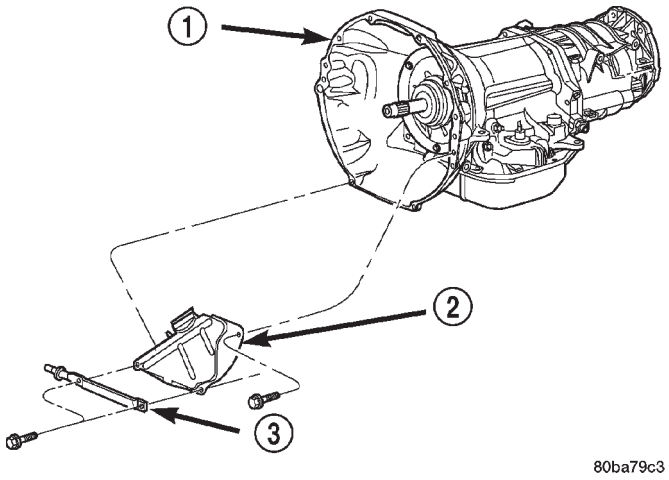


Fig. 13 Bell Housing Brace and Converter Cover

1 - Transmission
2 - Torque Converter Cover
3 - Bellhousing Brace

(14) Mark propeller shaft and axle yokes for assembly alignment. Then disconnect and remove propeller shaft. On 4 x 4 models, remove both propeller shafts.

(15) Disconnect wires from park/neutral position switch and transmission solenoid.

(16) Disconnect gearshift cable from transmission manual valve lever (Fig. 14).

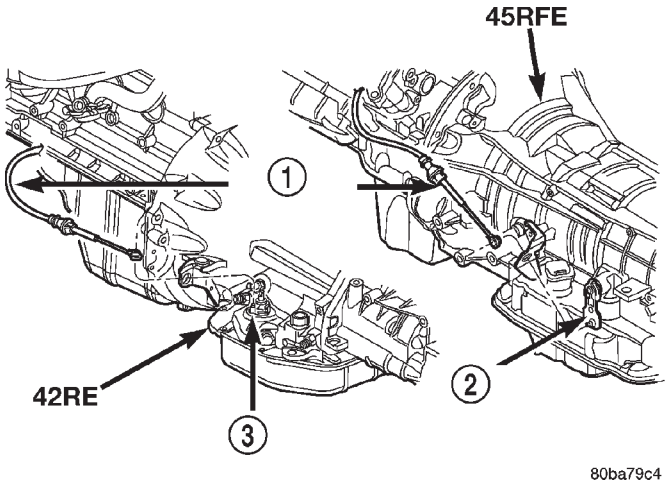


Fig. 14 Transmission Shift Cable

1 - SHIFT CABLE
2 - MANUAL LEVER
3 - MANUAL LEVER

AUTOMATIC TRANSMISSION - 42RE (Continued)

(17) Disconnect throttle valve cable from transmission bracket and throttle valve lever (Fig. 15).

(18) Disconnect transfer case shift cable from the transfer case shift lever (Fig. 16).

(19) Remove the clip securing the transfer case shift cable into the cable support bracket.

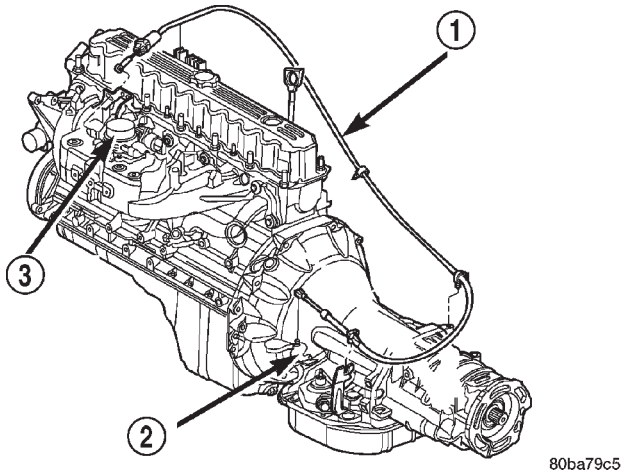


Fig. 15 Throttle Valve Cable

1 - THROTTLE VALVE CABLE
2 - THROTTLE VALVE LEVER
3 - THROTTLE BODY

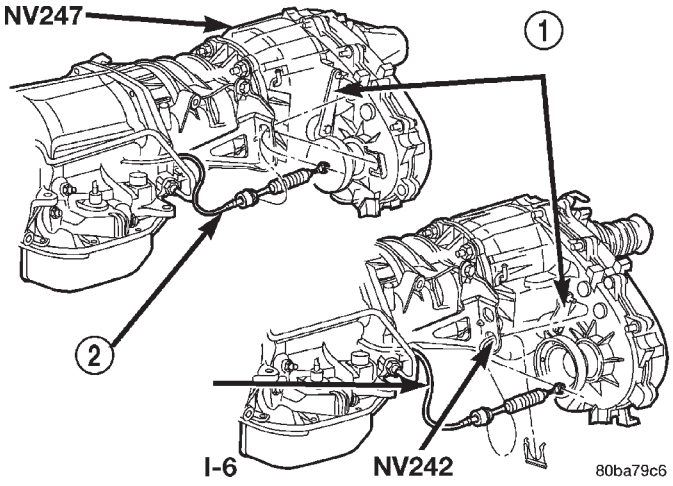


Fig. 16 Transfer Case Shift Cable

1 - TRANSFER CASE SHIFT LEVER
2 - TRANSFER CASE SHIFT CABLE

(20) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(21) Support rear of engine with safety stand or jack.

(22) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(23) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 17).

(24) Remove bolts attaching crossmember to frame and remove crossmember.

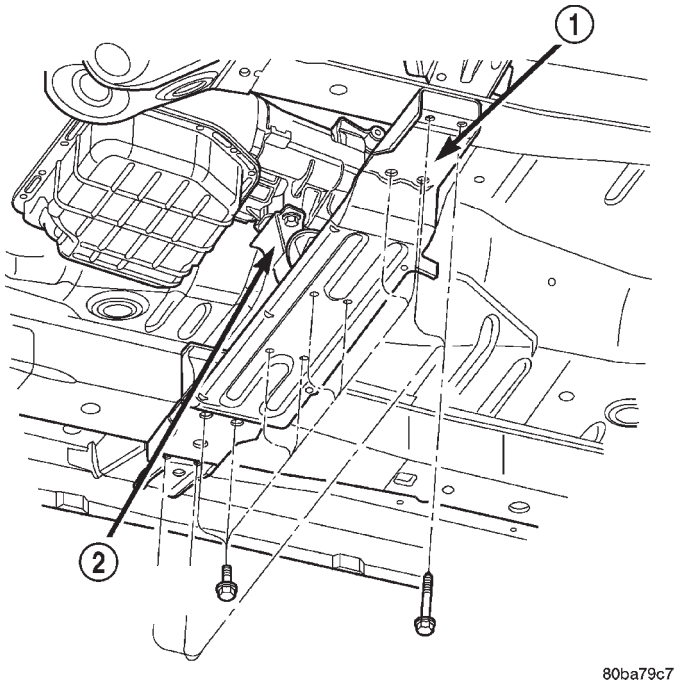


Fig. 17 Rear Transmission Crossmember

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

(25) Remove transfer case (Fig. 18) and (Fig. 19).

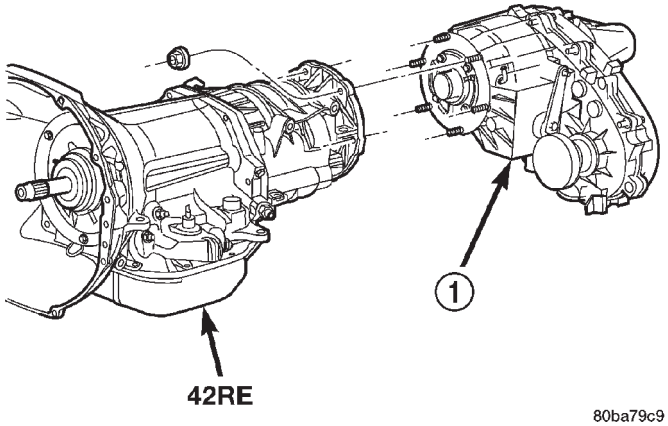


Fig. 18 Remove NV247 Transfer Case

1 - NV247 TRANSFER CASE

AUTOMATIC TRANSMISSION - 42RE (Continued)

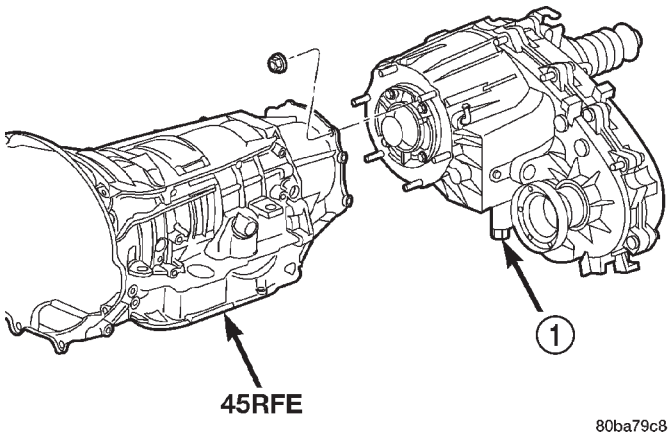


Fig. 19 Remove NV242 Transfer Case

1 - NV242 TRANSFER CASE

(26) Remove bolts holding the upper transmission bending braces to the torque converter housing and the overdrive unit (Fig. 20).

(27) Remove all remaining converter housing bolts.

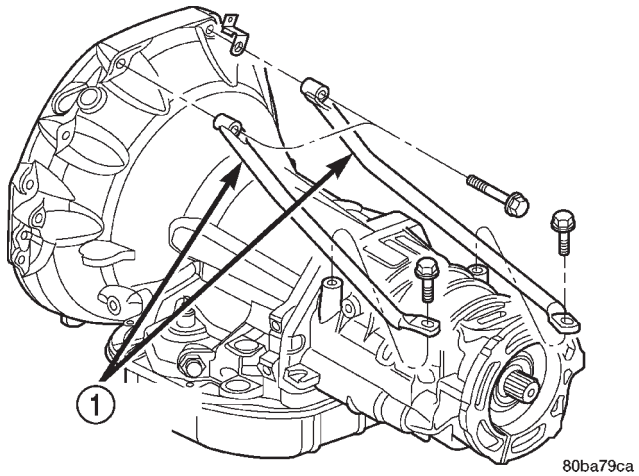


Fig. 20 Remove Upper Transmission Bending Braces

1 - TRANSMISSION BENDING BRACES

(28) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(29) Hold torque converter in place during transmission removal.

(30) Lower transmission and remove assembly from under the vehicle.

(31) To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY

(1) Clean transmission exterior with steam gun or with solvent. Wear eye protection during cleaning operations.

(2) Place transmission in a vertical position.

(3) Measure input shaft end play as follows (Fig. 21).

(a) Attach Adapter 8266-6 to Handle 8266-8.

(b) Attach dial indicator C-3339 to Handle 8266-8.

(c) Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-6 to secure it to the input shaft.

(d) Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.

(e) Move the input shaft in and out. Record the maximum travel for assembly reference.

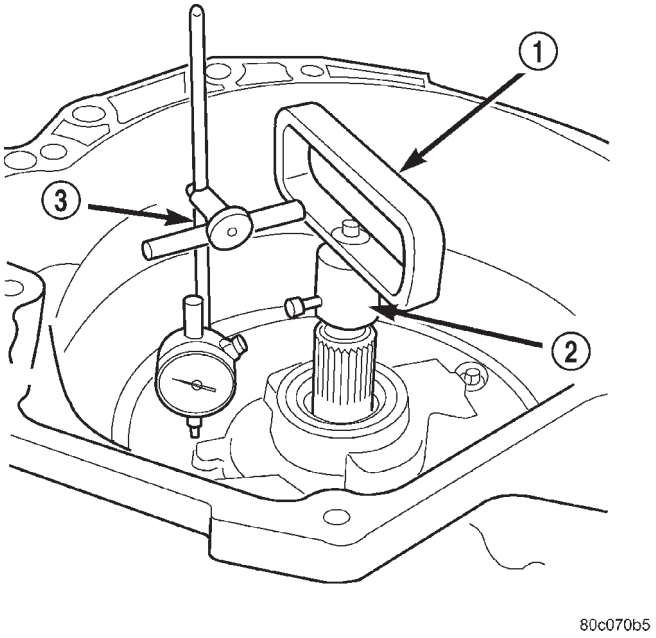


Fig. 21 Checking Input Shaft End Play

1 - TOOL 8266-8
2 - TOOL 8266-6
3 - TOOL C-3339

(4) Remove shift and throttle levers from valve body manual lever shaft.

(5) Place transmission in horizontal position.

(6) Remove transmission oil pan and gasket.

(7) Remove filter from valve body (Fig. 22). Keep filter screws separate from other valve body screws. Filter screws are longer and should be kept with filter.

(8) Remove park/neutral position switch.

(9) Remove hex head bolts attaching valve body to transmission case (Fig. 23). A total of 10 bolts are used. Note different bolt lengths for assembly reference.

AUTOMATIC TRANSMISSION - 42RE (Continued)

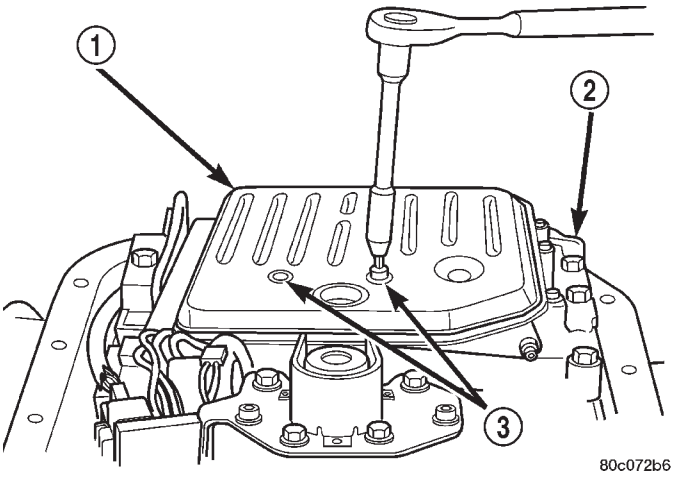


Fig. 22 Oil Filter Removal

1 - OIL FILTER
2 - VALVE BODY
3 - FILTER SCREWS (2)

(10) Remove valve body assembly. Push valve body harness connector out of case. Then work park rod and valve body out of case (Fig. 24).

(11) Remove accumulator piston and inner and outer springs (Fig. 25).

(12) Remove pump oil seal with suitable pry tool or slide-hammer mounted screw.

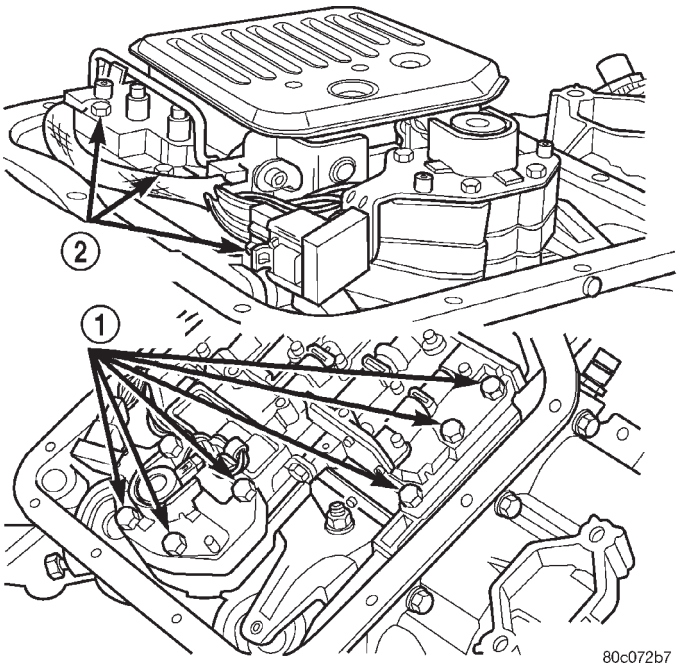


Fig. 23 Valve Body Bolt Locations

1 - VALVE BODY BOLTS
2 - VALVE BODY BOLTS

(13) Loosen front band adjusting screw locknut 4-5 turns. Then tighten band adjusting screw until band

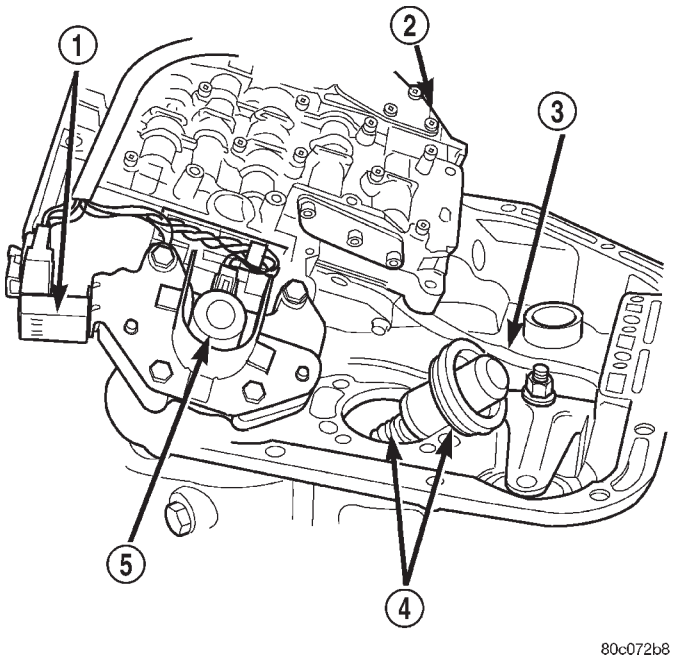


Fig. 24 Valve Body Removal

1 - GOVERNOR PRESSURE SENSOR
2 - VALVE BODY
3 - PARK ROD
4 - ACCUMULATOR PISTON
5 - GOVERNOR PRESSURE SOLENOID

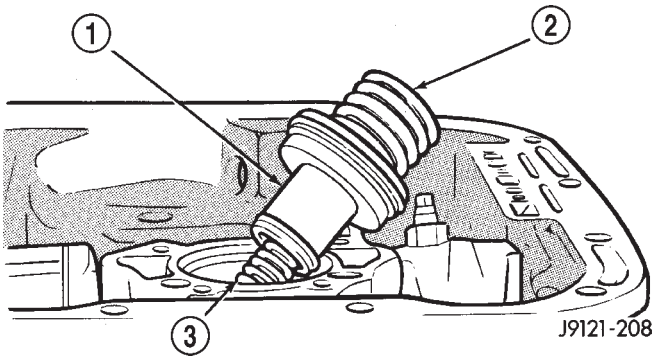


Fig. 25 Accumulator Piston And Springs

1 - ACCUMULATOR PISTON
2 - OUTER SPRING
3 - INNER SPRING

is tight around front clutch retainer. This prevents front/rear clutches from coming out with pump and possibly damaging clutch or pump components.

(14) Remove oil pump bolts.

(15) Thread bolts of Slide Hammer Tools C-3752 into threaded holes in pump body flange (Fig. 26).

(16) Bump slide hammer weights outward to remove pump and reaction shaft support assembly from case (Fig. 26).

(17) Loosen front band adjusting screw until band is completely loose.

AUTOMATIC TRANSMISSION - 42RE (Continued)

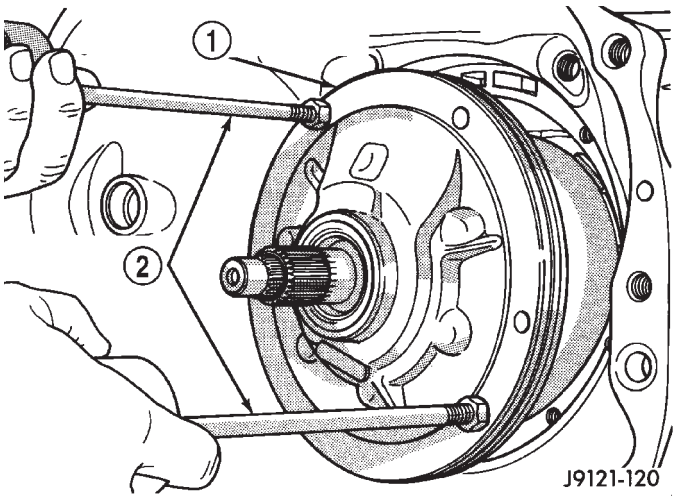


Fig. 26 Removing Oil Pump And Reaction Shaft Support Assembly

1 - OIL PUMP AND REACTION SHAFT SUPPORT ASSEMBLY
2 - SLIDE HAMMER TOOLS C-3752

(18) Squeeze front band together and remove band strut (Fig. 27).

(19) Remove front band lever (Fig. 28).

(20) Remove front band lever shaft plug, if necessary, from converter housing.

(21) Remove front band lever shaft.

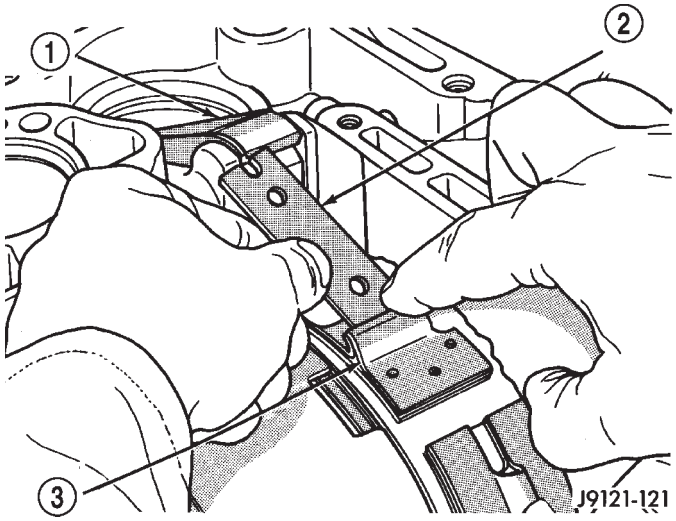


Fig. 27 Removing Front Band Strut

1 - BAND LEVER
2 - BAND STRUT
3 - FRONT BAND

(22) Remove front and rear clutch units as assembly. Grasp input shaft, hold clutch units together and remove them from case (Fig. 29).

(23) Lift front clutch off rear clutch (Fig. 30). Set clutch units aside for overhaul.

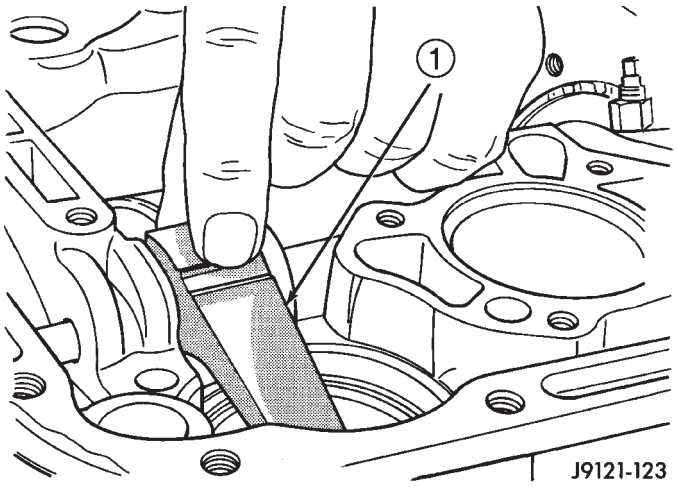


Fig. 28 Removing Front Band Lever

1 - FRONT BAND LEVER

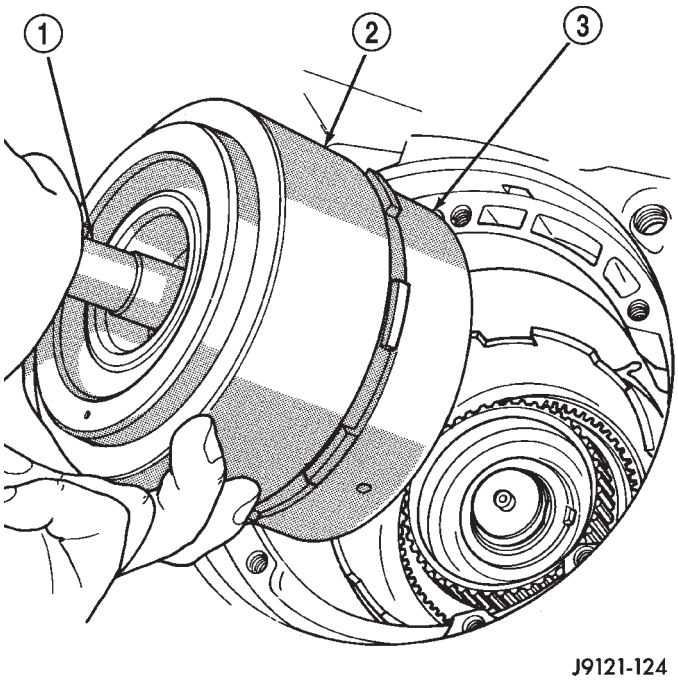


Fig. 29 Removing Front/Rear Clutch Assemblies

1 - INPUT SHAFT
2 - FRONT CLUTCH
3 - REAR CLUTCH

(24) Remove intermediate shaft thrust washer from front end of shaft or from rear clutch hub (Fig. 31).

(25) Remove output shaft thrust plate from intermediate shaft hub (Fig. 32).

(26) Slide front band off driving shell (Fig. 33) and remove band from case.

AUTOMATIC TRANSMISSION - 42RE (Continued)

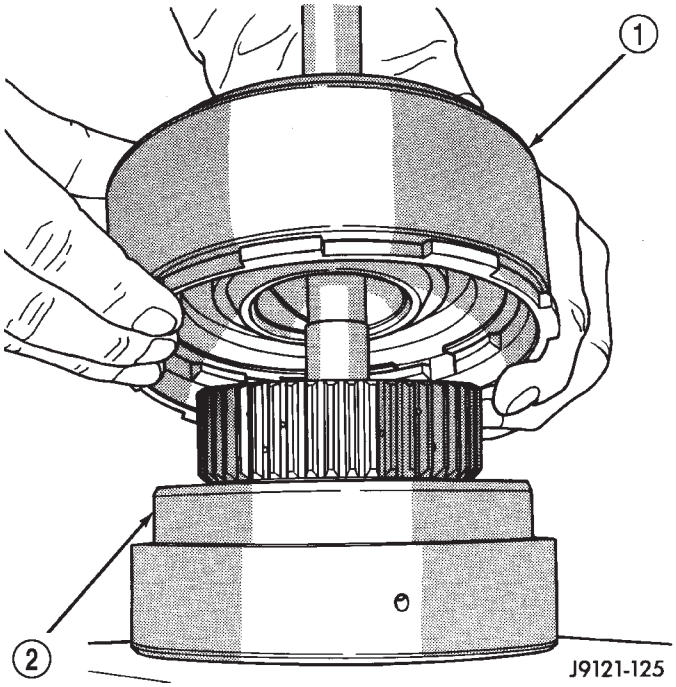


Fig. 30 Separating Front/Rear Clutch Assemblies

1 - FRONT CLUTCH
2 - REAR CLUTCH

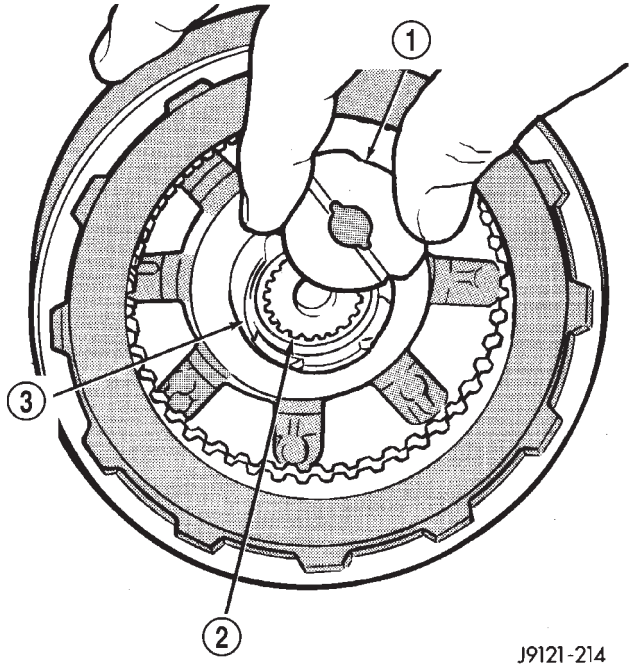


Fig. 31 Removing Intermediate Shaft Thrust Washer

1 - INTERMEDIATE SHAFT THRUST WASHER
2 - INPUT SHAFT
3 - REAR CLUTCH RETAINER HUB

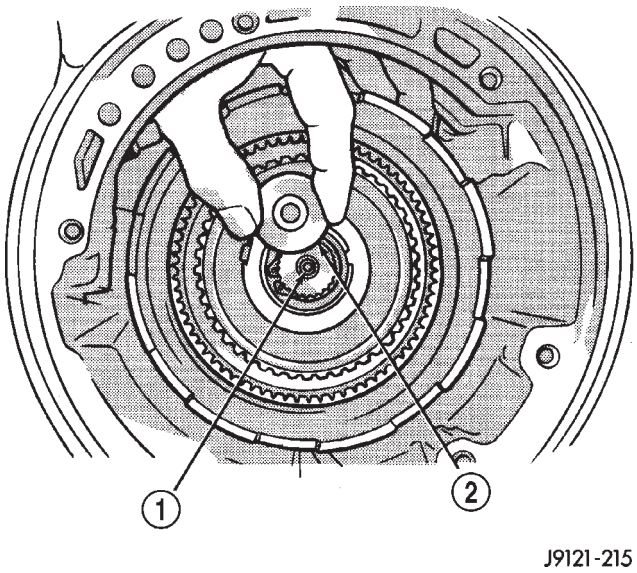


Fig. 32 Removing Intermediate Shaft Thrust Plate

1 - INTERMEDIATE SHAFT HUB
2 - INTERMEDIATE SHAFT THRUST PLATE

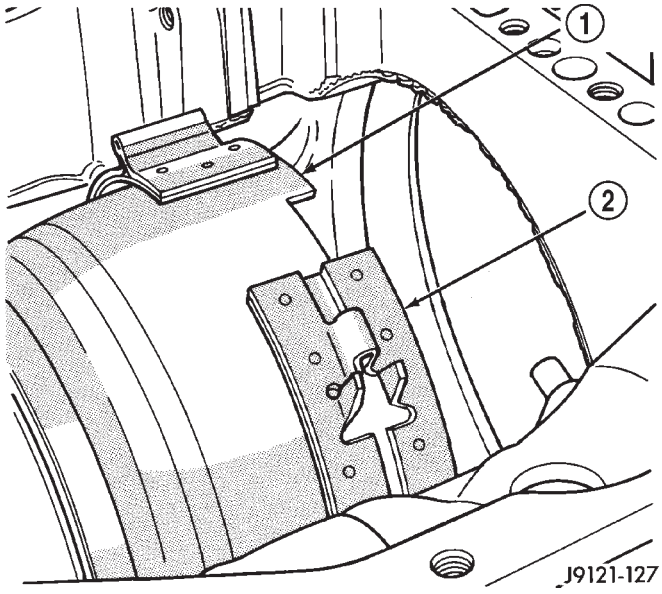


Fig. 33 Front Band Removal

1 - DRIVING SHELL
2 - FRONT BAND

(27) Remove planetary geartrain as assembly (Fig. 34). Support geartrain with both hands during removal. Do not allow machined surfaces on intermediate shaft or overdrive piston retainer to become nicked or scratched.

(28) If overdrive unit is not to be serviced, install Alignment Shaft 6227-2 into the overdrive unit to prevent misalignment of the overdrive clutches during service of main transmission components.

AUTOMATIC TRANSMISSION - 42RE (Continued)

(29) Loosen rear band adjusting screw 4-5 turns.
(30) Remove low-reverse drum snap-ring (Fig. 35).

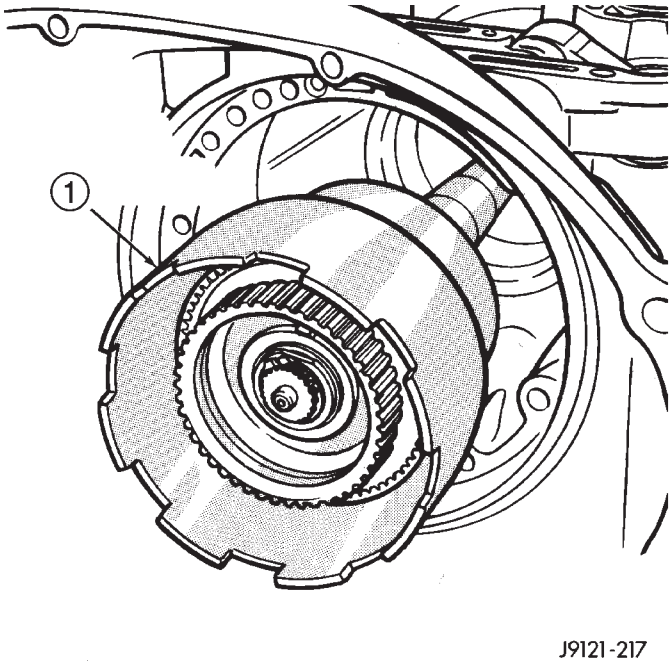


Fig. 34 Removing Planetary Geartrain And Intermediate Shaft Assembly

1 - PLANETARY GEARTRAIN AND INTERMEDIATE SHAFT ASSEMBLY

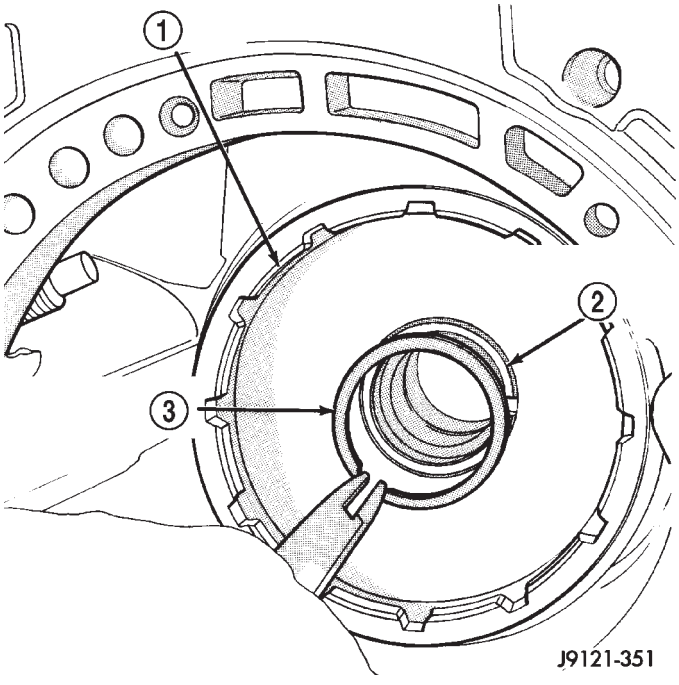


Fig. 35 Removing Low-Reverse Drum Snap-Ring

1 - LOW-REVERSE DRUM
2 - HUB OF OVERDRIVE PISTON RETAINER
3 - LOW-REVERSE DRUM SNAP-RING

(31) Remove low-reverse drum and reverse band.
(32) Remove overrunning clutch roller and spring assembly as a unit (Fig. 36).
(33) Compress front servo rod guide about 1/8 inch with Valve Spring Compressor C-3422-B (Fig. 37).
(34) Remove front servo rod guide snap-ring. Exercise caution when removing snap-ring. Servo bore can be scratched or nicked if care is not exercised.
(35) Remove compressor tools and remove front servo rod guide, spring and servo piston.

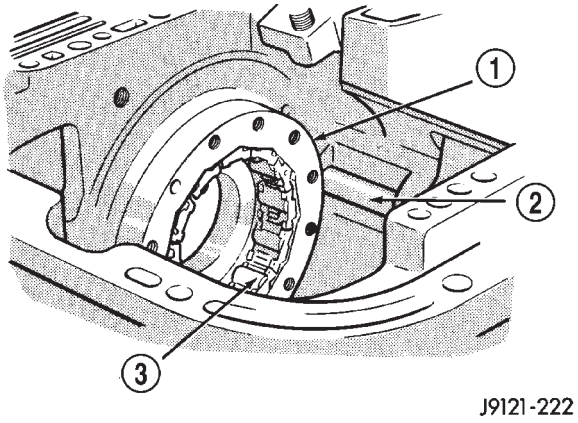


Fig. 36 Overrunning Clutch Assembly Removal

1 - OVERRUNNING CLUTCH CAM
2 - REAR BAND REACTION PIN
3 - OVERRUNNING CLUTCH ASSEMBLY

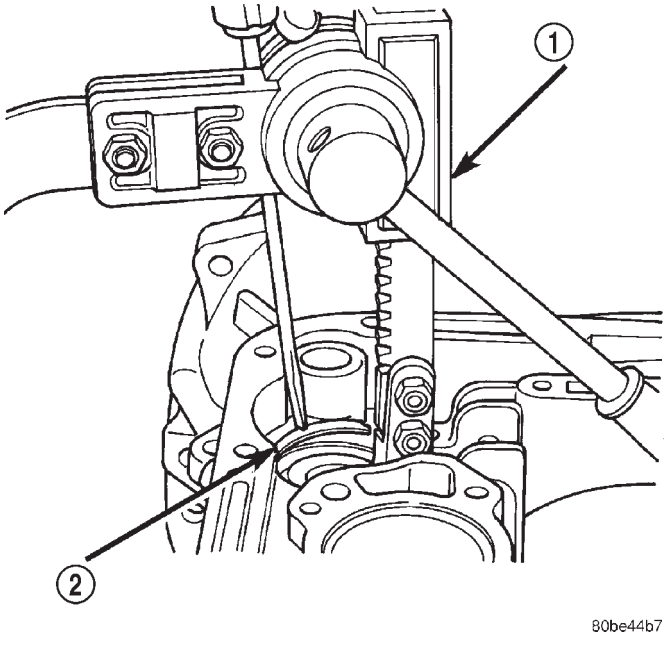


Fig. 37 Compressing Front Servo Rod Guide

1 - SPRING COMPRESSOR TOOL C-3422-B
2 - ROD GUIDE SNAP-RING

(36) Compress rear servo spring retainer about 1/16 inch with Valve Spring Compressor C-3422-B (Fig. 38).

(37) Remove rear servo spring retainer snap-ring. Then remove compressor tools and remove rear servo spring and piston.

(38) Inspect transmission components.

NOTE: To Service the overrunning clutch cam or overdrive piston retainer, refer to the Overrunning Clutch Cam service procedure in this section.

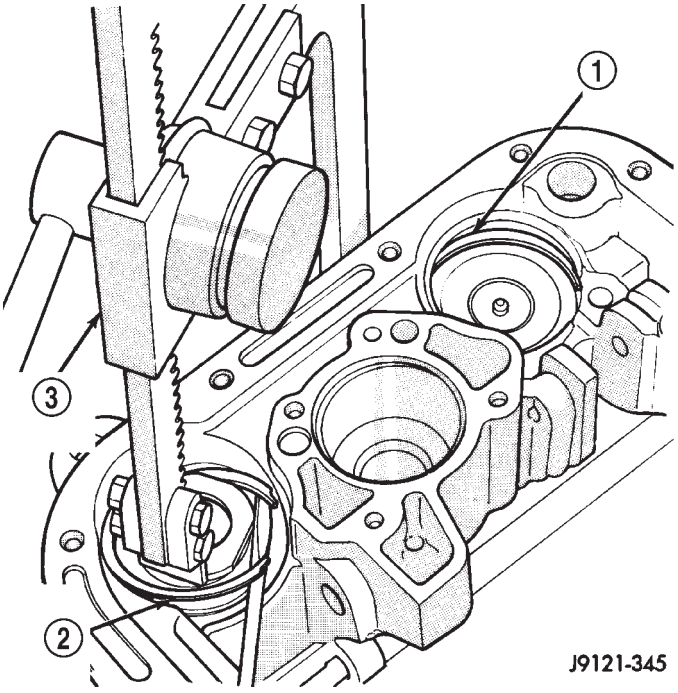


Fig. 38 Compressing Rear Servo Spring

1 - FRONT SERVO SNAP-RING
2 - REAR SERVO SNAP-RING
3 - SPECIAL TOOL

CLEANING

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Lubricate transmission parts with Mopar® ATF +4, type 9602, transmission fluid during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde™ to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

Lubricate the front band adjusting screw threads with petroleum jelly and thread the screw part-way into the case. Be sure the screw turns freely.

Inspect the transmission bushings during overhaul. Bushing condition is important as worn, scored bushings contribute to low pressures, clutch slip and accelerated wear of other components. However, do not replace bushings as a matter of course. Replace bushings only when they are actually worn, or scored.

Use recommended tools to replace bushings. The tools are sized and designed to remove, install, and seat bushings correctly. The bushing replacement tools are included in Bushing Tool Set C-3887-B.

Pre-sized service bushings are available for replacement purposes. Only the sun gear bushings are not serviced.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

ASSEMBLY

Do not allow dirt, grease, or foreign material to enter the case or transmission components during assembly. Keep the transmission case and components clean. Also make sure the tools and workbench area used for assembly operations are equally clean.

Shop towels used for wiping off tools and hands must be made from **lint free** material. Lint will stick to transmission parts and could interfere with valve operation, or even restrict fluid passages.

Lubricate the transmission components with Mopar® transmission fluid during reassembly. Use Mopar® Door Ease, or Ru-Glyde™ on seals and O-rings to ease installation.

AUTOMATIC TRANSMISSION - 42RE (Continued)

Petroleum jelly can also be used to hold thrust washers, thrust plates and gaskets in position during assembly. However, **do not** use chassis grease, bearing grease, white grease, or similar lubricants on any transmission part. These types of lubricants can eventually block or restrict fluid passages and interfere with valve operation. Use petroleum jelly only.

Do not force parts into place. The transmission components and subassemblies are easily installed by hand when properly aligned.

If a part seems extremely difficult to install, it is either misaligned or incorrectly assembled. Also verify that thrust washers, thrust plates and seal rings are correctly positioned before assembly. These parts can interfere with proper assembly if mis-positioned.

The planetary geartrain, front/rear clutch assemblies and oil pump are all much easier to install when the transmission case is upright.

(1) Install rear servo piston, spring and retainer (Fig. 39). Install spring on top of servo piston and install retainer on top of spring.

(2) Install front servo piston assembly, servo spring and rod guide (Fig. 40).

(3) Compress front/rear servo springs with Valve Spring Compressor C-3422-B and install each servo snap-ring (Fig. 41).

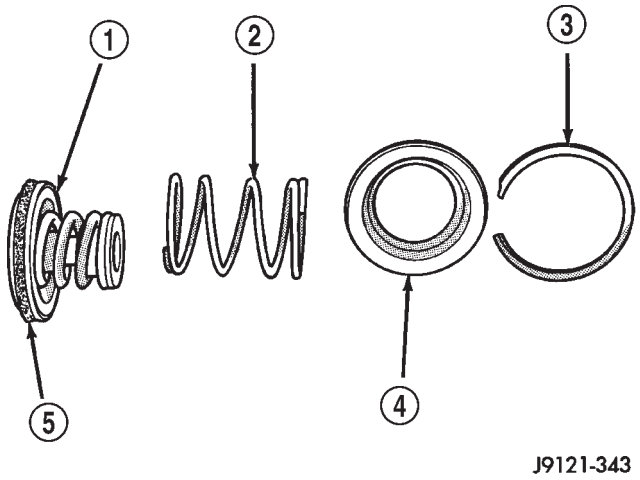


Fig. 39 Rear Servo Components

1 - SERVO PISTON
2 - PISTON SPRING
3 - SNAP-RING
4 - RETAINER
5 - PISTON SEAL

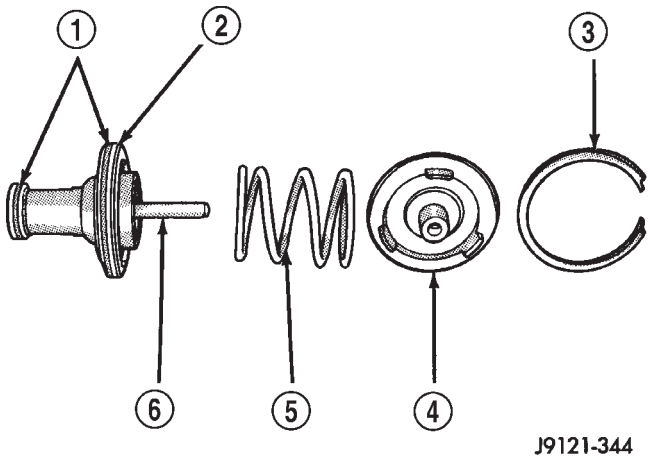


Fig. 40 Front Servo Components

1 - PISTON SEAL RINGS
2 - SERVO PISTON
3 - SNAP-RING
4 - ROD GUIDE
5 - SPRING
6 - ROD

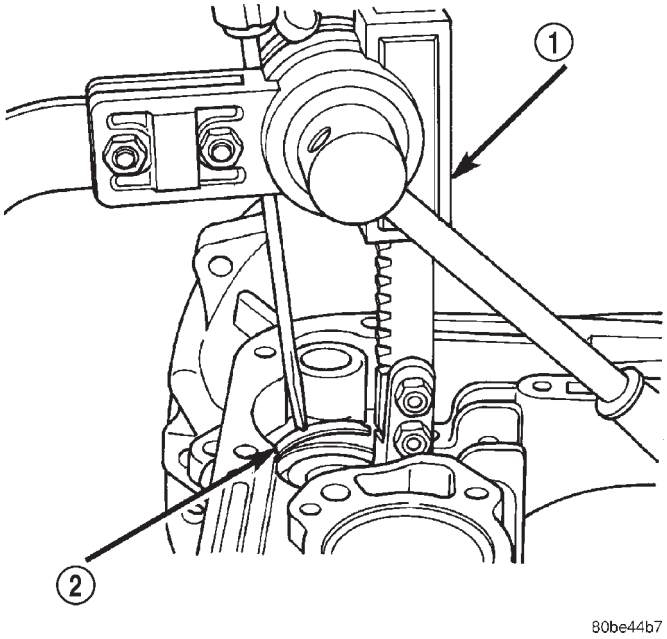


Fig. 41 Compressing Front/Rear Servo Springs

1 - SPRING COMPRESSOR TOOL C-3422-B
2 - ROD GUIDE SNAP-RING

(4) Lubricate clutch cam rollers with transmission fluid.

(5) Install rear band in case (Fig. 42). Be sure twin lugs on band are seated against reaction pin.

(6) Install low-reverse drum and check overrunning clutch operation as follows:

(a) Lubricate overrunning clutch race (on drum hub) with transmission fluid.

(b) Guide drum through rear band.

(c) Tilt drum slightly and start race (on drum hub) into overrunning clutch rollers.

(d) Press drum rearward and turn it in clockwise direction until drum seats in overrunning clutch (Fig. 43).

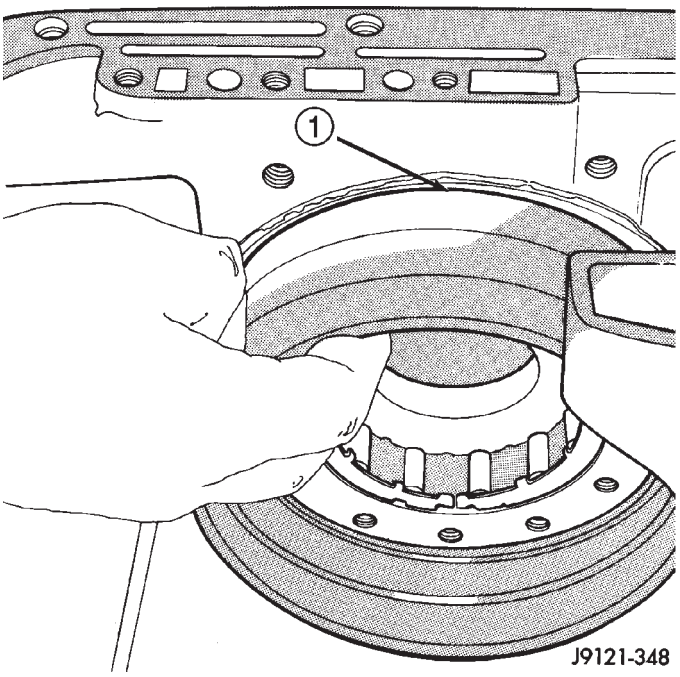


Fig. 42 Rear Band Installation

1 - REAR BAND

(e) Turn drum back and forth. Drum should rotate freely in clockwise direction and lock in counterclockwise direction (as viewed from front of case).

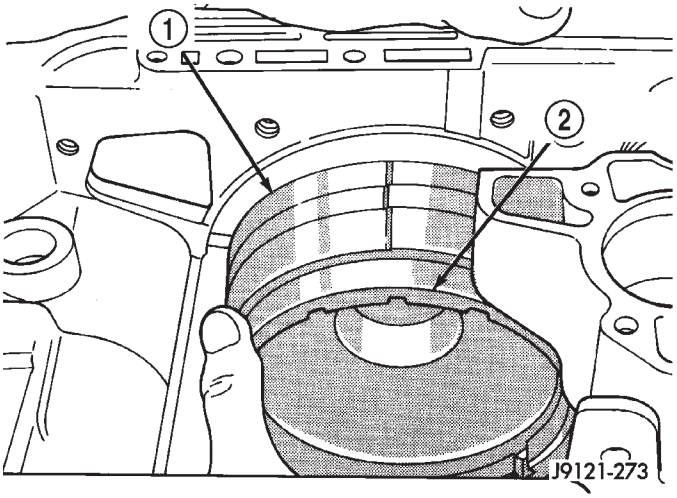


Fig. 43 Installing Low-Reverse Drum

1 - REAR BAND
2 - LOW-REVERSE DRUM

(7) Install snap-ring that secures low-reverse drum to hub of overdrive piston retainer (Fig. 44).

(8) Install rear band lever and pivot pin (Fig. 45). Align lever with pin bores in case and push pivot pin into place.

(9) Install planetary geartrain assembly (Fig. 46).

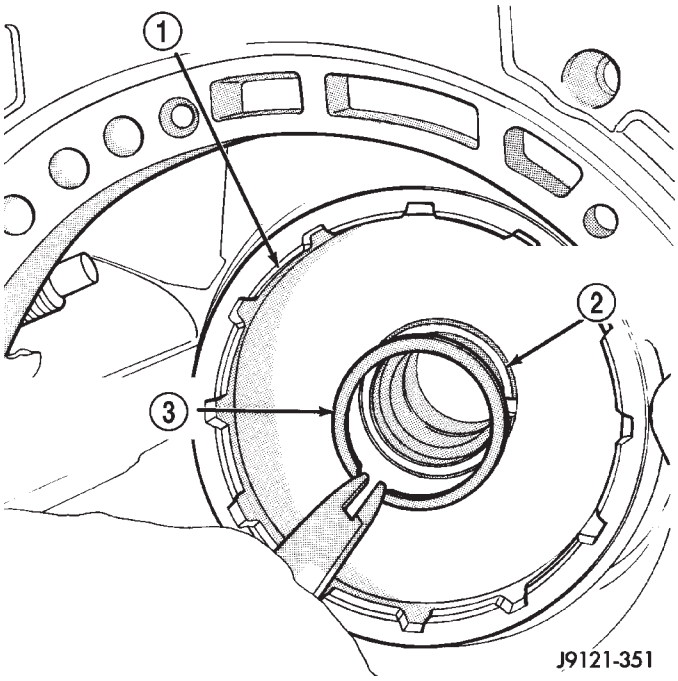


Fig. 44 Installing Low-Reverse Drum Retaining Snap-Ring

1 - LOW-REVERSE DRUM
2 - HUB OF OVERDRIVE PISTON RETAINER
3 - LOW-REVERSE DRUM SNAP-RING

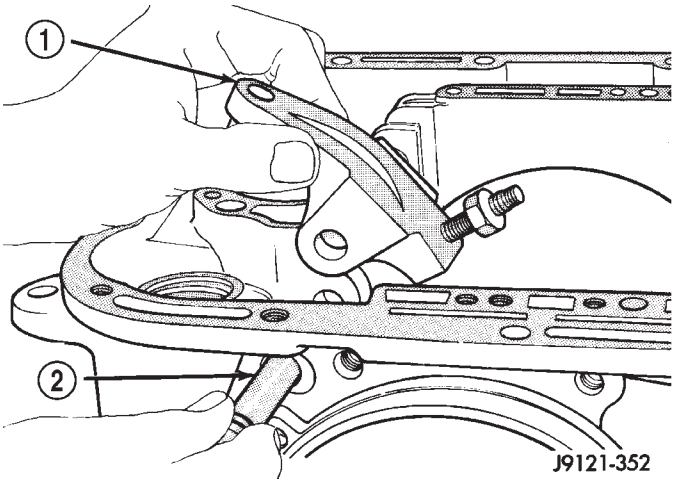


Fig. 45 Rear Band Lever And Pivot Pin Installation

1 - REAR BAND LEVER
2 - LEVER PIVOT PIN

AUTOMATIC TRANSMISSION - 42RE (Continued)

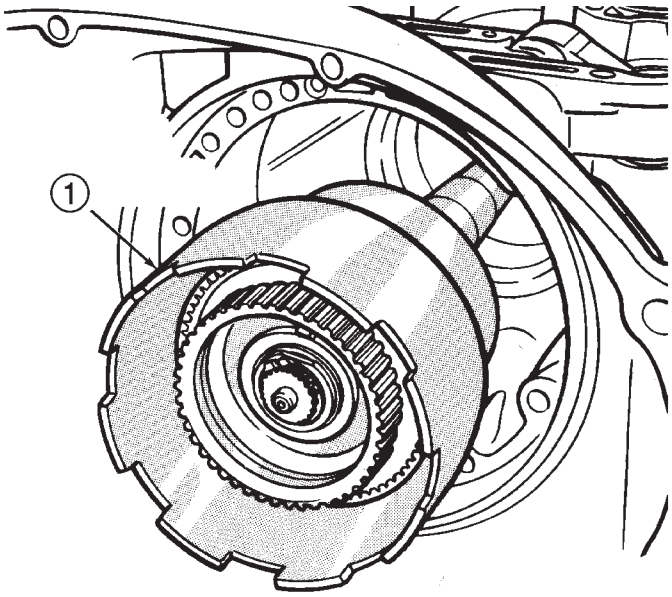


Fig. 46 Installing Planetary Geartrain

1 - PLANETARY GEARTRAIN AND INTERMEDIATE SHAFT ASSEMBLY

(10) Install thrust plate on intermediate shaft hub (Fig. 47). Use petroleum jelly to hold thrust plate in place.

(11) Check seal ring on rear clutch retainer hub and seal rings on input shaft (Fig. 48). Also verify that shaft seal rings are installed in sequence shown.

(12) Install rear clutch thrust washer (Fig. 49). Use additional petroleum jelly to hold washer in place if necessary.

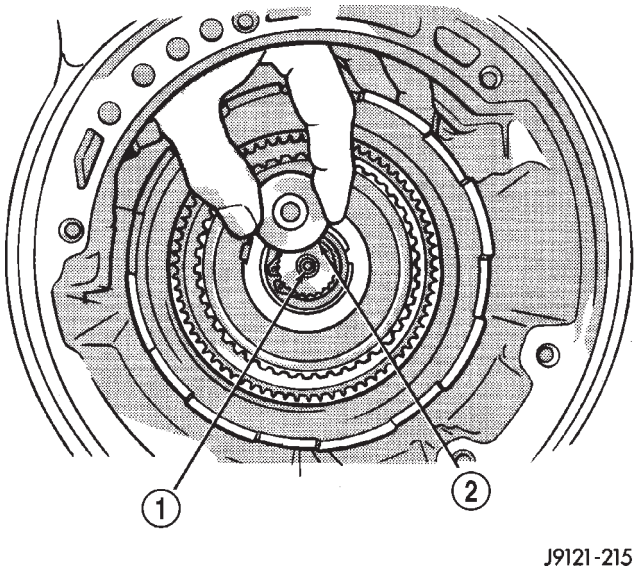


Fig. 47 Installing Intermediate Shaft Thrust Plate

1 - INTERMEDIATE SHAFT HUB
2 - INTERMEDIATE SHAFT THRUST PLATE

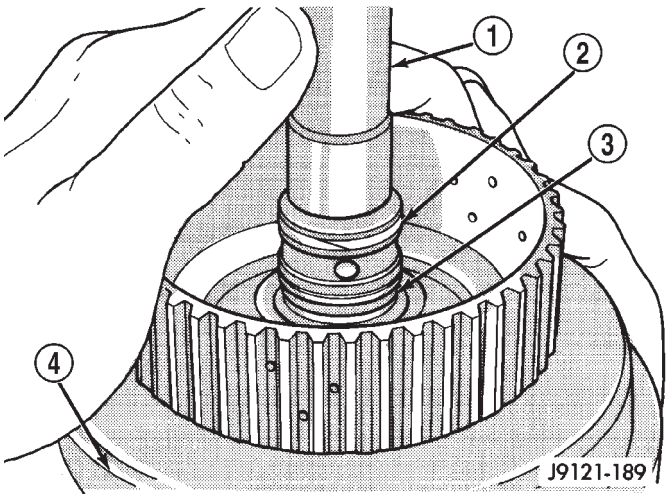


Fig. 48 Input Shaft Seal Ring Location

1 - INPUT SHAFT
2 - TEFLON SEAL RING
3 - PLASTIC SEAL RING
4 - REAR CLUTCH RETAINER

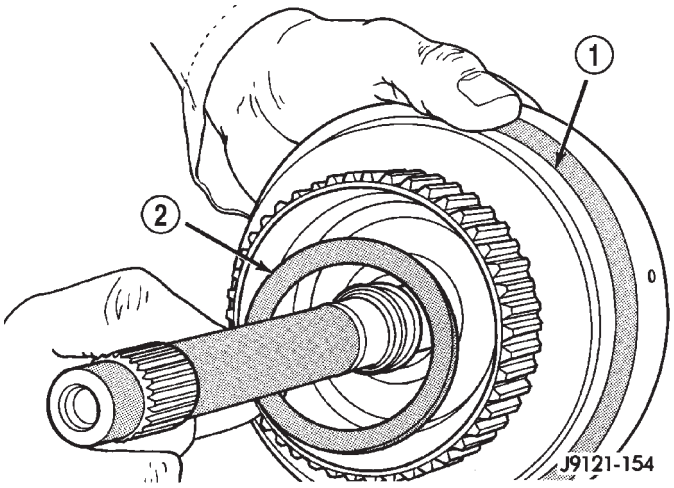


Fig. 49 Installing Rear Clutch Thrust Washer

1 - REAR CLUTCH RETAINER
2 - REAR CLUTCH THRUST WASHER (FIBER)

(13) Align clutch discs in front clutch and install front clutch on rear clutch (Fig. 50). Rotate front clutch retainer back and forth until completely seated on rear clutch retainer.

(14) Coat intermediate shaft thrust washer with petroleum jelly. Then install washer in rear clutch hub (Fig. 51). Use enough petroleum jelly to hold washer in place. Be sure grooved side of washer faces rearward (toward output shaft) as shown. Also note that washer only fits one way in clutch hub. Note thickness of this washer. It is a select fit part and is used to control transmission end play.

AUTOMATIC TRANSMISSION - 42RE (Continued)

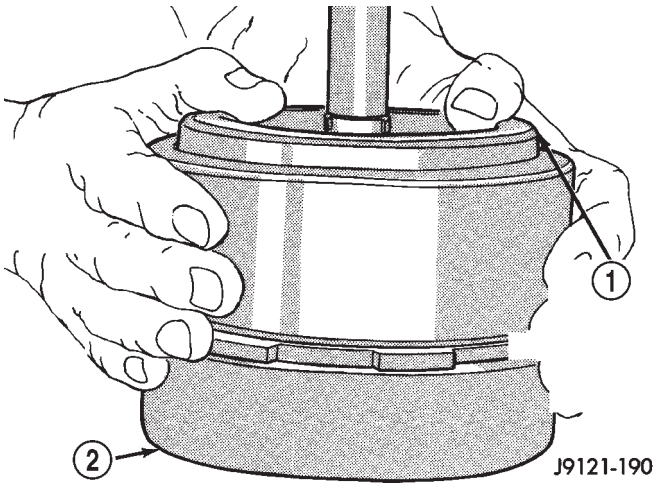


Fig. 50 Assembling Front And Rear Clutch Units

1 - TURN FRONT CLUTCH BACK & FORTH UNTIL SEATED
2 - REAR CLUTCH ASSEMBLY

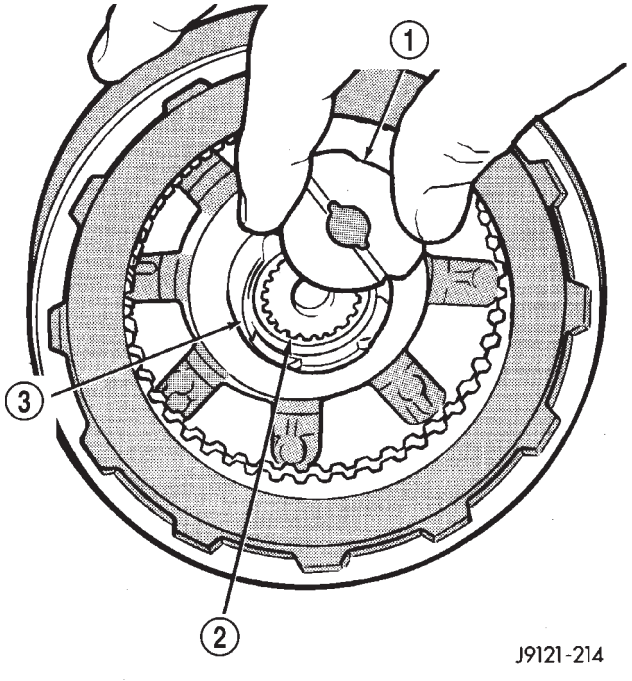


Fig. 51 Installing Intermediate Shaft Thrust Washer

1 - INTERMEDIATE SHAFT THRUST WASHER
2 - INPUT SHAFT
3 - REAR CLUTCH RETAINER HUB

(15) Align drive teeth on rear clutch discs with small screwdriver (Fig. 52). This makes installation on front planetary easier.

(16) Raise front end of transmission upward as far as possible and support case with wood blocks. Front/rear clutch and oil pump assemblies are easier to install if transmission is as close to upright position as possible.

(17) Slide front band into case.

(18) Install front and rear clutch units as assembly (Fig. 53). Align rear clutch with front annulus gear and install assembly in driving shell. Be sure output shaft thrust washer and thrust plate are not displaced during installation.

(19) Carefully work assembled clutches back and forth to engage and seat rear clutch discs on front annulus gear. Also be sure front clutch drive lugs are fully engaged in slots of driving shell after installation.

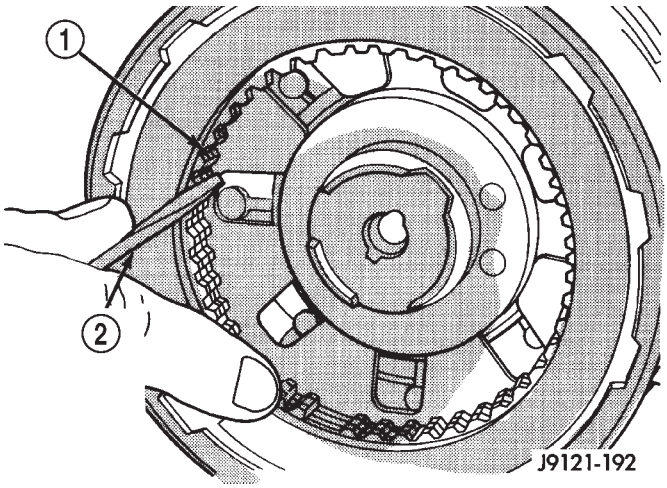


Fig. 52 Aligning Rear Clutch Disc Lugs

1 - REAR CLUTCH DISCS
2 - USE SMALL SCREWDRIVER TO ALIGN CLUTCH DISC TEETH

(20) Assemble front band strut.

(21) Install front band adjuster, strut and adjusting screw (Fig. 54).

(22) Tighten band adjusting screw until band just grips clutch retainer. Verify that front/rear clutches are still seated before continuing.

AUTOMATIC TRANSMISSION - 42RE (Continued)

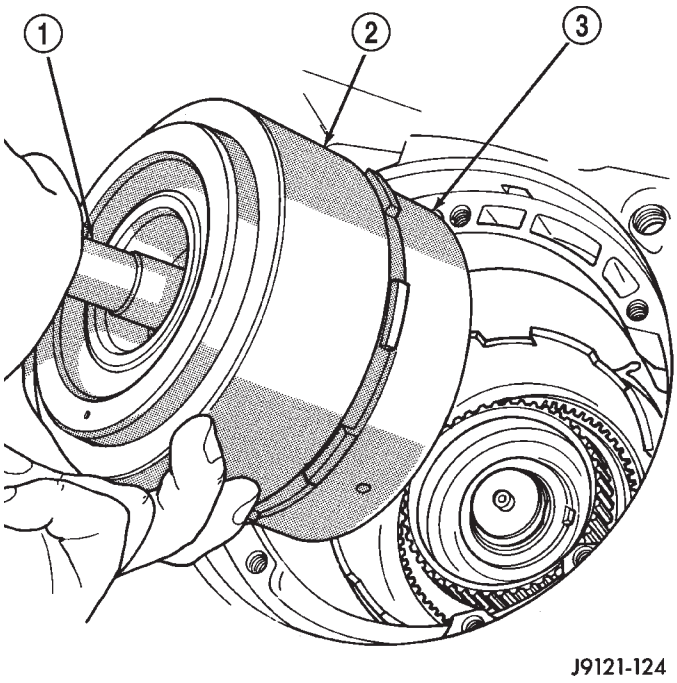


Fig. 53 Installing Front/Rear Clutch Assemblies

1 - INPUT SHAFT
2 - FRONT CLUTCH
3 - REAR CLUTCH

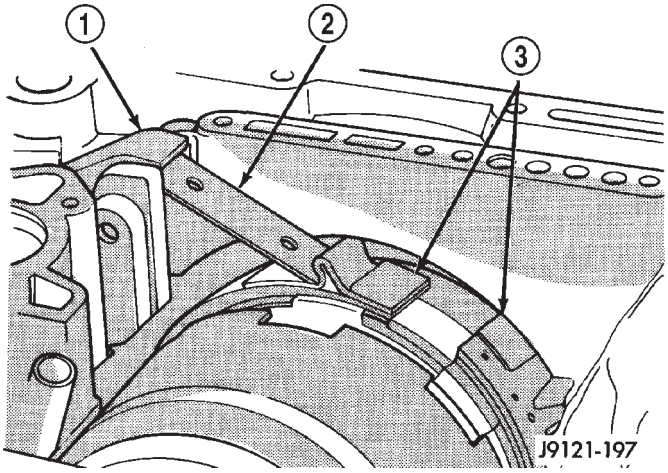


Fig. 54 Front Band Linkage Installation

1 - BAND LEVER
2 - BAND STRUT
3 - FRONT BAND

(23) Check seal rings on reaction shaft support hub. Verify that seal rings are hooked together and that the thrust washer is properly positioned (Fig. 55). Use petroleum jelly to hold thrust washer in place if necessary.

(24) Lubricate oil pump body seal with petroleum jelly. Lubricate pump shaft seal lip with petroleum jelly.

(25) Thread two Pilot Stud Tools C-3288-B into bolt holes in oil pump bore flange (Fig. 56).

(26) Align and install oil pump gasket (Fig. 56).

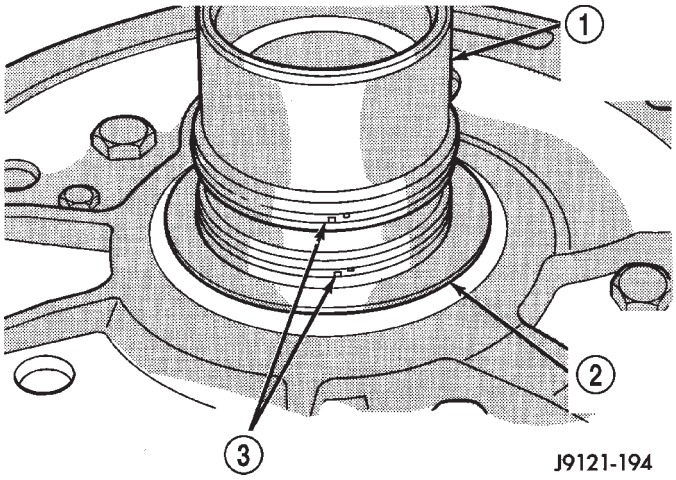


Fig. 55 Reaction Shaft Support Seal Rings And Thrust Washer

1 - REACTION SHAFT SUPPORT HUB
2 - THRUST WASHER
3 - SEAL RINGS

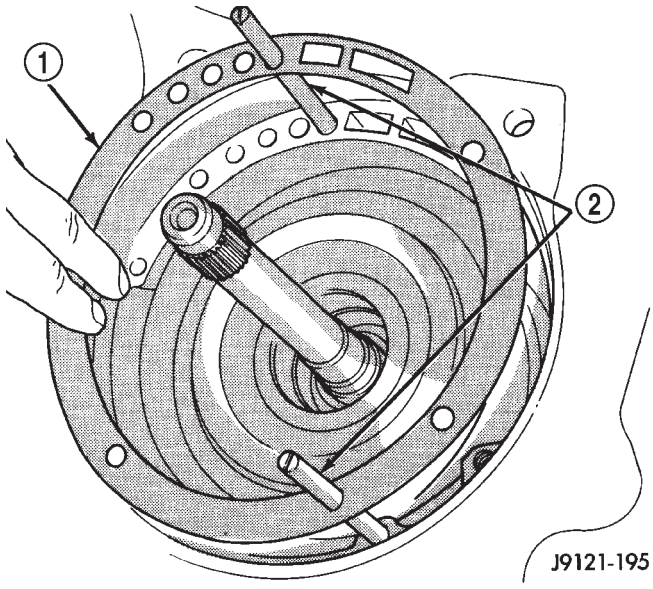


Fig. 56 Installing Pilot Studs And Oil Pump Gasket

1 - OIL PUMP GASKET
2 - PILOT STUD TOOLS C-3288-B

(27) Install oil pump (Fig. 57). Align and position pump on pilot studs. Slide pump down studs and work it into front clutch hub and case by hand. Then install 2 or 3 pump bolts to hold pump in place.

(28) Remove pilot stud tools and install remaining oil pump bolts. Tighten bolts alternately in diagonal pattern to 20 N·m (15 ft. lbs.).

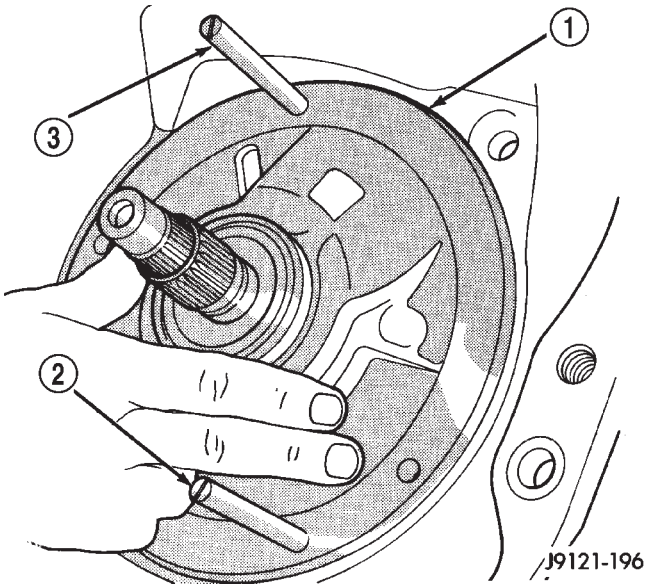


Fig. 57 Installing Oil Pump

1 - OIL PUMP
2 - PILOT STUD TOOL
3 - PILOT STUD TOOL

(29) Measure input shaft end play (Fig. 58).

NOTE: If end play is incorrect, transmission is incorrectly assembled, or the intermediate shaft thrust washer is incorrect. The intermediate shaft thrust washer is selective.

(a) Attach Adapter 8266-6 to Handle 8266-8.

(b) Attach dial indicator C-3339 to Handle 8266-8.

(c) Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-6 to secure it to the input shaft.

(d) Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.

(e) Move input shaft in and out and record reading. End play should be 0.56-2.31 mm (0.022-0.091 in.). Adjust as necessary.

(30) Install accumulator piston and inner and outer springs (Fig. 59).

(31) Verify that valve body solenoid harness is secured in 3-4 accumulator housing cover plate.

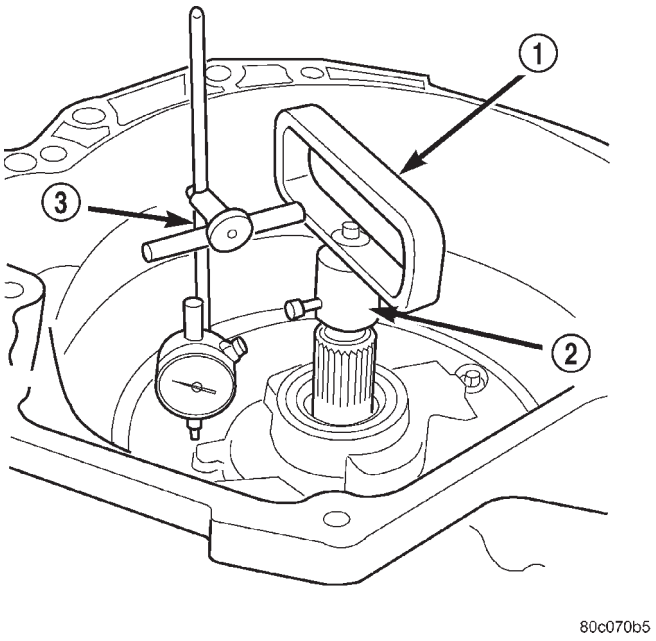


Fig. 58 Checking Input Shaft End Play

1 - TOOL 8266-8
2 - TOOL 8266-6
3 - TOOL C-3339

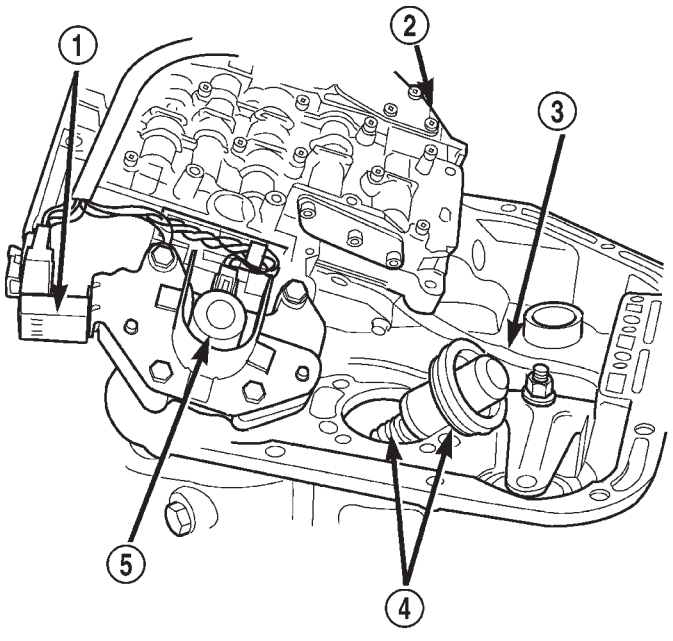


Fig. 59 Accumulator Piston And Springs

1 - GOVERNOR PRESSURE SENSOR
2 - VALVE BODY
3 - PARK ROD
4 - ACCUMULATOR PISTON
5 - GOVERNOR PRESSURE SOLENOID

AUTOMATIC TRANSMISSION - 42RE (Continued)

(32) Install valve body as follows:

(a) Align and carefully insert park rod into pawl. Rod will make click noise as it enters pawl. Move rod slightly to check engagement.

(b) Align and seat valve body on case. Be sure manual lever shaft and overdrive connector are fully seated in case. Also be sure valve body wiring is not pinched or kinked.

(c) Install and start all valve body attaching bolts by hand. Then tighten bolts evenly, in a diagonal pattern to 12 N·m (105 in. lbs.) torque. Do not overtighten valve body bolts. This could result in distortion and cross leakage after installation.

CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into the cavity.

(33) Install new filter on valve body. Tighten filter screws to 4 N·m (35 in. lbs.).

(34) Adjust front and rear bands.

(35) Install seal on park/neutral position switch. Then install and tighten switch to 34 N·m (25 ft. lbs.).

(36) Install magnet in oil pan. Magnet goes on small protrusion at corner of pan.

(37) Position new oil pan gasket on case and install oil pan. Tighten pan bolts to 17 N·m (13 ft. lbs.).

(38) Install new valve body manual shaft seal in case (Fig. 60). Lubricate seal lip and manual shaft with petroleum jelly. Start seal over shaft and into case. Seat seal with 15/16 inch, deep well socket.

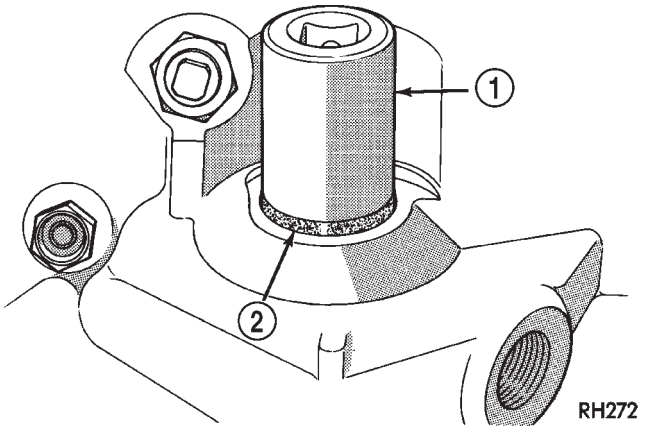


Fig. 60 Installing Manual Lever Shaft Seal

1 - 15/16'' SOCKET
2 - SEAL

(39) Install throttle valve and shift selector levers on valve body manual lever shaft.

INSTALLATION

(1) Check torque converter hub and hub drive notches for sharp edges burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal during installation.

(2) Lubricate oil pump seal lip with transmission fluid.

(3) Align converter and oil pump.

(4) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(5) Check converter seating with steel scale and straightedge (Fig. 61). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(6) Temporarily secure converter with C-clamp.

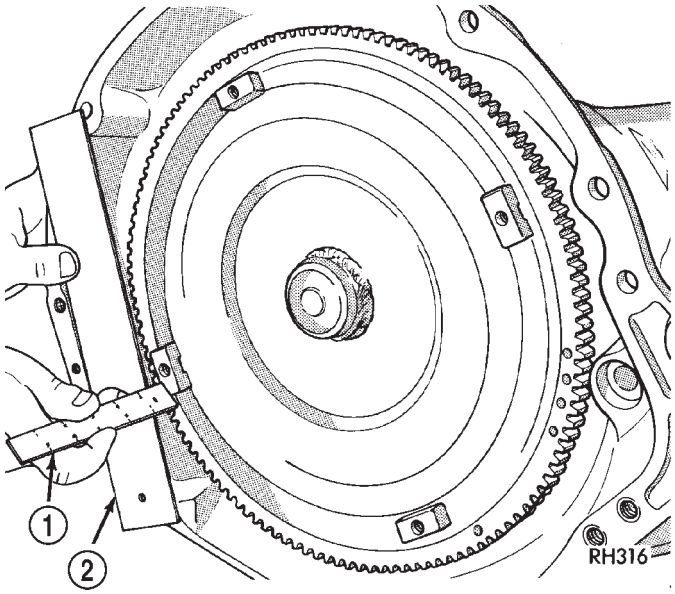


Fig. 61 Checking Torque Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

(7) Position transmission on jack and secure it with chains.

(8) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.

(9) Apply a light coating of Mopar® High Temp grease to the torque converter hub pocket in the rear of the crankshaft

(10) Raise transmission and align converter with drive plate and converter housing with engine block.

(11) Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.

(12) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.

(13) Install two bolts to attach converter housing to engine.

(14) Install the upper transmission bending braces to the torque converter housing and the overdrive unit. Tighten the bolts to 41 N·m (30 ft.lbs.).

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).

(16) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).

(17) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).

(18) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).

(19) Remove engine support fixture.

(20) Install crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - INSTALLATION)

(21) Install new plastic retainer grommet on any shift cable that was disconnected. Grommets should not be reused. Use pry tool to remove rod from grommet and cut away old grommet. Use pliers to snap new grommet into cable and to snap grommet onto lever.

(22) Connect gearshift and throttle valve cable to transmission.

(23) Connect wires to park/neutral position switch and transmission solenoid connector. Be sure transmission harnesses are properly routed.

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(24) Install all torque converter-to-driveplate bolts by hand.

(25) Verify that the torque converter is pulled flush to the driveplate. Tighten bolts to 31 N·m (270 in. lbs.).

(26) Install converter housing access cover. Tighten bolt to 23 N·m (200 in.lbs.).

(27) Install the bell housing brace to the torque converter cover and the engine to transmission bending brace. Tighten the bolts and nut to 41 N·m (30 ft.lbs.).

(28) Install starter motor (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION) and cooler line bracket.

(29) Connect cooler lines to transmission.

(30) Install transmission fill tube. Install new seal on tube before installation.

(31) Install exhaust components.

(32) Install transfer case. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).

(33) Install the transfer case shift cable to the cable support bracket and the transfer case shift lever.

(34) Align and connect propeller shaft(s).

(35) Adjust gearshift linkage and throttle valve cable if necessary.

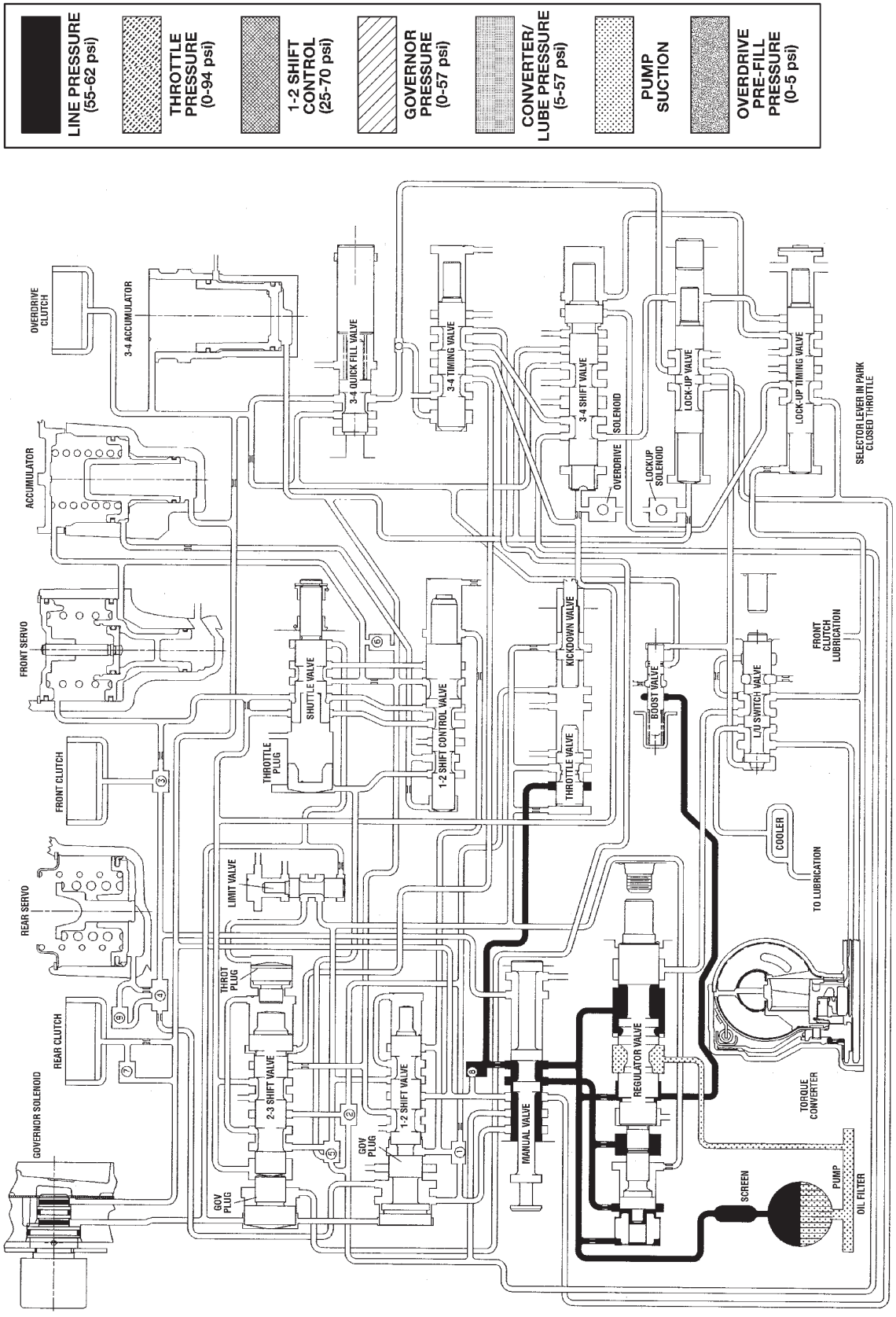
(36) Lower vehicle.

(37) Fill transmission with Mopar® ATF +4, type 9602, fluid.

AUTOMATIC TRANSMISSION - 42RE (Continued)

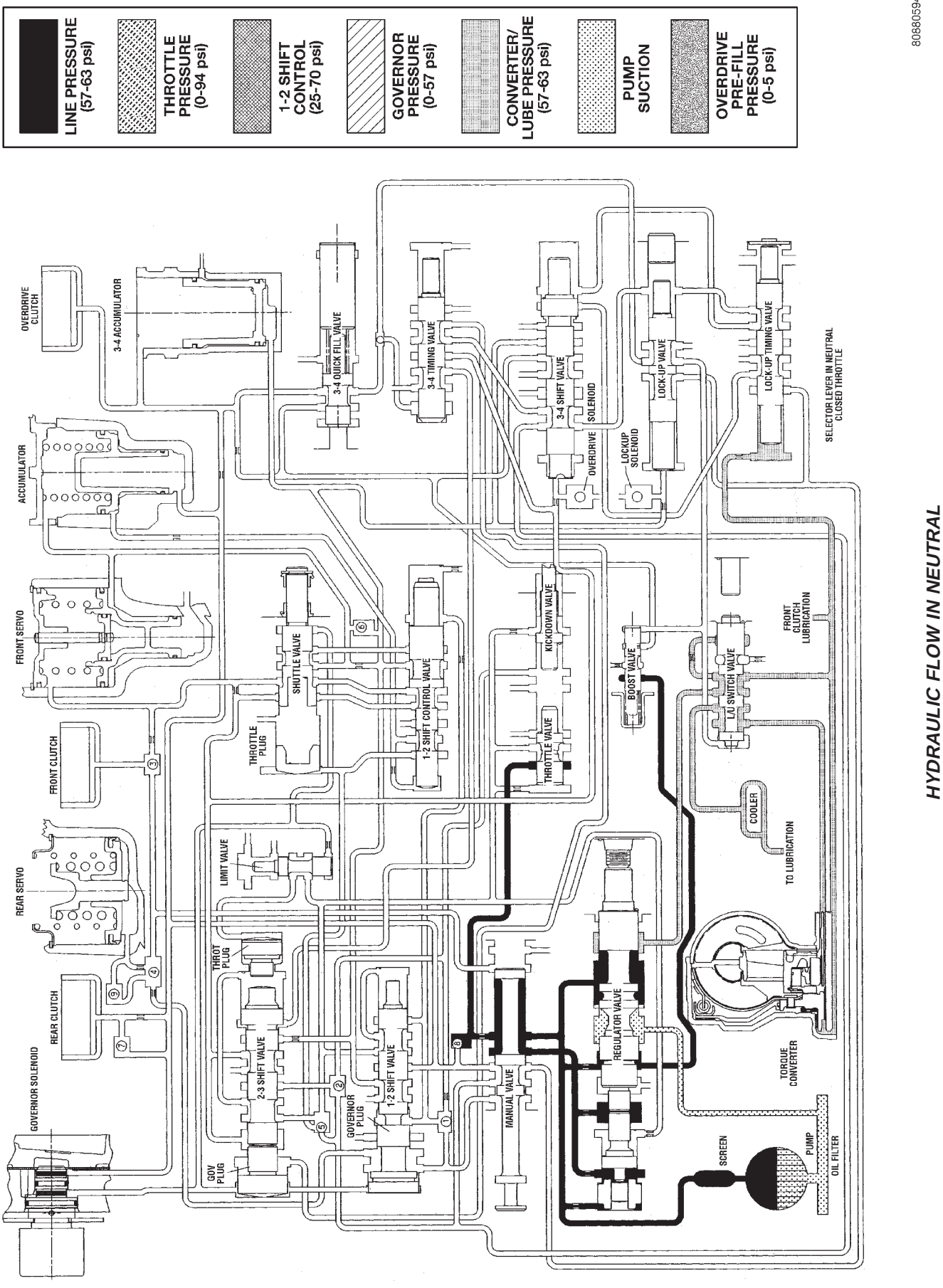
SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS



HYDRAULIC FLOW IN PARK

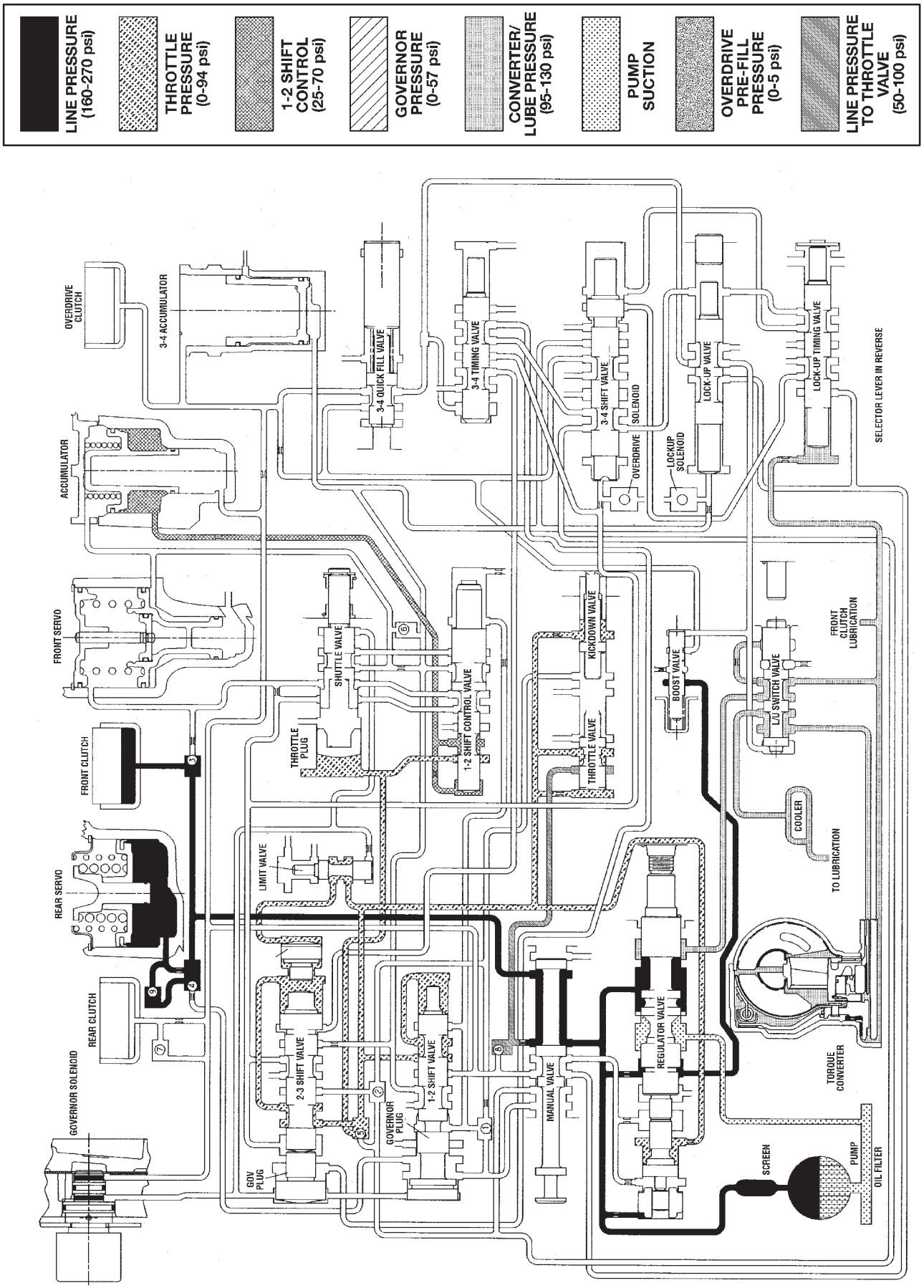
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN NEUTRAL

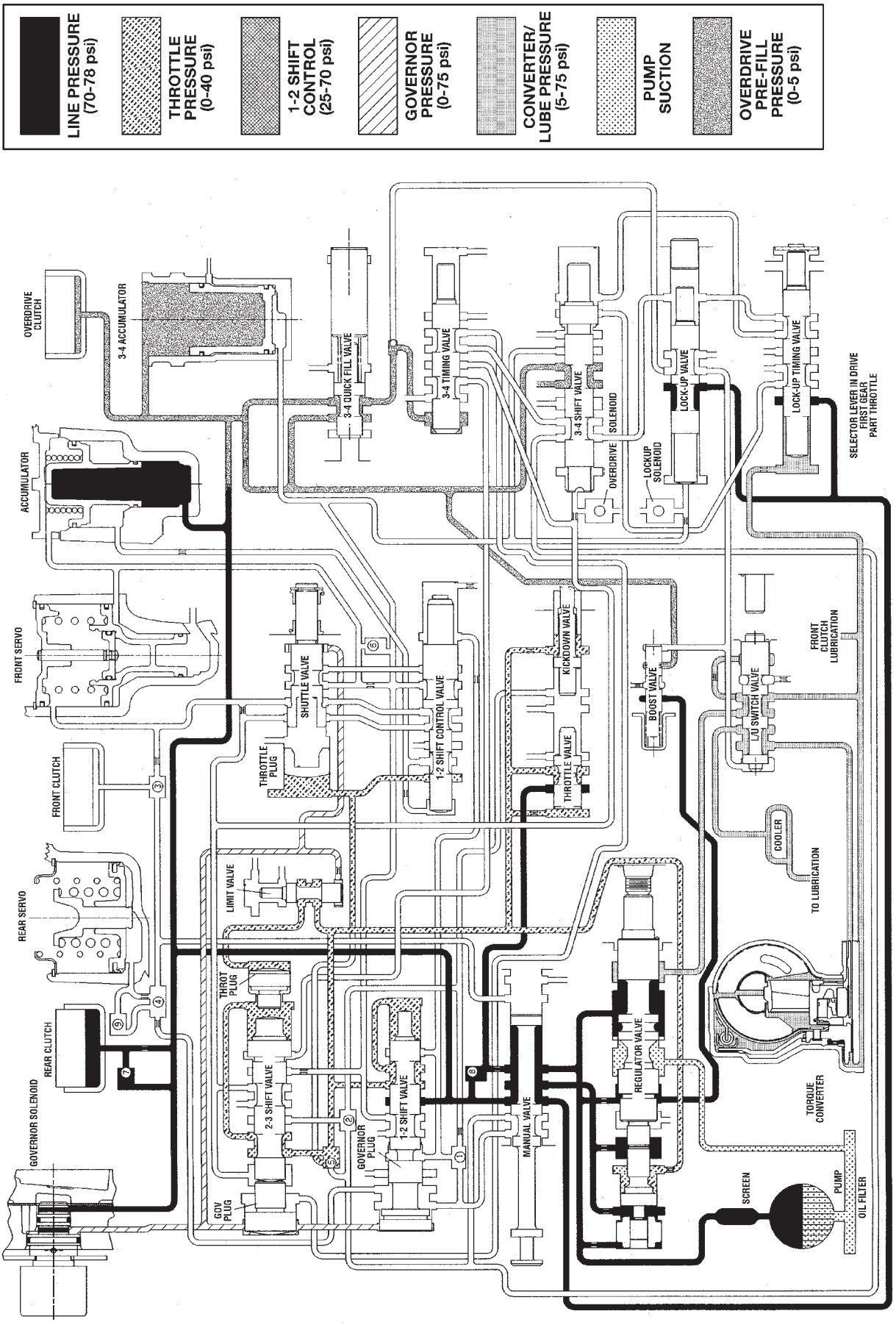
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN REVERSE

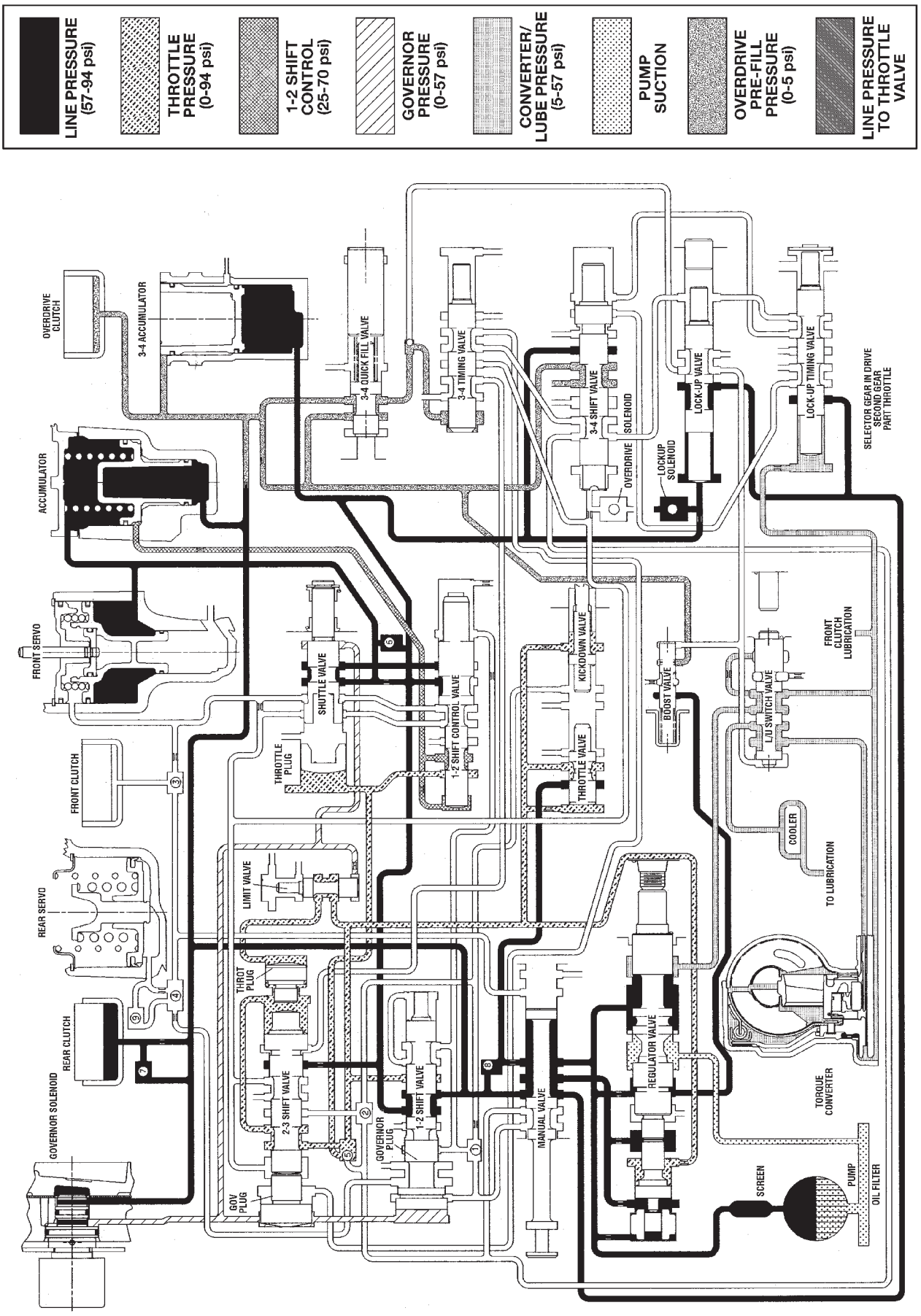
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE FIRST GEAR

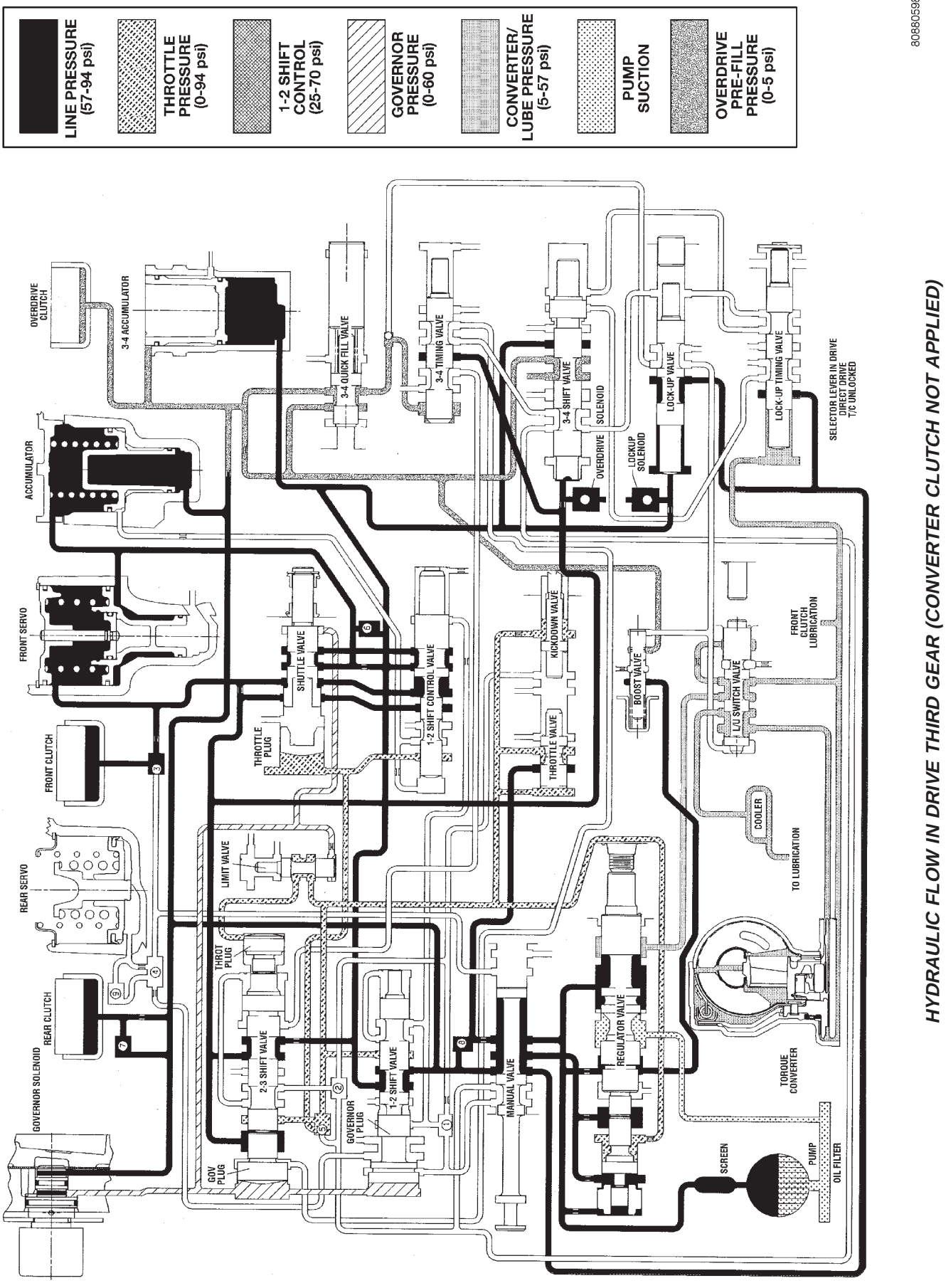
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE SECOND GEAR

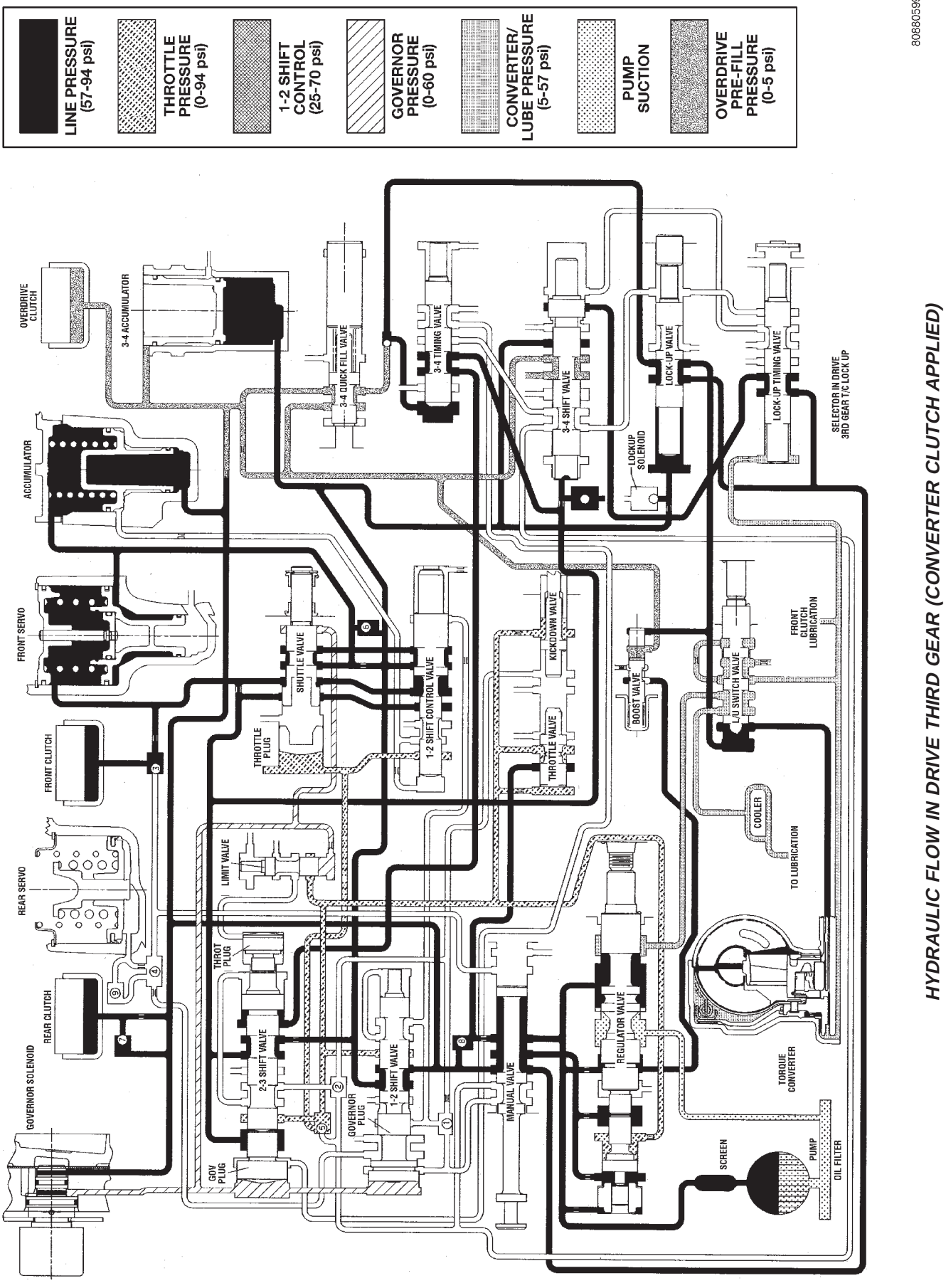
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH NOT APPLIED)

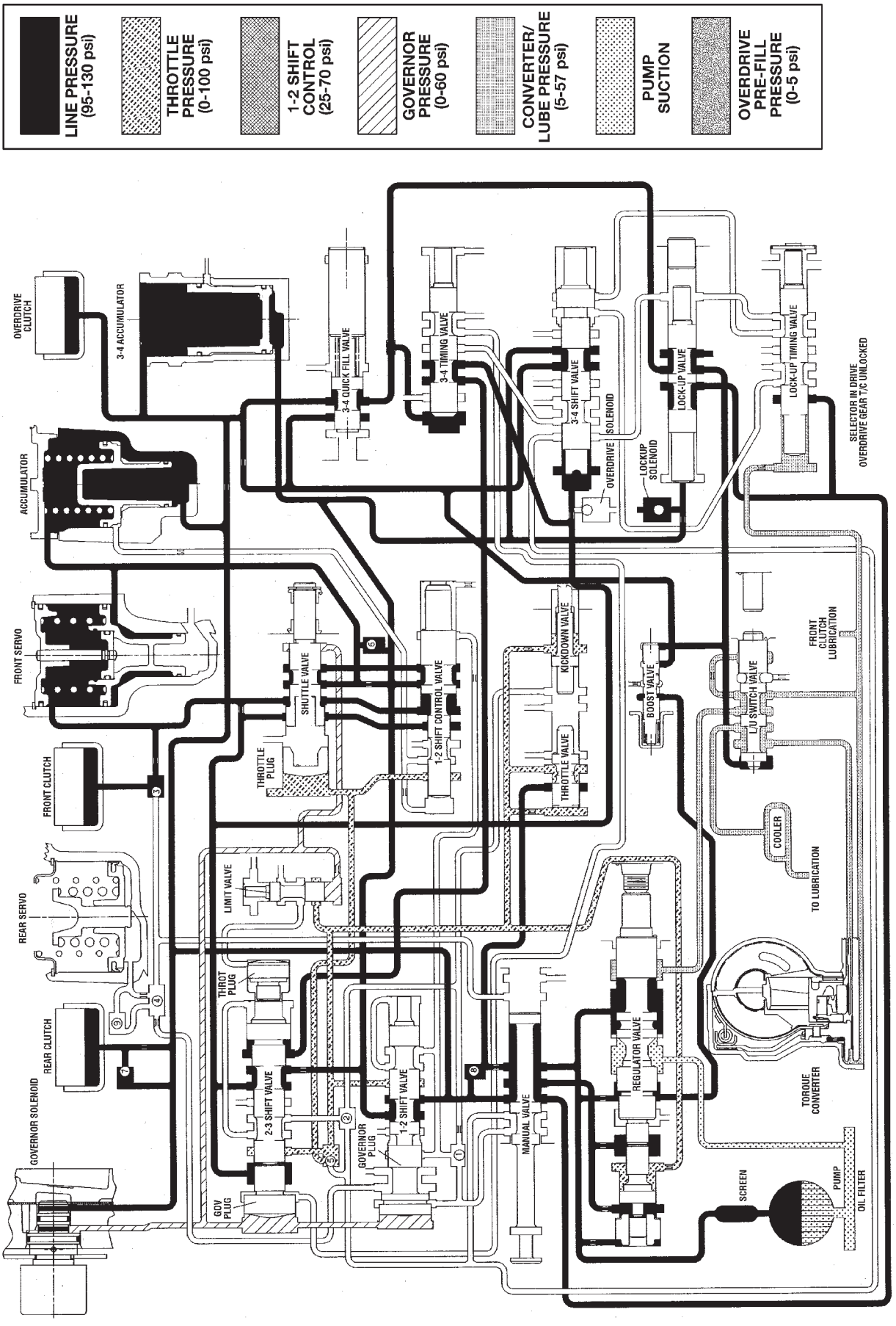
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH APPLIED)

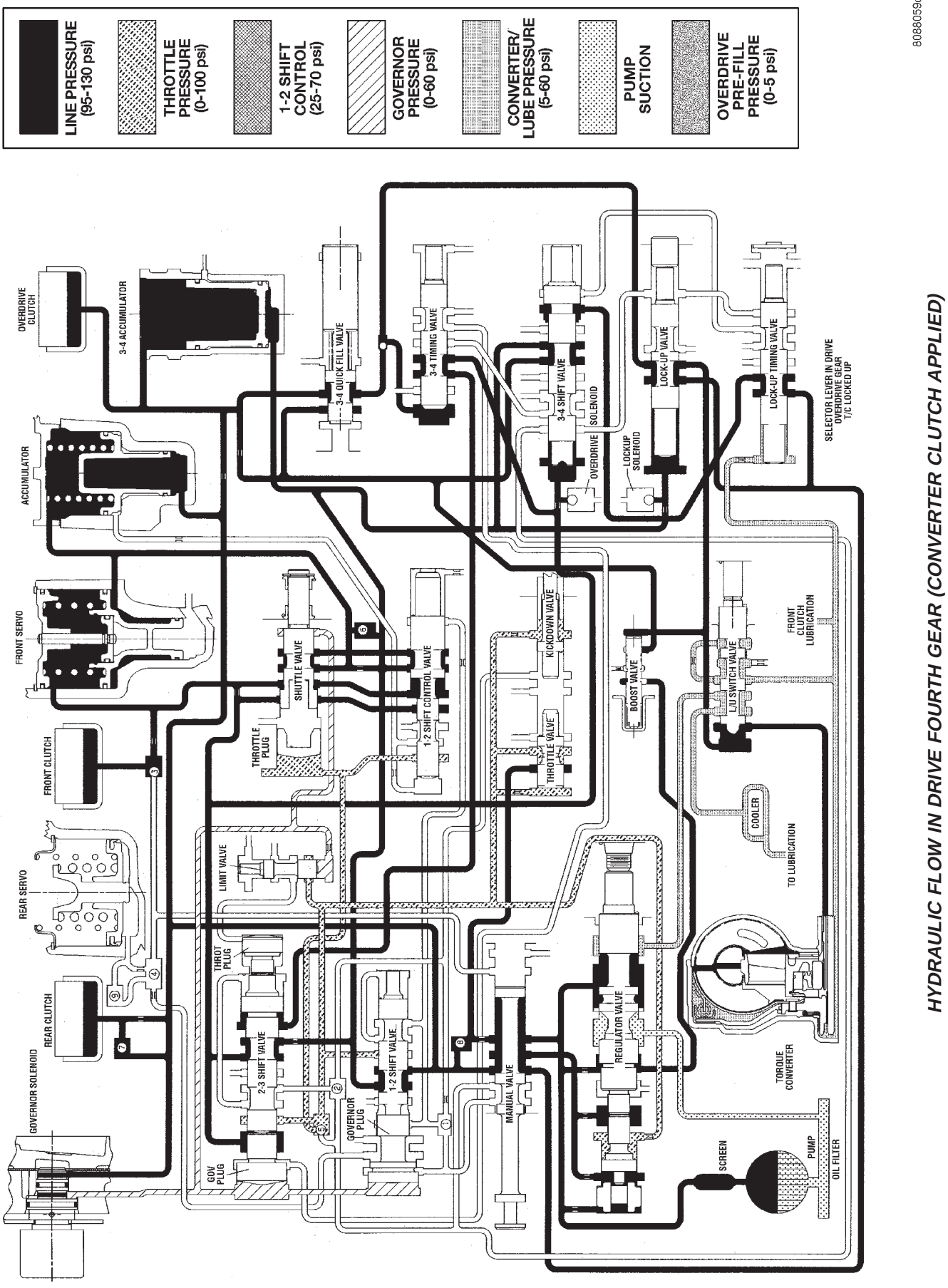
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH NOT APPLIED)

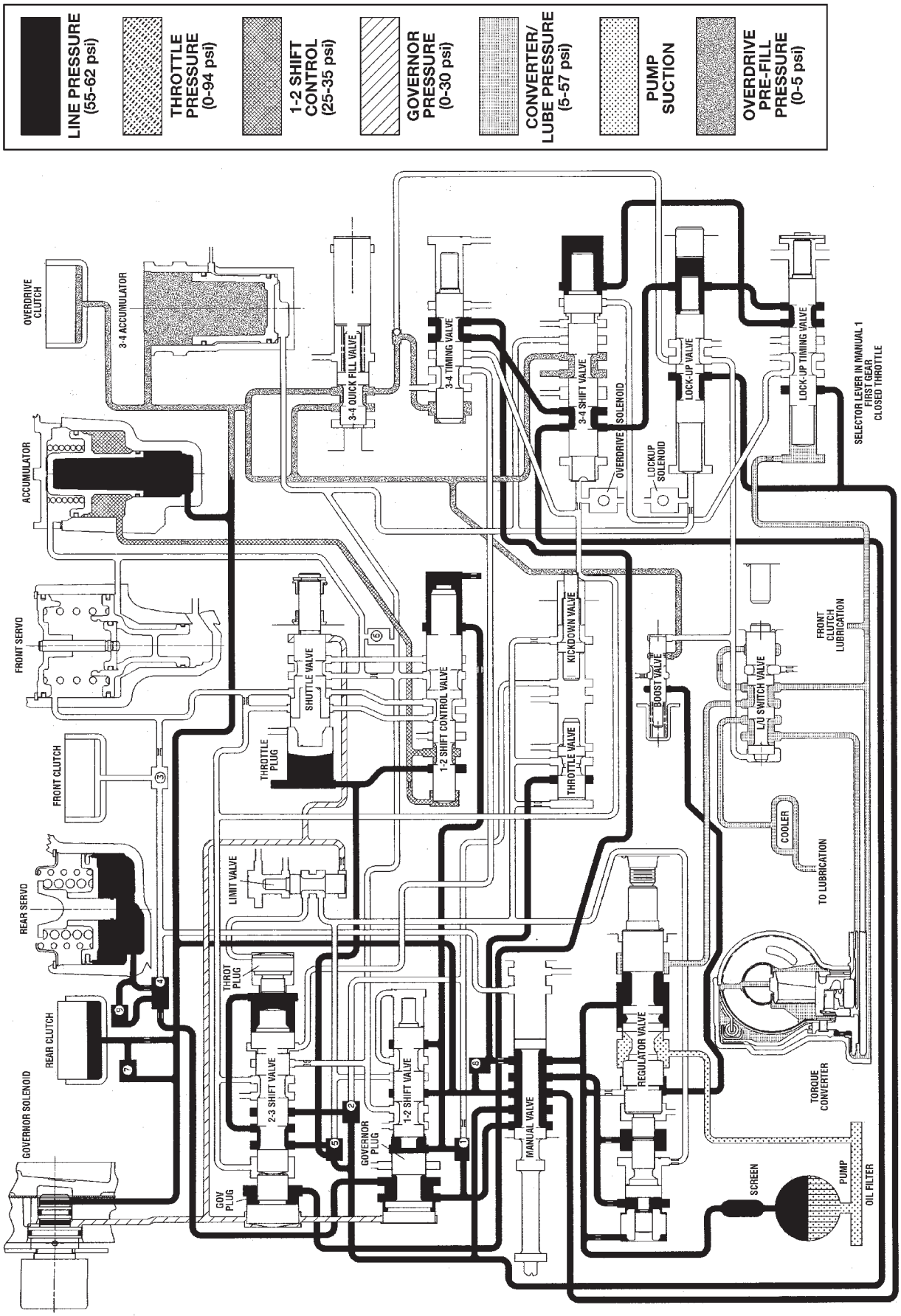
AUTOMATIC TRANSMISSION - 42RE (Continued)



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HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH APPLIED)

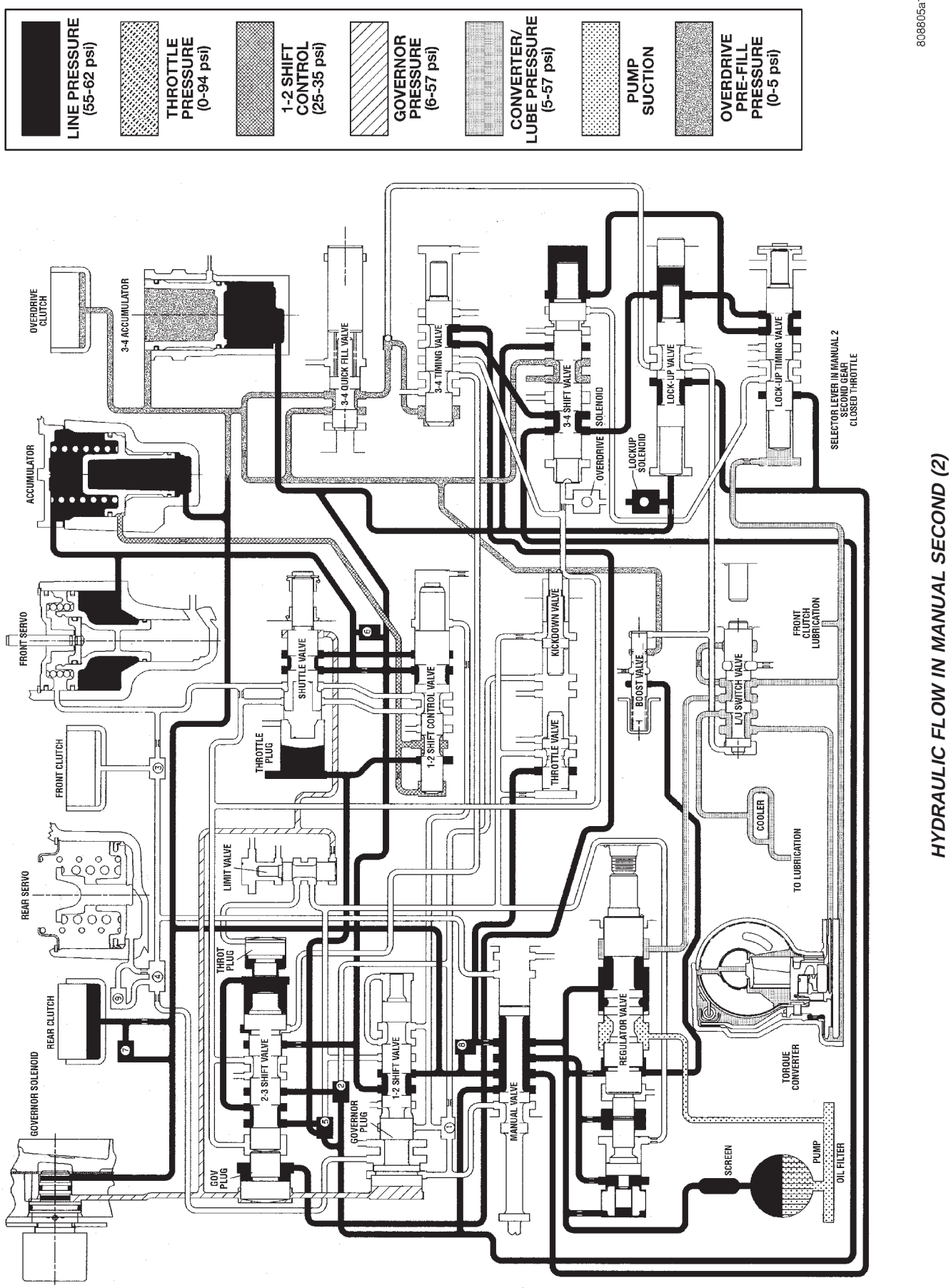
AUTOMATIC TRANSMISSION - 42RE (Continued)



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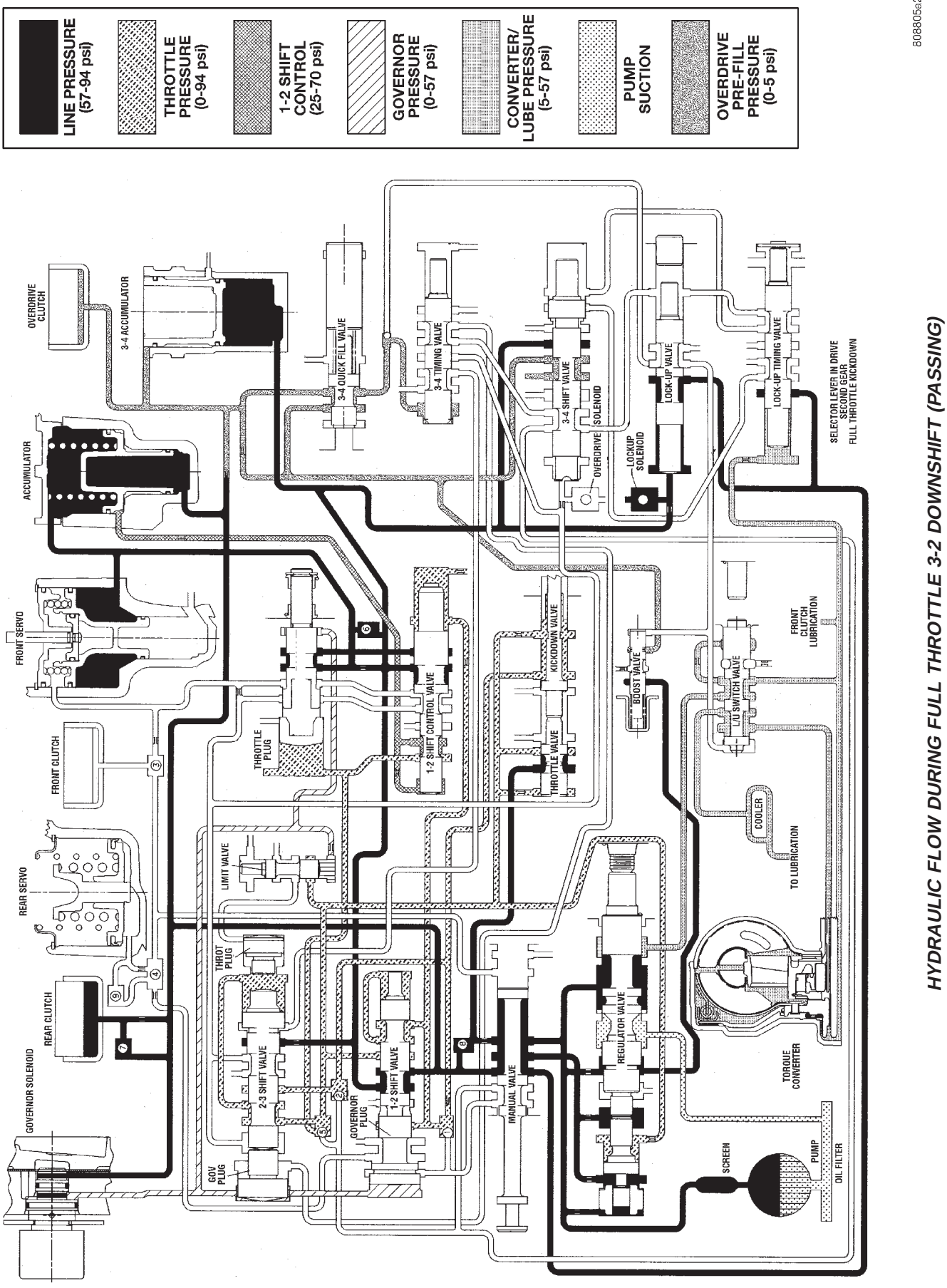
HYDRAULIC FLOW IN MANUAL LOW (1)

AUTOMATIC TRANSMISSION - 42RE (Continued)



HYDRAULIC FLOW IN MANUAL SECOND (2)

AUTOMATIC TRANSMISSION - 42RE (Continued)



HYDRAULIC FLOW DURING FULL THROTTLE 3-2 DOWNSHIFT (PASSING)

AUTOMATIC TRANSMISSION - 42RE (Continued)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Planetary end play	0.127-1.22 mm	0.005-0.048 in.
Input shaft end play	0.56-2.31 mm	0.022-0.091 in.
Clutch pack clearance/ Front.	1.70-3.40mm	0.067-0.134 in.
Clutch pack clearance/ Rear.	0.559-0.914 mm	0.022-0.036 in.
Front clutch	4 discs	
Rear clutch	4 discs	
Overdrive clutch	3 discs	

Component	Metric	Inch
Direct clutch	6 discs	
42RE Band adjustment from 72 in. lbs.		
Front band	Back off 3 turns	
Rear band	Back off 4 turns	
Recommended fluid	Mopar® ATF +4, type 9602	

GEAR RATIOS

1ST GEAR	2.74:1
2ND GEAR	1.54:1
3RD GEAR	1.0:1
4TH GEAR	0.69:1
REVERSE	2.21:1

THRUST WASHER/SPACER/SNAP-RING DIMENSIONS

Component	Metric	Inch
Front clutch thrust washer (reaction shaft support hub)	1.55 mm	0.061 in.
Rear clutch thrust washer (clutch retainer)	1.55 mm	0.061 in.
Intermediate shaft thrust plate (shaft hub pilot)	Select fit to set end play	
Output shaft thrust washer (rear clutch hub)	1.5-1.6 mm	0.060-0.063 in.
Rear clutch pack snap-ring	1.5 mm	0.060 in.
	1.95 mm	0.076 in.
	2.45 mm	0.098 in.
Planetary geartrain snap-ring (at front of output shaft)	Select fit (three thicknesses avalible)	
Overdrive piston thrust plate	Thrust plate and spacer are select fit. Refer to size charts and selection procedures in Overdrive Unit D&A procedures	
Intermiediate shaft spacer		

AUTOMATIC TRANSMISSION - 42RE (Continued)

PRESSURE TEST

Overdrive clutch	Fourth gear only	Pressure should be 469-496 kPa (68-72 psi) with closed throttle and increase to 620-896 kPa (90-130 psi) at 1/2 to 3/4 throttle.
Line pressure (at accumulator)	Closed throttle	372-414 kPa (54-60 psi).
Front servo	Third or Fourth gear only	No more than 21 kPa (3 psi) lower than line pressure.
Rear servo	1 range	No more than 21 kPa (3 psi) lower than line pressure.
	R range	1103 kPa (160 psi) at idle, builds to 1862 kPa (270 psi) at 1600 rpm.
Governor	D range closed throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1.5 psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1.5 psi) at stand still will prevent transmission from downshifting.

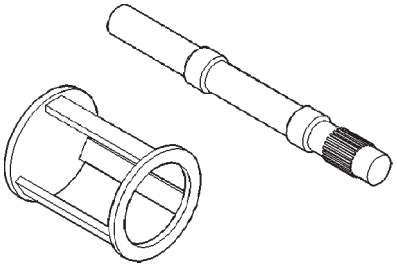
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	18	13	-
Bolt, torque convertor	31	-	270
Bolt, clevis bracket to crossmember	47	35	-
Bolt, clevis bracket to rear support	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Plug, front band reaction	17	13	-
Locknut, front band adj.	34	25	-
Switch, park/neutral	34	25	-
Bolt, fluid pan	17	13	-
Screws, fluid filter	4	-	35
Bolt, oil pump	20	15	-
Bolt, overrunning clutch cam	17	13	-
Bolt, O/D to trans.	34	25	-
Bolt, O/D piston retainer	17	13	-
Plug, pressure test port	14	10	-
Bolt, reaction shaft support	20	15	-
Locknut, rear band	41	30	-
Bolt, speedometer adapter	11	-	100
Screw, vehicle speed sensor	2.5	-	21
Bolt, valve body to case	12	-	100
Sensor, trans speed	27	20	-
Screw, solenoid wiring connector	4	-	35
Screw, solenoid to transfer plate	4	-	35

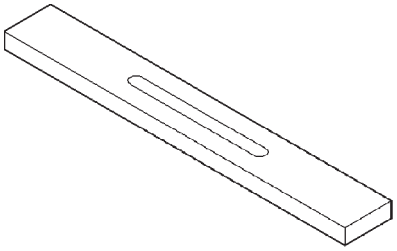
AUTOMATIC TRANSMISSION - 42RE (Continued)

SPECIAL TOOLS

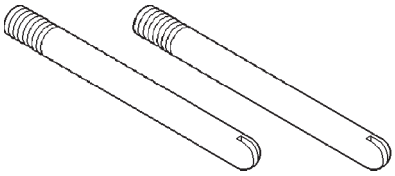
RE TRANSMISSIONS



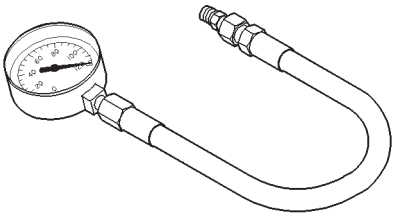
Shaft, Spring Compressor and Alignment - 6227



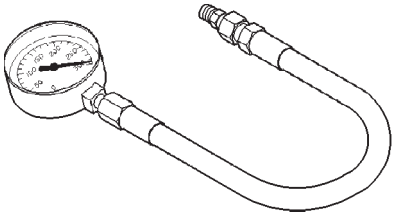
Bar, Gauge - 6311



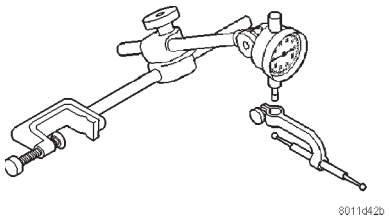
Pilot, Extension Housing - C-3288-B



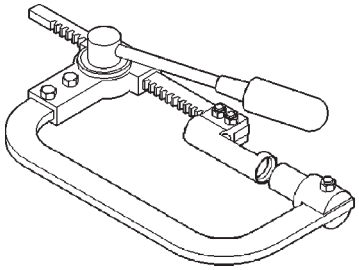
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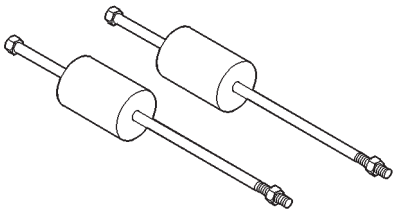
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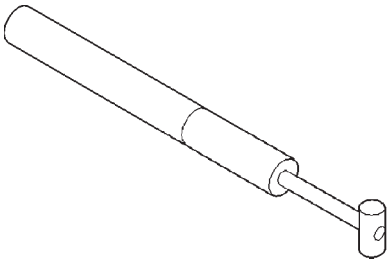
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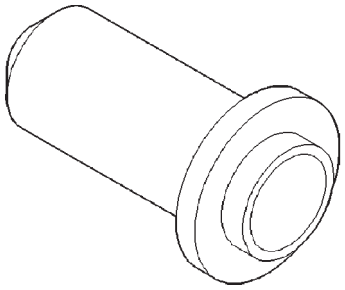
Compressor, Spring - C-3422-C



Puller, Slide Hammer - C-3752

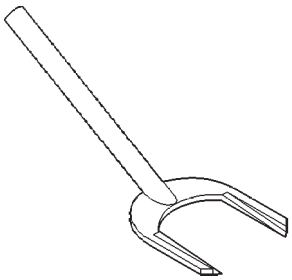


Gauge, Throttle Setting - C-3763

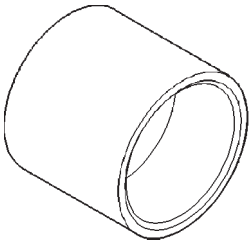


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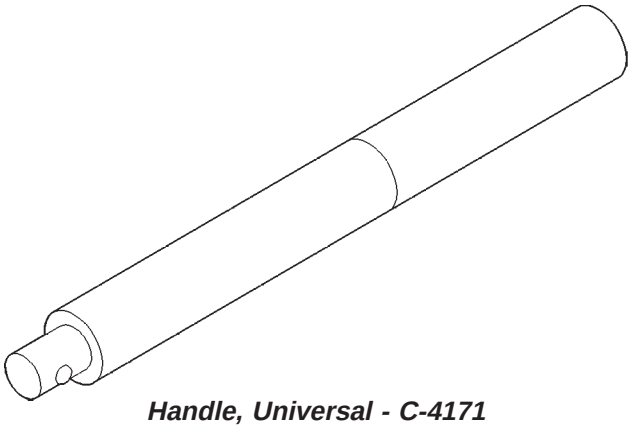
AUTOMATIC TRANSMISSION - 42RE (Continued)



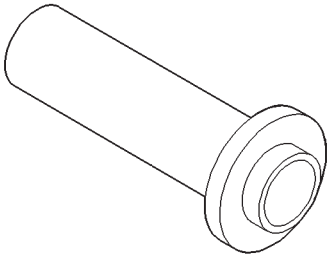
Remover, Seal - C-3985-B



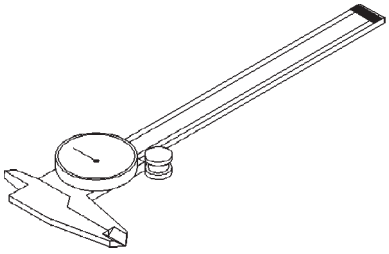
Installer, Seal - C-3995-A



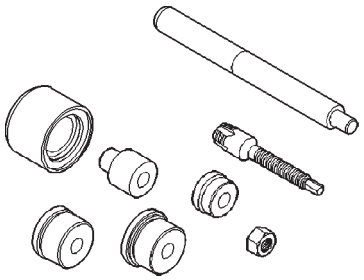
Handle, Universal - C-4171



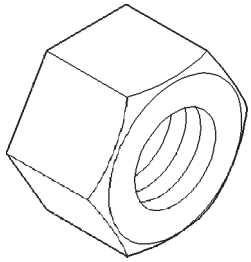
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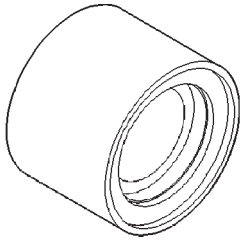
Dial Caliper - C-4962



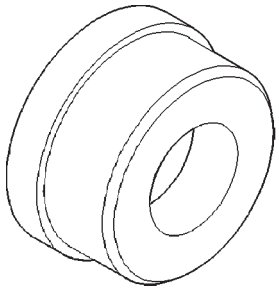
Kit, Bushing Remover/Installer - C-3887-J



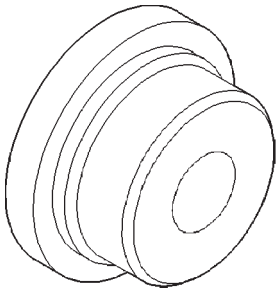
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Cup, Bushing Remover - SP-3633, From kit C-3887-J

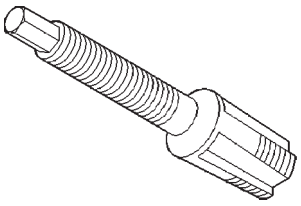


Remover, Bushing - SP-3551

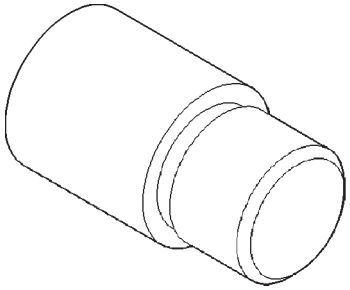


Installer, Bushing - SP-5117

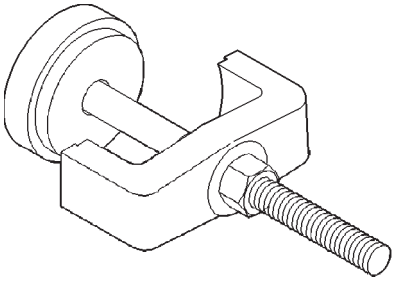
AUTOMATIC TRANSMISSION - 42RE (Continued)



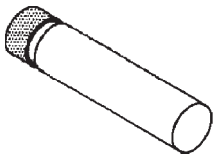
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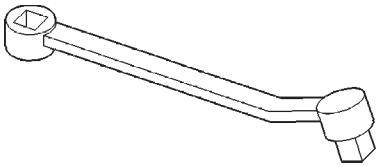
Installer, Bushing - SP-5325



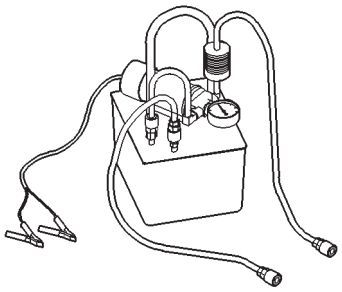
Compressor, Spring - C-3575-A



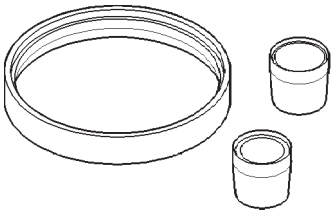
Gauge - 6312



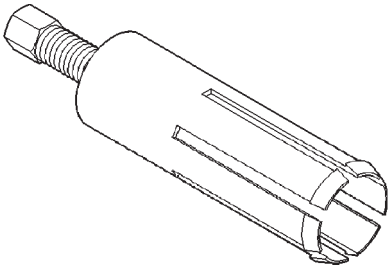
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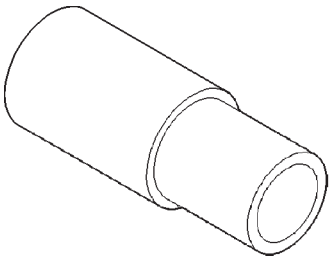
Flusher, Oil Cooler - 6906-B



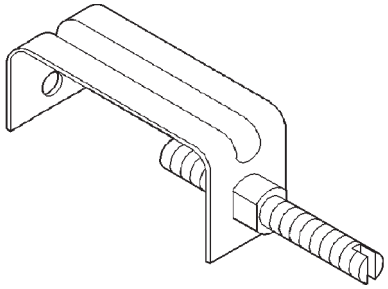
Installer, Piston - 8114



Remover, Bushing - 6957



Installer, Bushing - 6951



Retainer, Detent Ball and Spring - 6583

ACCUMULATOR

DESCRIPTION

The accumulator (Fig. 62) is a hydraulic device that has the sole purpose of cushioning the application of a band or clutch. The accumulator consists of a dual-land piston and a spring located in a bore in the transmission case. The 3-4 accumulator is located in a housing attached to the side of the valve body (Fig. 63).

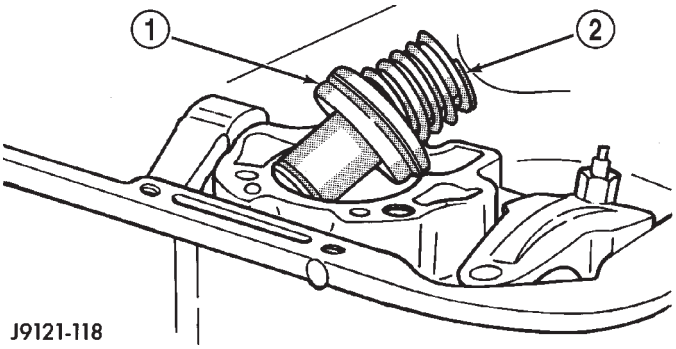


Fig. 62 Accumulator

1 - ACCUMULATOR PISTON
2 - PISTON SPRING

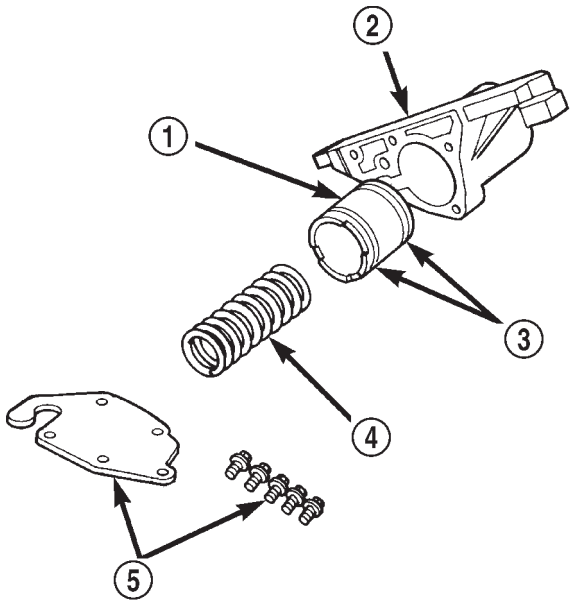


Fig. 63 3-4 Accumulator and Housing

1 - ACCUMULATOR PISTON
2 - 3-4 ACCUMULATOR HOUSING
3 - TEFLON SEALS
4 - PISTON SPRING
5 - COVER PLATE AND SCREWS

OPERATION

Both the accumulator and the 3-4 accumulator function the same. Line pressure is directed to the small end of the piston when the transmission is placed into a DRIVE position (Fig. 64), bottoming it against the accumulator plate. When the 1-2 upshift occurs (Fig. 65), line pressure is directed to the large end of the piston and then to the kickdown servo. As the line pressure reaches the accumulator, the combination of spring pressure and line pressure forces the piston away from the accumulator plate. This causes a balanced pressure situation, which results in a cushioned band application. After the kickdown servo has become immovable, line pressure will finish pushing the accumulator up into its bore. When the large end of the accumulator piston is seated in its bore, the band or clutch is fully applied.

NOTE: The accumulator is shown in the inverted position for illustrative purposes.

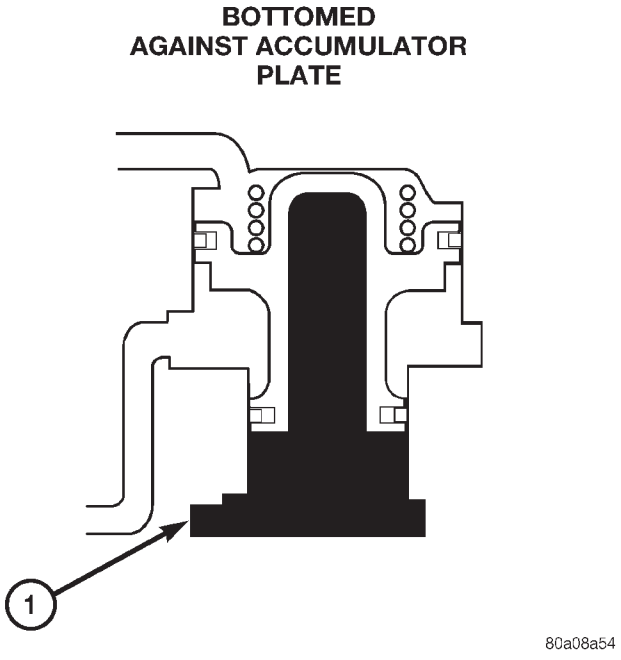


Fig. 64 Accumulator in DRIVE - FIRST Gear Position

1 - LINE PRESSURE

INSPECTION

Inspect the accumulator piston and seal rings (Fig. 66). Replace the seal rings if worn or cut. Replace the piston if chipped or cracked.

Check condition of the accumulator inner and outer springs (Fig. 66). Replace the springs if the coils are cracked, distorted or collapsed.

BANDS (Continued)

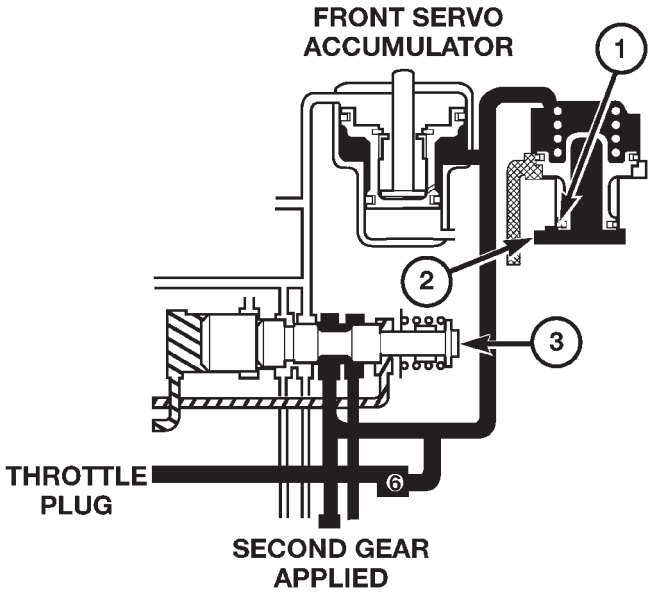


Fig. 65 Accumulator in SECOND Gear Position

1 - BOTTOM OF BORE
2 - LINE PRESSURE
3 - SHUTTLE VALVE

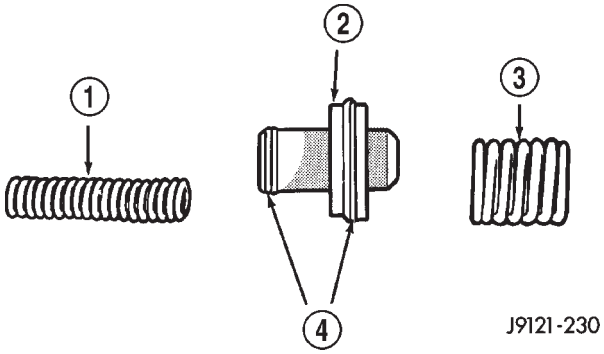


Fig. 66 Accumulator Components

1 - INNER SPRING
2 - ACCUMULATOR PISTON
3 - OUTER SPRING
4 - SEAL RINGS

BANDS

DESCRIPTION

KICKDOWN (FRONT) BAND

The kickdown, or “front”, band (Fig. 67) holds the common sun gear of the planetary gear sets. The front (kickdown) band is made of steel, and faced on its inner circumference with a friction-type lining. One end of the band is anchored to the transmission case, and the other is acted on with a pushing force by a servo piston. The front band is a single-wrap design (the band does not completely encompass/ wrap the drum that it holds).

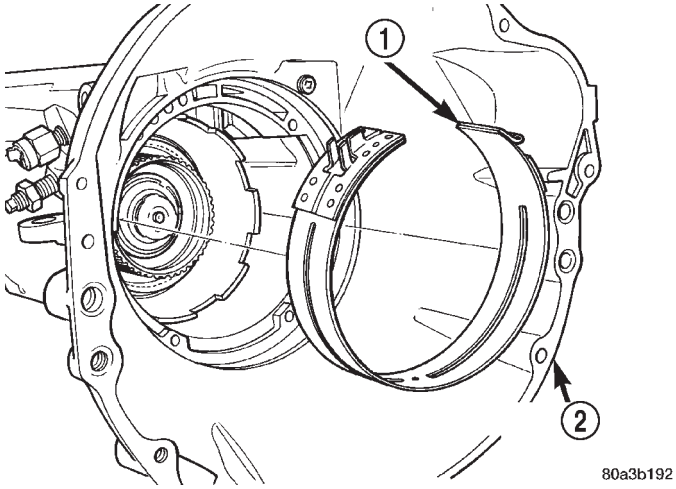


Fig. 67 Front Band

1 - FRONT BAND
2 - TRANSMISSION HOUSING

LOW/REVERSE (REAR) BAND

The low/reverse band, or “rear”, band (Fig. 68) is similar in appearance and operation to the front band. The rear band is slightly different in that it does not use a link bar, but is acted directly on by the apply lever. This is referred to as a double-wrap band design (the drum is completely encompassed/ wrapped by the band). The double-wrap band provides a greater holding power in comparison to the single-wrap design.

OPERATION

KICKDOWN (FRONT) BAND

The kickdown band holds the common sun gear of the planetary gear sets by applying and holding the front clutch retainer, which is splined to the sun gear driving shell, and in turn splined directly to the sun gear. The application of the band by the servo is typically done by an apply lever and link bar.

LOW/REVERSE (REAR) BAND

The rear band holds the rear planet carrier stationary by being mounted around and applied to the low/reverse drum.

BANDS (Continued)

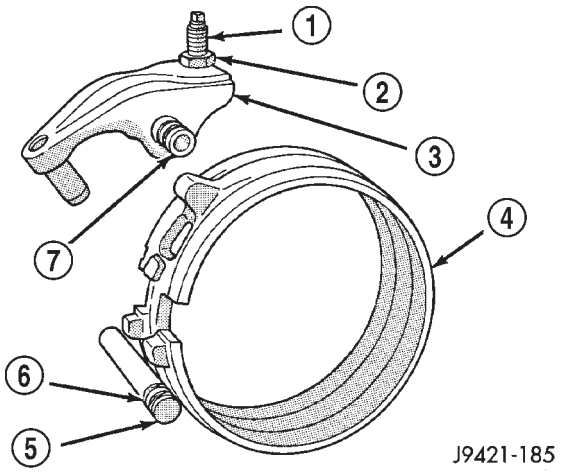


Fig. 68 Rear Band

1 - ADJUSTING SCREW
2 - LOCKNUT
3 - LEVER
4 - REAR BAND
5 - REACTION PIN
6 - O-RINGS
7 - PIVOT PIN

ADJUSTMENTS

ADJUSTMENT - BANDS

FRONT BAND

The front (kickdown) band adjusting screw is located on the left side of the transmission case above the manual valve and throttle valve levers.

(1) Raise vehicle.

(2) Loosen band adjusting screw locknut (Fig. 69). Then back locknut off 3-5 turns. Be sure adjusting screw turns freely in case. Apply lubricant to screw threads if necessary.

(3) Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with Inch Pound Torque Wrench C-3380-A, a 3-in. extension and appropriate Torx™ socket.

CAUTION: If Adapter C-3705 is needed to reach the adjusting screw, tighten the screw to only 5 N·m (47-50 in. lbs.) torque.

(4) Back off front band adjusting screw 3 turns.

(5) Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.

(6) Lower vehicle.

REAR BAND

The transmission oil pan must be removed for access to the rear band adjusting screw.

(1) Raise vehicle.

(2) Remove transmission oil pan and drain fluid.

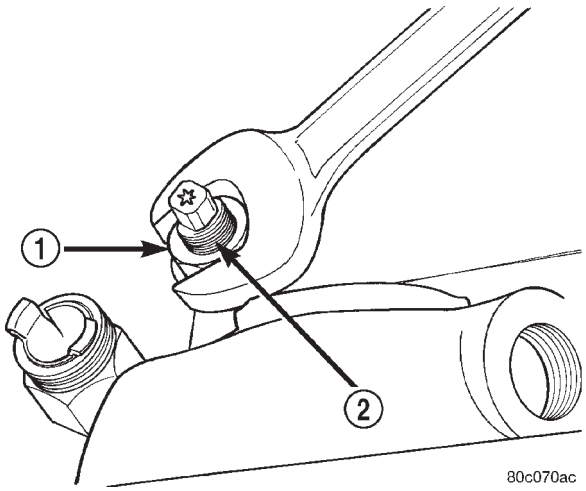


Fig. 69 Front Band Adjustment Screw Location

1 - LOCK-NUT
2 - FRONT BAND ADJUSTER

(3) Loosen band adjusting screw locknut 5-6 turns (Fig. 70). Be sure adjusting screw turns freely in lever.

(4) Tighten adjusting screw to 8 N·m (72 in. lbs.) torque.

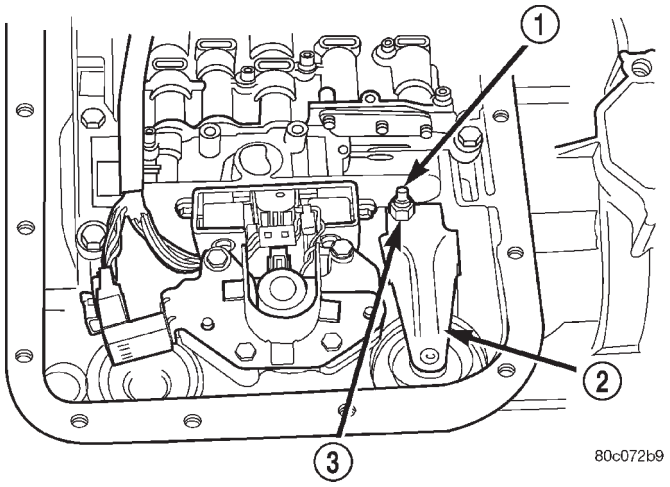


Fig. 70 Rear Band Adjusting Screw Location

1 - ADJUSTING SCREW
2 - REAR BAND LEVER
3 - LOCKNUT

(5) Back off adjusting screw 4 turns.

(6) Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.

(7) Position new gasket on oil pan and install pan on transmission. Tighten pan bolts to 17 N·m (13 ft. lbs.) torque.

(8) Lower vehicle and refill transmission with Mopar® ATF +4, type 9602, fluid.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 71).

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in the shifter assembly is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

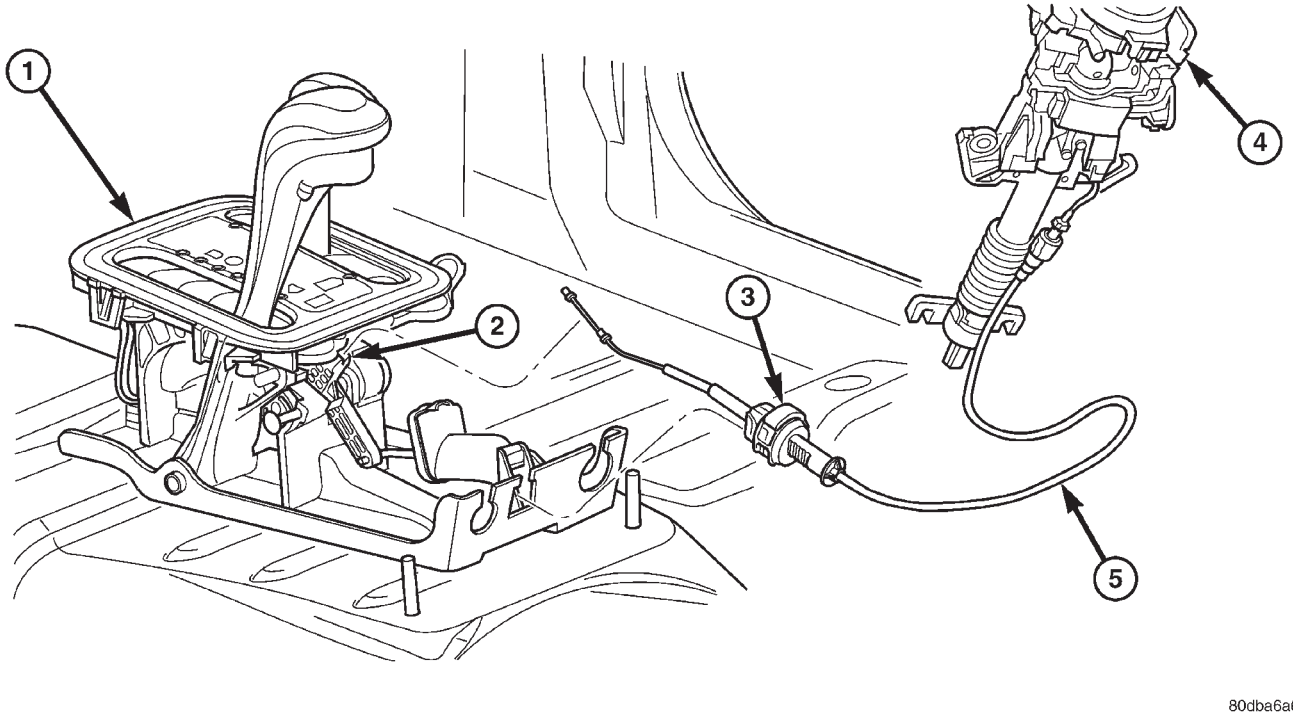


Fig. 71 Ignition Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM (Continued)

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE

(1) Remove floor console as necessary for access to the brake transmission shift interlock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift the transmission into the PARK position.

(3) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(4) Pull cable lock button up to release cable (Fig. 72).

(5) Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.

(6) Push lock button down until it snaps in place.

BTSI FUNCTION CHECK

(1) Verify removal of ignition key allowed in PARK position only.

(2) When the shift lever is in PARK, and the shift handle push-button is in the out position, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.

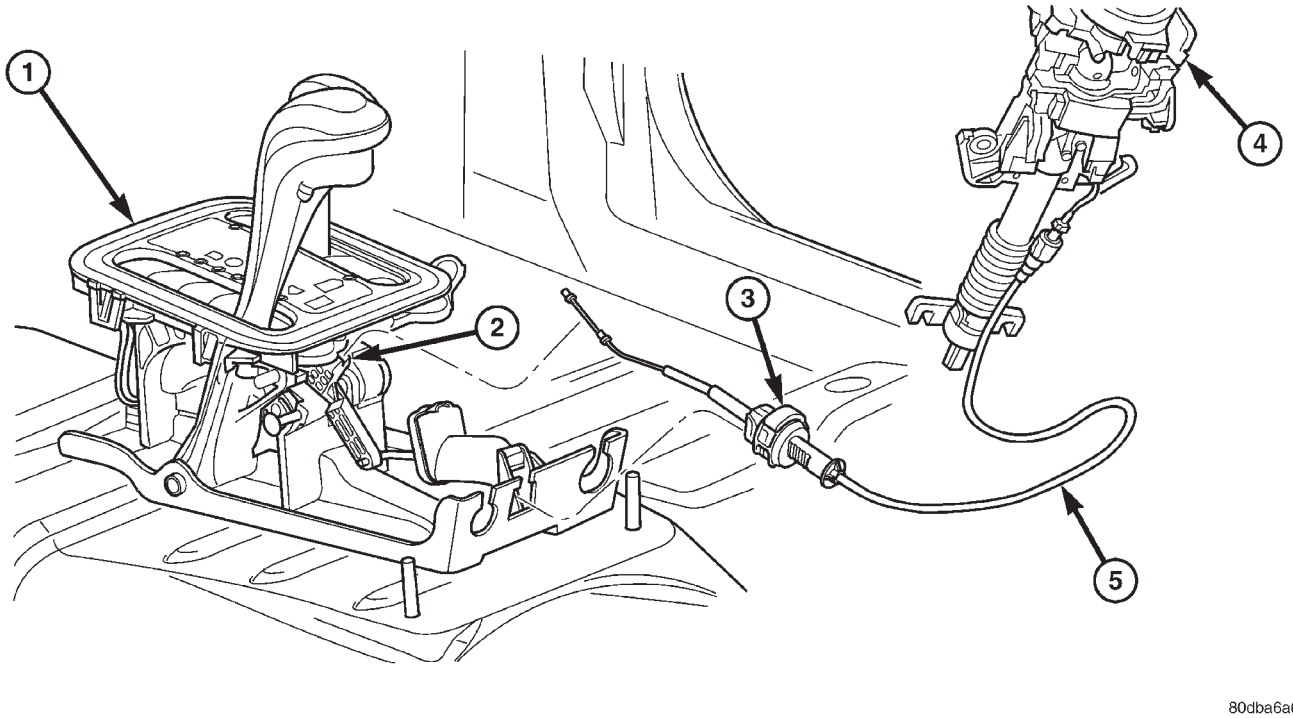
(3) Shifting out of PARK should be possible when the ignition key cylinder is in the off position.

(4) Shifting out of PARK should not be possible while applying normal push-button force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.

(6) Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.

(7) The floor shifter lever and gate positions should be in alignment with all transmission detent positions.



80dba6a6

Fig. 72 Brake Transmission Shift Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM (Continued)

(8) Engine starts must be possible with shifter lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gate positions other than PARK or NEUTRAL.

(9) With shifter lever handle push-button not depressed and lever detent in:

- PARK position- apply forward force on center of handle and remove pressure. Engine start must be possible.
- PARK position- apply rearward force on center of handle and remove pressure. Engine start must be possible.
- NEUTRAL position- engine start must be possible.
- NEUTRAL position, engine running and brakes applied- Apply forward force on center of shift handle. Transmission should not be able to shift into REVERSE detent.

ELECTRONIC GOVERNOR

DESCRIPTION

Governor pressure is controlled electronically. Components used for governor pressure control include:

- Governor body
- Valve body transfer plate
- Governor pressure solenoid valve
- Governor pressure sensor
- Fluid temperature thermistor
- Throttle position sensor (TPS)
- Transmission speed sensor
- Powertrain control module (PCM)

GOVERNOR PRESSURE SOLENOID VALVE

The solenoid valve is a duty-cycle solenoid which regulates the governor pressure needed for upshifts and downshifts. It is an electro-hydraulic device located in the governor body on the valve body transfer plate (Fig. 73).

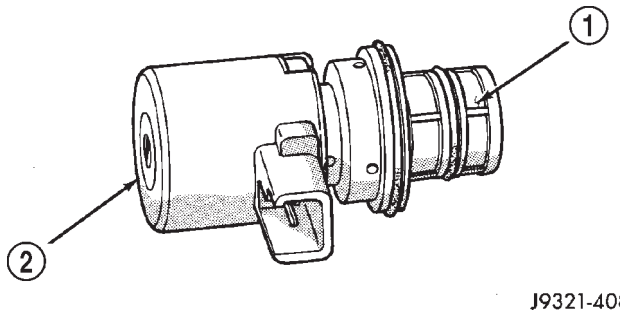


Fig. 73 Governor Pressure Solenoid Valve

1 - SOLENOID FILTER
2 - GOVERNOR PRESSURE SOLENOID

GOVERNOR PRESSURE SENSOR

The governor pressure sensor measures output pressure of the governor pressure solenoid valve (Fig. 74).

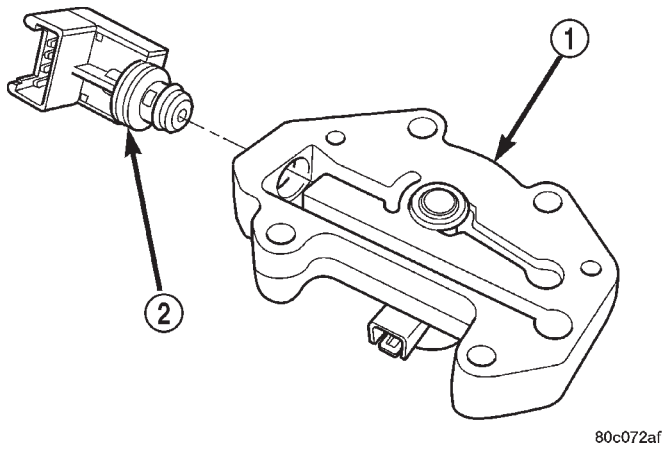


Fig. 74 Governor Pressure Sensor

1 - GOVERNOR BODY
2 - GOVERNOR PRESSURE SENSOR/TRANSMISSION FLUID TEMPERATURE THERMISTOR

GOVERNOR BODY AND TRANSFER PLATE

The transfer plate is designed to supply transmission line pressure to the governor pressure solenoid valve and to return governor pressure.

The governor pressure solenoid valve is mounted in the governor body. The body is bolted to the lower side of the transfer plate (Fig. 74).

GOVERNOR PRESSURE CURVES

There are four governor pressure curves programmed into the transmission control module. The different curves allow the control module to adjust governor pressure for varying conditions. One curve is used for operation when fluid temperature is at, or below, –1°C (30°F). A second curve is used when fluid temperature is at, or above, 10°C (50°F) during normal city or highway driving. A third curve is used during wide-open throttle operation. The fourth curve is used when driving with the transfer case in low range.

OPERATION

Compensation is required for performance variations of two of the input devices. Though the slope of the transfer functions is tightly controlled, offset may vary due to various environmental factors or manufacturing tolerances.

The pressure transducer is affected by barometric pressure as well as temperature. Calibration of the zero pressure offset is required to compensate for shifting output due to these factors.

ELECTRONIC GOVERNOR (Continued)

Normal calibration will be performed when sump temperature is above 50 degrees F, or in the absence of sump temperature data, after the first 10 minutes of vehicle operation. Calibration of the pressure transducer offset occurs each time the output shaft speed falls below 200 RPM. Calibration shall be repeated each 3 seconds the output shaft speed is below 200 RPM. A 0.5 second pulse of 95% duty cycle is applied to the governor pressure solenoid valve and the transducer output is read during this pulse. Averaging of the transducer signal is necessary to reject electrical noise.

Under cold conditions (below 50 degrees F sump), the governor pressure solenoid valve response may be too slow to guarantee 0 psi during the 0.5 second calibration pulse. Calibration pulses are continued during this period, however the transducer output valves are discarded. Transducer offset must be read at key-on, under conditions which promote a stable reading. This value is retained and becomes the offset during the ″cold″ period of operation.

GOVERNOR PRESSURE SOLENOID VALVE

The inlet side of the solenoid valve is exposed to normal transmission line pressure. The outlet side of the valve leads to the valve body governor circuit.

The solenoid valve regulates line pressure to produce governor pressure. The average current supplied to the solenoid controls governor pressure. One amp current produces zero kPa/psi governor pressure. Zero amps sets the maximum governor pressure.

The powertrain control module (PCM) turns on the trans control relay which supplies electrical power to the solenoid valve. Operating voltage is 12 volts (DC). The PCM controls the ground side of the solenoid using the governor pressure solenoid control circuit.

GOVERNOR PRESSURE SENSOR

The sensor output signal provides the necessary feedback to the PCM. This feedback is needed to adequately control governor pressure.

GOVERNOR BODY AND TRANSFER PLATE

The transfer plate channels line pressure to the solenoid valve through the governor body. It also channels governor pressure from the solenoid valve to the governor circuit. It is the solenoid valve that develops the necessary governor pressure.

GOVERNOR PRESSURE CURVES

LOW TRANSMISSION FLUID TEMPERATURE

When the transmission fluid is cold the conventional governor can delay shifts, resulting in higher than normal shift speeds and harsh shifts. The electronically controlled low temperature governor pressure curve is higher than normal to make the transmission shift at normal speeds and sooner. The PCM uses a temperature sensor in the transmission oil sump to determine when low temperature governor pressure is needed.

NORMAL OPERATION

Normal operation is refined through the increased computing power of the PCM and through access to data on engine operating conditions provided by the PCM that were not available with the previous stand-alone electronic module. This facilitated the development of a load adaptive shift strategy - the ability to alter the shift schedule in response to vehicle load condition. One manifestation of this capability is grade ″hunting″ prevention - the ability of the transmission logic to delay an upshift on a grade if the engine does not have sufficient power to maintain speed in the higher gear. The 3-2 downshift and the potential for hunting between gears occurs with a heavily loaded vehicle or on steep grades. When hunting occurs, it is very objectionable because shifts are frequent and accompanied by large changes in noise and acceleration.

WIDE OPEN THROTTLE OPERATION

In wide-open throttle (WOT) mode, adaptive memory in the PCM assures that up-shifts occur at the preprogrammed optimum speed. WOT operation is determined from the throttle position sensor, which is also a part of the emission control system. The initial setting for the WOT upshift is below the optimum engine speed. As WOT shifts are repeated, the PCM learns the time required to complete the shifts by comparing the engine speed when the shifts occur to the optimum speed. After each shift, the PCM adjusts the shift point until the optimum speed is reached. The PCM also considers vehicle loading, grade and engine performance changes due to high altitude in determining when to make WOT shifts. It does this by measuring vehicle and engine acceleration and then factoring in the shift time.

TRANSFER CASE LOW RANGE OPERATION

On four-wheel drive vehicles operating in low range, the engine can accelerate to its peak more rapidly than in Normal range, resulting in delayed shifts and undesirable engine ″flare.″ The low range governor pressure curve is also higher than normal to initiate upshifts sooner. The PCM compares electronic vehicle speed signal used by the speedometer to the transmission output shaft speed signal to determine when the transfer case is in low range.

ELECTRONIC GOVERNOR (Continued)

REMOVAL

(1) Hoist and support vehicle on safety stands.
(2) Remove transmission fluid pan and filter.
(3) Disengage wire connectors from pressure sensor and solenoid (Fig. 75).

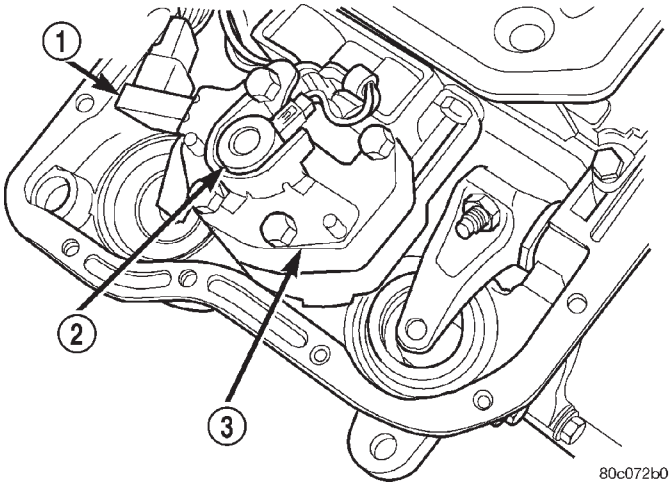


Fig. 75 Governor Solenoid And Pressure Sensor

1 - PRESSURE SENSOR
2 - PRESSURE SOLENOID
3 - GOVERNOR

(4) Remove screws holding pressure solenoid retainer to governor body.
(5) Separate solenoid retainer from governor (Fig. 76).

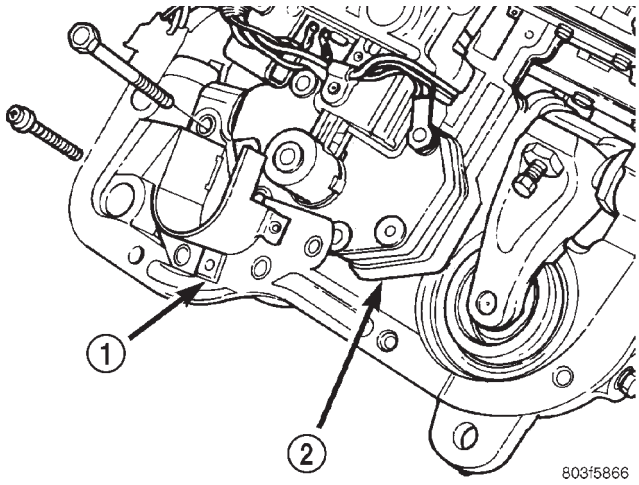


Fig. 76 Pressure Solenoid Retainer

1 - PRESSURE SOLENOID RETAINER
2 - GOVERNOR

(6) Pull solenoid from governor body (Fig. 77).
(7) Pull pressure sensor from governor body.
(8) Remove bolts holding governor body to valve body.

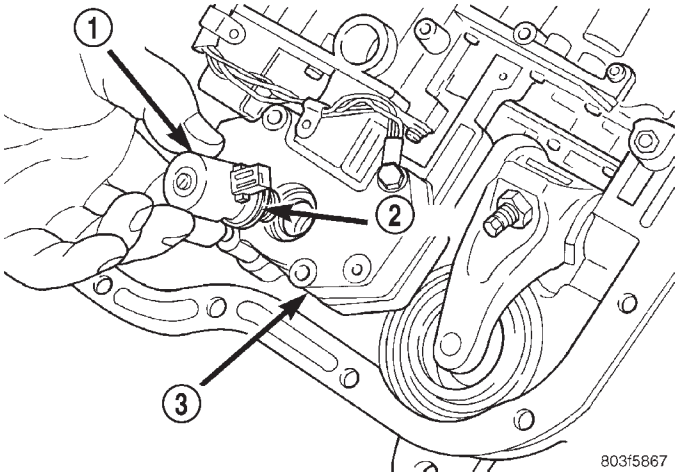


Fig. 77 Pressure Solenoid and O-ring

1 - PRESSURE SOLENOID
2 - O-RING
3 - GOVERNOR

(9) Separate governor body from valve body (Fig. 78).
(10) Remove governor body gasket.

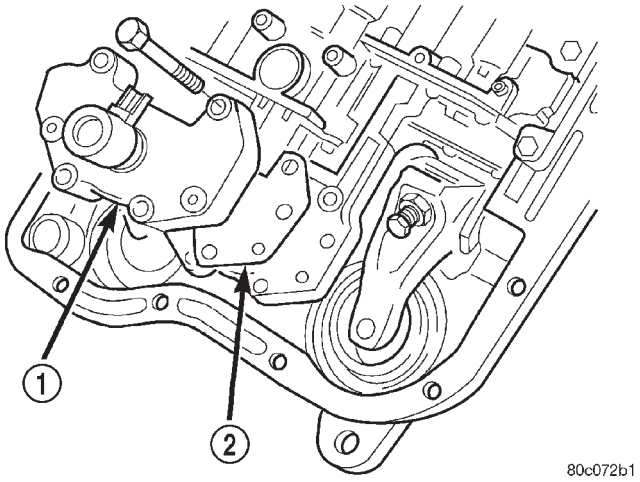


Fig. 78 Governor Body and Gasket

1 - GOVERNOR BODY
2 - GASKET

INSTALLATION

Before installing the pressure sensor and solenoid in the governor body, replace o-ring seals, clean the gasket surfaces and replace gasket.
(1) Place gasket in position on back of governor body (Fig. 79).
(2) Place governor body in position on valve body.
(3) Install bolts to hold governor body to valve body.
(4) Lubricate o-ring on pressure sensor with transmission fluid.
(5) Align pressure sensor to bore in governor body.

ELECTRONIC GOVERNOR (Continued)

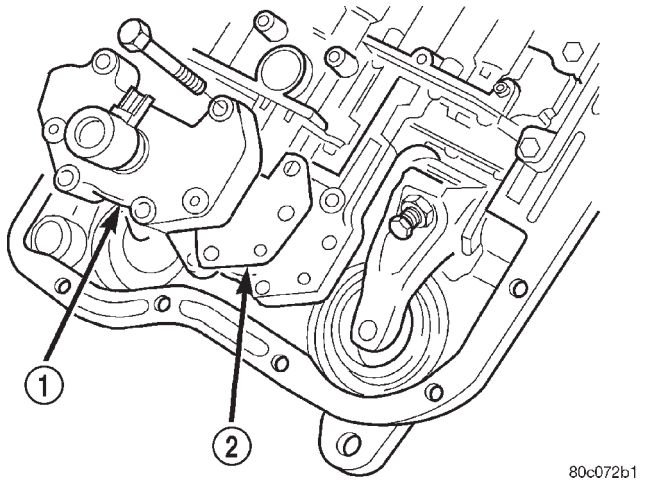


Fig. 79 Governor Body and Gasket

1 - GOVERNOR BODY
2 - GASKET

(6) Push pressure sensor into governor body.
(7) Lubricate o-ring, on pressure solenoid, with transmission fluid.
(8) Align pressure solenoid to bore in governor body (Fig. 80).
(9) Push solenoid into governor body.

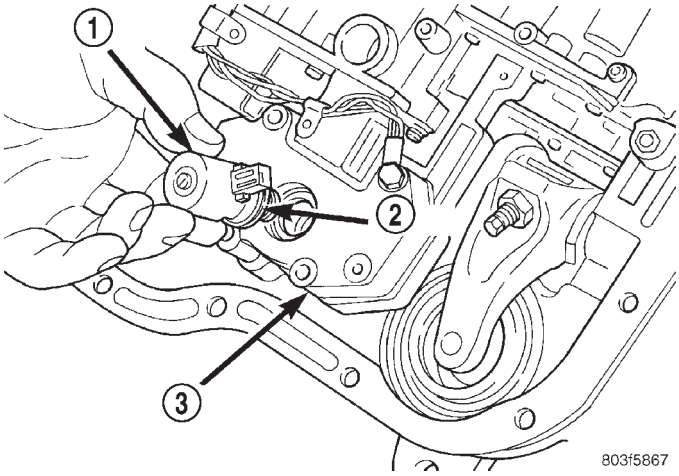


Fig. 80 Pressure Solenoid and O-ring

1 - PRESSURE SOLENOID
2 - O-RING
3 - GOVERNOR

(10) Place solenoid retainer in position on governor (Fig. 81).
(11) Install screws to hold pressure solenoid retainer to governor body.
(12) Engage wire connectors into pressure sensor and solenoid (Fig. 82).
(13) Install transmission fluid pan and (new) filter.
(14) Lower vehicle and road test to verify repair.

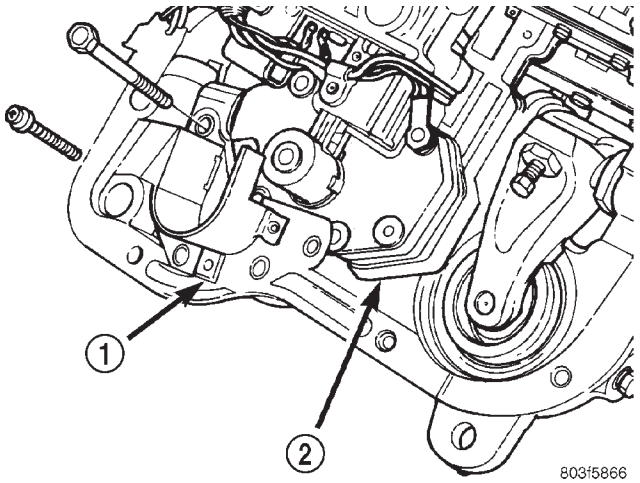


Fig. 81 Pressure Solenoid Retainer

1 - PRESSURE SOLENOID RETAINER
2 - GOVERNOR

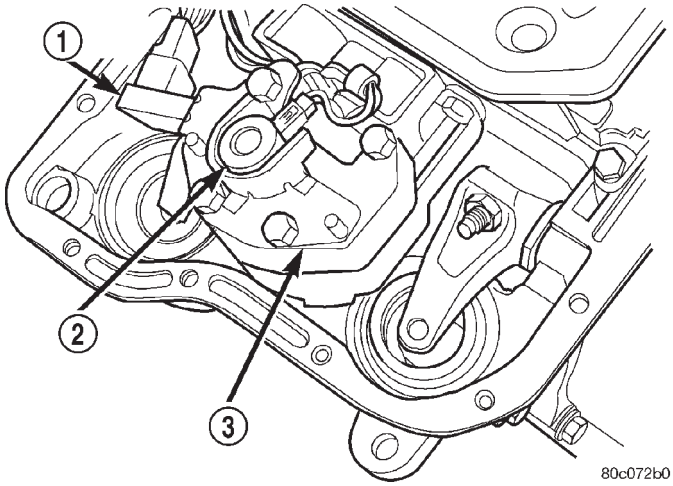


Fig. 82 Governor Solenoid And Pressure Sensor

1 - PRESSURE SENSOR
2 - PRESSURE SOLENOID
3 - GOVERNOR

EXTENSION HOUSING BUSHING

REMOVAL

(1) Remove extension housing yoke seal.
(2) Insert Remover 6957 into the extension housing. Tighten tool to bushing and remove bushing (Fig. 83).

INSTALLATION

(1) Align bushing oil hole with oil slot in extension housing.
(2) Tap bushing into place with Installer 6951 and Handle C-4171.

EXTENSION HOUSING BUSHING (Continued)

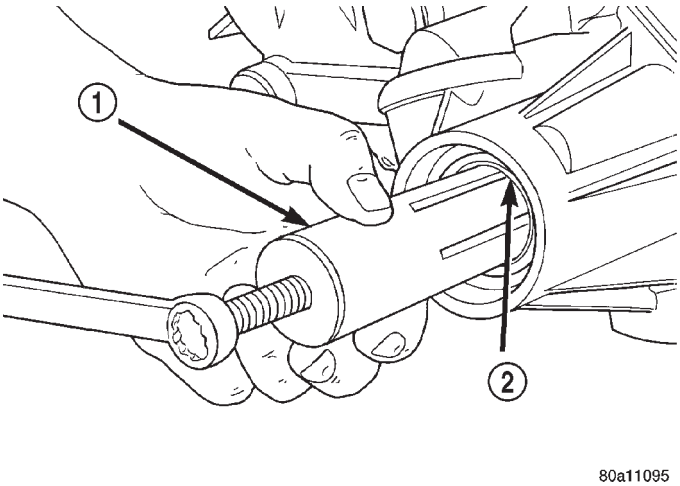


Fig. 83 Bushing Removal - Typical

1 - REMOVER 6957
2 - EXTENSION HOUSING BUSHING

(3) Install new oil seal in housing using Seal Installer C-3995-A (Fig. 84).

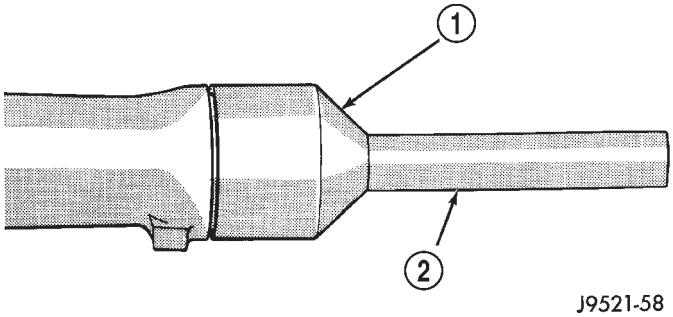


Fig. 84 Extension Housing Seal Installation

1 - SPECIAL TOOL C-3995-A OR C-3972-A
2 - SPECIAL TOOL C-4471

EXTENSION HOUSING SEAL

REMOVAL

(1) Raise vehicle.
(2) Mark propeller shaft and axle yoke for alignment reference.
(3) Disconnect and remove propeller shaft.
(4) Remove old seal with Seal Remover C-3985-B (Fig. 85) from overdrive housing.

INSTALLATION

(1) Place seal in position on overdrive housing.
(2) Drive seal into overdrive housing with Seal Installer C-3995-A (Fig. 86).
(3) Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.

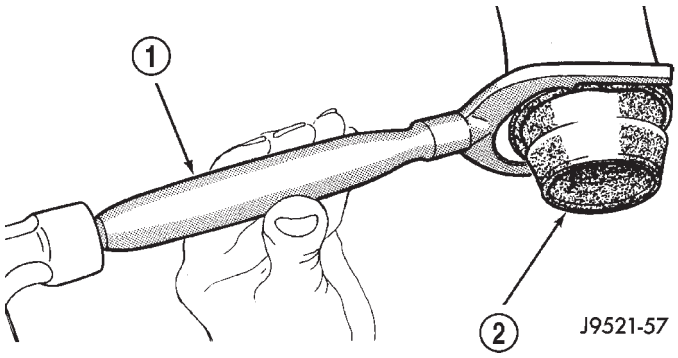


Fig. 85 Removing Overdrive Housing Yoke Seal

1 - SPECIAL TOOL C-3985-B
2 - SEAL

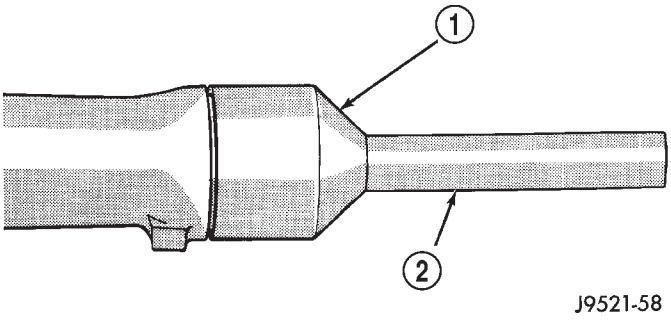


Fig. 86 Installing Overdrive Housing Seal

1 - SPECIAL TOOL C-3995-A OR C-3972-A
2 - SPECIAL TOOL C-4471

FLUID AND FILTER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

DIAGNOSIS AND TESTING - CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

FLUID AND FILTER (Continued)

(1) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(2) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

DIAGNOSIS AND TESTING - FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

STANDARD PROCEDURE - FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

Fluid level is checked with the engine running at curb idle speed, the transmission in NEUTRAL and the transmission fluid at normal operating temperature. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.**

The transmission fluid level can be checked two ways.

PROCEDURE ONE

(1) Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).

(2) Position vehicle on level surface.

(3) Start and run engine at curb idle speed.

(4) Apply parking brakes.

(5) Shift transmission momentarily into all gear ranges. Then shift transmission back to NEUTRAL.

(6) Clean top of filler tube and dipstick to keep dirt from entering tube.

(7) Remove dipstick (Fig. 87) and check fluid level as follows:

(a) Correct acceptable level is in crosshatch area.

(b) Correct maximum level is to MAX arrow mark.

(c) Incorrect level is at or below MIN line.

(d) If fluid is low, add only enough Mopar® ATF +4, type 9602, to restore correct level. Do not overfill.

FLUID AND FILTER (Continued)

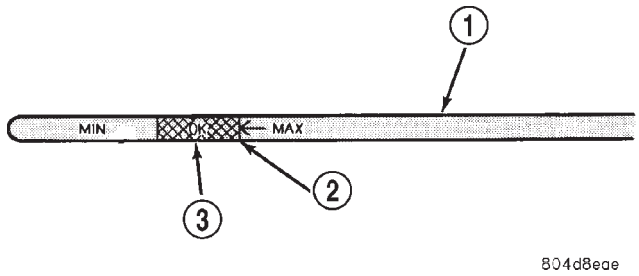


Fig. 87 Dipstick Fluid Level Marks - Typical

1 - DIPSTICK
2 - MAXIMUM CORRECT FLUID LEVEL
3 - ACCEPTABLE FLUID LEVEL

PROCEDURE TWO

(1) Start engine and apply parking brake.
(2) Shift the transmission into DRIVE for approximately 2 seconds.
(3) Shift the transmission into REVERSE for approximately 2 seconds.
(4) Shift the transmission into PARK.
(5) Hook up DRB® scan tool and select engine.
(6) Select sensors.
(7) Read the transmission temperature value.
(8) Compare the fluid temperature value with the figure. (Fig. 88)
(9) Adjust transmission fluid level shown on the dipstick according to the figure.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

(10) Check transmission for leaks.

STANDARD PROCEDURE - FLUID AND FILTER REPLACEMENT

For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). The service fluid fill after a filter change is approximately 3.8 liters (4.0 quarts).

REMOVAL

(1) Hoist and support vehicle on safety stands.
(2) Place a large diameter shallow drain pan beneath the transmission pan.
(3) Remove bolts holding front and sides of pan to transmission (Fig. 89).
(4) Loosen bolts holding rear of pan to transmission.
(5) Slowly separate front of pan and gasket away from transmission allowing the fluid to drain into drain pan.
(6) Hold up pan and remove remaining bolt holding pan to transmission.

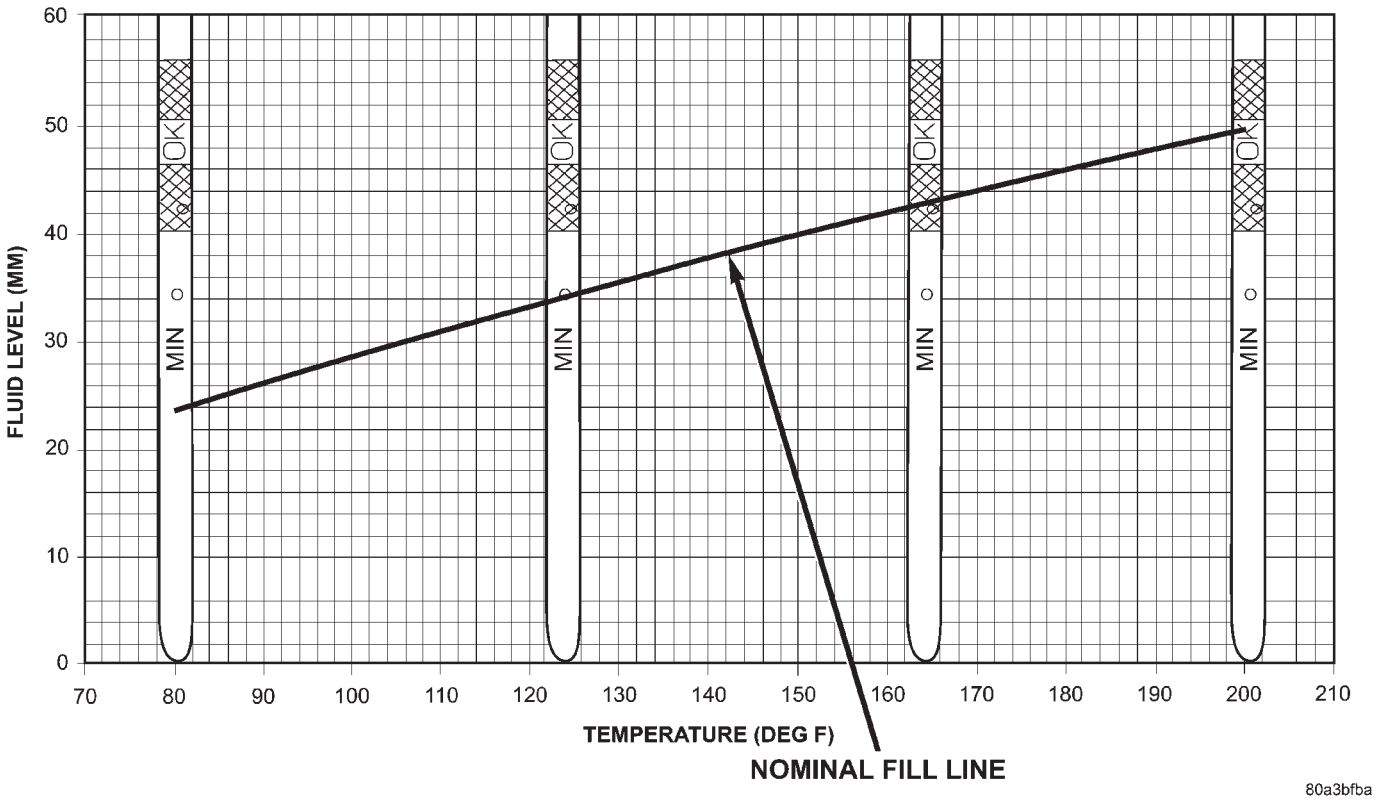


Fig. 88 42/44RE Fluid Fill Graph

FLUID AND FILTER (Continued)

(7) While holding pan level, lower pan and gasket away from transmission.

(8) Pour remaining fluid in pan into drain pan.

(9) Remove screws holding filter to valve body (Fig. 90).

(10) Separate filter from valve body and pour fluid in filter into drain pan.

(11) Dispose of used trans fluid and filter properly.

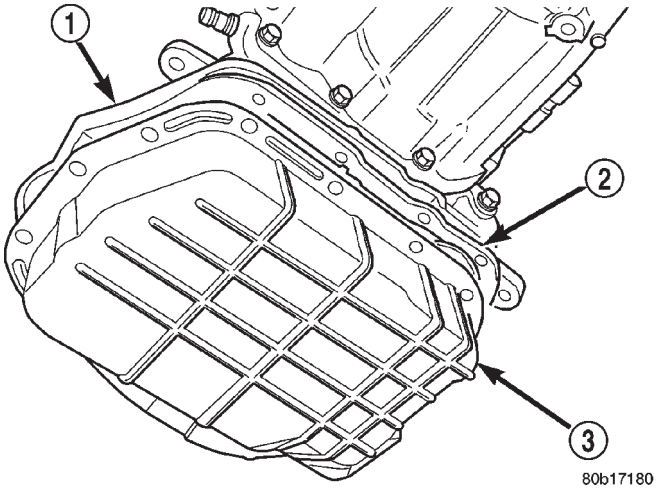


Fig. 89 Transmission Pan

1 - TRANSMISSION
2 - GASKET
3 - PAN

INSTALLATION

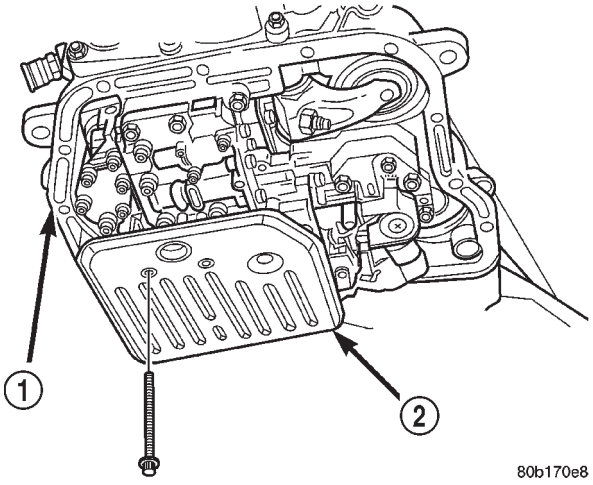


Fig. 90 Transmission Filter

1 - TRANSMISSION
2 - FILTER

(1) Position a new transmission oil filter onto the valve body.

(2) Install the screws to hold the filter to the valve body. Tighten the screws to 4 N·m (35 in.lbs.).

(3) Clean the gasket surfaces of the transmission oil pan and transmission pan rail.

NOTE: The transmission pan oil gasket is reusable. Inspect the sealing surfaces of the gasket. If the sealing ribs on both surfaces appear to be in good condition, clean the gasket of any foreign material and reinstall.

(4) Position the oil pan gasket onto the oil pan.

(5) Position the oil pan and gasket onto the transmission and install several bolts to hold the pan and gasket to the transmission.

(6) Install the remainder of the oil pan bolts. Tighten the bolts to 13.6 N·m (125 in.lbs.).

(7) Lower vehicle and fill transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/ FLUID - STANDARD PROCEDURE)

STANDARD PROCEDURE - TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

(1) Remove dipstick and insert clean funnel in transmission fill tube.

(2) Add following initial quantity of Mopar® ATF +4, type 9602, to transmission:

(a) If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF +4 to transmission.

(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **12 pints (6 quarts)** of ATF +4 to transmission.

(3) Apply parking brakes.

(4) Start and run engine at normal curb idle speed.

(5) Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.

(6) Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.

(7) Drive vehicle until transmission fluid is at normal operating temperature.

(8) With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

(9) Add fluid to bring level up to MAX arrow mark.

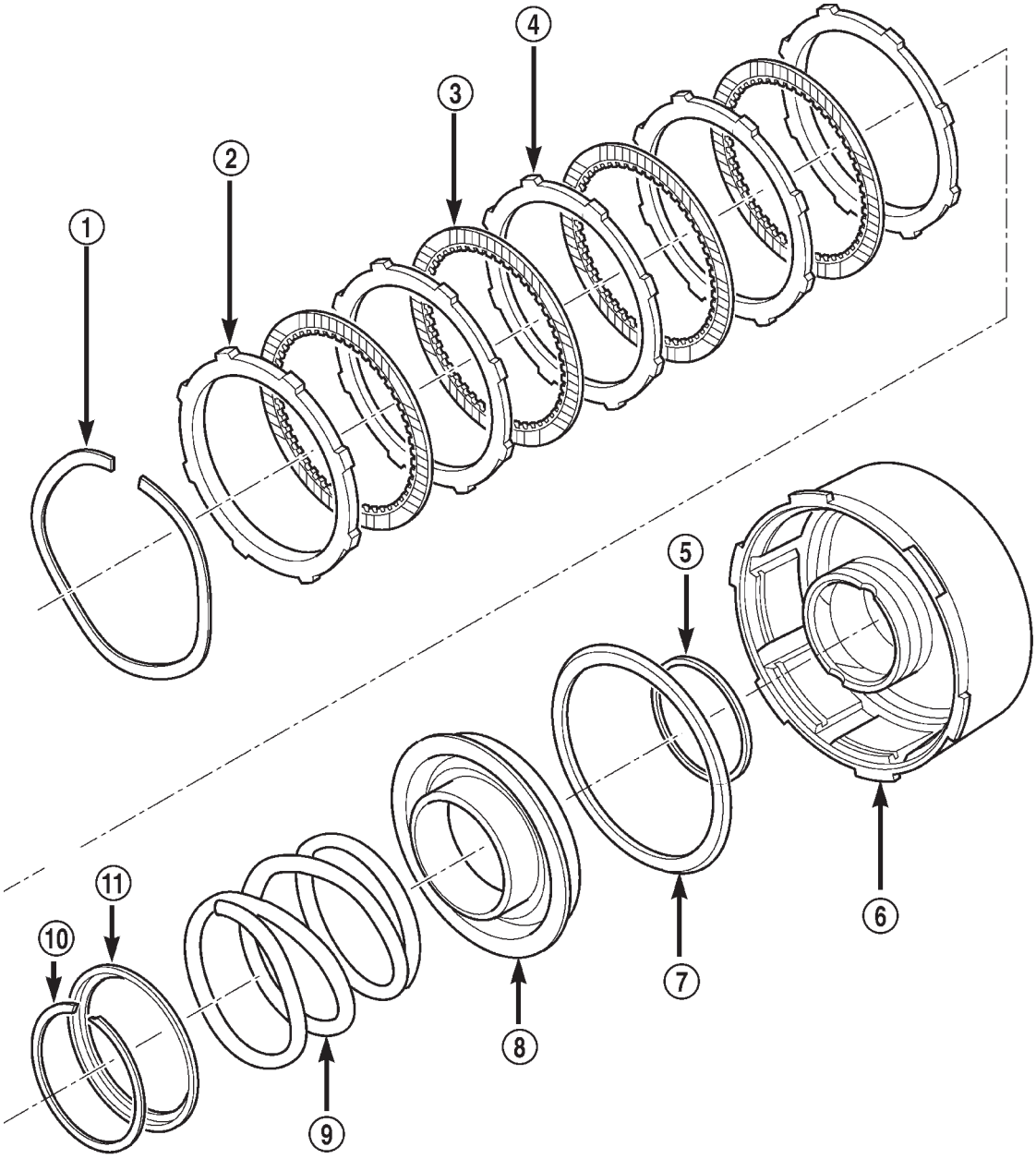
When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

FRONT CLUTCH

DESCRIPTION

The front clutch assembly (Fig. 91) is composed of the front clutch retainer, pressure plate, clutch plates, driving discs, piston, piston return spring, return spring retainer, and snap-rings. The front clutch is the forward-most component in the transmission geartrain and is directly behind the oil pump and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.



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Fig. 91 Front Clutch Components

1 - SNAP-RING (WAVE)
2 - REACTION PLATE
3 - CLUTCH DISC
4 - CLUTCH PLATE
5 - SEAL
6 - CLUTCH RETAINER
7 - SEAL
8 - PISTON
9 - SPRING
10 - SNAP-RING
11 - SPRING RETAINER

FRONT CLUTCH (Continued)

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap-ring is used to cushion the application of the clutch pack.

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one-way ball-check-valve located in the clutch retainer. The check-valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

DISASSEMBLY

(1) Remove waved snap-ring and remove pressure plate, clutch plates and clutch discs (Fig. 92).

(2) Compress clutch piston spring with Compressor Tool C-3575-A (Fig. 93). Be sure legs of tool are seated squarely on spring retainer before compressing spring.

(3) Remove retainer snap-ring and remove compressor tool.

(4) Remove spring retainer and clutch spring. Note position of retainer on spring for assembly reference.

(5) Remove clutch piston from clutch retainer. Remove piston by rotating it up and out of retainer.

(6) Remove seals from clutch retainer piston bore and clutch retainer hub. Discard both seals as they are not reusable.

INSPECTION

Inspect the front clutch components. Replace the clutch discs if warped, worn, scored, burned or charred, or if the facing is flaking off. Replace the steel plates if heavily scored, warped, or broken. Be sure the driving lugs on the plates are in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the clutch spring and spring retainer if either is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The steel plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged.

Check action of the check ball in the retainer (Fig. 94). The ball must move freely and not stick.

NOTE: Inspect the clutch retainer bushings carefully (Fig. 95). The retainer bushings are NOT serviceable. It will be necessary to replace the retainer if either bushing is scored, or worn.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

ASSEMBLY

NOTE: The 42RE transmission uses four plates and discs for the front clutch.

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seals in the clutch retainer lower groove and on outer diameter of the retainer hub. Be sure lip of each seal faces interior of clutch retainer.

(3) Lubricate lips of the retainer seals with liberal quantity of Mopar® Door Ease. Then lubricate retainer hub, bore and piston with light coat of transmission fluid.

(4) Install clutch piston in retainer (Fig. 96). Use twisting motion to seat piston in bottom of retainer.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip.

(5) Position spring in clutch piston (Fig. 97).

(6) Position spring retainer on top of piston spring. Make sure retainer is properly installed (Fig. 92).

(7) Compress piston spring and retainer with Compressor Tool C-3575-A (Fig. 93). Then install new snap-ring to secure spring retainer and spring.

(8) Install clutch plates and discs (Fig. 92). Install steel plate then disc until all plates and discs are installed. The front clutch uses 4 clutch discs and plates in a 42RE transmission.

(9) Install pressure plate and waved snap-ring (Fig. 92).

Clearance should be 1.70 to 3.40 mm (0.067 to 0.134 in.). If clearance is incorrect, clutch discs, plates, pressure plates and snap-ring may have to be changed.

FRONT CLUTCH (Continued)

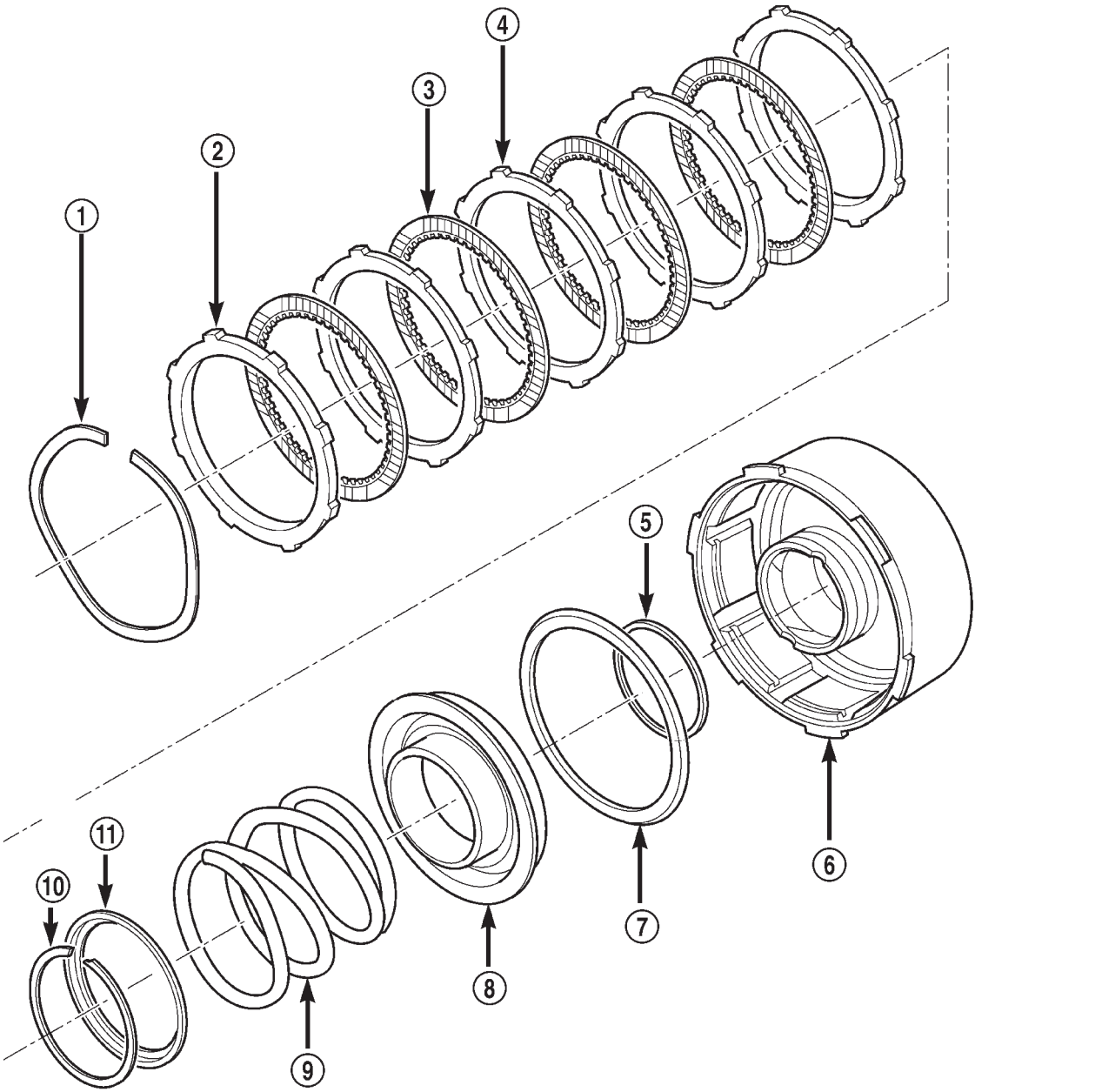


Fig. 92 42RE Front Clutch Components

1 - SNAP-RING (WAVE)
2 - REACTION PLATE
3 - CLUTCH DISC
4 - CLUTCH PLATE
5 - SEAL
6 - CLUTCH RETAINER
7 - SEAL
8 - PISTON
9 - SPRING
10 - SNAP-RING
11 - SPRING RETAINER

FRONT CLUTCH (Continued)

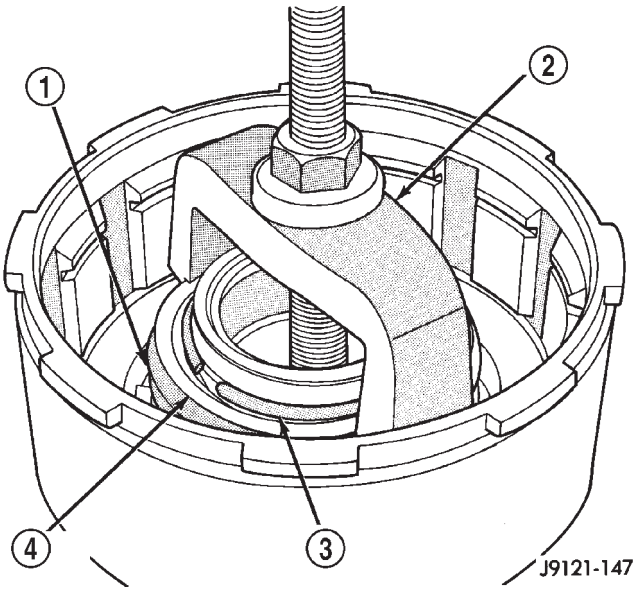


Fig. 93 Compressing Front Clutch Piston Spring

1 - FRONT CLUTCH SPRING
2 - COMPRESSOR TOOL C-3575-A
3 - RETAINER SNAP-RING
4 - SPRING RETAINER

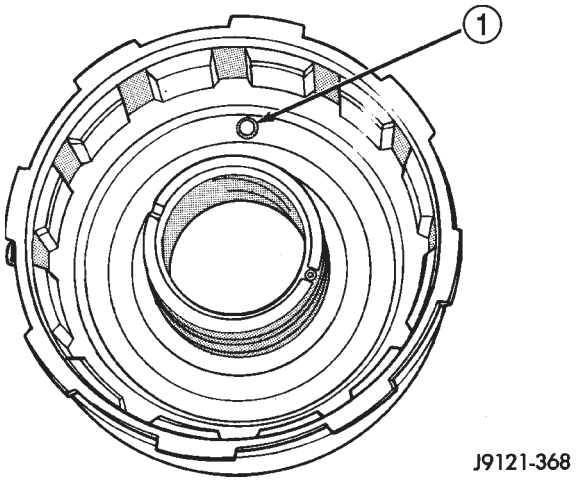


Fig. 94 Front Clutch Piston Retainer Check Ball Location

1 - RETAINER CHECK BALL

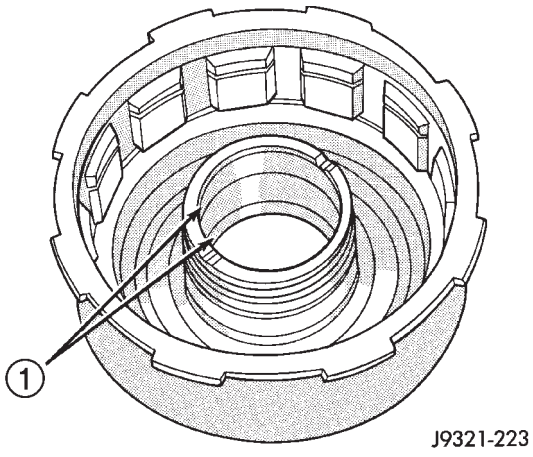


Fig. 95 Retainer Bushing Location/Inspection

1 - FRONT CLUTCH RETAINER BUSHINGS (NON-SERVICEABLE)

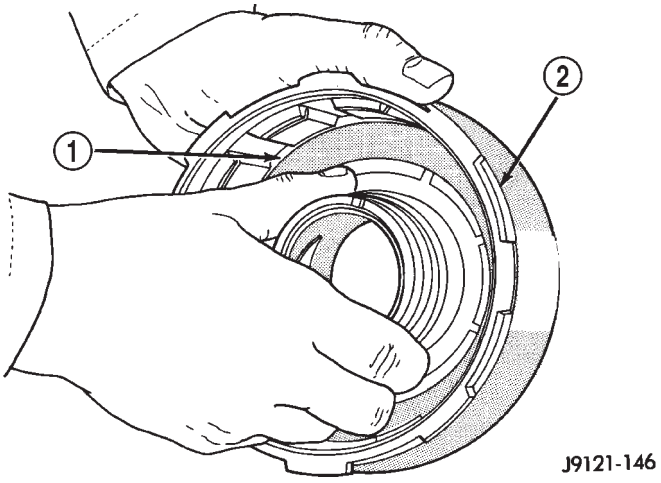


Fig. 96 Front Clutch Piston Installation

1 - CLUTCH PISTON
2 - FRONT CLUTCH RETAINER

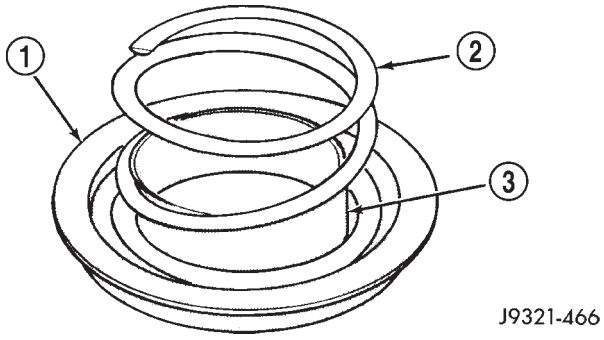


Fig. 97 Clutch Piston Spring Installation

1 - RETAINER
2 - CLUTCH SPRING
3 - PISTON

FRONT SERVO

DESCRIPTION

The kickdown servo (Fig. 98) consists of a two-land piston with an inner piston, a piston rod and guide, and a return spring. The dual-land piston uses seal rings on its outer diameters and an O-ring for the inner piston.

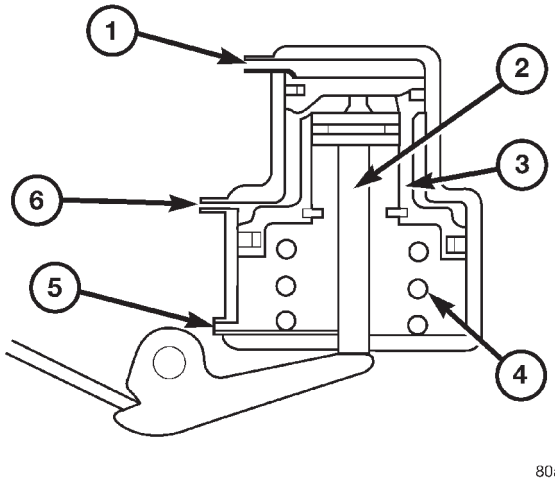


Fig. 98 Front Servo

1 - VENT
2 -PISTON ROD
3 - PISTON
4 - SPRING
5 - RELEASE PRESSURE
6 - APPLY PRESSURE

OPERATION

The application of the piston is accomplished by applying pressure between the two lands of the piston. The pressure acts against the larger lower land to push the piston downward, allowing the piston rod to extend though its guide against the apply lever. Release of the servo at the 2-3 upshift is accomplished by a combination of spring and line pressure, acting on the bottom of the larger land of the piston. The small piston is used to cushion the application of the band by bleeding oil through a small orifice in the larger piston. The release timing of the kickdown servo is very important to obtain a smooth but firm shift. The release has to be very quick, just as the front clutch application is taking place. Otherwise, engine runaway or a shift hesitation will occur. To accomplish this, the band retains its holding capacity until the front clutch is applied, giving a small amount of overlap between them.

DISASSEMBLY

(1) Remove seal ring from rod guide (Fig. 99).

(2) Remove small snap-ring from servo piston rod. Then remove piston rod, spring and washer from piston.

(3) Remove and discard servo component o-ring and seal rings.

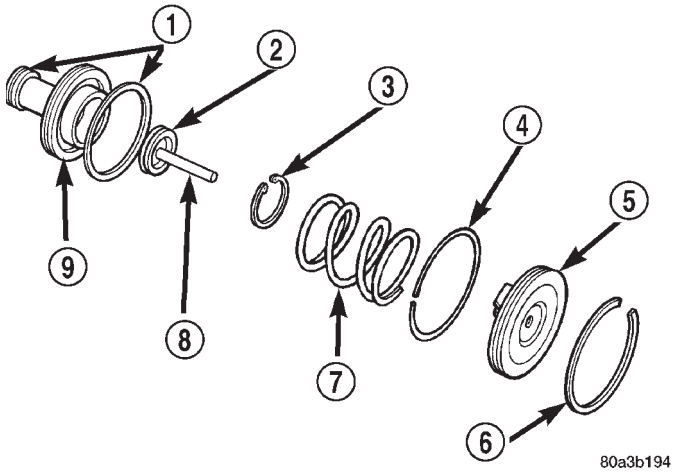


Fig. 99 Front Servo

1 - PISTON RINGS
2 - O-RING
3 - SNAP-RING
4 - SEAL RING
5 - PISTON ROD GUIDE
6 - SNAP-RING
7 - SERVO SPRING
8 - PISTON ROD
9 - SERVO PISTON

CLEANING

Clean the servo piston components (Fig. 100) with solvent and dry them with compressed air.

INSPECTION

Inspect the servo components (Fig. 101). Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap-ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

Replace any servo component if doubt exists about condition. Do not reuse suspect parts.

ASSEMBLY

Clean and inspect front servo components.

(1) Lubricate new o-ring and seal rings with petroleum jelly and install them on piston, guide and rod.

(2) Install rod in piston. Install spring and washer on rod. Compress spring and install snap-ring (Fig. 102).

FRONT SERVO (Continued)

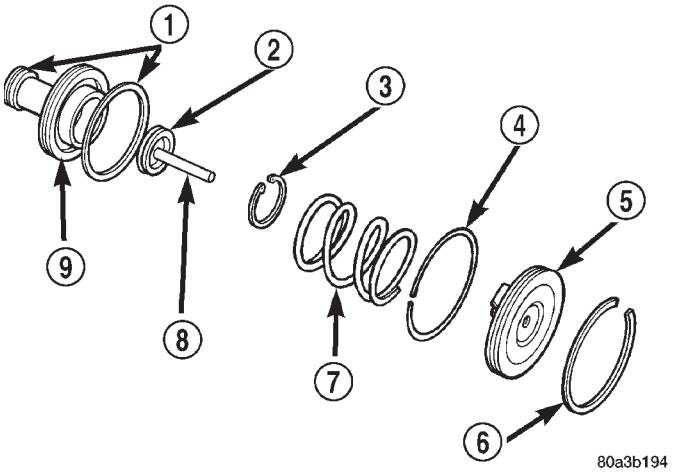


Fig. 100 Front Servo Piston

1 - PISTON RINGS
2 - O-RING
3 - SNAP-RING
4 - SEAL RING
5 - PISTON ROD GUIDE
6 - SNAP-RING
7 - SERVO SPRING
8 - PISTON ROD
9 - SERVO PISTON

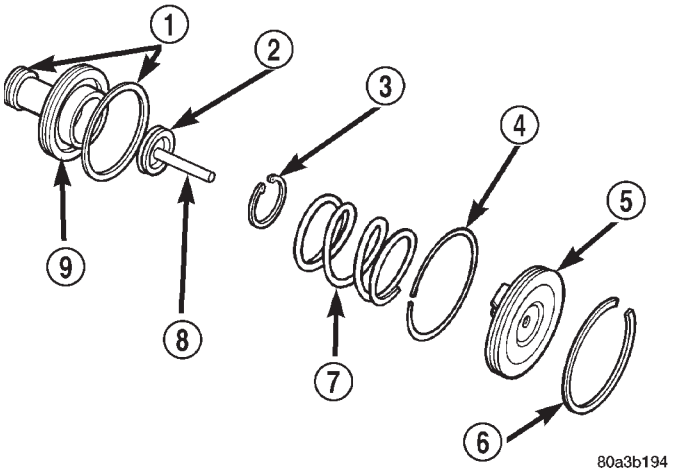


Fig. 101 Front Servo Piston

1 - PISTON RINGS
2 - O-RING
3 - SNAP-RING
4 - SEAL RING
5 - PISTON ROD GUIDE
6 - SNAP-RING
7 - SERVO SPRING
8 - PISTON ROD
9 - SERVO PISTON

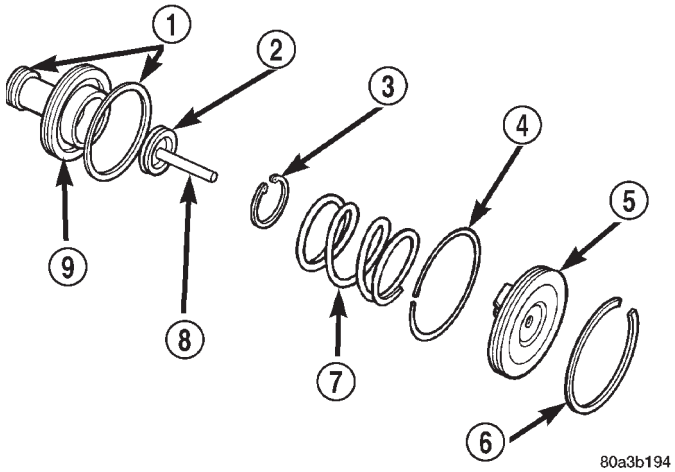


Fig. 102 Front Servo

1 - PISTON RINGS
2 - O-RING
3 - SNAP-RING
4 - SEAL RING
5 - PISTON ROD GUIDE
6 - SNAP-RING
7 - SERVO SPRING
8 - PISTON ROD
9 - SERVO PISTON

GEARSHIFT CABLE

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position - Normal position. Engine starts must be possible.

(d) NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

REMOVAL

(1) Shift transmission into PARK.
(2) Raise vehicle.

GEARSHIFT CABLE (Continued)

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 103).

(4) Remove shift cable from the cable support bracket.

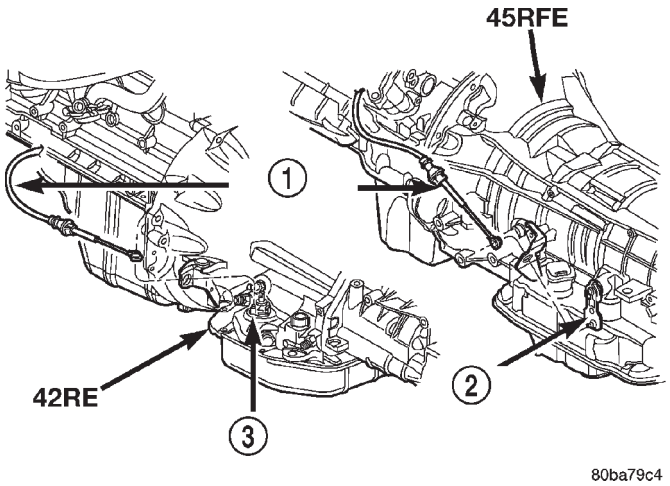


Fig. 103 Remove Shift Cable From Transmission

1 - SHIFT CABLE
2 - MANUAL LEVER
3 - MANUAL LEVER

(5) Lower vehicle.

(6) Remove necessary console parts for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 104).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 105).

(9) Pull cable through floor panel opening.

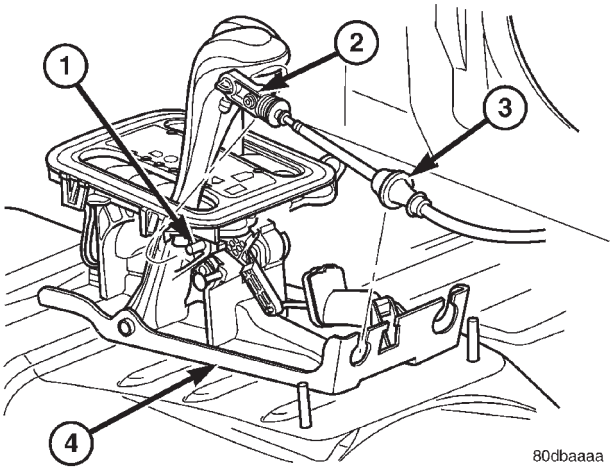


Fig. 104 Transmission Shift Cable at Shifter

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

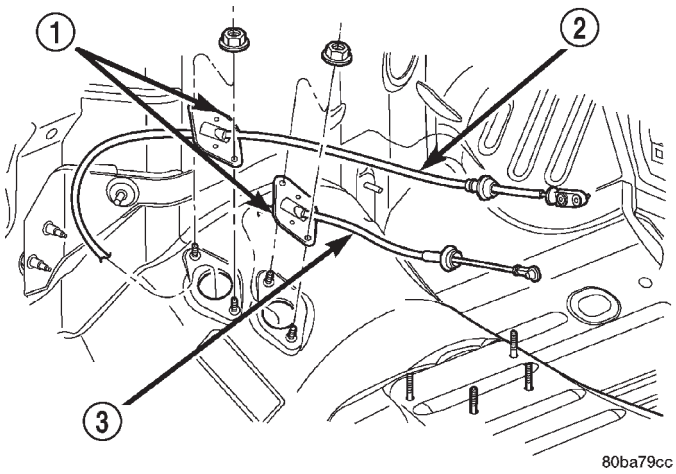


Fig. 105 Shift Cables at Floor Pan

1 - SEAL PLATES
2 - TRANSMISSION SHIFT CABLE
3 - TRANSFER CASE SHIFT CABLE

(10) Remove shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in.lbs.).

(4) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(5) Place the floor shifter lever in PARK position.

(6) Loosen the adjustment screw on the shift cable.

(7) Snap the shift cable onto the shift lever pin.

(8) Raise the vehicle.

(9) Install the shift cable to the shift cable support bracket.

(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.

(11) Snap the shift cable onto the transmission manual shift lever.

(12) Lower vehicle.

(13) Verify that the shift lever is in the PARK position.

(14) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(15) Verify correct shifter operation.

(16) Install any console parts removed for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is

GEARSHIFT CABLE (Continued)

INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the park/neutral position switch or TRS may be faulty.

(1) Shift transmission into PARK.

(2) Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(3) Loosen the shift cable adjustment screw (Fig. 106).

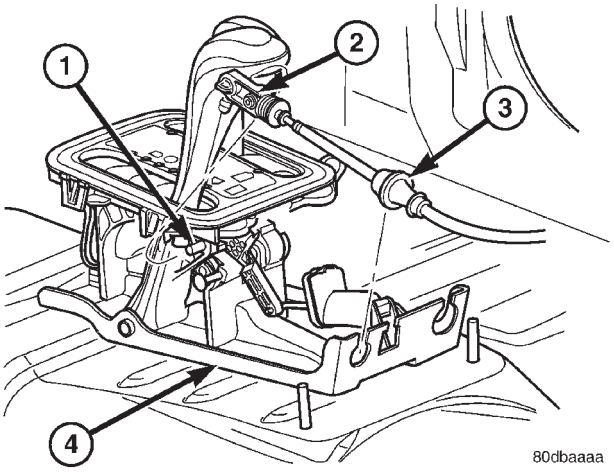


Fig. 106 Shift Cable at the Shifter

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

(4) Raise vehicle.

(5) Unsnap cable eyelet from transmission shift lever (Fig. 107).

(6) Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Snap cable eyelet onto transmission shift lever.

(9) Lower vehicle

(10) Tighten the shift cable adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct operation.

(12) Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

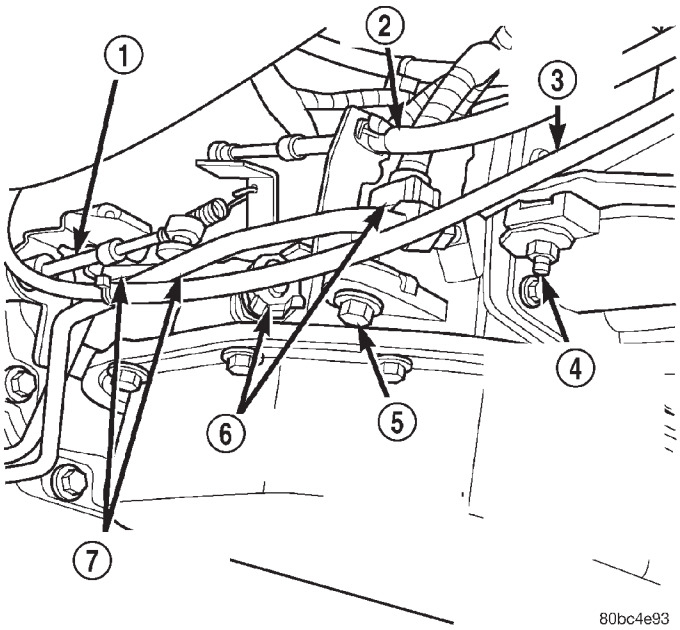


Fig. 107 Shift Cable at Transmission

1 - TRANSMISSION SHIFTER CABLE
2 - THROTTLE VALVE CABLE
3 - TRANSFER CASE SHIFTER CABLE
4 - TRANSFER CASE SHIFTER CABLE BRACKET RETAINING BOLT(S)
5 - THROTTLE VALVE CABLE BRACKET RETAINING BOLT
6 - ELECTRICAL CONNECTORS
7 - TRANSMISSION FLUID LINES

OIL PUMP

DESCRIPTION

The oil pump (Fig. 108) is located in the pump housing inside the bell housing of the transmission case. The oil pump consists of an inner and outer gear (Fig. 109), a housing, and a cover that also serves as the reaction shaft support.

OPERATION

As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

OIL PUMP (Continued)

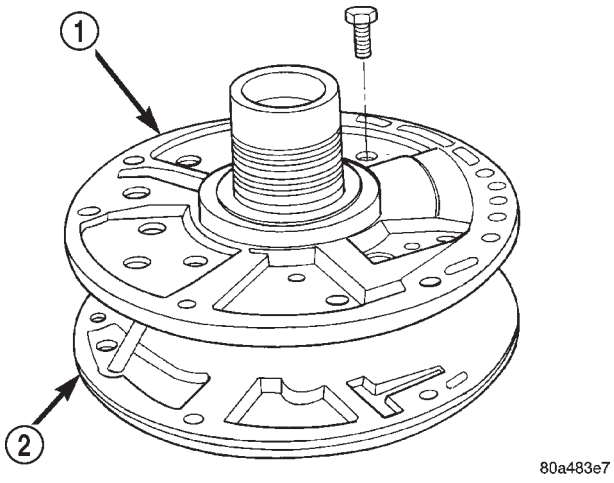


Fig. 108 Oil Pump and Reaction Shaft Support

1 - REACTION SHAFT SUPPORT
2 - PUMP

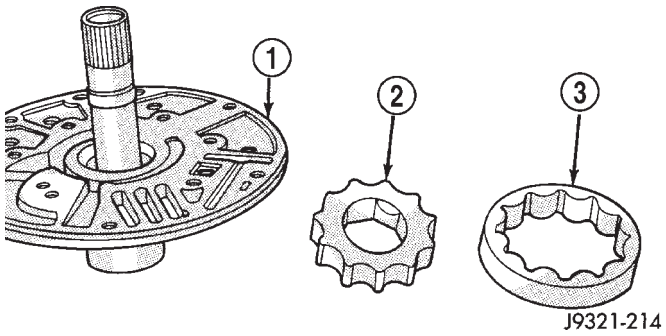


Fig. 109 Pump Gear Removal

1 - REACTION SHAFT SUPPORT
2 - INNER GEAR
3 - OUTER GEAR

STANDARD PROCEDURE - OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF +4, type 9602, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at curb idle speed**, with the shift selector in neutral.

(3) If one quart of transmission fluid is collected in the container in 20 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 20 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

(5) Refill the transmission to proper level.

DISASSEMBLY

(1) Remove seal ring from housing and reaction shaft support (Fig. 110).

(2) Mark pump housing and support assembly for alignment reference.

(3) Remove bolts attaching pump body to support (Fig. 111).

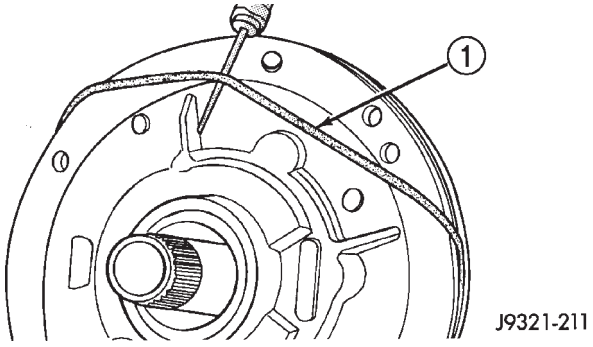


Fig. 110 Removing Pump Seal Ring

1 - PUMP HOUSING SEAL RING

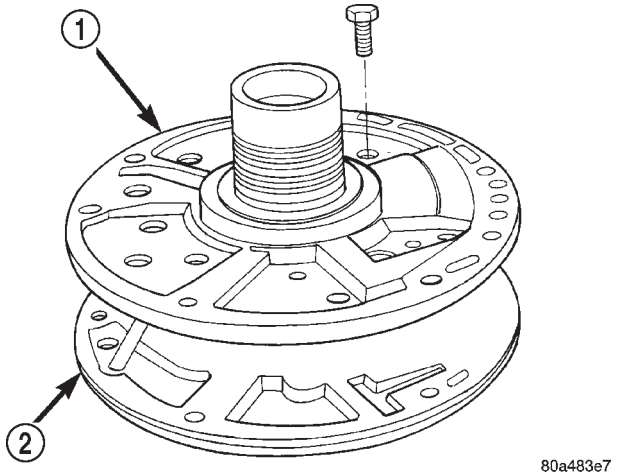


Fig. 111 Pump Support Bolts

1 - REACTION SHAFT SUPPORT
2 - PUMP

(4) Separate support from pump housing (Fig. 112).

(5) Remove inner and outer gears from reaction shaft support (Fig. 113).

OIL PUMP (Continued)

(6) If pump seal was not removed during transmission disassembly, remove seal with punch and hammer.

(7) Remove front clutch thrust washer from support hub (Fig. 114).

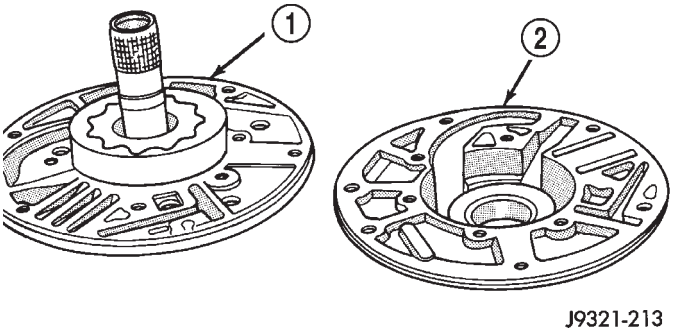


Fig. 112 Separating Pump Housing From Reaction Shaft Support

1 - REACTION SHAFT SUPPORT
2 - PUMP HOUSING

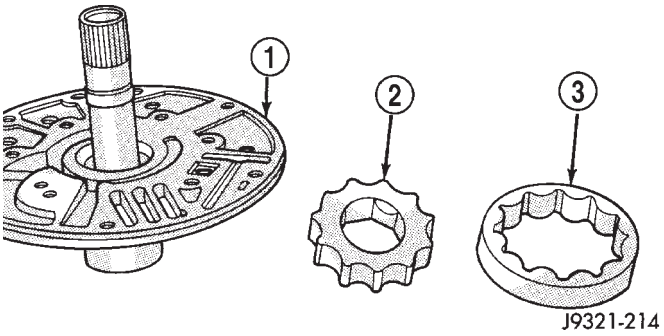


Fig. 113 Pump Gear Removal

1 - REACTION SHAFT SUPPORT
2 - INNER GEAR
3 - OUTER GEAR

OIL PUMP BUSHING REPLACEMENT

(1) Remove pump bushing with Tool Handle C-4171 and Bushing Remover SP-3551 from Tool Set C-3887-J (Fig. 115).

(2) Install new pump bushing with Tool Handle C-4171 and Bushing Installer SP-5117 (Fig. 115). Bushing should be flush with pump housing bore.

(3) Stake new pump bushing in two places with blunt punch (Fig. 116). Remove burrs from stake points with knife blade afterward.

REACTION SHAFT SUPPORT BUSHING REMOVAL

(1) Assemble Bushing Remover Tools SP-1191, 3633 and 5324 (Fig. 117). Do not clamp any part of reaction shaft or support in vise.

(2) Hold Cup Tool SP-3633 firmly against reaction shaft and thread remover SP-5324 into bushing as far as possible by hand. Then thread remover tool 3-4 additional turns into bushing with a wrench.

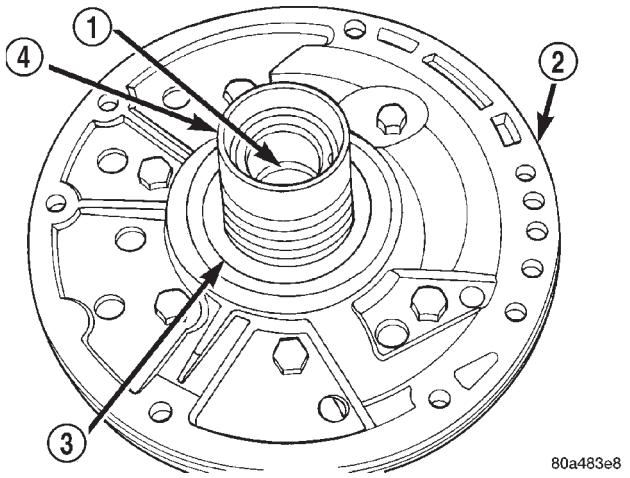


Fig. 114 Support Hub Thrust Washer

1 - BUSHING
2 - REACTION SHAFT SUPPORT
3 - THRUST WASHER
4 - HUB

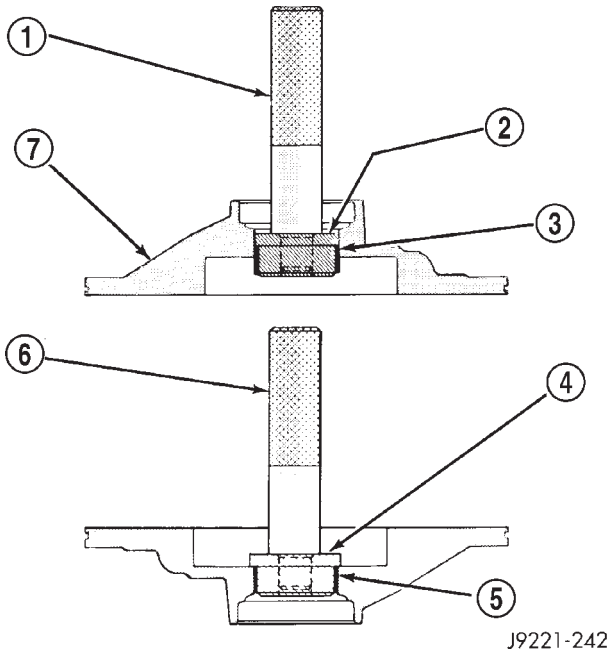


Fig. 115 Removing Oil Pump Bushing

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL SP-3551
3 - BUSHING
4 - SPECIAL TOOL SP-5117
5 - BUSHING
6 - SPECIAL TOOL C-4171
7 - PUMP HOUSING

(3) Turn remover tool hex nut down against remover cup to pull bushing from shaft. Clean all chips from shaft after bushing removal.

OIL PUMP (Continued)

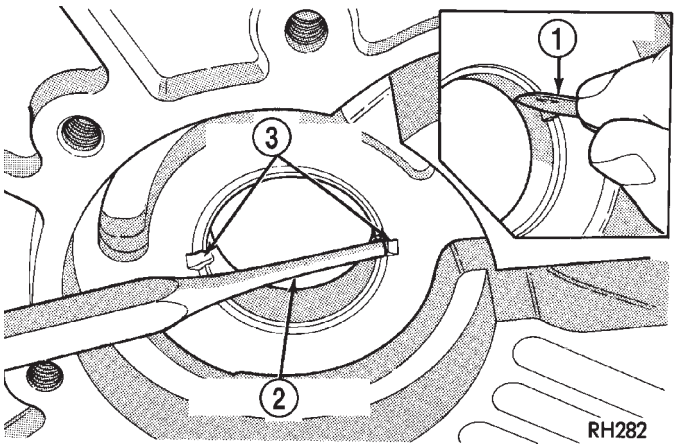


Fig. 116 Staking Oil Pump Bushing

1 - NARROW BLADE
2 - BLUNT PUNCH
3 - TWO STAKES

(4) Lightly grip old bushing in vise or with pliers and back remover tool out of bushing.

(5) Assemble Bushing Installer Tools C-4171 and SP-5325 (Fig. 117).

(6) Slide new bushing onto Installer Tool SP-5325.

(7) Position reaction shaft support upright on a clean smooth surface.

(8) Align bushing in bore. Then tap bushing into place until Bushing Installer SP-5325 bottoms.

(9) Clean reaction shaft support thoroughly after installing bushing.

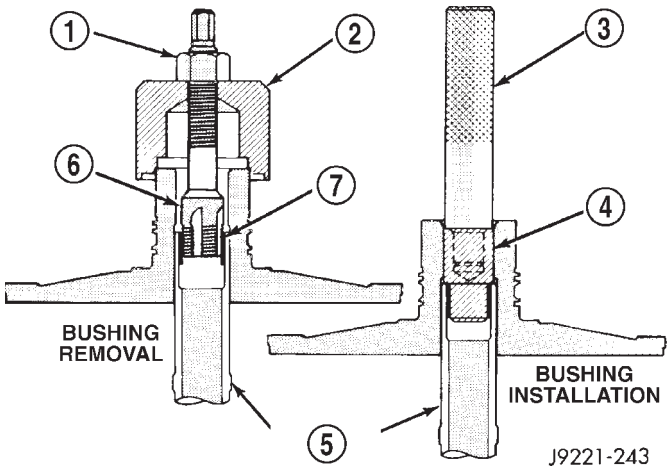


Fig. 117 Replacing Reaction Shaft Support Bushing

1 - SPECIAL TOOL SP-1191
2 - SPECIAL TOOL SP-3633
3 - SPECIAL TOOL C-4171
4 - SPECIAL TOOL SP-5325
5 - REACTION SHAFT
6 - SPECIAL TOOL SP-5324
7 - BUSHING

CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

Inspect the pump bushing. Then check the reaction shaft support bushing. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Clearance between outer gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Clearance between inner gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Both clearances can be measured at the same time by installing the gears in the pump body and measure pump component clearances as follows:

(1) Position an appropriate piece of Plastigage™ across both gears.

(2) Align the plastigage to a flat area on the reaction shaft housing.

(3) Install the reaction shaft to the pump housing.

(4) Separate the reaction shaft housing from the pump housing and measure the Plastigage™ following the instructions supplied with it.

Clearance between inner gear tooth and outer gear should be 0.08 to 0.19 mm (0.0035 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

Clearance between outer gear and pump housing should be 0.10 to 0.19 mm (0.004 to 0.0075 in.). Measure clearance with an appropriate feeler gauge.

ASSEMBLY

(1) Lubricate gear bore in pump housing with transmission fluid.

(2) Lubricate pump gears with transmission fluid.

(3) Support pump housing on wood blocks (Fig. 118).

(4) Install outer gear in pump housing (Fig. 118). Gear can be installed either way (it is not a one-way fit).

(5) Install pump inner gear (Fig. 119).

OIL PUMP (Continued)

CAUTION: The pump inner gear is a one way fit. The bore on one side of the gear inside diameter (I.D.) is chamfered. Be sure the chamfered side faces forward (to front of pump).

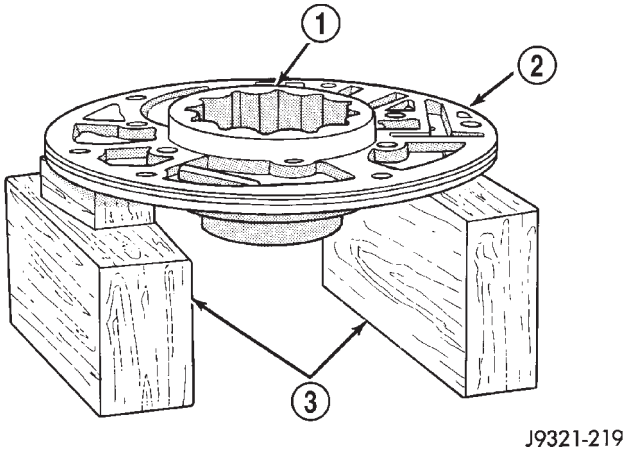


Fig. 118 Supporting Pump And Installing Outer Gear

1 - OUTER GEAR
2 - PUMP HOUSING
3 - WOOD BLOCKS

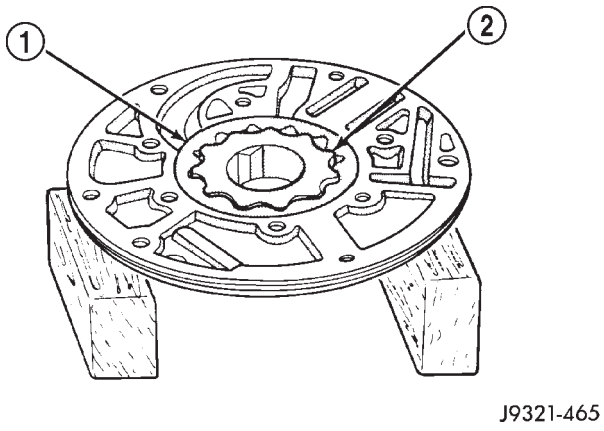


Fig. 119 Pump Inner Gear Installation

1 - OUTER GEAR
2 - INNER GEAR

(6) Install new thrust washer on hub of reaction shaft support. Lubricate washer with transmission fluid or petroleum jelly.

(7) If reaction shaft seal rings are being replaced, install new seal rings on support hub (Fig. 120). Lubricate seal rings with transmission fluid or petroleum jelly after installation. Squeeze each ring until ring ends are securely hooked together.

CAUTION: The reaction shaft support seal rings will break if overspread, or twisted. If new rings are being installed, spread them only enough for installation. Also be very sure the ring ends are securely hooked together after installation. Otherwise, the rings will either prevent pump installation, or break during installation.

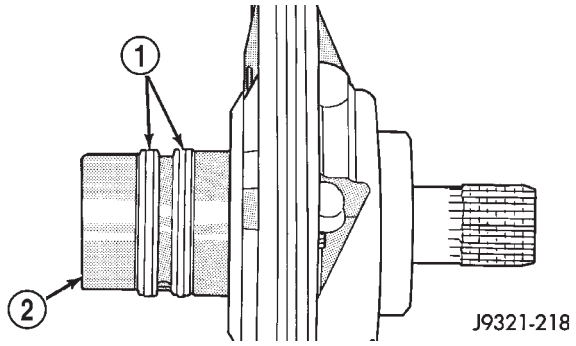


Fig. 120 Hub Seal Ring Position

1 - SEAL RINGS
2 - SUPPORT HUB

(8) Install reaction shaft support on pump housing (Fig. 121).

(9) Align reaction support on pump housing. Use alignment marks made at disassembly. Or, rotate support until bolt holes in support and pump housing are all aligned (holes are offset for one-way fit).

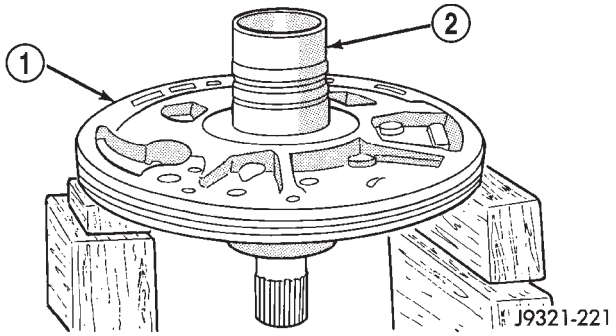


Fig. 121 Assembling Reaction Shaft Support And Pump Housing

1 - PUMP HOUSING
2 - REACTION SHAFT SUPPORT

(10) Install all bolts that attach support to pump housing. Then tighten bolts finger tight.

(11) Tighten support-to-pump bolts to required torque as follows:

(a) Reverse pump assembly and install it in transmission case. Position pump so bolts are facing out and are accessible.

(b) Secure pump assembly in case with 2 or 3 bolts, or with pilot studs.

(c) Tighten support-to-pump bolts to 20 N·m (15 ft. lbs.).

(d) Remove pump assembly from transmission case.

OIL PUMP (Continued)

(12) Install new oil seal in pump with Special Tool C-4193 and Tool Handle C-4171 (Fig. 122). Be sure seal lip faces inward.

(13) Install new seal ring around pump housing. Be sure seal is properly seated in groove.

(14) Lubricate lip of pump oil seal and O-ring seal with transmission fluid.

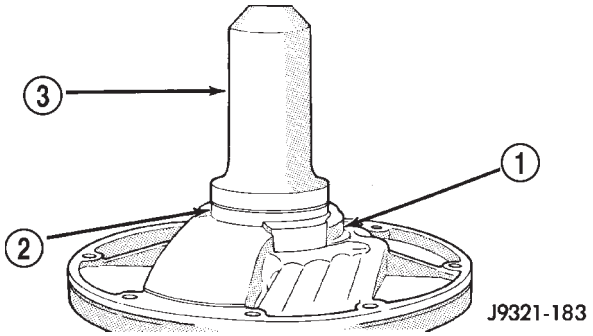


Fig. 122 Pump Oil Seal Installation

1 - PUMP BODY
2 - PUMP SEAL
3 - SPECIAL TOOL C-4193

OUTPUT SHAFT FRONT BEARING

REMOVAL

(1) Remove overdrive unit from the vehicle.

(2) Remove overdrive geartrain from housing.

(3) Remove snap-ring holding output shaft front bearing to overdrive geartrain. (Fig. 123).

(4) Pull bearing from output shaft.

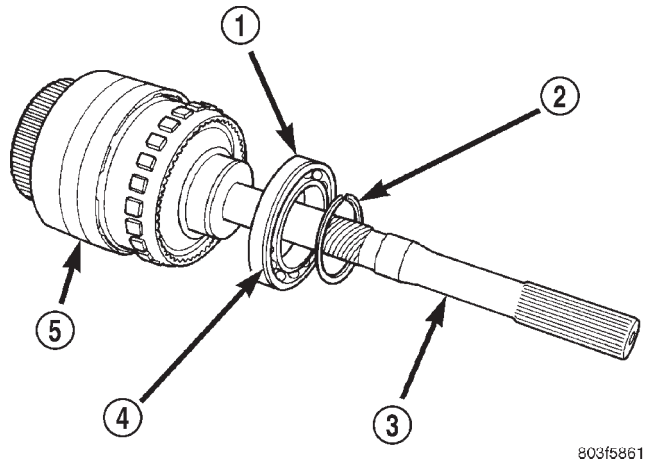


Fig. 123 Output Shaft Front Bearing

1 - OUTPUT SHAFT FRONT BEARING
2 - SNAP-RING
3 - OUTPUT SHAFT
4 - GROOVE TO REAR
5 - OVERDRIVE GEARTRAIN

INSTALLATION

(1) Place replacement bearing in position on geartrain with locating retainer groove toward the rear.

(2) Push bearing onto shaft until the snap-ring groove is visible.

(3) Install snap-ring to hold bearing onto output shaft.

(4) Install overdrive geartrain into housing.

(5) Install overdrive unit in vehicle.

OUTPUT SHAFT REAR BEARING

REMOVAL

(1) Remove overdrive unit from the vehicle. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/OVERDRIVE - REMOVAL)

(2) Remove overdrive geartrain from housing.

(3) Remove snap-ring holding output shaft rear bearing into overdrive housing (Fig. 124).

(4) Using a suitable driver inserted through the rear end of housing, drive bearing from housing.

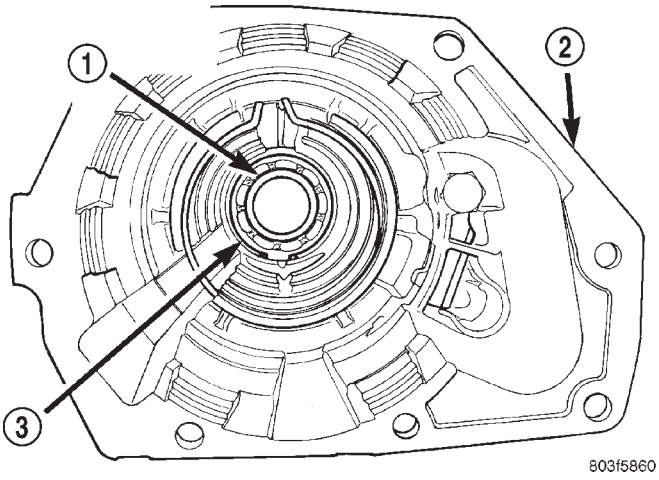


Fig. 124 Output Shaft Rear Bearing

1 - OUTPUT SHAFT REAR BEARING
2 - OVERDRIVE HOUSING
3 - SNAP-RING

INSTALLATION

(1) Place replacement bearing in position in housing.

(2) Using a suitable driver, drive bearing into housing until the snap-ring groove is visible.

(3) Install snap-ring to hold bearing into housing (Fig. 124).

(4) Install overdrive geartrain into housing.

(5) Install overdrive unit in vehicle.

OVERDRIVE CLUTCH

DESCRIPTION

The overdrive clutch (Fig. 125) is composed of the pressure plate, clutch plates, holding discs, overdrive piston retainer, piston, piston spacer, and snap-rings. The overdrive clutch is the forwardmost component in the transmission overdrive unit and is considered a holding component. The overdrive piston retainer, piston, and piston spacer are located on the rear of the main transmission case.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the piston retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through passages at the lower rear portion of the valve body area. With pressure applied between the piston retainer and piston, the piston moves away from the piston retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the intermediate shaft into the overdrive planetary gear set. The overdrive clutch discs are attached to the overdrive clutch hub while the overdrive clutch plates, reaction plate, and pressure plate are lugged to the overdrive housing. This allows the intermediate shaft to transfer the engine torque to the planetary gear and overrunning clutch. This drives the planetary gear inside the annulus, which is attached to the overdrive clutch drum and output shaft, creating the desired gear ratio. The waved snap-ring is used to cushion the application of the clutch pack.

OVERDRIVE OFF SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, fourth gear operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow upshifts to fourth gear. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the powertrain control module.

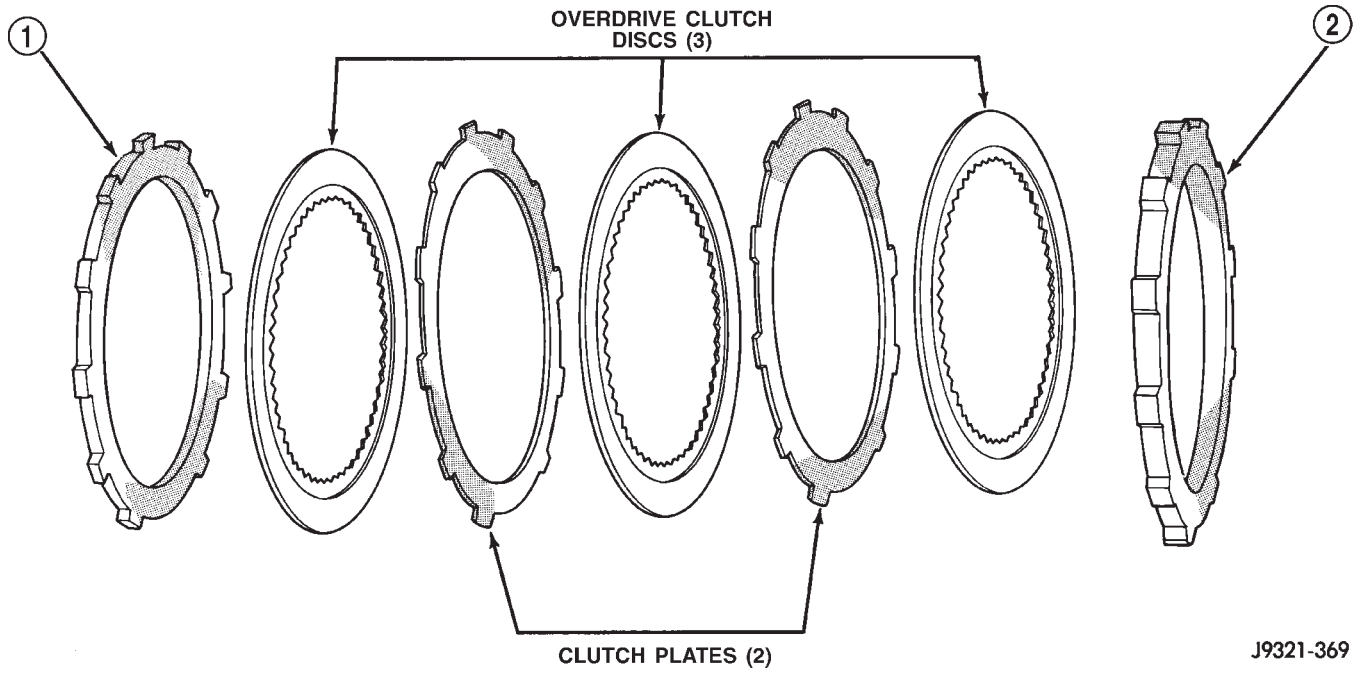


Fig. 125 Overdrive Clutch

1 - REACTION PLATE
2 - PRESSURE PLATE

OVERDRIVE OFF SWITCH (Continued)

DIAGNOSIS AND TESTING - OVERDRIVE ELECTRICAL CONTROLS

The overdrive off switch, valve body solenoid, case connectors and related wiring can all be tested with a 12 volt test lamp or a volt/ohmmeter. Check continuity of each component when diagnosis indicates this is necessary.

Switch and solenoid continuity should be checked whenever the transmission fails to shift into fourth gear range.

OVERDRIVE UNIT

REMOVAL

(1) Shift transmission into PARK.
(2) Raise vehicle.
(3) Remove transfer case, if equipped.
(4) Mark propeller shaft universal joint(s) and axle pinion yoke, or the companion flange and flange yoke, for alignment reference at installation, if neccesary.
(5) Disconnect and remove the rear propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
(6) Remove transmission oil pan, remove gasket, drain oil and reinstall pan.
(7) If overdrive unit had malfunctioned, or if fluid is contaminated, remove entire transmission. If diagnosis indicated overdrive problems only, remove just the overdrive unit.
(8) Support transmission with transmission jack.
(9) Remove bolts attaching overdrive unit to transmission (Fig. 126).

CAUTION: Support the overdrive unit with a jack before moving it rearward. This is necessary to prevent damaging the intermediate shaft. Do not allow the shaft to support the entire weight of the overdrive unit.

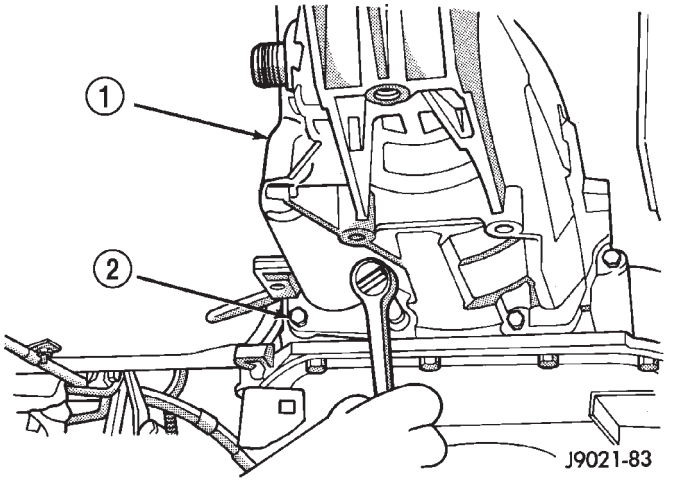


Fig. 126 Overdrive Unit Bolts

1 - OVERDRIVE UNIT
2 - ATTACHING BOLTS (7)

(10) Carefully work overdrive unit off intermediate shaft. Do not tilt unit during removal. Keep it as level as possible.
(11) If overdrive unit does not require service, immediately insert Alignment Tool 6227-2 in splines of planetary gear and overrunning clutch to prevent splines from rotating out of alignment. If misalignment occurs, overdrive unit will have to be disassembled in order to realign splines.
(12) Remove and retain overdrive piston thrust bearing. Bearing may remain on piston or in clutch hub during removal.
(13) Position drain pan on workbench.
(14) Place overdrive unit over drain pan. Tilt unit to drain residual fluid from case.
(15) Examine fluid for clutch material or metal fragments. If fluid contains these items, overhaul will be necessary.
(16) If overdrive unit does not require any service, leave alignment tool in position. Tool will prevent accidental misalignment of planetary gear and overrunning clutch splines.

OVERDRIVE UNIT (Continued)

DISASSEMBLY

(1) Remove transmission speed sensor and O-ring seal from overdrive case (Fig. 127).

(2) Remove overdrive piston thrust bearing (Fig. 128).

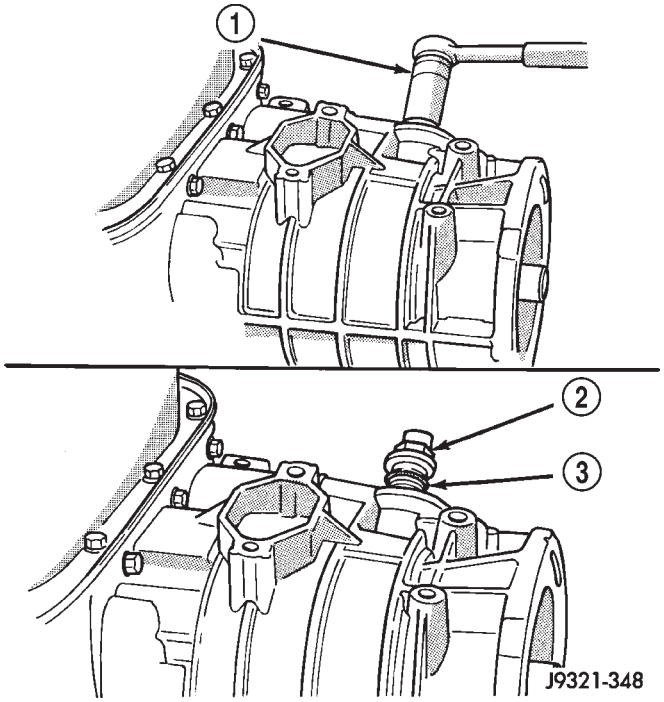


Fig. 127 Transmission Speed Sensor Removal

1 - SOCKET AND WRENCH
2 - SPEED SENSOR
3 - O-RING

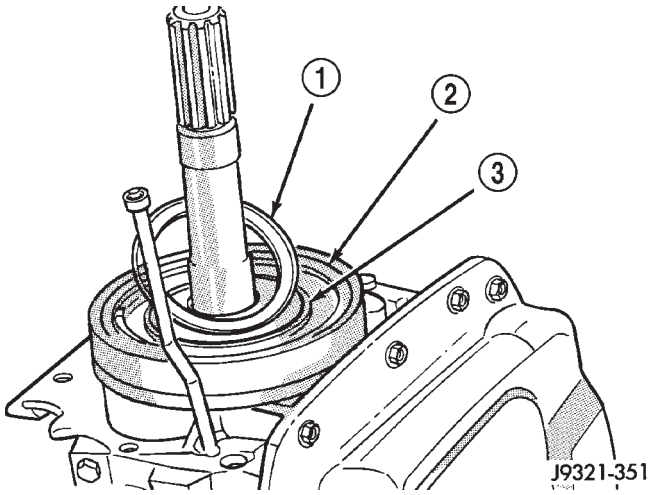


Fig. 128 Overdrive Piston Thrust Bearing Removal

1 - THRUST BEARING
2 - OVERDRIVE PISTON
3 - THRUST PLATE

OVERDRIVE PISTON

(1) Remove overdrive piston thrust plate (Fig. 129). Retain thrust plate. It is a select fit part and may possibly be reused.

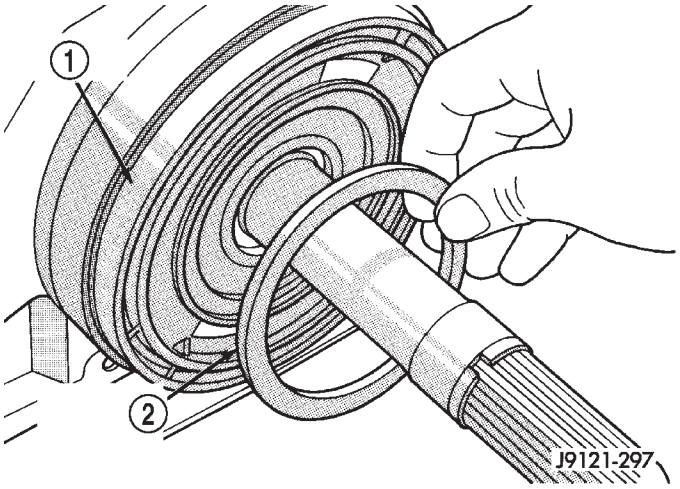


Fig. 129 Overdrive Piston Thrust Plate Removal

1 - OVERDRIVE PISTON
2 - OVERDRIVE PISTON SPACER (SELECT FIT)

(2) Remove intermediate shaft spacer (Fig. 130). Retain spacer. It is a select fit part and may possibly be reused.

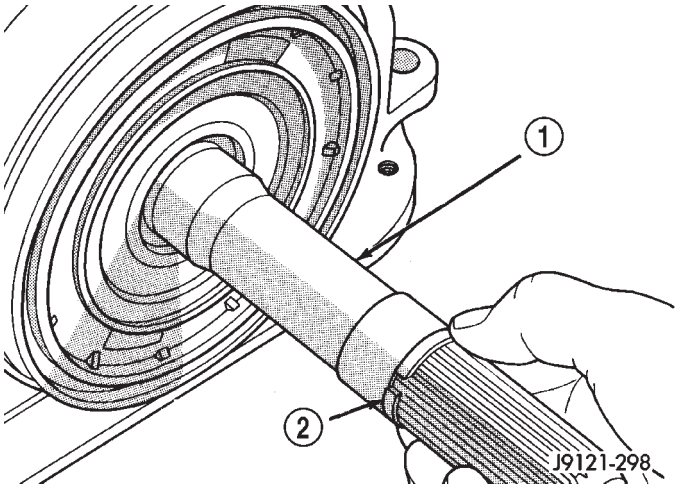


Fig. 130 Intermediate Shaft Spacer Location

1 - INTERMEDIATE SHAFT
2 - INTERMEDIATE SHAFT SPACER (SELECT FIT)

(3) Remove overdrive piston from retainer (Fig. 131).

OVERDRIVE UNIT (Continued)

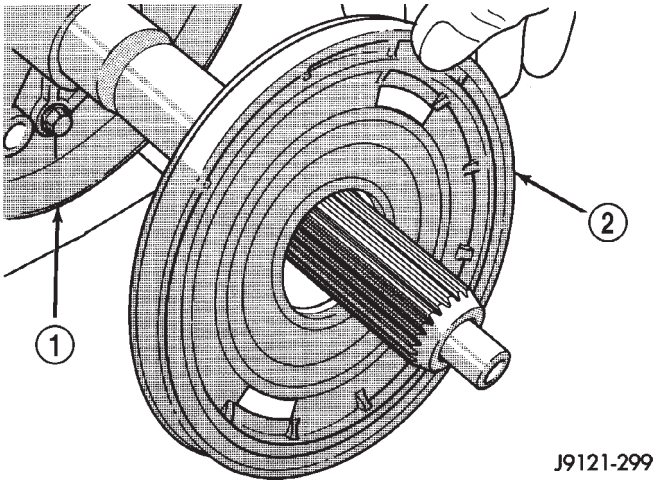


Fig. 131 Overdrive Piston Removal

1 - PISTON RETAINER
2 - OVERDRIVE PISTON

OVERDRIVE CLUTCH PACK

(1) Remove overdrive clutch pack wire retaining ring (Fig. 132).

(2) Remove overdrive clutch pack (Fig. 133).

NOTE: The 42RE transmission has three clutch discs and two clutch plates.

(3) Note position of clutch pack components for assembly reference (Fig. 134).

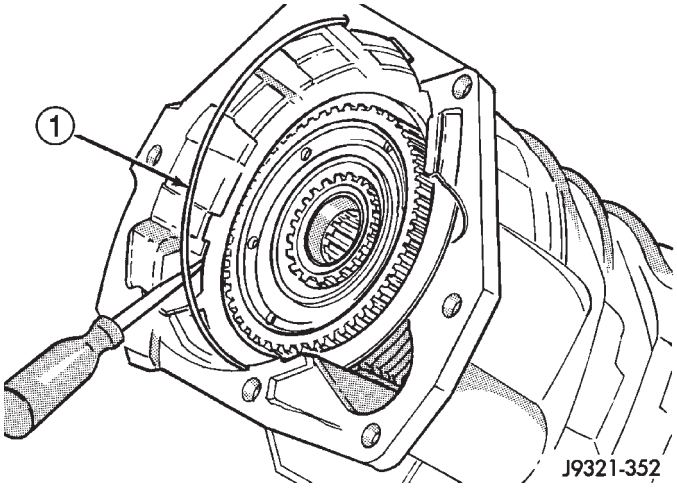


Fig. 132 Removing Overdrive Clutch Pack Retaining Ring

1 - OVERDRIVE CLUTCH PACK RETAINING RING

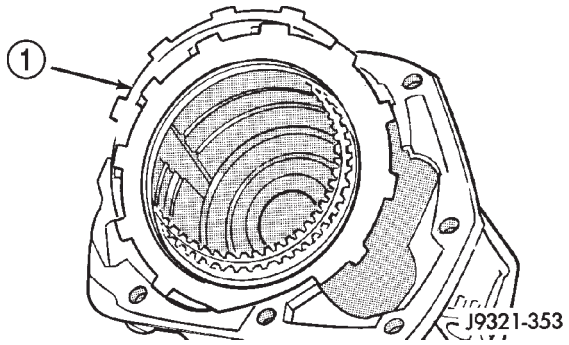


Fig. 133 Overdrive Clutch Pack Removal

1 - OVERDRIVE CLUTCH PACK

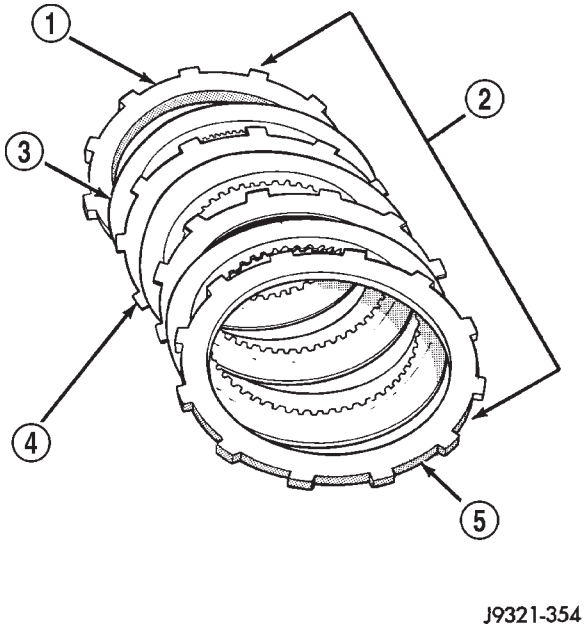


Fig. 134 42RE Overdrive Clutch Component Position

1 - PRESSURE PLATE (TO FRONT)
2 - OVERDRIVE CLUTCH PACK
3 - CLUTCH DISC (3)
4 - CLUTCH PLATE (2)
5 - REACTION PLATE (TO REAR)

OVERDRIVE UNIT (Continued)

OVERDRIVE GEARTRAIN

(1) Remove overdrive clutch wave spring (Fig. 135).

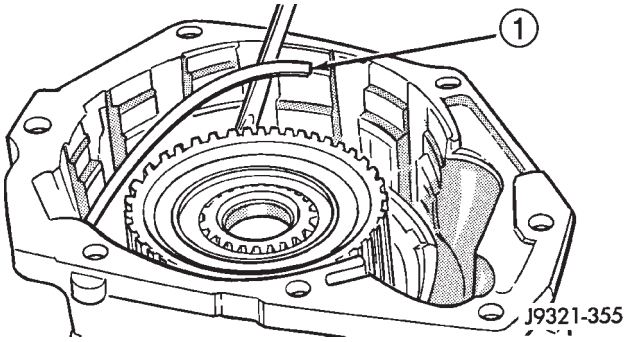


Fig. 135 Overdrive Clutch Wave

1 - WAVE SPRING

(2) Remove overdrive clutch reaction snap-ring (Fig. 136). Note that snap-ring is located in same groove as wave spring.

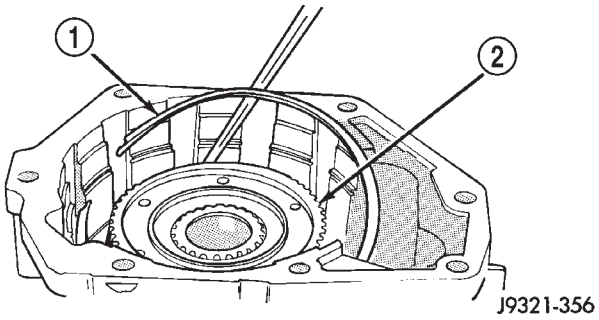


Fig. 136 Overdrive Clutch Reaction Snap-Ring Removal

1 - REACTION RING
2 - CLUTCH HUB

(3) Remove Torx™ head screws that attach access cover and gasket to overdrive case (Fig. 137).

(4) Remove access cover and gasket (Fig. 138).

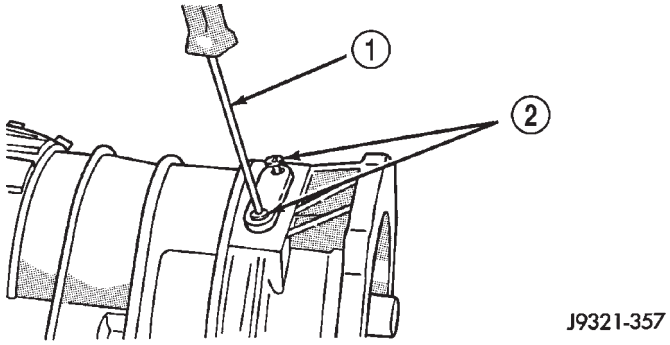


Fig. 137 Access Cover Screw Removal

1 - TORX SCREWDRIVER (T25)
2 - ACCESS COVER SCREWS

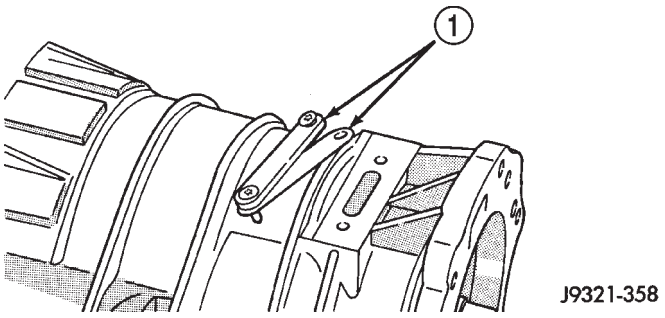


Fig. 138 Access Cover And Gasket Removal

1 - ACCESS COVER AND GASKET

(5) Expand output shaft bearing snap-ring with expanding-type snap-ring pliers. Then push output shaft forward to release shaft bearing from locating ring (Fig. 139).

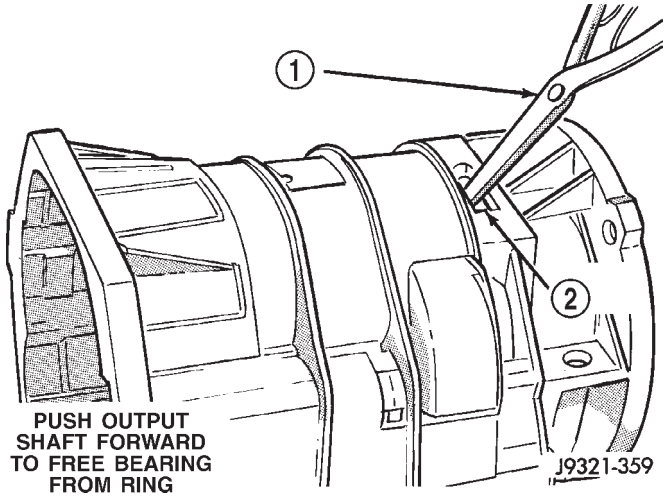


Fig. 139 Releasing Bearing From Locating Ring

1 - EXPAND BEARING LOCATING RING WITH SNAP-RING PLIERS
2 - ACCESS HOLE

(6) Lift gear case up and off geartrain assembly (Fig. 140).

(7) Remove snap-ring that retains rear bearing on output shaft.

(8) Remove rear bearing from output shaft (Fig. 141).

OVERDRIVE UNIT (Continued)

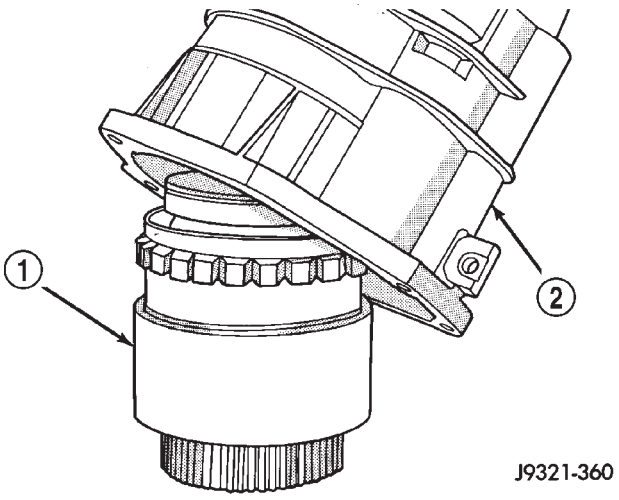


Fig. 140 Removing Gear Case From Geartrain Assembly

1 - GEARTRAIN ASSEMBLY
2 - GEAR CASE

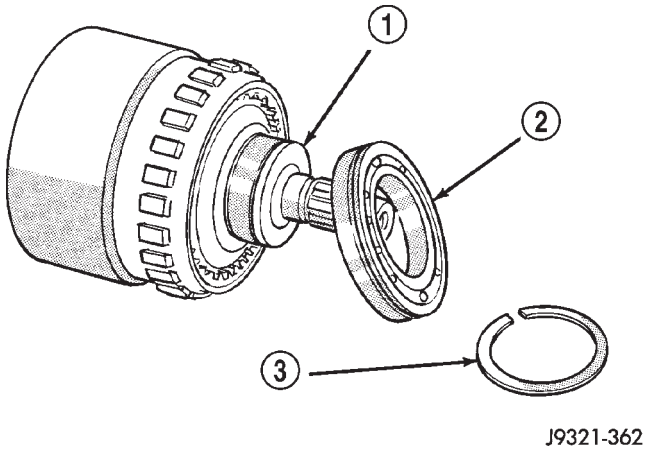


Fig. 141 Rear Bearing Removal

1 - OUTPUT SHAFT
2 - REAR BEARING
3 - SNAP-RING

DIRECT CLUTCH, HUB AND SPRING

WARNING: THE NEXT STEP IN DISASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE SPRING COMPRESSOR TOOL 6227-1 AND A HYDRAULIC SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 5-6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

(1) Mount geartrain assembly in shop press (Fig. 142).

(2) Position Compressor Tool 6227-1 on clutch hub (Fig. 142). Support output shaft flange with steel press plates as shown and center assembly under press ram.

(3) Apply press pressure slowly. Compress hub and spring far enough to expose clutch hub retaining ring and relieve spring pressure on clutch pack snap-ring (Fig. 142).

(4) Remove direct clutch pack snap-ring (Fig. 143).

(5) Remove direct clutch hub retaining ring (Fig. 144).

(6) Release press load slowly and completely (Fig. 145).

(7) Remove Special Tool 6227-1. Then remove clutch pack from hub (Fig. 145).

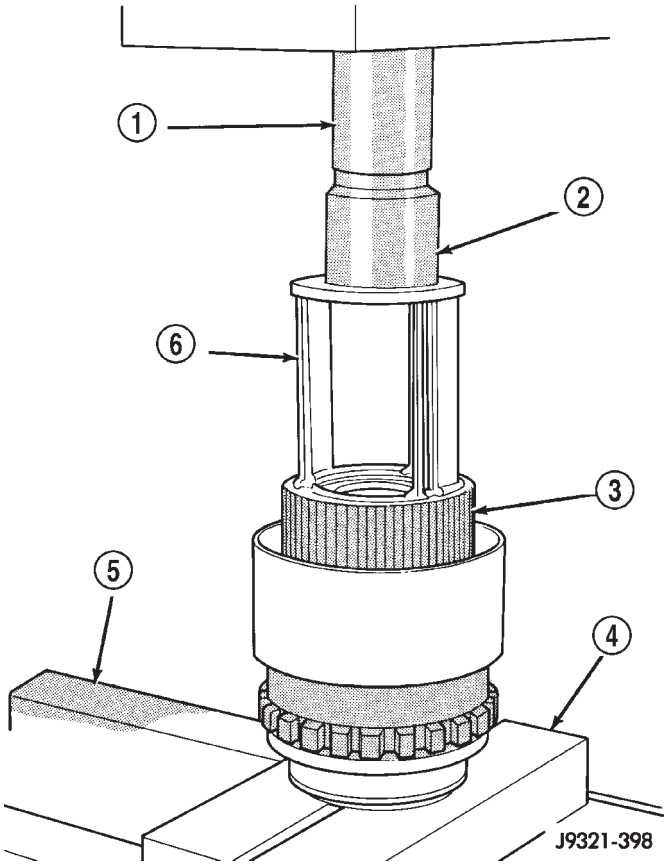


Fig. 142 Geartrain Mounted In Shop Press

1 - PRESS RAM
2 - SPECIAL TOOL C-3995-A (OR SIMILAR TOOL)
3 - CLUTCH HUB
4 - PLATES
5 - PRESS BED
6 - SPECIAL TOOL 6227-1

GEARTRAIN

(1) Remove direct clutch hub and spring (Fig. 146).

OVERDRIVE UNIT (Continued)

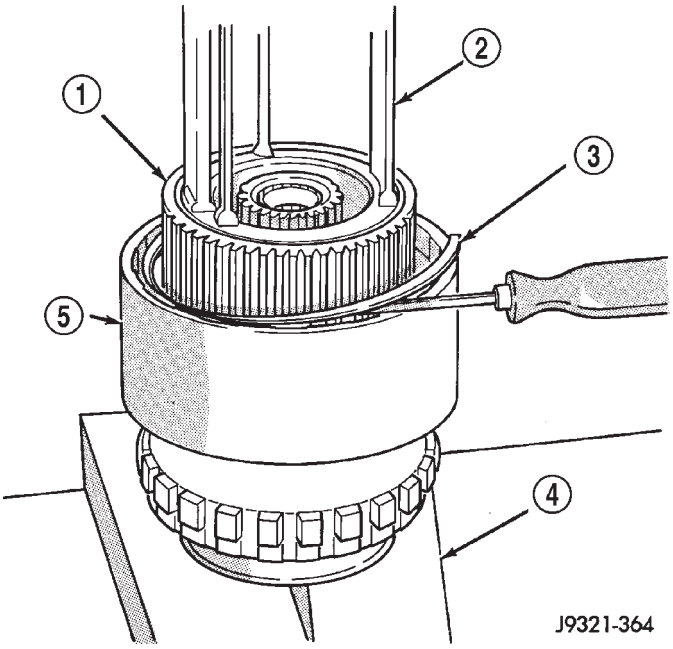


Fig. 143 Direct Clutch Pack Snap-Ring Removal

1 - CLUTCH HUB
2 - SPECIAL TOOL 6227-1
3 - DIRECT CLUTCH PACK SNAP-RING
4 - PRESS PLATES
5 - CLUTCH DRUM

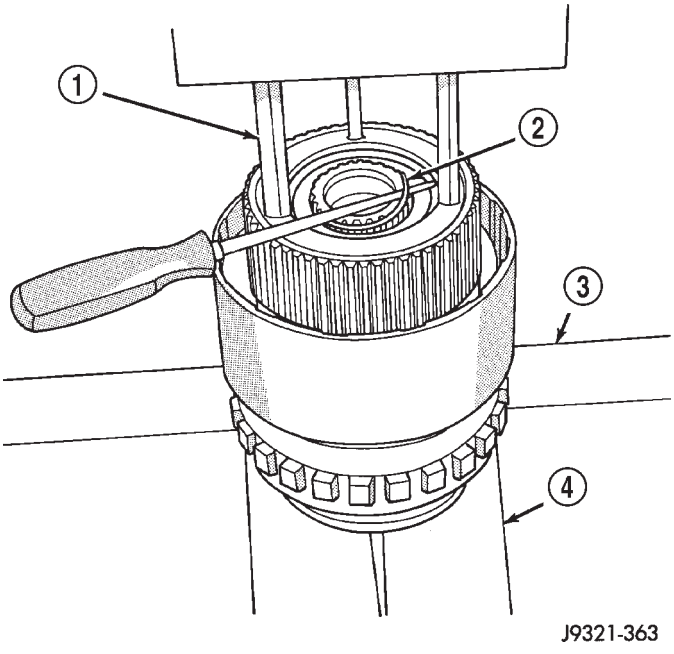


Fig. 144 Direct Clutch Hub Retaining Ring Removal

1 - SPECIAL TOOL 6227-1
2 - CLUTCH HUB RETAINING RING
3 - PRESS BED
4 - PRESS PLATES

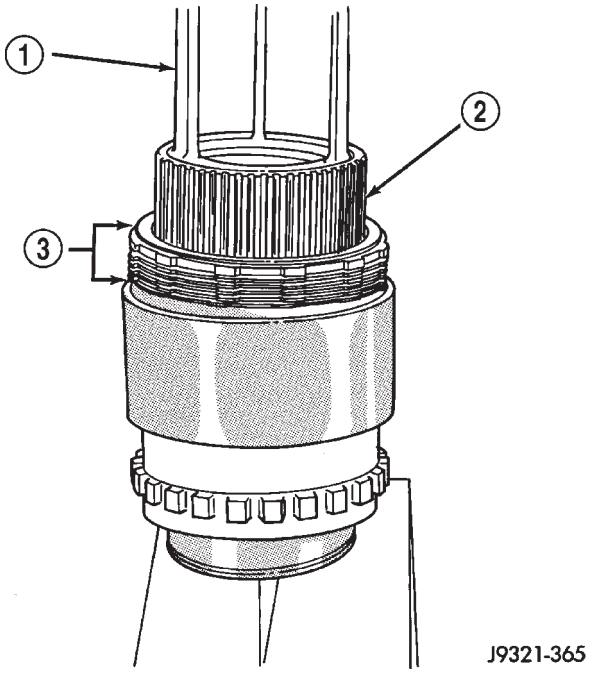


Fig. 145 Direct Clutch Pack Removal

1 - SPECIAL TOOL 6227-1
2 - DIRECT CLUTCH HUB
3 - DIRECT CLUTCH PACK

(2) Remove sun gear and spring plate. Then remove planetary thrust bearing and planetary gear (Fig. 147).

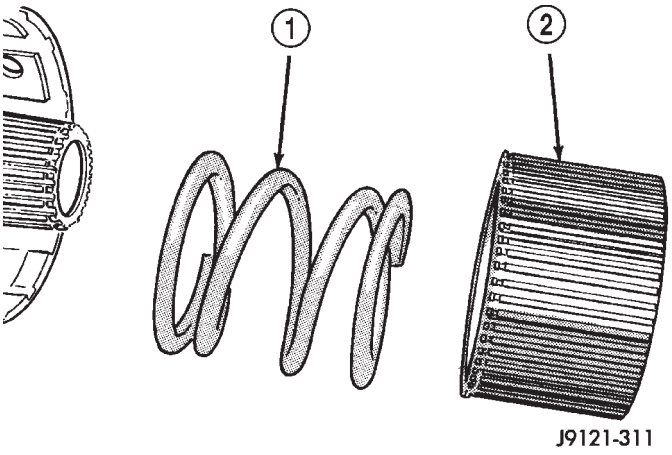


Fig. 146 Direct Clutch Hub And Spring Removal

1 - DIRECT CLUTCH SPRING
2 - DIRECT CLUTCH HUB

(3) Remove overrunning clutch assembly with expanding type snap-ring pliers (Fig. 148). Insert pliers into clutch hub. Expand pliers to grip hub splines and remove clutch with counterclockwise, twisting motion.

(4) Remove thrust bearing from overrunning clutch hub.

OVERDRIVE UNIT (Continued)

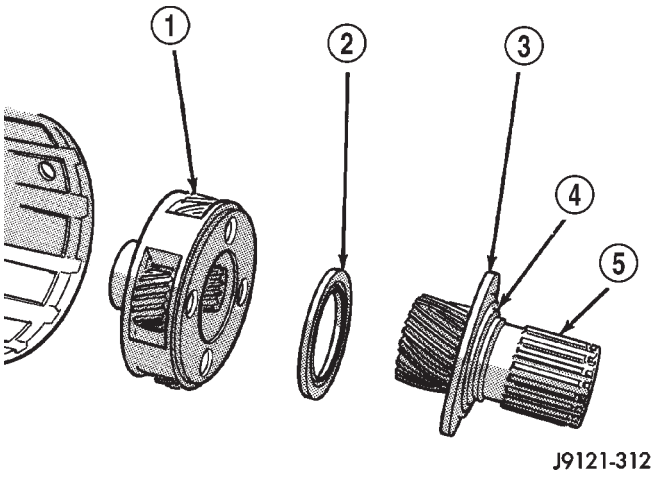


Fig. 147 Removing Sun Gear, Thrust Bearing And Planetary Gear

1 - PLANETARY GEAR
2 - PLANETARY THRUST BEARING
3 - CLUTCH SPRING PLATE
4 - SPRING PLATE SNAP-RING
5 - SUN GEAR

(5) Remove overrunning clutch from hub.

(6) Mark position of annulus gear and direct clutch drum for assembly alignment reference (Fig. 149). Use small center punch or scriber to make alignment marks.

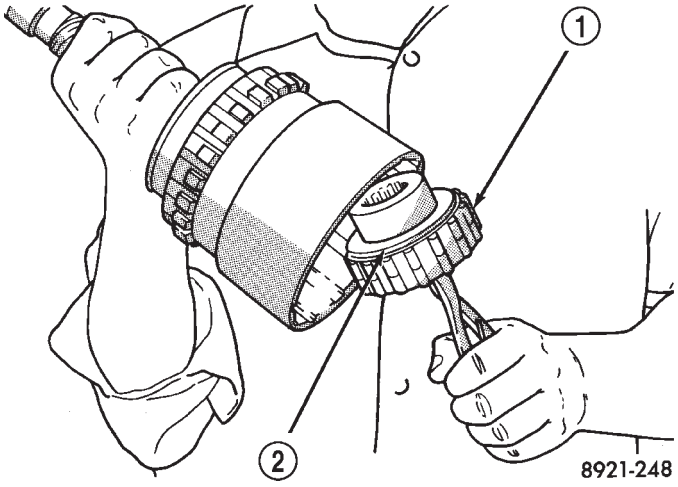


Fig. 148 Overrunning Clutch

1 - OVERRUNNING CLUTCH
2 - NEEDLE BEARING

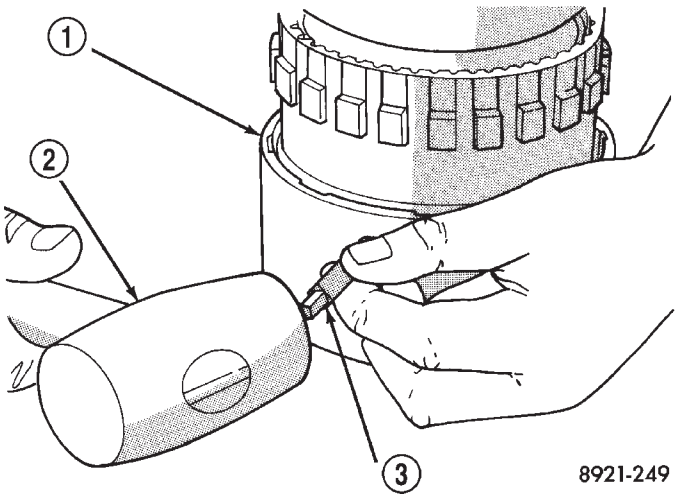


Fig. 149 Marking Direct Clutch Drum And Annulus Gear For Assembly Alignment

1 - DIRECT CLUTCH DRUM
2 - HAMMER
3 - PUNCH

(7) Remove direct clutch drum rear retaining ring (Fig. 150).

(8) Remove direct clutch drum outer retaining ring (Fig. 151).

(9) Mark annulus gear and output shaft for assembly alignment reference (Fig. 152). Use punch or scriber to mark gear and shaft.

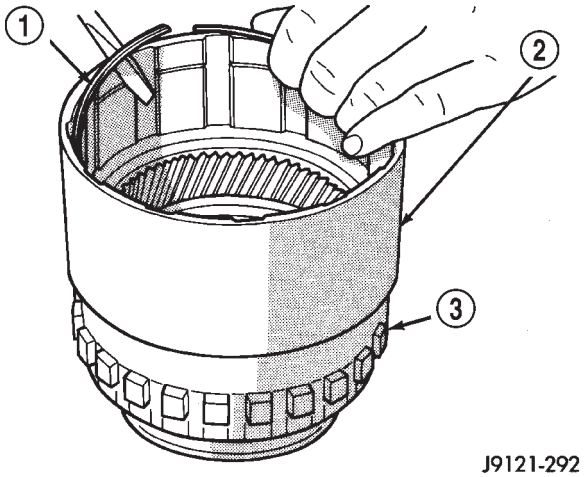


Fig. 150 Clutch Drum Inner Retaining Ring Removal

1 - INNER RETAINING RING
2 - DIRECT CLUTCH DRUM
3 - ANNULUS GEAR

OVERDRIVE UNIT (Continued)

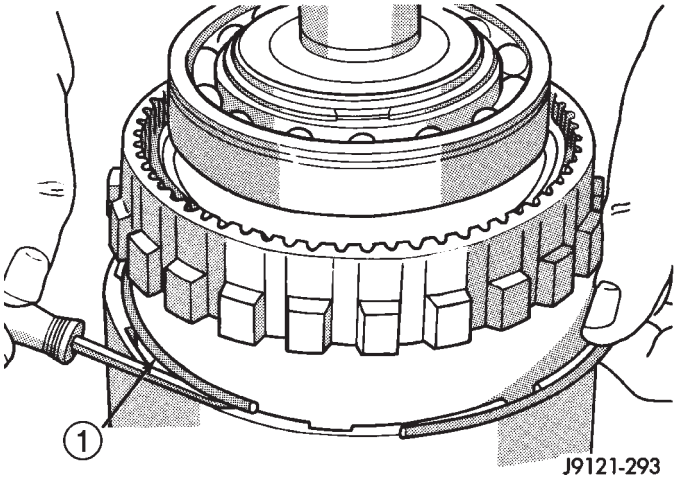


Fig. 151 Clutch Drum Outer Retaining Ring Removal

1 - OUTER RETAINING RING

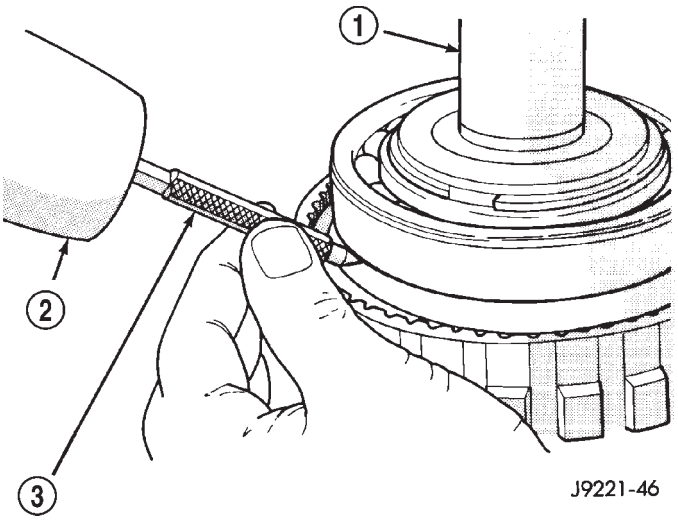


Fig. 152 Marking Annulus Gear And Output Shaft For Assembly Alignment

1 - OUTPUT SHAFT
2 - HAMMER
3 - PUNCH

(10) Remove snap-ring that secures annulus gear on output shaft (Fig. 153). Use two screwdrivers to unseat and work snap-ring out of groove as shown.

(11) Remove annulus gear from output shaft (Fig. 154). Use rawhide or plastic mallet to tap gear off shaft.

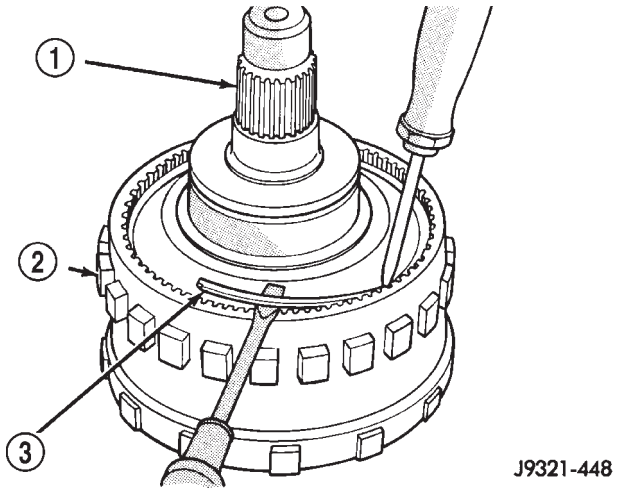


Fig. 153 Annulus Gear Snap-Ring Removal

1 - OUTPUT SHAFT
2 - ANNULUS GEAR
3 - SNAP-RING

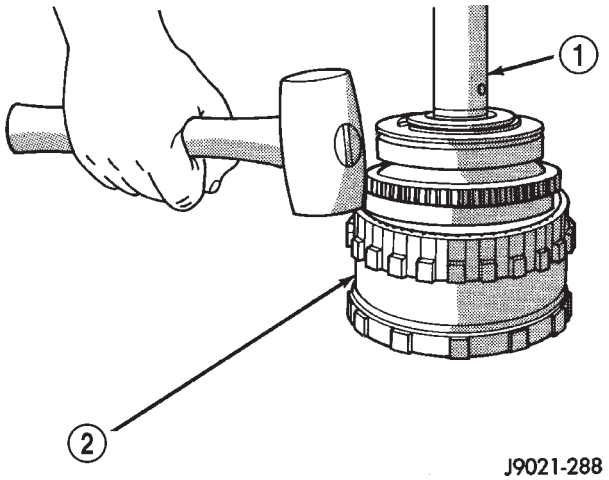


Fig. 154 Annulus Gear Removal

1 - OUTPUT SHAFT
2 - ANNULUS GEAR

OVERDRIVE UNIT (Continued)

GEAR CASE AND PARK LOCK

(1) Remove locating ring from gear case.
(2) Remove park pawl shaft retaining bolt and remove shaft, pawl and spring.
(3) Remove reaction plug snap-ring and remove reaction plug.
(4) Remove output shaft seal.

CLEANING

Clean the geartrain and case components with solvent. Dry all parts except the bearings with compressed air. Allow bearings to air dry.

Do not use shop towels for wiping parts dry unless the towels are made from a lint-free material. A sufficient quantity of lint (from shop towels, cloths, rags, etc.) could plug the transmission filter and fluid passages.

Discard the old case gasket and seals. Do not attempt to salvage these parts. They are not reusable. Replace any of the overdrive unit snap-rings if distorted or damaged.

Minor nicks or scratches on components can be smoothed with crocus cloth. However, do not attempt to reduce severe scoring on any components with abrasive materials. Replace severely scored components; do not try to salvage them.

INSPECTION

Check condition of the park lock components and the overdrive case.

Check the bushings in the overdrive case. Replace the bushings if severely scored or worn. Also replace the case seal if loose, distorted, or damaged.

Examine the overdrive and direct clutch discs and plates. Replace the discs if the facing is worn, severely scored, or burned and flaking off. Replace the clutch plates if worn, heavily scored, or cracked. Check the lugs on the clutch plates for wear. The plates should slide freely in the drum. Replace the plates or drum if binding occurs.

Check condition of the annulus gear, direct clutch hub, clutch drum and clutch spring. Replace the gear, hub and drum if worn or damaged. Replace the spring if collapsed, distorted, or cracked.

Be sure the splines and lugs on the gear, drum and hub are in good condition. The clutch plates and discs should slide freely in these components.

Inspect the thrust bearings and spring plate. Replace the plate if worn or scored. Replace the bearings if rough, noisy, brinnelled, or worn.

Inspect the planetary gear assembly and the sun gear and bushings. If either the sun gear or the bushings are damaged, replace the gear and bushings as an assembly. The gear and bushings are not serviced separately.

The planetary carrier and pinions must be in good condition. Also be sure the pinion pins are secure and in good condition. Replace the carrier if worn or damaged.

Inspect the overrunning clutch and race. The race surface should be smooth and free of scores. Replace the overrunning clutch assembly or the race if either assembly is worn or damaged in any way.

Replace the shaft pilot bushing and inner bushing if damaged. Replace either shaft bearing if rough or noisy. Replace the bearing snap-rings if distorted or cracked.

Check the machined surfaces on the output shaft. These surfaces should clean and smooth. Very minor nicks or scratches can be smoothed with crocus cloth. Replace the shaft if worn, scored or damaged in any way.

Inspect the output shaft bushings. The small bushing is the intermediate shaft pilot bushing. The large bushing is the overrunning clutch hub bushing. Replace either bushing if scored, pitted, cracked, or worn.

ASSEMBLY

GEARTRAIN AND DIRECT CLUTCH

(1) Soak direct clutch and overdrive clutch discs in Mopar® ATF +4, type 9602, transmission fluid. Allow discs to soak for 10-20 minutes.
(2) Install new pilot bushing and clutch hub bushing in output shaft if necessary (Fig. 155). Lubricate bushings with petroleum jelly, or transmission fluid.

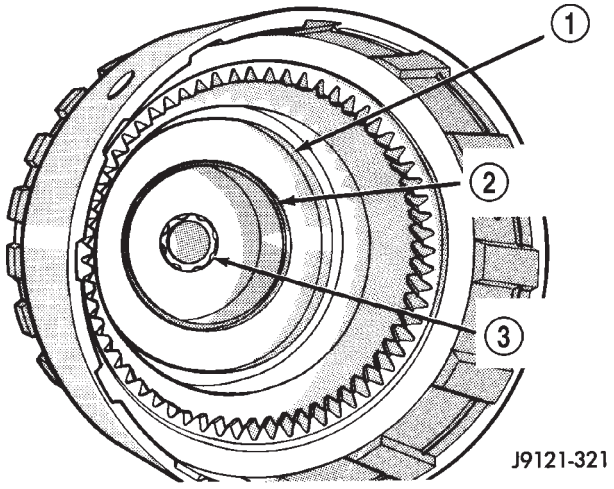


Fig. 155 Output Shaft Pilot Bushing

1 - OUTPUT SHAFT HUB
2 - OVERRUNNING CLUTCH HUB BUSHING
3 - INTERMEDIATE SHAFT PILOT BUSHING

(3) Install annulus gear on output shaft, if removed. Then install annulus gear retaining snap-ring (Fig. 156).

OVERDRIVE UNIT (Continued)

(4) Align and install clutch drum on annulus gear (Fig. 157). Be sure drum is engaged in annulus gear lugs.

(5) Install clutch drum outer retaining ring (Fig. 157).

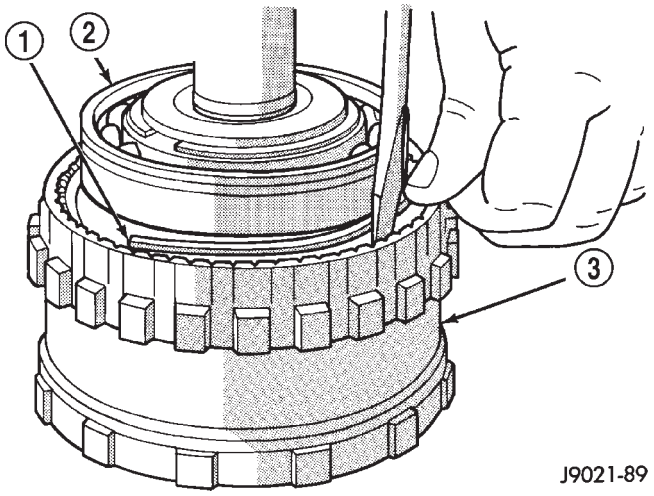


Fig. 156 Annulus Gear Installation

1 - SNAP-RING
2 - OUTPUT SHAFT FRONT BEARING
3 - ANNULUS GEAR

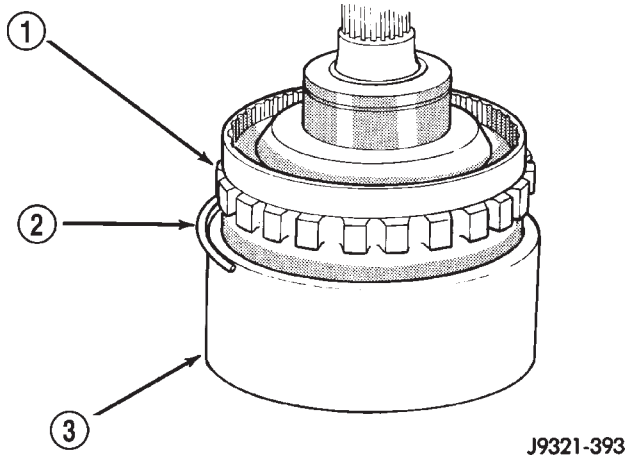


Fig. 157 Clutch Drum And Outer Retaining Ring Installation

1 - ANNULUS GEAR
2 - OUTER SNAP-RING
3 - CLUTCH DRUM

(6) Slide clutch drum forward and install inner retaining ring (Fig. 158).

(7) Install rear bearing and snap-ring on output shaft (Fig. 159). Be sure locating ring groove in bearing is toward rear.

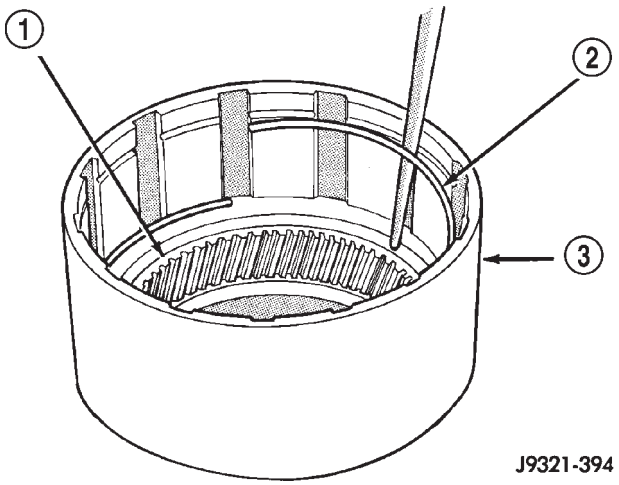


Fig. 158 Clutch Drum Inner Retaining Ring Installation

1 - ANNULUS GEAR
2 - INNER SNAP-RING
3 - CLUTCH DRUM

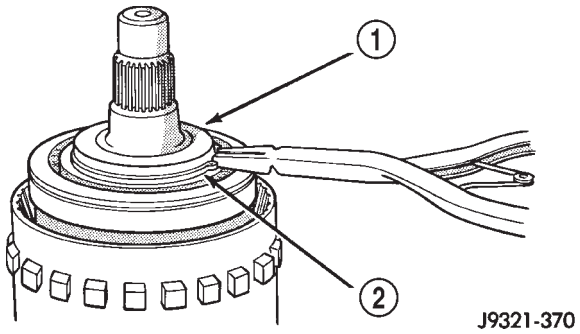


Fig. 159 Rear Bearing And Snap-Ring Installation

1 - REAR BEARING
2 - SNAP-RING

(8) Install overrunning clutch on hub (Fig. 160). Note that clutch only fits one-way. Shoulder on clutch should seat in small recess at edge of hub.

(9) Install thrust bearing on overrunning clutch hub. Use generous amount of petroleum jelly to hold bearing in place for installation. Bearing fits one-way only. Be sure bearing is seated squarely against hub. Reinstall bearing if it does not seat squarely.

(10) Install overrunning clutch in output shaft (Fig. 161). Insert snap-ring pliers in hub splines. Expand pliers to grip hub. Then install assembly with counterclockwise, twisting motion.

(11) Install planetary gear in annulus gear (Fig. 162). Be sure planetary pinions are fully seated in annulus gear before proceeding.

(12) Coat planetary thrust bearing and bearing contact surface of spring plate with generous amount of petroleum jelly. This will help hold bearing in place during installation.

OVERDRIVE UNIT (Continued)

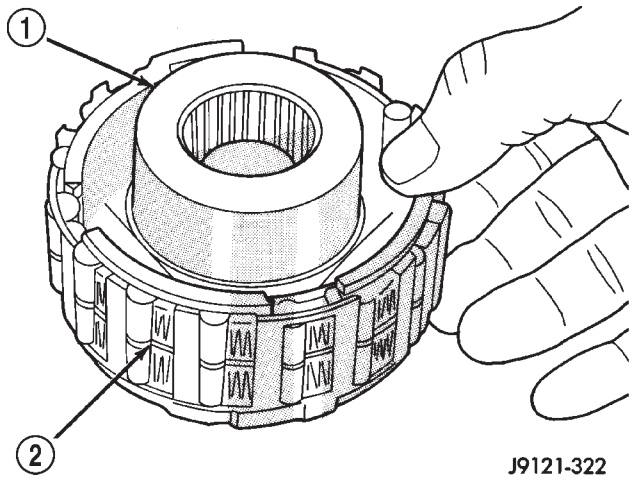


Fig. 160 Assembling Overrunning Clutch And Hub

1 - CLUTCH HUB
2 - OVERRUNNING CLUTCH

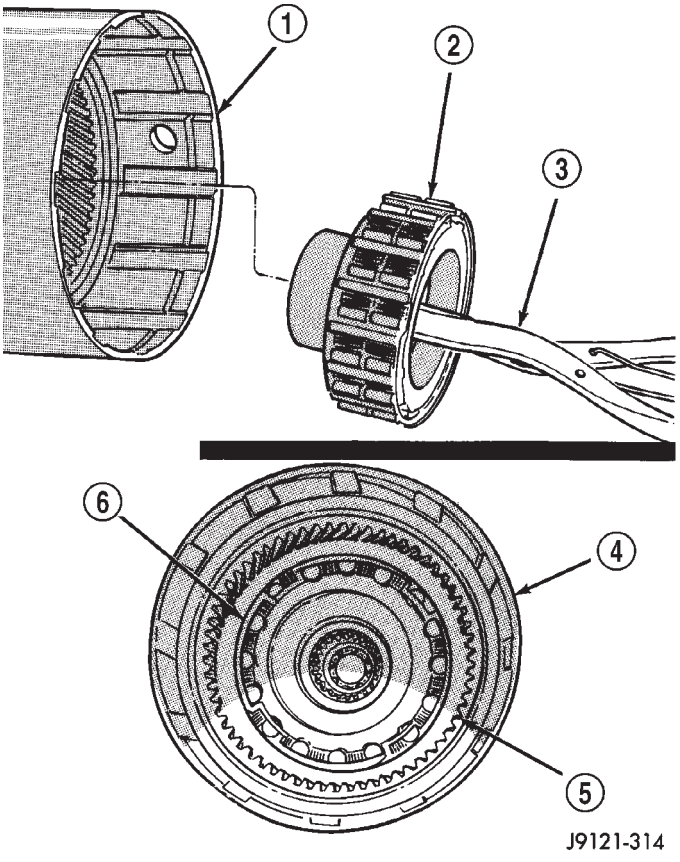


Fig. 161 Overrunning Clutch Installation

1 - CLUTCH DRUM
2 - OVERRUNNING CLUTCH ASSEMBLY
3 - EXPANDING-TYPE SNAP-RING PLIERS
4 - CLUTCH DRUM
5 - ANNULUS GEAR
6 - OVERRUNNING CLUTCH ASSEMBLY SEATED IN OUTPUT SHAFT

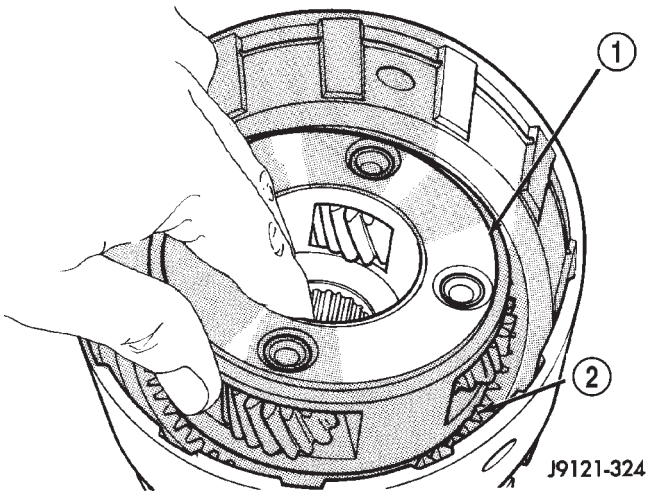


Fig. 162 Planetary Gear Installation

1 - PLANETARY GEAR
2 - ANNULUS GEAR

(13) Install planetary thrust bearing on sun gear (Fig. 163). Slide bearing onto gear and seat it against spring plate as shown. Bearing fits one-way only. If it does not seat squarely against spring plate, remove and reposition bearing.

(14) Install assembled sun gear, spring plate and thrust bearing (Fig. 164). Be sure sun gear and thrust bearing are fully seated before proceeding.

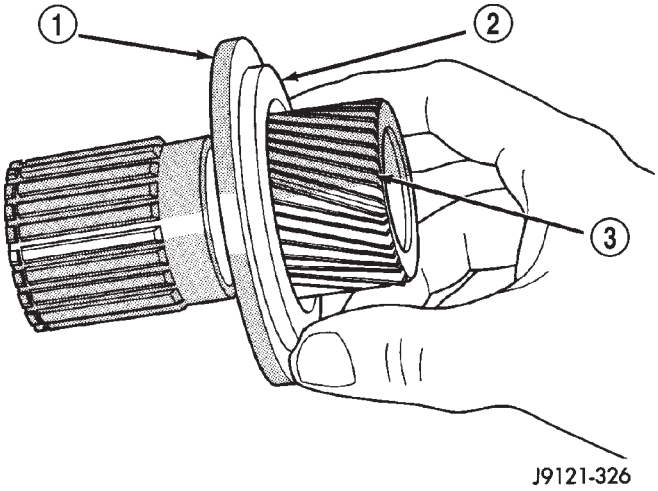


Fig. 163 Planetary Thrust Bearing Installation

1 - SPRING PLATE
2 - PLANETARY THRUST BEARING
3 - SUN GEAR

OVERDRIVE UNIT (Continued)

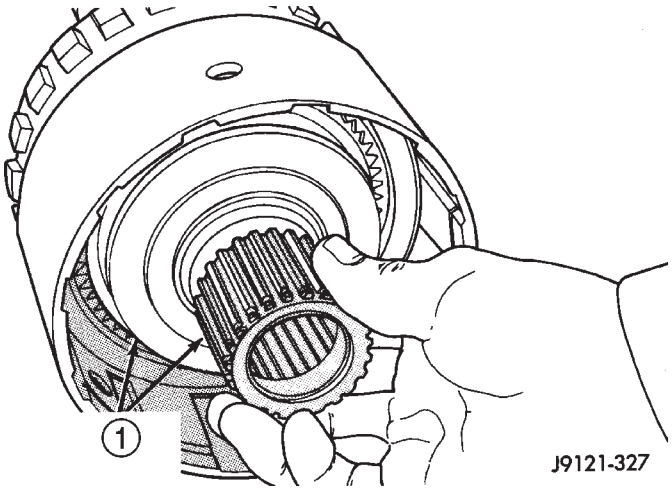


Fig. 164 Sun Gear Installation

1 - SUN GEAR AND SPRING PLATE ASSEMBLY

(15) Mount assembled output shaft, annulus gear, and clutch drum in shop press. Direct clutch spring, hub and clutch pack are easier to install with assembly mounted in press.

(16) Align splines in hubs of planetary gear and overrunning clutch with Alignment tool 6227-2 (Fig. 165). Insert tool through sun gear and into splines of both hubs. Be sure alignment tool is fully seated before proceeding.

(17) Install direct clutch spring (Fig. 166). Be sure spring is properly seated on spring plate.

NOTE: The 42RE transmission has 6 direct clutch discs and 5 clutch plates.

(18) Assemble and install direct clutch pack on hub as follows:

(a) Assemble clutch pack components (Fig. 167).

(b) Install direct clutch reaction plate on clutch hub first. Note that one side of reaction plate is counterbored. Be sure this side faces rearward. Splines at rear of hub are raised slightly. Counterbore in plate fits over raised splines. Plate should be flush with this end of hub (Fig. 168).

(c) Install first clutch disc followed by a steel plate until all discs and plates have been installed.

(d) Install pressure plate. This is last clutch pack item to be installed. Be sure plate is installed with shoulder side facing upward (Fig. 169).

(19) Install clutch hub and clutch pack on direct clutch spring (Fig. 170). Be sure hub is started on sun gear splines before proceeding.

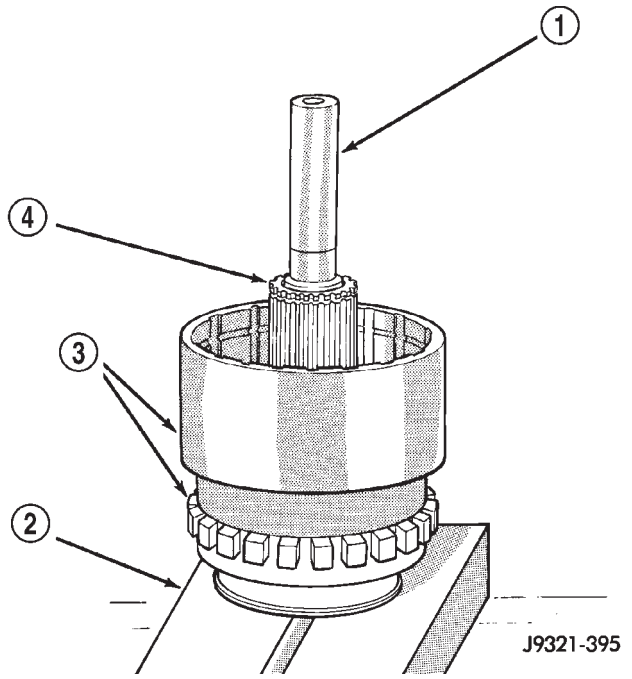


Fig. 165 Alignment Tool Installation

1 - SPECIAL TOOL 6227-2
2 - PRESS PLATES
3 - ASSEMBLED DRUM AND ANNULUS GEAR
4 - SUN GEAR

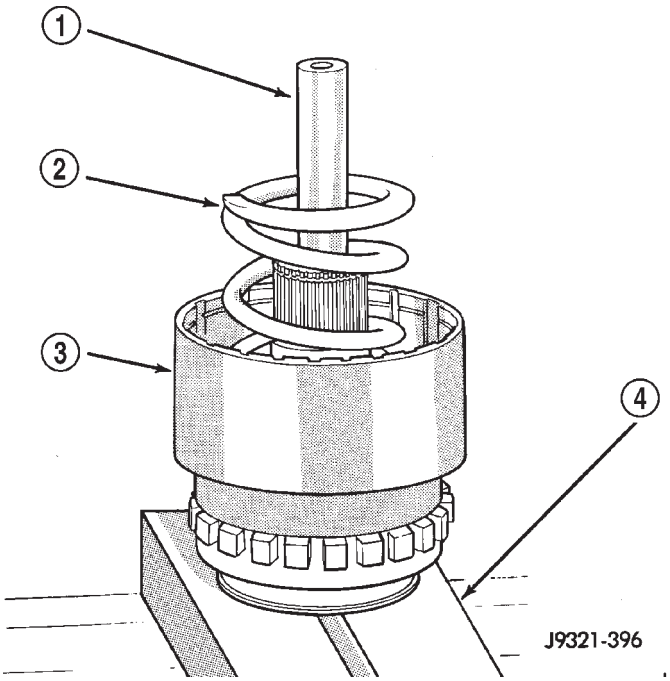


Fig. 166 Direct Clutch Spring Installation

1 - SPECIAL TOOL 6227-2
2 - DIRECT CLUTCH SPRING
3 - CLUTCH HUB
4 - PRESS PLATES

OVERDRIVE UNIT (Continued)

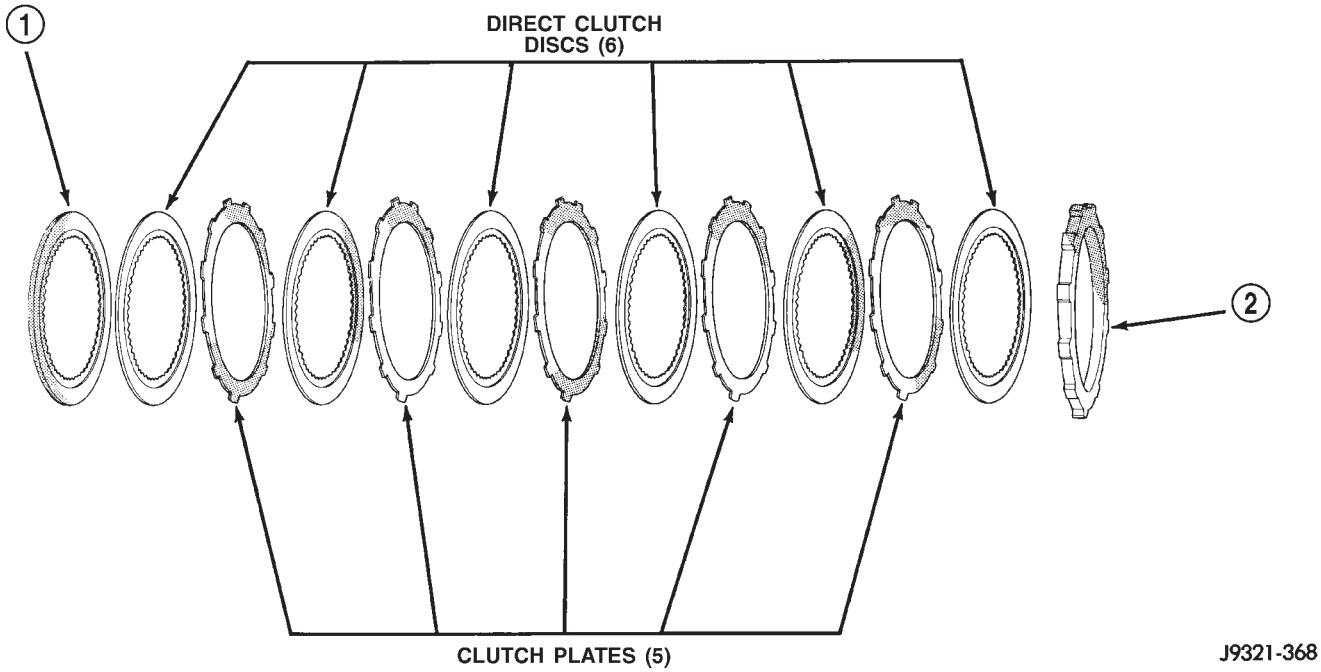


Fig. 167 42RE Direct Clutch Pack Components

1 - REACTION PLATE
2 - PRESSURE PLATE

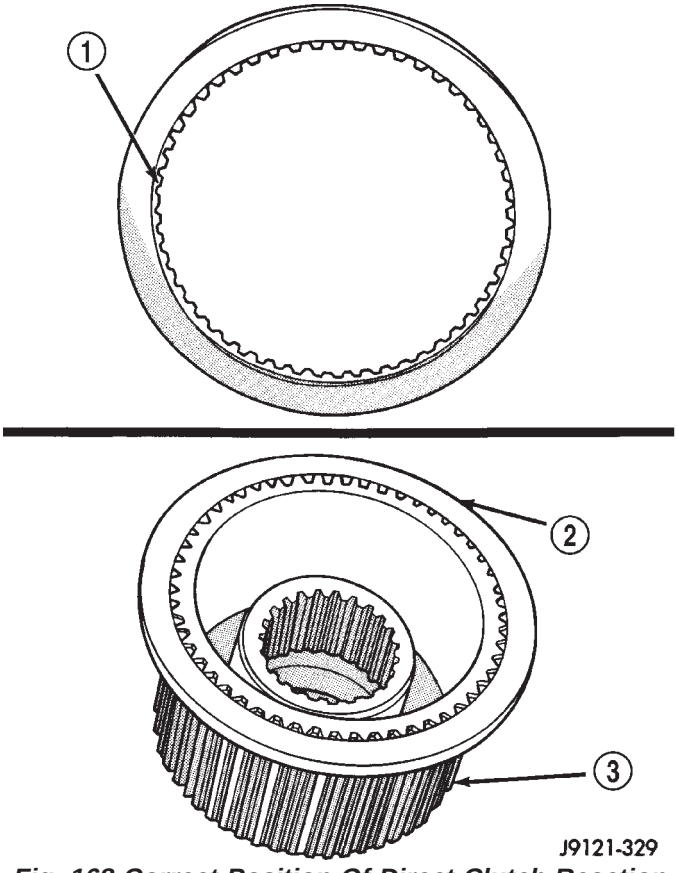


Fig. 168 Correct Position Of Direct Clutch Reaction Plate

1 - REACTION PLATE COUNTERBORE
2 - DIRECT CLUTCH REACTION PLATE (FLUSH WITH END OF HUB)
3 - CLUTCH HUB

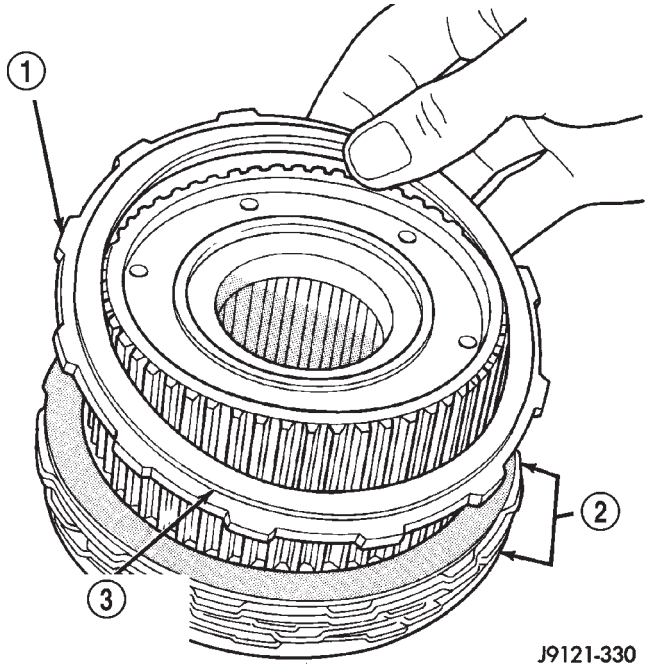


Fig. 169 Correct Position Of Direct Clutch Pressure Plate

1 - DIRECT CLUTCH PRESSURE PLATE
2 - CLUTCH PACK
3 - BE SURE SHOULDER SIDE OF PLATE FACES UPWARD

OVERDRIVE UNIT (Continued)

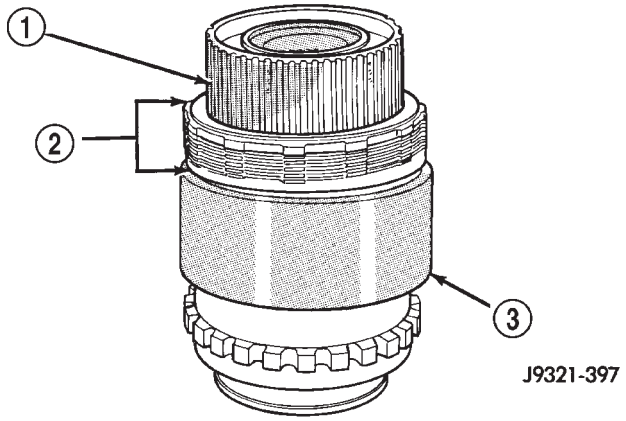


Fig. 170 Direct Clutch

1 - CLUTCH HUB
2 - DIRECT CLUTCH PACK
3 - CLUTCH DRUM

WARNING: THE NEXT STEP IN GEARTRAIN ASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH HUB AND SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE COMPRESSOR TOOL C-6227-1 AND A HYDRAULIC-TYPE SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

(20) Position Compressor Tool 6227-1 on clutch hub.

(21) Compress clutch hub and spring just enough to place tension on hub and hold it in place.

(22) Slowly compress clutch hub and spring. Compress spring and hub only enough to expose ring grooves for clutch pack snap ring and clutch hub retaining ring.

(23) Realign clutch pack on hub and seat clutch discs and plates in clutch drum.

(24) Install direct clutch pack snap-ring (Fig. 171). Be very sure snap-ring is fully seated in clutch drum ring groove.

(25) Install clutch hub retaining ring (Fig. 172). Be very sure retaining ring is fully seated in sun gear ring groove.

(26) Slowly release press ram, remove compressor tools and remove geartrain assembly.

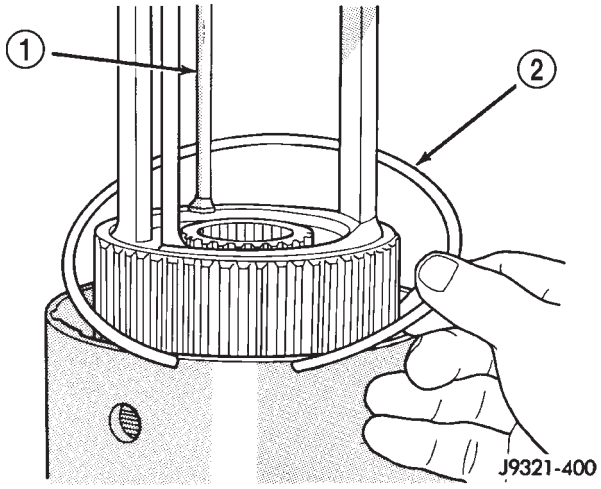


Fig. 171 Direct Clutch Pack Snap-Ring Installation

1 - SPECIAL TOOL 6227-1
2 - DIRECT CLUTCH PACK SNAP-RING

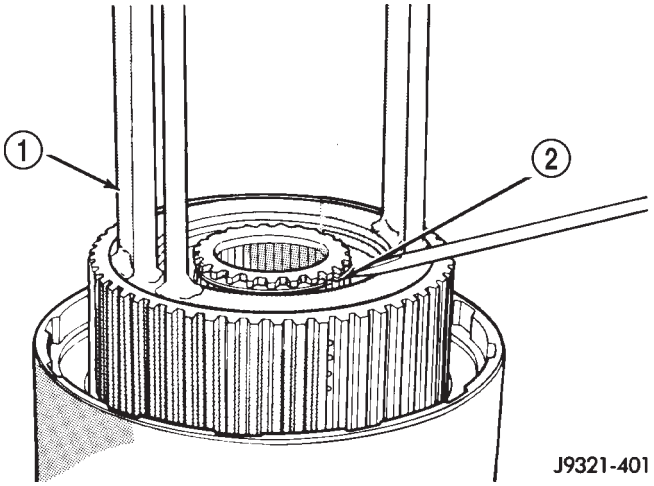


Fig. 172 Clutch Hub Retaining Ring Installation

1 - SPECIAL TOOL 6227-1
2 - CLUTCH HUB RETAINING RING

GEAR CASE

(1) Position park pawl and spring in case and install park pawl shaft. Verify that end of spring with 90° bend is hooked to pawl and straight end of spring is seated against case.

(2) Install pawl shaft retaining bolt. Tighten bolt to 27 N·m (20 ft. lbs.) torque.

(3) Install park lock reaction plug. Note that plug has locating pin at rear (Fig. 173). Be sure pin is seated in hole in case before installing snap-ring.

(4) Install reaction plug snap-ring (Fig. 174). Compress snap ring only enough for installation; do not distort it.

OVERDRIVE UNIT (Continued)

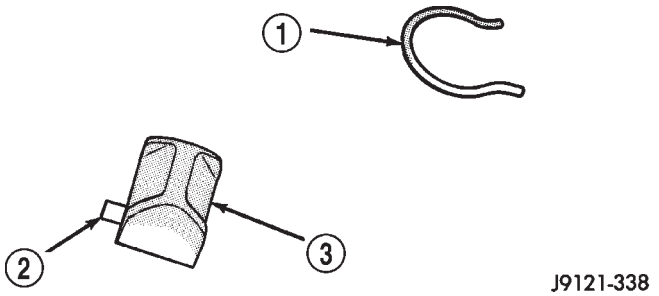


Fig. 173 Reaction Plug Locating Pin And Snap-Ring

1 - REACTION PLUG SNAP-RING (DO NOT OVERCOMPRESS TO INSTALL)
2 - LOCATING PIN
3 - PARK LOCK REACTION PLUG

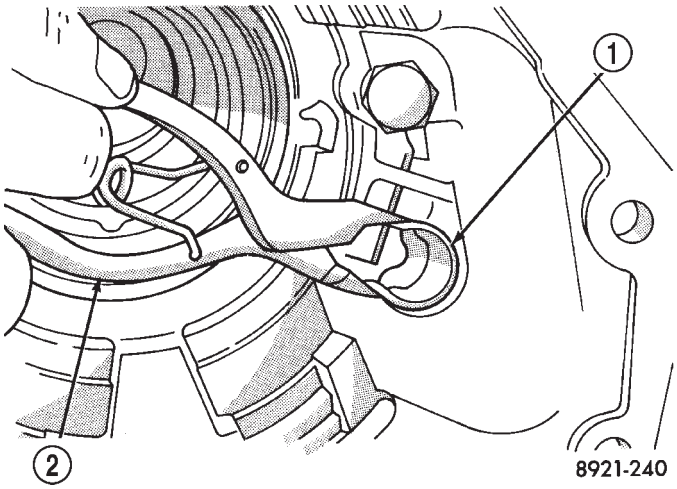


Fig. 174 Reaction Plug And Snap-Ring Installation

1 - REACTION PLUG SNAP-RING
2 - SNAP-RING PLIERS

(5) Install new seal in gear case. On 4x4 gear case, use Tool Handle C-4171 and Installer C-3860-A to seat seal in case. On 4 x 2 gear case, use same Handle C-4171 and Installer C-3995-A to seat seal in case.

(6) Verify that tab ends of rear bearing locating ring extend into access hole in gear case (Fig. 175).

(7) Support geartrain on Tool 6227-1 (Fig. 176). Be sure tool is securely seated in clutch hub.

(8) Install overdrive gear case on geartrain (Fig. 176).

(9) Expand front bearing locating ring with snap-ring pliers (Fig. 177). Then slide case downward until locating ring locks in bearing groove and release snap-ring.

(10) Install locating ring access cover and gasket in overdrive unit case (Fig. 178).

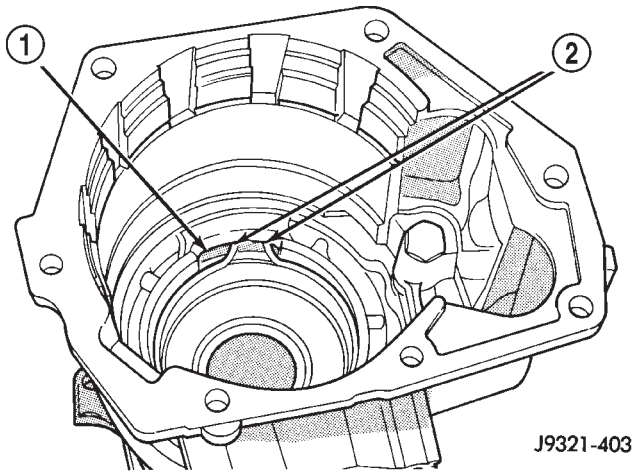


Fig. 175 Correct Rear Bearing Locating Ring Position

1 - CASE ACCESS HOLE
2 - TAB ENDS OF LOCATING RING

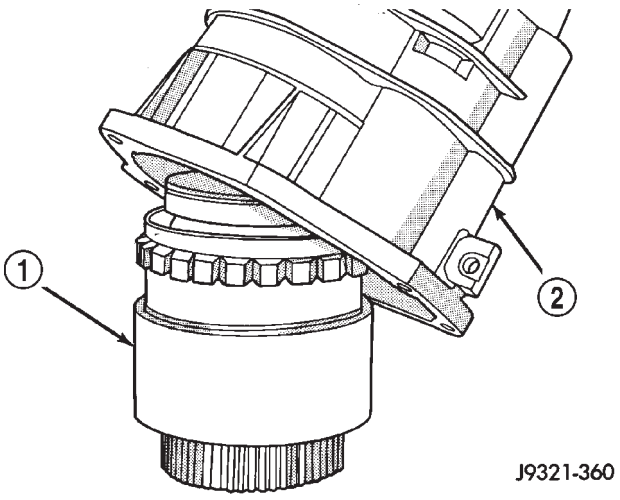


Fig. 176 Overdrive Gear Case Installation

1 - GEARTRAIN ASSEMBLY
2 - GEAR CASE

OVERDRIVE CLUTCH

(1) Install overdrive clutch reaction ring first. Reaction ring is flat with notched ends (Fig. 179).

(2) Install wave spring on top of reaction ring (Fig. 180). Reaction ring and wave ring both fit in same ring groove. Use screwdriver to seat each ring securely in groove. Also ensure that the ends of the two rings are offset from each other.

NOTE: The 42RE transmission has 3 overdrive clutch discs and 2 plates.

(3) Assemble overdrive clutch pack (Fig. 181).

(4) Install overdrive clutch reaction plate first.

OVERDRIVE UNIT (Continued)

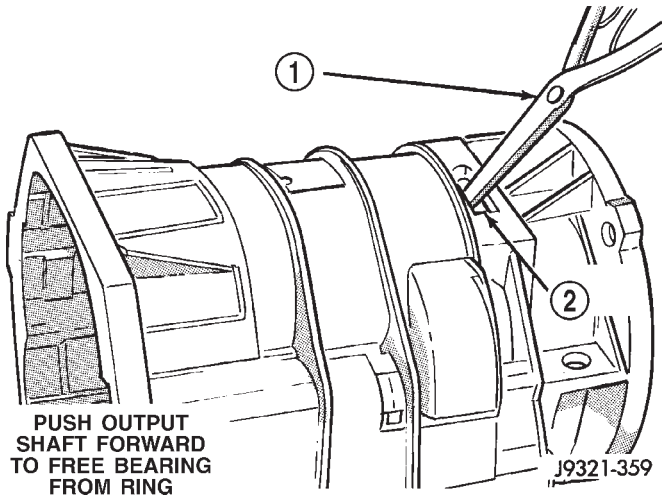


Fig. 177 Seating Locating Ring In Rear Bearing

1 - EXPAND BEARING LOCATING RING WITH SNAP-RING PLIERS
2 - ACCESS HOLE

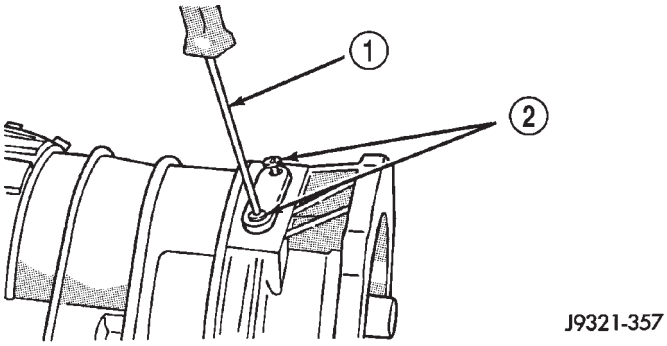


Fig. 178 Locating Ring Access Cover And Gasket Installation

1 - TORX SCREWDRIVER (T25)
2 - ACCESS COVER SCREWS

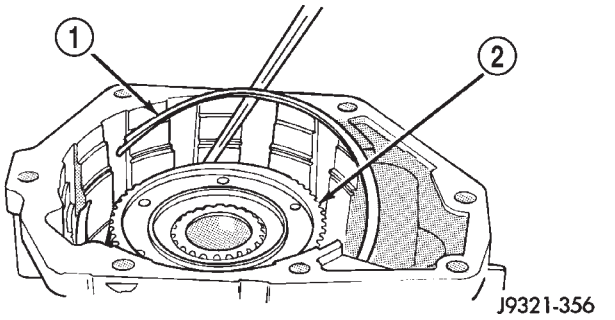


Fig. 179 Overdrive Clutch Reaction Ring Installation

1 - REACTION RING
2 - CLUTCH HUB

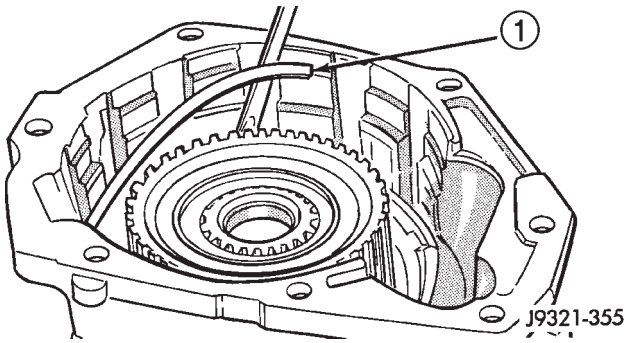


Fig. 180 Overdrive Clutch Wave Spring Installation

1 - WAVE SPRING

NOTE: The reaction plate is thinner than the pressure plate in a 42RE transmission.

(5) Install first clutch disc followed by first clutch plate. Then install remaining clutch discs and plates in same order.

(6) Install clutch pack pressure plate.

(7) Install clutch pack wire-type retaining ring (Fig. 182).

INTERMEDIATE SHAFT SPACER SELECTION

(1) Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.

(2) Determine correct thickness intermediate shaft spacer as follows:

(a) Insert Special Tool 6312 through sun gear, planetary gear and into pilot bushing in output shaft. Be sure tool bottoms against planetary shoulder.

(b) Position Gauge Tool 6311 across face of overdrive case (Fig. 183). Then position Dial Caliper C-4962 over gauge tool.

(c) Extend sliding scale of dial caliper downward through gauge tool slot until scale contacts end of Gauge Alignment Tool 6312. Lock scale in place. Remove dial caliper tool and note distance measured (Fig. 183).

(d) Select proper thickness end play spacer from spacer chart based on distance measured (Fig. 184).

(e) Remove Gauge Alignment Tool 6312.

OVERDRIVE UNIT (Continued)

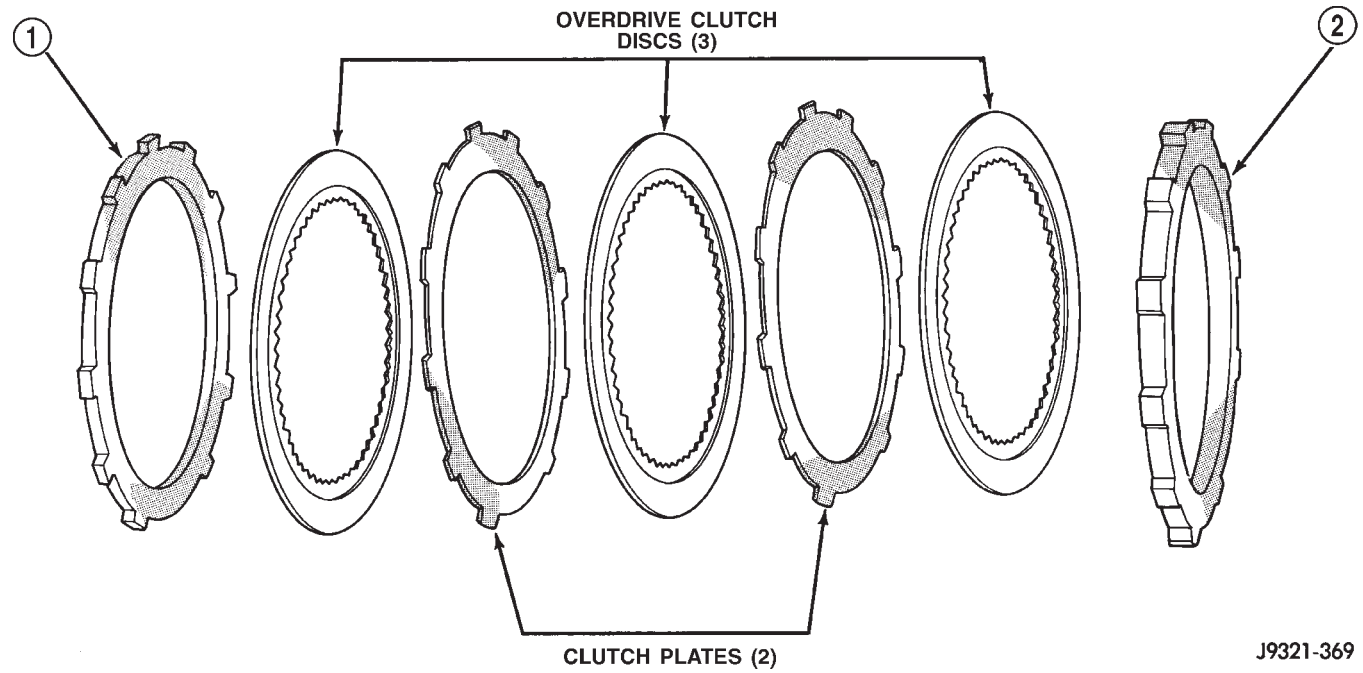


Fig. 181 42RE Overdrive Clutch Components

1 - REACTION PLATE
2 - PRESSURE PLATE

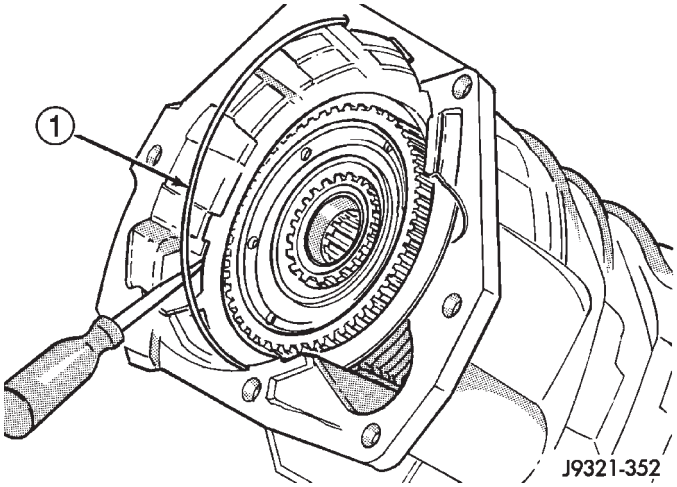


Fig. 182 Overdrive Clutch Pack Retaining Ring Installation

1 - OVERDRIVE CLUTCH PACK RETAINING RING

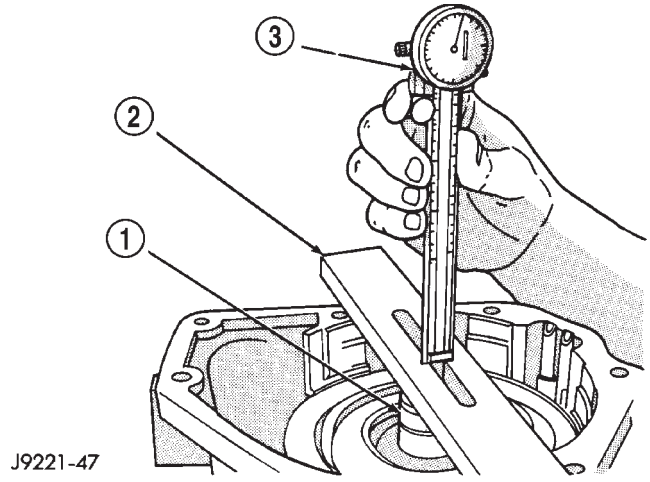


Fig. 183 Shaft End Play Measurement

1 - SPECIAL TOOL 6312
2 - SPECIAL TOOL 6311
3 - SPECIAL TOOL C-4962

OD THRUST PLATE SELECTION

(1) Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.

(2) Determine correct thickness overdrive piston thrust plate as follows:

(a) Position Gauge Tool 6311 across face of overdrive case. Then position Dial Caliper C-4962 over gauge tool (Fig. 185).

(b) Measure distance to clutch hub thrust bearing seat at four points 90° apart. Then average measurements by adding them and dividing by 4.

(c) Select and install required thrust plate from information in thrust plate chart (Fig. 186).

OVERDRIVE UNIT (Continued)

End Play Measurement (Inches)	Spacer Thickness (Inches)
.7336 - .7505	.158 - .159
.7506 - .7675	.175 - .176
.7676 - .7855	.193 - .194
.7856 - .8011	.211 - .212

J9121-341

Fig. 184 Intermediate Shaft End Play Spacer Selection

(3) Leave Alignment Tool 6227-2 in place. Tool will keep planetary and clutch hub splines in alignment until overdrive unit is ready for installation on transmission.

(4) Transmission speed sensor can be installed at this time if desired. However, it is recommended that sensor not be installed until after overdrive unit is secured to transmission.

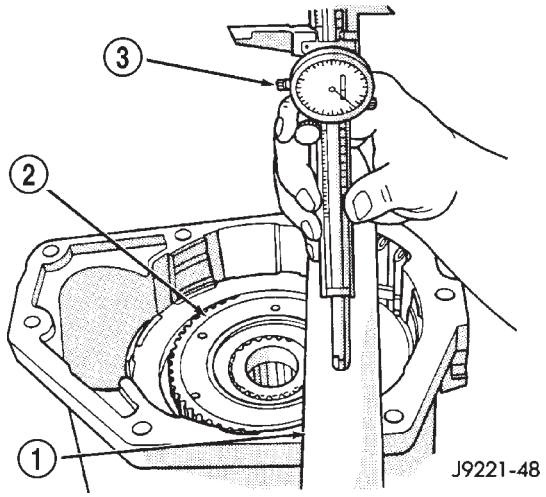


Fig. 185 Overdrive Piston Thrust Plate Measurement

1 - SPECIAL TOOL 6311
2 - DIRECT CLUTCH HUB THRUST BEARING SEAT
3 - SPECIAL TOOL C-4962

OVERDRIVE PISTON

(1) Install new seals on over drive piston.

(2) Stand transmission case upright on bellhousing.

(3) Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.

(4) Position Seal Guide 8114-2 on inner edge of overdrive piston retainer.

(5) Install overdrive piston in overdrive piston retainer by: aligning locating lugs on overdrive piston to the two mating holes in retainer.

(a) Aligning locating lugs on overdrive piston to the two mating holes in retainer.

End Play Measurement (Inches)	Spacer Thickness (Inches)
1.7500 - 1.7649	.108 - .110
1.7650 - 1.7799	.123 - .125
1.7800 - 1.7949	.138 - .140
1.7950 - 1.8099	.153 - .155
1.8100 - 1.8249	.168 - .170
1.8250 - 1.8399	.183 - .185
1.8400 - 1.8549	.198 - .200
1.8550 - 1.8699	.213 - .215
1.8700 - 1.8849	.228 - .230
1.8850 - 1.8999	.243 - .245

J9121-342

Fig. 186 Overdrive Piston Thrust Plate Selection

(b) Lubricate overdrive piston seals with Mopar® Door Ease, or equivalent.

(c) Install piston over Seal Guide 8114-2 and inside Guide Ring 8114-1.

(d) Push overdrive piston into position in retainer.

(e) Verify that the locating lugs entered the lug bores in the retainer.

(6) Install intermediate shaft spacer on intermediate shaft.

(7) Install overdrive piston thrust plate on overdrive piston.

(8) Install overdrive piston thrust bearing on overdrive piston.

(9) Install transmission speed sensor and O-ring seal in overdrive case (Fig. 127).

INSTALLATION

(1) Be sure overdrive unit Alignment Tool 6227-2 is fully seated before moving unit. If tool is not seated and gear splines rotate out of alignment, overdrive unit will have to be disassembled in order to realign splines.

(2) If overdrive piston retainer was not removed during service and original case gasket is no longer reusable, prepare new gasket by trimming it.

(3) Cut out old case gasket around piston retainer with razor knife (Fig. 187).

(4) Use old gasket as template and trim new gasket to fit.

(5) Position new gasket over piston retainer and on transmission case. Use petroleum jelly to hold gasket in place if necessary. Do not use any type of sealer to secure gasket. Use petroleum jelly only.

(6) Install selective spacer on intermediate shaft, if removed. Spacer goes in groove just rearward of shaft rear splines (Fig. 188).

(7) Install thrust bearing in overdrive unit sliding hub. Use petroleum jelly to hold bearing in position.

OVERDRIVE UNIT (Continued)

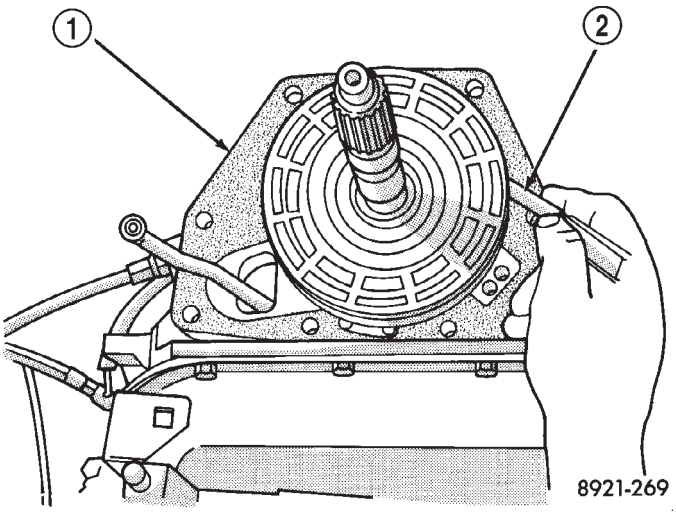


Fig. 187 Trimming Overdrive Case Gasket

1 - GASKET
2 - SHARP KNIFE

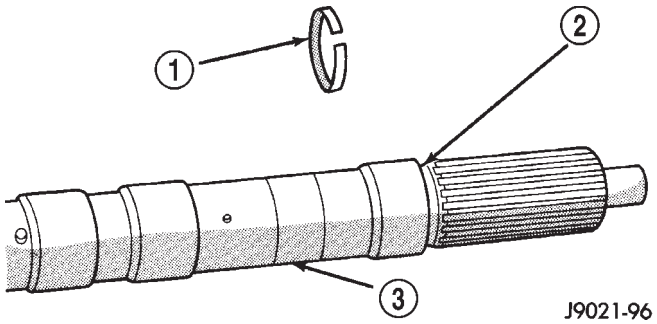


Fig. 188 Intermediate Shaft Selective Spacer Location

1 - SELECTIVE SPACER
2 - SPACER GROOVE
3 - INTERMEDIATE SHAFT

CAUTION: Be sure the shoulder on the inside diameter of the bearing is facing forward.

(8) Verify that splines in overdrive planetary gear and overrunning clutch hub are aligned with Alignment Tool 6227-2. Overdrive unit cannot be installed if splines are not aligned. If splines have rotated out of alignment, unit will have to be disassembled to realign splines.

(9) Carefully slide Alignment Tool 6227-2 out of overdrive planetary gear and overrunning clutch splines.

(10) Raise overdrive unit and carefully slide it straight onto intermediate shaft. Insert park rod into park lock reaction plug at same time. Avoid tilting overdrive during installation as this could cause planetary gear and overrunning clutch splines to rotate out of alignment. If this occurs, it will be necessary to remove and disassemble overdrive unit to realign splines.

(11) Work overdrive unit forward on intermediate shaft until seated against transmission case.

(12) Install bolts attaching overdrive unit to transmission unit. Tighten bolts in diagonal pattern to 34 N·m (25 ft-lbs).

(13) Connect the transmission speed sensor and overdrive wiring connectors.

(14) Install the transfer case, if equipped.

(15) Align and install rear propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/ PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON RETAINER

DESCRIPTION

The overrunning clutch (Fig. 189) consists of an inner race, an outer race (or cam), rollers and springs, and the spring retainer. The number of rollers and springs depends on what transmission and which overrunning clutch is being dealt with.

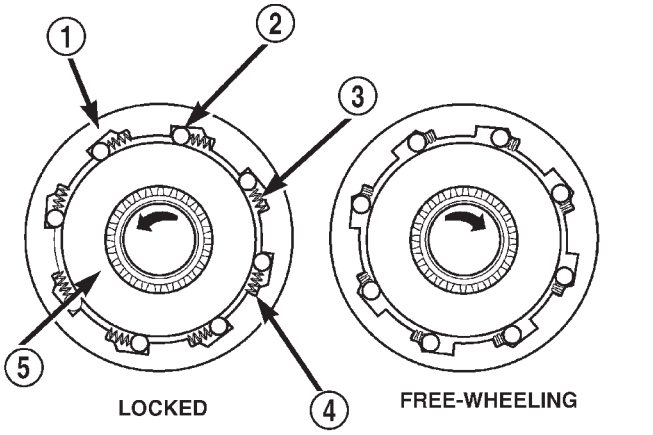


Fig. 189 Overrunning Clutch

1 - OUTER RACE (CAM)
2 - ROLLER
3 - SPRING
4 - SPRING RETAINER
5 - INNER RACE (HUB)

OPERATION

As the inner race is rotated in a clockwise direction (as viewed from the front of the transmission), the race causes the rollers to roll toward the springs, causing them to compress against their retainer. The compression of the springs increases the clearance

OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON RETAINER (Continued)

between the rollers and cam. This increased clearance between the rollers and cam results in a freewheeling condition. When the inner race attempts to rotate counterclockwise, the action causes the rollers to roll in the same direction as the race, aided by the pushing of the springs. As the rollers try to move in the same direction as the inner race, they are wedged between the inner and outer races due to the design of the cam. In this condition, the clutch is locked and acts as one unit.

DISASSEMBLY

NOTE: To service the overrunning clutch cam and the overdrive piston retainer, the transmission geartrain and the overdrive unit must be removed from the transmission.

(1) Remove the overdrive piston (Fig. 190).
(2) Remove the overdrive piston retainer bolts.
(3) Remove overdrive piston retainer.
(4) Remove case gasket.
(5) Mark the position of the overrunning clutch cam in the case (Fig. 191).
(6) Remove the overrunning clutch cam bolts.
(7) Remove the overrunning clutch cam.

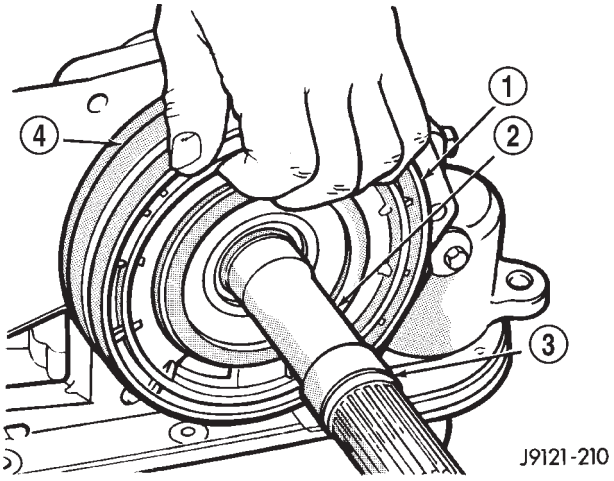


Fig. 190 Overdrive Piston Removal

1 - OVERDRIVE CLUTCH PISTON
2 - INTERMEDIATE SHAFT
3 - SELECTIVE SPACER
4 - PISTON RETAINER

CLEANING

Clean the overrunning clutch assembly, clutch cam, low-reverse drum, and overdrive piston retainer in solvent. Dry them with compressed air after cleaning.

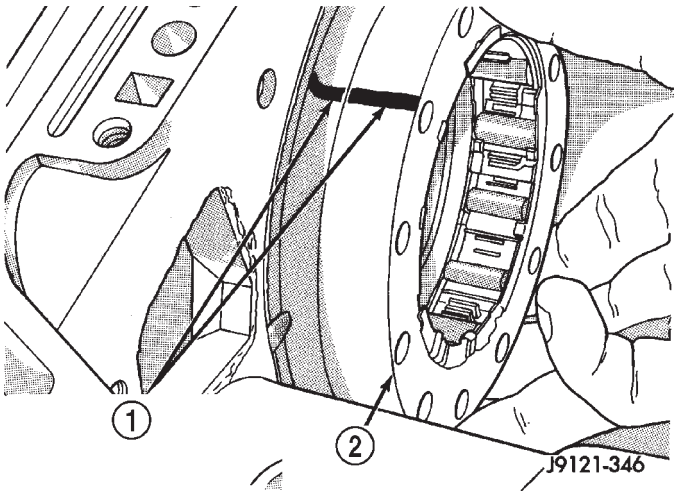


Fig. 191 Overrunning Clutch Cam Removal

1 - ALIGN MARKS IDENTIFYING NON-THREADED HOLE IN CAM AND CASE
2 - OVERRUNNING CLUTCH ASSEMBLY

INSPECTION

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse drum if the clutch race, roller surface or inside diameter is scored, worn or damaged. **Do not remove the clutch race from the low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.**

Examine the overdrive piston retainer carefully for wear, cracks, scoring or other damage. Be sure the retainer hub is a snug fit in the case and drum. Replace the retainer if worn or damaged.

ASSEMBLY

(1) Examine bolt holes in overrunning clutch cam. Note that one hole is **not threaded** (Fig. 192). This hole must align with blank area in clutch cam bolt circle (Fig. 193). Mark hole location on clutch cam and blank area in case with grease pencil, paint stripe, or scribe mark for assembly reference.

(2) Mark location of non-threaded hole in clutch cam and blank area in bolt circle with grease pencil.

(3) Align and install overrunning clutch and cam in case (Fig. 194). Be sure cam is correctly installed. Bolt holes in cam are slightly countersunk on one side. Be sure this side of cam faces rearward (toward piston retainer).

(4) Verify that non-threaded hole in clutch cam is properly aligned. Check alignment by threading a bolt into each bolt hole. Adjust clutch cam position if necessary.

OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON RETAINER (Continued)

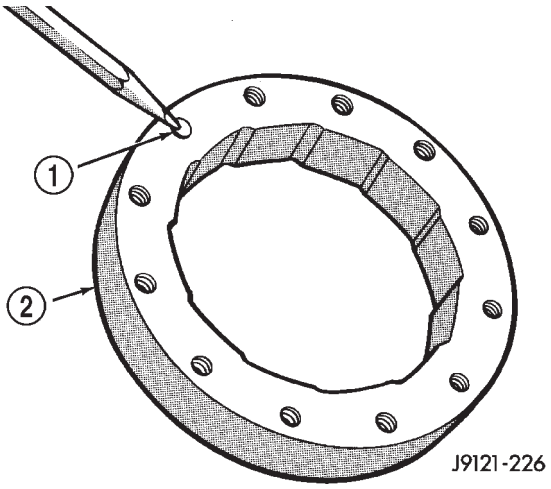


Fig. 192 Location Of Non-Threaded Hole In Clutch Cam

1 - NON-THREADED HOLE
2 - OVERRUNNING CLUTCH CAM

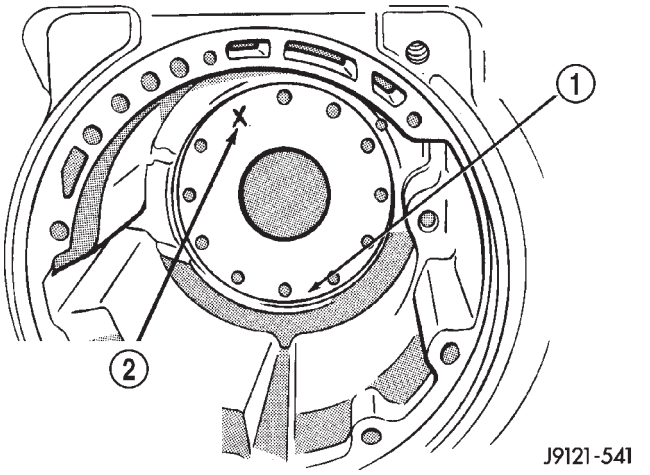


Fig. 193 Location Of Blank Area In Clutch Cam Bolt Circle

1 - OVERRUNNING CLUTCH CAM SEAT IN CASE
2 - NON-THREADED HOLE IN CLUTCH CAM ALIGNS HERE (BLANK AREA) OF SEAT

(5) Install and tighten overrunning clutch cam bolts to 17 N·m (13 ft. lbs.) torque. Note that clutch cam bolts are shorter than piston retainer bolts.

(6) Install new gasket at rear of transmission case. Use petroleum jelly to hold gasket in place. Be sure to align governor feed holes in gasket with feed passages in case (Fig. 195). Also install gasket before overdrive piston retainer. Center hole in gasket is smaller than retainer and cannot be installed over retainer.

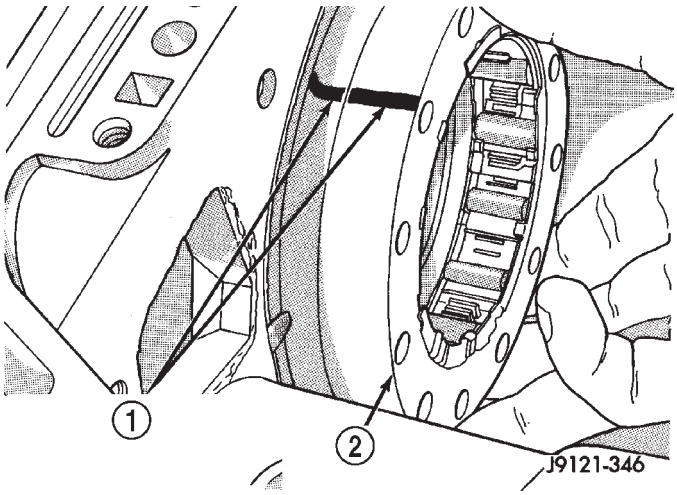


Fig. 194 Overrunning Clutch Installation

1 - ALIGN MARKS IDENTIFYING NON-THREADED HOLE IN CAM AND CASE
2 - OVERRUNNING CLUTCH ASSEMBLY

(7) Position overdrive piston retainer on transmission case and align bolt holes in retainer, gasket and case (Fig. 196). Then install and tighten retainer bolts to 17 N·m (13 ft. lbs.) torque.

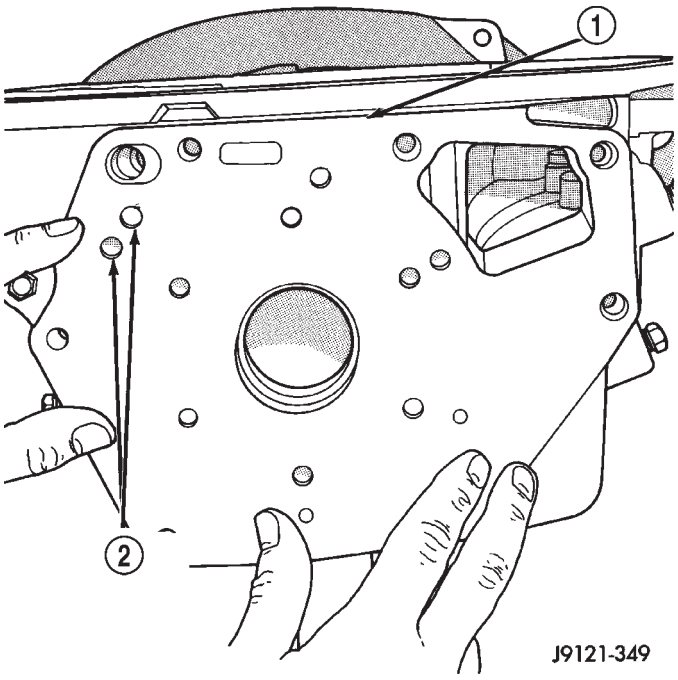


Fig. 195 Installing/Aligning Case Gasket

1 - CASE GASKET
2 - BE SURE GOVERNOR TUBE FEED HOLES IN CASE AND GASKET ARE ALIGNED

OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON RETAINER (Continued)

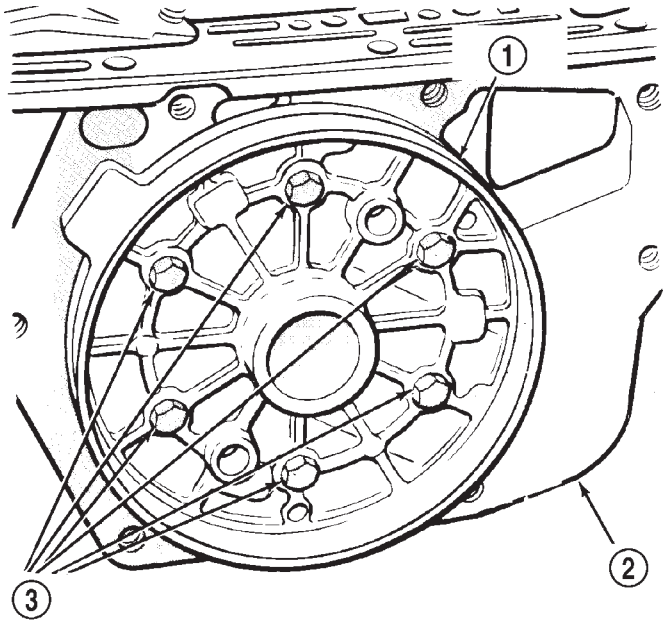


Fig. 196 Aligning Overdrive Piston Retainer

1 - PISTON RETAINER
2 - GASKET
3 - RETAINER BOLTS

(8) Install new seals on over drive piston.

(9) Stand transmission case upright on bellhousing.

(10) Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.

(11) Position Seal Guide 8114-2 on inner edge of overdrive piston retainer.

(12) Install overdrive piston in overdrive piston retainer by: aligning locating lugs on overdrive piston to the two mating holes in retainer.

(a) Aligning locating lugs on overdrive piston to the two mating holes in retainer.

(b) Lubricate overdrive piston seals with Mopar® Door Ease, or equivalent.

(c) Install piston over Seal Guide 8114-2 and inside Guide Ring 8114-1.

(d) Push overdrive piston into position in retainer.

(e) Verify that the locating lugs entered the lug bores in the retainer.

NOTE: Install the remaining transmission components and the overdrive unit.

PARK LOCK CABLE

REMOVAL

(1) Place the shifter in the PARK position.

(2) Lower the steering column cover.

(3) With the ignition switch in the “RUN” position depress the park lock cable locking tab, located on top of the cable connector at the steering column and pull the park lock cable straight out.

(4) Remove the park lock cable from steering column (Fig. 197).

(5) Remove the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(6) Disconnect the park lock cable from the shift BTSI lever and remove the cable from the shifter assembly bracket.

(7) Release the park lock cable from any remaining clips.

(8) Remove park lock cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Park Lock Cable.

(1) Verify that the shifter is in the PARK position.

(2) Push the park lock cable straight into the square mounting hole in the steering column until cable snaps in place.

(3) Route park lock cable to the shifter mechanism.

(4) Install the park lock cable end fitting into shifter BTSI lever.

(5) Pull rearward on the cable housing to snap park lock cable adjuster ears into floor shifter bracket.

(6) Place the ignition key cylinder in the ACCESSORY position.

(7) Push the cable adjuster lock clamp downward to lock it.

(8) Test the park lock cable operation.

(9) Install the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

PARK LOCK CABLE (Continued)

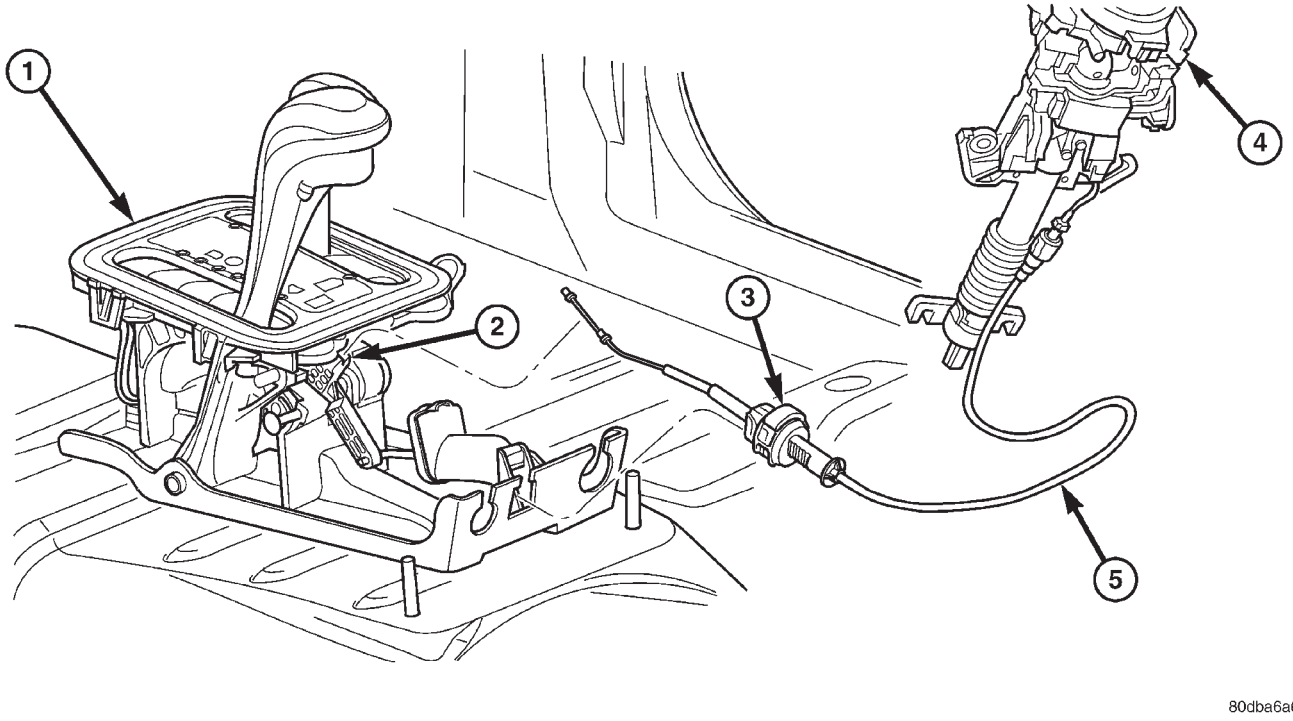


Fig. 197 Brake Transmission Shift Interlock

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

PARK/NEUTRAL POSITION SWITCH

DIAGNOSIS AND TESTING - PARK/NEUTRAL POSITION SWITCH

The center terminal of the park/neutral position switch is the starter-circuit terminal. It provides the ground for the starter solenoid circuit through the selector lever in PARK and NEUTRAL positions only. The outer terminals on the switch are for the backup lamp circuit.

SWITCH TEST

To test the switch, remove the wiring connector. Test for continuity between the center terminal and the transmission case. Continuity should exist only when the transmission is in PARK or NEUTRAL.

Shift the transmission into REVERSE and test continuity at the switch outer terminals. Continuity should exist only when the transmission is in REVERSE. Continuity should not exist between the outer terminals and the case.

Check gearshift linkage adjustment before replacing a switch that tests faulty.

REMOVAL

(1) Raise vehicle and position drain pan under switch.
(2) Disconnect switch wires.
(3) Remove switch from case.

INSTALLATION

(1) Move shift lever to PARK and NEUTRAL positions. Verify that switch operating lever fingers are centered in switch opening in case (Fig. 198).

PARK/NEUTRAL POSITION SWITCH (Continued)

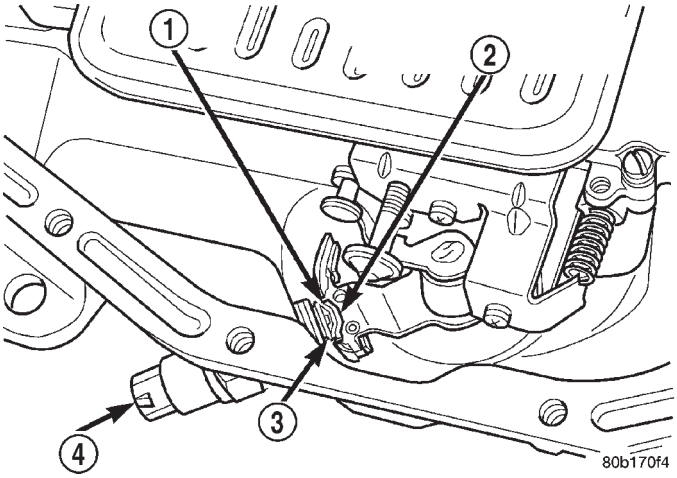


Fig. 198 Park/Neutral Position Switch

1 - NEUTRAL CONTACT
2 - MANUAL LEVER AND SWITCH PLUNGER IN REVERSE POSITION
3 - PARK CONTACT
4 - SWITCH

(2) Install new seal on switch and install switch in case. Tighten switch to 34 N·m (25 ft. lbs.) torque.

(3) Test continuity of new switch with 12V test lamp.

(4) Connect switch wires and lower vehicle.

(5) Top off transmission fluid level.

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

PRESSURE

Pressure (Fig. 199) is nothing more than force (lbs.) divided by area (in or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in or 1 pound per square inch, or PSI as it is commonly referred to.

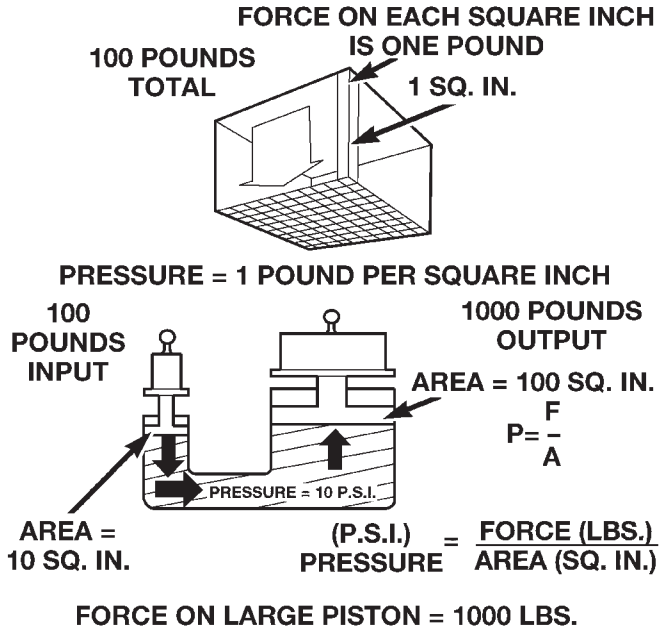


Fig. 199 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 200) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O-rings, D-rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

PISTONS (Continued)

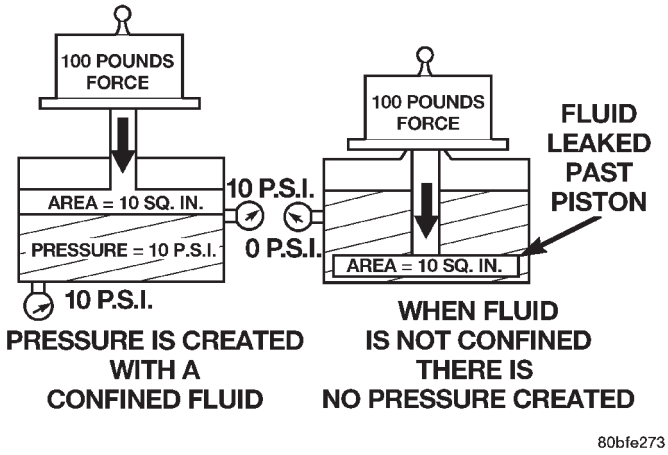


Fig. 200 Pressure on a Confined Fluid

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 201), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 201), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept “pressure is the same everywhere” means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

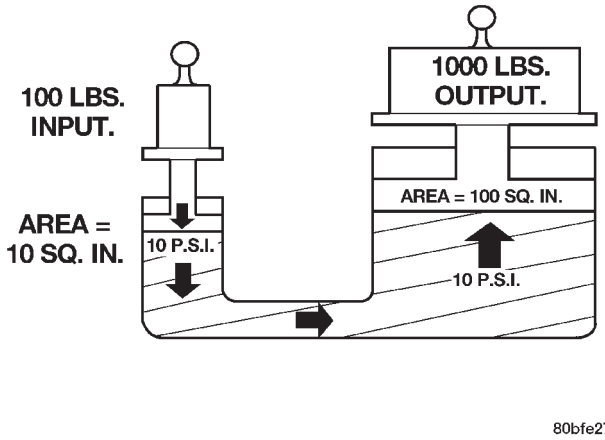


Fig. 201 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it’s a weight-to-distance output rather than a pressure-to-area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 202) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

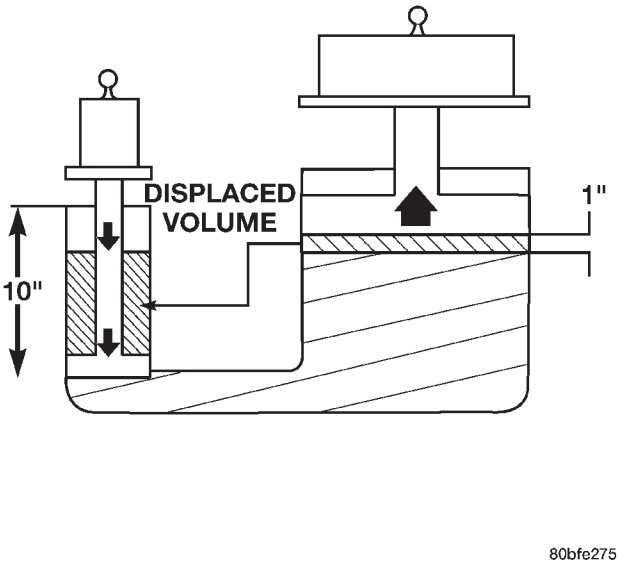
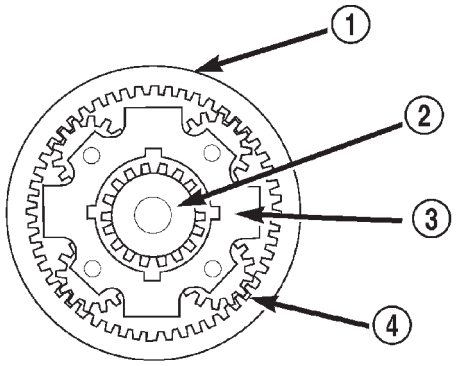


Fig. 202 Piston Travel

PLANETARY GEARTRAIN/ OUTPUT SHAFT

DESCRIPTION

The planetary gearsets (Fig. 203) are designated as the front, rear, and overdrive planetary gear assemblies and located in such order. A simple planetary gearset consists of three main members:



80be45f9

Fig. 203 Planetary Gearset

1 - ANNULUS GEAR
2 - SUN GEAR
3 - PLANET CARRIER
4 - PLANET PINIONS (4)

- The sun gear which is at the center of the system.
- The planet carrier with planet pinion gears which are free to rotate on their own shafts and are in mesh with the sun gear.
- The annulus gear, which rotates around and is in mesh with the planet pinion gears.

NOTE: The number of pinion gears does not affect the gear ratio, only the duty rating.

OPERATION

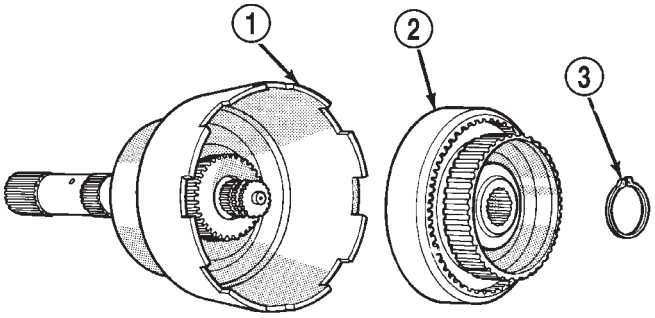
With any given planetary gearset, several conditions must be met for power to be able to flow:

- One member must be held.
- Another member must be driven or used as an input.
- The third member may be used as an output for power flow.
- For direct drive to occur, two gear members in the front planetary gearset must be driven.

NOTE: Gear ratios are dependent on the number of teeth on the annulus and sun gears.

DISASSEMBLY

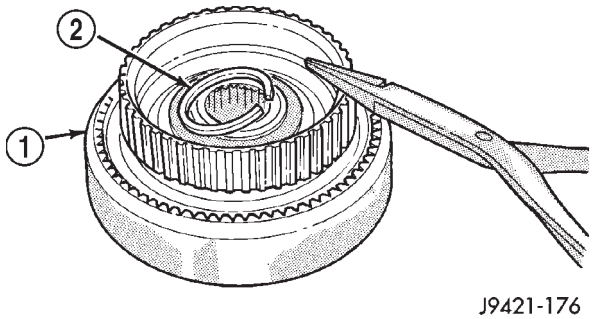
(1) Remove planetary snap-ring (Fig. 204).
(2) Remove front annulus and planetary assembly from driving shell (Fig. 204).
(3) Remove snap-ring that retains front planetary gear in annulus gear (Fig. 205).
(4) Remove tabbed thrust washer and tabbed thrust plate from hub of front annulus (Fig. 206).
(5) Separate front annulus and planetary gears (Fig. 206).
(6) Remove front planetary gear front thrust washer from annulus gear hub.
(7) Separate and remove driving shell, rear planetary and rear annulus from output shaft (Fig. 207).
(8) Remove front planetary rear thrust washer from driving shell.
(9) Remove tabbed thrust washers from rear planetary gear.
(10) Remove lock ring that retains sun gear in driving shell. Then remove sun gear, spacer and thrust plates.



J9421-175

Fig. 204 Front Annulus And Planetary Assembly Removal

1 - DRIVING SHELL
2 - FRONT ANNULUS AND PLANETARY ASSEMBLY
3 - PLANETARY SNAP-RING

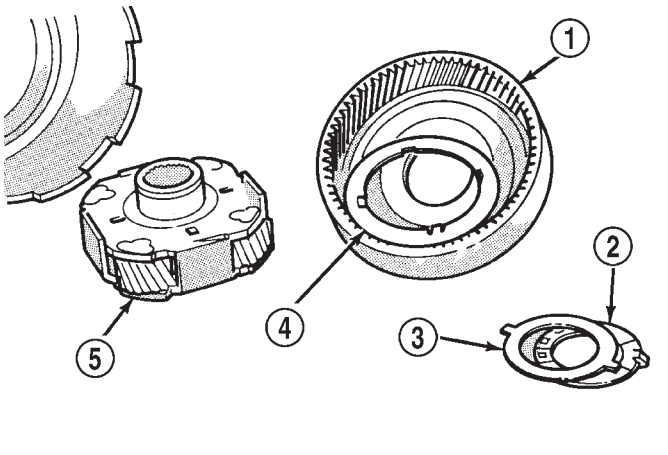


J9421-176

Fig. 205 Front Planetary Snap-Ring Removal

1 - FRONT ANNULUS GEAR
2 - PLANETARY SNAP-RING

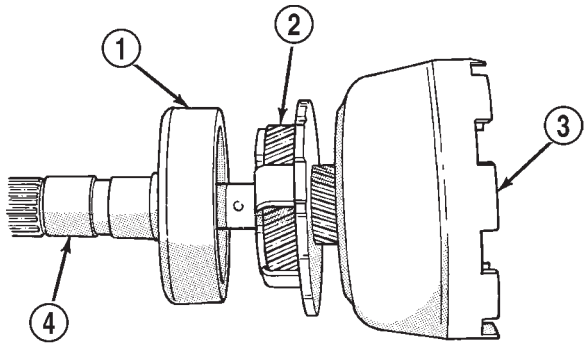
PLANETARY GEARTRAIN/OUTPUT SHAFT (Continued)



J9421-177

Fig. 206 Front Planetary And Annulus Gear Disassembly

1 - FRONT ANNULUS
2 - THRUST WASHER
3 - THRUST PLATE
4 - FRONT THRUST WASHER
5 - FRONT PLANETARY



J9421-178

Fig. 207 Removing Driving Shell, Rear Planetary And Rear Annulus

1 - REAR ANNULUS
2 - REAR PLANETARY
3 - DRIVING SHELL
4 - OUTPUT SHAFT

INSPECTION

Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Inspect the geartrain spacers, thrust plates, snap-rings, and thrust washers. Replace any of these parts that are worn, distorted or damaged. Do not attempt to reuse these parts.

The planetary gear thrust washers are different sizes. The large diameter washers go on the front planetary and the smaller washers go on the rear planetary. All the washers have four locating tabs on them. These tabs fit in the holes or slots provided in each planetary gear.

Inspect the output shaft carefully. Pay particular attention to the machined bushing/bearing surfaces on the shaft and the governor valve shaft bore at the shaft rear.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location (especially at the governor valve shaft bore).

The annulus gears can be removed from their supports if necessary. Just remove the snap-rings and separate the two parts when replacement is necessary. In addition, the annulus gear bushings can be replaced if severely worn, or scored. However it is not necessary to replace the bushings if they only exhibit normal wear. Check bushing fit on the output shaft to be sure.

ASSEMBLY

(1) Lubricate output shaft and planetary components with transmission fluid. Use petroleum jelly to lubricate and hold thrust washers and plates in position.

(2) Assemble rear annulus gear and support if disassembled. Be sure support snap-ring is seated and that shoulder-side of support faces rearward (Fig. 208).

(3) Install rear thrust washer on rear planetary gear. Use enough petroleum jelly to hold washer in place. Also be sure all four washer tabs are properly engaged in gear slots.

(4) Install rear annulus over and onto rear planetary gear (Fig. 208).

(5) Install assembled rear planetary and annulus gear on output shaft (Fig. 209). Verify that assembly is fully seated on shaft.

PLANETARY GEARTRAIN/OUTPUT SHAFT (Continued)

(6) Install front thrust washer on rear planetary gear (Fig. 210). Use enough petroleum jelly to hold washer on gear. Be sure all four washer tabs are seated in slots.

(7) Install spacer on sun gear (Fig. 211).

(8) Install thrust plate on sun gear (Fig. 212). Note that driving shell thrust plates are interchangeable. Use either plate on sun gear and at front/rear of shell.

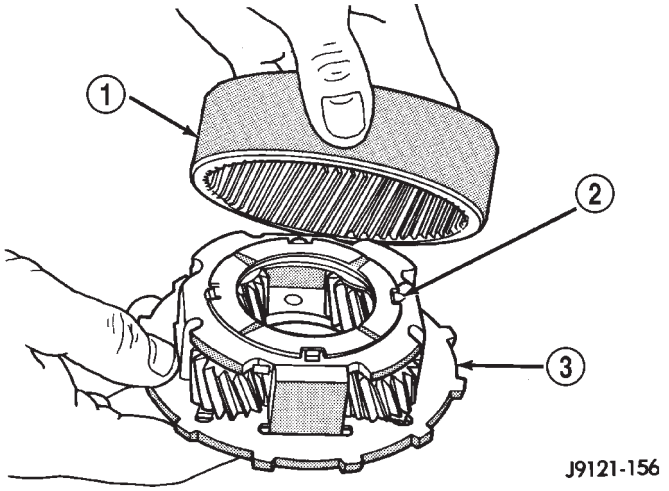


Fig. 208 Assembling Rear Annulus And Planetary Gear

1 - REAR ANNULUS GEAR
2 - TABBED THRUST WASHER
3 - REAR PLANETARY

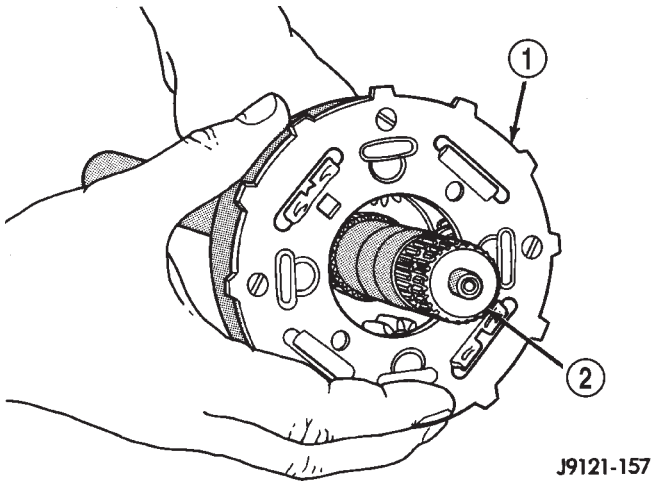


Fig. 209 Installing Rear Annulus And Planetary On Output Shaft

1 - REAR ANNULUS AND PLANETARY GEAR ASSEMBLY
2 - OUTPUT SHAFT

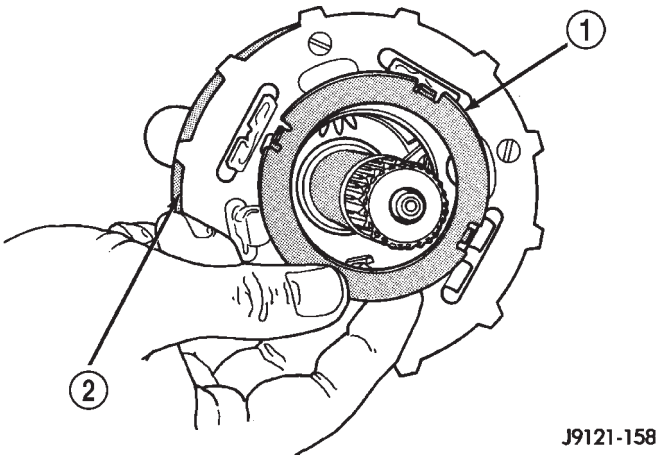


Fig. 210 Installing Rear Planetary Front Thrust Washer

1 - FRONT TABBED THRUST WASHER
2 - REAR PLANETARY GEAR

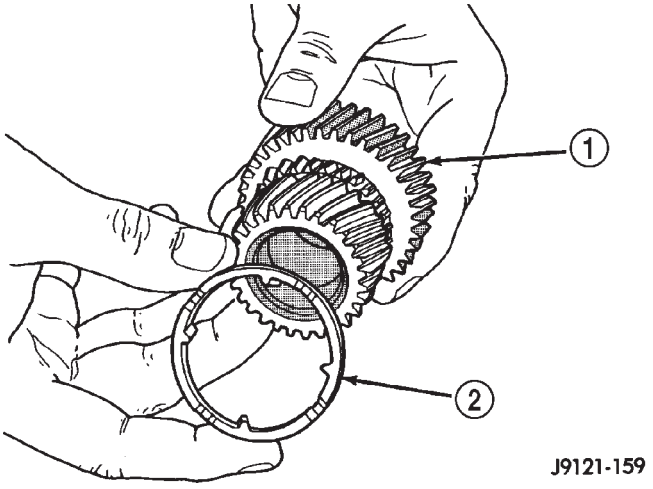


Fig. 211 Installing Spacer On Sun Gear

1 - SUN GEAR
2 - SUN GEAR SPACER

(9) Hold sun gear in place and install thrust plate over sun gear at rear of driving shell (Fig. 213).

(10) Position wood block on bench and support sun gear on block (Fig. 214). This makes it easier to align and install sun gear lock ring. Keep wood block handy as it will also be used for geartrain end play check.

PLANETARY GEARTRAIN/OUTPUT SHAFT (Continued)

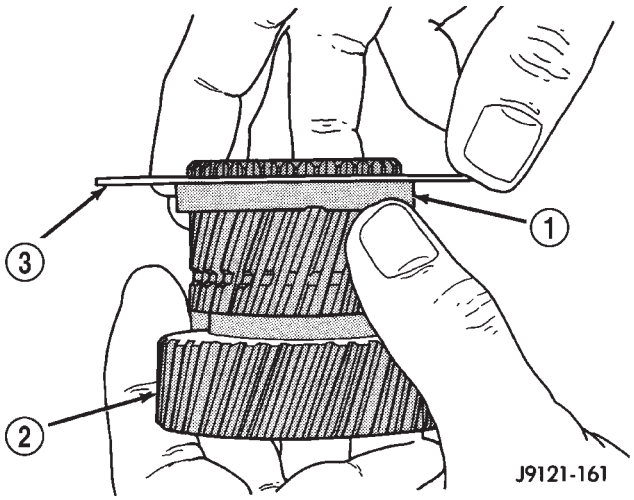


Fig. 212 Installing Driving Shell Front Thrust Plate On Sun Gear

1 - SPACER
2 - SUN GEAR
3 - THRUST PLATE

(11) Align rear thrust plate on driving shell and install sun gear lock ring. Be sure ring is fully seated in sun gear ring groove (Fig. 215).

(12) Install assembled driving shell and sun gear on output shaft (Fig. 216).

(13) Install rear thrust washer on front planetary gear (Fig. 217). Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

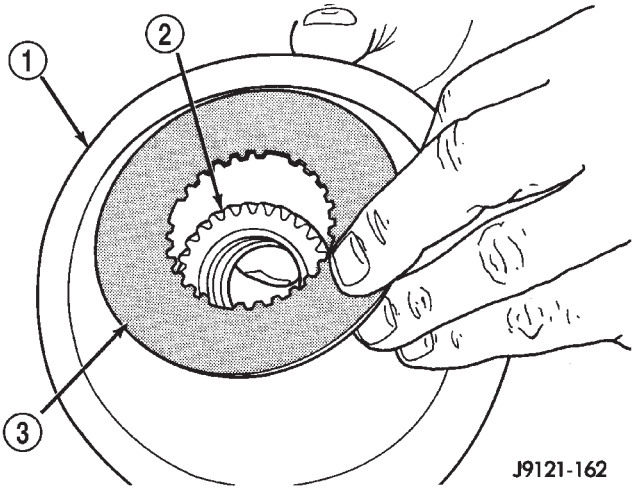


Fig. 213 Installing Driving Shell Rear Thrust Plate

1 - DRIVING SHELL
2 - SUN GEAR
3 - REAR THRUST PLATE

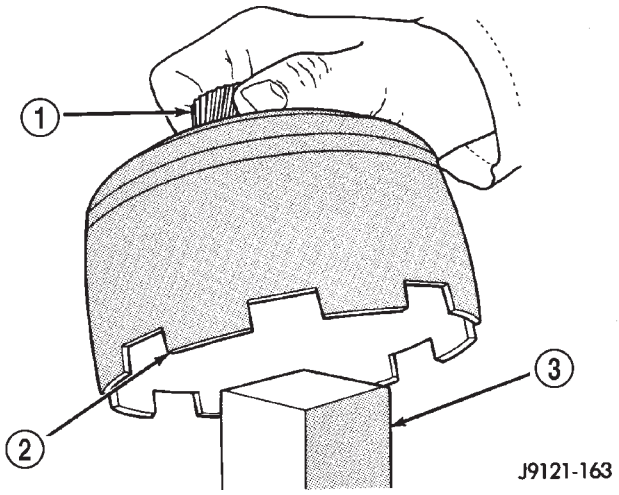


Fig. 214 Supporting Sun Gear On Wood Block

1 - SUN GEAR
2 - DRIVING SHELL
3 - WOOD BLOCK

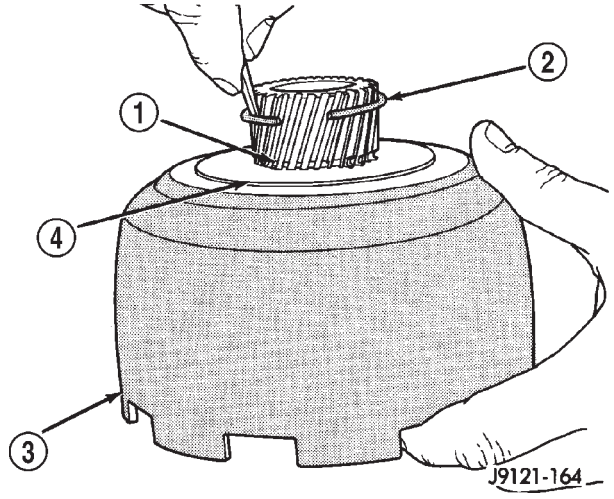


Fig. 215 Installing Sun Gear Lock Ring

1 - LOCK RING GROOVE
2 - SUN GEAR LOCK RING
3 - DRIVING SHELL
4 - REAR THRUST PLATE

PLANETARY GEARTRAIN/OUTPUT SHAFT (Continued)

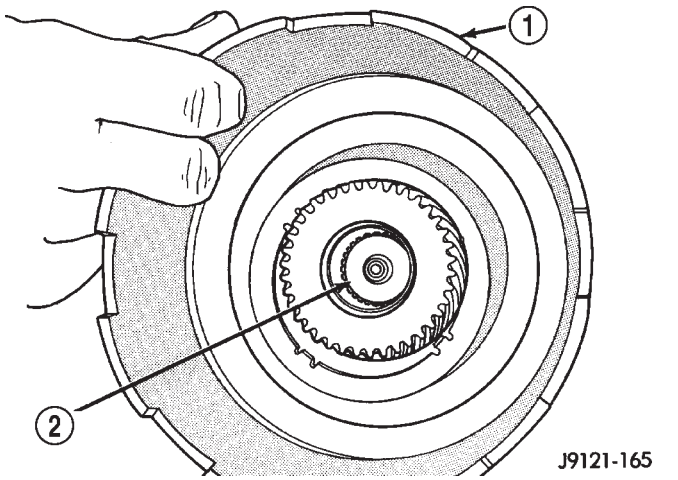


Fig. 216 Installing Assembled Sun Gear And Driving Shell On Output Shaft

1 - SUN GEAR/DRIVING SHELL ASSEMBLY
2 - OUTPUT SHAFT

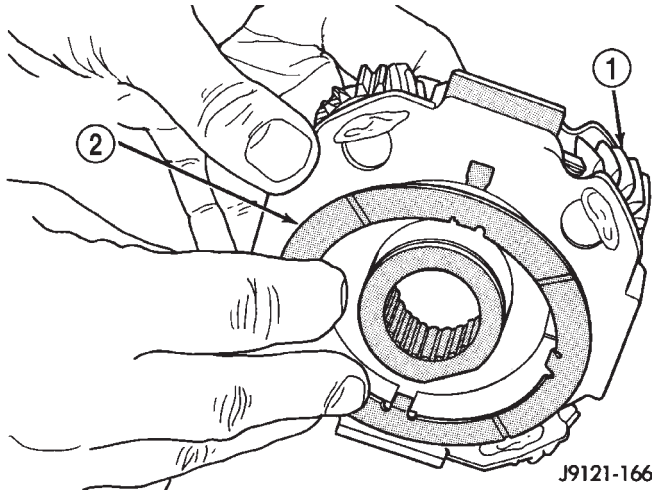


Fig. 217 Installing Rear Thrust Washer On Front Planetary Gear

1 - FRONT PLANETARY GEAR
2 - REAR TABBED THRUST WASHER

(14) Install front planetary gear on output shaft and in driving shell (Fig. 218).

(15) Install front thrust washer on front planetary gear. Use enough petroleum jelly to hold washer in place and be sure all four washer tabs are seated.

(16) Assemble front annulus gear and support, if necessary. Be sure support snap-ring is seated.

(17) Install front annulus on front planetary (Fig. 218).

(18) Position thrust plate on front annulus gear support (Fig. 219). Note that plate has two tabs on it. These tabs fit in notches of annulus hub.

(19) Install thrust washer in front annulus (Fig. 220). Align flat on washer with flat on planetary hub. Also be sure washer tab is facing up.

(20) Install front annulus snap-ring (Fig. 221). Use snap-ring pliers to avoid distorting ring during installation. Also be sure ring is fully seated.

(21) Install planetary selective snap-ring with snap-ring pliers (Fig. 222). Be sure ring is fully seated.

(22) Turn planetary geartrain assembly over so driving shell is facing workbench. Then support geartrain on wood block positioned under forward end of output shaft. This allows geartrain components to move forward for accurate end play check.

(23) Check planetary geartrain end play with feeler gauge (Fig. 223). Gauge goes between shoulder on output shaft and end of rear annulus support.

(24) Geartrain end play should be 0.12 to 1.22 mm (0.005 to 0.048 in.). If end play is incorrect, snap-ring (or thrust washers) may have to be replaced. Snap-rings are available in three different thicknesses for adjustment purposes.

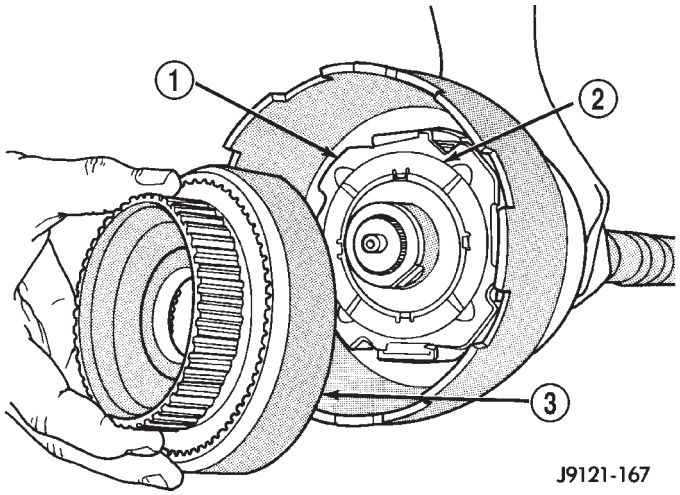


Fig. 218 Installing Front Planetary And Annulus Gears

1 - FRONT PLANETARY GEAR
2 - FRONT THRUST WASHER
3 - FRONT ANNULUS GEAR

PLANETARY GEARTRAIN/OUTPUT SHAFT (Continued)

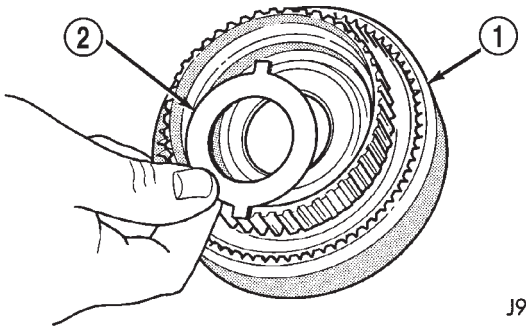


Fig. 219 Positioning Thrust Plate On Front Annulus Support

1 - FRONT ANNULUS
2 - THRUST PLATE

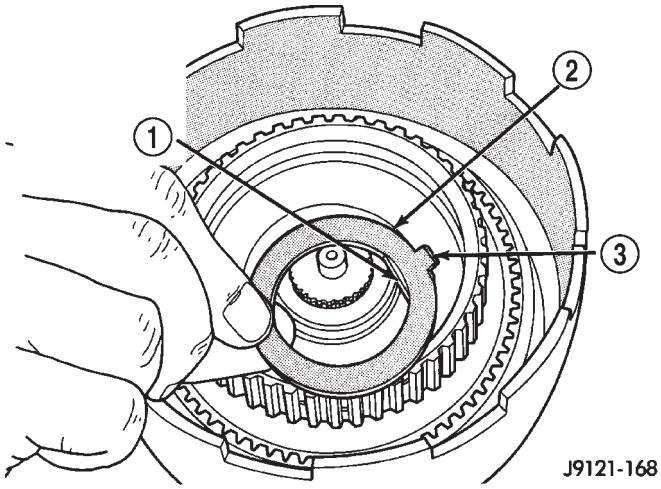


Fig. 220 Installing Front Annulus Thrust Washer

1 - WASHER FLAT ALIGNS WITH FLAT ON PLANETARY HUB
2 - FRONT ANNULUS THRUST WASHER
3 - TAB FACES FRONT

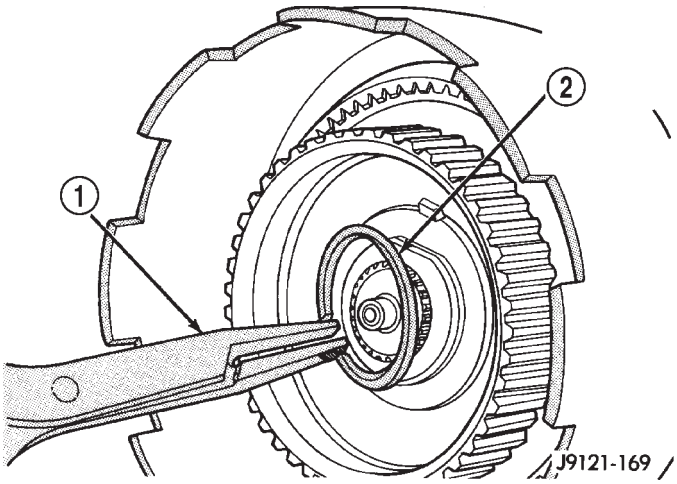


Fig. 221 Installing Front Annulus Snap-Ring

1 - SNAP-RING PLIERS
2 - FRONT ANNULUS SNAP-RING

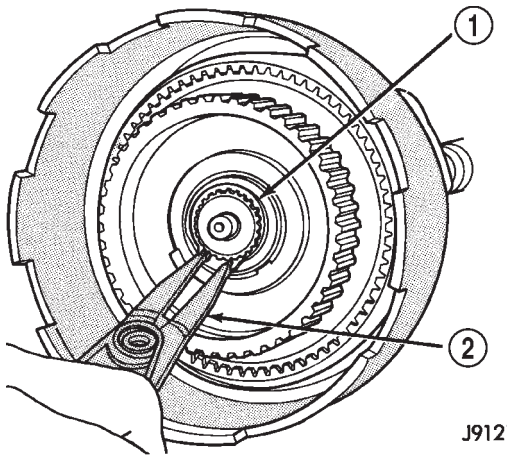


Fig. 222 Installing Planetary Selective Snap-Ring

1 - SELECTIVE SNAP-RING
2 - SNAP-RING PLIERS

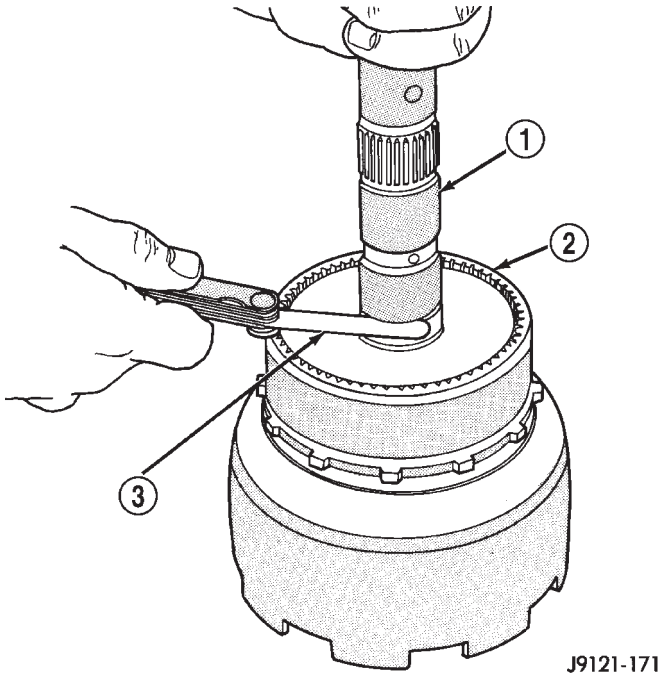


Fig. 223 Checking Planetary Geartrain End Play

1 - OUTPUT SHAFT
2 - REAR ANNULUS GEAR
3 - FEELER GAUGE

REAR CLUTCH

DESCRIPTION

The rear clutch assembly (Fig. 224) is composed of the rear clutch retainer, pressure plate, clutch plates, driving discs, piston, Belleville spring, and snap-rings. The Belleville spring acts as a lever to multiply the force applied on to it by the apply piston. The increased apply force on the rear clutch pack, in comparison to the front clutch pack, is needed to hold against the greater torque load imposed onto the rear pack. The rear clutch is directly behind the front clutch and is considered a driving component.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved spring is used to cushion the application of the clutch pack. The snap-ring is selective and used to adjust clutch pack clearance.

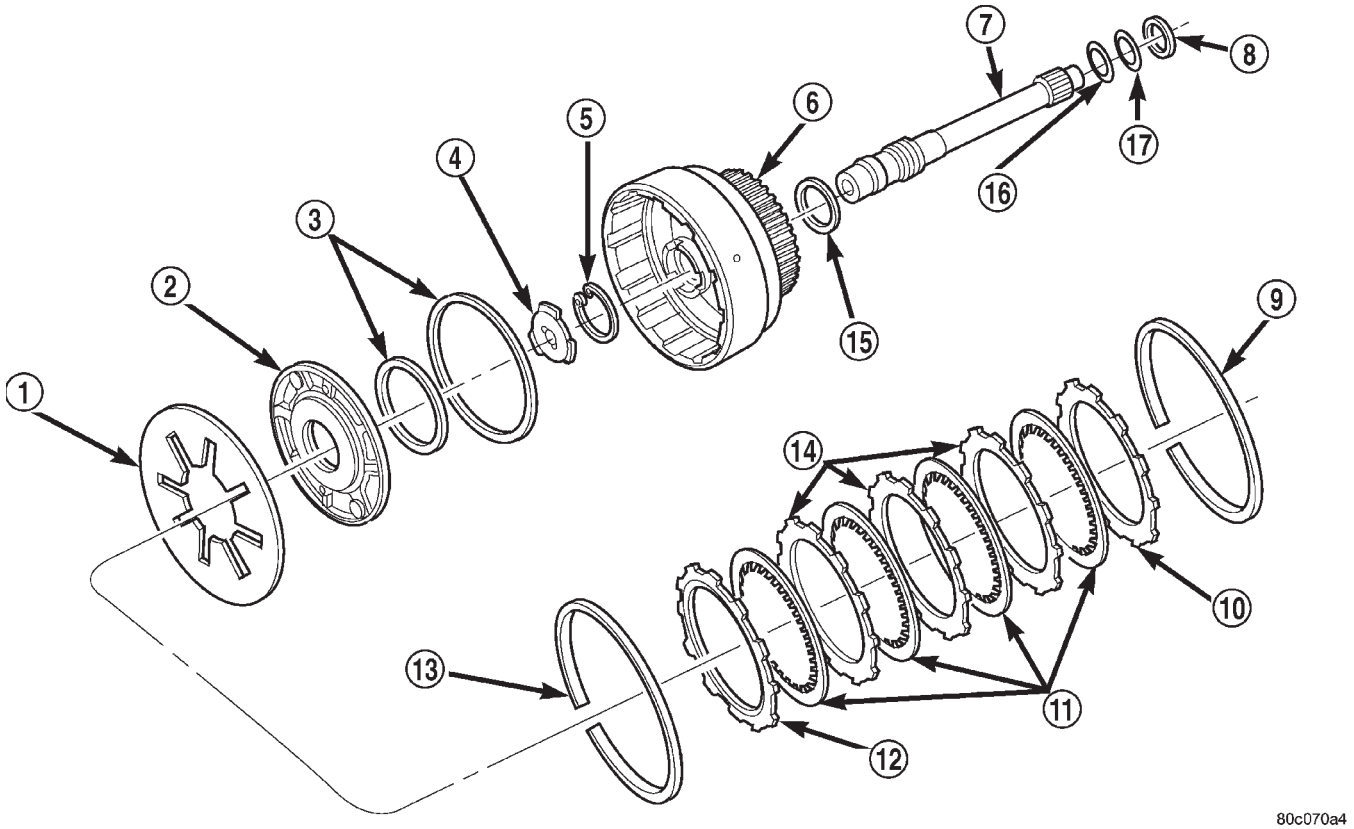


Fig. 224 Rear Clutch

1 - PISTON SPRING
2 - REAR CLUTCH PISTON
3 - CLUTCH PISTON SEALS
4 - OUTPUT SHAFT THRUST WASHER (METAL)
5 - INPUT SHAFT SNAP-RING
6 - REAR CLUTCH RETAINER
7 - INPUT SHAFT
8 - REAR CLUTCH THRUST WASHER (FIBER)
9 - CLUTCH PACK SNAP-RING (SELECTIVE)
10 - TOP PRESSURE PLATE
11 - CLUTCH DISCS (4)
12 - BOTTOM PRESSURE PLATE
13 - WAVE SPRING
14 - CLUTCH PLATES (3)
15 - RETAINER SEAL RING
16 - SHAFT REAR SEAL RING (PLASTIC)
17 - SHAFT FRONT SEAL RING (TEFLON)

REAR CLUTCH (Continued)

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one-way ball-check-valve located in the piston. The check-valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

DISASSEMBLY

(1) Remove fiber thrust washer from forward side of clutch retainer.

(2) Remove input shaft front/rear seal rings.

(3) Remove selective clutch pack snap-ring (Fig. 225).

(4) Remove top pressure plate, clutch discs, steel plates, bottom pressure plate and wave snap-ring and wave spring (Fig. 225).

(5) Remove clutch piston with rotating motion.

(6) Remove and discard piston seals.

(7) Remove input shaft snap-ring (Fig. 226). It may be necessary to press the input shaft in slightly to relieve tension on the snap-ring

(8) Press input shaft out of retainer with shop press and suitable size press tool. Use a suitably sized press tool to support the retainer as close to the input shaft as possible.

CLEANING

Clean the clutch components with solvent and dry them with compressed air. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to component surfaces and could restrict or block fluid passages after assembly.

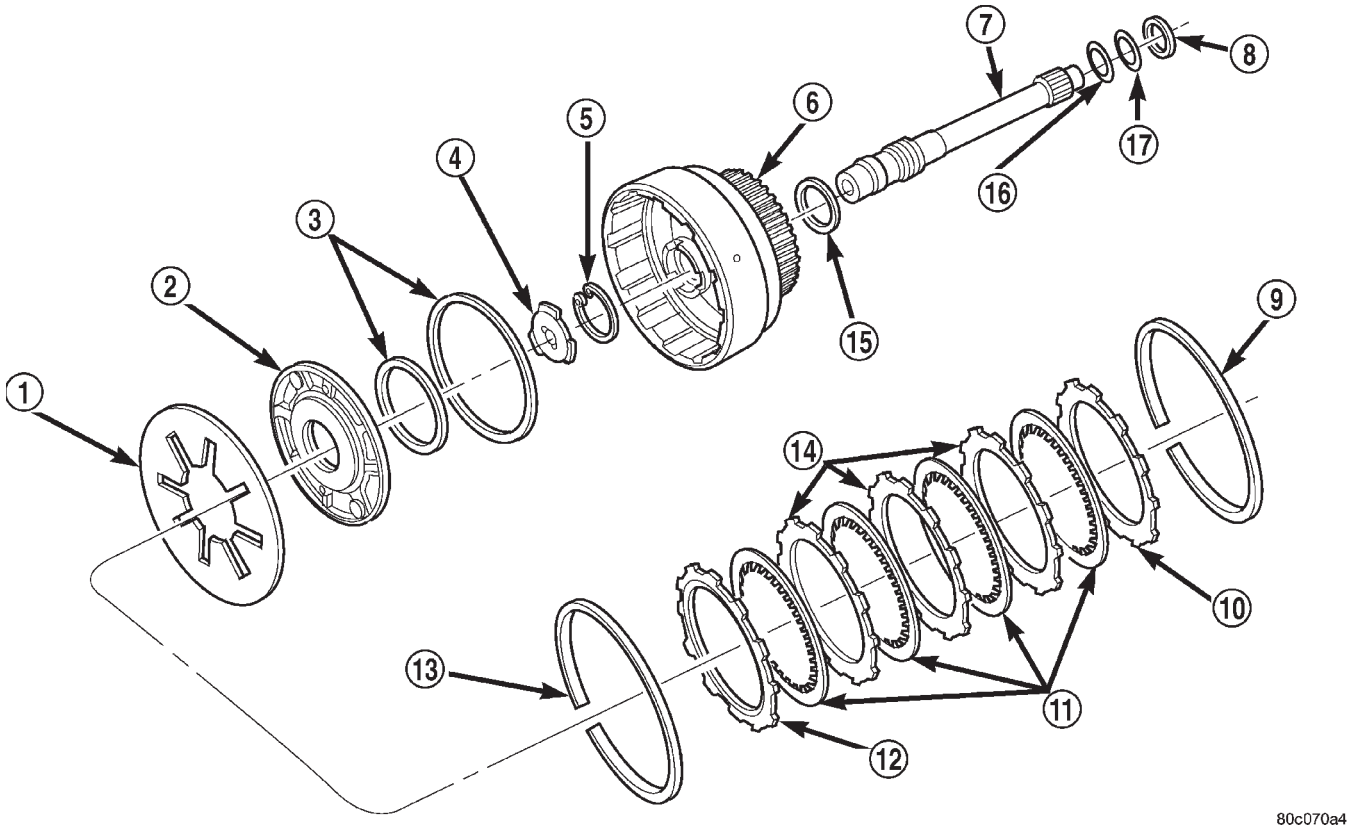


Fig. 225 Rear Clutch Components

1 - PISTON SPRING
2 - REAR CLUTCH PISTON
3 - CLUTCH PISTON SEALS
4 - OUTPUT SHAFT THRUST WASHER (METAL)
5 - INPUT SHAFT SNAP-RING
6 - REAR CLUTCH RETAINER
7 - INPUT SHAFT
8 - REAR CLUTCH THRUST WASHER (FIBER)
9 - CLUTCH PACK SNAP-RING (SELECTIVE)
10 - TOP PRESSURE PLATE
11 - CLUTCH DISCS (4)
12 - BOTTOM PRESSURE PLATE
13 - WAVE SPRING
14 - CLUTCH PLATES (3)
15 - RETAINER SEAL RING
16 - SHAFT REAR SEAL RING (PLASTIC)
17 - SHAFT FRONT SEAL RING (TEFLON)

REAR CLUTCH (Continued)

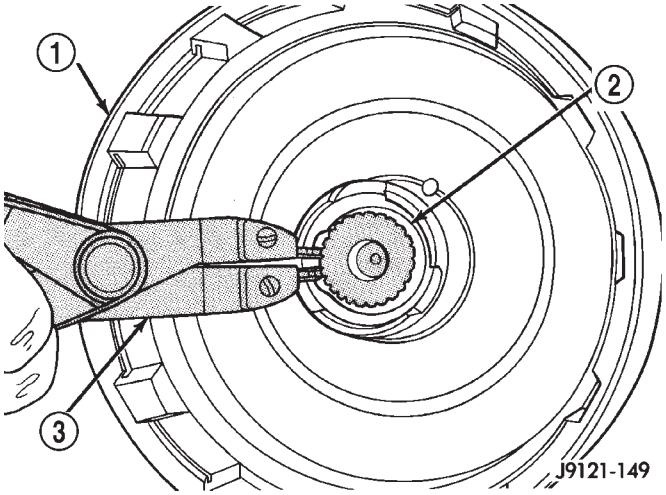


Fig. 226 Removing Input Shaft Snap-Ring

1 - REAR CLUTCH RETAINER
2 - INPUT SHAFT SNAP-RING
3 - SNAP-RING PLIERS

INSPECTION

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off. Replace the top and bottom pressure plates if scored, warped, or cracked. Be sure the driving lugs on the pressure and clutch plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston spring and wave spring if either part is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The clutch and pressure plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged. Also check action of the check balls in the retainer and piston. Each check ball must move freely and not stick.

Replace the retainer bushing if worn, scored, or doubt exists about bushing condition.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

Check condition of the fiber thrust washer and metal output shaft thrust washer. Replace either washer if worn or damaged.

Check condition of the seal rings on the input shaft and clutch retainer hub. Replace the seal rings only if worn, distorted, or damaged. The input shaft front seal ring is teflon with chamfered ends. The rear ring is metal with interlocking ends.

Check the input shaft for wear, or damage. Replace the shaft if worn, scored or damaged in any way.

ASSEMBLY

(1) Soak clutch discs in transmission fluid while assembling other clutch parts.

(2) Install new seal rings on clutch retainer hub and input shaft, if necessary, (Fig. 227) and (Fig. 228).

(a) Be sure clutch hub seal ring is fully seated in groove and is not twisted.

(3) Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then press input shaft into retainer (Fig. 229). Use a suitably sized press tool to support retainer as close to input shaft as possible.

(4) Install input shaft snap-ring (Fig. 226).

(5) Invert retainer and press input shaft in opposite direction until snap-ring is seated.

(6) Install new seals on clutch piston. Be sure lip of each seal faces interior of clutch retainer.

(7) Lubricate lip of piston seals with generous quantity of Mopar® Door Ease. Then lubricate retainer hub and bore with light coat of transmission fluid.

(8) Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020″ thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

(9) Install piston spring in retainer and on top of piston (Fig. 230). Concave side of spring faces downward (toward piston).

(10) Install wave spring in retainer (Fig. 230). Be sure spring is completely seated in retainer groove.

(11) Install bottom pressure plate (Fig. 225). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.

(12) Install first clutch disc in retainer on top of bottom pressure plate. Then install a clutch plate followed by a clutch disc until entire clutch pack is installed (4 discs and 3 plates are required) (Fig. 225).

(13) Install top pressure plate.

(14) Install selective snap-ring. Be sure snap-ring is fully seated in retainer groove.

(15) Using a suitable gauge bar and dial indicator, measure clutch pack clearance (Fig. 231).

(a) Position gauge bar across the clutch drum with the dial indicator pointer on the pressure plate (Fig. 231).

(b) Using two small screw drivers, lift the pressure plate and release it.

REAR CLUTCH (Continued)

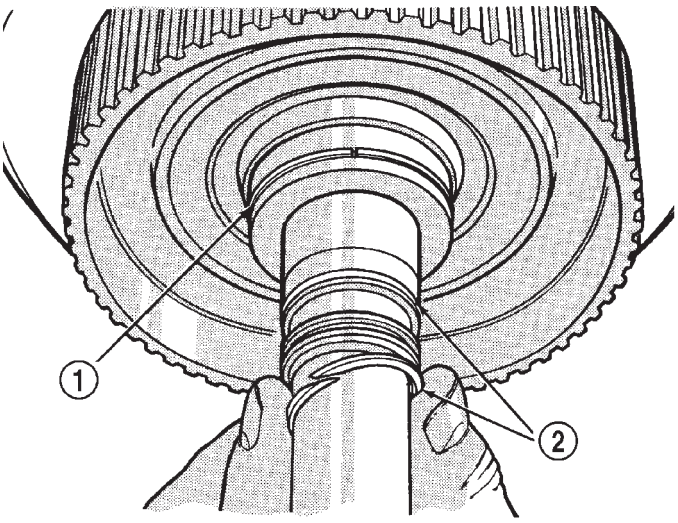


Fig. 227 Rear Clutch Retainer And Input Shaft Seal Ring Installation

1 - REAR CLUTCH RETAINER HUB SEAL RING
2 - INPUT SHAFT SEAL RINGS

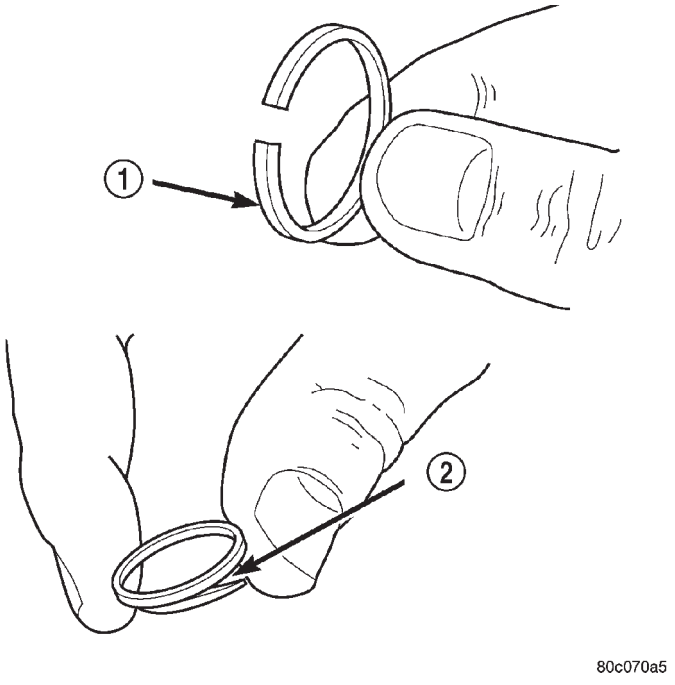


Fig. 228 Input Shaft Seal Ring Identification

1 - PLASTIC REAR SEAL RING
2 - TEFLON FRONT SEAL RING (SQUEEZE RING TOGETHER SLIGHTLY BEFORE INSTALLATION FOR BETTER FIT)

(c) Zero the dial indicator.

(d) Lift the pressure plate until it contacts the snap-ring and record the dial indicator reading.

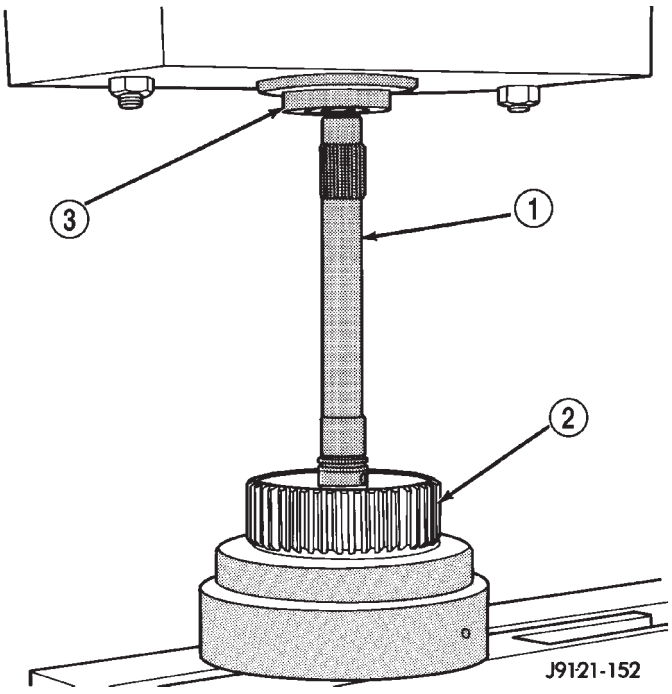


Fig. 229 Pressing Input Shaft Into Rear Clutch Retainer

1 - INPUT SHAFT
2 - REAR CLUTCH RETAINER
3 - PRESS RAM

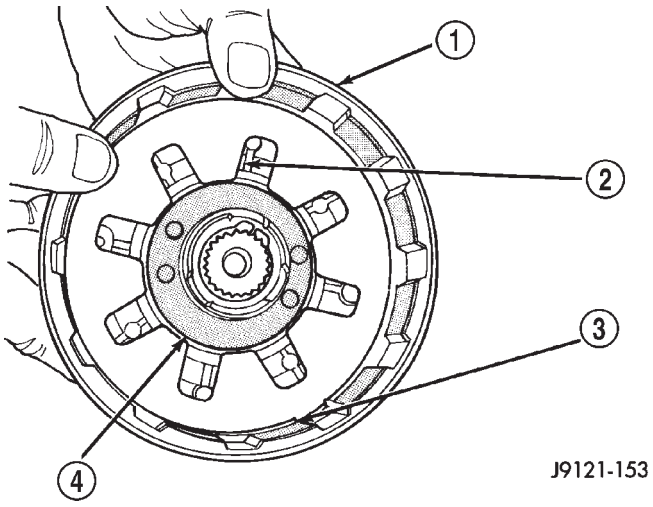


Fig. 230 Piston Spring/Wave Spring Position

1 - REAR CLUTCH RETAINER
2 - PISTON SPRING
3 - WAVE SPRING
4 - CLUTCH PISTON

Clearance should be 0.559 - 0.914 mm (0.022 - 0.036 in.). If clearance is incorrect, steel plates, discs, selective snap ring and pressure plates may have to be changed.

REAR CLUTCH (Continued)

The selective snap-ring thicknesses are:

- 0.107-0.109 in.
- 0.098-0.100 in.
- 0.095-0.097 in.
- 0.083-0.085 in.
- 0.076-0.078 in.
- 0.071-0.073 in.
- 0.060-0.062 in.

(16) Coat rear clutch thrust washer with petroleum jelly and install washer over input shaft and into clutch retainer (Fig. 232). Use enough petroleum jelly to hold washer in place.

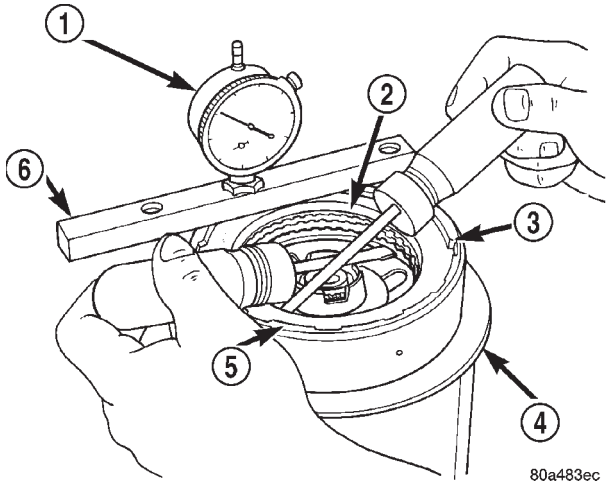


Fig. 231 Checking Rear Clutch Pack Clearance

1 - DIAL INDICATOR
2 - PRESSURE PLATE
3 - SNAP-RING
4 - STAND
5 - REAR CLUTCH
6 - GAUGE BAR

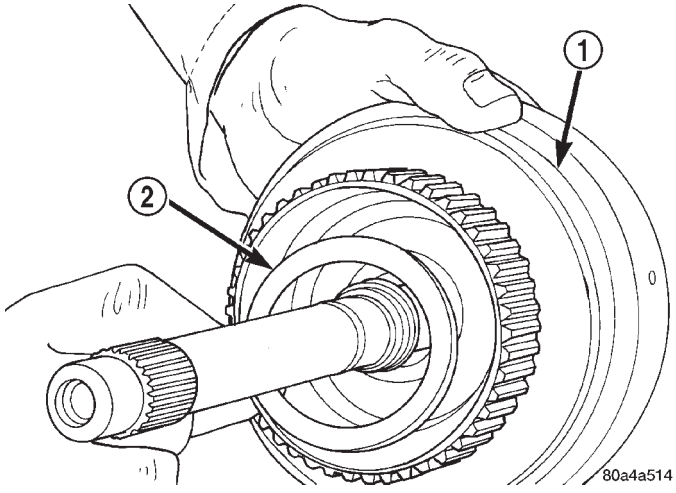


Fig. 232 Installing Rear Clutch Thrust Washer

1 - REAR CLUTCH RETAINER
2 - REAR CLUTCH THRUST WASHER

REAR SERVO

DESCRIPTION

The rear (low/reverse) servo consists of a single stage or diameter piston and a spring loaded plug. The spring is used to cushion the application of the rear (low/reverse) band.

OPERATION

While in the de-energized state (no pressure applied), the piston is held up in its bore by the piston spring. The plug is held down in its bore, in the piston, by the plug spring. When pressure is applied to the top of the piston, the plug is forced down in its bore, taking up any clearance. As the piston moves, it causes the plug spring to compress, and the piston moves down over the plug. The piston continues to move down until it hits the shoulder of the plug and fully applies the band. The period of time from the initial application, until the piston is against the shoulder of the plug, represents a reduced shocking of the band that cushions the shift.

DISASSEMBLY

(1) Remove small snap-ring and remove plug and spring from servo piston (Fig. 233).

(2) Remove and discard servo piston seal ring.

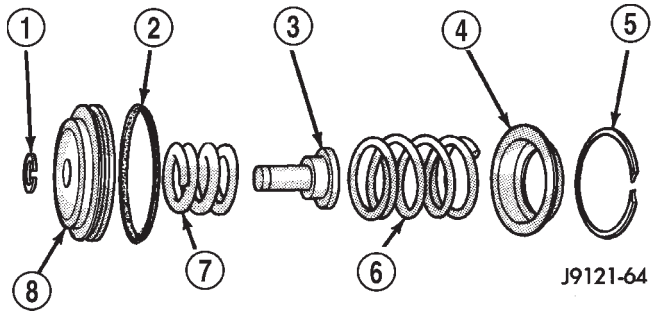


Fig. 233 Rear Servo Components

1 - SNAP-RING
2 - PISTON SEAL
3 - PISTON PLUG
4 - SPRING RETAINER
5 - SNAP-RING
6 - PISTON SPRING
7 - CUSHION SPRING
8 - PISTON

CLEANING

Remove and discard the servo piston seal ring (Fig. 234). Then clean the servo components with solvent and dry with compressed air. Replace either spring if collapsed, distorted or broken. Replace the plug and piston if cracked, bent, or worn. Discard the servo snap-rings and use new ones at assembly.

REAR SERVO (Continued)

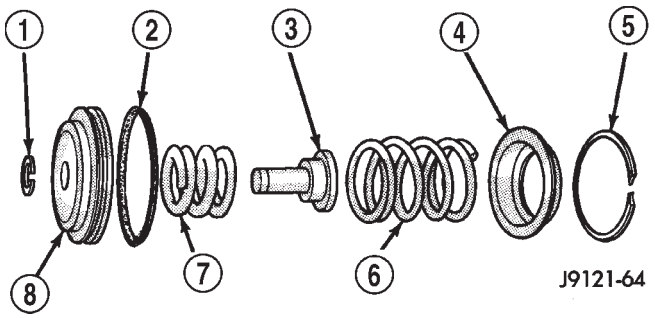


Fig. 234 Rear Servo Components

1 - SNAP-RING
2 - PISTON SEAL
3 - PISTON PLUG
4 - SPRING RETAINER
5 - SNAP-RING
6 - PISTON SPRING
7 - CUSHION SPRING
8 - PISTON

ASSEMBLY

(1) Lubricate piston and guide seals (Fig. 235) with petroleum jelly. Lubricate other servo parts with Mopar® ATF +4, type 9602, transmission fluid.

(2) Install new seal ring on servo piston.

(3) Assemble piston, plug, spring and new snap-ring.

(4) Lubricate piston seal lip with petroleum jelly.

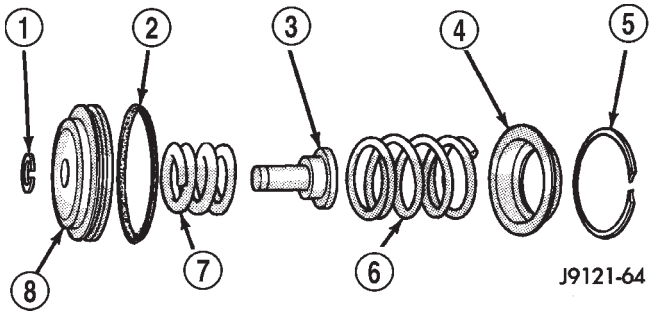


Fig. 235 Rear Servo Components

1 - SNAP-RING
2 - PISTON SEAL
3 - PISTON PLUG
4 - SPRING RETAINER
5 - SNAP-RING
6 - PISTON SPRING
7 - CUSHION SPRING
8 - PISTON

SHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- PARK (P)
- REVERSE (R)
- NEUTRAL (N)
- DRIVE (D)
- Manual SECOND (2)
- Manual LOW (1)

OPERATION

Manual LOW (1) range provides first gear only. Overrun braking is also provided in this range. Manual SECOND (2) range provides first and second gear only.

DRIVE range provides first, second third and overdrive fourth gear ranges. The shift into overdrive fourth gear range occurs only after the transmission has completed the shift into D third gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

The fourth gear upshift occurs automatically when the overdrive selector switch is in the ON position. No upshift to fourth gear will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to third is not yet complete.
- Vehicle speed is too low for the 3-4 shift to occur.
- Battery temperature is below -5° C (23° F).

REMOVAL

(1) Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift transmission into PARK.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 236).

(4) Disconnect the park lock cable from the shifter BTSI lever and the shifter assembly bracket. (Fig. 237)

(5) Disconnect the transfer case shift cable from the transfer case shift lever pin (Fig. 238), if equipped.

(6) Remove the clip holding the transfer case shift cable to the shifter assembly bracket, if equipped.

(7) Remove the transfer case shift cable from the shifter assembly bracket, if equipped.

SHIFT MECHANISM (Continued)

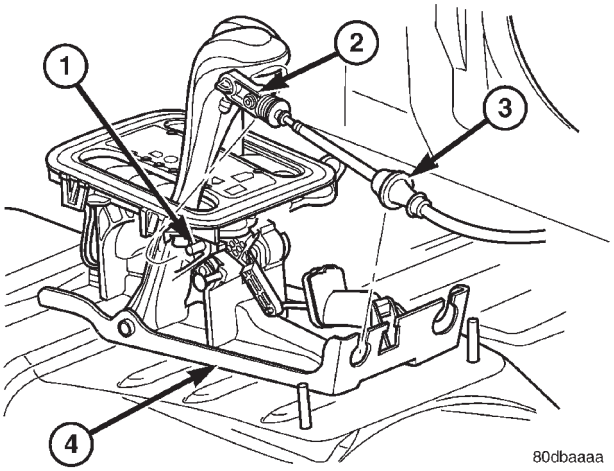


Fig. 236 Transmission Shift Cable

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

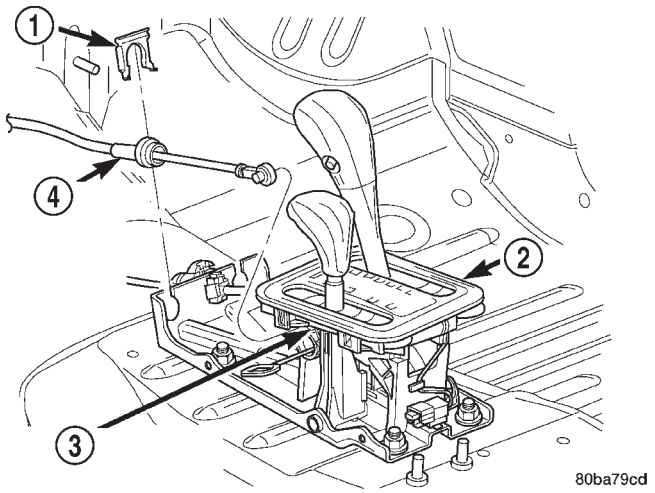


Fig. 238 Transfer Case Shift Cable

1 - CLIP
2 - SHIFTER
3 - TRANSFER CASE SHIFT LEVER PIN
4 - TRANSFER CASE SHIFT CABLE

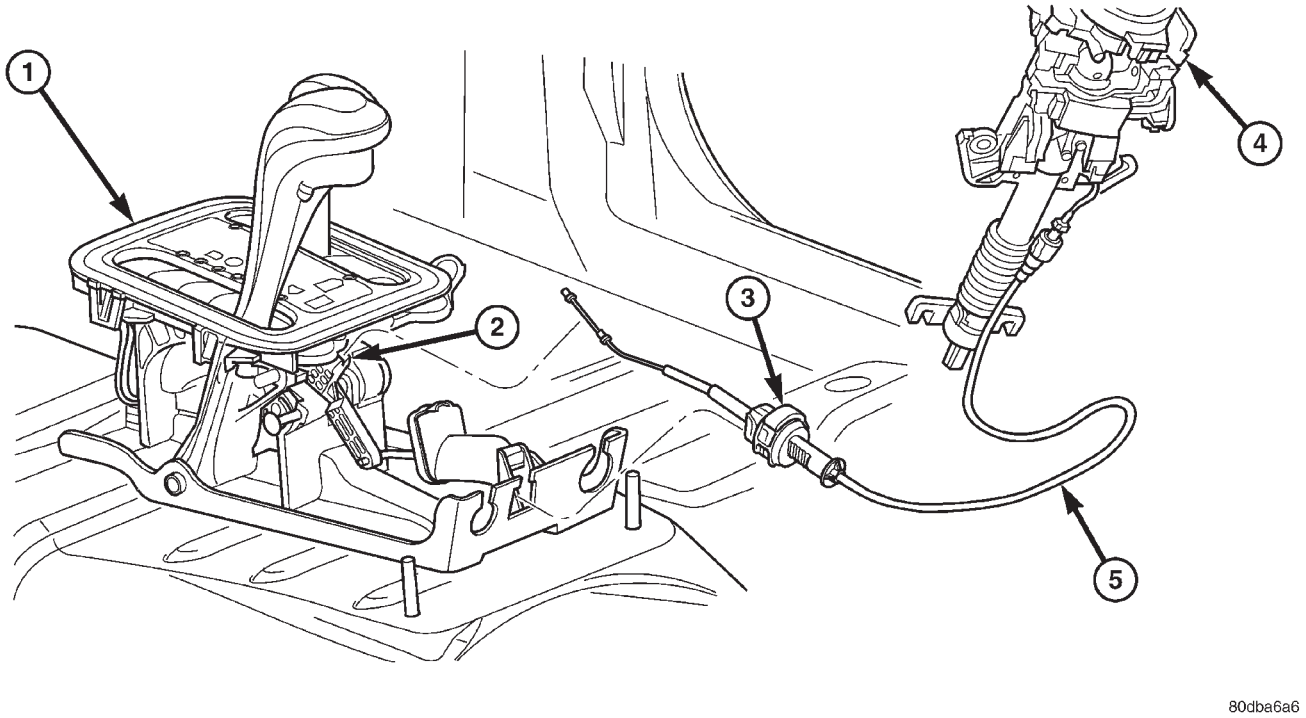


Fig. 237 Brake Transmission Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

SHIFT MECHANISM (Continued)

(8) Disengage all wiring connectors from the shifter assembly.

(9) Remove all nuts holding the shifter assembly to the floor pan (Fig. 239).

(10) Remove the shifter assembly from the vehicle.

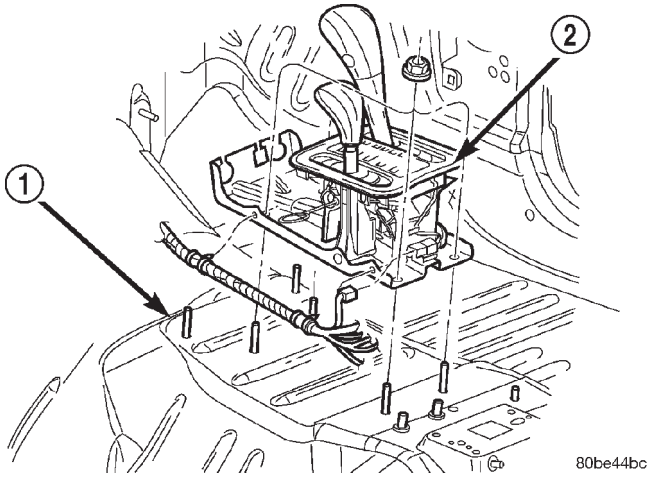


Fig. 239 Shifter Assembly

1 - FLOOR PAN
2 - SHIFTER ASSEMBLY

INSTALLATION

(1) Place the floor shifter lever in PARK position.

(2) Loosen the adjustment screw on the shift cable.

(3) Verify that the park lock cable adjustment tab is pulled upward to the unlocked position.

(4) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.

(5) Install the transfer case shift cable to the shifter assembly bracket. Install clip to hold cable to the bracket.

(6) Snap the transfer case shift cable, if equipped, onto the transfer case shift lever pin.

(7) Install the park lock cable into the shifter assembly bracket and into the shifter BTSI lever.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/SHIFT INTERLOCK MECHANISM - ADJUSTMENTS)

(8) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(9) Install shifter assembly onto the shifter assembly studs on the floor pan.

(10) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in.lbs.).

(11) Snap the shift cable onto the shift lever pin.

(12) Verify that the shift lever is in the PARK position.

(13) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(14) Place the key in the accessory position.

(15) Push downward on the park lock cable adjustment tab to lock the adjustment.

(16) Verify correct shifter, park lock, and BTSI operation.

(17) Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

SOLENOID

DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

SOLENOID (Continued)

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.

OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

SPEED SENSOR

DESCRIPTION

The speed sensor (Fig. 240) is located in the overdrive gear case. The sensor is positioned over the park gear and monitors transmission output shaft rotating speed.

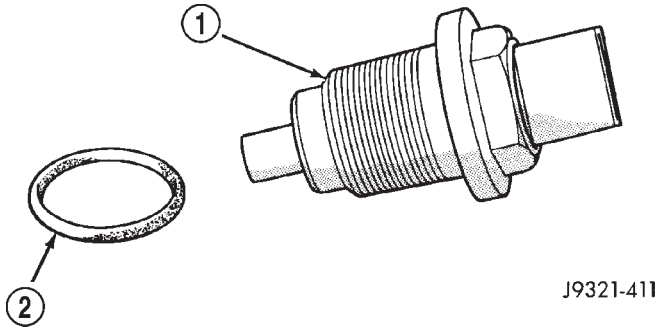


Fig. 240 Transmission Output Speed Sensor

1 - TRANSMISSION OUTPUT SHAFT SPEED SENSOR
2 - SEAL

OPERATION

Speed sensor signals are triggered by the park gear lugs as they rotate past the sensor pickup face. Input signals from the sensor are sent to the transmission control module for processing. Signals from this sensor are shared with the powertrain control module.

THROTTLE VALVE CABLE

DESCRIPTION

Transmission throttle valve cable adjustment is extremely important to proper operation. This adjustment positions the throttle valve, which controls shift speed, quality, and part-throttle downshift sensitivity.

If cable setting is too loose, early shifts and slippage between shifts may occur. If the setting is too tight, shifts may be delayed and part throttle downshifts may be very sensitive.

The transmission throttle valve is operated by a cam on the throttle lever. The throttle lever is operated by an adjustable cable (Fig. 241). The cable is attached to an arm mounted on the throttle lever shaft. A retaining clip at the engine-end of the cable is removed to provide for cable adjustment. The retaining clip is then installed back onto the throttle valve cable to lock in the adjustment.

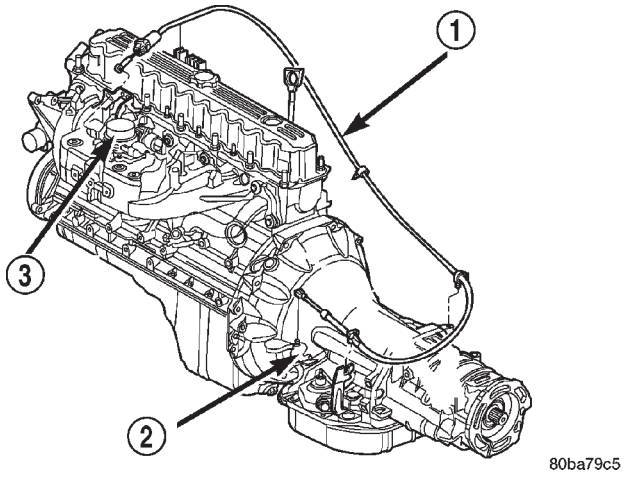


Fig. 241 Throttle Valve Cable

1 - THROTTLE VALVE CABLE
2 - THROTTLE VALVE LEVER
3 - THROTTLE BODY

ADJUSTMENTS - TRANSMISSION THROTTLE VALVE CABLE

A correctly adjusted throttle valve cable (Fig. 242) will cause the throttle lever on the transmission to move simultaneously with the throttle body lever from the idle position. Proper adjustment will allow

THROTTLE VALVE CABLE (Continued)

simultaneous movement without causing the transmission throttle lever to either move ahead of, or lag behind the lever on the throttle body.

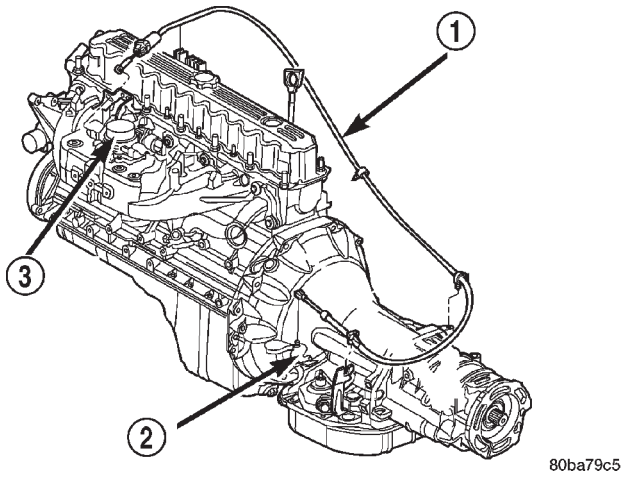


Fig. 242 Throttle Valve Cable

1 - THROTTLE VALVE CABLE
2 - THROTTLE VALVE LEVER
3 - THROTTLE BODY

ADJUSTMENT VERIFICATION

(1) Turn ignition key to OFF position.
(2) Remove air cleaner.
(3) Verify that lever on throttle body (Fig. 242) is at curb idle position. Then verify that the transmission throttle lever (Fig. 243) is also at idle (fully forward) position.
(4) Slide cable off attachment stud on throttle body lever.
(5) Compare position of cable end to attachment stud on throttle body lever:

- Cable end and attachment stud should be aligned (or centered on one another) to within 1 mm (0.039 in.) in either direction (Fig. 244).
- If cable end and attachment stud are misaligned (off center), cable will have to be adjusted as described in Throttle Valve Cable Adjustment procedure.

(6) Reconnect cable end to attachment stud. Then with aid of a helper, observe movement of transmission throttle lever and lever on throttle body.

- If both levers move simultaneously from idle to half-throttle and back to idle position, adjustment is correct.
- If transmission throttle lever moves ahead of, or lags behind throttle body lever, cable adjustment will be necessary. Or, if throttle body lever prevents transmission lever from returning to closed position, cable adjustment will be necessary.

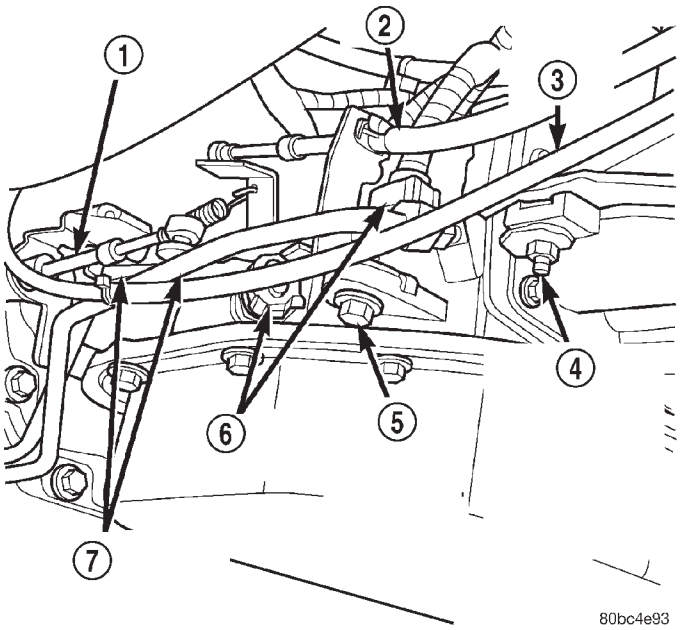


Fig. 243 Throttle Valve Cable at Transmission

1 - TRANSMISSION SHIFTER CABLE
2 - THROTTLE VALVE CABLE
3 - TRANSFER CASE SHIFTER CABLE
4 - TRANSFER CASE SHIFTER CABLE BRACKET RETAINING BOLT(S)
5 - THROTTLE VALVE CABLE BRACKET RETAINING BOLT
6 - ELECTRICAL CONNECTORS
7 - TRANSMISSION FLUID LINES

ADJUSTMENT PROCEDURE

(1) Turn ignition switch to OFF position.
(2) Remove air cleaner if necessary.
(3) Disconnect cable end from attachment stud. **Carefully slide cable off stud. Do not pry or pull cable off.**
(4) Verify that transmission throttle lever is in fully closed position. Then be sure lever on throttle body is at curb idle position.
(5) Pry the T.V. cable lock (A) into the UP position (Fig. 244). This will unlock the cable and allow for readjustment.
(6) Apply just enough tension on the T.V. cable (B) to remove any slack in the cable.**Pulling too tight will cause the T.V. lever on the transmission to move out of its idle position, which will result in an incorrect T.V. cable adjustment.** Slide the sheath of the T.V. cable (D) back and forth until the centerlines of the T.V. cable end (B) and the throttle bell crank lever (C) are aligned within one millimeter (1mm) (Fig. 244).
(7) While holding the T.V. cable in the set position push the T.V. cable lock (A) into the down position (Fig. 244). This will lock the present T.V. cable adjustment.

THROTTLE VALVE CABLE (Continued)

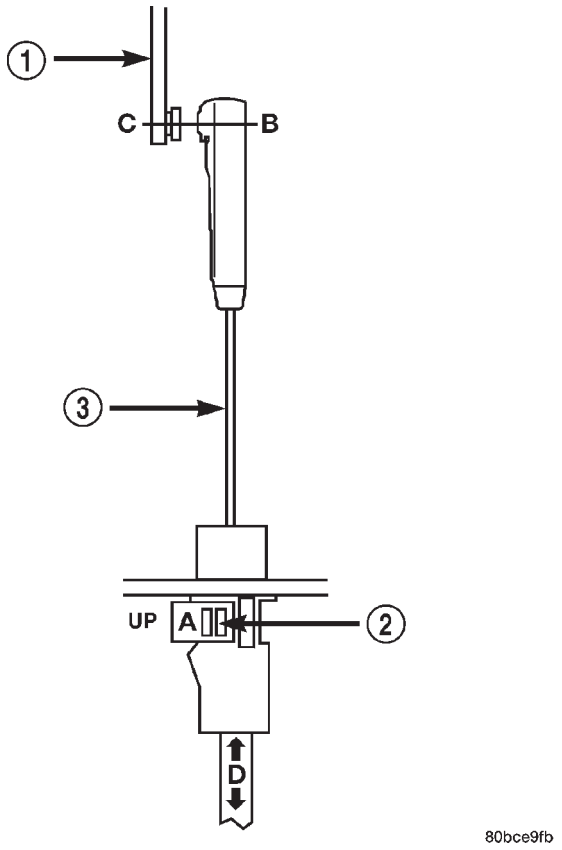


Fig. 244 Throttle Valve Cable at Throttle Linkage

1 - THROTTLE LINKAGE
2 - THROTTLE VALVE CABLE LOCKING CLIP
3 - THROTTLE VALVE CABLE

NOTE: Be sure that as the cable is pulled forward and centered on the throttle lever stud, the cable housing moves smoothly with the cable. Due to the angle at which the cable housing enters the spring housing, the cable housing may bind slightly and create an incorrect adjustment.

(8) Reconnect the T.V. cable (B) to the throttle bellcrank lever (C).

(9) Check cable adjustment. Verify transmission throttle lever and lever on throttle body move simultaneously.

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 245) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the all transmission fluid cooler(s) and lines.

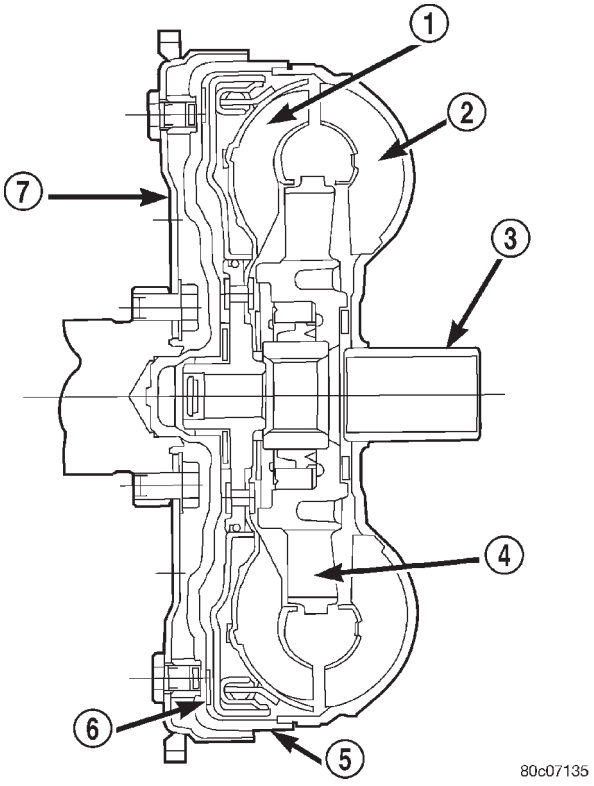


Fig. 245 Torque Converter Assembly

1 - TURBINE
2 - IMPELLER
3 - HUB
4 - STATOR
5 - FRONT COVER
6 - CONVERTER CLUTCH DISC
7 - DRIVE PLATE

TORQUE CONVERTER (Continued)

IMPELLER

The impeller (Fig. 246) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

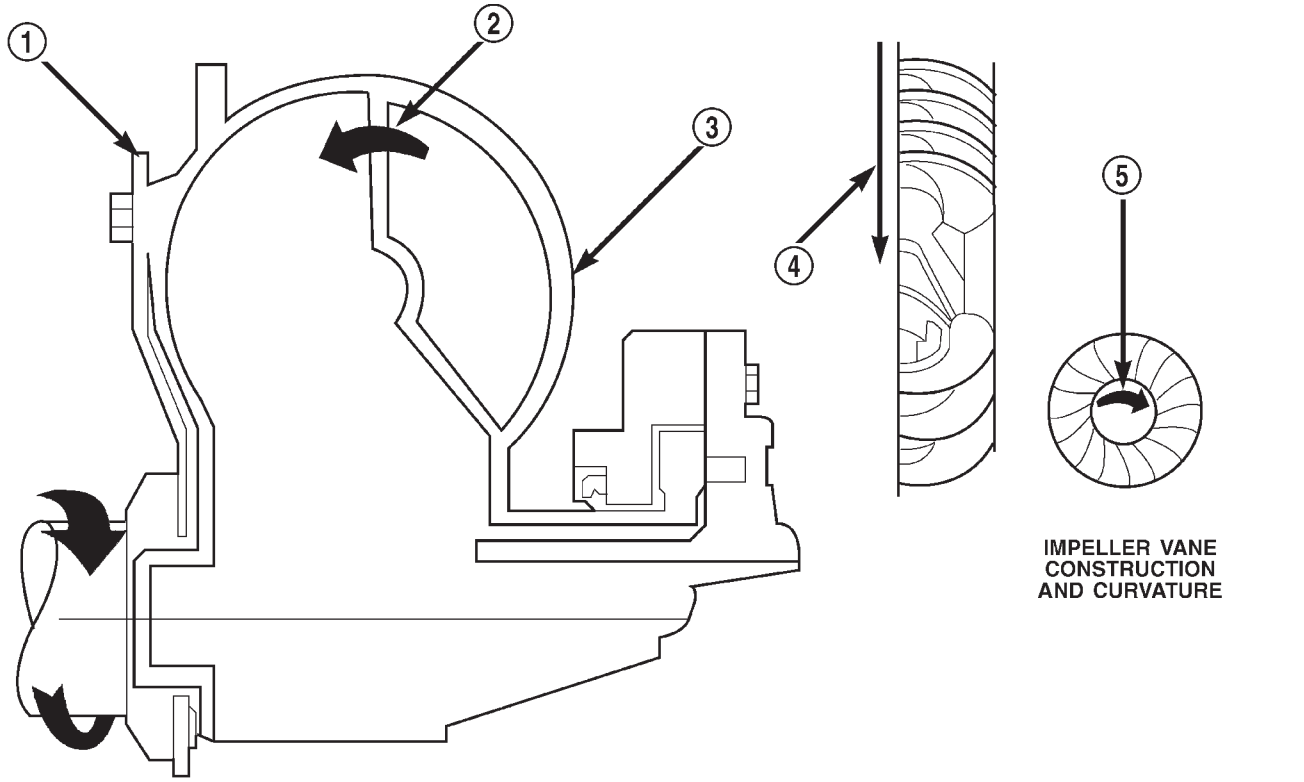


Fig. 246 Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

TORQUE CONVERTER (Continued)

TURBINE

The turbine (Fig. 247) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

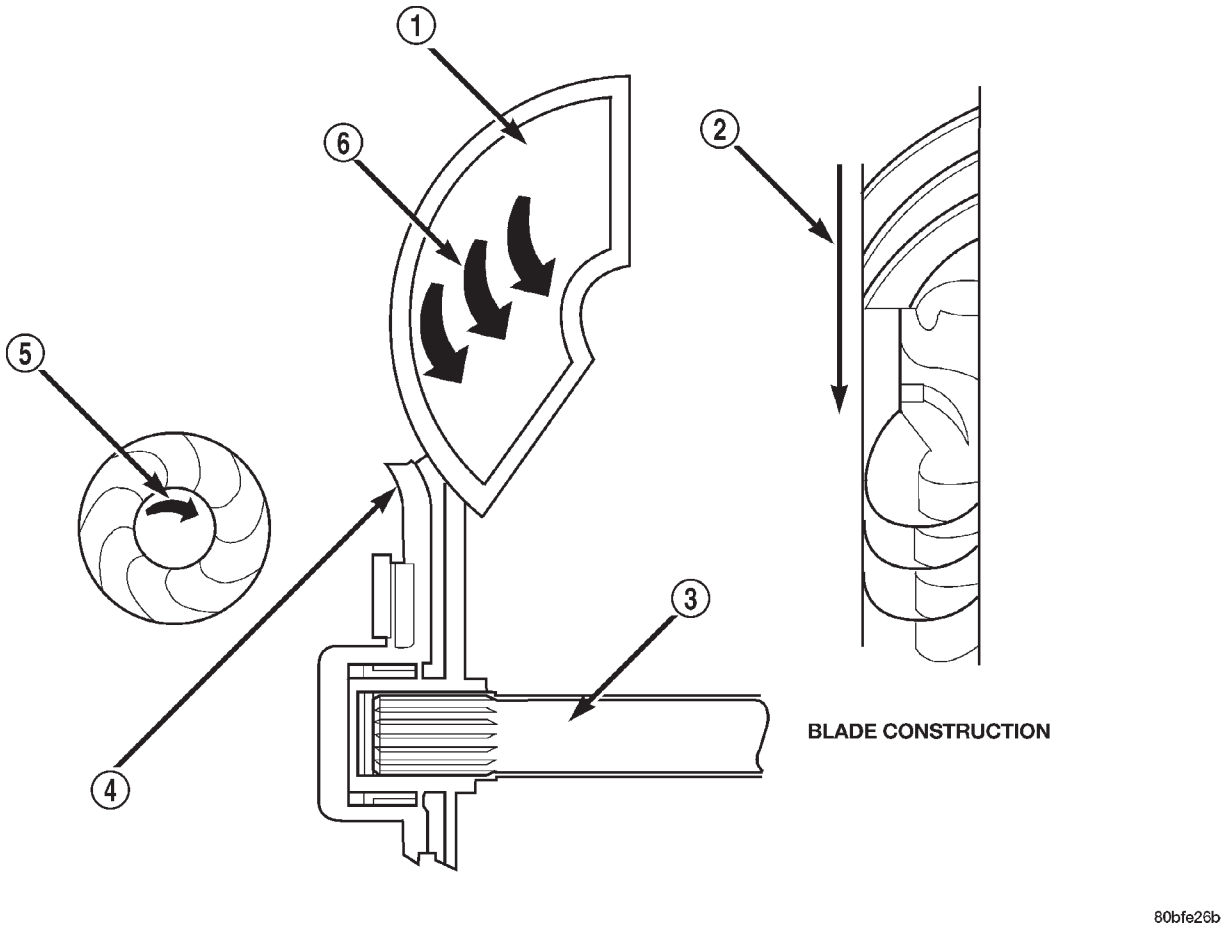


Fig. 247 Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

TORQUE CONVERTER (Continued)

STATOR

The stator assembly (Fig. 248) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 249). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

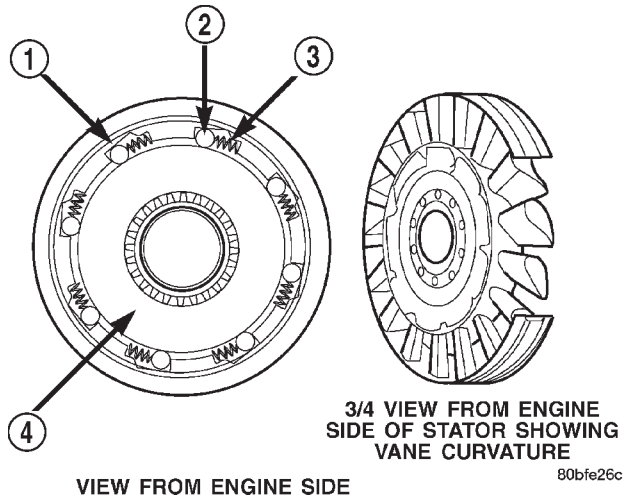


Fig. 248 Stator Components

1 - CAM (OUTER RACE)
2 - ROLLER
3 - SPRING
4 - INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 250) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston was added to the turbine, and a friction material was added to the inside of the front cover to provide this mechanical lock-up.

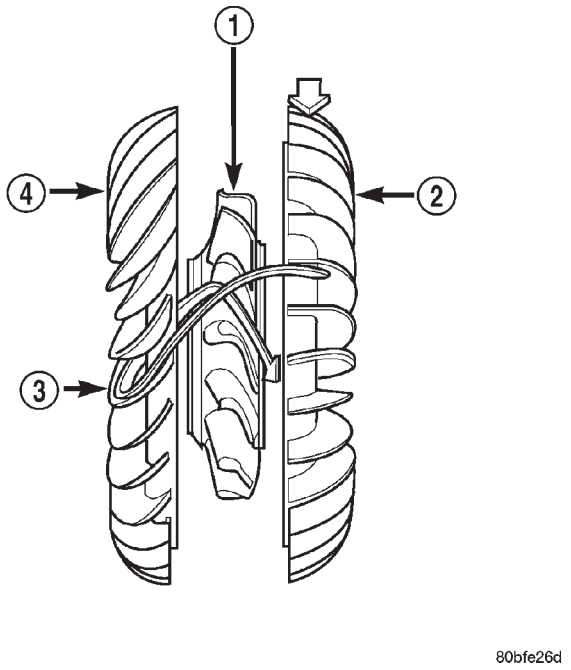


Fig. 249 Stator Location

1 - STATOR
2 - IMPELLER
3 - FLUID FLOW
4 - TURBINE

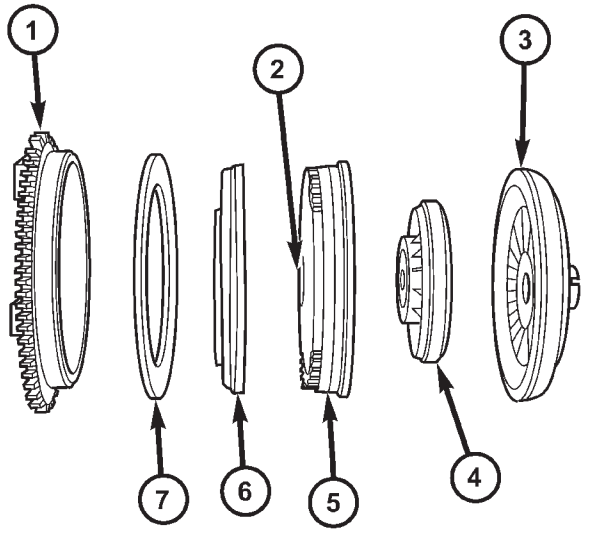


Fig. 250 Torque Converter Clutch (TCC)

1 - IMPELLER FRONT COVER
2 - THRUST WASHER ASSEMBLY
3 - IMPELLER
4 - STATOR
5 - TURBINE
6 - PISTON
7 - FRICTION DISC

TORQUE CONVERTER (Continued)

OPERATION

The converter impeller (Fig. 251) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 252). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counter-clockwise direction. When this happens the overrunning clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

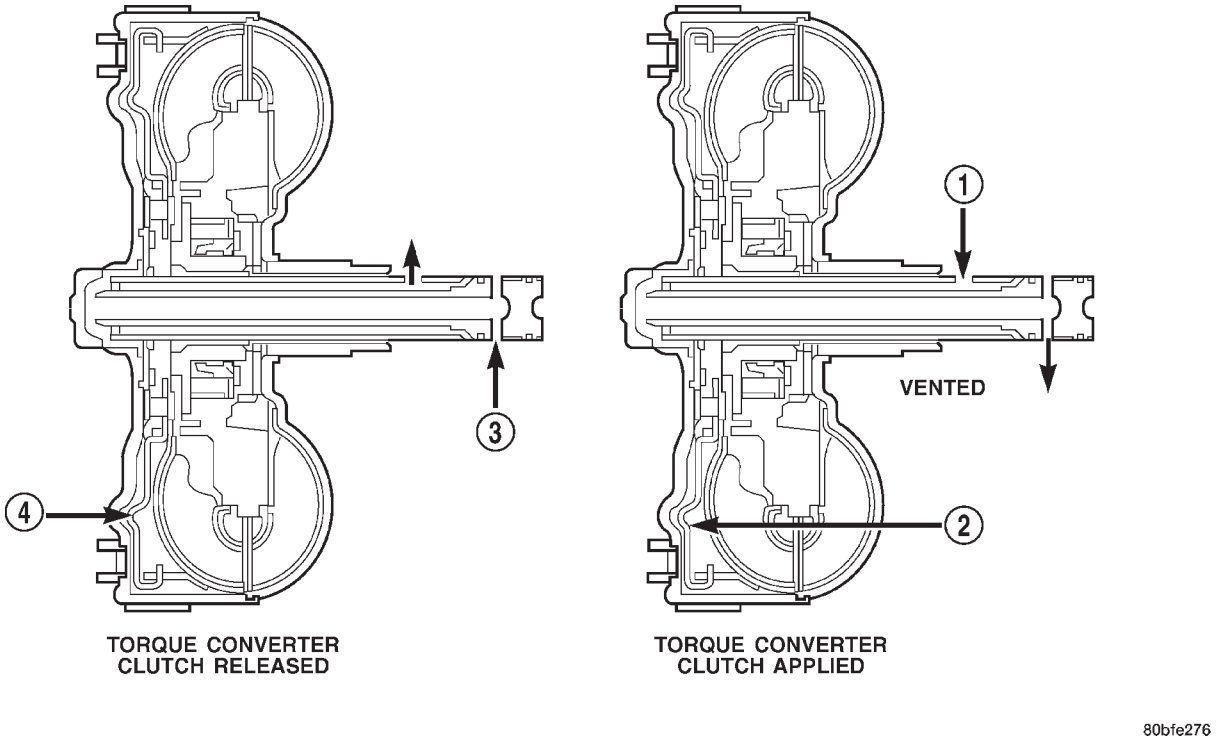


Fig. 251 Torque Converter Fluid Operation

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TORQUE CONVERTER (Continued)

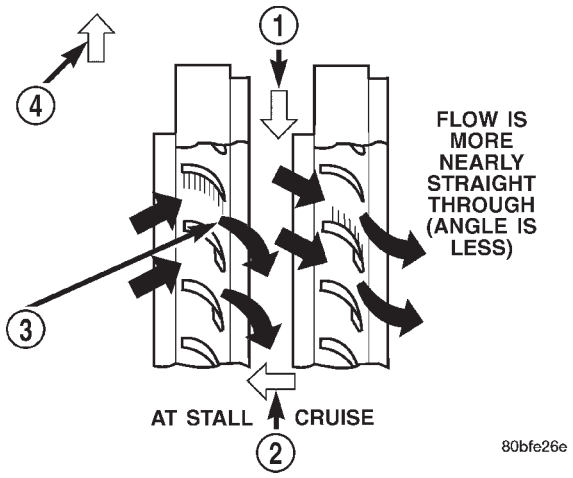


Fig. 252 Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

TORQUE CONVERTER CLUTCH (TCC)

The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in fourth gear, and in third gear under various conditions, such as when the O/D switch is OFF, when the vehicle is cruising on a level surface after the vehicle has warmed up. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased.

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 253). Surface of converter lugs should be 1/2 in. to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

(8) Install the transmission in the vehicle.

(9) Fill the transmission with the recommended fluid.

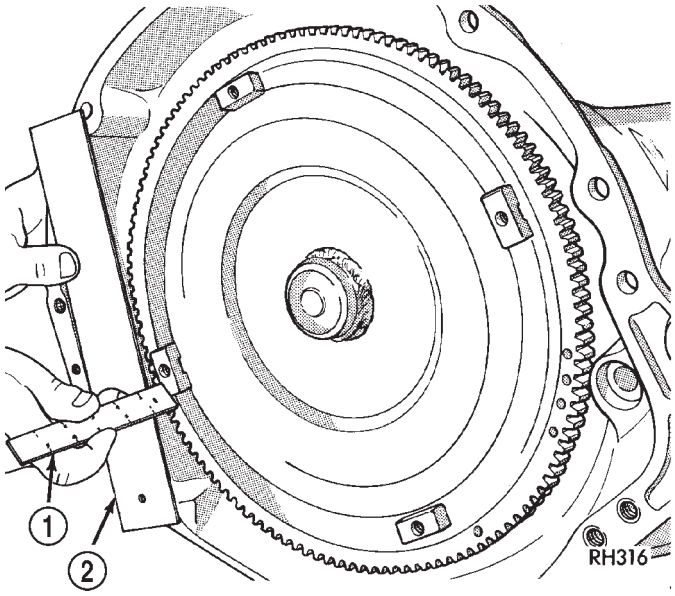


Fig. 253 Checking Torque Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

TORQUE CONVERTER DRAINBACK VALVE

DESCRIPTION

The drainback valve is located in the transmission cooler outlet (pressure) line.

OPERATION

The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have a hose nipple at one end, while the opposite end is threaded for a flare fitting. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

STANDARD PROCEDURE - TORQUE CONVERTER DRAINBACK VALVE

The converter drainback check valve is located in the cooler outlet (pressure) line near the radiator tank. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates significant amounts of sludge and/or clutch particles and metal shavings, the valve must be replaced.

The valve must be removed whenever the cooler and lines are reverse flushed. The valve can be flow tested when necessary. The procedure is exactly the same as for flow testing a cooler.

If the valve is restricted, installed backwards, or in the wrong line, it will cause an overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an overheating condition and eventual transmission failure.

TRANSMISSION TEMPERATURE SENSOR

DESCRIPTION

Transmission fluid temperature readings are supplied to the transmission control module by the thermistor (Fig. 254). The temperature readings are used to control engagement of the fourth gear overdrive clutch, the converter clutch, and governor pressure. Normal resistance value for the thermistor at room temperature is approximately 2000 ohms.

The thermistor is part of the governor pressure sensor assembly and is immersed in transmission fluid at all times.

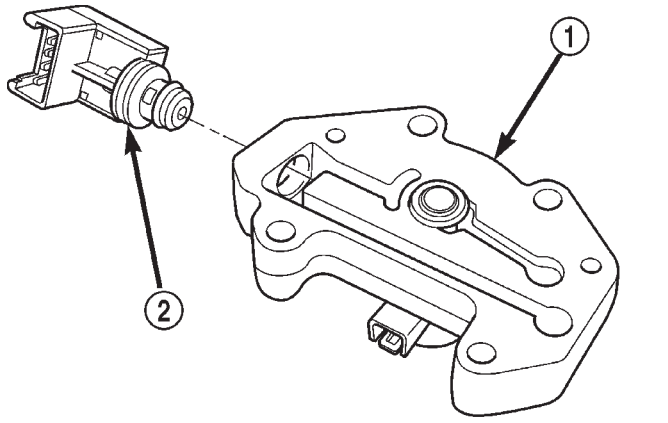


Fig. 254 Governor Pressure Sensor

1 - GOVERNOR BODY
2 - GOVERNOR PRESSURE SENSOR/TRANSMISSION FLUID TEMPERATURE THERMISTOR

OPERATION

The PCM prevents engagement of the converter clutch and overdrive clutch, when fluid temperature is below approximately 10°C (50°F).

If fluid temperature exceeds 126°C (260°F), the PCM causes a 4-3 downshift and engage the converter clutch. Engagement is according to the third gear converter clutch engagement schedule.

The overdrive OFF lamp in the instrument panel illuminates when the shift back to third occurs. The transmission will not allow fourth gear operation until fluid temperature decreases to approximately 110°C (230°F).

VALVE BODY

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components (Fig. 255), (Fig. 256), (Fig. 257), and (Fig. 258):

- Regulator valve
- Regulator valve throttle pressure plug
- Line pressure plug and sleeve
- Kickdown valve
- Kickdown limit valve
- 1-2 shift valve
- 1-2 control valve
- 2-3 shift valve
- 2-3 governor plug
- 3-4 shift valve
- 3-4 timing valve
- 3-4 quick fill valve
- 3-4 accumulator
- Throttle valve
- Throttle pressure plug
- Switch valve
- Manual valve
- Converter clutch lock-up valve
- Converter clutch lock-up timing Valve
- Shuttle valve
- Shuttle valve throttle plug
- Boost Valve
- 10 check balls

By adjusting the spring pressure acting on the regulator valve, transmission line pressure can be adjusted.

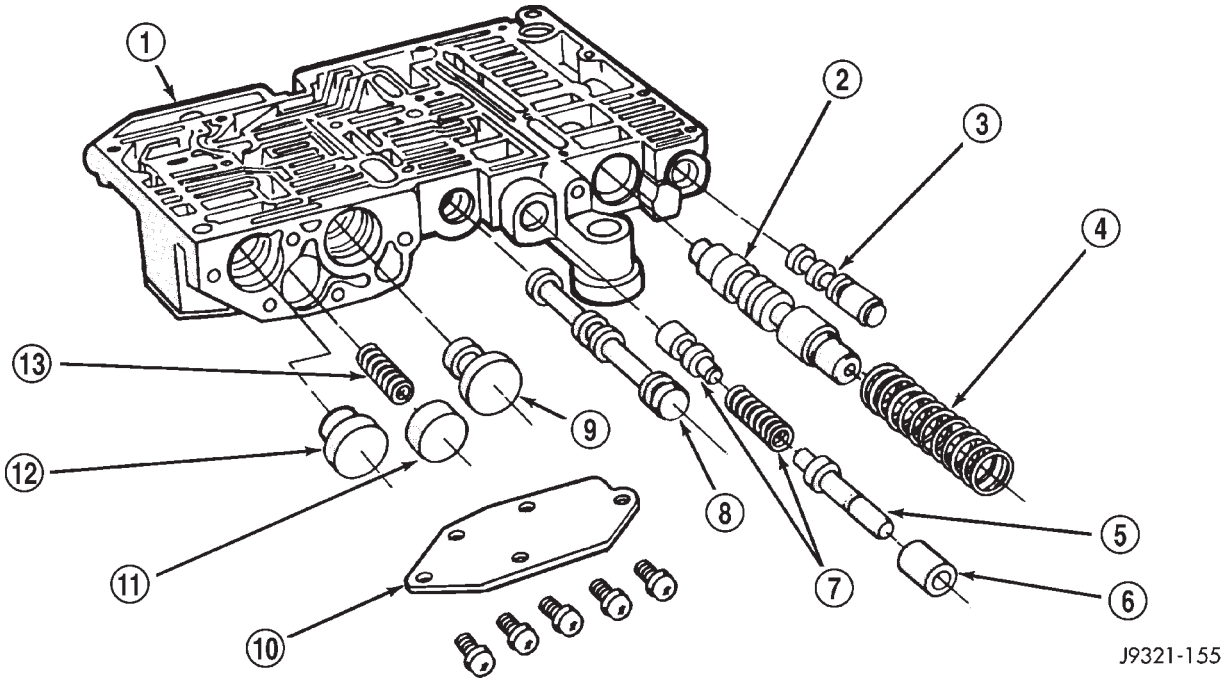


Fig. 255 Upper Housing Control Valve Locations

1 - UPPER HOUSING
2 - REGULATOR VALVE
3 - SWITCH VALVE
4 - REGULATOR VALVE SPRING
5 - KICKDOWN VALVE
6 - KICKDOWN DETENT
7 - THROTTLE VALVE AND SPRING
8 - MANUAL VALVE
9 - 1-2 GOVERNOR PLUG
10 - GOVERNOR PLUG COVER
11 - THROTTLE PLUG
12 - 2-3 GOVERNOR PLUG
13 - SHUTTLE VALVE PRIMARY SPRING

VALVE BODY (Continued)

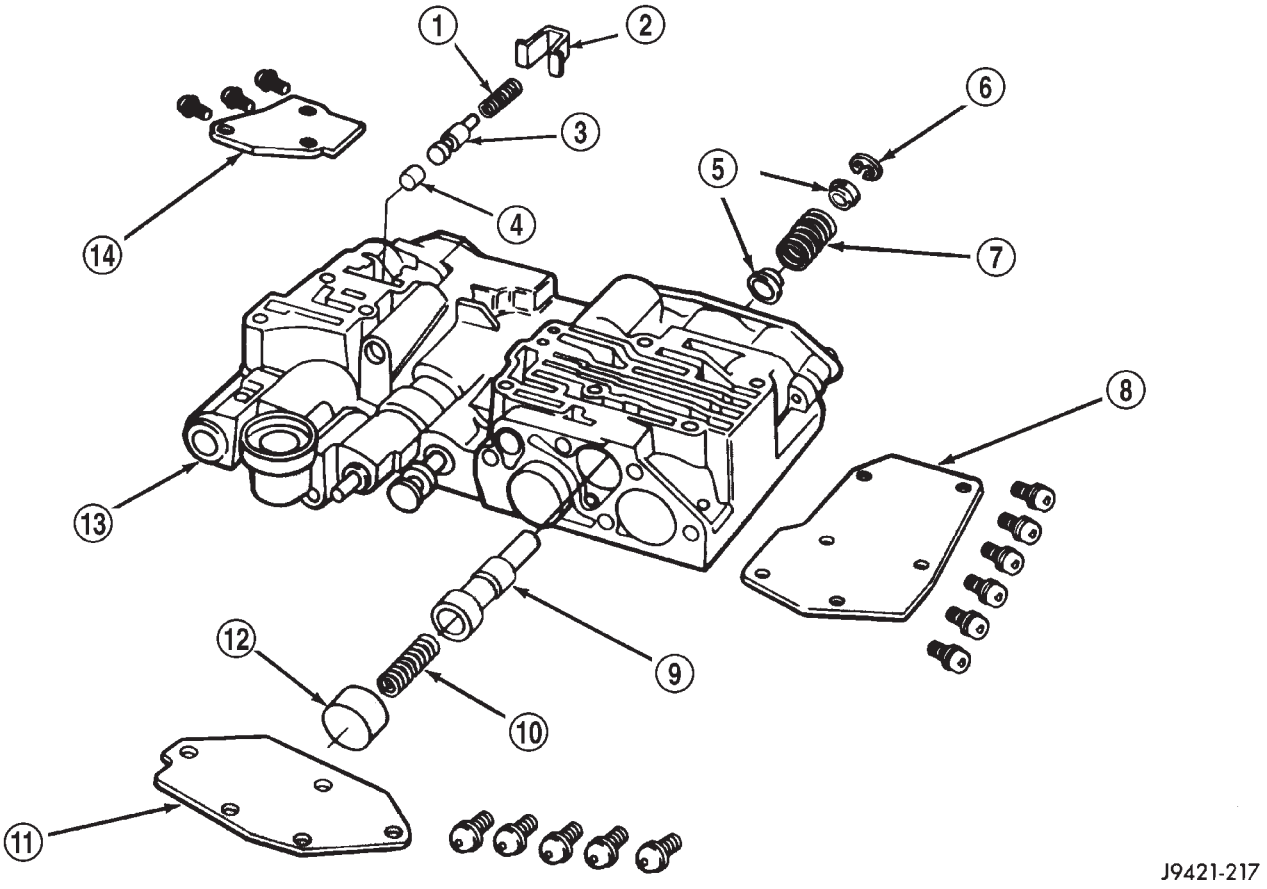


Fig. 256 Shuttle and Boost Valve Locations

1 - SPRING	8 - SHUTTLE VALVE COVER
2 - RETAINER	9 - SHUTTLE VALVE
3 - BOOST VALVE	10 - SHUTTLE VALVE PRIMARY SPRING
4 - BOOST VALVE PLUG	11 - GOVERNOR PLUG COVER
5 - SPRING GUIDES	12 - THROTTLE PLUG
6 - E-CLIP	13 - UPPER HOUSING
7 - SHUTTLE VALVE SECONDARY SPRING	14 - BOOST VALVE COVER

VALVE BODY (Continued)

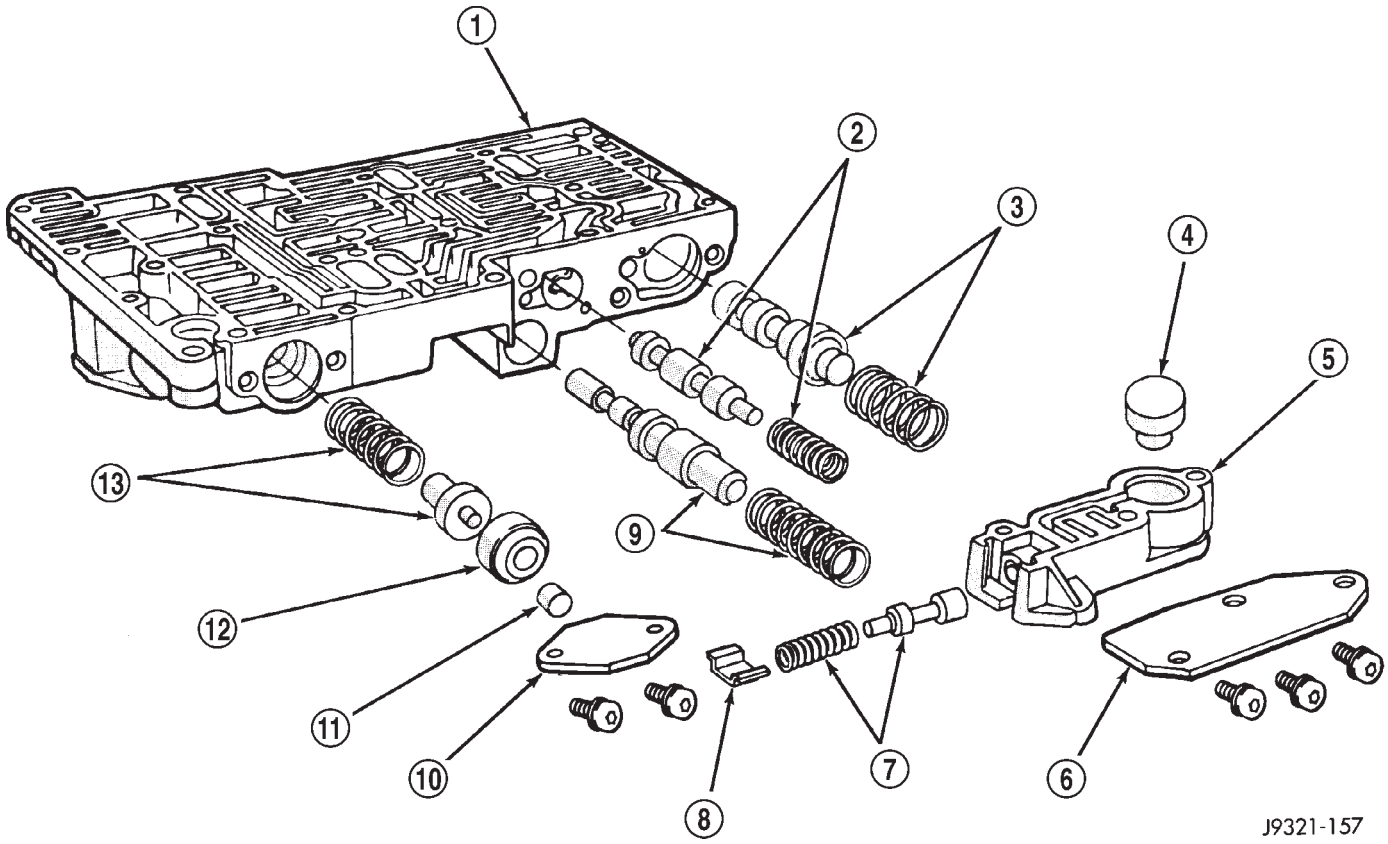


Fig. 257 Upper Housing Shift Valve and Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - LINE PRESSURE PLUG
12 - PLUG SLEEVE
13 - THROTTLE PRESSURE SPRING AND PLUG

VALVE BODY (Continued)

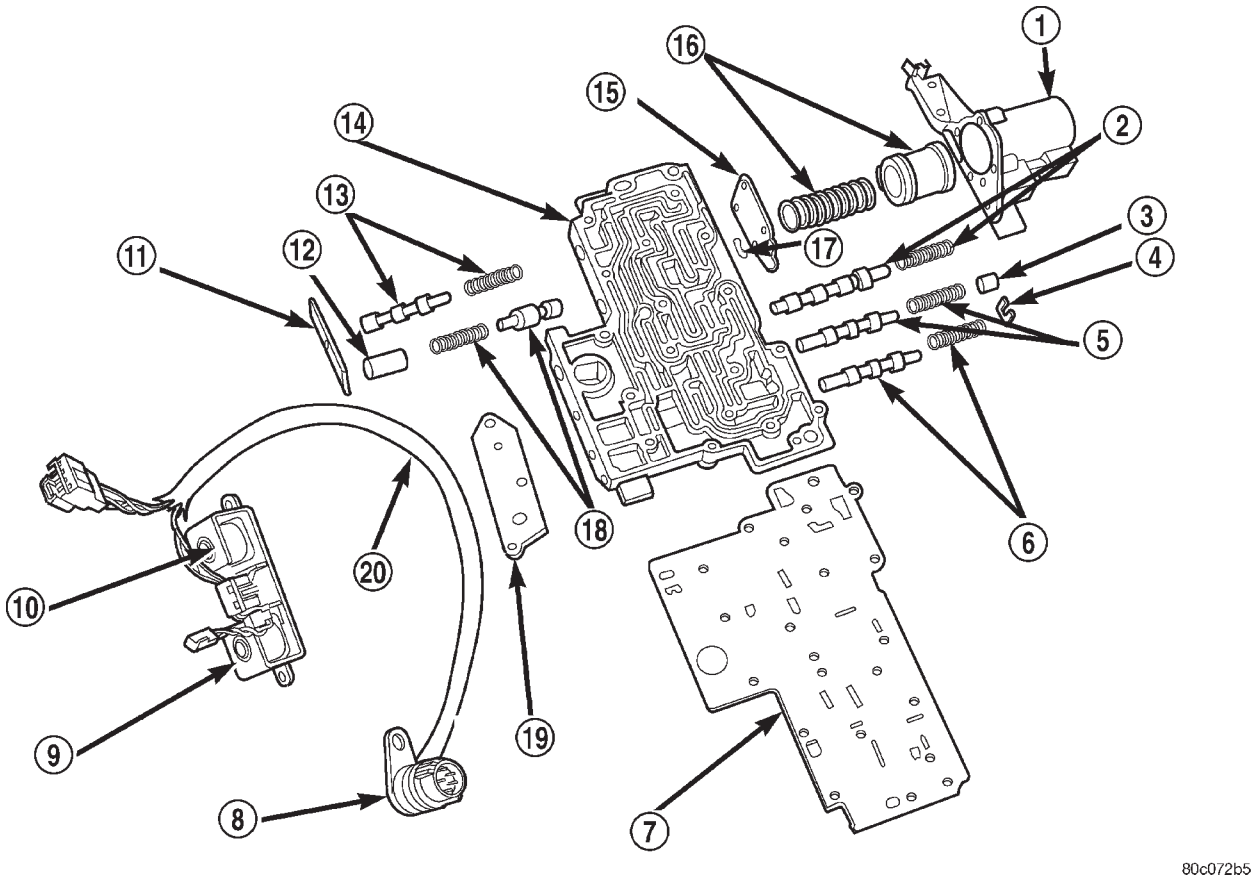


Fig. 258 Lower Housing Shift Valves and Springs

1 - 3-4 ACCUMULATOR HOUSING
2 - 3-4 SHIFT VALVE AND SPRING
3 - PLUG
4 - SPRING RETAINER
5 - CONVERTER CLUTCH VALVE AND SPRING
6 - CONVERTER CLUTCH TIMING VALVE AND SPRING
7 - OVERDRIVE SEPARATOR PLATE
8 - CASE CONNECTOR
9 - CONVERTER CLUTCH SOLENOID
10 - OVERDRIVE SOLENOID
11 - TIMING VALVE COVER
12 - PLUG
13 - 3-4 TIMING VALVE AND SPRING
14 - LOWER HOUSING
15 - ACCUMULATOR END PLATE
16 - 3-4 ACCUMULATOR PISTON AND SPRING
17 - E-CLIP
18 - 3-4 QUICK FILL SPRING AND VALVE
19 - SOLENOID GASKET
20 - HARNESS

VALVE BODY (Continued)

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

CHECK BALLS

CHECK BALL NUMBER	DESCRIPTION
1	Allows either the manual valve to put line pressure on the 1-2 governor plug or the KD Valve to put WOT line pressure on the 1-2 governor plug.
2	Allows either the manual valve to put line pressure on the 2-3 governor plug or the KD Valve to put WOT line pressure on the 2-3 governor plug.
3	Allows either the Reverse circuit or the 3rd gear circuit to pressurize the front clutch.
4	Allows either the Manual Low circuit from the Manual Valve or the Reverse from the Manual Valve circuit to pressurize the rear servo.
5	Directs line pressure to the spring end of the 2-3 shift valve in either Manual Low or Manual 2nd, forcing the downshift to 2nd gear regardless of governor pressure.
6	Provides a by-pass around the front servo orifice so that the servo can release quickly.
7	Provides a by-pass around the rear clutch orifice so that the clutch can release quickly.
8	Directs reverse line pressure through an orifice to the throttle valve eliminating the extra leakage and insuring that Reverse line pressure pressure will be sufficient.
9	Provides a by-pass around the rear servo orifice so that the servo can release quickly.
ECE (10)	Allows the lockup clutch to used at WOT in 3rd gear by putting line pressure from the 3-4 Timing Valve on the interlock area of the 2-3 shift valve, thereby preventing a 3rd gear Lock-up to 2nd gear kickdown.

VALVE BODY (Continued)

REGULATOR VALVE

The pressure regulator valve is needed to control the hydraulic pressure within the system and reduce the amount of heat produced in the fluid. The pressure regulator valve is located in the valve body near the manual valve. The pressure regulator valve train controls the maximum pressure in the lines by metering the dumping of fluid back into the sump. Regulated pressure is referred to as “line pressure.”

The regulator valve (Fig. 259) has a spring on one end that pushes the valve to the left. This closes a dump (vent) that is used to lower pressure. The closing of the dump will cause the oil pressure to increase. Oil pressure on the opposite end of the valve pushes the valve to the right, opening the dump and lowering oil pressure. The result is spring pressure working against oil pressure to maintain the oil at specific pressures. With the engine running, fluid flows from the pump to the pressure regulator valve, manual valve, and the interconnected circuits. As fluid is sent through passages to the regulator valve, the pressure pushes the valve to the right against the large spring. It is also sent to the reaction areas on the left side of the throttle pressure plug and the line pressure plug. With the gear selector in the PARK position, fluid recirculates through the regulator and manual valves back to the sump.

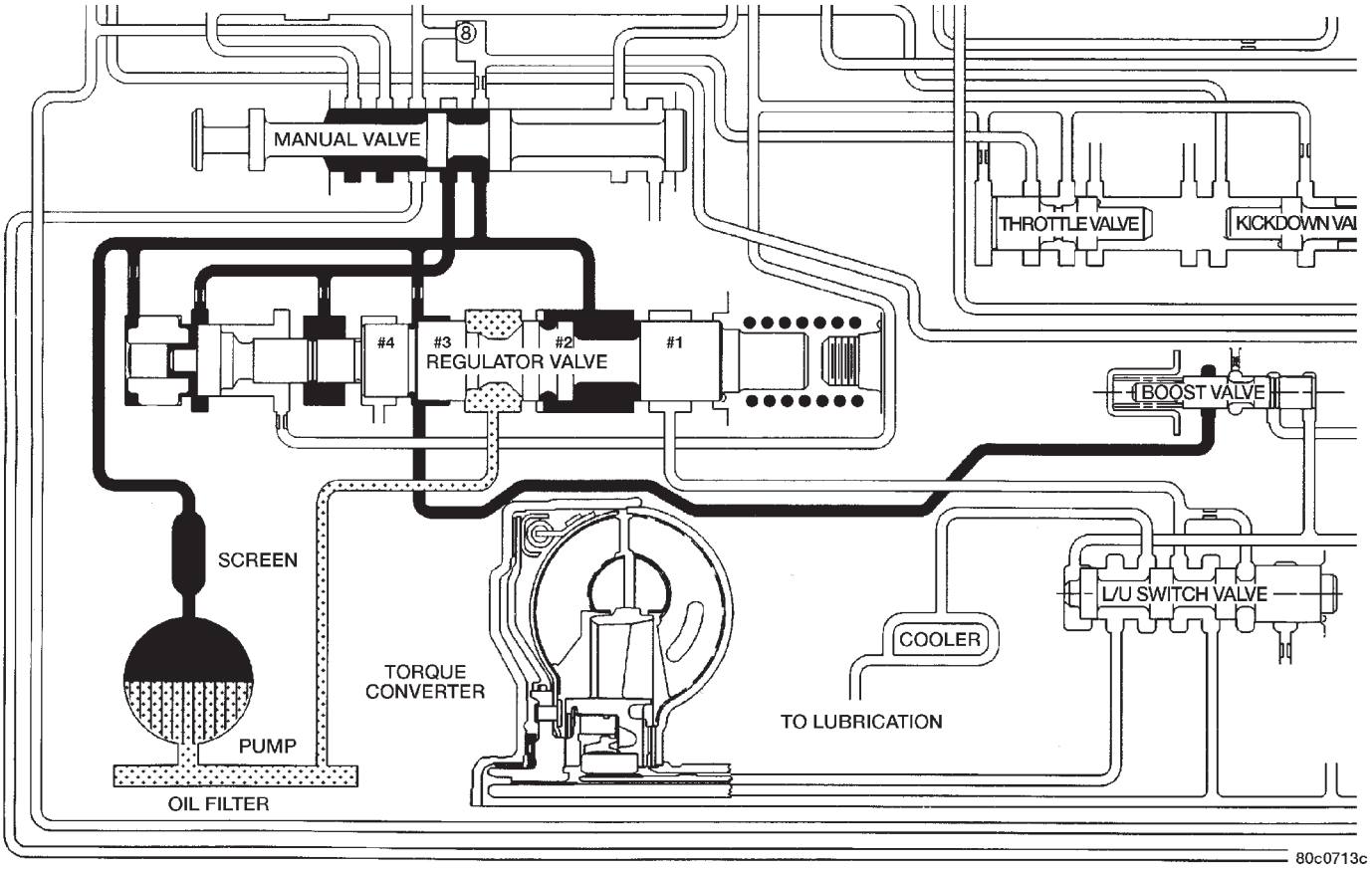


Fig. 259 Regulator Valve in PARK Position

VALVE BODY (Continued)

Meanwhile, the torque converter is filled slowly. In all other gear positions (Fig. 260), fluid flows between two right side lands to the switch valve and torque converter. At low pump speeds, the flow is controlled by the pressure valve groove to reduce pressure to the torque converter. After the torque converter and switch valve fill with fluid, the switch valve becomes the controlling metering device for torque converter pressure. The regulator valve then begins to control the line pressure for the other transmission circuits. The balance of the fluid pressure pushing the valve to the right and the spring pressure pushing to the left determines the size of the metering passage at land #2 (land #1 being at the far right of the valve in the diagram). As fluid leaks past the land, it moves into a groove connected to the filter or sump. As the land meters the fluid to the sump, it causes the pressure to reduce and the spring decreases the size of the metering passage. When the size of the metering passage is reduced, the pressure rises again and the size of the land is increased again. Pressure is regulated by this constant balance of hydraulic and spring pressure.

The metering at land #2 establishes the line pressure throughout the transmission. It is varied according to changes in throttle position and the transmission's internal condition within a range of 57-94 psi (except in REVERSE) (Fig. 261). The regulated line pressure in REVERSE (Fig. 262) is held at much higher pressures than in the other gear positions: 145-280 psi. The higher pressure for REVERSE is achieved by the manual valve blocking the supply of line pressure to the reaction area left of land #4. With this pressure blocked, there is less area for pressure to act on to balance the force of the spring on the right. This allows line pressure to push the valve train to the right, reducing the amount of fluid returned to the pump's inlet, increasing line pressure.

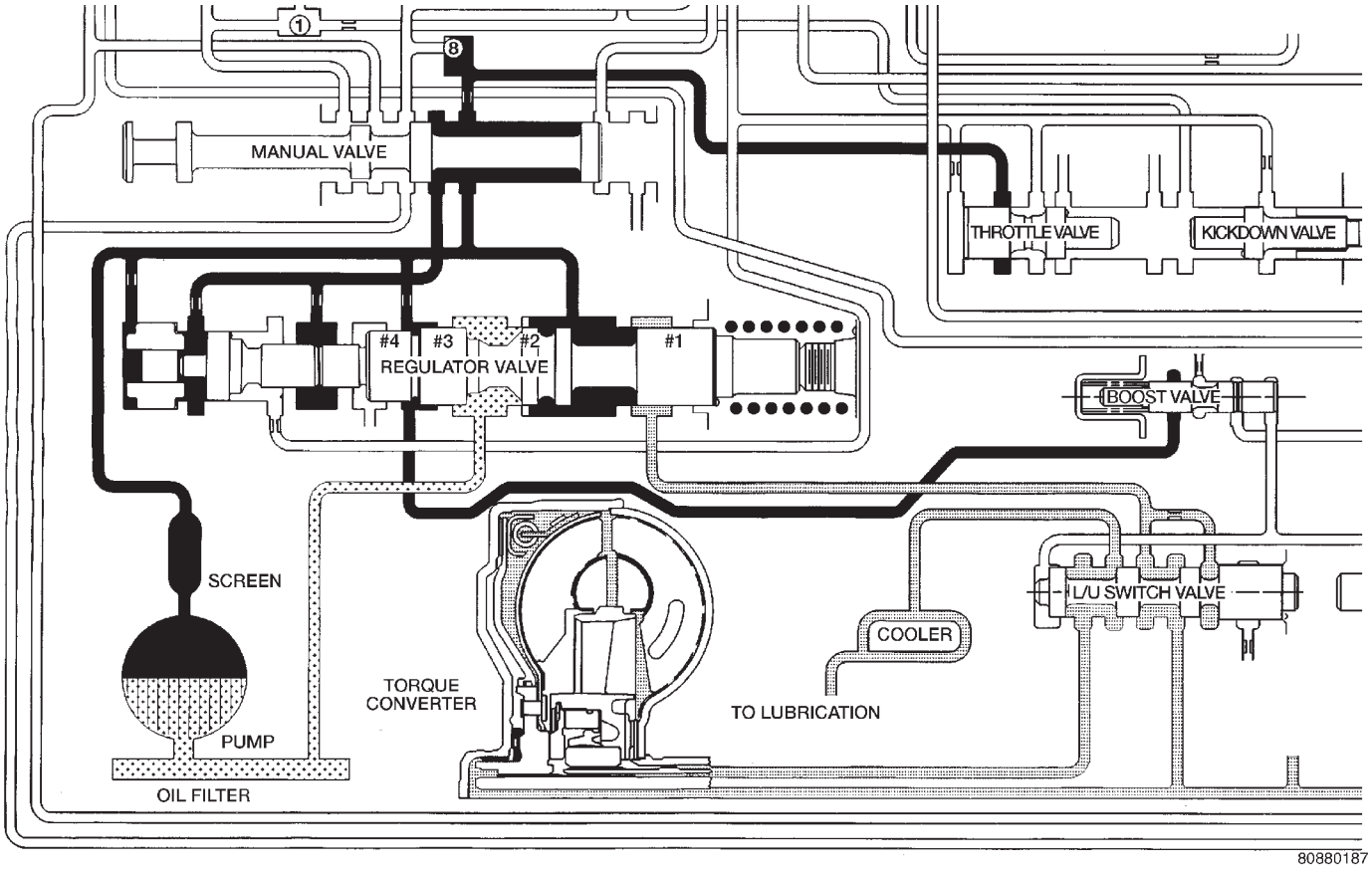


Fig. 260 Regulator Valve in NEUTRAL Position

VALVE BODY (Continued)

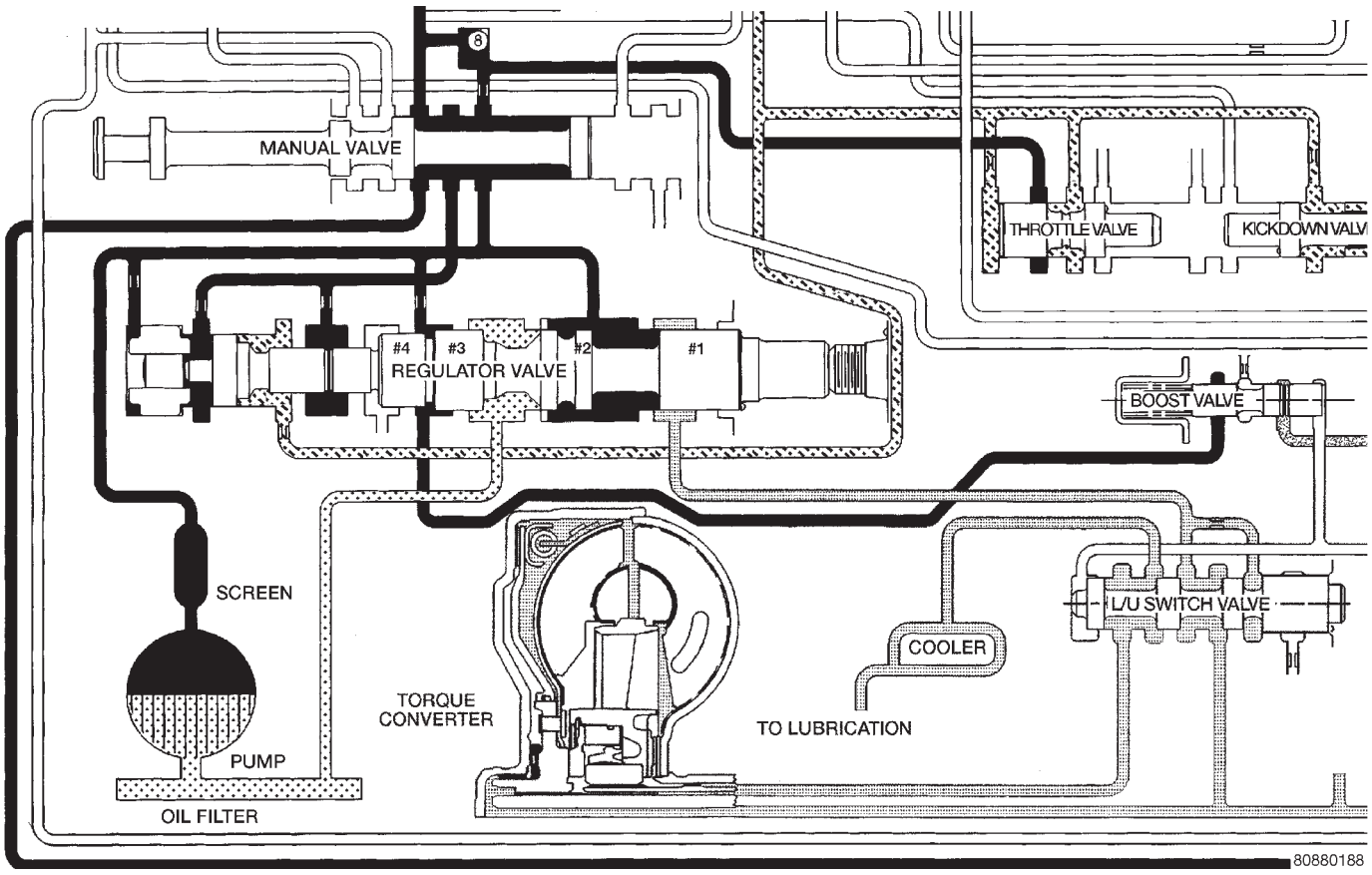


Fig. 261 Regulator Valve in DRIVE Position

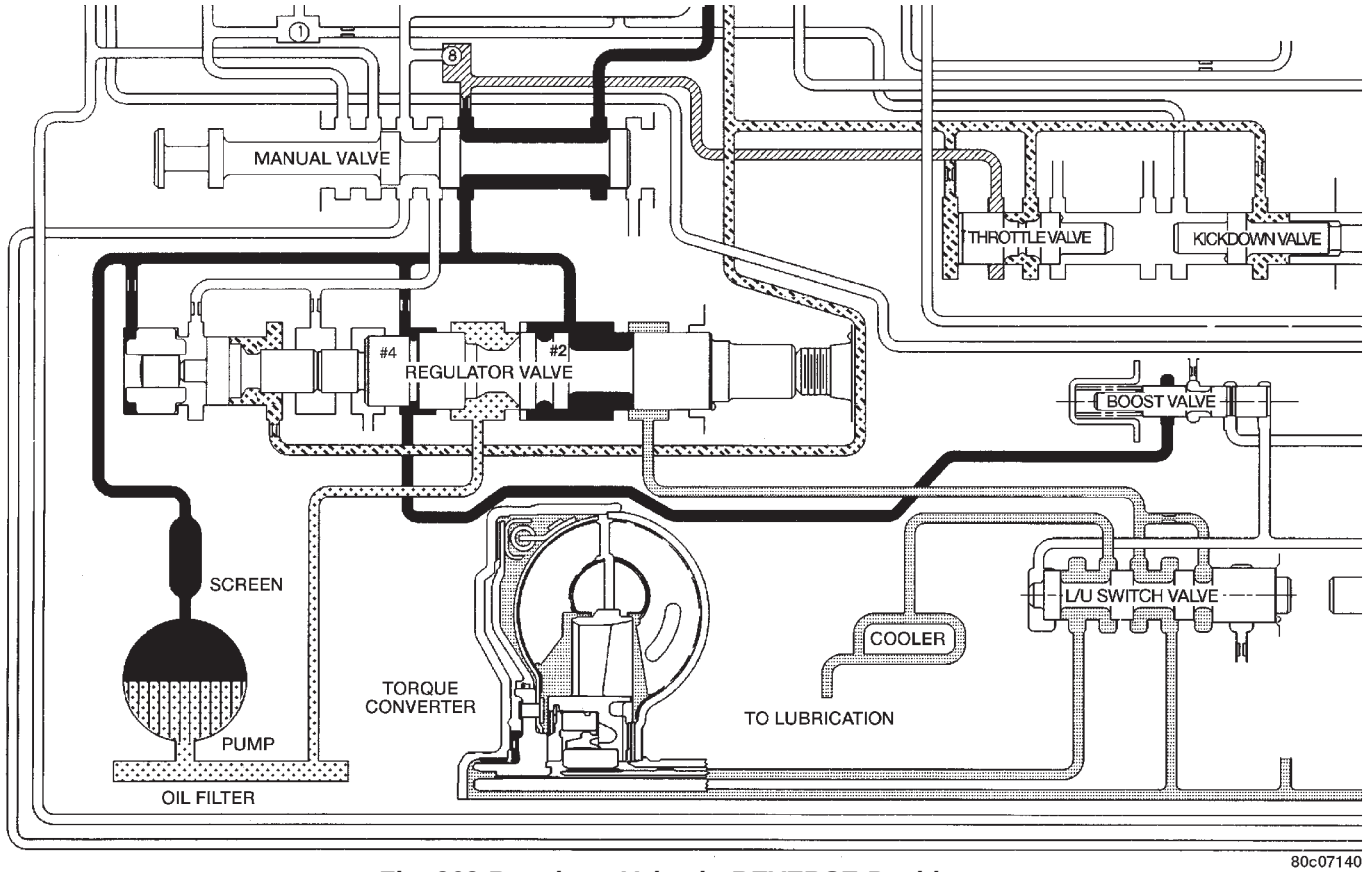


Fig. 262 Regulator Valve in REVERSE Position

VALVE BODY (Continued)

KICKDOWN VALVE

When the throttle valve is as far over to the left as it can go, the maximum line pressure possible will enter the throttle pressure circuit. In this case, throttle pressure will equal line pressure. With the kickdown valve (Fig. 263) pushed into the bore as far as it will go, fluid initially flows through the annular groove of the 2-3 shift valve (which will be in the direct drive position to the right).

After passing the annular groove, the fluid is routed to the spring end of the 2-3 shift valve. Fluid pressure reacting on the area of land #1 overcomes governor pressure, downshifting the 2-3 shift valve into the kickdown, or second gear stage of operation. The valve is held in the kickdown position by throttle pressure routed from a seated check ball (#2). Again, if vehicle speed is low enough, throttle pressure will also push the 1-2 shift valve left to seat its governor plug, and downshift to drive breakaway.

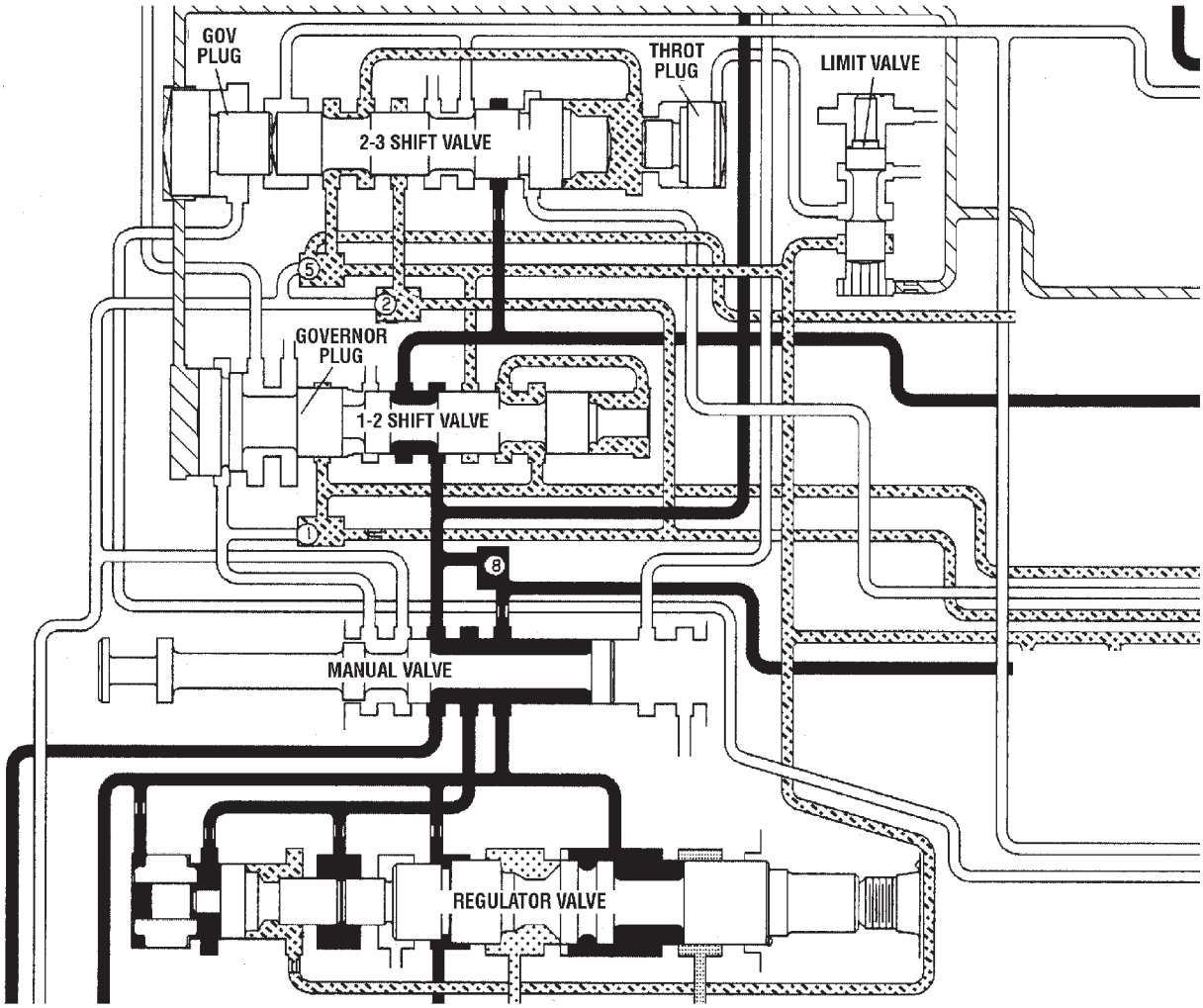


Fig. 263 Kickdown Valve-Wide Open Throttle

VALVE BODY (Continued)

KICKDOWN LIMIT VALVE

The purpose of the limit valve is to prevent a 3-2 downshift at higher speeds when a part-throttle downshift is not desirable. At these higher speeds only a full throttle 3-2 downshift will occur. At low road speeds (Fig. 264) the limit valve does not come into play and does not affect the downshifts. As the vehicle's speed increases (Fig. 265), the governor pressure also increases. The increased governor pressure acts on the reaction area of the bottom land of the limit valve overcoming the spring force trying to push the valve toward the bottom of its bore. This pushes the valve upward against the spring and bottoms the valve against the top of the housing. With the valve bottomed against the housing, the throttle pressure supplied to the valve will be closed off by the bottom land of the limit valve. When the supply of throttle pressure has been shut off, the 3-2 part throttle downshift plug becomes inoperative, because no pressure is acting on its reaction area.

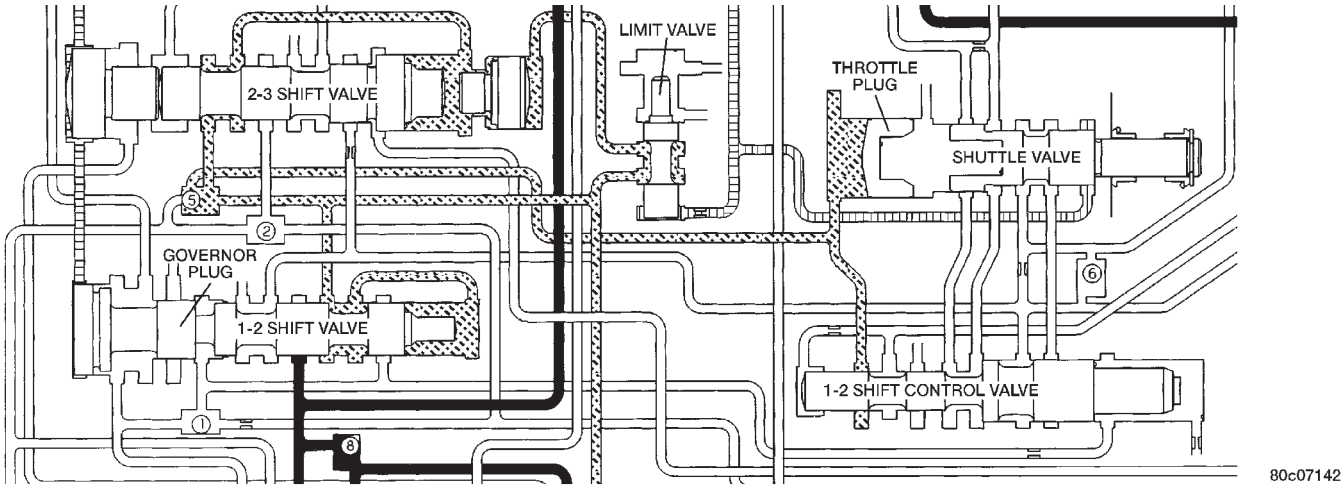


Fig. 264 Kickdown Limit Valve-Low Speeds

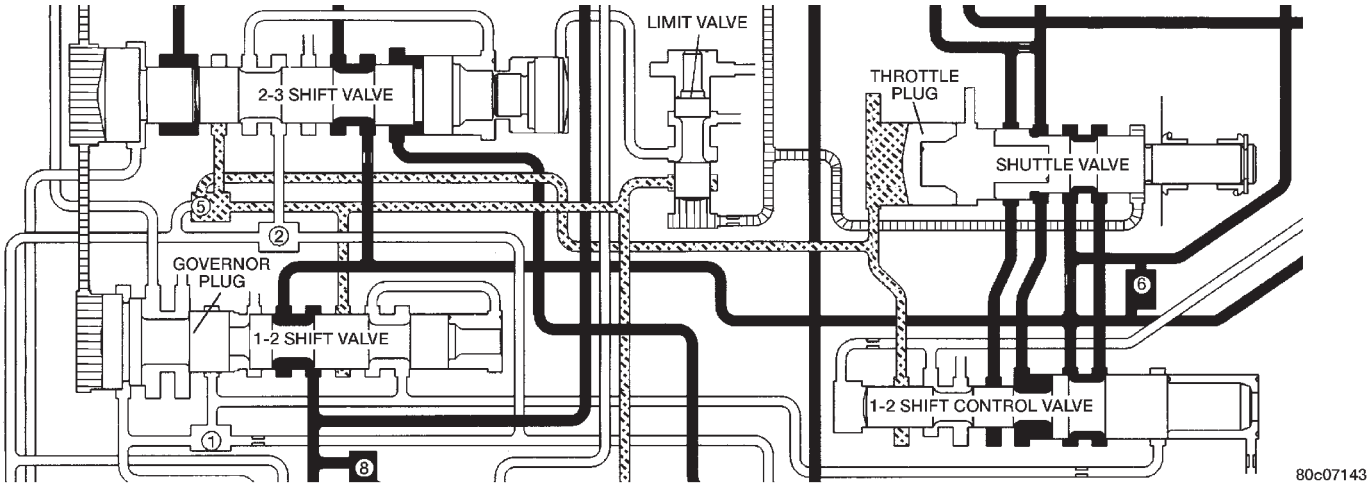


Fig. 265 Kickdown Limit Valve-High Speeds

VALVE BODY (Continued)

1-2 SHIFT VALVE

The 1-2 shift valve assembly (Fig. 266), or mechanism, consists of: the 1-2 shift valve, governor plug, and a spring on the end of the valve. After the manual valve has been placed into a forward gear range, line pressure is directed to the 1-2 shift valve. As the throttle is depressed, throttle pressure is applied to the right side of the 1-2 shift valve assembly. With throttle pressure applied to the right side of the valve, there is now both spring pressure and throttle pressure acting on the valve, holding it against the governor plug. As the vehicle begins to move and build speed, governor pressure is created and is applied to the left of the valve at the governor plug.

When governor pressure builds to a point where it can overcome the combined force of the spring and throttle pressure on the other side of the valve, the valve will begin to move over to the right. As the valve moves to the right, the middle land of the valve will close off the circuit supplying the throttle pressure to the right side of the valve. When the throttle pressure is closed off, the valve will move even farther to the right, allowing line pressure to enter another circuit and energize the front servo, applying the front band (Fig. 267).

The governor plug serves a dual purpose:

- It allows the shift valves to move either left or right, allowing both upshifts and downshifts.
- When in a manual selection position, it will be hydraulically “blocked” into position so no upshift can occur.

The physical blocking of the upshift while in the manual “1” position is accomplished by the directing of line pressure between both lands of the governor plug. The line pressure reacts against the larger land of the plug, pushing the plug back against the end plate overcoming governor pressure. With the combination of the line pressure and spring pressure, the valve cannot move, preventing any upshift.

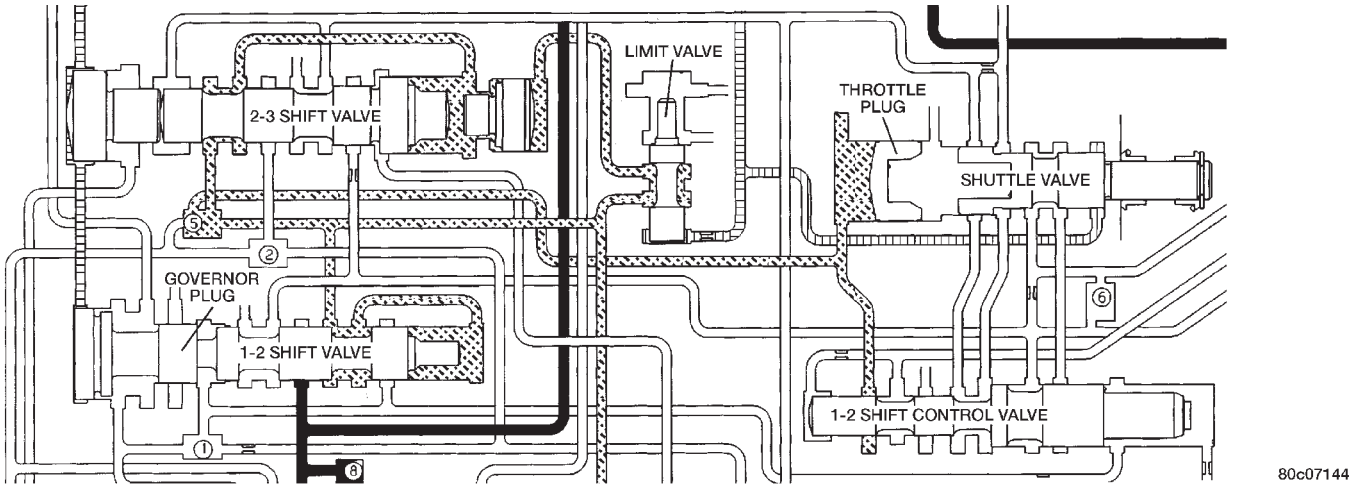


Fig. 266 1-2 Shift Valve-Before Shift

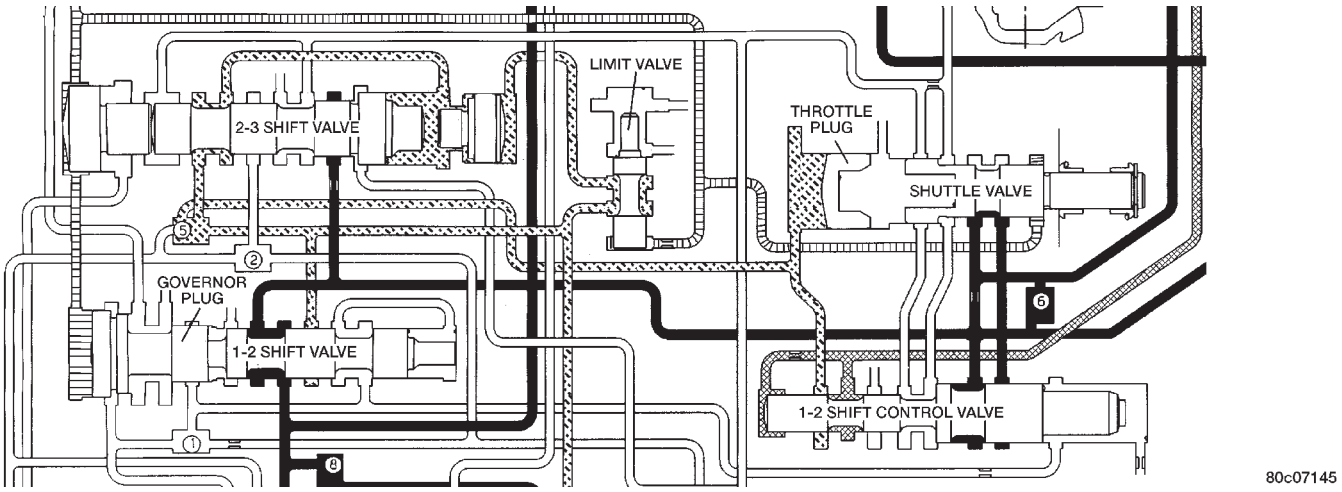


Fig. 267 1-2 Shift Valve-After Shift

VALVE BODY (Continued)

1-2 SHIFT CONTROL VALVE

It contains a valve with four lands and a spring. It is used as both a “relay” and “balanced” valve.

The valve has two specific operations (Fig. 268):

- Aid in quality of the 1-2 upshift.
- Aid in the quality and timing of the 3-2 kickdown ranges.

When the manual valve is set to the DRIVE position and the transmission is in the first or second gear range, 1-2 shift control or “modulated throttle pressure” is supplied to the middle of the accumulator piston by the 1-2 shift control valve. During the 1-2 upshift, this pressure is used to control the kickdown servo apply pressure that is needed to apply the kickdown and accumulator pistons. Thus, the 1-2 shift point is “cushioned” and the quality is improved. During a WOT kickdown, kickdown pressure is applied between the kickdown valve and the 1-2 shift control valve. This additional pressure is directed to the 1-2 shift control's spring cavity, adding to the spring load on the valve. The result of this increased “modulated” throttle pressure is a firmer WOT upshift.

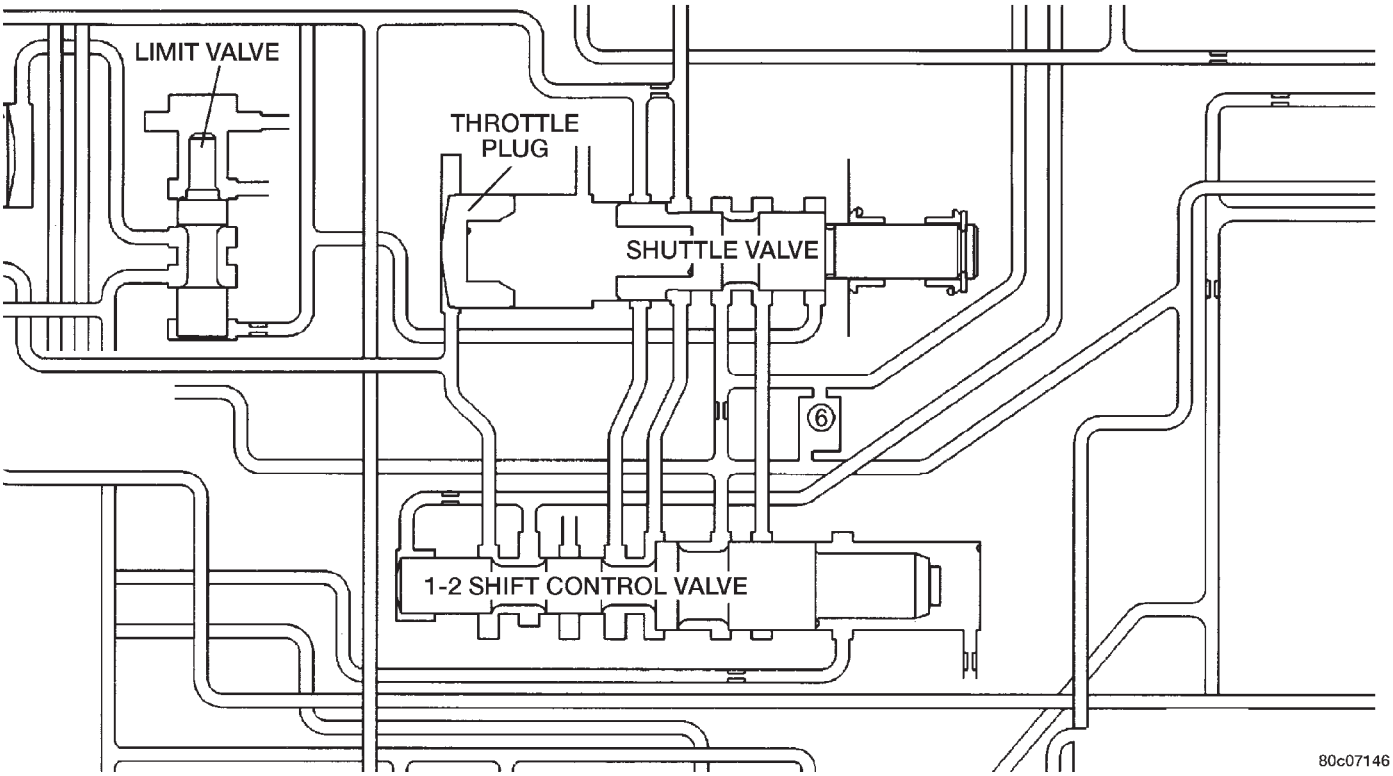


Fig. 268 1-2 Shift Control Valve

VALVE BODY (Continued)

2-3 SHIFT VALVE

The 2-3 shift valve mechanism (Fig. 269) consists of the 2-3 shift valve, governor plug and spring, and a throttle plug. After the 1-2 shift valve has completed its operation and applied the front band, line pressure is directed to the 2-3 shift valve through the connecting passages from the 1-2 shift valve. The line pressure will then dead–end at land #2 until the 2-3 valve is ready to make its shift. Now that the vehicle is in motion and under acceleration, there is throttle pressure being applied to the spring side of the valve and between lands #3 and #4.

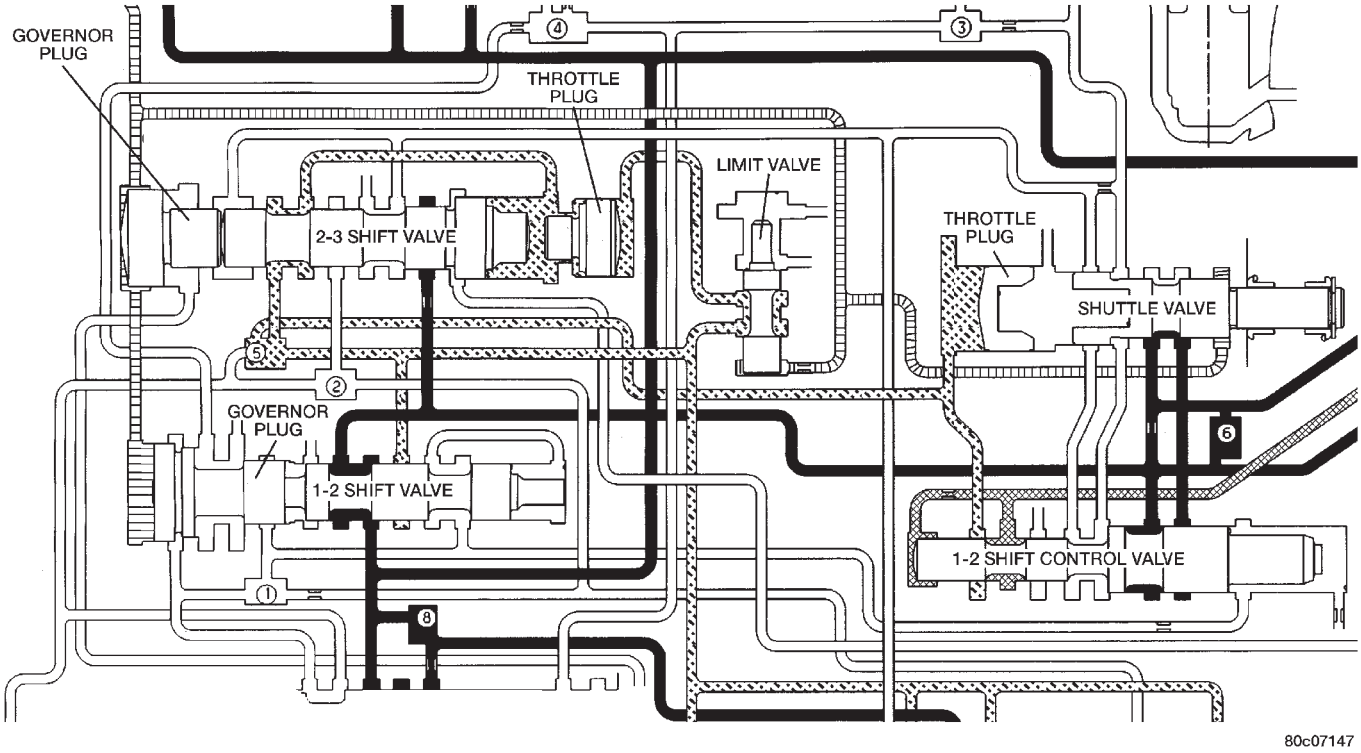


Fig. 269 2-3 Shift Valve-Before Shift

VALVE BODY (Continued)

As vehicle speed increases, governor pressure increases proportionately, until it becomes great enough to overcome the combined throttle and spring pressure on the right side of the valve. Since the throttle pressure end of the 2-3 shift valve is larger in diameter than the 1-2 shift valve, the 2-3 shift will always happen at a greater speed than the 1-2 shift. When this happens, the governor plug is forced against the shift valve moving it to the right. The shift valve causes land #4 to close the passage supplying throttle pressure to the 2-3 shift valve. Without throttle pressure present in the circuit now, the governor plug will push the valve over far enough to bottom the valve in its bore. This allows land #2 to direct line pressure to the front clutch.

After the shift (Fig. 270), line pressure is directed to the land between the shift valve and the governor plug, and to the release side of the kickdown servo. This releases the front band and applies the front clutch, shifting into third gear or direct drive. The rear clutch remains applied, as it has been in the other gears. During a manual “1” or manual “2” gear selection, line pressure is sent between the two lands of the 2-3 governor plug. This line pressure at the governor plug locks the shift valve into the second gear position, preventing an upshift into direct drive. The theory for the blocking of the valve is the same as that of the 1-2 shift valve.

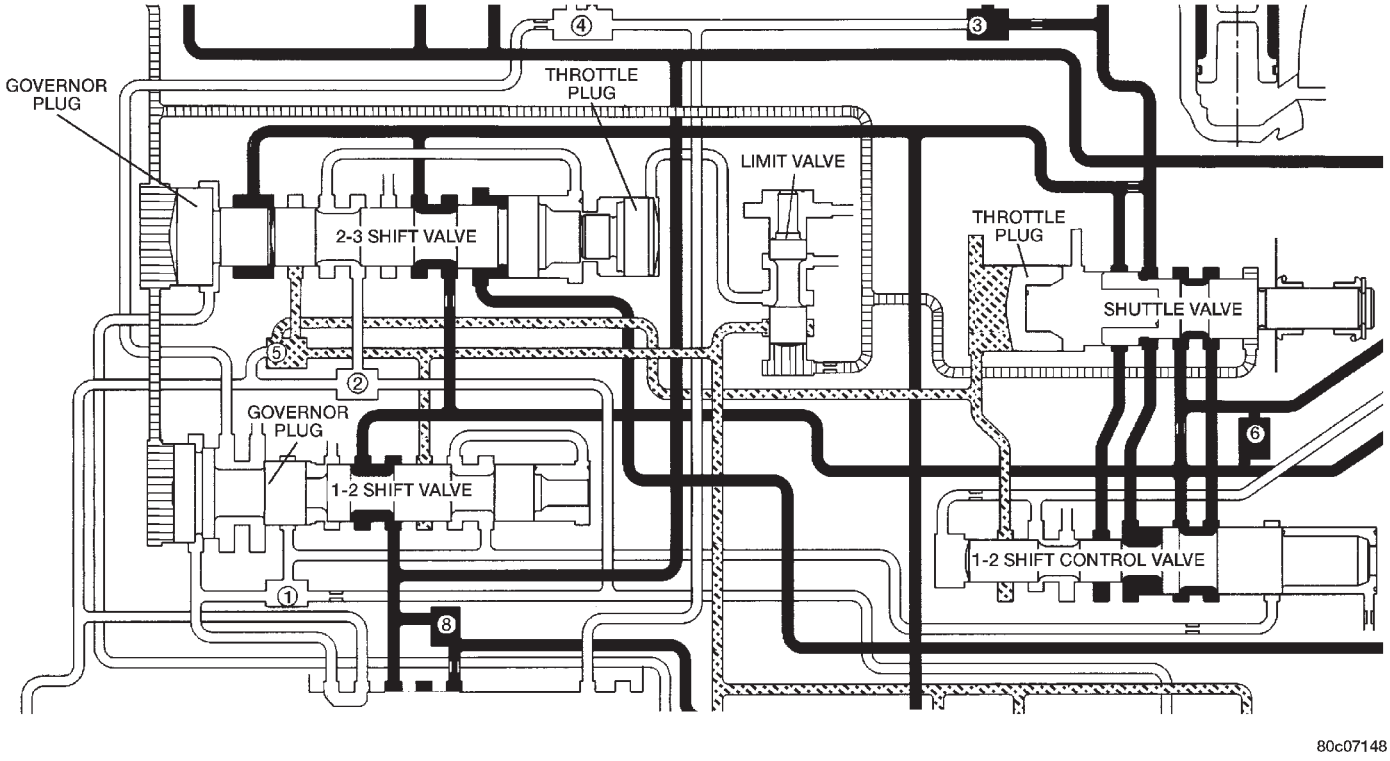


Fig. 270 2-3 Shift Valve-After Shift

VALVE BODY (Continued)

3-4 SHIFT VALVE

The PCM energizes the overdrive solenoid during the 3-4 upshift (Fig. 271). This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve. Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position (Fig. 272). This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive piston.

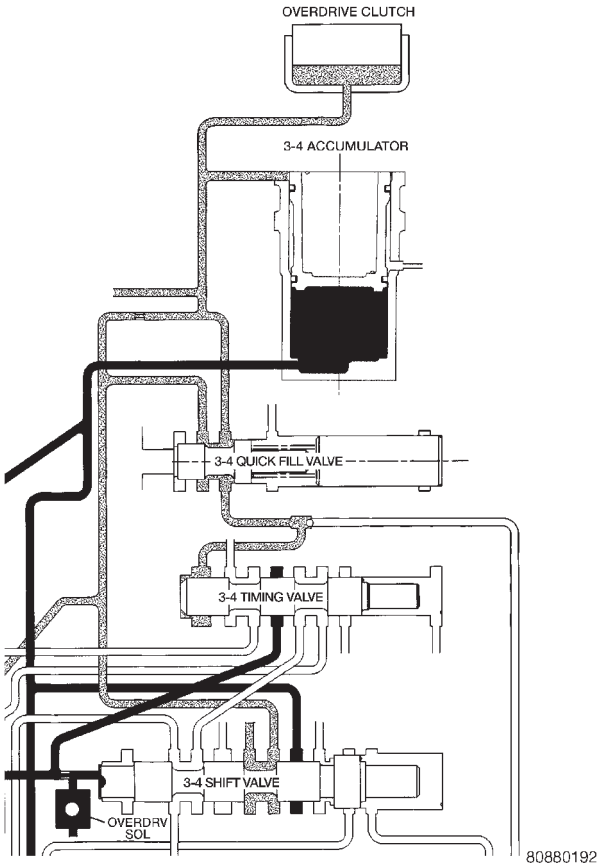


Fig. 271 3-4 Shift Valve Before Shift

3-4 TIMING VALVE

The 3-4 timing valve is moved by line pressure coming through the 3-4 shift valve (Fig. 272). After the shift, the timing valve holds the 2-3 shift valve in an upshift position. The purpose is to prevent the 2-3 valve from downshifting before the 3-4 valve (Fig. 271).

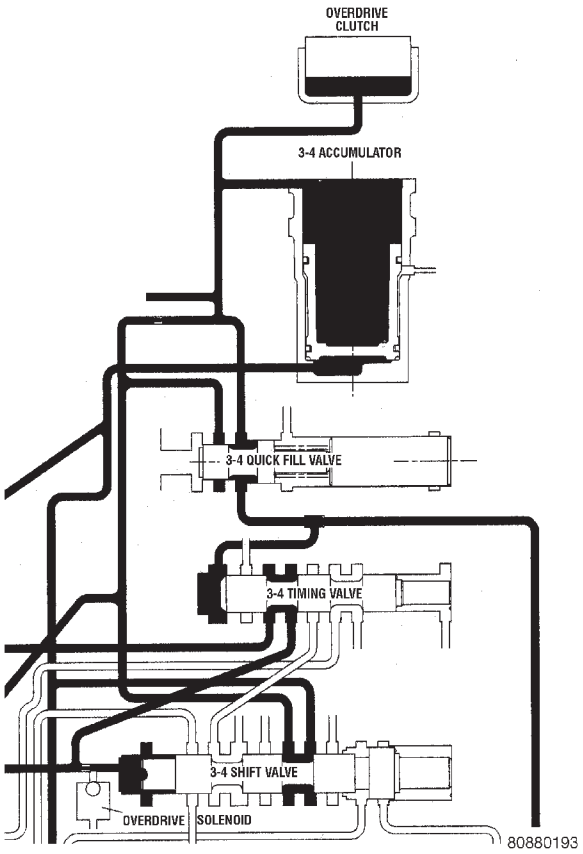


Fig. 272 3-4 Shift Valve After Shift

3-4 QUICK FILL VALVE

The 3-4 quick fill valve provides faster engagement of the overdrive clutch during 3-4 upshifts. The valve temporarily bypasses the clutch piston feed orifice at the start of a 3-4 upshift (Fig. 271). This exposes a larger passage into the piston retainer resulting in a much faster clutch fill and apply sequence. The quick fill valve does not bypass the regular clutch feed orifice throughout the 3-4 upshift. Instead, once a predetermined pressure develops within the clutch, the valve closes the bypass (Fig. 272). Clutch fill is then completed through the regular feed orifice.

VALVE BODY (Continued)

THROTTLE VALVE

In all gear positions the throttle valve (Fig. 273) is being supplied with line pressure. The throttle valve meters and reduces the line pressure that now becomes throttle pressure. The throttle valve is moved by a spring and the kickdown valve, which is mechanically connected to the throttle. The larger the throttle opening, the higher the throttle pressure (to a maximum of line pressure). The smaller the throttle opening, the lower the throttle pressure (to a minimum of zero at idle). As engine speed increases, the increase in pump speed increases pump output. The increase in pressure and volume must be regulated to maintain the balance within the transmission. To do this, throttle pressure is routed to the reaction area on the right side of the throttle pressure plug (in the regulator valve).

The higher engine speed and line pressure would open the vent too far and reduce line pressure too much. Throttle pressure, which increases with engine speed (throttle opening), is used to oppose the movement of the pressure valve to help control the metering passage at the vent. The throttle pressure is combined with spring pressure to reduce the force of the throttle pressure plug on the pressure valve. The larger spring at the right closes the regulator valve passage and maintains or increases line pressure. The increased line pressure works against the reaction area of the line pressure plug and the reaction area left of land #3 simultaneously moves the regulator valve train to the right and controls the metering passage.

The kickdown valve, along with the throttle valve, serve to delay upshifts until the correct vehicle speed has been reached. It also controls downshifts upon driver demand, or increased engine load. If these valves were not in place, the shift points would be at the same speed for all throttle positions. The kickdown valve is actuated by a cam connected to the throttle. This is accomplished through either a linkage or a cable. The cam forces the kickdown valve toward the throttle valve compressing the spring between them and moving the throttle valve. As the throttle valve land starts to uncover its port, line pressure is "metered" out into the circuits and viewed as throttle pressure. This increased throttle pressure is metered out into the circuits it is applied to: the 1-2 and 2-3 shift valves. When the throttle pressure is high enough, a 3-2 downshift will occur. If the vehicle speed is low enough, a 2-1 downshift will occur.

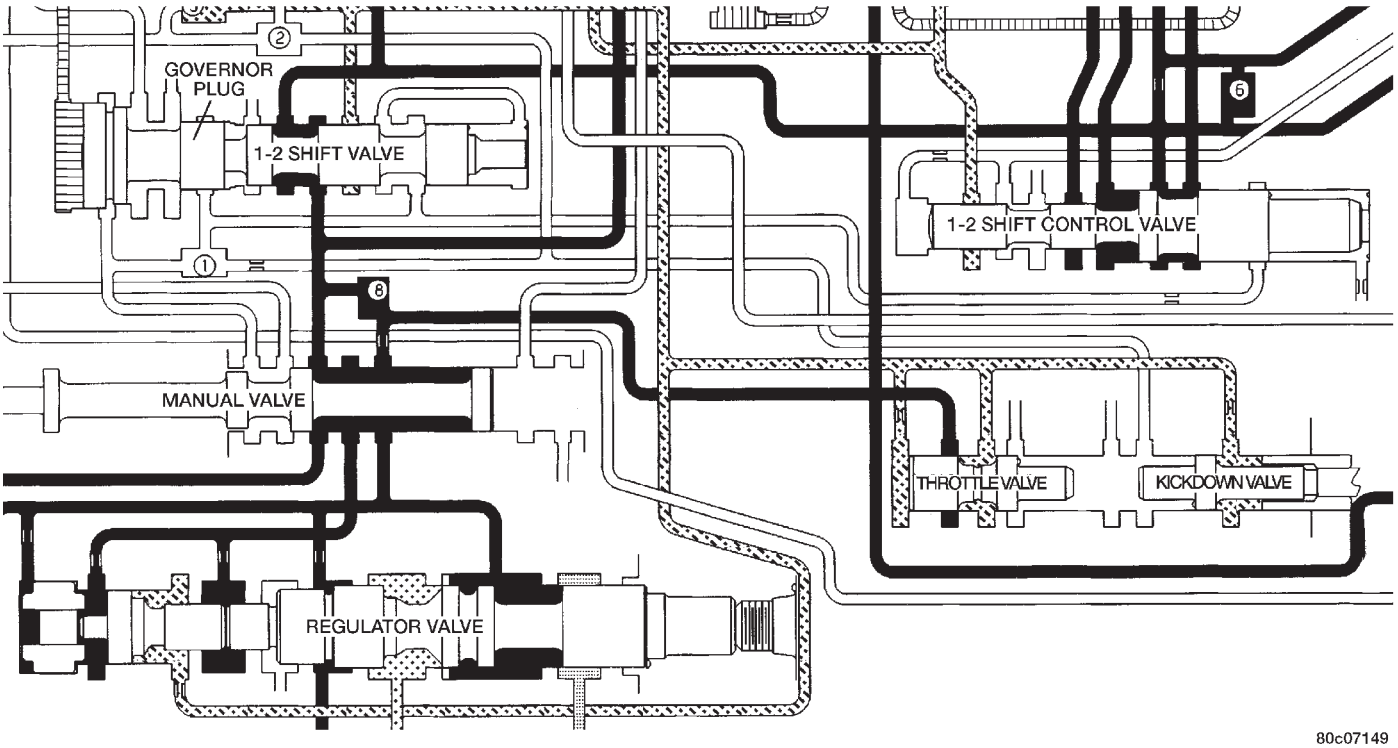


Fig. 273 Throttle Valve

VALVE BODY (Continued)

SWITCH VALVE

When the transmission is in Drive Second before the TCC application occurs (Fig. 274), the pressure regulator valve is supplying torque converter pressure to the switch valve. The switch valve directs this pressure through the transmission input shaft, into the converter, through the converter, back out between the input shaft and the reaction shaft, and back up to the switch valve. From the switch valve, the fluid pressure is directed to the transmission cooler, and lubrication pressure returns from the cooler to lubricate different portions of the transmission.

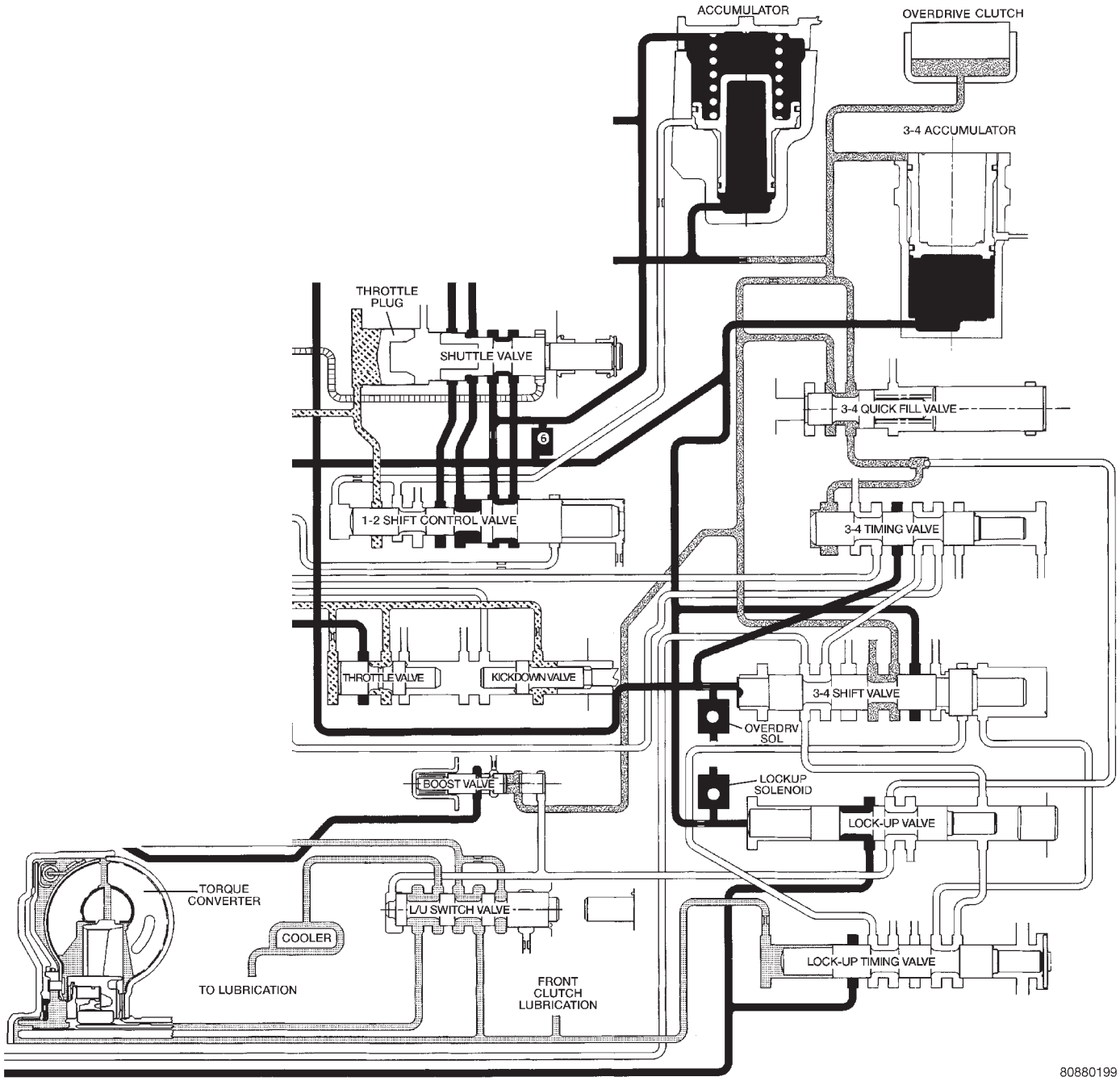


Fig. 274 Switch Valve-Torque Converter Unlocked

VALVE BODY (Continued)

Once the TCC control valve has moved to the right (Fig. 275), line pressure is directed to the tip of the switch valve, forcing the valve to the right. The switch valve now vents oil from the front of the piston in the torque converter, and supplies line pressure to the (rear) apply side of the torque converter piston. This pressure differential causes the piston to apply against the friction material, cutting off any further flow of line pressure oil. After the switch valve is shuttled right allowing line pressure to engage the TCC, torque converter pressure is directed past the switch valve into the transmission cooler and lubrication circuits.

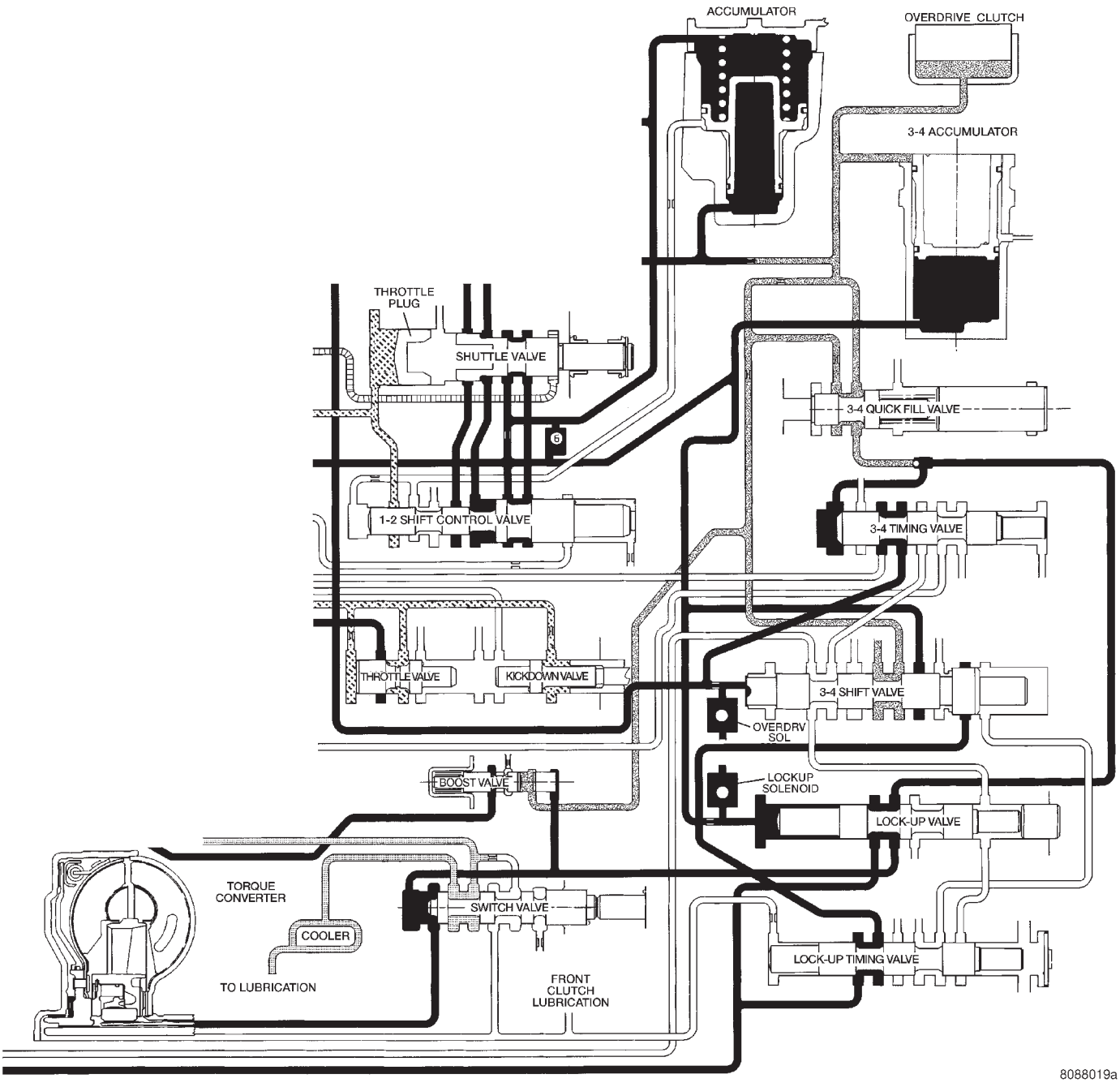


Fig. 275 Switch Valve-Torque Converter Locked

VALVE BODY (Continued)

MANUAL VALVE

The manual valve (Fig. 276) is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the side of the valve body. The valve is connected mechanically by either a cable or linkage to the gear-shift mechanism. The valve is held in each of its positions by a spring-loaded roller or ball that engages the “roostercomb” of the manual valve lever.

CONVERTER CLUTCH LOCK-UP VALVE

The torque converter clutch (TCC) lock-up valve controls the back (ON) side of the torque converter clutch. When the PCM energizes the TCC solenoid to engage the converter clutch piston, pressure is applied to the TCC lock-up valve which moves to the right and applies pressure to the torque converter clutch.

CONVERTER CLUTCH LOCK-UP TIMING VALVE

The torque converter clutch (TCC) lock-up timing valve is there to block any 4-3 downshift until the TCC is completely unlocked and the clutch is disengaged.

SHUTTLE VALVE

The assembly is contained in a bore in the valve body above the shift valves. When the manual valve is positioned in the Drive range, throttle pressure acts on the throttle plug of the shuttle valve (Fig. 268) to move it against a spring, increasing the spring force on the shuttle valve. During a part or full throttle 1-2 upshift, the throttle plug is bottomed by throttle pressure, holding the shuttle valve to the right against governor pressure, and opening a by–pass circuit. The shuttle valve controls the quality of the kickdown shift by restricting the rate of fluid discharge from the front clutch and servo release circuits. During a 3-2 kickdown, fluid discharges through the shuttle by-pass circuit. When the shuttle valve closes the by-pass circuit, fluid discharge is restricted and controlled for the application of the front band. During a 2-3 “lift foot” upshift, the shuttle valve by-passes the restriction to allow full fluid flow through the by-pass groove for a faster release of the band.

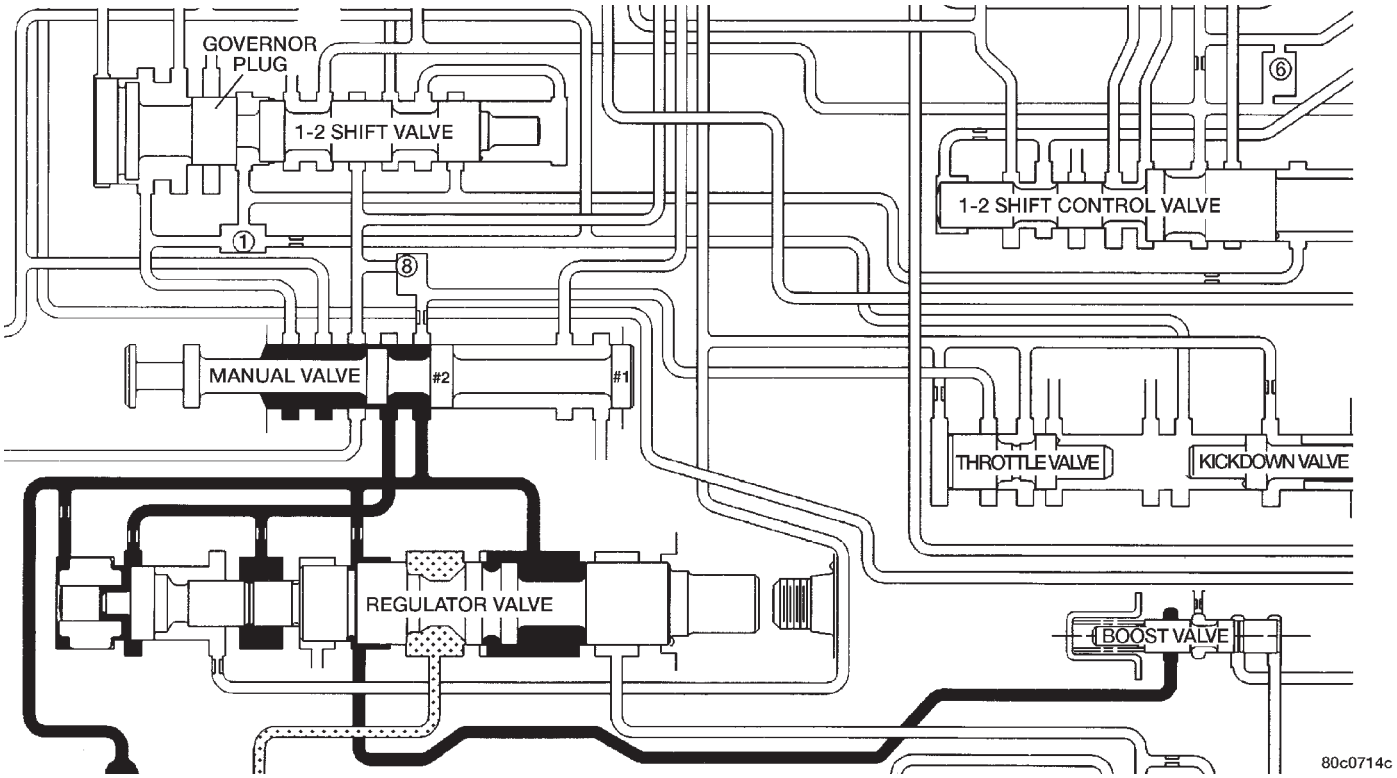


Fig. 276 Manual Valve

VALVE BODY (Continued)

BOOST VALVE

The boost valve (Fig. 277) provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts (Fig. 278), and when accelerating in fourth gear. The boost valve also serves to increase line pressure during torque converter lock-up.

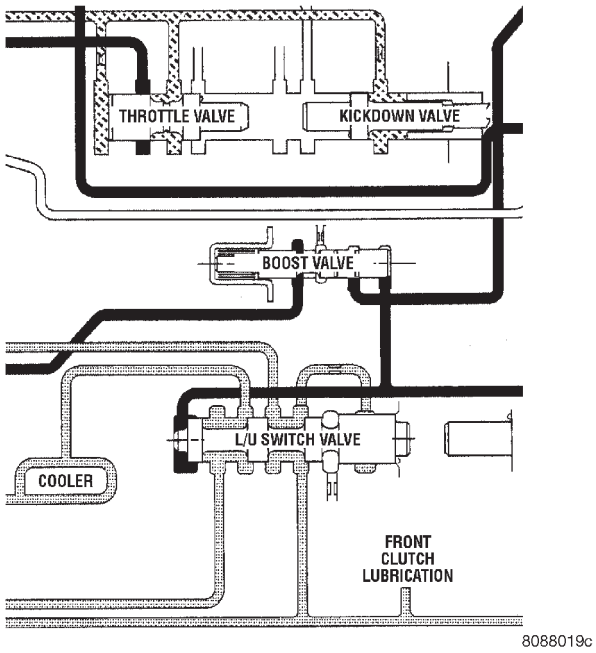


Fig. 277 Boost Valve Before Lock-up

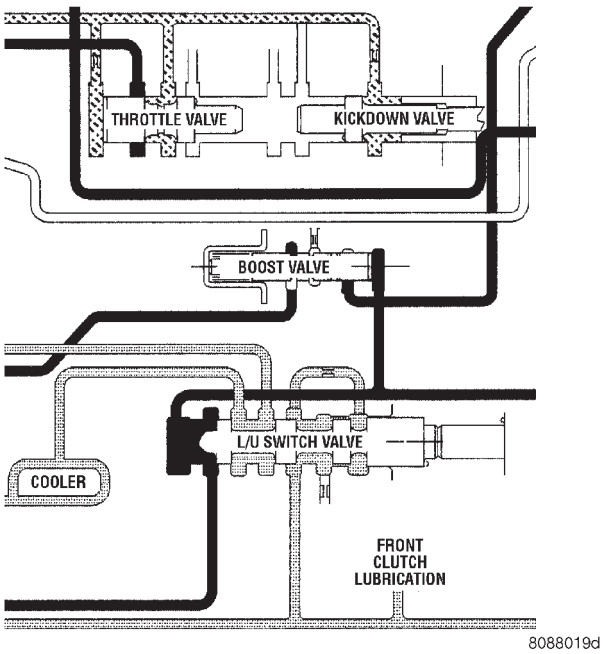


Fig. 278 Boost Valve After Lock-up

REMOVAL

The valve body can be removed for service without having to remove the transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components.

The only replaceable valve body components are:

- Manual lever.
- Manual lever washer, seal, E-clip, and shaft seal.
- Manual lever detent ball.
- Throttle lever.
- Fluid filter.
- Pressure adjusting screw bracket.
- Governor pressure solenoid.
- Governor pressure sensor (includes transmission temperature thermistor).
- Converter clutch/overdrive solenoid assembly and harness.
- Governor housing gasket.
- Solenoid case connector O-rings.

(1) Shift transmission into NEUTRAL.

(2) Raise vehicle.

(3) Remove gearshift and throttle levers from shaft of valve body manual lever.

(4) Disconnect wires at solenoid case connector (Fig. 279).

(5) Position drain pan under transmission oil pan.

(6) Remove transmission oil pan and gasket.

(7) Remove fluid filter from valve body.

(8) Remove bolts attaching valve body to transmission case.

(9) Lower valve body enough to remove accumulator piston and springs.

(10) Work manual lever shaft and electrical connector out of transmission case.

(11) Lower valve body, rotate valve body away from case, pull park rod out of sprag, and remove valve body (Fig. 280).

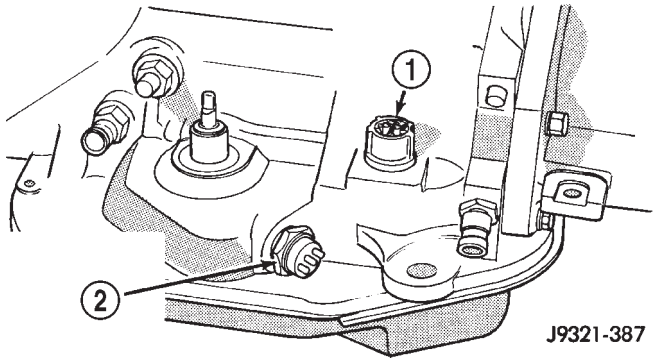


Fig. 279 Transmission Case Connector

1 - SOLENOID CASE CONNECTOR
2 - PARK/NEUTRAL POSITION SWITCH

VALVE BODY (Continued)

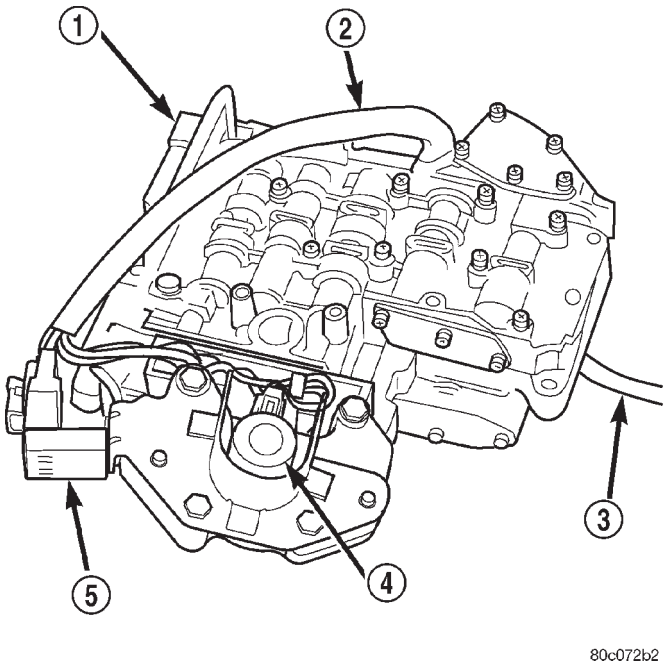


Fig. 280 Valve Body

1 - VALVE BODY
2 - WIRE HARNESS
3 - PARK ROD
4 - GOVERNOR PRESSURE SOLENOID
5 - GOVERNOR PRESSURE SENSOR

DISASSEMBLY

CAUTION: Do not clamp any valve body component in a vise. This practice can damage the component resulting in unsatisfactory operation after assembly and installation. Do not use pliers to remove any of the valves, plugs or springs and do not force any of the components out or into place. The valves and valve body housings will be damaged if force is used. Tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

(1) Disconnect wires from governor pressure sensor and solenoid.

(2) Remove screws attaching governor body and retainer plate to transfer plate.

(3) Remove retainer plate, governor body and gasket from transfer plate.

(4) Remove governor pressure sensor from governor body.

(5) Remove governor pressure solenoid by pulling it straight out of bore in governor body. Remove and discard solenoid O-rings if worn, cut, or torn.

(6) Remove small shoulder bolt that secures solenoid harness case connector to 3-4 accumulator housing (Fig. 281). Retain shoulder bolt. Either tape it to harness or thread it back into accumulator housing after connector removal.

(7) Unhook overdrive/converter solenoid harness from 3-4 accumulator cover plate (Fig. 282).

(8) Turn valve body over and remove screws that attach overdrive/converter solenoid assembly to valve body (Fig. 283).

(9) Remove solenoid and harness assembly from valve body (Fig. 284).

(10) Remove boost valve cover (Fig. 285).

(11) Remove boost valve retainer, valve spring and boost valve (Fig. 286).

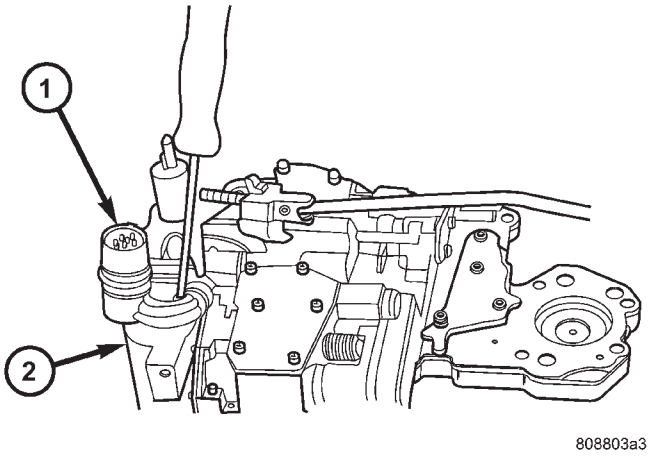


Fig. 281 Solenoid Harness Case Connector Shoulder Bolt

1 - SOLENOID HARNESS CASE CONNECTOR
2 - 3-4 ACCUMULATOR HOUSING

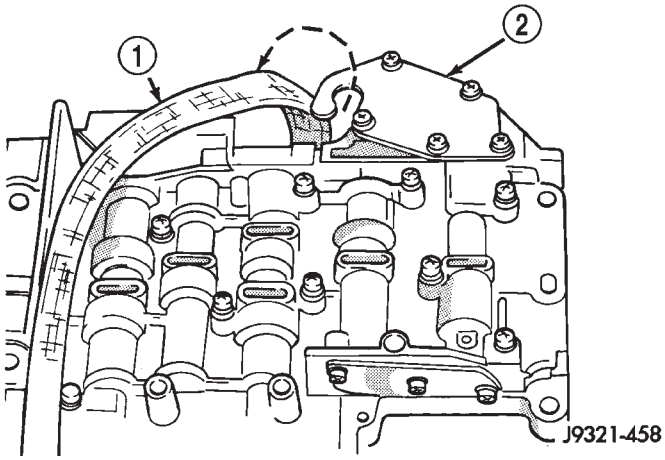


Fig. 282 Unhooking Solenoid Harness From Accumulator Cover Plate

1 - OVERDRIVE/CONVERTER SOLENOID WIRE HARNESS
2 - 3-4 ACCUMULATOR COVER PLATE

VALVE BODY (Continued)

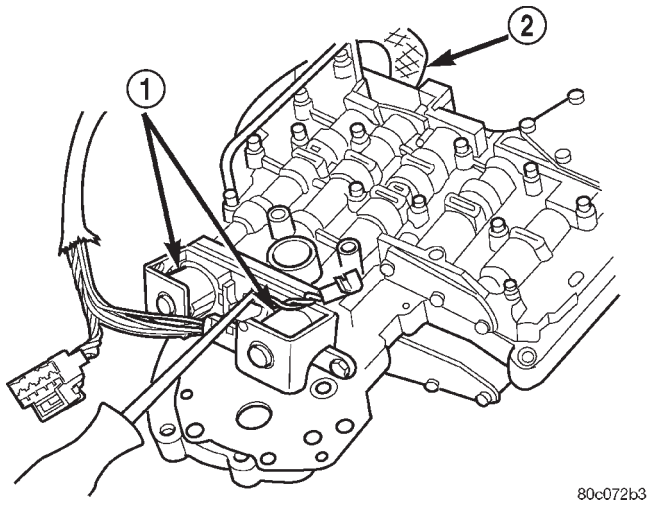


Fig. 283 Solenoid Assembly Screws

1 - OVERDRIVE/CONVERTER CLUTCH SOLENOID ASSEMBLY
2 - HARNESS

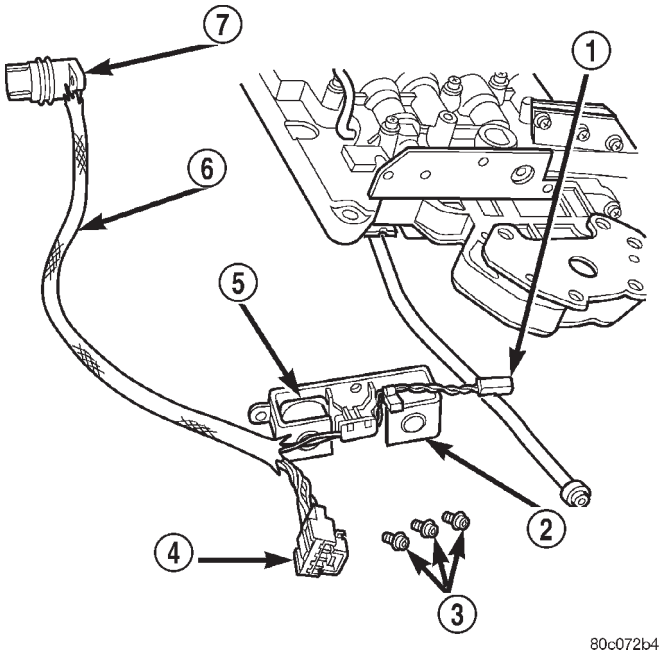


Fig. 284 Solenoid Assembly

1 - GOVERNOR SOLENOID WIRES
2 - CONVERTER CLUTCH SOLENOID
3 - SOLENOID SCREWS
4 - GOVERNOR SENSOR WIRES
5 - OVERDRIVE SOLENOID
6 - HARNESS
7 - CASE CONNECTOR

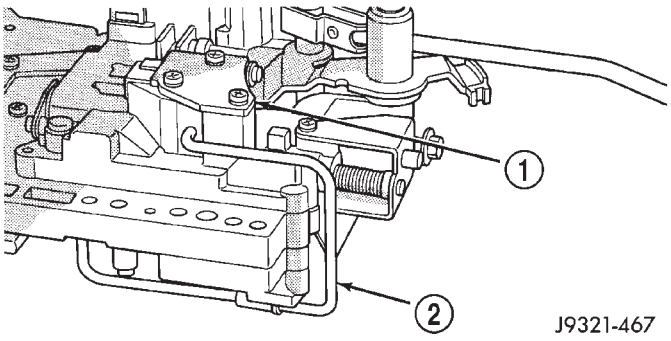


Fig. 285 Boost Valve

1 - BOOST VALVE HOUSING AND COVER
2 - BOOST VALVE TUBE

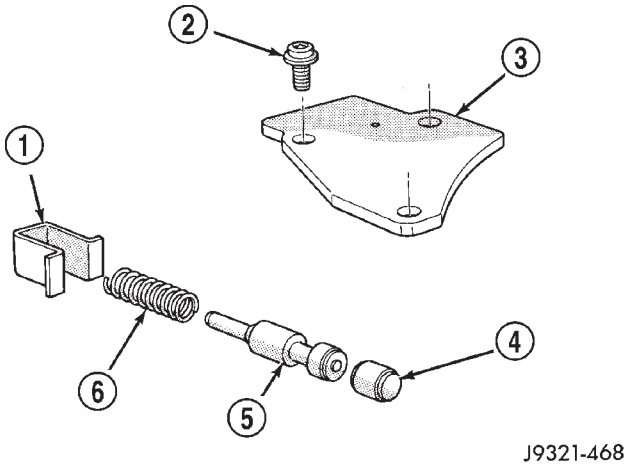


Fig. 286 Boost Valve Components

1 - SPRING AND VALVE RETAINER
2 - COVER SCREWS
3 - BOOST VALVE COVER
4 - BOOST VALVE PLUG
5 - BOOST VALVE
6 - BOOST VALVE SPRING

(12) Secure detent ball and spring with Retainer Tool 6583 (Fig. 287).

(13) Remove park rod E-clip and separate rod from manual lever (Fig. 288).

(14) Remove E-clip and washer that retains throttle lever shaft in manual lever (Fig. 289).

(15) Remove manual lever and throttle lever (Fig. 290). Rotate and lift manual lever off valve body and throttle lever shaft. Then slide throttle lever out of valve body.

VALVE BODY (Continued)

(16) Position pencil magnet next to detent housing to catch detent ball and spring. Then carefully remove Retainer Tool 6583 and remove detent ball and spring (Fig. 291).

(17) Remove screws attaching pressure adjusting screw bracket to valve body and transfer plate (Fig. 292). Hold bracket firmly against spring tension while removing last screw.

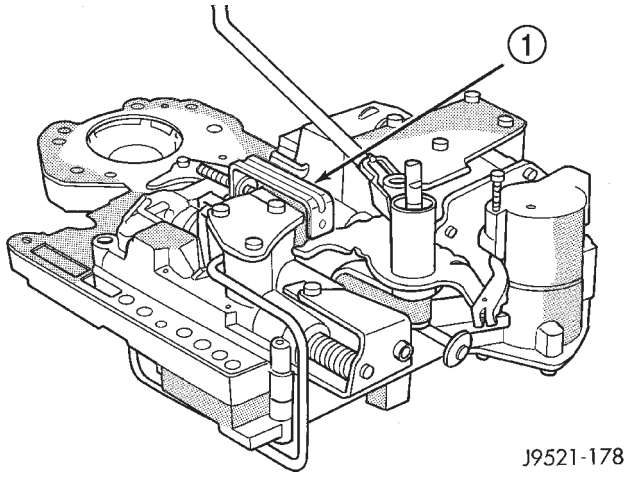


Fig. 287 Detent Ball And Spring

1 - SPECIAL TOOL 6583 POSITIONED ON DETENT HOUSING

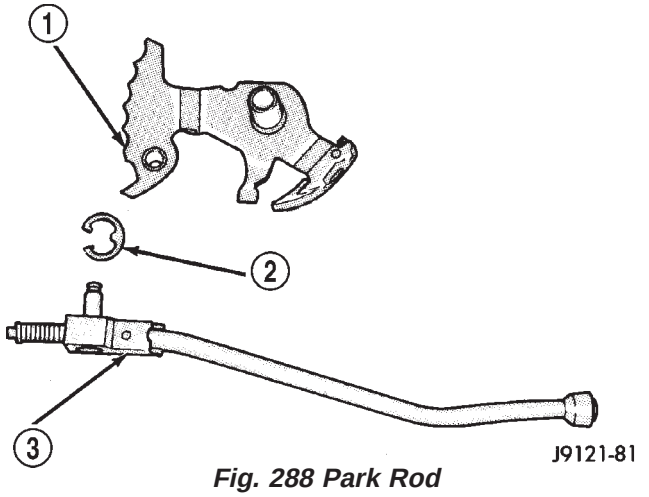


Fig. 288 Park Rod

1 - MANUAL LEVER
2 - E-CLIP
3 - PARK ROD

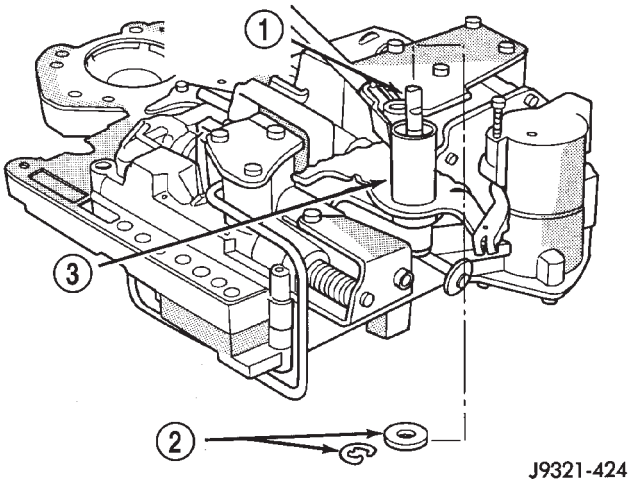


Fig. 289 Throttle Lever E-Clip And Washer

1 - THROTTLE LEVER SHAFT
2 - E-CLIP AND WASHER
3 - MANUAL SHAFT

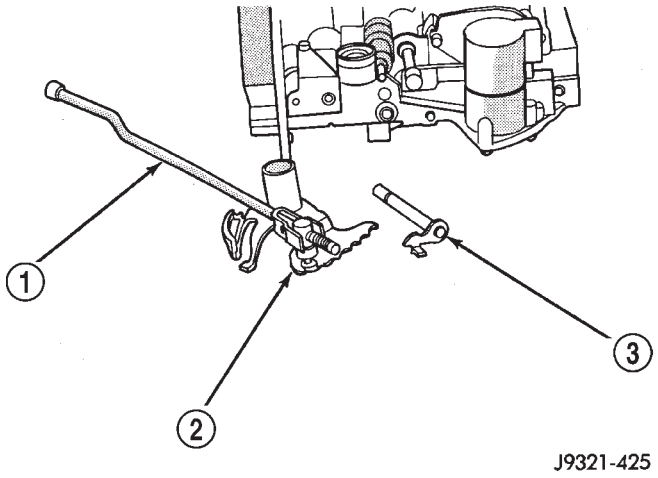


Fig. 290 Manual And Throttle Lever

1 - PARK ROD
2 - MANUAL LEVER ASSEMBLY
3 - THROTTLE LEVER

VALVE BODY (Continued)

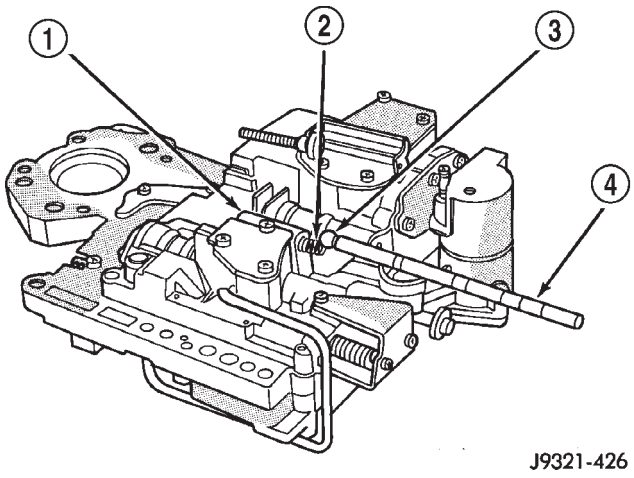


Fig. 291 Detent Ball And Spring

1 - DETENT HOUSING
2 - DETENT SPRING
3 - DETENT BALL
4 - PENCIL MAGNET

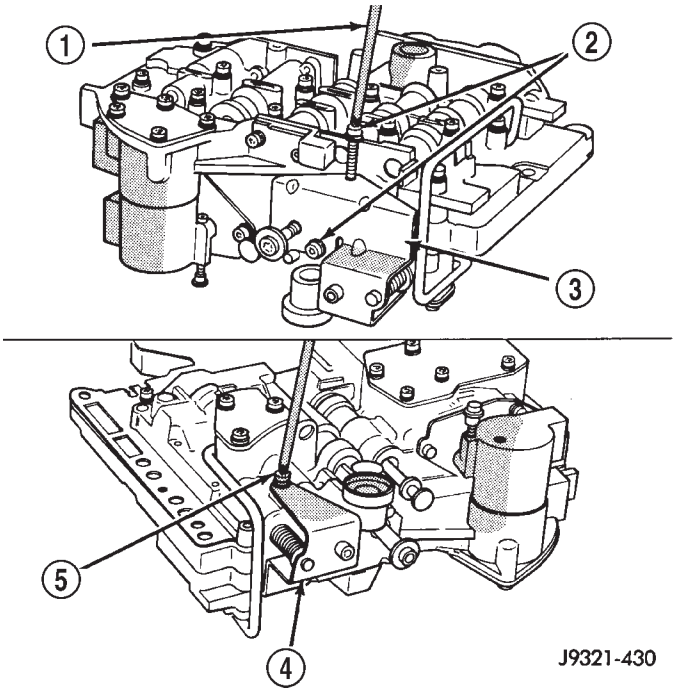


Fig. 292 Adjusting Screw Bracket Fastener

1 - T25 TORX™ BIT
2 - REMOVE THESE SCREWS FIRST
3 - BRACKET
4 - BRACKET
5 - REMOVE THIS SCREW LAST

(18) Remove adjusting screw bracket, line pressure adjusting screw, pressure regulator valve spring and switch valve spring (Fig. 293). Do not remove throttle pressure adjusting screw from bracket and do not disturb setting of either adjusting screw during removal.

(19) Turn upper housing over and remove switch valve, regulator valve and spring, and manual valve (Fig. 294).

(20) Remove kickdown detent, kickdown valve, and throttle valve and spring (Fig. 294).

(21) Loosen left-side 3-4 accumulator housing attaching screw about 2-3 threads. Then remove center and right-side housing attaching screws (Fig. 295).

(22) Carefully rotate 3-4 accumulator housing upward and remove 3-4 shift valve spring and converter clutch valve plug and spring (Fig. 296).

(23) Remove left-side screw and remove 3-4 accumulator housing from valve body (Fig. 297).

(24) Bend back tabs on boost valve tube brace (Fig. 298).

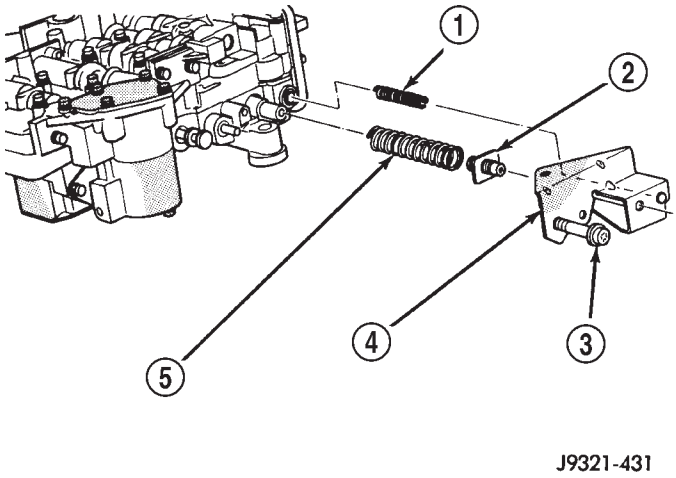


Fig. 293 Adjusting Screw Bracket And Spring

1 - SWITCH VALVE SPRING
2 - LINE PRESSURE SCREW
3 - THROTTLE PRESSURE ADJUSTING SCREW
4 - ADJUSTING SCREW BRACKET
5 - PRESSURE REGULATOR VALVE SPRING

VALVE BODY (Continued)

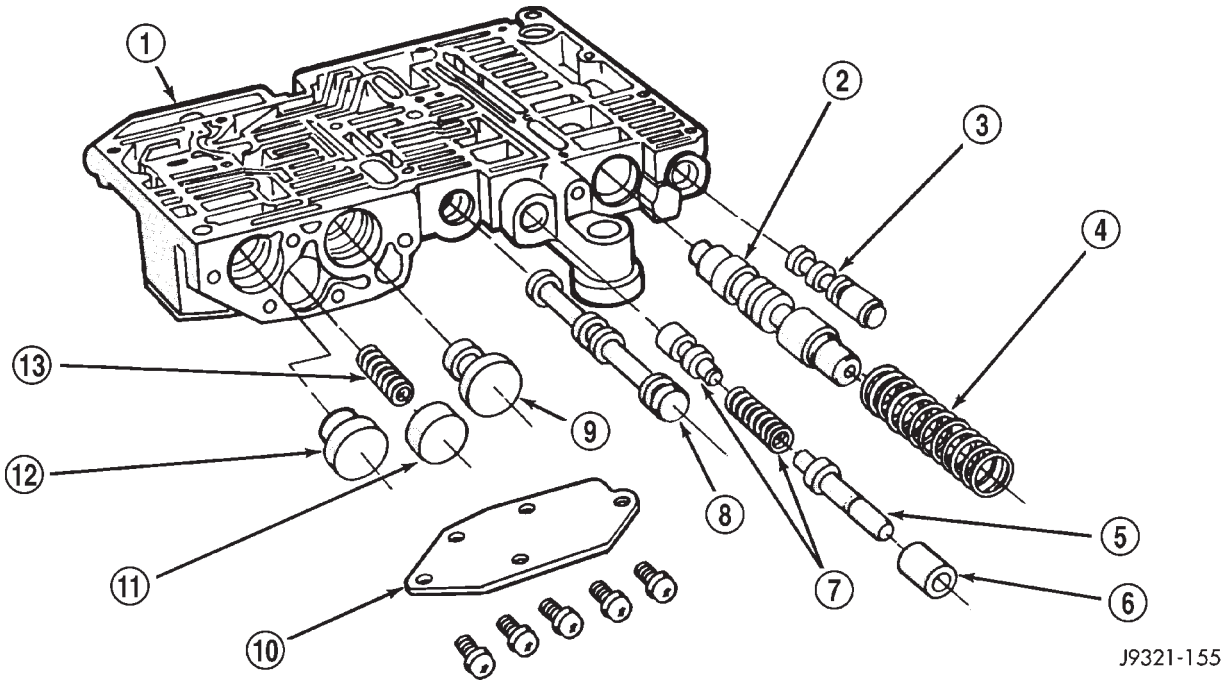


Fig. 294 Upper Housing Control Valve Locations

1 - UPPER HOUSING
2 - REGULATOR VALVE
3 - SWITCH VALVE
4 - REGULATOR VALVE SPRING
5 - KICKDOWN VALVE
6 - KICKDOWN DETENT
7 - THROTTLE VALVE AND SPRING
8 - MANUAL VALVE
9 - 1-2 GOVERNOR PLUG
10 - GOVERNOR PLUG COVER
11 - THROTTLE PLUG
12 - 2-3 GOVERNOR PLUG
13 - SHUTTLE VALVE PRIMARY SPRING

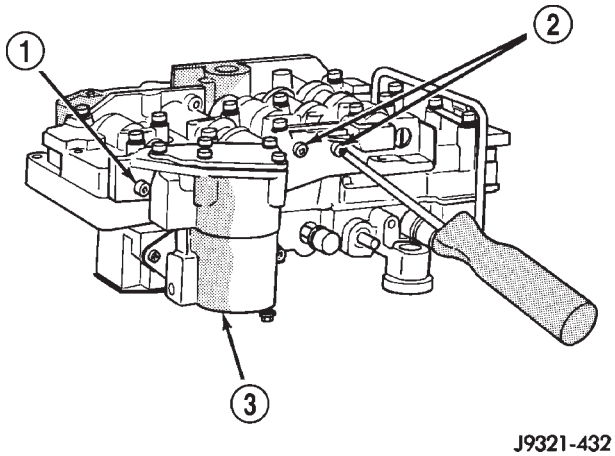


Fig. 295 Accumulator Housing Screw Locations

1 - LOOSEN THIS SCREW
2 - REMOVE THESE SCREWS
3 - 3-4 ACCUMULATOR HOUSING

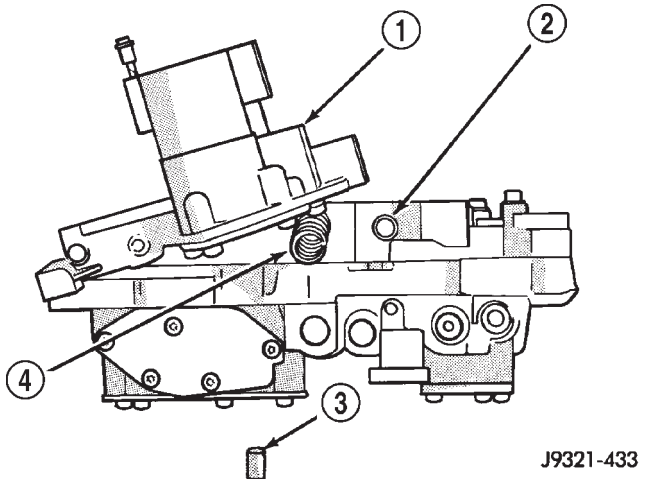


Fig. 296 3-4 Shift And Converter Clutch Valve Springs And Plug

1 - ACCUMULATOR HOUSING
2 - CONVERTER CLUTCH VALVE SPRING
3 - CLUTCH VALVE PLUG
4 - 3-4 SHIFT VALVE SPRING

VALVE BODY (Continued)

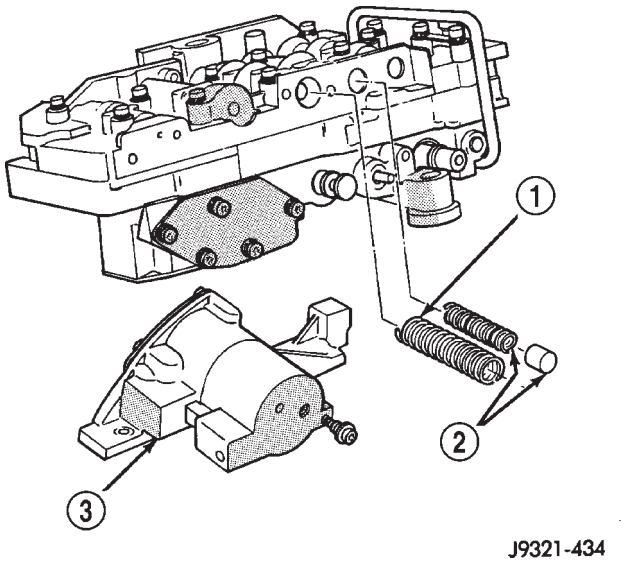


Fig. 297 Accumulator Housing, Valve Springs And Plug

1 - 3-4 SHIFT VALVE SPRING
2 - CONVERTER CLUTCH VALVE SPRING AND PLUG
3 - 3-4 ACCUMULATOR HOUSING

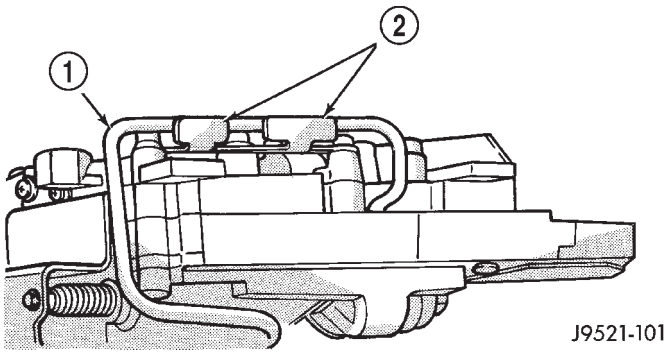


Fig. 298 Boost Valve Tube Brace

1 - BOOST VALVE TUBE
2 - TUBE BRACE (DOUBLE TAB)

(25) Remove boost valve connecting tube (Fig. 299). Disengage tube from upper housing port first. Then rock opposite end of tube back and forth to work it out of lower housing.

CAUTION: Do not use tools to loosen or pry the connecting tube out of the valve body housings. Loosen and remove the tube by hand only.

(26) Turn valve body over so lower housing is facing upward (Fig. 300). In this position, the two check balls in upper housing will remain in place and not fall out when lower housing and separator plate are removed.

(27) Remove screws attaching valve body lower housing to upper housing and transfer plate (Fig. 300). Note position of boost valve tube brace for assembly reference.

(28) Remove lower housing and overdrive separator plate from transfer plate (Fig. 300).

(29) Remove the ECE check ball from the transfer plate (Fig. 301). The ECE check ball is approximately 4.8 mm (3/16 in.) in diameter.

(30) Remove transfer plate from upper housing (Fig. 302).

(31) Turn transfer plate over so upper housing separator plate is facing upward.

(32) Remove upper housing separator plate from transfer plate (Fig. 303). Note position of filter in separator plate for assembly reference.

(33) Remove rear clutch and rear servo check balls from transfer plate. Note check ball location for assembly reference (Fig. 304).

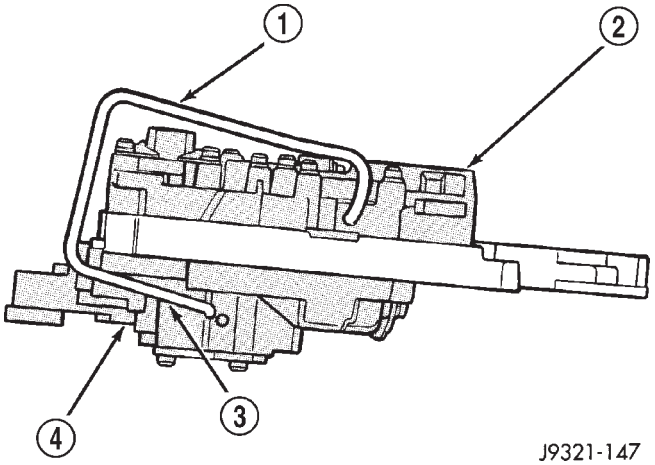


Fig. 299 Boost Valve Tube

1 - BOOST VALVE TUBE
2 - LOWER HOUSING
3 - DISENGAGE THIS END OF TUBE FIRST
4 - UPPER HOUSING

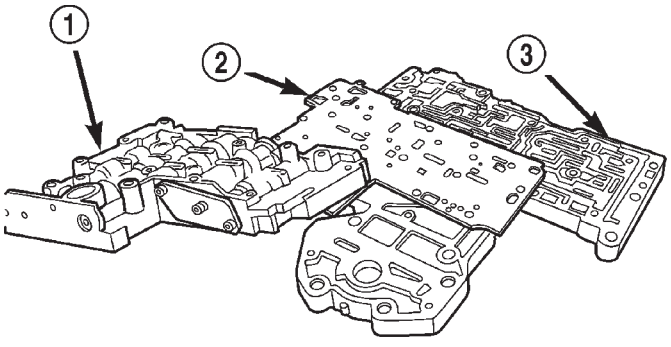


Fig. 300 Lower Housing

1 - LOWER HOUSING
2 - OVERDRIVE SEPARATOR PLATE
3 - TRANSFER PLATE AND UPPER HOUSING

VALVE BODY (Continued)

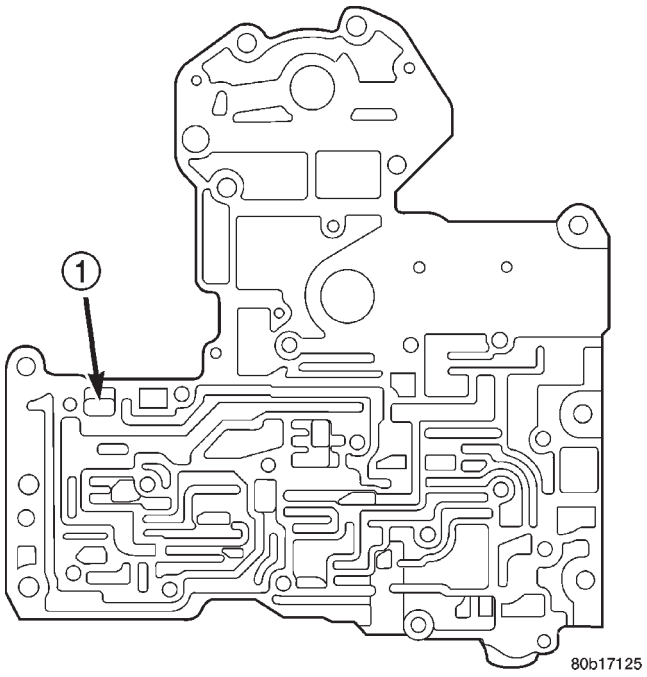


Fig. 301 ECE Check Ball

1 - ECE CHECK BALL (3/16″)

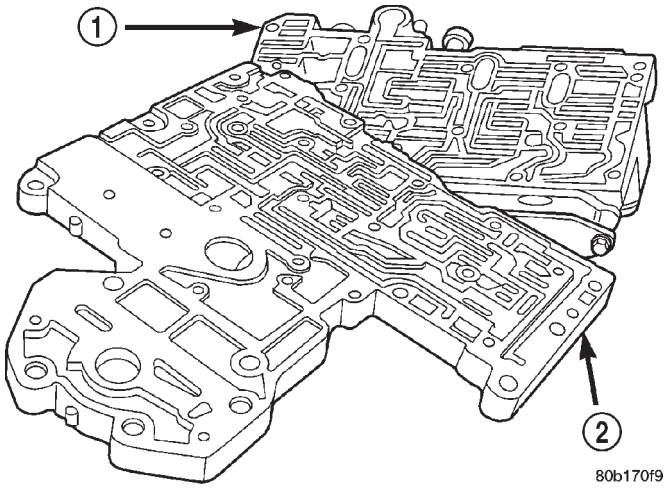


Fig. 302 Transfer Plate

1 - UPPER HOUSING
2 - TRANSFER PLATE

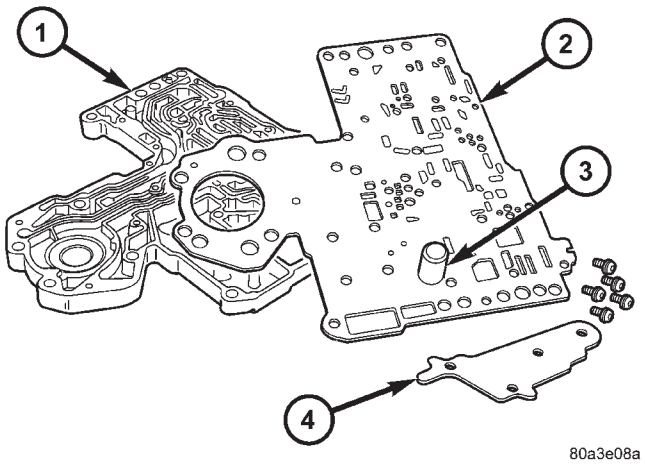


Fig. 303 Upper Housing Separator Plate

1 - TRANSFER PLATE
2 - UPPER HOUSING SEPARATOR PLATE
3 - FILTER SCREEN
4 - BRACE

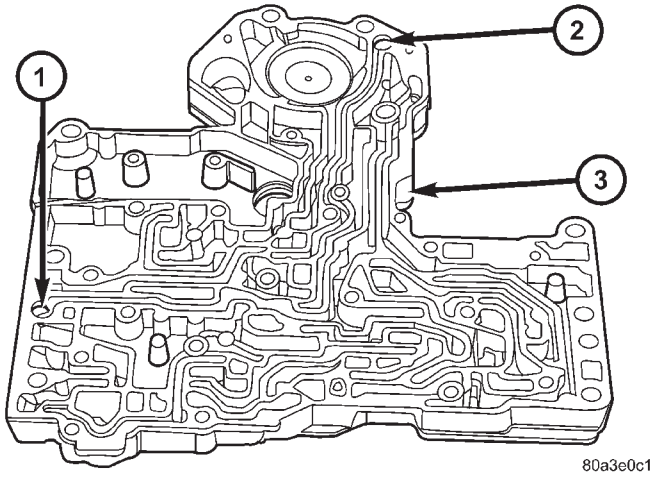


Fig. 304 Rear Clutch And Rear Servo Check Ball

1 - REAR CLUTCH CHECK BALL
2 - REAR SERVO CHECK BALL
3 - TRANSFER PLATE

VALVE BODY (Continued)

VALVE BODY UPPER HOUSING

(1) Note location of check balls in valve body upper housing (Fig. 305). Then remove the one large diameter and the six smaller diameter check balls.

(2) Remove governor plug and shuttle valve covers (Fig. 307).

(3) Remove E-clip that secures shuttle valve secondary spring on valve stem (Fig. 306).

(4) Remove throttle plug, primary spring, shuttle valve, secondary spring, and spring guides (Fig. 307).

(5) Remove boost valve retainer, spring and valve if not previously removed.

(6) Remove throttle plug and 1-2 and 2-3 governor plugs (Fig. 294).

(7) Turn upper housing around and remove limit valve and shift valve covers (Fig. 308).

(8) Remove limit valve housing. Then remove retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing (Fig. 308).

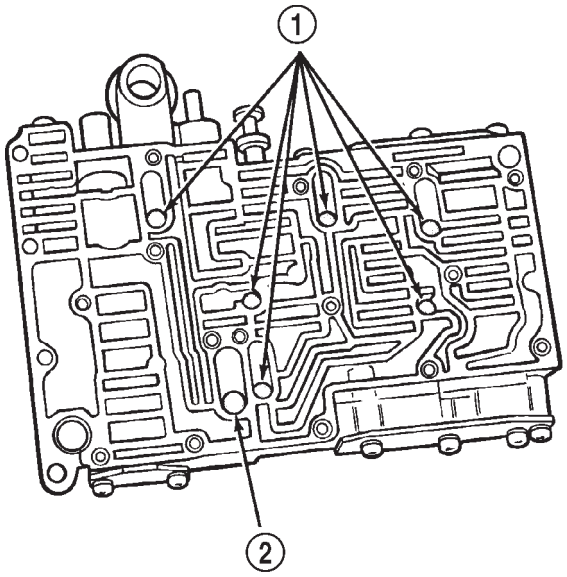


Fig. 305 Check Ball Locations In Upper Housing

1 - SMALL DIAMETER CHECK BALLS (6)
2 - LARGE DIAMETER CHECK BALL (1)

(9) Remove 1-2 shift control valve and spring (Fig. 308).

(10) Remove 1-2 shift valve and spring (Fig. 308).

(11) Remove 2-3 shift valve and spring from valve body (Fig. 308).

(12) Remove pressure plug cover (Fig. 308).

(13) Remove line pressure plug, sleeve, throttle pressure plug and spring (Fig. 308).

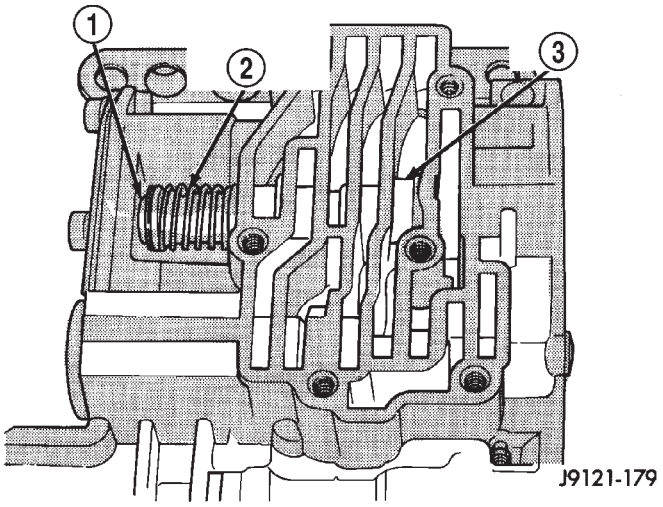


Fig. 306 Shuttle Valve E-Clip And Secondary Spring Location

1 - E-CLIP
2 - SECONDARY SPRING AND GUIDES
3 - SHUTTLE VALVE

VALVE BODY (Continued)

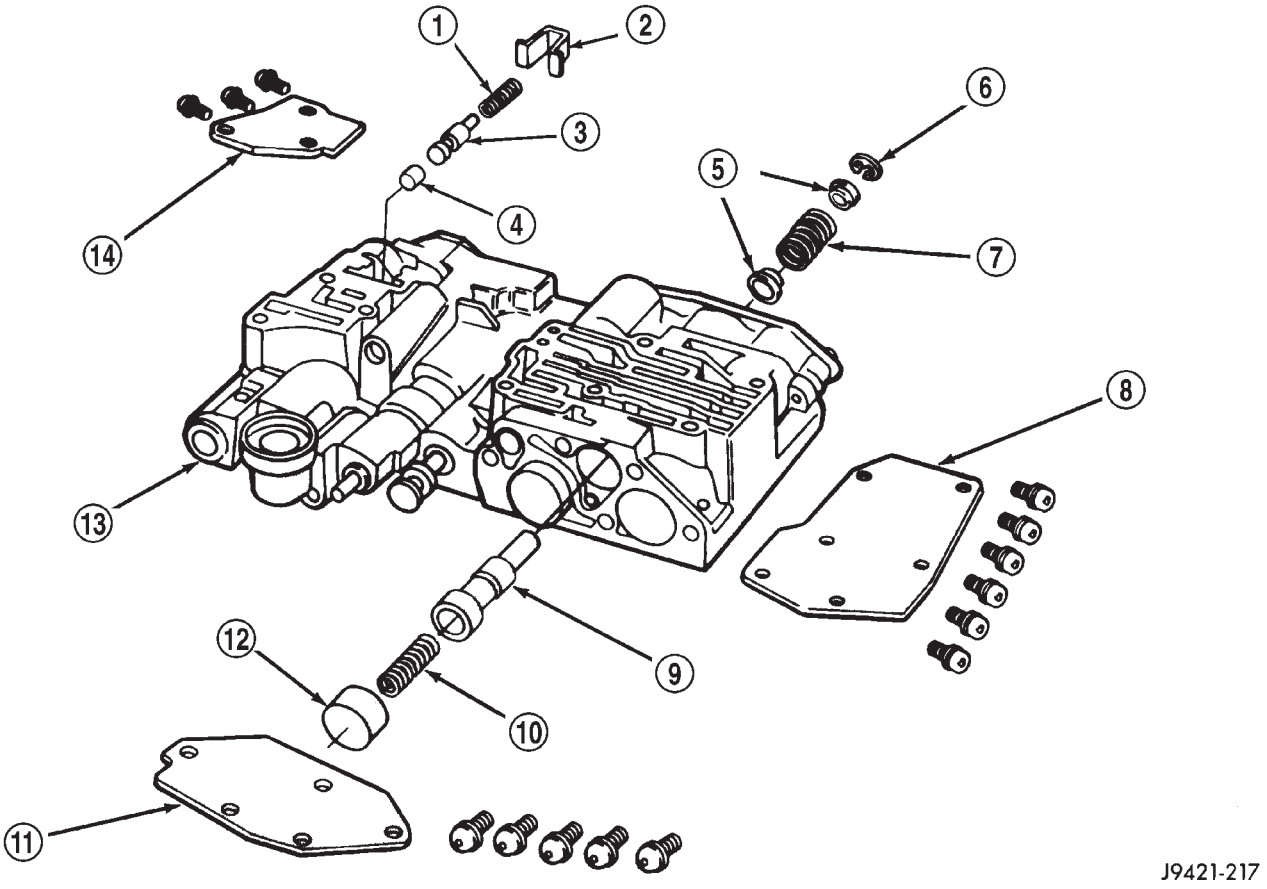


Fig. 307 Shuttle And Boost Valve Components

1 - SPRING
2 - RETAINER
3 - BOOST VALVE
4 - BOOST VALVE PLUG
5 - SPRING GUIDES
6 - E-CLIP
7 - SHUTTLE VALVE SECONDARY SPRING
8 - SHUTTLE VALVE COVER
9 - SHUTTLE VALVE
10 - SHUTTLE VALVE PRIMARY SPRING
11 - GOVERNOR PLUG COVER
12 - THROTTLE PLUG
13 - UPPER HOUSING
14 - BOOST VALVE COVER

VALVE BODY (Continued)

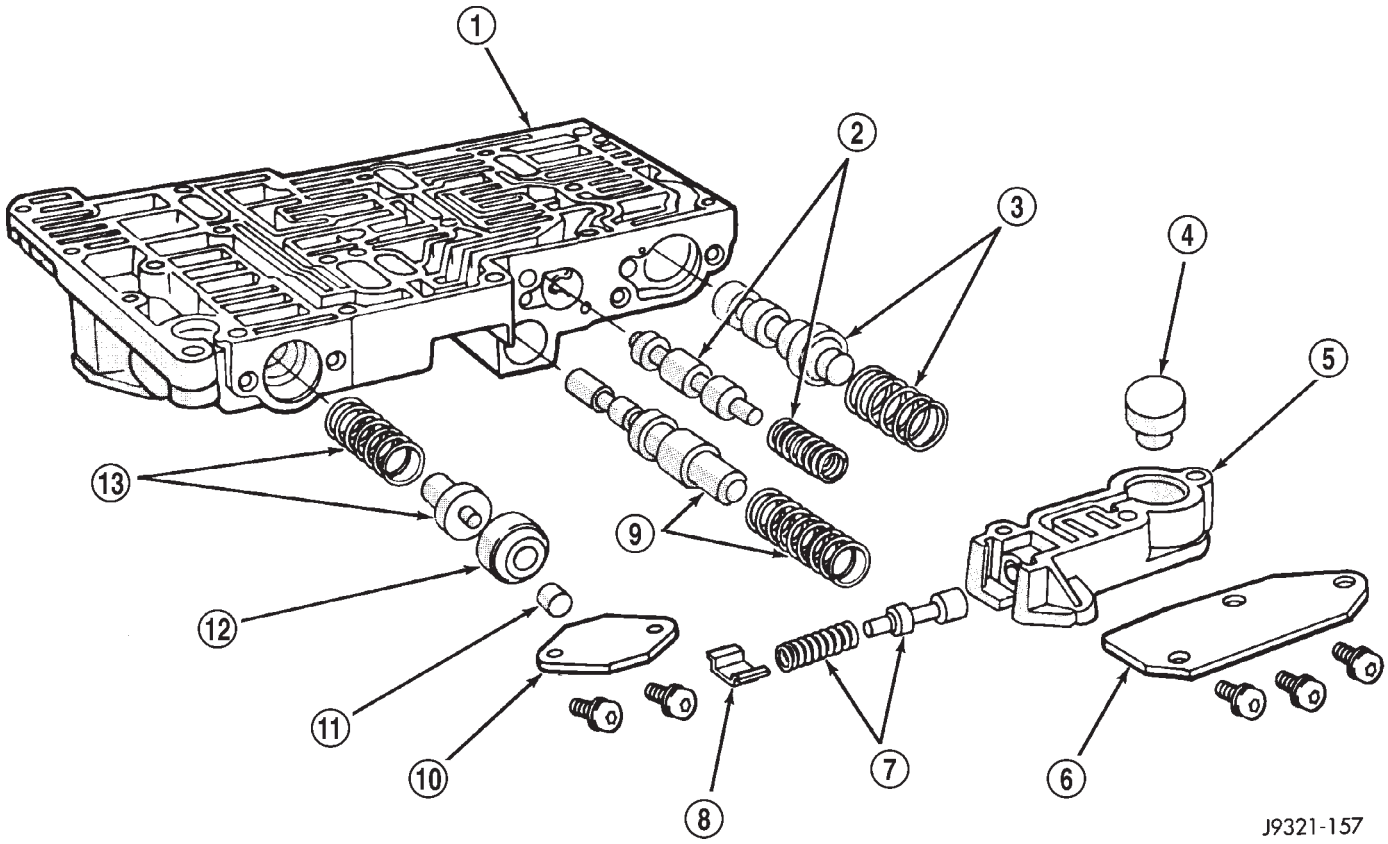


Fig. 308 Upper Housing Shift Valve And Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - LINE PRESSURE PLUG
12 - PLUG SLEEVE
13 - THROTTLE PRESSURE SPRING AND PLUG

VALVE BODY (Continued)

VALVE BODY LOWER HOUSING

(1) Remove timing valve cover.
(2) Remove 3-4 timing valve and spring.
(3) Remove 3-4 quick fill valve, spring and plug.
(4) Remove 3-4 shift valve and spring.
(5) Remove converter clutch valve, spring and plug (Fig. 309).
(6) Remove converter clutch timing valve, retainer and valve spring.

3-4 ACCUMULATOR HOUSING

(1) Remove end plate from housing.
(2) Remove piston spring.
(3) Remove piston. Remove and discard piston seals (Fig. 310).

CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the governor solenoid and sensor and the dual solenoid and harness assembly by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

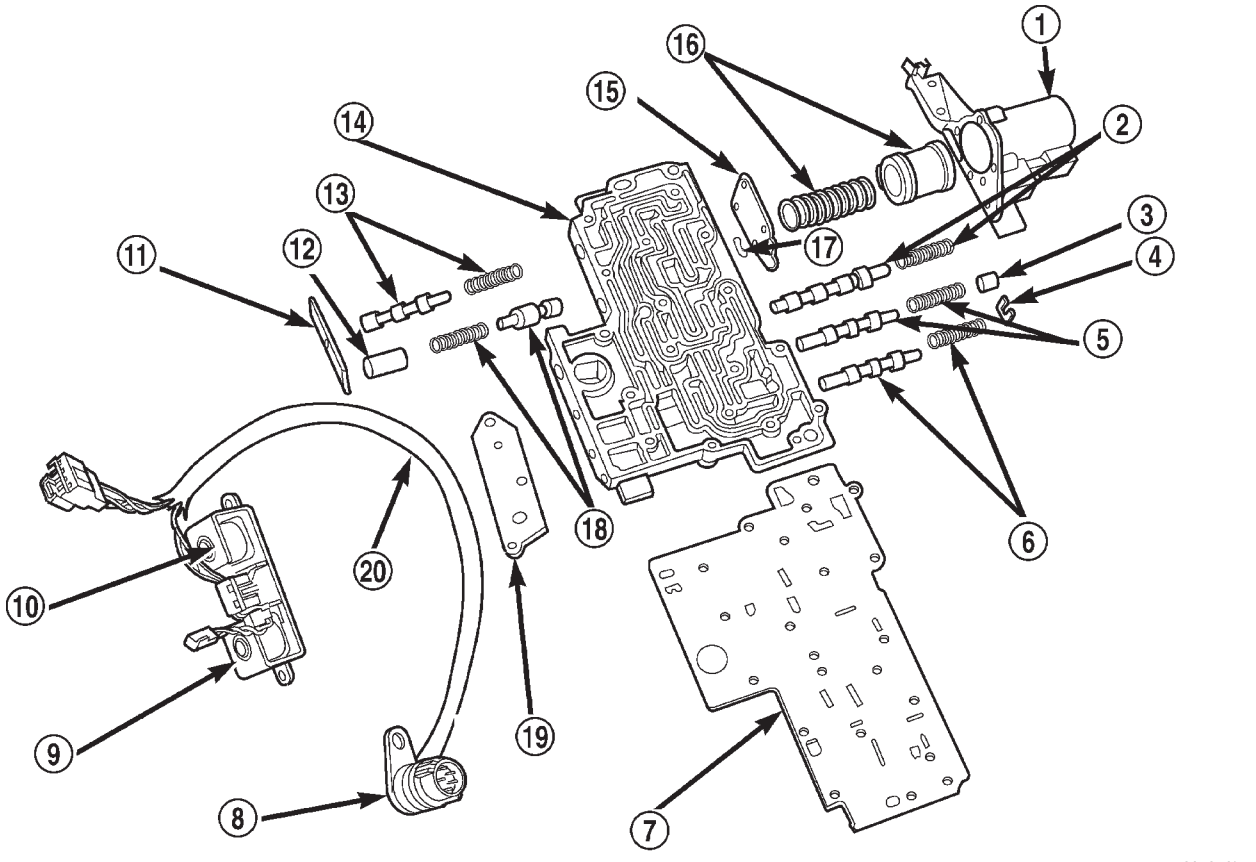


Fig. 309 Lower Housing Shift Valves and Springs

1 - 3-4 ACCUMULATOR HOUSING
2 - 3-4 SHIFT VALVE AND SPRING
3 - PLUG
4 - SPRING RETAINER
5 - CONVERTER CLUTCH VALVE AND SPRING
6 - CONVERTER CLUTCH TIMING VALVE AND SPRING
7 - OVERDRIVE SEPARATOR PLATE
8 - CASE CONNECTOR
9 - CONVERTER CLUTCH SOLENOID
10 - OVERDRIVE SOLENOID
11 - TIMING VALVE COVER
12 - PLUG
13 - 3-4 TIMING VALVE AND SPRING
14 - LOWER HOUSING
15 - ACCUMULATOR END PLATE
16 - 3-4 ACCUMULATOR PISTON AND SPRING
17 - E-CLIP
18 - 3-4 QUICK FILL SPRING AND VALVE
19 - SOLENOID GASKET
20 - HARNESS

VALVE BODY (Continued)

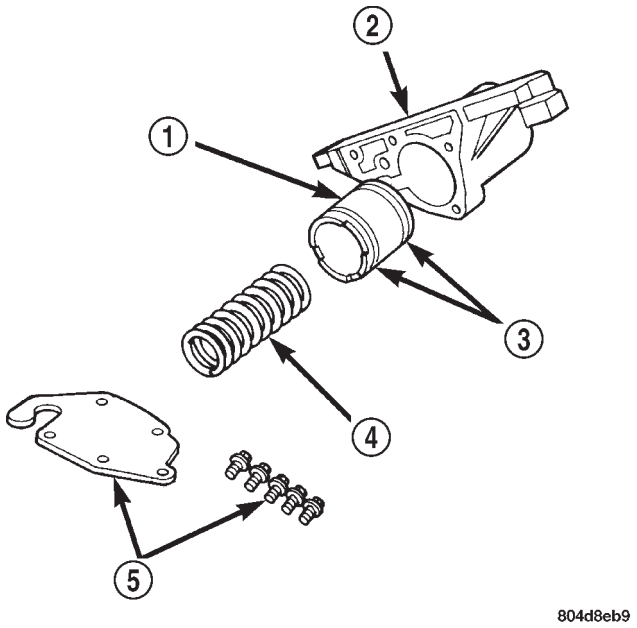


Fig. 310 Accumulator Housing Components

1 - ACCUMULATOR PISTON
2 - 3-4 ACCUMULATOR HOUSING
3 - TEFLON SEALS
4 - PISTON SPRING
5 - COVER PLATE AND SCREWS

Wipe the governor pressure sensor and solenoid valve with dry, lint free shop towels only. The O-rings on the sensor and solenoid valve are the only serviceable components. Be sure the vent ports in the solenoid valve are open and not blocked by dirt or debris. Replace the valve and/or sensor only when DRB scan tool diagnosis indicates this is necessary. Or, if either part has sustained physical damage (dented, deformed, broken, etc.).

CAUTION: Do not turn the small screw at the end of the solenoid valve for any reason. Turning the screw in either direction will ruin solenoid calibration and result in solenoid failure. In addition, the filter on the solenoid valve is NOT serviceable. Do not try to remove the filter as this will damage the valve housing.

INSPECTION

Inspect the throttle and manual valve levers and shafts. Do not attempt to straighten a bent shaft or correct a loose lever. Replace these components if worn, bent, loose or damaged in any way.

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straightedge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: Many of the valves and plugs, such as the throttle valve, shuttle valve plug, 1-2 shift valve and 1-2 governor plug, are made of coated aluminum. Aluminum components are identified by the dark color of the special coating applied to the surface (or by testing with a magnet). Do not sand aluminum valves or plugs under any circumstances. This practice could damage the special coating causing the valves/plugs to stick and bind.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.**Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Check the two separator plates for distortion or damage of any kind. Inspect the upper housing, lower housing, 3-4 accumulator housing, and transfer plate carefully. Be sure all fluid passages are clean and clear. Check condition of the upper housing and transfer plate check balls as well. The check balls and ball seats must not be worn or damaged.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

The only serviceable valve body components are listed below. The remaining valve body components are serviced only as part of a complete valve body assembly. Serviceable parts are:

- dual solenoid and harness assembly
- solenoid gasket
- solenoid case connector O-rings and shoulder bolt
- switch valve and spring

VALVE BODY (Continued)

- pressure adjusting screw and bracket assembly
- throttle lever
- manual lever and shaft seal
- throttle lever shaft seal, washer, and E-clip
- fluid filter and screws
- detent ball and spring
- valve body screws
- governor pressure solenoid
- governor pressure sensor and retaining clip
- park lock rod and E-clip

ASSEMBLY

CAUTION: Do not force valves or plugs into place during reassembly. If the valve body bores, valves and plugs are free of distortion or burrs, the valve body components should all slide into place easily. In addition, do not overtighten the transfer plate and valve body screws during reassembly. Overtightening can distort the housings resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

LOWER HOUSING

(1) Lubricate valves, springs, and the housing valve and plug bores with clean transmission fluid (Fig. 309).

(2) Install 3-4 timing valve spring and valve in lower housing.

(3) Install 3-4 quick fill valve in lower housing.

(4) Install 3-4 quick fill valve spring and plug in housing.

(5) Install timing valve end plate. Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

3-4 ACCUMULATOR

(1) Lubricate accumulator piston, seals and housing piston bore with clean transmission fluid (Fig. 310).

(2) Install new seal rings on accumulator piston.

(3) Install piston and spring in housing.

(4) Install end plate on housing.

TRANSFER PLATE

(1) Install rear clutch and rear servo check balls in transfer plate (Fig. 311).

(2) Install filter screen in upper housing separator plate (Fig. 312).

(3) Align and position upper housing separator plate on transfer plate (Fig. 313).

(4) Install brace plate (Fig. 313). Tighten brace attaching screws to 4 N·m (35 in. lbs.) torque.

(5) Install remaining separator plate attaching screws. Tighten screws to 4 N·m (35 in. lbs.) torque.

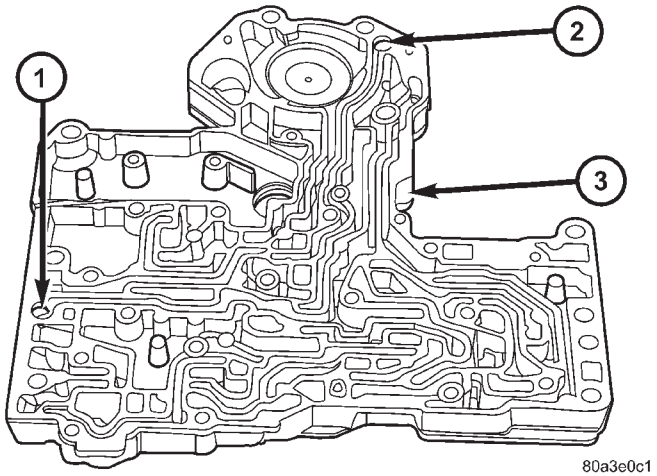


Fig. 311 Rear Clutch And Rear Servo Check Ball Locations

1 - REAR CLUTCH CHECK BALL
2 - REAR SERVO CHECK BALL
3 - TRANSFER PLATE

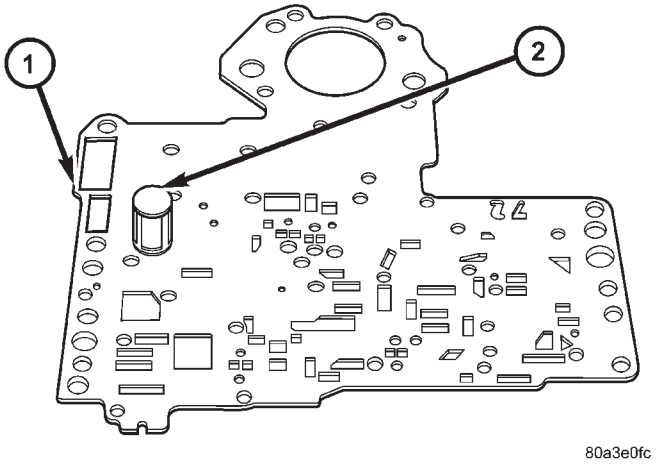


Fig. 312 Separator Plate Filter Screen Installation

1 - UPPER HOUSING SEPARATOR PLATE
2 - FILTER SCREEN

UPPER AND LOWER HOUSING

(1) Position upper housing so internal passages and check ball seats are facing upward. Then install check balls in housing (Fig. 314). Eight check balls are used. The single large check ball is approximately 8.7 mm (11/32 in.) diameter. The single small check ball is approximately 4.8 mm (3/16 in.) in diameter. The remaining 6 check balls are approximately 6.3 mm (1/4 in.) in diameter.

(2) Position assembled transfer plate and upper housing separator plate on upper housing (Fig. 315). Be sure filter screen is seated in proper housing recess.

VALVE BODY (Continued)

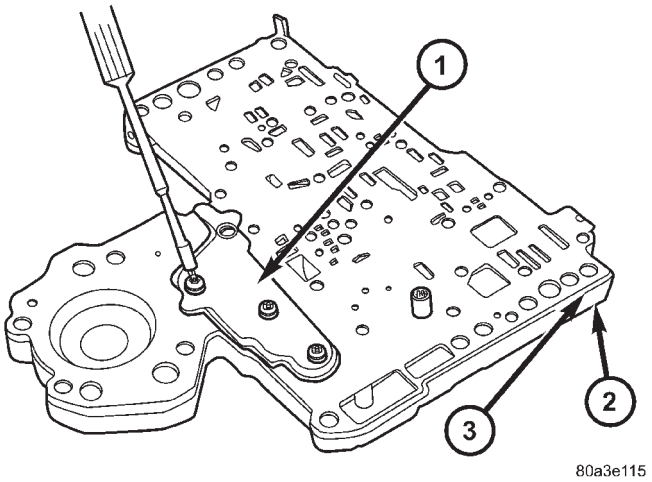


Fig. 313 Brace Plate

1 - BRACE
2 - TRANSFER PLATE
3 - SEPARATOR PLATE

(3) Install the ECE check ball into the transfer plate (Fig. 301). The ECE check ball is approximately 4.8 mm (3/16 in.) in diameter.

(4) Position lower housing separator plate on transfer plate (Fig. 316).

(5) Install lower housing on assembled transfer plate and upper housing (Fig. 317).

(6) Install and start all valve body screws by hand except for the screws to hold the boost valve tube brace. Save those screws for later installation. Then tighten screws evenly to 4 N·m (35 in. lbs.) torque. Start at center and work out to sides when tightening screws (Fig. 317).

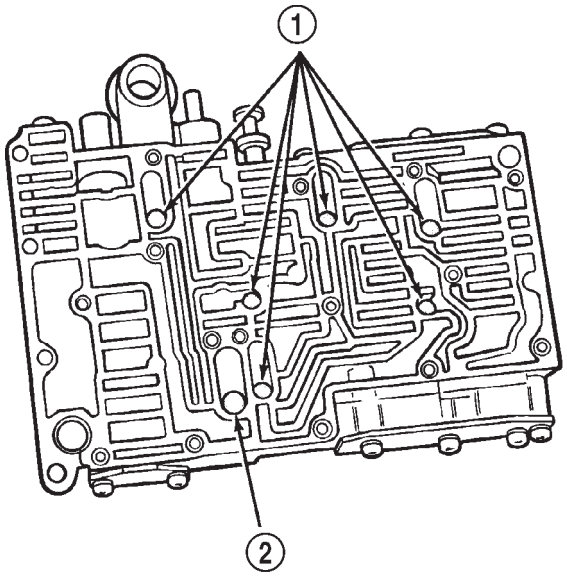


Fig. 314 Check Ball Locations In Upper Housing

1 - SMALL DIAMETER CHECK BALLS (6)
2 - LARGE DIAMETER CHECK BALL (1)

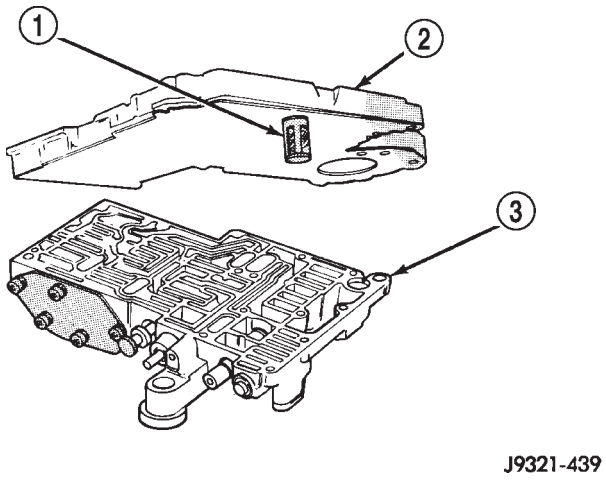


Fig. 315 Installing Transfer Plate On Upper Housing

1 - FILTER SCREEN
2 - TRANSFER PLATE/SEPARATOR PLATE ASSEMBLY
3 - UPPER HOUSING

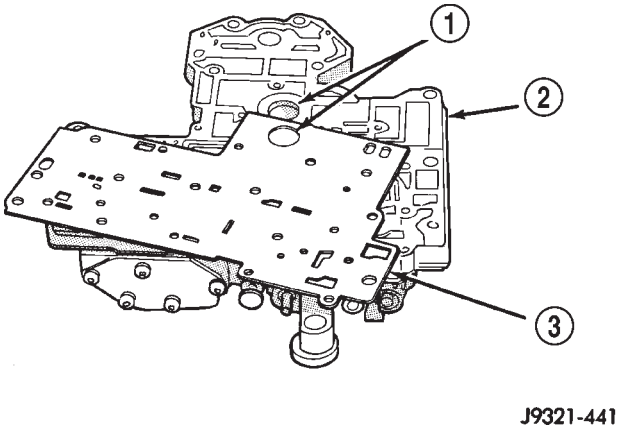


Fig. 316 Lower Housing Separator Plate

1 - BE SURE TO ALIGN BORES
2 - TRANSFER PLATE
3 - LOWER HOUSING (OVERDRIVE) SEPARATOR PLATE

VALVE BODY (Continued)

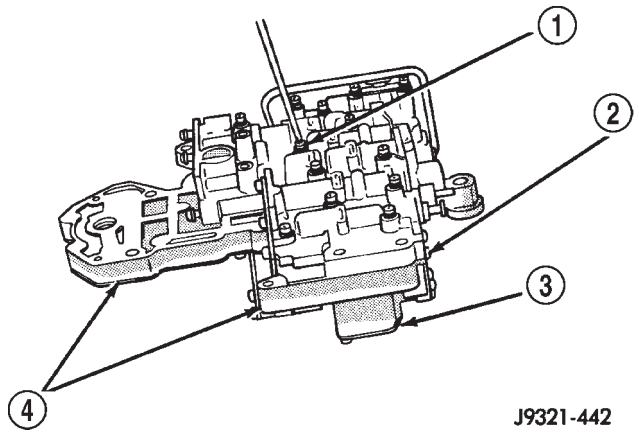


Fig. 317 Installing Lower Housing On Transfer Plate And Upper Housing

1 - VALVE BODY SCREWS (13)
2 - LOWER HOUSING
3 - UPPER HOUSING
4 - TRANSFER PLATE

UPPER HOUSING VALVE AND PLUG

Refer to (Fig. 318), (Fig. 319) and (Fig. 320) to perform the following steps.

(1) Lubricate valves, plugs, springs with clean transmission fluid.

(2) Assemble regulator valve line pressure plug, sleeve, throttle plug and spring. Insert assembly in upper housing and install cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(3) Install 1-2 and 2-3 shift valves and springs.

(4) Install 1-2 shift control valve and spring.

(5) Install retainer, spring, limit valve, and 2-3 throttle plug from limit valve housing.

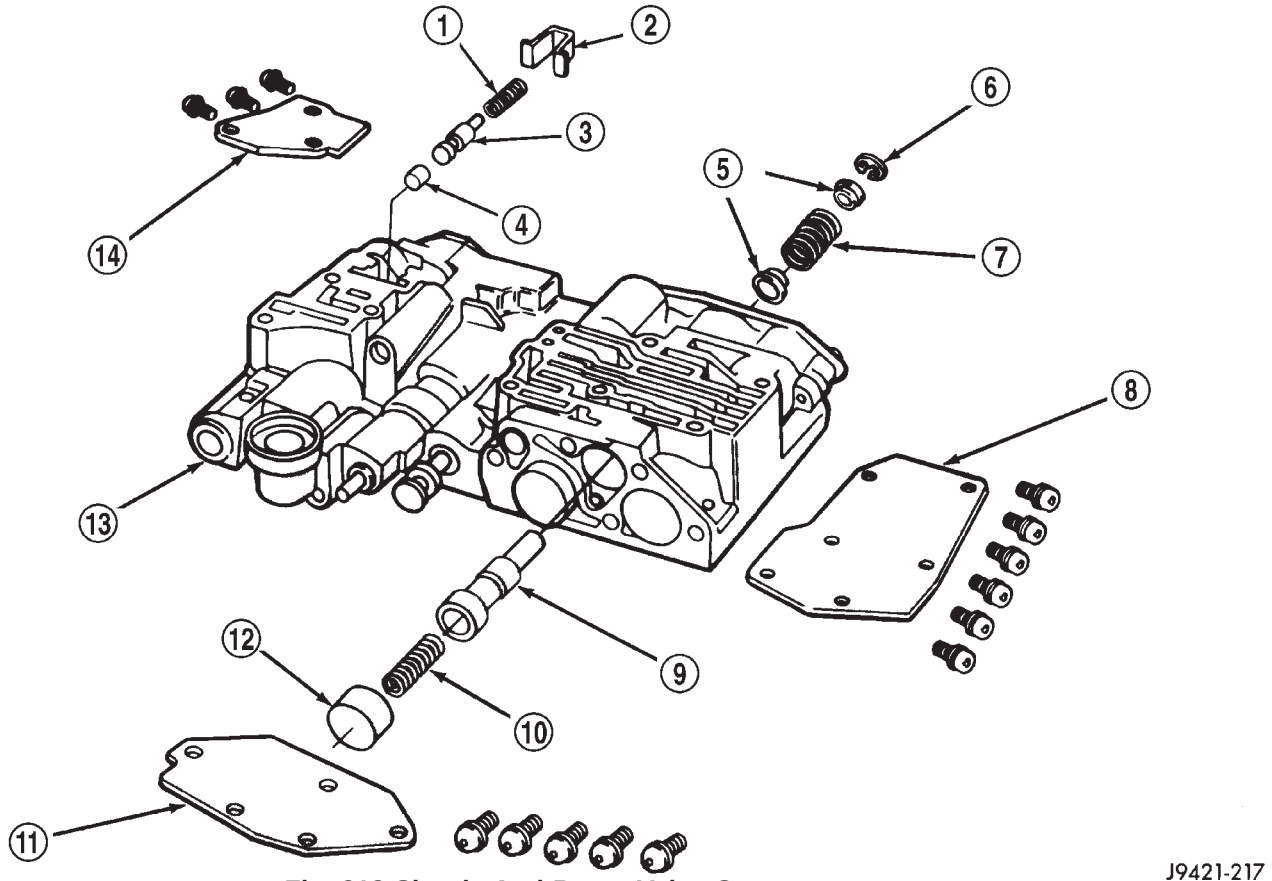


Fig. 318 Shuttle And Boost Valve Components

1 - SPRING
2 - RETAINER
3 - BOOST VALVE
4 - BOOST VALVE PLUG
5 - SPRING GUIDES
6 - E-CLIP
7 - SHUTTLE VALVE SECONDARY SPRING
8 - SHUTTLE VALVE COVER
9 - SHUTTLE VALVE
10 - SHUTTLE VALVE PRIMARY SPRING
11 - GOVERNOR PLUG COVER
12 - THROTTLE PLUG
13 - UPPER HOUSING
14 - BOOST VALVE COVER

VALVE BODY (Continued)

(6) Install limit valve housing and cover plate. Tighten screws to 4 N·m (35 in. lbs.).

(7) Install shuttle valve as follows:

(a) Insert plastic guides in shuttle valve secondary spring and install spring on end of valve.

(b) Install shuttle valve into housing.

(c) Hold shuttle valve in place.

(d) Compress secondary spring and install E-clip in groove at end of shuttle valve.

(e) Verify that spring and E-clip are properly seated before proceeding.

(8) Install shuttle valve cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(9) Install 1-2 and 2-3 valve governor plugs in valve body.

(10) Install shuttle valve primary spring and throttle plug.

(11) Align and install governor plug cover. Tighten cover screws to 4 N·m (35 in. lbs.) torque.

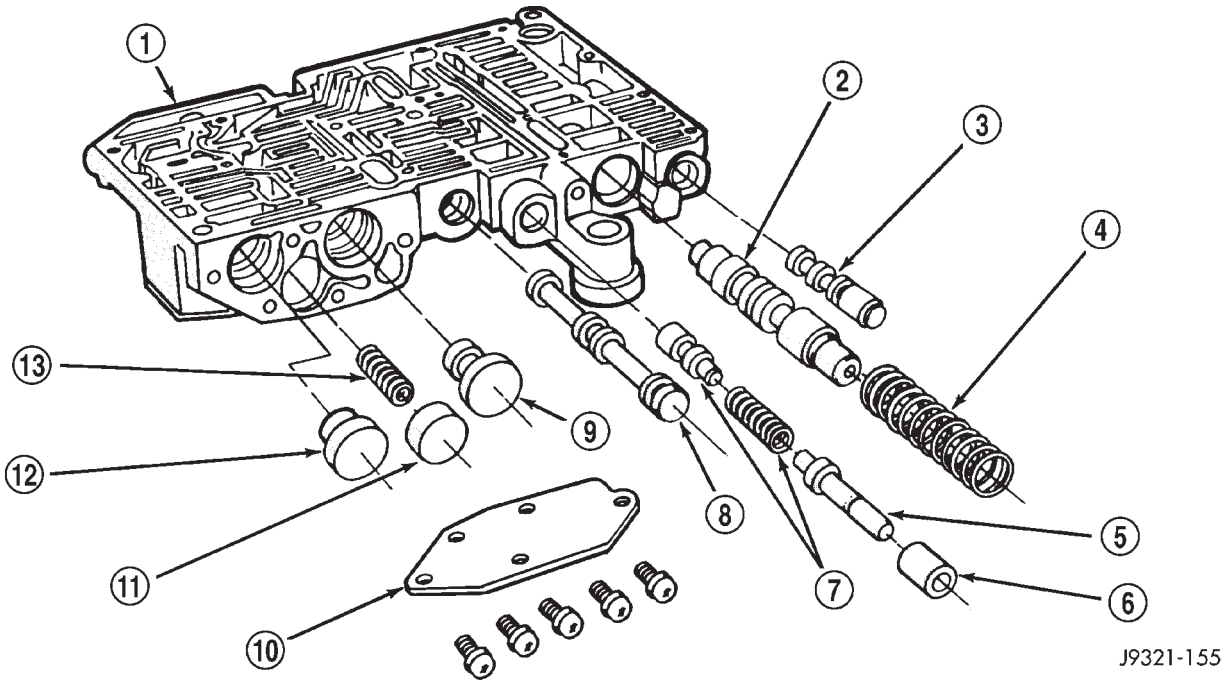


Fig. 319 Upper Housing Control Valve Locations

1 - UPPER HOUSING
2 - REGULATOR VALVE
3 - SWITCH VALVE
4 - REGULATOR VALVE SPRING
5 - KICKDOWN VALVE
6 - KICKDOWN DETENT
7 - THROTTLE VALVE AND SPRING
8 - MANUAL VALVE
9 - 1-2 GOVERNOR PLUG
10 - GOVERNOR PLUG COVER
11 - THROTTLE PLUG
12 - 2-3 GOVERNOR PLUG
13 - SHUTTLE VALVE PRIMARY SPRING

VALVE BODY (Continued)

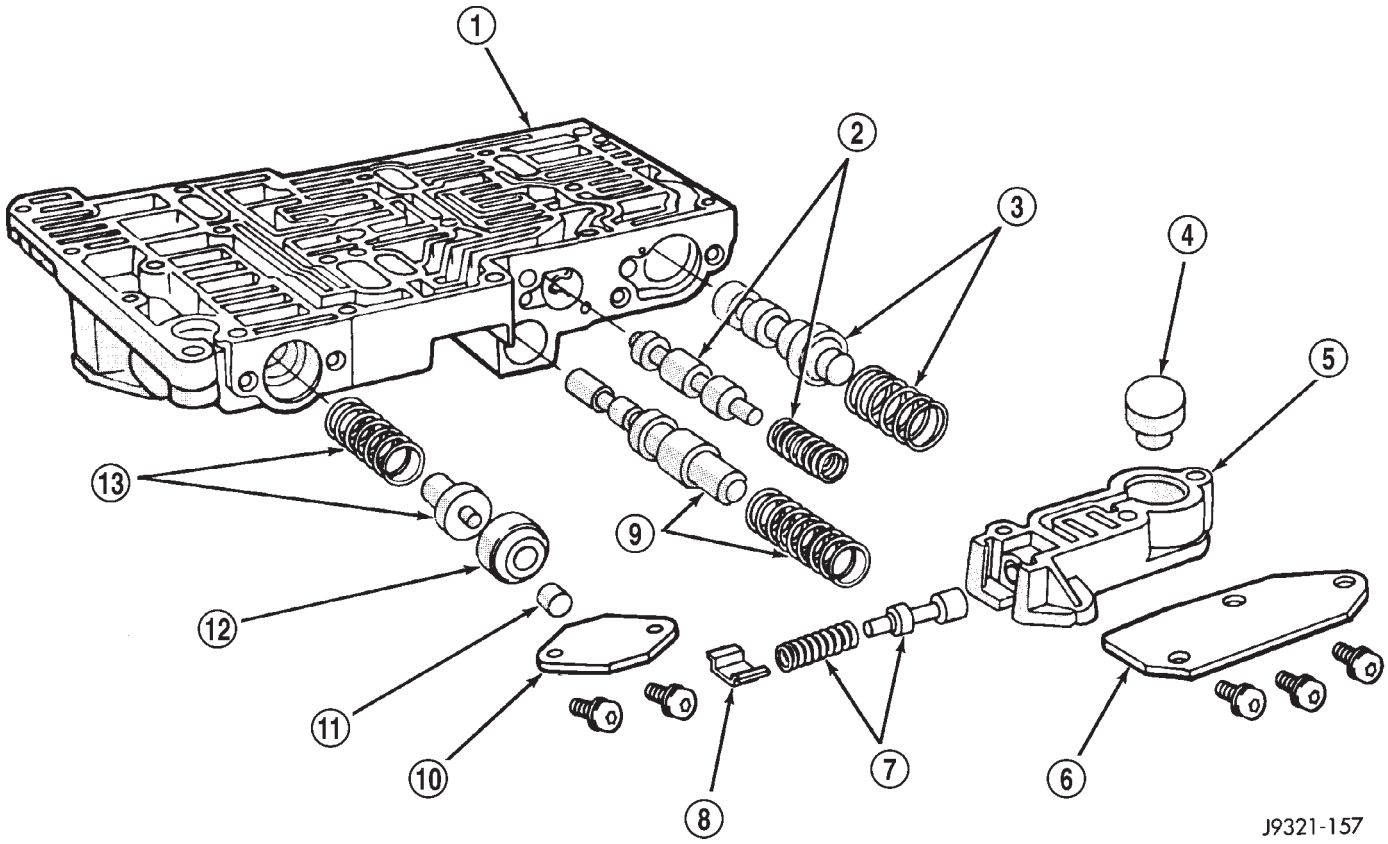


Fig. 320 Upper Housing Shift Valve And Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - LINE PRESSURE PLUG
12 - PLUG SLEEVE
13 - THROTTLE PRESSURE SPRING AND PLUG

VALVE BODY (Continued)

BOOST VALVE TUBE AND BRACE

(1) Position valve body assembly so lower housing is facing upward (Fig. 321).

(2) Lubricate tube ends and housing ports with transmission fluid or petroleum jelly.

(3) Start tube in lower housing port first. Then swing tube downward and work opposite end of tube into upper housing port (Fig. 321).

(4) Insert and seat each end of tube in housings.

(5) Slide tube brace under tube and into alignment with valve body screw holes (Fig. 322).

(6) Install and finger tighten three screws that secure tube brace to valve body housings (Fig. 322).

(7) Bend tube brace tabs up and against tube to hold it in position (Fig. 323).

(8) Tighten all valve body housing screws to 4 N·m (35 in. lbs.) torque after tube and brace are installed. Tighten screws in diagonal pattern starting at center and working outward.

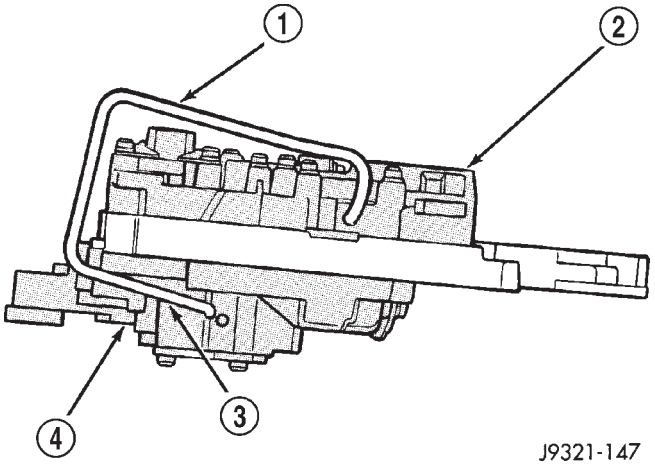


Fig. 321 Boost Valve Tube

1 - BOOST VALVE TUBE
2 - LOWER HOUSING
3 - DISENGAGE THIS END OF TUBE FIRST
4 - UPPER HOUSING

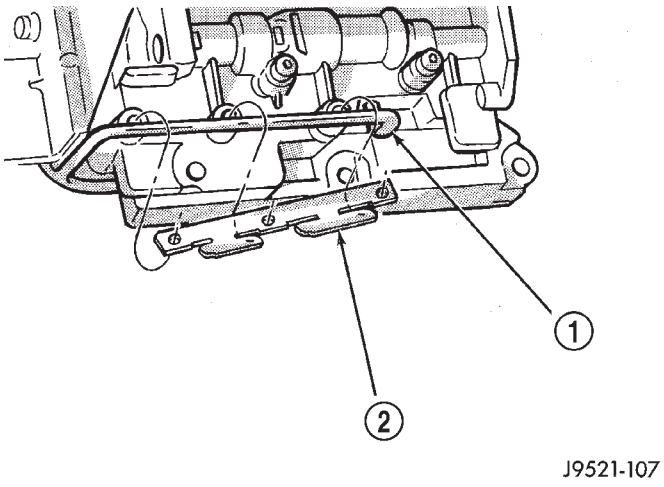


Fig. 322 Boost Valve Tube And Brace

1 - BOOST VALVE TUBE
2 - TUBE BRACE

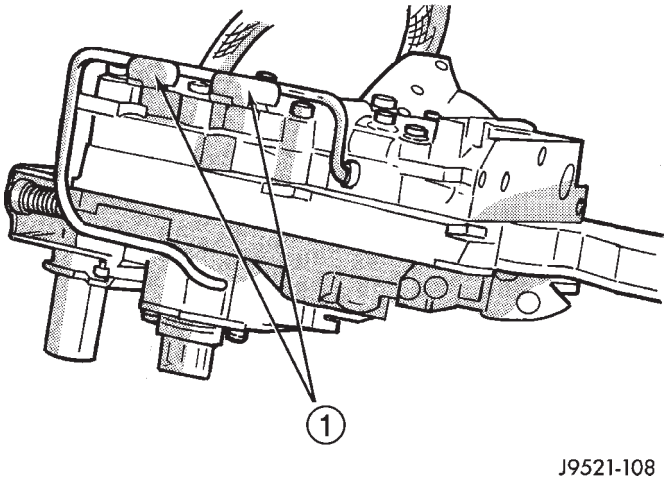


Fig. 323 Securing Boost Valve Tube With Brace Tabs

1 - BEND TABS UP AGAINST TUBE AS SHOWN

VALVE BODY (Continued)

3-4 ACCUMULATOR

(1) Position converter clutch valve and 3-4 shift valve springs in housing (Fig. 324).

(2) Loosely attach accumulator housing with right-side screw (Fig. 324). Install only one screw at this time as accumulator must be free to pivot upward for ease of installation.

(3) Install 3-4 shift valve and spring.

(4) Install converter clutch timing valve and spring.

(5) Position plug on end of converter clutch valve spring. Then compress and hold springs and plug in place with fingers of one hand.

(6) Swing accumulator housing upward over valve springs and plug.

(7) Hold accumulator housing firmly in place and install remaining two attaching screws. Be sure springs and clutch valve plug are properly seated (Fig. 325). Tighten screws to 4 N·m (35 in. lbs.).

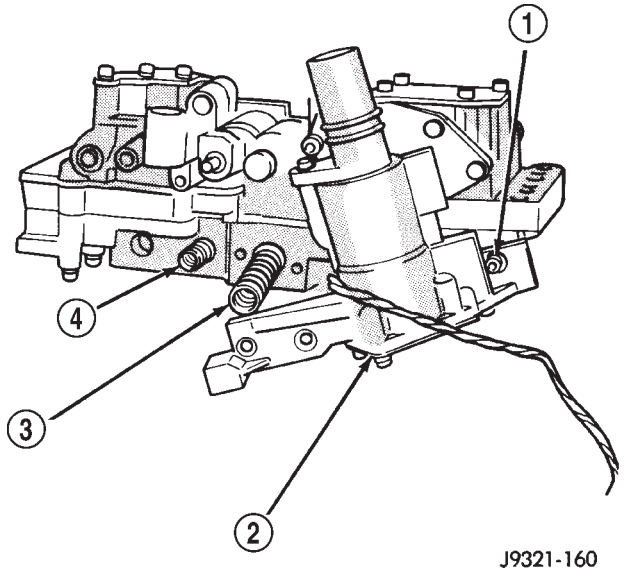


Fig. 324 Converter Clutch And 3-4 Shift Valve Springs

1 - RIGHT-SIDE SCREW
2 - 3-4 ACCUMULATOR
3 - 3-4 SHIFT VALVE SPRING
4 - CONVERTER CLUTCH VALVE SPRING

VALVE BODY FINAL

(1) Install boost valve, valve spring, retainer and cover plate. Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.

(2) Insert manual lever detent spring in upper housing.

(3) Position detent ball on end of spring. Then hold detent ball and spring in detent housing with Retainer Tool 6583 (Fig. 326).

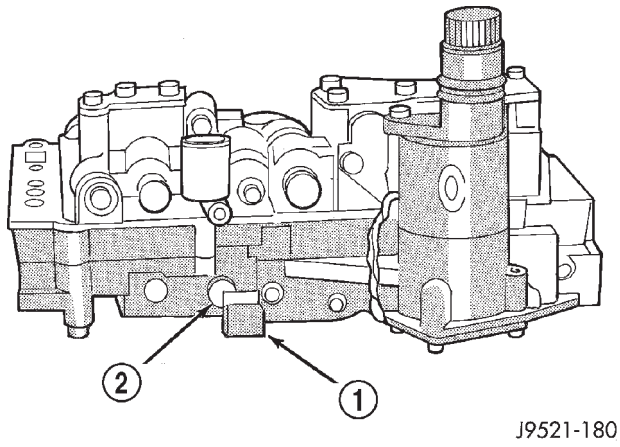


Fig. 325 Seating 3-4 Accumulator On Lower Housing

1 - ACCUMULATOR BOX
2 - CONVERTER CLUTCH VALVE PLUG

(4) Install throttle lever in upper housing. Then install manual lever over throttle lever and start manual lever into housing.

(5) Align manual lever with detent ball and manual valve. Hold throttle lever upward. Then press down on manual lever until fully seated. Remove detent ball retainer tool after lever is seated.

(6) Then install manual lever seal, washer and E-clip.

(7) Verify that throttle lever is aligned with end of kickdown valve stem and that manual lever arm is engaged in manual valve (Fig. 327).

(8) Position line pressure adjusting screw in adjusting screw bracket.

(9) Install spring on end of line pressure regulator valve.

(10) Install switch valve spring on tang at end of adjusting screw bracket.

(11) Install manual valve.

(12) Install throttle valve and spring.

(13) Install kickdown valve and detent.

(14) Install pressure regulator valve.

(15) Install switch valve.

(16) Position adjusting screw bracket on valve body. Align valve springs and press bracket into place. Install short, upper bracket screws first and long bottom screw last. Verify that valve springs and bracket are properly aligned. Then tighten all three bracket screws to 4 N·m (35 in. lbs.) torque.

(17) Perform Line Pressure and Throttle Pressure adjustments. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/VALVE BODY - ADJUSTMENTS)

(18) Lubricate solenoid case connector O-rings and shaft of manual lever with light coat of petroleum jelly.

VALVE BODY (Continued)

(19) Attach solenoid case connector to 3-4 accumulator with shoulder-type screw. Connector has small locating tang that fits in dimple at top of accumulator housing (Fig. 328). Seat tang in dimple before tightening connector screw.

(20) Install solenoid assembly and gasket. Tighten solenoid attaching screws to 8 N·m (72 in. lbs.) torque.

(21) Verify that solenoid wire harness is properly routed (Fig. 329). Solenoid harness must be clear of manual lever and park rod and not be pinched between accumulator housing and cover.

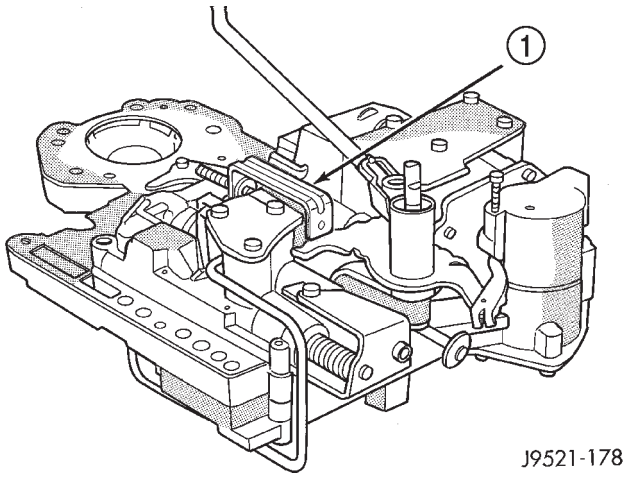


Fig. 326 Detent Ball Spring

1 - SPECIAL TOOL 6583 POSITIONED ON DETENT HOUSING

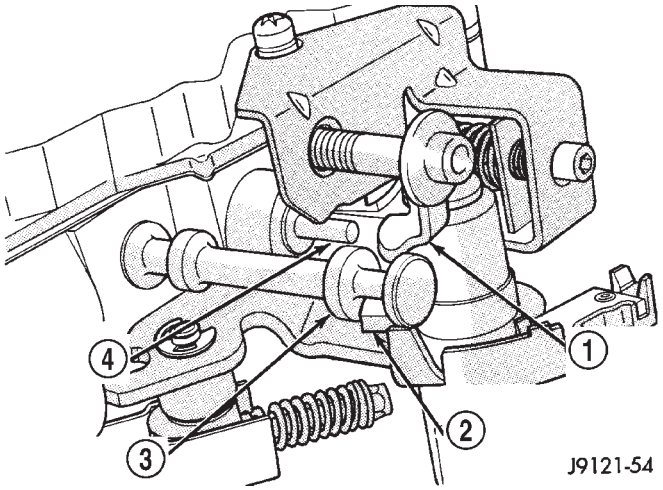


Fig. 327 Manual And Throttle Lever Alignment

1 - THROTTLE LEVER
2 - MANUAL LEVER VALVE ARM
3 - MANUAL VALVE
4 - KICKDOWN VALVE

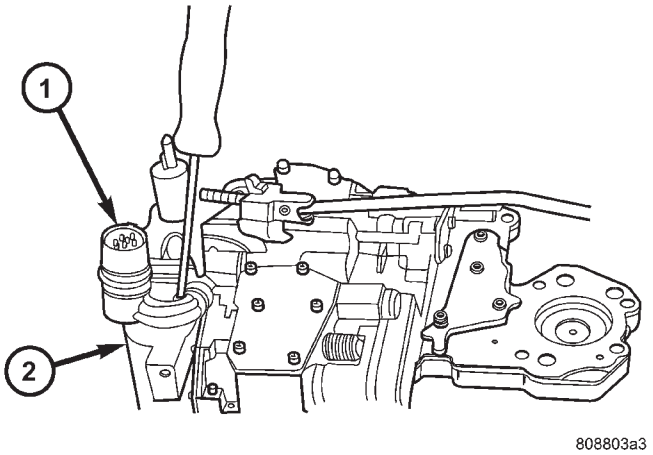


Fig. 328 Solenoid Harness Case Connector Shoulder Bolt

1 - SOLENOID HARNESS CASE CONNECTOR
2 - 3-4 ACCUMULATOR HOUSING

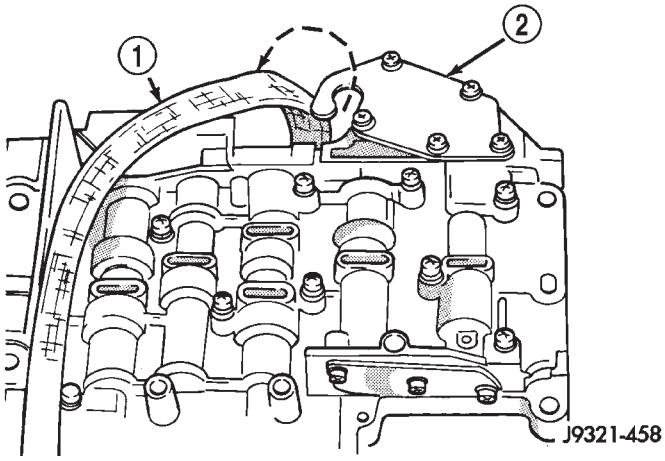


Fig. 329 Solenoid Harness Routing

1 - OVERDRIVE/CONVERTER SOLENOID WIRE HARNESS
2 - 3-4 ACCUMULATOR COVER PLATE

VALVE BODY (Continued)

GOVERNOR BODY, SENSOR AND SOLENOID

(1) Turn valve body assembly over so accumulator side of transfer plate is facing down.
(2) Install new O-rings on governor pressure solenoid and sensor.
(3) Lubricate solenoid and sensor O-rings with clean transmission fluid.
(4) Install governor pressure sensor in governor body.
(5) Install governor pressure solenoid in governor body. Push solenoid in until it snaps into place in body.
(6) Position governor body gasket on transfer plate.
(7) Install retainer plate on governor body and around solenoid. Be sure solenoid connector is positioned in retainer cutout.
(8) Align screw holes in governor body and transfer plate. Then install and tighten governor body screws to 4 N·m (35 in. lbs.) torque.
(9) Connect harness wires to governor pressure solenoid and governor pressure sensor.
(10) Install fluid filter and pan.
(11) Lower vehicle.
(12) Fill transmission with recommended fluid and road test vehicle to verify repair.

INSTALLATION

(1) Check condition of O-ring seals on valve body harness connector (Fig. 330). Replace seals on connector body if cut or worn.
(2) Check condition of manual lever shaft seal in transmission case. Replace seal if lip is cut or worn. Install new seal with 15/16 deep well socket (Fig. 331).
(3) Check condition of seals on accumulator piston (Fig. 332). Install new piston seals, if necessary.
(4) Place valve body manual lever in low (1 position) so ball on park lock rod will be easier to install in sprag.
(5) Lubricate shaft of manual lever with petroleum jelly. This will ease inserting shaft through seal in case.
(6) Lubricate seal rings on valve body harness connector with petroleum jelly.
(7) Position valve body in case and work end of park lock rod into and through pawl sprag. Turn propeller shaft to align sprag and park lock teeth if necessary. The rod will click as it enters pawl. Move rod to check engagement.

CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into this cavity.

(8) Install accumulator springs and piston into case. Then swing valve body over piston and outer spring to hold it in place.
(9) Align accumulator piston and outer spring, manual lever shaft and electrical connector in case.
(10) Then seat valve body in case and install one or two bolts to hold valve body in place.
(11) Tighten valve body bolts alternately and evenly to 11 N·m (100 in. lbs.) torque.
(12) Install new fluid filter on valve body. Tighten filter screws to 4 N·m (35 in. lbs.) torque.
(13) Install throttle and gearshift levers on valve body manual lever shaft.
(14) Check and adjust front and rear bands if necessary.
(15) Connect solenoid case connector wires.
(16) Install oil pan and new gasket. Tighten pan bolts to 13.6 N·m (125 in. lbs.) torque.
(17) Lower vehicle and fill transmission with Mopar® ATF +4, type 9602, fluid.
(18) Check and adjust gearshift and throttle valve cables, if necessary.

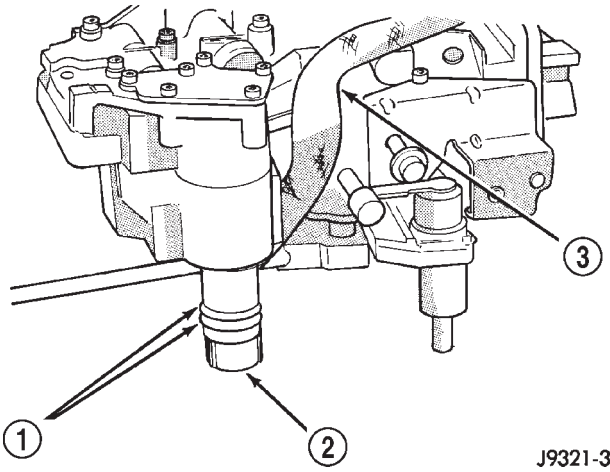


Fig. 330 Valve Body Harness Connector O-Ring Seal

1 - CONNECTOR O-RINGS
2 - VALVE BODY HARNESS CONNECTOR
3 - HARNESS

ADJUSTMENTS - VALVE BODY

CONTROL PRESSURE ADJUSTMENTS

There are two control pressure adjustments on the valve body;

- Line Pressure
- Throttle Pressure

Line and throttle pressures are interdependent because each affects shift quality and timing. As a result, both adjustments must be performed properly and in the correct sequence. Adjust line pressure first and throttle pressure last.

VALVE BODY (Continued)

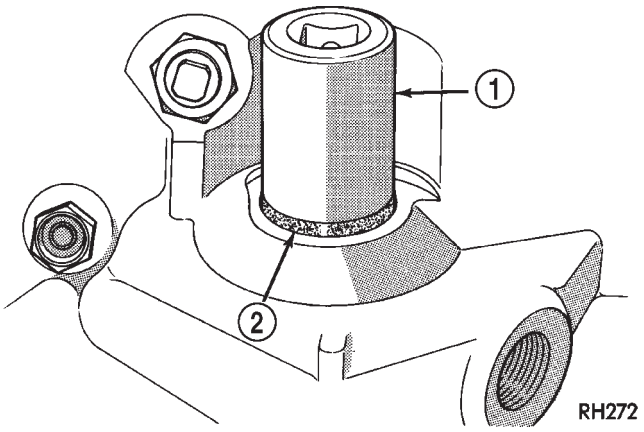


Fig. 331 Manual Lever Shaft Seal

1 - 15/16'' SOCKET
2 - SEAL

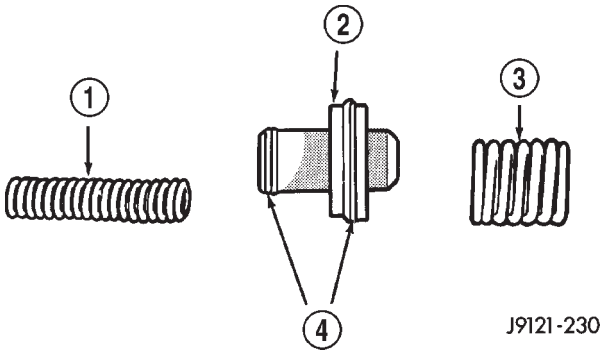


Fig. 332 Accumulator Piston Components

1 - INNER SPRING
2 - ACCUMULATOR PISTON
3 - OUTER SPRING
4 - SEAL RINGS

LINE PRESSURE ADJUSTMENT

Measure distance from the valve body to the inner edge of the adjusting screw with an accurate steel scale (Fig. 333).

Distance should be 33.4 mm (1-5/16 in.).

If adjustment is required, turn the adjusting screw in, or out, to obtain required distance setting.

NOTE: The 33.4 mm (1-5/16 in.) setting is an approximate setting. Manufacturing tolerances may make it necessary to vary from this dimension to obtain desired pressure.

One complete turn of the adjusting screw changes line pressure approximately 1-2/3 psi (9 kPa).

Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

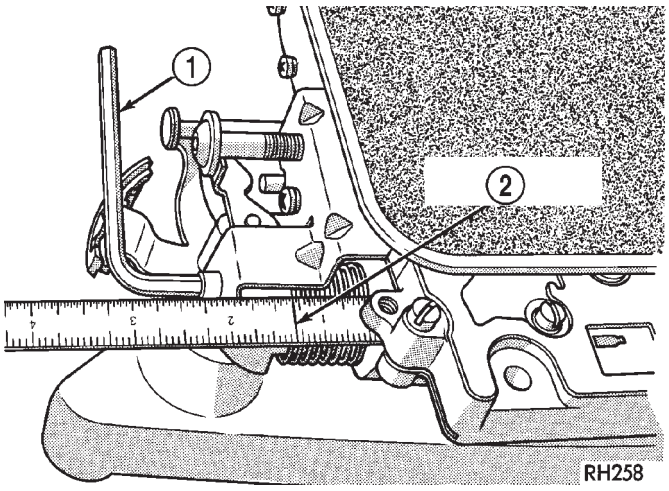


Fig. 333 Line Pressure Adjustment

1 - WRENCH
2 - 1–5/16 INCH

THROTTLE PRESSURE ADJUSTMENT

Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (Fig. 334).

Push the gauge tool inward to compress the kickdown valve against the spring and bottom the throttle valve.

Maintain pressure against kickdown valve spring. Turn throttle lever stop screw until the screw head touches throttle lever tang and the throttle lever cam touches gauge tool.

NOTE: The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.

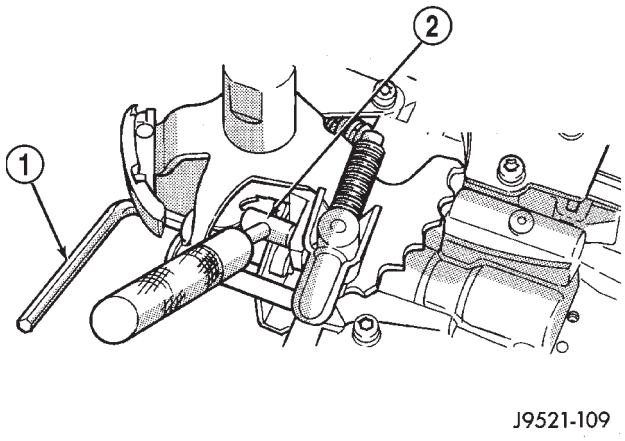


Fig. 334 Throttle Pressure Adjustment

1 - HEX WRENCH (IN THROTTLE LEVER ADJUSTING SCREW)
2 - SPECIAL TOOL C-3763 (POSITIONED BETWEEN THROTTLE LEVER AND KICKDOWN VALVE)

AUTOMATIC TRANSMISSION - 545RFE

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AUTOMATIC TRANSMISSION - 545RFE

DESCRIPTION

The 545RFE automatic transmission is a sophisticated, multi-range, electronically controlled transmission which combines optimized gear ratios for responsive performance, state of the art efficiency features and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum driveability. The three planetary gear sets also make available a unique alternate second gear ratio. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2prime) allows smoother 4-2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range. An additional overdrive ratio (0.67:1) is also provided for greater fuel economy and less NVH at highway speeds.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual Stage Hydraulic oil pump
- Valve body
- Solenoid pack

The TCM is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

AUTOMATIC TRANSMISSION - 545RFE (Continued)

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped on the left side of the case just above the oil pan sealing surface (Fig. 1). Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information which may also be necessary for identification purposes.

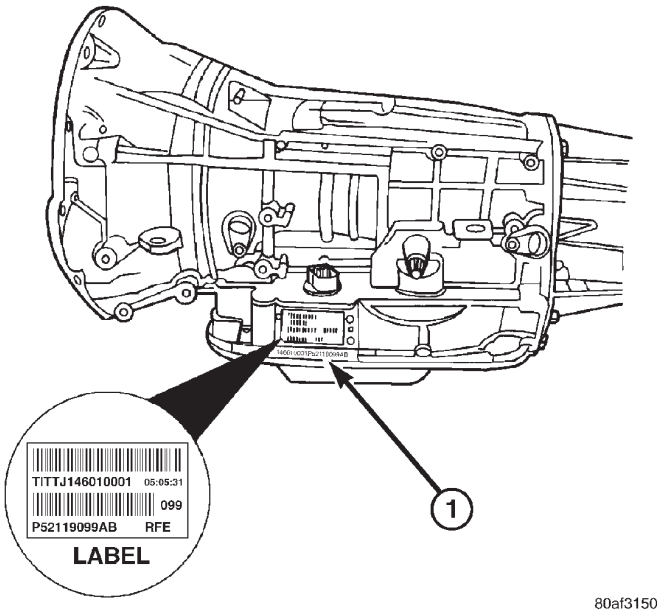


Fig. 1 Transmission Part And Serial Number Location

GEAR RATIOS The 545RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
5th	0.67:1
Reverse	3.00:1

OPERATION

The 545RFE offers full electronic control of all automatic up and downshifts, and features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmission includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output pressure greatly exceeds that which is needed to keep the clutches applied. The 545RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

A high-travel torque converter damper assembly allows earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 545RFE is packaged in a one-piece die-cast aluminum case. To reduce NVH, the case has high lateral, vertical and torsional stiffness. It is also designed to maximize the benefit of the structural dust cover that connects the bottom of the bell housing to the engine bedplate, enhancing overall power train stiffness. Dual filters protect the pump and other components. A pump return filter is added to the customary main sump filter. Independent lubrication and cooler circuits assure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

The hydraulic control system design (without electronic assist) provides the transmission with PARK, REVERSE, NEUTRAL, SECOND, and THIRD gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in “limp-in” mode) in the event of a electronic control system failure, or a situation that the Transmission Control Module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC’s, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB scan tool.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on a 545RFE automatic transmission, check for Diagnostic Trouble Codes with the DRB® scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

DIAGNOSIS AND TESTING - PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

(1) Check for transmission fault codes using DRB® scan tool.

(2) Check fluid level and condition.

(3) Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.

(4) Road test and note how transmission upshifts, downshifts, and engages.

(5) Perform stall test if complaint is based on sluggish acceleration. Or, if abnormal throttle opening is needed to maintain normal speeds with a properly tuned engine.

(6) Perform hydraulic pressure test if shift problems were noted during road test.

(7) Perform air-pressure test to check clutch operation.

VEHICLE IS DISABLED

(1) Check fluid level and condition.

(2) Check for broken or disconnected gearshift cable.

(3) Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.

(4) Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

(a) If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

(b) If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.

(c) If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

DIAGNOSIS AND TESTING - ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, overrunning clutch, or line presure problems.

A slipping clutch can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch Application chart provides a basis for analyzing road test results.

CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D–OVERDRIVE FIRST	ON					ON*	ON
SECOND	ON			ON			
SECOND PRIME	ON				ON		
THIRD	ON	ON					
FOURTH		ON			ON		
FIFTH		ON		ON			
LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
SECOND	ON			ON			
LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

*L/R clutch is on only with the output shaft speed below 150 rpm.

AUTOMATIC TRANSMISSION - 545RFE (Continued)

DIAGNOSIS AND TESTING - HYDRAULIC PRESSURE TEST

An accurate tachometer and pressure test gauges are required. Test Gauge C-3293-SP has a 300 psi range and is used at all locations where pressures exceed 100 psi.

Pressure Test Port Locations

Only two pressure ports are supplied on the transmission case. The torque converter clutch apply and release ports are located on the right side of the transmission case (Fig. 2).

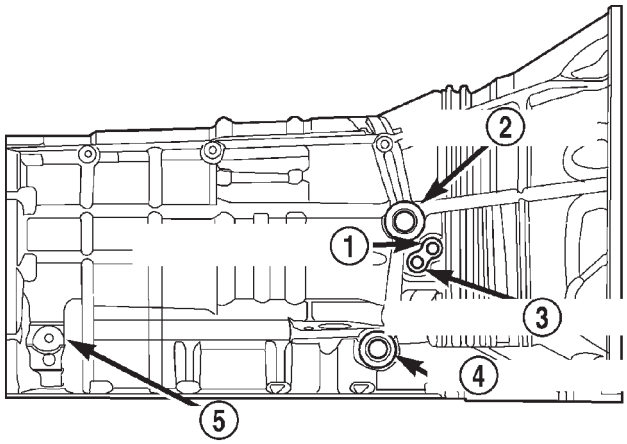


Fig. 2 Torque Converter Pressure Locations

1 - TCC RELEASE
2 - TO COOLER
3 - TCC APPLY
4 - FROM COOLER
5 - LINE PRESSURE SENSOR

To determine the line pressure, there are two available methods. The DRB® scan tool can be used to read line pressure from the line pressure sensor. The second method is to install Line Pressure Adapter 8259 (Fig. 4) into the transmission case and then install the pressure gauge and the original sensor into the adapter. This will allow a comparison of the DRB® readings and the gauge reading to determe the accuracy of the line pressure sensor. The DRB® line pressure reading should match the gauge reading within ±10 psi.

In order to access any other pressure tap locations, the transmission oil pan must be removed, the pressure port plugs removed and Valve Body Pressure Tap Adapter 8258-A (Fig. 5) installed. The extensions supplied with Adapter 8258-A will allow the installation of pressure gauges to the valve body. Refer to (Fig. 3) for correct pressure tap location identification.

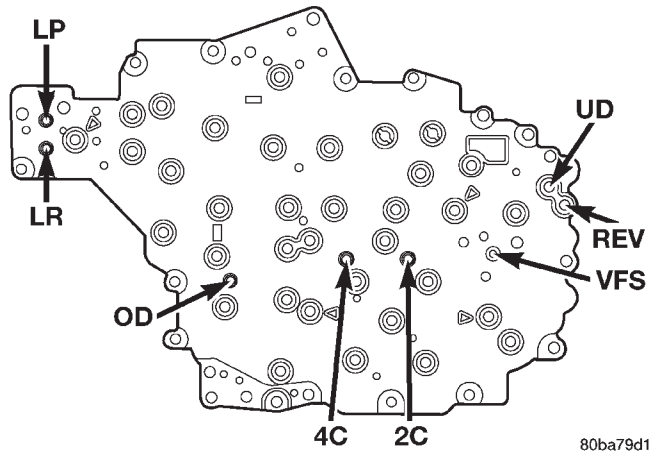


Fig. 3 Pressure Tap Locations

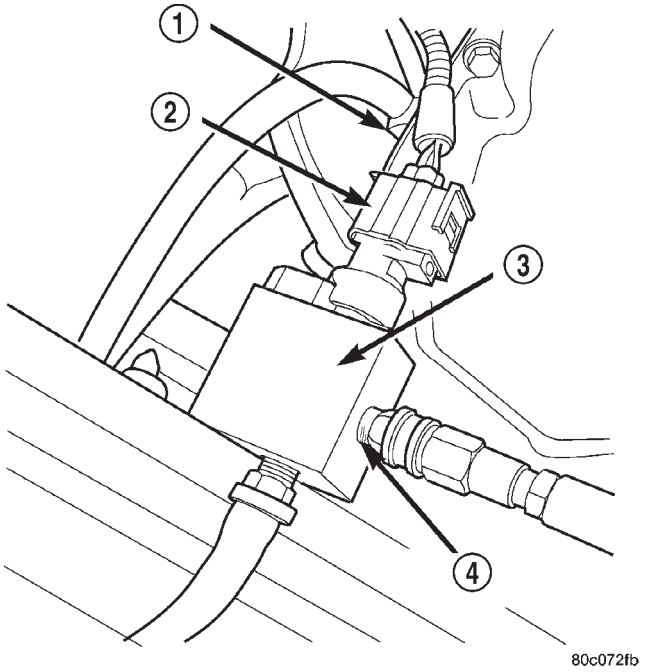


Fig. 4 Line Pressure Adapter 8259

1 - LINE PRESSURE SENSOR PORT
2 - LINE PRESSURE SENSOR
3 - TOOL 8259
4 - PRESSURE TAP

TEST PROCEDURE

All pressure readings should be taken with the transmission fluid level full, transmission oil at the normal operating temperature, and the engine at 1500 rpm. Check the transmission for proper operation in each gear position that is in question or if a specific element is in question, check the pressure readings in at least two gear positions that employ that element. Refer to the Hydraulic Schematics at the rear of this section to determine the correct pressures for each element in a given gear position.

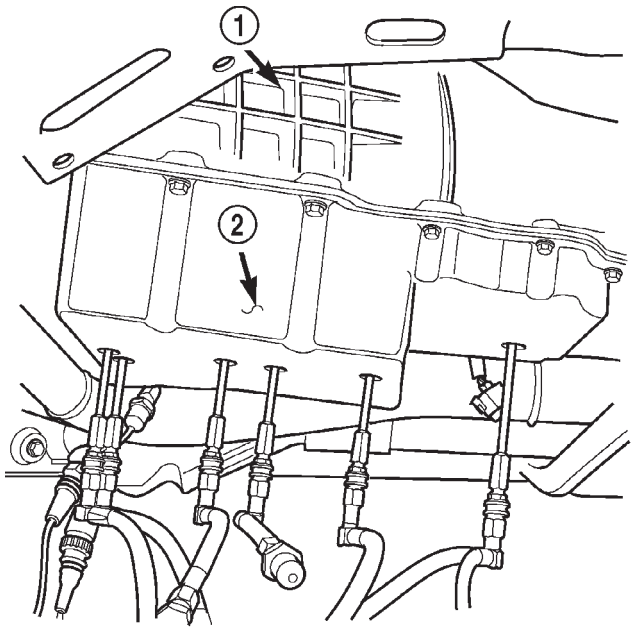


Fig. 5 Valve Body Pressure Tap Adapter 8258-A

1 - 545RFE TRANSMISSION
2 - TOOL 8258-A

NOTE: The 545RFE utilizes closed loop control of pump line pressure. The pressure readings may therefore vary greatly but should always follow line pressure.

Some common pressures that can be measured to evaluate pump and clutch performance are the upshift/downshift pressures and the garage shift pressures. The upshift/downshift pressure for all shifts except the 4-5 shift is 120 psi. The upshift pressure for the 4-5 shift is 130 psi. The garage shift pressure when performing a N-R shift is 220 psi. The garage shift pressure for the R-N and N-1 shifts is 120 psi.

DIAGNOSIS AND TESTING - AIR CHECKING TRANSMISSION CLUTCH OPERATION

Air-pressure testing can be used to check transmission clutch operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The clutch apply passages are shown (Fig. 6).

NOTE: The air supply which is used must be free of moisture and dirt. Use a pressure of 30 psi to test clutch operation.

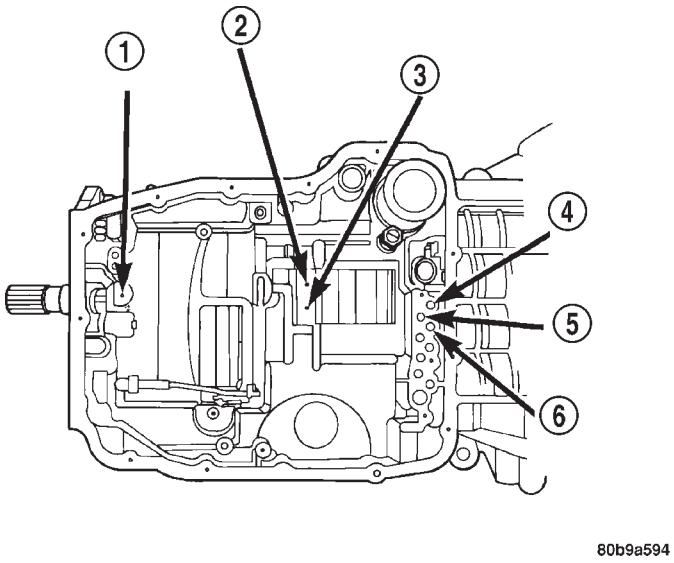


Fig. 6 Air Pressure Test Passages

1 - LOW REVERSE CLUTCH
2 - 4TH CLUTCH
3 - 2ND CLUTCH
4 - OVERDRIVE CLUTCH
5 - UNDERDRIVE CLUTCH
6 - REVERSE CLUTCH

Apply air pressure at each port. If the clutch is functioning, a soft thump will be heard as the clutch is applied. The clutch application can also be felt by touching the appropriate element while applying air pressure. As the air pressure is released, the clutch should also release.

DIAGNOSIS AND TESTING - CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

(1) Verify that a leak condition actually exists.
(2) Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Torque converter seal leaks tend to move along the drive hub and onto the rear of the converter. Pump cover seal tend to run down the cover and the inside surface of the bellhousing.

Some leaks, or suspected leaks, may be particularly difficult to locate. If necessary, a Mopar® approved dye may be used to locate a leak.

AUTOMATIC TRANSMISSION - 545RFE (Continued)

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

(1) Leaks at the weld joint around the outside diameter weld (Fig. 7).

(2) Leaks at the converter hub weld (Fig. 7).

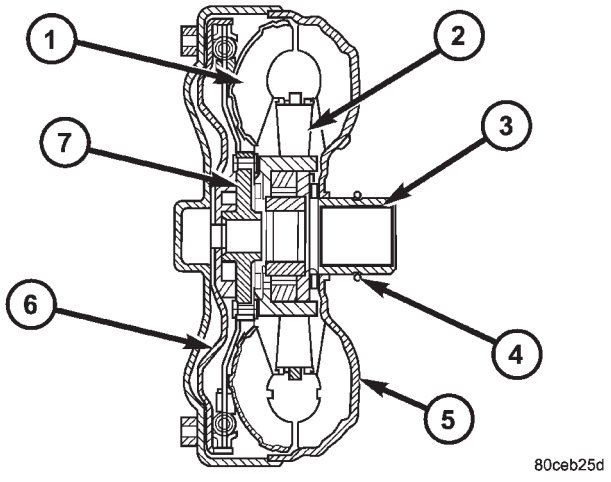


Fig. 7 Torque Converter Assembly

1 - TURBINE ASSEMBLY
2 - STATOR
3 - CONVERTER HUB
4 - O-RING
5 - IMPELLER ASSEMBLY
6 - CONVERTER CLUTCH PISTON
7 - TURBINE HUB

STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

CAUTION: The transmission and torque converter must be removed as an assembly to avoid component damage. The converter driveplate, converter hub o-ring, or oil seal can be damaged if the converter is left attached to the driveplate during removal. Be sure to remove the transmission and converter as an assembly.

(1) Disconnect the negative battery cable.

(2) Raise and support the vehicle

(3) Mark propeller shaft and axle yokes for assembly alignment.

(4) Remove the rear propeller shaft

(5) Remove the front propeller shaft.

(6) Remove the engine to transmission collar (Fig. 8).

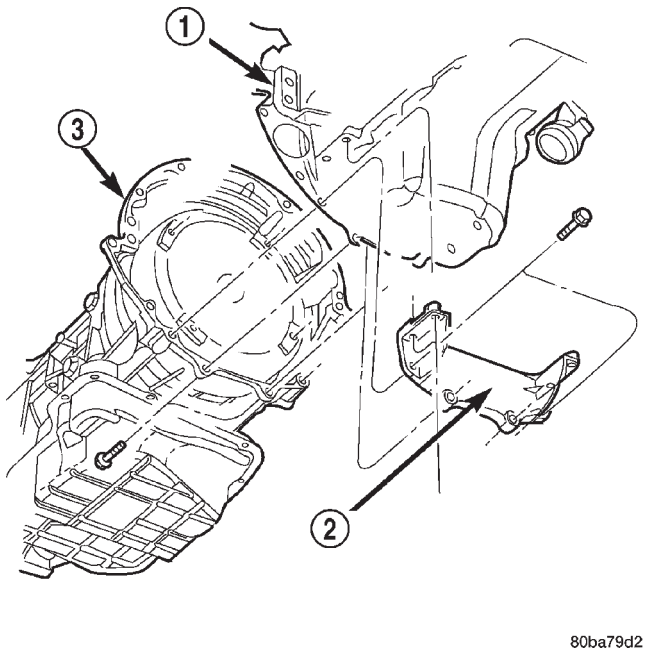


Fig. 8 Transmission Collar

1 - ENGINE
2 - ENGINE TO TRANSMISSION COLLAR
3 - TRANSMISSION

(7) Remove the exhaust support bracket from the rear of the transmission.

(8) Disconnect and lower or remove any necessary exhaust components.

(9) Remove the starter motor.

(10) Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.

(11) Disconnect wires from solenoid and pressure switch assembly, input and output speed sensors, and line pressure sensor.

(12) Disconnect gearshift cable from transmission manual valve lever (Fig. 9).

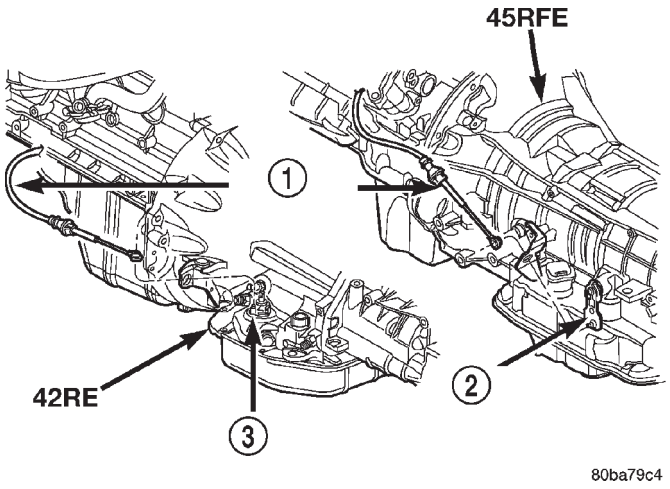


Fig. 9 Transmission Shift Cable

1 - SHIFT CABLE
2 - MANUAL LEVER
3 - MANUAL LEVER

(13) Disconnect transfer case shift cable from the transfer case shift lever (Fig. 10).

(14) Remove the clip securing the transfer case shift cable into the cable support bracket.

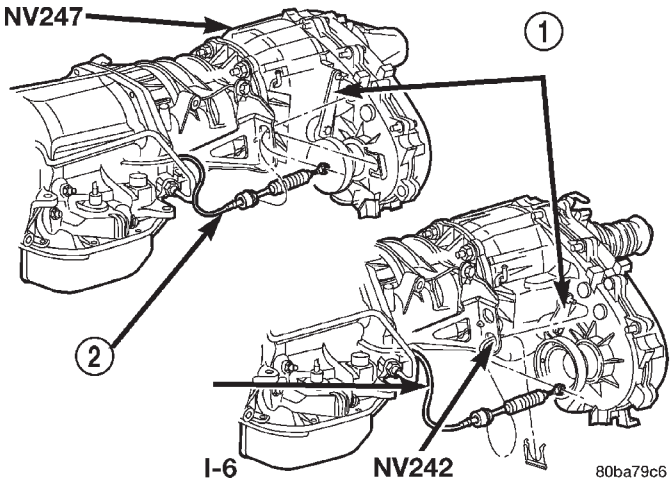


Fig. 10 Transfer Case Shift Cable

1 - TRANSFER CASE SHIFT LEVER
2 - TRANSFER CASE SHIFT CABLE

(15) Disconnect transmission fluid cooler lines at transmission fittings and clips.

(16) Disconnect the transmission vent hose from the transmission.

(17) Support rear of engine with safety stand or jack.

(18) Raise transmission slightly with service jack to relieve load on crossmember and supports.

(19) Remove bolts securing rear support and cushion to transmission and crossmember (Fig. 11).

(20) Remove bolts attaching crossmember to frame and remove crossmember.

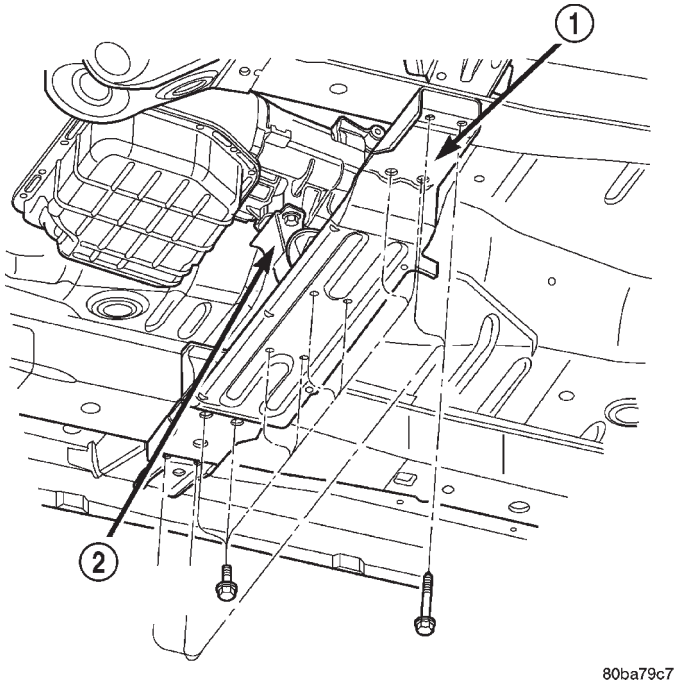


Fig. 11 Rear Transmission Crossmember

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

(21) Remove transfer case (Fig. 12) and (Fig. 13).

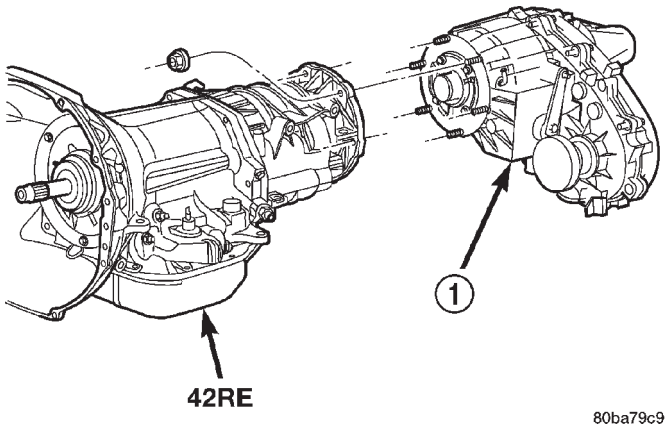


Fig. 12 Remove NV247 Transfer Case

1 - NV247 TRANSFER CASE

(22) Remove all remaining converter housing bolts.

(23) Carefully work transmission and torque converter assembly rearward off engine block dowels.

(24) Hold torque converter in place during transmission removal.

(25) Lower transmission and remove assembly from under the vehicle.

AUTOMATIC TRANSMISSION - 545RFE (Continued)

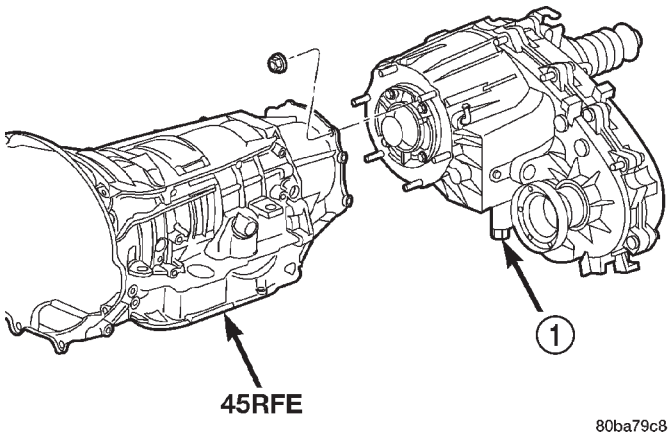


Fig. 13 Remove NV242 Transfer Case

1 - NV242 TRANSFER CASE

(26) To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY

(1) Drain fluid from transmission.

(2) Clean exterior of transmission with suitable solvent or pressure washer.

(3) Remove the torque converter from the transmission.

(4) Remove the manual shift lever from the transmission.

(5) Remove the input, output, and line pressure sensors from the transmission case (Fig. 14).

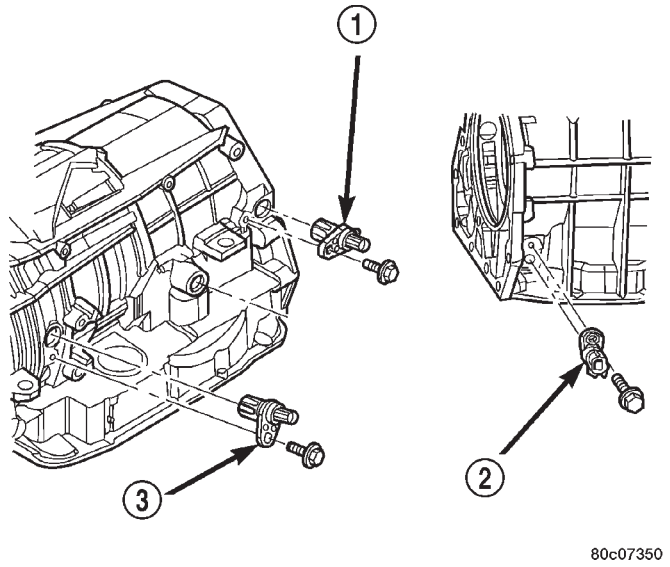


Fig. 14 Remove Input, Output, and Line Pressure Sensors

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

(6) Inspect the ends of the sensors for debris, which may indicate the nature of the transmission failure.

(7) Install Support Stand 8257 onto the transmission case (Fig. 15).

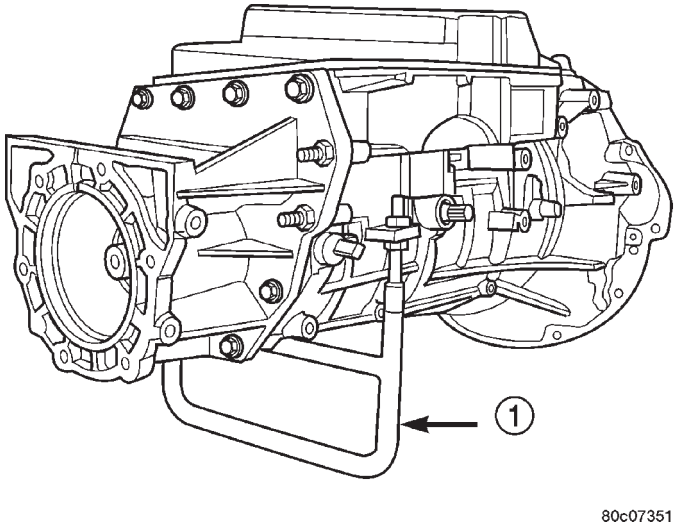


Fig. 15 Install Support Stand - Tool 8257

1 - TOOL 8257

(8) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 16).

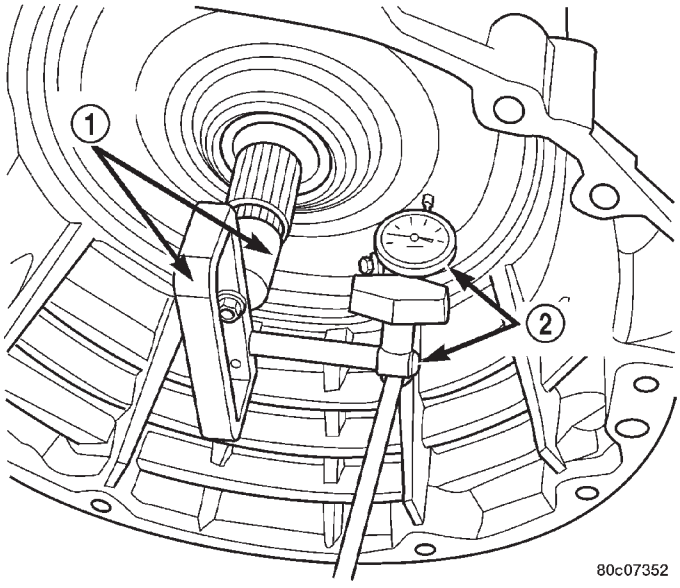


Fig. 16 Measure Input Shaft End Play

1 - TOOL 8266
2 - TOOL C-3339

AUTOMATIC TRANSMISSION - 545RFE (Continued)

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(9) Remove the bolts holding the transmission extension/adapter housing to the transmission case.

(10) Remove the extension/adapter housing from the transmission case.

(11) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 17).

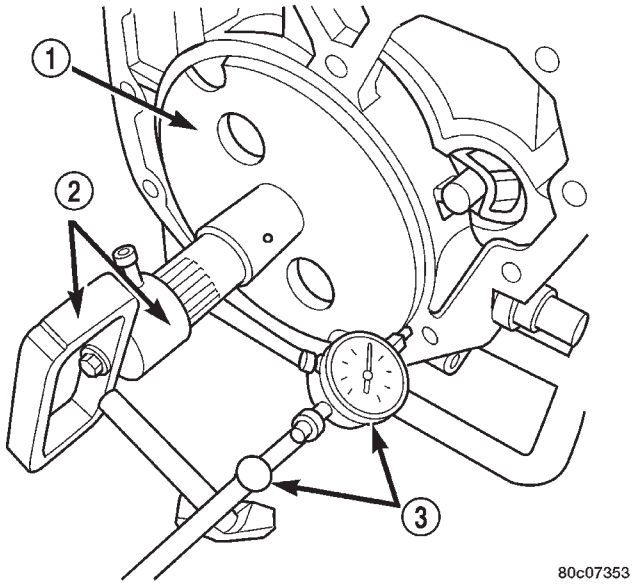


Fig. 17 Measure Output Shaft End Play

1 - TOOL 8261
2 - TOOL 8266
3 - TOOL C-3339

(12) Remove the bolts holding the transmission oil pan to the transmission case.

(13) Remove the transmission oil pan from the transmission case.

(14) Remove the primary oil filter and the oil cooler return filter (Fig. 18).

(15) Remove the cooler return filter bypass valve.

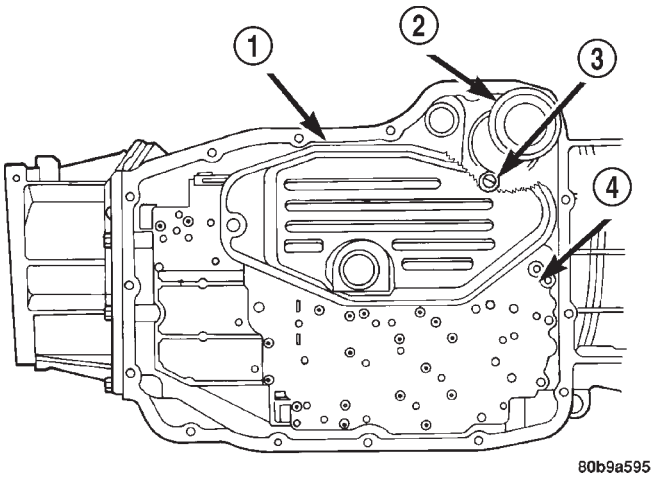


Fig. 18 Remove Primary Oil and Cooler Filters

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

(16) Remove the bolts holding the valve body to the transmission case (Fig. 19).

(17) Remove the valve body from the transmission case.

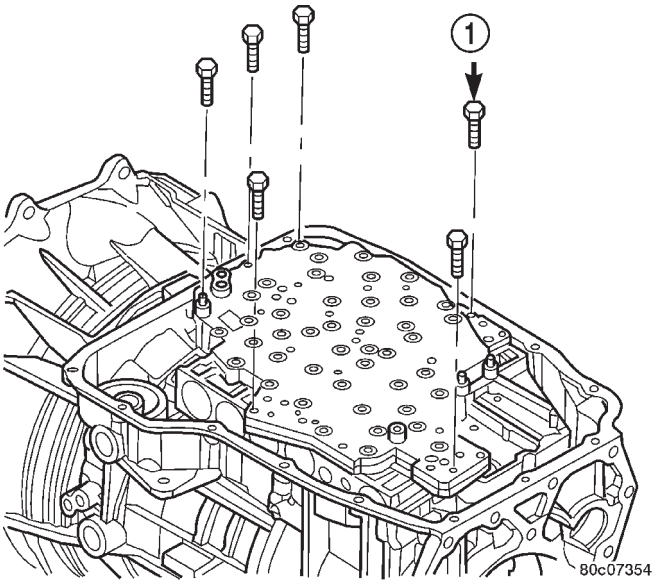


Fig. 19 Remove Valve Body Assembly

1 - VALVE BODY TO CASE BOLT (6)

(18) Remove the outer snap-ring securing the transmission front cover into the transmission case (Fig. 20).

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(19) Remove the inner snap-ring securing the transmission front cover to the oil pump (Fig. 20).

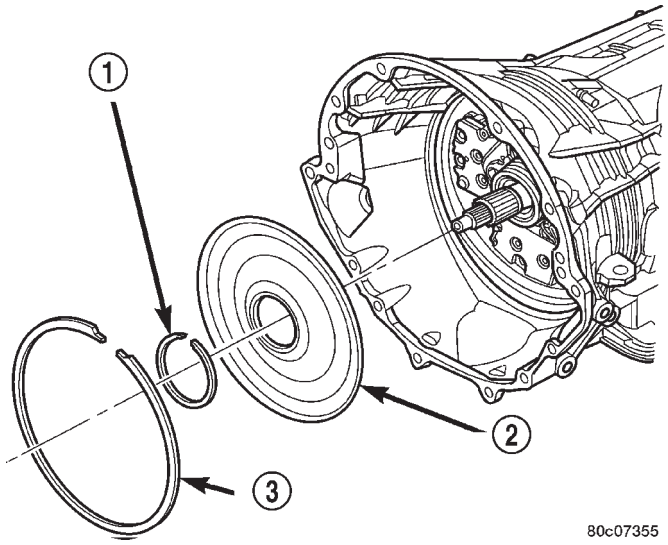


Fig. 20 Remove Transmission Front Cover

1 - INNER SNAP-RING
2 - TRANSMISSION COVER
3 - OUTER SNAP-RING

(20) Reaching through a case opening in the valve body area with a long blunted tool, remove the transmission front cover from the transmission case.

(21) Remove the bolts holding the oil pump into the transmission case (Fig. 21).

(22) Remove the oil pump. Hold inward on the input shaft to prevent pulling the input clutch assembly with the oil pump (Fig. 21).

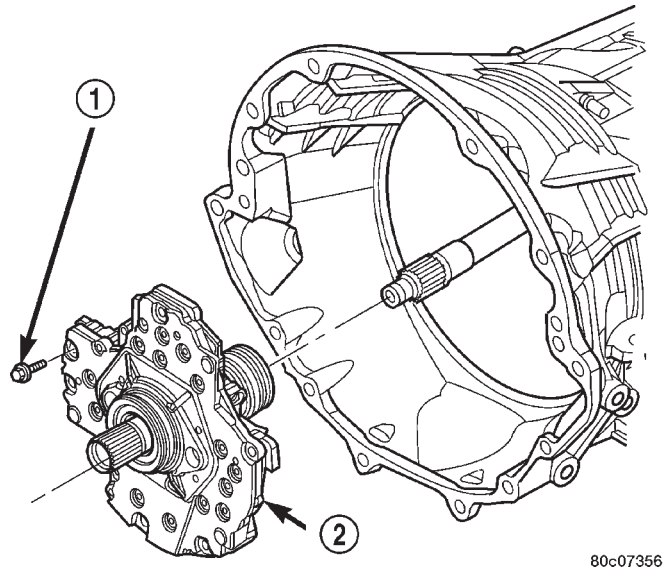


Fig. 21 Remove Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

(23) Remove the number 1 bearing from the input clutch assembly (Fig. 22).

(24) Remove the input clutch assembly from the transmission case (Fig. 22).

(25) Remove the number 5 bearing and selective thrust plate from the input clutch assembly (Fig. 22), or the 4C clutch retainer/bulkhead.

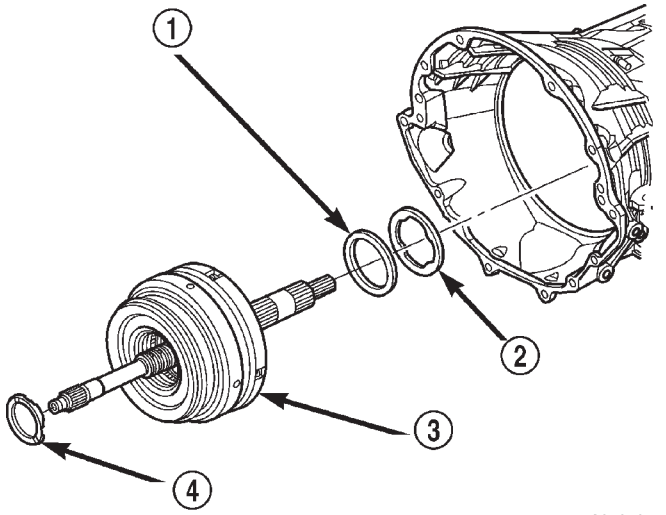


Fig. 22 Remove Input Clutch Assembly

1 - BEARING NUMBER 5
2 - THRUST PLATE (SELECT)
3 - INPUT CLUTCH ASSEMBLY
4 - BEARING NUMBER 1

(26) Remove the 4C clutch retainer/bulkhead tapered snap-ring from the transmission case (Fig. 23).

(27) Remove the 4C clutch retainer/bulkhead from the transmission case (Fig. 23).

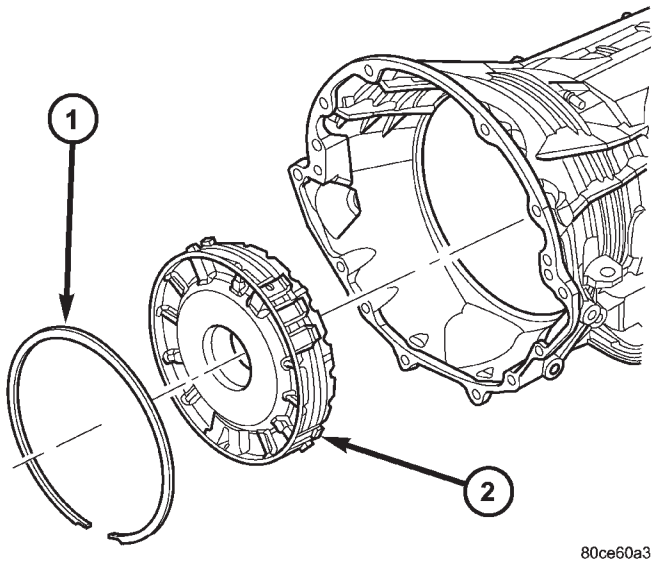


Fig. 23 Remove 4C Clutch Retainer/Bulkhead

1 - SNAP-RING
2 - 4C CLUTCH RETAINER/BULKHEAD

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(28) Remove the front 2C clutch pack snap-ring from the transmission case (Fig. 24).

(29) Remove the 2C clutch pack from the transmission case (Fig. 24).

(30) Remove the rear selective plate and number 6 bearing from the reaction annulus (Fig. 25).

(31) Remove the reaction annulus from the reaction planetary carrier (Fig. 25).

(32) Remove the number 7 bearing (Fig. 25).

(33) Remove the reaction sun gear (Fig. 25).

(34) Remove the number 8 bearing from the reaction planetary carrier (Fig. 25).

(35) Remove the reaction planetary carrier (Fig. 25). Note that this planetary gear set has three pinion gears.

(36) Remove the number 9 bearing from the reverse planetary gear set (Fig. 25).

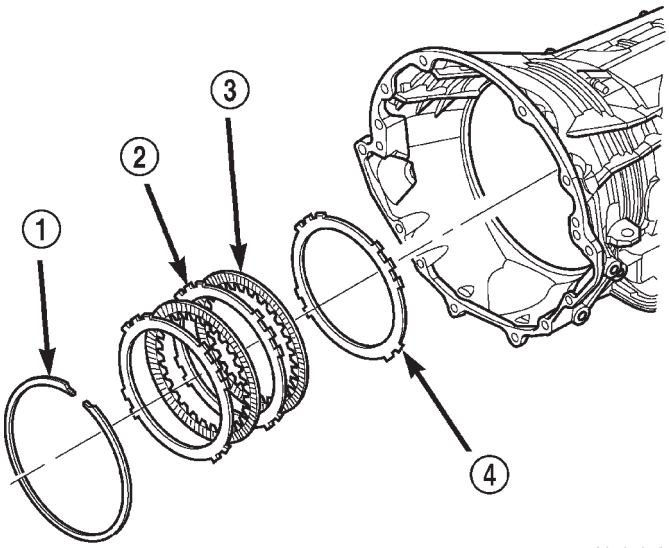


Fig. 24 Remove 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

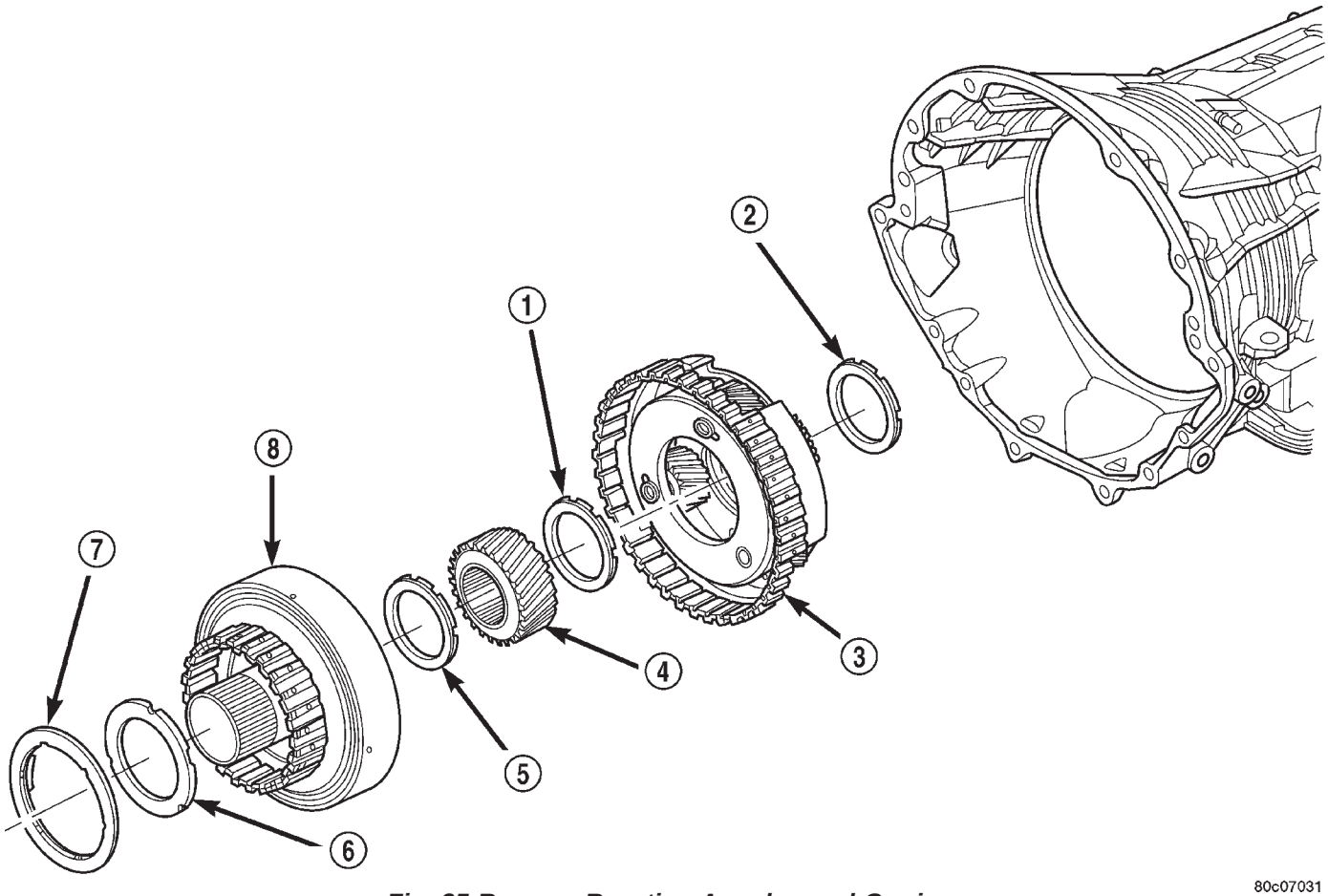


Fig. 25 Remove Reaction Annulus and Carrier

1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(37) Remove the snap-ring holding the park sprag gear onto the output shaft (Fig. 26).

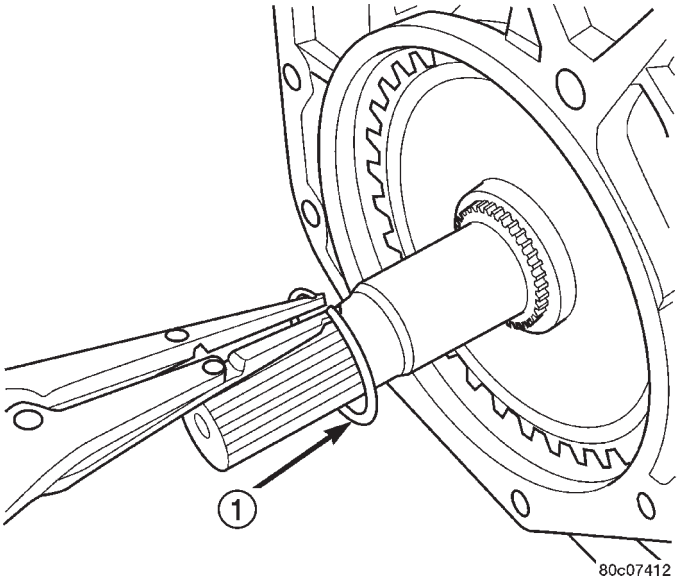


Fig. 26 Remove Park Sprag Snap-Ring

1 - SNAP-RING

(38) Remove the park sprag gear from the output shaft (Fig. 27).

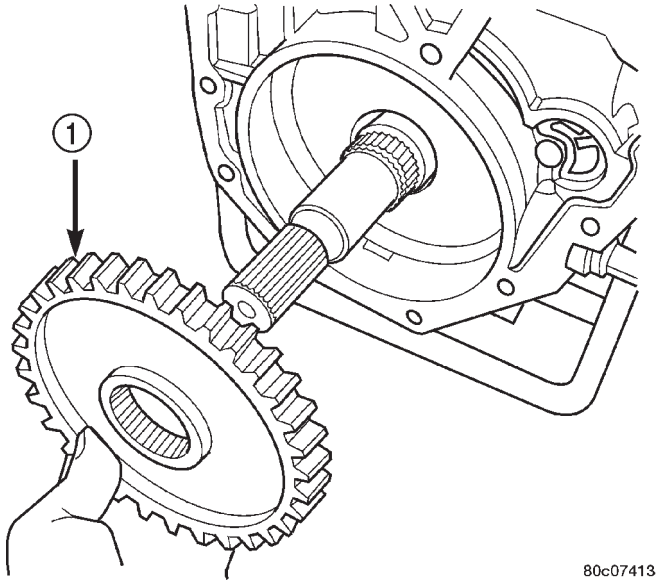


Fig. 27 Remove Park Sprag Gear

1 - PARK SPRAG GEAR

(39) Remove the input/reverse planetary assembly (Fig. 28).

(40) Remove the number 12 bearing from the input/reverse planetary assembly (Fig. 28).

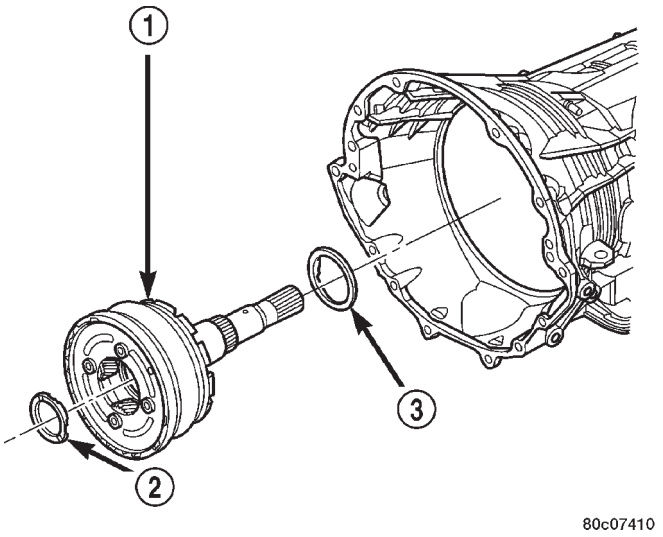


Fig. 28 Remove Input/Reverse Planetary Assembly

1 - INPUT/REVERSE PLANETARY ASSEMBLY
2 - BEARING NUMBER 9
3 - BEARING NUMBER 12

(41) Remove the snap-ring holding the low/reverse clutch retainer into the transmission case (Fig. 29).

(42) Remove the low/reverse clutch retainer from the transmission case (Fig. 29).

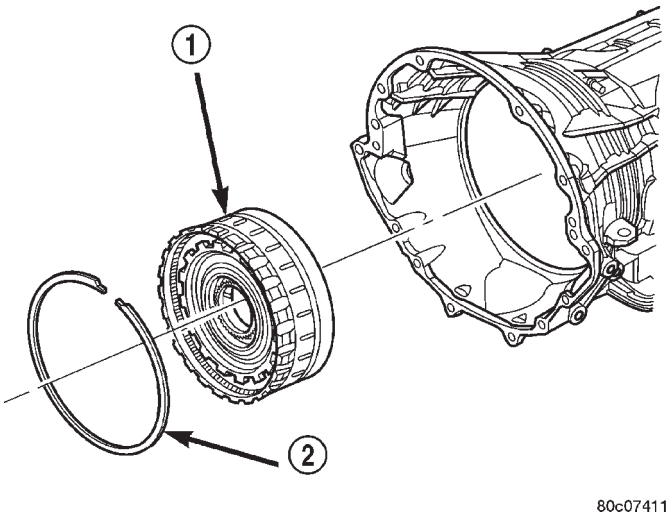


Fig. 29 Remove Low/Reverse Clutch Retainer

1 - LOW/REVERSE OVERRUNNING CLUTCH ASSEMBLY
2 - SNAP-RING

(43) Remove the park pawl rod and e-clip (Fig. 30).

(44) Remove the park pawl rod guide snap-ring (Fig. 30).

(45) Remove the park pawl rod guide (Fig. 30).

(46) Remove the park pawl pivot shaft, park pawl, and spring (Fig. 30).

(47) Remove the manual selector shaft (Fig. 30).

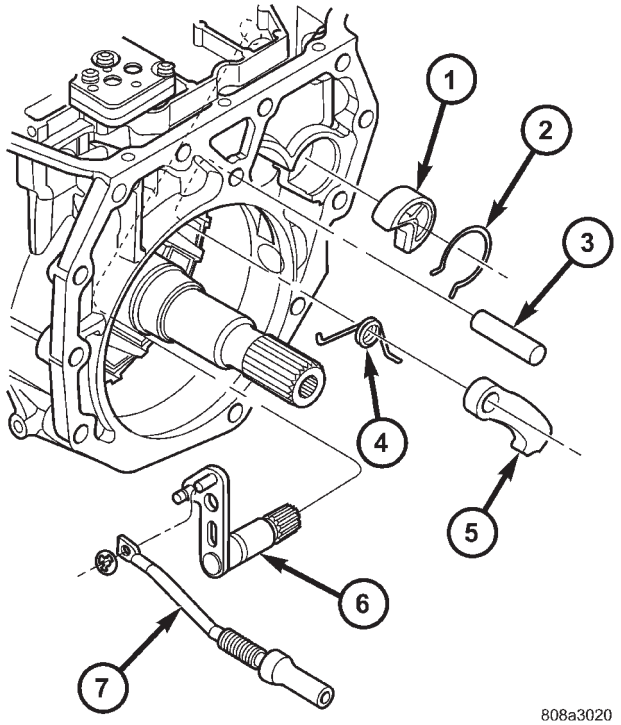


Fig. 30 Manual Shaft/Park Lock Components

1 - GUIDE
2 - SNAP-RING
3 - SHAFT
4 - SPRING
5 - PARK PAWL
6 - MANUAL SHAFT/LEVER
7 - PARK ROD

(48) Remove the manual selector shaft seal.
(49) Remove the dipstick tube seal.

CLEANING

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF +4, Type 9602, transmission fluid during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.
(2) Install the cooler filter bypass valve.
(3) Torque the bypass valve to specification. The valve uses a tapered pipe thread and excessive torque can damage the transmission case. Tighten the cooler filter bypass valve to 4.5 N·m (40 in.lbs.).
(4) Install a new selector shaft seal using Seal Installer 8253 (Fig. 31).

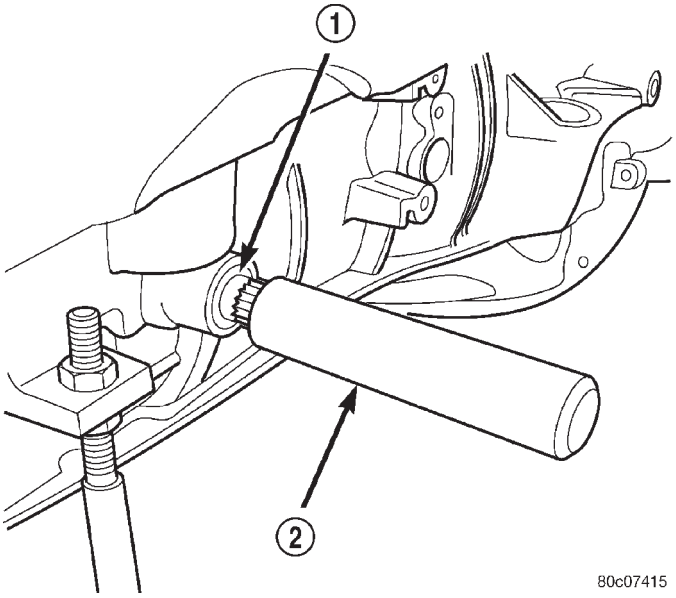


Fig. 31 Install Selector Shaft

1 - SEAL
2 - TOOL 8253

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(5) Install the manual selector shaft and retaining screw. Tighten the manual selector shaft retaining screw to 28 N·m (250 in.lbs.).

(6) Install the park pawl, spring, and shaft (Fig. 32).

(7) Install the park rod and e-clip (Fig. 32).

(8) Install the park rod guide and snap-ring (Fig. 32).

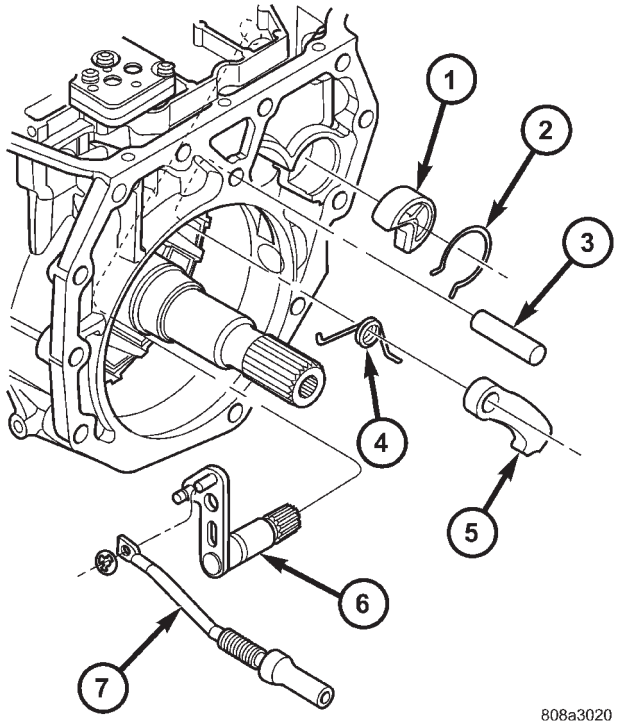


Fig. 32 Manual Shaft/Park Lock Components

1 - GUIDE
2 - SNAP-RING
3 - SHAFT
4 - SPRING
5 - PARK PAWL
6 - MANUAL SHAFT/LEVER
7 - PARK ROD

(9) Install a new dipstick tube seal using Seal Installer 8254 (Fig. 33).

NOTE: Before final assembly of transmission centerline, the 2C/4C clutch components should be installed into position and measured as follows:

(10) Install the 2C reaction plate into the transmission case (Fig. 34). The reaction plate is directional. The plate must be installed with the flat side toward the front of the transmission.

(11) Install the 2C clutch pack into the transmission case (Fig. 34).

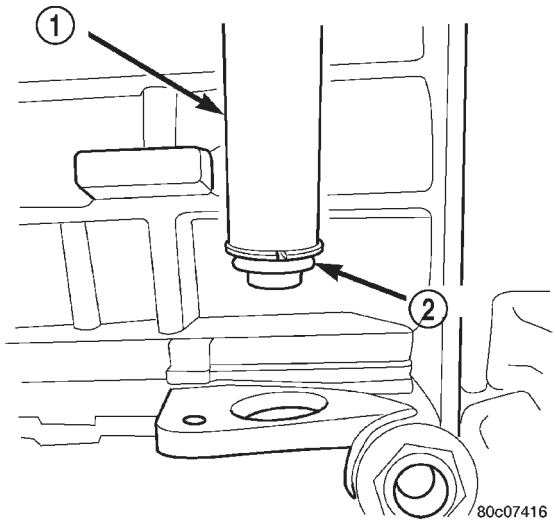


Fig. 33 Install Dipstick Tube Seal Using Tool 8254

1 - TOOL 8254
2 - SEAL

(12) Install the flat 2C clutch snap-ring into the transmission case (Fig. 34).

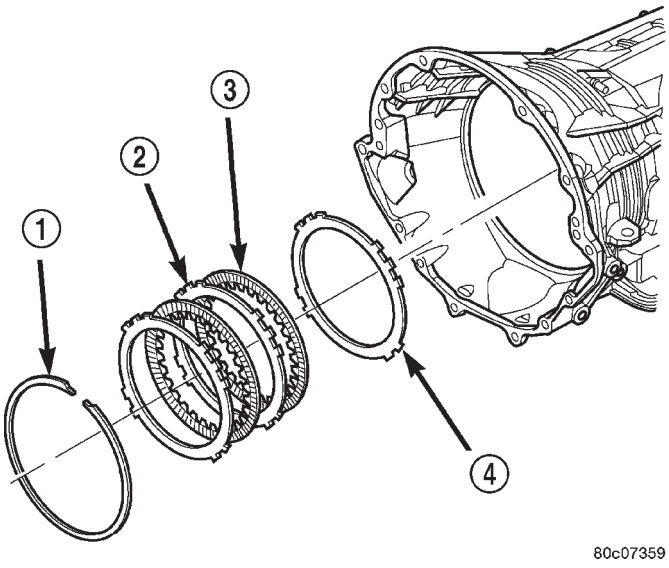


Fig. 34 Install 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

(13) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area.

(14) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

(15) Using a feeler gauge through the opening in the rear of the transmission case, measure the 2C clutch pack clearance between the 2C reaction plate and the transmission case at four different points. The average of these measurements is the 2C clutch pack clearance. The correct clutch clearance is 0.455-1.335 mm (0.018-0.053 in.). The reaction plate is not selective. If the clutch pack clearance is not within specification, the reaction plate, all the friction discs, and steels must be replaced.

(16) Remove the 4C retainer/bulkhead and all of the 2C clutch components from the transmission case.

(17) Install the low/reverse clutch assembly (Fig. 35). Make sure that the oil feed hole points toward the valve body area and that the bleed orifice is aligned with the notch in the rear of the transmission case.

(18) Install the snap-ring to hold the low/reverse clutch retainer into the transmission case (Fig. 35). The snap-ring is tapered and must be installed with the tapered side forward. Once installed, verify that the snap-ring is fully seated in the snap-ring groove.

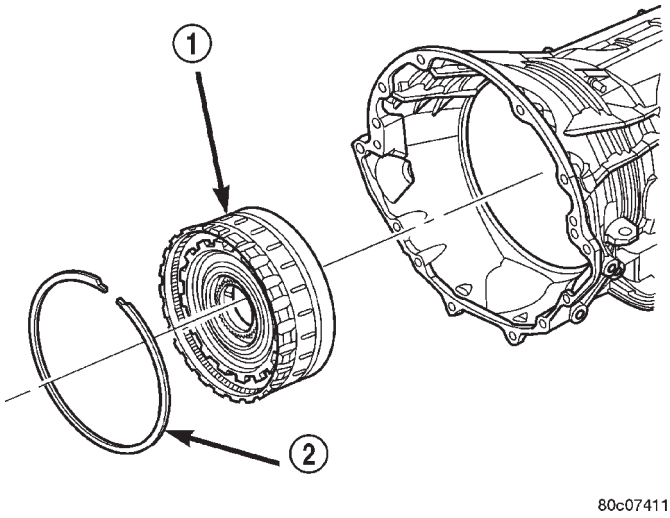


Fig. 35 Install Low/Reverse Clutch Retainer

1 - LOW/REVERSE OVERRUNNING CLUTCH ASSEMBLY
2 - SNAP-RING

(19) Air check the low/reverse clutch and verify correct overrunning clutch operation.

(20) Install the number 12 bearing over the output shaft and against the rear planetary gear set. The flat side of the bearing goes toward the planetary gearset and the raised tabs on the inner race should face the rear of the transmission.

(21) Install the reverse/input planetary assembly through the low/reverse clutch assembly (Fig. 36).

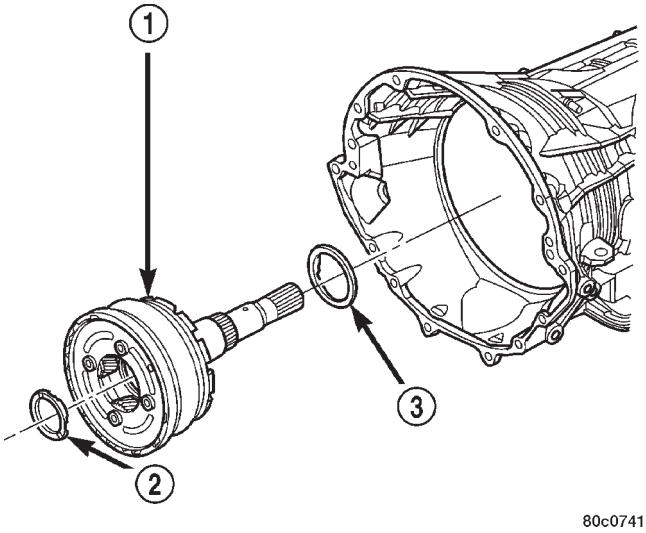


Fig. 36 Install Input/Reverse Planetary Assembly

1 - INPUT/REVERSE PLANETARY ASSEMBLY
2 - BEARING NUMBER 9
3 - BEARING NUMBER 12

(22) Install the park sprag onto the output shaft (Fig. 37).

(23) Install the snap-ring to hold the park sprag onto the output shaft (Fig. 38).

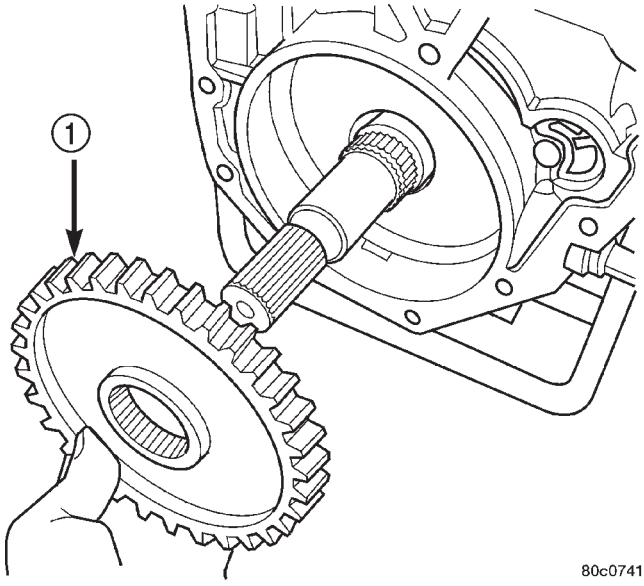


Fig. 37 Install Park Sprag Gear

1 - PARK SPRAG GEAR

AUTOMATIC TRANSMISSION - 545RFE (Continued)

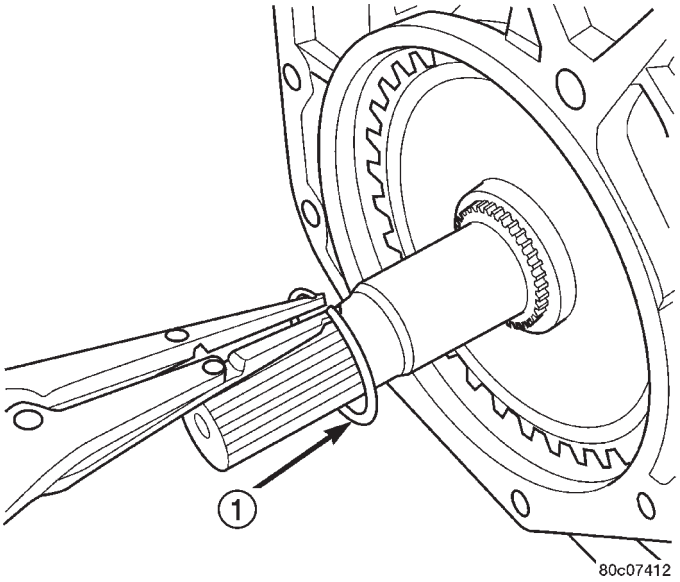


Fig. 38 Install Park Sprag Snap-Ring

1 - SNAP-RING

(24) Install the 2C reaction plate into the transmission case (Fig. 39). The reaction plate is directional. The plate must be installed with the flat side toward the front of the transmission.

(25) Install the 2C clutch pack into the transmission case (Fig. 39).

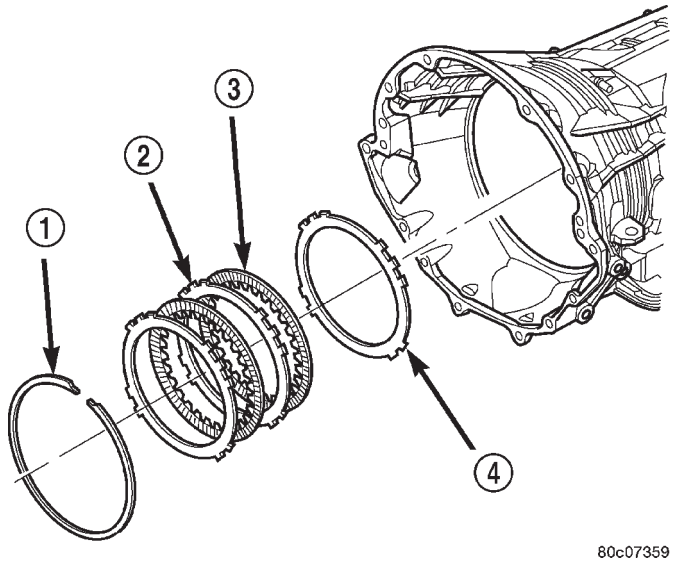


Fig. 39 Install 2C Clutch Pack

1 - SNAP-RING
2 - PLATE
3 - DISC
4 - REACTION PLATE

(26) Install the number 8 bearing inside the reaction carrier with the outer race against the reaction planetary carrier.

(27) Install the reaction planetary gear set and the number 9 bearing, with the inner race against the reaction planetary carrier, into the transmission case (Fig. 40).

(28) Install the flat 2C clutch snap-ring into the transmission case (Fig. 39).

(29) Install the reaction sun gear into the reaction planetary gear set. **Make sure** the small shoulder is facing the front of the transmission (Fig. 40).

(30) Install the number 7 bearing onto the reaction sun gear with the inner race against the sun gear (Fig. 40).

(31) Install the output shaft selective thrust plate onto the reaction annulus with the oil grooves facing the annulus gear and the tabs and notches aligned as shown in (Fig. 41).

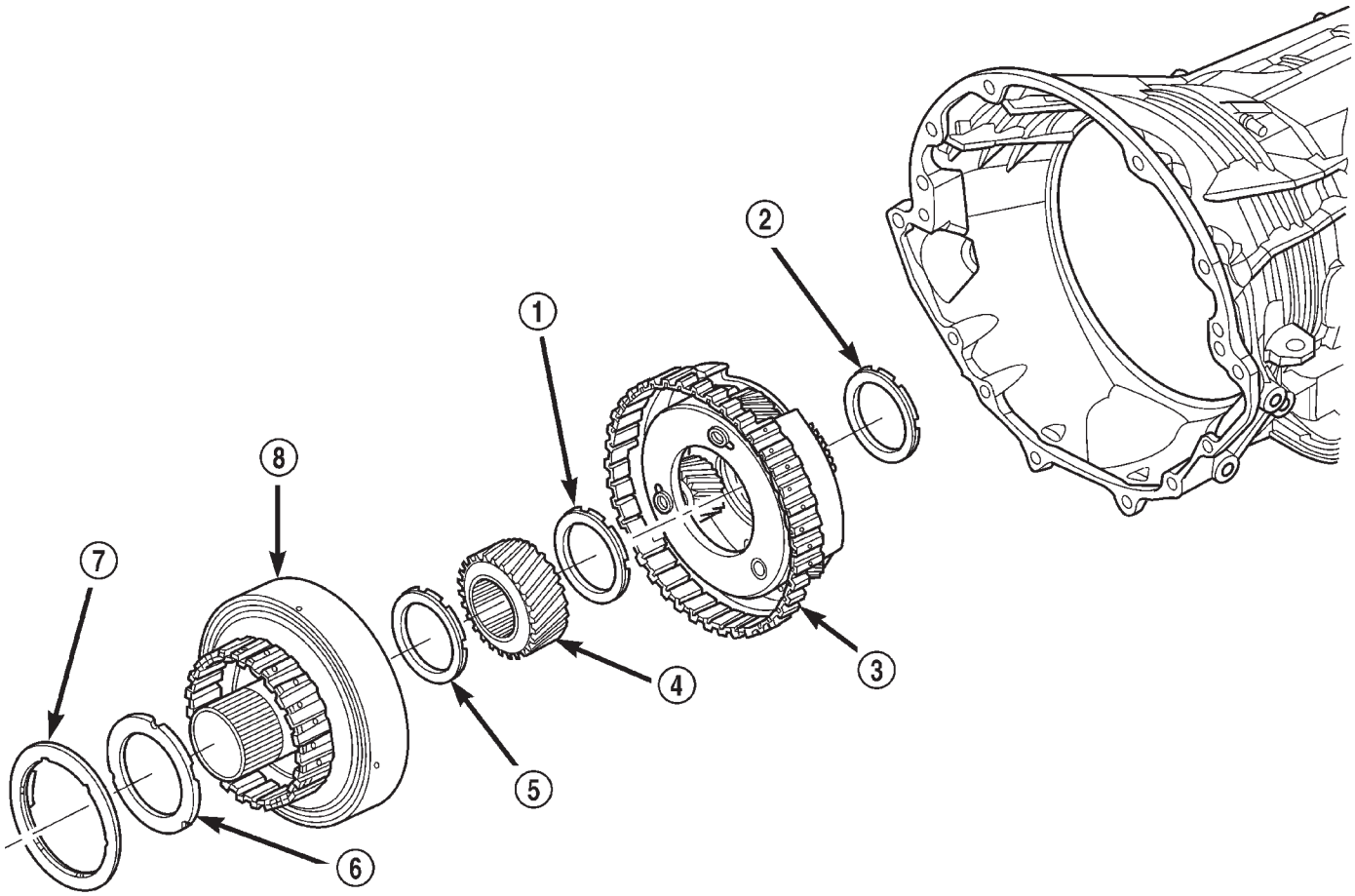
(32) Install the number 6 bearing against the output shaft selective thrust plate with the flat side against the thrust plate (Fig. 40) and the raised tabs on the inner race facing the front of the transmission.

(33) Install the reaction annulus into the reaction planetary gear set (Fig. 40).

(34) Install the 4C retainer/bulkhead into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area. Rotate the reaction annulus during the installation of the 4C retainer/bulkhead to ease installation.

(35) Install the 4C retainer/bulkhead tapered snap-ring into the transmission case (Fig. 42) with the taper toward the front of the case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.

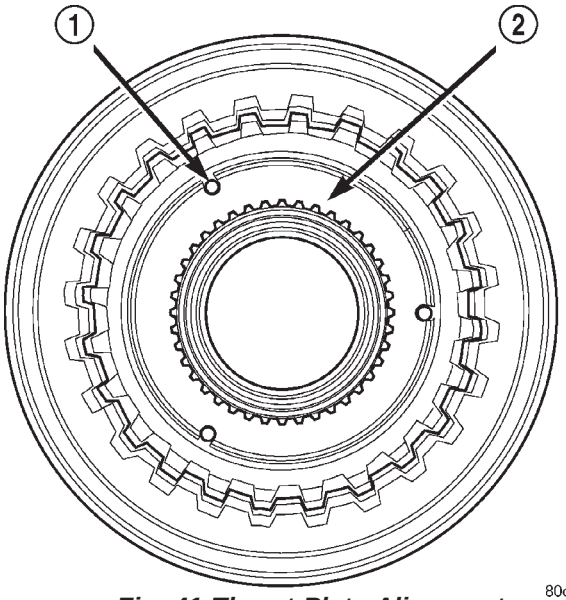
(36) Air check the 2C and 4C clutch operation.



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Fig. 40 Install Reaction Annulus and Carrier

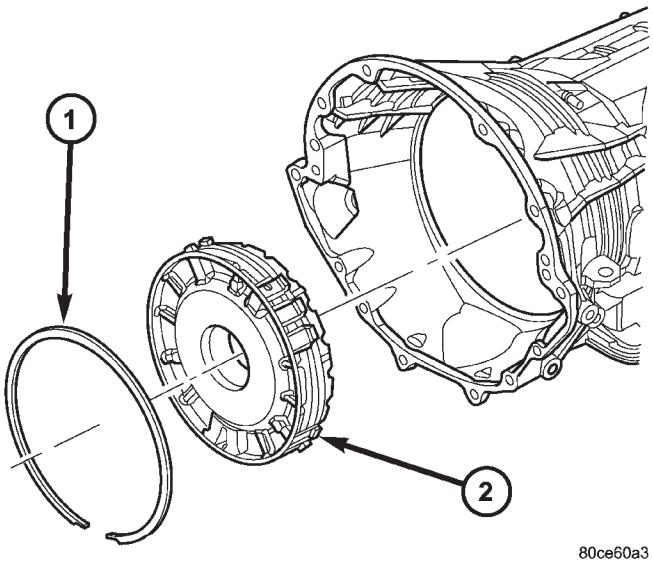
1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS



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Fig. 41 Thrust Plate Alignment

1 - LOCATING LUG (3)
2 - THRUST PLATE



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Fig. 42 Install 4C Clutch Retainer/Bulkhead

1 - SNAP-RING
2 - 4C CLUTCH RETAINER/BULKHEAD

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(37) Using Alignment Plate 8261, Adapter 8266-17 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the output shaft end-play (Fig. 43). The correct output shaft end-play is 0.22-0.55 mm (0.009-0.021 in.). Adjust as necessary. Install the chosen output shaft selective thrust plate and re-measure end-play to verify selection.

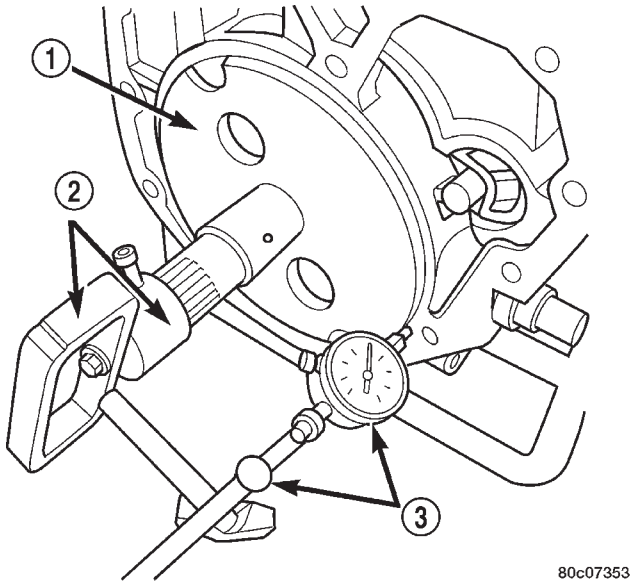


Fig. 43 Measure Output Shaft End Play

1 - TOOL 8261
2 - TOOL 8266
3 - TOOL C-3339

(38) Apply a bead of RTV silicone and install the extension/adapter housing onto the transmission case.

(39) Install and torque the bolts to hold the extension/adapter housing onto the transmission case. The correct torque is 54 N·m (40 ft.lbs.).

(40) Install the number 5 bearing and selective thrust plate onto the 4C retainer/bulkhead (Fig. 44). Be sure that the outer race of the bearing is against the thrust plate.

(41) Install the input clutch assembly into the transmission case (Fig. 44). Make sure that the input clutch assembly is fully installed by performing a visual inspection through the input speed sensor hole. If the tone wheel teeth on the input clutch assembly are centered in the hole, the assembly is fully installed.

(42) Install the number 1 bearing with the outer race up in the pocket of the input clutch assembly (Fig. 44).

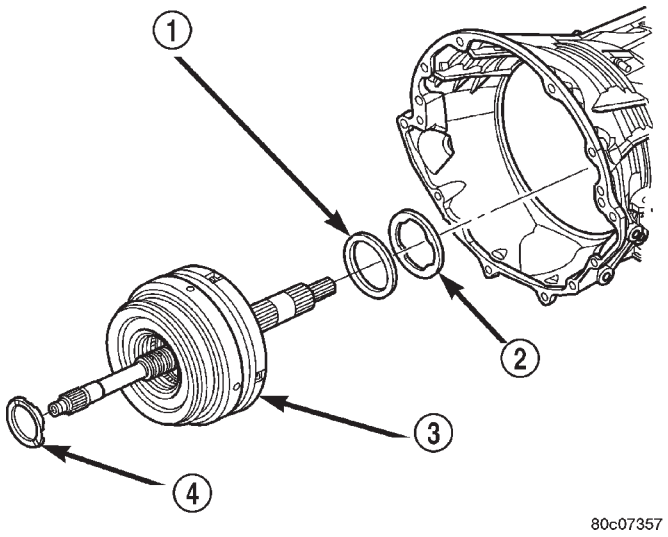


Fig. 44 Install Input Clutch Assembly

1 - BEARING NUMBER 5
2 - THRUST PLATE (SELECT)
3 - INPUT CLUTCH ASSEMBLY
4 - BEARING NUMBER 1

(43) Install the oil pump into the transmission case (Fig. 45).

(44) Install the bolts to hold the oil pump into the transmission case. Tighten the oil pump bolts to 28 N·m (250 in.lbs.).

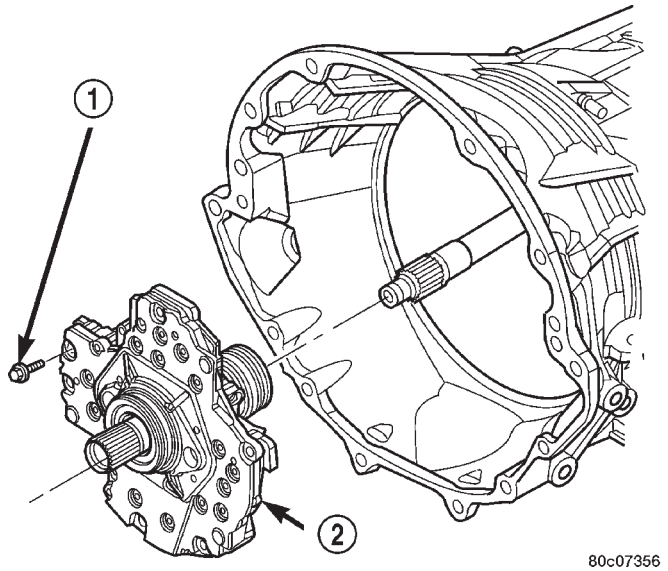


Fig. 45 Install Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

AUTOMATIC TRANSMISSION - 545RFE (Continued)

(45) Using Adapter 8266-1 from End-Play Tool Set 8266 and Dial Indicator C-3339, measure and record the input shaft end-play (Fig. 46). The correct end-play is 0.46-0.89 mm (0.018-0.035 in.). Adjust as necessary. Install the chosen thrust plate on the number 5 bearing and re-measure end-play to verify selection.

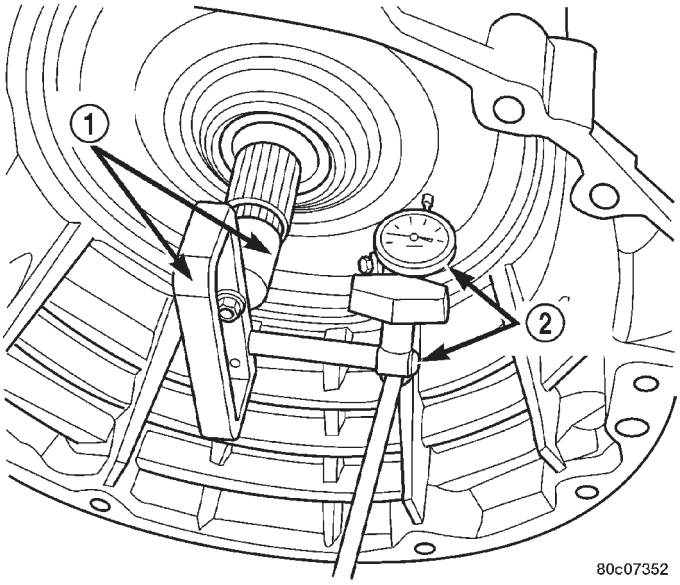


Fig. 46 Measure Input Shaft End Play

1 - TOOL 8266
2 - TOOL C-3339

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

(46) Install the transmission front cover into the transmission case (Fig. 47).

(47) Install the outer snap-ring to hold the transmission front cover into the transmission case (Fig. 47).

(48) Partially install the inner transmission front cover snap-ring onto the oil pump (Fig. 47).

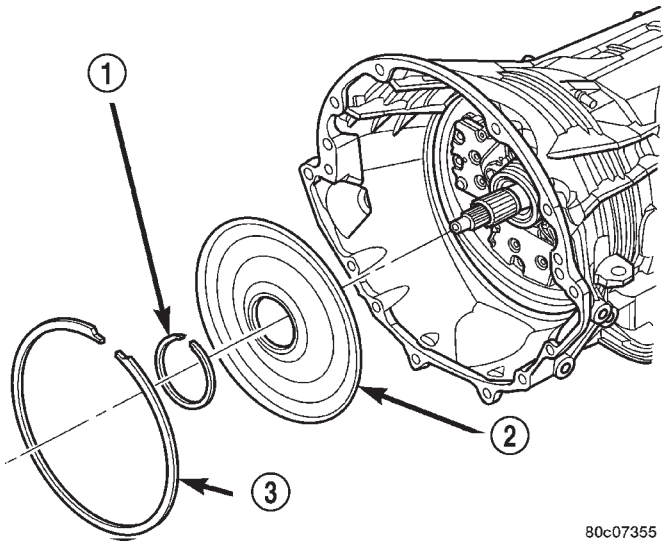


Fig. 47 Install the Transmission Front Cover

1 - INNER SNAP-RING
2 - TRANSMISSION COVER
3 - OUTER SNAP-RING

(49) Using Installer 8255, install the inner transmission front cover snap-ring the remainder of the way onto the oil pump (Fig. 48).

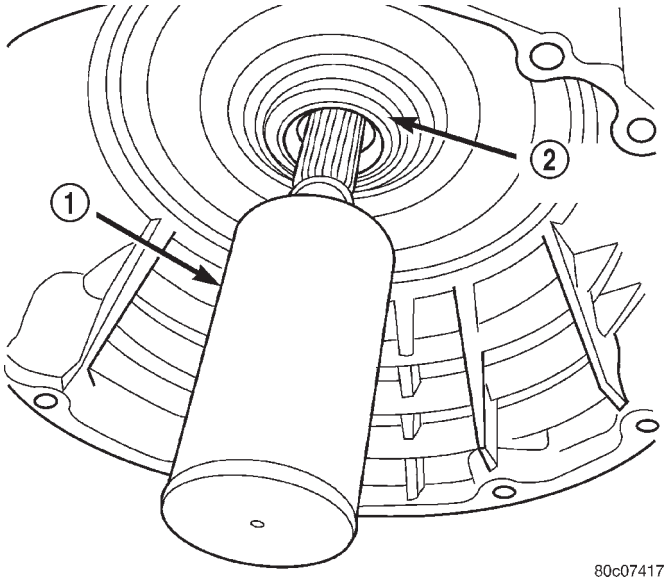


Fig. 48 Seat Snap-Ring Using Tool 8255

1 - TOOL 8255
2 - SNAP-RING

(50) Install the valve body (Fig. 49). Verify that the pin on the manual lever has properly engaged the TRS selector plate. Tighten the valve body to transmission case bolts to 12 N·m (105 in.lbs.).

AUTOMATIC TRANSMISSION - 545RFE (Continued)

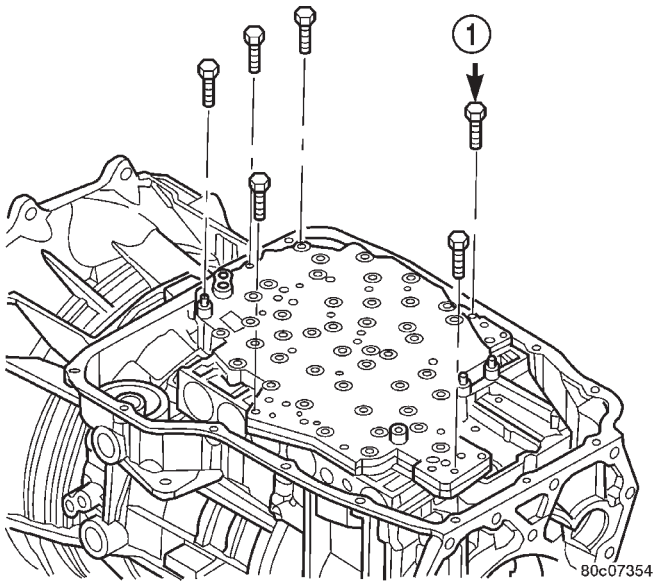


Fig. 49 Install Valve Body Assembly

1 - VALVE BODY TO CASE BOLT (6)

(51) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(52) Install the primary oil filter and the oil cooler return filter (Fig. 50). Tighten the screw to hold the primary oil filter to the valve body to 4.5 N·m (40 in.lbs.). Using Oil Filter Wrench 8321, tighten the cooler return oil filter to the transmission case to 14 N·m (125 in.lbs.).

(53) Apply RTV silicone to the oil pan and install the transmission oil pan. Tighten the bolts to 12 N·m (105 in.lbs.).

(54) Install the input, output, and line pressure sensors (Fig. 51). Tighten the bolts to 12 N·m (105 in.lbs.).

(55) Install the manual shift lever from the transmission. Torque the retaining cross-bolt to 16 N·m (140 in.lbs.).

INSTALLATION

(1) Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free of any debris. The hub must be smooth to avoid damaging pump seal at installation.

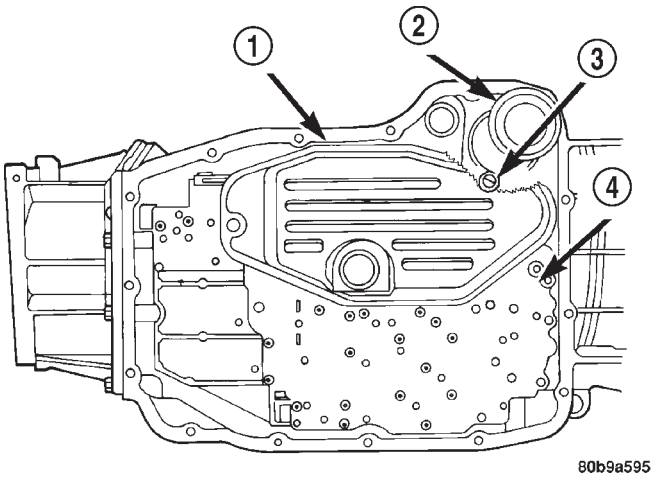


Fig. 50 Install Primary Oil and Cooler Filters

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

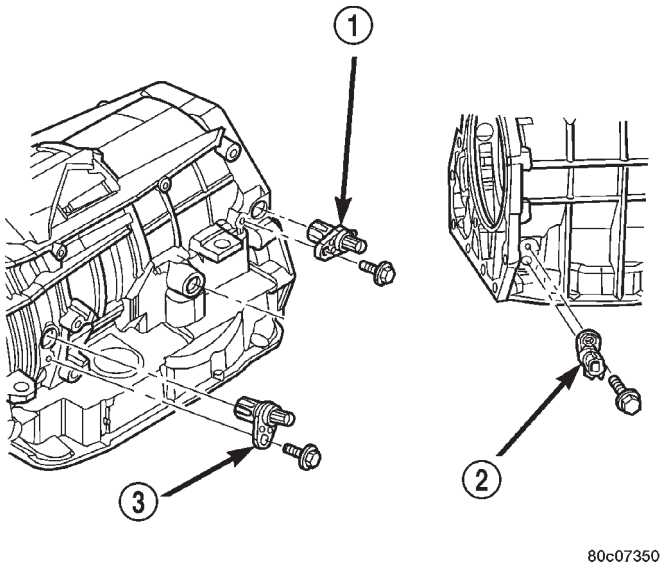


Fig. 51 Install Input, Output, and Line Pressure Sensors

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

(2) If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.

(3) Lubricate oil pump seal lip with transmission fluid.

(4) Align converter and oil pump.

(5) Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.

(6) Check converter seating with steel scale and straightedge (Fig. 52). Surface of converter lugs should be at least 13 mm (1/2 in.) to rear of straightedge when converter is fully seated.

(7) Temporarily secure converter with C-clamp.

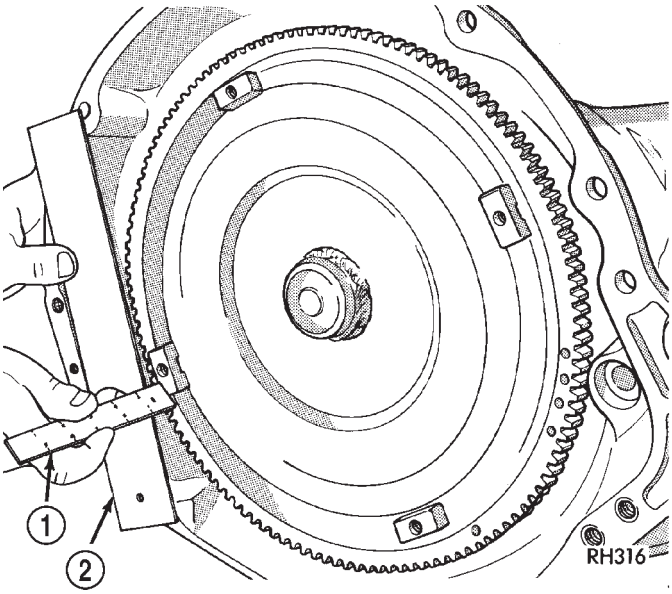


Fig. 52 Checking Torque Converter Seating - Typical

1 - SCALE
2 - STRAIGHTEDGE

(8) Position transmission on jack and secure it with chains.

(9) Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**

(10) Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.

(11) Raise transmission and align the torque converter with the drive plate and the transmission converter housing with the engine block.

(12) Move transmission forward. Then raise, lower, or tilt transmission to align the converter housing with the engine block dowels.

(13) Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.

(14) Install two bolts to attach the transmission to the engine.

(15) Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).

(16) Install rear transmission crossmember. Tighten crossmember to frame bolts to 68 N·m (50 ft.lbs.).

(17) Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).

(18) Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).

(19) Remove engine support fixture.

(20) Install new plastic retainer grommet on any shift cable that was disconnected. Grommets should not be reused. Use pry tool to remove rod from grommet and cut away old grommet. Use pliers to snap new grommet into cable and to snap grommet onto lever.

(21) Connect gearshift cable to transmission.

(22) Connect wires to solenoid and pressure switch assembly connector, input and output speed sensors, and line pressure sensor. Be sure transmission harnesses are properly routed.

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

(23) Install all torque converter-to-driveplate bolts by hand.

(24) Verify that the torque converter is pulled flush to the driveplate. Tighten bolts to 31 N·m (270 in. lbs.).

(25) Install starter motor and cooler line bracket.

(26) Connect cooler lines to transmission.

(27) Install transmission fill tube.

(28) Install exhaust components.

(29) Install transfer case. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).

(30) Install the transfer case shift cable to the cable support bracket and the transfer case shift lever.

(31) Install the transmission collar onto the transmission and the engine. Tighten the bolts to 54 N·m (40 ft.lbs.).

(32) Align and connect propeller shaft(s).

(33) Adjust gearshift cable if necessary.

(34) Lower vehicle.

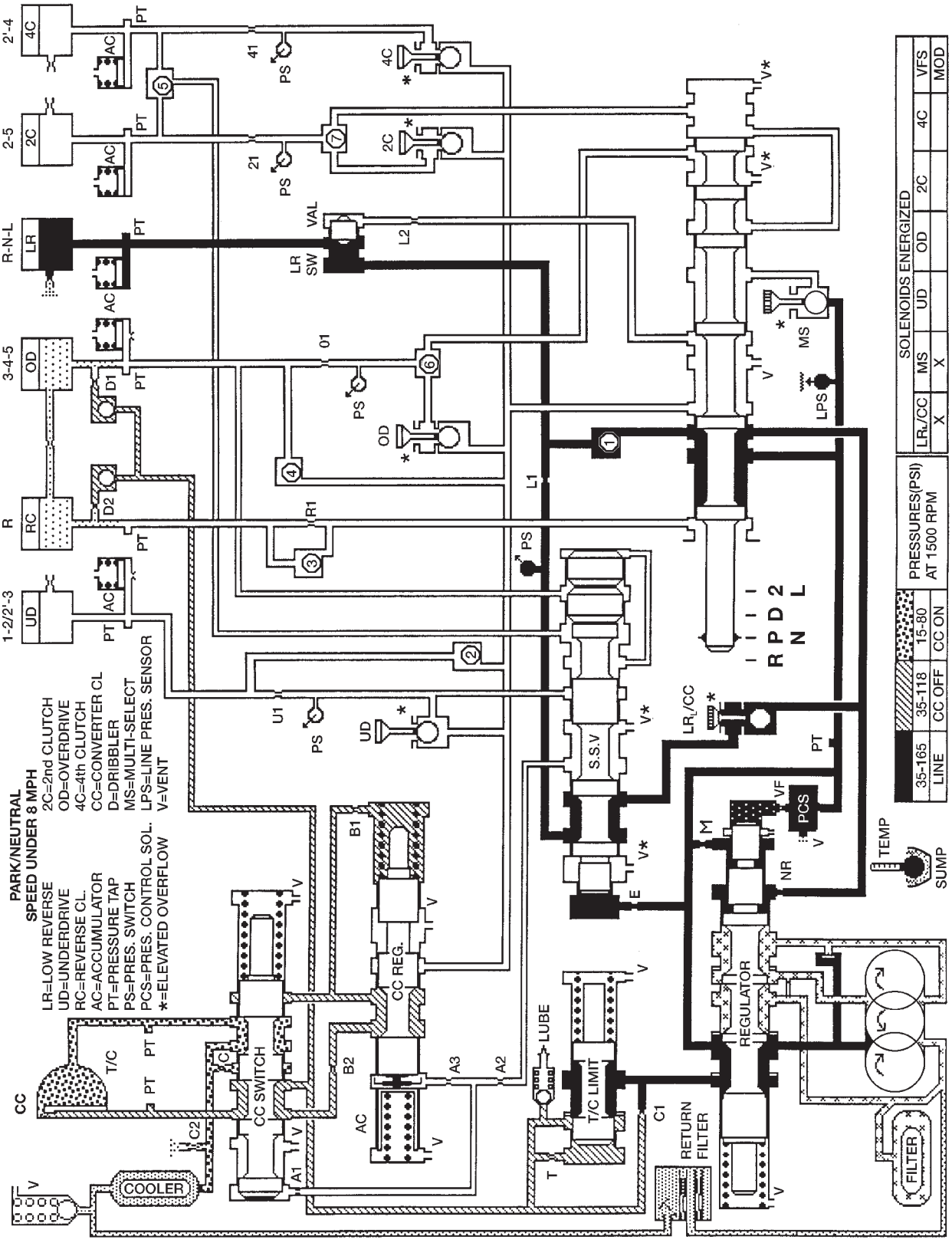
(35) Fill transmission with Mopar® ATF +4, type 9602, Automatic Transmission fluid.

AUTOMATIC TRANSMISSION - 545RFE (Continued)

SCHEMATICS AND DIAGRAMS

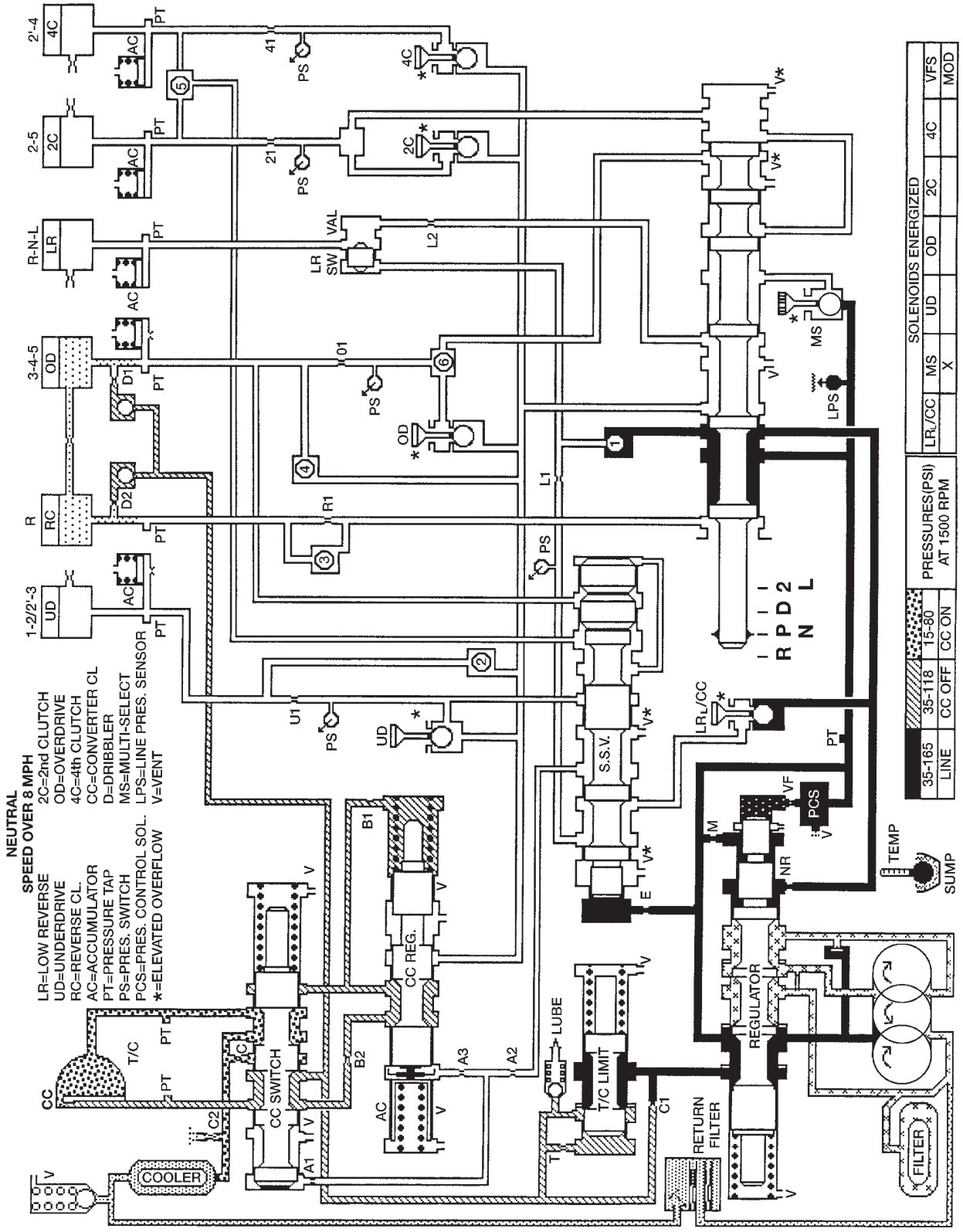
HYDRAULIC SCHEMATICS

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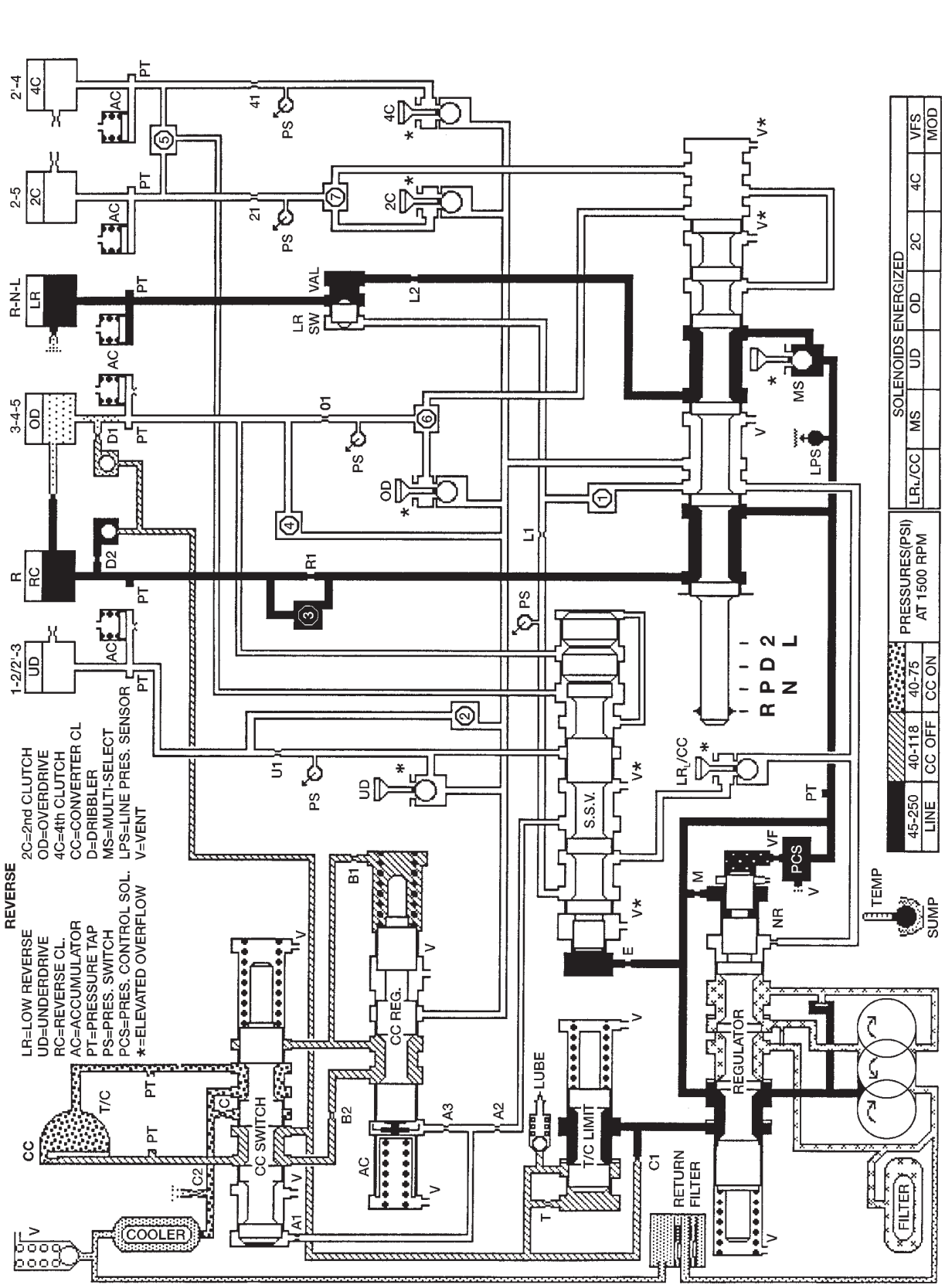


545RFE HYDRAULIC SCHEMATIC

AUTOMATIC TRANSMISSION - 545RFE (Continued)

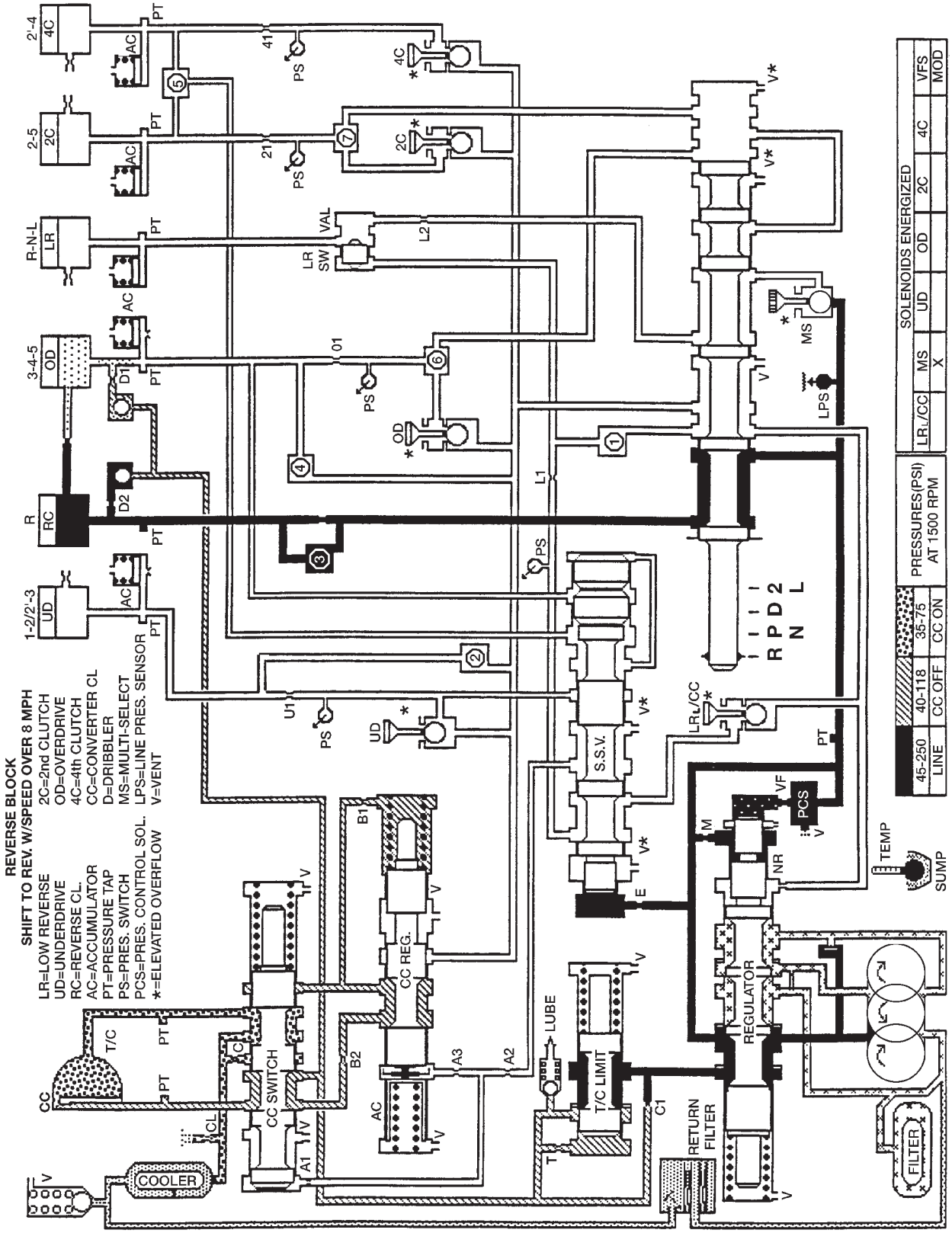


AUTOMATIC TRANSMISSION - 545RFE (Continued)



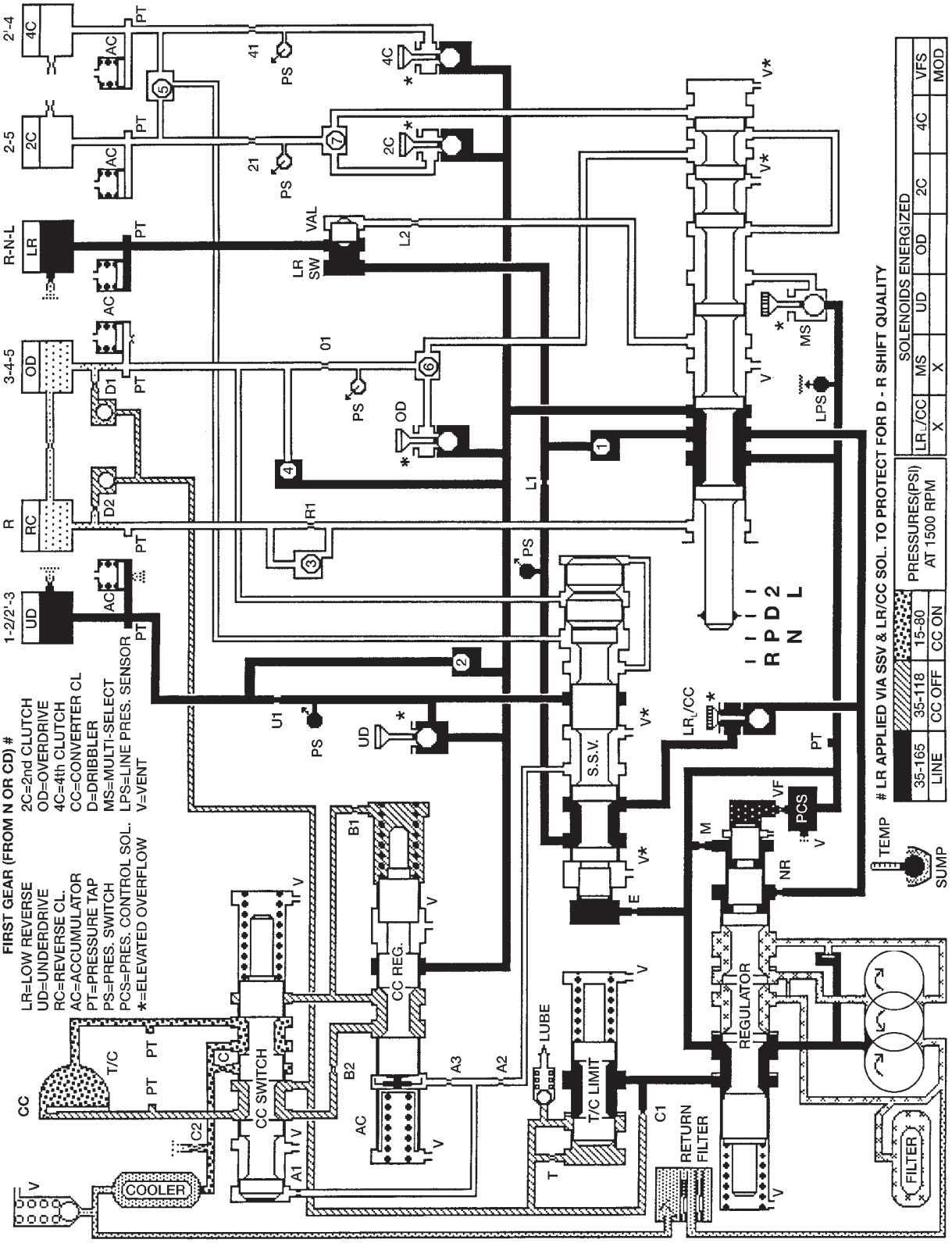
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AUTOMATIC TRANSMISSION - 545RFE (Continued)



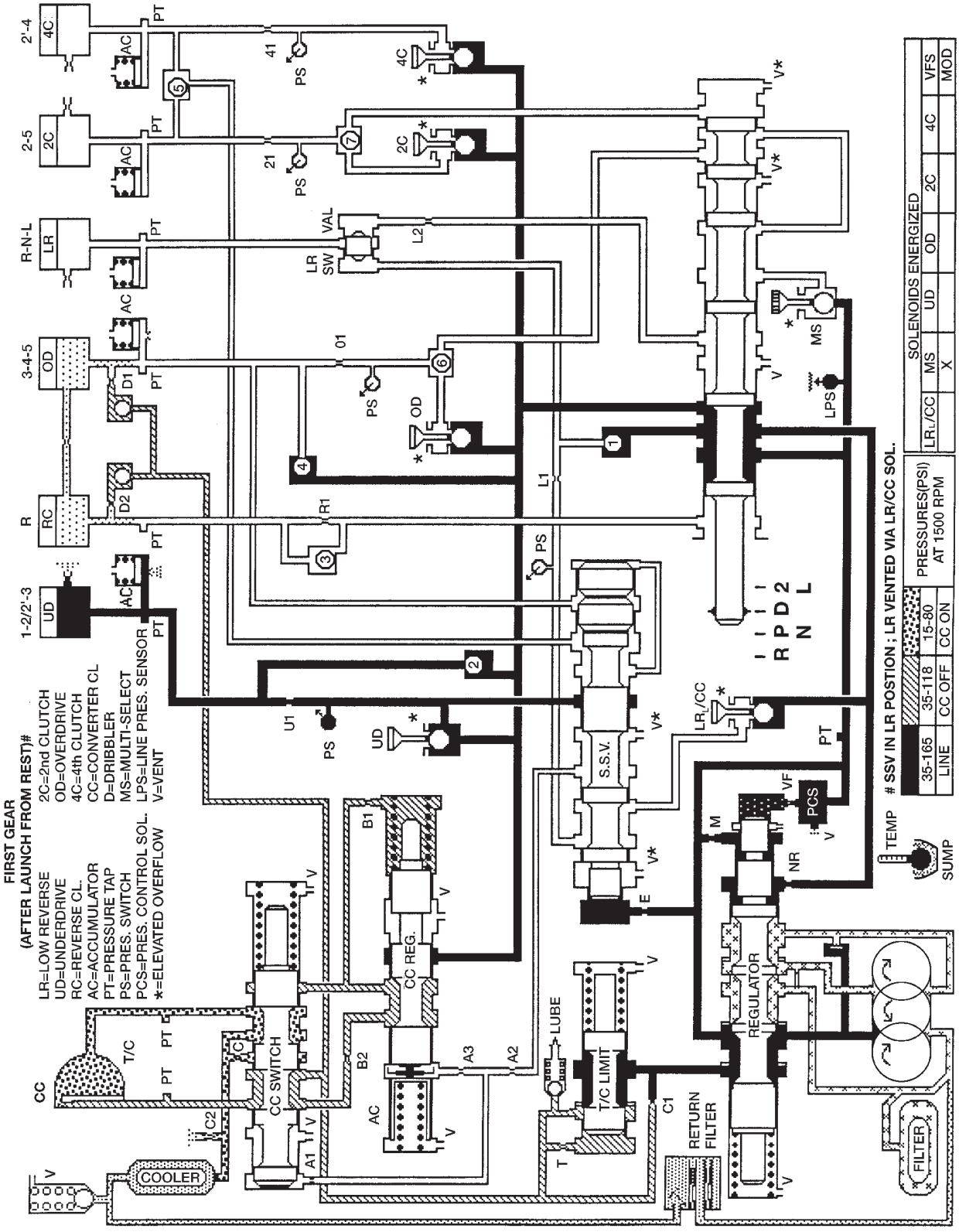
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AUTOMATIC TRANSMISSION - 545RFE (Continued)



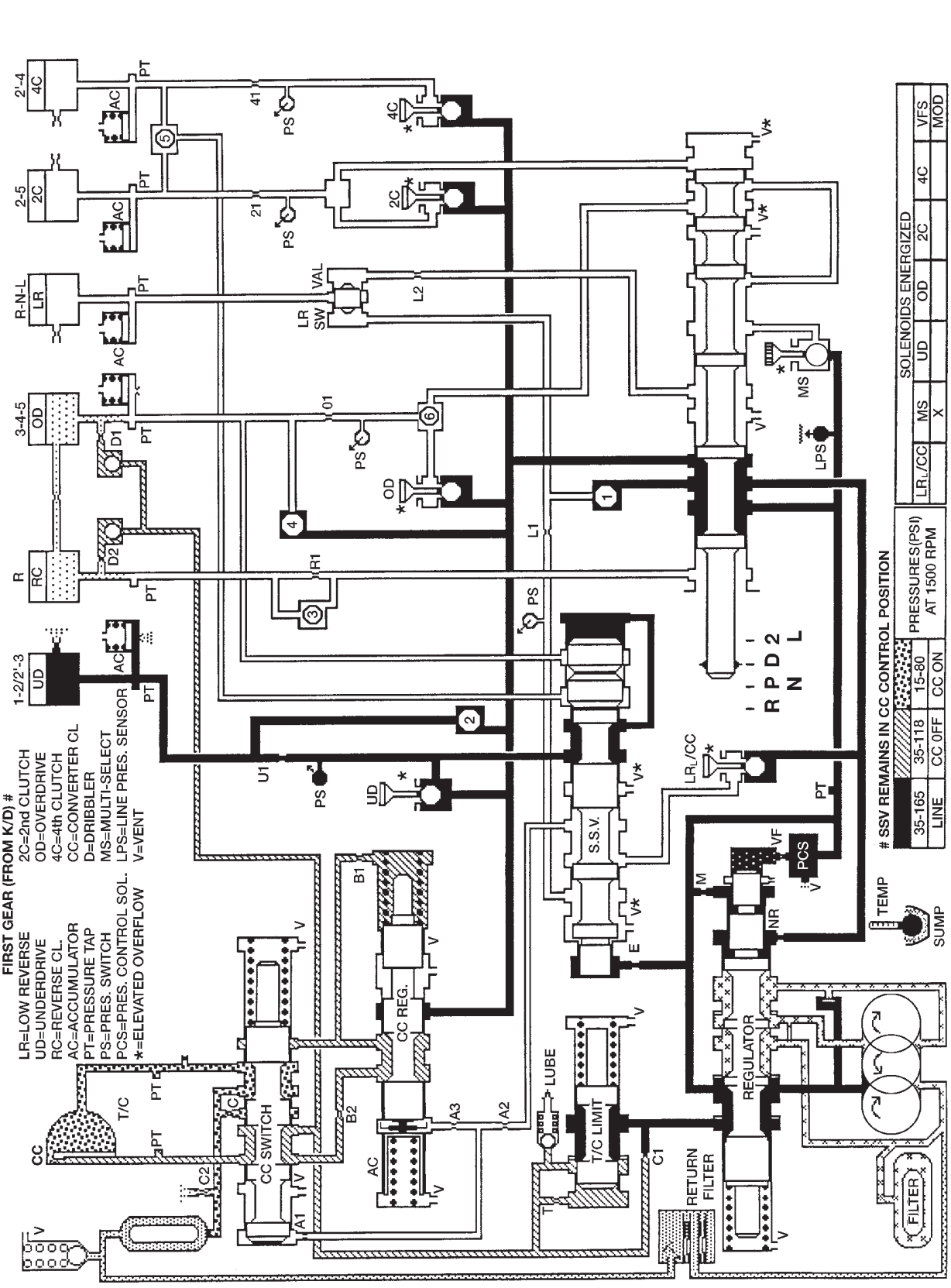
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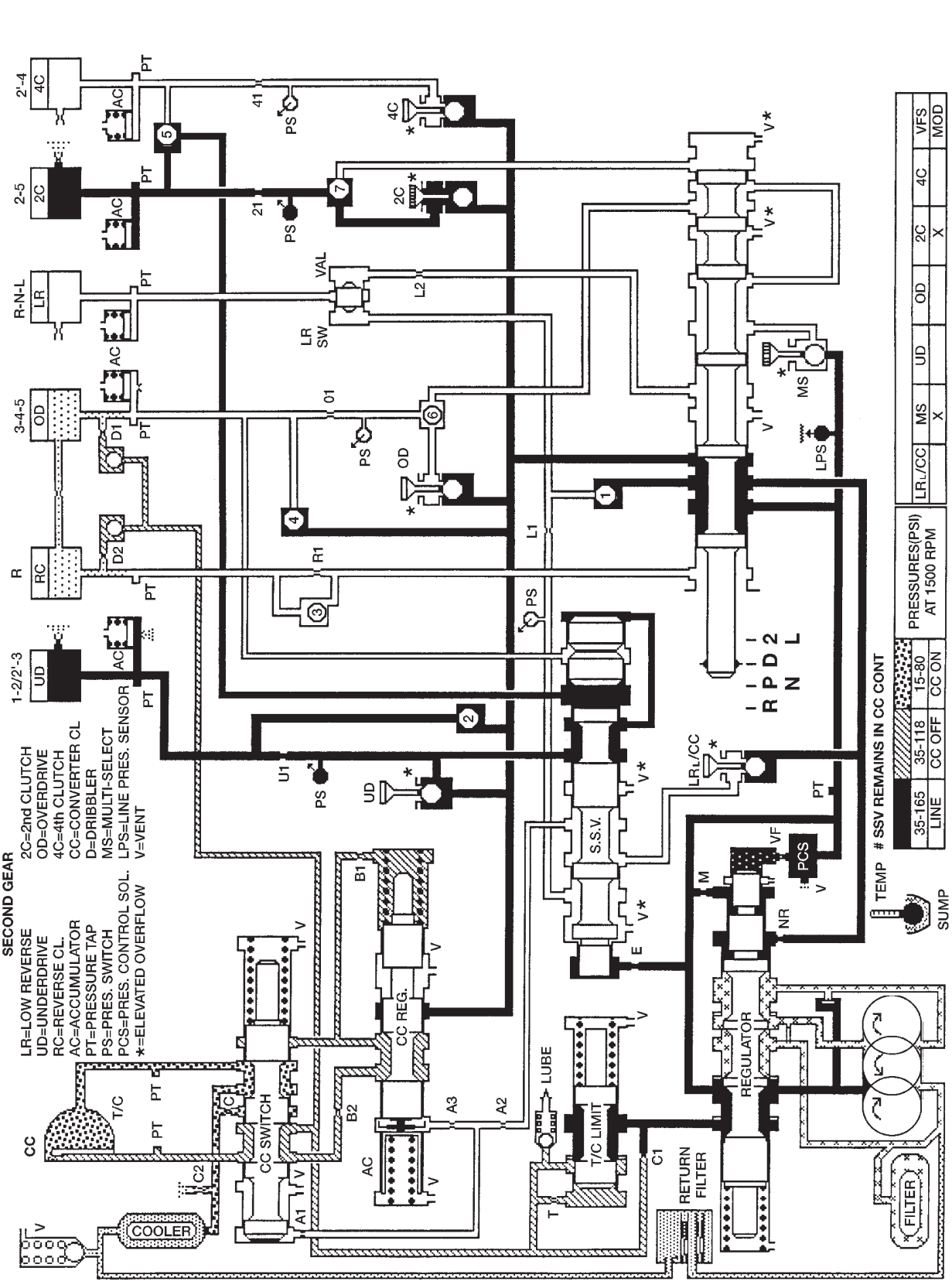
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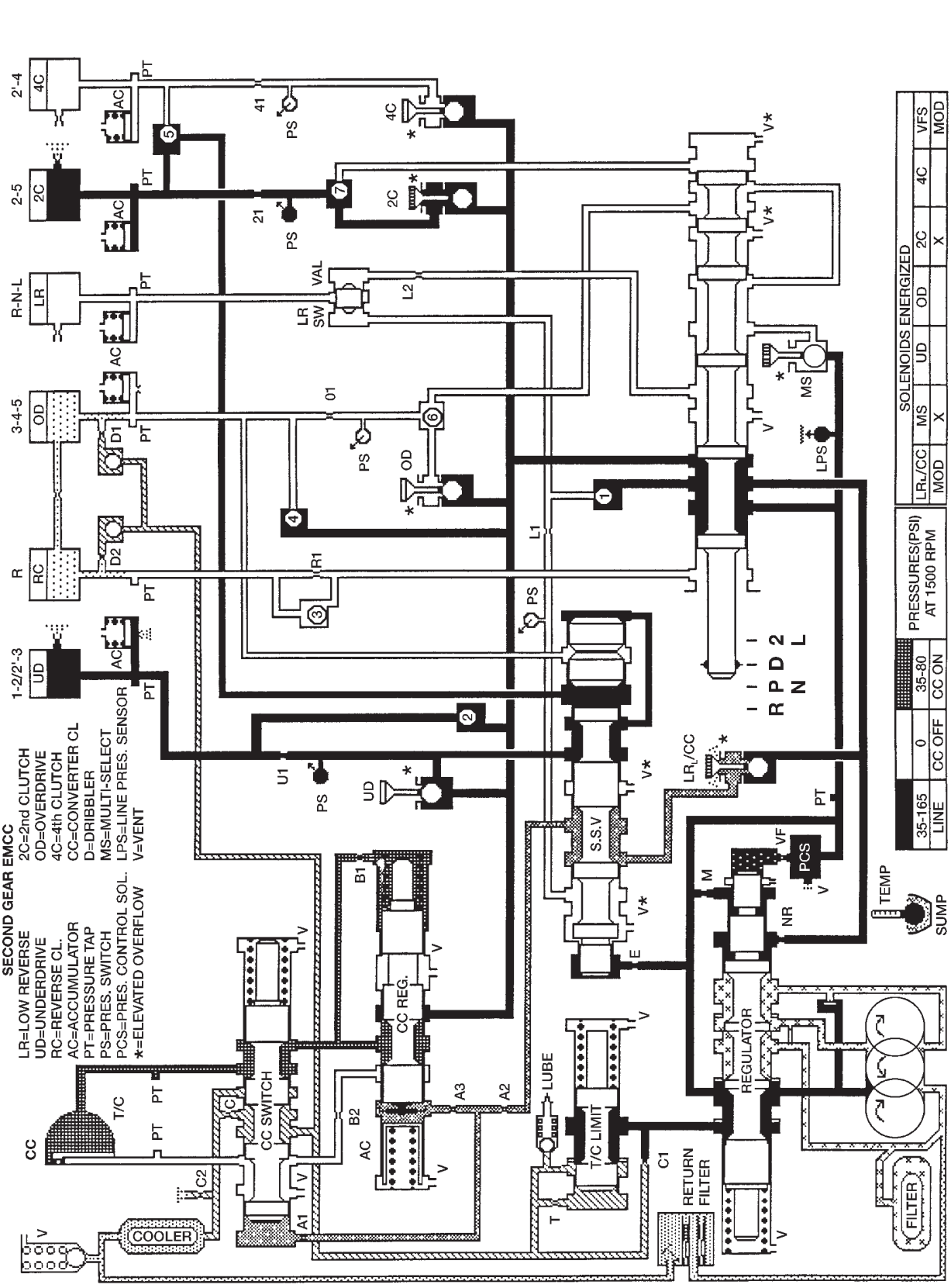
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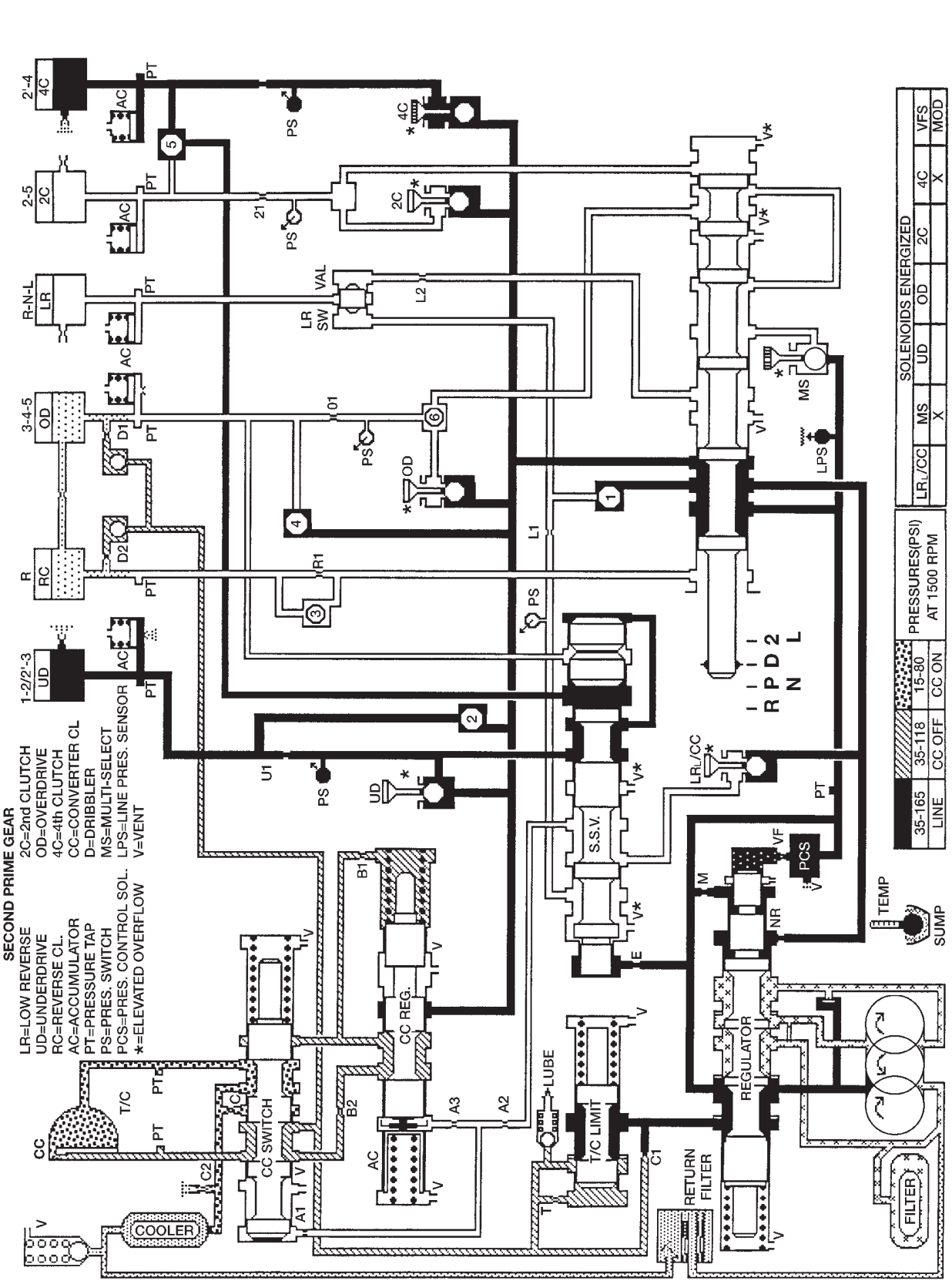
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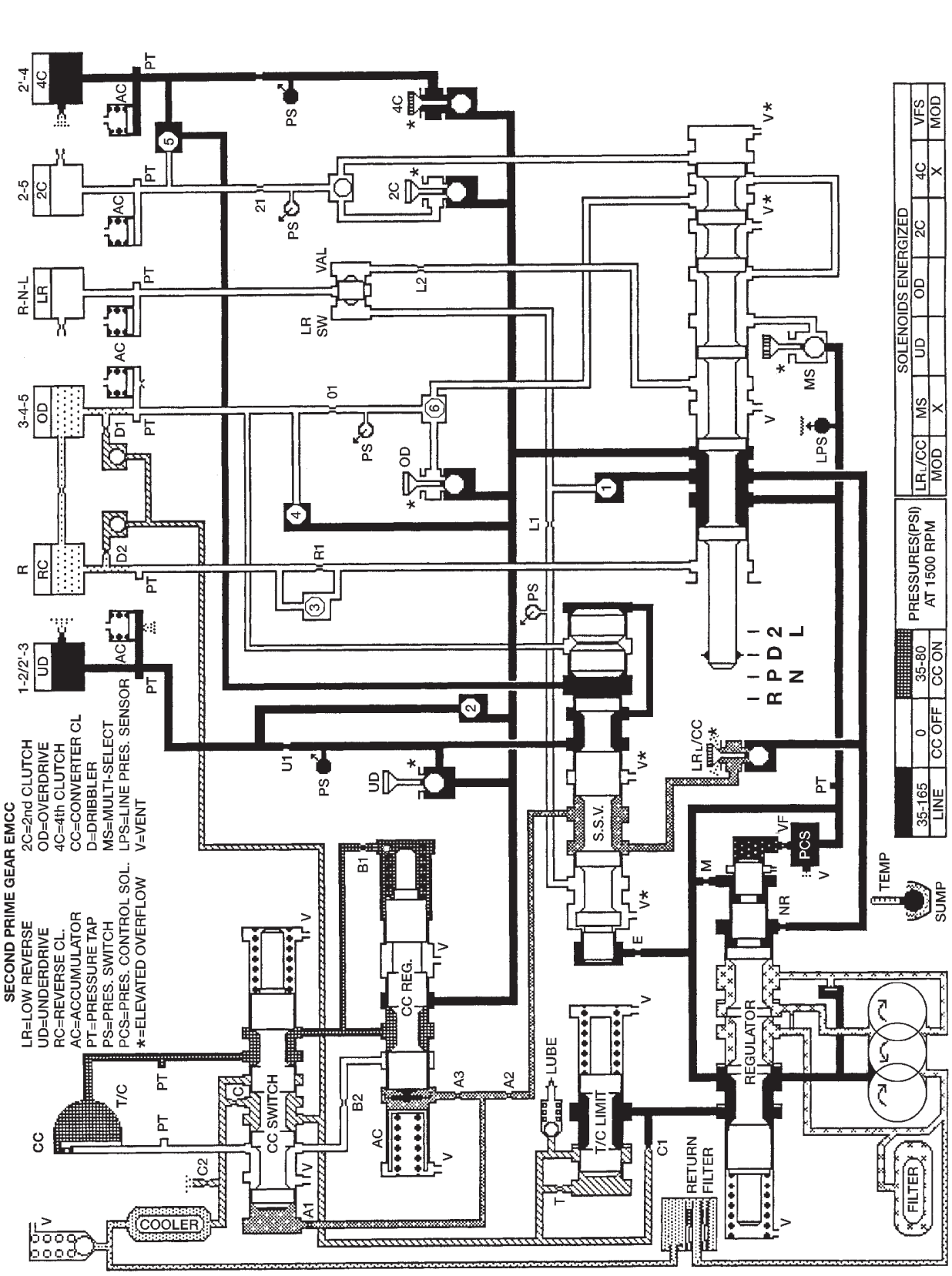


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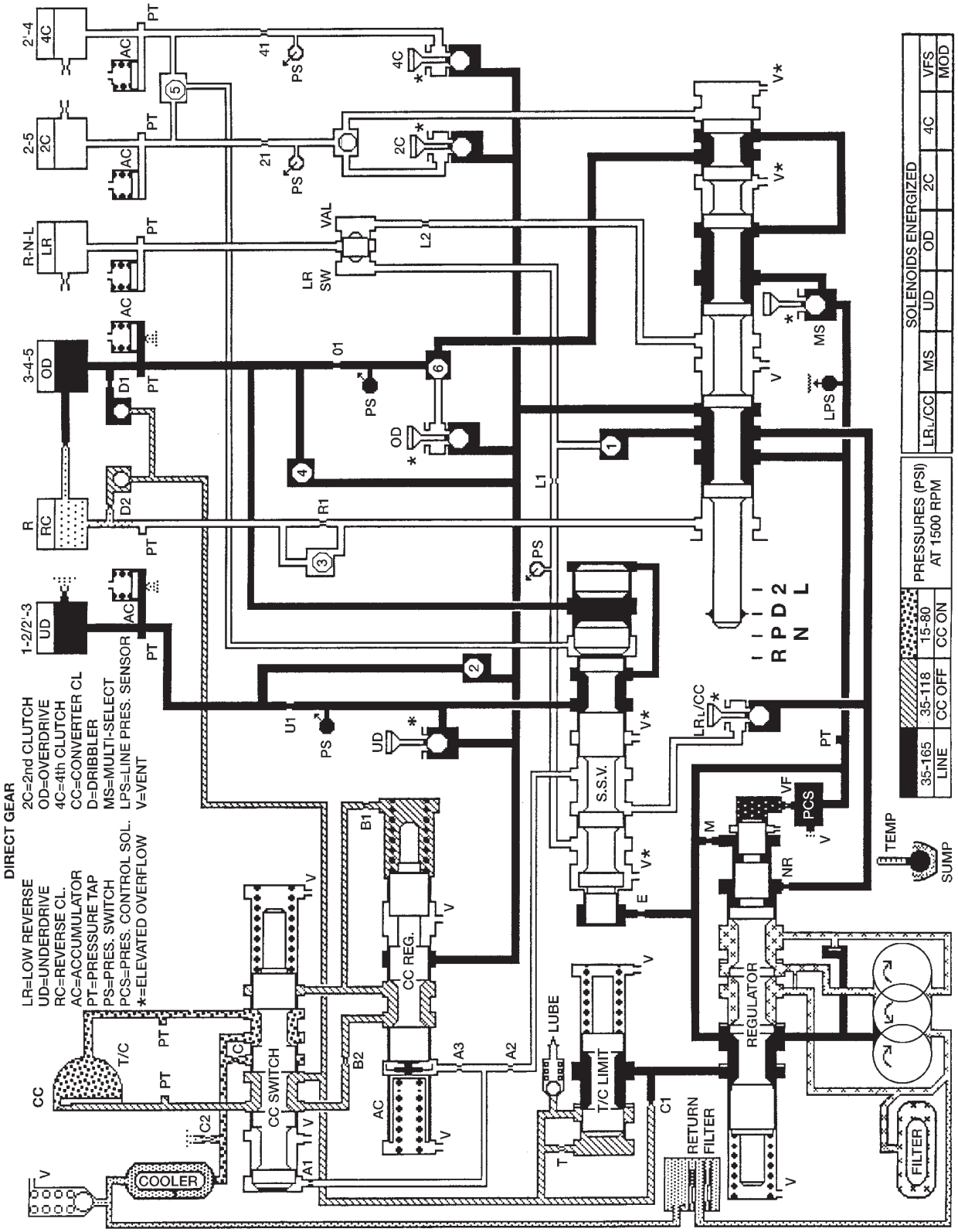


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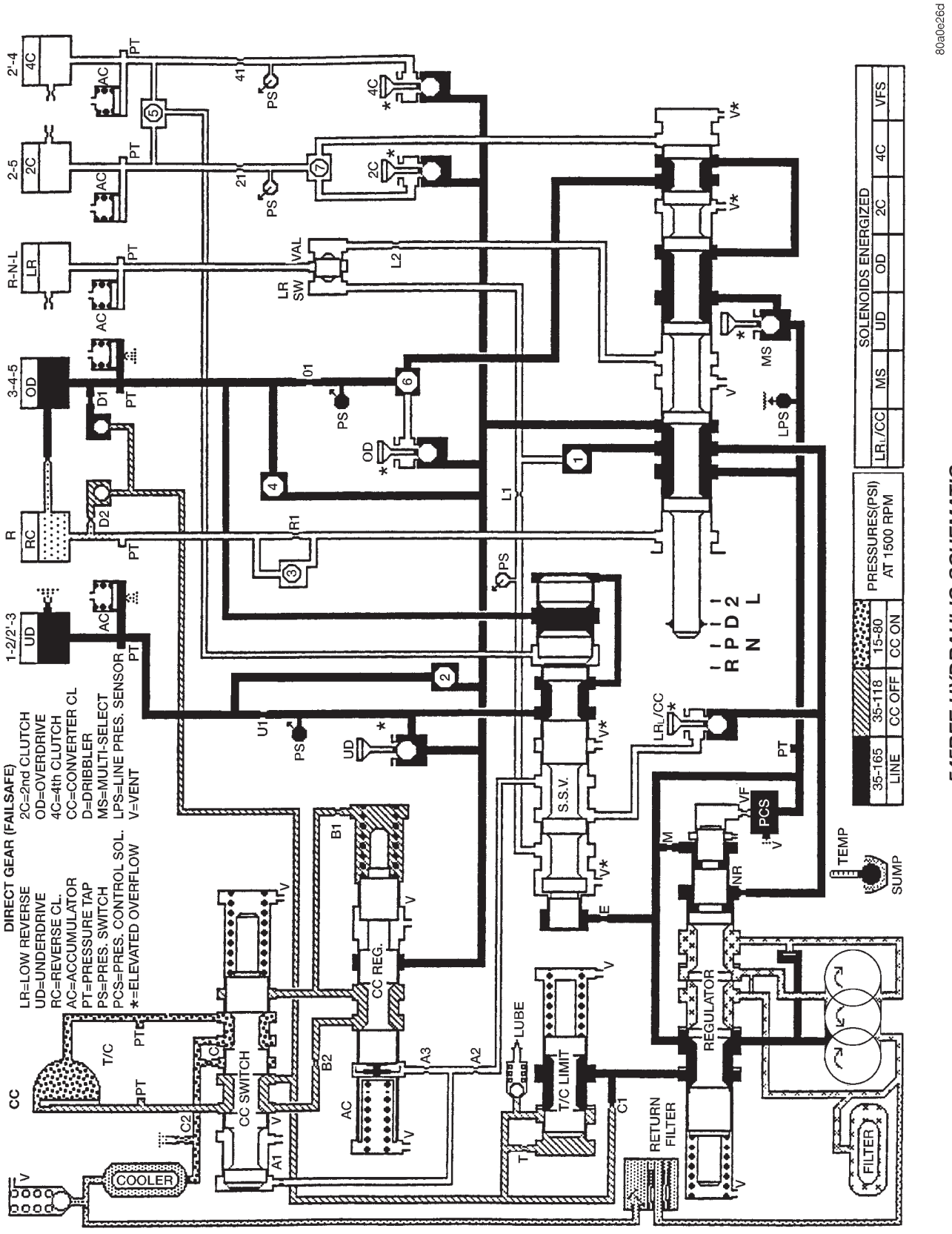
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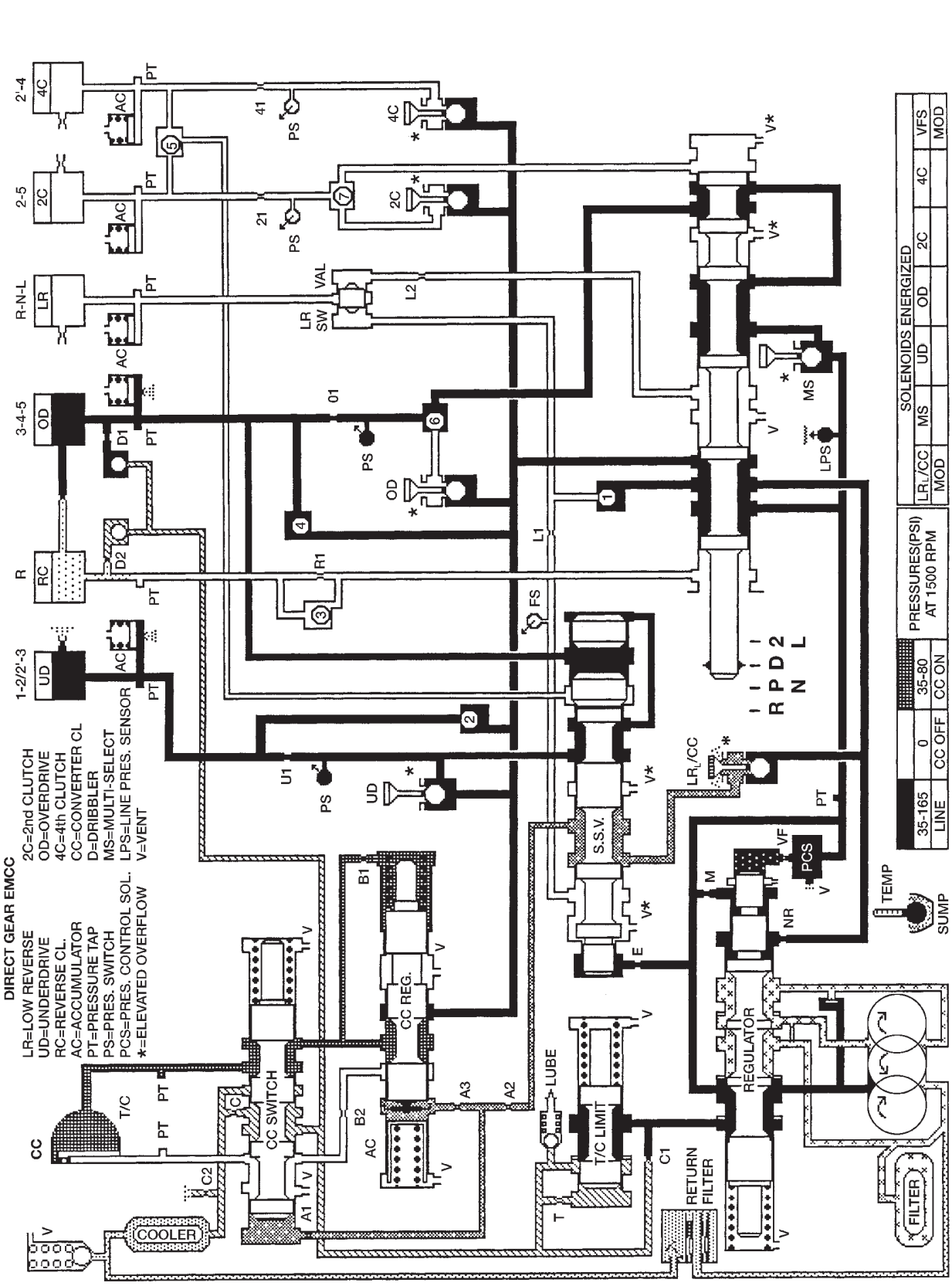
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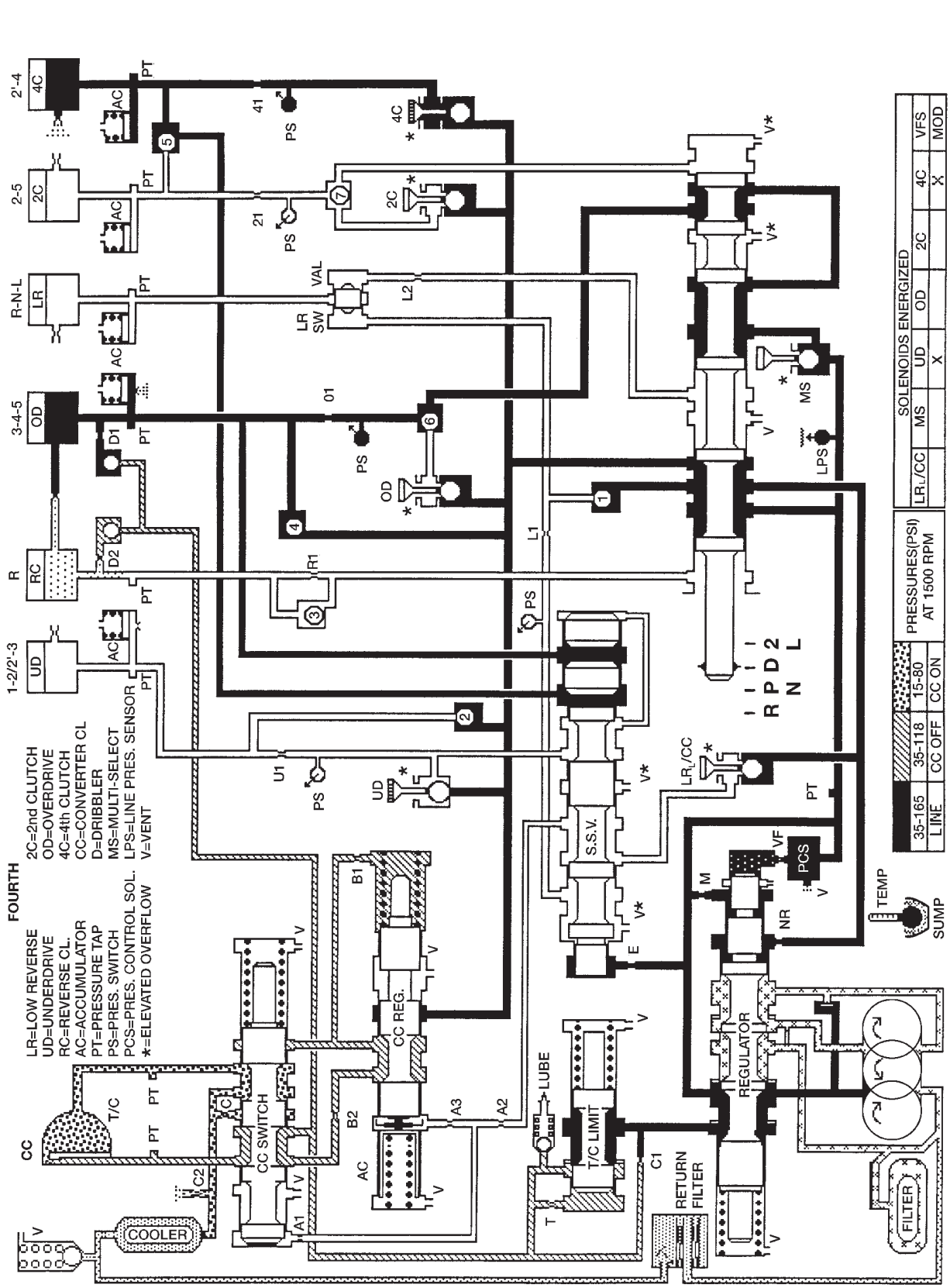
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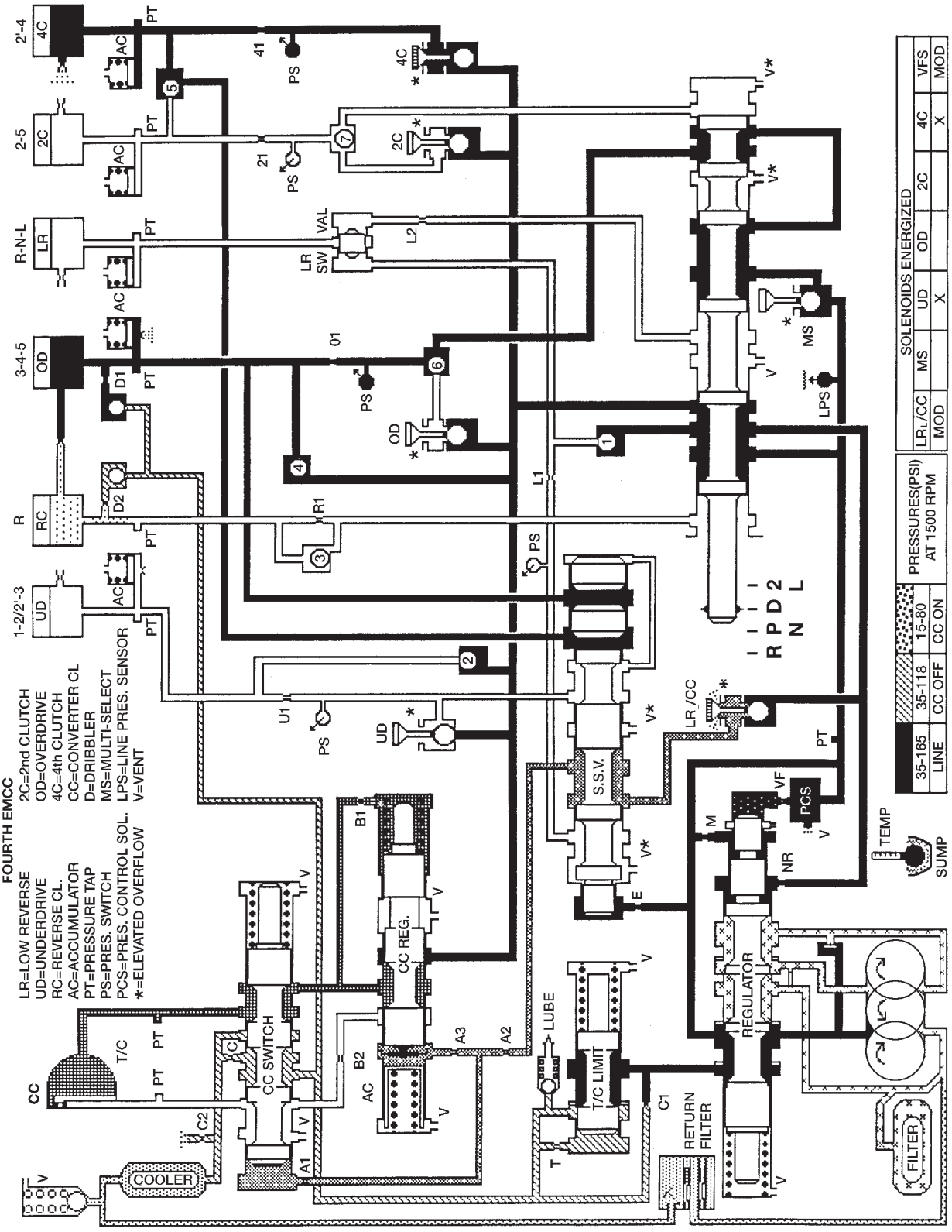


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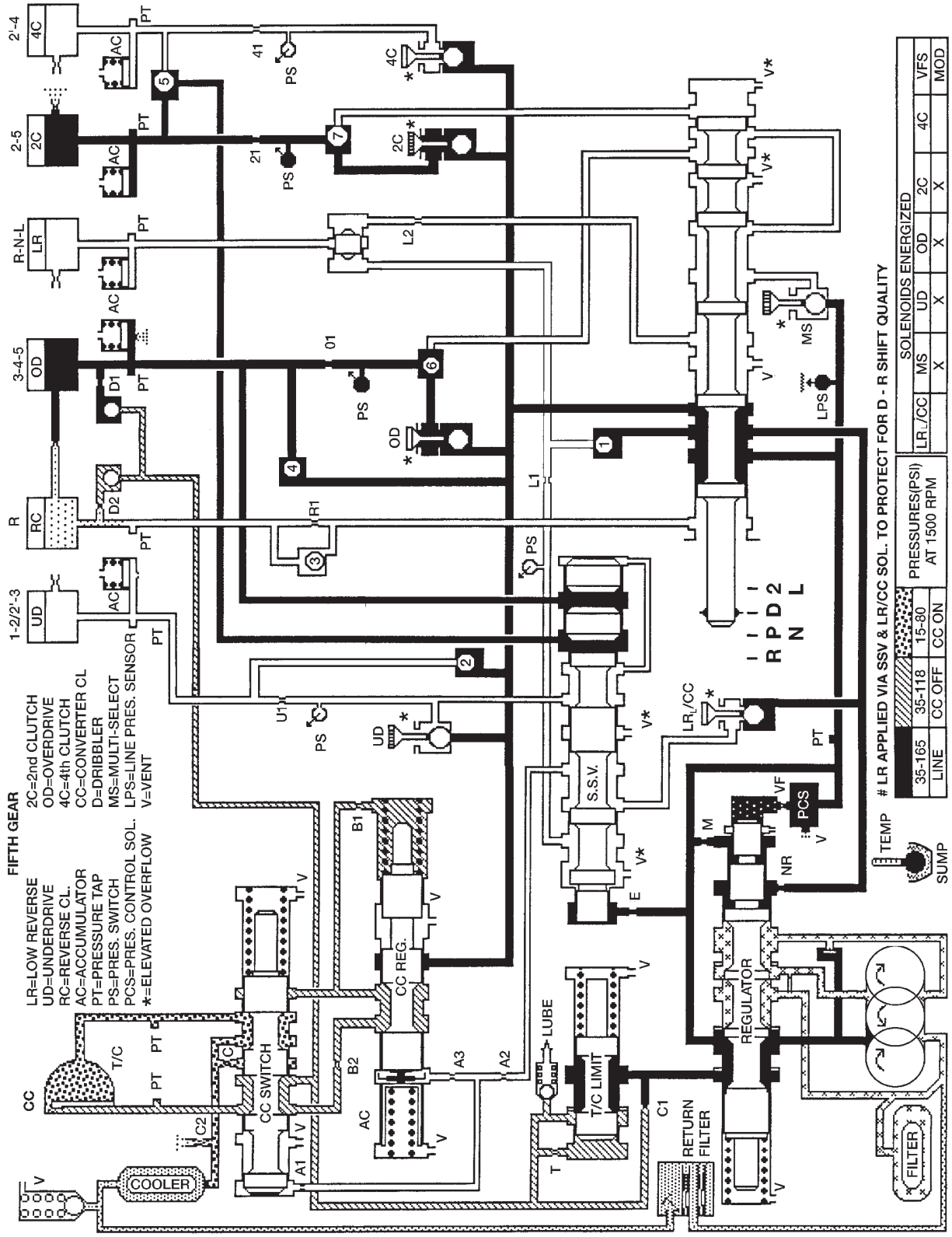


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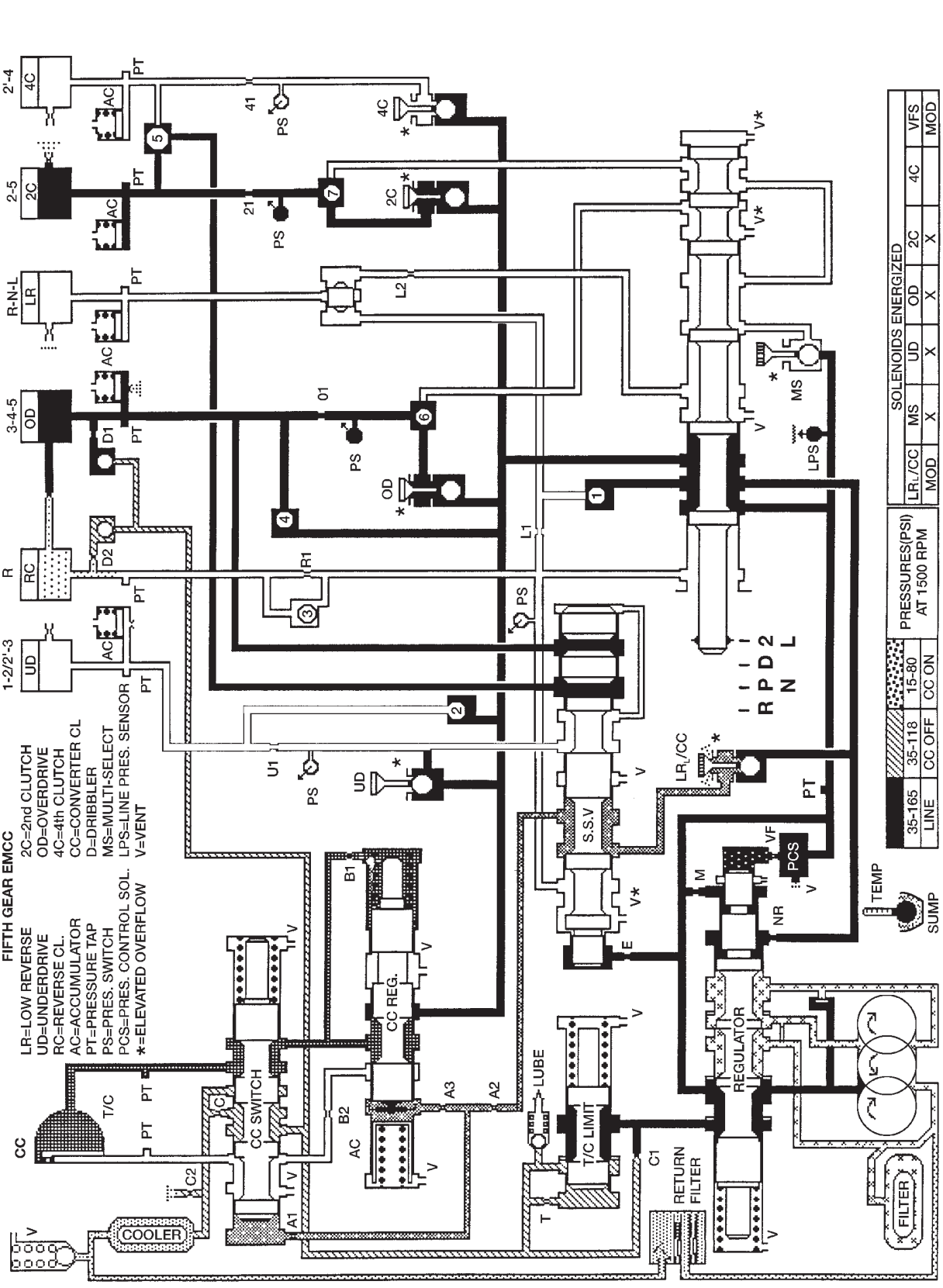
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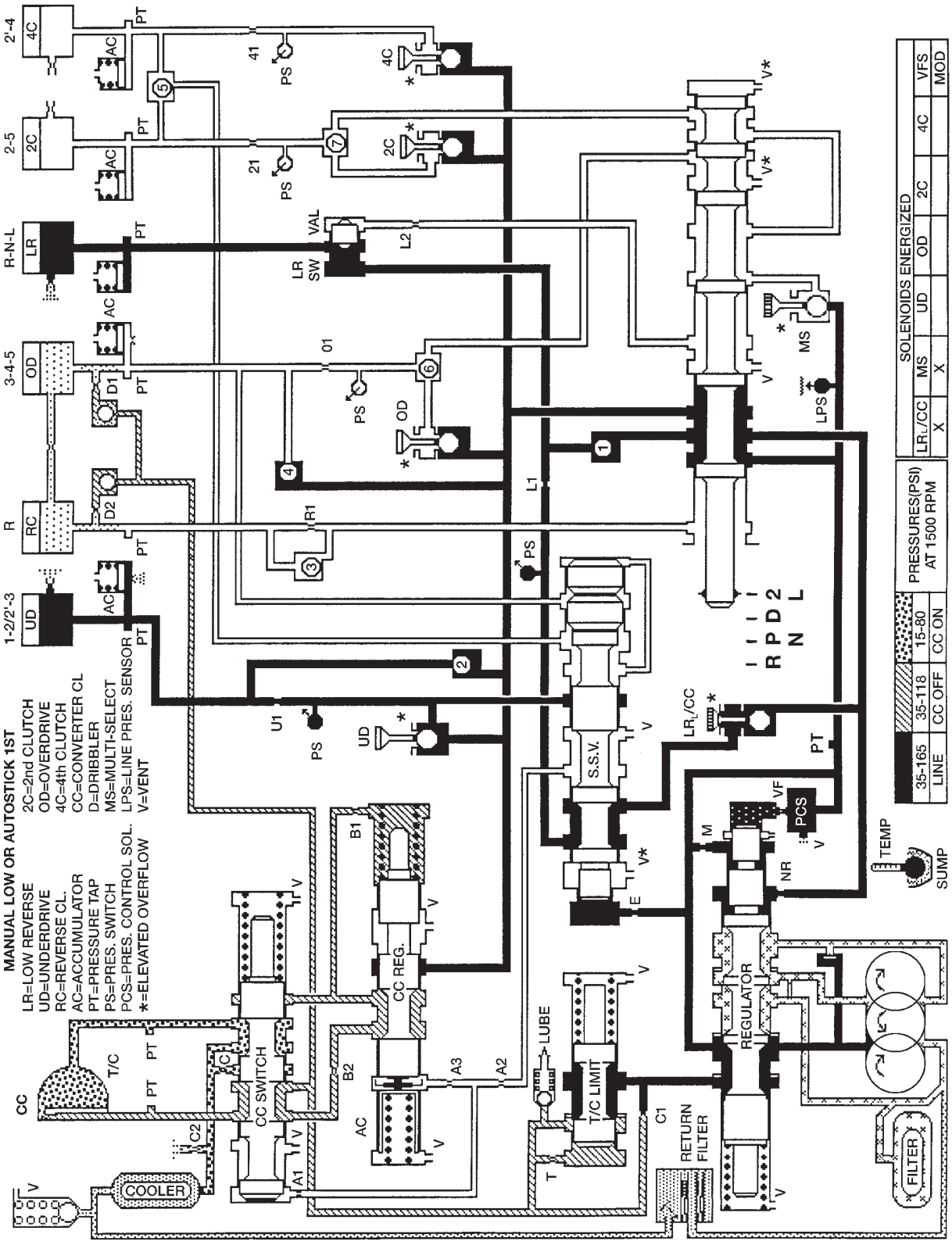


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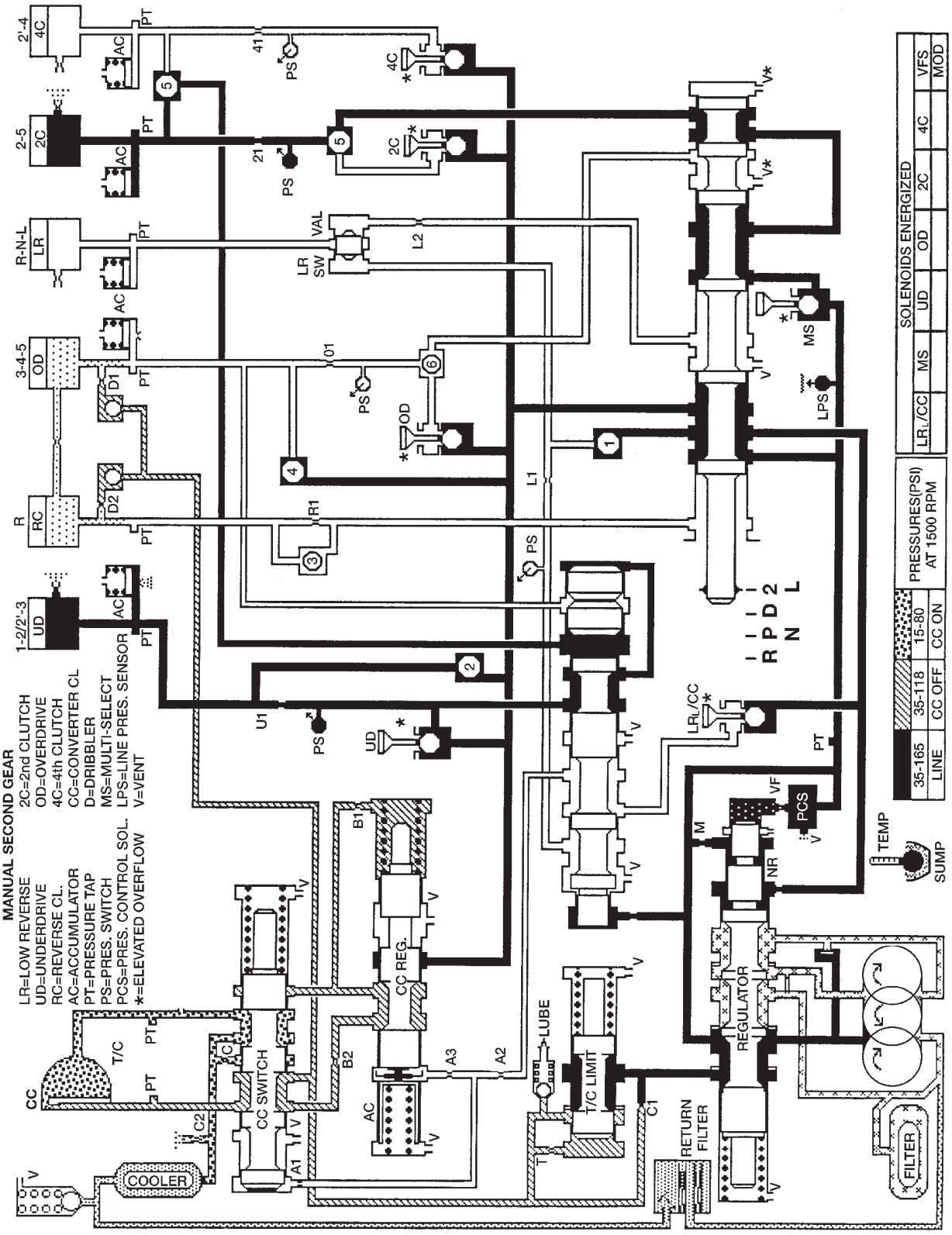


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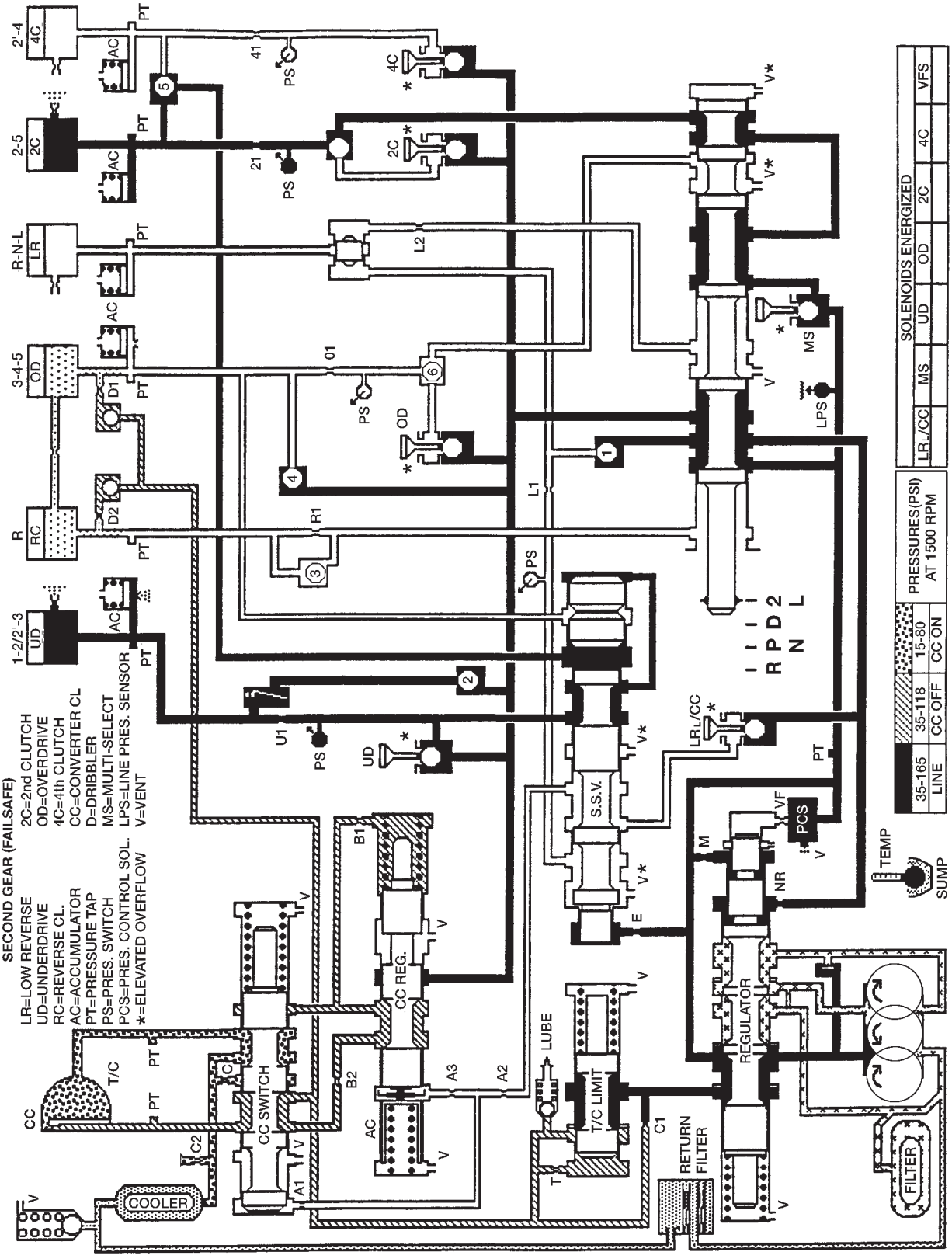
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AUTOMATIC TRANSMISSION - 545RFE (Continued)



545RFE HYDRAULIC SCHEMATIC

AUTOMATIC TRANSMISSION - 545RFE (Continued)



545RFE HYDRAULIC SCHEMATIC

AUTOMATIC TRANSMISSION - 545RFE (Continued)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Output Shaft End Play	0.22-0.55 mm	0.009-0.021 in.
Input Shaft End Play	0.46-0.89 mm	0.018-0.035 in.
2C Clutch Pack Clearance	0.455-1.335 mm	0.018-0.053 in.
4C Clutch Pack Clearance	0.770-1.390 mm	0.030-0.055 in.
L/R Clutch Pack Clearance	1.00-1.74 mm	0.039-0.069 in.
OD Clutch Pack Clearance	1.103-1.856 mm	0.043-0.073 in.
UD Clutch Pack Clearance	0.84-1.54 mm	0.033-0.061 in.
Reverse Clutch Pack Clearance	0.81-1.24 mm	0.032-0.049 in.
Recommended fluid	Mopar® ATF +4, type 9602	

GEAR RATIOS

1ST	3.00:1
2ND	1.67:1
2ND Prime	1.50:1
3RD	1.0:1
4TH	0.75:1
5TH	0.67:1
REVERSE	3.00:1

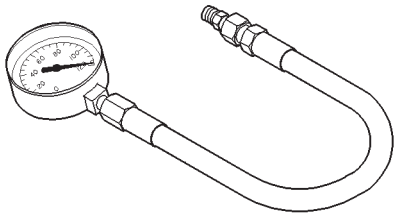
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	17.5	-	155
Bolt, torque convertor	31	23	-
Bolt/nut, crossmember	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Bolt, oil pan	11.8	-	105
Screw, primary fluid filter	4.5	-	40
Bolt, oil pump	28.2	-	250
Bolt, oil pump body to cover	4.5	-	40
Screw, plate to oil pump body	4.5	-	40
Bolt, valve body to case	11.8	-	105
Plug, pressure test port	5.1	-	45
Bolt, reaction shaft support	11.8	-	105
Screw, valve body to transfer plate	5.6	-	50
Screw, solenoid module to transfer plate	5.7	-	50
Screw, accumulator cover	4.5	-	40
Screw, detent spring	4.5	-	40
Bolt, input speed sensor	11.8	-	105
Bolt, output speed sensor	11.8	-	105
Bolt, line pressure sensor	11.8	-	105
Bolt, extension housing	54	40	-
Valve, cooler return filter bypass	4.5	-	40
Screw, manual valve cam retaining	4.5	-	40
Bolt, manual lever	28.2	-	250

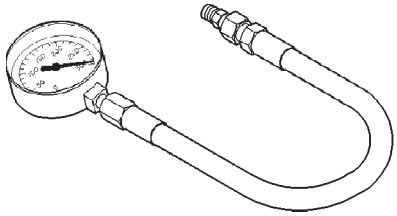
AUTOMATIC TRANSMISSION - 545RFE (Continued)

SPECIAL TOOLS

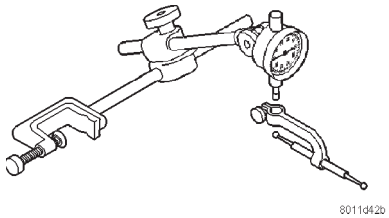
RFE TRANSMISSION



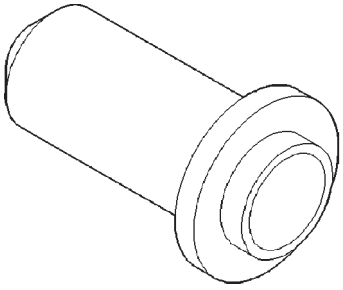
Gauge, Oil Pressure - C-3292



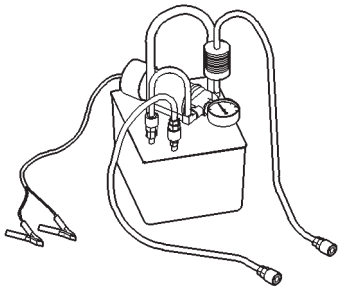
Gauge, Oil Pressure - C-3293SP



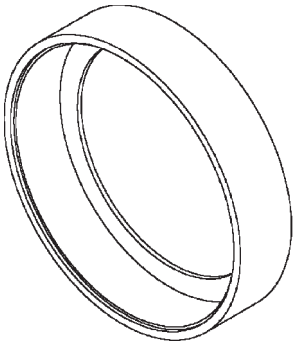
Dial Indicator - C-3339



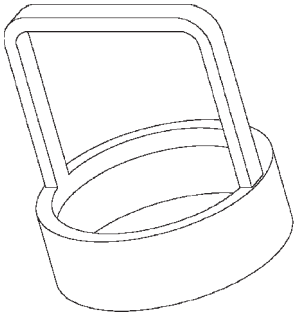
Installer, Seal - C-3860-A



Flusher, Oil Cooler - 6906-C

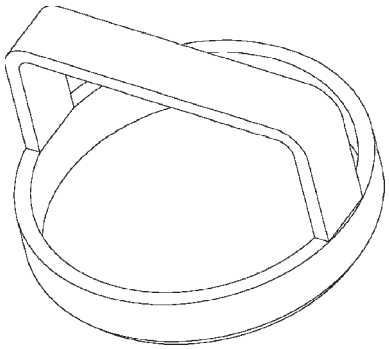


Compressor, Spring - 8249

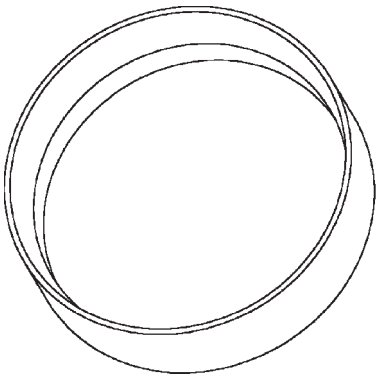


Compressor, Spring - 8250

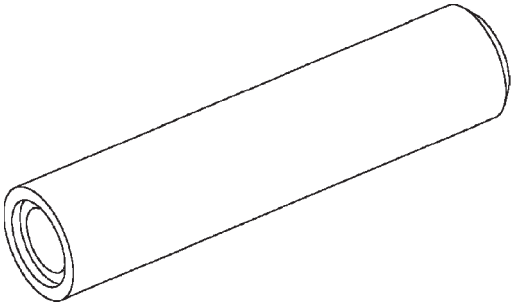
AUTOMATIC TRANSMISSION - 545RFE (Continued)



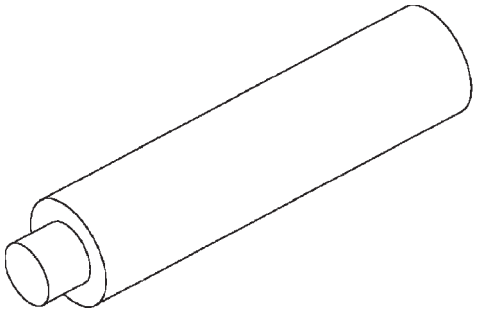
Compressor, Spring - 8251



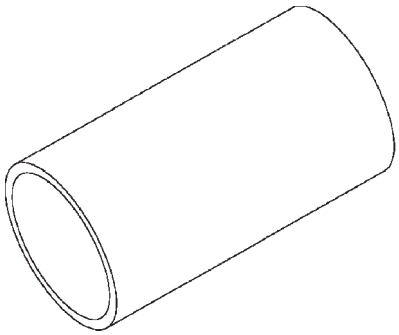
Installer, Piston - 8252



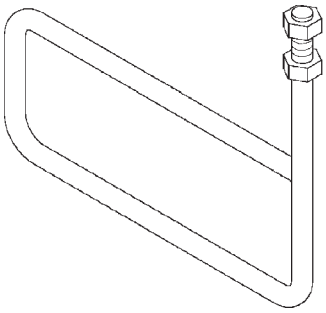
Installer, Seal - 8253



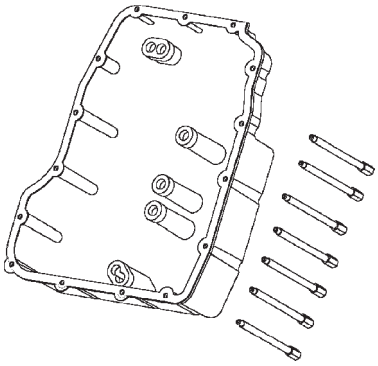
Installer, Seal - 8254



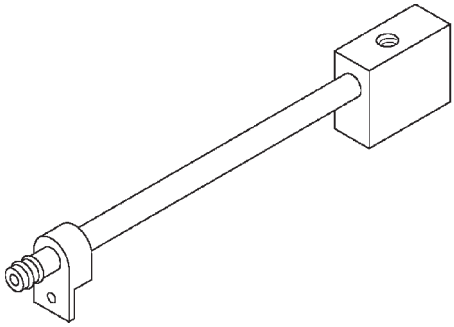
Installer, Snap-ring - 8255



Stand, Support - 8257

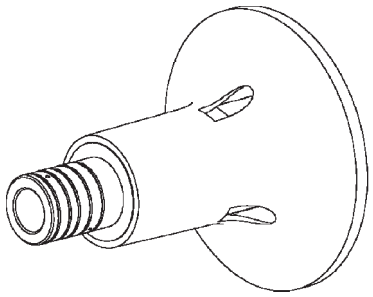


Adapter, Pressure Tap - 8258-A

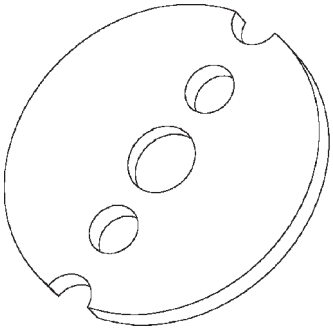


Adapter, Line Pressure - 8259

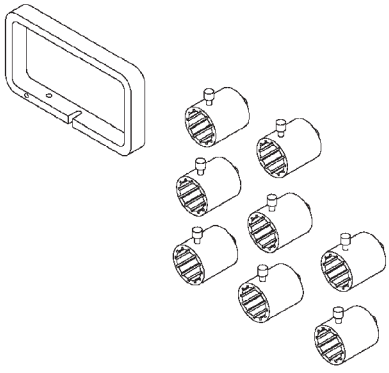
AUTOMATIC TRANSMISSION - 545RFE (Continued)



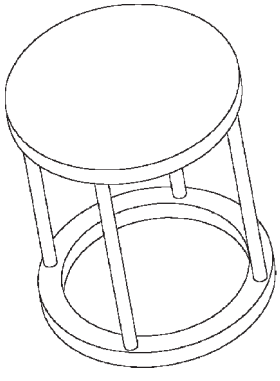
Fixture, Input Clutch Pressure - 8260



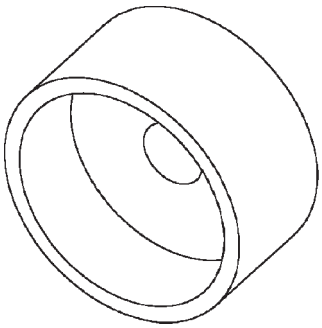
Plate, Alignment - 8261



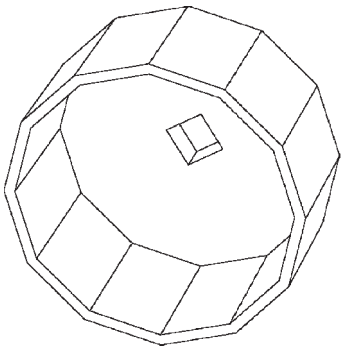
End Play Set - 8266



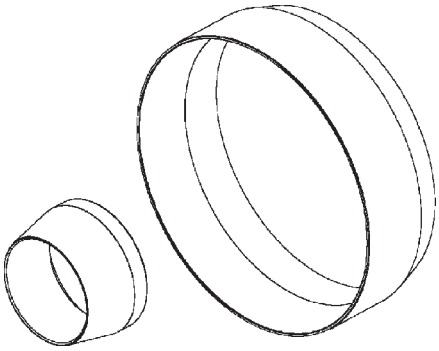
Compressor, Spring - 8285



Installer, Bearing - 8320



Wrench, Filter - 8321



Installer, Piston - 8504

4C RETAINER/BULKHEAD

DISASSEMBLY

(1) Remove the 2C piston belleville spring snap-ring from the 4C retainer /bulkhead (Fig. 53).

(2) Remove the 2C piston Belleville spring from the retainer/bulkhead (Fig. 53).

(3) Remove the 2C piston from the retainer/bulkhead. Use 20 psi of air pressure to remove the piston if necessary.

(4) Remove the 4C clutch snap-ring from the retainer/bulkhead (Fig. 53).

(5) Remove the 4C clutch pack from the retainer/bulkhead (Fig. 53).

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and remove the snap-ring (Fig. 53).

(7) Remove the 4C piston return spring and piston from the retainer/bulkhead (Fig. 53). Use 20 psi of air pressure to remove the piston if necessary.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install new seals on the 2C and 4C pistons (Fig. 53).

(3) Lubricate all seals with Mopar® ATF +4, type 9602 prior to installation.

(4) Install the 4C piston into the 4C retainer/bulkhead (Fig. 53).

(5) Position the 4C piston return spring onto the 4C piston.

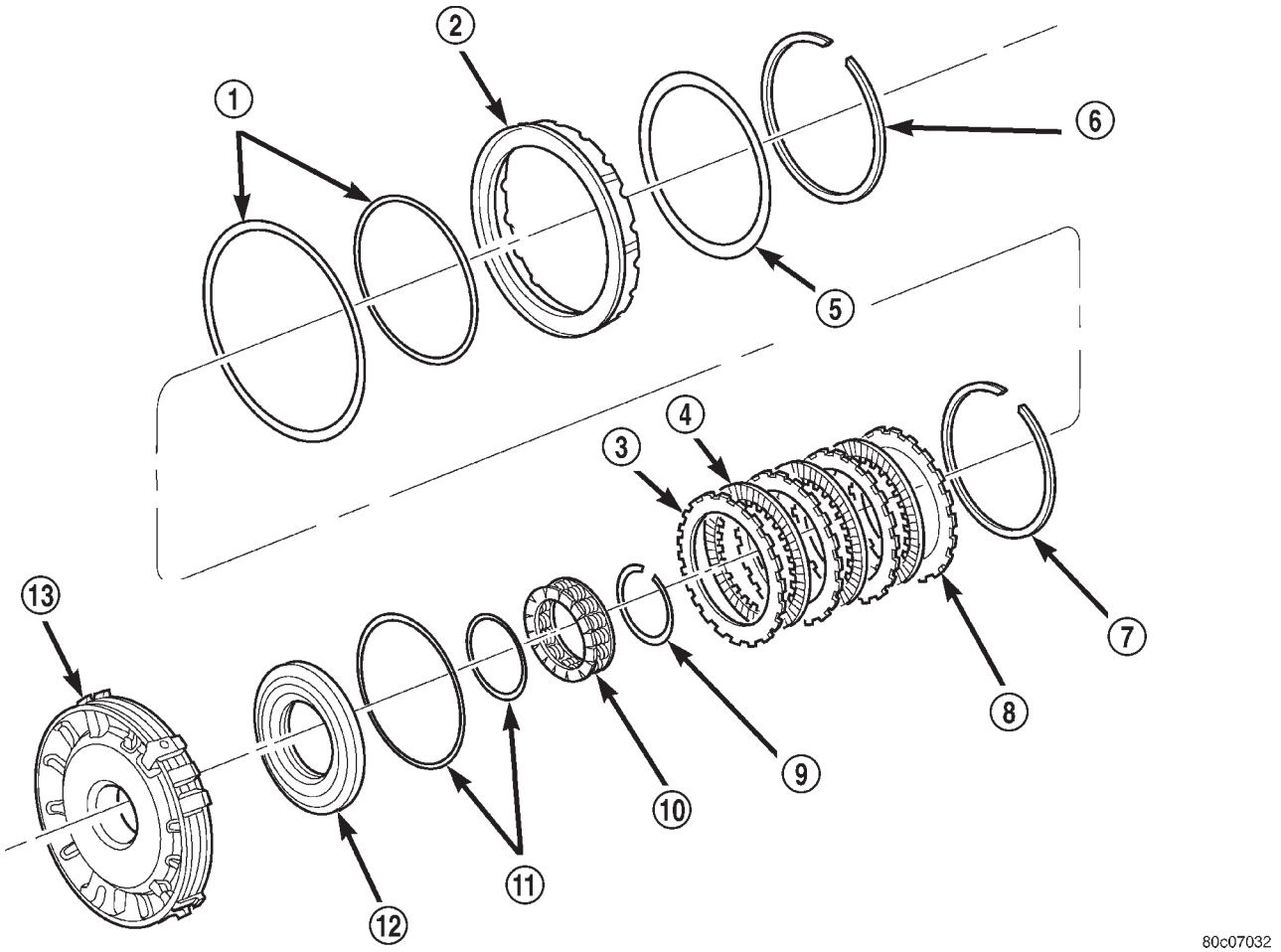


Fig. 53 4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

4C RETAINER/BULKHEAD (Continued)

(6) Using Spring Compressor 8250 and a suitable shop press, compress the 4C piston return spring and install the snap-ring (Fig. 54).

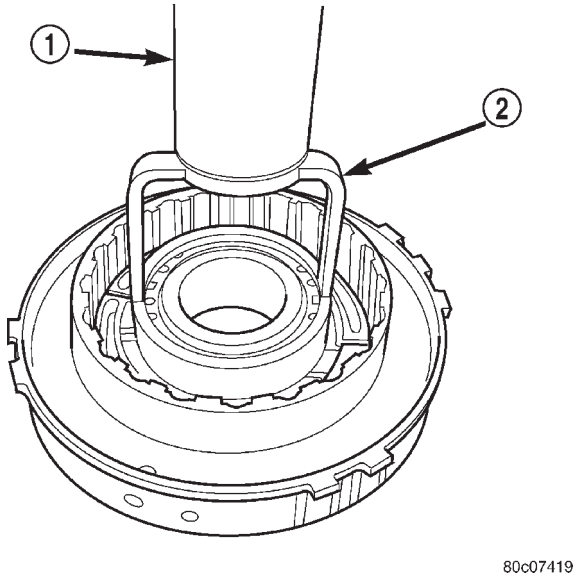


Fig. 54 Compress 4C Piston Return Spring Using Tool 8250

1 - PRESS
2 - TOOL 8250

(7) Assemble and install the 4C clutch pack into the retainer/bulkhead (Fig. 53) with the steel separator plate against the piston.

(8) Install the 4C reaction plate and snap-ring into the retainer/bulkhead (Fig. 53). The 4C reaction plate is non-directional.

(9) Measure the 4C clutch clearance. The correct clutch clearance is 0.77-1.39 mm (0.030-0.055 in.). The snap-ring is selectable. Install the chosen snap-ring and re-measure to verify the selection.

(10) Install the 2C piston into the retainer/bulkhead (Fig. 53).

(11) Position the 2C Belleville spring onto the 2C piston.

(12) Position the 2C Belleville spring snap-ring onto the 2C Belleville spring (Fig. 53).

(13) Using Spring Compressor 8249 and a suitable shop press (Fig. 55), compress the belleville spring until the snap-ring is engaged with the snap-ring groove in the retainer/bulkhead.

ADAPTER HOUSING SEAL

REMOVAL

(1) Remove the transfer case from the transmission.

(2) Using a screw mounted on a slide hammer, remove the adapter housing seal.

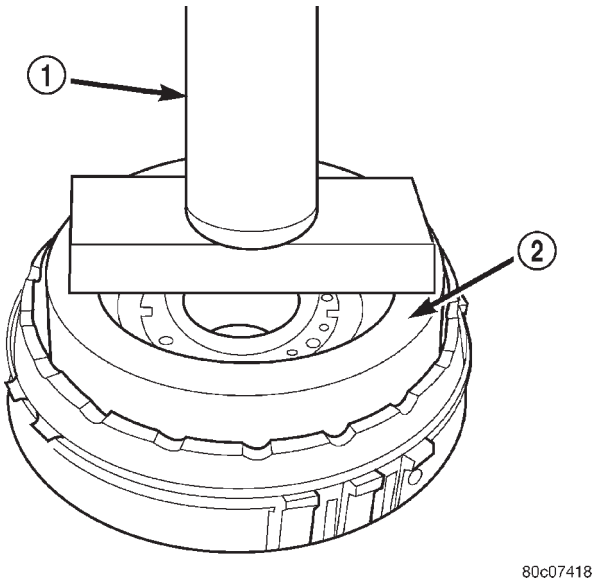


Fig. 55 Compress 2C Belleville Spring Using Tool 8249

1 - PRESS
2 - TOOL 8249

INSTALLATION

(1) Clean the adapter seal bore in the adapter housing of any residue or particles remaining from the original seal.

(2) Install new oil seal in the adapter housing using Seal Installer C-3860-A (Fig. 56). A properly installed seal is flush to the face of the seal bore.

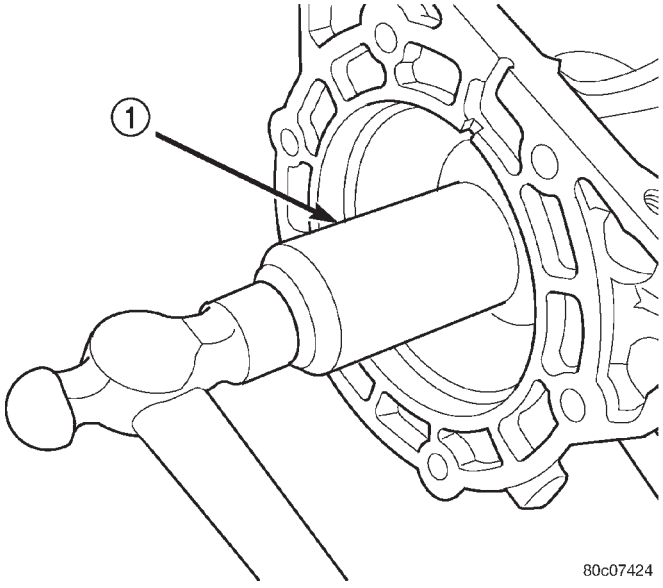


Fig. 56 Adapter Housing Seal Installation

1 - TOOL C-3860-A

(3) Install the transfer case onto the transmission.

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM

DESCRIPTION

The Brake Transmission Shifter/Ignition Interlock (BTSI), is a cable and solenoid operated system. It interconnects the automatic transmission floor mounted shifter to the steering column ignition switch (Fig. 57).

OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in the shifter assembly is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

(1) Verify that the key can only be removed in the PARK position

(2) When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.

(3) Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.

(4) Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.

(6) Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

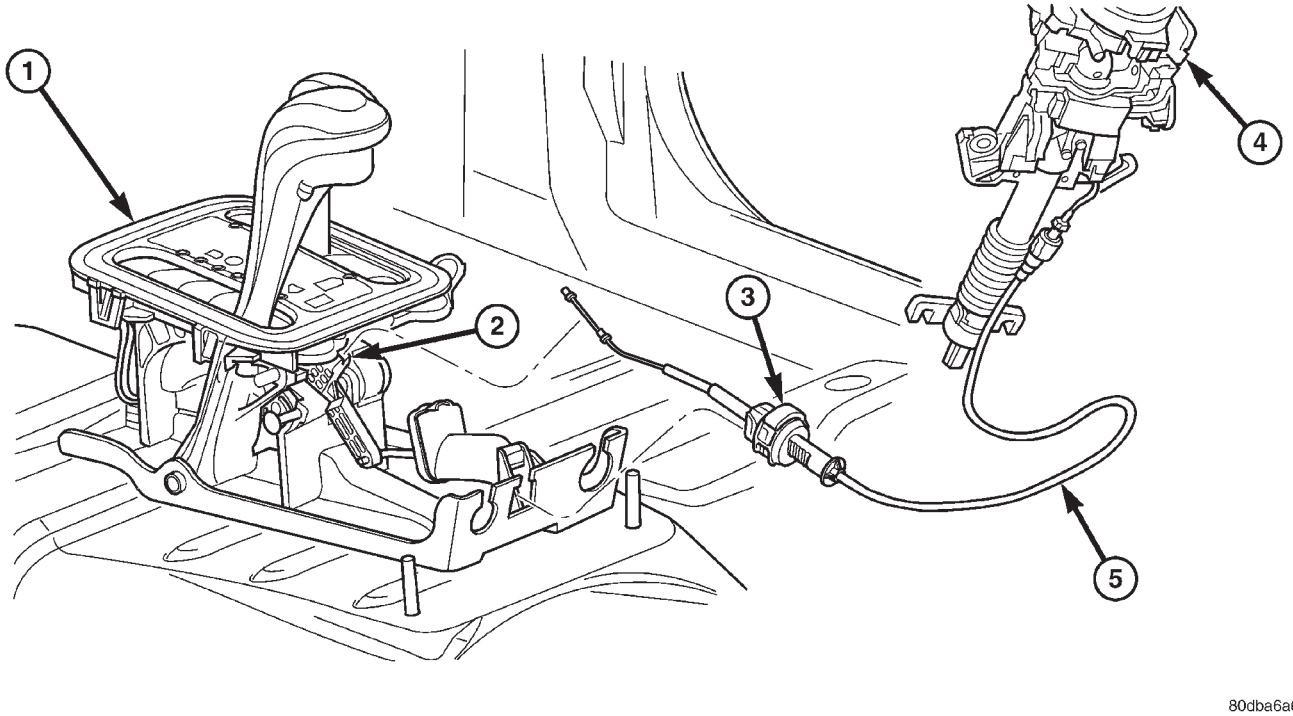


Fig. 57 Ignition Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

BRAKE TRANSMISSION SHIFT INTERLOCK MECHANISM (Continued)

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

The park interlock cable is part of the brake/shift lever interlock system. Correct cable adjustment is important to proper interlock operation. The gear shift and park lock cables must both be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE

(1) Remove floor console as necessary for access to the brake transmission shift interlock cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift the transmission into the PARK position.

(3) Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**

(4) Pull cable lock button up to release cable (Fig. 58).

(5) Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.

(6) Push lock button down until it snaps in place.

BTSI FUNCTION CHECK

(1) Verify removal of ignition key allowed in PARK position only.

(2) When the shift lever is in PARK, and the shift handle push-button is in the out position, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.

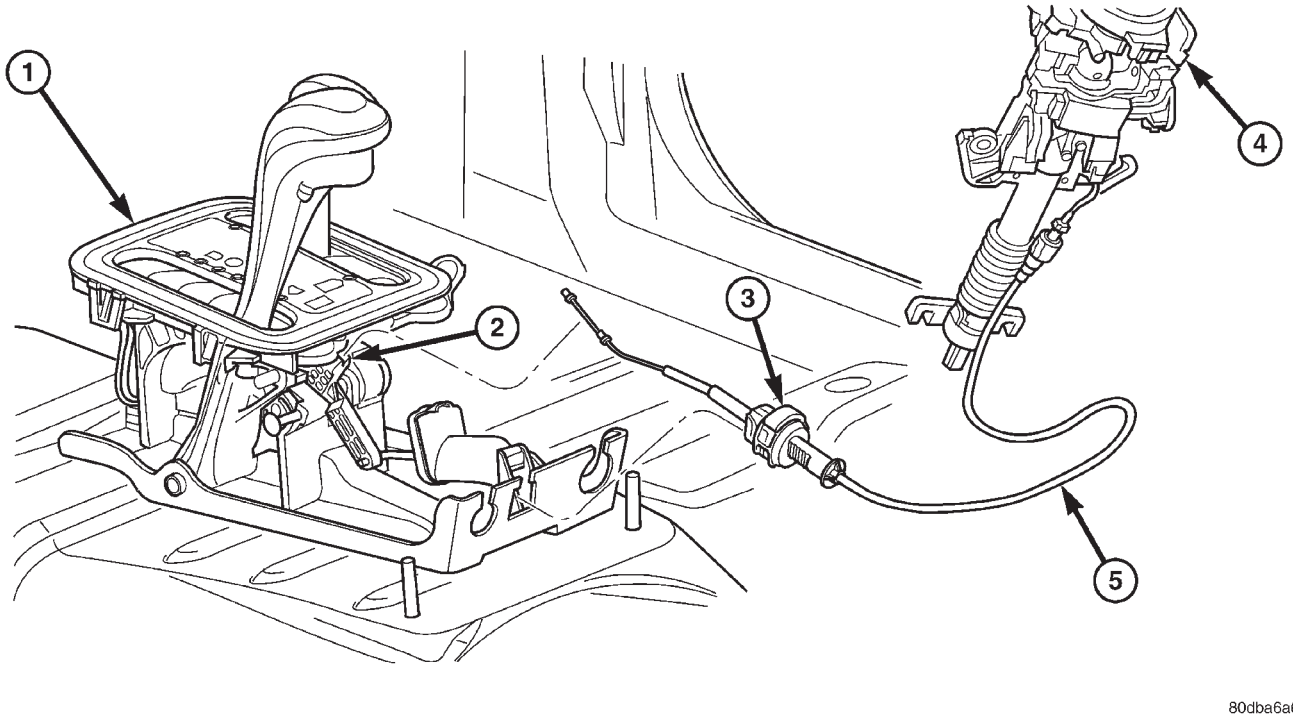
(3) Shifting out of PARK should be possible when the ignition key cylinder is in the off position.

(4) Shifting out of PARK should not be possible while applying normal push-button force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).

(5) Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.

(6) Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.

(7) The floor shifter lever and gate positions should be in alignment with all transmission detent positions.



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Fig. 58 Brake Transmission Shift Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

(8) Engine starts must be possible with shifter lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gate positions other than PARK or NEUTRAL.

(9) With shifter lever handle push-button not depressed and lever detent in:

- PARK position- apply forward force on center of handle and remove pressure. Engine start must be possible.
- PARK position- apply rearward force on center of handle and remove pressure. Engine start must be possible.
- NEUTRAL position- engine start must be possible.
- NEUTRAL position, engine running and brakes applied- Apply forward force on center of shift handle. Transmission should not be able to shift into REVERSE detent.

FLUID AND FILTER

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

DIAGNOSIS AND TESTING - CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

(1) Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.

(2) A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged main cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.

(3) Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

DIAGNOSIS AND TESTING - FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to reverse flush cooler and lines after repair
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The transmission cooler and lines should be reverse flushed whenever a malfunction generates sludge and/or debris. The torque converter should also be replaced at the same time.

Failure to flush the cooler and lines will result in recontamination. Flushing applies to auxiliary coolers as well. The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

FLUID AND FILTER (Continued)

STANDARD PROCEDURE

STANDARD PROCEDURE - FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P (PARK) and N (NEUTRAL) positions. Place the selector lever in P (PARK) to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 70° F fluid temperature.

NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

(1) Start engine and apply parking brake.
(2) Shift the transmission into DRIVE for approximately 2 seconds.
(3) Shift the transmission into REVERSE for approximately 2 seconds.
(4) Shift the transmission into PARK.
(5) Hook up DRB® scan tool and select transmission.
(6) Select sensors.
(7) Read the transmission temperature value.
(8) Compare the fluid temperature value with the chart. (Fig. 59)
(9) Adjust transmission fluid level shown on the dipstick according to the chart.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

(10) Check transmission for leaks.

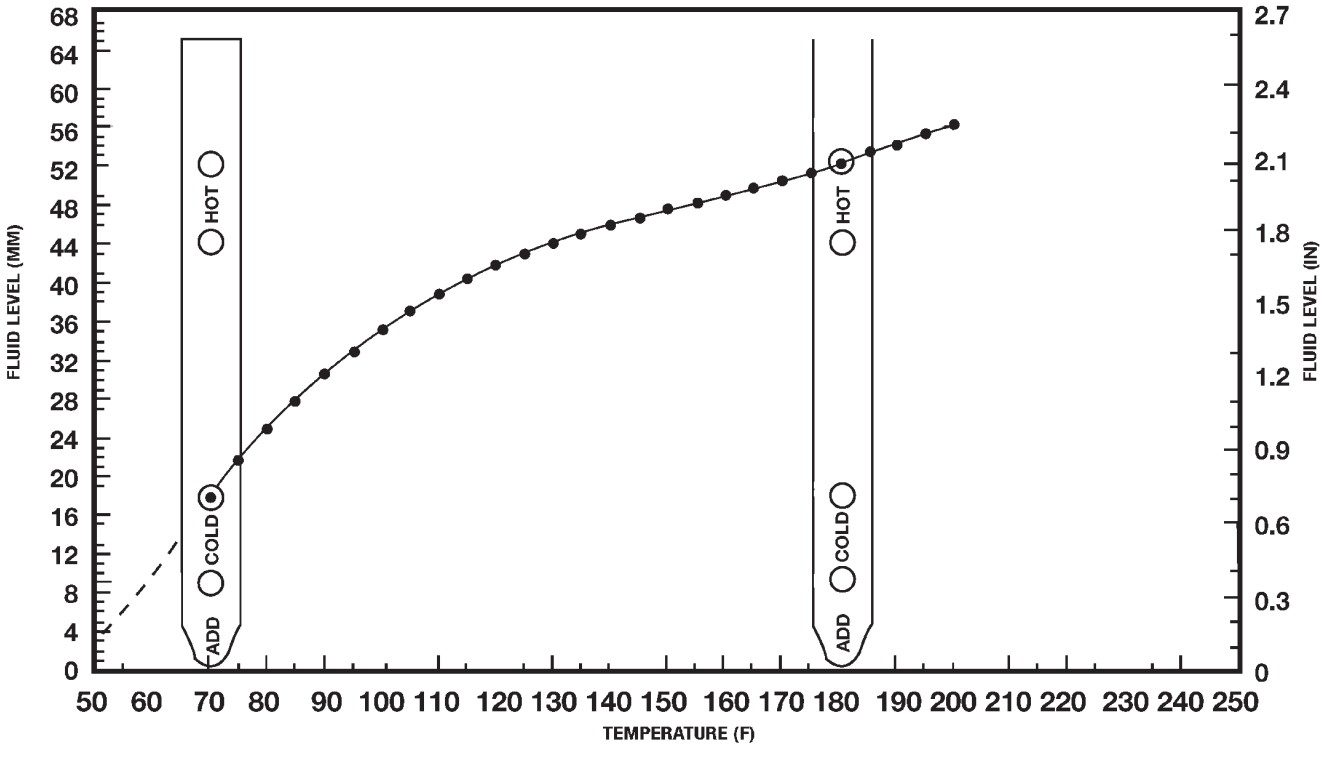


Fig. 59 Transmission Fluid Temperature Chart

FLUID AND FILTER (Continued)

STANDARD PROCEDURE - FLUID AND FILTER REPLACEMENT

For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

REMOVAL

(1) Hoist and support vehicle on safety stands.
(2) Place a large diameter shallow drain pan beneath the transmission pan.
(3) Remove bolts holding front and sides of pan to transmission.
(4) Loosen bolts holding rear of pan to transmission.
(5) Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.
(6) Hold up pan and remove remaining bolts holding pan to transmission.
(7) While holding pan level, lower pan away from transmission.
(8) Pour remaining fluid in pan into drain pan.
(9) Remove screw holding filter to valve body (Fig. 60).
(10) Separate filter from valve body and oil pump and pour fluid in filter into drain pan.
(11) Remove and discard the oil filter seal from the bottom of the oil pump.
(12) If replacing the cooler return filter, use Oil Filter Wrench 8321 to remove the filter from the transmission.
(13) Dispose of used trans fluid and filter(s) properly.

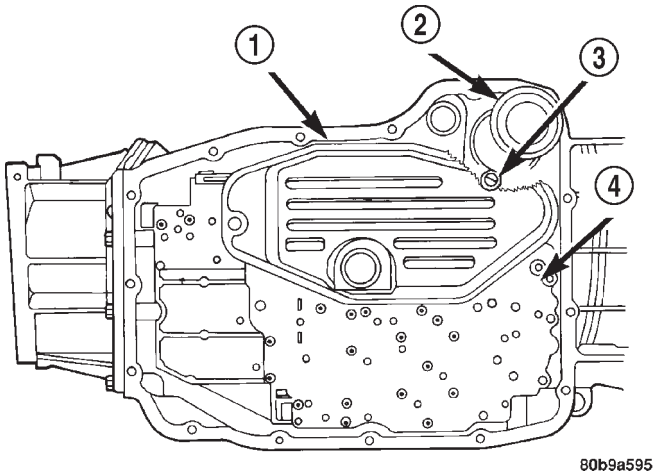


Fig. 60 Transmission Filters - 4X4 Shown

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal. A light coating of clutch material on the bottom of the pan does not indicate a problem unless accompanied by a slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts of debris, refer to the diagnosis section of this group.

CLEANING

(1) Using a suitable solvent, clean pan and magnet.
(2) Using a suitable gasket scraper, clean original sealing material from surface of transmission case and the transmission pan.

INSTALLATION

(1) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(2) Place replacement filter in position on valve body and into the oil pump.
(3) Install screw to hold filter to valve body (Fig. 60). Tighten screw to 4.5 N·m (40 in. lbs.) torque.
(4) Install new cooler return filter onto the transmission, if necessary. Torque the filter to 14.12 N·m (125 in.lbs.).
(5) Place bead of Mopar® RTV sealant onto the transmission case sealing surface.
(6) Place pan in position on transmission.
(7) Install bolts to hold pan to transmission. Tighten bolts to 11.8 N·m (105 in. lbs.) torque.
(8) Lower vehicle and fill transmission with Mopar® ATF +4, type 9602 fluid.

STANDARD PROCEDURE - TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:
(1) Remove dipstick and insert clean funnel in transmission fill tube.
(2) Add following initial quantity of Mopar® ATF +4 to transmission:
(a) If only fluid and filter were changed, add **10 pints (5 quarts)** of ATF +4 to transmission.
(b) If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **24 pints (12 quarts)** of ATF +4 to transmission.
(3) Check the transmission fluid (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/FLUID - STANDARD PROCEDURE) and adjust as required.

GEARSHIFT CABLE

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

(1) The floor shifter lever and gate positions should be in alignment with all transmission PARK, NEUTRAL, and gear detent positions.

(2) Engine starts must be possible with floor shift lever in PARK or NEUTRAL gate positions only. Engine starts must not be possible in any other gear position.

(3) With floor shift lever handle push-button not depressed and lever in:

(a) PARK position - Apply forward force on center of handle and remove pressure. Engine starts must be possible.

(b) PARK position - Apply rearward force on center of handle and remove pressure. Engine starts must be possible.

(c) NEUTRAL position - Normal position. Engine starts must be possible.

(d) NEUTRAL position - Engine running and brakes applied, apply forward force on center of shift handle. Transmission shall not be able to shift from NEUTRAL to REVERSE.

REMOVAL

(1) Shift transmission into PARK.

(2) Raise vehicle.

(3) Remove the shift cable eyelet from the transmission manual shift lever (Fig. 61).

(4) Remove shift cable from the cable support bracket.

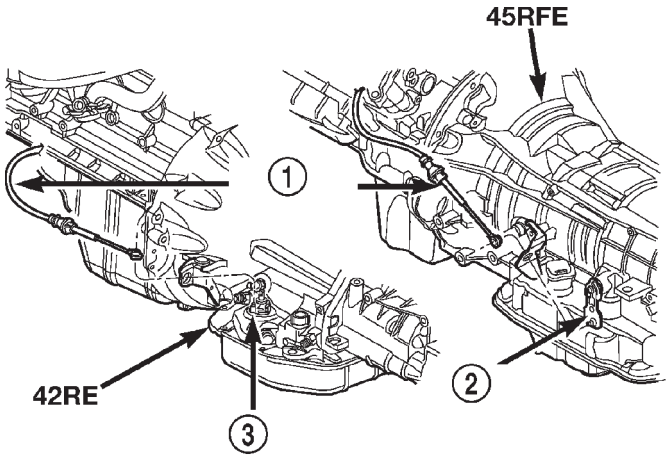


Fig. 61 Remove Shift Cable From Transmission

1 - SHIFT CABLE
2 - MANUAL LEVER
3 - MANUAL LEVER

(5) Lower vehicle.

(6) Remove necessary console parts for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 62).

(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 63).

(9) Pull cable through floor panel opening.

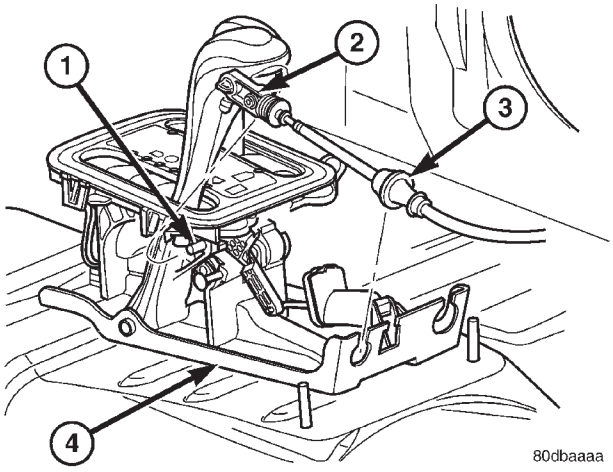


Fig. 62 Transmission Shift Cable at Shifter

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

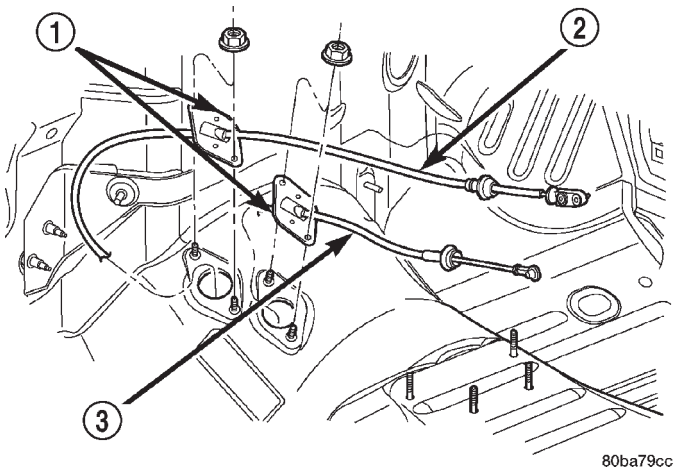


Fig. 63 Shift Cables at Floor Pan

1 - SEAL PLATES
2 - TRANSMISSION SHIFT CABLE
3 - TRANSFER CASE SHIFT CABLE

(10) Remove shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.

(2) Install seal plate to studs in floor pan.

GEARSHIFT CABLE (Continued)

(3) Install nuts to hold seal plate to floor pan. Tighten nuts to 7 N·m (65 in.lbs.).

(4) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.

(5) Place the floor shifter lever in PARK position.

(6) Loosen the adjustment screw on the shift cable.

(7) Snap the shift cable onto the shift lever pin.

(8) Raise the vehicle.

(9) Install the shift cable to the shift cable support bracket.

(10) Shift the transmission into PARK. PARK is the rearmost detent position on the transmission manual shift lever.

(11) Snap the shift cable onto the transmission manual shift lever.

(12) Lower vehicle.

(13) Verify that the shift lever is in the PARK position.

(14) Tighten the adjustment screw to 7 N·m (65 in.lbs.).

(15) Verify correct shifter operation.

(16) Install any console parts removed for access to shift lever assembly and shift cable. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the park/neutral position switch or TRS may be faulty.

(1) Shift transmission into PARK.

(2) Remove floor console as necessary for access to the shift cable adjustment. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(3) Loosen the shift cable adjustment screw (Fig. 64).

(4) Raise vehicle.

(5) Unsnap cable eyelet from transmission shift lever (Fig. 65).

(6) Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.

(7) Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.

(8) Snap cable eyelet onto transmission shift lever.

(9) Lower vehicle

(10) Tighten the shift cable adjustment screw to 7 N·m (65 in.lbs.).

(11) Verify correct operation.

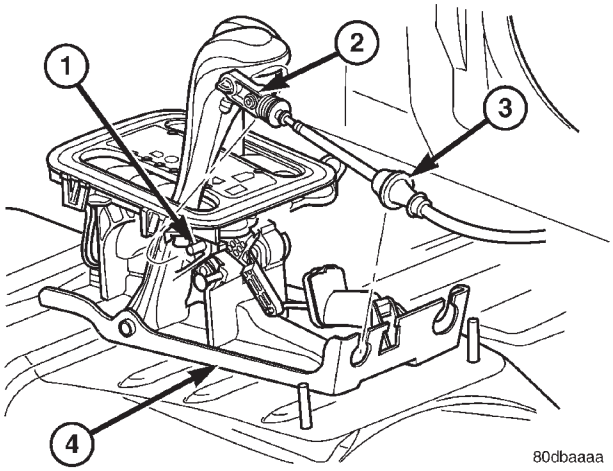


Fig. 64 Shift Cable at the Shifter

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

(12) Install any floor console components removed for access. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

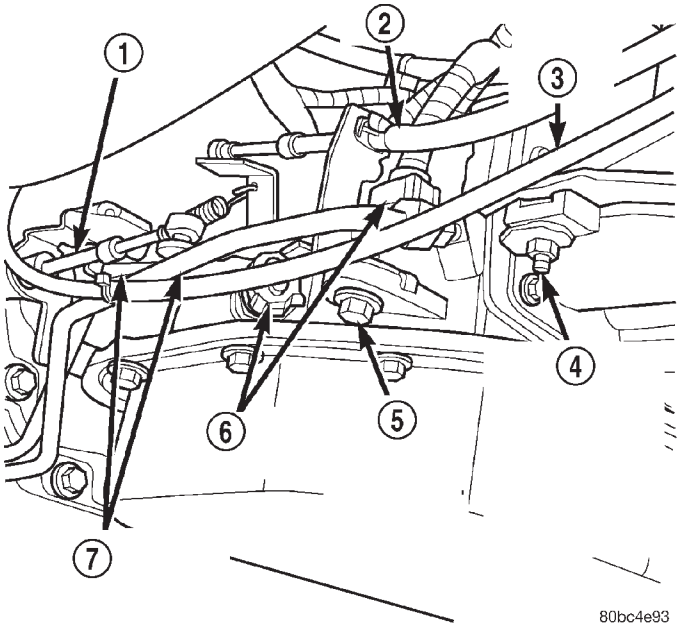


Fig. 65 Shift Cable at Transmission

1 - TRANSMISSION SHIFTER CABLE
2 - THROTTLE VALVE CABLE
3 - TRANSFER CASE SHIFTER CABLE
4 - TRANSFER CASE SHIFTER CABLE BRACKET RETAINING BOLT(S)
5 - THROTTLE VALVE CABLE BRACKET RETAINING BOLT
6 - ELECTRICAL CONNECTORS
7 - TRANSMISSION FLUID LINES

HOLDING CLUTCHES

DESCRIPTION

Three hydraulically applied multi-disc clutches are used to hold some planetary geartrain components stationary while the input clutches drive others. The 2C, 4C, and Low/Reverse clutches are considered holding clutches. The 2C and 4C clutches are located in the 4C retainer/bulkhead (Fig. 66), while the Low/Reverse clutch is located at the rear of the transmission case (Fig. 67).

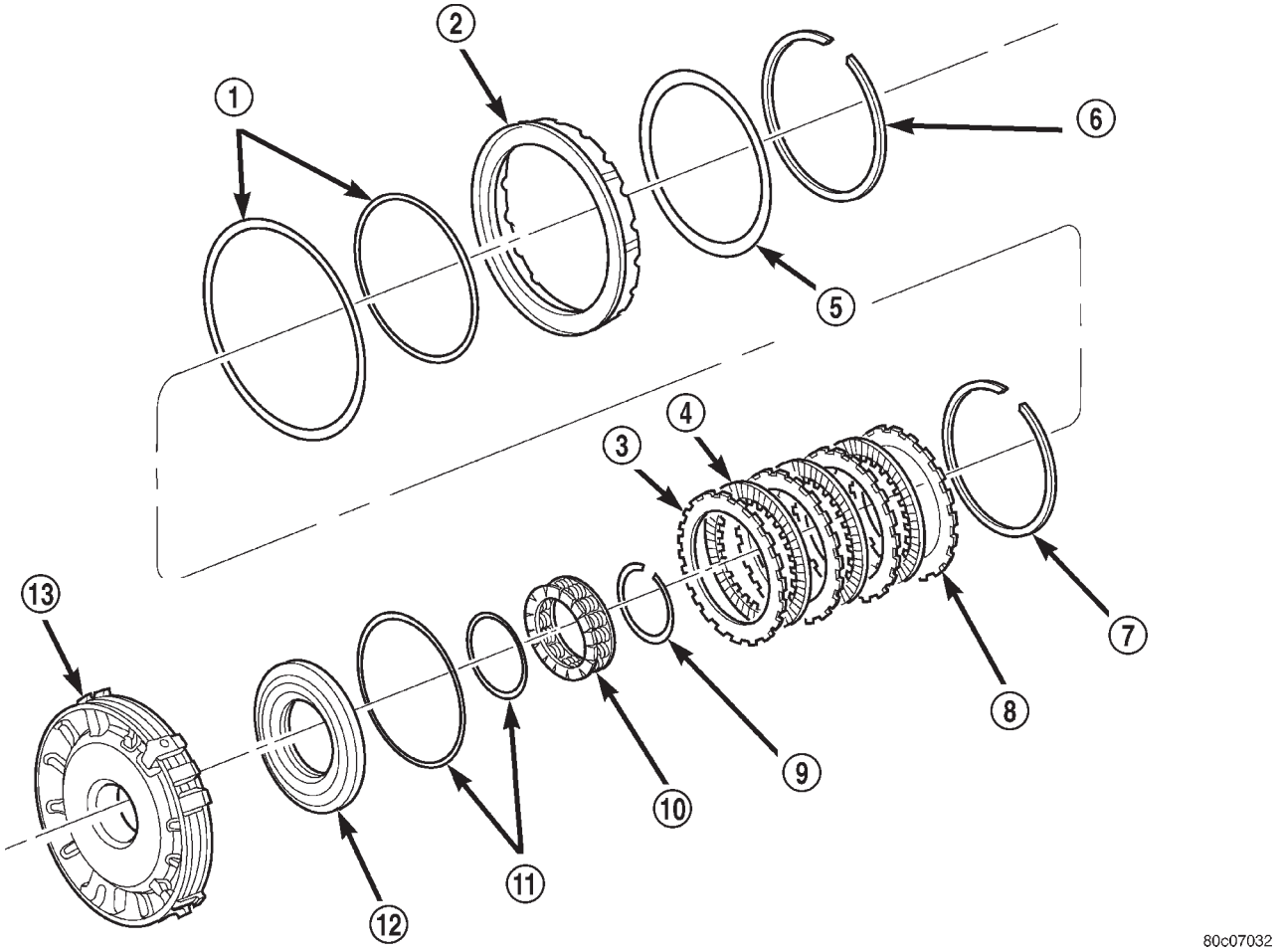


Fig. 66 2C and 4C Clutches

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

HOLDING CLUTCHES (Continued)

OPERATION

2C CLUTCH

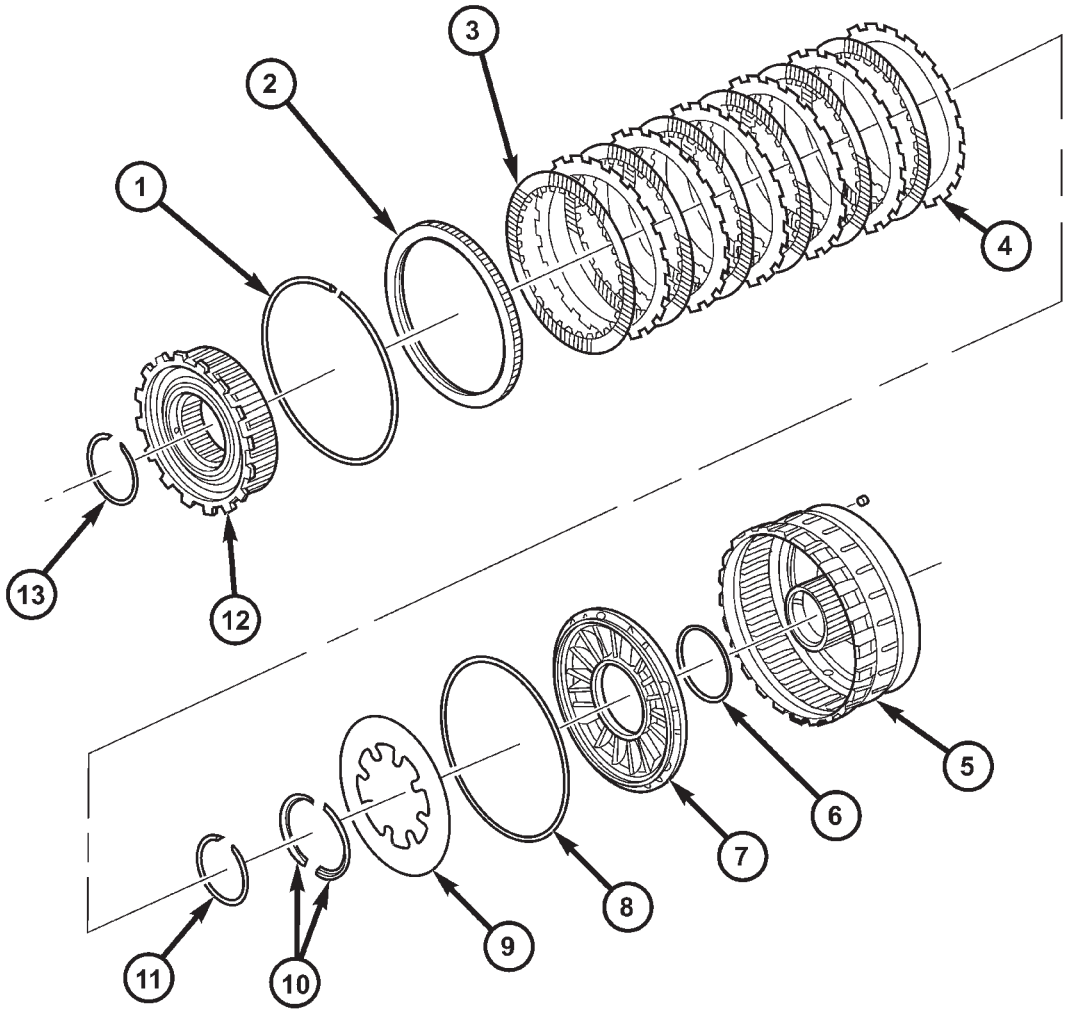
The 2C clutch is hydraulically applied in second and fifth gear by pressurized fluid against the 2C piston. When the 2C clutch is applied, the reverse sun gear assembly is held or grounded to the transmission case by holding the reaction planetary carrier.

4C CLUTCH

The 4C clutch is hydraulically applied in second prime and fourth gear by pressurized fluid against the 4C clutch piston. When the 4C clutch is applied, the reaction annulus gear is held or grounded to the transmission case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gear, only at low speeds, by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the input annulus assembly is held or grounded to the transmission case.



808a2e78

Fig. 67 Low/Reverse Clutch

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

INPUT CLUTCH ASSEMBLY

DESCRIPTION

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly (Fig. 68) and (Fig. 69). The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, second prime, and third (direct) gears by pressurized fluid against the underdrive piston.

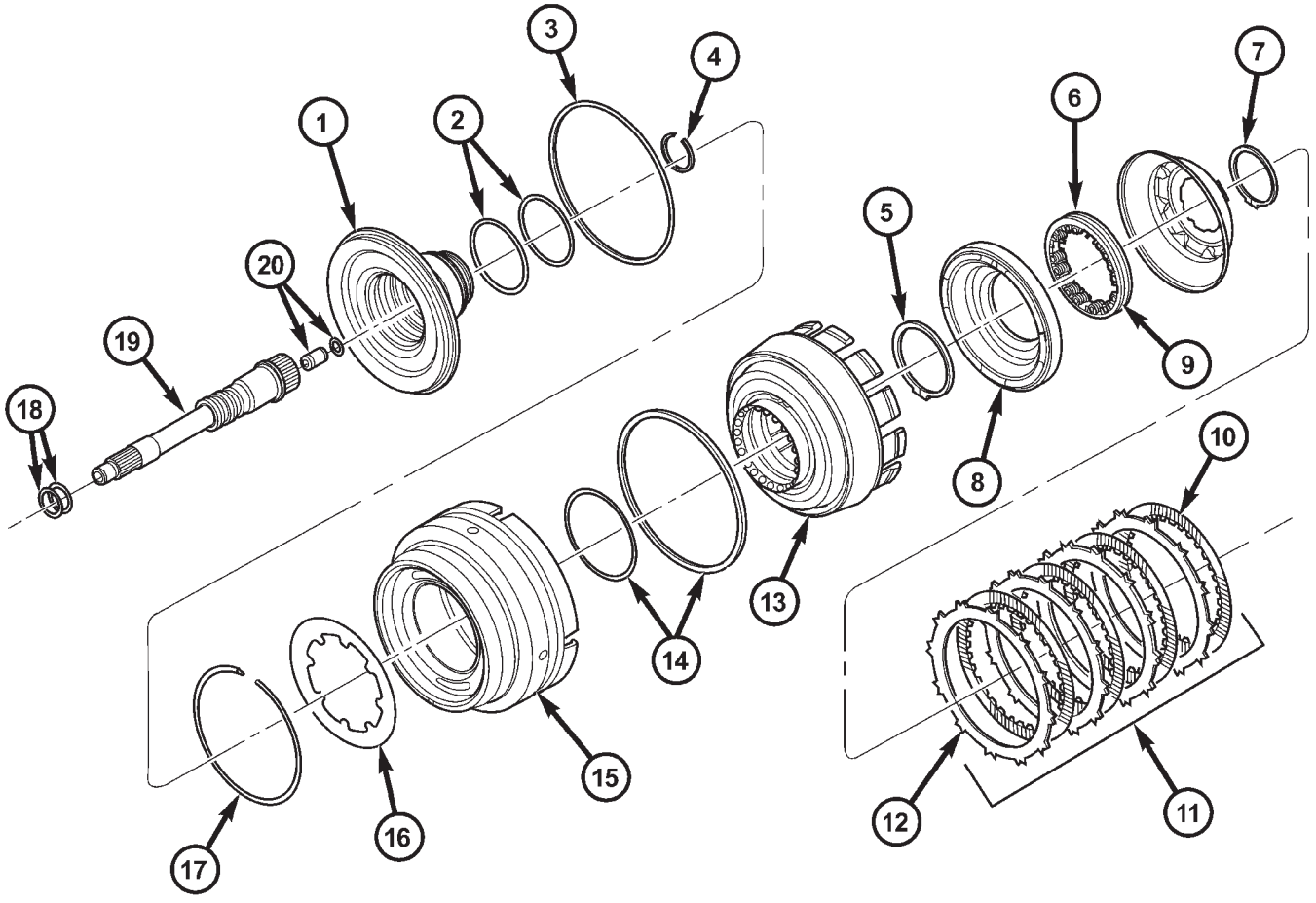


Fig. 68 Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

When the underdrive clutch is applied, the underdrive hub drives the input sun gear.

OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct), fourth, and fifth gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the reverse carrier/input annulus assembly.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the reaction annulus gear is driven.

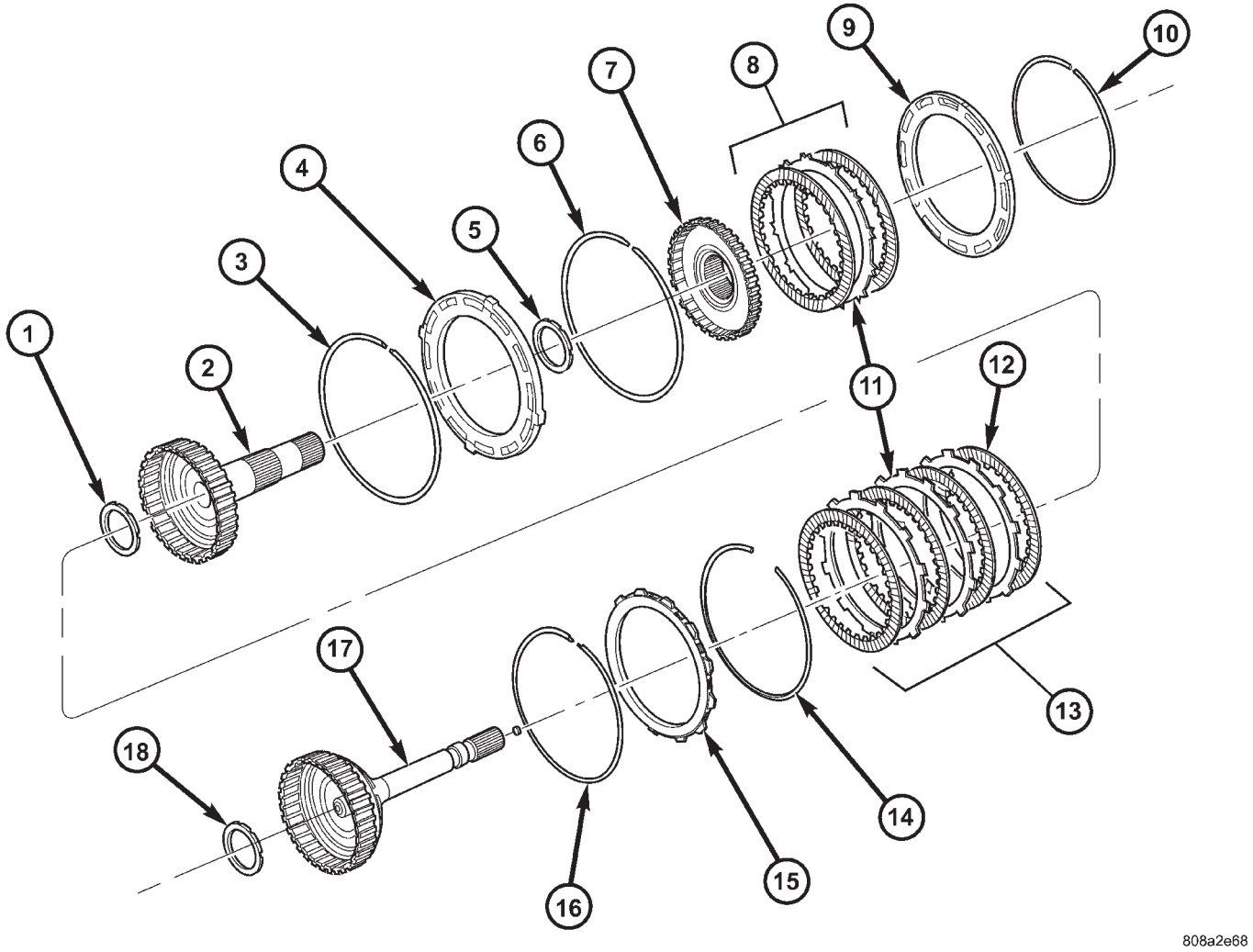


Fig. 69 Input Clutch Assembly - Part 2

1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

DISASSEMBLY

(1) Remove the reverse reaction plate selective snap-ring from the input clutch retainer (Fig. 70).

(2) Remove the reverse reaction plate from the input clutch retainer.

(3) Remove the reverse hub and reverse clutch pack from the input clutch retainer.

(4) Remove the number 4 bearing from the overdrive hub.

(5) Remove the overdrive hub from the input clutch retainer (Fig. 70).

(6) Remove the number 3 bearing from the underdrive hub.

(7) Remove the OD/reverse reaction plate snap-ring from the input clutch retainer.

(8) Remove the underdrive hub, overdrive clutch, and overdrive reaction plate from the input clutch retainer (Fig. 70).

NOTE: The overdrive friction discs and steel discs are thicker than the matching components in the underdrive and reverse clutches.

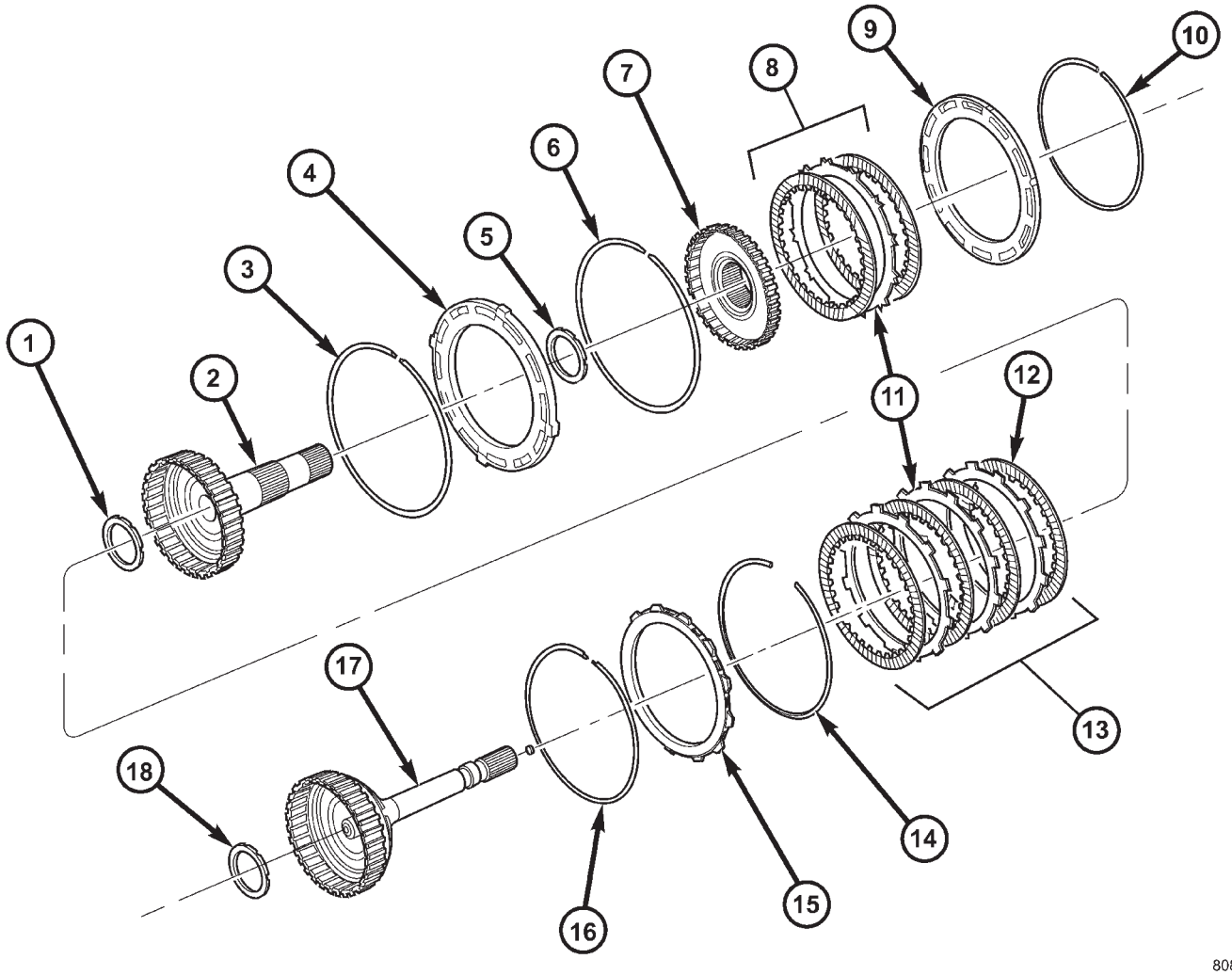


Fig. 70 Input Clutch Assembly - Part 2

1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

(9) Remove the number 2 bearing from the input clutch hub.

(10) Remove the overdrive clutch wave snap-ring from the input clutch retainer.

(11) Remove the UD/OD reaction plate tapered snap-ring from the input clutch retainer.

(12) Remove the UD/OD reaction plate from the input clutch retainer.

(13) Remove the UD/OD reaction plate flat snap-ring from the input clutch retainer (Fig. 70).

(14) Remove the underdrive clutch pack from the input clutch retainer (Fig. 72).

(15) Using Spring Compressor 8251, compress the UD/OD balance piston and remove the snap-ring from the input clutch hub (Fig. 71).

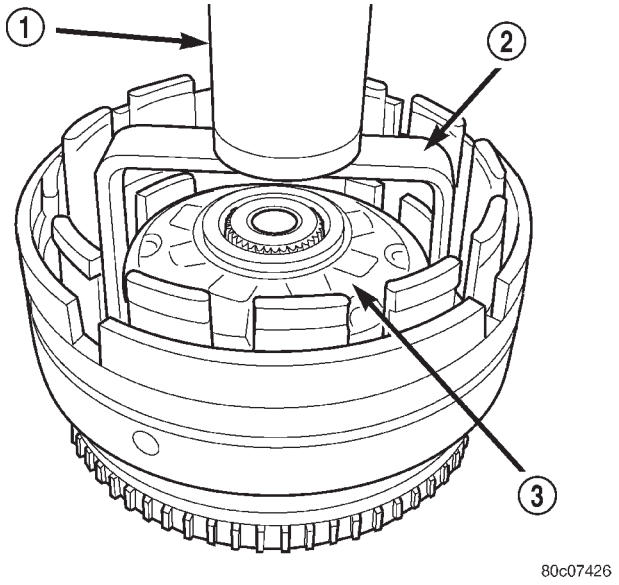


Fig. 71 Compressing UD/OD Balance Piston Using Tool 8251

1 - PRESS
2 - TOOL 8251
3 - BALANCE PISTON

(16) Remove the UD/OD balance piston and piston return spring from the input clutch retainer (Fig. 72).

(17) Remove the underdrive piston from the input clutch retainer (Fig. 72).

NOTE: Both the UD/OD balance piston and the underdrive piston have seals molded onto them. If the seal is damaged, do not attempt to install a new seal onto the piston. The piston/seal must be replaced as an assembly.

(18) Remove the input clutch retainer tapered snap-ring.

(19) Separate input clutch retainer from input clutch hub.

(20) Separate OD/reverse piston from input clutch hub retainer (Fig. 72).

(21) Remove all seals and o-rings from the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to make note of which o-ring belongs in which location.

ASSEMBLY

(1) Install all new seals and o-rings onto the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to install the correct o-ring in the correct location.

(2) Check the transmission lubrication check valve located in the input shaft using shop air. The valve should only allow air flow in one direction. If the valve allows no air flow, or air flow in both directions, the valve will need to be replaced.

(3) Lubricate all seals with Mopar® ATF +4, type 9602, prior to installation.

(4) Assemble the OD/reverse piston onto the input clutch hub (Fig. 73).

(5) Assemble the input clutch retainer onto the input clutch hub.

(6) Install the input clutch retainer tapered snap-ring with tapered side up onto the input clutch hub.

INPUT CLUTCH ASSEMBLY (Continued)

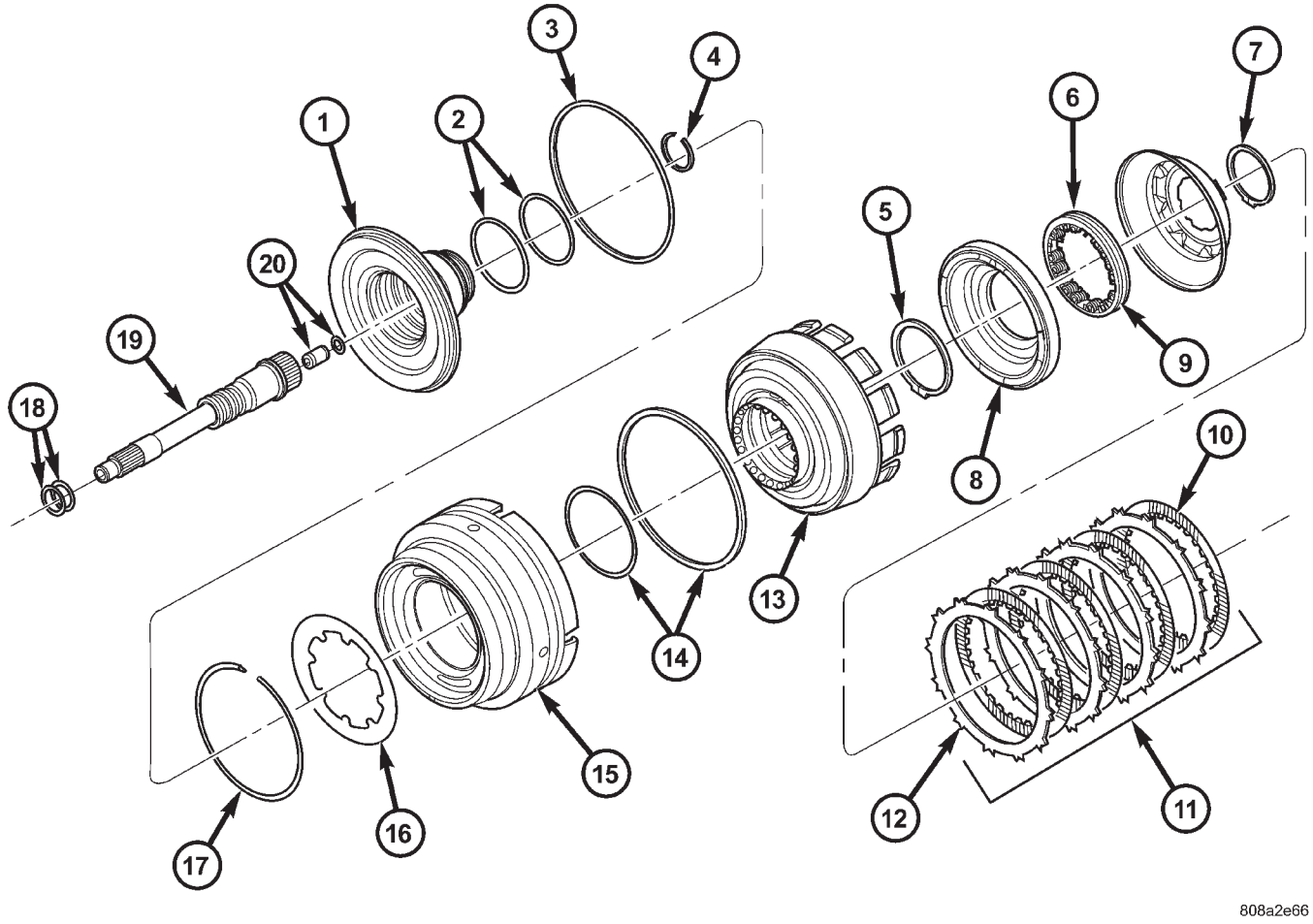


Fig. 72 Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

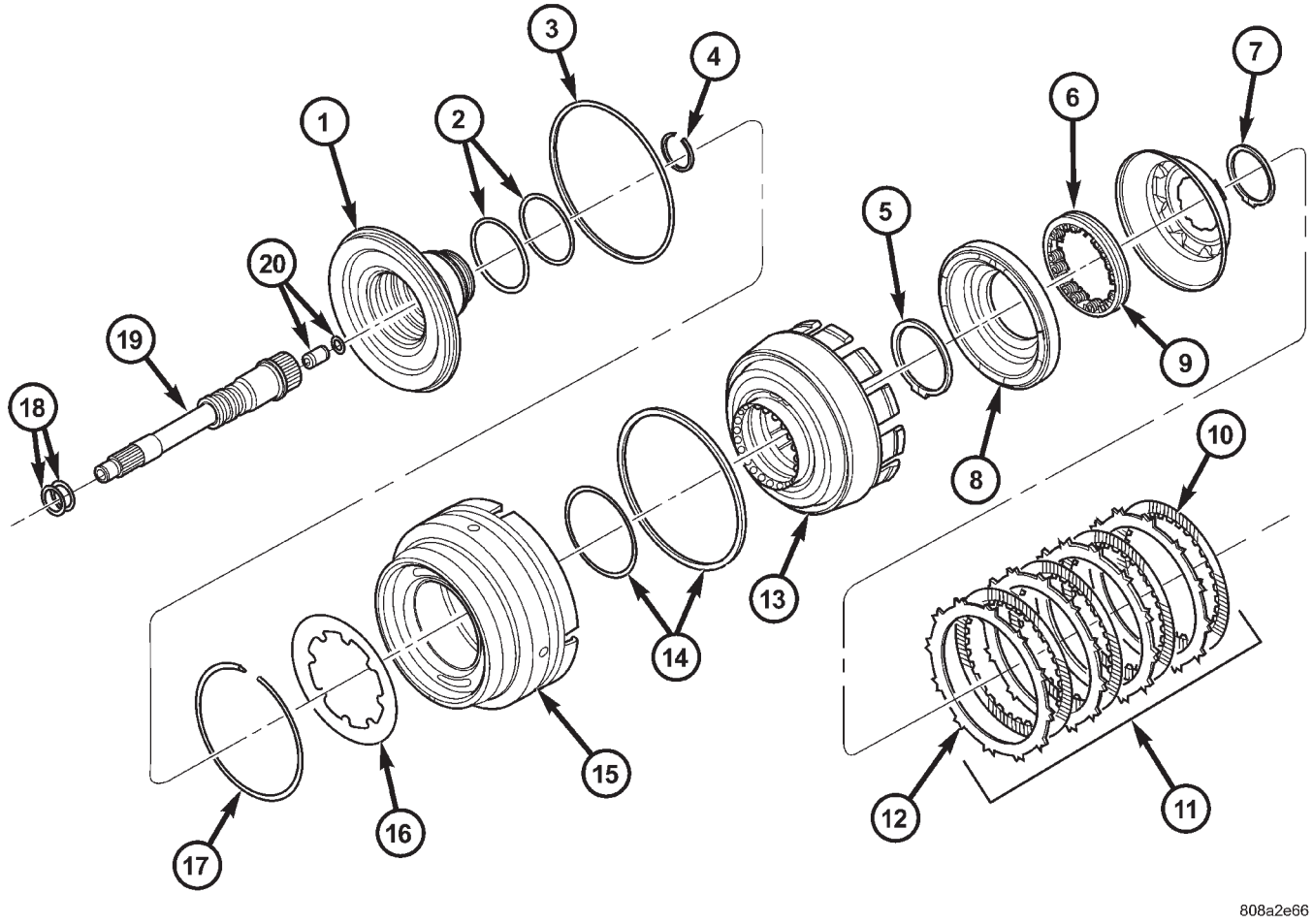


Fig. 73 Input Clutch Assembly - Part I

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

INPUT CLUTCH ASSEMBLY (Continued)

(7) Install Piston Guides 8504 into the input clutch retainer (Fig. 74) and onto the input clutch hub to guide the inner and outer underdrive piston seals into position.

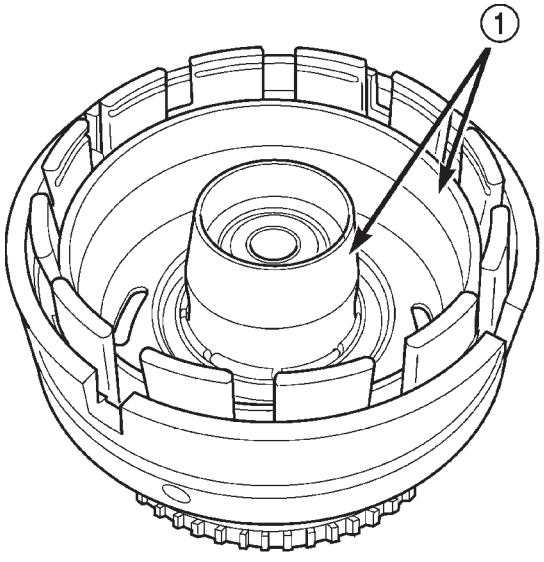


Fig. 74 Install Underdrive Piston Using Tool 8504

1 - TOOL 8504

(8) Install the underdrive piston into the input clutch retainer and over the input clutch hub (Fig. 73).

(9) Install the UD/OD balance piston return spring pack into the input clutch retainer.

(10) Install Piston Guide 8252 into the input clutch retainer (Fig. 75) to guide the UD/OD balance piston seal into position inside the underdrive piston.

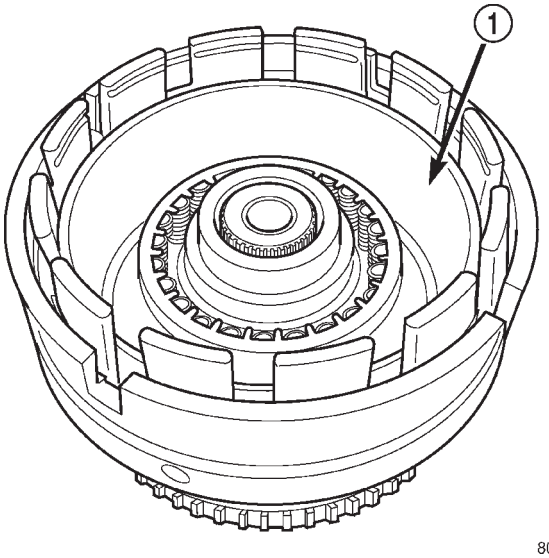


Fig. 75 Install Balance Piston Using Tool 8252

1 - TOOL 8252

(11) Install the UD/OD balance piston into the input clutch retainer and the underdrive piston.

(12) Using Spring Compressor 8251, compress the UD/OD return spring pack and secure the piston in place with the snap-ring (Fig. 76).

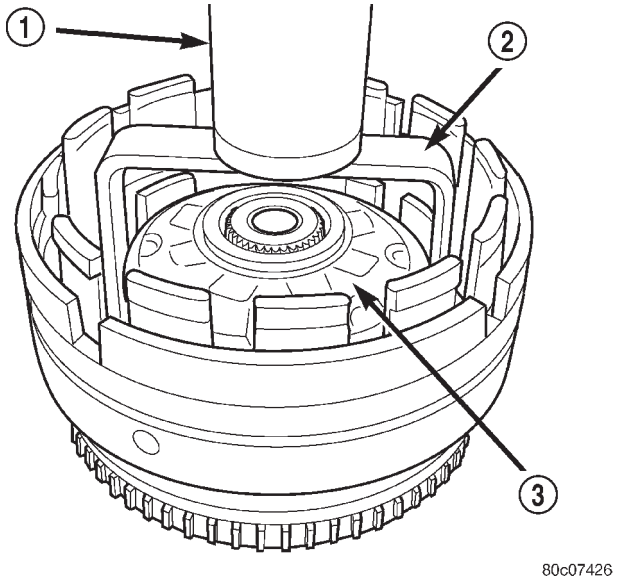


Fig. 76 Compressing UD/OD Balance Piston Using Tool 8251

1 - PRESS
2 - TOOL 8251
3 - BALANCE PISTON

INPUT CLUTCH ASSEMBLY (Continued)

(13) Install the underdrive clutch pack into the input clutch retainer (Fig. 73).

(14) Install the UD/OD reaction plate lower flat snap-ring (Fig. 77). The correct snap-ring can be identified by the two tabbed ears.

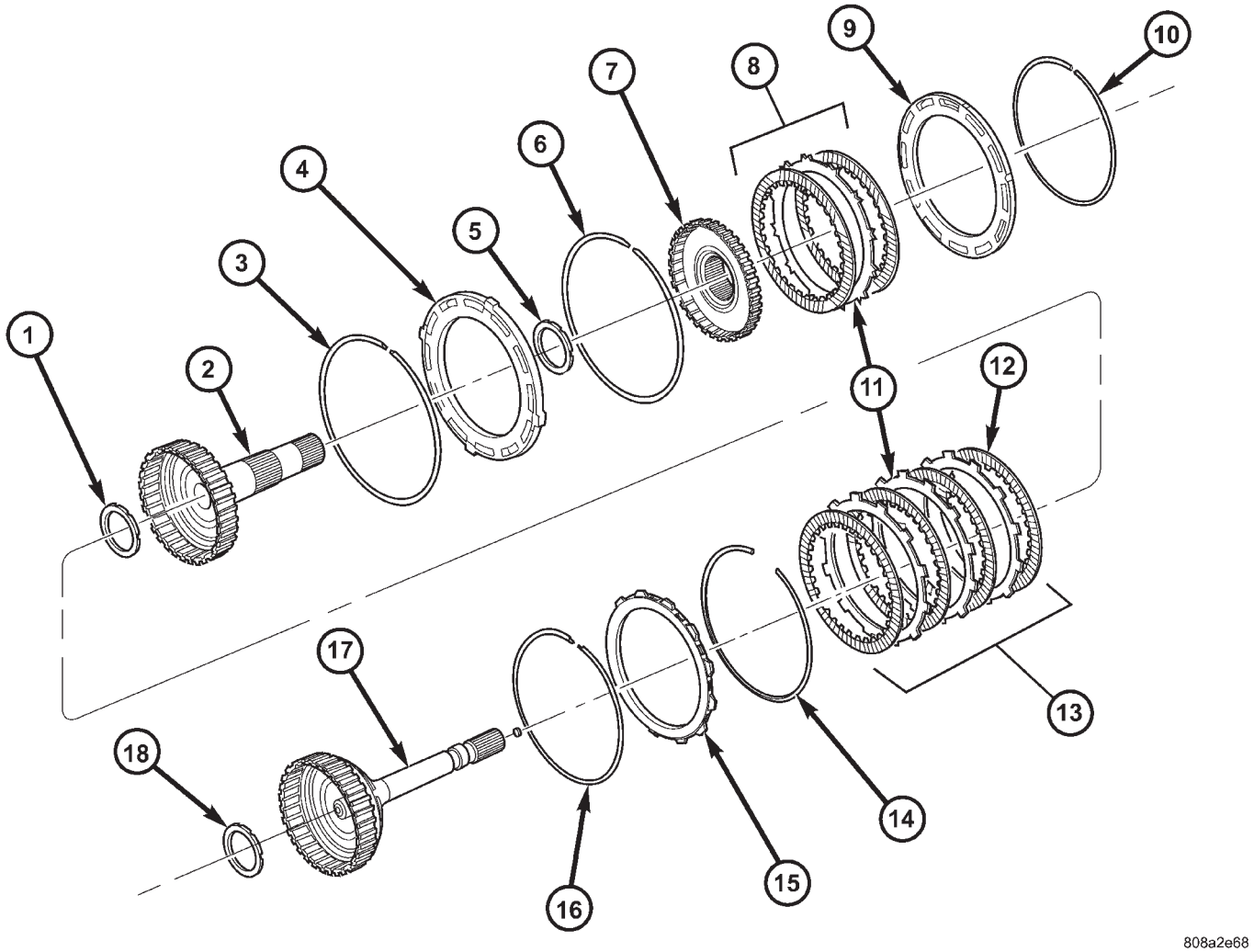


Fig. 77 Input Clutch Assembly - Part II

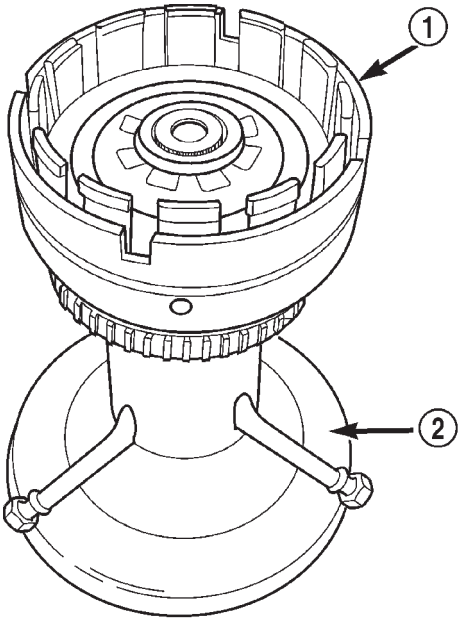
1 - BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - BEARING NUMBER 2

INPUT CLUTCH ASSEMBLY (Continued)

(15) Install the UD/OD reaction plate into the input clutch retainer. The reaction plate is to be installed with the big step down.

(16) Install the UD/OD reaction plate upper tapered snap-ring with tapered side up.

(17) Install the input clutch assembly into Input Clutch Pressure Fixture 8260 (Fig. 78). Mount a dial indicator to the assembly, push down on the clutch discs and zero the indicator against the underdrive clutch discs (Fig. 79). Apply 20 psi of air pressure to the underdrive clutch and record the dial indicator reading. Measure and record UD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with UD clutch pack clearance specification. The correct clutch clearance is 0.84-1.54 mm (0.033-0.061 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



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Fig. 78 Input Clutch Assembly Mounted on Tool 8260

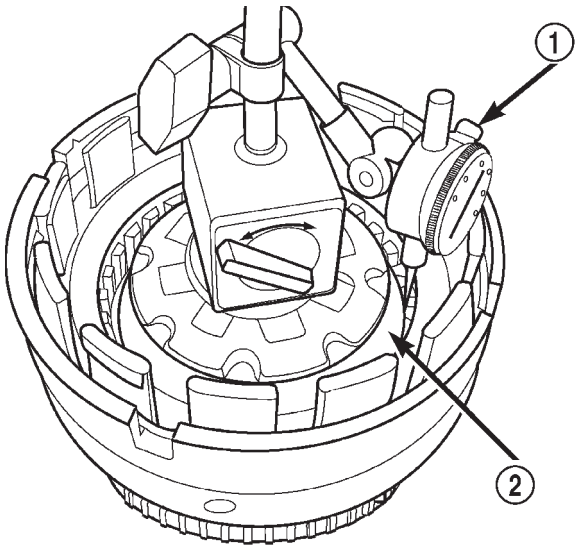
1 - INPUT CLUTCH ASSEMBLY
2 - TOOL 8260

(18) Install the overdrive clutch pack into the input clutch retainer (Fig. 77). The overdrive steel separator plates can be identified by the lack of the half-moon cuts in the locating tabs.

(19) Install the overdrive clutch wavy snap-ring with the two tabbed ears into the input clutch retainer.

(20) Install the OD/reverse reaction plate into the input clutch retainer. The reaction plate is non-directional (Fig. 77).

(21) Install the OD/reverse reaction plate flat snap-ring into the input clutch retainer.

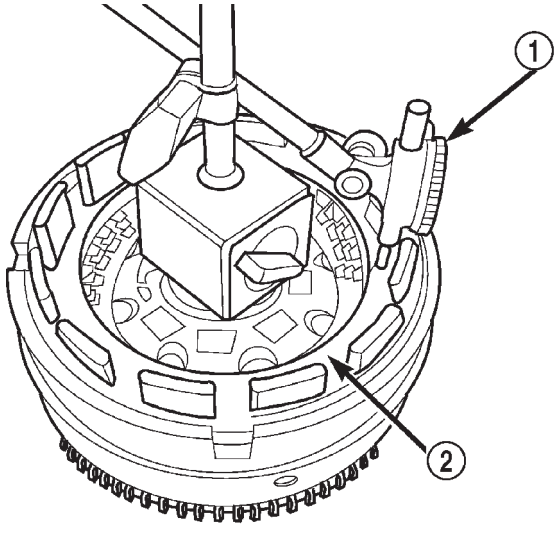


80c07440

Fig. 79 Measuring UD Clutch Clearance

1 - TOOL C-3339
2 - UNDERDRIVE CLUTCH PACK

(22) Mount a dial indicator to the assembly and zero the indicator against the OD/reverse reaction plate (Fig. 80). Apply 20 psi of air pressure to the overdrive clutch and record the dial indicator reading. Measure and record OD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with OD clutch pack clearance specification.Verify that the clutch clearance is 1.103-1.856 mm (0.043-0.073 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



80c07447

Fig. 80 Measuring OD Clutch Clearance

1 - TOOL C-3339
2 - OD/REV REACTION PLATE

INPUT CLUTCH ASSEMBLY (Continued)

(23) Install the reverse clutch pack into the input clutch retainer (Fig. 77).

(24) Install the reverse reaction plate into the input clutch retainer.

(25) Install the reverse reaction plate selective snap-ring into the input clutch retainer.

(26) Mount a dial indicator to the assembly, push down on the clutch discs, pull up on the reaction plate to ensure the plate is properly seated and zero the indicator against the reverse clutch discs (Fig. 81). Apply 20 psi of air pressure to the reverse clutch and record the dial indicator reading. Measure and record Reverse clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with Reverse clutch pack clearance specification. The correct clutch clearance is 0.58-1.47 mm (0.023-0.058 in.). Adjust as necessary. Install the chosen snap-ring and re-measure to verify selection.

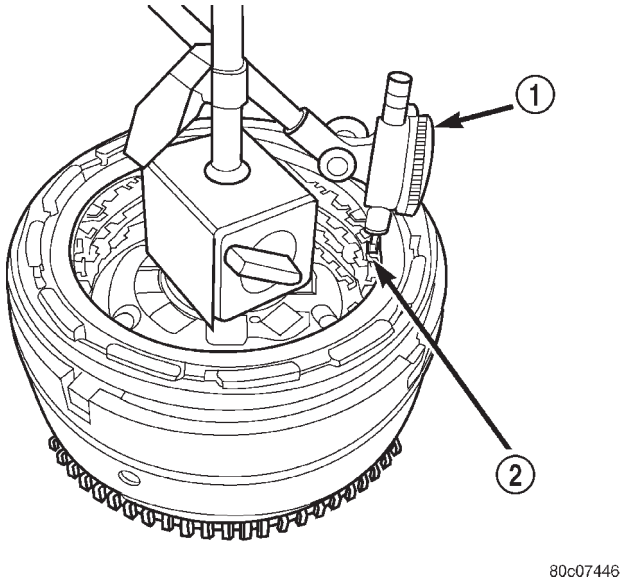


Fig. 81 Measuring Reverse Clutch Clearance

1 - TOOL C-3339
2 - REVERSE CLUTCH PACK

(27) Remove the reverse clutch pack from the input clutch retainer.

(28) Install the number 2 bearing onto the underdrive hub with outer race against the hub with petroleum jelly.

(29) Install the underdrive hub into the input clutch retainer.

(30) Install the number 3 bearing into the overdrive hub with the outer race against the hub with petroleum jelly.

(31) Install the overdrive hub into the input clutch retainer.

(32) Install the number 4 bearing into the reverse hub with outer race against the hub with petroleum jelly.

(33) Install the reverse hub into the input clutch retainer.

(34) Install the complete reverse clutch pack.

(35) Install the reverse reaction plate and snap-ring.

(36) Push up on reaction plate to allow reverse clutch to move freely.

INPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the input speed sensor (Fig. 82).

(4) Remove the bolt holding the input speed sensor to the transmission case.

(5) Remove the input speed sensor from the transmission case.

INSTALLATION

(1) Install the input speed sensor into the transmission case.

(2) Install the bolt to hold the input speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

INPUT SPEED SENSOR (Continued)

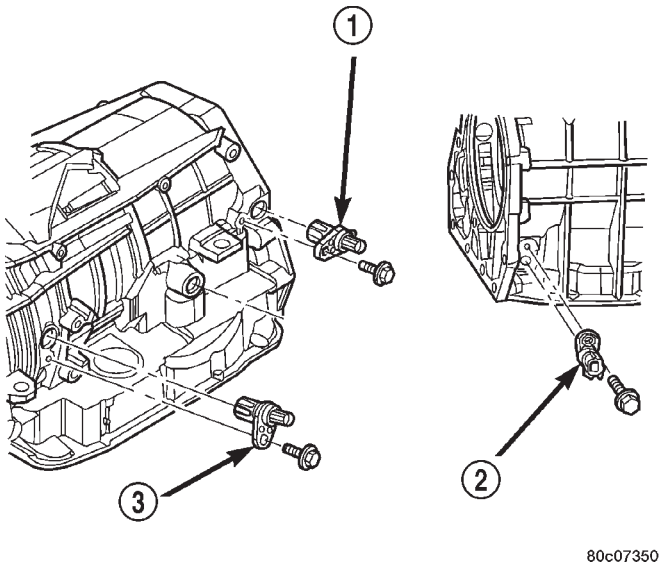


Fig. 82 Input Speed Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

(3) Install the wiring connector onto the input speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

LINE PRESSURE (LP) SENSOR

DESCRIPTION

The TCM utilizes a closed-loop system to control transmission line pressure. The system contains a variable force style solenoid, the Pressure Control Solenoid, mounted on the side of the solenoid and pressure switch assembly. The solenoid is duty cycle controlled by the TCM to vent the unnecessary line pressure supplied by the oil pump back to the sump. The system also contains a variable pressure style sensor, the Line Pressure Sensor, which is a direct input to the TCM. The line pressure solenoid monitors the transmission line pressure and completes the feedback loop to the TCM. The TCM uses this information to adjust its control of the pressure control solenoid to achieve the desired line pressure.

OPERATION

The TCM calculates the desired line pressure based upon inputs from the transmission and engine. The TCM calculates the torque input to the transmission and uses that information as the primary input to the calculation. The line pressure is set to a predetermined value during shifts and when the transmission is in the PARK and NEUTRAL positions. This is done to ensure consistent shift quality. During all other operation, the actual line pressure is compared to the desired line pressure and adjustments are made to the pressure control solenoid duty cycle.

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the line pressure sensor (Fig. 83).

(4) Remove the bolt holding the line pressure sensor to the transmission case.

(5) Remove the line pressure sensor from the transmission case.

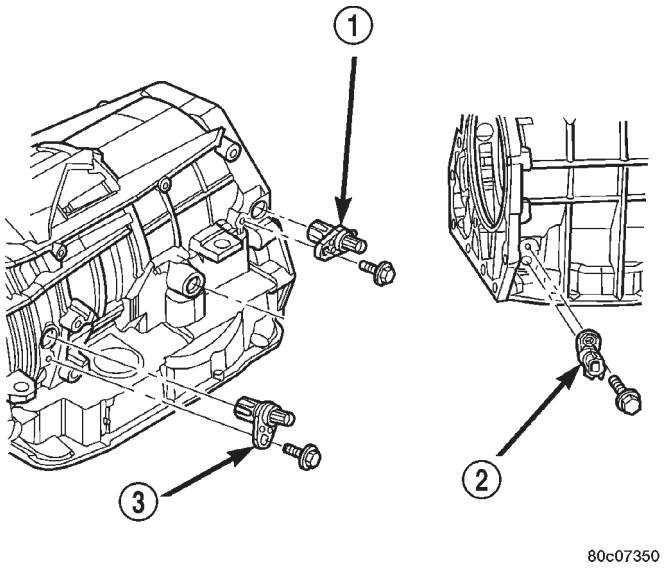


Fig. 83 Line Pressure Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

INSTALLATION

(1) Install the line pressure sensor into the transmission case.

(2) Install the bolt to hold the line pressure sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

(3) Install the wiring connector onto the line pressure sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

LOW/REVERSE CLUTCH

DISASSEMBLY

(1) Remove the inner overrunning clutch snap-ring from the low/reverse clutch retainer (Fig. 84).

(2) Remove the outer low/reverse reaction plate flat snap-ring (Fig. 84).

(3) Remove the low/reverse clutch and the overrunning clutch from the low/reverse clutch retainer as an assembly (Fig. 84).

(4) Separate the low/reverse clutch from the overrunning clutch.

(5) Remove the overrunning clutch snap-ring (Fig. 85).

(6) Remove the spacer from the overrunning clutch (Fig. 85).

(7) Separate the inner and outer races of the overrunning clutch (Fig. 85).

(8) Remove the overrunning clutch lower snap-ring (Fig. 85).

(9) Using Spring Compressor 8285 and a suitable shop press (Fig. 86), compress the low/reverse piston Belleville spring and remove the split retaining ring

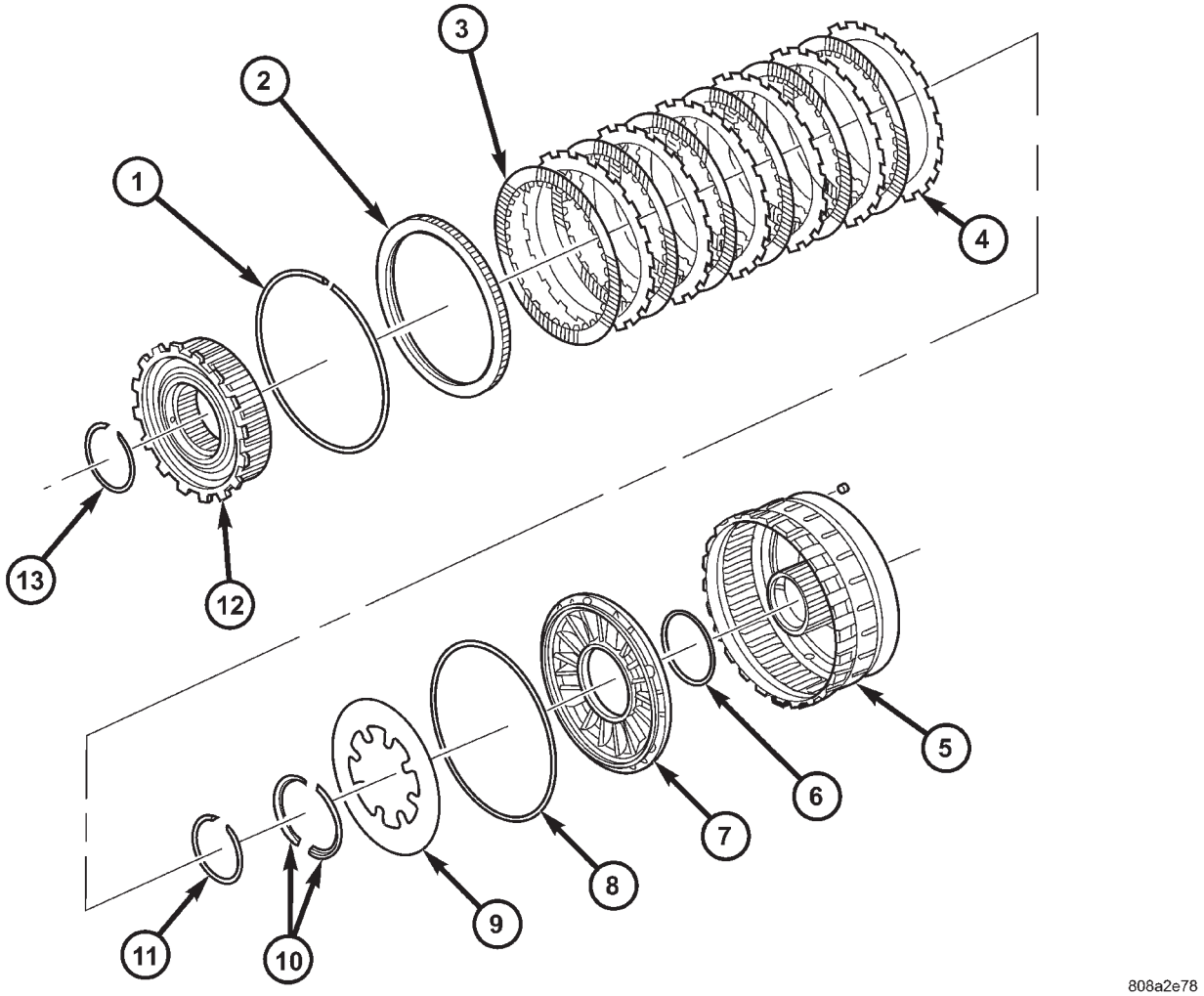


Fig. 84 Low/Reverse Clutch Assembly

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

LOW/REVERSE CLUTCH (Continued)

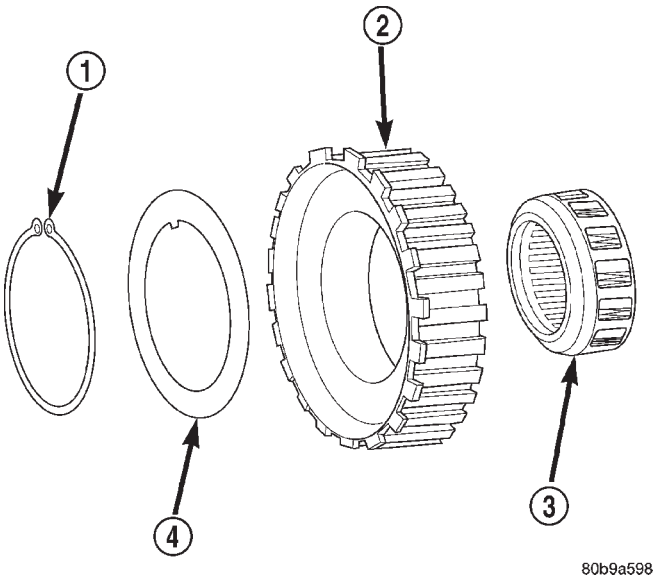


Fig. 85 Overrunning Clutch

1 - SNAP-RING
2 - OUTER RACE
3 - OVERRUNNING CLUTCH
4 - SPACER

holding the Belleville spring into the low/reverse clutch retainer.

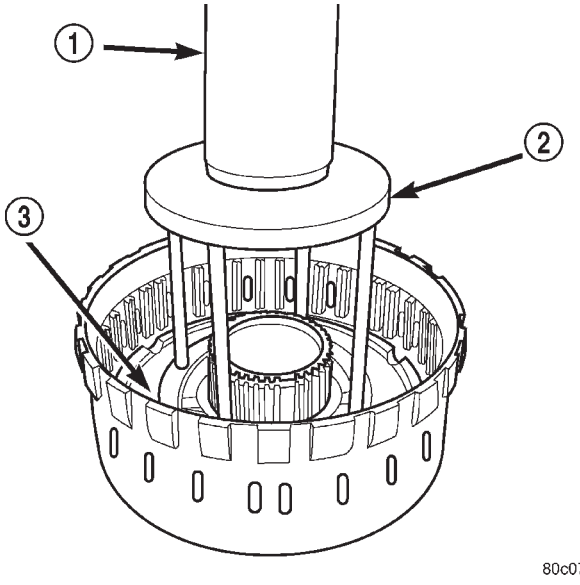


Fig. 86 Compress Low/Reverse Belleville Spring Using Tool 8285

1 - PRESS
2 - TOOL 8285
3 - BELLEVILLE SPRING

(10) Remove the low/reverse clutch Belleville spring and piston from the low/reverse clutch retainer. Use 20 psi of air pressure to remove the piston if necessary.

CLEANING

Clean the overrunning clutch assembly, clutch cam, and low-reverse clutch retainer. Dry them with compressed air after cleaning.

INSPECTION

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse clutch retainer if the clutch race, roller surface or inside diameter is scored, worn or damaged.

ASSEMBLY

(1) Check the bleed orifice to ensure that it is not plugged or restricted.

(2) Install a new seal on the low/reverse piston. Lubricate the seal with Mopar® ATF +4, type 9602, prior to installation.

(3) Install the low/reverse piston into the low/reverse clutch retainer.

(4) Position the low/reverse piston Belleville spring on the low/reverse piston.

(5) Using Spring Compressor 8285 and a suitable shop press (Fig. 86), compress the low/reverse piston Belleville spring and install the split retaining ring to hold the Belleville spring into the low/reverse clutch retainer.

(6) Install the lower overrunning clutch snap-ring (Fig. 85).

(7) Assemble the inner and outer races of the overrunning clutch (Fig. 85).

(8) Position the overrunning clutch spacer on the overrunning clutch.

(9) Install the upper overrunning clutch snap-ring (Fig. 85).

(10) Assemble and install the low/reverse clutch pack into the low/reverse clutch retainer (Fig. 84).

(11) Install the low/reverse reaction plate into the low/reverse clutch retainer (Fig. 84). The reaction plate is directional and must be installed with the flat side down.

(12) Install the low/reverse clutch pack snap-ring (Fig. 84). The snap-ring is selectable and should be chosen to give the correct clutch pack clearance.

(13) Measure the low/reverse clutch pack clearance and adjust as necessary. The correct clutch clearance is 1.00-1.74 mm (0.039-0.075 in.).

(14) Install the overrunning clutch into the low/reverse clutch retainer making sure that the index splines are aligned with the retainer.

(15) Install the overrunning clutch inner snap-ring.

OIL PUMP

DESCRIPTION

The oil pump (Fig. 87) is located at the front of the transmission inside the bell housing and behind the transmission front cover. The oil pump consists of two independent pumps (Fig. 88), a number of valves (Fig. 89), a front seal (Fig. 90), and a bolt on reaction shaft. The converter clutch switch and regulator valves, pressure regulator valve, and converter pressure limit valve are all located in the oil pump valve body.

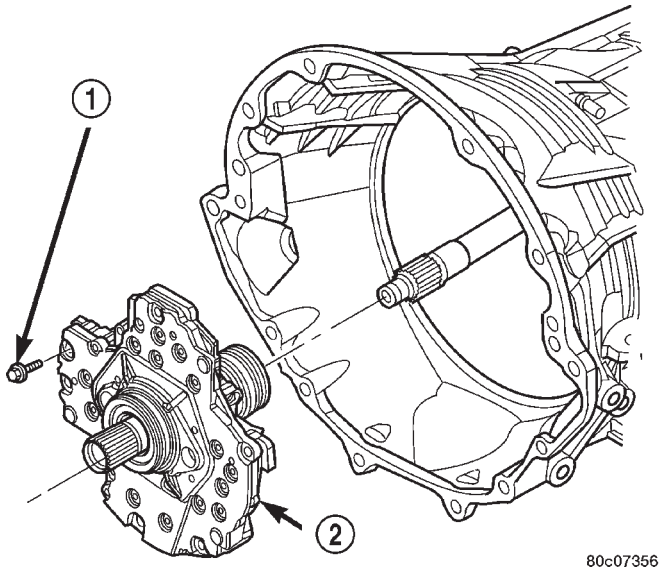


Fig. 87 Oil Pump

1 - OIL PUMP TO CASE BOLT (6)
2 - OIL PUMP

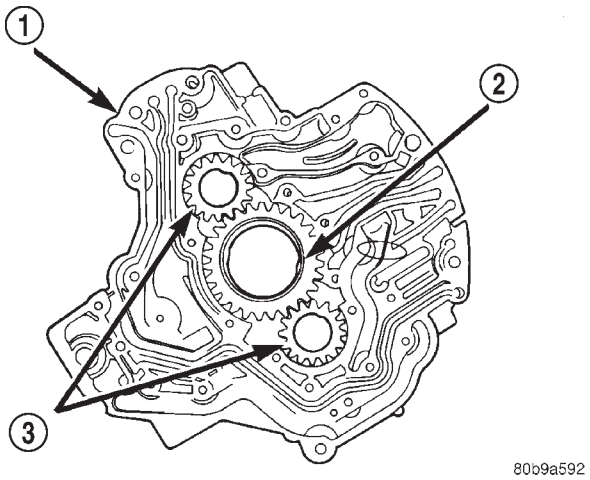


Fig. 88 Oil Pump Gears

1 - PUMP HOUSING
2 - DRIVE GEAR
3 - DRIVEN GEARS

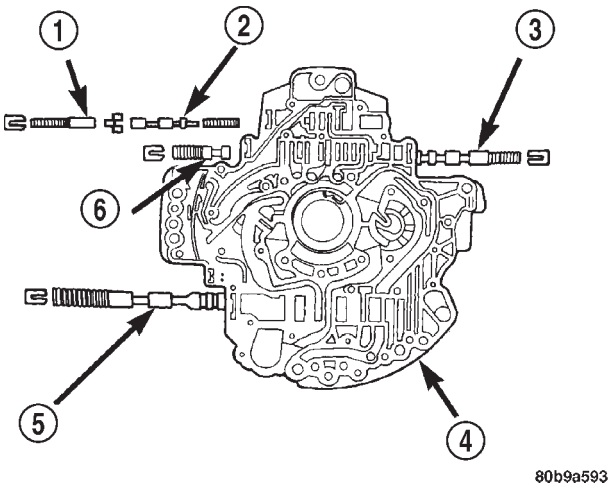


Fig. 89 Oil Pump Valves

1 - TORQUE CONVERTER CLUTCH ACCUMULATOR VALVE
2 - TORQUE CONVERTER CLUTCH CONTROL VALVE
3 - TORQUE CONVERTER CLUTCH SWITCH VALVE
4 - PUMP VALVE BODY
5 - PRESSURE REGULATOR VALVE
6 - TORQUE CONVERTER CLUTCH LIMIT VALVE

OPERATION

As the torque converter rotates, the converter hub rotates the oil pump drive gear. As the drive gear rotates both driven gears, a vacuum is created when the gear teeth come out of mesh. This suction draws fluid through the pump inlet from the oil pan. As the gear teeth come back into mesh, pressurized fluid is forced into the pump outlet and to the oil pump valves.

At low speeds, both sides of the pump supply fluid to the transmission. As the speed of the torque converter increases, the flow from both sides increases until the flow from the primary side alone is sufficient to meet system demands. At this point, the check valve located between the two pumps closes. The secondary side is shut down and the primary side supplies all the fluid to the transmission.

CONVERTER CLUTCH SWITCH VALVE

The converter clutch switch valve is used to control the hydraulic pressure supplied to the front (OFF) side of the torque converter clutch.

CONVERTER CLUTCH REGULATOR VALVE

The converter clutch regulator valve is used to control the hydraulic pressure supplied to the back (ON) side of the torque converter clutch.

TORQUE CONVERTER LIMIT VALVE

The torque converter limit valve serves to limit the available line pressure to the torque converter clutch to approximately 120 psi.

OIL PUMP (Continued)

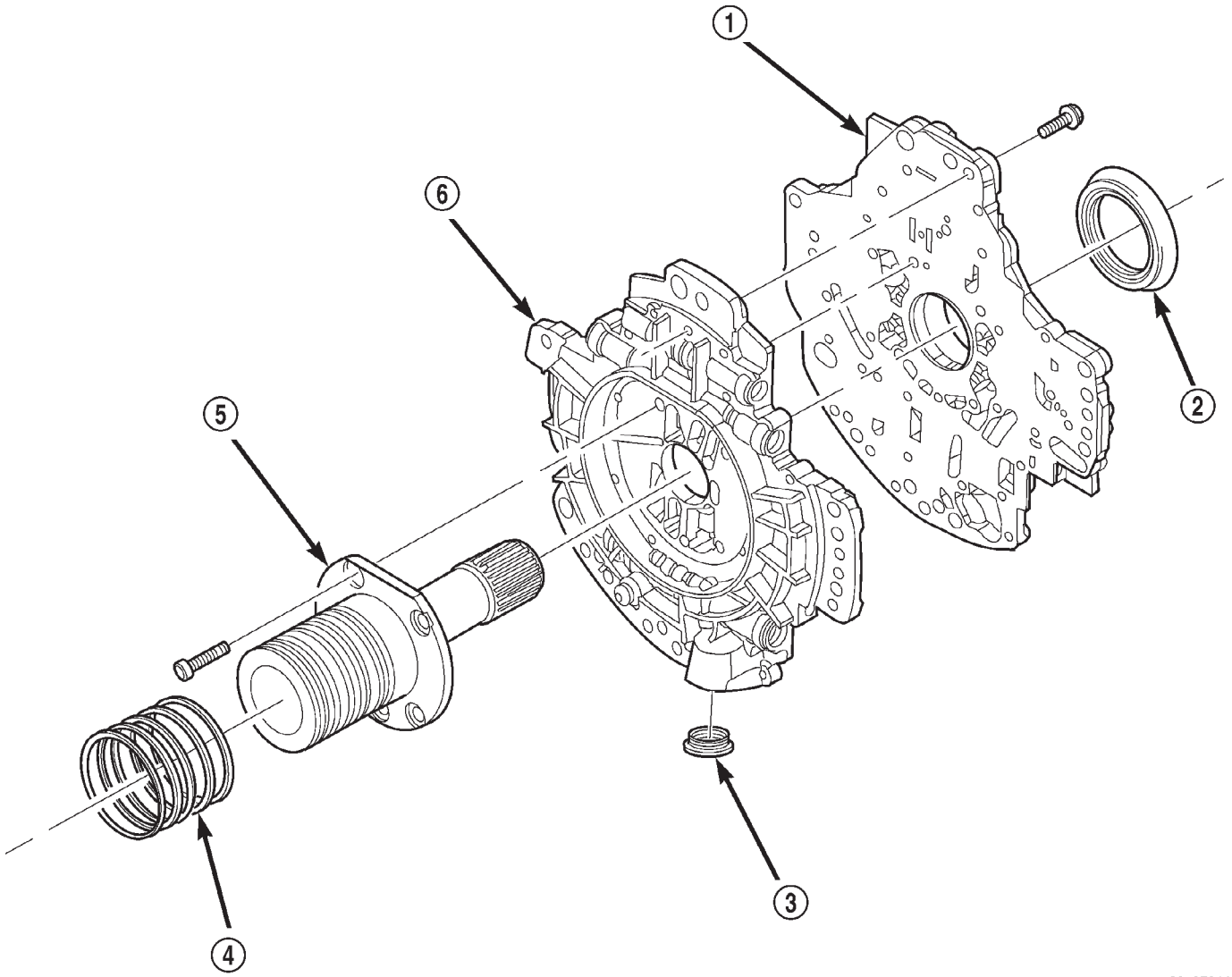


Fig. 90 Oil Pump Reaction Shaft

1 - PUMP HOUSING	4 - SEAL RING (5)
2 - SEAL	5 - REACTION SHAFT SUPPORT
3 - OIL FILTER SEAL	6 - PUMP VALVE BODY

STANDARD PROCEDURE - OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF +4, type 9602, Automatic Transmission Fluid.

(1) Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

(2) Run the engine **at 1800 rpm**, with the shift selector in neutral. Verify that the transmission fluid temperature is below 104.5° C (220° F) for this test.

(3) If one quart of transmission fluid is collected in the container in 30 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 30 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.

(4) Re-connect the **To cooler** line to the transmission cooler inlet.

OIL PUMP (Continued)

(5) Refill the transmission to proper level.

DISASSEMBLY

(1) Remove the bolts holding the reaction shaft support to the oil pump (Fig. 91).

(2) Remove the reaction shaft support from the oil pump (Fig. 91).

(3) Remove all bolts holding the oil pump halves together (Fig. 91).

(4) Using suitable prying tools, separate the oil pump sections by inserting the tools in the supplied areas and prying the halves apart.

NOTE: The oil pump halves are aligned to each other through the use of two dowels. Be sure to pry upward evenly to prevent damage to the oil pump components.

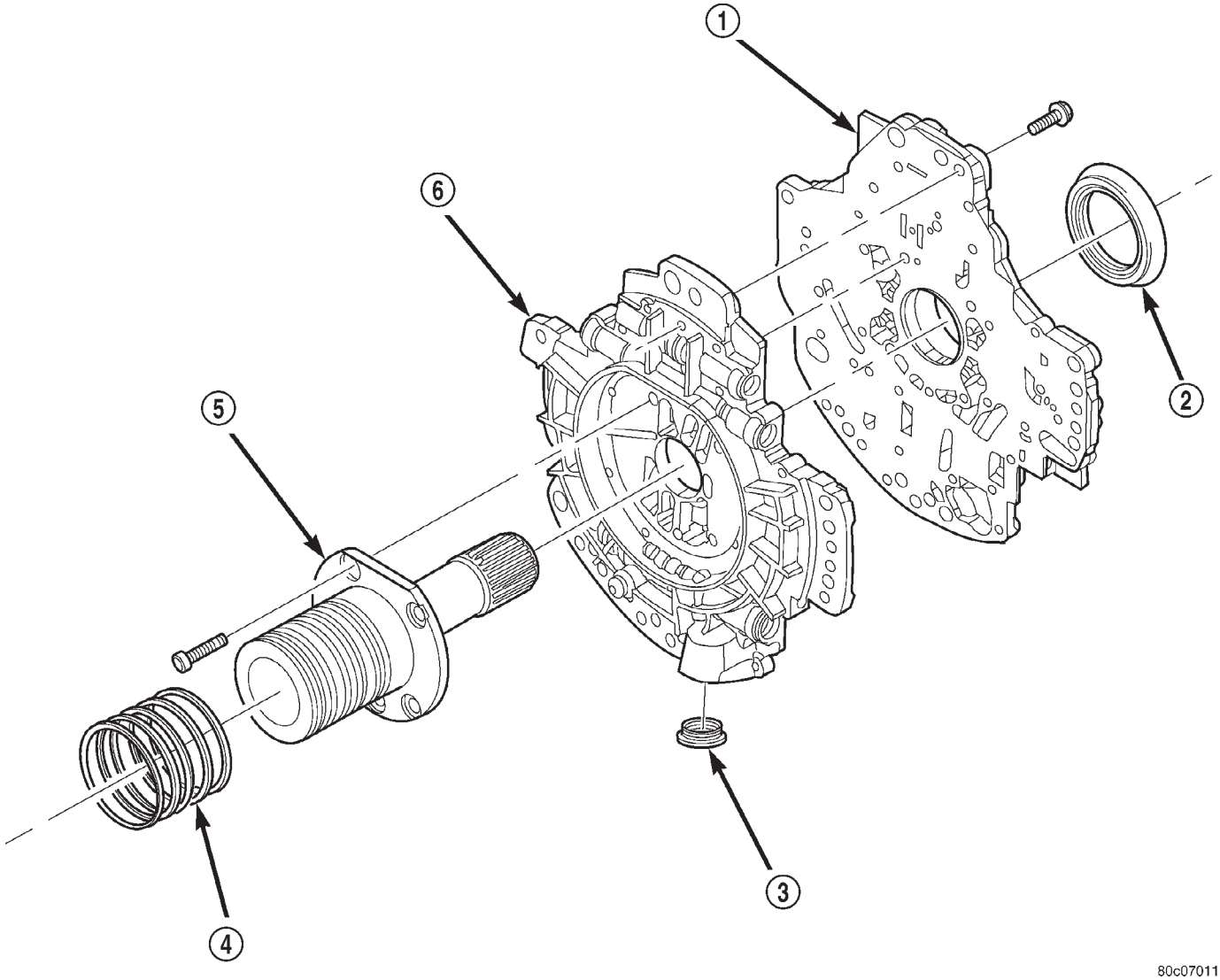


Fig. 91 Oil Pump Assembly

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

OIL PUMP (Continued)

(5) Remove the screws holding the separator plate onto the oil pump body (Fig. 92).

(6) Remove the separator plate from the oil pump body (Fig. 92).

(7) Mark all gears for location. The gears are select fit and if the oil pump is to be reused, the gears must be returned to their original locations.

(8) Remove the oil pump gears from the oil pump case (Fig. 92).

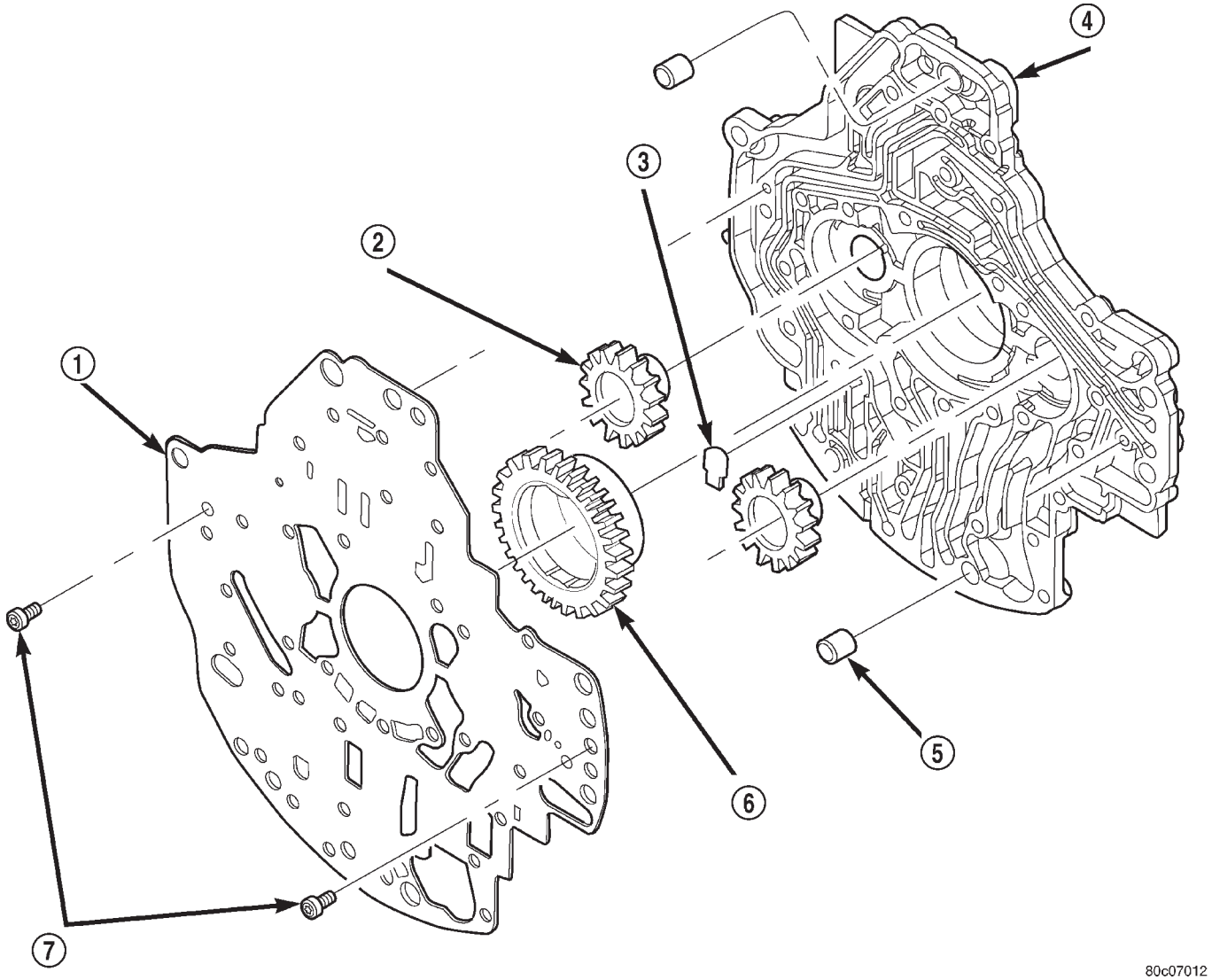


Fig. 92 Oil Pump Housing and Gears

1 - SEPARATOR PLATE
2 - DRIVEN GEAR (2)
3 - CHECK VALVE
4 - PUMP HOUSING
5 - DOWEL (2)
6 - DRIVE GEAR
7 - SCREW

OIL PUMP (Continued)

(9) Remove the oil pump valve retainers and associated valve and spring one at a time (Fig. 93) (Fig. 94). Mark the combination of components as a group and tag them as to the location from which they were removed.

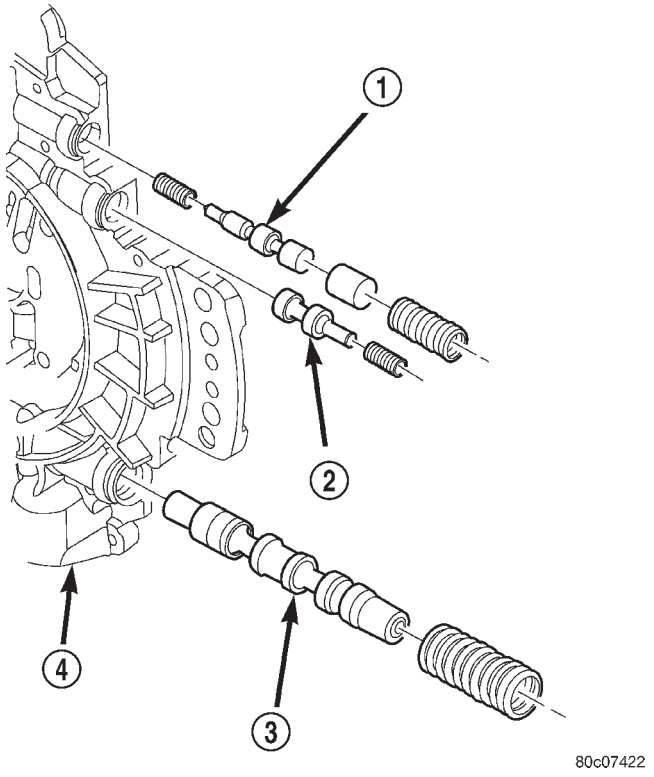


Fig. 93 Oil Pump Valve Body

1 - T/C REGULATOR VALVE
2 - T/C LIMIT VALVE
3 - REGULATOR VALVE
4 - OIL PUMP VALVE BODY

CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

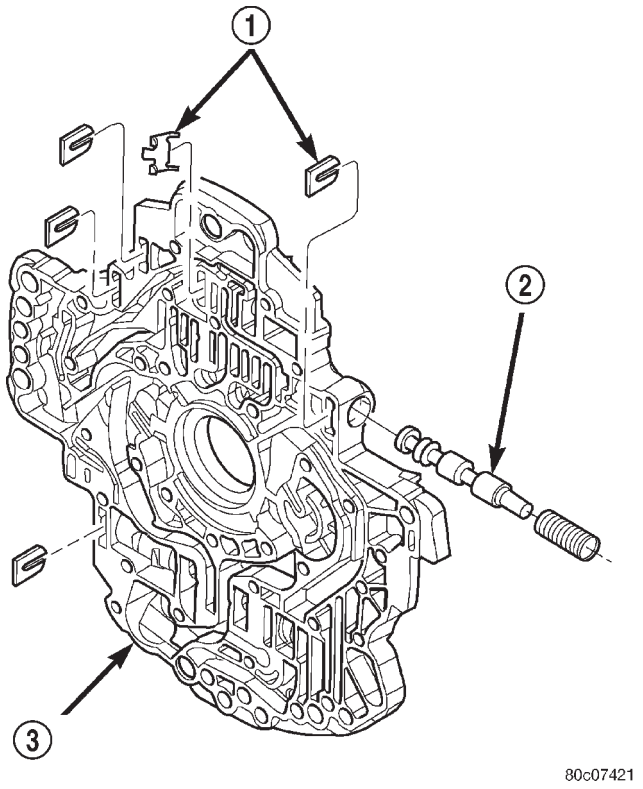


Fig. 94 T/C Switch Valve

1 - RETAINER
2 - T/C SWITCH VALVE
3 - OIL PUMP VALVE BODY

Inspect the pump reaction shaft support bushings. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the oil pump cover. Use a penlight to view the bore interiors. Replace the oil pump if any bores are distorted or scored. Inspect all of the valve springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

OIL PUMP (Continued)

ASSEMBLY

(1) Clean and inspect all components. Make sure that all passages are thoroughly cleaned and are free from dirt or debris. Make sure that all valves move freely in their proper bore. Make sure that all gear pockets and bushings are free from excessive wear and scoring. Replace the oil pump if any excessive wear or scoring is found.

(2) Coat the gears with Mopar® ATF +4, type 9602, and install into their original locations.

(3) Lubricate the oil pump valves with Mopar® ATF +4, type 9602, and install the valve, spring and retainer into the appropriate oil pump valve body bore (Fig. 93) (Fig. 94).

(4) Place the separator plate onto the oil pump body (Fig. 92).

(5) Install the screws to hold the separator plate onto the oil pump body (Fig. 92). Tighten the screws to 4.5 N·m (40 in.lbs.).

(6) Position the oil pump cover onto the locating dowels (Fig. 91).

(7) Seat the two oil pump halves together and install all bolts finger tight.

(8) Torque all bolts down slowly starting in the center and working outward. The correct torque is 4.5 N·m (40 in.lbs.).

(9) Verify that the oil pump gears rotate freely and smoothly.

(10) Position the reaction shaft support into the oil pump (Fig. 91).

(11) Install and torque the bolts to hold the reaction shaft support to the oil pump (Fig. 91). The correct torque is 12 N·m (105 in.lbs.).

OIL PUMP FRONT SEAL

REMOVAL

(1) Remove transmission from the vehicle.

(2) Remove the torque converter from the transmission.

(3) Using a screw mounted in a slide hammer, remove the oil pump front seal.

INSTALLATION

(1) Clean seal bore of the oil pump of any residue or particles from the original seal.

(2) Install new oil seal in the oil pump housing using Seal Installer C-3860-A (Fig. 95).

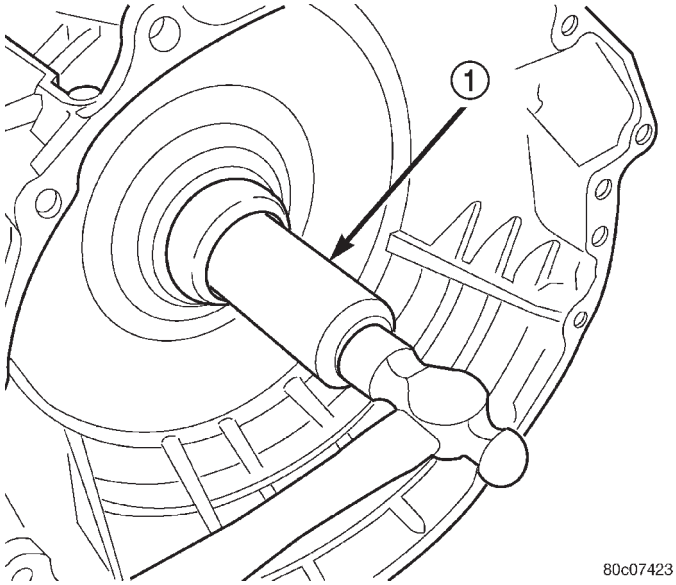


Fig. 95 Install Oil Pump Front Seal

1 - TOOL C-3860-A

OUTPUT SPEED SENSOR

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

REMOVAL

(1) Raise vehicle.

(2) Place a suitable fluid catch pan under the transmission.

(3) Remove the wiring connector from the output speed sensor (Fig. 96).

(4) Remove the bolt holding the output speed sensor to the transmission case.

(5) Remove the output speed sensor from the transmission case.

INSTALLATION

(1) Install the output speed sensor into the transmission case.

(2) Install the bolt to hold the output speed sensor into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).

(3) Install the wiring connector onto the output speed sensor

(4) Verify the transmission fluid level. Add fluid as necessary.

(5) Lower vehicle.

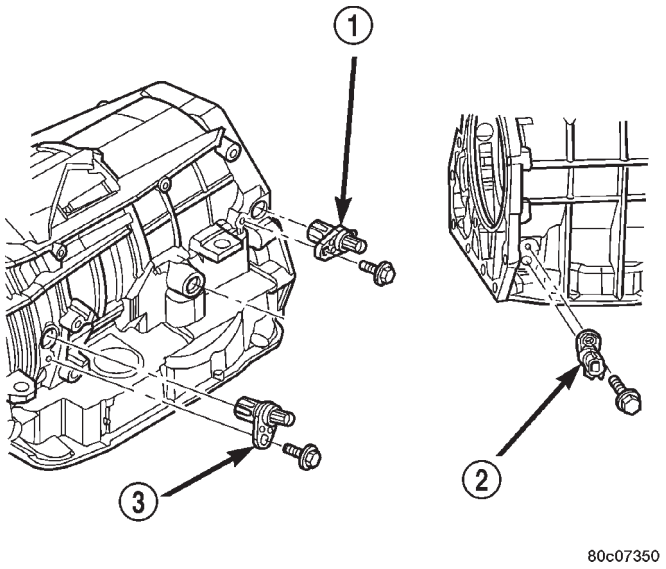


Fig. 96 Output Speed Sensor

1 - OUTPUT SPEED SENSOR
2 - LINE PRESSURE SENSOR
3 - INPUT SPEED SENSOR

OVERDRIVE SWITCH

DESCRIPTION

The overdrive OFF (control) switch is located in the shifter handle. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

OPERATION

At key-on, fourth and fifth gear operation is allowed. Pressing the switch once causes the overdrive OFF mode to be entered and the overdrive OFF switch lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the overdrive lamp to be turned off. The overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoids and allow upshifts to fourth and fifth gears. The control switch indicator light illuminates only when the overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

PARK LOCK CABLE

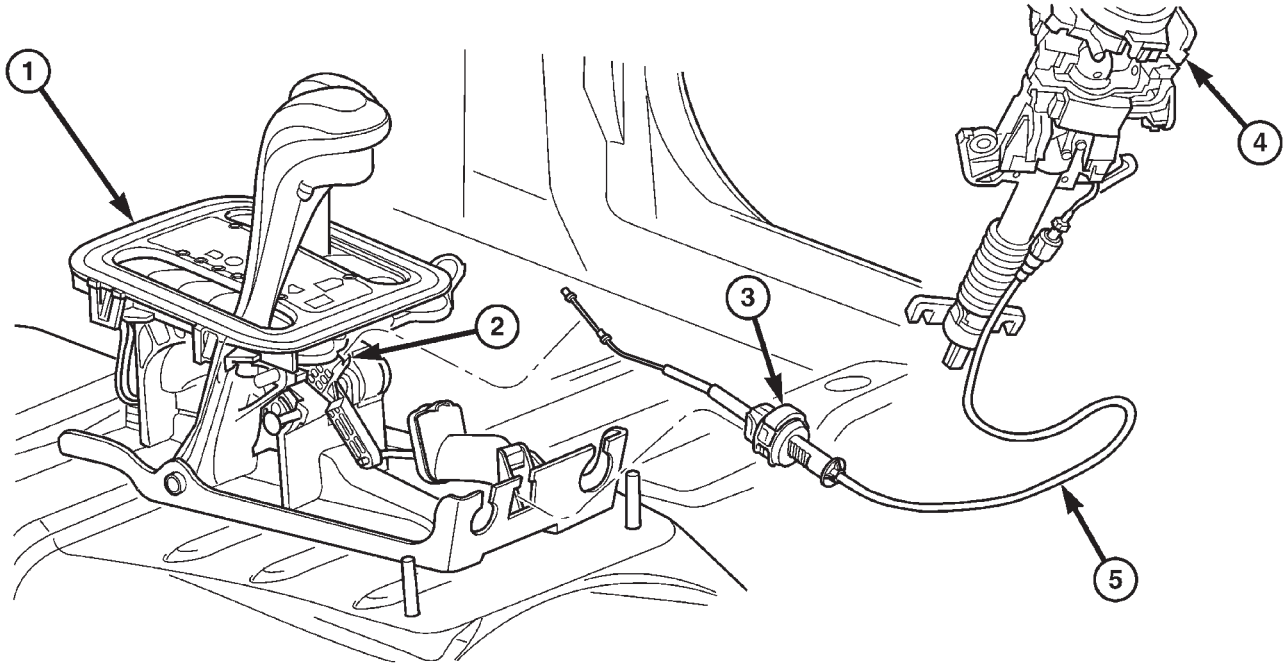
REMOVAL

(1) Place the shifter in the PARK position.
(2) Lower the steering column cover.
(3) With the ignition switch in the “RUN” position depress the park lock cable locking tab, located on top of the cable connector at the steering column and pull the park lock cable straight out.
(4) Remove the park lock cable from steering column (Fig. 97).
(5) Remove the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)
(6) Disconnect the park lock cable from the shift BTSI lever and remove the cable from the shifter assembly bracket.
(7) Release the park lock cable from any remaining clips.
(8) Remove park lock cable from the vehicle.

INSTALLATION

NOTE: The gearshift cable must be secured into position and properly adjusted before the installation of the Park Lock Cable.

(1) Verify that the shifter is in the PARK position.
(2) Push the park lock cable straight into the square mounting hole in the steering column until cable snaps in place.
(3) Route park lock cable to the shifter mechanism.
(4) Install the park lock cable end fitting into shifter BTSI lever.
(5) Pull rearward on the cable housing to snap park lock cable adjuster ears into floor shifter bracket.
(6) Place the ignition key cylinder in the ACCESSORY position.
(7) Push the cable adjuster lock clamp downward to lock it.
(8) Test the park lock cable operation.
(9) Install the floor console and related trim. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)



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Fig. 97 Brake Transmission Shift Interlock

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

PISTONS

DESCRIPTION

There are several sizes and types of pistons used in an automatic transmission. Some pistons are used to apply clutches. They all have in common the fact that they are round or circular in shape, located within a smooth walled cylinder, which is closed at one end and converts fluid pressure into mechanical movement. The fluid pressure exerted on the piston is contained within the system through the use of piston rings or seals.

OPERATION

The principal which makes this operation possible is known as Pascal's Law. Pascal's Law can be stated as: "Pressure on a confined fluid is transmitted equally in all directions and acts with equal force on equal areas."

PRESSURE

Pressure (Fig. 98) is nothing more than force (lbs.) divided by area (in or ft.), or force per unit area. Given a 100 lb. block and an area of 100 sq. in. on the floor, the pressure exerted by the block is: 100 lbs. 100 in or 1 pound per square inch, or PSI as it is commonly referred to.

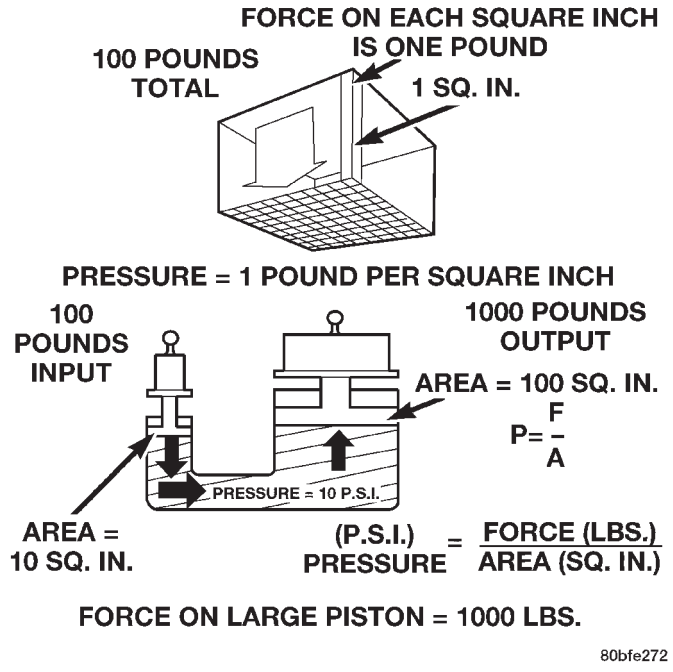


Fig. 98 Force and Pressure Relationship

PRESSURE ON A CONFINED FLUID

Pressure is exerted on a confined fluid (Fig. 99) by applying a force to some given area in contact with the fluid. A good example of this is a cylinder filled with fluid and equipped with a piston that is closely fitted to the cylinder wall. If a force is applied to the piston, pressure will be developed in the fluid. Of course, no pressure will be created if the fluid is not confined. It will simply "leak" past the piston. There must be a resistance to flow in order to create pressure. Piston sealing is extremely important in hydraulic operation. Several kinds of seals are used to accomplish this within a transmission. These include but are not limited to O-rings, D-rings, lip seals, sealing rings, or extremely close tolerances between the piston and the cylinder wall. The force exerted is downward (gravity), however, the principle remains the same no matter which direction is taken. The pressure created in the fluid is equal to the force applied, divided by the piston area. If the force is 100 lbs., and the piston area is 10 sq. in., then the pressure created equals 10 PSI. Another interpretation of Pascal's Law is that regardless of container shape or size, the pressure will be maintained throughout, as long as the fluid is confined. In other words, the pressure in the fluid is the same everywhere within the container.

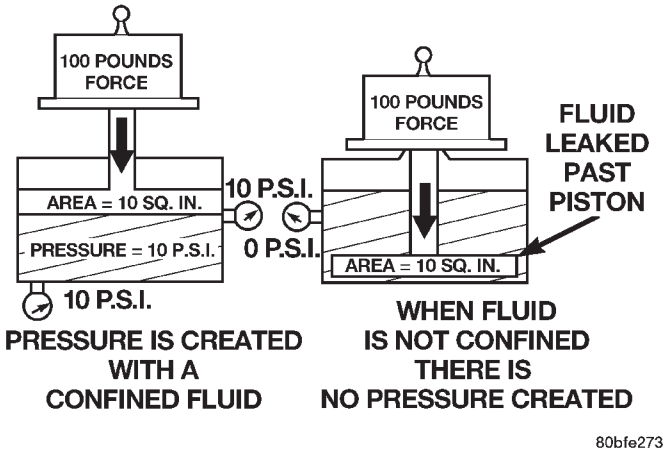


Fig. 99 Pressure on a Confined Fluid

PISTONS (Continued)

FORCE MULTIPLICATION

Using the 10 PSI example used in the illustration (Fig. 100), a force of 1000 lbs. can be moved with a force of only 100 lbs. The secret of force multiplication in hydraulic systems is the total fluid contact area employed. The illustration, (Fig. 100), shows an area that is ten times larger than the original area. The pressure created with the smaller 100 lb. input is 10 PSI. The concept "pressure is the same everywhere" means that the pressure underneath the larger piston is also 10 PSI. Pressure is equal to the force applied divided by the contact area. Therefore, by means of simple algebra, the output force may be found. This concept is extremely important, as it is also used in the design and operation of all shift valves and limiting valves in the valve body, as well as the pistons, of the transmission, which activate the clutches and bands. It is nothing more than using a difference of area to create a difference in pressure to move an object.

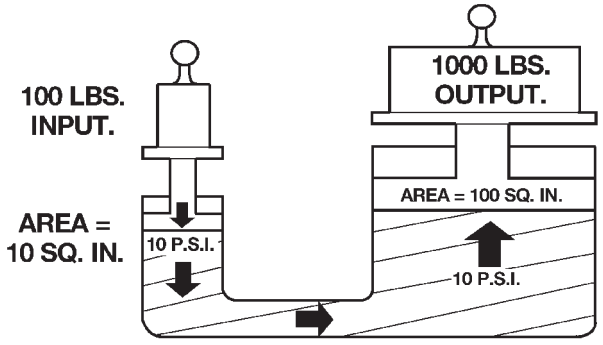


Fig. 100 Force Multiplication

PISTON TRAVEL

The relationship between hydraulic lever and a mechanical lever is the same. With a mechanical lever it's a weight-to-distance output rather than a pressure-to-area output. Using the same forces and areas as in the previous example, the smaller piston (Fig. 101) has to move ten times the distance required to move the larger piston one inch. Therefore, for every inch the larger piston moves, the smaller piston moves ten inches. This principle is true in other instances also. A common garage floor jack is a good example. To raise a car weighing 2000 lbs., an effort of only 100 lbs. may be required. For every inch the car moves upward, the input piston at the jack handle must move 20 inches downward.

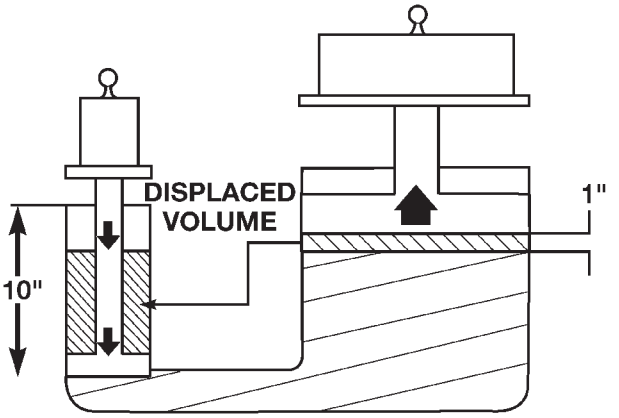


Fig. 101 Piston Travel

PLANETARY GEARTRAIN

DESCRIPTION

The planetary geartrain is located behind the 4C retainer/bulkhead, toward the rear of the transmission. The planetary geartrain consists of three primary assemblies:

- Reaction (Fig. 102).
- Reverse (Fig. 103).
- Input (Fig. 103).

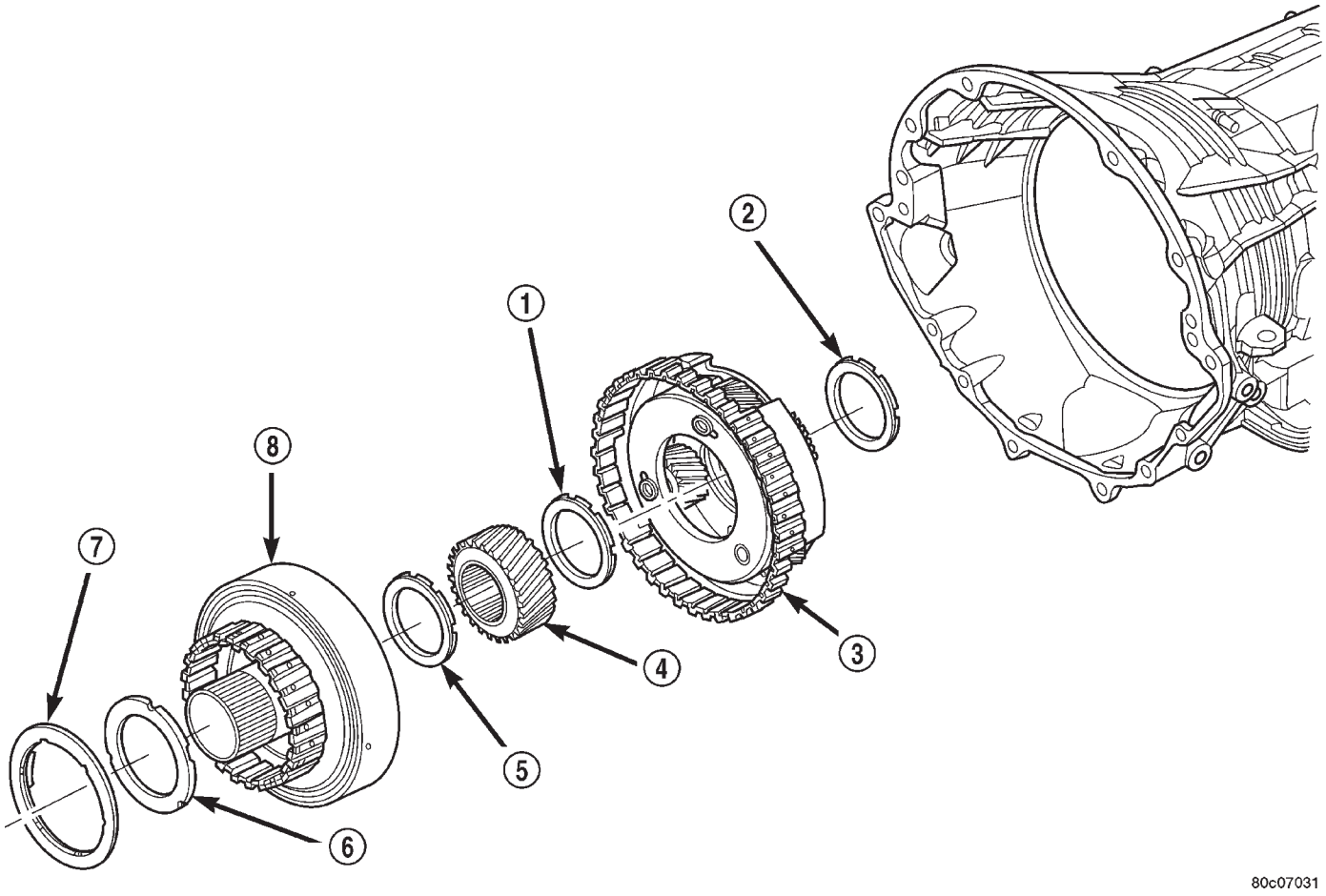


Fig. 102 Reaction Planetary Geartrain

1 - BEARING NUMBER 8
2 - BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - BEARING NUMBER 6
8 - REACTION ANNULUS

PLANETARY GEARTRAIN (Continued)

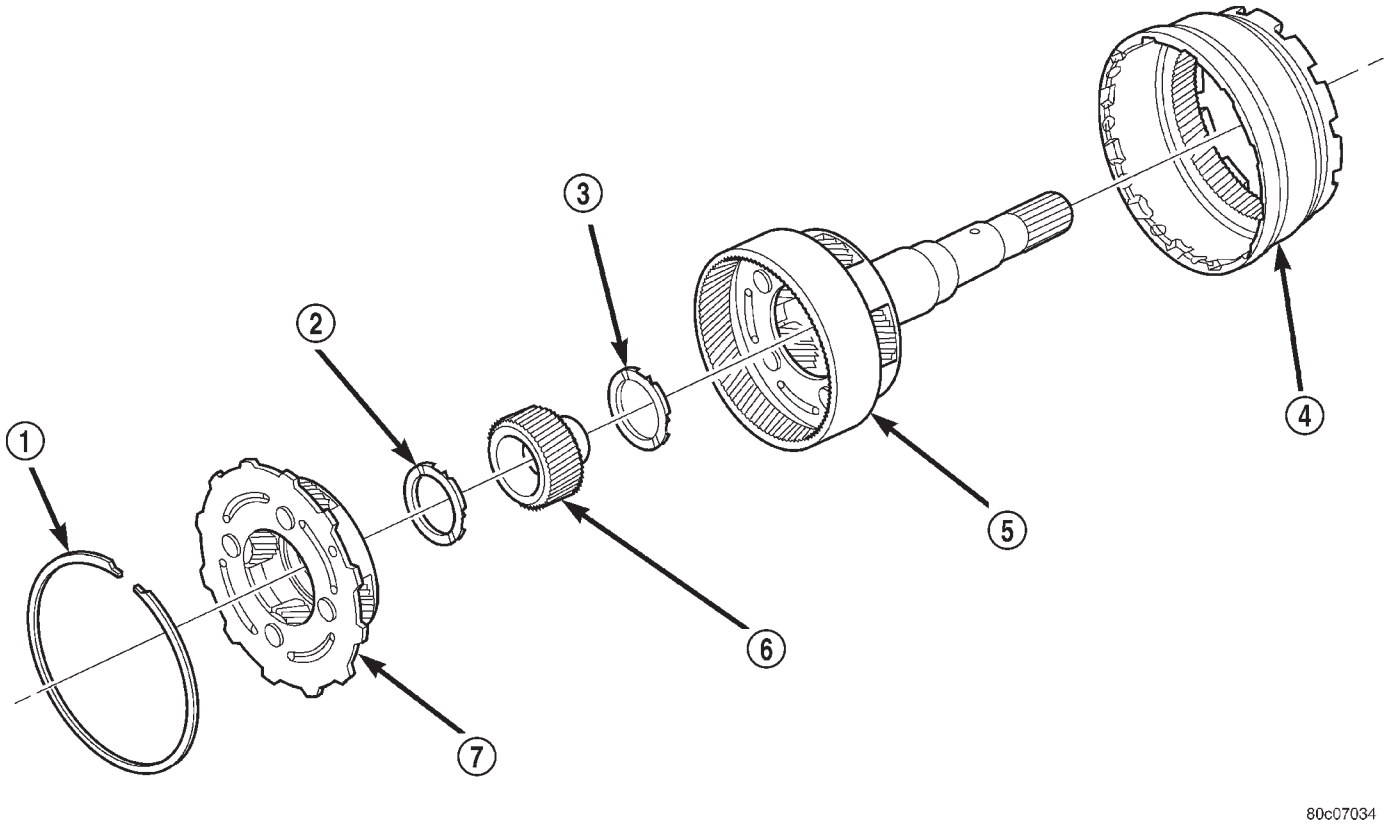


Fig. 103 Reverse/Input Planetary Geartrain

1 - SNAP-RING
2 - BEARING NUMBER 10
3 - BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

PLANETARY GEARTRAIN (Continued)

OPERATION

REACTION PLANETARY GEARTRAIN

The reaction planetary carrier and reverse sun gear of the reaction planetary geartrain are a single component which is held by the 2C clutch when required. The reaction annulus gear is a stand alone component that can be driven by the reverse clutch or held by the 4C clutch. The reaction sun gear is driven by the overdrive clutch.

REVERSE PLANETARY GEARTRAIN

The reverse planetary geartrain is the middle of the three planetary sets. The reverse planetary carrier can be driven by the overdrive clutch as required. The reverse planetary carrier is also splined to the input annulus gear, which can be held by the low/reverse clutch. The reverse planetary annulus, input planetary carrier, and output shaft are all one piece.

INPUT PLANETARY GEARTRAIN

The input sun gear of the input planetary geartrain is driven by the underdrive clutch.

DISASSEMBLY

(1) Remove the snap-ring holding the input annulus into the input carrier (Fig. 104).

(2) Remove the input annulus from the input carrier (Fig. 104).

(3) Remove the number 9 bearing from the reverse planetary carrier. Note that this planetary carrier has four pinion gears.

(4) Remove the reverse planetary gear carrier (Fig. 104).

(5) Remove the number 10 bearing from the input sun gear (Fig. 104).

(6) Remove the input sun gear from the input carrier (Fig. 104).

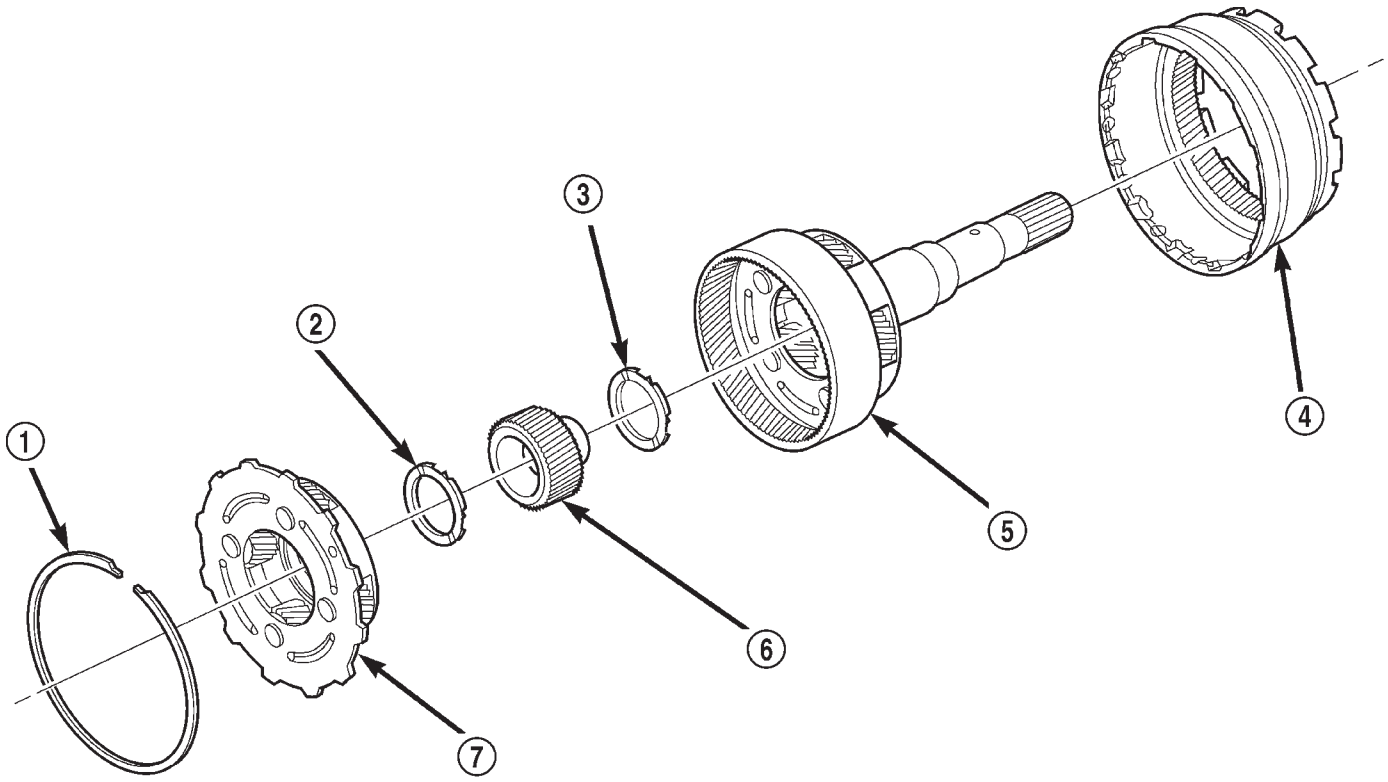
(7) Remove the number 11 bearing from the input carrier (Fig. 104).

CLEANING

Clean the planetary components in solvent and dry them with compressed air.

INSPECTION

Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable.



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Fig. 104 Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - BEARING NUMBER 10
3 - BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

PLANETARY GEARTRAIN (Continued)

Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location.

ASSEMBLY

(1) Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

(2) Install the number 11 bearing into the input planetary carrier so that the inner race will be toward the front of the transmission (Fig. 104).

(3) Install the input sun gear into the input carrier (Fig. 104).

(4) Install the number 10 bearing onto the rear of the reverse planetary carrier with the inner race toward the carrier (Fig. 104).

(5) Install the number 9 bearing onto the front of the reverse planetary carrier with the outer race toward the carrier and the inner race facing upward (Fig. 104).

(6) Install the reverse planetary gear carrier into the input carrier (Fig. 104).

(7) Install the input annulus gear into the input carrier (Fig. 104).

(8) Install the snap-ring to hold the input annulus gear into the input carrier (Fig. 104).

SHIFT MECHANISM

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)
- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides FIRST gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides FIRST and SECOND gear only.

DRIVE range provides FIRST, SECOND, THIRD and OVERDRIVE FOURTH and FIFTH gear ranges. The shift into OVERDRIVE FOURTH and FIFTH gear range occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 or 4-5 shifts.

The FOURTH and FIFTH gear upshifts occurs automatically when the overdrive selector switch is in the ON position. An upshift to FOURTH and FIFTH gears may not occur or may be delayed in some of the possible shift schedules. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - OPERATION)

REMOVAL

(1) Remove any necessary console parts for access to shift lever assembly and shifter cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL)

(2) Shift transmission into PARK.

(3) Disconnect the transmission shift cable at shift lever and shifter assembly bracket (Fig. 105).

(4) Disconnect the park lock cable from the shifter BTSI lever and the shifter assembly bracket. (Fig. 106)

(5) Disconnect the transfer case shift cable from the transfer case shift lever pin (Fig. 107), if equipped.

(6) Remove the clip holding the transfer case shift cable to the shifter assembly bracket, if equipped.

(7) Remove the transfer case shift cable from the shifter assembly bracket, if equipped.

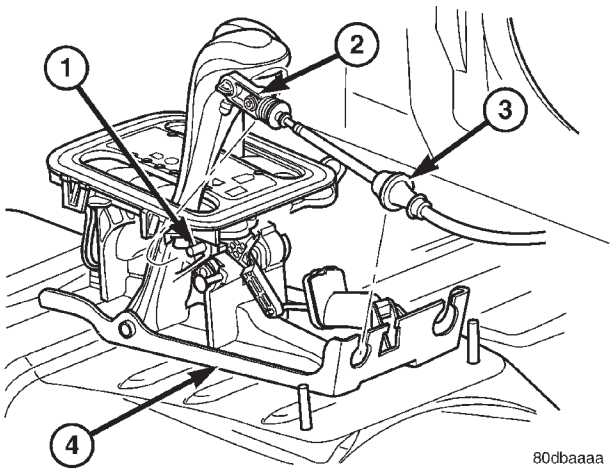


Fig. 105 Transmission Shift Cable

1 - SHIFT LEVER PIN
2 - ADJUSTMENT SCREW
3 - SHIFT CABLE
4 - SHIFTER ASSEMBLY BRACKET

(8) Disengage all wiring connectors from the shifter assembly.

(9) Remove all nuts holding the shifter assembly to the floor pan (Fig. 108).

SHIFT MECHANISM (Continued)

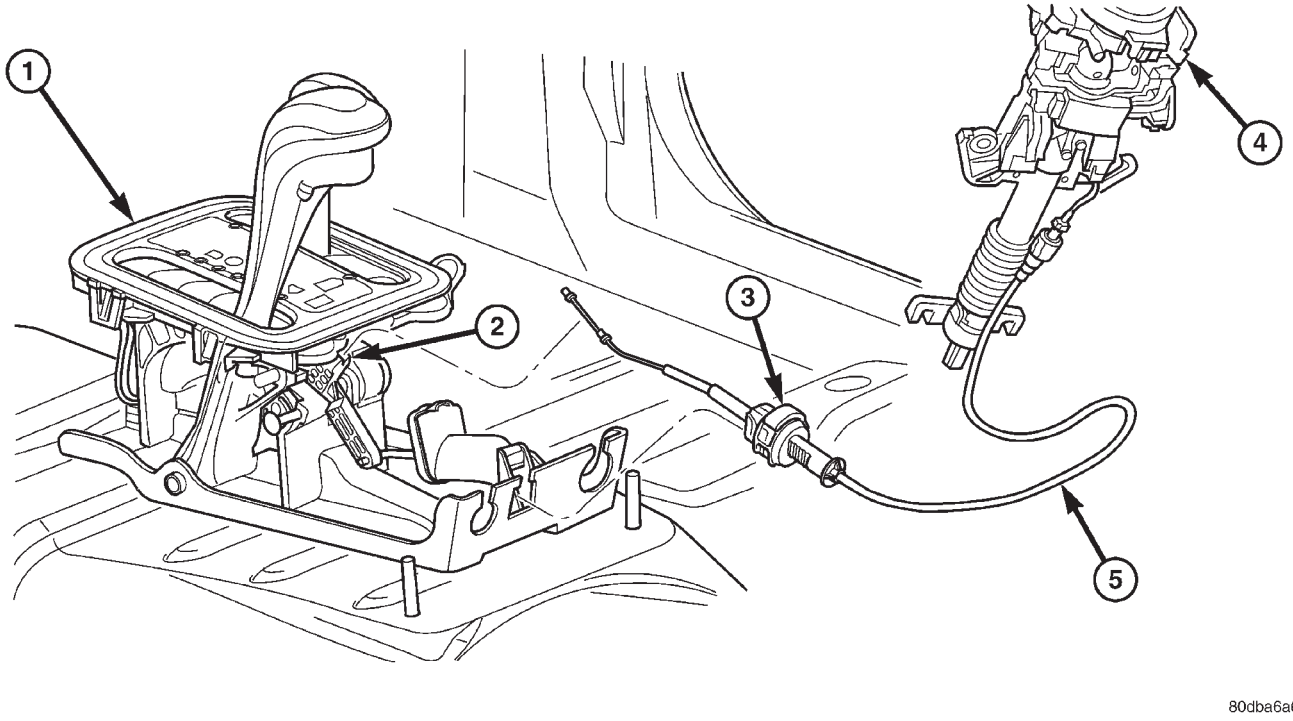


Fig. 106 Brake Transmission Interlock Cable

1 - SHIFT MECHANISM
2 - SHIFTER BTSI LEVER
3 - ADJUSTMENT CLIP
4 - STEERING COLUMN ASSEMBLY
5 - INTERLOCK CABLE

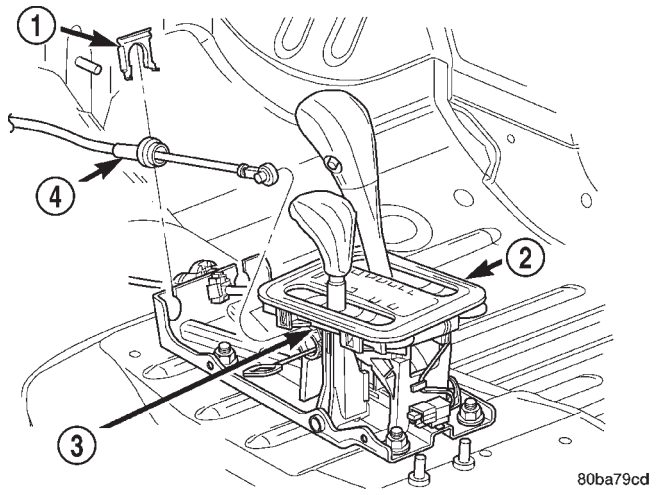


Fig. 107 Transfer Case Shift Cable

1 - CLIP
2 - SHIFTER
3 - TRANSFER CASE SHIFT LEVER PIN
4 - TRANSFER CASE SHIFT CABLE

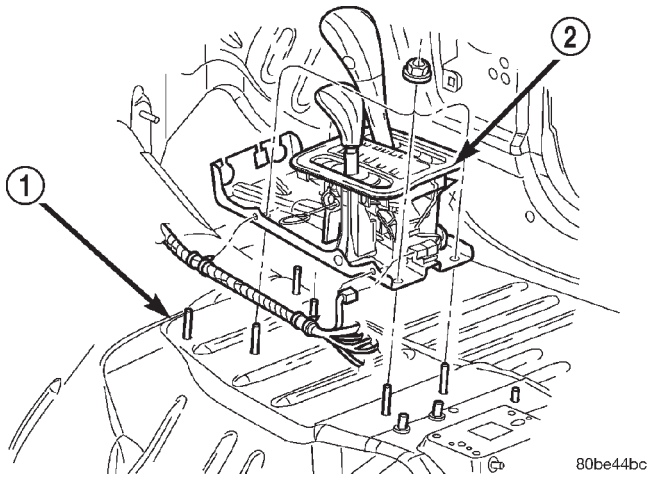


Fig. 108 Shifter Assembly

1 - FLOOR PAN
2 - SHIFTER ASSEMBLY

(10) Remove the shifter assembly from the vehicle.

SHIFT MECHANISM (Continued)

INSTALLATION

(1) Place the floor shifter lever in PARK position.
(2) Loosen the adjustment screw on the shift cable.
(3) Verify that the park lock cable adjustment tab is pulled upward to the unlocked position.
(4) Install wiring harness to the shifter assembly bracket. Engage any wire connectors removed from the shifter assembly.
(5) Install the transfer case shift cable to the shifter assembly bracket. Install clip to hold cable to the bracket.
(6) Snap the transfer case shift cable, if equipped, onto the transfer case shift lever pin.
(7) Install the park lock cable into the shifter assembly bracket and into the shifter BTSI lever.(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC/SHIFT INTERLOCK MECHANISM - ADJUSTMENTS)
(8) Install the shift cable to the shifter assembly bracket. Push cable into the bracket until secure.
(9) Install shifter assembly onto the shifter assembly studs on the floor pan.
(10) Install the nuts to hold the shifter assembly onto the floor pan. Tighten nuts to 28 N·m (250 in.lbs.).
(11) Snap the shift cable onto the shift lever pin.
(12) Verify that the shift lever is in the PARK position.
(13) Tighten the adjustment screw to 7 N·m (65 in.lbs.).
(14) Place the key in the accessory position.
(15) Push downward on the park lock cable adjustment tab to lock the adjustment.
(16) Verify correct shifter, park lock, and BTSI operation.
(17) Install any console parts removed for access to shift lever assembly and shift cables. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION)

SOLENOID SWITCH VALVE

DESCRIPTION

The Solenoid Switch Valve (SSV) is located in the valve body and controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

OPERATION

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th,and 5th gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

SOLENOIDS

DESCRIPTION

The typical electrical solenoid used in automotive applications is a linear actuator. It is a device that produces motion in a straight line. This straight line motion can be either forward or backward in direction, and short or long distance.

A solenoid is an electromechanical device that uses a magnetic force to perform work. It consists of a coil of wire, wrapped around a magnetic core made from steel or iron, and a spring loaded, movable plunger, which performs the work, or straight line motion.

The solenoids used in transmission applications are attached to valves which can be classified as **normally open** or **normally closed**. The **normally open** solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The **normally closed** solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control of the transmission.

The strength of the magnetic field is the primary force that determines the speed of operation in a particular solenoid design. A stronger magnetic field will cause the plunger to move at a greater speed than a weaker one. There are basically two ways to increase the force of the magnetic field:

1. Increase the amount of current applied to the coil or
2. Increase the number of turns of wire in the coil.

The most common practice is to increase the number of turns by using thin wire that can completely fill the available space within the solenoid housing. The strength of the spring and the length of the plunger also contribute to the response speed possible by a particular solenoid design.

SOLENOIDS (Continued)

A solenoid can also be described by the method by which it is controlled. Some of the possibilities include variable force, pulse-width modulated, constant ON, or duty cycle. The variable force and pulse-width modulated versions utilize similar methods to control the current flow through the solenoid to position the solenoid plunger at a desired position somewhere between full ON and full OFF. The constant ON and duty cycled versions control the voltage across the solenoid to allow either full flow or no flow through the solenoid's valve.

OPERATION

When an electrical current is applied to the solenoid coil, a magnetic field is created which produces an attraction to the plunger, causing the plunger to move and work against the spring pressure and the load applied by the fluid the valve is controlling. The plunger is normally directly attached to the valve which it is to operate. When the current is removed from the coil, the attraction is removed and the plunger will return to its original position due to spring pressure.

The plunger is made of a conductive material and accomplishes this movement by providing a path for the magnetic field to flow. By keeping the air gap between the plunger and the coil to the minimum necessary to allow free movement of the plunger, the magnetic field is maximized.

TORQUE CONVERTER

DESCRIPTION

The torque converter (Fig. 109) is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine, a stator, an overrunning clutch, an impeller and an electronically applied converter clutch. The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The converter clutch engages in third gear. The torque converter hub drives the transmission oil (fluid) pump and contains an o-ring seal to better control oil flow.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid. If the fluid is contaminated, flush the fluid cooler and lines.

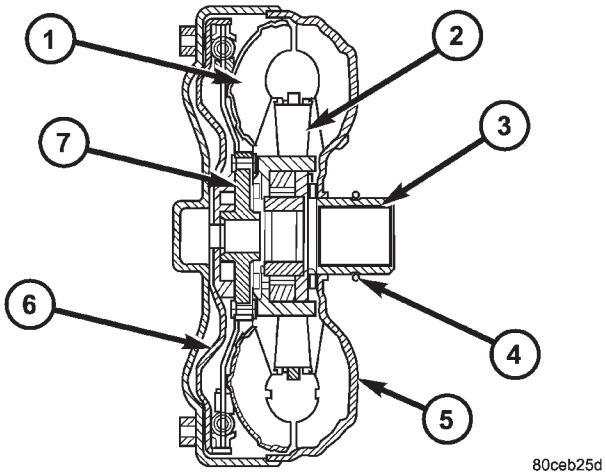


Fig. 109 Torque Converter Assembly

1 - TURBINE ASSEMBLY
2 - STATOR
3 - CONVERTER HUB
4 - O-RING
5 - IMPELLER ASSEMBLY
6 - CONVERTER CLUTCH PISTON
7 - TURBINE HUB

TORQUE CONVERTER (Continued)

IMPELLER

The impeller (Fig. 110) is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

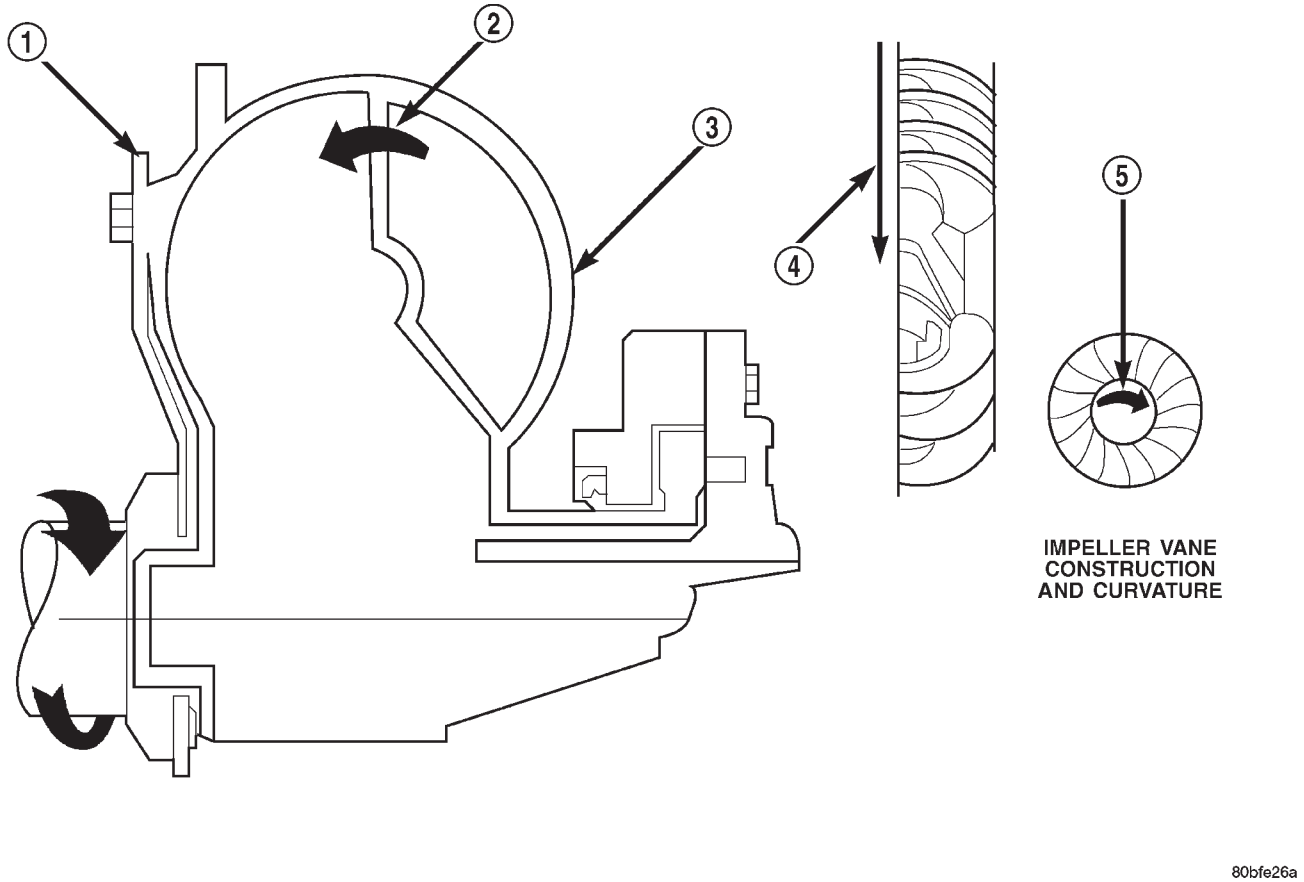


Fig. 110 Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

TORQUE CONVERTER (Continued)

TURBINE

The turbine (Fig. 111) is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

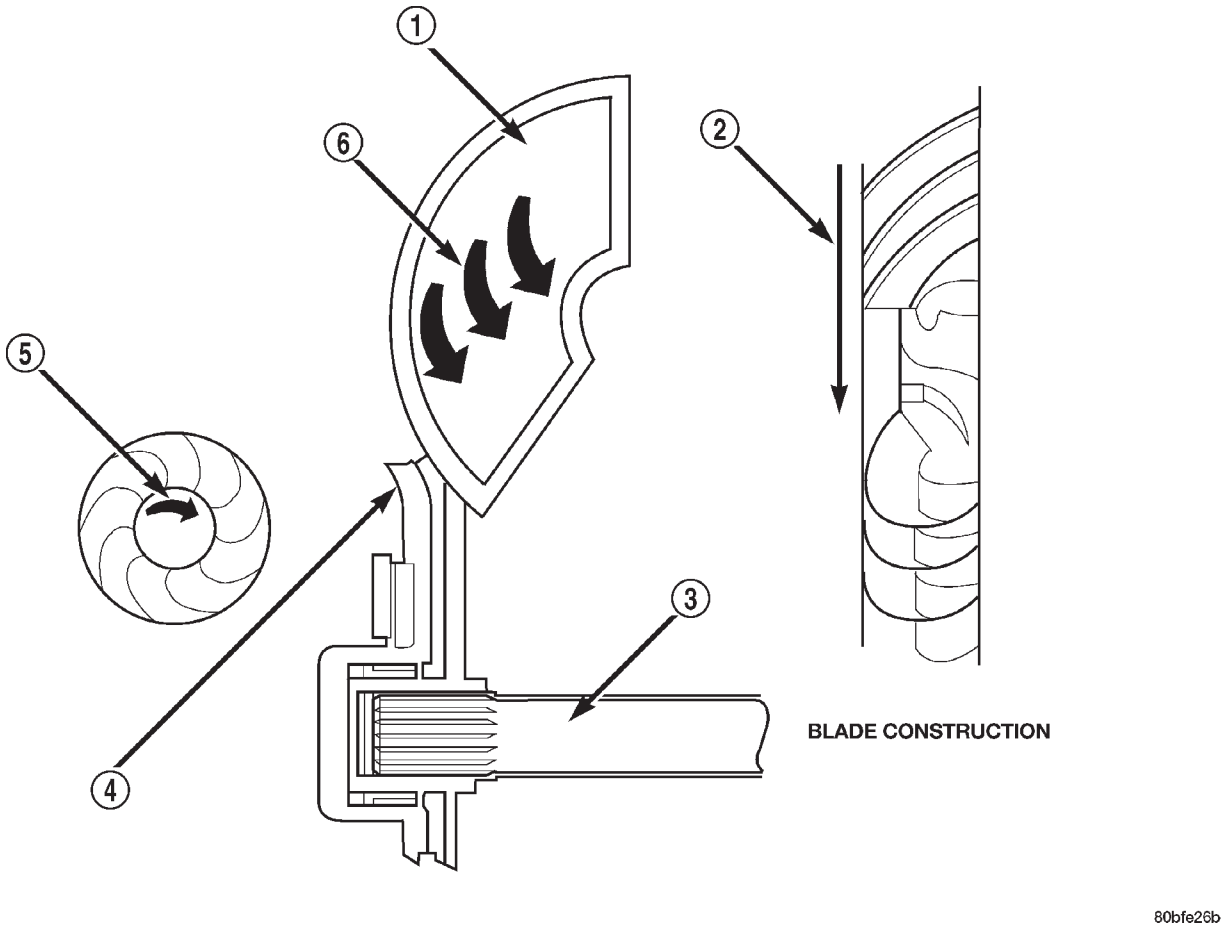


Fig. 111 Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

TORQUE CONVERTER (Continued)

STATOR

The stator assembly (Fig. 112) is mounted on a stationary shaft which is an integral part of the oil pump. The stator is located between the impeller and turbine within the torque converter case (Fig. 113). The stator contains an over-running clutch, which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

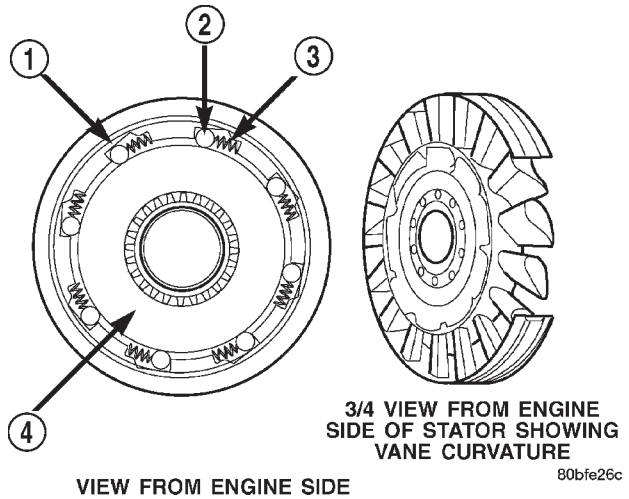


Fig. 112 Stator Components

1 - CAM (OUTER RACE)
2 - ROLLER
3 - SPRING
4 - INNER RACE

TORQUE CONVERTER CLUTCH (TCC)

The TCC (Fig. 114) was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston with friction material was added to the turbine assembly to provide this mechanical lock-up.

In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed

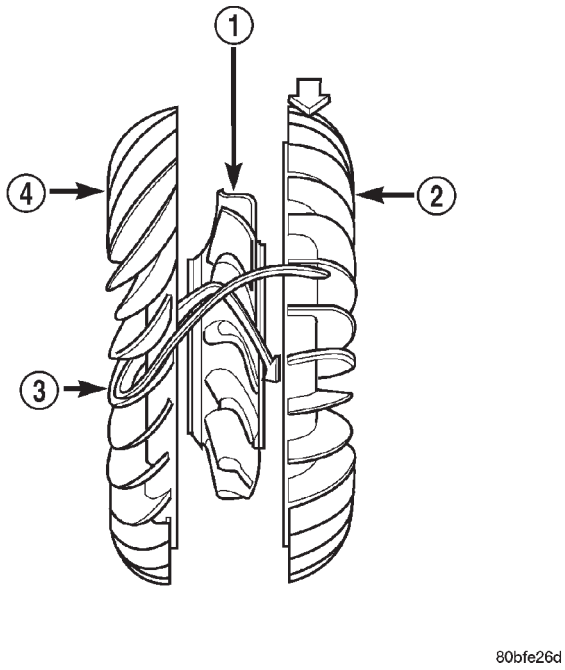


Fig. 113 Stator Location

1 - STATOR
2 - IMPELLER
3 - FLUID FLOW
4 - TURBINE

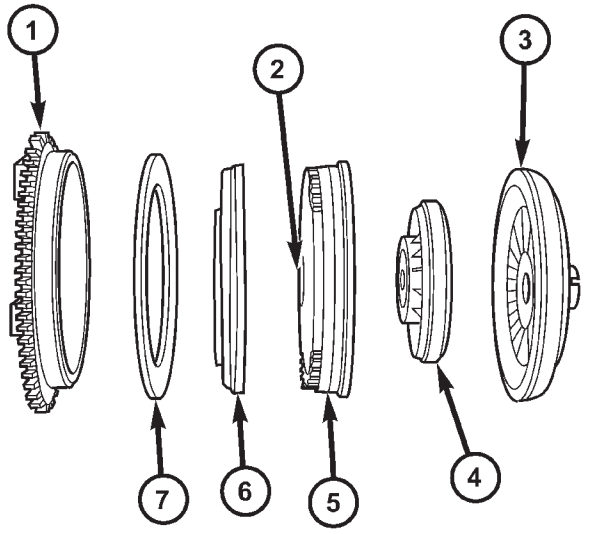


Fig. 114 Torque Converter Clutch (TCC)

1 - IMPELLER FRONT COVER
2 - THRUST WASHER ASSEMBLY
3 - IMPELLER
4 - STATOR
5 - TURBINE
6 - PISTON
7 - FRICTION DISC

TORQUE CONVERTER (Continued)

OPERATION

The converter impeller (Fig. 115) (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft (Fig. 116). Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, fourth, and fifth gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear, and above approximately 72 km/h (45 mph). If the control switch is in the OFF

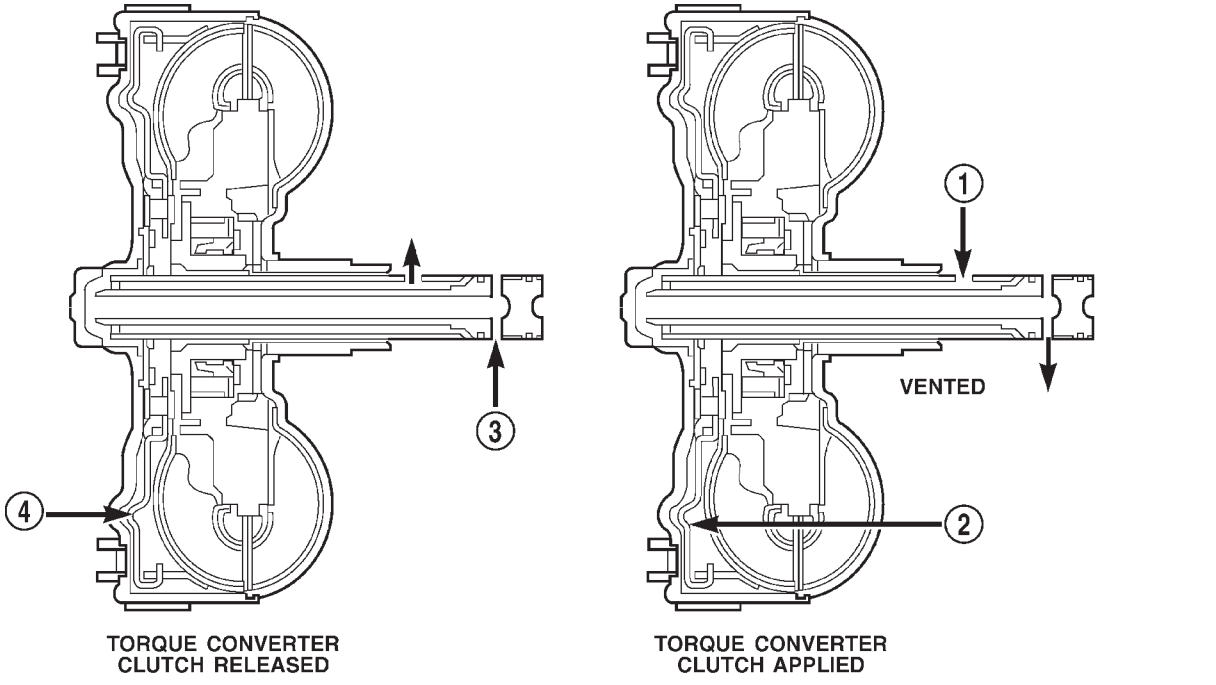


Fig. 115 Torque Converter Fluid Operation - Typical

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TORQUE CONVERTER (Continued)

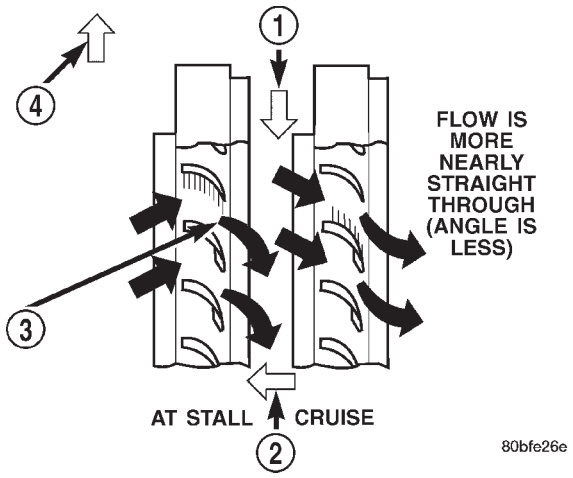


Fig. 116 Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

position, the clutch will engage after the shift to third gear, at approximately 56 km/h (35 mph) at light throttle.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

REMOVAL

(1) Remove transmission and torque converter from vehicle.

(2) Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

(3) Pull the torque converter forward until the center hub clears the oil pump seal.

(4) Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive flats for sharp edges, burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper or crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free from debris. The hub must be smooth to avoid damaging the pump seal at installation.

(1) Lubricate oil pump seal lip with transmission fluid.

(2) Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or converter hub o-ring while inserting torque converter into the front of the transmission.

(3) Align torque converter to oil pump seal opening.

(4) Insert torque converter hub into oil pump.

(5) While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.

(6) Check converter seating with a scale and straightedge (Fig. 117). Surface of converter lugs should be at least 13 mm (1/2 in.) to rear of straightedge when converter is fully seated.

(7) If necessary, temporarily secure converter with C-clamp attached to the converter housing.

TORQUE CONVERTER (Continued)

(8) Install the transmission in the vehicle.
(9) Fill the transmission with the recommended fluid.

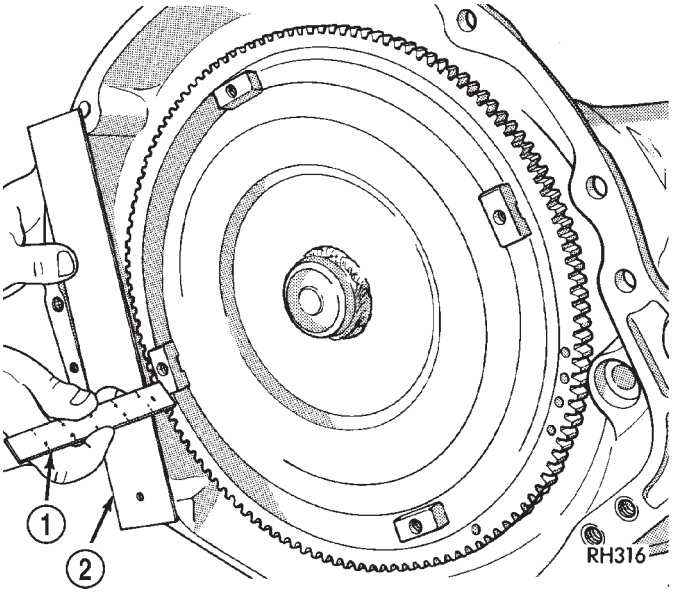


Fig. 117 Checking Torque Converter Seating-Typical

1 - SCALE
2 - STRAIGHTEDGE

TRANSMISSION CONTROL RELAY

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

TRANSMISSION RANGE SENSOR

DESCRIPTION

The Transmission Range Sensor (TRS) is part of the solenoid module, which is mounted to the top of the valve body inside the transmission.

The Transmission Range Sensor (TRS) has five switch contact pins that:

- Determine shift lever position
- Supply ground to the Starter Relay in Park and Neutral only.
- Supply +12 V to the backup lamps in Reverse only.

The TRS also has an integrated temperature sensor (thermistor) that communicates transmission temperature to the TCM and PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

There are many possible combinations of open and closed switches (codes). Seven of these possible codes are related to gear position and five are recognized as “between gear” codes. This results in many codes which should **never occur**. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

GEAR	C5	C4	C3	C2	C1
Park	CL	OP	OP	CL	CL
Temp 1	CL	OP	OP	CL	OP
Reverse	OP	OP	OP	CL	OP
Temp 2	OP	OP	CL	CL	OP
Neutral 1	OP	OP	CL	CL	CL
Neutral 2	OP	CL	CL	CL	CL
Temp 3	OP	CL	CL	CL	OP
Drive	OP	CL	CL	OP	OP
Temp 4	OP	CL	OP	OP	OP
Manual 2	CL	CL	OP	OP	OP
Temp 5	CL	OP	OP	OP	OP
Manual 1	CL	OP	CL	OP	OP

TRANSMISSION SOLENOID/ TRS ASSEMBLY

DESCRIPTION

The transmission solenoid/TRS assembly is internal to the transmission and mounted on the valve body assembly (Fig. 118). The assembly consists of six solenoids that control hydraulic pressure to the six friction elements (transmission clutches), and the torque converter clutch. The pressure control solenoid is located on the side of the solenoid/TRS assembly. The solenoid/TRS assembly also contains five pressure switches that feed information to the TCM.

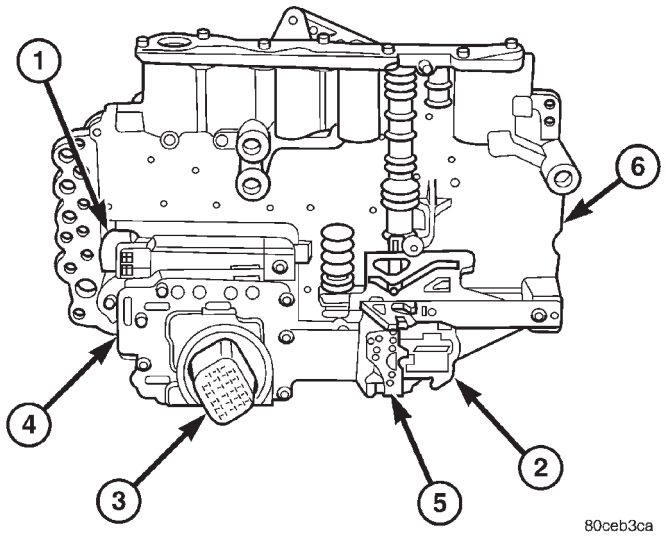


Fig. 118 Transmission Solenoid/TRS Assembly

1 - PRESSURE CONTROL SOLENOID
2 - TRANSMISSION RANGE SELECTOR PLATE
3 - 23-WAY CONNECTOR
4 - SOLENOID PACK
5 - TRANSMISSION RANGE SENSOR
6 - VALVE BODY

OPERATION

SOLENOIDS

Solenoids are used to control the L/R, 2C, 4C, OD, and UD friction elements. The reverse clutch is controlled by line pressure and the position of the manual valve in the valve body. All the solenoids are contained within the Solenoid and Pressure Switch Assembly. The solenoid and pressure switch assembly contains one additional solenoid, Multi-Select (MS), which serves primarily to provide 2nd and 3rd gear limp-in operation.

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid as necessary. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The MS and UD solenoids are normally applied to allow transmission limp-in in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The TCM relies on five pressure switches to monitor fluid pressure in the L/R, 2C, 4C, UD, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The switches close at 23 psi and open at 11 psi, and simply indicate whether or not pressure exists. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following chart:

GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
4TH	OP	OP	CL	OP	CL
5TH	OP	CL	OP	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

TRANSMISSION SOLENOID/TRS ASSEMBLY (Continued)

REMOVAL

(1) Remove the valve body from the transmission (Fig. 119).

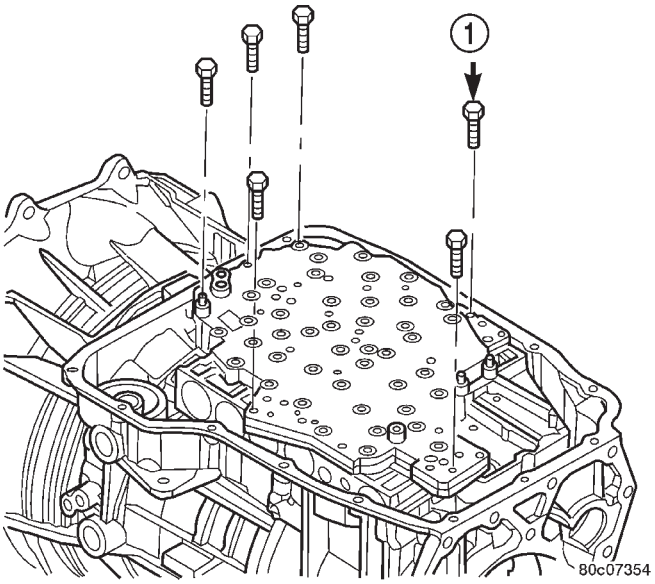


Fig. 119 Valve Body Bolts

1 - VALVE BODY TO CASE BOLT (6)

(2) Remove the screws holding the transmission solenoid/TRS assembly onto the valve body (Fig. 120).

(3) Separate the transmission solenoid/TRS assembly from the valve body.

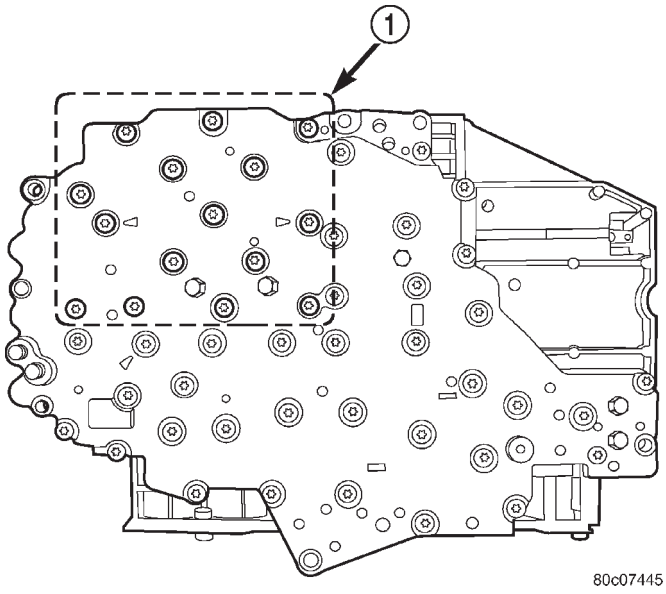


Fig. 120 Ttransmission Solenoid/TRS Assembly Screws

1 - SOLENOID PACK BOLTS (15)

INSTALLATION

(1) Place TRS selector plate in the PARK position.

(2) Position the transmission solenoid/TRS assembly onto the valve body. Be sure that both alignment dowels are fully seated in the valve body and that the TRS switch contacts are properly positioned in the selector plate

(3) Install the screws to hold the transmission solenoid/TRS assembly onto the valve body.

(4) Tighten the solenoid assembly screws adjacent to the arrows cast into the bottom of the valve body first. Tighten the screws to 5.7 N·m (50 in.lbs.).

(5) Tighten the remainder of the solenoid assembly screws to 5.7 N·m (50 in.lbs.).

(6) Install the valve body into the transmission.

TRANSMISSION TEMPERATURE SENSOR

DESCRIPTION

The transmission temperature sensor is a thermistor that is integral to the Transmission Range Sensor (TRS).

OPERATION

The transmission temperature sensor is used by the TCM to sense the temperature of the fluid in the sump. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in.

Calculated Temperature

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

VALVE BODY

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and a transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components (Fig. 121) and (Fig. 122):

- Solenoid switch valve
- Manual valve
- Low/reverse switch valve
- 5 Accumulators
- 7 check balls

OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

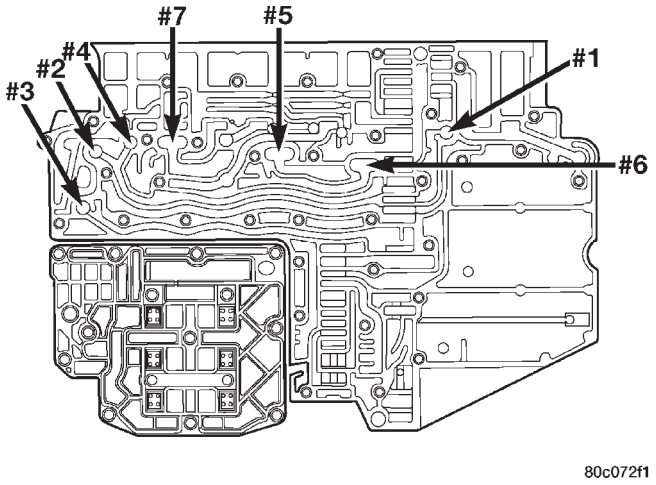


Fig. 122 Check Ball Locations

SOLENOID SWITCH VALVE

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will

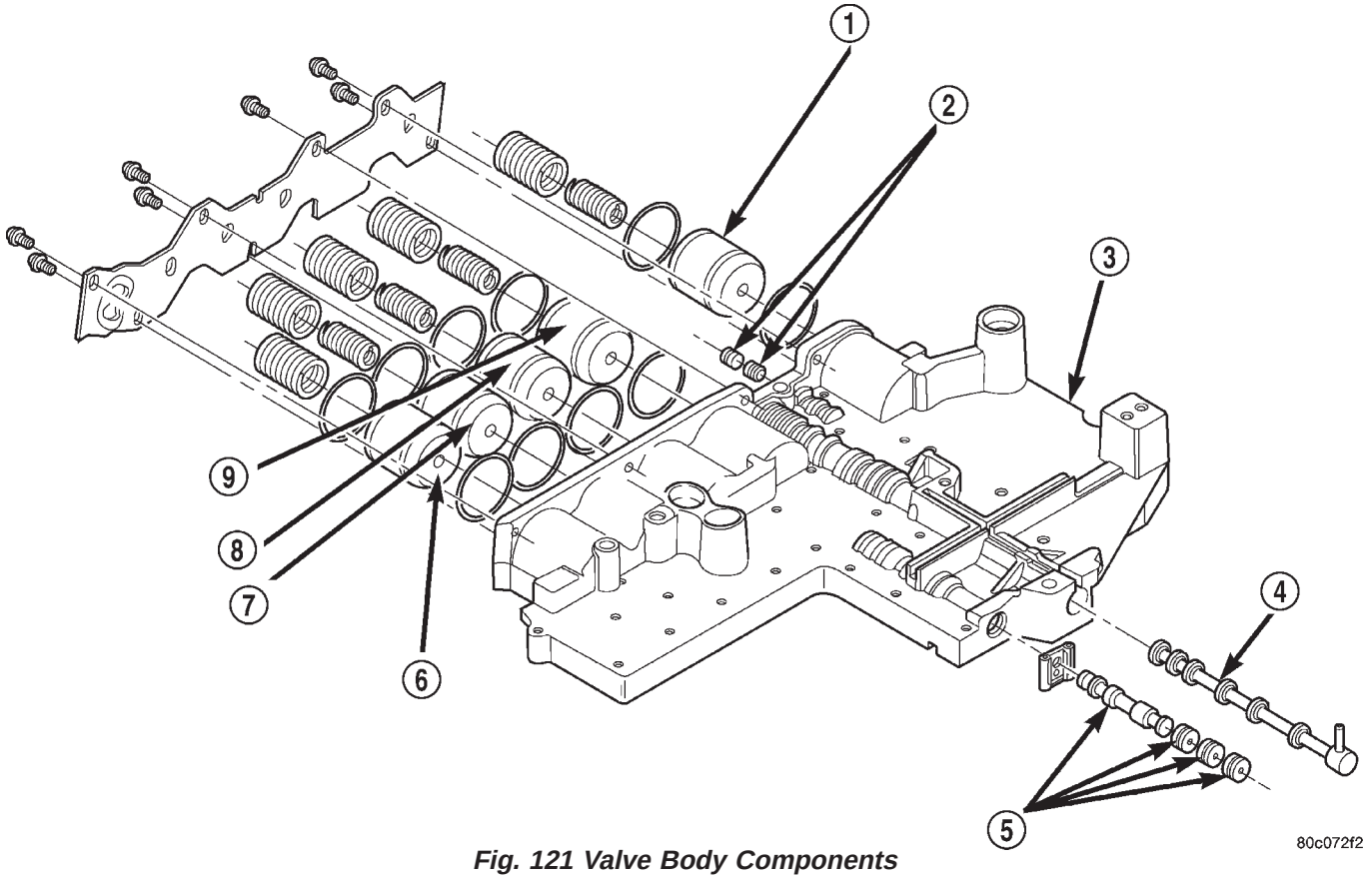


Fig. 121 Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

VALVE BODY (Continued)

be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th, and fifth gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the top of the valve body. The valve is connected mechanically by a cable to the gearshift mechanism. The valve is held in each of its positions by a roller detent spring (Fig. 123) that engages the “roostercomb” of the TRS selector plate.

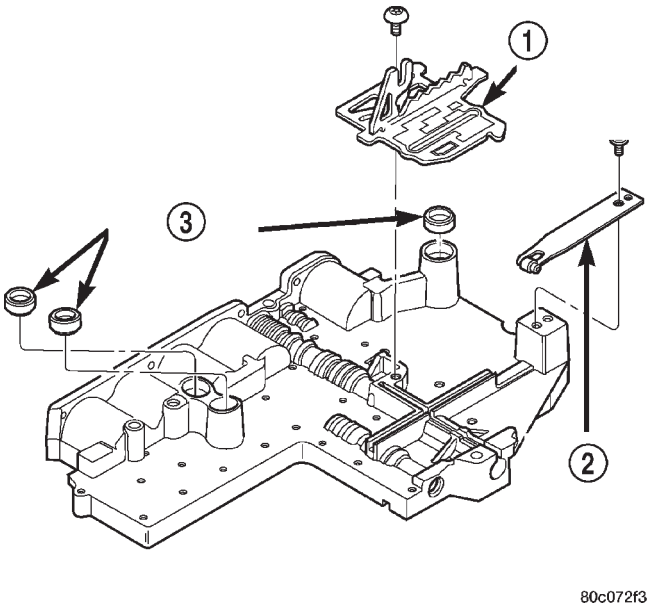


Fig. 123 TRS Selector Plate and Detent Spring

1 - TRS SELECTOR PLATE
2 - DETENT SPRING
3 - CLUTCH PASSAGE SEALS

LOW/REVERSE SWITCH VALVE

The low/reverse switch valve allows the low/reverse clutch to be operated by either the LR/CC solenoid or the MS solenoid.

REMOVAL

The valve body can be removed for service without having to remove the transmission assembly.

The valve body can be disassembled for cleaning and inspection of the individual components. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/VALVE BODY - DISASSEMBLY)

(1) Shift transmission into PARK.
(2) Raise vehicle.
(3) Disconnect wires at the solenoid and pressure switch assembly connector.
(4) Position drain pan under transmission oil pan.
(5) Remove transmission oil pan.
(6) Remove the primary oil filter from valve body. (Fig. 124)

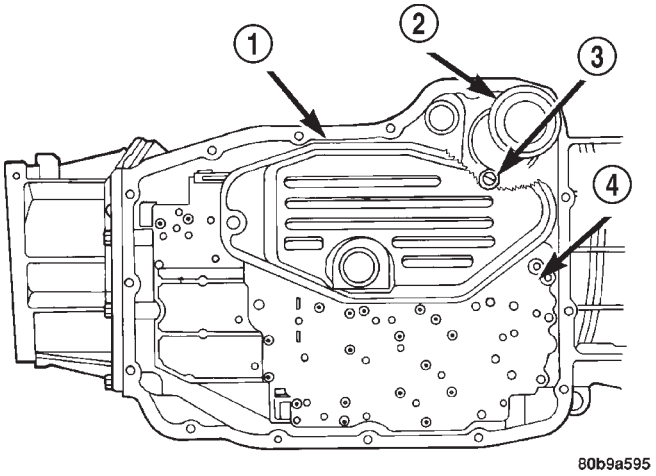


Fig. 124 Remove Primary Oil Filter

1 - PRIMARY OIL FILTER
2 - COOLER RETURN FILTER
3 - COOLER RETURN FILTER BYPASS VALVE
4 - VALVE BODY

VALVE BODY (Continued)

(7) Remove bolts attaching valve body to transmission case (Fig. 125).

(8) Lower the valve body and work the electrical connector out of transmission case.

(9) Separate the valve body from the transmission.

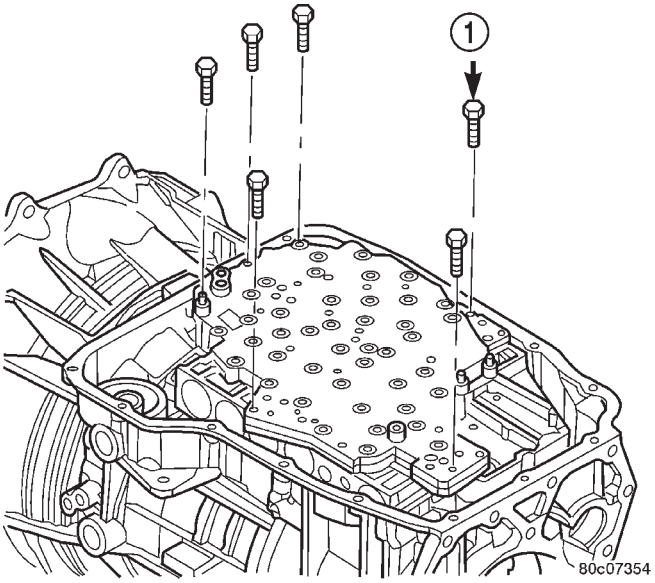


Fig. 125 Valve Body Bolts

1 - VALVE BODY TO CASE BOLT (6)

DISASSEMBLY

(1) Remove the screws holding the solenoid and pressure switch assembly to the valve body (Fig. 126). Do not remove the screws on the top of the solenoid and pressure switch assembly.

(2) Separate the solenoid and pressure switch assembly from the valve body.

(3) Remove the screw holding the detent spring (Fig. 127) onto the valve body.

(4) Remove the detent spring from the valve body.

(5) Remove the TRS selector plate from the valve body and the manual valve.

(6) Remove the clutch passage seals from the valve body, if necessary.

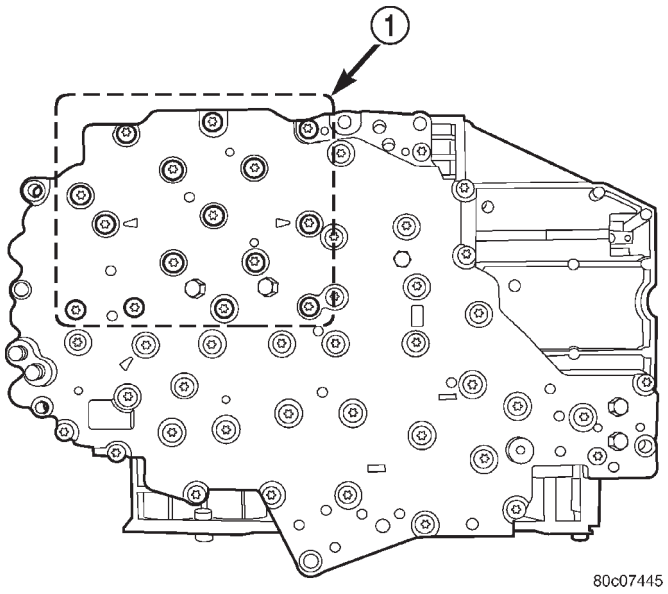


Fig. 126 Solenoid and Pressure Switch Assembly Screws

1 - SOLENOID PACK BOLTS (15)

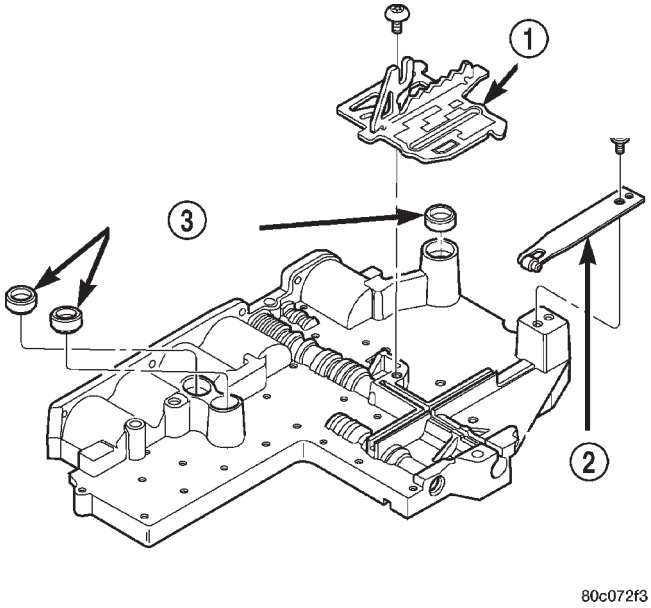


Fig. 127 Valve Body External Components

1 - TRS SELECTOR PLATE
2 - DETENT SPRING
3 - CLUTCH PASSAGE SEALS

VALVE BODY (Continued)

(7) Remove the screws holding the accumulator cover onto the valve body (Fig. 128).

(8) Remove the accumulator springs and pistons from the valve body. Note which accumulator piston and spring belong in each location.

(9) Place the valve body on the bench with the transfer plate upward.

NOTE: The valve body contains seven check balls. The transfer plate must be placed upward to prevent losing the check balls when the transfer plate is removed from the valve body.

(10) Remove the screws holding the valve body to the valve body transfer plate.

(11) Remove the transfer plate from the valve body. Note the location of all check balls (Fig. 129).

(12) Remove the check balls from the valve body.

(13) Remove the retainers securing the solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body and remove the associated valve and spring. Tag each valve and spring combination with location information to aid in assembly. (Fig. 130)

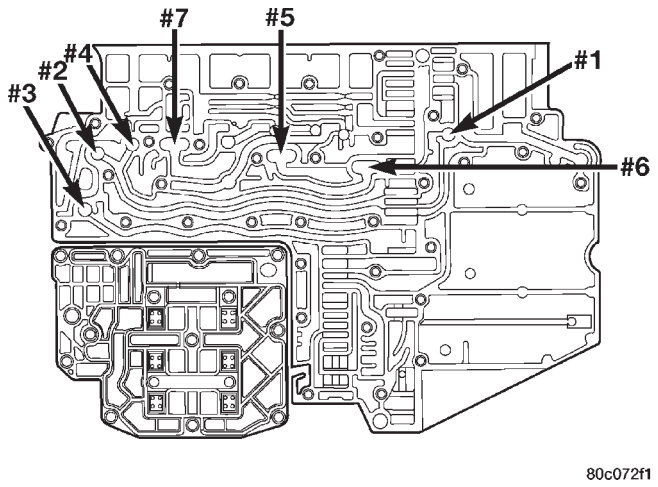


Fig. 129 Check Ball Locations

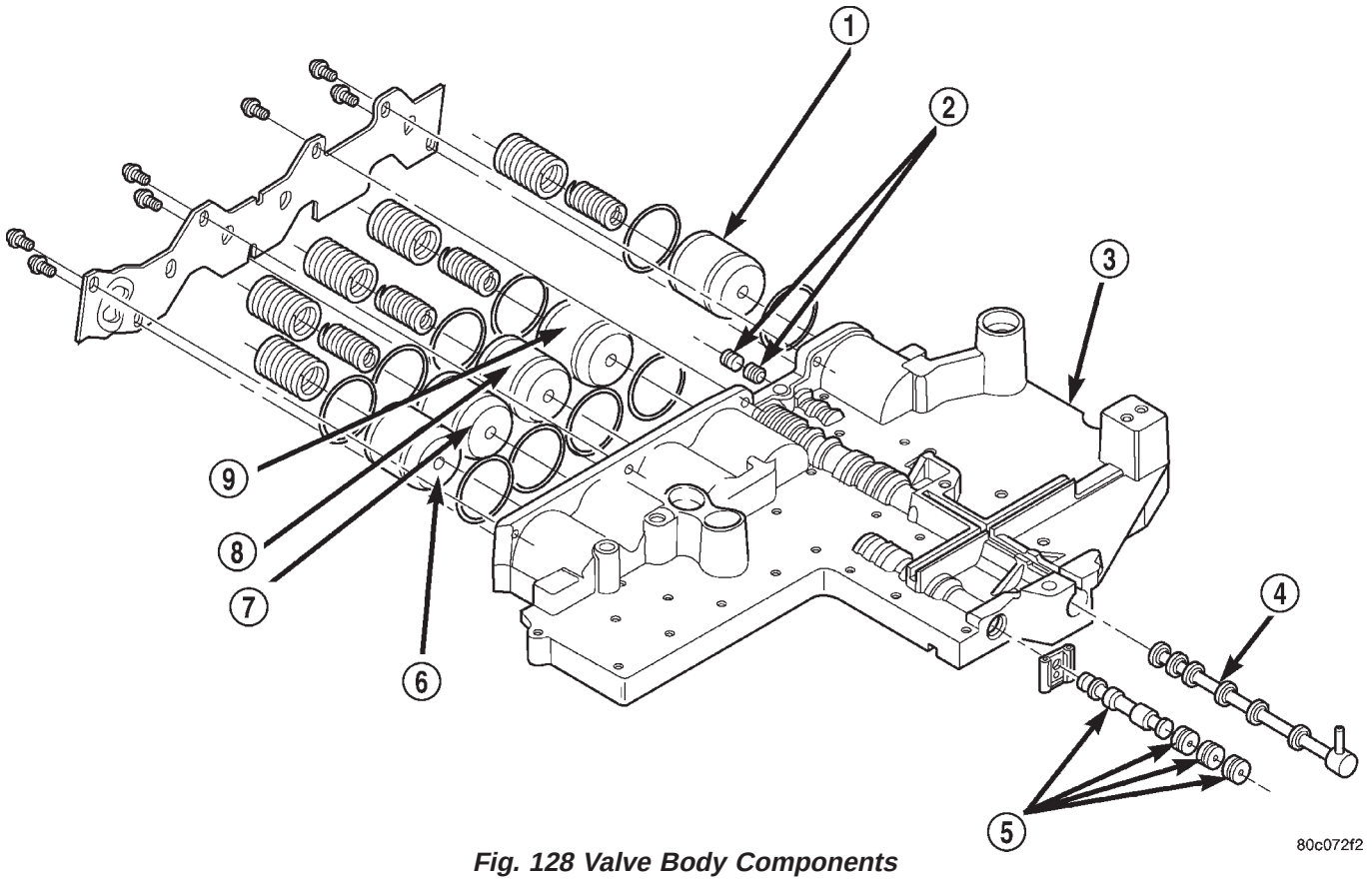


Fig. 128 Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

VALVE BODY (Continued)

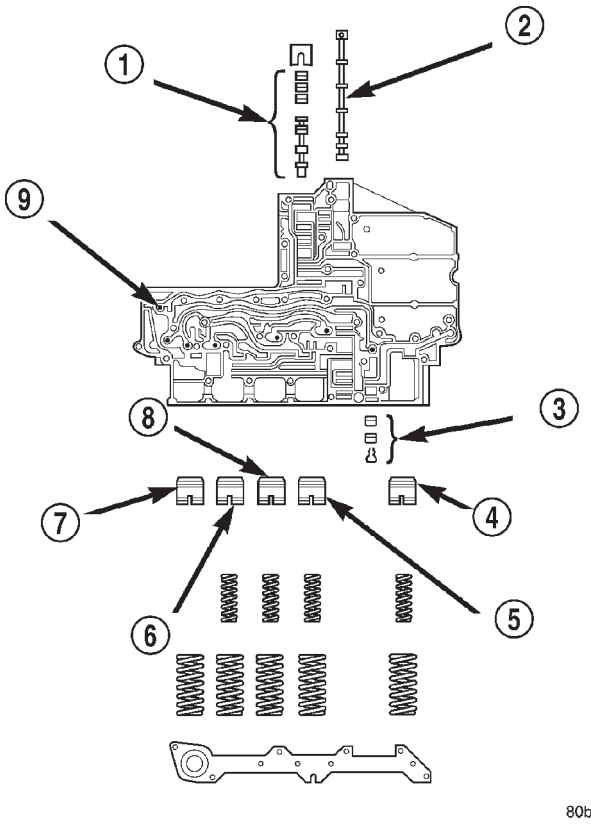


Fig. 130 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

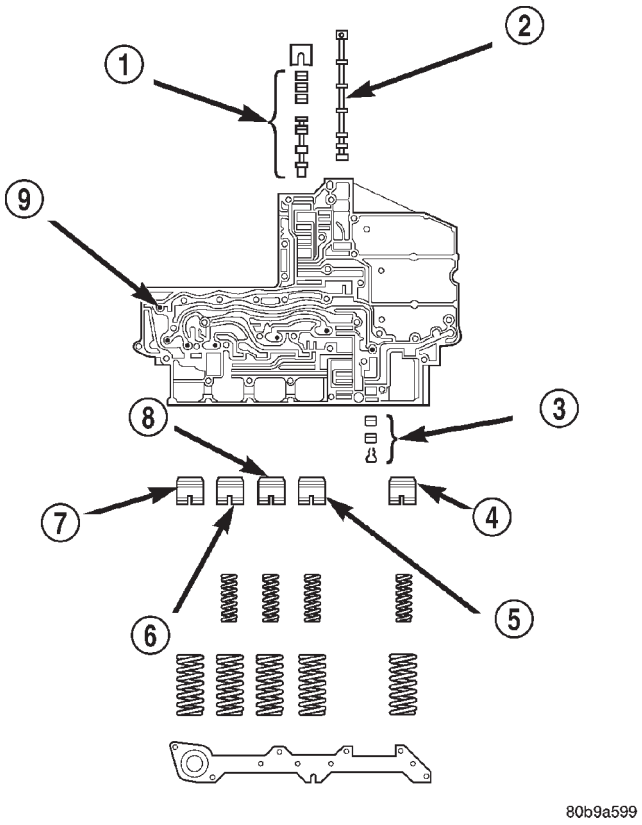


Fig. 131 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution. (Fig. 131)

Do not immerse any of the electrical components in cleaning solution. Clean the electrical components by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

INSPECTION

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straight-edge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

Inspect the valves and plugs (Fig. 132) for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

VALVE BODY (Continued)

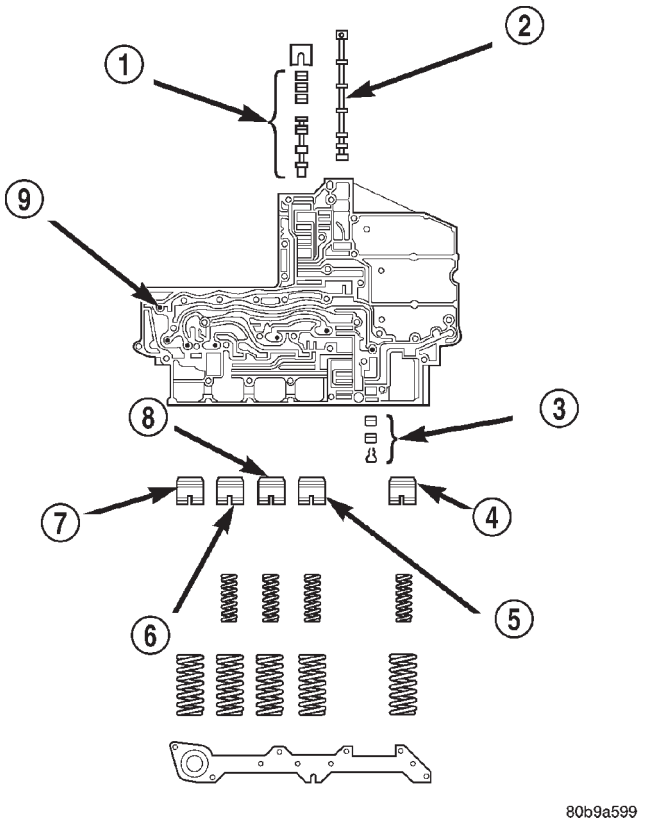


Fig. 132 Valve Body Components

1 - SOLENOID SWITCH VALVE
2 - MANUAL VALVE
3 - LOW REVERSE SWITCH VALVE
4 - LOW REVERSE ACCUMULATOR
5 - 2ND CLUTCH ACCUMULATOR
6 - UNDERDRIVE ACCUMULATOR
7 - OVERDRIVE ACCUMULATOR
8 - 4TH CLUTCH ACCUMULATOR
9 - CHECK BALLS (7)

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

Inspect all the accumulator bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the accumulator springs. The springs must be free of distortion, warpage or broken coils.

Inspect all the fluid seals on the valve body (Fig. 133). Replace any seals that are cracked, distorted, or damaged in any way. These seals pass fluid pressure directly to the clutches. Any pressure leak at these points, may cause transmission performance problems.

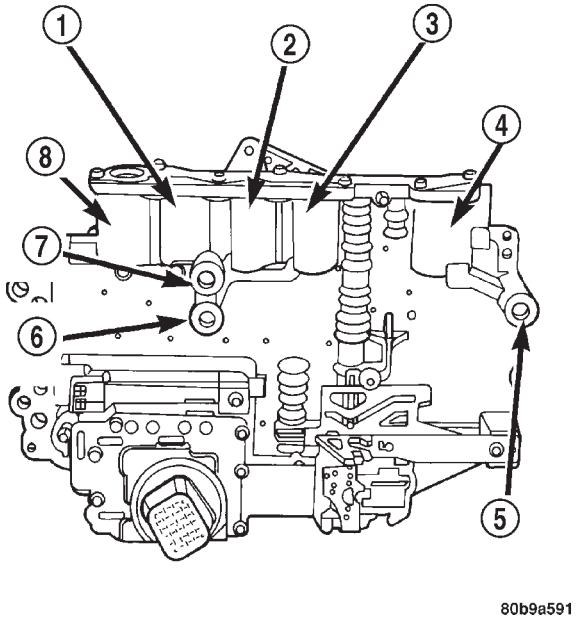


Fig. 133 Valve Body Seals

1 - UNDERDRIVE ACCUMULATOR (2 SPRINGS)
2 - 4TH CLUTCH ACCUMULATOR (2 SPRINGS)
3 - 2ND CLUTCH ACCUMULATOR (2 SPRINGS)
4 - LOW REVERSE ACCUMULATOR (2 SPRINGS)
5 - LOW/REVERSE PASSAGE SEAL
6 - 2ND CLUTCH PASSAGE SEAL
7 - 4TH CLUTCH PASSAGE SEAL
8 - OVERDRIVE ACCUMULATOR (1 SPRING)

ASSEMBLY

(1) Lubricate valves, springs, and the housing valve bores with clean transmission fluid.

(2) Install solenoid switch valve, manual valve, and the low/reverse switch valve into the valve body.

(3) Install the retainers to hold each valve into the valve body.

(4) Install the valve body check balls into their proper locations.

(5) Position the transfer plate onto the valve body.

(6) Install the screws to hold the transfer plate to the valve body. Tighten the screws to 5.6 N·m (50 in. lbs.).

(7) Install the accumulator pistons and springs into the valve body in the location from which they were removed. Note that all accumulators except the overdrive have two springs. The overdrive accumulator piston has only one spring.

VALVE BODY (Continued)

(8) Position the accumulator cover onto the valve body.

(9) Install the screws to hold the accumulator cover onto the valve body. Tighten the screws to 4.5 N·m (40 in. lbs.).

(10) Install the TRS selector plate onto the valve body and the manual valve.

(11) Install the solenoid and pressure switch assembly onto the valve body.

(12) Install the screws to hold the solenoid and pressure switch assembly onto the valve body. Tighten the screws to 5.7 N·m (50 in. lbs.). Tighten the screws adjacent to the arrows cast into the bottom of the transfer plate first.

(13) Position the detent spring onto the valve body.

(14) Install the screw to hold the detent spring onto the valve body. Tighten the screw to 4.5 N·m (40 in. lbs.).

(15) Install new clutch passage seals onto the valve body, if necessary

INSTALLATION

(1) Check condition of seals on valve body and the solenoid and pressure switch assembly. Replace seals if cut or worn.

(2) Place TRS selector plate in the PARK position.

(3) Place the transmission in the PARK position.

(4) Lubricate seal on the solenoid and pressure switch assembly connector with petroleum jelly.

(5) Position valve body in transmission and align the manual lever on the valve body to the pin on the transmission manual shift lever.

(6) Seat valve body in case and install one or two bolts to hold valve body in place.

(7) Tighten valve body bolts alternately and evenly to 12 N·m (105 in. lbs.) torque.

(8) Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

(9) Place replacement filter in position on valve body and into the oil pump.

(10) Install screw to hold filter to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.

(11) Connect the solenoid and pressure switch assembly connector.

(12) Install oil pan. Tighten pan bolts to 12 N·m (105 in. lbs.) torque.

(13) Lower vehicle and fill transmission with Mopar® ATF +4, type 9602, fluid.

(14) Check and adjust gearshift cable, if necessary.

TRANSFER CASE - NV242

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TRANSFER CASE - NV242

DESCRIPTION

The NV242 is a full transfer case (Fig. 1). It provides full time 2-wheel, or 4-wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

TRANSFER CASE IDENTIFICATION

Two versions of the NV242 are used in the WJ vehicles, NV242LD and NV242HD. The two transfer cases can be distinguished from one another by the rear output shaft retainer. The NV242LD uses a rubber boot to cover the rear output shaft, while the NV242HD uses a cast aluminum housing. Other than this difference, the two transfer cases are serviced the same.

A circular ID tag is attached to the rear case of each transfer case (Fig. 2). The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

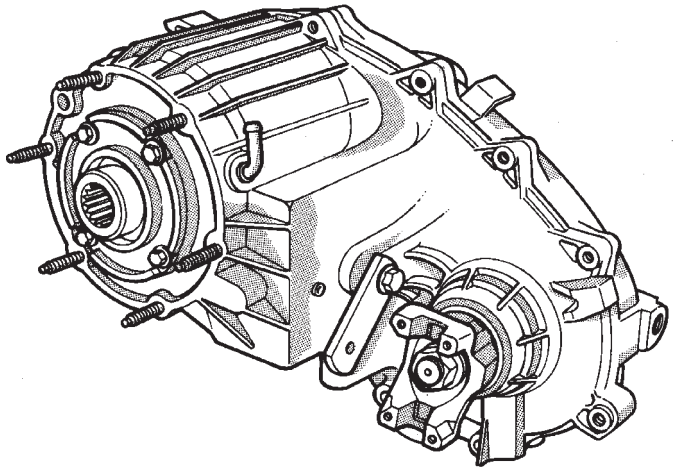


Fig. 1 NV242 Transfer Case

The transfer case serial number also represents the date of build.

SHIFT MECHANISM

Operating ranges are selected with a lever in the floor mounted shifter assembly. The shift lever is connected to the transfer case range lever by an adjustable cable. A straight line shift pattern is used. Range positions are marked on the shifter bezel.

TRANSFER CASE - NV242 (Continued)

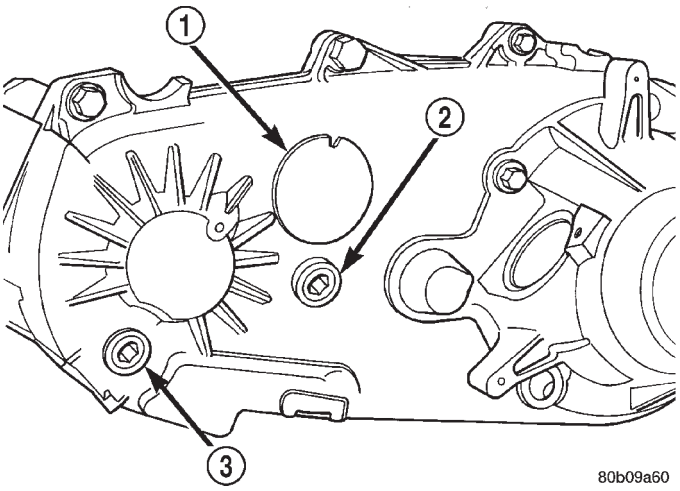


Fig. 2 Fill/Drain Plug And I.D. Tag Locations

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

OPERATION

The input gear is splined to the transmission output shaft. It drives the mainshaft through the planetary gear and range hub. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchro mechanism for shifting.

OPERATING RANGES

NV242 operating ranges are 2WD (2-wheel drive), 4x4 part-time, 4x4 full time, and 4 Lo.

The 2WD and 4x4 full time ranges can be used at any time and on any road surface.

The 4x4 part-time and 4 Lo ranges are for off road use only. The only time these ranges can be used on hard surface roads, is when the surface is covered with snow and ice.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV242

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case shift linkage binding.	1) Repair or replace linkage as necessary.
	2) Insufficient or incorrect lubricant.	2) Drain and refill transfer case with the correct type and quantity of lubricant.
	3) Internal transfer case components binding, worn, or damaged.	3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct type and quantity of lubricant.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Transfer case will not shift through 4X4 part time range (light remains on)	1) Incomplete shift due to drivetrain torque load.	1) Momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive Tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

TRANSFER CASE - NV242 (Continued)

REMOVAL

(1) Shift transfer case into NEUTRAL.
(2) Raise vehicle.
(3) Remove transfer case drain plug and drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember and skid plate, if equipped (Fig. 3).

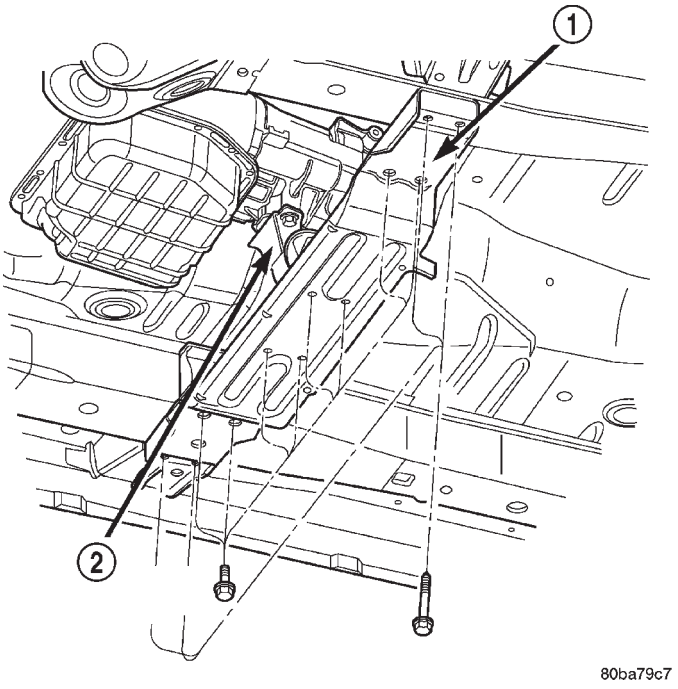


Fig. 3 Crossmember Removal

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

(7) Disconnect front/rear propeller shafts at transfer case. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
(8) Disconnect transfer case cable from range lever.
(9) Disconnect transfer case vent hose (Fig. 4) and transfer case position sensor.
(10) Support transfer case with transmission jack.
(11) Secure transfer case to jack with chains.
(12) Remove nuts attaching transfer case to transmission.
(13) Pull transfer case and jack rearward to disengage transfer case.
(14) Remove transfer case from under vehicle.

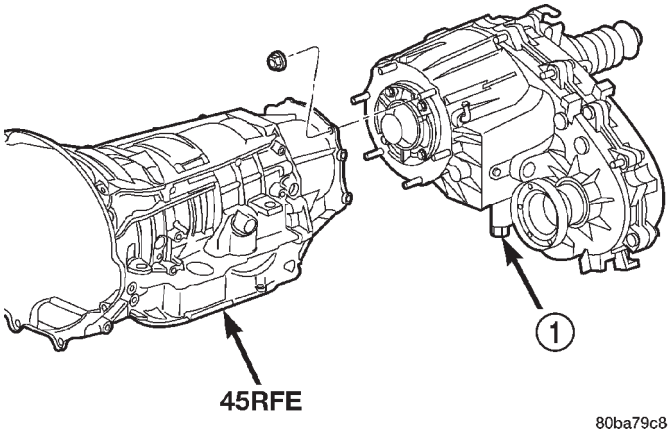


Fig. 4 Transfer Case Mounting

1 - NV242 TRANSFER CASE

DISASSEMBLY

REAR RETAINER - NV242LD

(1) Remove output shaft boot. Spread band clamp that secures boot on slinger with a suitable awl. Then slide boot off shaft (Fig. 5).

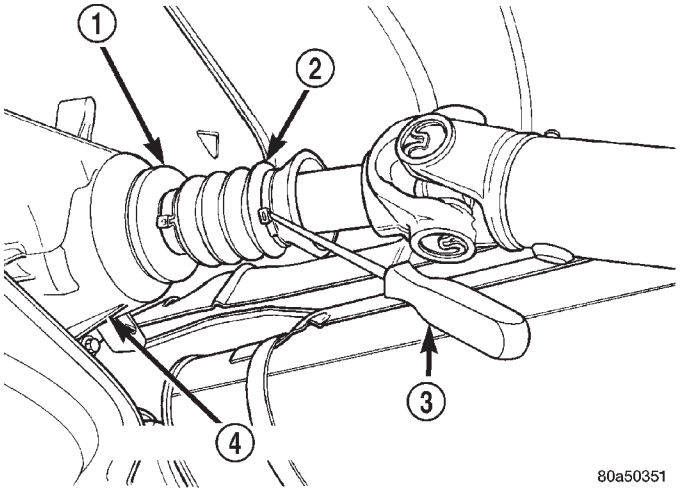


Fig. 5 Output Boot - Typical

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

(2) Using puller MD-998056-A, remove rear slinger (Fig. 6).

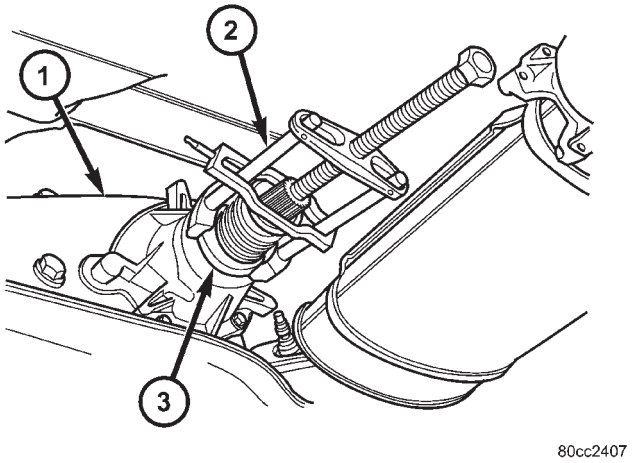


Fig. 6 Rear Slinger Removal

1 - TRANSFER CASE
2 - SPECIAL TOOL MD998056-A
3 - SLINGER

(3) Remove rear seal from retainer (Fig. 7). Use pry tool, or collapse seal with punch to remove it.

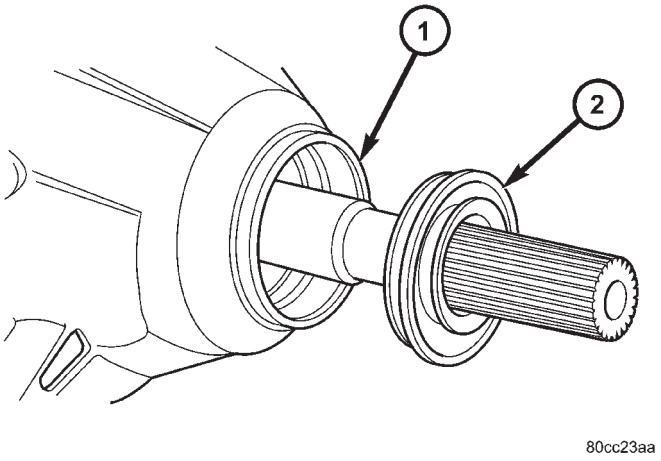


Fig. 7 Rear Retainer Seal

1 - REAR RETAINER
2 - OUTPUT SHAFT SEAL

(4) Remove rear output bearing I.D. retaining ring (Fig. 8).

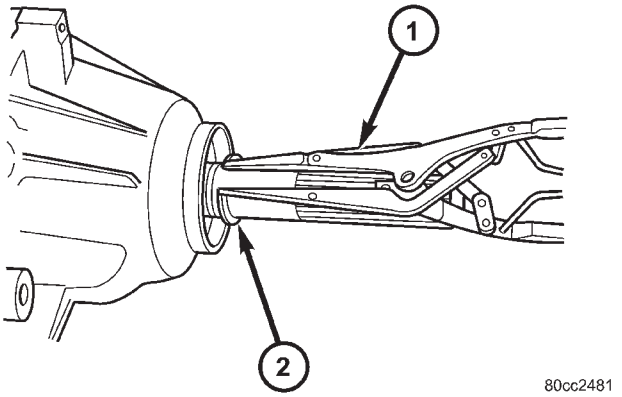


Fig. 8 Output Shaft Rear Bearing Retaining Ring

1 - SNAP-RING PLIERS
2 - RETAINING RING

(5) Remove rear retainer bolts.

(6) Remove rear retainer. Tap retainer with mallet and pry upward to break sealer bead. Then slide retainer off case and output shaft (Fig. 9).

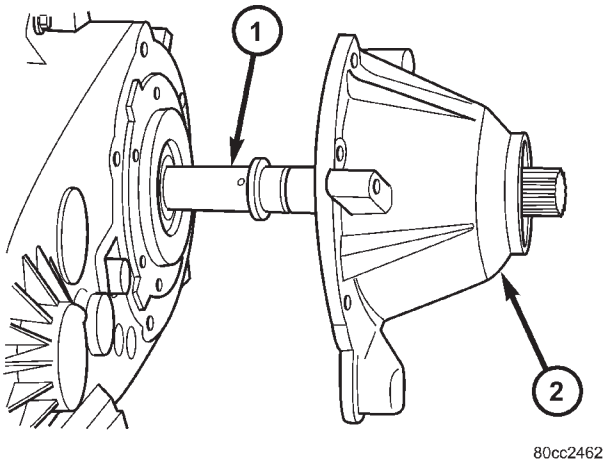


Fig. 9 Rear Retainer Removal

1 - MAINSHAFT
2 - REAR RETAINER

TRANSFER CASE - NV242 (Continued)

REAR RETAINER - NV242HD

(1) Remove extension housing bolts.

(2) Tap extension housing with plastic or rawhide mallet to loosen sealer (Fig. 10).

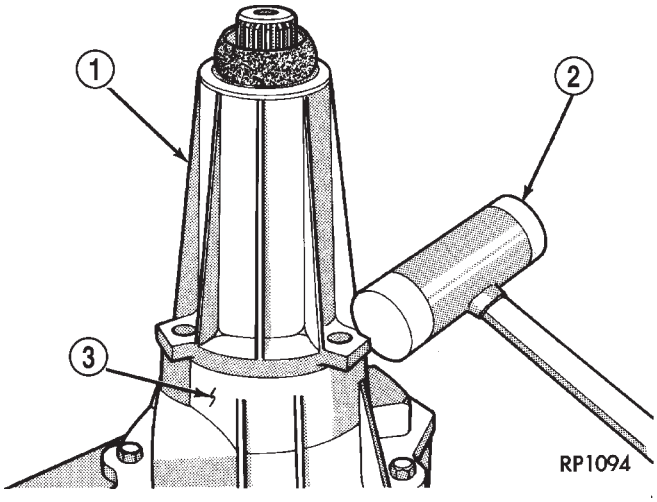


Fig. 10 Remove Extension Housing

1 - EXTENSION HOUSING
2 - PLASTIC HAMMER
3 - REAR RETAINER

(3) Separate extension housing from rear retainer.

(4) Remove rear bearing snap-ring (Fig. 11).

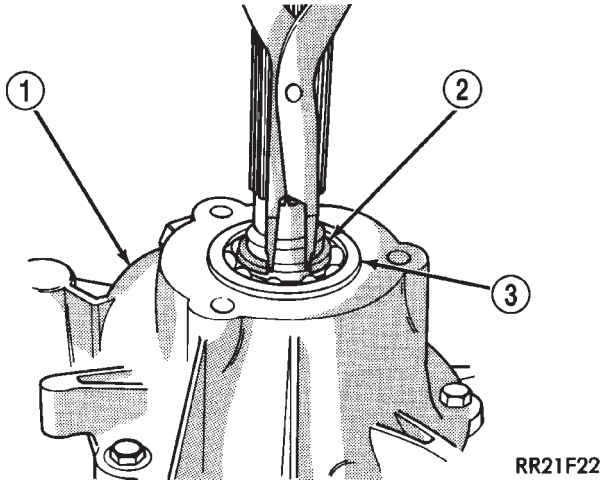


Fig. 11 Remove the Output Bearing Snap-ring

1 - REAR RETAINER
2 - SNAP-RING
3 - REAR BEARING

(5) Remove bolts holding rear retainer to rear case half.

(6) Loosen rear retainer with pry tool to break sealer bead. Pry only against retainer boss as shown (Fig. 12).

(7) Slide retainer off case and output shaft (Fig. 13).

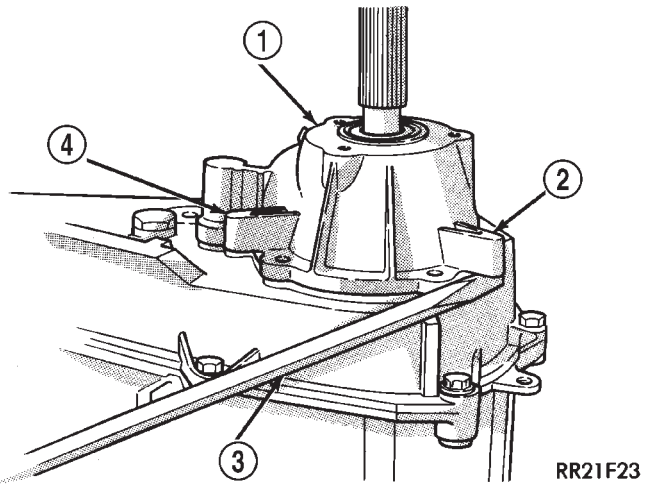


Fig. 12 Loosening Rear Retainer

1 - REAR RETAINER
2 - TAB (2)
3 - SCREWDRIVER
4 - TAB

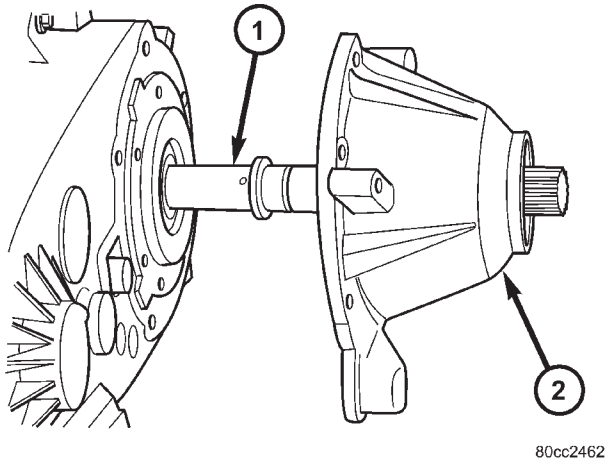


Fig. 13 Rear Retainer Removal

1 - MAINSHAFT
2 - REAR RETAINER

OIL PUMP AND REAR CASE HALF

(1) Remove rear bearing O.D. retaining ring with snap ring pliers. Then tilt pump and slide it off output shaft (Fig. 14)

(2) Remove pickup tube O-ring from pump (Fig. 15) but do not disassemble pump; it is not a repairable part.

(3) Remove seal from oil pump with pry tool.

(4) Remove bolts attaching rear case to front case (Fig. 16). Note position of the two black finish bolts at each end of the case. These bolts go through the case dowels and require a washer under the bolt head.

TRANSFER CASE - NV242 (Continued)

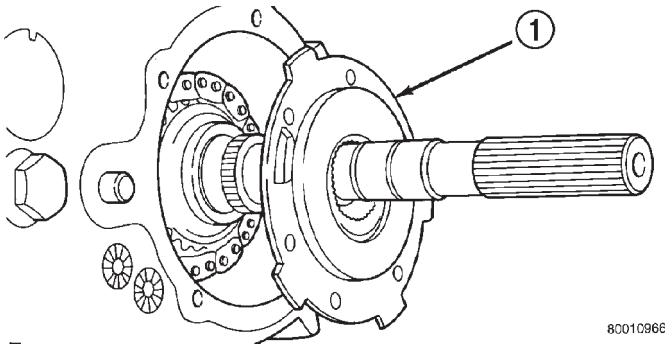


Fig. 14 Oil Pump Removal

1 - OIL PUMP

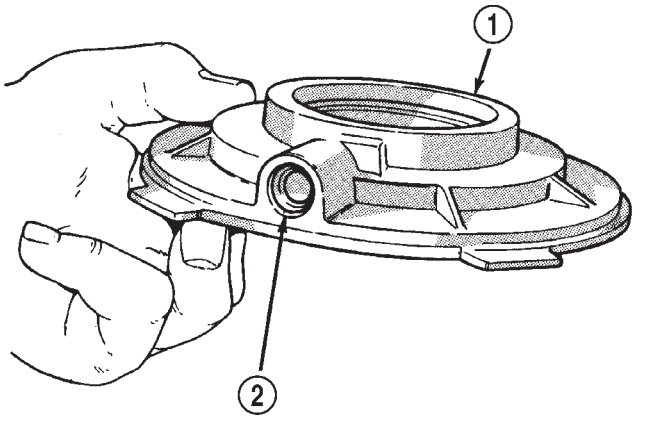


Fig. 15 Pickup Tube O-Ring Location

1 - OIL PUMP
2 - O-RING

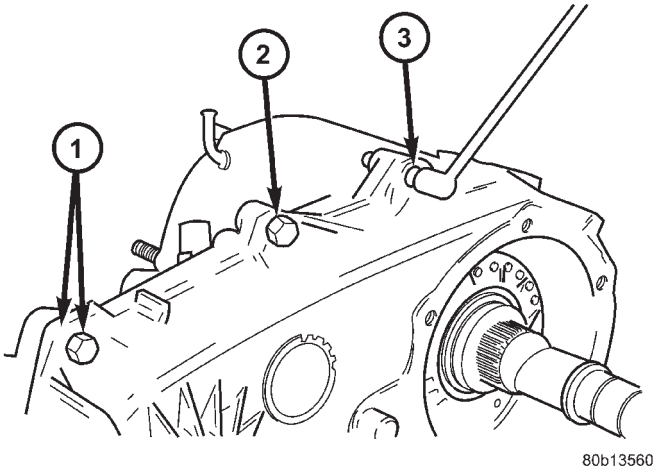


Fig. 16 Spline And Dowel Bolt Locations

1 - DOWEL BOLT AND WASHER (2)
2 - CASE BOLTS
3 - SPLINE HEAD BOLT (1)

(5) Remove rear case from front case (Fig. 17). Insert screwdrivers into slots cast into each end of case. Then pry upward to break sealer bead and remove rear case.

CAUTION: Do not pry on the sealing surface of either case half as the surfaces will become damaged.

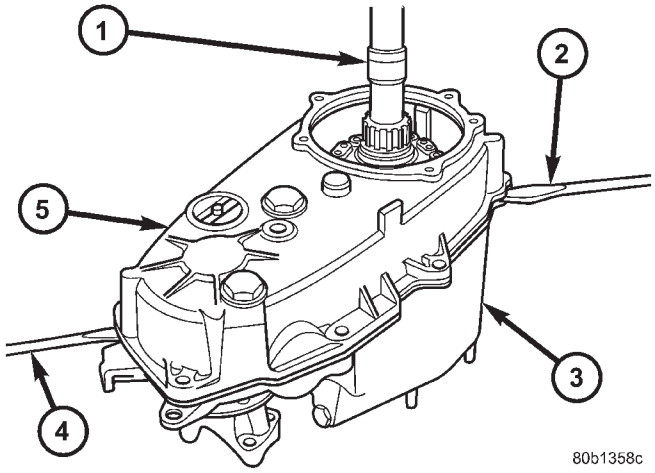


Fig. 17 Loosening/Removing Rear Case

1 - MAINSHAFT
2 - SCREWDRIVER
3 - FRONT CASE
4 - SCREWDRIVER
5 - REAR CASE

(6) Remove oil pickup tube and screen from rear case (Fig. 18).

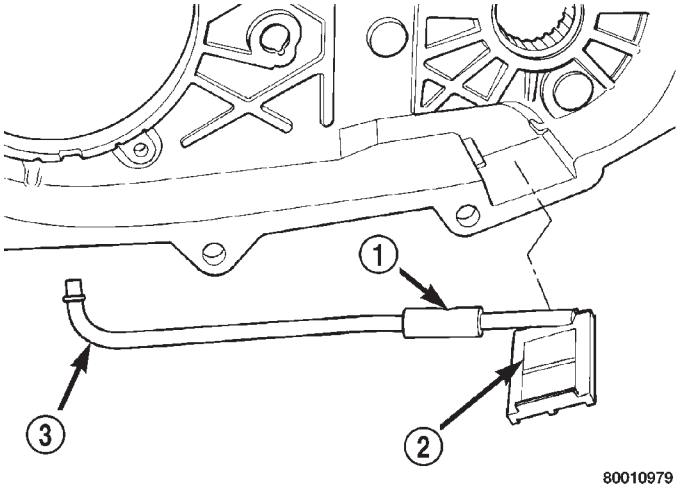


Fig. 18 Oil Pickup Screen, Hose And Tube Removal

1 - CONNECTING HOSE
2 - PICKUP SCREEN
3 - PICKUP TUBE

TRANSFER CASE - NV242 (Continued)

COMPANION FLANGE AND RANGE LEVER

(1) Remove transfer case position sensor (Fig. 19).

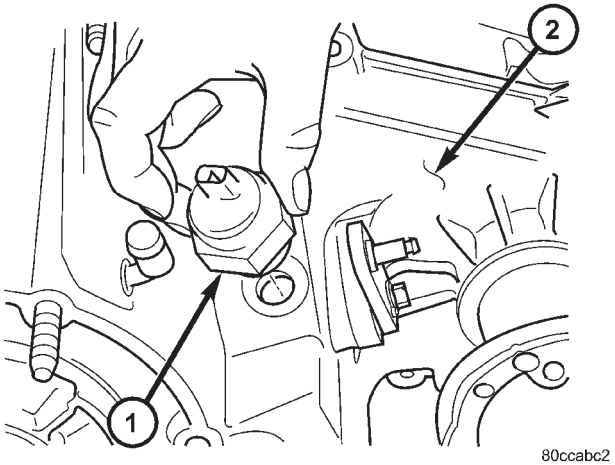


Fig. 19 Remove Transfer Case Position Sensor

1 - TRANSFER CASE POSITION SENSOR
2 - TRANSFER CASE

(2) Install two bolts (Fig. 20) partially into the propellor shaft companion flange, 180° from each other.

(3) Install the rectangular end of the Flange Holder C-3281 over the bolts to hold the companion flange stationary and remove the nut holding the companion flange to the output shaft.

(4) Use Remover C-452 (Fig. 21) to remove the companion flange.

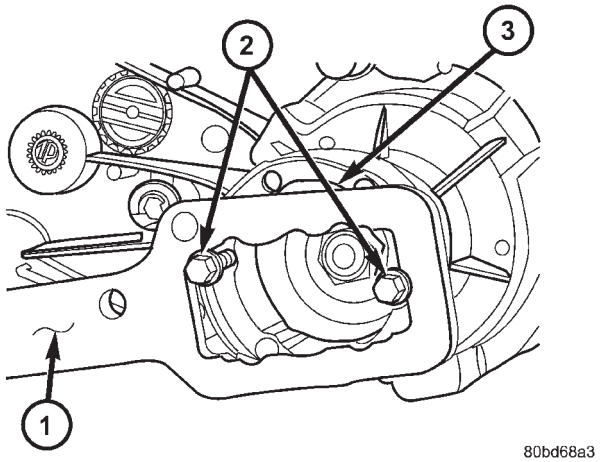


Fig. 20 Hold Companion Flange - Typical

1 - HOLDER C-3281
2 - BOLTS
3 - COMPANION FLANGE

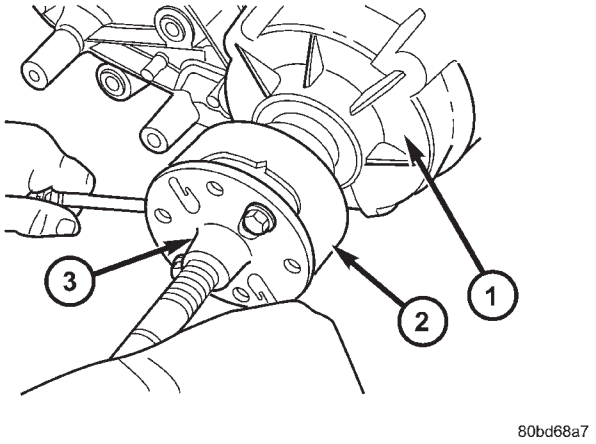


Fig. 21 Remove Companion Flange - Typical

1 - TRANSFER CASE
2 - COMPANION FLANGE
3 - REMOVER C-452

(5) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(6) Remove the bolt (Fig. 22) that attaches the range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft.

NOTE: Be sure to note the orientation of the range lever (lever up or down) so that it may be re-installed in the same direction.

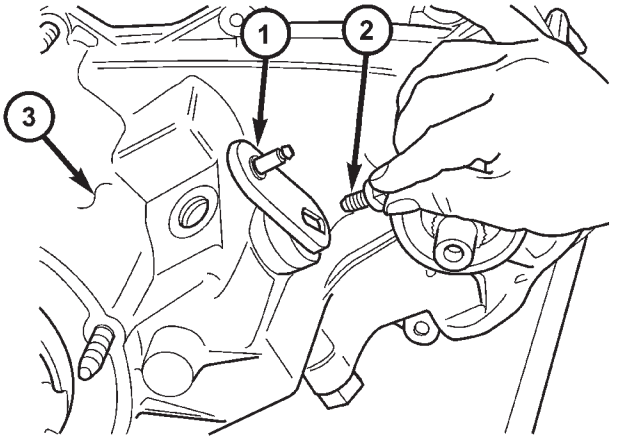


Fig. 22 Remove Shift Lever Bolt - Typical

1 - RANGE LEVER
2 - RANGE LEVER BOLT
3 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Remove drive sprocket snap-ring (Fig. 23).

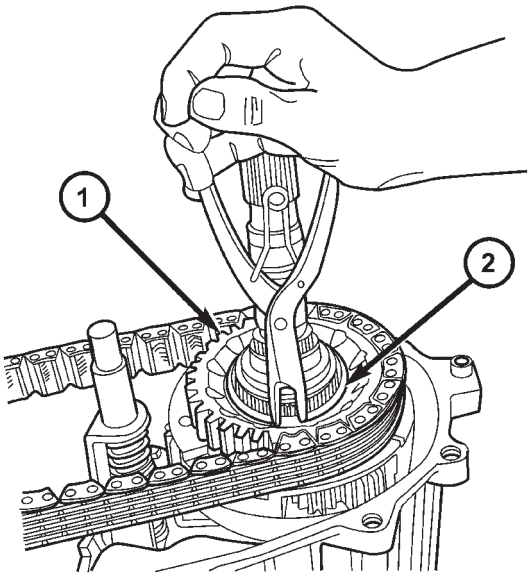


Fig. 23 Drive Sprocket Snap-Ring Removal

1 - DRIVE SPROCKET
2 - DRIVE SPROCKET SNAP-RING

(2) Remove drive sprocket and chain (Fig. 24).
(3) Remove front output shaft (Fig. 25).

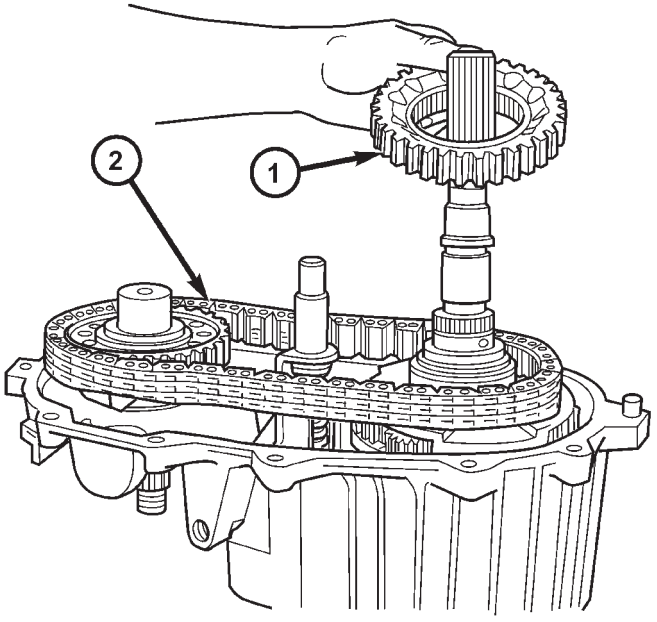


Fig. 24 Drive Sprocket And Chain Removal

1 - DRIVE SPROCKET
2 - DRIVE CHAIN

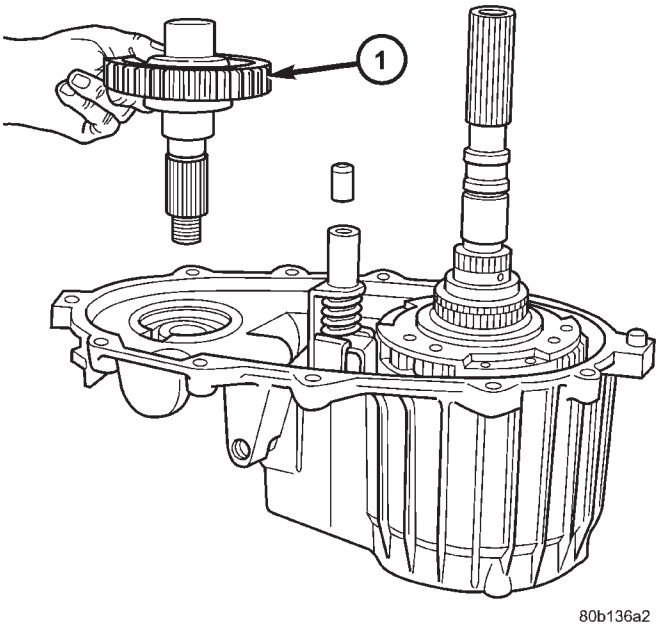


Fig. 25 Removing Front Output Shaft

1 - FRONT OUTPUT SHAFT

SHIFT FORKS AND MAINSHAFT

(1) Remove shift detent plug, spring and pin (Fig. 26).

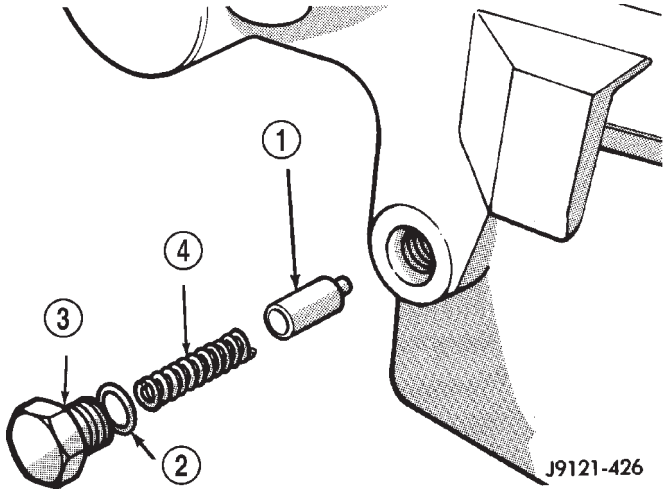


Fig. 26 Detent Component Removal

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

TRANSFER CASE - NV242 (Continued)

(2) Remove seal plug from low range fork lockpin access hole. Then move shift sector to align low range fork lockpin with access hole.

(3) Remove range fork lockpin with size number one easy-out tool as follows:

(a) Insert easy-out tool through access hole in side of transfer case and into lock-pin.

(b) Tap easy-out tool into lock-pin with hammer until tool is securely engaged into the lock-pin.

(c) Install a t-handle, such as from a tap and die set, onto the easy-out tool.

(d) Securely tighten the t-handle onto the tool.

(e) In one motion, pull upward and turn the t-handle counter-clockwise to remove the lock-pin.

(4) Remove shift rail by pulling it straight up and out of fork (Fig. 27).

(5) Remove mode fork and mainshaft as assembly (Fig. 28).

(6) Remove mode shift sleeve and mode fork assembly from mainshaft (Fig. 29). Note position of mode sleeve in fork and remove sleeve.

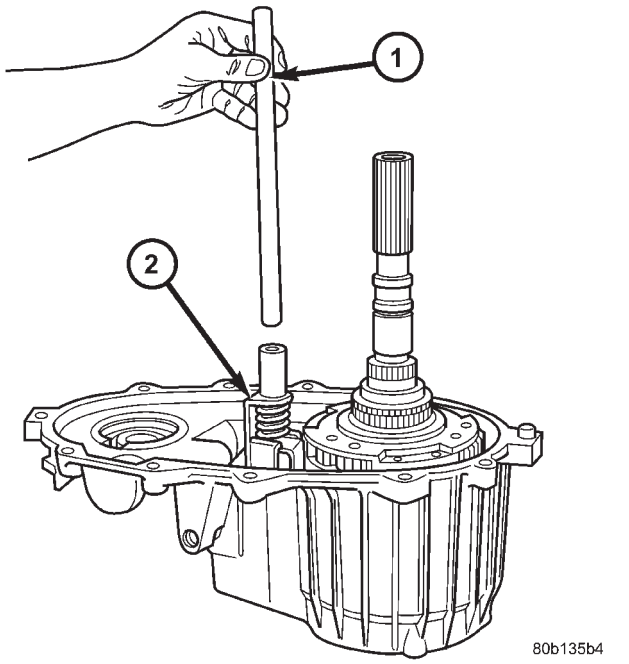


Fig. 27 Shift Rail Removal

1 - SHIFT RAIL
2 - MODE FORK

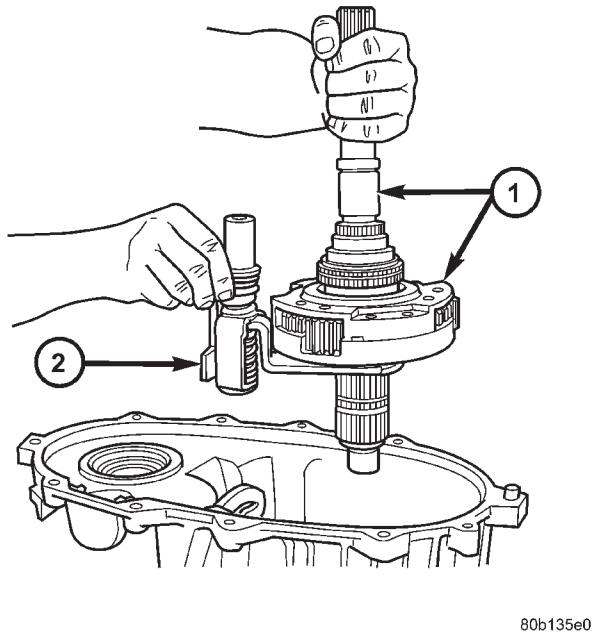


Fig. 28 Mainshaft And Mode Fork Removal

1 - MAINSHAFT ASSEMBLY
2 - MODE FORK

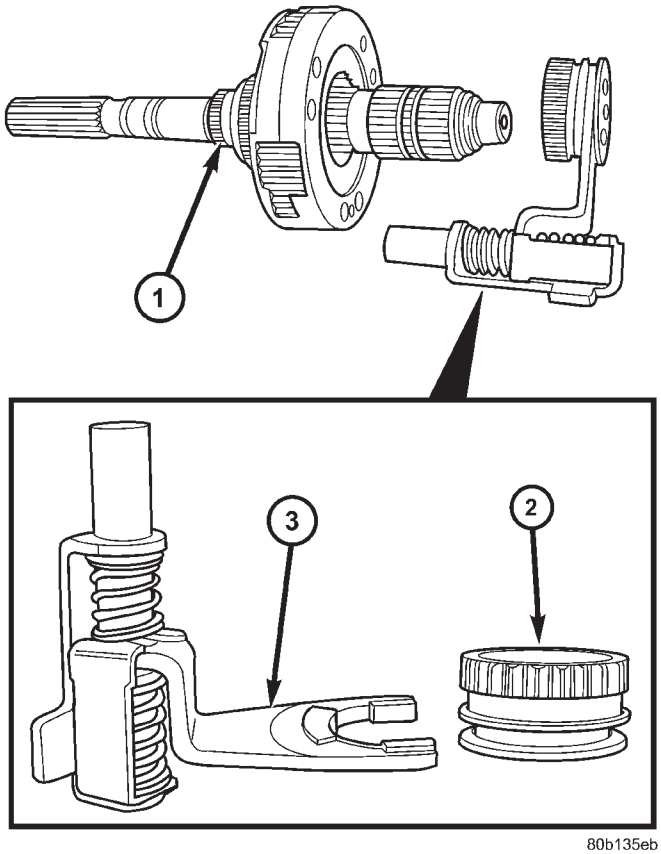


Fig. 29 Separate Mode Fork And Sleeve

1 - MAINSHAFT
2 - MODE SLEEVE
3 - MODE FORK ASSEMBLY

TRANSFER CASE - NV242 (Continued)

(7) Remove intermediate clutch shaft snap-ring (Fig. 30).
(8) Remove clutch shaft thrust ring (Fig. 31).
(9) Remove intermediate clutch shaft (Fig. 32).

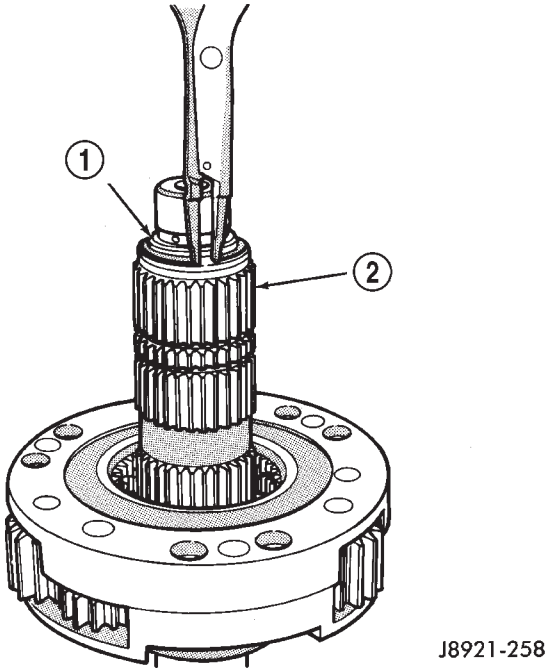


Fig. 30 Intermediate Clutch Shaft Snap-Ring Removal

1 - SNAP-RING
2 - INTERMEDIATE CLUTCH SHAFT

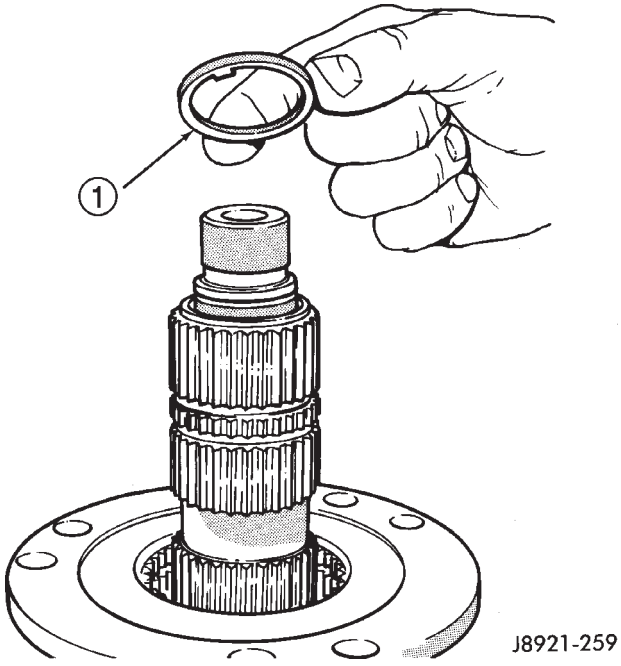


Fig. 31 Clutch Shaft Thrust Ring Removal

1 - CLUTCH SHAFT THRUST RING

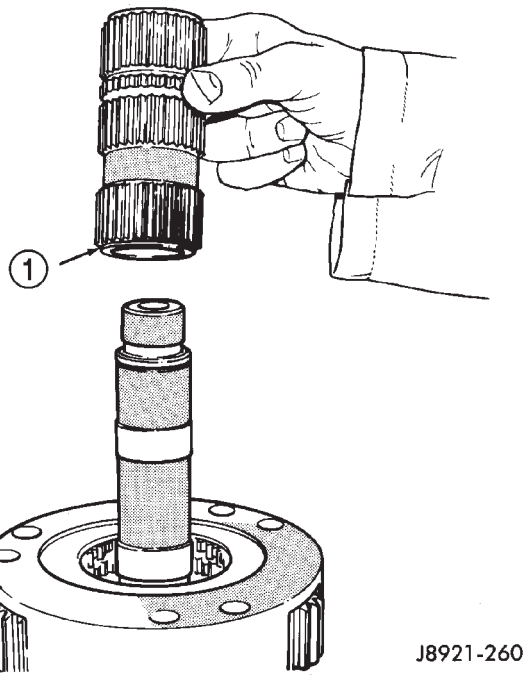


Fig. 32 Intermediate Clutch Shaft Removal

1 - INTERMEDIATE CLUTCH SHAFT

(10) Remove differential snap-ring (Fig. 33).
(11) Remove differential (Fig. 34).
(12) Remove differential needle bearings and both needle bearing thrust washers from mainshaft.

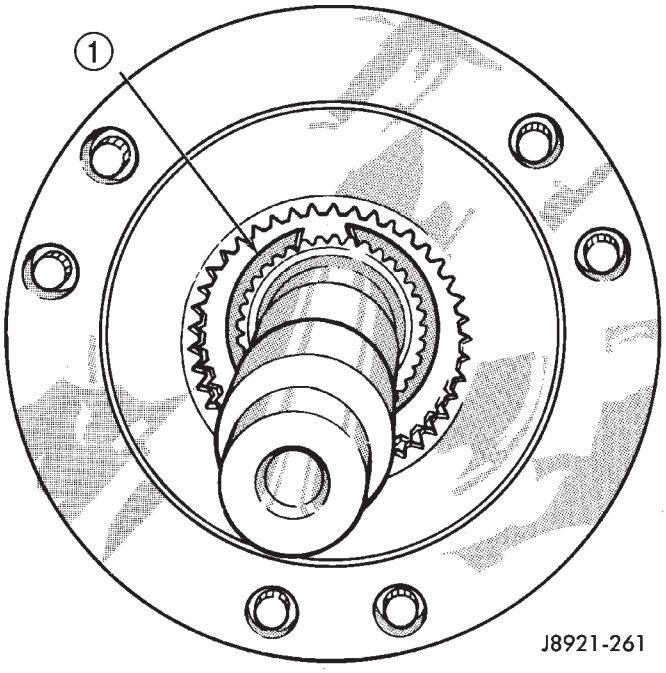


Fig. 33 Differential Snap-Ring Removal

1 - DIFFERENTIAL SNAP-RING

TRANSFER CASE - NV242 (Continued)

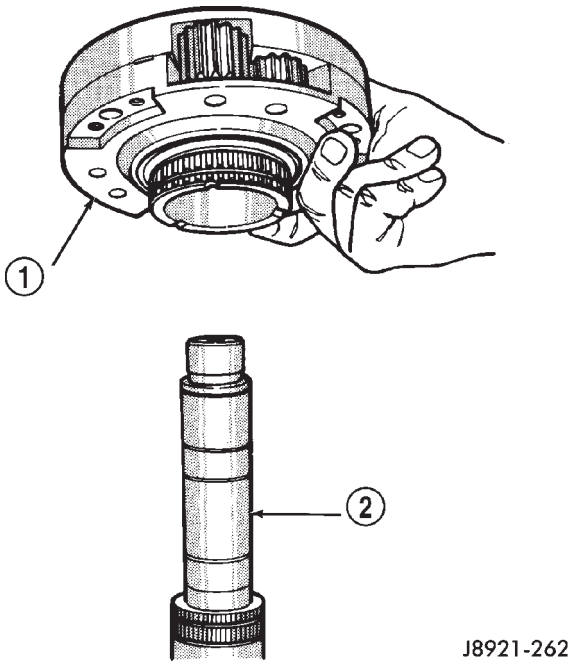


Fig. 34 Differential Removal

1 - DIFFERENTIAL
2 - MAINSHAFT

(13) Slide low range fork pin out of shift sector slot.
(14) Remove low range fork and sleeve (Fig. 35).
(15) Remove shift sector.

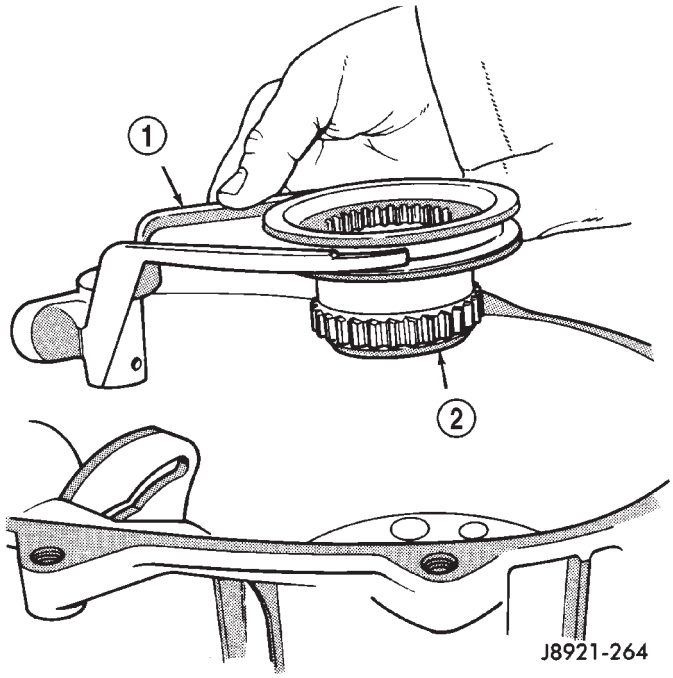


Fig. 35 Low Range Fork And Hub Removal

1 - LOW RANGE FORK
2 - FORK HUB

(16) Remove the shift sector shaft bushing and o-ring (Fig. 36).

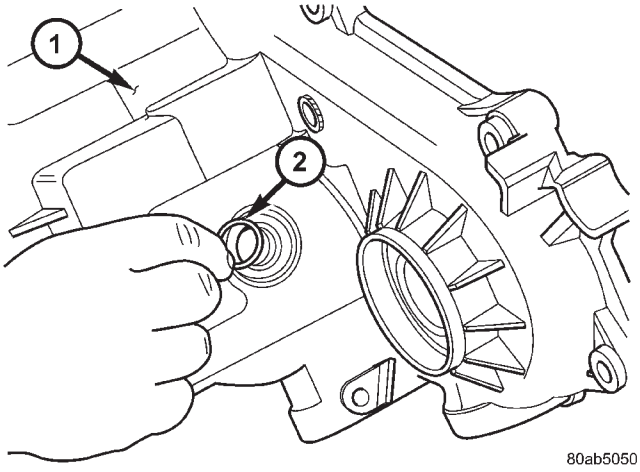


Fig. 36 Remove the Shift Sector O-Ring

1 - TRANSFER CASE FRONT HOUSING
2 - SHIFT SECTOR O-RING

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Remove front bearing retainer bolts.
(2) Remove front bearing retainer. Carefully pry retainer loose with screwdriver (Fig. 37). Position screwdriver in slots cast into retainer.
(3) Remove input gear snap-ring (Fig. 38).

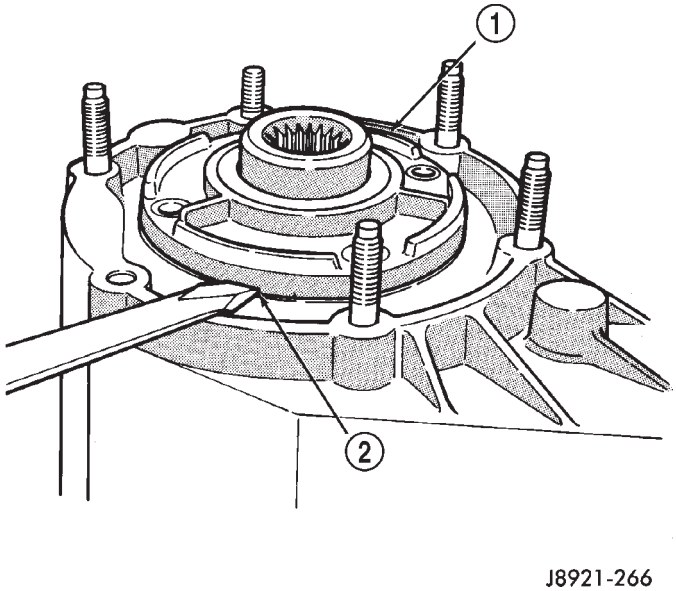


Fig. 37 Front Bearing Retainer Removal

1 - FRONT BEARING RETAINER
2 - RETAINER SLOT

TRANSFER CASE - NV242 (Continued)

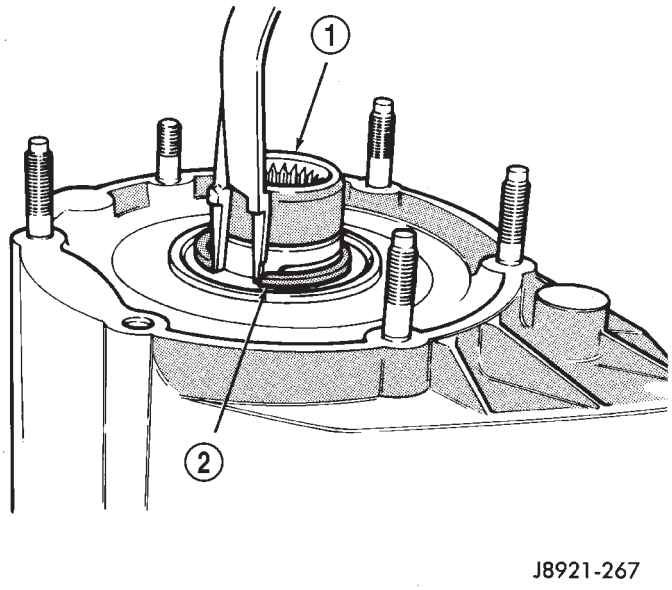


Fig. 38 Input Gear Snap Ring Removal

1 - INPUT GEAR
2 - SNAP-RING

(4) Remove input/low range gear assembly from bearing with Tool Handle C-4171 and Tool 7829A (Fig. 39).

(5) Remove low range gear snap-ring (Fig. 40).

(6) Remove input gear retainer, thrust washers and input gear from low range gear (Fig. 41).

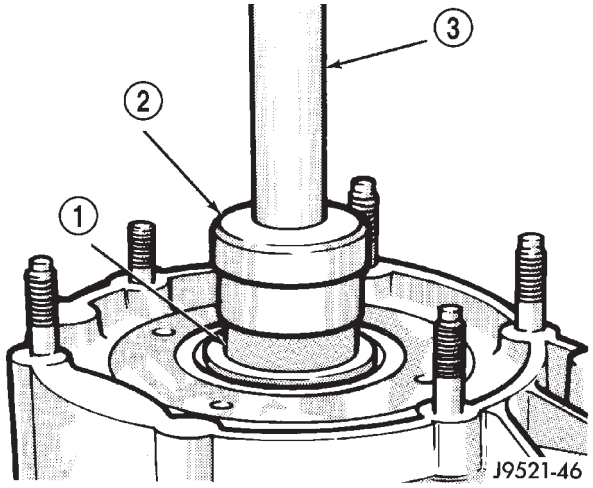


Fig. 39 Input And Low Range Gear Assembly Removal

1 - INPUT-LOW RANGE GEARS
2 - SPECIAL TOOL 7829-A
3 - SPECIAL TOOL C-4171

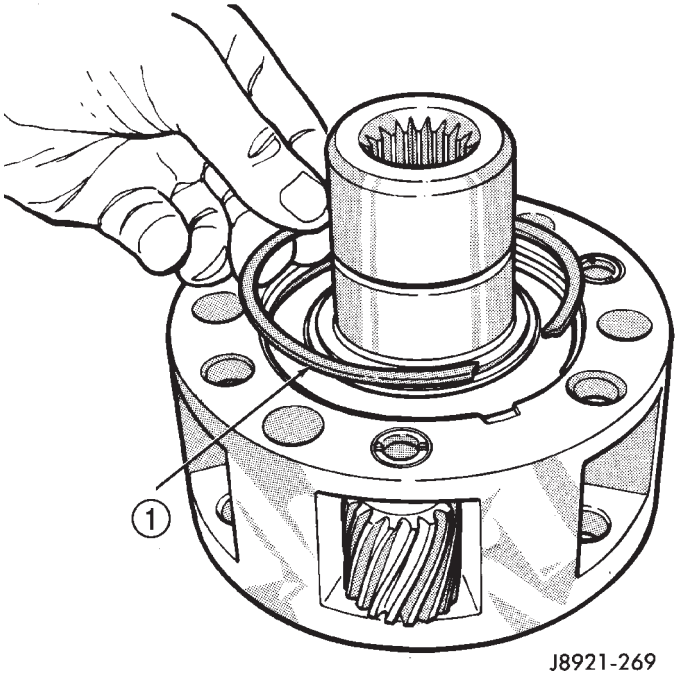


Fig. 40 Remove Low Range Gear Snap-Ring

1 - LOW RANGE GEAR SNAP-RING

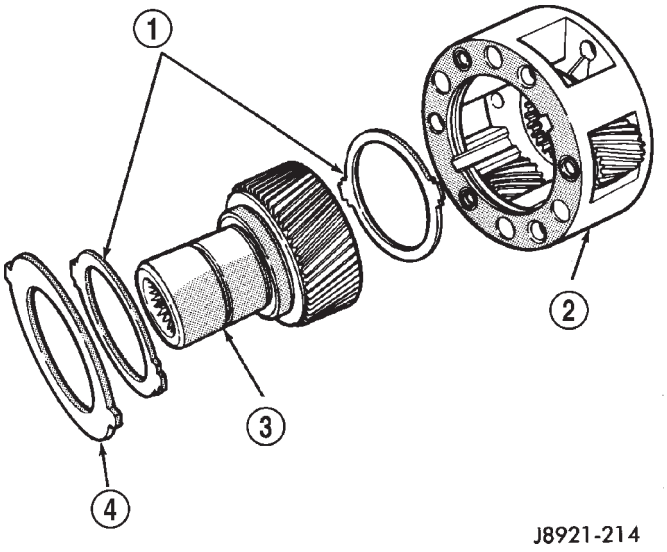


Fig. 41 Low Range And Input Gear Assembly

1 - THRUST WASHERS
2 - LOW RANGE GEAR
3 - INPUT GEAR
4 - RETAINER

TRANSFER CASE - NV242 (Continued)

(7) Inspect low range annulus gear (Fig. 42). **Gear is not a serviceable component. If damaged, replace gear and front case as assembly.**

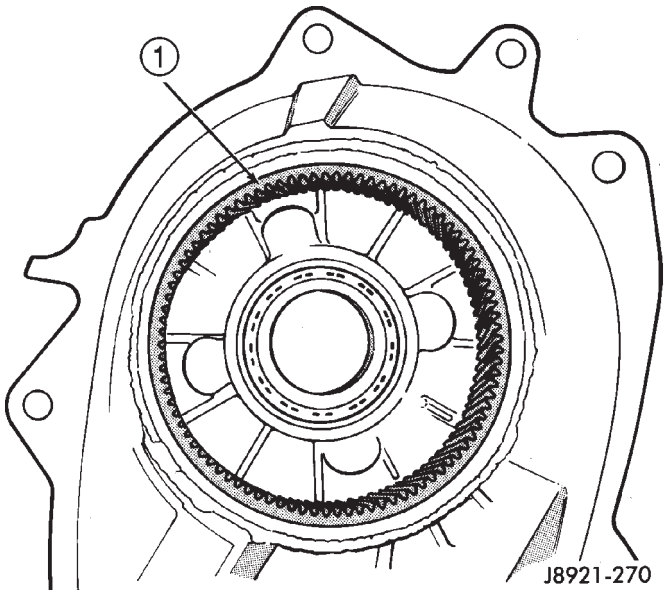


Fig. 42 Inspecting Low Range Annulus Gear

1 - LOW RANGE ANNULUS GEAR

(8) Remove oil seals from following components:
- front bearing retainer.
- rear retainer.
- oil pump.
- case halves.

DIFFERENTIAL

(1) Mark differential case halves for reference.
(2) Remove differential case bolts.
(3) Invert differential on workbench.
(4) Separate top case from bottom case. Use slots in case halves to pry them apart (Fig. 43).
(5) Remove thrust washers and planet gears from case pins (Fig. 44).
(6) Remove mainshaft and sprocket gears from bottom case (Fig. 45). Note gear position for reference before separating them.

CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

The oil pickup screen can be cleaned with solvent. Shake excess solvent from the screen after cleaning and allow it to air dry. Do not use compressed air.

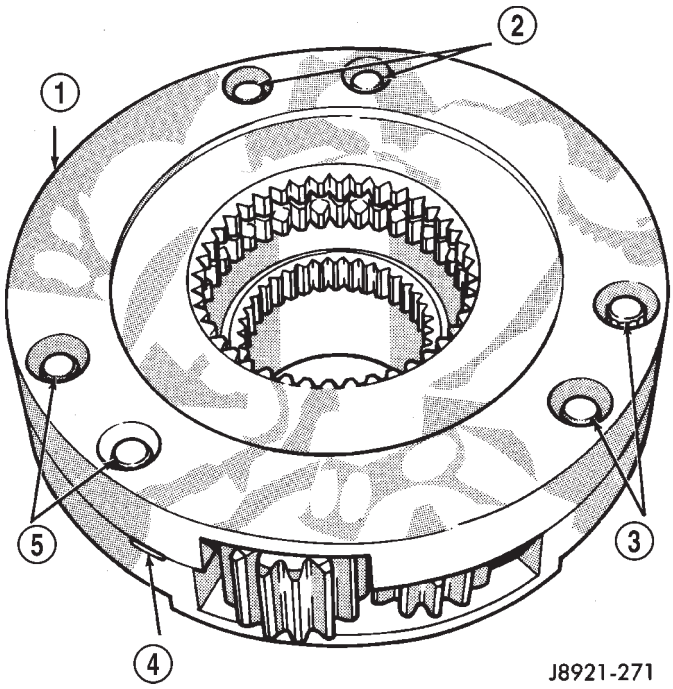


Fig. 43 Separating Differential Case Halves

1 - TOP CASE
2 - CASE BOLTS
3 - CASE BOLTS
4 - CASE SLOTS
5 - CASE BOLTS

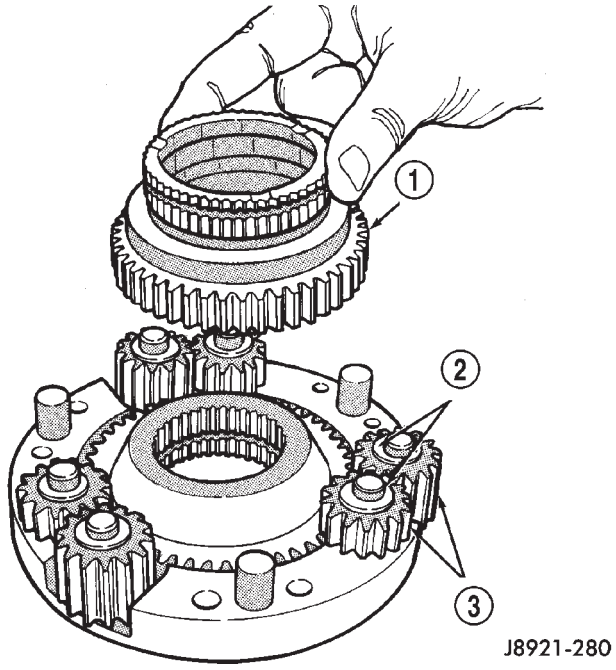


Fig. 44 Planet Gears And Thrust Washer Removal

1 - MAINSHAFT GEAR
2 - THRUST WASHERS (12)
3 - PLANET GEARS (6)

TRANSFER CASE - NV242 (Continued)

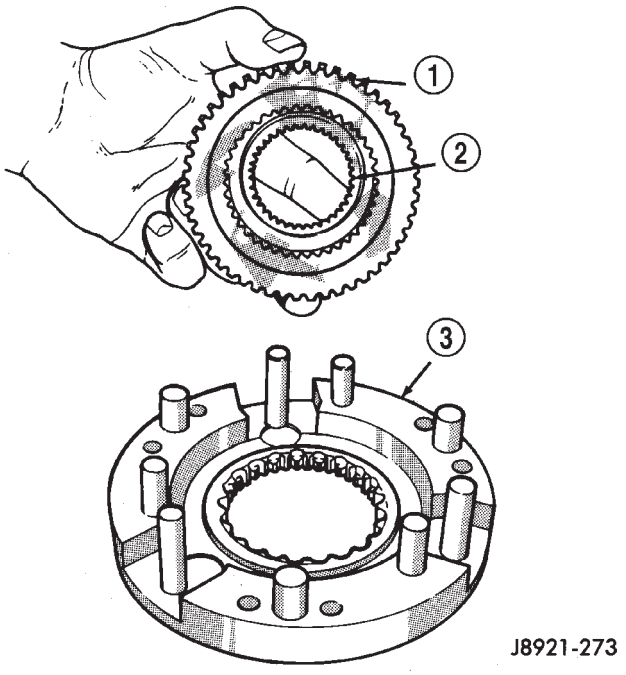


Fig. 45 Mainshaft And Sprocket Gear Removal

1 - MAINSHAFT GEAR
2 - SPROCKET GEAR
3 - BOTTOM CASE

INSPECTION

MAINSHAFT/SPROCKET/HUB

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER

Check the teeth on the gear (Fig. 46). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

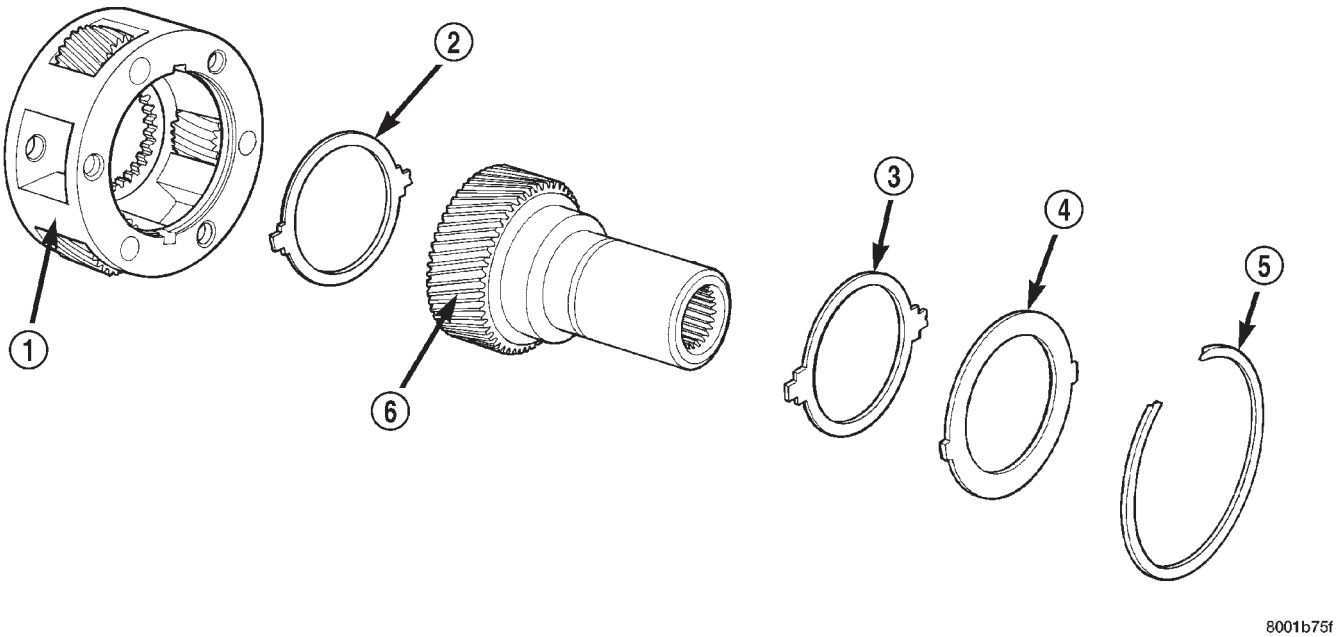


Fig. 46 Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

TRANSFER CASE - NV242 (Continued)

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (Fig. 47). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

Inspect the shift fork wear pads. The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are also serviceable.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

REAR RETAINER/BEARING/ SEAL/SLINGER/BOOT

Inspect the retainer components (Fig. 48). Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore. Clean the retainer sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper adhesion of the sealer during reassembly.

Replace the slinger and seal outright; do not reuse either part.

Replace any part if distorted, bent, or broken. Also replace the boot if cut or torn. Replace the boot band clamps, do not reuse them.

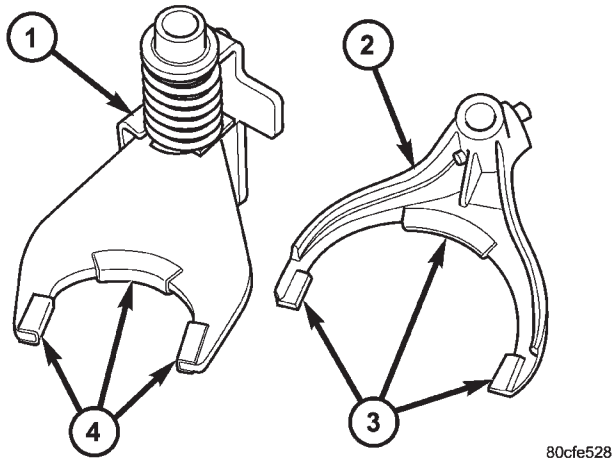


Fig. 47 Shift Fork And Wear Pad Locations

1 - MODE FORK
2 - RANGE FORK
3 - WEAR PADS (SERVICEABLE)
4 - WEAR PADS (SERVICEABLE)

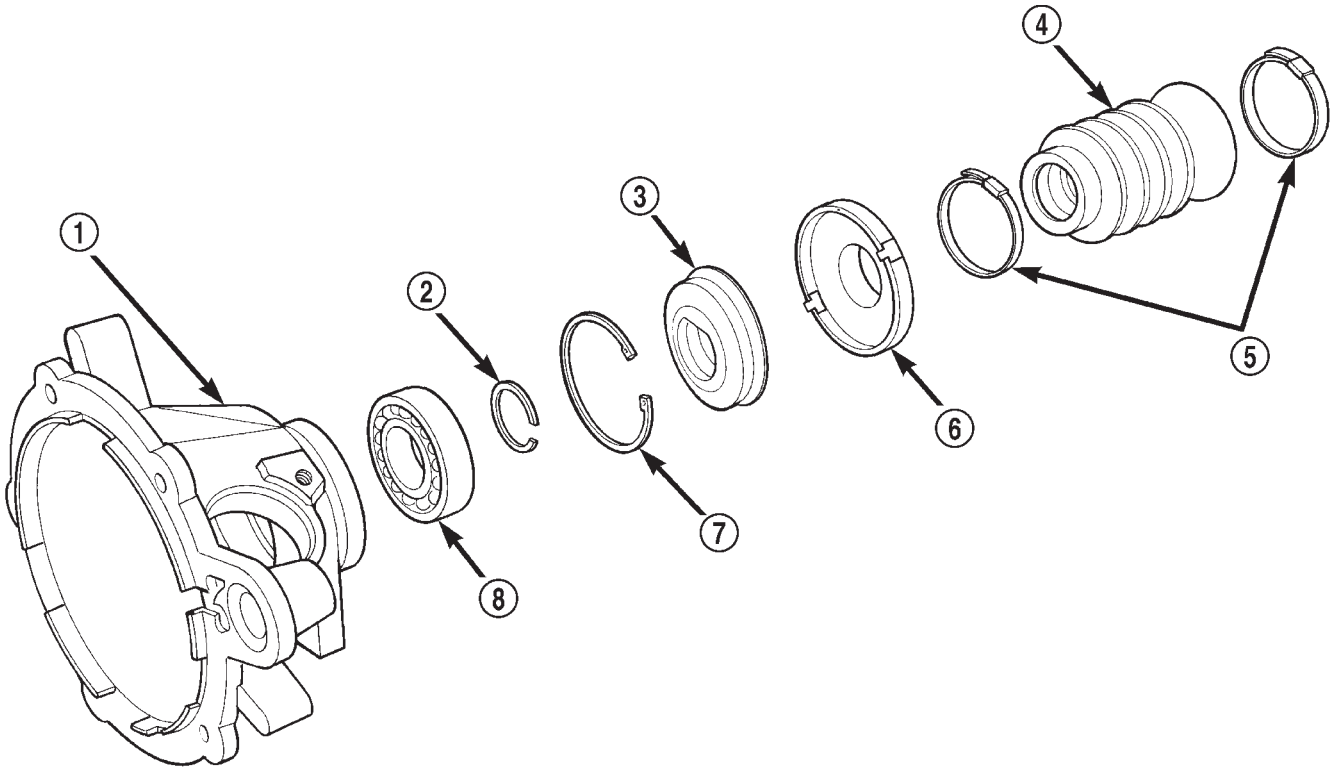


Fig. 48 Rear Retainer - Typical

1 - REAR RETAINER
2 - REAR BEARING I.D. MAINSHAFT RETAINING RING
3 - REAR SEAL
4 - BOOT
5 - BAND CLAMPS
6 - REAR SLINGER
7 - REAR BEARING O.D. RETAINING RING
8 - REAR BEARING

TRANSFER CASE - NV242 (Continued)

REAR OUTPUT SHAFT/YOKE/DRIVE CHAIN

Check condition of the seal contact surfaces of the yoke slinger (Fig. 49). This surface must be clean and smooth to ensure proper seal life. Replace the yoke nut and seal washer as neither part should be reused.

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

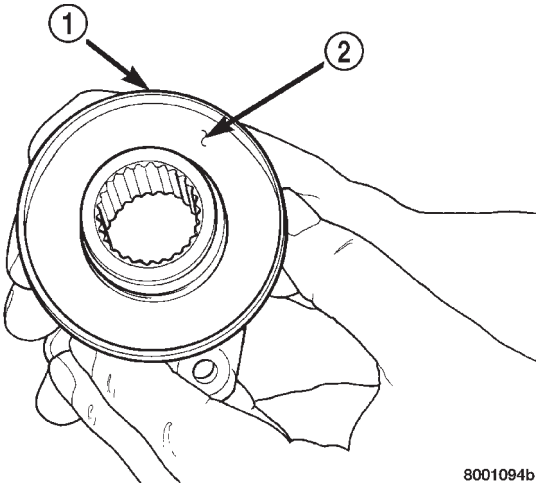


Fig. 49 Seal Contact Surface Of Yoke Slinger

1 - FRONT SLINGER (PART OF YOKE)
2 - SEAL CONTACT SURFACE MUST BE CLEAN AND SMOOTH

LOW RANGE ANNULUS GEAR

Inspect annulus gear condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (Fig. 50)

FRONT-REAR CASES AND FRONT RETAINER

Inspect the cases and retainer for wear and damage. Clean the sealing surfaces with a scraper and 3M all purpose cleaner. This will ensure proper sealer adhesion at assembly. Replace the input retainer seal; do not reuse it.

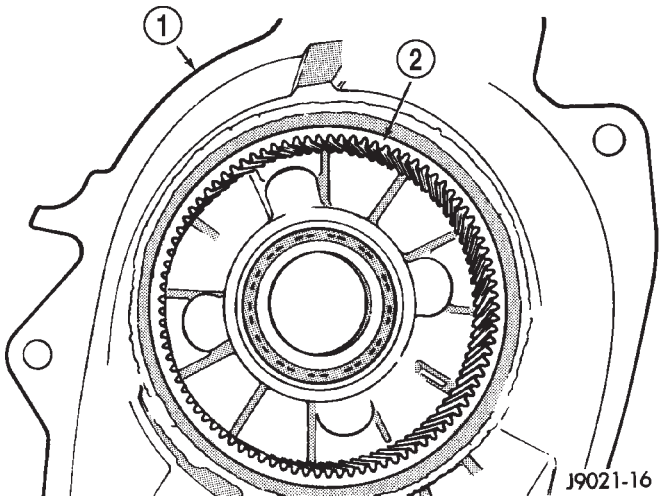


Fig. 50 Low Range Annulus Gear

1 - FRONT CASE
2 - LOW RANGE ANNULUS GEAR

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil™ stainless steel inserts if required.

OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ASSEMBLY

Lubricate transfer case components with automatic transmission fluid or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

TRANSFER CASE - NV242 (Continued)

BEARING AND SEAL

(1) Remove snap-ring that retains front output shaft front bearing in case (Fig. 51). Then remove bearing. Use hammer handle, or hammer and brass punch to tap bearing out of case.

(2) Install new front output shaft front bearing with Tool Handle C-4171 and Installer 8033-A with the tapered cone upward (Fig. 52).

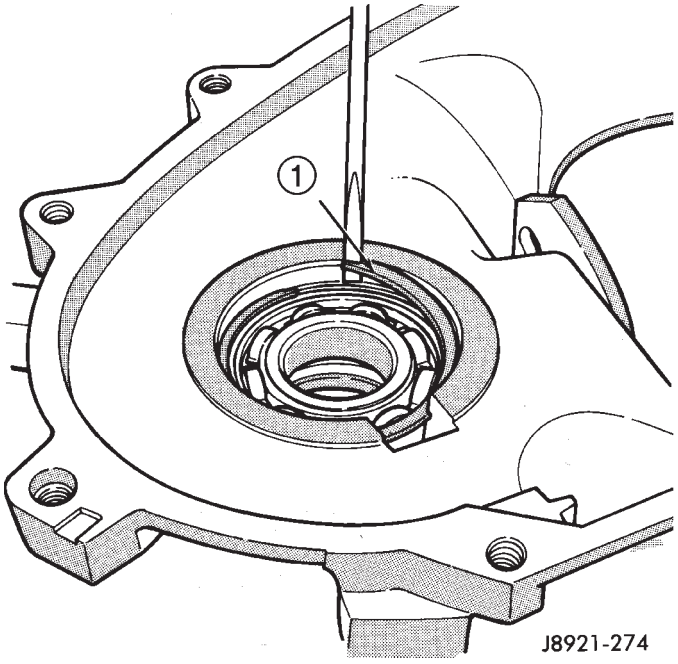


Fig. 51 Front Output Shaft Front Bearing Snap-Ring Removal

1 - FRONT BEARING SNAP-RING

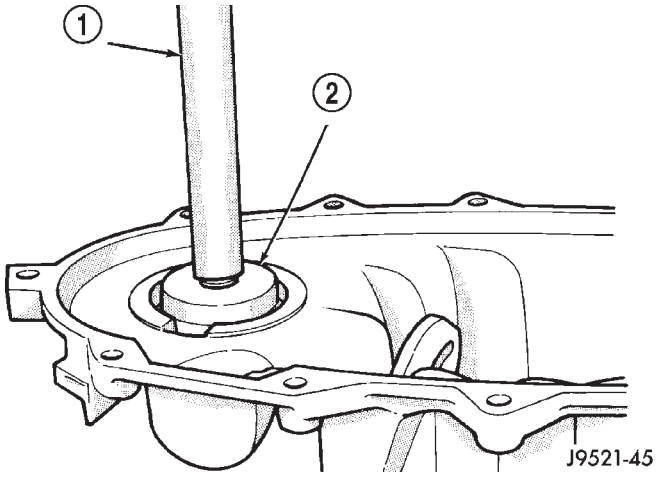


Fig. 52 Front Output Shaft Front Bearing Installation

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 8033-A

(3) Install front bearing snap-ring (Fig. 51).

(4) Remove front output shaft seal using an appropriate pry tool (Fig. 53) or slide-hammer mounted screw.

(5) Install new front output shaft oil seal with Installer 6952-A (Fig. 54).

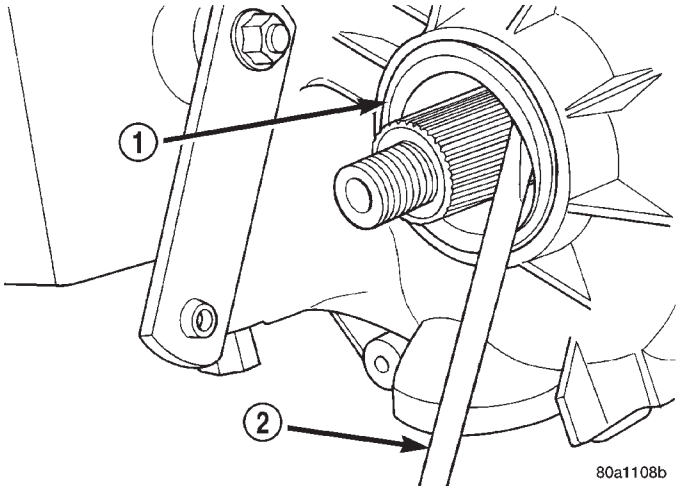


Fig. 53 Remove Front Output Shaft Seal

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

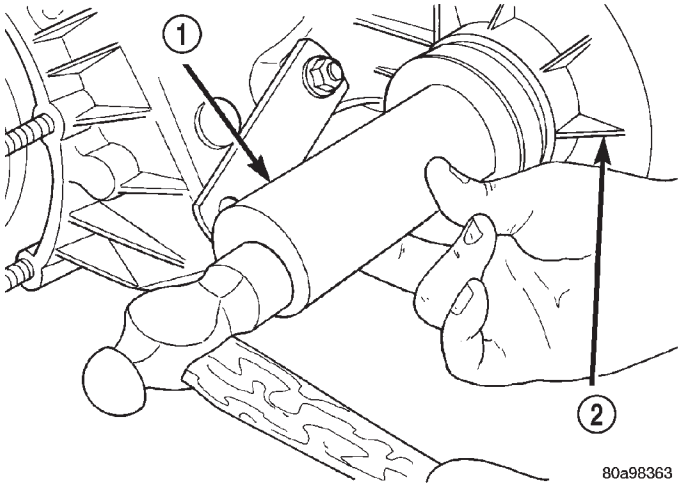


Fig. 54 Install Front Output Shaft Seal

1 - INSTALLER 6952-A
2 - TRANSFER CASE

TRANSFER CASE - NV242 (Continued)

(6) Remove input gear bearing with Tool Handle C-4171 and Remover C-4210 (Fig. 55).

(7) Install snap-ring on new input gear bearing.

(8) Install new input gear bearing with Tool Handle C-4171 and Remover C-4210. Install bearing far enough to seat snap-ring against case (Fig. 56).

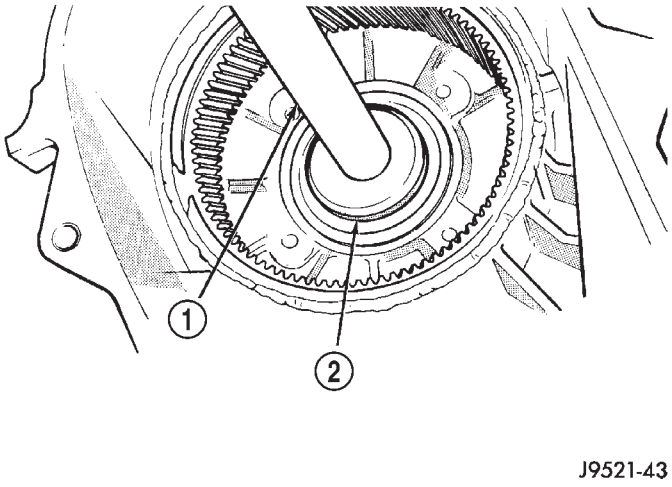


Fig. 55 Input Gear Bearing Removal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-4210

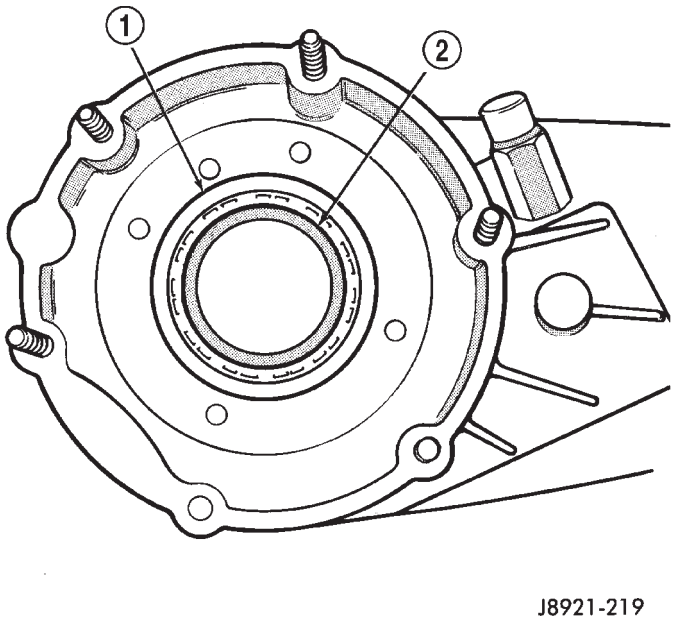


Fig. 56 Seating Input Gear Bearing

1 - SNAP-RING
2 - INPUT SHAFT BEARING

(9) Remove the input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 57).

(10) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 58).

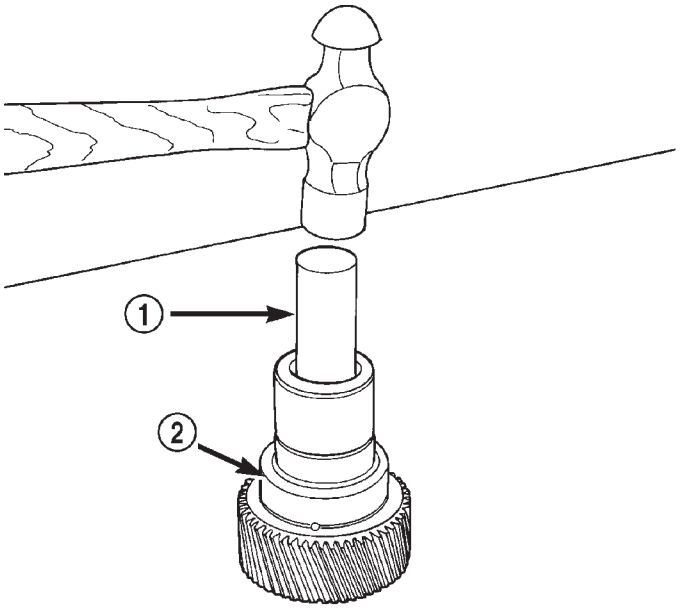


Fig. 57 Remove Input Gear Pilot Bearing

1 - DRIFT
2 - INPUT GEAR

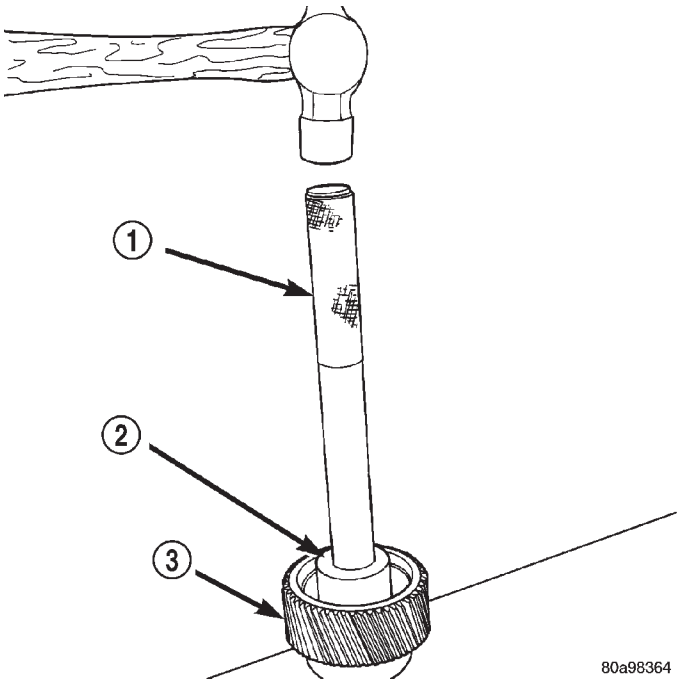


Fig. 58 Install Input Gear Pilot Bearing

1 - HANDLE C-4171
2 - INSTALLER 8128
3 - INPUT GEAR

TRANSFER CASE - NV242 (Continued)

(11) Install new seal in front bearing retainer with Installer 7884 (Fig. 59).

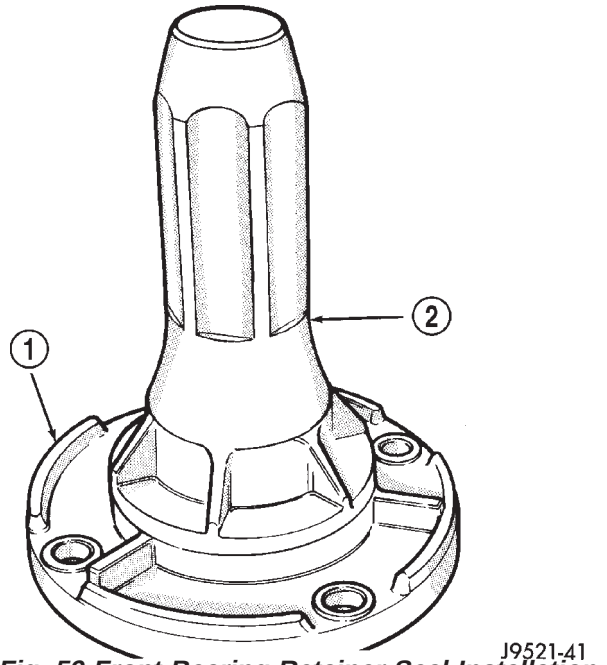


Fig. 59 Front Bearing Retainer Seal Installation

1 - FRONT BEARING RETAINER
2 - SPECIAL TOOL 7884

(12) Remove output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 60).

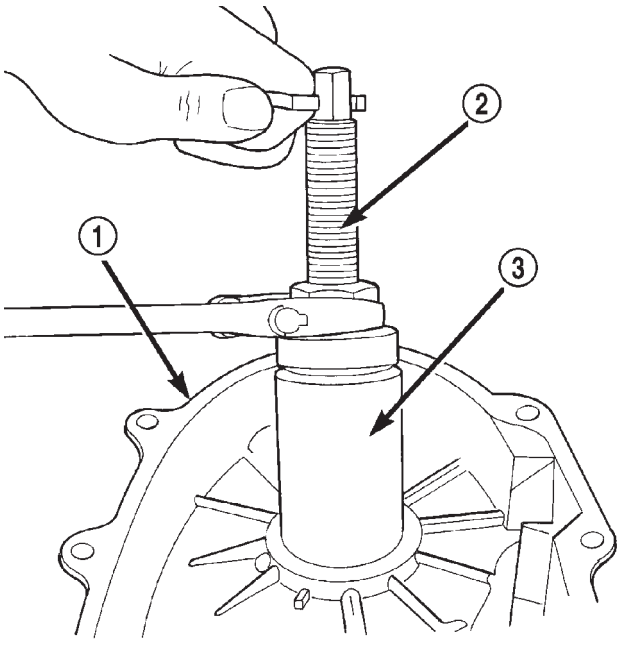


Fig. 60 Remove Front Output Shaft Rear Bearing

1 - REAR CASE
2 - SPECIAL TOOL L-4454-1 AND L-4454-3
3 - SPECIAL TOOL 8148

(13) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 61). Lubricate bearing after installation.

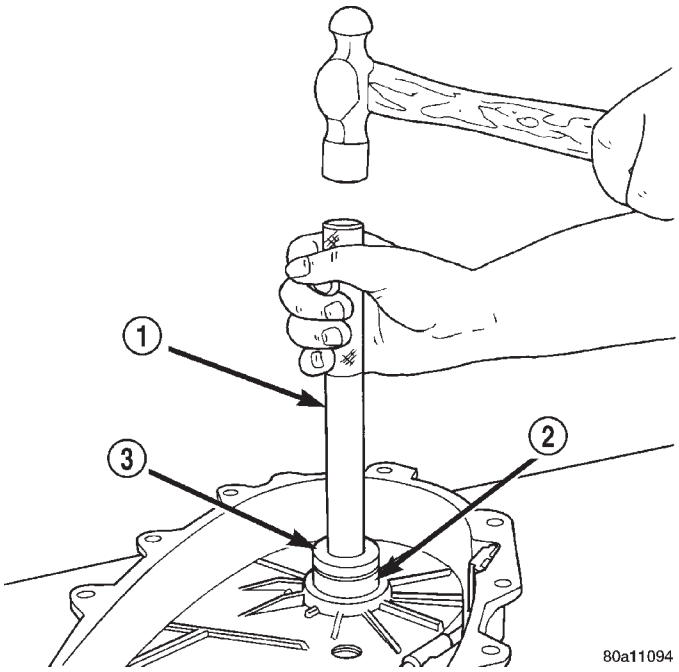


Fig. 61 Install Front Output Shaft Rear Bearing

1 - HANDLE C-4171
2 - OUTPUT SHAFT INNER BEARING
3 - INSTALLER 5066

(14) Install new seal in oil pump feed housing with Special Tool 7888 (Fig. 62).

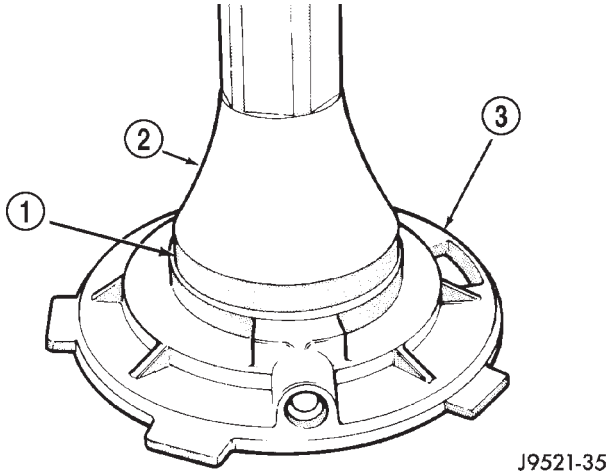


Fig. 62 Oil Pump Seal Installation

1 - HOUSING SEAL
2 - SPECIAL TOOL 7888
3 - OIL PUMP FEED HOUSING

TRANSFER CASE - NV242 (Continued)

(15) Install new pickup tube O-ring in oil pump (Fig. 63).

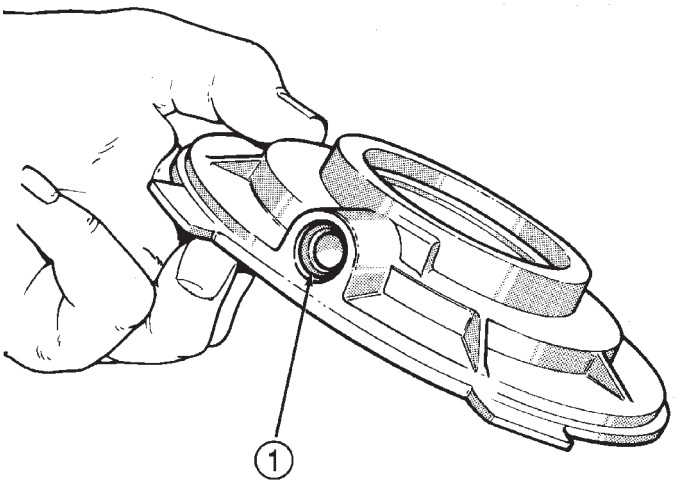


Fig. 63 Pickup Tube O-Ring Installation

1 - PICKUP TUBE O-RING

(16) Remove rear retainer bearing with Installer 8128 and Handle C-4171, NV242HD only.

(17) Install rear bearing in retainer with Handle C-4171 and Installer 5064 (Fig. 64), NV242HD only.

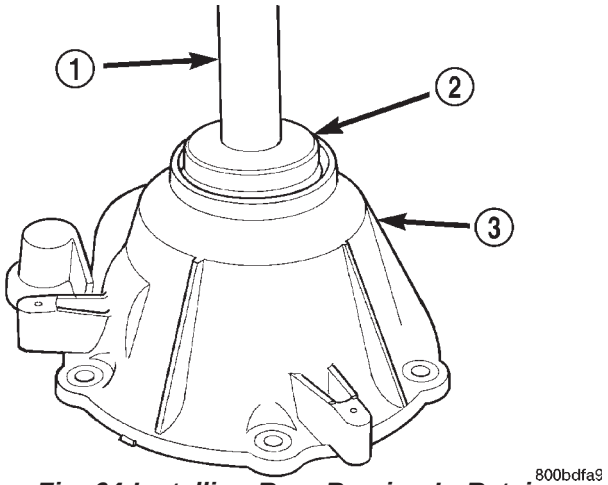


Fig. 64 Installing Rear Bearing In Retainer

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL 5064
3 - REAR RETAINER

DIFFERENTIAL

(1) Lubricate differential components with automatic transmission fluid.

(2) Install sprocket gear in differential bottom case (Fig. 65).

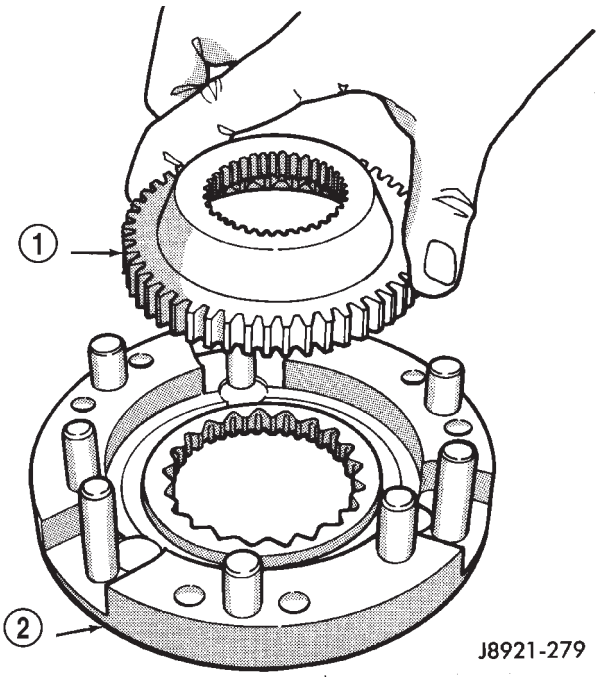


Fig. 65 Installing Differential Sprocket Gear

1 - SPROCKET GEAR
2 - BOTTOM CASE

(3) Install differential planet gears and new thrust washers (Fig. 66). **Be sure thrust washers are installed at top and bottom of each planet gear.**

(4) Install differential mainshaft gear (Fig. 66).

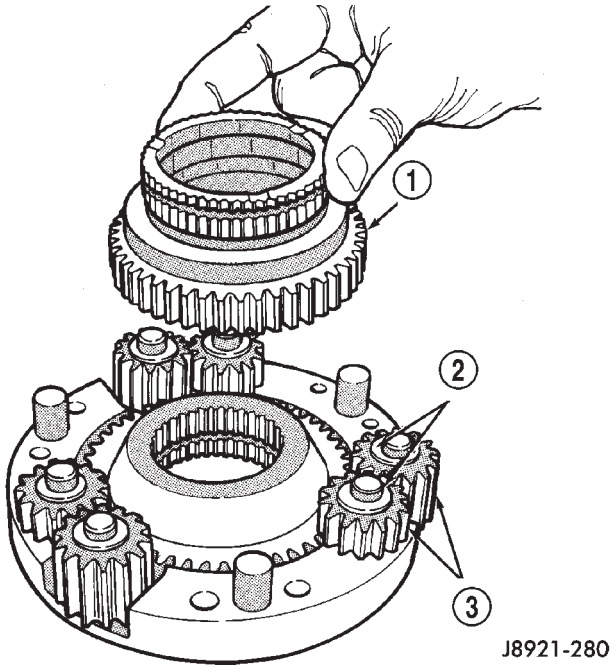


Fig. 66 Installing Mainshaft And Planet Gears

1 - MAINSHAFT GEAR
2 - THRUST WASHERS (12)
3 - PLANET GEARS (6)

TRANSFER CASE - NV242 (Continued)

(5) Align and position differential top case on bottom case (Fig. 67). Align using scribe marks made at disassembly.

(6) While holding differential case halves together, invert the differential and start the differential case bolts.

(7) Tighten differential case bolts to specified torque.

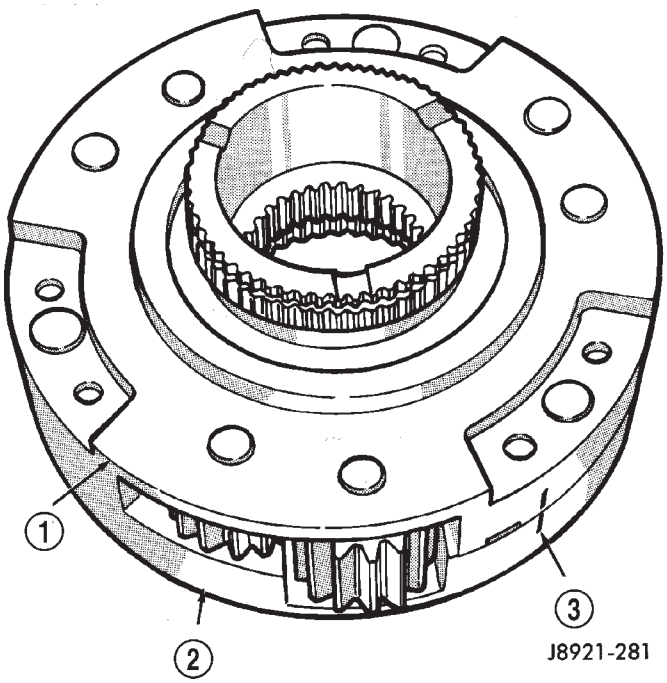


Fig. 67 Differential Case Assembly

1 - TOP CASE
2 - BOTTOM CASE
3 - CASE ALIGNMENT MARKS

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Assemble low range gear, input gear thrust washers, input gear and input gear retainer (Fig. 68).

(2) Install low range gear snap ring (Fig. 69).

(3) Lubricate input gear and low range gears with automatic transmission fluid.

(4) Start input gear shaft into front case bearing.

(5) Press input gear shaft into front bearing.

(6) Install new input gear snap ring (Fig. 70).

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front bearing retainer.

(8) Install front bearing retainer (Fig. 71). Tighten retainer bolts to 16 ft. lbs. (21 N·m) torque.

SHIFT FORKS, SECTOR, AND MAINSHAFT

(1) Install the shift sector shaft o-ring and bushing.

(2) Install shift sector.

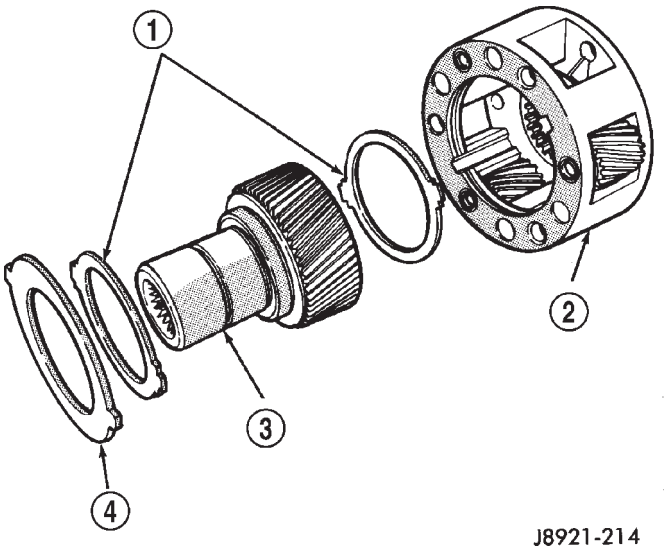


Fig. 68 Low Range And Input Gear Assembly

1 - THRUST WASHERS
2 - LOW RANGE GEAR
3 - INPUT GEAR
4 - RETAINER

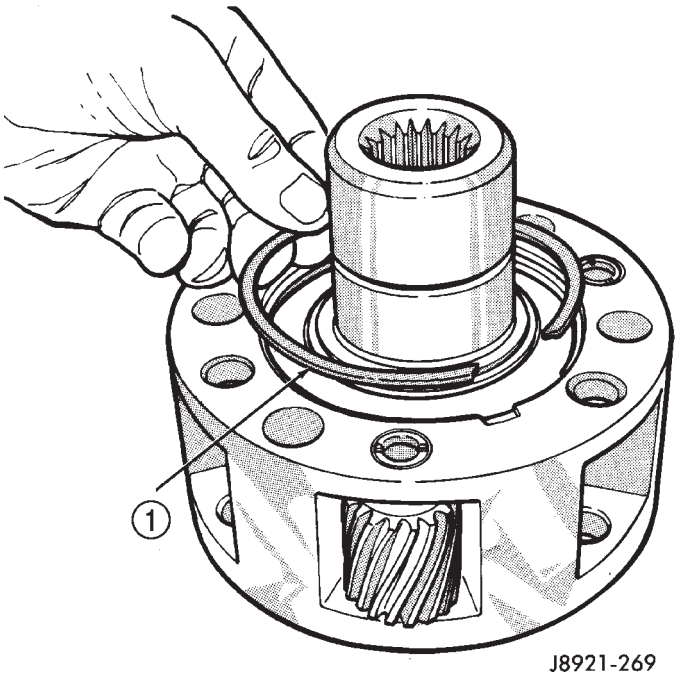


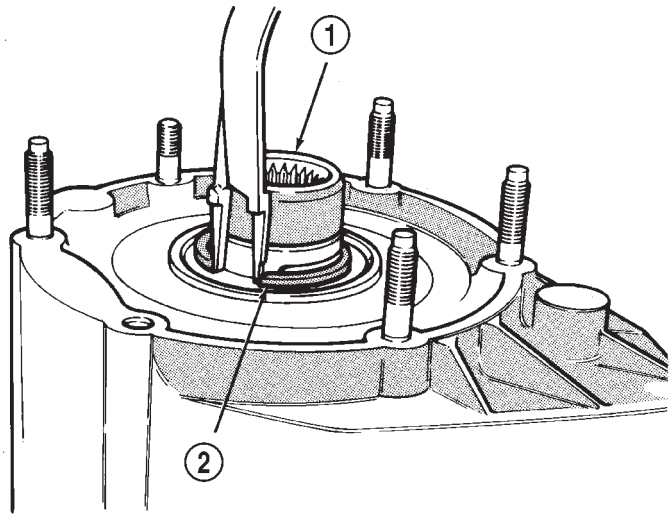
Fig. 69 Install Low Range Gear Snap-Ring

1 - LOW RANGE GEAR SNAP-RING

(3) Install new pads on low range fork, if necessary.

(4) Assemble low range fork and sleeve.

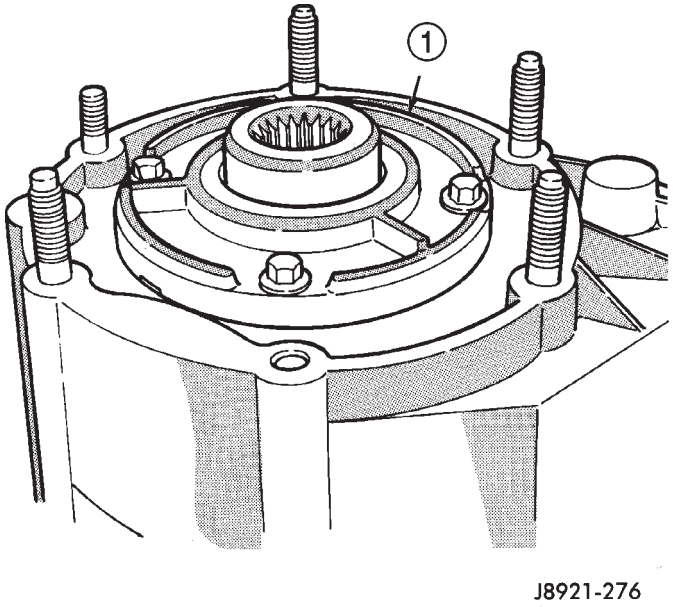
TRANSFER CASE - NV242 (Continued)



J8921-267

Fig. 70 Input Gear Snap-Ring Installation

1 - INPUT GEAR
2 - SNAP-RING



J8921-276

Fig. 71 Installing Front Bearing Retainer

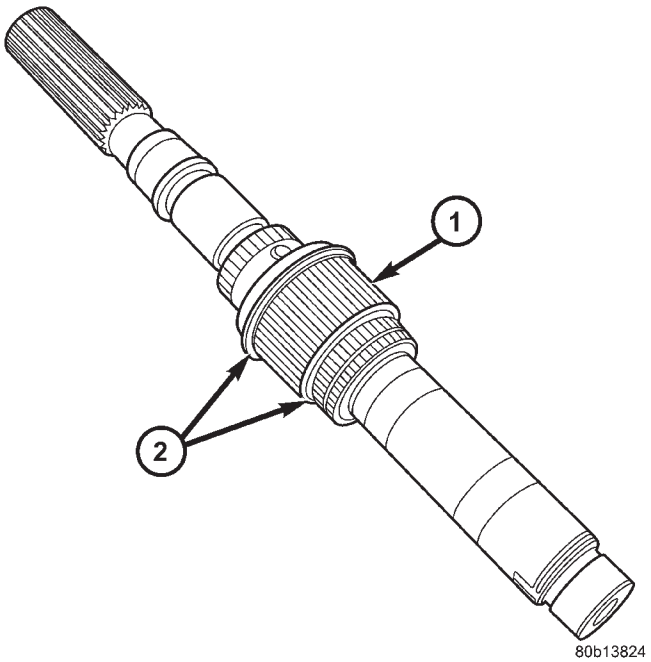
1 - FRONT BEARING RETAINER

(5) Position low range fork and sleeve in case. Be sure low range fork pin is engaged in shift sector slot.

(6) Install first mainshaft bearing spacer on mainshaft (Fig. 72).

(7) Install bearing rollers on mainshaft (Fig. 72). Coat bearing rollers with generous quantity of petroleum jelly to hold them in place.

(8) Install remaining bearing spacer on mainshaft (Fig. 72). Do not displace any bearings while installing spacer.

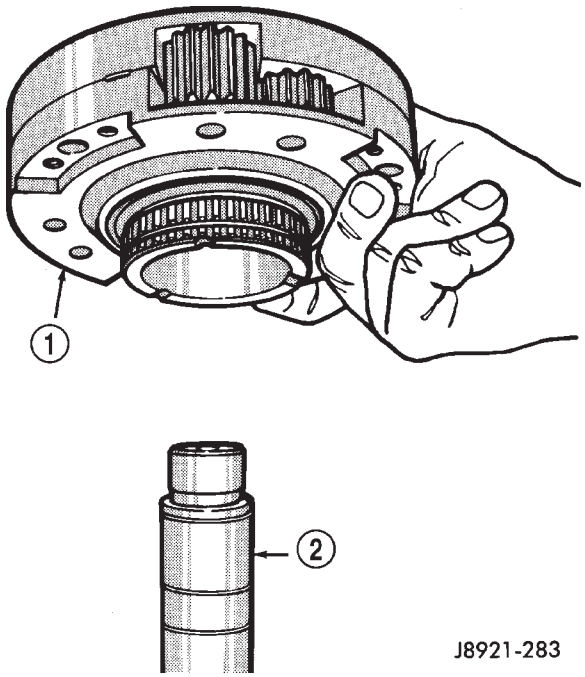


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Fig. 72 Installing Mainshaft Bearing Rollers and Spacers

1 - MAINSHAFT BEARING ROLLERS
2 - BEARING SPACERS

(9) Install differential (Fig. 73). Do not displace mainshaft bearings when installing differential.



J8921-283

Fig. 73 Differential Installation

1 - DIFFERENTIAL
2 - MAINSHAFT

TRANSFER CASE - NV242 (Continued)

(10) Install differential snap-ring (Fig. 74).
(11) Install intermediate clutch shaft (Fig. 75).

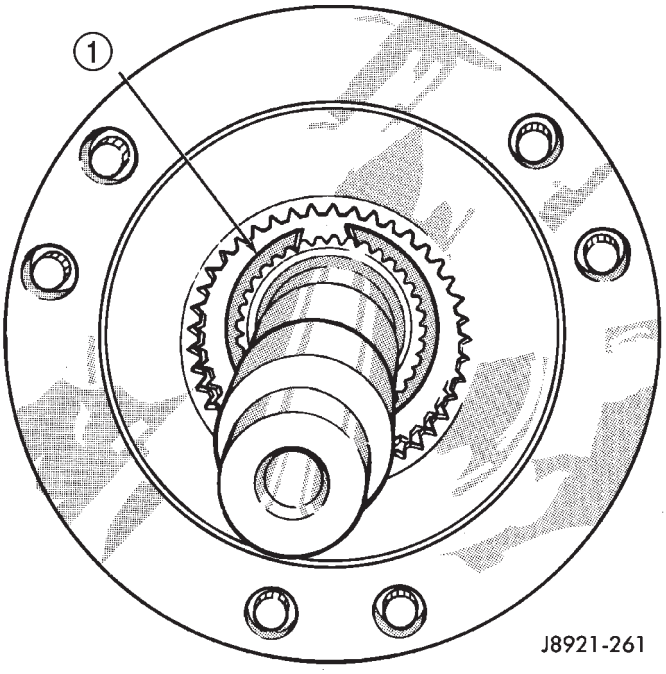


Fig. 74 Installing Differential Snap-Ring

1 - DIFFERENTIAL SNAP-RING

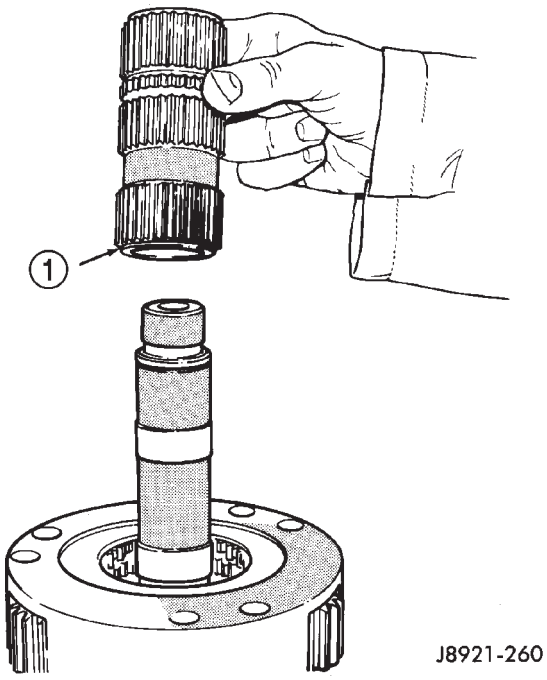


Fig. 75 Installing Intermediate Clutch Shaft

1 - INTERMEDIATE CLUTCH SHAFT

(12) Install clutch shaft thrust washer (Fig. 76).
(13) Install clutch shaft snap-ring (Fig. 77).

(14) Inspect mode fork assembly (Fig. 78). Replace pads and bushing if necessary. Replace fork tube if bushings inside tube are worn or damaged. Also check springs and slider bracket (Fig. 78). Replace worn, damaged components.

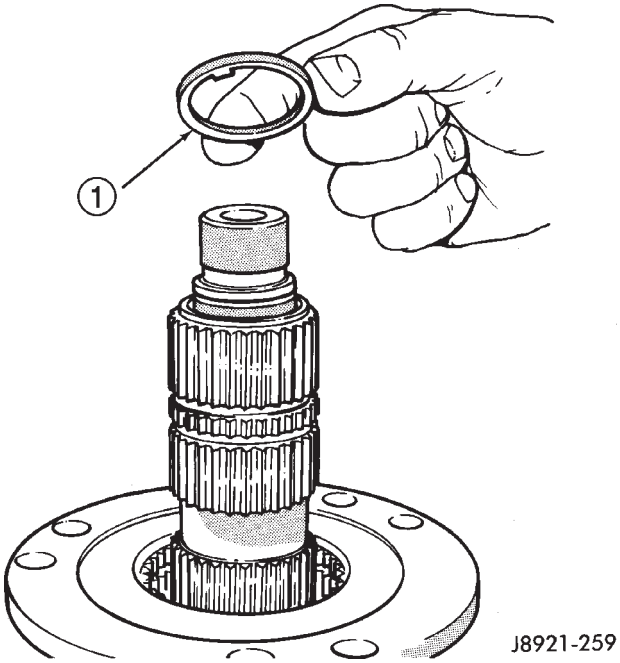


Fig. 76 Installing Clutch Shaft Thrust Washer

1 - CLUTCH SHAFT THRUST RING

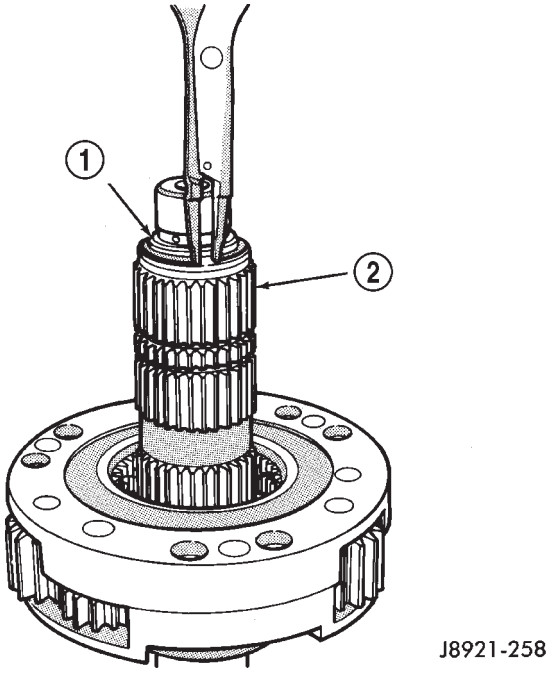


Fig. 77 Installing Clutch Shaft Snap-Ring

1 - SNAP-RING
2 - INTERMEDIATE CLUTCH SHAFT

TRANSFER CASE - NV242 (Continued)

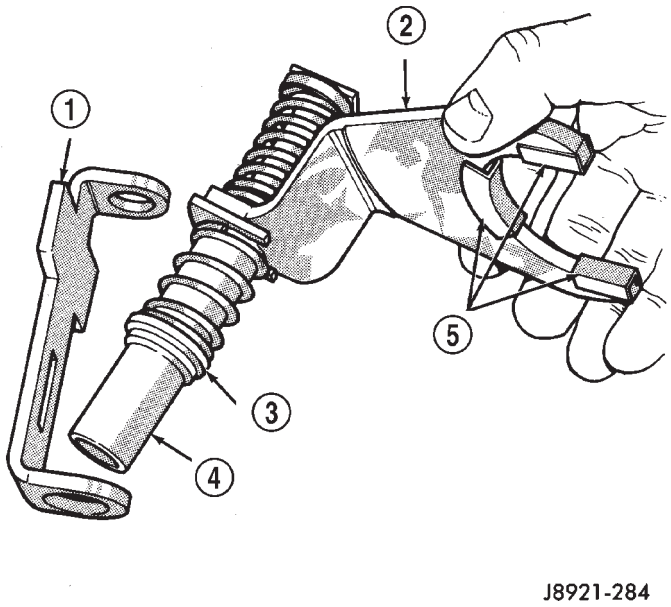


Fig. 78 Mode Fork Assembly Inspection

1 - SLIDER
2 - MODE FORK
3 - BUSHING/SPRING
4 - TUBE
5 - PADS

(15) Install mode sleeve in mode fork (Fig. 79). Then install assembled sleeve and fork on mainshaft. Be sure mode sleeve splines are engaged in differential splines.

(16) Install mode fork and mainshaft assembly in case (Fig. 80). Rotate mainshaft slightly to engage shaft with low range gears.

(17) Rotate mode fork pin into shift sector slot.

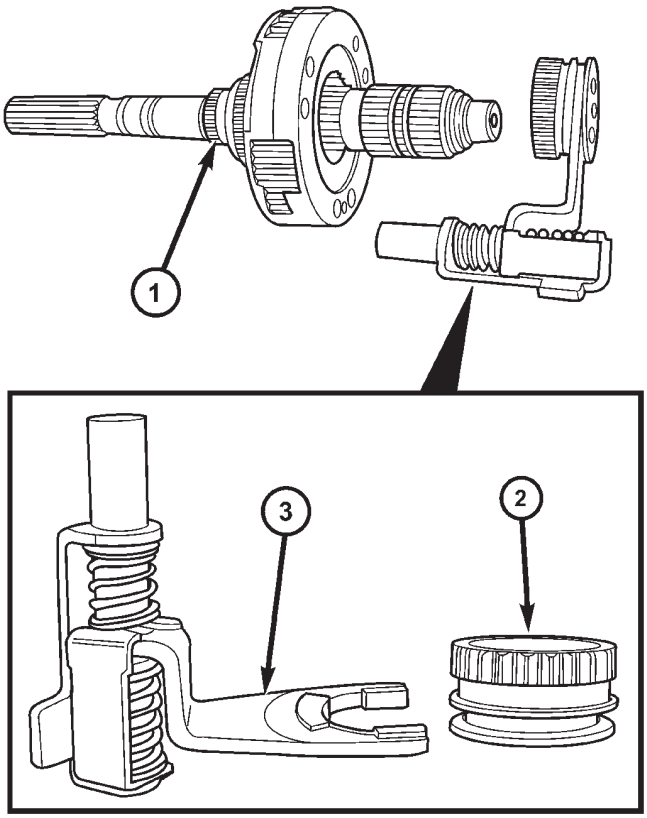


Fig. 79 Installing Mode Fork And Sleeve

1 - MAINSHAFT
2 - MODE SLEEVE
3 - MODE FORK ASSEMBLY

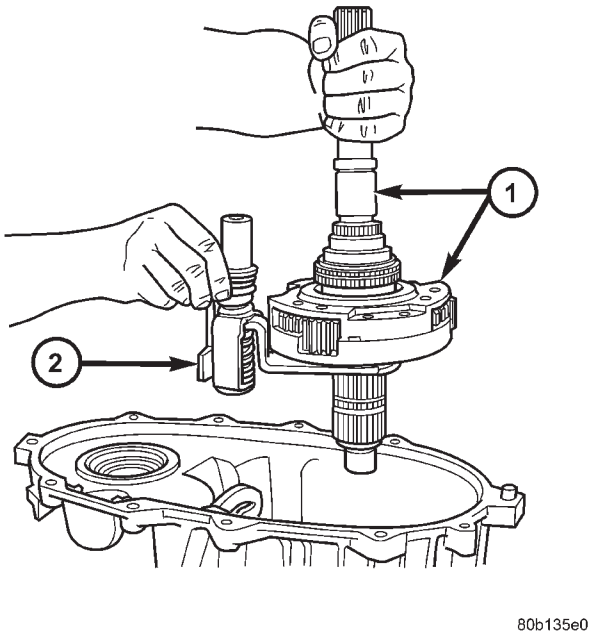


Fig. 80 Assembled Mainshaft And Mode Fork Installation

1 - MAINSHAFT ASSEMBLY
2 - MODE FORK

TRANSFER CASE - NV242 (Continued)

(18) Install shift rail (Fig. 81). Be sure rail is seated in both shift forks.

(19) Rotate shift sector to align lockpin hole in low range fork with access hole in case.

(20) Insert an easy-out in range fork lockpin to hold it securely for installation (Fig. 82). Lockpin is slightly tapered on one end. Insert tapered end into fork and rail.

(21) Insert lockpin through access hole and into shift fork (Fig. 82). Then remove easy-out and seat the pin with pin punch.

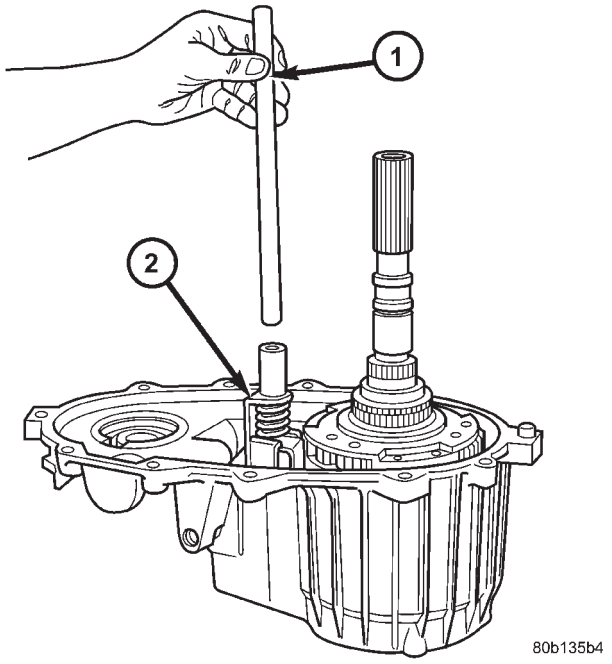


Fig. 81 Shift Rail Installation

1 - SHIFT RAIL
2 - MODE FORK

(22) Install plug in lockpin access hole.

(23) Install detent plunger, detent spring and detent plug in case (Fig. 83).

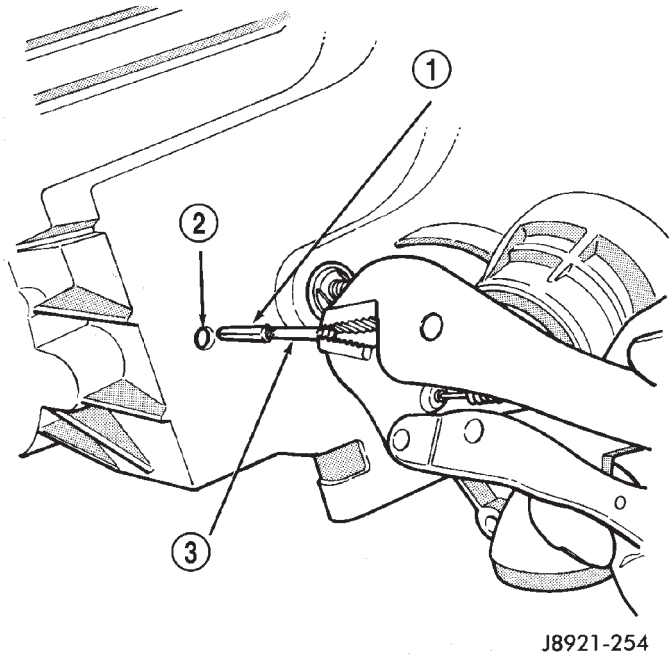


Fig. 82 Installing Low Range Fork Lockpin

1 - LOW RANGE FORK LOCK PIN
2 - ACCESS HOLE
3 - EASY-OUT

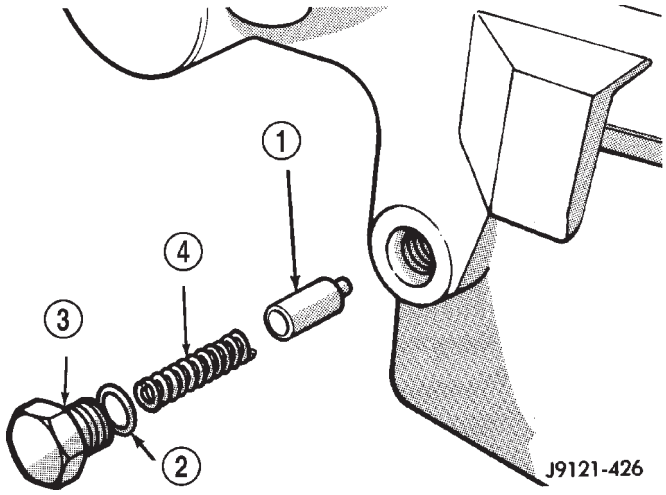


Fig. 83 Detent Pin, Spring And Plug Installation

1 - PLUNGER
2 - O-RING
3 - PLUG
4 - SPRING

TRANSFER CASE - NV242 (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Install front output shaft (Fig. 84).

(2) Install drive chain (Fig. 84). Engage chain with front output shaft sprocket teeth.

(3) Install drive sprocket (Fig. 84). Engage drive sprocket teeth with chain. Then engage sprocket splines with mainshaft splines.

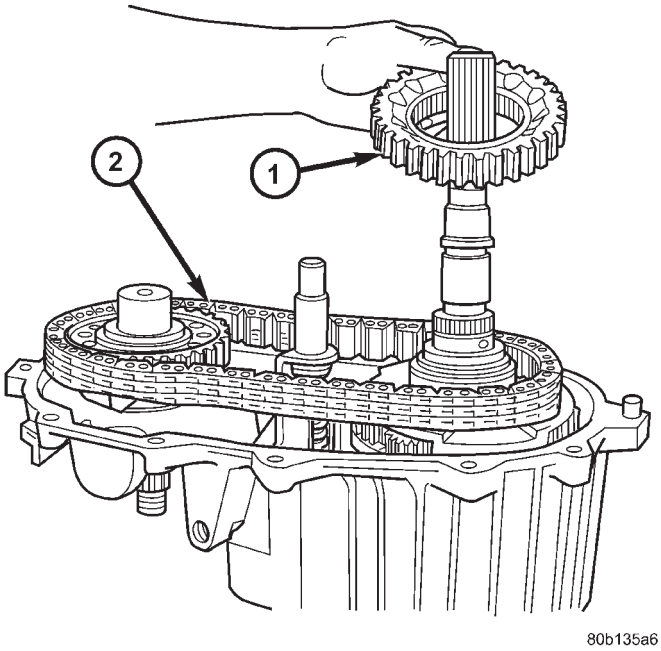


Fig. 84 Drive Chain And Sprocket Installation

1 - DRIVE SPROCKET
2 - DRIVE CHAIN

(4) Install drive sprocket snap-ring (Fig. 85).

OIL PUMP AND REAR CASE

(1) Insert oil pickup tube in oil pump and attach oil screen and connector hose to pickup tube. Then install assembled pump, tube and screen in rear case (Fig. 86). Be sure screen is seated in case slot as shown.

(2) Install magnet in front case pocket (Fig. 87).

(3) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to seal surface of front case.

(4) Align and install rear case on front case. Be sure case locating dowels are in place and that mainshaft splines are engaged in oil pump inner gear.

(5) Install and tighten front case-to-rear case bolts to 41 N·m (30 ft. lbs.) torque. **Be sure to install a washer under each bolt used at case dowel locations.**

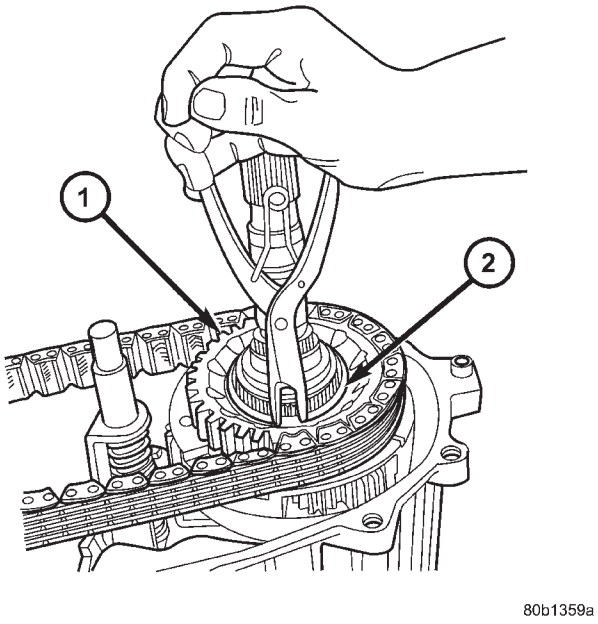


Fig. 85 Drive Sprocket Snap-Ring Installation

1 - DRIVE SPROCKET
2 - DRIVE SPROCKET SNAP-RING

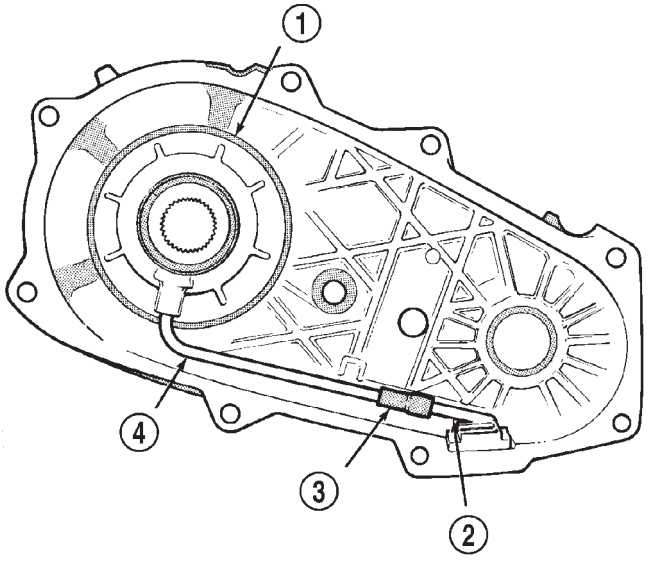


Fig. 86 Oil Screen And Pickup Tube Installation

1 - OIL PUMP
2 - OIL SCREEN
3 - CONNECTOR
4 - PICKUP TUBE

TRANSFER CASE - NV242 (Continued)

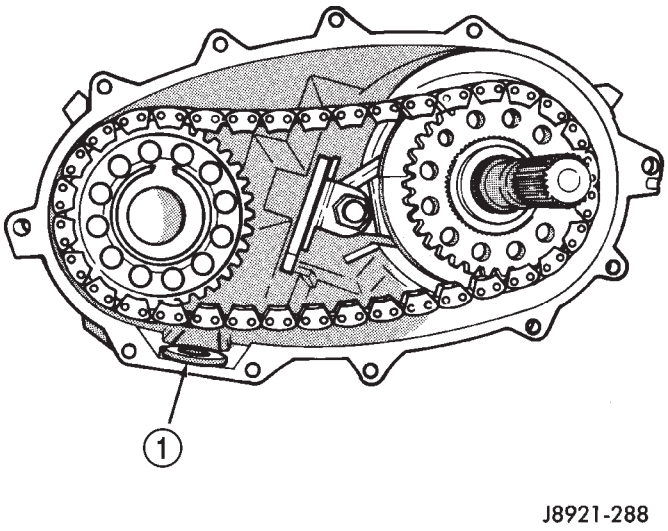


Fig. 87 Installing Case Magnet

1 - MAGNET

REAR RETAINER - NV242LD

(1) Apply bead of Mopar® Sealer, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

(2) Install rear retainer on rear case. Tighten retainer bolts to 20-27 N·m (15-20 ft. lbs.) torque.

(3) Install rear bearing I.D. retaining ring and spacer on output shaft.

(4) Apply liberal quantity of petroleum jelly to new rear seal and to output shaft. Petroleum jelly is needed to protect seal lips during installation.

(5) Slide seal onto Seal Protector 6992 (Fig. 88). Slide seal protector and seal onto output shaft.

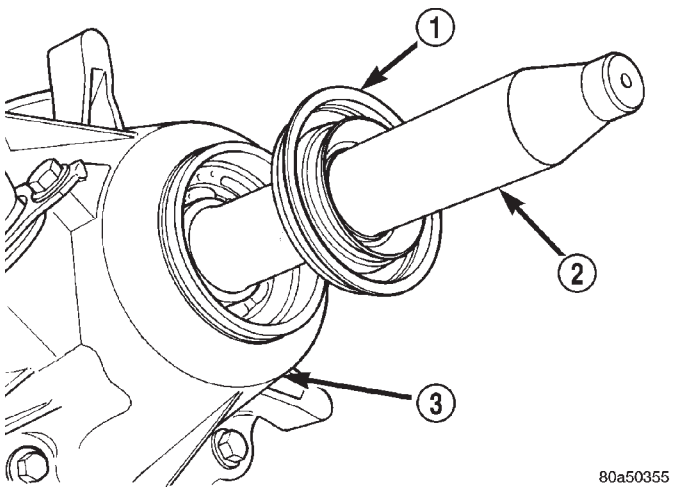


Fig. 88 Output Shaft Seal and Protector

1 - OUTPUT SHAFT SEAL
2 - SPECIAL TOOL 6992
3 - TRANSFER CASE

(6) Slide Installer C-4076-B onto seal protector with the recessed side of the tool toward the seal. Drive seal into rear bearing retainer with Installer C-4076-B and Handle MD-998323 (Fig. 89).

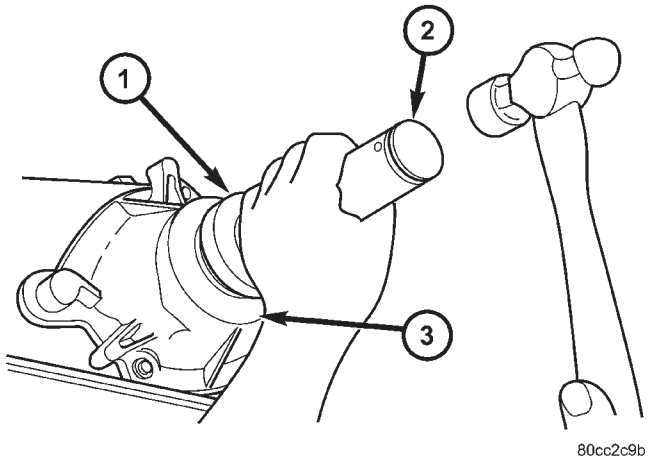


Fig. 89 Rear Seal Installation

1 - SPECIAL TOOL 8691
2 - HANDLE
3 - TRANSFER CASE

(7) Install rear slinger with Installer 8408.

(8) Install boot on output shaft slinger and crimp retaining clamp with tool C-4975-A (Fig. 90).

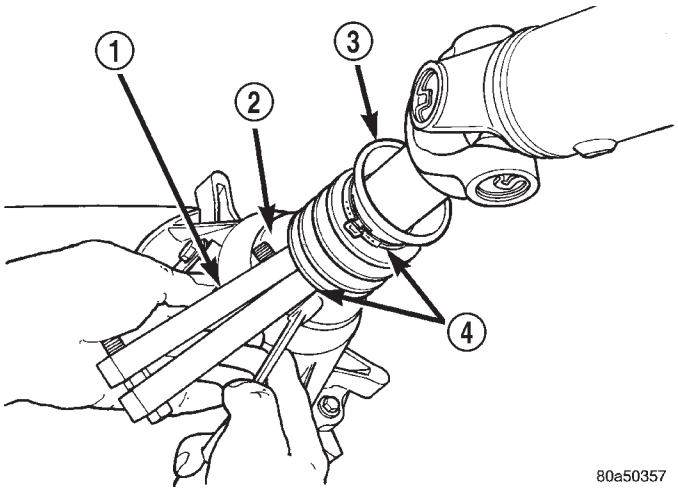


Fig. 90 Slinger Boot Installation

1 - SPECIAL TOOL C-4975-A
2 - SLINGER
3 - BOOT
4 - CLAMP

TRANSFER CASE - NV242 (Continued)

NV242HD REAR RETAINER

(1) Apply bead of Mopar® Sealer, or Loctite™ Ultra Gray, to mating surface of rear retainer. Sealer bead should be a maximum of 3/16 in.

(2) Install rear retainer on rear case. Tighten retainer bolts to 20-27 N·m (15-20 ft. lbs.) torque.

(3) Install new output shaft bearing snap-ring (Fig. 91). Lift mainshaft slightly to seat snap-ring in shaft groove, if necessary.

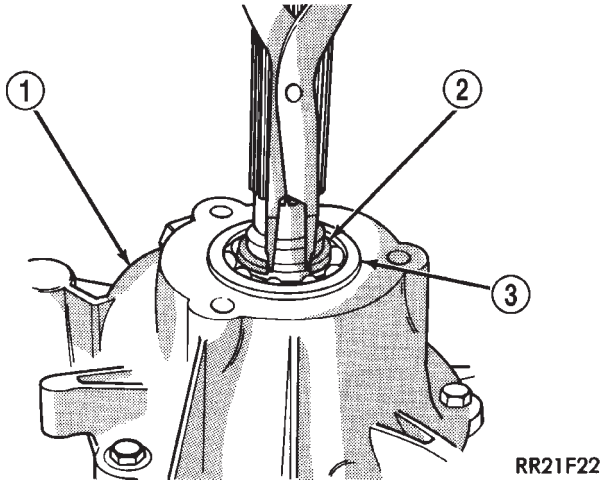


Fig. 91 Install Output Bearing Snap-ring

1 - REAR RETAINER
2 - SNAP-RING
3 - REAR BEARING

(4) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting surface of extension housing. Allow sealer to set-up slightly before proceeding.

(5) Install extension housing on rear retainer.

(6) Install extension housing bolts and tighten to 35-46 N·m (26-34 ft. lbs.).

COMPANION FLANGE

(1) Lubricate companion flange hub with transmission fluid and install flange on front shaft.

(2) Install new seal washer on front shaft.

(3) Install flange on front shaft and tighten nut to 122-176 N·m (90-130 ft. lbs.).

INSTALLATION

(1) Mount transfer case on a transmission jack.

(2) Secure transfer case to jack with chains.

(3) Position transfer case under vehicle.

(4) Align transfer case and transmission shafts and install transfer case on transmission.

(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 4).

(6) Align and connect propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

(7) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(8) Install rear crossmember and skid plate, if equipped. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(9) Remove transmission jack and support stand.

(10) Connect shift rod to transfer case range lever.

(11) Connect transfer case vent hose and transfer case position sensor.

(12) Adjust transfer case shift cable.

(13) Lower vehicle and verify transfer case shift operation.

TRANSFER CASE - NV242 (Continued)

SPECIFICATIONS

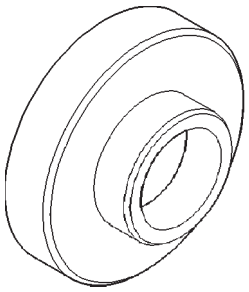
TRANSFER CASE - NV242

TORQUE SPECIFICATIONS

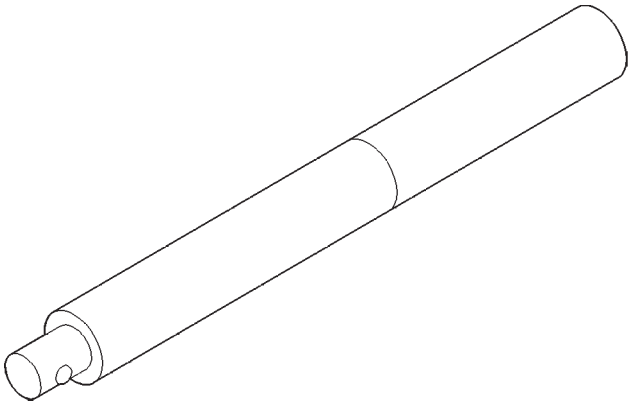
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	11.8-17.7	-
Bolt, Diff. Case	17-27	12.5-19.9	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Front Brg. Retainer	16-27	11.8-19.9	-
Bolt, Case Half	35-46	25.8-33.9	-
Nut, Front Yoke	122-176	90-130	-
Screw, Oil Pump	1.2-1.8	-	12-15
Nut, Range Lever	27-34	19.9-25	-
Bolt, Rear Retainer	35-46	25.8-33.9	-
Nuts, Mounting	35	25.8	-
Bolts, U-Joint	19	14	-

SPECIAL TOOLS

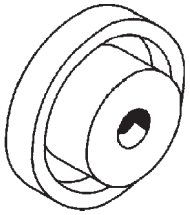
TRANSFER CASE - NV242



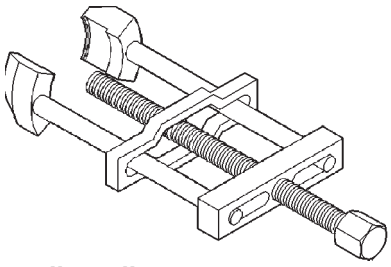
Installer, Seal - C-4076-B



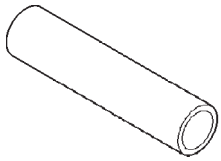
Handle, Universal - C-4171



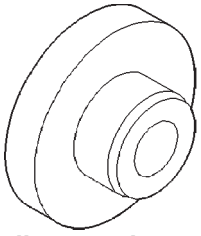
Remover, Bearing - C-4210



Puller, Slinger - MD-998056-A

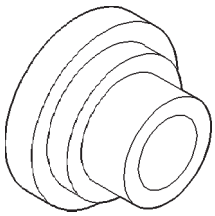


Installer - MD-998323

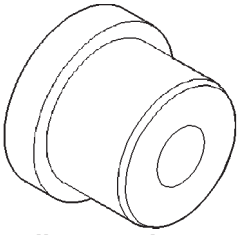


Installer, Bearing - 5064

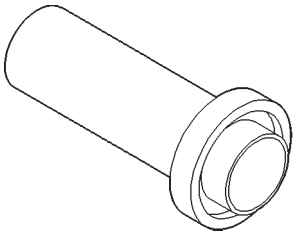
TRANSFER CASE - NV242 (Continued)



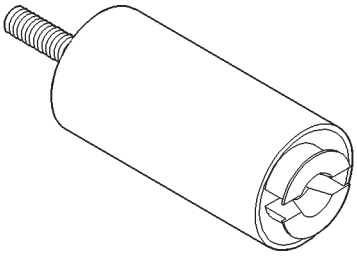
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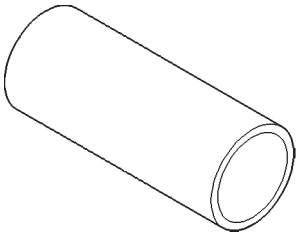
Installer, Bearing - 5066



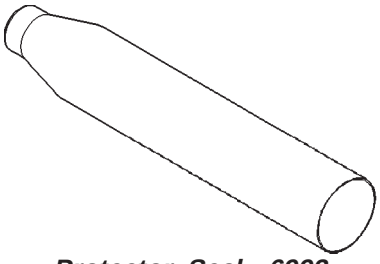
Installer, Seal - 6952-A



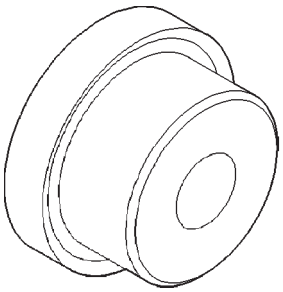
Remover, Bearing - L-4454



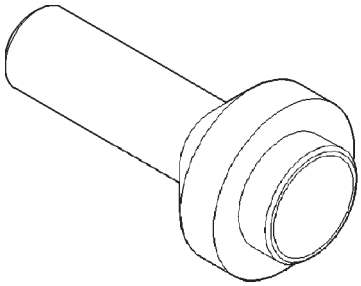
Cup - 8148



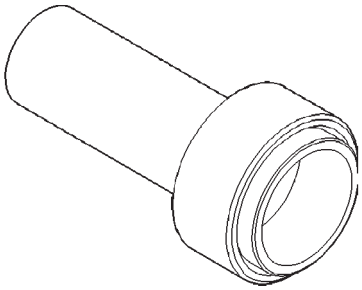
Protector, Seal - 6992



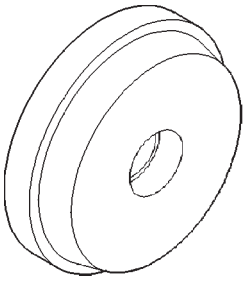
Installer, Input Gear Bearing - 7829-A



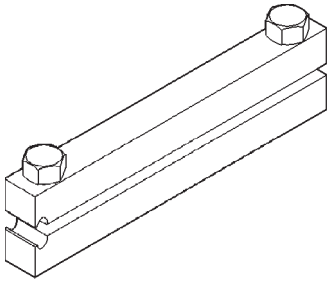
Installer, Seal - 7884



Installer, Pump Housing Seal - 7888



Installer, Bearing - 8033-A



Installer, Boot Clamp - C-4975-A

FLUID

STANDARD PROCEDURE - FLUID DRAIN/ REFILL

The fill and drain plugs are both in the rear case (Fig. 92).

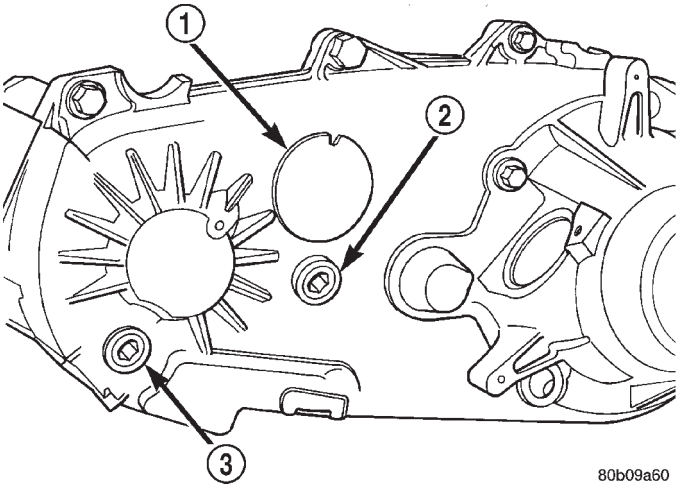


Fig. 92 Fill/Drain Plug and I.D. Tag Location - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

(1) Raise vehicle.
(2) Position drain pan under transfer case.
(3) Remove drain and fill plugs and drain lubricant completely.
(4) Install drain plug. Tighten plug to 20-34 N·m (15-25 ft. lbs.).
(5) Remove drain pan.
(6) Fill transfer case to bottom edge of fill plug opening with Mopar® Transfer Case Lubricant.
(7) Install and tighten fill plug to 20-34 N·m (15-25 ft. lbs.).
(8) Lower vehicle.

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle.
(2) Remove front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - REMOVAL)
(3) Remove front output shaft companion flange.
(4) Remove seal from front case with pry tool (Fig. 93).

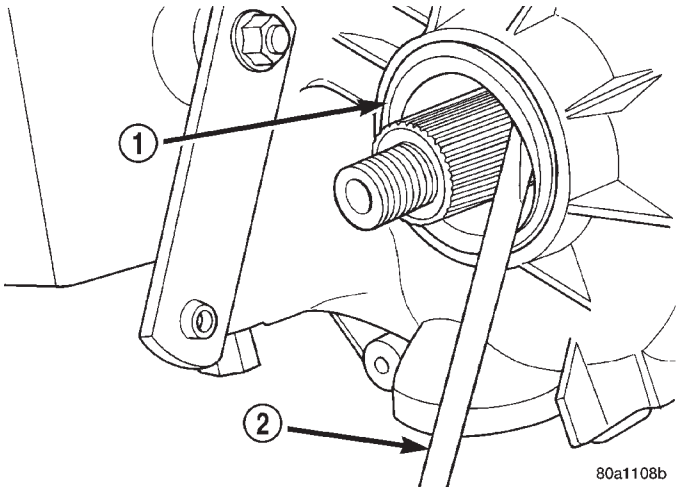


Fig. 93 Remove Front Output Shaft Seal

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:
(a) Place new seal on tool. Garter spring on seal goes toward interior of case.
(b) Start seal in bore with light taps from hammer (Fig. 94). Once seal is started, continue tapping seal into bore until installer tool seats against case.

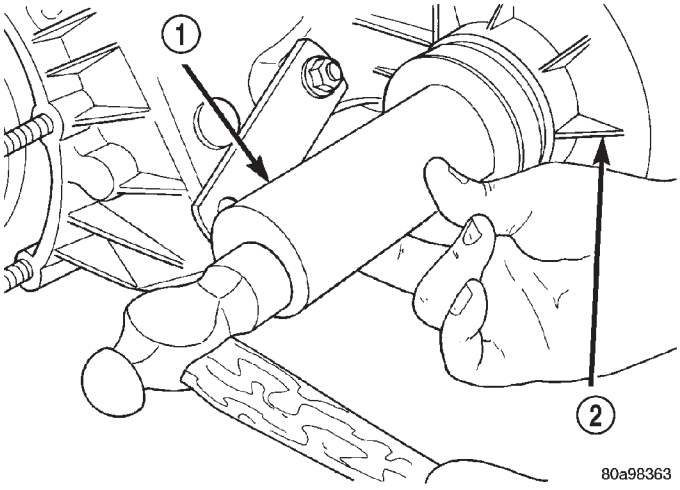


Fig. 94 Front Output Seal Installation

1 - INSTALLER 6952-A
2 - TRANSFER CASE

(2) Install companion flange and tighten nut to 122-176 (90-130 ft. lbs.) torque.
(3) Install front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - INSTALLATION)

POSITION SENSOR

DESCRIPTION

The transfer case position sensor (Fig. 95) is an electronic device whose output can be interpreted to indicate the transfer case's current operating mode. The sensor consists of a five position, resistive multiplexed circuit which returns a specific resistance value to the Powertrain Control Module (PCM) for each transfer case operating mode. The sensor is located on the top of the transfer case, just left of the transfer case centerline and rides against the sector plate roostercomb. The PCM supplies 5VDC (+/- 0.5V) to the sensor and monitors the return voltage to determine the sector plate, and therefore the transfer case, position.

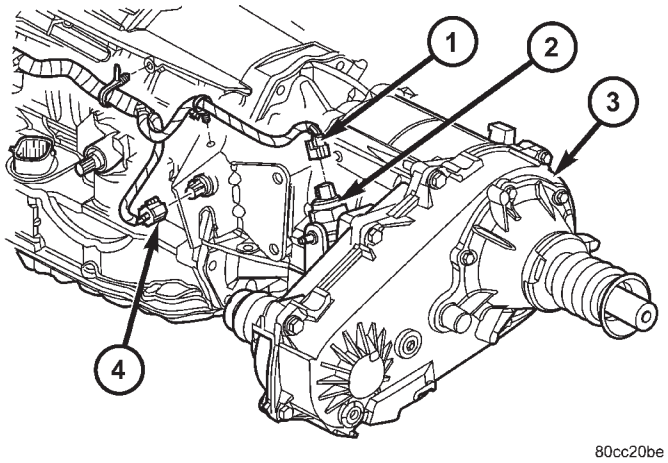


Fig. 95 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

OPERATION

During normal vehicle operation, the Powertrain Control Module (PCM) monitors the transfer case position sensor return voltage to determine the operating mode of the transfer case. Refer to the Operating Mode Versus Resistance table for the correct resistance for each position (Fig. 96).

OPERATING MODE VERSUS RESISTANCE

SENSOR POSITION	OPERATING MODE	SENSOR RESISTANCE (ohms)
1	2WD	1124-1243
2	4WD PART TIME	650-719
3	4WD FULL TIME	389-431
4	NEUTRAL	199-221
5	4WD LOW	57-64

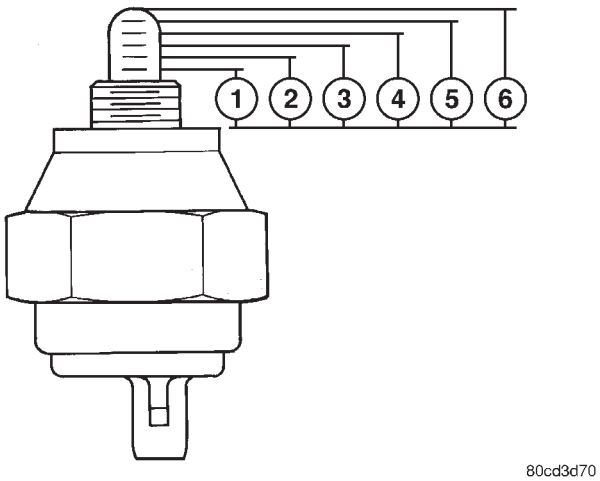


Fig. 96 Position Sensor Linear Movement

1 - POSITION 1 - 10mm ±0.5mm
2 - POSITION 2 - 12mm ±0.5mm
3 - POSITION 3 - 14mm ±0.5mm
4 - POSITION 4 - 16mm ±0.5mm
5 - POSITION 5 - 18mm ±0.5mm
6 - POSITION 6 - 20mm±0.5mm - FULL EXTENSION

POSITION SENSOR (Continued)

REMOVAL

(1) Raise and support the vehicle.

(2) Disengage the transfer case position sensor connector from the position sensor (Fig. 97).

(3) Remove the position sensor from the transfer case.

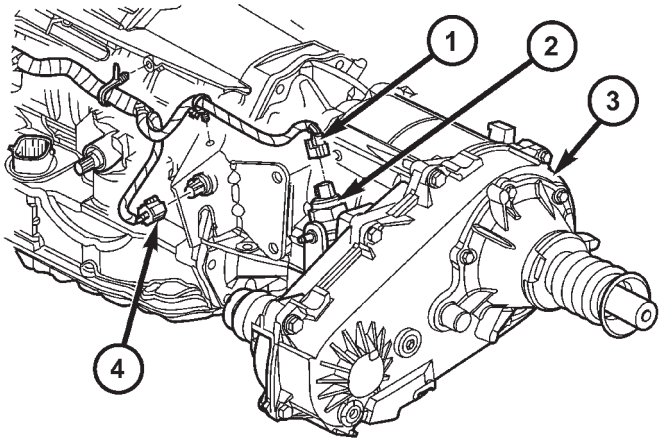


Fig. 97 Transfer Case Position Sensor and Connector

1 - TRANSFER CASE POSITION SENSOR CONNECTOR
2 - TRANSFER CASE POSITION SENSOR
3 - TRANSFER CASE
4 - OUTPUT SPEED SENSOR CONNECTOR

INSTALLATION

(1) Inspect the o-ring seal on the transfer case position sensor. Replace the o-ring if necessary.

(2) Install the transfer case position sensor into the transfer case. Torque the sensor to 20-34 N·m (15-25 ft.lbs.).

(3) Engage the transfer case position sensor connector to the position sensor.

(4) Lower vehicle.

(5) Verify proper sensor operation.

REAR RETAINER BUSHING AND SEAL - NV242HD

REMOVAL

(1) Raise vehicle.

(2) Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(3) Using a suitable pry tool or slide-hammer mounted screw, remove the rear retainer seal.

(4) Using Remover 6957, remove bushing from rear retainer (Fig. 98).

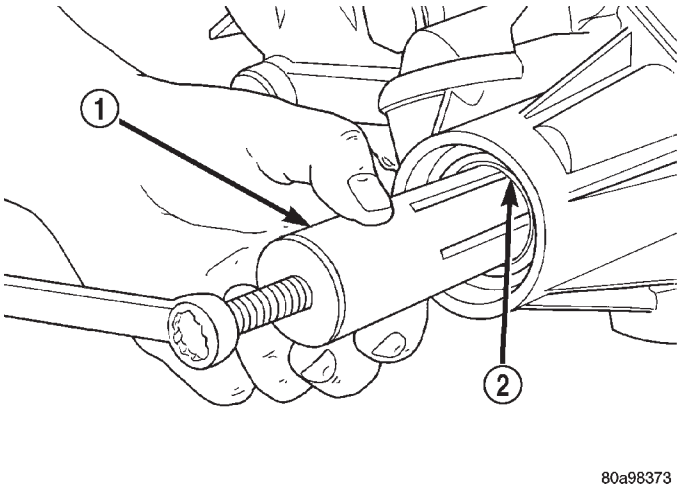


Fig. 98 Rear Retainer Bushing Removal

1 - REMOVER 6957
2 - REAR RETAINER BUSHING

INSTALLATION

(1) Clean fluid residue from sealing surface and inspect for defects.

(2) Position replacement bushing in rear retainer with fluid port in bushing aligned with slot in retainer.

(3) Using Installer 8160, drive bushing into retainer until installer seats against case (Fig. 99).

(4) Using Installer C-3995-A, install seal in rear retainer (Fig. 100).

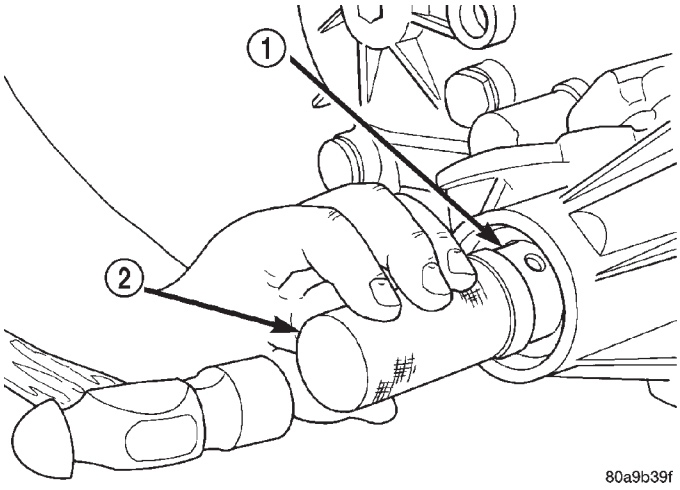


Fig. 99 Rear Retainer Bushing Install

1 - REAR RETAINER BUSHING
2 - INSTALLER 8160

REAR RETAINER BUSHING AND SEAL - NV242HD (Continued)

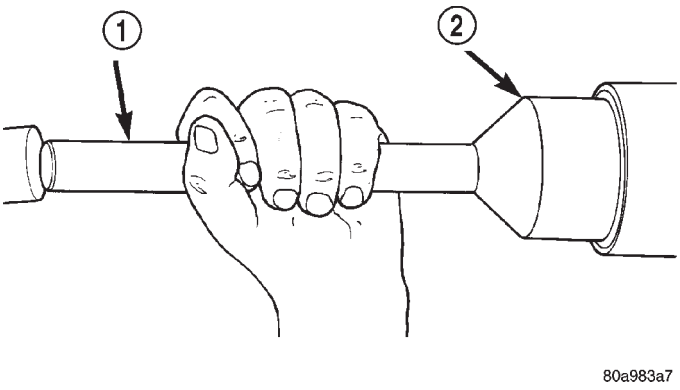


Fig. 100 Install Rear Retainer Seal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-3995-A

(5) Install the rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
(6) Verify proper fluid level.
(7) Lower vehicle.

SHIFT CABLE

REMOVAL

(1) Shift transfer case into NEUTRAL.
(2) Raise vehicle.
(3) Disconnect the shift cable eyelet from the transfer case shift lever (Fig. 101).
(4) Remove shift cable from the cable support bracket.

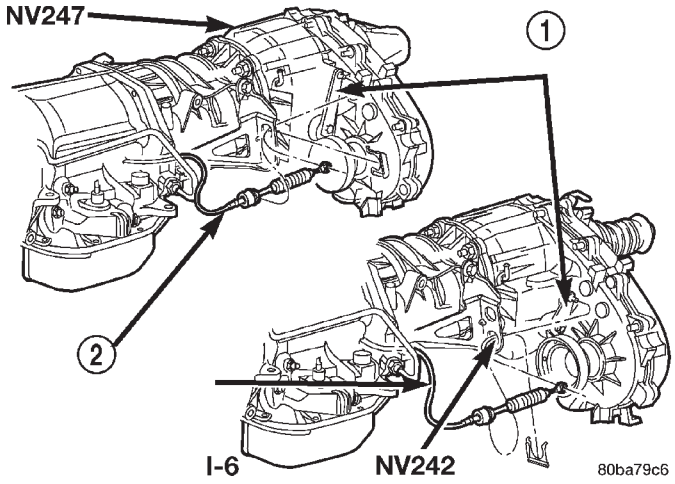


Fig. 101 Transfer Case Shift Cable at Transfer Case

1 - TRANSFER CASE SHIFT LEVER
2 - TRANSFER CASE SHIFT CABLE

(5) Lower vehicle.
(6) Remove any necessary console parts for access to shift lever assembly and shift cable.
(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 102).
(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 103).
(9) Pull cable through floor panel opening.

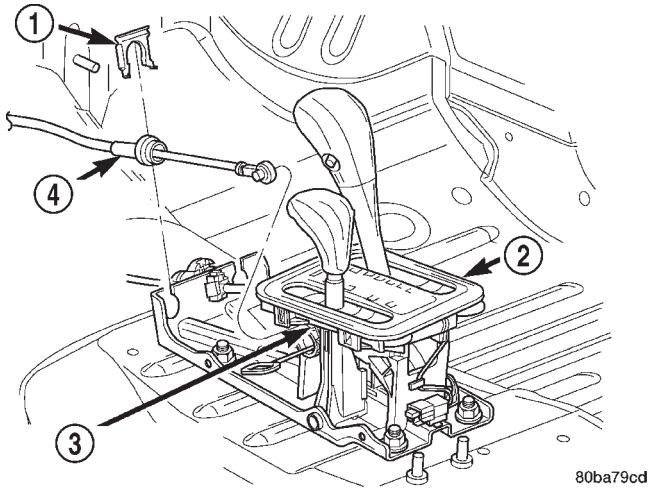


Fig. 102 Transfer Case Shift Cable at Shifter

1 - CLIP
2 - SHIFTER
3 - TRANSFER CASE SHIFT LEVER PIN
4 - TRANSFER CASE SHIFT CABLE

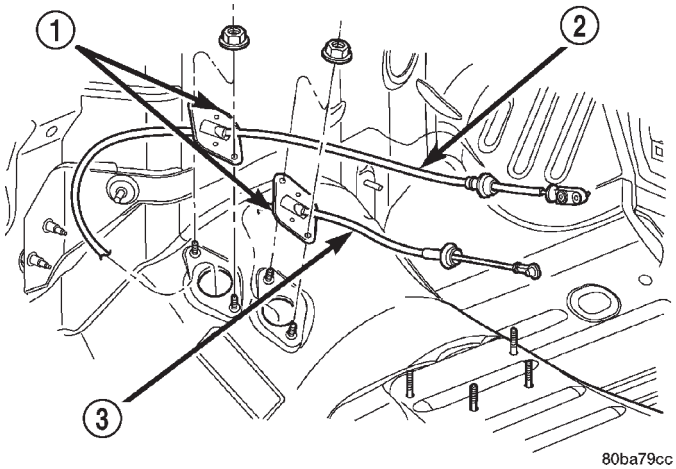


Fig. 103 Shift Cables at Floor Pan

1 - SEAL PLATES
2 - TRANSMISSION SHIFT CABLE
3 - TRANSFER CASE SHIFT CABLE

(10) Remove transfer case shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.
(2) Install seal plate to studs in floor pan.
(3) Install nuts to hold seal plate to floor pan (Fig. 103). Tighten nuts to 7 N·m (65 in.lbs.).

SHIFT CABLE (Continued)

(4) Install the transfer case shift cable to the shifter assembly bracket. Seat cable in bracket and install clip (Fig. 102).

(5) Verify the transfer case shift lever (at console) is in the NEUTRAL position.

(6) Snap the cable onto the shift lever pin (Fig. 102).

(7) Raise the vehicle.

(8) Install the shift cable to the shift cable support bracket and install clip (Fig. 101).

(9) Verify that the transfer case is still in the NEUTRAL position.

(10) Snap the shift cable onto the transfer case shift lever (Fig. 101).

(11) Lower vehicle.

(12) Verify correct transfer case operation in all ranges.

(13) Install any console parts removed for access to transfer case shift cable.

TRANSFER CASE - NV247

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TRANSFER CASE - NV247

DESCRIPTION

The NV247 (Fig. 1) is an on-demand 4-wheel drive transfer case with two operating ranges and a neutral position. Operating ranges are 4-high and 4-low. The 4-low range is used for extra pulling power in off-road situations.

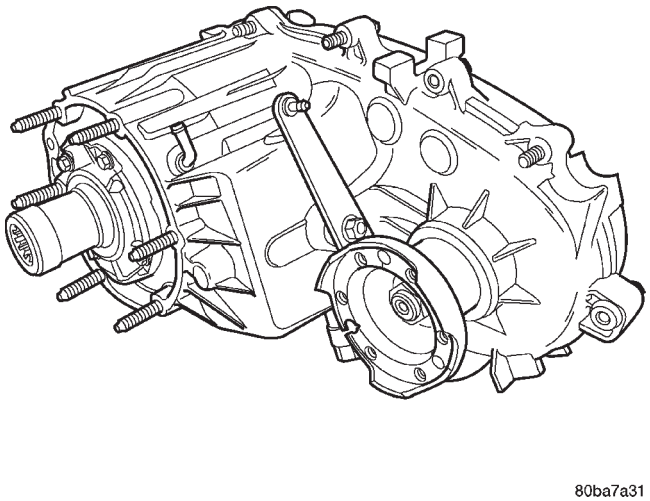


Fig. 1 NV247 Transfer Case

TRANSFER CASE IDENTIFICATION

A circular I.D. tag is attached to the rear case of each NV247 transfer case (Fig. 2). The tag indicates the following information:

- Model number
- Serial number
- Assembly number
- Gear ratio
- Location of manufacture

The transfer case serial number also represents the date of build.

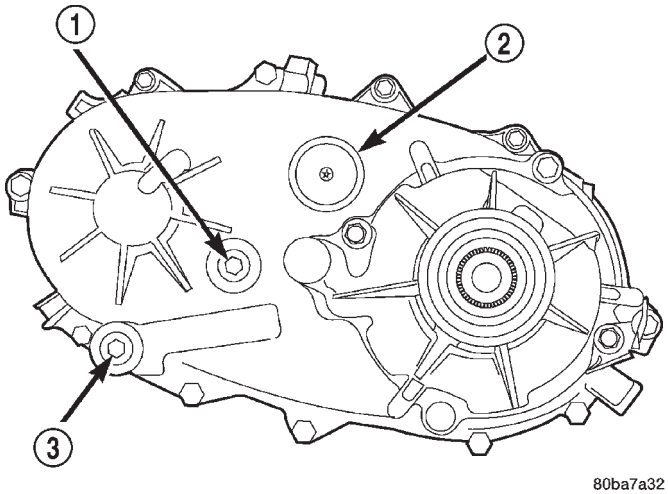


Fig. 2 Transfer Case I.D. Tag

1 - FILL PLUG
2 - I.D. TAG
3 - DRAIN PLUG

TRANSFER CASE - NV247 (Continued)

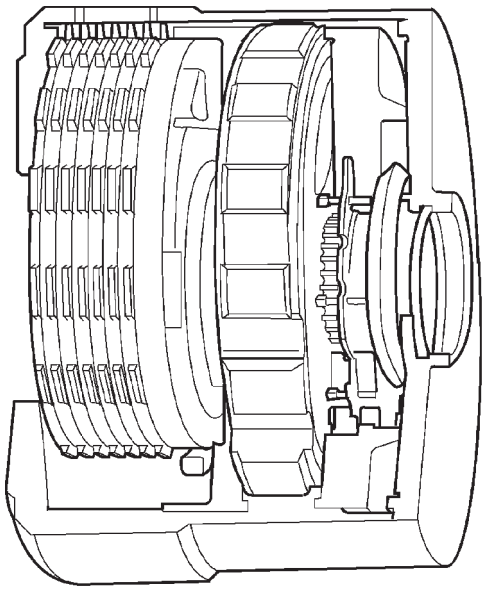
OPERATION

Under normal driving conditions, the system operates conventionally, and the majority of available torque is applied to the rear wheels. However, when front-to-rear wheel speed variations exist, the progressive differential transfers torque to the axle with the better traction, thus minimizing wheel spin and maximizing control.

The key to this design is a progressive coupling (Fig. 3), which is supplied with pressurized oil by a gerotor style pump. The pump rotor and case are driven by the front and rear driveshafts respectively, and deliver pressurized oil flow to the coupling in proportion to their speed difference. The progressive coupling contains a multi-disc clutch pack that is alternately splined to the front and rear driveshafts, and controls torque variation between the front and rear driveshafts as dictated by the pump.

A set of orifices and valves control the speed-differential starting point and rate of torque transfer rise in the clutch. This allows the system to disregard the normal speed differences between axles that result from variations in front-to-rear loading and typical cornering.

Transfer case operating ranges are selected with a floor mounted shift lever. The shift lever is connected to the transfer case range lever by an adjustable cable. Range positions are marked on the shifter bezel plate.



80ba7a55

Fig. 3 Progressive Coupling

DIAGNOSIS AND TESTING - TRANSFER CASE - NV247

CONDITION	POSSIBLE CAUSE	CORRECTION
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	1. Vehicle speed too great to permit shifting	1. Reduce speed to 3-4 km/h (2-3 mph) before attempting to shift
	2. Transfer case external shift cable binding	2. Lubricate, repair or replace cable, or thighten loose components as necessary
	3. Insufficient or incorrect lubricant	3. Drain and refill to edge of fill hole with correct lubricant
	4. Internal components binding, worn, or damaged	4. Disassemble unit and replace worn or damaged components as necessary
TRANSFER CASE NOISY IN ALL MODES	1. Insufficient or incorrect lubricant	1. Drain and refill to edge of fill hole with correct lubricant. **If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise**

TRANSFER CASE - NV247 (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
NOISY IN—OR JUMPS OUT OF 4WD LOW RANGE	1. Transfer case not completely engaged in 4WD LOW (possibly from shift to 4L while rolling)	1. Stop vehicle, shift transfer case to neutral, then shift back to 4WD LOW
	2. Shift linkage loose, binding, or is misadjusted	2. Tighten, lubricate, or repair linkage as necessary. Adjust linkage if necessary
	3. Range fork cracked, inserts worn, or fork is binding on shift rail	3. Disassemble unit and repair as necessary
	4. Annulus gear or lockplate worn or damaged	4. Disassemble unit and repair as necessary
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	1. Transfer case over filled	1. Drain to correct level
	2. Vent closed or restricted	2. Clear or replace vent if necessary
	3. Output shaft seals damaged or installed correctly	3. Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores and nicks with fine sandpaper or replace yoke(s) if necessary.

REMOVAL

(1) Shift transfer case into NEUTRAL.
(2) Raise vehicle.
(3) Remove transfer case drain plug and drain transfer case lubricant.
(4) Mark front and rear propeller shaft yokes for alignment reference.
(5) Support transmission with jack stand.
(6) Remove rear crossmember and skid plate, if equipped (Fig. 4).
(7) Disconnect front propeller shaft from transfer case at companion flange. Remove rear propeller shaft from vehicle. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

CAUTION: Do not allow propshafts to hang at attached end. Damage to joint can result.

(8) Disconnect transfer case cable from range lever.
(9) Disconnect transfer case vent hose (Fig. 5).
(10) Support transfer case with transmission jack.
(11) Secure transfer case to jack with chains.
(12) Remove nuts attaching transfer case to transmission.
(13) Pull transfer case and jack rearward to disengage transfer case (Fig. 5).
(14) Remove transfer case from under vehicle.

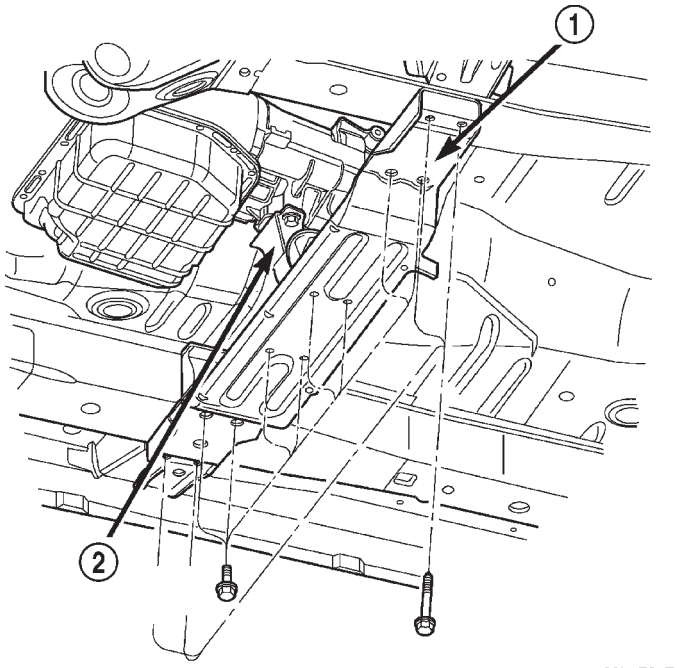


Fig. 4 Crossmember Removal

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

DISASSEMBLY

Position transfer case on shallow drain pan. Remove drain plug and drain lubricant remaining in case.

TRANSFER CASE - NV247 (Continued)

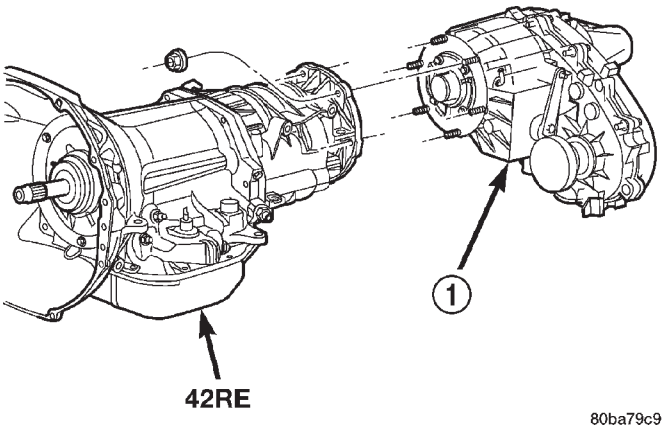


Fig. 5 Transfer Case Mounting

1 - NV247 TRANSFER CASE

REAR RETAINER AND OIL PUMP

(1) Remove rear retainer bolts (Fig. 6).

(2) Remove rear bearing locating ring access plug (Fig. 7).

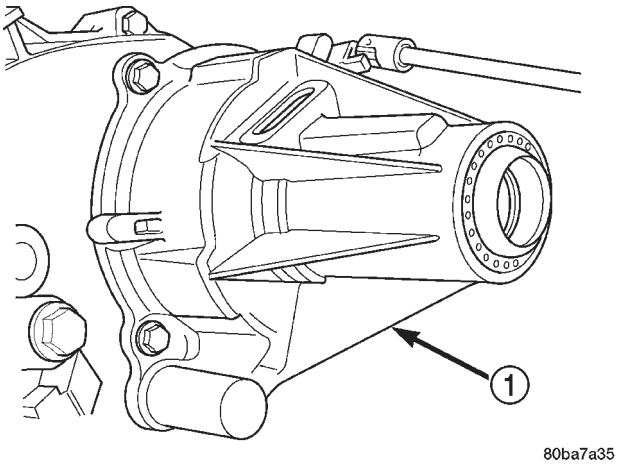


Fig. 6 Rear Retainer Bolt Removal

1 - REAR RETAINER

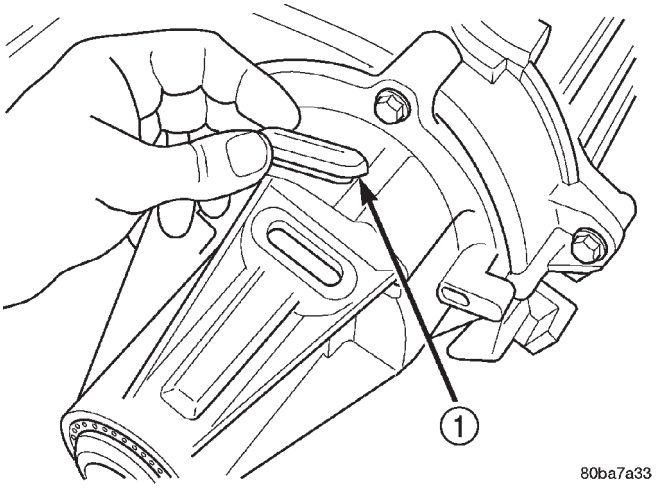


Fig. 7 Remove Rubber Access Plug

1 - PLUG

(3) Loosen rear retainer with pry tool to break sealer bead. Pry only against retainer boss as shown (Fig. 8).

(4) Remove rear retainer as follows:

(a) Spread rear bearing locating ring with snap ring pliers (Fig. 9).

(b) Then slide retainer off mainshaft and rear bearing (Fig. 10).

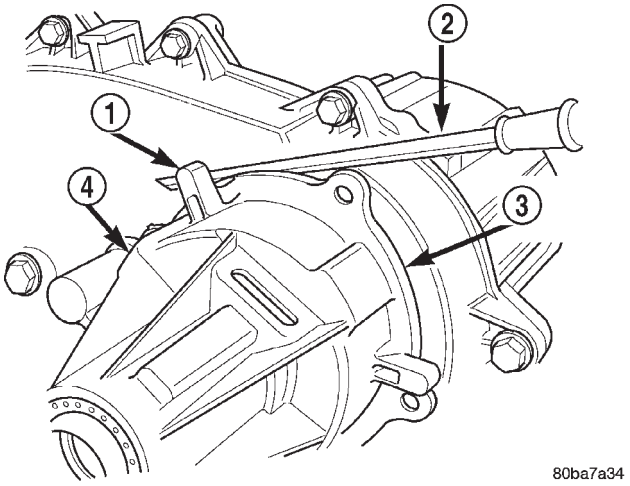


Fig. 8 Loosening Rear Retainer

1 - RETAINER BOSS
2 - PRY TOOL
3 - SEALER BEAD
4 - REAR RETAINER

TRANSFER CASE - NV247 (Continued)

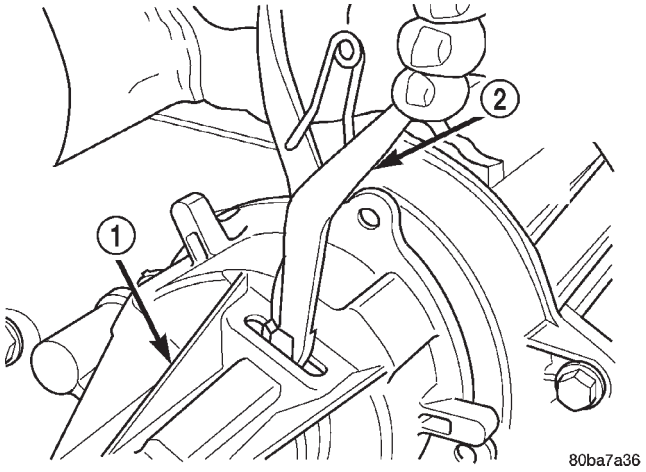


Fig. 9 Disengaging Rear Bearing Locating Ring

1 - REAR RETAINER
2 - PARALLEL JAW SNAP-RING PLIERS

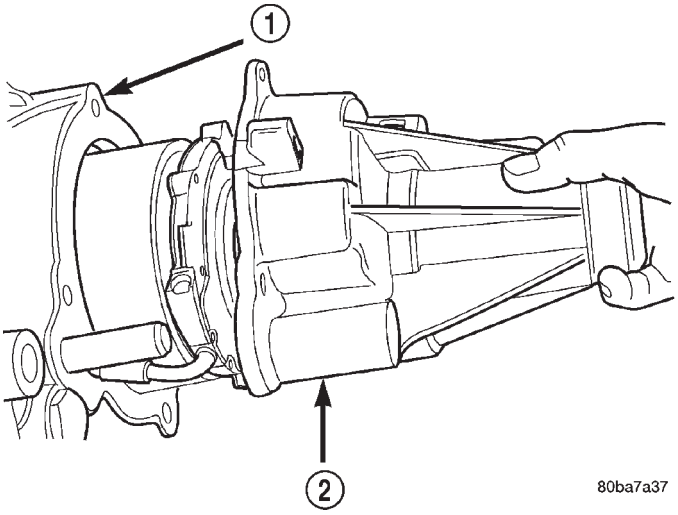


Fig. 10 Rear Retainer Removal

1 - REAR CASE
2 - REAR RETAINER

(5) Remove rear bearing snap-ring.

(6) Remove rear bearing. Note position of bearing locating ring groove for assembly reference.

(7) Disengage oil pickup tube from oil pump and remove oil pump assembly (Fig. 11).

(8) Remove pick-up tube o-ring from oil pump (Fig. 12), if necessary. Do not disassemble the oil pump, it is not serviceable.

COMPANION FLANGE AND RANGE LEVER

(1) Remove front companion flange nut as follows:

(a) Move range lever to 4L position.

(b) Remove nut with socket and impact wrench.

(2) Remove companion flange. If flange is difficult to remove by hand, remove it with bearing splitter, or with standard two jaw puller. Be sure puller tool is positioned on flange and not on slinger as slinger will be damaged.

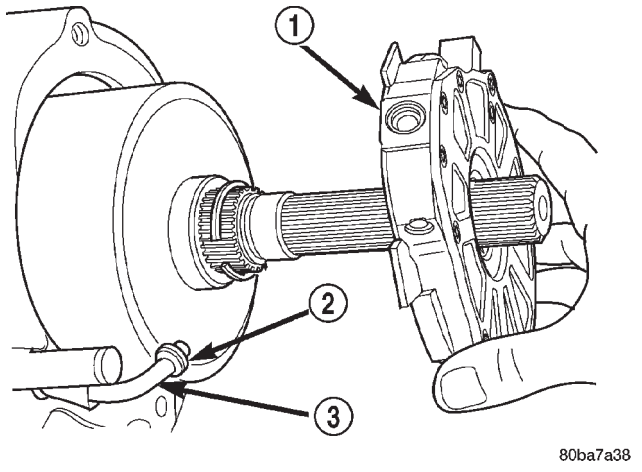


Fig. 11 Rear Bearing and Oil Pump Removal

1 - OIL PUMP
2 - TUBE O-RING
3 - OIL PICKUP TUBE

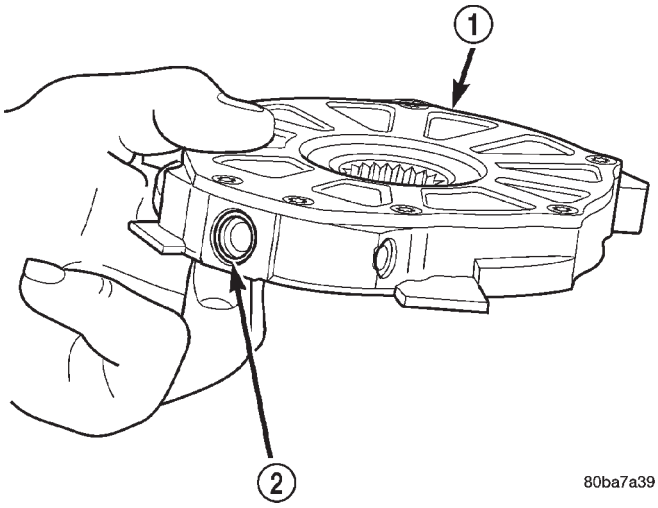


Fig. 12 Pick-up Tube O-ring Location

1 - OIL PUMP
2 - O-RING

(3) Remove seal washer from front output shaft. Discard washer as it should not be reused.

(4) Remove nut and washer that attach range lever to sector shaft. Then move sector to neutral position and remove range lever from shaft.

NOTE: Note position of range lever so it can be re-installed correctly.

TRANSFER CASE - NV247 (Continued)

REAR CASE

(1) Support transfer case so rear case is facing upward.

(2) Remove bolts holding front case to rear case. The case alignment bolt require flat washers (Fig. 13).

(3) Loosen rear case with flat blade screwdriver to break sealer bead. Insert screwdriver blade only into notches provided at each end of case (Fig. 14).

(4) Remove rear case (Fig. 15).

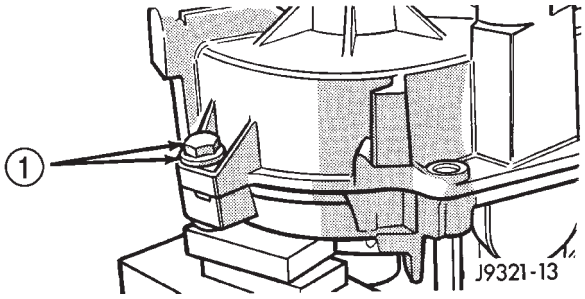


Fig. 13 Rear Case Alignment Bolt Locations

1 - ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

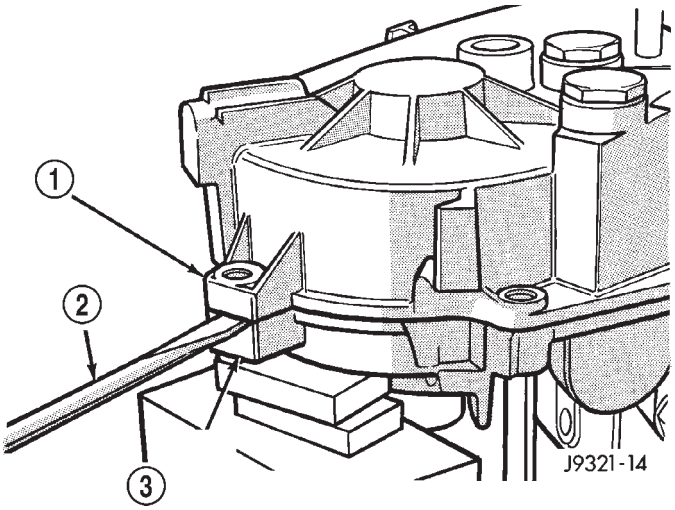


Fig. 14 Loosening Rear Case

1 - REAR CASE
2 - PRY TOOL (IN CASE SLOT)
3 - FRONT CASE

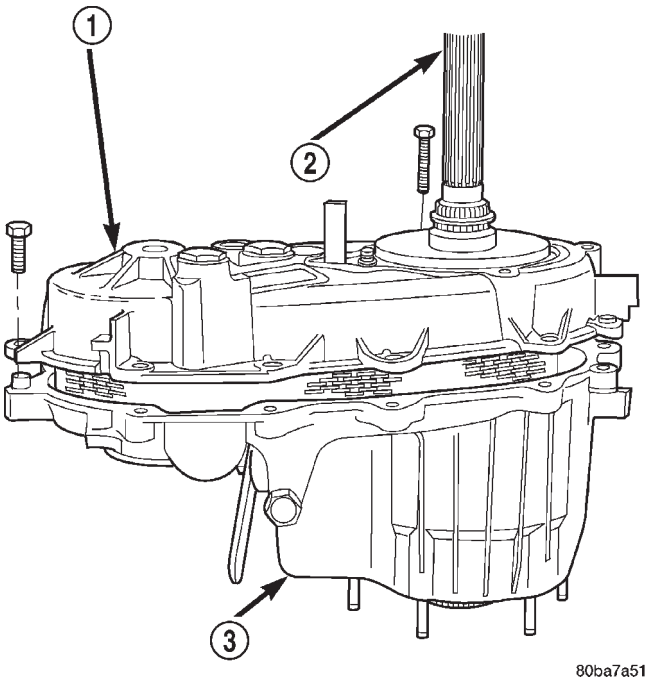


Fig. 15 Rear Case Removal

1 - REAR HOUSING
2 - MAINSHAFT
3 - TRANSFER CASE

PROGRESSIVE COUPLING

(1) Remove oil pump locating snap-ring and progressive coupling thrust washer from the mainshaft (Fig. 16).

(2) Remove progressive coupling from mainshaft (Fig. 16).

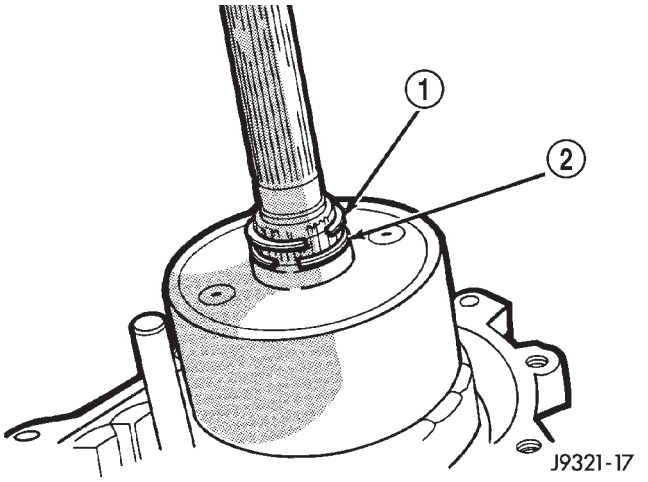


Fig. 16 Progressive Coupling Removal

1 - SNAP-RING
2 - PROGRESSIVE COUPLING

TRANSFER CASE - NV247 (Continued)

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Remove oil pickup tube from rear case (Fig. 17).

(2) Remove drive gear snap-ring (Fig. 18).

(3) Disengage drive gear (Fig. 18). Pry gear upward and off mainshaft as shown.

(4) Remove front output shaft, drive chain and drive gear as assembly (Fig. 18).

(5) Remove output shaft drive gear snap ring.

(6) Remove output shaft drive gear from output shaft.

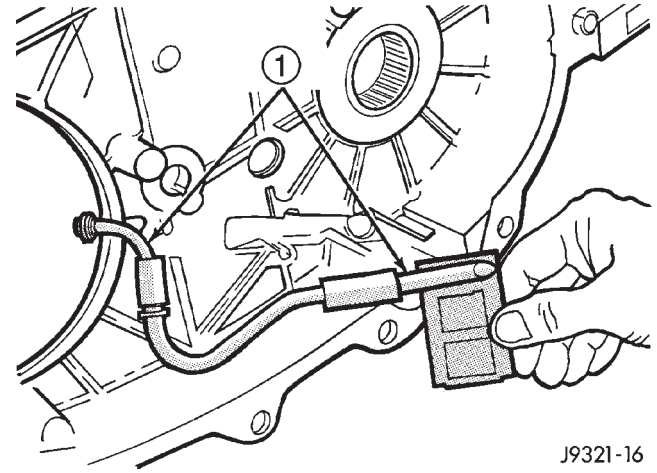


Fig. 17 Oil Pickup Tube Removal

1 - OIL PICKUP TUBE

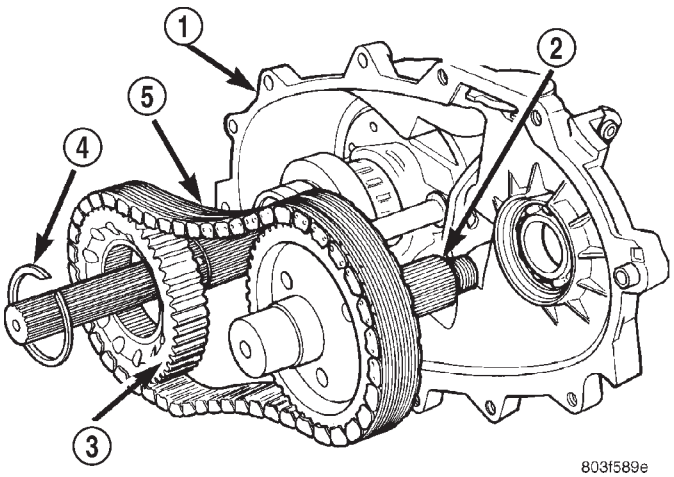


Fig. 18 Front Output Shaft, Drive Gear And Chain Removal

1 - REAR HOUSING
2 - OUTPUT SHAFT AND SPROCKET
3 - MAINSHAFT SPROCKET
4 - SNAP-RING
5 - DRIVE CHAIN

SHIFT FORKS AND MAINSHAFT

(1) Remove detent plug, O-ring, detent spring and detent plunger (Fig. 19).

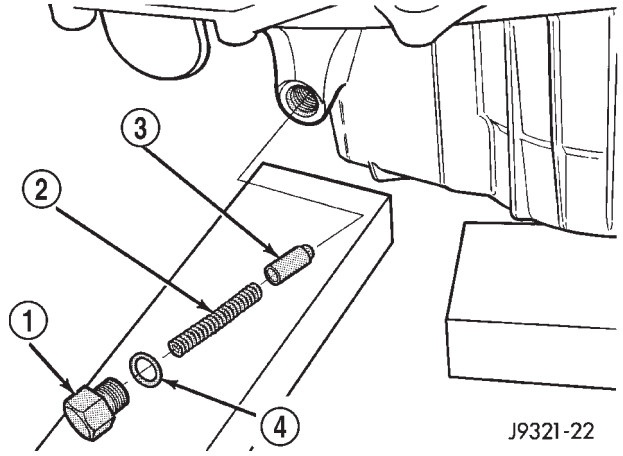


Fig. 19 Detent Plug, Spring And Plunger Removal

1 - DETENT PLUG
2 - DETENT SPRING
3 - DETENT PLUNGER
4 - PLUG O-RING

(2) Remove shift rail from shift fork and transfer case housing.

(3) Rotate range shift fork until it disengages from shift sector.

(4) Remove mainshaft and shift fork from input gear pilot bearing.

NOTE: Loose needle bearings are used to support the drive sprocket hub on the mainshaft. Do not lift mainshaft by drive sprocket hub or needle bearings will become dislodged.

(5) Wrap rag around mainshaft underneath drive sprocket hub and remove drive sprocket hub from mainshaft. Be sure to retrieve all the drive sprocket hub needle bearings.

(6) Remove snap ring holding clutch sleeve onto mainshaft.

TRANSFER CASE - NV247 (Continued)

(7) Remove range clutch sleeve, blockout spring, locking clutch, and locking clutch spring from mainshaft (Fig. 20).

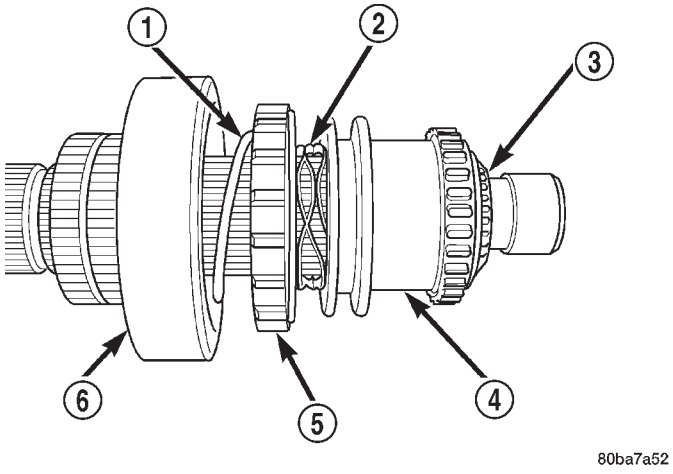


Fig. 20 Range Clutch Sleeve, Blockout Spring, Locking Clutch and Spring

1 - LOCKING CLUTCH SPRING
2 - BLOCKOUT SPRING
3 - SNAP-RING
4 - RANGE CLUTCH SLEEVE
5 - LOCKING CLUTCH
6 - DRIVE SPROCKET HUB

(8) Remove shift sector. Rotate and tilt sector as needed to remove it (Fig. 21).

(9) Remove shift sector bushing and O-ring (Fig. 22).

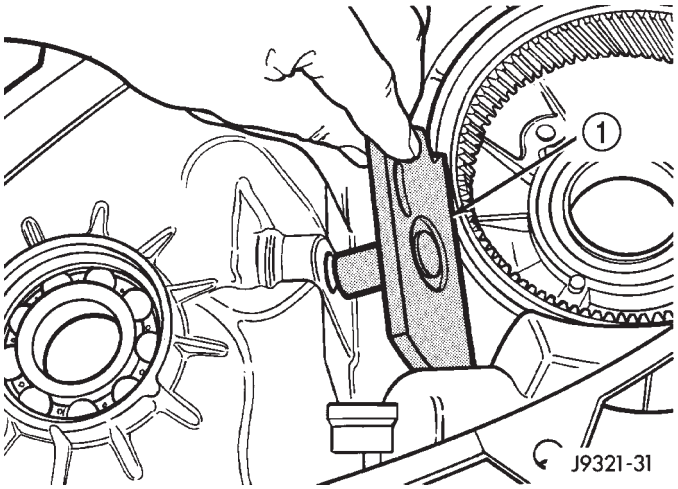


Fig. 21 Shift Sector Removal

1 - SHIFT SECTOR

INPUT GEAR/LOW RANGE ASSEMBLY

(1) Turn front case on side so front bearing retainer is accessible.

(2) Remove front bearing retainer bolts (Fig. 23).

(3) Remove front bearing retainer as follows:

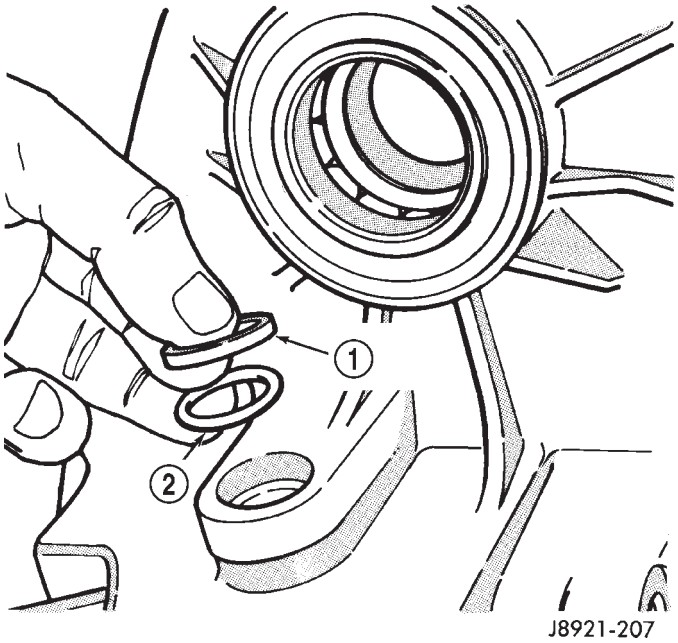


Fig. 22 Sector Bushing And O-Ring Removal

1 - SHIFT SECTOR BUSHING
2 - O-RING

(a) Loosen retainer with flat blade screwdriver to break sealer bead. **To avoid damaging case and retainer, position screwdriver blade only in slots provided in retainer (Fig. 24).**

(b) Then remove retainer from case and gear.

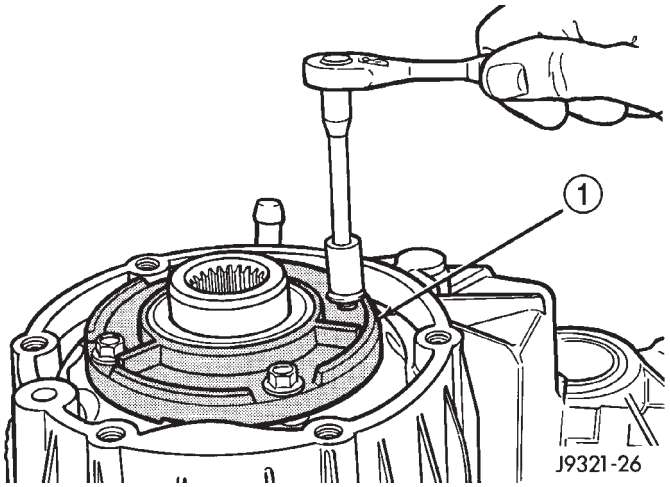


Fig. 23 Front Bearing Retainer Bolt Removal

1 - FRONT BEARING RETAINER

TRANSFER CASE - NV247 (Continued)

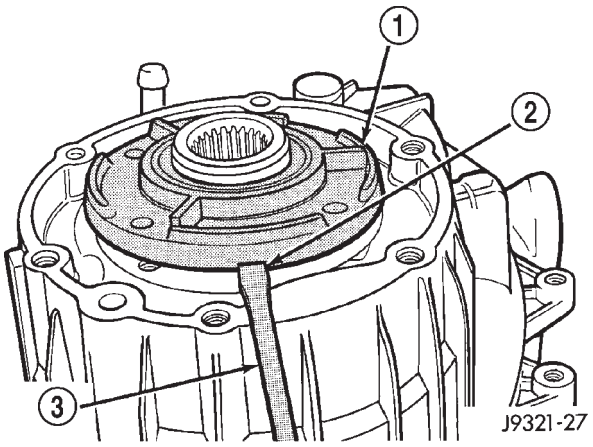


Fig. 24 Front Bearing Retainer Removal

1 - FRONT BEARING RETAINER
2 - RETAINER NOTCH
3 - FLAT BLADE SCREWDRIVER

(4) Remove snap-ring that retains input gear shaft in front bearing (Fig. 25).

(5) Remove input and low range gear assembly (Fig. 26).

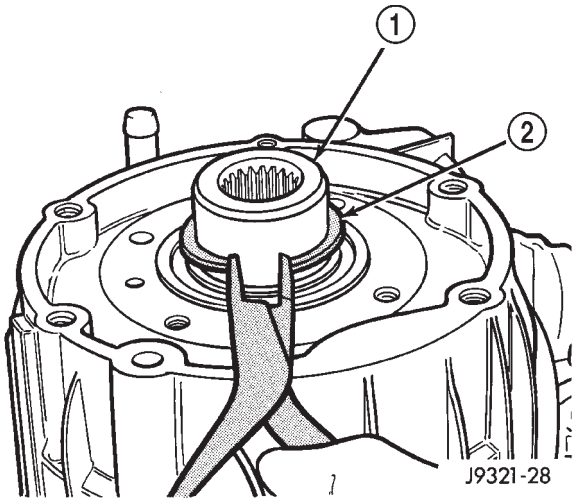


Fig. 25 Input Gear Snap-Ring Removal

1 - INPUT GEAR
2 - SNAP-RING

(6) Remove oil seals from following components:

- front bearing retainer.
- rear retainer.
- case halves.

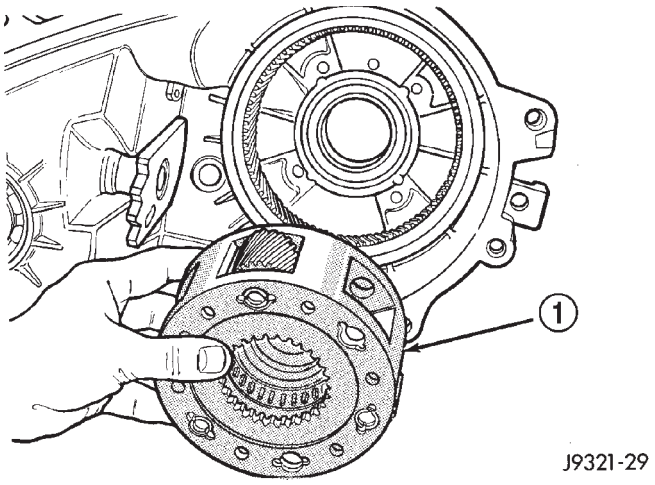


Fig. 26 Input And Low Range Gear Assembly Removal

1 - INPUT AND LOW RANGE GEAR ASSEMBLY

INPUT AND LOW RANGE GEAR

(1) Remove snap-ring that retains input gear in low range gear (Fig. 27).

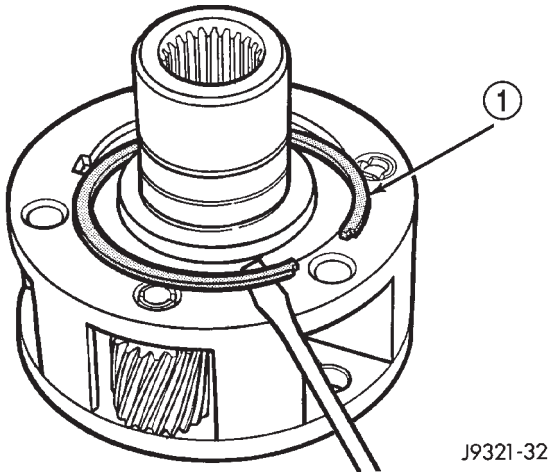


Fig. 27 Input Gear Snap-Ring Removal

1 - INPUT GEAR SNAP-RING

TRANSFER CASE - NV247 (Continued)

(2) Remove retainer (Fig. 28).
(3) Remove front tabbed thrust washer (Fig. 29).
(4) Remove input gear (Fig. 30).
(5) Remove rear tabbed thrust washer from low range gear (Fig. 31).

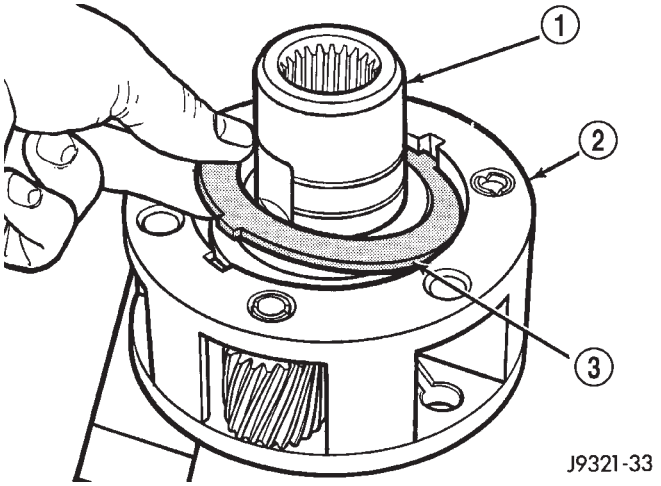


Fig. 28 Input Gear Retainer

1 - INPUT GEAR
2 - LOW RANGE GEAR
3 - RETAINER

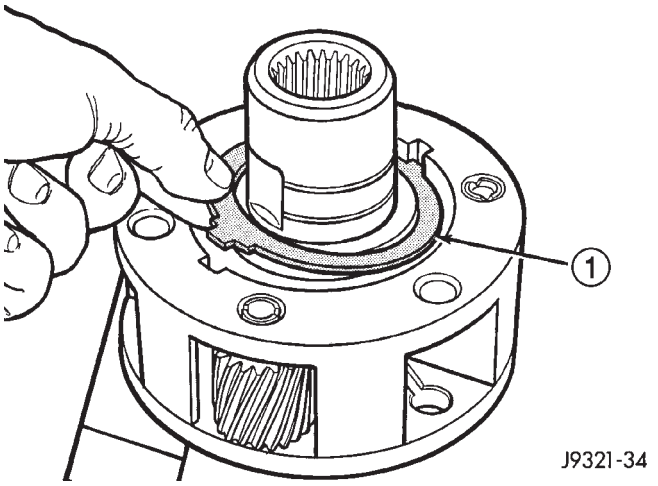


Fig. 29 Front Tabbed Thrust Washer

1 - FRONT TABBED THRUST WASHER

CLEANING

Clean the transfer case components with parts cleaning solvent. Flush the oil passages in the cases and drivetrain components with solvent. This will help remove dirt and particles from these passages.

Dry the transfer case components with compressed air or allow them to air dry on clean shop towels.

Apply compressed air through all oil passages in the cases and gear components to clear them of any residue.

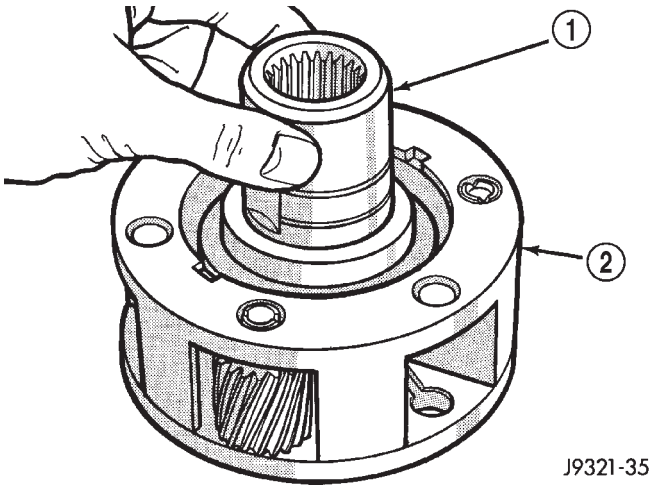


Fig. 30 Input Gear Removal

1 - INPUT GEAR
2 - LOW RANGE GEAR

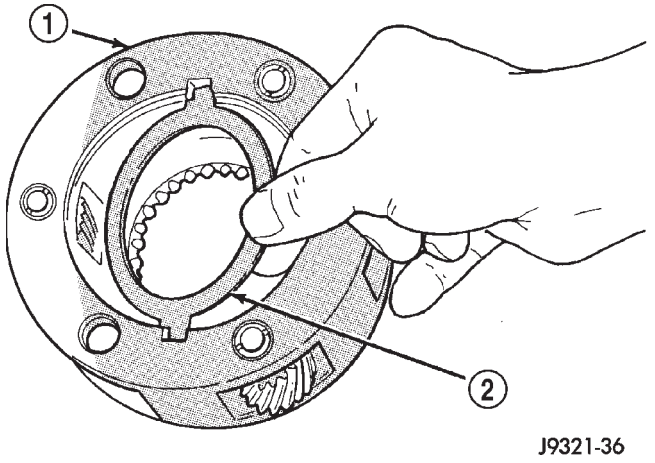


Fig. 31 Rear Tabbed Thrust Washer Removal

1 - LOW RANGE GEAR
2 - REAR TABBED THRUST WASHER

INSPECTION

MAINSHAFT

Examine the mainshaft components carefully for evidence of wear or damage.

Replace the thrust washers if worn or damaged.

Replace the mainshaft and sprocket gears if the teeth or gear bores are worn or damaged.

Replace the mainshaft bearings if worn, flat spotted, brinelled, or damaged in any way.

Replace the mainshaft if it is bent, exhibits wear or damage to the bearing surfaces, splines or gear teeth.

TRANSFER CASE - NV247 (Continued)

INPUT AND LOW RANGE GEARS

Inspect the low range gear pinions and pinion pins. Replace the low range gear if any of the pins or pinions are worn or damaged.

Inspect the thrust washers, retainer, and snap-ring. Replace the snap-ring if bent, or distorted. Replace the thrust washers and retainer if worn, cracked or damaged in any way.

Examine the input gear carefully. Be sure the gear teeth and bearing surfaces are in good condition. Replace the gear if wear or damage is evident.

Check the input gear pilot bearing. Rotate the bearing and check for roughness or noise. Also check bearing position in the bore. The bearing should be recessed approximately 2.5 mm (0.100 in.) below the top edge of the bore. The bearing should not be seated at the bottom of the bore. Replace the bearing if worn, or roughness is evident. Replace both the gear and bearing if the bearing is a loose fit in the bore.

GEAR CASE AND RETAINERS

Examine both case halves and retainers carefully. Replace any retainer or case half if wear, cracks, or other damage is evident.

Check condition of the low range annulus gear and the shift rail bushing in the front case (Fig. 32). The low range annulus gear is not a serviceable part. Replace the gear and case as an assembly if the gear is loose, worn, or damaged. The shift rail bushing is a serviceable part and can be replaced if necessary.

Check the bushing in the rear retainer. Replace the bushing if worn or scored.

Examine the sealing surfaces of both case halves and retainers. Small burrs, or scratches on these surfaces can be reduced with crocus cloth or a fine tooth file.

Examine condition of the shift rail bushing in the front case. If the bushing is worn or damaged, it can be removed with a blind hole type puller. A replacement bushing can be installed with a suitable size driver. Recess the bushing slightly below the edge of the bore but do not seat it all the into the case.

GEARTRAIN

Inspect the mainshaft splines, gear teeth and bearing surfaces carefully for evidence of wear, or damage. Replace the shaft if necessary. do not attempt to salvage it if damaged.

The shift rail and range fork are an assembly. Replace both parts if either is damaged. However, the nylon pads in the fork can be replaced if worn, or cracked.

Inspect the transfer case snap-rings closely. Do not attempt to salvage a distorted snap-ring by straightening or reshaping it. Replace any snap-ring that is distorted, or worn.

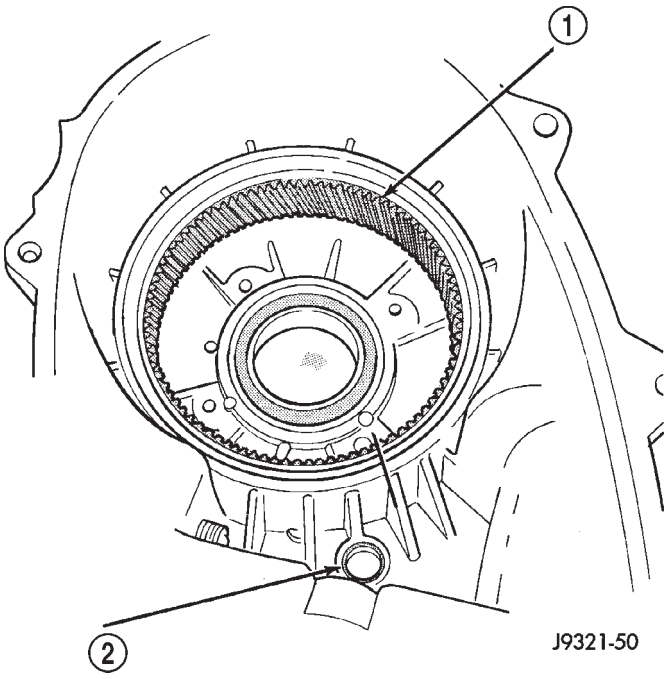


Fig. 32 Low Range Annulus Gear Location

1 - LOW RANGE ANNULUS GEAR
2 - SHIFT RAIL BUSHING

Inspect the low range gear, input gear and the gear thrust washers retainer, and snap-ring. The low range gear is serviced as an assembly only. Replace the gear if the case or pinions are damaged.

During inspection, also make sure the seal surface of the input gear is in good condition. Minor nicks on this surface can be reduced with crocus cloth. However, replace the gear if the seal surface is severely scored or worn.

OIL PUMP AND PROGRESSIVE COUPLING

The oil pump and progressive coupling are not serviceable components. Replace the coupling as an assembly if it is damaged. Replace the oil pump as an assembly if the gear teeth are worn, or if the pump has become damaged.

BEARINGS AND SEALS

The transfer case seals should be replaced during overhaul. Use new seals in the input gear bearing retainer, front case and rear retainer. Also replace the yoke seal washer and the detent plug O-ring.

Check condition of each transfer case bearing. Replace any bearing exhibiting signs of roughness, wear, or damage.

TRANSFER CASE - NV247 (Continued)

ASSEMBLY

Lubricate transfer case components with Mopar® Transfer Case Lubricant or petroleum jelly (where indicated) during assembly.

CAUTION: The bearing bores in various transfer case components contain oil feed holes. Make sure replacement bearings do not block the holes.

BEARINGS AND SEALS

(1) Remove front output shaft seal from front case with pry tool (Fig. 33).

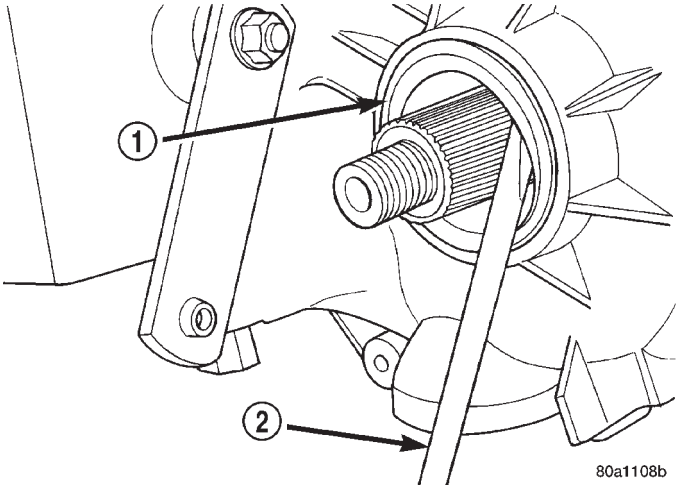


Fig. 33 Remove Front Output Shaft Seal

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

(2) Remove snap-ring that retains front output shaft bearing in front case (Fig. 34).

(3) Using tool 6953, remove bearing from front case (Fig. 35).

(4) Using tool 6953, install new bearing.

(5) Install snap-ring to hold bearing into case.

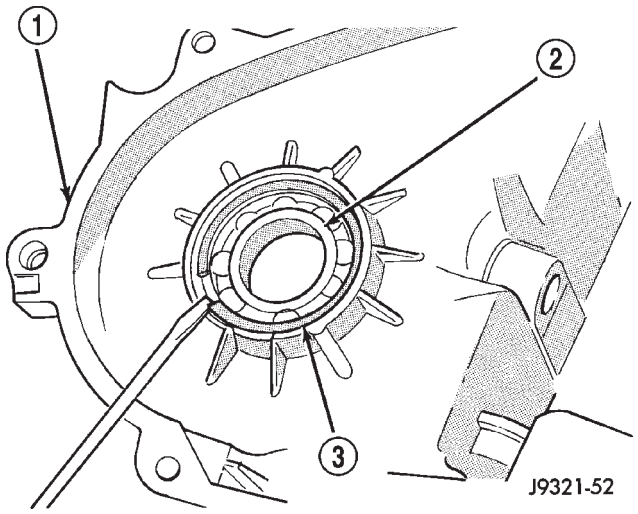


Fig. 34 Output Shaft Front Bearing Snap-Ring Removal

1 - FRONT CASE
2 - OUTPUT SHAFT FRONT BEARING
3 - BEARING SNAP-RING

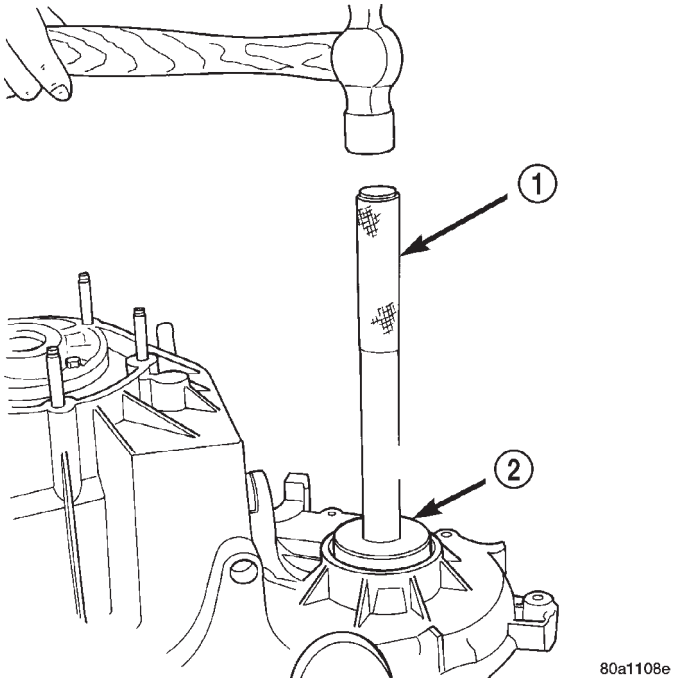


Fig. 35 Remove Output Shaft Front Bearing

1 - HANDLE C-4171
2 - REMOVER/INSTALLER 6953

TRANSFER CASE - NV247 (Continued)

(6) Install new front output seal in front case with Installer Tool 6952-A as follows:

(a) Place new seal on tool. **Garter spring on seal goes toward interior of case.**

(b) Start seal in bore with light taps from hammer (Fig. 36). Once seal is started, continue tapping seal into bore until installer tool bottoms against case.

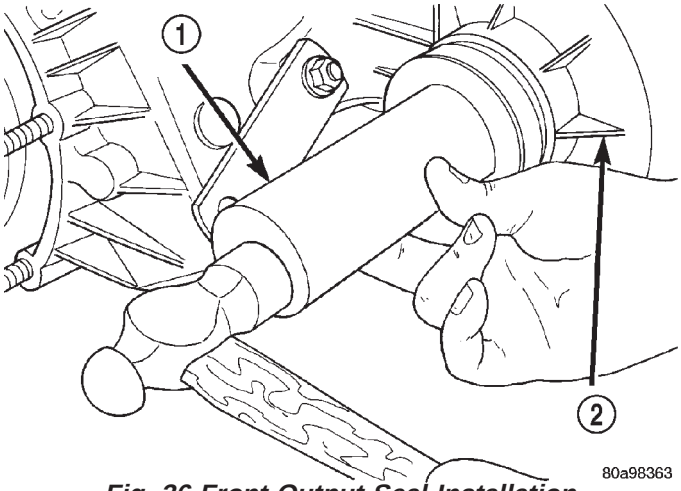


Fig. 36 Front Output Seal Installation

1 - INSTALLER 6952-A
2 - TRANSFER CASE

(7) Remove the output shaft rear bearing with the screw and jaws from Remover L-4454 and Cup 8148 (Fig. 37).

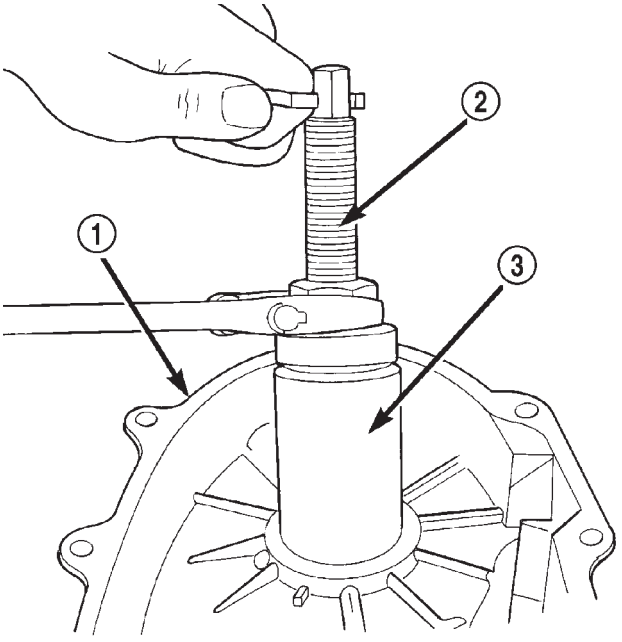


Fig. 37 Output Shaft Rear Bearing Removal

1 - REAR CASE
2 - SPECIAL TOOL L-4454-1 AND L-4454-3
3 - SPECIAL TOOL 8148

(8) Install new bearing with Tool Handle C-4171 and Installer 5066 (Fig. 38). **The bearing bore is chamfered at the top. Install the bearing so it is flush with the lower edge of this chamfer (Fig. 39).**

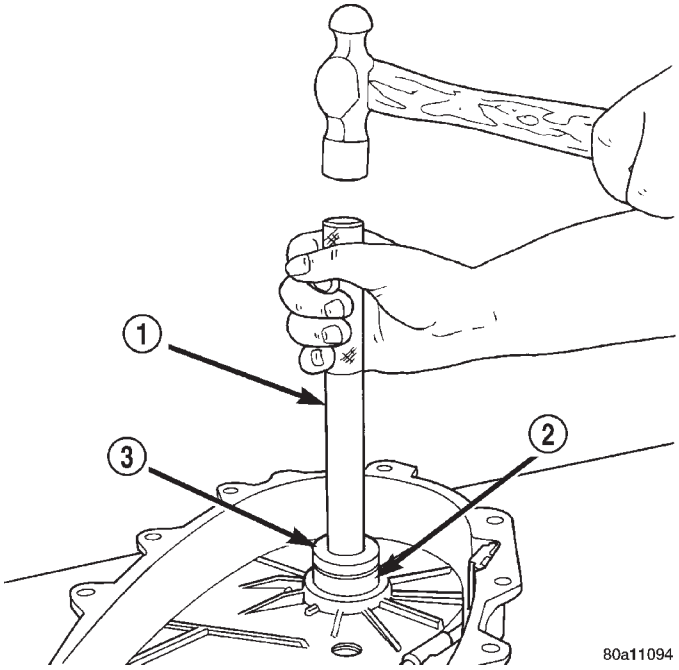


Fig. 38 Output Shaft Rear Bearing Installation

1 - HANDLE C-4171
2 - OUTPUT SHAFT INNER BEARING
3 - INSTALLER 5066

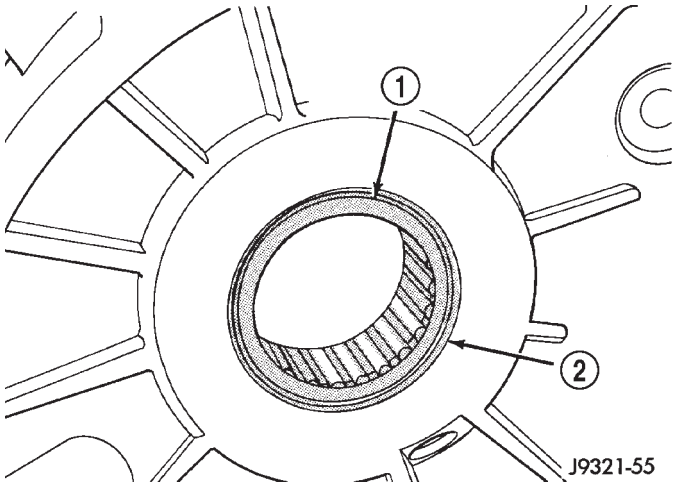


Fig. 39 Output Shaft Rear Bearing Installation Depth

1 - BEARING (SEATED) AT LOWER EDGE OF CHAMFER
2 - CHAMFER

TRANSFER CASE - NV247 (Continued)

(9) Using Remover C-4210 and Handle C-4171, drive input shaft bearing from inside the annulus gear opening in the case. (Fig. 40).

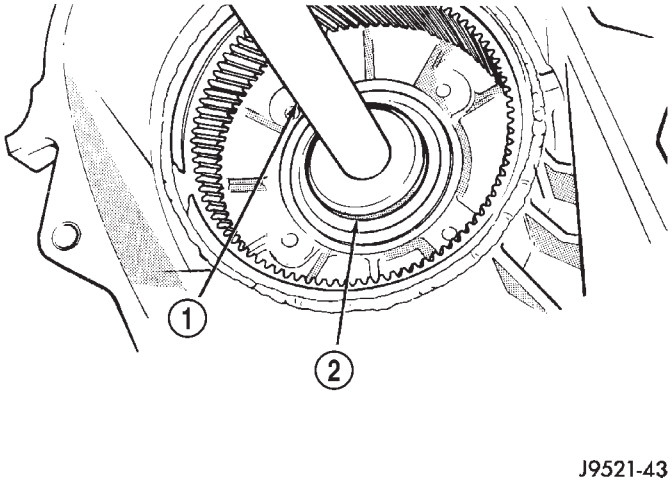


Fig. 40 Input Shaft Bearing Removal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-4210

(10) Install locating ring on new bearing.

(11) Position case so forward end is facing upward.

(12) Using Remover C-4210 and Handle C-4171, drive input shaft bearing into case. The bearing locating ring must be fully seated against case surface (Fig. 41).

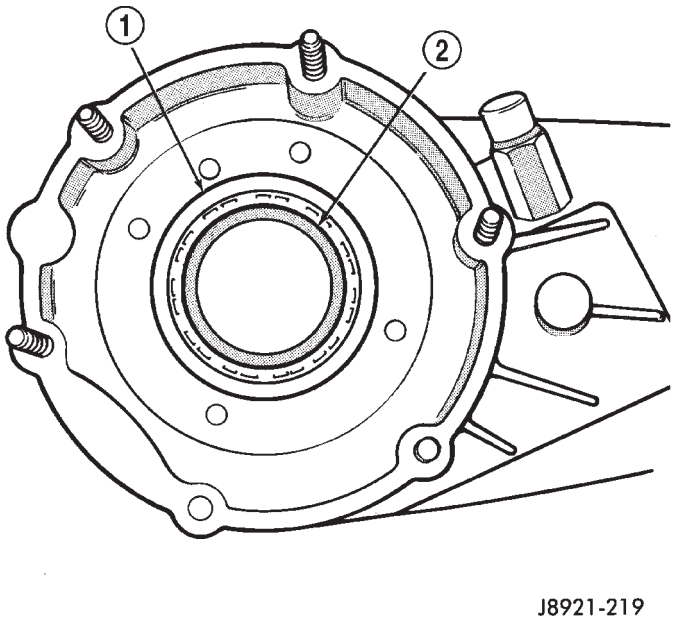


Fig. 41 Seating Input Shaft Bearing

1 - SNAP-RING
2 - INPUT SHAFT BEARING

(13) Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear and driving the bearing out with the drift and a hammer (Fig. 42).

(14) Install new pilot bearing with Installer 8128 and Handle C-4171 (Fig. 43).

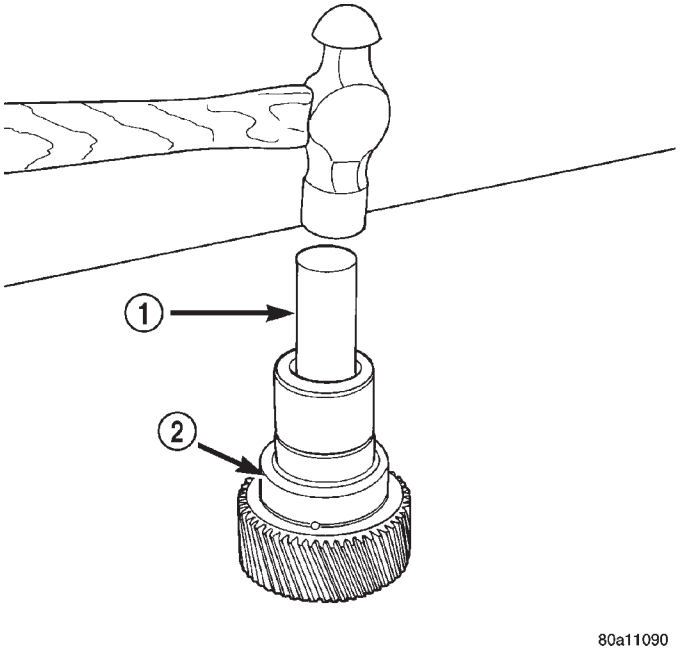


Fig. 42 Remove Input Gear Pilot Bearing

1 - DRIFT
2 - INPUT GEAR

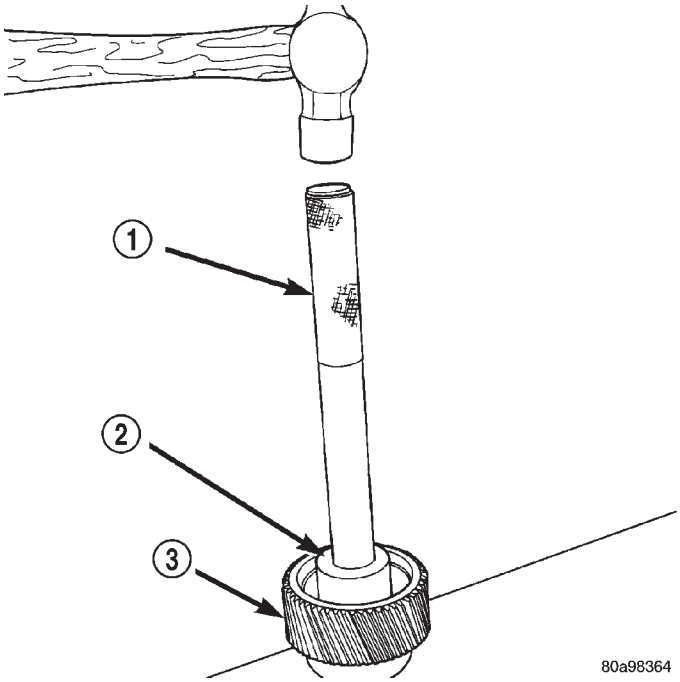


Fig. 43 Install Input Gear Pilot Bearing

1 - HANDLE C-4171
2 - INSTALLER 8128
3 - INPUT GEAR

TRANSFER CASE - NV247 (Continued)

(15) Remove front bearing retainer seal with suitable pry tool.

(16) Install new front bearing retainer with Installer 7884 (Fig. 44).

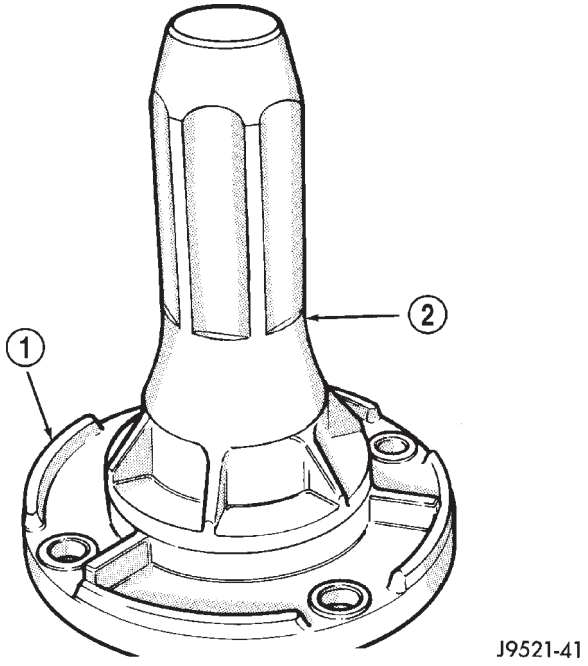


Fig. 44 Install Front Bearing Retainer Seal

1 - FRONT BEARING RETAINER
2 - SPECIAL TOOL 7884

INPUT AND LOW RANGE GEAR

(1) Lubricate gears and thrust washers (Fig. 45) with transfer case lubricant.

(2) Install first thrust washer in low range gear (Fig. 45). Be sure washer tabs are properly aligned in gear notches.

(3) Install input gear in low range gear. Be sure input gear is fully seated.

(4) Install remaining thrust washer in low range gear and on top of input gear. Be sure washer tabs are properly aligned in gear notches.

(5) Install retainer on input gear and install snap-ring.

(6) Align and install low range/input gear assembly in front case (Fig. 46). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

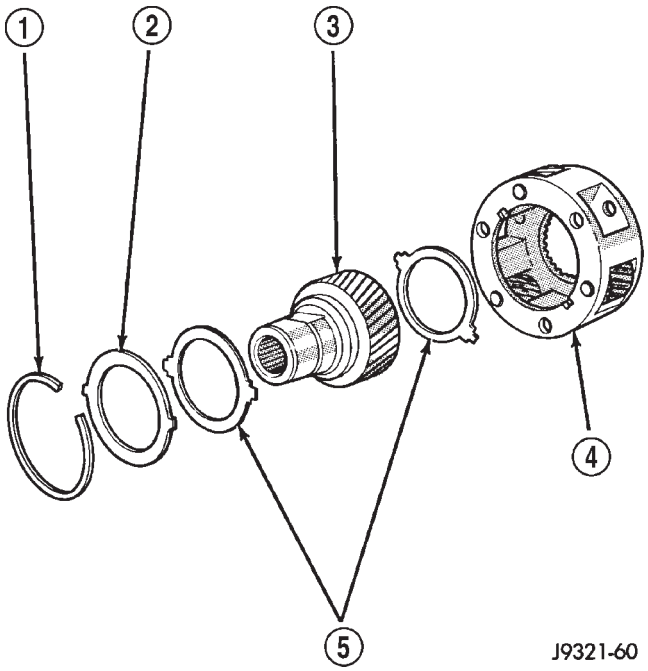


Fig. 45 Input/Low Range Gear Components

1 - SNAP-RING
2 - RETAINER PLATE
3 - INPUT GEAR
4 - LOW RANGE GEAR
5 - THRUST WASHERS

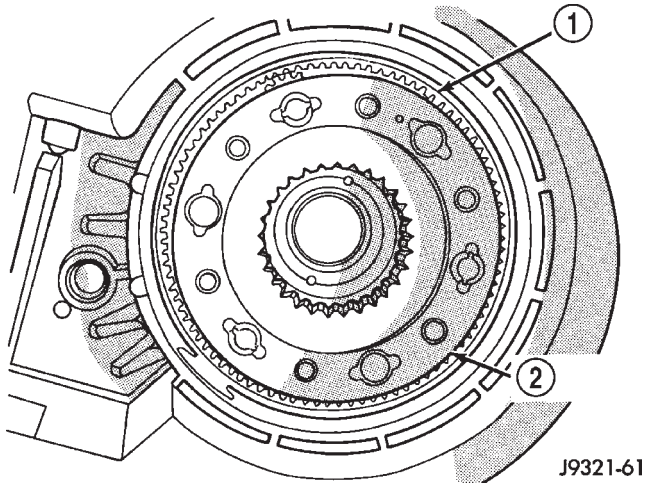


Fig. 46 Input/Low Range Gear Installation

1 - ANNULUS GEAR
2 - INPUT/LOW RANGE GEAR

TRANSFER CASE - NV247 (Continued)

(7) Install snap-ring to hold input/low range gear into front bearing (Fig. 47).

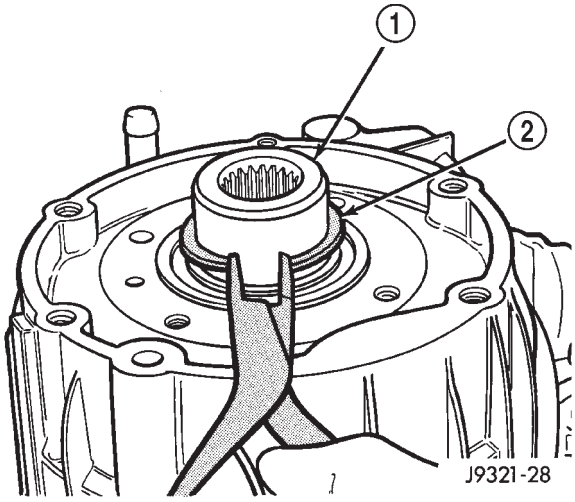


Fig. 47 Install Input Gear Snap-Ring

1 - INPUT GEAR
2 - SNAP-RING

(8) Clean gasket sealer residue from retainer and inspect retainer for cracks or other damage.

(9) Apply a 3 mm (1/8 in.) bead of Mopar® gasket maker or silicone adhesive to sealing surface of retainer.

(10) Align cavity in seal retainer with fluid return hole in front of case.

CAUTION: Do not block fluid return cavity on sealing surface of retainer when applying Mopar® gasket maker or silicone adhesive sealer. Seal failure and fluid leak can result.

(11) Install bolts to hold retainer to transfer case (Fig. 48). Tighten to 21 N·m (16 ft. lbs.) of torque.

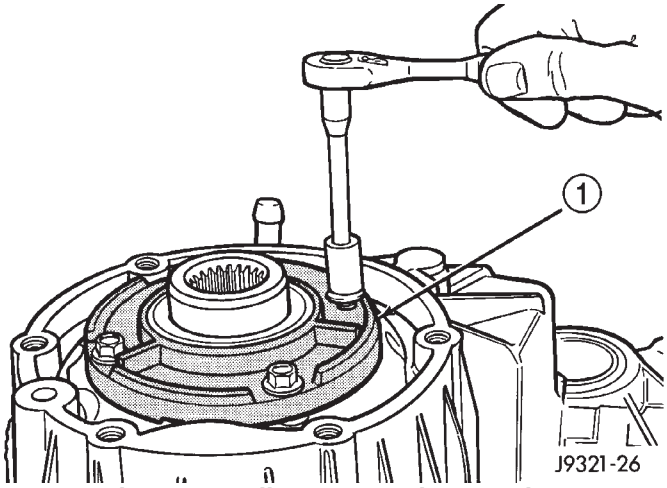


Fig. 48 Install Front Bearing Retainer

1 - FRONT BEARING RETAINER

SHIFT FORKS AND MAINSHAFT

(1) Install new sector shaft O-ring and bushing (Fig. 49).

(2) Install shift sector (Fig. 50).

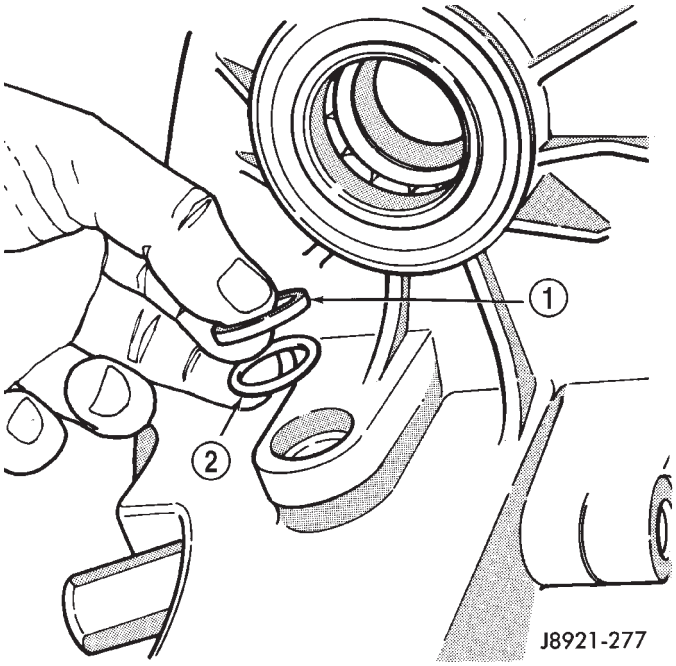


Fig. 49 Sector O-Ring And Bushing Installation

1 - SECTOR BUSHING
2 - O-RING

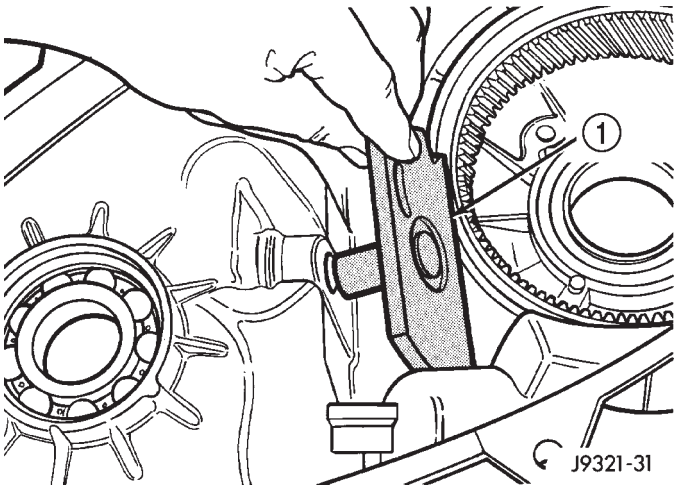


Fig. 50 Shift Sector Installation

1 - SHIFT SECTOR

(3) Install locking clutch spring, locking clutch, blockout spring, and range clutch sleeve, to mainshaft as shown in (Fig. 51). Install snap ring.

(4) Install drive sprocket hub to mainshaft and manually load the needle bearings.

(5) Install new pads on range fork, if necessary.

TRANSFER CASE - NV247 (Continued)

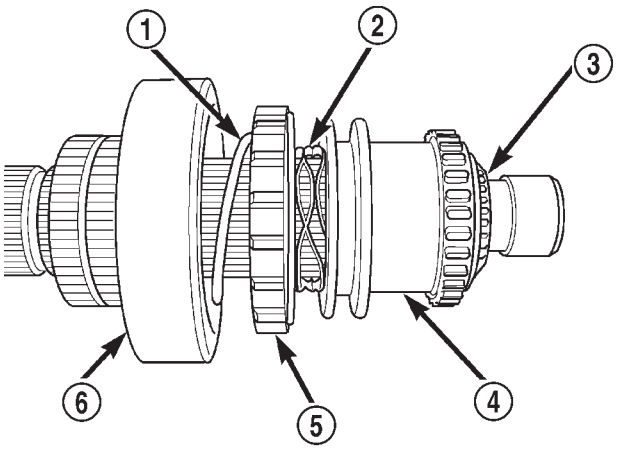


Fig. 51 Range Clutch Sleeve, Blockout Spring, Locking Clutch and Spring

1 - LOCKING CLUTCH SPRING
2 - BLOCKOUT SPRING
3 - SNAP-RING
4 - RANGE CLUTCH SLEEVE
5 - LOCKING CLUTCH
6 - DRIVE SPROCKET HUB

(6) Install range shift fork to range clutch sleeve. Install mainshaft/range shift fork assembly into transfer case and input planetary assembly. Rotate fork until it engages with slot in shift sector.

(7) Install shift rail to shift range fork and transfer case housing.

(8) Rotate shift sector to NEUTRAL position.

(9) Install new O-ring on detent plug (Fig. 52).

(10) Lubricate detent plunger with transfer case lubricant or light coat of petroleum jelly.

(11) Install detent plunger, spring and plug (Fig. 52).

(12) Verify that plunger is properly engaged in sector.

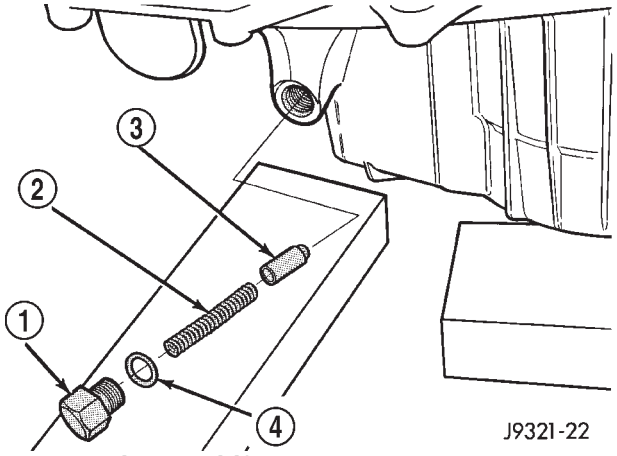


Fig. 52 Shift Detent Components

1 - DETENT PLUG
2 - DETENT SPRING
3 - DETENT PLUNGER
4 - PLUG O-RING

FRONT OUTPUT SHAFT AND DRIVE CHAIN

(1) Lubricate front output shaft-sprocket assembly, drive chain and drive sprocket with transfer case lubricant.

(2) Assemble drive chain, drive sprocket and front output shaft (Fig. 53).

(3) Start drive sprocket on mainshaft.

(4) Guide front shaft into bearing and drive sprocket onto mainshaft drive gear (Fig. 53).

(5) Install drive sprocket snap-ring (Fig. 54).

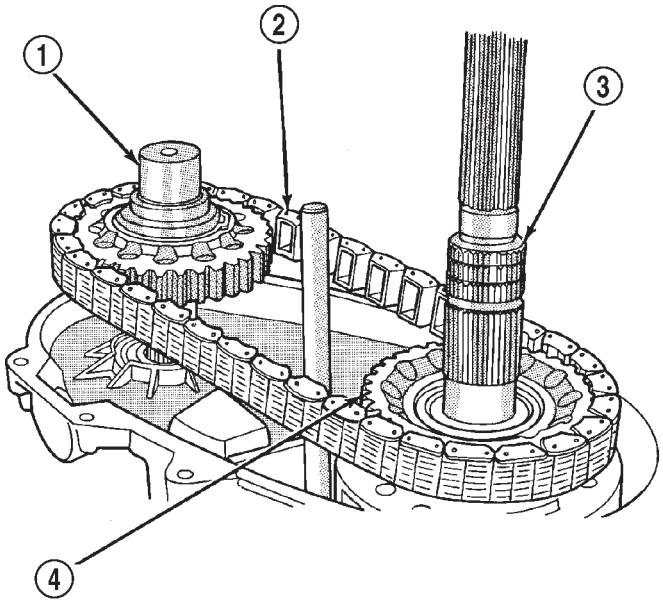


Fig. 53 Installing Drive Chain, Front Output Shaft And Drive Sprocket

1 - FRONT OUTPUT SHAFT
2 - DRIVE CHAIN
3 - MAINSHAFT
4 - DRIVE GEAR

TRANSFER CASE - NV247 (Continued)

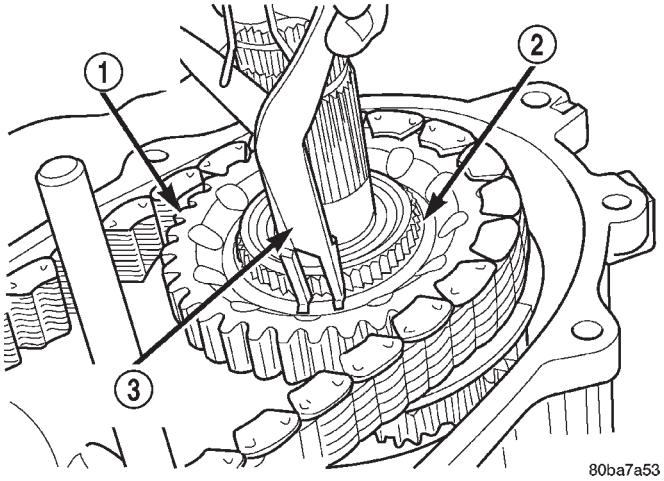


Fig. 54 Installing Drive Sprocket Snap-Ring

1 - MAINSHAFT DRIVE SPROCKET
2 - DRIVE SPROCKET SNAP-RING
3 - SNAP-RING PLIERS

(6) Install roller bearings if removed.
(7) Install progressive coupling (Fig. 55).
(8) Install the progressive coupling thrust washer over the output shaft and against the coupling.
(9) Install the oil pump locating snap-ring onto the output shaft.

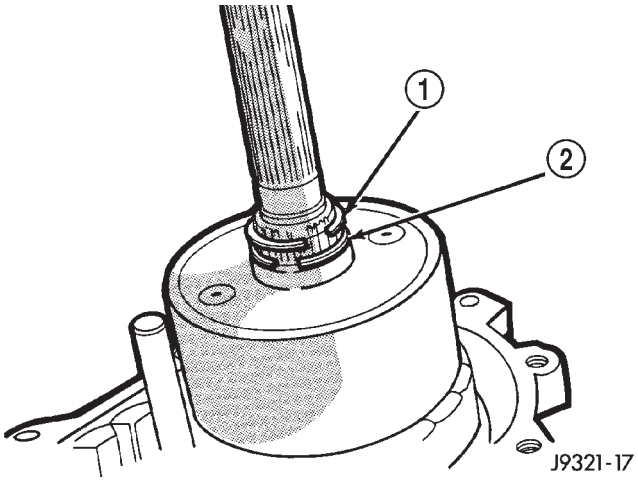


Fig. 55 Progressive Coupling Installation

1 - SNAP-RING
2 - PROGRESSIVE COUPLING

(10) Install oil pickup tube in rear case. Be sure tube is seated in case notch as shown (Fig. 56).

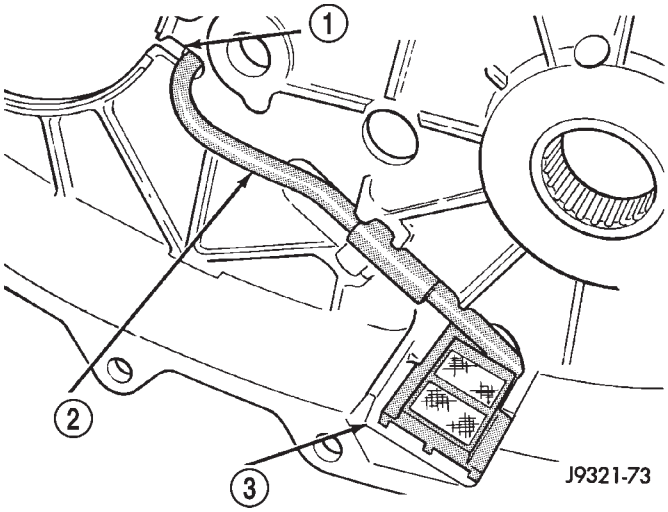


Fig. 56 Oil Pickup Tube Installation

1 - CASE NOTCH
2 - OIL PICKUP TUBE ASSEMBLY
3 - CASE SLOT

(11) Install magnet in front case pocket (Fig. 57).

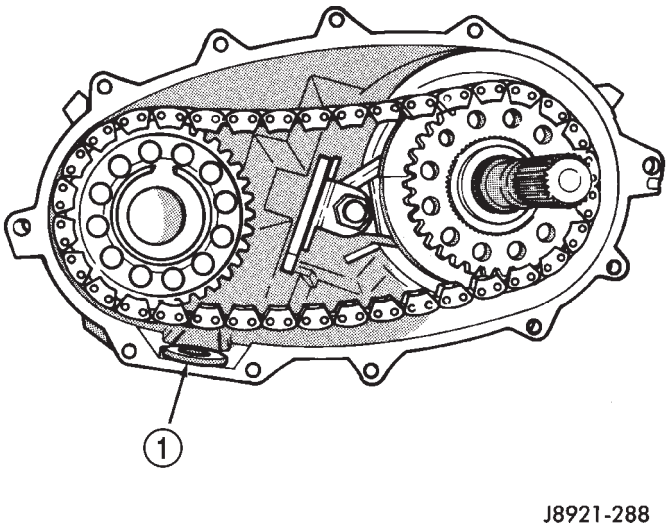


Fig. 57 Installing Case Magnet

1 - MAGNET

TRANSFER CASE - NV247 (Continued)

(12) Clean sealing flanges of front case and rear case with a wax and grease remover.

(13) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting flange of front case. Work sealer bead around bolt holes as shown (Fig. 58).

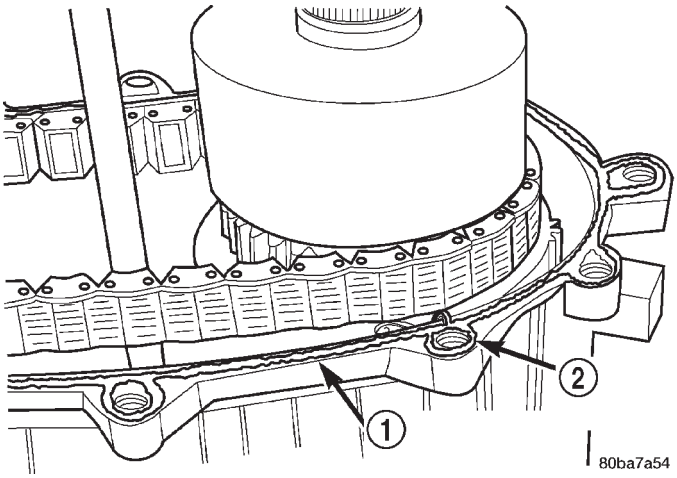


Fig. 58 Applying Sealer To Front Case Flange

1 - FRONT CASE FLANGE
2 - SEALER BEAD

(14) Align and install rear case on front case (Fig. 59).

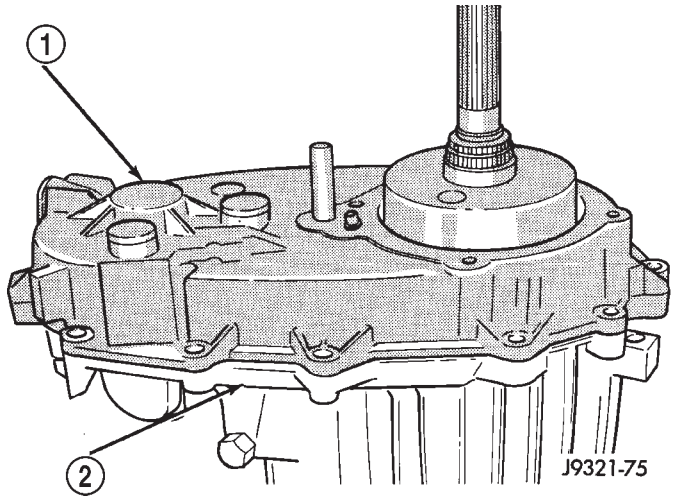


Fig. 59 Rear Case Installation

1 - REAR CASE
2 - FRONT CASE

(15) Verify that oil pickup tube is still seated in case notch and tube end is pointed toward mainshaft (Fig. 60).

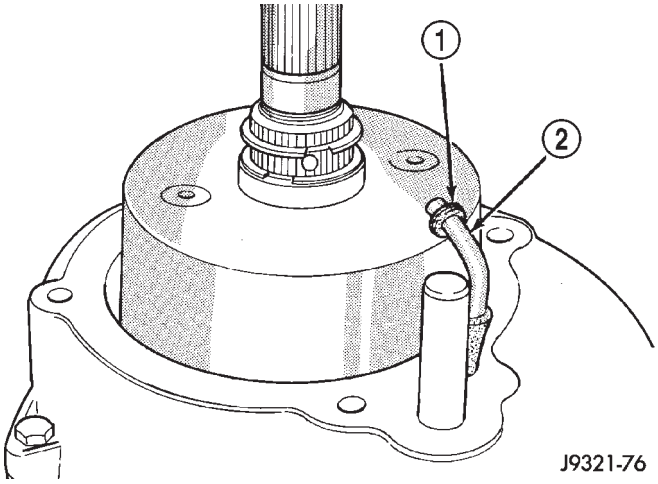


Fig. 60 Checking Position Of Oil Pickup Tube

1 - TUBE O-RING
2 - CORRECT PICKUP TUBE POSITION

(16) Install case attaching bolts. Alignment bolts at each end of case are only ones requiring washers (Fig. 61).

(17) Tighten case bolts to 27-34 N·m (20-25 ft. lbs.) torque.

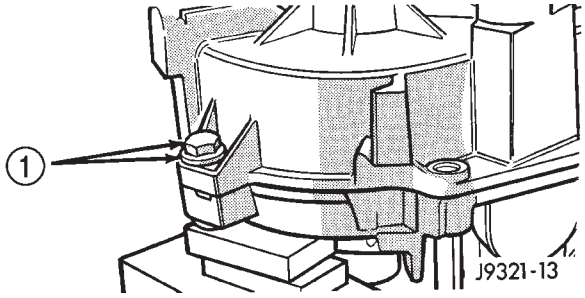


Fig. 61 Alignment Bolt

1 - ALIGNMENT BOLT AND WASHER (AT EACH END OF CASE)

TRANSFER CASE - NV247 (Continued)

COMPANION FLANGE AND RANGE LEVER

(1) Install range lever, washer and locknut on sector shaft (Fig. 62). Tighten locknut to 27-34 N·m (20-25 ft. lbs.) torque.

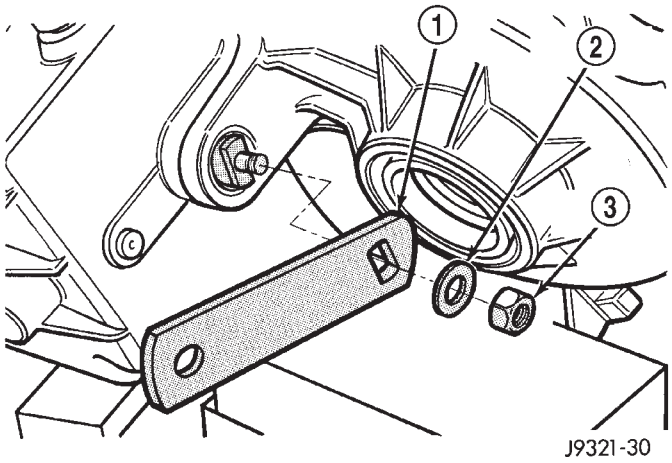


Fig. 62 Range Lever Installation - Typical

1 - RANGE LEVER
2 - WASHER
3 - LOCKNUT

(2) Install new seal washer on front output shaft (Fig. 63).

(3) Lubricate flange hub with transfer case lubricant and install flange on front shaft.

(4) Install new seal washer on front shaft.

(5) Install companion flange and new nut on front output shaft.

(6) Tighten flange nut to 122-176 N·m (90-130 ft. lbs.) torque. Use Tool C-3281, or similar tool to hold flange while tightening yoke nut.

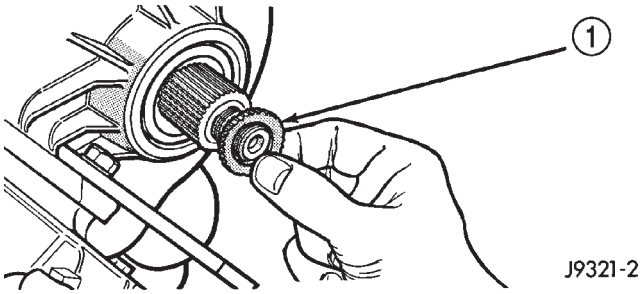


Fig. 63 Flange Seal Washer Installation

1 - YOKE SEAL WASHER

REAR RETAINER AND OIL PUMP

(1) Install new O-ring on flanged end of oil pickup tube.

(2) Install oil pump (Fig. 64).

(3) Insert oil pickup tube in pump (Fig. 65).

(4) Install rear bearing on mainshaft (Fig. 65). Locating ring groove in bearing goes toward end of mainshaft.

(5) Install rear bearing retaining snap-ring (Fig. 66).

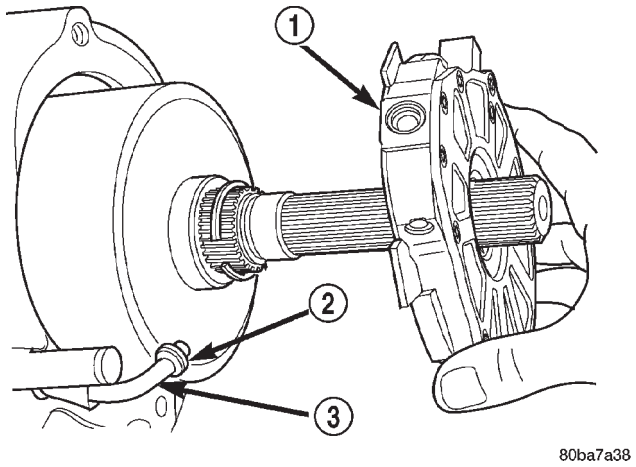


Fig. 64 Installing Oil Pump

1 - OIL PUMP
2 - TUBE O-RING
3 - OIL PICKUP TUBE

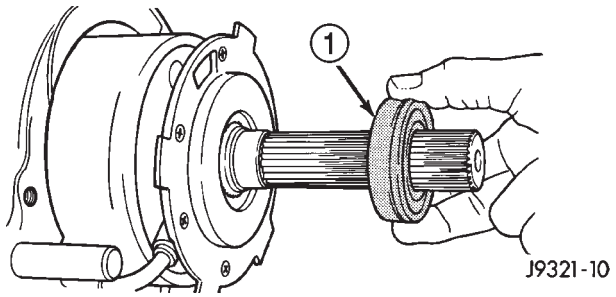


Fig. 65 Rear Bearing Installation

1 - REAR BEARING

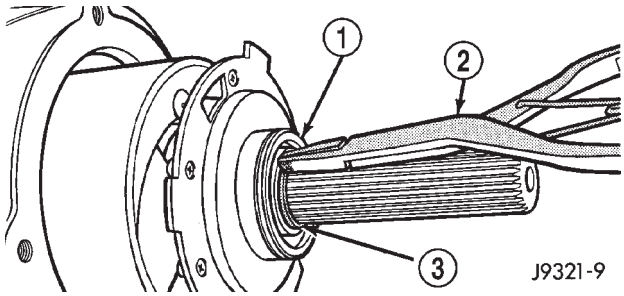


Fig. 66 Rear Bearing Snap-Ring Installation

1 - REAR BEARING
2 - SNAP-RING PLIERS
3 - SNAP-RING

(6) Install rear bearing locating ring in rear retainer, if ring was removed during overhaul.

TRANSFER CASE - NV247 (Continued)

(7) Apply 3 mm (1/8 in.) wide bead of Mopar® gasket maker or silicone adhesive sealer to mounting surface of rear retainer. Allow sealer to set-up slightly before proceeding.

(8) Slide rear retainer onto mainshaft (Fig. 67).

(9) Spread rear bearing locating ring and slide rear retainer into place on rear case (Fig. 68).

(10) Install and tighten rear retainer bolts to 27-34 N·m (20-25 ft. lbs.).

(11) Install rubber access plug (Fig. 69).

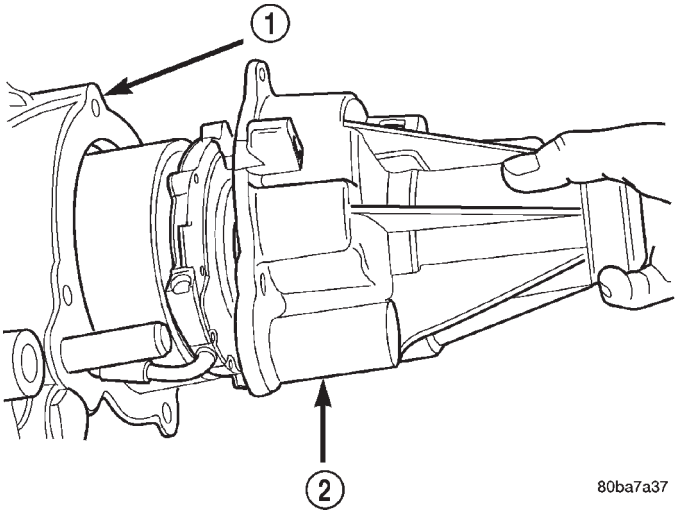


Fig. 67 Rear Retainer Installation

1 - REAR CASE
2 - REAR RETAINER

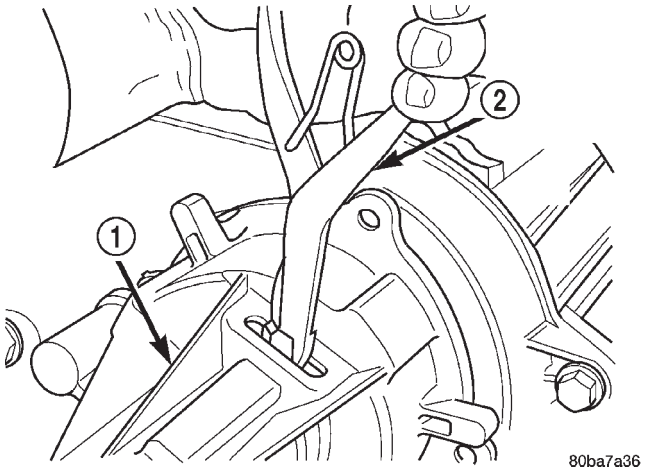


Fig. 68 Engaging Rear Bearing Locating Ring

1 - REAR RETAINER
2 - PARALLEL JAW SNAP-RING PLIERS

FINAL ASSEMBLY

(1) Install drain plug. Tighten plug to 41-54 N·m (30-40 ft. lbs.) torque.

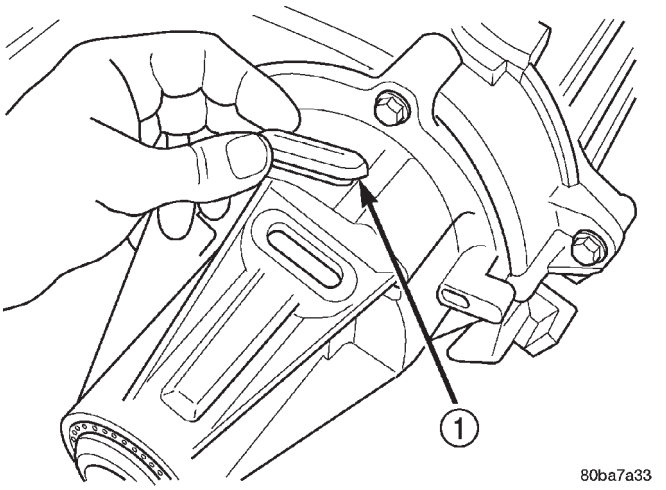


Fig. 69 Installing Rubber Access Plug

1 - PLUG

(2) Level transfer case and fill it with Mopar® Transfer Case Lubricant. Correct fill level is to bottom edge of fill plug hole.

(3) Install and tighten fill plug to 41-54 N·m (30-40 ft. lbs.) torque.

INSTALLATION

(1) Mount transfer case on a transmission jack.

(2) Secure transfer case to jack with chains.

(3) Position transfer case under vehicle.

(4) Align transfer case and transmission shafts and install transfer case on transmission.

(5) Install and tighten transfer case attaching nuts to 35 N·m (26 ft. lbs.) torque (Fig. 70).

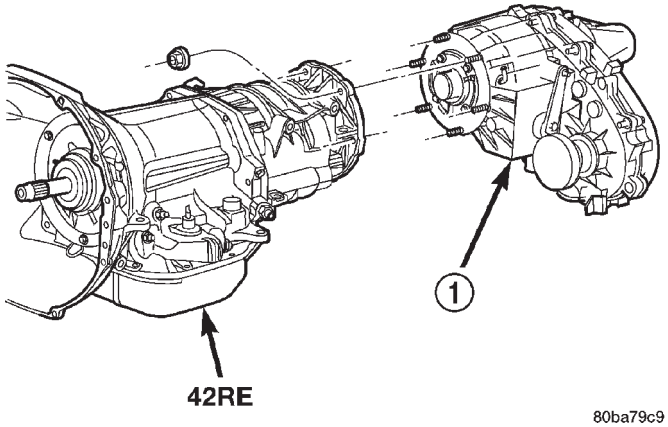


Fig. 70 Install Transfer Case

1 - NV247 TRANSFER CASE

TRANSFER CASE - NV247 (Continued)

(6) Connect front propeller shaft and install rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

(7) Fill transfer case with correct fluid. Check transmission fluid level. Correct as necessary.

(8) Install rear crossmember (Fig. 71) and skid plate, if equipped. Tighten crossmember bolts to 41 N·m (30 ft. lbs.) torque.

(9) Remove transmission jack and support stand.

(10) Verify transfer case is in NEUTRAL. Connect shift cable to transfer case range lever.

(11) Lower vehicle and verify transfer case shift operation.

(12) Adjust the transfer case shift cable, if necessary.

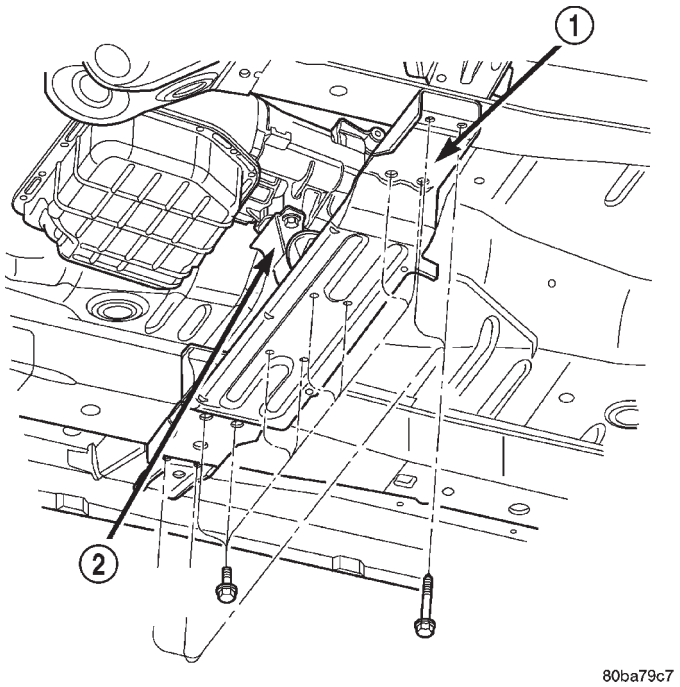


Fig. 71 Crossmember Installation

1 - CROSSMEMBER
2 - REAR TRANSMISSION MOUNT

SPECIFICATIONS

TRANSFER CASE - NV247

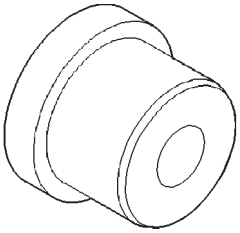
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Bolt, crossmember	41-47	30.2-34.7	-
Plug, Detent	16-24	11.8-17.7	-
Plugs, drain/fill	20-34	15-25	-
Bolts, front brg. retainer	16-24	11.8-17.7	-
Bolts, case half	27-34	19.9-25	-
Nut, companion flange	122-176	90-130	-
Bolts, rear extension	27-34	19.9-25	-
Lock-nut, shift	27-34	19.9-25	-
Nuts, T-case mount stud	33-41	24.3-30.2	-

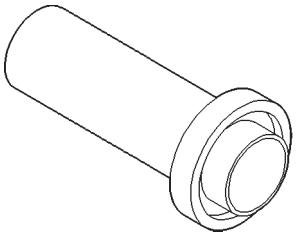
TRANSFER CASE - NV247 (Continued)

SPECIAL TOOLS

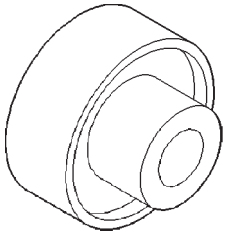
TRANSFER CASE - NV247



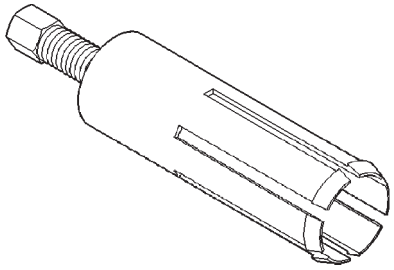
Installer, Bearing - 5066



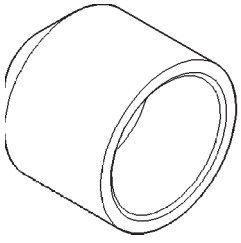
Installer, Seal - 6952-A



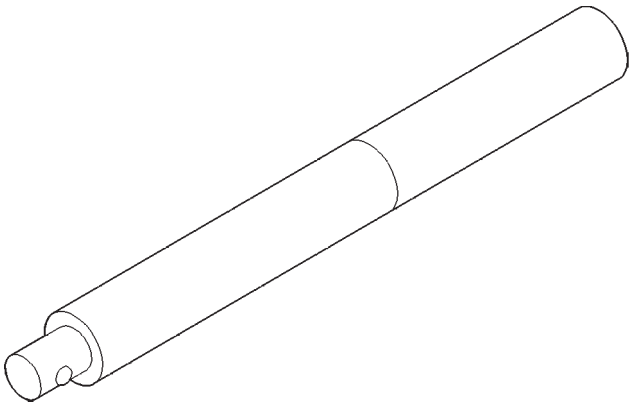
Installer, Bearing - 6953



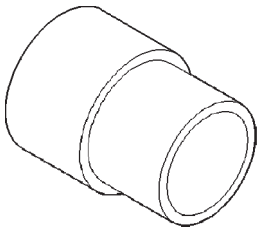
Remover, Bushing - 6957



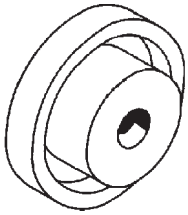
Installer, Seal - C-3995-A



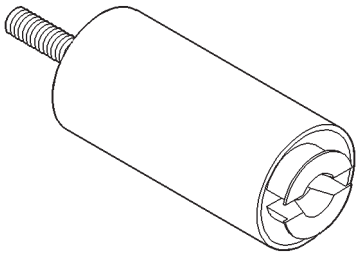
Handle - C-4171



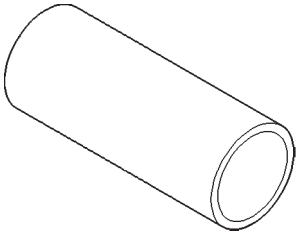
Installer, Bushing - 8145



Remover, Bearing - C-4210

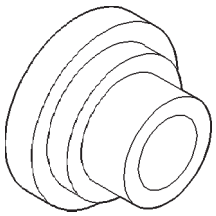


Remover, Bearing - L-4454

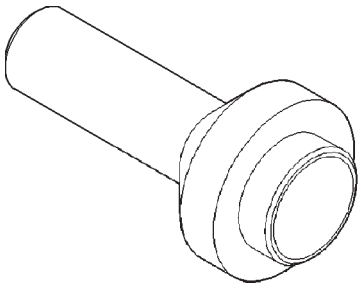


Cup - 8148

TRANSFER CASE - NV247 (Continued)



Installer, Bearign - 8128



Installer, Seal - 7884

FLUID

STANDARD PROCEDURE - FLUID DRAIN/ REFILL

The fill and drain plugs are both in the rear case (Fig. 72).

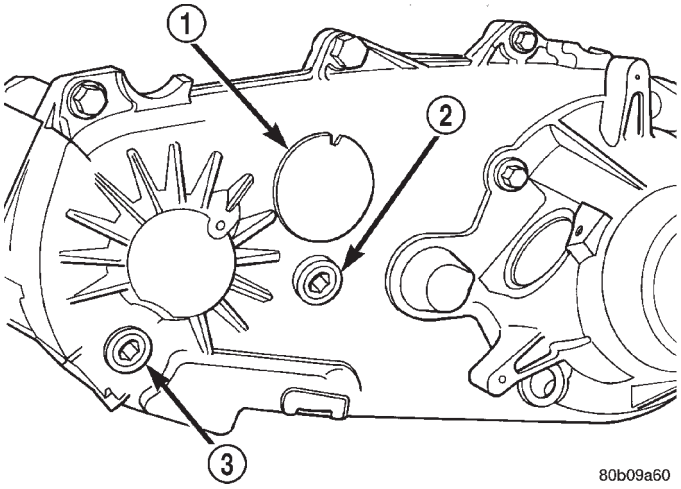


Fig. 72 Fill/Drain Plug and I.D. Tag Location - Typical

1 - I.D. TAG
2 - FILL PLUG
3 - DRAIN PLUG

(1) Raise vehicle.
(2) Position drain pan under transfer case.
(3) Remove drain and fill plugs and drain lubricant completely.
(4) Install drain plug. Tighten plug to 20-34 N·m (15-25 ft. lbs.).
(5) Remove drain pan.
(6) Fill transfer case to bottom edge of fill plug opening with Mopar® Transfer Case Lubricant.
(7) Install and tighten fill plug to 20-34 N·m (15-25 ft. lbs.).
(8) Lower vehicle.

FRONT OUTPUT SHAFT SEAL

REMOVAL

(1) Raise vehicle on hoist.
(2) Remove front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - REMOVAL)
(3) Remove front output shaft companion shaft.
(4) Remove seal from front case with pry tool (Fig. 73).

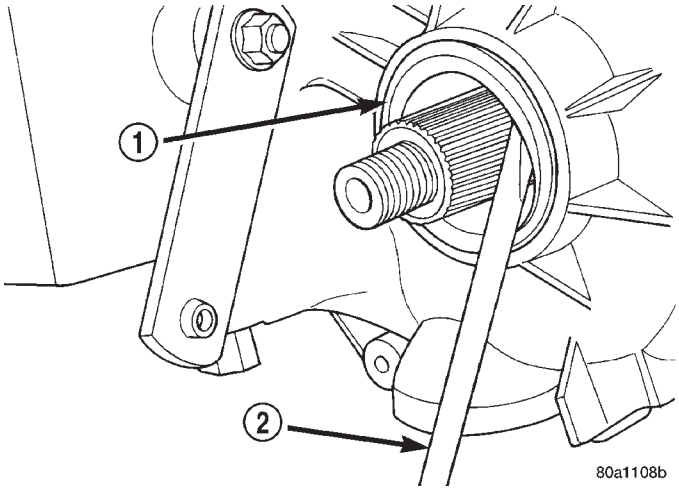


Fig. 73 Remove Front Output Shaft Seal

1 - OUTPUT SHAFT SEAL
2 - PRYBAR

INSTALLATION

(1) Install new front output seal in front case with Installer Tool 6952-A as follows:
(a) Place new seal on tool. Garter spring on seal goes toward interior of case.
(b) Start seal in bore with light taps from hammer (Fig. 74). Once seal is started, continue tapping seal into bore until installer tool seats against case.
(2) Install companion flange and torque nut to 122-176 N·m (90-130 ft. lbs.).
(3) Install front propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - INSTALLATION)

FRONT OUTPUT SHAFT SEAL (Continued)

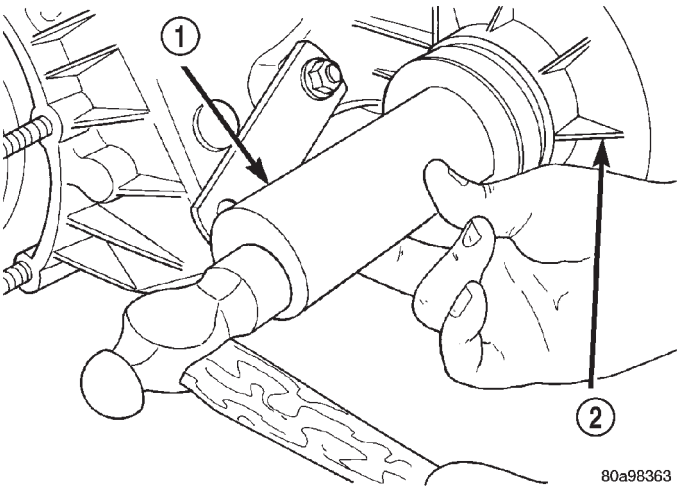


Fig. 74 Front Output Seal Installation

1 - INSTALLER 6952-A
2 - TRANSFER CASE

REAR RETAINER BUSHING AND SEAL

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)

(3) Using a suitable pry tool or slide-hammer mounted screw, remove the rear retainer seal.

(4) Using Remover 6957, remove bushing from rear retainer (Fig. 75).

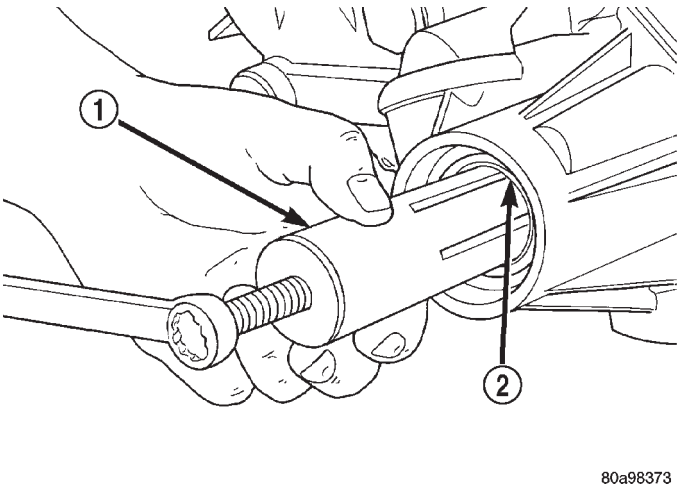


Fig. 75 Rear Retainer Bushing Removal

1 - REMOVER 6957
2 - REAR RETAINER BUSHING

INSTALLATION

(1) Clean fluid residue from sealing surface and inspect for defects.

(2) Position replacement bushing in rear retainer with fluid port in bushing aligned with slot in retainer.

(3) Using Installer 8145, drive bushing into retainer until installer seats against case (Fig. 76).

(4) Using Installer C-3995-A, install seal in rear retainer (Fig. 77).

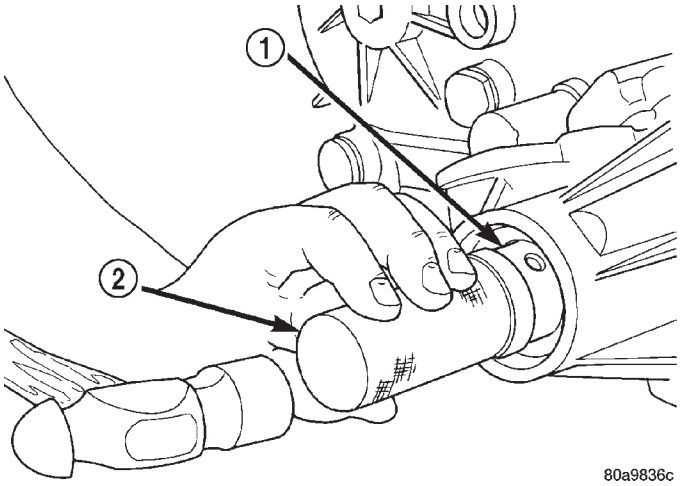


Fig. 76 Rear Retainer Bushing Installation

1 - REAR RETAINER BUSHING
2 - INSTALLER 8145

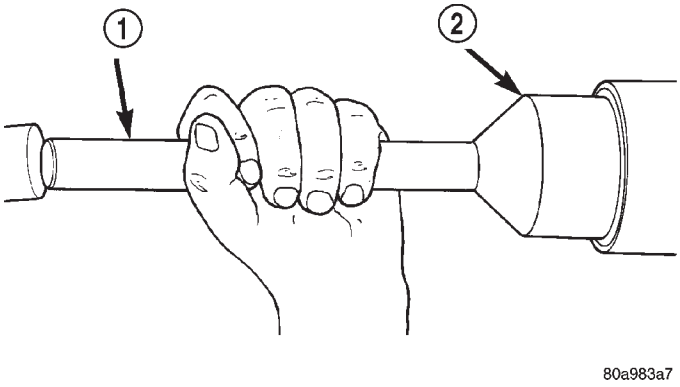


Fig. 77 Install Rear Retainer Seal

1 - SPECIAL TOOL C-4171
2 - SPECIAL TOOL C-3995-A

(5) Install rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

(6) Verify proper fluid level.

(7) Lower vehicle.

SHIFT CABLE

REMOVAL

(1) Shift transfer case into NEUTRAL.
(2) Raise vehicle.
(3) Disconnect the shift cable eyelet from the transfer case shift lever (Fig. 78).
(4) Remove shift cable from the cable support bracket.

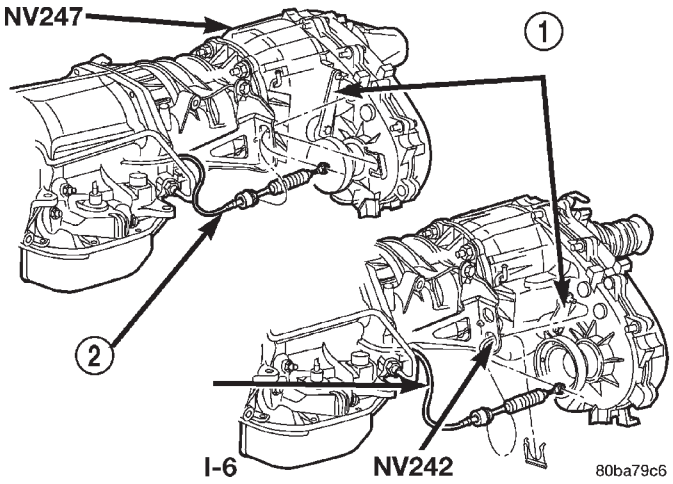


Fig. 78 Transfer Case Shift Cable at Transfer Case

1 - TRANSFER CASE SHIFT LEVER
2 - TRANSFER CASE SHIFT CABLE

(5) Lower vehicle.
(6) Remove any necessary console parts for access to shift lever assembly and shift cable.
(7) Disconnect cable at shift lever and shifter assembly bracket (Fig. 79).
(8) Remove the nuts holding the shift cable seal plate to the floor pan (Fig. 80).
(9) Pull cable through floor panel opening.
(10) Remove transfer case shift cable from vehicle.

INSTALLATION

(1) Route cable through hole in floor pan.
(2) Install seal plate to studs in floor pan.
(3) Install nuts to hold seal plate to floor pan (Fig. 80). Tighten nuts to 7 N·m (65 in.lbs.).
(4) Install the transfer case shift cable to the shifter assembly bracket. Seat cable in bracket and install clip (Fig. 79).
(5) Verify the transfer case shift lever (at console) is in the NEUTRAL position.
(6) Snap the cable onto the shift lever pin (Fig. 79).
(7) Raise the vehicle.

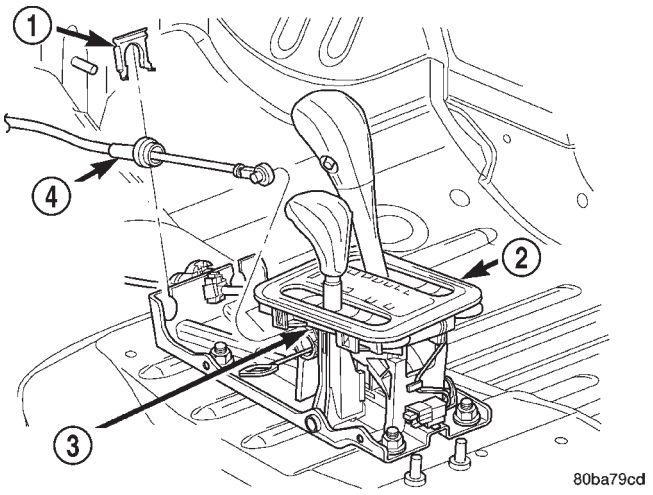


Fig. 79 Transfer Case Shift Cable at Shifter

1 - CLIP
2 - SHIFTER
3 - TRANSFER CASE SHIFT LEVER PIN
4 - TRANSFER CASE SHIFT CABLE

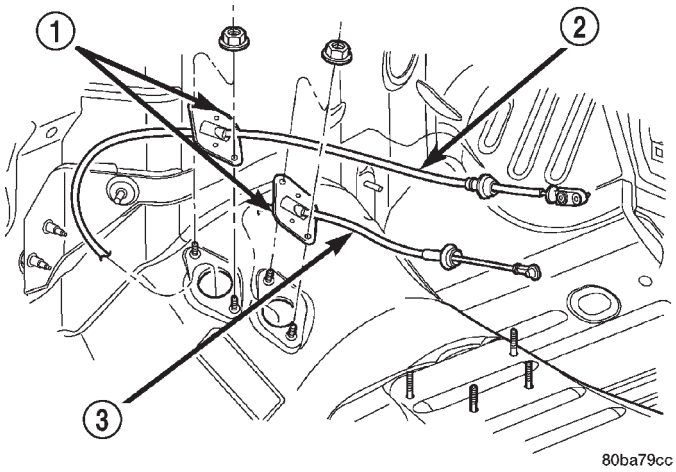


Fig. 80 Shift Cables at Floor Pan

1 - SEAL PLATES
2 - TRANSMISSION SHIFT CABLE
3 - TRANSFER CASE SHIFT CABLE

(8) Install the shift cable to the shift cable support bracket and install clip (Fig. 78).
(9) Verify that the transfer case is still in the NEUTRAL position.
(10) Snap the shift cable onto the transfer case shift lever (Fig. 78).
(11) Lower vehicle.
(12) Verify correct transfer case operation in all ranges.
(13) Install any console parts removed for access to transfer case shift cable.

TIRES/WHEELS

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TIRES/WHEELS

DIAGNOSIS AND TESTING - TIRE AND WHEEL RUNOUT

Radial runout is the difference between the high and low points on the tire or wheel (Fig. 1).

Lateral runout is the **wobble** of the tire or wheel.

Radial runout of more than 1.5 mm (.060 inch) measured at the center line of the tread may cause the vehicle to shake.

Lateral runout of more than 2.0 mm (.080 inch) measured near the shoulder of the tire may cause the vehicle to shake.

Sometimes radial runout can be reduced. Relocate the wheel and tire assembly on the mounting studs (See Method 1). If this does not reduce runout to an acceptable level, the tire can be rotated on the wheel. (See Method 2).

METHOD 1 (RELOCATE WHEEL ON HUB)

(1) Drive vehicle a short distance to eliminate tire flat spotting from a parked position.

(2) Check wheel bearings and adjust if adjustable or replace if necessary.

(3) Check the wheel mounting surface.

(4) Relocate wheel on the mounting, two studs over from the original position.

(5) Tighten wheel nuts until all are properly torqued, to eliminate brake distortion.

(6) Check radial runout. If still excessive, mark tire sidewall, wheel, and stud at point of maximum runout and proceed to Method 2.

METHOD 2 (RELOCATE TIRE ON WHEEL)

NOTE: Rotating the tire on wheel is particularly effective when there is runout in both tire and wheel.

TIRES/WHEELS (Continued)

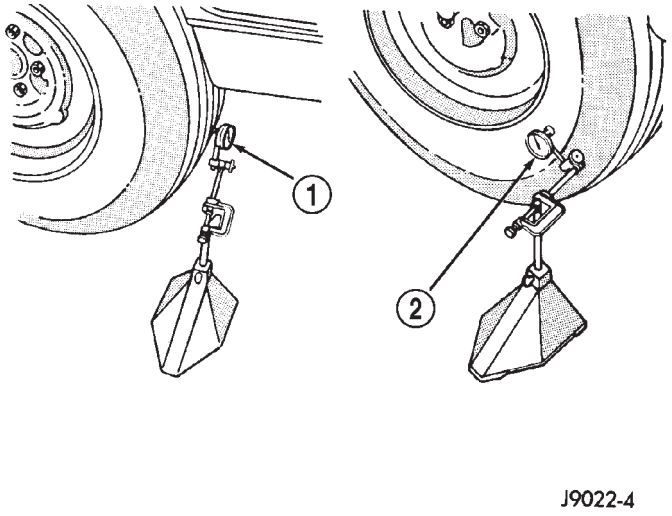


Fig. 1 Checking Tire/Wheel/Hub Runout

1 - RADIAL RUNOUT
2 - LATERAL RUNOUT

(1) Remove tire from wheel and mount wheel on service dynamic balance machine.

(2) Check wheel radial runout (Fig. 2) and lateral runout (Fig. 3).

- STEEL WHEELS: Radial runout 0.040 in., Lateral runout 0.045 in. (maximum)
- ALUMINUM WHEELS: Radial runout 0.030 in., Lateral runout 0.035 in. (maximum)

(3) If point of greatest wheel lateral runout is near original chalk mark, remount tire 180 degrees. Recheck runout,(Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE) .

STANDARD PROCEDURE

STANDARD PROCEDURE - TIRE AND WHEEL BALANCE

It is recommended that a two plane service dynamic balancer be used when a tire and wheel assembly require balancing. Refer to balancer operation instructions for proper cone mounting procedures. Typically use front cone mounting method for steel wheels. For aluminum wheel use back cone mounting method without cone spring.

NOTE: Static should be used only when a two plane balancer is not available.

NOTE: Cast aluminum and forged aluminum wheels require coated balance weights and special alignment equipment.

Wheel balancing can be accomplished with either on or off vehicle equipment. When using on-vehicle balancing equipment, remove the opposite wheel/tire. Off-vehicle balancing is recommended.

For static balancing, find the location of the heavy spot causing the imbalance. Counter balance wheel directly opposite the heavy spot. Determine weight

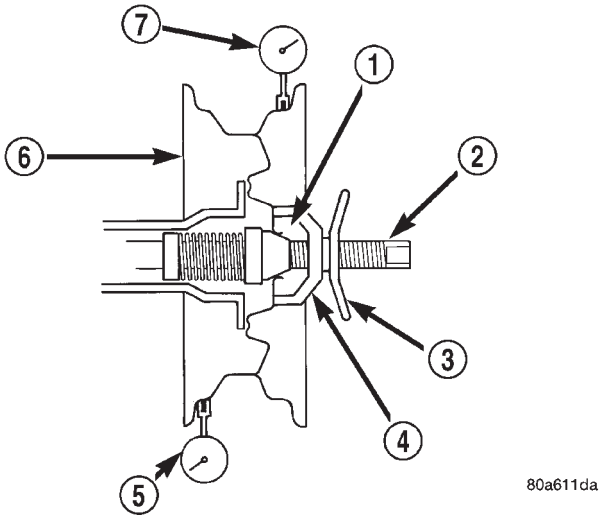


Fig. 2 Radial Runout

1 - MOUNTING CONE
2 - SPINDLE SHAFT
3 - WING NUT
4 - PLASTIC CUP
5 - DIAL INDICATOR
6 - WHEEL
7 - DIAL INDICATOR

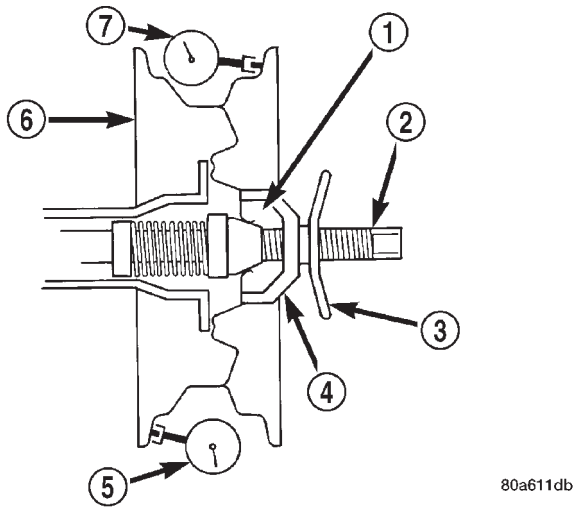


Fig. 3 Lateral Runout

1 - MOUNTING CONE
2 - SPINDLE SHAFT
3 - WING NUT
4 - PLASTIC CUP
5 - DIAL INDICATOR
6 - WHEEL
7 - DIAL INDICATOR

TIRES/WHEELS (Continued)

required to counter balance the area of imbalance. Place half of this weight on the **inner** rim flange and the other half on the **outer** rim flange (Fig. 4).

For dynamic balancing, the balancing equipment is designed to locate the amount of weight to be applied to both the inner and outer rim flange (Fig. 5).

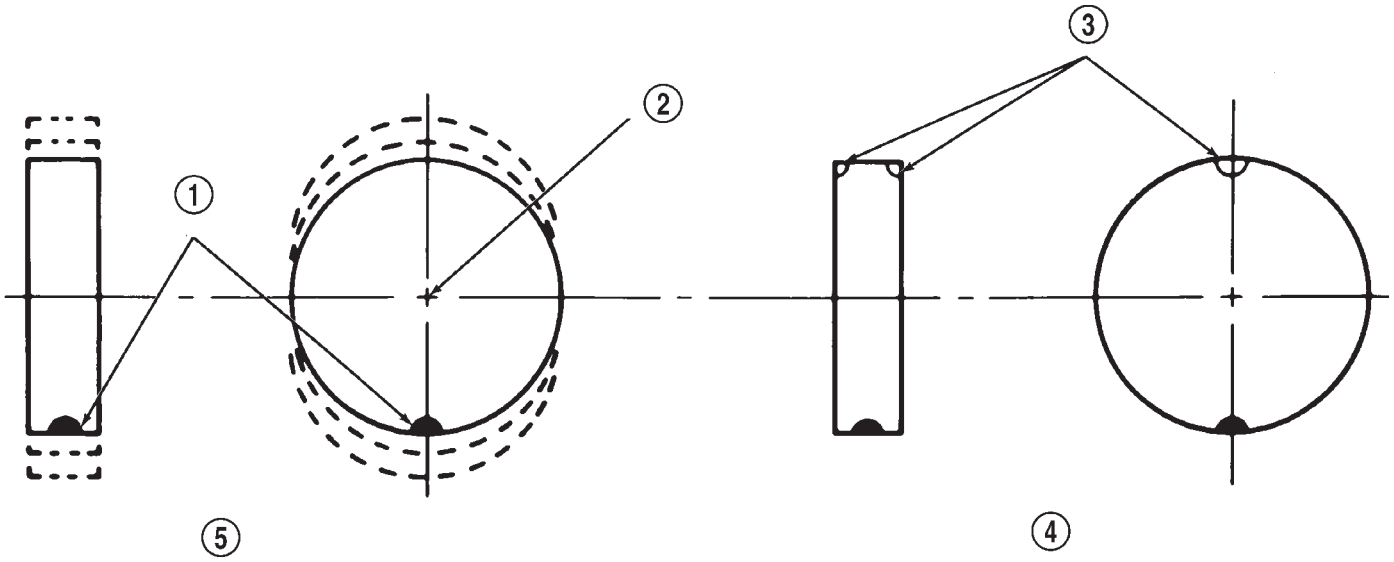


Fig. 4 Static Unbalance & Balance

1 - HEAVY SPOT
2 - CENTER LINE OF SPINDLE
3 - ADD BALANCE WEIGHTS HERE
4 - CORRECTIVE WEIGHT LOCATION
5 - TIRE OR WHEEL TRAMP, OR WHEEL HOP

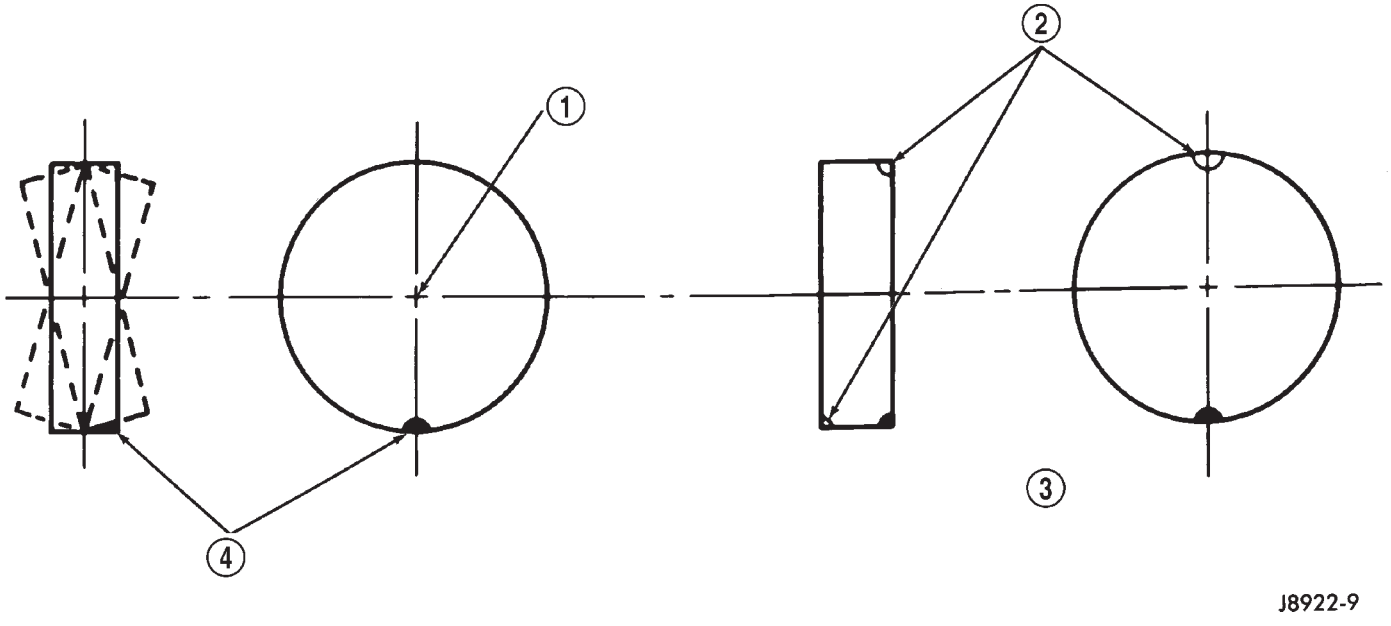


Fig. 5 Dynamic Unbalance & Balance

1 - CENTER LINE OF SPINDLE
2 - ADD BALANCE WEIGHTS HERE
3 - CORRECTIVE WEIGHT LOCATION
4 - HEAVY SPOT WHEEL SHIMMY AND VIBRATION

TIRES/WHEELS (Continued)

STANDARD PROCEDURE - MATCH MOUNTING

Tires and wheels are currently not match mounted at the factory. Match mounting is a technique used to reduce runout in the wheel/tire assembly. This means that the high spot of the tire is aligned with the low spot on the wheel rim. The high spot on the tire is marked with a paint mark or a bright colored adhesive label on the outboard sidewall. The low spot on the rim is identified with a label on the outside of the rim and a dot on the inside of the rim. If the outside label has been removed the tire will have to be removed to locate the dot on the inside of the rim.

Before dismounting a tire from its wheel, a reference mark should be placed on the tire at the valve stem location. This reference will ensure that it is remounted in the original position on the wheel.

(1) Use a dial indicator to locate the high spot of the tire on the center tread rib (Fig. 6). Record the indicator reading and mark the high spot on the tire. Place a mark on the tire at the valve stem location (Fig. 7).

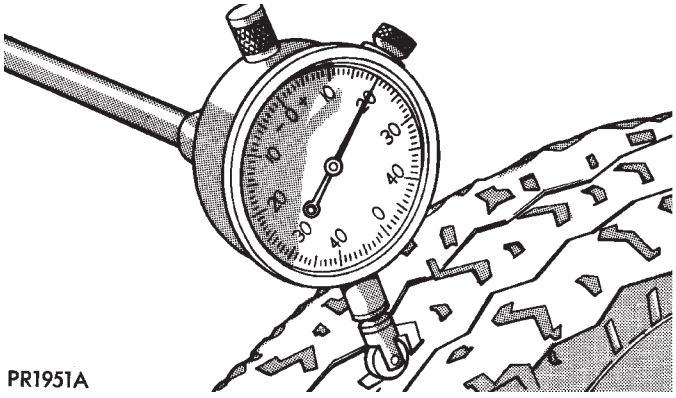


Fig. 6 Dial Indicator

(2) Break down the tire and remount it 180 degrees on the rim (Fig. 8).

(3) Measure the total runout again and mark the tire to indicate the high spot.

(4) If runout is still excessive use the following procedures.

(a) If the high spot is within 101.6 mm (4.0 in.) of the first spot and is still excessive, replace the tire.

(b) If the high spot is within 101.6 mm (4.0 in.) of the first spot on the wheel, the wheel may be out of specifications,(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING).

(c) If the high spot is NOT within 101.6 mm (4.0 in.) of either high spot, draw an arrow on the tread from second high spot to first. Break down the tire and remount it 90 degrees on rim in that direction (Fig. 9). This procedure will normally reduce the runout to an acceptable amount.

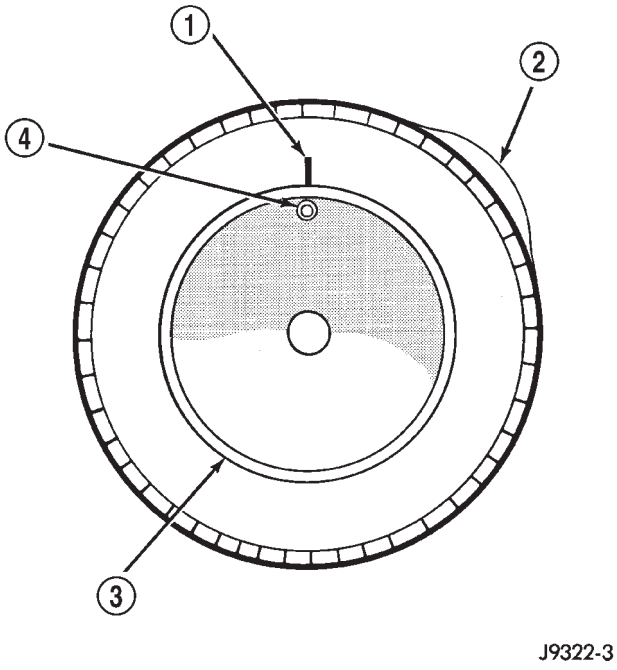


Fig. 7 First Measurement On Tire

1 - REFERENCE MARK
2 - 1ST MEASUREMENT HIGH SPOT MARK TIRE AND RIM
3 - WHEEL
4 - VALVE STEM

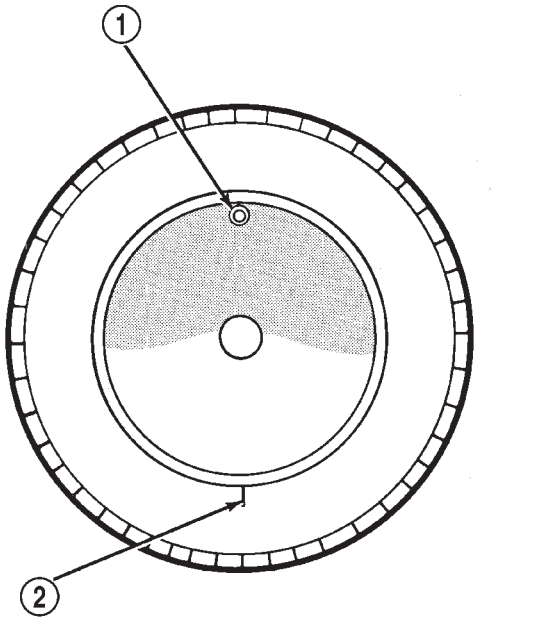


Fig. 8 Remount Tire 180 Degrees

1 - VALVE STEM
2 - REFERENCE MARK

TIRES/WHEELS (Continued)

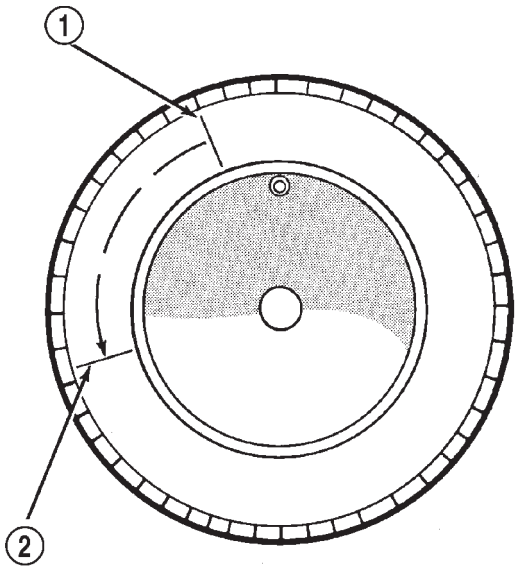


Fig. 9 Remount Tire 90 Degrees In Direction of Arrow

1 - 2ND HIGH SPOT ON TIRE
2 - 1ST HIGH SPOT ON TIRE

STANDARD PROCEDURE - TIRE ROTATION

Tires on the front and rear operate at different loads and perform different steering, driving, and braking functions. For these reasons they wear at unequal rates and tend to develop irregular wear patterns. These effects can be reduced by rotating the tires at regular intervals. The benefits of tire rotation are:

- Increase tread life
- Maintain traction levels
- A smooth, quiet ride

The suggested method of tire rotation is (Fig. 10). Other rotation methods can be used, but they will not provide all the tire longevity benefits.

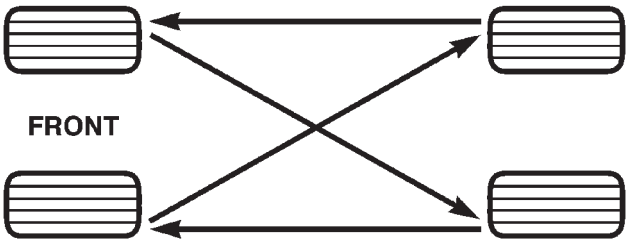


Fig. 10 Tire Rotation Pattern

STANDARD PROCEDURE - WHEEL INSTALLATION

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

NOTE: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification (Fig. 11). **Never use oil or grease on studs or nuts.**

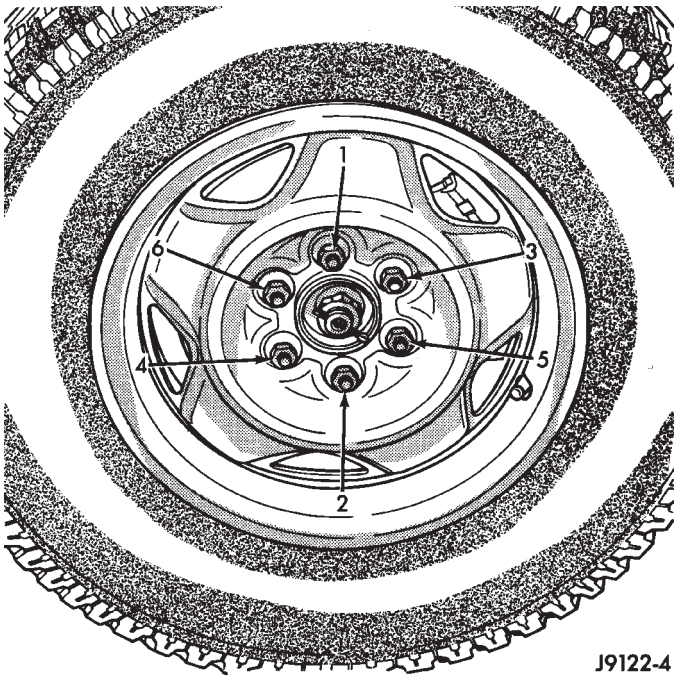


Fig. 11 LUG NUT TIGHTENING PATTERN - TYPICAL

TIRES

DESCRIPTION

DESCRIPTION - TIRES

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care they will give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe brake applications
- High speed driving
- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval shown in the section on Tire Rotation.(Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE), This will help to achieve a greater tread life.

TIRE IDENTIFICATION

Tire type, size, aspect ratio and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Refer to the chart to decipher the tire identification code (Fig. 12).

Performance tires have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. These ratings are:

- **Q** up to 100 mph
- **S** up to 112 mph
- **T** up to 118 mph
- **U** up to 124 mph
- **H** up to 130 mph
- **V** up to 149 mph
- **Z** more than 149 mph (consult the tire manufacturer for the specific speed rating)

An All Season type tire will have either **M + S, M & S or M–S** (indicating mud and snow traction) imprinted on the side wall.

TIRE CHAINS

Tire snow chains may be used on **certain** models. Refer to the Owner's Manual for more information.

DESCRIPTION - RADIAL–PLY TIRES

Radial-ply tires improve handling, tread life and ride quality, and decrease rolling resistance.

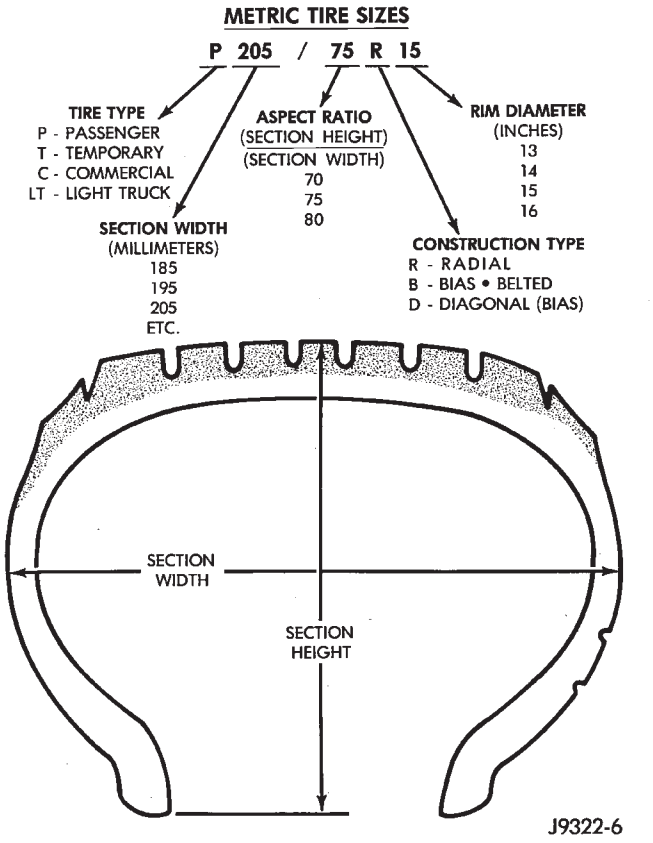


Fig. 12 Tire Identification

Radial-ply tires must always be used in sets of four. Under no circumstances should they be used on the front only. They may be mixed with temporary spare tires when necessary. A maximum speed of 50 MPH is recommended while a temporary spare is in use.

Radial-ply tires have the same load-carrying capacity as other types of tires of the same size. They also use the same recommended inflation pressures.

The use of oversized tires, either in the front or rear of the vehicle, can cause vehicle drive train failure. This could also cause inaccurate wheel speed signals when the vehicle is equipped with Anti-Lock Brakes.

The use of tires from different manufactures on the same vehicle is NOT recommended. The proper tire pressure should be maintained on all four tires.

DESCRIPTION - TIRE INFLATION PRESSURES

Under inflation will cause rapid shoulder wear, tire flexing, and possible tire failure (Fig. 13).

Over inflation will cause rapid center wear and loss of the tire's ability to cushion shocks (Fig. 14).

Improper inflation can cause:

- Uneven wear patterns
- Reduced tread life
- Reduced fuel economy

TIRES (Continued)

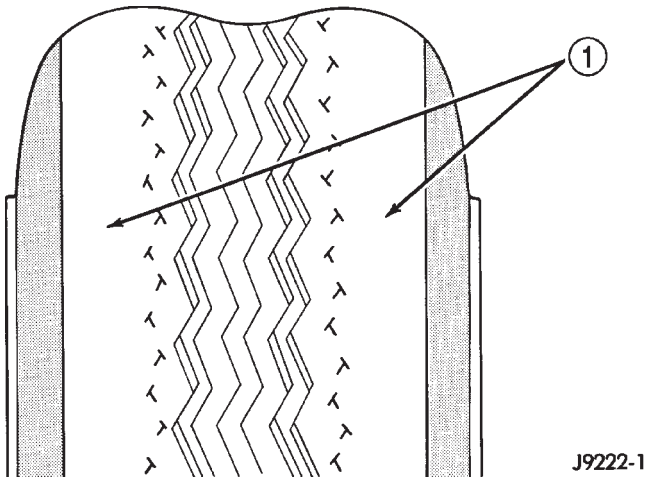


Fig. 13 Under Inflation Wear

1 - THIN TIRE THREAD AREAS

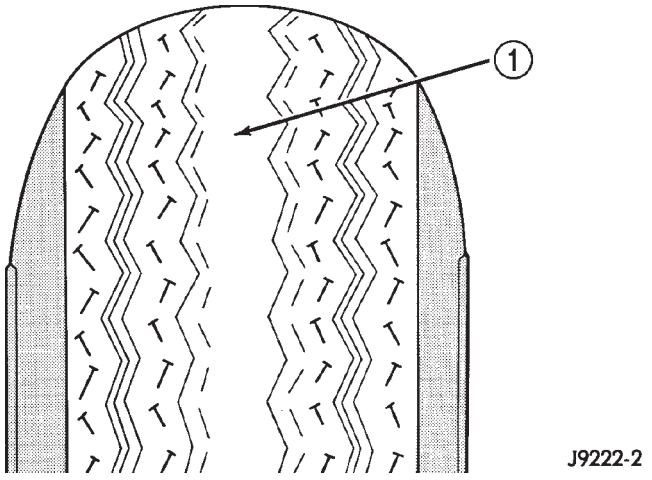


Fig. 14 Over Inflation Wear

1 - THIN TIRE THREAD AREA

- Unsatisfactory ride
- Vehicle drift

For proper tire pressure specification refer to the Tire Inflation Pressure Chart provided with the vehicles Owners Manual. A Certification Label on the drivers side door pillar provides the minimum tire and rim size for the vehicle. The label also list the cold inflation pressure for these tires at full load operation

Tire pressures have been chosen to provide safe operation, vehicle stability, and a smooth ride. Tire pressure should be checked cold once a month. Tire pressure decreases as the ambient temperature drops. Check tire pressure frequently when ambient temperature varies widely.

Tire inflation pressures are cold inflation pressure. The vehicle must sit for at least 3 hours to obtain the correct cold inflation pressure reading. Or be driven less than one mile after sitting for 3 hours. Tire inflation pressures may increase from 2 to 6 pounds per square inch (psi) during operation. Do not reduce this normal pressure build-up.

WARNING: OVER OR UNDER INFLATED TIRES CAN AFFECT VEHICLE HANDLING AND TREAD WEAR. THIS MAY CAUSE THE TIRE TO FAIL SUDDENLY, RESULTING IN LOSS OF VEHICLE CONTROL.

DESCRIPTION - TIRE PRESSURE FOR HIGH SPEED

Where speed limits allow the vehicle to be driven at high speeds, correct tire inflation pressure is very important. For speeds up to and including 120 km/h (75 mph), tires must be inflated to the pressures shown on the tire placard. For continuous speeds in excess of 120 km/h (75 mph), tires must be inflated to the maximum pressure specified on the tire sidewall.

Vehicles loaded to the maximum capacity should not be driven at continuous speeds above 75 mph (120 km/h).

For emergency vehicles that are driven at speeds over 90 mph (144 km/h), special high speed tires must be used. Consult tire manufacturer for correct inflation pressure recommendations.

DESCRIPTION - REPLACEMENT TIRES

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - PRESSURE GAUGES

A quality air pressure gauge is recommended to check tire pressure. After checking the air pressure, replace valve cap finger tight.

DIAGNOSIS AND TESTING - TREAD WEAR INDICATORS

Tread wear indicators are molded into the bottom of the tread grooves. When tread depth is 1.6 mm (1/16 in.), the tread wear indicators will appear as a 13 mm (1/2 in.) band (Fig. 15).

Tire replacement is necessary when indicators appear in two or more grooves or if localized balding occurs.

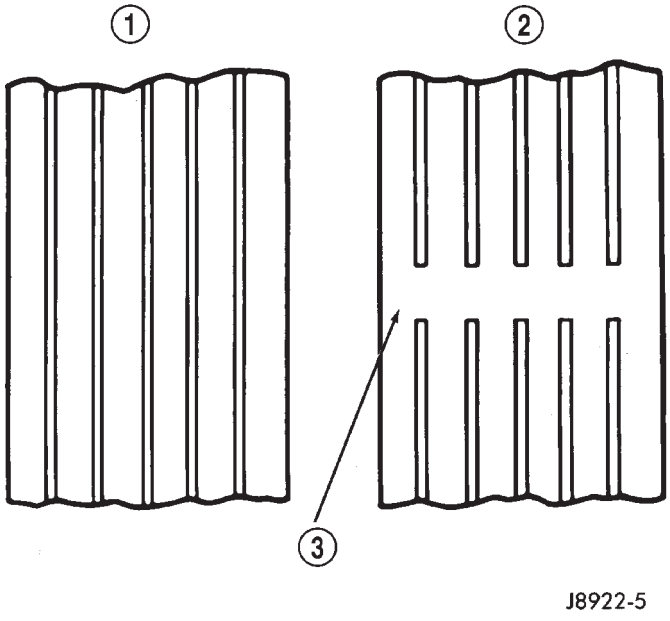


Fig. 15 Tread Wear Indicators

1 - TREAD ACCEPTABLE
2 - TREAD UNACCEPTABLE
3 - WEAR INDICATOR

DIAGNOSIS AND TESTING - TIRE WEAR PATTERNS

Under inflation will cause wear on the shoulders of tire. Over inflation will cause wear at the center of tire.

Excessive camber causes the tire to run at an angle to the road. One side of tread is then worn more than the other (Fig. 16).

Excessive toe-in or toe-out causes wear on the tread edges and a feathered effect across the tread (Fig. 16).

DIAGNOSIS AND TESTING - TIRE NOISE OR VIBRATION

Radial-ply tires are sensitive to force impulses caused by improper mounting, vibration, wheel defects, or possibly tire imbalance.

To find out if tires are causing the noise or vibration, drive the vehicle over a smooth road at varying speeds. Note the noise level during acceleration and deceleration. The engine, differential and exhaust noises will change as speed varies, while the tire noise will usually remain constant.

STANDARD PROCEDURE - REPAIRING LEAKS

For proper repairing, a radial tire must be removed from the wheel. Repairs should only be made if the defect, or puncture, is in the tread area (Fig. 17). The tire should be replaced if the puncture is located in the sidewall.

Deflate tire completely before removing the tire from the wheel. Use lubrication such as a mild soap solution when dismounting or mounting tire. Use tools free of burrs or sharp edges which could damage the tire or wheel rim.

Before mounting tire on wheel, make sure all rust is removed from the rim bead and repaint if necessary.

Install wheel on vehicle, and tighten to proper torque specification (Refer to 22 - TIRES/WHEELS/ WHEELS - SPECIFICATIONS).

TIRES (Continued)

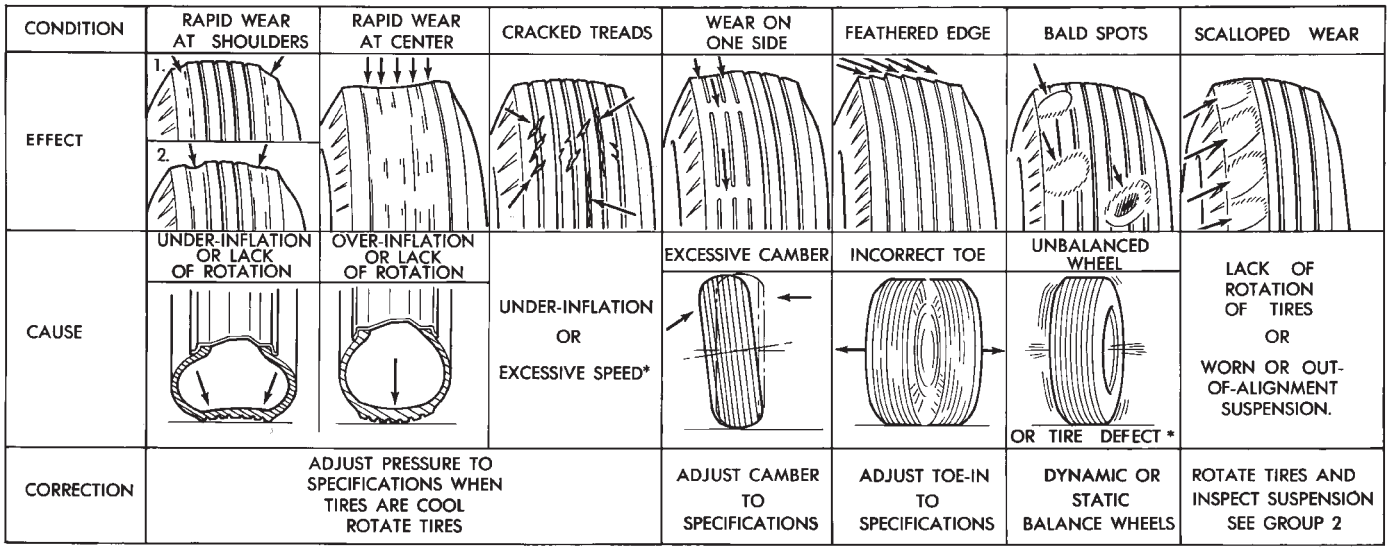


Fig. 16 Tire Wear Patterns

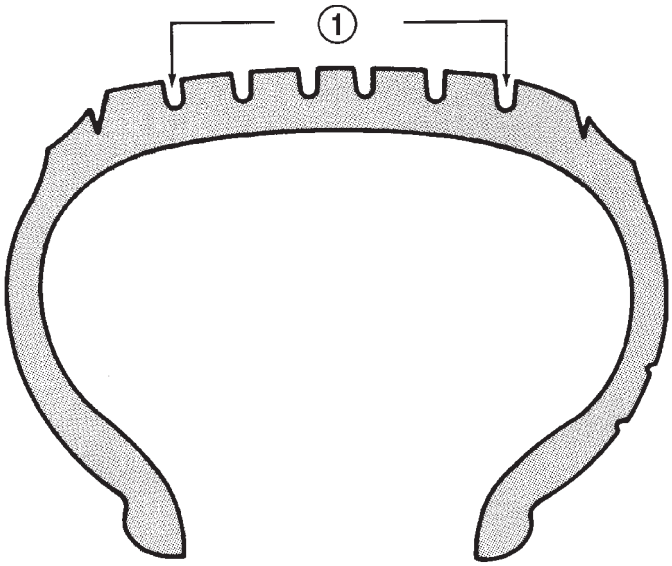


Fig. 17 Tire Repair Area

1 - REPAIRABLE AREA

CLEANING

Remove the protective coating on the tires before delivery of a vehicle. This coating may cause deterioration of the tires.

To remove the protective coating, apply warm water and let it soak for a few minutes. Afterwards, scrub the coating away with a soft bristle brush. Steam cleaning may also be used to remove the coating.

NOTE: DO NOT use gasoline, mineral oil, oil-based solvent or a wire brush for cleaning.

SPECIFICATIONS

TIRES

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
TIRE	P225/75R16
TIRE	P245/70R16
TIRE	P235/65R17

SPECIFICATIONS -

SPECIFICATIONS

DESCRIPTION - RIM	SPECIFICATION - TIRE
BASE LAREDO (2.7L & 4.0L) 16x7	P225/75R16
OPTIONAL LAREDO (2.7L, 4.0L, 4.7L) 16x7	P245/70R16
LAREDO 4.7L (JAPAN & AUSTRALIA) 17x7.5	P235/65R17
OPTIONAL LAREDO (UP COUNTRY) 17x7.5	P235/65R17
BASE LIMITED 17x7.5	P235/65R17
OPTIONAL LIMITED (UP COUNTRY) & OVERLAND 17x7.5	P235/65R17
BASE WHEEL / SNOW TIRE	P235/65R17

SPARE TIRE

DESCRIPTION - SPARE / TEMPORARY TIRE

The temporary spare tire is designed for emergency use only. The original tire should be repaired or replaced at the first opportunity, then reinstalled. Do not exceed speeds of 50 M.P.H. when using the temporary spare tire. Refer to Owner's Manual for complete details.

WHEELS

DESCRIPTION

The rim size is on the vehicle safety certification label located on the drivers door shut face. The size of the rim is determined by the drivetrain package. Original equipment wheels/rims are designed for operation up to the specified maximum vehicle capacity.

All models use stamped steel, cast aluminum or forged aluminum wheels. Every wheel has raised sections between the rim flanges and rim drop well called safety humps (Fig. 18) .

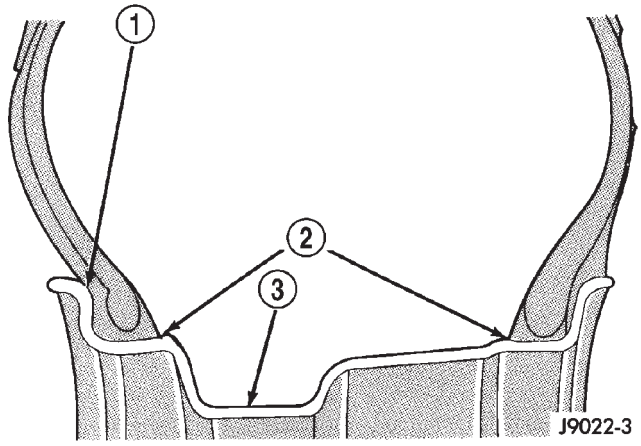


Fig. 18 Safety Rim

1 - FLANGE
2 - RIDGE
3 - WELL

Initial inflation of the tire forces the bead over these raised sections. In case of rapid loss of air pressure, the raised sections help hold the tire on the wheel.

The wheel studs and nuts are designed for specific applications. All aluminum and some steel wheels have wheel stud nuts with an enlarged nose. This enlarged nose is necessary to ensure proper retention of the wheels. Do not use replacement studs or nuts with a different design or lesser quality.

DIAGNOSIS AND TESTING - WHEEL INSPECTION

Inspect wheels for:

- Excessive run out
- Dents or cracks
- Damaged wheel lug nut holes
- Air Leaks from any area or surface of the rim

NOTE: Do not attempt to repair a wheel by hammering, heating or welding.

If a wheel is damaged an original equipment replacement wheel should be used. When obtaining replacement wheels, they should be equivalent in load carrying capacity. The diameter, width, offset, pilot hole and bolt circle of the wheel should be the same as the original wheel.

WARNING: FAILURE TO USE EQUIVALENT REPLACEMENT WHEELS MAY ADVERSELY AFFECT THE SAFETY AND HANDLING OF THE VEHICLE. USED WHEELS ARE NOT RECOMMENDED. THE SERVICE HISTORY OF THE WHEEL MAY HAVE INCLUDED SEVERE TREATMENT OR VERY HIGH MILEAGE. THE RIM COULD FAIL WITHOUT WARNING.

STANDARD PROCEDURE - WHEEL REPLACEMENT

The wheel studs and nuts are designed for specific applications. They must be replaced with equivalent parts. Do not use replacement parts of lesser quality or a substitute design. All aluminum and some steel wheels have wheel stud nuts which feature an enlarged nose. This enlarged nose is necessary to ensure proper retention of the aluminum wheels.

NOTE: Do not use chrome plated lug nuts with chrome plated wheels.

Before installing the wheel, be sure to remove any build up of corrosion on the wheel mounting surfaces. Ensure wheels are installed with good metal-to-metal contact. Improper installation could cause loosening of wheel nuts. This could affect the safety and handling of your vehicle.

To install the wheel, first position it properly on the mounting surface. All wheel nuts should then be tightened just snug. Gradually tighten them in sequence to the proper torque specification. **Never use oil or grease on studs or nuts.**

Wheels must be replaced if they have:

- Excessive runout

WHEELS (Continued)

- Bent or dented
- Leak air through welds
- Have damaged bolt holes

Wheel repairs employing hammering, heating, or welding are not allowed.

Original equipment wheels are available through your dealer. Replacement wheels from any other source should be equivalent in:

- Load carrying capacity
- Diameter
- Width
- Offset
- Mounting configuration

Failure to use equivalent replacement wheels may affect the safety and handling of your vehicle. Replacement with **used** wheels is not recommended. Their service history may have included severe treatment.

SPECIFICATIONS

TORQUE CHART

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Lug Nut 1/2 X 20 with 60° Cone	115-150	85-115	—

STUDS

REMOVAL

CAUTION: Do not use a hammer to remove wheel studs.

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove brake caliper, caliper adapter and rotor,(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
(4) Remove stud from hub with Remover C-4150A (Fig. 19).

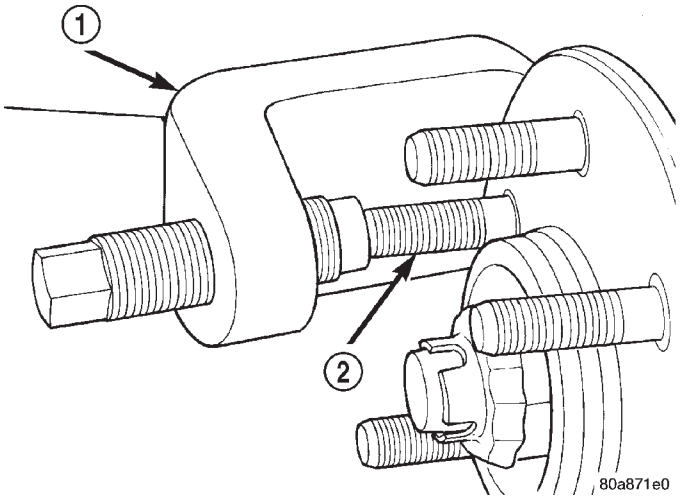


Fig. 19 Wheel Stud Removal

1 - REMOVER
2 - WHEEL STUD

INSTALLATION

CAUTION: Do not use a hammer to remove wheel studs.

(1) Install the new stud into the hub flange.
(2) Install the three washers onto the stud, then install the lug nut with the flat side of the nut against the washers.
(3) Tighten the lug nut until the stud is pulled into the hub flange. Verify that the stud is properly seated into the flange.
(4) Remove the lug nut and washers.
(5) Install the brake rotor, caliper adapter, and caliper,(Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
(6) Install the wheel and tire assembly, use new lug nut on stud or studs that were replaced.
(7) Remove the support and lower vehicle.

TIRE PRESSURE MONITORING SENSOR

DESCRIPTION

The EVIC will monitor the tire pressure signals from the five tire sensors and determine if any tire has gone below the low pressure threshold or raised above the high pressure threshold. Refer to the table below.

LOW TIRE PRESSURE THRESHOLDS	
SYSTEM STATUS INDICATOR	TIRE PRESSURE
ON	179 kPa (26 PSI)
OFF	214 kPa (31 PSI)

HIGH TIRE PRESSURE THRESHOLDS	
SYSTEM STATUS INDICATOR	TIRE PRESSURE
ON	310 kPa (45 PSI)
OFF	276 kPa (40 PSI)

The Remote Tire Pressure Monitors (RTPM) are not internally serviceable. For a Sensor Failure or Low Battery fault, the RTPM must be replaced.

OPERATION

If equipped with the Tire Pressure Monitoring System, each of the vehicle's five wheels will have a valve stem with a pressure sensor and radio transmitter built in. Signals from the tire pressure sensors are received and interpreted by the Electronic Vehicle Information Center (EVIC). A sensor in a mounted wheel will broadcast its detected pressure once per minute when the vehicle is moving faster than 40 km/h (25 mph). The spare tire sensor will broadcast once every hour. Each sensor's broadcast is uniquely coded so that the EVIC can determine location. The individual tire pressures can be displayed graphically on the EVIC

DIAGNOSIS AND TESTING - TIRE PRESSURE MONITORING SYSTEM

All Tire Pressure Monitoring System Faults are specific to one location. If a ″BATTERY LOW″ or ″SENSOR FAILURE″ fault is detected, the location will be displayed. The appropriate sensor/transmitter can then be replaced. If a single sensor/transmitter cannot be detected by the EVIC, replace that sensor transmitter. If none of the sensors/transmitters can be detected, refer to symptoms in the EVIC section. For additional system description and diagnosis, refer to Tire Pressure Monitoring in the Body Diagnostic manual.

REMOVAL - TIRE PRESSURE SENSOR/ TRANSMITTER

(1) Remove the tire/wheel from the vehicle.

CAUTION: When removing the stick on balancing weights from the wheel, do not use an abrasive cleaner or a cleaner which will damage the protective finish on the wheel.

(2) Remove the balancing weights from the wheel.

NOTE: The cap used on this valve stem contains an O-ring seal to prevent contamination and moisture from entering the valve stem. Retain this valve stem cap for re-use. Do not substitute a regular valve stem cap in its place.

(3) Remove the cap from the valve stem.

NOTE: The valve stem used on this vehicle is made of aluminum and the core is nickel plated brass. The original valve stem core must be reinstalled and not substituted for a valve stem core made of a different material. This is required to prevent corrosion in the valve stem caused by the different metals.

(4) Using the appropriate tool, remove the core from the valve stem (Fig. 20).

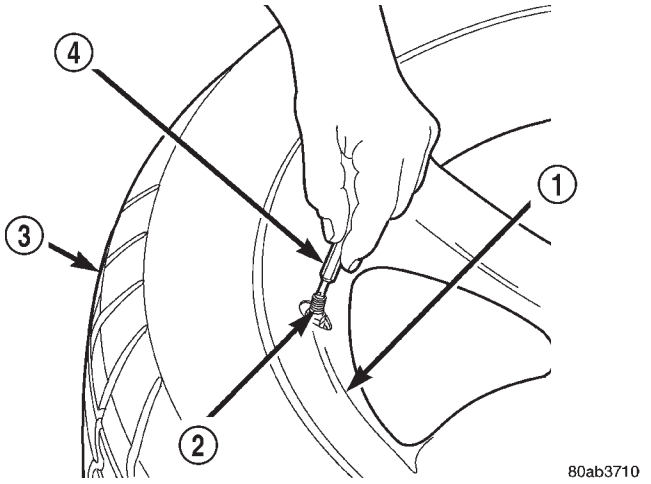


Fig. 20 REMOVING VALVE STEM CORE - TYPICAL

1 - WHEEL
2 - VALVE STEM
3 - TIRE
4 - VALVE STEM CORE TOOL

(5) Let the tire fully deflate.

SENSOR (Continued)

CAUTION: The pressure transmitter must be removed from the wheel and dropped into the tire prior to breaking the bead and dismounting the tire. Failure to do this will greatly increase the risk of damaging the pressure transducer when servicing the tire.

(6) Remove nut mounting valve stem of pressure sensor/transmitter to the wheel (Fig. 21). Drop sensor/transmitter into tire.

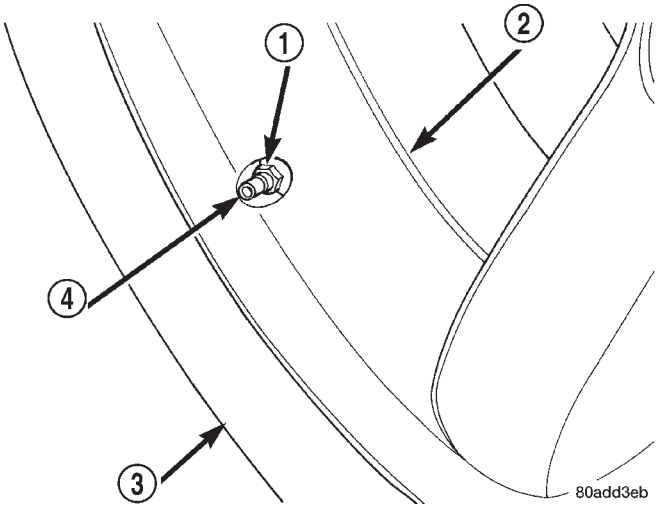


Fig. 21 VALVE STEM/PRESSURE TRANSMITTER - TYPICAL

1 - NUT
2 - WHEEL
3 - TIRE
4 - VALVE STEM

CAUTION: When breaking the top and bottom bead of the tire off the wheel, care must be used so the bead breaking mechanism on the tire changer does not damage the wheel. This includes the surface of the wheel flange on the inside of the wheel.

(7) Using the tire changer manufacturers procedure, first break down the upper bead of the tire. Then break down the bottom bead of the tire.

CAUTION: When dismounting the upper tire bead from the wheel, the proper procedure must be used. Not using the proper procedure will result in damage to the wheel and tire.

(8) Dismount the upper bead of the tire from the wheel. **The upper bead must be fully dismounted from the wheel to remove the tire pressure transmitter from the inside of the tire. The bottom bead of the tire does not need to be removed from the wheel.**

(9) Pull upward on the tire (Fig. 22). Reach into the tire and remove the pressure sensor/transmitter from inside the tire.

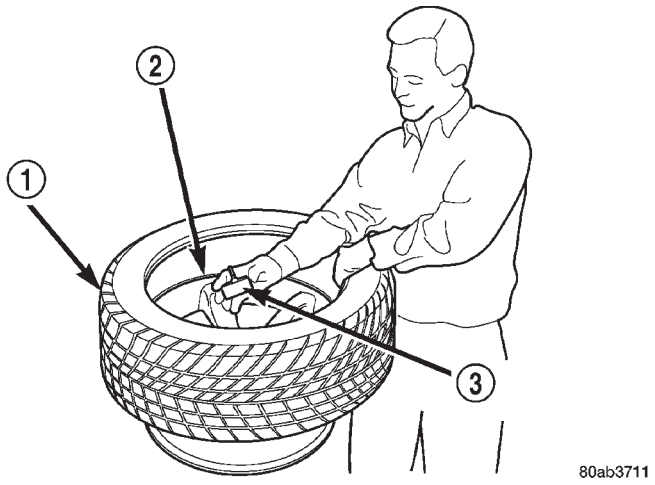


Fig. 22 PRESSURE TRANSMITTER REMOVAL - TYPICAL

1 - TIRE
2 - WHEEL
3 - PRESSURE TRANSMITTER

INSTALLATION - TIRE PRESSURE SENSOR/ TRANSMITTER

NOTE: When installing the tire pressure sensor/ transmitter, inspect the sealing O-ring at the bottom of the valve stem for any sign of damage or deterioration. Replace O-ring if necessary, before installing the pressure transmitter on the wheel. Also, be sure the surface of the wheel that the O-ring seals against is clean and not damaged.

SENSOR (Continued)

(1) Install the tire pressure sensor/transmitter on the wheel (Fig. 23).

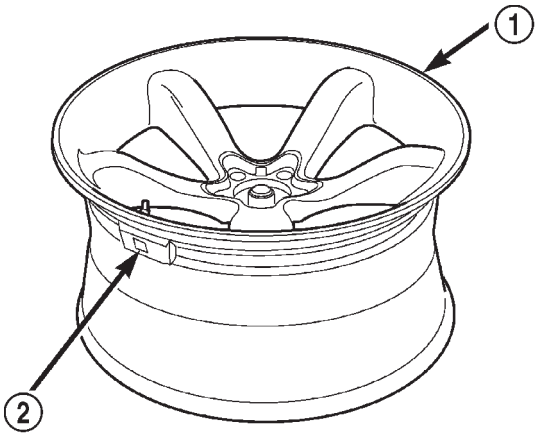


Fig. 23 TIRE PRESSURE SENSOR/TRANSMITTER - TYPICAL

1 - WHEEL
2 - TIRE PRESSURE TRANSMITTER

(2) Tighten the tire pressure sensor/transmitter mounting nut to a torque of 11 N·m (97 in. lbs.) (Fig. 24). When tightening the sensor/transmitter nut, hold the transmitter so it does not rotate. If the sensor/transmitter rotates so the top edge is not level with the wheel (Fig. 25), damage to the transmitter will occur when mounting the tire. If the top edge of the transmitter is not level with the wheel, it can be rotated into position by lightly tapping it with your hand.

CAUTION: When mounting the upper bead of the extended mobility tire, the proper procedure must be used. Not using the proper procedure will result in damage to the wheel and tire.

(3) Mount the upper bead of the tire on the wheel.
(4) Install the original or an OEM replacement valve stem cap on the valve stem.
(5) Using a soap solution, check that no air leak is present where the valve stem mounts to the wheel.
(6) Balance the tire/wheel assembly using the correct procedure for using wheel flange mount and stick-on wheel weights. For balancing information and wheel weight positioning, (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).
(7) Install the tire/wheel on the vehicle (Refer to 22 - TIRES/WHEELS - STANDARD PROCEDURE).
(8) Program the identification code for the new tire pressure sensor/transmitter into the TPM module.

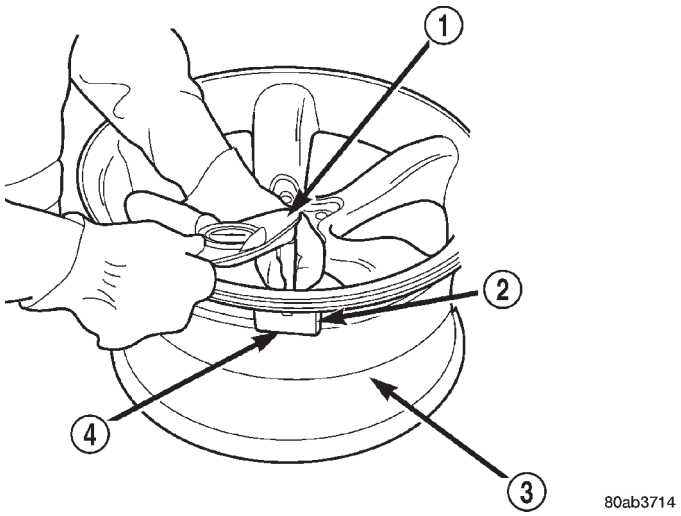


Fig. 24 TIGHTENING SENSOR/TRANSDUCER - TYPICAL

1 - TORQUE WRENCH
2 - WHEN TORQUING TRANSMITTER MOUNTING NUT DO NOT LET THIS END OF TRANSMITTER ROTATE AWAY FROM THE WHEEL
3 - WHEEL
4 - TIRE PRESSURE TRANSMITTER

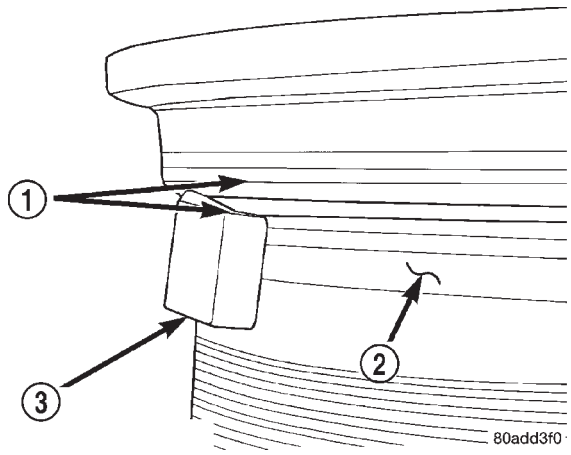


Fig. 25 CORRECTLY POSITIONED SENSOR/TRAN - TYPICAL

1 - THE TOP EDGES OF THE TIRE PRESSURE SENSOR/TRANSMITTER MUST BE FLUSH WITH THE WHEEL HERE
2 - WHEEL
3 - TIRE PRESSURE SENSOR/TRANSMITTER

(9) Verify that the TPM module has been programmed with the identification code from the new tire pressure sensor/transmitter Refer to the appropiate electrical section. If the identification code and tire pressure thresholds from the new tire pressure transmitter are present in the receivers memory the new tire pressure transmitter has been correctly programmed to the receiver.

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BODY

DIAGNOSIS AND TESTING

WATER LEAKS

Water leaks can be caused by poor sealing, improper body component alignment, body seam porosity, missing plugs, or blocked drain holes. Centrifugal and gravitational force can cause water to drip from a location away from the actual leak point, making leak detection difficult. All body sealing points should be water tight in normal wet-driving conditions. Water flowing downward from the front of the vehicle should not enter the passenger or luggage compartment. Moving sealing surfaces will not always seal water tight under all conditions. At times, side glass or door seals will allow water to enter the passenger compartment during high pressure washing or hard driving rain (severe) conditions. Overcompensating on door or glass adjustments to stop a water leak that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After completing a repair, water test vehicle to verify leak has stopped before returning vehicle to use.

VISUAL INSPECTION BEFORE WATER LEAK TESTS

Verify that floor and body plugs are in place, body drains are clear, and body components are properly aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

WATER LEAK TESTS

WARNING: DO NOT USE ELECTRIC SHOP LIGHTS OR TOOLS IN WATER TEST AREA. PERSONAL INJURY CAN RESULT.

When the conditions causing a water leak have been determined, simulate the conditions as closely as possible.

- If a leak occurs with the vehicle parked in a steady light rain, flood the leak area with an open-ended garden hose.
- If a leak occurs while driving at highway speeds in a steady rain, test the leak area with a reasonable velocity stream or fan spray of water. Direct the spray in a direction comparable to actual conditions.
- If a leak occurs when the vehicle is parked on an incline, hoist the end or side of the vehicle to simulate this condition. This method can be used when the leak occurs when the vehicle accelerates, stops or turns. If the leak occurs on acceleration, hoist the front of the vehicle. If the leak occurs when braking, hoist the back of the vehicle. If the leak occurs on left turns, hoist the left side of the vehicle. If the leak occurs on right turns, hoist the right side of the vehicle. For hoisting recommendations refer to Group 0, Lubrication and Maintenance, General Information section.

WATER LEAK DETECTION

To detect a water leak point-of-entry, do a water test and watch for water tracks or droplets forming on the inside of the vehicle. If necessary, remove interior trim covers or panels to gain visual access to the

leak area. If the hose cannot be positioned without being held, have someone help do the water test.

Some water leaks must be tested for a considerable length of time to become apparent. When a leak appears, find the highest point of the water track or drop. The highest point usually will show the point of entry. After leak point has been found, repair the leak and water test to verify that the leak has stopped.

Locating the entry point of water that is leaking into a cavity between panels can be difficult. The trapped water may splash or run from the cavity, often at a distance from the entry point. Most water leaks of this type become apparent after accelerating, stopping, turning, or when on an incline.

MIRROR INSPECTION METHOD

When a leak point area is visually obstructed, use a suitable mirror to gain visual access. A mirror can also be used to deflect light to a limited-access area to assist in locating a leak point.

BRIGHT LIGHT LEAK TEST METHOD

Some water leaks in the luggage compartment can be detected without water testing. Position the vehicle in a brightly lit area. From inside the darkened luggage compartment inspect around seals and body seams. If necessary, have a helper direct a drop light over the suspected leak areas around the luggage compartment. If light is visible through a normally sealed location, water could enter through the opening.

PRESSURIZED LEAK TEST METHOD

When a water leak into the passenger compartment cannot be detected by water testing, pressurize the passenger compartment and soap test exterior of the vehicle. To pressurize the passenger compartment, close all doors and windows, start engine, and set heater control to high blower in HEAT position. If engine can not be started, connect a charger to the battery to ensure adequate voltage to the blower. With interior pressurized, apply dish detergent solution to suspected leak area on the exterior of the vehicle. Apply detergent solution with spray device or soft bristle brush. If soap bubbles occur at a body seam, joint, seal or gasket, the leak entry point could be at that location.

WIND NOISE

Wind noise is the result of most air leaks. Air leaks can be caused by poor sealing, improper body component alignment, body seam porosity, or missing plugs in the engine compartment or door hinge pillar areas. All body sealing points should be airtight in normal driving conditions. Moving sealing surfaces will not always seal airtight under all conditions. At times, side glass or door seals will allow wind noise to be noticed in the passenger compartment during high cross winds. Over compensating on door or glass adjustments to stop wind noise that occurs under severe conditions can cause premature seal wear and excessive closing or latching effort. After a repair procedure has been performed, test vehicle to verify noise has stopped before returning vehicle to use.

Wind noise can also be caused by improperly fitted exterior moldings or body ornamentation. Loose moldings can flutter, creating a buzzing or chattering noise. An open cavity or protruding edge can create a whistling or howling noise. Inspect the exterior of the vehicle to verify that these conditions do not exist.

VISUAL INSPECTION BEFORE TESTS

Verify that floor and body plugs are in place and body components are aligned and sealed. If component alignment or sealing is necessary, refer to the appropriate section of this group for proper procedures.

ROAD TESTING WIND NOISE

(1) Drive the vehicle to verify the general location of the wind noise.

(2) Apply 50 mm (2 in.) masking tape in 150 mm (6 in.) lengths along weatherstrips, weld seams or moldings. After each length is applied, drive the vehicle. If noise goes away after a piece of tape is applied, remove tape, locate, and repair defect.

POSSIBLE CAUSE OF WIND NOISE

- Moldings standing away from body surface can catch wind and whistle.
- Gaps in sealed areas behind overhanging body flanges can cause wind-rushing sounds.
- Misaligned movable components.
- Missing or improperly installed plugs in pillars.
- Weld burn through holes.

STANDARD PROCEDURE

STANDARD PROCEDURE - BODY LUBRICATION

All mechanisms and linkages should be lubricated when necessary. This will maintain ease of operation and provide protection against rust and excessive wear. The weatherstrip seals should be lubricated to prolong their life as well as to improve door sealing.

All applicable exterior and interior vehicle operating mechanisms should be inspected and cleaned. Pivot/sliding contact areas on the mechanisms should then be lubricated.

(1) When necessary, lubricate the operating mechanisms with the specified lubricants.

BODY (Continued)

(2) Apply silicone lubricant to a cloth and wipe it on door seals to avoid over-spray that can soil passenger's clothing.

(3) Before applying lubricant, the component should be wiped clean. After lubrication, any excess lubricant should be removed.

(4) The hood latch, latch release mechanism, latch striker, and safety latch should be lubricated periodically.

(5) The door lock cylinders should be lubricated twice each year (preferably autumn and spring).

(a) Spray a small amount of lock cylinder lubricant directly into the lock cylinder.

(b) Apply a small amount to the key and insert it into the lock cylinder.

(c) Rotate it to the locked position and then back to the unlocked position several times.

(d) Remove the key. Wipe the lubricant from it with a clean cloth to avoid soiling of clothing.

STANDARD PROCEDURE - DRILLING AND WELDING

When holes must be drilled or punched in an inner body panel, verify depth of space to the outer body panel, electrical wiring, or other components. Damage to vehicle can result.

Do not weld exterior panels unless combustible material on the interior of vehicle is removed from the repair area. Fire or hazardous conditions, can result.

Always have a fire extinguisher ready for use when welding.

SPECIFICATIONS

BODY LUBRICANTS

COMPONENT	SERVICE INTERVAL	LUBRICANT
Door Hinges	As Required	Multi-Purpose Grease NLGI GC-LB (Water Resistant) (1)
Door Latches	As Required	Multi-Purpose Grease NLGI GC-LB (Water Resistant) (1)
Hood Latch, Release Mechanism and Safety Latch	As Required (When Performing Other Underhood Service)	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Hood Hinges	As Required	Engine Oil
Seat Track and Release Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Hinge	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Liftgate Support Arms	As Required	Engine Oil
Liftgate Latches	As Required	White Spray Lubricant (3)
Liftgate Release Handle (Pivot and Slide Contact Surfaces)	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (2)
Window System Components	As Required	White Spray Lubricant (3)
Lock Cylinders	Twice a Year	Lock-Cylinder Lubricant (4)
Parking Brake Mechanism	As Required	Multi-Purpose Grease NLGI GC-LB 2 EP (1)
1 = Mopar Wheel Bearing Grease (High Temp) 2 = Mopar Multi-Mileage Lubricant 3 = Mopar Spray White Lube 4 = Mopar Lock Cylinder Lubricant		

BODY (Continued)

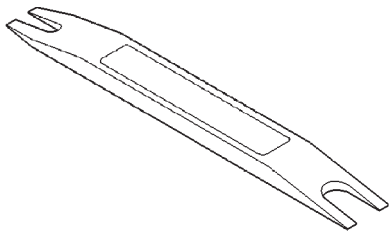
SPECIFICATIONS - TORQUE

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
BUCKET SEAT BACK FRAME RECLINER BOLTS TO SEAT CUSHION FRAME	28	20	—
BUCKET SEAT RECLINER TO SEAT BACK FRAME BOLTS	28	20	—
BUCKET SEAT TRACK ADJUSTER NUTS TO SEAT CUSHION FRAME	28	20	—
FRONT BUCKET SEAT TO FLOOR PAN BOLTS	40	30	—
FRONT BUCKET SEAT TO FLOOR PAN FRONT BOLTS	40	30	—
FRONT DOOR HINGE BOLTS	35	26	—
FRONT DOOR LATCH TO DOOR SCREWS	10	—	89
FRONT DOOR STRIKER TO B-PILLAR	28	20	—
HOOD LATCH TO RADIATOR CROSSMEMBER	11	8	—
LIFT GATE LATCH STRIKER TO D-PILLAR NUTS	10	—	89
REAR DOOR LATCH TO DOOR SCREWS	10	—	89
REAR DOOR STRIKER TO C-PILLAR SCREWS	28	20	—
REAR SEAT BACK LATCH/HINGE TO SEAT BACK FRAME	28	20	—
REAR SEAT BACK LEFT SIDE SUPPORT BRACKET TO CENTER PIVOT BRACKET	28	20	—
REAR SEAT BACK RIGHT SIDE SUPPORT BRACKET	28	20	—
REAR SEAT CUSHION LATCH BASE PANEL SCREWS	8	—	75
REAR SEAT CUSHION TO FLOOR PAN BOLTS	11	8	—
SUNROOF MODULE TO ROOF PANEL NUTS	11	8	—

SPECIAL TOOLS

BODY



Remover, Moldings C-4829

DECKLID/HATCH/LIFTGATE/TAILGATE

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EXTERIOR HANDLE

REMOVAL

(1) Remove the liftgate trim panel refer to (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(2) Remove the latch, outside handle linkage, and power lock connector.

(3) Remove the fasteners attaching the outside handle to the liftgate.

(4) Remove the outside handle from the liftgate.

INSTALLATION

(1) Position the outside handle on the liftgate.

(2) Install the fasteners attaching outside handle to liftgate.

(3) Connect outside handle link and power lock connector.

(4) Install liftgate trim panel, refer to (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

FLIP-UP GLASS

REMOVAL

CAUTION: DO NOT DISCONNECT THE PROP ROD CYLINDERS WITH THE LIFTGATE FLIP UP GLASS CLOSED. THE PROP ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS. THIS PRESSURE COULD CAUSE DAMAGE AND/OR PERSONAL INJURY IF THEY ARE REMOVED WHILE THE PISTONS ARE COMPRESSED.

(1) Using a trim stick or other suitable device, separate the flip up glass hinge cover from the hinge on the liftgate (Fig. 1).

(2) Open liftgate flip up glass. Support the glass for ease of repair.

(3) Using a small flat blade or equivalent tool, gently pry open the locking caps on the end of the prop rods.

(4) Remove prop rod cylinders from ball studs.

(5) Lower the flip up glass.

(6) Remove hinge fasteners from liftgate.

(7) Separate flip up glass from liftgate.

FLIP-UP GLASS (Continued)

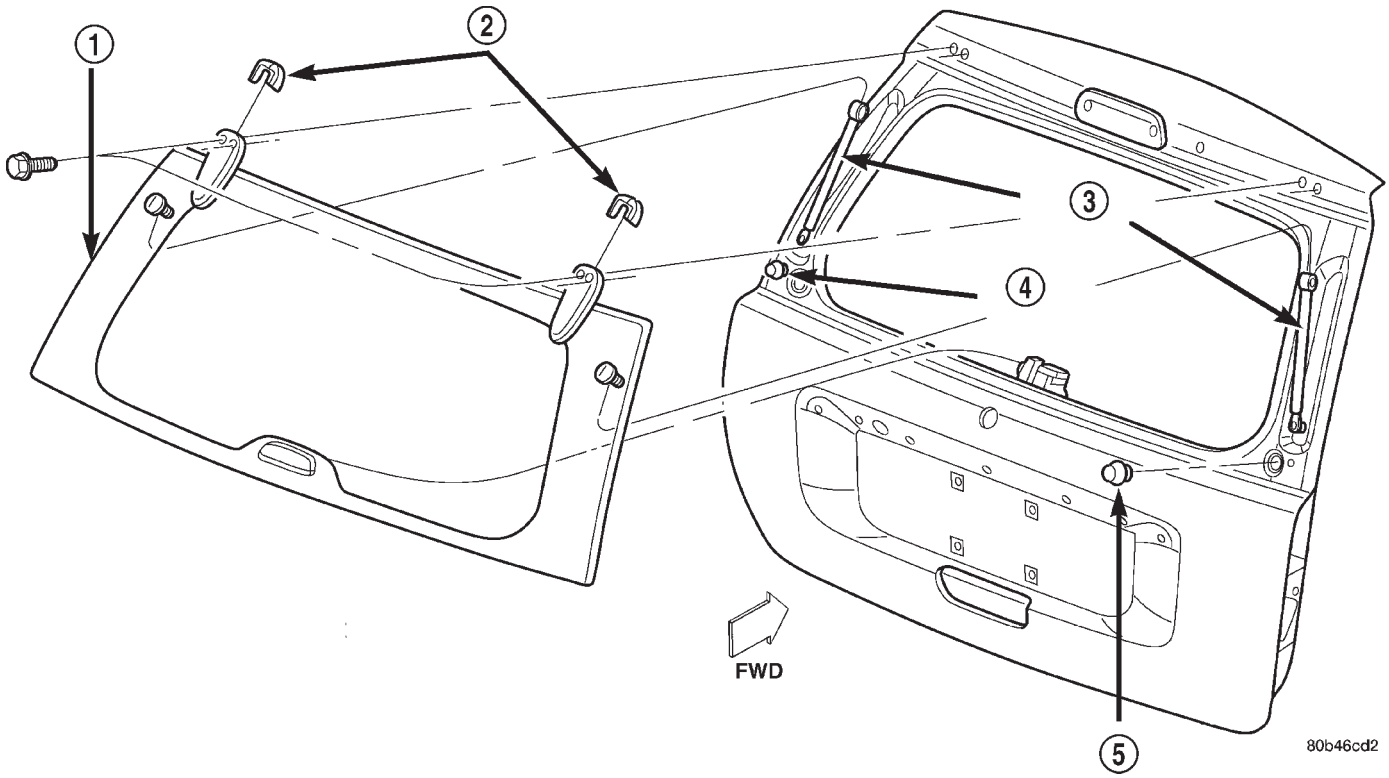


Fig. 1 Flip-Up Glass

1 - FLIP-UP GLASS
2 - HINGE COVER
3 - SUPPORT PROP
4 - BUMPER
5 - BUMPER

INSTALLATION

(1) Position flip up glass on liftgate.
(2) Install hinge fasteners, hand tight only.
(3) With the glass panel in the fully open position, fully raised position, push the glass forward to completely seat the hinges. Tighten hinge fasteners to 6N·m (60 in. lbs.).
(4) Install prop rods on ball studs and compress locking caps to lock rods on ball studs.
(5) Lower the flip up glass and install the flip up glass hinge cover.
(6) Check the flip up glass for proper alignment and latching.

FLIP-UP GLASS LATCH

REMOVAL

(1) Open liftgate flip up glass.
(2) Remove the trim panel (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).
(3) Remove latch (Fig. 2).
(4) Disconnect switch connectors.
(5) Remove latch from liftgate.

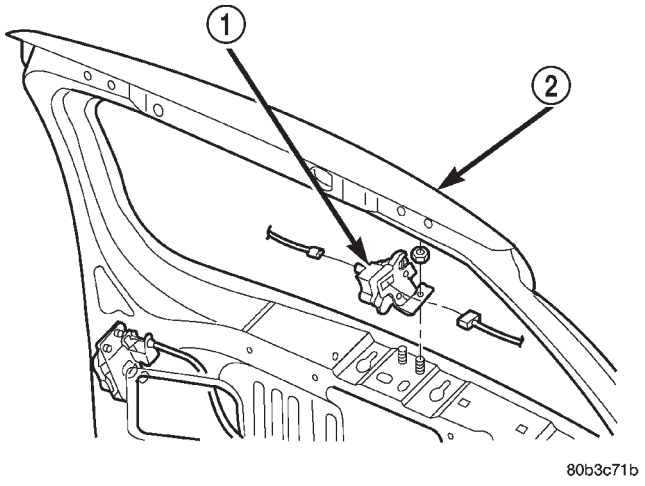


Fig. 2 Flip-up Glass Latch

1 - LATCH
2 - LIFTGATE

INSTALLATION

(1) Position the latch on the liftgate (Fig. 2).
(2) Connect switch connectors.
(3) Adjust latch to the proper position, and tighten the fasteners to 11 N·m (100 in. lbs.).

FLIP-UP GLASS LATCH (Continued)

(4) Close flip up glass panel and verify proper operation.

(5) Install liftgate trim panel, refer to (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

FLIP-UP GLASS LATCH STRIKER

REMOVAL

(1) Raise flip up glass panel.

(2) Mark the position of the handle/striker on the glass panel.

(3) Remove the screws attaching the handle/striker to the glass.

INSTALLATION

(1) Position the handle/striker on the glass panel and align the reference marks.

(2) Install the screws attaching the handle/striker to the glass panel. Tighten the fasteners to 6 N·m (60 in. lbs.).

FLIP-UP GLASS SWITCH

REMOVAL

(1) Remove license plate lamp housing/trim panel from liftgate, refer to (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP UNIT - REMOVAL).

(2) Squeeze the locking tabs inward to release the switch from the housing.

(3) Disconnect the switch harness connector, remove the switch from the housing.

INSTALLATION

(1) Install switch harness connector.

(2) Position switch in housing, snap switch into place.

(3) Install license plate lamp housing/trim panel onto liftgate, refer to (Refer to 8 - ELECTRICAL/ LAMPS/LIGHTING - EXTERIOR/LICENSE PLATE LAMP UNIT - INSTALLATION).

HINGE

REMOVAL

NOTE: It is not necessary to remove the liftgate to replace one or both hinges. The hinges can be replaced one at a time.

(1) Open the liftgate. Support the liftgate for ease of repair.

(2) Remove the liftgate header trim panel.

(3) Mark the hinge location with a grease pencil or other suitable device.

(4) Remove the hinge screws (Fig. 5).

(5) Remove hinge.

INSTALLATION

NOTE: It is not necessary to remove the liftgate to replace one or both hinges. The hinges can be replaced one at a time.

(1) Position the hinge on the roof panel and on the liftgate. (Use 3M™ Fast and Firm or equivalent on the hinge to body mating surfaces as a sealant.

(2) Install and tighten hinge screws at roof panel to 28N·m (21 ft. lbs.).

(3) Install hinge screws at liftgate. Tighten screws to 28N·m (21 ft. lbs.).

(4) Install liftgate header trim panel.

(5) Check the liftgate for proper alignment and operation.

LATCH

REMOVAL

(1) Raise the liftgate.
(2) Remove the liftgate trim panel (Fig. 3).
(3) Disconnect the power connector.
(4) Disconnect the outside handle link from the latch.
(5) Remove the latch screws and remove latch.

INSTALLATION

(1) Install the latch into the liftgate and tighten the screws to 7N·m (5 ft. lbs.).
(2) Connect the outside handle to the liftgate latch.
(3) Plug in the connector for the power.
(4) Install the liftgate trim panel.

LATCH STRIKER

REMOVAL

(1) Raise liftgate.
(2) Remove tail lamp, refer to (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP - REMOVAL).
(3) Remove nuts attaching striker to D-pillar (Fig. 4).
(4) Separate striker from D-pillar.

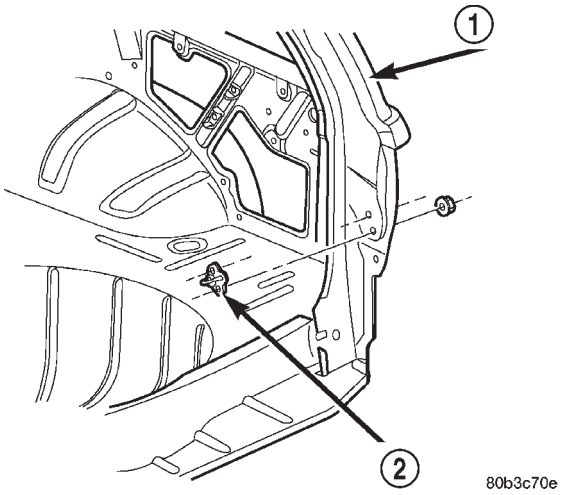


Fig. 4 Liftgate Latch Striker

1 - D-PILLAR
2 - STRIKER

INSTALLATION

(1) Position striker on D-pillar.
(2) Install nuts attaching striker to D-pillar. Tighten nuts to 10 N·m (7 ft. lbs.) torque (Fig. 4).
(3) Install tail lamp (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP - INSTALLATION).

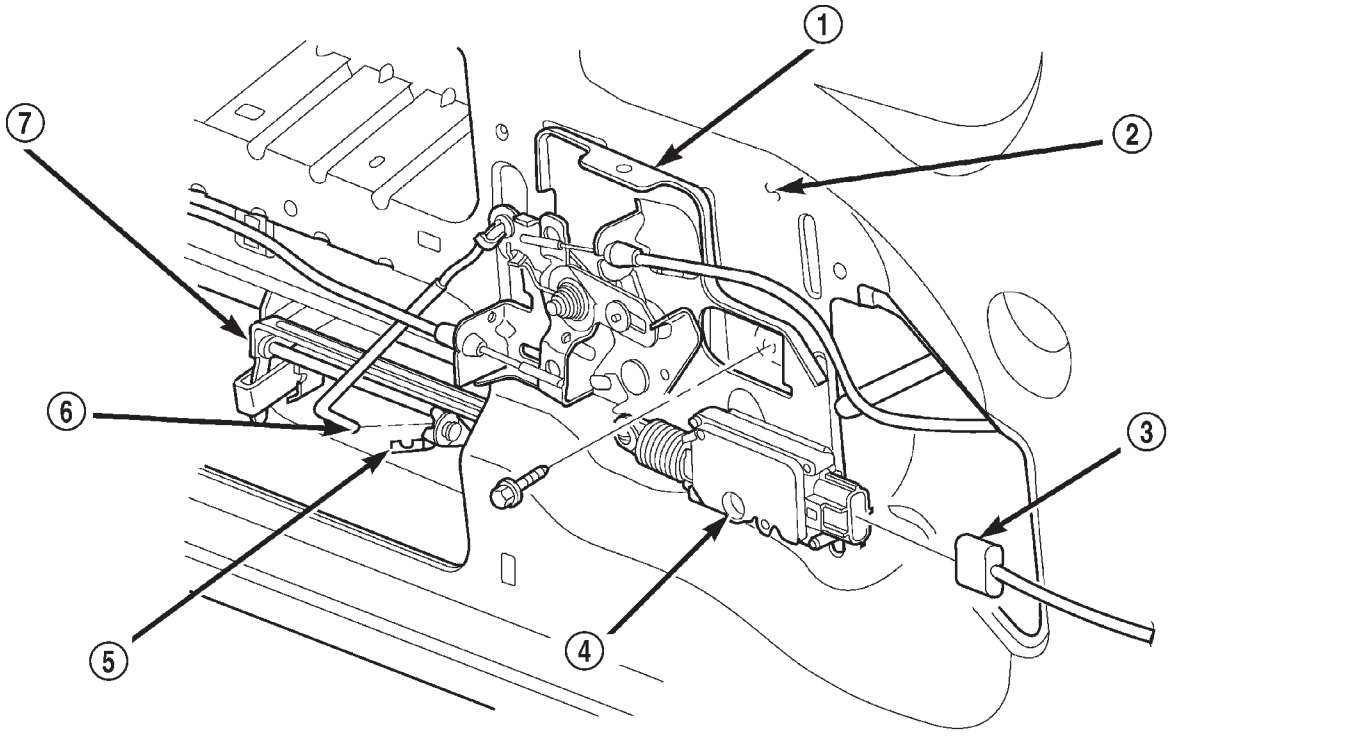


Fig. 3 LIFTGATE LATCH

1 - LATCH
2 - LIFTGATE
3 - CONNECTOR
4 - ACTUATOR
5 - CLIP
6 - OUTSIDE HANDLE TO LATCH ROD
7 - OUTSIDE HANDLE

LIFTGATE

REMOVAL

CAUTION: DO NOT DISCONNECT THE SUPPORT ROD CYLINDERS WITH THE LIFTGATE CLOSED. THE SUPPORT ROD PISTONS ARE OPERATED BY HIGH PRESSURE GAS. THIS PRESSURE COULD CAUSE DAMAGE AND /OR PERSONAL INJURY IF THEY ARE REMOVED WHILE THE PISTONS ARE COMPRESSED.

(1) Open the liftgate. Support the liftgate for ease of repair.
(2) Remove the liftgate trim panel.
(3) Remove the prop rods from the liftgate.
(4) Unplug the wire harnesses and disconnect the washer hose.
(5) Mark the hinge location with a wax pencil or other suitable device (Fig. 5).
(6) Remove the hinge screws and remove liftgate from vehicle.

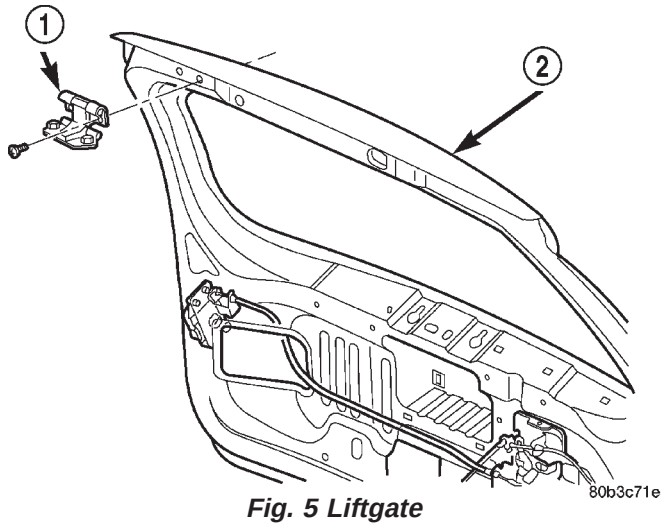


Fig. 5 Liftgate

1 - HINGE
2 - LIFTGATE

INSTALLATION

(1) Position the liftgate on the vehicle and align the witness marks.
(2) Install the hinge screws at liftgate. Tighten hinge screws to 28N·m (21ft. lbs.).
(3) Connect the wire harnesses and the washer hose.
(4) Install the trim panel.
(5) Install the prop rods.
(6) Close the liftgate and check for proper latching and alignment.

ADJUSTMENTS

LIFTGATE ADJUSTMENT

The position of the liftgate can be adjusted upward or downward by the use of slots in the hinge. An inward or outward adjustment is achieved by use of slots in the body. If an inward or outward adjustment is needed, use 3M™ Fast and Firm or equivalent on the hinge to body mating surface as a sealant.

TRIM PANEL

REMOVAL

REMOVAL - LIFTGATE TRIM PANEL

NOTE: The liftgate trim panel is attached with screws and spring clips.

(1) Raise the liftgate.
(2) Remove the screws securing the liftgate trim panel to the liftgate (Fig. 6).
(3) Disconnect the rear window defroster wires.
(4) Using a trim stick, or other suitable tool, pry the liftgate trim panel off the liftgate.

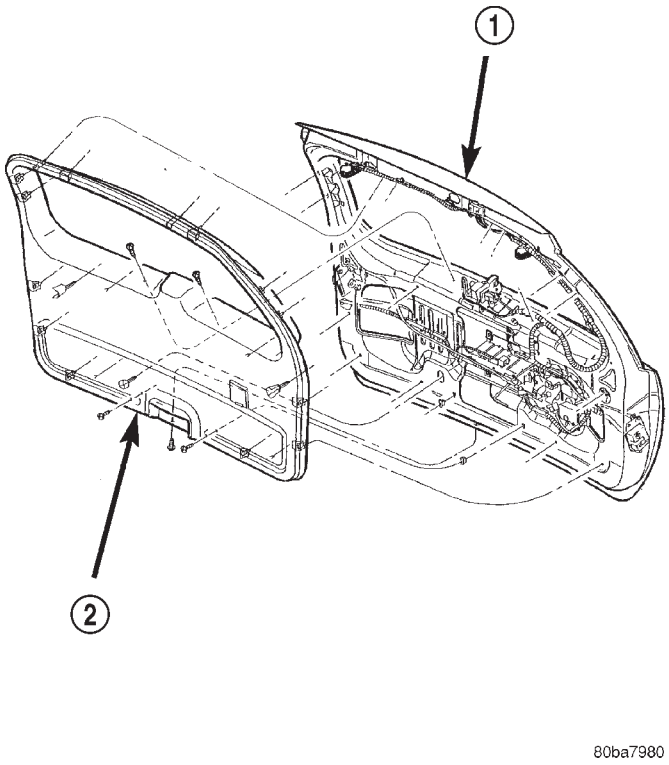


Fig. 6 Liftgate Trim Panel

1 - LIFTGATE
2 - LIFTGATE TRIM PANEL

TRIM PANEL (Continued)

REMOVAL - LOWER LIFTGATE OPENING TRIM PANEL

(1) Remove screws at outboard end of lower liftgate trim panel.

(2) Open the spare tire cover and remove the screws near the center of the lower liftgate trim panel (Fig. 7).

(3) Remove the lower liftgate trim panel.

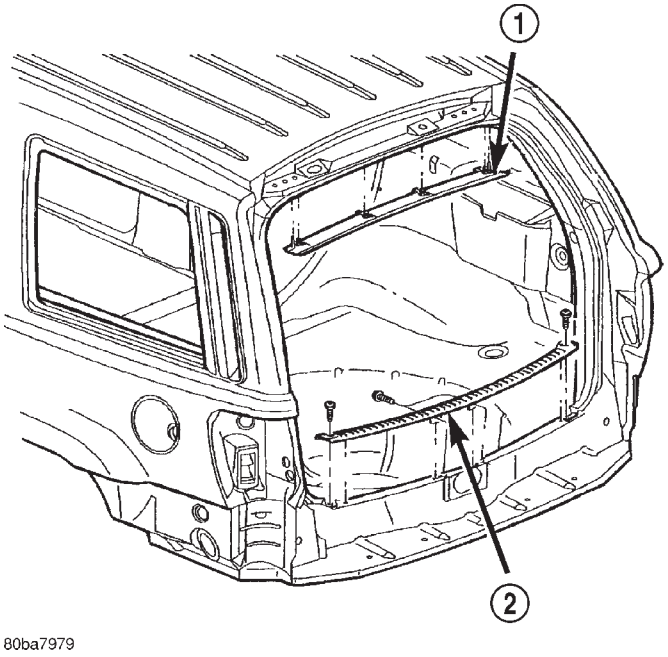


Fig. 7 Liftgate Opening Trim Panel

1 - UPPER LIFTGATE OPENING TRIM PANEL
2 - LOWER LIFTGATE OPENING TRIM PANEL

INSTALLATION

INSTALLATION - LIFTGATE TRIM PANEL

NOTE: The liftgate trim panel is attached with screws and spring clips.

(1) Align the liftgate trim panel spring clips and press the panel into the liftgate.

(2) Install the trim panel screws.

(3) Connect the rear defroster wires.

INSTALLATION - LOWER LIFTGATE OPENING TRIM PANEL

(1) Align the screw holes and locators to the holes in the liftgate opening.

(2) Install the screws in the liftgate opening trim panel.

(3) Install the spare tire cover.

LIFTGATE INSULATOR

REMOVAL

(1) Remove the liftgate trim panel, refer to (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - REMOVAL).

(2) Separate the liftgate insulator from the liftgate and trim panel (Fig. 8).

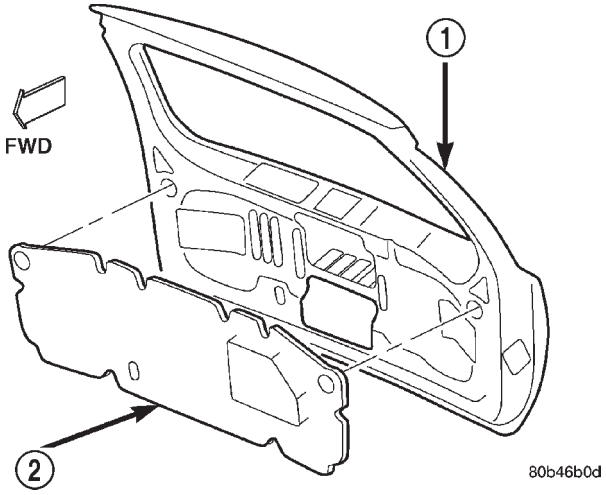


Fig. 8 Liftgate Insulator Pad

1 - LIFTGATE
2 - INSULATION PAD

INSTALLATION

(1) Thoroughly clean the area of any adhesive or insulation material.

(2) Install the insulator in the liftgate.

(3) Install the liftgate trim panel refer to (Refer to 23 - BODY/DECKLID/HATCH/LIFTGATE/TAILGATE/TRIM PANEL - INSTALLATION).

DOOR - FRONT

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CHECK STRAP

REMOVAL

(1) Remove the waterdam, refer to (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL).
(2) Remove speaker.
(3) Remove screws attaching door check to A-pillar.
(4) Remove nuts attaching door check to door (Fig. 1).
(5) Remove door check through speaker location hole.

INSTALLATION

(1) Position door check on door through speaker location hole (Fig. 1).
(2) Install nuts attaching door check to door.
(3) Install screws attaching door check to A-pillar.
(4) Install speaker.
(5) Install the waterdam, refer to (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION).

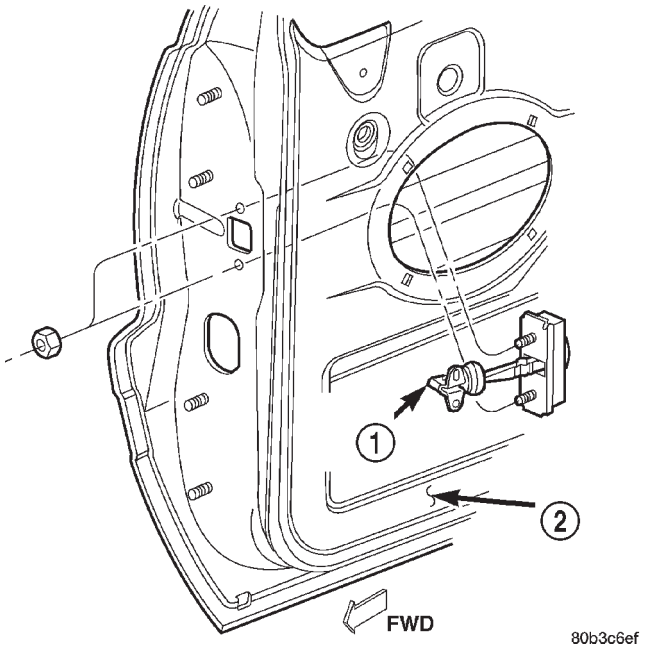


Fig. 1 Door Check

1 - DOOR CHECK
2 - FRONT DOOR

DOOR

REMOVAL

(1) Disconnect front door harness connector (Fig. 2).
(2) Support door with padded floor jack.
(3) Remove retaining clips from hinge pins.
(4) Tap out hinge pins.
(5) Separate door from vehicle.

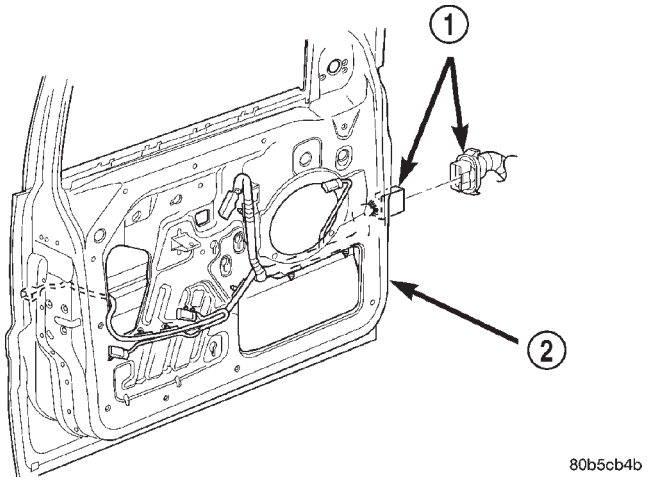


Fig. 2 Front Door Harness Connector

1 - HARNESS CONNECTOR
2 - DOOR

INSTALLATION

(1) Position door at vehicle and align hinges.
(2) Install hinge pins.
(3) Install retaining clips for hinge pins.
(4) Connect front door harness connector (Fig. 2).

ADJUSTMENTS

DOOR ADJUSTMENT

Minor adjustment for alignment of the door is made by moving the latch striker.

IN AND OUT

(1) Loosen the latch striker.
(2) Tap the latch striker inward if the door character line is outboard of the body character line or tap the latch striker outward if the door character line is inboard of the body character line.
(3) Inspect the alignment. If correct, tighten striker to 28 N·m (21 ft. lbs.).

UP AND DOWN

(1) Loosen the latch striker.
(2) Tap the latch striker downward if the door character line is higher than the body character line or tap the latch striker upward if the door character line is lower than the body character line.
(3) Inspect the alignment. If correct, tighten to 28 N·m (21 ft. lbs.).

DOOR GLASS

REMOVAL

(1) Locate glass to full down position.
(2) Remove the waterdam, refer to (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL).
(3) Remove inner belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - REMOVAL).
(4) Remove outer belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - REMOVAL).
(5) Locate glass to 3/4 up position.
(6) Using a long flat blade or hook type tool, disengage clips (Fig. 3) attaching glass retainer to glass lift plate.
(7) Carefully push bottom of glass panel outward to disengage glass retainer studs from lift plate (Fig. 4).
(8) Lift glass upward and out of door.

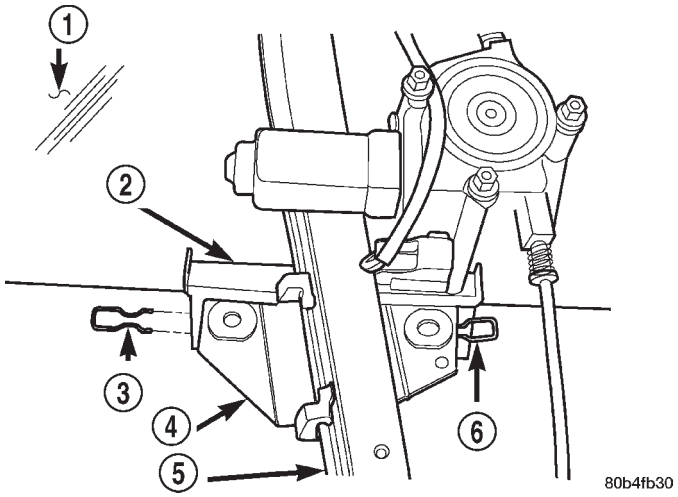


Fig. 3 Front Door Glass Clips

1 - GLASS
2 - RETAINER
3 - CLIP
4 - LIFT PLATE
5 - REGULATOR
6 - CLIP

INSTALLATION

(1) Lower glass into position.
(2) Carefully align glass retainer studs with lift plate and insert studs into lift plate.

DOOR GLASS (Continued)

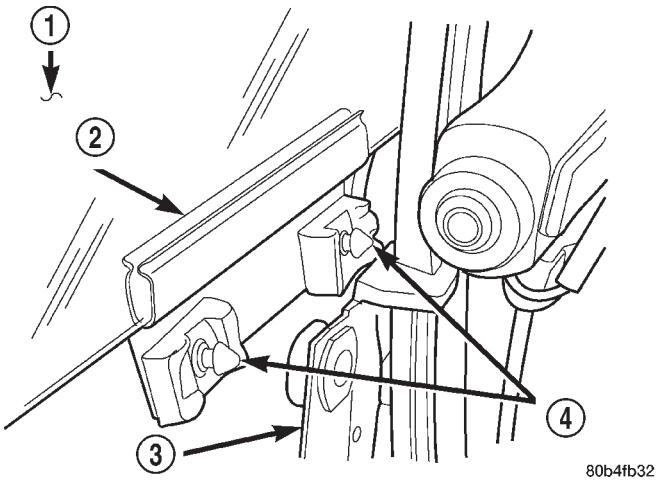


Fig. 4 Front Door Glass Retainer

1 - GLASS
2 - RETAINER
3 - LIFT PLATE
4 - STUD

(3) Engage clips attaching glass retainer to glass lift plate.

(4) Locate glass to full down position.

(5) Install outer belt weatherstrip, (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - INSTALLATION).

(6) Install inner belt weatherstrip, (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - INSTALLATION).

(7) Install waterdam, refer to (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION).

EXTERIOR HANDLE

REMOVAL

(1) Remove glass run channel, refer to (Refer to 23 - BODY/DOOR - FRONT/GLASS RUN CHANNEL - REMOVAL).

(2) Disconnect lock cylinder to latch rod.

(3) Disconnect outside handle to latch rod

(4) Remove fasteners attaching outside handle to door (Fig. 5).

(5) Remove outside handle from door.

(6) Disconnect anti-theft harness connector, if equipped.

(7) Separate outside handle from vehicle.

INSTALLATION

(1) Position outside handle at door (Fig. 5).

(2) Connect anti-theft harness connector, if equipped.

(3) Position outside handle in door.

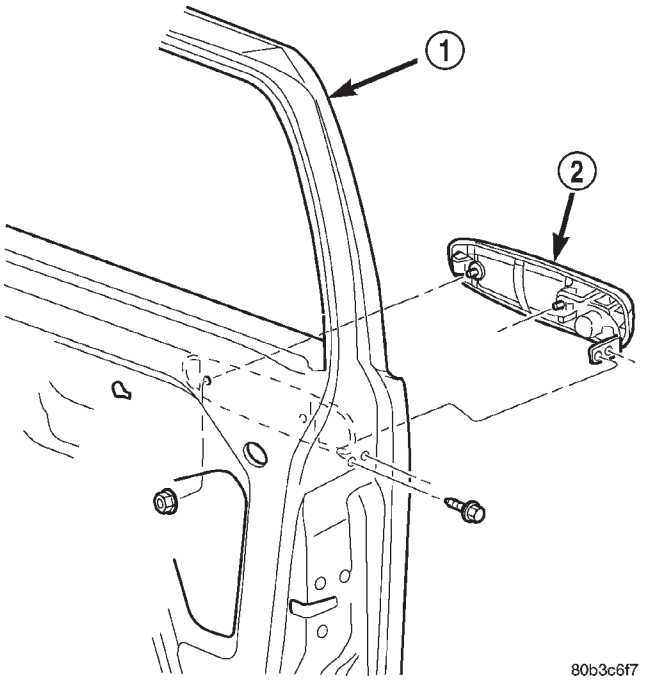


Fig. 5 Front Door Outside Handle

1 - DOOR
2 - OUTSIDE HANDLE

(4) Install fasteners attaching outside handle to door.

(5) Connect outside handle to latch rod

(6) Connect lock cylinder to latch rod.

(7) Install glass run channel, refer to (Refer to 23 - BODY/DOOR - FRONT/GLASS RUN CHANNEL - INSTALLATION).

GLASS RUN CHANNEL

REMOVAL

NOTE: Only the rearward glass run channel is serviceable.

(1) Remove the waterdam, refer to (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - REMOVAL).

(2) Remove inner belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - REMOVAL).

(3) Remove outer belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - REMOVAL).

(4) Remove bolt attaching run channel to inner door panel (Fig. 6).

(5) Peel back glass run channel weatherstrip on rear run channel.

(6) Pull glass run channel downward to separate from door.

GLASS RUN CHANNEL (Continued)

(7) Remove glass run channel from door.

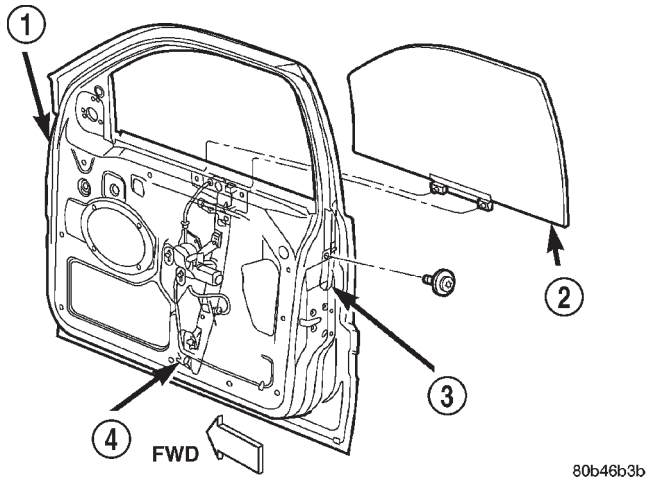


Fig. 6 Front Door Glass Run Channel

1 - DOOR
2 - GLASS
3 - GLASS RUN CHANNEL
4 - REGULATOR

INSTALLATION

(1) Position glass run channel in door (Fig. 6).

(2) Align glass run channel with door frame run channel and slide channel upward to secure door.

(3) Press glass run channel weatherstrip into rear run channel.

(4) Install bolt attaching run channel to inner door panel.

(5) Install outer belt weatherstrip, (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - INSTALLATION).

(6) Install inner belt weatherstrip, (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - INSTALLATION).

(7) Install the waterdam, (Refer to 23 - BODY/DOOR - FRONT/WATERDAM - INSTALLATION).

HINGE

REMOVAL

(1) Open and support door.

(2) Using a wax pencil, or other suitable device, reference mark the hinge placement

(3) Disconnect the door wire harness.

(4) Remove the door check from the “A” pillar (Fig. 7).

(5) Remove the fasteners retaining the door hinge to the door (Fig. 8).

(6) Remove the door.

(7) Remove the hinge from the “A” pillar.

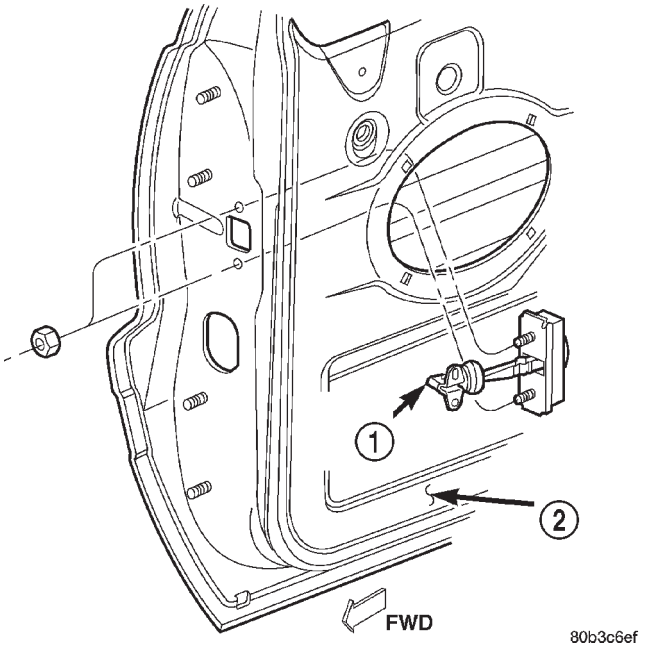


Fig. 7 Front Door Check

1 - DOOR CHECK
2 - FRONT DOOR

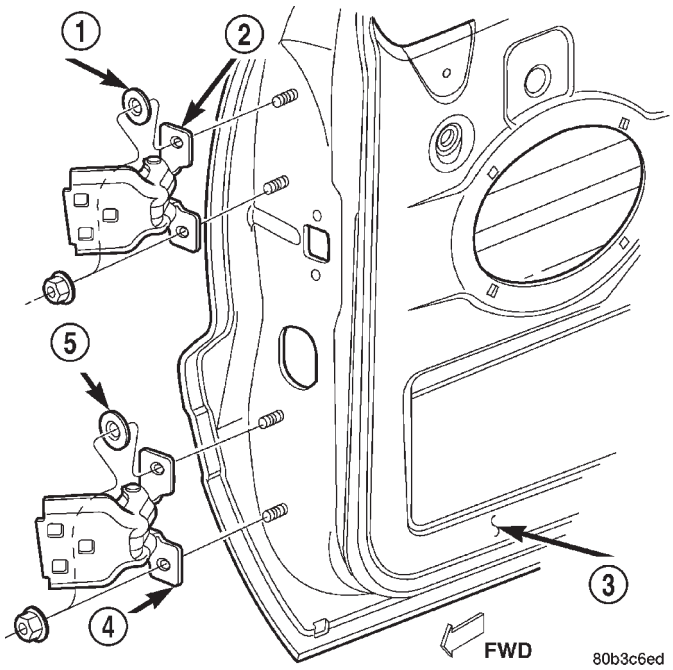


Fig. 8 Front Door Hinges

1 - WASHER
2 - UPPER HINGE
3 - FRONT DOOR
4 - LOWER HINGE
5 - WASHER

HINGE (Continued)

INSTALLATION

(1) Position hinge on “A” pillar. (Use 3M® Fast and Firm or equivalent on the hinge to body mating surface as a sealant.)
(2) Install hinge to body bolts, but do not tighten.
(3) Align the hinge to the reference marks and torque the bolts to 35N·m (26 ft. lbs.).
(4) Install the door on the hinge and align with the reference marks.
(5) Tighten the door to hinge fasteners.
(6) For adjustment see door adjustment procedure.

INSIDE HANDLE ACTUATOR

REMOVAL

(1) Remove door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
(2) Disconnect latch and lock rods from inside handle actuator.
(3) Remove screws attaching inside handle actuator to trim panel (Fig. 9).
(4) Separate inside handle actuator from trim panel.

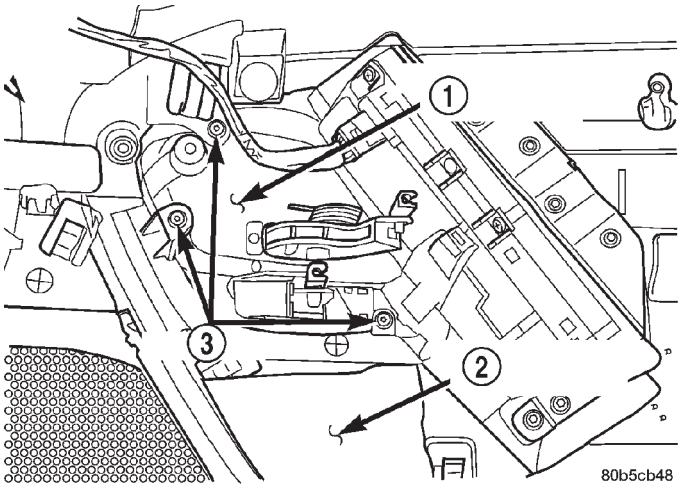


Fig. 9 Front Door Inside Handle Actuator

1 - INSIDE HANDLE ACTUATOR
2 - DRIVER'S DOOR TRIM PANEL
3 - SCREW

INSTALLATION

(1) Position inside handle actuator in trim panel.
(2) Install screws attaching inside handle actuator to trim panel (Fig. 9).
(3) Connect latch and lock rods to inside handle actuator.
(4) Install door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

LATCH

REMOVAL

(1) Remove glass run channel, refer to (Refer to 23 - BODY/DOOR - FRONT/GLASS RUN CHANNEL - REMOVAL).
(2) Remove screws attaching door latch to door (Fig. 10).
(3) Disconnect all rods from door latch.
(4) Disconnect wire harness connector, if equipped.
(5) Separate door latch from door.

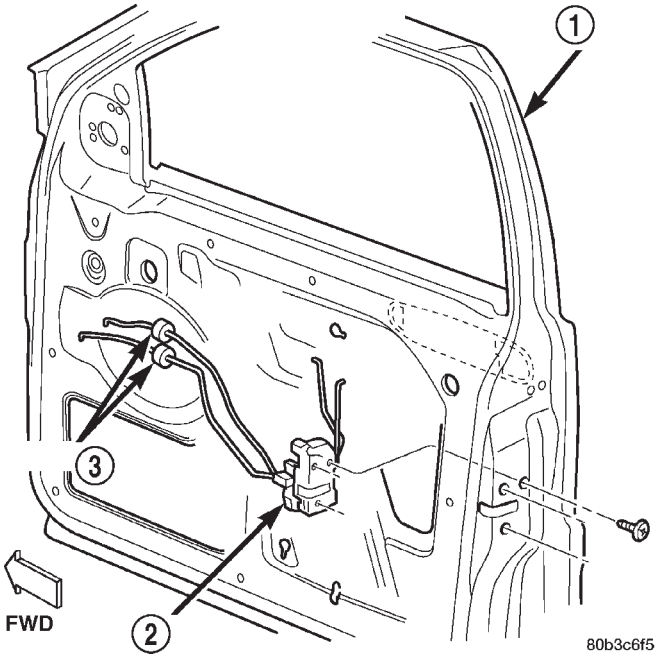


Fig. 10 Door Latch

1 - DOOR
2 - LATCH
3 - ISOLATOR

INSTALLATION

(1) Position door latch at door.
(2) Connect wire harness connector, if equipped.
(3) Connect all rods to door latch.
(4) Install screws attaching door latch to door. Tighten screws to 10 N·m (7 ft. lbs.) torque (Fig. 10).
(5) Install glass run channel, refer to (Refer to 23 - BODY/DOOR - FRONT/GLASS RUN CHANNEL - INSTALLATION).

LATCH (Continued)

ADJUSTMENTS

DOOR LATCH

DOOR LATCH ADJUSTMENT

(1) Locate access hole (Fig. 11).

(2) Insert a 5/32-inch hex-wrench through hole and into adjustment screw. Loosen screw.

(3) Operate outside handle button several times to release any restriction because of mis-alignment.

(4) Tighten adjustment screw to 3 N·m (30 in-lbs) torque.

(5) Test handle button and lock cylinder for proper operation.

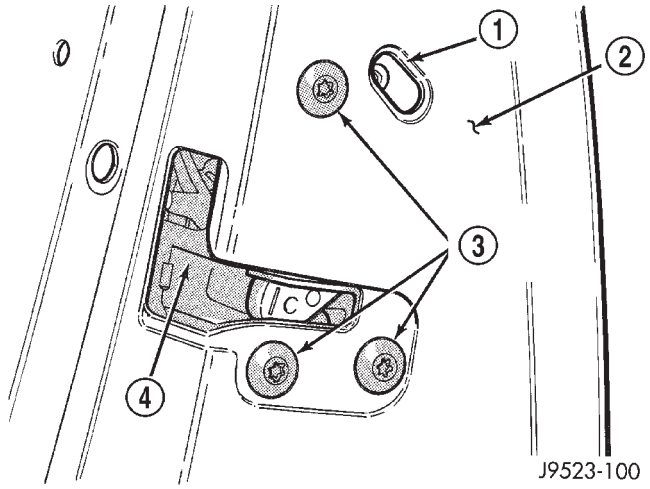


Fig. 11 Door Latch Adjustment

1 - ACCESS HOLE
2 - DOOR
3 - LATCH MOUNTING BOLTS
4 - LATCH

LATCH STRIKER

REMOVAL

(1) Remove screws attaching striker to B-pillar.

(2) Separate striker and spacer from B-pillar (Fig. 12).

INSTALLATION

(1) Position striker and spacer on B-pillar.

(2) Install screws attaching striker to B-pillar. Tighten screws to 28 N·m (20 ft. lbs.) torque (Fig. 12).

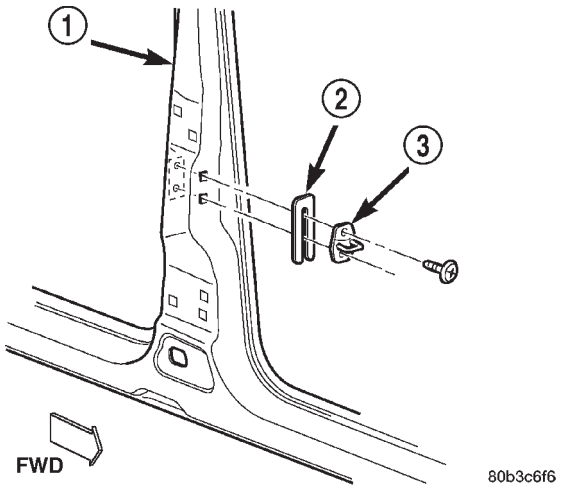


Fig. 12 Front Door Latch Striker

1 - B-PILLAR
2 - SPACER
3 - STRIKER

LOCK CYLINDER

REMOVAL

(1) Remove outside door handle, refer to (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - REMOVAL).

(2) Remove screw securing lock cylinder retainer to outside door handle (Fig. 13).

(3) Separate lock cylinder from door handle.

(4) Disconnect lock cylinder switch, if equipped.

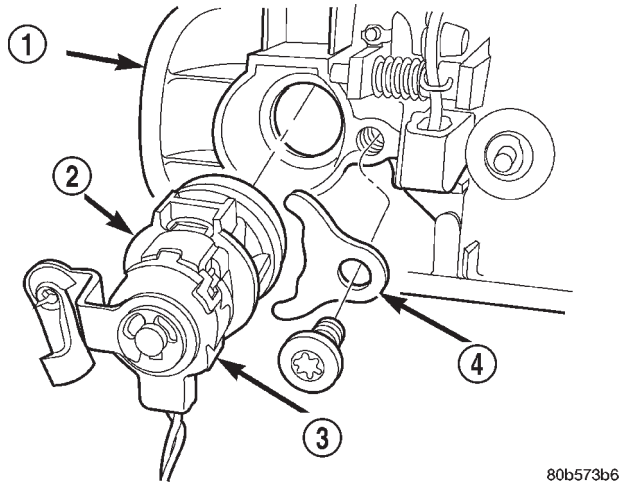


Fig. 13 Front Door Lock Cylinder

1 - OUTSIDE DOOR HANDLE
2 - LOCK CYLINDER
3 - ANTI-THEFT SWITCH
4 - RETAINER

LOCK CYLINDER (Continued)

INSTALLATION

(1) Connect lock cylinder switch, if equipped.
(2) Position lock cylinder in door handle.
(3) Position lock cylinder retainer and install screw (Fig. 13).
(4) Install outside door handle, refer to (Refer to 23 - BODY/DOOR - FRONT/EXTERIOR HANDLE - INSTALLATION).

TRIM PANEL

REMOVAL

(1) Remove trim plug from mirror flag bezel.
(2) Remove screws attaching trim panel to door (Fig. 14).
(3) Using trim remover (C-4829 or equivalent), detach trim panel perimeter push-in fasteners from door inner panel.
(4) Lift trim panel upward and separate from door.
(5) If equipped, disconnect harness connectors for power accessories.
(6) Disconnect latch rods from inside handle actuator.
(7) Separate trim panel from vehicle.

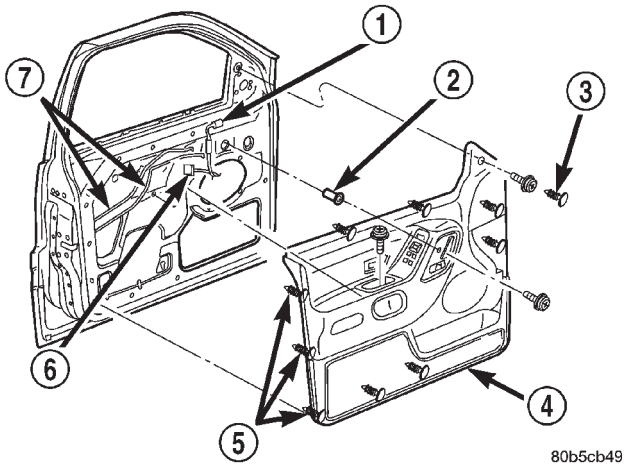


Fig. 14 Front Door Trim Panel

1 - HARNESS CONNECTOR
2 - NUTSERT
3 - TRIM PLUG
4 - TRIM PANEL
5 - PUSH-IN FASTENER
6 - HARNESS CONNECTOR
7 - LATCH RODS

INSTALLATION

(1) Connect latch rods to inside handle actuator.
(2) If equipped, connect harness connectors to power accessories.
(3) Position trim panel on door inner panel.
(4) Press trim panel push-in fasteners inward around perimeter of door.
(5) Install screws attaching trim panel to door (Fig. 14).
(6) Install trim plug in mirror flag bezel.

WATERDAM

REMOVAL

(1) Remove door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
(2) Peel the waterdam from door.
(3) Route all harnesses and linkage rods through waterdam as necessary.
(4) Separate waterdam from door (Fig. 15).

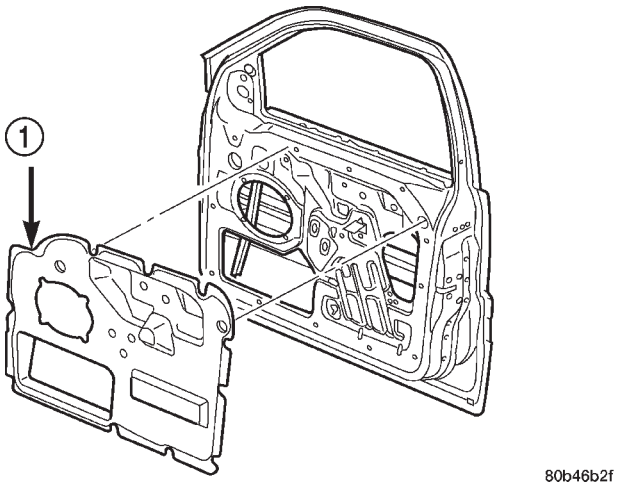


Fig. 15 Front Door Waterdam

1 - INSULATOR PAD

INSTALLATION

(1) Waterdam contact surface must be free of contaminants. Clean as necessary.
(2) Route all harnesses and linkage rods through waterdam as necessary.
(3) Position waterdam on door and align all holes.
(4) Press waterdam on door (Fig. 15).
(5) Install door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

WINDOW REGULATOR

REMOVAL

(1) Remove front door glass, refer to (Refer to 23 - BODY/DOOR - FRONT/DOOR GLASS - REMOVAL).

(2) Loosen bolts attaching regulator to inner door panel (Fig. 16).

(3) Remove bolt attaching regulator to inner door panel (Fig. 17).

(4) Lift regulator upward to disengage bolts from door inner panel.

(5) Disengage power window regulator harness connector, if equipped.

(6) Remove regulator through access hole in door.

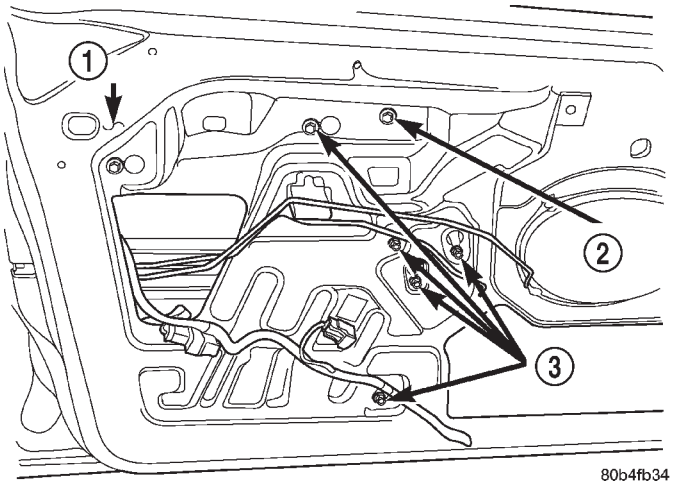


Fig. 16 Front Door Regulator Bolts

1 - FRONT DOOR
2 - REMOVE BOLT
3 - LOOSEN BOLTS

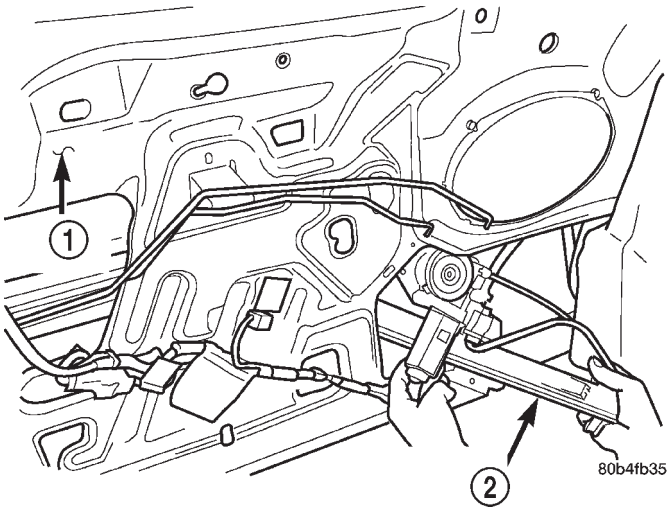


Fig. 17 Front Door Window Regulator

1 - FRONT DOOR
2 - REGULATOR

INSTALLATION

(1) Position regulator in door through access hole.

(2) Engage power window regulator harness connector, if equipped.

(3) Lift regulator upward and engage bolts in door inner panel key hole slots.

(4) Install bolt attaching regulator to inner door panel.

(5) Tighten bolts attaching regulator to inner door panel.

(6) Install front door glass, refer to (Refer to 23 - BODY/DOOR - FRONT/GLASS RUN CHANNEL - INSTALLATION).

DOORS - REAR

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CHECK STRAP

REMOVAL

(1) Remove waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL).
(2) Remove speaker.
(3) Remove screws attaching door check to B-pillar.
(4) Remove nuts attaching door check to door (Fig. 1).
(5) Remove door check through speaker location hole.

INSTALLATION

(1) Position door check on door through speaker location hole.
(2) Install nuts attaching door check to door (Fig. 1).
(3) Install screws attaching door check to B-pillar.
(4) Install speaker.
(5) Install waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION).

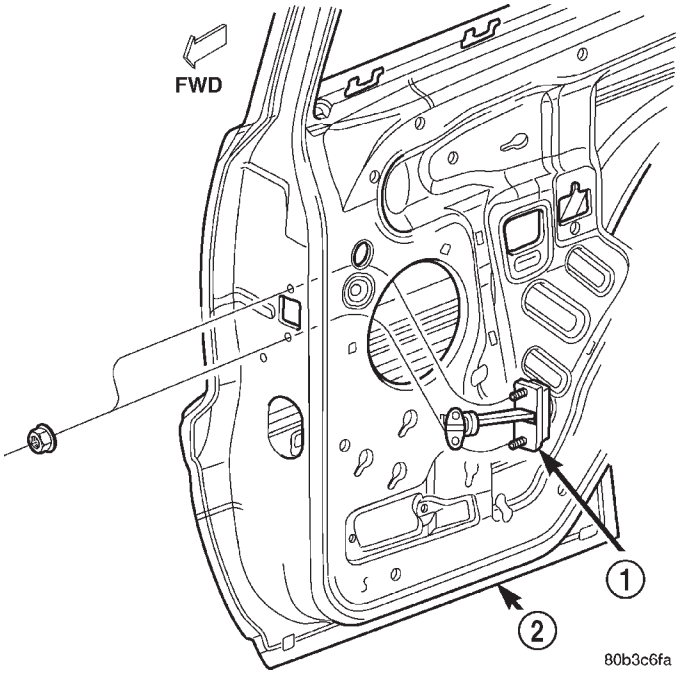


Fig. 1 Door Check

1 - DOOR CHECK
2 - REAR DOOR

DOOR

REMOVAL

(1) Disconnect rear door harness connector (Fig. 2).
(2) Support door with padded floor jack.
(3) Remove retaining clips from hinge pins.
(4) Tap out hinge pins.
(5) Separate door from vehicle.

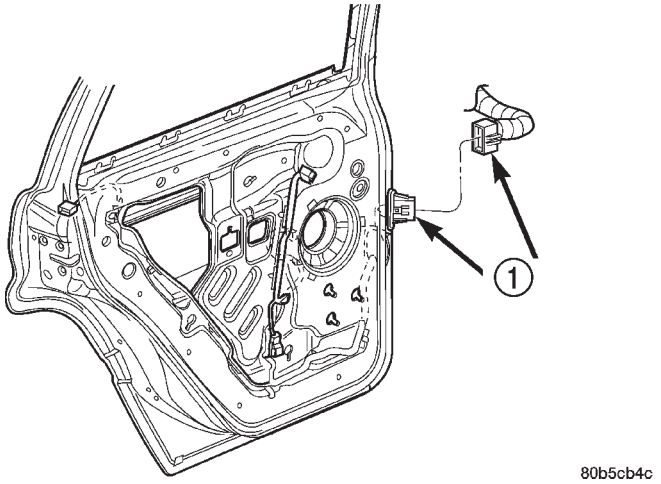


Fig. 2 Rear Door Harness Connector

1 - HARNESS CONNECTOR

INSTALLATION

(1) Position door at vehicle and align hinges.
(2) Install hinge pins.
(3) Install retaining clips for hinge pins.
(4) Connect rear door harness connector (Fig. 2).

DOOR GLASS

REMOVAL

(1) Remove waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL).
(2) Remove inner belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/RDR INNER BELT WEATHERSTRIP - REMOVAL).
(3) Remove stationary glass, refer to (Refer to 23 - BODY/STATIONARY GLASS/DOOR GLASS - REMOVAL).
(4) Disengage clips attaching window glass to lift plate.
(5) Press studs out of lift plate.
(6) Lift window glass from door (Fig. 3).

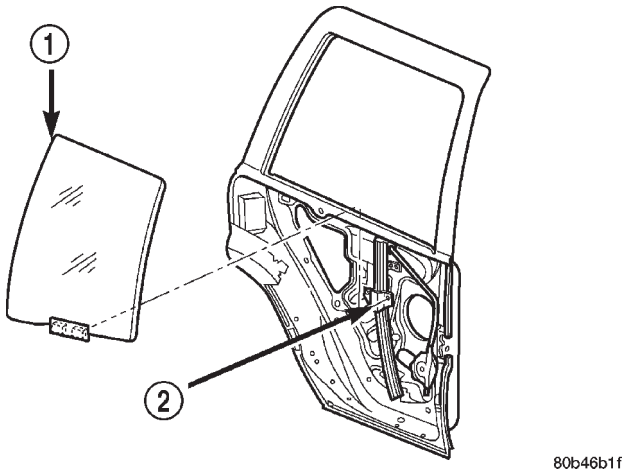


Fig. 3 Glass Channel

1 - GLASS
2 - REGULATOR

INSTALLATION

(1) Position window glass in door (Fig. 3).
(2) Engage studs into lift plate.
(3) Engage clips attaching window glass to lift plate.
(4) Install stationary glass, refer to (Refer to 23 - BODY/STATIONARY GLASS/DOOR GLASS - INSTALLATION).
(5) Install inner belt weatherstrip, refer to (Refer to 23 - BODY/WEATHERSTRIP/SEALS/RDR INNER BELT WEATHERSTRIP - INSTALLATION).
(6) Install waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION).

EXTERIOR HANDLE

REMOVAL

(1) Remove waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL).
(2) Locate glass to full up position.
(3) Disconnect lock knob to latch rod.
(4) Disconnect outside handle to latch rod.
(5) Remove fasteners attaching outside handle to door (Fig. 4).
(6) Remove outside handle from door.
(7) Separate outside handle from vehicle.

EXTERIOR HANDLE (Continued)

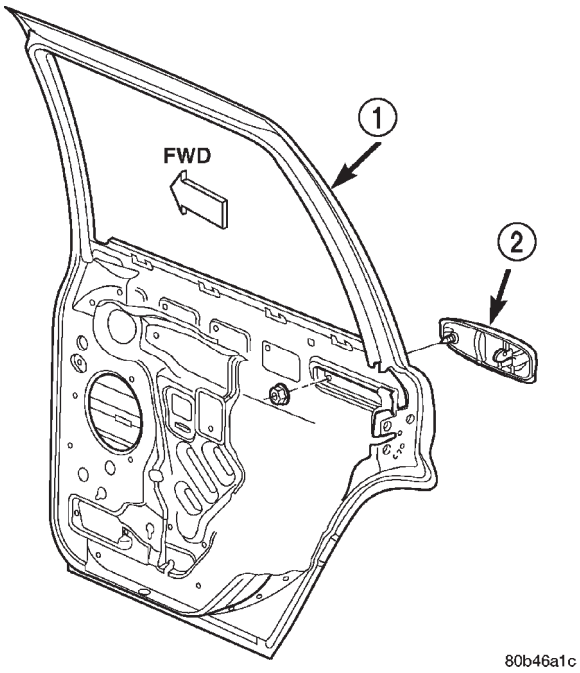


Fig. 4 Front

1 - DOOR
2 - OUTSIDE HANDLE

INSTALLATION

(1) Position outside handle in door.
(2) Install fasteners attaching outside handle to door (Fig. 4).
(3) Connect outside handle to latch rod.
(4) Connect lock knob to latch rod.
(5) Locate glass to full down position.
(6) Install waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION).

HINGE

REMOVAL

(1) Open front door and rear door.
(2) Reference mark hinges for installation (Fig. 5).
(3) Support rear door for removal of hinges.
(4) Remove B pillar trim.
(5) Remove nuts holding door to hinge.
(6) Remove door.
(7) Remove bolts holding hinge to B pillar.

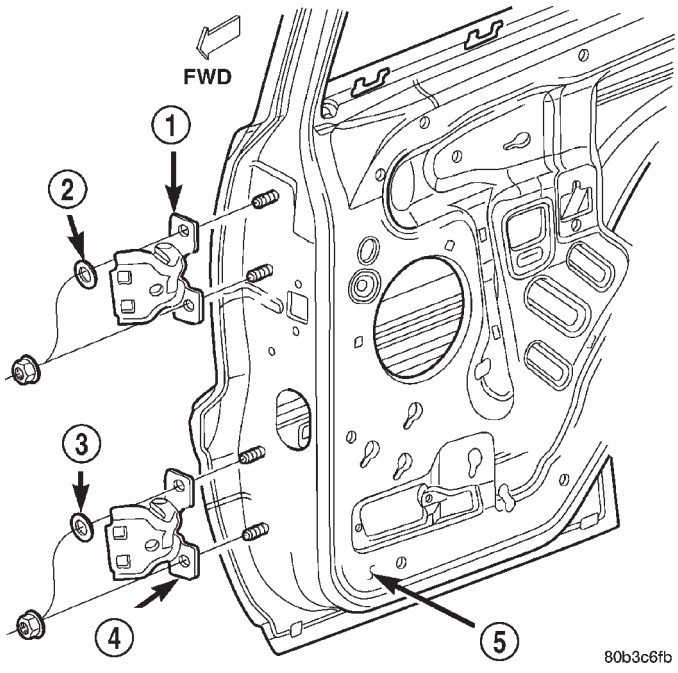


Fig. 5 Rear Door Hinge

1 - UPPER HINGE
2 - WASHER
3 - WASHER
4 - LOWER HINGE
5 - REAR DOOR

INSTALLATION

(1) Install hinge on B pillar and align reference marks (Fig. 5).
(2) Install bolts holding hinge to B pillar. Tighten bolts to 35N·m (23 ft. lbs.).
(3) Install door on hinge and align reference marks. Install bolts and tighten to 35N·m (26 ft. lbs.).
(4) Check door for fit and ease of operation. Adjust as necessary, refer to (Refer to 23 - BODY/DOOR - FRONT/DOOR - ADJUSTMENTS).
(5) Install B pillar trim.

INSIDE HANDLE ACTUATOR

REMOVAL

(1) Remove door trim panel, refer to (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).

(2) Disconnect latch and lock rods from inside handle actuator.

(3) Remove screws attaching inside handle actuator to trim panel (Fig. 6).

(4) Separate inside handle actuator from trim panel.

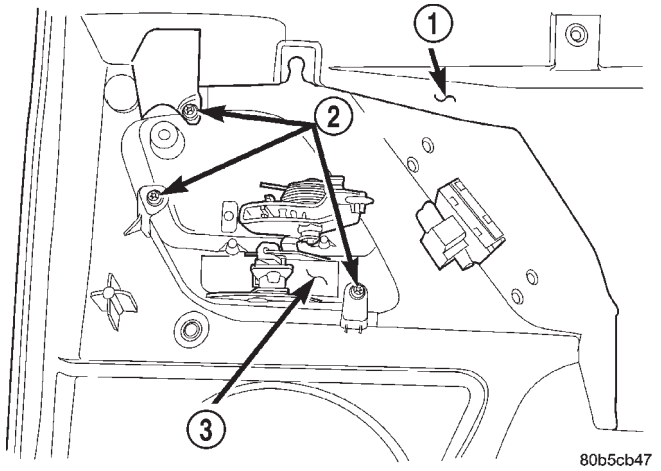


Fig. 6 Rear Door Inside Handle Actuator

1 - REAR DOOR TRIM PANEL
2 - SCREW
3 - INSIDE HANDLE ACTUATOR

INSTALLATION

(1) Position inside handle actuator in trim panel.

(2) Install screws attaching inside handle actuator to trim panel (Fig. 6).

(3) Connect latch and lock rods to inside handle actuator.

(4) Install door trim panel, refer to (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

LATCH

REMOVAL

(1) Remove waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL).

(2) Remove screws attaching latch to door (Fig. 7).

(3) Disconnect rods from door latch.

(4) Separate door latch from door.

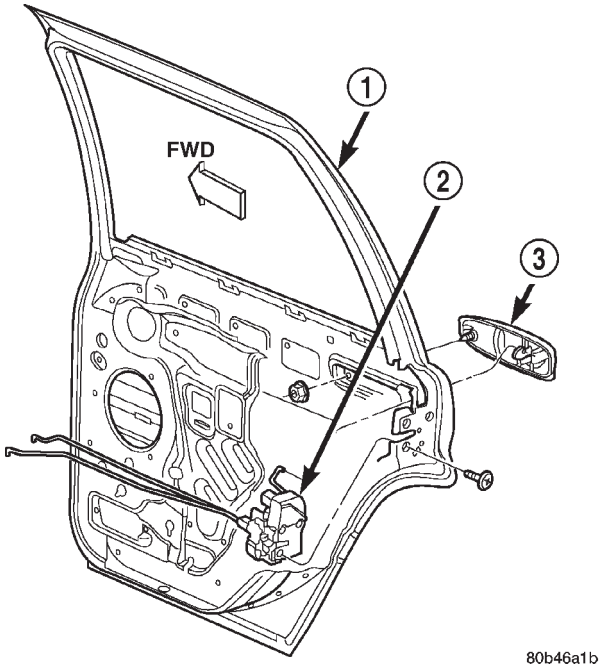


Fig. 7 Rear Door Latch

1 - DOOR
2 - LATCH
3 - OUTSIDE HANDLE

INSTALLATION

(1) position latch in door.

(2) Connect rods to door latch.

(3) Install screws attaching latch to door. Tighten screws to 10 N·m (95 in. lbs.) torque (Fig. 7).

(4) Install waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION).

LATCH STRIKER

REMOVAL

(1) Remove screws attaching striker to C-pillar (Fig. 8).
(2) Separate striker and spacer from vehicle.

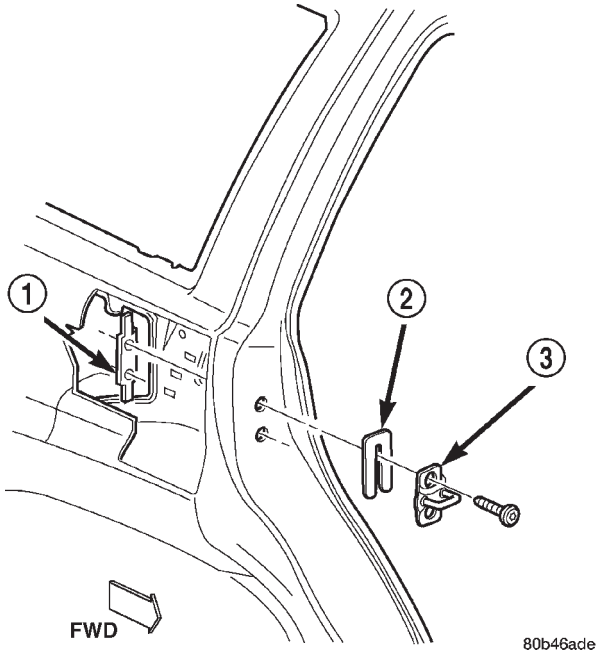


Fig. 8 Rear Door Latch Striker

1 - TAPPING PLATE
2 - SPACER
3 - STRIKER

INSTALLATION

(1) Position striker and spacer on C-pillar.
(2) Install screws. Tighten to 28 N·m (250 in. lbs.) torque.

TRIM PANEL

REMOVAL

(1) Remove screws attaching trim panel to door (Fig. 9).
(2) Using trim remover (C-4829 or equivalent), detach trim panel perimeter push-in fasteners from door inner panel.
(3) Lift trim panel upward and separate from door.
(4) If equipped, disconnect harness connectors for power accessories.
(5) Disconnect latch rods from inside handle actuator.
(6) Separate trim panel from vehicle.

INSTALLATION

(1) Connect latch rods to inside handle actuator.

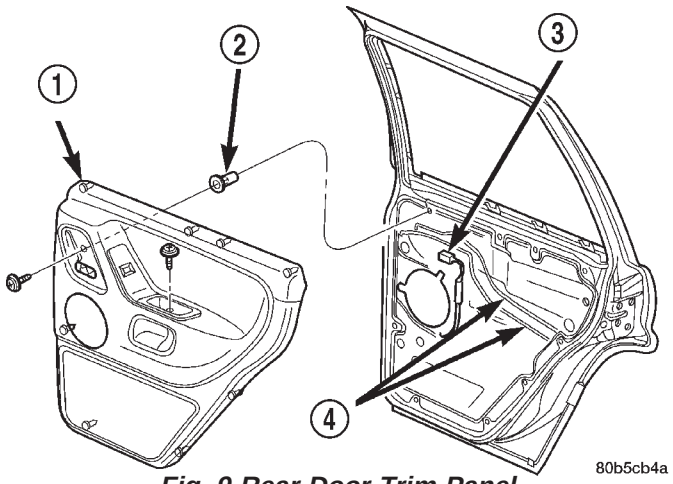


Fig. 9 Rear Door Trim Panel

1 - TRIM PANEL
2 - NUTSERT
3 - HARNESS CONNECTOR
4 - LATCH RODS

(2) If equipped, connect harness connectors to power accessories.
(3) Position trim panel on door inner panel.
(4) Press trim panel push-in fasteners inward around perimeter of door.
(5) Install screws attaching trim panel to door (Fig. 9).

WATERDAM

REMOVAL

(1) Remove door trim panel, refer to (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
(2) Peel the waterdam from door.
(3) Route all harnesses and linkage rods through waterdam as necessary.
(4) Separate waterdam from door (Fig. 10).

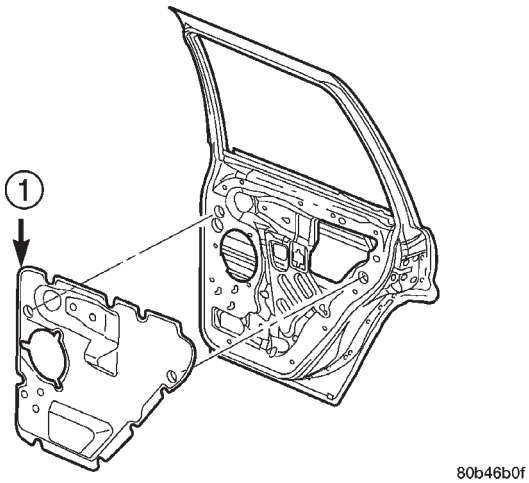


Fig. 10 Rear Door Waterdam

1 - INSULATOR PAD

WATERDAM (Continued)

INSTALLATION

(1) Waterdam contact surface must be free of contaminants. Clean as necessary.
(2) Route all harnesses and linkage rods through waterdam as necessary.
(3) Position waterdam on door and align all holes (Fig. 10).
(4) Press waterdam on door.
(5) Install door trim panel, refer to (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

WINDOW REGULATOR

REMOVAL

(1) Remove waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - REMOVAL).
(2) Remove the stationary glass, refer to (Refer to 23 - BODY/STATIONARY GLASS/DOOR GLASS - REMOVAL).
(3) Raise the door glass and support.
(4) Disconnect the speaker harness and power window harness, if equipped.
(5) Remove the window clips retaining regulator (Fig. 11).
(6) Remove the door glass.
(7) Remove the fasteners retaining the regulator (Fig. 12).
(8) Remove the regulator.

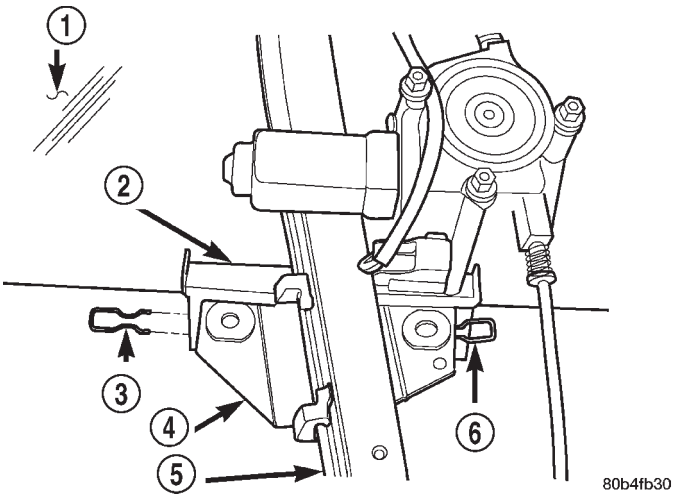


Fig. 11 Window Regulator Retainer Clips

1 - GLASS
2 - RETAINER
3 - CLIP
4 - LIFT PLATE
5 - REGULATOR
6 - CLIP

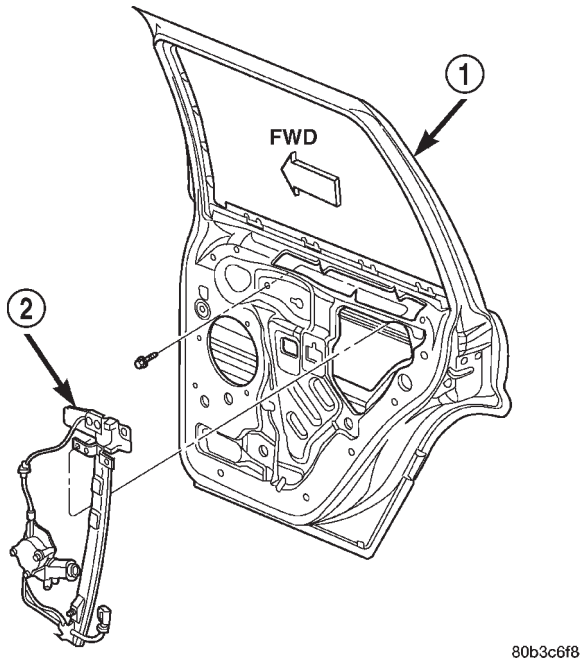


Fig. 12 Rear Door Window Regulator

1 - DOOR
2 - REGULATOR

INSTALLATION

(1) Position the window regulator in the door.
(2) Install the fasteners retaining the regulator (Fig. 12).
(3) Install the door glass.
(4) Install the window clips retaining regulator (Fig. 11).
(5) Lower the door glass.
(6) Install the stationary glass, refer to (Refer to 23 - BODY/STATIONARY GLASS/DOOR GLASS - INSTALLATION).
(7) Connect the power window and speaker harness if equipped.
(8) Install the waterdam, refer to (Refer to 23 - BODY/DOORS - REAR/WATERDAM - INSTALLATION).
(9) Cycle the glass and check for proper operation.

EXTERIOR

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BODY SIDE MOLDINGS

REMOVAL

REMOVAL–FRONT DOOR

(1) Open the front door.

(2) Using a trim stick, pry the upper rear edge off the door. Continue to the front edge of the front door (Fig. 1).

(3) Using a heat gun, warm the adhesive tape on the lower edge of the cladding and pull the cladding from the door.

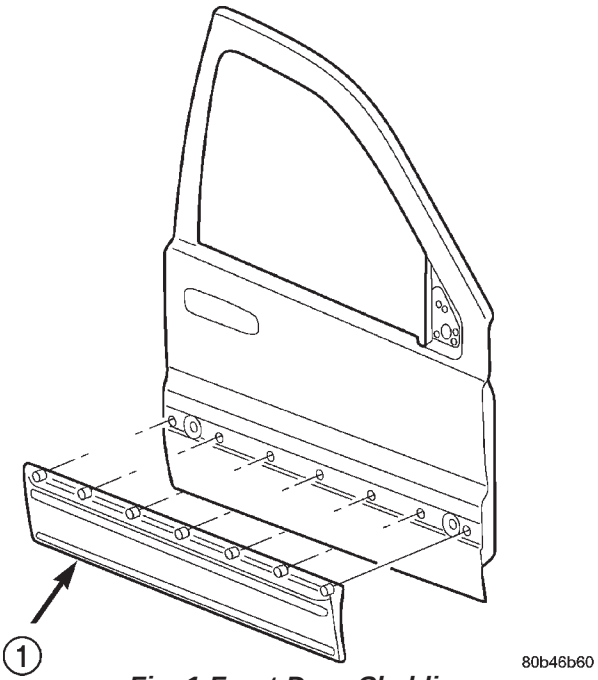


Fig. 1 Front Door Cladding

1 - CLADDING

BODY SIDE MOLDINGS (Continued)

REMOVAL–REAR DOOR

(1) Open the rear door.

(2) Using a trim stick, pry the upper rear edge off the door. Continue towards the front edge of the rear door (Fig. 2).

(3) Using a heat gun, warm the adhesive tape on the bottom of the cladding and remove the cladding.

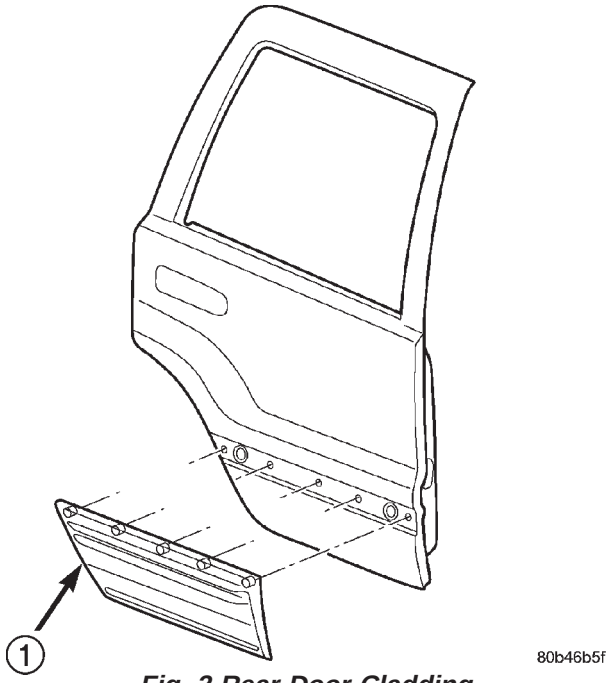


Fig. 2 Rear Door Cladding

1 - CLADDING

REMOVAL–FENDER/QUARTER PANEL

(1) Remove the screws at wheel opening (Fig. 3).

(2) Using a trim stick, gently pry bottom of cladding up.

(3) Lift upwards and remove cladding.

INSTALLATION

INSTALLATION–FRONT DOOR

(1) Clean the area thoroughly with Mopar Super Kleen, or equivalent.

(2) Align the body side cladding with the slots in the door. Press the adhesive pad to the door and snap the retainers into the slots.

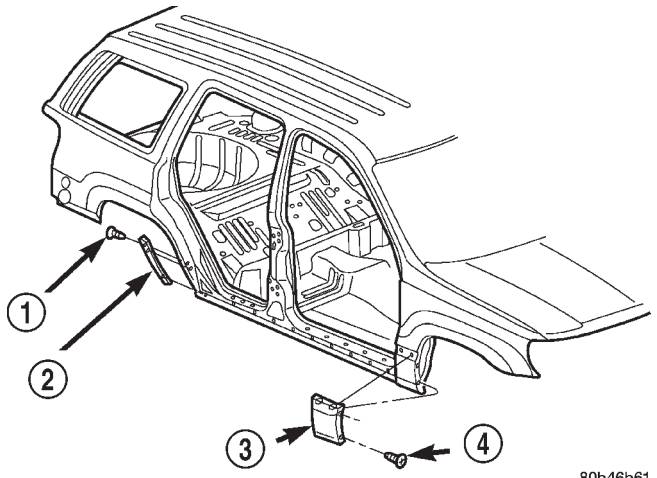


Fig. 3 Front Fender/ Quarter Panel

1 - SCREW
2 - QUARTER PANEL CLADDING
3 - FRONT FENDER CLADDING
4 - SCREW

INSTALLATION–REAR DOOR

(1) Clean the area thoroughly with Mopar Super Kleen, or equivalent.

(2) Align the body side cladding with the slots in the door. Press the adhesive pad to the door and snap the retainers into the slots.

INSTALLATION–FENDER/QUARTER PANEL

(1) Thoroughly clean the area with Mopar Super Kleen or equivalent.

(2) Align the cladding with the screw holes in the fender.

(3) Press the cladding in place.

(4) Install the screws at the wheel opening.

COWL GRILLE

REMOVAL

(1) Remove wiper arms, refer to (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - REMOVAL).
(2) Remove plenum seal.
(3) Remove plastic push nuts attaching cowl cover to cowl (Fig. 4).
(4) Remove windshield washer tubes at connector.
(5) Remove cowl cover from cowl.

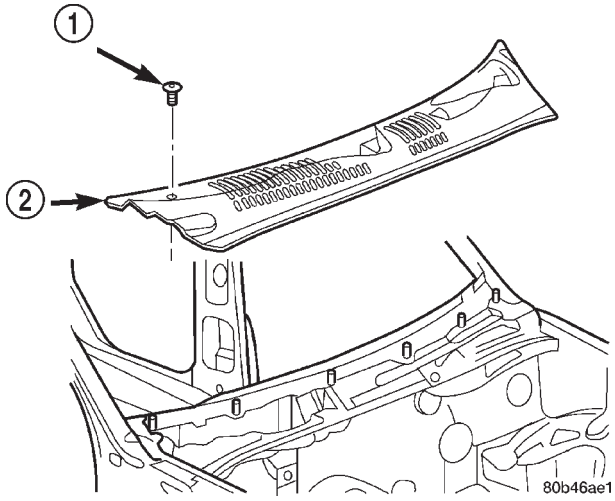


Fig. 4 Cowl Cover

1 - PLASTIC NUT
2 - COWL COVER

INSTALLATION

(1) Position cowl cover on cowl.
(2) Install windshield washer tubes at connector.
(3) Install plastic push nuts attaching cowl cover to cowl (Fig. 4).
(4) Install plenum seal.
(5) Install windshield wiper arms, refer to (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER ARMS - INSTALLATION).

D-PILLAR APPLIQUE

REMOVAL

(1) Using a trim stick, carefully pry applique from panel (Fig. 5).

INSTALLATION

(1) Position applique on panel with retainers aligned.
(2) Press applique firmly in place.

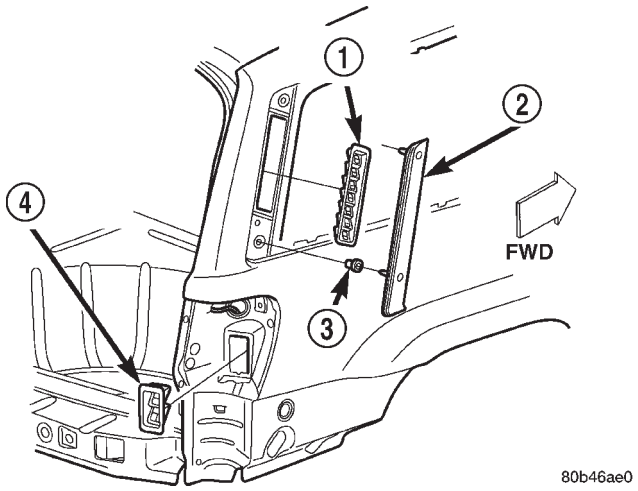


Fig. 5 D-Pillar Applique & Air Exhauster

1 - D-PILLAR EXHAUSTER
2 - D-PILLAR APPLIQUE
3 - CLIP
4 - TAIL LAMP EXHAUSTER

D-PILLAR AIR EXHAUSTER

REMOVAL

(1) Remove D-pillar applique, refer to (Refer to 23 - BODY/EXTERIOR/COWL GRILLE SCREEN - REMOVAL).
(2) Carefully pry air exhauster from D-pillar using a flat blade screwdriver (Fig. 5).

INSTALLATION

(1) Reseal air exhauster using foam tape.
(2) Install air exhauster on D-pillar.
(3) Install D-pillar applique, refer to (Refer to 23 - BODY/EXTERIOR/COWL GRILLE SCREEN - INSTALLATION).

AIR EXHAUSTER

REMOVAL

(1) Remove tail lamp, refer to (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP - REMOVAL).
(2) Using a trim stick, pry the top of the air exhauster downward to detach the retaining clips.
(3) Separate air exhauster from vehicle (Fig. 5).

INSTALLATION

(1) Position air exhauster in opening.
(2) Press air exhauster inward to secure.
(3) Install tail lamp, refer to (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/TAIL LAMP - INSTALLATION).

EXTERIOR NAME PLATES

REMOVAL

NOTE: Exterior nameplates are attached to body panels with adhesive tape.

(1) Apply a length of masking tape on the body, parallel to the top edge of the nameplate to use as a guide, if necessary.
(2) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun. Do not exceed 52°C (120°F) when heating emblem.
(3) Insert a plastic trim stick or a hard wood wedge behind the emblem to separate the adhesive backing from the body.
(4) Clean adhesive residue from body with MOPAR Super Clean solvent or equivalent.

INSTALLATION

(1) Remove protective cover from adhesive tape on back of emblem.
(2) Position emblem properly on body.
(3) Press emblem firmly to body with palm of hand.
(4) If temperature is below 21°C (70°F) warm emblem with a heat lamp or gun to assure adhesion. Do not exceed 52°C (120°F) when heating emblem.

FRONT FENDER

REMOVAL

(1) Using a wax crayon or equivalent, mark position of fender.
(2) Remove front fender liner.
(3) Pull back fascia and remove screws attaching fender to fascia.
(4) Remove screws attaching lower fender bracket located behind fascia.
(5) Remove screws attaching fender to rocker panel (Fig. 6).
(6) Remove screws attaching rear of fender to A-pillar brackets.
(7) Open hood.

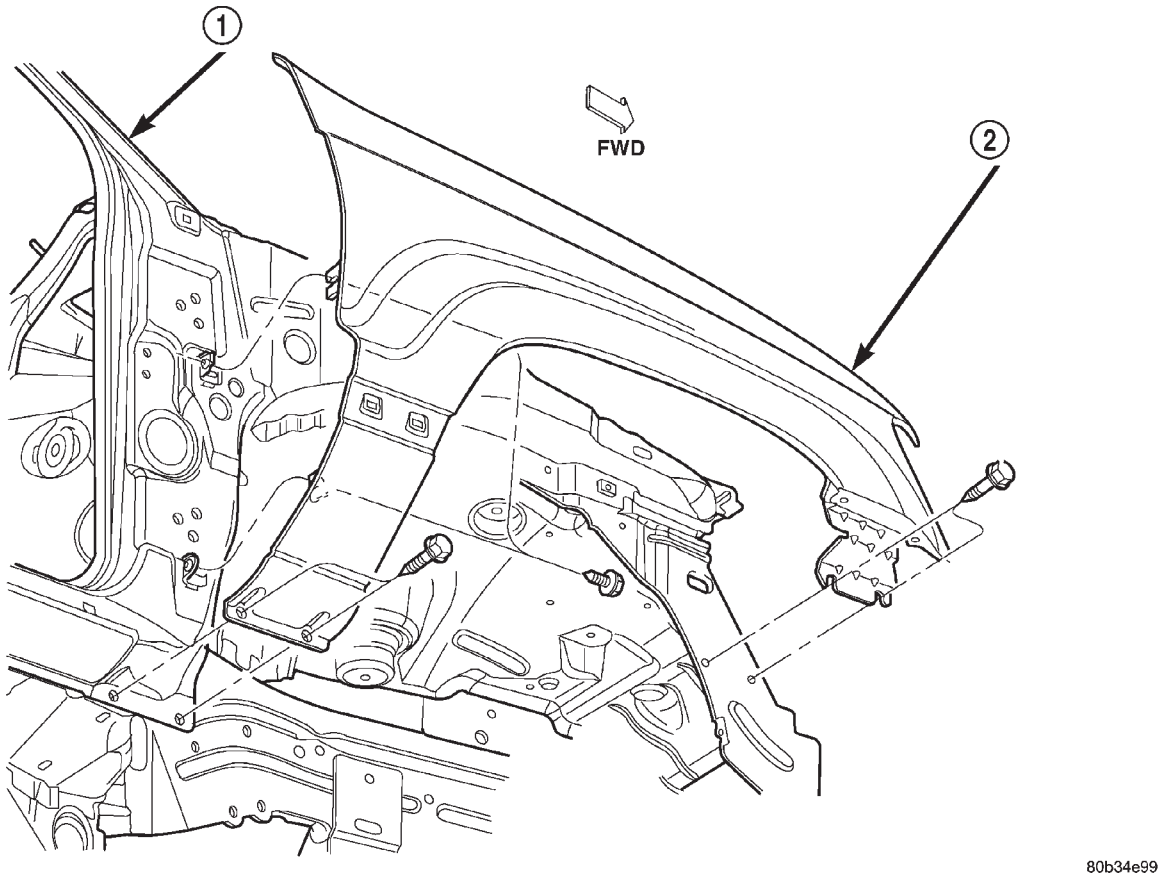


Fig. 6 Fender Mounting

1 - BODY
2 - FENDER

FRONT FENDER (Continued)

(8) Loosen screw under hood hinge, attaching fender to engine compartment rail.
(9) Remove screws attaching fender to engine compartment rail (Fig. 7).
(10) Right fender only:
(a) If equipped, remove radio antenna.
(11) Separate fender from body.

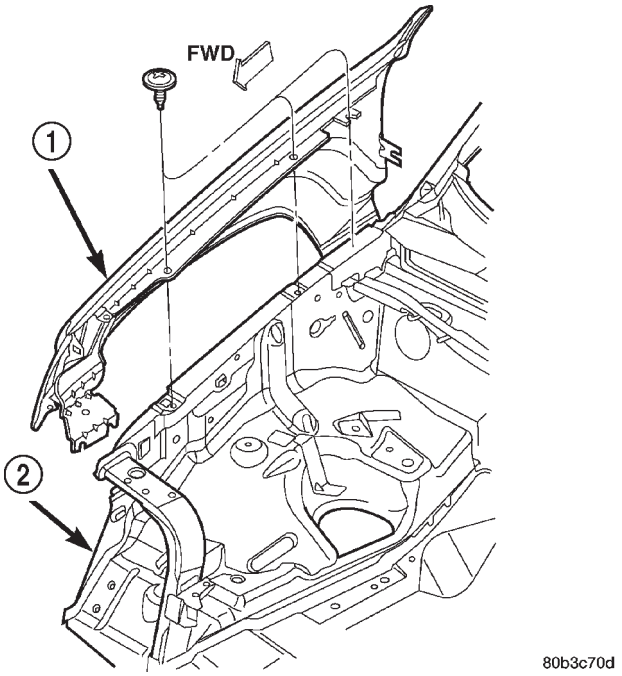


Fig. 7 Upper Fender Mounting

1 - FENDER
2 - BODY

INSTALLATION

(1) Position fender on body.
(2) Right fender only:
(a) If equipped, install radio antenna.
(3) Install all screws finger-tight.
(4) Align fender with adjacent body panels and wax crayon reference marks.
(5) Tighten all screws.
(6) Install inner fender liner.

FUEL FILL DOOR

REMOVAL

(1) Open the fuel filler door.
(2) Remove the screws attaching the door to the quarter panel (Fig. 8).
(3) Remove the door from the panel.

INSTALLATION

(1) Position the fuel filler door on the quarter panel with the screw holes aligned.

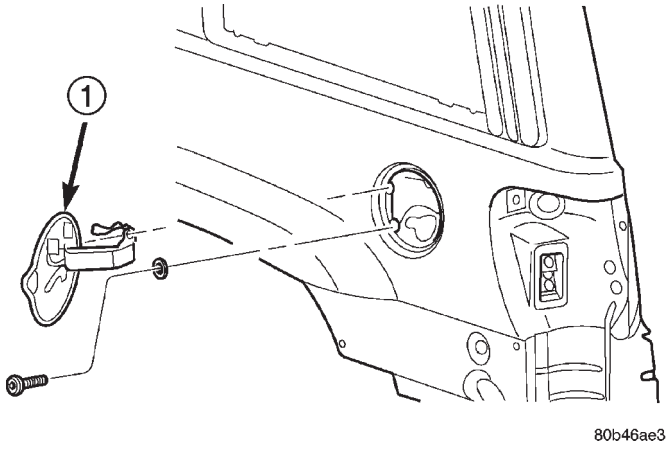


Fig. 8 Fuel Filler Door

1 - FUEL FILL DOOR

(2) Install the screws attaching the fuel filler door to the quarter panel.

GRILLE

REMOVAL

(1) Remove fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(2) Disengage retainers attaching grille insert to grille/fascia.
(3) Separate grille insert from grille/fascia (Fig. 9).

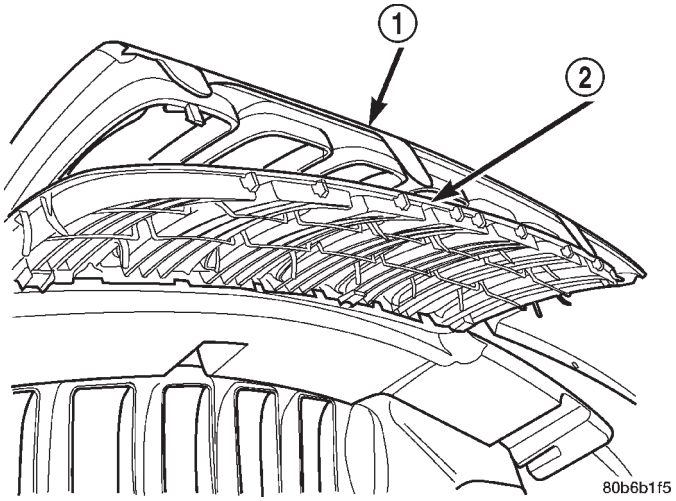


Fig. 9 Grille Insert

1 - GRILLE/FASCIA
2 - INSERT

INSTALLATION

(1) Position grille insert in grille/fascia (Fig. 9).
(2) Engage retainers attaching grille insert to grille/fascia.

GRILLE (Continued)

(3) Install fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).

HEADLAMP MOUNTING MODULE

REMOVAL

CAUTION: Take special care when handling the HMM not to damage the upper mounting tabs. Step #3 must be performed prior to removing HMM from the vehicle to prevent damage to HMM.

(1) Remove fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - REMOVAL).
(2) Remove inner fender liner.
(3) Reach into the wheelhouse opening and disengage the retainer attaching the HMM to each side of the body.
(4) Remove bolts attaching headlamp mounting module to body (Fig. 10).
(5) Disconnect headlamp wire harness connectors.
(6) Separate headlamp mounting module from vehicle.

INSTALLATION

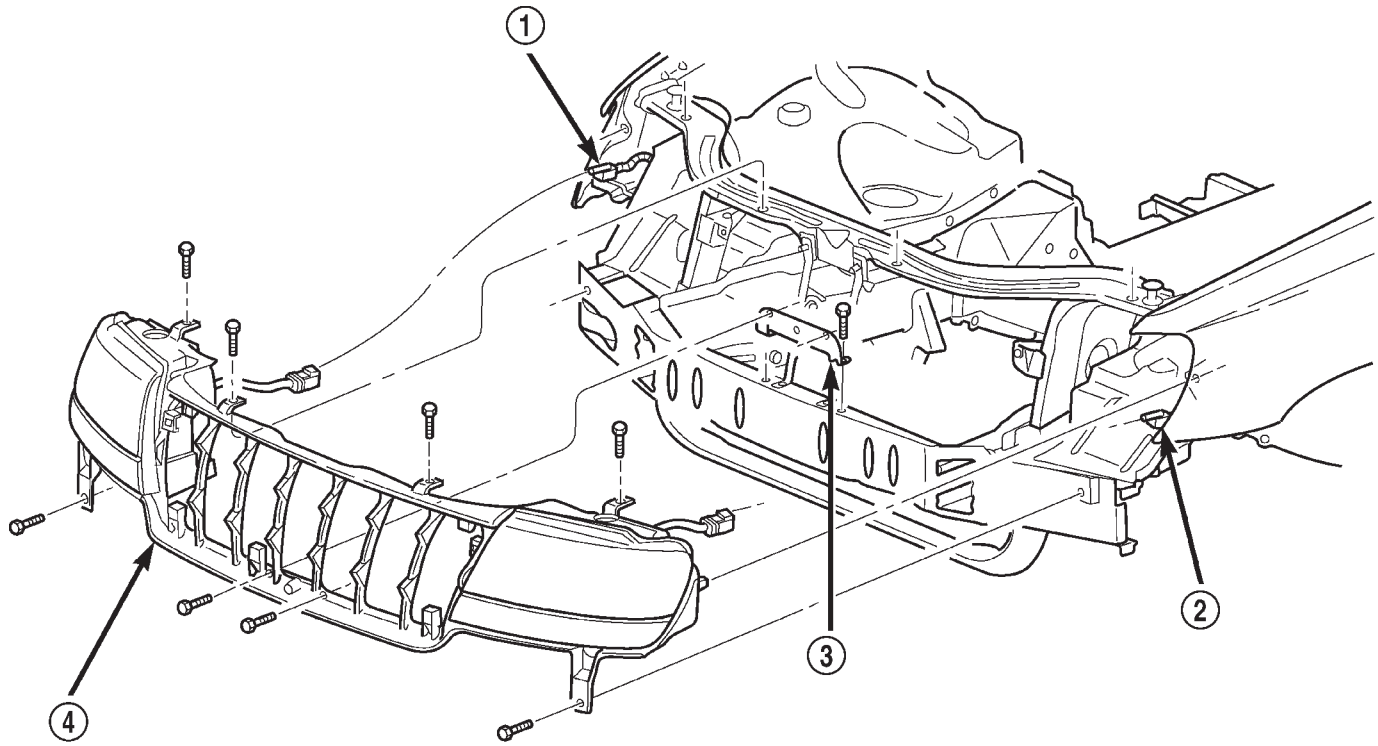
(1) Position headlamp mounting module at vehicle.
(2) Connect headlamp wire harness connectors.
(3) Engage the retainer attaching the HMM to each side of the body.
(4) Install bolts attaching headlamp mounting module to body (Fig. 10).
(5) Install inner fender liner.
(6) Install front fascia, refer to (Refer to 13 - FRAMES & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).

LUGGAGE RACK

REMOVAL

NOTE: The skid strips are attached to the roof panel with adhesive.

(1) Using a trim stick, or other suitable device, pry support cover off.
(2) If necessary, slide the crossbars to expose the screws attaching the slide rails to the supports.
(3) Remove the screws retaining the slide rails to the supports.



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Fig. 10 Headlamp Mounting Module

1 - CONNECTOR
2 - CONNECTOR
3 - MOUNTING BRACKET
4 - HEADLAMP MODULE

LUGGAGE RACK (Continued)

(4) Remove the screws attaching the supports to the roof panel.
(5) Separate the supports from the roof panel.

NOTE: If a crossbar needs to be serviced, the forward or rearward supports will have to be removed.

INSTALLATION

(1) Position the supports on the roof panel and install the screw. Be sure that the gasket is properly seated.
(2) Position the luggage rack on the supports.
(3) Install the screws attaching the side rails to the supports.
(4) Position the supports covers on the supports and press into place.

SIDE VIEW MIRROR GLASS

REMOVAL

(1) With damaged mirror still on vehicle, position mirror glass down and centered.
(2) Position a wide leverage device between the bottom edge of the glass and the mirror shell.
(3) Firmly apply pressure in an upward direction until glass assembly disengages from adapter plate.
(4) Disconnect the heater wire terminal, if equipped, or the EC plug, if equipped.

INSTALLATION

(1) Connect the heater wire terminal or the EC plug, if equipped.
(2) Position the replacement glass in the mirror shell and align the four snap tabs with the four cavities in the shell.
(3) Apply firm pressure inward until the replacement glass assembly engages with the adapter plate. Correct assembly will result in a firm click. Glass assembly should exhibit even gaps to the shell when complete.
(4) Pull lightly on corners of glass assembly to ensure all four snaps are engaged and there is no free play.

SIDE VIEW MIRROR

REMOVAL

(1) Remove door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
(2) Disengage power mirror harness connector, if equipped.
(3) Remove mirror flag seal.
(4) Remove nuts attaching mirror to door (Fig. 11).
(5) Separate mirror from door.

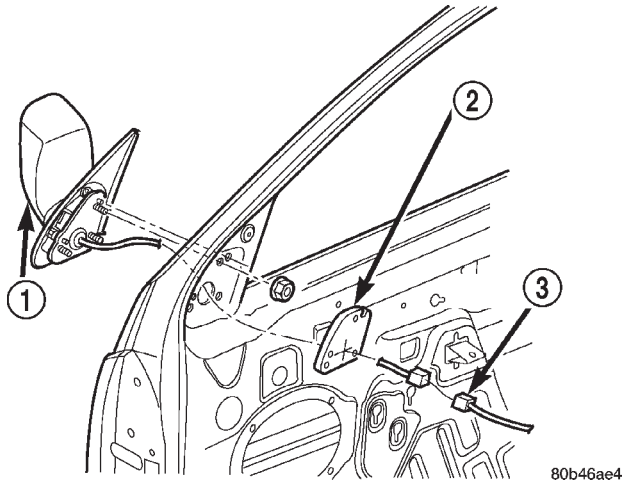


Fig. 11 Side View Mirror

1 - SIDEVIEW MIRROR
2 - MIRROR FLAG SEAL
3 - CONNECTOR

INSTALLATION

(1) Position mirror on door. Verify that gasket seal is properly positioned.
(2) Install nuts attaching mirror to door (Fig. 11).
(3) Install mirror retaining nuts.
(4) Install mirror flag seal.
(5) Engage power mirror harness connector, if equipped.
(6) Install door trim panel, refer to (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - INSTALLATION).

ROCK RAIL

REMOVAL

(1) Remove the bolts and remove the rock rail. (Fig. 12)

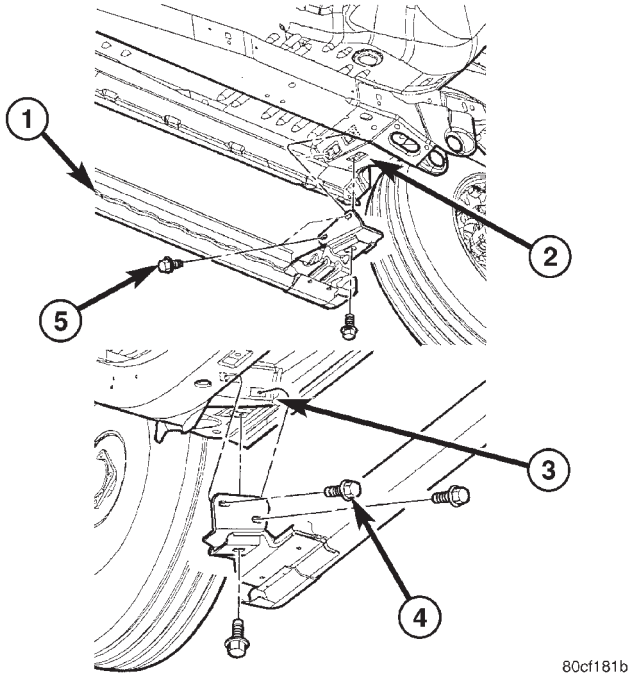


Fig. 12 ROCK RAIL

1 - ROCK RAIL
2 - J-NUTS (3)
3 - J-NUTS (3)
4 - BOLTS (3)
5 - BOLTS (3)

INSTALLATION

NOTE: Shims may be used to adjust rock rail positioning, if required.

(1) Loosen the rear bracket slide bolts. (Fig. 13)
(2) Install the rock rail and install the bolts.
(3) Tighten the front bolts to 27 N·m (20 ft. lbs.).
(4) Slide the rear bracket to contact the mounting surface and tighten the rear mounting bolts to 27 N·m (20 ft. lbs.).
(5) Tighten the slide bolts to 27 N·m (20 ft. lbs.).
(6) Loosen the end cap bolts and slide the end caps against the body.
(7) Tighten the end cap bolts.

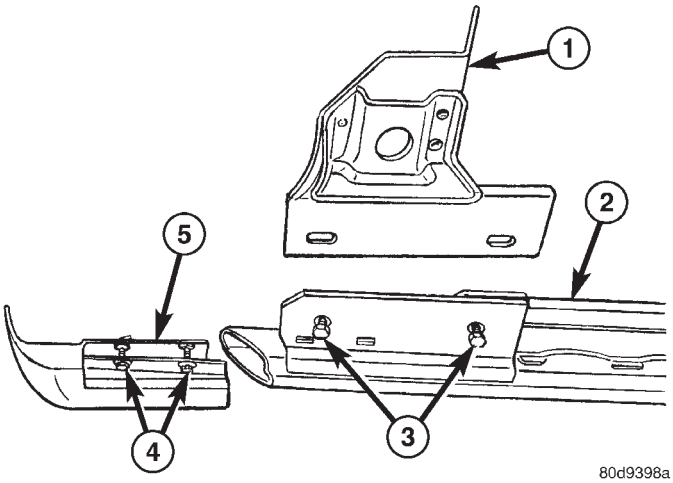


Fig. 13 REAR ROCK RAIL BRACKET

1 - REAR BRACKET
2 - ROCK RAIL
3 - REAR BRACKET BOLTS (2)
4 - END CAP BOLTS (2 PER CAP)
5 - END CAP (2)

HOOD

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GAS PROP

REMOVAL

(1) Raise and support hood.
(2) Using a small flat blade, pry the retainer attaching hood support prop to lower ball stud.
(3) Slide retainer attaching hood support prop upper ball stud downward.
(4) Disconnect hood support prop from lower ball stud and rotate support prop upward and disconnect from upper ball stud (Fig. 1).

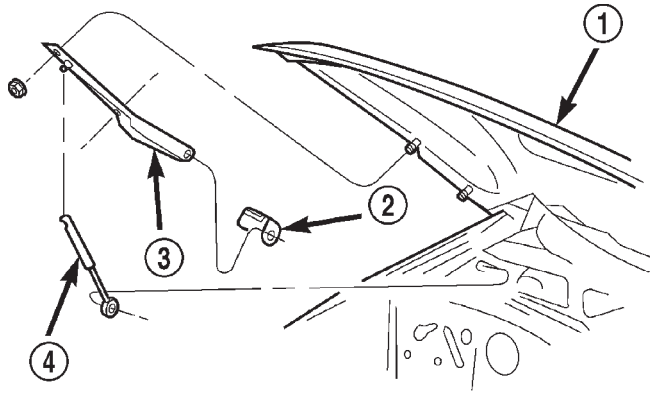


Fig. 1 Hood Support Prop

1 - HOOD
2 - COVER
3 - HINGE
4 - PROP

INSTALLATION

(1) Position hood support prop on upper ball stud (Fig. 1).
(2) Slide retainer upward to secure support prop to upper ball stud.
(3) Position support prop on lower ball stud and press retainer inward to secure.

HINGE

REMOVAL

(1) Raise and support hood.
(2) Using a wax crayon or equivalent, mark position of hinge.
(3) Remove hood hinge prop rod.
(4) Remove nuts attaching hinge to hood (Fig. 1).
(5) Remove bolts attaching hinge to body.
(6) Separate hinge from vehicle.

INSTALLATION

(1) Position hinge on vehicle and align reference marks.
(2) Install bolts attaching hinge to body.
(3) Install nuts attaching hinge to hood.
(4) Install hood hinge prop rod.

HOOD

REMOVAL

(1) Raise hood.
(2) If equipped, disconnect underhood lamp harness connector. (Connector is located under cowl cover).
(3) Using a wax crayon or equivalent, mark location of hood hinges on hood for installation alignment.
(4) Support hood in the open position.
(5) Remove hood support prop rods.

HOOD (Continued)

(6) Remove bolts attaching hinges to hood.
(7) With the aid of a helper, remove hood from vehicle.

INSTALLATION

(1) Position hood on hinges.
(2) Install bolts finger-tight.
(3) Align hinges with installation reference marks and tighten bolts.
(4) Install hood support prop rods.
(5) Connect underhood lamp connector.
(6) Inspect hood for proper alignment and adjust as necessary.

ADJUSTMENTS

HOOD ADJUSTMENT

The hood attaching holes are enlarged to aid front, back and side to side adjustment.
(1) If hood is low in relation to cowl panel, insert shims between hinge and hood.
(2) Adjust hood bumper in or out to adjust hood-to-fender height alignment.
(3) Adjust the hood latch as necessary. Tighten the nuts to 11N·m (8 ft. lbs.).
(4) Align the latch striker so that striker enters the latch squarely and without binding.

INSULATION

REMOVAL

(1) Raise the hood.
(2) Remove the insulation panel fasteners.
(3) Remove the hood insulation panel.

INSTALLATION

(1) Position the insulation panel on the underside of the hood.
(2) Install the insulation panel fasteners.
(3) Close the hood.

LATCH

REMOVAL

(1) Remove nuts attaching latch to radiator crossmember support (Fig. 2).
(2) Disconnect hood release cable from latch.
(3) Separate latch from vehicle.

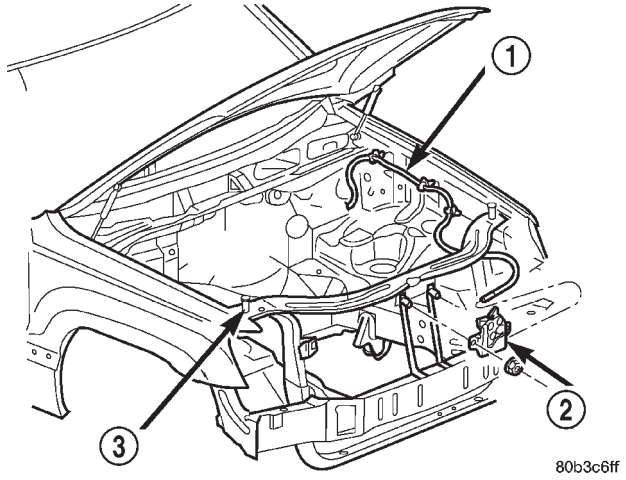


Fig. 2 Hood Latch

1 - HOOD RELEASE CABLE
2 - LATCH
3 - BUMPER

INSTALLATION

(1) Connect latch release cable to latch.
(2) Position latch on radiator crossmember support.
(3) Install nuts attaching latch to radiator crossmember support. Tighten nuts to 11 N·m (8 ft. lbs.) torque (Fig. 2).

LATCH RELEASE CABLE

REMOVAL

(1) Disconnect cable from hood latch (Fig. 3).
(2) Disconnect cable from retaining clips on left inner fender panel.
(3) Remove left cowl side trim panel.
(4) Remove fasteners attaching cable bracket to cowl side panel (Fig. 4).
(5) Route cable through dash panel and remove it from under instrument panel.

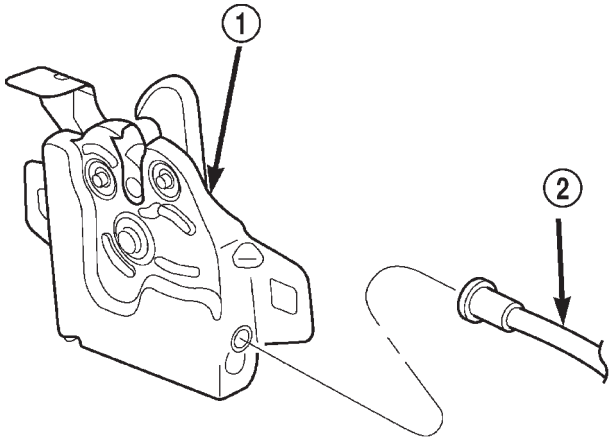


Fig. 3 Hood Latch

1 - HOOD LATCH
2 - HOOD RELEASE CABLE

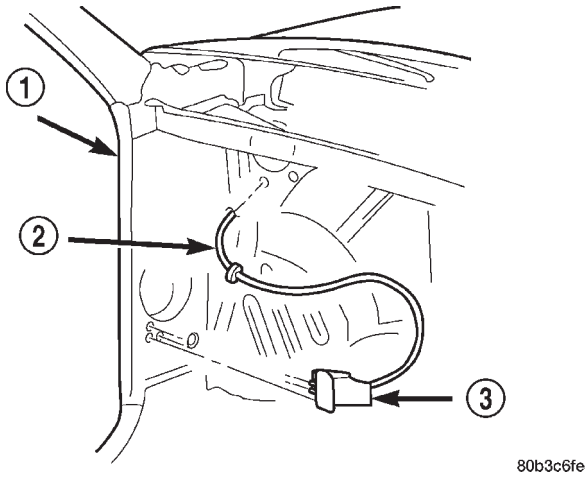


Fig. 4 Hood Release Cable

1 - LOWER COWL
2 - HOOD RELEASE CABLE
3 - RELEASE HANDLE

INSTALLATION

(1) Route cable through hole in dash panel into engine compartment.
(2) Pull cable forward and seat grommet in dash panel.
(3) Position cable bracket on cowl side panel and install fasteners (Fig. 4).
(4) Install left cowl side trim panel.
(5) Route and install cable in retaining clips on left inner fender panel.
(6) Connect cable to hood latch (Fig. 3).

INSTRUMENT PANEL SYSTEM

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INSTRUMENT PANEL SYSTEM

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

NOTE: Before starting this procedure, be certain to turn the steering wheel until the front wheels are in the straight-ahead position.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim from the right and left A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).

(3) Remove the top cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(4) Remove the four nuts that secure the instrument panel to the studs on the dash panel near the windshield fence line (Fig. 1).

(5) Remove the scuff plates from the right and left front door sills. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - REMOVAL).

(6) Remove the trim panels from the right and left inner cowl sides. (Refer to 23 - BODY/INTERIOR/COWL TRIM - REMOVAL).

(7) Remove the console from the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(8) Remove the fuse cover from the Junction Block (JB). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - REMOVAL).

(9) Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).

(10) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(11) Remove the steering column bracket from the instrument panel steering column support bracket. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN BRACKET - REMOVAL).

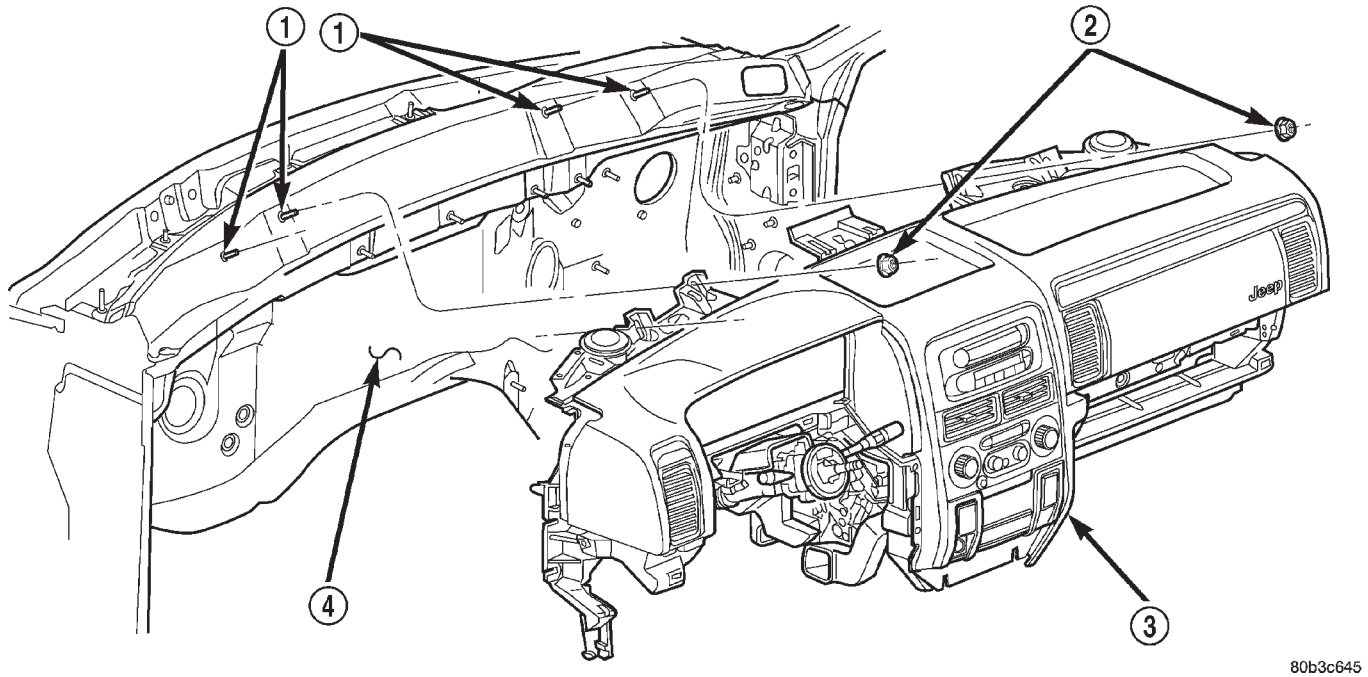


Fig. 1 Instrument Panel to Dash Panel Mounting

1 - STUD (4)
2 - NUT (4)
3 - INSTRUMENT PANEL
4 - DASH PANEL

INSTRUMENT PANEL SYSTEM (Continued)

(12) Remove the screw that secures the lower tilting steering column shroud to the steering column multi-function switch mounting housing (Fig. 2).

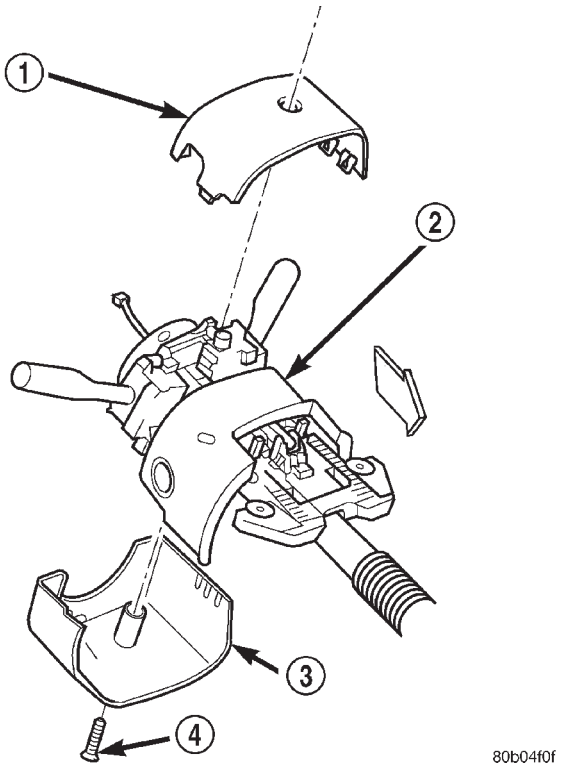


Fig. 2 Steering Column Shrouds Remove/Install

1 - UPPER TILTING COLUMN SHROUD
2 - FIXED COLUMN SHROUD
3 - LOWER TILTING COLUMN SHROUD
4 - SCREW

(13) Unsnap the two halves of the tilting steering column shroud from each other and remove both halves from the steering column.

(14) Disconnect the instrument panel wire harness connectors from the following steering column components (Fig. 3):

- the two lower clockspring connector receptacles
- the left multi-function switch connector receptacle
- the right multi-function switch connector receptacle
- the two ignition switch connector receptacles
- the shifter interlock solenoid connector receptacle
- if the vehicle is so equipped, the Sentry Key Immobilizer Module (SKIM) connector receptacle.

(15) Turn the ignition switch to the On position, then release and remove the shifter interlock cable connector from the ignition lock housing receptacle.

(16) Turn the ignition switch back to the Lock position to prevent steering wheel rotation and the loss of clockspring centering following steering column removal.

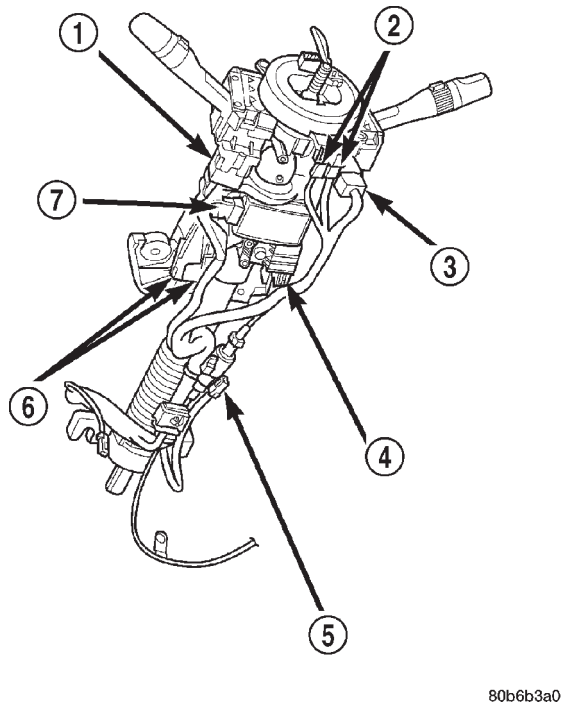


Fig. 3 Steering Column Connections

1 - LEFT MULTIFUNCTION SWITCH CONNECTOR
2 - LOWER CLOCKSPRING CONNECTORS
3 - RIGHT MULTIFUNCTION SWITCH CONNECTOR
4 - SHIFTER INTERLOCK CABLE CONNECTOR
5 - SHIFTER INTERLOCK SOLENOID CONNECTOR
6 - IGNITION SWITCH CONNECTOR RECEPTACLES
7 - SKIM CONNECTOR

(17) Remove the bolt that secures the coupler to the lower steering column shaft (Fig. 4).

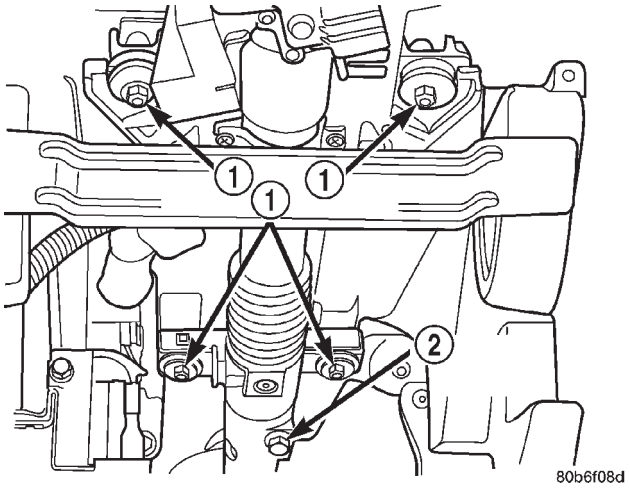


Fig. 4 Steering Column Mounting

1 - COLUMN MOUNTING NUTS
2 - COUPLER BOLT

INSTRUMENT PANEL SYSTEM (Continued)

(18) Remove the four nuts that secure the steering column to the studs on the instrument panel steering column support bracket.

(19) Remove the steering column from the instrument panel. Be certain that the steering wheel is locked and secured from rotation to prevent the loss of clockspring centering.

(20) Disconnect the left and right body wire harness connectors, the Ignition Off Draw (IOD) wire harness connector and the fused B(+) wire harness connector from the connector receptacles of the JB (Fig. 5).

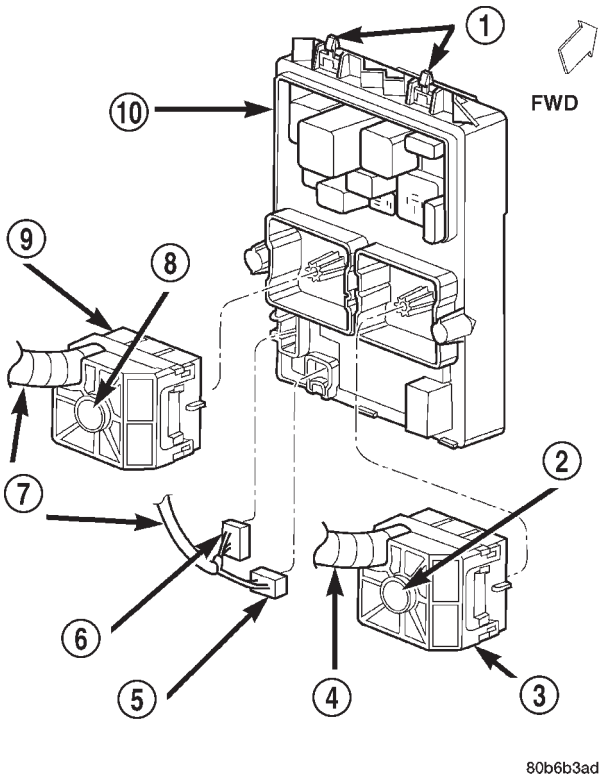


Fig. 5 Junction Block Connections

1 - SNAP CLIPS
2 - SCREW
3 - CONNECTOR
4 - LEFT BODY WIRE HARNESS
5 - IOD CONNECTOR
6 - FUSED B+ CONNECTOR
7 - RIGHT BODY WIRE HARNESS
8 - SCREW
9 - CONNECTOR
10 - JUNCTION BLOCK

(21) Disconnect the instrument panel wire harness connectors from the following floor panel transmission tunnel components (Fig. 6):

- the Airbag Control Module (ACM) connector receptacle
- the park brake switch terminal
- the transmission shifter connector receptacle.

(22) Remove the two nuts that secure the instrument panel wire harness ground eyelets to the studs on the floor panel transmission tunnel in front of and behind the ACM.

(23) Disengage the retainers that secure the instrument panel wire harness to the floor panel transmission tunnel.

(24) Remove the instrument panel to center floor tunnel bracket from the instrument panel and the floor panel transmission tunnel. (Refer to 23 - BODY/ INSTRUMENT PANEL/IP CENTER FLOOR TUNNEL BRACKET - REMOVAL).

(25) Remove the one screw that secures the floor duct to the heater and air conditioner housing near the driver side of the floor panel transmission tunnel and remove the duct from the housing.

(26) If the vehicle is equipped with the manual heating and air conditioning system, disconnect the vacuum harness connector located near the driver side of the floor panel transmission tunnel behind the driver side floor duct.

(27) Remove the one screw that secures the instrument panel steering column support bracket to the driver side end of the heater and air conditioner housing (Fig. 7).

(28) Remove the one screw that secures the instrument panel steering column support bracket to the intermediate bracket on the driver side dash panel (Fig. 8).

INSTRUMENT PANEL SYSTEM (Continued)

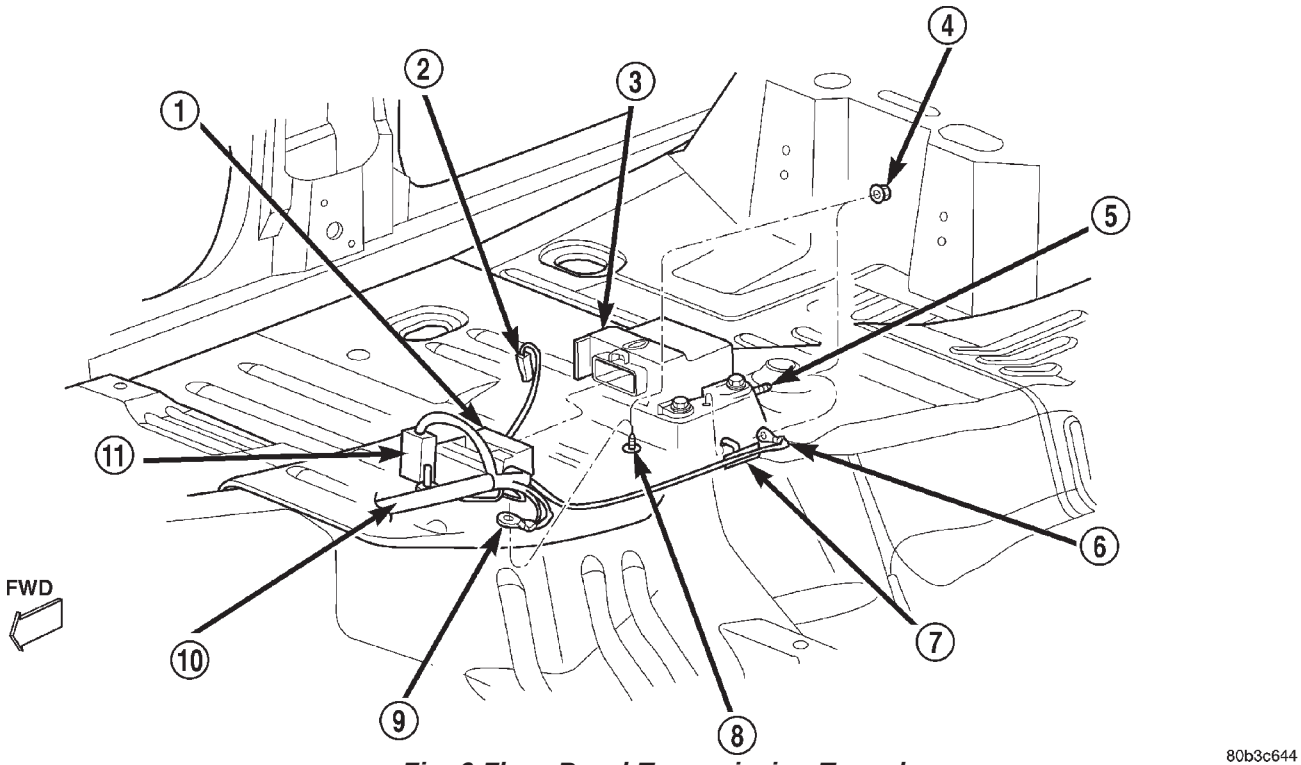


Fig. 6 Floor Panel Transmission Tunnel

1 - AIRBAG CONTROL MODULE CONNECTOR
2 - PARK BRAKE SWITCH CONNECTOR
3 - AIRBAG CONTROL MODULE
4 - NUT (2)
5 - STUD
6 - GROUND EYELET
7 - RETAINER
8 - STUD
9 - GROUND EYELET
10 - INSTRUMENT PANEL WIRE HARNESS
11 - TRANSMISSION SHIFTER CONNECTOR

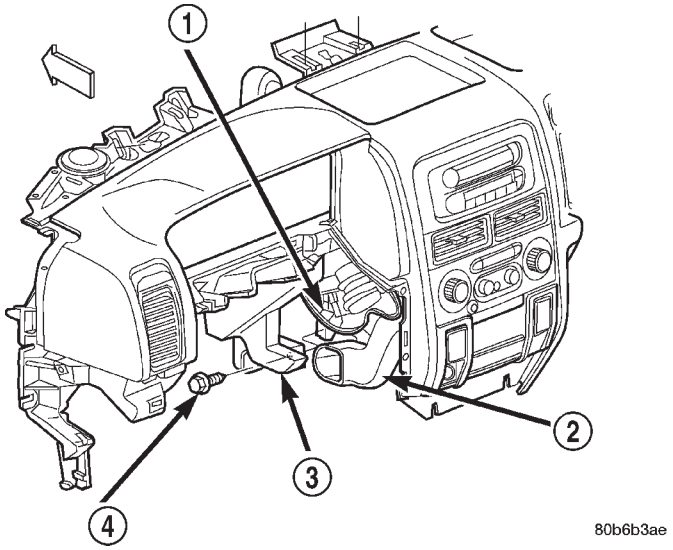


Fig. 7 Instrument Panel to Heater-A/C Housing - Driver Side

1 - HEATER AND AIR CONDITIONER HOUSING
2 - FLOOR DUCT
3 - INSTRUMENT PANEL STEERING COLUMN SUPPORT BRACKET
4 - SCREW

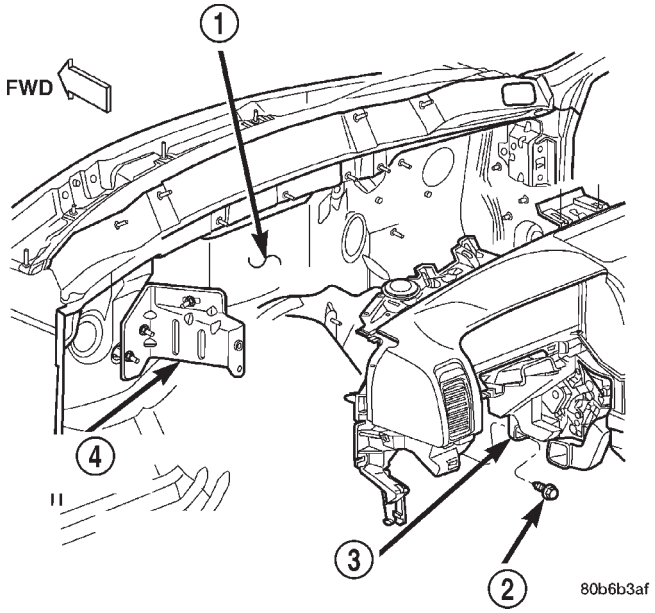


Fig. 8 Instrument Panel to Intermediate Bracket Mounting

1 - DASH PANEL
2 - SCREW
3 - INSTRUMENT PANEL STEERING COLUMN SUPPORT BRACKET
4 - INTERMEDIATE BRACKET

INSTRUMENT PANEL SYSTEM (Continued)

(29) Remove the nut that secures the instrument panel steering column support bracket to the stud on the driver side cowl plenum panel (Fig. 9).

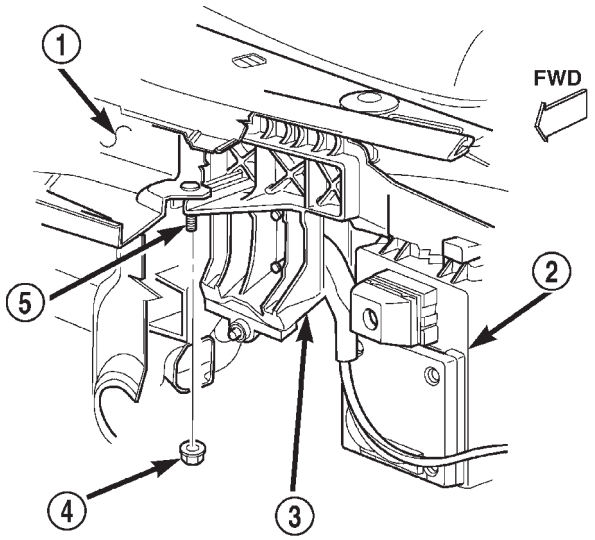


Fig. 9 Instrument Panel to Cowl Plenum Mounting

1 - COWL PLENUM PANEL
2 - JUNCTION BLOCK
3 - INSTRUMENT PANEL STEERING COLUMN SUPPORT BRACKET
4 - NUT
5 - STUD

(30) Remove the two screws that secure the instrument panel to the driver side cowl side inner panel (Fig. 10).

(31) Remove the end cap from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL END CAP - REMOVAL).

(32) Remove the lower right center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - REMOVAL).

(33) Disconnect the instrument panel wire harness connector from the lower cavity of the inline connector on the passenger side cowl side inner panel (Fig. 11).

(34) Disconnect the two halves of the radio antenna coaxial cable connector near the right cowl side inner panel under the end of the instrument panel.

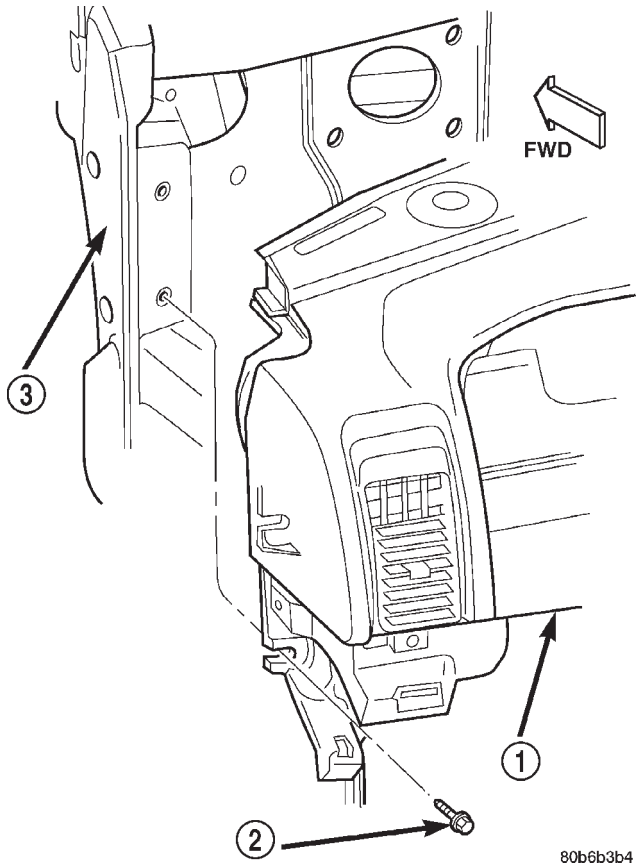


Fig. 10 Instrument Panel to Driver Side Cowl Side Inner Panel Mounting

1 - INSTRUMENT PANEL
2 - SCREW (2)
3 - COWL SIDE PANEL

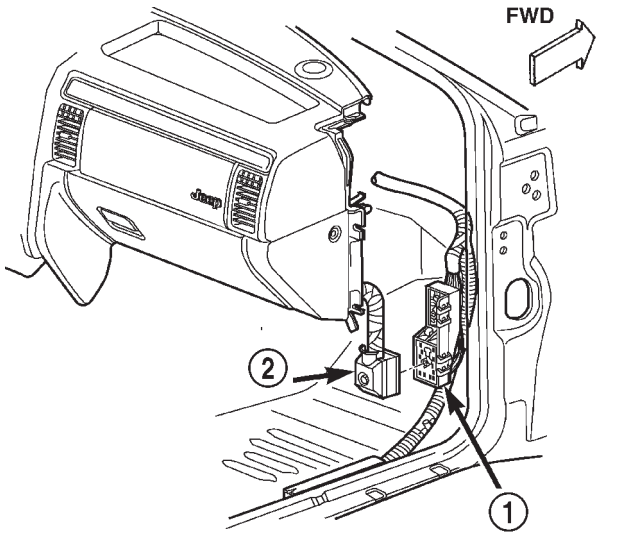


Fig. 11 Instrument Panel Passenger Side Connection

1 - INLINE CONNECTOR
2 - INSTRUMENT PANEL WIRE HARNESS CONNECTOR

INSTRUMENT PANEL SYSTEM (Continued)

(35) Disconnect the two instrument panel wire harness connectors from the two heater and air conditioner housing connectors located near the blower motor on the passenger side end of the housing (Fig. 12).

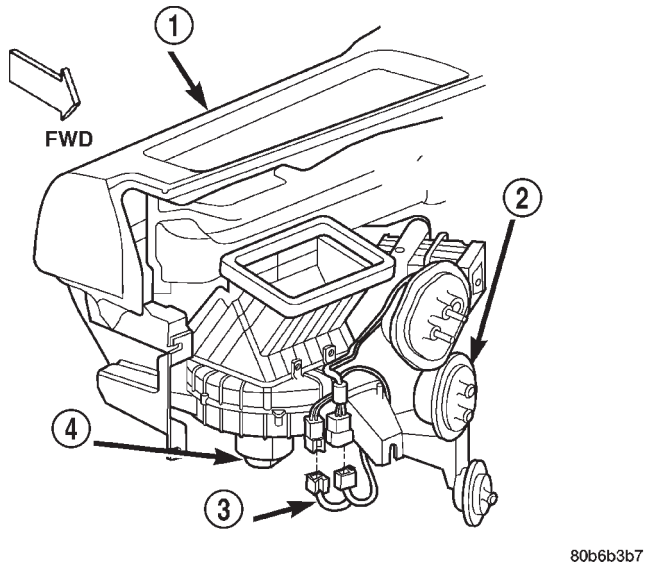


Fig. 12 Heater and Air Conditioner Housing Connections

1 - INSTRUMENT PANEL
2 - HVAC HOUSING
3 - INSTRUMENT PANEL WIRE HARNESS
4 - BLOWER MOTOR

(36) Remove the two screws that secure the passenger side instrument panel structural duct to the heater and air conditioner housing (Fig. 13).

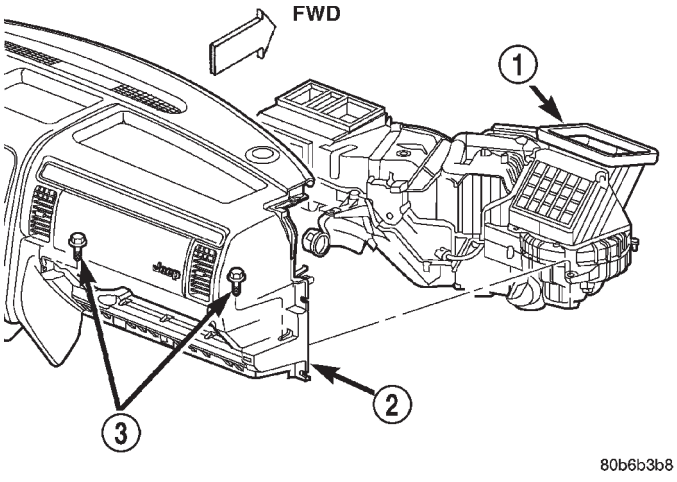


Fig. 13 Passenger Side Instrument Panel to Heater-A/C Housing Mounting

1 - HEATER AND AIR CONDITIONER HOUSING
2 - INSTRUMENT PANEL STRUCTURAL DUCT
3 - SCREW (2)

(37) Remove the two screws that secure the instrument panel to the passenger side cowl side inner panel (Fig. 14).

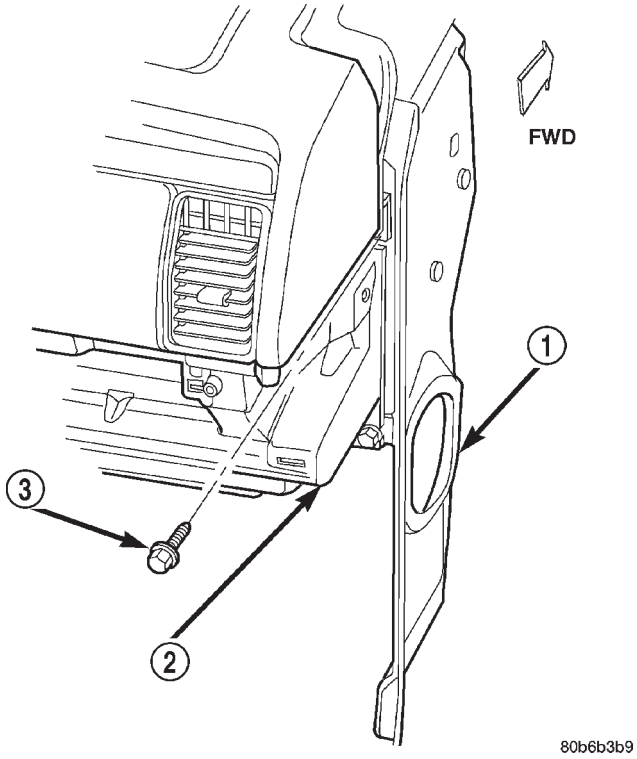


Fig. 14 Instrument Panel to Passenger Side Cowl Side Inner Panel Mounting

1 - COWL SIDE INNER PANEL
2 - INSTRUMENT PANEL STRUCTURAL DUCT
3 - SCREW (2)

(38) With the aid of an assistant, lift the instrument panel assembly upward off of the studs on the dash panel near the windshield fence line and to disengage the molded plastic hook formations on the instrument panel structural duct from the guide holes at each cowl side inner panel.

(39) Pull the instrument panel rearward from the dash panel and the cowl side inner panels and remove it through the driver side front door of the vehicle.

INSTRUMENT PANEL SYSTEM (Continued)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Prior to installing the instrument panel into the vehicle, loosen the three nuts that secure the instrument panel intermediate bracket and the accelerator pedal assembly to the studs on the dash panel (Fig. 8).

(2) With the aid of an assistant, load the instrument panel assembly through the driver side front door of the vehicle and hang it on the studs on the dash panel near the windshield fence line (Fig. 1).

(3) Be certain that the molded plastic hook formations on the instrument panel structural duct are inserted into and seated in the guide holes at each cowl side inner panel.

(4) Loosely install the two screws that secure each end of the instrument panel to the cowl side inner panels.

(5) Install and tighten the two screws that secure the passenger side instrument panel structural duct to the heater and air conditioner housing (Fig. 13). Tighten the screws to 11.8 N·m (105 in. lbs.).

(6) Install and tighten the one screw that secures the instrument panel steering column support bracket to the driver side end of the heater and air conditioner housing (Fig. 7). Tighten the screw to 11.8 N·m (105 in. lbs.).

(7) Tighten the two screws that secure each end of the instrument panel to the cowl side inner panels (Fig. 10) and (Fig. 14). Tighten the screws to 11.8 N·m (105 in. lbs.).

(8) Install and tighten the one screw that secures the instrument panel steering column support bracket to the intermediate bracket on the driver side dash panel (Fig. 8). Tighten the screw to 11.3 N·m (100 in. lbs.).

(9) Tighten the three nuts that secure the instrument panel intermediate bracket and the accelerator pedal assembly to the studs on the dash panel. Tighten the nuts to 11.3 N·m (100 in. lbs.).

(10) Install and tighten the four nuts that secure the instrument panel to the studs on the dash panel near the windshield fence line. Tighten the nuts to 11.8 N·m (105 in. lbs.).

(11) Install and tighten the nut that secures the instrument panel steering column support bracket to the stud on the driver side cowl plenum panel (Fig. 9). Tighten the nut to 28.2 N·m (250 in. lbs.).

(12) Reinstall the instrument panel to center floor tunnel bracket onto the instrument panel and the floor panel transmission tunnel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER FLOOR TUNNEL BRACKET - INSTALLATION).

(13) Reconnect the two instrument panel wire harness connectors to the two heater and air conditioner housing connectors located near the blower motor on the passenger side end of the housing (Fig. 12).

(14) Reconnect the two halves of the radio antenna coaxial cable connector near the right cowl side inner panel under the end of the instrument panel.

(15) Reconnect the instrument panel wire harness connector to the lower cavity of the inline connector on the passenger side cowl side inner panel and tighten the connector screw (Fig. 11). Tighten the screw to 4 N·m (36 in. lbs.).

(16) Reinstall the lower right center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - INSTALLATION).

(17) Reinstall the end cap onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

(18) If the vehicle is equipped with the manual heating and air conditioning system, reconnect the vacuum harness connector located near the driver side of the floor panel transmission tunnel behind the driver side floor duct.

(19) Position the driver side floor duct to the heater and air conditioner housing near the driver side of the floor panel transmission tunnel (Fig. 7).

(20) Install and tighten the one screw that secures the driver side floor duct to the heater and air conditioner housing near the driver side of the floor panel transmission tunnel. Tighten the screw to 2.2 N·m (20 in. lbs.).

(21) Route the instrument panel wire harness to the floor panel transmission tunnel and engage the retainers that secure the harness to the mounting brackets on the tunnel (Fig. 6).

(22) Install the instrument panel wire harness ground eyelets to the studs on the floor panel transmission tunnel in front of and behind the airbag control module and secure the eyelets with nuts. Tighten the nuts to 7.3 N·m (65 in. lbs.).

(23) Reconnect the instrument panel wire harness connectors to the following floor panel transmission tunnel components:

- the Airbag Control Module (ACM) connector receptacle
- the park brake switch terminal
- the transmission shifter connector receptacle.

(24) Reconnect the left and right body wire harness connectors, the Ignition Off Draw (IOD) wire harness connector and the fused B(+) wire harness connector to the connector receptacles of the Junction Block (JB) and tighten the connector screws (Fig. 5). Tighten the screws to 4 N·m (36 in. lbs.).

(25) Engage the lower steering column shaft with the steering shaft coupler and position the steering column to the mounting studs on the instrument panel steering column support bracket (Fig. 4).

(26) Install and tighten the four nuts that secure the steering column to the studs on the instrument panel steering column support bracket. Tighten the nuts to 11.8 N·m (105 in. lbs.).

(27) Install and tighten the bolt that secures the coupler to the lower steering column shaft. Tighten the bolt to 49 N·m (36 ft. lbs.).

(28) Turn the ignition switch to the On position, then install the shifter interlock cable connector into the ignition lock housing receptacle.

(29) Reconnect the instrument panel wire harness connectors to the following steering column components (Fig. 3):

- the two lower clockspring connector receptacles
- the left multi-function switch connector receptacle
- the right multi-function switch connector receptacle
- the two ignition switch connector receptacles
- the shifter interlock solenoid connector receptacle
- if the vehicle is so equipped, the Sentry Key Immobilizer Module (SKIM) connector receptacle.

(30) Position the lower tilting steering column shroud to the steering column multi-function switch mounting housing, then install and tighten the screw that secures the shroud to the housing (Fig. 2). Tighten the screw to 1.9 N·m (17 in. lbs.).

(31) Position the upper tilting steering column shroud over the steering column. Align the upper and lower shrouds with each other and snap the two halves together.

(32) Reinstall the steering column bracket onto the instrument panel steering column support bracket. (Refer to 23 - BODY/INSTRUMENT PANEL/IP STEERING COLUMN BRACKET - INSTALLATION).

(33) Reinstall the steering column opening cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(34) Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(35) Reinstall the fuse cover onto the Junction Block (JB). (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - INSTALLATION).

(36) Reinstall the console onto the floor panel transmission tunnel. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(37) Reinstall the trim panels onto the right and left inner cowl sides. (Refer to 23 - BODY/INTERIOR/COWL TRIM - INSTALLATION).

(38) Reinstall the scuff plates onto the right and left front door sills. (Refer to 23 - BODY/INTERIOR/DOOR SILL SCUFF PLATE - INSTALLATION).

(39) Reinstall the top cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(40) Reinstall the trim onto the right and left A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(41) Reconnect the battery negative cable.

CLUSTER BEZEL

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Place the tilt steering wheel in its fully lowered position.

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry each of the four corners of the cluster bezel away from the instrument panel far enough to disengage the four snap clips from their receptacles (Fig. 15).

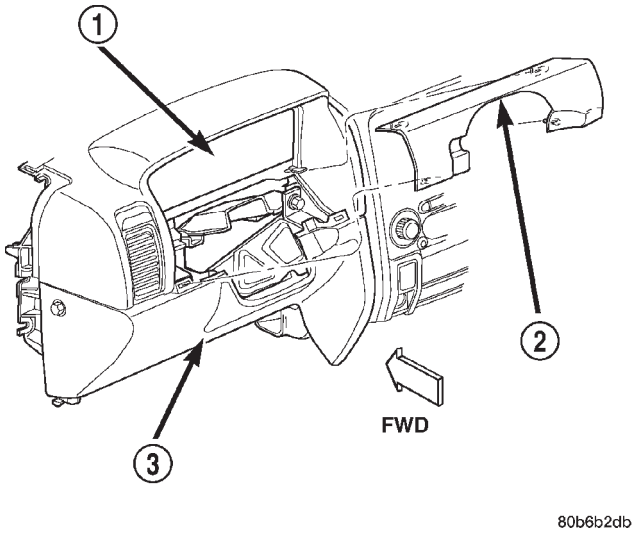


Fig. 15 Cluster Bezel Remove/Install

1 - INSTRUMENT CLUSTER
2 - INSTRUMENT PANEL CLUSTER BEZEL
3 - STEERING COLUMN OPENING COVER

(4) Being certain not to scratch the instrument cluster lens with the two snap clips on the lower edge of the cluster bezel, roll the top of the cluster bezel rearward over the top of the steering column.

(5) If the vehicle is so equipped, reach behind the cluster bezel to access and disconnect the instrument panel wire harness connector for the headlamp leveling switch from the switch connector receptacle.

(6) Remove the cluster bezel from the instrument panel.

INSTALLATION

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(1) Position the cluster bezel onto the instrument panel (Fig. 15).

(2) If the vehicle is so equipped, reach behind the cluster bezel to access and reconnect the instrument panel wire harness connector for the headlamp leveling switch to the switch connector receptacle.

(3) Being certain not to scratch the instrument cluster lens with the two snap clips on the lower edge of the cluster bezel, slide the lower edge of the cluster bezel forward and down over the top of the steering column to position it onto the instrument panel.

(4) Align the two snap clips on the lower edge of the cluster bezel with their receptacles in the instrument panel.

(5) Press firmly on the cluster bezel over each of the lower snap clip locations until each of the snap clips is fully engaged in its receptacle.

(6) Align the two receptacles on the upper edge of the cluster bezel with the snap clips on the instrument panel.

(7) Press firmly on the cluster bezel over each of the upper snap clip locations until each of the snap clips is fully engaged in its receptacle.

(8) Reconnect the battery negative cable.

GLOVE BOX

STANDARD PROCEDURE - GLOVE BOX ROLL DOWN

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(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box until the integral stops on the back edge of the glove box bin are resting against the rubber stop bumpers in the upper glove box opening reinforcement.

(3) Using hand pressure, lift upward on the arm of the pneumatic glove box door damper on the outboard side of the glove box bin to unsnap the damper connector feature from the keyed slot in the bin (Fig. 16).

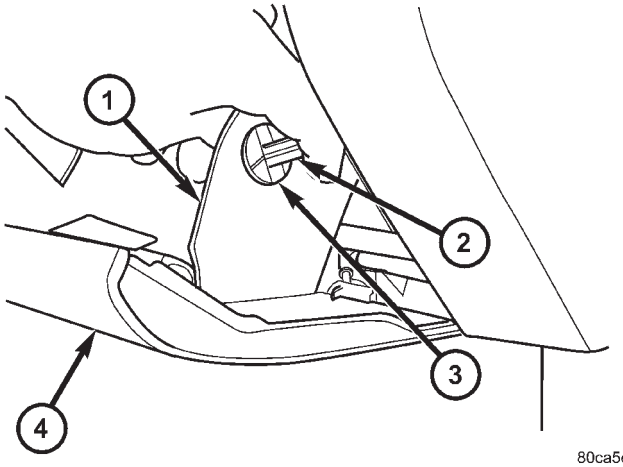


Fig. 16 Glove Box Damper

1 - BIN
2 - DAMPER
3 - CONNECTOR
4 - GLOVE BOX DOOR

(4) Reach into the glove box and with the middle finger of each hand, deflect the rubber flap of the two glove box stop bumpers on the upper glove box opening reinforcement toward the front of the vehicle.

(5) With the glove box stop bumpers deflected, roll the glove box door downward until the integral stops on the back edge of the glove box bin pass through the rubber stop bumper openings in the upper glove box opening reinforcement (Fig. 17)

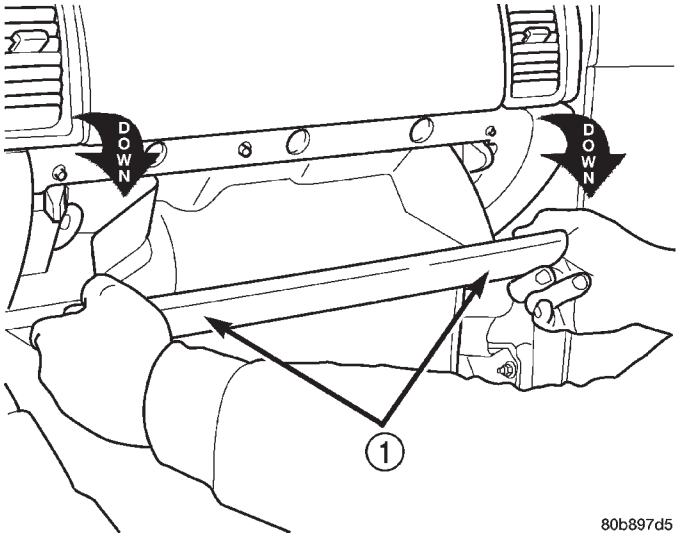


Fig. 17 Glove Box Roll Down

1 - GLOVE BOX DOOR

(6) Before rolling the glove box back up into the instrument panel, grasp the pneumatic glove box damper arm and pull the connector feature rearward to the end of its travel. The rubber stop bumpers will be deflected automatically by the integral stops on the back of the glove box when the glove box is rolled back up into the instrument panel.

(7) With the glove box stops oriented behind the stop bumpers, position the connector feature of the damper to the keyed slot on the outboard end of the glove box bin.

(8) Using hand pressure, press downward on the damper arm until the damper connector feature snaps back into the keyed slot.

GLOVE BOX (Continued)

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Roll the glove box down from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

NOTE: Be certain to use care not to damage or remove the glove box hinge bumpers on the lower instrument panel glove box opening reinforcement when removing the glove box from the instrument panel.

(3) Firmly grip both ends of the glove box door, then twist and pull the door as necessary to disengage the inboard hinge hook from the inboard hinge pin on the instrument panel and reorient the hook to the underside of the hinge pin (Fig. 18).

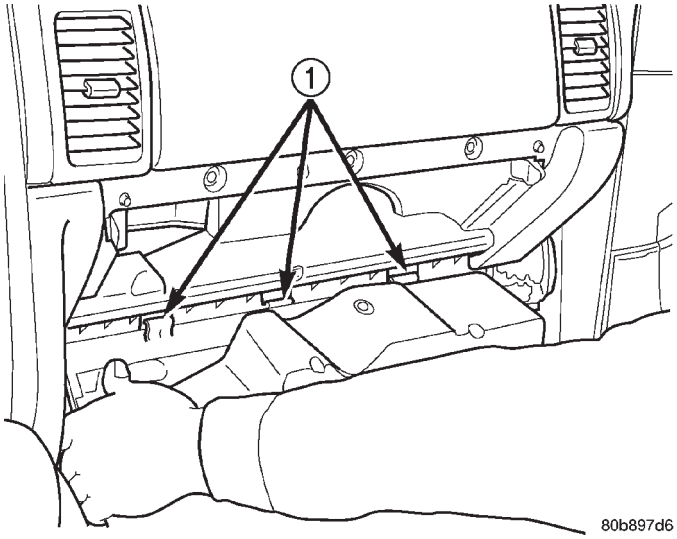


Fig. 18 Glove Box Remove/Install

1 - GLOVE BOX HINGE HOOKS AND HINGE PINS (3)

(4) Raise the glove box door until it is perpendicular to the instrument panel.

(5) Twist the door slightly in the counterclockwise direction and use a jiggling action to disengage the remaining two hinge hooks from their respective hinge pins on the instrument panel.

(6) Remove the glove box from the instrument panel.

INSTALLATION

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NOTE: Be certain to use care not to damage or remove the glove box hinge bumpers on the lower instrument panel glove box opening reinforcement when installing the glove box onto the instrument panel.

(1) Position the glove box to the instrument panel with the outboard hinge hook oriented over the outboard hinge pin and the center hinge hook oriented under the center hinge pin (Fig. 18).

(2) Raise the glove box door until it is perpendicular to the instrument panel.

(3) Firmly grip both ends of the glove box door and twist the door slightly in the clockwise direction to engage the inboard glove box hinge hook over the inboard hinge pin on the instrument panel.

(4) Roll the glove box back up into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

(5) Reconnect the battery negative cable.

GLOVE BOX LATCH

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Roll down the glove box from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

(3) Remove the three screws that secure the glove box latch to the inner glove box door (Fig. 19).

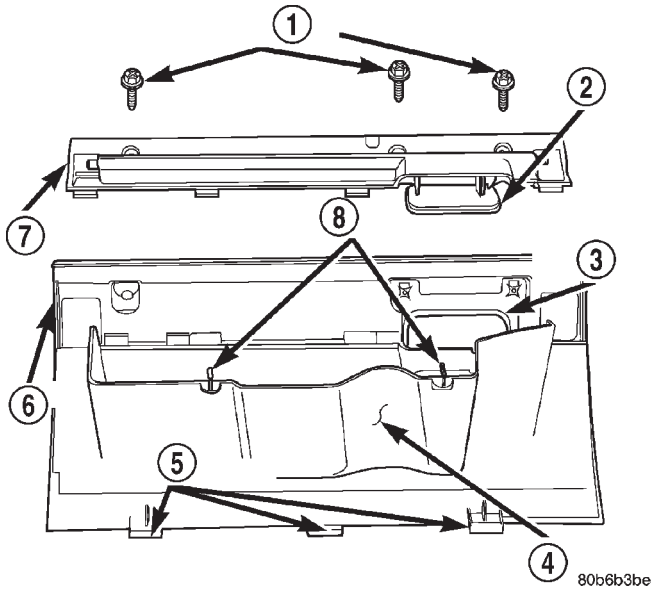


Fig. 19 Glove Box Latch Remove/Install

1 - SCREW (3)
2 - LATCH HANDLE
3 - LATCH HANDLE POCKET
4 - BIN
5 - HINGE HOOKS
6 - DOOR
7 - GLOVE BOX LATCH
8 - STOPS

(4) Lift up on the latch handle on the outer glove box door far enough to loosen the latch assembly on the inner glove box door.

(5) Remove the latch unit from the inner glove box door.

INSTALLATION

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(1) Position the latch unit to the inner glove box door (Fig. 19).

(2) Guide the latch handle into the latch handle pocket on the outer glove box door.

(3) Install and tighten the three screws that secure the glove box latch to the inner glove box door. Tighten the screws to 2.2 N·m (20 in. lbs.).

(4) Roll the glove box back up into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/ GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

(5) Reconnect the battery negative cable.

GLOVE BOX LATCH STRIKER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) If the inboard glove box latch striker is being serviced, remove the lower right center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - REMOVAL). If the outboard glove box latch striker is being serviced, remove the end cap from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).

(3) Remove the one screw that secures the upper mounting flange of the glove box latch striker to the instrument panel structural duct at either side of the glove box opening (Fig. 20).

(4) Pull the upper mounting flange of the glove box latch striker downward to disengage the hook formation on the lower end of the striker from the mounting hole in the instrument panel structural duct.

(5) Remove the glove box latch striker from the instrument panel.

INSTALLATION

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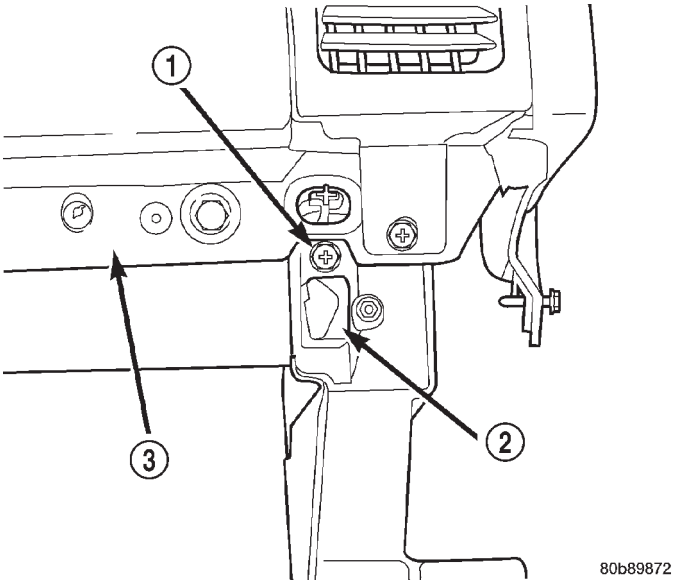


Fig. 20 Glove Box Latch Striker Remove/Install

1 - SCREW
2 - GLOVE BOX LATCH STRIKER
3 - INSTRUMENT PANEL TOP PAD

(1) Position the glove box latch striker to the instrument panel.

(2) Engage the hook formation on the lower end of the glove box latch striker in the mounting hole in the instrument panel structural duct.

(3) Roll the upper mounting flange of the glove box latch striker upward until it is flush with the instrument panel structural duct on either side of the glove box opening.

(4) Install and tighten the screw that secures the upper mounting flange of the glove box latch striker to the instrument panel structural duct (Fig. 20). Tighten the screw to 2.2 N·m (20 in. lbs.).

(5) If the inboard glove box latch striker was serviced, reinstall the lower right center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - INSTALLATION). If the outboard glove box latch striker was serviced, reinstall the end cap onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

(6) Reconnect the battery negative cable.

INSTRUMENT PANEL END CAP

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Unlatch and open the glove box.

(3) Remove the one screw that secures the outboard end of the end cap to the instrument panel top pad (Fig. 21).

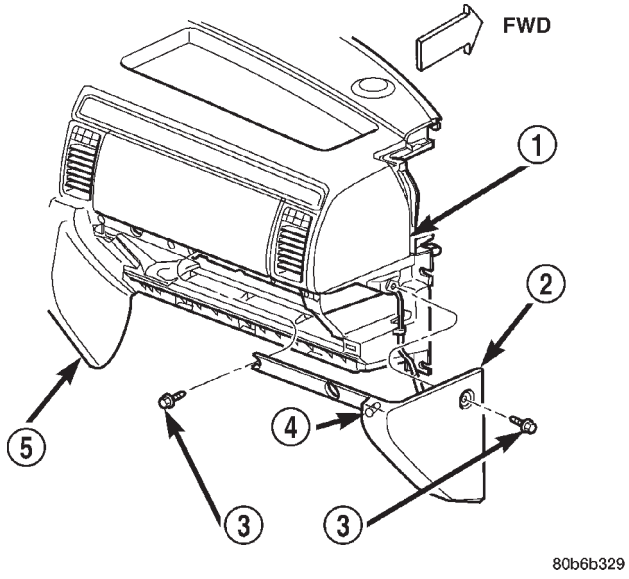


Fig. 21 Instrument Panel End Cap Remove/Install

1 - INSTRUMENT PANEL TOP PAD
2 - END CAP
3 - SCREW (4)
4 - BUMPER
5 - LOWER RIGHT CENTER BEZEL

(4) Remove the three screws that secure the end cap to the instrument panel glove box opening.

(5) Pull the end cap straight back from the instrument panel to disengage the one snap clip that secures it to the receptacle in the instrument panel structural duct.

(6) Remove the end cap from the instrument panel.

INSTALLATION

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(1) Be certain that the glove box catch bumper is installed in the mounting hole nearest the outboard end of the end cap extension over the instrument panel upper glove box opening reinforcement (Fig. 21).

(2) Position the end cap to the instrument panel. Be certain that the end of the end cap extension near the center of the upper glove box opening reinforcement is positioned underneath the end of the extension from the lower right center bezel.

(3) Align the snap clip on the end cap with the receptacle on the instrument panel structural duct.

(4) Press firmly on the instrument panel end cap over the snap clip location until the snap clip is fully engaged in its receptacle.

(5) Install and tighten the three screws that secure the end cap to the instrument panel glove box opening. Tighten the screws to 2.2 N·m (20 in. lbs.).

(6) Install and tighten the one screw that secures the outboard end of the end cap to the instrument panel top pad. Tighten the screw to 2.2 N·m (20 in. lbs.).

(7) Close and latch the glove box.

(8) Reconnect the battery negative cable.

INSTRUMENT PANEL STUCTURAL DUCT

REMOVAL

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(1) Disconnect and isolate the battery negative cable.
(2) Remove the instrument panel from the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).
(3) Place the instrument panel on a suitable work surface. Be certain to take the proper precautions to protect the instrument panel from any possible cosmetic damage.
(4) Remove all of the individual components that remain secured to the instrument panel structural duct as described elsewhere in this service information.

INSTALLATION

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(1) Reinstall all of the individual components that were removed from the instrument panel structural duct as described elsewhere in this service information.
(2) Reinstall the instrument panel into the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).
(3) Reconnect the battery negative cable.

INSTRUMENT PANEL TOP COVER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.
(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry the rear edge (farthest from the windshield) of the top cover up and away from the instrument panel far enough to disengage the four snap clip retainers from their receptacles in the instrument panel top pad (Fig. 22).

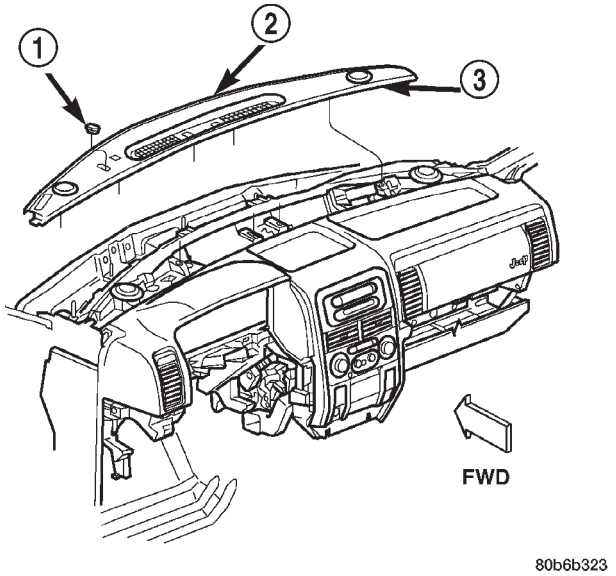


Fig. 22 Instrument Panel Top Cover Remove/Install

1 - ULTRA LIGHT SENSOR PLUG
2 - SEAL
3 - INSTRUMENT PANEL TOP COVER

(3) Remove the top cover from the top of the instrument panel.

INSTRUMENT PANEL TOP COVER (Continued)

INSTALLATION

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(1) If the vehicle is not equipped with the optional automatic headlamps light sensor/vehicle theft security system indicator, be certain that the hole plug is installed in the clearance hole located to the outboard side of the driver side defroster outlet in the instrument panel top cover (Fig. 22).

(2) Before installing the top cover onto the top of the instrument panel, be certain that the rubber top cover seal is properly positioned on the forward edge of the top cover panel.

(3) Position the top cover onto the top of the instrument panel.

(4) Align the four snap clips on the top cover with the snap clip receptacles in the instrument panel top pad.

(5) Press firmly downward on the top cover over each of the four snap clip locations until each of the snap clips is fully seated in their receptacles in the instrument panel top pad.

(6) Reconnect the battery negative cable.

INSTRUMENT PANEL TOP PAD

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the trim from the right and left A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).

(3) Remove the top cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - REMOVAL).

(4) Remove the four nuts that secure the instrument panel top pad to the studs on the dash panel near the windshield fence line (Fig. 23).

(5) Remove the speakers from the instrument panel top pad. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - REMOVAL - INSTRUMENT PANEL SPEAKER).

(6) Disengage the retainer that secures each of the two instrument panel wire harness speaker take outs to the mounting hole in the instrument panel top pad. Tuck the loose ends of these speaker take outs down the defroster ducts to keep them out of the way during the remainder of this procedure.

(7) If the vehicle is so equipped, remove the two screws that secure the automatic headlamp light sensor/vehicle theft security system indicator unit to the instrument panel top pad just outboard of the driver side defroster outlet. Move the sensor/indicator unit towards the windshield to keep it out of the way during the remainder of this procedure.

(8) Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).

(9) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(10) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(11) Roll the glove box down from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

(12) Remove the end cap from the passenger side lower outboard end of the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - REMOVAL).

(13) Remove the lower right center bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - REMOVAL).

(14) Remove the glove box lamp and switch from the instrument panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/GLOVE BOX LAMP/SWITCH - REMOVAL).

INSTRUMENT PANEL TOP PAD (Continued)

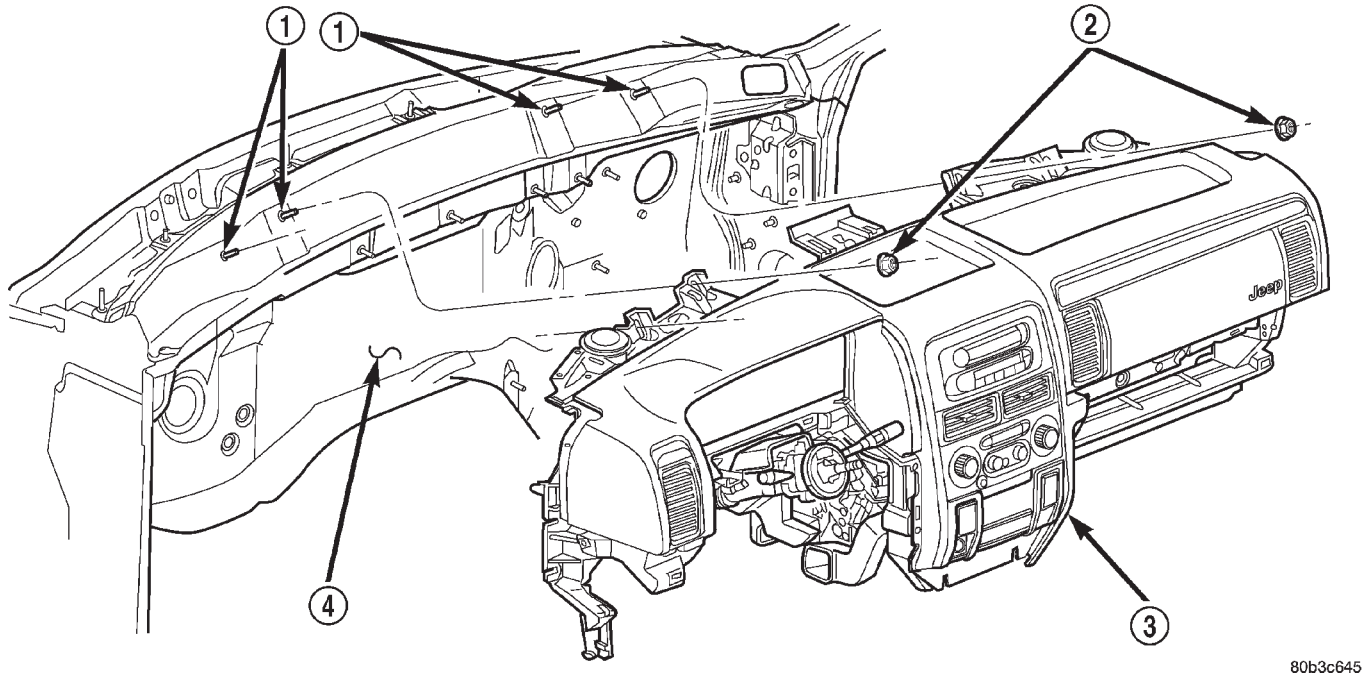


Fig. 23 Instrument Panel Top Pad to Dash Panel Mounting

1 - STUD (4)
2 - NUT (4)
3 - INSTRUMENT PANEL
4 - DASH PANEL

(15) Remove the two large screws on the glove box opening upper reinforcement that secure the top pad to the instrument panel structural duct (Fig. 24).

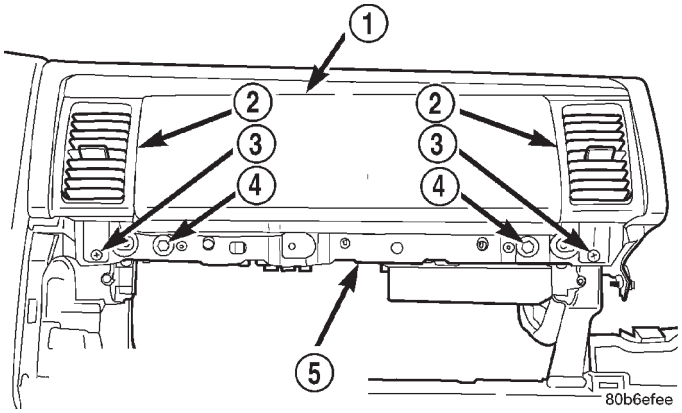


Fig. 24 Instrument Panel Top Pad to Glove Box Opening Mounting

1 - PASSENGER SIDE TRIM BEZEL
2 - PANEL OUTLETS
3 - SMALL SCREWS
4 - LARGE SCREWS
5 - GLOVE BOX OPENING UPPER REINFORCEMENT

(16) Remove the two small screws on the glove box opening upper reinforcement that secure the panel outlets to the instrument panel structural duct.

(17) Remove the center upper bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - UPPER - REMOVAL).

(18) Remove the center lower bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - LOWER - REMOVAL).

(19) Remove the four screws that secure the radio to the instrument panel structural duct. Pull the radio out of the instrument panel only far enough to access the screws that secure the top pad to the instrument panel structural duct.

(20) Remove the four screws that secure the heater-A/C control to the instrument panel structural duct. Pull the heater-A/C control out of the instrument panel only far enough to access the screws that secure the top pad to the instrument panel structural duct.

(21) Remove all of the screws that secure the perimeter of the top pad to the instrument panel structural duct.

INSTRUMENT PANEL TOP PAD (Continued)

(22) Remove the front bin from the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(23) Reach through the front bin opening of the floor console to access and remove the two screws that secure the center floor tunnel bracket to the instrument panel.

(24) Reach through the front bin opening of the floor console to access and loosen the two nuts that secure the center floor tunnel bracket to the studs on the floor panel transmission tunnel.

(25) Slide the center floor tunnel bracket rearward in the vehicle far enough to disengage the locating hole in the lower flange of the top pad from the locating pin on the instrument panel structural duct (Fig. 25).

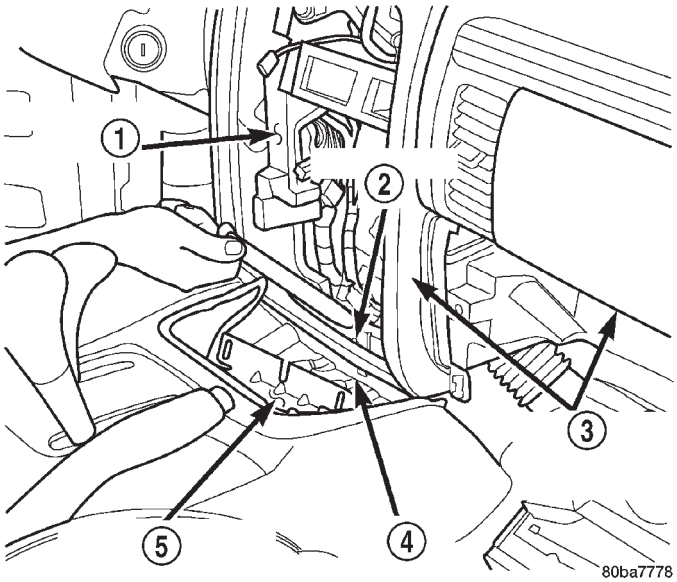


Fig. 25 Instrument Panel Top Pad Remove/Install

1 - STRUCTURAL DUCT
2 - LOCATING PIN
3 - INSTRUMENT PANEL TOP PAD
4 - LOWER FLANGE
5 - CENTER FLOOR TUNNEL BRACKET

(26) Remove the instrument panel top pad from the instrument panel structural duct.

INSTALLATION

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If the top pad is being replaced with a new unit, be certain to transfer or install the panel outlets and the passenger side trim bezel to the new unit before it is installed on the instrument panel structural duct. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/AIR OUTLETS - REMOVAL) and (Refer to 23 - BODY/INSTRUMENT PANEL/IP TRIM BEZEL - PASSENGER - REMOVAL).

(1) Position the instrument panel top pad over the instrument panel structural duct and the studs on the dash panel near the windshield fence line.

(2) Route the instrument panel wire harness take out for the glove box lamp and switch unit to the switch mounting hole in the upper glove box opening reinforcement.

(3) Reach through the front bin opening of the floor console to engage the locating hole in the lower flange of the top pad with the locating pin on the instrument panel structural duct (Fig. 25).

(4) Reach through the front bin opening of the floor console to slide the center floor tunnel bracket forward in the vehicle far enough to capture the lower flange of the top pad between the bracket and the structural duct.

(5) Reach through the front bin opening of the floor console to install and tighten the two screws that secure the center floor tunnel bracket to the instrument panel. Tighten the screws to 11.8 N·m (105 in. lbs.).

INSTRUMENT PANEL TOP PAD (Continued)

(6) Reach through the front bin opening of the floor console to access and tighten the two nuts that secure the center floor tunnel bracket to the studs on the floor panel transmission tunnel. Tighten the nuts to 11.8 N·m (105 in. lbs.).

(7) Reinstall the front bin into the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(8) Install and tighten all of the screws that secure the perimeter of the top pad to the instrument panel structural duct. Tighten the screws to 2.2 N·m (20 in. lbs.).

(9) Install and tighten the four screws that secure the heater-A/C control to the instrument panel structural duct. Tighten the screws to 2.2 N·m (20 in. lbs.).

(10) Install and tighten the four screws that secure the radio to the instrument panel structural duct. Tighten the screws to 2.2 N·m (20 in. lbs.).

(11) Reinstall the center lower bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - LOWER - INSTALLATION).

(12) Reinstall the center upper bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - UPPER - INSTALLATION).

(13) Install and tighten the two large screws on the glove box opening upper reinforcement that secure the top pad to the instrument panel structural duct (Fig. 24). Tighten the screws to 11.8 N·m (105 in. lbs.).

(14) Install and tighten the two small screws on the glove box opening upper reinforcement that secure the panel outlets to the instrument panel structural duct. Tighten the screws to 2.2 N·m (20 in. lbs.).

(15) Reinstall the glove box lamp and switch into the instrument panel. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - INTERIOR/GLOVE BOX LAMP/SWITCH - INSTALLATION).

(16) Reinstall the lower right center bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP LOWER RIGHT CENTER BEZEL - INSTALLATION).

(17) Reinstall the end cap onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL END CAP - INSTALLATION).

(18) Roll the glove box back up into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/GLOVE BOX - STANDARD PROCEDURE - GLOVE BOX ROLL DOWN).

(19) Reinstall the steering column opening cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(20) Reinstall the instrument cluster into the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(21) Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(22) If the vehicle is so equipped, position the automatic headlamp light sensor/vehicle theft security system indicator unit to the instrument panel top pad just outboard of the driver side defroster outlet. Install and tighten the two screws that secure the sensor/indicator unit. Tighten the screws to 2.2 N·m (20 in. lbs.).

(23) Engage the retainer that secures each of the two instrument panel wire harness speaker take outs to the mounting hole in the instrument panel top pad.

(24) Reinstall the speakers onto the instrument panel top pad. (Refer to 8 - ELECTRICAL/AUDIO/SPEAKER - INSTALLATION - INSTRUMENT PANEL SPEAKER).

(25) Install and tighten the four nuts that secure the instrument panel top pad to the studs on the dash panel near the windshield fence line (Fig. 23). Tighten the nuts to 11.8 N·m (105 in. lbs.).

(26) Reinstall the top cover onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP COVER - INSTALLATION).

(27) Reinstall the trim onto the right and left A-pillars. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(28) Reconnect the battery negative cable.

INSTRUMENT PANEL C-CHANNEL COVER BRACKET

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Place the instrument panel top down on a suitable work surface. Be certain to take the proper precautions to protect the top of the instrument panel from any possible cosmetic damage.

(4) Disengage the radio antenna coaxial cable retainer from the mounting hole in the instrument panel wire harness mounting tab on the passenger side outboard end of the instrument panel C-channel cover bracket.

(5) Remove the screw that secures the instrument panel wire harness mounting tab on the passenger side outboard end of the instrument panel C-channel cover bracket (Fig. 26).

(6) Remove the screw that secures the passenger side courtesy lamp to the lower tab of instrument panel C-channel cover bracket.

(7) Remove the eight screws that secure the C-channel cover bracket to the instrument panel structural duct.

(8) Remove the C-channel cover bracket from the instrument panel structural duct.

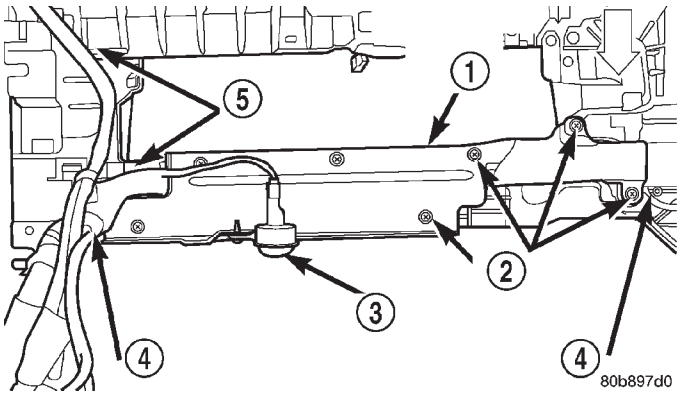


Fig. 26 Instrument Panel C-Channel Cover Bracket Remove/Install

1 - C-CHANNEL COVER BRACKET
2 - SCREWS (8)
3 - PASSENGER SIDE COURTESY LAMP
4 - INSTRUMENT PANEL WIRE HARNESS
5 - STRUCTURAL DUCT

INSTALLATION

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(1) Position the C-channel cover bracket to the instrument panel structural duct.

(2) Install and tighten the eight screws that secure the C-channel cover bracket to the instrument panel structural duct (Fig. 26). Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Position the passenger side courtesy lamp to the lower tab of instrument panel C-channel cover bracket.

(4) Install and tighten the screw that secures the passenger side courtesy lamp to the lower tab of instrument panel C-channel cover bracket. Tighten the screw to 2.2 N·m (20 in. lbs.).

(5) Position the instrument panel wire harness mounting tab to the passenger side outboard end of the instrument panel C-channel cover bracket.

(6) Install and tighten the screw that secures the instrument panel wire harness mounting tab to the passenger side outboard end of the instrument panel C-channel cover bracket. Tighten the screw to 2.2 N·m (20 in. lbs.).

(7) Engage the radio antenna coaxial cable retainer in the mounting hole in the instrument panel wire harness mounting tab on the passenger side outboard end of the instrument panel C-channel cover bracket.

(8) Reinstall the instrument panel into the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(9) Reconnect the battery negative cable.

INSTRUMENT PANEL CENTER BEZEL - LOWER

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry each of the four corners of the center lower bezel away from the instrument panel far enough to disengage the four snap clips from their receptacles (Fig. 27).

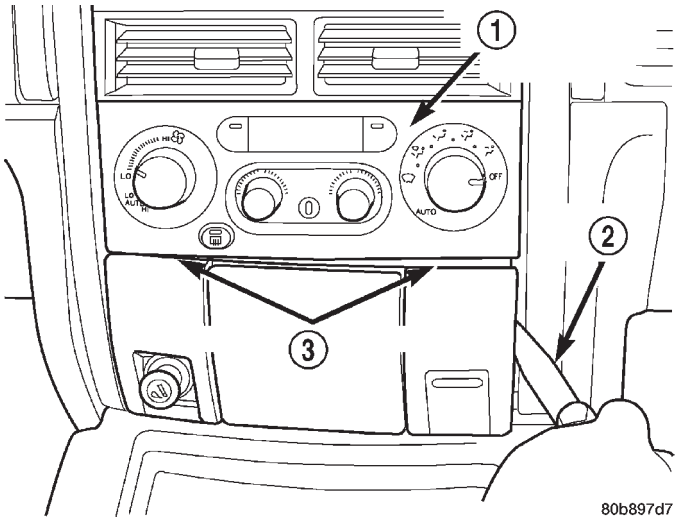


Fig. 27 Instrument Panel Center Lower Bezel Remove/Install

1 - HEATER AND AIR CONDITIONER CONTROLS
2 - TRIM STICK
3 - CENTER LOWER BEZEL

(3) Pull the center lower bezel away from the instrument panel far enough to access the instrument panel wire harness connectors.

(4) Squeeze the mounting legs of the ash receiver lamp hood and remove it from the rectangular hole in the ash receiver flame shield.

(5) If the vehicle is so equipped, disconnect the instrument panel wire harness connectors for the two heated seat switches from the switch connector receptacles.

(6) Disconnect the instrument panel wire harness connectors for the cigar lighter and accessory power outlet from the lighter and outlet connector receptacles.

(7) Remove the center lower bezel from the instrument panel.

INSTALLATION

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(1) Position the center lower bezel to the instrument panel.

(2) Reconnect the instrument panel wire harness connectors for the cigar lighter and the accessory power outlet to the lighter and outlet connector receptacles.

(3) If the vehicle is so equipped, reconnect the instrument panel wire harness connectors for the two heated seat switches to the switch connector receptacles.

(4) Squeeze the mounting legs of the ash receiver lamp hood and install them into the rectangular hole in the ash receiver flame shield.

(5) Align the two lower snap clips on the center lower bezel with their receptacles in the instrument panel top pad.

(6) Using hand pressure, press firmly and evenly on the center lower bezel over each of the lower snap clip locations until each of the snap clips is fully engaged in its receptacle.

(7) Align the two upper snap clips on the center lower bezel with their receptacles in the instrument panel top pad.

(8) Using hand pressure, press firmly and evenly on the center lower bezel over each of the upper snap clip locations until each of the snap clips is fully engaged in its receptacle.

(9) Reconnect the battery negative cable.

INSTRUMENT PANEL CENTER BEZEL - UPPER

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry each of the four corners of the center upper bezel away from the instrument panel far enough to disengage the four snap clips from their receptacles (Fig. 28).

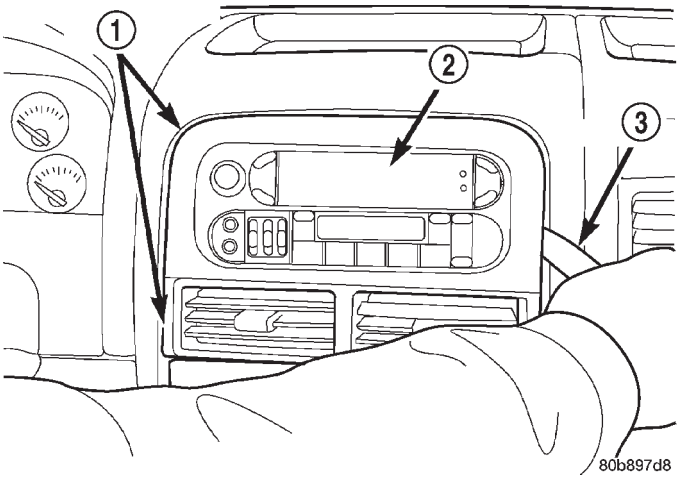


Fig. 28 Instrument Panel Center Upper Bezel Remove/Install

1 - CENTER UPPER BEZEL
2 - RADIO
3 - TRIM STICK

(3) Remove the center upper bezel from the instrument panel.

INSTALLATION

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(1) Position the center upper bezel onto the instrument panel.

(2) Align the four snap clips on the center upper bezel with their receptacles in the instrument panel top pad.

(3) Using hand pressure, press firmly and evenly on the center upper bezel over each of the snap clip locations until each of the snap clips is fully engaged in its receptacle.

(4) Reconnect the battery negative cable.

INSTRUMENT PANEL CENTER FLOOR TUNNEL BRACKET

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the front bin from the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).

(3) Reach through the front bin opening of the floor console to access and disengage the instrument

INSTRUMENT PANEL CENTER FLOOR TUNNEL BRACKET (Continued)

panel wire harness retainer from the mounting hole on the driver side of the instrument panel center floor tunnel bracket.

(4) Remove the two screws that secure the center floor tunnel bracket to the instrument panel (Fig. 29).

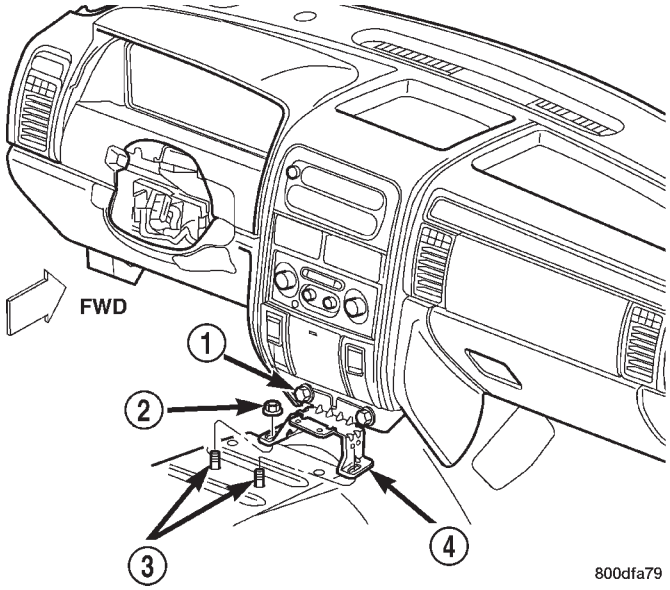


Fig. 29 Instrument Panel Center Floor Tunnel Bracket Remove/Install

1 - SCREW (2)
2 - NUT (2)
3 - STUDS
4 - CENTER FLOOR TUNNEL BRACKET

(5) Remove the two nuts that secure the center floor tunnel bracket to the studs on the floor panel transmission tunnel.

(6) Remove the center floor tunnel bracket from the instrument panel and the floor panel transmission tunnel.

INSTALLATION

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(1) Position the center floor tunnel bracket over the floor panel transmission tunnel studs and slide it up against the instrument panel (Fig. 29).

(2) Install and tighten the two nuts that secure the center floor tunnel bracket to the studs on the floor panel transmission tunnel. Tighten the nuts to 11.3 N·m (100 in. lbs.).

(3) Install and tighten the two screws that secure the center floor tunnel bracket to the instrument panel. Tighten the screws to 11.3 N·m (100 in. lbs.).

(4) Reach through the front bin opening of the floor console to access and engage the instrument panel wire harness retainer with the mounting hole on the driver side of the instrument panel center floor tunnel bracket.

(5) Reinstall the front bin into the floor console. (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).

(6) Reconnect the battery negative cable.

INSTRUMENT PANEL COURTESY LAMP BRACKET

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel fuse cover from the bottom of the Junction Block (JB) and Body Control Module (BCM) unit. (Refer to 8 - ELECTRICAL/ POWER DISTRIBUTION/FUSE COVER - REMOVAL).

(3) Reach under the steering column opening cover to access and remove the screw that secures the courtesy lamp unit to the lower end of the instrument panel courtesy lamp bracket near the inboard side of the JB (Fig. 30).

(4) Remove the courtesy lamp from the lower end of the courtesy lamp bracket.

INSTRUMENT PANEL COURTESY LAMP BRACKET (Continued)

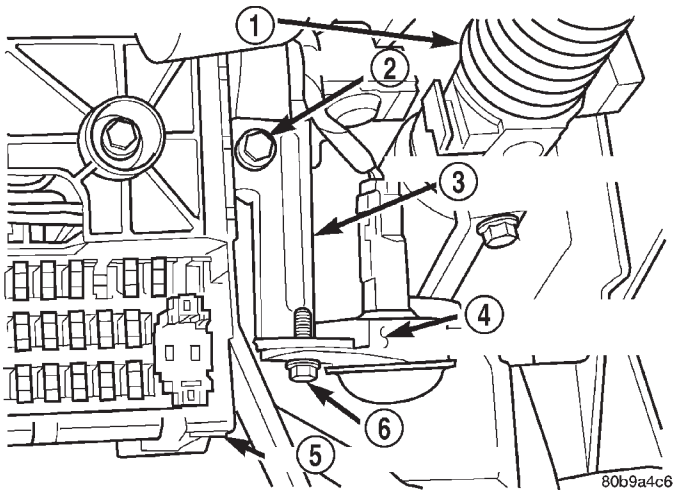


Fig. 30 Instrument Panel Courtesy Lamp Bracket Remove/Install

1 - STEERING COLUMN
2 - SCREW
3 - COURTESY LAMP BRACKET
4 - DRIVER SIDE COURTESY LAMP
5 - JUNCTION BLOCK
6 - SCREW

(5) Reach under the steering column opening cover to access and remove the screw that secures the courtesy lamp bracket and the inboard side of the JB to the instrument panel steering column support bracket.

(6) Remove the courtesy lamp bracket from the inboard side of the JB and the instrument panel steering column support bracket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Reach under the instrument panel to position the upper end of the courtesy lamp bracket to the inboard side of the Junction Block (JB) and the instrument panel steering column support bracket (Fig. 30).

(2) Install and tighten the screw that secures the courtesy lamp bracket and the inboard side of the JB to the instrument panel steering column support bracket. Tighten the screw to 2.2 N·m (20 in. lbs.).

(3) Position the courtesy lamp to the lower end of the courtesy lamp bracket.

(4) Install and tighten the screw that secures the courtesy lamp to the lower end of the courtesy lamp bracket. Tighten the screw to 2.2 N·m (20 in. lbs.).

(5) Reinstall the instrument panel fuse cover to the bottom of the JB and Body Control Module (BCM) unit. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - INSTALLATION).

(6) Reconnect the battery negative cable.

INSTRUMENT PANEL INTERMEDIATE BRACKET

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the accelerator pedal assembly from the shoulder studs on the dash panel. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/ACCELERATOR PEDAL - REMOVAL).

(3) Remove the instrument panel from the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(4) Remove the one nut that secures the instrument panel intermediate bracket to the stud on the dash panel (Fig. 31).

(5) Remove the instrument panel intermediate bracket from the two shoulder studs and the one stud on the dash panel.

INSTRUMENT PANEL INTERMEDIATE BRACKET (Continued)

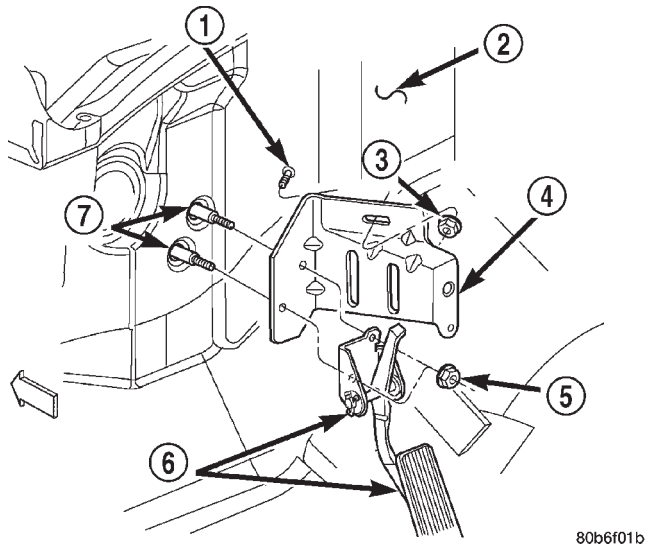


Fig. 31 Instrument Panel Intermediate Bracket Remove/Install

1 - STUD
2 - DASH PANEL
3 - NUT (2)
4 - INTERMEDIATE BRACKET
5 - NUT (2)
6 - ACCELERATOR PEDAL
7 - SHOULDER STUDS

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the instrument panel intermediate bracket to the two shoulder studs and the one stud on the dash panel (Fig. 31).

(2) Loosely install the one nut that secures the intermediate bracket to the one stud on the dash panel.

(3) Reinstall the instrument panel into the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(4) Reinstall the accelerator pedal assembly onto the shoulder studs on the dash panel. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/ACCELERATOR PEDAL - INSTALLATION).

(5) Reconnect the battery negative cable.

INSTRUMENT PANEL LOWER RIGHT CENTER BEZEL

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Unlatch and open the glove box.

(3) Remove the three screws that secure the lower right center bezel to the instrument panel glove box opening (Fig. 32).

(4) Pull the lower right center bezel straight back from the instrument panel to disengage the two snap clips that secure it to the receptacles in the instrument panel top pad.

(5) Remove the lower right center bezel from the instrument panel.

INSTALLATION

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(1) Be certain that the glove box catch bumper is installed in the mounting hole nearest the inboard

INSTRUMENT PANEL LOWER RIGHT CENTER BEZEL (Continued)

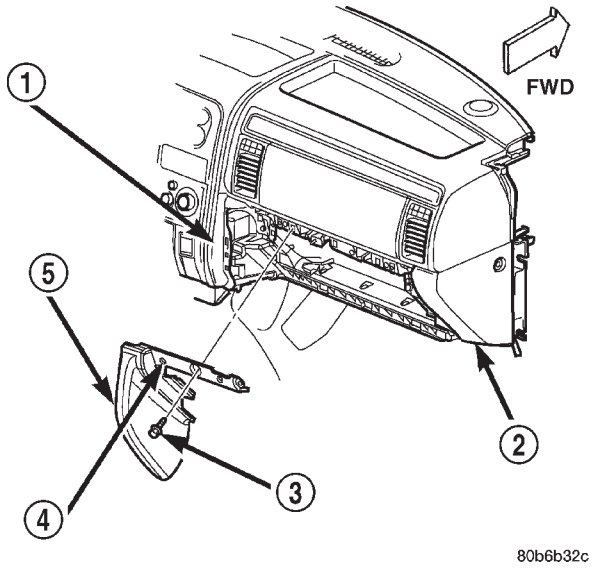


Fig. 32 Instrument Panel Lower Right Center Bezel Remove/Install

1 - INSTRUMENT PANEL TOP PAD
2 - END CAP
3 - SCREWS (3)
4 - BUMPER
5 - LOWER RIGHT CENTER BEZEL

end of the lower right center bezel extension over the instrument panel upper glove box opening reinforcement.

(2) Position the lower right center bezel to the instrument panel. Be certain that the end of the lower right center bezel extension near the center of the upper glove box opening reinforcement is positioned on top of the end of the extension from the end cap (Fig. 32).

(3) Align the snap clips on the lower right center bezel with the receptacles in the instrument panel top pad.

(4) Using hand pressure, press firmly on the lower right center bezel over each of the snap clip locations until the snap clips are fully engaged in their receptacles.

(5) Install and tighten the three screws that secure the lower right center bezel to the instrument panel glove box opening. Tighten the screws to 2.2 N·m (20 in. lbs.).

(6) Close and latch the glove box.

(7) Reconnect the battery negative cable.

INSTRUMENT PANEL PLENUM BRACKET

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Place the instrument panel top down on a suitable work surface. Be certain to take the proper precautions to protect the top of the instrument panel from any possible cosmetic damage.

(4) Remove the one screw that secures the plenum bracket to the instrument panel steering column support bracket (Fig. 33).

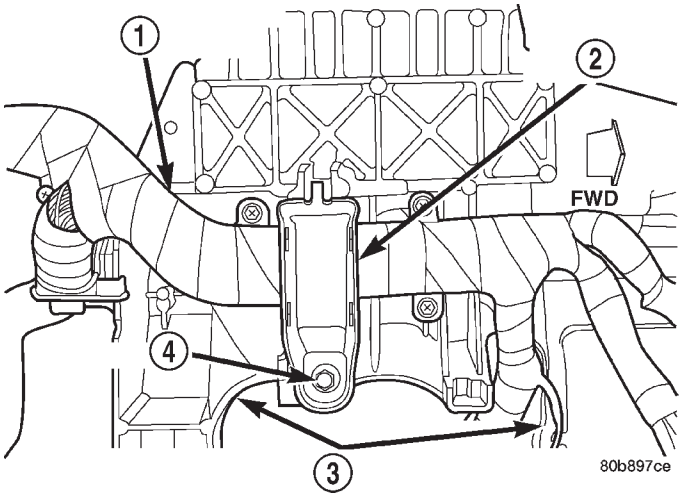


Fig. 33 Instrument Panel Plenum Bracket Remove/Install

1 - INSTRUMENT PANEL WIRE HARNESS
2 - PLENUM BRACKET
3 - STEERING COLUMN SUPPORT BRACKET
4 - SCREW

(5) Remove the plenum bracket from the instrument panel steering column support bracket.

INSTRUMENT PANEL PLENUM BRACKET (Continued)

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the plenum bracket to the instrument panel steering column support bracket (Fig. 33).

(2) Install and tighten the one screw that secures the plenum bracket to the instrument panel steering column support bracket. Tighten the screw to 11.8 N·m (105 in. lbs.).

(3) Reinstall the instrument panel into the vehicle. (Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(4) Reconnect the battery negative cable.

INSTRUMENT PANEL STEERING COLUMN BRACKET

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the steering column opening cover from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

(3) Remove the four screws that secure the steering column bracket to the instrument panel steering column support bracket (Fig. 34).

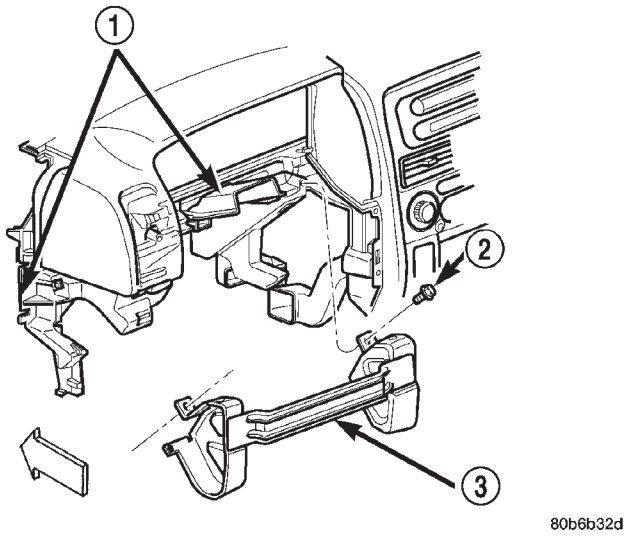


Fig. 34 Instrument Panel Steering Column Bracket Remove/Install

1 - INSTRUMENT PANEL STEERING COLUMN SUPPORT BRACKET
2 - SCREW (4)
3 - INSTRUMENT PANEL STEERING COLUMN BRACKET

(4) Remove the steering column bracket from the instrument panel steering column support bracket.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the steering column bracket to the instrument panel steering column support bracket (Fig. 34).

(2) Install and tighten the four screws that secure the steering column bracket to the instrument panel steering column support bracket. Tighten the screws to 11.8 N·m (105 in. lbs.).

(3) Reinstall the steering column opening cover. (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).

(4) Reconnect the battery negative cable.

INSTRUMENT PANEL STEERING COLUMN SUPPORT BRACKET

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument cluster from the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - REMOVAL).

(3) Remove the instrument panel plenum bracket from the steering column support bracket. (Refer to 23 - BODY/INSTRUMENT PANEL/IP PLENUM BRACKET - REMOVAL).

(4) Remove the three screws that secure the instrument panel wire harness mounting tabs to the back of the steering column support bracket.

(5) Remove the two screws that secure the 16-way data link connector to the instrument panel steering column support bracket and remove the connector from the bracket (Fig. 35).

(6) Remove the Junction Block (JB) and Body Control Module (BCM) unit from the instrument panel steering column support bracket, but do not disconnect any of the instrument panel wire harness connectors from the unit. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - REMOVAL).

(7) From the face of the instrument panel, remove the five screws that secure the steering column support bracket to the instrument panel structural duct.

(8) Remove the steering column support bracket from the instrument panel structural duct.

INSTALLATION

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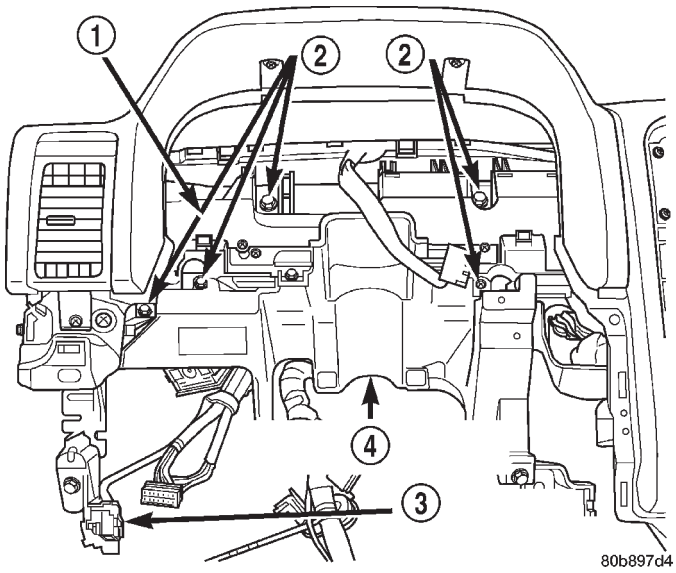


Fig. 35 Instrument Panel Steering Column Support Bracket Remove/Install

1 - STRUCTURAL DUCT
2 - SCREWS (5)
3 - 16–WAY DATA LINK CONNECTOR
4 - STEERING COLUMN SUPPORT BRACKET

(1) Position the steering column support bracket to the instrument panel structural duct.

(2) From the face of the instrument panel, install and tighten the five screws that secure the steering column support bracket to the instrument panel structural duct (Fig. 35). Tighten the screws to 11.8 N·m (105 in. lbs.).

(3) Position the instrument panel wire harness mounting tabs to the back of the steering column support bracket.

(4) Install and tighten the three screws that secure the instrument panel wire harness mounting tabs to the back of the steering column support bracket. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Reinstall the instrument panel plenum bracket onto the steering column support bracket. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL PLENUM BRACKET - INSTALLATION).

(6) Reinstall the Junction Block (JB) and Body Control Module (BCM) unit onto the instrument

panel steering column support bracket. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/JUNCTION BLOCK - INSTALLATION).

(7) Position the 16-way data link connector to the instrument panel steering column support bracket.

(8) Install and tighten the two screws that secure the 16-way data link connector to the instrument panel steering column support bracket. Tighten the screws to 2.2 N·m (20 in. lbs.).

(9) Reinstall the instrument cluster onto the instrument panel. (Refer to 8 - ELECTRICAL/INSTRUMENT CLUSTER - INSTALLATION).

(10) Reconnect the battery negative cable.

INSTRUMENT PANEL TRIM BEZEL - DRIVER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Using a trim stick or another suitable wide flat-bladed tool, gently pry the edges of the driver side trim bezel up and away from the instrument panel far enough to disengage the two snap clips from their receptacles (Fig. 36).

(3) Remove the driver side trim bezel from the instrument panel top pad.

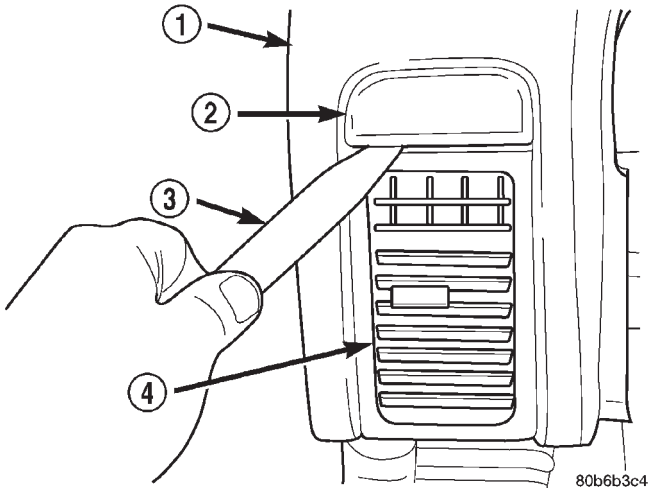


Fig. 36 Instrument Panel Driver Side Trim Bezel Remove/Install

1 - INSTRUMENT PANEL TOP PAD
2 - DRIVER SIDE TRIM BEZEL
3 - TRIM STICK
4 - PANEL OUTLET

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Position the driver side trim bezel to the instrument panel top pad.

(2) Align the snap clips on the driver side trim bezel with the receptacles in the instrument panel top pad.

(3) Using hand pressure, press firmly and evenly on the driver side trim bezel over the snap clip locations until each of the snap clips is fully engaged in its receptacle.

(4) Reconnect the battery negative cable.

INSTRUMENT PANEL TRIM BEZEL - PASSENGER

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the top pad from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - REMOVAL).

(3) From the underside of the top pad, remove the four screws from the top of the passenger airbag door that secure the passenger side trim bezel to the instrument panel (Fig. 37).

(4) Remove the passenger side trim bezel from the instrument panel top pad.

INSTALLATION

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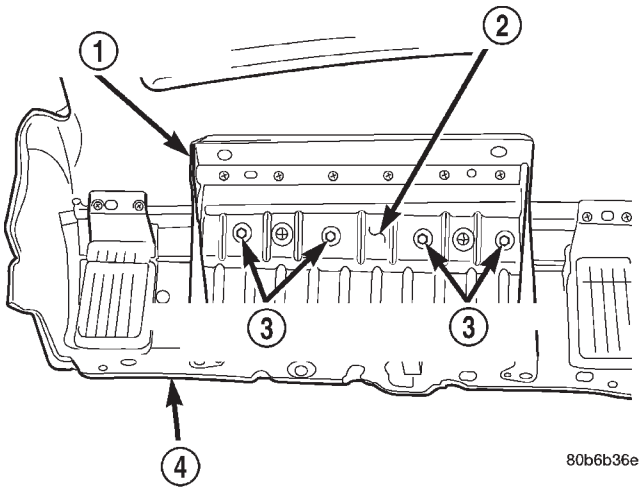


Fig. 37 Instrument Panel Passenger Side Trim Bezel Remove/Install

1 - INSTRUMENT PANEL AIRBAG DOOR REINFORCEMENT
2 - PASSENGER AIRBAG DOOR
3 - PASSENGER SIDE TRIM BEZEL SCREWS (4)
4 - INSTRUMENT PANEL TOP PAD

(1) Position the passenger side trim bezel to the instrument panel top pad.

(2) From the underside of the top pad, install and tighten the four screws through the passenger airbag door that secure the passenger side trim bezel to the instrument panel (Fig. 37). Tighten the screws to 11.8 N·m (105 in. lbs.).

(3) Reinstall the top pad onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL TOP PAD - INSTALLATION).

(4) Reconnect the battery negative cable.

POWER OUTLET DOOR

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the center lower bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - LOWER - REMOVAL).

(3) With the power outlet door in the open position, carefully spread the power outlet door hinge arms far enough to disengage the pivot pins from the pivots on the back side of the center lower bezel (Fig. 38).

NOTE: The power outlet door is more easily serviced while in the open position. The illustration shows the door in the closed position for improved visibility of the assist spring orientation and anchor point details.

(4) Disengage the stepped ends of the assist spring from the anchor holes in the inboard power outlet door hinge arm and in the side of the ash receiver housing.

(5) Remove the power outlet door from the instrument panel center lower bezel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

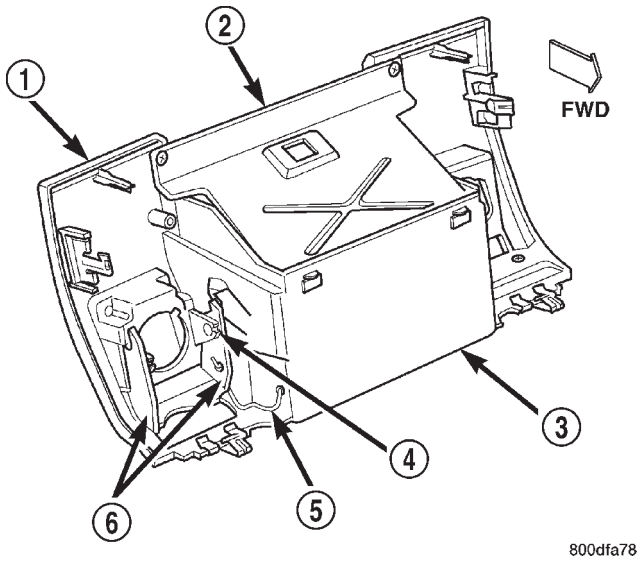


Fig. 38 Instrument Panel Power Outlet Door Remove/Install

1 - CENTER LOWER BEZEL
2 - ASH RECEIVER FLAME SHIELD
3 - ASH RECEIVER HOUSING
4 - PIVOT PINS
5 - ASSIST SPRING
6 - POWER OUTLET DOOR HINGE ARMS

(1) Position the power outlet door to the instrument panel center lower bezel.

(2) Engage the stepped ends of the assist spring with the anchor holes in the inboard power outlet door hinge arm and in the side of the ash receiver housing (Fig. 38).

(3) With the power outlet door in the open position, carefully spread the power outlet door hinge arms far enough to engage the pivot pins with the pivots on the back side of the lower center bezel.

(4) Reinstall the center lower bezel into the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/IP CENTER BEZEL - LOWER - INSTALLATION).

(5) Reconnect the battery negative cable.

STEERING COLUMN OPENING COVER

REMOVAL

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(1) Disconnect and isolate the battery negative cable.

(2) Remove the fuse cover from the Junction Block (JB) and Body Control Module (BCM) unit under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - REMOVAL).

(3) Remove the cluster bezel from the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - REMOVAL).

(4) Remove the one screw that secures the outboard end of the steering column opening cover to the U-nut on the outboard end of the instrument panel top pad (Fig. 39).

(5) Remove the two screws that secure the lower edge of the steering column opening cover to the U-nuts on the instrument panel steering column support bracket.

(6) Pull the steering column opening cover rearward to disengage the three snap clips (one outboard and two inboard) that secure it to the receptacles in the instrument panel.

(7) Remove the steering column opening cover from the instrument panel.

INSTALLATION

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

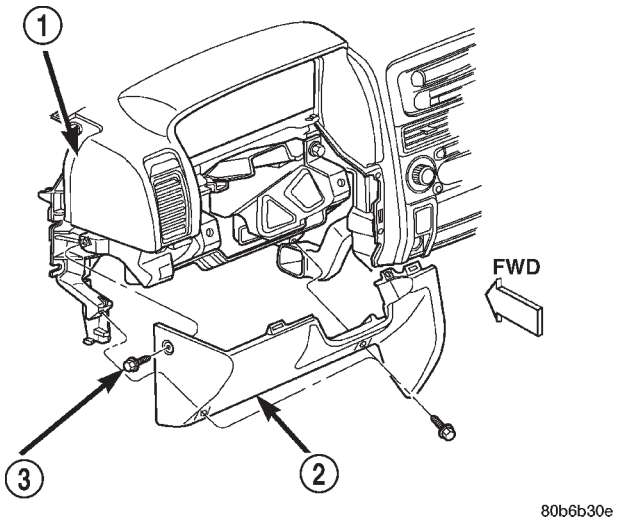


Fig. 39 Steering Column Opening Cover Remove/Install

1 - INSTRUMENT PANEL TOP PAD
2 - STEERING COLUMN OPENING COVER
3 - SCREW (3)

(1) Position the steering column opening cover onto the instrument panel (Fig. 39).

(2) Align the three snap clips on the steering column opening cover with their receptacles in the instrument panel.

(3) Using hand pressure, press firmly and evenly on the steering column opening cover over the snap clip locations until each of the snap clips is fully engaged in its receptacle.

(4) Install and tighten the two screws that secure the lower edge of the steering column opening cover to the instrument panel steering column support bracket. Tighten the screws to 2.2 N·m (20 in. lbs.).

(5) Install and tighten the one screw that secures the outboard end of the steering column opening cover to the U-nut on the outboard end of the instrument panel top pad. Tighten the screw to 2.2 N·m (20 in. lbs.).

(6) Reinstall the cluster bezel onto the instrument panel. (Refer to 23 - BODY/INSTRUMENT PANEL/CLUSTER BEZEL - INSTALLATION).

(7) Reinstall the fuse cover onto the Junction Block (JB) and Body Control Module (BCM) unit under the driver side outboard end of the instrument panel. (Refer to 8 - ELECTRICAL/POWER DISTRIBUTION/FUSE COVER - INSTALLATION).

(8) Reconnect the battery negative cable.

INTERIOR

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A-PILLAR TRIM

REMOVAL

The A-pillar trim is attached to the A-pillar with spring clips.

(1) Grasp A-pillar trim and pull trim outward from A-pillar (Fig. 1).

(2) Separate A-pillar trim from A-pillar.

INSTALLATION

(1) Position A-pillar trim on A-pillar and, starting at the bottom, press into place (Fig. 1).

(2) Using a trim stick or other suitable tool, carefully cover the edge of the trim with weatherstrip.

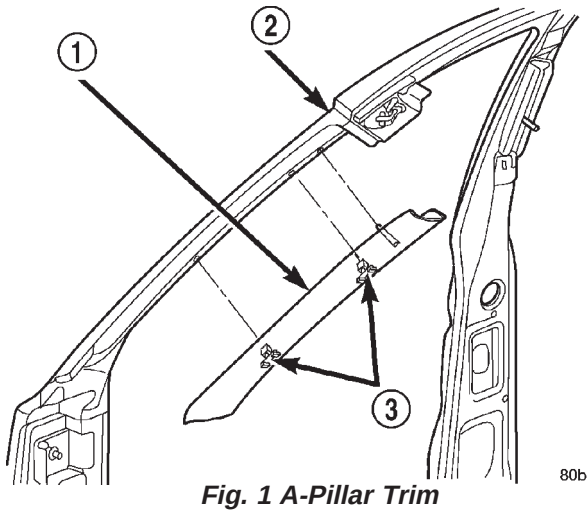


Fig. 1 A-Pillar Trim

1 - A-PILLAR TRIM
2 - A-PILLAR
3 - SPRING CLIP

ASSIST HANDLE

REMOVAL

(1) Remove the screws holding the assist handle to the roof panel.
(2) Remove the assist handle from the roof panel.

INSTALLATION

(1) Align the assist handle with the screw holes in the roof panel.
(2) Install the screws holding the assist handle to the roof panel.

B-PILLAR LOWER TRIM

REMOVAL

(1) Remove front door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL).
(2) Remove front seat shoulder belt anchor bolt.
(3) Remove front seat shoulder belt height adjustment knob and turning loop.
(4) Remove screw attaching front of quarter panel trim to floor.
(5) Remove screws attaching front and rear of B-pillar lower trim to floor.
(6) Remove screw attaching B-pillar lower trim to B-pillar (Fig. 2).
(7) Grasp B-pillar lower trim and pull outward to separate from B-pillar.
(8) Route seat/shoulder belt through access slot in B-pillar lower trim.
(9) Separate B-pillar lower trim from B-pillar.

INSTALLATION

(1) Position B-pillar lower trim panel at B-pillar (Fig. 2).
(2) Route seat/shoulder belt through access slot in B-pillar lower trim.
(3) Press B-pillar lower trim onto B-pillar.

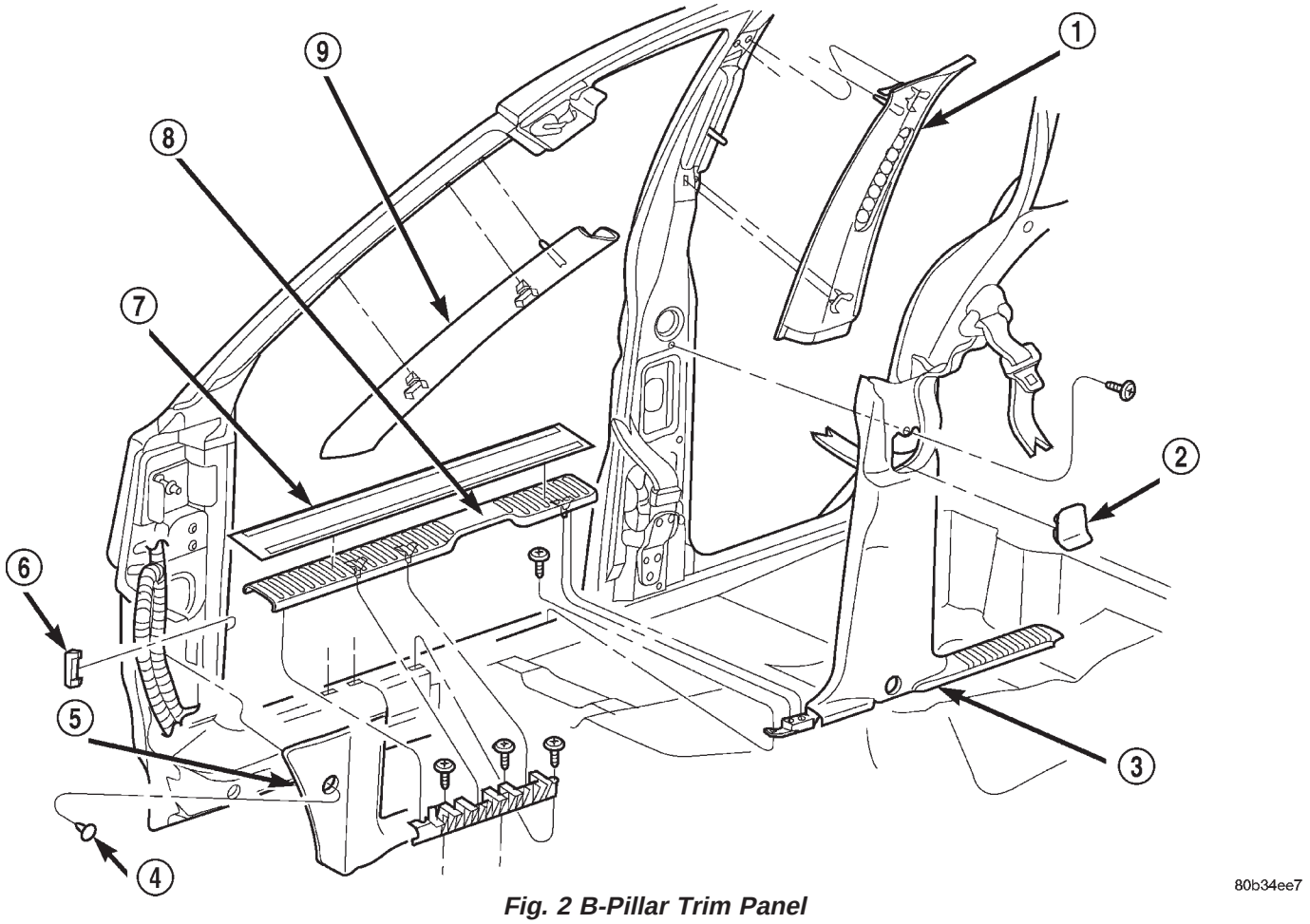


Fig. 2 B-Pillar Trim Panel

1 - B-PILLAR UPPER TRIM
2 - ACCESS COVER
3 - B-PILLAR LOWER TRIM
4 - PLASTIC NUT
5 - COWL LOWER TRIM
6 - CLIP
7 - SCUFF PLATE
8 - SILL TRIM
9 - A-PILLAR TRIM

B-PILLAR LOWER TRIM (Continued)

(4) Install screw attaching B-pillar lower trim to B-pillar.
(5) Install screw attaching front of B-pillar lower trim to floor.
(6) Install screw attaching front of quarter panel trim to floor.
(7) Install front seat shoulder belt anchor bolt.
(8) Install front seat shoulder belt height adjustment knob and turning loop.
(9) Install front door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION).

B-PILLAR UPPER TRIM

REMOVAL

(1) Remove shoulder belt height adjustment knob.
(2) Remove front seat belt turning loop.
(3) Remove the screw attaching lower B pillar trim.
(4) Pull lower B pillar trim out far enough to remove upper trim panel.
(5) Grasp upper B-pillar trim and pull outward to detach from B-pillar (Fig. 2).

INSTALLATION

(1) Position trim panel on B-pillar (Fig. 2).
(2) Ensure trim panel covers inner edge of door opening weatherstrip and press inward to seat.
(3) Install screw attaching lower B pillar trim panel.
(4) Install front seat belt turning loop.
(5) Install shoulder belt height adjustment knob.

CARPETS AND FLOOR MATS

REMOVAL

REMOVAL - FRONT CARPET

(1) Remove door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL).
(2) Remove the B-pillar lower trim, refer to (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
(3) Remove front seats (Refer to 23 - BODY/SEATS/SEAT - REMOVAL).
(4) Remove the rear seats lower cushions (Refer to 23 - BODY/SEATS/SEAT CUSHION - REMOVAL).
(5) Remove center floor console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - REMOVAL).
(6) Remove any other interfering trim or molding.
(7) Lift carpet and mat from floor panel.

REMOVAL - CARGO AREA CARPET

(1) Lift tailgate.
(2) Fold rear seat cushions forward.
(3) Remove rear seat backs (Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL).
(4) Remove the rear shoulder belts (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR SEAT BELT & RETRACTOR - REMOVAL).
(5) Remove the retractable security cargo cover assembly.
(6) Remove the spare tire cover.
(7) Remove the rear cargo tie down footman loops. The side mounted footman loops are retained by screws. The floor footman loops are riveted (Fig. 3).
(8) Remove the C pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
(9) Remove the CD changer, if equipped (Refer to 8 - ELECTRICAL/AUDIO/CD CHANGER - REMOVAL).
(10) Remove the Infinity amp, if equipped (Refer to 8 - ELECTRICAL/AUDIO/AMPLIFIER - REMOVAL).
(11) Lift the carpet.

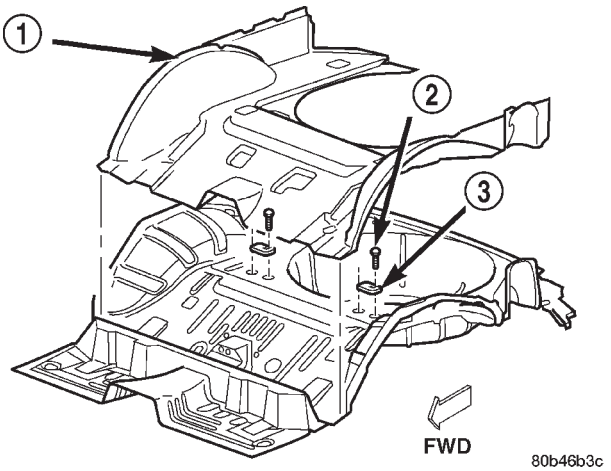


Fig. 3 Cargo Area Carpet

1 - CARGO AREA CARPET
2 - RIVET
3 - CARGO TIE-DOWN LOOP

INSTALLATION

INSTALLATION - FRONT CARPET

(1) Carefully lay the carpet and mat on the floor panel. Align the carpet to allow installation of the components fastened to the floor panel.
(2) Install the center console (Refer to 23 - BODY/INTERIOR/FLOOR CONSOLE - INSTALLATION).
(3) Install the front seats (Refer to 23 - BODY/SEATS/SEAT - INSTALLATION).
(4) Install the rear seat cushions (Refer to 23 - BODY/SEATS/SEAT CUSHION - INSTALLATION).

CARPETS AND FLOOR MATS (Continued)

(5) Install the lower B pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).
(6) Install the door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION).
(7) Install any other moldings or trim panels removed.

INSTALLATION - CARGO AREA CARPET

(1) Thoroughly clean the area with Mopar Super Kleen®, or equivalent.
(2) Lay the new carpet in.
(3) Install the “C” pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).
(4) Install the CD changer, if equipped (Refer to 8 - ELECTRICAL/AUDIO/CD CHANGER - INSTALLATION).
(5) Install the footman loops (Fig. 3).
(6) Install the rear shoulder belts (Refer to 8 - ELECTRICAL/RESTRAINTS/REAR SEAT BELT & RETRACTOR - INSTALLATION).
(7) Install the rear seat backs (Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION).
(8) Install the Infinity amp, if equipped (Refer to 8 - ELECTRICAL/AUDIO/AMPLIFIER - INSTALLATION).
(9) Install the spare tire cover.
(10) Install the retractable security cover.

COWL TRIM

REMOVAL

(1) Remove front door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - REMOVAL).
(2) Remove screws attaching cowl trim to floor.
(3) Remove plastic nut.
(4) Grasp cowl trim and pull outward to separate from clip.
(5) Separate cowl trim from vehicle.

INSTALLATION

(1) Position cowl trim and press into place.
(2) Install screws attaching cowl trim to floor.
(3) Install plastic nut.
(4) Install front door sill trim (Refer to 23 - BODY/INTERIOR/DOOR SILL TRIM - INSTALLATION).

C-PILLAR TRIM

REMOVAL

(1) Remove rear shoulder belt turning loop.
(2) Remove rear shoulder belt height adjustment knob.
(3) Remove screws attaching quarter panel trim.
(4) Pull quarter panel trim outward as necessary.
(5) Grasp C-pillar upper trim and pull outward to disengage from C-pillar (Fig. 4).
(6) Route rear shoulder belt through access hole.
(7) Separate C-pillar upper trim from vehicle.

INSTALLATION

(1) Position C-pillar upper trim at C-pillar (Fig. 4).
(2) Route rear shoulder belt through access hole.
(3) Press C-pillar upper trim onto C-pillar.
(4) Press quarter panel trim into place as necessary.
(5) Ensure front edge of trim is covered by weatherstrip.
(6) Install screws attaching quarter panel trim.
(7) Install rear shoulder belt height adjustment knob.
(8) Install rear shoulder belt turning loop.

C-PILLAR TRIM (Continued)

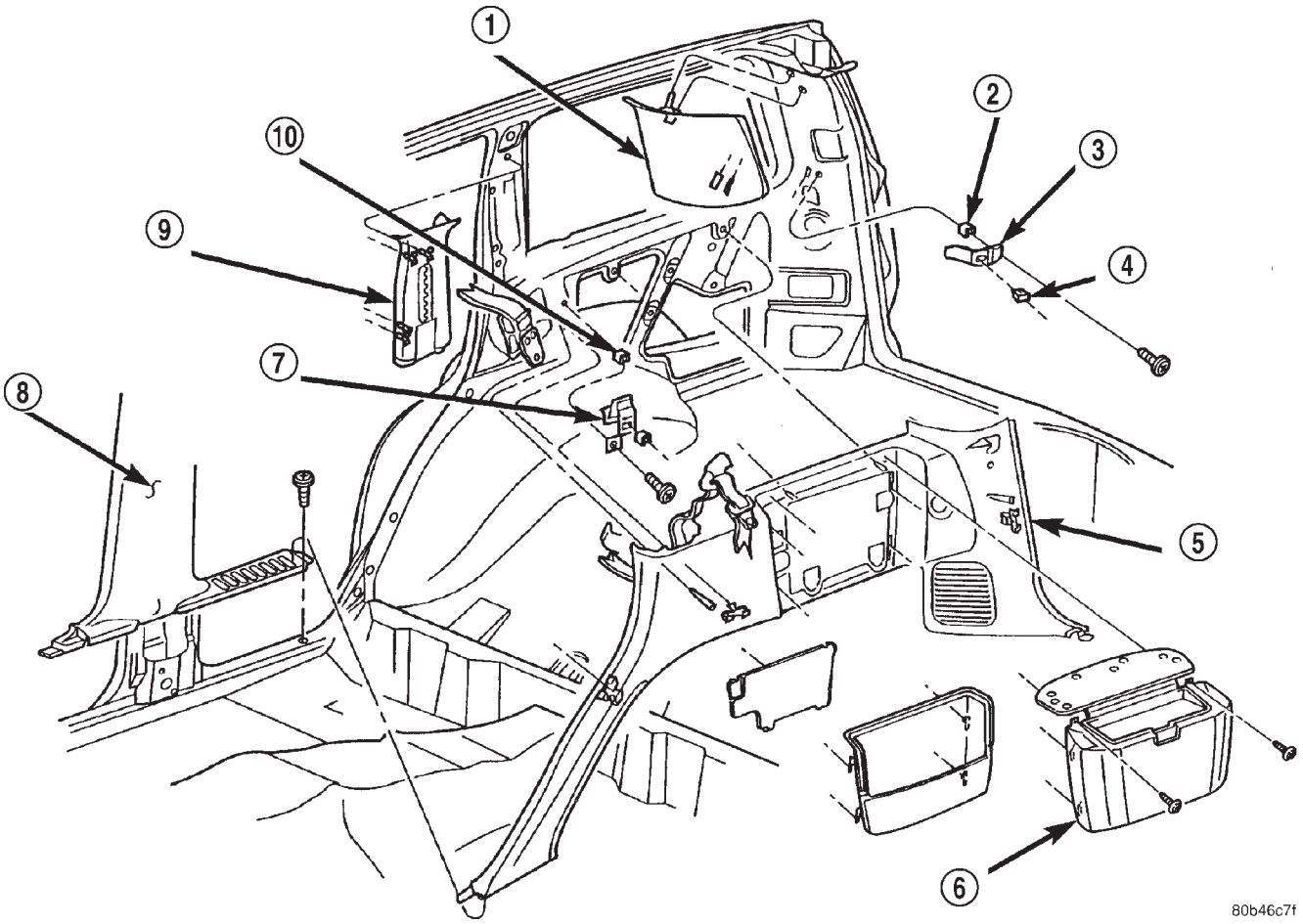


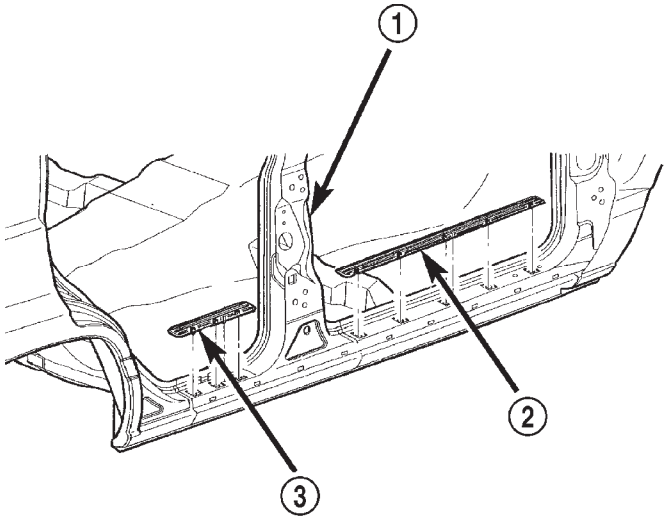
Fig. 4 Right Side Trim Panel

1 - D-PILLAR TRIM
2 - SNAP-IN NUT
3 - BRACKET
4 - SNAP-IN NUT
5 - QUARTER TRIM PANEL
6 - STORAGE BIN
7 - BRACKET
8 - B-PILLAR LOWER TRIM
9 - C-PILLAR UPPER TRIM
10 - SNAP-IN NUT

DOOR SILL SCUFF PLATE

REMOVAL

(1) Using a trim stick or other suitable tool, carefully pry up the scuff plate from the door sill (Fig. 5).
(2) Remove the scuff plate.



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Fig. 5 Door Sill Scuff Plates

1 - B-PILLAR
2 - FRONT DOOR SCUFF PLATE
3 - REAR DOOR SCUFF PLATE

INSTALLATION

(1) Install the scuff plate on the door sill (Fig. 5).
(2) Press the molded in snap retainers into the door sill.

DOOR SILL TRIM

REMOVAL

The sill trim molding is held in place with molded in snap retainers (Fig. 6).
(1) Using a trim stick or other suitable device, carefully pry up one corner of the sill trim.
(2) Grasp the edge of the trim and pull up gently to release the snap retainers.

INSTALLATION

(1) Position the sill molding on the door sill.
(2) Press the snap retainers into place.

DOOR SILL TRIM (Continued)

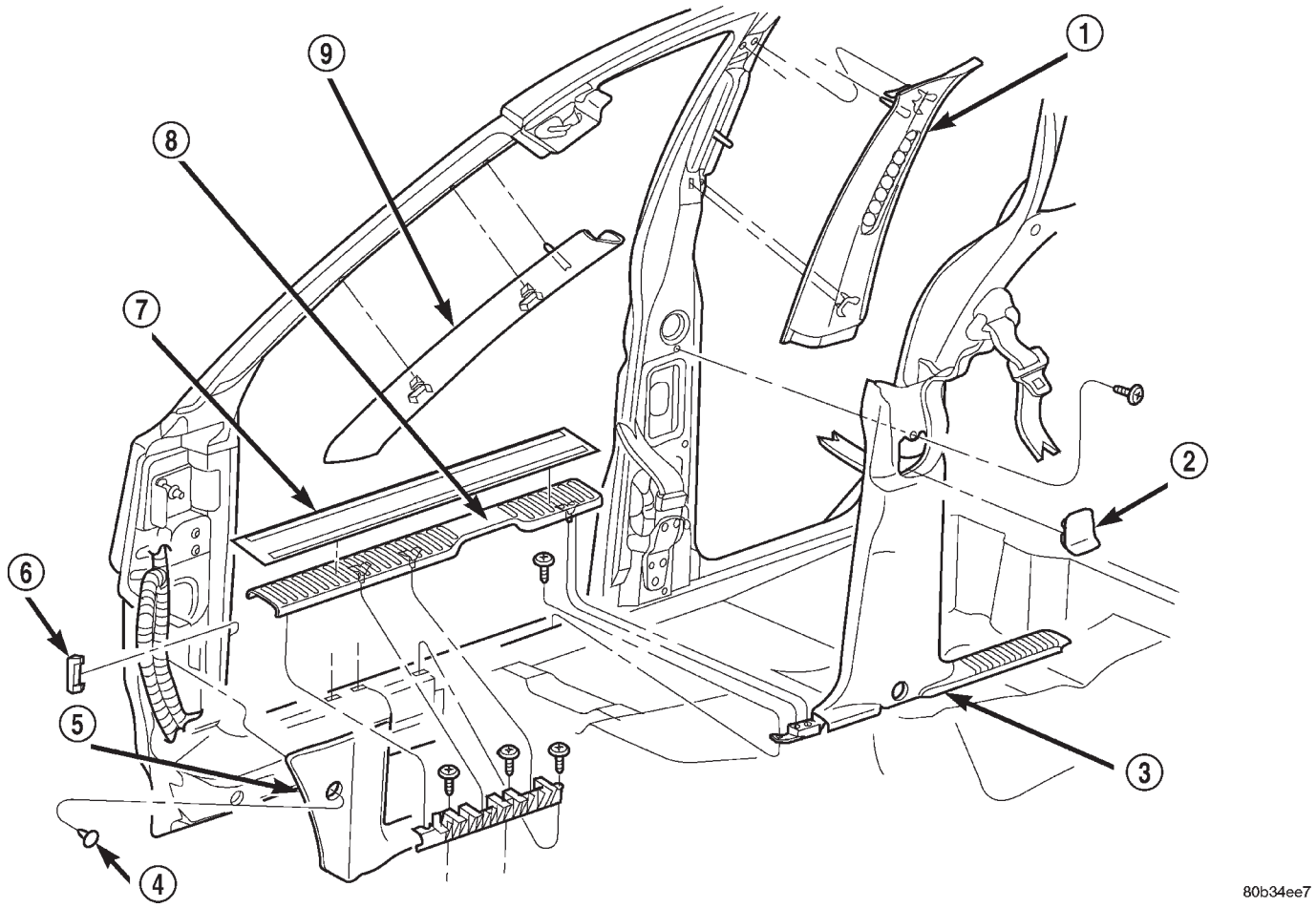


Fig. 6 Sill Trim Molding

1 - B-PILLAR UPPER TRIM
2 - ACCESS COVER
3 - B-PILLAR LOWER TRIM
4 - PLASTIC NUT
5 - COWL LOWER TRIM
6 - CLIP
7 - SCUFF PLATE
8 - SILL TRIM
9 - A-PILLAR TRIM

D-PILLAR TRIM

REMOVAL

The D-pillar trim is attached to the D-pillar with spring clips (Fig. 7).

(1) Remove liftgate opening upper trim panel (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL).

(2) Grasp D-pillar trim and pull outward from D-pillar.

(3) Separate D-pillar trim from D-pillar.

INSTALLATION

(1) Position D-pillar trim panel at D-pillar and press into place.

(2) Install upper liftgate opening trim panel (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION).

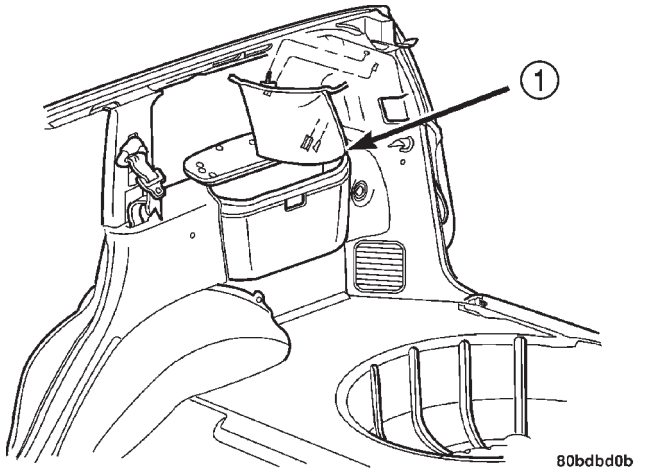


Fig. 7 D Pillar Upper Trim

1 - D PILLAR UPPER TRIM

FLOOR CONSOLE

REMOVAL

CAUTION: The ACM should be depowered by disconnecting the negative battery cable in any operation requiring the key to be turned "ON", while working in the console area. E.G. console, carpet, or seat removal or installation; shifter linkage adjustment or replacement; parking brake cable replacement or adjustment. Failure to take proper precautions could result in accidental airbag deployment and possible personal injury.

(1) Set park brake.
(2) Place transmission shift lever and transfer case lever in full rearward position.
(3) Remove mat from front bin and remove screws attaching front of console to floor (Fig. 8).
(4) Remove screws attaching rear bin to console.
(5) Remove rear bin.
(6) Pull rear passenger cupholder outward to access screws.
(7) Remove screws attaching rear of console to floor.
(8) Lift the console upward and rearward.
(9) Remove console from vehicle.

INSTALLATION

CAUTION: The ACM should be depowered by disconnecting the negative battery cable in any operation requiring the key to be turned "ON", while working in the console area. E.G. console, carpet, or seat removal or installation; shifter linkage adjustment or replacement; parking brake cable replacement or adjustment. Failure to take proper precautions could result in accidental airbag deployment and possible personal injury.

(1) Position console in vehicle. Ensure rear passenger HEVAC duct is engaged.
(2) Install screws attaching rear of console to floor.
(3) Position rear bin in console.
(4) Install screws attaching rear bin to console.
(5) Install screws attaching front of console to floor and place front bin mat in front bin.
(6) Return transmission shift lever and transfer case lever to original position.
(7) Release park brake.

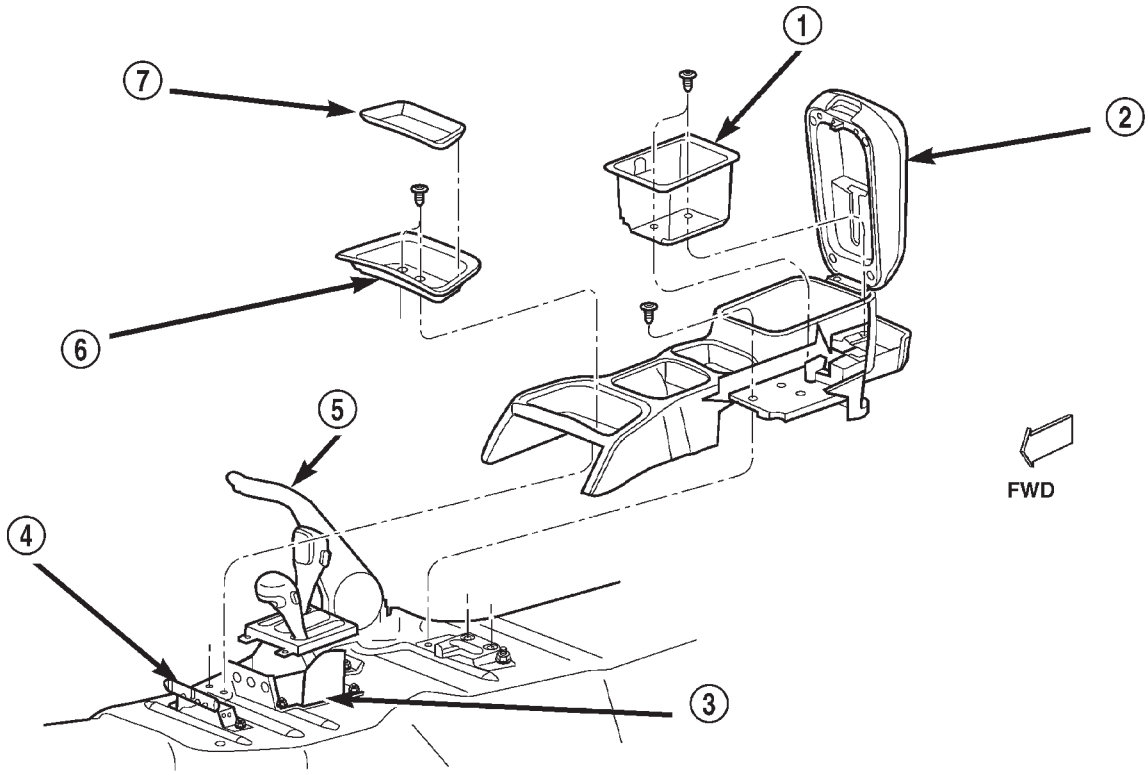


Fig. 8 Floor Console

1 - REAR BIN
2 - CONSOLE LID
3 - SHIFTER CONSOLE
4 - BRACKET
5 - PARKING BRAKE
6 - FRONT PIN
7 - MAT

HEADLINER

REMOVAL

CAUTION: The headliner is a one-piece, molded component. It has limited flexibility and must not be bent. Damage may possibly result.

(1) Record radio presets and disconnect negative battery cable.
(2) Remove A pillar trim moldings (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
(3) Remove B pillar upper trim moldings (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).
(4) Remove C pillar trim moldings (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).
(5) Remove D pillar trim molding (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).
(6) Remove the sun visors (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL).
(7) Disconnect the vanity lamp electrical connector.
(8) Remove assist handles from roof rails (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - REMOVAL).
(9) Remove dome lamp and overhead console, if equipped.
(10) Remove rear cargo/dome lamp.
(11) Remove sun roof pinch welt, if equipped.
(12) Disengage rear washer hose from liftgate (Fig. 9).
(13) Disengage the wire harness connectors at rear of headliner.
(14) Disconnect the rear washer hose at the left “A” pillar (Fig. 10).
(15) Disengage the wire harness for the sunroof, if equipped.
(16) Fold down the rear seats, move the front seats full forward, and lower the front seat backs.
(17) Partially lower the headliner and disengage the sunroof drain hoses, if equipped (Fig. 11).
(18) With the aid of an assistant, remove the headliner through the liftgate opening.

INSTALLATION

(1) With the aid of an assistant, position the headliner in the vehicle.
(2) Connect the sunroof drain hoses, if equipped.
(3) Connect the sunroof harness, the rear wire harnesses, and the washer hose at the “A” pillar and at the liftgate.
(4) Install the sunroof pinch welt, if equipped.
(5) Install the roof rail assist handles (Refer to 23 - BODY/INTERIOR/ASSIST HANDLE - INSTALLATION).

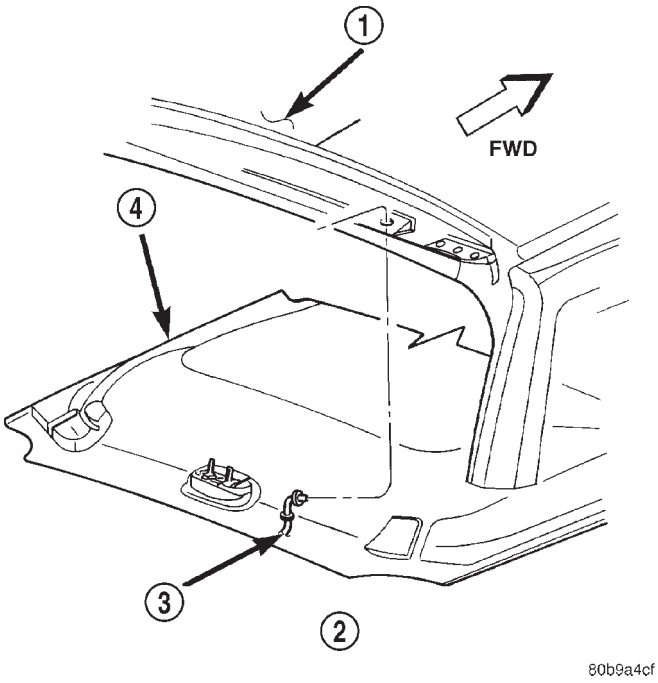


Fig. 9 Liftgate Washer Hose Routing at Rear of Headliner

1 - ROOF
2 - REAR WASHER HOSE ROUTING
3 - REAR WASHER HOSE
4 - HEADLINER

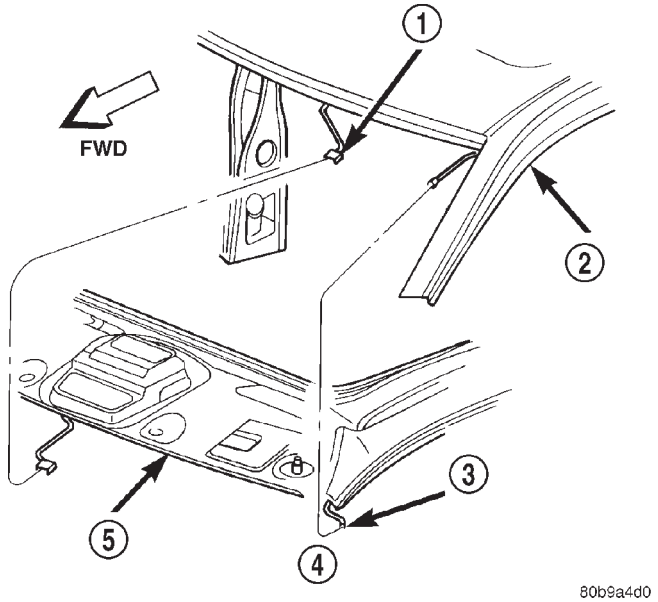


Fig. 10 Rear Liftgate Washer Hose Routing at A Pillar

1 - OVERHEAD CONSOLE WIRE HARNESS
2 - ROOF
3 - REAR WASHER HOSE
4 - REAR WASHER HOSE ROUTING
5 - HEADLINER

HEADLINER (Continued)

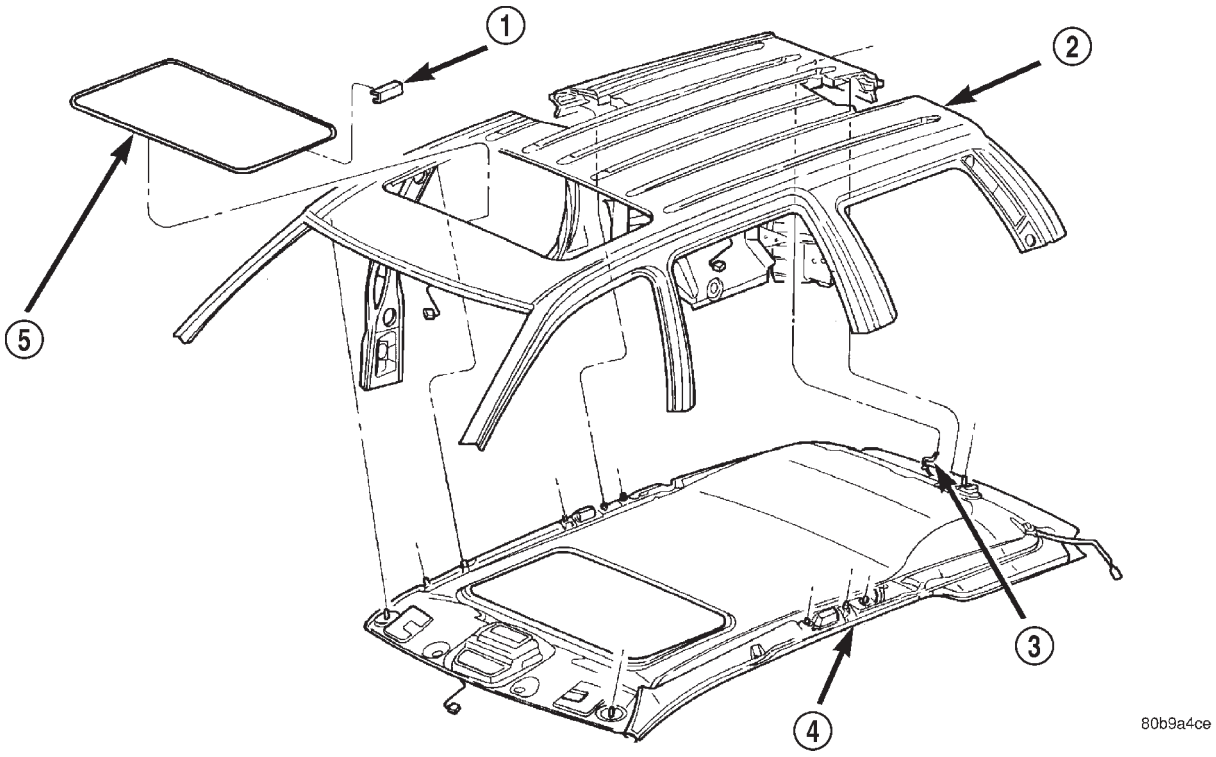


Fig. 11 Headliner

1 - SUNROOF PINCH WELT
2 - ROOF
3 - REAR WASHER HOSE
4 - HEADLINER
5 - SUNROOF

(6) Install the sun visors (Refer to 23 - BODY/INTERIOR/SUN VISOR - INSTALLATION).

(7) Install the overhead console, if equipped.

(8) Install the rear cargo/dome lamp.

(9) Install the D pillar trim (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).

(10) Install the C pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).

(11) Install the upper B pillar trim (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).

(12) Install the A pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

(13) Connect the negative battery cable.

LIFTGATE OPENING UPPER TRIM

REMOVAL

The upper liftgate opening trim is held on with spring clips.

(1) Grasp the rear of the trim piece and pull down and back to disengage clips (Fig. 12).

(2) Slide the trim piece to the rear to disengage headliner locating hooks.

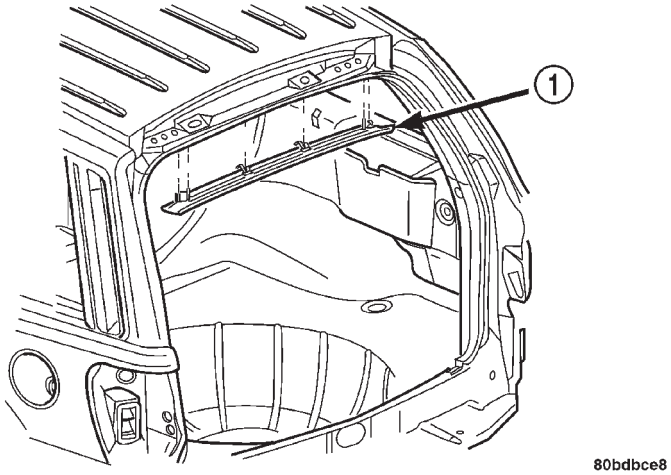


Fig. 12 Upper Liftgate Opening Trim

1 - UPPER LIFTGATE OPENING TRIM

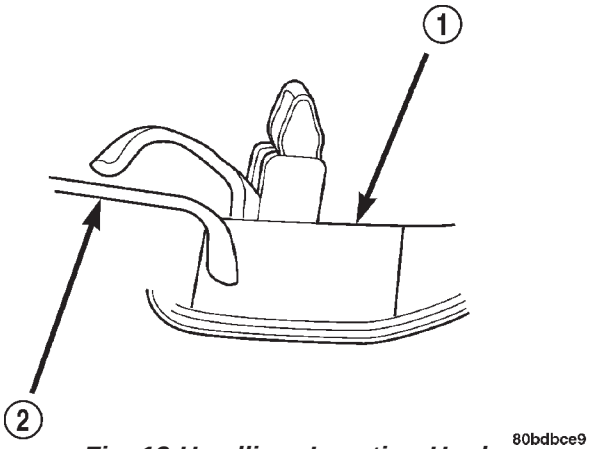


Fig. 13 Headliner Locating Hooks

1 - UPPER LIFTGATE OPENING TRIM
2 - HEADLINER

INSTALLATION

The liftgate upper opening trim piece is equipped with headliner locating hooks (Fig. 13).

(1) Align the locating hooks with the slots in the headliner.

(2) Engage the spring clips and press the liftgate upper opening trim panel into place.

QUARTER TRIM PANEL

REMOVAL

(1) Move rear seat to cargo position.

(2) If equipped, remove sunshade cover.

(3) Open liftgate.

(4) Remove upper and lower liftgate opening trim panels (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - REMOVAL).

(5) Remove D-pillar upper trim (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL).

(6) Remove storage bin (right side only) (Refer to 23 - BODY/INTERIOR/REAR STORAGE BOX - REMOVAL).

(7) Remove C-pillar upper trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).

(8) Remove mounting screws.

(9) Pull quarter trim panel forward and disengage connectors for CD player and power outlet, if equipped.

(10) Pull quarter trim panel extension in the rear door opening upward.

(11) Remove rear quarter trim panel.

INSTALLATION

(1) Position quarter trim panel, engage connectors for CD player and power outlet, if equipped, and align screw holes.

(2) Install quarter trim panel.

(3) Install C-pillar upper trim panel (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).

(4) Install storage bin (Refer to 23 - BODY/INTERIOR/REAR STORAGE BOX - INSTALLATION).

(5) Install D-pillar upper trim panel (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION).

(6) Install upper and lower liftgate opening trim panels (Refer to 23 - BODY/INTERIOR/LIFTGATE OPENING UPPER TRIM - INSTALLATION).

(7) If equipped, install sunshade cover.

(8) Install cargo loops.

(9) Move the rear seat to the upright position.

REAR STORAGE BOX

REMOVAL

(1) Open the storage bin lid and remove screws on each side of the lid hinge.

(2) Pull upward sharply on the bottom of the bin to disengage hooks.

(3) Raise bin and move inboard to disengage the quarter trim panel.

REAR STORAGE BOX (Continued)

INSTALLATION

(1) Position the bin hooks high in the slots on the quarter trim panel.
(2) Push downward until the bin snaps into place.
(3) Install the hinge screws.

REAR VIEW MIRROR

REMOVAL

(1) If equipped, disconnect mirror harness connector.
(2) Loosen the mirror base setscrew (Fig. 14).
(3) Slide the mirror base upward and off the bracket.

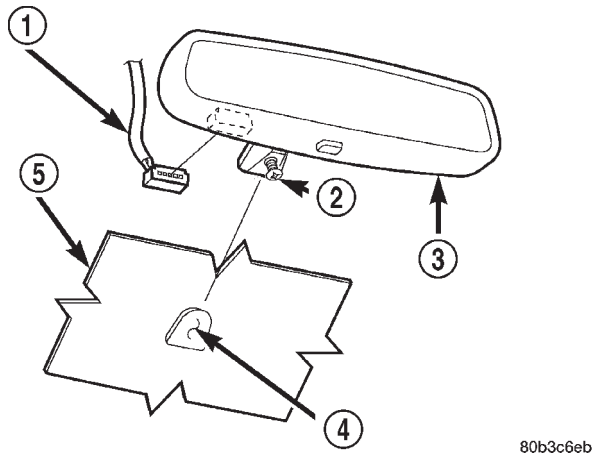


Fig. 14 Rear View Mirror

1 - CONNECTOR
2 - SCREW
3 - REAR VIEW MIRROR
4 - SUPPORT BUTTON
5 - WINDSHIELD

INSTALLATION

INSTALLATION

(1) Position the mirror base at the bracket and slide it downward onto the support bracket (Fig. 14).
(2) Tighten the setscrew 1 N·m (15 in. lbs.) torque.
(3) If equipped, connect mirror harness connector.

INSTALLATION - REARVIEW MIRROR SUPPORT BRACKET

(1) Mark the position for the mirror bracket on the outside of the windshield glass with a wax pencil.
(2) Clean the bracket contact area on the glass. Use a mild powdered cleanser on a cloth saturated with isopropyl (rubbing) alcohol. Finally, clean the glass with a paper towel dampened with alcohol.
(3) Sand the surface on the support bracket with fine grit-sandpaper. Wipe the bracket surface clean with a paper towel.
(4) Apply accelerator to the surface on the bracket according to the following instructions:
  (a) Crush the vial to saturate the felt applicator.
  (b) Remove the paper sleeve.
  (c) Apply accelerator to the contact surface on the bracket.
  (d) Allow the accelerator to dry for five minutes.
  (e) Do not touch the bracket contact surface after the accelerator has been applied.
(5) Apply adhesive accelerator to the bracket contact surface on the windshield glass. Allow the accelerator to dry for one minute. Do not touch the glass contact surface after the accelerator has been applied.
(6) Install the bracket according to the following instructions:
  (a) Apply one drop of adhesive at the center of the bracket contact-surface on the windshield glass.
  (b) Apply an even coat of adhesive to the contact surface on the bracket.
  (c) Align the bracket with the marked position on the windshield glass.
  (d) Press and hold the bracket in place for at least one minute.

NOTE: Verify that the mirror support bracket is correctly aligned, because the adhesive will cure rapidly.

(7) Allow the adhesive to cure for 8-10 minutes. Remove any excess adhesive with an alcohol-dampened cloth.
(8) Allow the adhesive to cure for an additional 8-10 minutes before installing the mirror.

SUN VISOR

REMOVAL

(1) Remove screws attaching sunvisor arm support bracket to headliner and roof panel.
(2) Disengage electrical connections for vanity mirror, if equipped.
(3) Detach sunvisor from support bracket.
(4) Remove sunvisor from vehicle.
(5) Remove retaining screw and support bracket.

INSTALLATION

(1) Install the retaining screw and support bracket.
(2) Position the sunvisor in the vehicle.
(3) Connect the electrical harness for the lighted vanity mirror, if equipped.
(4) Attach the sunvisor to the support bracket.
(5) Install the support bracket w/sunvisor onto the headliner and roof panel.

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PAINT

SPECIFICATIONS - PAINT CODES

EXTERIOR COLORS

EXTERIOR COLOR	DAIMLERCHRYSLER CODE
Dark Garnet Red Pearlcoat	XRV
Inferno Red Tinted Pearlcoat	WEL
Woodland Brown Satin Glow	YUB
Onyx Green Pearlcoat	YJR
Steel Blue Pearlcoat	XBQ
Patriot Blue Pearlcoat	WBT
Silverstone Metallic Clearcoat	XS5
Graphite Metallic Clearcoat	ZDR
Black Clearcoat	DX8
Stone White Clearcoat	SW1

INTERIOR COLORS

INTERIOR COLOR	DAIMLERCHRYSLER CODE
Dark Slate Grey	DV
Taupe	L5
Sandstone	T5
Dark Slate/Light Slate	DB

LAREDO FASCIA/CLADDING COLORS

COLOR	DAIMLERCHRYSLER CODE
Dark Grey Metallic	XS9

PAINT CODE

DESCRIPTION

Exterior vehicle body colors are identified on the Body Code plate. The plate is located on the in the engine compartment and attached to the top of the right frame rail. Refer to the Introduction section at the front of this manual for body code plate description. The paint code is also identified on the Vehicle Safety Certification Label which is located on the drivers door shut face. The first digit of the paint code listed on the vehicle indicates the sequence of application, i.e.: P = primary coat, Q = secondary coat.

BASE COAT/CLEAR COAT FINISH

DESCRIPTION

The original equipment finish is a multi-step process that involves cleaning, electrodeposition (e-coat), base coat, and clear coat steps. Additionally, selected areas of the vehicle may be coated with an anti-chip finish.

PAINT TOUCH-UP

DESCRIPTION

When a painted metal surface has been scratched or chipped, it should be touched-up as soon as possible to avoid corrosion. For best results, use Mopar® Scratch Filler/Primer, Touch-Up Paints and Clear Top Coat. Refer to Introduction group of this manual for Body Code Plate information.

WARNING: USE AN OSHA APPROVED BREATHING FILTER WHEN SPRAYING PAINT OR SOLVENTS IN A CONFINED AREA. PERSONAL INJURY CAN RESULT.

OPERATION

(1) Scrape loose paint and corrosion from inside scratch or chip.

(2) Clean affected area with Mopar® Tar/Road Oil Remover, and allow to dry.

(3) Fill the inside of the scratch or chip with a coat of filler/primer. Do not overlap primer onto good surface finish. The applicator brush should be wet enough to puddle-fill the defect without running. Do not stroke brush applicator on body surface. Allow the filler/primer to dry hard.

(4) Cover the filler/primer with color touch-up paint. Do not overlap touch-up color onto the original color coat around the scratch or chip. Butt the new color to the original color, if possible. Do not stroke applicator brush on body surface. Allow touch-up paint to dry hard.

(5) On vehicles without clear coat, the touch-up color can be lightly finesse sanded (1500 grit) and polished with rubbing compound.

(6) On vehicles with clear coat, apply clear top coat to touch-up paint with the same technique as described in Step 4. Allow clear top coat to dry hard. If desired, Step 5 can be performed on clear top coat.

WARNING: AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT. AVOID PROLONGED SKIN CONTACT WITH PETROLEUM OR ALCOHOL – BASED CLEANING SOLVENTS. PERSONAL INJURY CAN RESULT.

FINESSE SANDING/BUFFING & POLISHING

DESCRIPTION

CAUTION: Do not remove more than .5 mils of clearcoat finish, if equipped. Base coat paint must retain clear coat for durability.
Use a Paint Thickness Gauge #PR-ETG-2X or equivalent to determine film thickness before and after the repair.

Minor acid etching, orange peel, or smudging in clearcoat or single-stage finishes can be reduced with light finesse sanding, hand buffing, and polishing. **If the finish has been finesse sanded in the past, it cannot be repeated. Finesse sanding operation should be performed by a trained automotive paint technician.**

SEATS

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FRONT HEADREST

REMOVAL

(1) Depress head restraint release button and lift head restraint to full up position.

(2) Using a small flat blade, depress tab on right side head restraint release button and using your hand, simultaneously press tab on left side head restraint release button (Fig. 1) and pull head restraint up to separate from seat back.

INSTALLATION

(1) Position head restraint in seat back, press tab on left side head restraint release button and push down head restraint to secure.

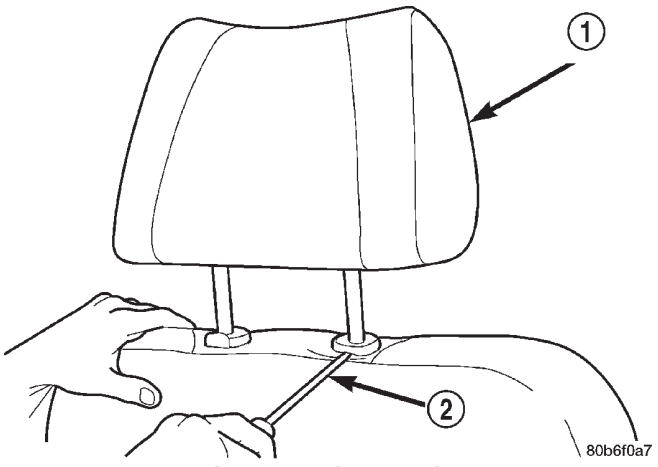


Fig. 1 Head Restraint

1 - HEAD RESTRAINT
2 - FLAT BLADE

FRONT HEADREST SLEEVE

REMOVAL

(1) Remove head restraint (Refer to 23 - BODY/SEATS/FRONT HEADREST - REMOVAL).
(2) Remove seat back cover (Refer to 23 - BODY/SEATS/FRONT SEAT BACK COVER - REMOVAL).
(3) Remove hog rings attaching cushion pad to seat back frame (Fig. 2).
(4) Remove cushion pad from seat back frame.
(5) Rotate head restraint sleeve 1/4 turn counterclockwise to release retaining tab.
(6) Pull sleeve from seat back frame (Fig. 3).

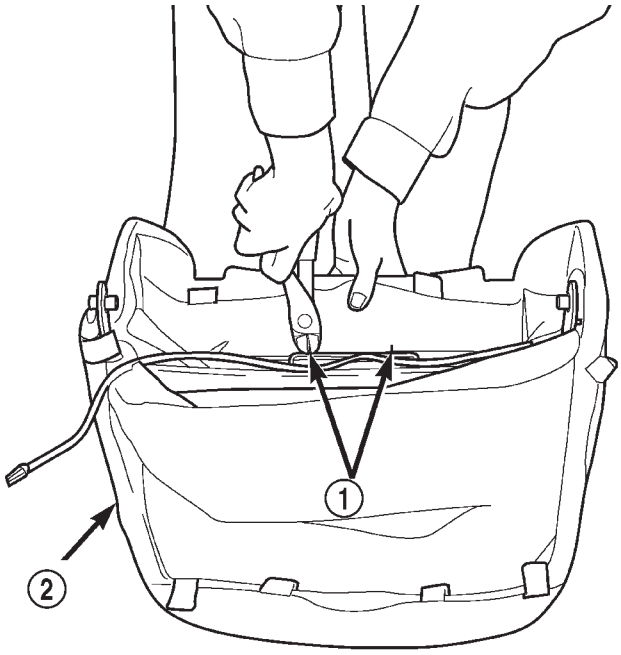


Fig. 2 Cushion Pad

1 - HOG RING
2 - SEAT BACK CUSHION PAD

INSTALLATION

(1) Position sleeve in seat back frame.
(2) Rotate head restraint sleeve 1/4 turn clockwise to engage retaining tab.
(3) Install cushion pad onto seat back frame.
(4) Install hog rings attaching cushion pad to seat back frame.
(5) Install seat back cover (Refer to 23 - BODY/SEATS/FRONT SEAT BACK COVER - INSTALLATION).
(6) Install head restraint (Refer to 23 - BODY/SEATS/FRONT HEADREST - INSTALLATION).

FRONT SEAT

REMOVAL

(1) Move seat to full rearward position.

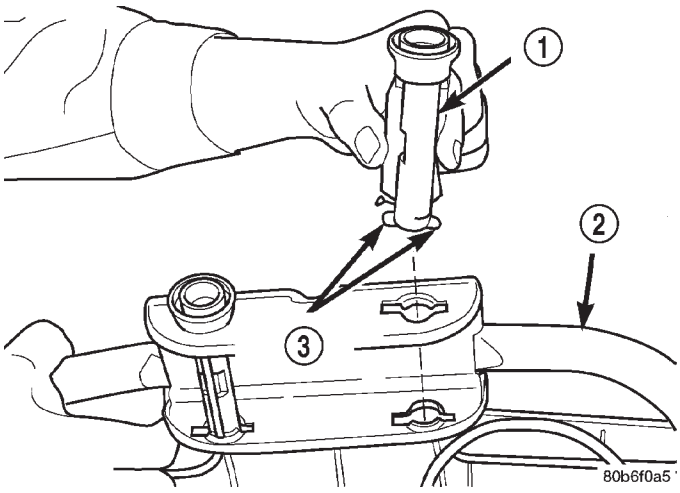


Fig. 3 Head Restraint Sleeve

1 - HEAD RESTRAINT SLEEVE
2 - SEAT BACK FRAME
3 - RETAINING TAB

(2) Remove front bolts attaching seat to floor pan (Fig. 4).
(3) Move seat to full forward position.
(4) Using a trim stick, pry cover from seat track (power seat only).
(5) Remove rear bolts attaching seat to floor pan.
(6) If equipped, disconnect power seat wire harness connector.
(7) Remove seat from vehicle.

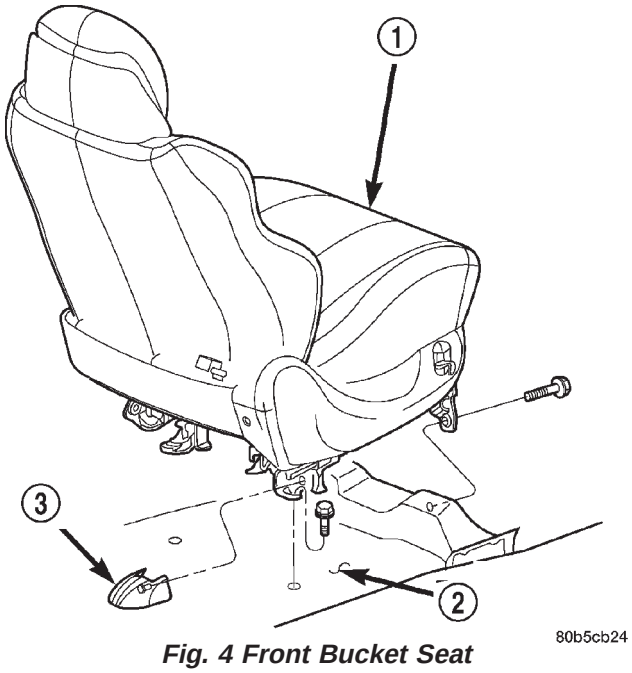


Fig. 4 Front Bucket Seat

1 - POWER BUCKET SEAT
2 - FLOOR PAN
3 - SEAT TRACK COVER

FRONT SEAT (Continued)

INSTALLATION

(1) Position seat on floor pan.
(2) If equipped, connect power seat wire harness connector.
(3) Install rear bolts attaching seat to floor pan. Tighten bolts to 40 N·m (30 ft. lbs.) torque.
(4) If equipped, install cover on seat track.
(5) Move seat to full rearward position.
(6) Install front bolts attaching seat to floor pan. Tighten bolts to 40 N·m (30 ft. lbs.) torque.

FRONT SEAT BACK

REMOVAL

(1) Move seat to full rearward position.
(2) Remove inboard bolt attaching seat back frame to seat cushion frame.
(3) Move seat to full forward position.
(4) Move seat back to full recline position.
(5) Remove screws attaching seat side shield to seat frame.
(6) Disconnect wire harness connector from recliner motor, if equipped.
(7) From the underside of the seat, disconnect the wire harness connector for the power lumber and/or heated seat, if equipped.
(8) Remove outboard bolts attaching recliner to seat cushion frame.
(9) Route the power lumber and/or heated seat harness through the seat cushion cover, if equipped.
(10) Separate seat back from seat cushion.

INSTALLATION

(1) Position seat back on seat cushion.
(2) Route the power lumber and heater harness through the seat cushion cover, if equipped.
(3) Install recliner bolts attaching seat back frame to seat cushion frame. Tighten bolts to 28 N·m (20 ft. lbs.) torque.
(4) Install the inboard bolt attaching seat back frame to seat cushion frame. Tighten bolt to 47N·m (35 ft.lbs.).
(5) Connect wire harness connector to recliner motor and/or heated seat, if equipped.
(6) From the underside of the seat, connect the power lumber and/or heated seat wire harness connector to the seat harness, if equipped.
(7) Install screws attaching seat side shield to seat frame.

FRONT SEAT BACK COVER

REMOVAL

(1) Remove head restraint (Refer to 23 - BODY/SEATS/FRONT HEADREST - REMOVAL).
(2) Using a trim stick, carefully pry head restraint release button caps from the top of seat back.
(3) Remove seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - REMOVAL).
(4) Disengage J-strap at base of seat back.
(5) Slide hand between the face of the seat back pad and the cushion cover and carefully separate hook and loop fastener (Fig. 5).
(6) Roll cover upward and disengage hog rings.
(7) Roll cover upward to top of seat back.
(8) Separate cover from seat back.

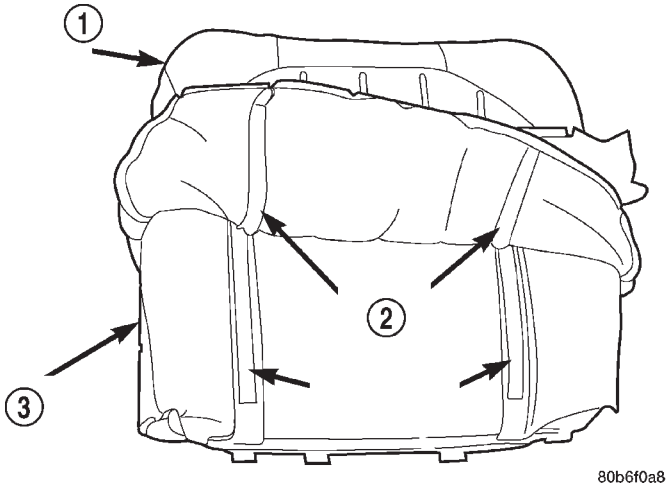


Fig. 5 Seat Back Cover

1 - SEAT BACK COVER
2 - HOOK AND LOOP FASTENER
3 - SEAT BACK PAD

INSTALLATION

(1) Position cover inside-out at the top of seat back.
(2) Roll cover downward.
(3) Engage hog rings.
(4) Align seat back cover with hook and loop fasteners and secure.
(5) Roll cover downward.
(6) Engage J-strap at base of seat back.
(7) Install seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - INSTALLATION).

NOTE: The taller head restraint release button cap is positioned on the left hand side and the head restraint button cap with the hidden button is positioned on the right hand side.

FRONT SEAT BACK COVER (Continued)

(8) Position head restraint release button caps on head restraint sleeves and press to secure.

(9) Install head restraint (Refer to 23 - BODY/SEATS/FRONT HEADREST - INSTALLATION).

FRONT SEAT CUSHION/COVER

REMOVAL

(1) Remove seat from vehicle (Refer to 23 - BODY/SEATS/FRONT SEAT - REMOVAL).

(2) Remove seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - REMOVAL).

(3) Disengage J-straps attaching cushion cover to seat cushion frame.

(4) Disengage hog rings attaching cushion cover to cushion frame at rear of seat along bottom of cushion cover (Fig. 6).

(5) Roll up edges of cover and route seat function switches through access hole on outboard side of seat cushion, if equipped.

(6) Disengage seat cushion heater element connector, if equipped.

(7) Disengage hog rings attaching cover to cushion along cover insert.

(8) Separate seat cushion cover from seat cushion.

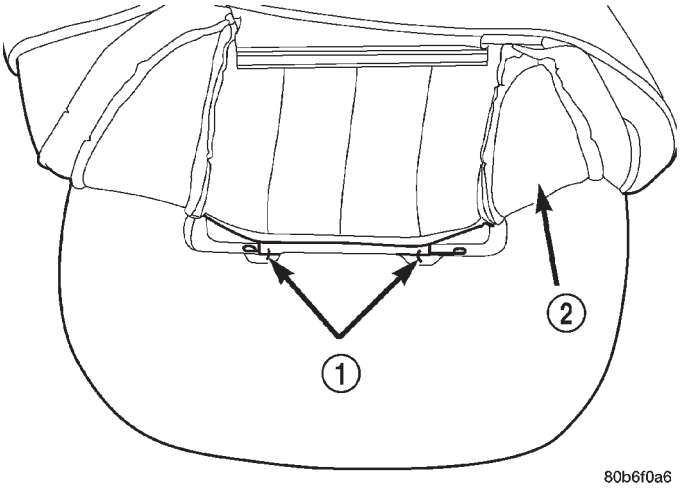


Fig. 6 Seat Cushion Cover

1 - HOG RING
2 - CUSHION COVER

INSTALLATION

(1) Position seat cover on cushion.

(2) Engage hog rings attaching cushion cover to cushion along insert.

(3) Engage seat cushion heater element connector, if equipped.

(4) Route seat function switches through access hole on outboard side of seat cushion, if equipped.

(5) Engage J-straps attaching cushion cover to seat cushion frame.

(6) Engage hog rings attaching cushion cover to cushion frame.

(7) Install seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - INSTALLATION).

(8) Install seat (Refer to 23 - BODY/SEATS/FRONT SEAT - INSTALLATION).

FRONT SEAT SIDE SHIELD

REMOVAL

(1) Remove screws attaching side shield to seat frame.

(2) Disconnect wire harness connectors from power seat and power lumbar switches, if equipped.

(3) Separate side shield from seat.

INSTALLATION

(1) Position side shield on seat.

(2) Connect wire harness connectors to power seat and power lumbar switches, if equipped.

(3) Install screws attaching side shield to seat frame.

SEAT TRACK & RECLINER ASSEMBLY

REMOVAL

(1) Remove seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - REMOVAL).

(2) Disengage J-strap at base of seat back.

(3) Roll seat back cover upward to access bolts attaching recliner to seat back frame.

(4) Remove bolts attaching recliner to seat back frame.

(5) Separate recliner from seat back.

INSTALLATION

(1) Position recliner on seat back.

(2) Install bolts attaching recliner to seat back frame. Tighten bolts to 28 N·m (20 ft. lbs.) torque.

(3) Roll seat back cover downward.

(4) Engage J-strap at base of seat back.

(5) Install seat back (Refer to 23 - BODY/SEATS/FRONT SEAT BACK - INSTALLATION).

SEAT TRACK ADJUSTER

REMOVAL

(1) Remove seat (Refer to 23 - BODY/SEATS/FRONT SEAT - REMOVAL).

(2) Remove side shield (Refer to 23 - BODY/SEATS/FRONT SEAT SIDE SHIELD - REMOVAL).

(3) Remove nuts attaching seat track adjuster to seat cushion frame (Fig. 7) and (Fig. 8). Roll cushion trim cover up to access the two front nuts.

(4) Disengage clips attaching wire harness to adjuster.

(5) Disengage seat memory module connector, if equipped.

(6) Separate seat track from seat cushion frame.

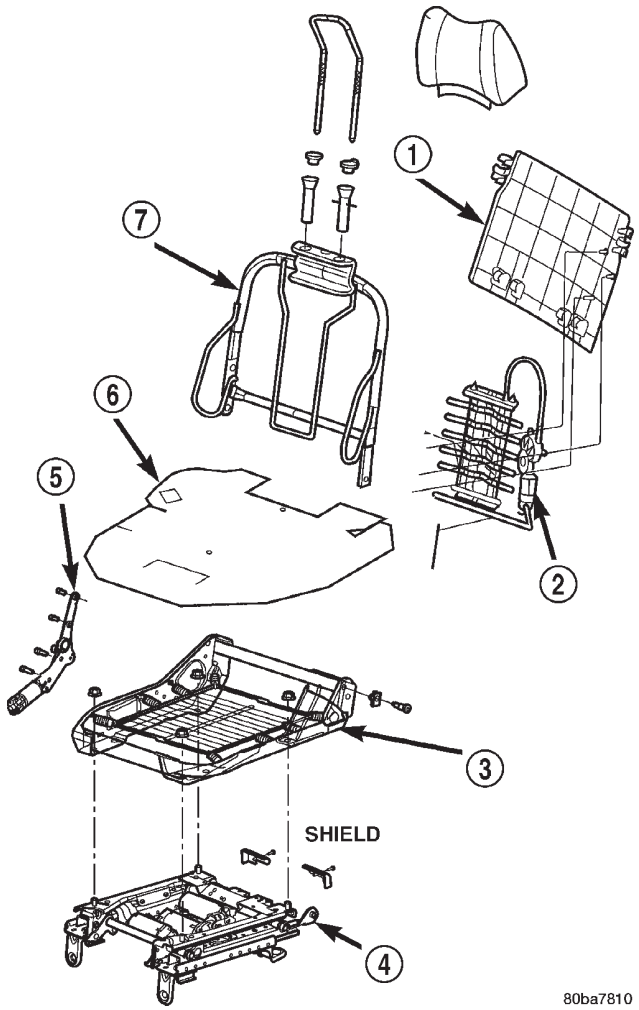


Fig. 7 Seat Track Adjuster—Power

1 - BACK PANEL
2 - LUMBAR ASSEMBLY
3 - SEAT CUSHION FRAME
4 - POWER SEAT TRACK ADJUSTER
5 - POWER RECLINER
6 - SEAT CUSHION PAD
7 - SEAT BACK FRAME

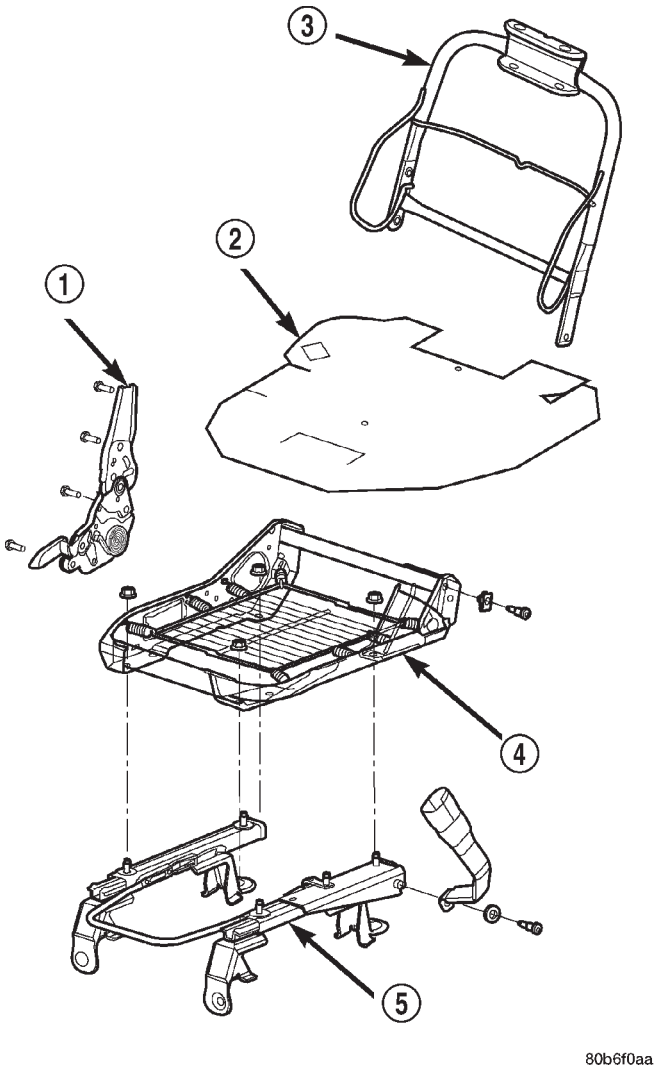


Fig. 8 Seat Track Adjuster — Manual

1 - MANUAL RECLINER
2 - SEAT CUSHION PAD
3 - SEAT BACK FRAME
4 - SEAT CUSHION FRAME
5 - MANUAL SEAT TRACK ADJUSTER

INSTALLATION

(1) Transfer seat memory module, if equipped.

(2) Position seat track on seat cushion frame.

(3) Route harness through frame and engage clips attaching wire harness to adjuster.

(4) Engage seat memory module connector, if equipped.

(5) Install nuts attaching seat track adjuster to seat cushion frame. Tighten nuts to 28 N·m (20 ft. lbs.) torque.

(6) Install the side shield (Refer to 23 - BODY/SEATS/FRONT SEAT SIDE SHIELD - INSTALLATION).

(7) Install seat (Refer to 23 - BODY/SEATS/FRONT SEAT - INSTALLATION).

REAR HEADREST

REMOVAL

(1) Depress head rest release button and lift head rest to full up position.

(2) Using a small flat blade, depress tab on outboard side head rest release button and using your hand, simultaneously press tab on inboard side head rest release button (Fig. 9) and pull head rest up to separate from seat back.

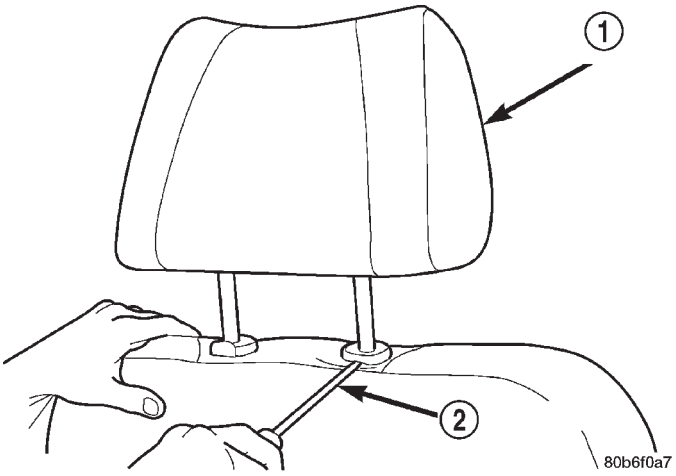


Fig. 9 Head Rest

1 - HEAD RESTRAINT
2 - FLAT BLADE

INSTALLATION

(1) Position head rest in seat back, press tab on inboard side head rest release button cap and push down head restraint to secure.

REAR HEADREST RELEASE KNOB

REMOVAL

(1) Using a razor knife or equivalent, cut the release knob from the release lever.

(2) Pull the release knob from the lever (Fig. 10).

INSTALLATION

(1) Position the release knob on the lever and press to snap in place.

REAR HEADREST FOLDING MECHANISM

REMOVAL

(1) Remove the head rest (Refer to 23 - BODY/SEATS/REAR HEADREST - REMOVAL).

(2) Remove folding mechanism cover (Fig. 10).

(3) Remove the screws that secure the head rest bun to the folding mechanism.

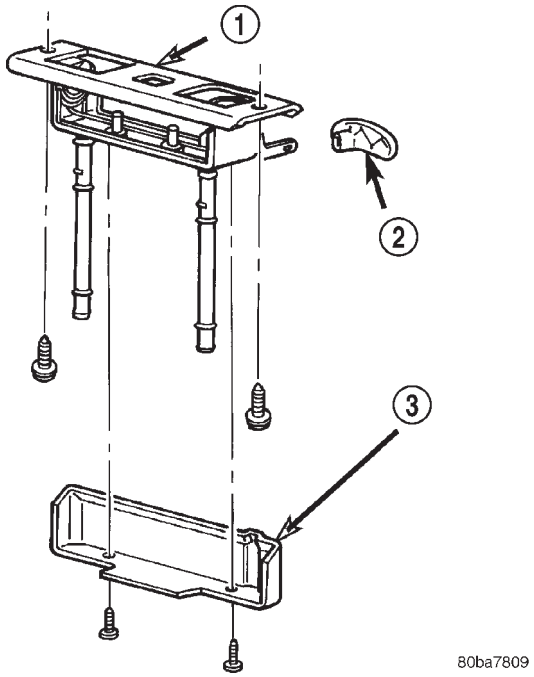


Fig. 10 Rear Seat Head Rest Folding Mechanism

1 - REAR SEAT HEAD REST FOLDING MECHANISM
2 - RELEASE KNOB
3 - FOLDING MECHANISM COVER

NOTE: The folding release knob is always located on the outboard side.

INSTALLATION

(1) Position the head rest bun on the folding mechanism and install the screws.

(2) Install the folding mechanism cover.

(3) Install the head restraint (Refer to 23 - BODY/SEATS/REAR HEADREST - INSTALLATION).

REAR HEADREST SLEEVE

REMOVAL

(1) Remove seat back (Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL).
(2) Remove head rest (Refer to 23 - BODY/SEATS/REAR HEADREST - REMOVAL).
(3) Remove head rest caps.
(4) Remove seat back cover (Refer to 23 - BODY/SEATS/REAR SEAT BACK COVER - REMOVAL).
(5) Rotate head rest sleeve 1/4 turn counter-clockwise to release retaining tab.
(6) Pull sleeve from seat back frame.

INSTALLATION

(1) Position sleeve in seat back frame.
(2) Rotate head rest sleeve 1/4 turn clockwise to engage retaining tab.
(3) Install seat back cover (Refer to 23 - BODY/SEATS/REAR SEAT BACK COVER - INSTALLATION).
(4) Install head rest caps.

NOTE: The head rest cap with the taller button is always on the inboard side of the seat back.

(5) Install the head rest (Refer to 23 - BODY/SEATS/REAR HEADREST - INSTALLATION).

NOTE: The folding head rest release knob is always on the outboard side.

(6) Install the seat back (Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION).

REAR SEAT BACK

REMOVAL

(1) Move rear seat cushions to forward cargo position.
(2) Remove bolts attaching seatback side support bracket to floor pan (right side) (Fig. 11).
(3) Tilt seatback forward, and slide it outboard to detach it from pin on center pivot bracket.
(4) Remove right side (60%) seatback from vehicle.
(5) Remove bolts attaching seatback side support bracket and center pivot bracket to floor pan (left side).
(6) Remove left side (40%) seatback from vehicle.

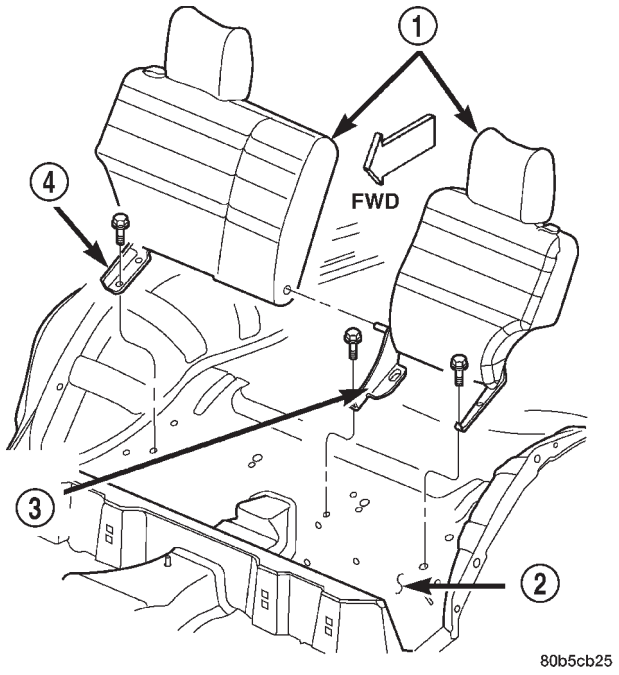


Fig. 11 Rear Seat Back

1 - SEAT BACK
2 - FLOOR PAN
3 - CENTER PIVOT BRACKET
4 - SIDE SUPPORT BRACKET

INSTALLATION

(1) Position left side (40%) seatback in vehicle.
(2) Position left side support bracket and center pivot bracket with bolt holes aligned and install bolts. Tighten bolts to 28 N·m (20 ft. lbs.) torque.
(3) Position right side (60%) seatback in vehicle.
(4) Install seatback onto center pivot bracket pin. Ensure seat back is properly engaged on the center pivot pin.
(5) Position right side support bracket with bolt holes aligned and install bolts. Tighten bolts to 28 N·m (20 ft. lbs.) torque.
(6) Return seat cushions to seating position.

REAR SEAT BACK COVER

REMOVAL

(1) Remove seat back (Refer to 23 - BODY/SEATS/REAR SEAT BACK - REMOVAL).
(2) Remove head restraint (Refer to 23 - BODY/SEATS/REAR HEADREST - REMOVAL).
(3) Remove head restraint caps.
(4) Disengage J-straps on outboard side of seat back.
(5) Disengage J-straps at base of seat back.
(6) Remove screws attaching latch release handle to seat back frame.
(7) Roll seat back cover upward.
(8) Disengage hook and loop fasteners attaching seat back cover to seat back pad (Fig. 12).
(9) Roll seat back cover upward and route latch release handle through seat back cover.
(10) Separate seat back cover from seat back.
(11) Separate seat back pad from seat back frame.

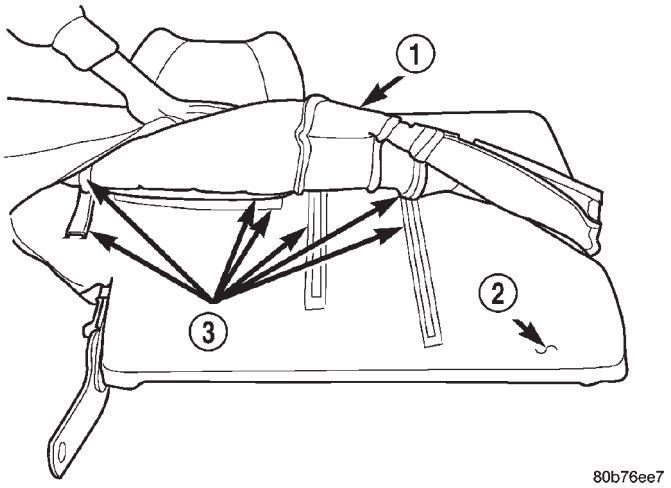


Fig. 12 Rear Seat Back Cover

1 - SEAT BACK COVER
2 - SEAT BACK PAD
3 - HOOK AND LOOP FASTENER

INSTALLATION

(1) Position seat back cover and pad on seat back frame.
(2) Route latch release handle through seat back cover.
(3) Roll seat back cover partially downward aligning holes in seat back cover for head restraint and latch release handle.
(4) Roll seat back cover downward align and engage hook and loop fasteners to seat back pad.
(5) Engage J-straps at base of seat back.
(6) Engage J-straps on outboard side of seat back.
(7) Install screws attaching latch release handle to seat back frame.
(8) Install head restraint (Refer to 23 - BODY/SEATS/REAR HEADREST - INSTALLATION).
(9) Install seat back (Refer to 23 - BODY/SEATS/REAR SEAT BACK - INSTALLATION).

REAR SEAT CUSHION

REMOVAL

(1) Disengage seat cushion at rear by pulling upward on release strap.
(2) Remove bolts attaching seat cushion to floor pan (Fig. 13).
(3) Remove seat cushion from vehicle.

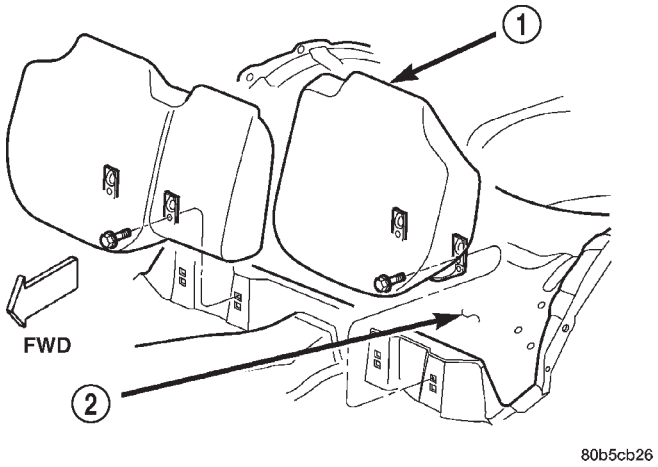


Fig. 13 Rear Seat Cushion

1 - SEAT CUSHION
2 - FLOOR PAN

INSTALLATION

(1) Position seat cushion in vehicle.
(2) Install bolts attaching seat cushion to floor pan. Tighten bolts to 11 N·m (8 ft. lbs.) torque.
(3) Lock seat cushion down by pressing firmly on center of cushion until latch engages.

REAR SEAT CUSHION COVER

REMOVAL

(1) Remove rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - REMOVAL).
(2) From the underside of the seat, disengage J-straps attaching cover to seat cushion base panel.
(3) Remove push-in fasteners attaching cushion cover to seat cushion base panel (Fig. 14).
(4) Roll back cover.
(5) Disengage hog rings attaching cushion cover to seat cushion foam pad.
(6) Separate cushion cover from seat cushion foam pad.

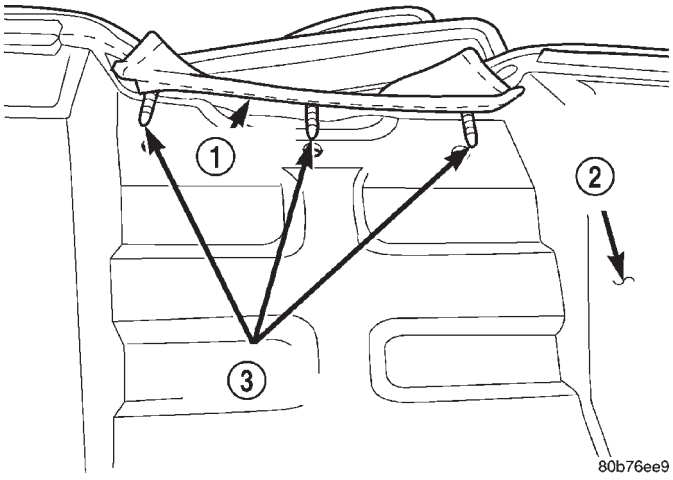


Fig. 14 Push-in Fasteners

1 - CUSHION COVER
2 - SEAT CUSHION BASE PANEL
3 - PUSH-IN FASTENER

INSTALLATION

(1) Position cushion cover on seat cushion foam pad.
(2) Engage hog rings attaching cushion cover to seat cushion foam pad.
(3) Align cushion cover and engage J-straps attaching cushion cover to seat cushion base panel.
(4) Install push-in fasteners attaching cushion cover to seat cushion base panel.
(5) Install rear seat cushion (Refer to 23 - BODY/SEATS/REAR SEAT CUSHION - INSTALLATION).

REAR SEAT CUSHION RELEASE LATCH

REMOVAL

(1) Unlatch seat and pivot seat upward.
(2) Disengage J-strap at seat cushion base panel.
(3) Roll back cushion cover.
(4) Remove screws attaching latch to base panel.
(5) Separate latch from base panel.

INSTALLATION

(1) Position latch on base panel.
(2) Install screws attaching latch to base panel. Tighten screws to 8 N·m (75 in. lbs.) torque.
(3) Route the cushion release strap from the loop on the latch through the slot in the trim cover.
(4) Engage J-strap at seat cushion base panel.
(5) latch seat.

FOLDING REAR SEAT BACK LATCH HANDLE

REMOVAL

(1) Pull handle to release latch.
(2) Remove screws attaching release handle to seat back frame.
(3) Using a small flat blade, disengage retainers securing latch release cable housing to latch release handle.
(4) Rotate cable end until barrel end aligns with key hole slot in latch release handle.
(5) Disengage cable barrel end from release handle.
(6) Separate latch release handle from seat back (Fig. 15).

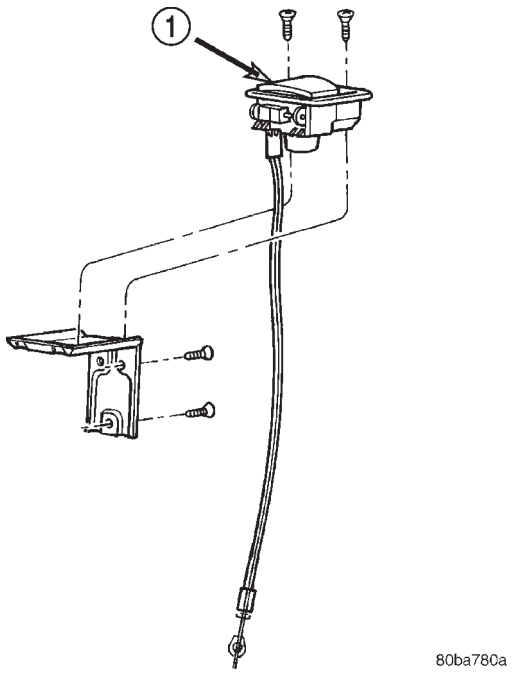


Fig. 15 Rear Seat Release Handle

1 - REAR SEAT FOLDING RELEASE HANDLE

FOLDING REAR SEAT BACK LATCH HANDLE (Continued)

INSTALLATION

(1) Route cable end into latch release handle.
(2) Rotate cable end until barrel end aligns with key hole slot in latch release handle and insert into handle.
(3) Engage retainers securing latch release cable housing to latch release handle.
(4) Position latch release handle in seat back. Ensure seat back cover is properly aligned.
(5) Install screws attaching release handle to seat back frame.

FOLDING REAR SEAT BACK LATCH/HINGE

REMOVAL

(1) Remove seat back (Refer to 23 - BODY/SEATS/ REAR SEAT BACK - REMOVAL).
(2) Disengage J-straps on outboard side of seat back.
(3) Disengage release cable from latch.
(4) Remove bolts attaching latch/hinge to seat back frame.
(5) Separate latch/hinge from seat back frame.

INSTALLATION

(1) Position latch/hinge on seat back frame.
(2) Install bolts attaching latch/hinge to seat back frame. Tighten bolts to 28 N·m (20 ft. lbs.) torque.
(3) Engage latch release cable.
(4) Engage J-straps on outboard side of seat back.
(5) Install seat back (Refer to 23 - BODY/SEATS/ REAR SEAT BACK - INSTALLATION).

STATIONARY GLASS

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DOOR GLASS

REMOVAL

(1) Remove door trim panel.
(2) Remove waterdam.
(3) Remove inner belt weatherstrip.
(4) Remove bolt attaching bottom of rear glass run channel to door.
(5) Pull run channel downward and separate from door.
(6) Remove screws attaching stationary door glass frame to door (Fig. 1) and (Fig. 2).
(7) Separate stationary door glass from door.

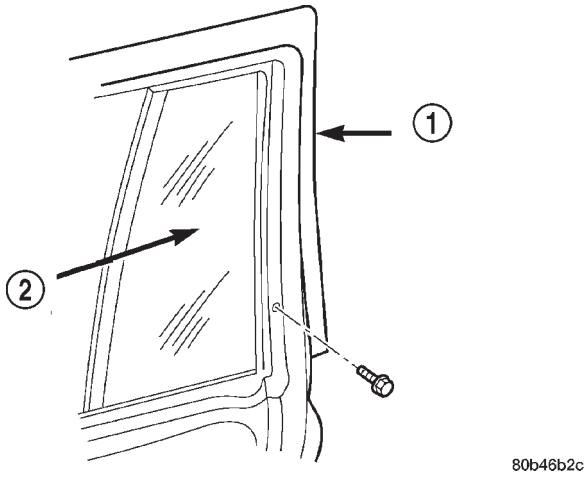


Fig. 1 Stationary Door Glass

1 - DOOR
2 - STATIONARY DOOR GLASS

INSTALLATION

(1) Position stationary door glass in door.
(2) Install screws attaching stationary door glass frame to door.
(3) Install glass run channel.
(4) Install inner belt weatherstrip.
(5) Install waterdam.
(6) Install door trim panel.

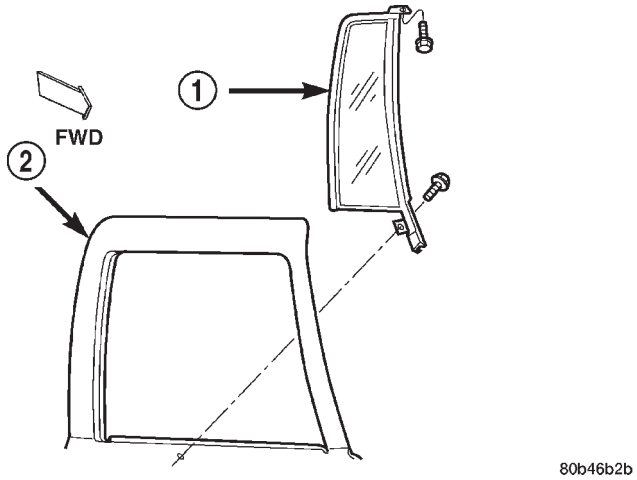


Fig. 2 Stationary Door Glass

1 - STATIONARY DOOR GLASS
2 - DOOR

QUARTER WINDOW

REMOVAL

(1) Cut urethane bonding from around quarter window glass using a suitable sharp cold knife. A pneumatic cutting device can be used if available.
(2) Separate glass from vehicle.

INSTALLATION

CAUTION: Open a window before installing glass. This will avoid pressurizing the passenger compartment. If a door or liftgate is slammed before urethane is cured, water leaks can result.

The window opening fence should be cleaned of old urethane bonding material.
(1) Clean inside of glass with Mopar Glass Cleaner and lint-free cloth.
(2) Apply PVC (vinyl) primer 25 mm (1 in.) wide around edge of glass. Wipe with clean/dry lint-free cloth.

QUARTER WINDOW (Continued)

(3) Apply fence primer around edge of fence. Allow at least eighteen minutes drying time.

(4) Apply a 10 mm (0.4 in.) bead of urethane around window vinyl border location.

(5)
Position glass into window opening and lock clips into place (Fig. 3).

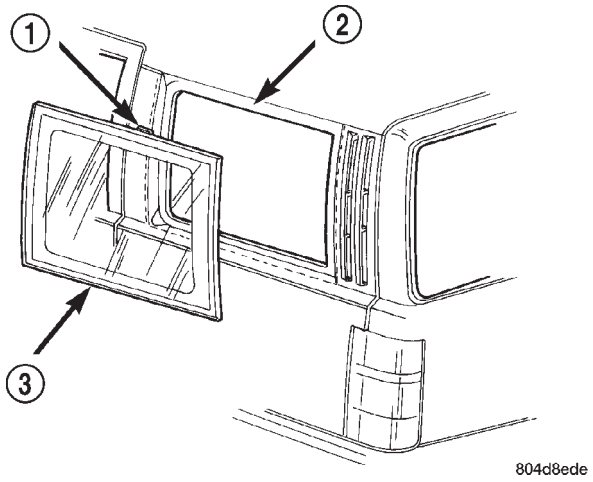


Fig. 3 Quarter Window Glass

1 - CLIP
2 - ROOF PANEL
3 - QUARTER WINDOW GLASS

WINDSHIELD

REMOVAL

(1) Remove inside rear view mirror.

(2) Remove cowl cover.

(3) Remove screws attaching windshield side molding to A-pillar (Fig. 4).

(4) Remove upper windshield molding.

(5) Cut urethane bonding from around windshield using a suitable sharp cold knife. A pneumatic cutting device can be used if available (Fig. 5).

(6) Separate windshield from vehicle.

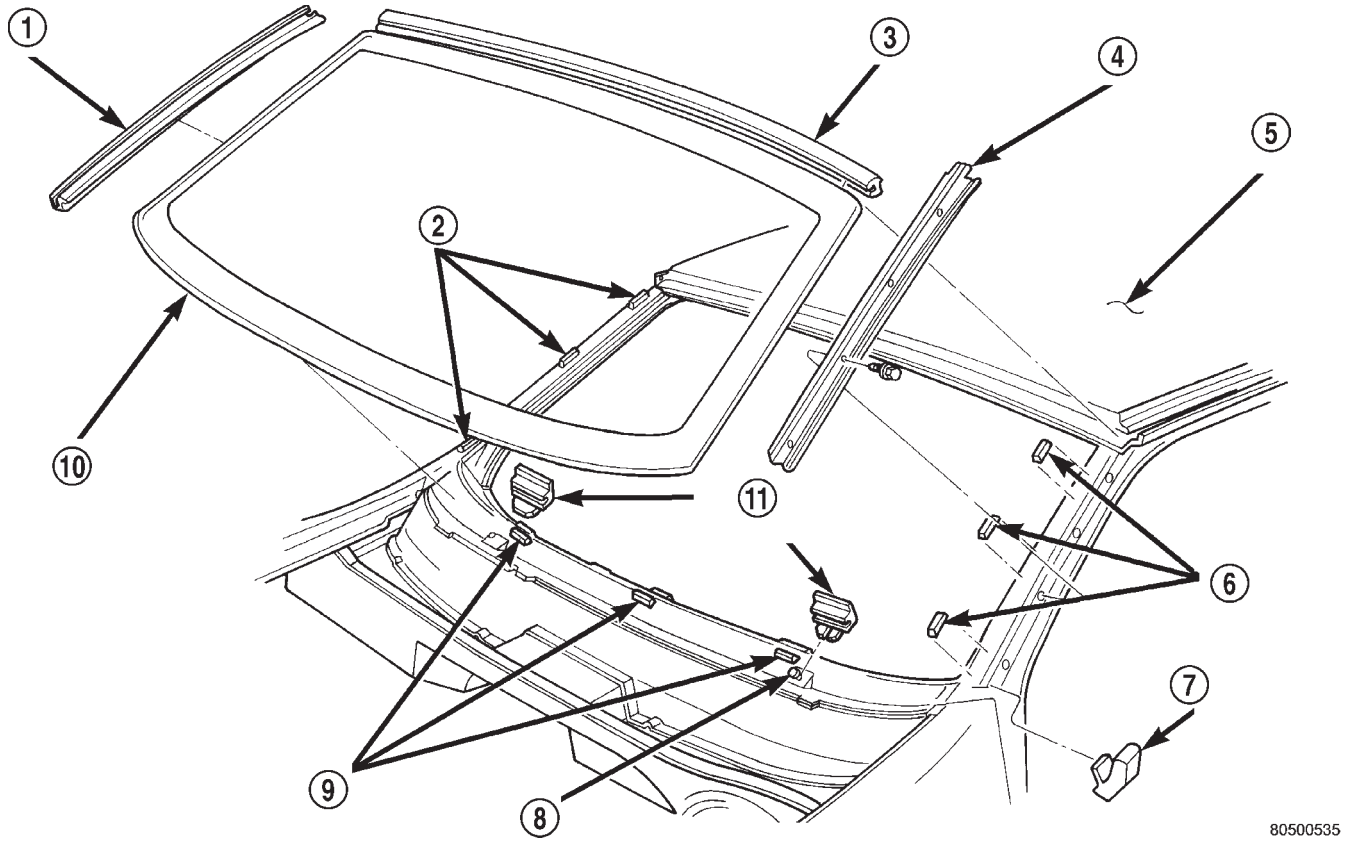


Fig. 4 Windshield

1 - SIDE MOLDING
2 - SUPPORT SPACER
3 - UPPER MOLDING
4 - SIDE MOLDING
5 - ROOF PANEL
6 - SUPPORT SPACER
7 - BLOCKER
8 - STUD
9 - SUPPORT SPACER
10 - WINDSHIELD
11 - ALIGNMENT SPACER

WINDSHIELD (Continued)

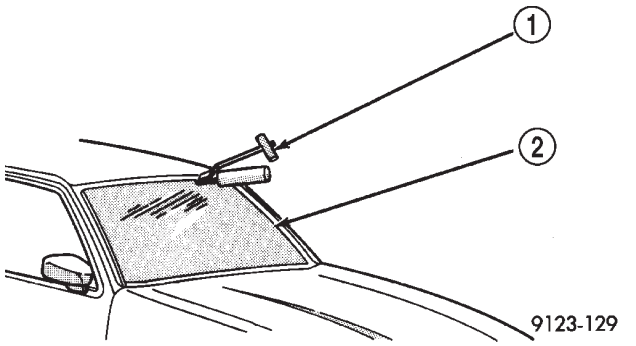


Fig. 5 Cut Urethane Around Windshield—Typical

1 - COLD KNIFE
2 - WINDSHIELD

INSTALLATION

WARNING: REVIEW ALL WARNINGS AND CAUTIONS IN THIS GROUP BEFORE PRECEDING WITH INSTALLATION.

CAUTION: Open a window before installing windshield. This will avoid pressurizing the passenger compartment. If a door or liftgate is slammed before urethane is cured, water leaks can result.

The windshield fence should be cleaned of old urethane bonding material. Support spacers should be cleaned and properly installed on weld studs or repair screws at bottom of windshield opening.

(1) Place replacement windshield into windshield opening. Position glass in the center of the opening against the support spacers. Mark the glass at the support spacers with a grease pencil or masking tape and ink pen to use as a reference for installation. Remove replacement windshield from windshield opening (Fig. 6).

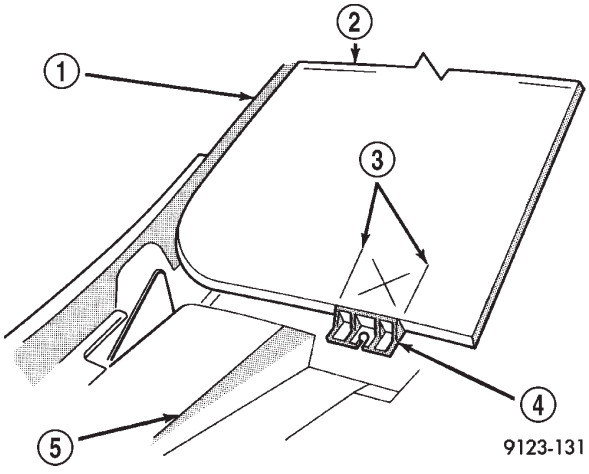


Fig. 6 Center Windshield and Mark at Support Spacers

1 - A-PILLAR
2 - WINDSHIELD
3 - MARKS
4 - SUPPORT SPACER
5 - COWL

(2) Position the windshield inside up on a suitable work surface with two padded, wood 10 cm by 10 cm by 50 cm (4 in. by 4 in. by 20 in.) blocks, placed parallel 75 cm (2.5 ft.) apart (Fig. 7).

(3) Clean inside of windshield with Mopar Glass Cleaner and lint-free cloth.

(4) Apply clear glass primer 25 mm (1 in.) wide around edge of windshield. Wipe with clean/dry lint-free cloth.

(5) Apply black-out primer 15 mm (.75 in.) wide on top and sides of windshield and 25 mm (1 in.) on bottom of windshield. Allow at least three minutes drying time.

(6) Position windshield spacers on lower fence above support spacers at the edge of the windshield opening (Fig. 4).

(7) Apply a 10 mm (0.4 in.) bead of urethane around perimeter of windshield along the inside of the moldings. Apply two beads along the bottom edge.

(8) Install upper molding onto windshield.

(9) Apply fence primer around the perimeter of the windshield opening fence. Allow at least 18 minutes drying time.

(10) With aid of a helper, position windshield over windshield opening. Align reference marks at bottom of windshield to support spacers.

(11) Slowly lower windshield glass to windshield opening fence. Guide top molding into proper position if necessary. Push windshield inward to fence spacers at bottom and until top molding is flush to roof line.

(12) Clean excess urethane from exterior with Mopar Super Clean or equivalent.

(13) Install windshield side moldings.

(14) Install cowl cover and wipers.

(15) Install inside rear view mirror.

(16) After urethane has cured, water test windshield to verify repair.

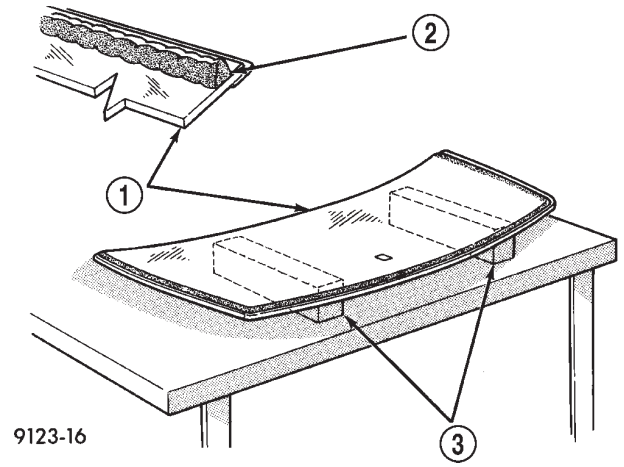


Fig. 7 Work Surface Set up and Molding Installation

1 - WINDSHIELD AND MOULDINGS
2 - URETHANE BEAD AROUND GLASS 7mm (.3 in.) FROM EDGE
3 - BLOCKS

SUNROOF

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SUNROOF

DESCRIPTION

WARNING: Keep fingers and other body parts out of sunroof opening at all times.

The sunroof features a power sliding glass panel and a sunshade which can be manually positioned anywhere along its travel, rearward of glass panel front edge.

The sunroof is electrically operated from a switch located on the mini overhead console. To operate the sunroof the ignition switch must be in the On/Run position. The sunroof has both manual and Express Open modes of operation when opening. To open the sunroof in the Express Open mode, the switch is pressed rearward for less than **1 second.** This causes the sunroof glass to automatically retract and stop at a position slightly forward of full open that reduces low speed wind buffeting. The sunroof can also be opened manually by pressing and holding the switch rearward. Once the switch is held reward for more than **1 second,** the glass will retract in the manual mode. Releasing the switch at any time during travel will cause the sunroof to stop at the current position.

To close the sunroof from an open position, the switch must be pushed forward and held until the sunroof glass comes to a complete stop. Releasing the switch at any time in this mode will cause the sunroof to stop at the current position.

To vent the sunroof from the closed position, the switch is pushed forward and held. Releasing the switch at any time during travel will cause the sunroof to stop at the current vent position. To reach the fully vented position, continue to hold the switch forward until vent motion stops. To close the sunroof from the vent position, push and hold the switch rearward until the glass comes to a complete stop.

DIAGNOSIS AND TESTING - SUNROOF

CAUTION: The sunroof motor is only to be powered through the vehicle battery and vehicle wire harness. Applying power to the sunroof motor leads will cause failure of the sunroof control unit.

Before beginning sunroof diagnostics verify that all other power accessories are in proper operating condition. Refer to Sunroof Diagnostic Chart for possible causes. If not, a common electrical problem may exist. Refer to Group 8W, Wiring Diagrams, of this publication for circuit, splice and component descriptions. Check the condition of the circuit protection (20 amp high current fuse (battery feed) located in the Power Distribution Center (PDC). Check the cover of the PDC for location of the fuse. Check for correct operation of the sunroof delay relay. Inspect all wiring connector pins for proper engagement and continuity. Check for battery voltage at battery and ignition pins of the power sunroof express module wiring connector. Refer to Group 8W, Wiring Diagrams, for circuit information. The controller will not operate at less than 10 volts. Check the ground at the sunroof express module.

Before beginning diagnosis for wind noise or water leaks, verify that the problem was not caused by

SUNROOF (Continued)

releasing the control switch before the sunroof was fully closed. The sunroof module has a water-management system. During washing high-pressure water may be forced between the glass panel seal and the roof opening. Normally this water will drain. However, when some type of drying blower system is used, like those found in automatic car washes, the water may not have a chance to drain before the blower forces air between the seal and the roof opening. This causes the water to blow over the edge of the module and onto the headlining.

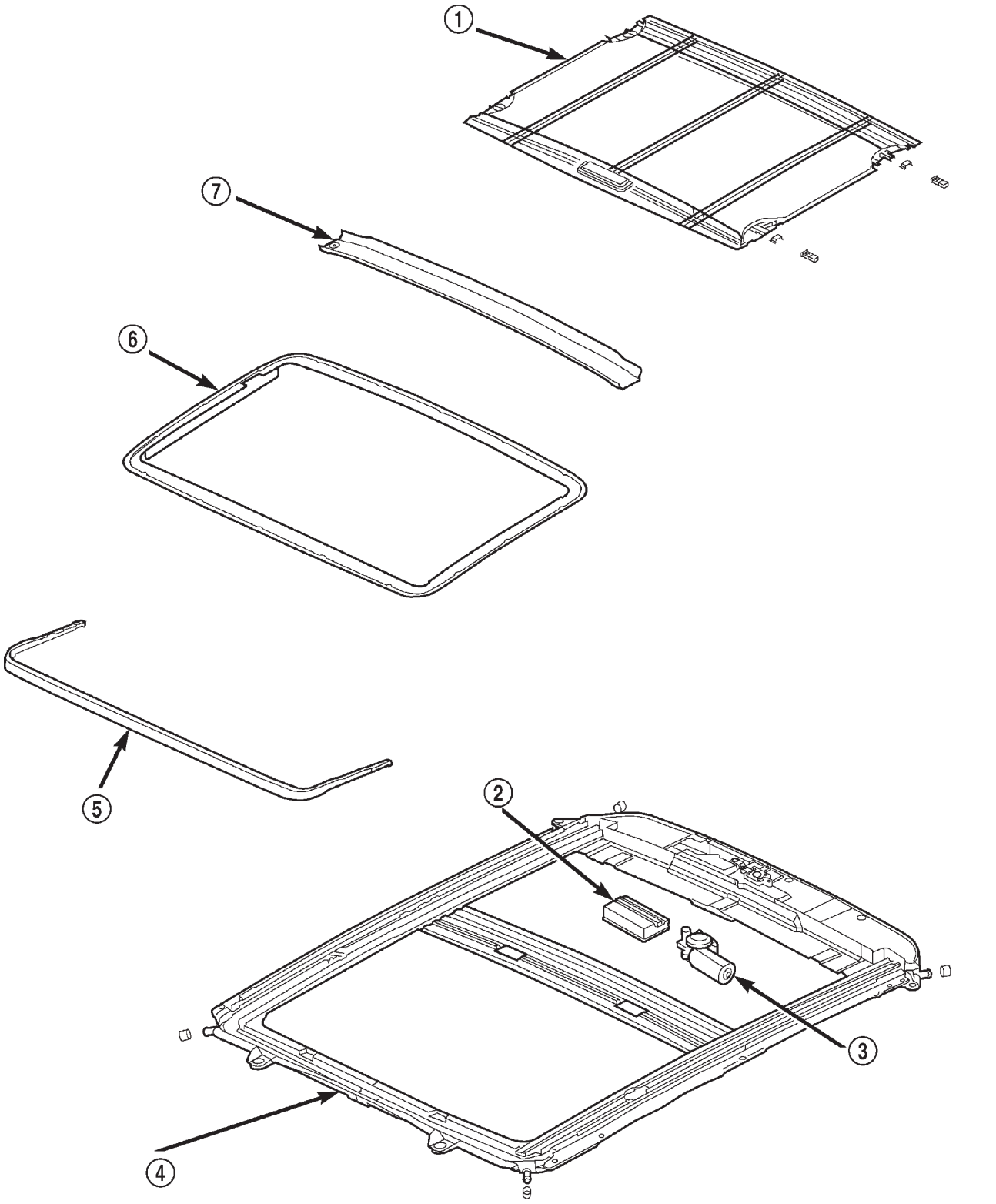
Refer to (Fig. 1) Sunroof Assembly for exploded view of the sunroof.

SYMPTOM	STEP	POSSIBLE CAUSE
Sunroof squeaks when opening/closing.	1	Identify if the cause is a seal squeak. If seal is worn, replace the seal.
	2	Check seal compression for uniformity in opening, If not uniform, glass is not centered in opening.
	3	Re-center glass by repositioning module in opening.
	4	Identify if mechanism squeaks.
	5	Check for lubrication, re-lube if necessary.
	6	Check for dirt/debris in tracks, clean and re-lube.
	7	Identify if motor squeaks, replace the motor.
Water leaks into the vehicle.	1	Check for a good connection at the drain tubes, re-connect where needed.
	2	Check for plugged/pinched hoses throughout.
	3	Adjust the glass panel. Refer to glass panel adjustments in this section.
	4	Check seal for wear/damage, replace glass as necessary.
Motor inoperative.	1	Check connectors at the motor, switch, control module and power source.
	2	Check for defective control module, replace if necessary.
	3	Replace the motor.
Motor noise when opening/ closing.	1	Identify if motor noise, replace motor.
	2	Insure noise is from the motor and not cables, (cable ratcheting).
Grinding noise when opening/ closing.	1	Identify if the motor is grinding, replace motor.
(Mechanism noise, scraping.)	2	Check for lubrication in tracks and mechanism, re-lube if necessary.
	3	Check for dirt/debris in tracks, clean and re-lube.
(Cable ratcheting.)	4	Cables ratchet at the motor pinion; mechanism jammed, fix mechanism and replace cables and motor bracket.
Wind noise when sunroof fully closed.	1	Check seal compression for uniformity in opening, If not uniform, glass is not centered in opening.
	2	Glass not adjusted flush to roof. Refer to glass panel adjustments in this section.
	3	Mechanism not fully closed. A) Motor out of time, re-time motor/mechanism. Refer to glass panel adjustments in this section. B) Cable ratcheting, replace cables and motor bracket.
	4	Seal worn, replace glass.
Sunroof will not open/close.	1	Check switch and switch connection.

SUNROOF (Continued)

SYMPTOM	STEP	POSSIBLE CAUSE
	2	Check mechanism for binding (result of forcing the glass closed/ broken components).
	3	See motor inoperative above.
Sunroof ″rattles″, anytime, closed/open.	1	Loose attachment screws (module), re-fasten and adjust module.
	2	Loose glass panel, re-fasten and adjust glass panel.
	3	Loose drain channel, refasten/secure to repair.
	4	Broken mechanism, replace the sunroof assembly module.
	5	Mechanism not fully closed. A) Motor out of time, re-time motor/mechanism. Refer to glass panel adjustments in this section. B) Cable ratcheting, replace cables and motor bracket.
	6	Check for sunshade out of track or for sunshade broken slide block.
	7	Loose wind deflector. Replace if broken.
	8	Loose wind deflector spring. Replace if loose.
Sunshade squeaks/rattles, anytime.	1	Sunshade slide blocks out of track(s), put back in tracks.
-OR-	2	Missing felt pads on the drain channel, add felt pads.
Sunshade force high/low or binding during operation.	3	Felt on the drain channel rolling off, (sunshade rubs on adhesive), replace felt pads.
	4	Slide block binding in sunshade, free-up slide block by actuating a couple times, grease slide block(s) and spring(s).
	5	Broken slide block in sunshade, replace slide block.
	6	Slide block spring missing, replace spring and slide block.
	7	Sunshade interference with drain channel or trim welt, replace trim welt and/or sunshade.
Motor/sunroof control module operation: Auto open doesn’t work, or doesn’t stop at closed position.	1	After power disconnect or replacement, sunroof module has to complete on full cycle to program the sunroof control module. Full cycle = close > open > close > vent > close.

SUNROOF (Continued)



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Fig. 1 Sunroof Assembly

1 - SUNSHADE
2 - EXPRESS MODULE
3 - DRIVE MOTOR
4 - FRAME ASSEMBLY
5 - WIND DEFLECTOR
6 - GLASS PANEL
7 - DRAIN CHANNEL

DRAIN TUBE

REMOVAL

(1) Remove the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)

(2) Disengage clamps attaching drain tube to sunroof (Fig. 2).

(3) Tape the end of the old drain tube to the new drain tube. Ensure that the tape build up on the tube ends is not excessive.

(4) Remove front/rear trim panels as necessary to disengage clamps securing drain tube to body.

(5) Remove the drain tube plug from the underside of the vehicle.

(6) From the underside of the vehicle carefully, pull/route the drain tube through the body panel. Applying a soapy water solution to the new tube may aid in this procedure.

INSTALLATION

(1) Install the plug adapter to the bottom of the drain tube.

(2) Engage clamps securing drain tube to body (Fig. 2).

(3) Install front/rear trim panels as necessary.

(4) Install drain tube to sunroof and engage clamp.

(5) Install the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)

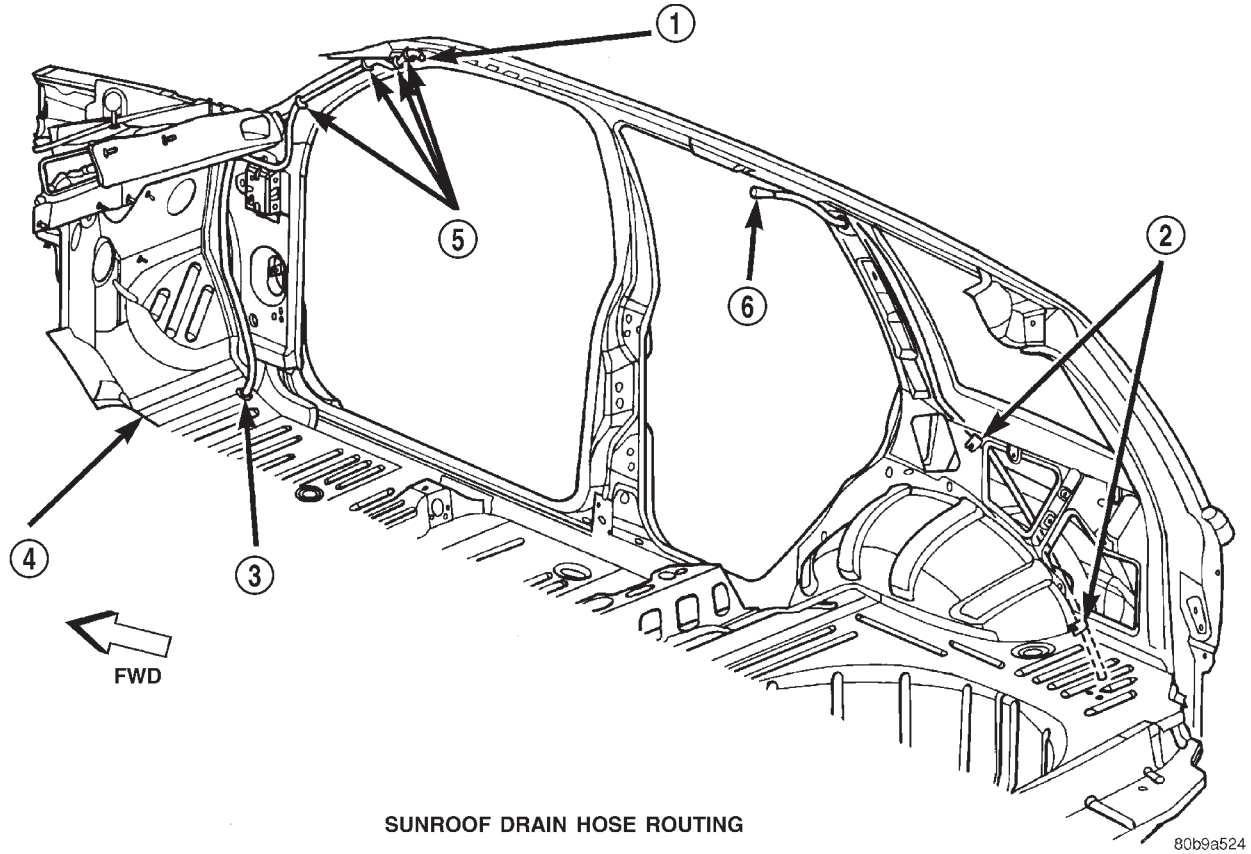


Fig. 2 Sunroof Drain Hose Routing

1 - DRAIN HOSE
2 - CLAMPS
3 - PLUG
4 - FLOOR
5 - CLAMPS
6 - DRAIN HOSE

CONTROL MODULE

REMOVAL

(1) Move the glass panel to the fully closed position.
(2) Remove the A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
(3) Remove the sun visors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL)
(4) Remove the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL)
(5) Lower headliner as necessary to gain access to the sunroof express module.
(6) Disconnect the express module wire harness connectors.
(7) Remove express module screw.
(8) Remove express module from the keyway by sliding module towards the center of the vehicle.

INSTALLATION

(1) Insert sunroof express module in the keyway located in the sunroof module and slide the module outward to lock it into position.
(2) Install the sunroof express module screw.
(3) Connect the wire connectors to the sunroof express module.
(4) Install the headliner into position.
(5) Install the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION)
(6) Install the sun visors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - INSTALLATION)
(7) Install the A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)
(8) Test sunroof operation, adjust if necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)

DRIVE MOTOR

REMOVAL

CAUTION: The sunroof system is timed from the factory so that the motor shuts off automatically when the sunroof window reaches a certain position. Extreme care must be taken when removing the motor, timing may be thrown off causing possible damage to the sunroof system. Anytime the motor is removed from the sunroof assembly the sunroof glass panel must be in the FULLY CLOSED POSITION or the unit will be out of timing. The drive motor cannot be reset to the park position after being removed.

CAUTION: The sunroof motor should only be powered through the vehicle battery and sunroof wire harness. Applying power to the sunroof motor leads will cause failure of the control module.

(1) Move glass panel to the fully closed position.
(2) Remove the A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL)
(3) Remove the B-pillar upper trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL)
(4) Remove the C-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL)
(5) Remove the D-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - REMOVAL)
(6) Remove the sunvisors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - REMOVAL)
(7) Remove the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - REMOVAL)
(8) Disconnect the control switch wire connector.
(9) Remove headliner as necessary to gain access to sunroof drive motor. Refer to Headliner Removal and Installation for proper procedures.
(10) Disconnect the drive motor wire harness connectors (Fig. 3).
(11) Remove drive motor fasteners and remove motor from the sunroof housing.

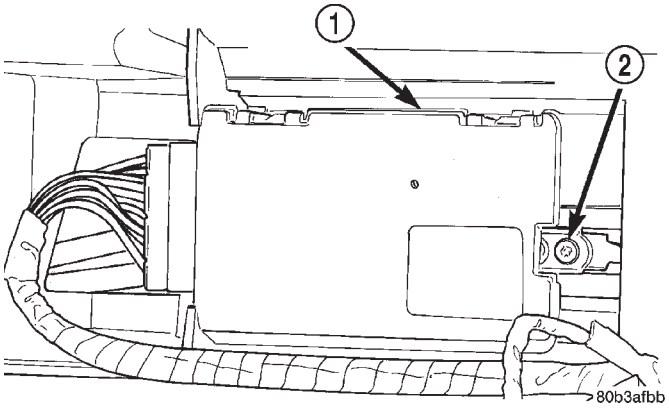


Fig. 3 Sunroof Drive Motor and Express Module

1 - EXPRESS MODULE
2 - SCREW

INSTALLATION

(1) Ensure that the window is in the fully closed position before mounting the motor. If motor fails with the window in the open position the sunroof glass panel timing will have to be timed. The new motor comes in the fully closed position and with a gage for setting cable timing. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS - TIMING)
(2) Place drive motor into position on the sunroof housing and install fasteners.

DRIVE MOTOR (Continued)

(3) Connect express module, drive motor, and control switch wire connectors.
(4) Set headliner into position.
(5) Test sunroof operation, adjust as necessary. (Refer to 23 - BODY/SUNROOF/GLASS PANEL - ADJUSTMENTS)
(6) Finish installing the headliner.
(7) Connect the control switch wire connector.
(8) Install the overhead console. (Refer to 8 - ELECTRICAL/OVERHEAD CONSOLE - INSTALLATION)
(9) Install the sunvisors. (Refer to 23 - BODY/INTERIOR/SUN VISOR - INSTALLATION)
(10) Install the D-pillar trim. (Refer to 23 - BODY/INTERIOR/D-PILLAR TRIM - INSTALLATION)
(11) Install the C-pillar trim. (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION)
(12) Install the B-pillar upper trim. (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION)
(13) Install the A-pillar trim. (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION)

WIND DEFLECTOR

REMOVAL

(1) Open sunroof glass panel.
(2) Push down one corner of the wind deflector and let the other corner rise up (Fig. 4).
(3) Push the low corner towards the opposite side of the vehicle until tab on sunshade clears the body. Then raise the corner up.
(4) Repeat the procedure to the other corner.
(5) Lift wind deflector to 90% of the way.
(6) Push the attaching ends of the deflector to the rear of the vehicle to disengage the deflector.

INSTALLATION

(1) Place wind deflector at 90% in the vertical position to the sunroof. With the sunroof open.
(2) Push ends of the deflector towards the front of the vehicle to engage ends.
(3) Lower wind deflector to normal position.
(4) Push one corner to the opposite side of the vehicle until tab clears vehicle body and lower deflector for that corner.
(5) Push the side that was just installed completely down.
(6) Push the opposite corner cross vehicle until tab clears the body. Then lower deflector to position.
(7) Test sunroof operation.

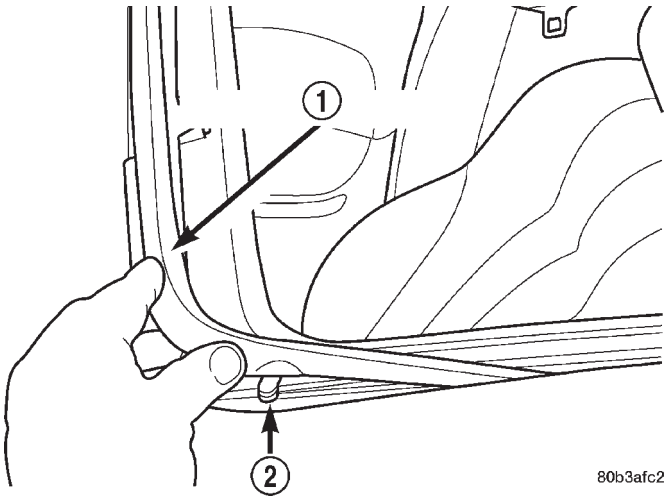


Fig. 4 Wind Deflector

1 - WIND DEFLECTOR
2 - TAB

GLASS PANEL

REMOVAL

(1) Slide sunshade rearward to the open position.
(2) Move the glass panel to the fully closed position.
(3) Remove the four attaching screws (Fig. 5).
(4) Lift off glass panel and remove from vehicle.

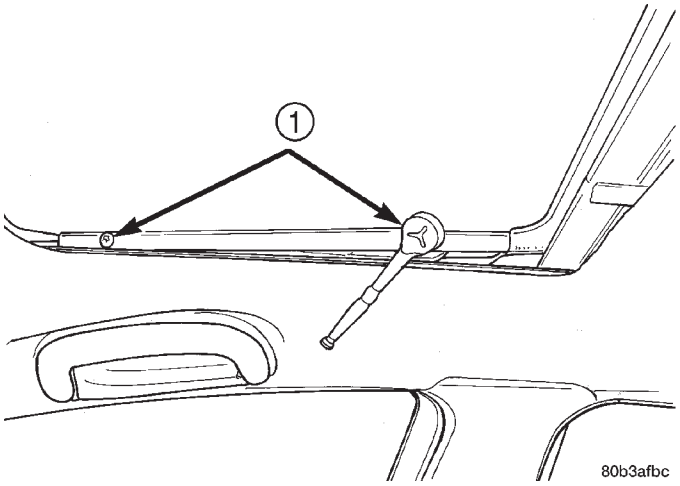


Fig. 5 Sunroof Glass Panel Removal

1 - ATTACHING SCREW

GLASS PANEL (Continued)

INSTALLATION

NOTE: Sunroof glass must be set in place and attached as close as possible to flush with the roof surface. For wind noise reasons, care must be taken to ensure that the glass is not remounted either a) Overflush to the roof surface at the front edge of the glass, or b) Underflush to the roof surface at the rear edge of the glass.

(1) Position glass panel in to opening.
(2) Start the four attaching screws.
(3) Tighten screws.
(4) Verify sunroof operation and alignment. Check fit and adjust as necessary. (Refer to 23 - BODY/ SUNROOF/GLASS PANEL - ADJUSTMENTS - FIT)

ADJUSTMENTS

ADJUSTMENTS - FIT

(1) Move the sunshade rearward to the open position.
(2) Move the sunroof glass panel to the fully closed position.
(3) Loosen the forward screws on each side enough to make the front adjustment.
(4) Adjust the front of the sunroof glass panel 1 mm (1/32 inch) below the top surface of the roof panel.
(5) Tighten the front two screws.
(6) Loosen the rear screws on each side enough to make the rear adjustment.
(7) Adjust the rear of the sunroof glass panel 1 mm (1/32 inch) above the top surface of the roof panel.
(8) Tighten the rear two screws.
(9) Check for proper fit. If not OK, repeat glass panel adjustment.

ADJUSTMENT - TIMING

NOTE: A gage comes with the new motor.

(1) If the glass panel was not in the fully closed position, when the motor was removed, the sunroof glass panel needs to be timed, before the new motor is installed.
(2) Remove sunroof glass panel.
(3) Set gage into the track near the rear of the opening between the driver slide and the bracket (Fig. 6).
(4) Move the driver slide forward or aft to get proper setting.
(5) Repeat the operation on the other side.
(6) Install drive motor.

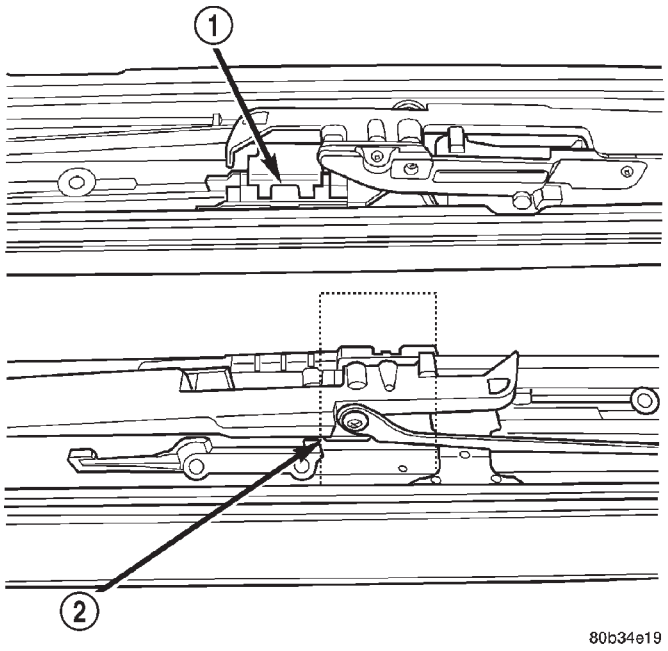


Fig. 6 Sunroof Drive Cable Timing

1 - MOVE DRIVER SLIDE FORWARD/AFT
2 - GAGE

SUNSHADE

REMOVAL

(1) Open sunroof approximately 50% of the way.
(2) Push sunshade down until tabs clear glass.
(3) Move sunshade forward of glass panel.
(4) Compress the spring loaded plungers holding the guide blocks in the track.
(5) Slide the sunshade forward while lifting the front through the opening until the rear guide blocks are accessible.

CAUTION: Use care not to crease the sunshade when removing or installing.

(6) Disengage rear guide blocks from track.

INSTALLATION

(1) Install the sunshade from outside of the vehicle with the sunroof fully open.
(2) Put rear guide blocks into sunshade guide track.
(3) Push sunshade back and down through the sunroof opening.
(4) Using a flat blade tool, put front guide blocks into the sunshade track. By pushing the block towards the center of the vehicle.
(5) Move the glass panel to approximately halfway to the fully closed position.

SUNSHADE (Continued)

(6) Push sunshade down until the sunshade clears the glass then move sunshade rearward behind the glass panel.

HOUSING ASSEMBLY

REMOVAL

(1) Move glass panel to the fully closed position.
(2) Disconnect battery negative cable.
(3) Recline both front seats.
(4) Remove headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - REMOVAL)
(5) Disconnect the drain tubes from sunroof housing (Fig. 7).
(6) Loosen fasteners attaching sunroof housing assembly.
(7) With the aid of a helper, remove fasteners attaching sunroof housing assembly to roof panel.

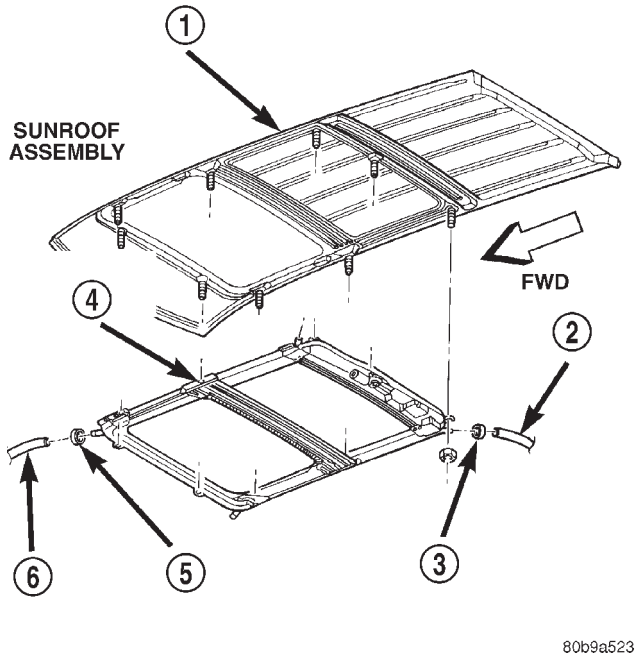


Fig. 7 SUNROOF ASSEMBLY

1 - ROOF
2 - DRAIN HOSE
3 - CLAMP
4 - SUNROOF ASSEMBLY
5 - CLAMP
6 - DRAIN HOSE

INSTALLATION

(1) Raise the sunroof housing assembly and guide into position and start fasteners (Fig. 7).
(2) Tighten the fasteners, front to rear, attaching the sunroof module to roof panel. Tighten the fasteners, front to rear, to 11 N·m (97 in. lbs.) torque.
(3) Connect the drain tubes to the sunroof housing.
(4) Set headliner into position.
(5) Connect express module, drive motor, and control switch wire connectors.
(6) Test sunroof operation, adjust as necessary.
(7) Finish installing the headliner. (Refer to 23 - BODY/INTERIOR/HEADLINER - INSTALLATION)
(8) Connect battery negative cable.

WEATHERSTRIP/SEALS

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B-PILLAR DOOR SEAL

REMOVAL

The B-pillar seal is attached to the rear door with adhesive tape.

(1) Peel seal from the door (Fig. 1).

INSTALLATION

(1) Clean contact area with Mopar® Super Kleen or equivalent.

(2) Remove carrier from seal.

(3) Align seal on door and press into place.

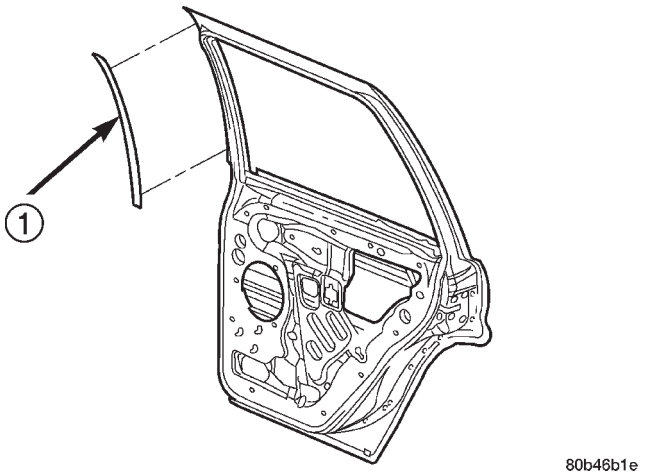


Fig. 1 B-Pillar Seal

1 - B-PILLAR SEAL

COWL WEATHERSTRIP

REMOVAL

(1) Raise hood.
(2) Pull cowl plenum seal from cowl.
(3) Separate cowl plenum seal from cowl (Fig. 2).

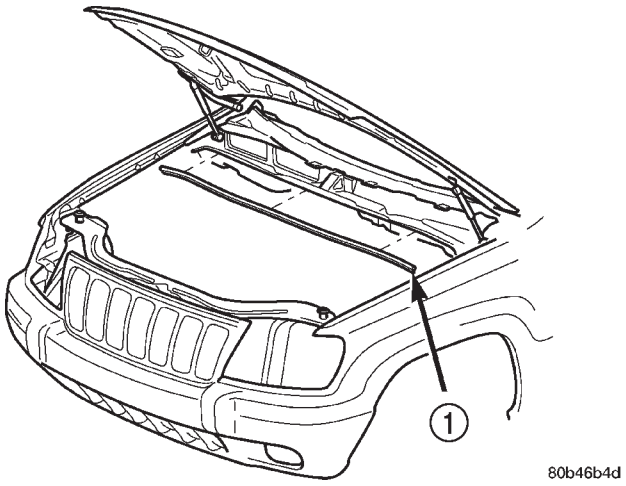


Fig. 2 Cowl Plenum Seal

1 - PLENUM SEAL

INSTALLATION

(1) Position cowl plenum seal on cowl.
(2) Press cowl plenum seal to seat.

FRONT DOOR GLASS RUN WEATHERSTRIP

REMOVAL

(1) Remove inner belt weatherstrip (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - REMOVAL).
(2) Remove outer belt weatherstrip (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - REMOVAL).
(3) Grasp seal from upper run channel corner and firmly pull weatherstrip from flange and run channel (Fig. 3).

INSTALLATION

NOTE: Soapy water may be used to aid in installation.

(1) Remove front door speaker.
(2) Position weatherstrip on flange aligning each corner.
(3) Press weatherstrip into position.
(4) Carefully move door glass for and aft and press weatherstrip into glass run channels.
(5) Install front door speaker.

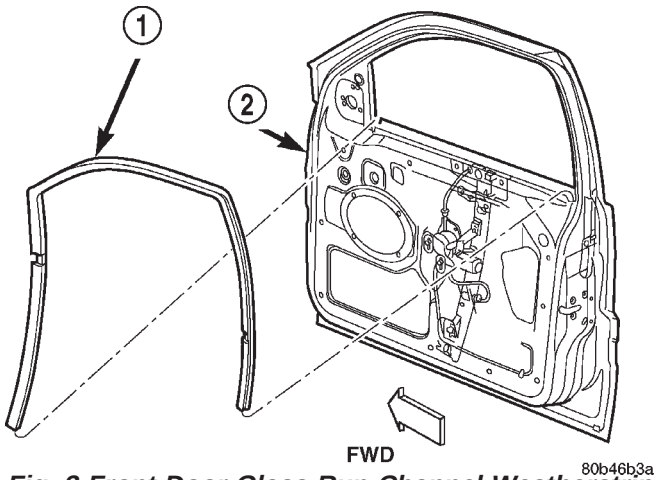


Fig. 3 Front Door Glass Run Channel Weatherstrip

1 - GLASS RUN CHANNEL WEATHERSTRIP
2 - DOOR

(6) Install outer belt weatherstrip (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR OUTER BELT WEATHERSTRIP - INSTALLATION).
(7) Install inner belt weatherstrip (Refer to 23 - BODY/WEATHERSTRIP/SEALS/FDR INNER BELT WEATHERSTRIP - INSTALLATION).

FRONT DOOR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove door trim panel (Refer to 23 - BODY/DOOR - FRONT/TRIM PANEL - REMOVAL).
(2) Using a trim stick or other suitable device, carefully pry up inner edge of seal (Fig. 4).
(3) Grasp the edge of the seal and pull upward to remove seal from door flange.

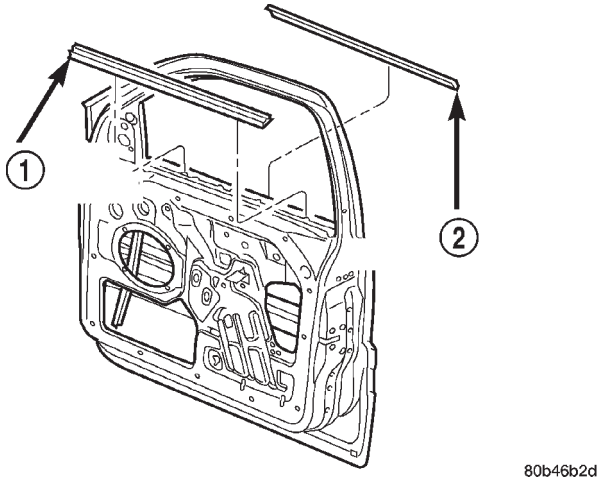


Fig. 4 Inner/Outer Belt Weather Strip

1 - INNER BELT WEATHERSTRIP
2 - OUTER BELT WEATHERSTRIP

FRONT DOOR INNER BELT WEATHERSTRIP (Continued)

INSTALLATION

(1) Position the seal on the door flange.
(2) Firmly press downward to seat seal on the door flange.
(3) Install the door trim panel (Refer to 23 - BODY/ DOOR - FRONT/TRIM PANEL - INSTALLATION).

FDR OUTER BELT WEATHERSTRIP

REMOVAL

(1) Lower the door glass.
(2) Remove the screw from the inner door panel attaching the seal to outer door panel (Fig. 4).
(3) Pull the seal rearward to release from the side view mirror bezel.
(4) Lift seal and separate from door panel.

INSTALLATION

(1) Position seal on the door panel.
(2) Push the seal forward to install under the side view mirror bezel.
(3) Install the screw from the inner door panel attaching the seal to outer door panel.
(4) Raise the door glass.

FLIP-UP GLASS WEATHERSTRIP

REMOVAL

(1) Raise flip up glass.
(2) Carefully pull the seal away from the flange around the edge of the glass opening (Fig. 5).
(3) Remove it from the vehicle.

INSTALLATION

(1) Thoroughly clean the surface of the flange as necessary.
(2) Align the weather strip seal with the window opening corners.
(3) Firmly seat the seal around the entire flange. But the seal ends together and smooth out any remaining length.
(4) Weatherstrip break should be 120mm left of latch opening. Cut any surplus from non-plug end only.

FRONT DOOR 2ND WEATHERSTRIP

REMOVAL

The front door secondary weatherstrip is attached to the door shutface with push-in fasteners.

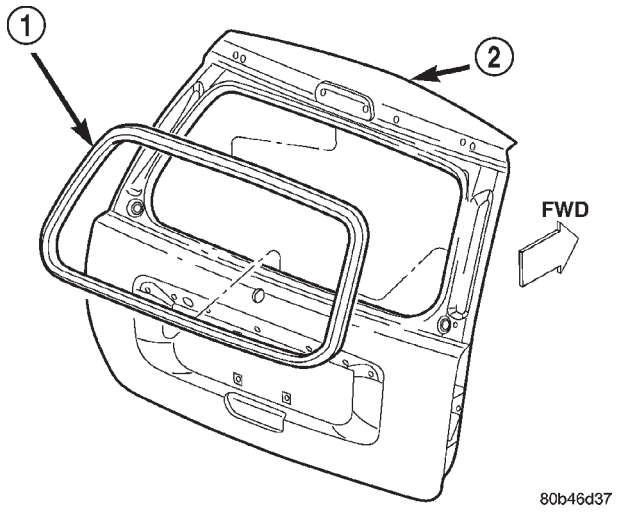


Fig. 5 Flip-up Glass Weatherstrip

1 - WEATHERSTRIP
2 - LIFTGATE W/FLIP-UP GLASS

(1) Open door.
(2) Using a trim panel removal tool, remove push-in fasteners attaching secondary weatherstrip to door shutface (Fig. 6).
(3) Separate secondary weatherstrip from door.

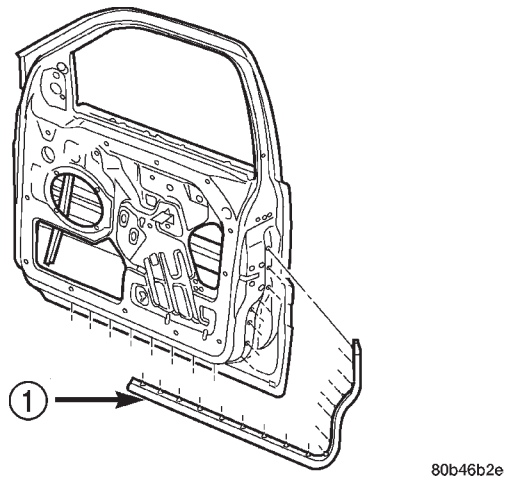


Fig. 6 Front Door Secondary Weatherstrip

1 - SECONDARY WEATHERSTRIP

INSTALLATION

(1) Clean contact area as necessary.
(2) Position secondary weatherstrip on door shutface.
(3) Install push-in fasteners attaching secondary weatherstrip to door shutface.

FRONT DOOR WEATHERSTRIP

REMOVAL

(1) Remove A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - REMOVAL).
(2) Remove B-pillar upper trim (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).
(3) Remove B-pillar lower trim (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).
(4) Pull weatherstrip from door opening flange.

INSTALLATION

(1) Position weatherstrip at corners.
(2) Move upward and around edge of door opening seating weatherstrip onto flange (Fig. 7).
(3) Engage connector plug with each end of weatherstrip at bottom of door opening.
(4) Install B-pillar lower trim (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).
(5) Install B-pillar upper trim (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).
(6) Install A-pillar trim (Refer to 23 - BODY/INTERIOR/A-PILLAR TRIM - INSTALLATION).

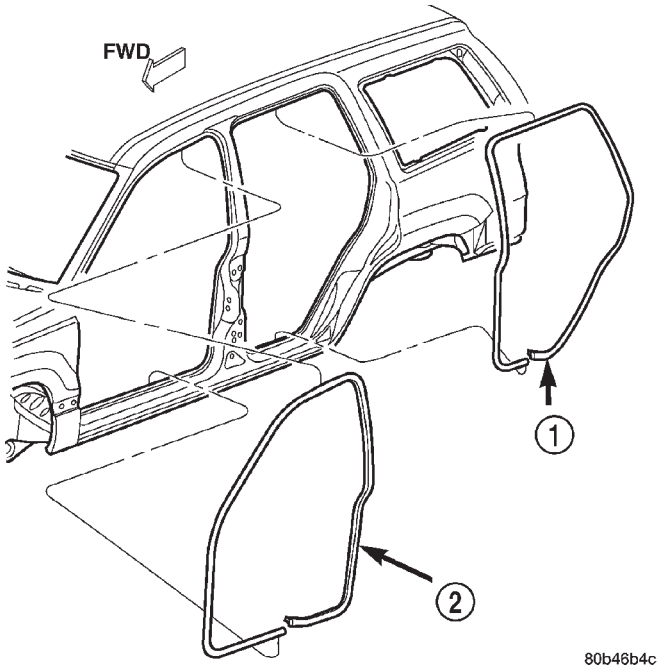


Fig. 7 Door Opening

1 - REAR DOOR OPENING WEATHERSTRIP
2 - FRONT DOOR OPENING WEATHERSTRIP

HOOD SEAL

REMOVAL

(1) Raise hood.
(2) Pull hood seal from upper radiator crossmember.
(3) Separate seal from upper radiator crossmember (Fig. 8).

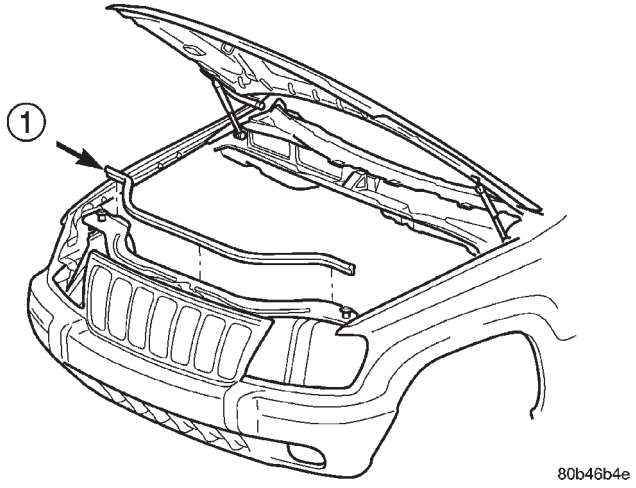


Fig. 8 Hood Seal

1 - HOOD SEAL

INSTALLATION

(1) Position seal on upper radiator crossmember.
(2) Press seal onto upper radiator crossmember to seat.

LIFTGATE OPENING WEATHERSTRIP

REMOVAL

(1) Pull seal away from flange around edge of liftgate opening.
(2) Separate weatherstrip from opening (Fig. 9).
(3) Clean weatherstrip flange as necessary.

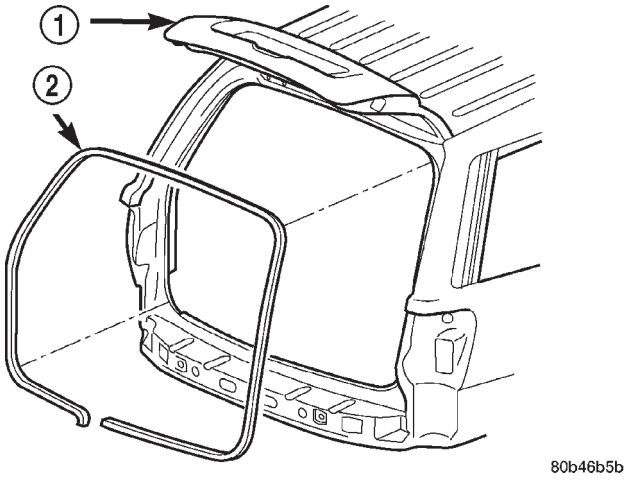


Fig. 9 Liftgate Opening Weatherstrip

1 - LIFTGATE
2 - WEATHERSTRIP

INSTALLATION

(1) Position weatherstrip in opening with left end of seal at opening centerline.
(2) Press weatherstrip onto flange in a clockwise direction.
(3) Center and butt weatherstrip ends together at centerline.
(4) If necessary, cut surplus from weatherstrip (non-plug end only).

RDR INNER BELT WEATHERSTRIP

REMOVAL

(1) Remove door trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
(2) Using a trim stick, carefully pry rear inner edge of inner belt weatherstrip upward.
(3) Grasp weatherstrip and pull upward to separate from door flange (Fig. 10).

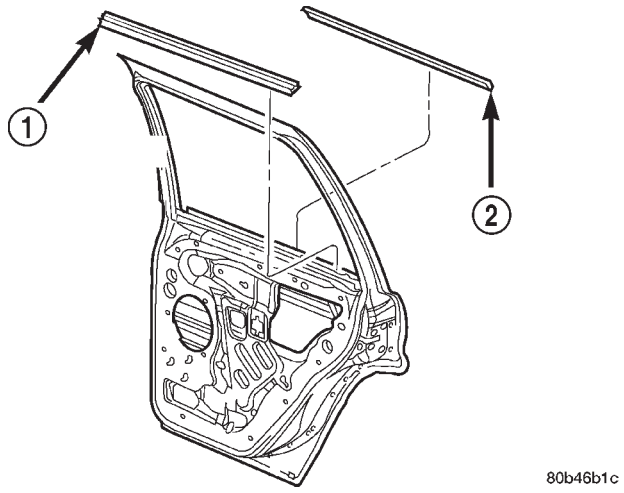


Fig. 10 Rear Door Inner/Outer Belt Weatherstrip

1 - INNER BELT WEATHERSTRIP
2 - OUTER BELT WEATHERSTRIP

INSTALLATION

(1) Position weatherstrip on door flange.
(2) Firmly press downward to seat weatherstrip on flange.
(3) Install trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

RDR OUTER BELT WEATHERSTRIP

REMOVAL

(1) Remove trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - REMOVAL).
(2) Using a small flat blade, disengage tangs attaching outer belt weatherstrip to inner door panel.
(3) Lift weatherstrip upward and separate from door (Fig. 10).

INSTALLATION

(1) Position the weatherstrip onto the door flange.
(2) Force the weatherstrip onto door flange and engage tangs. Continue rearward until it is seated on flange.
(3) Instal trim panel (Refer to 23 - BODY/DOORS - REAR/TRIM PANEL - INSTALLATION).

RDR SECONDARY WEATHERSTRIP

REMOVAL

The rear door secondary weatherstrip is attached to the door shutface with push-in fasteners.

(1) Open door.

(2) Using a trim panel removal tool, remove push-in fasteners attaching secondary weatherstrip to door shutface.

(3) Separate secondary weatherstrip from door (Fig. 11).

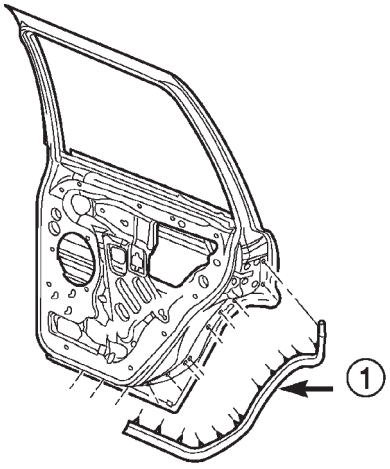


Fig. 11 Rear Door Secondary Weatherstrip

1 - SECONDARY WEATHERSTRIP

INSTALLATION

(1) Clean contact area as necessary.

(2) Position secondary weatherstrip on door shutface.

(3) Install push-in fasteners attaching secondary weatherstrip to door shutface.

REAR DOOR WEATHERSTRIP

REMOVAL

(1) Remove C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - REMOVAL).

(2) Remove B-pillar upper trim (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - REMOVAL).

(3) Remove B-pillar lower trim(Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - REMOVAL).

(4) Remove screws at front of quarter trim panel.

(5) Pull weatherstrip from door opening flange.

INSTALLATION

(1) Position weatherstrip at corners.

(2) Move upward and around edge of door opening seating weatherstrip onto flange (Fig. 7).

(3) Engage connector plug with each end of weatherstrip at bottom of door opening.

(4) Install screws at front of quarter trim panel.

(5) Install B-pillar lower trim (Refer to 23 - BODY/INTERIOR/B-PILLAR LOWER TRIM - INSTALLATION).

(6) Install B-pillar upper trim (Refer to 23 - BODY/INTERIOR/B-PILLAR UPPER TRIM - INSTALLATION).

(7) Install C-pillar trim (Refer to 23 - BODY/INTERIOR/C-PILLAR TRIM - INSTALLATION).

ROOF RAIL WEATHERSTRIP / RETAINR

REMOVAL

(1) Open front and rear doors.

(2) Remove secondary seal from retainer to access the screws holding the retainer to the A pillar and roof panel.

(3) Remove the screws holding the retainer in place (Fig. 12).

(4) Remove the retainer.

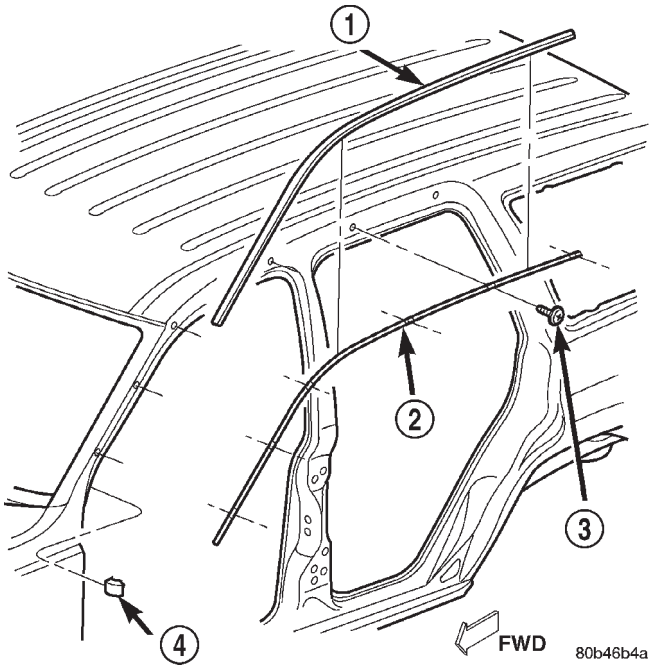


Fig. 12 Upper Body Seal With Retainer

1 - ROOF RAIL WEATHERSTRIP
2 - RETAINER
3 - SCREW
4 - BLOCKER

INSTALLATION

(1) Position the retainer on the A pillar and roof panel.

(2) Align the screw holes and install the screws.

(3) Install secondary seal.

BODY STRUCTURE

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GAP AND FLUSH

SPECIFICATIONS - GAP AND FLUSH

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REAR VIEW	2

GAP AND FLUSH (Continued)

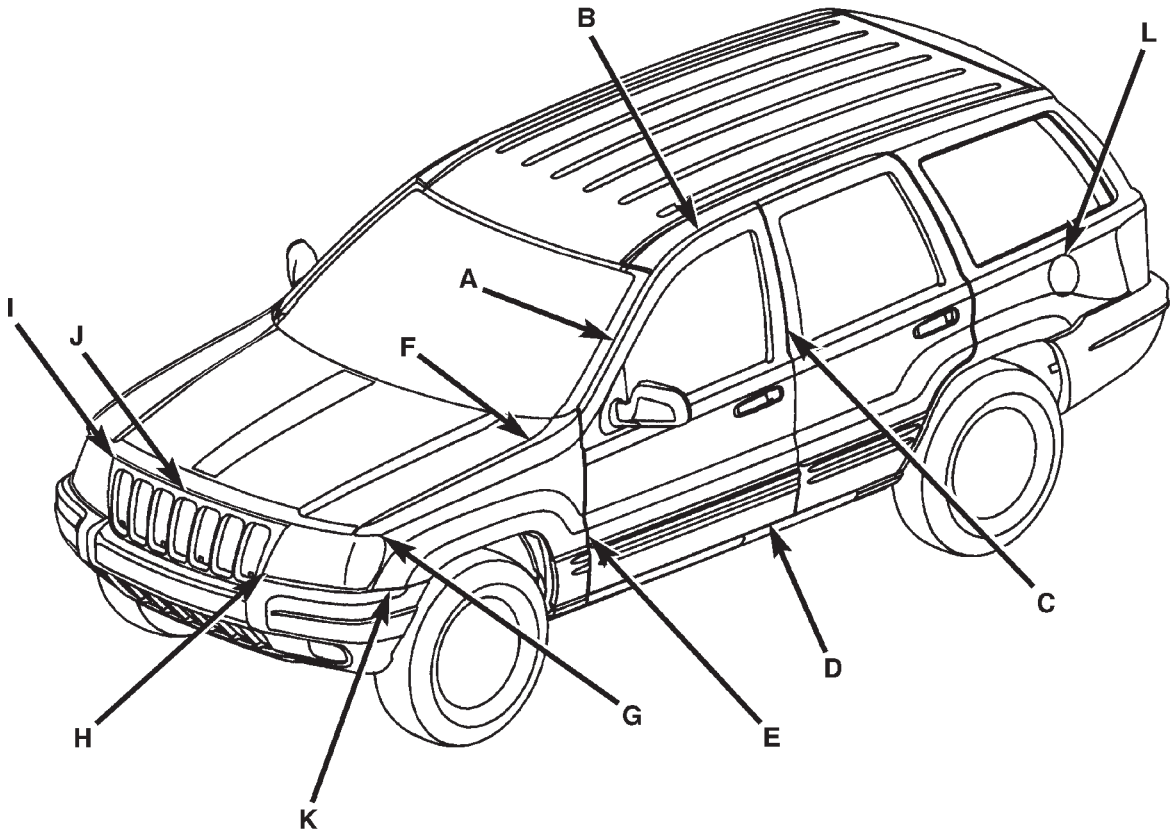


Fig. 1 FRONT VIEW

NOTE:
All measurements are in mm.

LOCATION	DESCRIPTION	GAP	FLUSH
A	Front Door to Windshield Pillar	N/A	3.0 +/- 1.0
B	Front Door Header to Aperture	6.0 +/- 1.0	1.0 +/- 1.5
C	Front Door to Rear Door	5.0 +/- 1.0	0.0 +/- 1.0
D	Front Door to Aperture at Sill	7.0 +/- 1.5	N/A
E	Front Door to Fender	5.0 +/- 1.0	0.5 +/- 1.0
F	Hood to Fender	5.0 +/- 1.0	0.0 +/- 1.0
G	Headlamp to Fender	5.0 +/- 2.0	3.0 +/- 2.0
H	Headlamp to Grille	5.5 +/- 2.0	0.0 +/- 2.0
I	Grille to Headlamp	N/A	0.0 +/- 1.0
J	Grille to Hood	10.0 +/- 2.0	0.8 +/- 2.0
K	Front Fascia to Fender	Net + 1.0 - 0.0	3.0 +/- 3.0
L	Fuel Filler Door to Bodyside	3.0 +/- 0.75	0.5 +/- 0.75

GAP AND FLUSH (Continued)

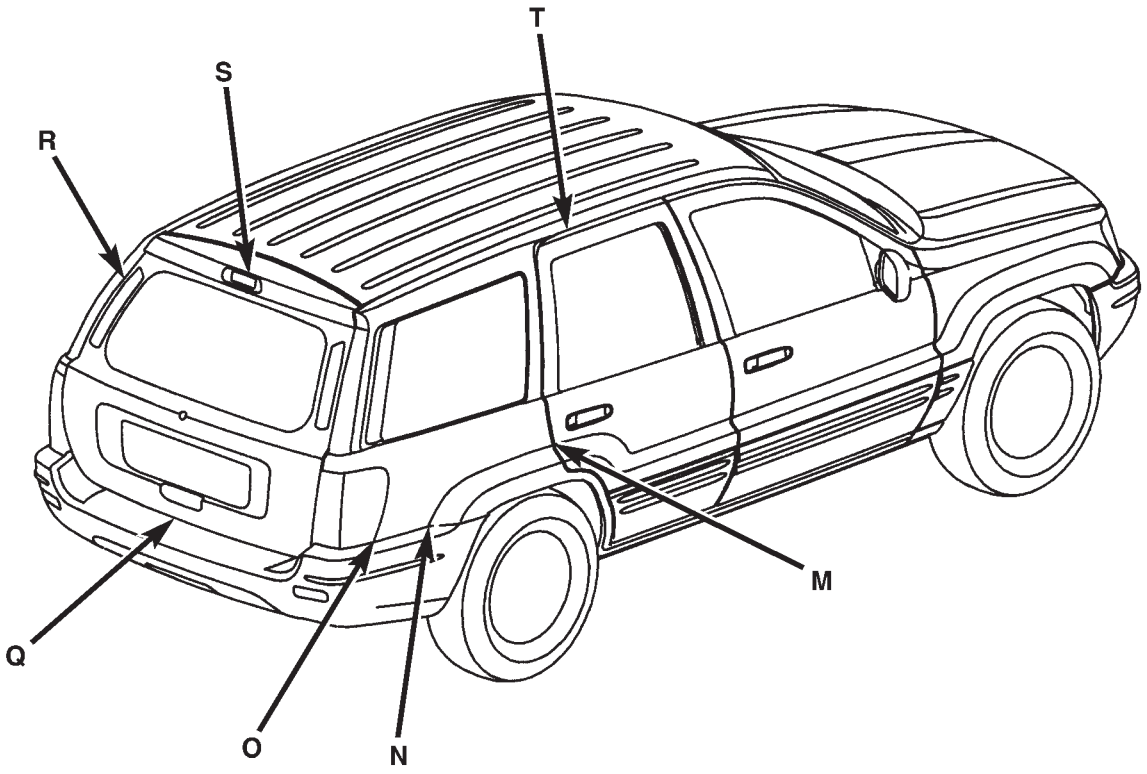


Fig. 2 REAR VIEW

NOTE:
All measurements are in mm.

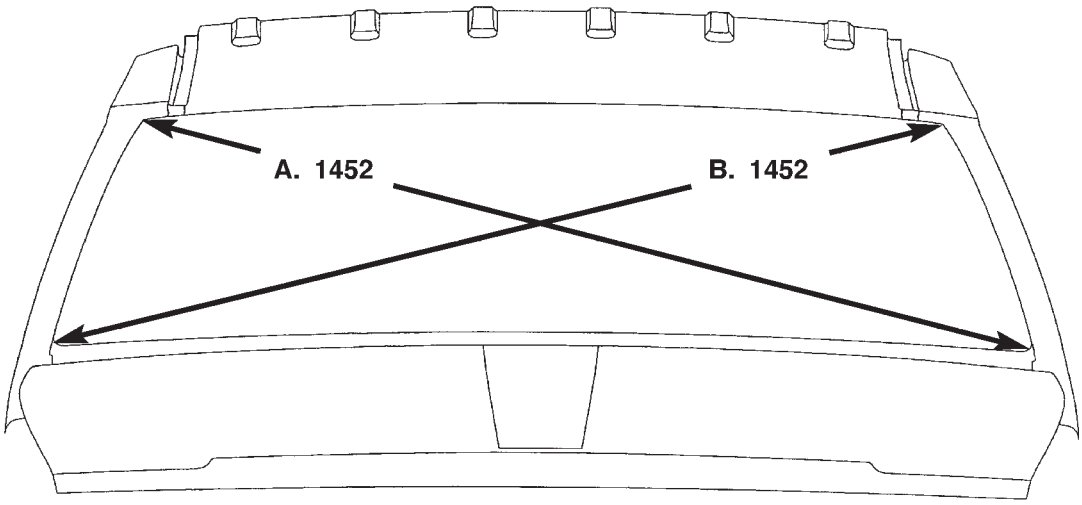
LOCATION	DESCRIPTION	GAP	FLUSH
M	Rear Door to Quarter Panel	5.0 +/- 1.0	0.0 +/- 1.0
N	Aperture to Rear Fascia	Net to 1.0	3.0 +/- 2.0
O	Taillamp to Quarter Panel	2.0 +/- 1.0	3.0 +/- 1.5
Q	Liftgate to Fascia	10.0 +/- 3.0	N/A
R	Liftgate to Aperture	5.0 +/- 1.5	1.0 +/- 1.0
S	Liftgate to Roof	11.0 +/- 1.5	1.0 +/- 1.0
T	Rear Door Header to Aperture	6.0 +/- 1.0	1.0 +/- 1.5

OPENING DIMENSIONS

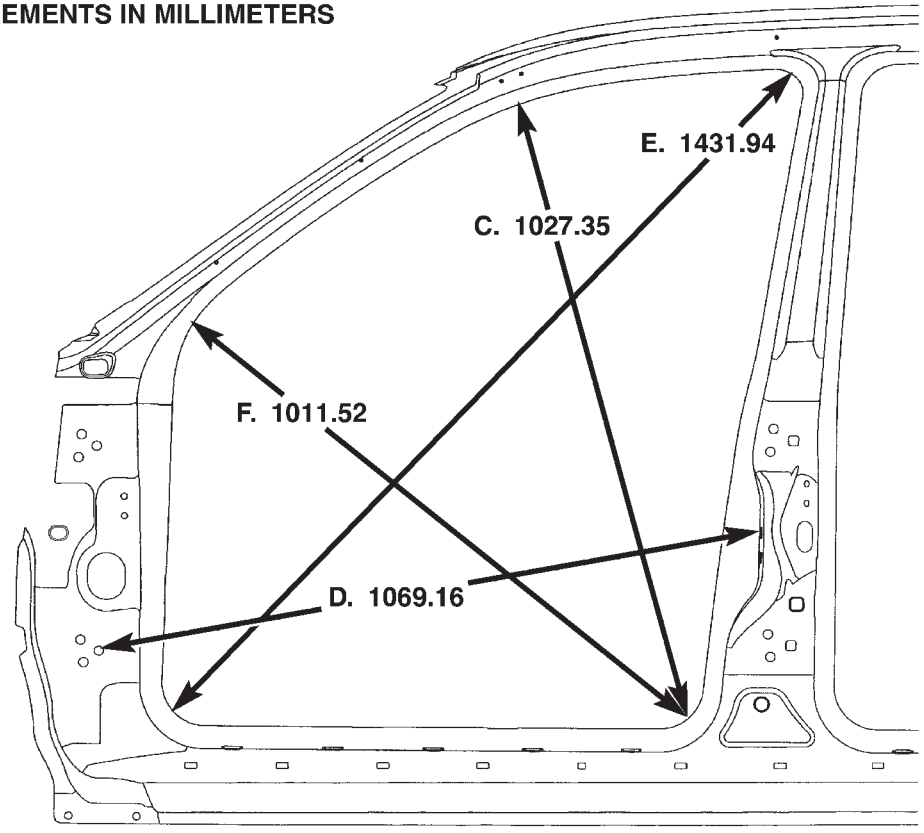
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LIFTGATE OPENING AND ENGINE COMPARTMENT	5

OPENING DIMENSIONS (Continued)



ALL MEASUREMENTS IN MILLIMETERS



A. & B. Center of radius at bottom to center of radius at top.

C. Center of front door lower rear corner radius to center of A-pillar radius.

D. Center of door hinge mount to center of door striker mount.

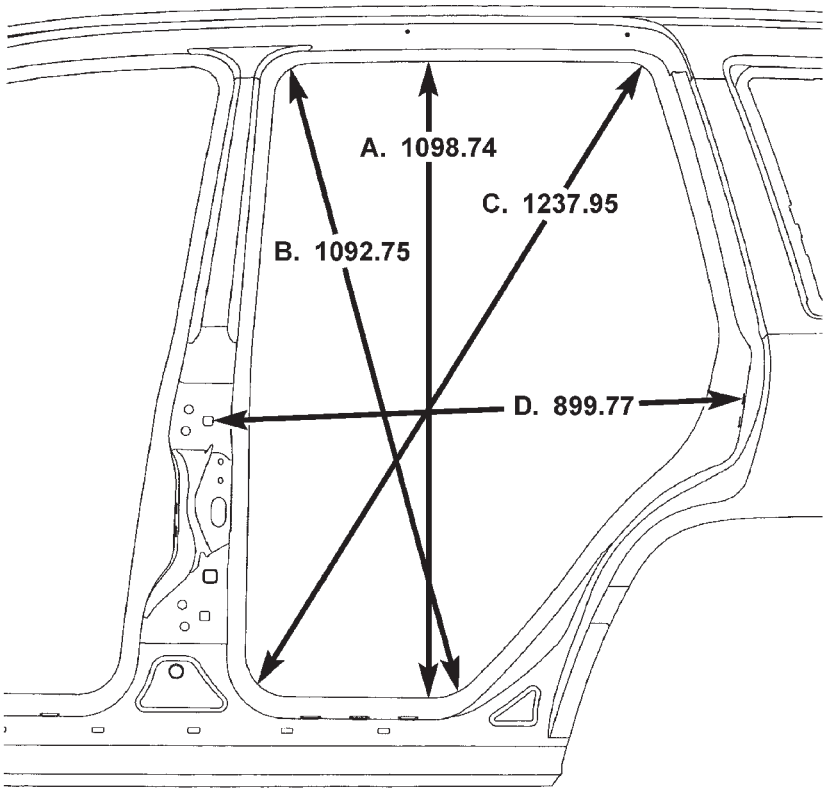
E. Center of radius at bottom front to center of radius at top rear.

F. Center of radius at bottom rear to center of radius at lower A-pillar.

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Fig. 3 WINDSHIELD AND FRONT DOOR OPENING

OPENING DIMENSIONS (Continued)

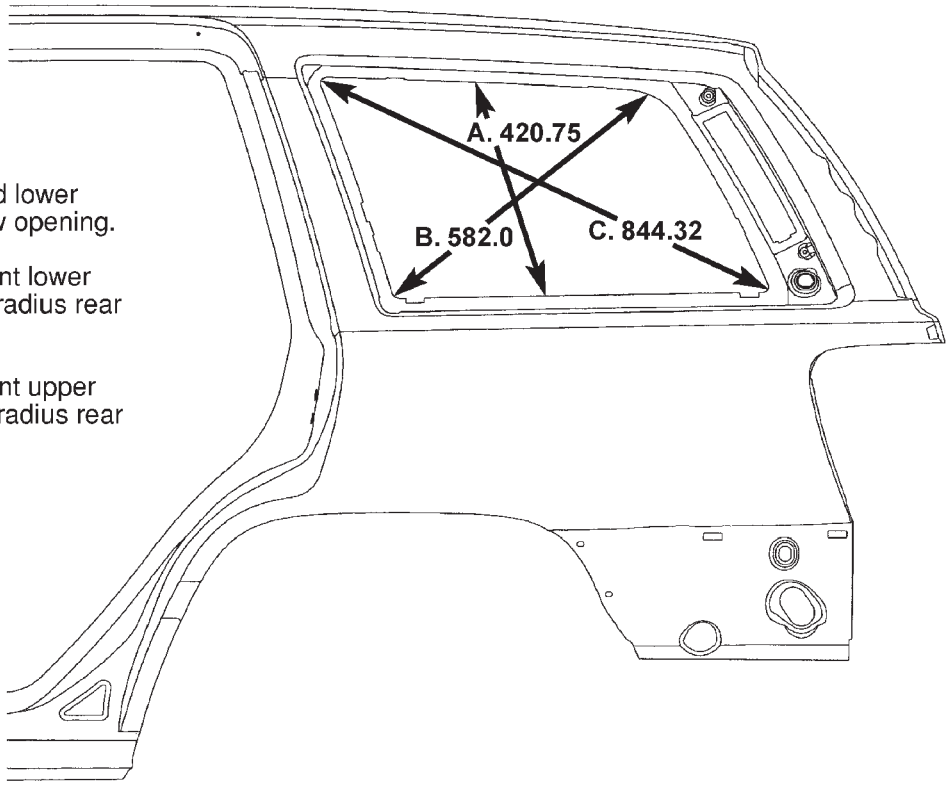


A. Quarter panel to front outer body side upper and lower seam.

B. Center of front upper door radius to center of rear lower door radius.

C. Center of front lower door radius to center of rear upper door radius.

D. Rear door hinge mount to rear door striker mount.



A. Center of upper and lower rear quarter window opening.

B. Center of radius front lower corner to center of radius rear upper corner.

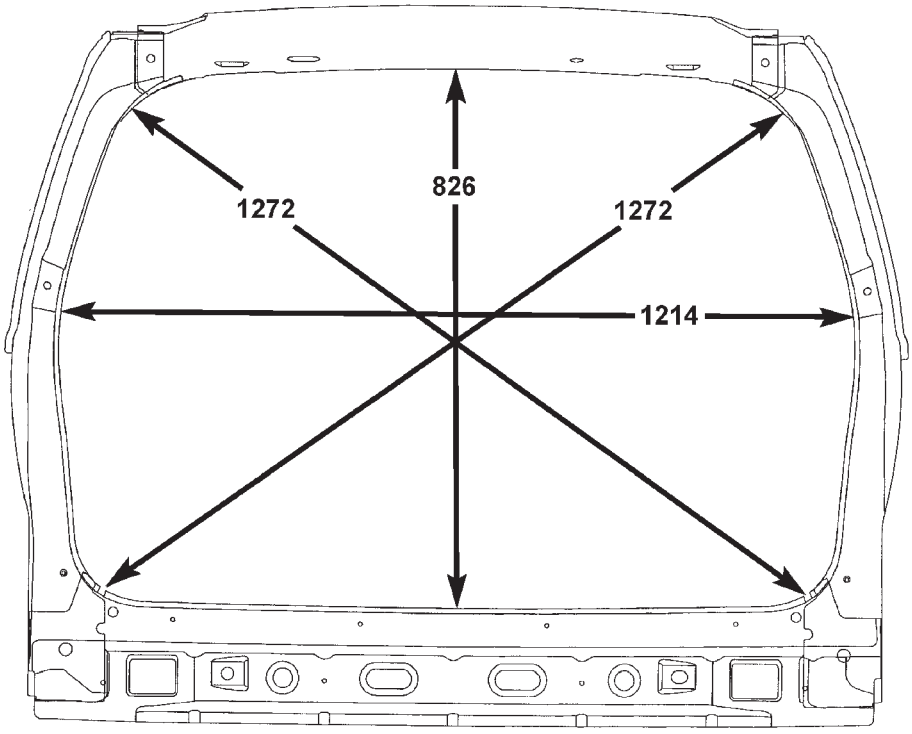
C. Center of radius front upper corner ro center of radius rear lower corner.

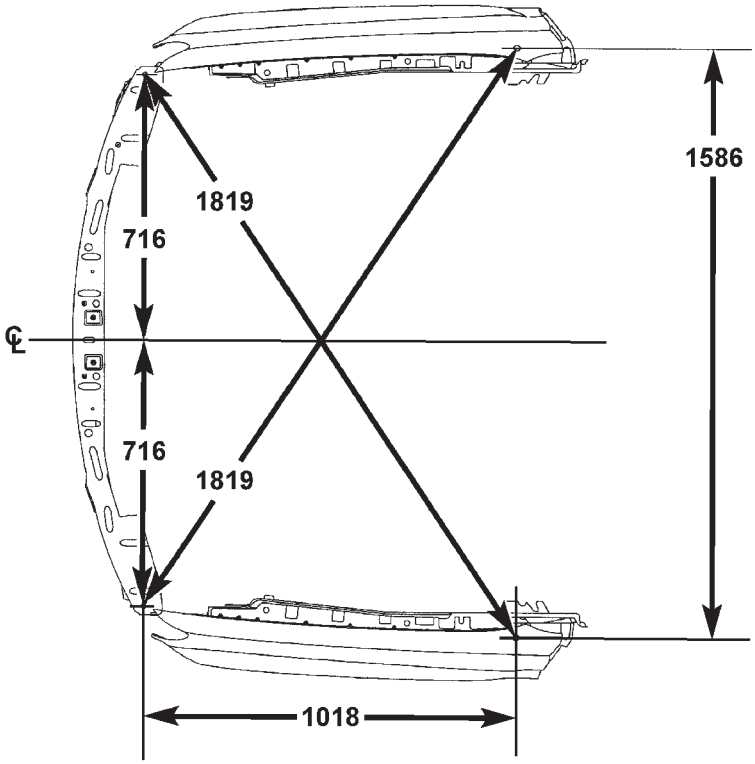
ALL MEASUREMENTS IN MILLIMETERS

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Fig. 4 REAR DOOR AND QUARTER GLASS OPENING

OPENING DIMENSIONS (Continued)





ALL MEASUREMENTS IN MILLIMETERS

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Fig. 5 LIFTGATE OPENING AND ENGINE COMPARTMENT

SEALER LOCATIONS

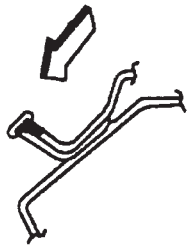
SPECIFICATIONS

SEALER LOCATIONS

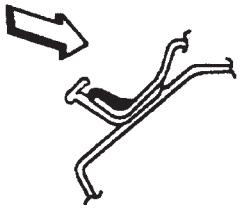
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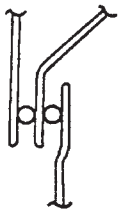
SEALER LOCATIONS (Continued)



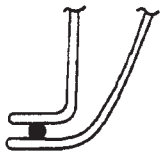
HOLD GUN NOZZLE IN DIRECTION OF ARROW IN ORDER TO EFFECTIVELY SEAL METAL JOINTS.



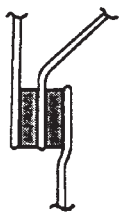
DO NOT HOLD GUN NOZZLE IN DIRECTION OF ARROW. SEALER APPLIED AS SHOWN IS INEFFECTIVE.



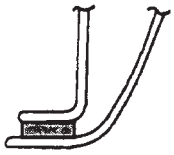
3 METAL THICKNESS



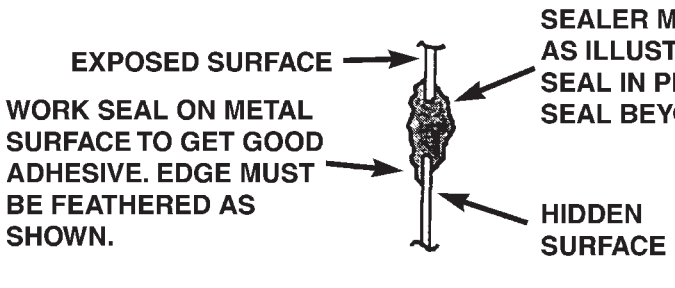
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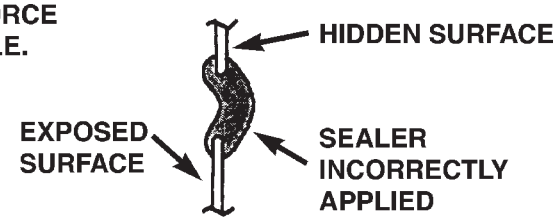


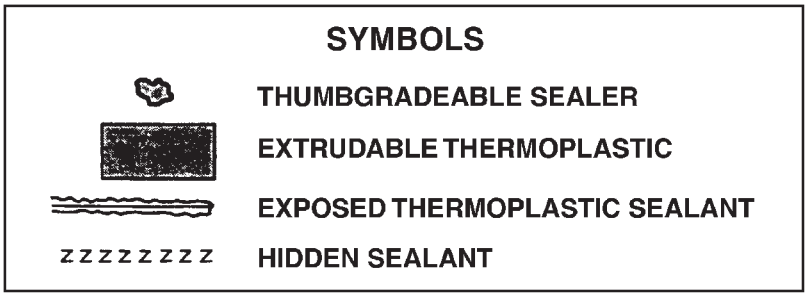
3 METAL THICKNESS



2 METAL THICKNESS







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Fig. 6 APPLICATION METHODS

SEALER LOCATIONS (Continued)

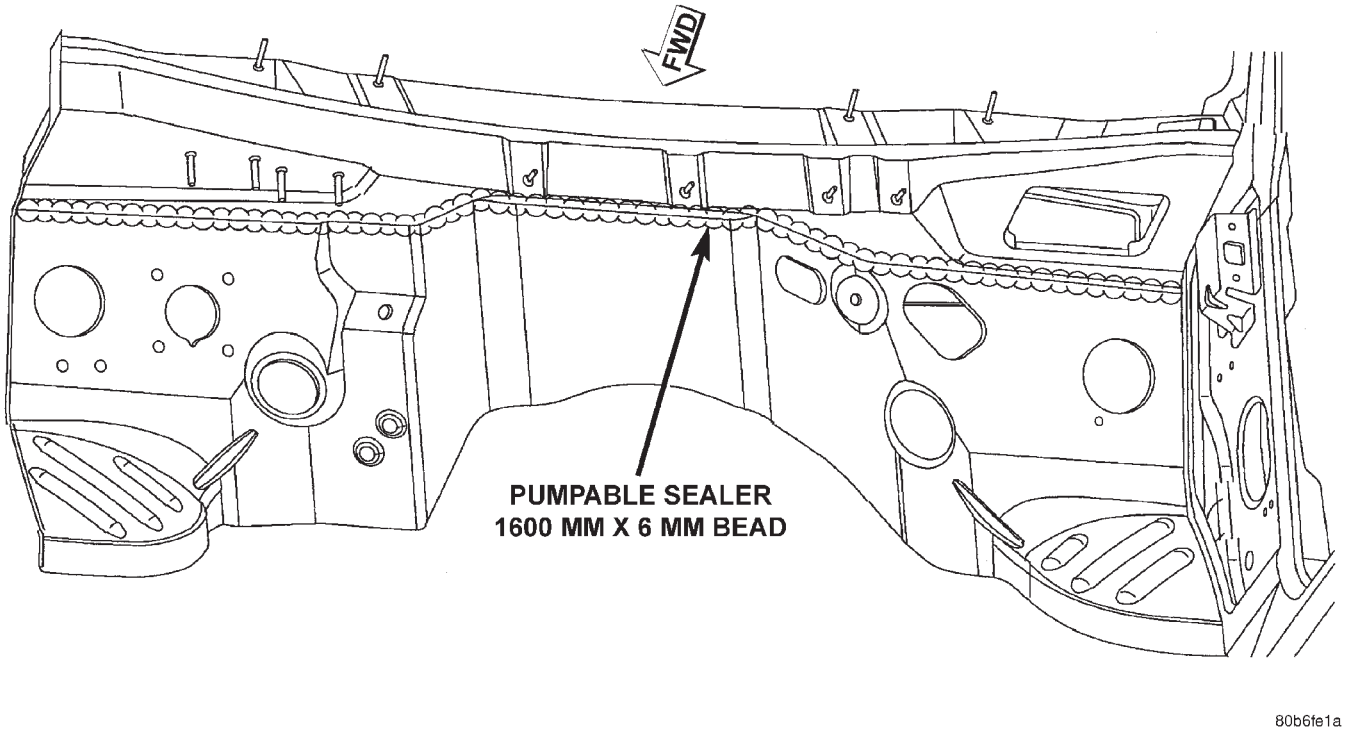


Fig. 7 COWL PLENUM AND DASH PANEL

SEALER LOCATIONS (Continued)

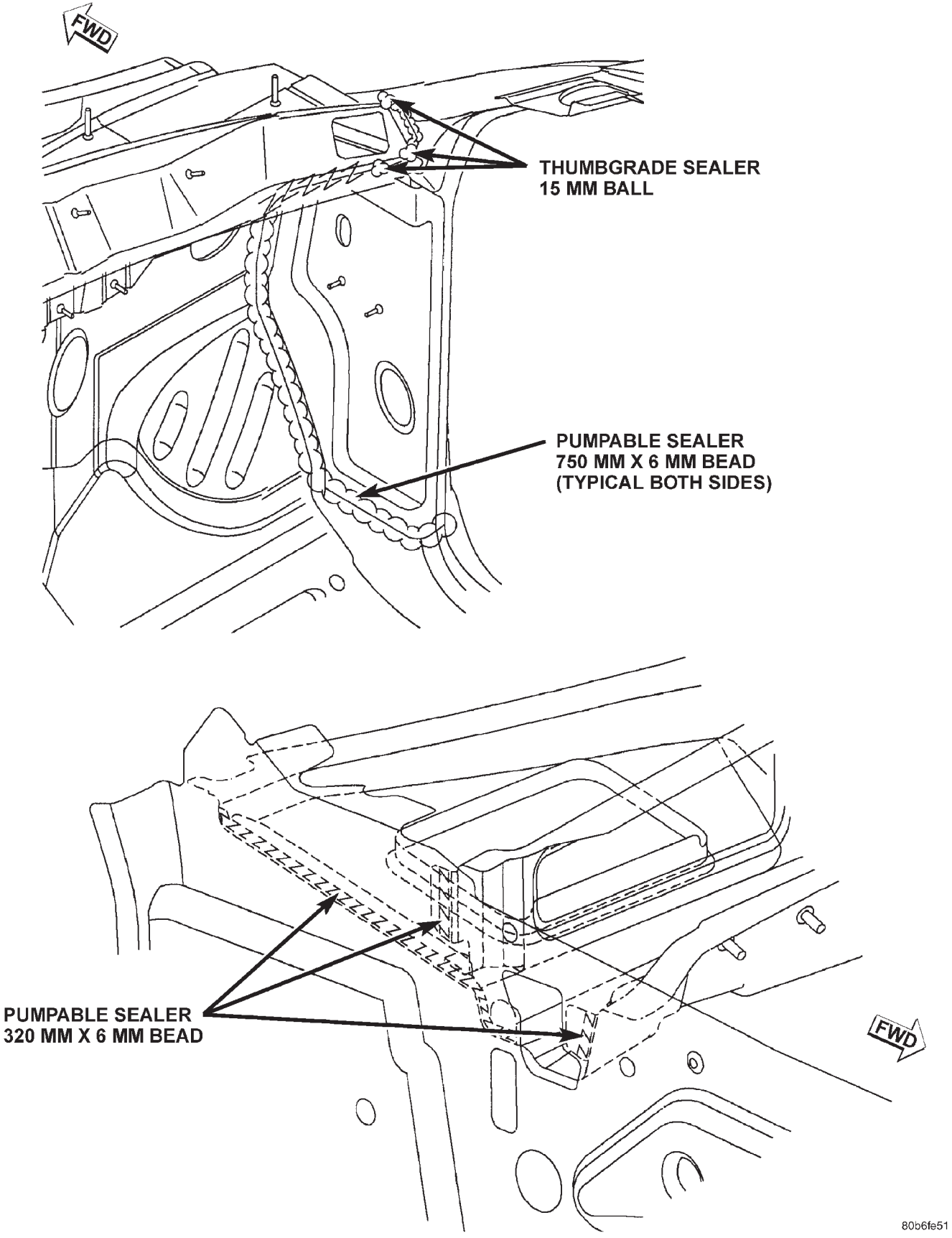


Fig. 8 DASH, COWL AND PLENUM

SEALER LOCATIONS (Continued)

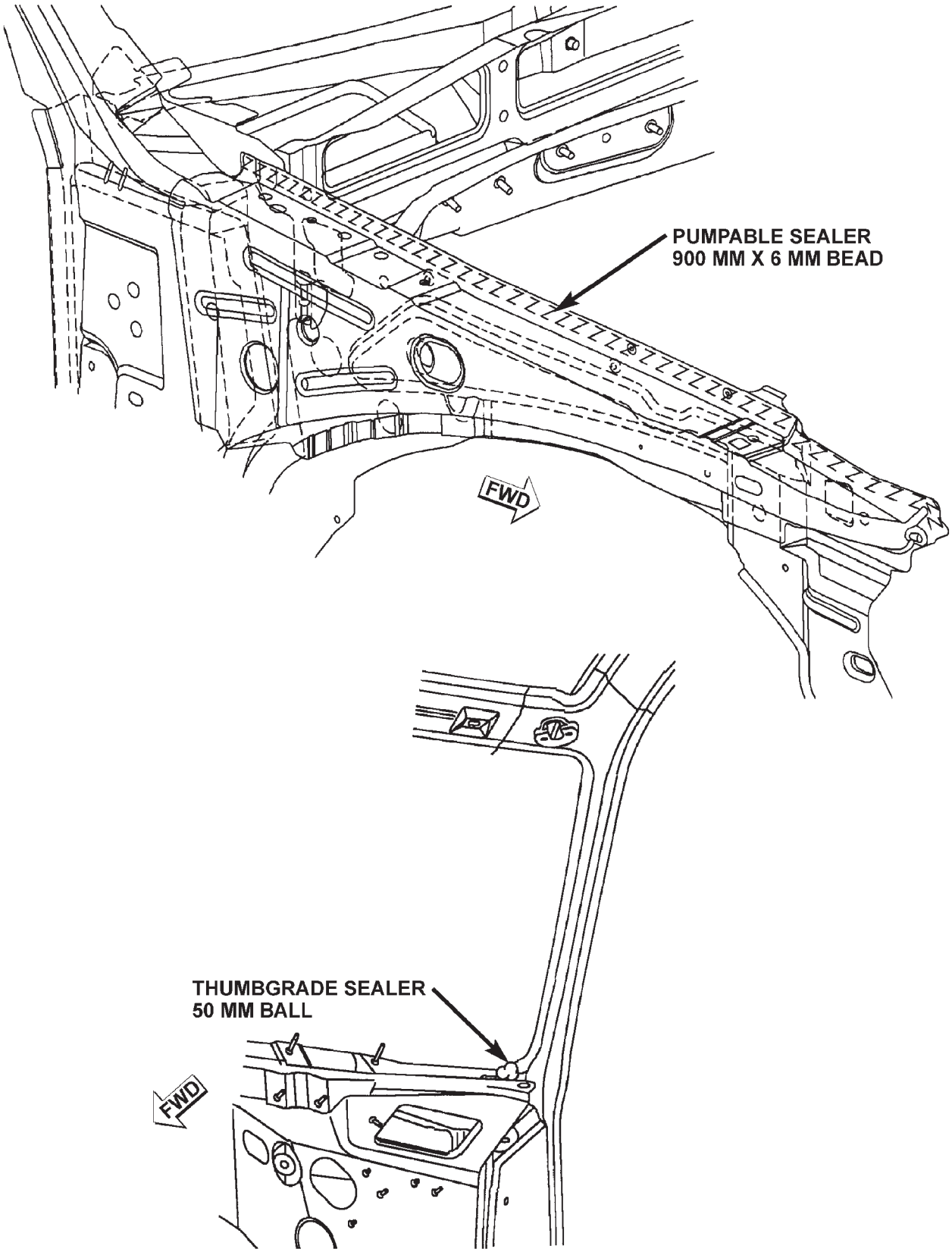


Fig. 9 INNER FENDER AND COWL

SEALER LOCATIONS (Continued)

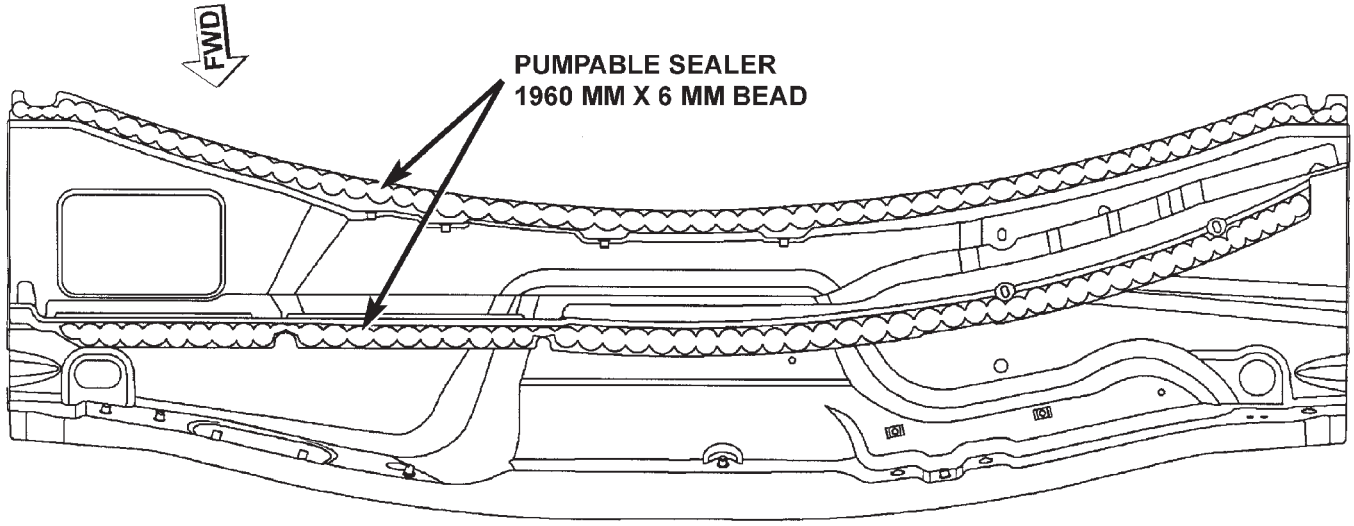


Fig. 10 LOWER PLENUM AND BAFFLE

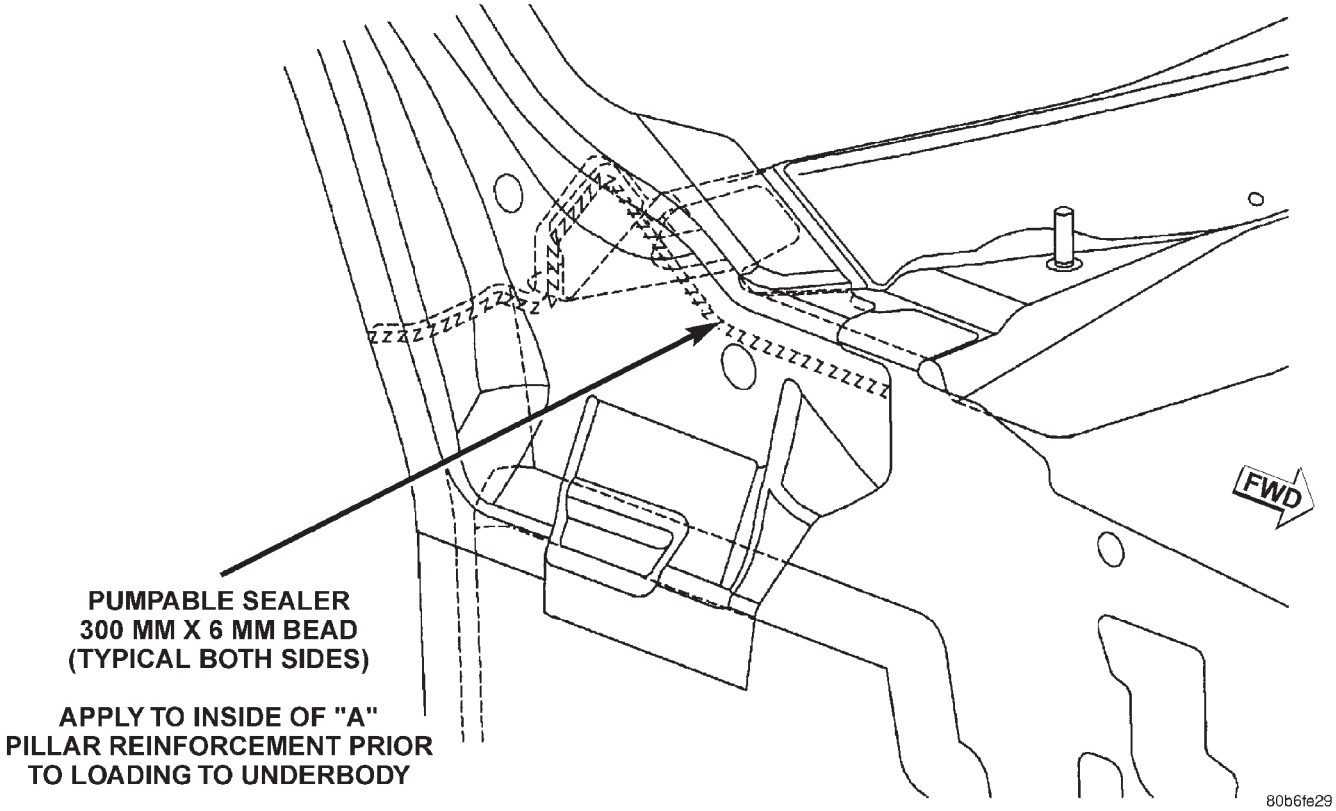


Fig. 11 A-PILLAR

SEALER LOCATIONS (Continued)

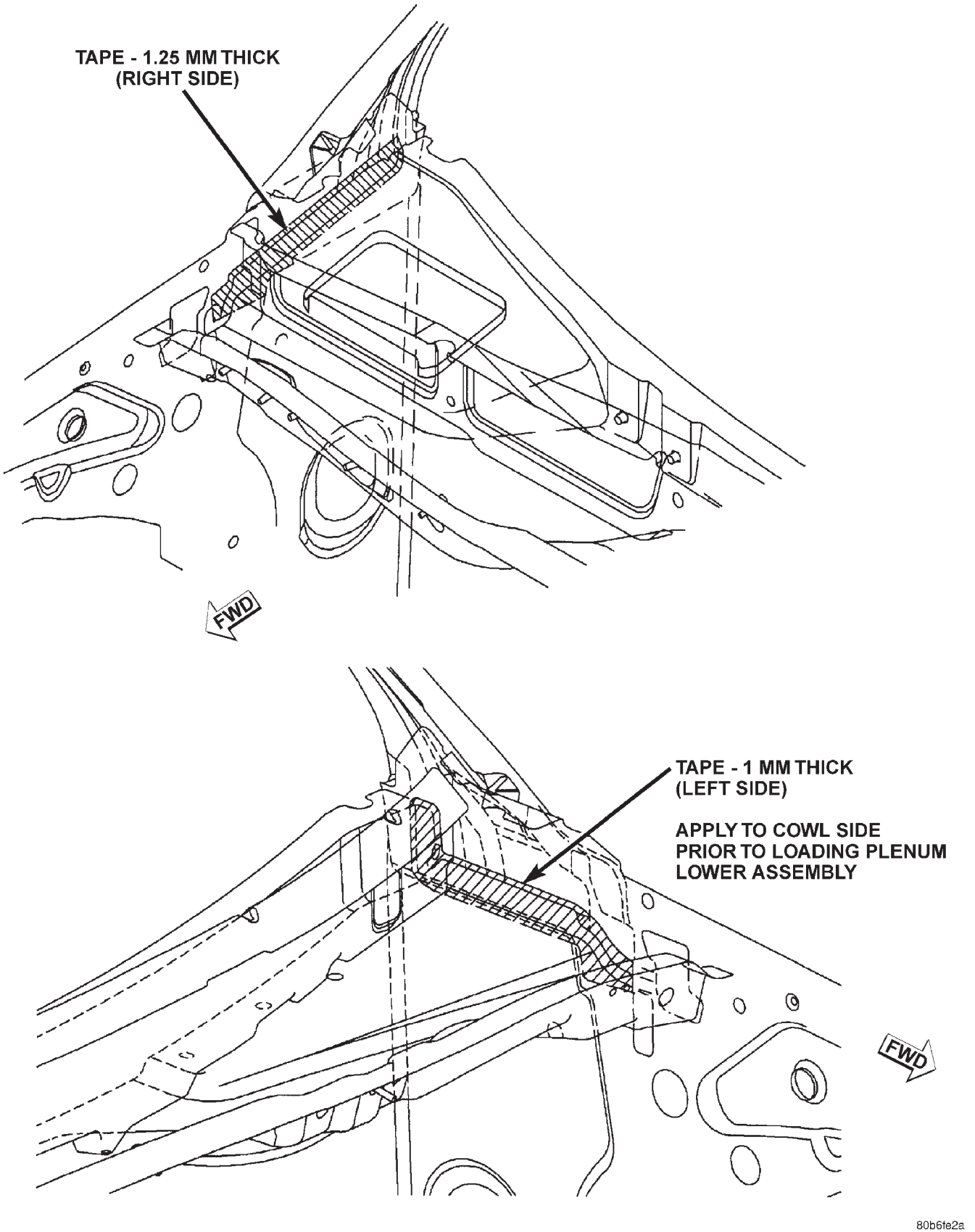


Fig. 12 COWL SIDE ATTACHMENT

SEALER LOCATIONS (Continued)

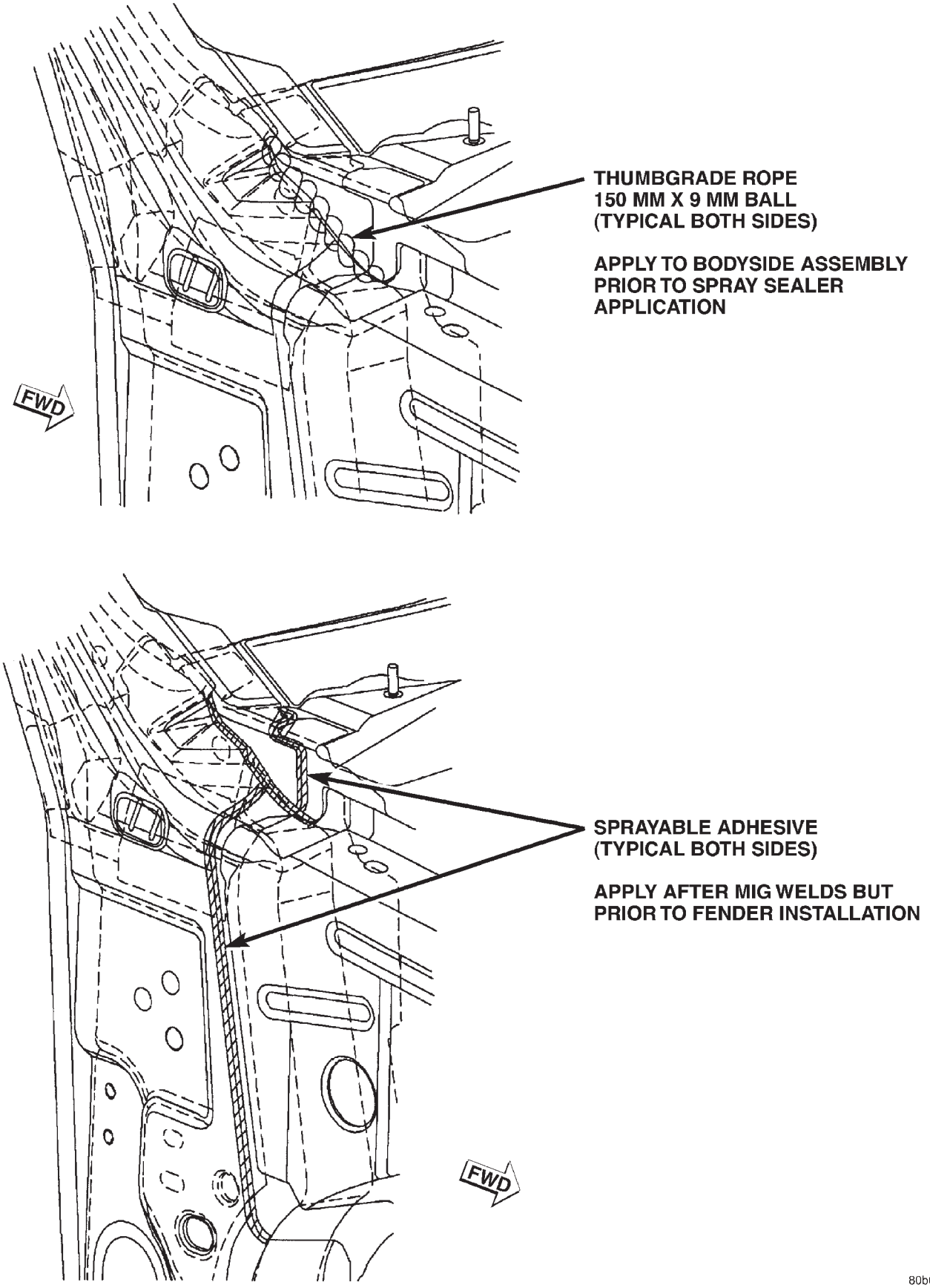


Fig. 13 BODYSIDE ATTACHMENT

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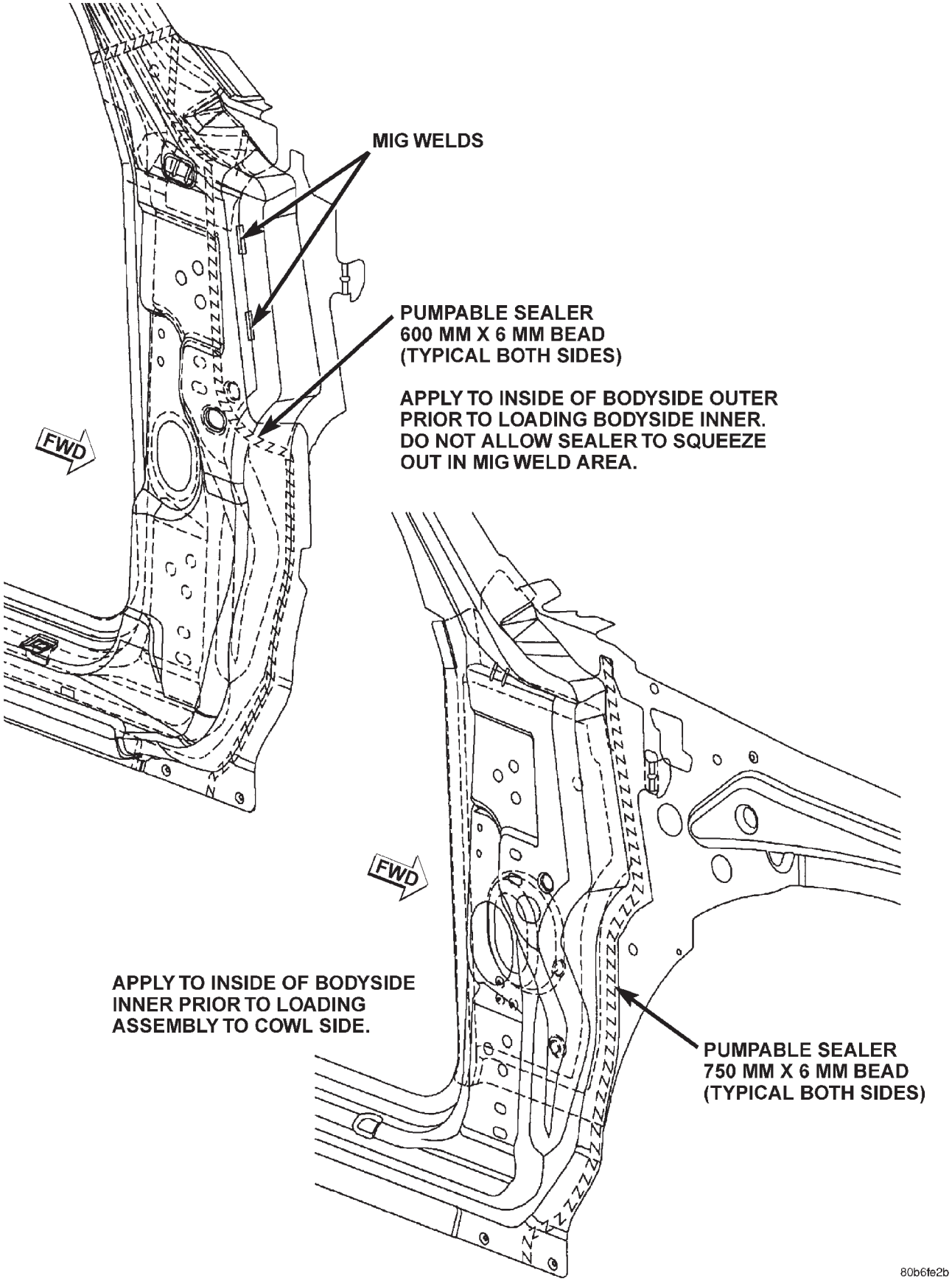


Fig. 14 BODYSIDE INNER AND OUTER TO COWL

SEALER LOCATIONS (Continued)

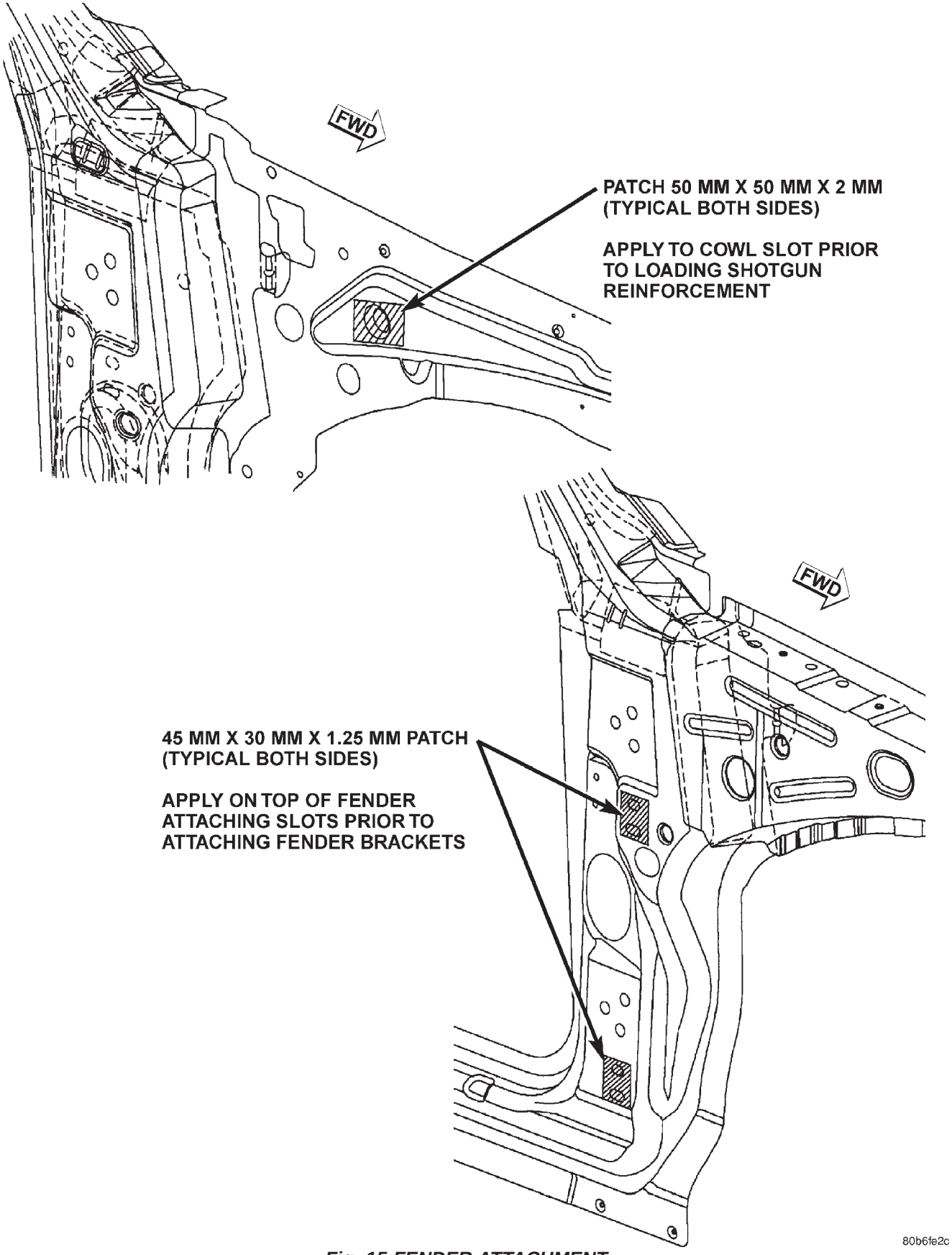
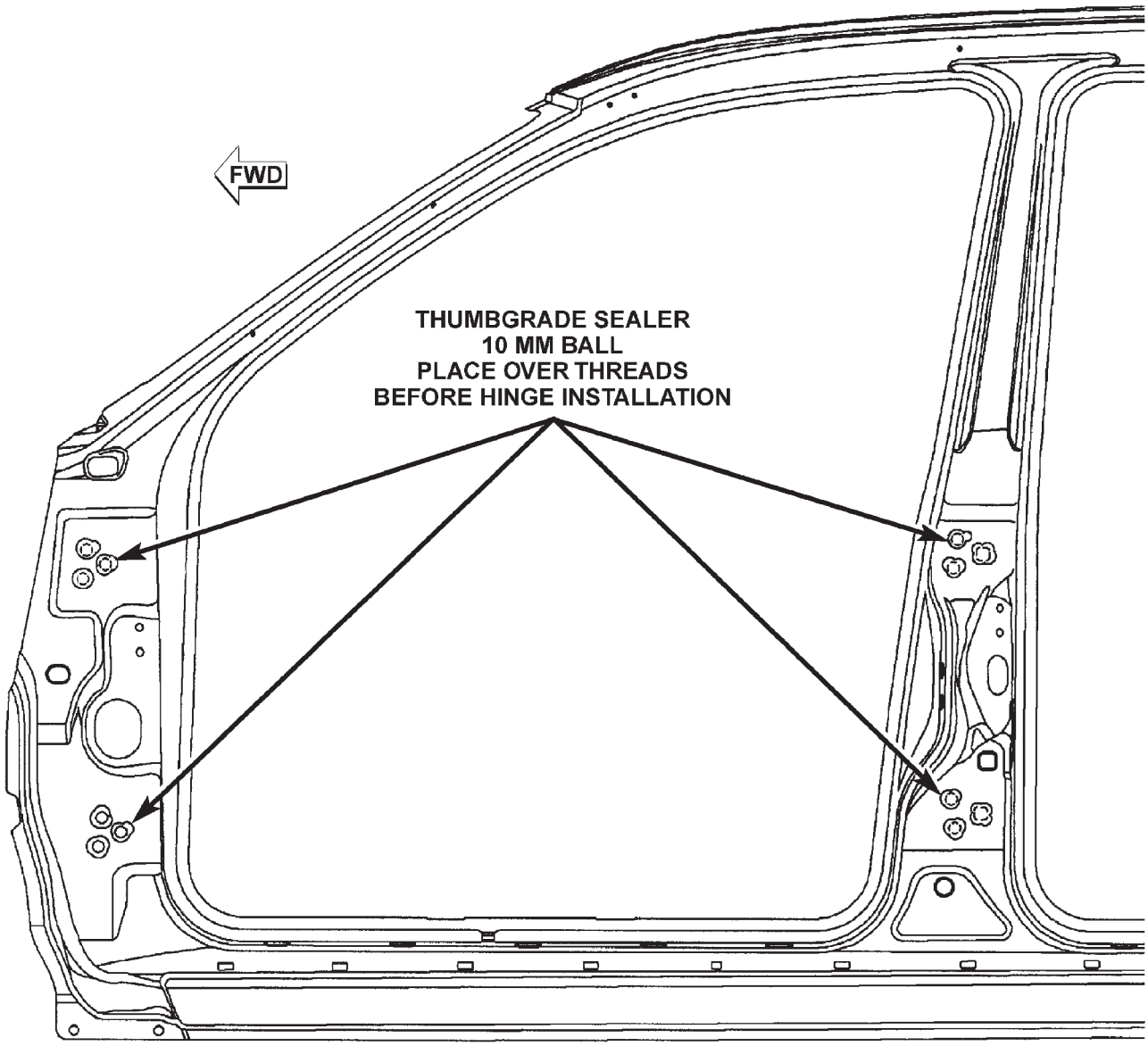


Fig. 15 FENDER ATTACHMENT

SEALER LOCATIONS (Continued)



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Fig. 16 DOOR HINGE BOLT HOLES

SEALER LOCATIONS (Continued)

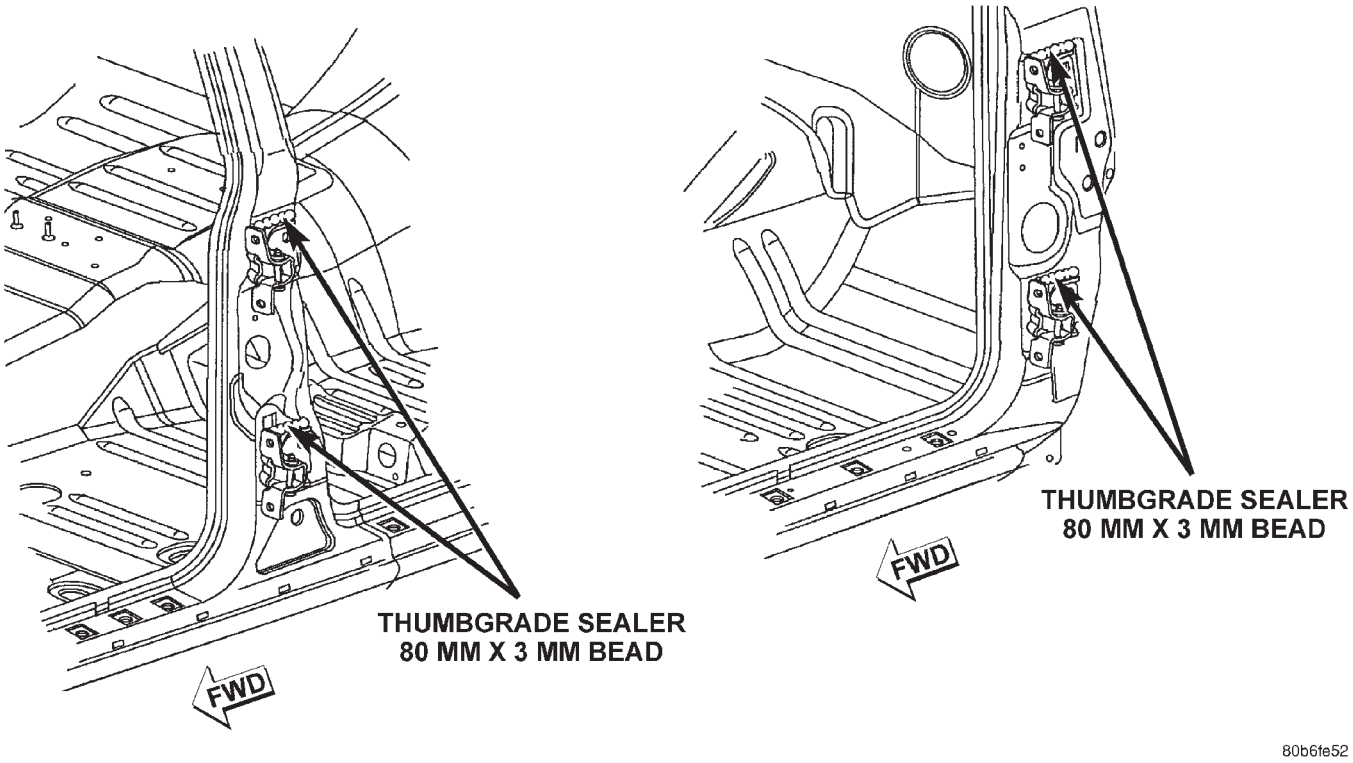


Fig. 17 A-PILLAR AND B-PILLAR HINGE AREA

SEALER LOCATIONS (Continued)

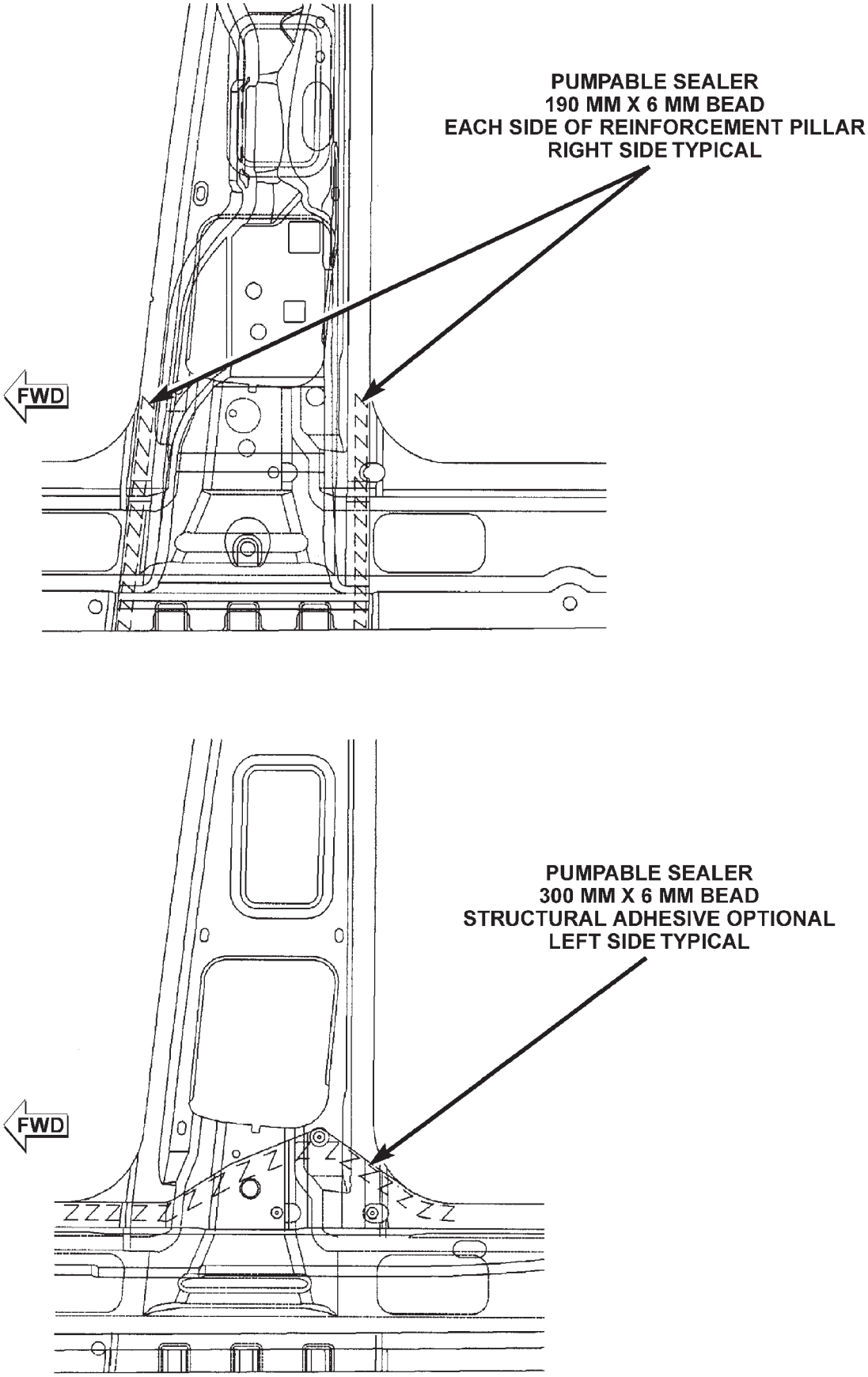


Fig. 18 B-PILLAR AND SILL

SEALER LOCATIONS (Continued)

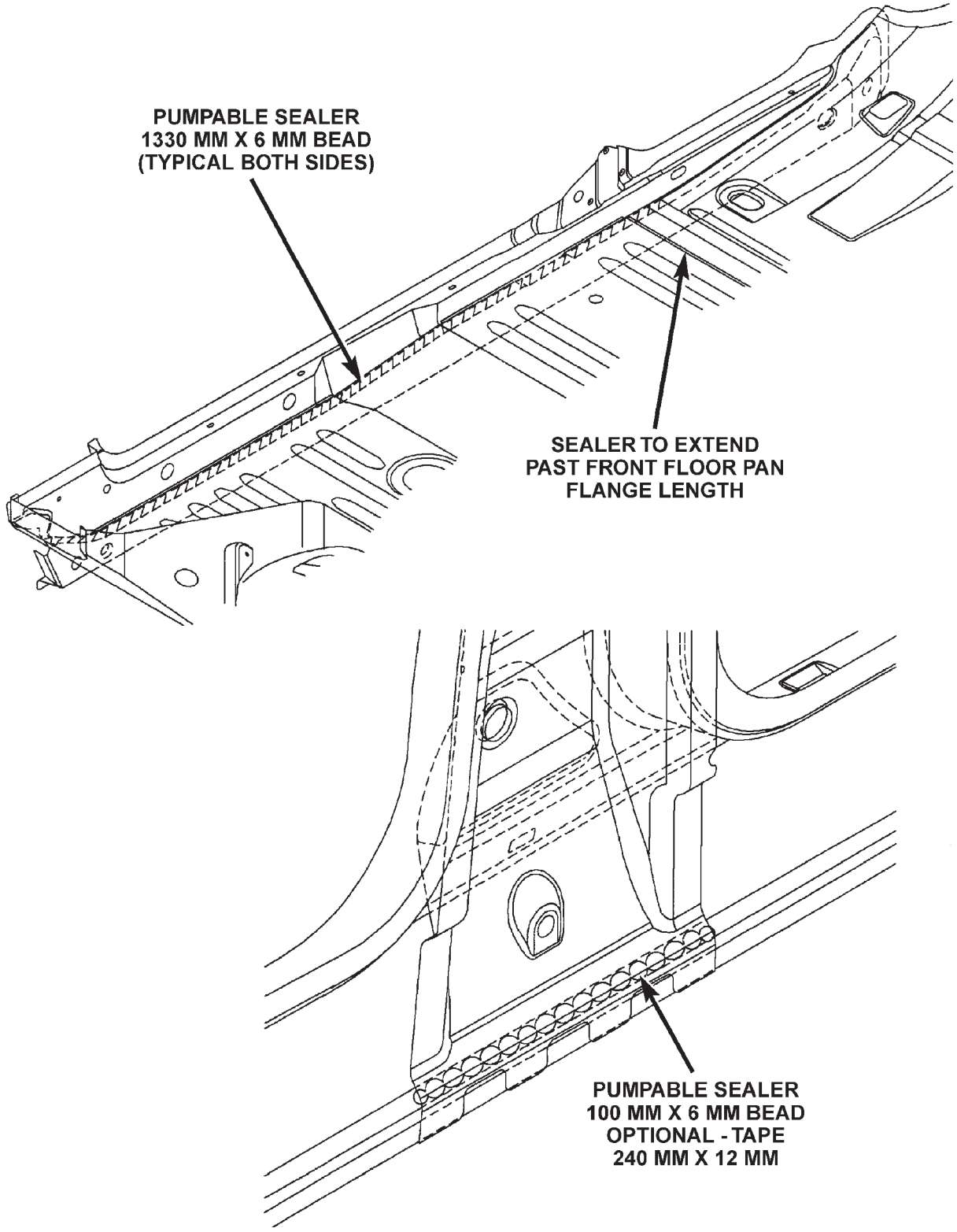


Fig. 19 SILL AND B-PILLAR

SEALER LOCATIONS (Continued)

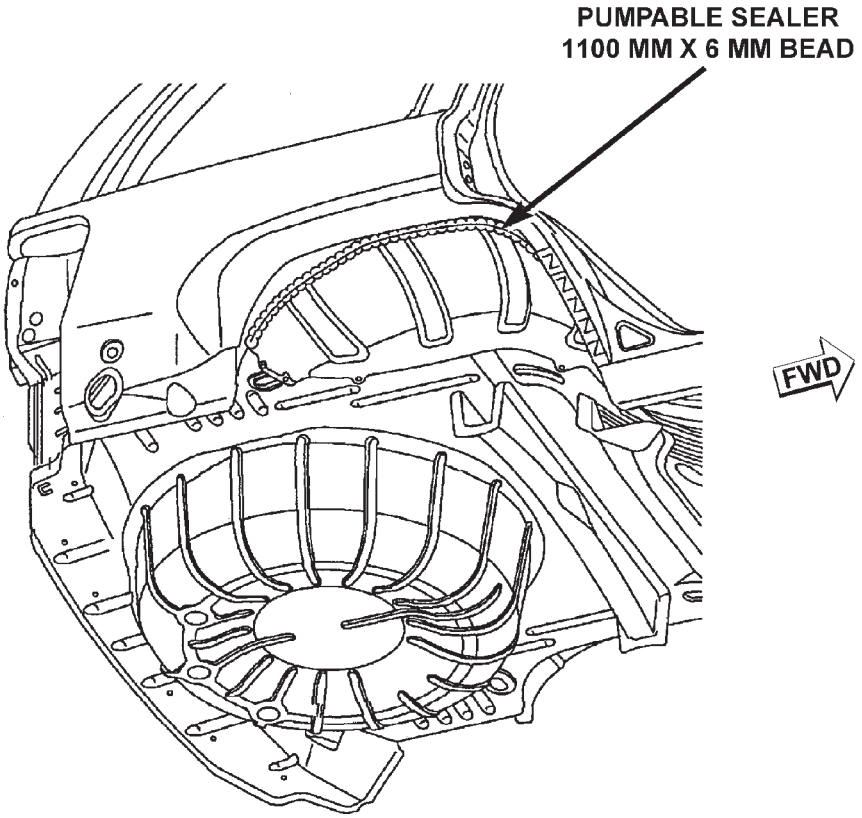


Fig. 20 BODYSIDE APERTURE AND REAR WHEELHOUSE

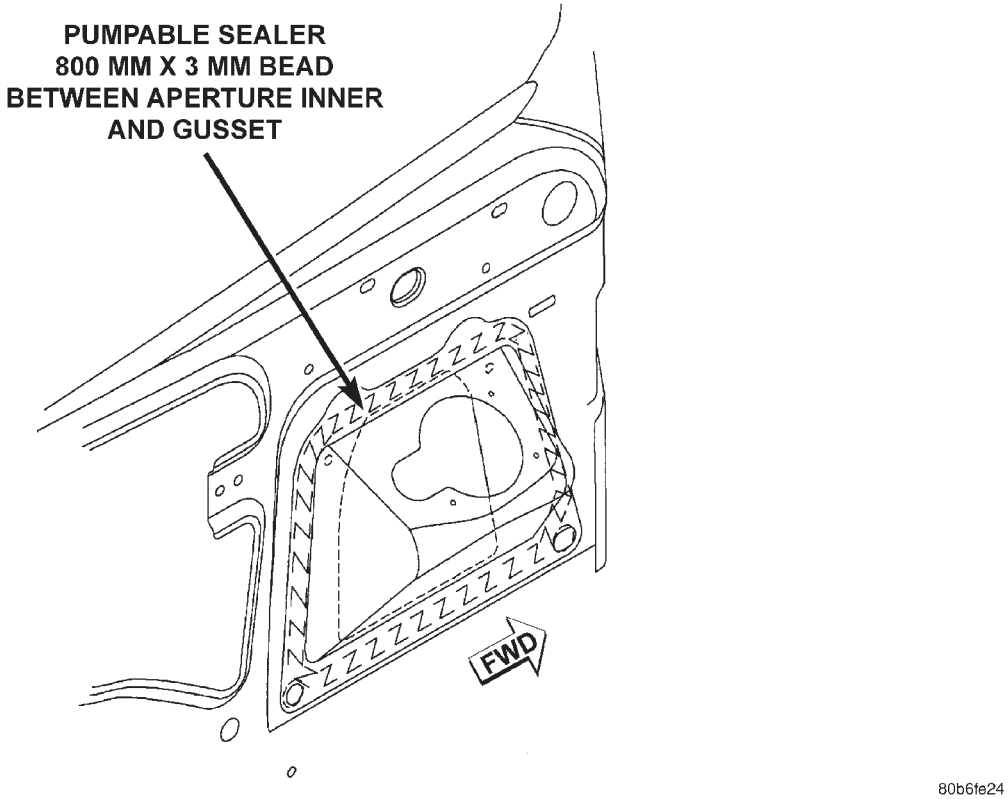


Fig. 21 FUEL FILLER GUSSET

SEALER LOCATIONS (Continued)

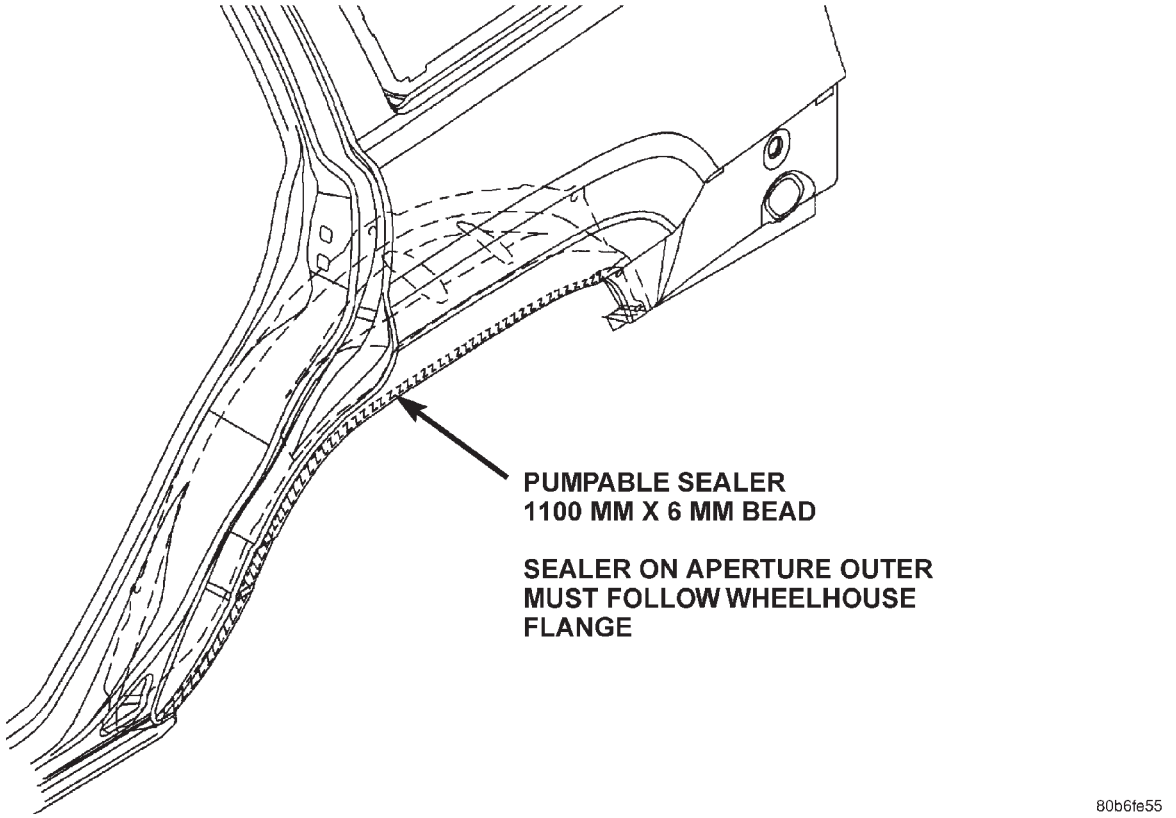


Fig. 22 OUTER WHEELHOUSE FLANGE

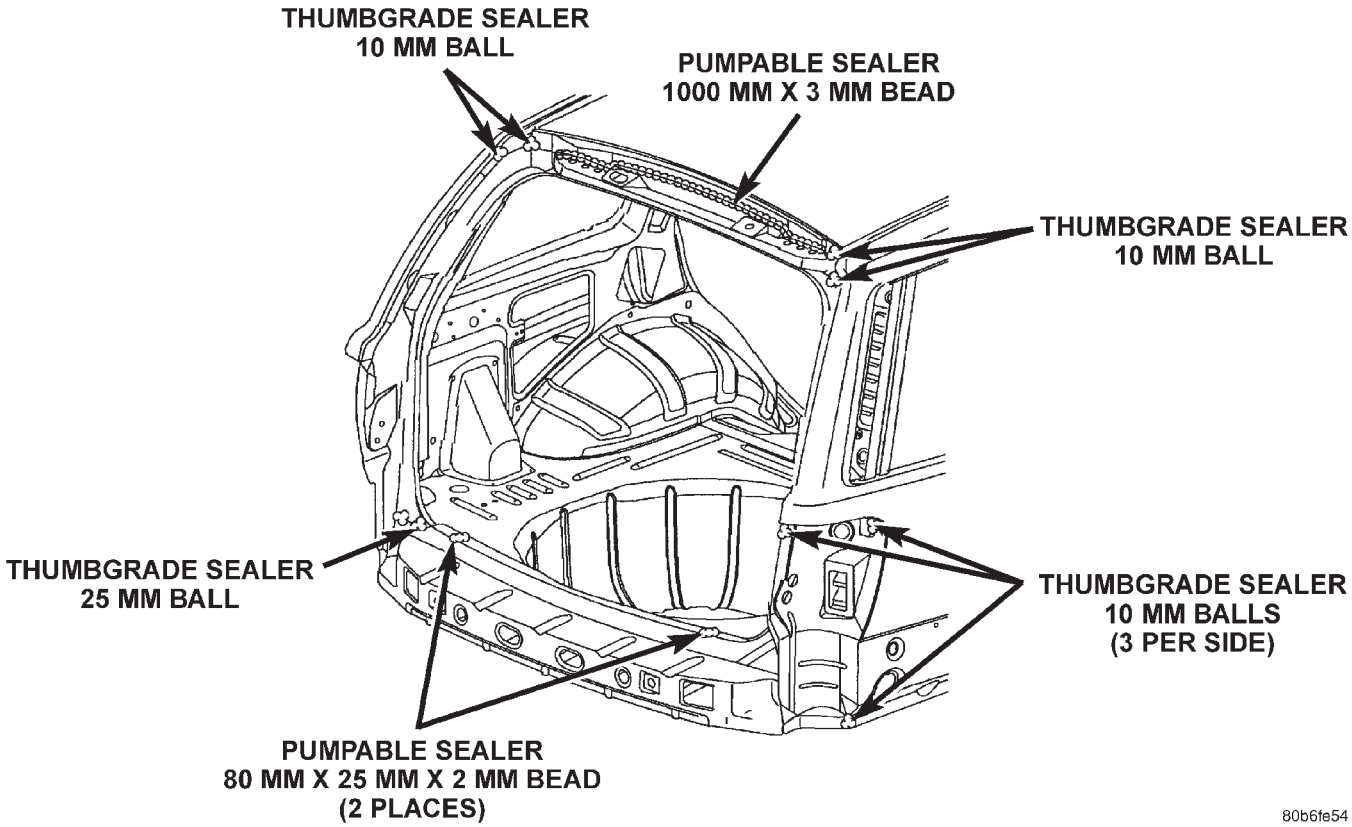


Fig. 23 LIFTGATE OPENING

SEALER LOCATIONS (Continued)

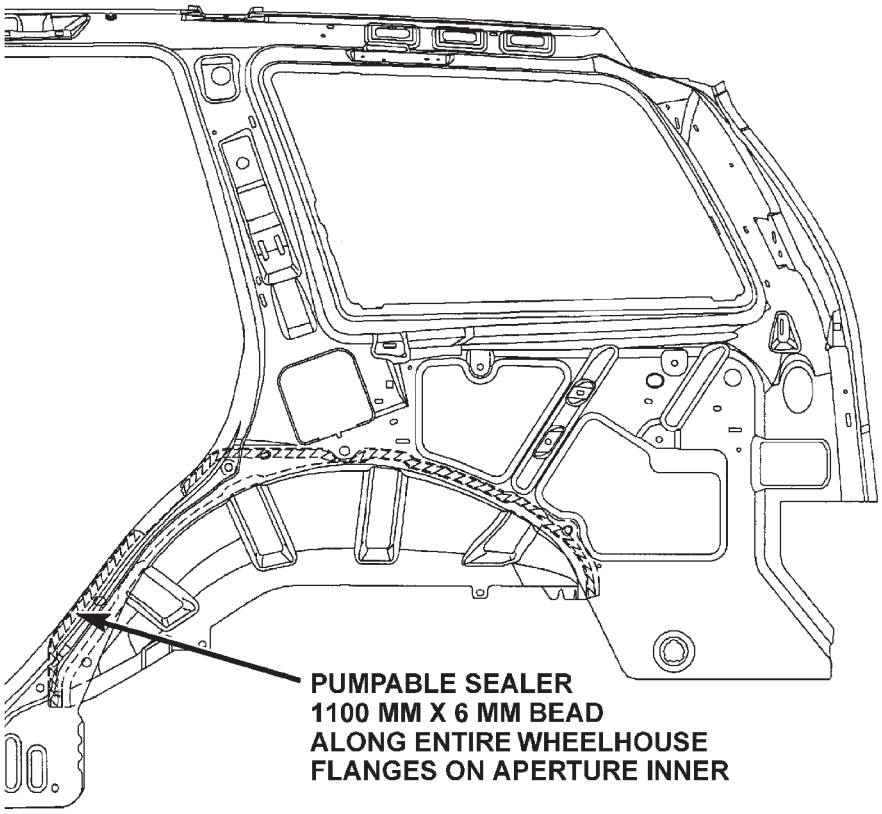


Fig. 24 INNER WHEELHOUSE FLANGE TO BODYSIDE APERTURE

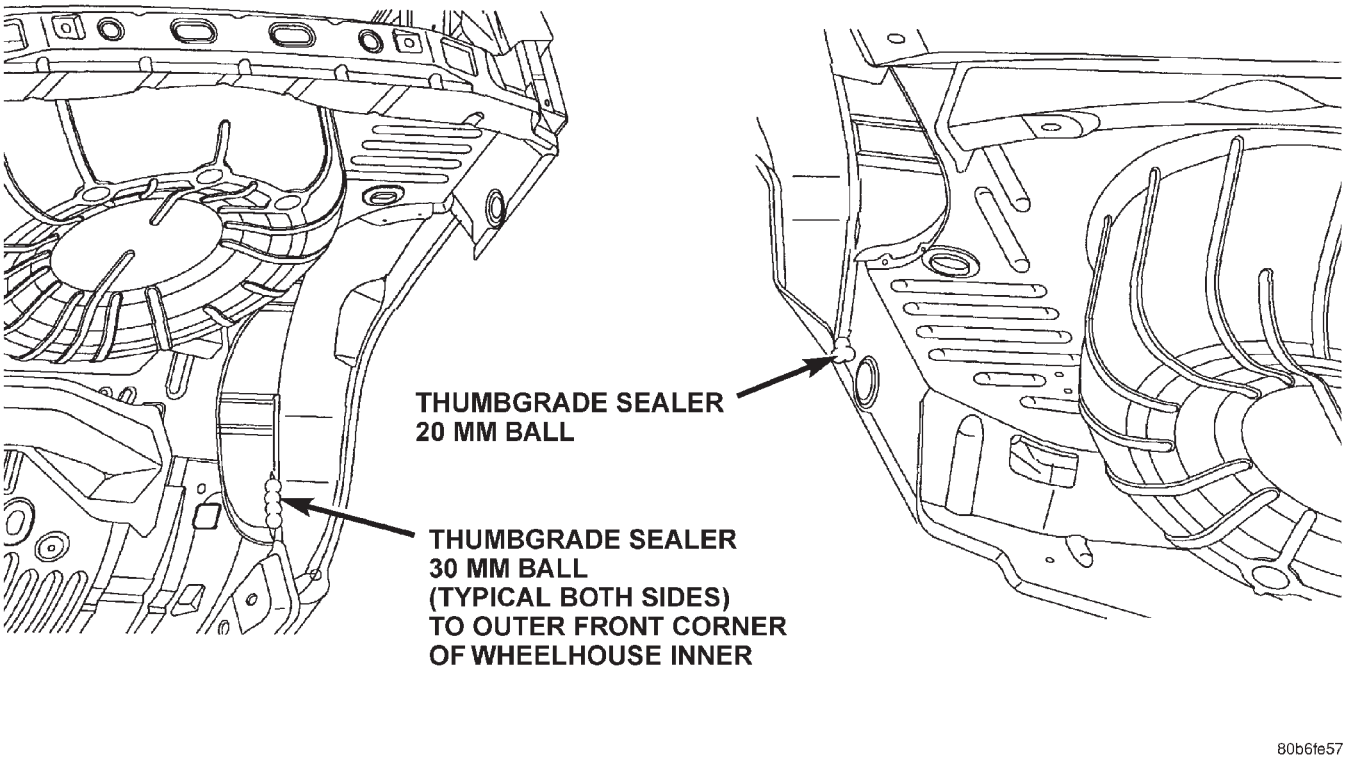
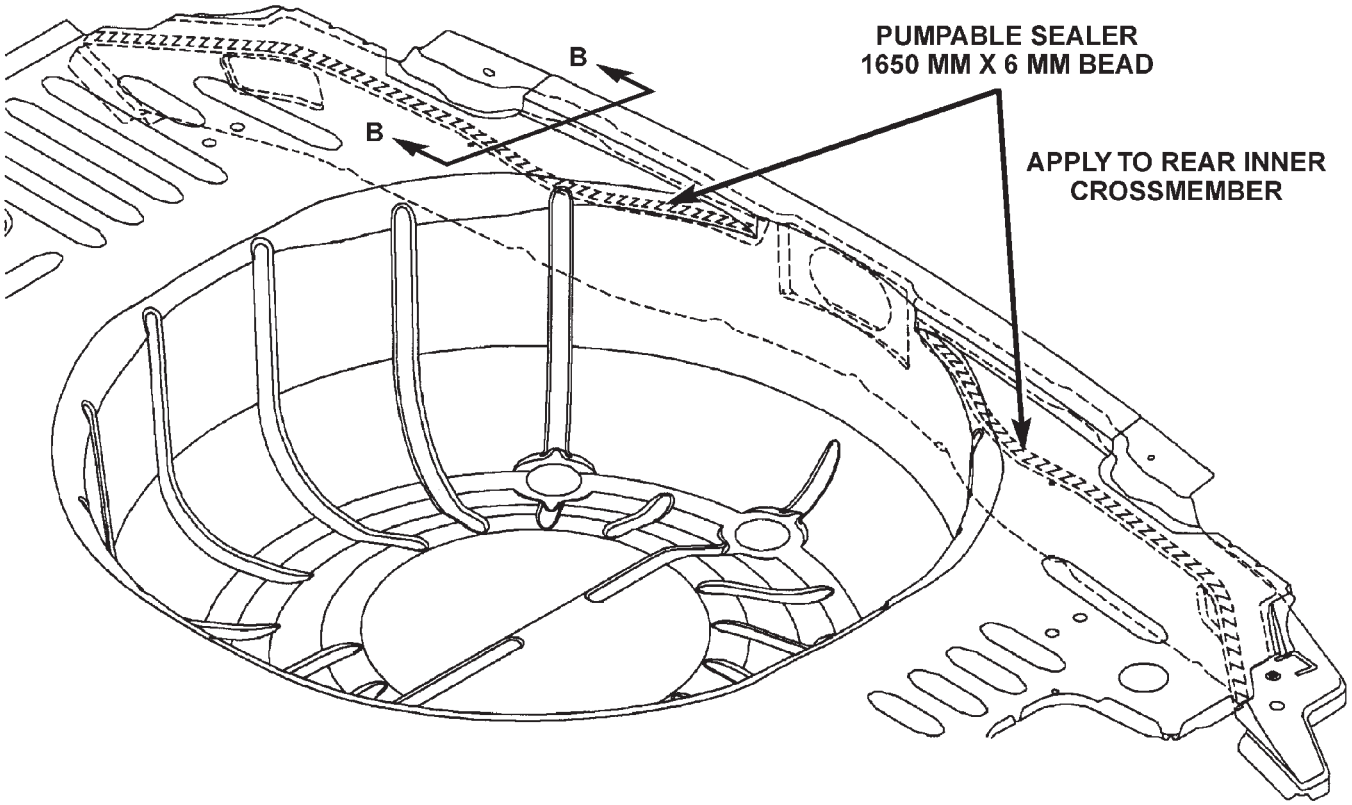
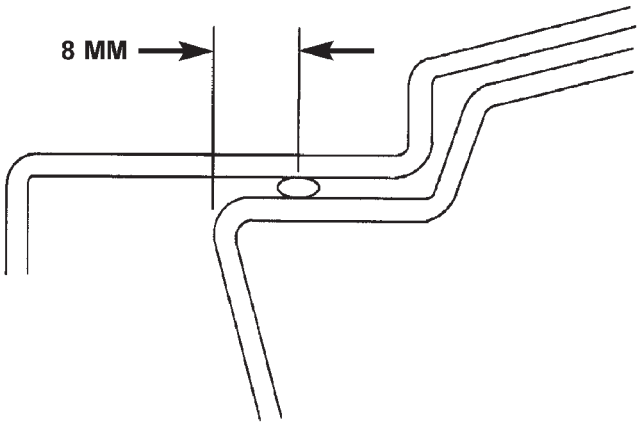


Fig. 25 WHEELHOUSE LOWER

SEALER LOCATIONS (Continued)





SECTION B - B

℄ OF SEALER BEAD
TO BE APPROXIMATELY 8 MM
REARWARD OF FRONT EDGE
OF REAR INNER CROSSMEMBER

80b6fe58

Fig. 26 REAR INNER CROSSMEMBER

SEALER LOCATIONS (Continued)

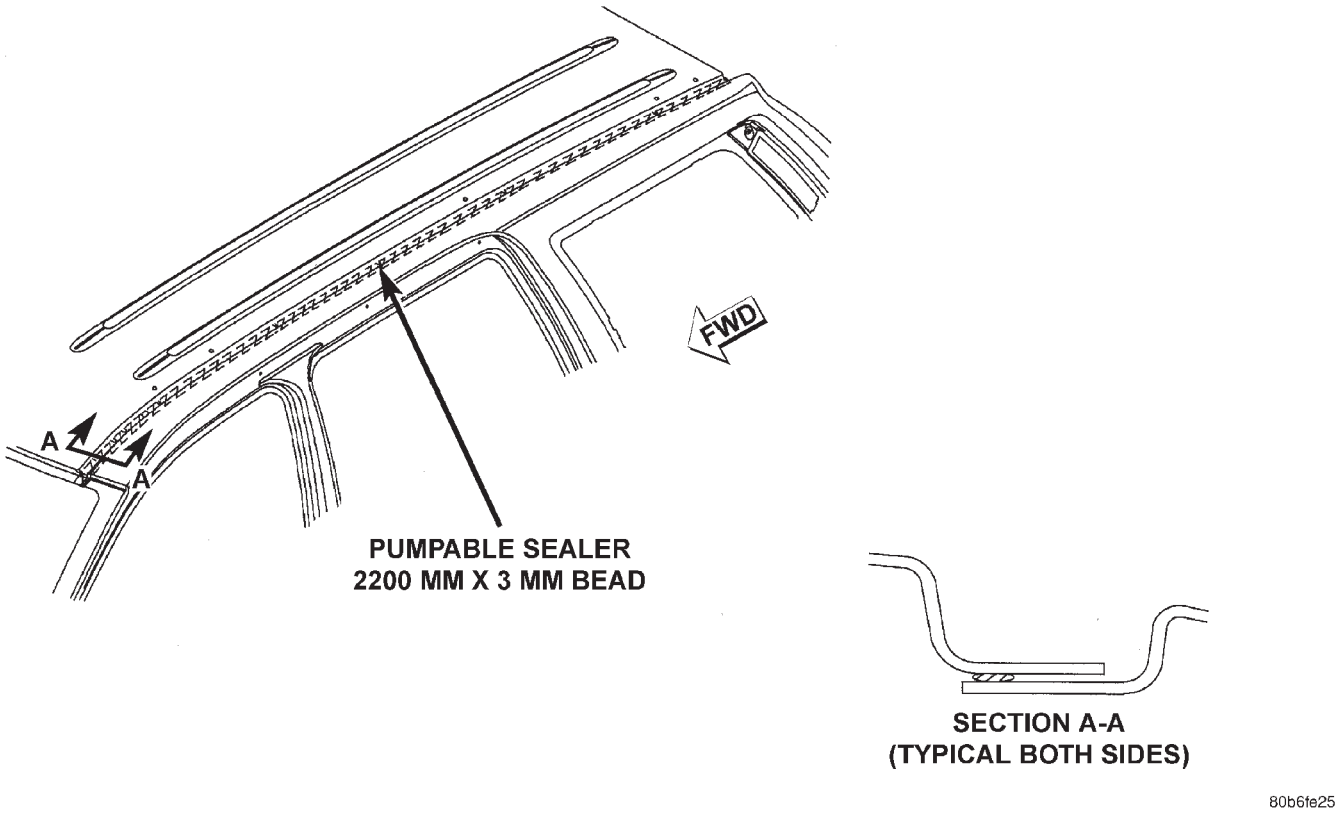


Fig. 27 ROOF TO BODY SIDE APERTURE

STUCTURAL ADHESIVE LOCATIONS

SPECIFICATIONS - STRUCTURAL ADHESIVE LOCATIONS

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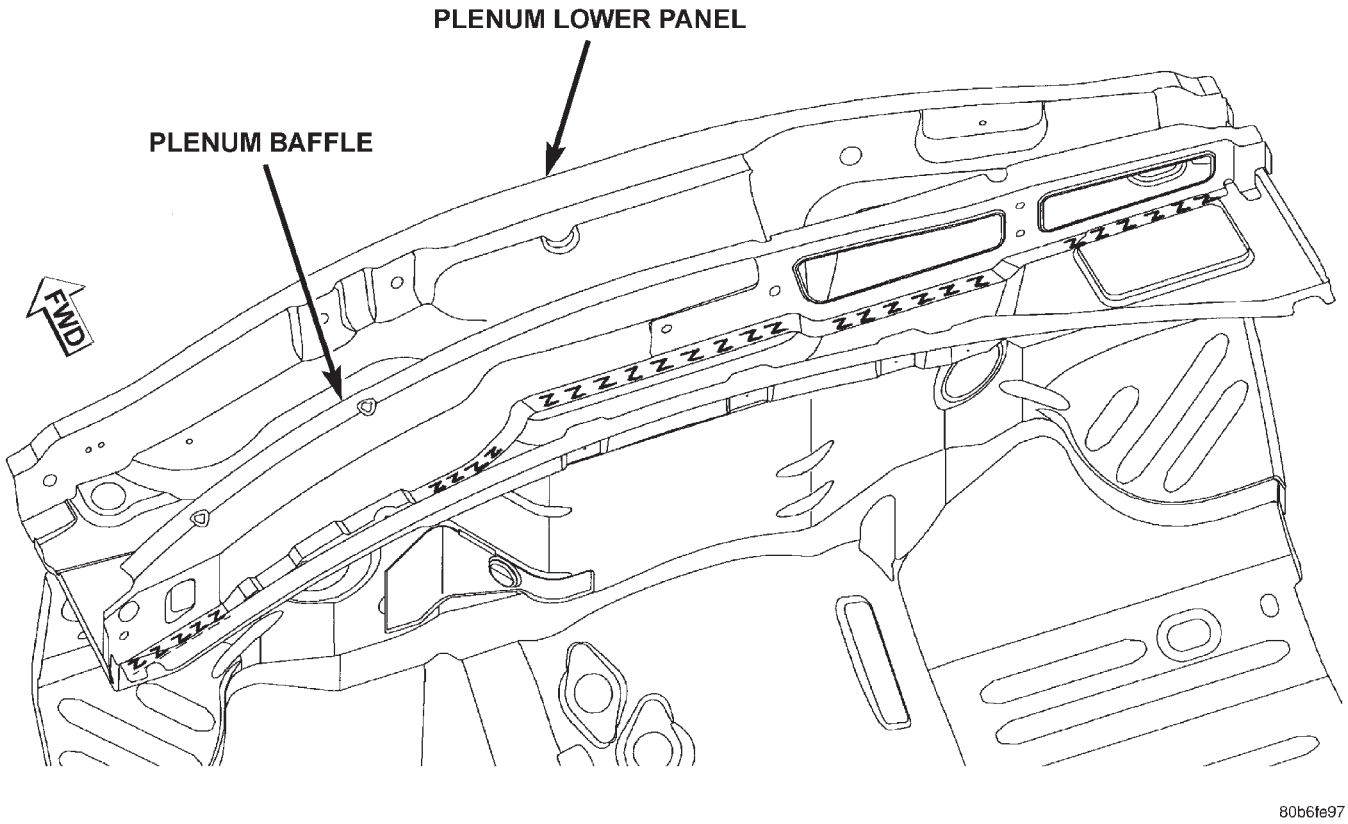


Fig. 28 COWL PLENUM

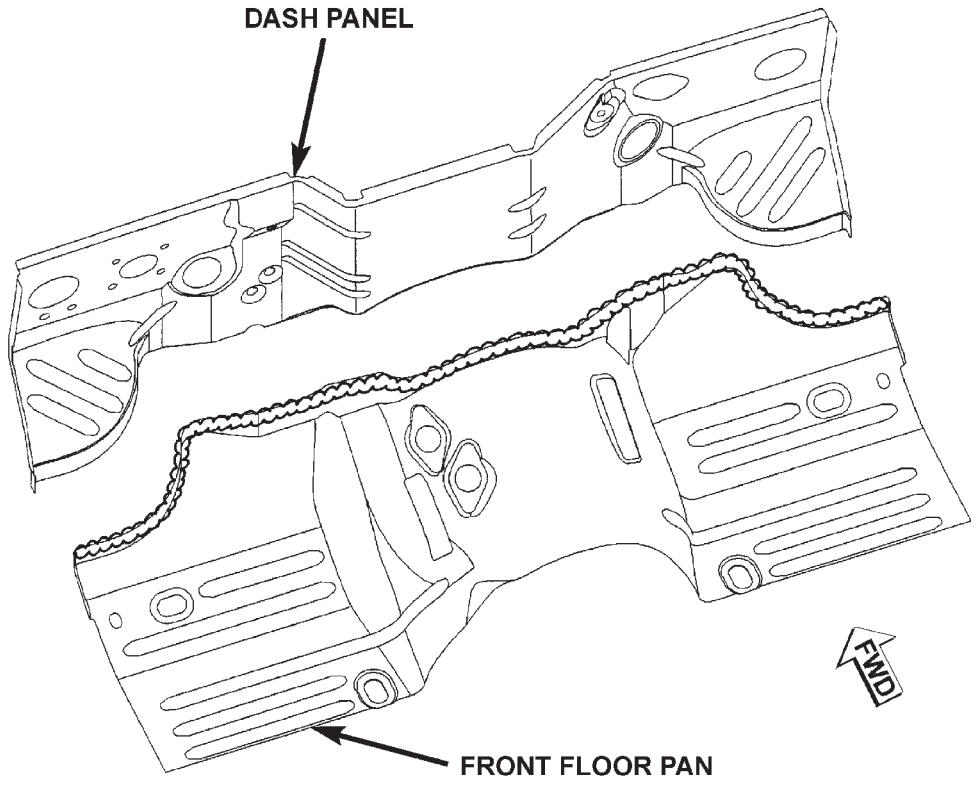


Fig. 29 DASH PANEL AND FRONT FLOOR PAN

STUCTURAL ADHESIVE LOCATIONS (Continued)

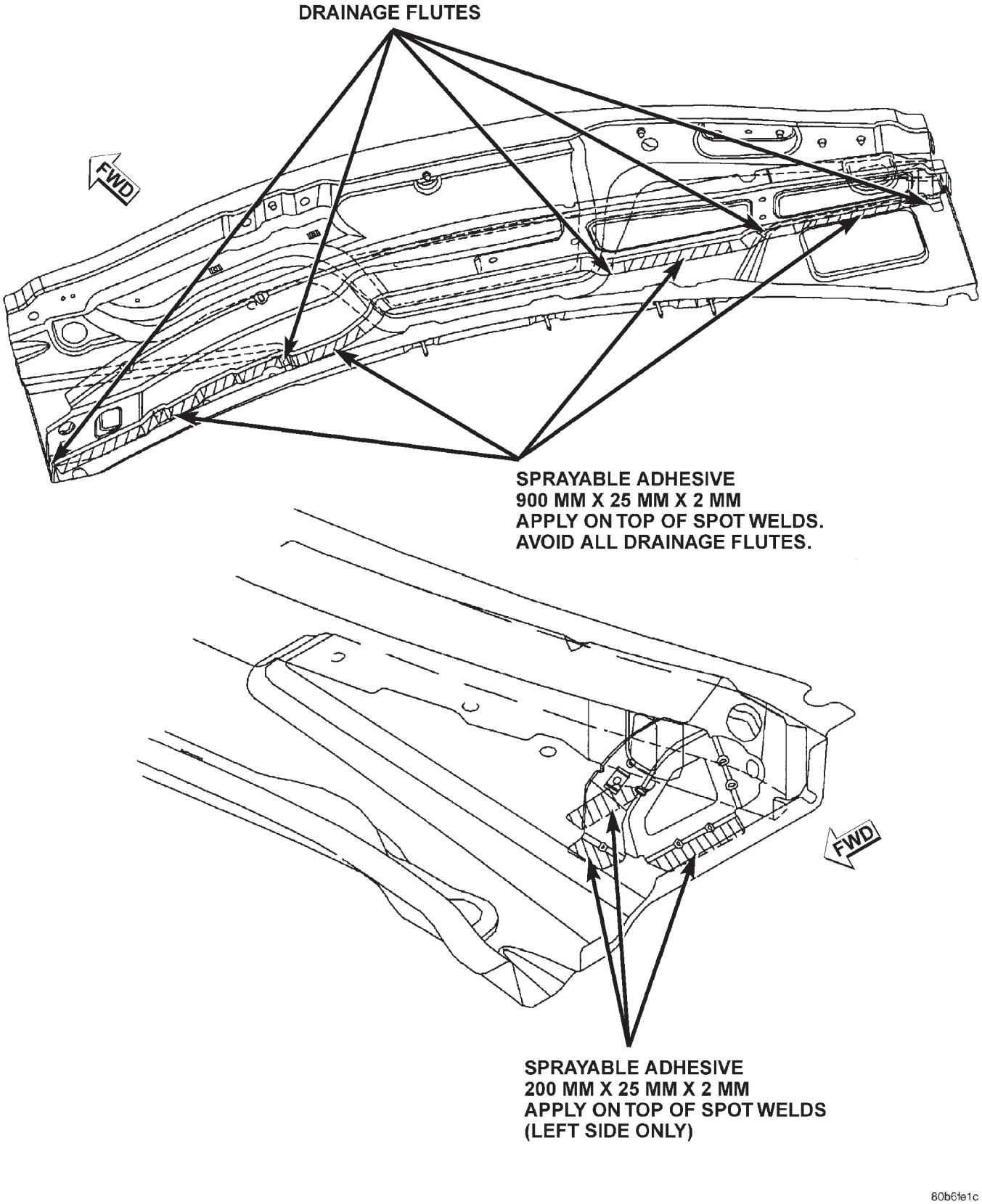


Fig. 30 PLENUM AND WINDSHIELD WIPER MOUNTING

STUCTURAL ADHESIVE LOCATIONS (Continued)

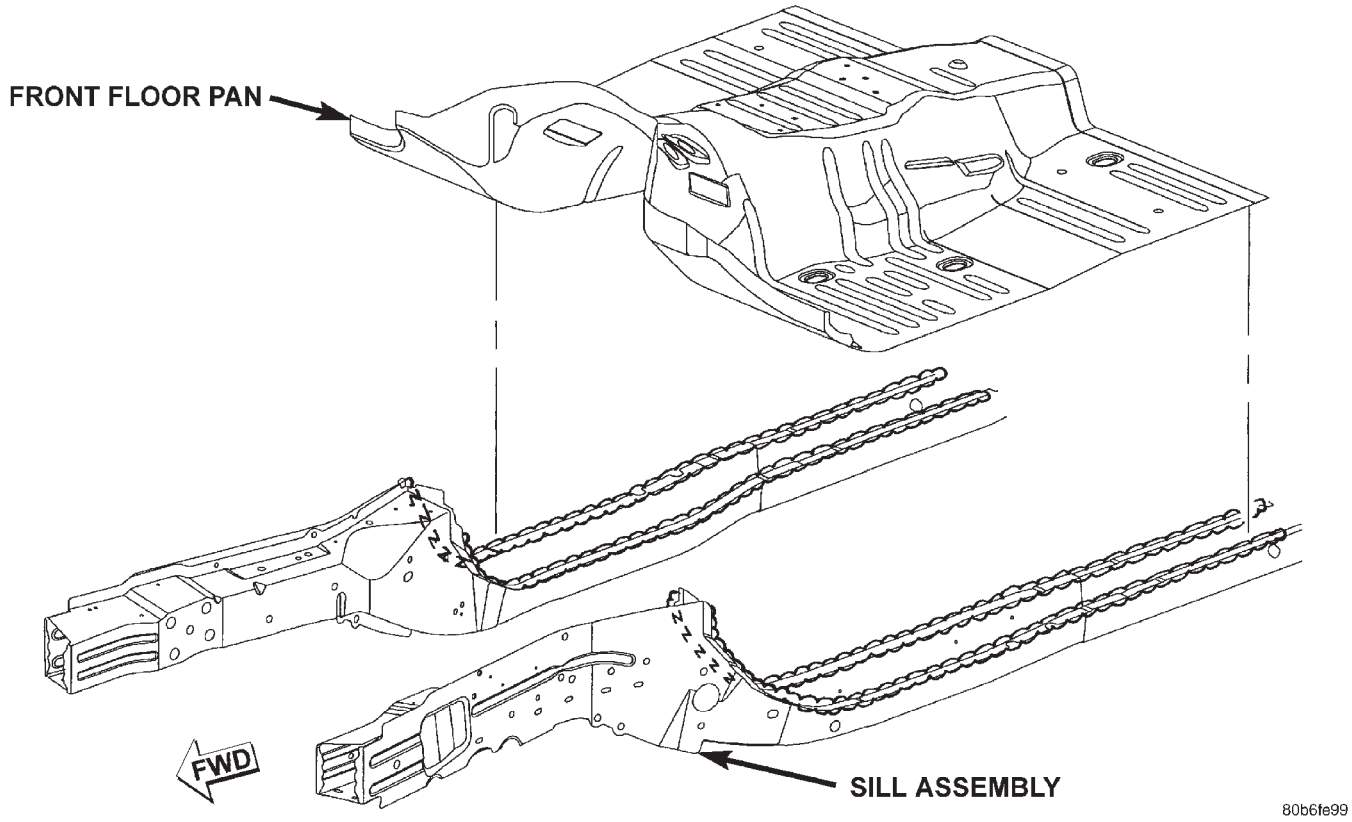


Fig. 31 FRONT FLOOR PAN AND SILLS

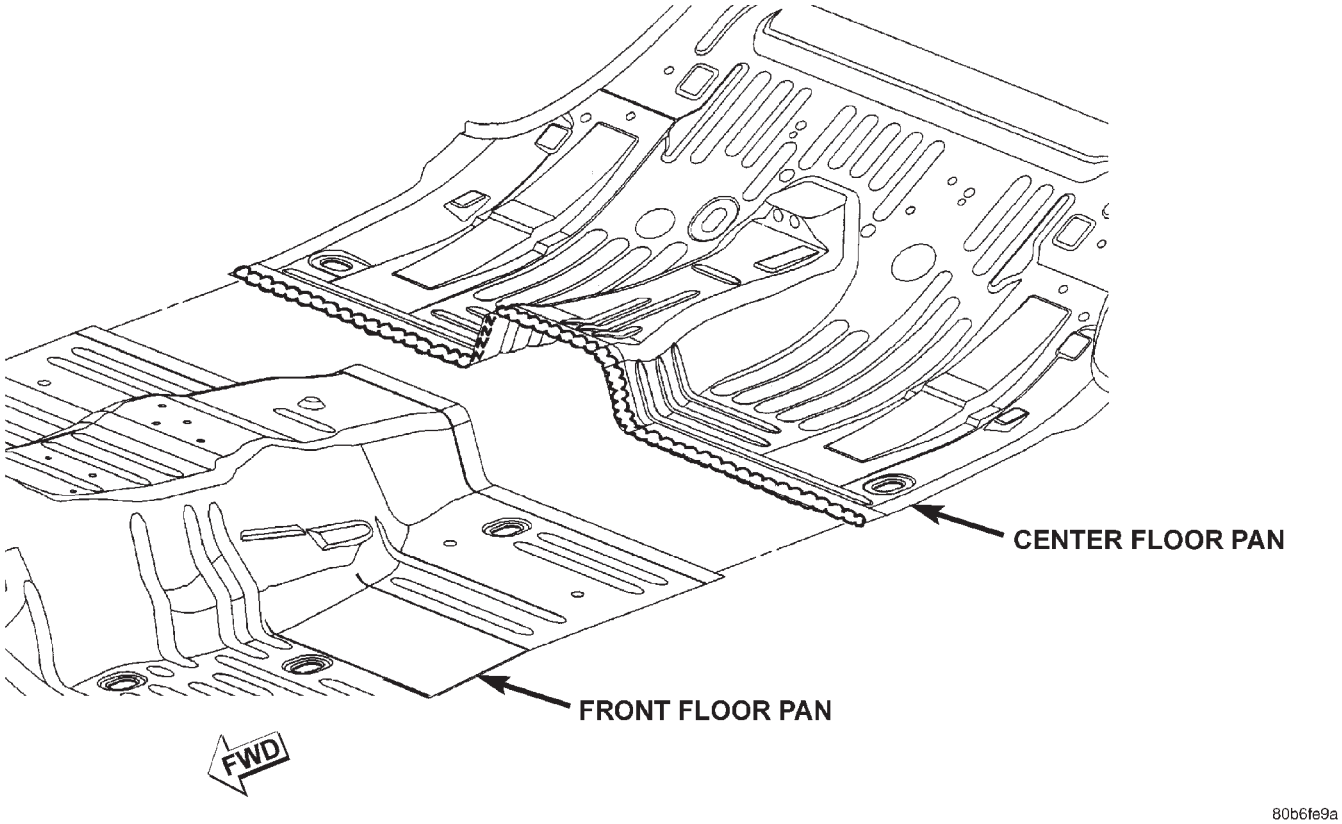


Fig. 32 FRONT AND CENTER FLOOR PAN

STUCTURAL ADHESIVE LOCATIONS (Continued)

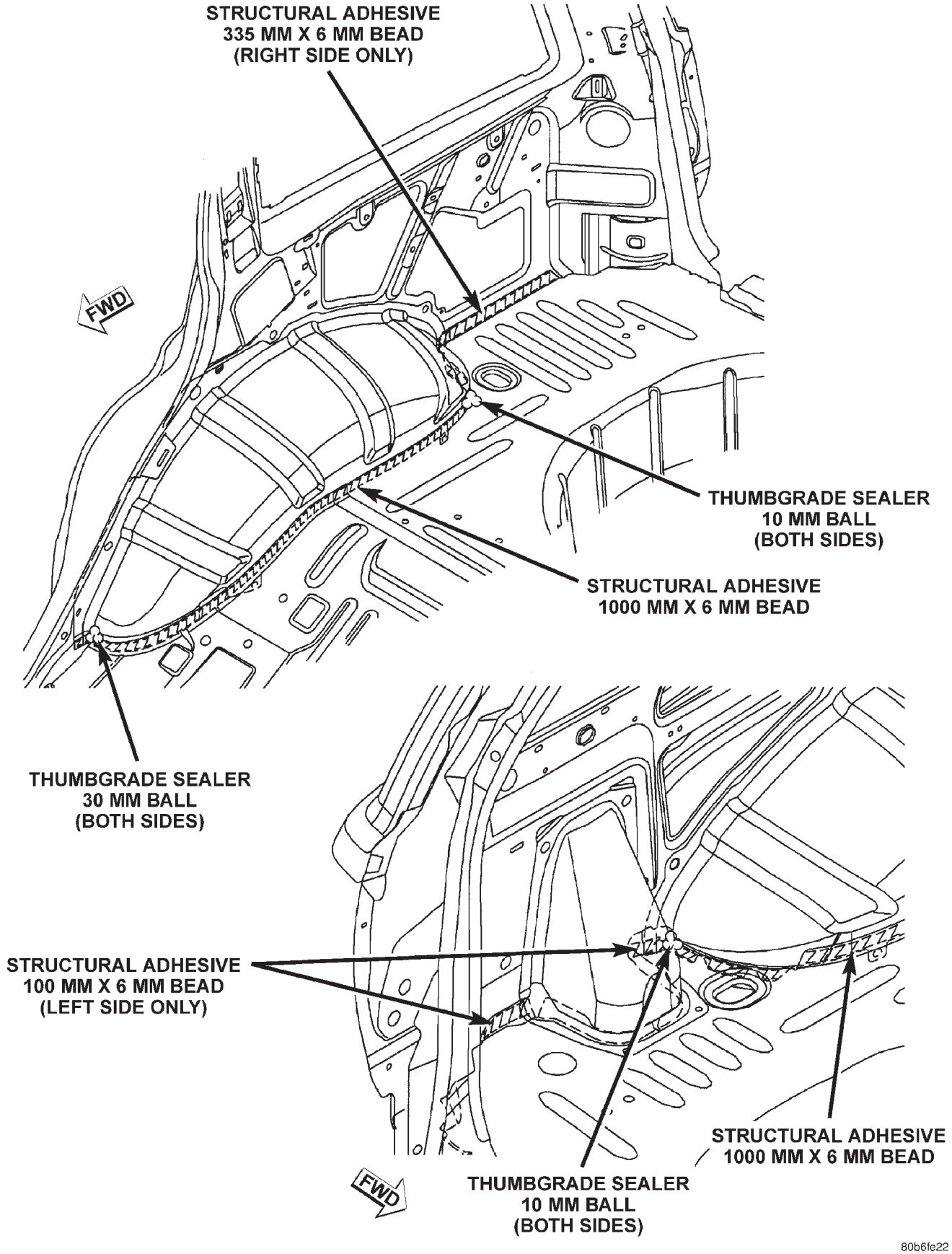


Fig. 33 FRONT PAN AND INNER BODY SIDE APERTURE

STUCTURAL ADHESIVE LOCATIONS (Continued)

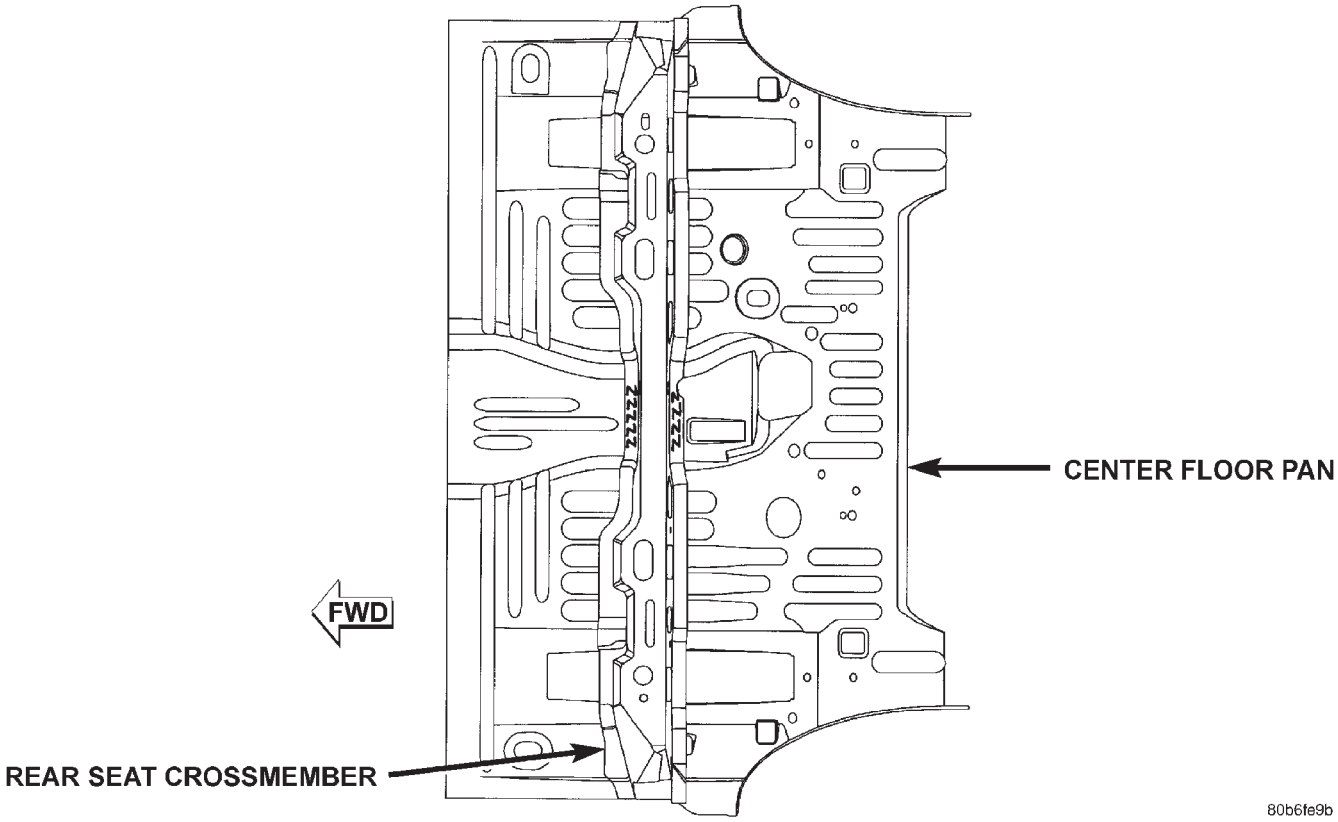


Fig. 34 REAR SEAT CROSSMEMBER

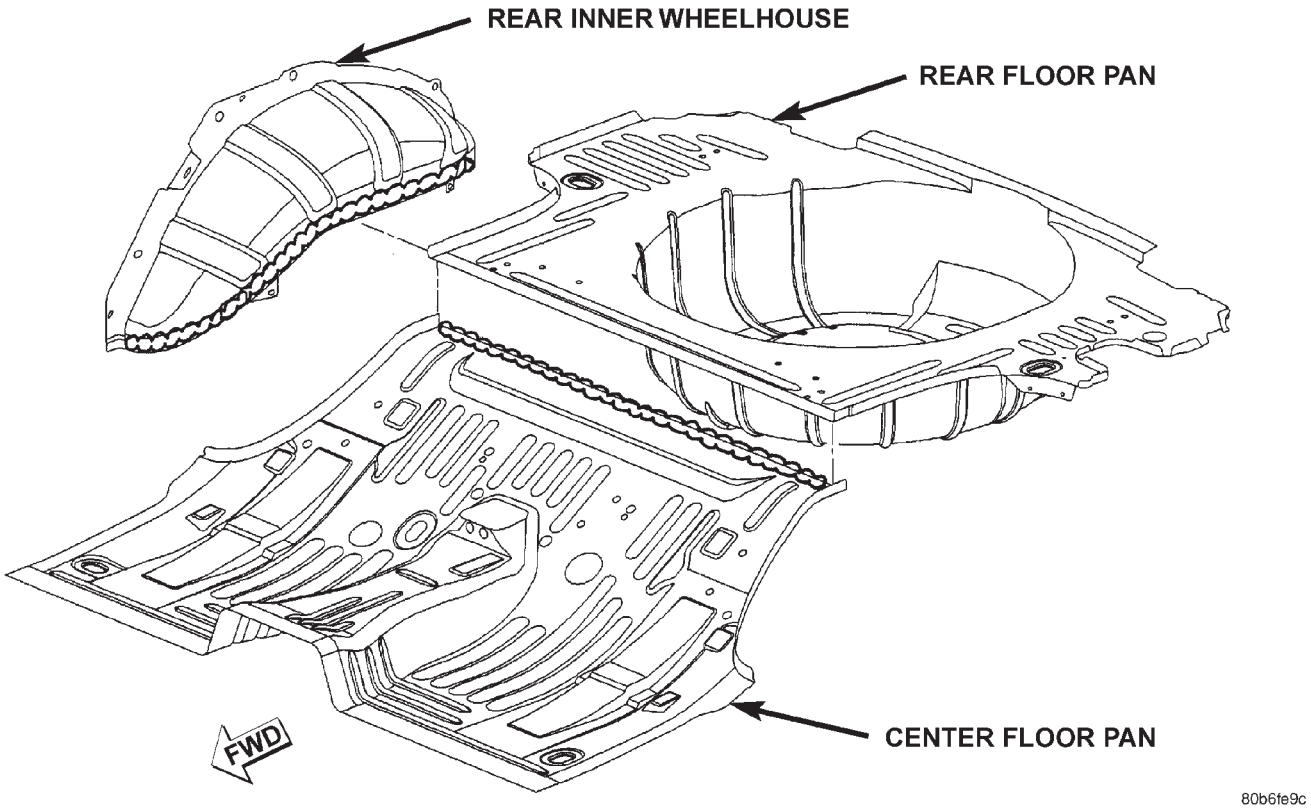


Fig. 35 REAR INNER WHEELHOUSE

STUCTURAL ADHESIVE LOCATIONS (Continued)

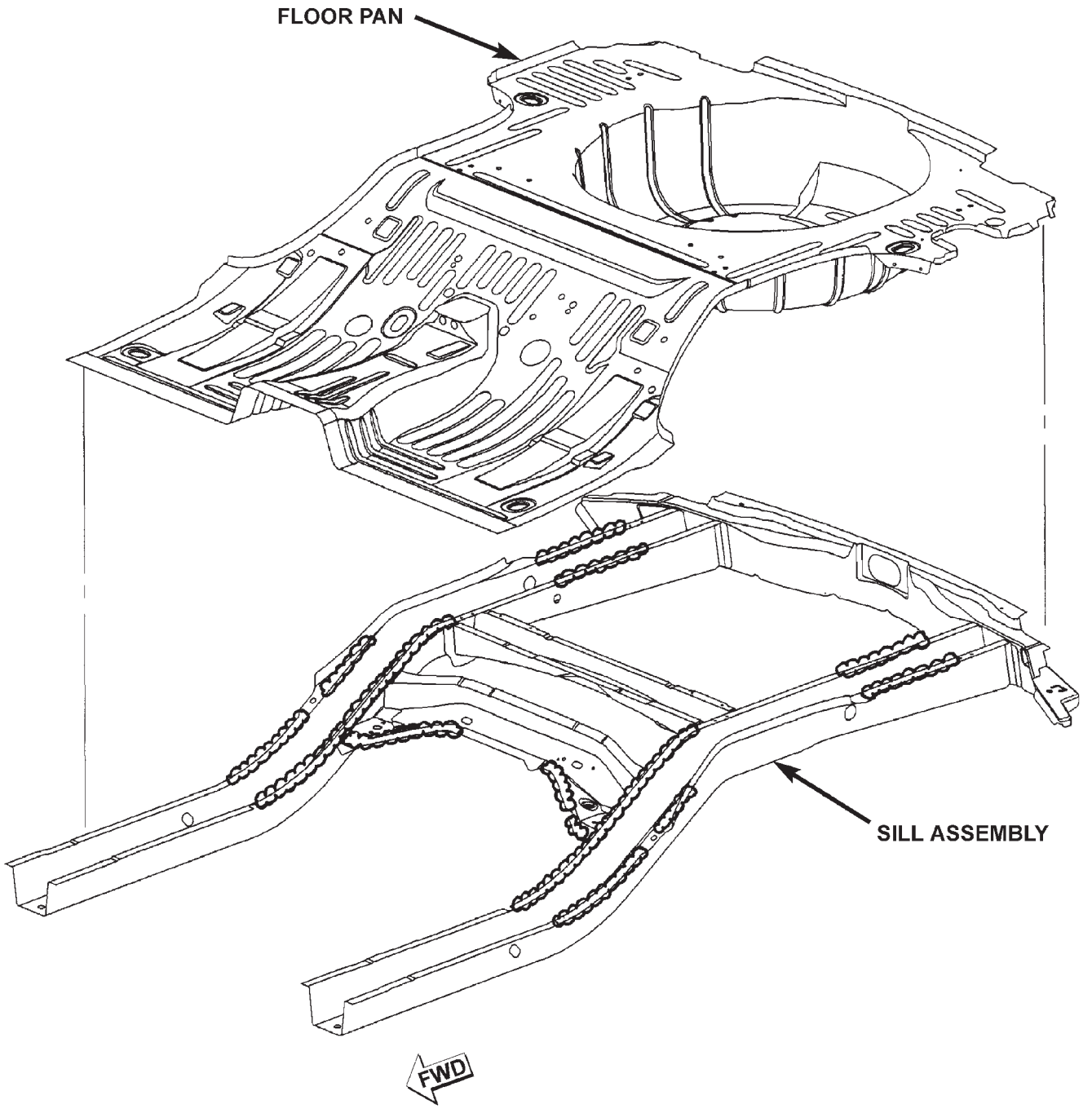


Fig. 36 FLOOR PAN AND SILL ASSEMBLY

STUCTURAL ADHESIVE LOCATIONS (Continued)

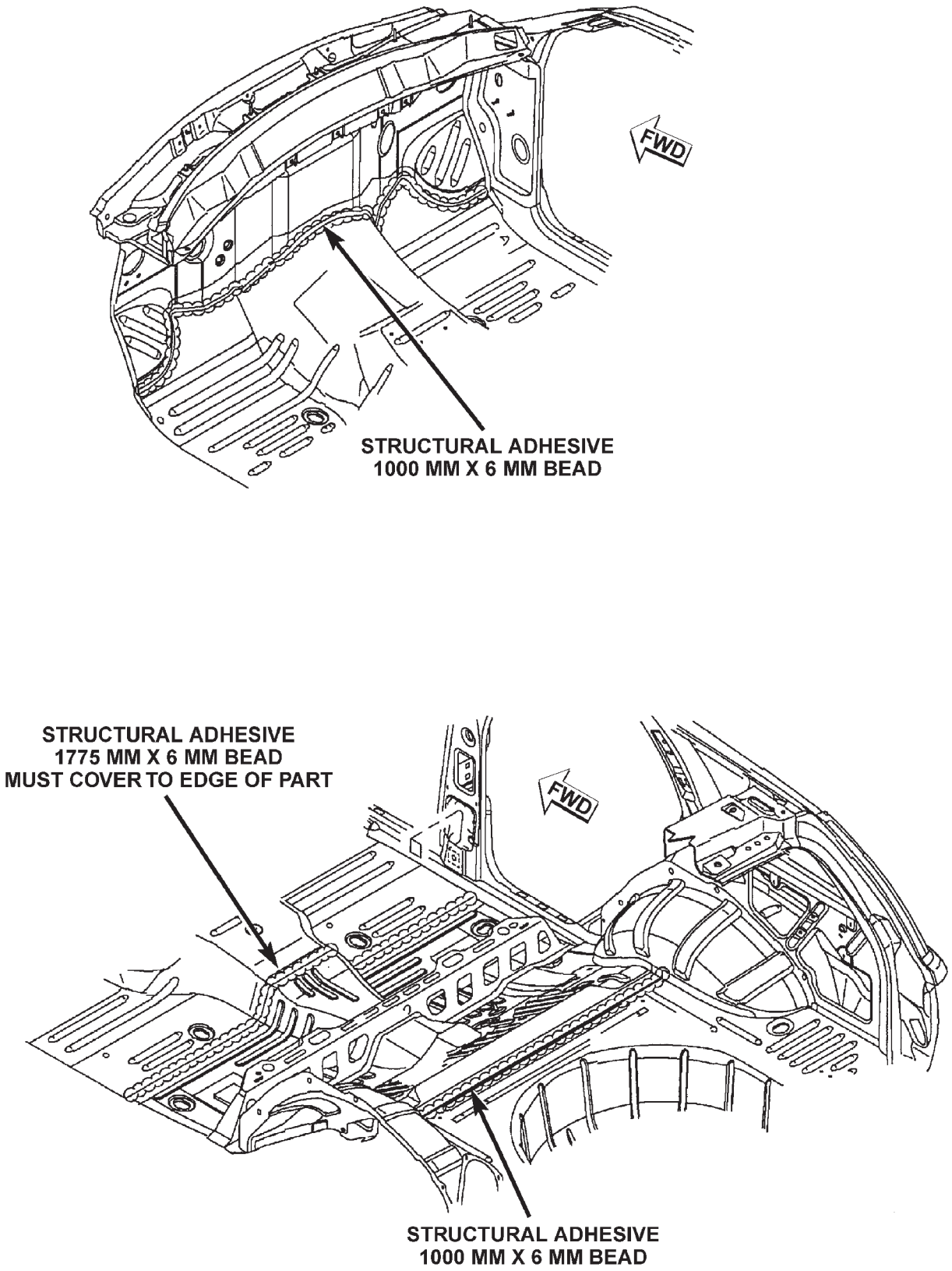


Fig. 37 FLOOR PAN

STUCTURAL ADHESIVE LOCATIONS (Continued)

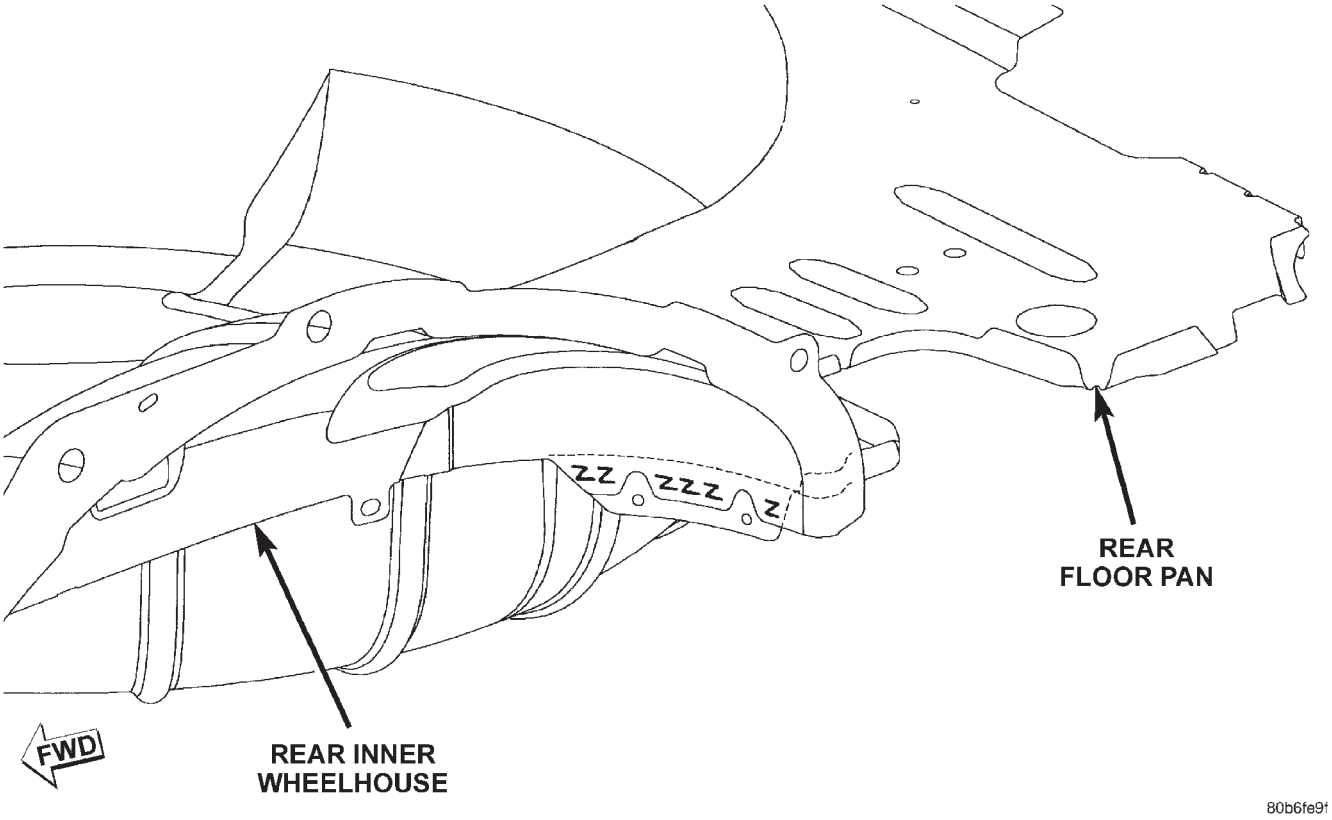


Fig. 38 REAR INNER WHEELHOUSE AND REAR FLOOR PAN

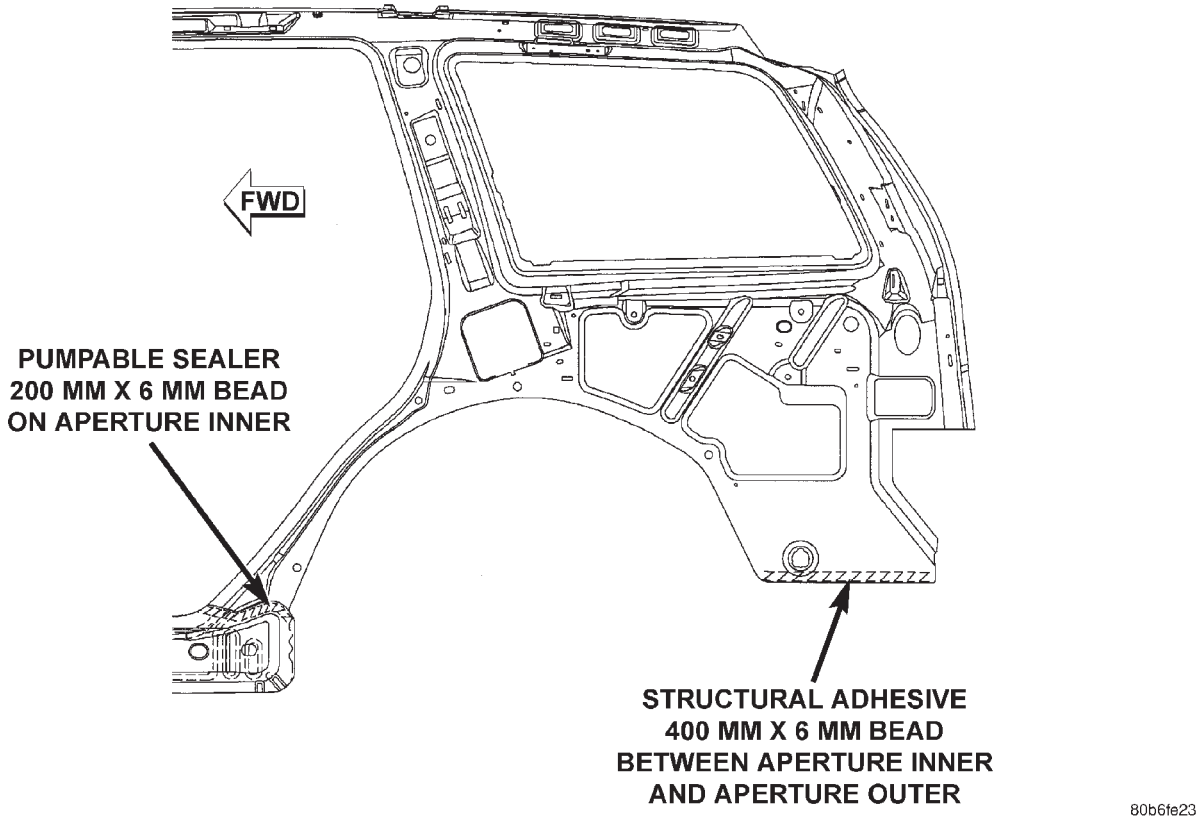


Fig. 39 RIGHT INNER BODYSIDE APERTURE

STUCTURAL ADHESIVE LOCATIONS (Continued)

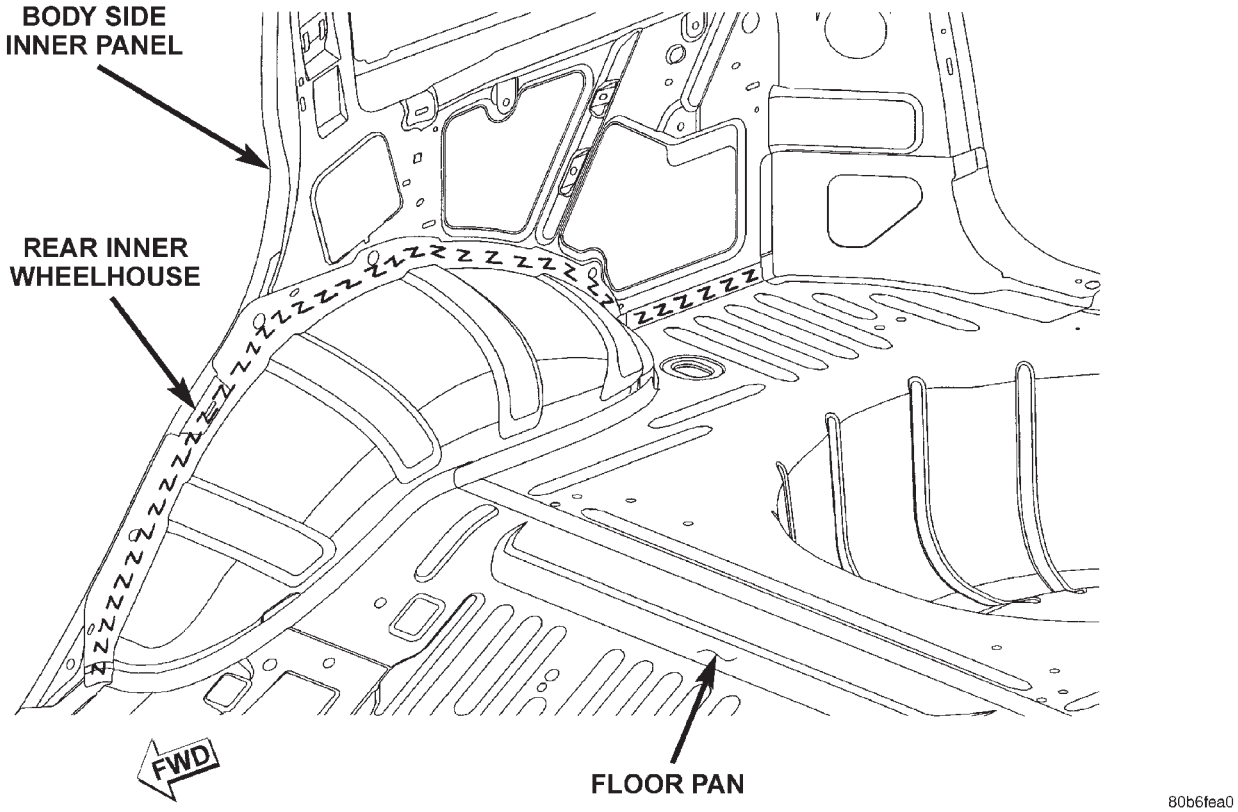


Fig. 40 BODY SIDE INNER PANEL AND WHEELHOUSE

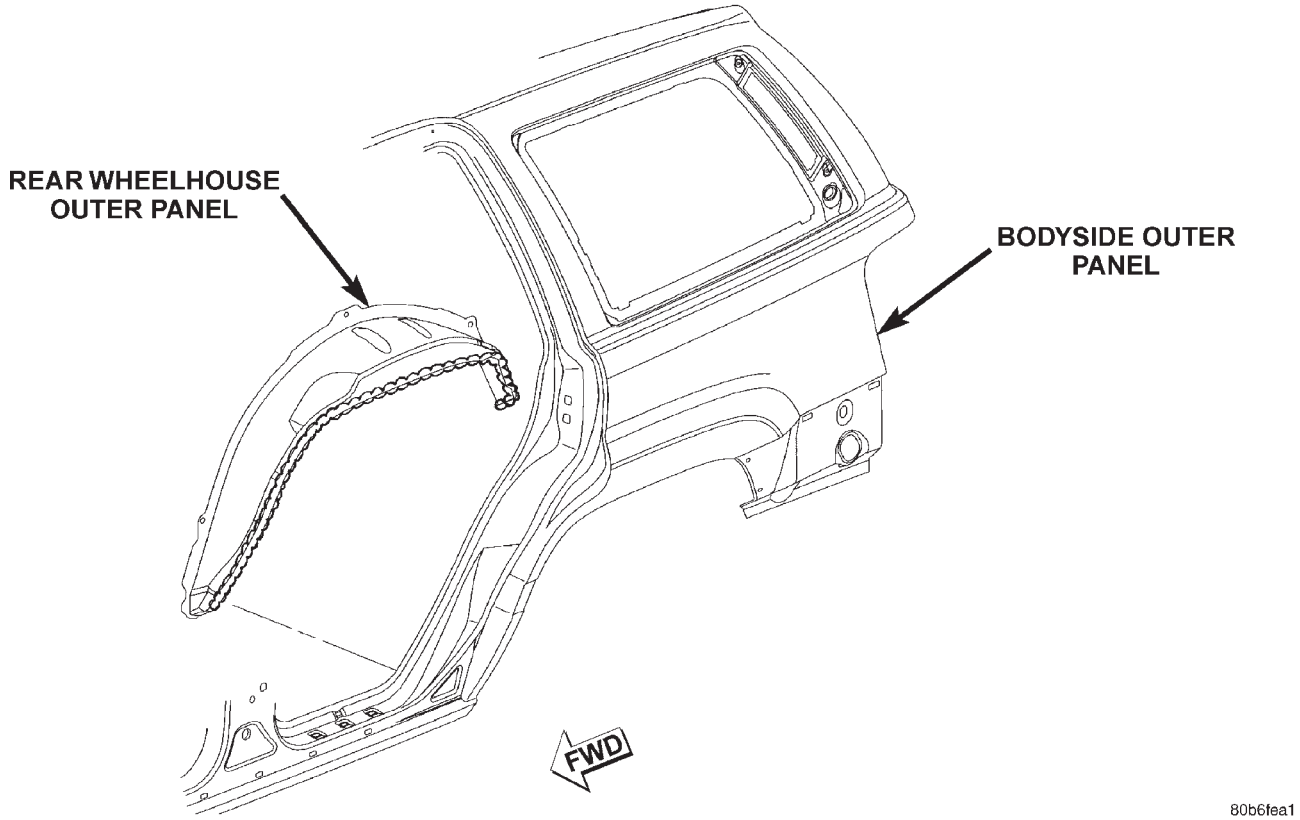


Fig. 41 BODY SIDE OUTER PANEL AND REAR WHEELHOUSE OUTER PANEL

STUCTURAL ADHESIVE LOCATIONS (Continued)

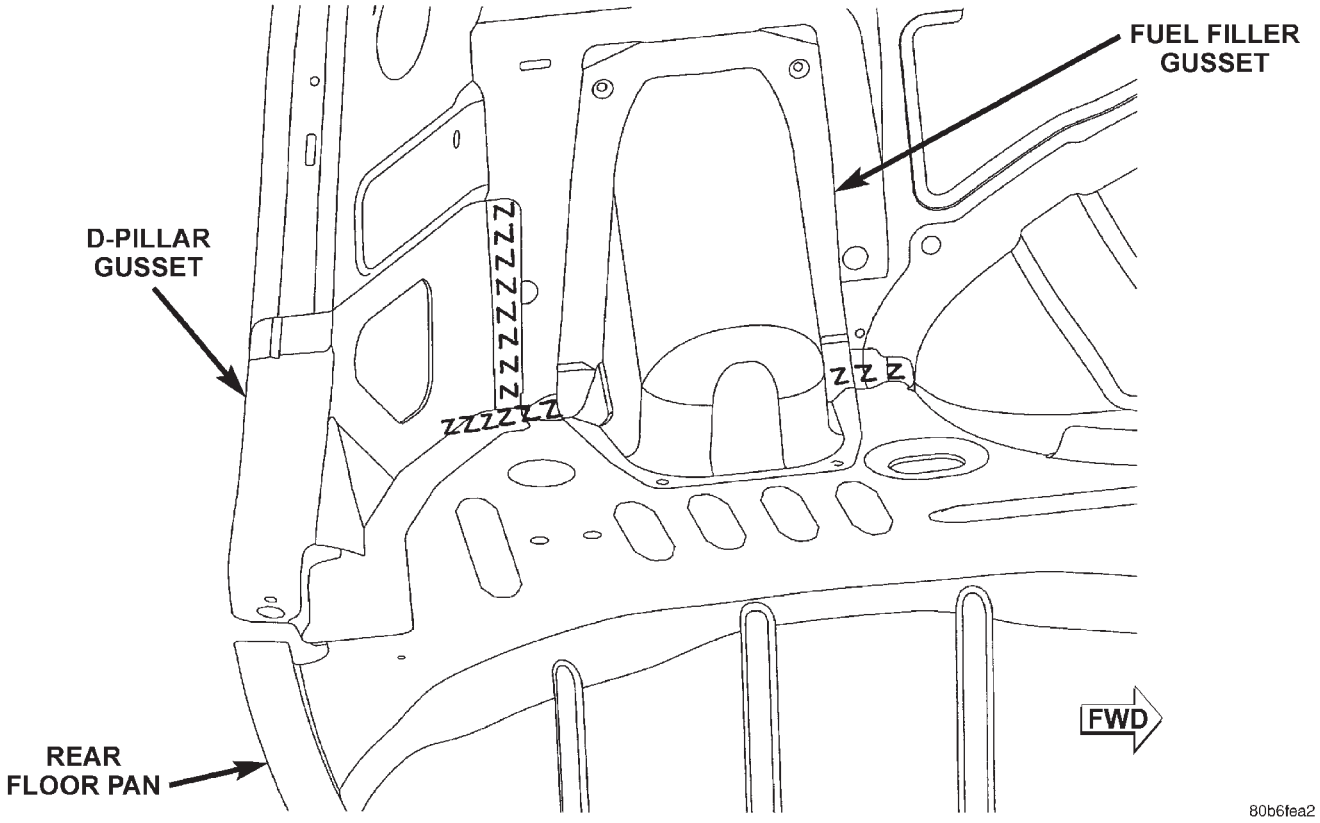


Fig. 42 D-PILLAR AND FUEL FILLER GUSSETS

STUCTURAL ADHESIVE LOCATIONS (Continued)

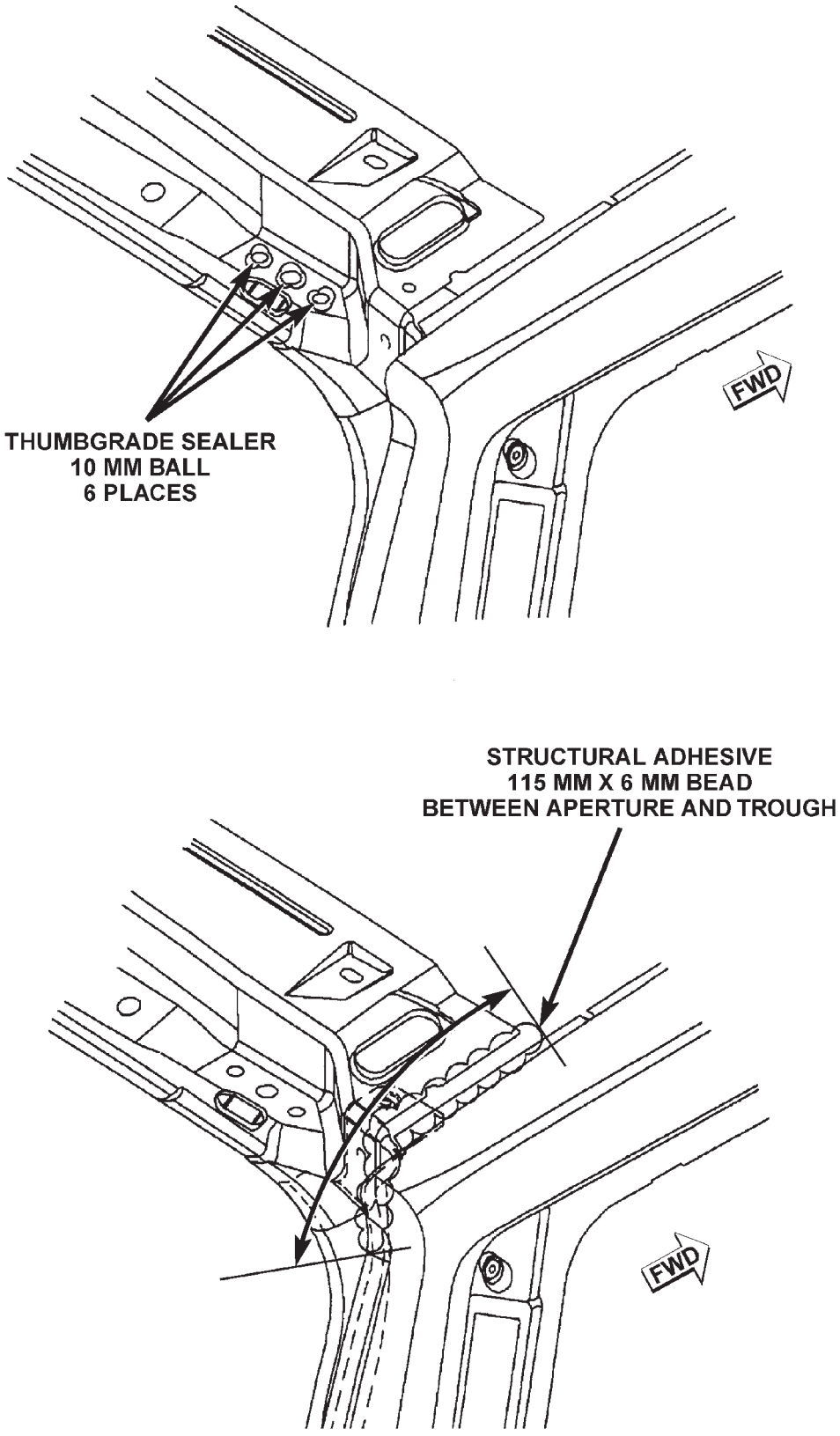


Fig. 43 LIFTGATE

STUCTURAL ADHESIVE LOCATIONS (Continued)

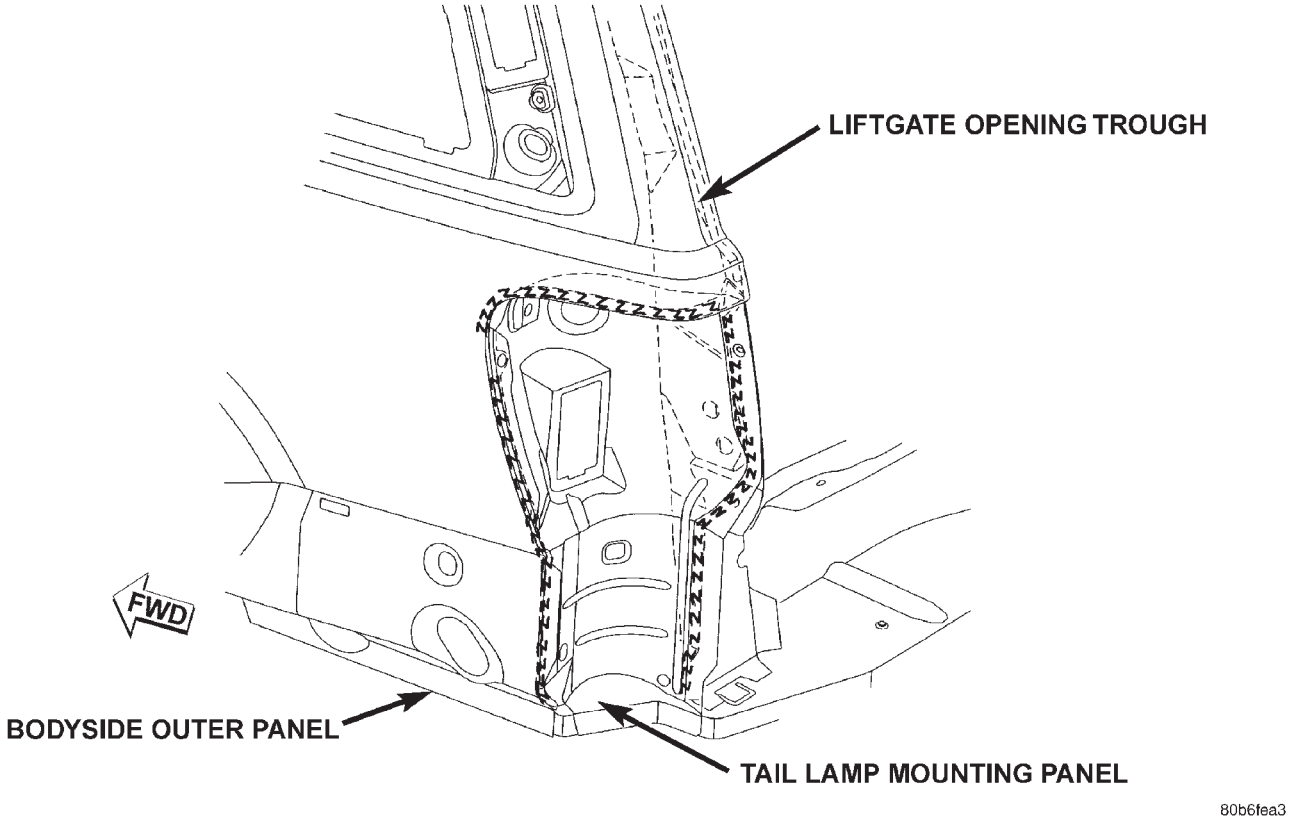


Fig. 44 TAILLAMP MOUNTING PANEL

STUCTURAL ADHESIVE LOCATIONS (Continued)

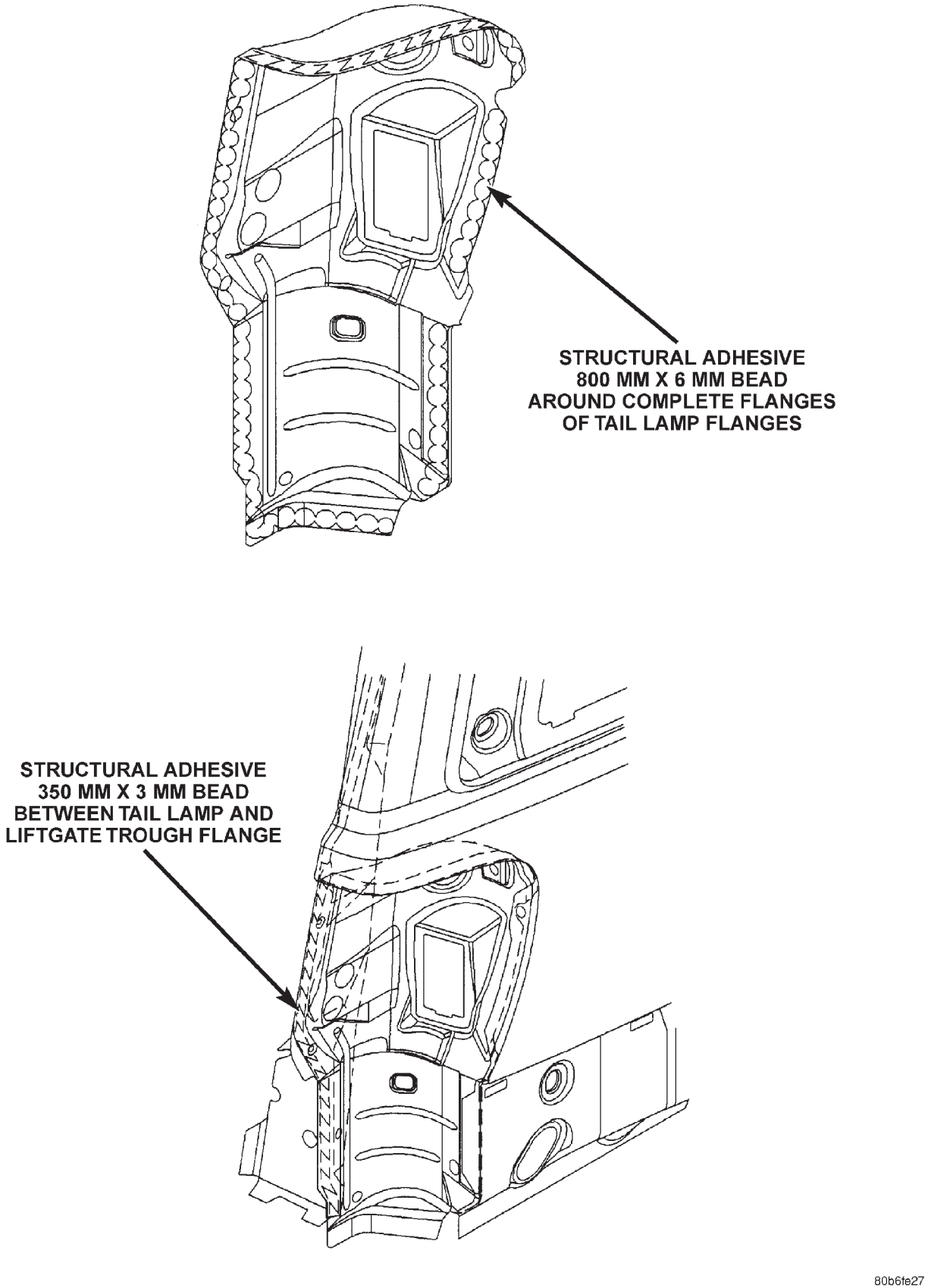


Fig. 45 TAILLAMP

STUCTURAL ADHESIVE LOCATIONS (Continued)

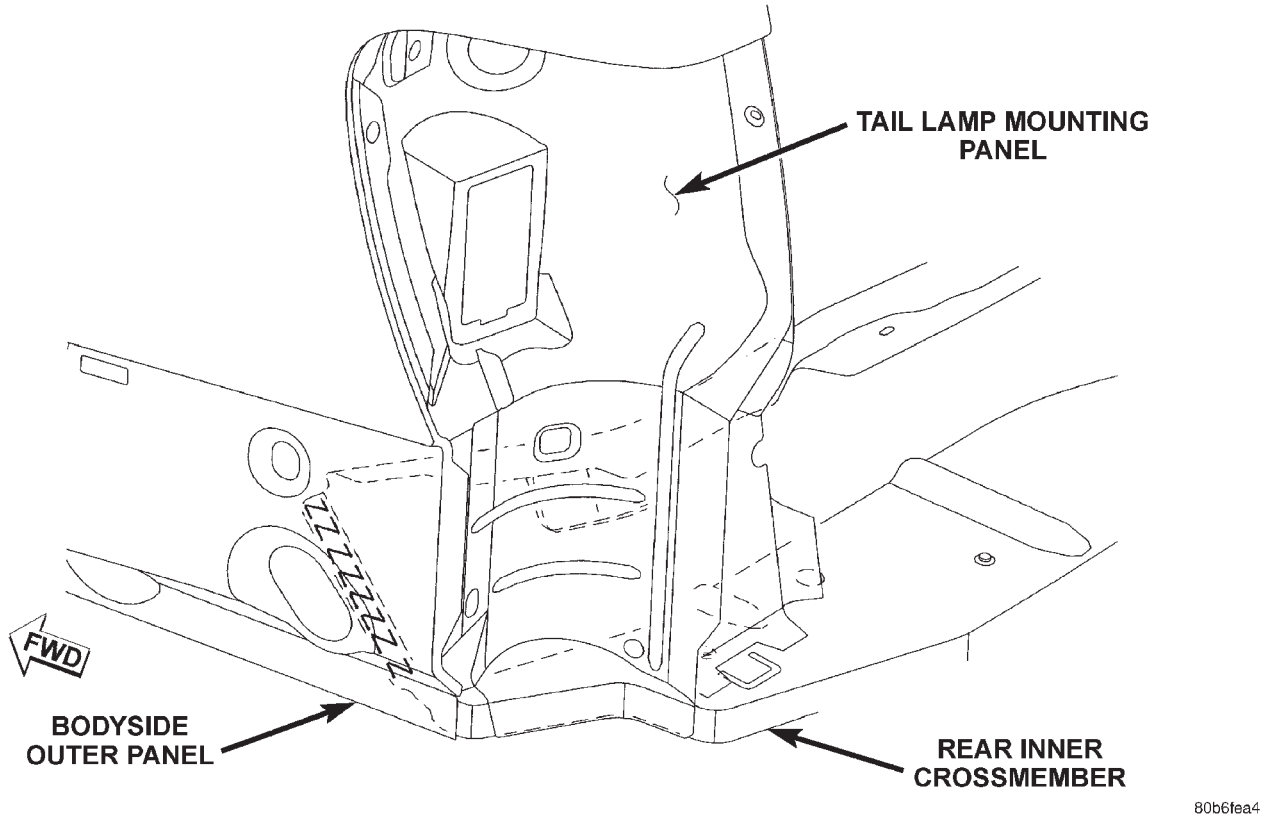


Fig. 46 REAR INNER CROSSMEMBER

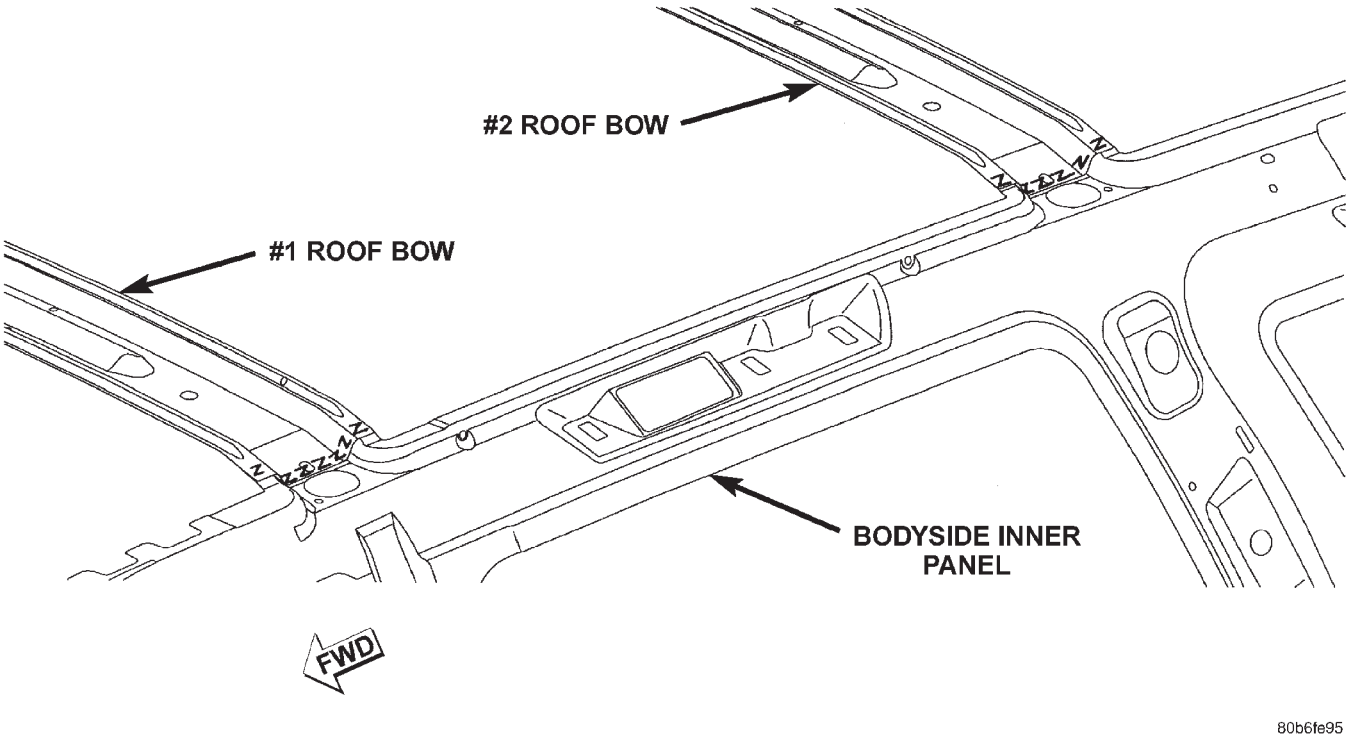


Fig. 47 ROOF BOWS

STUCTURAL ADHESIVE LOCATIONS (Continued)

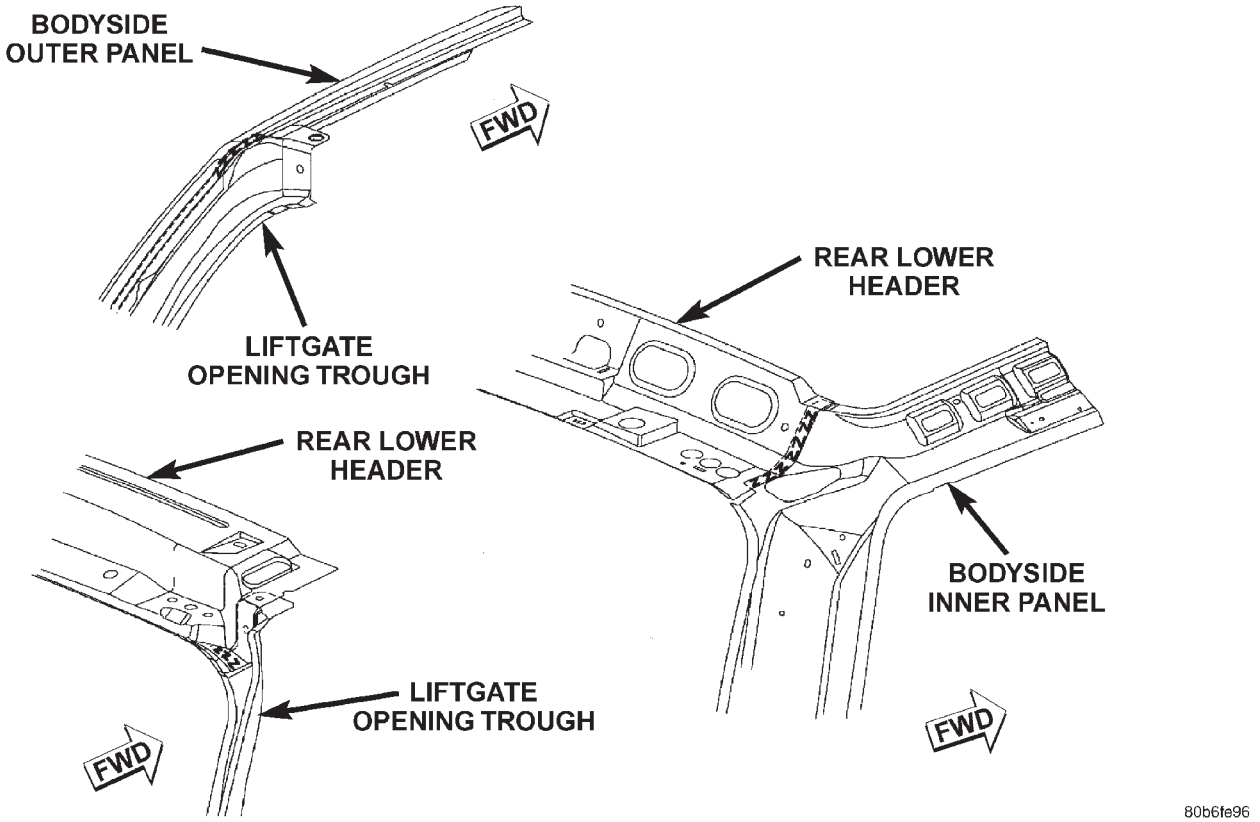


Fig. 48 REAR LOWER HEADER

WELD LOCATIONS

SPECIFICATIONS

WELD LOCATIONS

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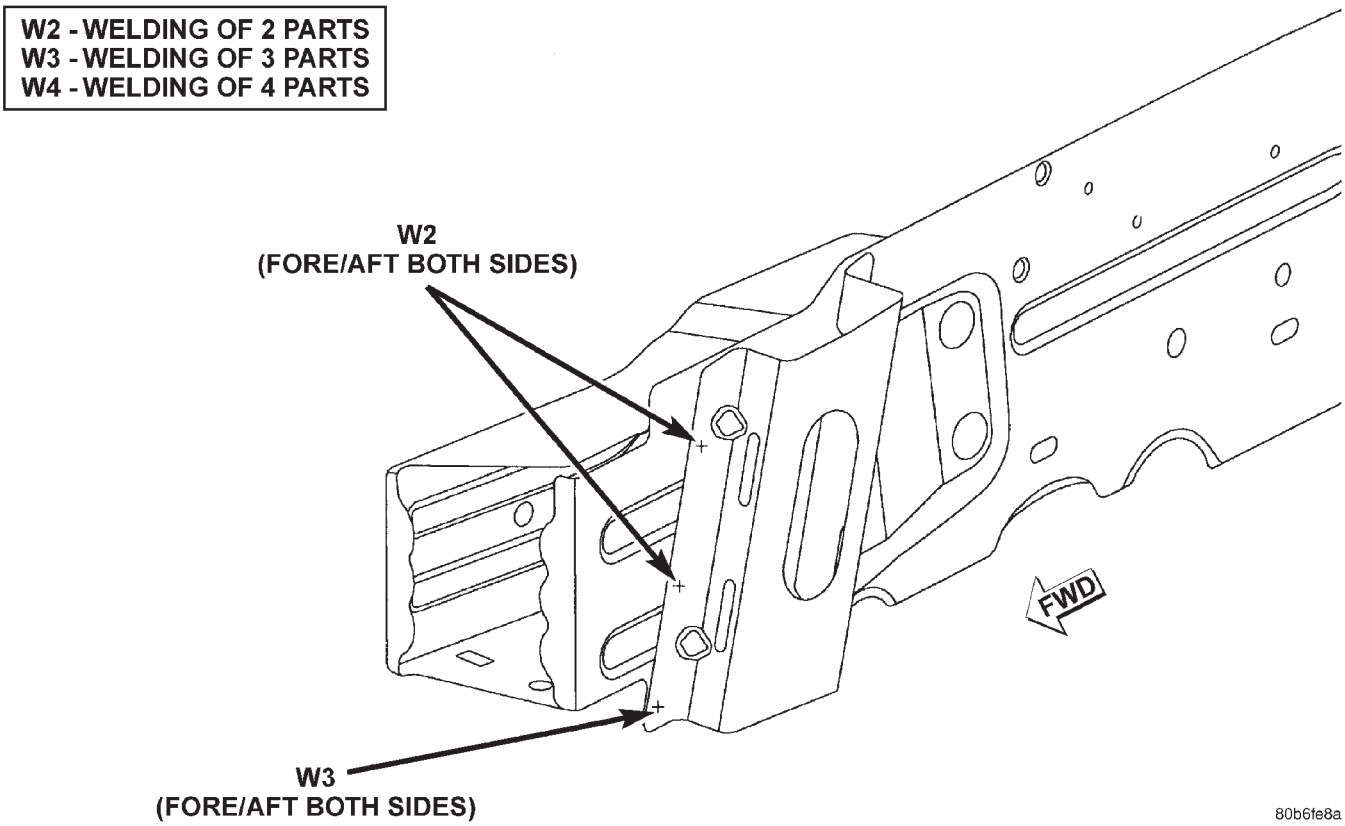


Fig. 49 RADIATOR SUPPORT BRACKETS

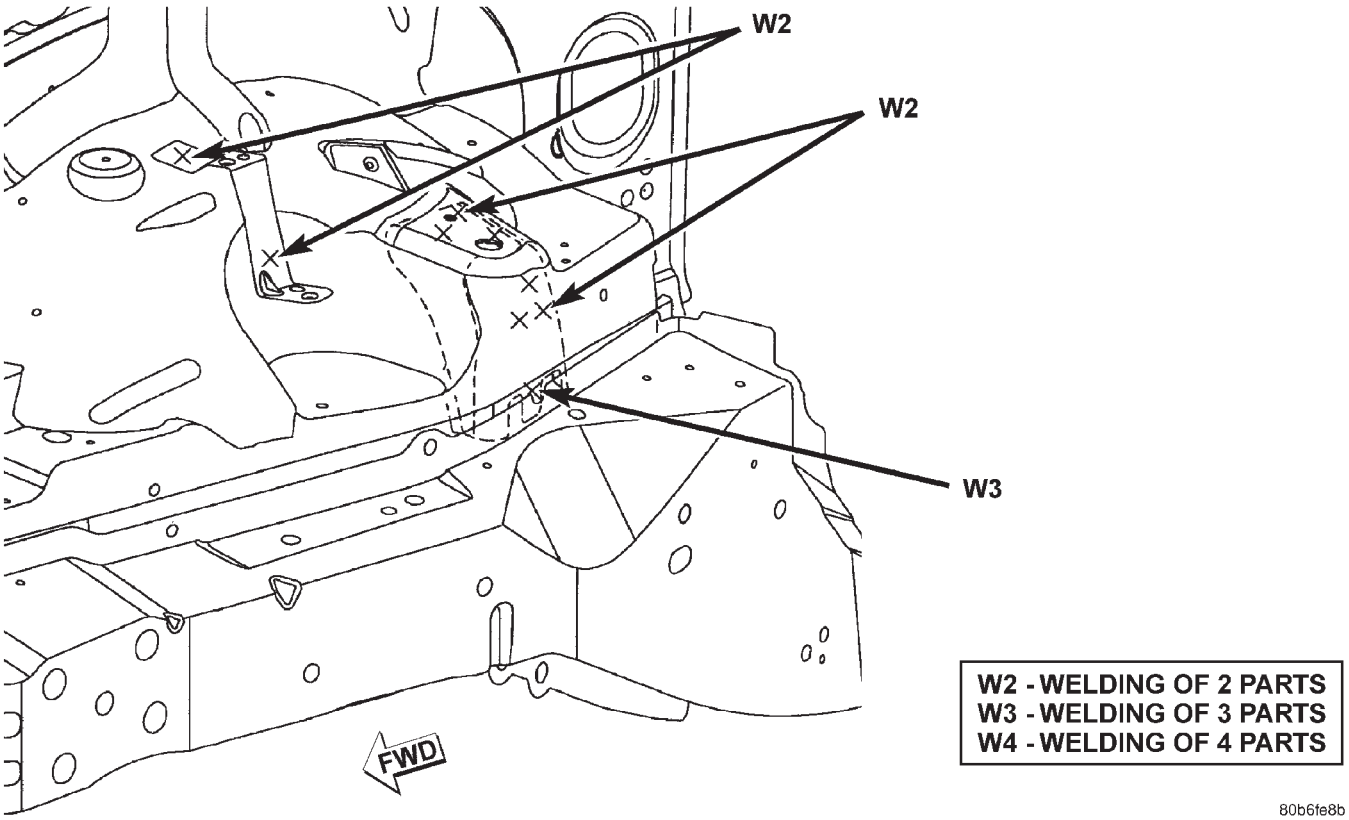


Fig. 50 FRONT SUSPENSION SUPPORT REINFORCEMENT

WELD LOCATIONS (Continued)

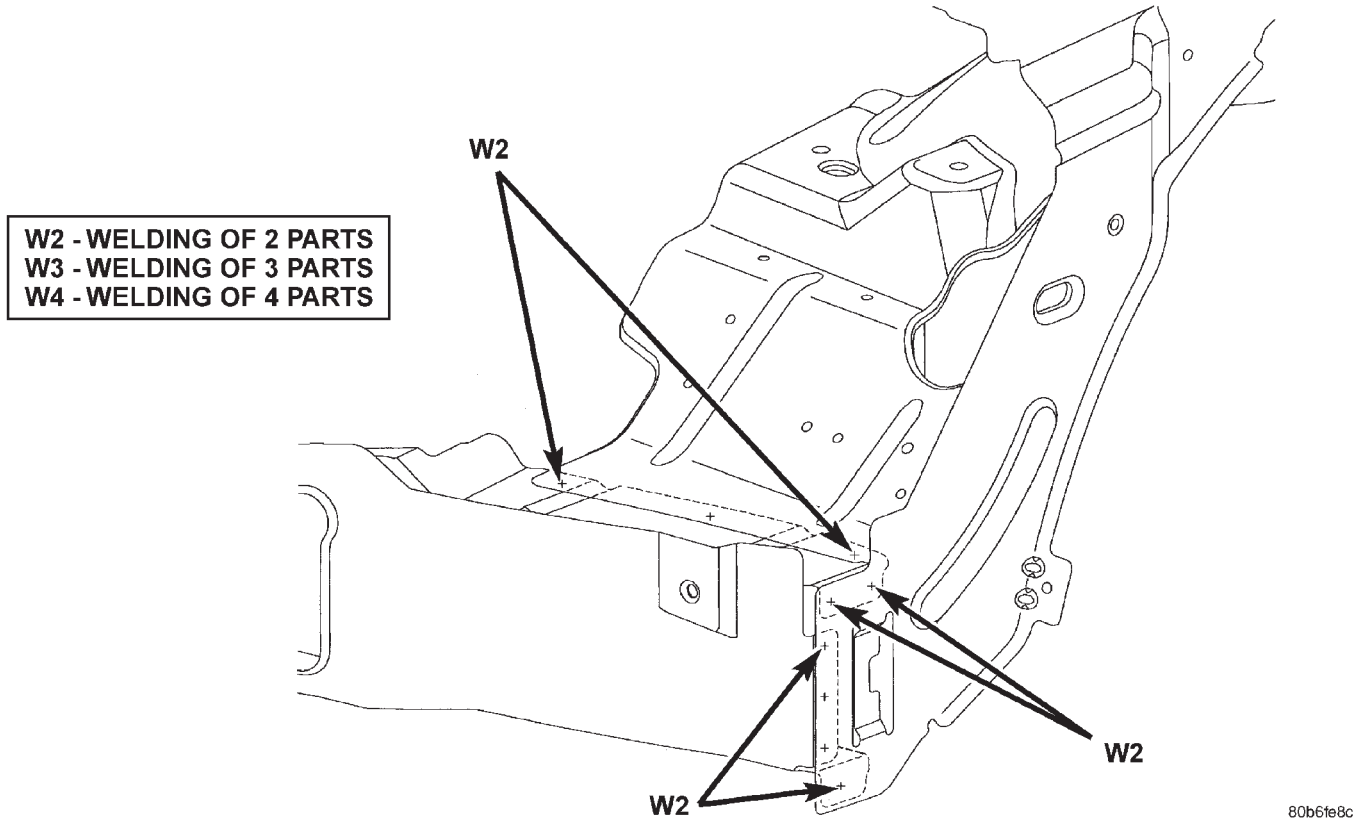


Fig. 51 FRONT LOWER CROSSMEMBER TO COWL SIDE PANEL

WELD LOCATIONS (Continued)

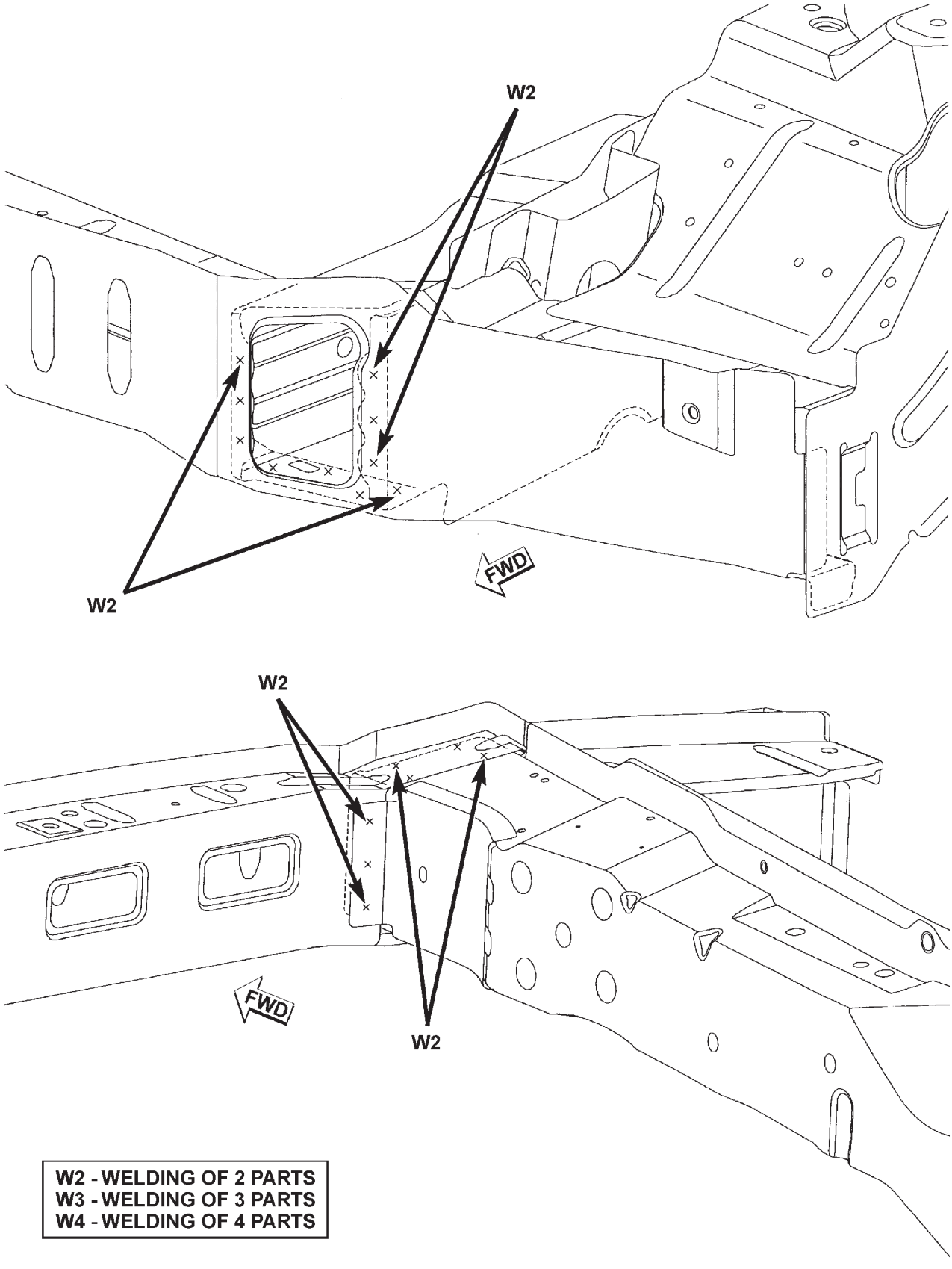


Fig. 52 FRONT SILL TO LOWER CROSSMEMBER

WELD LOCATIONS (Continued)

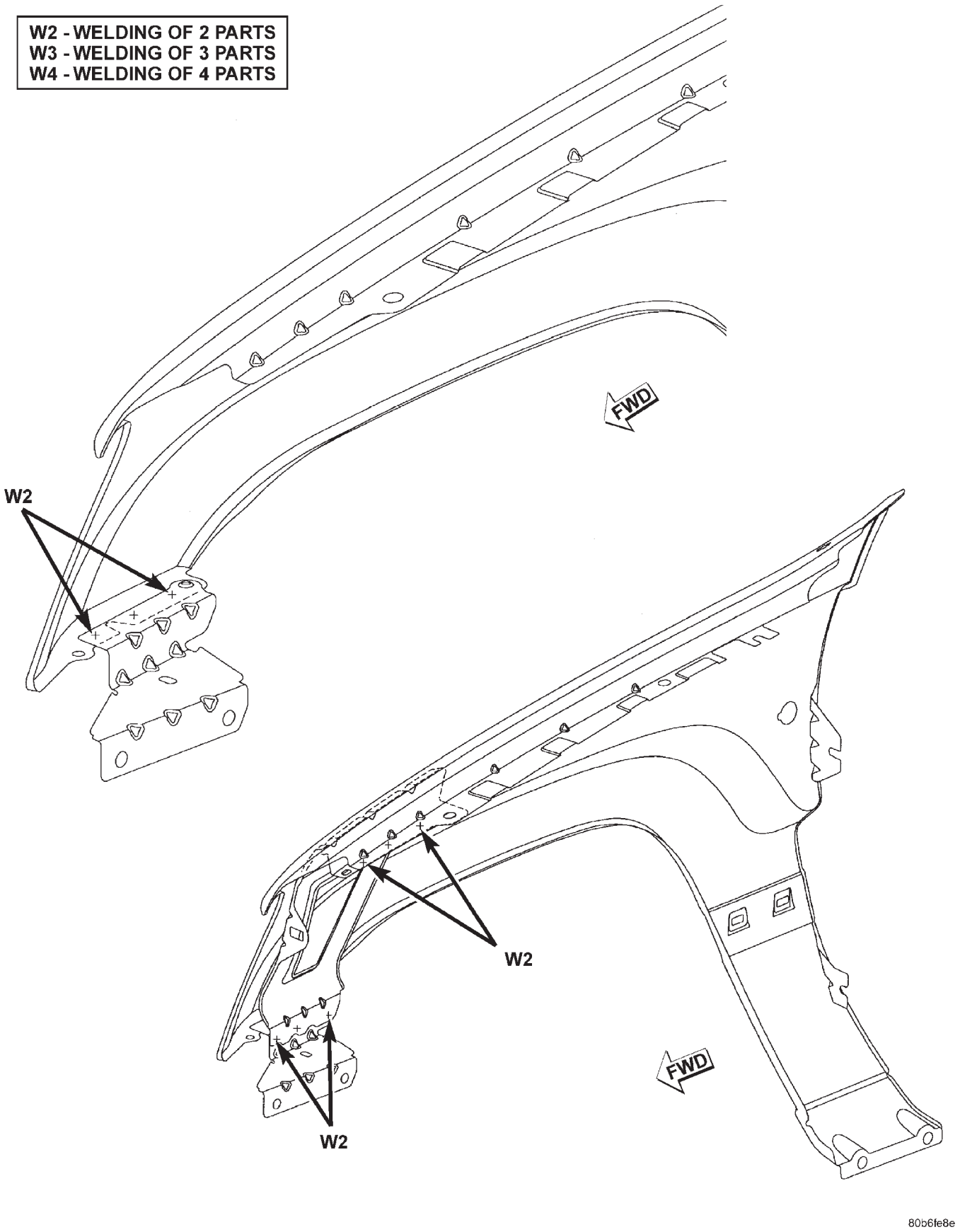
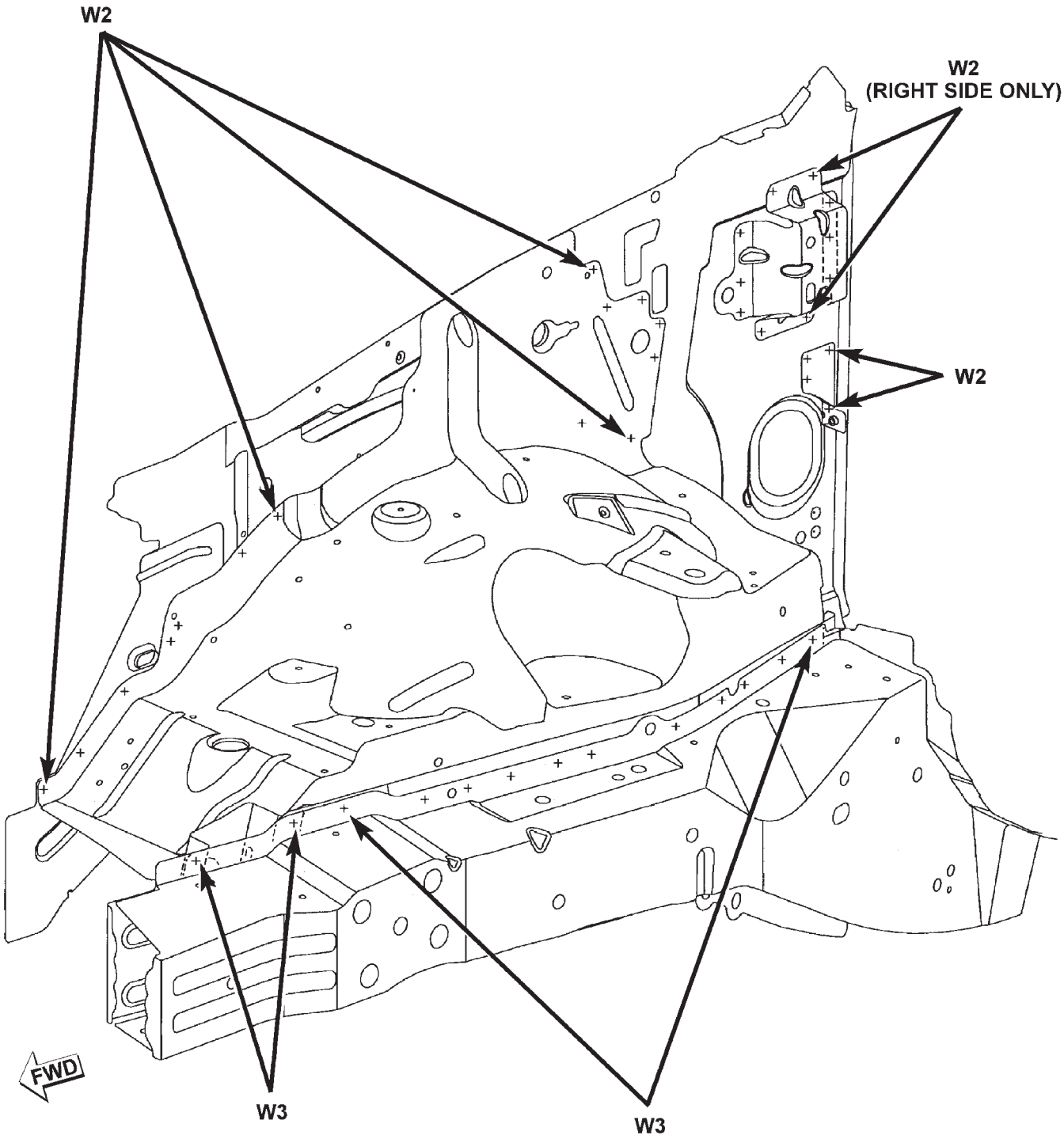


Fig. 53 FRONT FENDER MOUNTING BRACKET AND REINFORCEMENT

WELD LOCATIONS (Continued)



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

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Fig. 54 FRONT SUSPENSION SUPPORT TO SILLS AND COWL SIDE PANEL

WELD LOCATIONS (Continued)

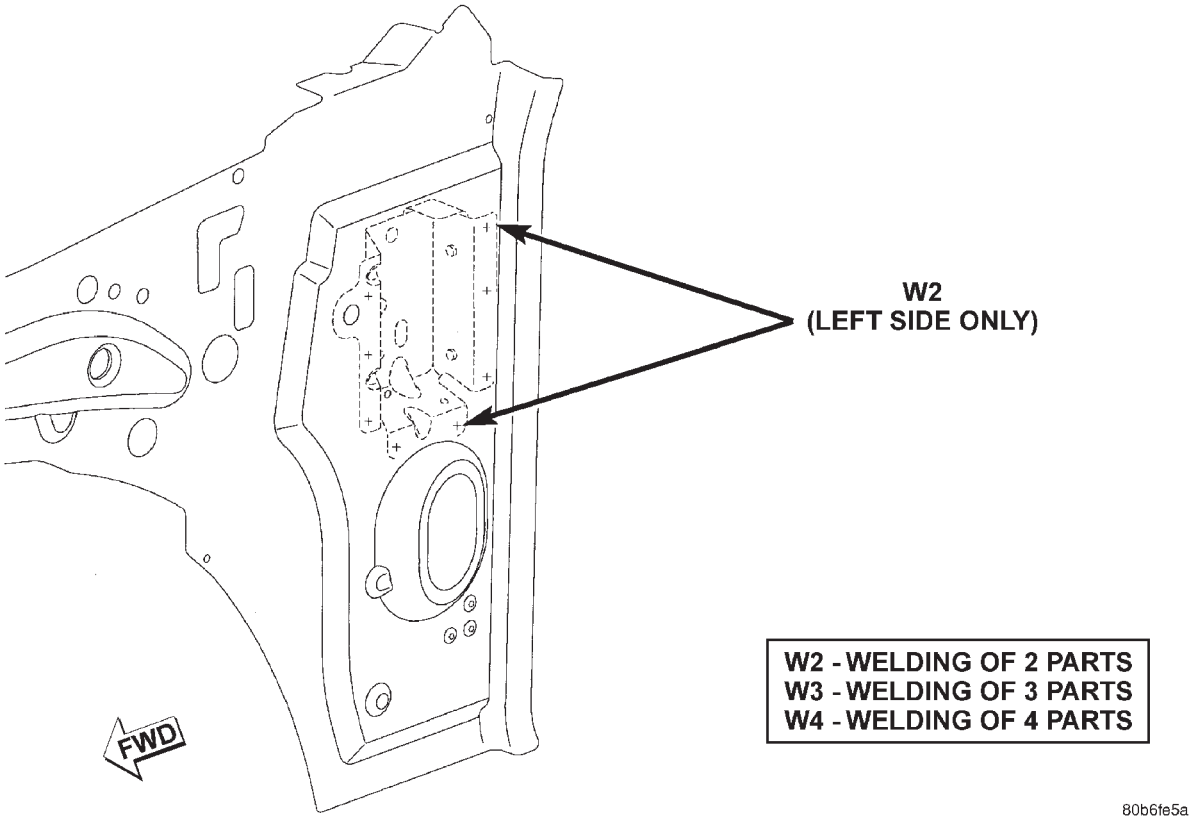
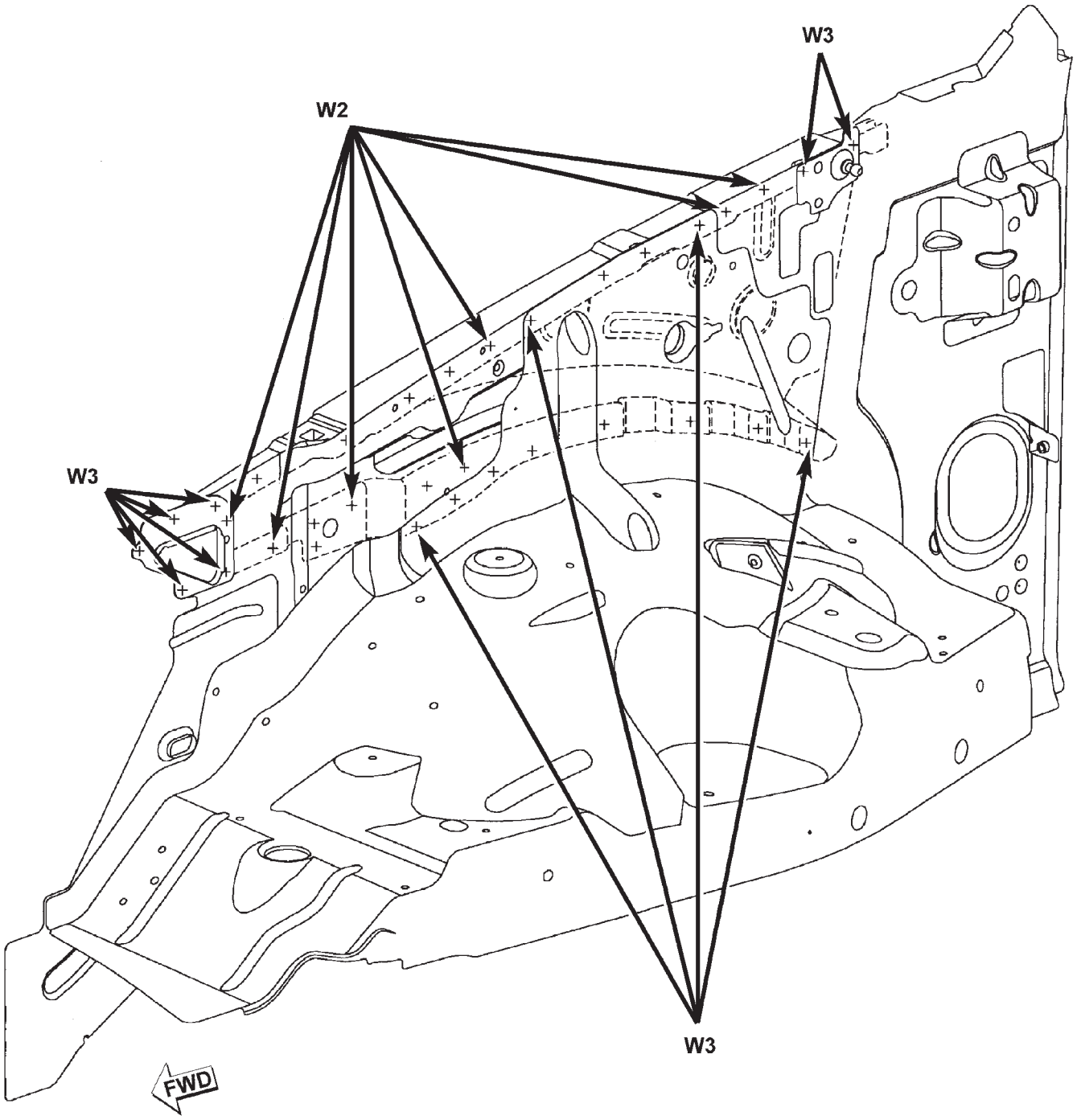


Fig. 55 LEFT INSTRUMENT PANEL BRACKET TO COWL SIDE PANEL

WELD LOCATIONS (Continued)



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

80b6fe5b

Fig. 56 COWL SIDE UPPER REINFORCEMENT TO COWL SIDE AND FRONT SUSPENSION SUPPORT

WELD LOCATIONS (Continued)

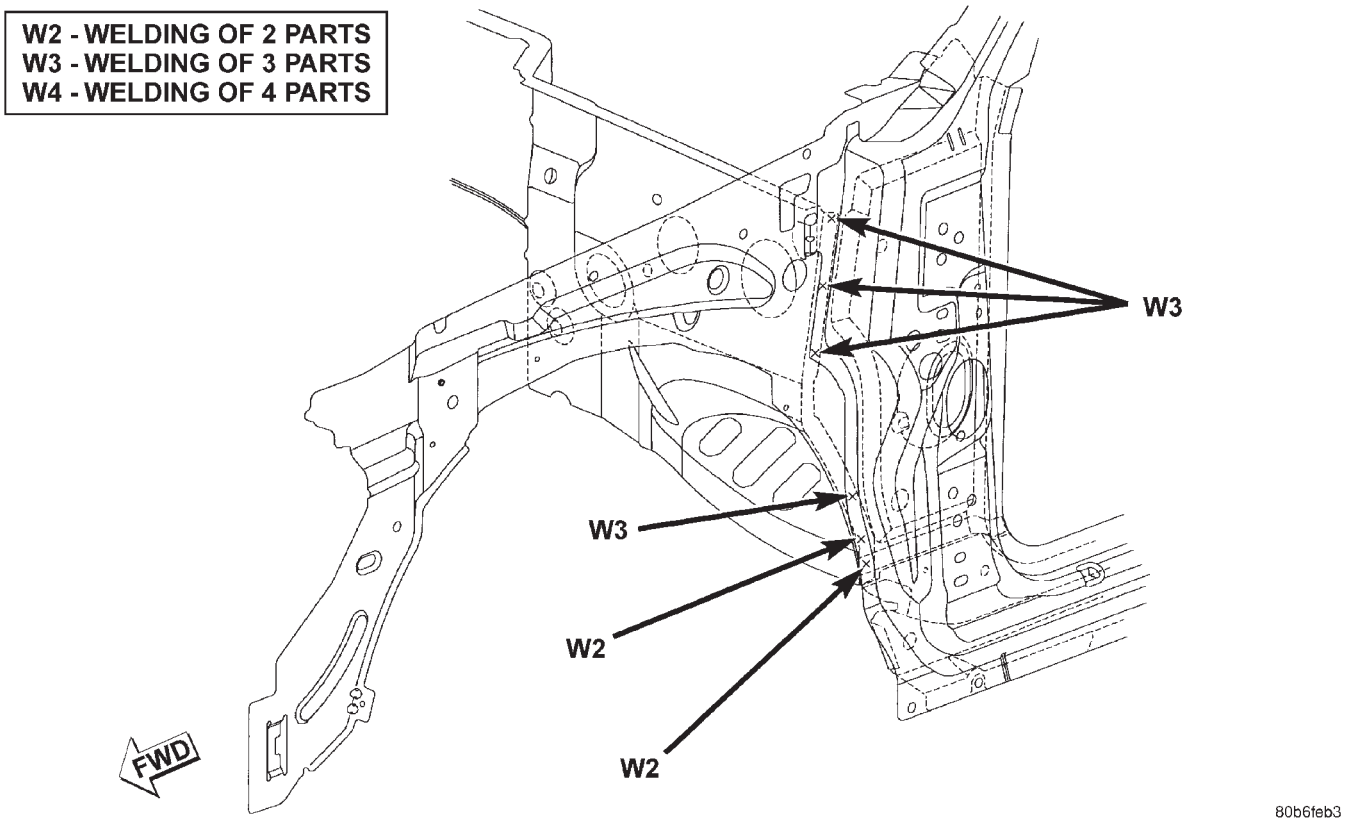


Fig. 57 COWL SIDE PANEL TO DASH PANEL AND INNER BODYSIDE PANEL AND SILL

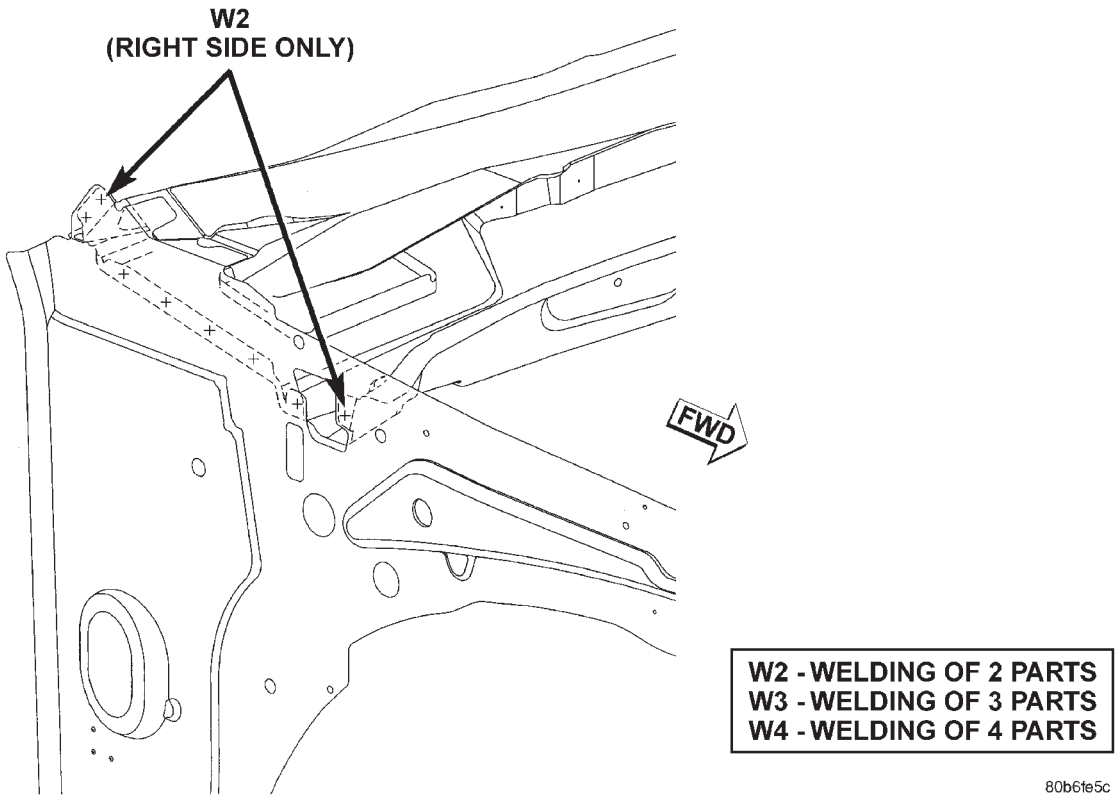


Fig. 58 PLENUM ASSEMBLY TO COWL SIDE PANEL

WELD LOCATIONS (Continued)

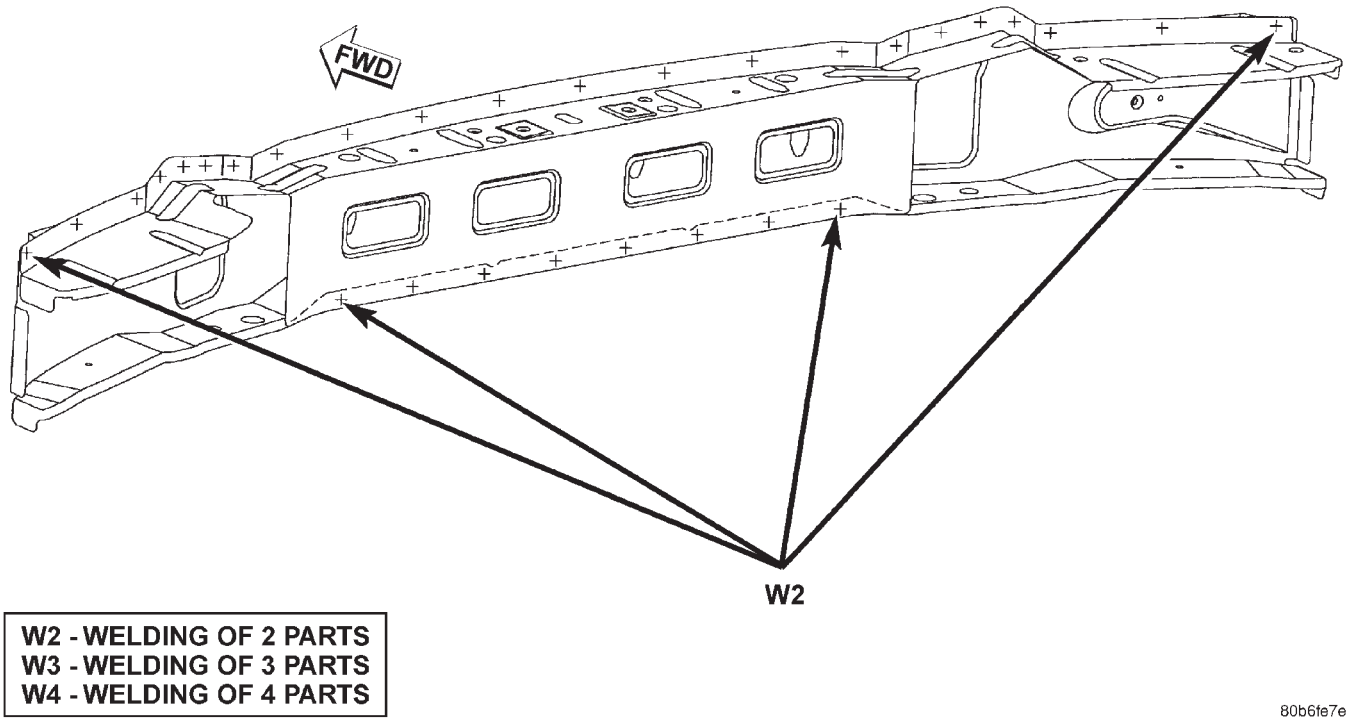


Fig. 59 FRONT LOWER CROSSMEMBER

WELD LOCATIONS (Continued)

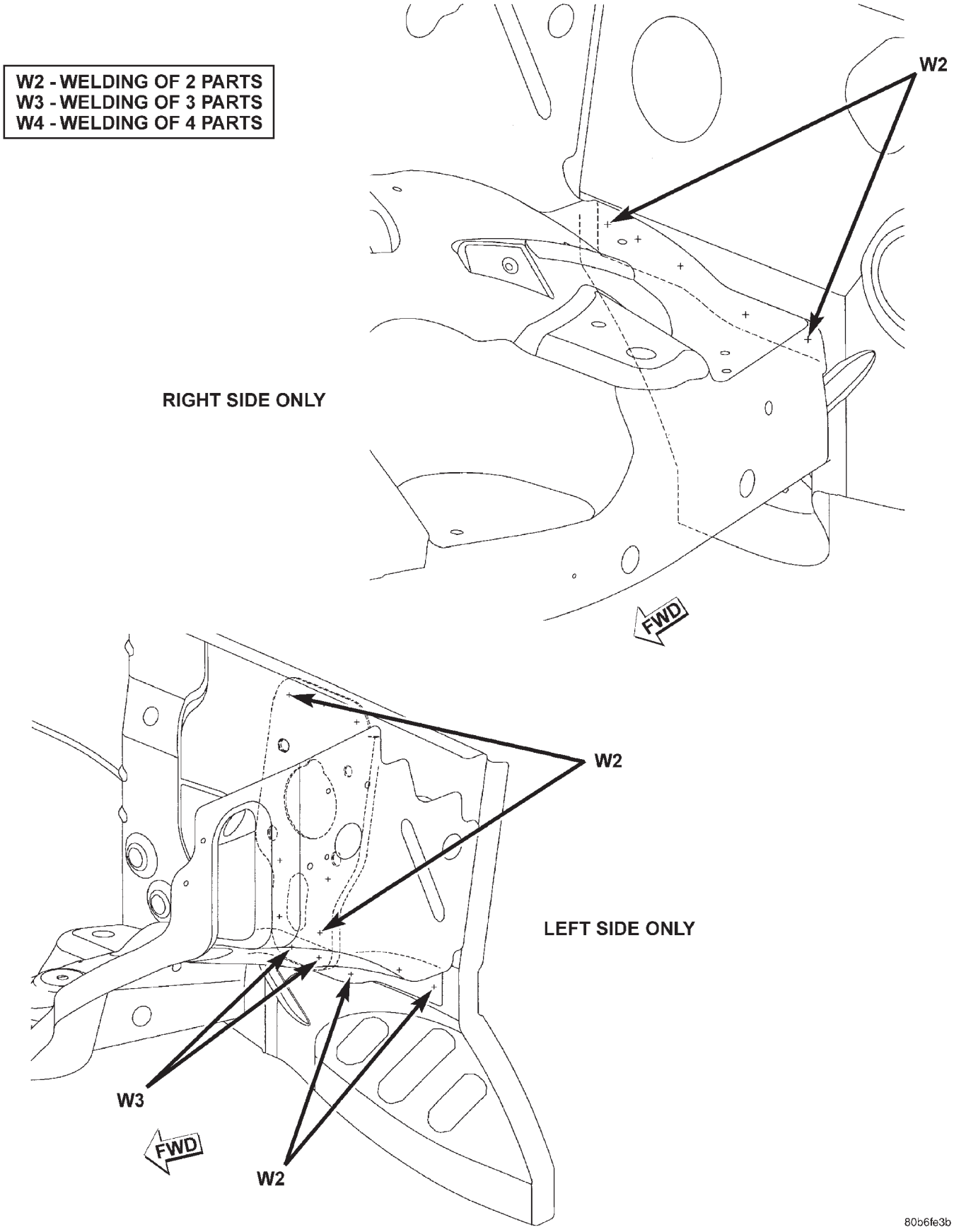


Fig. 60 FRONT SUSPENSION SUPPORT TO DASH

WELD LOCATIONS (Continued)

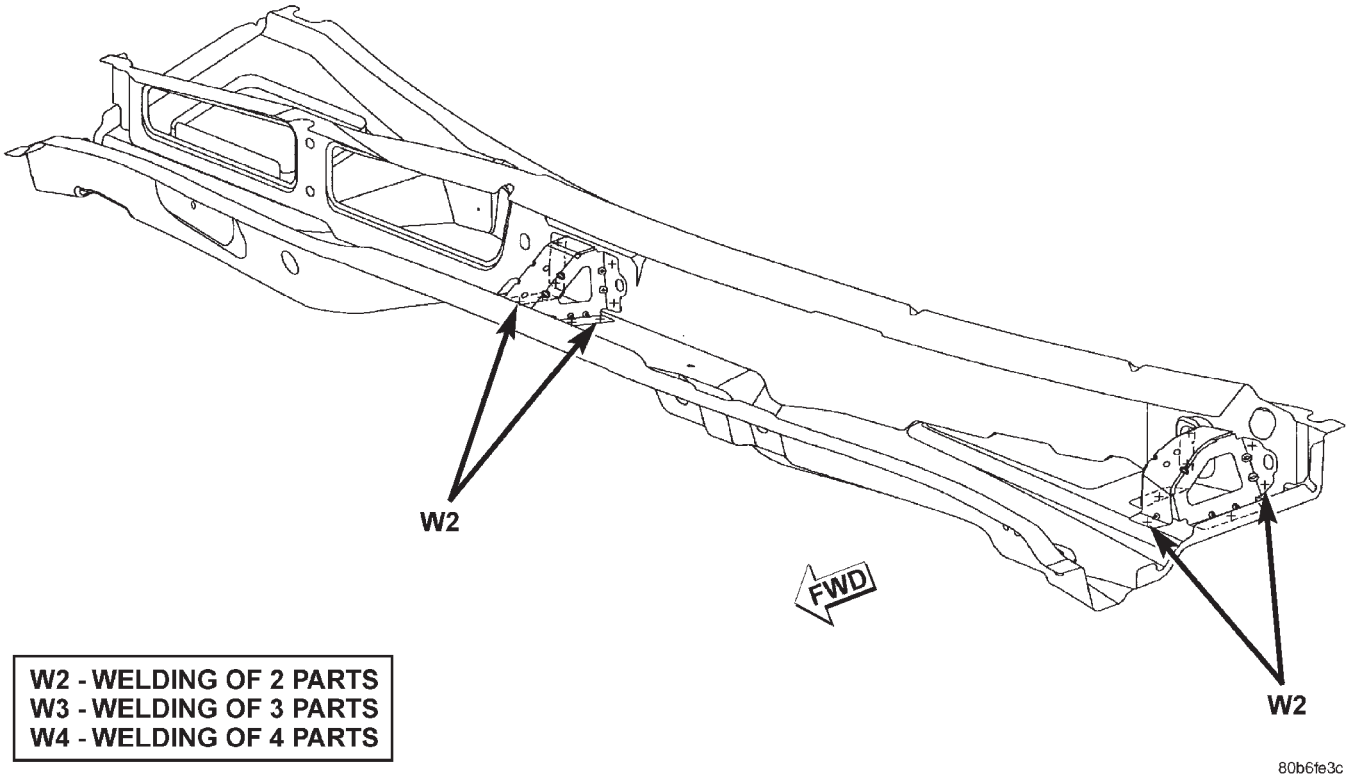


Fig. 61 WIPER MOUNTING BRACKETS TO PLENUM ASSEMBLY

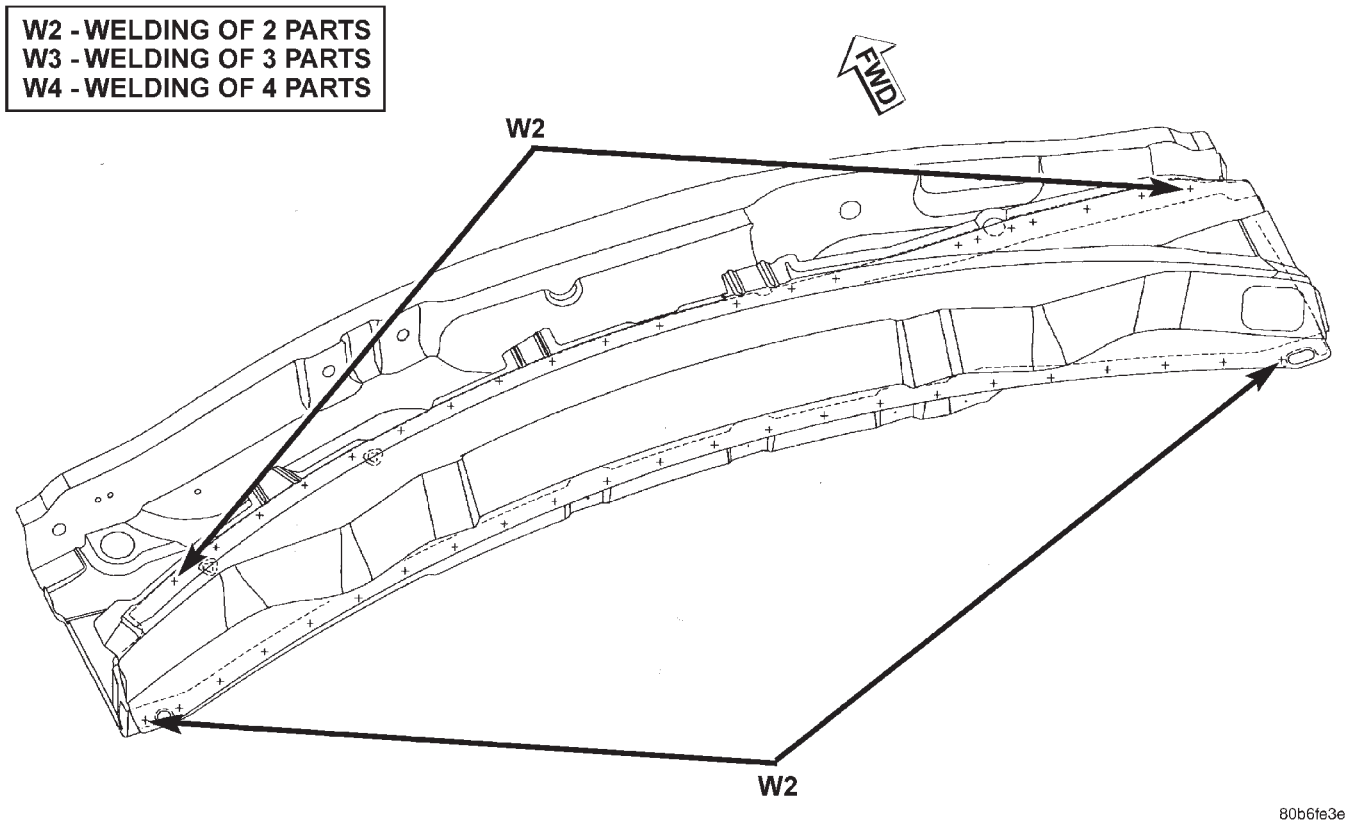


Fig. 62 COWL TOP AND PLENUM ASSEMBLY

WELD LOCATIONS (Continued)

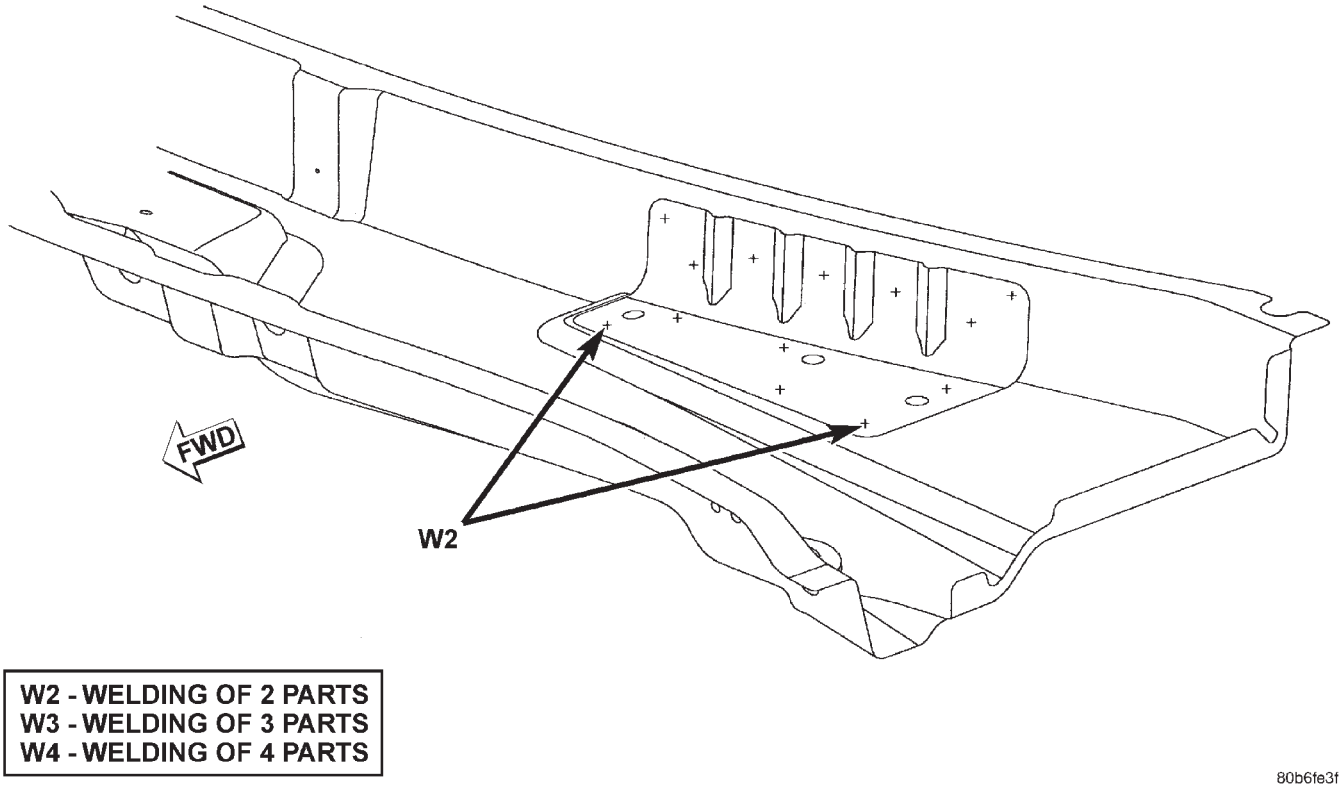


Fig. 63 LOWER PLENUM REINFORCEMENT TO LOWER PLENUM PANEL

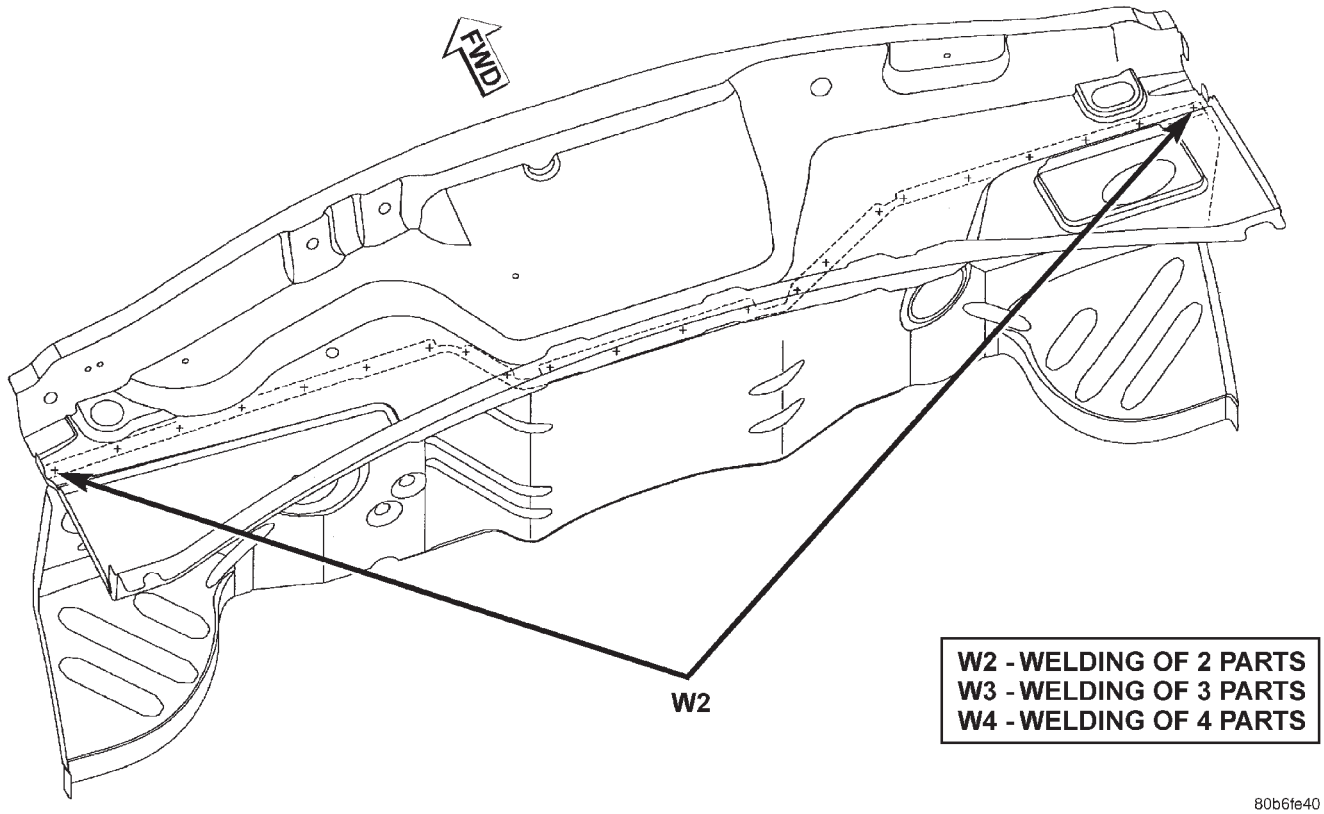


Fig. 64 DASH PANEL TO LOWER PLENUM PANEL

WELD LOCATIONS (Continued)

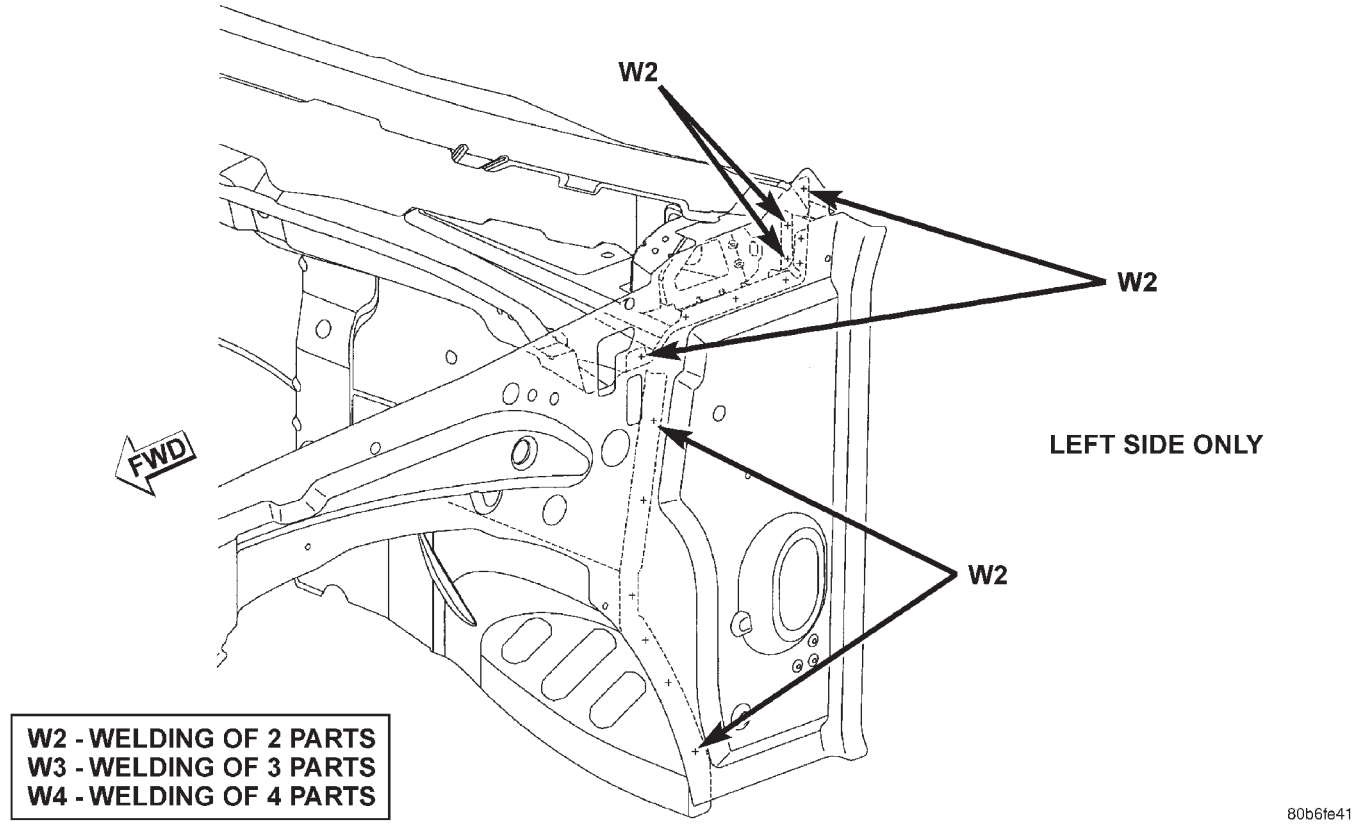


Fig. 65 PLENUM ASSEMBLY TO COWL

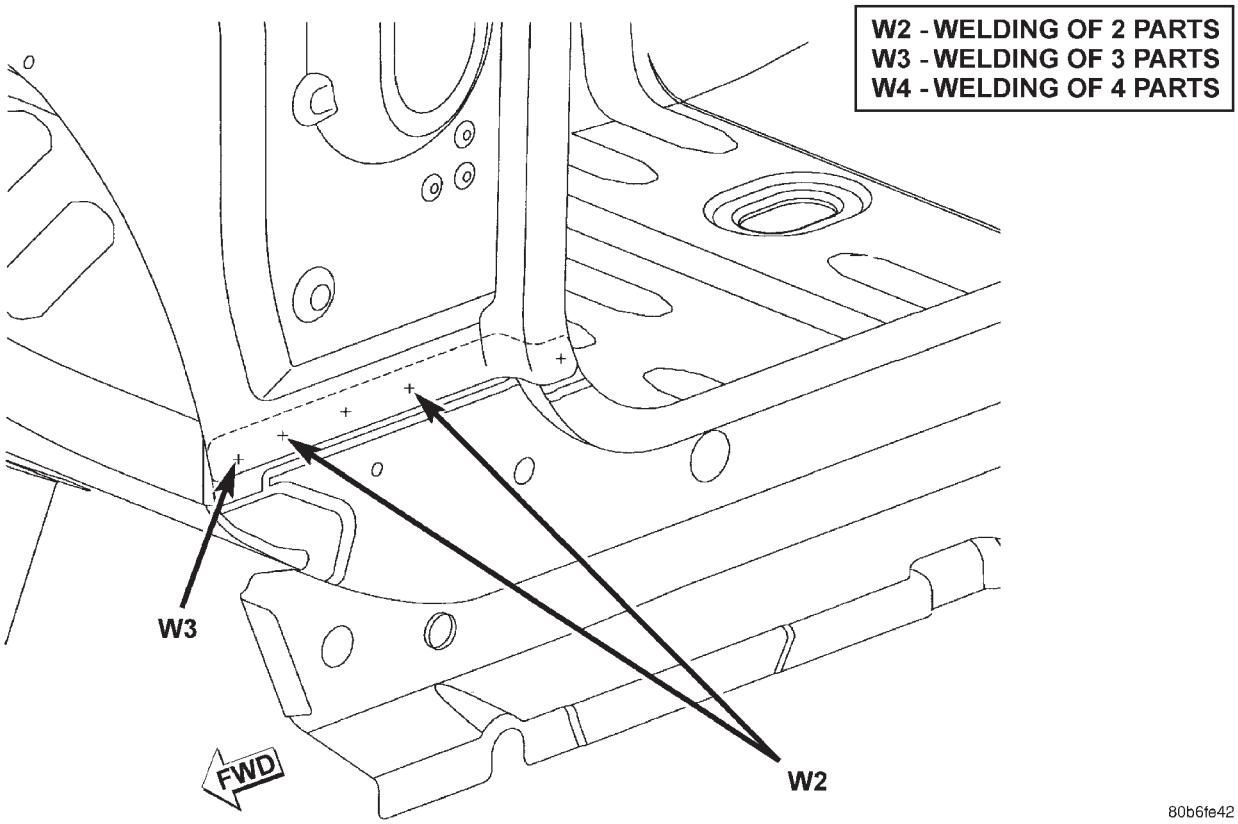
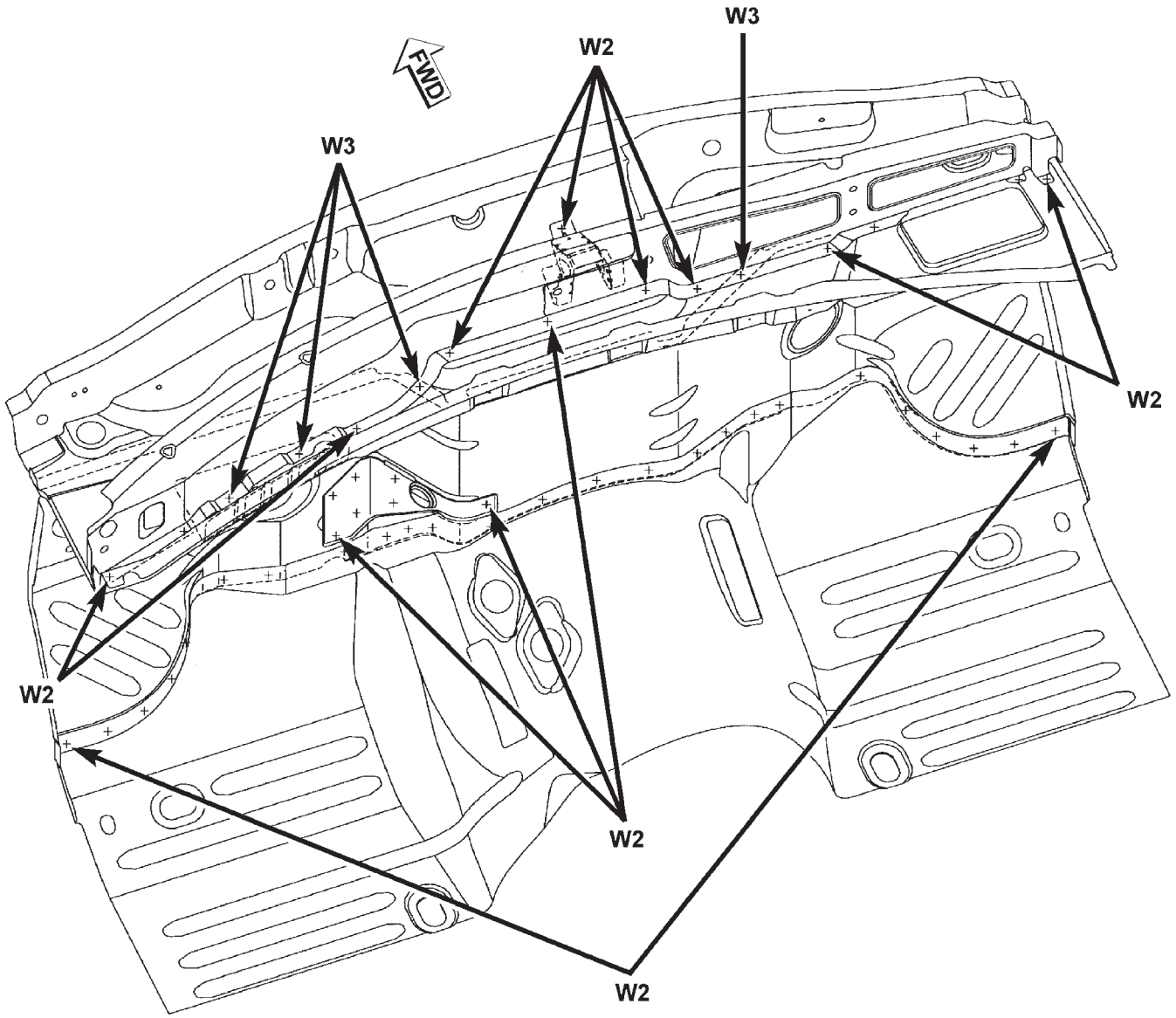


Fig. 66 COWL PANEL TO BODYSIDE SILL

WELD LOCATIONS (Continued)



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

80b6fe47

Fig. 67 COWL PANEL TO FRONT FLOOR PAN

WELD LOCATIONS (Continued)

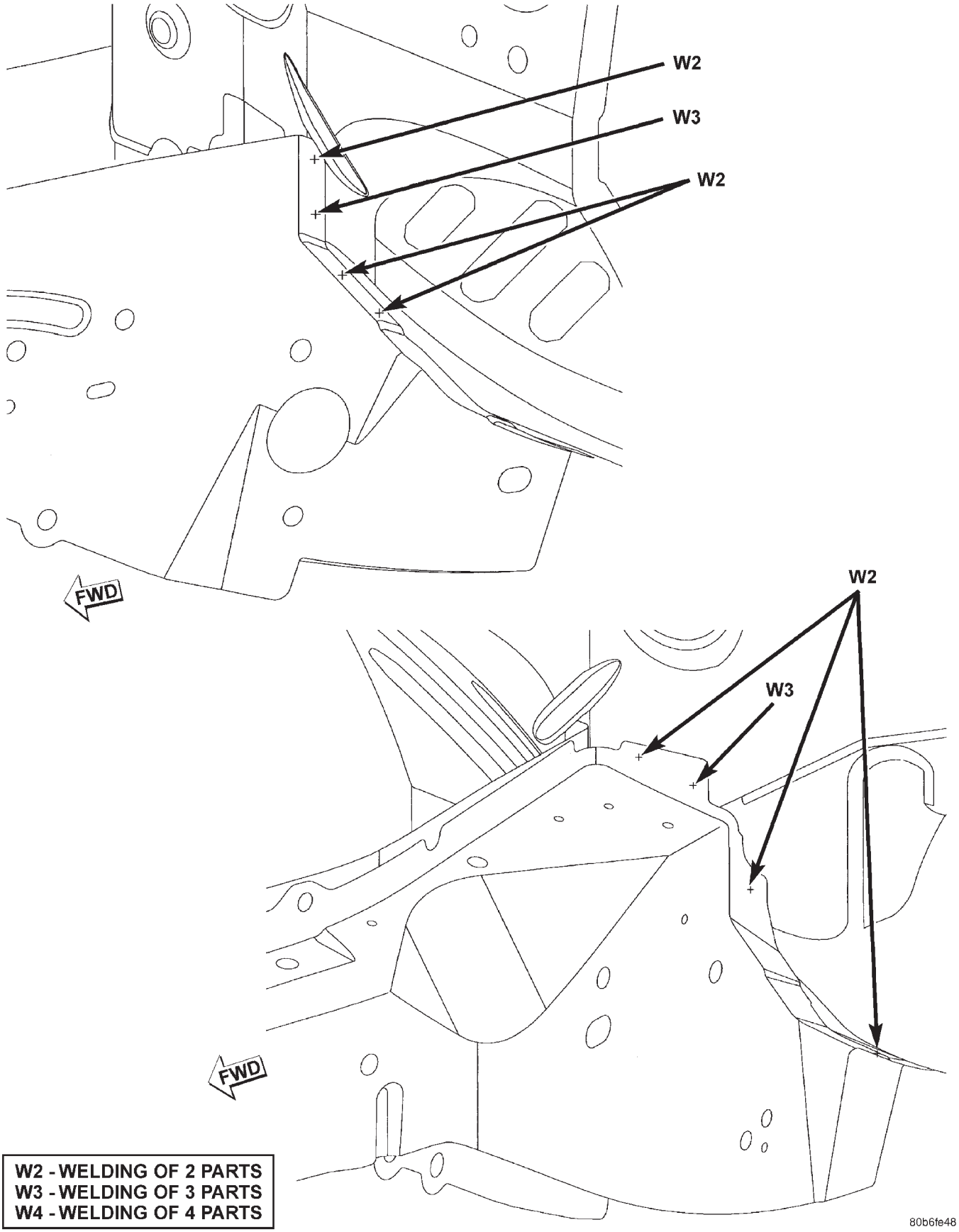


Fig. 68 FRONT SILLS TO DASH AND FRONT FLOOR PAN

WELD LOCATIONS (Continued)

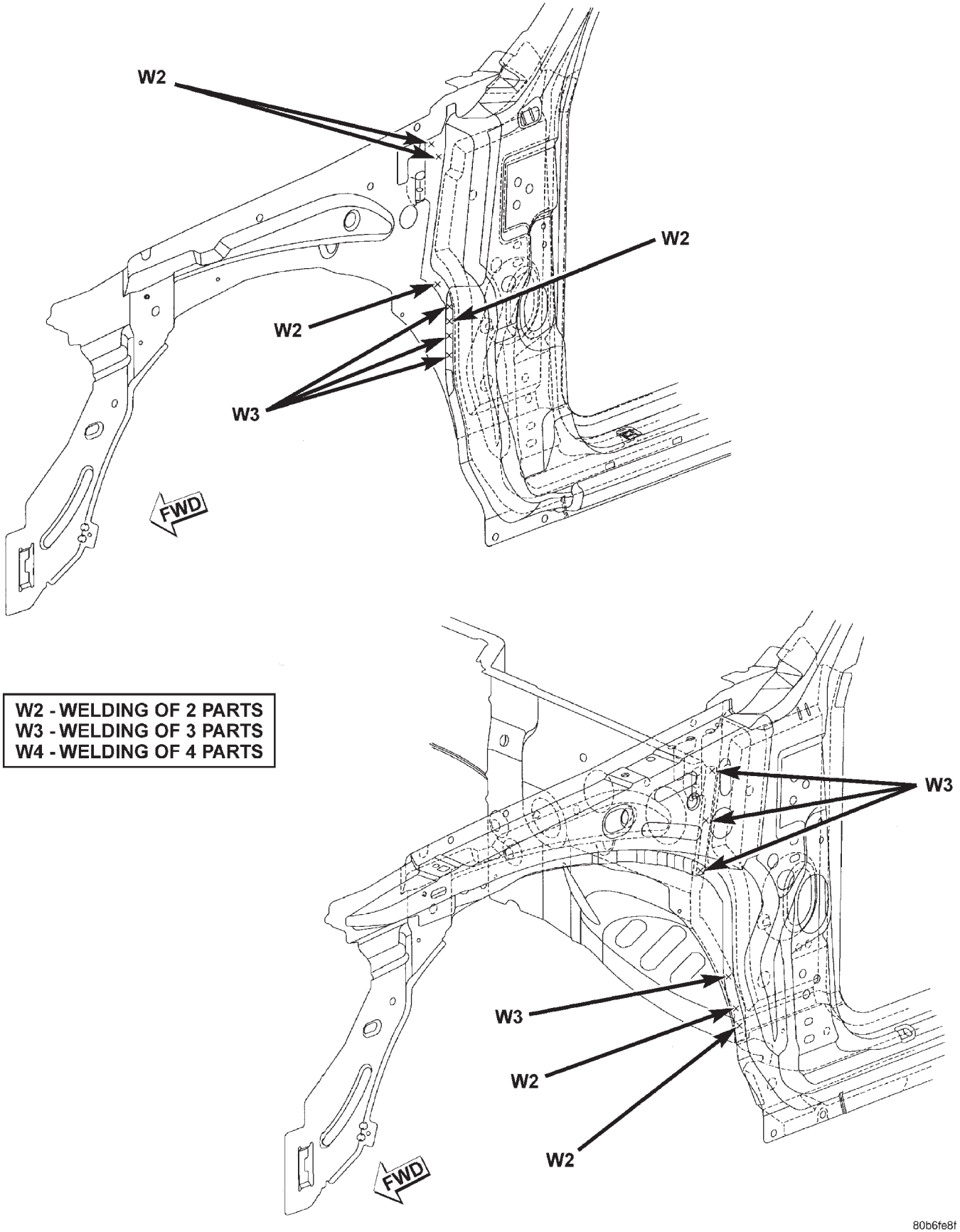


Fig. 69 COWL SIDE PANEL DASH INNER BODYSIDE AND OUTER BODYSIDE PANELS

WELD LOCATIONS (Continued)

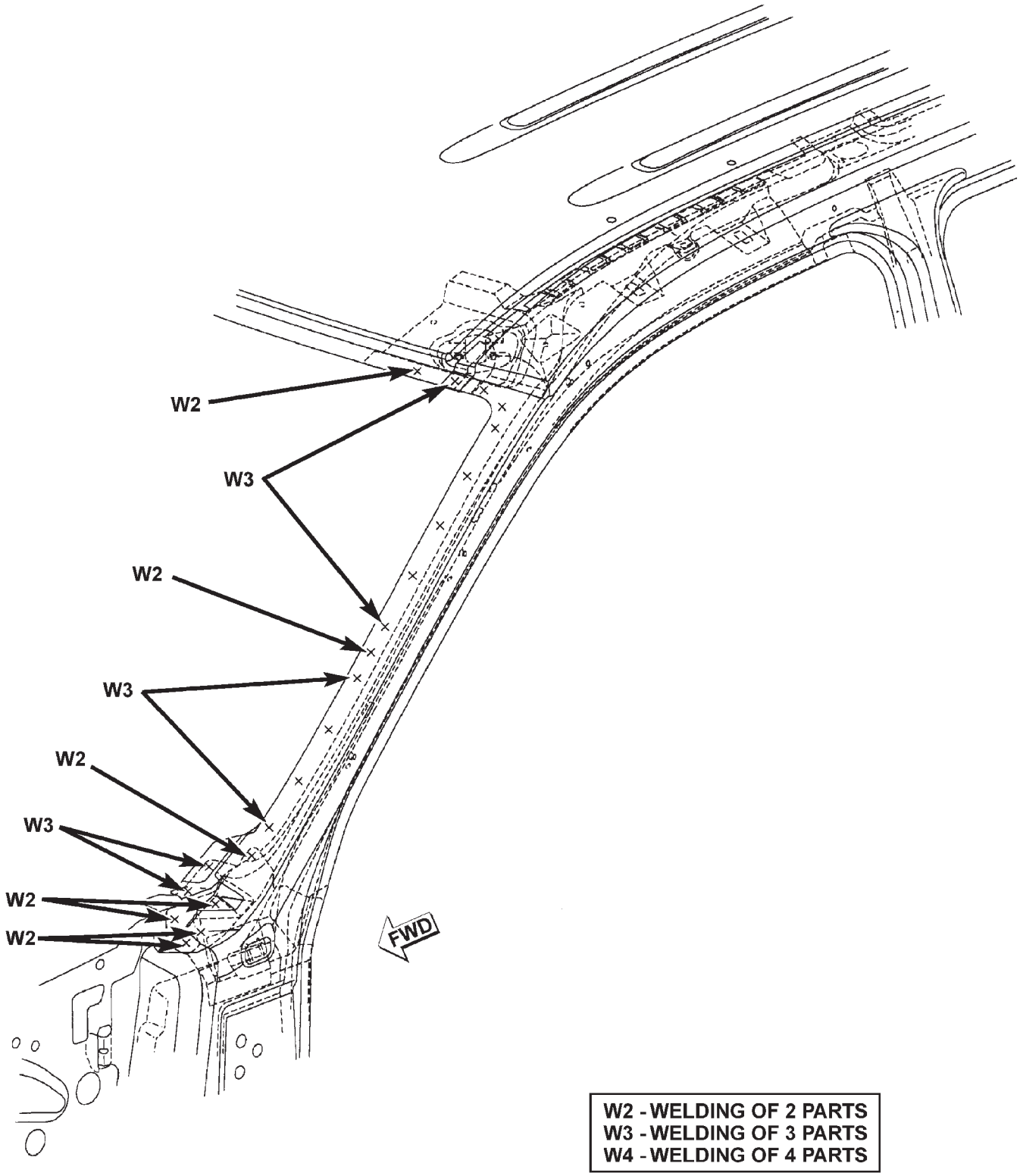


Fig. 70 UPPER FRONT INNER PILLAR TO ROOF AND COWL

WELD LOCATIONS (Continued)

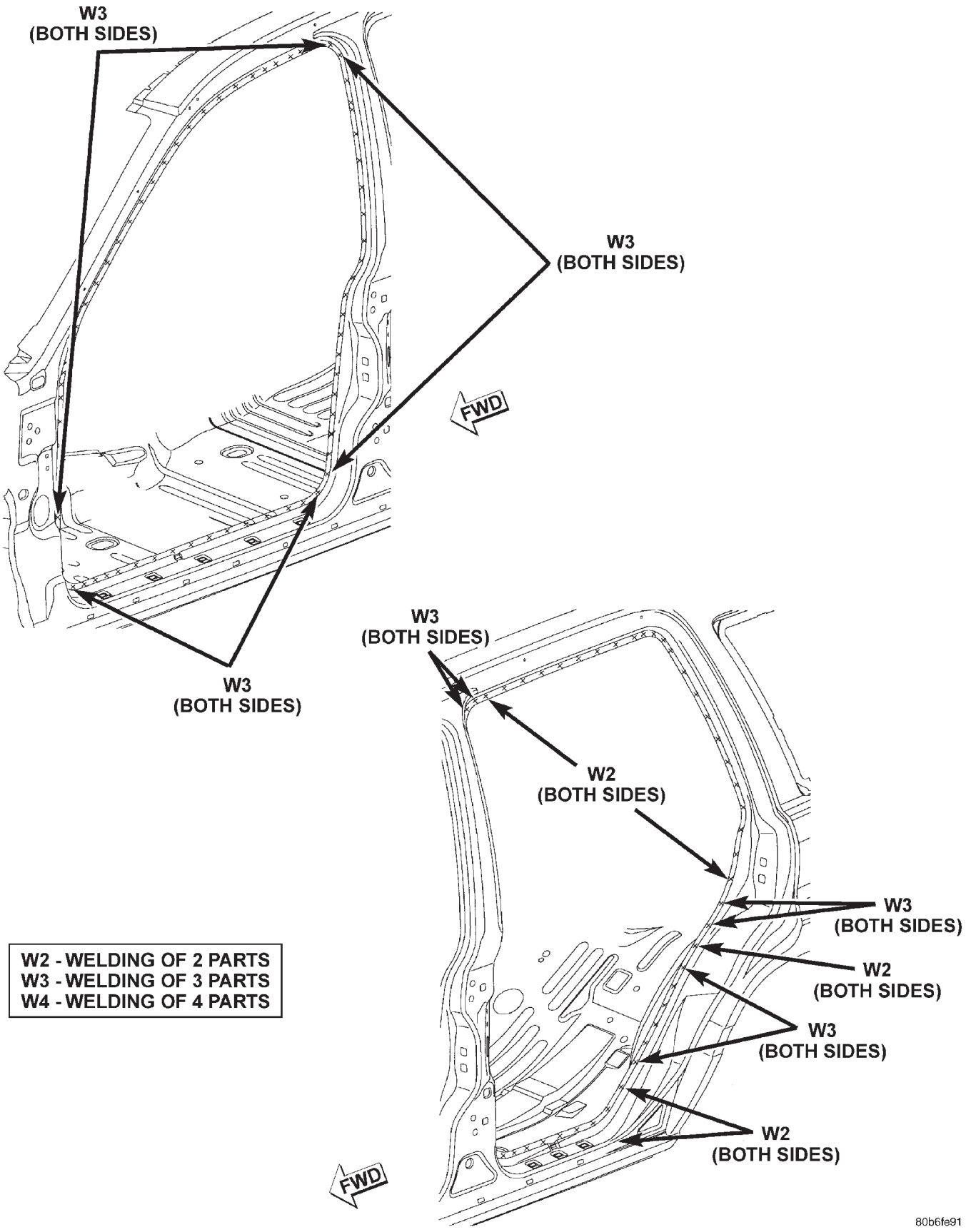


Fig. 71 DOOR OPENINGS

WELD LOCATIONS (Continued)

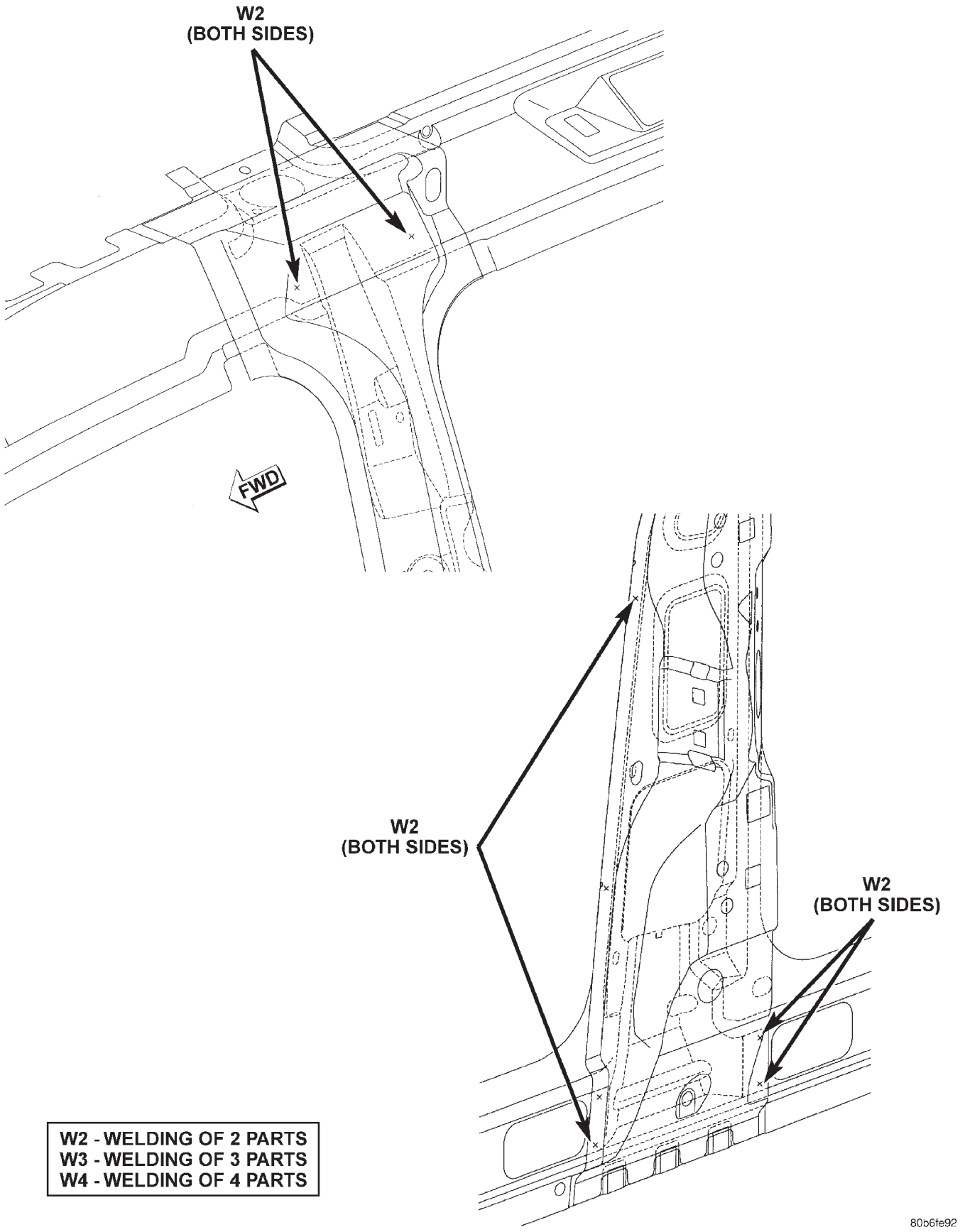


Fig. 72 B-PILLAR REINFORCEMENT TO INNER BODYSIDE APERTURE

WELD LOCATIONS (Continued)

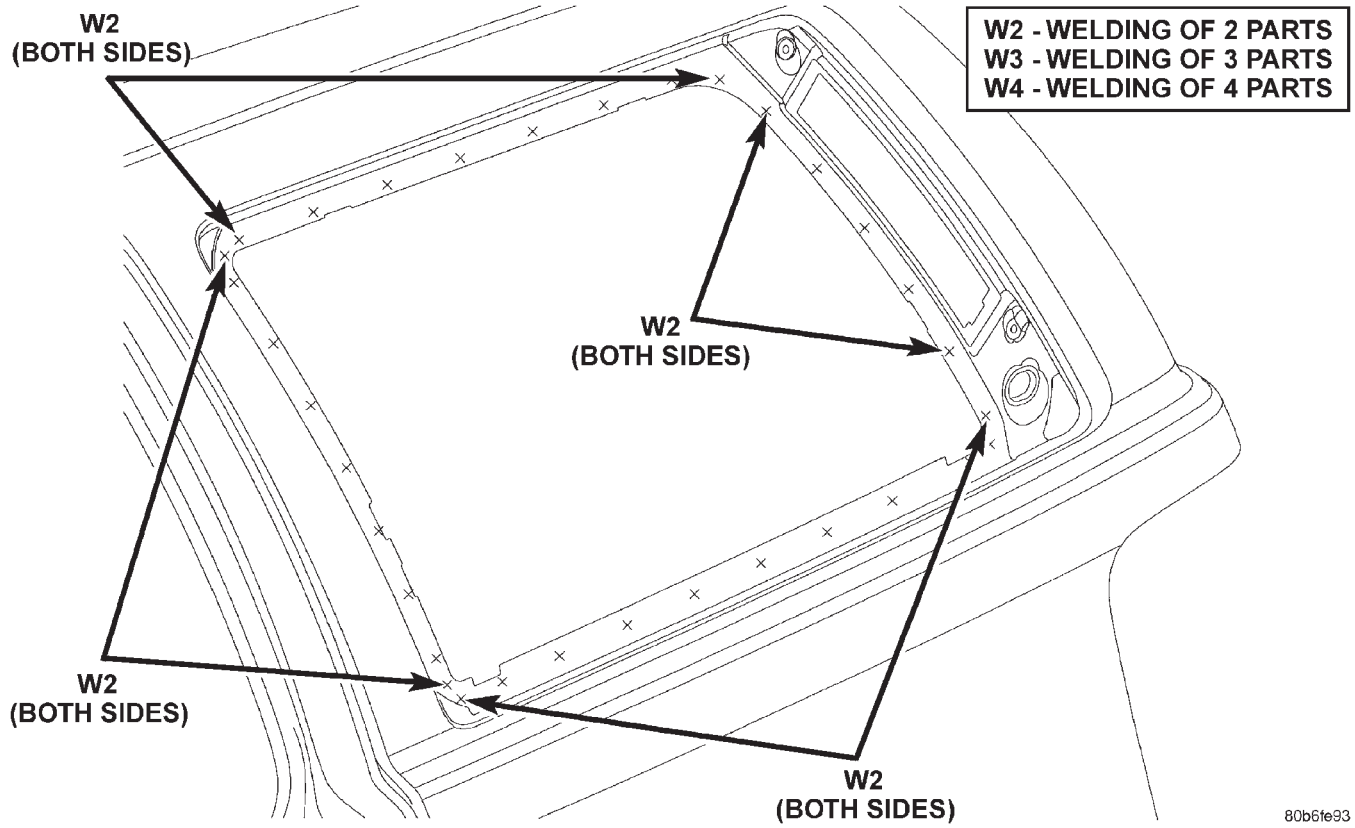


Fig. 73 REAR QUARTER WINDOW TO BODYSIDE APERTURE INNER AND OUTER

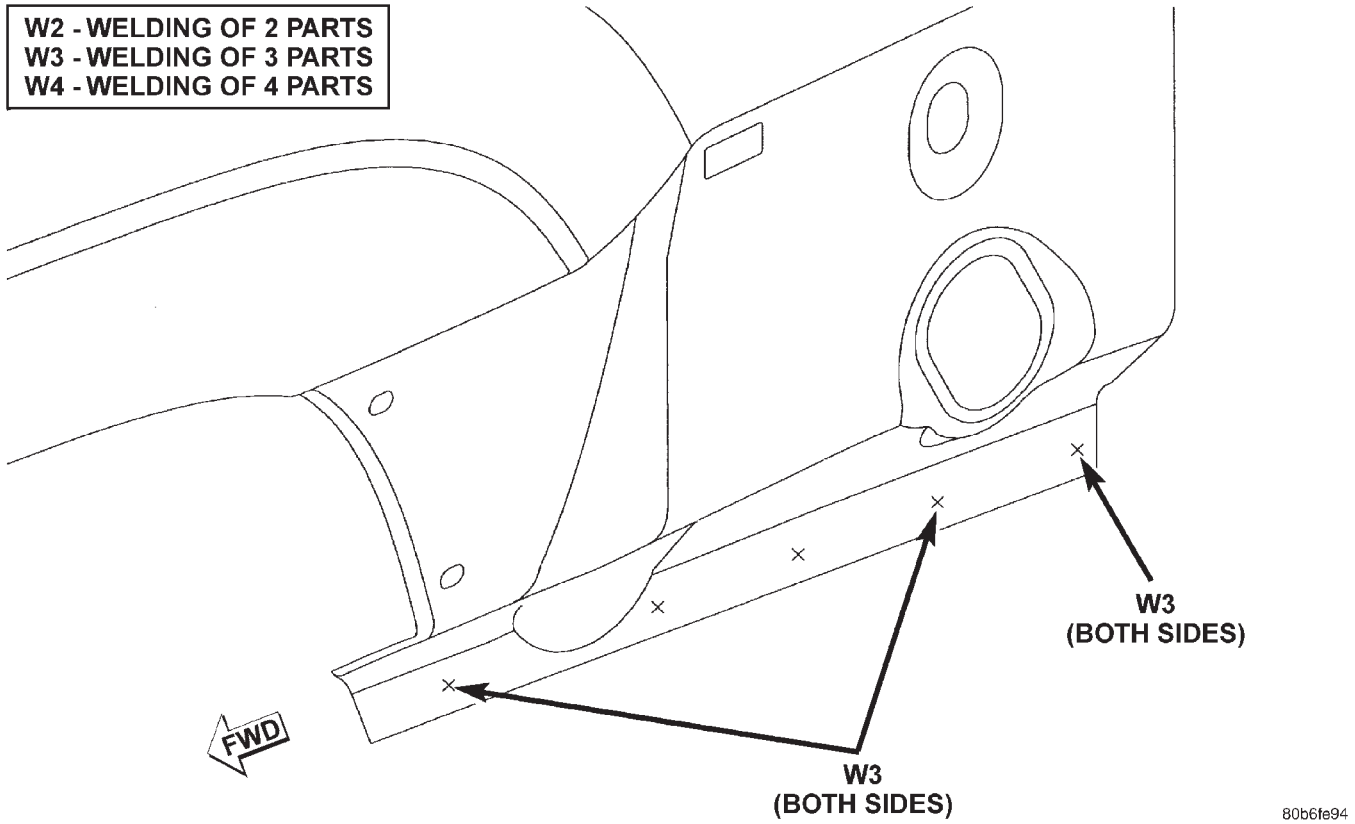


Fig. 74 LOWER REAR QUARTER TO BODYSIDE APERTURE INNER AND OUTER

WELD LOCATIONS (Continued)

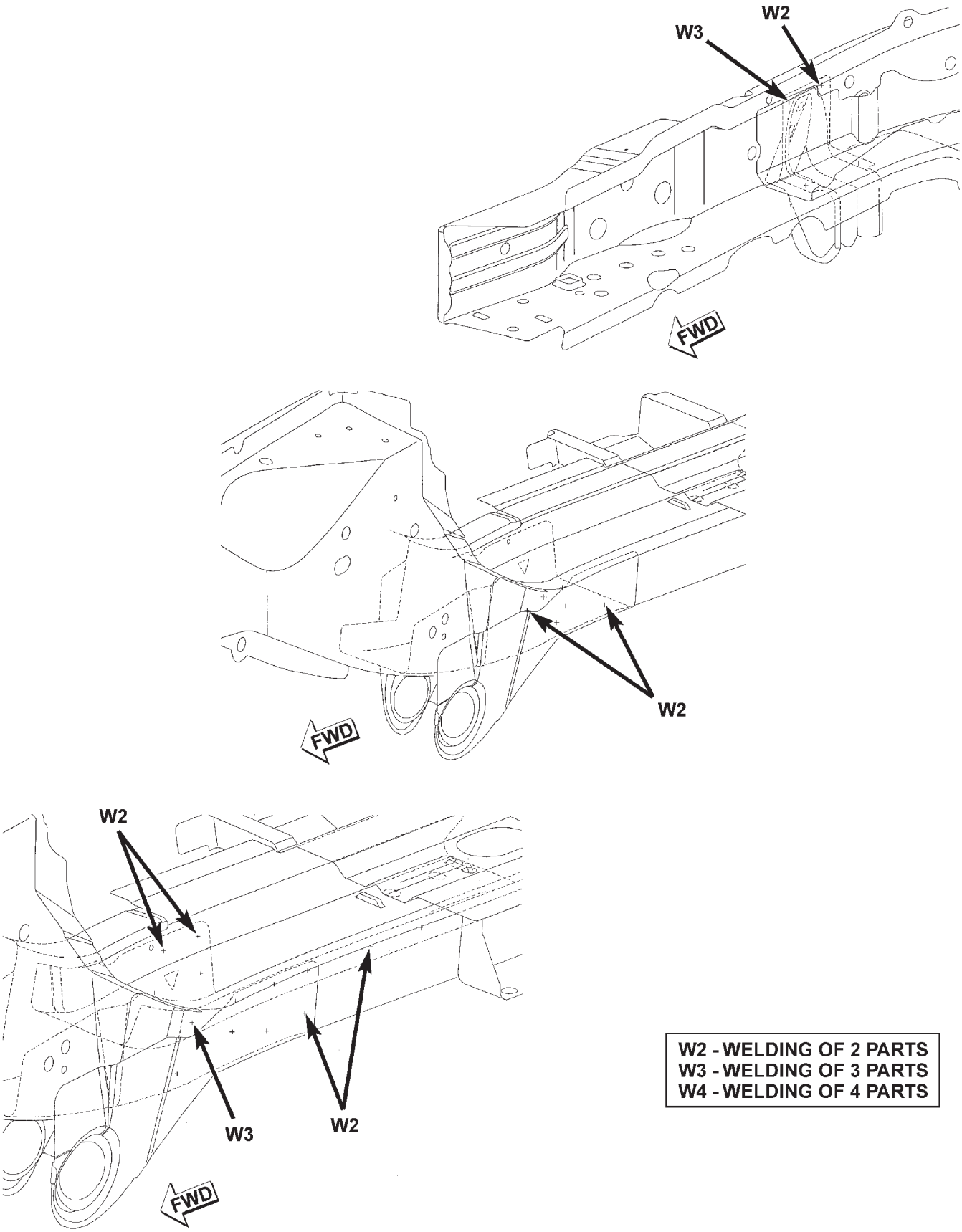


Fig. 75 INNER TRACK BAR, LOWER CONTROL ARM AND TRANSMISSION CROSSMEMBER BRACKETS TO FRONT SILLS

WELD LOCATIONS (Continued)

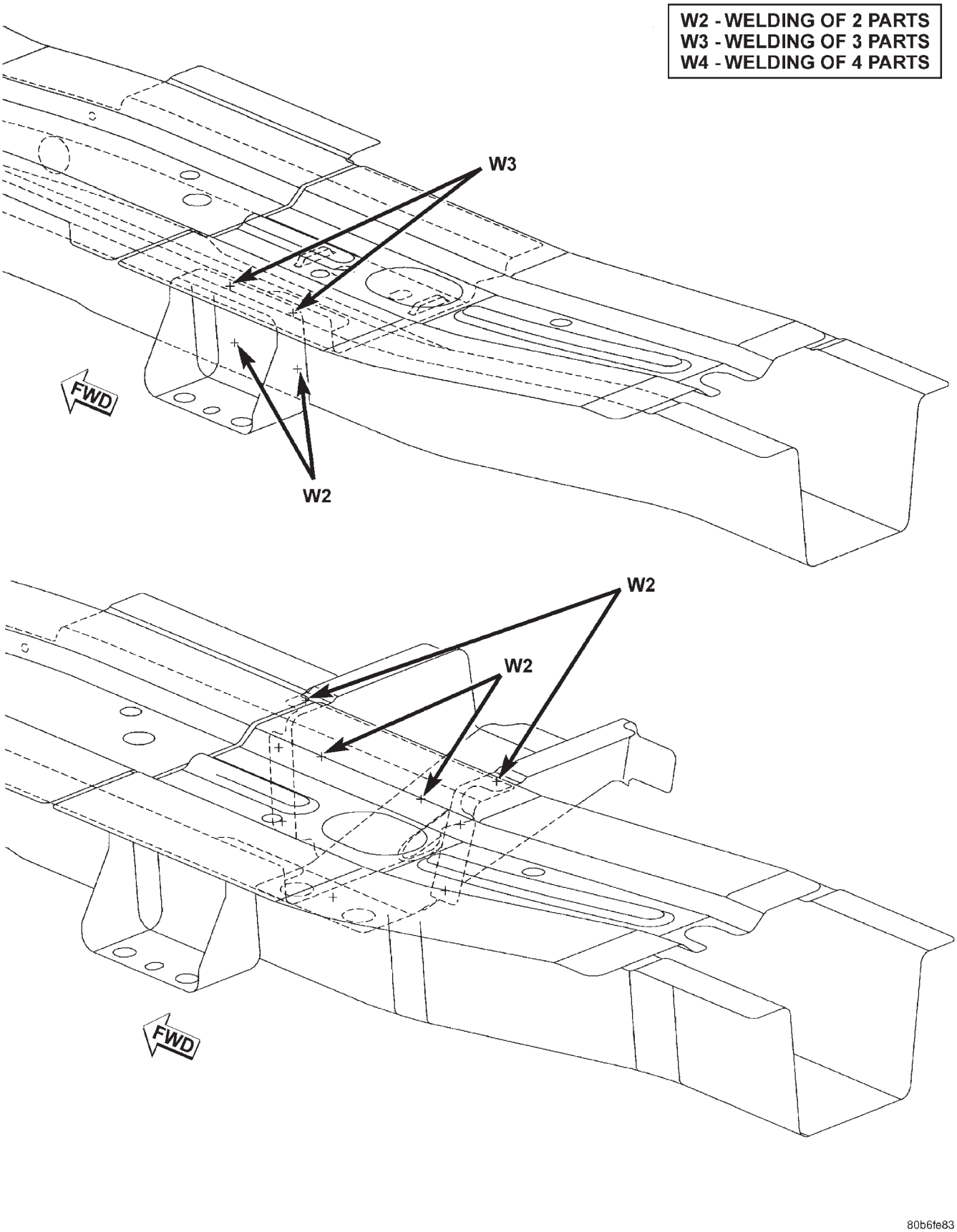


Fig. 76 TRANSMISSION CROSSMEMBER BRACKET AND REINFORCEMENT TO FRONT SILLS

WELD LOCATIONS (Continued)

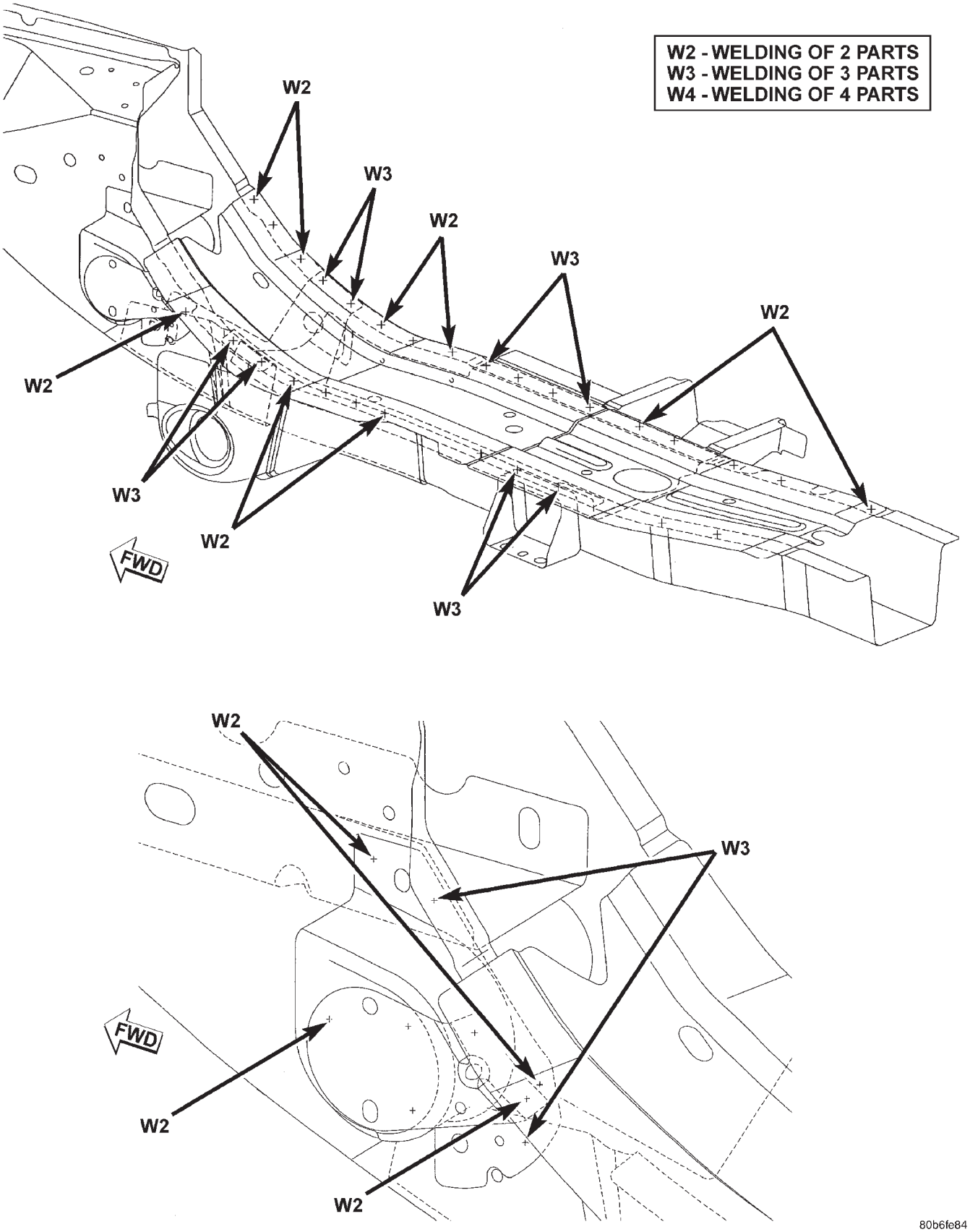


Fig. 77 UPPER SILLS AND UPPER CONTROL ARM REINFORCEMENT AND BRACKETS TO FRONT SILLS

WELD LOCATIONS (Continued)

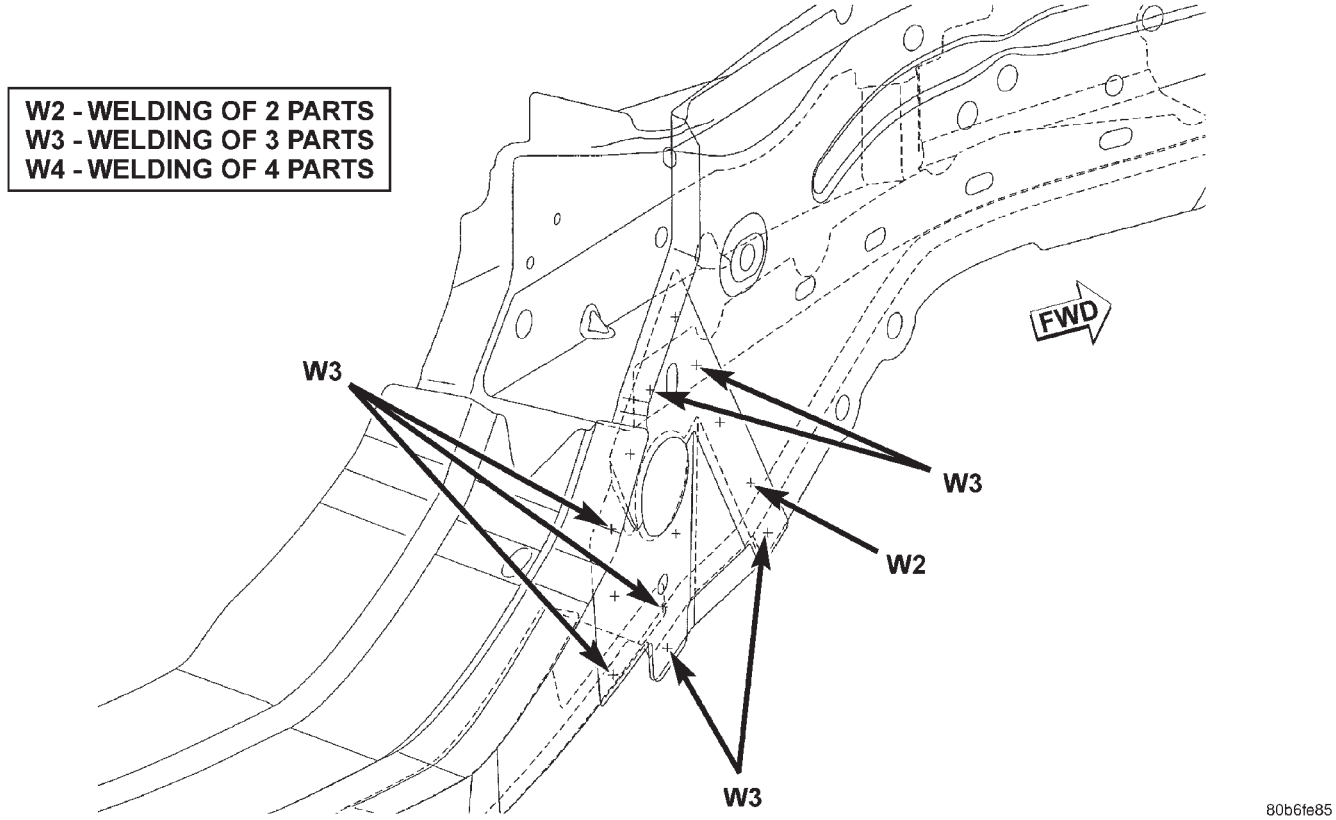


Fig. 78 REINFORCEMENT TO FRONT OUTER SILLS

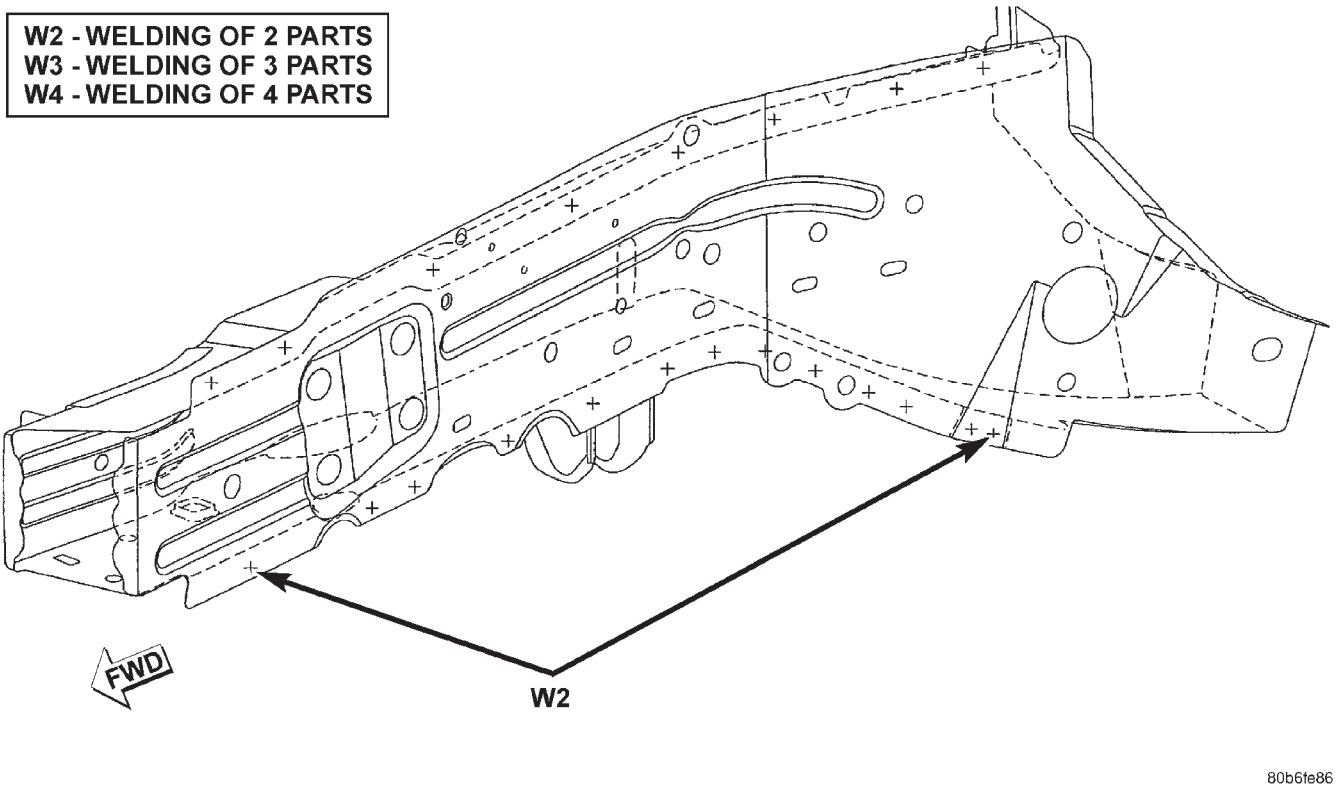


Fig. 79 FRONT INNER SILL TO FRONT OUTER SILL

WELD LOCATIONS (Continued)

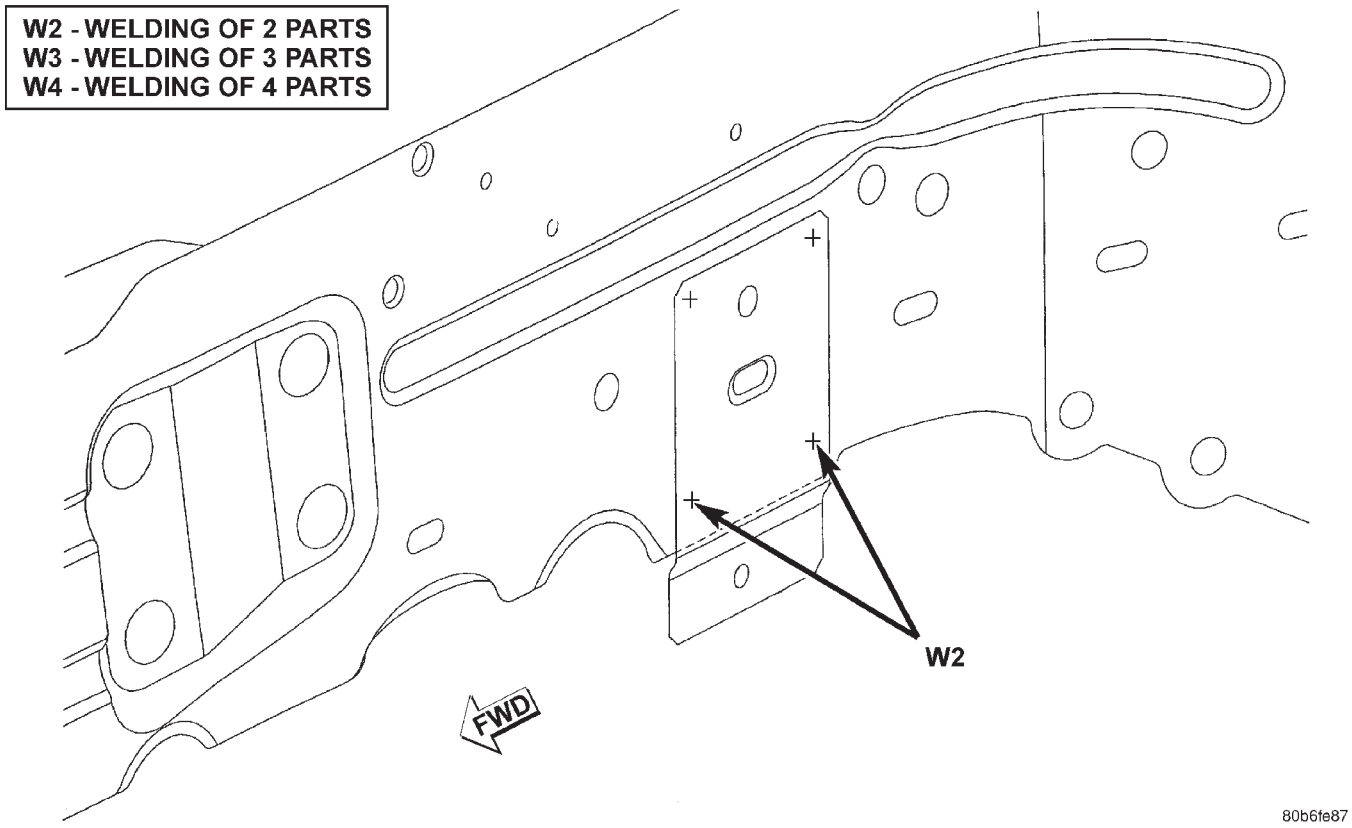


Fig. 80 OUTER TRACK BAR BRACKET TO FRONT OUTER SILL

WELD LOCATIONS (Continued)

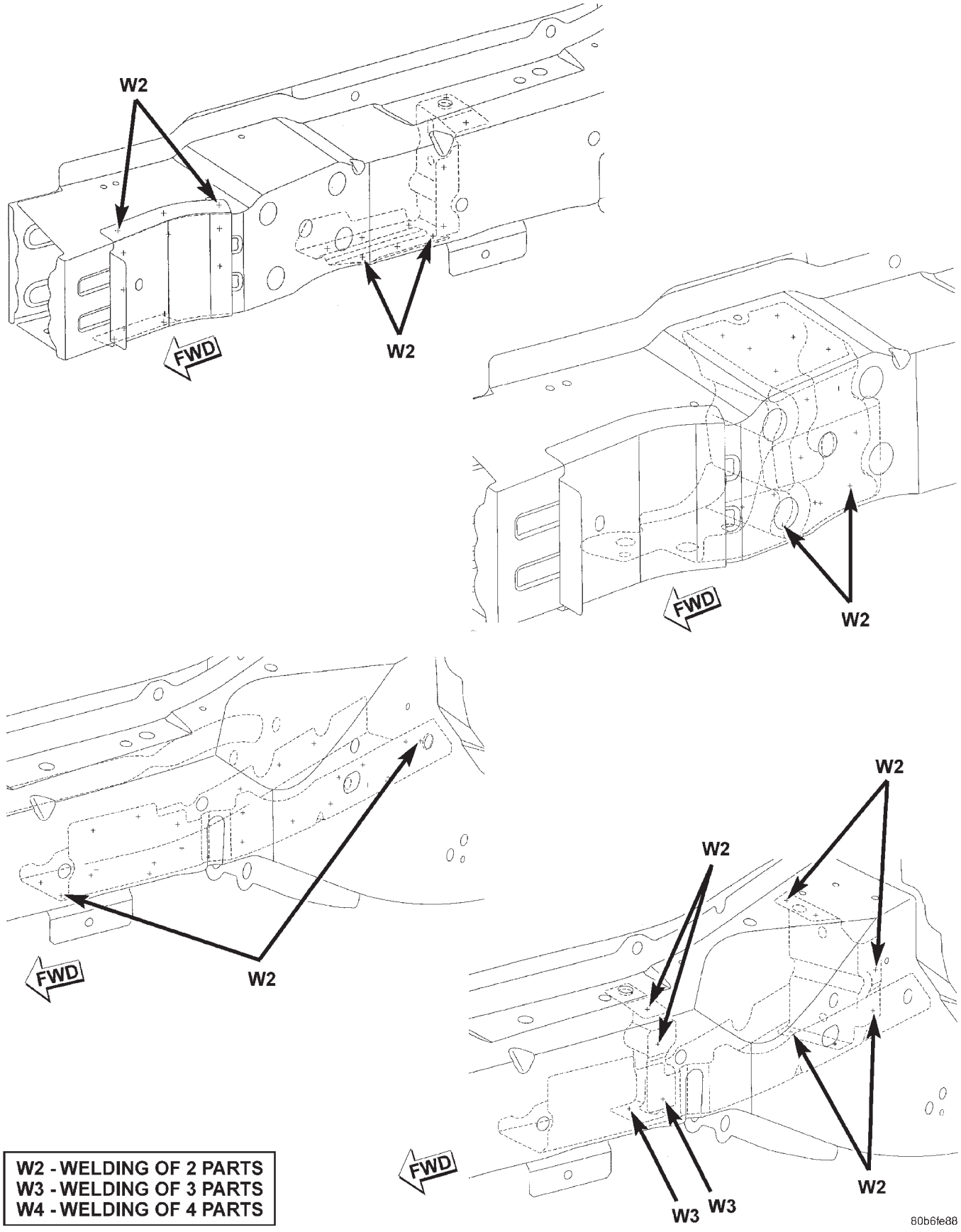


Fig. 81 REINFORCEMENT FOR FRONT ENGINE MOUNTING AND STEERING GEAR TO FRONT INNER SILL

WELD LOCATIONS (Continued)

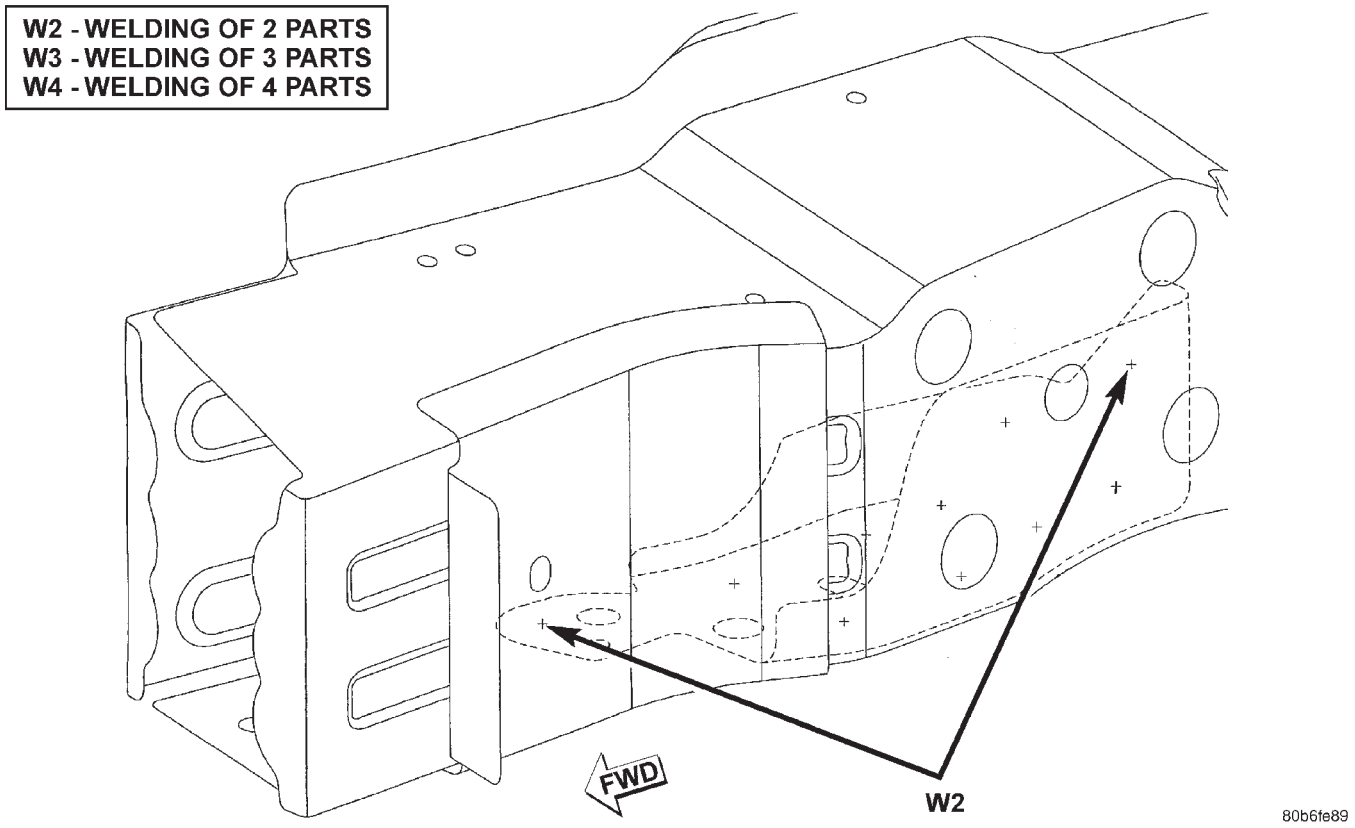


Fig. 82 LARGE AND SMALL SWAY BAR TAPPING PLATES TO FRONT INNER SILLS

WELD LOCATIONS (Continued)

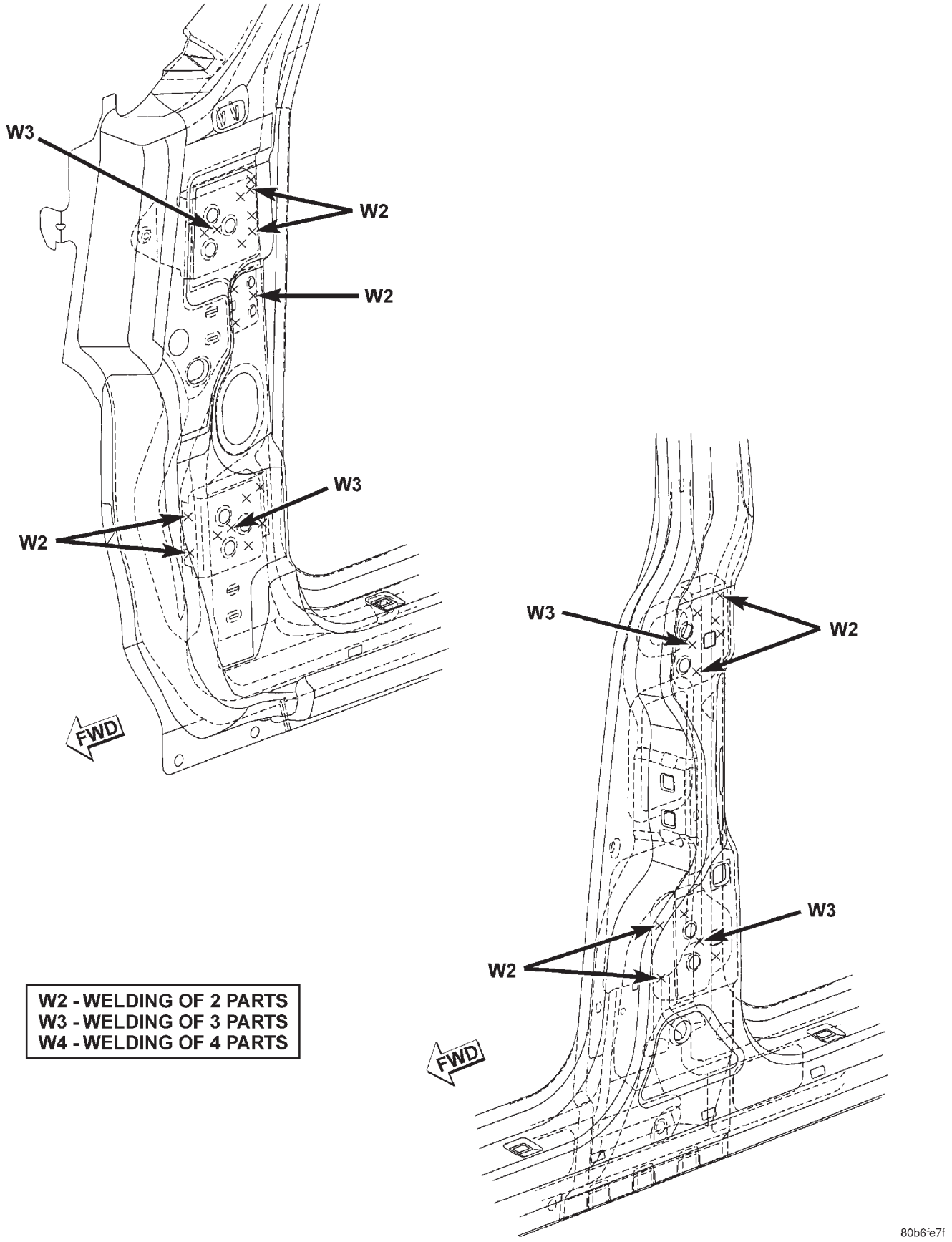


Fig. 83 FRONT AND REAR DOOR HINGE TAPPING PLATES

WELD LOCATIONS (Continued)

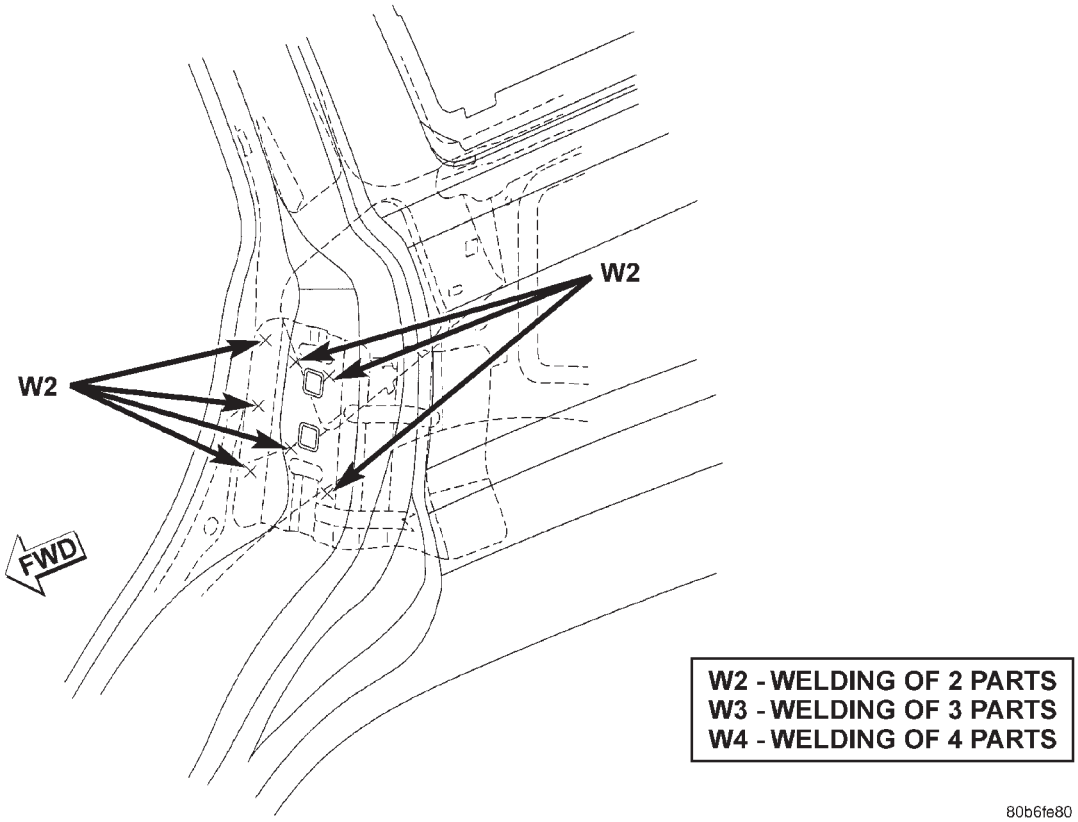


Fig. 84 REAR DOOR STRIKER REINFORCEMENT

WELD LOCATIONS (Continued)

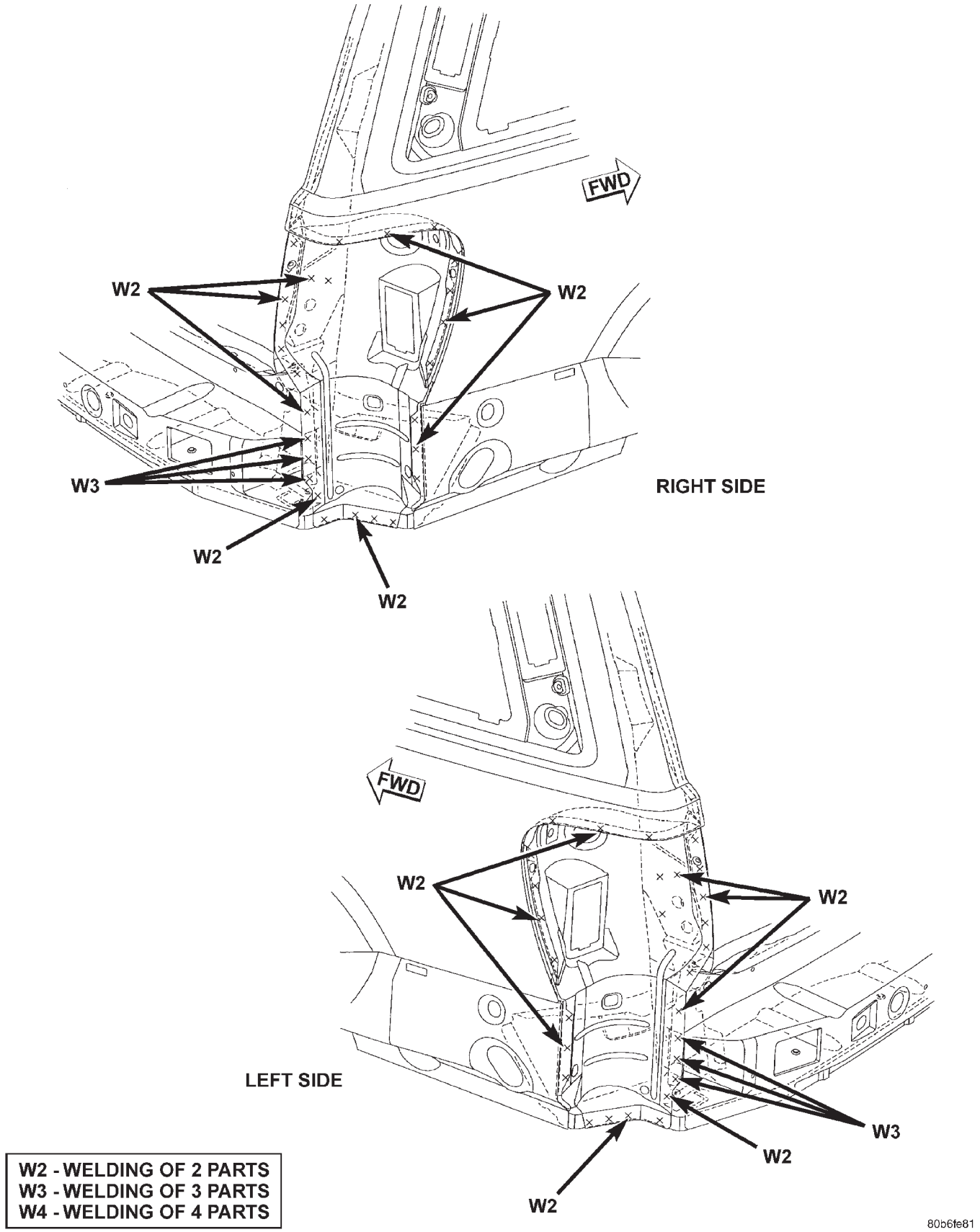


Fig. 85 TAIL LAMP MOUNTING PANELS

WELD LOCATIONS (Continued)

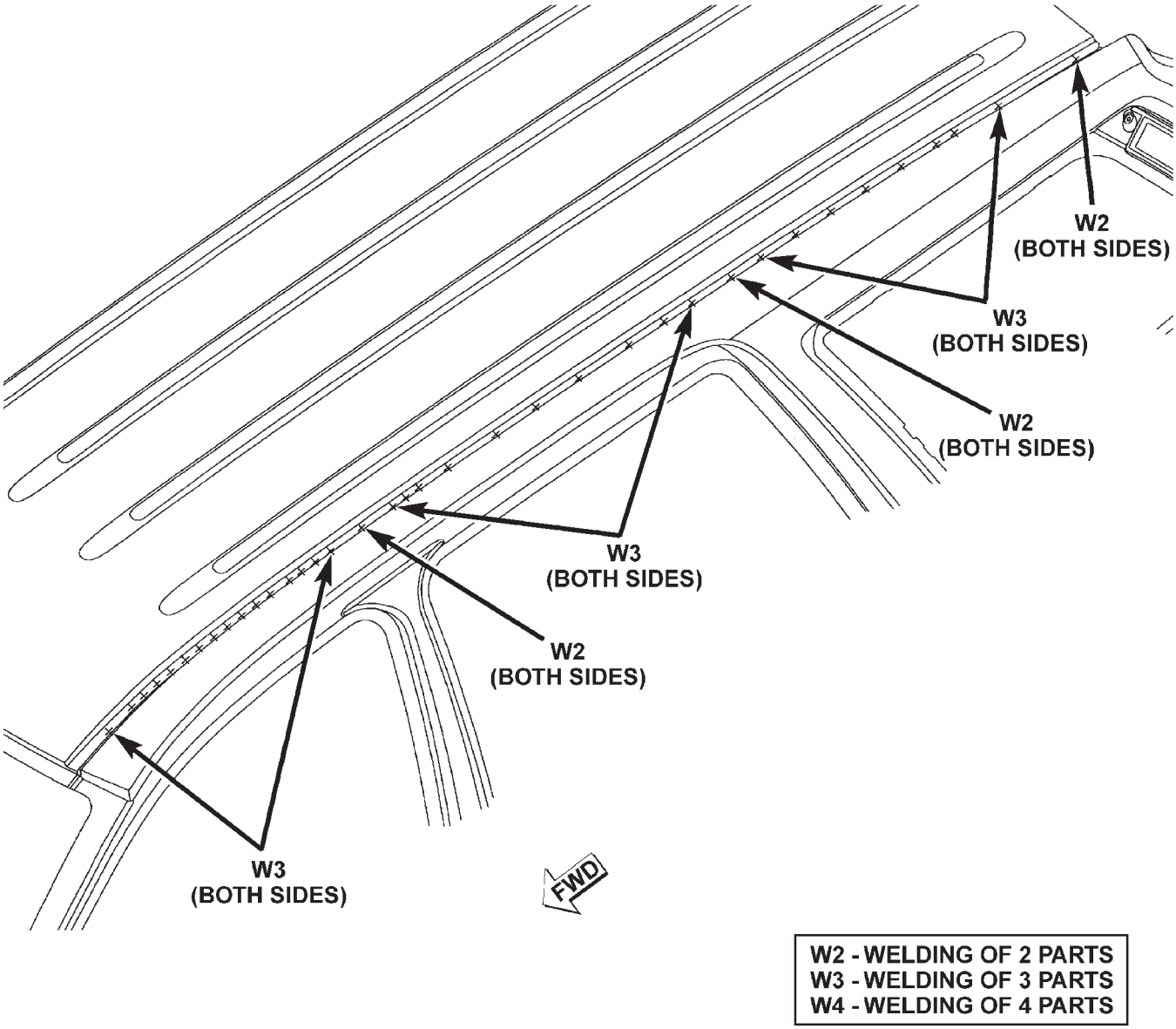


Fig. 86 ROOF PANEL TO BODYSIDE APERTURE

WELD LOCATIONS (Continued)

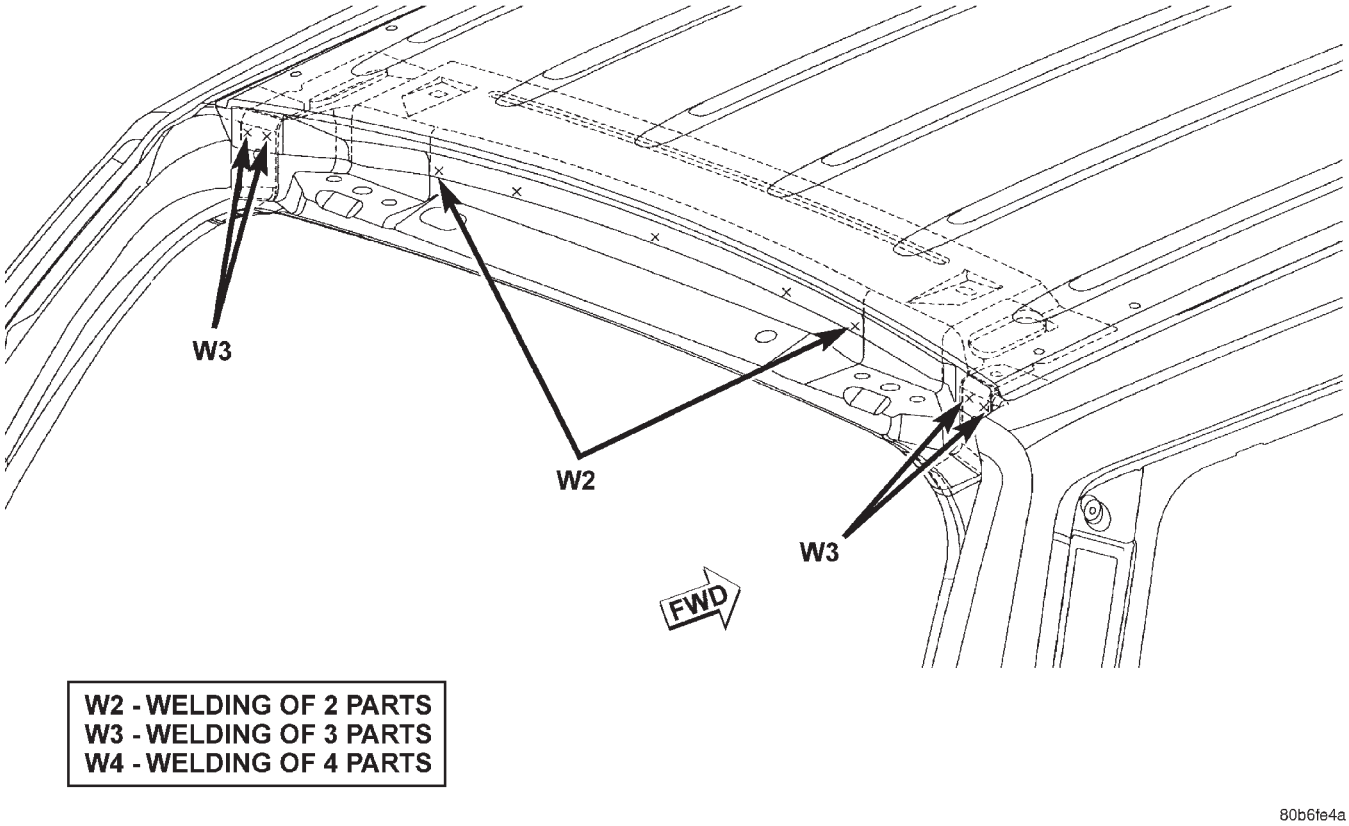


Fig. 87 ROOF PANEL TO REAR HEADER

WELD LOCATIONS (Continued)

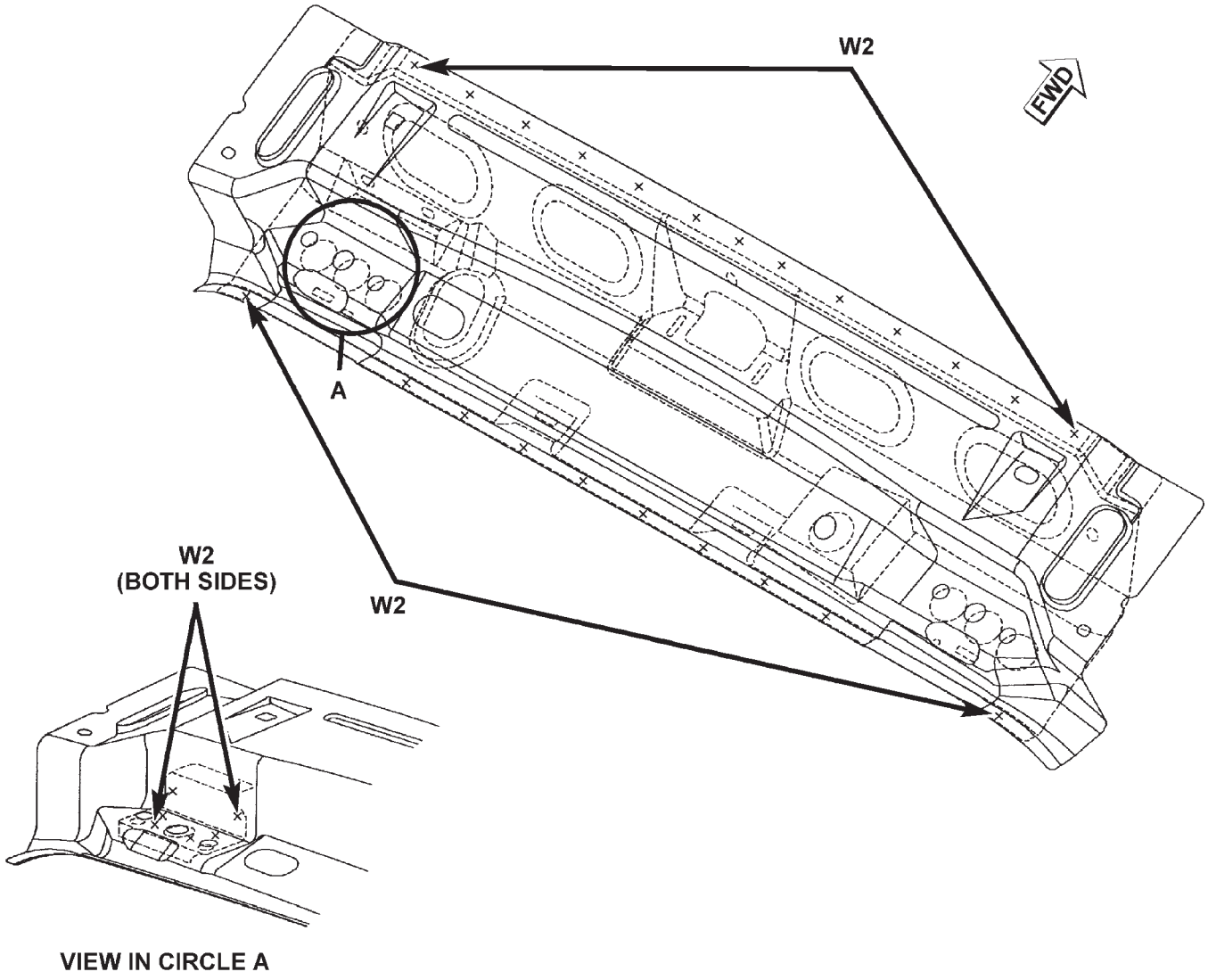


Fig. 88 UPPER REAR HEADER TO LOWER HEADER

WELD LOCATIONS (Continued)

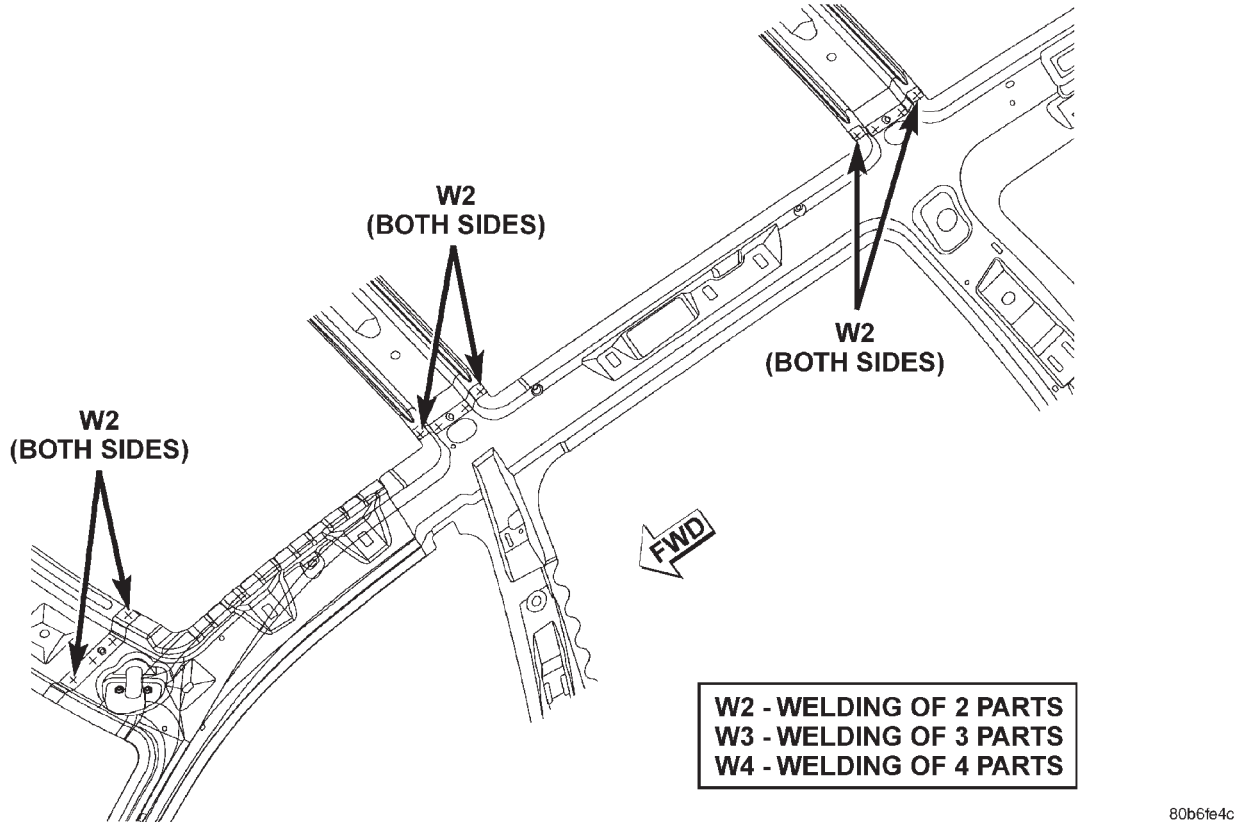


Fig. 89 FRONT HEADER AND ROOF BOWS TO INNER PANEL

WELD LOCATIONS (Continued)

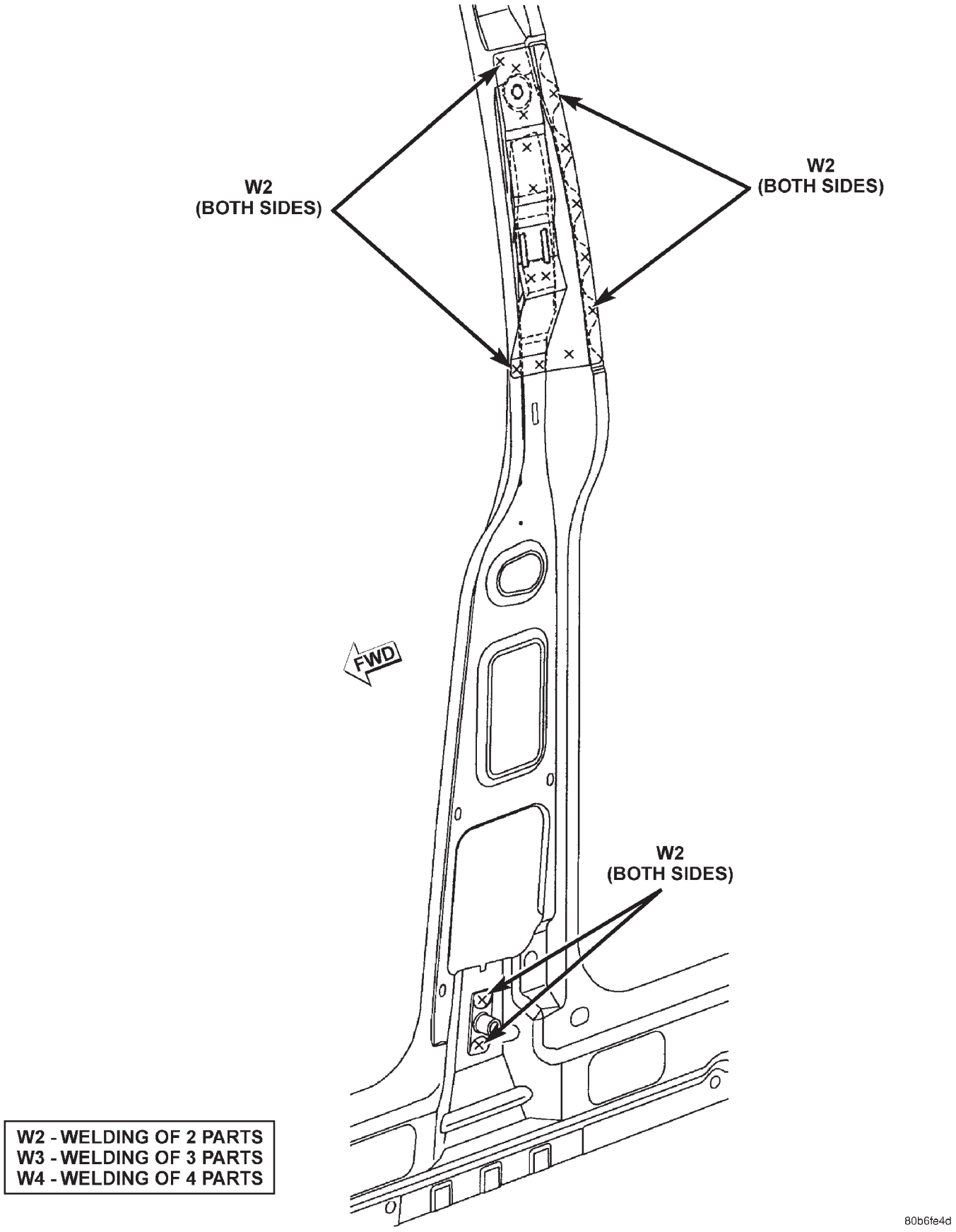


Fig. 90 FRONT SEAT/SHOULDER BELT TO INNER PANEL REINFORCEMENT

WELD LOCATIONS (Continued)

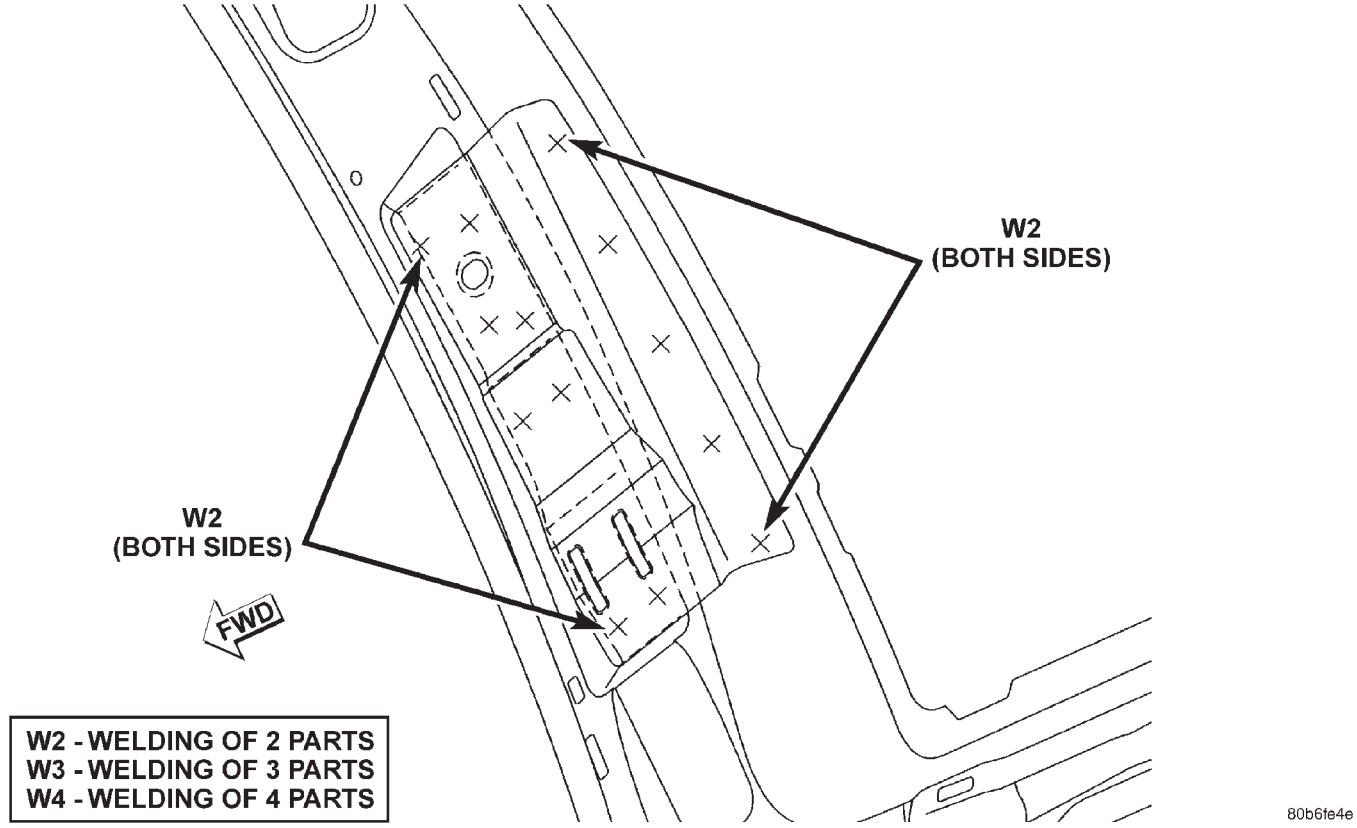


Fig. 91 REAR SEAT/SHOULDER BELT TO INNER PANEL REINFORCEMENT

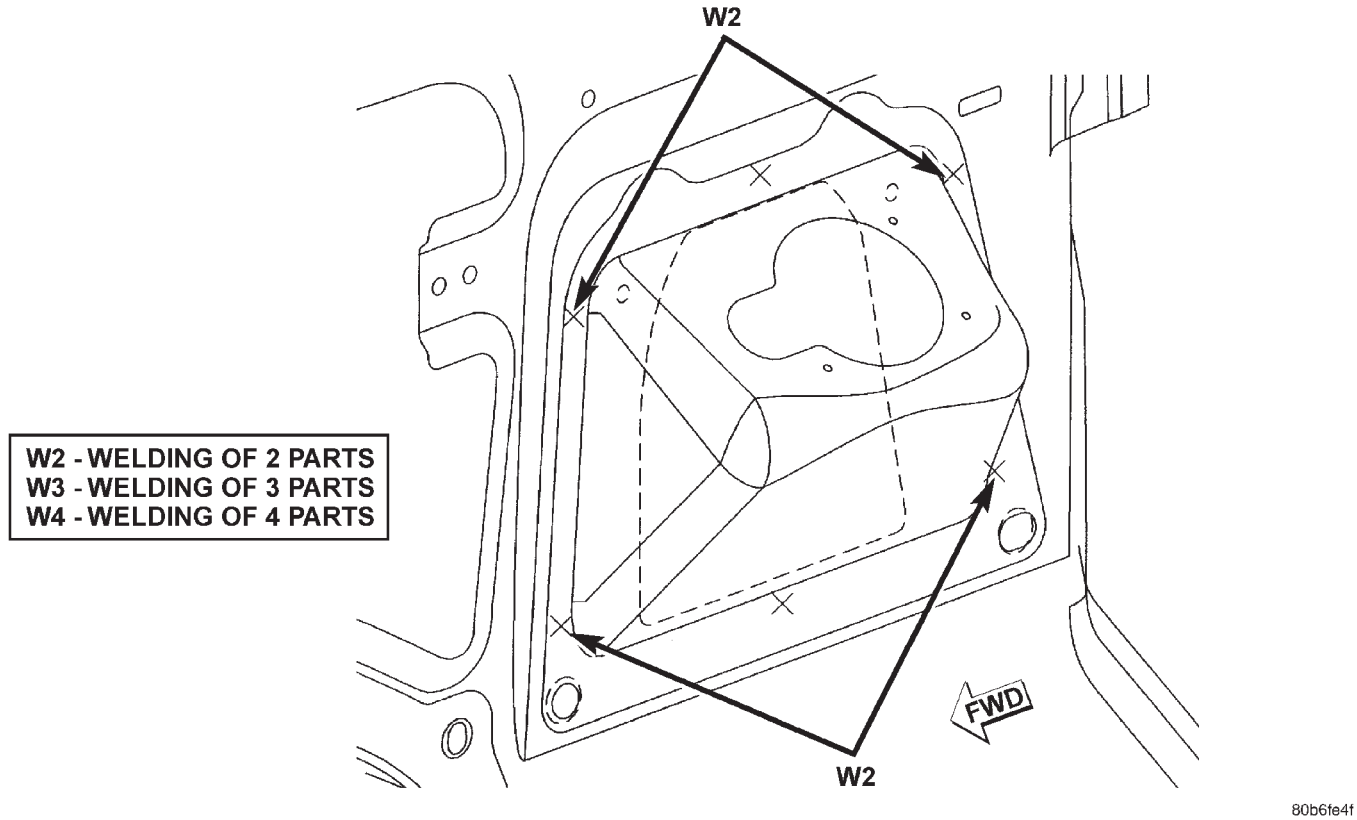


Fig. 92 FUEL FILLER GUSSET TO INNER QUARTER PANEL

WELD LOCATIONS (Continued)

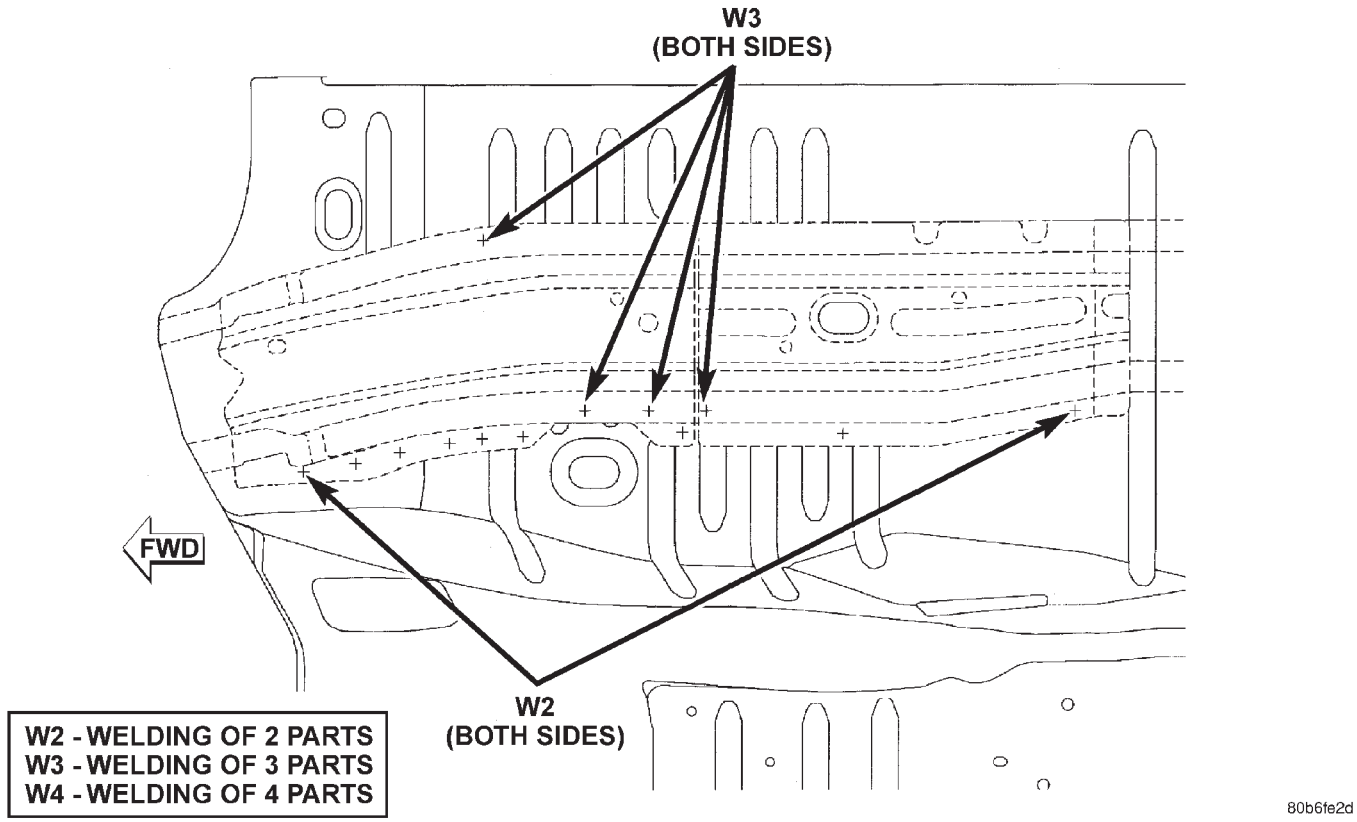
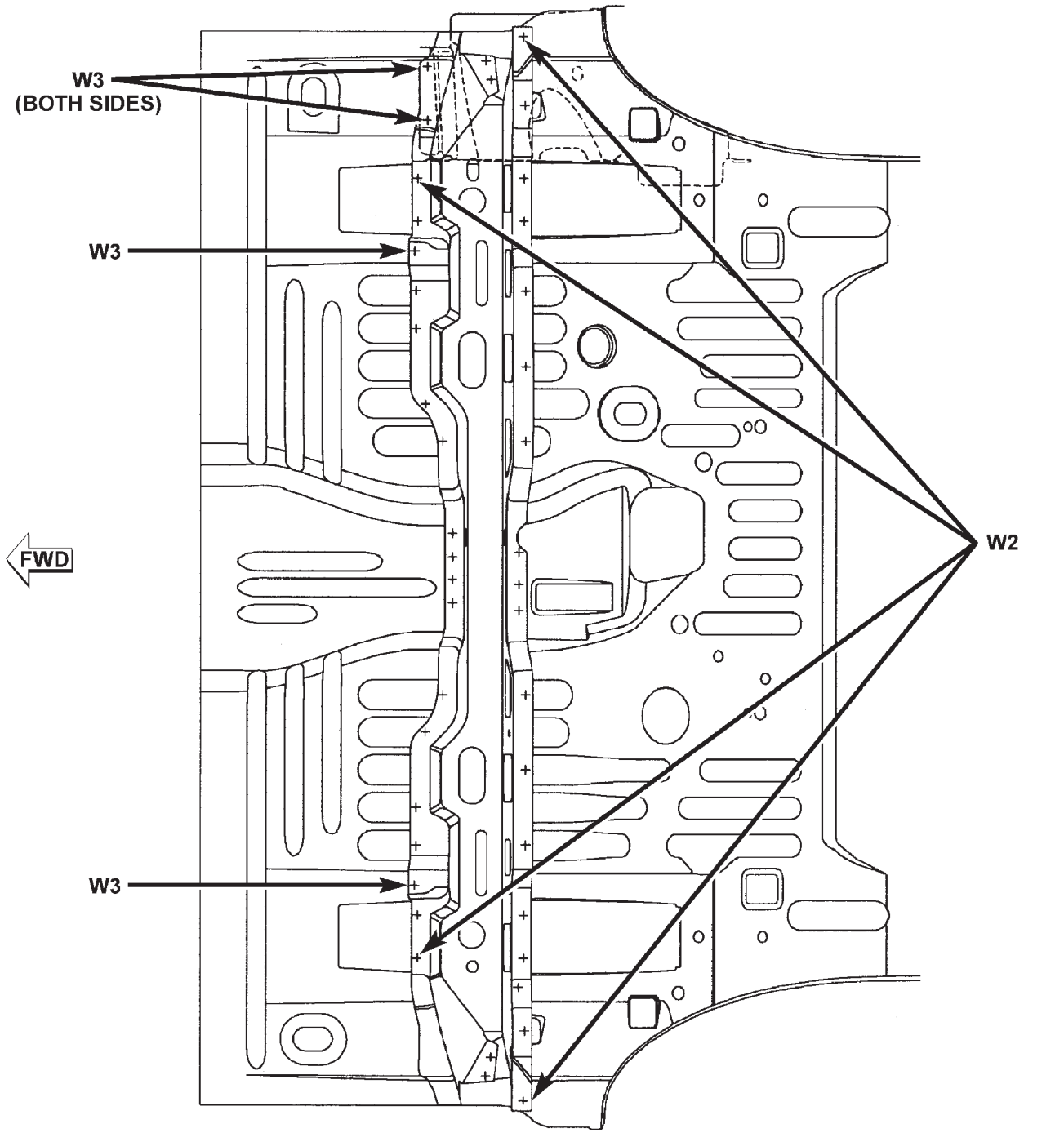


Fig. 93 FRONT FLOOR PAN TO SILL REINFORCEMENT

WELD LOCATIONS (Continued)



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

80b6fe2e

Fig. 94 CENTER FLOOR PAN TO REAR SEAT CROSSMEMBER

WELD LOCATIONS (Continued)

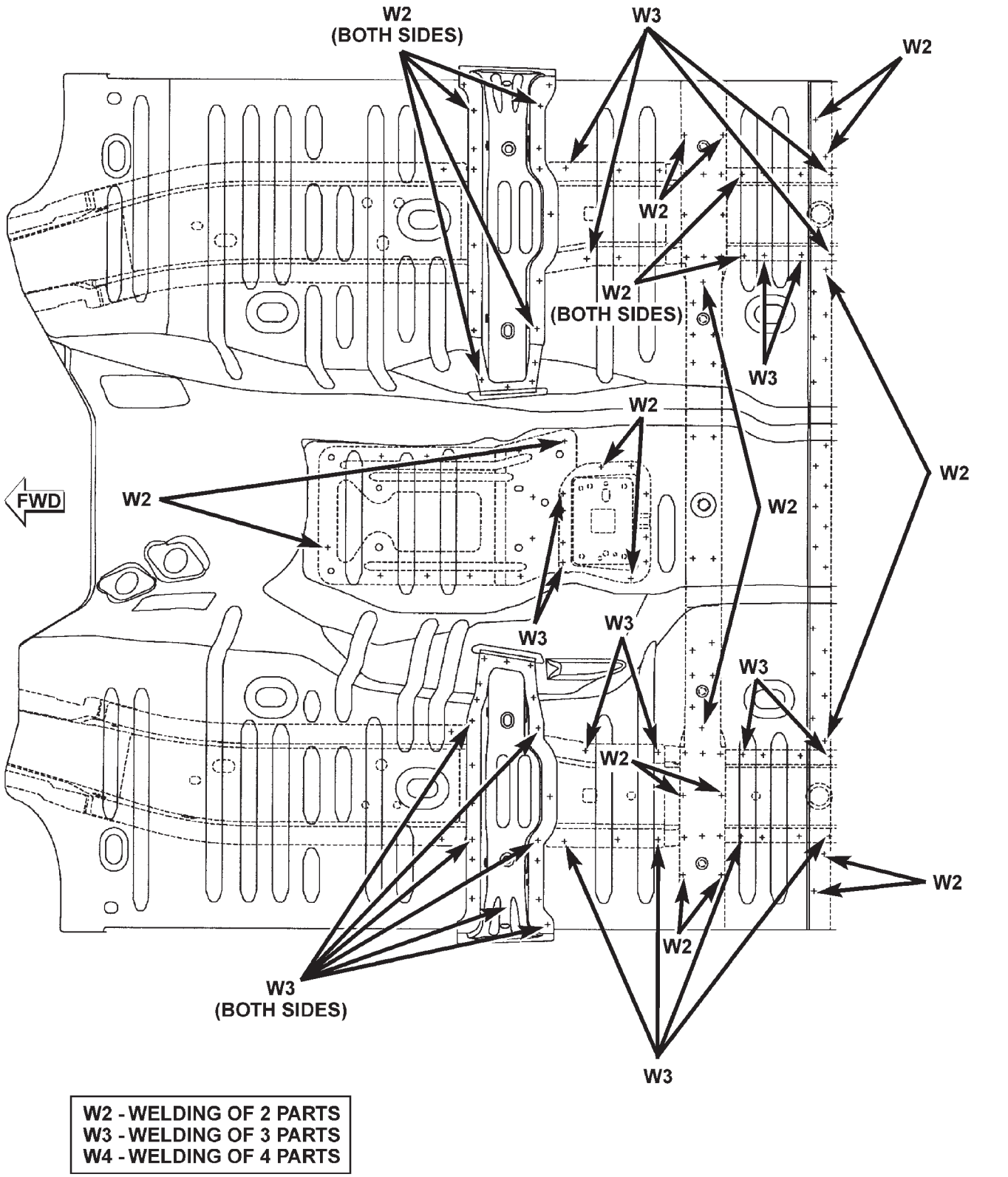


Fig. 95 FRONT FLOOR PAN TO FRONT SEAT REINFORCEMENT AND RAILS

WELD LOCATIONS (Continued)

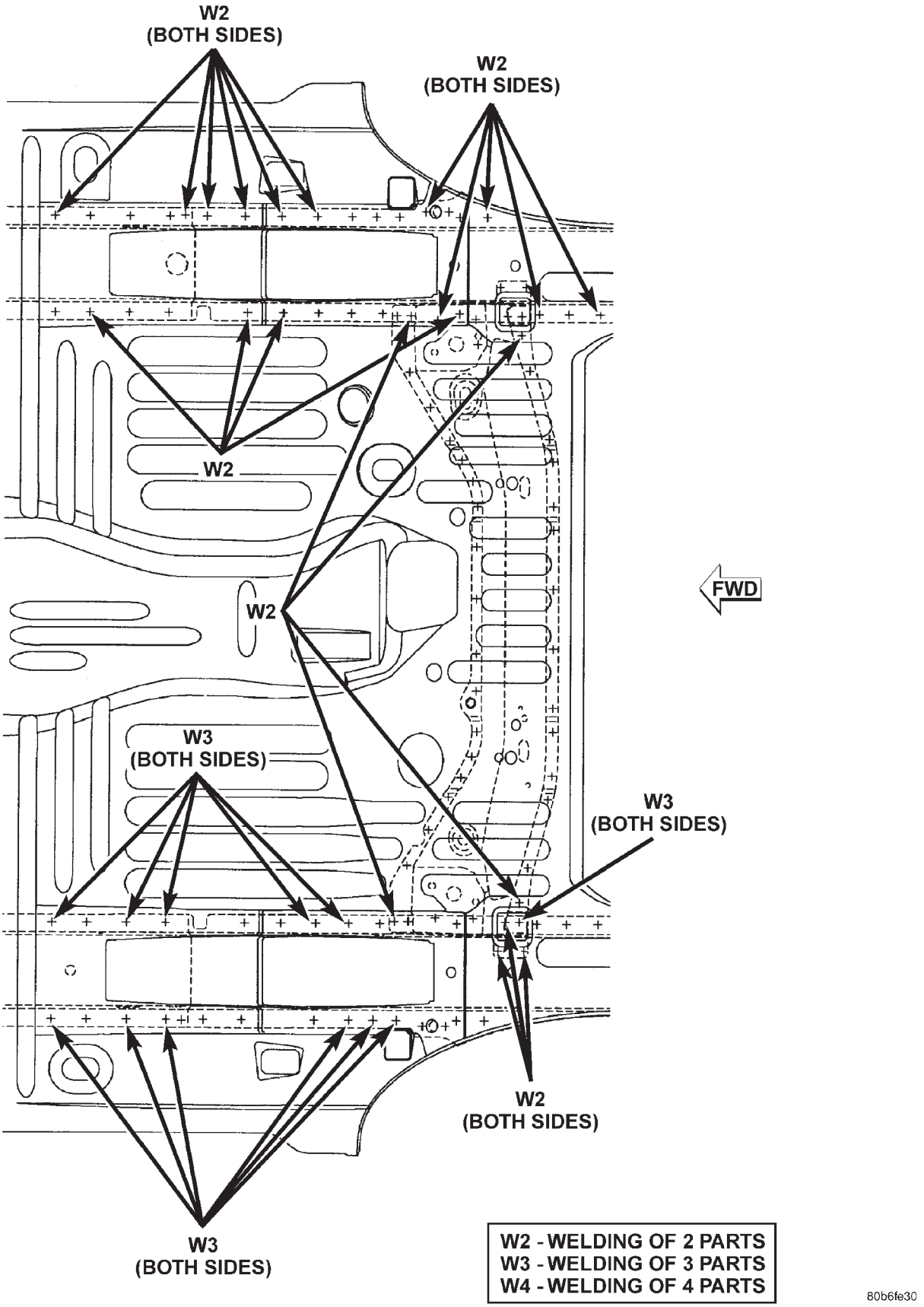


Fig. 96 CENTER FLOOR PAN TO UPPER CONTROL ARM CROSSMEMBER AND RAILS

WELD LOCATIONS (Continued)

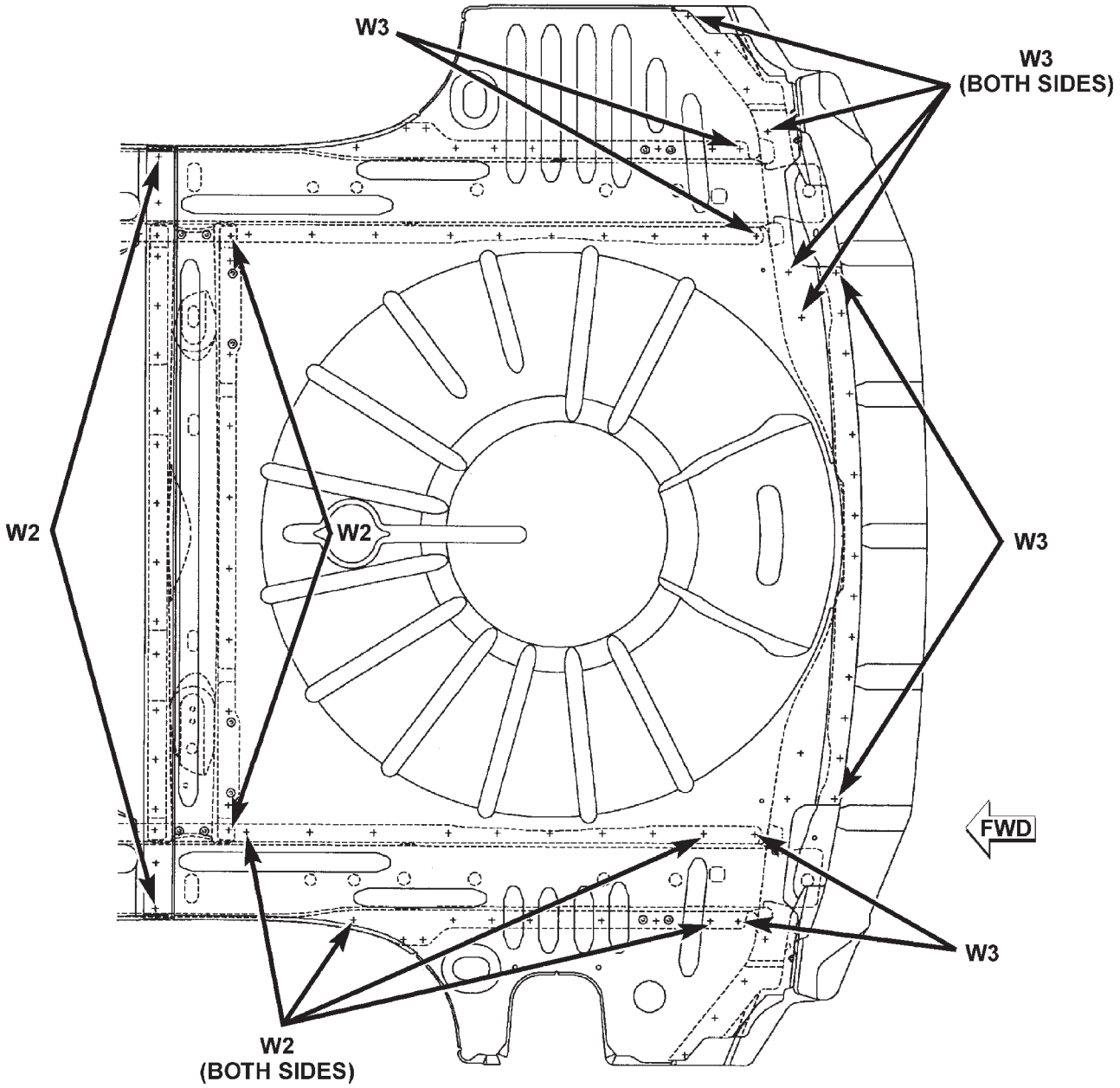


Fig. 97 REAR FLOOR PAN TO RAILS AND SPRING GUIDE CROSSMEMBER

WELD LOCATIONS (Continued)

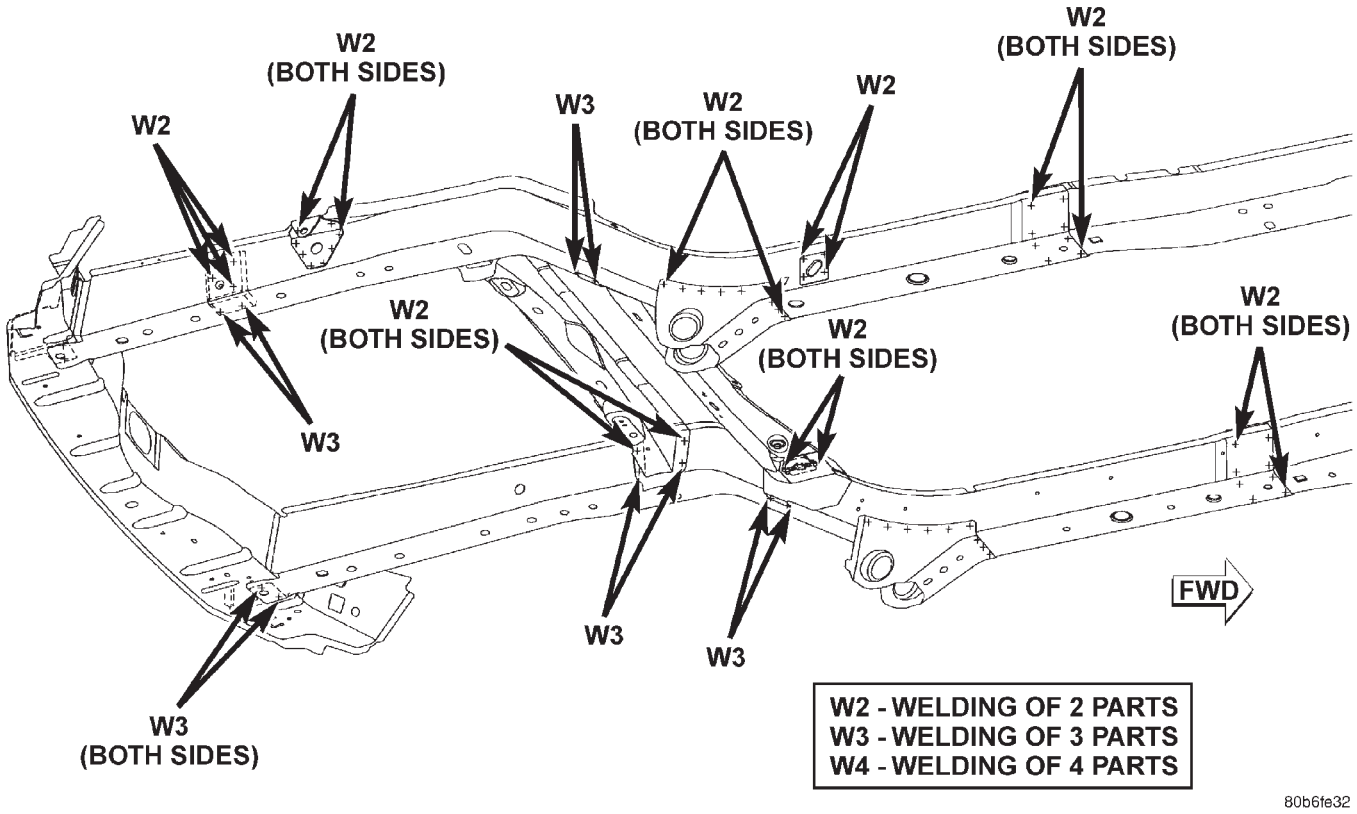


Fig. 98 REAR RAILS

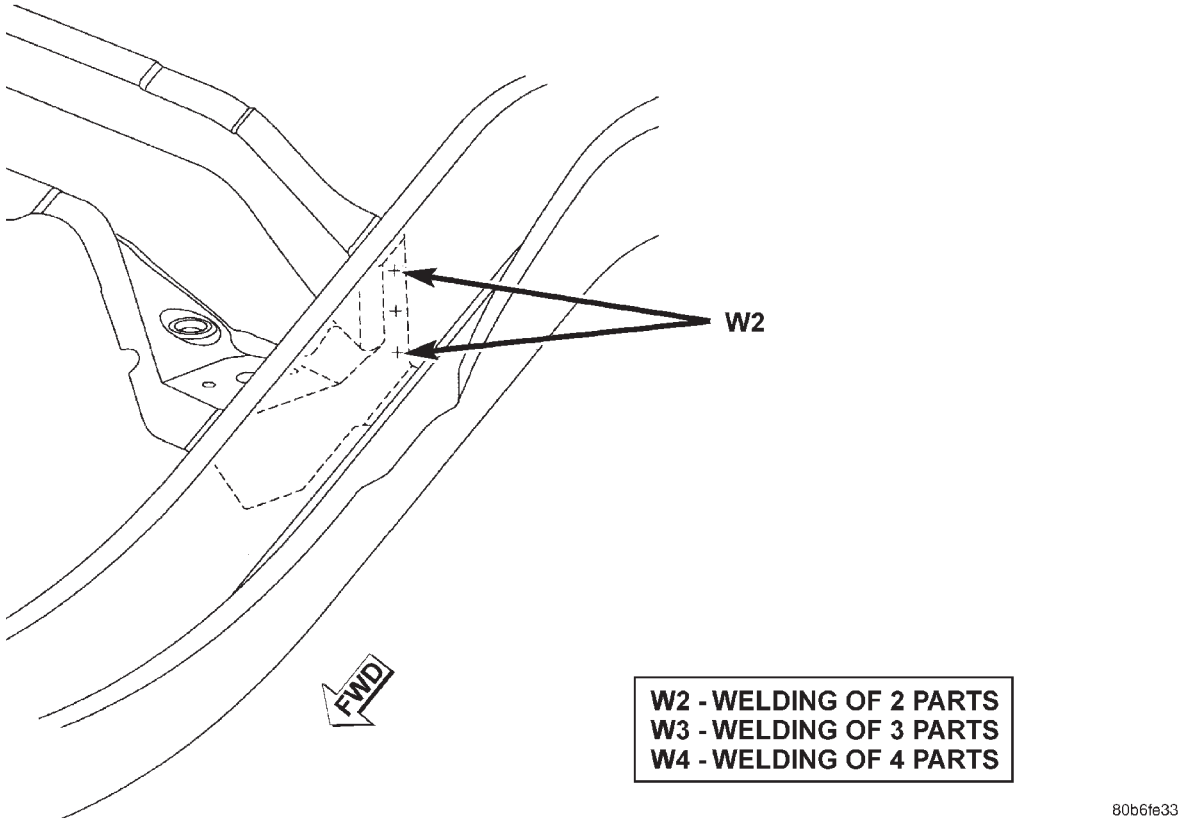


Fig. 99 UPPER CONTROL ARM CROSSMEMBER TO REAR RAIL

WELD LOCATIONS (Continued)

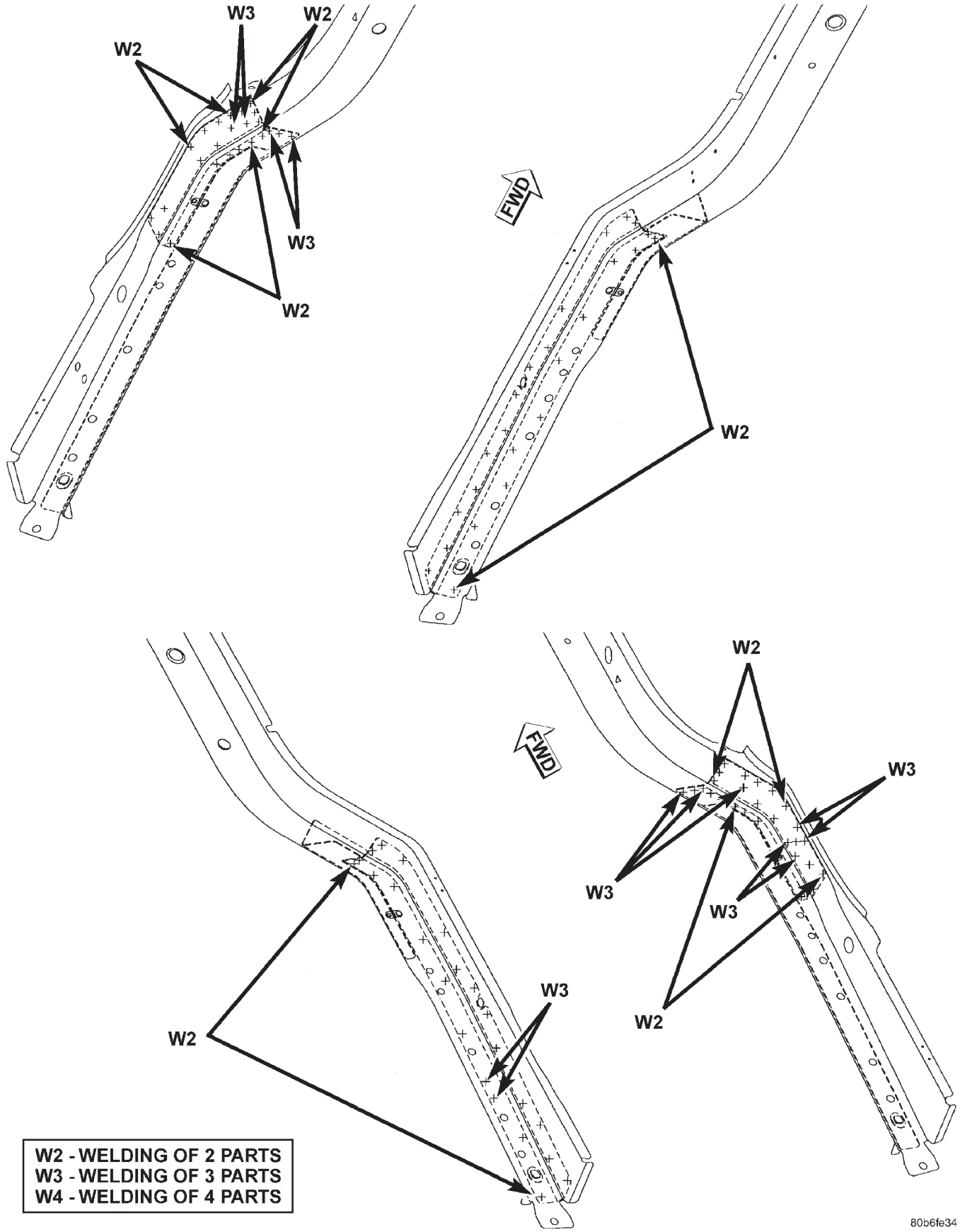
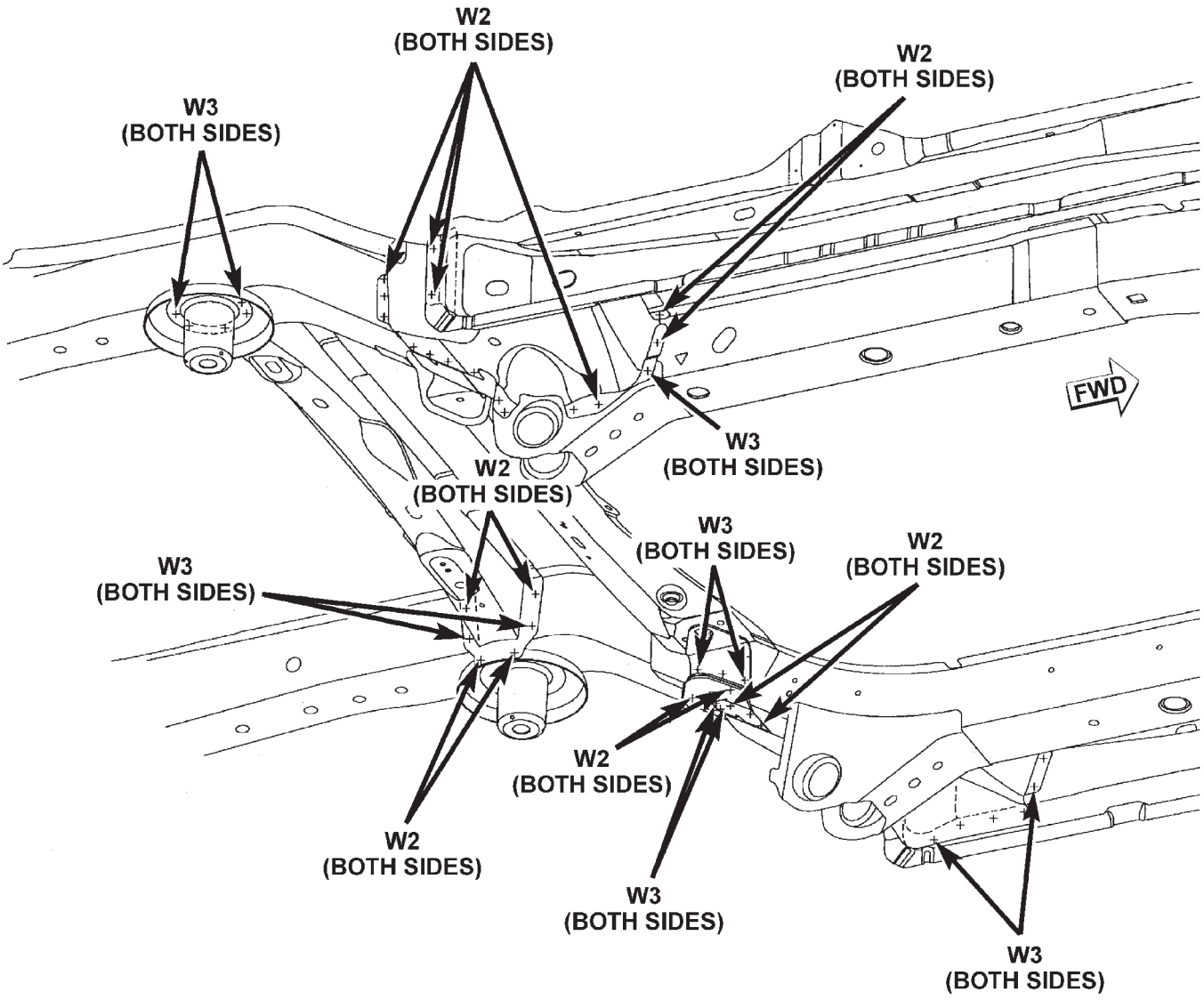


Fig. 100 REAR RAIL REINFORCEMENT TO REAR RAILS

WELD LOCATIONS (Continued)



W2 - WELDING OF 2 PARTS
W3 - WELDING OF 3 PARTS
W4 - WELDING OF 4 PARTS

80b6fe35

Fig. 101 UPPER CONTROL ARM REINFORCEMENTS TO REAR RAIL

WELD LOCATIONS (Continued)

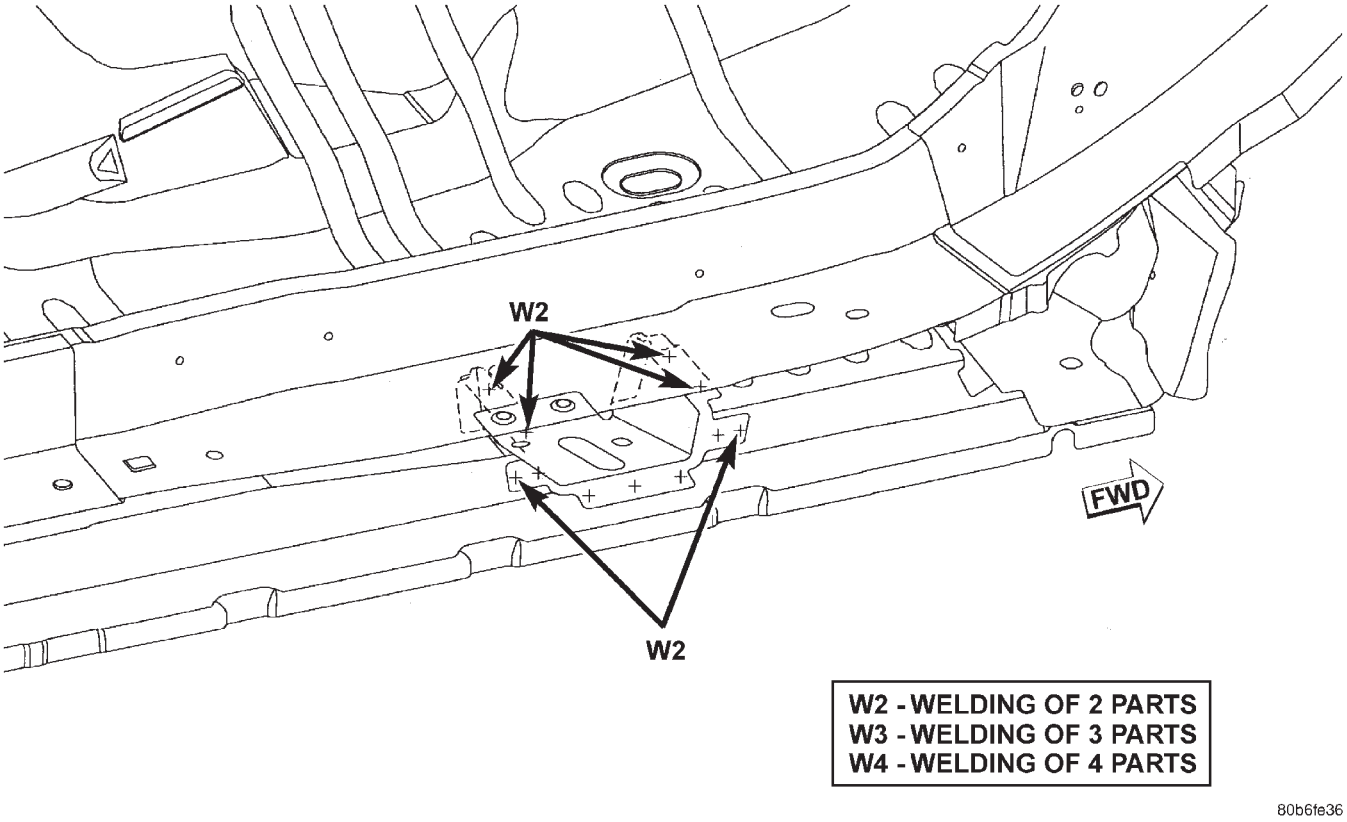


Fig. 102 OUTER TRANSMISSION CROSSMEMBER REINFORCEMENT TO RAIL AND BODYSIDE SILL

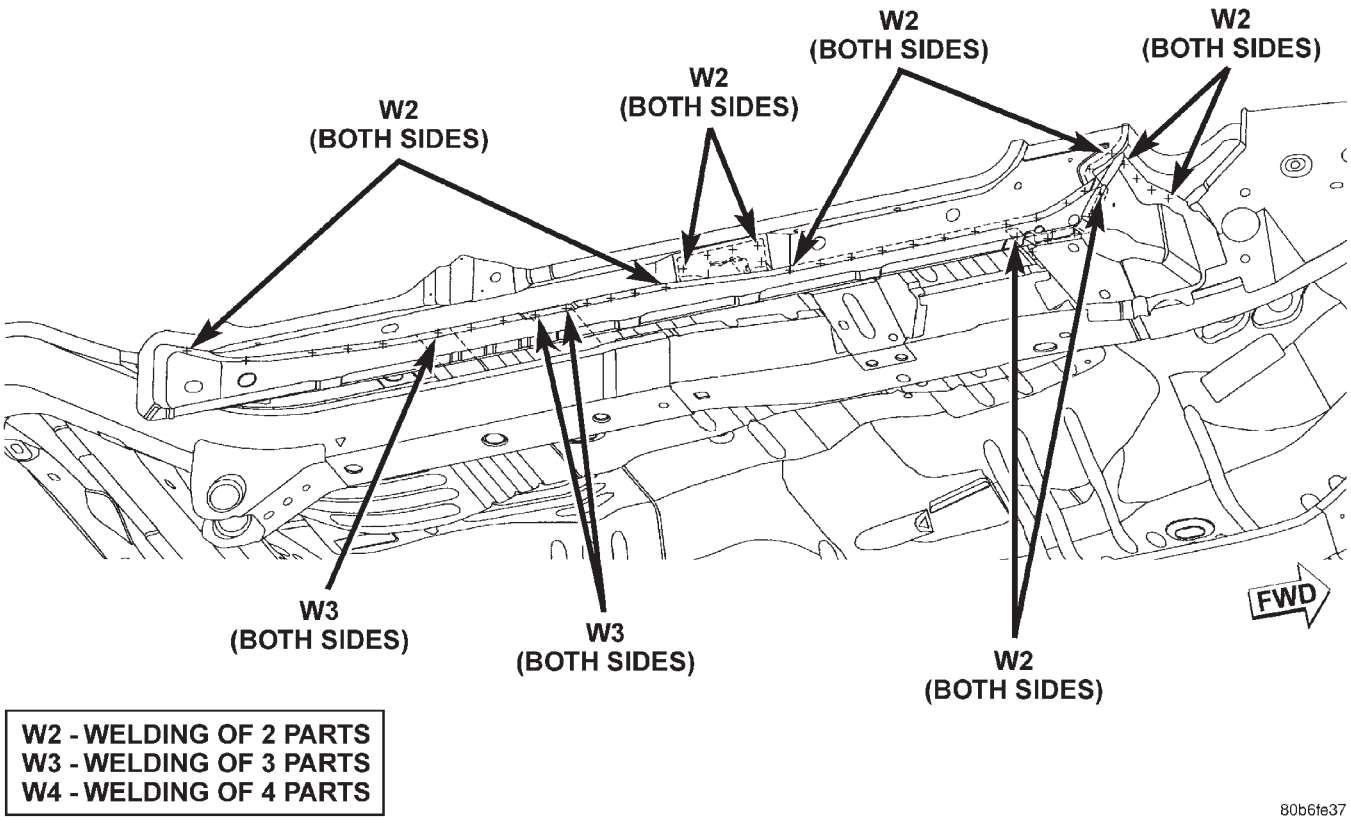


Fig. 103 BODYSIDE SILL TO FLOOR PAN

WELD LOCATIONS (Continued)

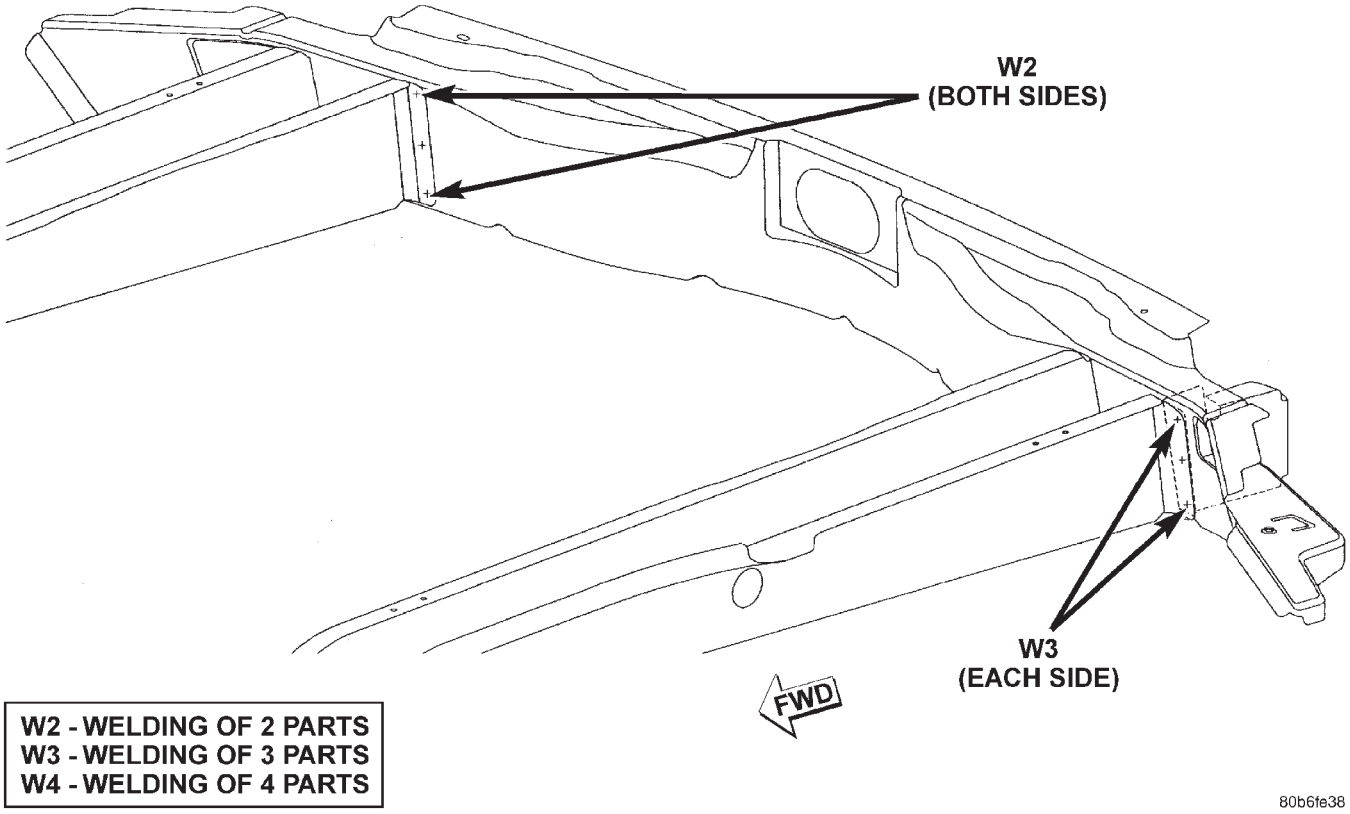


Fig. 104 REAR RAILS TO REAR CROSSMEMBER

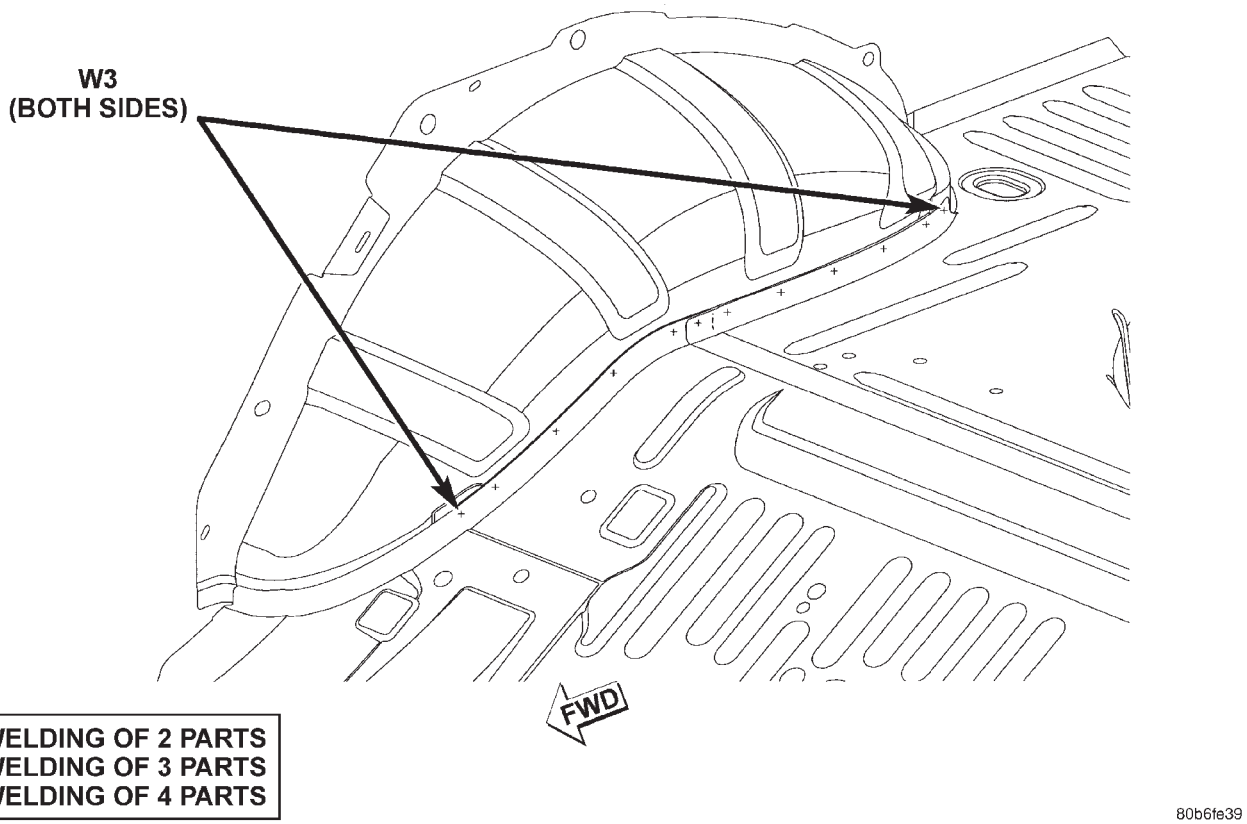


Fig. 105 INNER WHEELHOUSE TO FLOOR PAN

WELD LOCATIONS (Continued)

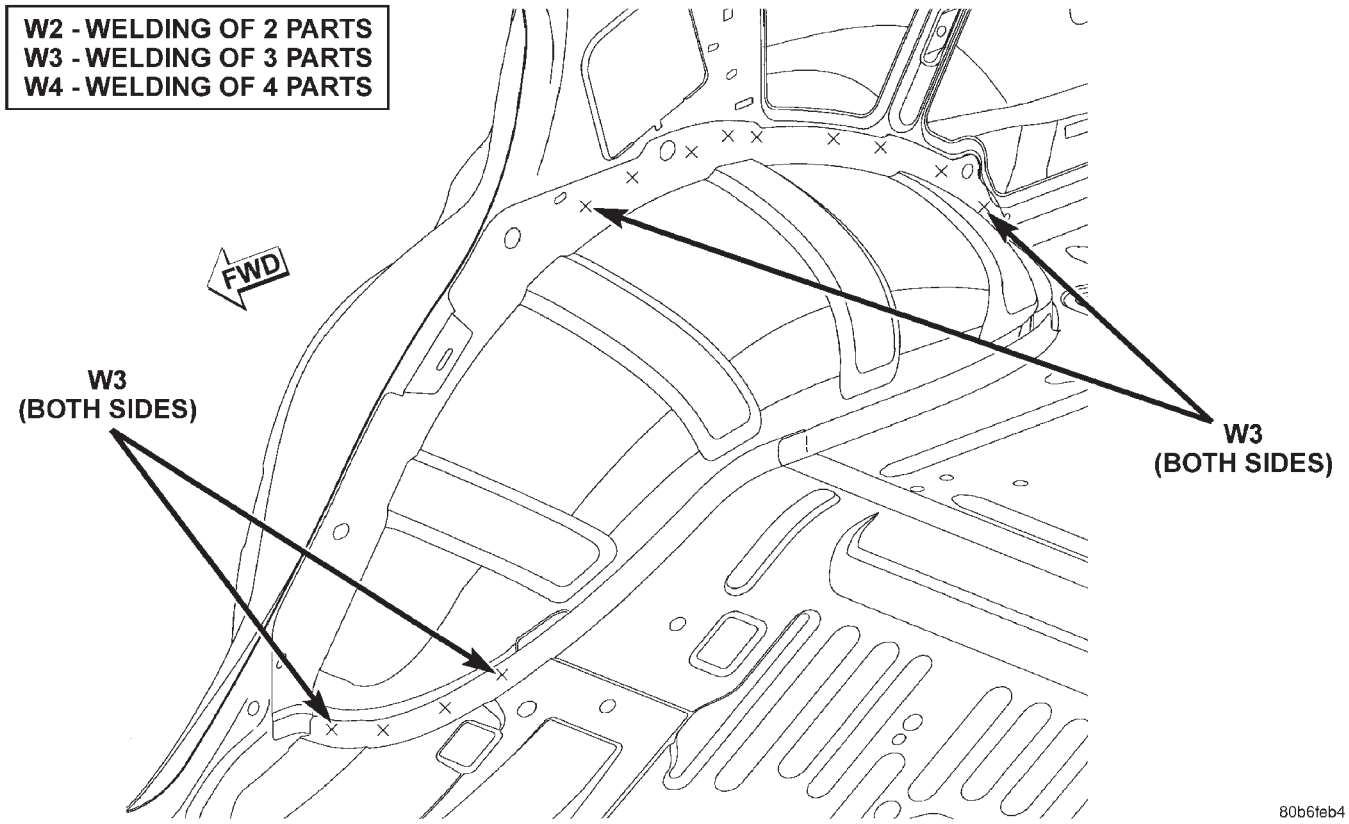


Fig. 106 INNER WHEELHOUSE TO INNER BODYSIDE APERTURE AND FLOOR PAN

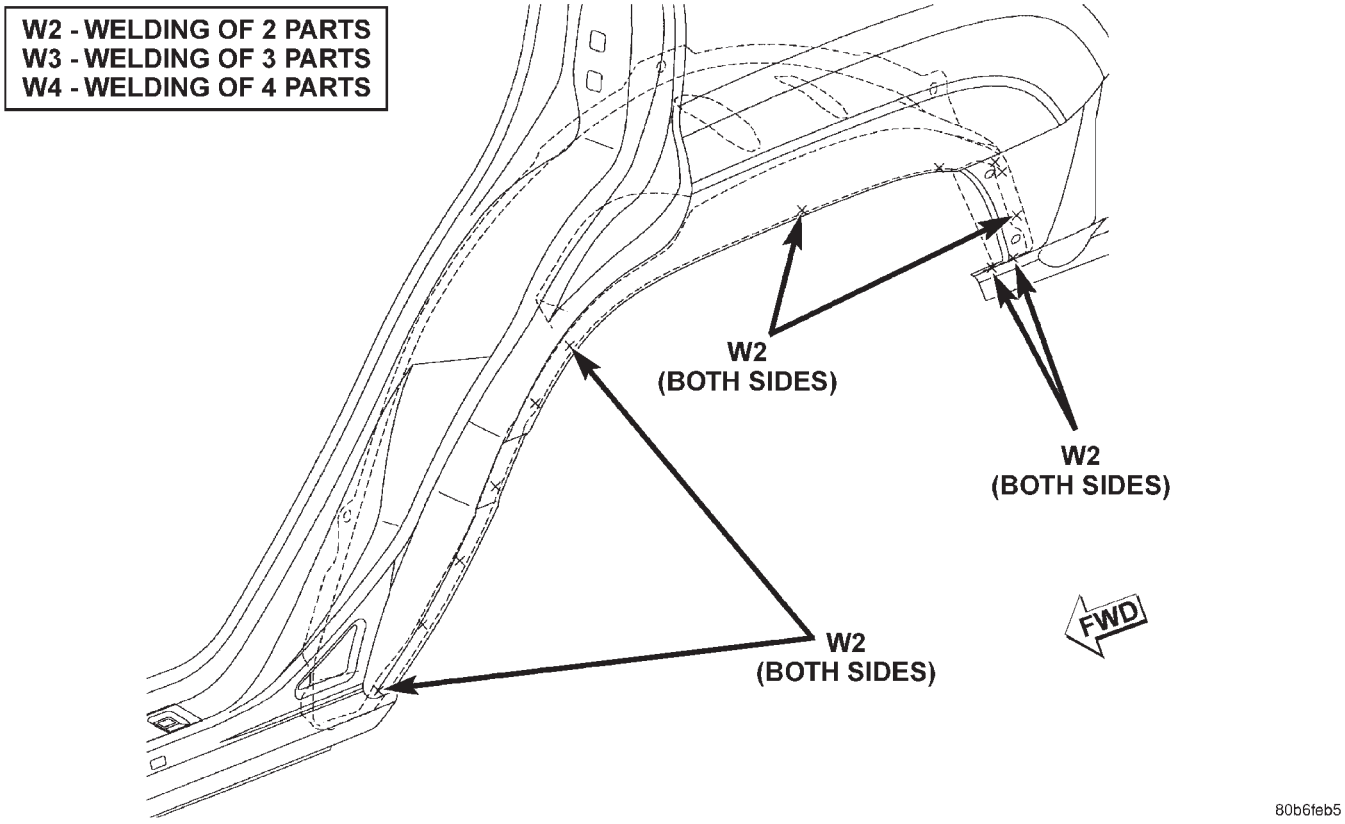


Fig. 107 OUTER WHEELHOUSE TO OUTER BODYSIDE APERTURE

WELD LOCATIONS (Continued)

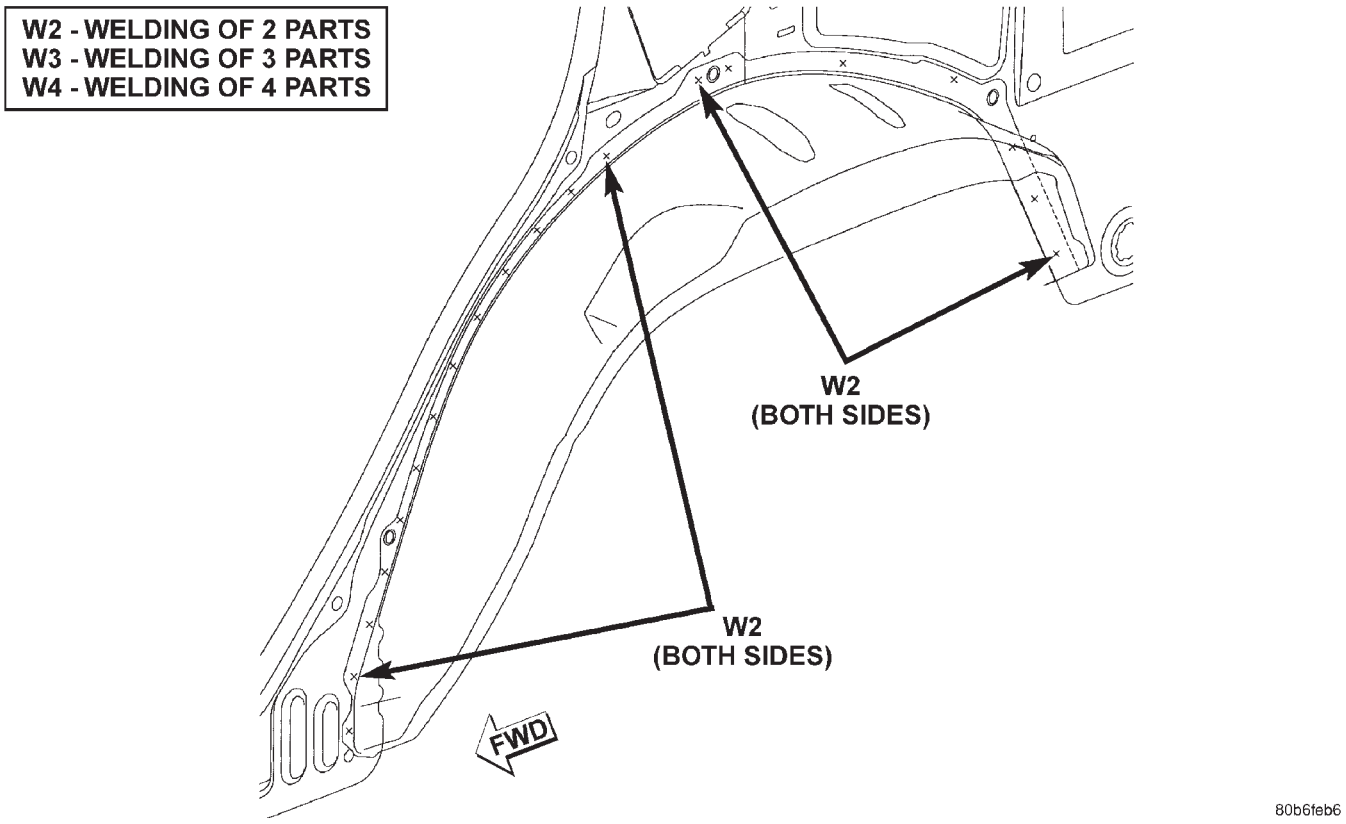


Fig. 108 OUTER WHEELHOUSE TO INNER BODYSIDE APERTURE

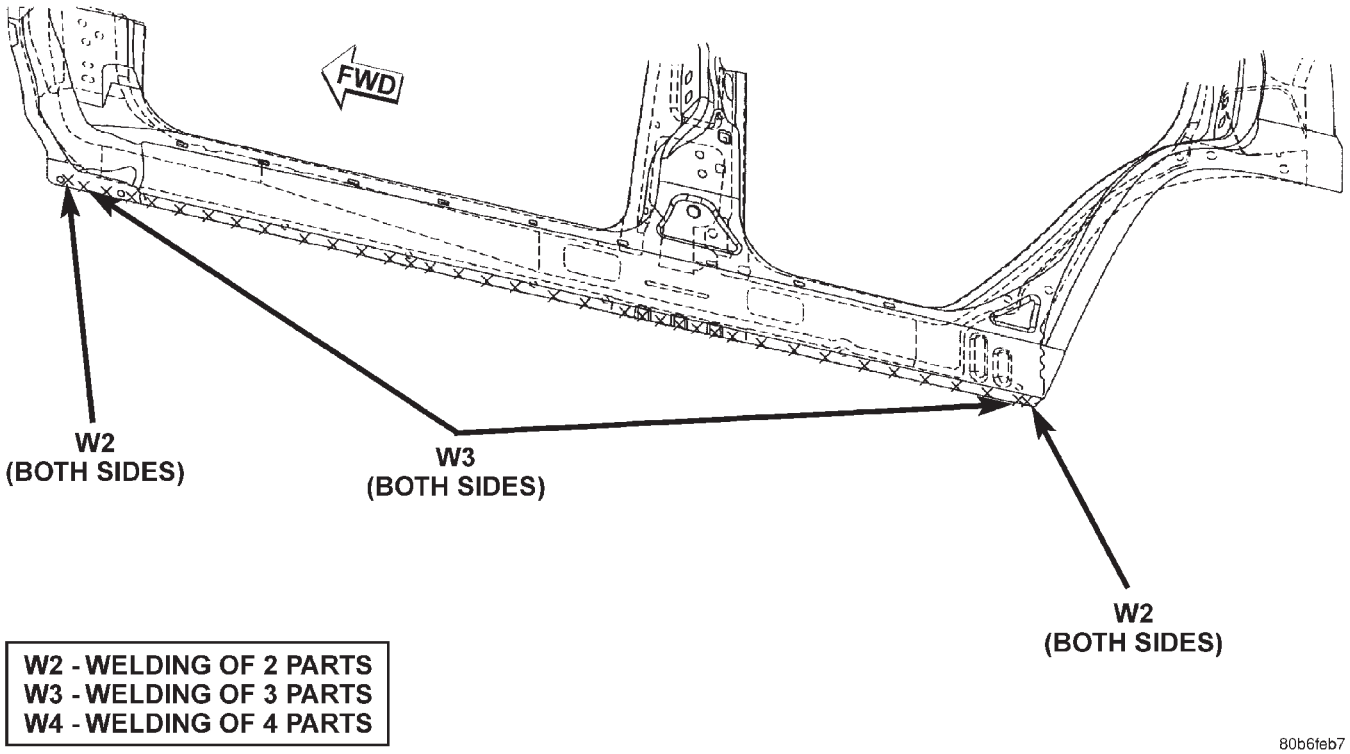


Fig. 109 INNER BODYSIDE APERTURE TO OUTER BODYSIDE APERTURE

WELD LOCATIONS (Continued)

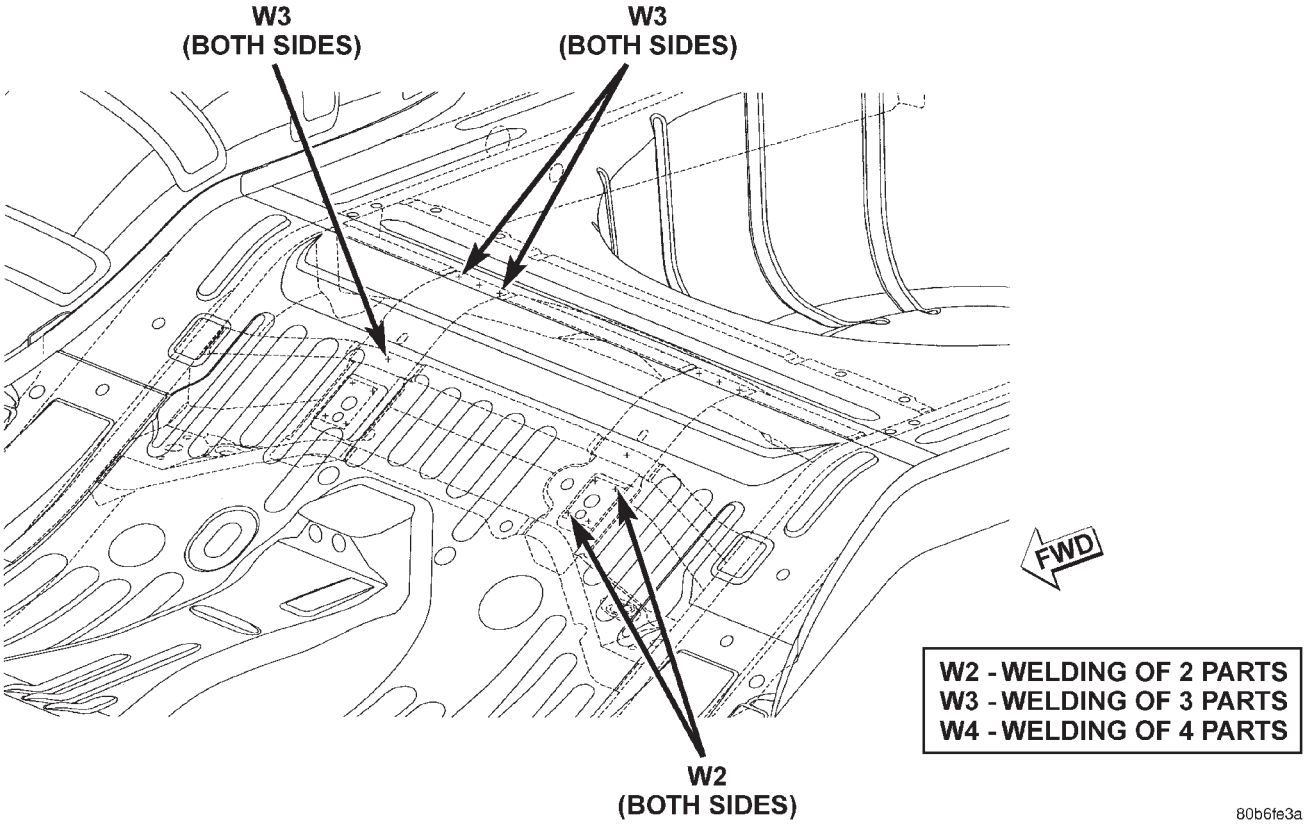


Fig. 110 REAR INBOARD SEAT BELT REINFORCEMENT TO FLOOR PAN

HEATING & AIR CONDITIONING

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HEATING & AIR CONDITIONING

DESCRIPTION

DESCRIPTION - COOLING SYSTEM REQUIREMENTS

To maintain the performance level of the heating-air conditioning system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or condenser will reduce the performance of the air conditioning and engine cooling systems.

The engine cooling system includes the heater core and the heater hoses. Refer to Cooling for more information before opening, or attempting any service to the engine cooling system.

DESCRIPTION - HEATER AND AIR CONDITIONER

A manual temperature control type heating-air conditioning system is standard factory-installed equipment on this model. An electronically controlled Automatic Zone Control (AZC) type heating-air conditioning system is an available factory-installed option.

All vehicles are equipped with a common HVAC housing assembly (Fig. 1). The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel.

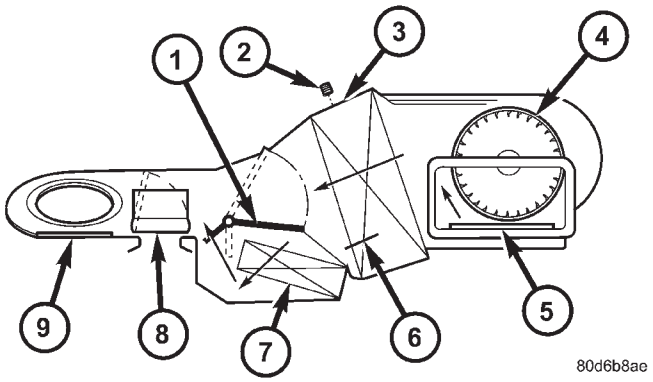


Fig. 1 Blend-Air HVAC System - (typical)

1 - Blend Door
2 - Expansion Valve
3 - Evaporator Core
4 - Blower Assembly
5 - Recirculation Door
6 - Evaporator Probe
7 - Heater Core
8 - Heat/Defrost Door
9 - Panel/Defrost Door

DESCRIPTION - REFRIGERANT SYSTEM SERVICE PORT

The two refrigerant system service ports are used to charge, recover/recycle, evacuate, and test the air conditioning refrigerant system. Unique service port coupler sizes are used on the R-134a system to ensure that the refrigerant system is not accidentally contaminated by the use of the wrong refrigerant (R-12), or refrigerant system service equipment.

HEATING & AIR CONDITIONING (Continued)

OPERATION

OPERATION - HEATER AND AIR CONDITIONER

Outside fresh air enters the vehicle through the cowl top opening at the base of the windshield, and passes through a plenum chamber to the HVAC system blower housing. Air flow velocity can then be adjusted with the blower motor speed selector switch on the a/c heater control panel. The air intake openings must be kept free of snow, ice, leaves, and other obstructions for the HVAC system to receive a sufficient volume of outside air.

It is also important to keep the air intake openings clear of debris because leaf particles and other debris that is small enough to pass through the cowl plenum screen can accumulate within the HVAC housing. The closed, warm, damp and dark environment created within the HVAC housing is ideal for the growth of certain molds, mildews and other fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, which enter the housing with the fresh air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during HVAC system operation.

Both the manual and AZC heater and air conditioner are blend-air type systems. In a blend-air system, a blend door controls the amount of unconditioned air (or cooled air from the evaporator) that is allowed to flow through, or around, the heater core. A temperature control knob on the a/c heater control panel determines the discharge air temperature by energizing the blend door actuator, which operates the blend door. This allows an almost immediate control of the output air temperature of the system. The AZC system will have separate blend doors and temperature controls for each front seat occupant.

The mode control knob on the a/c heater control panel is used to direct the conditioned air to the selected system outlets. On manual temperature control systems, the mode control knob switches engine vacuum to control the mode doors, which are operated by vacuum actuators. On AZC systems, the mode control knob switches electrical current to control the mode doors, which are operated by electronic actuators.

The outside air intake can be shut off on manual temperature control systems by selecting the Recirculation Mode with the mode control knob. The outside air intake can be shut off on Automatic Zone Control (AZC) type system by pushing the Recirculation Mode button. This will operate the recirculation door that closes off the outside fresh air intake and recirculates the air that is already inside the vehicle.

The air conditioner for all models is designed for the use of non-CFC, R-134a refrigerant. The air conditioning system has an evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. This air conditioning system uses a thermal expansion valve to meter refrigerant flow to the evaporator coil. To maintain minimum evaporator temperature and prevent evaporator freezing, the system utilizes an evaporator thermister probe with the appropriate operating logic located in the body control module (BCM).

OPERATION - REFRIGERANT SYSTEM SERVICE PORT

The high pressure service port is located on the liquid line near the receiver/drier. The low pressure service port is located on the suction line near the evaporator at the rear of the engine compartment.

Each of the service ports has a threaded plastic protective cap installed over it from the factory. After servicing the refrigerant system, always reinstall both of the service port caps.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - A/C PERFORMANCE

The air conditioning system is designed to provide the passenger compartment with low temperature and low specific humidity air. The evaporator, located in the HVAC housing on the dash panel below the instrument panel, is cooled to temperatures near the freezing point. As warm damp air passes through the cooled evaporator, the air transfers its heat to the refrigerant in the evaporator and the moisture in the air condenses on the evaporator fins. During periods of high heat and humidity, an air conditioning system will be more effective in the Recirculation Mode. With the system in the Recirculation Mode, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, the air conditioning system performance levels improve.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the air conditioning system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. High humidity greatly reduces the ability of the evaporator to lower the temperature of the air.

HEATING & AIR CONDITIONING (Continued)

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their air conditioning system on humid days. A performance test is the best way to determine whether the system is performing up to standard. This test also provides valuable clues as to the possible cause of trouble with the air conditioning system.

If the vehicle has the optional Automatic Zone Control (AZC) system, and has intermittent operational problems or fault codes, be certain that the wire harness connectors on the HVAC housing are properly seated (Fig. 2). To check this condition, unplug the two wire harness connector halves, then plug them in again.

Before performing the following procedure, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING). The air temperature in the test room and in the vehicle must be a minimum of 21° C (70° F) for this test.

(1) Connect a tachometer and a manifold gauge set.

(2) If the vehicle has the standard manual temperature control, set the A/C Heater mode control switch knob in the Panel position, the temperature control knob in the full cool (Fresh Air Mode) position, the A/C button in the On position, and the blower motor switch knob in the highest speed position. If the vehicle has the optional AZC, set the A/C Heater mode control switch knob in the Panel position, the temperature control knob in the full cool position, the A/C button in the On position, and the blower motor switch knob in the highest (manual) speed position.

(3) Start the engine and hold the idle at 1,300 rpm with the compressor clutch engaged.

(4) The engine should be at operating temperature. The doors and windows must be open.

(5) Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.

(6) The compressor clutch may cycle, depending upon the ambient temperature and humidity.

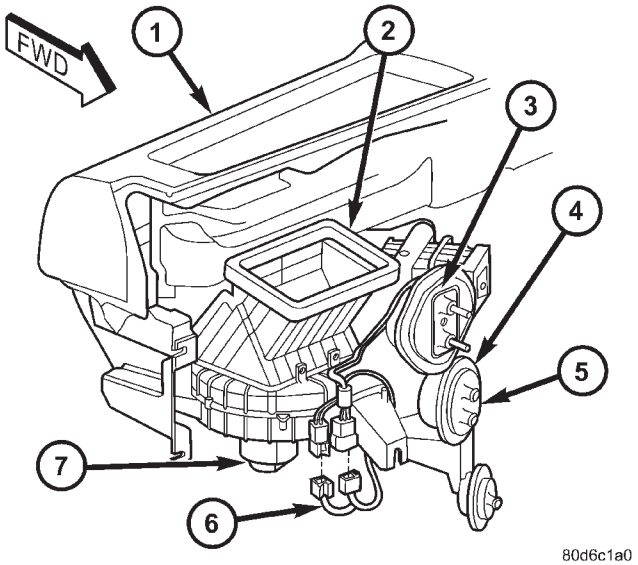


Fig. 2 HVAC Housing - (rear view)

1 - Instrument Panel
2 - Air Intake
3 - Expansion Valve
4 - HVAC Housing
5 - Heater Core Input/Output Ports
6 - Instrument Panel Wiring Harness
7 - Blower Motor

(7) With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.

(8) Compare the discharge air temperature to the Performance Temperature and Pressure chart. If the discharge air temperature is high, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE).

Performance Temperature and Pressure					
Ambient Air Temperature and Humidity	21° C (70° F @ 80% humidity)	27° C (80° F @ 80% humidity)	32° C (90° F @ 80% humidity)	38° C (100° F @ 50% humidity)	43° C 110° F @ 20% humidity)
Air Temperature at Center Panel Outlet	10 to 13° C (50 to 55° F)	14 to 17° C (58 to 63° F)	15 to 18° C (60 to 65° F)	17 to 20° C (63 to 68° F)	14 to 17° C (58 to 63° F)
Evaporator Inlet Pressure at Charge Port	241 to 276 kPa (35 to 40 psi)	262 to 290 kPa (38 to 42 psi)	269 to 296 kPa (39 to 43 psi)	275 to 303 kPa (40 to 44 psi)	262 to 290 kPa (38 to 42 psi)
Compressor Discharge Pressure	1241 to 1792 kPa (180 to 260 psi)	1380 to 1930 kPa (200 to 280 psi)	1380 to 1930 kPa (200 to 280 psi)	1655 to 2206 kPa (240 to 320 psi)	1567 to 2068 kPa (220 to 300 psi)
Note: The discharge air temperatures will be lower if the humidity is less than the percentages shown.					

HEATING & AIR CONDITIONING (Continued)

(9) Compare the compressor discharge pressure to the Performance Temperature and Pressure chart. If the compressor discharge pressure is high, see the Pressure Diagnosis chart.

Pressure Diagnosis		
Condition	Possible Causes	Correction
Rapid compressor clutch cycling (ten or more cycles per minute).	1. Low refrigerant system charge.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Faulty fuse.	2. Check the fuses in the Power Distribution Center and the junction block. Repair the shorted circuit or component and replace the fuses, if required.
	3. Faulty a/c compressor clutch coil.	3. See A/C Compressor/Diagnosis and Testing - Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required.
	4. Faulty compressor clutch relay.	4. See A/C Compressor Clutch Relay/Diagnosis and Testing - Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required.
	6. Faulty a/c high pressure transducer.	6. See A/C High Pressure Transducer/Diagnosis and Testing in this group. Test the a/c high pressure transducer and replace, if required.
	7. Faulty Fin Probe.	7. Check for open circuit.
	8. Faulty Powertrain Control Module (PCM).	8. Refer to the proper Diagnostic Procedures manual for testing of the PCM. Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system.	1. See Refrigerant Oil/Standard Procedure - Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required.
	2. Blend door inoperative or sealing improperly.	2. See Blend Door in this group. Inspect the blend door for proper operation and sealing and correct, if required.
	3. Blend door actuator faulty or inoperative.	3. Perform blend door actuator diagnosis, replace if faulty.

HEATING & AIR CONDITIONING (Continued)

Pressure Diagnosis		
Condition	Possible Causes	Correction
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge.	1. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	2. Refrigerant flow through the accumulator is restricted.	2. See Accumulator in this group. Replace the restricted accumulator, if required.
	3. Refrigerant flow through the evaporator coil is restricted.	3. See A/C Evaporator in this group. Replace the restricted evaporator coil, if required.
	4. Faulty compressor.	4. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. Condenser air flow restricted.	1. Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Refer to Cooling for more information on air seals. Clean, repair, or replace components as required.
	2. Inoperative cooling fan.	2. Refer to Cooling for more information. Test the cooling fan and replace, if required.
	3. Refrigerant system overcharged.	3. See Plumbing/Standard Procedure - Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required.
	4. Air in the refrigerant system.	4. See Plumbing/Diagnosis and Testing - Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
	5. Engine overheating.	5. Refer to Cooling for more information. Test the cooling system and repair, if required.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping.	1. Refer to Cooling for more information. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required.
	2. Faulty compressor.	2. See A/C Compressor in this group. Replace the compressor, if required.
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines.	1. See Liquid, Suction, and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required.
	2. Restricted refrigerant flow through the a/c expansion valve.	2. See A/C Expansion Valve in this group. Replace the Expansion Valve if restricted.
	3. Restricted refrigerant flow through the condenser.	3. See A/C Condenser in this group. Replace the restricted condenser, if required.

HEATING & AIR CONDITIONING (Continued)

DIAGNOSIS AND TESTING - HEATER PERFORMANCE

Before performing the following tests, refer to Cooling for the procedures to check the radiator coolant level, serpentine drive belt tension, radiator air flow and the radiator fan operation. Also be certain that the accessory vacuum supply line is connected at the engine intake manifold for the manual temperature control system.

MAXIMUM HEATER OUTPUT

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the floor heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the HVAC housing floor outlets. Compare the test thermometer reading to the Temperature Reference chart.

Temperature Reference				
Ambient Air Temperature	15.5° C (60° F)	21.1° C (70° F)	26.6° C (80° F)	32.2° C (90° F)
Minimum Air Temperature at Floor Outlet	62.2° C (144° F)	63.8° C (147° F)	65.5° C (150° F)	67.2° C (153° F)

If the floor outlet air temperature is too low, refer to Cooling to check the engine coolant temperature specifications. Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Cooling for the procedures.

OBSTRUCTED COOLANT FLOW

Possible locations or causes of obstructed coolant flow:

- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

If proper coolant flow through the cooling system is verified, and heater outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS

Possible locations or causes of insufficient heat:

- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.

TEMPERATURE CONTROL

If the heater outlet air temperature cannot be adjusted with the temperature control knob(s) on the A/C Heater control panel, the following could require service:

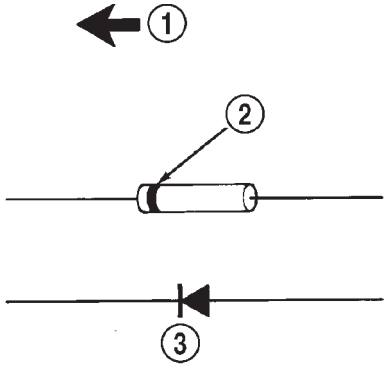
- The A/C heater control.
- The blend door actuator(s).
- The wire harness circuits for the A/C heater control or the blend door actuator(s).
- The blend door(s).
- Improper engine coolant temperature.

STANDARD PROCEDURE - DIODE REPLACEMENT

(1) Disconnect and isolate the negative battery cable.

(2) Locate the diode in the harness, and remove the protective covering.

(3) Remove the diode from the harness, pay attention to the current flow direction (Fig. 3).



948W-197

Fig. 3 DIODE IDENTIFICATION

1 - CURRENT FLOW
2 - BAND AROUND DIODE INDICATES CURRENT FLOW
3 - DIODE AS SHOWN IN THE DIAGRAMS

(4) Remove the insulation from the wires in the harness. Only remove enough insulation to solder in the new diode.

(5) Install the new diode in the harness, making sure current flow is correct. If necessary refer to the appropriate wiring diagram for current flow.

(6) Solder the connection together using rosin core type solder only. **Do not use acid core solder.**

(7) Tape the diode to the harness using electrical tape making, sure the diode is completely sealed from the elements.

(8) Re-connect the battery, and test affected systems.

SPECIFICATIONS

A/C APPLICATION TABLE

Item	Description	Notes
VEHICLE	WJ - Grand Cherokee	
SYSTEM	R134a w/ expansion valve	
COMPRESSOR	Nippondenso 10PA17	ND-8 PAG oil
Freeze–up Control	Evaporator Probe	Evaporator mounted
Low psi Control	opens < 22 psi - resets > 34-38 psi	
High psi Control	opens > 450-490 psi - resets < 270-330 psi	line mounted
CONTROL HEAD	Manual type	manual controls
	Automatic Zone Control (AZC)	Automatic Zone Control (AZC) with dual infrared sensing
Mode Doors	Vacuum actuators (manual)	electric actuator (AZC)
Blend Door	Electric actuator	(manual and AZC)
Blend Door (passenger)	Electric actuator	(AZC only)
Recirculation Door	Vacuum actuator (manual)	electric actuator (AZC)
Blower Motor	Hardwired to control head	resistor block (manual), blower controller (AZC)
COOLING FAN	Hybrid - viscous clutch/electric	PCM output
CLUTCH		
Control	Relay	PCM controlled
Draw	2.0-3.9 amps @ 12 V	± 0.5V@ 70° F
Gap	0.016″-0.031″	
DRB III®		
Reads	TPS, RPM, A/C switch	
Actuators	Clutch relay	

HEATING & AIR CONDITIONING (Continued)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
A/C COMPRESSOR SHAFT BOLT	13	9.6	115
A/C COMPRESOR LINE MANIFOLD FASTENERS 4.0L/4.7L	25.4	18.75	225
A/C COMPRESOR LINE MANIFOLD FASTENERS 2.7L DIESEL	22	16.2	195
A/C COMPRESSOR TO ENGINE BLOCK BOLTS - 4.0L/4.7L	45-65	33-48	398-575
A/C COMPRESSOR TO ENGINE BLOCK BOLTS - 2.7L DIESEL	30	22	266
A/C COMPRESSOR REAR BRACE BOLTS - 4.0L	40-55	30-41	354-487
A/C COMPRESSOR REAR BRACE BOLTS - 4.7L	35-45	26-33	310-398
A/C CONDENSER TO REFRIG. LINE FASTENERS	28	21	248
A/C EVAPORATOR LINE to TXV FASTENERS	28	21	247
ACCUMULATOR RETAINING BAND (4.0L/4.7L)	12	9.0	106
ACCUMULATOR RETAINING BAND (3.1L DIESEL)	5	3.7	44
BLOWER MOTOR SCREWS	2.2	1.7	20
DOOR ACTUATOR SCREWS	2.2	1.7	20
HVAC HOUSING SCREWS	2.2	1.7	20
HVAC HOUSING TO DASH PANEL NUTS (ENGINE COMP. SIDE)	7	5	62
HVAC HOUSING TO DASH PANEL NUTS (PASSENGER COMP. SIDE)	4.5	3.3	40
EXPANSION VALVE TO HVAC FASTENERS	20	15	177
SUCTION LINE TO ACCUMULATOR FITTING	28	20.7	248

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CONTROLS

DIAGNOSIS AND TESTING - VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the standard equipment manual temperature control system HVAC housing. Testing of the A/C Heater mode control switch operation will determine if the vacuum and electrical controls are functioning. However, it is possible that a vacuum control system that operates perfectly at engine idle (high engine vacuum) may not function properly at high engine speeds or loads (low engine vacuum). This can be caused by leaks in the vacuum system, or a faulty vacuum check valve.

A vacuum system test will help to identify the source of poor vacuum system performance or vacuum system leaks. Before starting this test, stop the engine and make certain that the problem isn't a disconnected vacuum supply tube at the engine intake manifold vacuum tap or the vacuum reservoir.

Use an adjustable vacuum test set (Special Tool C-3707-B) and a suitable vacuum pump to test the HVAC vacuum control system. With a finger placed over the end of the vacuum test hose probe (Fig. 1), adjust the bleed valve on the test set gauge to obtain a vacuum of exactly 27 kPa (8 in. Hg.). Release and block the end of the probe several times to verify that the vacuum reading returns to the exact 27 kPa (8 in. Hg.) setting. Otherwise, a false reading will be obtained during testing.

VACUUM CHECK VALVES

(1) Remove the vacuum check valve to be tested. The valves are located in the (black) vacuum supply tubes at either the engine intake manifold vacuum tap, or on the bottom of the HVAC unit behind the passenger front floor duct.

(2) Connect the test set vacuum supply hose to the A/C Heater control side of the valve. When connected to this side of the check valve, no vacuum should pass and the test set gauge should return to the 27 kPa (8 in. Hg.) setting. If OK, go to Step 3. If not OK, replace the faulty valve.

(3) Connect the test set vacuum supply hose to the engine vacuum side of the valve. When connected to this side of the check valve, vacuum should flow through the valve without restriction. If not OK, replace the faulty valve.

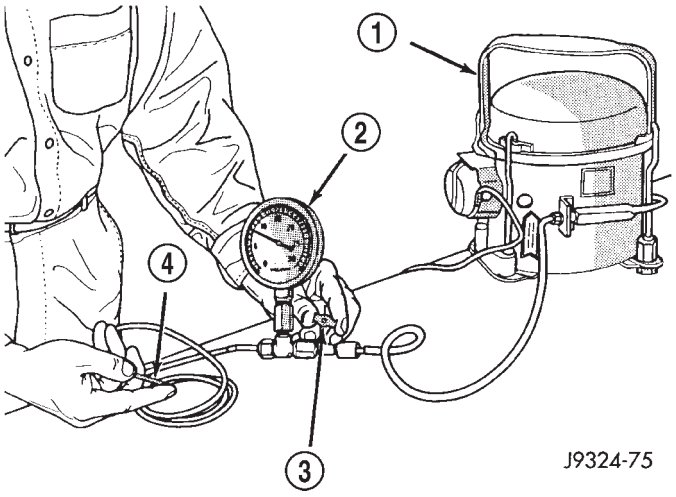


Fig. 1 ADJUST VACUUM TEST BLEED VALVE - TYPICAL

1 - VACUUM PUMP TOOL C-4289
2 - VACUUM TEST SET C-3707
3 - BLEED VALVE
4 - PROBE

A/C HEATER CONTROL

(1) Connect the test set vacuum probe to the HVAC vacuum supply (black) tube in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

(2) Place the A/C Heater mode control switch knob in each mode position, one position at a time, and pause after each selection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each selection is made. If not OK, a component or vacuum line in the vacuum circuit of the selected mode has a leak. See the procedure in Locating Vacuum Leaks.

CAUTION: Do not use lubricant on the switch ports or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. A drop of clean water in the connector plug holes will help the connector slide onto the switch ports.

CONTROLS (Continued)

LOCATING VACUUM LEAKS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the vacuum harness connector from the back of the A/C Heater mode control switch on the control panel.

(2) Connect the test set vacuum hose probe to each port in the vacuum harness connector, one at a time, and pause after each connection (Fig. 2). The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty mode control switch. If not OK, go to Step 3.

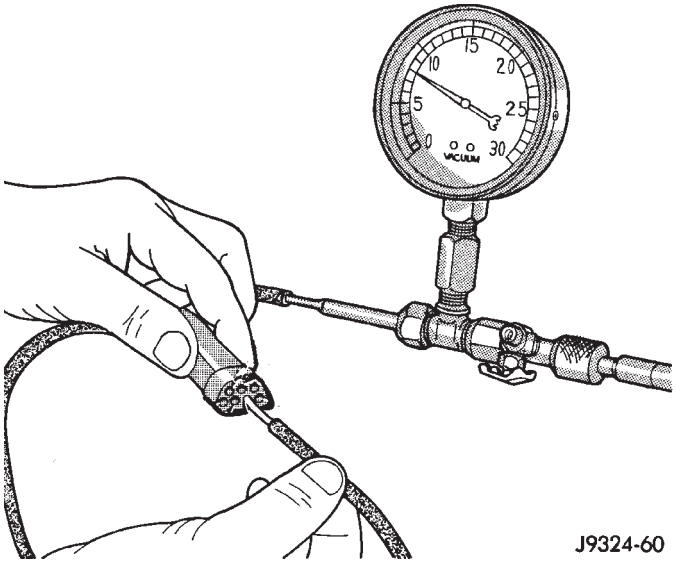


Fig. 2 VACUUM CIRCUIT TEST

(3) Determine the vacuum line color of the vacuum circuit that is leaking. To determine the vacuum line colors, refer to the Vacuum Circuits chart (Fig. 3).

(4) Disconnect and plug the vacuum line from the component (fitting, actuator, valve, switch, or reservoir) on the other end of the leaking circuit. Instrument panel disassembly or removal may be necessary to gain access to some components.

(5) Connect the test set hose or probe to the open end of the leaking circuit. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty disconnected component. If not OK, go to Step 6.

(6) To locate a leak in a vacuum line, leave one end of the line plugged and connect the test set hose or probe to the other end. Run your fingers slowly along the line while watching the test set gauge. The vacuum reading will fluctuate when your fingers contact the source of the leak. To repair the vacuum line, cut out the leaking section of the line. Then, insert the loose ends of the line into a suitable length of 3 millimeter (1/8-inch) inside diameter rubber hose.

CONTROLS (Continued)

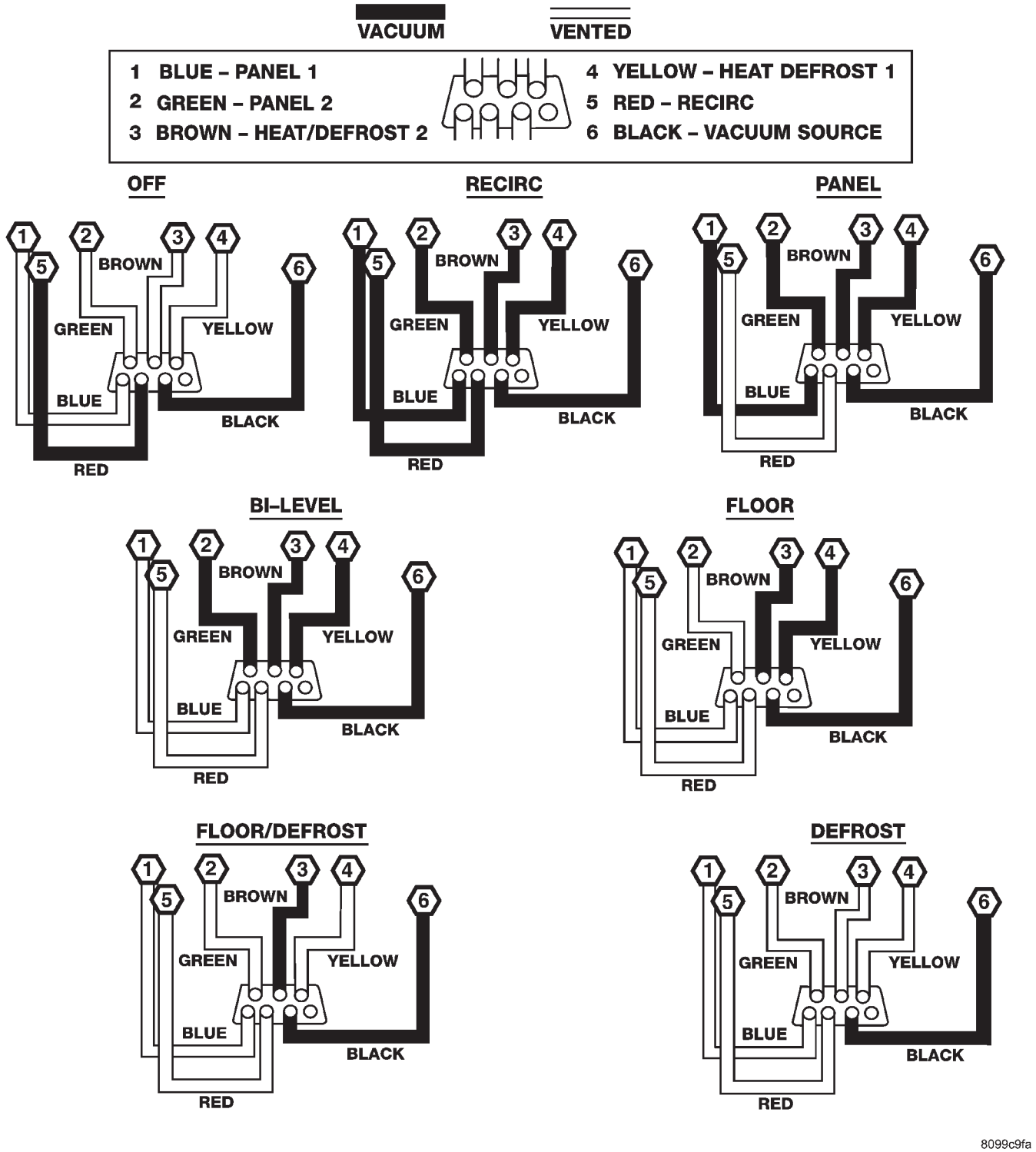


Fig. 3 VACUUM CIRCUITS

A/C COMPRESSOR CLUTCH

DESCRIPTION

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 4). The electromagnetic coil unit and the hub bearing and pulley assembly are each retained on the nose of the compressor front housing with snap rings. The clutch plate is keyed to the compressor shaft and secured with a bolt.

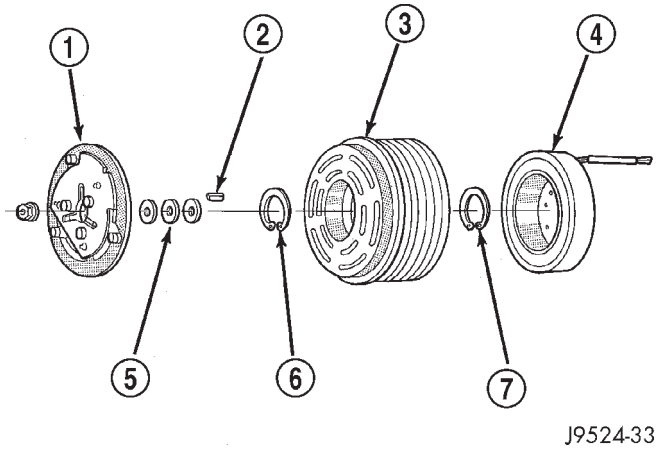


Fig. 4 COMPRESSOR CLUTCH - TYPICAL

1 - CLUTCH PLATE
2 - SHAFT KEY
3 - PULLEY
4 - COIL
5 - CLUTCH SHIMS
6 - SNAP RING
7 - SNAP RING

OPERATION

The compressor clutch components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt. When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the compressor shaft. When the coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch engagement is controlled by several components: the a/c switch on the a/c heater control panel, the Automatic Zone Control (AZC) control module (if the vehicle is so equipped), the evaporator probe, the a/c high pressure transducer, the a/c compressor clutch relay, the body control module (BCM) and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to thirty seconds. Refer to Electronic Control Modules for more information on the PCM controls.

DIAGNOSIS AND TESTING - COMPRESSOR CLUTCH COIL

For circuit descriptions and diagrams, refer to the appropriate wiring diagrams. The battery must be fully-charged before performing the following tests. Refer to Battery for more information.

(1) Connect an ammeter (0 to 10 ampere scale) in series with the clutch coil terminal. Use a voltmeter (0 to 20 volt scale) with clip-type leads for measuring the voltage across the battery and the compressor clutch coil.

(2) With the a/c heater mode control switch in any a/c mode, the a/c heater control a/c switch in the ON position, and the blower motor switch in the lowest speed position, start the engine and run it at normal idle.

(3) The compressor clutch coil voltage should read within 0.2 volts of the battery voltage. If there is voltage at the clutch coil, but the reading is not within 0.2 volts of the battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as required. If there is no voltage reading at the clutch coil, use a DRBIII® scan tool and the appropriate diagnostic information for testing of the compressor clutch circuit. The following components must be checked and repaired as required before you can complete testing of the clutch coil:

- Fuses in the junction block and the Power Distribution Center (PDC)
- A/C heater mode control switch
- A/C compressor clutch relay
- A/C high pressure transducer
- A/C evaporator probe
- Powertrain Control Module (PCM)
- Body Control Module (BCM)

(4) The compressor clutch coil is acceptable if the current draw measured at the clutch coil is 2.0 to 3.9 amperes with the electrical system voltage at 11.5 to 12.5 volts. This should only be checked with the work area temperature at 21° C (70° F). If system voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until the system voltage drops below 12.5 volts.

(a) If the clutch coil current reading is four amperes or more, the coil is shorted and should be replaced.

(b) If the clutch coil current reading is zero, the coil is open and should be replaced.

A/C COMPRESSOR CLUTCH (Continued)

STANDARD PROCEDURE - COMPRESSOR CLUTCH BREAK-IN

After a new compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the A/C Heater control in the Recirculation Mode, the A/C button in the on position, the blower motor switch in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

REMOVAL

The refrigerant system can remain fully-charged during compressor clutch, pulley, or coil replacement. The compressor clutch can be serviced in the vehicle.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the serpentine drive belt. Refer to Cooling for the procedures.

(3) Remove the bolt that secures the compressor clutch to the compressor shaft (Fig. 5). A band-type oil filter wrench may be used to secure the clutch during bolt removal.

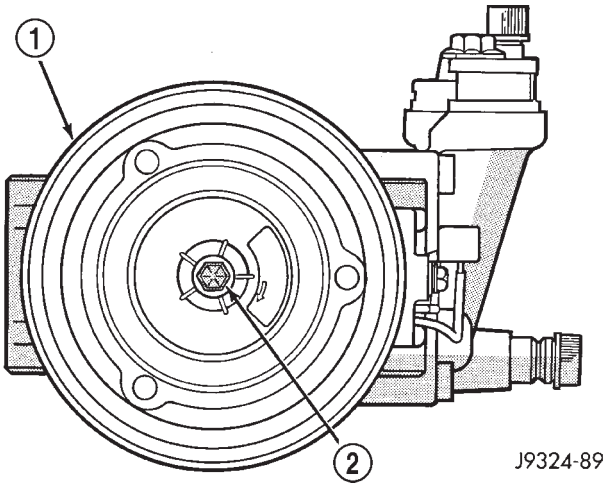


Fig. 5 COMPRESSOR SHAFT BOLT

1 - COMPRESSOR CLUTCH PLATE
2 - COMPRESSOR SHAFT BOLT

(4) Tap the clutch plate with a plastic mallet to release it from the splines on the compressor shaft. Remove the clutch plate and shim(s) from the compressor shaft (Fig. 6).

CAUTION: Do not pry between the clutch plate assembly and the pulley to remove it from the compressor shaft. Prying may damage the clutch plate assembly.

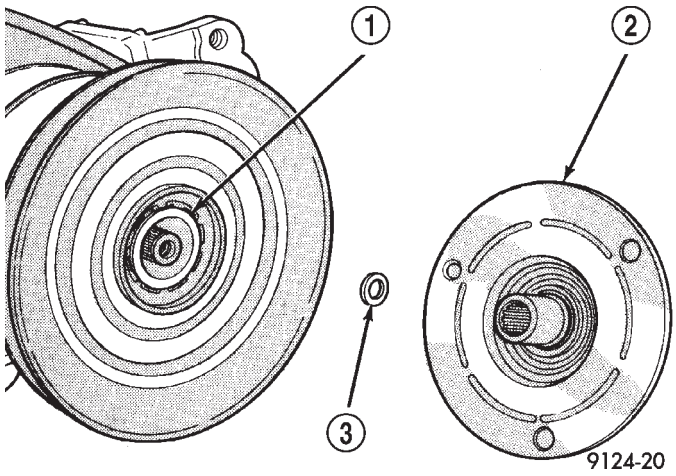


Fig. 6 CLUTCH PLATE AND SHIM(S)

1 - COMPRESSOR SHAFT
2 - CLUTCH PLATE
3 - CLUTCH PLATE SHIM

(5) Remove the external snap ring that secures the compressor clutch pulley to the nose of the compressor front housing with snap ring pliers (Special Tool C-4574) and slide the pulley assembly off of the compressor (Fig. 7).

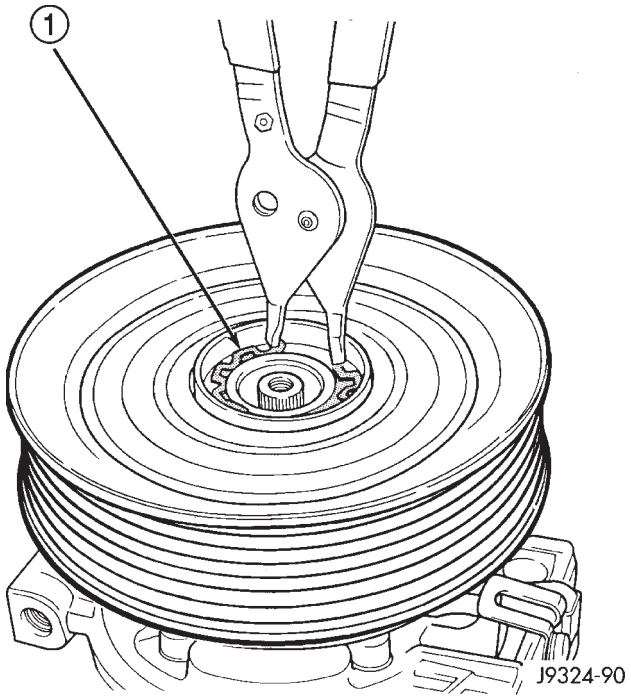


Fig. 7 PULLEY SNAP RING

1 - SNAP RING

(6) Remove the screw and retainer from the clutch coil lead wire harness on the compressor front housing.

A/C COMPRESSOR CLUTCH (Continued)

(7) Remove the external snap ring that secures the compressor clutch coil to the nose of the compressor front housing with snap ring pliers and slide the coil assembly off of the compressor (Fig. 8).

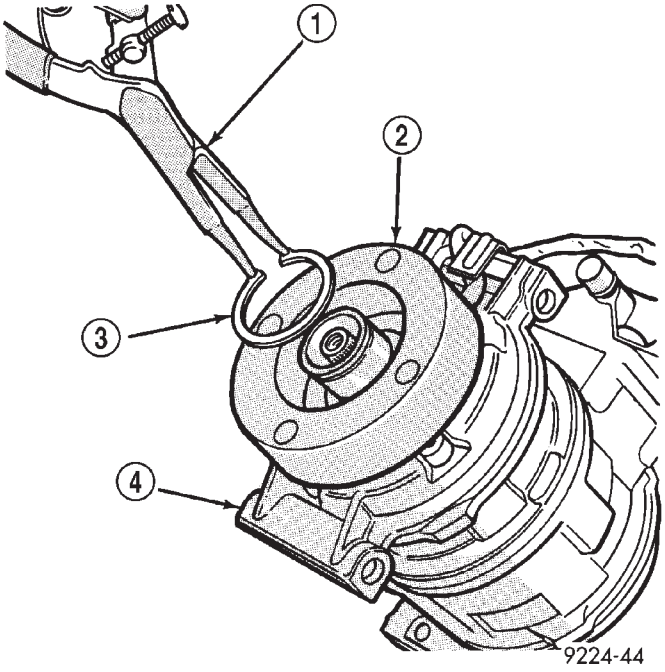


Fig. 8 CLUTCH COIL SNAP RING

1 - SNAP RING PLIERS
2 - CLUTCH COIL
3 - SNAP RING
4 - COMPRESSOR

INSPECTION

Examine the friction surfaces of the clutch pulley and the clutch plate for wear. The pulley and plate should be replaced if there is excessive wear or scoring.

If the friction surfaces are oily, inspect the shaft and nose area of the compressor for refrigerant oil. Remove the felt wick from around the shaft inside the nose of the compressor front housing. If the felt is saturated with refrigerant oil, the compressor shaft seal is leaking and the compressor must be replaced.

Check the clutch pulley bearing for roughness or excessive leakage of grease. Replace the bearing, if required.

INSTALLATION

(1) Align the dowel pin on the back of the clutch field coil with the hole in the compressor front housing and press the field coil into place over the nose of the compressor.

(2) Install the clutch coil lead wire harness retaining clip on the compressor front housing and tighten the retaining screw.

(3) Install the clutch field coil and snap ring with snap ring pliers (Special Tool C-4574). The bevel side of the snap ring must be facing outward. Also, both eyelets of the snap ring must be to the right or left of the pin on the compressor. Press in on the snap ring to be certain that it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

(4) Install the pulley assembly onto the compressor. If necessary, place a block of wood on the friction surface and tap gently with a hammer (Fig. 9).

CAUTION: Do not mar the pulley friction surface.

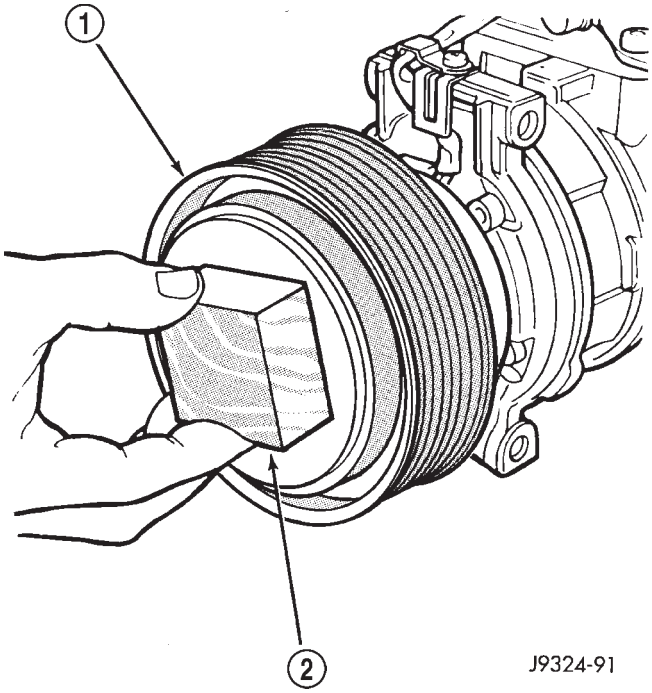


Fig. 9 PULLEY ASSEMBLY INSTALL

1 - PULLEY ASSEMBLY
2 - WOOD BLOCK

(5) Install the pulley assembly retaining snap ring (bevel side outward) with snap ring pliers (Special Tool C-4574). Press in on the snap ring to be certain that it is properly seated in the groove.

(6) If the original clutch plate assembly and pulley assembly are to be reused, the old shim(s) can be used. If not, place a stack of shim(s) equal to the old shim(s) on the shaft against the shoulder.

(7) Install the clutch plate assembly onto the shaft.

(8) With the clutch plate assembly tight against the shim(s), measure the air gap between the clutch plate and the pulley face with feeler gauges. The air

A/C COMPRESSOR CLUTCH (Continued)

gap should be between 0.35 to 0.65 millimeter (0.014 to 0.026 inch). If the proper air gap is not obtained, add or subtract shims as needed until the desired air gap is obtained.

(9) Install the compressor shaft bolt. Tighten the bolt to 13 N·m (115 in. lbs.).

NOTE: The shims may compress after tightening the shaft bolt. Check the air gap in four or more places to verify the air gap is still correct. Spin the pulley before performing a final check of the air gap.

(10) To complete the installation, (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION)

A/C COMPRESSOR CLUTCH RELAY

DESCRIPTION

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, the current capacity is lower, and the relay case dimensions are smaller than those of the conventional ISO relay.

OPERATION

The compressor clutch relay is a electromechanical device that switches battery current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds to inputs from the a/c compressor switch on the a/c heater control panel, the Automatic Zone Control (AZC) control module (if the vehicle is so equipped), the a/c fin probe, and the a/c high pressure transducer. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C COMPRESSOR CLUTCH RELAY - DIAGNOSIS AND TESTING)

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

The compressor clutch relay cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - A/C COMPRESSOR CLUTCH RELAY

For circuit descriptions and diagrams, refer to the appropriate wiring information.

The compressor clutch relay (Fig. 10) is located in the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location. Remove the relay from the PDC to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Relay Circuit Test procedure in this group. If not OK, replace the faulty relay.

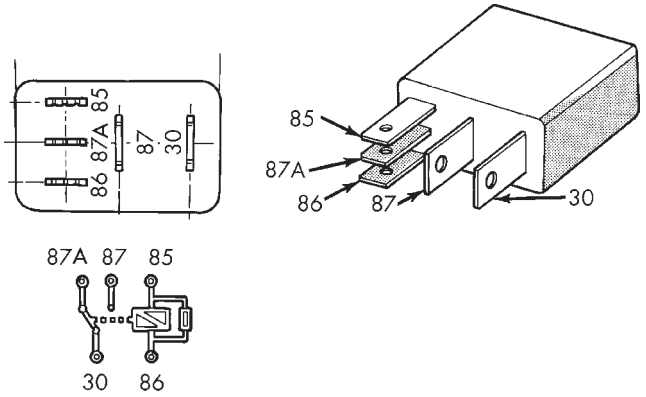


Fig. 10 A/C COMPRESSOR CLUTCH RELAY

30 - COMMON FEED
85 - COIL GROUND
86 - COIL BATTERY
87 - NORMALLY OPEN
87A - NORMALLY CLOSED

RELAY CIRCUIT TEST

For circuit descriptions and diagrams, refer to the appropriate wiring information..

(1) The relay common feed terminal cavity (30) is connected to fused battery feed. There should be battery voltage at the cavity for relay terminal 30 at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is not used in this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the compressor clutch coil. There should be continuity between this cavity and the A/C compressor clutch relay output circuit cavity of the compressor clutch coil wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The relay coil battery terminal (86) is connected to the fused ignition switch output (run/start) circuit. There should be battery voltage at the cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the

A/C COMPRESSOR CLUTCH RELAY (Continued)

open circuit to the fuse in the junction block as required.

(5) The coil ground terminal cavity (85) is switched to ground through the Powertrain Control Module (PCM). There should be continuity between this cavity and the A/C compressor clutch relay control circuit cavity of the PCM wire harness connector C (gray) at all times. If not OK, repair the open circuit as required.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 11).

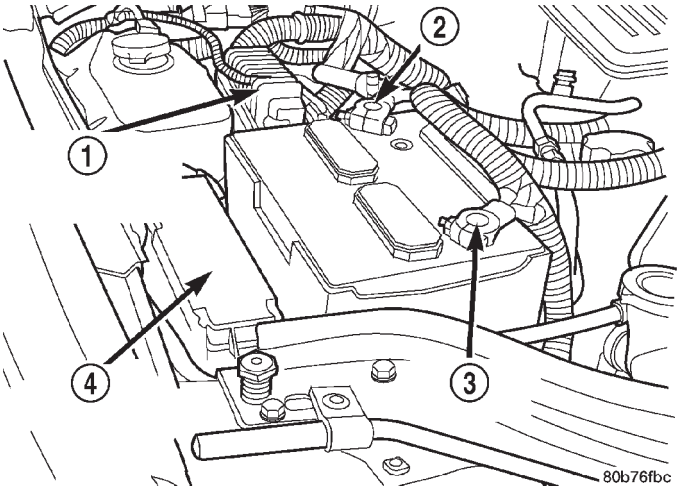


Fig. 11 POWER DISTRIBUTION CENTER (PDC)

1 - TRANSMISSION CONTROL MODULE (TCM)
2 - NEGATIVE CABLE
3 - POSITIVE CABLE
4 - POWER DISTRIBUTION CENTER (PDC)

(3) Refer to the label on the PDC for compressor clutch relay identification and location.

(4) Unplug the compressor clutch relay from the PDC.

INSTALLATION

(1) Install the compressor clutch relay by aligning the relay terminals with the cavities in the PDC and pushing the relay firmly into place.

(2) Install the PDC cover.

(3) Connect the battery negative cable.

(4) Test the relay operation.

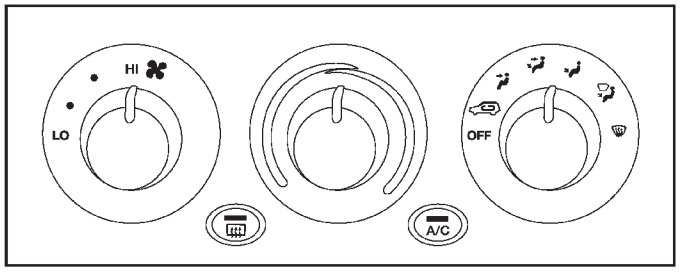
A/C HEATER CONTROL

DESCRIPTION

The manual temperature control HVAC system uses a combination of electrical, and vacuum controls. The Automatic Zone Control (AZC) HVAC system uses only electrical controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the suggested operation and use of these controls.

Both a/c heater control panels are located on the instrument panel inboard of the steering column and below the radio (Fig. 12). Both control panels contain rotary-type temperature control knob(s), a rotary-type mode control switch knob, a rotary-type blower motor speed switch knob and an air conditioning compressor push button switch. The rear window defogger push button switch is also located on a/c heater control panel. The AZC control panel also features a recirculation push button switch and a vacuum fluorescent display area.

MANUAL AIR CONDITIONING SYSTEM



AUTOMATIC ZONE CONTROL SYSTEM

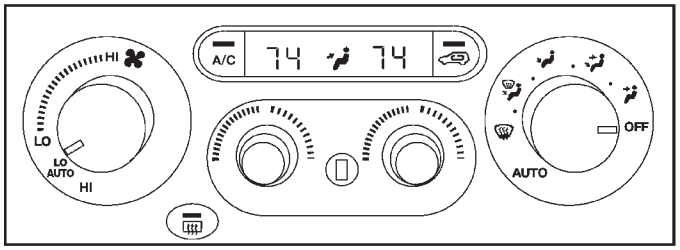


Fig. 12 A/C HEATER CONTROL PANELS

OPERATION

The AZC control module uses infrared sensing technology to control occupant comfort levels, not the actual passenger compartment air temperature. Dual infrared sensors mounted in the face of the control unit independently measure the surface temperature to maintain customer-perceived comfort temperature under changing conditions. Dual Zone temperature control provides wide side-to-side variation in comfort temperature to exceed the needs of either front seat occupant. This sensing system replaces interior air temperature and solar sensors used to approximate direct sensing control through complex control programs.

A/C HEATER CONTROL (Continued)

Both the manual A/C Heater control panel and the AZC control panel are serviced only as complete units and cannot be repaired. If faulty or damaged, the entire control panel unit must be replaced.

DIAGNOSIS AND TESTING - AUTOMATIC ZONE CONTROL SYSTEM

The Automatic Zone Control (AZC) control module has a system self-diagnostic mode which continuously monitors various parameters during normal system operation. If a system fault is detected, a current and historical fault is recorded. When the current fault is cleared, the historical fault remains until reset (manually or automatically). Both the current and historical fault codes can be accessed through either the front panel, or over the Programmable Communications Interface (PCI) bus using a DRBIII® scan tool, and the appropriate diagnostic information.

The AZC control module is capable of three different types of self-diagnostic tests, as follows:

- Fault Code Tests
- Input Circuit Tests
- Output Circuit/Actuator Tests

The information that follows describes:

- How to read the self-diagnostic display
- How to enter the AZC control module self-diagnostic test mode
- How to select the self-diagnostic test types
- How to perform the different tests

ENTERING THE AZC SELF-DIAGNOSTIC MODE

To enter the AZC self-diagnostic mode, perform the following:

(1) Depress the a/c and recirc buttons at the same time and hold. Rotate the left temperature control knob clockwise (CW) one detent.

(2) If you continue to keep the a/c and recirc buttons depressed, the AZC control module will perform a Segment Test of the Vacuum Fluorescent (VF) display. In the Segment Test you should see all of the display segments illuminate as long as both buttons are held. If a display segment fails to illuminate, the vacuum fluorescent display is faulty and the a/c heater control must be replaced.

(3) After viewing the Segment Test, release the A/C and Recirc buttons and the display will clear momentarily. **If a 0 is displayed, then no faults are set in the system.** Should there be any faults, either ″current″ or ″historical″, all fault codes will be displayed in ascending numerical sequence (note no effort is made to display fault codes in chronological order). Each fault code is displayed for one second before the next code is displayed. Once all fault codes have been displayed, the system will then repeat the fault code numbers. This will continue until the left side set temperature control is moved at least one detent position in the CW direction or the ignition is turned ″OFF″.

FAULT CODE TESTS

Fault codes are two-digit numbers that identify a circuit that is malfunctioning. There are two different kinds of fault codes.

1. **Current Fault Codes** - Current means the fault is present right now. There are two types of current faults: input faults, and system faults.
2. **Historical Fault Codes** - Historical or stored means that the fault occurred previously, but is not present right now. A majority of historical fault codes are caused by intermittent wire harness or wire harness connector problems.

CURRENT FAULT CODES	
Input faults	01 = IR thermister circuit open
	02 = IR thermister circuit shorted
	03 = Fan pot shorted
	04 = Fan pot open
	05 = Mode pot shorted
	06 = Mode pot open
	07 = IR sensor delta too large
	08 = Reserved
	09 = Reserved
	10 = One of four motor drivers has drive ″A″ shorted to ground
	11 = Engine air intake temperature Buss message missing
	12 = Country code Buss message missing

A/C HEATER CONTROL (Continued)

CURRENT FAULT CODES	
System Faults	13 = Mode motor not responding
	14 = AI (Recirc) motor not responding
	15 = Left temperature door not responding
	16 = Right temperature door not responding
	17 = Mode door travel range too small
	18 = Mode door travel range too large
	19 = AI (Recirc) door travel too small
	20 = AI (Recirc) door travel too large
	21 = Left temperature door travel too small
	22 = Left temperature door travel too large
	23 = Right temperature door travel too small
	24 = Right temperature door travel too large
	25 = Calibration check sum error
	26 = Engine coolant temp bus message missing
	27 = Vehicle speed bus message missing
	28 = Engine RPM bus message missing
	29 = OAT bus message missing
	30 = Display intensity bus message missing
	31 = VIN number bus message missing
	32 = Raw OAT bus message missing

A/C HEATER CONTROL (Continued)

HISTORICAL FAULT CODES	
Input faults	33 = IR thermister circuit was open
	34 = IR thermister circuit was shorted
	35 = Fan pot was shorted
	36 = Fan pot was open
	37 = Mode pot was shorted
	38 = Mode pot was open
	39 = IR sensor delta was too large
	40 = Reserved
	41 = Reserved
	42 = One of four motor drivers had drive ″A″ shorted to ground
	43 = Engine air intake temperature Buss message missing
	44 = Country code Buss message missing
System Faults	45 = Mode motor was not responding
	46 = AI (Recirc) motor was not responding
	47 = Left temperature door was not responding
	48 = Right temperature door was not responding
	49 = Mode door travel range too small
	50 = Mode door travel range too large
	51 = AI (Recirc) door travel range too small
	52 = AI (Recirc) door travel range too large
	53 = Left temperature door travel too small
	54 = Left temperature door travel too large
	55 = Right temperature door travel too small
	56 = Right temperature door travel too large
	57 = Calibration check sum error
	58 = Engine coolant temp bus message missing
	59 = Vehicle speed bus message missing
	60 = Engine RPM bus message missing
	61 = OAT bus message missing
	62 = Display intensity bus message missing
	63 = VIN number bus message missing
	64 = Raw OAT bus message was missing
	65 = Reserved
	66 = Reserved
	67 = Reserved

NOTE: A battery disconnect will erase all faults stored in Random Access Memory (RAM) of the AZC control module. It is recommended that all faults be recorded before they are erased.

RETRIEVING FAULT CODES

(1) To begin the fault code tests, depress the A/C and Recirc buttons at the same time and rotate the left temperature control knob clockwise (CW) one detent, then release the push-button.

A/C HEATER CONTROL (Continued)

(2) **If there are no fault codes, the "00" display value will remain in the VF window.** Should there be any codes, each will be displayed for one second in ascending numerical sequence (note: no effort is made to display faults in the order they occurred). The left side set temperature display will be blanked and the right side set temperature display will indicate current and historical codes (8 historical max) presently active. Once all codes have been displayed, the system will repeat the fault code numbers. This will continue until the left side set temperature control is moved at least one detent position in either direction, by pressing both the A/C and Recirc buttons at the same time, or the ignition is turned off. Record all of the fault codes, then see the Current and Historical Fault Code charts for the descriptions.

CLEARING FAULT CODES

Current faults cannot be electronically cleared. Repair must be made to the system to eliminate the fault causing code. Historical fault codes can be cleared manually, or automatically. To clear a historical fault manually, depress and hold either the A/C or Recirc button for at least three seconds while the display is in the fault code mode of operation. Historical fault codes are cleared automatically when the corresponding current fault code has been cleared, and has remained cleared for a number of ignition cycles. The faults have been cleared when two horizontal bars appear in the Test Selector display.

EXITING SELF-DIAGNOSTIC MODE

The self-diagnostic mode can be exited by pressing both the A/C and Recirc buttons at the same time, or turning off the ignition.

MONITOR CURRENT PARAMETERS

While in the display fault code mode of operation, current system parameters can also be monitored and/or forced. Rotating the left side set temperature control clockwise will increase the pointer number while rotating the control counter clockwise will decrease the pointer number. Rotating the right set temperature control will have no impact on pointer value or the value of the parameter being monitored. Once the desired pointer number has been selected, pressing either the AC or Recirc buttons will display the current value of the selected parameter. **The right side set temperature display is only capable of displaying only values ranging from 0 to 99, the left side set temperature display is used for values greater than 99. If the value is less than 99, the left side set temperature display remains blanked.** While a parameter is being overridden, the system will continue to function normally except for the parameter which is being manually controlled.

For values < 0, the ″G″ segment in the left side set temperature Most Significant Digit (MSD)(or left-most number in the pair) will be used to indicate a negative number. For values between -01 to -99 the Least Significant Digit (LSD)(or right-most number of the pair) in the left side set temperature will remain blank. System control of parameter being displayed can be overridden by rotating the right set temperature control in either direction. Rotating the right temperature control in the CW direction, the selected parameter value is overridden and incremented beginning at the value which was being displayed. Rotating the right temperature control in the CCW direction, the selected parameter value is overridden and decremented beginning at the value which was being displayed. The rate at which incrementing and decrement occurs is one unit value per set temperature detent position.

HVAC SYSTEM POINTER		
Pointer Number	DESCRIPTION	Value Displayed
01	A/C Enable	0 or 1 0 = disabled 1 = enabled
02	Final fan PWM duty cycle	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
03	Left NPRG *	0 to 255
* NPRG equals a calculated number based on outside and in-vehicle conditions. This value is used by the AZC to position the Mode motor, Air Inlet motor, and control blower motor speed.		
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
04	Right NPRG	0 to 255

A/C HEATER CONTROL (Continued)

HVAC SYSTEM POINTER		
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
05	Avg NPRG	0 TO 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
06	Primary control side	0 or 1 0 = left 1 = right
07	EE Check sum (calculated)	0 to 255
08	Target intensity (in % ON time)	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
09	Not Used	0 to 0
10	Not Used	0 to 0
11	Right NINC *	0 to 255
* NINC equals a calculated number based on the IR sensor and IR thermistor values used to calculate the NPRG.		
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
12	Left NINC	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
13	Right NMIX *	0 to 255
* NMIX equals a calculated number based on outside and in-vehicle conditions used by the AZC to position the Temperature motors.		

HVAC SYSTEM POINTER		
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
14	Left NMIX	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CW = decrease	
15	Not Used	0 to 0
16	Not Used	0 to 0
17	Reserved	
18	Reserved	
19	Reserved	

MODE VALUE POINTER		
Pointer Number	DESCRIPTION	Value Displayed
20	mode range in delta counts	0 to 9999
21	Current mode position (in counts)	0 to 9999
22	mode target position in ratio	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
23	mode target position in counts	0 to 9999
24	Not Used	0 to 0
25	number of valve moves since last index	0 to 9999
26	Not Used	0 to 0
27	Not Used	0 to 0
28	Not Used	0 to 0
29	mode motor state	0 to 5
	0 = in position, 1 = moving toward panel, 2 = moving toward defrost, 3 = searching range, 4 = stalled moving toward panel, 5 = stalled moving toward defrost	

A/C HEATER CONTROL (Continued)

LEFT SIDE TEMPERATURE POINTER		
Pointer Number	DESCRIPTION	Value Displayed
30	Left side temp range in delta counts	0 to 9999
31	Current left side temp position (in counts)	0 to 9999
32	Left side temp target position (in ratio)	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
33	Left side temp target in counts	0 to 9999
34	Not used	0 to 0
35	number of valve moves since last index	0 to 9999
36	Not used	0 to 0
37	Not used	0 to 0
38	Not used	0 to 0
39	Left side temp motor state	0 to 5
	0 = in position, 1 = moving toward panel, 2 = moving toward defrost, 3 = searching range, 4 = stalled moving toward panel, 5 = stalled moving toward defrost	

RIGHT SIDE TEMPERATURE POINTER		
Pointer Number	DESCRIPTION	Value Displayed
40	Right side temp range in delta counts	0 to 9999
41	Current right side temp position (in counts)	0 to 9999
42	Right side temp target position (in ratio)	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
43	Right side temp target in counts	0 to 9999
44	Not used	0 to 0
45	number of valve moves since last index	0 to 9999
46	Not used	0 to 0
47	Not used	0 to 0
48	Not used	0 to 0
49	Right side temp motor state	0 to 5
	0 = in position, 1 = moving toward panel, 2 = moving toward defrost, 3 = searching range, 4 = stalled moving toward panel, 5 = stalled moving toward defrost	

AIR INLET POINTER		
Pointer Number	DESCRIPTION	Value Displayed
50	Air inlet range (in counts)	0 to 9999
51	Current air inlet position (in counts)	0 to 9999
52	Air inlet target position (in ratio)	0 to 255
	While the value of this pointer is being displayed, turning the right set temperature control either direction will manually control the value. CW = increase; CCW = decrease	
53	Air inlet target in counts	0 to 9999
54	Not used	0 to 0
55	number of motor moves since last index	0 to 9999
56	Not used	0 to 0
57	Not used	0 to 0
58	Not used	0 to 0
59	Air inlet motor state	0 to 5
	0 = in position, 1 = moving toward panel, 2 = moving toward defrost, 3 = searching range, 4 = stalled moving toward panel, 5 = stalled moving toward defrost	
60	Reserved	
61	Actual Outside Air Temp (in degrees F)	-40 to 215
62	Not used	0 to 0

A/C HEATER CONTROL (Continued)

AIR INLET POINTER		
63	Engine Intake Air Temperature (in degrees F)	-40 to 215
64	Vehicle speed in MPH	0 to 255
65	Engine RPM/100	-0 to 82
66	Engine Coolant Temp - 40 (in degrees F)	-40 to 215
67	Country Code	0 to 255
68	Not used	0 to 0
69	Not used	0 to 0

IR SENSOR POINTER		
Pointer Number	DESCRIPTION	Value Displayed
70	Thermistor temp (in degrees)	-40 to 215
71	Left side sensor A/D (filtered)	0 to 255
72	Right side sensor A/D (filtered)	0 to 255
73	Left side temp (in degrees F)	-40 to 140
74	Right side temp (in degrees F)	-40 to 140
75	Not used	0 to 0
76	Not used	0 to 0
77	Not used	0 to 0
78	Not used	0 to 0
79	Not used	0 to 0

IDENTIFICATION POINTER		
Pointer Number	DESCRIPTION	Value Displayed
80	ROM bit pattern number (digits 1,2,3 & 4)	0 to 9999
81	ROM bit pattern number (digits 5,6,7 & 8)	0 to 9999
82	CAL bit pattern number (digits 1,2,3 & 4)	0 to 9999
83	CAL bit pattern number (digits 5,6,7 & 8)	0 to 9999
84	Not used	0 to 0
85	Not used	0 to 0
86	Not used	0 to 0
87	Not used	0 to 0
88	Not used	0 to 0
89	Not used	0 to 0

OUTPUT CIRCUIT/ACTUATOR TESTS

In the Output Circuit/Actuator Test mode, the output circuits can be viewed, monitored, overridden, and tested. If a failure occurs in an output circuit, test the circuit by overriding the system. Test the actuator through its full range of operation.

(1) To begin the Output Circuit/Actuator Tests you must be in the Select Test mode.

(2) With a “00” value displayed in the Test Selector and no stick man, turn the rotary temperature control knob until the test number you are looking for appears in the Test Selector display. See the Circuit Testing charts for a listing of the test numbers, test items, test types, system tested, and displayed values.

(3) To see the output value, depress the a/c or recirc button. The values displayed will represent the output from the AZC control module.

(4) To enter the actuator test, depress the a/c or recirc button. Then, rotate the right temperature set knob to the desired position.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the center upper, and center lower bezels from the instrument panel. Refer to Instrument Panel System for the procedures.

(3) Remove the 4 screws that secure the a/c heater control to the instrument panel (Fig. 13).

(4) Pull the a/c heater control assembly away from the instrument panel far enough to access the connections on the back of the control.

(5) Unplug the wire and/or vacuum harness connectors from the back of the a/c heater control (Fig. 14).

(6) Remove the a/c heater control from the instrument panel.

A/C HEATER CONTROL (Continued)

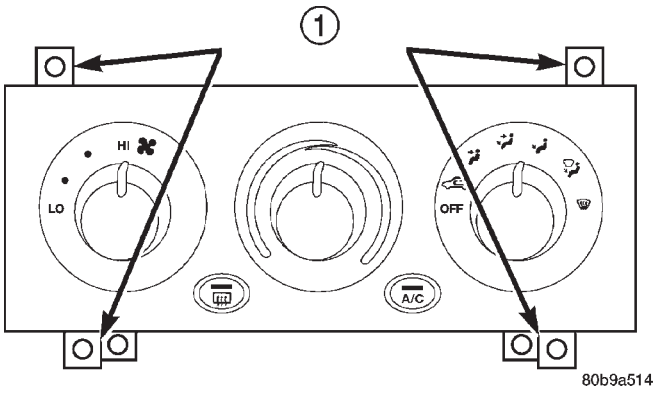


Fig. 13 A/C HEATER CONTROL REMOVE/INSTALL

1 - MOUNTING SCREW TABS

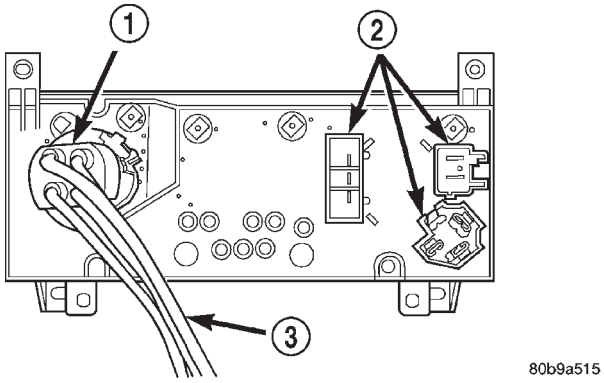


Fig. 14 A/C HEATER CONTROL CONNECTIONS

1 - MODE SWITCH
2 - ELECTRICAL CONNECTIONS
3 - VACUUM HARNESS

INSTALLATION

(1) Plug the wire harness and/or vacuum harness connectors into the back of the a/c heater control.

(2) Position the a/c heater control in the instrument panel and secure it with 4 screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reinstall the center upper, and center lower bezels onto the instrument panel. Refer to Instrument Panel System for the procedures.

(4) Connect the battery negative cable.

A/C PRESSURE TRANSDUCER

DESCRIPTION

The A/C pressure transducer is installed on a fitting located on the refrigerant discharge line near the condenser. An internally threaded hex fitting on the transducer connects it to the externally threaded Schrader-type fitting on the discharge line. A rubber O-ring seals the connection between the transducer and the discharge line fitting. Three terminals within a molded plastic connector receptacle on the top of the transducer connect it to the vehicle electrical system through a take out and connector of the headlamp and dash wire harness.

The A/C pressure transducer cannot be adjusted or repaired and if faulty or damaged, it must be replaced.

OPERATION

The A/C pressure transducer monitors the pressures in the high side of the refrigerant system through its connection to a fitting on the discharge line. The transducer will change its internal resistance in response to the pressures it monitors. The Powertrain Control Module (PCM) provides a five volt reference signal and a sensor ground to the transducer, then monitors the output voltage of the transducer on a sensor return circuit to determine refrigerant pressure. The PCM is preporgrammed to respond to this and other sensor inputs by controlling the operation of the air conditioning compressor clutch and the radiator cooling fan to help optimize air conditioning system performance and to protect the system components from damage. The A/C pressure transducer input to the PCM will also prevent the air conditioning compressor clutch from engaging when the ambient temperatures are below about 0.556° C (33° F) due to the pressure/temperature relationship of the refrigerant. The Schrader-type valve in the liquid line fitting permits the A/C pressure transducer to be removed or installed without distrubing the refrigerant in the system. The A/C pressure transducer is diagnosed using the DRBIII® scan tool. Refer to the appropriate diagnostic information.

A/C PRESSURE TRANSDUCER (Continued)

DIAGNOSIS AND TESTING - A/C PRESSURE TRANSDUCER

The A/C pressure transducer is tested using a DRBIII® scan tool. Refer to the appropriate diagnostic information. Before testing the A/C pressure transducer, be certain that the transducer wire harness connection is clean of corrosion and properly connected. For the air conditioning system to operate, an A/C pressure transducer voltage reading between 0.7 and 4.56 volts is required. Voltage outside this range indicate a low or high refrigerant system pressure condition to the Powertrain Control Module (PCM). The PCM is programmed to respond to a low or high refrigerant system pressure by suppressing operation of the compressor. Refer to the A/C Pressure Transducer Voltage table for the possible condition indicated by the transducer voltage readings.

A/C PRESSURE TRANSDUCER VOLTAGE	
VOLTAGE	POSSIBLE INDICATION
0.0	1. NO SENSOR SUPPLY VOLTAGE FROM PCM. 2. SHORTED SENSOR CIRCUIT. 3. FAULTY TRANSDUCER
0.150 TO 0.450	1. AMBIENT TEMPERATURE BELOW 10° c (50° F). 2. LOW REFRIGERANT SYSTEM PRESSURE.
0.451 TO 4.519	1. NORMAL REFRIGERANT SYSTEM PRESSURE.
4.520 TO 4.850	1. HIGH REFRIGERANT SYSTEM PRESSURE.
5.0	1. OPEN SENSOR CIRCUIT. 2. FAULTY TRANSDUCER.

REMOVAL

WARNING: Transducer can be removed without recoverying the system, but some loss of refrigerant can be expected(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION).

(1) Disconnect and isolate the battery negative cable.
(2) Disconnect the headlamp and dash wire harness connector for the A/C pressure transducer from the transducer connector receptacle.
(3) Using an open end wrench, unscrew the A/C pressure transducer from the fitting on the discharge line.
(4) Remove the seal from the A/C pressure transducer fitting and discard.

INSTALLATION

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the A/C pressure transducer fitting.
(2) Using an open end wrench, install and tighten the A/C pressure transducer onto the fitting on the discharge line.
(3) Reconnect the headlamp and dash wire harness connector for the A/C pressure transducer to the transducer connector receptacle.
(4) Reconnect the battery negative cable.

BLOWER MOTOR CONTROLLER

DESCRIPTION

Models equipped with the optional Automatic Zone Control (AZC) system have a blower motor controller. The controller allows the selection of almost infinitely variable blower motor speeds. The controller is mounted to the HVAC housing, under the instrument panel and just inboard of the blower motor, in the same location used for the blower motor resistor on manual temperature control systems. It can be accessed without removing any other components.

OPERATION

The blower motor controller output to the blower motor can be adjusted by the blower motor speed switch knob on the AZC A/C Heater control panel, or it can be adjusted automatically by the logic circuitry and programming of the AZC control module. In either case, the AZC control module sends the correct pulse width modulated signal to the blower motor controller to obtain the selected or programmed blower motor speed.

The blower motor controller cannot be repaired and, if faulty or damaged, it must be replaced.

BLOWER MOTOR CONTROLLER (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Depress locking tab and unplug the wire harness connector from the blower motor controller.

(3) Depress locking tab and unplug the controller connector from the blower motor.

(4) Remove the 2 screws that secure the blower motor controller to the HVAC housing.

(5) Remove the blower motor controller from the HVAC housing (Fig. 15).

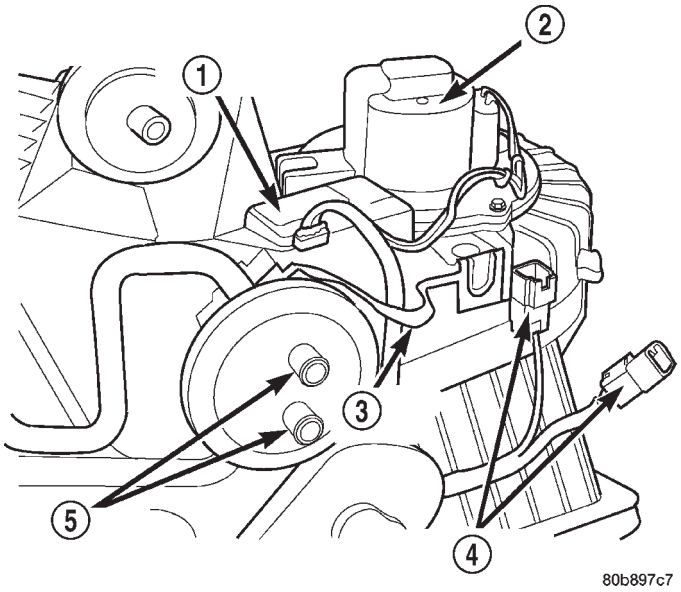


Fig. 15 BLOWER MOTOR CONTROLLER REMOVE/ INSTALL

1 - BLOWER MOTOR CONTROLLER
2 - BLOWER MOTOR
3 - GROUND STRAP
4 - ELECTRICAL CONNECTORS
5 - HEATER CORE TUBES

INSTALLATION

(1) Install the blower motor controller in the HVAC housing. The housing is indexed to allow controller mounting in only one position. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Plug in the wire harness connector to the blower motor controller.

(3) Plug in the connector from the blower motor controller to the blower motor.

(4) Connect the battery negative cable.

BLOWER MOTOR RESISTOR BLOCK

DESCRIPTION

Models with the standard manual temperature control system have a blower motor resistor. The blower motor resistor is mounted to the bottom of the HVAC housing, under the instrument panel and just inboard of the blower motor. It can be accessed for service without removing any other components.

OPERATION

The resistor has multiple resistor wires, each of which will reduce the current flow to the blower motor to change the blower motor speed by changing the resistance in the blower motor ground path. The blower motor switch directs the ground path through the correct resistor wire to obtain the selected speed.

With the blower motor switch in the lowest speed position, the ground path for the motor is applied through all of the resistor wires. Each higher speed selected with the blower motor switch applies the blower motor ground path through fewer of the resistor wires, increasing the blower motor speed. When the blower motor switch is in the highest speed position, the blower motor resistor is bypassed and the blower motor receives a direct path to ground.

The blower motor resistor cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING - BLOWER MOTOR RESISTOR BLOCK

For circuit descriptions and diagrams, refer to the appropriate wiring information.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the blower motor resistor.

BLOWER MOTOR RESISTOR BLOCK (Continued)

(3) Check for continuity between each of the blower motor switch input terminals of the resistor and the resistor output terminal. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor as required. If not OK, replace the faulty blower motor resistor.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Depress locking tab and unplug the wire harness connector from the blower motor resistor.

(3) Depress locking tab and unplug the resistor connector from the blower motor.

(4) Remove the 2 screws that secure the blower motor resistor to the HVAC housing.

(5) Remove the blower motor resistor from the HVAC housing (Fig. 16).

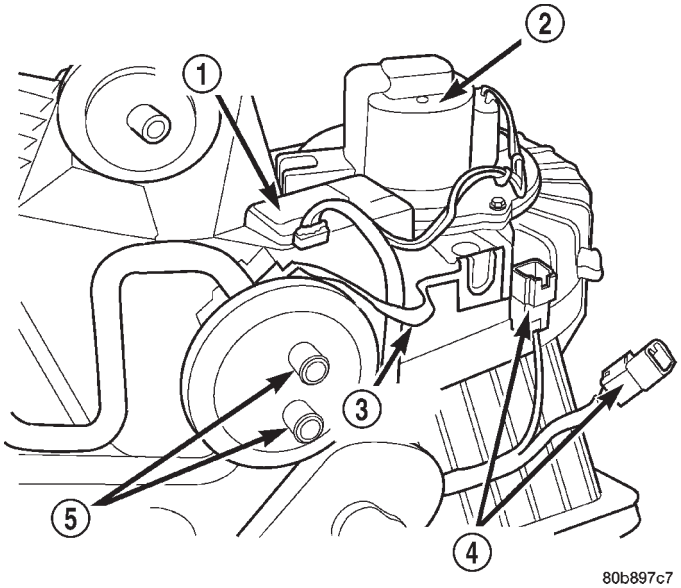


Fig. 16 BLOWER MOTOR RESISTOR REMOVE/ INSTALL

1 - BLOWER MOTOR RESISTOR
2 - BLOWER MOTOR
3 - GROUND STRAP
4 - ELECTRICAL CONNECTORS
5 - HEATER CORE TUBES

INSTALLATION

(1) Install the blower motor resistor in the HVAC housing. The housing is indexed to allow mounting in only one position. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Plug in the wire harness connector to the blower motor resistor.

(3) Plug in the connector from the blower motor resistor to the blower motor.

(4) Connect the battery negative cable.

BLOWER MOTOR SWITCH

DESCRIPTION

The A/C Heater blower motor is controlled by a rotary-type blower motor switch, mounted in the A/C Heater control panel. On vehicles with manual temperature control systems, the switch allows the selection of four blower motor speeds, but will only operate with the ignition switch in the On position and the A/C Heater mode control switch in any position, except Off. On vehicles with the Automatic Zone Control (AZC) systems, the switch allows the selection of Lo Auto, Hi Auto, and ten speed settings between Lo and Hi.

OPERATION

On manual temperature control systems, the blower motor switch is connected in series with the blower motor ground path through the a/c heater mode control switch. The blower motor switch directs this ground path to the blower motor through the blower motor resistor wires, or directly to the blower motor, as required to achieve the selected blower motor speed.

On AZC systems, the blower motor switch is just one of many inputs to the AZC control module. In the manual blower modes, the AZC control module adjusts the blower motor speed through the blower motor controller as required to achieve the selected blower switch position. In the auto blower modes, the AZC control assembly is programmed to select and adjust the blower motor speed through the blower motor controller as required to achieve and maintain the selected comfort level.

The blower motor switch cannot be repaired and, if faulty or damaged, it must be replaced. The switch is serviced only as a part of the a/c heater control assembly.

DIAGNOSIS AND TESTING - BLOWER MOTOR SWITCH-MANUAL TEMPERATURE CONTROL SYSTEM

For circuit descriptions and diagrams, refer to the appropriate wiring information.

BLOWER MOTOR SWITCH (Continued)

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Check for battery voltage at the fuse in the Power Distribution Center (PDC). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the a/c heater control from the instrument panel. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL) Check for continuity between the ground circuit cavity of the a/c heater control wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to ground as required.

(3) With the a/c heater control wire harness connector unplugged, place the a/c heater mode control switch knob in any position except the Off position. Check for continuity between the ground circuit terminal and each of the blower motor driver circuit terminals of the a/c heater control as you move the blower motor switch knob to each of the four speed positions. There should be continuity at each driver circuit terminal in only one blower motor switch speed position. If OK, test and repair the blower driver circuits between the a/c heater control connector and the blower motor resistor as required. If not OK, replace the faulty a/c heater control unit.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The blower motor switch cannot be adjusted or repaired, and if faulty or damaged, the a/c heater control must be replaced. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL)

IN-CAR TEMPERATURE SENSOR

DESCRIPTION

Models equipped with the optional Automatic Zone Control (AZC) system use automatic dual zone temperature control with infrared sensing technology. The temperature sensor is located in the center instrument panel, between the dual temperature knobs of the AZC.

OPERATION

The Automatic Zone Control uses infrared sensing technology to control occupant comfort levels, not the actual passenger compartment air temperature. Dual infrared sensors mounted in the face of the control unit independently measure the surface temperature to maintain customer-perceived comfort temperature under changing conditions. Dual Zone temperature control provides wide side-to-side variation in comfort temperature to exceed the needs of either front seat occupant. This sensing system replaces interior air temperature and solar sensors used to approximate direct sensing control through complex control programs.

The infrared temperature sensor cannot be adjusted or repaired and, if faulty or damaged, the AZC head must be replaced.

NOTE: The infrared sensor window may be permanently damaged if any type of cosmetic vinyl dressings are allowed to contact the lens. Avoid spraying or wiping this area with any cleaner or conditioner. This may result in impaired temperature sensing and control.

REMOVAL

The infrared temperature sensor cannot be adjusted or repaired and, if faulty or damaged, the AZC head must be replaced. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C HEATER CONTROL - REMOVAL)

BLEND DOOR ACTUATOR

DESCRIPTION

The blend door for all models is actuated by an electric actuator, while the AZC system uses 2 separate actuators to allow the driver and passenger to select individual comfort levels. In the following procedures, service for both types of actuators is covered.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The blend door actuator is used on all models, whether equipped with manual or Automatic Zone Control (AZC). This actuator is located on the front of the HVAC housing to the right of the floor panel transmission tunnel, and can be removed from the passenger compartment without instrument panel or HVAC housing removal.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the glove box door. Refer to Instrument Panel System for the procedures.

(3) Remove the lower I/P glove box door surround panel. Refer to Instrument Panel System for the procedures.

(4) Unplug the wire harness connector from the blend door actuator (Fig. 17).

(5) Remove the 2 screws that secure the blend door actuator to the HVAC housing.

(6) Remove the blend door actuator from the HVAC housing.

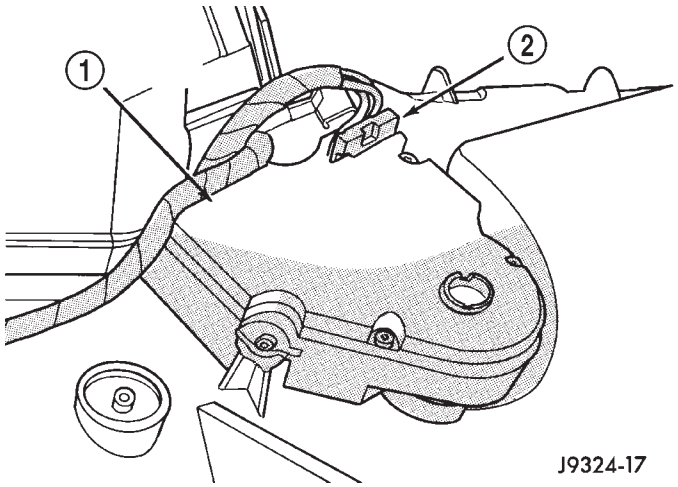


Fig. 17 BLEND DOOR ACTUATOR

1 - BLEND DOOR ACTUATOR
2 - ELECTRICAL CONNECTOR

INSTALLATION

(1) Install the blend door actuator on the HVAC housing and tighten the two mounting screws to 2.2 N·m (20 in. lbs.).

(2) Plug in the wire harness connector to the blend door actuator.

(3) Install the glove box door. Refer to Instrument Panel System for the procedures.

(4) Install the lower I/P glove box door surround panel. Refer to Instrument Panel System for the procedures.

(5) Connect and the battery negative cable.

MODE DOOR ACTUATOR

DESCRIPTION

The mode door actuators for vehicles equipped with the standard equipment manual temperature control system are vacuum controlled. The optional Automatic Zone Control (AZC) system uses electric motors to actuate all mode doors. The service procedures for both types of actuators are covered by the following procedures.

MODE DOOR ACTUATOR (Continued)

REMOVAL

REMOVAL - HEAT/DEFROST - PANEL/DEFROST DOOR ELECTRIC ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

These actuators are used only on models equipped with the optional Automatic Zone Control (AZC) system.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the two bolts that secure the center instrument panel support bracket to the left side of the floor panel transmission tunnel.

(3) Remove the two bolts that secure the center instrument panel support bracket to the instrument panel.

(4) Remove the center instrument panel support bracket from the vehicle.

(5) Unplug the wire harness connector from the heat/defrost - panel/defrost door actuator (Fig. 18).

(6) Remove the three screws that secure the heat/defrost-panel/defrost door motor to the HVAC housing.

(7) Remove the heat/defrost-panel/defrost door motor from the HVAC housing.

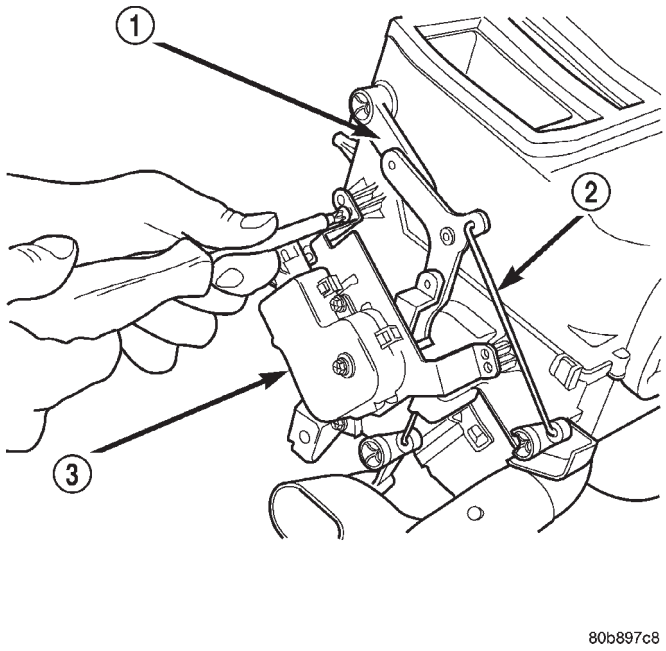


Fig. 18 HEAT/DEFROST - PANEL/DEFROST DOOR ACTUATOR

1 - LEVER ASSEMBLY
2 - LINKAGE
3 - ELECTRIC ACTUATOR

REMOVAL - HEAT/DEFROST DOOR VACUUM ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the HVAC housing from the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Unplug the vacuum harness connector from the heat/defrost door vacuum actuator (Fig. 19).

(3) Disengage the heat/defrost door pivot connection from the heat/defrost door pivot pin.

(4) Remove the screws that secure the heat/defrost door vacuum actuator to the HVAC housing.

(5) Remove the heat/defrost door vacuum actuator from the HVAC housing.

MODE DOOR ACTUATOR (Continued)

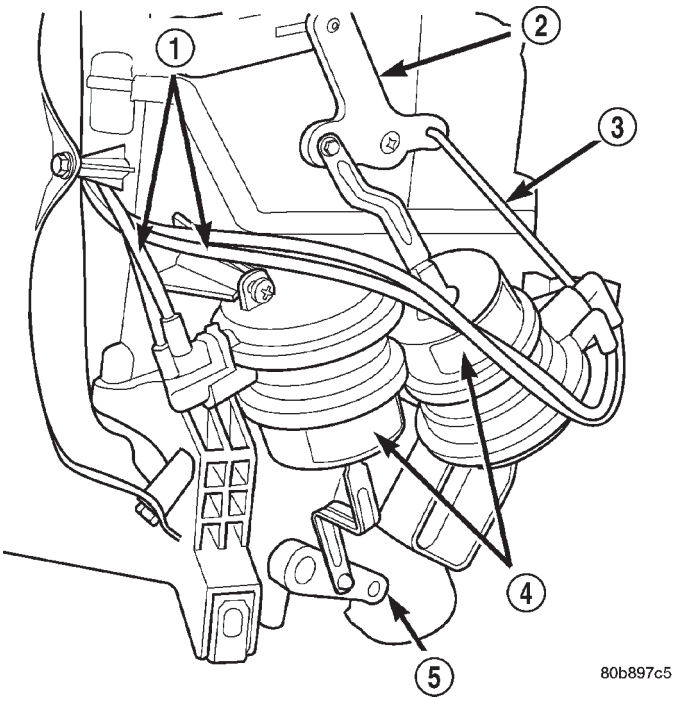


Fig. 19 MODE DOOR ACTUATORS-MANUAL SYSTEM

1 - VACUUM LINES
2 - ACTUATING LEVERS
3 - LINKAGE
4 - VACUUM ACTUATORS
5 - ACTUATING LEVER

REMOVAL - PANEL/DEFROST DOOR VACUUM ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the HVAC housing from the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Unplug the vacuum harness connector from the heat/defrost door vacuum actuator (Fig. 20).

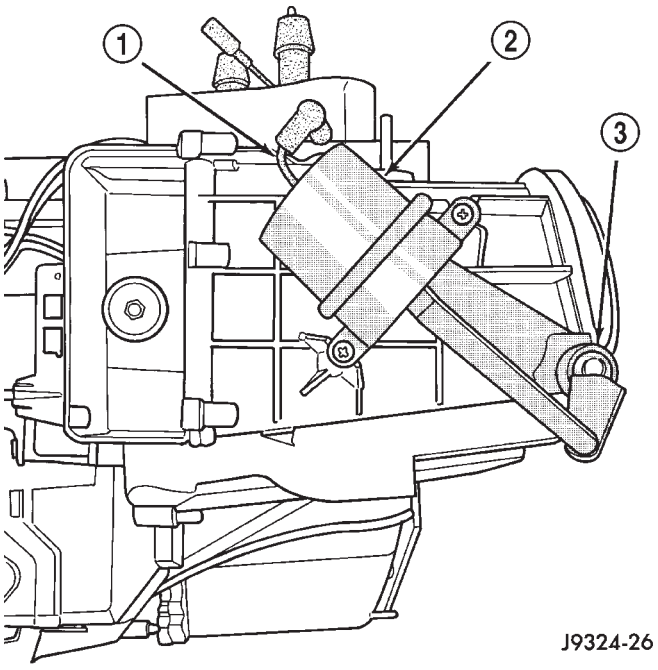


Fig. 20 PANEL/DEFROST DOOR ACTUATOR

1 - VACUUM LINE
2 - PANEL/DEFROST DOOR ACTUATOR
3 - SHAFT RETAINER

(3) Disengage the panel/defrost door pivot connection from the panel/defrost door pivot pin.

(4) Remove the screws that secure the panel/defrost door vacuum actuator to the HVAC housing.

(5) Remove the panel/defrost door vacuum actuator from the HVAC housing.

INSTALLATION

INSTALLATION - HEAT/DEFROST - PANEL/ DEFROST DOOR ELECTRIC ACTUATOR

(1) Install the heat/defrost-panel/defrost door actuator on the HVAC housing, and tighten the three mounting screws to 2.2 N·m (20 in. lbs.).

(2) Plug in the wire harness connector to the heat/ defrost - panel/defrost door actuator.

(3) Install the center instrument panel support bracket on the vehicle.

(4) Install the two bolts that secure the center instrument panel support bracket to the instrument panel.

(5) Install the two bolts that secure the center instrument panel support bracket to the left side of the floor panel transmission tunnel.

(6) Connect the battery negative cable.

MODE DOOR ACTUATOR (Continued)

INSTALLATION - HEAT/DEFROST DOOR VACUUM ACTUATOR

(1) Install the heat/defrost door vacuum actuator on the HVAC housing and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Engage the heat/defrost door pivot connection with the heat/defrost door pivot pin.

(3) Plug in the vacuum harness connector to the heat/defrost door vacuum actuator.

(4) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

INSTALLATION - PANEL/DEFROST DOOR VACUUM ACTUATOR

(1) Install the panel/defrost door vacuum actuator on the HVAC housing and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Engage the panel/defrost door pivot connection with the panel/defrost door pivot pin.

(3) Plug in the vacuum harness connector to the heat/defrost door vacuum actuator.

(4) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

RECIRCULATION DOOR ACTUATOR

DESCRIPTION

The recirculation door actuator for vehicles equipped with the standard equipment manual temperature control system is vacuum controlled. The optional Automatic Zone Control (AZC) system uses an electric recirculation door actuator. In the following procedures, service for both types of actuators is covered.

REMOVAL

REMOVAL - RECIRCULATION DOOR VACUUM ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel System for the procedures.

(2) Unplug the vacuum harness connector from the recirculation door vacuum actuator.

(3) Disengage the recirculation door pivot connection from the door pivot pin.

(4) Disengage the recirculation door actuating rod from the recirculation door lever.

(5) Remove the screws that secure the recirculation door vacuum actuator to the HVAC housing.

(6) Remove the recirculation door vacuum actuator from the HVAC housing.

REMOVAL - RECIRCULATION DOOR ELECTRIC ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

This actuator is used only on models equipped with the optional Automatic Zone Control (AZC) system.

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel System for the procedures.

(2) Unplug the wire harness connector from the recirculation door actuator.

(3) Remove the 2 screws securing the recirculation door housing to the HVAC unit (Fig. 21). Tilt the front of the housing up while reaching around the back releasing 2 tangs holding the rear of the housing down.

(4) Remove the recirculation door housing from the HVAC unit.

(5) Remove the screws that secure the recirculation door actuator to the HVAC housing.

(6) Remove the recirculation door actuator from the HVAC housing.

RECIRCULATION DOOR ACTUATOR (Continued)

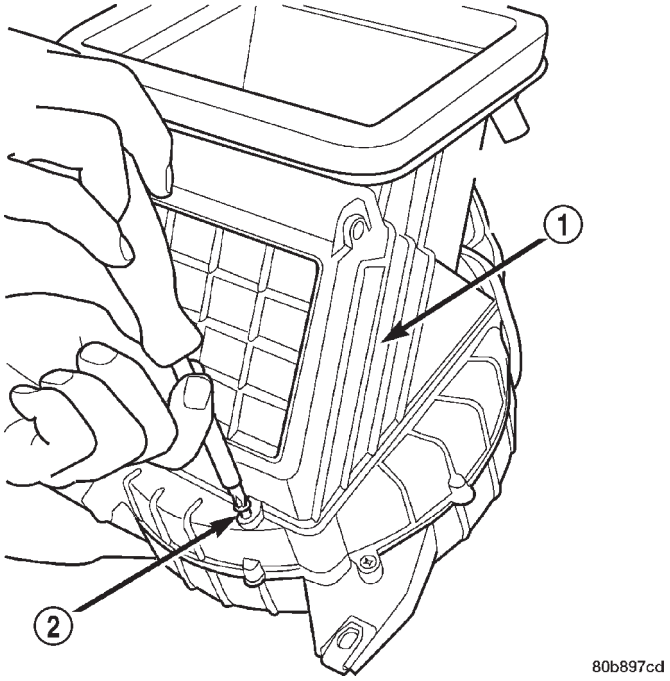


Fig. 21 RECIRCULATION DOOR HOUSING

1 - RECIRCULATION DOOR HOUSING
2 - ATTACHING SCREWS

INSTALLATION

INSTALLATION - RECIRCULATION DOOR VACUUM ACTUATOR

(1) Install the recirculation door vacuum actuator on the HVAC housing and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Engage the recirculation door actuating rod with the recirculation door lever.

(3) Engage the recirculation door pivot connection with the door pivot pin.

(4) Plug in the vacuum harness connector to the recirculation door vacuum actuator.

(5) Install the instrument panel in the vehicle. Refer to Instrument Panel System for the procedures.

INSTALLATION - RECIRCULATION DOOR ELECTRIC ACTUATOR

(1) Install the recirculation door actuator on the recirculation door housing and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Install the recirculation door housing on the HVAC unit and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Plug in the wire harness connector to the recirculation door actuator.

(4) Install the instrument panel in the vehicle. Refer to Instrument Panel System for the procedures.

VACUUM CHECK VALVE

DESCRIPTION

Two vacuum check valves (non AZC only) are installed on the vacuum supply system. One is on the accessory vacuum supply line in the engine compartment, near the vacuum tap on the engine intake manifold. A second vacuum check valve is located on the bottom of the HVAC unit behind the passenger front floor duct on the black vacuum line. The vacuum check valves are designed to allow vacuum to flow in only one direction through the accessory vacuum supply circuits.

OPERATION

The use of a vacuum check valve helps to maintain the system vacuum needed to retain the selected A/C Heater mode settings. The check valve will prevent the engine from bleeding down system vacuum through the intake manifold during extended heavy engine load (low engine vacuum) operation.

The vacuum check valve cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

(1) Unplug the HVAC vacuum supply line connector at the vacuum check valve near the engine intake manifold vacuum adapter fitting.

(2) Note the orientation of the check valve in the vacuum supply line for correct installation.

(3) Unplug the vacuum check valve from the vacuum supply line fittings.

INSTALLATION

(1) Plug in the vacuum check valve at the vacuum supply line fittings, noting the orientation of the check valve in the vacuum supply line for correct installation.

(2) Plug in the HVAC vacuum supply line connector at the vacuum check valve near the engine intake manifold vacuum adapter fitting.

VACUUM RESERVOIR

DESCRIPTION

The vacuum reservoir is mounted in the right front of the vehicle behind the headlamp mounting module (Fig. 22). The headlamp mounting module and headlamp assembly must be removed from the vehicle to access the vacuum reservoir for service. Refer to Lamps/Lighting for the procedures.

OPERATION

Engine vacuum is stored in the vacuum reservoir. The stored vacuum is used to operate the vacuum-

VACUUM RESERVOIR (Continued)

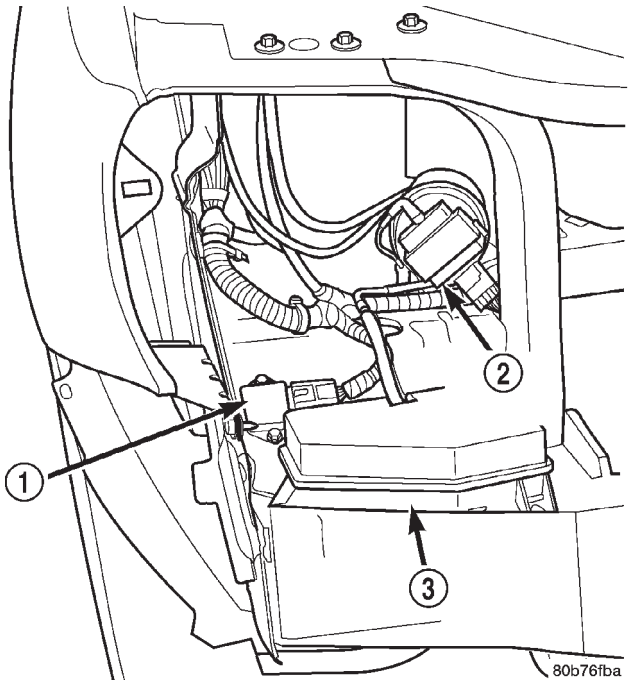


Fig. 22 VACUUM RESERVOIR

1 - FAN RELAY
2 - SPEED CONTROL SERVO
3 - VACUUM RESERVOIR

controlled vehicle accessories during periods of low engine vacuum such as when the vehicle is climbing a steep grade, or under other high engine load operating conditions.

The vacuum reservoir cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

(1) Remove the right side headlamp mounting module and headlamp assembly. Refer to Lamps/Lighting for the procedures.

(2) Remove the two screws that secure the vacuum reservoir to the base of the radiator closure panel.

(3) Remove the vacuum reservoir.

INSTALLATION

(1) Install the vacuum reservoir in the vehicle and tighten the two screws to 3.4 N·m (30 in. lbs.).

(2) Install the right side headlamp mounting module and headlamp assembly. Refer to Lamps/Lighting for the procedures.

EVAPORATOR TEMPERATURE SENSOR

DESCRIPTION

The evaporator probe is a 2 wire temperature sensing element located at the coldest point on the face of the evaporator. The switch is attached to the evaporator coil fins. The evaporator temperature probe prevents condensate water on the evaporator coil from freezing and obstructing A/C system air flow.

OPERATION

The probe is used to switch the clutch OFF before evaporator freeze-up occurs. Output from the probe is sampled by the Body Control Module (BCM). The clutch is switched OFF when the probe temperature reaches 1.1° C (34° F). It is allowed to switch ON when the probe temperature reaches 2.2° C (36° F).

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the HVAC housing from the vehicle(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL).

(3) Disassemble the HVAC housing(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - DISASSEMBLY).

(4) Carefully pull the probe out of the evaporator core.

INSTALLATION

(1) Install the new probe into the evaporator.

NOTE: The new probe must not go into the same hole (in the evaporator core) that the old probe was removed from.

(2) Reassemble the HVAC housing(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY).

(3) Reinstall the HVAC assembly in the vehicle(Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION).

(4) Reconnect the battery negative cable.

DISTRIBUTION

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AIR OUTLETS

REMOVAL

The driver side, and passenger side panel outlets are available for service. The center outlets are only serviced as part of the instrument cluster center bezel unit.

(1) Remove the instrument panel top pad from the instrument panel. Refer to Instrument Panel System for the procedures.

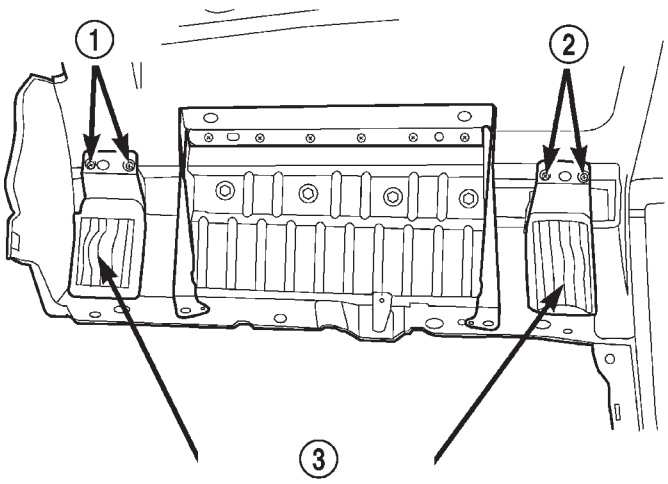
(2) Remove the two screws that secure each outlet to the backside of the instrument panel top pad (Fig. 1).

(3) Remove the outlet from the top pad.

INSTALLATION

(1) Fasten the outlet to the top pad. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(2) Install the instrument panel top pad on the instrument panel. Refer to Instrument Panel System for the procedures.



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Fig. 1 PANEL OUTLETS (PASSENGER SIDE)

1 - MOUNTING SCREWS
2 - MOUNTING SCREWS
3 - PANEL OUTLETS

BLOWER MOTOR

DESCRIPTION

The blower motor and blower wheel are located in the passenger side end of the HVAC housing, below the glove box module. The blower motor controls the velocity of the air flowing through the HVAC housing by spinning a squirrel cage-type blower wheel within the housing at the selected speed. The blower motor and blower wheel can be serviced from the passenger compartment side of the housing.

OPERATION

The blower motor will only operate when the ignition switch is in the On position, and the a/c heater mode control switch is in any position, except off. The blower motor circuit is protected by a fuse in the junction block. On models with the standard manual temperature control system, the blower motor speed is controlled by regulating the battery feed through the blower motor switch and the blower motor resistor. On models with the optional Automatic Zone Control (AZC) system, the blower motor speed is controlled by using Pulse Width Modulation (PWM). The blower motor controller adjusts the battery feed voltage to the blower motor, based upon an input from the blower motor switch, through the AZC control module. Pulse width modulation of blower power allows the blower to operate at any speed from stationary, to full speed.

The blower motor and blower motor wheel cannot be repaired, and if faulty or damaged, they must be replaced. The blower motor and blower wheel are each serviced separately.

DIAGNOSIS AND TESTING - BLOWER MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

For circuit descriptions and diagrams, refer to the appropriate wiring information. Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor circuit wiring or wire harness connections
- Faulty blower motor resistor (if the vehicle is so equipped)
- Faulty blower motor controller (if the vehicle is so equipped)
- Faulty blower motor switch
- Faulty a/c heater mode control switch
- Faulty blower motor.

Possible causes of the blower motor not operating in all speeds include:

- Faulty fuse
- Faulty blower motor switch
- Faulty blower motor resistor (if the vehicle is so equipped)
- Faulty blower motor controller (if the vehicle is so equipped)
- Faulty AZC module (if the vehicle is so equipped)
- Faulty blower motor circuit wiring or wire harness connections.

VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or bent
- Blower motor faulty.

NOISE

To verify that the blower is the source of the noise, unplug the blower motor wire harness connector and operate the HVAC system. If the noise goes away, possible causes include:

- Foreign material in the HVAC housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

BLOWER MOTOR (Continued)

(1) Disconnect and isolate the battery negative cable.

(2) Pinch the connector retainer and unplug the blower motor wire harness from the blower motor (Fig. 2).

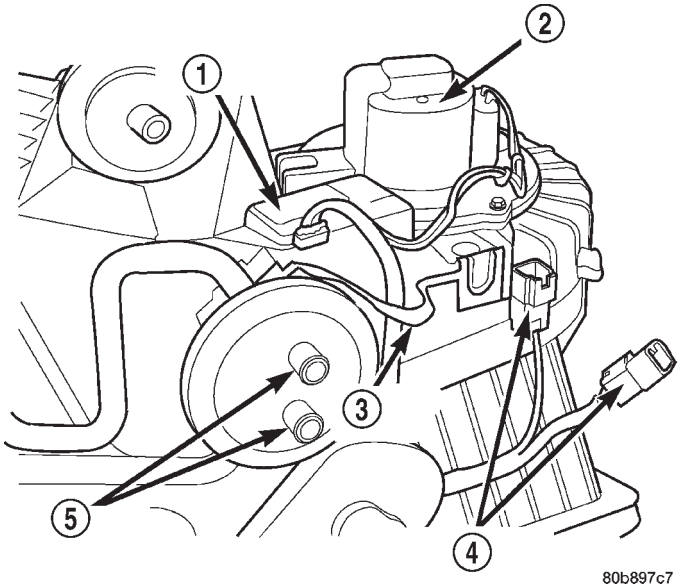


Fig. 2 BLOWER MOTOR (HOUSING REMOVED FROM VEHICLE)

1 - BLOWER MOTOR RESISTOR
2 - BLOWER MOTOR
3 - GROUND STRAP
4 - ELECTRICAL CONNECTORS
5 - HEATER CORE TUBES

(3) Remove the three screws that secure the blower motor and blower wheel assembly to the HVAC housing, using either a T-25 Torx® head or flat-bladed screwdriver.

(4) Lower the blower motor and wheel from the HVAC housing.

(5) Remove the blower wheel retainer clip (Fig. 3).

(6) Remove the wheel from the blower motor shaft.

INSTALLATION

(1) Press the blower wheel hub onto the blower motor shaft. Be sure the flat on the blower motor shaft is indexed to the flat on the inside of the blower wheel hub.

(2) Install the retainer clip over the blower wheel hub.

(3) Install the blower motor in the HVAC housing with three mounting screws. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(4) Plug the blower motor wire harness connector into the blower motor socket.

(5) Connect the battery negative cable.

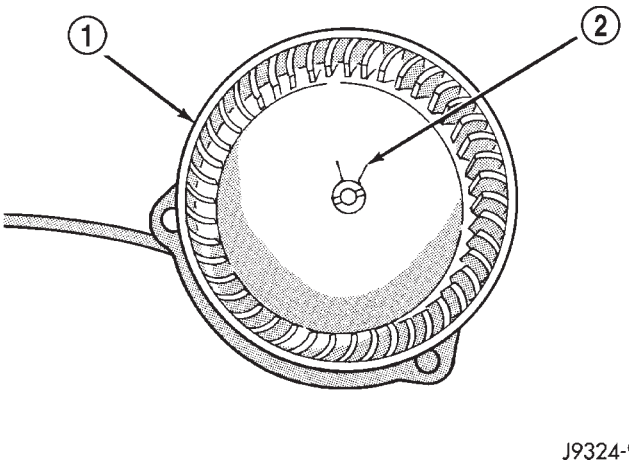


Fig. 3 BLOWER MOTOR WHEEL REMOVE/INSTALL

1 - BLOWER MOTOR WHEEL
2 - RETAINER CLIP

DEFROSTER DUCTS

REMOVAL

(1) Remove the instrument panel assembly from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(2) Remove the three screws that secure the defroster duct to the HVAC unit housing (Fig. 4).

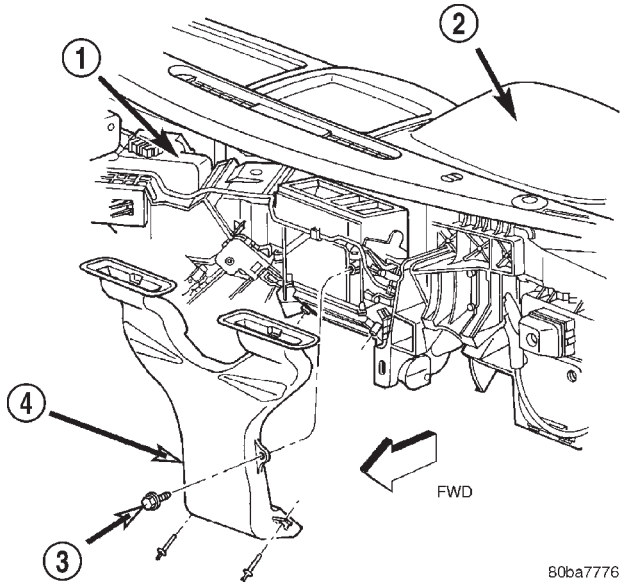


Fig. 4 HVAC DEFROSTER DUCT

1 - HVAC UNIT HOUSING
2 - INSTRUMENT PANEL
3 - SCREWS
4 - DEFROSTER DUCT

(3) Remove the defroster duct from the HVAC unit housing.

DEFROSTER DUCTS (Continued)

INSTALLATION

(1) Install the defroster duct on the HVAC unit housing.

(2) Install the three screws that secure the defroster duct to the HVAC unit housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Install the instrument panel assembly in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

FLOOR DISTRIBUTION DUCTS

REMOVAL

(1) To remove the driver side floor duct from the vehicle, remove the knee blocker panel for access to attaching screw. See Instrument Panel System for the procedures.

(2) The passenger side floor duct fastener can be accessed under the right-center instrument panel.

(3) Remove the screw that secures the floor duct(s) to the HVAC housing (Fig. 5).

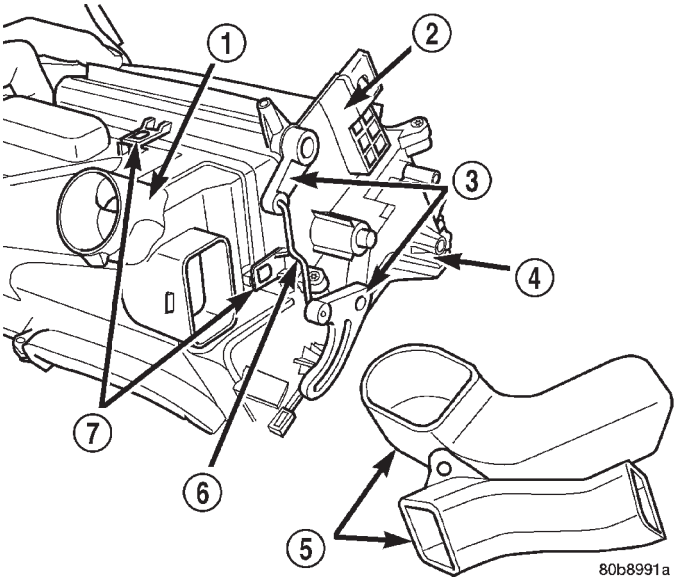


Fig. 5 FLOOR DUCTS (HOUSING REMOVED)

1 - FLOOR DUCT ADAPTER
2 - HEAT/DEFROST DOOR SUB-ASSEMBLY
3 - DOOR LEVERS
4 - LOWER HOUSING
5 - FLOOR DUCTS
6 - LINKAGE
7 - RETAINING TABS

INSTALLATION

(1) Attach the floor duct(s) to the HVAC housing.

(2) Install the screw that secures the floor duct(s) to the HVAC housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Install the knee blocker panel. See Instrument Panel System for the procedures.

INSTRUMENT PANEL DUCTS

REMOVAL

(1) Remove the instrument panel top pad from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL TOP COVER - REMOVAL).

(2) Unsnap the duct extension(s) from the instrument panel structural duct assembly (Fig. 6).

(3) Remove the duct extension(s) from the instrument panel (Fig. 7).

INSTALLATION

(1) Connect the duct extension(s) to the instrument panel.

(2) Snap the duct extension(s) to the instrument panel structural duct assembly.

(3) Install the instrument panel top pad in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL/ INSTRUMENT PANEL TOP COVER - INSTALLATION).

REAR FLOOR HEAT DUCT

REMOVAL

(1) To remove the rear floor ducts from the vehicle, remove the knee blocker panels for access, and pull carpeting back.

(2) Pull the floor ducts from the HVAC housing (Fig. 8).

NOTE: The ductwork running from the HVAC housing rearward through the passenger compartment is molded into the carpeting, and must be replaced as a unit if damaged.

INSTALLATION

(1) Attach the floor ducts to the HVAC housing.

(2) Install the knee blocker panels.

(3) Install the carpeting back in its original position.

REAR FLOOR HEAT DUCT (Continued)

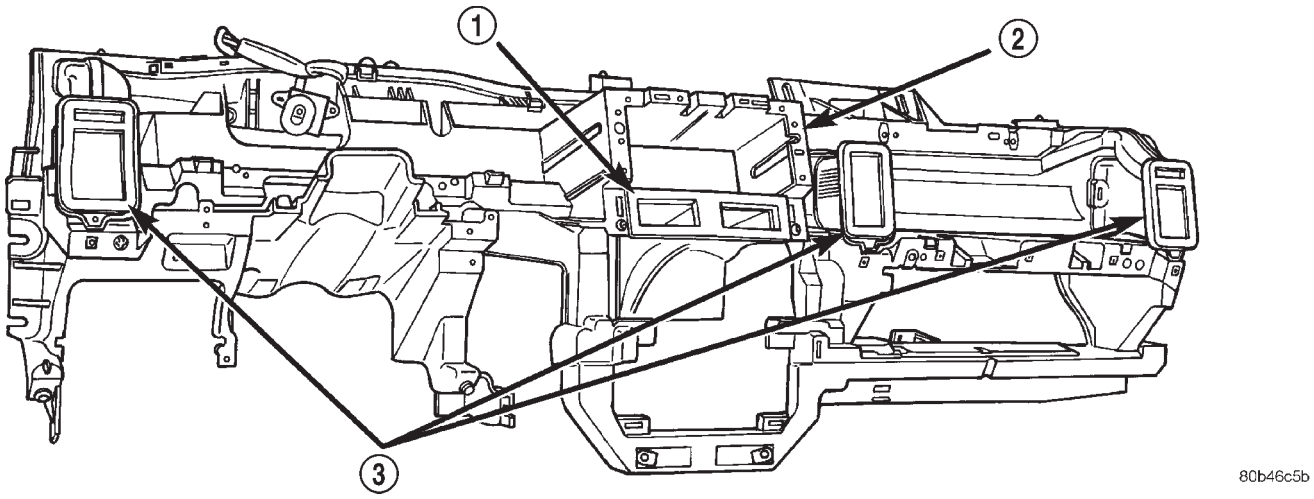


Fig. 6 INSTRUMENT PANEL STRUCTURAL DUCT ASSEMBLY

1 - CENTER DUCT
2 - INSTRUMENT PANEL STRUCTURAL DUCT ASSEMBLY
3 - PANEL DUCT EXTENSIONS

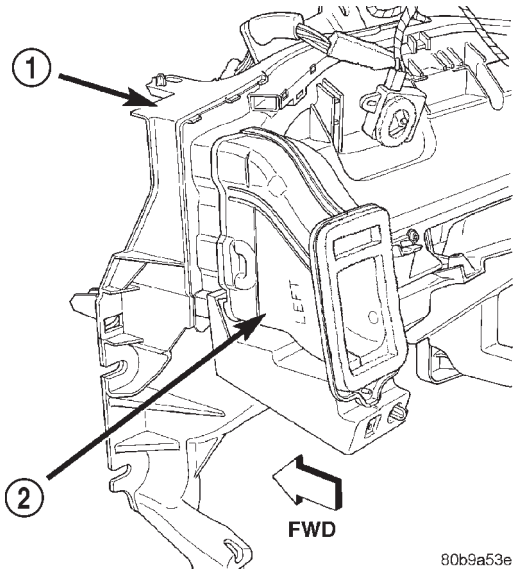


Fig. 7 INSTRUMENT PANEL DUCT EXTENSION

1 - INSTRUMENT PANEL STRUCTURAL DUCT ASSEMBLY
2 - PANEL DUCT EXTENSION

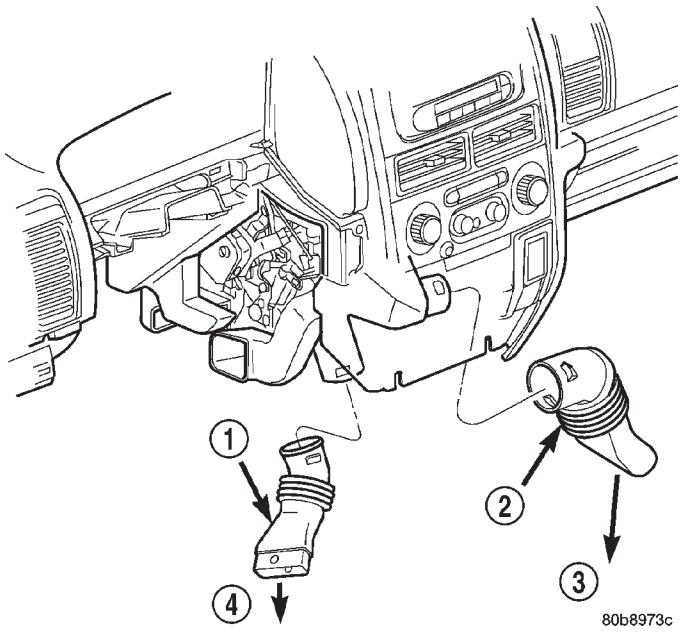


Fig. 8 REAR FLOOR DUCTS

1 - LEFT REAR PASSENGER FLOOR AIR DUCT
2 - RIGHT REAR PASSENGER FLOOR AIR DUCT
3 - TO CARPET DUCT
4 - TO CARPET DUCT

HVAC HOUSING

REMOVAL

The HVAC housing assembly must be removed from the vehicle and the two halves of the housing separated for service access of the heater core, evaporator coil, blend door(s), and each of the various mode doors.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN PLUMBING BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - REMOVAL).

(3) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(4) Disconnect the liquid line refrigerant line from the evaporator inlet tube(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LIQUID LINE - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/LIQUID LINE - REMOVAL). Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Disconnect the suction line refrigerant line from the evaporator outlet tube(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/SUCTION LINE - REMOVAL), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/SUCTION LINE - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/SUCTION LINE - REMOVAL). Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Disconnect the heater hoses from the heater core tubes. Clamp off the heater hoses to prevent loss of coolant. Refer to Cooling for the procedures. Install plugs in, or tape over the opened heater core tubes.

(7) If the vehicle is equipped with the manual temperature control system, unplug the HVAC system vacuum supply line connector from the tee fitting near the heater core tubes.

(8) Remove the coolant reserve/overflow bottle from the passenger side inner fender shield. Refer to Cooling for the procedures.

(9) Remove the Powertrain Control Module (PCM) from the passenger side dash panel in the engine compartment and set it aside. Do not unplug the PCM wire harness connectors. Refer to Electronic Control Modules for the procedures.

(10) Remove the nuts from the HVAC housing mounting studs on the engine compartment side of the dash panel (Fig. 9).

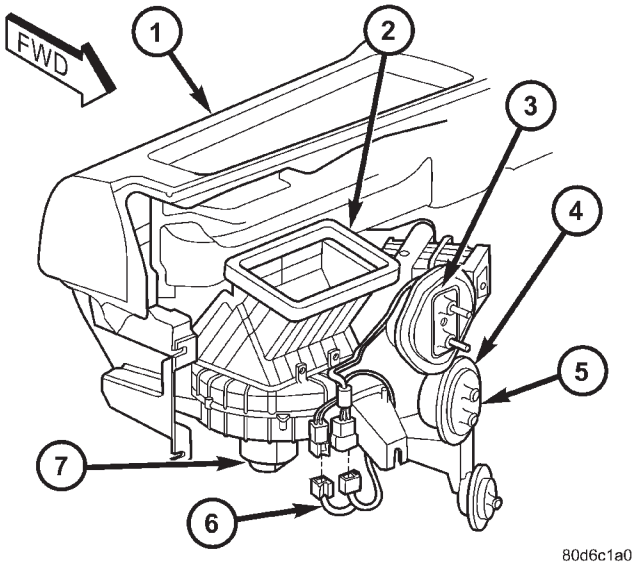


Fig. 9 HVAC Housing - (rear view)

1 - Instrument Panel
2 - Air Intake
3 - Expansion Valve
4 - HVAC Housing
5 - Heater Core Input/Output Ports
6 - Instrument Panel Wiring Harness
7 - Blower Motor

(11) Remove the rear floor heat ducts from the floor heat duct outlets (Fig. 10).

(12) Unplug the HVAC housing wire harness connectors.

(13) Remove the HVAC housing mounting nuts from the studs on the passenger compartment side of the dash panel (Fig. 11).

HVAC HOUSING (Continued)

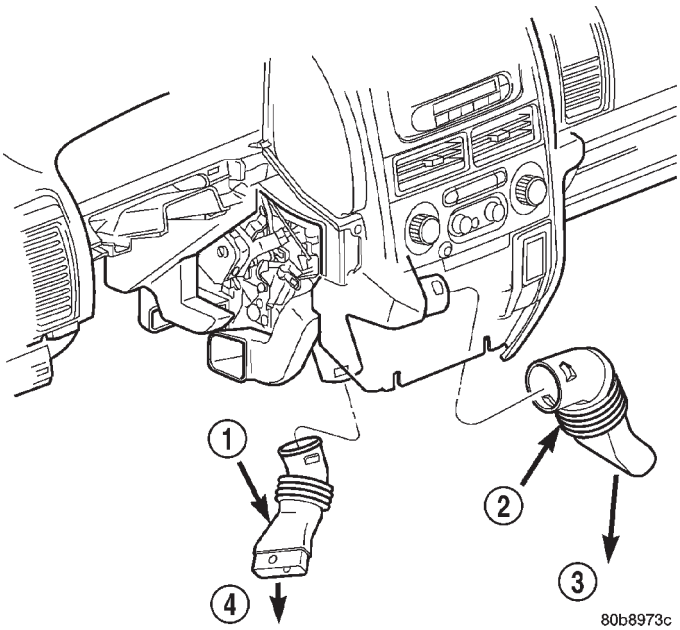


Fig. 10 REAR FLOOR DUCTS

1 - LEFT REAR PASSENGER FLOOR AIR DUCT
2 - RIGHT REAR PASSENGER FLOOR AIR DUCT
3 - TO CARPET DUCT
4 - TO CARPET DUCT

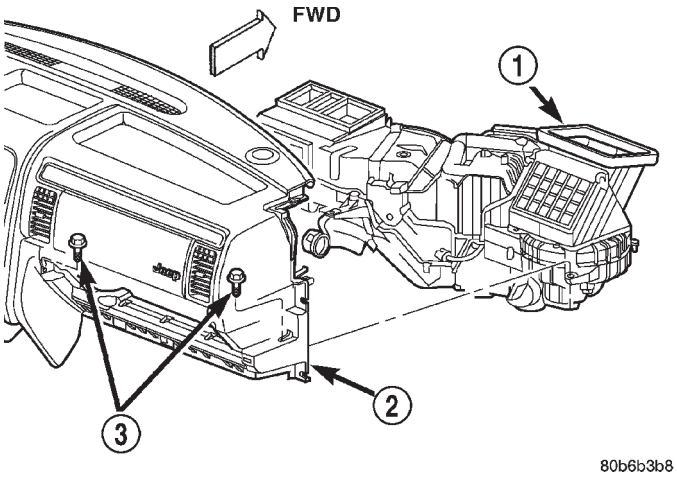


Fig. 11 Passenger Side Instrument Panel to Heater-A/C Housing Mounting

1 - HEATER AND AIR CONDITIONER HOUSING
2 - INSTRUMENT PANEL STRUCTURAL DUCT
3 - SCREW (2)

(14) Remove the HVAC housing from the vehicle, ensuring that the interior is covered in case of loss of fluids.

DISASSEMBLY

(1) Remove the HVAC housing from the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Place the HVAC housing with the tubing side down on a work bench, making allowance for leakage of fluids.

(3) Using a sharp knife, split the foam seal surrounding the panel outlet opening, at the dividing line of the upper and lower cases (Fig. 12).

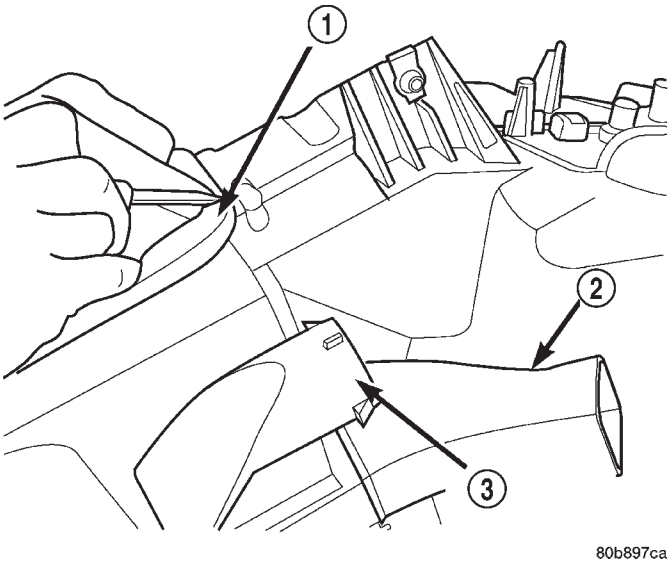


Fig. 12 SPLIT FOAM SEAL AT PANEL OUTLET

1 - ONE PIECE FOAM SEAL
2 - FLOOR DUCT
3 - TO REAR PASSENGER FLOOR AIR DUCT

(4) Place the HVAC housing in the upright position on the work bench.

(5) Remove the mode door actuator on the left side of the housing, which controls the mode door in the top of the case (Fig. 13) (Fig. 14).

(6) Remove the screw with plastic washer holding the lever assembly to the upper case section, and move aside (Fig. 15).

(7) Remove the 5 clips that secure the two housing halves to each other. There are 2 on either side at the center, and 1 located at the forward end of the mode door side of the case (Fig. 16).

HVAC HOUSING (Continued)

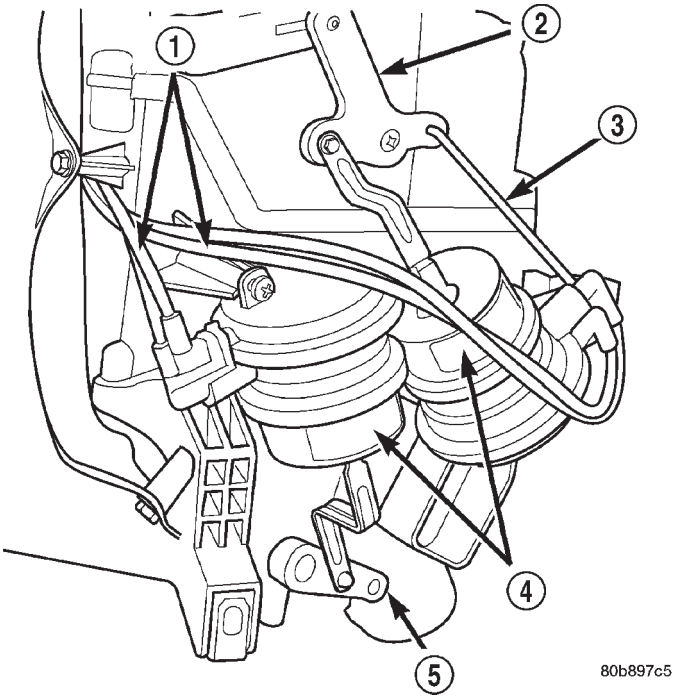


Fig. 13 MODE DOOR ACTUATORS - MANUAL SYSTEM

1 - VACUUM LINES
2 - ACTUATING LEVERS
3 - LINKAGE
4 - VACUUM ACTUATORS
5 - ACTUATING LEVER

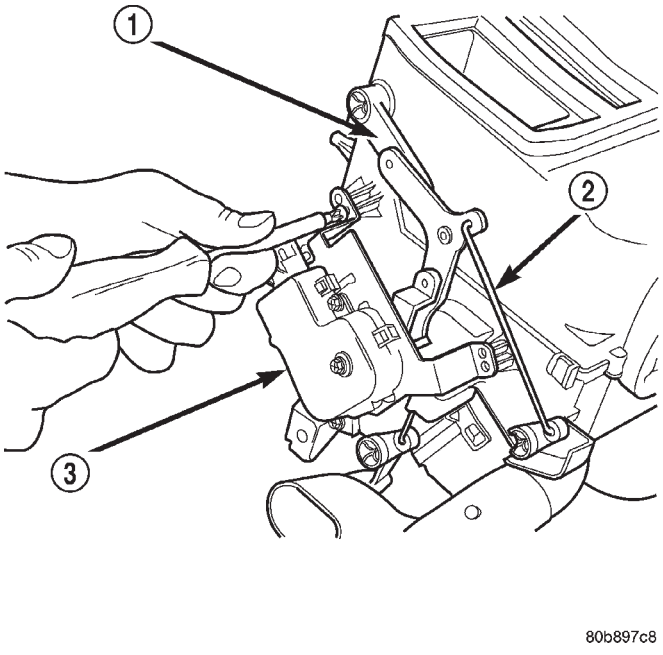


Fig. 14 MODE DOOR ACTUATOR - AZC SYSTEM

1 - LEVER ASSEMBLY
2 - LINKAGE
3 - ELECTRIC ACTUATOR

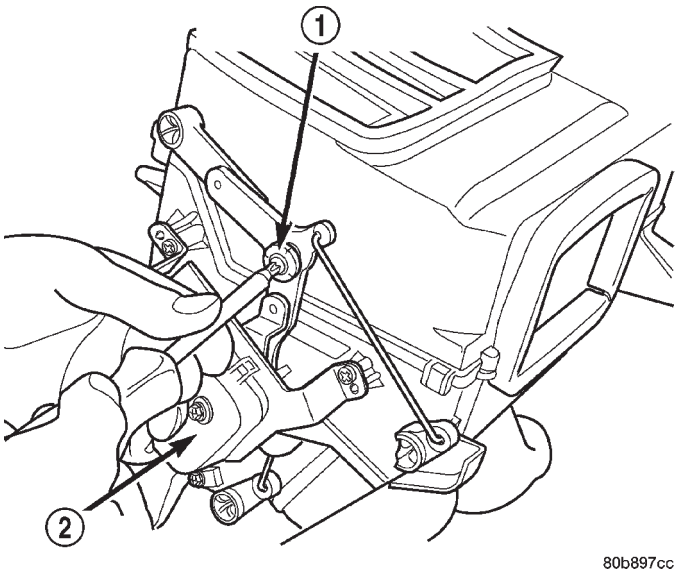


Fig. 15 REMOVE SCREW WITH PLASTIC WASHER

1 - SCREW WITH PLASTIC WASHER
2 - ELECTRIC ACTUATOR

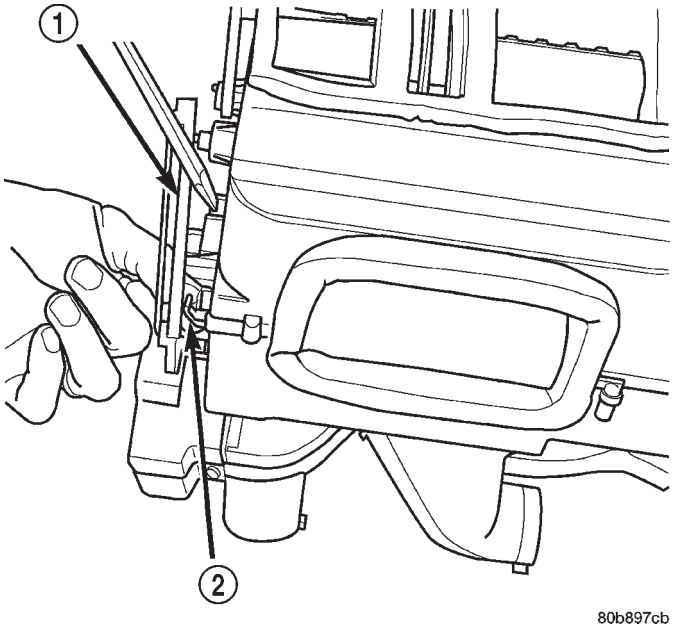


Fig. 16 HVAC HOUSING CLIPS

1 - ACTUATING LEVERS AND LINKAGE
2 - HOUSING CLIP

(8) Release the wire harness electrical connector(s) from the mounts on the lower case at the blower motor end of the unit (Fig. 17).

HVAC HOUSING (Continued)

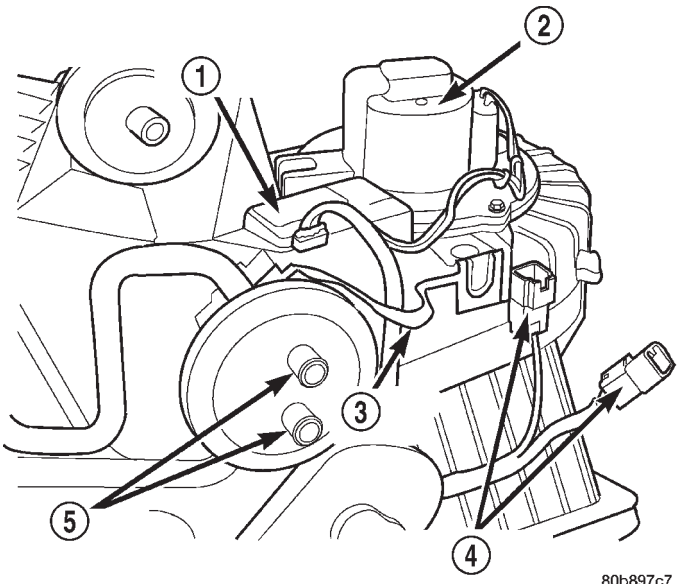


Fig. 17 WIRE HARNESS ELECTRICAL CONNECTOR(S)

1 - BLOWER MOTOR RESISTOR
2 - BLOWER MOTOR
3 - GROUND STRAP
4 - ELECTRICAL CONNECTORS
5 - HEATER CORE TUBES

(9) Remove the 10 screws that secure the two housing halves to each other.

(10) Separate the top half of the HVAC housing from the bottom half (Fig. 18).

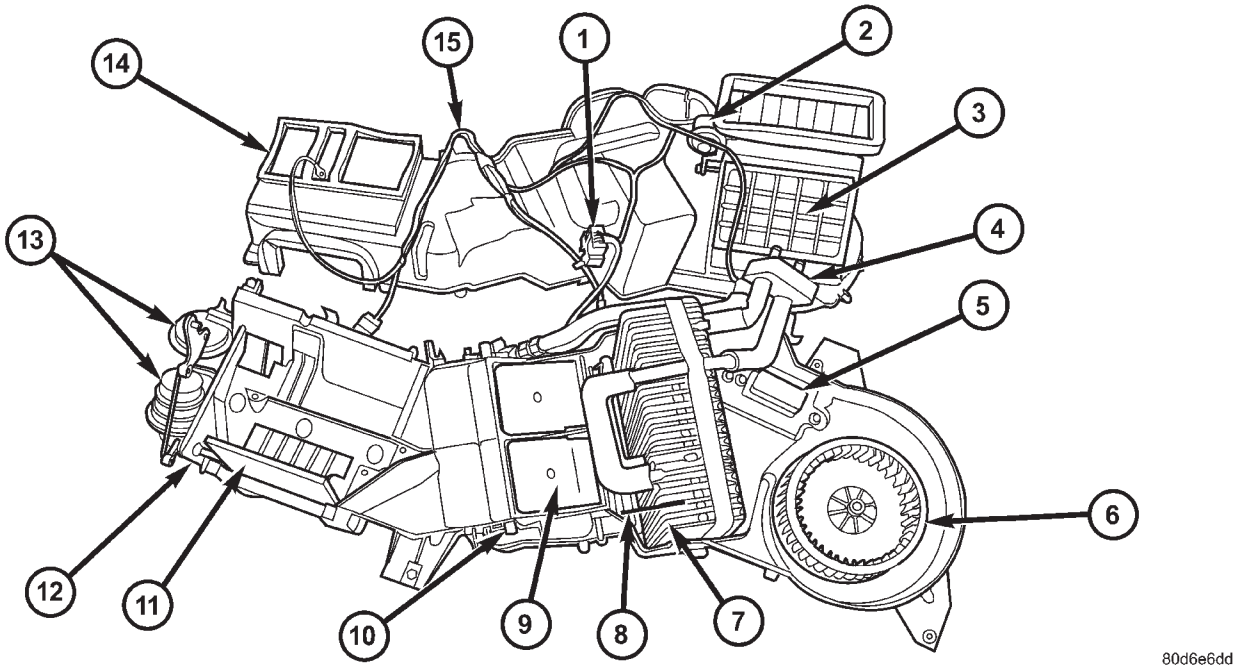


Fig. 18 HVAC HOUSING- CASE SEPARATED

1 - ELECTRICIAL CONNECTORS
2 - VACUUM ACTUATOR
3 - RECIRCULATION DOOR
4 - THERMAL EXPANSION VALVE
5 - BLOWER MOTOR RESISTOR/CONTROLLER
6 - BLOWER WHEEL
7 - EVAPORATOR AND TUBES
8 - FIN SENSOR PROBE
9 - BLEND DOOR
10 - PIVOT SHAFT (MOTOR REMOVED)
11 - PANEL/OUTLET DOOR
12 - LOWER HOUSING
13 - VACUUM ACTUATORS
14 - UPPER HOUSING
15 - VACUUM HARNESS

HVAC HOUSING (Continued)

NOTE: The blend door sub-assembly is attached to the housing with 2 screws, and may be removed for service (Fig. 19).

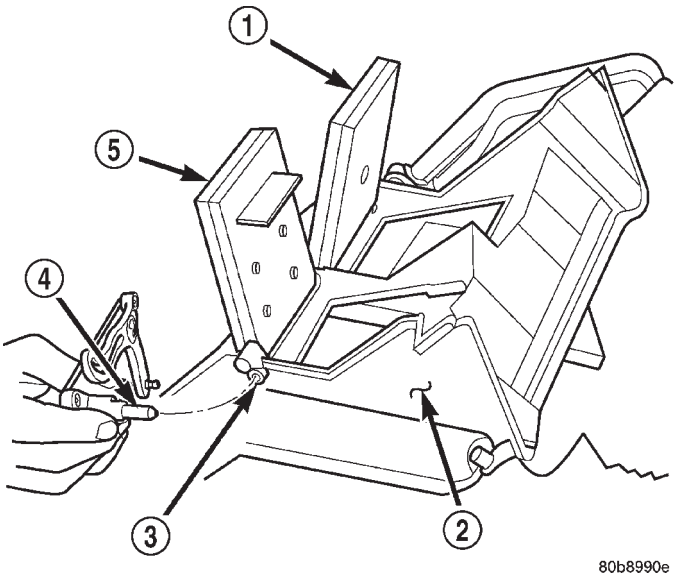


Fig. 19 BLEND DOOR SUB-ASSEMBLY (AZC)

1 - PASSENGER SIDE BLEND DOOR
2 - BLEND DOOR SUB-ASSEMBLY
3 - DOOR PIVOT SHAFT BUSHING
4 - DOOR SHAFT LEVER
5 - DRIVER SIDE BLEND DOOR

ASSEMBLY

(1) Place the top half of the HVAC housing on the bottom half. Be certain that each of the door pivot pins align with the pivot holes in the HVAC housing.

(2) Install the 10 screws that secure the two housing halves to each other. Tighten the HVAC housing screws to 2.2 N·m (20 in. lbs.).

(3) Attach the wire harness electrical connector(s) to the mounts on the lower case at the blower motor end of the unit.

(4) Install the 5 clips that secure the two housing halves to each other. Check doors for binding after replacement, and after assembly of housing.

(5) Install the screw with plastic washer holding the lever assembly to the upper case section.

(6) Install the mode door actuator on the left side of the housing.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN PLUMBING BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Position the HVAC housing to the dash panel. Be certain that the evaporator condensate drain tube and the housing mounting studs are inserted into their correct mounting holes.

(2) Install the HVAC housing mounting nuts to the studs on the passenger compartment side of the dash panel. Tighten the nuts to 4.5 N·m (40 in. lbs.).

(3) Connect the HVAC housing wire harness connectors.

(4) Reinstall the rear floor heat ducts to the center floor heat duct outlets.

(5) Install and tighten the nuts onto the HVAC housing mounting studs on the engine compartment side of the dash panel. Tighten the nuts to 7 N·m (60 in. lbs.).

(6) Reinstall the PCM to the passenger side dash panel in the engine compartment. Refer to Electronic Control Modules for the procedures.

(7) Reinstall the coolant reserve/overflow bottle to the passenger side inner fender shield. Refer to Cooling for the procedures.

(8) If the vehicle is equipped with the manual temperature control system, connect the HVAC system vacuum supply line connector to the tee fitting near the heater core tubes.

(9) Unclamp/unplug the heater core hoses and tubes. Connect the heater hoses to the heater core tubes and fill the engine cooling system. Refer to Cooling for the procedures.

(10) Unplug or remove the tape from the suction line and the evaporator outlet tube fittings. Connect the suction line to the evaporator outlet tube. Tighten retaining nut to 28 N·m (250 in. lbs.).

(11) Unplug or remove the tape from the liquid line and the evaporator inlet tube fittings. Connect the liquid line to the evaporator inlet tube. Tighten retaining nut to 28 N·m (250 in. lbs.).

(12) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -

HVAC HOUSING (Continued)

STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(13) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(14) Install the instrument panel in the vehicle(Refer to 23 - BODY/INSTRUMENT PANEL - INSTALLATION).

(15) Connect the battery negative cable.

(16) Start the engine and check for proper operation of the heating and air conditioning systems.

BLEND DOOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Remove evaporator from lower case to ease access to plastic door shaft bushing.

(3) Pinch the retention tabs holding the blend door pivot shaft to the case. The 3 plastic tabs, located on the inside of the case, are part of the shaft retainer.

(4) Remove door(s).

INSTALLATION

(1) Install the blend door(s) by snapping the pivot shaft into the HVAC case.

(2) Install the evaporator in the lower case.

(3) Reassemble the HVAC housing and install in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

NOTE: The blend door sub-assembly is attached to the housing with 2 screws, and may be removed for service (Fig. 20).

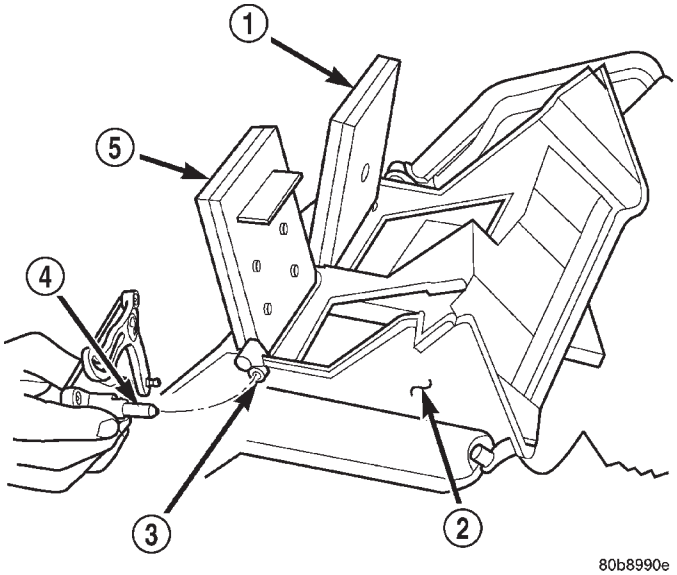


Fig. 20 BLEND DOOR SUB-ASSEMBLY

1 - PASSENGER SIDE BLEND DOOR
2 - BLEND DOOR SUB-ASSEMBLY
3 - DOOR PIVOT SHAFT BUSHING
4 - DOOR SHAFT LEVER
5 - DRIVER SIDE BLEND DOOR

MODE DOOR

REMOVAL

REMOVAL - PANEL OUTLET DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

MODE DOOR (Continued)

(2) Pinch the retention tabs holding the panel outlet door pivot shaft to the case. The 3 plastic tabs, located on the inside of the case, are part of the shaft retainer (Fig. 21).

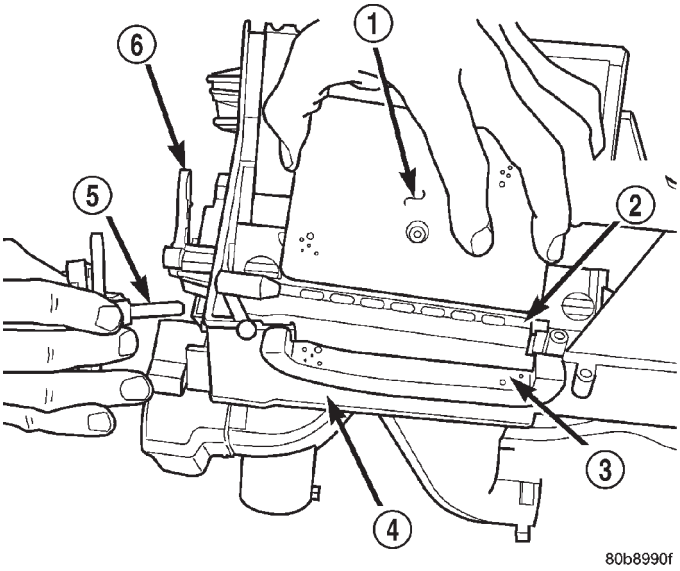


Fig. 21 PANEL OUTLET DOOR

1 - PANEL/OUTLET DOOR
2 - DOOR SHAFT
3 - FOAM SEAL (SPLIT)
4 - LOWER HOUSING
5 - PANEL OUTLET DOOR LEVER
6 - LEVER

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the panel outlet door pivot shaft retainer from the pivot shaft.

(4) Remove the panel outlet door from the HVAC housing.

REMOVAL - HEAT/DEFROST DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Remove the evaporator, and styrofoam tray from the lower case.

(3) Place the HVAC housing upside down on a work bench.

(4) Unscrew and remove the 2 floor heat ducts.

(5) Unsnap and remove the duct adapter from the bottom of the heat/defrost door sub-assembly (Fig. 22).

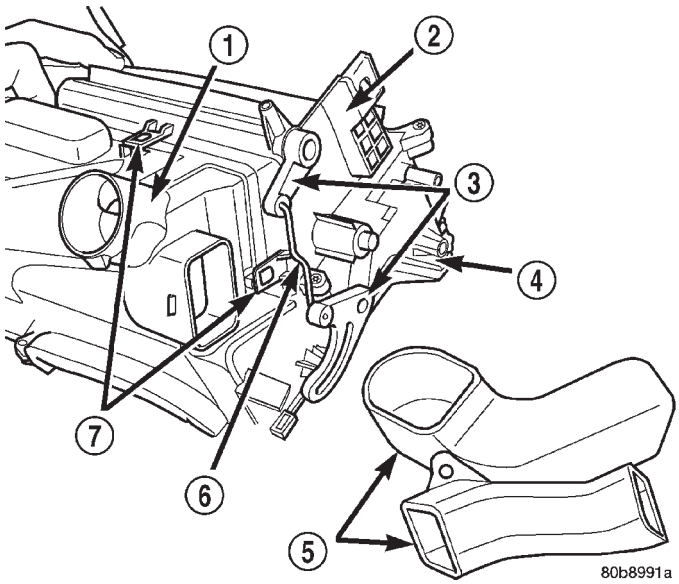


Fig. 22 HEAT/DEFROST DOOR DUCTS, AND ADAPTER

1 - FLOOR DUCT ADAPTER
2 - HEAT/DEFROST DOOR SUB-ASSEMBLY
3 - DOOR LEVERS
4 - LOWER HOUSING
5 - FLOOR DUCTS
6 - LINKAGE
7 - RETAINING TABS

(6) Gently pry the metal linkage from the heat/defrost door lever.

(7) Remove the heat/defrost door sub-assembly, which is attached to the housing with 4 screws (Fig. 23).

(8) Pinch the retention tabs holding the heat/defrost door pivot shaft lever to the case. The 3 plastic tabs, located on the inside of the case, are part of the shaft retainer.

(9) Remove the heat/defrost door (Fig. 24).

MODE DOOR (Continued)

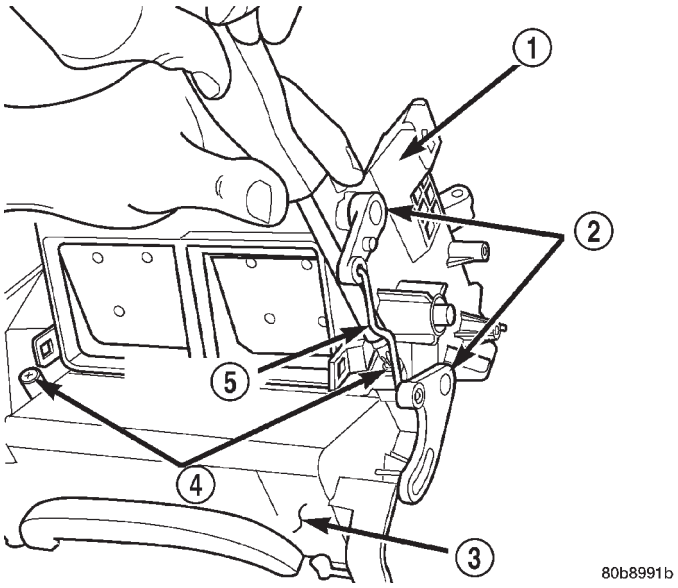


Fig. 23 HEAT/DEFROST DOOR SUB-ASSEMBLY REMOVAL

1 - HEAT/DEFROST DOOR SUB-ASSEMBLY
2 - LEVERS
3 - LOWER HOUSING
4 - SCREWS
5 - LINKAGE

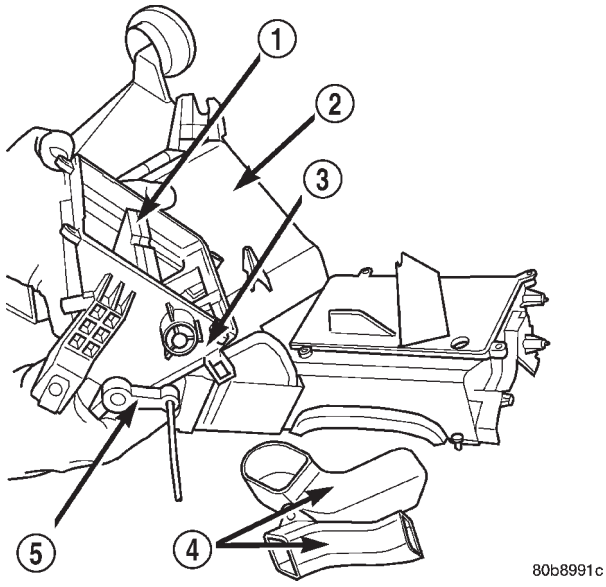


Fig. 24 HEAT/DEFROST DOOR REMOVAL

1 - HEAT/DEFROST DOOR
2 - LOWER HOUSING
3 - HEAT/DEFROST DOOR SUB-ASSEMBLY
4 - FLOOR DUCTS
5 - DOOR LEVER

REMOVAL - PANEL/DEFROST DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the HVAC housing. See HVAC Housing in this group for the procedures.

(2) Pinch the retention tabs holding the panel/defrost door pivot shaft to the case. The 3 plastic tabs, located on the inside of the case, are part of the shaft retainer (Fig. 25).

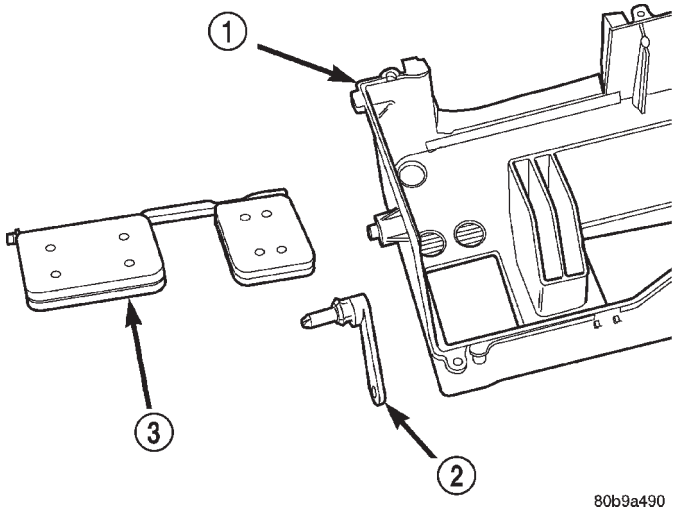


Fig. 25 PANEL/DEFROST DOOR

1 - UPPER HOUSING
2 - LEVER
3 - PANEL/DEFROST MODE DOOR

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the panel/defrost door pivot shaft retainer from the pivot shaft.

(4) Remove the panel/defrost door from the HVAC housing.

MODE DOOR (Continued)

INSTALLATION

INSTALLATION - PANEL OUTLET DOOR

(1) Snap the panel outlet door pivot shaft retainer on the pivot shaft.

(2) Attach the panel outlet door pivot shaft to the HVAC case.

(3) Reassemble the HVAC housing and install in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

INSTALLATION - HEAT/DEFROST DOOR

(1) Install the heat/defrost door by snapping the heat/defrost door pivot shaft into the HVAC case.

(2) Install the heat/defrost door sub-assembly and tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Attach the metal linkage to the heat/defrost door lever.

(4) Snap the duct adapter to the bottom of the heat/defrost door sub-assembly.

(5) Install the 2 floor heat ducts and tighten the mounting screws to 2.2 N·m (20 in. lbs.)..

(6) Install the evaporator, and styrofoam tray in the lower case.

(7) Reassemble the HVAC housing and install in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

INSTALLATION - PANEL/DEFROST DOOR

(1) Snap the panel/defrost door pivot shaft retainer on the pivot shaft.

(2) Attach the panel/defrost door pivot shaft to the HVAC case.

(3) Reassemble the HVAC housing and install in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

RECIRCULATION DOOR

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove the HVAC housing from the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Place the HVAC housing right side up on the work bench.

(3) Unplug the wire/vacuum connector from the recirculation door actuator.

(4) Remove the 2 screws fastening the recirculation door sub-assembly to the main housing (Fig. 26).

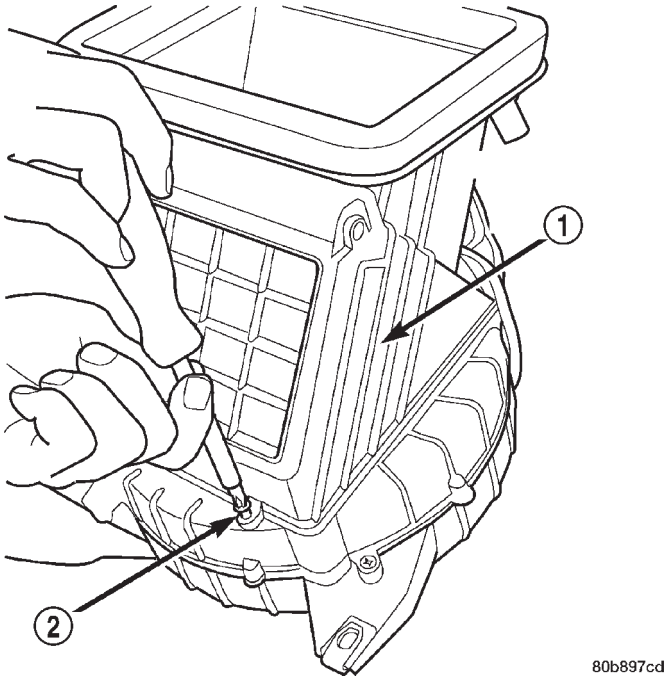


Fig. 26 RECIRCULATION DOOR HOUSING

1 - RECIRCULATION DOOR HOUSING
2 - ATTACHING SCREWS

RECIRCULATION DOOR (Continued)

(5) Raise the front of the door sub-assembly while releasing the 2 tabs holding the rear to the main housing, and remove the recirculation door housing.

(6) Remove the electric/vacuum actuator from the recirculation door sub-assembly and set aside.

(7) Pinch the retention tabs holding the recirculation door pivot shaft to the case. The 3 plastic tabs, located on the inside of the case, are part of the shaft retainer.

(8) Remove the recirculation door from the recirculation air door housing.

INSTALLATION

(1) Install the recirculation door in the recirculation air door housing by snapping the pivot shaft retention tabs into the case.

(2) Install the electric/vacuum actuator on the recirculation door sub-assembly. Check door for binding after replacement.

(3) Install the recirculation door housing on the HVAC case and tighten the 2 screws to 2.2 N·m (20 in. lbs.).

(4) Plug in the wire/vacuum connector to the recirculation door actuator.

(5) Install the HVAC housing in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

PLUMBING

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PLUMBING

DESCRIPTION - REFRIGERANT LINE

The refrigerant lines and hoses are used to carry the refrigerant between the various air conditioning system components. A barrier hose design with a nylon tube, which is sandwiched between rubber layers, is used for the R-134a air conditioning system on this vehicle. This nylon tube helps to further contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant hoses are made from lightweight aluminum or steel, and commonly use braze-less fittings.

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

OPERATION - REFRIGERANT LINE

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

WARNING

WARNING: THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT UNDER HIGH PRESSURE. SEVERE PERSONAL INJURY MAY RESULT FROM IMPROPER SERVICE PROCEDURES. REPAIRS SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.
AVOID BREATHING THE REFRIGERANT AND REFRIGERANT OIL VAPOR OR MIST. EXPOSURE MAY IRRITATE THE EYES, NOSE, AND/OR THROAT. WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM DIRECT CONTACT WITH THE REFRIGERANT. IF EYE CONTACT OCCURS, SEEK MEDICAL ATTENTION IMMEDIATELY.
DO NOT EXPOSE THE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC LEAK DETECTOR IS RECOMMENDED.
IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE THE WORK AREA BEFORE RESUMING SERVICE. LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.
THE EVAPORATION RATE OF R-134a REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT THE SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH THE REFRIGERANT.
THE R-134a SERVICE EQUIPMENT OR THE VEHICLE REFRIGERANT SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR AND R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS, AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.

PLUMBING (Continued)

CAUTION

CAUTION

CAUTION: Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with the service equipment being used.
Never add R-12 to a refrigerant system designed to use R-134a. Damage to the system will result.
R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible.
Do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.
Do not overcharge the refrigerant system. This will cause excessive compressor head pressure and can cause noise and system failure.
Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.
The refrigerant system must always be evacuated before charging.
Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system.
Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.
Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.
Before connecting an open refrigerant fitting, always install a new seal or gasket. Coat the fitting and seal with clean refrigerant oil before connecting.
Do not remove the sealing caps from a replacement component until it is to be installed.
When installing a refrigerant line, avoid sharp bends that may restrict refrigerant flow. Position the refrigerant lines away from exhaust system components or any sharp edges, which may damage the line.
Tighten refrigerant fittings only to the specified torque. The aluminum fittings used in the refrigerant system will not tolerate overtightening.
When disconnecting a refrigerant fitting, use a wrench on both halves of the fitting. This will prevent twisting of the refrigerant lines or tubes.
Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.
Keep service tools and the work area clean. Contamination of the refrigerant system through careless work habits must be avoided.

REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

There are two types of refrigerant fittings:

- All fittings with O-rings need to be coated with refrigerant oil before installation. Use only O-rings that are the correct size and approved for use with R-134a refrigerant. Failure to do so may result in a leak.
- Unified plumbing connections with gaskets cannot be serviced with O-rings. The gaskets are not reusable and new gaskets do not require lubrication before installing.

Using the proper tools when making a refrigerant plumbing connection is very important. Improper tools or improper use of the tools can damage the refrigerant fittings. Always use two wrenches when loosening or tightening tube fittings. Use one wrench to hold one side of the connection stationary, while loosening or tightening the other side of the connection with a second wrench.

The refrigerant must be recovered completely from the system before opening any fitting or connection. Open the fittings with caution, even after the refrigerant has been recovered. If any pressure is noticed as a fitting is loosened, tighten the fitting and recover the refrigerant from the system again.

Do not discharge refrigerant into the atmosphere. Use an R-134a refrigerant recovery/recycling device that meets SAE Standard J2210.

The refrigerant system will remain chemically stable as long as pure, moisture-free R-134a refrigerant and refrigerant oil is used. Dirt, moisture, or air can upset this chemical stability. Operational troubles or serious damage can occur if foreign material is present in the refrigerant system.

When it is necessary to open the refrigerant system, have everything needed to service the system

PLUMBING (Continued)

ready. The refrigerant system should not be left open to the atmosphere any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are to be installed.

All tools, including the refrigerant recycling equipment, the manifold gauge set, and test hoses should be kept clean and dry. All tools and equipment must be designed for R-134a refrigerant.

DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

If the air conditioning system is not cooling properly, determine if the refrigerant system is fully-charged. (Refer to 24 - HEATING & AIR CONDITIONING - DIAGNOSIS AND TESTING - A/C PERFORMANCE)

An electronic leak detector designed for R-134a refrigerant is recommended for locating and confirming refrigerant system leaks. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

An oily residue on or near refrigerant system lines, connector fittings, components, or component seals can indicate the general location of a possible refrigerant leak. However, the exact leak location should be confirmed with an electronic leak detector prior to component repair or replacement.

To detect a leak in the refrigerant system, perform one of the following procedures:

SYSTEM EMPTY

(1) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(2) Connect and dispense 0.283 kilograms (0.625 pounds or 10 ounces) of R-134a refrigerant into the evacuated refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(3) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(4) With the engine not running, use a electronic R-134a leak detector and search for leaks. Because R-134a refrigerant is heavier than air, the leak detector probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(5) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, the A/C button in the On position, and select the Recirculation Mode.

SYSTEM LOW

(1) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(2) Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run with the air conditioning system turned on for five minutes.

(3) With the engine not running, use a electronic R-134a leak detector and search for leaks. Because R-134a refrigerant is heavier than air, the leak detector probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(4) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, the A/C button in the On position, and select the Recirculation Mode.

STANDARD PROCEDURE

STANDARD PROCEDURE - REFRIGERANT SYSTEM SERVICE EQUIPMENT

WARNING: EYE PROTECTION MUST BE WORN WHEN SERVICING AN AIR CONDITIONING REFRIGERANT SYSTEM. TURN OFF (ROTATE CLOCKWISE) ALL VALVES ON THE EQUIPMENT BEING USED, BEFORE CONNECTING TO OR DISCONNECTING FROM THE REFRIGERANT SYSTEM. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

When servicing the air conditioning system, a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used. Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the

PLUMBING (Continued)

equipment manufacturer for proper care and use of this equipment.

A manifold gauge set may be needed with some recovery/recycling/charging equipment (Fig. 1). The service hoses on the gauge set being used should have manual (turn wheel), or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

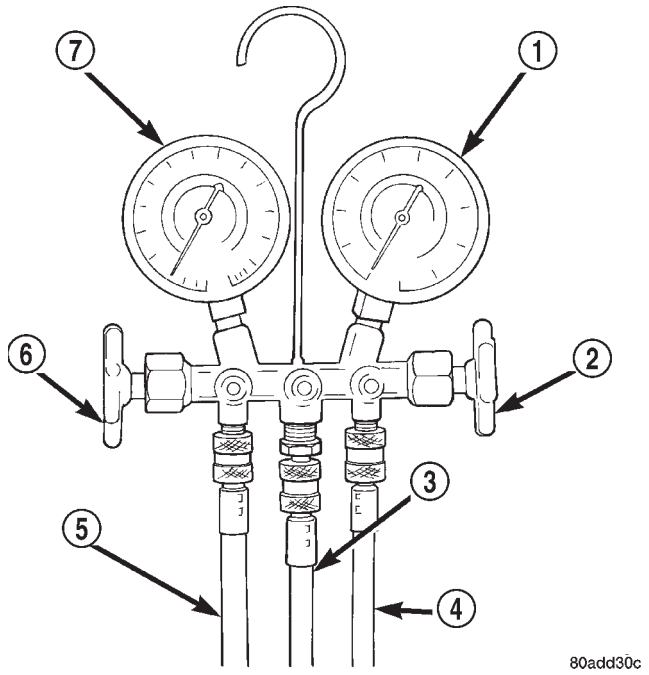


Fig. 1 MANIFOLD GAUGE SET - TYPICAL

1 - HIGH PRESSURE GAUGE
2 - VALVE
3 - VACUUM/REFRIGERANT HOSE (YELLOW W/ BLACK STRIPE)
4 - HIGH PRESSURE HOSE (RED W/ BLACK STRIPE)
5 - LOW PRESSURE HOSE (BLUE W/ BLACK STRIPE)
6 - VALVE
7 - LOW PRESSURE GAUGE

MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

LOW PRESSURE GAUGE HOSE The low pressure hose (Blue with Black stripe) attaches to the suction service port. This port is located on the suction line near the dash panel.

HIGH PRESSURE GAUGE HOSE The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the discharge line between the compressor and the condenser inlet.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

STANDARD PROCEDURE - REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to recover the refrigerant from an R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for the proper care and use of this equipment.

STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be charged. If moisture and air enters the system and becomes mixed with the refrigerant, the compressor head pressure will rise above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating the refrigerant system will remove the air and boil the moisture out of the system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 and a manifold gauge set to the refrigerant system of the vehicle.

(2) Open the low and high side valves and start the charging station vacuum pump. When the suction gauge reads 88 kPa (26 in. Hg.) vacuum or greater, close all of the valves and turn off the vacuum pump.

PLUMBING (Continued)

(a) If the refrigerant system fails to reach the specified vacuum, the system has a leak that must be corrected. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS)

(b) If the refrigerant system maintains the specified vacuum for five minutes, restart the vacuum pump, open the suction and discharge valves and evacuate the system for an additional ten minutes.

(3) Close all of the valves, and turn off the charging station vacuum pump.

(4) The refrigerant system is now ready to be charged with R-134a refrigerant. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

After the refrigerant system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS - CHARGE CAPACITY)

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

PARTIAL CHARGE METHOD

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

The partial charge method is used to add a partial charge to a refrigerant system that is low on refrigerant. To perform this procedure the evaporator inlet and outlet tube temperatures are measured. The temperature difference is measured with a temperature meter with one or two clamp-on thermocouple probes. The difference between the evaporator inlet and outlet tube temperatures will determine the amount of refrigerant needed.

Before adding a partial refrigerant charge, check for refrigerant system leaks. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - DIAGNOSIS AND TESTING - REFRIGERANT SYSTEM LEAKS) If a leak is found, make the necessary repairs before attempting a full or partial refrigerant charge.

(1) Attach a manifold gauge set to the refrigerant system service ports.

(2) Attach the two clamp-on thermocouple probes to the inlet and outlet tubes of the evaporator coil.

- If a single thermocouple probe is used, attach the probe to the evaporator inlet tube just before the collar of the refrigerant line connector fitting. The probe must make contact with the bottom surface of the evaporator inlet tube.
- If dual thermocouple probes are used, attach probe 1 to the evaporator inlet tube, and probe 2 to the evaporator outlet tube. Attach both probes to the evaporator tubes just before the collar of the refrigerant line connector fittings. The probes must make contact with the bottom surfaces of the evaporator inlet and outlet tubes.

(3) Open all of the windows or doors of the passenger compartment.

(4) Set the A/C button on the A/C Heater controls to the on position, the temperature control knob in the full cool position, select Recirculation Mode, and place the blower motor switch in the highest speed position.

(5) Start the engine and hold the engine idle speed at 1,000 rpm. Allow the engine to warm up to normal operating temperature.

(6) The compressor clutch may cycle, depending upon ambient temperature, humidity, and the refrigerant system charge level.

(7) Hold the engine idle speed at 1,000 rpm.

(8) Allow three to five minutes for the refrigerant system to stabilize, then record the temperatures of the evaporator inlet and outlet tubes.

- If a single probe is used, record the temperature of the evaporator inlet tube. Then remove the probe from the inlet tube and attach it to the evaporator outlet tube just before the collar of the refrigerant line connector fitting. The probe must make contact with the bottom surface of the evaporator outlet tube. Allow the thermocouple and meter time to stabilize, then record the temperature of the evaporator outlet tube. Subtract the inlet tube temperature reading from the outlet tube temperature reading.
- If dual probes are used, record the temperatures of both the evaporator inlet and outlet tubes. Then subtract the inlet tube temperature reading from the outlet tube temperature reading.

(9) If the measured temperature differential is higher than 22° C to 26° C (40° F to 47° F), add 0.4 kilograms (14 ounces) of refrigerant.

PLUMBING (Continued)

(10) Allow three to five minutes for the refrigerant system to stabilize, then take a second set of thermocouple measurements. Record the temperature difference to determine if an additional charge is required.

(11) Record the compressor discharge pressure. If the reading is higher than the pressure shown in the Compressor Discharge Pressure Chart, the system could be overcharged. If the reading is equal to, or lower, than the pressure shown in the chart, continue with this procedure.

Compressor Discharge Pressure Chart						
Ambient Temperature	16°C (60°F)	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Compressor Discharge Pressure	1378 kPa (200 psi)	1516 kPa (220 psi)	1723 kPa (250psi)	1930 kPa (280 psi)	2206 kPa (320 psi)	2413 kPa (350 psi)

(12) **EXAMPLE:** The ambient temperature is 21° C (70° F). The evaporator inlet tube temperature is 12° C (54° F) and the evaporator outlet tube temperature is 10° C (50° F). Subtract the inlet tube temperature from the outlet tube temperature. The difference is -2° C (-4° F). With a -2° C (-4° F) temperature differential at 21° C (70° F) ambient temperature, the system is fully charged.

(13) Add enough refrigerant to bring the refrigerant system up to a full charge.

(14) Remove the jumper wire from the low pressure cycling clutch switch wire harness connector and plug the connector back into the switch.

SPECIFICATIONS

CHARGE CAPACITY

The R-134a refrigerant system charge capacity for this vehicle is 0.765 kilograms (1.687 pounds/27 ounces).

A/C COMPRESSOR

DESCRIPTION

DESCRIPTION - A/C COMPRESSOR

The air conditioning system uses a Nippondenso 10PA17 ten cylinder, double-acting swash plate-type compressor on all models. This compressor has a fixed displacement of 170 cubic centimeters (10.374 cubic inches), and has both the suction and discharge ports located on the cylinder head. A label identifying the use of R-134a refrigerant is located on the compressor.

DESCRIPTION - HIGH PRESSURE RELIEF VALVE

A high pressure relief valve is located on the compressor manifold, which is on the side of the compressor. This mechanical valve is designed to vent refrigerant from the system to protect against damage to the compressor and other system components, caused by condenser air flow restriction or an overcharge of refrigerant.

OPERATION

OPERATION - A/C COMPRESSOR

The compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The compressor draws in low-pressure refrigerant vapor from the evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the condenser through the compressor discharge port.

The compressor cannot be repaired. If faulty or damaged, the entire compressor assembly must be replaced. The compressor clutch, pulley, and coil, are available for service.

OPERATION - HIGH PRESSURE RELIEF VALVE

The high pressure relief valve vents the system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The valve closes when a minimum discharge pressure of 2756 kPa (400 psi) is reached.

A/C COMPRESSOR (Continued)

The high pressure relief valve vents only enough refrigerant to reduce the system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the system. If the valve vents refrigerant, it does not mean that the valve is faulty.

The high pressure relief valve is a factory-calibrated unit. The valve cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the compressor assembly.

DIAGNOSIS AND TESTING - COMPRESSOR NOISE

When investigating an air conditioning related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during air conditioning operation can often be misleading. For example: What sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose compressor clutch assembly.

Drive belts are speed sensitive. At different engine speeds and depending upon belt tension, belts can develop noises that are mistaken for a compressor noise. Improper belt tension can cause a misleading noise when the compressor clutch is engaged, which may not occur when the compressor clutch is disengaged. Check the serpentine drive belt condition and tension as described in Cooling before beginning this procedure.

(1) Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise. Listen to the compressor while the clutch is engaged and disengaged. Probe the compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.

(2) Loosen all of the compressor mounting hardware and retighten. Tighten the compressor clutch mounting nut. Be certain that the clutch coil is mounted securely to the compressor, and that the clutch plate and pulley are properly aligned and have the correct air gap. (Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C COMPRESSOR CLUTCH - INSTALLATION)

(3) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set to be certain that the discharge pressure does not exceed 2760 kPa (400 psi).

(4) Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines for kinks or sharp bends that will restrict refrigerant flow, which can cause noises. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION - REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS)

(5) If the noise is from opening and closing of the high pressure relief valve, reclaim, evacuate, and recharge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)If the high pressure relief valve still does not seat properly, replace the a/c compressor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - REMOVAL)

(6) If the noise is from liquid slugging on the suction line, check the refrigerant oil level and the refrigerant system charge. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - SPECIFICATIONS - CHARGE CAPACITY).

(7) If the noise continues, replace the compressor and repeat Step 1.

REMOVAL

REMOVAL

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Recover the refrigerant from the system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(2) Disconnect and isolate the battery negative cable.

(3) Remove the serpentine drive belt. Refer to Cooling for the procedures.

(4) Unplug the compressor clutch coil wire harness connector.

A/C COMPRESSOR (Continued)

(5) Remove the (2) refrigerant line retaining bolts that secure the suction line and discharge line to the compressor. Install plugs in, or tape over all of the opened refrigerant fittings.

(6) Remove the bolts that secure the compressor (Fig. 2) or (Fig. 3) and (Fig. 4).

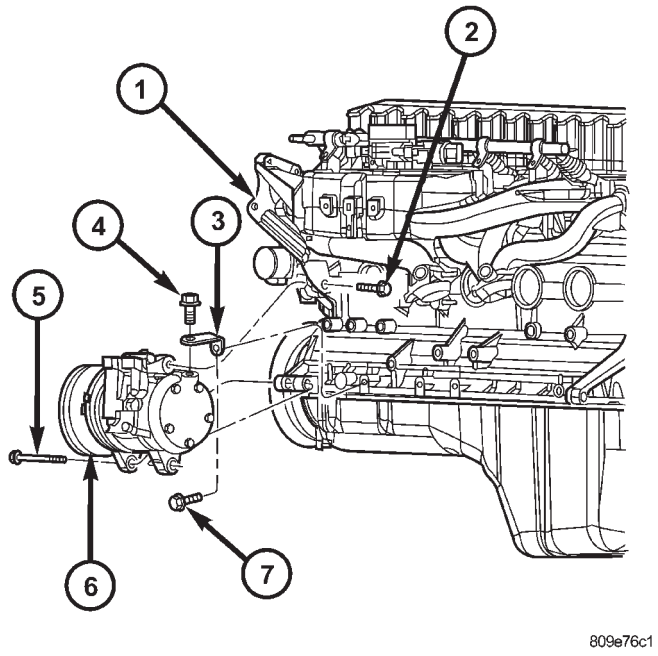


Fig. 2 COMPRESSOR REMOVE/INSTALL - 4.0L ENGINE

1 - POWER STEERING PUMP MOUNTING BRACKET
2 - BOLT
3 - BRACE
4 - BOLT
5 - BOLT
6 - A/C COMPRESSOR
7 - BOLT

(7) Remove the compressor.

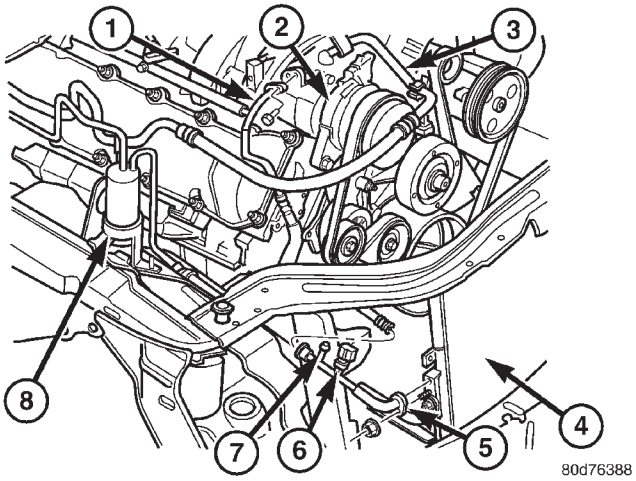


Fig. 3 COMPRESSOR AND A/C LINES - V8

1 - DISCHARGE LINE
2 - A/C COMPRESSOR
3 - SUCTION LINE
4 - A/C/ CONDENSOR
5 - DISCHARGE LINE TO CONDENSOR
6 - A/C PRESSURE TRANSDUCER SWITCH
7 - A/C/ SERVICE PORT
8 - RECEIVER DRIER

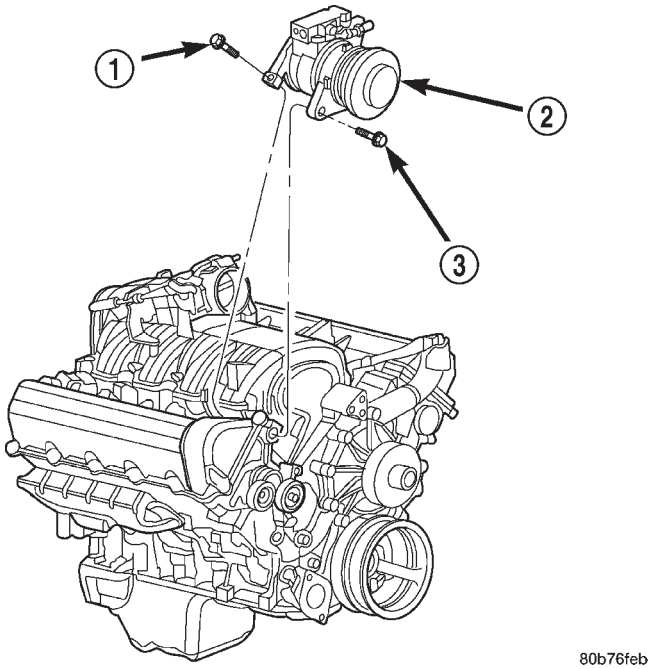


Fig. 4 COMPRESSOR REMOVE/INSTALL - V8 ENGINE - RIGHT VIEW

1 - BOLT
2 - A/C COMPRESSOR
3 - BOLT

A/C COMPRESSOR (Continued)

REMOVAL - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect the negative battery cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Remove the accessory drive belt from the compressor clutch. Refer to Cooling for the procedure (Fig. 5).

(4) Raise the vehicle on a hoist.

(5) Remove the front splash shield (if equipped).

(6) Remove the (2) refrigerant line retaining bolts from the compressor. Remove both lines from the compressor and cover all openings.

(7) Disconnect the compressor clutch electrical connector.

(8) Remove the compressor mounting bolts and remove the compressor from the vehicle.

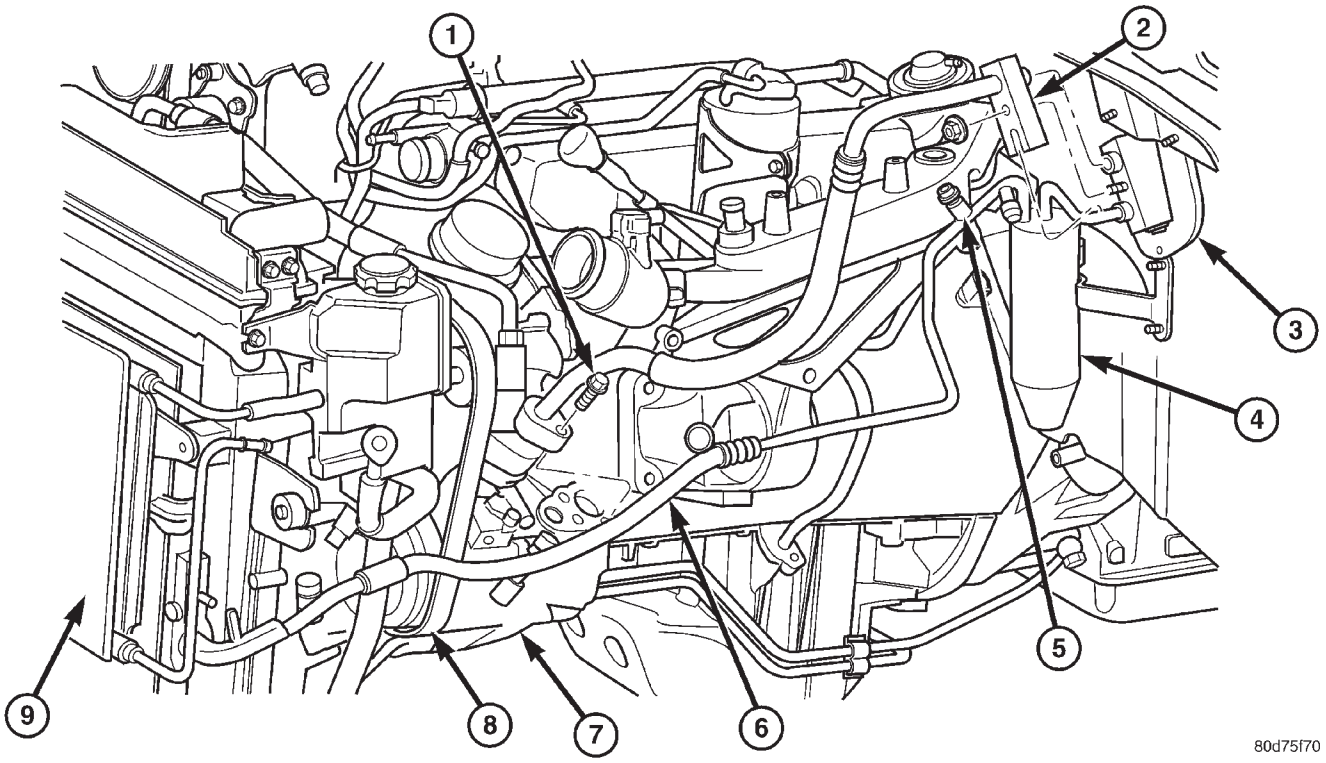


Fig. 5 2.7L Diesel Compressor-RHD (LHD typical)

1 - SUCTION LINE MOUNTING SCREW
2 - SUCTION LINE TO H-BLOCK
3 - H-BLOCK
4 - RECEIVER DRIER
5 - LIQUID LINE SERVICE PORT
6 - LIQUID LINE AND RECEIVER DRIER
7 - A/C COMPRESSOR
8 - A/C COMPRESSOR DRIVE BELT
9 - RADIATOR - CONDENSOR ASSEMBLY

A/C COMPRESSOR (Continued)

INSTALLATION

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

NOTE: If a replacement compressor is being installed, be certain to check the refrigerant oil level. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE) Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - DESCRIPTION)

(1) Install the compressor. Tighten the 4.0L mounting bolts fastening the compressor to the block to 45-65 N·m (35-50 ft. lbs.). Tighten the mounting bolts holding the rear brace to the compressor and block to 40-55 N·m (30-40 ft. lbs.). Tighten the 4.7L compressor front mounting screws to 45-65 N·m (35-50 ft. lbs.), and the rear mounting screws to 35-45 N·m (25-35 ft. lbs.).

(2) Remove the tape or plugs from all of the opened refrigerant line fittings. Install the suction line and discharge line fittings to the manifold on the compressor. Tighten the mounting bolts to 25.4 N·m (225 in. lbs.).

(3) Install the serpentine drive belt. Refer to Cooling for the procedures.

(4) Plug in the compressor clutch coil wire harness connector.

(5) Connect the battery negative cable.

(6) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(7) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

INSTALLATION - 2.7L TURBO DIESEL

CAUTION: Check the oil level before installing the new compressor. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/REFRIGERANT OIL - STANDARD PROCEDURE)

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Lift the compressor into position and install the (4) mounting bolts. Torque the bolts to 41 N·m (30 ft. lbs.).

(2) Connect the compressor clutch electrical connector.

(3) Install both refrigerant lines on the compressor. Make certain the sealing 0-rings are free of tears and well lubricated with R-134a refrigerant oil. Torque the line retaining bolts to 22 N·m (200 in. lbs.).

(4) Install the front splash shield (if equipped).

(5) Lower the vehicle from the hoist.

(6) Install the accessory drive belt on the compressor clutch. Refer to Cooling for the procedure.

(7) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING -

A/C COMPRESSOR (Continued)

STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(8) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(9) Connect the negative battery cable.

A/C CONDENSER

DESCRIPTION

The condenser is located in the air flow in front of the engine cooling radiator. The condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the compressor to give up its heat to the air passing over the condenser fins.

OPERATION

When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it has become a high-pressure liquid refrigerant. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings in the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or condenser service.

The condenser cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

CAUTION: Before removing the condenser, note the location of each of the radiator and condenser air seals. These seals are used to direct air through the condenser and radiator. The air seals must be reinstalled in their proper locations in order for the air conditioning and engine cooling systems to perform as designed.

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Remove the screws attaching the grille and headlamp mounting module to the upper crossmember of the vehicle. Refer to Body for this and further steps in the procedure.

(4) Remove the headlamps from their mounts.

(5) Remove the nuts that secure the hood latch and brace to the upper crossmember.

(6) The radiator upper crossmember can be adjusted left or right through the use of its slotted mounting holes. Before removal, mark the original position of the crossmember.

(7) Remove the bolts that secure the radiator to the upper crossmember and set it aside (Fig. 6).

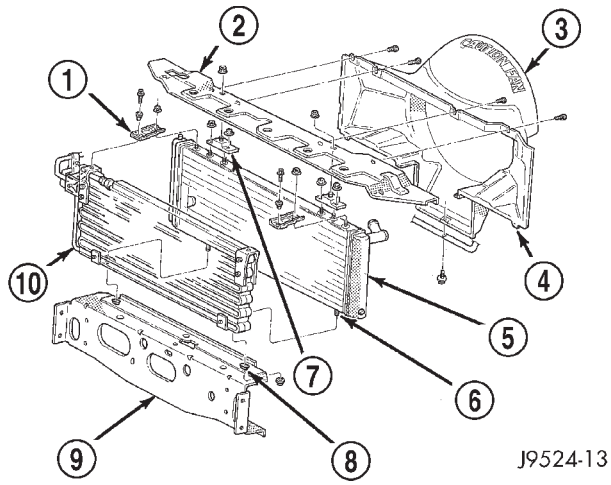


Fig. 6 CONDENSER MOUNTING - TYPICAL

1 - CONDENSER-TO-RADIATOR MOUNTING BRACKETS (2)
2 - UPPER CROSSMEMBER
3 - FAN SHROUD
4 - ALIGNMENT TABS
5 - RADIATOR
6 - ALIGNMENT DOWELS (2)
7 - RUBBER ISOLATORS (2)
8 - RUBBER GROMMETS (2)
9 - LOWER CROSSMEMBER
10 - CONDENSER

(8) Remove the engine air filter inlet duct secured at the headlamp mounting module.

(9) Remove the headlamp mounting module and front fascia for access to the condenser and fittings.

(10) Disconnect the discharge line and liquid line refrigerant line fittings from the condenser. Install plugs in, or tape over all of the opened refrigerant line fittings.

A/C CONDENSER (Continued)

(11) Remove the bolts that secure the upper condenser and transmission cooler.

(12) Carefully lift the condenser out of the vehicle.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

CAUTION: Before removing the condenser, note the location of each of the radiator and condenser air seals. These seals are used to direct air through the condenser and radiator. The air seals must be reinstalled in their proper locations in order for the air conditioning and engine cooling systems to perform as designed.

(1) Carefully position the condenser in the vehicle.

(2) Install the bolts that secure the upper condenser and transmission cooler.

(3) Remove the tape or plugs from the refrigerant line fittings on the condenser inlet and the discharge line. Connect the discharge line to the condenser inlet. Tighten the retaining nut to 28 N·m (250 in. lbs.).

(4) Remove the tape or plugs from the refrigerant line fittings on the condenser outlet and the liquid line. Connect the liquid line to the condenser outlet. Tighten the retaining nut to 28 N·m (250 in. lbs.).

(5) Install the headlamp mounting module and front fascia. Refer to Body for the procedure.

(6) Install the engine air filter inlet duct.

(7) Install the bolts that secure the radiator to the upper crossmember.

(8) Install the nuts that secure the hood latch and brace to the upper crossmember.

(9) Install the headlamps in their mounts.

(10) Install the screws attaching the grille and headlamp mounting module to the upper crossmember of the vehicle. Refer to Body for this and further steps in the procedure.

(11) Evacuate and Recharge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(12) Connect the battery negative cable.

NOTE: If the condenser is replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/REFRIGERANT OIL - DESCRIPTION)

A/C DISCHARGE LINE

REMOVAL

REMOVAL - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the negative battery cable.

(2) Recover the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Remove both headlamps from the vehicle. Refer to Lamps/Lighting for the procedure.

(4) Remove the a/c high pressure transducer(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - REMOVAL).

(5) Remove the front fascia from the vehicle. Refer to Front Fascia for the procedure (Fig. 7).

(6) Remove the refrigerant line retaining fastener from the condenser inlet fitting. Remove the line and cap the condenser inlet tube to prevent contamination of the system.

A/C DISCHARGE LINE (Continued)

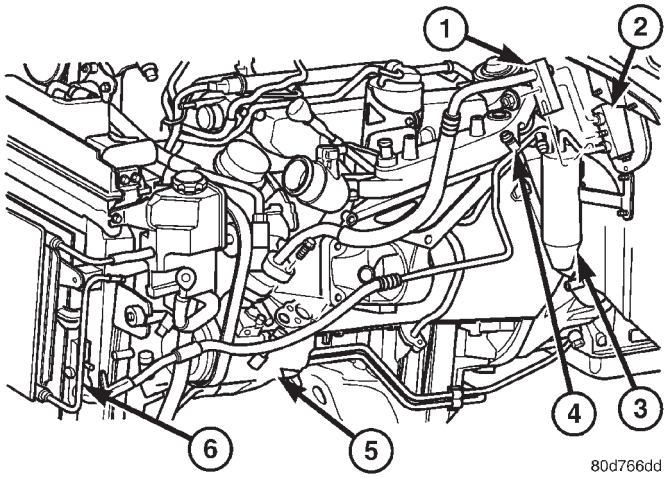


Fig. 7 Suction-Discharge Lines- RHD (LHD-typical)

1 - SUCTION LINE
2 - H-BLOCK
3 - RECEIVER DRIER
4 - DISCHARGE LINE & SERVICE PORT
5 - A/C COMPRESSOR
6 - DISCHARGE LINE & CONDENSOR CONNECTION

(7) Raise the vehicle on a hoist.
(8) Remove the front splash shield (if equipped).
(9) Remove the refrigerant line retaining fastener from the compressor outlet fitting. Remove the line and cap the compressor outlet opening to prevent contamination of the system.
(10) Unclip and remove the discharge line from the vehicle.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

(1) Disconnect and isolate the battery negative cable.
(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)
(3) Remove the a/c high pressure transducer(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - REMOVAL).
(4) Disconnect the discharge line from the condenser inlet. Install plugs in, or tape over all of the opened refrigerant line fittings.
(5) Remove the bolt that secures the discharge line fitting to compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.
(6) Remove the discharge line assembly from the vehicle.

INSTALLATION

INSTALLATION - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Carefully position the discharge line in the vehicle.
(2) Remove the cap and install the discharge line on the compressor. Be certain the sealing o-ring is well lubricated with PAG oil and free of tears. Torque the retaining fastener to 22 N·m (200 in. lbs.).
(3) Install the front splash shield (if equipped).
(4) Lower the vehicle from the hoist.
(5) Remove the cap and install the discharge line on the condenser. Be certain the sealing o-ring is well lubricated with PAG oil and free of tears. Torque the retaining fastener to 28 N·m (21 ft. lbs.).
(6) Install the front fascia on the vehicle. Refer to Front Fascia for the procedure.
(7) Install both headlamps in the vehicle. Refer to Lamps/Lighting for the procedure.
(8) Install the a/c high pressure transducer, and connect the electrical connector(Refer to 24 - HEAT-

A/C DISCHARGE LINE (Continued)

ING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - INSTALLATION).

(9) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(10) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(11) Connect the negative battery cable.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Remove the tape or plugs from the discharge line block fitting and the manifold on the compressor. Install the discharge line block fitting to the manifold on the compressor. Tighten the mounting bolt to 25.4 N·m (225 in. lbs.).

(2) Remove the tape or plugs from the refrigerant line fittings on the condenser inlet and the discharge line. Connect the discharge line to the condenser inlet. Tighten the retaining nut to 28 N·m (250 in. lbs.).

(3) Install the a/c high pressure transducer(Refer to 24 - HEATING & AIR CONDITIONING/CONTROLS/A/C PRESSURE TRANSDUCER - INSTALLATION).

(4) Connect the battery negative cable.

(5) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(6) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

A/C EXPANSION VALVE

DESCRIPTION

The “H” valve type thermal expansion valve (TXV) is located at the front of the heater-A/C housing between the liquid and suction lines and the evaporator coil.

The expansion valve is a factory calibrated unit and cannot be adjusted or repaired. If faulty or damaged, the expansion valve must be replaced.

OPERATION

High-pressure, high temperature liquid refrigerant from the liquid line passes through the expansion valve orifice, converting it inot a low-pressure, low-temperature mixture of liquid and gas before it enters the evaporator coil. A temperature sensor in the expansion valve control head monitors the temperature of the refrigerant leaving the evaporator coil throught the suction line, and adjusts the orifice size at the liquid line to let the proper amoount of refrigerant into the evaporator coil to meet the vehicle cooling requirements. Controlling the refrigerant flow through the evaporator ensures that none of the refrigerant leaving the evaporator is still in a liquid state, which could damage the compressor.

DIAGNOSIS AND TESTING - A/C EXPANSION VALVE

The expansion valve is located on the engine side of the dash panel near the shock tower.

The expansion valve can fail in three different positions (open, closed or restricted).

In an Open Position: this will result in a noisy compressor or no cooling. The cause can be broken spring, broken ball or excessive moisture in the A/C system. If the spring or ball are found to be defective, replace the expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant.

In a Closed Position: There will be low suction pressure and no cooling. This may be caused by a failed power dome or excessive moisture in the A/C system. If the power dome on the expansion valve is found to be defective replace the expansion valve. If excessive moisture is found recycle the refrigerant.

A Restricted Orifice: There will be low suction pressure and no cooling. This may be caused by debris in the refrigerant system. If debris is believed to be the cause, recycle the refrigerant and replace the expansion valve and the receiver/drier.

A/C EXPANSION VALVE (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the A/C system-(Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - STANDARD PROCEDURE).

(3) Disconnect the the A/C lines from the expansion valve. Cap or tape over the open A/C lines.

(4) Remove the lines from the expansion valve(Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/LIQUID LINE - REMOVAL), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ LIQUID LINE - REMOVAL), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - REMOVAL) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - REMOVAL).

(5) Remove the expansion valve retainer screw from the expansion valve.

(6) Remove the expansion valve.

(7) Remove the expansion valve gasket.

INSTALLATION

(1) Install a NEW gasket and install the eapansion valve to the evaporator.

(2) Install the expansion valve bolts and tighten to 11 N·m (100 in. lbs.).

(3) Install NEW seals on the A/C lines and install the lines to the expansion valve(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - INSTALLATION), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C DISCHARGE LINE - INSTALLATION), (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ LIQUID LINE - INSTALLATION) and (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/ LIQUID LINE - INSTALLATION).

(4) Evacuate the A/C system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(5) Recharge the A/C system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(6) Connect the battery negative cable.

LIQUID LINE

REMOVAL

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) The liquid line is serviced as an integral part of the receiver/drier assembly(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - REMOVAL) or (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - REMOVAL).

REMOVAL - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) The liquid line is service as an integral part of the receiver/drier assembly(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - REMOVAL).

INSTALLATION

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) The liquid line is serviced as an integral part of the receiver/drier assembly(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - INSTALLATION) or (Refer to 24 - HEAT-

LIQUID LINE (Continued)

ING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - INSTALLATION).

INSTALLATION - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) The liquid line is serviced as an integral part of the receiver/drier bottle assembly(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/RECEIVER / DRIER - INSTALLATION).

SUCTION LINE

REMOVAL

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

(3) Remove the retainer nut from the evaporator connection (Fig. 8) or (Fig. 9).

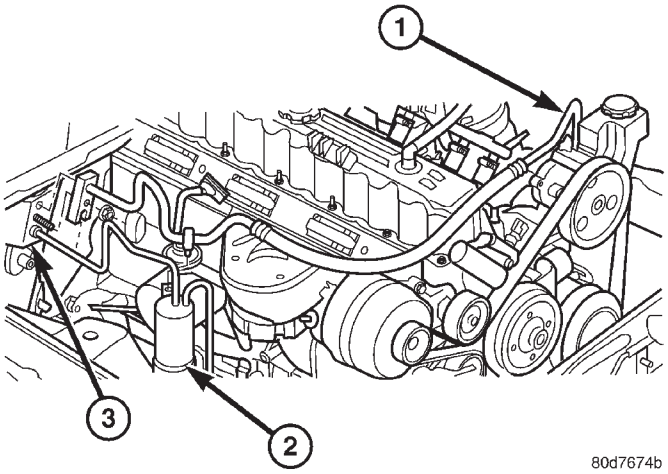


Fig. 8 SUCTION LINE - I-6

1 - SUCTION LINE
2 - RECEIVER DRIER- LIQUID LINE
3 - H-BLOCK

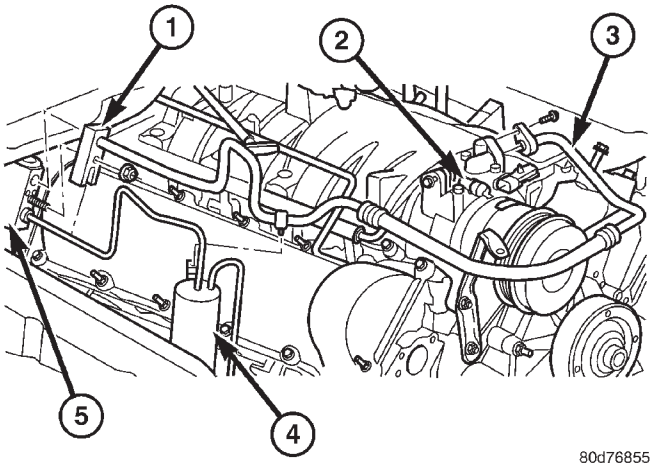


Fig. 9 V-8 Suction Line

1 - SUCTION LINE TO H-BLOCK
2 - A/C COMPRESSOR
3 - SUCTION LINE TO COMPRESSOR
4 - RECEIVER DRIER ASSEMBLY
5 - H-BLOCK

(4) Slide the suction line off the stud and liquid line. Install plugs in, or tape over all the opened refrigerant line fittings. Remove from clip.

(5) Remove the bolt that secures the suction line fitting to compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Remove the suction line assembly from the vehicle.

SUCTION LINE (Continued)

REMOVAL - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Disconnect the negative battery cable.

(2) Recover the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT RECOVERY)

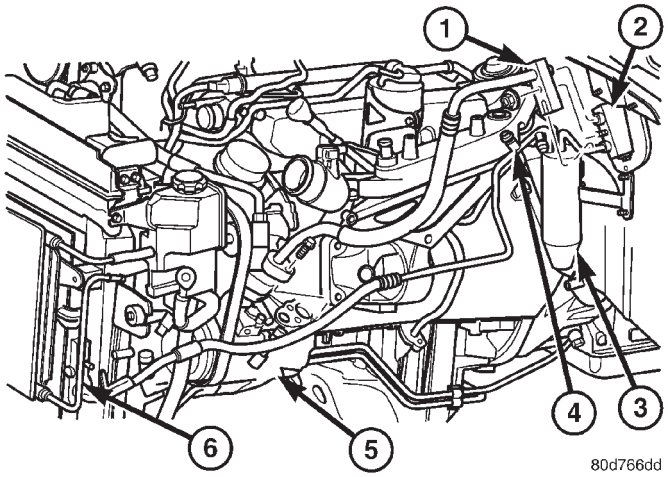


Fig. 10 Suction-Discharge Lines- RHD (LHD-typical)

1 - SUCTION LINE
2 - H-BLOCK
3 - RECEIVER DRIER
4 - DISCHARGE LINE & SERVICE PORT
5 - A/C COMPRESSOR
6 - DISCHARGE LINE & CONDENSOR CONNECTION

(3) Remove the refrigerant line retaining fastener from the H-Valve Block (Fig. 10). Remove the line and gasket from the H-Valve block and cap or tape over both ends.

(4) Remove the refrigerant line support bracket bolt from the cylinder head cap.

(5) Remove the refrigerant line retaining fastener from the compressor inlet fitting. Remove the line and cap the compressor outlet tube to prevent contamination of the system.

(6) Unclip and remove the suction line from the vehicle.

INSTALLATION

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Remove the tape or plugs from the suction line block fitting and the manifold on the compressor. Install the suction line block fitting to the manifold on the compressor. Tighten the mounting bolt to 25.4 N·m (225 in. lbs.).

(2) Remove the tape or plugs from the refrigerant line fittings on the evaporator outlet and the suction line. Slide the suction line copnnection block over the liquid line and evaporator stud. Tighten the retaining nut to 28 N·m (250 in. lbs.).

(3) Connect the battery negative cable.

(4) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(5) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

SUCTION LINE (Continued)

INSTALLATION - 2.7L TURBO DIESEL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Carefully position the suction line in the vehicle.

(2) Remove the cap or tape and install the suction line on the compressor. Be certain the sealing o-ring is well lubricated with PAG oil and free of tears. Torque the retaining fastener to 22 N·m (200 in. lbs.).

(3) Position and install the refrigerant line support bracket bolt on the cylinder head cap. Torque the bolt to 20 N·m (177 in. lbs.).

(4) Remove the cap or tape and install the suction line on the H-Valve Block. Be certain the sealing O-ring is well lubricated with PAG oil and free of tears. Torque the retaining fastener to 28 N·m (21 ft. lbs.).

(5) Install the tie-straps retaining the wire harness on the suction line.

(6) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(7) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

(8) Connect the negative battery cable.

A/C EVAPORATOR

DESCRIPTION

The evaporator coil is located in the HVAC housing, under the instrument panel. The evaporator coil is positioned in the HVAC housing so that all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator coil fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

OPERATION

Refrigerant enters the evaporator from the orifice tube as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas before it leaves the evaporator.

The evaporator coil cannot be repaired and, if faulty or damaged, it must be replaced.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Remove and disassemble the HVAC housing. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL) (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - DISASSEMBLY)

(2) Lift the evaporator coil unit out of the lower half of the HVAC housing (Fig. 11).

A/C EVAPORATOR (Continued)

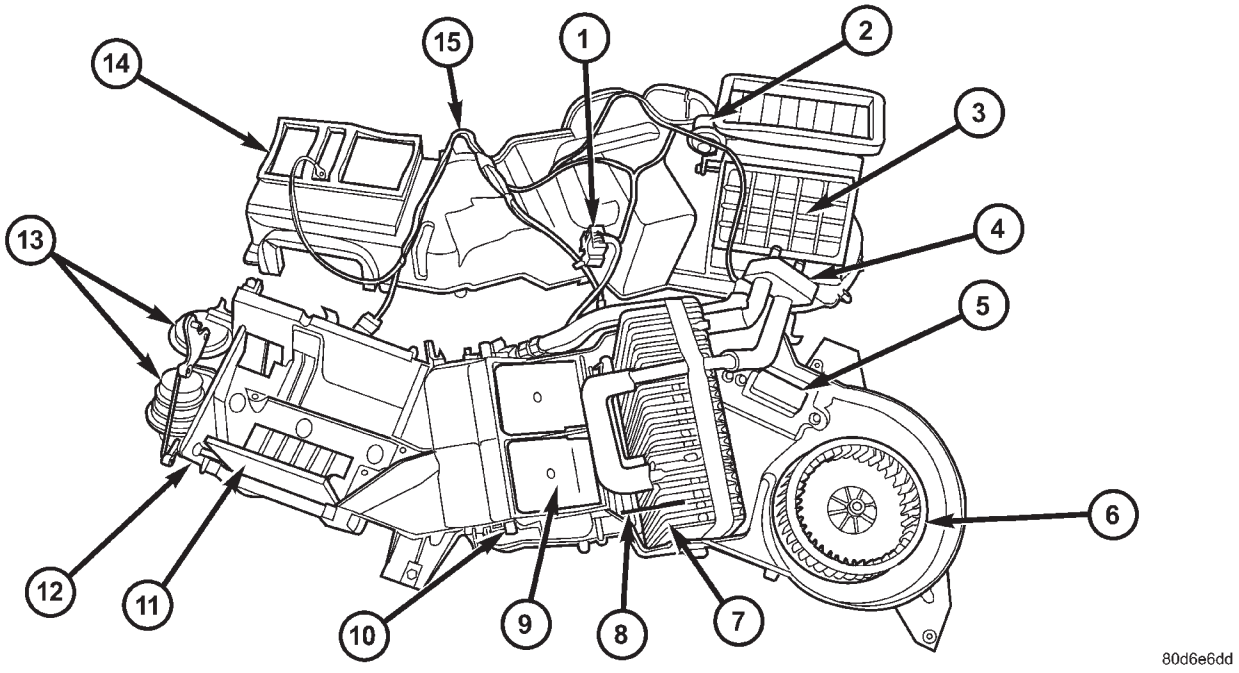


Fig. 11 HVAC HOUSING- CASE SEPARATED

1 - ELECTRICIAL CONNECTORS
2 - VACUUM ACTUATOR
3 - RECIRCULATION DOOR
4 - THERMAL EXPANSION VALVE
5 - BLOWER MOTOR RESISTOR/CONTROLLER
6 - BLOWER WHEEL
7 - EVAPORATOR AND TUBES
8 - FIN SENSOR PROBE
9 - BLEND DOOR
10 - PIVOT SHAFT (MOTOR REMOVED)
11 - PANEL/OUTLET DOOR
12 - LOWER HOUSING
13 - VACUUM ACTUATORS
14 - UPPER HOUSING
15 - VACUUM HARNESS

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Install the evaporator coil in the bottom half of the HVAC housing. Be certain that the evaporator foam insulator wrap is reinstalled.

(2) Reassemble the HVAC housing and install in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - ASSEMBLY) (Refer to 24 - HEATING & AIR CONDITIONING/DISTRIBUTION/HVAC HOUSING - INSTALLATION)

NOTE: If the evaporator is replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system.

HEATER CORE

DESCRIPTION

The heater core is located in the HVAC housing, under the instrument panel. It is a heat exchanger made of rows of tubes and fins.

OPERATION

Engine coolant is circulated through heater hoses to the heater core at all times. As the coolant flows through the heater core, heat removed from the engine is transferred to the heater core fins and tubes. Air directed through the heater core picks up the heat from the heater core fins. The temperature control door allows control of the heater output air temperature by controlling how much of the air flowing through the HVAC housing is directed through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced. Refer to Cooling for more information on the engine cooling system, the engine coolant and the heater hoses.

REMOVAL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE AIRBAG SYSTEM BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE AIRBAG SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN AN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Remove the HVAC housing from the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - REMOVAL)

(2) Remove the foam gasket surrounding the core tubes.

NOTE: Notice the orientation of the irregularly shaped gasket on the tubes. The gasket must be placed correctly to ensure proper sealing against the body during reinstallation.

(3) Remove the screws and retainers that secure the heater core and tubes to the HVAC housing (Fig. 12).

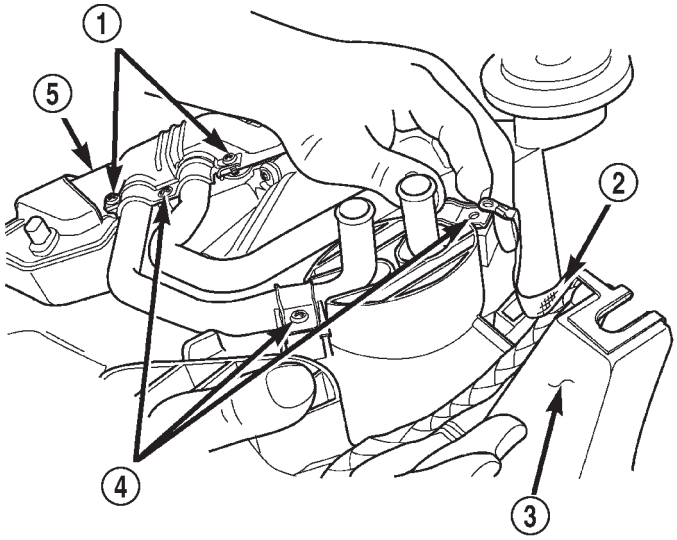


Fig. 12 HEATER CORE, TUBES, AND RETAINERS

1 - TUBE-TO-CORE CLAMPS
2 - GROUND STRAP
3 - HVAC HOUSING
4 - TUBE RETAINERS AND SCREWS
5 - HEATER CORE

(4) Remove the mode door actuator if necessary, for clearance to remove the core.

(5) Lift the heater core straight up and out of the HVAC housing (Fig. 13).

(6) When replacing individual tubes, loosen and remove the round tube-to-core clamp, and pull tube from core.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is

HEATER CORE (Continued)

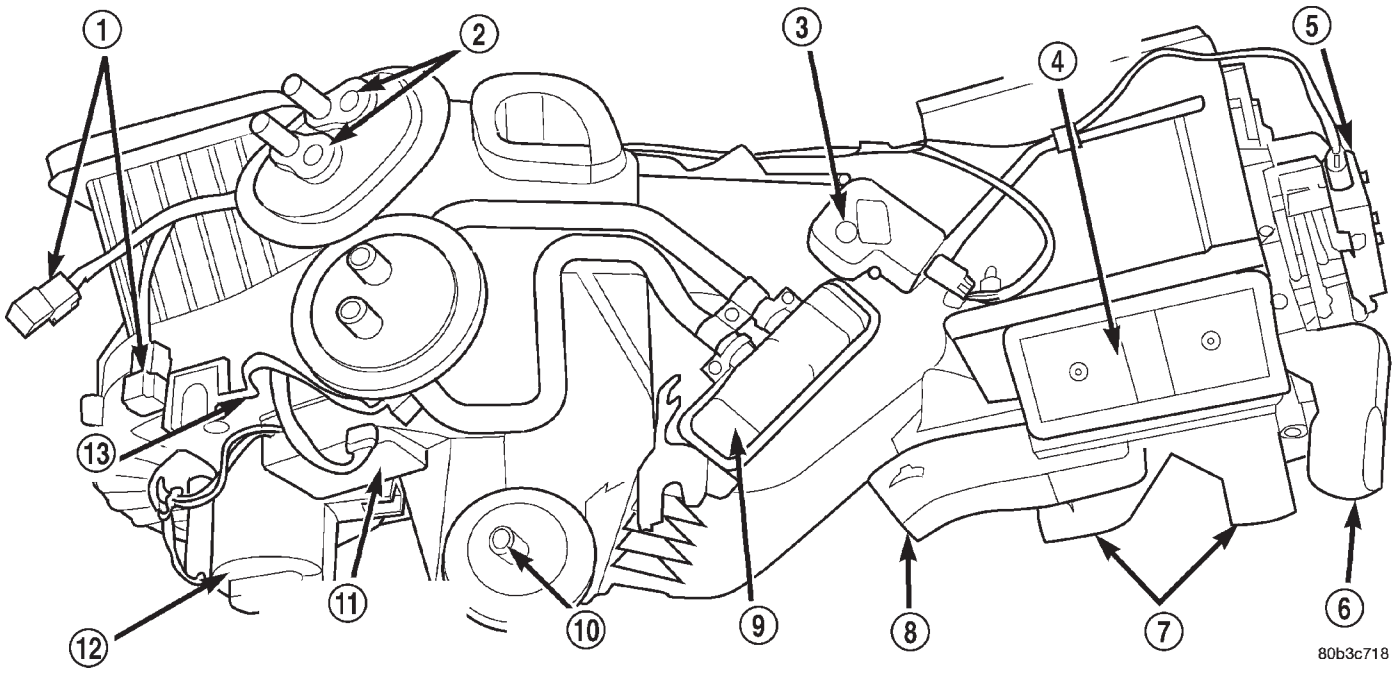


Fig. 13 HEATER CORE AND TUBES - (Typical)

1 - ELECTRICAL CONNECTORS
2 - EXPANSION VALVE
3 - ELECTRIC ACTUATOR
4 - OUTLET TO DEFROSTER DUCTS
5 - ELECTRIC ACTUATOR
6 - FLOOR DUCT
7 - TO REAR PASSENGER FLOOR AIR DUCTS
8 - FLOOR DUCT
9 - HEATER CORE AND TUBES
10 - HOUSING DRAIN
11 - BLOWER MOTOR RESISTOR/CONTROLLER
12 - BLOWER MOTOR
13 - GROUND STRAP

pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) When installing individual tubes, insert tube into core ensuring that tube O-ring is seated in core and not pinched. Hold tube in seated position while installing the round tube-to-core clamp (Fig. 14).

NOTE: The round tube-to-heater-core clamp should be left loose enough to turn the tube in the core. Position the core in the housing, and then tighten the tube-to-heater-core clamp after orienting the tubes to the molded HVAC housing.

(2) Lower the heater core into the HVAC housing.

(3) Install the mode door actuator, if removed from housing for core removal.

(4) Position the retainers over the heater core tubes. Install and tighten the screws that secure the heater core and retainers to the HVAC housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

NOTE: The grounding strap is to be attached to the lower heater core tube retainer.

(5) Reinstall the HVAC housing to the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ DISTRIBUTION/HVAC HOUSING - INSTALLATION)

RECEIVER / DRIER

DESCRIPTION

The receiver/drier is mounted in the engine compartment between the condenser and is part of the liquid line assembly. The filter/drier cannot be repaired, if the filter/drier is faulty, damaged, left open to the atmosphere or contaminated the line assembly must be replaced.

OPERATION

The filter-drier performs a filtering action to prevent foreign material in the refrigerant from contaminating the expansion valve. A desiccant bag is mounted inside the filter-drier canister to absorb any

RECEIVER / DRIER (Continued)

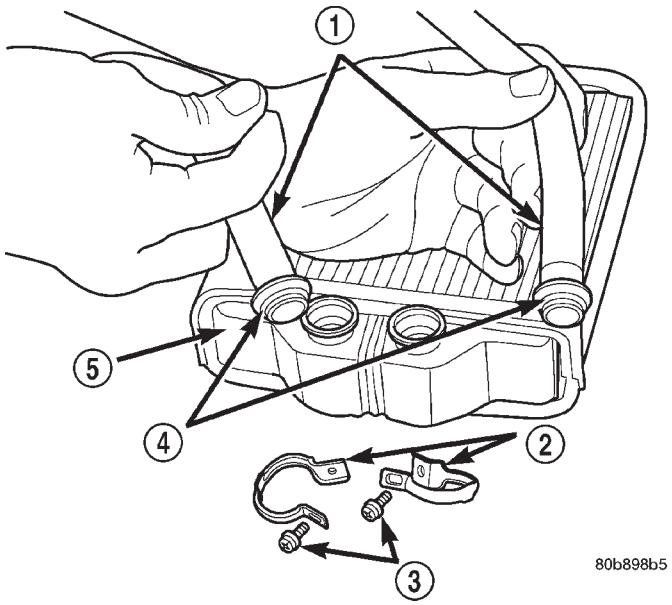


Fig. 14 HEATER CORE, TUBES, AND O-RINGS

1 - HEATER CORE TUBES
2 - TUBE-TO-CORE CLAMPS
3 - SCREWS
4 - O-RINGS
5 - HEATER CORE

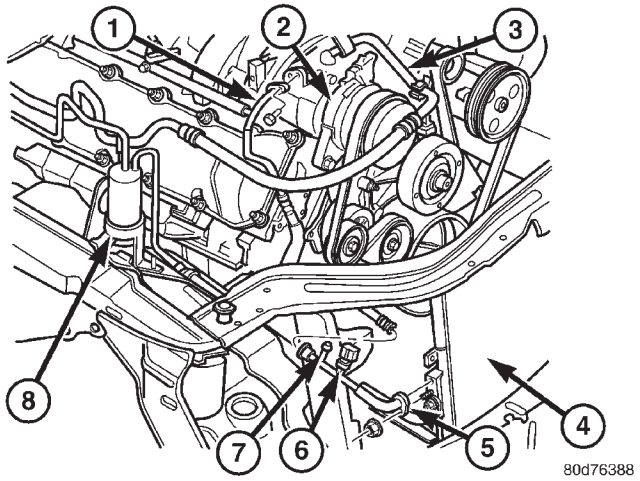


Fig. 15 COMPRESSOR AND A/C LINES - V8

1 - DISCHARGE LINE
2 - A/C COMPRESSOR
3 - SUCTION LINE
4 - A/C/ CONDENSOR
5 - DISCHARGE LINE TO CONDENSOR
6 - A/C PRESSURE TRANSDUCER SWITCH
7 - A/C/ SERVICE PORT
8 - RECEIVER DRIER

moisture which may have netered and become trapped within the refrigerant system. In addition, during periods of high demand air conditioner operation, the filter-drier acts as a reservoir to store surplus refrigerant. Refrigerant enters the filter-drier as a high-pressure, low-temperature liquid.

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

(1) Recover the refrigerant from the refrigerant system(Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).

(2) Remove the battery and the battery tray(Refer to 8 - ELECTRICAL/BATTERY SYSTEM/BATTERY - REMOVAL) and (Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - REMOVAL).

(3) Remove the screw from the receiver/drier bracket (Fig. 15) or (Fig. 16).

(4) Remove the retaining nut from the evaporator connection and then slide the suction line off the stud and liquid line.

(5) Remove the receiver/drier bracket from the stud and disconnect the liquid line from the evaporator inlet. Install plugs in or tape over all of the evaporator connection openings and opened refrigerant line fittings.

(6) Disconnect the liquid line from the condenser outlet. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Remove liquid line assembly.

INSTALLATION

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS SECTION BEFORE PERFORMING THE FOLLOWING OPERATION. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING - WARNING) (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - CAUTION)

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to

RECEIVER / DRIER (Continued)

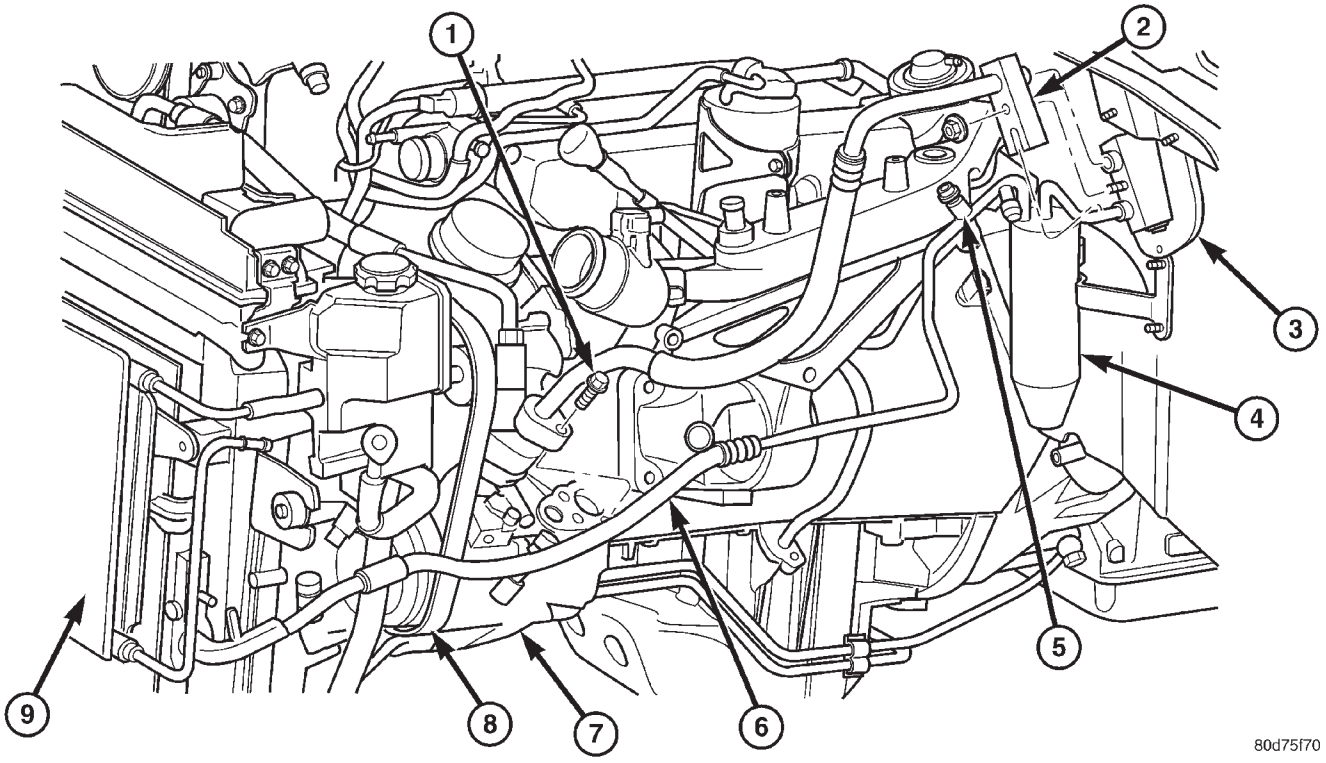


Fig. 16 2.7L Diesel Compressor-RHD (LHD typical)

1 - SUCTION LINE MOUNTING SCREW
2 - SUCTION LINE TO H-BLOCK
3 - H-BLOCK
4 - RECEIVER DRIER
5 - LIQUID LINE SERVICE PORT
6 - LIQUID LINE AND RECEIVER DRIER
7 - A/C COMPRESSOR
8 - A/C COMPRESSOR DRIVE BELT
9 - RADIATOR - CONDENSOR ASSEMBLY

inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

(1) Remove the tape or plugs from the refrigerant line fittings on the condenser outlet and the condenser end of the liquid line. Connect the liquid line to the condenser outlet. Tighten the retaining nut to 20.16 N·m (180 in. lbs.).

(2) Remove the tape or plugs from the refrigerant line fittings on the evaporator end of the liquid line and the evaporator inlet. Place the receiver/drier bracket on the stud and connect the liquid line to the evaporator inlet.

(3) Remove the tape or plugs from the suction line and evaporator outlet. Slide the suction line connection block on the liquid line on the evaporator connection stud. Tighten the retaining nut to 20.16 N·m (180 in. lbs.).

(4) Insert a screw for the receiver/drier bracket and hand turn three turns. Tighten the screw to 10.64 N·m (95 in. lbs.).

(5) Install the battery tray and the battery(Refer to 8 - ELECTRICAL/BATTERY SYSTEM/TRAY - INSTALLATION) and (Refer to 8 - ELECTRICAL/ BATTERY SYSTEM/BATTERY - INSTALLATION).

(6) Evacuate the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM EVACUATE)

(7) Charge the refrigerant system. (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE - REFRIGERANT SYSTEM CHARGE)

NOTE: If the receiver/drier is replaced, add 120 milliliters (4 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle. (Refer to 24 - HEATING & AIR CONDITIONING/ PLUMBING/REFRIGERANT OIL - DESCRIPTION)

REFRIGERANT

DESCRIPTION

The refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

OPERATION

R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. Even a small amount of R-12 added to an R-134a refrigerant system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance. In addition, the PolyAlkylene Glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the compressor identifying to service technicians that the air conditioning system is equipped with R-134a.

REFRIGERANT OIL

DESCRIPTION

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, PolyAlkylene Glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The 10PA17 compressor used in this vehicle is designed to use an ND8 PAG refrigerant oil. Use only refrigerant oil of this same type to service the refrigerant system.

OPERATION

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause compressor damage, and too much can reduce air conditioning system performance.

PAG refrigerant oil is much more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture contamination.

STANDARD PROCEDURE - REFRIGERANT OIL LEVEL

When an air conditioning system is assembled at the factory, all components except the compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the compressor is dispersed throughout the refrigerant system. The accumulator, evaporator, condenser, and compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of oil in the refrigerant system. This ensures proper lubrication of the compressor. Too little oil will result in damage to the compressor. Too much oil will reduce the cooling capacity of the air conditioning system.

It will not be necessary to check the oil level in the compressor or to add oil, unless there has been an oil loss. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when a accumulator, evaporator coil, or condenser are replaced. See the Refrigerant Oil Capacities chart. When a compressor is replaced, the refrigerant oil must be drained from the old compressor and measured. Drain all of the refrigerant oil from the new compressor, then fill the new compressor with the same amount of refrigerant oil that was drained out of the old compressor.

Refrigerant Oil Capacities		
Component	ml	fl oz
A/C System	130	4.40
Receiver Drier	70	2.37
Condenser	10	0.34
Evaporator	50	1.69
Compressor	drain and measure the oil from the old compressor - see text.	

VISCOUS HEATER

DESCRIPTION

DESCRIPTION

The diesel engine has an engine mounted mechanical device called a Viscous Heater that is used to heat the coolant coming from the engine to the heater core. The Viscous Heater is driven by the engine fan belt and has a electro-mechanical clutch which is controlled by the HVAC control unit.

DESCRIPTION - VISCOUS HEATER CLUTCH

The basic viscous heater clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly and a clutch plate. The electromagnetic coil unit and the hub bearing and pulley assembly are each retained on the nose of the compressor front housing with snap rings (Fig. 17). The clutch plate is keyed to the viscous heater shaft and secured with a nut. These components provide the means to engage and disengage the viscous heater from the engine accessory drive belt.

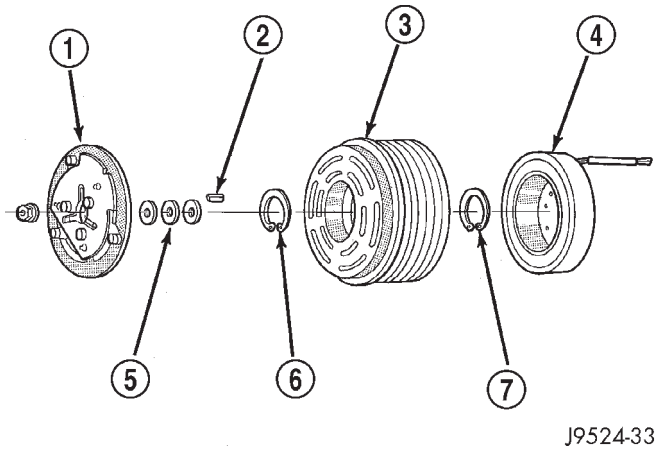


Fig. 17 CLUTCH ASSEMBLY- typical

1 - CLUTCH PLATE
2 - SHAFT KEY
3 - PULLEY
4 - COIL
5 - CLUTCH SHIMS
6 - SNAP RING
7 - SNAP RING

OPERATION

OPERATION - VISCOUS HEATER

The Viscous Heater is driven by the engine fan belt. The Viscous Heater has an electro-mechanical clutch that receives a signal from the HVAC control head and the Viscous Heater controller that energizes and engages the clutch. Once engaged the clutch allows the Viscous Heater to increase the temperature of the coolant flowing to the heater core, which provides heat the passenger compartment quicker than normal engines without the Viscous Heater. The Viscous Heater generates heat by means of friction which heats a special Silicon Oil within its housing which is then transferred to the engine coolant when the coolant passes over fins within the pump. Please note that the coolant is isolated from the silicon oil within the pump housing. When demand for passenger compartment heat decreases the Viscous Heater clutch will receive an input from the Viscous heater controller to disengage.

OPERATION - VISCOUS HEATER CLUTCH

When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the viscous heater shaft. When the coil is not energized the pulley freewheels on the clutch hub bearing, which is part of the pulley. The viscous heater clutch and coil are the only serviced parts on the viscous heater assembly. If the viscous heater is inoperative or damaged the entire assembly must be replaced. The viscous heater clutch engagement is controlled by several components: the viscous heater controller, the engine powertrain control module and the HVAC control head.

REMOVAL

REMOVAL - VISCOUS HEATER

(1) Drain the engine coolant(Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(2) Remove the engine accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

(3) Remove the heater hose clamps at the Viscous Heater.

(4) Remove the heater hoses from the Viscous Heater.

(5) Unplug the Viscous Heater clutch electrical connector.

(6) Remove the bolts holding the Viscous Heater to the mounting bracket.

(7) Remove the Viscous Heater from the vehicle.

REMOVAL - VISCOUS HEATER CLUTCH

(1) The viscous heater clutch can be serviced in the vehicle and the cooling system does not have to be drained.

(2) Disconnect and isolate the battery negative cable.

(3) Remove the serpentine drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).

VISCOUS HEATER (Continued)

(4) Unplug the clutch coil wire harness connector.
(5) Remove the bolts that secure the viscous heater to the mounting bracket.
(6) Remove the viscous heater from the mounting bracket. Support the viscous heater in the engine compartment while servicing the clutch.
(7) Insert the two pins of the spanner wrench (special Tool C-4489 or equivalent) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 18).

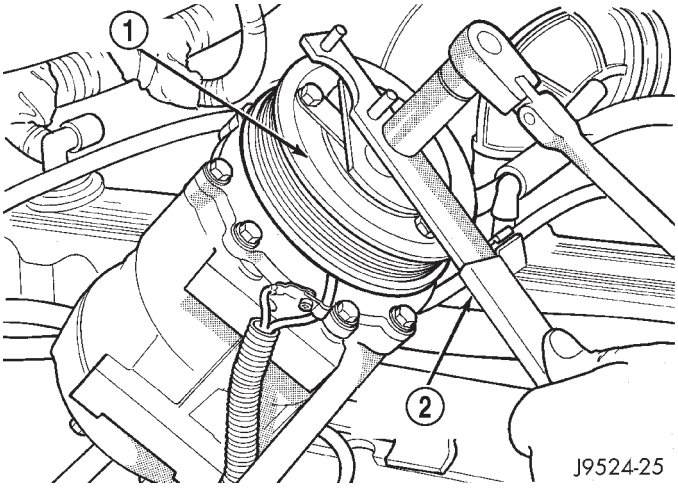


Fig. 18 CLUTCH NUT REMOVE-typical

1 - CLUTCH PLATE
2 - SPANNER

(8) Remove the clutch plate.
(9) Remove the clutch shims.
(10) Remove the external front housing snap ring with snap ring pliers (Fig. 19).

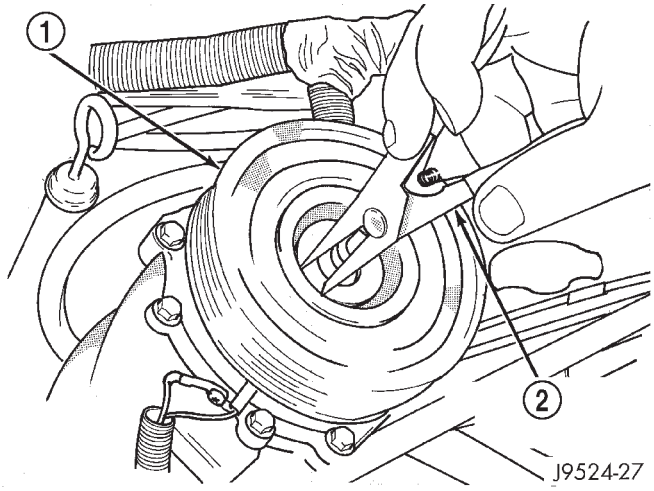


Fig. 19 EXTERNAL SNAP RING REMOVE- typical

1 - PULLEY
2 - SNAP RING PLIERS

(11) Install the lip of the rotor puller (Special Tool C-6141–1 or equivalent) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141–2 or equivalent) (Fig. 20).

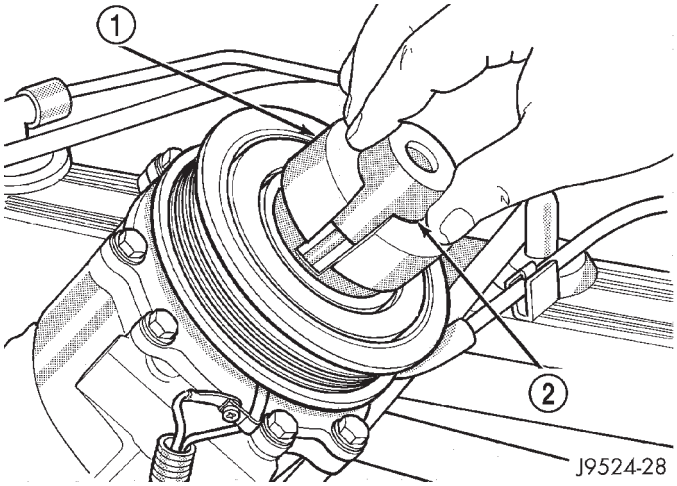


Fig. 20 SHAFT PROTECTOR AND PULLER- typical

1 - PULLER JAW
2 - SHAFT PROTECTOR

(12) Install the puller through bolts (Special Tool C-6461 or equivalent) through the puller flange and into the jaws of the rotor puller and tighten. Turn the puller center bolt clockwise until the rotor is free (Fig. 21).

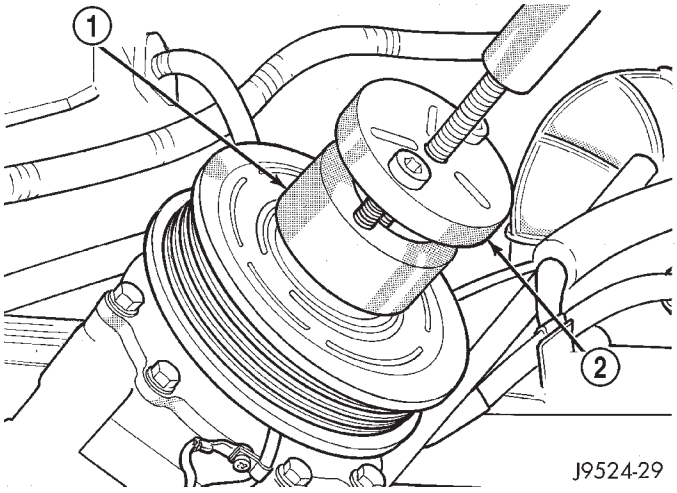


Fig. 21 INSTALL PULLER PLATE- typical

1 - PULLER JAW
2 - PULLER

(13) Remove the screw and retainer from the clutch coil lead wire harness on the viscous heater housing.

VISCOUS HEATER (Continued)

(14) Remove the snap ring from the hub and remove the clutch field coil (Fig. 22). Slide the clutch field coil off of the hub.

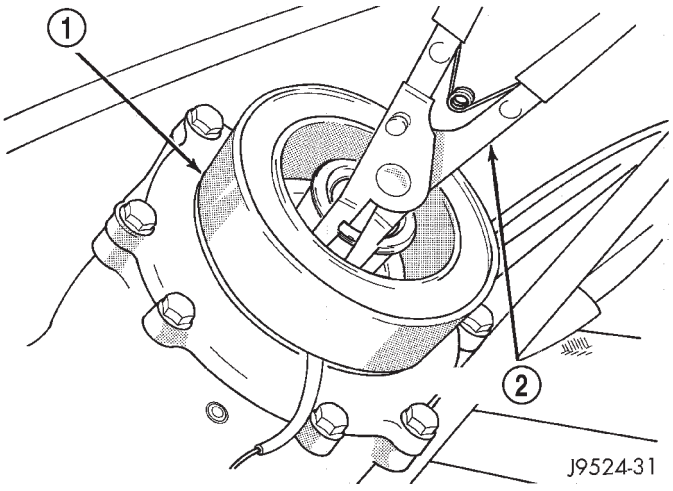


Fig. 22 CLUTCH FIELD COIL SNAP RING REMOVE-typical

1 - COIL
2 - SNAP RING PLIERS

INSTALLATION

INSTALLATION

(1) Install Viscous Heater to engine mounting bracket.

(2) Install the Viscous Heater mounting bolts and tighten to 33 N·m (25 ft. lbs.).

(3) Plug the wiring harness electrical connector to the Viscous Heater clutch.

(4) Install heater hoses to the Viscous Heater connections.

(5) Install heater hose clamps to Viscous Heater connections.

(6) Install the engine accessory drive belt(Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

(7) Refill the engine cooling system(Refer to 7 - COOLING/ENGINE - STANDARD PROCEDURE).

(8) Reconnect the battery negative cable.

(9) Operate vehicle and check for any coolant leaks, repair as required.

INSTALLATION - VISCOUS HEATER CLUTCH

(1) Install the clutch field coil and snap ring.

(2) Install the screw and retainer on the clutch coil lead wire harness on the viscous heater housing. Tighten the screw to 2.2 N·m (20 in. lbs.)

(3) Align the rotor assembly squarely on the front housing hub.

(4) Install the rotor bearing asembly with the installer (Special Tool C-6871 or equalivent). Thread the installer on the shaft, then turn the nut until the rotor asembly is seated.

(5) Install the external front housing snap ring with snap ring pliers. The bevel side of the snap ring must be facing outward. Press the snap ring to make sure it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

(6) Install the original clutch shims on the shaft.

(7) Install the clutch plate. Install the shaft hex nut and tighten to 15–20 N·m (11–15 ft. lbs.).

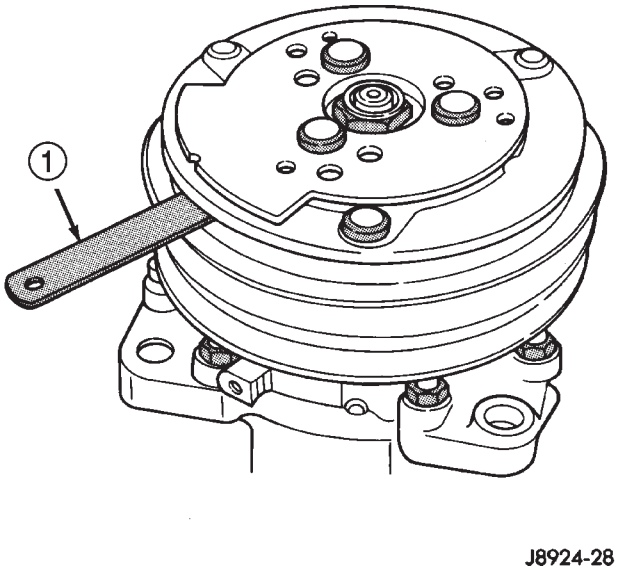


Fig. 23 CHECK CLUTCH AIR GAP-typical

1 - FEELER GAUGE

(8) Check the clutch air gap with a feeler gauge (Fig. 23). If the gap does not meet specification, add or substract shims as required. The air gap specification if 0.41 to 0.79 millimeters (0.016 to 0.031 inches).

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch (and not having the old shims available) use a 1.0, 0.50 and 0.13 millimeter (0.040, 0.020 and 0.005 inch) shim from the new clutch hardware package that is provided with the new clutch.

(9) Reinstall the viscous heater to the mounting bracket. Tighten the mounting screws to 33 N·m (25 ft. lbs.).

(10) Reinstall the battery negative cable.

EMISSIONS CONTROL

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EMISSIONS CONTROL

DESCRIPTION

DESCRIPTION - EMISSION CONTROL SYSTEM

The Powertrain Control Module (PCM) monitors many different circuits in the fuel injection, ignition, emission and engine systems. If the PCM senses a problem with a monitored circuit often enough to indicate an actual problem, it stores a Diagnostic Trouble Code (DTC) in the PCM's memory. If the code applies to a non-emissions related component or system, and the problem is repaired or ceases to exist, the PCM cancels the code after 40 warm-up cycles. Diagnostic trouble codes that affect vehicle emissions illuminate the Malfunction Indicator (check engine) Lamp. Refer to Malfunction Indicator Lamp in this section.

Certain criteria must be met before the PCM stores a DTC in memory. The criteria may be a specific range of engine RPM, engine temperature, and/or input voltage to the PCM.

The PCM might not store a DTC for a monitored circuit even though a malfunction has occurred. This may happen because one of the DTC criteria for the circuit has not been met. **For example**, assume the diagnostic trouble code criteria requires the PCM to monitor the circuit only when the engine operates between 750 and 2000 RPM. Suppose the sensor's output circuit shorts to ground when engine operates above 2400 RPM (resulting in 0 volt input to the PCM). Because the condition happens at an engine speed above the maximum threshold (2000 rpm), the PCM will not store a DTC.

There are several operating conditions for which the PCM monitors and sets DTC's. Refer to Monitored Systems, Components, and Non-Monitored Circuits in this section.

Technicians must retrieve stored DTC's by connecting the DRB scan tool (or an equivalent scan tool) to the 16–way data link connector (Fig. 1).

NOTE: Various diagnostic procedures may actually cause a diagnostic monitor to set a DTC. For instance, pulling a spark plug wire to perform a spark test may set the misfire code. When a repair is completed and verified, connect the DRB scan tool to the 16–way data link connector to erase all DTC's and extinguish the MIL (check engine lamp).

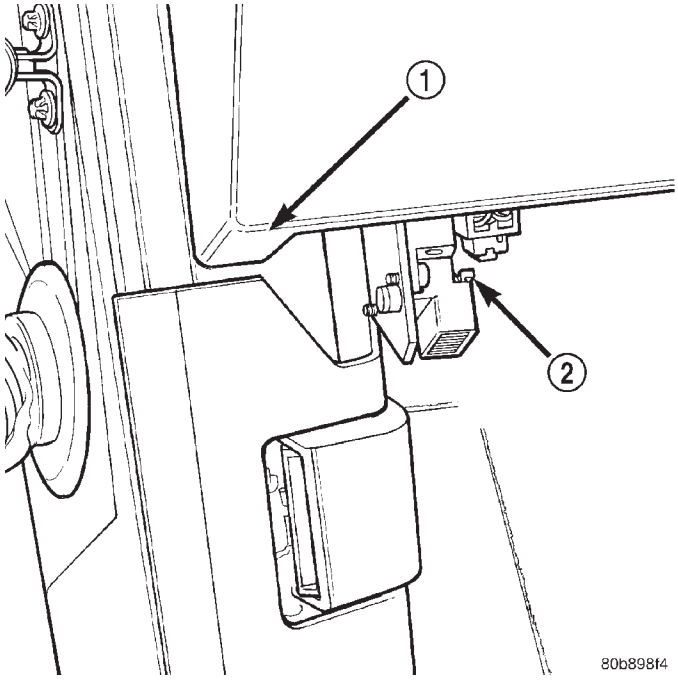


Fig. 1 Data Link (Diagnostic) Connector Location

1 - INSTRUMENT PANEL LOWER/LEFT EDGE
2 - DATA LINK CONNECTOR

EMISSIONS CONTROL (Continued)

DESCRIPTION - STATE DISPLAY TEST MODE

The switch inputs to the Powertrain Control Module (PCM) have two recognized states; HIGH and LOW. For this reason, the PCM cannot recognize the difference between a selected switch position versus an open circuit, a short circuit, or a defective switch. If the State Display screen shows the change from HIGH to LOW or LOW to HIGH, assume the entire switch circuit to the PCM functions properly. Connect the DRB scan tool to the data link connector and access the state display screen. Then access either State Display Inputs and Outputs or State Display Sensors.

DESCRIPTION - CIRCUIT ACTUATION TEST MODE

The Circuit Actuation Test Mode checks for proper operation of output circuits or devices the Powertrain Control Module (PCM) may not internally recognize. The PCM attempts to activate these outputs and allow an observer to verify proper operation. Most of the tests provide an audible or visual indication of device operation (click of relay contacts, fuel spray, etc.). Except for intermittent conditions, if a device functions properly during testing, assume the device, its associated wiring, and driver circuit work correctly. Connect the DRB scan tool to the data link connector and access the Actuators screen.

DESCRIPTION - DIAGNOSTIC TROUBLE CODES

A Diagnostic Trouble Code (DTC) indicates the PCM has recognized an abnormal condition in the system.

Remember that DTC's are the results of a system or circuit failure, but do not directly identify the failed component or components.

NOTE: For a list of DTC's, refer to the charts in this section.

BULB CHECK

Each time the ignition key is turned to the ON position, the malfunction indicator (check engine) lamp on the instrument panel should illuminate for approximately 2 seconds then go out. This is done for a bulb check.

OBTAINING DTC'S USING DRB SCAN TOOL

(1) Connect the DRB scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.

(2) Turn the ignition switch on and access the "Read Fault" screen.

(3) Record all the DTC's and "freeze frame" information shown on the DRB scan tool.

(4) To erase DTC's, use the "Erase Trouble Code" data screen on the DRB scan tool. **Do not erase any DTC's until problems have been investigated and repairs have been performed.**

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0030 (M)	1/1 O2 Sensor Heater Circuit Malfunction	Problem detected in oxygen sensor heater relay circuit.
P0031 (M)	1/1 O2 Sensor Heater Circuit Low	Problem detected in oxygen sensor heater relay circuit.
P0032 (M)	1/1 O2 Sensor Heater Circuit High	Problem detected in oxygen sensor heater relay circuit.
P0036 (M)	1/2 O2 Sensor Heater Circuit Malfunction	Problem detected in oxygen sensor heater relay circuit.
P0037 (M)	1/2 O2 Sensor Heater Circuit Low	Problem detected in oxygen sensor heater relay circuit.
P0038 (M)	1/2 O2 Sensor Heater Circuit High	Problem detected in oxygen sensor heater relay circuit.
P0043 (M)	1/3 O2 Sensor Heater Circuit Low	Problem detected in oxygen sensor heater relay circuit.
P0044 (M)	1/3 O2 Sensor Heater Circuit High	Problem detected in oxygen sensor heater relay circuit.
P0051 (M)	2/1 O2 Sensor Heater Circuit Low	Problem detected in oxygen sensor heater relay circuit.
P0052 (M)	2/1 O2 Sensor Heater Circuit High	Problem detected in oxygen sensor heater relay circuit.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0057 (M)	2/2 O2 Sensor Heater Circuit Low	Problem detected in oxygen sensor heater relay circuit.
P0058 (M)	2/2 O2 Sensor Heater Circuit High	Problem detected in oxygen sensor heater relay circuit.
P0071 (M)	Amb/Bat Temp Sensor Performance	
P0106	Barometric Pressure Out of Range	MAP sensor input voltage out of an acceptable range detected during reading of barometric pressure at key-on.
P0107 (M)	Map Sensor Voltage Too Low	MAP sensor input below minimum acceptable voltage.
P0108 (M)	Map Sensor Voltage Too High	MAP sensor input above maximum acceptable voltage.
PO111 (M)	Intake Air Temp Sensor Performance	
P0112 (M)	Intake Air Temp Sensor Voltage Low	Intake air (charge) temperature sensor input below the minimum acceptable voltage.
P0113 (M)	Intake Air Temp Sensor Voltage High	Intake air (charge) temperature sensor input above the maximum acceptable voltage.
P0116	Coolant Temp Sensor Performance	A rationatilty error has been detected in the coolant temp sensor.
P0117 (M)	ECT Sensor Voltage Too Low	Engine coolant temperature sensor input below the minimum acceptable voltage.
P0118 (M)	ECT Sensor Voltage Too High	Engine coolant temperature sensor input above the maximum acceptable voltage.
P0121 (M)	TPS Voltage Does Not Agree With MAP	TPS signal does not correlate to MAP sensor signal.
P0121 (M)	Accelerator Position Sensor (APPS) Signal Voltage Too Low	APPS voltage input below the minimum acceptable voltage.
P0122 (M)	Throttle Position Sensor Voltage Low	Throttle position sensor input below the acceptable voltage range.
P0122 (M)	Accelerator Position Sensor (APPS) Signal Voltage Too Low	APPS voltage input below the minimum acceptable voltage.
P0123 (M)	Throttle Position Sensor Voltage High	Throttle position sensor input above the maximum acceptable voltage.
P0123 (M)	Accelerator Position Sensor (APPS) Signal Voltage Too High	APPS voltage input above the maximum acceptable voltage.
P0125 (M)	Closed Loop Temp Not Reached	Time to enter Closed Loop Operation (Fuel Control) is excessive.
P0125 (M)	Engine is Cold Too Long	Engine does not reach operating temperature.
P0130 (M)	1/1 O2 Sensor Heater Circuit Malfunction	Oxygen sensor heater element malfunction.
P0131 (M)	1/1 O2 Sensor Shorted To Ground	Oxygen sensor input voltage maintained below normal operating range.
P0132 (M)	1/1 O2 Sensor Shorted To Voltage	Oxygen sensor input voltage maintained above normal operating range.
P0133 (M)	1/1 O2 Sensor Slow Response	Oxygen sensor response slower than minimum required switching frequency.
P0134 (M)	1/1 O2 Sensor Stays at Center	Neither rich or lean condition is detected from the oxygen sensor input.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0135 (M)	1/1 O2 Sensor Heater Failure	Oxygen sensor heater element malfunction.
P0136 (M)	1/2 O2 Sensor Heater Circuit Malfunction	Oxygen sensor heater element malfunction.
P0137 (M)	1/2 O2 Sensor Shorted To Ground	Oxygen sensor input voltage maintained below normal operating range.
P0138 (M)	1/2 O2 Sensor Shorted To Voltage	Oxygen sensor input voltage maintained above normal operating range.
P0139 (M)	1/2 O2 Sensor Slow Response	Oxygen sensor response not as expected.
P0140 (M)	1/2 O2 Sensor Stays at Center	Neither rich or lean condition is detected from the oxygen sensor.
P0141 (M)	1/2 O2 Sensor Heater Failure	Oxygen sensor heater element malfunction.
P0143 (M)	1/3 O2 Sensor Shorted To Ground	Oxygen sensor input voltage maintained below normal operating range.
P0144 (M)	1/3 O2 Sensor Shorted To Voltage	Oxygen sensor input voltage maintained above normal operating range.
P0145 (M)	1/3 O2 Sensor Slow Response	Oxygen sensor response slower than minimum required switching frequency.
P0146 (M)	1/3 O2 Sensor Stays at Center	Neither rich or lean condition is detected from the oxygen sensor.
P0147 (M)	1/3 O2 Sensor Heater Failure	Oxygen sensor heater element malfunction.
P0151 (M)	2/1 O2 Sensor Shorted To Ground	Oxygen sensor input voltage maintained below normal operating range.
P0152 (M)	2/1 O2 Sensor Shorted To Voltage	Oxygen sensor input voltage sustained above normal operating range.
P0153 (M)	2/1 O2 Sensor Slow Response	Oxygen sensor response slower than minimum required switching frequency.
P0154 (M)	2/1 O2 Sensor Stays at Center	Neither rich or lean condition is detected from the oxygen sensor.
P0155 (M)	2/1 O2 Sensor Heater Failure	Oxygen sensor heater element malfunction.
P0157 (M)	2/2 O2 Sensor Shorted To Ground	Oxygen sensor input voltage maintained below normal operating range.
P0158 (M)	2/2 O2 Sensor Shorted To Voltage	Oxygen sensor input voltage maintained above normal operating range.
P0159	2/2 O2 Sensor Slow Response	Oxygen sensor response slower than minimum required switching frequency.
P0160 (M)	2/2 O2 Sensor Stays at Center	Neither rich or lean condition is detected from the oxygen sensor.
P0161 (M)	2/2 O2 Sensor Heater Failure	Oxygen sensor heater element malfunction.
PO165	Starter Relay Circuit	Problem detected in starter relay circuit.
P0168	Decreased Engine Performance Due To High Injection Pump Fuel Temp	Fuel temperature is above the engine protection limit. Engine power will be derated.
P0171 (M)	1/1 Fuel System Lean	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0172 (M)	1/1 Fuel System Rich	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
P0174 (M)	2/1 Fuel System Lean	A lean air/fuel mixture has been indicated by an abnormally rich correction factor.
P0175 (M)	2/1 Fuel System Rich	A rich air/fuel mixture has been indicated by an abnormally lean correction factor.
P0176	Loss of Flex Fuel Calibration Signal	No calibration voltage present from flex fuel sensor.
P0177	Water In Fuel	Excess water found in fuel by water-in-fuel sensor.
P0178	Flex Fuel Sensor Volts Too Low	Flex fuel sensor input below minimum acceptable voltage.
P0178	Water In Fuel Sensor Voltage Too Low	Loss of water-in-fuel circuit or sensor.
P0179	Flex Fuel Sensor Volts Too High	Flex fuel sensor input above maximum acceptable voltage.
P0181	Fuel Injection Pump Failure	Low power, engine derated, or engine stops.
P0182 (M)	CNG Temp Sensor Voltage Too Low	Compressed natural gas temperature sensor voltage below acceptable voltage.
P0183 (M)	CNG Temp Sensor Voltage Too High	Compressed natural gas temperature sensor voltage above acceptable voltage.
P0201 (M)	Injector #1 Control Circuit	An open or shorted condition detected in control circuit for injector #1 or the INJ 1 injector bank.
P0202 (M)	Injector #2 Control Circuit	An open or shorted condition detected in control circuit for injector #2 or the INJ 2 injector bank.
P0203 (M)	Injector #3 Control Circuit	An open or shorted condition detected in control circuit for injector #3 or the INJ 3 injector bank.
P0204 (M)	Injector #4 Control Circuit	Injector #4 or INJ 4 injector bank output driver stage does not respond properly to the control signal.
P0205 (M)	Injector #5 Control Circuit	Injector #5 output driver stage does not respond properly to the control signal.
P0206 (M)	Injector #6 Control Circuit	Injector #6 output driver stage does not respond properly to the control signal.
P0207 (M)	Injector #7 Control Circuit	Injector #7 output driver stage does not respond properly to the control signal.
P0208 (M)	Injector #8 Control Circuit	Injector #8 output driver stage does not respond properly to the control signal.
P0209 (M)	Injector #9 Control Circuit	Injector #9 output driver stage does not respond properly to the control signal.
P0210 (M)	Injector #10 Control Circuit	Injector #10 output driver stage does not respond properly to the control signal.
P0215	Fuel Injection Pump Control Circuit	Failure in fuel pump relay control circuit.
P0216 (M)	Fuel Injection Pump Timing Failure	High fuel supply restriction, low fuel pressure or possible wrong or incorrectly installed pump keyway.
P0217	Decreased Engine Performance Due To Engine Overheat Condition	Engine overheating. ECM will derate engine performance.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0219	Crankshaft Position Sensor Overspeed Signal	Engine has exceeded rpm limits.
P0222 (M)	Idle Validation Signals Both Low	Problem detected with idle validation circuits within APPS.
P0223 (M)	Idle Validation Signals Both High (Above 5 Volts)	Problem detected with idle validation circuits within APPS.
P0230	Transfer Pump (Lift Pump) Circuit Out of Range	Problem detected in fuel transfer pump circuits.
P0232	Fuel Shutoff Signal Voltage Too High	Fuel shut-off signal voltage too high from ECM to fuel injection pump.
P0234 (M)	Turbo Boost Limit Exceeded	Problem detected in turbocharger wastegate.
P0236 (M)	Map Sensor Too High Too Long	Problem detected in turbocharger wastegate.
P0237 (M)	Map Sensor Voltage Too Low	MAP sensor voltage input below the minimum acceptable voltage.
P0238 (M)	Map Sensor Voltage Too High	MAP sensor voltage input above the maximum acceptable voltage.
PO243	Wastegate Solenoid Circuit	
P0251 (M)	Fuel Inj. Pump Mech. Failure Fuel Valve Feedback Circuit	Problem sensed with fuel circuit internal to fuel injection pump.
P0253 (M)	Fuel Injection Pump Fuel Valve Open Circuit	Problem sensed with fuel circuit internal to fuel injection pump.
P0254	Fuel Injection Pump Fuel Valve Current Too High	Problem caused by internal fuel injection pump failure.
P0300 (M)	Multiple Cylinder Mis-fire	Misfire detected in multiple cylinders.
P0301 (M)	CYLINDER #1 MISFIRE	Misfire detected in cylinder #1.
P0302 (M)	CYLINDER #2 MISFIRE	Misfire detected in cylinder #2.
P0303 (M)	CYLINDER #3 MISFIRE	Misfire detected in cylinder #3.
P0304 (M)	CYLINDER #4 MISFIRE	Misfire detected in cylinder #4.
P0305 (M)	CYLINDER #5 MISFIRE	Misfire detected in cylinder #5.
P0306 (M)	CYLINDER #6 MISFIRE	Misfire detected in cylinder #6.
P0307 (M)	CYLINDER #7 MISFIRE	Misfire detected in cylinder #7
P0308 (M)	CYLINDER #8 MISFIRE	Misfire detected in cylinder #8.
P0309 (M)	CYLINDER #9 MISFIRE	Misfire detected in cylinder #9.
P0310 (M)	CYLINDER #10 MISFIRE	Misfire detected in cylinder #10.
P0320 (M)	No Crank Referance Signal at PCM	No reference signal (crankshaft position sensor) detected during engine cranking.
P0320 (M)	No RPM Signal to PCM (Crankshaft Position Sensor Signal to JTEC)	A CKP signal has not been detected at the PCM.
P0325	Knock Sensor #1 Circuit	Knock sensor (#1) signal above or below minimum acceptable threshold voltage at particular engine speeds.
P0330	Knock Sensor #2 Circuit	Knock sensor (#2) signal above or below minimum acceptable threshold voltage at particular engine speeds.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0336 (M)	Crankshaft Position (CKP) Sensor Signal	Problem with voltage signal from CKP.
P0340 (M)	No Cam Signal At PCM	No fuel sync
P0341 (M)	Camshaft Position (CMP) Sensor Signal	Problem with voltage signal from CMP.
P0350	Ignition Coil Draws Too Much Current	A coil (1-5) is drawing too much current.
P0351 (M)	Ignition Coil # 1 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
P0352 (M)	Ignition Coil # 2 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
P0353 (M)	Ignition Coil # 3 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time.
P0354 (M)	Ignition Coil # 4 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time (High Impedance).
P0355 (M)	Ignition Coil # 5 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time (High Impedance).
P0356 (M)	Ignition Coil # 6 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time (high impedance).
P0357 (M)	Ignition Coil # 7 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time (high impedance).
P0358 (M)	Ignition Coil # 8 Primary Circuit	Peak primary circuit current not achieved with maximum dwell time (high impedance).
P0370	Fuel Injection Pump Speed/Position Sensor Sig Lost	Problem caused by internal fuel injection pump failure.
P0380 (M)	Intake Air Heater Relay #1 Control Circuit	Problem detected in #1 air heater solenoid/relay circuit (not heater element)
P0381 (M)	Wait To Start Lamp Inoperative	Problem detected in wait-to-start bulb circuit.
P0382 (M)	Intake Air Heater Relay #2 Control Circuit	Problem detected in #2 air heater solenoid/relay circuit (not heater element)
P0387	Crankshaft Position Sensor Supply Voltage Too Low	CKP sensor voltage input below the minimum acceptable voltage.
P0388	Crankshaft Position Sensor Supply Voltage Too High	CKP sensor voltage input above the maximum acceptable voltage.
PO0400	Diesel EGR System Failure	
P0401	EGR System Failure	Required change in air/fuel ration not detected during diagnostic test.
P0403	EGR Solenoid Circuit	An open or shorted condition detected in the EGR solenoid control circuit.
P0404	EGR Position Sensor Rationality	EGR position sensor signal does not correlate to EGR duty cycle.
P0405	EGR Position Sensor Volts Too Low	EGR position sensor input below the acceptable voltage range.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0406	EGR Position Sensor Volts Too High	EGR position sensor input above the acceptable voltage range.
P0412	Secondary Air Solenoid Circuit	An open or shorted condition detected in the secondary air (air switching/aspirator) solenoid control circuit.
P0420 (M)	1/1 Catalytic Converter Efficiency	Catalyst 1/1 efficiency below required level.
P0432 (M)	1/2 Catalytic Converter Efficiency	Catalyst 2/1 efficiency below required level.
P0441 (M)	Evap Purge Flow Monitor	Insufficient or excessive vapor flow detected during evaporative emission system operation.
P0442 (M)	Evap Leak Monitor Medium Leak Detected	A small leak has been detected in the evaporative system.
P0443 (M)	Evap Purge Solenoid Circuit	An open or shorted condition detected in the EVAP purge solenoid control circuit.
P0455 (M)	Evap Leak Monitor Large Leak Detected	A large leak has been detected in the evaporative system.
P0456 (M)	Evap Leak Monitor Small Leak Detected	Leak has been detected in the evaporative system.
P0460	Fuel Level Unit No Change Over Miles	During low fuel
P0460	Fuel Level Unit No Change Over Miles	Fuel level sending unit voltage does not change for more than 40 miles.
PO061	Fuel Level Unit No Change Over Time	
P0462	Fuel Level Sending Unit Volts Too Low	Fuel level sensor input below acceptable voltage.
P0462 (M)	Fuel Level Sending Unit Volts Too Low	Open circuit between PCM and fuel gauge sending unit.
P0463	Fuel Level Sending Unit Volts Too High	Fuel level sensor input above acceptable voltage.
P0463 (M)	Fuel Level Sending Unit Volts Too High	Circuit shorted to voltage between PCM and fuel gauge sending unit.
P0500 (M)	No Vehicle Speed Sensor Signal	No vehicle speed sensor signal detected during road load conditions.
P0500 (M)	No Vehicle Speed Sensor Signal	A vehicle speed signal was not detected.
P0505 (M)	Idle Air Control Motor Circuits	
P0508 (M)	IAC Motor Sense Circuit Low	
P0509 (M)	IAC Motor Sense Circuit High	
P0521	Oil Pressure Switch Rationality	
P0522	Oil Pressure Voltage Too Low	Oil pressure sending unit (sensor) voltage input below the minimum acceptable voltage.
P0523	Oil Pressure Voltage Too High	Oil pressure sending unit (sensor) voltage input above the maximum acceptable voltage.
P0524	Oil Pressure Too Low	Engine oil pressure is low. Engine power derated.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0545	A/C Clutch Relay Circuit	Problem detected in air conditioning clutch relay control circuit.
P0551	Power Steering Switch Failure	Incorrect input state detected for the power steering switch circuit. PL: High pressure seen at high speed.
P0562	Charging System Voltage Too Low	Supply voltage sensed at ECM too low.
P0563	Charging System Voltage Too High	Supply voltage sensed at ECM too high.
P0572	Brake Switch Input #1 Signal Missing	
P0573	Brake Switch Input #2 Signal Missing	
P0575	Cruise Control Switch Voltage Low	
P0576	Cruise Control Switch Voltage High	
P0577	Cruise Control Switch Voltage High	
P0600	PCM Failure SPI Communications	No communication detected between co-processors in the control module.
P0601 (M)	Internal Controller Failure	Internal control module fault condition (check sum) detected.
P0602 (M)	ECM Fueling Calibration Error	ECM Internal fault condition detected.
P0604	RAM Check Failure	Transmission control module RAM self test fault detected. -Aisin transmission
P0605	ROM Check Falure	Transmission control module ROM self test fault detected -Aisin transmission
P0606 (M)	ECM Failure	ECM Internal fault condition detected.
P0615	Starter Relay Control Circuit	An open or shorted condition detected in the starter relay control circuit.
P0622 (G)	Generator Field Not Switching Properly	An open or shorted condition detected in the generator field control circuit.
P0645	A/C Clutch Relay Circuit	An open or shorted condition detected in the A/C clutch relay control circuit.
P0700	EATX Controller DTC Present	This SBEC III or JTEC DTC indicates that the EATX or Aisin controller has an active fault and has illuminated the MIL via a CCD (EATX) or SCI (Aisin) message. The specific fault must be acquired from the EATX via CCD or from the Aisin via ISO-9141.
P0703	Brake Switch Stuck Pressed or Released	Incorrect input state detected in the brake switch circuit. (Changed from P1595)
P0703	Brake Switch Sense Circuit	
P0711 (M)	Trans Temp Sensor, No Temp Rise After Start	Relationship between the transmission temperature and overdrive operation and/or TCC operation indicates a failure of the Transmission Temperature Sensor. OBD II Rationality. Was MIL code 37.
P0712	Trans Temp Sensor Voltage Too Low	Transmission fluid temperature sensor input below acceptable voltage. Was MIL code 37.

EMISSIONS CONTROL (Continued)

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(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P0712 (M)	Trans Temp Sensor Voltage Too Low	Voltage less than 1.55 volts (4-speed auto. trans. only).
P0713	Trans Temp Sensor Voltage Too High	Transmission fluid temperature sensor input above acceptable voltage. Was MIL code 37.
P0713 (M)	Trans Temp Sensor Voltage Too High	Voltage greater than 3.76 volts (4-speed auto. trans. only).
P0720 (M)	Low Output SPD Sensor RPM, Above 15 MPH	The relationship between the Output Shaft Speed Sensor and vehicle speed is not within acceptable limits.
P0720 (M)	Low Output Spd Sensor RPM Above 15 mph	Output shaft speed is less than 60 rpm with vehicle speed above 15 mph (4-speed auto. trans. only).
P0740 (M)	Torq Con Clu, No RPM Drop at Lockup	Relationship between engine and vehicle speeds indicated failure of torque convertor clutch lock-up system (TCC/PTU solenoid)
P0743 (M)	Torque Converter Clutch Solenoid/ Trans Relay Circuits	An open or shorted condition detected in the torque converter clutch (part throttle unlock) solenoid control circuit. Shift solenoid C electrical fault - Aisin transmission
P0743 (M)	Torque Converter Clutch Solenoid/ Trans Relay Circuits	An open or shorted condition detected in the torque converter part throttle unlock solenoid control circuit (3 or 4-speed auto. trans. only).
P0748 (M)	Governor Pressur Sol Control/Trans Relay Circuits	An open or shorted condition detected in the Governor Pressure Solenoid circuit or Trans Relay Circuit in JTEC RE transmissions.
P0748 (M)	Governor Pressure Sol Control/Trans Relay Circuits	An open or shorted condition detected in the governor pressure solenoid or relay circuits (4-speed auto. trans. only).
P0751 (M)	O/D Switch Pressed (Lo) More Than 5 Minutes	Overdrive override switch input is in a prolonged depressed state.
P0751 (M)	O/D Switch Pressed (LO) More Than 5 Min	Overdrive Off switch input too low for more than 5 minutes (4-speed auto. trans. only).
P0753 (M)	Trans 3-4 Shift Sol/Trans Relay Circuits	An open or shorted condition detected in the overdrive solenoid control circuit or Trans Relay Circuit in JTEC RE transmissions. Was MIL code 45.
P0753 (M)	Trans 3-4 Shift Sol/Trans Relay Circuits	An open or shorted condition detected in the transmission 2-4 shift solenoid circuit (4-speed auto. trans. only).
P0756	AW4 Shift Sol B (2-3) Functional Failure	Shift solenoid B (2-3) functional fault - Aisin transmission
P0783 (M)	3-4 Shift Sol, No RPM Drop at Lockup	The overdrive solenoid is unable to engage the gear change from 3rd gear to the overdrive gear.
P0801	Reverse Gear Lockout Circuit Open or Short	An open or shorted condition detected in the transmission reverse gear lock-out solenoid control circuit.
P0830	Clutch Depressed Switch Circuit	Problem detected in clutch switch circuit.
P0833	Clutch Released Switch Circuit	Problem detected in clutch switch circuit.
P0836	4WD Mux Switch Circuit	
P0837	4WD Mux Switch Performance	

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1110	Decrease Engine Performance Due To High Intake Air Temperature	Intake manifold air temperature is above the engine protection limit. Engine power will be derated.
P1180	Decreased Engine Performance Due To High Injection Pump Fuel Temp	Fuel temperature is above the engine protection limit. Engine power will be derated.
P1192	Intake Air Temp Sensor Voltage Low	
P1193	Intake Air Temp Sensor Voltage High	
P1194	O2 Heater Performance	
P1195 (M)	1/1 O2 Sensor Slow During Catalyst Monitor	A slow switching oxygen sensor has been detected in bank 1/1 during catalyst monitor test. (Also see SCI DTC $66) (was P0133)
P1196 (M)	2/1 O2 Sensor Slow During Catalyst Monitor	A slow switching oxygen sensor has been detected in bank 2/1 during catalyst monitor test. (Also see SCI DTC $7A) (was P0153)
P1197	1/2 O2 Sensor Slow During Catalyst Monitor	A slow switching oxygen sensor has been detected in bank 1/2 during catalyst monitor test. (Also see SCI DTC $68) (was P0139)
P1198	Radiator Temperature Sensor Volts Too High	Radiator coolant temperature sensor input above the maximum acceptable voltage.
P1199	Radiator Temperature Sensor Volts Too Low	Radiator coolant temperature sensor input below the minimum acceptable voltage.
P1280	Fuel System Relay Circuit	
P1281	Engine is Cold Too Long	Engine coolant temperature remains below normal operating temperatures during vehicle travel (Thermostat).
P1282	Fuel Pump/System Relay Control Circuit	An open or shorted condition detected in the fuel pump relay control circuit.
P1283	Idle Select Signal Invalid	ECM or fuel injection pump module internal fault condition detected.
P1284 (M)	Fuel Injection Pump Battery Voltage Out-Of-Range	Fuel injection pump module internal fault condition detected. Engine power will be derated.
P1285 (M)	Fuel Injection Pump Controller Always On	Fuel injection pump module relay circuit failure detected. Engine power will be derated.
P1286	Accelerator Position Sensor (APPS) Supply Voltage Too High	High voltage detected at APPS.
P1287	Fuel Injection Pump Controller Supply Voltage Low	ECM or fuel injection pump module internal fault condition detected. Engine power will be derated.
P1288	Intake Manifold Short Runner Solenoid Circuit	An open or shorted condition detected in the short runner tuning valve circuit.
P1289	Manifold Tune Valve Solenoid Circuit	An open or shorted condition detected in the manifold tuning valve solenoid control circuit.
P1290	High Pressure Solenoid Relay Ckt.	CNG Fuel System Pressure Too High–Compressed natural gas system pressure above normal operating range.
P1291	No Temp Rise Seen From Intake Heaters	Energizing Heated Air Intake does not change intake air temperature sensor an acceptable amount.

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1291 (M)	No Temperature Rise Seen From Intake Air Heaters	Problem detected in intake manifold air heating system.
P1292	CNG Pressure Sensor Voltage Too High	Compressed natural gas pressure sensor reading above acceptable voltage.
P1293	CNG Pressure Sensor Voltage Too Low	Compressed natural gas pressure sensor reading below acceptable voltage.
P1294 (M)	Target Idle Not Reached	Target RPM not achieved during drive idle condition. Possible vacuum leak or IAC (AIS) lost steps.
P1295 (M)	No 5 Volts to TP Sensor	Loss of a 5 volt feed to the Throttle Position Sensor has been detected.
P1295 (M)	Accelerator Position Sensor (APPS) Supply Voltage Too Low	APPS supply voltage input below the minimum acceptable voltage.
P1296	No 5 Volts to MAP Sensor	Loss of a 5 volt feed to the MAP Sensor has been detected.
P1297 (M)	No Change in MAP From Start To Run	No difference is recognized between the MAP reading at engine idle and the stored barometric pressure reading.
P1298	Lean Operation at Wide Open Throttle	A prolonged lean condition is detected during Wide Open Throttle
P1299	Vacuum Leak Found (IAC Fully Seated)	MAP Sensor signal does not correlate to Throttle Position Sensor signal. Possible vacuum leak.
P1388	Auto Shutdown Relay Control Circuit	An open or shorted condition detected in the ASD or CNG shutoff relay control ckt.
P1388	Auto Shutdown Relay Control Circuit	An open or shorted condition detected in the auto shutdown relay circuit.
P1389	No ASD Relay Output Voltage At PCM	No Z1 or Z2 voltage sensed when the auto shutdown relay is energized.
P1389 (M)	No ASD Relay Output Voltage at PCM	An open condition detected In the ASD relay output circuit.
P1390	Timing Belt Skipped 1 Tooth or More	Relationship between Cam and Crank signals not correct
P1391 (M)	Intermittent Loss of CMP or CKP	Loss of the Cam Position Sensor or Crank Position sensor has occurred. For PL 2.0L
P1398 (M)	Mis-Fire Adaptive Numerator at Limit	PCM is unable to learn the Crank Sensor's signal in preparation for Misfire Diagnostics. Probable defective Crank Sensor
P1399	Wait To Start Lamp Cicuit	An open or shorted condition detected in the Wait to Start Lamp circuit.
P1403	No 5V to EGR Sensor	Loss of 5v feed to the EGR position sensor.
P01475	Aux 5 Volt Supply Voltage High	Sensor supply voltage for ECM sensors is too high.
P1476	Too Little Secondary Air	Insufficient flow of secondary air injection detected during aspirator test (was P0411)
P1477	Too Much Secondary Air	Excessive flow of secondary air injection detected during aspirator test (was P0411).

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1478	Battery Temp Sensor Volts Out of Limit	Internal temperature sensor input voltage out of an acceptable range.
P1479	Transmission Fan Relay Circuit	An open or shorted condition detected in the transmission fan relay circuit.
P1480	PCV Solenoid Circuit	An open or shorted condition detected in the PCV solenoid circuit.
P1481	EATX RPM Pulse Perf	EATX RPM pulse generator signal for misfire detection does not correlate with expected value.
P1482	Catalyst Temperature Sensor Circuit Shorted Low	Catalyst temperature sensor circuit shorted low.
P1483	Catalyst Temperature Sensor Circuit Shorted High.	Catalyst temperature sensor circuit shorted high.
P1484	Catalytic Converter Overheat Detected	A catalyst overheat condition has been detected by the catalyst temperature sensor.
P1485	Air Injection Solenoid Circuit	An open or shorted condition detected in the air assist solenoid circuit.
P1486	Evap Leak Monitor Pinched Hose Found	LDP has detected a pinched hose in the evaporative hose system.
P1487	Hi Speed Rad Fan CTRL Relay Circuit	An open or shorted condition detected in the control circuit of the #2 high speed radiator fan control relay.
P1488	Auxiliary 5 Volt Supply Output Too Low	Auxiliary 5 volt sensor feed is sensed to be below an acceptable limit.
P1488	5 Volt Supply Voltage Low	Sensor supply voltage for ECM sensors is too low.
P1489	High Speed Fan CTRL Relay Circuit	An open or shorted condition detected in the control circuit of the high speed radiator fan control relay.
P1490	Low Speed Fan CTRL Relay Circuit	An open or shorted condition detected in control circuit of the low speed radiator fan control relay.
P1491	Rad Fan Control Relay Circuit	An open or shorted condition detected in the radiator fan control relay control circuit. This includes PWM solid state relays.
P1492	Ambient/Batt Temp Sen Volts Too High	External temperature sensor input above acceptable voltage.
P1492 (M)	Ambient/Batt Temp Sensor Volts Too High	Battery temperature sensor input voltage above an acceptable range.
P1493 (M)	Ambient/Batt Temp Sen Volts Too Low	External temperature sensor input below acceptable voltage.
P1493 (M)	Ambient/Batt Temp Sen Volts Too Low	Battery temperature sensor input voltage below an acceptable range.
P1494 (M)	Leak Detection Pump Sw or Mechanical Fault	Incorrect input state detected for the Leak Detection Pump (LDP) pressure switch.
P1495	Leak Detection Pump Solenoid Circuit	An open or shorted condition detected in the Leak Detection Pump (LDP) solenoid circuit.
P1496	5 Volt Supply, Output Too Low	5 volt sensor feed is sensed to be below an acceptable limit. (less than 4v for 4 sec)

EMISSIONS CONTROL (Continued)

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(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1498	High Speed Rad Fan Ground CTRL Rly Circuit	An open or shorted condition detected in the control circuit of the #3 high speed radiator fan control relay.
P1499	Hydraulic cooling fan solenoid circuit	An open or shorted condition detected in the cooling fan control solenoid circuit.
P1594 (G)	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
P1594	Charging System Voltage Too High	Battery voltage sense input above target charging voltage during engine operation.
P1595	Speed Control Solenoid Circuits	An open or shorted condition detected in either of the speed control vacuum or vent solenoid control circuits.
P1595	Speed Control Solenoid Circuits	An open or shorted condition detected in the speed control vacuum or vent solenoid circuits.
P1596	Speed Control Switch Always High	Speed control switch input above maximum acceptable voltage.
P1597	Speed Control Switch Always Low	Speed control switch input below minimum acceptable voltage.
P1597	Speed Control Switch Always Low	Speed control switch input below the minimum acceptable voltage.
P1598	A/C Pressure Sensor Volts Too High	A/C pressure sensor input above maximum acceptable voltage.
P1598	A/C Sensor Input Hi	Problem detected in air conditioning electrical circuit.
P1599	A/C Pressure Sensor Volts Too Low	A/C pressure sensor input below minimum acceptable voltage.
P1599	A/C Sensor Input Lo	Problem detected in air conditioning electrical circuit.
P1602	PCM not programmed	
P1680	Clutch Released Switch Circuit	Problem detected in clutch switch electrical circuit.
P1681	No I/P Cluster CCD/J1850 Messages Received	No CCD/J1850 messages received from the cluster control module.
P1682 (G)	Charging System Voltage Too Low	Battery voltage sense input below target charging voltage during engine operation and no significant change in voltage detected during active test of generator output circuit.
P1682	Charging System Voltage Too Low	Charging system output voltage low.
P1683	SPD CTRL PWR Relay; or S/C 12v Driver CKT	An open or shorted condition detected in the speed control servo power control circuit.
P1683	Spd ctrl pwr rly, or s/c 12v driver circuit	An open or shorted condition detected in the speed control servo power control circuit.
P1684	Batt Loss (disconnected) in last 50 Starts	The battery has been disconnected within the last 50 starts
P1685	SKIM Invalid Key - (Wrong or Invalid Key MSG Received From SKIM)	The engine controler has received an invalid key from the SKIM.
P1686	No SKIM BUS Messages Received	No CCD/J1850 messages received from the Smart Key Immobilizer Module (SKIM).

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1687	No MIC BUS Message (No Cluster BUS Message)	No CCD/J1850 messages received from the Mechanical Instrument Cluster (MIC) module.
P1688 (M)	Internal Fuel Injection Pump Controller Failure	Internal problem within the fuel injection pump. Low power, engine derated, or engine stops.
P1689 (M)	No Communication Between ECM and Injection Pump Module	Data link circuit failure between ECM and fuel injection pump. Low power, engine derated, or engine stops.
P1690 (M)	Fuel Injection Pump CKP Sensor Does Not Agree With ECM CKP Sensor	Problem in fuel sync signal. Possible injection pump timing problem. Low power, engine derated, or engine stops.
P1691	Fuel Injection Pump Controller Calibration Error	Internal fuel injection pump failure. Low power, engine derated, or engine stops.
P1692	DTC Set In ECM	A ″Companion DTC″ was set in both the ECM and PCM.
P1693 (M)	DTC Detected in Companion Module	A fault has been generated in the companion engine control module.
P1693 (M)	DTC Detected in PCM/ECM or DTC Detected in ECM	A ″Companion DTC″ was set in both the ECM and PCM.
P1694	Fault In Companion Module	No CCD/J1850 messages received from the powertrain control module-Aisin transmission
P1694 (M)	No BUS (CCD) Messages received from ECM	Bus communication failure to PCM.
P1695	No CCD/J1850 Message From Body Control Module	No CCD/J1850 messages received from the body control module.
P1696	PCM Failure EEPROM Write Denied	Unsuccessful attempt to write to an EEPROM location by the control module.
P1697	PCM Failure SRI Mile Not Stored	Unsuccessful attempt to update Service Reminder Indicator (SRI or EMR) mileage in the control module EEPROM.
P1698	No CCD/J1850 Message From TCM	No CCD/J1850 messages received from the electronic transmission control module (EATX) or the Aisin transmission controller.
P1698	No CCD Messages received from PCM	Bus communication failure to PCM. A ″Companion DTC″ was set in both the ECM and PCM.
P1699	No Climate Control Bus Messages	
P1719	Skip Shift Solenoid Circuit	An open or shorted condition detected in the transmission 2-3 gear lock-out solenoid control circuit.
P1740	TCC or OD Sol Perf	A rationality error has been detected in either the TCC solenoid or overdrive solenoid systems.
P1740 (M)	TCC OR O/D Solenoid Performance	Problem detected in transmission convertor clutch and/or overdrive circuits (diesel engine with 4-speed auto. trans. only).

EMISSIONS CONTROL (Continued)

(M) Malfunction Indicator Lamp (MIL) illuminated during engine operation if this DTC was recorded (depending if required by CARB and/or EPA). MIL is displayed as an engine icon on instrument panel.		
(G) Generator lamp illuminated		
Generic Scan Tool P-Code	DRB Scan Tool Display	Brief Description of DTC
P1756 (M)	GOV Press Not Equal to Target @ 15-20 PSI	The requested pressure and the actual pressure are not within a tolerance band for the Governor Control System which is used to regulate governor pressure to control shifts for 1st, 2nd, and 3rd gear. (Mid Pressure Malfunction)
P1756 (M)	Governor Pressure Not Equal to Target @ 15-20 PSI	Governor sensor input not between 10 and 25 psi when requested (4-speed auto. trans. only).
P1757	GOV Press Not Equal to Target @ 15-20 PSI	The requested pressure and the actual pressure are not within a tolerance band for the Governor Control System which is used to regulate governor pressure to control shifts for 1st, 2nd, and 3rd gear (Zero Pressure Malfunction)
P1757 (M)	Governor Pressure Above 3 PSI In Gear With 0 MPH	Governor pressure greater than 3 psi when requested to be 0 psi (4-speed auto. trans. only).
P1762 (M)	Gov Press Sen Offset Volts Too Lo or High	The Governor Pressure Sensor input is greater than a calibration limit or is less than a calibration limit for 3 consecutive park/neutral calibrations.
P1762 (M)	Governor Press Sen Offset Volts Too Low or High	Sensor input greater or less than calibration for 3 consecutive Neutral/Park occurrences (4-speed auto. trans. only).
P1763	Governor Pressure Sensor Volts Too Hi	The Governor Pressure Sensor input is above an acceptable voltage level.
P1763 (M)	Governor Pressure Sensor Volts Too HI	Voltage greater than 4.89 volts (4-speed auto. trans. only).
P1764 (M)	Governor Pressure Sensor Volts Too Low	The Governor Pressure Sensor input is below an acceptable voltage level.
P1764 (M)	Governor Pressure Sensor Volts Too Low	Voltage less than .10 volts (4-speed auto. trans. only).
P1765 (M)	Trans 12 Volt Supply Relay CTRL Circuit	An open or shorted condition is detected in the Transmission Relay control circuit. This relay supplies power to the TCC
P1765 (M)	Trans 12 Volt Supply Relay Ctrl Circuit	Current state of solenoid output port is different than expected (4-speed auto. trans. only).
P1830	Clutch Override Relay Circuit	Problem detected in clutch pedal switch override relay circuit.
P1899 (M)	P/N Switch Stuck in Park or in Gear	Incorrect input state detected for the Park/Neutral switch.
P1899 (M)	P/N Switch Stuck in Park or in Gear	Incorrect input state detected for the Park/Neutral switch (3 or 4-speed auto. trans. only).

EMISSIONS CONTROL (Continued)

DESCRIPTION - TASK MANAGER

The PCM is responsible for efficiently coordinating the operation of all the emissions-related components. The PCM is also responsible for determining if the diagnostic systems are operating properly. The software designed to carry out these responsibilities is referred to as the 'Task Manager'.

DESCRIPTION - MONITORED SYSTEMS

There are new electronic circuit monitors that check fuel, emission, engine and ignition performance. These monitors use information from various sensor circuits to indicate the overall operation of the fuel, engine, ignition and emission systems and thus the emissions performance of the vehicle.

The fuel, engine, ignition and emission systems monitors do not indicate a specific component problem. They do indicate that there is an implied problem within one of the systems and that a specific problem must be diagnosed.

If any of these monitors detect a problem affecting vehicle emissions, the Malfunction Indicator Lamp (MIL) will be illuminated. These monitors generate Diagnostic Trouble Codes that can be displayed with the MIL or a scan tool.

The following is a list of the system monitors:

- Misfire Monitor
- Fuel System Monitor
- Oxygen Sensor Monitor
- Oxygen Sensor Heater Monitor
- Catalyst Monitor
- Leak Detection Pump Monitor (if equipped)

All these system monitors require two consecutive trips with the malfunction present to set a fault.

Refer to the appropriate Powertrain Diagnostics Procedures manual for diagnostic procedures.

The following is an operation and description of each system monitor:

OXYGEN SENSOR (O2S) MONITOR

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The O2S is also the main sensing element for the Catalyst and Fuel Monitors.

The O2S can fail in any or all of the following manners:

- slow response rate
- reduced output voltage
- dynamic shift
- shorted or open circuits

Response rate is the time required for the sensor to switch from lean to rich once it is exposed to a richer than optimum A/F mixture or vice versa. As the sensor starts malfunctioning, it could take longer to detect the changes in the oxygen content of the exhaust gas.

The output voltage of the O2S ranges from 0 to 1 volt. A good sensor can easily generate any output voltage in this range as it is exposed to different concentrations of oxygen. To detect a shift in the A/F mixture (lean or rich), the output voltage has to change beyond a threshold value. A malfunctioning sensor could have difficulty changing beyond the threshold value.

OXYGEN SENSOR HEATER MONITOR

If there is an oxygen sensor (O2S) shorted to voltage DTC, as well as a O2S heater DTC, the O2S fault MUST be repaired first. Before checking the O2S fault, verify that the heater circuit is operating correctly.

Effective control of exhaust emissions is achieved by an oxygen feedback system. The most important element of the feedback system is the O2S. The O2S is located in the exhaust path. Once it reaches operating temperature 300° to 350°C (572 ° to 662°F), the sensor generates a voltage that is inversely proportional to the amount of oxygen in the exhaust. The information obtained by the sensor is used to calculate the fuel injector pulse width. This maintains a 14.7 to 1 Air Fuel (A/F) ratio. At this mixture ratio, the catalyst works best to remove hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxide (NOx) from the exhaust.

The voltage readings taken from the O2S sensor are very temperature sensitive. The readings are not accurate below 300°C. Heating of the O2S sensor is done to allow the engine controller to shift to closed loop control as soon as possible. The heating element used to heat the O2S sensor must be tested to ensure that it is heating the sensor properly.

The O2S sensor circuit is monitored for a drop in voltage. The sensor output is used to test the heater by isolating the effect of the heater element on the O2S sensor output voltage from the other effects.

LEAK DETECTION PUMP MONITOR (IF EQUIPPED)

The leak detection assembly incorporates two primary functions: it must detect a leak in the evapora-

EMISSIONS CONTROL (Continued)

tive system and seal the evaporative system so the leak detection test can be run.

The primary components within the assembly are: A three port solenoid that activates both of the functions listed above; a pump which contains a switch, two check valves and a spring/diaphragm, a canister vent valve (CVV) seal which contains a spring loaded vent seal valve.

Immediately after a cold start, between predetermined temperature thresholds limits, the three port solenoid is briefly energized. This initializes the pump by drawing air into the pump cavity and also closes the vent seal. During non test conditions the vent seal is held open by the pump diaphragm assembly which pushes it open at the full travel position. The vent seal will remain closed while the pump is cycling due to the reed switch triggering of the three port solenoid that prevents the diaphragm assembly from reaching full travel. After the brief initialization period, the solenoid is de-energized allowing atmospheric pressure to enter the pump cavity, thus permitting the spring to drive the diaphragm which forces air out of the pump cavity and into the vent system. When the solenoid is energized and de energized, the cycle is repeated creating flow in typical diaphragm pump fashion. The pump is controlled in 2 modes:

Pump Mode: The pump is cycled at a fixed rate to achieve a rapid pressure build in order to shorten the overall test length.

Test Mode: The solenoid is energized with a fixed duration pulse. Subsequent fixed pulses occur when the diaphragm reaches the Switch closure point.

The spring in the pump is set so that the system will achieve an equalized pressure of about 7.5" water. The cycle rate of pump strokes is quite rapid as the system begins to pump up to this pressure. As the pressure increases, the cycle rate starts to drop off. If there is no leak in the system, the pump would eventually stop pumping at the equalized pressure. If there is a leak, it will continue to pump at a rate representative of the flow characteristic of the size of the leak. From this information we can determine if the leak is larger than the required detection limit (currently set at .040" orifice by CARB). If a leak is revealed during the leak test portion of the test, the test is terminated at the end of the test mode and no further system checks will be performed.

After passing the leak detection phase of the test, system pressure is maintained by turning on the LDP's solenoid until the purge system is activated. Purge activation in effect creates a leak. The cycle rate is again interrogated and when it increases due to the flow through the purge system, the leak check portion of the diagnostic is complete.

The canister vent valve will unseal the system after completion of the test sequence as the pump diaphragm assembly moves to the full travel position.

Evaporative system functionality will be verified by using the stricter evap purge flow monitor. At an appropriate warm idle the LDP will be energized to seal the canister vent. The purge flow will be clocked up from some small value in an attempt to see a shift in the 02 control system. If fuel vapor, indicated by a shift in the 02 control, is present the test is passed. If not, it is assumed that the purge system is not functioning in some respect. The LDP is again turned off and the test is ended.

MISFIRE MONITOR

Excessive engine misfire results in increased catalyst temperature and causes an increase in HC emissions. Severe misfires could cause catalyst damage. To prevent catalytic convertor damage, the PCM monitors engine misfire.

The Powertrain Control Module (PCM) monitors for misfire during most engine operating conditions (positive torque) by looking at changes in the crankshaft speed. If a misfire occurs the speed of the crankshaft will vary more than normal.

FUEL SYSTEM MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide. The catalyst works best when the Air Fuel (A/F) ratio is at or near the optimum of 14.7 to 1.

The PCM is programmed to maintain the optimum air/fuel ratio of 14.7 to 1. This is done by making short term corrections in the fuel injector pulse width based on the O2S sensor output. The programmed memory acts as a self calibration tool that the engine controller uses to compensate for variations in engine specifications, sensor tolerances and engine fatigue over the life span of the engine. By monitoring the actual fuel-air ratio with the O2S sensor (short term) and multiplying that with the program long-term (adaptive) memory and comparing that to the limit, it can be determined whether it will pass an emissions test. If a malfunction occurs such that the PCM cannot maintain the optimum A/F ratio, then the MIL will be illuminated.

CATALYST MONITOR

To comply with clean air regulations, vehicles are equipped with catalytic converters. These converters reduce the emission of hydrocarbons, oxides of nitrogen and carbon monoxide.

Normal vehicle miles or engine misfire can cause a catalyst to decay. This can increase vehicle emissions

EMISSIONS CONTROL (Continued)

and deteriorate engine performance, driveability and fuel economy.

The catalyst monitor uses dual oxygen sensors (O2S's) to monitor the efficiency of the converter. The dual O2S's sensor strategy is based on the fact that as a catalyst deteriorates, its oxygen storage capacity and its efficiency are both reduced. By monitoring the oxygen storage capacity of a catalyst, its efficiency can be indirectly calculated. The upstream O2S is used to detect the amount of oxygen in the exhaust gas before the gas enters the catalytic converter. The PCM calculates the A/F mixture from the output of the O2S. A low voltage indicates high oxygen content (lean mixture). A high voltage indicates a low content of oxygen (rich mixture).

When the upstream O2S detects a lean condition, there is an abundance of oxygen in the exhaust gas. A functioning converter would store this oxygen so it can use it for the oxidation of HC and CO. As the converter absorbs the oxygen, there will be a lack of oxygen downstream of the converter. The output of the downstream O2S will indicate limited activity in this condition.

As the converter loses the ability to store oxygen, the condition can be detected from the behavior of the downstream O2S. When the efficiency drops, no chemical reaction takes place. This means the concentration of oxygen will be the same downstream as upstream. The output voltage of the downstream O2S copies the voltage of the upstream sensor. The only difference is a time lag (seen by the PCM) between the switching of the O2S's.

To monitor the system, the number of lean-to-rich switches of upstream and downstream O2S's is counted. The ratio of downstream switches to upstream switches is used to determine whether the catalyst is operating properly. An effective catalyst will have fewer downstream switches than it has upstream switches i.e., a ratio closer to zero. For a totally ineffective catalyst, this ratio will be one-to-one, indicating that no oxidation occurs in the device.

The system must be monitored so that when catalyst efficiency deteriorates and exhaust emissions increase to over the legal limit, the MIL will be illuminated.

DESCRIPTION - TRIP DEFINITION

The term "Trip" has different meanings depending on what the circumstances are. If the MIL (Malfunction Indicator Lamp) is OFF, a Trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.

When any Emission DTC is set, the MIL on the dash is turned ON. When the MIL is ON, it takes 3 good trips to turn the MIL OFF. In this case, it depends on what type of DTC is set to know what a "Trip" is.

For the Fuel Monitor or Mis-Fire Monitor (continuous monitor), the vehicle must be operated in the "Similar Condition Window" for a specified amount of time to be considered a Good Trip.

If a Non-Contiuous OBDII Monitor fails twice in a row and turns ON the MIL, re-running that monitor which previously failed, on the next start-up and passing the monitor, is considered to be a Good Trip. These will include the following:

- Oxygen Sensor
- Catalyst Monitor
- Purge Flow Monitor
- Leak Detection Pump Monitor (if equipped)
- EGR Monitor (if equipped)
- Oxygen Sensor Heater Monitor

If any other Emission DTC is set (not an OBDII Monitor), a Good Trip is considered to be when the Oxygen Sensor Monitor and Catalyst Monitor have been completed; or 2 Minutes of engine run time if the Oxygen Sensor Monitor or Catalyst Monitor have been stopped from running.

It can take up to 2 Failures in a row to turn on the MIL. After the MIL is ON, it takes 3 Good Trips to turn the MIL OFF. After the MIL is OFF, the PCM will self-erase the DTC after 40 Warm-up cycles. A Warm-up cycle is counted when the ECT (Engine Coolant Temperature Sensor) has crossed 160°F and has risen by at least 40°F since the engine has been started.

DESCRIPTION - COMPONENT MONITORS

There are several components that will affect vehicle emissions if they malfunction. If one of these components malfunctions the Malfunction Indicator Lamp (MIL) will illuminate.

Some of the component monitors are checking for proper operation of the part. Electrically operated components now have input (rationality) and output (functionality) checks. Previously, a component like the Throttle Position sensor (TPS) was checked by the PCM for an open or shorted circuit. If one of these conditions occurred, a DTC was set. Now there is a check to ensure that the component is working. This is done by watching for a TPS indication of a greater or lesser throttle opening than MAP and engine rpm indicate. In the case of the TPS, if engine vacuum is high and engine rpm is 1600 or greater and the TPS indicates a large throttle opening, a DTC will be set. The same applies to low vacuum if the TPS indicates a small throttle opening.

All open/short circuit checks or any component that has an associated limp in will set a fault after 1 trip with the malfunction present. Components without

an associated limp in will take two trips to illuminate the MIL.

Refer to the Diagnostic Trouble Codes Description Charts in this section and the appropriate Powertrain Diagnostic Procedure Manual for diagnostic procedures.

DESCRIPTION - NON-MONITORED CIRCUITS

The PCM does not monitor the following circuits, systems and conditions that could have malfunctions causing driveability problems. The PCM might not store diagnostic trouble codes for these conditions. However, problems with these systems may cause the PCM to store diagnostic trouble codes for other systems or components. For example, a fuel pressure problem will not register a fault directly, but could cause a rich/lean condition or misfire. This could cause the PCM to store an oxygen sensor or misfire diagnostic trouble code

FUEL PRESSURE

The fuel pressure regulator controls fuel system pressure. The PCM cannot detect a clogged fuel pump inlet filter, clogged in-line fuel filter, or a pinched fuel supply or return line. However, these could result in a rich or lean condition causing the PCM to store an oxygen sensor or fuel system diagnostic trouble code.

SECONDARY IGNITION CIRCUIT

The PCM cannot detect an inoperative ignition coil, fouled or worn spark plugs, ignition cross firing, or open spark plug cables.

CYLINDER COMPRESSION

The PCM cannot detect uneven, low, or high engine cylinder compression.

EXHAUST SYSTEM

The PCM cannot detect a plugged, restricted or leaking exhaust system, although it may set a fuel system fault.

FUEL INJECTOR MECHANICAL MALFUNCTIONS

The PCM cannot determine if a fuel injector is clogged, the needle is sticking or if the wrong injector is installed. However, these could result in a rich or lean condition causing the PCM to store a diagnostic trouble code for either misfire, an oxygen sensor, or the fuel system.

EXCESSIVE OIL CONSUMPTION

Although the PCM monitors engine exhaust oxygen content when the system is in closed loop, it cannot determine excessive oil consumption.

THROTTLE BODY AIRFLOW

The PCM cannot detect a clogged or restricted air cleaner inlet or filter element.

VACUUM ASSIST

The PCM cannot detect leaks or restrictions in the vacuum circuits of vacuum assisted engine control system devices. However, these could cause the PCM to store a MAP sensor diagnostic trouble code and cause a high idle condition.

PCM SYSTEM GROUND

The PCM cannot determine a poor system ground. However, one or more diagnostic trouble codes may be generated as a result of this condition. The module should be mounted to the body at all times, also during diagnostic.

PCM CONNECTOR ENGAGEMENT

The PCM may not be able to determine spread or damaged connector pins. However, it might store diagnostic trouble codes as a result of spread connector pins.

DESCRIPTION - HIGH AND LOW LIMITS

The PCM compares input signal voltages from each input device with established high and low limits for the device. If the input voltage is not within limits and other criteria are met, the PCM stores a diagnostic trouble code in memory. Other diagnostic trouble code criteria might include engine RPM limits or input voltages from other sensors or switches that must be present before verifying a diagnostic trouble code condition.

DESCRIPTION - LOAD VALUE

ENGINE	IDLE/NEUTRAL	2500 RPM/NEUTRAL
All Engines	2% to 8% of Maximum Load	9% to 17% of Maximum Load

EMISSIONS CONTROL (Continued)

OPERATION - TASK MANAGER

The Task Manager determines which tests happen when and which functions occur when. Many of the diagnostic steps required by OBD II must be performed under specific operating conditions. The Task Manager software organizes and prioritizes the diagnostic procedures. The job of the Task Manager is to determine if conditions are appropriate for tests to be run, monitor the parameters for a trip for each test, and record the results of the test. Following are the responsibilities of the Task Manager software:

- Test Sequence
- MIL Illumination
- Diagnostic Trouble Codes (DTCs)
- Trip Indicator
- Freeze Frame Data Storage
- Similar Conditions Window

Test Sequence

In many instances, emissions systems must fail diagnostic tests more than once before the PCM illuminates the MIL. These tests are know as 'two trip monitors.' Other tests that turn the MIL lamp on after a single failure are known as 'one trip monitors.' A trip is defined as 'start the vehicle and operate it to meet the criteria necessary to run the given monitor.'

Many of the diagnostic tests must be performed under certain operating conditions. However, there are times when tests cannot be run because another test is in progress (conflict), another test has failed (pending) or the Task Manager has set a fault that may cause a failure of the test (suspend).

- Pending

Under some situations the Task Manager will not run a monitor if the MIL is illuminated and a fault is stored from another monitor. In these situations, the Task Manager postpones monitors **pending** resolution of the original fault. The Task Manager does not run the test until the problem is remedied.

For example, when the MIL is illuminated for an Oxygen Sensor fault, the Task Manager does not run the Catalyst Monitor until the Oxygen Sensor fault is remedied. Since the Catalyst Monitor is based on signals from the Oxygen Sensor, running the test would produce inaccurate results.

- Conflict

There are situations when the Task Manager does not run a test if another monitor is in progress. In these situations, the effects of another monitor running could result in an erroneous failure. If this **conflict** is present, the monitor is not run until the conflicting condition passes. Most likely the monitor will run later after the conflicting monitor has passed.

For example, if the Fuel System Monitor is in progress, the Task Manager does not run the EGR Monitor. Since both tests monitor changes in air/fuel ratio and adaptive fuel compensation, the monitors will conflict with each other.

- Suspend

Occasionally the Task Manager may not allow a two trip fault to mature. The Task Manager will **suspend** the maturing of a fault if a condition exists that may induce an erroneous failure. This prevents illuminating the MIL for the wrong fault and allows more precis diagnosis.

For example, if the PCM is storing a one trip fault for the Oxygen Sensor and the EGR monitor, the Task Manager may still run the EGR Monitor but will suspend the results until the Oxygen Sensor Monitor either passes or fails. At that point the Task Manager can determine if the EGR system is actually failing or if an Oxygen Sensor is failing.

MIL Illumination

The PCM Task Manager carries out the illumination of the MIL. The Task Manager triggers MIL illumination upon test failure, depending on monitor failure criteria.

The Task Manager Screen shows both a Requested MIL state and an Actual MIL state. When the MIL is illuminated upon completion of a test for a third trip, the Requested MIL state changes to OFF. However, the MIL remains illuminated until the next key cycle. (On some vehicles, the MIL will actually turn OFF during the third key cycle) During the key cycle for the third good trip, the Requested MIL state is OFF, while the Actual MIL state is ON. After the next key cycle, the MIL is not illuminated and both MIL states read OFF.

Diagnostic Trouble Codes (DTCs)

With OBD II, different DTC faults have different priorities according to regulations. As a result, the priorities determine MIL illumination and DTC erasure. DTCs are entered according to individual priority. DTCs with a higher priority overwrite lower priority DTCs.

Priorities

- Priority 0 —Non-emissions related trouble codes
- Priority 1 — One trip failure of a two trip fault for non-fuel system and non-misfire.
- Priority 2 — One trip failure of a two trip fault for fuel system (rich/lean) or misfire.
- Priority 3 — Two trip failure for a non-fuel system and non-misfire or matured one trip comprehensive component fault.
- Priority 4 — Two trip failure or matured fault for fuel system (rich/lean) and misfire or one trip catalyst damaging misfire.

EMISSIONS CONTROL (Continued)

Non-emissions related failures have no priority. One trip failures of two trip faults have low priority. Two trip failures or matured faults have higher priority. One and two trip failures of fuel system and misfire monitor take precedence over non-fuel system and non-misfire failures.

DTC Self Erasure

With one trip components or systems, the MIL is illuminated upon test failure and DTCs are stored.

Two trip monitors are components requiring failure in two consecutive trips for MIL illumination. Upon failure of the first test, the Task Manager enters a maturing code. If the component fails the test for a second time the code matures and a DTC is set.

After three good trips the MIL is extinguished and the Task Manager automatically switches the trip counter to a warm-up cycle counter. DTCs are automatically erased following 40 warm-up cycles if the component does not fail again.

For misfire and fuel system monitors, the component must pass the test under a Similar Conditions Window in order to record a good trip. A Similar Conditions Window is when engine RPM is within ±375 RPM and load is within ±10% of when the fault occurred.

NOTE: It is important to understand that a component does not have to fail under a similar window of operation to mature. It must pass the test under a Similar Conditions Window when it failed to record a Good Trip for DTC erasure for misfire and fuel system monitors.

DTCs can be erased anytime with a DRB III. Erasing the DTC with the DRB III erases all OBD II information. The DRB III automatically displays a warning that erasing the DTC will also erase all OBD II monitor data. This includes all counter information for warm-up cycles, trips and Freeze Frame.

Trip Indicator

The **Trip** is essential for running monitors and extinguishing the MIL. In OBD II terms, a trip is a set of vehicle operating conditions that must be met for a specific monitor to run. All trips begin with a key cycle.

Good Trip

The Good Trip counters are as follows:

- Specific Good Trip
- Fuel System Good Trip
- Misfire Good Trip
- Alternate Good Trip (appears as a Global Good Trip on DRB III)
- Comprehensive Components
- Major Monitor
- Warm-Up Cycles

Specific Good Trip

The term Good Trip has different meanings depending on the circumstances:

- If the MIL is OFF, a trip is defined as when the Oxygen Sensor Monitor and the Catalyst Monitor have been completed in the same drive cycle.
- If the MIL is ON and a DTC was set by the Fuel Monitor or Misfire Monitor (both continuous monitors), the vehicle must be operated in the Similar Condition Window for a specified amount of time.
- If the MIL is ON and a DTC was set by a Task Manager commanded once-per-trip monitor (such as the Oxygen Sensor Monitor, Catalyst Monitor, Purge Flow Monitor, Leak Detection Pump Monitor, EGR Monitor or Oxygen Sensor Heater Monitor), a good trip is when the monitor is passed on the next start-up.
- If the MIL is ON and any other emissions DTC was set (not an OBD II monitor), a good trip occurs when the Oxygen Sensor Monitor and Catalyst Monitor have been completed, or two minutes of engine run time if the Oxygen Sensor Monitor and Catalyst Monitor have been stopped from running.

Fuel System Good Trip

To count a good trip (three required) and turn off the MIL, the following conditions must occur:

- Engine in closed loop
- Operating in Similar Conditions Window
- Short Term multiplied by Long Term less than threshold
- Less than threshold for a predetermined time

If all of the previous criteria are met, the PCM will count a good trip (three required) and turn off the MIL.

Misfire Good Trip

If the following conditions are met the PCM will count one good trip (three required) in order to turn off the MIL:

- Operating in Similar Condition Window
- 1000 engine revolutions with no misfire

Warm-Up Cycles

Once the MIL has been extinguished by the Good Trip Counter, the PCM automatically switches to a Warm-Up Cycle Counter that can be viewed on the DRB III. Warm-Up Cycles are used to erase DTCs and Freeze Frames. Forty Warm-Up cycles must occur in order for the PCM to self-erase a DTC and Freeze Frame. A Warm-Up Cycle is defined as follows:

- Engine coolant temperature must start below and rise above 160° F
- Engine coolant temperature must rise by 40° F
- No further faults occur

EMISSIONS CONTROL (Continued)

Freeze Frame Data Storage

Once a failure occurs, the Task Manager records several engine operating conditions and stores it in a Freeze Frame. The Freeze Frame is considered one frame of information taken by an on-board data recorder. When a fault occurs, the PCM stores the input data from various sensors so that technicians can determine under what vehicle operating conditions the failure occurred.

The data stored in Freeze Frame is usually recorded when a system fails the first time for two trip faults. Freeze Frame data will only be overwritten by a different fault with a higher priority.

CAUTION: Erasing DTCs, either with the DRB III or by disconnecting the battery, also clears all Freeze Frame data.

Similar Conditions Window

The Similar Conditions Window displays information about engine operation during a monitor. Absolute MAP (engine load) and Engine RPM are stored in this window when a failure occurs. There are two different Similar conditions Windows: Fuel System and Misfire.

FUEL SYSTEM

- **Fuel System Similar Conditions Window** — An indicator that 'Absolute MAP When Fuel Sys Fail' and 'RPM When Fuel Sys Failed' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Fuel Sys Fail** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Fuel Sys Fail** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **Upstream O2S Volts** — A live reading of the Oxygen Sensor to indicate its performance. For example, stuck lean, stuck rich, etc.
- **SCW Time in Window (Similar Conditions Window Time in Window)** — A timer used by the PCM that indicates that, after all Similar Conditions have been met, if there has been enough good engine running time in the SCW without failure detected. This timer is used to increment a Good Trip.
- **Fuel System Good Trip Counter** — A Trip Counter used to turn OFF the MIL for Fuel System DTCs. To increment a Fuel System Good Trip, the engine must be in the Similar Conditions Window, Adaptive Memory Factor must be less than calibrated threshold and the Adaptive Memory Factor must stay below that threshold for a calibrated amount of time.
- **Test Done This Trip** — Indicates that the monitor has already been run and completed during the current trip.

MISFIRE

- **Same Misfire Warm-Up State** — Indicates if the misfire occurred when the engine was warmed up (above 160° F).
- **In Similar Misfire Window** — An indicator that 'Absolute MAP When Misfire Occurred' and 'RPM When Misfire Occurred' are all in the same range when the failure occurred. Indicated by switching from 'NO' to 'YES'.
- **Absolute MAP When Misfire Occurred** — The stored MAP reading at the time of failure. Informs the user at what engine load the failure occurred.
- **Absolute MAP** — A live reading of engine load to aid the user in accessing the Similar Conditions Window.
- **RPM When Misfire Occurred** — The stored RPM reading at the time of failure. Informs the user at what engine RPM the failure occurred.
- **Engine RPM** — A live reading of engine RPM to aid the user in accessing the Similar Conditions Window.
- **Adaptive Memory Factor** — The PCM utilizes both Short Term Compensation and Long Term Adaptive to calculate the Adaptive Memory Factor for total fuel correction.
- **200 Rev Counter** — Counts 0–100 720 degree cycles.
- **SCW Cat 200 Rev Counter** — Counts when in similar conditions.
- **SCW FTP 1000 Rev Counter** — Counts 0–4 when in similar conditions.
- **Misfire Good Trip Counter** — Counts up to three to turn OFF the MIL.
- **Misfire Data**— Data collected during test.
- **Test Done This Trip**— Indicates YES when the test is done.

EVAPORATIVE EMISSIONS

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EVAPORATIVE EMISSIONS

DESCRIPTION

DESCRIPTION - EVAPORATION CONTROL SYSTEM

The evaporation control system prevents the emission of fuel tank vapors into the atmosphere. When fuel evaporates in the fuel tank, the vapors pass through the control valve, through the fuel management valve, and through vent hoses and tubes to a charcoal filled evaporative canister. The canister temporarily holds the vapors. The Powertrain Control Module (PCM) allows intake manifold vacuum to draw vapors into the combustion chambers during certain operating conditions.

Gas powered engines use a duty cycle purge system. The PCM controls vapor flow by operating the duty cycle EVAP purge solenoid. Refer to Duty Cycle EVAP Canister Purge Solenoid.

When equipped with certain emissions packages, a Leak Detection Pump (LDP) will be used as part of the evaporative system for OBD II requirements. Also refer to Leak Detection Pump.

Vehicles powered with gasoline engines are also equipped with ORVR (On-Board Refueling Vapor Recovery). Refer to ORVR for additional information.

EVAPORATIVE EMISSIONS (Continued)

NOTE: The evaporative system uses specially manufactured lines/hoses. If replacement becomes necessary, only use fuel resistant, low permeation hose.

Certain components can be found in (Fig. 1).

DESCRIPTION - CCV SYSTEM

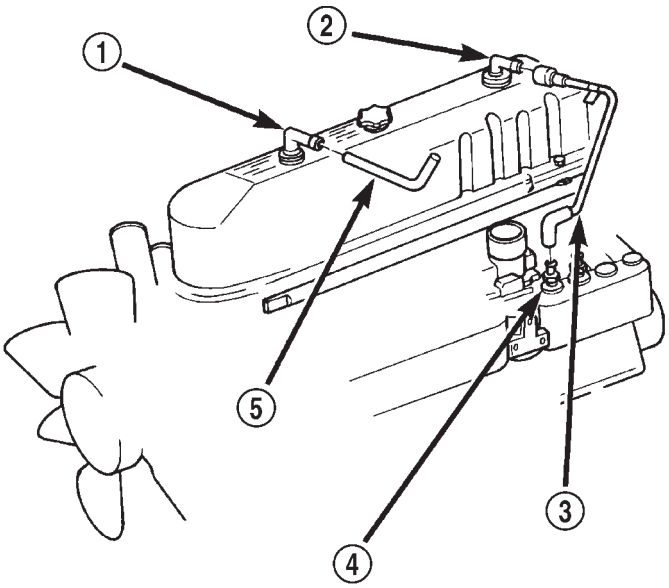
The 4.0L 6–cylinder engine is equipped with a Crankcase Ventilation (CCV) system. The system consists of:

- A fixed orifice fitting of a calibrated size. This fitting is pressed into a rubber grommet located on the top/rear of cylinder head (valve) cover (Fig. 2).
- a pair of breather tubes (lines) to connect the system components.
- the air cleaner housing.
- an air inlet fitting (Fig. 2).

DESCRIPTION - PCV SYSTEM

The 4.7L V-8 engine is equipped with a closed crankcase ventilation system and a Positive Crankcase Ventilation (PCV) valve.

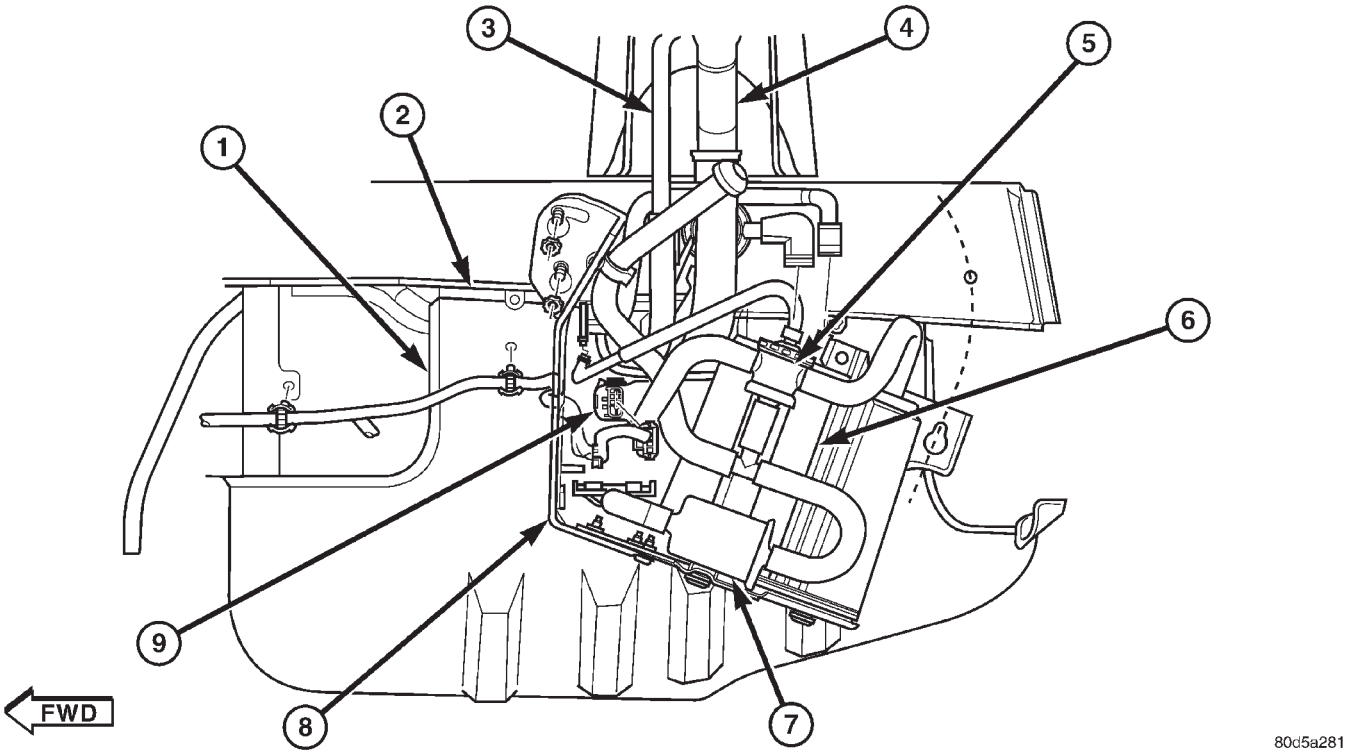
This system consists of:



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Fig. 2 CCV System—4.0L Engine

1 - AIR INLET FITTING
2 - FIXED ORIFICE FITTING
3 - CCV BREATHER TUBE (REAR)
4 - INT. MAN. FITTING
5 - CCV BREATHER TUBE (FRONT)



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Fig. 1 ORVR / LDP COMPONENTS

1 - FUEL TANK (LEFT SIDE)
2 - FRAME RAIL (LEFT-REAR OUTSIDE)
3 - FUEL VENT TUBE
4 - FUEL FILL TUBE
5 - CONTROL VALVE
6 - EVAP CANISTER
7 - LDP FILTER
8 - TWO-PIECE SUPPORT BRACKET
9 - LEAK DETECTION PUMP (LDP)

EVAPORATIVE EMISSIONS (Continued)

- a PCV valve mounted to the oil filler housing (Fig. 3). The PCV valve is sealed to the oil filler housing with an o-ring.
- the air cleaner housing
- two interconnected breathers threaded into the rear of each cylinder head (Fig. 4).
- tubes and hose to connect the system components.

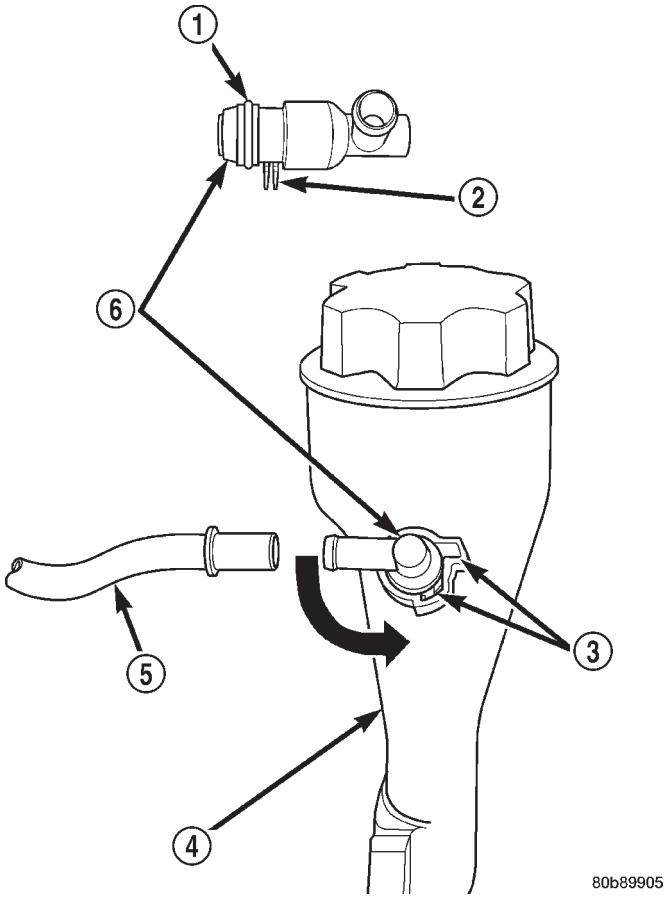


Fig. 3 PCV Valve/Oil Filler Tube (Housing)—4.7L Engine

1 - O-RING
2 - LOCATING TABS
3 - CAM LOCK
4 - OIL FILLER TUBE
5 - PCV LINE/HOSE
6 - PCV VALVE

OPERATION

OPERATION - 4.0L CCV SYSTEM

The CCV system performs the same function as a conventional PCV system, but does not use a vacuum controlled PCV valve.

The fixed orifice fitting meters the amount of crankcase vapors drawn out of the engine.

When the engine is operating, fresh air enters the engine and mixes with crankcase vapors. Engine vacuum draws the vapor/air mixture through the fixed orifice and into the intake manifold. The vapors are then consumed during engine combustion.

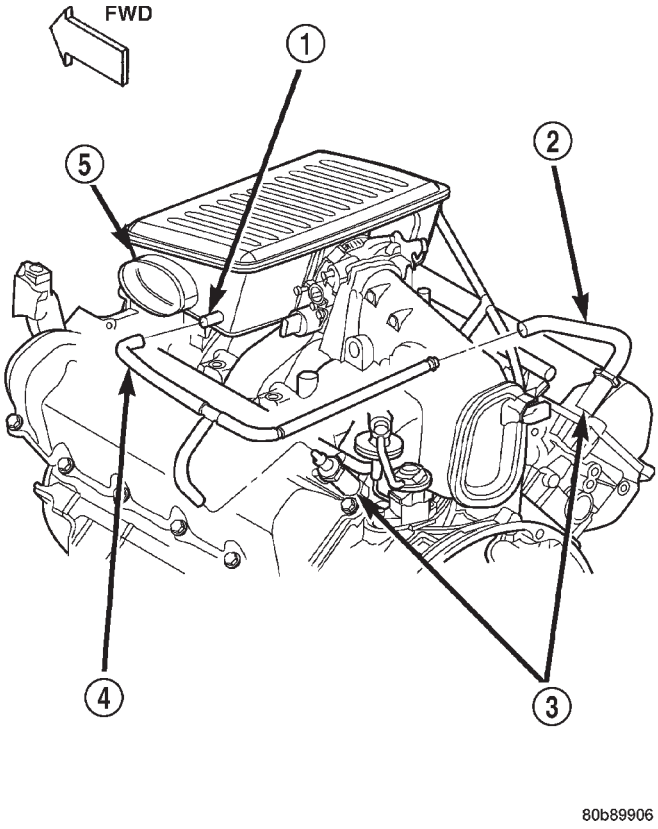


Fig. 4 PCV System Hoses/Tubes—4.7L Engine

1 - FRESH AIR FITTING
2 - CONNECTING TUBES/HOSES
3 - CRANKCASE BREATHERS (2)
4 - RUBBER HOSE
5 - AIR CLEANER RESONATOR

OPERATION - 4.7L PCV SYSTEM

The PCV system operates by engine intake manifold vacuum. Filtered air is routed into the crankcase through the air cleaner hose and crankcase breathers. The metered air, along with crankcase vapors, are drawn through the PCV valve and into a passage in the intake manifold. The PCV system manages crankcase pressure and meters blow-by gases to the intake system, reducing engine sludge formation.

The PCV valve contains a spring loaded plunger. This plunger meters the amount of crankcase vapors routed into the combustion chamber based on intake manifold vacuum.

TYPICAL PCV valves are shown in (Fig. 5), (Fig. 6) and (Fig. 7).

When the engine is not operating, or during an engine pop-back, the spring forces the plunger back against the seat (Fig. 5). This will prevent vapors from flowing through the valve.

EVAPORATIVE EMISSIONS (Continued)

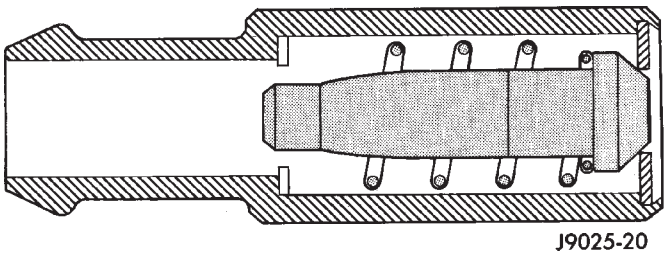


Fig. 5 Engine Off or Engine Pop-Back—No Vapor Flow

During periods of high manifold vacuum, such as idle or cruising speeds, vacuum is sufficient to completely compress spring. It will then pull the plunger to the top of the valve (Fig. 6). In this position there is minimal vapor flow through the valve.

During periods of moderate manifold vacuum, the plunger is only pulled part way back from inlet. This results in maximum vapor flow through the valve (Fig. 7).

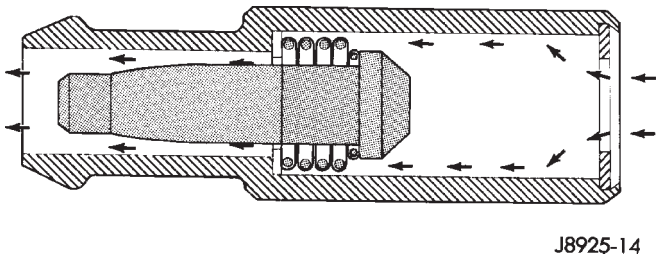


Fig. 6 High Intake Manifold Vacuum—Minimal Vapor Flow

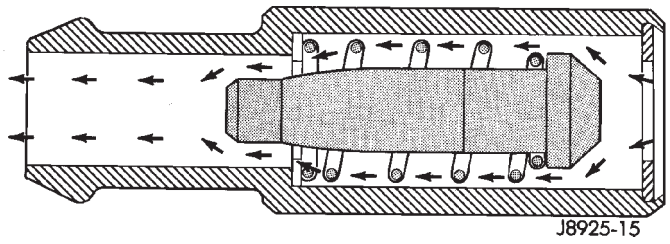


Fig. 7 Moderate Intake Manifold Vacuum—Maximum Vapor Flow

SPECIFICATIONS

TORQUE - EVAPORATION SYSTEM

DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Crankcase Breathers - 3.7L / 4.7L	12	-	106
EVAP Canister Mounting	11	-	100
EVAP Canister Purge Solenoid Mounting Nuts	9	-	80
LDP Pump-to-Support Bracket	2	-	20
LDP Pump Support Bracket-to-Frame	28	-	250

CCV HOSE

DIAGNOSIS AND TESTING - CCV SYSTEM - 4.0L

Before attempting diagnosis, be sure locations of fixed orifice fitting and air inlet fitting (Fig. 8) have not been inadvertently exchanged. The fixed orifice fitting is light grey in color and is located at **rear** of valve cover. The air inlet fitting is black in color and is located at **front** of valve cover.

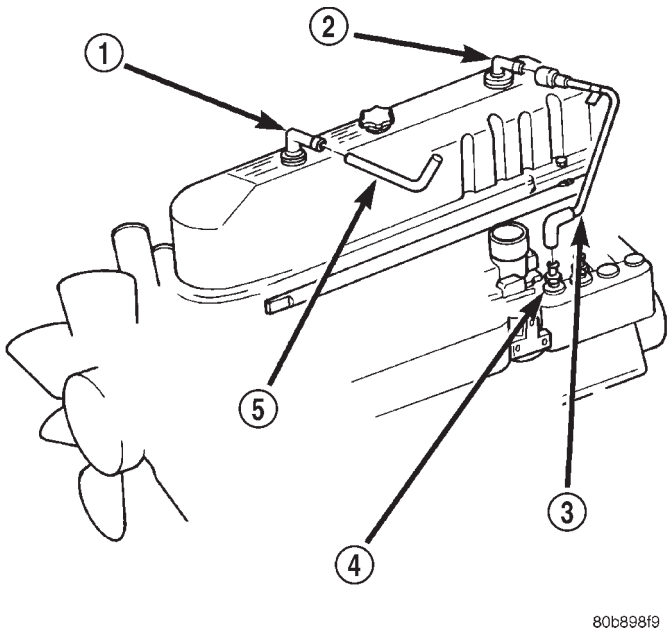


Fig. 8 Fixed Orifice Fitting and CCV System—4.0L Engine

1 - AIR INLET FITTING
2 - FIXED ORIFICE FITTING
3 - CCV BREATHER TUBE (REAR)
4 - INT. MAN. FITTING
5 - CCV BREATHER TUBE (FRONT)

(1) Pull fixed orifice fitting (Fig. 8) from valve cover and leave tube attached.

(2) Start engine and bring to idle speed.

(3) If fitting is not plugged, a hissing noise will be heard as air passes through fitting orifice. Also, a strong vacuum should be felt with a finger placed at fitting inlet.

(4) If vacuum is not present, remove fitting orifice fitting from tube. Start engine. If vacuum can now be felt, replace fixed orifice fitting. Do not attempt to clean plastic fitting.

(5) If vacuum is still not felt at hose, check line/hose for kinks or for obstruction. If necessary, clean out intake manifold fitting at intake manifold. Do this by turning a 1/4 inch drill (by hand) through the fitting to dislodge any solid particles. Blow out the fitting with shop air. If necessary, use a smaller drill to avoid removing any metal from the fitting.

(6) Return fixed orifice fitting to valve cover and leave tube attached.

(7) Disconnect air inlet fitting and its attached hose at front of valve cover (Fig. 8). Start engine and bring to idle speed. Hold a piece of stiff paper (such as a parts tag) loosely over the rubber grommet (opening) of the disconnected air inlet fitting.

(8) The paper should be drawn against the rubber grommet with noticeable force. This will be after allowing approximately one minute for crankcase pressure to reduce.

(9) If vacuum is not present, check breather hoses/tubes/lines for obstructions or restrictions.

(10) After testing, reconnect all system hoses/tubes/lines.

REMOVAL - FIXED ORIFICE FITTING

When installing fixed orifice fitting, be sure locations of fixed orifice fitting and air inlet fitting (Fig. 9) have not been inadvertently exchanged. The fixed orifice fitting is light grey in color and is located at **rear** of valve cover. The air inlet fitting is black in color and is located at **front** of valve cover.

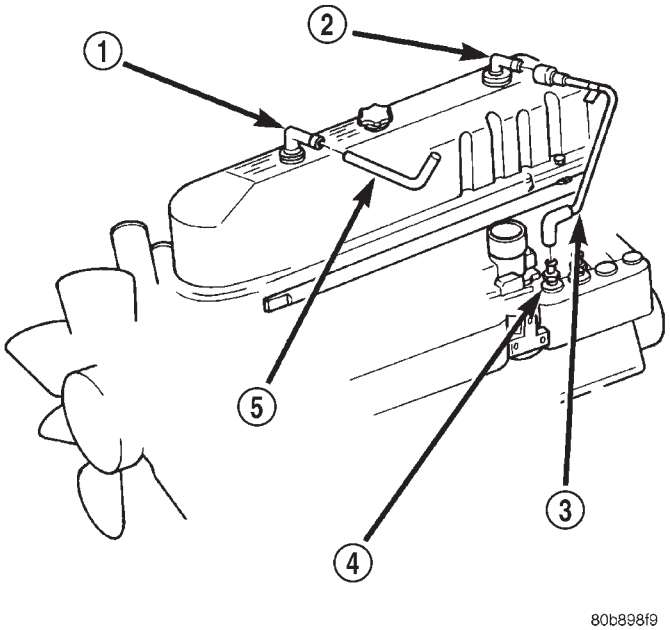


Fig. 9 FIXED ORIFICE FITTING - 4.0L

1 - AIR INLET FITTING
2 - FIXED ORIFICE FITTING
3 - CCV BREATHER TUBE (REAR)
4 - INT. MAN. FITTING
5 - CCV BREATHER TUBE (FRONT)

(1) Pull fixed orifice fitting (Fig. 9) from valve cover grommet.

(2) Separate fitting from CCV breather tube.

CCV HOSE (Continued)

INSTALLATION - FIXED ORIFICE FITTING

When installing fixed orifice fitting, be sure locations of fixed orifice fitting and air inlet fitting (Fig. 9) have not been inadvertently exchanged. The fixed orifice fitting is light grey in color and is located at **rear** of valve cover. The air inlet fitting is black in color and is located at **front** of valve cover.

(1) Connect fitting to CCV breather tube.

(2) Return fixed orifice fitting to valve cover grommet.

EVAP/PURGE SOLENOID

DESCRIPTION

The duty cycle EVAP canister purge solenoid (DCP) regulates the rate of vapor flow from the EVAP canister to the intake manifold. The Powertrain Control Module (PCM) operates the solenoid.

OPERATION

During the cold start warm-up period and the hot start time delay, the PCM does not energize the solenoid. When de-energized, no vapors are purged. The PCM de-energizes the solenoid during open loop operation.

The engine enters closed loop operation after it reaches a specified temperature and the time delay ends. During closed loop operation, the PCM cycles (energizes and de-energizes) the solenoid 5 or 10 times per second, depending upon operating conditions. The PCM varies the vapor flow rate by changing solenoid pulse width. Pulse width is the amount of time that the solenoid is energized. The PCM adjusts solenoid pulse width based on engine operating condition.

REMOVAL

The duty cycle evaporative (EVAP) canister purge solenoid is located in the engine compartment near the brake master cylinder (Fig. 10).

(1) Disconnect electrical connector at solenoid.

(2) Disconnect vacuum lines at solenoid.

(3) Lift solenoid slot (Fig. 10) from mounting bracket for removal.

INSTALLATION

(1) Position solenoid slot to mounting bracket.

(2) Connect vacuum lines to solenoid. Be sure vacuum lines are firmly connected and not leaking or damaged. If leaking, a Diagnostic Trouble Code (DTC) may be set with certain emission packages.

(3) Connect electrical connector to solenoid.

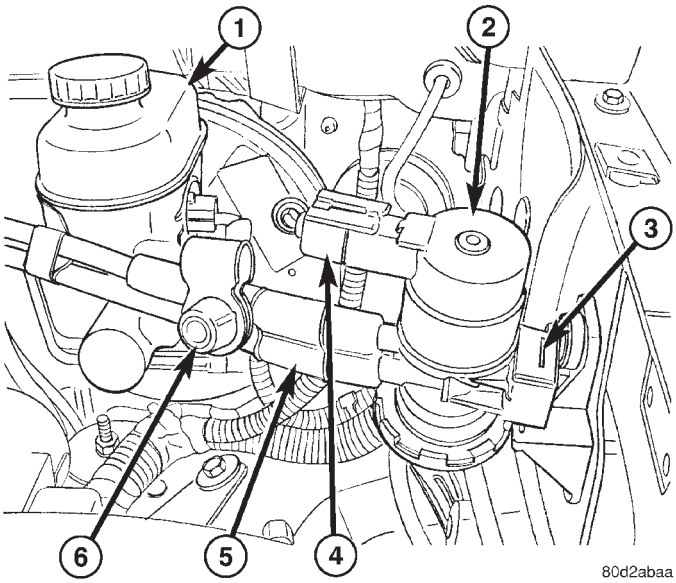


Fig. 10 EVAP/PURGE SOLENOID LOCATION

1 - BRAKE MASTER CYLINDER
2 - EVAP SOLENOID
3 - SLOT
4 - ELEC. CONNEC.
5 - VACUUM LINE CONNEC.
6 - TEST PORT

FUEL FILLER CAP

DESCRIPTION

The plastic fuel tank filler tube cap is threaded onto the end of the fuel fill tube. Certain models are equipped with a 1/4 turn cap.

OPERATION

The loss of any fuel or vapor out of fuel filler tube is prevented by the use of a pressure-vacuum fuel fill cap. Relief valves inside the cap will release fuel tank pressure at predetermined pressures. Fuel tank vacuum will also be released at predetermined values. This cap must be replaced by a similar unit if replacement is necessary. This is in order for the system to remain effective.

CAUTION: Remove fill cap before servicing any fuel system component to relieve tank pressure. If equipped with a California emissions package and a Leak Detection Pump (LDP), the cap must be tightened securely. If cap is left loose, a Diagnostic Trouble Code (DTC) may be set.

REMOVAL

If replacement of the 1/4 turn fuel tank filler tube cap is necessary, it must be replaced with an identical cap to be sure of correct system operation.

FUEL FILLER CAP (Continued)

CAUTION: Remove the fuel tank filler tube cap to relieve fuel tank pressure. The cap must be removed prior to disconnecting any fuel system component or before draining the fuel tank.

LEAK DETECTION PUMP

DESCRIPTION

The evaporative emission system is designed to prevent the escape of fuel vapors from the fuel system (Fig. 11). Leaks in the system, even small ones, can allow fuel vapors to escape into the atmosphere. Government regulations require onboard testing to make sure that the evaporative (EVAP) system is functioning properly. The leak detection system tests for EVAP system leaks and blockage. It also performs self-diagnostics. During self-diagnostics, the Powertrain Control Module (PCM) first checks the Leak Detection Pump (LDP) for electrical and mechanical faults. If the first checks pass, the PCM then uses the LDP to seal the vent valve and pump air into the system to pressurize it. If a leak is present, the PCM will continue pumping the LDP to replace the air that leaks out. The PCM determines the size of the leak based on how fast/long it must pump the LDP as it tries to maintain pressure in the system.

EVAP LEAK DETECTION SYSTEM COMPONENTS

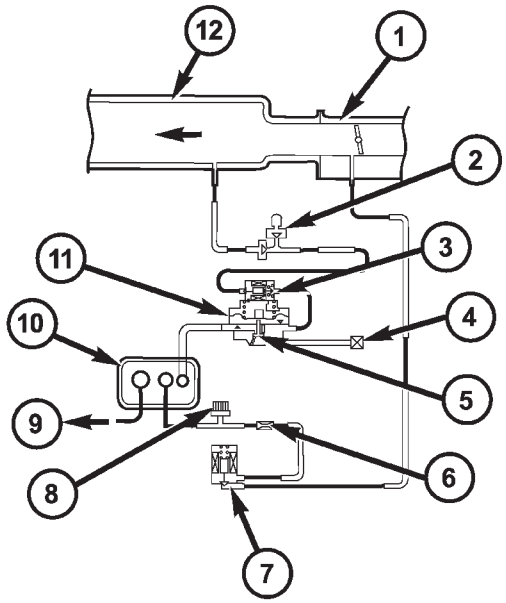
Service Port: Used with special tools like the Miller Evaporative Emissions Leak Detector (EELD) to test for leaks in the system.

EVAP Purge Solenoid: The PCM uses the EVAP purge solenoid to control purging of excess fuel vapors stored in the EVAP canister. It remains closed during leak testing to prevent loss of pressure.

EVAP Canister: The EVAP canister stores fuel vapors from the fuel tank for purging.

EVAP Purge Orifice: Limits purge volume.

EVAP System Air Filter: Provides air to the LDP for pressurizing the system. It filters out dirt while allowing a vent to atmosphere for the EVAP system.



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Fig. 11 TYPICAL SYSTEM COMPONENTS

1 - Throttle Body
2 - Service Vacuum Supply Tee (SVST)
3 - LDP Solenoid
4 - EVAP System Air Filter
5 - LDP Vent Valve
6 - EVAP Purge Orifice
7 - EVAP Purge Solenoid
8 - Service Port
9 - To Fuel Tank
10 - EVAP Canister
11 - LDP
12 - Intake Air Plenum

LEAK DETECTION PUMP (Continued)

OPERATION

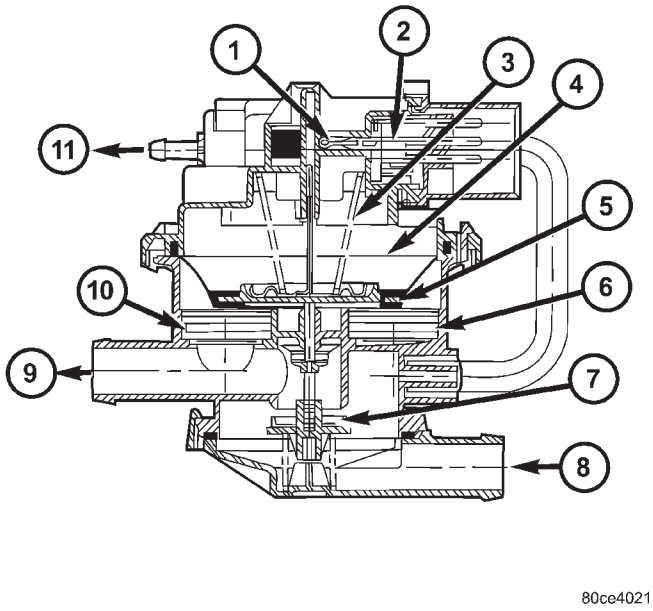
The main purpose of the LDP is to pressurize the fuel system for leak checking. It closes the EVAP system vent to atmospheric pressure so the system can be pressurized for leak testing. The diaphragm is powered by engine vacuum. It pumps air into the EVAP system to develop a pressure of about 7.5″ H2O (1/4) psi. A reed switch in the LDP allows the PCM to monitor the position of the LDP diaphragm. The PCM uses the reed switch input to monitor how fast the LDP is pumping air into the EVAP system. This allows detection of leaks and blockage. The LDP assembly consists of several parts (Fig. 12). The solenoid is controlled by the PCM, and it connects the upper pump cavity to either engine vacuum or atmospheric pressure. A vent valve closes the EVAP system to atmosphere, sealing the system during leak testing. The pump section of the LDP consists of a diaphragm that moves up and down to bring air in through the air filter and inlet check valve, and pump it out through an outlet check valve into the EVAP system. The diaphragm is pulled up by engine vacuum, and pushed down by spring pressure, as the LDP solenoid turns on and off. The LDP also has a magnetic reed switch to signal diaphragm position to the PCM. When the diaphragm is down, the switch is closed, which sends a 12 V (system voltage) signal to the PCM. When the diaphragm is up, the switch is open, and there is no voltage sent to the PCM. This allows the PCM to monitor LDP pumping action as it turns the LDP solenoid on and off.

LDP AT REST (NOT POWERED)

When the LDP is at rest (no electrical/vacuum) the diaphragm is allowed to drop down if the internal (EVAP system) pressure is not greater than the return spring. The LDP solenoid blocks the engine vacuum port and opens the atmospheric pressure port connected through the EVAP system air filter. The vent valve is held open by the diaphragm. This allows the canister to see atmospheric pressure (Fig. 13).

DIAPHRAGM UPWARD MOVEMENT

When the PCM energizes the LDP solenoid, the solenoid blocks the atmospheric port leading through the EVAP air filter and at the same time opens the engine vacuum port to the pump cavity above the diaphragm. The diaphragm moves upward when vacuum above the diaphragm exceeds spring force. This upward movement closes the vent valve. It also causes low pressure below the diaphragm, unseating the inlet check valve and allowing air in from the EVAP air filter. When the diaphragm completes its upward movement, the LDP reed switch turns from closed to open (Fig. 14).



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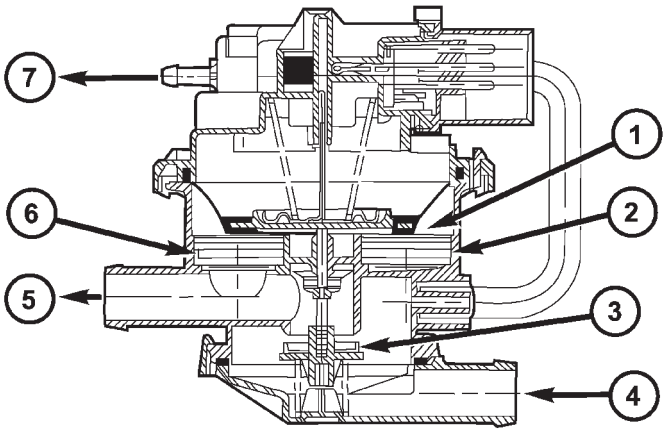
Fig. 12 EVAP LEAK DETECTION SYSTEM COMPONENTS

1 - Reed Switch
2 - Solenoid
3 - Spring
4 - Pump Cavity
5 - Diaphragm
6 - Inlet Check Valve
7 - Vent Valve
8 - From Air Filter
9 - To Canister
10 - Outlet Check Valve
11 - Engine Vacuum

DIAPHRAGM DOWNWARD MOVEMENT

Based on reed switch input, the PCM de-energizes the LDP solenoid, causing it to block the vacuum port, and open the atmospheric port. This connects the upper pump cavity to atmosphere through the EVAP air filter. The spring is now able to push the diaphragm down. The downward movement of the diaphragm closes the inlet check valve and opens the outlet check valve pumping air into the evaporative system. The LDP reed switch turns from open to closed, allowing the PCM to monitor LDP pumping (diaphragm up/down) activity (Fig. 15). During the pumping mode, the diaphragm will not move down far enough to open the vent valve. The pumping cycle is repeated as the solenoid is turned on and off. When the evaporative system begins to pressurize, the pressure on the bottom of the diaphragm will begin to oppose the spring pressure, slowing the pumping action. The PCM watches the time from when the solenoid is de-energized, until the diaphragm drops down far enough for the reed switch to

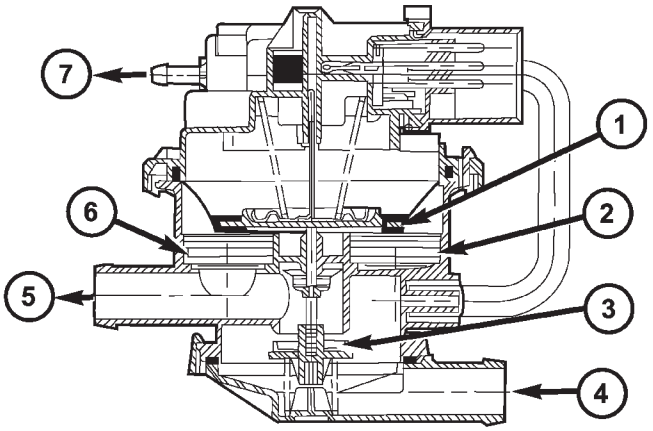
LEAK DETECTION PUMP (Continued)



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Fig. 13 LDP AT REST

1 - Diaphragm
2 - Inlet Check Valve (Closed)
3 - Vent Valve (Open)
4 - From Air Filter
5 - To Canister
6 - Outlet Check Valve (Closed)
7 - Engine Vacuum (Closed)



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Fig. 14 DIAPHRAGM UPWARD MOVEMENT

1 - Diaphragm
2 - Inlet Check Valve (Open)
3 - Vent Valve (Closed)
4 - From Air Filter
5 - To Canister
6 - Outlet Check Valve (Closed)
7 - Engine Vacuum (Open)

change from opened to closed. If the reed switch changes too quickly, a leak may be indicated. The longer it takes the reed switch to change state, the tighter the evaporative system is sealed. If the system pressurizes too quickly, a restriction somewhere in the EVAP system may be indicated.

PUMPING ACTION

Action : During portions of this test, the PCM uses the reed switch to monitor diaphragm movement. The solenoid is only turned on by the PCM after the reed switch changes from open to closed, indicating that the diaphragm has moved down. At other times during the test, the PCM will rapidly cycle the LDP solenoid on and off to quickly pressurize the system. During rapid cycling, the diaphragm will not move enough to change the reed switch state. In the state of rapid cycling, the PCM will use a fixed time interval to cycle the solenoid. If the system does not pass the EVAP Leak Detection Test, the following DTCs may be set:

- P0442 - EVAP LEAK MONITOR 0.040″ LEAK DETECTED
- P0455 - EVAP LEAK MONITOR LARGE LEAK DETECTED
- P0456 - EVAP LEAK MONITOR 0.020″ LEAK DETECTED
- P1486 - EVAP LEAK MON PINCHED HOSE FOUND
- P1494 - LEAK DETECTION PUMP SW OR MECH FAULT
- P1495 - LEAK DETECTION PUMP SOLENOID CIRCUIT

DIAGNOSIS AND TESTING - ENABLING CONDITIONS TO RUN EVAP LEAK DETECTION TEST

- Cold start: with ambient temperature (obtained from modeling the inlet air temperature sensor on passenger vehicles and the battery temperature sensor on Jeep & Dodge Truck vehicles) between 4° C (40° F) and 32° C (90° F) for 0.040 leak. Between 4° C (40° F) and 29° C (85° F) for 0.020 leak.
- Engine coolant temperature within:-12° to -8° C (10° to 18° F) of battery/ambient.
- Battery voltage between 10 and 15 volts.
- Low fuel warning light off (fuel level must be between 15% and 85%.
- MAP sensor reading 22 in Hg or above (This is the manifold absolute pressure, not vacuum).

LEAK DETECTION PUMP (Continued)

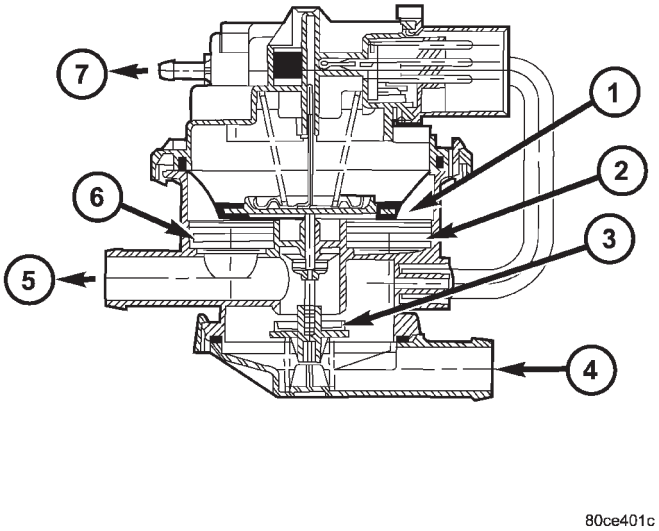


Fig. 15 DIAPHRAGM DOWNWARD MOVEMENT

1 - Diaphragm
2 - Inlet Check Valve (Closed)
3 - Vent Valve (Closed)
4 - From Air Filter
5 - To Canister
6 - Outlet Check Valve (Open)
7 - Engine Vacuum (Closed)

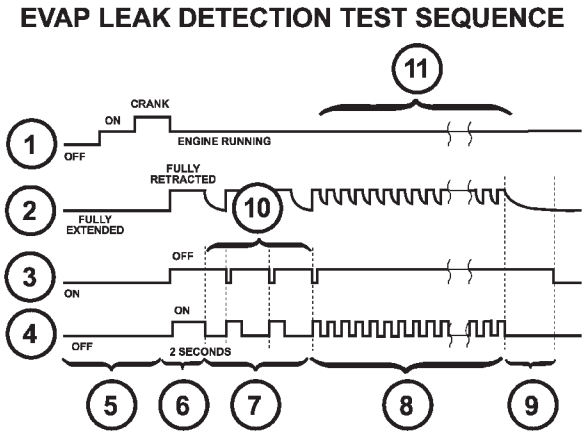
- No engine stall during test.

NOTE: IF BATTERY VOLTAGE DROPS BELOW 10 VOLTS FOR MORE THAN 5 SECONDS DURING ENGINE CRANKING, THE EVAP LEAK DETECTION TEST WILL NOT RUN.

NOTE: THE FOLLOWING VALUES ARE APPROXIMATE AND VEHICLE SPECIFIC. USE THE VALUES SEEN IN PRE TEST/MONITOR TEST SCREEN ON THE DRB III®. SEE TSB 25-02-98 FOR MORE DETAIL.

A DTC will not be set if a one-trip fault is set or if the MIL is illuminated for any of the following:

- Purge Solenoid Electrical Fault
- All TPS Faults
- All Engine Controller Self Test Faults
- LDP Pressure Switch Fault
- All Cam and/or Crank Sensor Fault
- EGR Solenoid Electrical Fault
- All MAP Sensor Faults
- All Injector Faults
- Ambient/Battery Temperature Sensor Electrical Faults
- Baro Out of Range
- Vehicle Speed Faults
- All Coolant Sensor Faults
- LDP Solenoid Circuit



EVAP LDP TEST SEQUENCE

1 - IGNITION SWITCH
2 - LDP DIAPHRAM
3 - LDP SWITCH
4 - LDP SOLENOID
5 - SECTION 1
6 - SECTION 2
7 - SECTION 3
8 - SECTION 4
9 - SECTION 5
10 - 3 TEST CYCLES TO TEST FOR BLOCKAGE
11- RAPID PUMP CYCLING FOR 70 CYCLES

NOTE: IF BATTERY TEMPERATURE IS NOT WITHIN RANGE, OR IF THE ENGINE COOLANT TEMPERATURE IS NOT WITHIN A SPECIFIED RANGE OF THE BATTERY TEMPERATURE, THE PCM WILL NOT RUN TESTS FOR DTC P1494, P1486, P0442, P0455 AND P0441. THESE TEMPERATURE CALIBRATIONS MAY BE DIFFERENT BETWEEN MODELS.

SECTION 1 - P1495 Leak Detection Pump Solenoid Circuit- When the ignition key is turned to ″ON″, the LDP diaphragm should be in the down position and the LDP reed switch should be closed. If the EVAP system has residual pressure, the LDP diaphragm may be up. This could result in the LDP reed switch being open when the key is turned to ″ON″ and a P1494 fault could be set because the PCM is expecting the reed switch to be closed.

After the key is turned ″ON″, the PCM immediately tests the LDP solenoid circuit for electrical faults. If a fault is detected, DTC P1495 will set, the

LEAK DETECTION PUMP (Continued)

MIL will illuminate, and the remaining EVAP Leak Detection Test is canceled.

SECTION 2 - P1494 Leak Detection Pump Switch or Mechanical Fault- If DTC P1495 is not set, the PCM will check for DTC P1494. If the LDP reed switch was closed when the key was turned to ″ON″, the PCM energizes the LDP solenoid for up to 8 seconds and monitors the LDP switch. As the LDP diaphragm is pulled up by engine vacuum, the LDP reed switch should change from closed to open. If it does not, the PCM sets a temporary fault (P1494) in memory, and waits until the next time the Enabling Conditions are met to run the test again. If this is again detected, P1494 is stored and the MIL is illuminated. If the problem is not detected during the next enabling cycle, the temporary fault will be cleared.

However, if the PCM detects the reed switch open when the key is turned to ″ON″, the PCM must determine if this condition is due to residual pressure in the EVAP system, or an actual fault. The PCM stores information in memory on EVAP system purging from previous engine run or drive cycles.

If little or no purging took place, residual pressure could be holding the LDP diaphragm up, causing the LDP switch to be open. Since this is not a malfunction, the PCM cancels the EVAP Leak Detection Test without setting the temporary fault.

If there was sufficient purging during the previous cycle to eliminate EVAP system pressure, the PCM judges that this is a malfunction and sets a temporary fault in memory. The next time that the Enabling Conditions are met, the test will run again. If the fault is again detected, the MIL will illuminate and DTC P1494 will be stored. If the fault is not detected, the temporary fault will be cleared.

SECTION 3 - P1486 EVAP Leak Monitor Pinched Hose Found- If no fault has been detected so far, the PCM begins testing for possible blockage in the EVAP system between the LDP and the fuel tank. This is done by monitoring the time required for the LDP to pump air into the EVAP system during two to three pump cycles. If no blockage is present, the LDP diaphragm is able to quickly pump air out of the LDP each time the PCM turns off the LDP solenoid. If a blockage is present, the PCM detects that the LDP takes longer to complete each pump cycle. If the pump cycles take longer than expected (approximately 6 to 10 seconds) the PCM will suspect a blockage. On the next drive when Enabling Conditions are met, the test will run again. If blockage is again detected, P1486 is stored, and the MIL is illuminated.

SECTION 4 - No DTC Can Be Set During This Time- After the LDP blockage tests are completed, the PCM then tests for EVAP system leakage. First, the PCM commands the LDP to rapidly pump for 20 to 50 seconds (depending on fuel level) to build pressure in the EVAP system. This evaluates the system J18-24-0 to see if it can be sufficiently pressurized. This evaluation (rapid pump cycling) may occur several times prior to leak checking. The LDP reed switch does not close and open during rapid pumping because the diaphragm does not travel through its full range during this part of the test.

SECTION 5 - P0456, P0442, P0455 EVAP Leak Monitor and Leak Detected- Next, the PCM performs one or more test cycles by monitoring the time required for the LDP reed switch to close (diaphragm to drop) after the LDP solenoid is turned off.

If the switch does not close, or closes after a long delay, it means that the system does not have any significant leakage and the EVAP Leak Detection Test is complete.

However, if the LDP reed switch closes quickly, there may be a leak or the fuel level may be low enough that the LDP must pump more to finish pressurizing the EVAP system. In this case, the PCM will rapidly pump the LDP again to build pressure in the EVAP system, and follow that by monitoring the time needed for several LDP test cycles. This process of rapid pumping followed by several LDP test cycles may repeat several times before the PCM judges that a leak is present.

When leaks are present, the LDP test cycle time will be inversely proportional to the size of the leak. The larger the leak, the shorter the test cycle time. The smaller the leak, the longer the test cycle time. DTC's may be set when a leak as small as 0.5 mm (0.020″) diameter is present.

If the system detects a leak, a temporary fault will be stored in PCM memory. The time it takes to detect a .020, .040, or Large leak is based on calibrations that vary from model to model. The important point to remember is if a leak is again detected on the next EVAP Leak Detection Test, the MIL will illuminate and a DTC will be stored based on the size of leak detected. If no leak is detected during the next test, the temporary fault will be cleared.

DIAGNOSTIC TIPS During diagnosis, you can compare the LDP solenoid activity with the monitor sequence in Figure 6. If the PCM detects a problem that could set a DTC, the testing is halted and LDP solenoid activity will stop. As each section of the test begins, it indicates that the previous section passed successfully. By watching to see which tests complete, you can see if any conditions are present that the PCM considers abnormal.

For example, if the LDP solenoid is energized for the test cycles to test for blockage (P1486), it means that the LDP has already passed its test for P1494. Then, if the PCM detects a possible blockage, it will

LEAK DETECTION PUMP (Continued)

set a temporary fault without turning on the MIL and continue the leak portion of the test. However, the PCM will assume that the system is already pressurized and skip the rapid pump cycles.

Always diagnose leaks, if possible, before disconnecting connections. Disconnecting connections may mask a leak condition.

Keep in mind that if the purge solenoid seat is leaking, it could go undetected since the leak would end up in the intake manifold. Disconnect the purge solenoid at the manifold when leak checking. In addition, a pinched hose fault (P1486) could set if the purge solenoid does not purge the fuel system properly (blocked seat). The purge solenoid must vent the fuel system prior to the LDP system test. If the purge solenoid cannot properly vent the system the LDP cannot properly complete the test for P1486 and this fault can set due to pressure being in the EVAP system during the test sequence.

Multiple actuation's of the DRB III® Leak Detection Pump (LDP) Monitor Test can hide a 0.020 leak because of excess vapor generation. Additionally, any source for additional vapor generation can hide a small leak in the EVAP system. Excess vapor generation can delay the fall of the LDP diaphragm thus hiding the small leak. An example of this condition could be bringing a cold vehicle into a warm shop for testing or high ambient temperatures.

Fully plugged and partially plugged underhood vacuum lines have been known to set MIL conditions. P1494 and P0456 can be set for this reason. Always, thoroughly, check plumbing for pinches or blockage before condemning components.

TEST EQUIPMENT The Evaporative Emission Leak Detector (EELD) Miller Special Tool 8404 is capable of visually detecting leaks in the evaporative system and will take the place of the ultrasonic leak detector 6917A. The EELD utilizes shop air and a smoke generator to visually detect leaks down to 0.020 or smaller. The food grade oil used to make the smoke includes an UV trace dye that will leave telltale signs of the leak under a black light. This is helpful when components have to be removed to determine the exact leak location. For detailed test instructions, follow the operators manual packaged with the EELD.

NOTE: Be sure that the PCM has the latest software update. Reprogram as indicated by any applicable Technical Service Bulletin. After LDP repairs are completed, verify the repair by running the DRB III® Leak Detection Pump (LDP) Monitor Test as described in Technical Service Bulletin 18-12-99.

REMOVAL

The Leak Detection Pump (LDP) is located under the left quarter panel behind the left/rear wheel (Fig. 16). It is attached to a two-piece support bracket (Fig. 17). The LDP and LDP filter are replaced (serviced) as one unit.

(1) Remove stone shield behind left/rear wheel (Fig. 18). Drill out plastic rivets for removal.

(2) Remove 3 LDP mounting bolts (Fig. 19).

(3) Remove support bracket brace bolt (Fig. 17).

(4) Loosen, but do not remove 2 support bracket nuts at frame rail (Fig. 19).

(5) To separate and lower front section of two-piece support bracket, remove 3 attaching bolts on bottom of support bracket (Fig. 17). While lowering support bracket, disconnect LDP wiring clip (Fig. 20).

(6) Disconnect electrical connector at LDP (Fig. 20).

(7) Carefully remove vapor/vacuum lines at LDP (Fig. 20).

(8) Remove LDP.

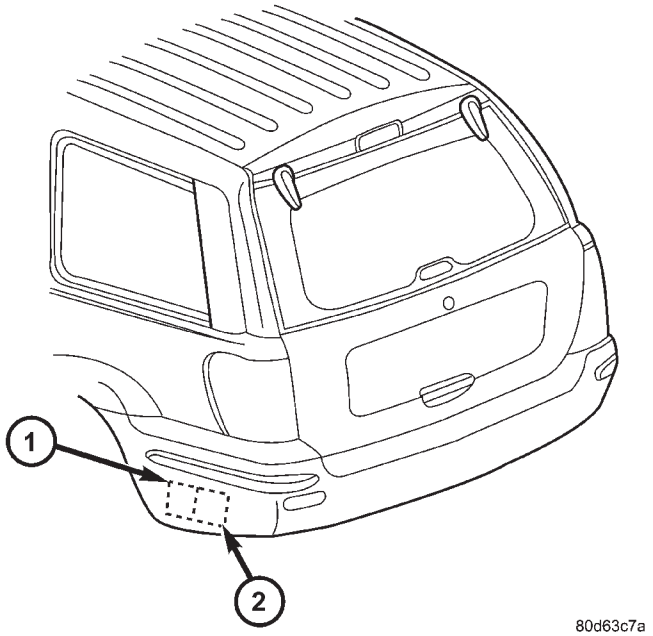


Fig. 16 LOCATION, LDP / EVAP CANISTER

1 - LEAK DETECTION PUMP
2 - EVAP CANISTER

INSTALLATION

The LDP is located in the left quarter panel behind the left/rear wheel. It is attached to a two-piece support bracket (Fig. 17). The LDP and LDP filter are replaced (serviced) as one unit.

(1) Position LDP and carefully install vapor/vacuum lines to LDP and LDP filter. **The vapor/vacuum lines and hoses must be firmly connected.**

LEAK DETECTION PUMP (Continued)

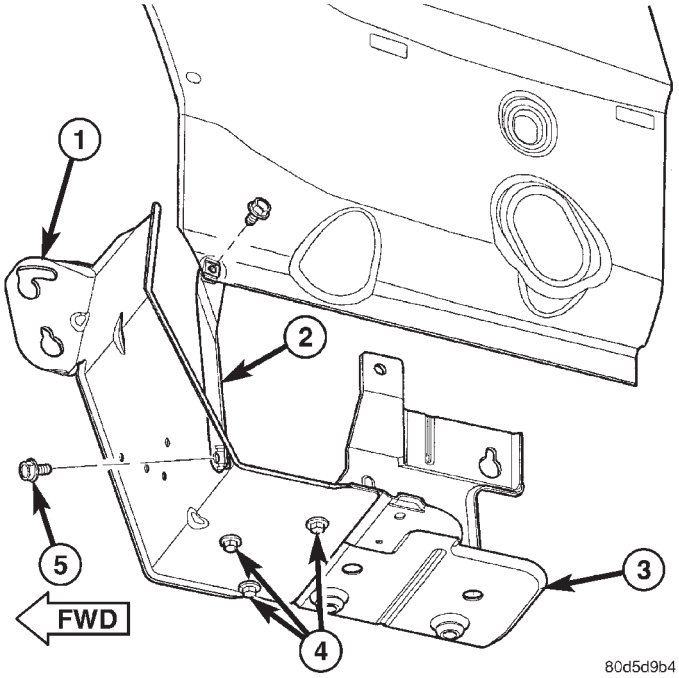


Fig. 17 TWO-PIECE SUPPORT BRACKET

1 - TWO-PIECE SUPPORT BRACKET (FRONT)
2 - SUPPORT BRACKET BRACE
3 - TWO-PIECE SUPPORT BRACKET (REAR)
4 - SUPPORT BRACKET ATTACHING BOLTS (3)
5 - SUPPORT BRACKET BRACE BOLT

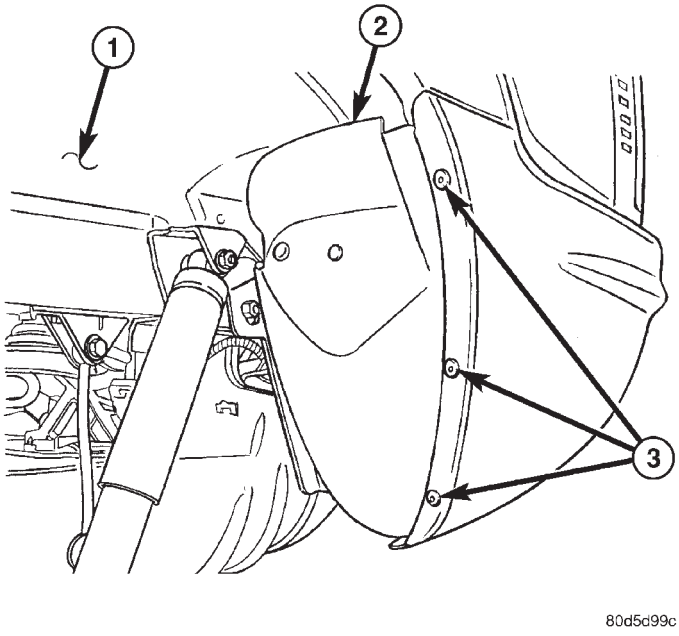


Fig. 18 STONE SHIELD

1 - LEFT-REAR WHEELHOUSE
2 - STONE SHIELD
3 - PLASTIC RIVETS

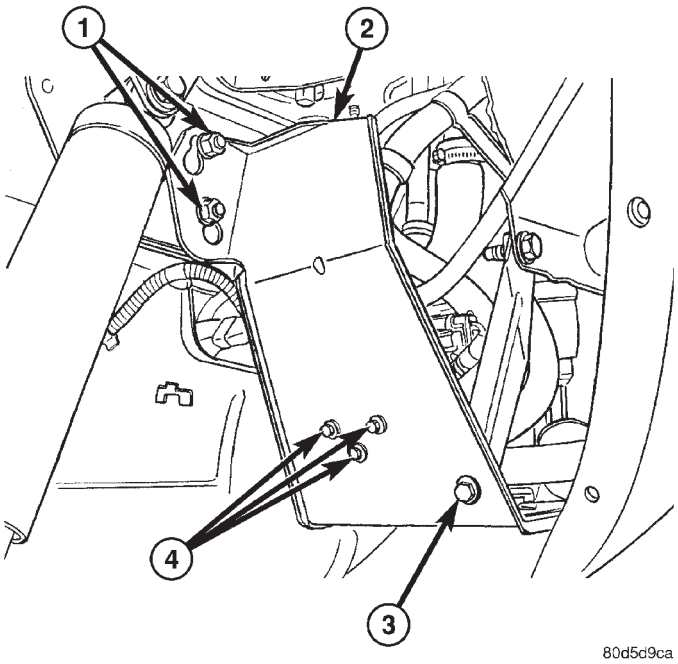


Fig. 19 LDP MOUNTING BOLTS

1 - SUPPORT BRACKET NUTS (2)
2 - SUPPORT BRACKET (FRONT)
3 - SUPPORT BRACKET BRACE BOLT
4 - LDP MOUNTING BOLTS (3)

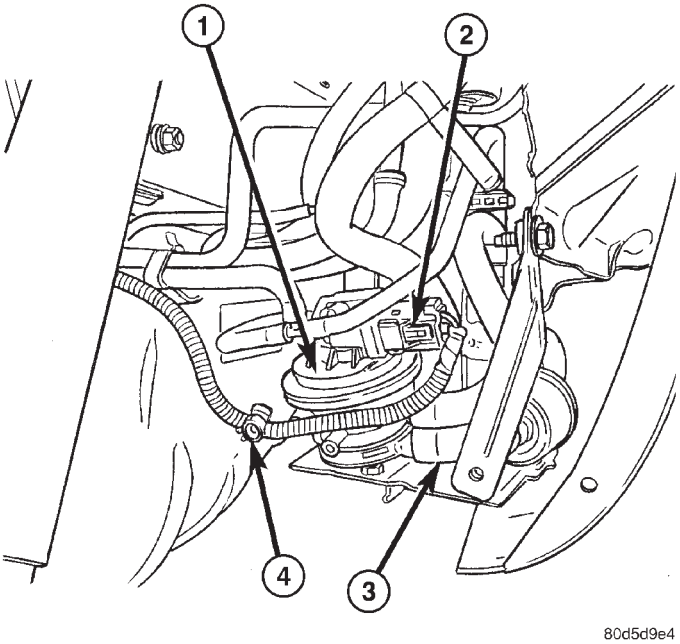


Fig. 20 LDP REMOVAL / INSTALLATION

1 - LDP
2 - ELEC. CONNECT.
3 - VAPOR / VACUUM LINES
4 - WIRING CLIP

LEAK DETECTION PUMP (Continued)

Check the vapor/vacuum lines at the LDP, LDP filter and EVAP canister purge solenoid for damage or leaks. If a leak is present, a Diagnostic Trouble Code (DTC) may be set.

(2) Connect electrical connector to LDP.

(3) While raising front section of support bracket, connect LDP wiring clip (Fig. 20).

(4) Install 3 LDP mounting bolts (Fig. 19). Refer to Torque Specifications.

(5) Join front and rear sections of two-piece support bracket by installing 3 bolts on bottom of support bracket (Fig. 17). Do not tighten bolts at this time.

(6) Install support bracket brace bolt (Fig. 17). Do not tighten bolt at this time.

(7) Tighten 2 support bracket nuts at frame rail (Fig. 19). Refer to Torque Specifications.

(8) Tighten 3 support bracket bolts and brace bolt. Refer to Torque Specifications.

(9) Position stone shield behind left/rear wheel (Fig. 18). Install new plastic rivets.

ORVR

DESCRIPTION

The ORVR (On-Board Refueling Vapor Recovery) system consists of a unique fuel tank, flow management valve, fluid control valve, one-way check valve and vapor canister. Certain ORVR components can be found in (Fig. 1).

OPERATION

The ORVR (On-Board Refueling Vapor Recovery) system is used to remove excess fuel tank vapors. This is done while the vehicle is being refueled. Certain ORVR components can be found in (Fig. 1).

Fuel flowing into the fuel filler tube (approx. 1" I.D.) creates an aspiration effect drawing air into the fuel fill tube. During refueling, the fuel tank is vented to the EVAP canister to capture escaping vapors. With air flowing into the filler tube, there are no fuel vapors escaping to the atmosphere. Once the refueling vapors are captured by the EVAP canister, the vehicle's computer controlled purge system draws vapor out of the canister for the engine to burn. The vapor flow is metered by the purge solenoid so that there is no, or minimal impact on driveability or tailpipe emissions.

As fuel starts to flow through the fuel fill tube, it opens the normally closed check valve and enters the fuel tank. Vapor or air is expelled from the tank through the control valve and on to the vapor canister. Vapor is absorbed in the EVAP canister until vapor flow in the lines stops. This stoppage occurs following fuel shut-off, or by having the fuel level in the tank rise high enough to close the control valve. This control valve contains a float that rises to seal the large diameter vent path to the EVAP canister. At this point in the refueling process, fuel tank pressure increases, the check valve closes (preventing liquid fuel from spiting back at the operator), and fuel then rises up the fuel filler tube to shut off the dispensing nozzle.

PCV VALVE

DIAGNOSIS AND TESTING - PCV VALVE/PCV SYSTEM - 4.7L

(1) Disconnect PCV line/hose (Fig. 21) by disconnecting rubber connecting hose at PCV valve fitting.

(2) Remove PCV valve at oil filler tube by rotating PCV valve downward until locating tabs have been freed at cam lock (Fig. 21). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**

(3) After valve is removed, check condition of valve o-ring (Fig. 21). Also, PCV valve should rattle when shaken.

(4) Reconnect PCV valve to its connecting line/hose.

(5) Start engine and bring to idle speed.

(6) If valve is not plugged, a hissing noise will be heard as air passes through valve. Also, a strong vacuum should be felt with a finger placed at valve inlet.

(7) If vacuum is not felt at valve inlet, check line/hose for kinks or for obstruction. If necessary, clean out intake manifold fitting at rear of manifold. Do this by turning a 1/4 inch drill (by hand) through the fitting to dislodge any solid particles. Blow out the fitting with shop air. If necessary, use a smaller drill to avoid removing any metal from the fitting.

PCV VALVE (Continued)

(8) **Do not attempt to clean the old PCV valve.**

(9) Return PCV valve back to oil filler tube by placing valve locating tabs (Fig. 21) into cam lock. Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.

(10) Connect PCV line/hose and connecting rubber hose to PCV valve.

(11) Disconnect rubber hose from fresh air fitting at left side of air cleaner resonator box (Fig. 22). Start engine and bring to idle speed. Hold a piece of stiff paper (such as a parts tag) loosely over the opening of the disconnected rubber hose.

(12) The paper should be drawn against the hose opening with noticeable force. This will be after allowing approximately one minute for crankcase pressure to reduce.

(13) If vacuum is not present, disconnect each PCV system hose at top of each breather (Fig. 22). Check for obstructions or restrictions.

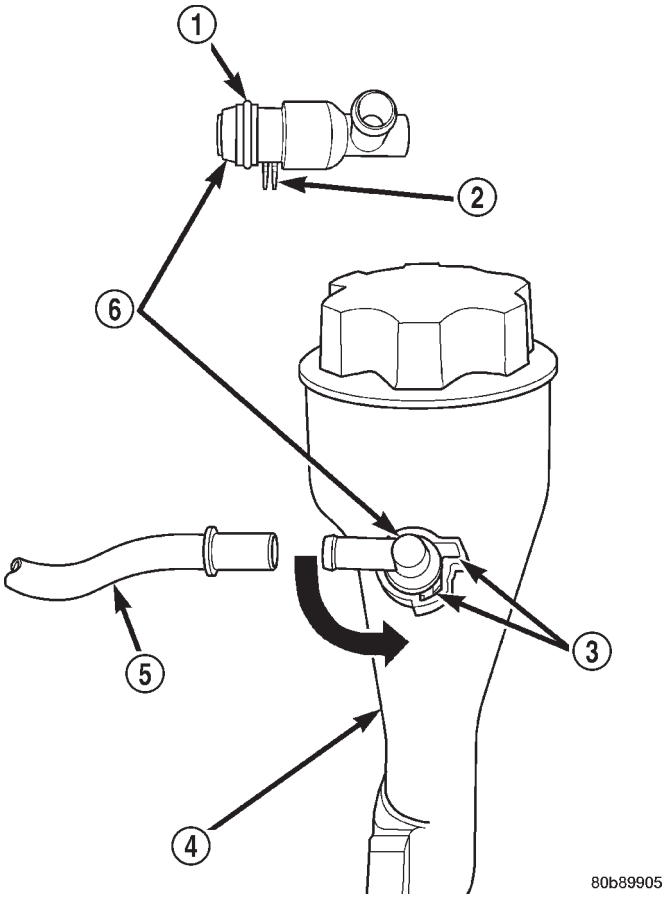


Fig. 21 PCV Valve/Oil Filler Tube—4.7L V-8 Engine

1 - O-RING
2 - LOCATING TABS
3 - CAM LOCK
4 - OIL FILLER TUBE
5 - PCV LINE/HOSE
6 - PCV VALVE

(14) If vacuum is still not present, remove each PCV system breather (Fig. 22) from each cylinder head. Check for obstructions or restrictions. If plugged, replace breather. Tighten breather to 12 N·m (106 in. lbs.) torque. Do not attempt to clean breather

(15) If vacuum is still not present, disconnect each PCV system hose at each fitting and check for obstructions or restrictions.

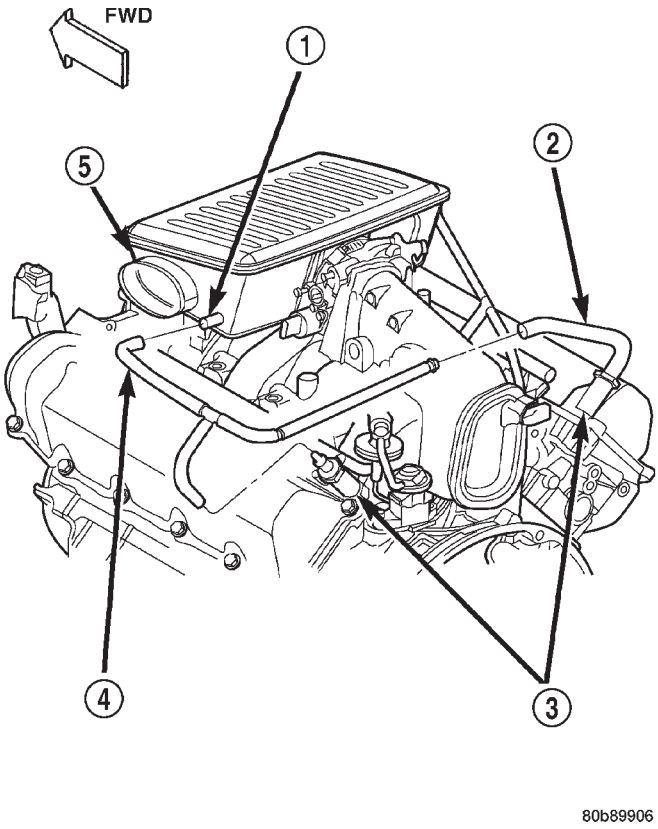


Fig. 22 PCV Breathers/Tubes/Hoses—4.7L V-8 Engine

1 - FRESH AIR FITTING
2 - CONNECTING TUBES/HOSES
3 - CRANKCASE BREATHERS (2)
4 - RUBBER HOSE
5 - AIR CLEANER RESONATOR

PCV VALVE (Continued)

REMOVAL - PCV VALVE - 4.7L

The PCV valve is located on the oil filler tube (Fig. 23). Two locating tabs are located on the side of the valve (Fig. 23). These 2 tabs fit into a cam lock in the oil filler tube. An o-ring seals the valve to the filler tube.

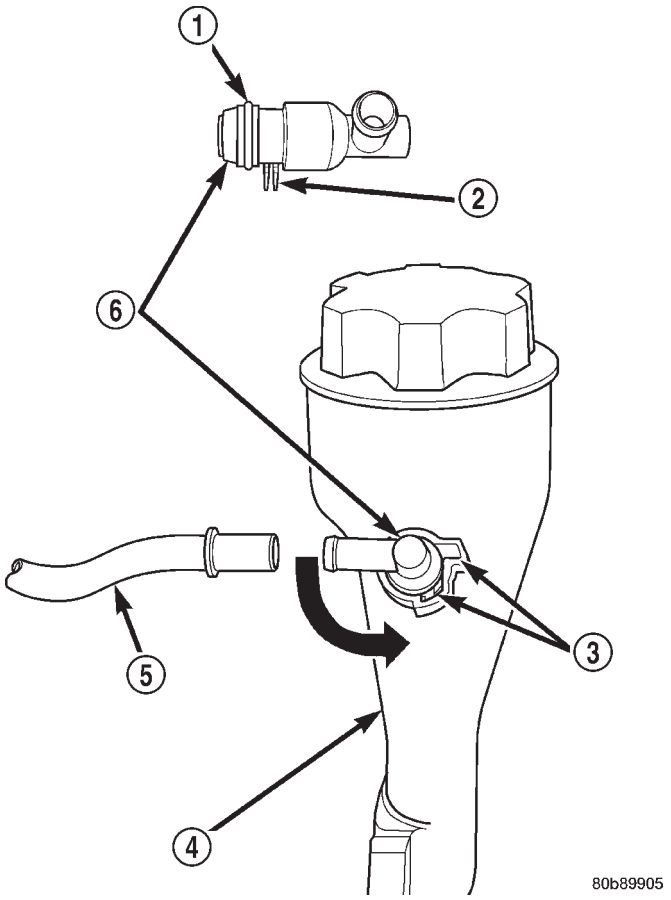


Fig. 23 PCV Valve/Oil Filler Tube Location

1 - O-RING
2 - LOCATING TABS
3 - CAM LOCK
4 - OIL FILLER TUBE
5 - PCV LINE/HOSE
6 - PCV VALVE

(1) Disconnect PCV line/hose (Fig. 23) by disconnecting rubber hose at PCV valve fitting.

(2) Remove PCV valve at oil filler tube by rotating PCV valve downward (counter-clockwise) until locating tabs have been freed at cam lock (Fig. 23). After tabs have cleared, pull valve straight out from filler tube. **To prevent damage to PCV valve locating tabs, valve must be pointed downward for removal. Do not force valve from oil filler tube.**

(3) After valve is removed, check condition of valve o-ring (Fig. 23).

INSTALLATION - PCV VALVE - 4.7L

The PCV valve is located on the oil filler tube (Fig. 23). Two locating tabs are located on the side of the valve (Fig. 23). These 2 tabs fit into a cam lock in the oil filler tube. An o-ring seals the valve to the filler tube.

(1) Return PCV valve back to oil filler tube by placing valve locating tabs (Fig. 23) into cam lock. Press PCV valve in and rotate valve upward. A slight click will be felt when tabs have engaged cam lock. Valve should be pointed towards rear of vehicle.

(2) Connect PCV line/hose and rubber hose to PCV valve.

VACUUM LINES

DESCRIPTION

A vacuum schematic for emission related items can be found on the VECI label. Refer to Vehicle Emission Control Information (VECI) Label for label location.

VAPOR CANISTER

DESCRIPTION

A maintenance free, EVAP canister is used on all gasoline powered models. The canister is attached to a two-piece support bracket located behind the left-rear wheel.

OPERATION

The EVAP canister is filled with granules of an activated carbon mixture. Fuel vapors entering the EVAP canister are absorbed by the charcoal granules.

The canister serves two functions: as a temporary fuel vapor storage point while refueling the vehicle for the ORVR system, as a temporary vapor storage point while the engine is running.

Fuel tank pressure vents into the EVAP canister. Fuel vapors are temporarily held in the canister until they can be drawn into the intake manifold. The duty cycle EVAP canister purge solenoid allows the EVAP canister to be purged at predetermined times and at certain engine operating conditions.

Refer to ORVR for additional information.

VAPOR CANISTER (Continued)

REMOVAL

The EVAP canister is located behind the left-rear wheel (Fig. 24). It is attached to a two-piece support bracket (Fig. 25).

(1) Remove rear bumper facia. Refer to Rear Facia Removal / Installation in Frame & Bumpers section.

(2) Remove 1 support bracket brace bolt (Fig. 25).

(3) Loosen, but do not remove 2 support bracket nuts (Fig. 26).

(4) Remove upper/rear support bracket mounting bolt (Fig. 27).

(5) Carefully lower support bracket assembly to gain access to vapor / vacuum lines. To prevent damage to lines, suspend bracket assembly with rope or string.

(6) Disconnect necessary vacuum / vapor lines at EVAP canister.

(7) Remove EVAP canister mounting bolt (Fig. 28).

(8) Lift canister from support bracket (2 pins are used to align canister into support bracket)

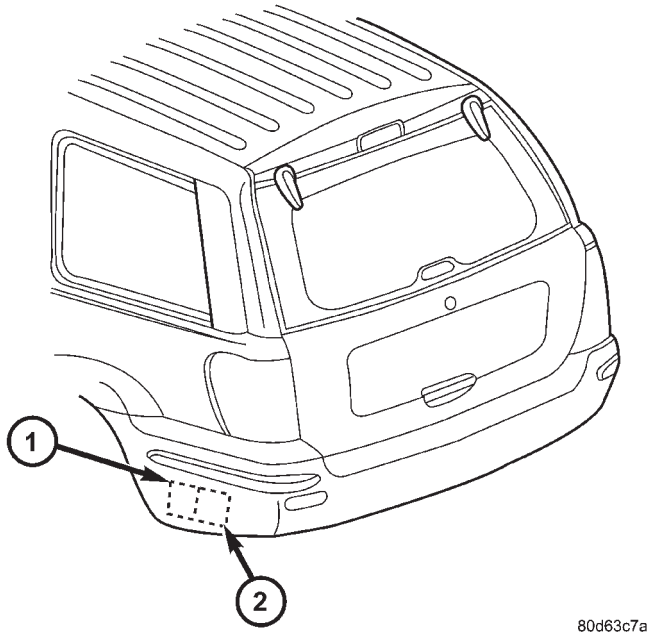


Fig. 24 LOCATION, LDP / EVAP CANISTER

1 - LEAK DETECTION PUMP
2 - EVAP CANISTER

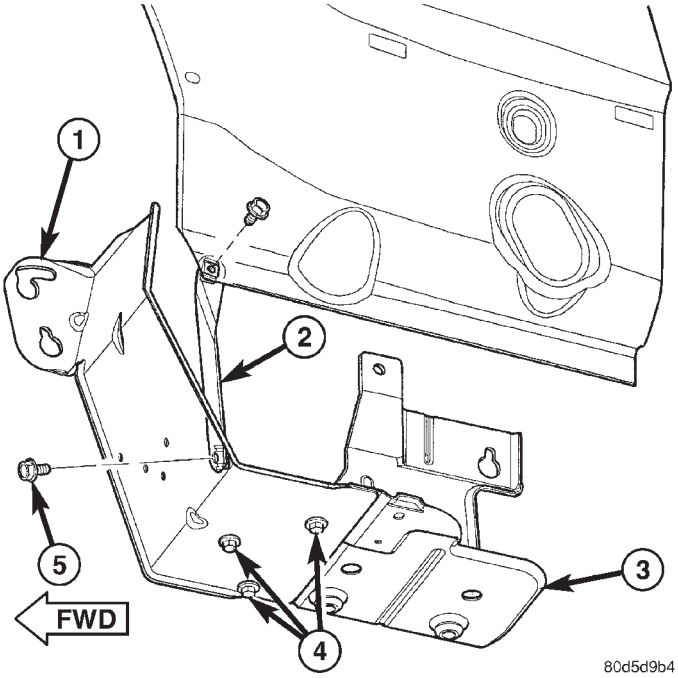


Fig. 25 TWO-PIECE SUPPORT BRACKET

1 - TWO-PIECE SUPPORT BRACKET (FRONT)
2 - SUPPORT BRACKET BRACE
3 - TWO-PIECE SUPPORT BRACKET (REAR)
4 - SUPPORT BRACKET ATTACHING BOLTS (3)
5 - SUPPORT BRACKET BRACE BOLT

INSTALLATION

The EVAP canister is located behind the left-rear wheel (Fig. 24). It is attached to a two-piece support bracket (Fig. 25).

(1) Position canister to support bracket. Guide 2 alignment pins into support bracket.

(2) Install EVAP canister mounting bolt (Fig. 28). Refer to Torque Specifications.

(3) Carefully install vapor / vacuum lines to canister. **The vapor/vacuum lines and hoses must be firmly connected. Check the vapor/vacuum lines at the LDP, LDP filter and EVAP canister purge solenoid for damage or leaks. If a leak is present, a Diagnostic Trouble Code (DTC) may be set.**

VAPOR CANISTER (Continued)

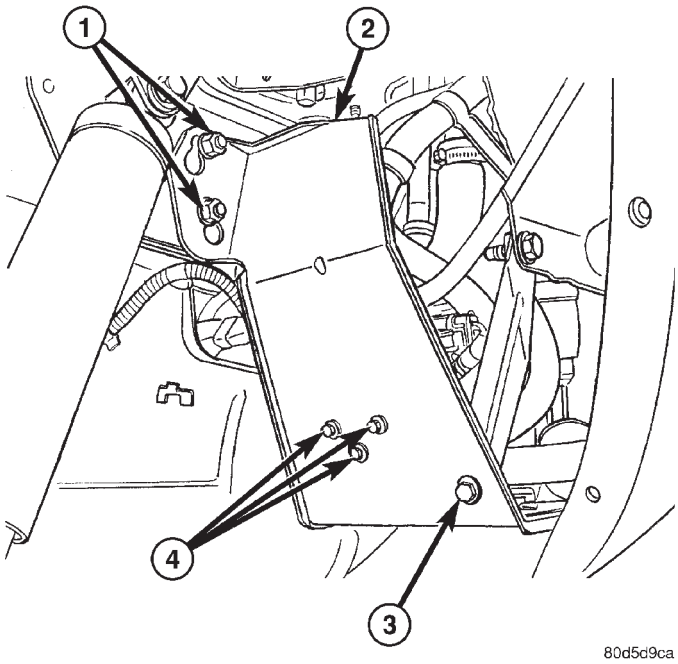


Fig. 26 SUPPORT BRACKET NUTS

1 - SUPPORT BRACKET NUTS (2)
2 - SUPPORT BRACKET (FRONT)
3 - SUPPORT BRACKET BRACE BOLT
4 - LDP MOUNTING BOLTS (3)

(4) Carefully raise support bracket assembly to frame rail. Install 1 support bracket brace bolt (Fig. 25) and 2 support bracket nuts (Fig. 26).

(5) Install upper/rear support bracket mounting bolt (Fig. 27). Refer to Torque Specifications.

(6) Install rear bumper facia. Refer to Rear Facia Removal / Installation in Frame & Bumpers section.

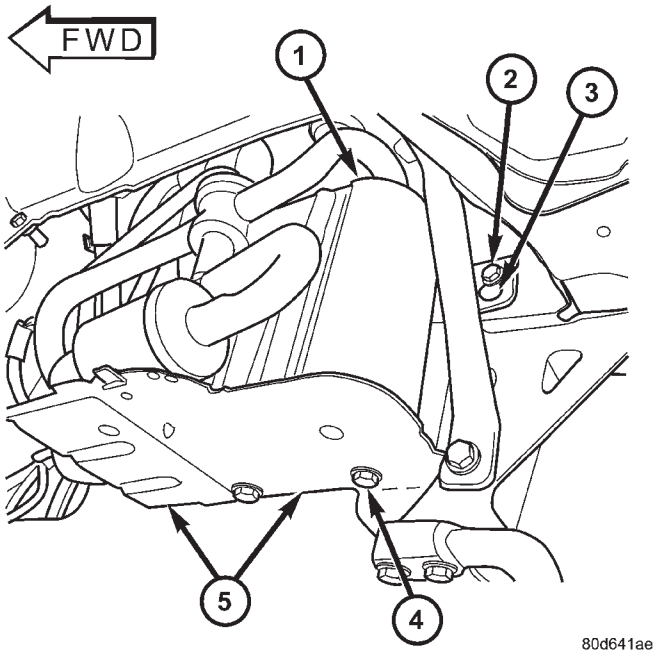


Fig. 27 SUPPORT BRACKET BOLT

1 - EVAP CANISTER
2 - UPPER / REAR SUPPORT BRACKET BOLT
3 - SLOTTED HOLE
4 - ALIGNMENT PINS (2)
5 - TWO-PIECE SUPPORT BRACKET

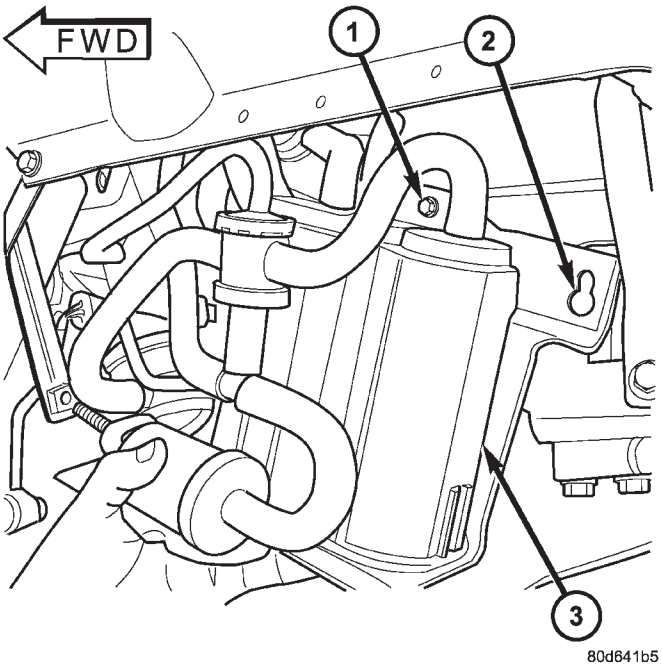


Fig. 28 EVAP CANISTER REMOVE / INSTALL

1 - EVAP CANISTER MOUNTING BOLT
2 - SLOTTED HOLE
3 - EVAP CANISTER (LOWERED)

SERVICE MANUAL COMMENTS

What features do you find most useful? _____

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What errors have you found? Please include page number. _____

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What topics are hard to locate, confusing, or not covered completely? _____

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