TOYOTA TRUCK & 4RUNNER REPAIR MANUAL

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HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

An **INDEX** is provided on the first page of each section to guide you to the item to be repaired.

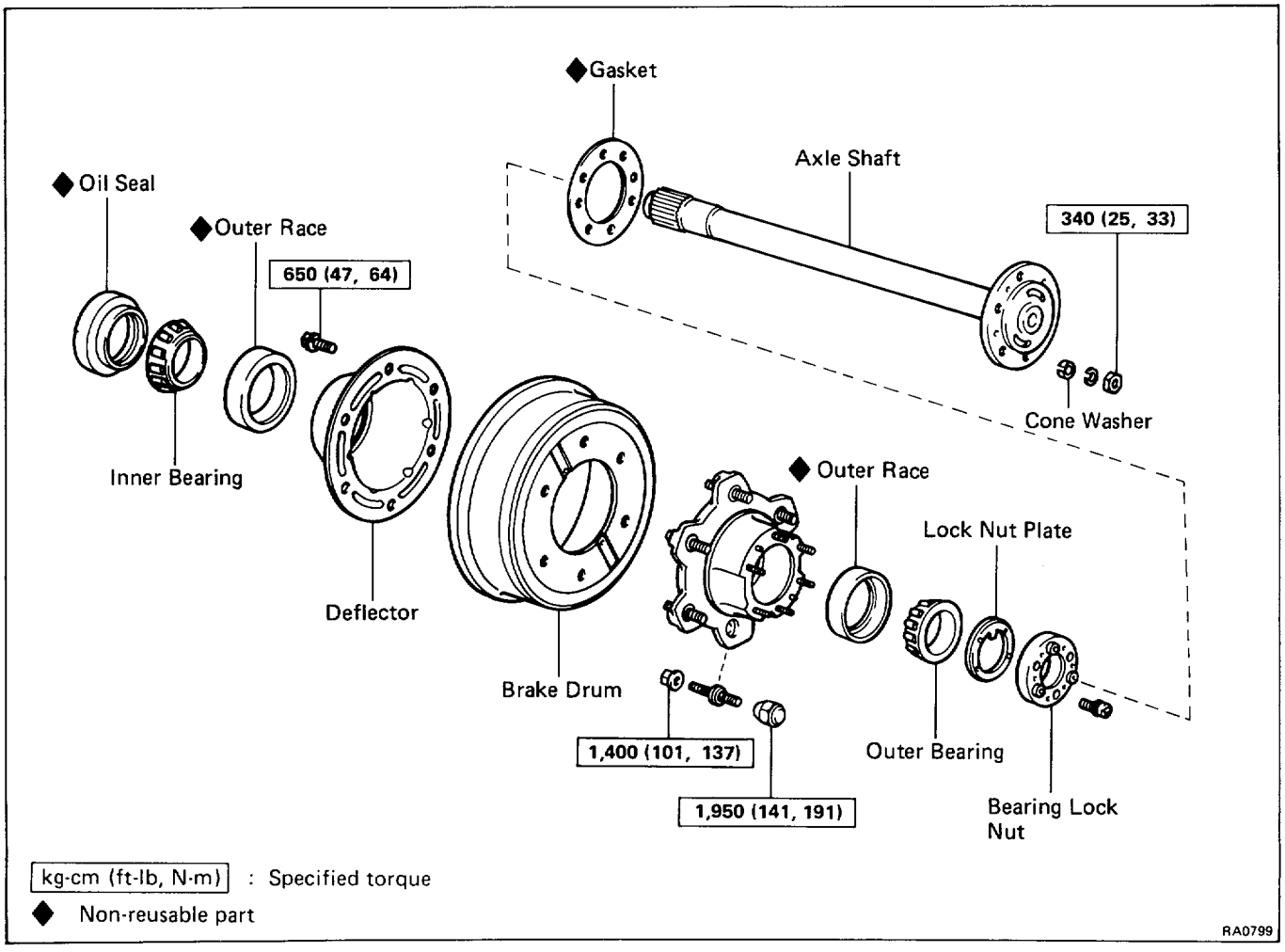
At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

TROUBLESHOOTING tables are included for each system to help you diagnose the system problem and find the cause. The repair for each possible cause is referenced in the remedy column to quickly lead you to the solution.

REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



The procedures are presented in a step-by-step format:

- The photo or illustration shows *what* to do and *where* to do it.
- The task heading tells *what* to do.
- The detailed text tells *how* to perform the task and gives other information such as specifications and warnings.

Example:

Task heading: what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the figure.

SST 09350-30020 (09350-06120)

Set part No. *Component part No.*

Detail text: how to do it

(b) Measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)

Specification

Photograph or illustration: what to do and where

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance and only when necessary, the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

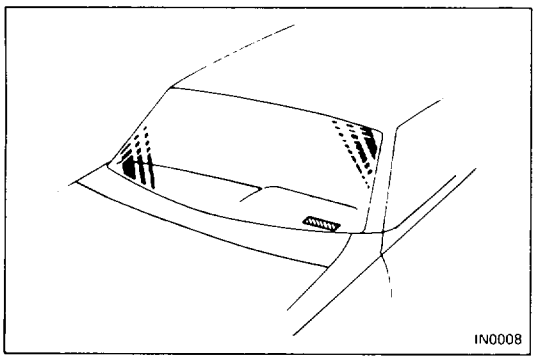
References have been kept to a minimum. However, when they are required you are given the page to go to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, specifications, for quick reference.

WARNINGS, CAUTIONS, NOTES:

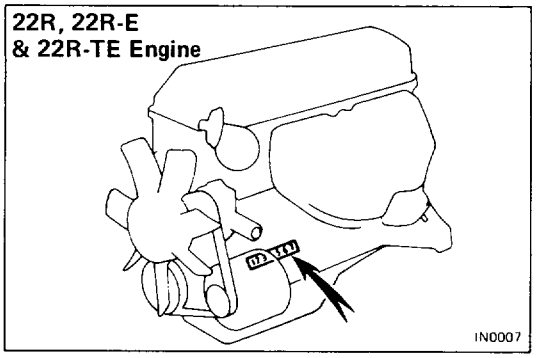
- WARNINGS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- CAUTIONS are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- NOTES are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.


IN0008

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on top of the instrument panel.



IN0007

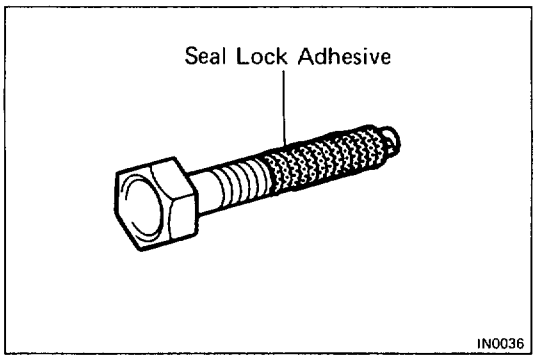
ENGINE SERIAL NUMBER

The engine serial number is stamped on the left side of the cylinder block.

GENERAL REPAIR INSTRUCTIONS

1. Use fender seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (−) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting it or prying it.
   (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.

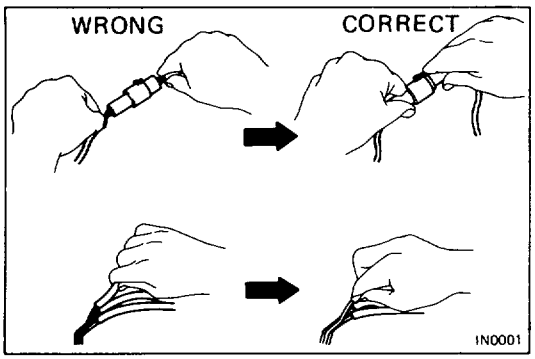
5. Non-reusable parts
   (a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.
   (b) Non-reusable parts are indicated in the component illustrations by the "◆" symbol.



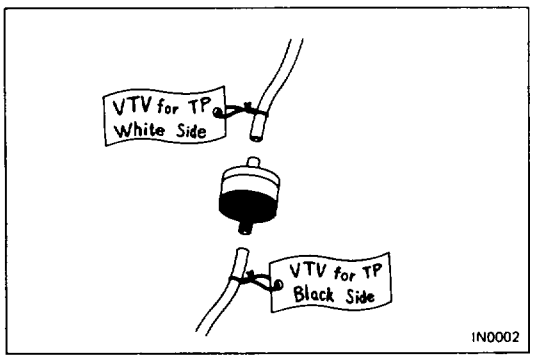
6. Precoated parts

   Precoated parts are the bolts and nuts, which have been coated with a seal lock adhesive at the factory.
   (a) If a precoated part is tightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
   (b) Recoating of precoated parts
      (1) Clean off the old adhesive from the bolt, nut or installation part threads.
      (2) Dry with compressed air.
      (3) Apply the specified seal lock adhesive to the bolt or nut threads.
   (c) Precoated parts are indicated in the component illustrations by the "★" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the fuse amp rating or use one of a lower rating.
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations. (See page IN-8)
   (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.
   (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone, even for a small job that can be finished quickly.



12. Observe the following precautions to avoid damage to the parts:
    (a) **Do not open the cover or the case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)**
    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the distributor, coil, air filter, carburetor intake, air pump and VCV from water.
    (f) Never use an impact wrench to remove or install thermo switches or thermo sensors.
    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.



13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTIONS FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

WARNING: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the folloing precautions and explain them to your customer.

1. **Use only unleaded gasoline.**
2. **Avoid prolonged idling.**

   Avoid running the engine at fast idle speed for more than 10 minutes and at idle speed for more than 20 minutes.
3. **Avoid spark jump test.**

   (a) Spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

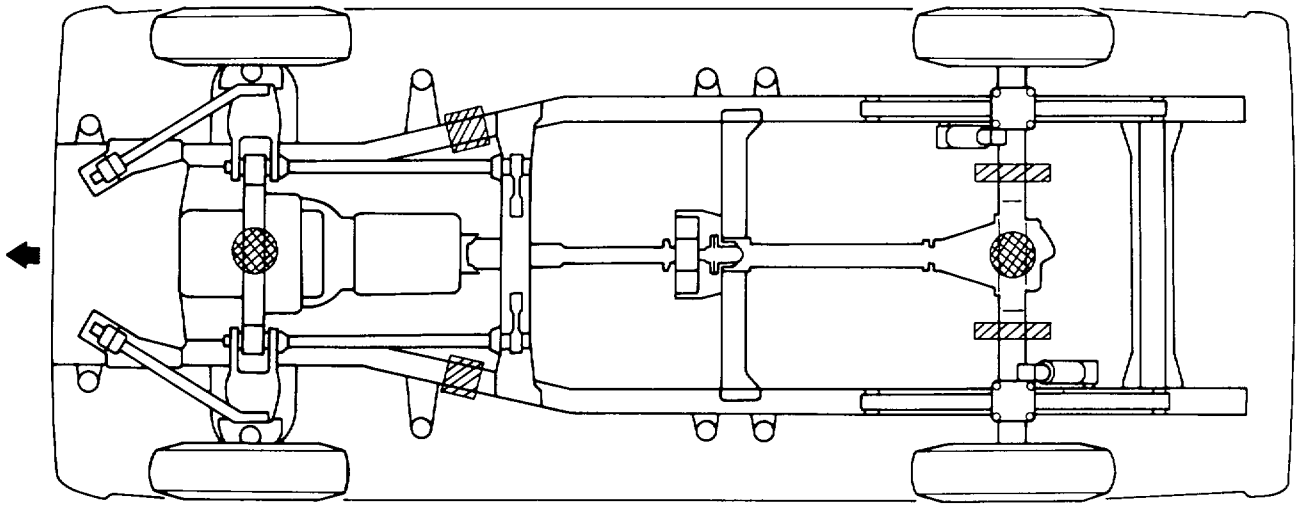
   (b) While testing, never race the engine.
4. **Avoid prolonged engine compression measurement.**

   Engine compression tests must be made as rapidly as possible.
5. **Do not run engine when fuel tank is nearly empty.**

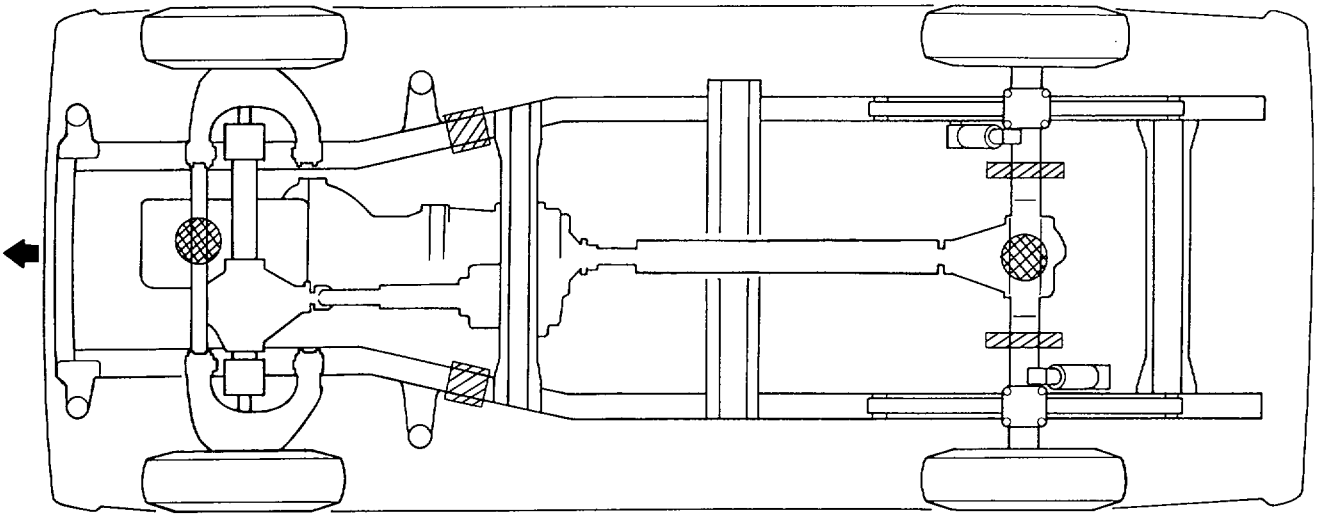
   This may cause the engine to misfire and create an extra load on the converter.
6. **Avoid coasting with ignition turned off and prolonged braking.**
7. **Do not dispose of used catalyst along with parts contaminated with gasoline or oil.**

VEHICLE LIFT AND SUPPORT LOCATIONS

[2WD]



[4WD]



JACK POSITION .....

Front ..... Center of crossmember
Rear ..... Center of rear axle housing

SUPPORT POSITION

Safety stand .....

IN0012
IN0108

ABBREVIATIONS USED IN THIS MANUAL

AAP	Auxiliary Acceleration Pump
ABV	Air By-pass Valve
A/C	Air Conditioner
ALR	Automatic Locking Retractor
APPROX.	Approximate
AS	Air Suction
ASV	Air Switching Valve
A/T, AT	Automatic Transmission
ATF	Automatic Transmission Fluid
B_0	Overdrive Brake
B_1	Second Coast Brake, No. 1 Brake
B_2	Second Brake, No. 2 Brake
B_3	First and Reverse Brake, No. 3 Brake
B_4	Transfer Low Speed Brake
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
C_0	Overdrive Direct Clutch
C_1	Forward Clutch, Front Clutch
C_2	Direct Clutch, Rear Clutch
C_3	Transfer Direct Clutch
C_4	Transfer Front Drive Clutch
CALIF.	Vehicles Sold in California
CB	Circuit Breaker
C&C	Cab and Chassis
CMH	Cold Mixture Heater
ECT	Electronic Controlled Transmission
ECU	Electronic Controlled Unit
EFI	Electronic Fuel Injection
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EVAP	Evaporative (Emission Control)
EX	Exhaust (manifold, valve)
Ex.	Except
F_0	Overdrive One-way Clutch
F_1	No. 1 One-way Clutch
F_2	No. 2 One-way Clutch
FED.	Vehicles Sold in USA except California
FIPG	Formed in Place Gasket
FL	Fusible Link
HAC	High Altitude Compensation
HAI	Hot Air Intake
IN	Intake (manifold, valve)
IG	Ignition
LH	Left-hand
LSPV	Load Sensing Proportioning Valve
MAS	Mixture Adjusting Screw
MAX.	Maximum
MC	Mixture Control
MP	Multipurpose
M/T, MT	Manual Transmission
OC	Oxidation Catalyst
O/D	Overdrive
O/S	Oversize
PCV	Positive Crankcase Ventilation
PPS	Progressive Power Steering
PS	Power Steering
RH	Right-hand
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
S/W	Switch
TCCS	Toyota Computer Controlled System
TDC	Top Dead Center
T/M	Transmission
TWC	Three-way Catalyst
U/S	Undersize
VCS	Vacuum Control Switch
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
2WD	Two Wheel Drive Vehicles (4x2)
4WD	Four Wheel Drive Vehicles (4x4)
w/	With
w/o	Without

MAINTENANCE

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MAINTENANCE SCHEDULE	MA-2
MAINTENANCE OPERATIONS	MA-4
GENERAL MAINTENANCE	MA-18

GENERAL NOTES:

- Every service item in the periodic maintenance list must be performed.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

MAINTENANCE SCHEDULE

Maintenance operations: A = Check and adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

NORMAL CONDITION SCHEDULE

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be performed at the same intervals shown in each maintenance schedule.								See page (item No.)
		Miles x 1,000	10	15	20	30	40	45	50	60	
		Km x 1,000	16	24	32	48	64	72	80	96	
		Months	12	18	24	36	48	54	60	72	
ENGINE	Valve clearance*					A				A	MA-8 (item 12)
	Drive belts(1)					I				I	MA-4 (item 1)
	Engine oil and oil filter*	22R, 22R-E engine	R		R	R	R		R	R	MA-5 (item 5)
		22R-TE engine	R(4)								
	Engine coolant(2)									R	MA-6 (item 6)
	Exhaust pipes and mountings					I				I	MA-7 (item 10)
FUEL	Idle speed	22R-E, 22R-TE engine(3)	A			A				A	MA-8 (item 13)
	Idle speed and fast idle speed	22R engine(5)				A					MA-8 (item 13) MA-10 (item 14)
	Air filter*					R				R	MA-5 (item 4)
	Fuel lines and connections					I				I	MA-7 (item 9)
	Fuel tank cap gasket									R	MA-7 (item 8)
IGNITION	Spark plugs**					R				R	MA-5 (item 2)
EVAP	Charcoal canister	Calif. only								I	MA-6 (item 7)
EXHAUST	Oxygen sensor*(6)	Fed. and Canada 22R-E & 22R-TE engine only	R(6)								MA-7 (item 11)
BRAKES	Brake linings and drums	4WD		I		I		I		I	MA-11 (item 16)
		2WD			I		I			I	
	Brake pads and discs	4WD		I		I		I		I	MA-11 (item 17)
		2WD			I		I			I	
	Brake line pipes and hoses	4WD		I		I		I		I	MA-11 (item 15)
		2WD			I		I			I	
CHASSIS	Steering linkage	4WD		I		I		I		I	MA-12 (item 18)
		2WD			I		I			I	
	Ball joints and dust covers	4WD		I		I		I		I	MA-12 (item 21)
		2WD			I		I			I	
	Drive shaft boots	4WD		I		I		I		I	MA-12 (item 20)
	Automatic transmission, manual transmission transfer (4WD), differential and steering gear housing oil(7)	4WD		I		I		I		I	MA-13 (item 22) MA-13 (item 23)
		2WD			I		I			I	MA-12 (item 19)
	Front wheel bearing and thrust bush grease (4WD only)	4WD				R				R	MA-15 (item 26)
		2WD					R				
	Steering knuckle and chassis grease(8)	4WD		R		R		R		R	MA-16 (item 27)
	Propeller shaft grease(8)	4WD		R		R		R		R	MA-16 (item 27)
	Bolts and nuts on chassis and body	4WD		I		I		I		I	MA-17 (item 28)
		2WD			I		I			I	

Maintenance services indicated by a star (★) or asterisk (*) are required under the terms of the Emission Control Systems Warranty. See Owner's Guide or Warranty Booklet for complete warranty information.

★ For vehicles sold in California

* For vehicles sold outside California

NOTE:

(1) After 60,000 miles (96,000 km) or 72 months, inspect every 10,000 miles (16,000 km) or 12 months.
(2) After 60,000 miles (96,000 km) or 72 months, replace every 30,000 miles (48,000 km) or 36 months.
(3) After 60,000 miles (96,000 km) or 72 months, adjust every 30,000 miles (48,000 km) or 36 months.
(4) Replace every 5,000 miles (8,000 km) or 6 months, but replace oil filter every 10,000 miles (16,000 km) or 12 months.
(5) Adjustment at 30,000 miles (48,000 km) or 36 months only.
(6) Replace at 80,000 miles (129,000 km) only.
(7) Inspect the steering gear housing for oil leakage only.
(8) If the propeller shaft has been immersed in water, it should be re-greased daily.

Follow the severe condition schedule if vehicle is operated mainly under one or more of the following severe conditions:

- Towing a trailer, using a camper or car top carrier.
- Repeat short trips less than 5 miles (8 km) and outside temperatures remain below freezing.
- Extensive idling and/or low speed driving for a long distance such as police, taxi or door-to-door delivery use.
- Operating on dusty, rough muddy or salt spread roads.

SEVERE CONDITION SCHEDULE

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be performed at the same intervals shown in each maintenance schedule.															See page (item No.)
		Miles x 1,000	5	7.5	10	15	20	22.5	25	30	35	37.5	40	45	50	52.5	55	60	
		Km x 1,000	8	12	16	24	32	36	40	48	56	60	64	72	80	84	88	96	
		Months	6	9	12	18	24	27	30	36	42	45	48	54	60	63	66	72	
ENGINE	Valve clearance*									A								A	MA-8 (item 12)
	Drive belts(1)									I								I	MA-4 (item 1)
	Engine oil and oil filter*	22R, 22R-E engine	R		R	R	R		R	R	R		R	R	R		R	R	MA-5 (item 5)
		22R-TE engine	R (4)																
	Engine coolant(2)																	R	MA-6 (item 6)
	Exhaust pipes and mountings					I				I				I				I	MA-7 (item 10)
FUEL	Idle speed	22R-E, 22R-TE engine(3)			A					A								A	MA-8 (item 13)
	Idle speed and fast idle speed	22R engine(5)								A									MA-8 (item 13), MA-10 (item 14)
	Air filter*(9)		I		I	I	I		I	R	I		I	I	I		I	R	MA-5 (item 3,4)
	Fuel lines and connections									I								I	MA-7 (item 9)
	Fuel tank cap gasket																	R	MA-7 (item 8)
IGNITION	Spark plugs**									R								R	MA-5 (item 2)
EVAP	Charcoal canister	Calif. only																I	MA-6 (item 7)
EXHAUST	Oxygen sensor*	Fed. and Canada 22R-E, 22R-TE engine only	R (6)																MA-7 (item 11)
BRAKES	Brake linings and drums	4WD		I		I		I		I		I		I		I		I	MA-11 (item 16)
		2WD			I		I			I			I		I			I	
	Brake pads and discs	4WD		I		I		I		I		I		I		I		I	MA-11 (item 17)
		2WD			I		I			I			I		I			I	
	Brake line pipes and hoses	4WD				I				I				I				I	MA-11 (item 15)
		2WD					I						I					I	
CHASSIS	Steering linkage(10)	4WD		I		I		I		I		I		I		I		I	MA-12 (item 18)
		2WD			I		I			I			I		I			I	
	Ball joints and dust covers	4WD		I		I		I		I		I		I		I		I	MA-12 (item 21)
		2WD			I		I			I			I		I			I	
	Drive shaft boots	4WD		I		I		I		I		I		I		I		I	MA-12 (item 20)
	Automatic transmission, manual transmission, transfer (4WD), differential and steering gear housing oil(7)	4WD				R				R				R				R	MA-14 (item 24), MA-15 (item 25)
		2WD					R						R					R	MA-12 (item 19)
	Front wheel bearing and thrust bush grease (4WD only)	4WD								R								R	MA-15 (item 26)
		2WD											R						
	Steering knuckle and chassis grease(8)	4WD		R		R		R		R		R		R		R		R	MA-16 (item 27)
	Propeller shaft grease(8)	4WD		R		R		R		R		R		R		R		R	MA-16 (item 27)
	Bolts and nuts on chassis and body(9)	4WD		I		I		I		I		I		I		I		I	MA-17 (item 28)
		2WD			I		I			I			I		I			I	

Maintenance services indicated by a star (★) or asterisk (*) are required under the terms of the Emission Control Systems Warranty. See Owner's Guide or Warranty Booklet for complete warranty information.

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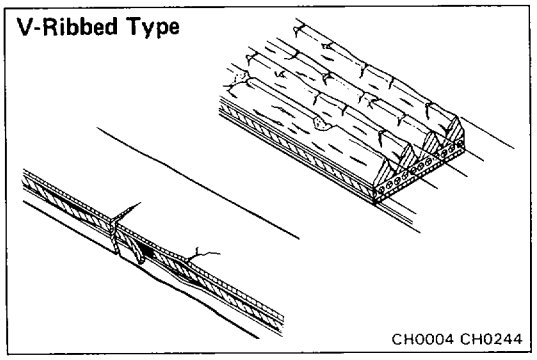
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(2) After 60,000 miles (96,000 km) or 72 months, replace every 30,000 miles (48,000 km) or 36 months.
(3) After 60,000 miles (96,000 km) or 72 months, adjust every 30,000 miles (48,000 km) or 36 months.
(4) Replace every 2,500 miles (4,000 km) or 3 months, but oil filter replace every 5,000 miles (8,000 km) or 6 months.
(5) Adjustment at 30,000 miles (48,000 km) or 36 months only.
(6) Replace at 80,000 miles (129,000 km) only.
(7) Inspect the steering gear housing for oil leakage only.
(8) If the propeller shaft has been immersed in water, it should be re-greased daily.
(9) Applicable when operating mainly on dusty roads. If not, follow the normal condition schedule.
(10) Applicable when operating mainly on rough and/or muddy roads. If not, follow the normal condition schedule.

MAINTENANCE OPERATIONS

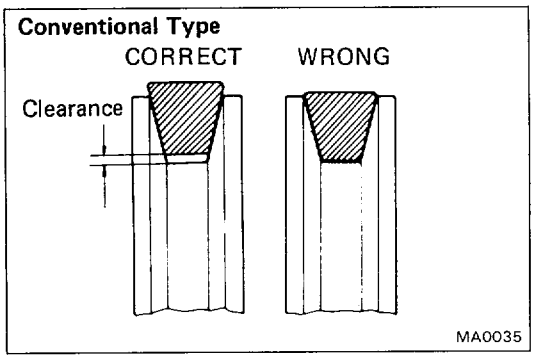
ENGINE

Cold Engine Operations



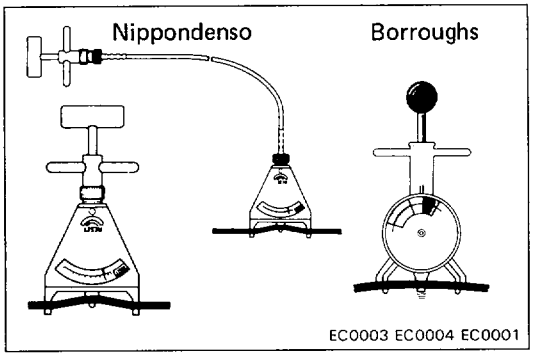
1. INSPECT DRIVE BELTS

(a) Visually check the belt for separation of the adhesive rubber above and below the core, core separation from the belt side, severed core, separation of the rib from the adhesive rubber, cracking or separation of the ribs, torn or worn ribs or cracks in the inner ridges of the ribs.



Conventional type only: Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belt.



(b) Using a belt tension gauge, check the drive belt tension.

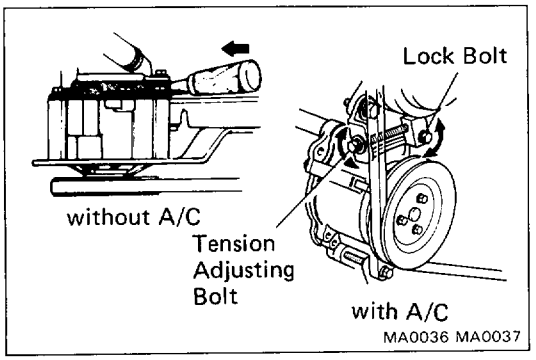
Belt tension gauge:

Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:

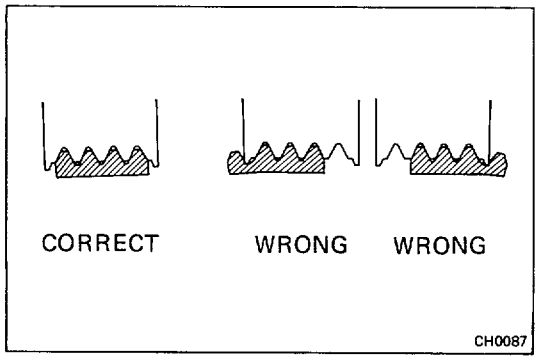
V-ribbed type

Alternator (w/ Air Pump)		
with A/C	**Used belt**	**100 ± 20 lb**
	New belt	**160 ± 20 lb**
without A/C	**Used belt**	**85 ± 20 lb**
	New belt	**105 ± 25 lb**
Conventional type	**Used belt**	**80 ± 20 lb**
	New belt	**125 ± 25 lb**



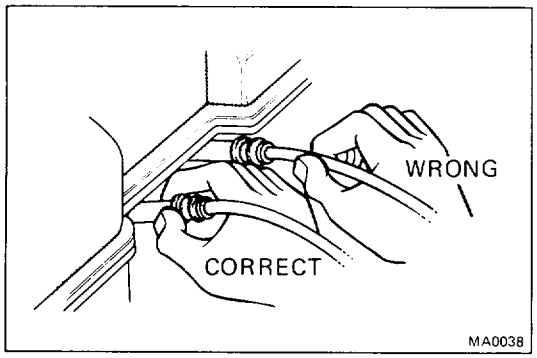
If necessary, adjust the drive belt tension.

CAUTION: (w/ Air Pump) Do not pry on the die-cast body of the air pump.



NOTE:

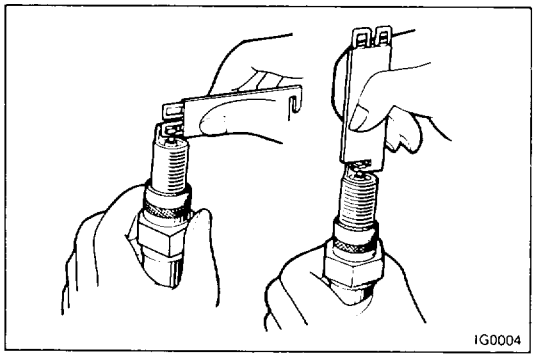
- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.



2. REPLACE SPARK PLUGS

(a) Disconnect the high-tension cords at the boot. Do not pull on the cords.

(b) Remove the spark plugs.

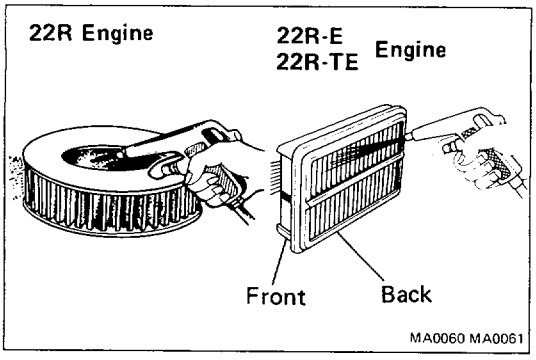


(c) Set the gap on the new plugs.

Gap: 0.8 mm (0.031 in.)

Recommended spark plugs:

ND	**W16EXR-U**
NGK	**BPR5EY**



3. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

NOTE: Oiliness may indicate a stuck PCV valve.

If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.

First blow from inside (or back side) thoroughly, then blow off the outside (or front side) of the element.

4. REPLACE AIR FILTER

Replace the used air cleaner element with a new one.

5. REPLACE ENGINE OIL AND OIL FILTER
(See page LU-3)

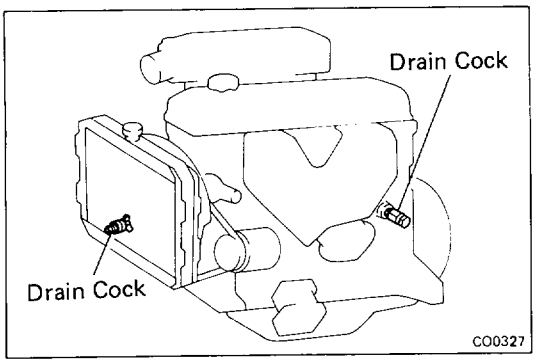
Oil grade: API grade SF or SF/CC multigrade, fuel-efficient and recommended viscosity oil.

Engine oil capacity:

Drain and refill

w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)

w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)



6. REPLACE ENGINE COOLANT

(a) Drain the coolant from the radiator and engine drain cocks. (Engine drain is at left rear of engine block.)

(b) Close the drain cocks.

(c) Fill system with coolant.

Coolant capacity (w/ heater or air conditioner):

22R, 22R-E (ex. 4WD A/T)
8.4 liters (8.9 US qts, 7.4 Imp. qts)

22R-E (4WD A/T), 22R-TE
9.1 liters (9.6 US qts, 8.0 Imp. qts)

Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturers instruction.

7. CALIFORNIA VEHICLES ONLY: INSPECT CHARCOAL CANISTER

A. 22R-E AND 22R-TE ENGINE

(a) Disconnect the hoses to the charcoal canister. Label hoses for correct installation.

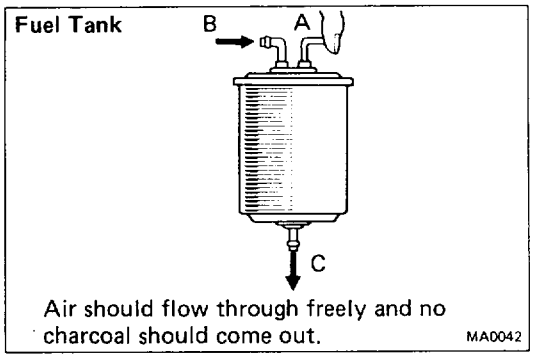
(b) Plug pipe A with your finger and blow compressed air (3 kg/cm², 43 psi or 294 kPa) through pipe B (fuel tank side).

- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(c) Connect the hoses to the charcoal canister.



B. 22R ENGINE

(a) Inspect the fuel tank and carburetor charcoal canisters.

(b) (Fuel tank)

Disconnect the hoses to the fuel tank charcoal canister. Label hoses for correct installation.

(Carburetor)

Disconnect the hoses to the carburetor charcoal canister located below the battery. Label hoses for correct installation.

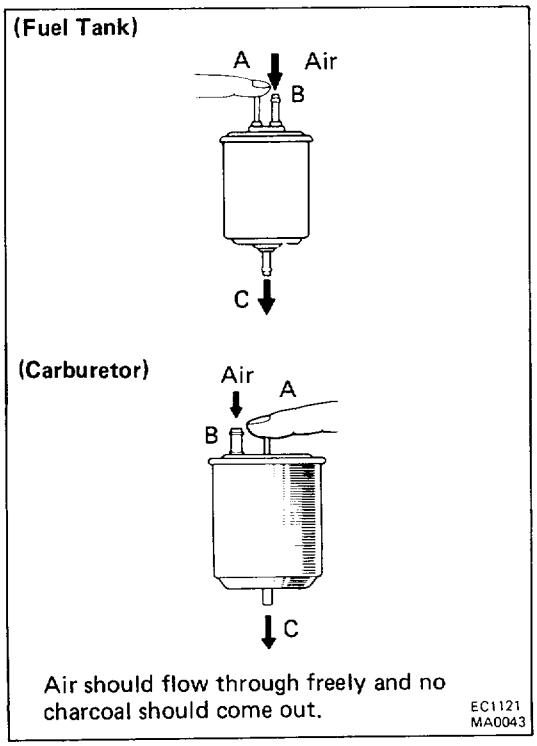
(c) Plug pipe A with your finger and blow compressed air (3 kg/cm², 43 psi or 294 kPa) through pipe B (fuel tank side).

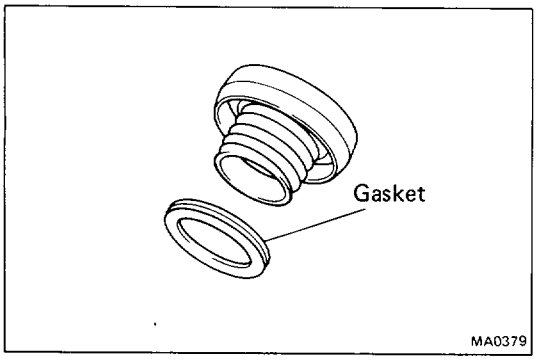
- Check that air comes out of the bottom pipe C without resistance.
- Check that no activated charcoal comes out.

If necessary, replace the charcoal canister.

NOTE: Do not attempt to wash the charcoal.

(d) Connect the hoses to the charcoal canister.





8. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (O-ring) from the fuel tank cap. Do not damage the cap.

(b) Install the new gasket by hand.

(c) Inspect the cap for damage or cracks.

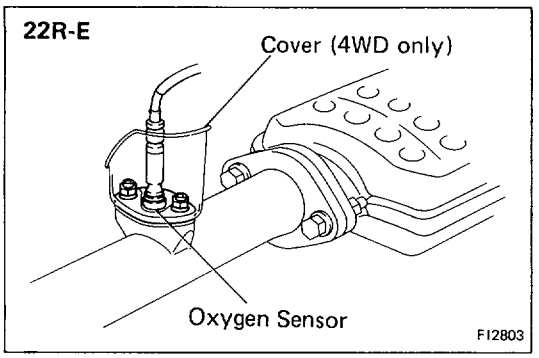
(d) Install the cap and check the torque limiter.

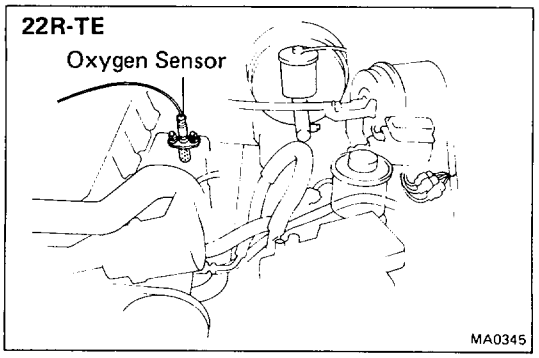
9. INSPECT FUEL LINES AND CONNECTIONS
(22R Engine: See page FU-29)
(22R-E and 22R-TE Engine: See page FI-63)

Visually inspect the fuel lines for cracks, leakage or loose connections.

10. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.





11. FEDERAL AND CANADA 22R-E, 22R-TE ENGINE: REPLACE OXYGEN SENSOR

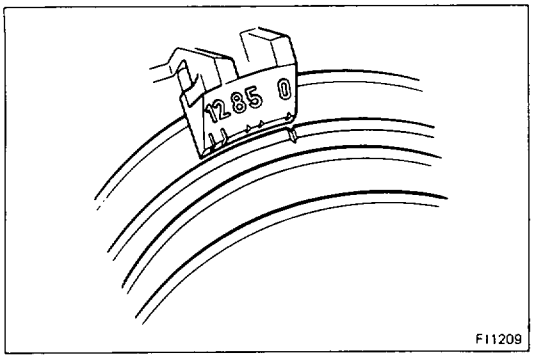
(a) Disconnect the oxygen sensor wiring connector.

(b) Remove the cover (4WD), oxygen sensor and gasket from the exhaust pipe.

(c) Install the new gasket, oxygen sensor and cover (4WD) to the exhaust pipe.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

(d) Inspect oxygen sensor operation.
Inspect feedback control.
(See page FI-80)



Hot Engine Operations

12. ADJUST VALVE CLEARANCE

(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the cylinder head cover.

(c) Set No. 1 cylinder to TDC/compression.

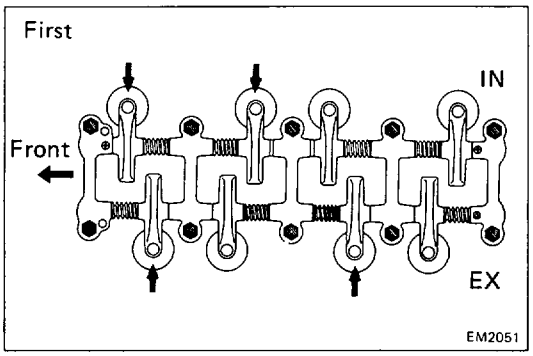
- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the O position.
- Check that the rocker arms on No. 1 cylinder are loose and rockers on No. 4 are tight.

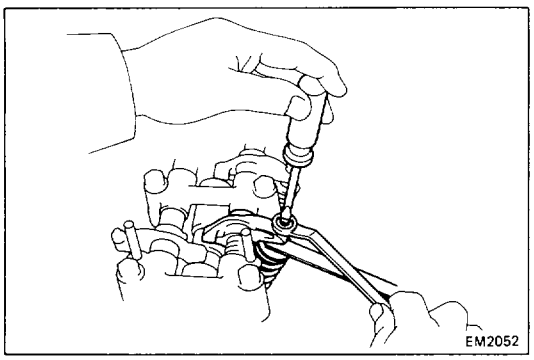
If not, turn the crankshaft one complete revolution and align marks as above.

(d) Adjust the clearance of half of the valves.

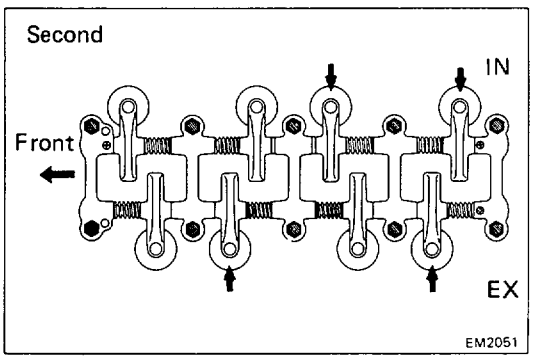
- Adjust only those valves indicated by arrows.

Valve clearance: Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)





- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The thickness gauge should move with a very slight drag.



(e) Turn the crankshaft one complete revolution (360°) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the cylinder head cover.

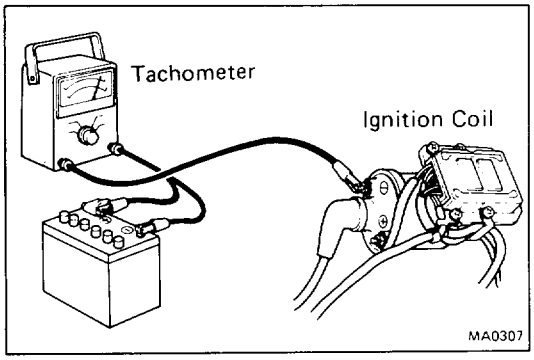
(g) Reinstall the air cleaner (22R engine).

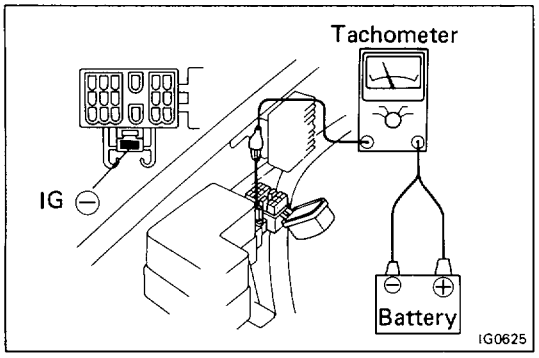
13. ADJUST IDLE SPEED

A. 22R-E AND 22R-TE ENGINE

(a) Preparation

- Air cleaner installed
- All pipes and hoses of air intake system connected
- All vacuum lines connected (i. e., EGR system, etc.)
- EFI system wiring connectors fully plugged
- Engine at normal operating temperature
- Accessories switched off
- Transmission in "N" range





(b) Connect a tachometer to the engine.

Connect the tachometer positive (+) terminal to the ignition coil negative (—) terminal.

NOTE: The rpm signal for the 22R-E and 22R-TE can also be taken from the IG⊖ terminal of the check connector.

CAUTION:

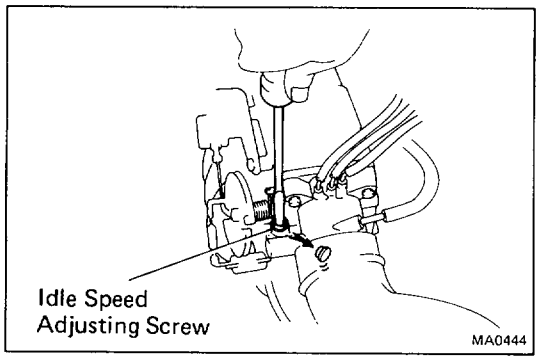
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.**

(c) Race the engine at 2,500 rpm for approx. 2 minutes.

(d) Set the idle speed by turning the idle speed adjusting screw.

Idle speed: 22R-E 750 rpm
22R-TE 800 rpm

(e) Remove the tachometer.

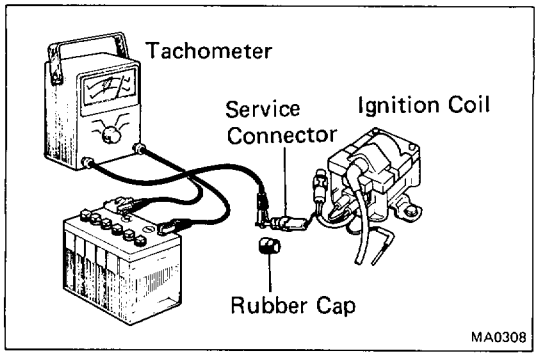


B. 22R ENGINE

(a) Preparation

- Air cleaner installed
- Choke valve fully open
- Accessories switched off
- All vacuum lines connected (i.e., AS, EGR systems, etc.)
- Transmission in "N" range
- Engine idling at normal operating temperature

(b) Connect a tachometer to the engine.
Remove the rubber cap and connect the tachometer positive (+) terminal to the service connector at the igniter.



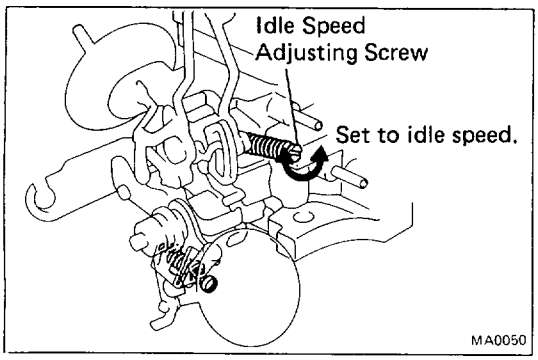
CAUTION:

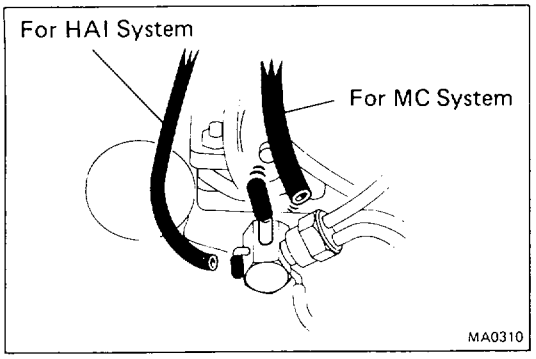
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.**

(c) Set the idle speed by turning the idle speed adjusting screw.

Idle speed: 700 rpm

NOTE: Leave the tachometer connected for further adjustment.

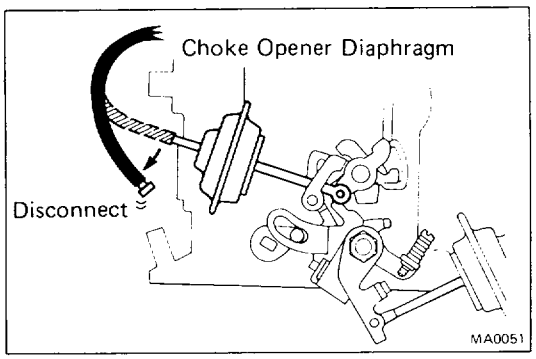




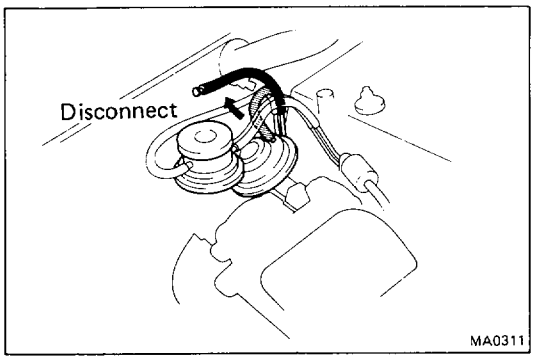
14. **22R ENGINE:**
ADJUST FAST IDLE SPEED

(a) Stop the engine and remove the air cleaner.

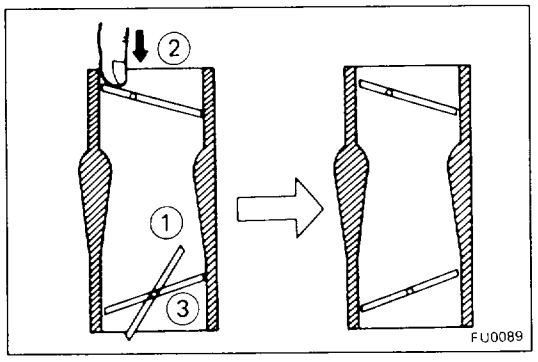
(b) Plug the hose connections for HAI system and MC system to prevent rough idling.



(c) Disconnect the hose from the choke opener diaphragm and plug the hose end.
This will shut off the choke opener system.

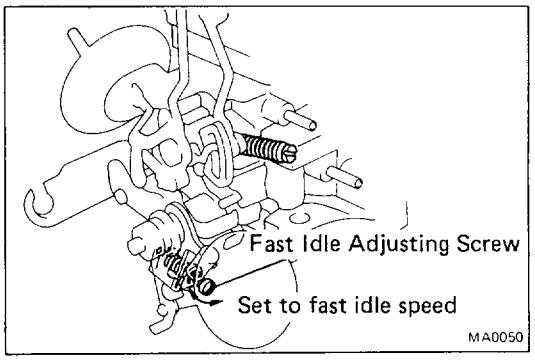


(d) Disconnect the hose from the EGR valve.
This will shut off the EGR system.



(e) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(f) Start the engine, but do NOT touch the accelerator pedal.



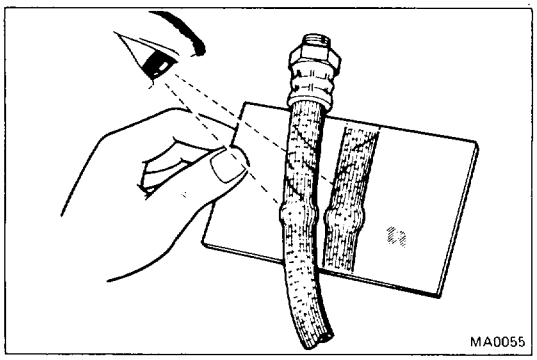
(g) Set the fast idle speed by turning the fast idle adjusting screw.

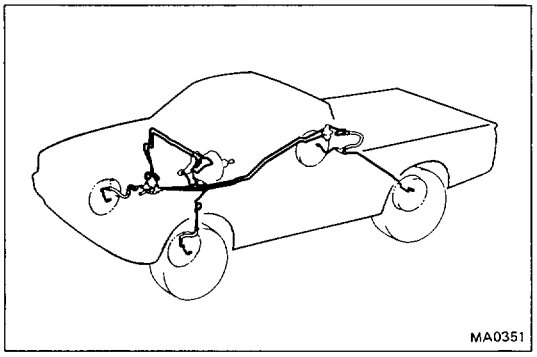
Fast idle speed: 3,000 rpm

(h) Reconnect the vacuum hoses to the proper locations.

(i) Reinstall the air cleaner.

(j) Stop the engine and remove the tachometer.


MA0055


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BRAKES

15. INSPECT BRAKE LINE PIPES AND HOSES

NOTE: Inspect in a well lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

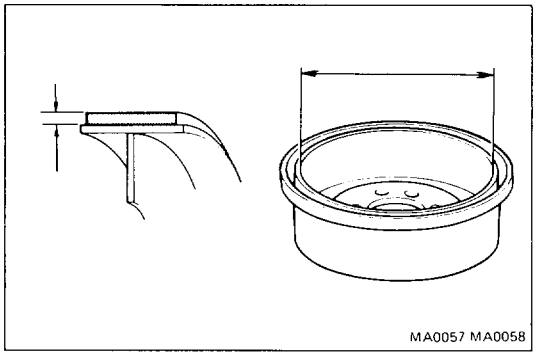
(a) Check all brake lines and hoses for:

- Damage
- Corrosion
- Wear
- Leaks
- Deformation
- Bends
- Cracks
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.


MA0057 MA0058

16. INSPECT REAR BRAKE LININGS AND DRUMS (2WD: See page BR-36 or 44, 4WD: See page BR-50)

(a) Check the linings for wear.

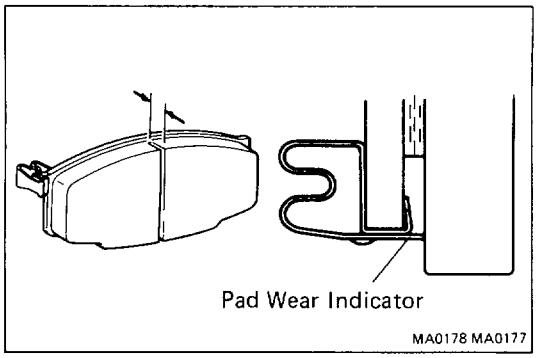
Minimum lining thickness: 1.0 mm (0.039 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter:
2WD 256.0 mm (10.079 in.)
4WD 297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth.

NOTE: Do not use compressed air to clean the brake parts.



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17. INSPECT FRONT BRAKE PADS AND DISCS (2WD: See page BR-13 or 21, 4WD: See page BR-29)

(a) Check the thickness of the disc brake pads and check for irregular wear.

Minimum pad thickness: 1.0 mm (0.039 in.)

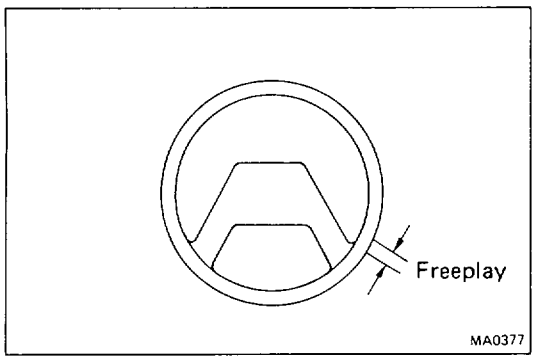
(b) Check the disc for wear or runout.

Minimum disc thickness:
2WD FS 17 type 21.0 mm (0.827 in.)
PD 60 type 24.0 mm (0.945 in.)
4WD 19.0 mm (0.748 in.)

Maximum disc runout: 0.15 mm (0.0059 in.)

NOTE: If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator.

If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.



CHASSIS

18. INSPECT STEERING LINKAGE

(a) Check that the steering wheel freeplay is:

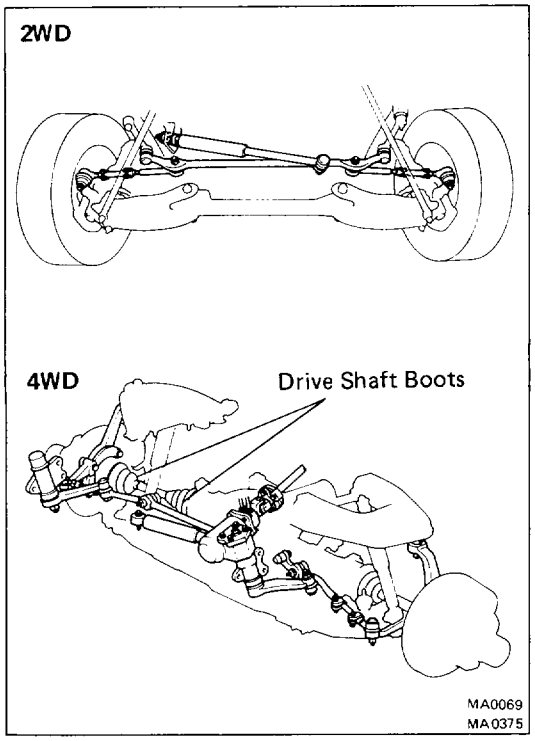
Maximum: 30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

(b) Check the steering linkage for looseness or damage. Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.



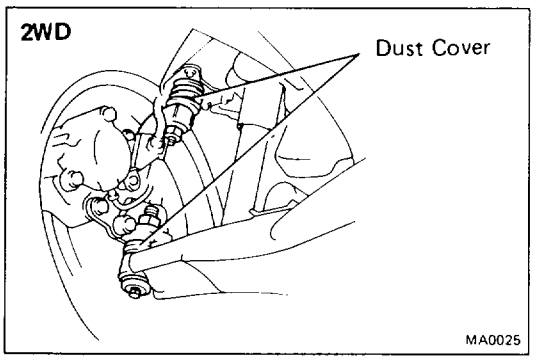
19. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leaks.

If leakage is found, check for cause and repair.

20. (4WD) INSPECT DRIVE SHAFT BOOTS

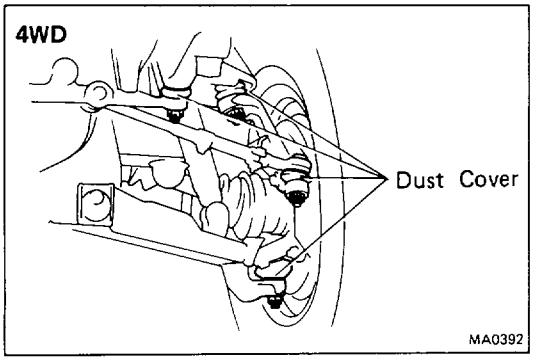
Inspect the drive shaft boots for clamp looseness, grease leakage or damage.

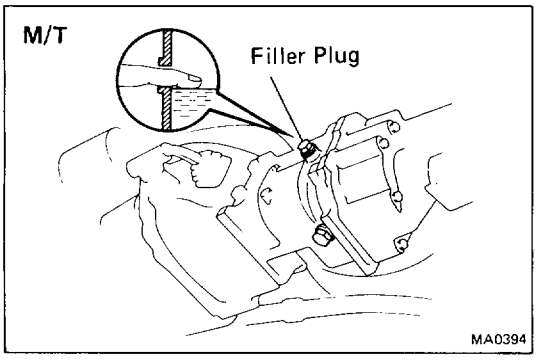


21. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness. (See page FA-13)

(b) Inspect the dust cover for damage.

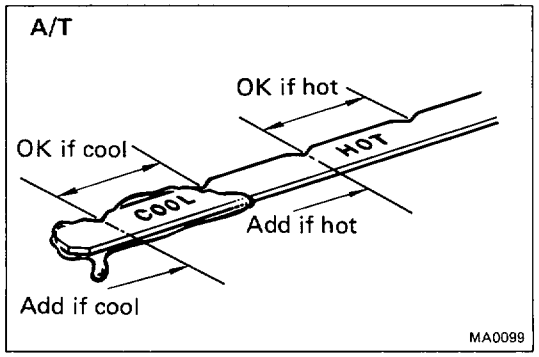




22. (2WD)
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

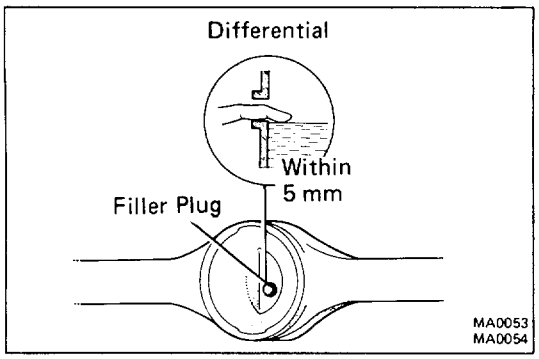
Transmission oil (M/T) —
Oil grade: API GL-4 or GL-5
Viscosity: SAE 75W-90



Check the automatic transmission for oil leakage.

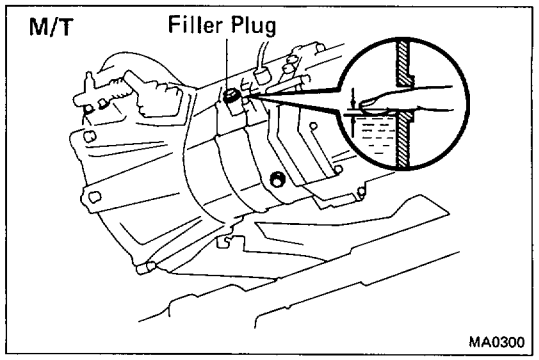
If leakage is found, check for cause and repair.

Transmission fluid (A/T): ATF DEXRON® II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

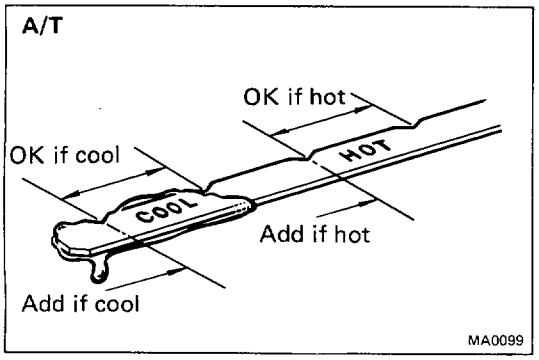
Differential oil —
Oil grade: API GL-5 hypoid gear oil
Viscosity: Above −18°C (0°F) SAE 90
Below −18°C (0°F) SAE 80W-90 or 80W



23. (4WD)
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

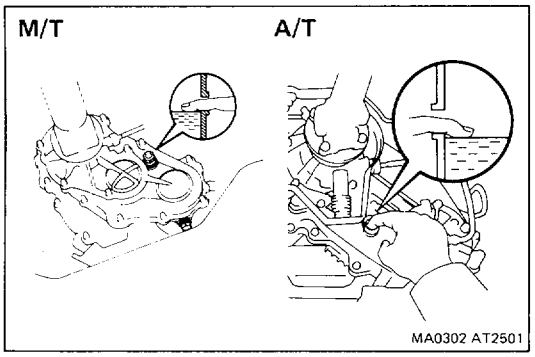
Transmission oil (M/T) —
Oil grade: API GL-4 or GL-5
Viscosity: SAE 75W-90



Check the automatic transmission for oil leakage.

If leakage is found, check for cause and repair.

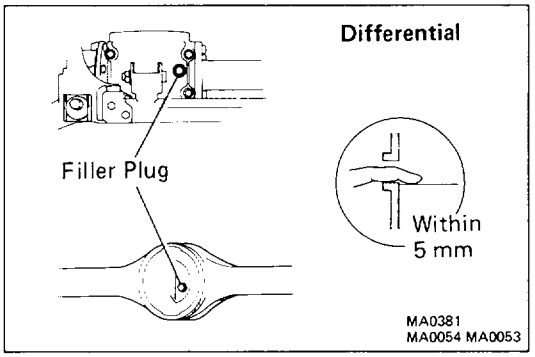
Transmission fluid (A/T): ATF DEXRON® II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transfer oil (M/T) —
Oil grade: API GL-4 or GL-5
Viscosity: SAE 75W-90

Transfer fluid (A/T): ATF DEXRON® II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil —

Oil grade:	**API GL-5 hypoid gear oil**	
Viscosity:	**Above −18°C (0°F)**	**SAE 90**
	Below −18°C (0°F)	**SAE 80W-90 or 80W**

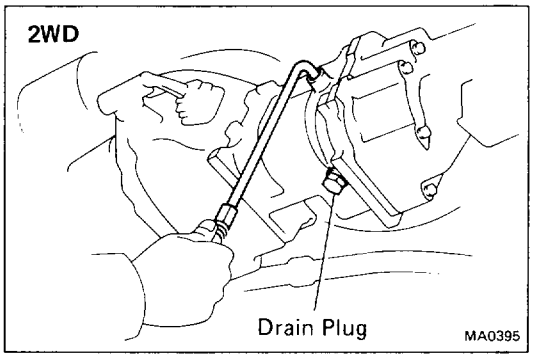
24. REPLACE MANUAL TRANSMISSION, TRANSFER (4WD) AND DIFFERENTIAL OIL

(a) Remove the drain plug and drain the oil.

(b) Reinstall the drain plug.

(c) Add new oil until it begins to run out of the filler hole.

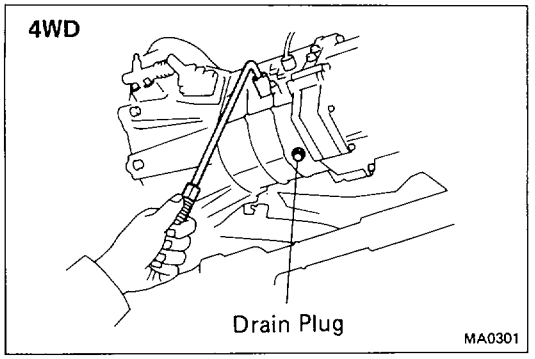
Oil grade and viscosity: See page MA-13



Oil capacity:

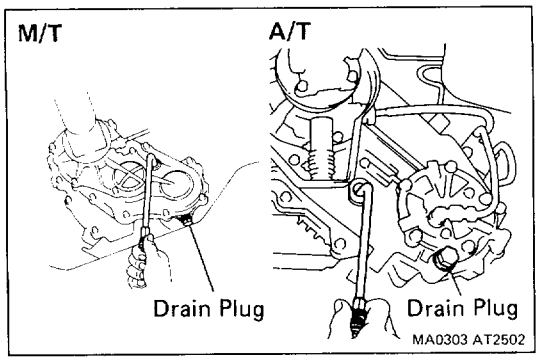
Transmission —
2WD

G40, 57	**2.2 liters (2.3 US qts, 1.9 Imp. qts)**
W46, 55, 56	**2.4 liters (2.5 US qts, 2.1 Imp. qts)**
R150	**2.6 liters (2.7 US qts, 2.3 Imp. qts)**

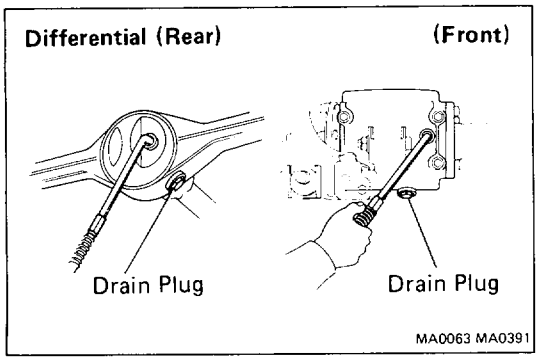


4WD

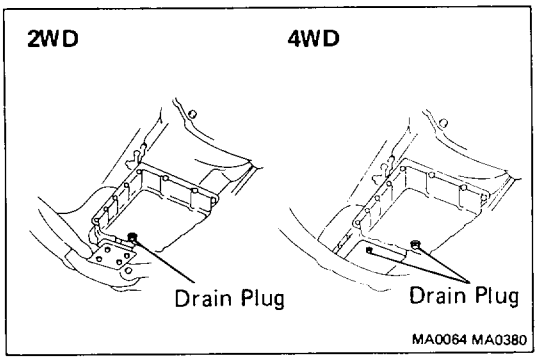
W56	**3.0 liters (3.2 US qts, 2.6 Imp. qts)**



Transfer —
W56 1.6 liters (1.7 US qts, 1.4 Imp. qts)
A340H 0.8 liters (0.8 US qts, 0.7 Imp. qts)



Differential —
2WD
7.5 in. 1.35 liters (1.4 US qts, 1.2 Imp. qts)
8.0 in. 1.8 liters (1.9 US qts, 1.6 Imp. qts)
4WD
Front 1.6 liters (1.7 US qts, 1.4 Imp. qts)
Rear 22R,22R-E
2.2 liters (2.3 US qts, 1.9 Imp. qts)
22R-TE
2.35 liters (2.5 US qts, 2.1 Imp. qts)



25. REPLACE AUTOMATIC TRANSMISSION FLUID

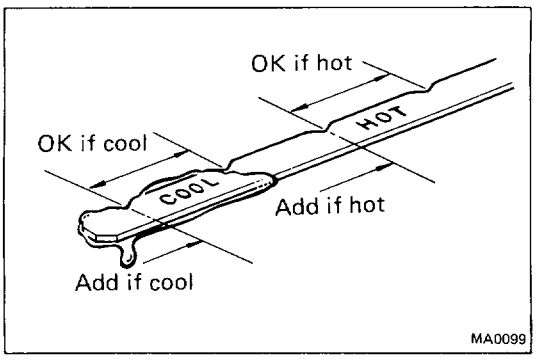
(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, add new fluid through the dipstick tube.

Fluid: ATF DEXRON® II

Drain and refill capacity:
2WD A43D 2.4 liters (2.5 US qts, 2.1 Imp. qts)
4WD A340H 4.5 liters (4.8 US qts, 4.0 Imp. qts)



(d) Start the engine and shift the selector into all positions from "P" through "L" and then shift into "P".

(e) With the engine idling, check the fluid level.
Add fluid up to the cool level on the dipstick.

CAUTION: Do not overfill.

2WD
SEE PAGES FA-7 to 9

26. (4WD) REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
2WD — (See pages FA-7 to 9)
4WD — (See pages FA-46 to 49)

2WD —
Grease grade: Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
0.6 — 1.8 kg (1.3 — 4.0 lb, 5.9 — 18 N)

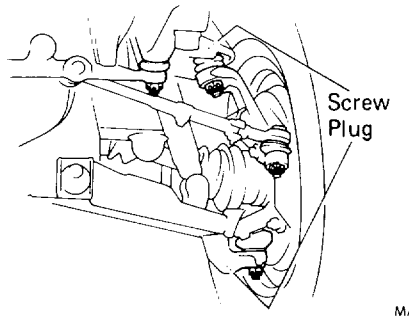
4WD
SEE PAGES FA-44 to 47

4WD —

Grease grade: Lithium base multipurpose grease (NLGI No.2)

Wheel bearing friction preload (at starting):
2.8 — 5.6 kg (6.2 — 12.3 lb, 27 — 55 N)

(b) Repack the drive shaft thrust bush grease.
(See pages FA-49 to 54)



27. (4WD)
LUBE STEERING KNUCKLE AND CHASSIS
(Including propeller shaft)

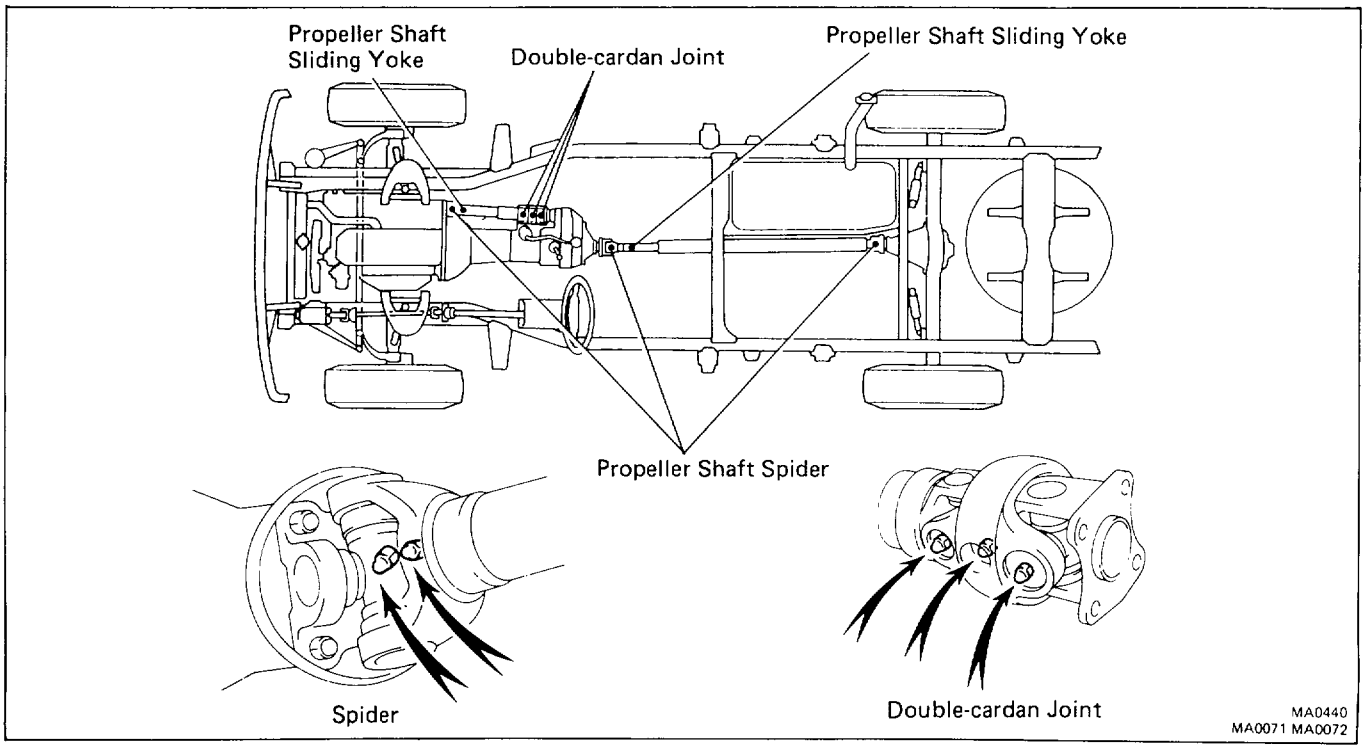
(a) Remove the screw plug from each steering knuckle and repack with lubricant.

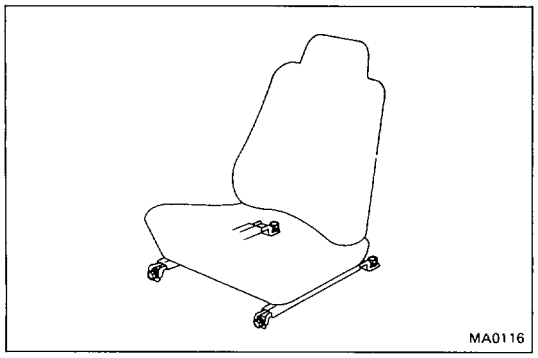
Steering knuckle grease: Molybdenum disulphide lithium base chassis grease (NLGI No.2)

(b) Reinstall the two screw plugs.

(c) Lubricate chassis components, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:
Propeller shaft (ex. Double-cardan joint) —
Lithium base chassis grease (NLGI No.2)
Double-cardan joint — Molybdenum disulphide
Lithium base chassis grease (NLGI No.2)
Drag link ends —
Lithium base chassis grease (NLGI No.1)



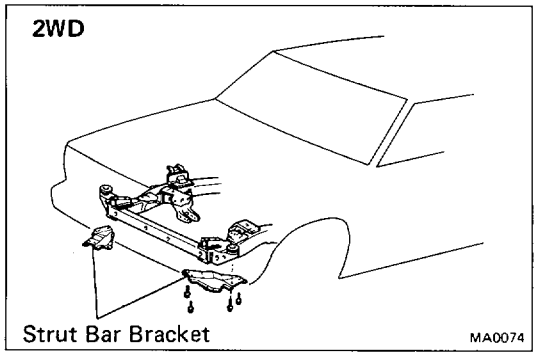

MA0116

28. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Seat mounting bolts

Torque: 375 kg-cm (27 ft-lb, 37 N·m)



Strut Bar Bracket
MA0074

- Strut bar bracket-to-frame mounting bolts (2WD)

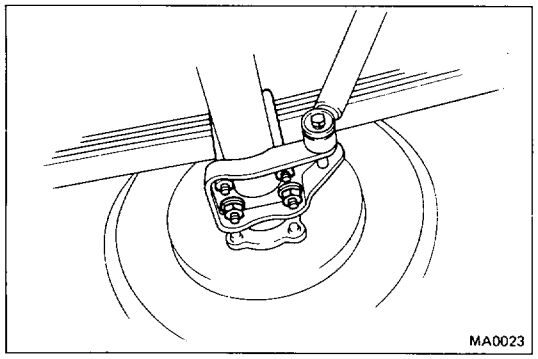
Torque: 530 kg-cm (38 ft-lb, 52 N·m)

- Leaf spring U-bolt mounting nuts

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

Under Severe Conditions:
In addition to the above maintenance items, check for loose or missing bolts and nuts on the following:

- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc.


MA0023

29. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
  Hood locks securely when closed
- Doors
  Door locks operate properly
  Doors close properly
- Seats
  Seats adjust easily and lock securely in any positions
  Seat backs lock securely at any angle
  Fold-down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

GENERAL MAINTENANCE

These are maintenance and inspections items which are considered to be the owner's responsibility. They can be performed by the owner or he can have them done at a service shop. These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform.
Items and procedures for general maintenance are as follows.

OUTSIDE VEHICLE

1. **TIRES**
   (a) Check the pressure with a gauge. If necessary, adjust.
   (b) Check for cuts, damage or excessive wear.

2. **WHEEL NUTS**
   When checking the tires, check the nuts for looseness or for missing nuts. If necessary, tighten them.

3. **TIRE ROTATION**
   It is recommended that the tires be rotated every 7,500 miles (12,000 km).

4. **WINDSHIELD WIPER BLADES**
   Check for wear or cracks whenever they do not wipe clean. If necessary replace.

5. **FLUID LEAKS**
   (a) Check underneath for leaking fuel, oil, water or other fluid.
   (b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. **DOORS AND ENGINE HOOD**
   (a) Check that all doors and the tailgate operate smoothly, and that all latches lock securely.
   (b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. **LIGHTS**
   (a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.
   (b) Check the headlight aim.

8. **WARNING LIGHTS AND BUZZERS**
   Check that all warning lights and buzzers function properly.

9. **HORN**
   Check that it is working.

10. **WINDSHIELD GLASS**
    Check for scratches, pits or abrasions.

11. **WINDSHIELD WIPER AND WASHER**
    (a) Check operation of the wipers and washer.
    (b) Check that the wipers do not streak.

12. **WINDSHIELD DEFROSTER**
    Check that air comes out from the defroster outlet when operating the heater or air conditioner.

13. **REAR VIEW MIRROR**
    Check that it is mounted securely.

14. **SUN VISORS**
    Check that they move freely and are mounted securely.

15. **STEERING WHEEL**
    Check that it has specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. **SEATS**
    (a) Check that the seat adjusters operate smoothly.
    (b) Check that all latches lock securely in any position.
    (c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.
    (d) For fold-down seat backs, check that the latches lock securely.

17. **SEAT BELTS**
    (a) Check that the seat belt system such as the buckles, retractors and anchors operate properly and smoothly.
    (b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. CLUTCH PEDAL (See page CL-3)

Check the pedal for smooth operation.

Check that the pedal has the proper freeplay.

20. BRAKE PEDAL (See page BR-5)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and freeplay.

(c) Check the brake booster function.

21. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

22. PARKING BRAKE (See page BR-7)

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that vehicle is held securely with only the parking brake applied.

23. AUTOMATIC TRANSMISSION "PARK" MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that vehicle is held securely with the selector lever in "P" position and all brakes released.

UNDER HOOD

24. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

Check that the coolant level is between the "FULL" and "LOW" lines on the see-through reservoir.

26. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.

(b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If level is low, add distilled water only.

28. BRAKE AND CLUTCH FLUID LEVELS

(a) Check that the brake fluid level is near the upper level line on the see-through reservoir.

(b) Check that the clutch fluid level is within ± 5 mm (0.20 in.) of the reservoir hem.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

30. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

31. POWER STEERING FLUID LEVEL

Check the level on the dipstick.
The level should be in the "HOT" or "COLD" range depending on the fluid temperature.

32. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the parking brake applied, shift the selector into all positions from "P" to "L", and then shift into "P".

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re-insert the dipstick and check that the fluid level is in the HOT range.

(d) Perform this check with the fluid at normal driving temperature (70 — 80°C or 158 — 176°F).

NOTE: Wait until the engine cools down (approx. 30 min.) before checking the fluid level after extended high speed driving in hot weather, driving in heavy traffic or pulling a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.
If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

ENGINE MECHANICAL

	Page
TROUBLESHOOTING (22R-E, 22R-TE)	EM-2
(22R)	EM-5
ENGINE TUNE-UP	EM-9
IDLE HC/CO CONCENTRATION CHECK METHOD	EM-10
COMPRESSION CHECK	EM-12
CYLINDER HEAD	EM-13
TIMING CHAIN	EM-45
CYLINDER BLOCK	EM-52

TROUBLESHOOTING (22R-E, 22R-TE)

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty	Troubleshoot cooling system	CO-2
	Incorrect ignition timing	Reset timing	IG-15

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to injector	Troubleshoot EFI system	FI-10
	• No fuel in tank		
	• Fuel pump not working		
	• Fuel filter clogged		
	• Fuel line clogged or leaking		
	EFI system problems	Repair as necessary	
	Ignition problems	Perform spark test	IG-5
	• Ignition coil	Inspect coil	IG-7
	• Igniter		
	• Distributor	Inspect distributor	IG-9
	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords disconnected or broken	Inspect cords	IG-6
	Vacuum leaks	Repair as necessary	
	• PCV hoses		
	• EGR valve		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Low compression	Check compression	EM-12

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords faulty	Inspect cords	IG-6
	Ignition problems		
	• Ignition coil	Inspect coil	IG-7
	• Igniter		
	• Distributor	Inspect distributor	IG-9
	Incorrect ignition timing	Reset timing	IG-15
	Vacuum leaks	Repair as necessary	
	• PCV hoses		
	• EGR valve		
	• Intake manifold		
	• Air intake chamber		
	• Throttle body		
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect idle speed	Adjust idle	MA-8
	EFI system problems	Repair as necessary	

ROUGH IDLING (CONT'D)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (cont'd)	Engine overheats	Check cooling system	CO-2
	Low compression	Check compression	EM-12
	Incorrect valve clearance	Adjust valve clearance	MA-8

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords faulty	Inspect cords	IG-6
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-15
	Fuel system clogged	Check fuel system	
	Air cleaner clogged	Check air cleaner	MA-5
	EFI system problems	Repair as necessary	
	Emission control system problem (cold engine) • EGR system always on	Check EGR system	EC-12,15
	Engine overheats	Check cooling system	CO-2
	Low compression	Check compression	EM-12

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine dieseling (run after ignition switch is turned off)	EFI system problems	Repair as necessary	

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	FI-86
	As system faulty	Check AS system	EC-19
Muffler explosion (after fire) all the time	Air cleaner clogged	Check air cleaner	MA-5
	EFI system problem	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-15
	Incorrect valve clearance	Adjust valve clearance	MA-8

AFTER FIRE, BACKFIRE (CONT'D)

Problem	Possible cause	Remedy	Page
Engine backfires	EFI system problem	Repair as necessary	
	Vacuum leak • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Check hoses and repair as necessary	
	Pulling in air between air flow meter and throttle body	Repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FI-10
	Incorrect ignition timing	Reset timing	IG-15
	Incorrect valve clearance	Adjust valve clearance	MA-8
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-21

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	EC-5
	Piston ring worn or damaged	Check rings	EM-65
	Valve stem and guide worn	Check valves	EM-22
	Valve stem seal worn	Check seals	

POOR GASOLINE MILEAGE

Problem	Possible cause	Remedy	Page
Poor gasoline mileage	Fuel leak	Repair as necessary	
	Air cleaner clogged	Check air cleaner	MA-5
	Incorrect ignition timing	Reset timing	IG-15
	EFI system problems • Injector faulty • Deceleration fuel cut system faulty	Repair as necessary	
	Spark plugs faulty	Inspect plugs	IG-6
	EGR system always on	Check EGR system	EC-12
	Low compression	Check compression	EM-12
	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Clutch slips	Troubleshoot clutch	CL-2
	Brakes drag	Troubleshoot brakes	BR-2
Unpleasant odor	Incorrect idle speed	Adjust idle	MA-8
	Incorrect ignition timing	Reset timing	IG-15
	Vacuum leaks • PCV hoses • EGR valve • Intake manifold • Air intake chamber • Throttle body	Repair as necessary	
	EFI system problems	Repair as necessary	

TROUBLESHOOTING (22R)

ENGINE OVERHEATING

Problem	Possible cause	Remedy	Page
Engine overheats	Cooling system faulty Incorrect ignition timing	Troubleshoot cooling system Reset timing	CO-2 IG-15

HARD STARTING

Problem	Possible cause	Remedy	Page
Engine will not crank or cranks slowly	Starting system faulty	Troubleshoot starting system	ST-2
Engine will not start/ Hard to start (cranks OK)	No fuel supply to carburetor	Troubleshoot fuel system	FU-2
	Carburetor problems • Choke operating • Flooding • Needle valve sticking or clogged • Vacuum hose disconnected or damaged • Fuel cut solenoid valve not open • Secondary throttle valve not close	Repair as necessary	FU-4
	Ignition problems	Perform spark test	IG-5
	• Ignition coil • Igniter	Inspect coil	IG-7
	• Distributor	Inspect distributor	IG-9
	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords disconnected or broken	Inspect cords	IG-6
	Vacuum leaks • PCV line • EGR line • MC line • Intake manifold • CMH	Repair as necessary	
	Low compression	Chek compression	EM-12

ROUGH IDLING

Problem	Possible cause	Remedy	Page
Rough idle or stalls	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords faulty	Inspect cords	IG-6
	Vacuum leaks • PCV line • MC line • EGR line • Intake manifold • HAC line • CMH	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-15
	Ignition problems	Perform spark test	IG-5
	• Ignition coil • Igniter	Inspect coil	IG-7
	• Distributor	Inspect distributor	IG-9

ROUGH IDLING (CONT'D)

Problem	Possible cause	Remedy	Page
Rough idle or stalls	Carburetor problems • Idle speed incorrect • Slow jet clogged • Idle mixture incorrect • Fuel cut solenoid valve not open • Fast idle speed setting incorrect (cold engine) • Choke system faulty	Perform on-vehicle inspection of carburetor	FU-3
	HAI system faulty	Check HAI system	EC-59
	Engine overheats	Troubleshoot cooling system	CO-2
	EGR valve faulty	Check EGR valve	EC-36
	MC valve faulty	Check MC valve	EC-34
	Incorrect valve clearance	Adjust valve clearance	MA-8
	Low compression	Check compression	EM-12

ENGINE HESITATES/POOR ACCELERATION

Problem	Possible cause	Remedy	Page
Engine hesitates/ Poor acceleration	Spark plugs faulty	Inspect plugs	IG-6
	High-tension cords faulty	Inspect cords	IG-6
	Vacuum leaks • PCV line • EGR line • HAC line • Intake manifold • CMH • MC line	Repair as necessary	
	Incorrect ignition timing	Reset timing	IG-15
	Air filter clogged	Check air filter	MA-5
	Fuel line clogged	Check fuel line	
	Carburetor problems • Float level too low • Accelerator pump faulty • Power valve faulty • Choke valve closed (hot engine) • Choke system • Secondary throttle stopper operation faulty (cold engine)	Repair as necessary	FU-4
	CMH system faulty (cold engine)		
	Emission control system problem • HAI system always on (hot engine)	Check HAI system	EC-59
	• AAP system faulty	Check AAP system	EC-66
	• EGR system always on (cold engine)	Check EGR system	EC-36
	• HAC system faulty	Check HAC system	EC-54
	Engine overheats	Check cooling system	CO-2
	Low compression	Check compression	EM-12

ENGINE DIESELING

Problem	Possible cause	Remedy	Page
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems • Linkage sticking • Idle speed or fast idle speed out of adjustment • Fuel cut solenoid faulty	Repair as necessary	FU-4
	Incorrect ignition timing	Reset timing	IG-15
	EGR system faulty	Check EGR system	EC-36

AFTER FIRE, BACKFIRE

Problem	Possible cause	Remedy	Page
Muffler explosion (after fire) on deceleration only	AI system faulty	Check AI system	EC-46
	AS system faulty	Check AS system	EC-39
	MC system faulty	Check MC system	EC-34
	Deceleration fuel cut system always off	Check fuel cut system	EC-68
Muffler explosion (after fire) all the time	Air filter clogged	Check air filter	MA-5
	Choke system faulty	Check choke	EC-61
	Incorrect ignition timing	Reset timing	IG-15
	Incorrect valve clearance	Adjust valves clearance	MA-8
Engine backfires	Choke valve open (cold engine)	Check choke system	EC-61
	Carburetor vacuum leak	Check hoses and repair as necessary	
	Insufficient fuel flow	Troubleshoot fuel system	FU-2
	Incorrect ignition timing	Reset timing	IG-15
	Incorrect valve clearance	Adjust valve clearance	MA-8
	Carbon deposits in combustion chambers	Inspect cylinder head	EM-21

EXCESSIVE OIL CONSUMPTION

Problem	Possible cause	Remedy	Page
Excessive oil consumption	Oil leak	Repair as necessary	
	PCV line clogged	Check PCV system	EC-27
	Piston ring worn or damaged	Check rings	EM-65
	Valve stem and guide worn	Check valves and guides	EM-22
	Valve stem oil seal worn or damaged	Check oil seal	

POOR FUEL MILEAGE

Problem	Possible cause	Remedy	Page
Poor fuel mileage	Fuel leak	Repair as necessary	
	Air filter clogged	Check air filter	MA-5
	Incorrect ignition timing	Reset timing	IG-15
	Carburetor problems • Choke system faulty • Idle speed too high • Deceleration fuel cut system faulty • Power valve always open	Perform on-vehicle inspection of carburetor	FU-4
	Spark plugs faulty	Inspect plugs	IG-5
	EGR system always on	Check EGR system	EC-36
	Low compression	Check compression	EM-12
	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Clutch slips	Troubleshoot clutch	CL-2
	Brakes drag	Troubleshoot brakes	BR-2

ENGINE TUNE-UP

1. INSPECT ENGINE COOLANT
(See page CO-3)

2. INSPECT ENGINE OIL
(See page LU-3)

3. INSPECT AIR CLEANER
(See page MA-5)

4. INSPECT BATTERY
(See page CH-3)

5. INSPECT HIGH-TENSION CODE
(See page IG-6)

6. INSPECT SPARK PLUGS
(See page IG-6)

7. INSPECT DRIVE BELTS
(See page MA-4)

8. INSPECT VALVE CLEARANCE
(See page MA-8)

Valve clearance:	Intake	0.20 mm (0.008 in.)
	Exhaust	0.30 mm (0.012 in.)

9. INSPECT IGNITION TIMING
(See step 3 on page IG-15)

Ignition timing:

22R	0° TDC @ Max. 950 rpm (w/ Vacuum advancer OFF)
22R-E, 22R-TE	5° BTDC @ Idle (T and E_1 short circuit)

10. (22R)
INSPECT CARBURETOR FLOAT LEVEL
(See step 3 on page FU-3)

11. (22R)
INSPECT FAST IDLE SPEED
(See step 14 on page MA-10)

12. ADJUST IDLE SPEED
(See page MA-8)

Idle speed:	22R	700 rpm
	22R-E	750 rpm
	22R-TE	800 rpm

NOTE: Adjust idle mixture as necessary.

IDLE HC/CO CONCENTRATION CHECK METHOD

NOTE: This check method is used only to determine whether or not the idle HC/CO complies with regulations.

PRECHECK

INITIAL CONDITIONS

(a) Normal engine operating temperature

(b) Choke fully open (22R)

(c) Air cleaner installed

(d) All pipe and hoses of air intake system connected (22R-E, 22R-TE)

(e) All accessories switched off

(f) All vacuum lines properly connected

(g) EFI system wiring connectors fully plugged

(h) Idle speed set correctly

(i) Carburetor fuel level about even with the correct level in the sight glass (22R)

(j) Tachometer and HC/CO meter calibrated and at hand

MEASUREMENT

1. CHECK V_F VOLTAGE (22R-E, 22R-TE)

(a) Short terminals T and E_1 of the check connector.

(b) Connect the voltmeter to the check connector.

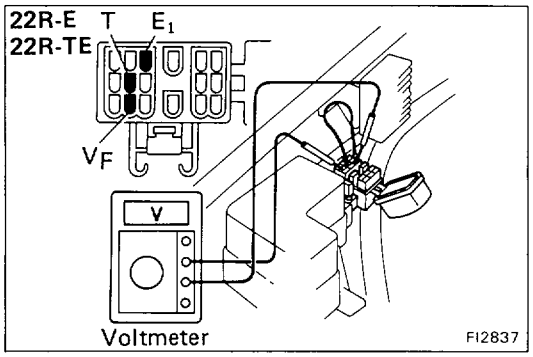
Check connector location: Near the No. 2 relay block

Connect the positive (+) testing probe to the Ox terminal and negative (−) testing probe to terminal E.

(c) Race the engine at 2,500 rpm for approx. 90 seconds.

(d) Maintain engine speed at 2,500 rpm.

(e) Check that the needle of the voltmeter fluctuates 8 times or more in 10 seconds within 0 — 7 volts.



2. (22R)
RACE ENGINE AT 2,500 RPM FOR APPROX. 90 SECONDS

3. INSERT TESTING PROBE OF HC/CO METER INTO TAILPIPE AT LEAST 40 cm (1.3 ft)

4. MEASURE HC/CO CONCENTRATION AT IDLE

Wait at least one minute before measuring to allow the concentration to stabilize.

Complete the measuring within three minutes.

If the HC/CO concentration does not conform to regulation, see the table below for possible causes.

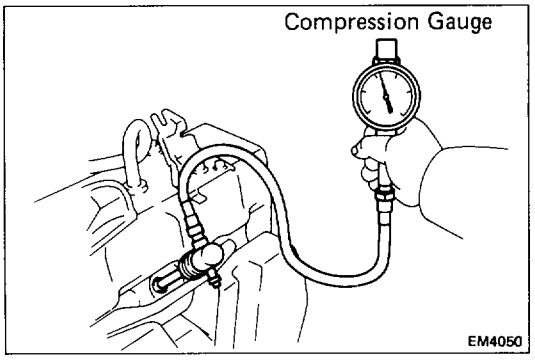
TROUBLESHOOTING

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed ignition wires • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky exhaust valves 5. Leaky cylinder
High	Low	Rough idle Fluctuating HC reading	1. Vacuum leak: • Vacuum hose • Intake manifold • Intake chamber (22R-E, 22R-TE) • PCV line • Carburetor base (22R) • Throttle body (22R-E, 22R-TE) • CMH (22R) 2. Leaky MC valve (22R)
High	High	Rough idle Black smoke from exhaust	1. Restricted air filter 2. Plugged PCV valve 3. AS system problem (22R) 4. Faulty carburetion: (22R) • Faulty choke action • Incorrect float setting • Leaking needle or seat • Leaking power valve 5. Faulty EFI system: (22R-E, 22R-TE) • Faulty pressure regulator • Clogged fuel return line • Faulty air flow meter • Defective water temp. sensor • Defective air temp. sensor • Faulty ECU • Faulty injector • Faulty cold start injector

COMPRESSION CHECK

NOTE: If there is lack of power, excessive oil consumption or poor fuel mileage, measure the cylinder compression pressure.

1. **WARM UP ENGINE**
2. **REMOVE SPARK PLUGS**
3. **DISCONNECT DISTRIBUTOR CONNECTOR**
4. **(22R-E, 22R-TE)**
   DISCONNECT COLD START INJECTOR CONNECTOR
5. **(22R-E, 22R-TE)**
   DISCONNECT SOLENOID RESISTOR CONNECTOR
6. **MEASURE CYLINDER COMPRESSION PRESSURE**



(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine with the starter motor, measure the compression pressure.

CAUTION: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

NOTE: A fully charged battery must be used to obtain at least 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:

22R, 22R-E	12 kg/cm² (171 psi, 1,177 kPa)
22R-TE	10.5 kg/cm² (149 psi, 1,030 kPa)

Minimum pressure:

22R, 22R-E	10 kg/cm² (142 psi, 981 kPa)
22R-TE	8.5 kg/cm² (121 psi, 834 kPa)

Difference between each cylinder:
Less than 1.0 kg/cm² (14 psi, 98 kPa)

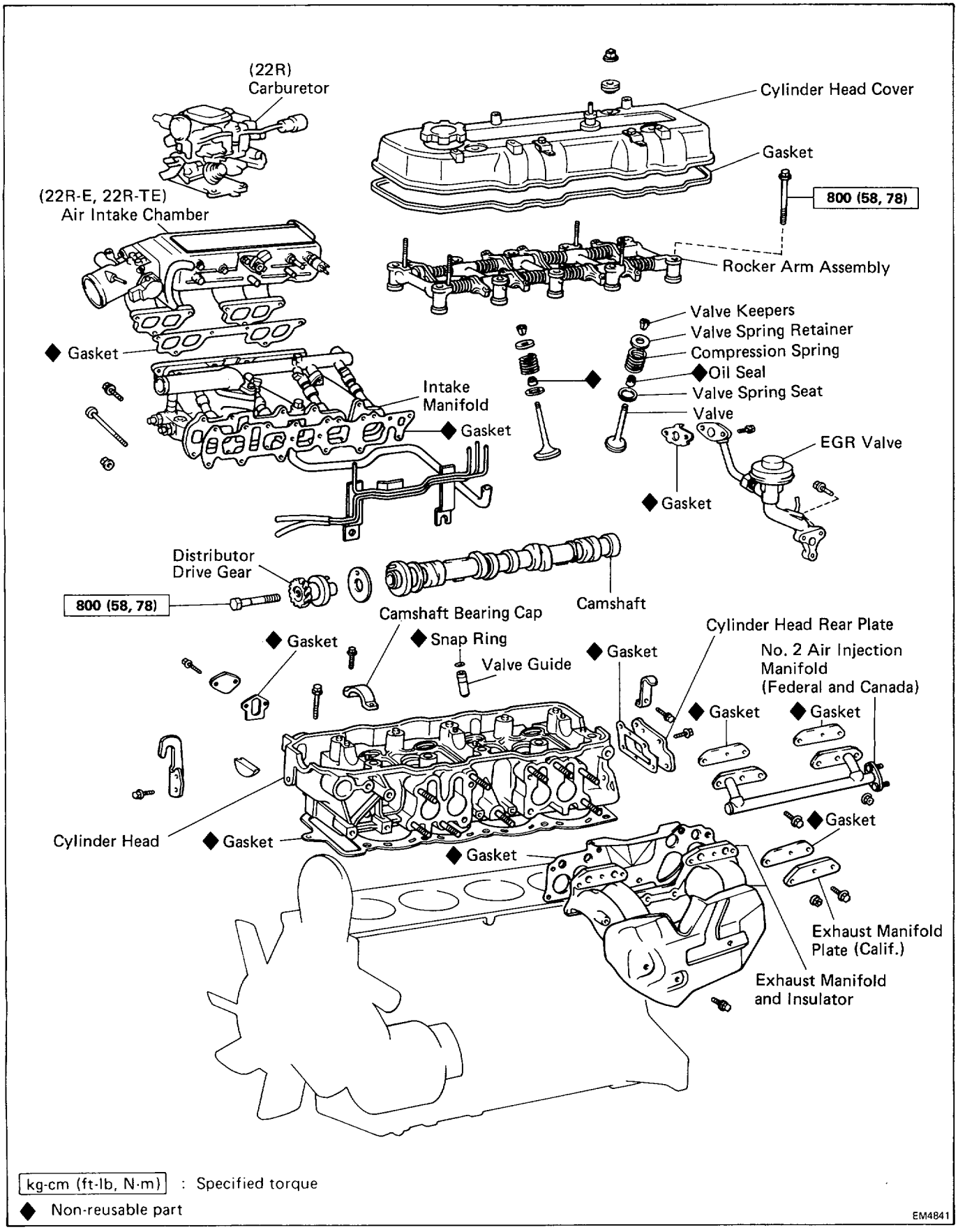
(e) If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for the low compression cylinder.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

7. **(22R-E, 22R-TE)**
   CONNECT SOLENOID RESISTOR CONNECTOR
8. **(22R-E, 22R-TE)**
   CONNECT COLD START INJECTOR CONNECTOR
9. **CONNECT DISTRIBUTOR CONNECTOR**
10. **INSTALL SPARK PLUGS**

CYLINDER HEAD

COMPONENTS



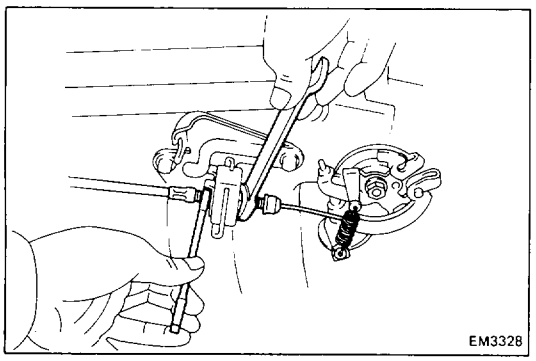
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

EM4841

22R-E, 22R-TE
PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK
3. (22R-TE)
   REMOVE TURBOCHARGER
   (See steps 3 to 13 on pages TC-8, 9)
4. (22R-E)
   REMOVE AIR CLEANER HOSE
5. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD
   (a) Remove the exhaust pipe clamp.
   (b) Remove the three nuts, and disconnect the exhaust pipe
6. REMOVE OIL DIPSTICK
7. REMOVE DISTRIBUTOR AND SPARK PLUGS
8. REMOVE RADIATOR INLET HOSE
9. DISCONNECT HEATER WATER INLET HOSE FROM HEATER WATER INLET PIPE
10. DISCONNECT ACCELERATOR WIRE
11. (A/T)
    DISCONNECT THROTTLE CABLE
    Disconnect the throttle cable from the bracket and clamp.
12. DISCONNECT GROUND STRAP FROM ENGINE REAR SIDE
13. DISCONNECT FOLLOWING PARTS:
    (a) (22R-E)
    No.1 and No.2 PCV hoses
    (22R-TE)
    No.2 PCV hose
    (b) Brake booster hose
    (c) (w/ PS)
    Air control valve hoses
    (d) (with A/C)
    VSV hoses.
    (e) EVAP hose
    (f) EGR vacuum modulator hose
    (g) (22R-E)
    Fuel pressure up VSV and hose
    Reed valve hose
    (22R-TE)
    Pressure regulator hose
    (h) (22R-TE)
    VCV
    (i) No.1 air valve hose from throttle body
    (j) No.2 air valve hose from throttle body
    (k) No.2 and No.3 water by-pass hoses from the throttle body


EM3328

14. REMOVE EGR VACUUM MODULATOR

15. DISCONNECT FOLLOWING WIRES:

(a) Cold start injector wire

(b) Throttle position wire

(c) (Calif. and C&C)
EGR gas temp. sensor wire

16. REMOVE CHAMBER WITH THROTTLE BODY

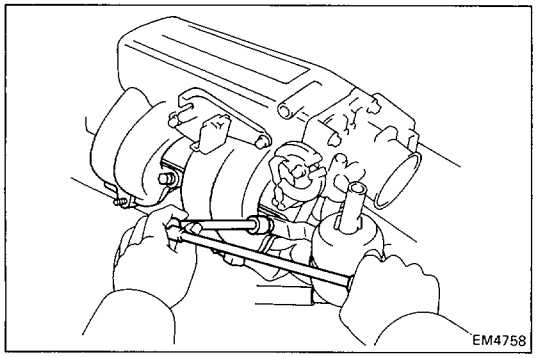
(a) Remove the union bolt holding the cold start injector pipe to the chamber.

(b) Remove the bolts holding the No.1 EGR pipe to the chamber.

(c) Remove the bolts holding the manifold stay to the chamber.

(d) Remove the four bolts, two nuts, bond strap and fuel hose clamp.

(e) Remove the chamber with the throttle body, resonator and gasket.



17. DISCONNECT FUEL RETURN HOSE

18. DISCONNECT FOLLOWING WIRES:

(a) Auxiliary air valve wire

(b) Knock sensor wire

(c) Oil pressure sender gauge or switch

(d) Starter wire (terminal 50)

(e) Transmission wires

(f) (with A/C)
Compressor wires

(g) Injector wires

(h) Water temp. sender gauge wire

(i) (A/T)
OD temp. switch wire

(j) Oxygen sensor wire

(k) Igniter wire

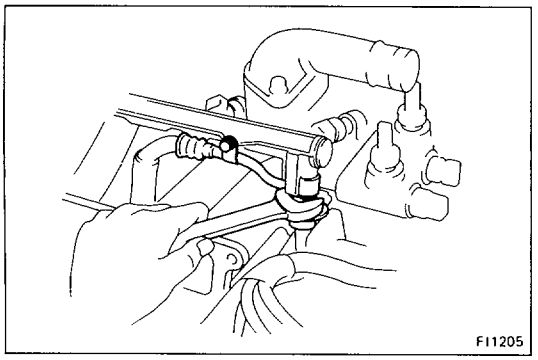
(l) (with A/C)
VSV wire

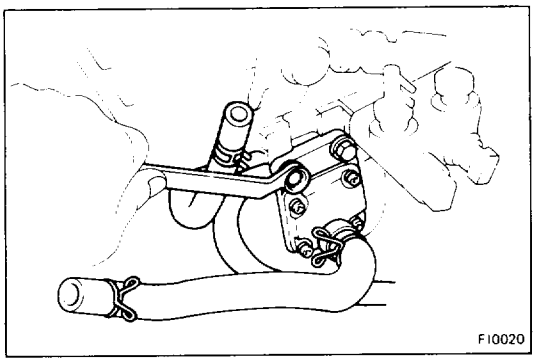
(m) Cold start injector time switch wire

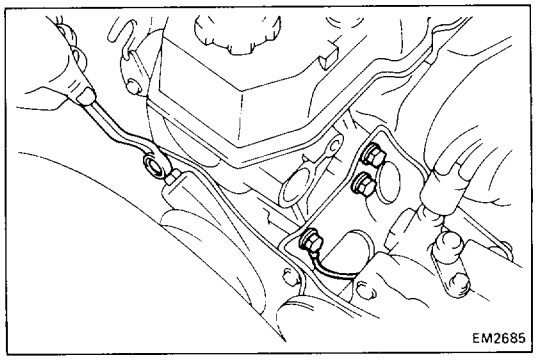
(n) Water temp. sensor wire

19. DISCONNECT FUEL HOSE FROM DELIVERY PIPE

Remove the bolt, pulsation damper and two gaskets.







20. REMOVE AUXILIARY AIR VALVE

(a) Disconnect the water by-pass hose.

(b) Remove the two bolts and auxiliary air valve.

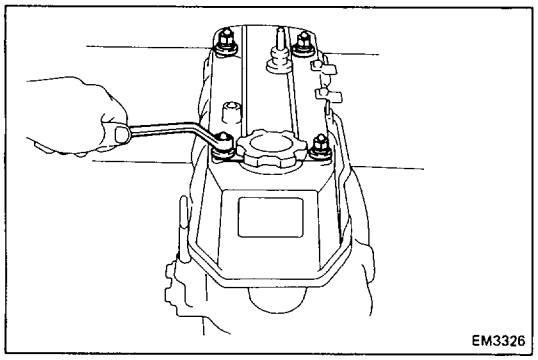
21. (22R-E)
DISCONNECT BY-PASS HOSE FROM INTAKE MANIFOLD

(22R-TE)
DISCONNECT OIL COOLER HOSE FROM INTAKE MANIFOLD

22. (w/ PS)
REMOVE PS BELT

23. (w/ PS)
DISCONNECT PS BRACKET FROM CYLINDER HEAD

Remove the four bolts, and disconnect the ground strap and bracket.


EM3326

REMOVAL OF CYLINDER HEAD

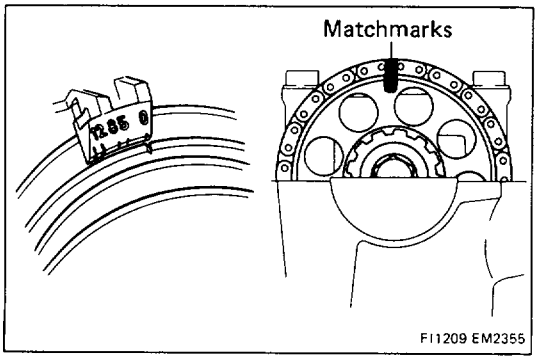
1. REMOVE HEAD COVER

(a) Remove the ground strap from the body.

(b) Remove the four nuts and seals.

(c) Remove the head cover.

CAUTION: Cover the oil return hole in the head with a rag to prevent objects from falling in.



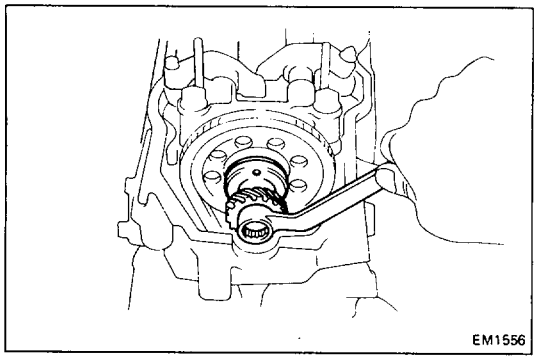
FI1209 EM2355

2. REMOVE CAM SPROCKET BOLT

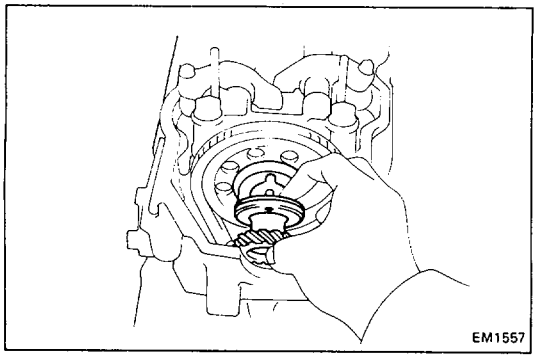
(a) Turn the crankshaft until the No.1 cylinder position is set at T.D.C. compression.

(b) Place matchmarks on the sprocket and chain.

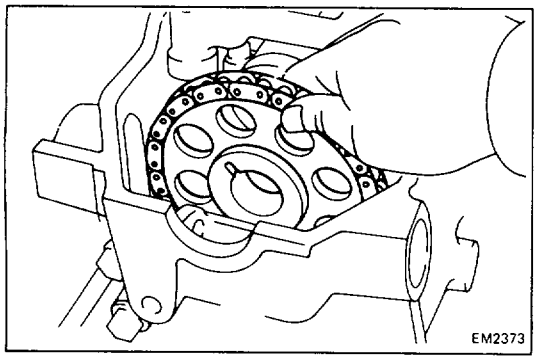
(c) Remove the half-circular plug.


EM1556

(d) Remove the cam sprocket bolt.

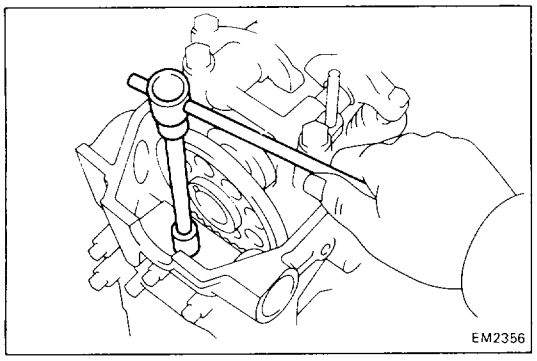

EM1557

3. REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (22R) OR CAMSHAFT THRUST PLATE (22R-E, 22R-TE)


EM2373

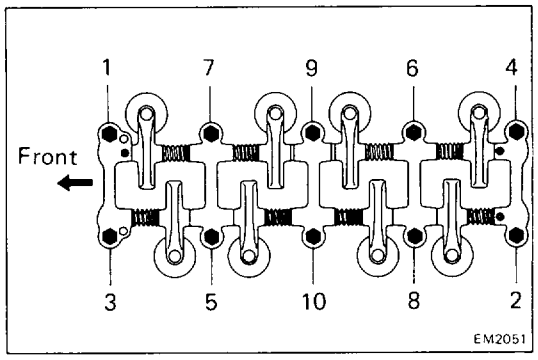
4. REMOVE CAM SPROCKET

Remove the cam sprocket and chain from the camshaft and leave on the vibration damper.



5. **REMOVE CHAIN COVER BOLT**

Remove the bolt in front of the head before the other head bolts are removed.



6. **REMOVE CYLINDER HEAD BOLTS**

Remove the head bolts gradually in two or three passes and in the numerical order shown.

CAUTION: Head warpage or cracking could result from removing in incorrect order.

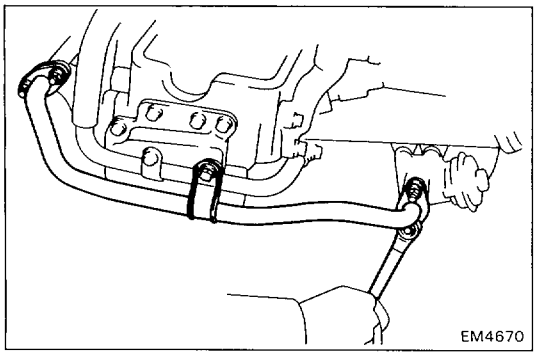
7. **REMOVE ROCKER ARM ASSEMBLY**

It may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

8. **REMOVE CYLINDER HEAD**

Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.
NOTE: If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block saliences.

CAUTION: Be careful not to damage the cylinder head and block surfaces of the cylinder head gasket side.

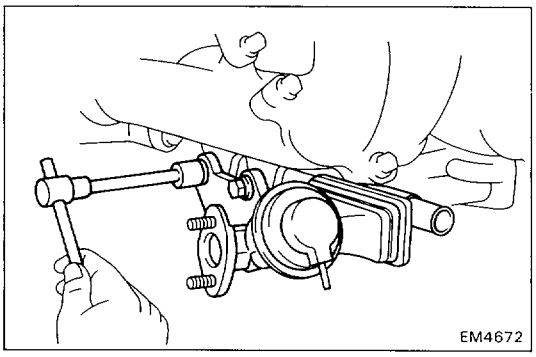


DISASSEMBLY OF CYLINDER HEAD

(See page EM-13)

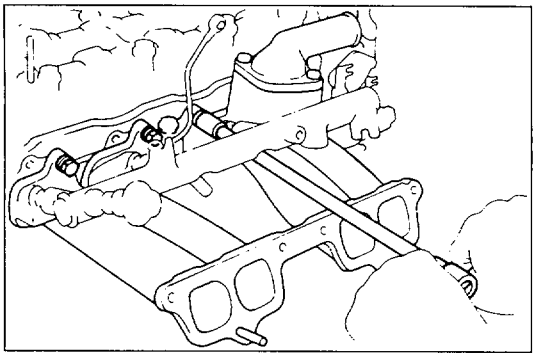
1. (22R-E)
   REMOVE NO.1 AIR INJECTION MANIFOLD

   Remove the bolt, four nuts, No.1 air injection manifold and two gaskets.



2. **REMOVE INTAKE MANIFOLD WITH DELIVERY PIPE AND INJECTION NOZZLE**

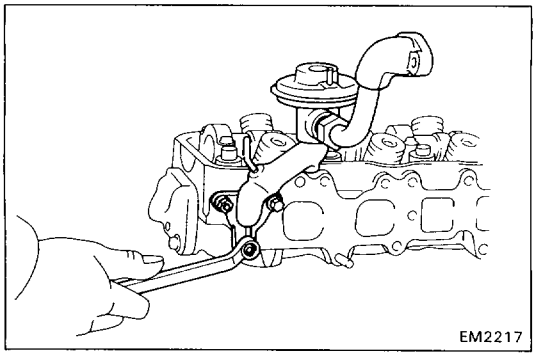
   (a) (22R-E)
   Remove the two nuts and read valve.



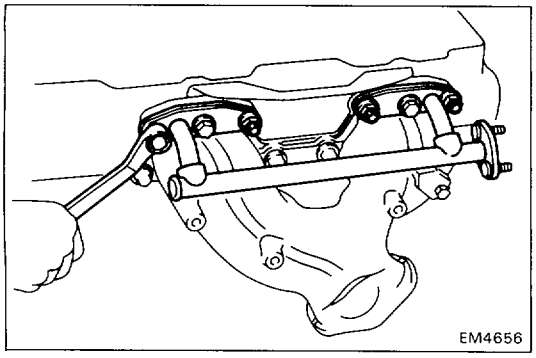
   (b) Remove the bolt the heater inlet pipe from the cylinder head.

   (c) Remove the seven bolts, one hexagon bolt, two nuts and No. 1 air pipe.

   (d) Remove the intake manifold together with the delivery pipe, injection nozzles and heater water inlet pipe.



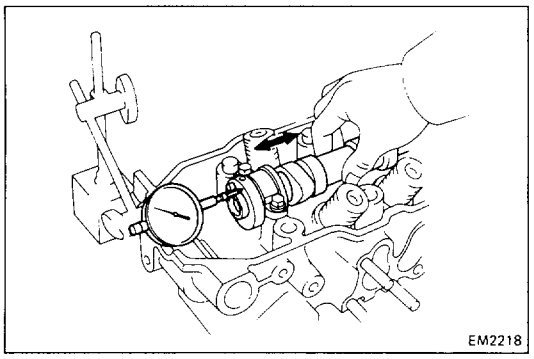
3. **REMOVE EGR VALVE**



4. (22R-E)
   REMOVE EXHAUST MANIFOLD WITH NO.2 AIR INJECTION MANIFOLD

5. **REMOVE TWO ENGINE HANGERS AND GROUND STRAP**

6. **REMOVE CYLINDER HEAD REAR COVER**


EM2218

7. MEASUE CAMSHAFT THRUST CLEARANCE

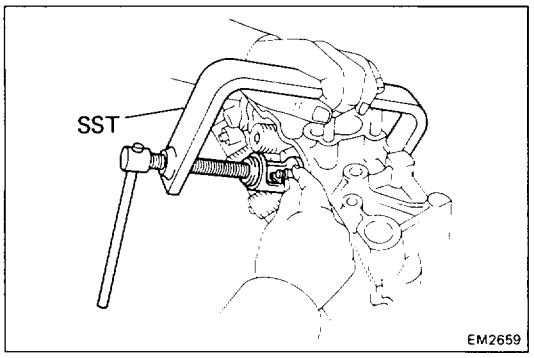
Using a dial gauge, measure the camshaft thrust clearance.

Standard clearance: **0.08 — 0.18 mm (0.0031 — 0.0071 in.)**

Maximum clearance: **0.25 mm (0.0098 in.)**

If clearance is greater than maximum, replace the head.

8. REMOVE CAM BEARING CAPS AND SHAFT



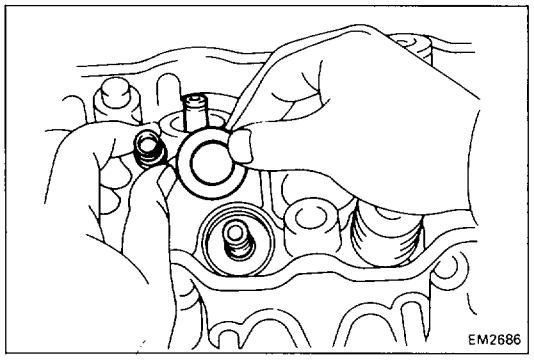
EM2659

9. REMOVE VALVES

(a) Using SST, compress the valve retainer until the two keepers can be removed.

SST 09202-43013

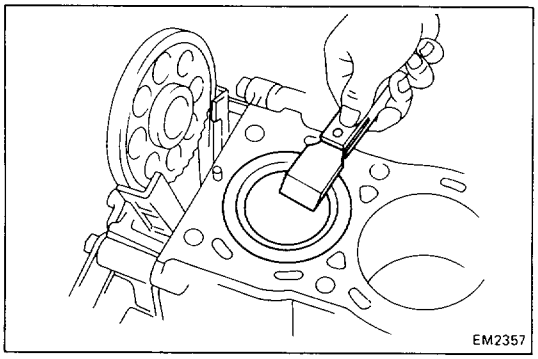
(b) Remove the valve keepers, retainers, springs and valves.


EM2686

(c) Remove the valve seals.

(d) Using a small screwdriver or magnet, remove the valve spring seats.

NOTE: Keep the valves arranged so they can be installed in the same order as removed.

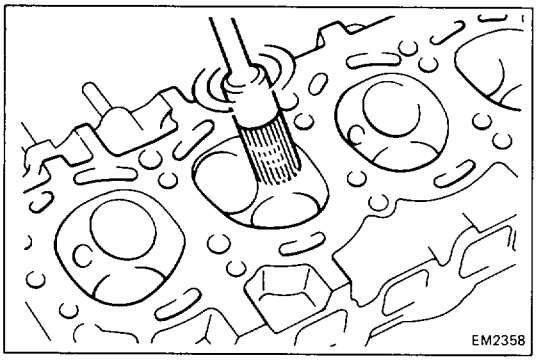


INSPECTION AND CLEANING OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Scrape the carbon from the piston top.

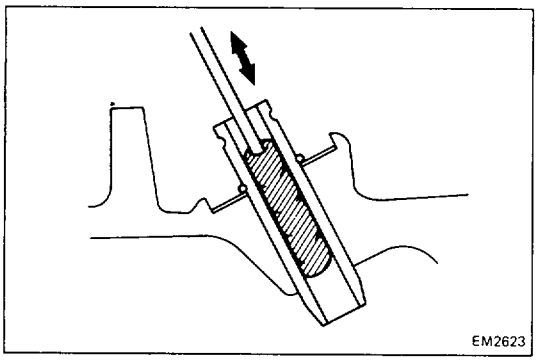
(b) Remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.



2. CLEAN COMBUSTION CHAMBER

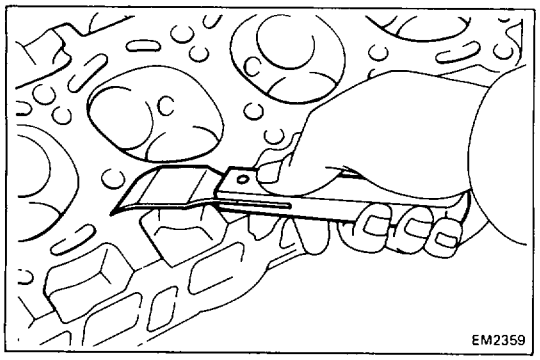
Using a wire brush, remove all the carbon from the combustion chambers.

CAUTION: Be careful not to scratch the head gasket contact surface.



3. CLEAN VALVE GUIDES

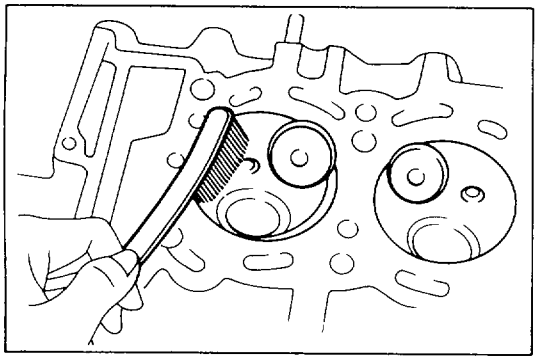
Using a valve guide brush and solvent, clean all valve guides.



4. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the manifold and head surfaces.

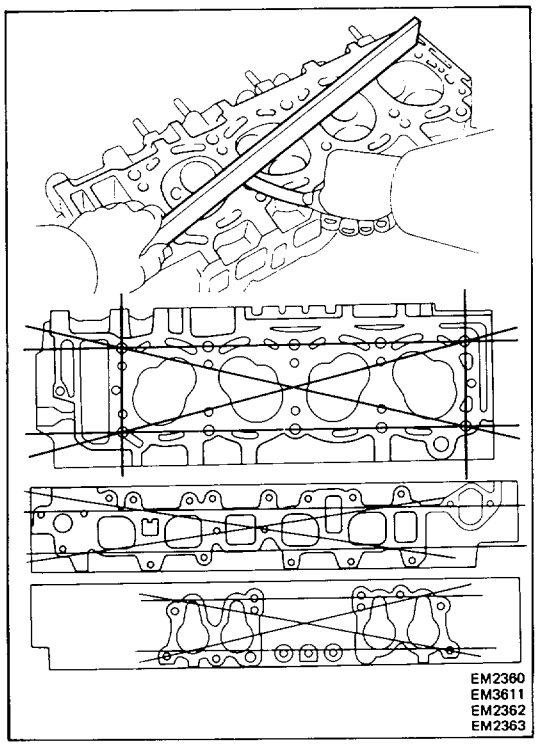
CAUTION: Do not scratch the surfaces.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, clean the head.

CAUTION: Do not clean the head in a hot tank as this will seriously damage it.



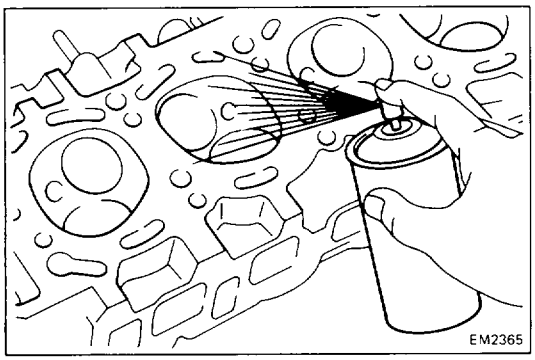
6. INSPECT HEAD FOR FLATNESS

(a) Using a precision straightedge and feeler gauge, check that the head and manifold surfaces are not warped.

(b) Measure warpage along the four edges and diagonally as illustrated.

Maximum head surface warpage: 0.15 mm (0.0059 in.)
Maximum manifold surface warpage: 0.20 mm (0.0079 in.)

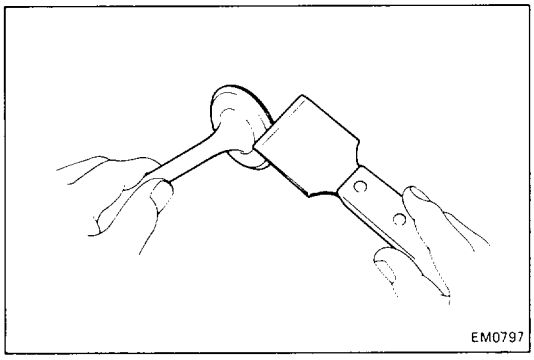
If warpage is greater than specified value, replace the head.



7. INSPECT CYLINDER HEAD FOR CRACKS

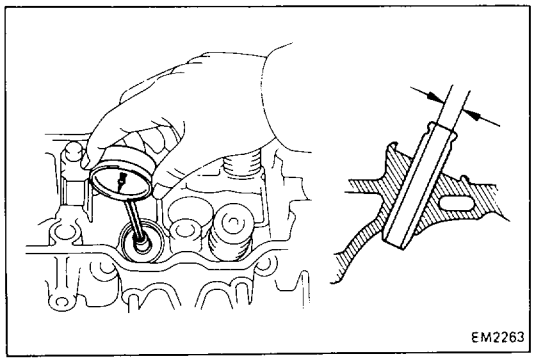
Using a dye penetrant, check the combustion chamber, intake and exhaust ports, head surface and the top of the head for cracks.

If a crack is found, replace the head.



8. CLEAN VALVES

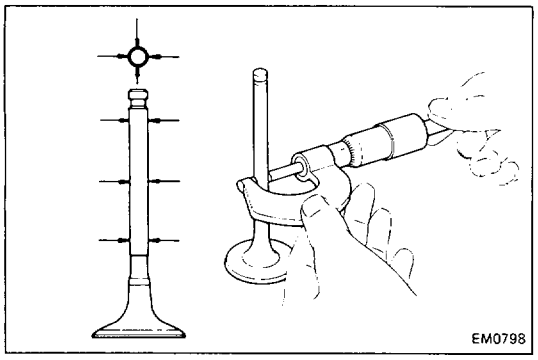
Use an old valve to chip any carbon from the valve head. Using a gasket scraper, clean the valve thoroughly.



9. INSPECT VALVE STEM GUIDE WEAR

(a) Using a dial indicator or telescoping gauge, measure the inside diameter of the valve guide.

Standard inside diameter: 8.01 — 8.03 mm (0.3154 — 0.3161 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Standard valve stem diameter:

Intake	**7.970 — 7.985 mm (0.3138 — 0.3144 in.)**
Exhaust	**7.965 — 7.980 mm (0.3136 — 0.3142 in.)**

(c) Subtract the valve stem measurement from the valve guide measurement.

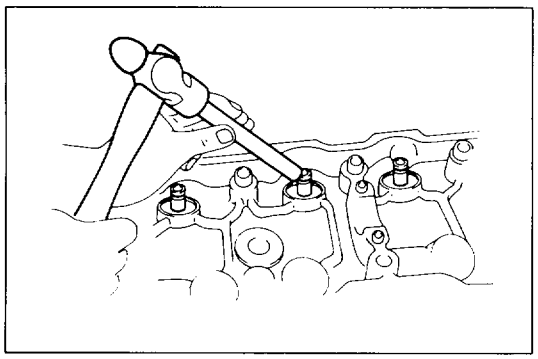
Standard oil clearance:

Intake	**0.025 — 0.060 mm (0.0010 — 0.0024 in.)**
Exhaust	**0.030 — 0.065 mm (0.0012 — 0.0026 in.)**

Maximum oil clearance:

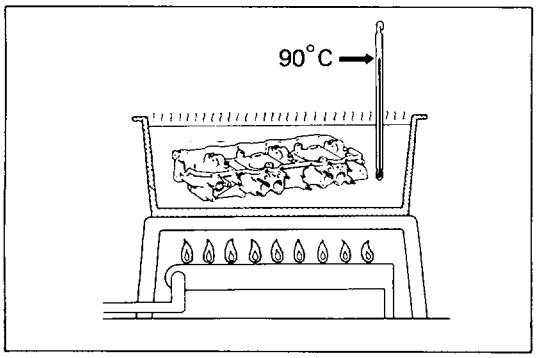
Intake	**0.08 mm (0.0031 in.)**
Exhaust	**0.10 mm (0.0039 in.)**

If the clearance is greater than following values, replace the valve and guide:

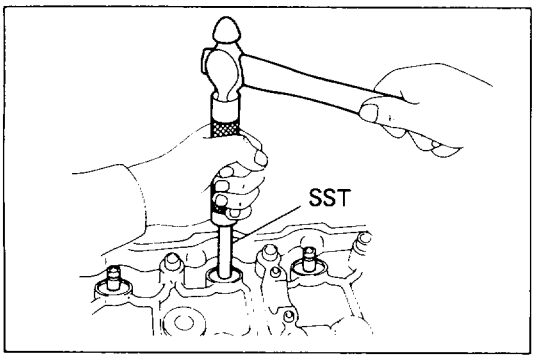


10. IF NECESSARY, REPLACE VALVE GUIDE

(a) Using a brass bar and hammer, break the valve guide.

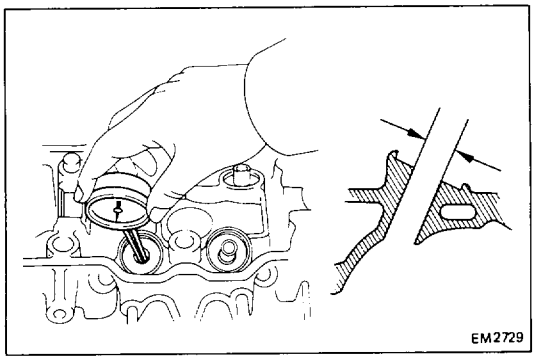


(b) Heat the cylinder head to approx. 90°C (194°F).



(c) Using SST and hammer, drive out the valve guide.

SST 09201-60011



(d) Using a caliper gauge, measure the valve guide bore of the cylinder head.

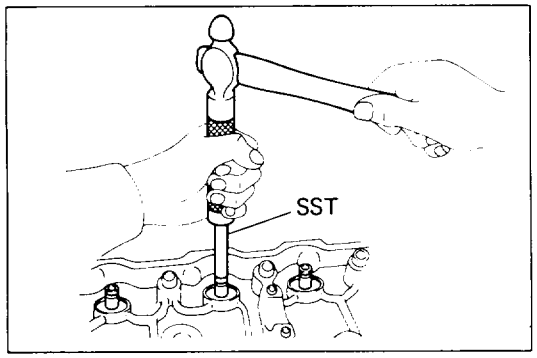
(e) Select a new valve guide.

If the valve guide bore of the cylinder head is more than 13.018 mm (0.5125 in.), machine the bore to the following dimension.

Rebored valve guide bushing bore dimension (cold):
13.050 — 13.068 mm (0.5138 — 0.5145 in.)

Both intake and exhaust

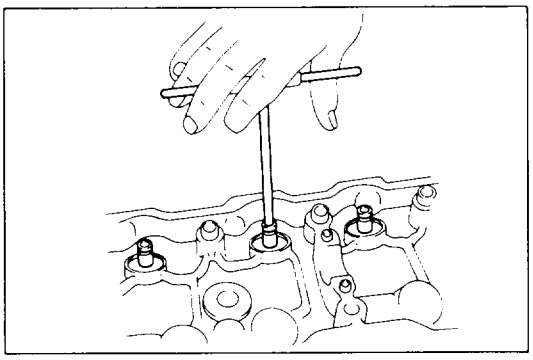
Guide bore mm (in.)	Guide size
13.000 — 13.018 (0.5118 — 0.5125)	Use STD
Over 13.018 (0.5125)	Use O/S 0.05



(f) Heat the cylinder head to approx. 90°C (194°F)

(g) Using SST and hammer, drive in a new valve guide until the snap ring makes contact with the cylinder head.

SST 09201-60011



(h) Using a sharp 8 mm reamer, ream the valve guide to obtain the specified clearance between the guide and new valve.

Intake clearance: **0.025 — 0.06 mm (0.0010 — 0.0024 in.)**

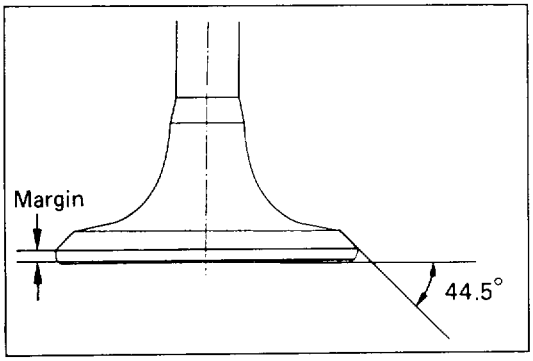
Exhaust clearance: **0.030 — 0.065 mm (0.0012 — 0.0026 in.)**

11. INSPECT AND GRIND VALVES

(a) Grind the valves only enough to remove pits and carbon.

Make sure the valves are ground at the correct valve face angle.

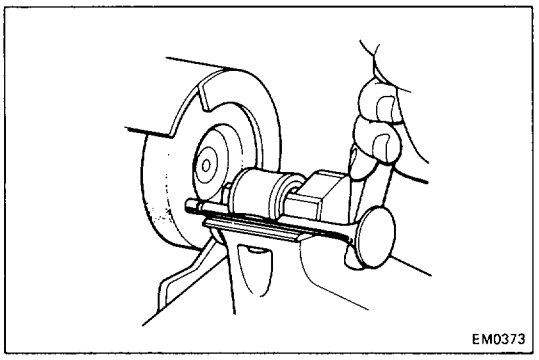
Valve face angle: 44.5°



(b) Check the valve head margin.

Minimum margin:	**22R, 22R-E**		**0.6 mm (0.024 in.)**
	22R-TE	**IN**	**0.9 mm (0.035 in.)**
		EX	**1.1 mm (0.043 in.)**

If the valve head margin is less than specified, replace the valve.


EM0373

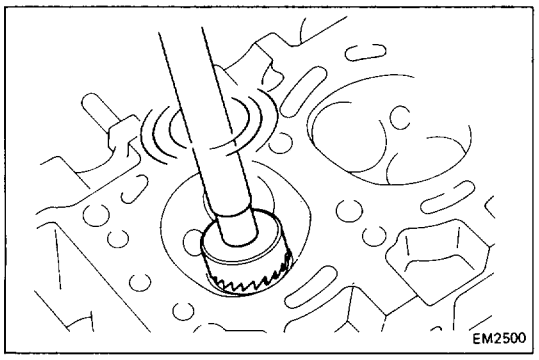
(c) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

CAUTION: Do not grind more than 0.5 mm (0.020 in.)

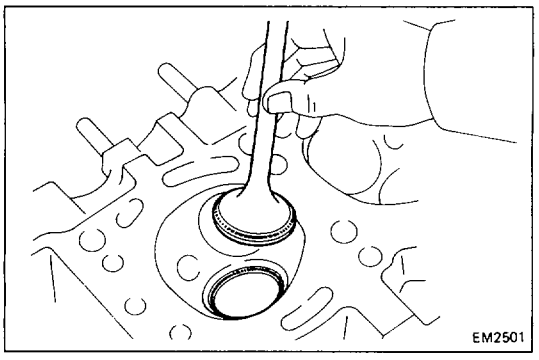
Standard overall length:

Intake	**22R, 22R-E**	**113.5 mm (4.468 in.)**
	22R-TE	**113.8 mm (4.480 in.)**
Exhaust	**22R, 22R-E**	**112.4 mm (4.425 in.)**
	22R-TE	**112.9 mm (4.445 in.)**


EM2500

12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° cutter, resurface the valve seats. Remove enough metal to clean the seats.

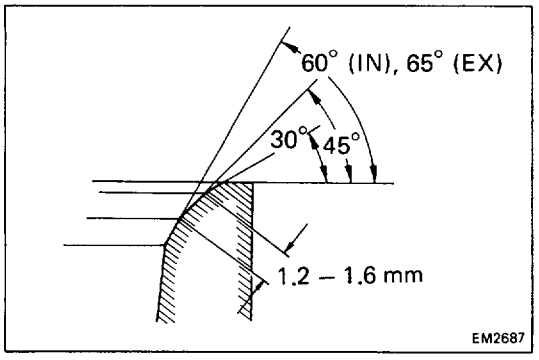

EM2501

(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Install the valve. While applying light pressure to the valve, rorate the valve against the seat.

(c) Check the valve face and seat for the following:

- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.



EM2687

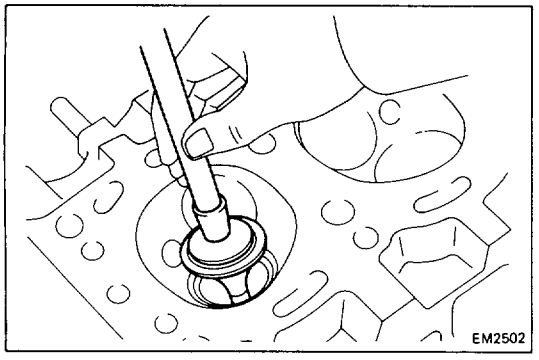
- Check that the seat contact is on the middle of the valve face with the following width:

  1.2 — 1.6 mm (0.047 — 0.063 in.)

  If not, correct the valve seat as follows:

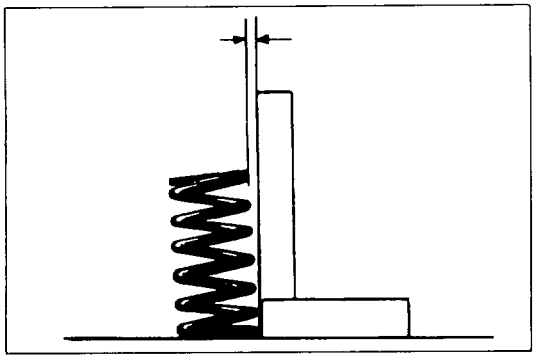
  If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

  If seating is too low on the valve face, use 60° (IN) or 65° (EX) and 45° cutters to correct the seat.


EM2502

(d) Hand-lap the valve and valve seat together with abrasive compound.

(e) Clean the valve and valve seat after hand-lapping.

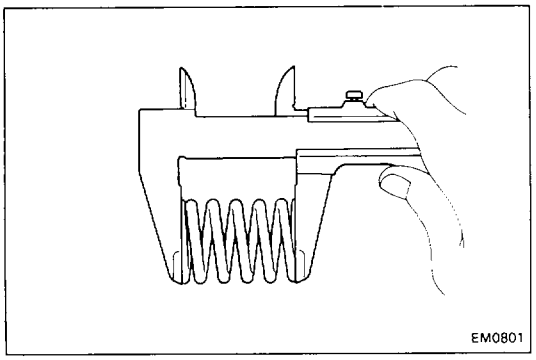


13. INSPECT VALVE SPRINGS

(a) Using a steel square, check the squareness of the valve springs.

Maximum allowable: 1.6 mm (0.063 in.)

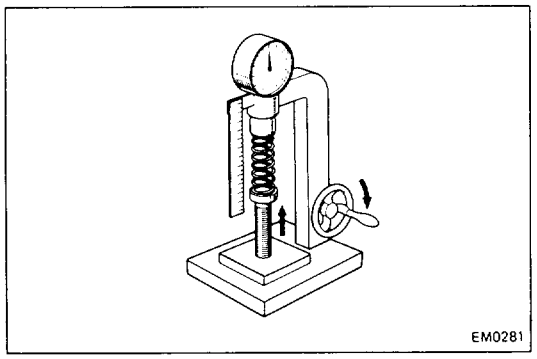
If a spring is out of square more than maximum allowable, replace the sring.



(b) Measure the free height of all springs.

Free height: 48.5 mm (1.909 in.)

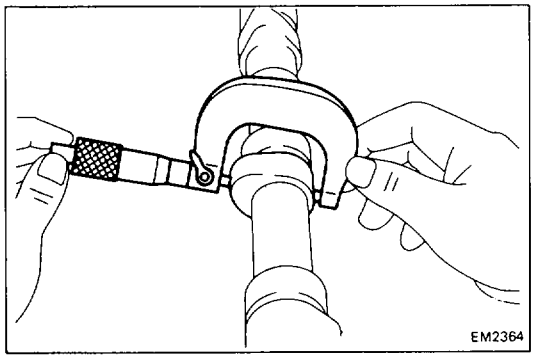
Replace any spring that is not correct.



(c) Using a spring tester, check the tension of each spring at the specified installed height.

Installed height: 40.5 mm (1.594 in.)
Standard installed tension: 30.0 kg (66.1 lb, 294 N)
Minimum installed tension: 28.5 kg (62.8 lb, 279 N)

If the installed tension is less than minimum, replace the spring.

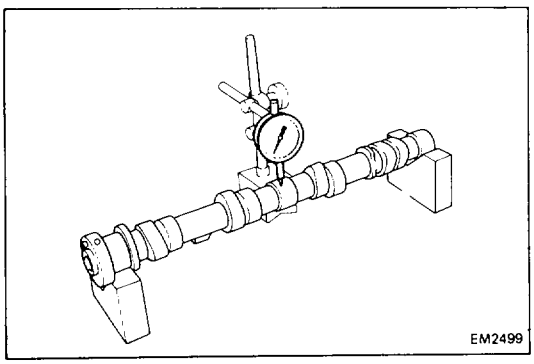


14. INSPECT CAMSHAFT AND BEARING CAPS

(a) Using a micrometer, measure the cam lobes.

Standard intake lobe height: 42.63 — 42.72 mm (1.6783 — 1.6819 in.)
Standard exhaust lobe height: 42.69 — 42.78 mm (1.6807 — 1.6842 in.)

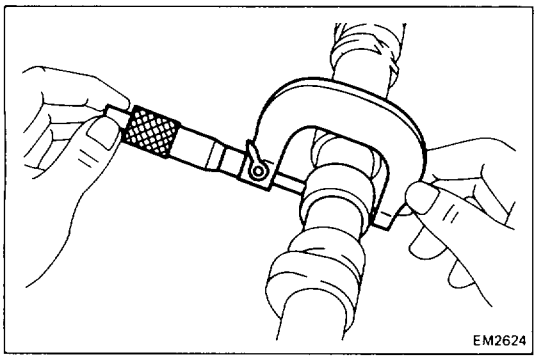
If the lobe height is less than standard allowable, the camshaft is worn and must be replaced.



(b) Place the camshaft on V-blocks and measure the runout at the center journal.

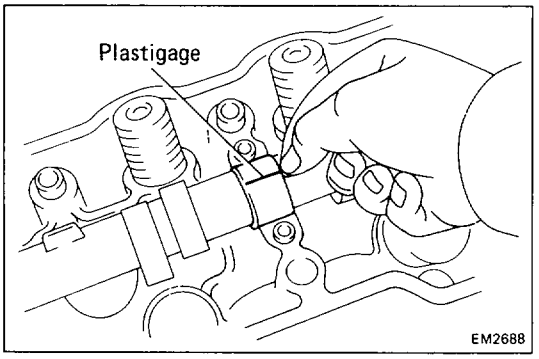
Maximum circle runout: 0.2 mm (0.008 in.)

If the runout is greater than maximum allowable, replace the camshaft.



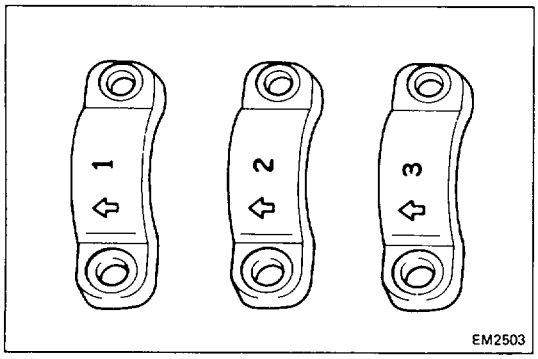
(c) Using a micrometer, measure the journal diameter.

Standard diameter: 32.98 — 33.00 mm (1.2984 — 1.2992 in.)



(d) Measure the camshaft journal oil clearance.

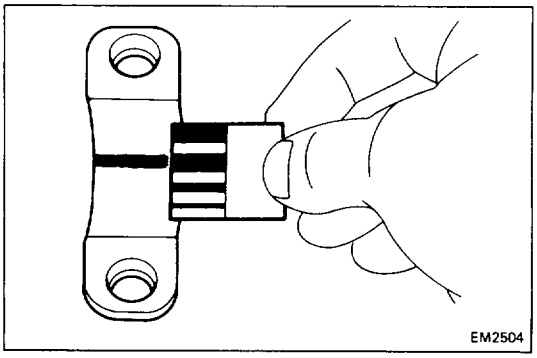
- Clean the bearing caps and camshaft journal.
- Lay a strip of Plastigage across each journal.



- Install the correct numbered bearing cap on each journal with the arrows pointing toward the front. Torque each bolt.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

NOTE: Do not turn the camshaft while the Plastigage is in place.

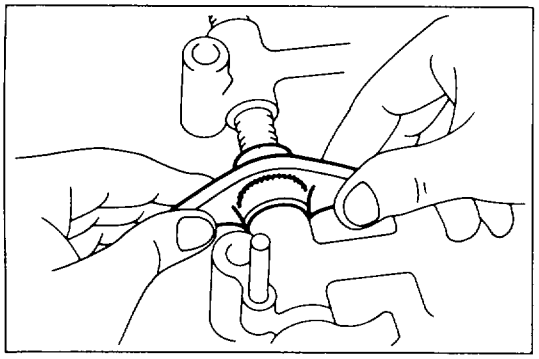


- Remove the caps. Measure the Plastigage at its widest point.

Standard clearance: 0.01 — 0.05 mm (0.0004 — 0.0020 in.)
Maximum clearance: 0.1 mm (0.004 in.)

If clearance is greater than maximum, replace the head and/or camshaft.

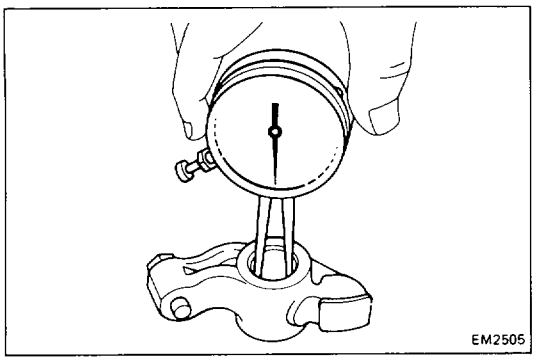
- Clean out the pieces of Plastigage from the bearings and journals.



15. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

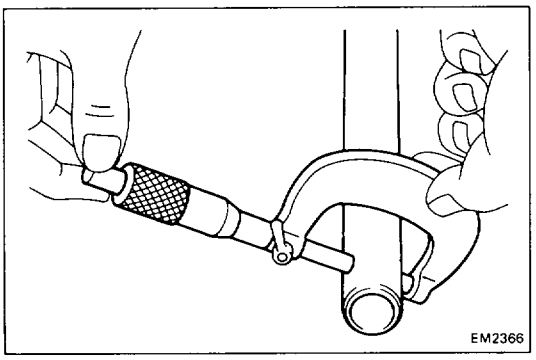
If movement is felt, disassemble the rocker arm assembly and measure the oil clearance as follows:



(a) Disassemble rocker arm assembly.
- Remove the three screws.
- Slide the rocker stands, springs and rocker arms off the shafts.

(b) Using a dial indicator, measure the inside diameter of the rocker arm.

Standard inside diameter: 16.000 – 16.018 mm (0.6299 – 0.6306 in.)



(c) Using a micrometer, measure the outside diameter of the shaft.

Standard diameter: 15.97 – 15.99 mm (0.6287 – 0.6295 in.)

(d) Subtract the shaft diameter from the rocker arm diameter.

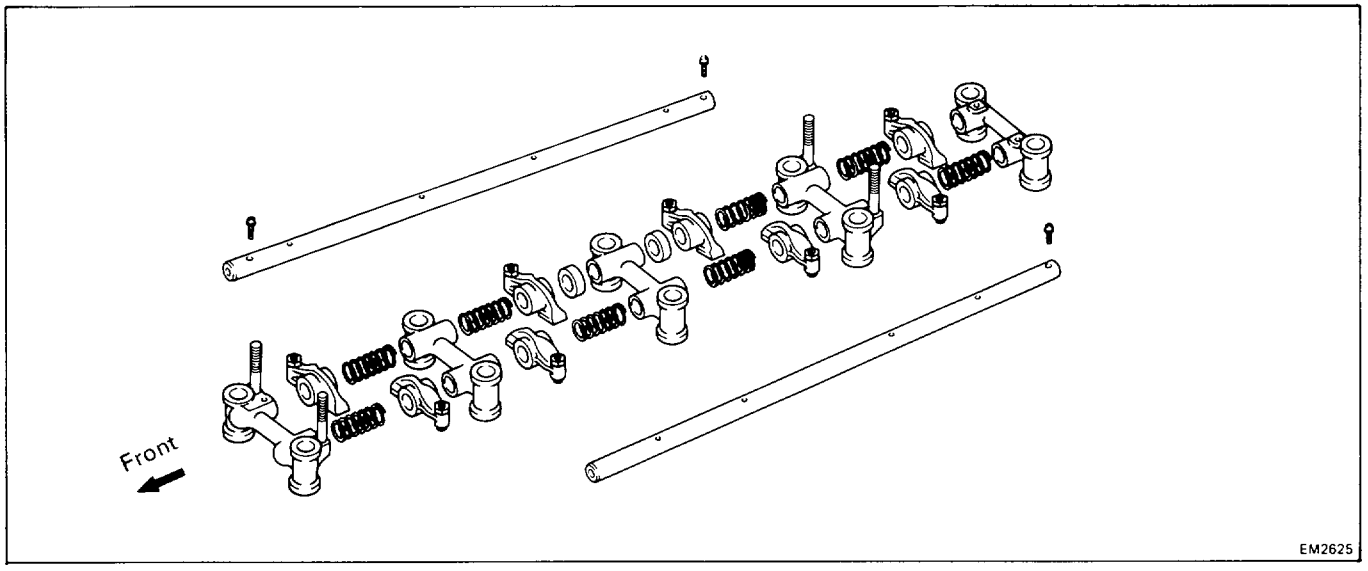
Standard oil clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

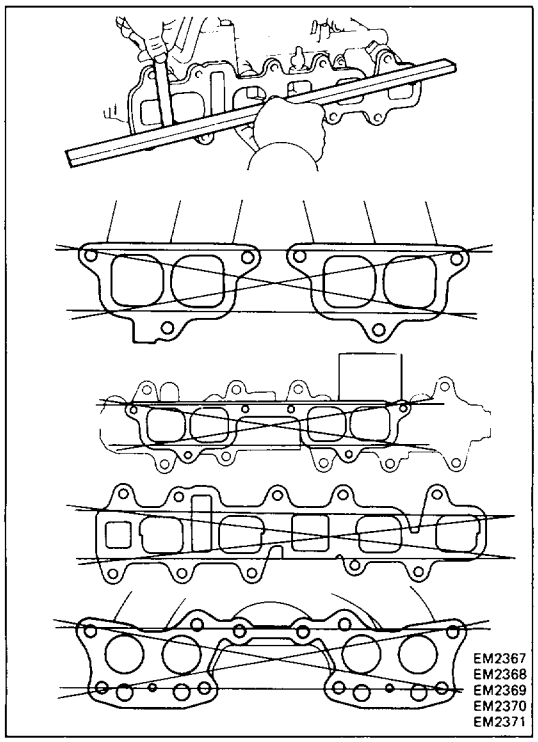
Maximum oil clearance: 0.08 mm (0.0031)

If the oil clearance is not within specification, replace the rocker arm and/or shaft.

(e) Assemble the rocker arm assembly as shown, and install the three screws.

NOTE: All rocker arms are the same but all rocker stands are different and must be assembled in the correct order.





16. INSPECT INTAKE AIR INTAKE CHAMBER, AND EXHAUST MANIFOLDS

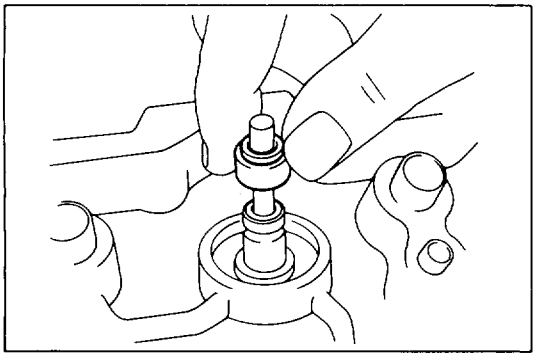
Using a precision straightedge and feeler gauge, check the surfaces contacting the cylinder head for warpage. If warpage is greater than maximum, replace the manifold.

Maximum intake warpage: 0.2 mm (0.008 in.)
Maximum exhaust warpage: 0.7 mm (0.028 in.)
Maximum air intake chamber warpage: 0.2 mm (0.008 in.)

ASSEMBLY OF CYLINDER HEAD

(See page EM-13)

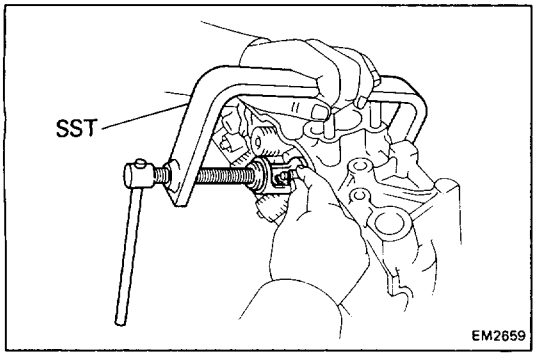
NOTE:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



1. INSTALL VALVES

(a) Lubricate and insert valves in the cylinder head valve guides. Make sure the valves are installed in the correct order.

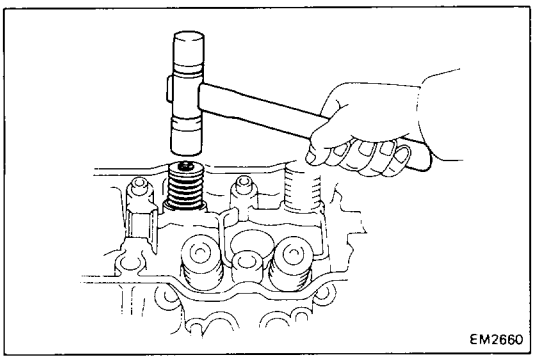
(b) Install the valve spring seats and new seals.



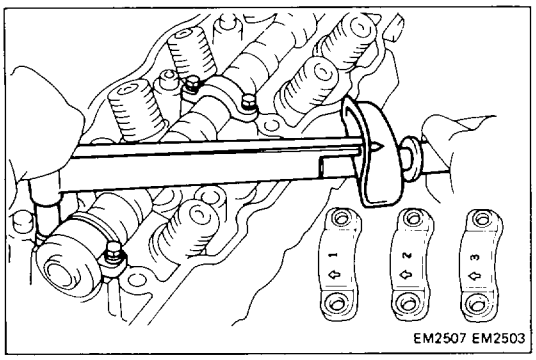
(c) Install springs and spring retainers on the valves.

(d) Using SST, compress valve retainers and place two keepers around the valve stem.

SST 09202-43013



(e) Tap the stem lightly to assure proper fit.



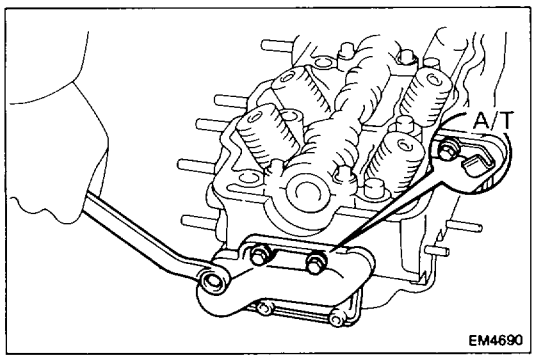
2. INSTALL CAMSHAFT

(a) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front with arrows pointing toward the front.

(b) Install and torque the cap bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

(c) Turn the camshaft to position the dowel at the top.

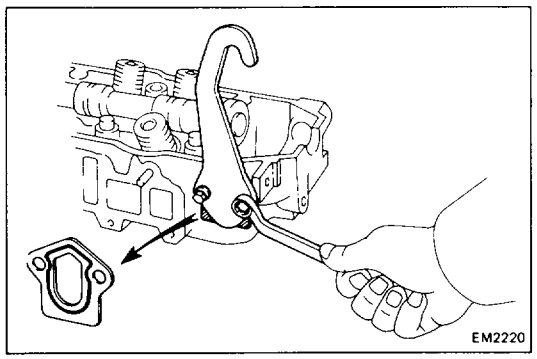


3. INSTALL CYLINDER HEAD REAR COVER

Install a new gasket, cylinder head rear cover and throttle cable clamp (for A/T) with the four bolts.

4. INSTALL LH ENGINE HANGER AND GROUND STRAP

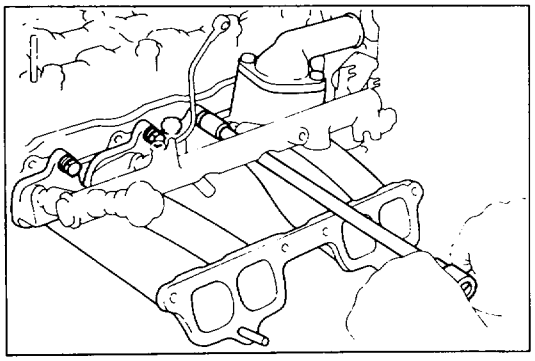
5. (22R-E)
INSTALL RH ENGINE HANGER



6. INSTALL PLUG PLATE (22R-E), OR RH ENGINE HANGER (22R-TE)

Install the new gaskets and plug plate (22R-E) or RH engine hanger (22R-TE) with the two bolts.

NOTE: Attach the flat side of the gasket to the cylinder head.



7. INSTALL INTAKE MANIFOLD

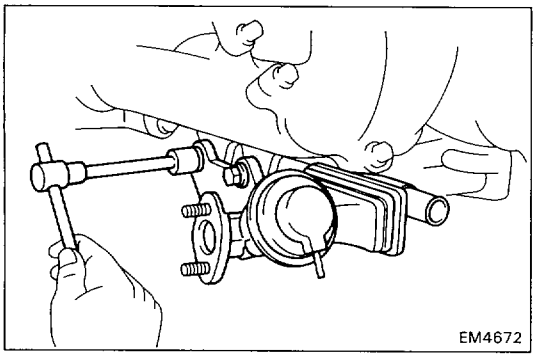
(a) Position a new gasket on the cylinder head.

(b) Install the intake manifold with the delivery pipe and injection nozzles and No.1 air pipe.

(c) Install the seven bolts, one hexagon bolt and two nuts. Torque the bolts and nuts.

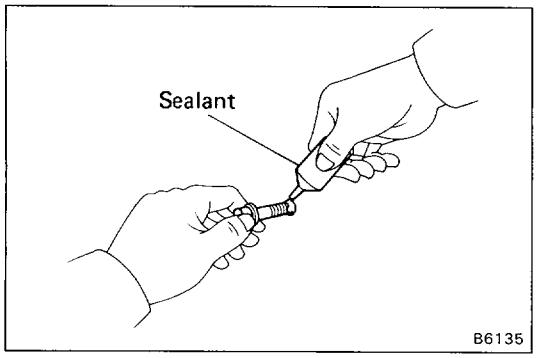
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

(d) Install the bolt the heater inlet pipe to the cylinder head.



(e) (22R-E)

Install the read valve with the two nuts.



8. INSTALL EGR VALVE

(a) Clean the set bolt (closest to the front) threads and cylinder head bolt holes of any sealer, oil or foreign particles.

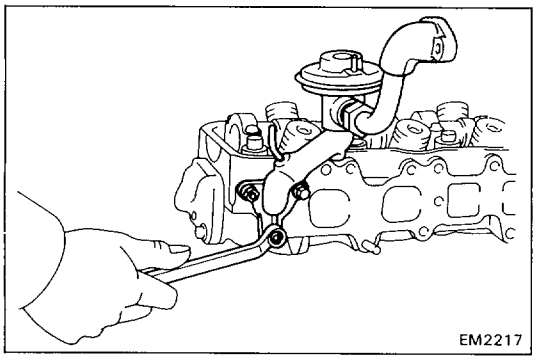
Remove any oil with kerosene or gasoline.

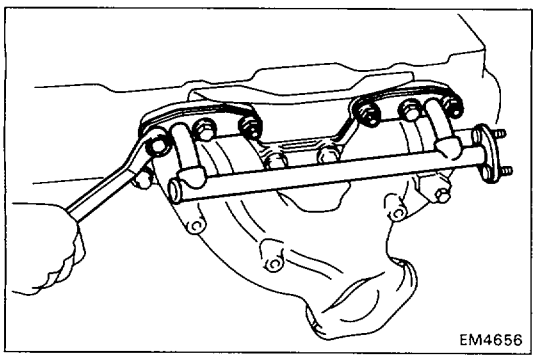
(b) Apply sealant to 2 or 3 threads of the bolt end.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

- This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.

(c) Install the EGR valve with the two bolts and nut.



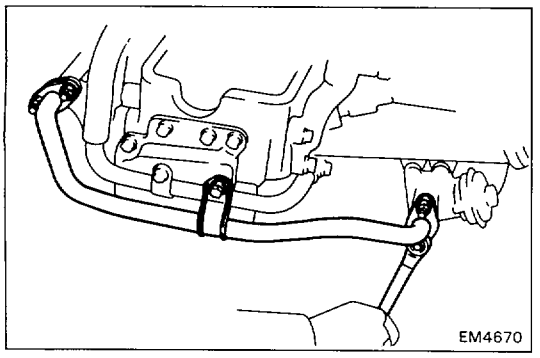


9. (22R-E)
INSTALL EXHAUST MANIFOLD

(a) Position a new gasket on the cylinder head.

(b) Install the exhaust manifold with eight nuts. Torque the nuts.

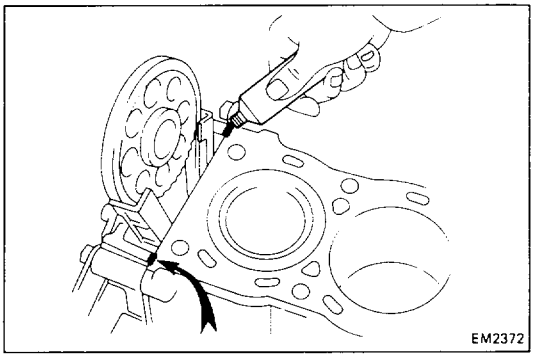
Torque: 450 kg-cm (33 ft-lb, 44 N·m)



10. (22R-E)
INSTALL NO.1 AIR INJECTION MANIFOLD

(a) Position new gaskets on the reed valve and No.2 air injection pipe.

(b) Install the No.1 air injection pipe with four nuts and bolt.



INSTALLATION OF CYLINDER HEAD

(See page EM-13)

1. APPLY SEAL PACKING TO CYLINDER BLOCK

(a) Apply seal packing to two locations as shown.

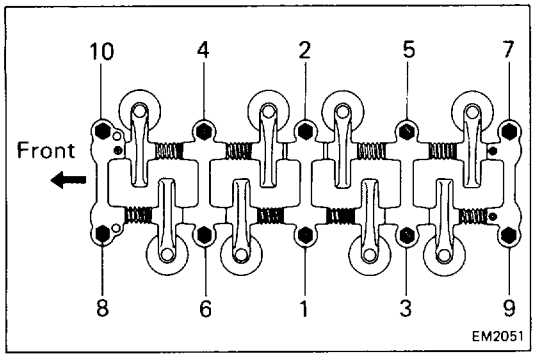
Seal packing: Part No. 08826-00080 or equivalent

(b) Place a new head gasket over dowels on the cylinder block.

2. INSTALL CYLINDER HEAD

(a) If the sprocket was removed, align the alignment marks placed on the sprocket and chain during removal.

(b) Position the cylinder head over dowels on the block.

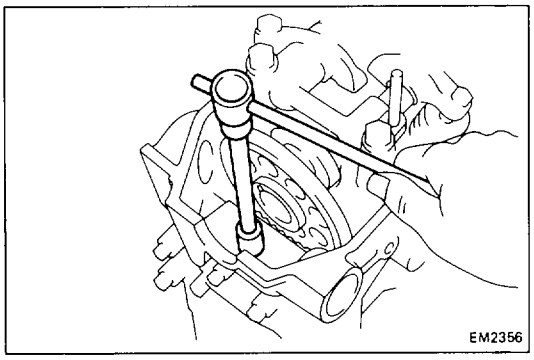


3. INSTALL ROCKER ARM ASSEMBLY

(a) Place the rocker arm assembly over the dowels on the cylinder head.

(b) Install and tighten the head bolts gradually in three passes and in the sequence shown. Torque the bolts on the final pass.

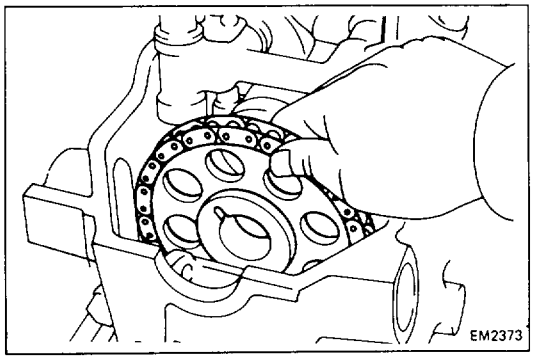
Torque: 800 kg-cm (58 ft-lb, 78 N·m)



4. INSTALL CHAIN COVER BOLT

Torque the bolt.

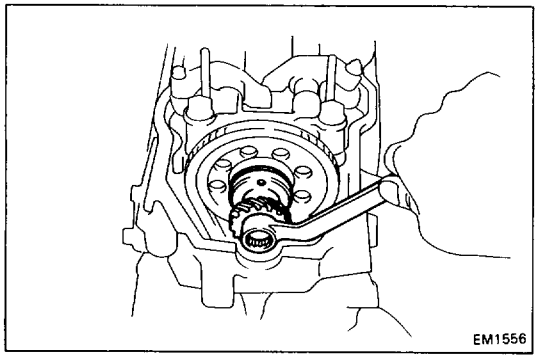
Torque: 130 kg-cm (9 ft-lb, 13 N·m)



(a) While holding up on the sprocket and chain, turn the crankshaft until the No. 1 and No. 4 cylinders are at top dead center.

(b) Place the chain sprocket over the camshaft dowel.

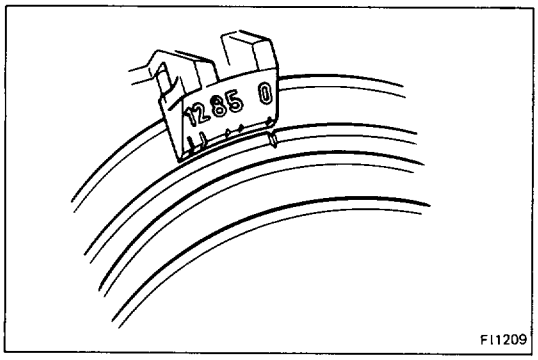
NOTE: If the chain does not seem long enough, turn the crankshaft back and forth while pulling up on the chain and sprocket.



5. INSTALL DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (22R) OR CAMSHAFT THRUST PLATE (22R-E, 22R-TE)

Place the distributor drive gear and fuel pump drive cam (22R) or camshaft thrust plate (22R-E, 22R-TE) over the chain sprocket. Torque the bolt.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

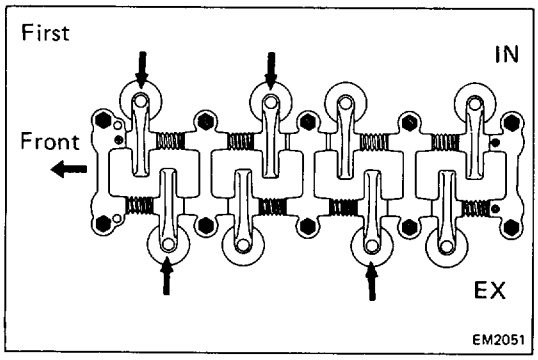


6. ADJUST VALVES CLEARANCE

(a) Set the No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley at the O mark position timing mark.
- Check that the rocker arms on the No.1 cylinder are loose and the rockers on No.4 are tight.

If not, turn the crankshaft one complete revolution and align the marks as above.



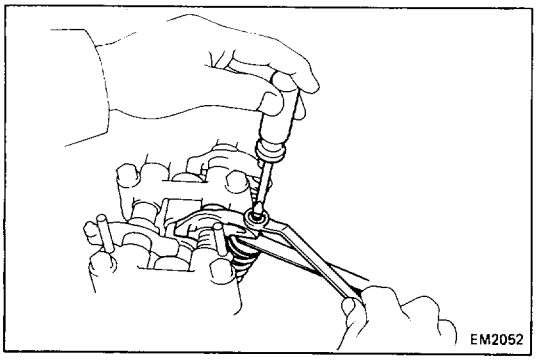
(b) Adjust the clearance of half of the valves.

- Adjust only those valves indicated by arrows as shown.

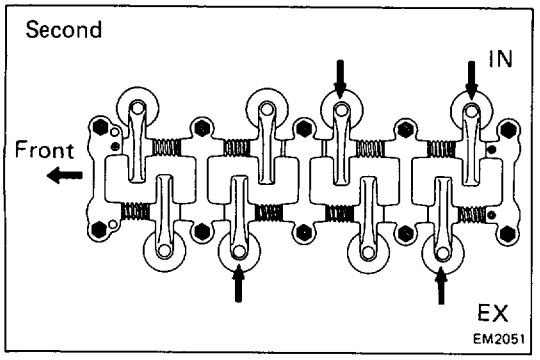
Valve clearance (Cold):

Intake	**0.20 mm (0.008 in.)**
Exhaust	**0.30 mm (0.012 in.)**

NOTE: After installing the cylinder head, warm up the engine and adjust the valve clearance.

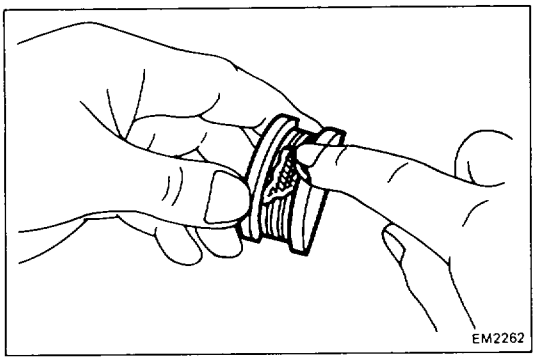


- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.
- Recheck the clearance. The thickness gauge should move with a very slight drag.



(c) Turn the crankshaft one revolution and adjust the other valves.

(d) Set the No.1 cylinder to TDC/compression.

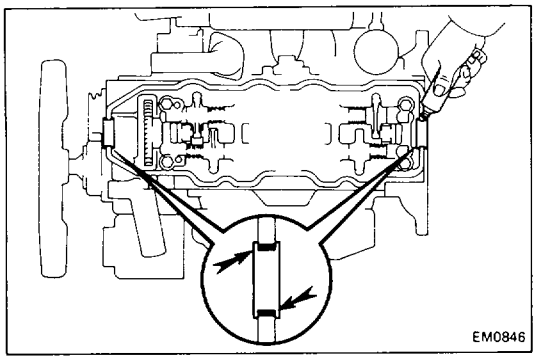


7. INSTALL HALF-CIRCULAR PLUG

(a) Apply seal packing to the cylinder head installation surface of the plug.

Seal packing: Part No. 08826-00080 or equivalent

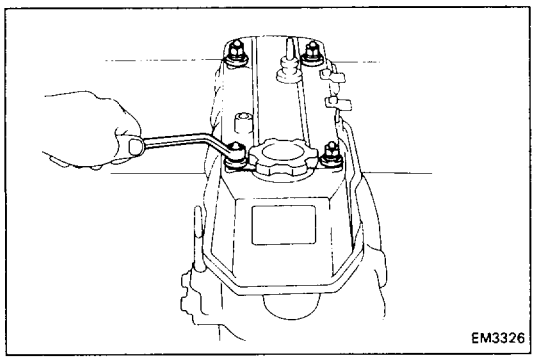
(b) Install the half-circular plug to the cylinder head.



8. INSTALL HEAD COVER

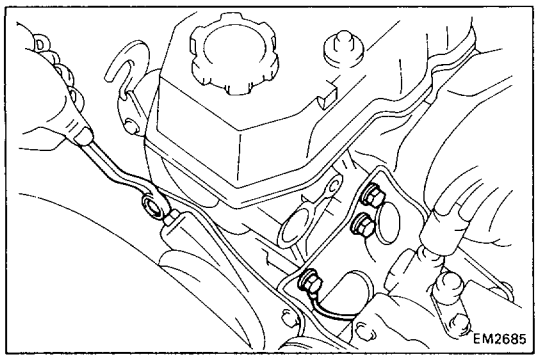
(a) Apply seal packing to four the location shown.

Seal packing: Part No. 08826-00080 or equivalent



(b) Install the gasket to the cylinder head.

(c) Place the head cover on the cylinder head and install the four seals and nuts.



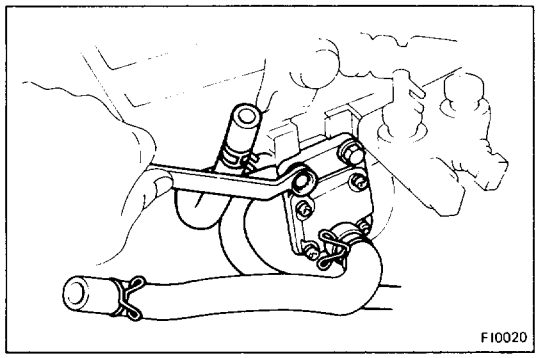
POST INSTALLATION

1. **(w/ PS)**
CONNECT PS BRACKET TO CYLINDER HEAD
Install the four bolts and bond strap. Torque the bolts.
Torque: 450 kg-cm (33 ft-lb, 44 N·m)

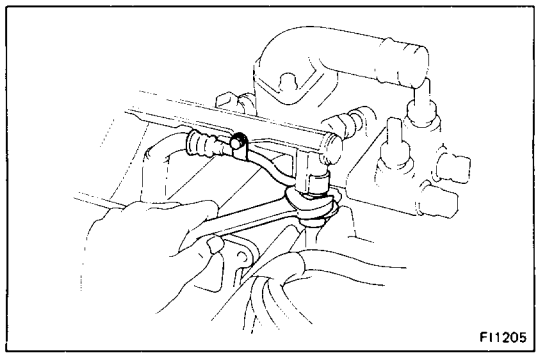
2. **(w/ PS)**
INSTALL DRIVE BELT AND ADJUST BELT TENSION
(See page MA-4)

3. **(22R-E)**
CONNECT BY-PASS HOSE TO INTAKE MANIFOLD

(22R-TE)
CONNECT OIL COOLER HOSE FROM INTAKE MANIFOLD



4. **INSTALL AUXILIARY AIR VALVE**
   (a) Install the auxiliary air valve to the intake manifold.
   (b) Connect the water by-pass hose.



5. **CONNECT FUEL HOSE TO DELIVERY PIPE**
   (a) Install the fuel hose with a bolt.
   (b) Install the pulsation damper and new gaskets. Torque the damper.
   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

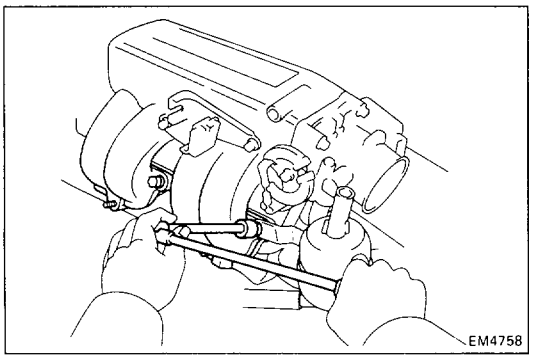
6. **CONNECT FOLLOWING WIRES:**
   (a) Water temp. sensor wire
   (b) Cold start injector time switch wire
   (c) (with A/C)
   VSV wire
   (d) Igniter wire
   (e) Oxygen sensor wire
   (f) (A/T)
   OD temp. switch wire
   (g) Water temp. sender gauge wire
   (h) Injector wires
   (i) (with A/C)
   Compressor wires
   (j) Transmission wires

(k) Starter wire (terminal 50)
(l) Oil pressure sender gauge or switch
(m) Knock sensor wire
(n) Auxiliary air valve wire

7. CONNECT FUEL RETURN HOSE

8. INSTALL CHAMBER WITH THROTTLE BODY

(a) Position new gaskets on the intake manifold and No.1 EGR pipe.
(b) Install the chamber, throttle body, fuel hose clamp, resonator and bond strap with the four bolts and two nuts.
(c) Connect the chamber and stay with a bolt.
(d) Install the bolts holding the EGR valve to the chamber.
(e) Install the new gaskets and cold start injector pipe.



9. CONNECT FOLLOWING WIRES:

(a) (Calif. and C&C)
EGR gas temp. sensor wire
(b) Throttle position wire
(c) Cold start injector wire

10. INSTALL EGR VACUUM MODULATOR

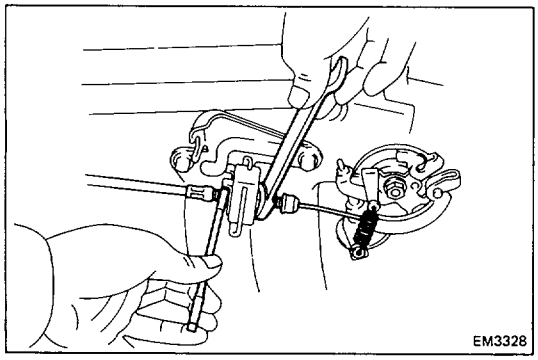
11. CONNECT FOLLOWING PARTS:

(a) No.2 and No.3 water by-pass hoses to the throttle body
(b) No.2 air valve hose to throttle body
(c) No.1 air valve hose to throttle body
(d) (22R-TE)
VCV
(e) (22R-E)
Fuel pressure up VSV and hose
Reed valve hose
(22R-TE)
Pressure regulator hose
(f) EGR vacuum modulator hose
(g) EVAP hose
(h) (with A/C)
VSV hoses
(i) (w/ PS)
Air control valve hoses
(j) Brake booster hose
(k) (22R-E)
No.1 and No.2 PCV hoses
(22R-TE)
No.2 PCV hoses

12. CONNECT GROUND STRAP TO ENGINE REAR SIDE

13. (A/T)
CONNECT THROTTLE CABLE
Connect the throttle cable to the clamp and bracket

14. CONNECT ACCELERATOR CABLE



15. CONNECT HEATER WATER INLET HOSE TO HEATER WATER INLET PIPE

16. INSTALL RADIATOR INLET HOSE

17. INSTALL SPARK PLUGS AND DISTRIBUTOR
(See page IG-15)

18. INSTALL OIL LEVEL GAUGE

19. CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD
(a) Install the new gaskets, and connect the exhaust pipe to the exhaust manifold with the three nuts.
(b) Install the exhaust pipe clamp.

20. (22R-E)
INSTALL AIR CLEANER HOSE

21. (22R-TE)
INSTALL TURBOCHARGER
(See steps 6 to 15 on pages TC-12 to 15)

22. FILL WITH ENGINE OIL
Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient, and recommended viscosity oil.

Oil capacity:
Dry fill 4.8 liters (5.1 US qts, 4.2 Imp. qts)
Drain and refill
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.6 liters (4.9 US qts, 4.0 Imp. qts)

23. FILL WITH COOLANT
(See step 3 on page CO-3)

24. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

25. START ENGINE
Warm up the engine and inspect for leaks.

26. PERFORM ENGINE ADJUSTMENT
(a) Readjust the valve clearance.
(See page MA-8)
(b) Recheck ignition timing. (See step 1 on page IG-15)
(c) Adjust idle speed. (See step 13 on page MA-8)

27. RECHECK COOLANT AND ENGINE OIL LEVEL

28. ROAD TEST
Road test the vehicle.

22R
PREPARATION FOR REMOVAL

(See page EM-13)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK

3. DRAIN ENGINE OIL

4. REMOVE AIR CLEANER
   (a) Disconnect air hoses and air duct from the air cleaner.
   (b) Remove the two nuts and wing nut.
   (c) Remove the air cleaner.

5. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD
   Remove three nuts holding the exhaust manifold to the exhaust pipe.

6. DISCONNECT RADIATOR INLET HOSE FROM WATER OUTLET

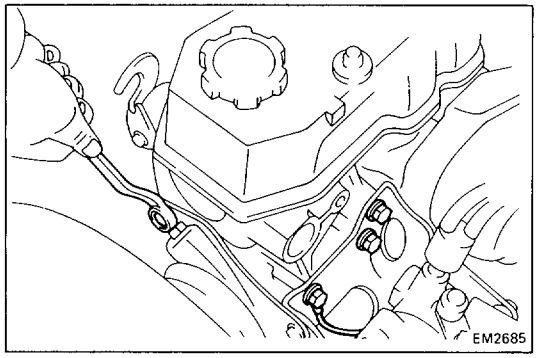
7. (w/ Air Pump)
   DISCONNECT NO.3 AIR HOSE FROM CHECK VALVE

8. DISCONNECT TWO HEATER HOSES

9. DISCONNECT ACCELERATOR CABLE FROM CARBURETOR
   Disconnect the cable from the carburetor and bracket.

10. DISCONNECT FOLLOWING WIRES:
    (a) (with A/C)
    VSV wire
    (b) Vacuum switch wire
    (c) VSV wire for EVAP
    (d) Water temp. sender gauge wire
    (e) Cold mixture heater wire
    (f) Temp. switch wire
    (g) Fuel cut solenoid valve wire
    (h) (Calif.)
    EACV wire

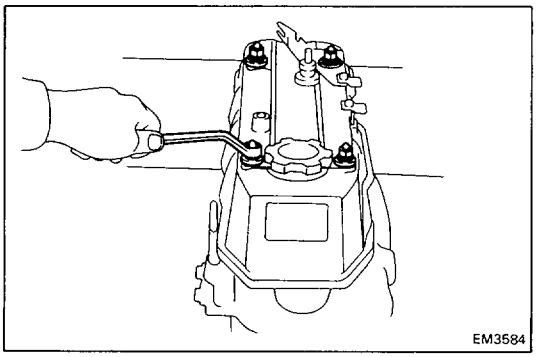
11. DISCONNECT FOLLOWING PARTS:
    (a) Charcoal canister hose
    (b) Brake booster hose
    (c) Fuel main hose from the fuel inlet pipe
    (d) Fuel return hose from the fuel return pipe
    (e) (Ex. Calif.)
    HAC from the bracket
    (f) Vacuum switch, EBCV (Calif.) and VSV with the bracket



12. REMOVE GROUND STRAP OF REAR SIDE

13. REMOVE DISTRIBUTOR AND SPARK PLUGS

14. (w/ PS)
DISCONNECT PS BRACKET FROM CYLINDER HEAD
(a) Remove the drive belt.
(b) Remove the four bolts, and disconnect the ground strap and bracket.
(c) (w/ Air pump and A/C)
Remove the bolt and compressor stay.

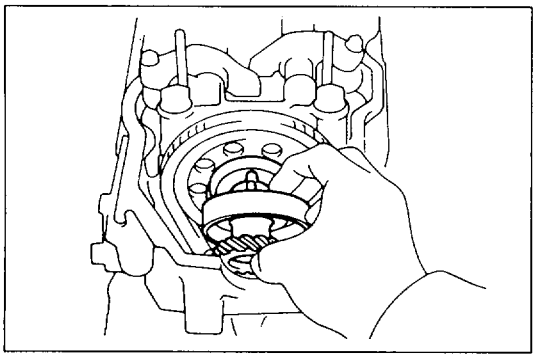


REMOVAL OF CYLINDER HEAD

(See page EM-13)

1. REMOVE HEAD COVER (See step 1 on page EM-17)

2. REMOVE CAM SPROCKET BOLT
(See step 2 on page EM-17)



3. REMOVE DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM (See step 3 on page EM-17)

4. REMOVE CAM SPROCKET
(See step 4 on page EM-17)

5. REMOVE CHAIN COVER BOLT
(See step 5 on page EM-18)

6. REMOVE CYLINDER HEAD BOLTS
(See step 6 on page EM-18)

7. REMOVE ROCKER ARM ASSEMBLY
(See step 7 on page EM-18)

8. REMOVE CYLINDER HEAD
(See step 8 on page EM-18)

DISASSEMBLY OF CYLINDER HEAD

(See page EM-13)

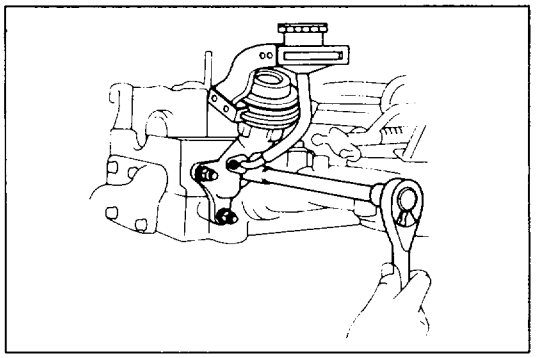
1. REMOVE HEAT INSULATER FROM EXHAUST MANIFOLD

2. REMOVE CHECK VALVE WITH AIR PIPE
   (a) Disconnect the air pipe from the exhaust manifold.
   (b) Disconnect No.3 air hose from the EACV.
   (c) Remove the check valve with the air pipe.

3. REMOVE FUEL PUMP FROM CYLINDER HEAD
   (a) Remove the three fuel hoses from the fuel pump.
   (b) Remove the fuel pump from the cylinder head.

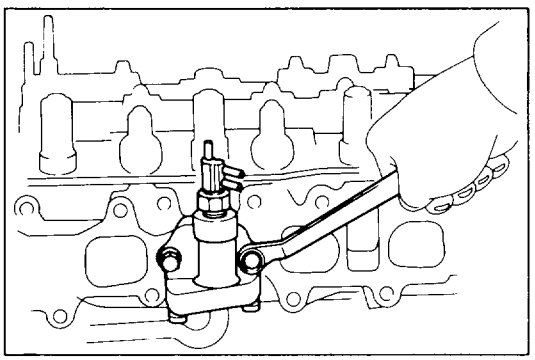
4. REMOVE FUEL PIPE FROM INTAKE MANIFOLD

5. REMOVE ENGINE HANGER AND AIR PIPE FROM CYLINDER HEAD

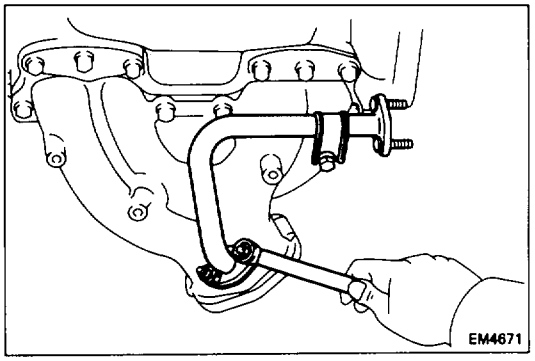


6. REMOVE EGR PIPE AND EGR VALVE WITH VACUUM MODULATOR
   (a) Remove the vacuum hose from the air pipe.
   (b) Disconnect the EGR pipe from the intake manifold.
   (c) Remove the EGR valve with the EGR pipe.

7. REMOVE INTAKE MANIFOLD WITH CARBURETOR
   (a) Remove the ground strap from the cylinder head.
   (b) Remove the six bolts and two nuts.
   (c) Remove the intake manifold with the carburetor.



8. REMOVE CYLINDER HEAD SIDE COVER



9. REMOVE EXHAUST MANIFOLD FROM CYLINDER HEAD
   (a) (w/ Air Pump)
   Remove the two nuts, bolt, No.2 air tube gasket.
   (b) Remove the eight nuts, exhaust manifold and gasket.

10. MEASURE CAMSHAFT THRUST CLEARANCE
(See step 7 on page EM-20)

11. REMOVE CAM BEARING CAPS AND SHAFT

12. REMOVE VALVES
(See step 9 on page EM-20)

INSPECTION OF CYLINDER HEAD

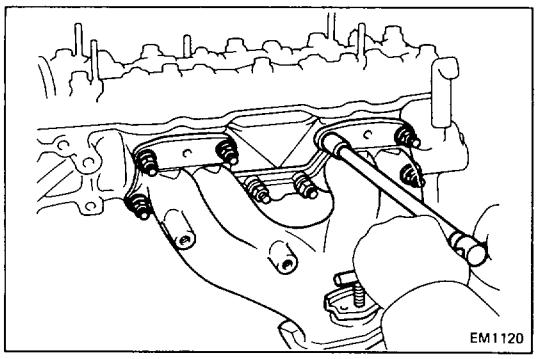
(See page EM-21)

ASSEMBLY OF CYLINDER HEAD

(See page EM-29)

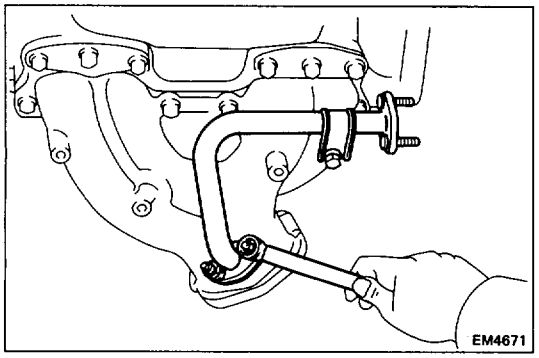
NOTE:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.

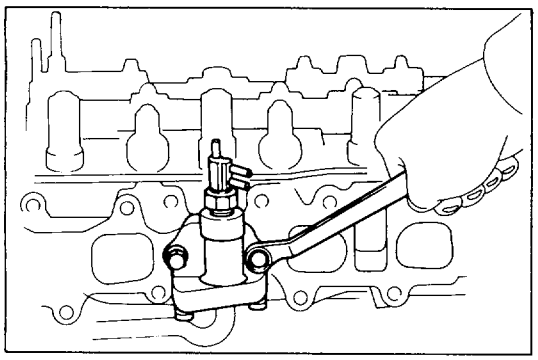


1. **INSTALL VALVE (See step 1 on page EM-29)**
2. **INSTALL CAMSHAFT (See step 2 on page EM-30)**
3. **INSTALL EXHAUST MANIFOLD TO CYLINDER HEAD**
   (a) Position a new gasket on the cylinder head.
   (b) Install the exhaust manifold with eight nuts. Torque the nuts.

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)



   (c) (w/ Air Pump)
   Position a new gasket on the exhaust manifold.
   (d) (w/ Air Pump)
   Install the No. 2 air tube with the bolt and two nuts.



4. **INSTALL CYLINDER HEAD SIDE COVER**
   (a) Position a new gasket on the cylinder head.
   (b) Install the thermostatic valve with two bolts. Torque the bolts.

   Torque: 220 kg-cm (16 ft-lb, 22 N·m)
5. **INSTALL INTAKE MANIFOLD WITH CARBURETOR**
   (a) Install the intake manifold with the carburetor.
   (b) Install the six bolts and two nuts. Torque the bolts and nuts.

   Torque: 195 kg-cm (14 ft-lb, 19 N·m)
   (c) Install the ground strap with the bolt.
6. **INSTALL FUEL PIPE TO INTAKE MANIFOLD**
7. **INSTALL EGR PIPE AND EGR VALVE WITH VACUUM MODULATOR**
   (a) Install the EGR valve with EGR pipe to the intake manifold.
   (b) Connect the vacuum hose to the air pipe.

8. INSTALL FUEL PUMP TO CYLINDER HEAD
   (a) Install the fuel pump with the two bolts. Torque the bolts.
   Torque: 220 kg-cm (16 ft-lb, 22 N·m)
   (b) Connect the three fuel pipes.

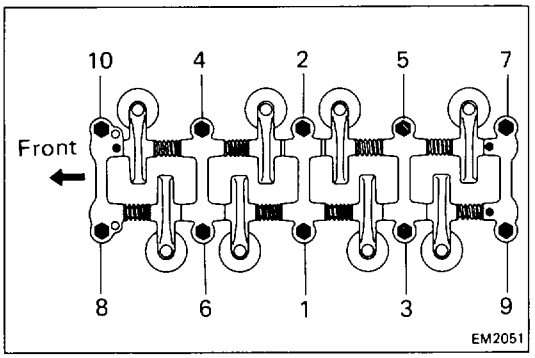
9. INSTALL CHECK VALVE WITH AIR PIPE
   (a) Install the check valve with the air pipe.
   (b) Connect No.3 air hose to the EACV.
   (c) Connect the air pipe to the exhaust manifold.

10. INSTALL HEAT INSULATER TO EXHAUST MANIFOLD

INSTALLATION OF CYLINDER HEAD

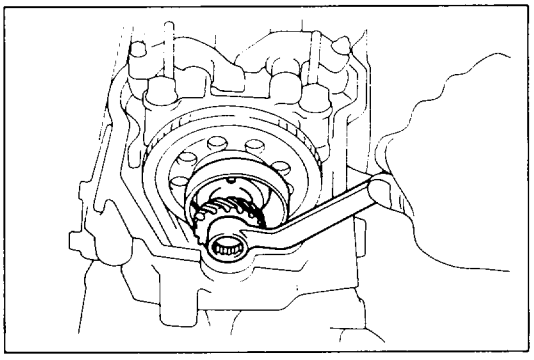
1. APPLY SEAL PACKING TO CYLINDER BLOCK
   (See step 1 on page EM-32)

2. INSTALL CYLINDER HEAD
   (See step 2 on page EM-32)



3. INSTALL ROCKER ARM ASSEMBLY
   (See step 3 on page EM-32)

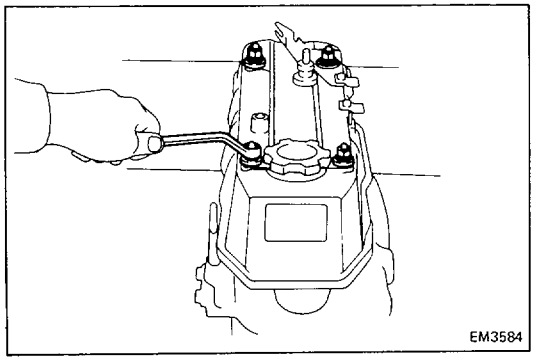
4. INSTALL CHAIN COVER BOLT
   (See step 4 on page EM-32)



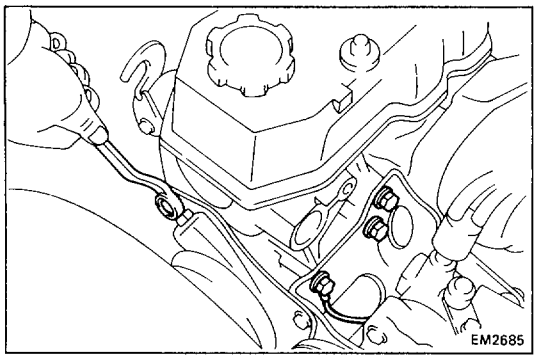
5. INSTALL DISTRIBUTOR DRIVE GEAR AND FUEL PUMP DRIVE CAM
   (See step 5 on page EM-33)

6. ADJUST VALVES CLEARANCE
   (See step 6 on page EM-33)

7. INSTALL HALF-CIRCULAR PLUG
   (See step 7 on page EM-34)



8. INSTALL HEAD COVER
   (See step 8 on page EM-34)



POST INSTALLATION

1. **(w/ PS)**
   CONNECT PS BRACKET TO CYLINDER HEAD
   (a) (w/ Air Pump and A/C)
   Install the compressor stay.
   (b) Connect the PS bracket and ground strap with the four bolts.
   Torque: 450 kg-cm (33 ft-lb, 44 N·m)
   (c) Install drive belt and adjust belt tension.
   (See page MA-4)

2. **INSTALL DISTRIBUTOR AND SPARK PLUGS**

3. **INSTALL GROUND STRAP OF REAR SIDE**

4. **CONNECT FOLLOWING PARTS:**
   (a) Vacuum switch, EBCV (Ex. Calif.) and VSV with the bracket
   (b) (Ex. Calif.)
   HAC to bracket
   (c) Fuel return hose to the fuel return pipe
   (d) Fuel main hose to the fuel inlet pipe
   (e) Brake booster hose
   (f) Charcoal canister hose

5. **CONNECT FOLLOWING WIRES:**
   (a) (Calif.)
   EACV wire
   (b) Fuel cut solenoid valve wire
   (c) Temp. switch wire
   (d) Cold mixture heater wire
   (e) Water temp. sender gauge wire
   (f) VSV wire for EVAP
   (g) Vacuum switch wire
   (h) (with A/C)
   VSV wire

6. **CONNECT ACCELERATOR CABLE TO CARBURETOR**
   Connect the cable to the carburetor and bracket.

7. **(w/ Air Pump)**
   CONNECT NO.3 AIR HOSE TO CHECK VALVE

8. **CONNECT TWO HEATER HOSES**

9. **CONNECT RADIATOR INLET HOSE TO WATER OUTLET**

10. **CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD**
    Connect the exhaust pipe with the three nuts to the exhaust manifold.

11. INSTALL AIR CLEANER

(a) Install the air cleaner on the carburetor.

(b) Connect the air hoses and air duct.

12. FILL WITH ENGINE OIL

Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient and recommended viscosity oil.

Capacity:

Dry fill **4.8 liters (5.1 US qts, 4.2 Imp. qts)**

Drain and refill

w/o Oil filter change

3.8 liters (4.0 US qts, 3.3 Imp. qts)

w/ Oil filter change

4.3 liters (4.5 US qts, 3.8 Imp. qts)

13. FILL WITH COOLANT

(See step 3 on page CO-3)

14. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

15. START ENGINE

Warm up the engine and inspect for leaks.

16. PERFORM ENGINE ADJUSTMENT

(a) Readjust the valve clearance.
(See page MA-8)

(b) Recheck ignition timing. (See step 1 on page IG-15)

(c) Adjust idle speed. (See step 13 on page MA-8)

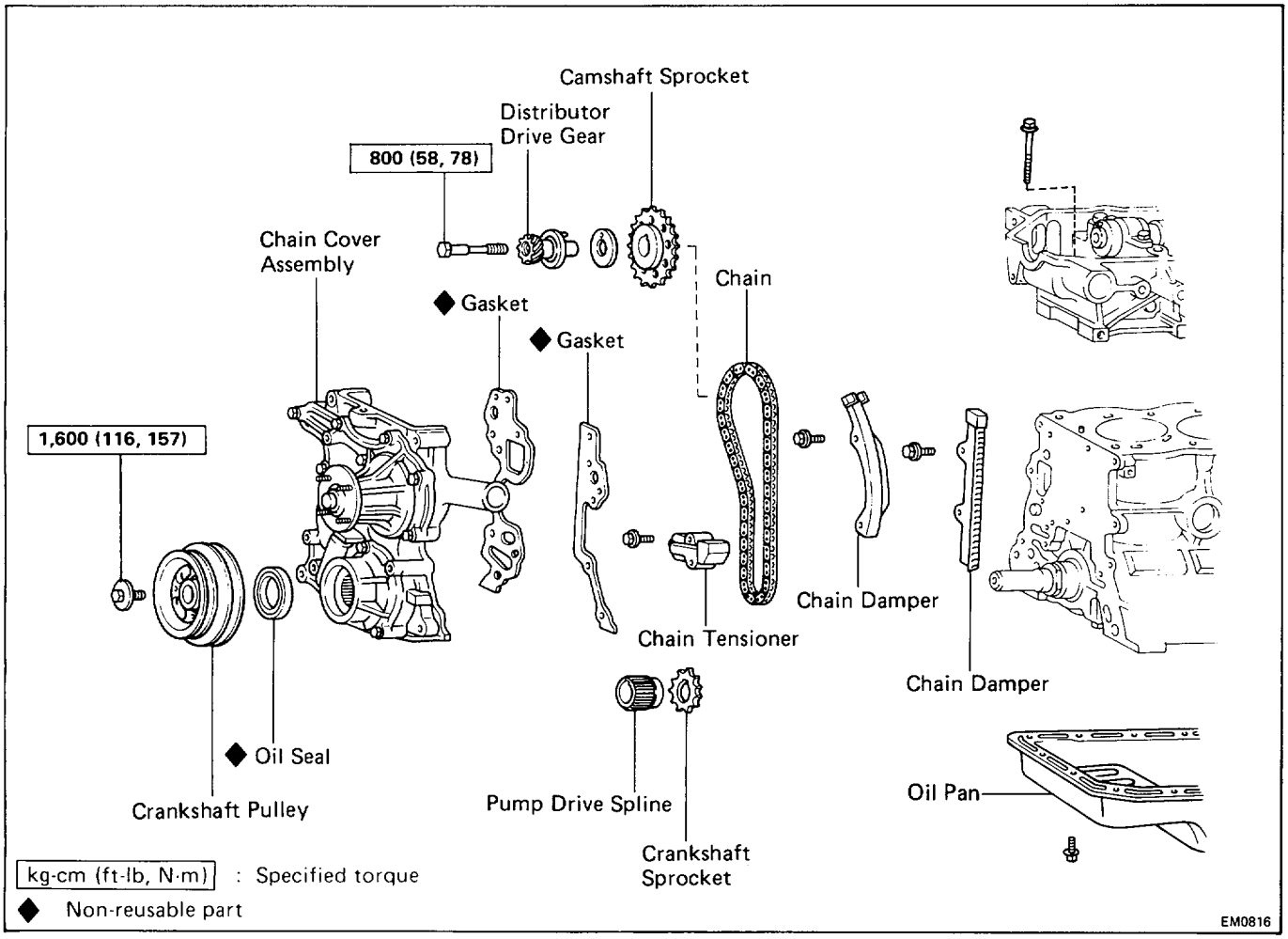
17. RECHECK COOLANT AND ENGINE OIL LEVEL

18. ROAD TEST

Road test the vehicle.

TIMING CHAIN

COMPONENTS



PREPARATION OF REMOVAL

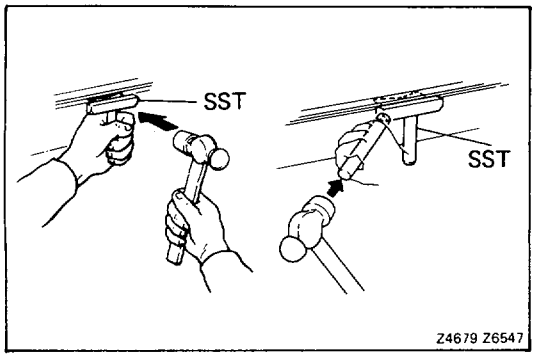
1. **REMOVE CYLINDER HEAD**
   (22R-E, 22R-TE See page EM-14)
   (22R See page EM-38)

2. **REMOVE RADIATOR**
   (See page CO-8)

3. **REMOVE OIL PAN**
   (a) Remove the engine undercover.
   (b) Remove the engine mounting bolts.
   (c) Place a jack under the transmission and raise the engine approx. 25 mm (0.98 in.).
   (d) Remove the sixteen bolts and two nuts.
   (e) Using SST and brass bar, separate the oil pan from the cylinder block.

   SST 09032-00100

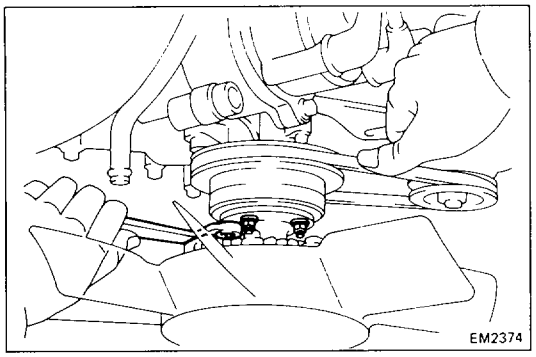
   NOTE: When removing the oil pan, be careful not to damage the oil pan flange.



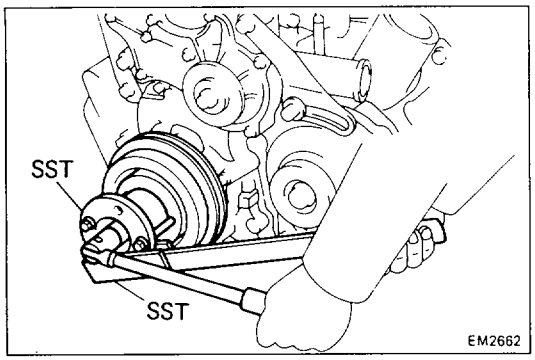
REMOVAL OF TIMING CHAIN

1. (w/ PS)
   REMOVE PS BELT

2. (with A/C)
   REMOVE A/C BELT, COMPRESSOR AND BRACKET

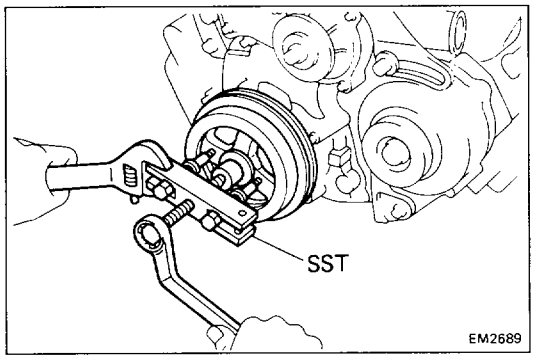


3. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
   (a) Loosen the water pump pulley set bolts.
   (b) Loosen the belt adjusting bolt and pivot bolt of the alternator, and remove the drive belt.
   (c) Remove the set nuts, fluid coupling with fan and water pump pulley.



4. REMOVE CRANKSHAFT PULLEY
   (a) (with A/C (w/o Air pump) or w/ PS (w/ Air pump)) Remove the No.2 crankshaft pulley.
   (b) Using SST to hold the crankshaft pulley, loosen the pulley bolt.

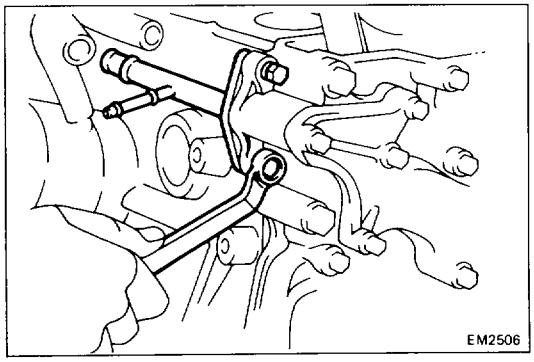
   SST 09213-70010 and 09330-00021



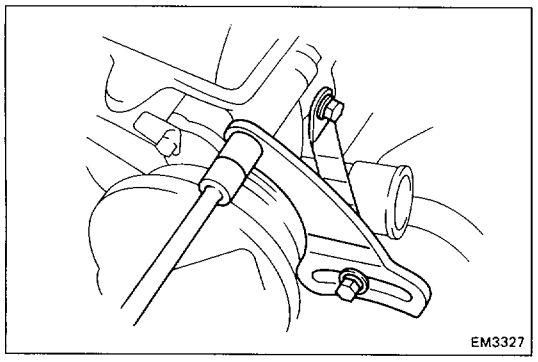
   (c) Using SST, remove the crankshaft pulley.

   SST 09213-31021

   NOTE: If the front seal is to be replaced, see page LU-6.



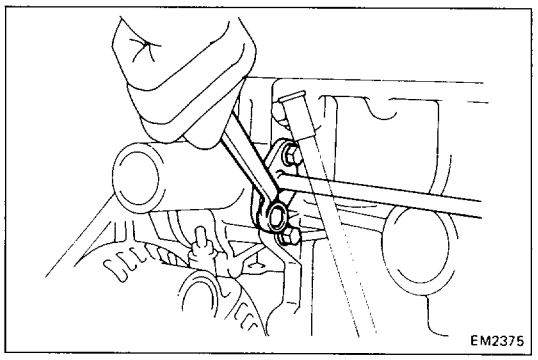
5. REMOVE NO.1 WATER BY-PASS PIPE
   (22R, 22R-E)
   Remove the two bolts and pipe.
   (22R-TE)
   Remove the two bolts, and disconnect the pipe from the timing chain cover.



6. REMOVE FAN BELT ADJUSTING BAR

(a) (w/ PS)
Remove the bolt and PS lower bracket.

(b) Remove the three bolts and bar.

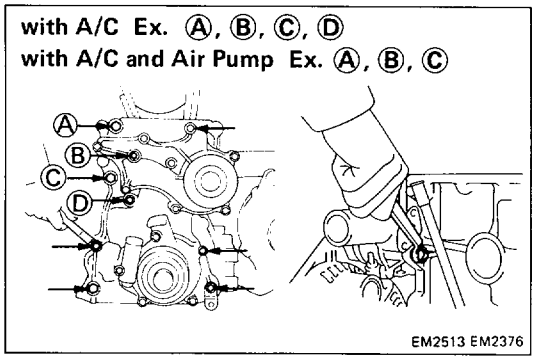


7. (22R, 22R-E)
DISCONNECT HEATER WATER OUTLET PIPE

Remove the two bolts, and disconnect heater water outlet pipe.

(22R-TE)
REMOVE NO.3 TURBO WATER PIPE

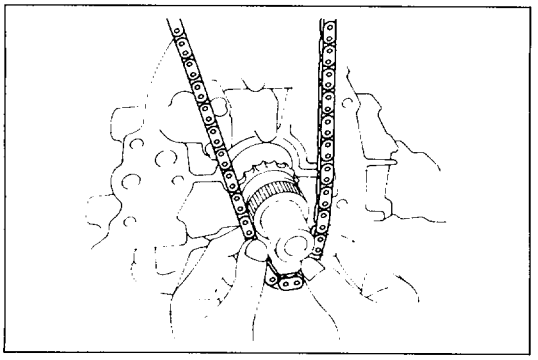
Remove the two bolts and No.3 turbo water pipe.



8. REMOVE CHAIN COVER ASSEMBLY

(a) Remove timing chain cover bolts shown by the arrows.

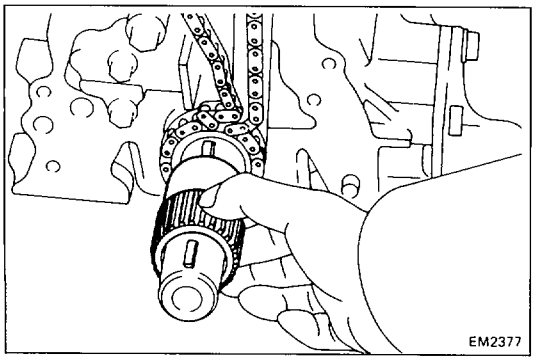
(b) Using a plastic faced hammer, loosen the chain cover and remove it.



9. REMOVE CHAIN AND CAMSHAFT SPROCKET

(a) Remove the chain from the damper.

(b) Remove the cam sprocket and chain together.

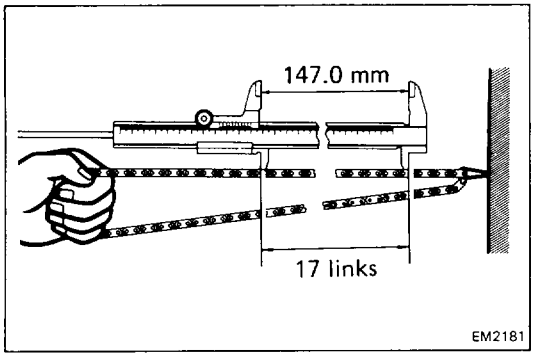


10. REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET

If the oil pump drive spline and sprocket cannot be removed by hand, use SST to remove them together.

SST 09213-36020

11. REMOVE GASKET MATERIAL ON CYLINDER BLOCK



INSPECTION OF COMPONENTS

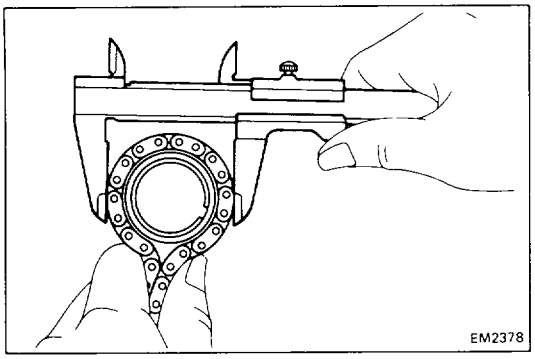
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain fully stretched.

(b) Make the same measurements at least three other places selected at random.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

If over the limit at any one place, replace the chain.

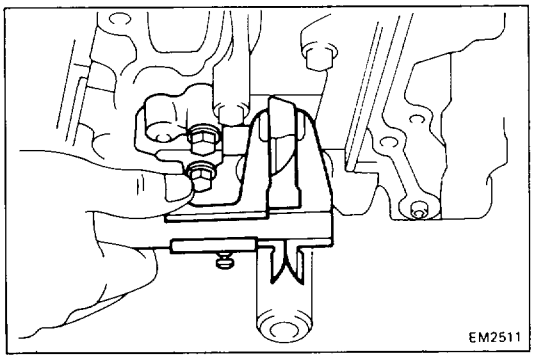


(c) Wrap the chain around the sprocket.

(d) Using a vernier caliper, measure the outer sides of the chain rollers as shown. Measure both sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)
Camshaft sprocket minimum: 113.8 mm (4.480 in.)

If the measurement is less than minimum, replace the chain and two sprockets.

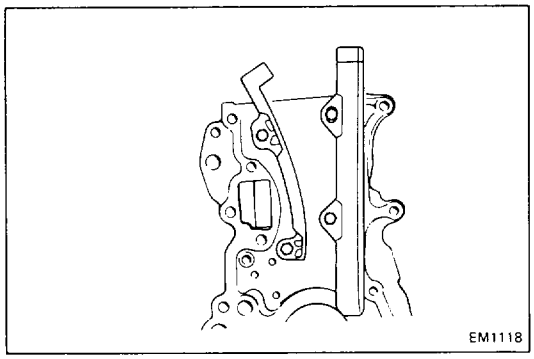


2. MEASURE CHAIN TENSIONER

Using a vernier caliper, measure the tensioner as shown.

Tensioner minimum: 11.0 mm (0.433 in.)

If the tensioner is worn or less than minimum, replace the chain tensioner.

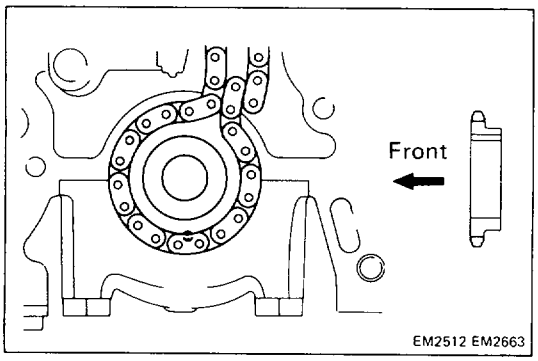


3. MEASURE CHAIN DAMPERS

Using a micrometer, measure each damper.

Damper wear limit: 0.5 mm (0.020 in.)

If either damper is worn or less than minimum, replace the damper.



INSTALLATION OF TIMING CHAIN

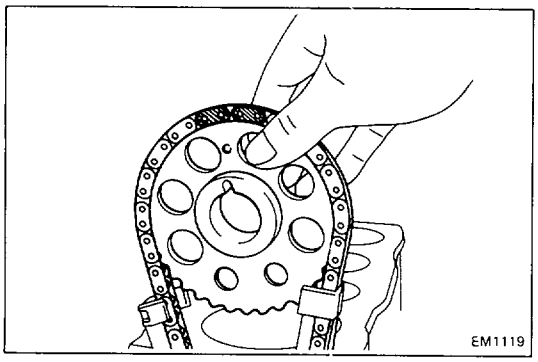
(See page EM-45)

1. INSTALL CRANKSHAFT SPROCKET AND CHAIN

(a) Turn the crankshaft until the shaft key is on top.

(b) Slide the sprocket over the key on the crankshaft.

(c) Place the timing chain on the sprocket with the single bright link aligned with the timing mark on the sprocket.

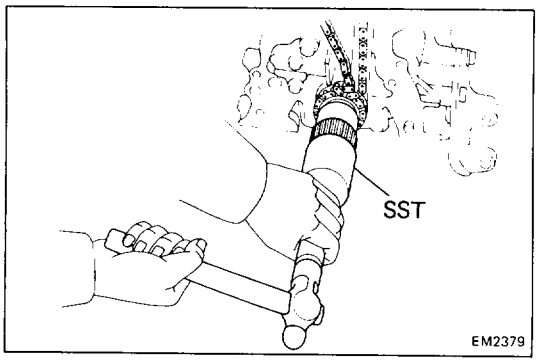


2. PLACE CHAIN ON CAMSHAFT SPROCKET

(a) Place the timing chain on the sprocket so that the space between the bright chain links is aligned with the timing mark.

(b) Make sure the chain is positioned dampers.

(c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.

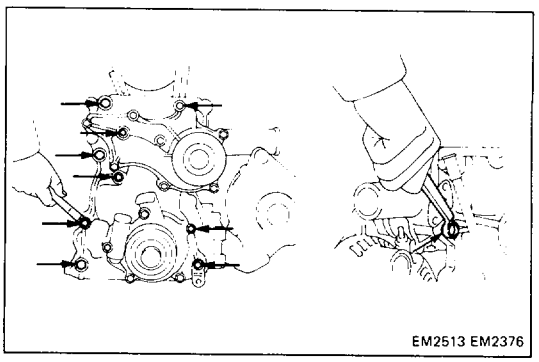


3. INSTALL OIL PUMP DRIVE SPLINE

Slide the oil pump drive spline over the crankshaft key.

NOTE: If the oil pump drive spline is difficult to install by hand, install using SST.

SST 09608-35014 (09608-06040)



4. INSTALL TIMING CHAIN COVER ASSEMBLY

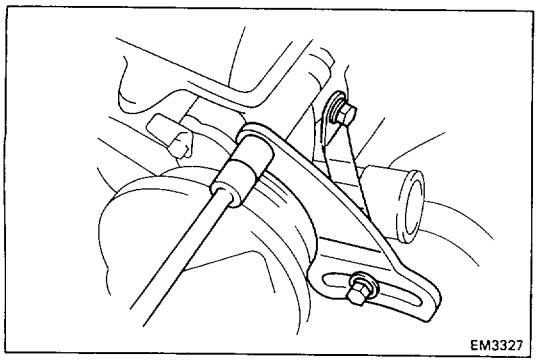
(a) Remove the old cover gaskets. Clean the gasket surface. Install new gaskets over the dowels.

(b) Slide the cover assembly over the dowels and pump spline.

(c) Insert the bolts as shown and torque them.

Torque:

8 mm bolt 130 kg-cm (9 ft-lb, 13 N·m)
10 mm bolt 400 kg-cm (29 ft-lb, 39 N·m)

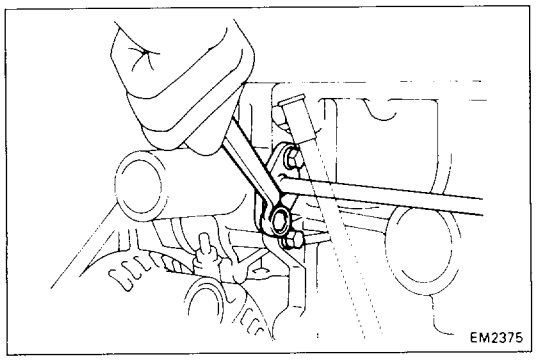


5. INSTALL FAN BELT ADJUSTING BAR

(a) Temporarily install the adjusting bar to the alternator.

(b) Install the adjusting bar to the chain cover and cylinder head.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

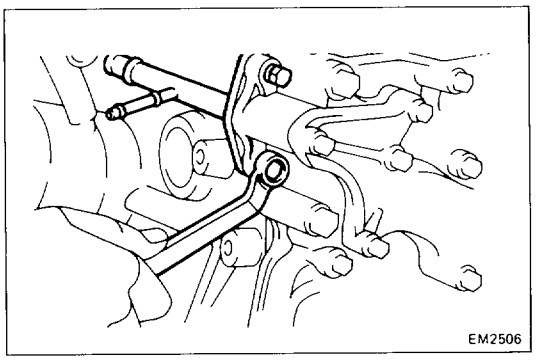


6. (22R, 22R-E)
INSTALL HEATER WATER OUTLET PIPE

Connect the heater water outlet pipe to the timing chain cover with two bolts.

(22R-TE)
INSTALL NO.3 TURBO WATER PIPE

Install the No.3 turbo water pipe with the two bolts.



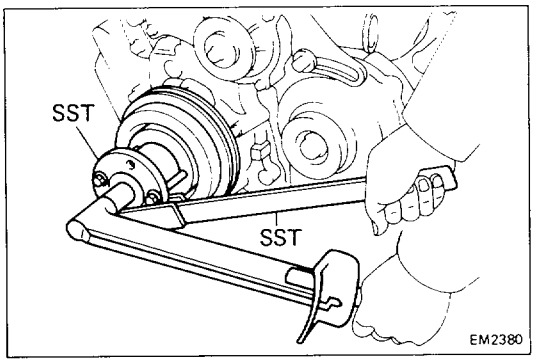
7. **INSTALL NO.1 WATER BY-PASS PIPE**

(22R, 22R-E)

Install the pipe with the two bolts.

(22R-TE)

Connect the pipe to the timing chain cover with the two bolts.



8. **INSTALL CRANKSHAFT PULLEY**

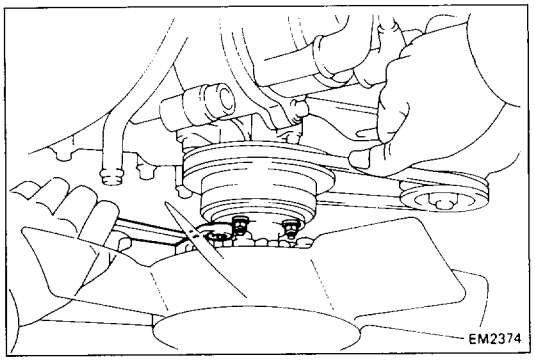
(a) Install the crankshaft pulley and bolt.

(b) Using SST to hold the crankshaft pulley, torque the bolt.

SST 09213-70010 and 09330-00021

Torque: 1600 kg-cm (116 ft-lb, 157 N·m)

(c) (with A/C)
Install the No.2 crankshaft pulley.



9. **INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN**

(a) Temporarily install the water pump pulley and fluid coupling with fan with four nuts.

(b) Place the drive belt on to each pulley.

(c) Stretch the belt tight and tighteen the four nuts.

10. **ADJUST DRIVE BELT TENSION**
(See page MA-4)

11. **(with A/C)**
INSTALL A/C COMPRESSOR BRACKET, COMPRESSOR AND BELT
(See page MA-4)

12. **(w/ PS)**
INSTALL PS BELT
(See page MA-4)

13. INSTALL OIL PAN

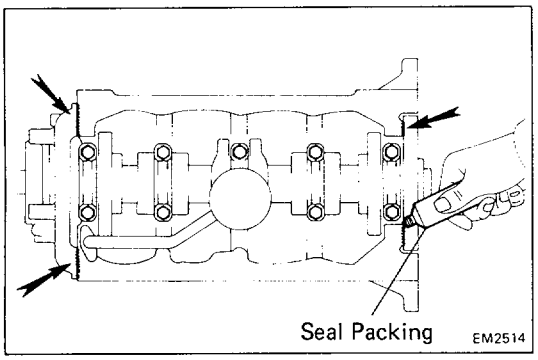
(a) Remove any old packing material and be careful no to drop any oil on the contacting surfaces of the oil pan and cylinder block.

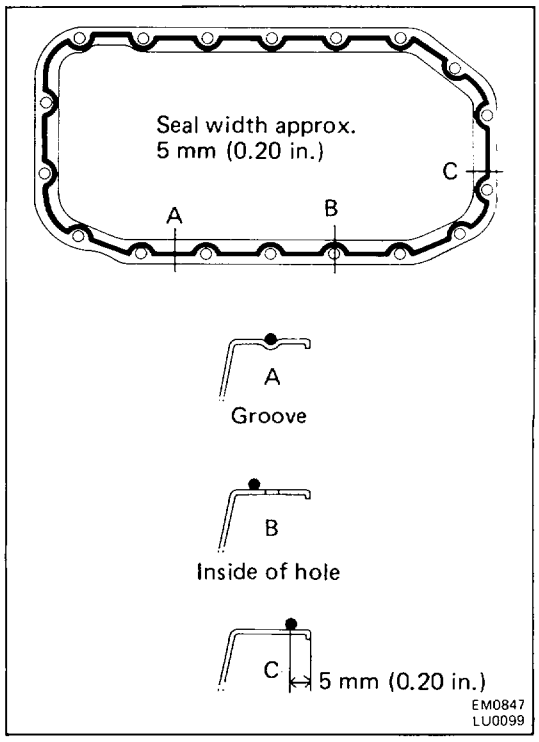
- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non-residue solvent.

CAUTION: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the joint part of the cylinder block and chain cover, cylinder block and rear oil seal retainer.

Seal packing: Part No. 08826-00080 or equivalent





(c) Apply seal packing to the oil pan as shown in the figure.

Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 5-mm (0.20 in.) opening.

NOTE: Avoid applying an excess amount to the surface. Be especially careful near oil passages.

- Parts must be assembled within 5 minutes of application. Otherwise, the material must be removed and re-applied.
- Immediately remove nozzle from tube and reinstall cap.

(d) Install the oil pan over the studs on the block with sixteen bolts and two nuts. Torque the bolts and nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(e) Lower the engine and install the engine mounting bolts.

(f) Intall the engine under cover.

POST INSTALLATION

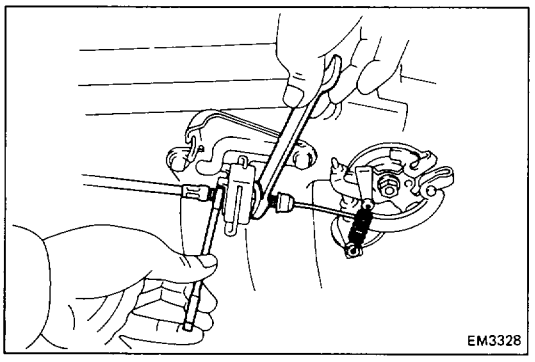
1. INSTALL RADIATOR

2. INSTALL CYLINDER HEAD
(22R-E, 22R-TE See page EM-32)
(22R See page EM-42)

22R-E, 22R-TE
CYLINDER BLOCK

PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE ENGINE UNDER COVER
3. REMOVE ENGINE HOOD
   Disconnect the washer hose from the hood.
4. DRAIN ENGINE OIL
5. DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK
6. (A/T)
   DRAIN AUTOMATIC TRANSMISSION FLUID
7. REMOVE AIR CLEANER HOSE AND AIR CLEANER
8. REMOVE RADIATOR WITH SHROUD
   (a) (A/T)
   Disconnect the two cooler hoses.
   (b) Disconnect the radiator upper and lower hoses from the engine.
   (c) (22R-TE)
   Disconnect the No.1 turbo water hose.
   (d) Disconnect the reservoir hose.
   (e) (with A/C)
   Remove the No.2 fan shroud.
   (f) Remove the radiator with the shroud.
9. REMOVE COUPLING FAN WITH FAN

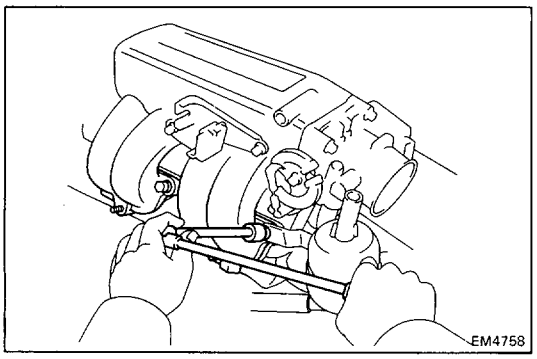

EM3328

10. DISCONNECT TWO HEATER HOSES
11. DISCONNECT CABLES FROM BRACKET
    Disconnect the accelerator cable and throttle cable for A/T from the bracket.
12. DISCONNECT FOLLOWING PARTS:
    (a) No.1 and No.2 PCV hose
    (b) Brake booster hose
    (c) Air control valve hoses
    (d) EVAP hose (from canister)
    (e) (w/ cruise control)
    Actuater hose
    (f) EGR vacuum modulator hose
    (g) No.1 air valve hose from the throttle body
    (h) No.2 air valve hose from the chamber
    (i) No.2 and No.3 water by-pass hose from the throttle body

(j) Air control valve hose for the actuator
(k) Pressure regulator hose from the chamber
(l) Cold start injection pipe
(m) BVSV hoses

13. DISCONNECT FOLLOWING WIRES:

(a) Cold start injection wire
(b) Throttle position sensor wire
(c) (Calif. and C&C)
EGR gas temp. sensor wire



14. REMOVE CHAMBER WITH THROTTLE BODY

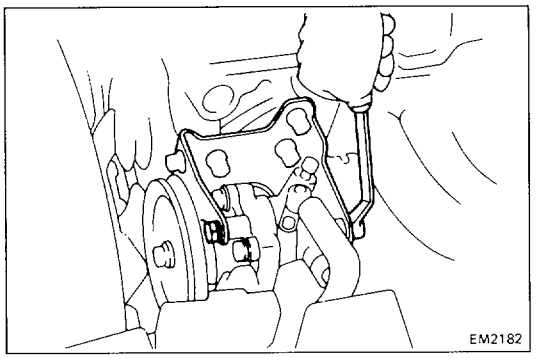
(a) Remove the two bolts holding the EGR valve to the chamber.
(b) Disconnect the chamber from the stay.
(c) Remove the bolts and nuts holding the chamber to the intake manifold.
(d) Remove the chamber with the throttle body, resonator and ground strap, return hose clamp.

15. DISCONNECT FOLLOWING WIRES:

(a) Cold start injector time switch wire
(b) Water temp. sensor wire
(c) (with A/C)
VSV wire
(d) (22R-TE)
Oxygen sensor wire
(e) (A/T)
OD temp. switch wire
(f) Injector wires
(g) (with A/C)
A/C compressor wire
(h) Knock sensor connector
(i) Air valve wire
(j) Oil pressure switch wire
(k) Starter wire

REMOVAL OF CYLINDER BLOCK

1. **DISCONNECT FOLLOWING PARTS:**
   (a) Alternator wires
   (b) High-tension cord for ignition coil
   (c) Distributor wire from igniter

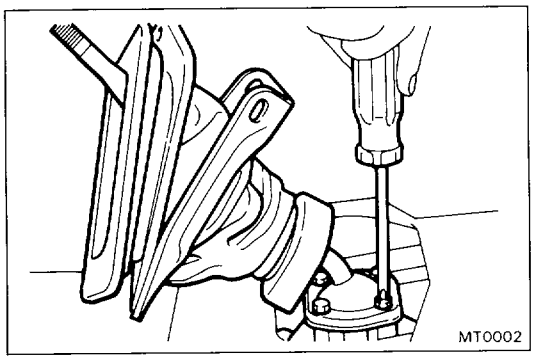


2. **(w/ PS)**
   REMOVE VANE PUMP FROM BRACKET
   (a) Remove the drive belt.
   (b) Remove the four bolts.
   (c) Remove the PS pump.
   NOTE: Lay the PS pump to one side without disconnecting the hoses.

3. **DISCONNECT GROUND STRAP FROM VANE PUMP BRACKET**

4. **(with A/C)**
   REMOVE COMPRESSOR FROM BRACKET
   (a) Loosen the drive belt adjusting bolt and remove the drive belt.
   (b) Remove the compressor on the front side without disconnecting the hoses.

5. **DISCONNECT GROUND STRAPS FROM ENGINE REAR SIDE AND RH SIDE**

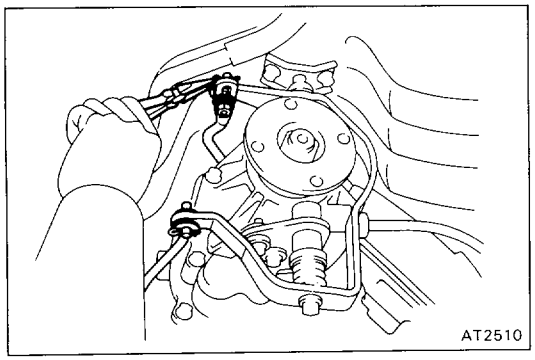


6. **(M/T)**
   REMOVE SHIFT LEVER FROM INSIDE OF VEHICLE

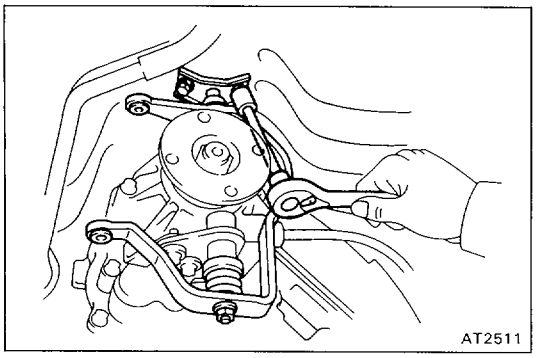
7. **(R150)**
   REMOVE SHIFT LEVER RETAINER

8. **REMOVE REAR PROPELLER SHAFT**
   (See page 2WD PR-3)
   (See page 4WD PR-5)

9. **(A/T)**
   DISCONNECT MANUAL SHIFT LINKAGE FROM NEUTRAL START SWITCH



10. **(4WD A/T)**
    DISCONNECT TRANSFER SHIFT LINKAGE
    (a) Disconnect the No.1 and No.2 transfer shift linkages from the cross shaft.



(b) Remove the cross shaft from the body.

11. **DISCONNECT SPEEDOMETER CABLE**

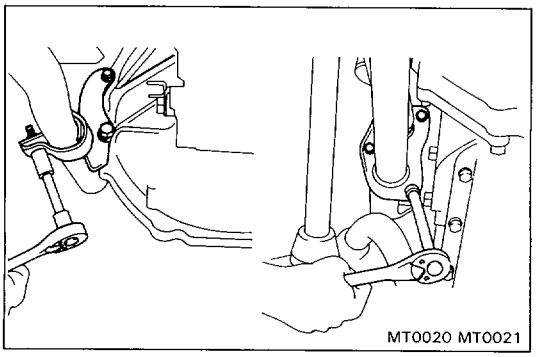
CAUTION: Do not lose the felt dust protector and washers.

12. **(4WD)**
REMOVE TRANSFER UNDER COVER

13. **(4WD)**
REMOVE STABILIZAR BAR

14. **(4WD)**
REMOVE FRONT PROPELLER SHAFT
(See page PR-4)

15. **REMOVE NO.1 FRAME CROSSMEMBER**



16. **REMOVE FRONT EXHAUST PIPE**

(a) (22R-E)

Remove the LH front door scuff plate.

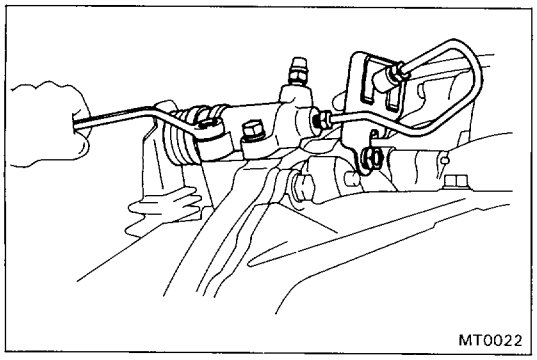
(b) (22R-E)

Disconnect the oxygen sensor connector.

(c) Disconnect the exhaust pipe from the exhaust manifold.

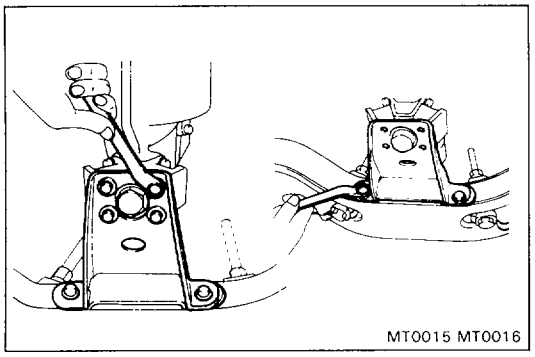
(d) Remove the exhaust pipe clamp from the clutch housing.

(e) Remove the exhaust pipe from the catalytic converter.



17. **(M/T)**
REMOVE CLUTCH RELEASE CYLINDER WITH BRACKET FROM TRANSMISSION

18. **(4WD)**
REMOVE NO.1 FRONT FLOOR HEAT INSULATOR AND BRAKE TUBE HEAT INSULATOR

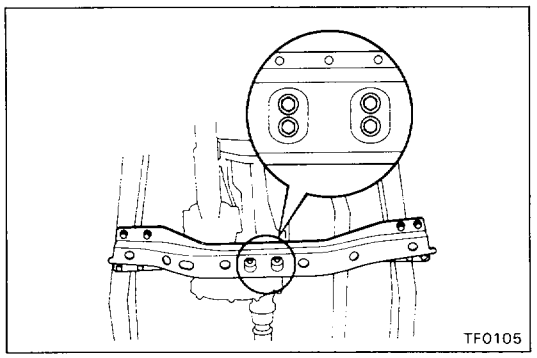

MT0015 MT0016

19. (2WD)
REMOVE ENGINE REAR MOUNTING AND BRACKET

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly by raising the engine with a jack.

(c) Remove the four bolts from the support member.


TF0105

(4WD)
REMOVE FRAME CROSSMEMBER NO.2 FROM SIDE FRAME

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly with a jack.

(c) Remove the four bolts from the side frame and remove the No.2 frame crossmember.

20. REMOVE ENGINE WITH TRANSMISSION FOR VEHICLE

(a) Attach the engine hoist chain to the lift brackets of the engine.

(b) Remove the mounting nuts and bolts.

(c) Lift the engine out of the vehicle slowly and carefully.

NOTE: Make sure the engine is clear of all wiring and hoses.

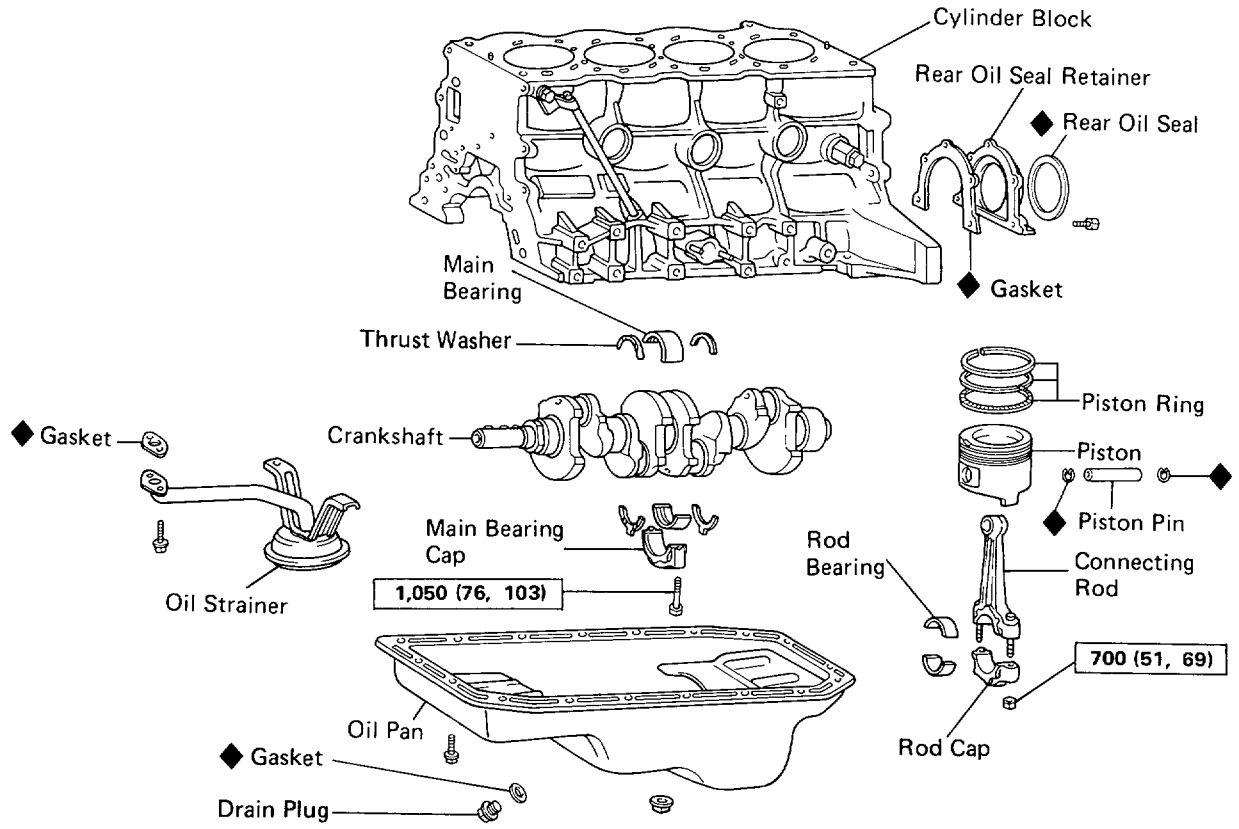
21. REMOVE TRANSMISSION FROM ENGINE

(a) Remove the starter.

(b) Remove the two stiffener plates and exhaust pipe bracket from engine.

(c) Remove the transmission from the engine.

COMPONENTS



PREPARATION FOR DISASSEMBLY

1. (M/T)
   REMOVE CLUTCH COVER AND DISC
   (See page CL-10)
2. REMOVE FLYWHEEL (M/T) OR DRIVE PLATE (A/T) AND REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
   (See page EM-14)
5. REMOVE TIMING CHAIN (See page EM-45)
6. REMOVE ALTERNATOR (See page CH-5)

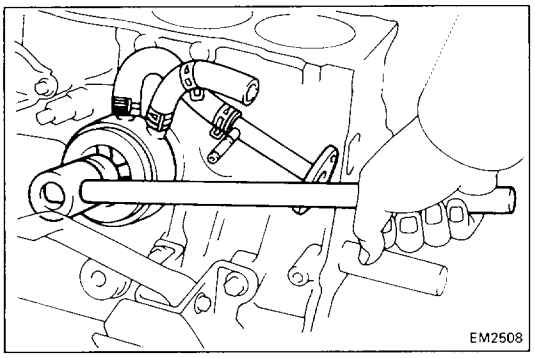
DISASSEMBLY OF CYLINDER BLOCK

1. REMOVE LH ENGINE MOUNTING BRACKET AND ALTERNATOR BRACKET

2. REMOVE CHAIN DAMPERS

3. REMOVE CHAIN TENSIONER

4. REMOVE OIL FILTER
(See step 2 on page LU-3)


EM2508

5. (22R-TE)
REMOVE OIL COOLER

Remove the oil cooler relief valve, gasket and oil cooler.

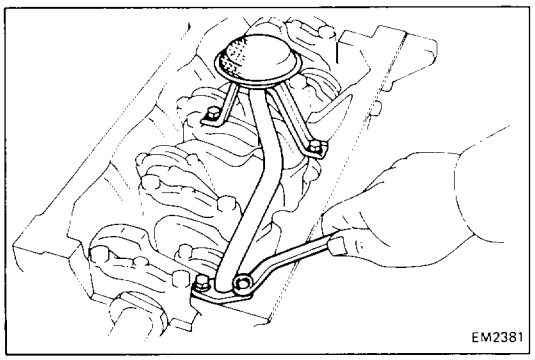
6. REMOVE RH ENGINE MOUNTING BRACKET, CHAMBAR STAY AND GROUND STRAP

7. (A/T)
REMOVE FLEXIBLE HOSE CLAMP

8. REMOVE OIL PRESSURE SENDER GAUGE OR SWITCH

9. REMOVE KNOCK CONTROL SENSOR

10. REMOVE FUEL FILTER AND BRACKET

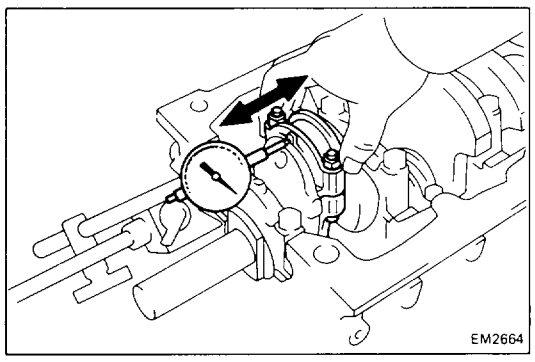

EM2381

11. REMOVE OIL STRAINER

Remove the four bolts, strainer and gasket.

12. REMOVE REAR OIL SEAL RETAINER

Remove the five bolts, rear oil seal retainer and gasket.

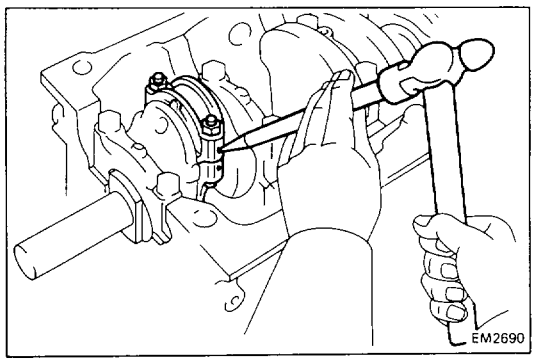

EM2664

13. MEASURE CONNECTING ROD THRUST CLEARANCE

Using a dial gauge, measure the thrust clearance.

Standard clearance: 0.16 — 0.26 mm (0.0063 — 0.0102 in.)
Maximum clearance: 0.3 mm (0.012 in.)

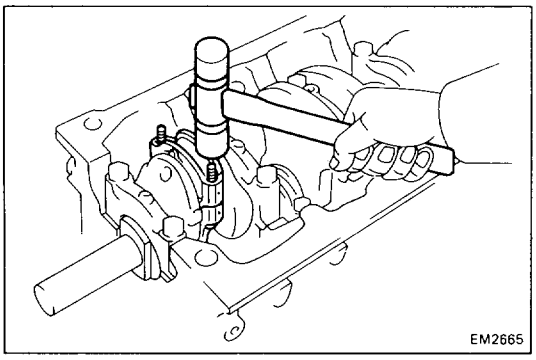
If clearance is greater than maximum, replace the connecting rod and/or crankshaft.


EM2690

14. MEASURE OIL CLEARANCE

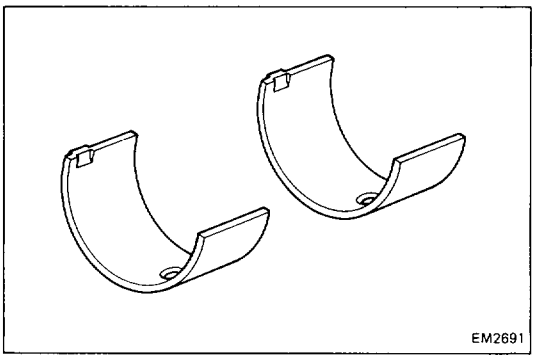
(a) Using a punch or numbering stamp, mark connecting rods and caps to ensure correct reassembly.

(b) Remove the rod cap nuts.



(c) Using a plastic-faced hammer, tap the rod bolts lightly and lift off the rod cap.

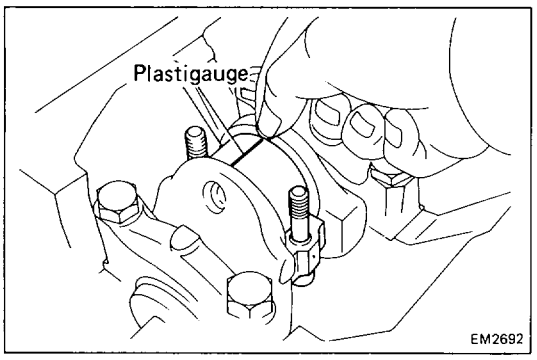
NOTE: Keep the bearing inserted with the cap.



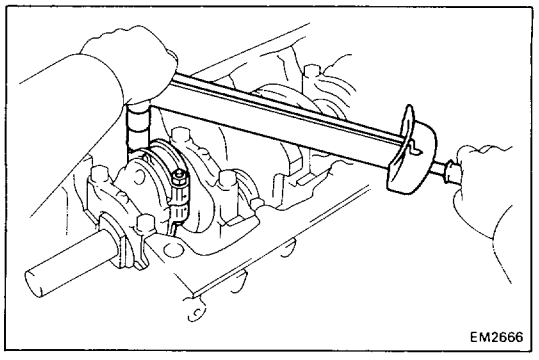
(d) Clean the bearings and crankshaft pins.

(e) Inspect each bearing for pitting and radial scratches.

If bearings are damaged, replace.



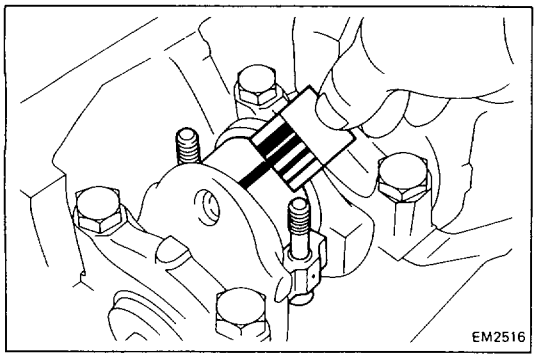
(f) Lay a strip of Plastigage across the crankshaft pin.



(g) Align the rod and cap marks and fit on the cap. Torque the rod cap nuts.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

NOTE: Do not turn the crankshaft.



(h) Remove the rod cap.

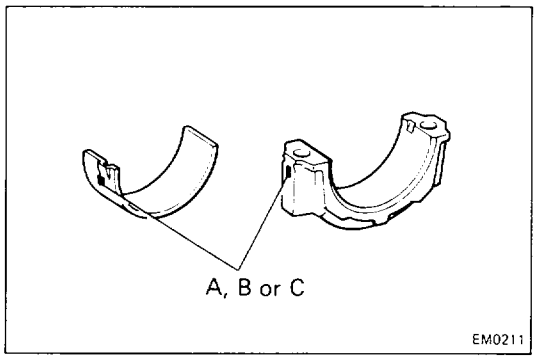
(i) Measure the Plastigage at its widest point.

Standard clearance: 0.025 — 0.055 mm (0.0010 — 0.0022 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the bearings and/or grind the crank pins.

Undersized bearing: U/S 0.25

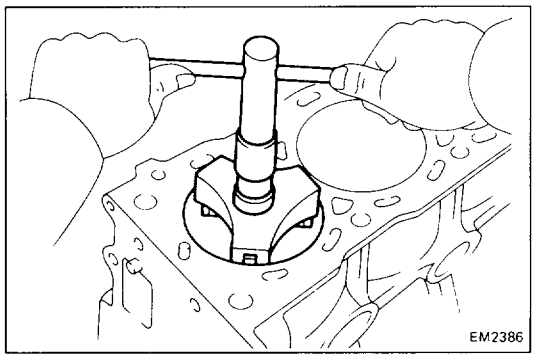


NOTE: If using standard bearing, replace with one having the same number as maked on the bearing cap. There are three sizes of standard bearings, marked A, B, C accordingly.

mm (in.)

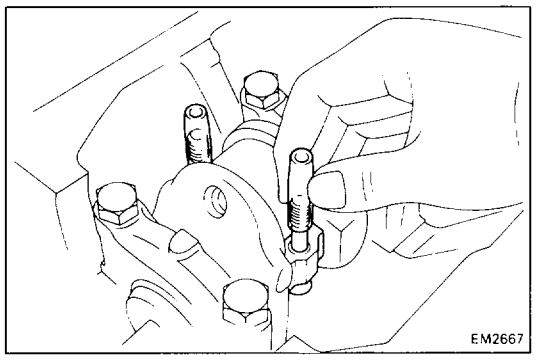
Size	Big End Inner Diameter	Crank Pin Diameter	Bearing Center Wall Thickness
A	56.000 – 56.006 (2.2047 – 2.2050)	52.988 – 53.000 (2.0861 – 2.0866)	1.484 – 1.488 (0.0584 – 0.0586)
B	56.006 – 56.012 (2.2050 – 2.2052)		1.488 – 1.492 (0.0586 – 0.0587)
C	56.012 – 56.018 (2.2052 – 2.2054)		1.492 – 1.496 (0.0587 – 0.0589)
U/S 0.25	56.000 – 56.018 (2.2047 – 2.2054)	52.701 – 52.711 (2.0748 – 2.0752)	1.626 – 1.636 (0.0640 – 0.0644)

(j) Clean out the pieces of Plastigage from the bearings and journals.



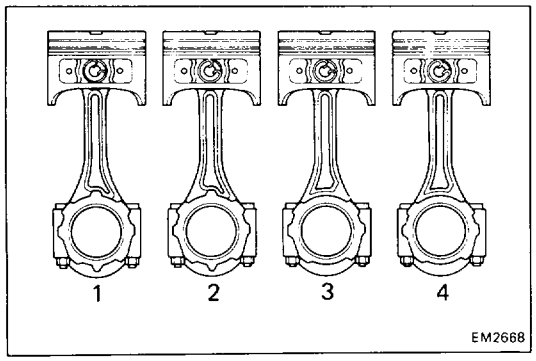
15. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

(a) Remove all the carbon from top of the bore to the top of the cylinder.

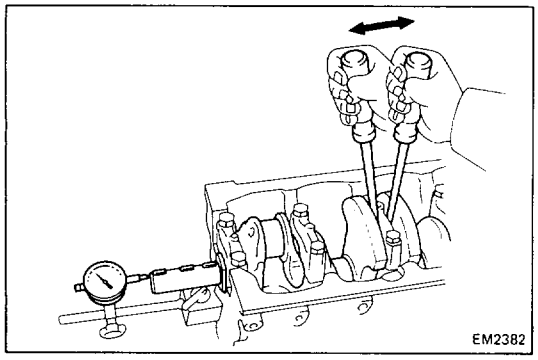


(b) Cover the rod bolts with a short piece of hose to protect the crank pin from damage.

(c) Push the piston and connecting rod assembly out through the top of the cylinder block.



(d) Arrange the piston and connecting rod caps in order.



16. MEASURE CRANKSHAFT THRUST CLEARANCE

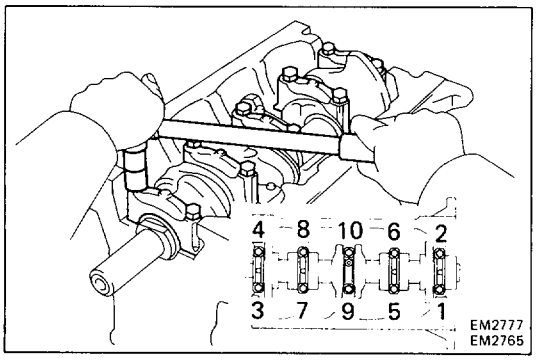
Using a dial gauge, measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard clearance: **0.02 — 0.22 mm (0.0008 — 0.0087 in.)**
Maximum clearance: **0.3 mm (0.012 in.)**

If the clearance is greater than maximum, replace the thrust washer.

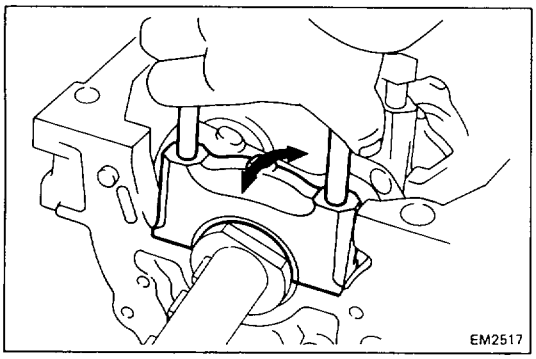
Thrust whasher thickness:

Standard	**2.690 — 2.740 mm (0.1059 — 0.1079 in.)**
O/S 1.25	**2.753 — 2.803 mm (0.1084 — 0.1104 in.)**
O/S 2.50	**2.815 — 2.865 mm (0.1108 — 0.1128 in.)**



17. MEASURE OIL CLEARANCE

(a) Gradually loosen and remove the bearing cap bolts in three passes and in the numerical order shown.



(b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No. 3 journal only).

NOTE:

- Keep the lower bearing inserted with the cap.
- Arrange the caps and lower thrust washers in correct order.

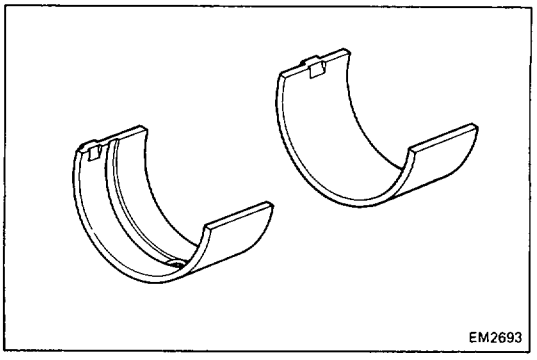
(c) Lift off the crankshaft.

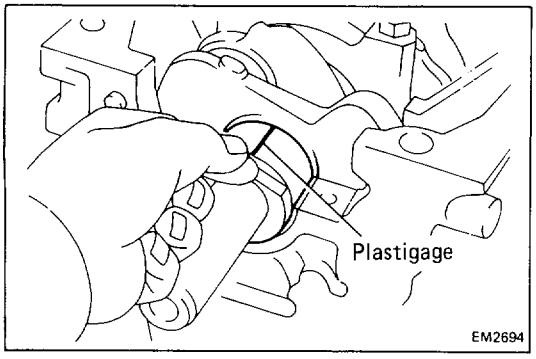
NOTE: Keep the upper bearings and upper thrust washers (for the No. 3 journal only) inserted in the cylinder block.

(d) Clean the journals and bearings.

(e) Check the journals and bearings for pitting and scratches.

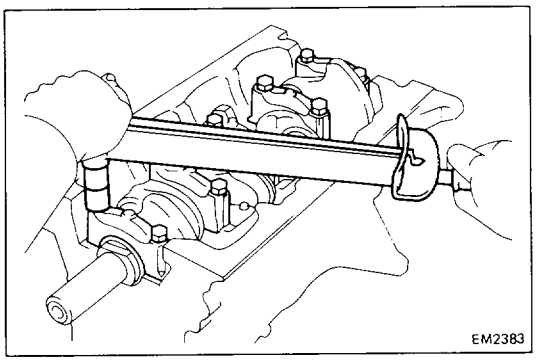
If the journal or bearing is damaged, grind or replace the crankshaft and replace the bearing.





(f) Install the upper main bearings on the cylinder block and crankshaft.

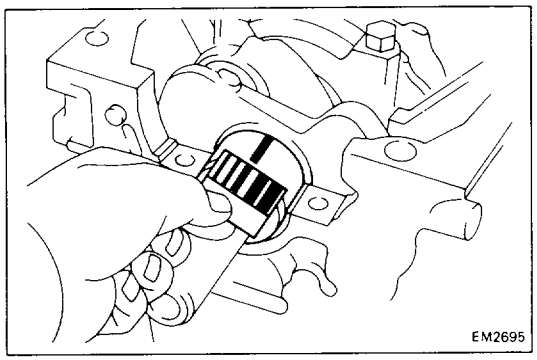
(g) Lay a strip of Plastigage across the main journals.



(h) Install the main bearing caps. Torque the cap bolts.

Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

NOTE: Do not turn the crankshaft.



(i) Remove the main bearing caps.

(j) Measure the Plastigage at its widest point.

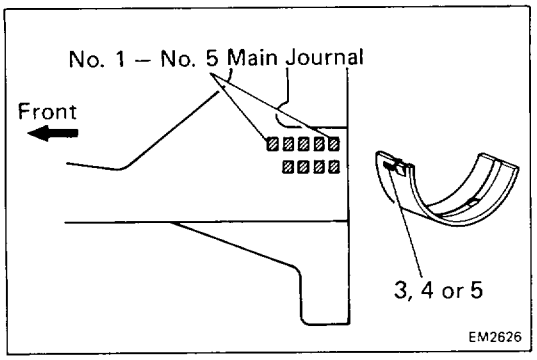
Standard clearance: 0.025 — 0.055 mm (0.0010 — 0.0022 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

If the clearance is greater than maximum, replace the bearings and/or grind the main journals.

Undersized bearing: U/S 0.25

(k) Clean out the pieces of Plastigage from the bearings and journals.



NOTE: If using a standard bearing, replace with one having the same number as maked on the cylinder block. There are three sizes of standard bearings, marked 3, 4, 5 accordinly.

mm (in.)

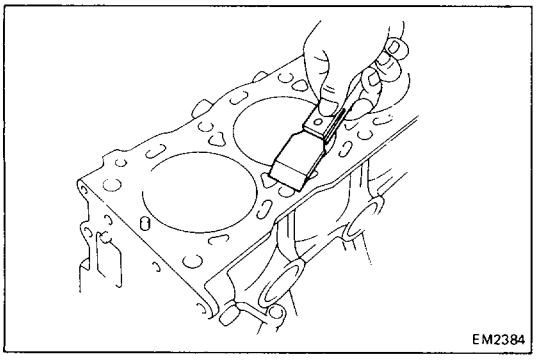
Size	Cylinder Block Main Journal Bore	Main Journal Diameter	Bearing Center Wall Thickness
3	64.004 — 64.010 (2.5198 — 2.5201)	59.984 — 60.000 (2.3616 — 2.3622)	1.988 — 1.992 (0.0783 — 0.0784)
4	64.010 — 64.016 (2.5201 — 2.5203)		1.992 — 1.996 (0.0784 — 0.0786)
5	64.016 — 64.022 (2.5203 — 2.5205)		1.996 — 2.000 (0.0786 — 0.0787)
U/S 0.25	64.004 — 64.022 (2.5198 — 2.5205)	59.701 — 59.711 (2.3504 — 2.3508)	2.126 — 2.136 (0.0837 — 0.0841)

18. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings from the cylinder block.

(c) Arrange the caps and bearings in order.


EM2384

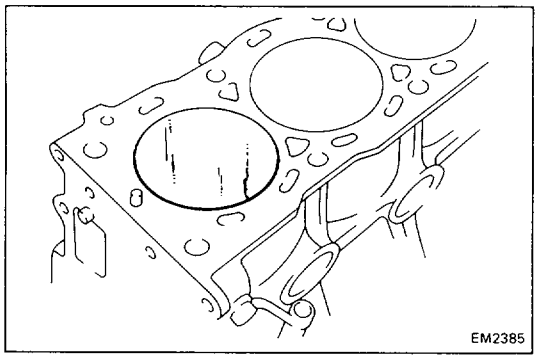
INSPECTION OF CYLINDER BLOCK

1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from cylinder block surfaces.

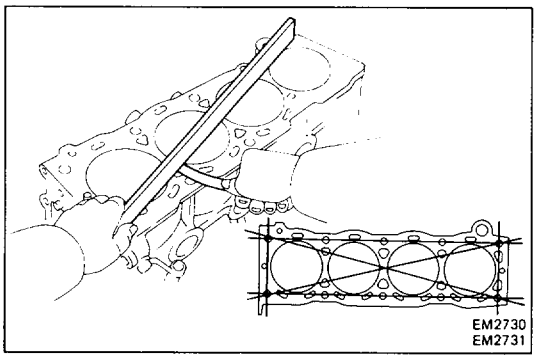
2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, clean the block.


EM2385

3. INSPECT CYLINDERS

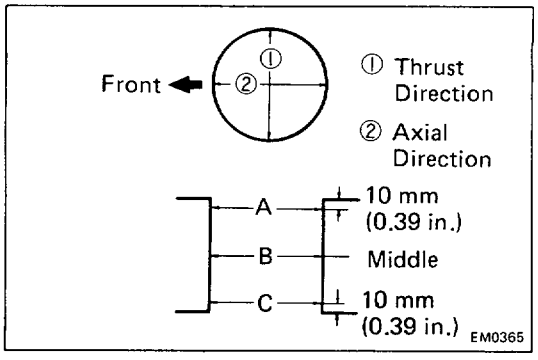
Visually inspect cylinders for vertical scratches. If deep scratches are present, rebore all four cylinders.


EM2730
EM2731

4. INSPECT CYLINDER BLOCK WARPAGE

Warpage limit: 0.05 mm (0.0020 in.)

If warpage is greater than specified value, replace the cylinder block.



5. MEASURE CYLINDER BORE

Using a cylinder micrometer, measure the cylinder bore at positions A, B and C in the thrust and axial directions. If any of the following measurements is not within specifications rebore all four cylinders.

(a) Cylinder diameter greater than maximum.

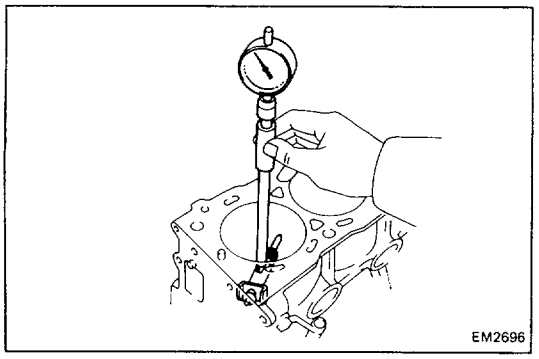
Standard size piston
Maximum diameter: 92.03 mm (3.6232 in.)
Oversized piston (O/S 0.50)
Maximum diameter: 92.53 mm (3.6429 in.)
Oversized piston (O/S 1.00)
Maximum diameter: 93.03 mm (3.6626 in.)

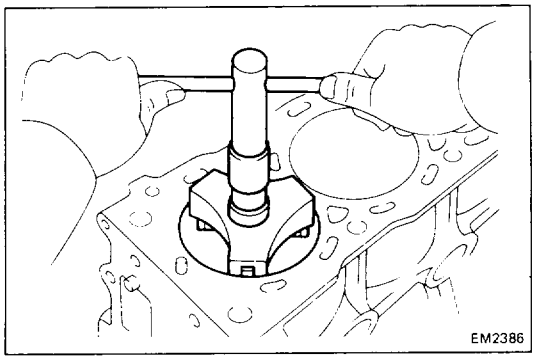
(b) Difference between measurements A, B and C is greater than the taper limit.

Taper limit: 0.01 mm (0.0004 in.)

(c) Difference between the thrust and axial measurements is greater than the out-of-round limit.

Out-of-round limit: 0.02 mm (0.0008 in.)

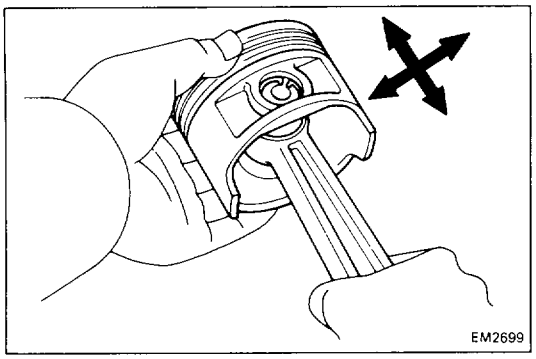

EM2696



6. REMOVE CYLINDER RIDGE

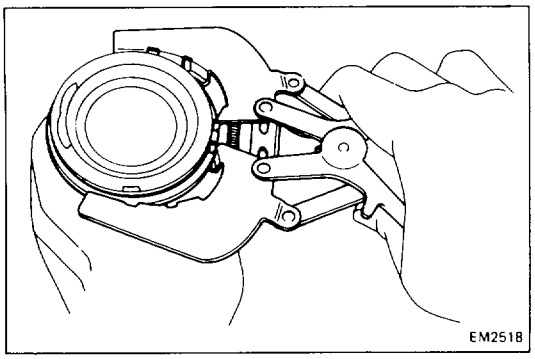
If wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the top of the cylinder.

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY



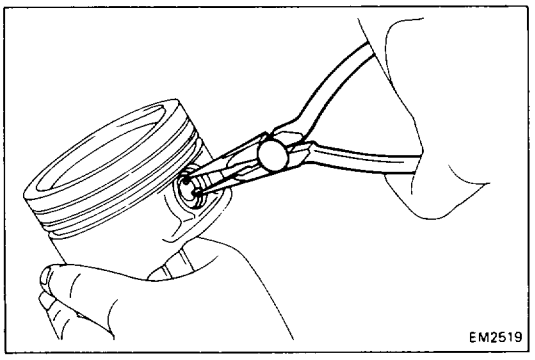
1. CHECK FIT BETWEEN PISTON AND PIN

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



2. REMOVE PISTON RINGS

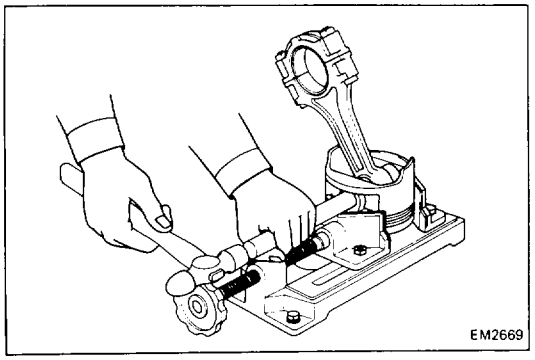
Using a piston ring expander, remove the piston rings. Keep the rings for each cylinder separated.



3. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using needle-nose pliers, remove the snap rings from the piston.

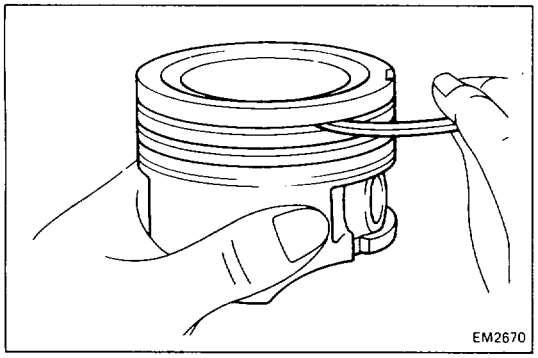
(b) Heat the piston in hot water approx. 60°C (140°F).



(c) Using a plastic-faced hammer and brass bar, tap the pin lightly to remove the pin from the piston.

NOTE:

- The piston and pin are a matched set.
- Keep the piston, pin, rings and connecting rod together for each cylinder.



INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY

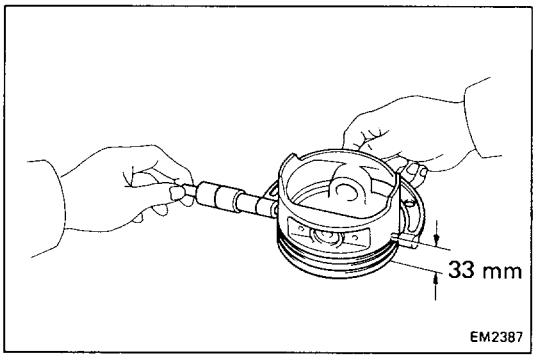
1. CLEAN PISTON

(a) Scrape off carbon from the piston top.

(b) Using a groove cleaning tool or broken ring, clean the ring grooves.

(c) Using solvent and a brush, clean the piston thoroughly.

CAUTION: Do not use a wire brush.

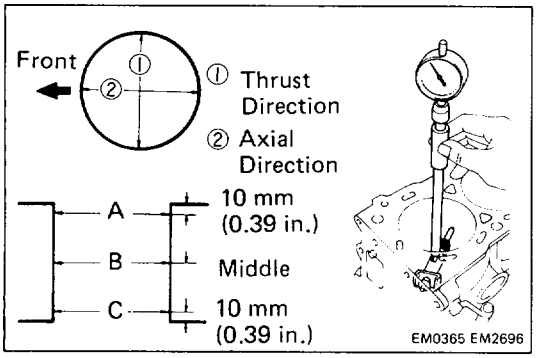


2. MEASURE PISTON DIAMETER

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 33 mm (1.30 in.) from the piston head.

Standard diameter:

22R, 22R-E	91.970 — 92.000 mm (3.6209 — 3.6220 in.)
22R-TE	91.935 — 91.965 mm (3.6195 — 3.6207 in.)

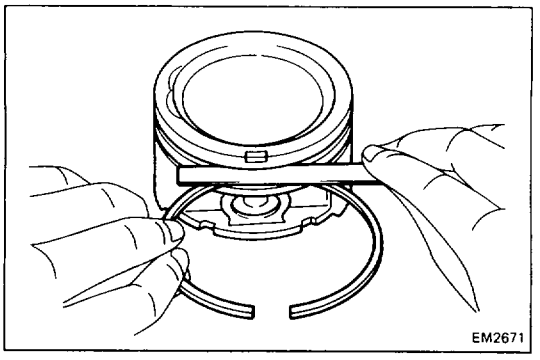


(b) Check that the difference between the cylinder diameter and the piston diameter is within specification.

Piston clearance:

22R, 22R-E	0.02 — 0.04 mm (0.0008 — 0.0016 in.)
22R-TE	0.055 — 0.075 mm (0.0022 — 0.0030 in.)

If not within specification, replace the piston and/or rebore the cylinder and install new piston.



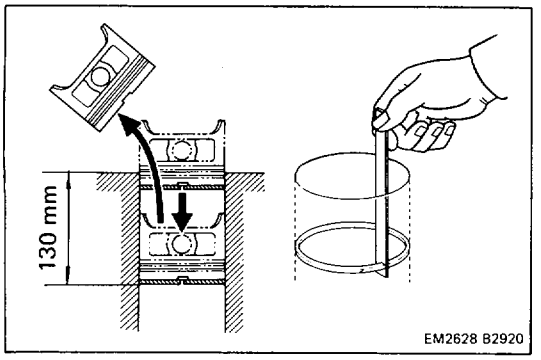
3. MEASURE CLEARANCE BETWEEN PISTON GROOVE AND PISTON RING

Using a thickness gauge, measure the clearance between the piston ring and the ring land.

Standard ring groove clearnce: 0.03 — 0.07 mm (0.0012 — 0.0028 in.)

Maximum ring groove clearance: 0.2 mm (0.008 in.)

If the clearance is greater than maximum, replace the piston.



4. MEASURE RING END GAP

Measure the ring end gap.

(a) Insert the piston ring into the cylinder.

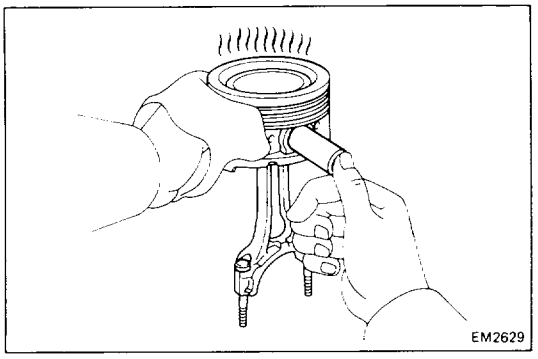
(b) Using a piston, push the ring a little beyond the bottom of the ring travel.
(130 mm (5.12 in.) from top surface of cylinder block)

(c) Using a thickness gauge, measure the end gap.

Ring end gap:

Standard	**No.1**	**0.25 — 0.47 mm (0.0098 — 0.0185 in.)**
	No.2	**0.60 — 0.82 mm (0.0236 — 0.0323 in.)**
	Oil	**0.20 — 0.57 mm (0.0079 — 0.0224 in.)**
Maximum	**No.1**	**1.07 mm (0.0421 in.)**
	No.2	**1.42 mm (0.0559 in.)**
	Oil	**1.17 mm (0.0461 in.)**

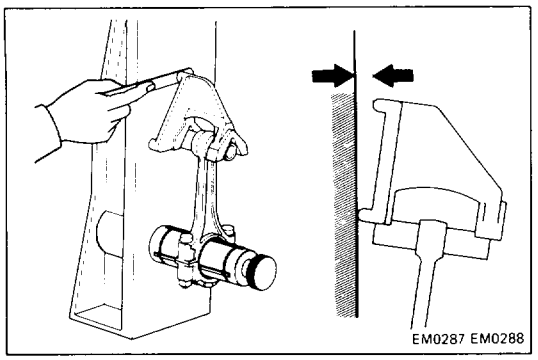
If not within specification, replace the ring. Do not file the ring end.


EM2629

5. INSPECT PISTON PIN FIT

At 80°C (176°F), you should be able to push the pin into the piston with your thumb.

If the pin can be installed at a lower temperature, replace it and the piston.


EM0287 EM0288

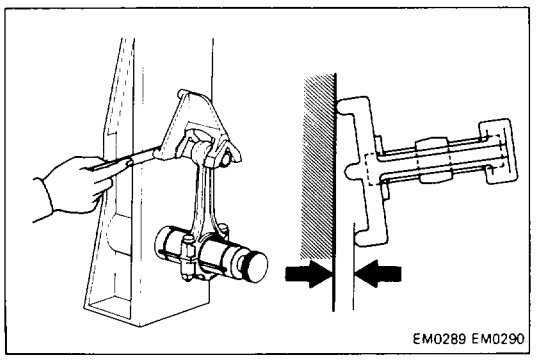
6. INSPECT CONNECTING RODS

(a) Using a rod aligner, check the connecting rod alignment.

If the rod is bent or twisted, replace the connecting rod.

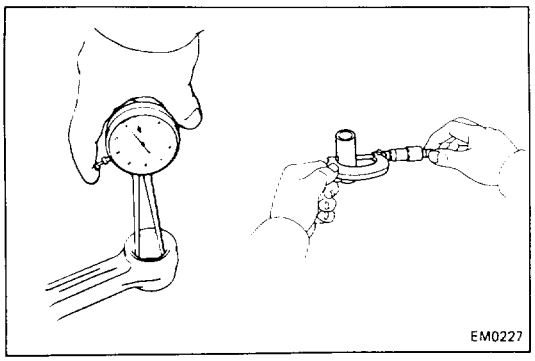
- Check that the rod is not bent.

Bend limit: 0.05 mm (0.0020 in.) per 100 mm (3.94 in.)


EM0289 EM0290

- Check that the rod is not twisted.

Twist limit: 0.15 mm (0.0059 in.) per 100 mm (3.94 in.)


EM0227

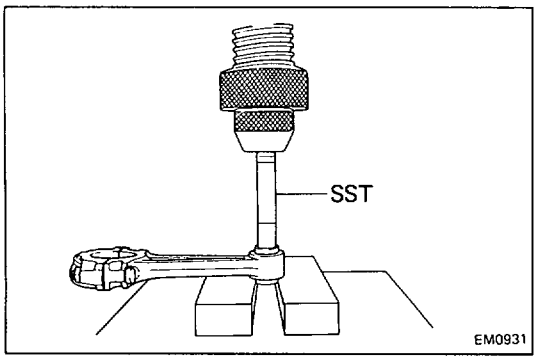
(b) Measure the oil clearance between the rod bushing and piston pin.

- Using an inside dial indicator, measure the inside diameter of the rod bushing.
- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the measurements is less than the oil clearance limit.

Standard oil clearance: 0.005 — 0.011 mm (0.0002 — 0.0004 in.)

Maximum oil clearance: 0.015 mm (0.0006 in.)

If the clearance is greater than maximum replace the rod bushing.

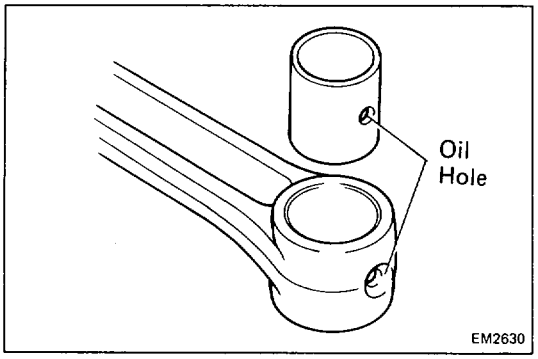


REPLACEMENT OF ROD BUSHING

1. REMOVE ROD BUSHING

Using SST, remove the rod bushing from the connecting rod.

SST 09222-30010

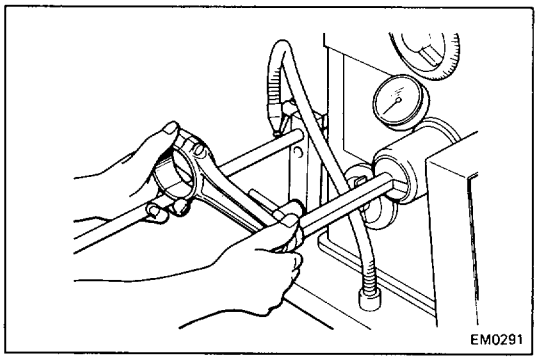


2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod.

SST 09222-30010

NOTE: Align the bushing oil hole with the connecting rod oil hole.



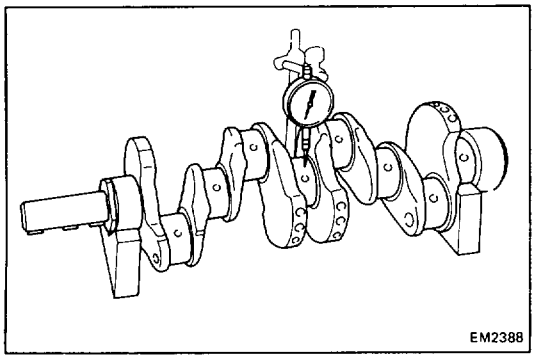
3. HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD

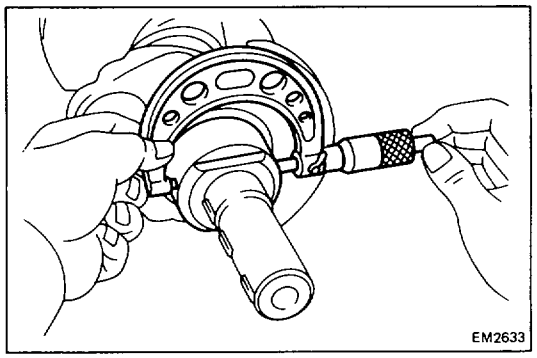
(a) Hone the new bushing and check that the oil clearance is within standard specification.

Standard oil clearance: 0.005 — 0.011 mm (0.0002 — 0.0004 in.)

(b) Check the pin fit at the normal room temperature.

Coat the pin with engine oil and push the pin into the rod with thumb pressure.


EM2388


EM2633

INSPECTION AND REPAIR OF CRANKSHAFT

1. MEASURE CRANKSHAFT

(a) Place the crankshaft on V-blocks.

(b) Using a dial gauge, measure the runout at the center journal.

Maximum circle runout: 0.1 mm (0.004 in.)

If the runout is greater than maximum, replace the crankshaft.

(c) Using a micrometer, check the diameter of the main and crank pin journal.

Measure the journals for out-of-round and taper as shown.

Main journal diameter: 59.984 — 60.000mm (2.3616 — 2.3622 in.)
Crank pin diameter: 52.988 — 53.000 mm (2.0861 — 2.0866 in.)
Taper and out-of-round limit: 0.01 mm (0.0004 in.)

If journals are worn, regrind or replace the crankshaft.

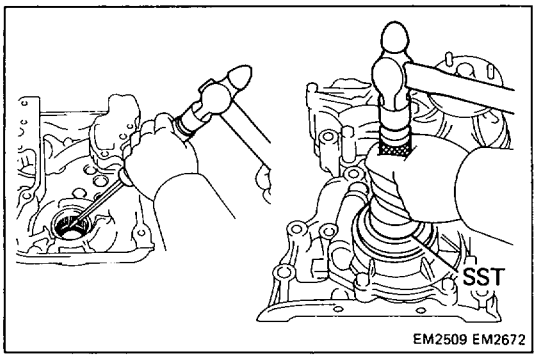
2. GRIND CRANK PIN AND/OR MAIN JOURNAL, IF NECESSARY

Grind the crank pins and/or main journals to the undersized finished diameter. Install a new pin and/or main undersize bearings.

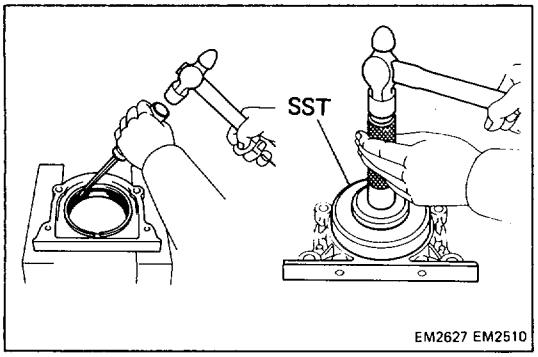
Bearing size (U/S 0.25)
Main journal finished diameter: 59.701 — 59.711 mm (2.3504 — 2.3508 in.)
Crank pin finished diameter: 52.701 — 52.711 mm (2.0748 — 2.0752 in.)
Taper and out-of-round limit: 0.01 mm (0.0004 in.)

REPLACEMENT OF OIL SEALS

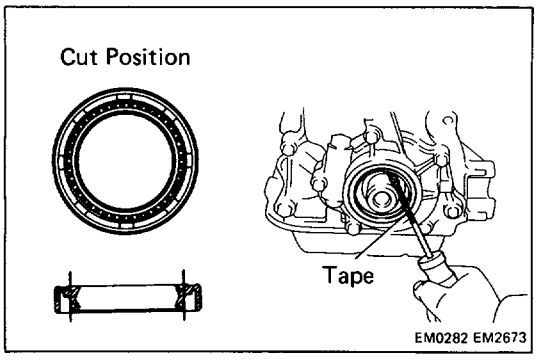
NOTE: There are two ways of oil seal replacement in accordance with the timing belt case or rear oil seal retainer condition.



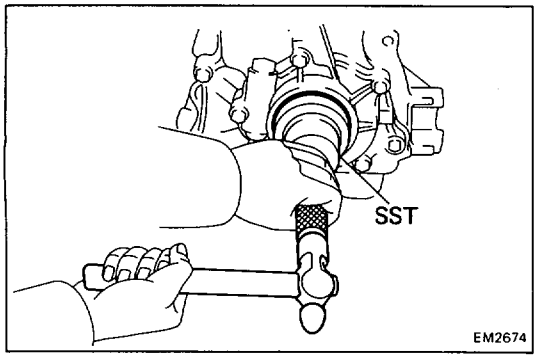
1. **IF TIMING CHAIN COVER IS REMOVED FROM CYLINDER BLOCK (Replacement of front oil seal)**
   (a) Using a screwdriver, remove the oil seal.
   (b) Apply MP grease to the oil seal lip.
   (c) Using SST, install a new oil seal.
   SST 09223-50010



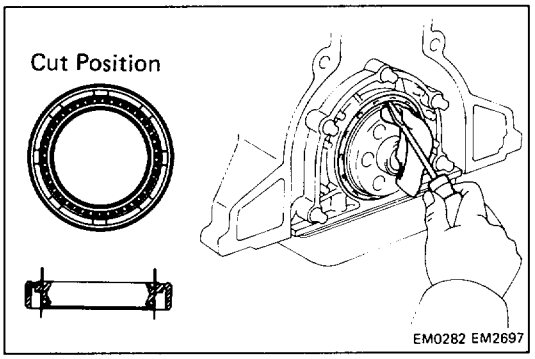
2. **IF REAR OIL SEAL RETAINER IS REMOVED FROM CYLINDER BLOCK (Replacement of rear oil seal)**
   (a) Using a screwdriver, remove the oil seal.
   (b) Apply MP grease to a new oil seal lip.
   (c) Using SST, install the oil seal.
   SST 09223-41020



3. **IF TIMING CHAIN COVER IS INSTALLED ON CYLINDER BLOCK (Replacement of front oil seal)**
   (a) Using a knife, cut off the oil seal lip.
   (b) Using a screwdriver, pry out the oil seal.
   NOTE: Be careful not to damage the crankshaft. Tape the screwdriver.



   (c) Apply MP grease to a new oil seal lip.
   (d) Using SST, install the oil seal.
   SST 09223-50010

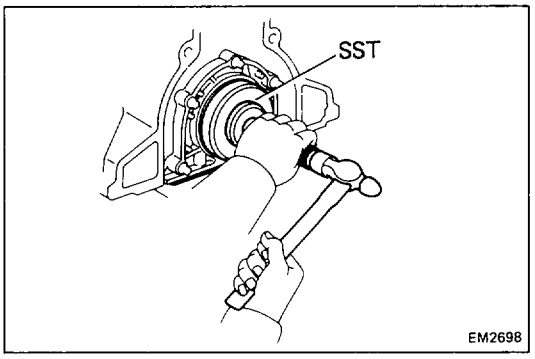


4. **IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDER BLOCK (Replacement of rear oil seal)**

(a) Using the knife, cut off lip of oil seal.

(b) Using a screwdriver, pry out the oil seal.

NOTE: Be careful not to damage crankshaft. Tape the screwdriver.



(c) Check crankshaft of oil seal lip contact surface for cracks or damage.

(d) Apply MP grease to a new oil seal.

(e) Using SST, install the oil seal.

SST 09223-41020

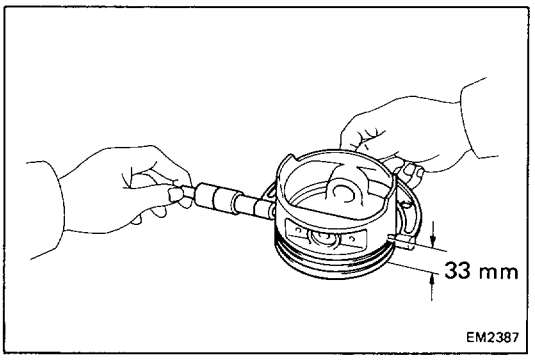
Size		Outside Diameter mm (in.)
O/S 0.50	22R-E	92.470 – 92.500 (3.6405 – 3.6417)
	22R-TE	92.435 – 92.465 (3.6392 – 3.6403)
O/S 1.00	22R-E	92.970 – 93.000 (3.6602 – 3.6614)
	22R-TE	92.935 – 92.965 (3.6589 – 3.6600)

BORING OF CYLINDERS

1. **SELECT OVERSIZED PISTON**

O/S pistons with pins are available in the sizes listed.

Replace pistons in matched sets. Take the largest bore measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston selected.



2. **CALCULATE DIMENSION TO BORE CYLINDERS**

(a) Using a micrometer, measure the piston diameter as shown.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C - H

P = piston diameter

C = piston clearance

22R, 22R-E 0.02 – 0.04 mm (0.0008 – 0.0016 in.)

22R-TE 0.0055 – 0.075 mm (0.0022 – 0.0030 in.)

H = allowance for honing

Less than 0.02 mm (0.0008 in.)

3. **BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS**

Honing amount: 0.02 mm (0.0008 in.) maximum

CAUTION: Excess honing will destroy the finished roundness.

GENERAL ASSEMBLY NOTE:

Thoroughly clean all parts to be assembled. Before installing parts, apply new engine oil to all sliding and rotating surfaces.

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

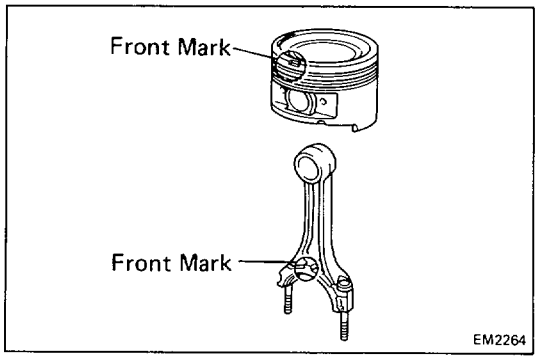
1. ASSEMBLY PISTON AND CONNECTING ROD

(a) Install a new snap ring on one side of the piston pin hole.

(b) Heat the piston in hot water to approx. 80°C (176°F).

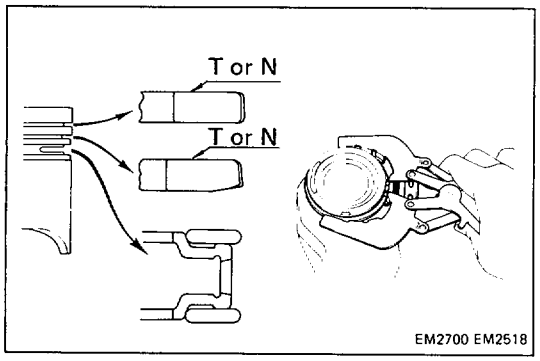
(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.

(d) Install a new snap ring on the other side of the pin.



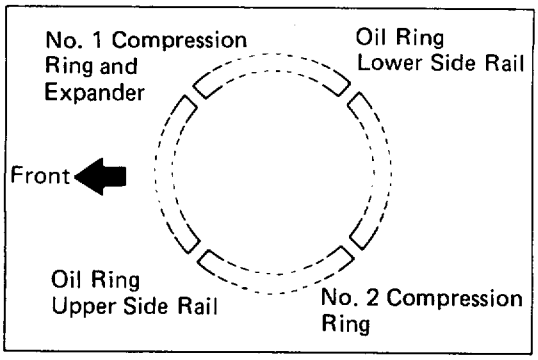
2. PLACE RINGS ON PISTON

(a) Using a ring expander, install the top two compression rings with the code marks facing upward.



(b) Position the piston rings so that the ring end gaps are in the shaded area as shown.

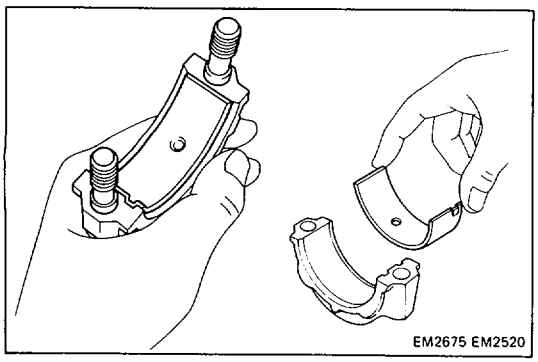
CAUTION: Do not align the end gaps.

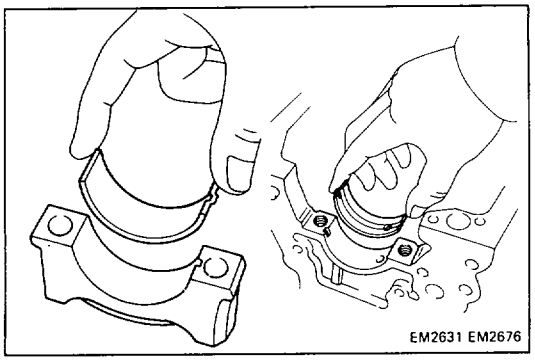


3. INSTALL BEARING INSERTS

(a) Install the bearing inserts in the connecting rods and rod caps.

(b) Lubricate the face of the bearings with engine oil.





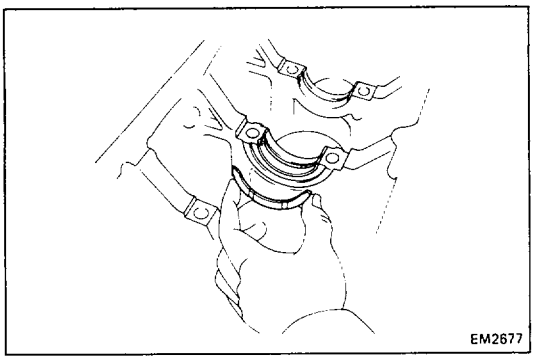
INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

(See page EM-57)

1. INSTALL MAIN BEARINGS

Install the bearing in the cylinder block and bearing caps.

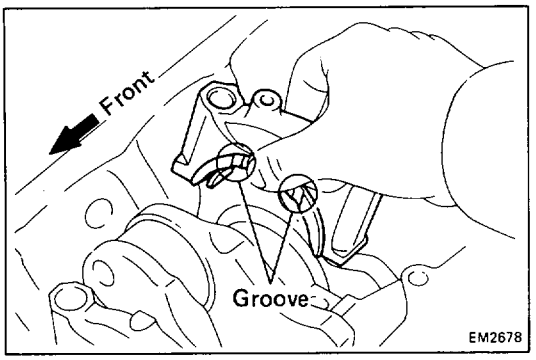
CAUTION: Install the upper bearing with the oil hole in the block.



2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No. 3 main bearing cap position of the block with the oil grooves facing outward.

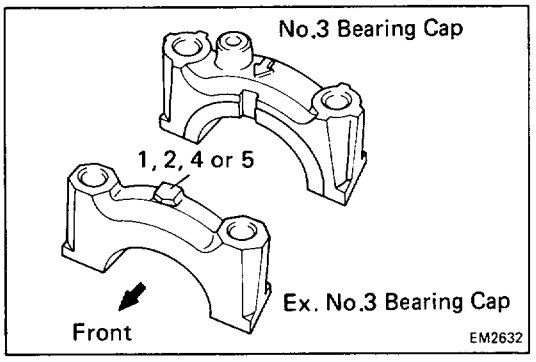
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



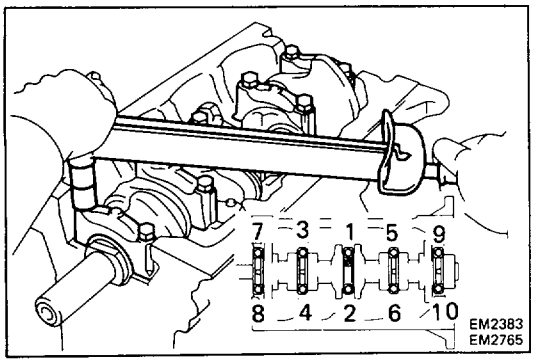
4. INSTALL MAIN BEARINGS CAPS WITH LOWER THRUST WASHERS

NOTE: Each bearing cap is numbered.

(a) Install the thrust washers on the No. 3 bearing cap with the grooves facing outward.



(b) Install the bearing caps in their proper location.



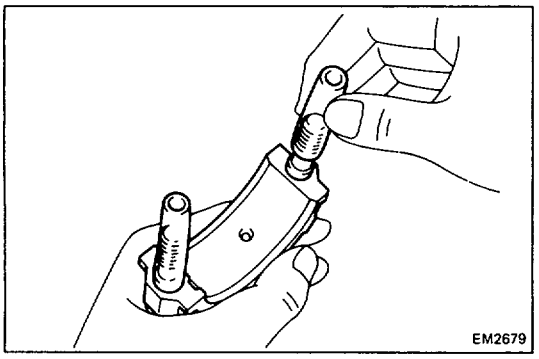
(c) Apply a light coating of engine oil on the threads and under the cap bolt heads.

(d) Install and tighten the cap bolts in two or three passes and in the sequence shown.

Torque: 1,050 kg-cm (76 ft-lb, 103 N·m)

(e) Check that the crankshaft turns.

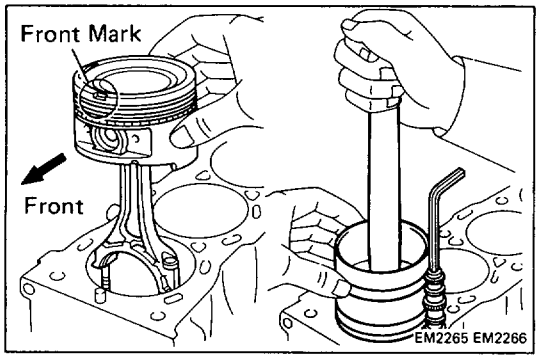
(f) Check the crankshaft thrust clearance.
(See page EM-61)



5. INSTALL PISTON AND CONNECTING ROD ASSEMBLY

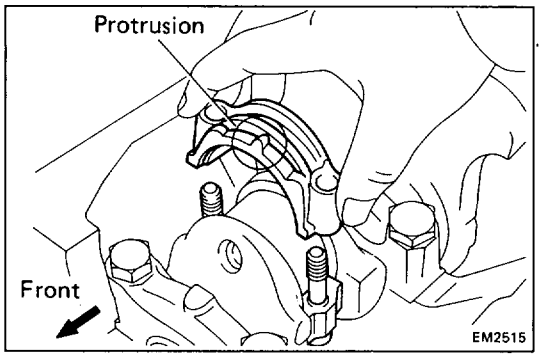
(a) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.

(b) Lubricate the cylinder bore and rod journal with clean engine oil.



(c) Tighten the compressor snugly but NOT tightly against the piston and gently tap the correctly numbered piston and rod assembly into its cylinders with a wooden hammer handle or like object. Make sure the notch and mark are facing forward.

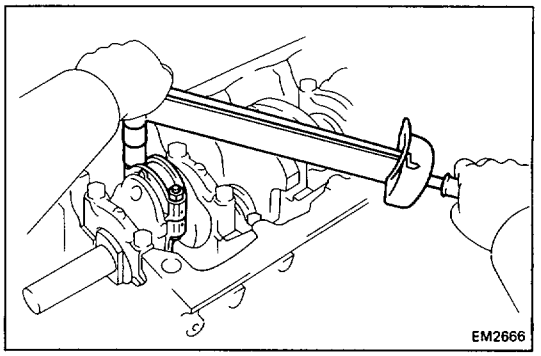
NOTE: If the ring compressor is wound too tightly around the piston, the bottom edge of the ring compressor will catch against the beveled surface at the top of the cylinder when tapping the piston in.



6. INSTALL CONNECTING ROD CAPS

(a) Match the numbered cap with the numbered rod.

(b) Install the rod caps with the protrusion facing forward.



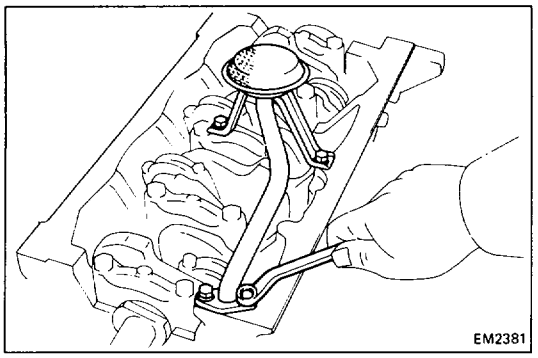
(c) Apply a light coat of the engine oil on the threads and under of the rod nuts.

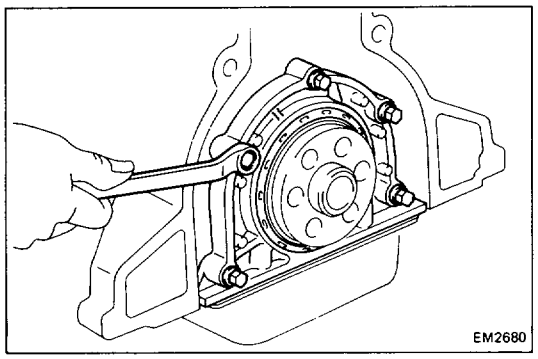
(d) Install and tighten the rod nuts alternately and in two or three passes.

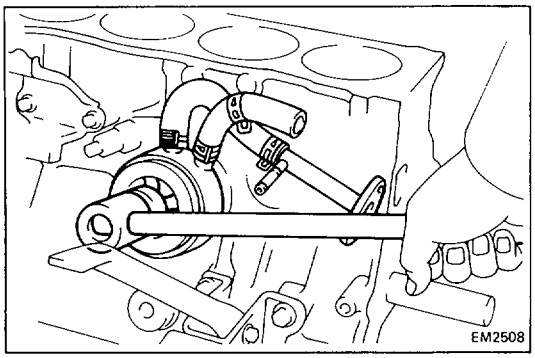
Torque: 700 kg-cm (51 ft-lb, 69 N·m)

(e) Check that the crankshaft turns smoothly.

(f) Check the rod thrust clearance.
(See page EM-58)







ASSEMBLY OF CYLINDER BLOCK

(See page EM-57)

1. **INSTALL OIL STRAINER**
   (a) Clean the oil strainer.
   (b) Place the gasket in place and install the oil strainer assembly with four bolts. Torque the bolts.
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)

2. **INSTALL REAR OIL SEAL RETAINER**
   Install a new gasket and the retainer with the four bolts, Torque the bolts.
   Torque: 180 kg-cm (9 ft-lb, 13 N·m)

3. **INSTALL FUEL FILTER BRACKET AND FILTER**

4. **INSTALL KNOCK CONTROL SENSOR**

5. **INSTALL OIL PRESSURE SENDER GAUGE OR SWITCH**

6. **(A/T)**
   INSTALL FLEXIBLE HOSE CLAMP

7. **INSTALL RH ENGINE MOUNTING BRACKET, CHAMBER STAY AND GROUND STRAP**

8. **(22R-TE)**
   INSTALL OIL COOLER
   (a) Replace the O-ring.
   (b) Install a new gasket on the oil cooler relief valve.
   (c) Install the oil cooler with the oil cooler relief valve.
   Torque: 450kg-cm (33 ft-lb, 44 N·m)

9. **INSTALL OIL FILTER**
   (See page LU-3)

10. **INSTALL CHAIN TENSIONER**

11. **INSTALL CHAIN DAMPERS**

12. **INSTALL ALTERNATOR BRACKET AND LH ENGINE MOUNTING BRACKET**

13. **INSTALL TIMING CHAIN (See page EM-49)**

14. **INSTALL ALTERNATOR**

15. **INSTALL CYLINDER HEAD (See page EM-32)**

16. **REMOVE ENGINE STANDS**

17. **INSTALL REAR END PLATE**

18. **INSTALL FLYWHEEL OR DRIVE PLATE ON CRANKSHAFT**
    Install the flywheel or drive plate on the crankshaft with the six bolts. Torque the bolts.
    Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)

19. **(M/T)**
    INSTALL CLUTCH DISC AND COVER TO FLYWHEEL
    (See page CL-13)

INSTALLATION OF ENGINE

1. **CONNECT TRANSMISSION TO ENGINE**

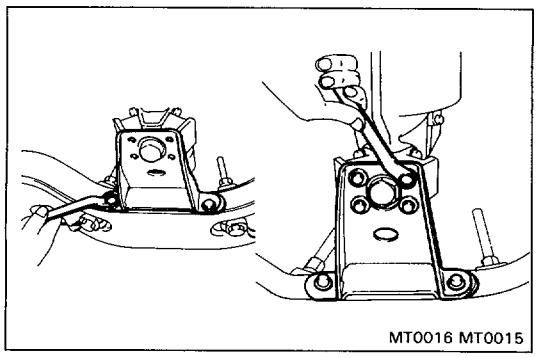
2. **PLACE ENGINE WITH TRANSMISSION IN VEHICLE**
   (a) Attach the engine hoist chain to the lifting brackets on the engine.
   (b) Lower the engine with transmission into the engine compartment.

3. **(4WD)**
   PLACE JACK UNDER TRANSMISSION
   Be sure to put a wooden block between the jack and the transmission pan.

4. **JACK UP AND PUT TRANSMISSION ONTO MEMBER**

5. **INSTALL ENGINE MOUNTING TO FRAME BRACKET**
   (a) Align the engine mounting and frame bracket.
   (b) Install the engine mounting bolts on each side of the engine.
   (c) Remove the hoist chain.

6. **(2WD)**
   INSTALL ENGINE REAR MOUNTING AND BRACKET
   (a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.


MT0016 MT0015

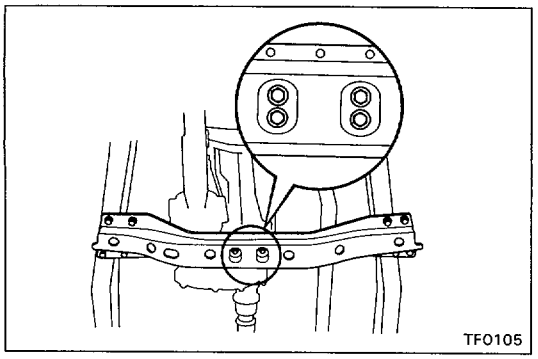
(b) Install the engine rear mounting bracket to the support member. Torque the bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(c) Lower the transmission and rest it on the extension housing.

(d) Install the bracket to the mounting. Torque the bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)


TF0105

(4WD)
INSTALL FRAME NO.2 CROSSMEMBER

(a) Raise the transmission slightly with a jack.

(b) Install the frame No. 2 crossmember to the side frame with the bolts.
Torque the bolts.

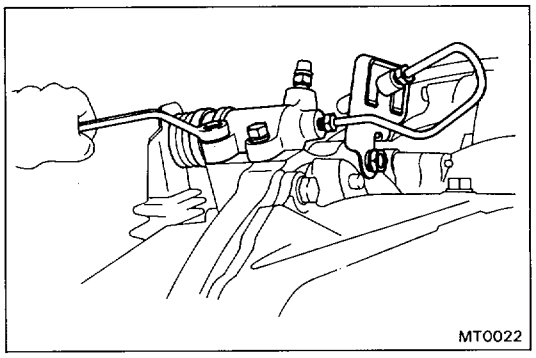
Torque: 970 kg-cm (70 ft-lb, 95 N·m)

(c) Lower the transmission and transfer.

(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

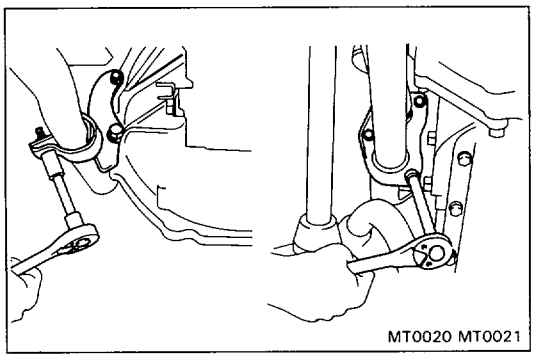
7. (4WD)
INSTALL BRAKE TUBE HEAT INSULATOR AND NO.1 FRONT FLOOR HEAT INSULATOR


MT0022

8. (M/T)
INSTALL CLUTCH RELEASE CYLINDER WITH BRACKET TO TRANSMISSION

Torque:

Bracket	400 kg-cm (29 ft-lb, 39 N·m)
Release cylinder	120 kg-cm (9 ft-lb, 12 N·m)


MT0020 MT0021

9. INSTALL EXHAUST PIPE
   (a) Connect the exhaust pipe to the catalytic converter.
   (b) Connect the exhaust pipe to the exhaust manifold.
   (c) Install the exhaust pipe clamp.
   (d) (22R-E)
   Connect the oxygen sensor connector.
   (e) (22R-E)
   Install the LH front door scuff plate.

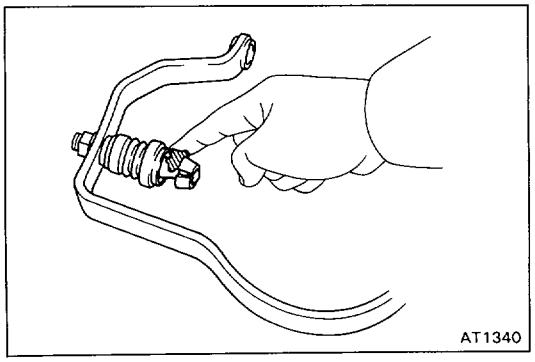
10. INSTALL NO.1 FRAME CROSSMEMBER

11. (4WD)
INSTALL FRONT PROPELLER SHAFT
(See page PR-13)

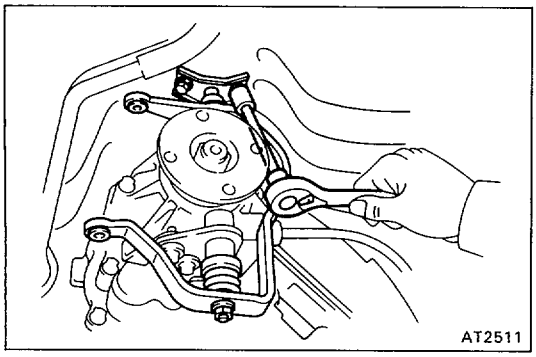
12. (4WD)
INSTALL STABILIZAR BAR
(See page FA-97)

13. (4WD)
INSTALL TRANSFER UNDER COVER

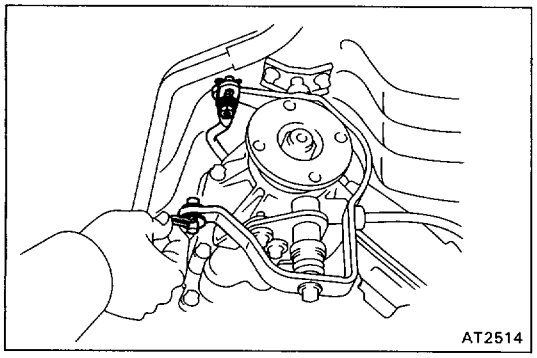
14. CONNECT SPEEDOMETER CABLE


AT1340

15. (4WD A/T)
CONNECT TRANSFER SHIFT LINKAGE
   (a) Apply MP grease to the cross shaft joint.



(b) Install the cross shaft to the body.



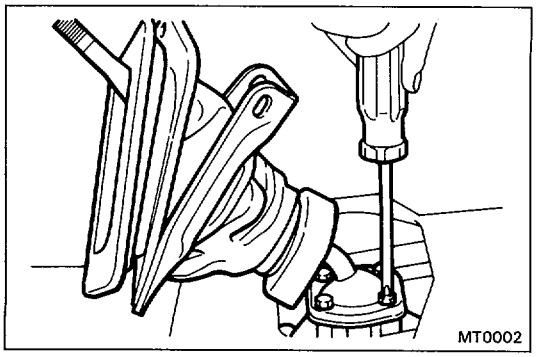
(c) Connect the No.1 and No.2 transfer shift linkage to the cross shaft.

16. **(A/T)**
CONNECT MANUAL SHIFT LINKAGE TO NEUTRAL START SWITCH

17. **INSTALL PROPELLER SHAFT**
(See page 2WD PR-12)
(See page 4WD PR-13)

18. **(R150)**
INSTALL SHIFT LEVER RETAINER

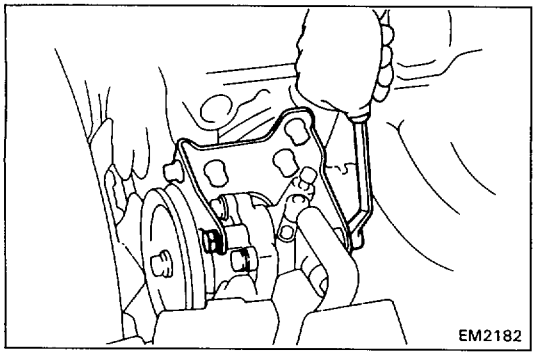
19. **(M/T)**
INSTALL SHIFT LEVER



(a) Apply MP grease to the shift lever.
(b) Install the shift lever to the transmission.

20. **CONNECT GROUND STRAPS TO ENGINE REAR SIDE AND RH SIDE**

21. **(with A/C)**
INSTALL COMPRESSOR TO BRACKET
(a) Install the compressor with four bolts.
(b) Install the drive belt and adjust the belt tension.



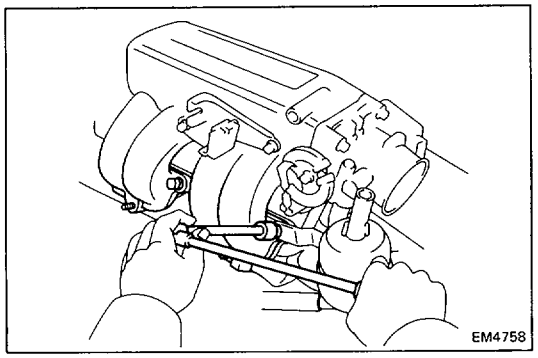
22. **CONNECT GROUND STRAP FOR VANE PUMP BRACKET**

23. **(w/ PS)**
INSTALL PS PUMP WITH VANE PUMP BRACKET
Install the PS pump with four bolts.

24. **CONNECT FOLLOWING PARTS:**
(a) Distributor wire
(b) High-tension cords
(c) Alternator wires

POST INSTALLATION

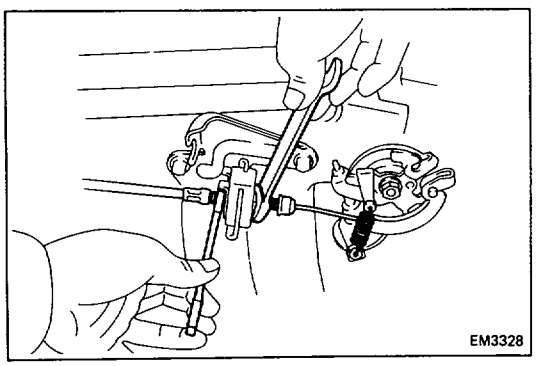
1. **CONNECT FOLLOWING WIRES:**
   - (a) Transmission wires
   - (b) Starter wire
   - (c) Oil pressure switch wire
   - (d) Air valve wire
   - (e) Knock sensor wire
   - (f) (with A/C)
     A/C compressor wire
   - (g) Injector wires
   - (h) (A/T)
     OD temp. switch wire
   - (i) (22R-TE)
     Oxygen sensor wire
   - (j) (with A/C)
     VSV wire
   - (k) Water temp. sensor wire
   - (l) Cold start injector time switch wire



2. **INSTALL CHAMBER WITH THROTTLE BODY**
   - (a) Position a new gasket on the intake manifold.
   - (b) Install the resonator and chamber with throttle body.
   - (c) Install the four bolts.
   - (d) Install the return hose clamp, ground strap and two nuts.
   - (e) Connect the chamber and stay with a bolt.
   - (f) Install the EGR valve to the chamber with two bolts.

3. **CONNECT FOLLOWING WIRES:**
   - (a) (Calif. and C&C)
     EGR gas temp. sensor wire
   - (b) Throttle position sensor wire
   - (c) Cold start injection wire

4. **CONNECT FOLLOWING PARTS:**
   - (a) BVSV hoses
   - (b) Cold start injection pipe
   - (c) Pressure regulator hose to the chamber
   - (d) Air control valve hose to actuator
   - (e) No.2 and No.3 water by-pass hose to the throttle body.
   - (f) No.2 air valve hose to the chamber
   - (g) Air valve hose No.1 to the throttle body
   - (h) EGR vacuum modulator hose
   - (i) (w/ cruise control)
     Actuator hose
   - (j) EVAP hose (for canister)
   - (k) Air control valve hoses
   - (l) Brake booster hose
   - (m) No.1 and No.2 PCV hose



5. **CONNECT CABLES TO BRACKET**
   Connect the accelerator cable and throttle cable for A/T to the bracket.

6. **CONNECT TWO HEATER HOSES**

7. **INSTALL COUPLING FAN WITH FAN**

8. **INSTALL RADIATOR WITH SHROUD**
   (a) Install the radiator with the shroud.
   (b) (with A/C)
   Remove the No.2 fan shroud.
   (c) Connect the reservoir hose.
   (d) (22R-TE)
   Disconnect the No.1 turbo water hose.
   (e) Connect the radiator upper and lower hoses to the engine.

9. **INSTALL AIR CLEANER HOSE AND AIR CLEANER**

10. **FILL WITH ENGINE OIL**
    Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient and recommended viscosity oil.
    Capacity:
    Dry fill 4.8 liters (5.1 US qts. 4.2 Imp. qts)
    Drain and refill
    w/o Oil filter change
    3.8 liters (4.0 US qts, 3.3 Imp. qts)
    w/ Oil filter change
    4.3 liters (4.5 US qts, 3.8 Imp. qts)

11. **FILL WITH COOLANT**
    (See step 3 on page CO-3)

12. **INSTALL ENGINE UNDER COVER**

13. **INSTALL AND ADJUST HOOD (See page BO-3)**

14. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

15. **START ENGINE**
    Warm up the engine and inspect for leaks.

16. **PERFORM ENGINE ADJUSTMENT**

17. **ROAD TEST**
    Road test the vehicle.

18. **RECHECK COOLANT AND ENGINE OIL LEVEL**

22R
CYLINDER BLOCK
PREPARATION OF REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

2. **REMOVE ENGINE UNDER COVER**

3. **REMOVE ENGINE HOOD**

   Disconnect the washer hose from the hood.

4. **DRAIN COOLANT FROM RADIATOR AND CYLINDER BLOCK**

5. **REMOVE AIR CLEANER**

   (a) Disconnect air hoses No.1 and No.4 from the air cleaner.

   (b) Remove the air cleaner.

6. **REMOVE COUPLING FAN WITH FAN**

7. **DISCONNECT TWO HEATER HOSES**

8. **REMOVE RADIATOR WITH SHROUD**

   (a) Disconnect the radiator upper and lower hoses from the engine.

   (b) Disconnect the reservoir hose.

   (c) Remove the radiator with the shroud.

9. **DISCONNECT ACCELERATOR CABLE FROM CARBURETOR**

   Disconnect the cable from carburetor and bracket.

10. **DISCONNECT FOLLOWING WIRES:**

    (a) VSV wire for EVAP

    (b) VSV wire for A/C

    (c) Vacuum switch wire

    (d) (Ex. Calif.)
    HAC wire

    (e) Cold mixture heater wire

    (f) Fuel cut solenoid wire

    (g) Water temperature sender gauge wire

    (h) (Calif.)
    EACV wire

    (i) Starter wire

    (j) Oil pressure switch wire

11. **DISCONNECT FOLLOWING PARTS:**

    (a) Brake booster hose

    (b) Fuel main hose from fuel inlet pipe

    (c) Fuel return hose from fuel return pipe

    (d) Charcoal canister hose

12. **REMOVE DRIVE BELT**

REMOVAL OF CYLINDER BLOCK
(See page EM-54)

PREPARATION FOR DISASSEMBLY
(See page EM-57)

DISASSEMBLY OF CYLINDER BLOCK
(See page EM-58)

INSPECTION OF CYLINDER BLOCK
(See page EM-63)

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-64)

INSPECTION OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-65)

REPLACEMENT OF ROD BUSHING
(See page EM-67)

INSPECTION AND REPAIR OF CRANKSHAFT
(See page EM-68)

REPLACEMENT OF REAR OIL SEAL
(See page EM-69)

BORING OF CYLINDERS
(See page EM-70)

ASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-71)

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY
(See page EM-72)

ASSEMBLY OF CYLINDER BLOCK
(See page EM-74)

INSTALLATION OF ENGINE
(See page EM-75)

POST INSTALLATION OF CYLINDER BLOCK

1. **CONNECT FOLLOWING WIRES:**
   - (a) Starter wire
   - (b) Oil pressure switch wire
   - (c) (Ex. Calif.)
     VCS wire
   - (d) (Calif.)
     EACV wire
   - (e) Water temp. sender gauge wire
   - (f) Fuel cut solenoid wire
   - (g) Cold mixture heater wire
   - (h) (Ex. Calif.)
     HAC wire
   - (i) Vacuum switch wire
   - (j) (with A/C)
     VSV wire
   - (k) VSV wire for EVAP

2. **CONNECT FOLLOWING PARTS:**
   - (a) Charcoal canister hose from the VSV
   - (b) Fuel return hose from the fuel return pipe
   - (c) Fuel main hose from the fuel inlet pipe
   - (d) Brake booster hose

3. **CONNECT ACCELERATOR CABLE TO CARBURETOR**
   - (a) Connect the cable to the carburetor and bracket.
   - (b) Install the tension spring.

4. **INSTALL RADIATOR WITH SHROUD**
   - (a) Install the radiator with the shroud.
   - (b) Connect the reservoir hose.
   - (c) Connect the radiator upper and lower hoses to the engine.

5. **INSTALL COUPLING FAN WITH FAN**

6. **CONNECT TWO HEATER HOSES**

7. **INSTALL AIR CLEANER**
   - (a) Connect No.1 and No.4 air hoses to the cleaner.
   - (b) Install the air cleaner.

8. **FILL WITH ENGINE OIL**

Fill the engine with new oil, API grade SF or SF/CC multi-grade, fuel efficient and recommended viscosity oil.

Capacity:

Dry fill

4.8 liters (5.1 US qts, 4.2 Imp. qts)

Drain and refill

w/o Oil filter change

3.8 liters (4.0 US qts, 3.3 Imp. qts)

w/ Oil filter change

4.3 liters (4.5 US qts, 3.8 Imp. qts)

9. **FILL WITH COOLANT**

Close the radiator and engine drain cocks and fill with coolant.

Total capacity (w/ Heater):

8.4 liters (8.9 US qts, 7.4 Imp. qts)

10. **INSTALL ENGINE UNDER COVER**

11. **INSTALL AND ADJUST HOOD (See page BO-2)**

12. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**

13. **START ENGINE**

Warm up the engine and inspect for leaks.

14. **PERFORM ENGINE ADJUSTMENT**

15. **ROAD TEST**

Road test the vehicle.

16. **RECHECK COOLANT AND ENGINE OIL LEVEL**

TURBOCHARGER SYSTEM (22R-TE)

	Page
PRECAUTIONS	TC-2
TURBOCHARGER DIAGNOSIS	TC-3
ON-VEHICLE INSPECTION	TC-5
TURBOCHARGER	TC-7

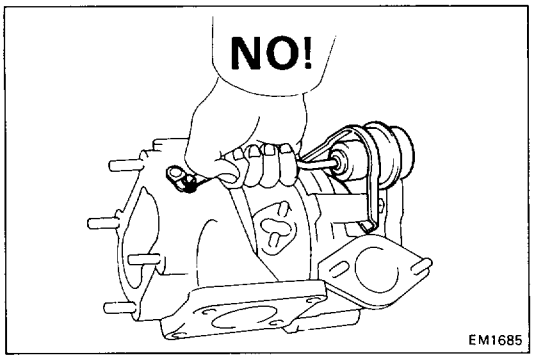
PRECAUTIONS

- Do not stop the engine immediately after pulling a trailer or high speed or uphill driving. Idle the engine 20 — 120 seconds, depending on the severity of the driving condition.
- Avoid sudden racing or acceleration immediately after starting a cold engine.
- If the turbocharger is defective and must be replaced, first check for the cause of the defect in reference to the following items and replace parts if necessary:

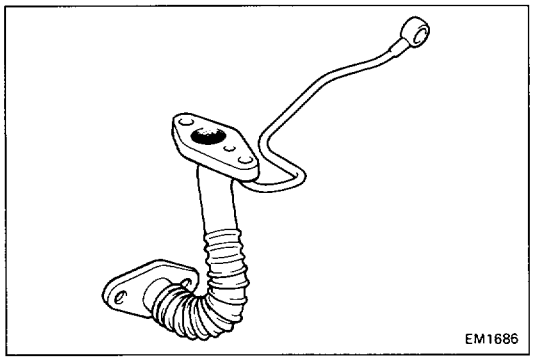
  Engine oil level and quality

  Conditions under which the turbocharger was used

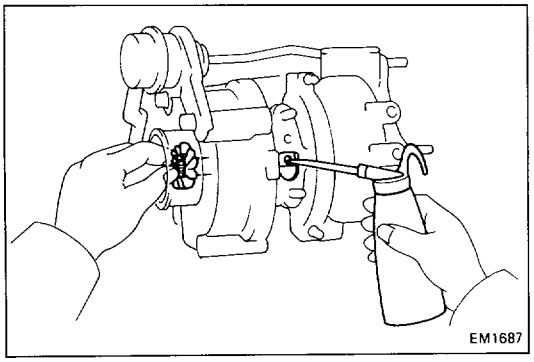
  Oil lines leading to the turbocharger



- Use caution when removing and reinstalling the turbocharger assembly. Do not drop it or bang it against anything or grasp it by easily-deformed parts, such as the actuator or rod, when moving.
- Before removing the turbocharger, plug the intake and exhaust ports and oil inlet to prevent entry of dirt or other foreign particles.



- If replacing the turbocharger, check for accumulation of sludge particles in the oil pipes and, if necessary, replace the oil pipes.
- Completely remove the gaskets adhered to the lubrication oil pipe flange and turbocharger oil flange.
- If replacing bolts or nuts, do so only with the specified new ones to guard against breakage or deformation.



- If replacing the turbocharger, put 20 cc (1.2 cu in.) of oil into the turbocharger oil inlet and turn the impeller wheel by hand to spread oil to the bearing.
- If overhauling or replacing the engine, cut the fuel supply and ignition function after reassembly and crank the engine for 30 seconds to distribute oil throughout the engine. Then allow the engine to idle for 60 seconds.

TURBOCHARGER DIAGNOSIS

NOTE: Before troubleshooting the turbocharger, first check the engine itself. (Valve clearance, engine compression, ignition timing, etc.)

INSUFFICIENT ACCELERATION, LACK OF POWER OR EXCESSIVE FUEL CONSUMPTION

(Possible Cause)	(Check Procedure and Correction Method)
1. TURBOCHARGING PRESSURE TOO LOW	Check turbocharging pressure. (See page TC-5) **Standard pressure: 0.37 — 0.50 kg/cm² (5.3 — 7.1 psi, 36 — 49 kPa)** If the pressure is above specification, begin diagnosis from item 2.
2. RESTRICTED INTAKE AIR SYSTEM	Check intake air system, and repair or replace parts as necessary. (See page TC-5)
3. LEAK IN INTAKE AIR SYSTEM	Check intake air system, and repair or replace parts as necessary. (See page TC-5)
4. RESTRICTED EXHAUST SYSTEM	Check exhaust system, and repair or replace parts as necessary. (See page TC-5)
5. LEAK IN EXHAUST SYSTEM	Check exhaust system, and repair or replace parts as necessary. (See page TC-5)
6. ERRATIC TURBOCHARGER OPERATION	Check rotation of impeller wheel. If it does not turn or turns with a heavy drag, replace the turbocharger assembly. Check axial play of bearing shaft. If not within limits, replace the turbocharger assembly. **Standard clearance: 0.13 mm (0.0051 in.) or less**

EXCESSIVE KNOCKING DURING ACCELRATION

(Possible Cause)	(Check Procedure and Correction Method)
TURBOCHARGING PRESSURE TOO HIGH	Check turbocharging pressure. (See page TC-5) **Standard pressure: 0.37 — 0.50 kg/cm² (5.3 — 7.1 psi, 36 — 49 kPa)** If the pressure is above specification, first check if the actuator hose is disconnected or cracked. If not, replace the turbocharger assembly.

ABNORMAL NOISE

(Possible Cause)	(Check Procedure and Correction Method)
1. TURBOCHARGER INSULATOR RESONANCE	Check for loose, improperly installed or deformed insulator mount bolts, and repair or replace as necessary.
2. EXHAUST PIPE LEAKING OR VIBRATING	Check for exhaust pipe deformation, loose mount bolts or a damaged gasket, and repair or replace as necessary.
3. ERRATIC TURBOCHARGER OPERATION	Refer to item 6 of insufficient acceleration, lack of power or excessive fuel consumption.

EXCESSIVE OIL CONSUMPTION OR WHITE EXHAUST

(Possible Cause)	(Check Procedure and Correction Method)
FAULTY TURBOCHARGER SEAL	Check for oil leakage in exhaust system. • Remove the turbine elbow from the turbocharger and check for excessive carbon deposits on the turbine wheel. Excessive carbon deposits would indicate a faulty turbocharger. Check for oil leakage in intake air system. • Check for axial play in impeller wheel, and replace the turbocharger if necessary. (See page TC-11). **CAUTION: Do not mistakenly diagnose ordinary oil mist from the PCV in the blow by gas as an oil leak from the turbocharger.**

ON-VEHICLE INSPECTION

1. INSPECT INTAKE AIR SYSTEM

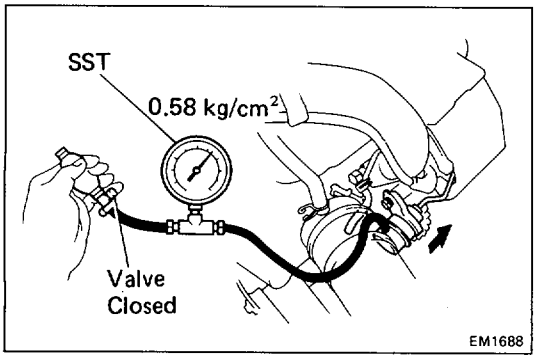
Check for leakage or clogging between the air cleaner and turbocharger inlet and between the turbocharger outlet and cylinder head.

- Clogged air cleaner ..... Clean or replace the element
- Hoses collapsed or deformed ..... Repair or replace
- Leakage from connections ..... Check each connection and repair
- Cracks in components ..... Check and replace

2. INSPECT EXHAUST SYSTEM

Check for leakage or clogging between the cylinder head and turbocharger inlet and between the turbocharger or let and exhaust pipe.

- Deformed components ..... Repair or replace
- Foreign material in passages .... Remove
- Leakage from components ..... Repair or replace
- Cracks in components ..... Check and replace



3. INSPECT OPERATION OF ACTUATOR AND WASTE GATE VALVE

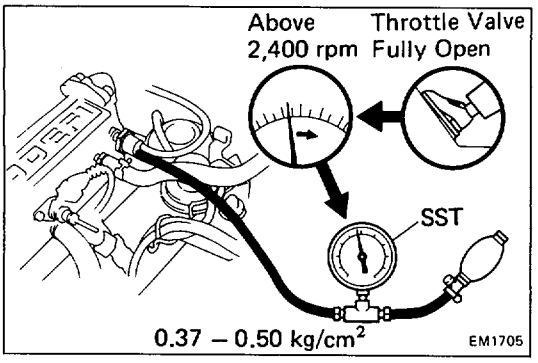
(a) Disconnect the actuator hose.

(b) Using a turbocharger pressure gauge (SST), apply approx. 0.58 kg/cm² (8.2 psi, 57 kPa) of pressure to the actuator and check that the rod moves.

If the rod does not move; replace the turbocharger assembly.

SST 09992-00241

CAUTION: Never apply more than 0.7 kg/cm² (10.0 psi 69 kPa) of pressure to the actuator.



4. CHECK TURBOCHARGING PRESSURE

(a) Install a turbocharger pressure gauge (SST) to the gas filter.

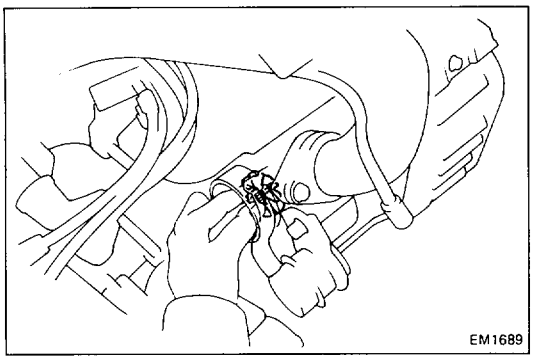
SST 09992-00241

(b) While driving with the engine running at 2,400 rpm or more with the throttle valve fully open in the L range, check the turbocharging pressure.

Standard pressure: 0.37 — 0.50 kg/cm² (5.3 — 7.1 psi, 36 — 49 kPa)

If the pressure is less than that specified, check the intake air and exhaust systems for leakage. If there is no leakage, replace the turbocharger assembly.

If the pressure is above specification, check if the actuator hose is disconnected or cracked. If not, replace the turbocharger assembly.



5. INSPECT IMPELLER WHEEL ROTATION

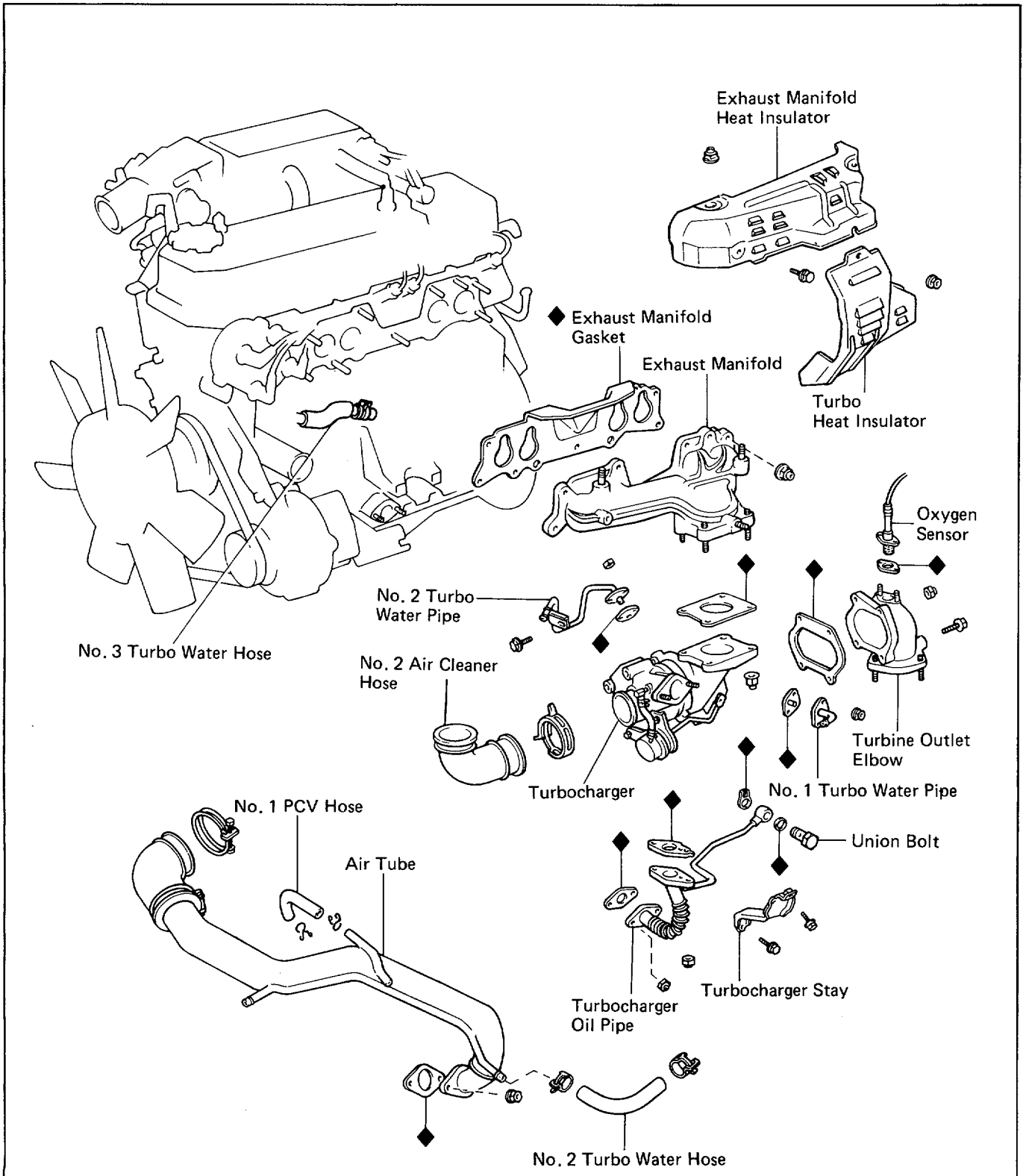
(a) Disconnect the air cleaner hose.

(b) Grasp the edge of the impeller wheel and turn it. Check that it turns smoothly.

If it does not turn or if it turns with a drag, replace the turbocharger assembly.

TURBOCHARGER

COMPONENTS

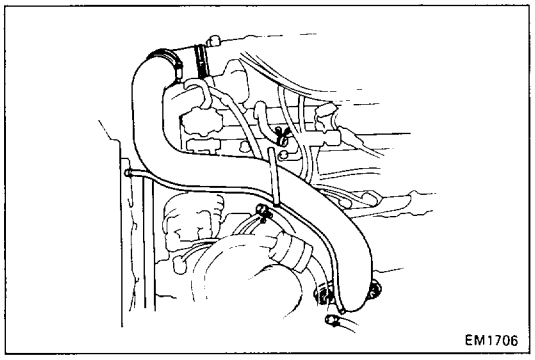


◆ Non-reusable part

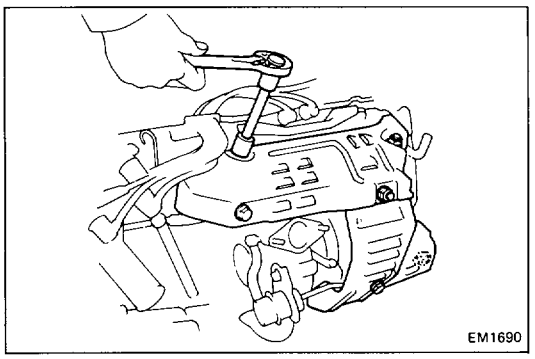
EM1712

REMOVAL OF TURBOCHARGER

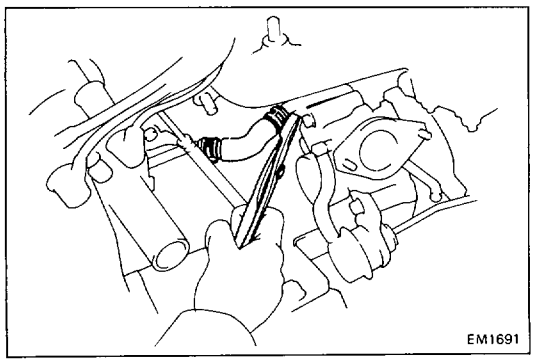
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT
3. DISCONNECT OXYGEN SENSOR WIRE CLAMP AND CONNECTOR


EM1706

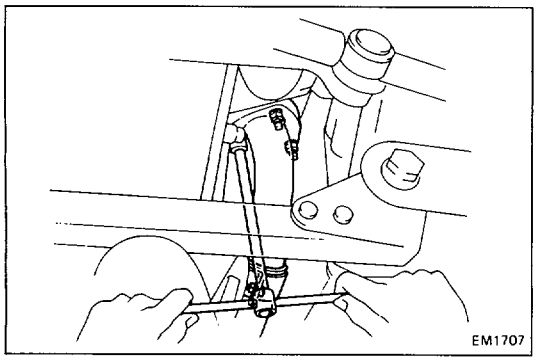
4. REMOVE AIR TUBE ASSEMBLY
   (a) Disconnect the No.1 and No.3 PCV hoses.
   (b) Disconnect the No. 1 and No. 2 turbo water hoses.
   (c) Loosen the clamp on the throttle body.
   (d) Remove the two nuts, air tube assembly and gasket.
5. REMOVE NO.1 AIR CLEANER HOSE ASSEMBLY
6. REMOVE NO.2 AIR CLEANER HOSE


EM1690

7. REMOVE EXHAUST MANIFOLD AND TURBO HEAT INSULATORS


EM1691

8. DISCONNECT NO.3 TURBO WATER HOSE



9. RAISE VEHICLE

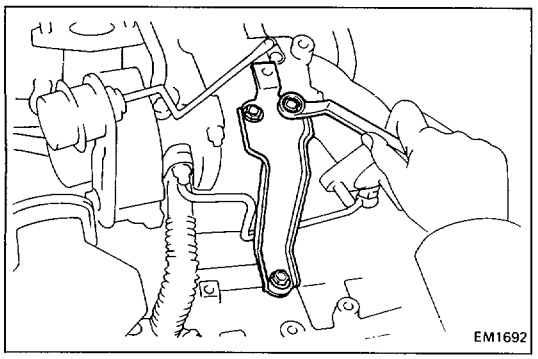
CAUTION: Be sure the vehicle is securely supported.

10. DISCONNECT EXHAUST PIPE FROM TURBINE OUTLET ELBOW

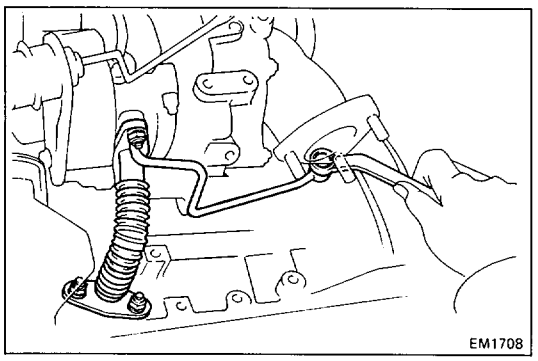
(a) Remove the three nuts from the flange.

(b) Loosen the pipe clamp bolt and nut, and disconnect the clamp.

(c) Disconnect the exhaust pipe from the manifold and remove the gasket.



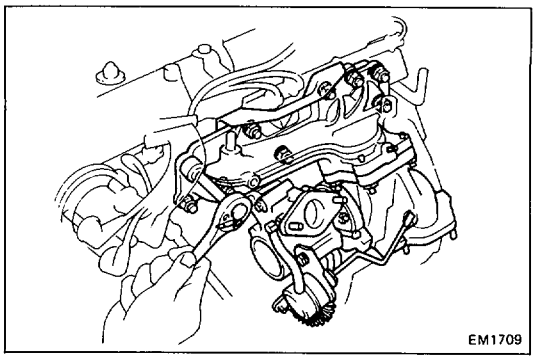
11. REMOVE TURBOCHARGER STAY



12. DISCONNECT TURBO OIL PIPE

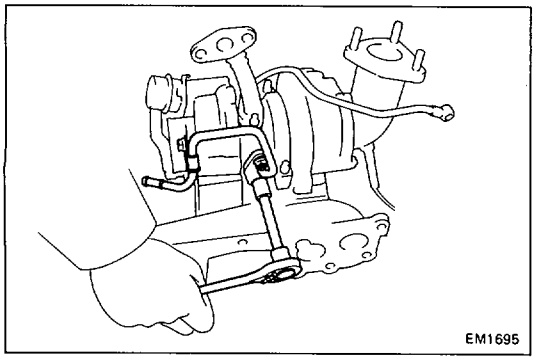
(a) Remove the union bolt and two gaskets.

(b) Remove the two nuts from the flange of the oil pipe.



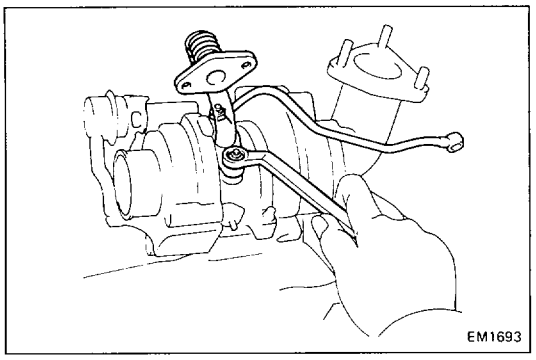
13. REMOVE TURBOCHARGER WITH EXHAUST MANIFOLD

Remove the nine nuts holding the cylinder head and exhaust manifold, and remove the turbocharger with the exhaust manifold and gaskets.



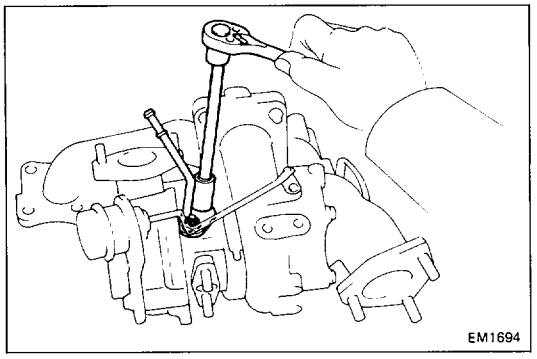
14. REMOVE NO.2 TURBO WATER PIPE

Remove the bolt, two nuts, water pipe and gasket.



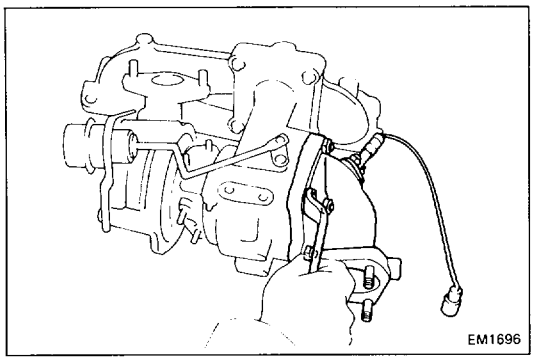
15. REMOVE TURBO OIL PIPE

Remove the two nuts, oil pipe and gasket.



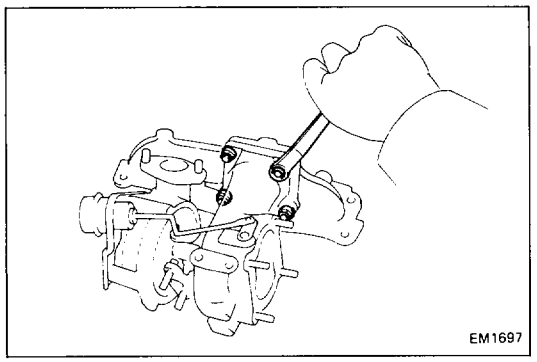
16. REMOVE NO.1 TURBO WATER PIPE

Remove the two nuts, water pipe and gasket.



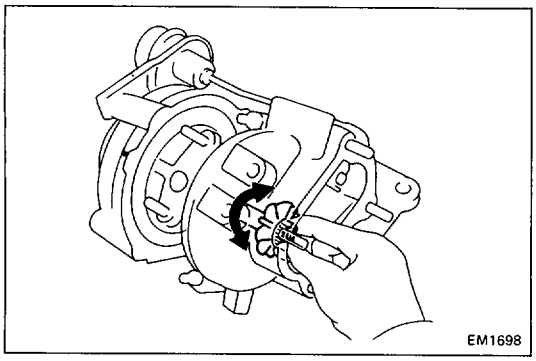
17. REMOVE TURBINE OUTLET ELBOW

Remove the four nuts, turbine outlet elbow (with the oxygen sensor) and gasket.



18. REMOVE EXHAUST MANIFOLD

Remove the four nuts, exhaust manifold and gasket.

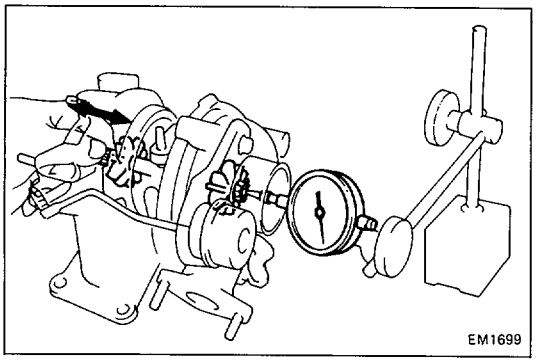

EM1698

INSPECTION OF TURBOCHARGER

1. INSPECT IMPELLER WHEEL ROTATION

Grasp the edge of the turbine wheel and turn it. Check that the impeller wheel turns smoothly.

If the impeller wheel does not turn or if it turns with a drag, replace the turbocharger assembly.

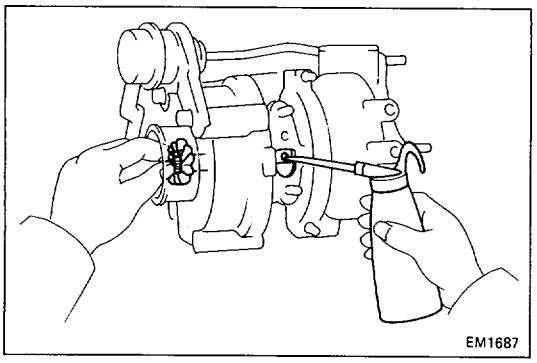

EM1699

2. INSPECT AXIAL PLAY OF SHAFT BEARING

Insert a dial gauge into the intake side, hold the turbine wheel edge by hand and check the axial play.

Standard clearance: 0.13 mm (0.0051 in.) or less

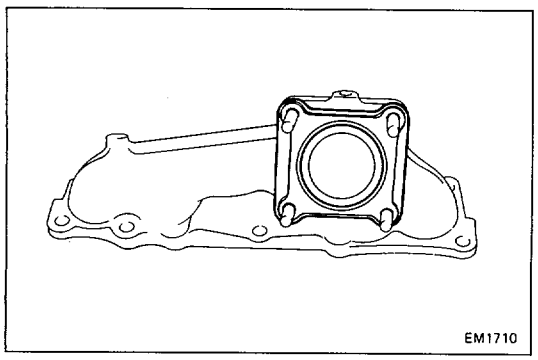
If not within specification, replace the turbocharger assembly.


EM1687

INSTALLATION OF TURBOCHARGER

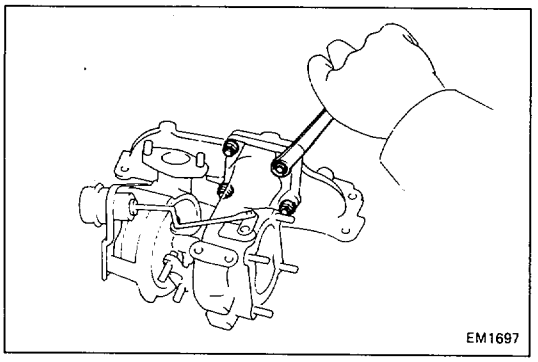
(See page TC-7)

CAUTION: After replacing the turbocharger assembly, pour approx. 20 cc (1.2 cu in.) of new oil into the oil inlet and turn the impeller wheel by hand to splash oil on the bearing.


EM1710

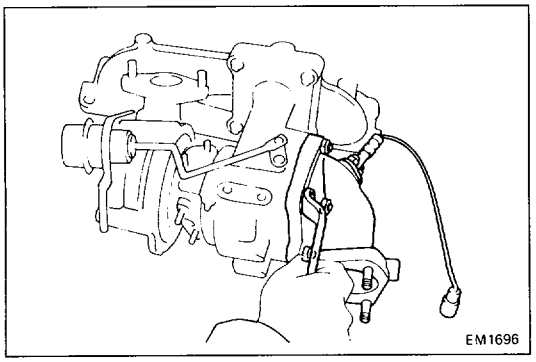
1. INSTALL EXHAUST MANIFOLD

(a) Place a new gasket on the manifold with the groove of the gasket facing upward (turbocharger side).


EM1697

(b) Install the exhaust manifold with the four nuts.

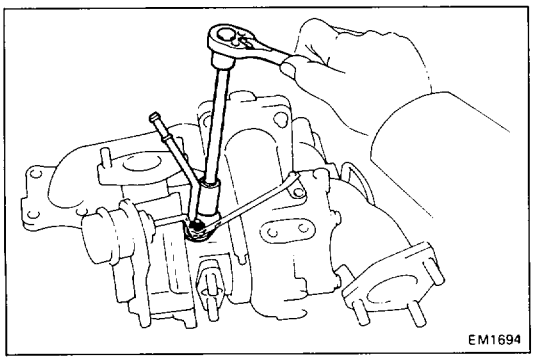
Torque: 400 kg-cm (29 ft-lb, 39 N·m)



2. **INSTALL TURBINE OUTLET ELBOW**

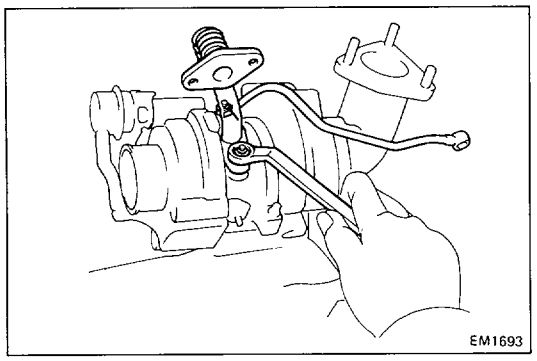
Install a new gasket and the turbine outlet elbow with the four nuts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



3. **INSTALL NO.1 TURBO WATER PIPE**

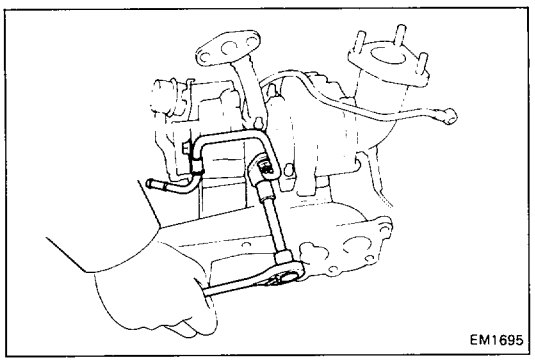
Install a new gasket and the water pipe with the two nuts.



4. **INSTALL TURBO OIL PIPE**

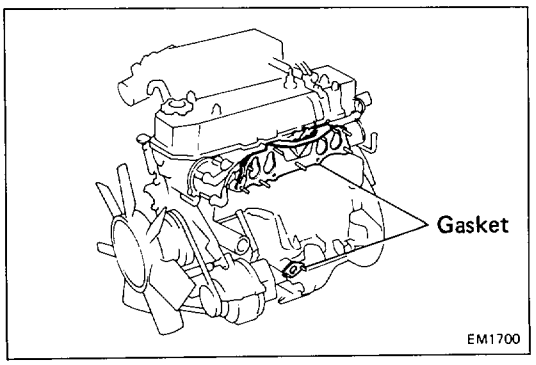
Install a new gasket and the oil pipe with the two nuts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



5. **INSTALL NO.2 TURBO WATER PIPE**

Install a new gasket and the water pipe with the two nuts and bolt.



6. **INSTALL TURBOCHARGER WITH EXHAUST MANIFOLD**

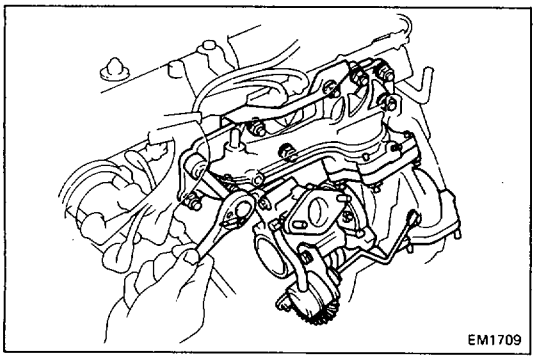
(a) Position a new exhaust manifold gasket and a new turbocharger oil pipe flange gasket on the engine.

(b) Place the turbocharger with exhaust manifold through the exhaust manifold stud bolts and oil pipe stud bolts.

(c) Temporarily install the nine nuts holding the cylinder head and exhaust manifold.

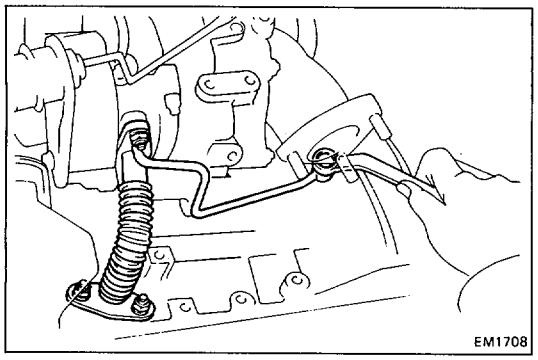
(d) Temporarily install the oil pipe flange nuts.

(e) Temporarily install the union bolt with two new gaskets.


EM1709

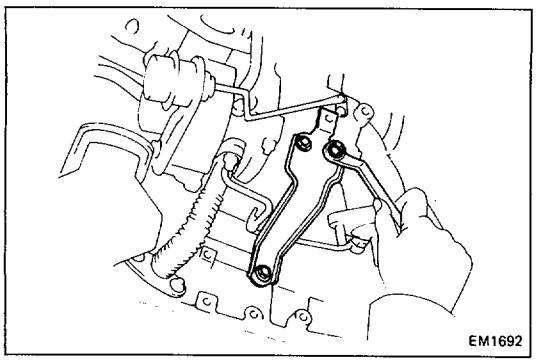
(f) Torque the exhaust manifold mounting nuts.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)


EM1708

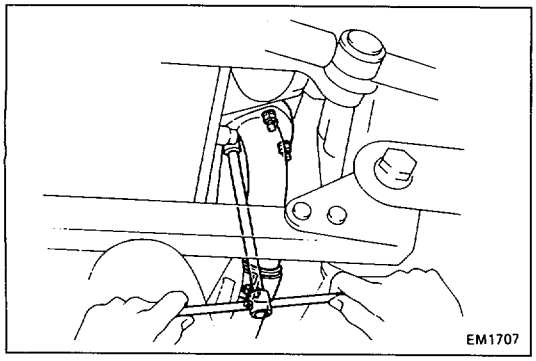
(g) Torque the oil pipe union bolt and flange mounting nuts.

Torque: Bolt 280 kg-cm (20 ft-lb, 27 N·m)
Nut 195 kg-cm (14 ft-lb, 19 N·m)


EM1692

7. INSTALL TURBOCHARGER STAY

Torque:
Turbocharger to stay
195 kg-cm (14 ft-lb, 19 N·m)
Cylinder block to stay
400 kg-cm (29 ft-lb, 39 N·m)


EM1707

8. CONNECT EXHAUST PIPE TO TURBINE OUTLET ELBOW

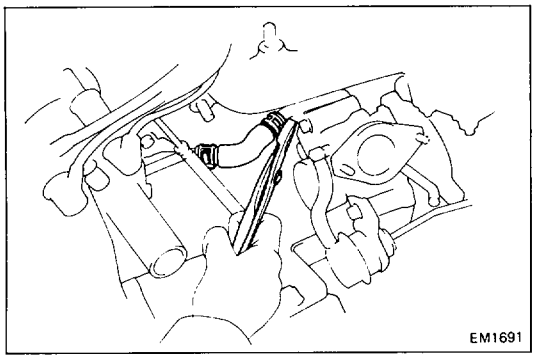
(a) Place a new gasket on the exhaust pipe.

(b) Connect the exhaust pipe and torque new flange nuts.

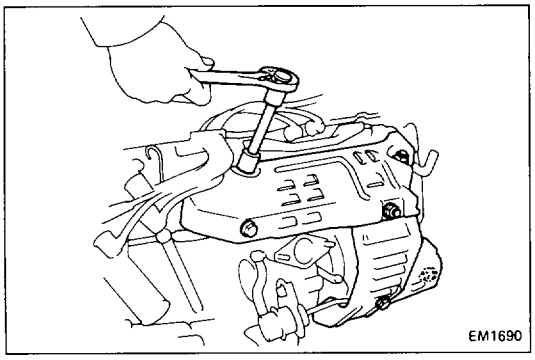
Torque: 440 kg-cm (32 ft-lb, 43 N·m)

(c) Connect the clamp and tighten the bolt and nut.

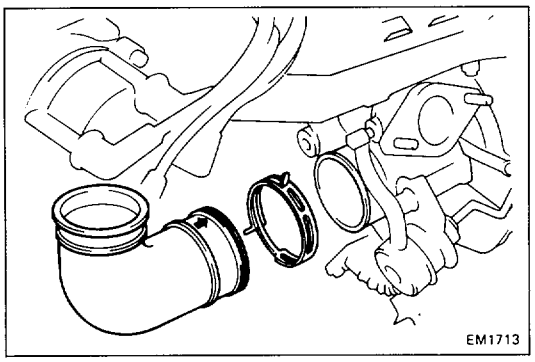
9. LOWER VEHICLE



10. CONNECT NO.3 TURBO WATER HOSE

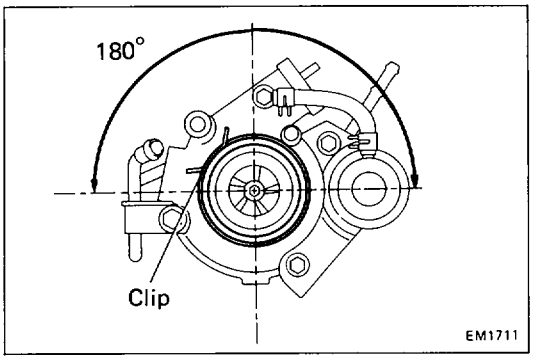


11. INSTALL TURBO AND EXHAUST MANIFOLD HEAT INSULATORS



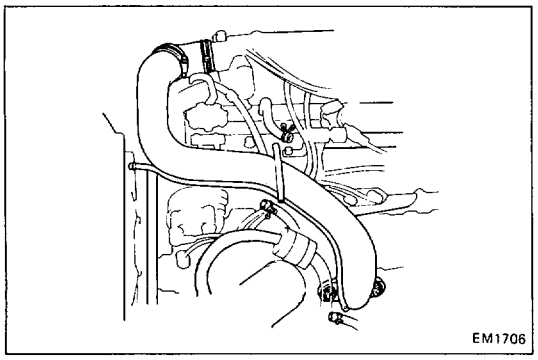
12. INSTALL NO.2 AIR CLEANER HOSE

Install the No.2 air cleaner hose with the arrow facing the turbocharger side as shown in the figure, and fasten with the clip.



NOTE: Fasten the clip as shown.

13. INSTALL NO. 1 AIR CLEANER HOSE ASSEMBLY



14. INSTALL AIR TUBE ASSEMBLY

(a) Install the air tube assembly with the two nuts and clamp.

(b) Connect the No. 1 and No. 2 turbo water hoses.

(c) Connect the No.2 and No.3 PCV hoses.

15. CONNECT OXYGEN SENSOR CONNECTOR AND CLAMP

16. FILL ENGINE WITH COOLANT

17. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

18. START ENGINE AND CHECK FOR LEAKS

EMISSION CONTROL SYSTEMS

Page

EFI ENGINE (22R-E, 22R-TE)

SYSTEM PURPOSE EC-2
COMPONENT LAYOUT AND SCHEMATIC DRAWING EC-3
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM EC-5
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM EC-7
DASH POT (DP) SYSTEM EC-9
EXHAUST GAS RECIRCULATION (EGR) SYSTEM EC-12
AIR SUCTION (AS) SYSTEM EC-19
THREE-WAY CATALYST (TWC) SYSTEM EC-22

CARBURETOR ENGINE (22R)

SYSTEM PURPOSE EC-24
COMPONENT LAYOUT AND SCHEMATIC DRAWING EC-25
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM EC-27
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM EC-29
MIXTURE CONTROL (MC) SYSTEM EC-34
EXHAUST GAS RECIRCULATION (EGR) SYSTEM EC-36
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THREE-WAY CATALYST (TWC) SYSTEM EC-52
OXIDATION CATALYST (OC) SYSTEM EC-52
HIGH ALTITUDE COMPENSATION (HAC) SYSTEM EC-54
AUXILIARY SYSTEMS EC-59
1. Automatic Hot Air Intake (HAI) System EC-59
2. Automatic Choke System EC-61
3. Choke Breaker (CB) System EC-62
4. Choke Opener System EC-63
5. Auxiliary Acceleration Pump (AAP) System .. EC-66
6. Deceleration Fuel Cut System EC-68
7. Idle Advance System EC-71
8. Cold Mixture Heater (CMH) System EC-73

NOTE: TROUBLESHOOTING
See page EM-2 (22R-E, 22R-TE)
See page EM-5 (22R)

EC

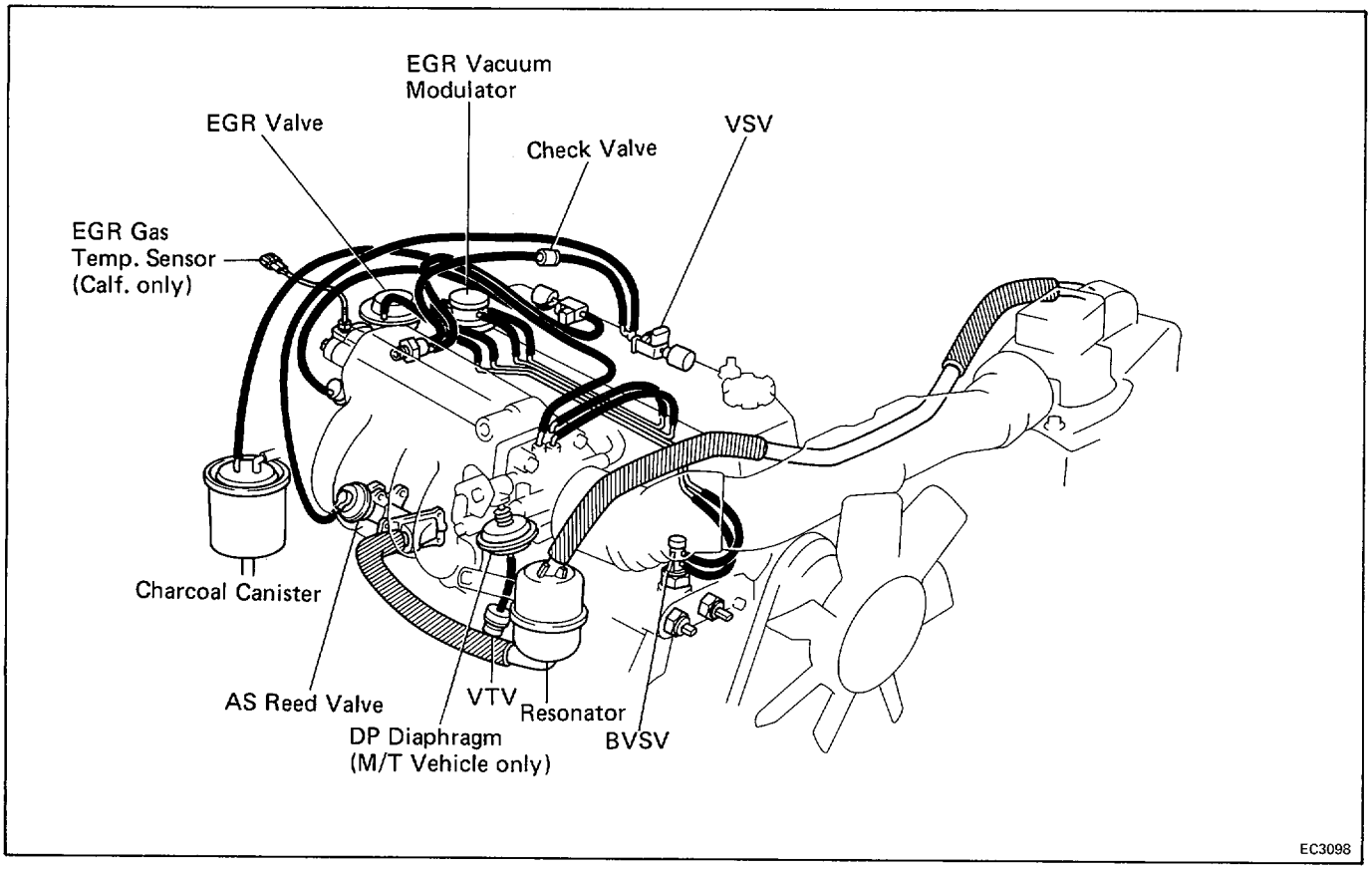
SYSTEM PURPOSE

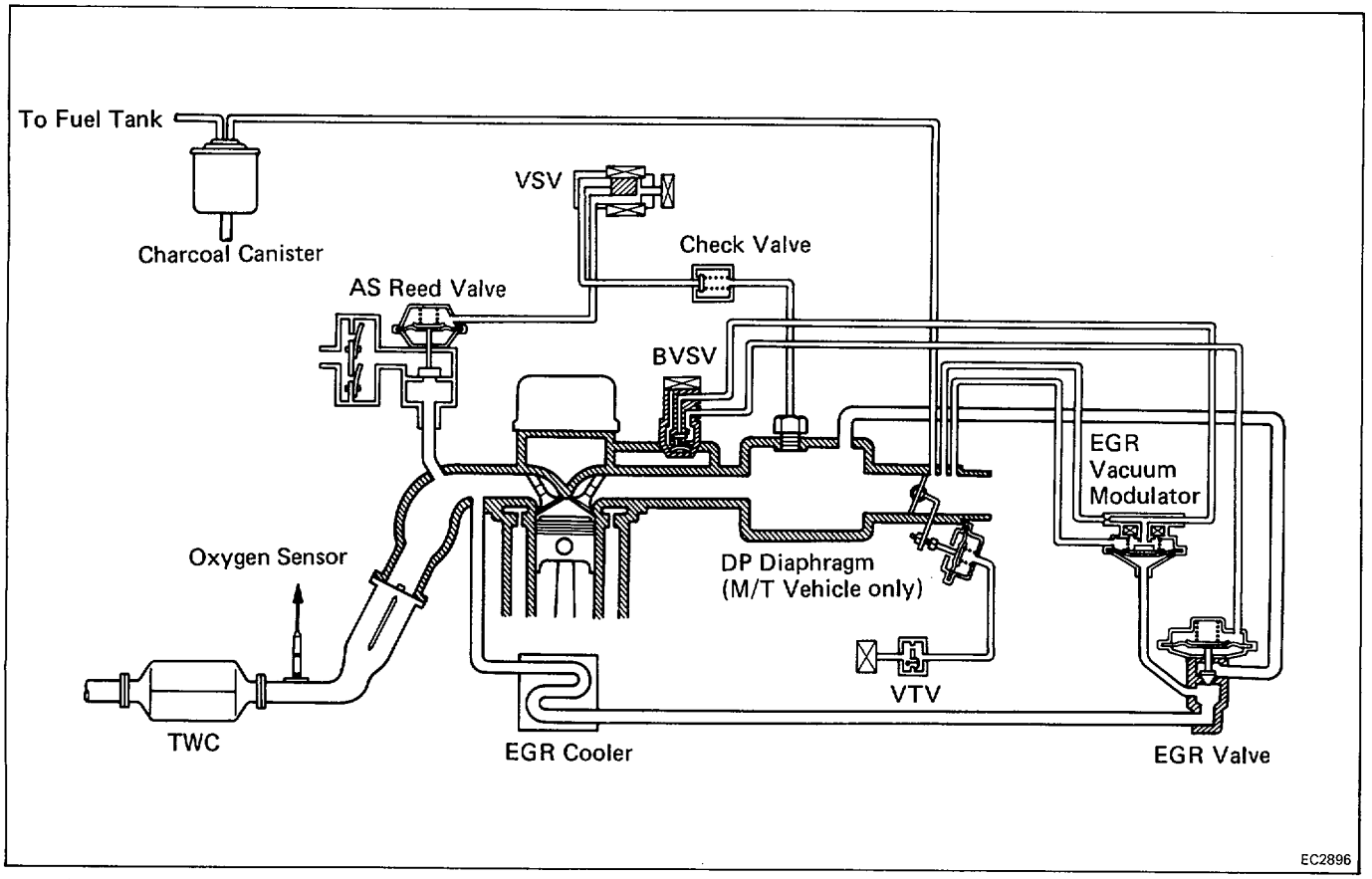
System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Dash pot *1	DP	Reduces HC and CO performance at idle
Exhaust gas recirculation	EGR	Reduces NOx
Air suction	AS	Reduces HC and CO
Three-way catalyst	TWC	Reduces HC,CO and NOx
Electronic fuel injection *2	EFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark: *1 M/T vehicles only

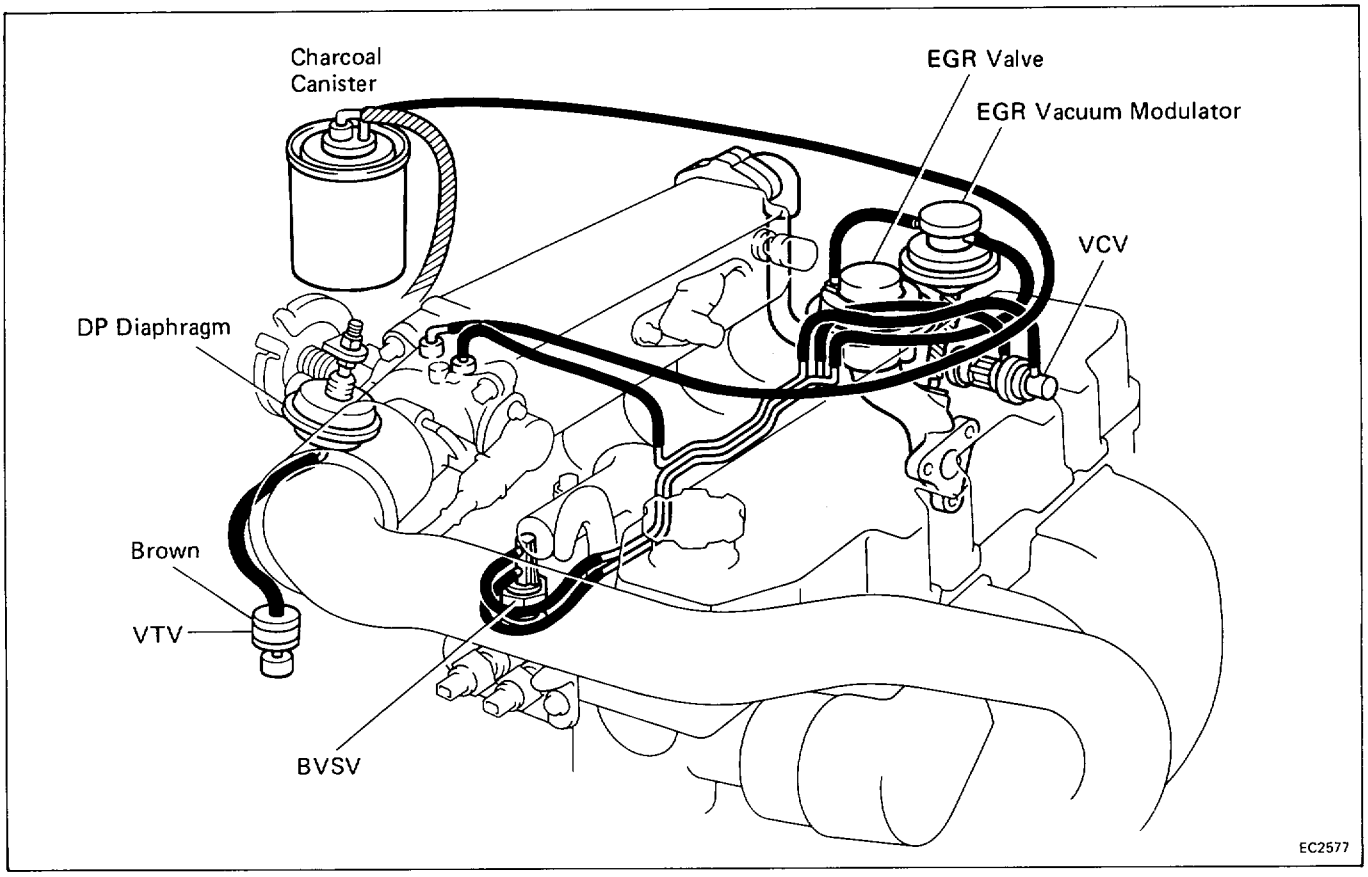
*2 For inspection and repair of the EFI system, refer to the EFI section of this manual.

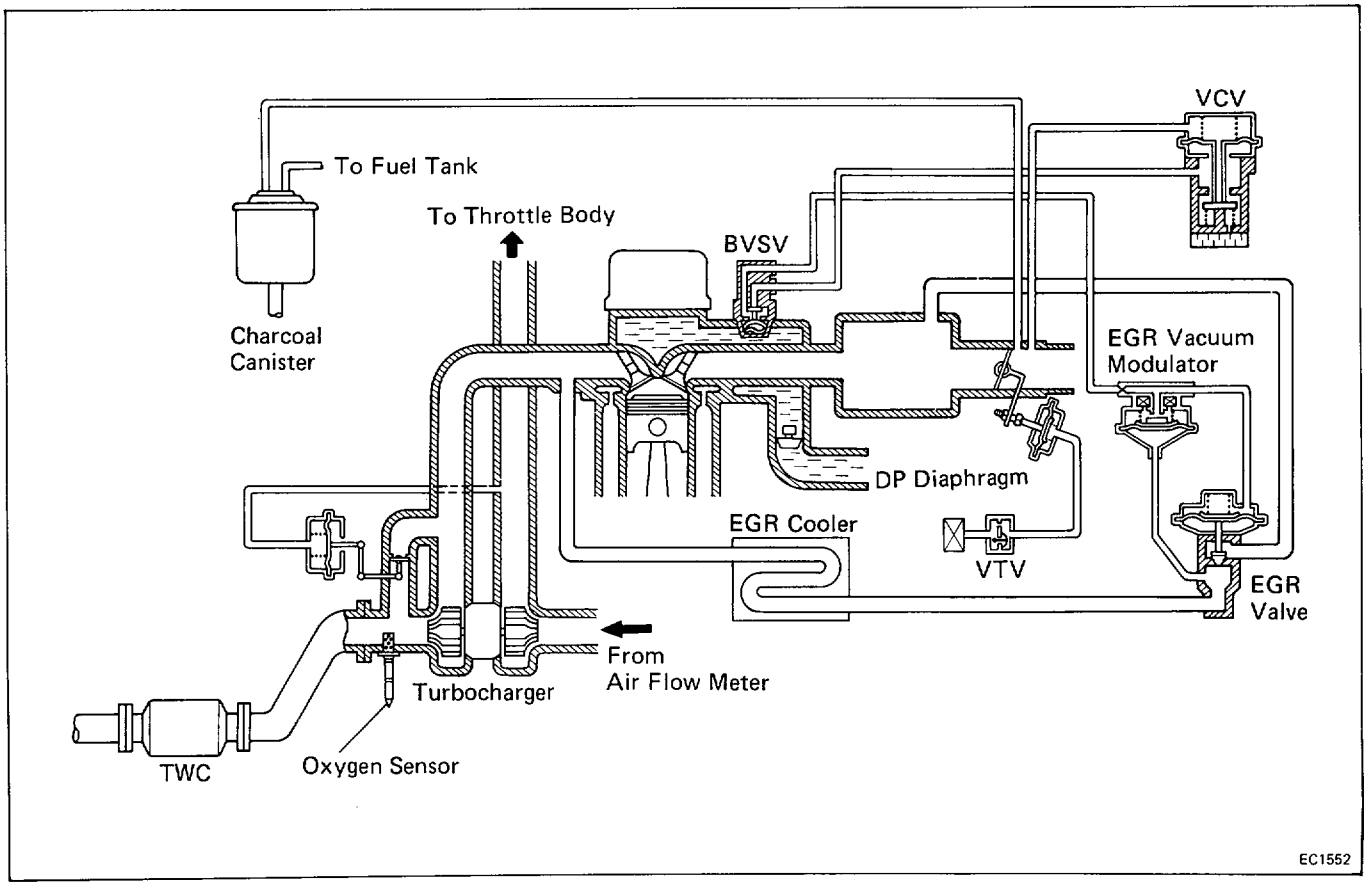
COMPONENT LAYOUT AND SCHEMATIC DRAWING (22R-E ENGINE)



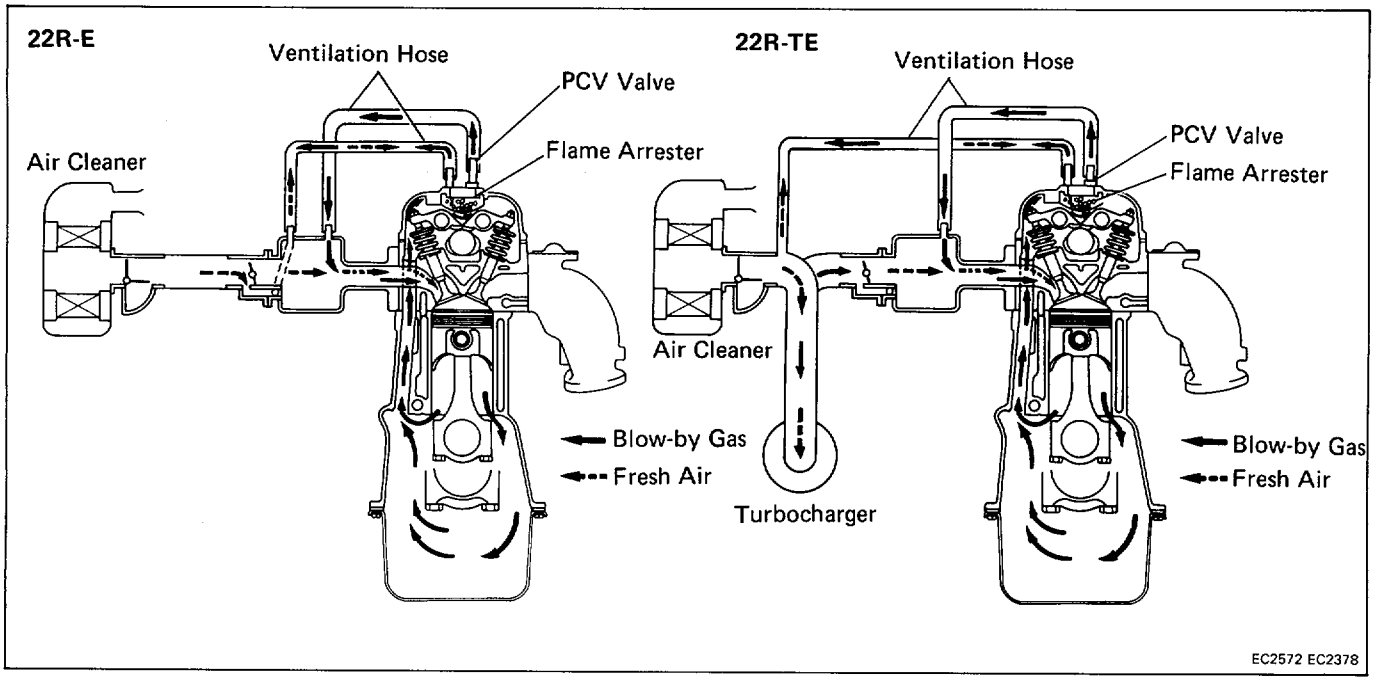


COMPONENT LAYOUT AND SCHEMATIC DRAWING (22R-TE ENGINE)





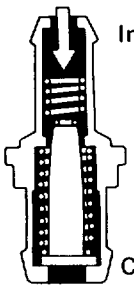
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or Backfiring

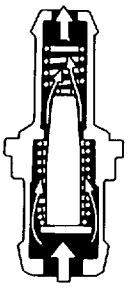
22R-E : Engine not running or backfiring.
22R-TE: Engine not running, backfiring, acceleration or heavy load.



○PCV VALVE IS CLOSED.

EC1001

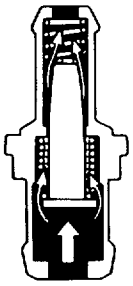
Normal Operation



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS LARGE.

EC1002

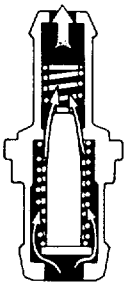
Idling or Decelerating



○PCV VALVE IS OPEN.
○VACUUM PASSAGE IS SMALL.

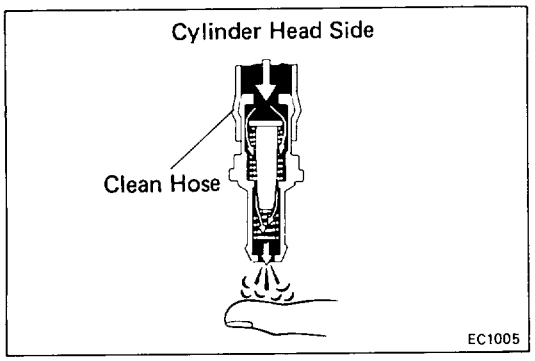
EC1003

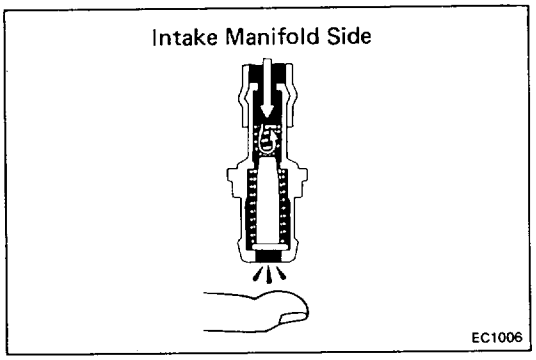
Acceleration or Heavy Load (Ex. 22R-TE)



○PCV VALVE IS FULLY OPEN.

EC1004





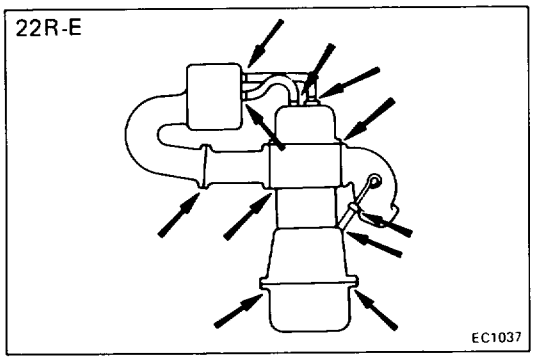
INSPECTION OF PCV VALVE

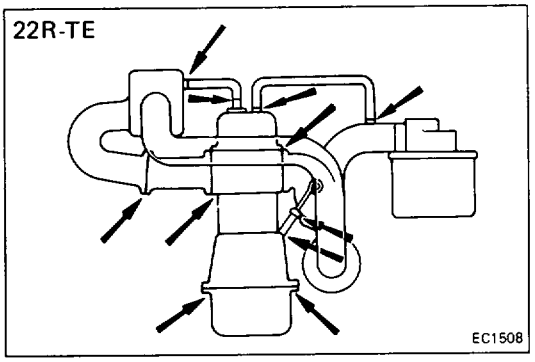
1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**

   Check that air passes through easily.

   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.
4. **BLOW FROM INTAKE MANIFOLD SIDE**

   Check that air passes through with difficulty.
   If the PCV valve fails either check, replace it.
5. **REINSTALL PCV VALVE**



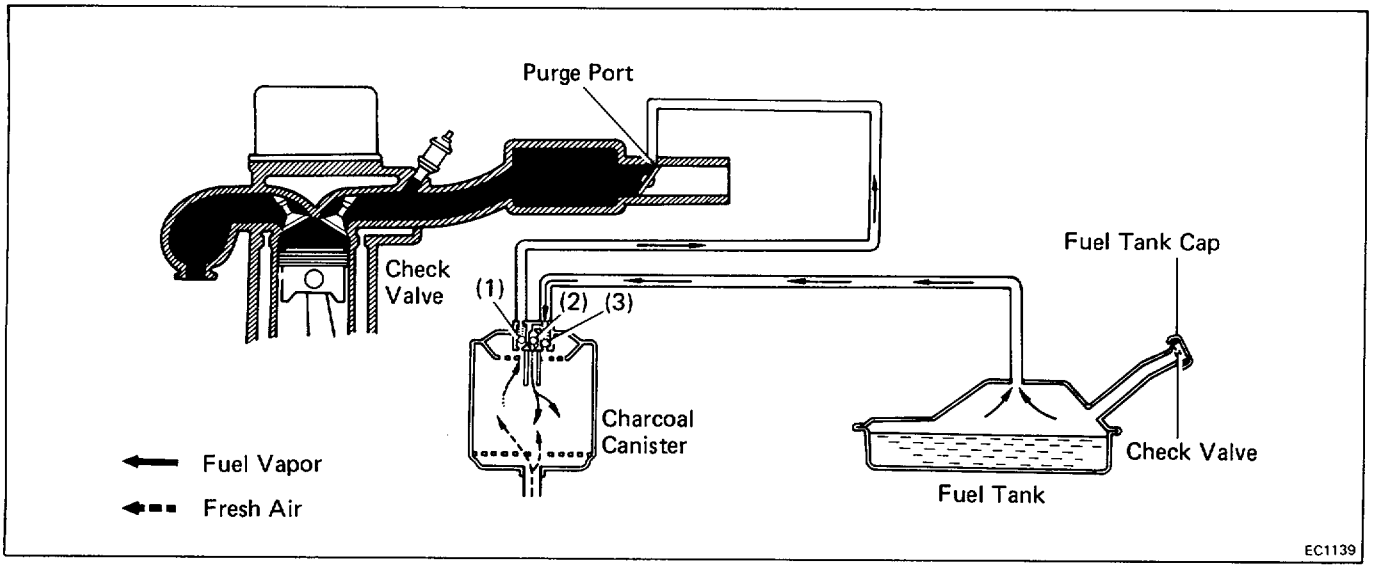


INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

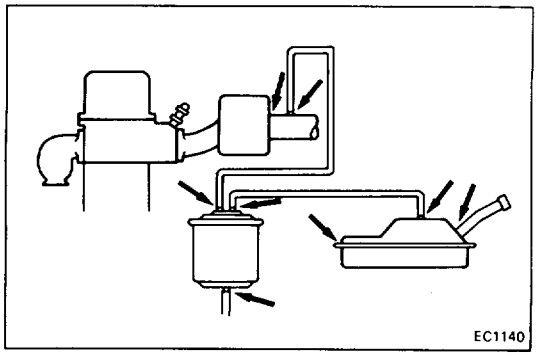
Check for cracks, leaks or damage.

FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the throttle body for combustion in the cylinders.

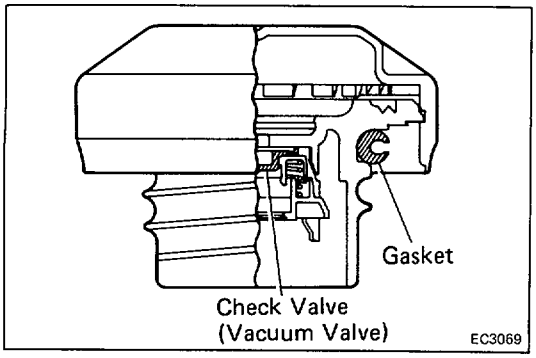
Condition	Check Valve in Charcoal Canister			Check valve in Fuel Filler Cap	Evaporated Fuel (HC)
	(1)	(2)	(3)		
Parking, idling and low speed	CLOSED	—	—	—	HC from tank is absorbed in the canister.
Medium and high speed	OPEN	—	—	—	HC from canister is led into throttle body.
High pressure in tank	—	OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)



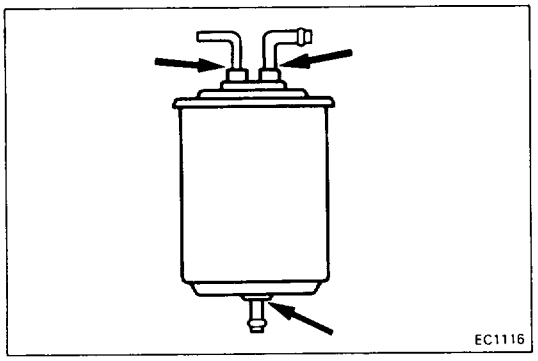
INSPECTION OF FUEL VAPOR LINES, FUEL TANK AND FILLER CAP

1. **VISUALLY INSPECT LINES AND CONNECTIONS**
   Look for loose connections, sharp bends or damage.

2. **VISUALLY INSPECT FUEL TANK**
   Look for deformation, cracks or fuel leakage.



3. **VISUALLY INSPECT FUEL TANK CAP**
   Look for a damaged or deformed gasket and cap.
   If necessary, repair or replace the cap.

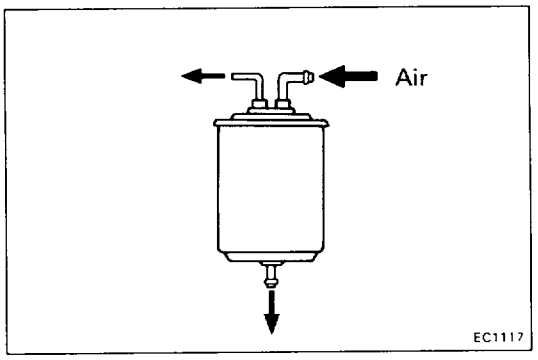


INSPECTION OF CHARCOAL CANISTER

1. **REMOVE CHARCOAL CANISTER**

2. **VISUALLY INSPECT CHARCOAL CANISTER CASE**

   Look for cracks or damage.

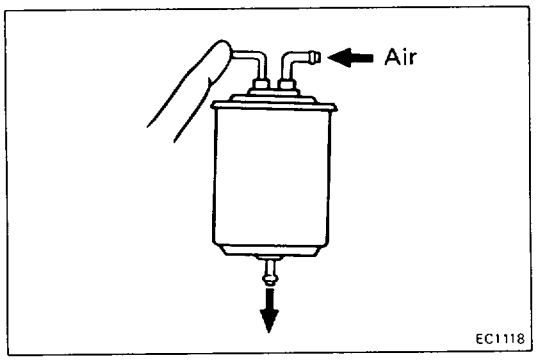


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

   (a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.

   (b) Blow into the purge pipe and check that the air does not flow from the other pipes.

   If a problem is found, replace the charcoal canister.



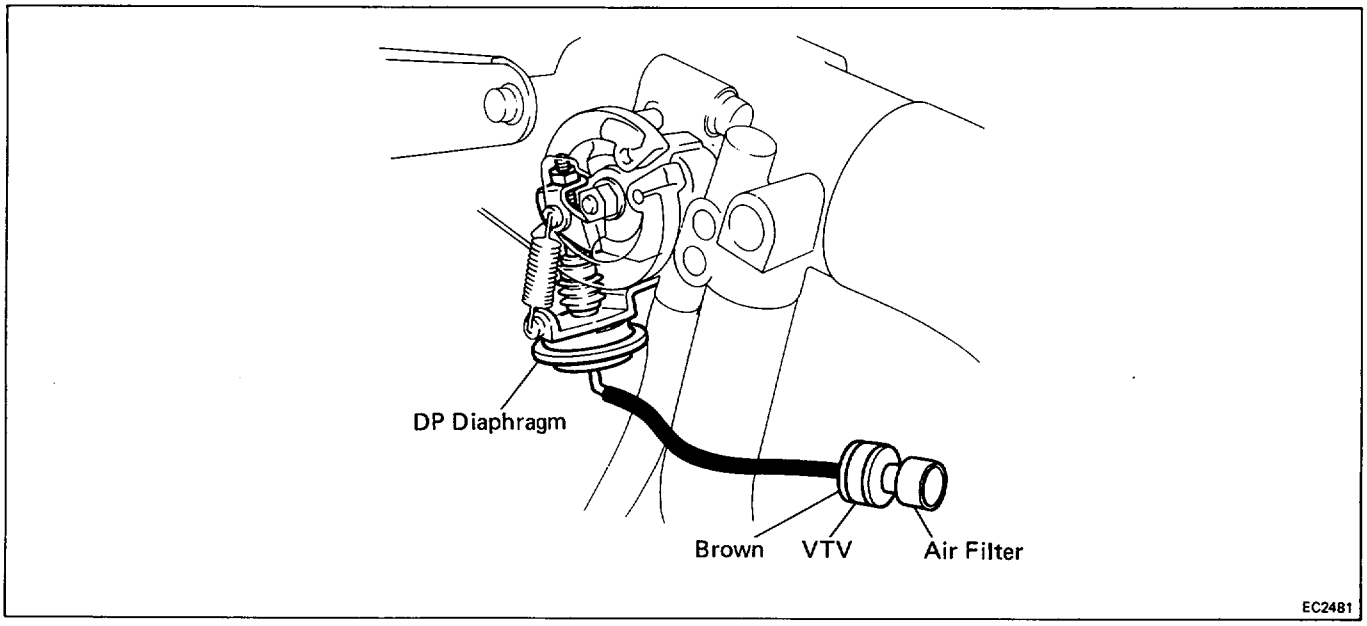
4. **CLEAN FILTER IN CANISTER**

   Clean the filter by blowing 3 kg/cm² (43 psi, 294 kPa) of compressed air into the tank pipe, while holding the purge pipe closed.

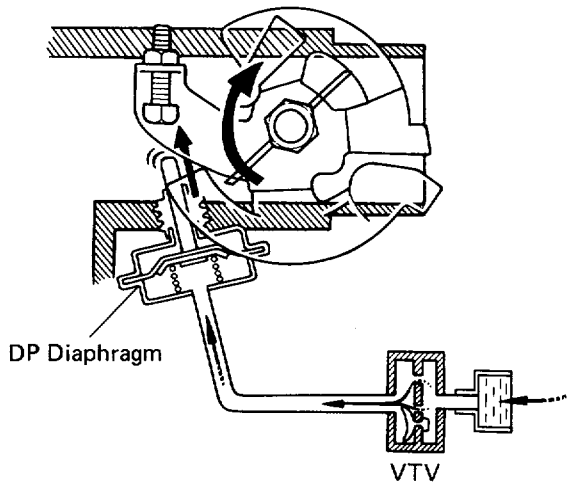
   NOTE:
   - Do not attempt to wash the canister.
   - No activated carbon should come out.

5. **INSTALL CHARCOAL CANISTER**

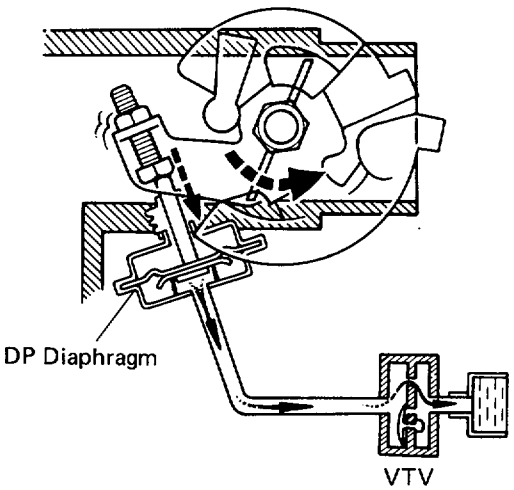
DASH POT (DP) SYSTEM (M/T Vehicles only)



Normal Driving



Deceleration



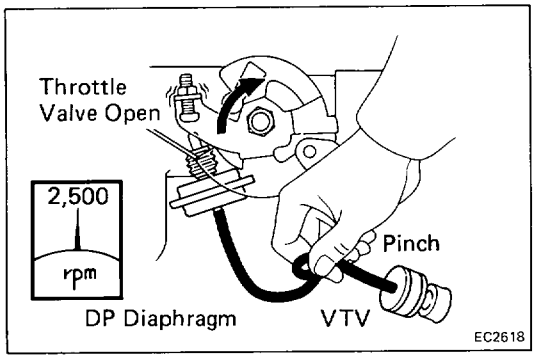
To reduce HC and CO emissions, when decelerating the dash pot opens the throttle valve slightly more than at idle. This causes the air-fuel mixture to burn completely.

Condition	DP Diaphragm	VTV	Throttle Valve
Idling	Pushed in by return force of throttle valve	CLOSED	Idle speed position
Normal driving	Pushed out by diaphragm spring	OPEN	High speed position
Deceleration	Pushed in by return force of throttle valve	CLOSED	Slightly opens and then slowly closes to idle position

INSPECTION OF DP SYSTEM

1. **WARM UP ENGINE**

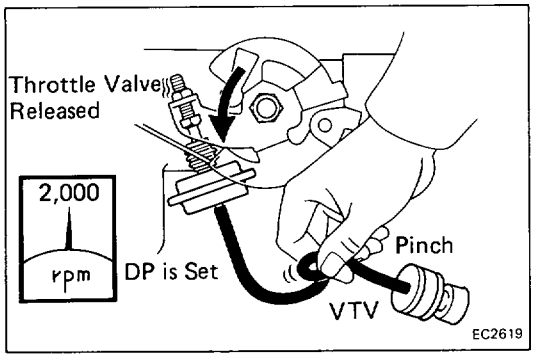
2. **CHECK IDLE SPEED AND ADJUST, IF NECESSARY**



3. **CHECK DP SETTING SPEED**

   (a) Maintain the engine speed at 2,500 rpm.

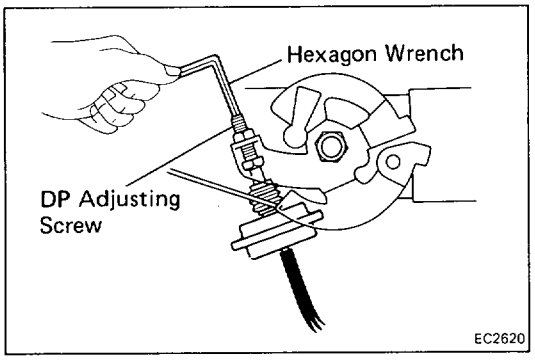
   (b) Pinch the vacuum hose between the DP and VTV.



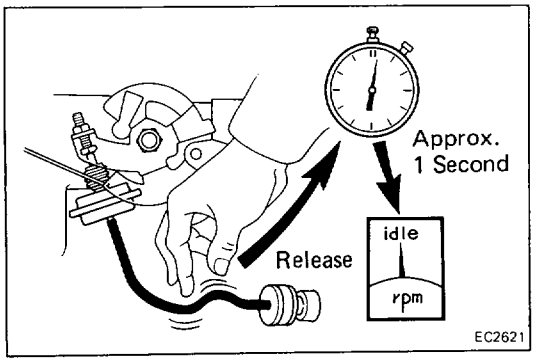
   (c) Release the throttle valve.

   (d) Check that the DP is set.

   DP setting speed: 2,000 rpm



If not at specified speed, adjust with the DP adjusting screw.

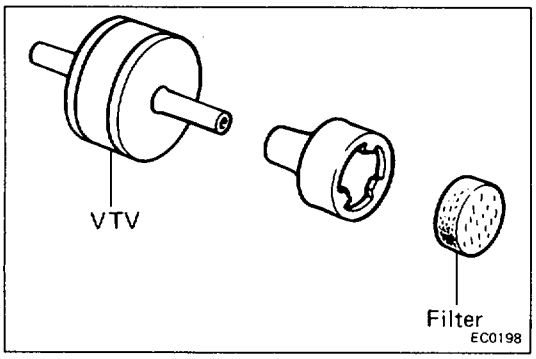


4. **CHECK OPERATION OF VTV**

   (a) Set the DP speed in the same procedure as above; 3. (a) to (c).

   (b) Release the pinched hose and check that the engine returns to idle speed in approx. 1 second.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

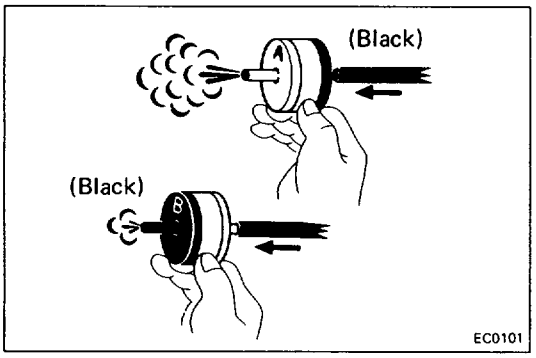


INSPECTION OF VTV

1. CHECK AND CLEAN FILTER ON VTV

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

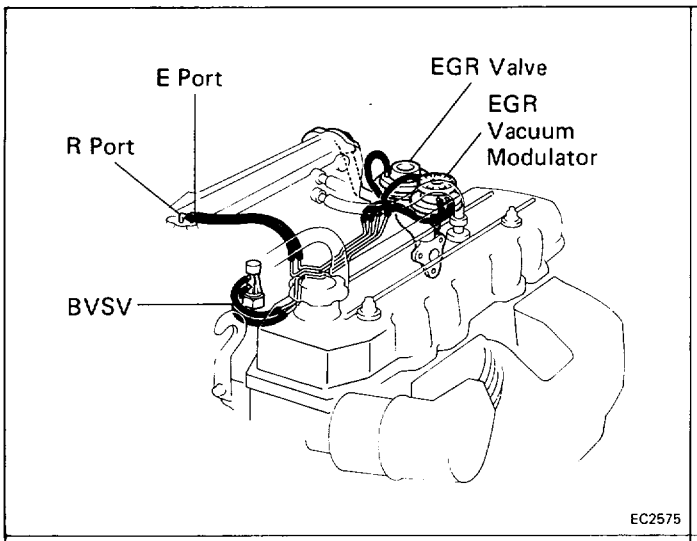


2. CHECK VTV BY BLOWING AIR INTO EACH SIDE

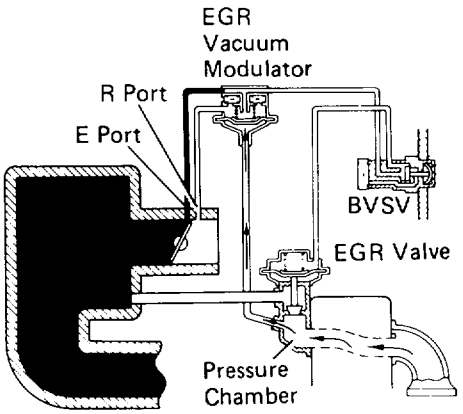
(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

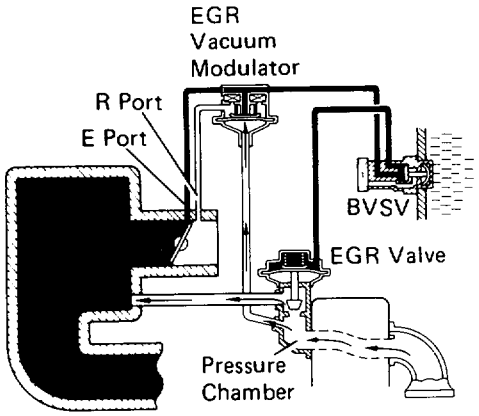
EXHAUST GAS RECIRCULATION (EGR) SYSTEM (22R-E ENGINE)



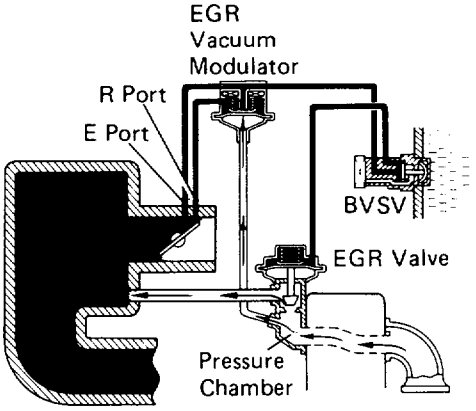
(1)



(2)



(3)

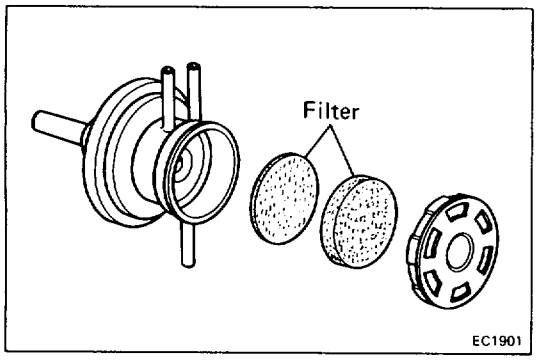


To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below E port	—		—	CLOSED	Not recirculated
		Positioned between E port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: *Pressure increase→Modulator closes→EGR valve opens→Pressure drops→EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

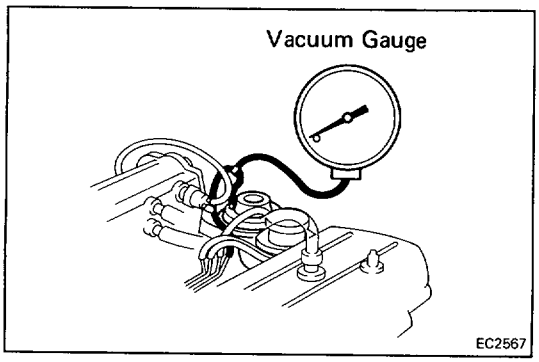


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

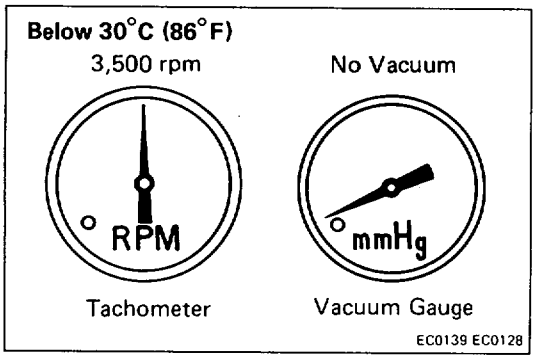


2. PREPARATION

Disconnect the vacuum hose from the EGR valve and, using a three way union, connect a vacuum gauge to it.

3. CHECK SEATING OF EGR VALVE

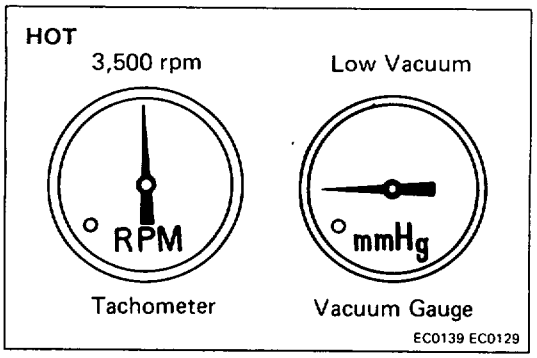
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

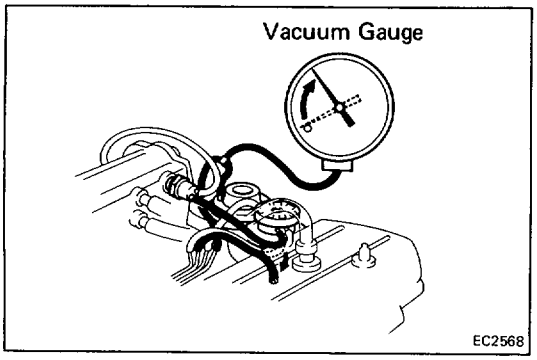
(b) Check that the vacuum gauge indicates zero at 3,500 rpm.



5. CHECK BVSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.

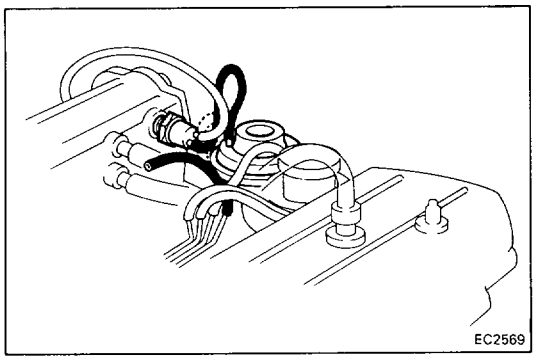


(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.


EC2569

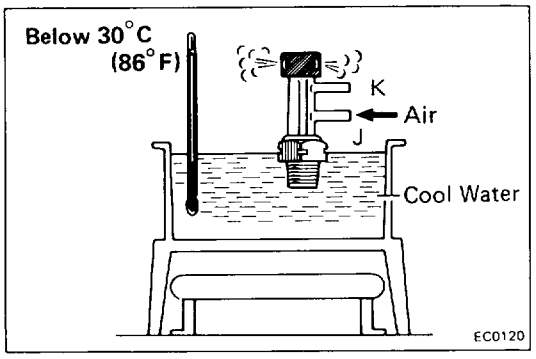
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper location.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



EC0120

INSPECTION OF BVSV

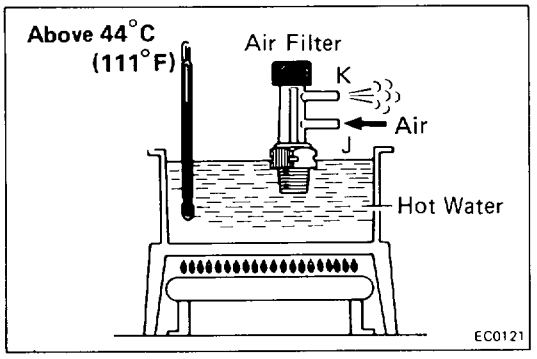
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F).

(d) Check that air flows from pipe J to the air filter.



EC0121

(e) Heat the BVSV to above 44°C (111°F).

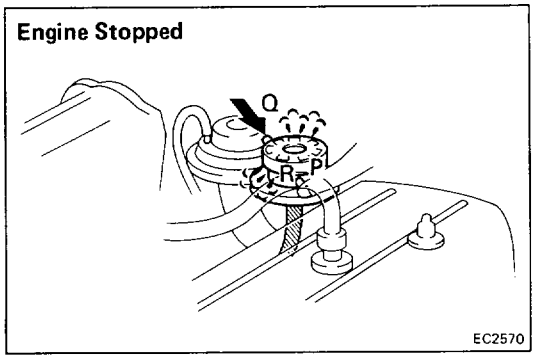
(f) Check that air flows from pipe J to pipe K.

(g) Apply sealant to the threads of the BVSV and reinstall.

Sealant: Part No. 08833 – 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.



EC2570

INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.

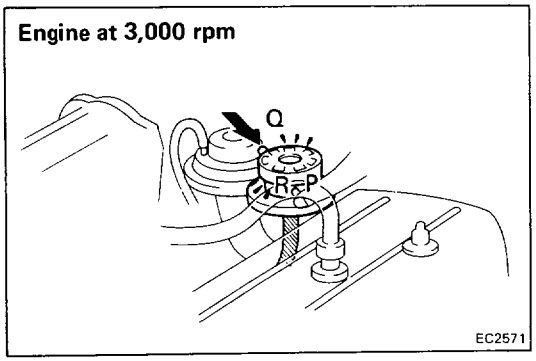
(b) Plug port P and R with your finger.

(c) Blow air into port Q. Check that the air passes through to the air filter side freely.

(d) Start the engine and maintain the speed at 3,500 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.



EC2571

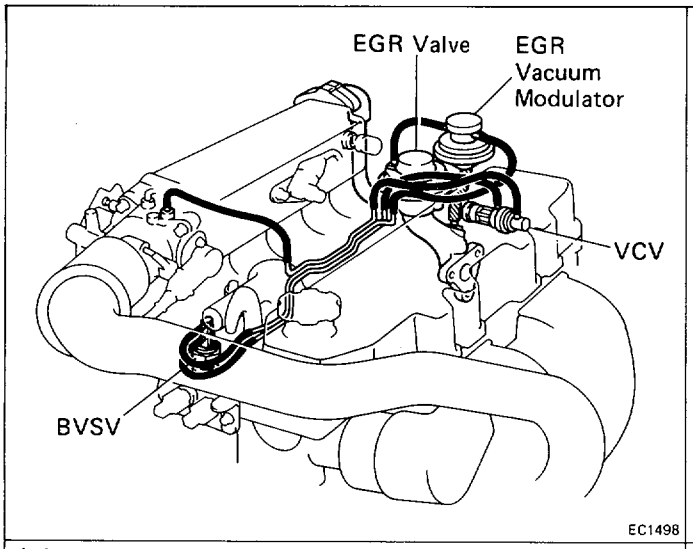
INSPECTION OF EGR VALVE

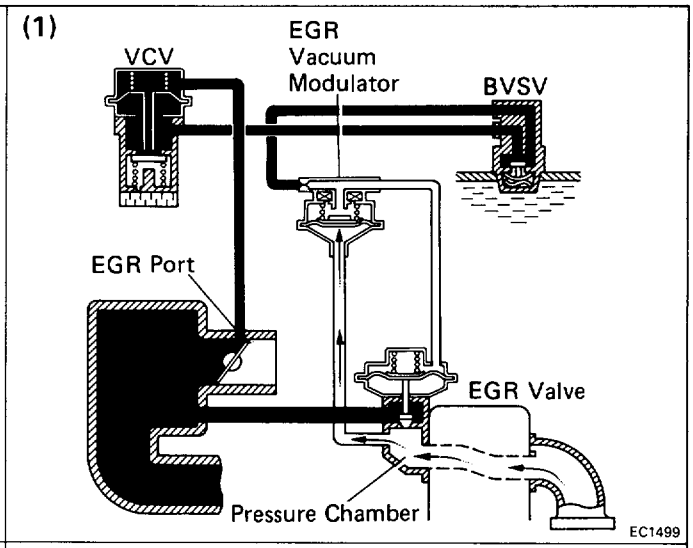
1. REMOVE EGR VALVE

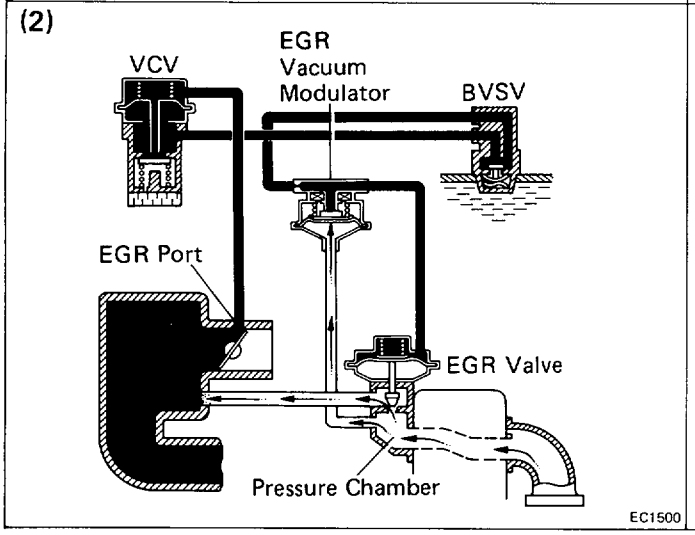
Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

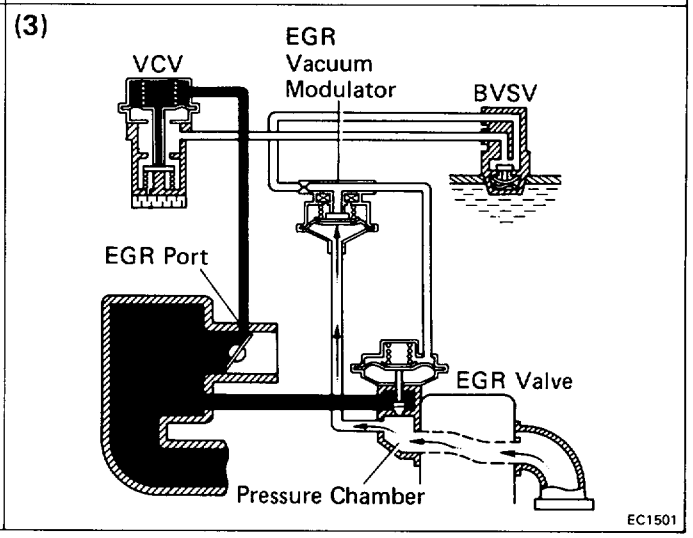
2. INSTALL EGR VALVE WITH NEW GASKET

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (22R-TE ENGINE)





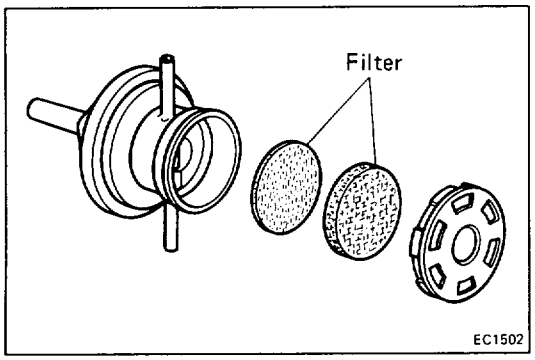




To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber	EGR Vacuum Modulator	EGR Port Vacuum	VCV	EGR Valve	Exhaust Gas
Below 30°C(86°F)	CLOSED	–	–	–	–	–	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below EGR port	–	–	–	–	CLOSED	Not recirculated
		Positioned above EGR port	(1) LOW	OPENS passage to atmosphere	–	–	CLOSED	Not recirculated
			HIGH	CLOSES passage to atmosphere	(2) HIGH	ON	OPEN	Recirculated
					* (3) LOW	OFF	CLOSED	Not recirculated

*Positive pressure is also included. The purpose of the VCV is to prevent action of EGR vacuum modulator when there is pressure. (During low vacuum, the EGR valve shuts off before the VCV.)

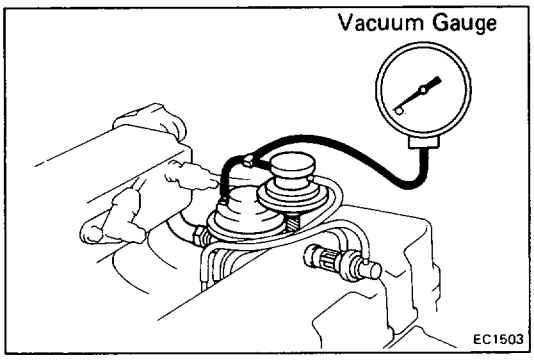


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filters.

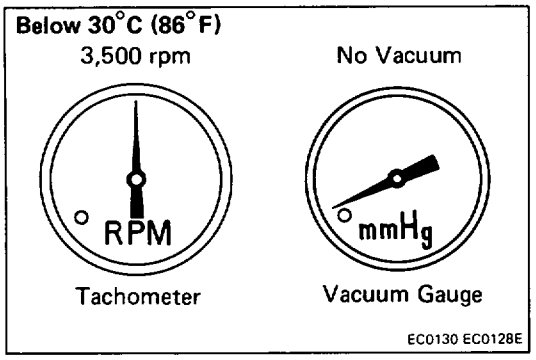


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

3. CHECK SEATING OF EGR VALVE

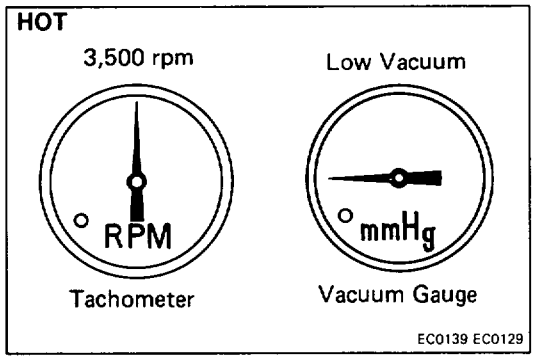
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C (86°F).

(b) Check that the vacuum gauge indicates zero at 3,500 rpm.

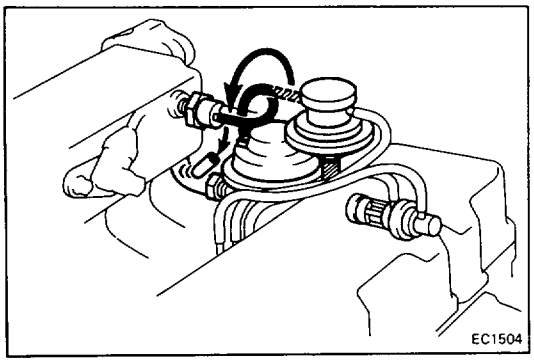


5. CHECK BVSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.

(c) Disconnect the vacuum gauge and reconnect the vacuum hose to the proper location.



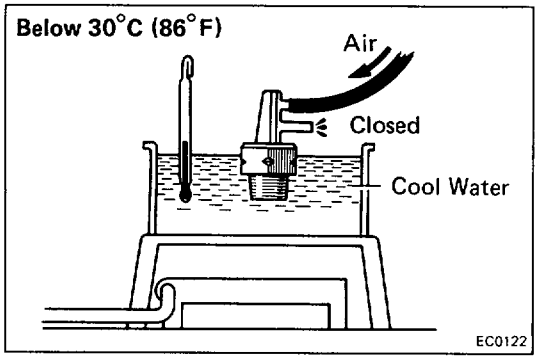
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

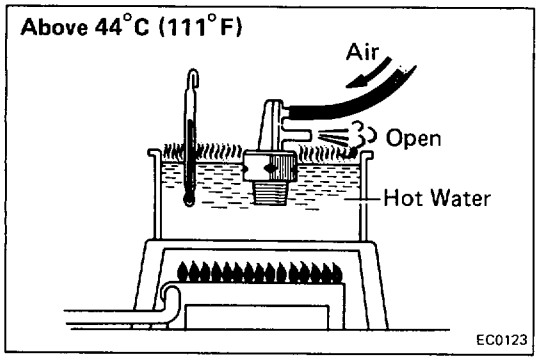
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 30°C (86°F) with cool water.

(d) Blow air into a pipe and check that the BVSV is closed.



(e) Heat the BVSV to above 44°C (111°F) with hot water.

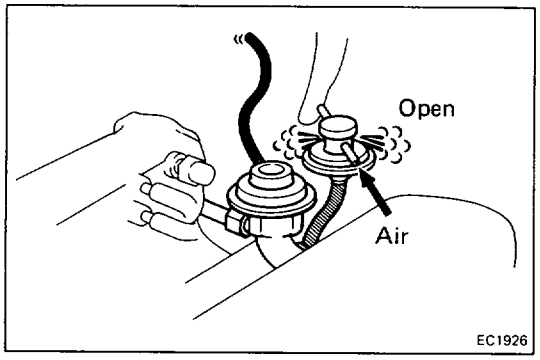
(f) Blow air into a pipe and check that the BVSV is open.

(g) Apply sealant to the threads of the BVSV and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.



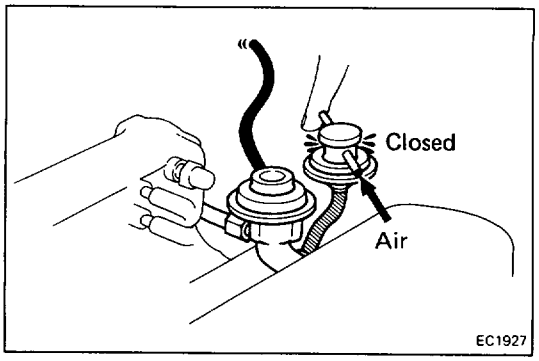
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the two vacuum hoses from the EGR vacuum modulator.

(b) Plug one pipe with your finger.

(c) Blow air into the other pipe and check that the air passes through to the air filter side freely.



(d) Start the engine and maintain the speed at 3,500 rpm.

(e) Repeat the above test and check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.

If a problem is found, replace the EGR vacuum modulator.

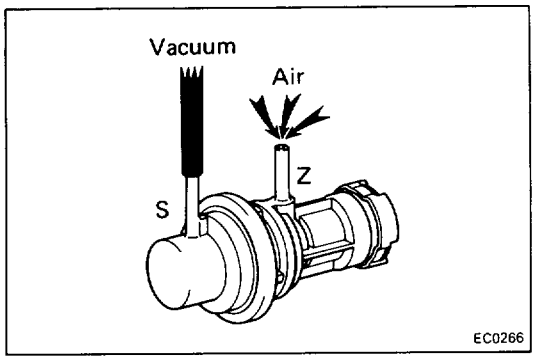
INSPECTION OF EGR VALVE

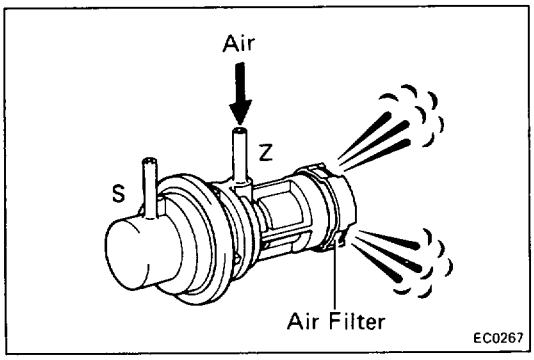
1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits.

If a problem is found, replace it.

2. INSTALL EGR VALVE WITH A NEW GASKET





INSPECTION OF VCV

CHECK VCV BY BLOWING AIR INTO PIPE

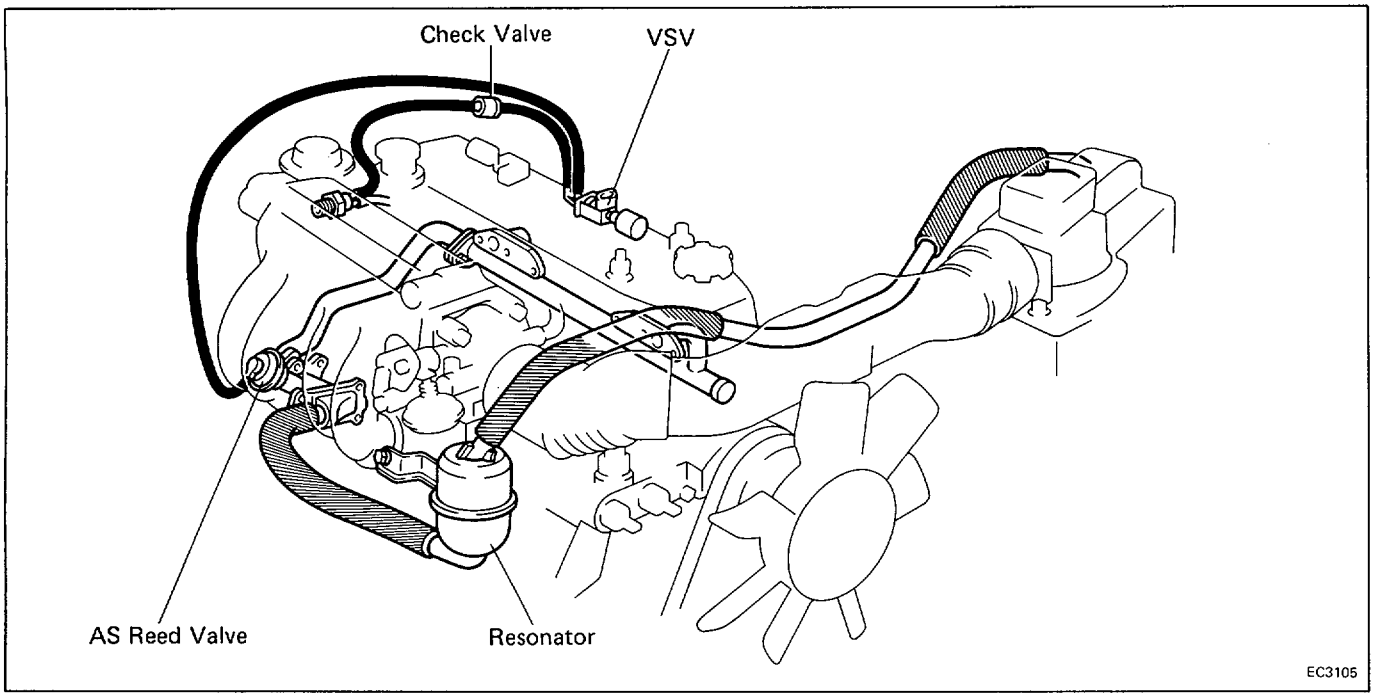
(a) Check that the air is sucked to pipe Z, while applying vacuum above 30 mmHg (1.18 in. Hg, 4.0 kPa) to pipe S.

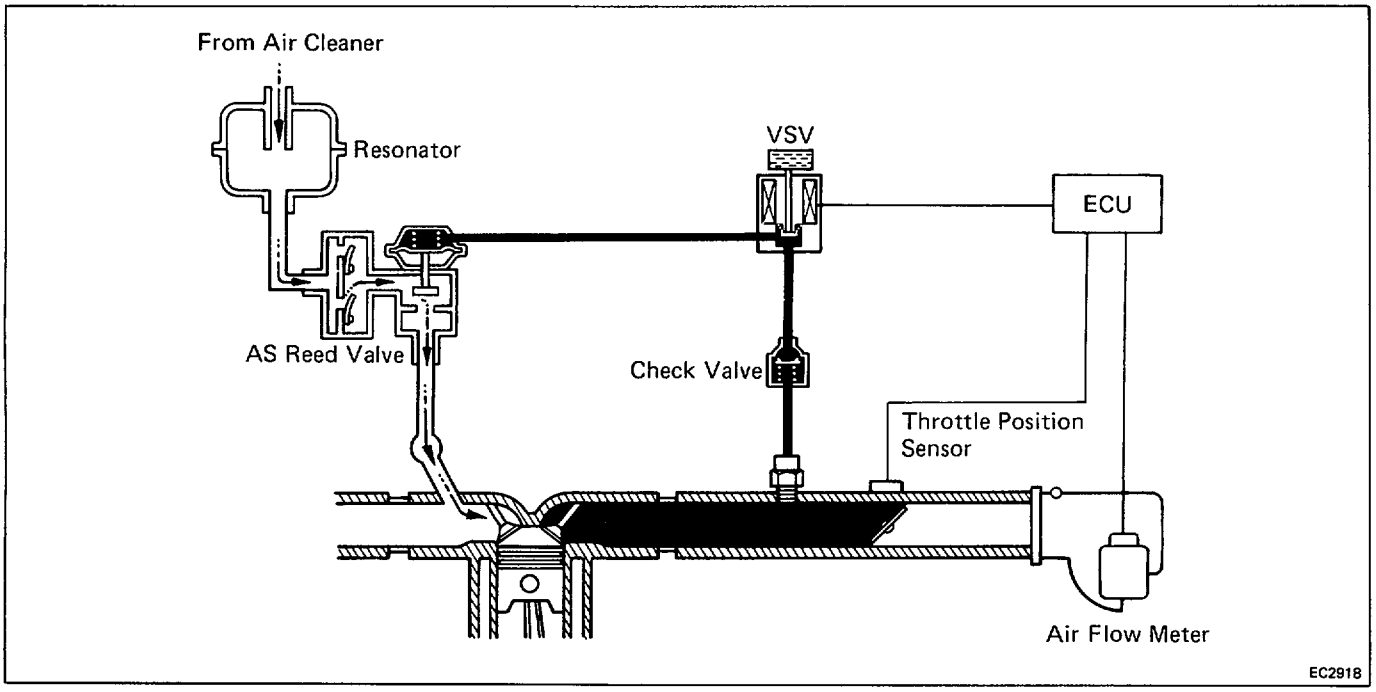
(b) Stop the applied vacuum.

(c) Blow air into pipe Z and check that the air comes out of the air filter.

If a problem is found, replace the VCV.

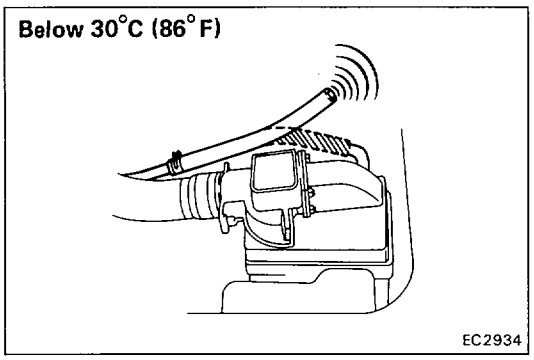
AIR SUCTION (AS) SYSTEM

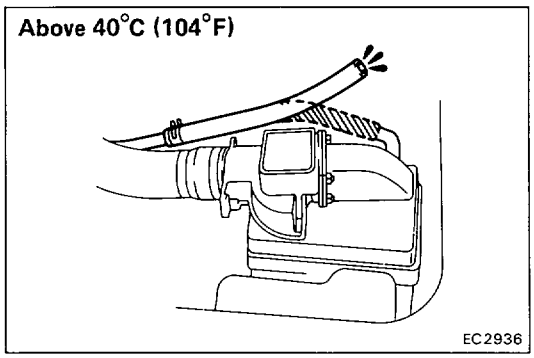


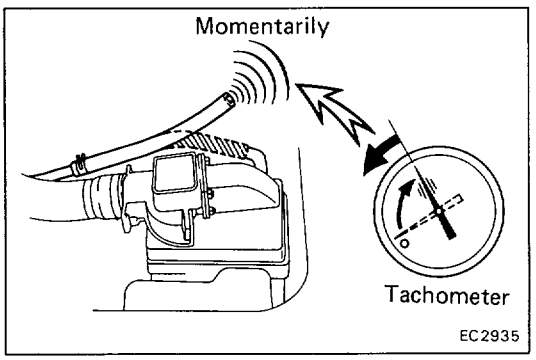


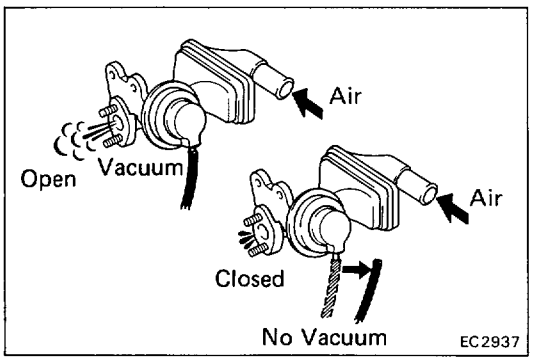
To reduce HC and CO emissions, this system draws in air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

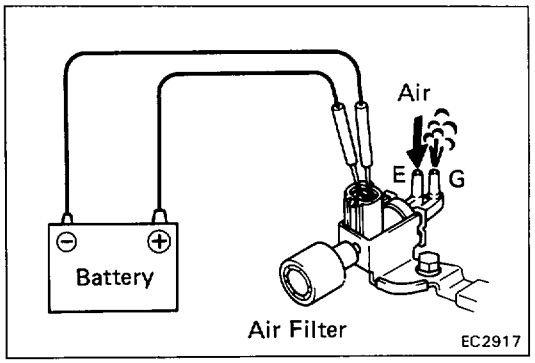
Condition	Coolant Temp.	Throttle valve position	Vehicle speed	Engine RPM	VSV	AS
Normal driving	Below 30°C (86°F)	—	—	Below 3,600 rpm	ON	ON
				Above 3,600 rpm	OFF	OFF
Deceleration	Above 40°C) (104°F)	Idling	Below 4 km/h (2 mph)	Below 1,000 rpm	OFF	OFF
				Above 1,000 rpm	ON	ON
			Above 4 km/h (2 mph)	Below 1,000 rpm	ON	ON
				Above 1,000 rpm	ON	ON











INSPECTION OF AS SYSTEM

1. **VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS**

2. **CHECK AS SYSTEM WITH COLD ENGINE**
   (a) The coolant temperature should be below 30°C (86°F).
   (b) Disconnect the No. 1 AS hose from the air cleaner case.
   (c) Check that a bubbling noise is heard from the No. 1 AS hose at idle.

3. **CHECK AS SYSTEM WITH WARM ENGINE**
   (a) Warm up the engine to above 40°C (104°F).
   (b) With the engine idling, check that a bubbling noise is not heard from the No. 1 AS hose.
   (c) Race the engine and quickly close the throttle valve. Check that a bubbling noise stops momentarily.

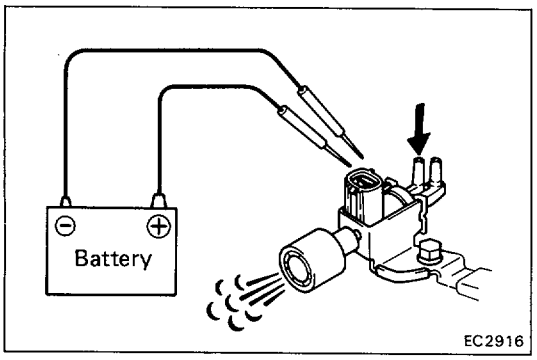
INSPECTION OF REED VALVE

CHECK REED VALVE BY BLOOWING AIR INTO PIPE

(a) Apply vacuum to the reed valve diaphragm.
(b) Blow air into a pipe and check that the reed valve is open.
(c) Release the vacuum and check that the reed valve is closed.

INSPECTION OF VSV

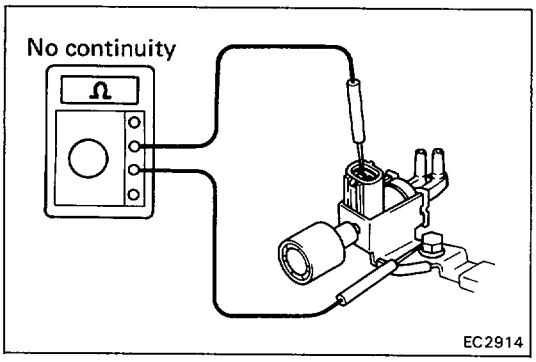
1. **CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE**
   (a) Connect the VSV terminals to the battery terminals as illustrated.
   (b) Blow into pipe E and check that air comes out of pipe G.



(c) Disconnect the battery.

(b) Blow into pipe E and check that air comes out of air filter.

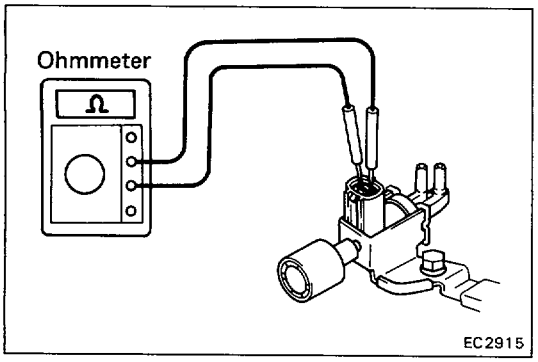
If a problem is found, repair the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body.

If there is continuity, replace the VSV.

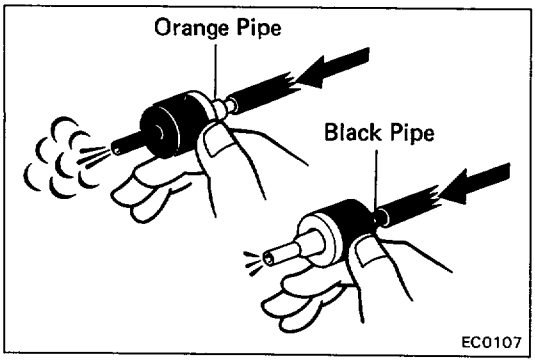


3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals as shown.

Specified resistance: 30 — 50 Ω at 20°C (68°F)

If resistance is not within specification, replace the VSV.



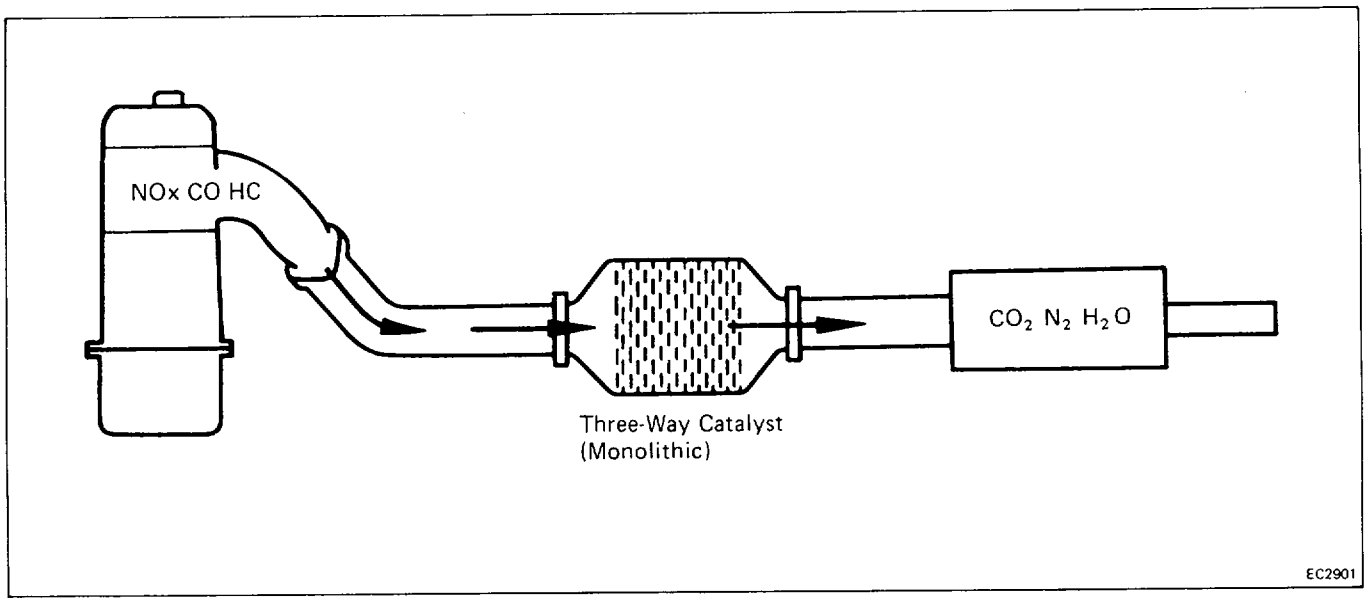
INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the block pipe to the orange pipe.

THREE-WAY CATALYST (TWC) SYSTEM

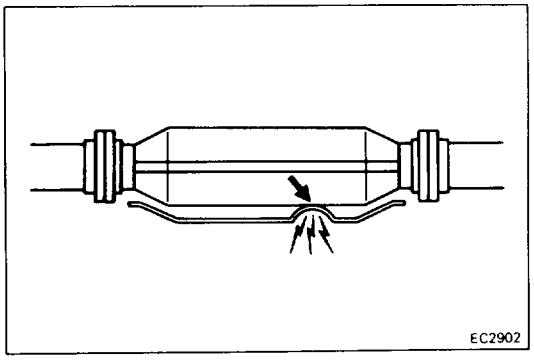


To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

INSPECTION OF EXHAUST PIPE ASSEMBLY

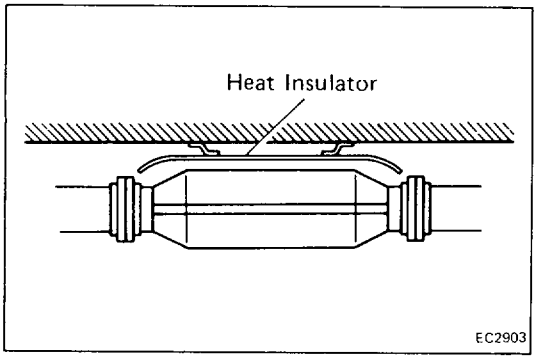
1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



INSPECTION OF CATALYTIC CONVERTER

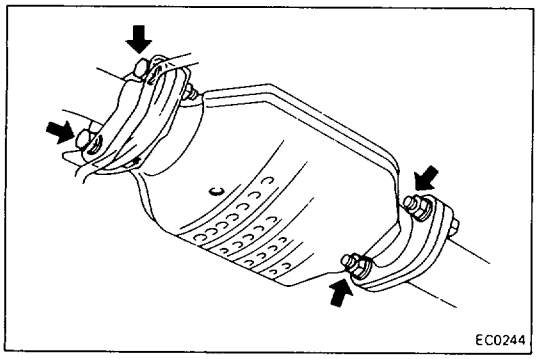
CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it contacts the catalyst, repair or replace it.



INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR



REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CONVERTER
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the converter and gaskets.
2. INSTALL CONVERTER
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Torque the bolts.

   Torque: Catalyst — Exhaust pipe
   440 kg-cm (32 ft-lb, 43 N·m)

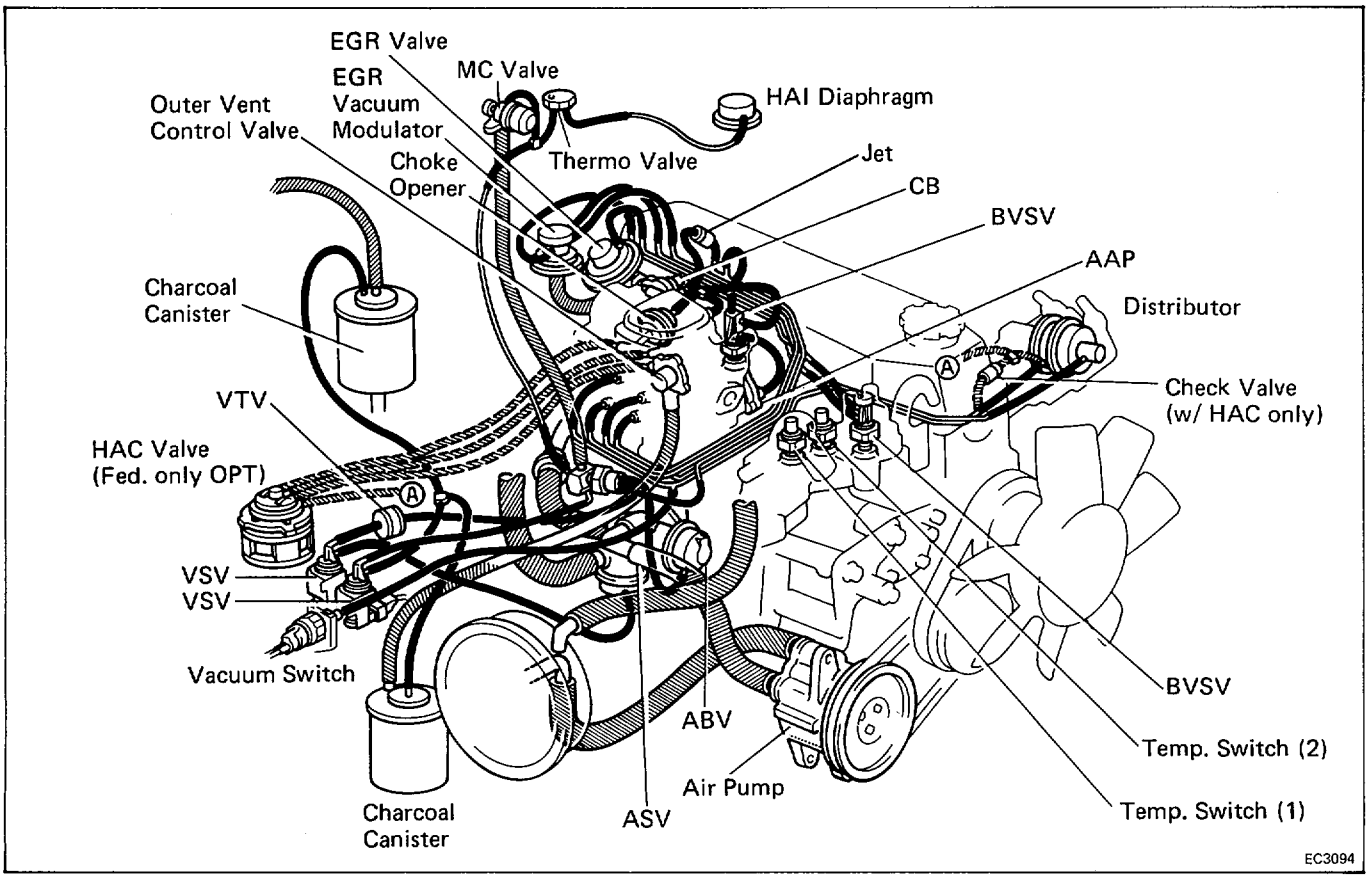
   (c) Reinstall the bracket bolts and tighten them.

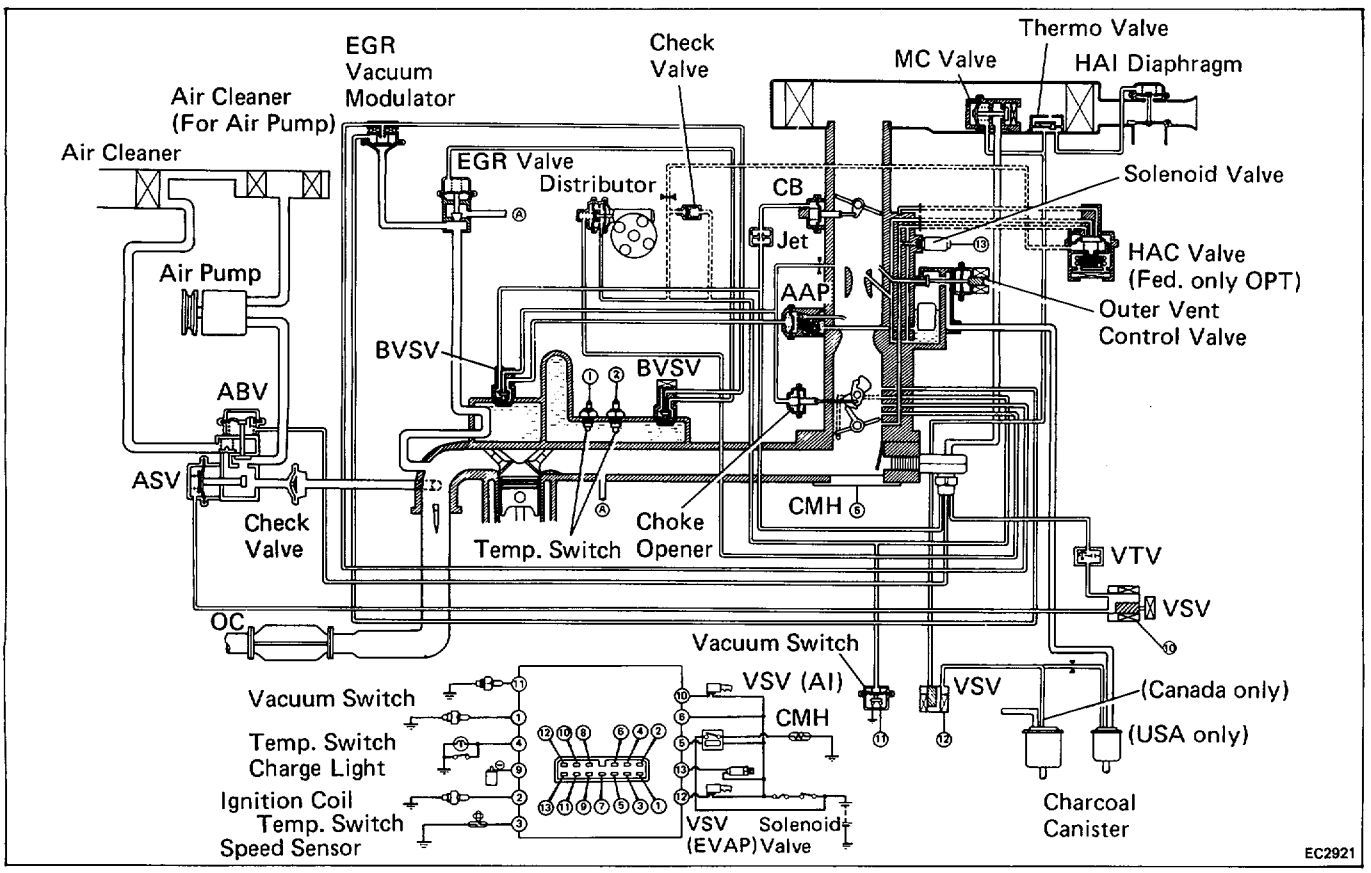
SYSTEM PURPOSE

System	Abbre-viation	Purpose	Federal & Canada	California
Positive crankcase ventilation	PCV	Reduces blow-by gas (HC)	●	●
Fuel evaporative emission control	EVAP	Reduces evaporative HC	●	●
Mixture control	MC	Reduces HC and CO	●	●
Exhaust gas recirculation	EGR	Reduces NOx	●	●
Air suction and fuel system feedback control	—	Maintains air-fuel ratio for TWC and reduces HC, CO and NOx	—	●
Air injection	AI	Reduces HC and CO	●	—
Air suction	AS	Reduces HC and CO	—	●
Three-way catalyst	TWC	Reduces HC, CO and NOx	—	●
Oxidation catalyst	OC	Reduces HC and CO	●	—
High altitude compensation	HAC	Insures air-fuel mixture at high altitude	● (OPT)*	—
Auxiliary system:				
Automatic hot air intake	HAI	Improves driveability—cold	●	●
Automatic choke	—	Improves driveability—cold	●	●
Choke breaker	CB	Improves driveability—cold	●	●
Choke opener	—	Improves driveability—hot	●	●
Auxiliary acceleration pump	AAP	Improves driveability—cold	●	●
Deceleration fuel cut	—	Prevents overheating OC or TWC, and after burning	●	●
Idle advance	—	Improves fuel economy at idle	●	●
Cold mixture heater	CMH	Improves driveability—cold	●	●

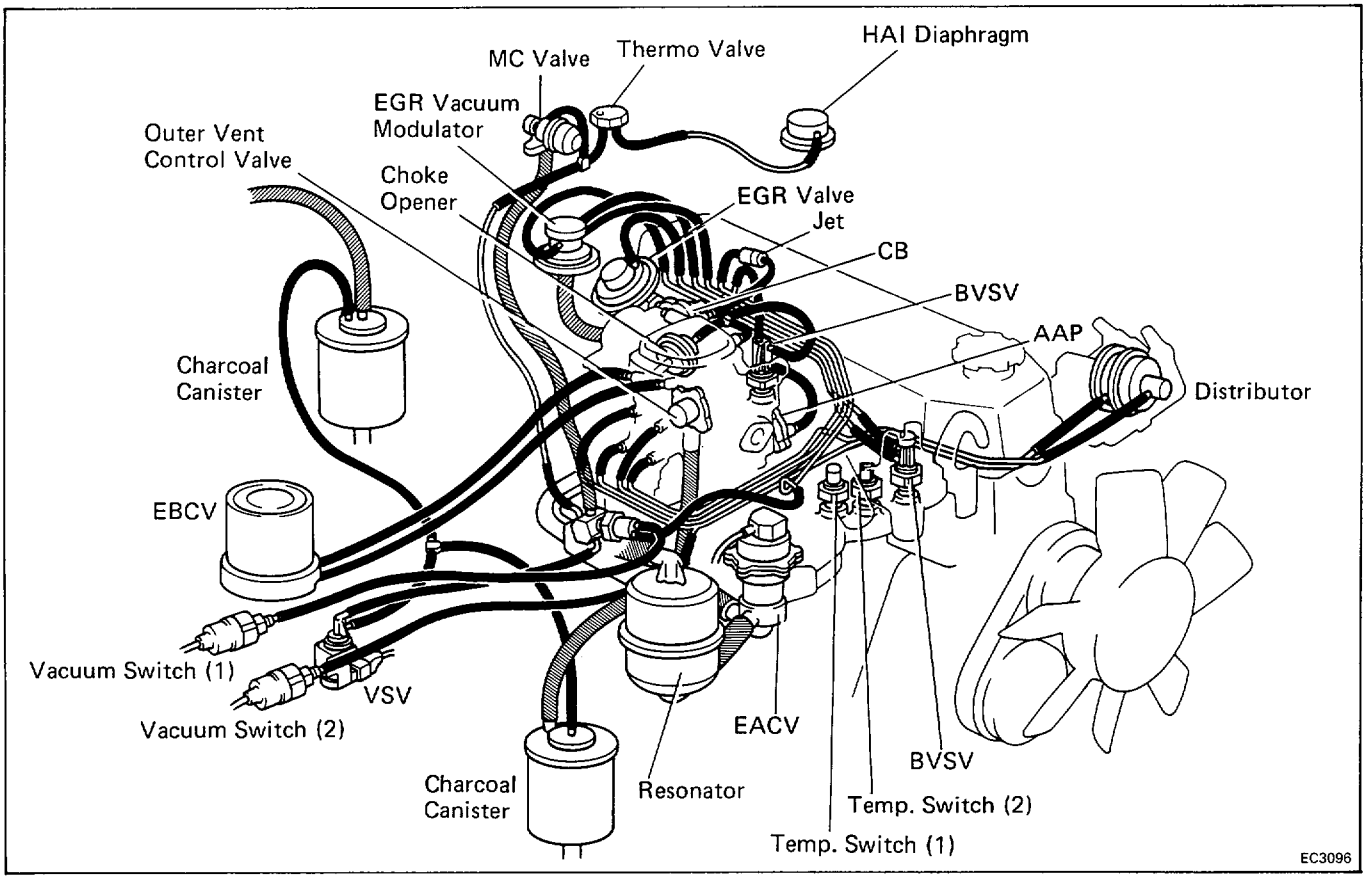
Remarks: * Option in USA only, except in California.

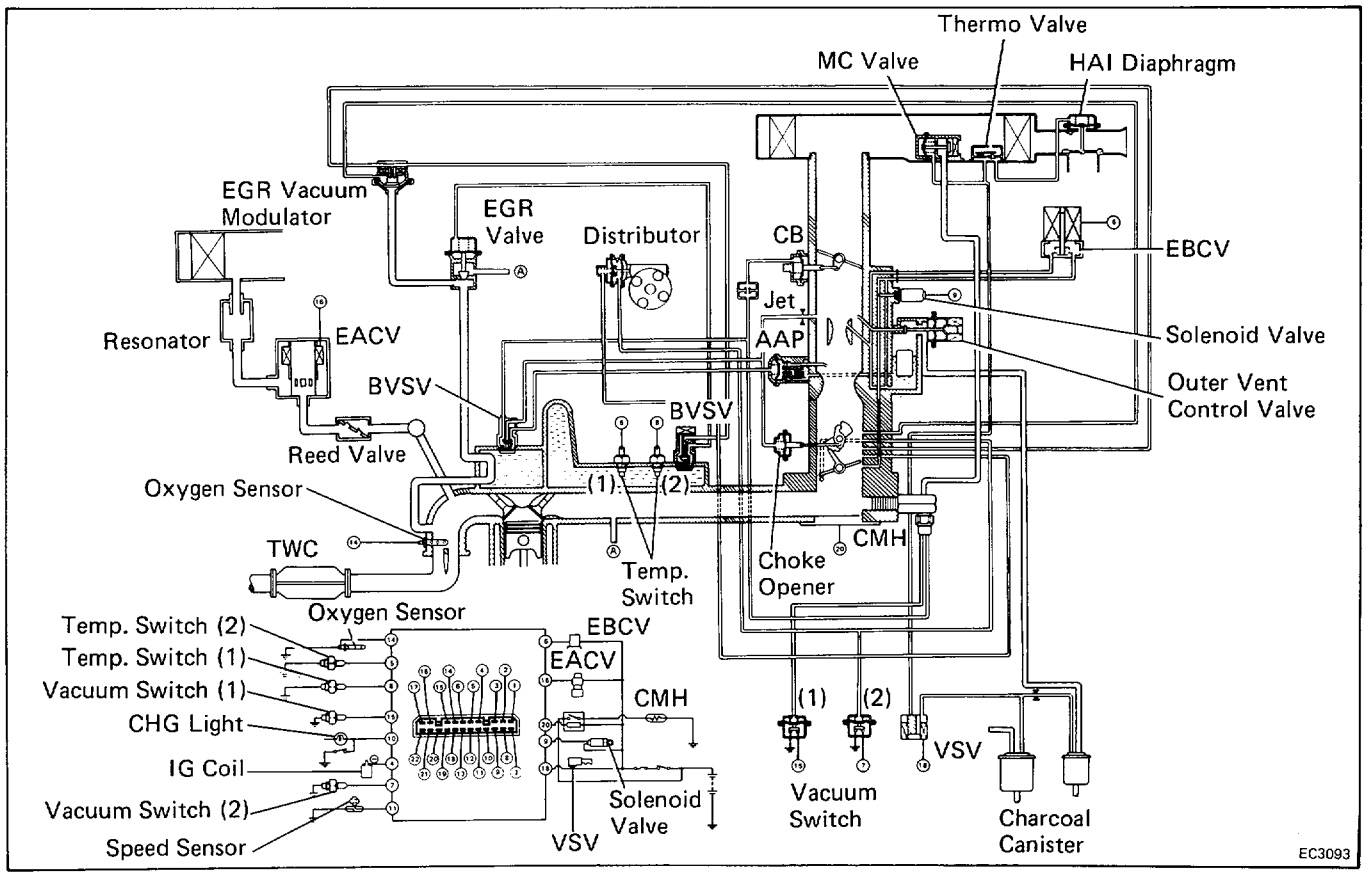
COMPONENT LAYOUT AND SCHEMATIC DRAWING
(Federal and Canada)



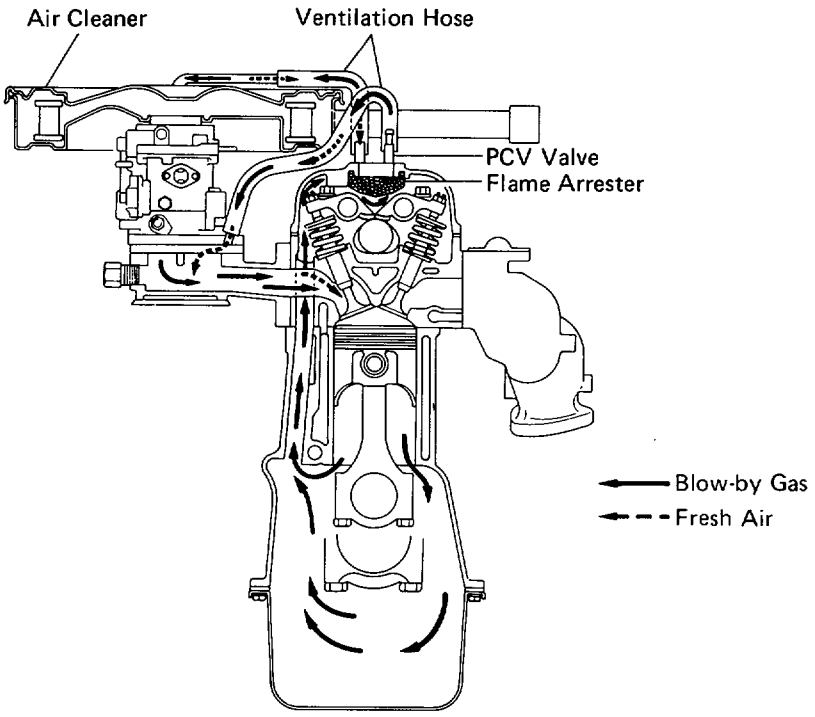


COMPONENT LAYOUT AND SCHEMATIC DRAWING (California)



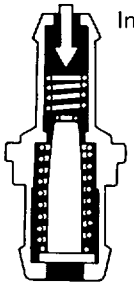


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



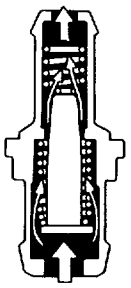
To reduce HC emissions, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or Backfiring



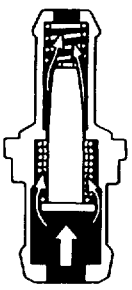
- PCV VALVE IS CLOSED.

Normal Operation



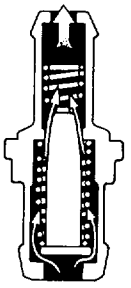
- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

Idling or Decelerating

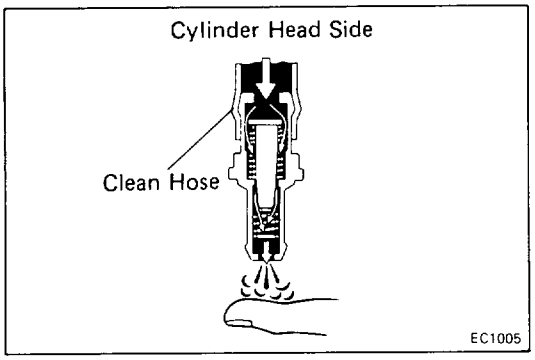


- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

Acceleration of Heavy Load

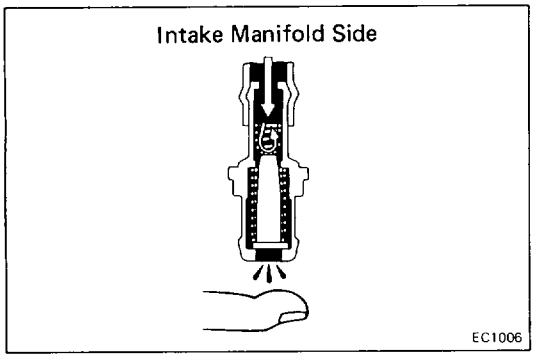


- PCV VALVE IS FULLY OPEN.

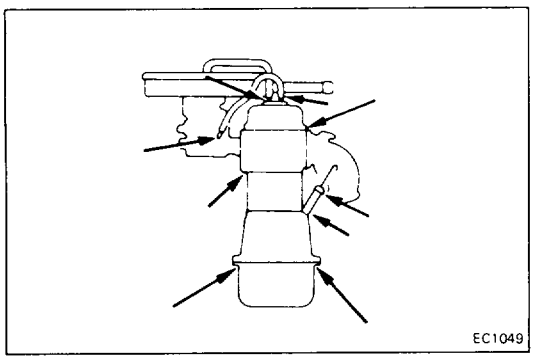


INSPECTION OF PCV VALVE

1. **REMOVE PCV VALVE**
2. **ATTACH CLEAN HOSE TO PCV VALVE**
3. **BLOW FROM CYLINDER HEAD SIDE**
   Check that air passes through easily.
   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. **BLOW FROM INTAKE MANIFOLD SIDE**
   Check that air passes through with difficulty.
   If the PCV valve fails either of the checks, replace it.
5. **REINSTALL PCV VALVE**

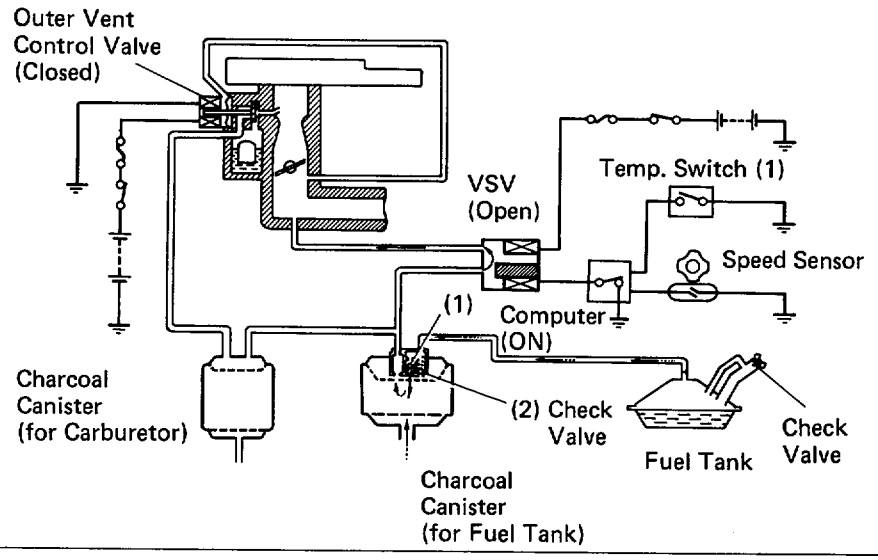


INSPECTION OF PCV HOSES AND CONNECTIONS

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKET

Check for cracks, leaks or damage.

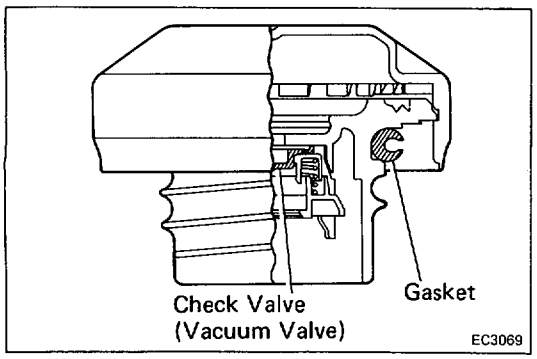
FUEL EVAPORATIVE EMISSION CONTROL (EVAP) SYSTEM



To reduce HC emissions, evaporated fuel from the fuel tank and float chamber is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

IG S/W	Engine	*Outer Vent Control Valve	Coolant Temp.	Temp. S/W (1)	Vehicle Speed	Computer	VSV	Check (1)	Valve (2)	Check Valve in Cap	Evaporated Fuel (HC)
OFF	Not running	OPEN	–	–	–	–	–	–	–	–	HC from tank and float chamber is absorbed into the canister.
ON	Running	CLOSED	Below 43°C (109°F)	ON	–	OFF	CLOSED	–	–	–	HC from tank is absorbed into the canister
			Above 55°C (131°F)	OFF	Below 7 mph (11 km/h)	OFF	CLOSED	–	–	–	
					Above 16 mph (25 km/h)	ON	OPEN	–	–	–	HC from canister is led into the intake manifold.
High pressure in tank		–	–	–	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank		–	–	–	–	–	–	CLOSED	OPEN	OPEN	Air is led into the tank.

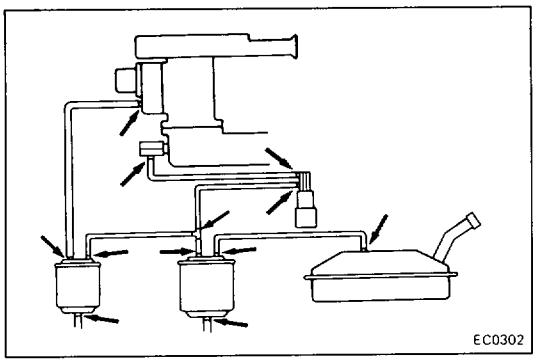
Remarks: *The outer vent control valve is pulled by intake manifold vacuum and held by the solenoid. The solenoid itself cannot pull the valve.



INSPECTION OF FUEL TANK CAP, FUEL VAPOR LINES AND FUEL TANK

1. VISUALLY INSPECT FUEL TANK CAP

Look for damaged or deformed gasket and cap.
If a problem is found, repair or replace the cap.



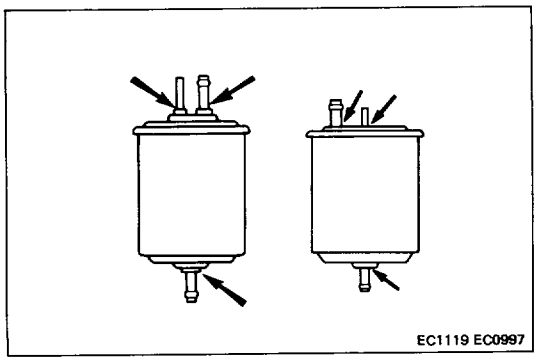
2. **VISUALLY INSPECT LINES AND CONNECTIONS**

Look for loose connections, sharp bends or damage.

3. **VISUALLY INSPECT FUEL TANK**

Look for deformation, cracks or fuel leakage.

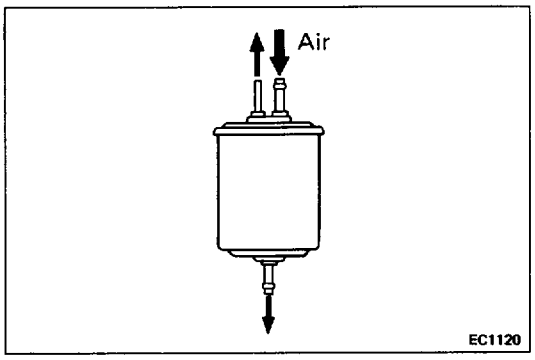
INSPECTION OF CHARCOAL CANISTER(S)



1. **REMOVE CHARCOAL CANISTER(S)**

2. **VISUALLY INSPECT CHARCOAL CANISTER(S)**

Look for cracks or damage.

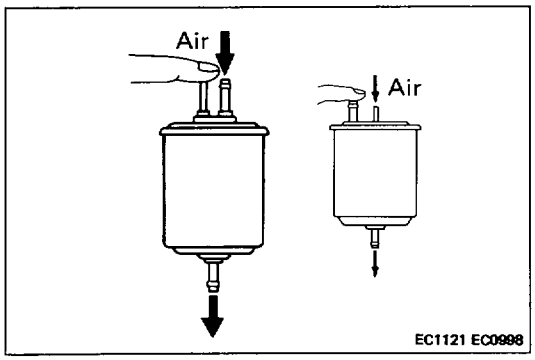


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

(a) Using low pressure compressed air, blow into the tank pipe and check that the air flows without resistance from the other pipes.

(b) Blow into the purge pipe and check that the air flows without resistance from the other pipes.

If a problem is found, replace the charcoal canister.



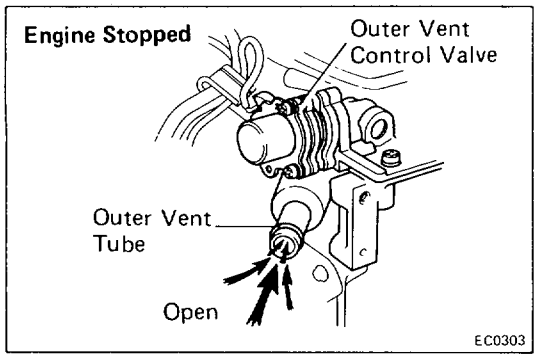
4. **CLEAN FILTER IN CANISTER(S)**

Clean the filter by blowing 3 kg/cm^2 (43 psi, 294 kPa) of compressed air into the pipe, while holding the other upper canister pipes closed.

NOTE:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. **REINSTALL CHARCOAL CANISTER(S)**

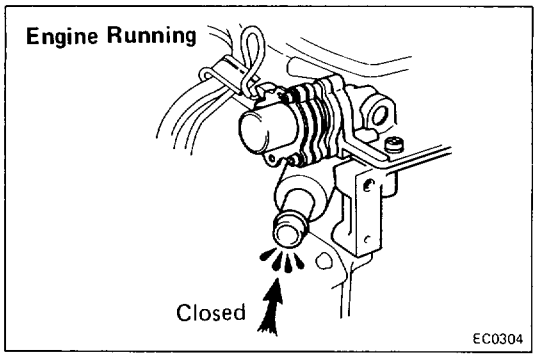


INSPECTION OF OUTER VENT CONTROL VALVE

1. CHECK OUTER VENT CONTROL VALVE OPERATION

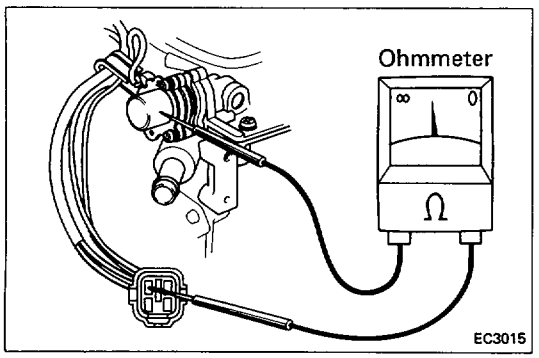
(a) Disconnect the outer vent hose from the carburetor.

(b) Blow air into the outer vent pipe and check that the outer vent control valve is open.



(c) Start the engine.

(d) With the engine idling, blow air into the outer vent pipe and check that the outer vent control valve is closed.

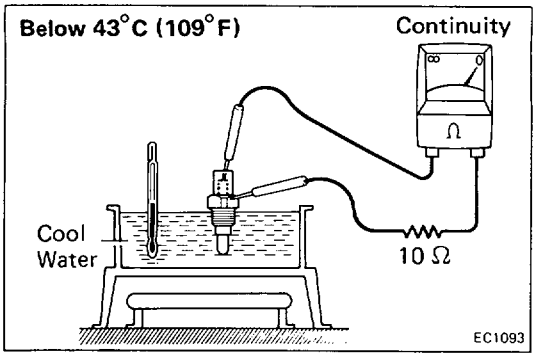


2. CHECK SOLENOID

(a) Unplug the wiring connector.

(b) Using an ohmmeter, measure the resistance between the positive(+) terminal and the solenoid body.

Specified resistance: 63 — 73 Ω at 20°C (68°F)



INSPECTION OF TEMP. SWITCH (1)

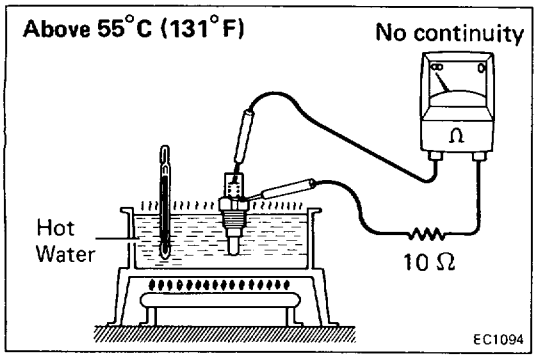
CHECK TEMP. SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the temp. switch from the intake manifold.

(c) Cool the temp. switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.



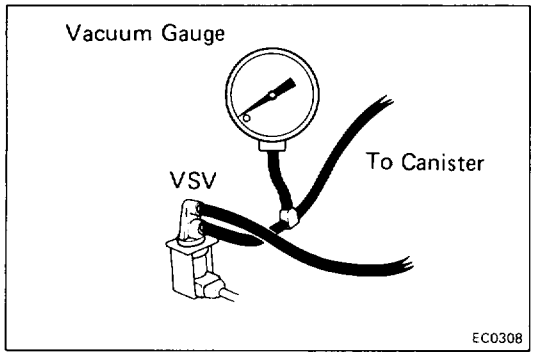
(e) Heat the switch to above 55°C (131°F) with hot water.

(f) Check that there is no continuity.

(g) Apply sealant to the threads of the switch and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

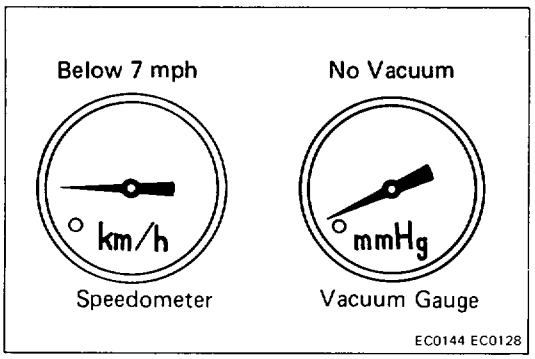


INSPECTION OF SPEED SENSOR TO VSV

1. CONNECT VACUUM GAUGE

(a) Using a 3-way connector, connect the vacuum gauge to the hose between the VSV and canister.

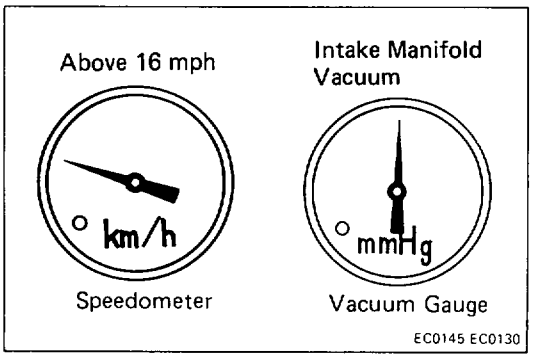
(b) Set the gauge at the driver's seat.



2. PERFORM ROAD TEST, OBSERVING SPEEDOMETER AND VACUUM GAUGE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates zero at low speed driving (below 7 mph or 11 km/h).



(c) Check that the vacuum gauge indicates intake manifold vacuum at middle and high speed driving (above 16 mph or 25 km/h).

If a problem is found, inspect speed sensor and VSV.

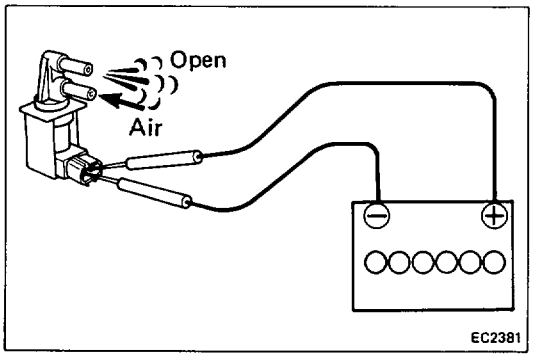
3. REMOVE VACUUM GAUGE AND RECONNECT HOSE

INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

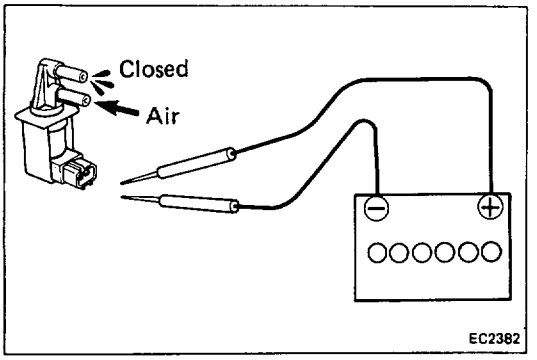
(a) Connect the VSV terminals to the battery terminal as shown.

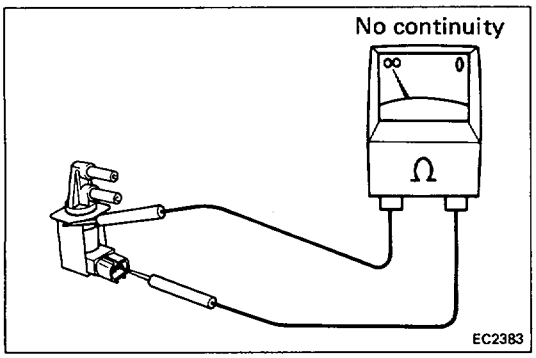
(b) Blow into a pipe, and check that the VSV is open.



(c) Disconnect the battery positive (+) terminal.

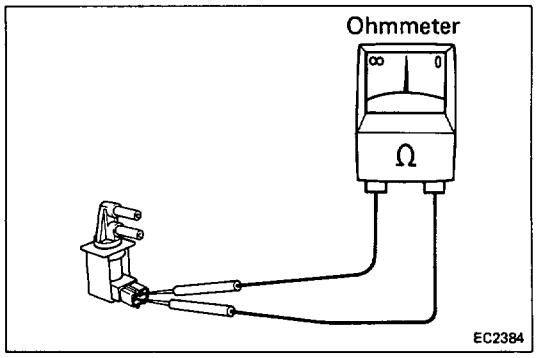
(d) Blow into a pipe and check that the VSV is closed.





2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the VSV body. If a short circuit is found, repair or replace the VSV.

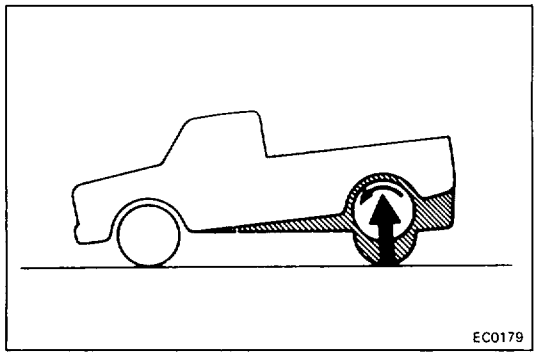


3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminals as shown.

Specified resistance: 38 — 44 Ω at 20°C (68°F)

If the resistance is not within specification, replace the VSV.



INSPECTION OF SPEED SENSOR

1. JACK UP ONE REAR WHEEL TO CLEAR GROUND AND CHOCK FRONT WHEELS

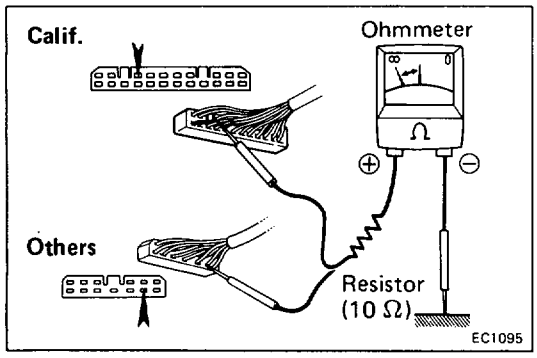
2. RELEASE PARKING BRAKE

3. SET SHIFT LEVER INTO NEUTRAL

NOTE: For 4WD vehicles, check that the transfer shift lever in the H2 range.

4. UNPLUG WIRING CONNECTOR FROM COMPUTER

Computer location: Left Cowl Side



5. CHECK ON-OFF CYCLES OF SPEED SENSOR

(a) Place the positive (+) terminal of the ohmmeter on the wiring connector terminal and the negative (—) terminal on ground.

(b) Turn the rear wheel slowly.

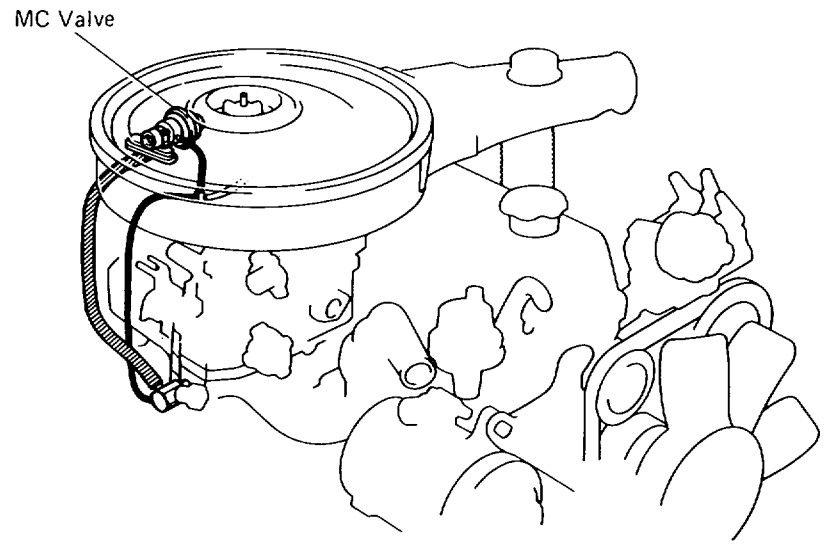
(c) Check that the ohmmeter needle deflects consistently

CAUTION: The ohmmeter probe should be inserted from the rear side of the connector.

If the ohmmeter needle does not deflect, check that the speed sensor terminals at the back side of the speedometer air properly connected. If the connection is OK, replace the speedometer assembly.

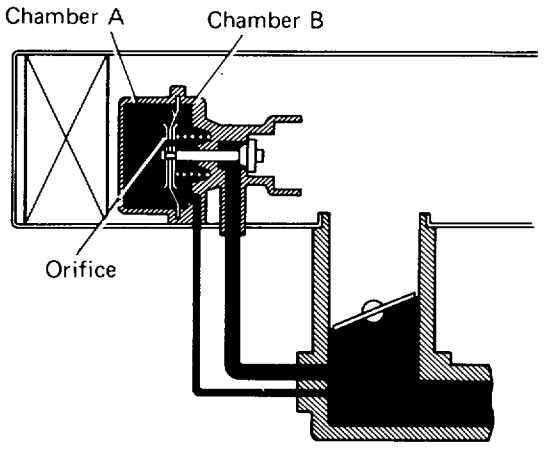
6. RECONNECT WIRING CONNECTOR TO COMPUTER

MIXTURE CONTROL (MC) SYSTEM



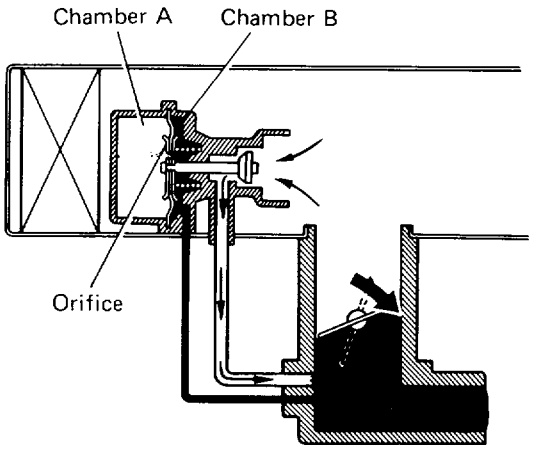
EC0312

CONSTANT RPM



EC0313

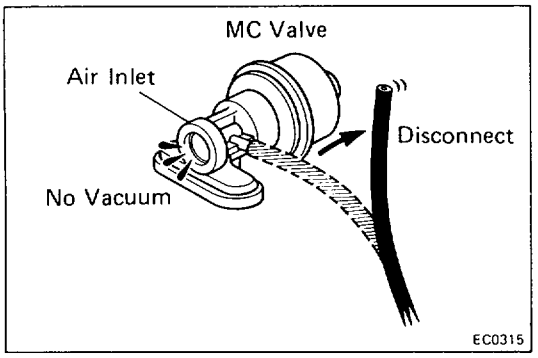
SUDDEN DECELERATION, STEP (1)

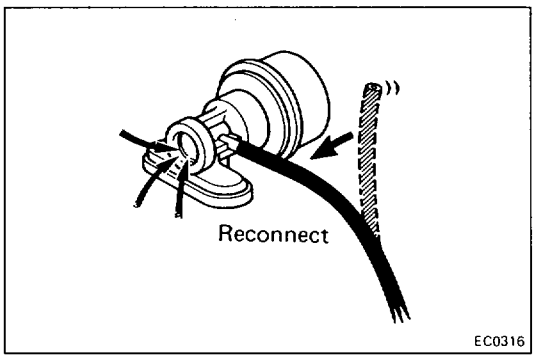


EC0314

To reduce HC and CO emissions, this system allows air to enter the intake manifold on sudden deceleration.

Condition		Vacuum in Chambers A and B	MC Valve	Fresh Air
Constant RPM		Same vacuum	CLOSED	No air flow
Sudden deceleration	Step (1)	High vacuum acts on chamber B	OPEN	Air is routed through MC valve to intake manifold.
	Step (2)	After a few seconds, vacuum in both chambers equalizes through the orifice.	CLOSED	No air flow





INSPECTION OF MC SYSTEM

1. **REMOVE AIR CLEANER COVER AND AIR FILTER**

2. **START ENGINE**

3. **CHECK MC VALVE**

   (a) Disconnect the vacuum hose from the MC valve.

   (b) Place your fingers over the air inlet of the MC valve.

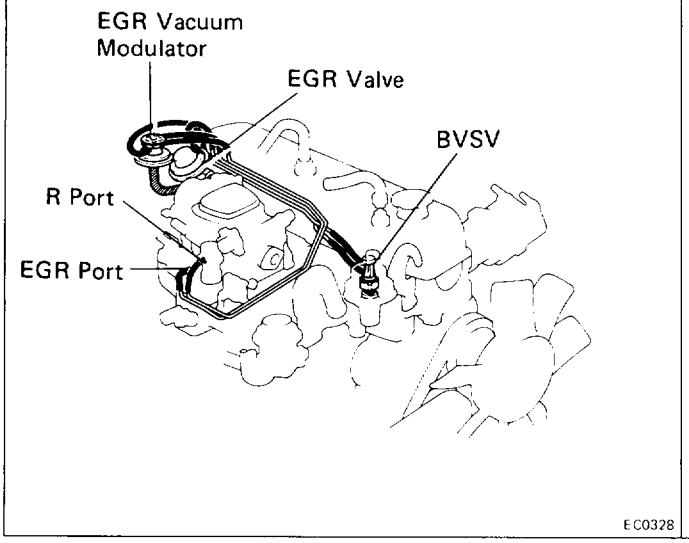
   (c) Check that vacuum is not felt.

   (d) Reconnect the vacuum hose and check that vacuum is felt momentarily.

   NOTE: At this time, the engine will idle rough or die, but this is normal.

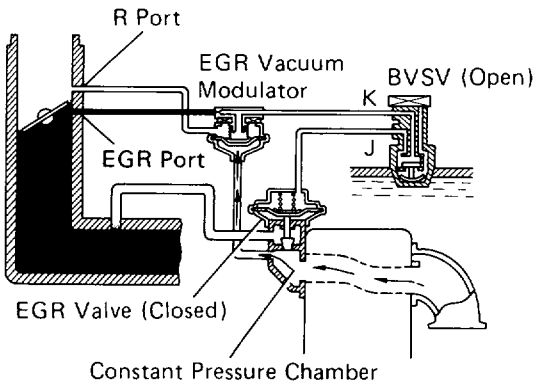
4. **REINSTALL AIR FILTER AND CLEANER COVER**

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



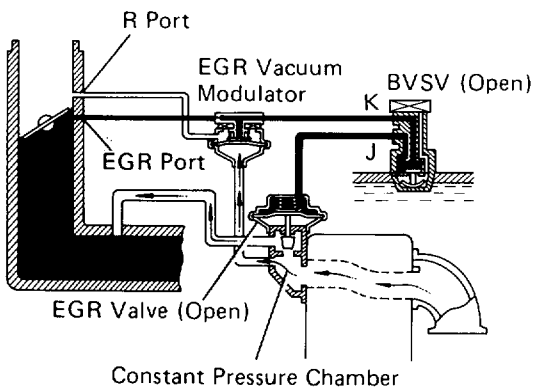
EC0328

(1)



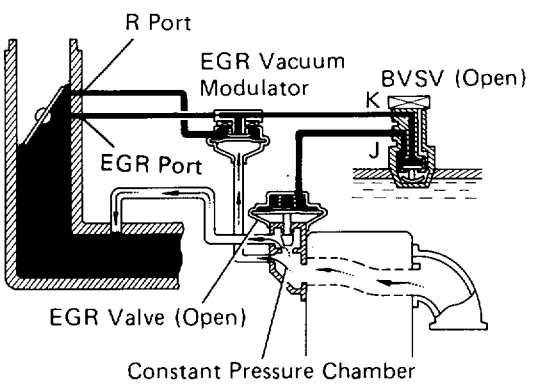
EC0329

(2)



EC0330

(3)



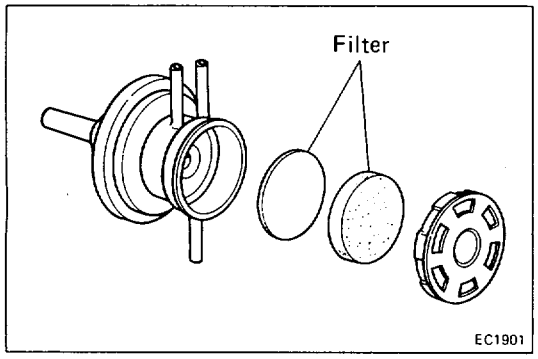
EC0331

To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.		BVSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 45°C (113°F)		CLOSED (J-K)	—	—		—	CLOSED	Not recirculated
Fed. and Canada	Above 66°C (151°F)	OPEN (J-K)	Positioned below EGR port	—		—	CLOSED	Not recirculated
			Positioned between EGR port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
Calif.	Above 64°C (147°F)			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
			Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: *Pressure increase→Modulator closes→EGR valve opens→Pressure drops→EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

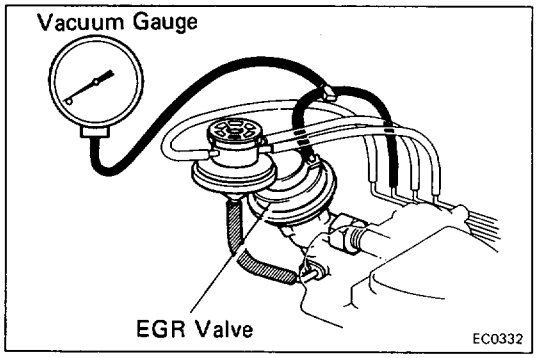


INSPECTION OF EGR SYSTEM

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

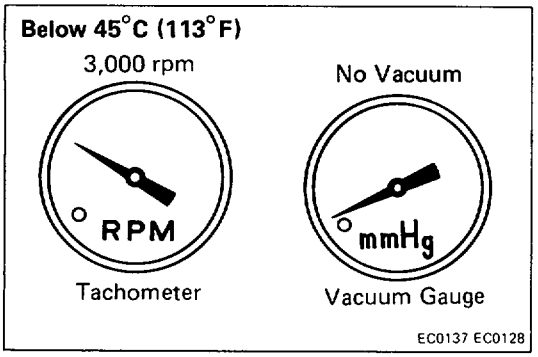


2. PREPARATION

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

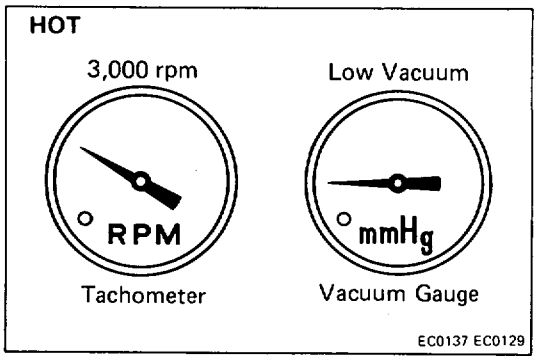
Start the engine and check that the engine starts and runs at idle.



4. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 45°C (113°F).

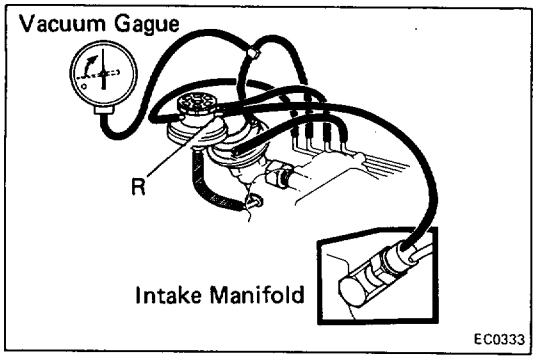
(b) Check that the vacuum gauge indicates zero at 3,000 rpm.



5. CHECK BVSV, VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 3,000 rpm.

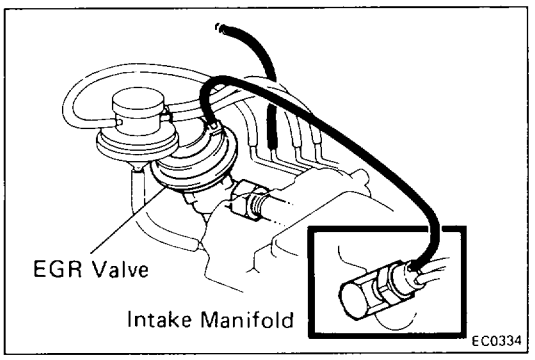


(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

NOTE: As a large amount of EGR gas enters, the engine will misfire slightly at this time.

(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



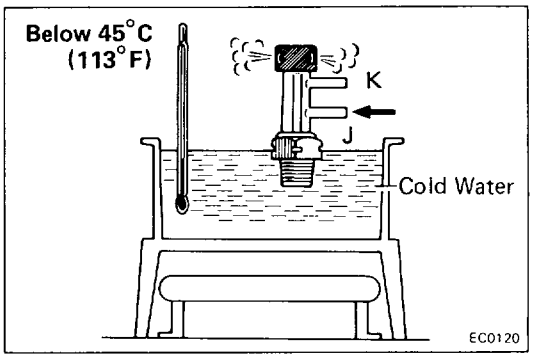
6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF BVSV

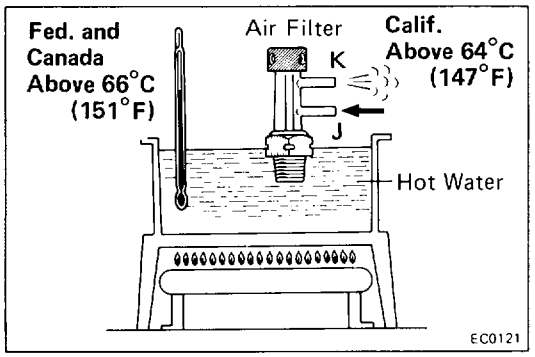
CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV.

(c) Cool the BVSV to below 45°C (113°F) with cool water.

(d) Check that air flows from pipe J to the air filter.



(e) Heat the BVSV to above 66°C (151°F) (Fed. and Canada), 64°C (147°F) (Calif.) with hot water.

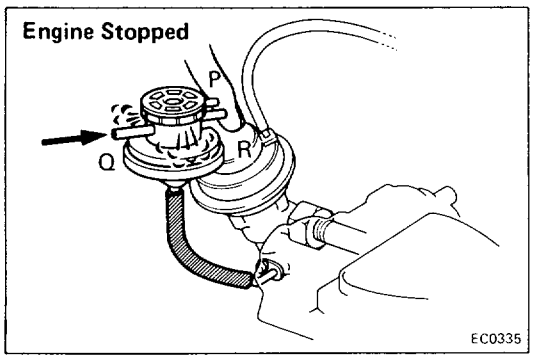
(f) Check that air flows from pipe J to pipe K.

(g) Apply sealant to the threads of the BVSV and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

If a problem is found, replace the BVSV.



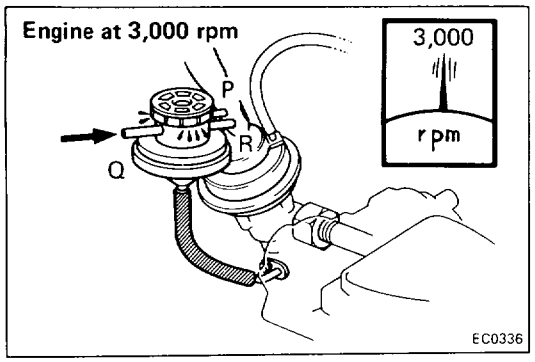
INSPECTION OF EGR VACUUM MODULATOR

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from port P, Q and R of the EGR vacuum modulator.

(b) Plug port P and R with your finger.

(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



(d) Start the engine and maintain the speed at 3,000 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

(f) Reconnect the vacuum hoses to the proper locations.

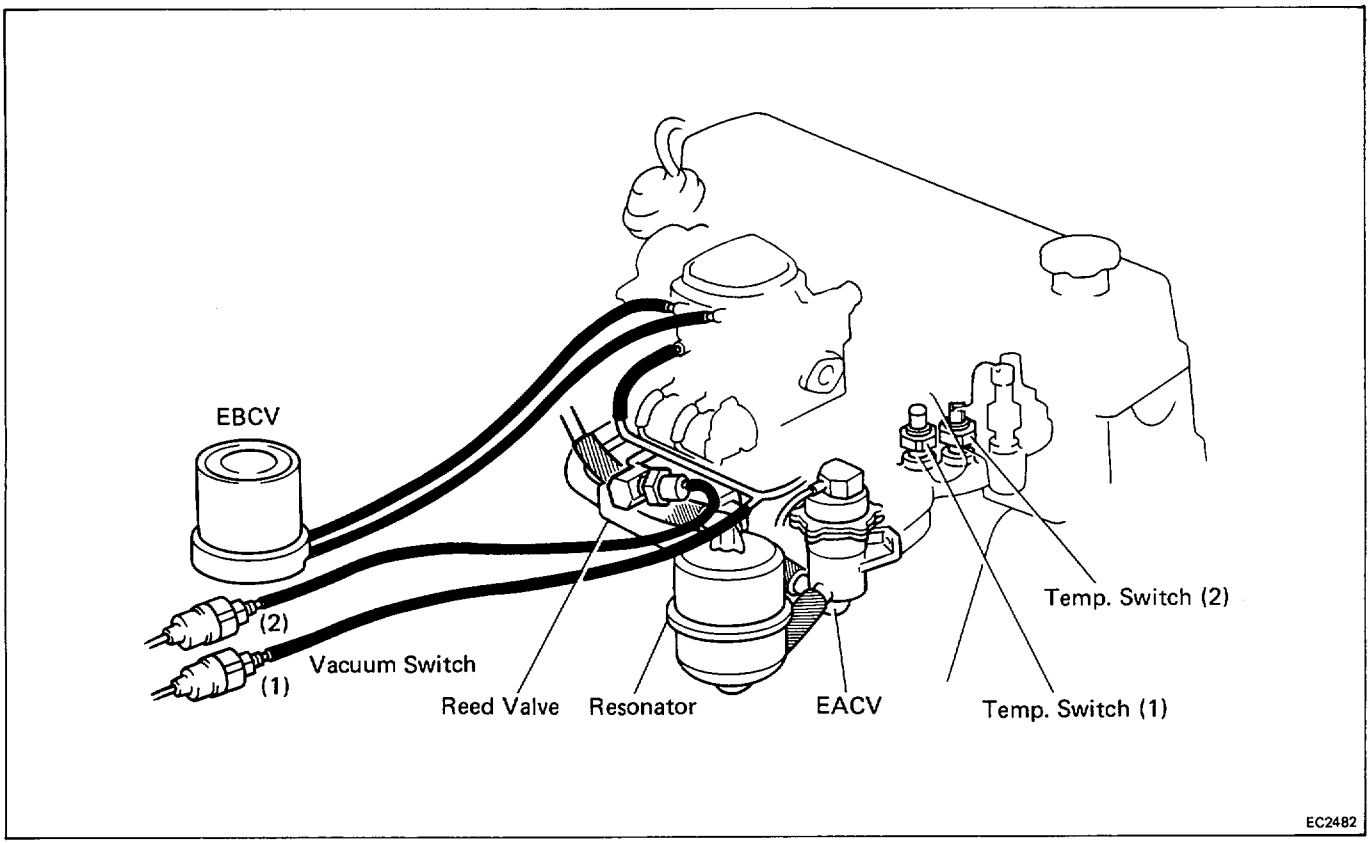
INSPECTION OF EGR VALVE

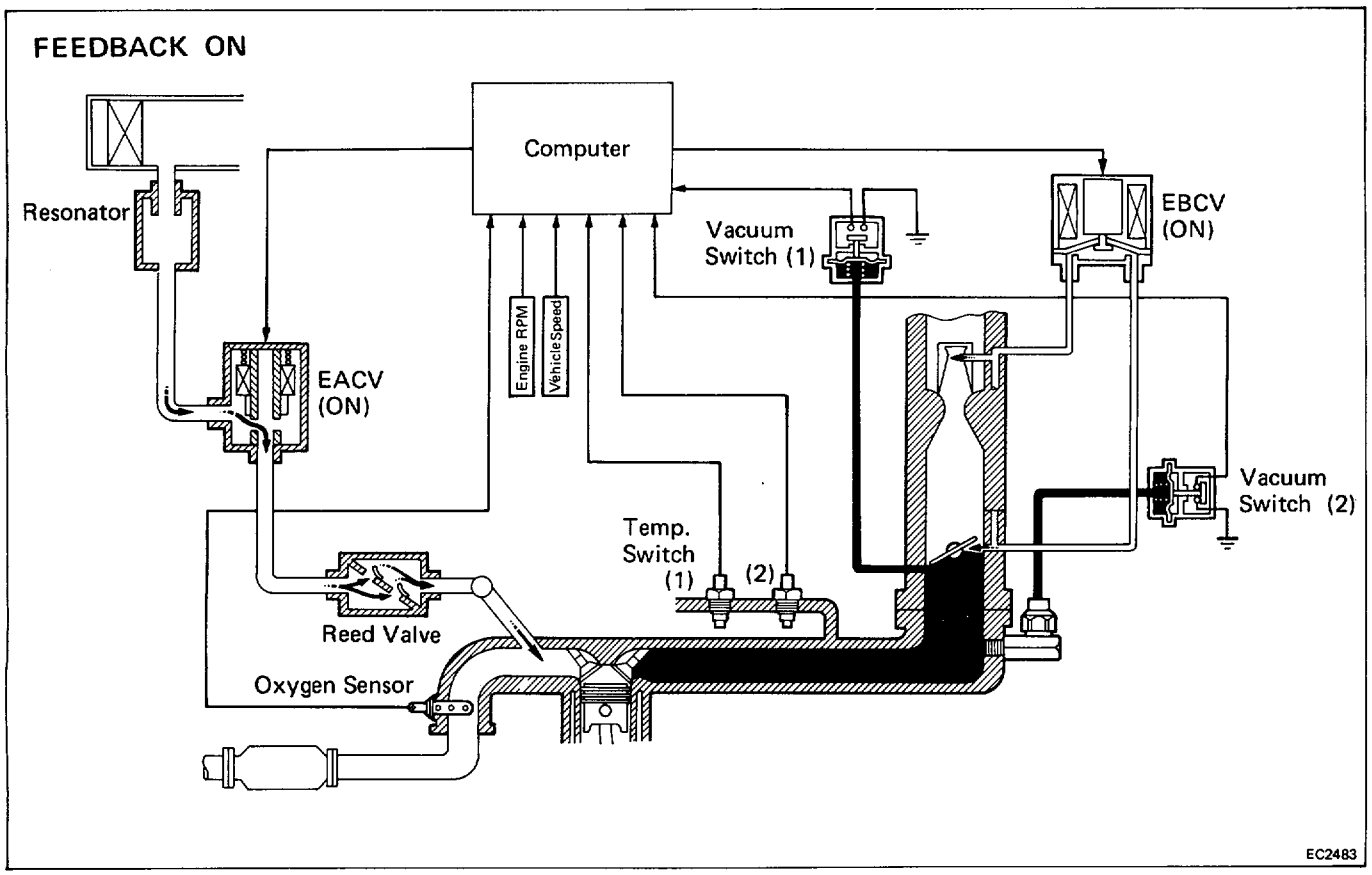
1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

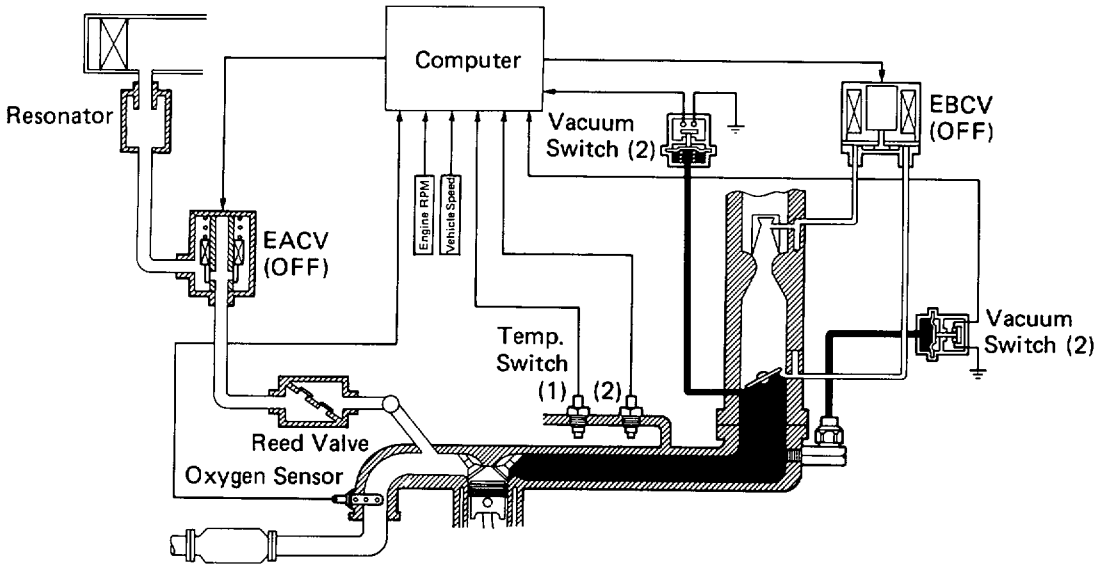
2. INSTALL EGR VALVE WITH A NEW GASKET

AIR SUCTION AND FUEL SYSTEM FEEDBACK CONTROL SYSTEM (California)





FEEDBACK OFF



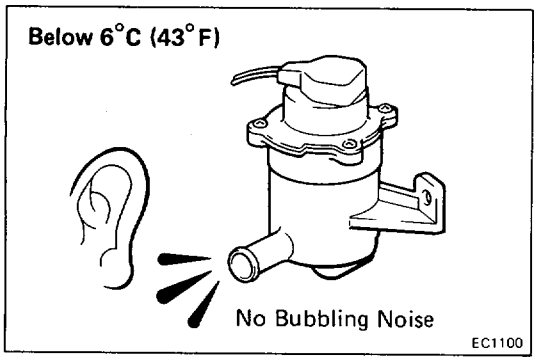
EC2484

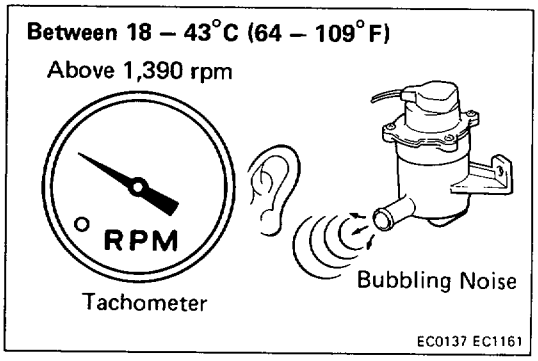
To maintain a stoichiometric air/fuel ratio in order to simultaneously reduce HC, CO and NO_x emissions by the three-way catalyst, consist of the fuel system feedback control system and sir suction feedback system.

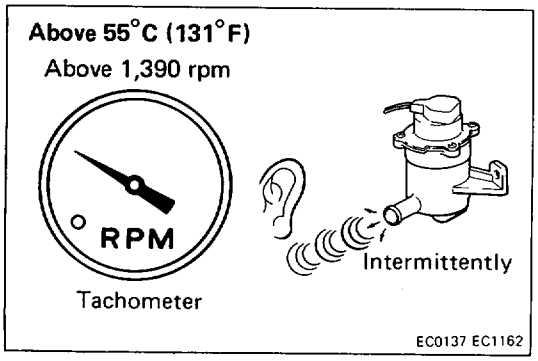
	*Vacuum Switch (1)	*Vacuum Switch (2)	Coolant Temp.	Temp. Switch (1)	Temp. Switch (2)	Engine RPM	Vehicle Speed	**Oxygen Sensor Signal	EACV	AS	
AS System Feedback Control System	ON	OFF	—	—	—	—	—	—	CLOSED	OFF	
		ON	Below 6°C (43°F)	ON	ON	—	—	—			
			Between 18 – 43°C (64 – 109°F)		OFF	—	—	—	Always OPEN	Always ON	
			Above 55°C (131°F)	OFF		Below 1,000 rpm	Below 7 mph(11 km/h)	—			
							Above 16mph(26km/h)	RICH	OPEN	ON	***Feed BACK
						Above 1,390 rpm	—	LEAN	CLOSED	OFF	
	OFF	ON	—	—	—	—	—	—	OPEN	ON	

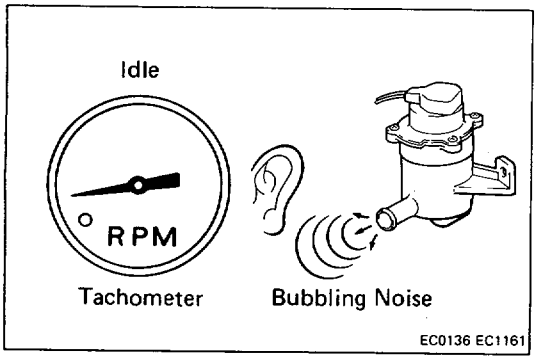
	*Vacuum Switch	**Oxygen Sensor Signal	EBCV	Fuel Control System	
Fuel System Feedback Control System	OFF	—	CLOSED	OFF	
	ON	RICH	OPEN	ON	***Feedback
		LEAN	CLOSED	OFF	

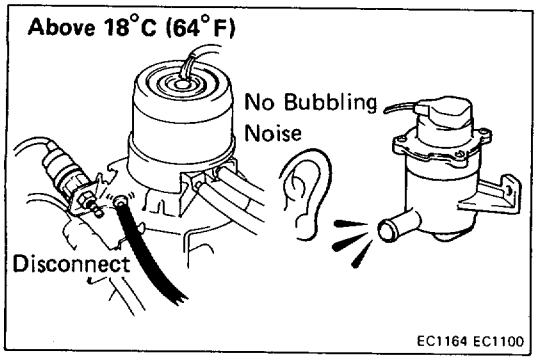
Remarks:
* By means of vacuum switch (1), detects deceleration condition.
By means of vacuum switch (2), detects heavy load driving condition.
** Signal of air-fuel ratio of inlet gas for TWC.
*** By means of Oxygen sensor, detects oxygen concentration in exhaust manifold after combusion.
If air-fuel ratio is rich for TWC, opens EACV and EBCV. If lean, closes EACV and EBCV.
Air-fuel ratio RICH → Oxygen sensor RICH → EACV, EBCV open
EACV, EBCV close ← Oxygen sensor LEAN ← Air-fuel ratio LEAN











INSPECTION OF AS SYSTEM

1. **VISUALY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTION**

2. **DISCONNECT AS HOSE FROM EACV**

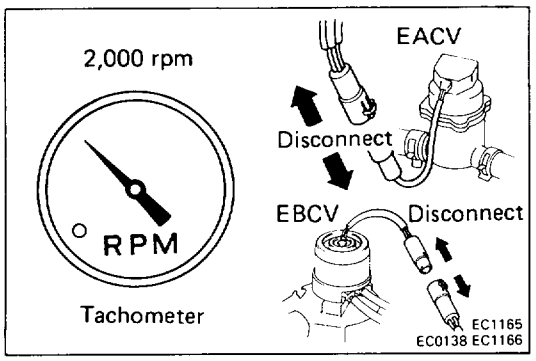
3. **CHECK COLD CONDITION**
   (a) The coolant temperature should be below 6°C (43°F).
   (b) Check that a bubbling noise is not heard from the EACV.
   (c) Warm up the engine to between 18 – 43°C (64 – 109°F).
   (d) Maintain engine speed at above 1,390 rpm.
   (e) Check that a bubbling noise is heard from the EACV.

4. **CHECK HOT CONDITION**
   (a) Warm up the engine to above 55°C (131°F).
   (b) Maintain engine speed at above 1,390 rpm.
   (c) Check that a bubbling noise is heard intermittently from the EACV.

5. **CHECK IDLE CONDITION**
   With the engine idling (below 1,000 rpm, below 7 mph), check that a bubbling noise is heard from the EACV.

6. **CHECK HEAVY LOAD CONDITION**
   (a) The coolant temperature should be above 18°C (64°F)
   (b) Disconnect the vacuum hose from the vacuum switch and plug the hose end.
   (c) Check that a bubbling noise is not heard from the EACV.

7. **RECONNECT HOSES TO PROPER LOCATION**

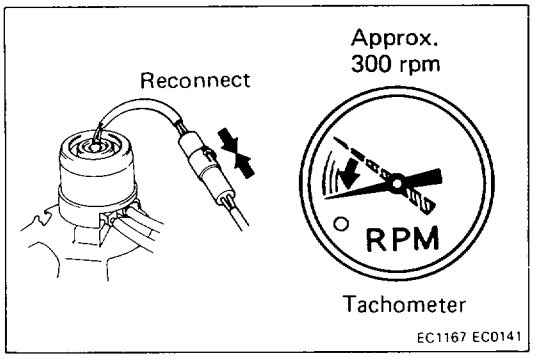


INSPECTION OF FUEL FEEDBACK CONTROL SYSTEM

CHECK FEEDBACK CONDITION

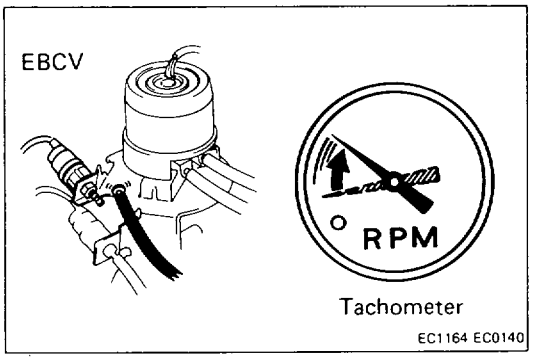
(a) Maintain engine speed at 2,000 rpm.

(b) Disconnect the connectors of EACV and EBCV.



(c) Wait a few seconds.

(d) Reconnect the EBCV connector and check that the engine drops approx. 300 rpm immediately.

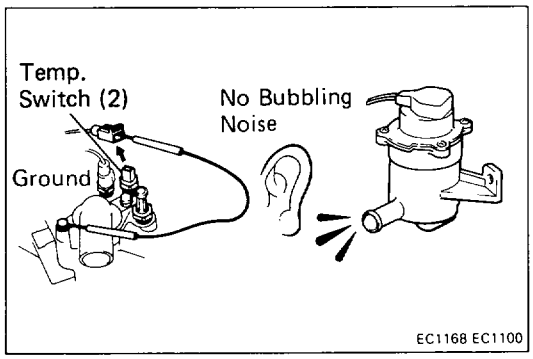


(e) Disconnect the vacuum hose from vacuum switch and plug the hose end.

(f) Check that the engine speed return to 2,000 rpm, after few seconds.

(g) Reconnect the vacuum hose and connector to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF EACV

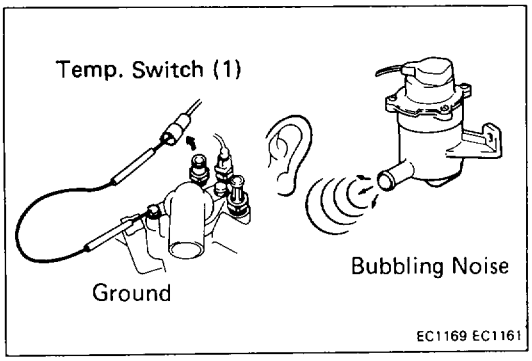
CHECK EACV

(a) Disconnect the AS hose from the EACV.

(b) Disconnect the connector from the temp. switch (2), and ground it.

(c) Check that a bubbling noise is not heard from the EACV.

(d) Reconnect the connector to temp. switch (2).



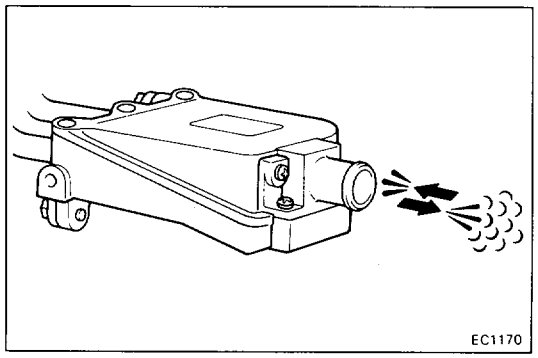
(e) Disconnect the connector from the temp. switch (1), and ground it.

(f) Maintain engine speed at above 1,390 rpm.

(g) Check that a bubbling noise is heard from the EACV.

(h) Reconnect the connector to temp. switch (1).

If a problem is found, replace the EACV.


EC1170

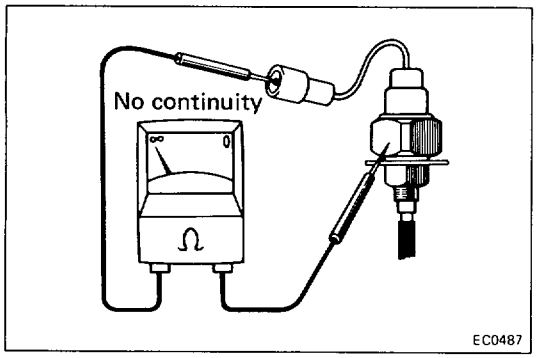
INSPECTION OF REED VALVE

CHECK REED VALVE BY BLOWING AND SUCKING ON PIPE

Check that there is air passage when blown hard, and no air passage when sucked.

INSPECTION OF VACUUM SWITCH (1)

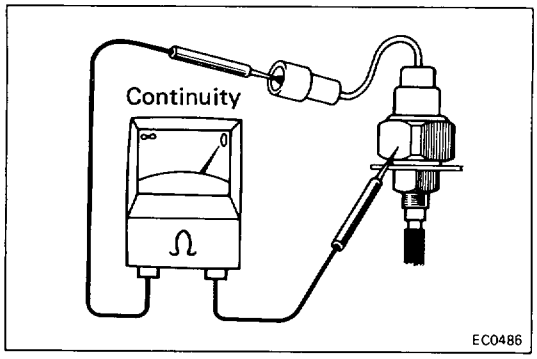
(See page EC-70)



EC0487

INSPECTION OF VACUUM SWITCH (2)

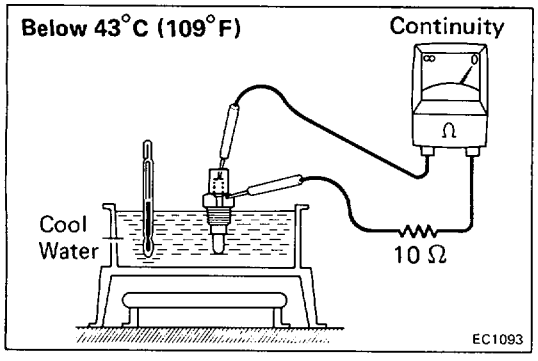
(a) Using an ohmmeter, check that there is no continuity between the switch terminal and switch body.



EC0486

(b) Warm up the engine to normal operating temperature.

(c) Using an ohmmeter, check for continuity between the switch terminal and the body.



EC1093

INSPECTION OF TEMP. SWITCH (1)

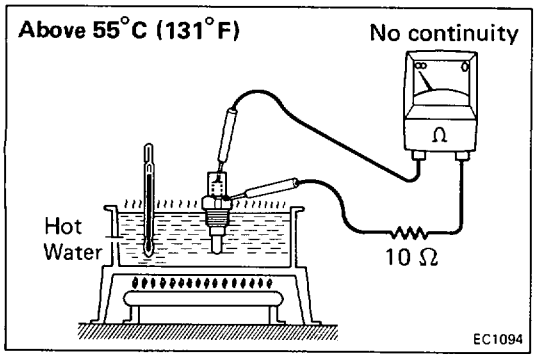
CHECK TEMP. SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the temp. switch.

(c) Cool the temp. switch to below 43°C (109°F).

(d) Using an ohmmeter, check that there is continuity.



EC1094

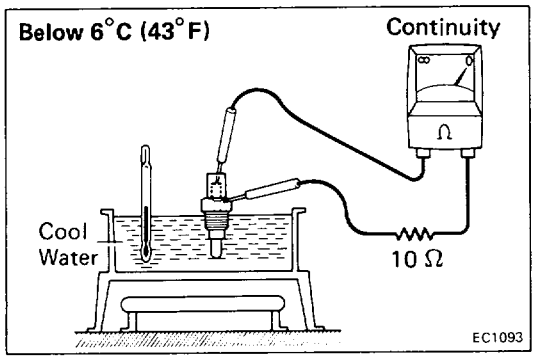
(e) Heat the switch to above 55°C (131°F) with hot water.

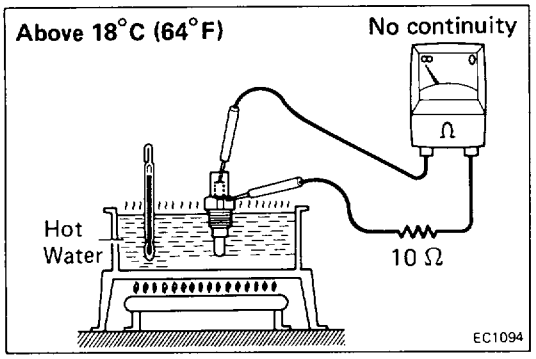
(f) Check that there is no continuity.

(g) Apply sealant to the threads of the switch and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.





INSPECTION OF TEMP. SWITCH (2)

CHECK TEMP. SWITCH BY USING OHMMETER

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the temp. switch from the intake manifold.

(c) Cool the temp. switch to below 6°C (43°F).

(d) Using an ohmmeter, check that there is continuity.

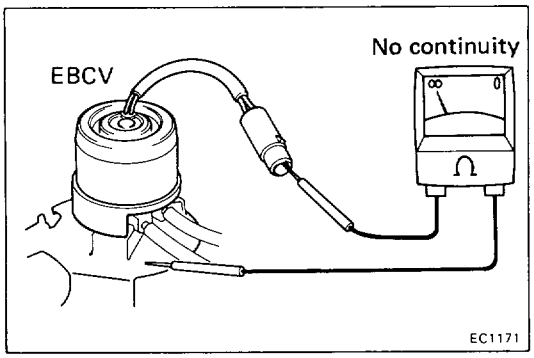
(e) Heat the switch to above 18°C (64°F) with hot water.

(f) Check that there is no continuity.

(g) Apply sealant to the threads of the switch and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

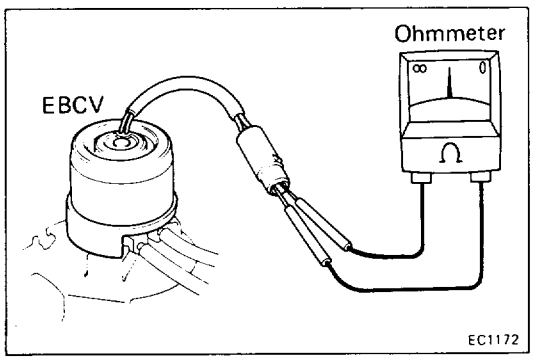


INSPECTION OF EBCV

1. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the positive (+) terminal and the EBCV body.

If there is continuity, replace the EBCV.



2. CHECK FOR OPEN CIRCUIT

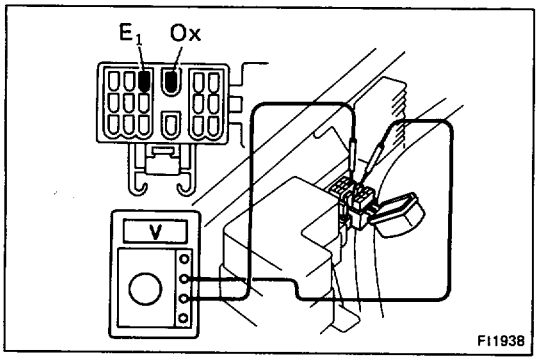
Using an ohmmeter, measure the resistance between the positive (+) terminal and the other terminal as shown.

Specified resistance: 11 — 13 Ω at 20°C (68°F)

If the resistance is not within specification.
Replace the EBCV.

INSPECTION OF SPEED SENSOR

(See page EC-33)



INSPECTION OF OXYGEN SENSOR

CHECK OXYGEN SENSOR WITH VOLTMETER

(a) Warm up the engine to normal operating temperature.

(b) Connect the voltmeter to the check connector.

Check connector location: Near the No.2 relay block

Connect the positive (+) testing probe to the Ox terminal and negative (—) testing probe to terminal E.

(c) Race the engine at 2,500 rpm for approx. 90 seconds.

(d) Maintain engine speed at 2,500 rpm.

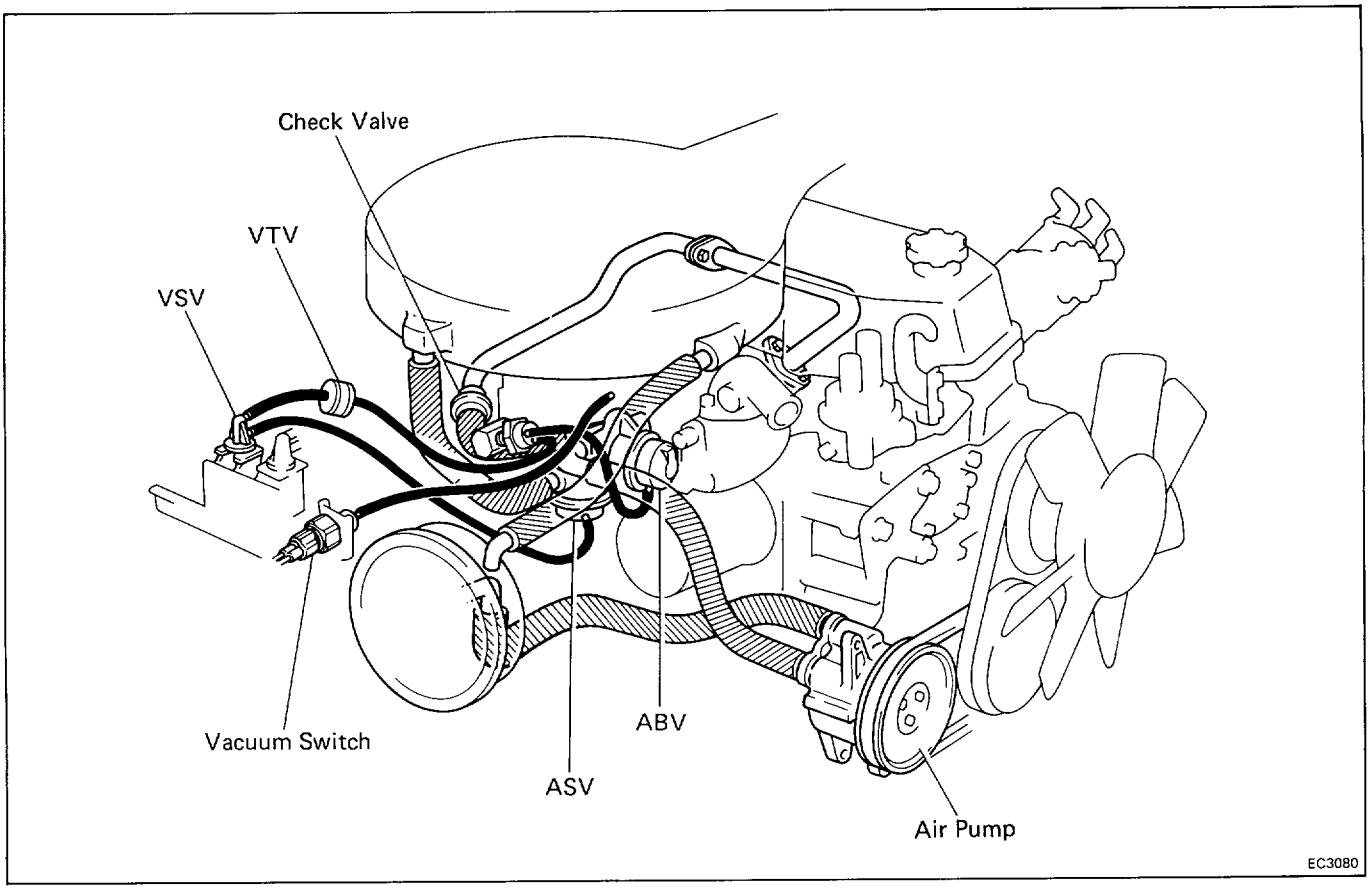
(e) Check that the needle of the voltmeter fluctuates 8 times or more in 10 seconds within 1 — 5 volts.

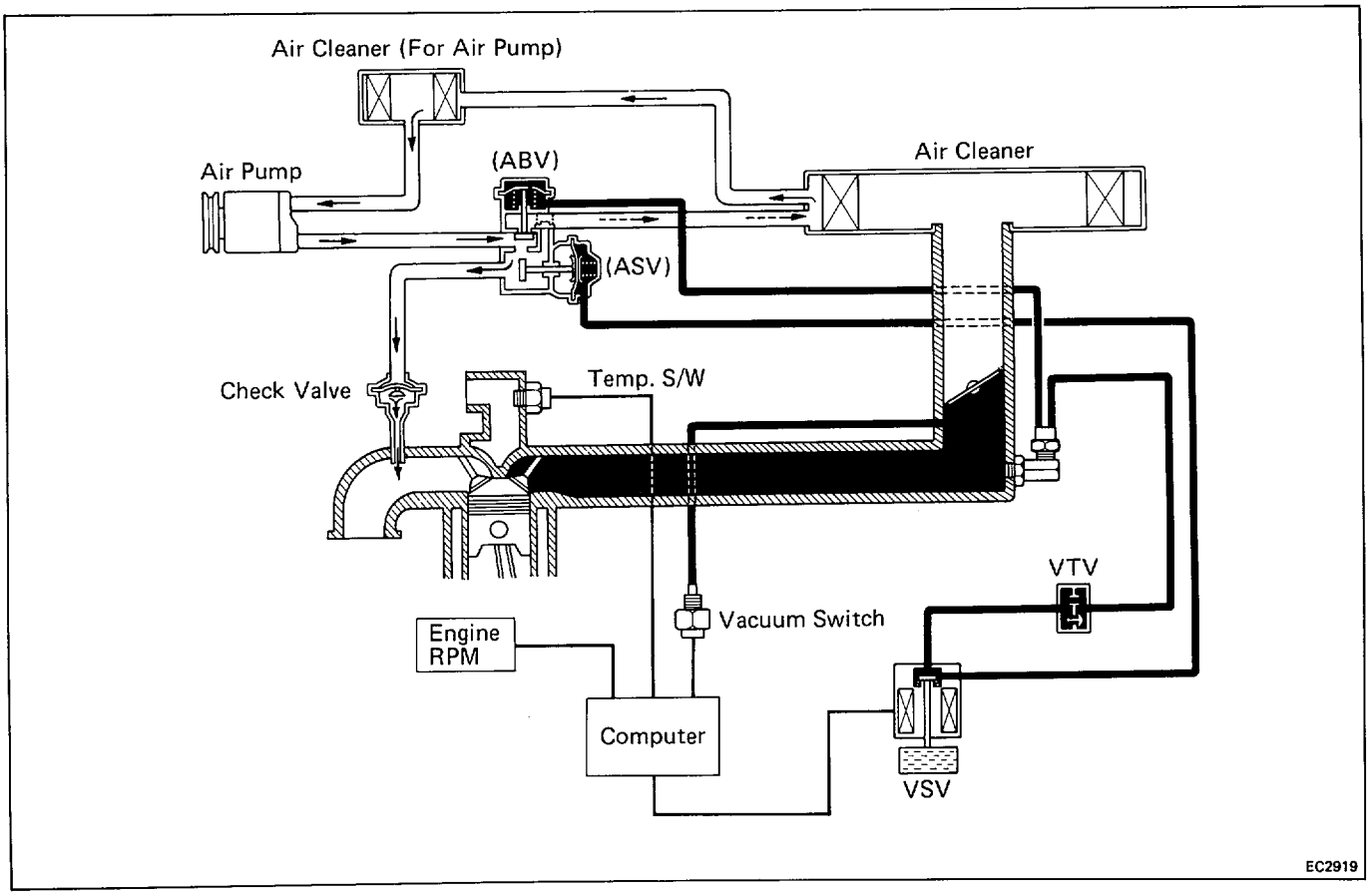
NOTE:

- If this test is positive, the Oxygen sensor is OK.
- If not, inspect the other parts, hose connections and wiring of air suction and fuel system feedback control system (EC-39).

If no problem is found, replace the Oxygen sensor.

AIR INJECTION (AI) SYSTEM (Federal and Canada)

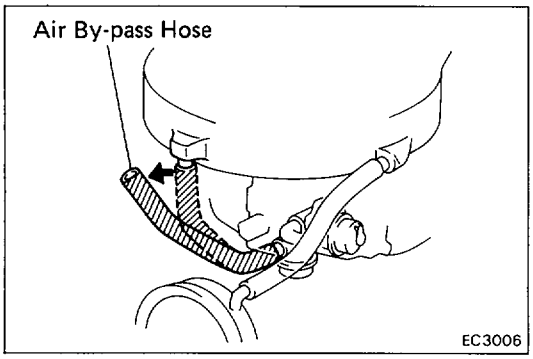




For reburning the unburnt HC and CO in the exhaust port, compressed air from the air pump is blown into the exhaust port.

Coolant Temp.	Water Temp. S/W	Engine RPM	VSV	Driving Condition	Vacuum S/W	ABV	ASV	Air from Air Pump	AI System
Below 6°C (43°F)	CLOSED	–	CLOSED	–	–	–	CLOSED	By-passed into the air cleaner	OFF
Above 18°C (64°F)	OPEN	Below 4,250 rpm	OPEN	Low and medium speed	–	OPEN	OPEN	Injected to the exhaust port	ON
				Full load driving	–	OPEN	CLOSED	*By-passed into the air cleaner	OFF
				Sudden deceleration	–	Momentarily CLOSED	OPEN	Momentarily by-passed into the air cleaner	Momentarily OFF
		Above 4,740 rpm	CLOSED	Except deceleration	–	–	–	By-passed into the air cleaner	OFF
			OPEN	Sudden deceleration	CLOSED	Momentarily CLOSED	OPEN	Momentarily by-passed into the air cleaner	Momentarily OFF
				Deceleration	CLOSED	OPEN	OPEN	Injected to the exhaust port	ON

Remark: *This action is delayed by VTV.

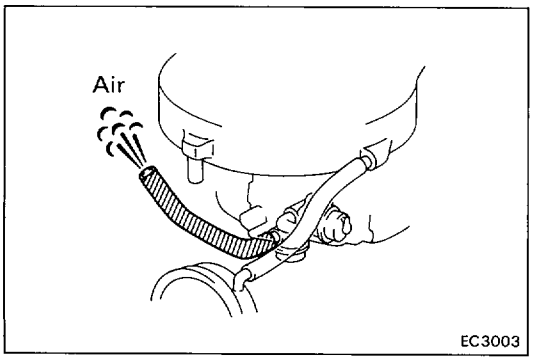


INSPECTION OF AI SYSTEM

1. **VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNECTIONS**

2. **PREPARATION**

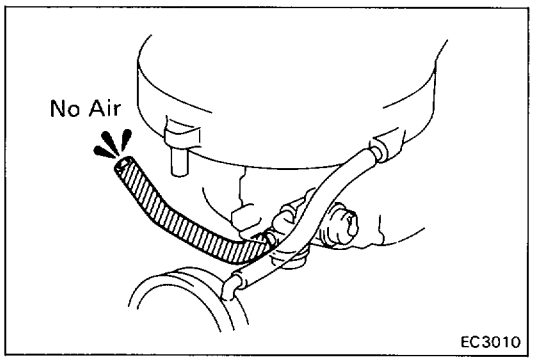
Disconnect the air by-pass hose from the air cleaner.



3. **CHECK ASV WITH COLD ENGINE**

(a) The coolant temperature should be below 6°C (43°F)

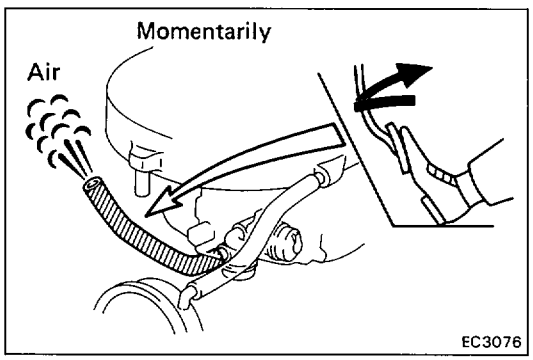
(b) Start the engine and check that air discharged from the air by-pass hose.



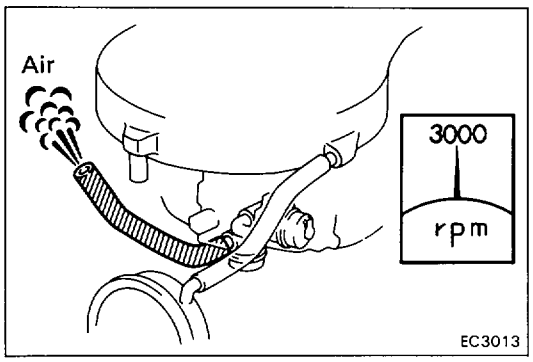
4. **CHECK ASV AND ABV WITH WARM ENGINE**

(a) Warm up the engine to normal operating temperature.

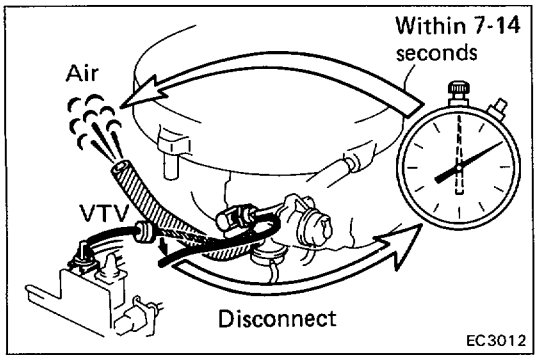
(b) With the engine idling, check that air is not discharged from the air by-pass hose.



(c) Race the engine and quickly close the throttle valve, check that air is discharged momentarily from the air by-pass hose.



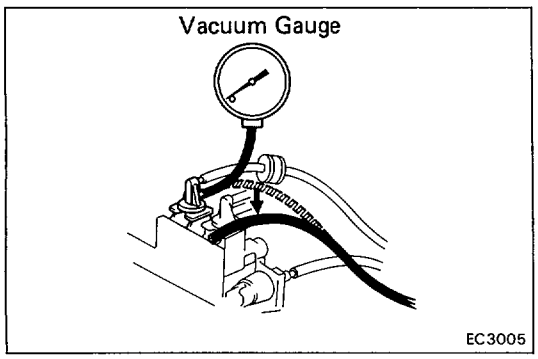
(d) Increase the engine speed to 3,000 rpm and check that air is discharged from the air by-pass hose.



5. CHECK VTV

(a) Disconnect the hose between the VTV and gas filter at the VTV side. Check that air is discharged from the air by-pass hose within 7 — 14 seconds.

(b) Reconnect the hose to the VTV.

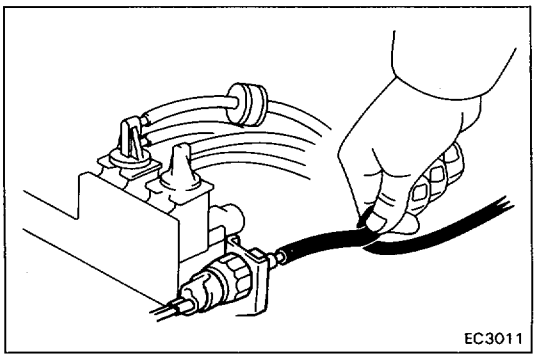


6. CHECK VSV

(a) Disconnect the hose between the VSV and ASV at the VSV side.

(b) Connect the vacuum gauge to the VSV port.

(c) Increase the engine speed at 4,800 rpm and check that the vacuum gauge indicates zero.



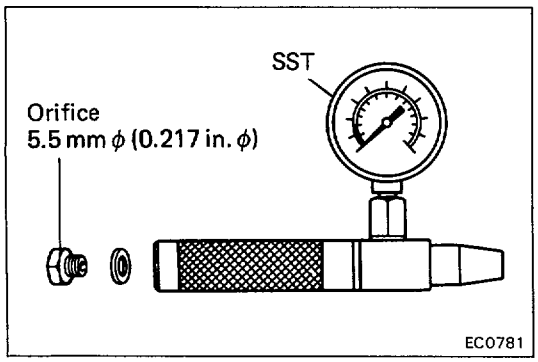
(d) Pinch the hose between the vacuum switch and air pipe.

(e) Increase the engine speed at 4,800 rpm and check that the vacuum gauge indicates intake manifold vacuum.

(f) Disconnect the vacuum gauge.

(g) Reconnect the hose to the VSV.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF AIR PUMP

1. CHECK AIR PUMP FOR ABNORMAL NOISE

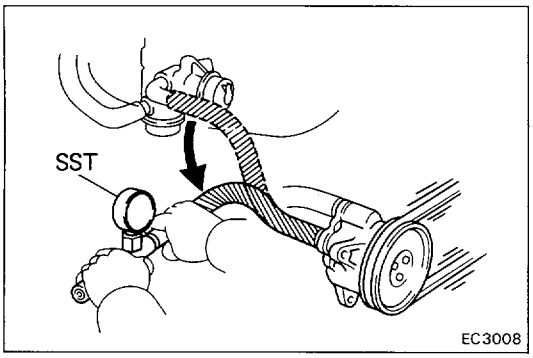
2. CHECK AIR PUMP DISCHARGE PRESSURE

(a) Connect the air pump tester (SST) to the hose at the air pump outlet.

SST 09258-14010

(b) Select and use a specified orifice (5.5 mm dia. or 0.217 in. dia.) on the SST.

(c) Set the engine speed at 1,800 rpm.



(d) The gauge of the SST should indicate in the green zone.

If the SST indicates in the red zone, replace the pump assembly.

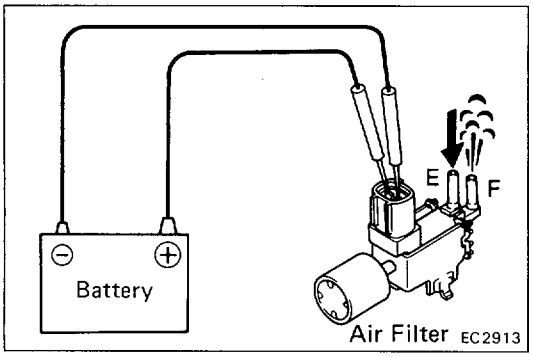
(e) Reconnect the hose to the proper location.

INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

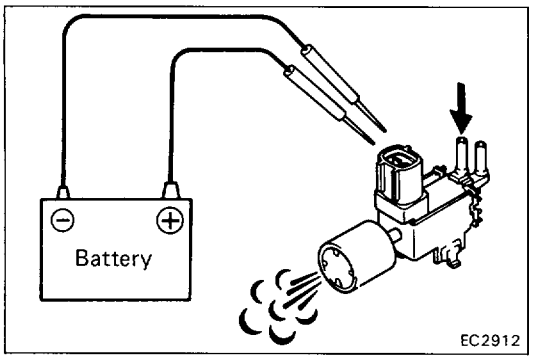
(b) Blow into pipe E and check that air comes out of pipe F.



(c) Disconnect the battery.

(b) Blow into pipe E and check that air comes out of air filter.

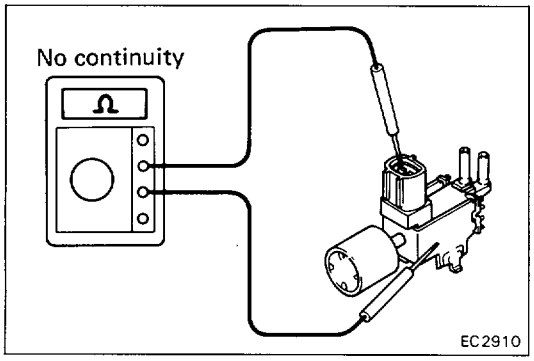
If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body.

If there is continuity, replace the VSV.

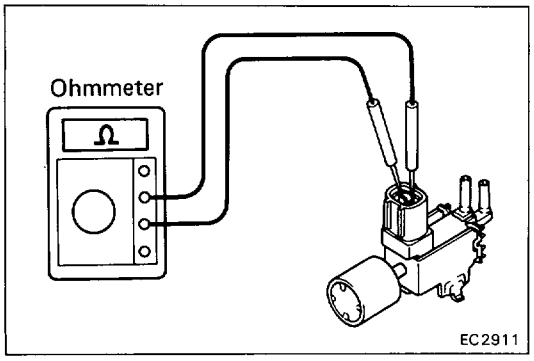


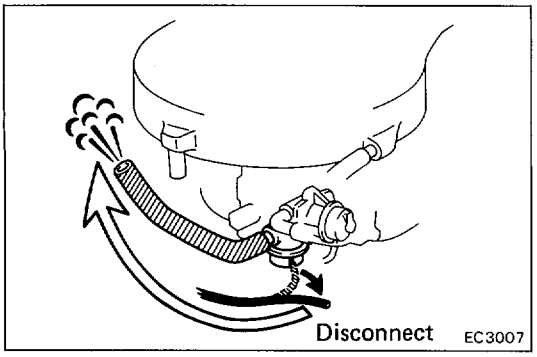
3. CHECK FOR OPEN CIRCUIT

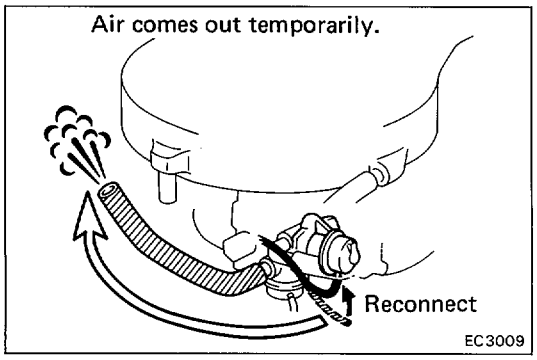
Using an ohmmeter, measure the resistance between the terminals as shown.

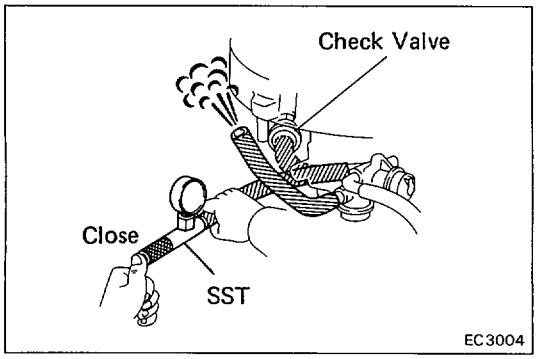
Specified resistance: 30 — 50 Ω at 20°C (68°F)

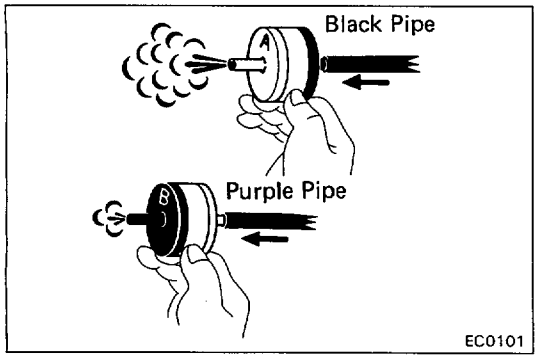
If resistance is not within specification, replace the VSV.

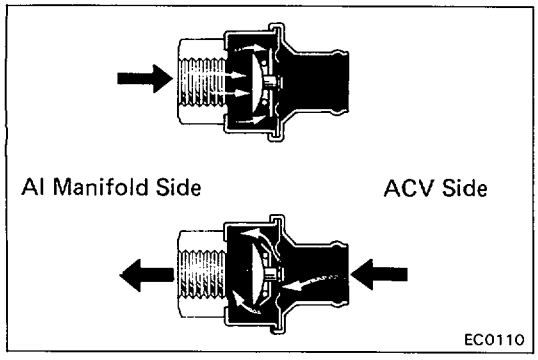












INSPECTION OF ACV

1. CHECK ASV OPERATION

(a) Disconnect the air hose from the check valve, and air by-pass hose from the air cleaner.

(b) Disconnect the vacuum hose from the ASV.

(c) Check that compressed air comes out of the air bypass hose at idle.

(d) Reconnect the vacuum hose to the ASV.

2. CHECK ABV OPERATION

(a) Disconnect the air hose from the ABV.

(b) Reconnect the hose and check that compressed air momentarily come out from the by-pass hose at idle.

3. CHECK OPENING PRESSURE OF RELIEF VALVE

(a) Connect the air pump tester (SST) to the air hose to check valve.

SST 09258-14010

(b) Close the orifice on the SST with your finger.

(c) Increase the engine speed gradually and measure the relief valve opening pressure.

Opening pressure: 0.23 — 0.39 kg/cm² (3.3 — 5.5 psi)

(d) Remove the SST and reconnect the air hoses and vacuum hoses to the proper locations.

INSPECTION OF VTV

CHECK VTV BY BLOWING AIR INTO EACH SIDE

(a) Check that air flows without resistance from B to A.

(b) Check that air flows with difficulty from A to B.

If a problem is found, replace the VTV.

INSPECTION OF VACUUM SWITCH (2)

(See page EC-43)

INSPECTION OF TEMP. SWITCH (2)

(See page EC-44)

INSPECTION OF CHECK VALVE

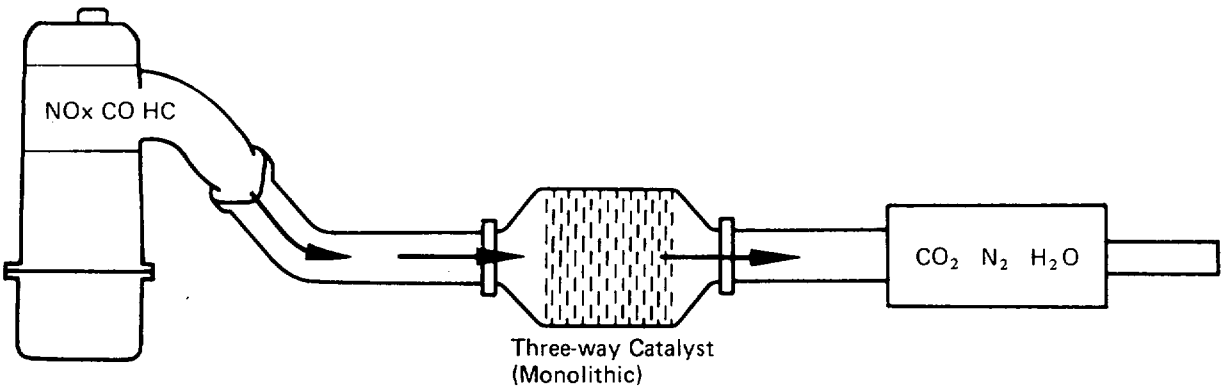
CHECK VALVE BY BLOWING AIR FROM EACH SIDE

(a) Check that air does not flow from manifold side to ACV side.

(b) Check that air flows from ACV side to manifold side.

If a problem is found, replace the valve.

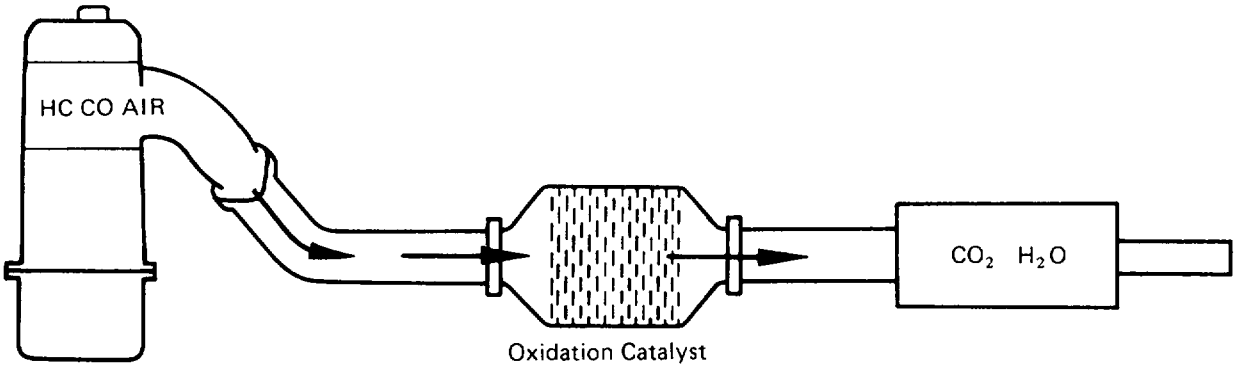
THREE-WAY CATALYST (TWC) SYSTEM (California)



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the catalyst.

Exhaust Port		TWC		Exhaust Gas
HC, CO and NO_x	→	Oxidation and reduction	→	CO_2 H_2O N_2

OXIDATION CATALYST (OC) SYSTEM (Federal and Canada)

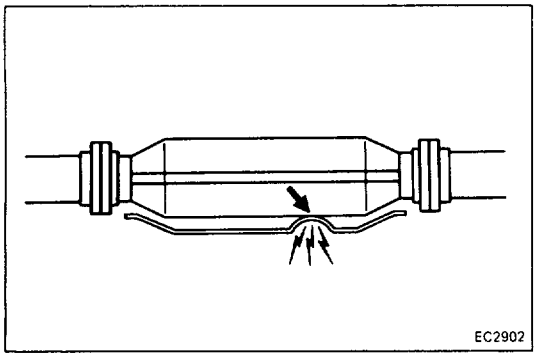


To reduce HC and CO emissions, HC and CO are oxidized and converted to water (H_2O) and carbon dioxide (CO_2) by the catalyst.

Exhaust		Converter		Exhaust Gas
Unburnt HC, CO and AIR	→	Oxidation	→	CO_2 H_2O

INSPECTION OF EXHAUST PIPE ASSEMBLY

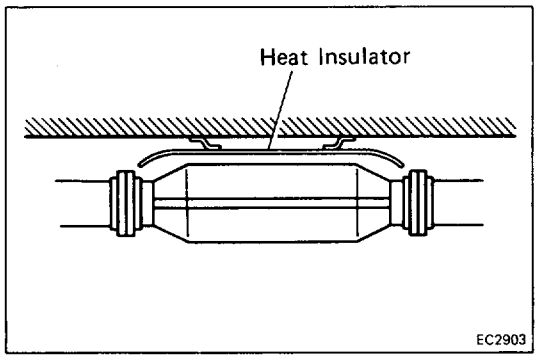
1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE



INSPECTION OF CATALYTIC CONVERTER

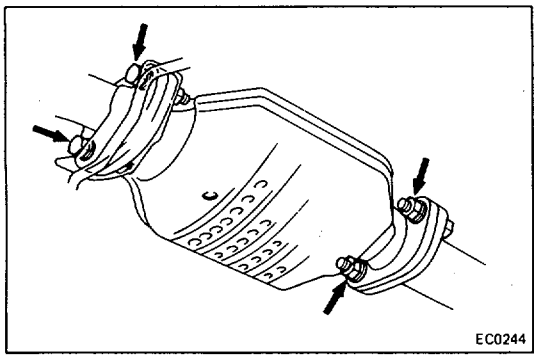
CHECK FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that is contacts the catalyst, repair or replace it.



INSPECTION OF HEAT INSULATOR

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

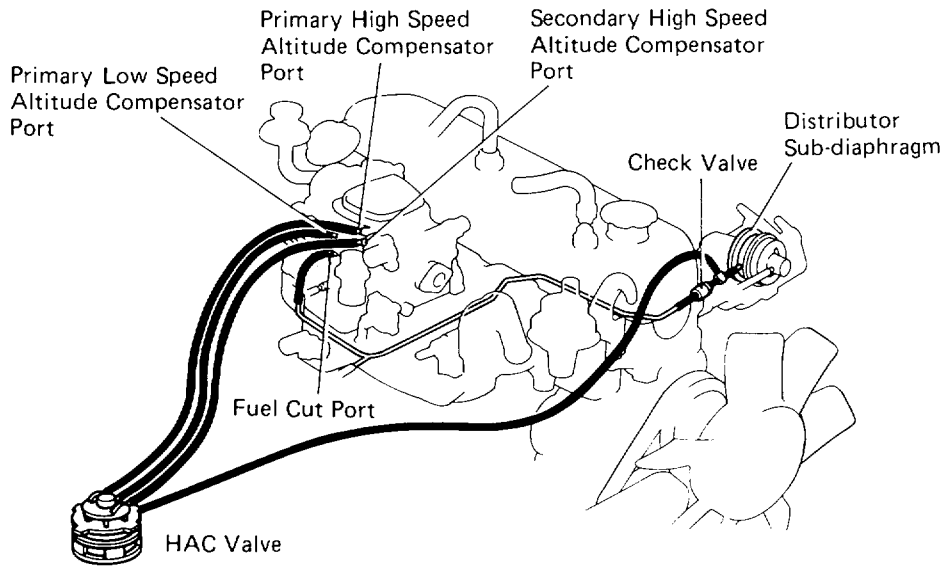


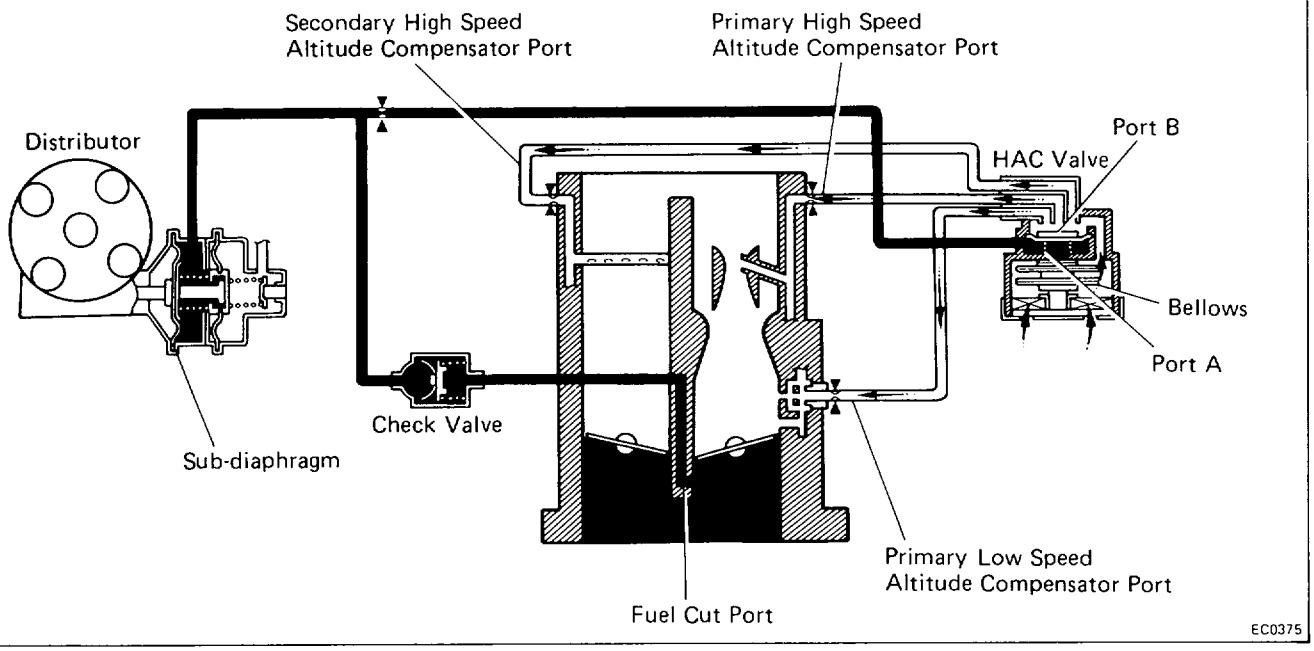
REPLACEMENT OF CATALYTIC CONVERTER

1. REMOVE CATALYTIC CONVERTER
   (a) Jack up the vehicle.
   (b) Check that the converter is cool.
   (c) Remove the bolts at the front and rear of the converter.
   (d) Remove the converter and gaskets.
2. INSTALL CATALYTIC CONVERTER
   (a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.
   (b) Torque the bolts.

   Torque: Catalyst — Exhaust pipe
   440 kg-cm (32 ft-lb, 43 N·m)

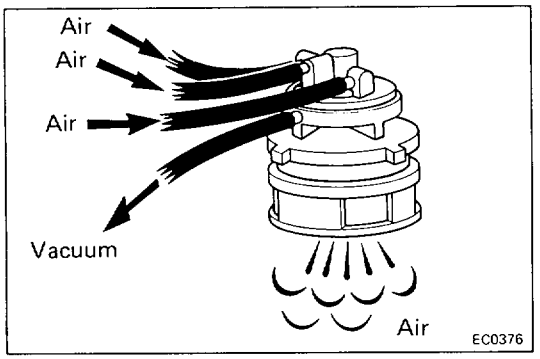
HIGH ALTITUDE COMPENSATION (HAC) SYSTEM (Federal (Option))





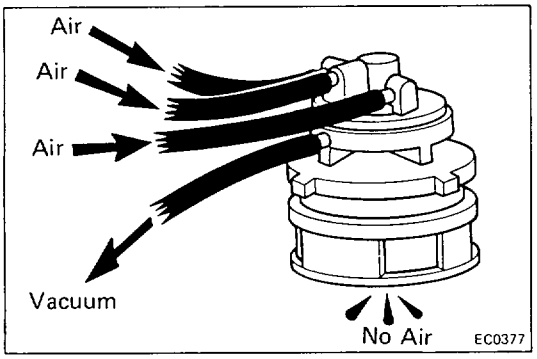
As altitude increases, the air-fuel mixture becomes richer. This system insures proper air-fuel mixture by supplying additional air to the primary low and high speed circuits and secondary high speed circuit of the carburetor, and advances the ignition timing to improve driveability at high altitude (above 1,198 m (3,930 ft)).

Altitude	Bellows in HAC Valve	Port A in HAC Valve	Distributor Sub-diaphragm	Port B in HAC Valve	Air from HAC Valve	Vacuum Ignition Timing
HIGH Above 1,198m (3,930 ft)	EXPANDED	CLOSED	PULLED (Always)	OPEN	Led into primary low and high speed circuits and secondary high speed circuit	ADVANCED (+12°) (Always)
LOW Below 783m (2,570 ft)	CONTRACTED	OPEN	NOT PULLED (PULLED only during idling)	CLOSED	STOPPED	INITIAL TIMING (ADVANCED (+12°) only during idling)

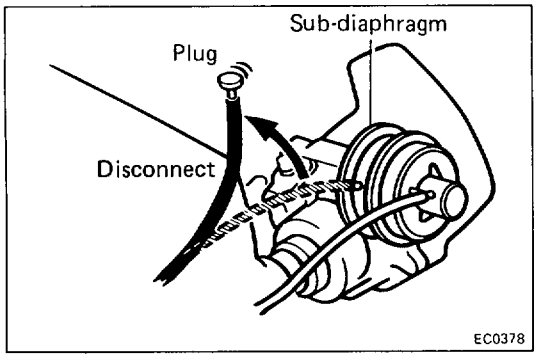


INSPECTION OF HAC SYSTEM

PRECHECK:
Before checking the HAC system, determine the position of the HAC valve. This can be done by blowing into any one of the three ports on top of the HAC valve with the engine idling. If the passage is open, the valve is in the high altitude position.



If it is closed, the valve is in the low altitude position.

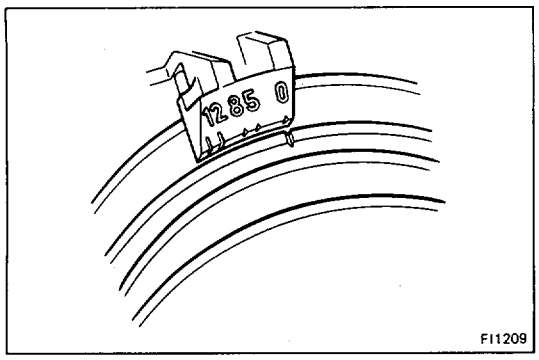


A. AT HIGH ALTITUDE

1. CHECK IGNITION TIMING AT IDLE

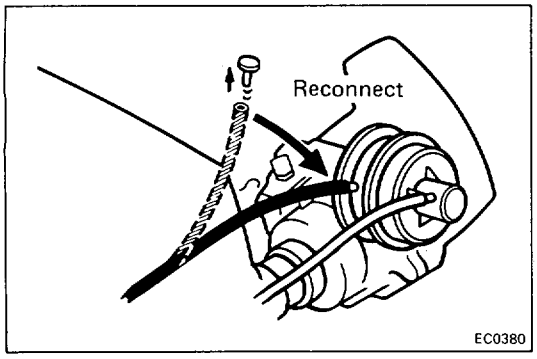
(a) Warm up the engine.

(b) Disconnect the hose from the distributor subdiaphragm, and plug the hose end.

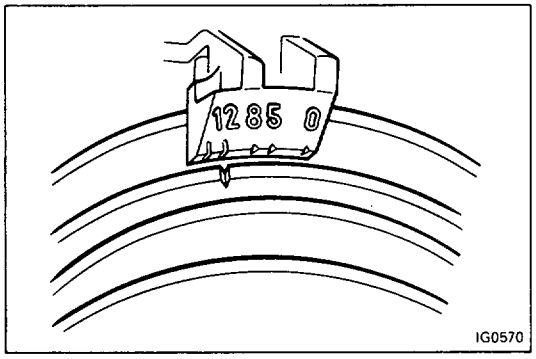


(c) Check the ignition timing.

Ignition timing: 0° BTDC @ Max. 950 rpm

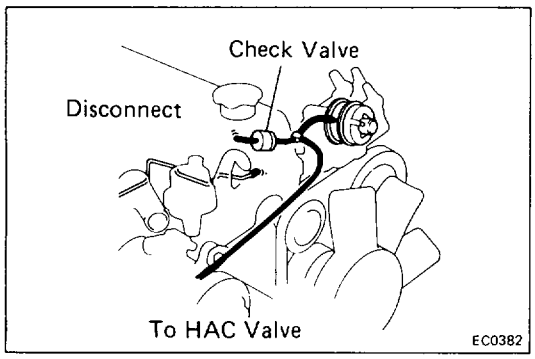


(d) Reconnect the hose to the sub-diaphragm.



(e) Check that the ignition timing advances.

Ignition timing: Approx. 12° BTDC @ Max. 950 rpm

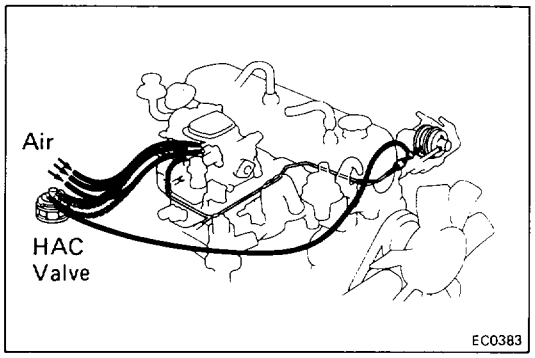


2. CHECK THE CHECK VALVE

(a) Disconnect the vacuum hose between the check valve and vacuum pipe at the vacuum pipe side, and plug the pipe end.

(b) Check that the ignition timing remains stationary for more than one minute.

(c) Stop the engine and reconnect the hose to the vacuum pipe.



3. CHECK CARBURETOR

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows into the carburetor.

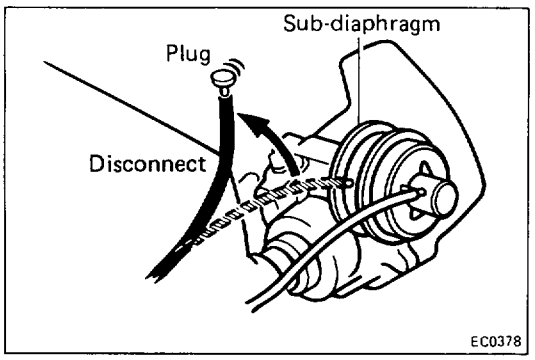
(c) Reconnect the hoses to the proper locations.

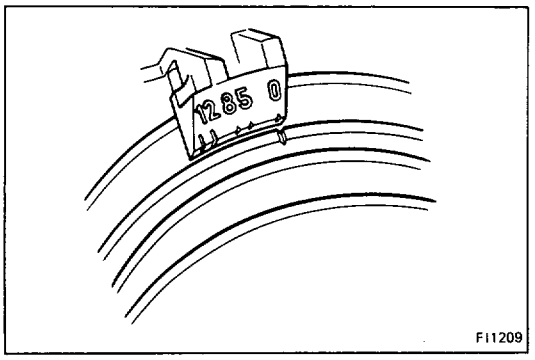
B. AT LOW ALTITUDE

1. CHECK IGNITION TIMING AT IDLE

(a) Warm up the engine.

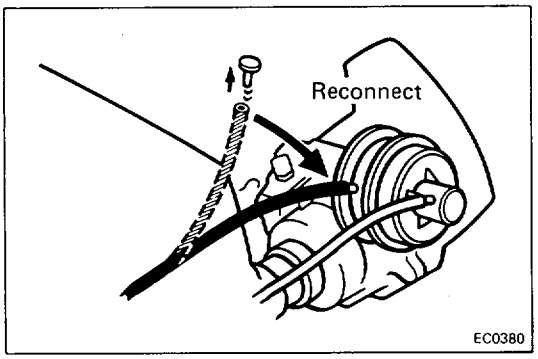
(b) Disconnect the hose from the distributor sub-diaphragm, and plug the hose end.



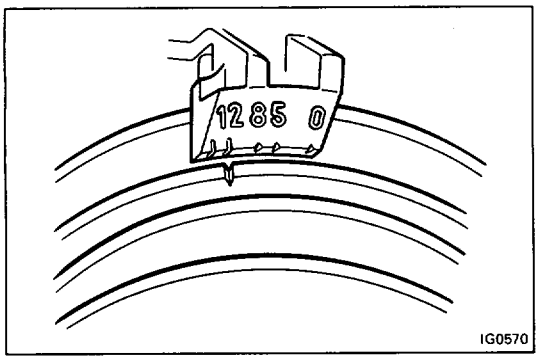


(c) Check the ignition timing.

Ignition timing: 0° BTDC @ Max. 950 rpm

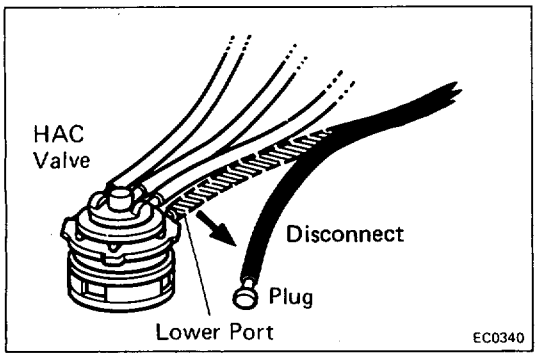


(d) Reconnect the hose to the sub-diaphragm.



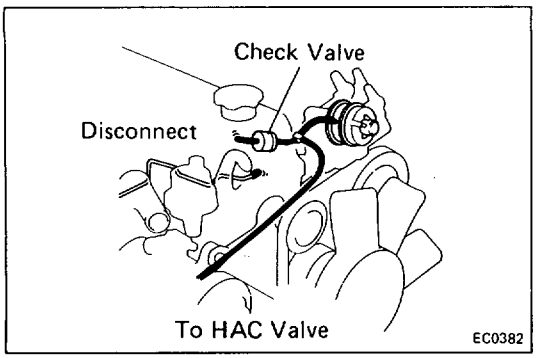
(e) Check that the ignition timing advances.

Ignition timing: Approx. 12° BTDC @ Max. 950 rpm



2. CHECK THE CHECK VALVE

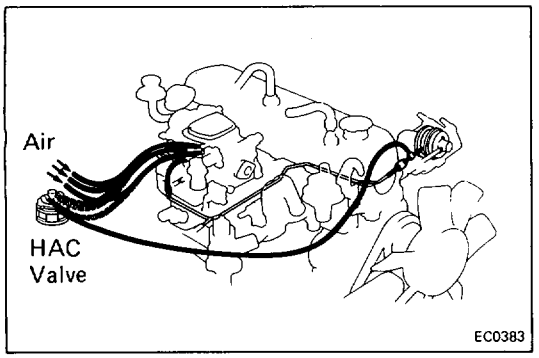
(a) Disconnect the vacuum hose from lowest port of the HAC valve, and plug the hose end.



(b) Disconnect the vacuum hose between the check valve and vacuum pipe at the pipe side, and plug the pipe end.

(c) Check that the ignition timing remains stationary for more than one minute.

(d) Stop the engine and reconnect the hoses to the vacuum pipe and HAC valve.



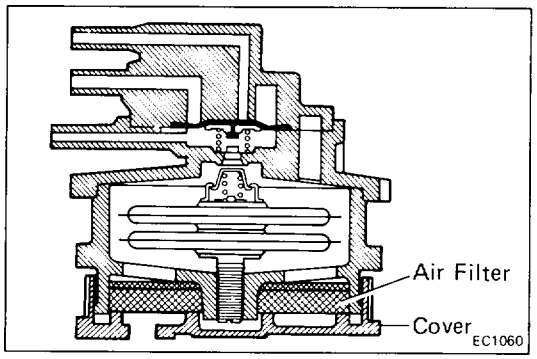
3. CHECK CARBURETOR

(a) Disconnect three hoses from the pipes on top of the HAC valve.

(b) Blow air into each hose and check that air flows into the carburetor.

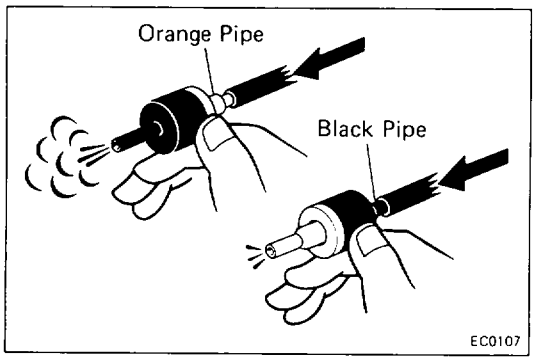
(c) Reconnect the hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF HAC VALVE

VISUALLY CHECK AND CLEAN AIR FILTER IN HAC VALVE

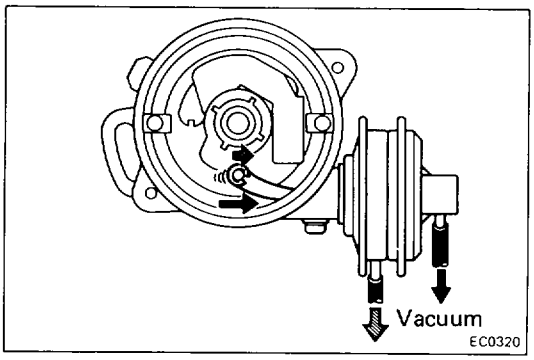


INSPECTION OF CHECK VALVE

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.



INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

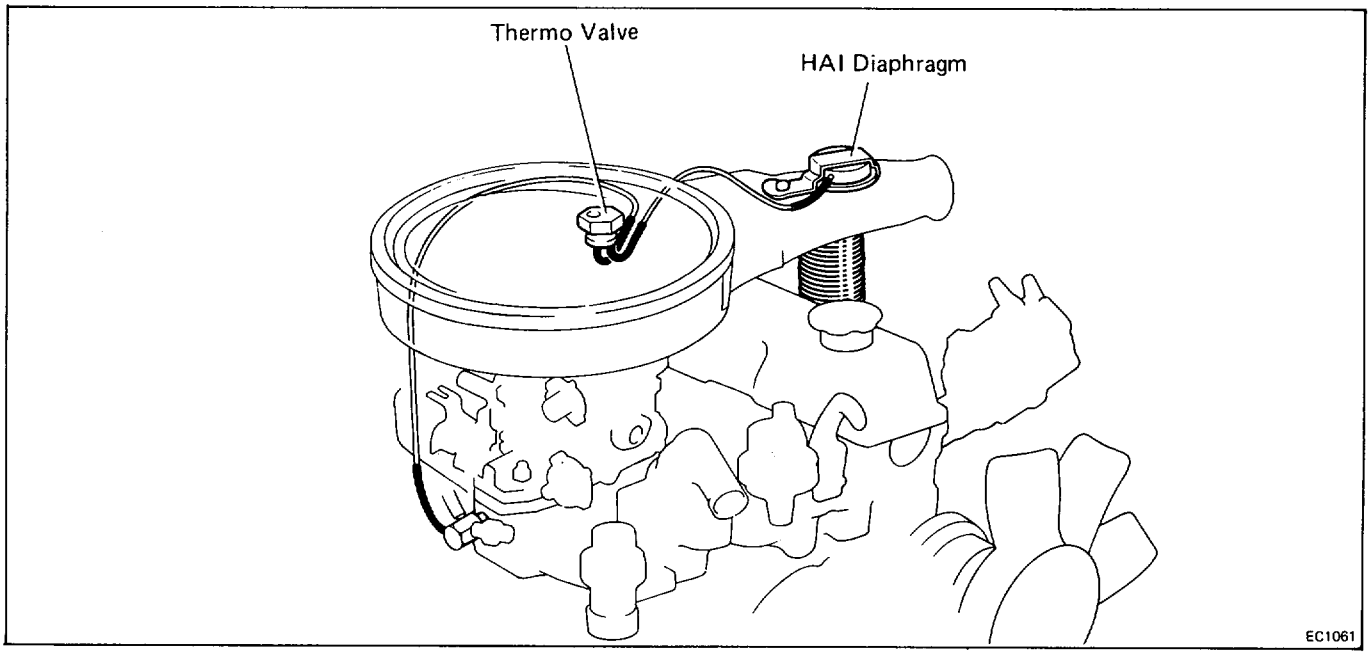
CHECK OPERATION OF VACUUM ADVANCER

(a) Remove the distributor cap and rotor.

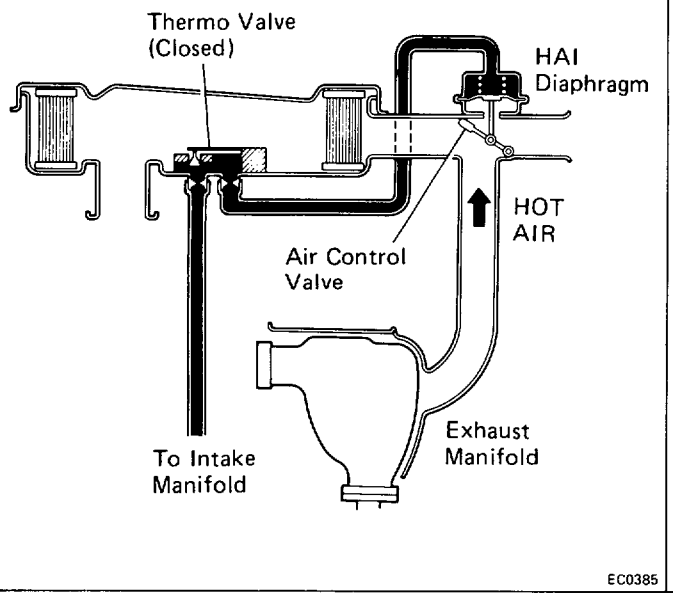
(b) Apply vacuum to the diaphragm, and check that the vacuum advancer moves in accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

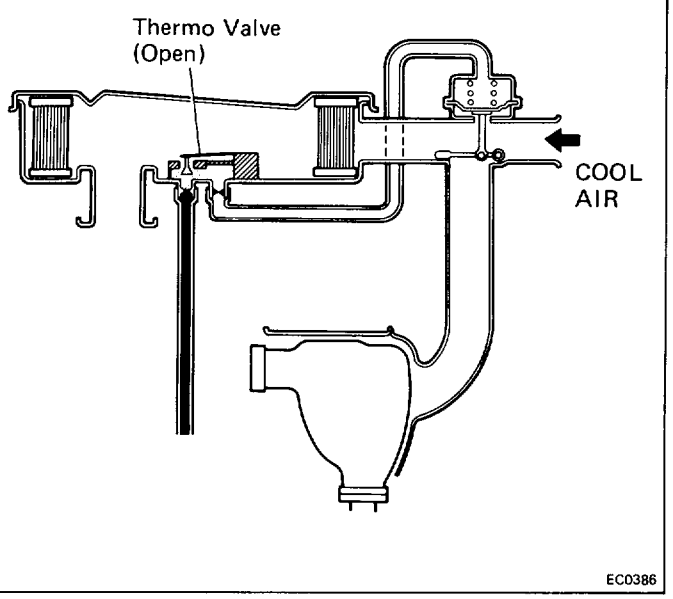
AUXILIARY SYSTEMS
1. Automatic Hot Air Intake (HAI) System



Below 30°C (86°F)

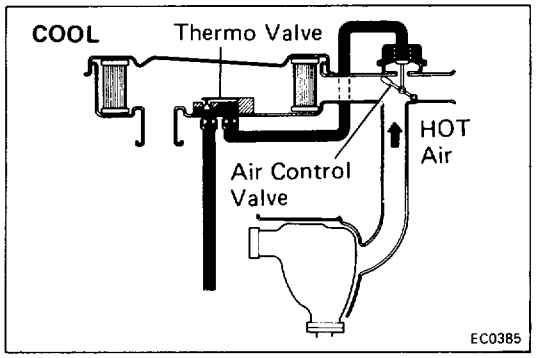


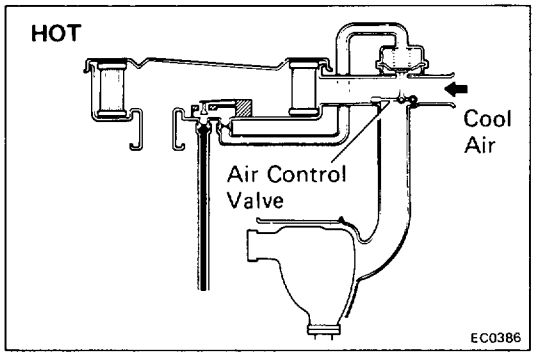
Above 45°C (113°F)



This system leads a hot air supply to the carburetor in cold weather to improve driveability and to prevent the carburetor from icing in extremely cold weather.

Temperature in Air Cleaner	Thermo Valve	Air Control Valve	Intake Air
Cool Below 30°C (86°F)	CLOSED	Hot air passage OPEN	HOT
Hot Above 45°C (113°F)	OPEN	Cool air passage OPEN	COOL





INSPECTION OF HAI SYSTEM

1. CHECK AIR CONTROL VALVE OPERATION

(a) Remove the air cleaner cover.

(b) Cool the thermo valve by blowing compressed air on it.

(c) Check that the air control valve closes the cool air passage at idle.

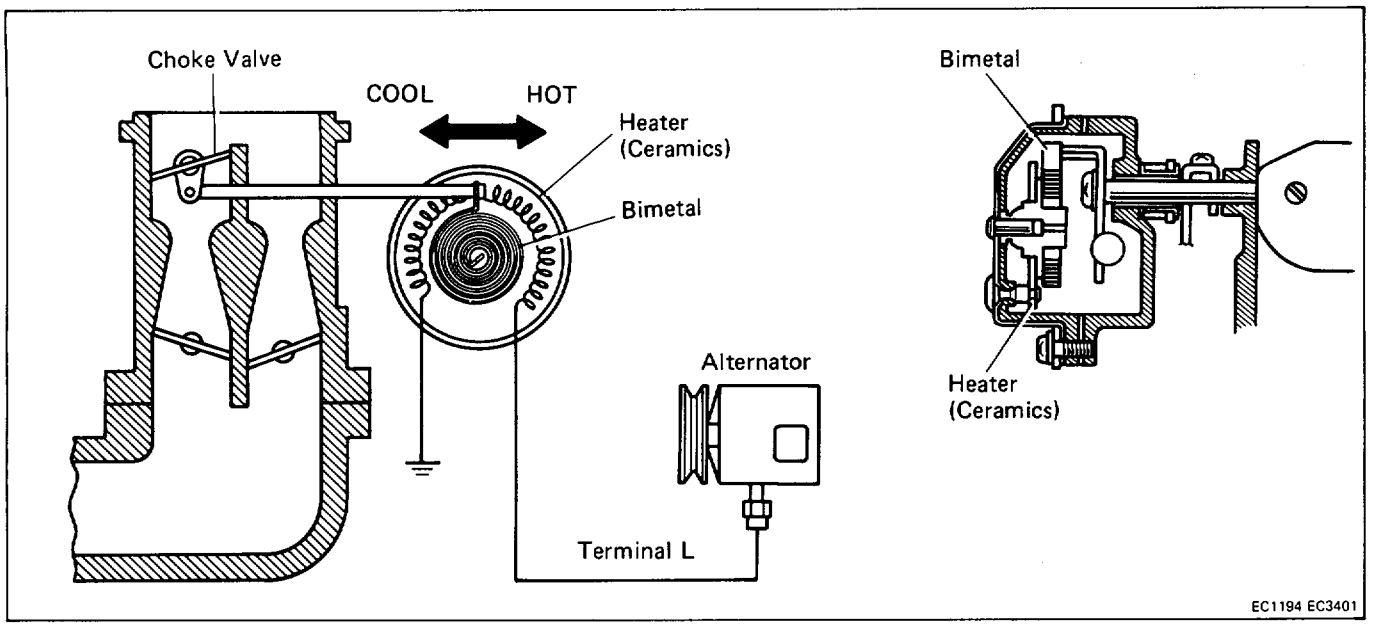
(d) Reinstall the air cleaner cover and warm up the engine.

(e) Check that the air control valve opens the cool air passage at idle.

2. CHECK HOSES AND CONNECTIONS

Visually check the hoses and connections for cracks, leaks or damage.

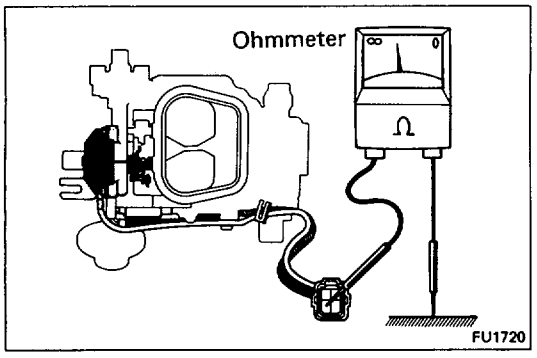
2. Automatic Choke System



This system temporarily supplies a rich mixture to the engine by closing the choke valve when the engine is cold.

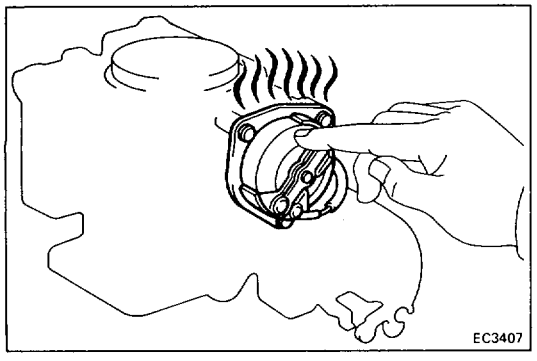
IG S/W	Engine	Current from L Terminal to Heater	Bimetal	Choke Valve
OFF	Not running	Not flowing	Expanded	CLOSED
ON	Not running	*Not flowing	Expanded	CLOSED
	Running	Flowing	Heated and contracted	OPEN

Remarks: * On alternators with IC regulator, slight voltage will occur when the ignition switch is turned ON, but not sufficient current to warm up the heater.



INSPECTION OF HEATER (Ceramic)

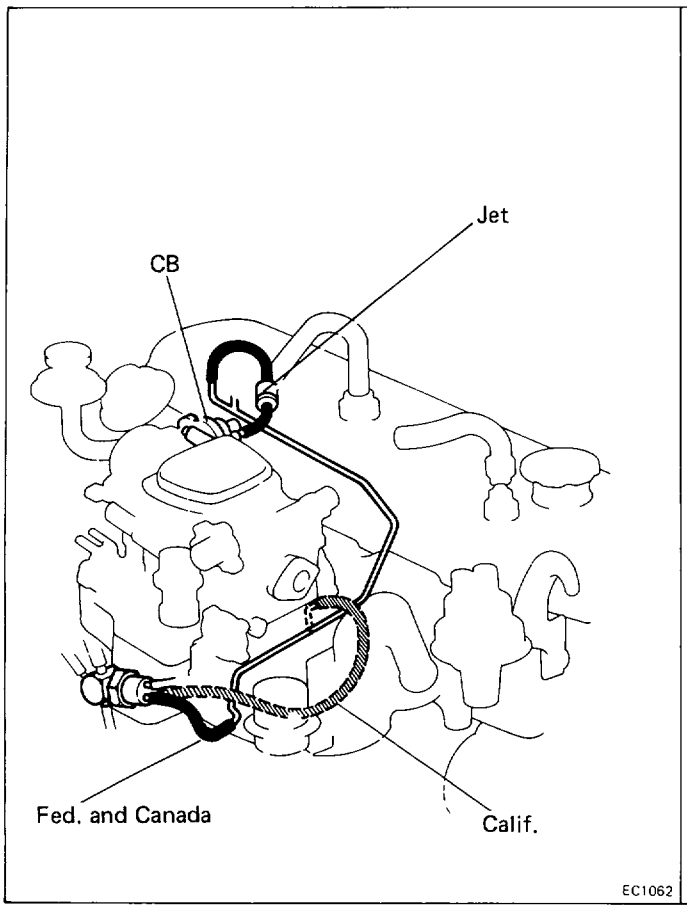
1. UNPLUG WIRING CONNECTOR
2. MEASURE RESISTANCE WITH OHMMETER
   Resistance: 19 — 23 Ω at 20°C (68°F)

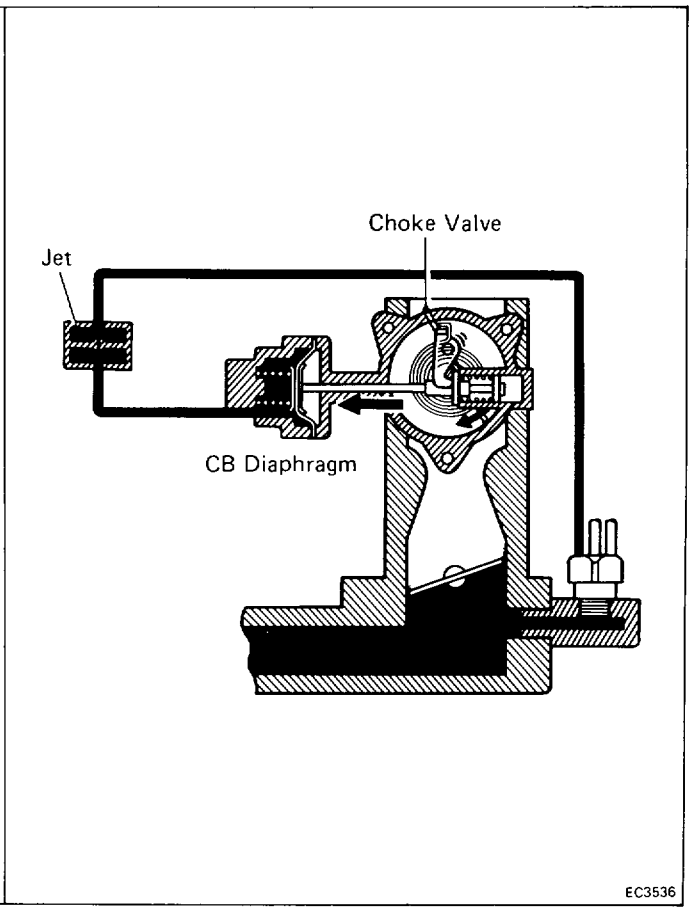


INSPECTION OF AUTOMATIC CHOKE SYSTEM

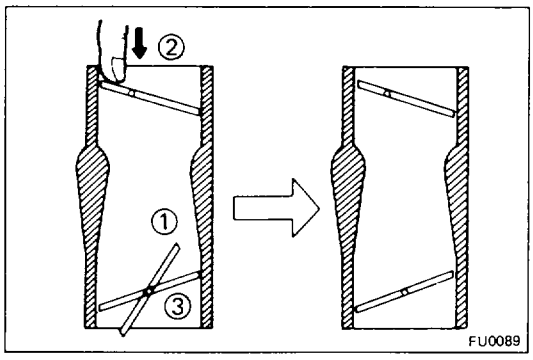
1. START ENGINE
2. SHORTLY AFTER, CHECK THAT CHOKE VALVE BEGINS TO OPEN AND CHOKE HOUSING IS HEATED

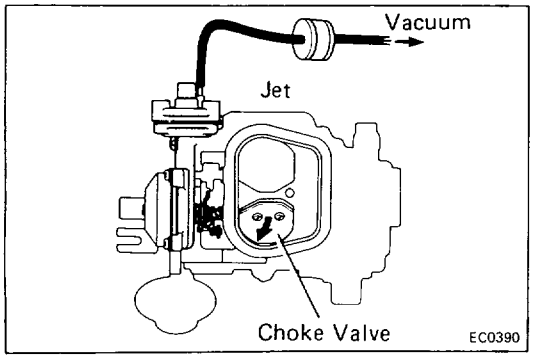
3. Choke Breaker (CB) System





This system slightly opens the choke valve to prevent a too rich mixture after firing when the choke is closed.





INSPECTION OF CB SYSTEM

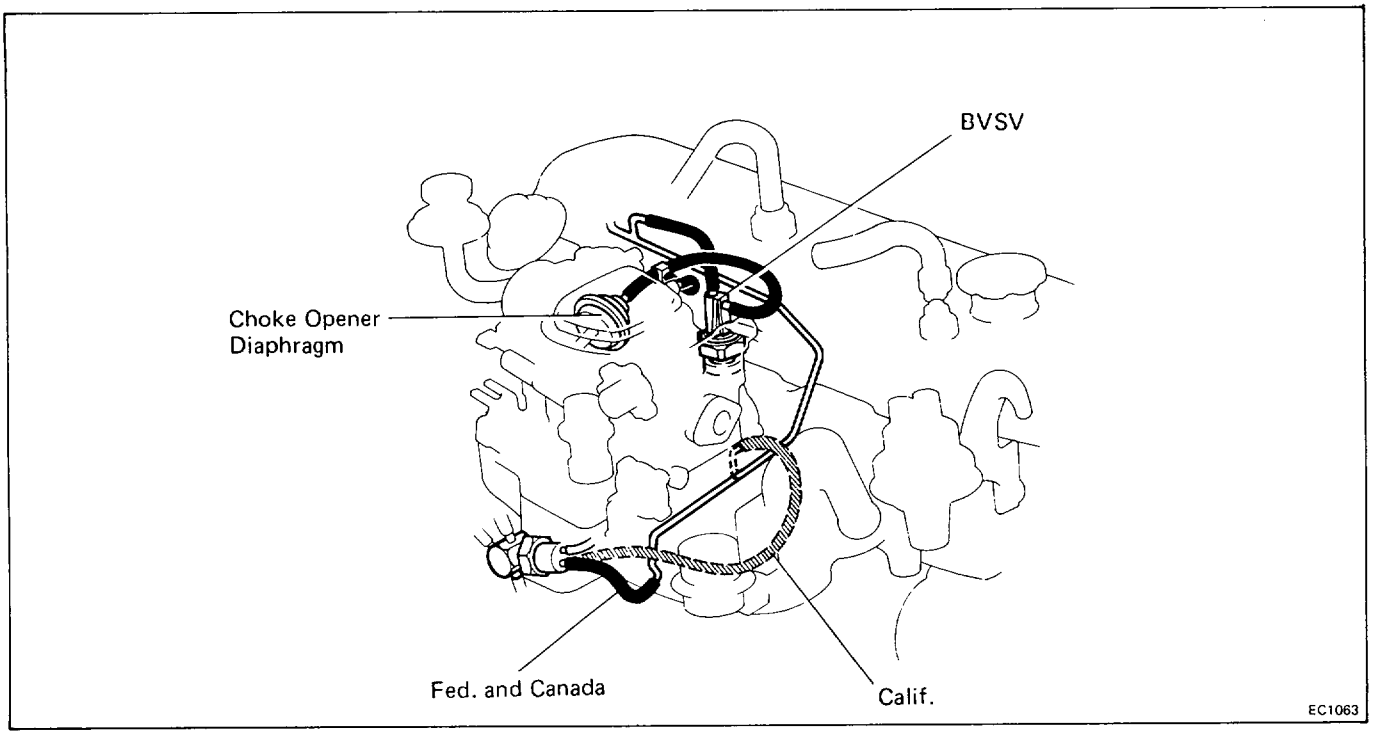
CHECK CHOKE LINKAGE AND DIAPHRAGM WITH COLD ENGINE

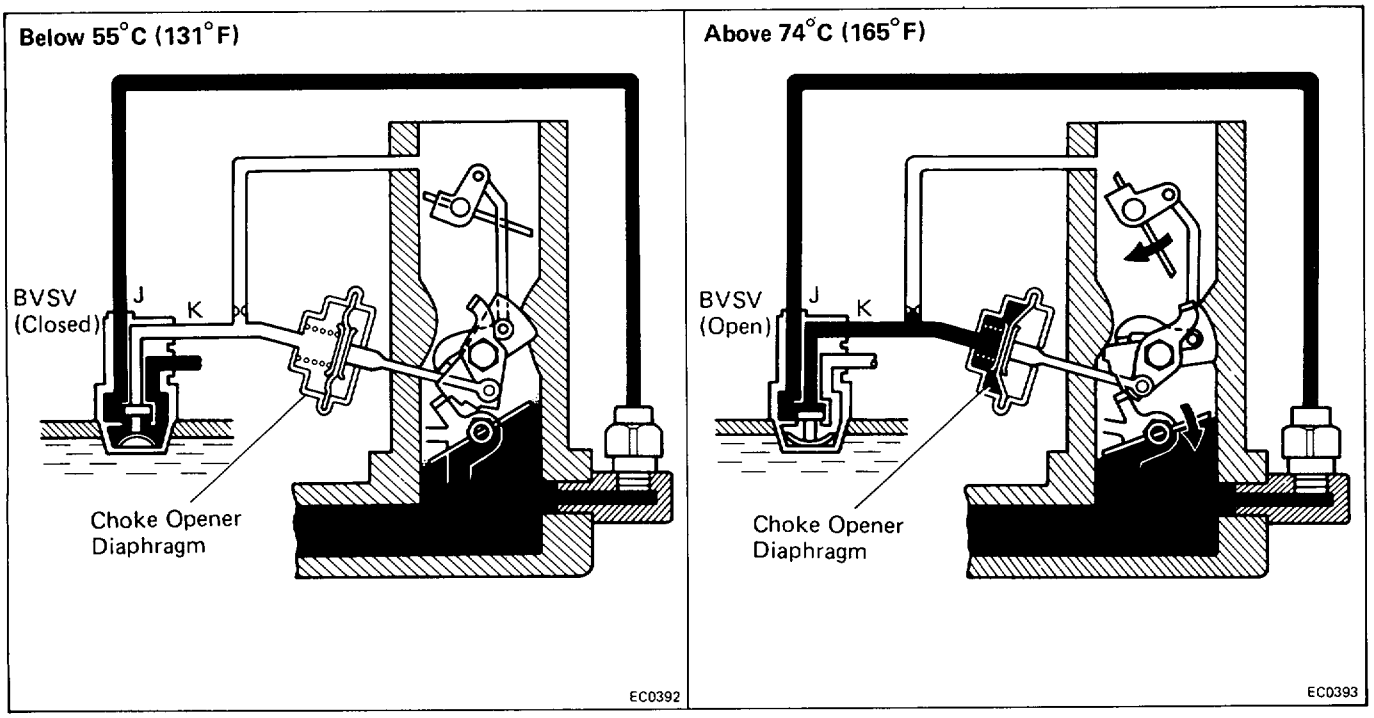
(a) While holding the throttle valve slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

(b) Disconnect the vacuum hose between the jet and vacuum pipe.

(c) Apply vacuum to the jet and check that the choke valve slightly opens.

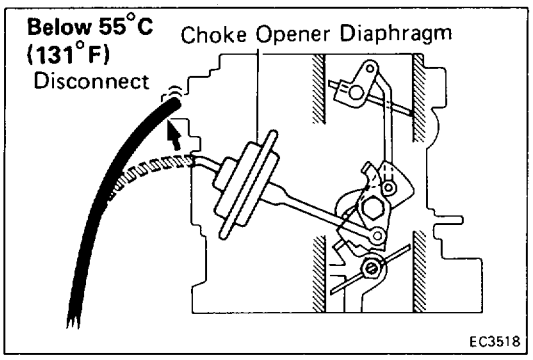
4. Choke Opener System

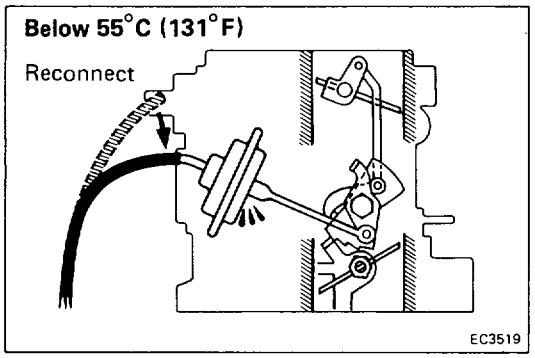


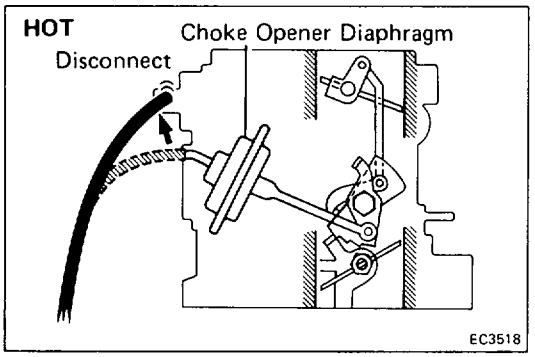


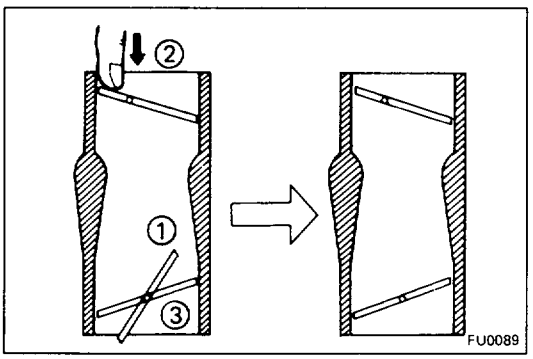
After warm-up, this system forcibly holds the choke valve open to prevent an over-rich mixture and release the fast idle cam to the 4th step to lower the engine rpm.

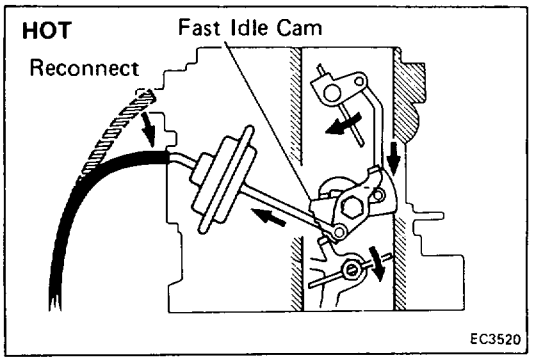
Coolant Temp.	BVSV	Diaphragm	Choke Valve	Fast Idle Cam	Engine RPM
Below 55°C (131°F)	CLOSED (J-K)	Released by spring tension	Closed by automatic choke	Set at 1st or 2nd step	HIGH
Above 74°C (165°F)	OPEN (J-K)	Pulled by manifold vacuum	OPEN	Released to 4th step	LOW











INSPECTION OF CHOKE OPENER SYSTEM

1. CHECK BVSV WITH COLD ENGINE

(a) The coolant temperature should be below 55°C (131°F).

(b) Disconnect the vacuum hose from the choke opener diaphragm.

(c) Step down on the accelerator pedal and release it. Then start the engine.

(d) Reconnect the vacuum hose and check that the choke linkage does not move.

2. CHECK BVSV, DIAPHRAGM AND LINKAGE WITH WARM ENGINE

(a) Warm up the engine to normal operating temperature.

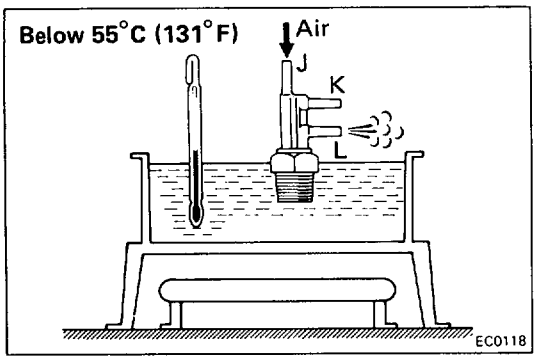
(b) Disconnect the vacuum hose from the choke opener diaphragm.

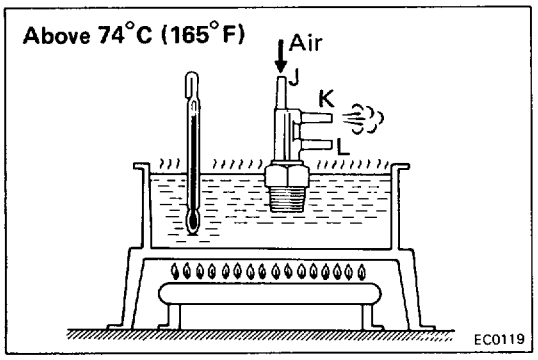
(c) Set the fast idle cam.
While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.

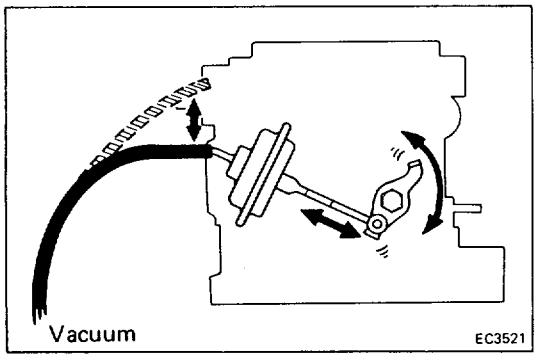
(d) Start the engine, but do not touch the accelerator pedal.

(e) Reconnect the vacuum hose, and check that the choke linkage moves, and that the fast idle cam is released to the 4th step.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART







INSPECTION OF BVSV

CHECK BVSV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.

(b) Remove the BVSV from the intake manifold.

(c) Cool the BVSV to below 55°C (131°F).

(d) Check that air flows from pipe J to pipe L.

(e) Heat the BVSV to above 74°C (165°F).

(f) Check that air flows from pipe J to pipe K.

If a problem is found, replace the BVSV.

(g) Apply sealant to the threads of the BVSV and reinstall.

Sealant: Part No. 08833 — 00070, THREE BOND 1324 or equivalent

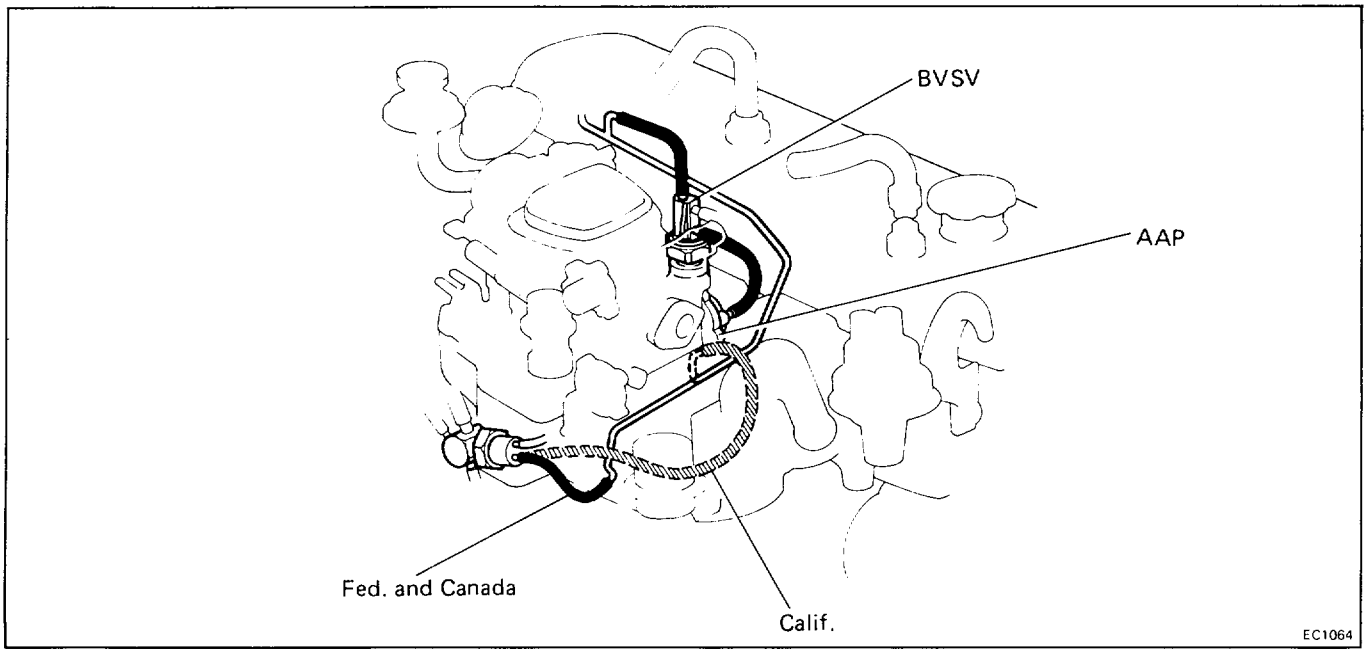
(h) Fill the radiator with coolant.

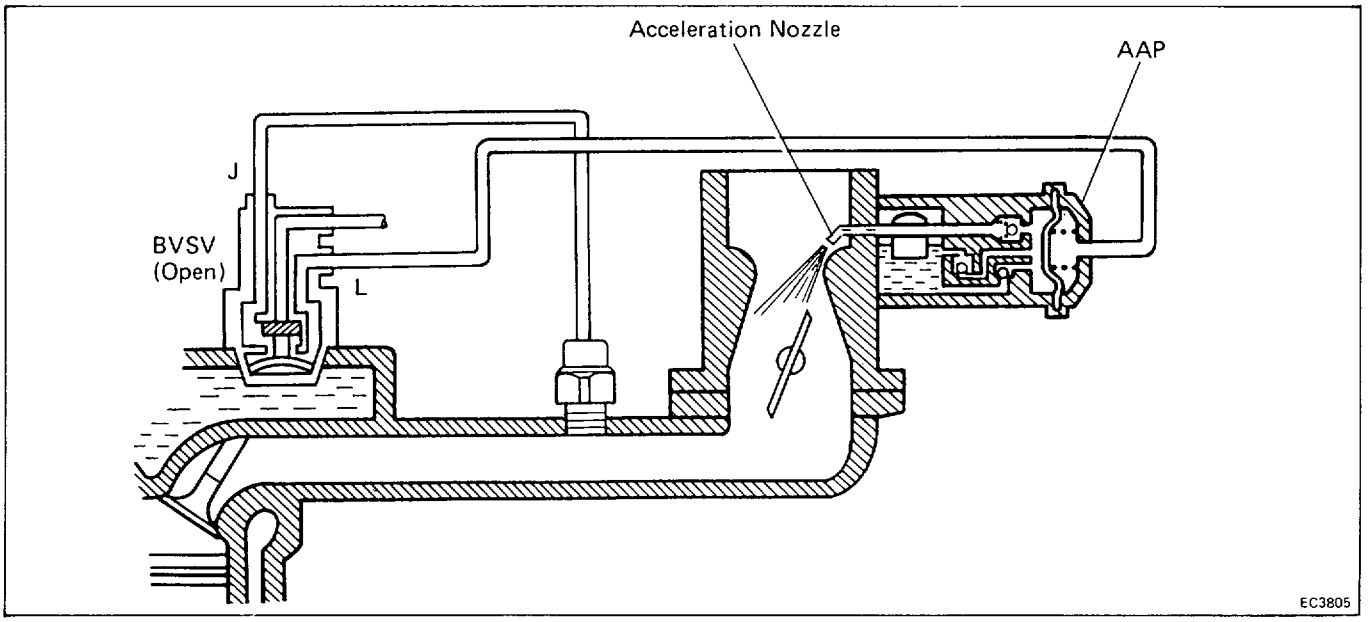
INSPECTION OF DIAPHRAGM

CHECK THAT CHOKE LINKAGE MOVES IN ACCORDANCE WITH APPLIED VACUUM

If a problem is found, replace the diaphragm.

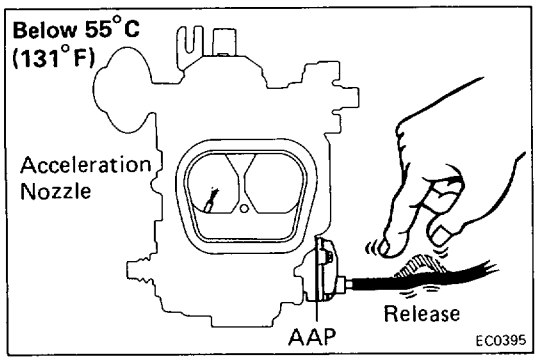
5. Auxiliary Acceleration Pump (AAP) System





The carburetor air-fuel mixture is very lean. When accelerating with a cold engine, the main acceleration pump capacity is insufficient to provide good acceleration. The AAP system compensates for this by forcing more fuel into the acceleration nozzle to obtain better cold engine performance.

Coolant Temp.	BVSV	Engine	Intake Vacuum	Diaphragm in AAP	Fuel
Below 55°C (131°F)	OPEN (J-L)	Constant RPM	HIGH	Pulled by vacuum	Drawn into AAP Chamber
		Acceleratаion	LOW	Returned by spring tension	Forced into acceleration Nozzle
Above 74°C (165°F)	CLOSED (J-L)	—	—	No operation	—

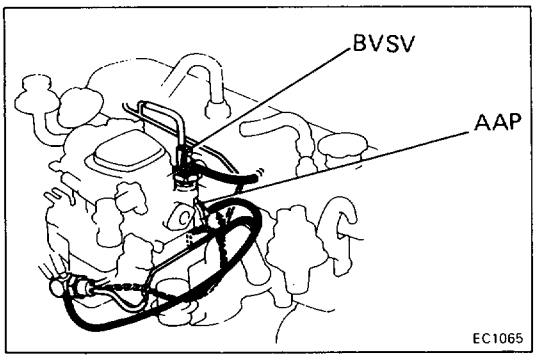


INSPECTION OF AAP SYSTEM

1. **CHECK SYSTEM WITH COLD ENGINE**
   (a) Check that the coolant temperature is below 55°C (131°F).
   (b) Remove the air cleaner.
   (c) Start the engine.
   (d) Pinch the AAP hose, and stop the engine.
   (e) Release the hose.
   (f) Check that gasoline spurts out from the acceleration nozzle.

2. **REPEAT (c), (d) AND (e) ABOVE AFTER WARM-UP**
   (a) Check that gasoline does not spurt out from the acceleration nozzle.
   (b) Reinstall the air cleaner.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY, OTHERWISE INSPECT EACH PART



INSPECTION OF AAP DIAPHRAGM

CHECK DIAPHRAGM OPERATION AT IDLE

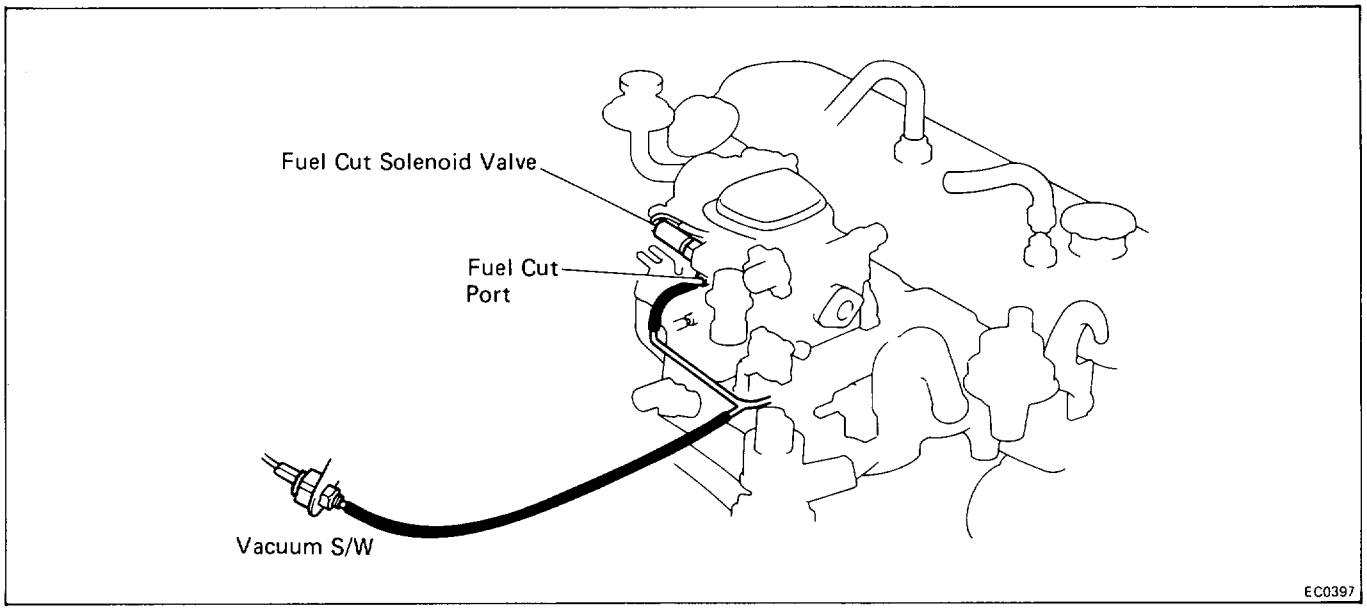
(a) Start the engine.
(b) Disconnect the vacuum hose from the AAP.
(c) Apply and release vacuum to the diaphragm at idle.
(d) Check that the engine rpm changes by releasing vacuum.
(e) Reconnect the AAP hose.

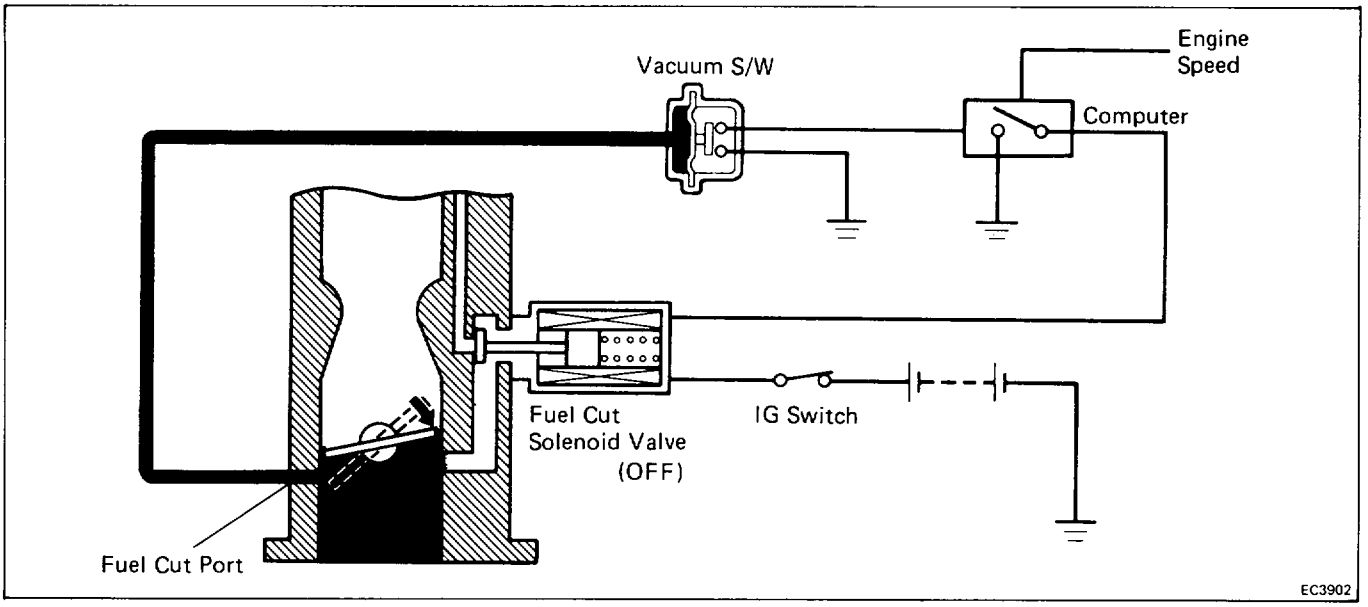
If a problem is found, replace the diaphragm.

INSPECTION OF BVSV

(See page EC-65)

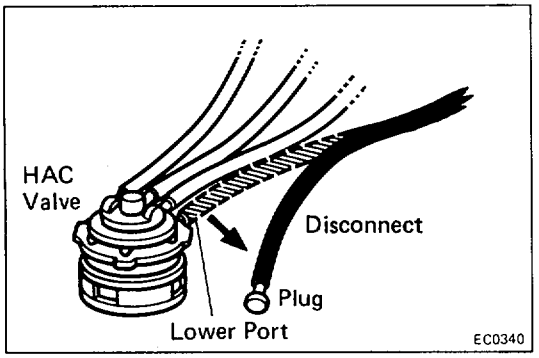
6. Deceleration Fuel Cut System



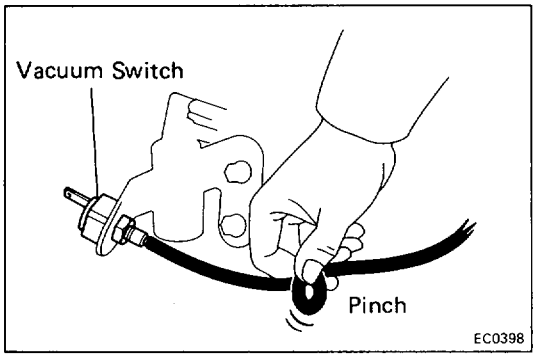


During deceleration this system cuts off part of the fuel in the slow circuit of the carburetor. This prevents overheating and afterburning in the exhaust system.

Engine RPM	Vacuum in the Vacuum S/W	Vacuum S/W	Computer	Fuel Cut Solenoid Valve	Slow Circuit in Carburetor
Below 1,810 rpm	Low vacuum below 360 mmHg (14.17 in.Hg, 48.0 kPa)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg, 56.7 kPa)	OFF	ON	ON	OPEN
Above 2,200 rpm	Low vacuum below 360 mmHg (14.17 in.Hg, 48.0 kPa)	ON	ON	ON	OPEN
	High vacuum above 425 mmHg (16.73 in.Hg, 56.7 kPa)	OFF	OFF	OFF	CLOSED



PREPARATION:
(For vehicles with HAC system)
Disconnect the vacuum hose from the lower port of the HAC valve, and plug the hose end.



INSPECTION OF DECELERATION FUEL CUT SYSTEM

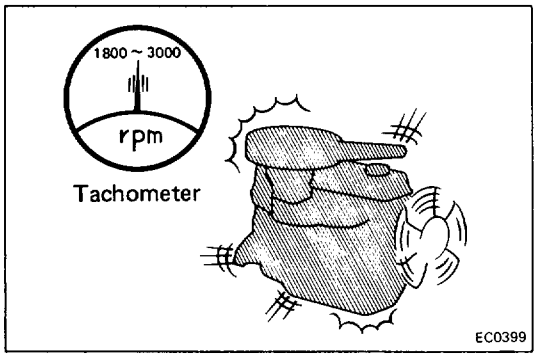
CHECK SYSTEM OPERATION

(a) Connect a tachometer to the engine.

(b) Start the engine.

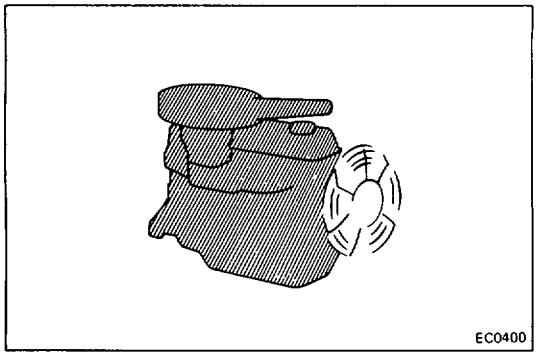
(c) Check that the engine runs normally.

(d) Pinch off the vacuum hose to the vacuum switch.

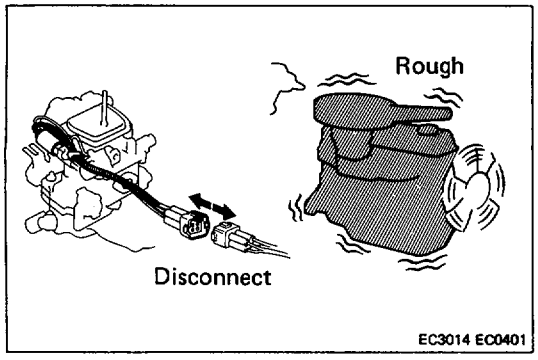


(e) Gradually increase engine speed to 3,000 rpm. Check that the engine misfires slightly between 1,800 and 3,000 rpm.

CAUTION: Perform this inspection quickly to avoid overheating the catalytic converter.



(f) Release the pinched hose. Again gradually increase the engine speed to 3,000 rpm and check that the engine operation returns to normal.

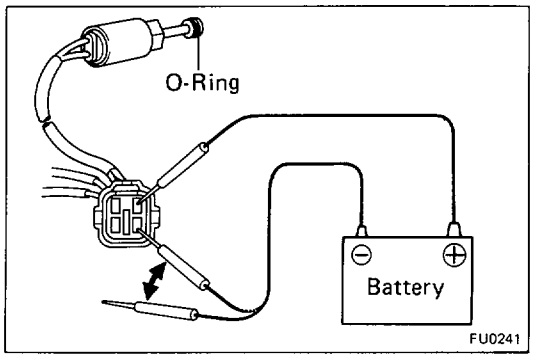


(g) With the engine idling, disconnect the wiring connector to the solenoid valve. Check that the engine idles rough or dies.

CAUTION: Perform this inspection quickly to avoid otherheating the catalyst.

(h) Stop the engine, and reconnect the wiring. Remove the tachometer.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY, OTHERWISE INSPECT EACH PART



INSPECTION OF FUEL CUT SOLENOID VALVE

(a) Remove the solenoid valve.

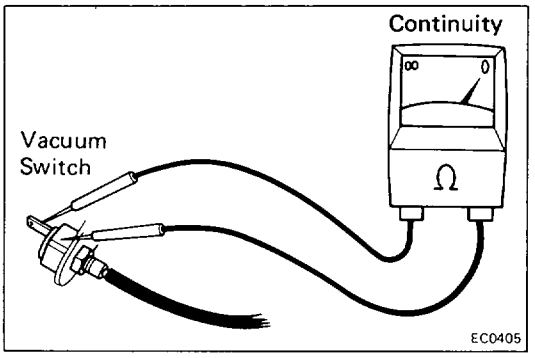
(b) Connect the two terminals and the battery terminals as shown.

(c) Check that you can feel a "click" from the solenoid valve when the battery is connected and disconnected.

(d) Check the O-ring for damage.

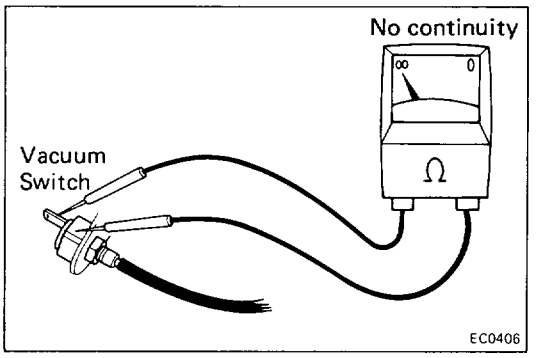
If problem is found, replace the solenoid valve or O-ring.

(e) Reinstall the valve and reconnect the wiring connector.



INSPECTION OF VACUUM SWITCH

(a) Using an ohmmeter, check for continuity between the switch terminal and switch body.



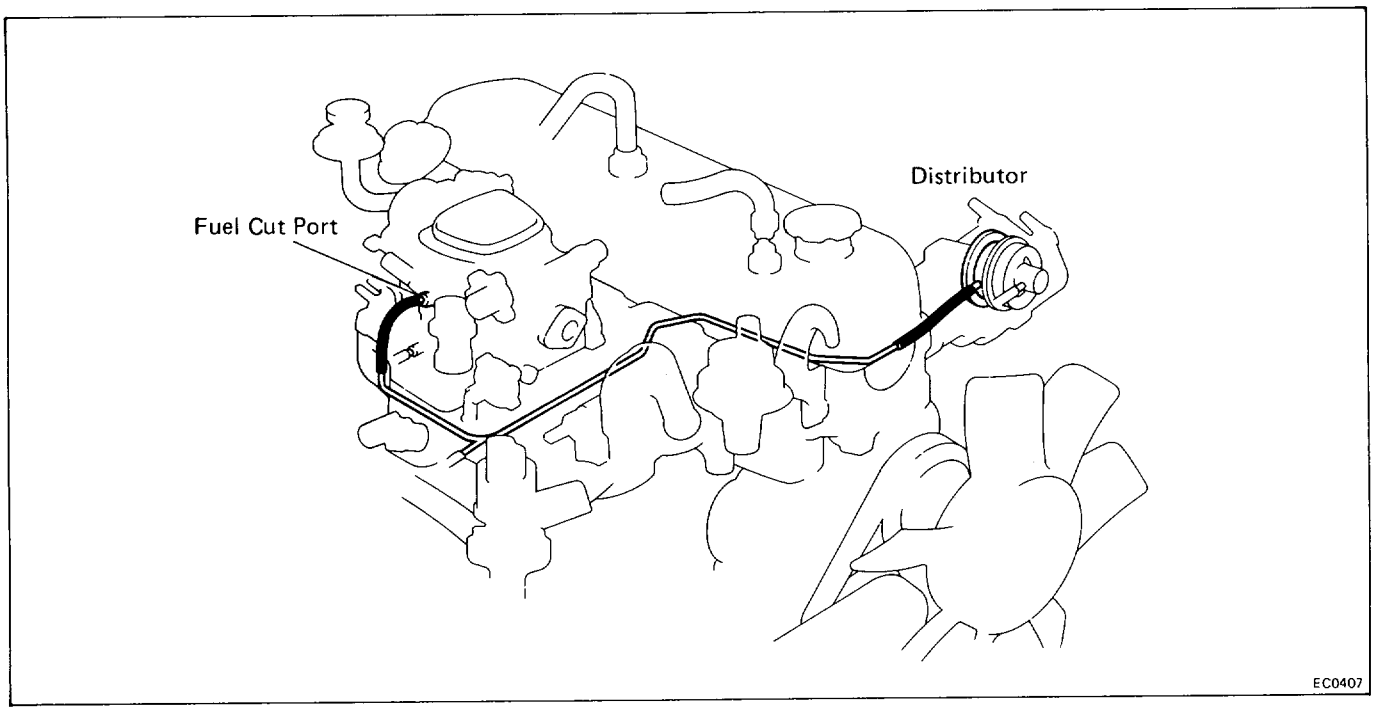
(b) Start the engine.

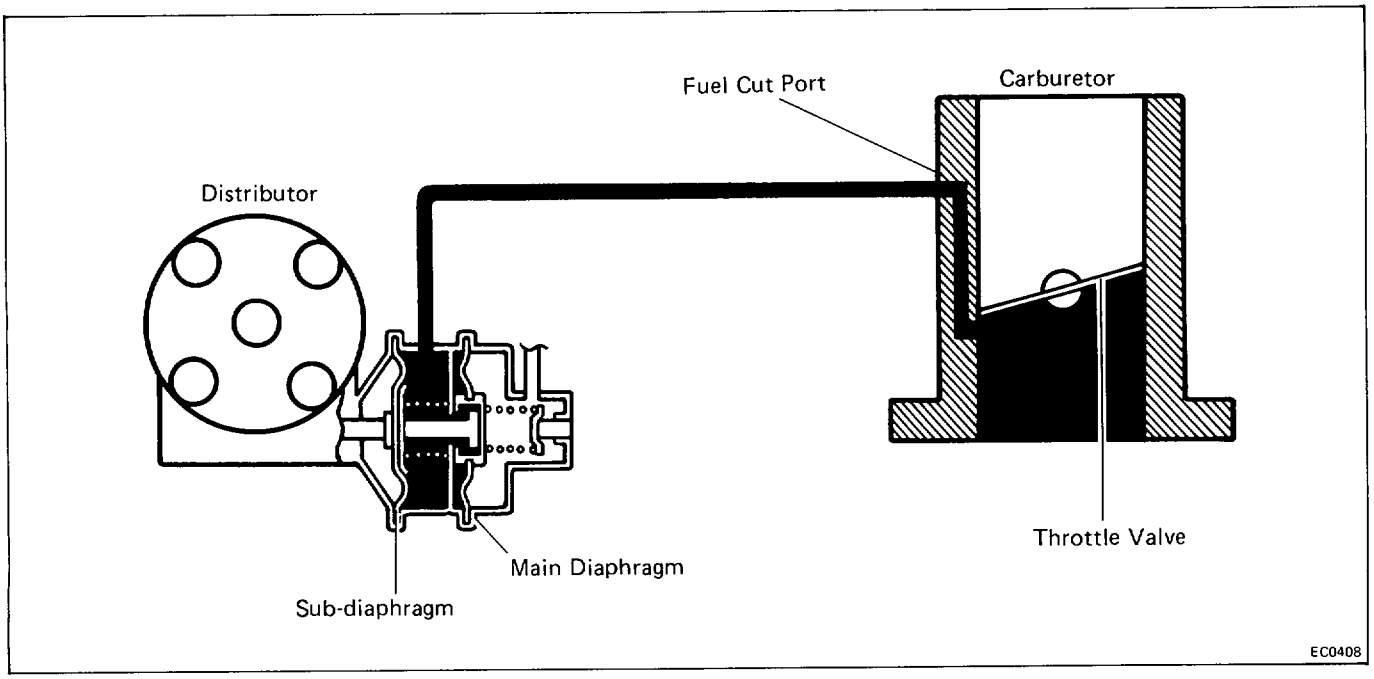
(c) Using an ohmmeter, check that there is no continuity between the switch terminal and the body.

If a problem is found, replace the vacuum switch.

7. Idle Advance System

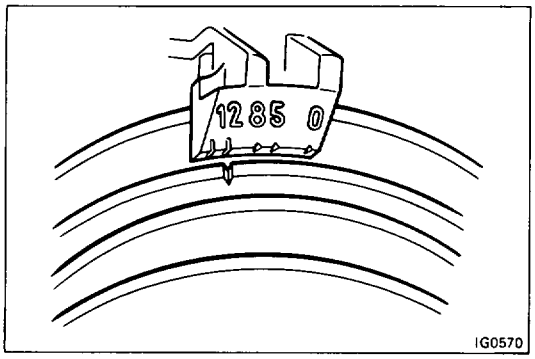
With HAC system: Refer to page EC-50 of HAC system.





To improve fuel economy at idle, this system advances the ignition timing only while the engine is idling.

Condition	Distributor Sub-diaphragm	Sub-vacuum Advance
Idling	Pulled by fuel cut port vacuum	ADVANCED (+12°)
Cruising	Not pulled	NOT ADVANCED



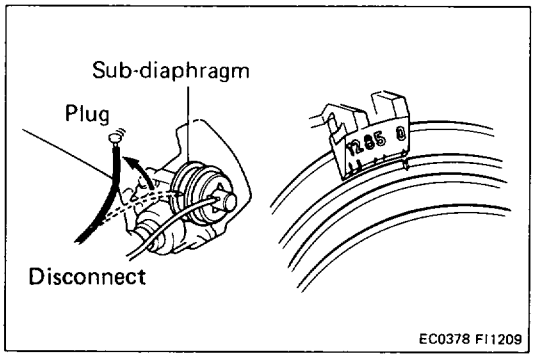
INSPECTION OF IDLE ADVANCE SYSTEM

CHECK IDLE ADVANCE SYSTEM OPERATION

(a) Warm up the engine to normal operating temperature.

(b) Check the ignition timing at idle.

Ignition timing: Approx. 12° BTDC @ Max. 950 rpm



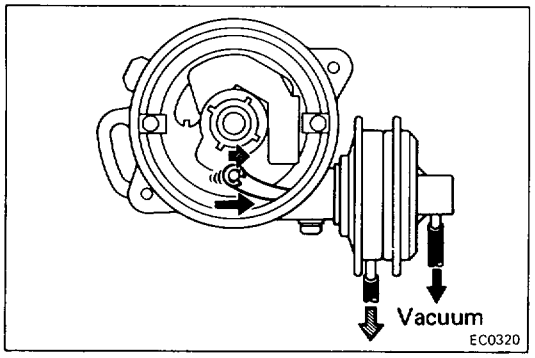
(c) Disconnect the vacuum hose from the distributor sub-diaphragm and plug the hose end.

(d) Check the ignition timing at idle.

Ignition timing: 0° BTDC @ Max. 950 rpm

(e) Reconnect the vacuum hose and remove the timing light.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART



INSPECTION OF DISTRIBUTOR VACUUM ADVANCER

CHECK OPERATION OF VACUUM ADVANCER BY APPLYING VACUUM

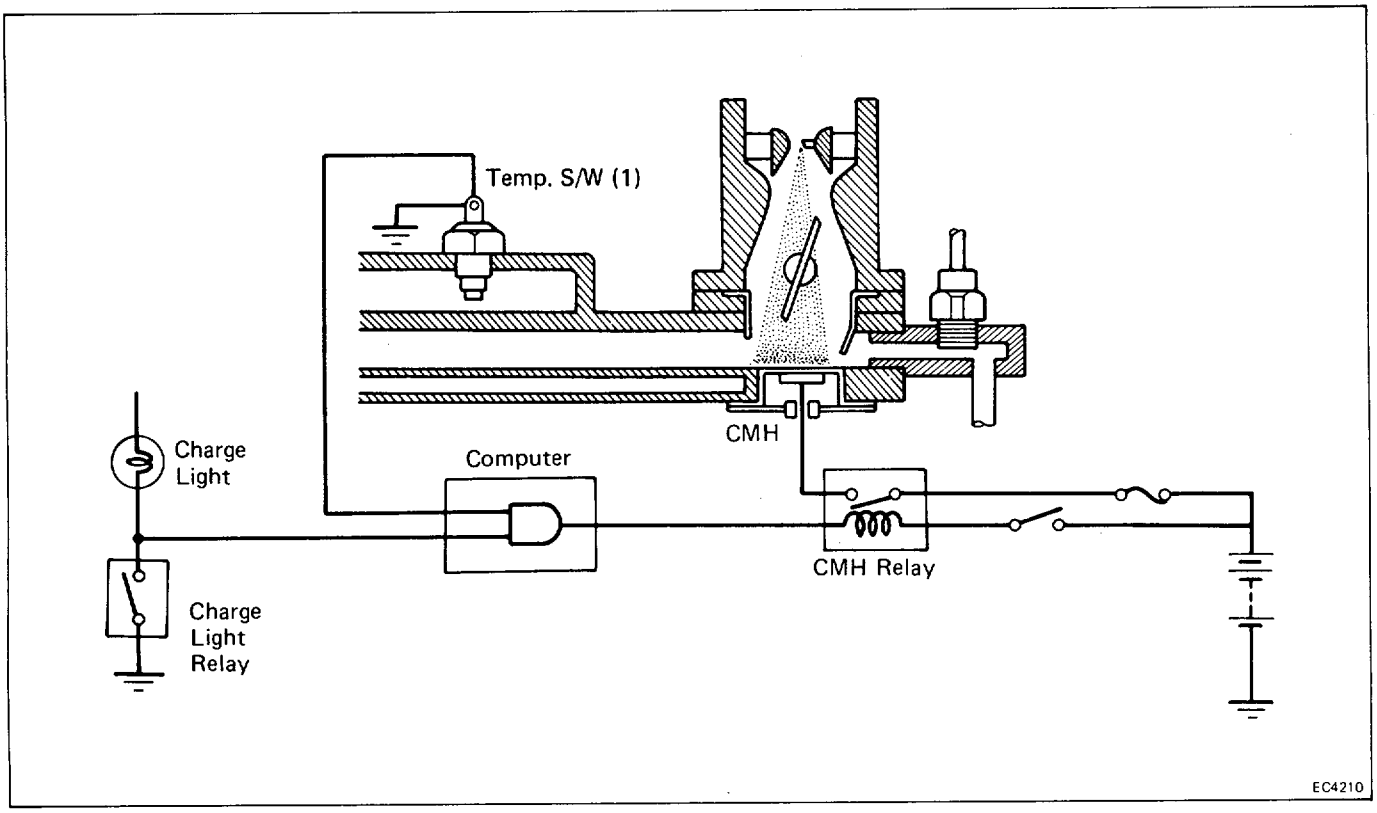
(a) Remove the distributor cap and rotor.

(b) Check that the vacuum advancer moves is accordance with the vacuum.

(c) Reinstall the rotor and distributor cap.

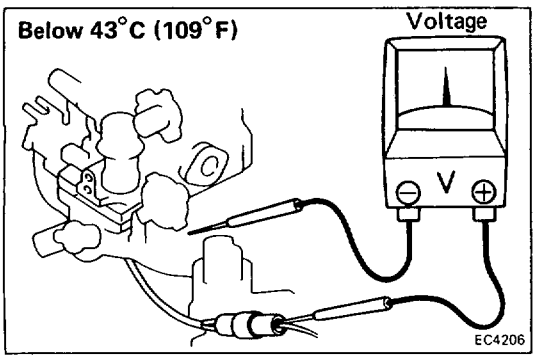
If a problem is found, repair or replace the distributor vacuum advancer.

8. Cold Mixture Heater (CMH) System



To reduce cold engine emission and improve drivability, the intake manifold riser is heated during cold engine operation to accelerate vaporization of the liquid fuel.

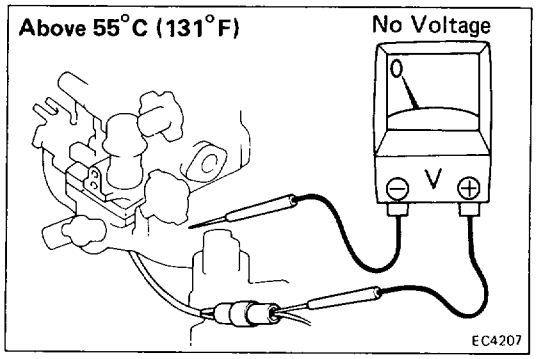
IG S/W	Engine	Coolant Temp.	Temp. S/W (1)	Computer	CMH Relay	CMH
OFF	Not running	—	—	—	OFF	OFF
ON	Not running	—	—	OFF	OFF	OFF
	Running	Below 43°C (109°F)	ON	ON	ON	ON (Heated)
		Above 55°C (131°F)	OFF	OFF	OFF	OFF



INSPECTION OF CMH SYSTEM

1. **START ENGINE**
2. **CHECK CMH WITH COLD ENGINE**
   (a) The coolant temperature should be below 43°C (109°F).
   (b) Using a voltmeter check that there is voltage between the positive (+) terminal and intake manifold.

CAUTION: The voltmeter probe should be inserted from the rear side of the connector.



3. CHECK CMH WITH WARM ENGINE

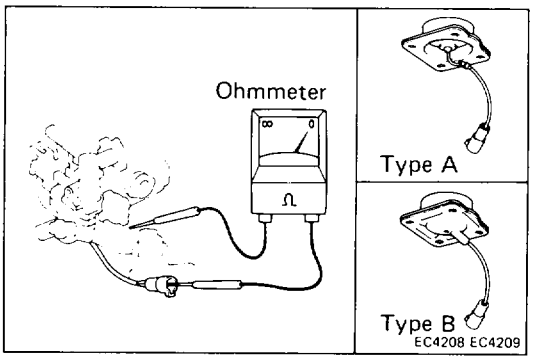
(a) Warm up the engine to above 55°C (131°F).

(b) Check that there is no voltage.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

INSPECTION OF TEMP. SWITCH (1)

(See page EC-31)



INSPECTION OF CMH

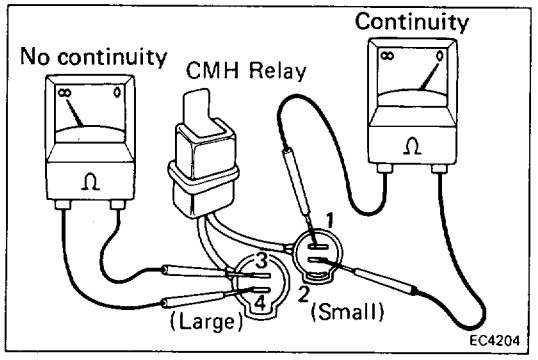
MEASURE RESISTANCE

(a) Unplug the wiring connector.

(b) Using an ohmmeter, measure the resistance between the positive (+) terminal and intake manifold.

Resistance at 20°C (68°F):
Type A (ND) 0.35 — 1.0 Ω
Type B (TDK) 0.5 — 2.0 Ω

(c) Plug in the wiring connector.

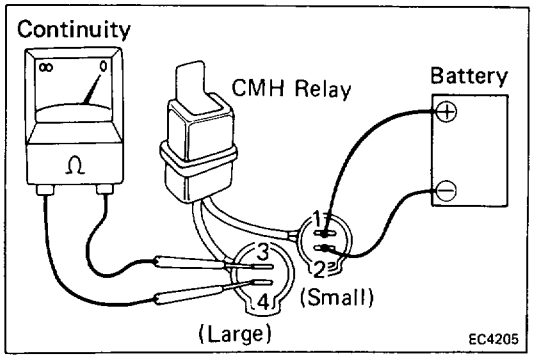


INSPECTION OF CMH RELAY

1. INSPECT RELAY CONTINUITY

Check that there is continuity between terminals 1 and 2. Check that there is no continuity between terminals 3 and 4.

Relay location: Right fender apron



2. INSPECT RELAY OPERATION

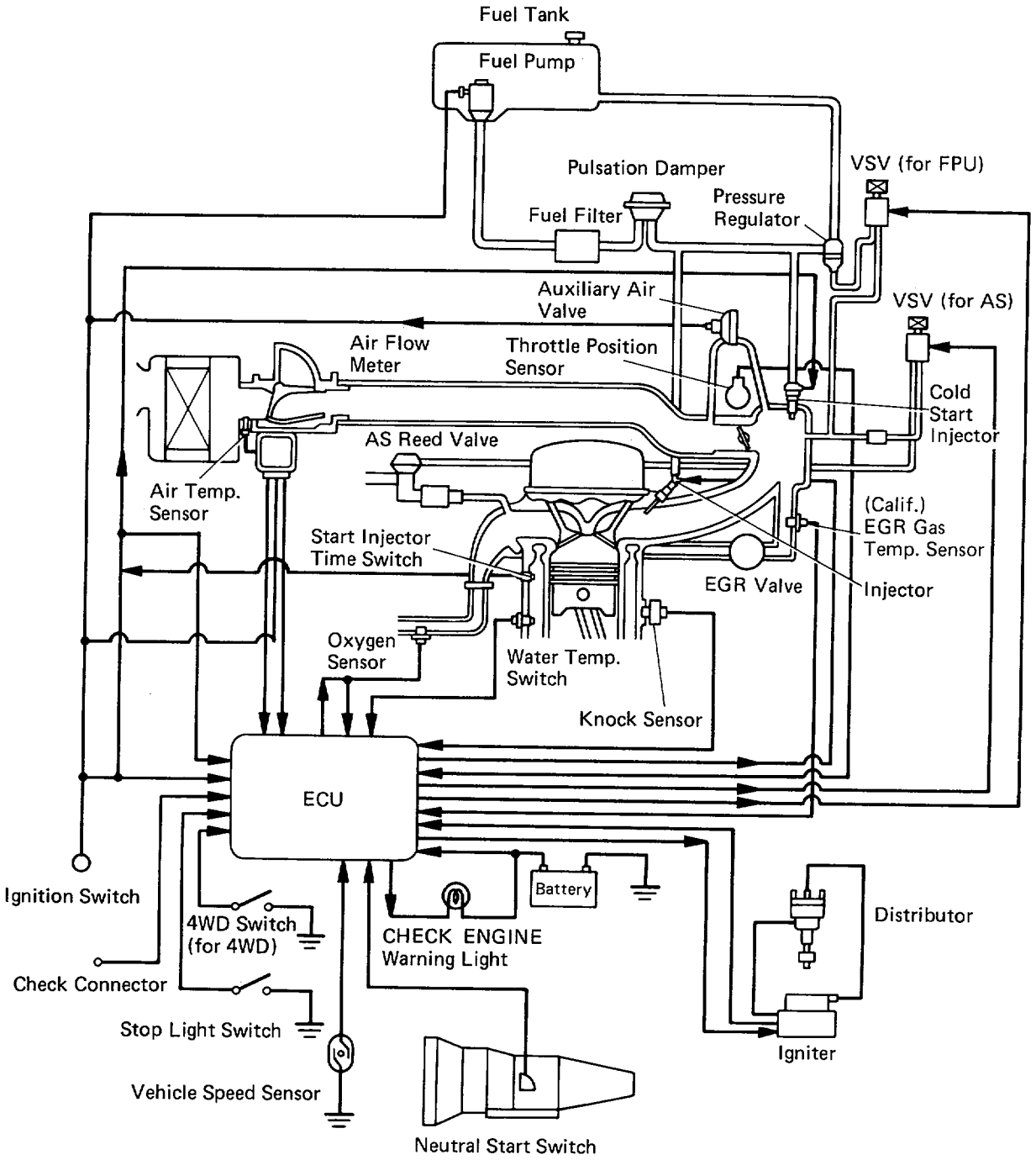
Check the continuity between terminals 3 and 4 with battery voltage applied between terminals 1 and 2.

EFI SYSTEM (22R-E, 22R-TE)

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EGR Gas Temp. Sensor	FI-83
ECU	FI-84
Fuel Cut RPM	FI-86

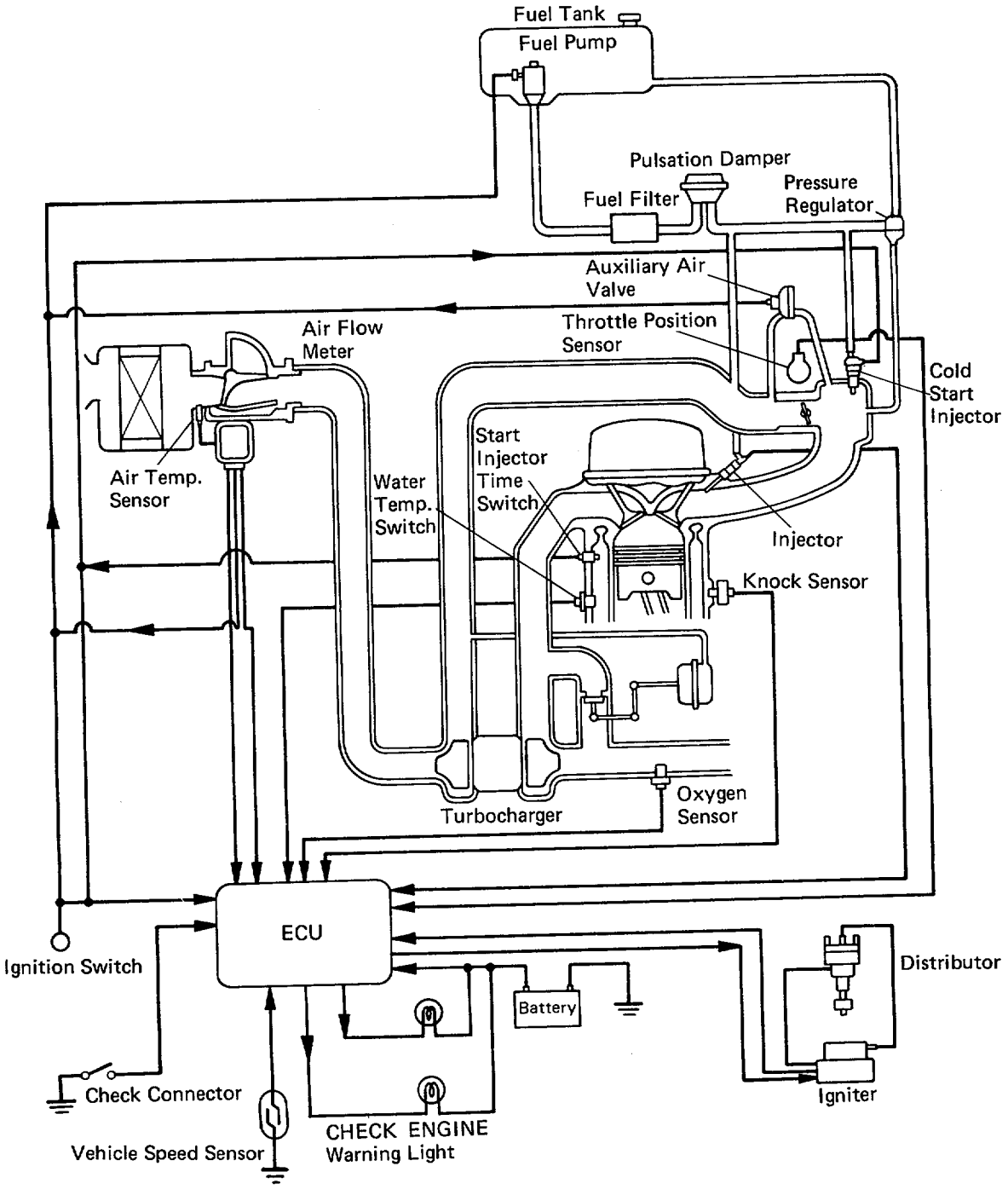
SYSTEM DESCRIPTION

22R-E



FI2667

22R-TE



FI2668

The EFI used on Toyotas has three basic systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the EFI injectors.
These injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU. Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 22R-E and 22R-TE engine is equipped with a Toyota Computer Control System (TCCS) which centrally controls the EFI, ESA, diagnosis systems, etc. by means of an Electronic Control Unit (ECU – formerly EFI computer) employing a microcomputer.

By means of the ECU, the TCCS controls the following functions:

1. Electronic Fuel Injection (EFI)

   The ECU receives signals from various sensors indicating changing engine operation conditions such as:

   Intake air volume
   Intake air temperature
   Coolant temperature
   Engine rpm
   Acceleration/deceleration
   Exhaust oxygen content etc.

   These signals are utilized by the ECU to determine the injection duration necessary for an optimum air-fuel ratio.

2. Electronic Spark Advance (ESA)

   The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant.

3. (22R-TE)
   Turbocharger Indicator

   The ECU detects turbocharger pressure, which is determined by the intake volume and engine rpm, and lights the green colored turbocharger indicator light in the combination meter. Moreover, if the turbocharger pressure increases abnormally, the ECU will light the "CHECK ENGINE" warning light on the instrument panel.

4. Electronic Controlled Transmission (ECT)

   The ECU signals the ECT ECU, which outputs the throttle opening angle signal and the coolant temperature condition signal to control the torque converter lock-up.

5. Diagnosis

   The ECU detects any malfunctions or abnormalties in the sensor network and lights the "CHECK ENGINE" warning light on the instrument panel. At the same time, the trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic code can be read by the number of blinks of the "CHECK ENGINE" warning light when terminals T and E_1 are short-circuited. There are 15 (22R-E Federal anc Canada), 16 (22R-E California), 17 (22R-E C & C) and 13 (22R-TE) different diagnostic codes including one for "normal operation."

6. Fail-Safe

   In the event of a sensor malfunction, a back-up circuit will take over to provide minimal drivability, and the "CHECK ENGINE" warning light will light.

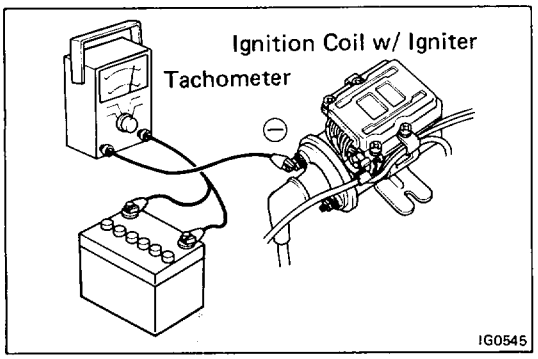
PRECAUTIONS

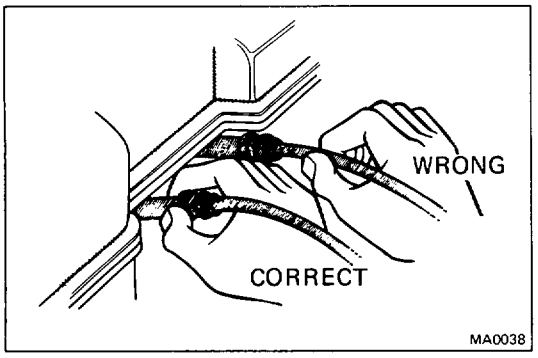
1. **Before working on the fuel system, disconnect the negative terminal from the battery.**

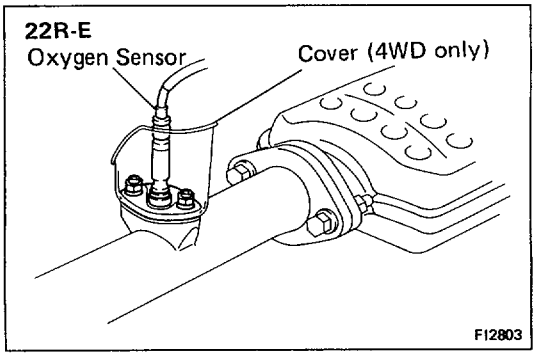
   NOTE: Any diagnosis code retained by the computer will be cleared when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.

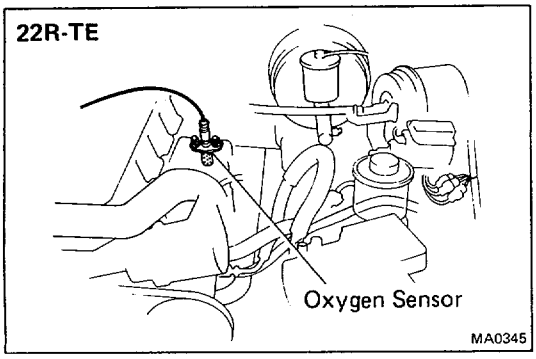
2. **When working on the fuel system, do not smoke or work near any fire hazard.**

3. **Keep gasoline off rubber or leather parts.**









INSPECTION PRECAUTIONS

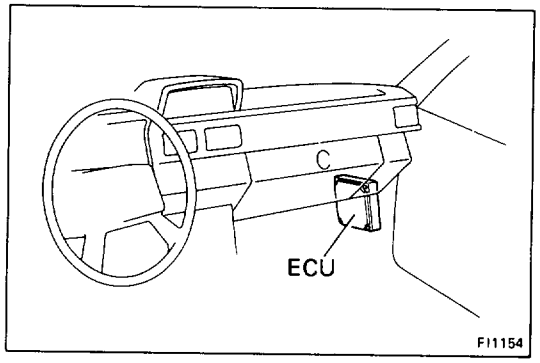
MAINTENANCE PRECAUTIONS

1. INSURE CORRECT ENGINE TUNE-UP

2. PRECAUTIONS WHEN CONNECTING GAUGE
   (a) Connect the tachometer (+) terminal to the ignition coil (–) terminal.
   (b) Use the battery as the power source for the timing light, tachometer, etc.

3. IN EVENT OF ENGINE MISFIRE, THE CATALYTIC CONVERTER MAY OVERHEAT. THEREFORE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN
   (a) Insure correct drive belt adjustment.
   (b) Insure proper connection of battery terminals, etc.
   (c) Handle high-tension cords carefully.
   (d) After repair work, insure that the ignition coil terminals and all other ignition system lines are reconnected securely.
   When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR
   (a) Do not allow oxygen sensor to receive an impact.
   (b) Do not allow water to come into contact with the sensor.



WHEN CAR IS EQUIPPED WITH A MOBILE RADIO SYSTEM (HAM, CB, ETC.)

The ECU has been designed so that it will not be affected by outside interference.
However, if your vehicle is equipped with an amature radio transceiver, etc. (even one with approx. 10 W output), it may, at times, have an effect upon ECU operation, especially if the antenna and feeder are installed nearby.
Therefore, observe the following precautions.

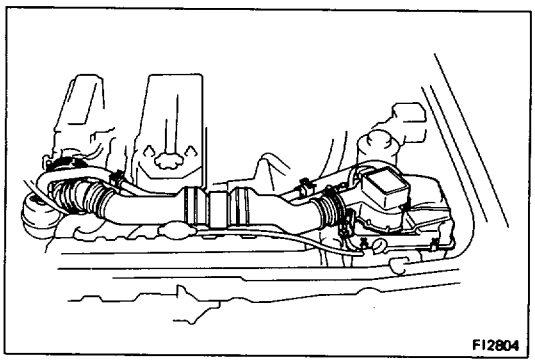
(a) Install the antenna as far as possible from the ECU. The ECU is located into the right side kick panel so the antenna should be installed at the rear, left side of the vehicle.
If installing on the bumper, do so on the right side, if possible.

(b) Keep the antenna feeder as far away as possible from the ECU wires – at least 20 cm (7.87 in.) – and, especially, do not wind them together.

(c) Insure that the feeder and antenna are properly adjusted.

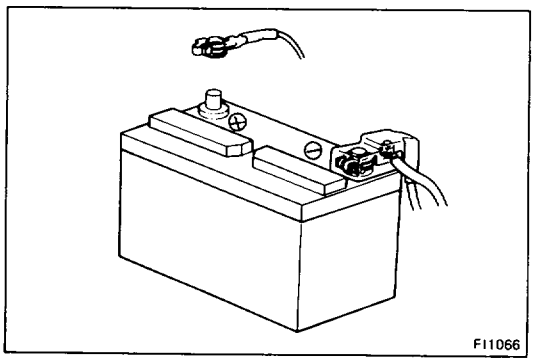
(d) Do not equip your vehicle with a powerful mobile radio system.

(e) Do not open the cover or the case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



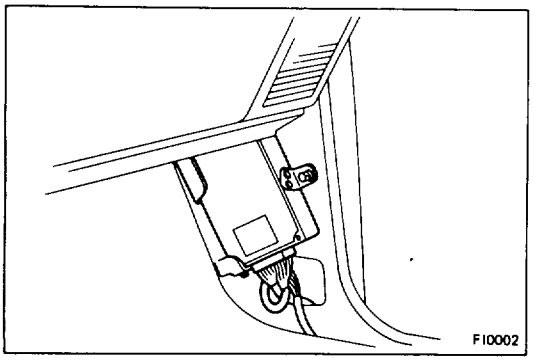
INTAKE SYSTEM

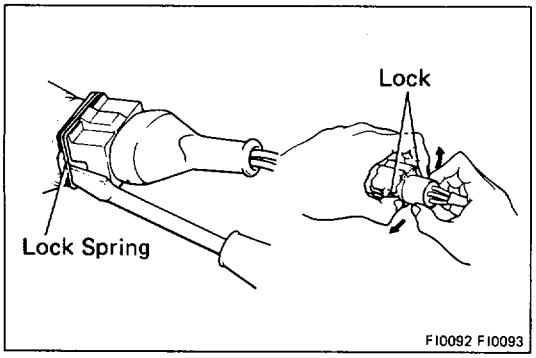
1. Separation of the engine oil level gauge, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air intake system between the air flow meter and cylinder head will allow air suction and cause the engine to run out of tune.



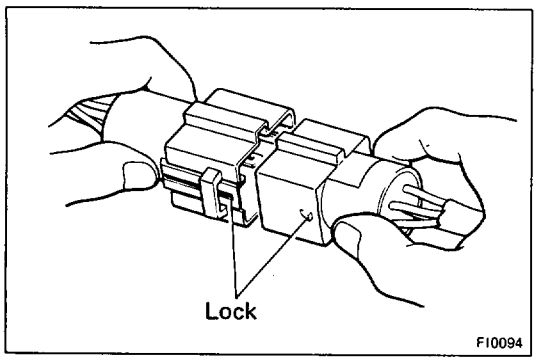
ELECTRONIC PARTS

1. Before removing EFI wiring connectors, terminals, etc., first disconnect power by either turning OFF the ignition switch or disconnecting the battery terminals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.
3. Do not permit parts to during removal or installation. Handle all EFI parts carefully and, in particular, the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECU cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.
7. Parts should be replaced as an assembly.

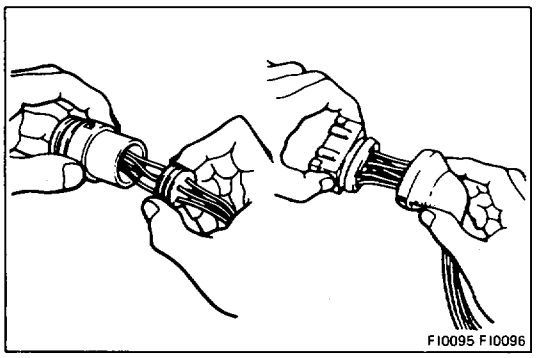




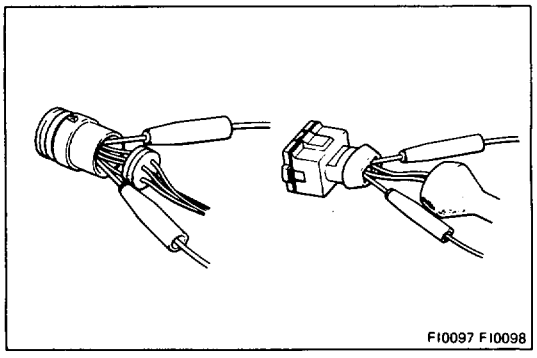
8. Sufficient care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector, pulling on the connectors.



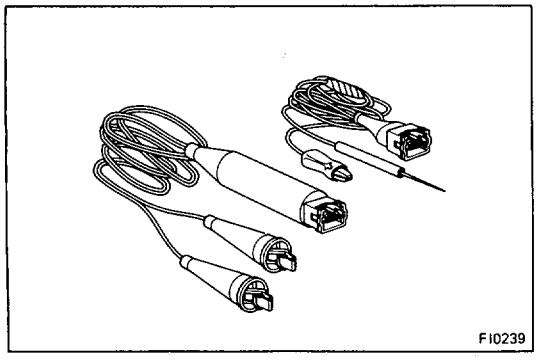
   (b) Fully insert the connector and insure that it is locked.



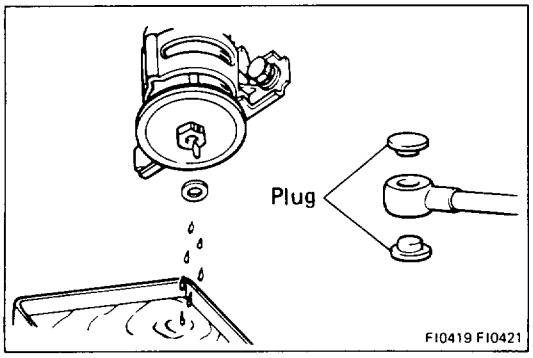
9. When inspecting a connector with a circuit tester.
   (a) Carefully take out the water-proofing rubber if it is a water-proof type connector.



   (b) Insert the tester probe into the connector from the wiring side when checking the continuity, amperage or voltage.
   (c) Do not apply unnecessary force to the terminal.
   (d) After checking, install the water-proofing rubber on the connector securely.

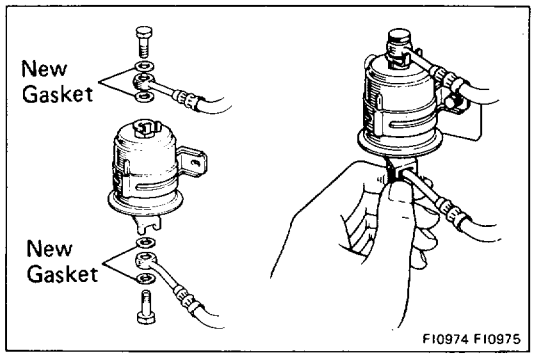


10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
    SST 09842-30020 and 09842-30050

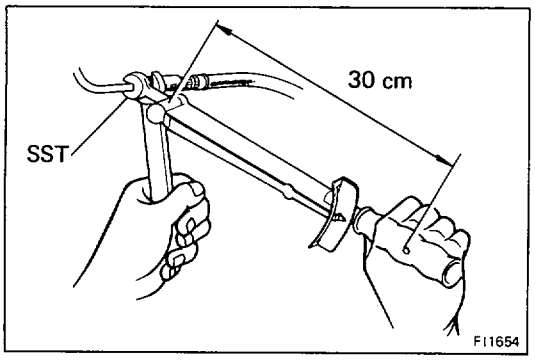


FUEL SYSTEM

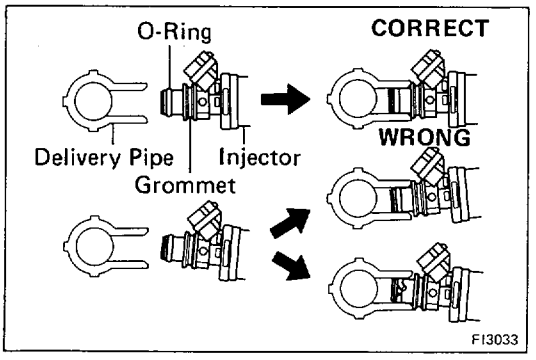
1. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline will come out so observe the following procedure.
   (a) Put a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.



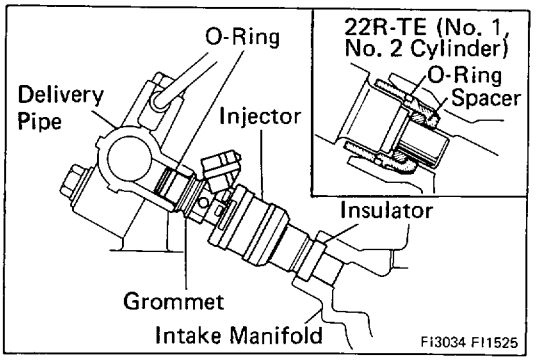
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure:
   (Union bolt type)
   (a) Always use a new gasket.
   (b) Hand tighten the union bolt.
   (c) Torque the bolt to the specified torque.
   Torque: 300 kg-cm (22 ft-lb, 29 N·m)



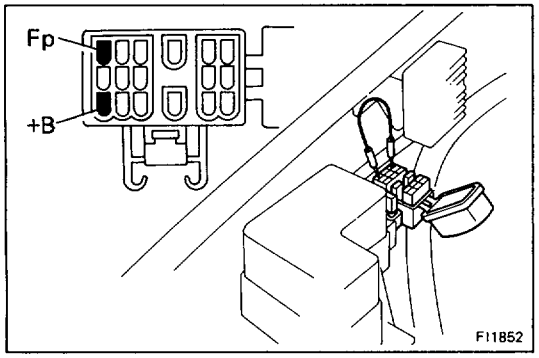
   (Flare nut type)
   (a) Apply a thin coat of oil to the flare and tighten the flare nut.
   (b) Then using SST, tighten the unit to the specified torque.
   SST 09631-22020
   Torque: 310 kg-cm (22 ft-lb, 30 N·m)
   NOTE: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.)



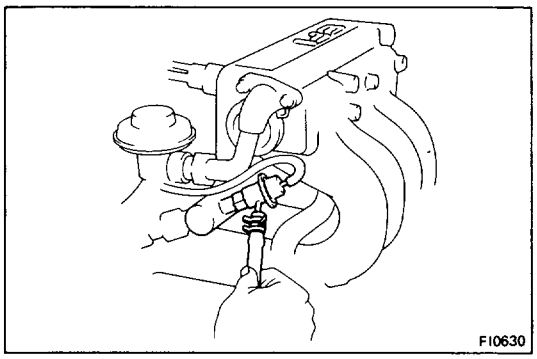
3. Take the following precautions when removing and installing the injectors.
   (a) Never re-use an O-ring.
   (b) When placing an O-ring on the injector, use care not to damage it in any way.
   (c) Lubricate the O-ring with spindle oil or gasoline before installing – never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and intake manifold as shown in the figure.



5. Confirm that there are no fuel leaks after performing maintenance on the fuel system.
   (a) With engine stopped, turn the ignition switch on.
   (b) Short terminals Fp and +B of the check connector.



   (c) When the pressure regulator fuel return hose (shown in the figure at left), is pinched, the pressure within the high pressure line will rise to approx. 4 kg/cm^2 (57 psi, 392 kPa). In this state, check to see that there are no leaks from any part of the fuel system.

CAUTION: Always pinch the hose. Avoid bending as it may cause the hose to crack.

TROUBLESHOOTING

TROUBLESHOOTING HINTS

1. Engine troubles are usually not caused by the EFI system. When troubleshooting, always first check the condition of these systems.
   (a) Electronic source
   - Battery
   - Fusible links
   - Fuses

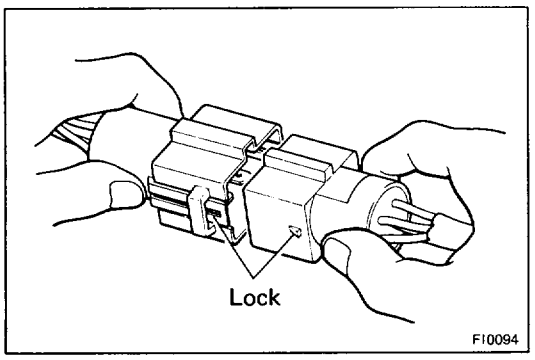
   (b) Fuel supply
   - Fuel leakage
   - Fuel filter
   - Fuel pump

   (c) Ignition system
   - Spark plug
   - High-tension cord
   - Distributor
   - Igniter and ignition coil

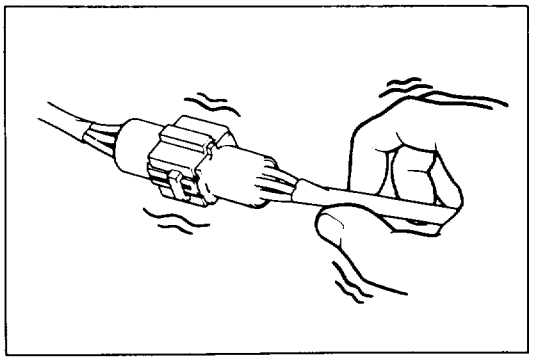
   (d) Air intake system
   - Vacuum leaks

   (e) Emission control system
   - EGR system
   - PCV system

   (f) Others
   - Ignition timing
   - Idle speed
   - etc.

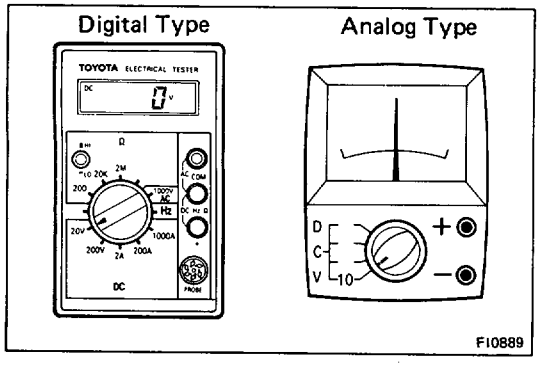


2. The most frequent cause of problems is simply a bad contact in wiring connectors. So always make sure that connections are secure.
   When inspecting the connector, pay particular attention to the following points:
   (a) Check to see that the terminals are not bent.
   (b) Check to see that the connector is pushed in completely and locked.



   (c) Check to see that there is no signal change when the connector is slightly tapped or wiggled.

3. Sufficiently troubleshoot for other causes before replacing the ECU. The ECU is of high quality and it is expensive.



4. Use a volt/ohmmeter with a high impedance (10 kΩ/V minimum) for troubleshooting an electrical circuit.
(See page FI-31)

TROUBLESHOOTING PROCEDURES

SYMPTOM—DIFFICULT TO START OR NO START (ENGINE WILL NOT CRANK OR CRANKS SLOWLY)

CHECK ELECTRONIC SOURCE

BAD →
1. Battery
   (1) Connection
   (2) Gravity – Drive belt – Charging system
   (3) Voltage
2. Fusible link

OK ↓

CHECK STARTING SYSTEM

BAD →
1. Ignition switch
2. Starter relay for M/T
3. Clutch start switch for M/T
4. Neutral start switch for A/T
5. Starter
6. Wiring/Connection

SYMPTOM – DIFFICULT TO START OR NO START (CRANKS OK)

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

→ Malfunction code → Diagnostic code(s) (See page FI-26)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Hose connections
2. PCV hoses
3. EGR system – EGR valve stays open

↓ OK

CHECK IGNITION SPARK
1. Unplug connectors of injector resistor and start injector time switch.
2. Check by holding high-tension cord 8 – 10 mm (0.31 – 0.39 in.) away from engine block while engine is cranking. A strong spark should be noted.

→ BAD →
1. High-tension cords
2. Distributor
3. Ignition coil, igniter
4. ECU

↓ OK

CHECK IGNITION TIMING
STD: 5° BTDC @ idle
(T and E_1 short circuit)

→ NO → Adjust ignition timing

↓ OK

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
   (1) Short terminals Fp and +B of the check connector.
   (2) Fuel pressure at fuel hose of cold start injector can be felt. (See page FI-51)

→ BAD →
1. Fuel line – Leakage – Deformation
2. Fuse
3. Circuit opening relay (See page FI-73)
4. Fuel pump (See page FI-50)
5. Fuel filter
6. Fuel pressure regulator (See page FI-57)

↓ OK

CHECK FUEL PUMP SWITCH IN AIR FLOW METER
Check continuity between terminals Fc and E_1 while measuring plate of air flow meter is open.

→ BAD → Air flow meter (See page FI-64)

↓ OK

CHECK SPARK PLUGS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

→ NO →
1. Spark plug
2. Compression pressure
   Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm
3. Injector – Leakage (See page FI-58)

→ NO All Plugs Wet →
1. Injector(s) – Shorted
2. Injector wiring between resistor and ECU shorted
3. Cold start injector – Leakage (See page FI-55)
4. Start injector time switch (See page FI-75)

↓ OK CONTINUED ON PAGE FI-13

OK CONTINUED FROM PAGE FI-14

CHECK AIR VALVE
1. Disconnect air hose from air valve.
2. Check that the air valve opens when cold.

Room temperature: Below 20°C (68°F)

NO →
1. Air valve (See page FI-66)
2. Water hoses
3. Air hoses

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

NO →
1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Fuse (EFI 15A)
   (3) Main relay
3. Air flow meter
4. Water temp. sensor
5. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU

SYMPTOM – ENGINE OFTEN STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

Malfunction code → Diagnostic code(s) (See page FI-26)

Normal code ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Hose connections
2. PCV hoses
3. EGR system – EGR valve stays open

OK ↓

CHECK FUEL SUPPLY TO INJECTOR
1. Fuel in tank
2. Fuel pressure in fuel line
   (1) Short terminals Fp and +B of the check connector.
   (2) You can feel fuel pressure at fuel hose of fuel filter.
   (See page FI-51)

BAD →
1. Fuel line – Leakage – Deformation
2. Fuse
3. Circuit opening relay (See page FI-73)
4. Fuel pump (See page FI-50)
5. Fuel filter
6. Fuel pressure regulator (See page FI-57)

OK ↓

CHECK AIR FILTER ELEMENT

BAD → Element – Clean or replace

OK ↓

CHECK IDLE SPEED
STD: 22R-E 750 rpm
22R-TE 800 rpm

BAD → Adjust idle speed

OK ↓

CHECK IGNITION TIMING
STD: 5° BTDC @ idle
(T and E_1 short circuit)

BAD → Adjust ignition timing

OK ↓

CHECK SPARK PLUGS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

BAD →
1. Spark plug
2. Compression pressure
   Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm

OK ↓

CHECK COLD START INJECTOR
(See page FI-55)

BAD →
1. Cold start injector
2. Start injector time switch
   (See page FI-75)

OK CONTINUED ON PAGE FI-15

OK CONTINUED FROM PAGE FI-14

CHECK AIR VALVE
1. Disconnect air hose from air valve.
2. Check that air valve opens when cold.
Room temperature: Below 20°C (68°F)

BAD →
1. Air valve (See page FI-66)
2. Water hoses
3. Air hoses

OK ↓

RECHECK FUEL PRESSURE
(See page FI-51)

BAD →
1. Fuel pump (See page FI-50)
2. Fuel filter
3. Fuel pressure regulator (See page FI-57)

OK ↓

CHECK INJECTORS
(See page FI-58)

BAD → Injection condition

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Main relay
3. Air flow meter
4. Water temp. sensor
5. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU

SYMPTOM – ENGINE SOMETIMES STALLS

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

Malfunction code →
Diagnostic code(s) (See page FI-26)

Normal code ↓

CHECK AIR FLOW METER
(See page FI-64)

BAD → Air flow meter

OK ↓

CHECK WIRING CONNECTORS AND RELAYS
Check that there is a signal change when the connector or relay is slightly tapped or wiggled.

BAD →
1. Connector
2. Main relay (See page FI-72)
3. Circuit opening relay (See page FI-73)

SYMPTOM – ROUGH IDLING AND/OR MISSING

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

→ Malfunction code → Diagnostic code(s) (See page FI-26)

↓ Normal code

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

→ BAD →
1. Hose connections
2. PCV hoses
3. EGR system – EGR valve stays open

↓ OK

CHECK AIR FILTER ELEMENT

→ BAD → Element – Clean or replace

↓ OK

CHECK IDLE SPEED
STD: 22R-E 750 rpm
22R-TE 800 rpm

→ BAD → Adjust idle speed

↓ OK

CHECK IGNITION TIMING
STD: 5° BTDC @ idle
(T and E_1 short circuit)

→ BAD → Adjust ignition timing

↓ OK

CHECK SPARK PLUGS AND PLUG CORDS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

→ BAD →
1. Spark plugs and high-tension cords
2. Compression pressure
Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm

↓ OK

CHECK COLD START INJECTOR
(See page FI-55)

→ BAD →
1. Cold start injector
2. Cold start injector time switch. (See page FI-75)

↓ OK

CHECK FUEL PRESSURE
(See page FI-51)

→ BAD →
1. Fuel pump (See page FI-50)
2. Fuel filter
3. Fuel pressure regulator (See page FI-57)

↓ OK

CHECK INJECTORS
(See page FI-58)

→ BAD → Injection condition

↓ OK CONTINUED ON PAGE FI-17

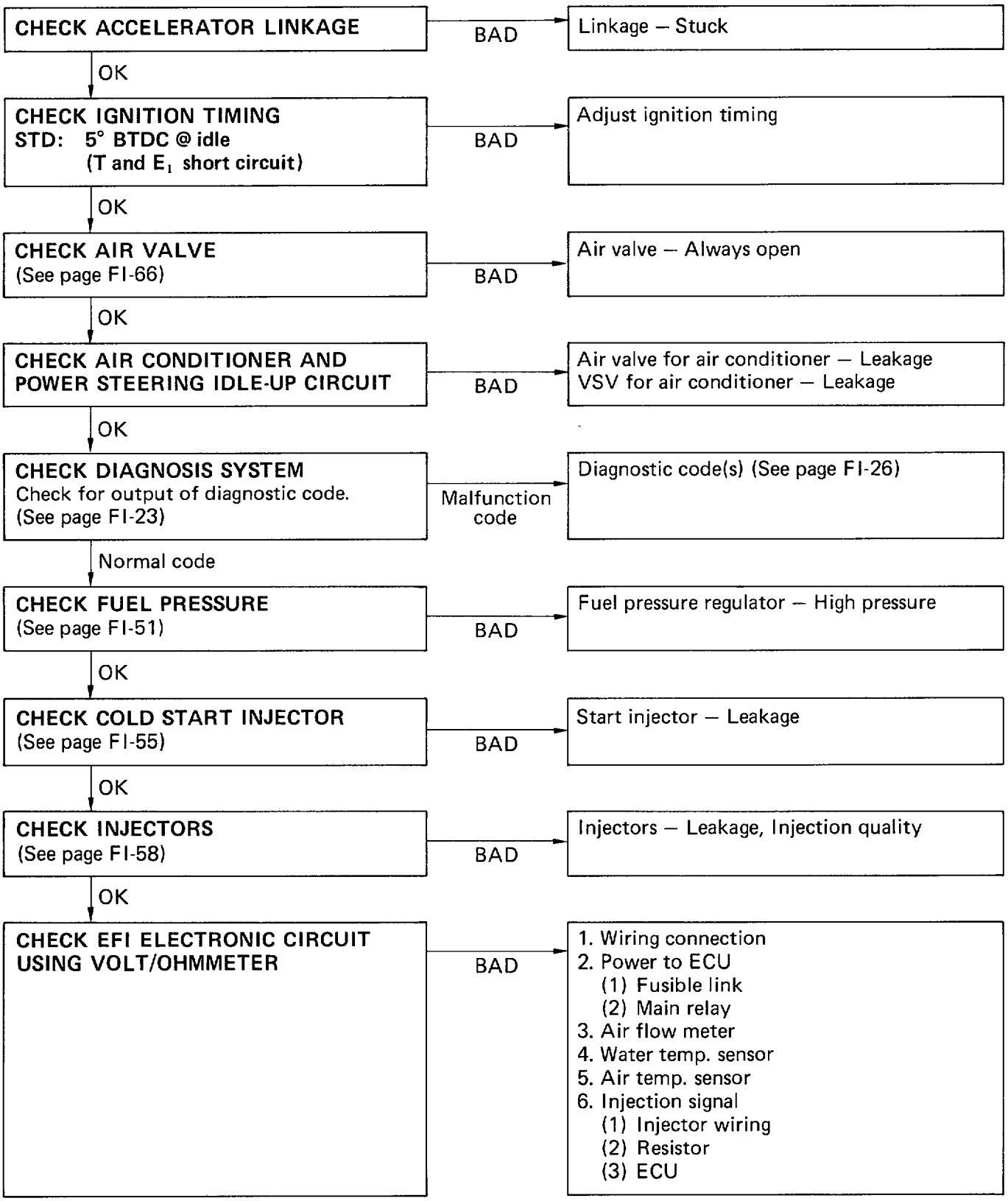
OK CONTINUED FROM PAGE FI-16

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD →

1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Main relay
3. Air flow meter
4. Water temp. sensor
5. Air temp. sensor
6. Throttle position sensor
7. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU
8. Oxygen sensor

SYMPTOM – HIGH ENGINE IDLE SPEED (NO DROP)



SYMPTOM — ENGINE BACKFIRES-Lean Air Fuel Mixture

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

Malfunction code → Diagnostic code(s) (See page FI-26)

Normal code ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE

BAD →
1. Hose connections
2. PCV hoses
3. EGR system – EGR valve stays open

OK ↓

CHECK IGNITION TIMING
STD: 5° BTDC @ idle
(T and E_1 short circuit)

BAD → Adjust ignition timing

OK ↓

CHECK COLD START INJECTOR
(See page FI-55)

BAD →
1. Cold start injector
2. Cold start injector time switch. (See page FI-75)

OK ↓

CHECK FUEL PRESSURE
(See page FI-51)

BAD →
1. Fuel pump (See page FI-50)
2. Fuel filter
3. Fuel pressure regulator (See page FI-57)

OK ↓

CHECK INJECTORS
(See page FI-58)

BAD → Injectors – Clogged

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Main relay
3. Air flow meter
4. Water temp. sensor
5. Air temp. sensor
6. Throttle position sensor
7. Injection signal
   (1) Injection wiring
   (2) Resistor
   (3) ECU
   (4) Fuel cut signal
8. Oxygen sensor

SYMPTOM – MUFFLER EXPLOSION (AFTER FIRE) -Rich Air Fuel Mixture-Misfire

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code.
(See page FI-23)

Malfunction code → Diagnostic code(s) (See page FI-26)

Normal code ↓

CHECK IGNITION TIMING
STD: 5° BTDC @ idle
(T and E_1 short circuit)

BAD → Adjust ignition timing

OK ↓

CHECK COLD START INJECTOR
(See page FI-55)

BAD → 1. Cold start injector
2. Cold start injector time switch
(See page FI-75)

OK ↓

CHECK INJECTORS

BAD → Injectors – Leakage

OK ↓

CHECK SPARK PLUGS AND PLUG CORDS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

BAD → 1. Spark plugs and high-tension cords
2. Compression pressure
Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm

OK ↓

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD → 1. Throttle position sensor
2. Injection signal
(1) Fuel cut signal
(2) Injector wiring
(3) Resistor
(4) ECU
3. Oxygen sensor

SYMPTOM — ENGINE HESITATES AND/OR POOR ACCELERATION

CHECK CLUTCH, BRAKE → BAD → 1. Clutch – Slips 2. Brakes – Drag

OK ↓

CHECK FOR VACUUM LEAKS IN AIR INTAKE LINE → NAD → 1. Hose connections 2. PCV hoses 3. EGR system – EGR valve stays open

OK ↓

CHECK AIR FILTER ELEMENT → BAD → Element – Clean or replace

OK ↓

CHECK DIAGNOSIS SYSTEM
Check for output of diagnostic code. (See page FI-23)
→ Malfunction code → Diagnostic code(s) (See page FI-26)

Normal code ↓

CHECK IGNITION SPARK
1. Unplug connectors of injector resistor and cold start injector time switch.
2. Check by holding high-tension cord 8 – 10 mm (0.31 – 0.39 in.) away from cylinder block while engine cranking. A strong spark should be noted.

→ BAD → 1. High-tension cord 2. Distributor 3. Ignition coil, Igniter

OK ↓

CHECK IGNITION TIMING
STD: 5° BTDC @ idle (T and E_1 short circuit)
→ BAD → Adjust ignition timing

OK ↓

CHECK FUEL PRESSURE
(See page FI-51)
→ BAD → 1. Fuel pump (See page FI-50) 2. Fuel filter 3. Fuel pressure regulator (See page FI-57)

OK CONTINUED ON PAGE FI-22

OK CONTINUED FROM PAGE FI-21

CHECK INJECTORS
(See oage FI-58)

BAD → Injection condition

OK

CHECK SPARK PLUGS
Plug gap: 0.8 mm (0.031 in.)
NOTE:
Check compression pressure if necessary.

BAD →
1. Spark plugs
2. Compression pressure
   Limit: 10.0 kg/cm² (142 psi, 981 kPa) at 250 rpm

OK

CHECK EFI ELECTRONIC CIRCUIT USING VOLT/OHMMETER

BAD →
1. Wiring connection
2. Power to ECU
   (1) Fusible link
   (2) Main relay
3. Air flow meter
4. Water temp. sensor
5. Air temp. sensor
6. Throttle position sensor
7. Injection signal
   (1) Injector wiring
   (2) Resistor
   (3) ECU

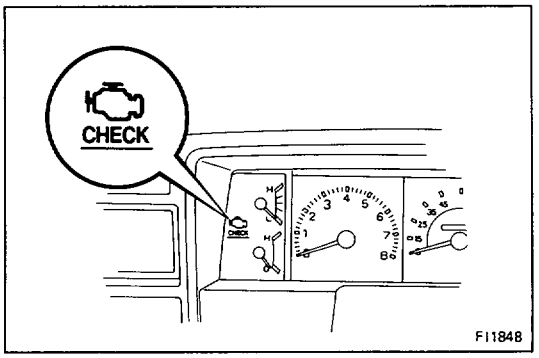
DIAGNOSIS SYSTEM

DESCRIPTION

The ECU contains a built-in self-diagnosis system by which troubles with the engine signal network are detected and a "CHECK ENGINE" warning light on the instrument panel flashes.

By analyzing various signals as shown in the table (page FI-26) the ECU detects system malfunctions which are related to the various operating parameter sensors or to the actuator. The ECU stores the failure code associated with the detected failure until the diagnostic system is cleared by removing the EFI fuse with ignition switch off.

The "CHECK ENGINE" warning light on the instrument panel alerts the driver that a malfunction has been detected. The light goes out automatically when the malfunction has been corrected.



"CHECK ENGINE" LIGHT CHECK

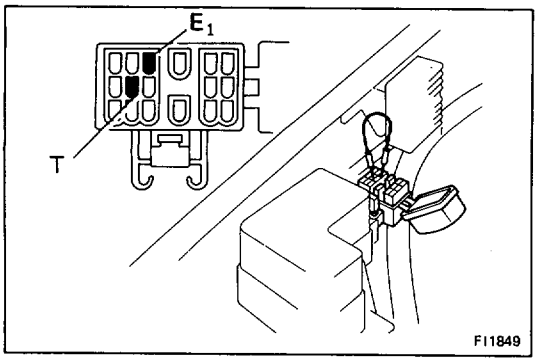
1. The "CHECK ENGINE" warning light will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the "CHECK ENGINE" warning light should go out.

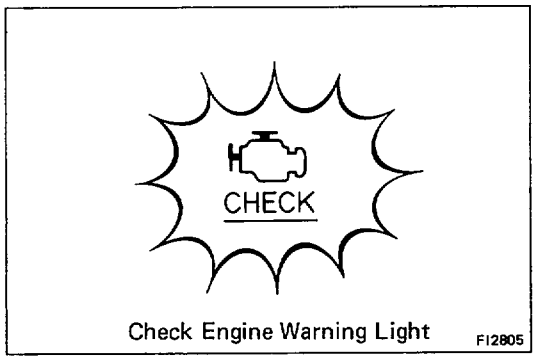
   If the light remains on, the diagnosis system has detected a malfunction in or abnormality in the system.

OUTPUT OF DIAGNOSTIC CODES

To obtain an output of diagnostic codes, proceed as follows:

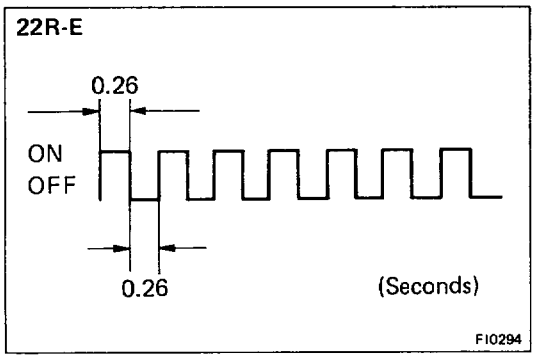
1. Initial conditions
   (a) Battery voltage above 11 volts.
   (b) Throttle valve fully closed (throttle position sensor IDL points closed).
   (c) Transmission in neutral position.
   (d) Accessory switches OFF.
   (e) Engine at normal operating temperature.
2. Turn the ignition switch to ON. Do not start the engine.
3. Using a sub-wire short terminals T and E_1 of the check connector located near the No. 2 relay block.





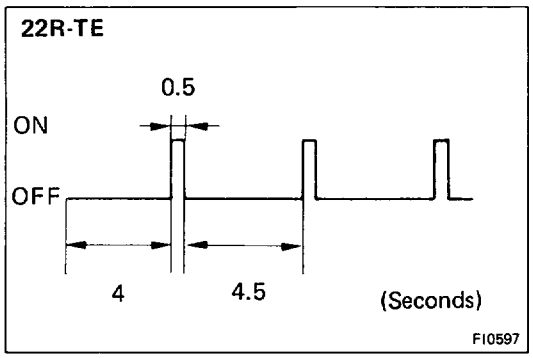
Check Engine Warning Light FI2805

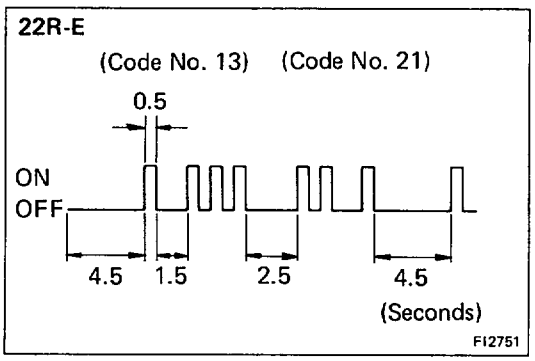
4. Read the diagnostic code as indicated by the number of flashes of the "CHECK ENGINE" warning light.



Diagnostic code (See page FI-26)

(a) Normal System Operation
The light will blink once every 0.26(22R-E), 4.5 (22R-TE) seconds.



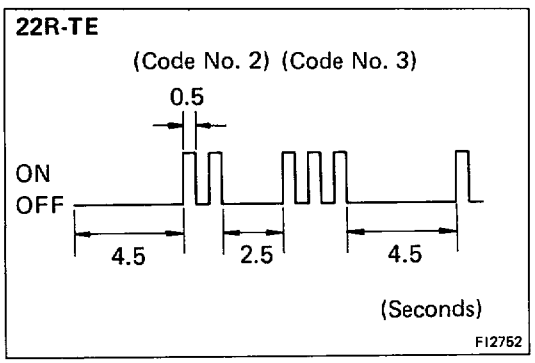


(b) Malfunction Code Indication

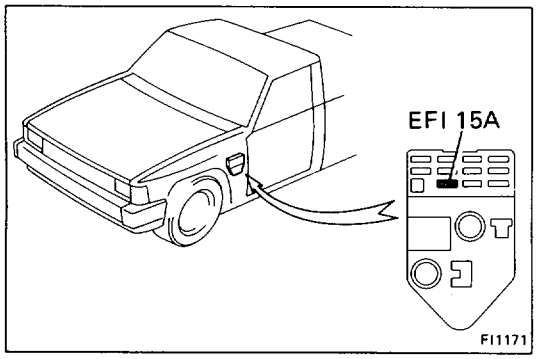
- The light will blink a number of times equal to the malfunction code indication as follows:
  1. Between the first digit and second digit, 1.5 seconds. (22R-E only)
  2. Between code and code, 2.5 seconds.
  3. Between all malfunction codes, 4.5 seconds.

The diagnostic code series will be repeated as long as the check connector terminals T and E_1 are shorted.

NOTE: In event of a number of trouble codes, indication will begin from the small value and continue to the larger in order.



5. After the diagnosis check, remove the sub-wire.



CANCELLING OUT DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the fuse EFI (15A) for 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch off.

   NOTE:

   - Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, etc.) will also be cancelled out.
   - If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in event of future trouble.
   - If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.

2. After cancellation, road test the vehicle, if necessary, confirm that a "normal" code (No. 1) is now read on the "CHECK ENGINE" warning light.

   If the same diagnostic code is still indicated, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

(1) Including "normal", the ECU is programmed with the following 15(22R-E Federal and Canada), 16(22R-E California), 17(22R-E C & C) and 13(22R-TE) diagnostic codes.

(2) When 2 or more codes are indicated, the lowest number (code) will appear first.

(3) All detected diagnostic codes, except 11 and 13, will be retained in memory be the ECU from the time of detection until cancelled out.

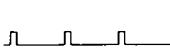
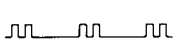
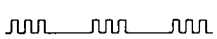
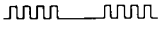
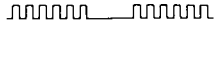
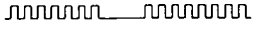
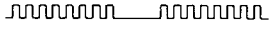
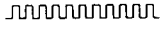
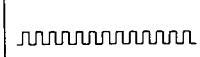
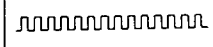
(4) Once the malfunction is cleared, the "CHECK ENGINE" warning light on the instrument panel will go out but the diagnostic code(s) remain stored in ECU memory (except for code 11 and 13).

DIAGNOSTIC CODES (22R-E)

Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area
–	 ON OFF FI1401	Normal	This appears when none of the other codes are identified.	———
12	 FI1389	RPM Signal	NO "Ne" signal to ECV within 2 seconds after engine has been cranked.	• Distributor circuit • Distributor • Igniter circuit • Igniter • Starter signal circuit • ECV
13	 FI1390	RPM Signal	NO "Ne signal to ECU when engine speed is above 1,500 rpm.	• Distributor circuit • Distributor • Igniter circuit • Igniter • ECU
14	 FI1391	Ignition Signal	NO "IGf" signal to ECU 4 – 5 times in succession.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU
21	 FI1400	Oxygen Sensor	• Detection of oxygen sensor detrioration.	• Oxygen sensor circuit • Oxygen sensor • ECU
		Oxygen Sensor Heater	• Open or short circuit in oxygen sensor heater.	• Oxygen sensor heater circuit • Oxygen sensor heater • ECU
22	 FI1392	Water Temp. Sensor Signal	• Open or short circuit in water temp. sensor signal.	• Water temp. sensor circuit • Water temp. sensor • ECU
24	 FI1611	Intake Air Temp. Sensor Signal	• Open or short circuit in intake air temp. sensor signal.	• Intake air temp. sensor circuit • Intake air temp. sensor • ECU
25	 FI2562	Air-fuel Ratio Lean Malfunction	• When oxygen sensor signal continues at the upper (rich) or lower (lean) limit for a certain period of time during feedback condition. • When air-fuel ratio feedback compensation value or adaptive control value continues at the upper (lean) or lower (rich) limit renewed for a certain period of time.	• Injector circuit • Injector • Fuel line pressure • Oxygen sensor circuit • Oxygen sensor • Air flow meter • Air intake system • ECU
26	 FI2563	Air-fuel Ratio Rich Malfunction		• Injector circuit • Injector • Fuel line pressure • Air-flow meter • Cold start injector • ECU

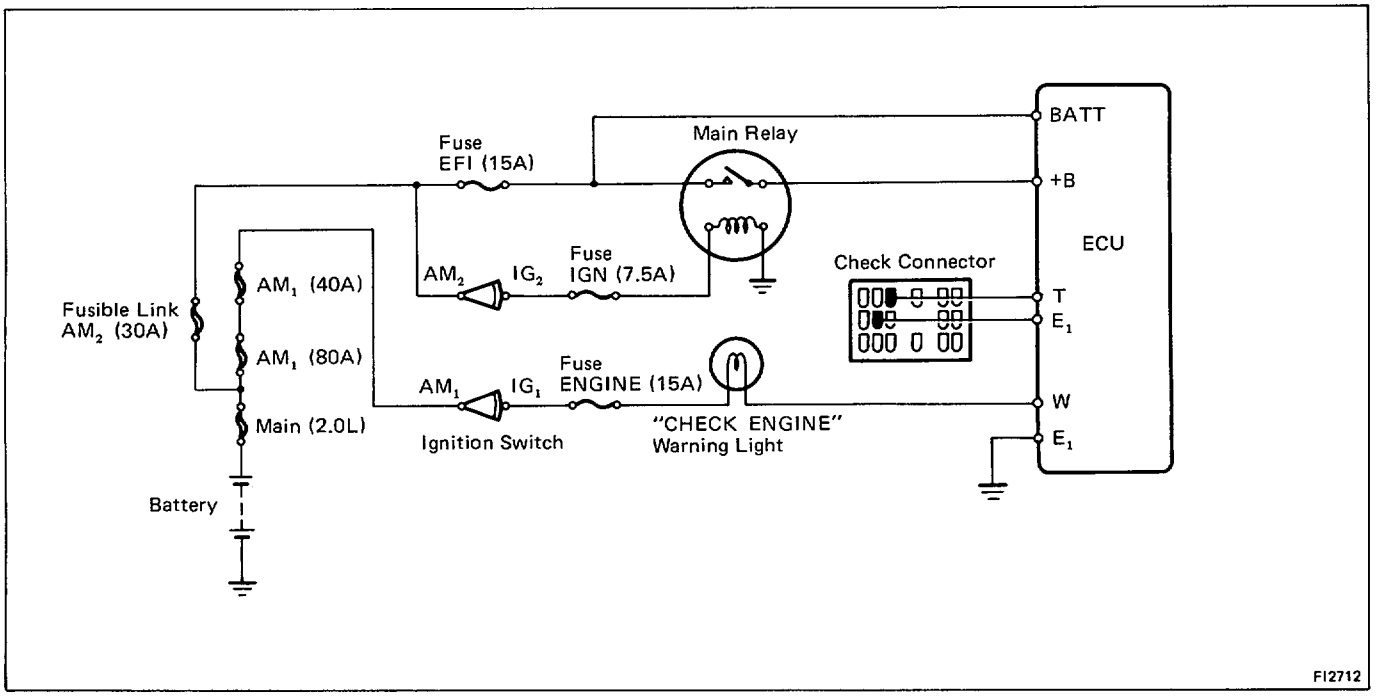
Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area
31	 FI1394	Air flow. Meter Signal	• Short circuit between VC and VB, VC and E_2, or VS and VC. • Open circuit between VC and E_2.	• Air flow meter circuit • Air flow meter
35		HAC Sensor Signal	• Open circuit in HAC sensor signal	• HAC sensor circuit • HAC sensor • ECU
41	 FI1396	Throttle Position Sensor Signal	• Open or short circuit in throttle position sensor signal.	• Throttle position sensor circuit • Throttle position sensor
42	 FI1397	Vehicle Speed Sensor Signal	• NO "SPD" signal for 5 seconds when engine speed is above 2,500 rpm.	• Vehicle speed sensor circuit • Vehicle speed sensor • ECU
43	 FI1398	Starter Signal	• NO "STA" signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	• IG switch circuit • IG switch • ECU
52	 FI1618	Knock Sensor Signal	• Open or short circuit in knock sensor signal.	• Knock sensor circuit • Knock sensor • ECU
53	 FI1619	Knock Control Signal in ECU	• Knock control in ECU faulty.	• ECU
71	 FI2622	EGR System Malfunction	• EGR gas temp. below pre-determined level during EGR operation.	• EGR valve • EGR hose • EGR gas temp. sensor circuit • EGR gas temp. sensor • VSV for EGR circuit • ECU
51	 FI1399	Switch Signal	• No "IDL" signal or No "NSW" signal or "A/C" signal to ECU, with the check terminals E_1 and T shorted.	• A/C switch circuit • A/C switch • A/C Amplifire • Throttle position sensor circuit • Throttle position sensor • (A/T) Neutral start switch circuit • (A/T) Neutral start switch • ECU

(22R-TE)

Code No.	Number of blinks "CHECK ENGINE"	System	Diagnosis	Trouble area
1	 ON OFF	Normal	This appears when none of the other codes are identified.	———
2		Air flow. Meter Signal	• Short circuit between VC and VB, VC and E_2, or VS and VC. • Open circuit between VC and E_2.	• Air flow meter circuit • Air flow meter
3		Ignition Signal	NO "IGf" signal to ECU 4–5 times in succession.	• Igniter and ignition coil circuit • Igniter and ignition coil • ECU
4		Water Temp. Sensor Signal	• Open or short circuit in water temp. sensor signal.	• Water temp. sensor circuit • Water temp. sensor • ECU
5		Oxygen Sensor	• Open or short circuit in oxygen sensor	• Oxygen sensor circuit • Oxygen sensor • ECU
6		RPM Signal	NO "Ne signal to ECU when engine speed is above 1,500 rpm.	• Distributor circuit • Distributor • Igniter circuit • Igniter • ECU
7		Throttle Position Sensor Signal	• Open or short circuit in throttle position sensor signal.	• Throttle position sensor circuit • Throttle position sensor
8		Intake Air Temp. Sensor Signal	• Open or short circuit in intake air temp. sensor signal.	• Intake air temp. sensor circuit • Intake air temp. sensor ECU
10		Starter Signal	• NO "STA" signal to ECU until engine speed reaches 800 rpm with vehicle not moving.	• IG switch circuit • IG switch • ECU
11		Switch Signal	• Air conditioner switch ON, neutral start switch OFF, idle switch OFF during diagnosis check.	• A/C switch circuit • A/C switch • A/C Amplifire • Throttle position sensor circuit • Throttle position sensor • ECU
12		Knock Sensor Signal	• Open or short circuit in knock sensor signal.	• Knock sensor circuit • Knock sensor • ECU
13		Knock Control Signal	• Knock control ECU faulty.	• ECU
14		Turbocharger Pressure	• When the fuel cut-off due to high boost is occured.	• Turbocharger • Air flow meter circuit • Air flow meter • ECU

FI1060 FI1061

INSPECTION OF DIAGNOSIS CIRCUIT



1. Does CHECK ENG. light come on when ignition switch is at ON?
   - YES → System Normal
   - NO → Does CHECK ENG. light come on when ECU terminal W is grounded to the body?
     - YES → Check wiring between ECU terminal E_1 and body ground.
       - OK → Try another ECU.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECU and ignition switch.
       - BAD → Repair or replace.

2. Does CHECK ENG. light go OFF when engine is started?
   - YES → System Normal
   - NO → Check wiring between ECU and CHECK ENG. light.
     - BAD → Repair
     - OK → Is there diagnosis code output when check connector T and E_1 is short circuited?
       - NO → Try another ECU.
       - YES → Does CHECK ENG. light go out after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK
           - NO → Cancel out diagnostic code.

TROUBLESHOOTING WITH VOLT/OHMMETER

PREPARATION FOR TROUBLESHOOTING

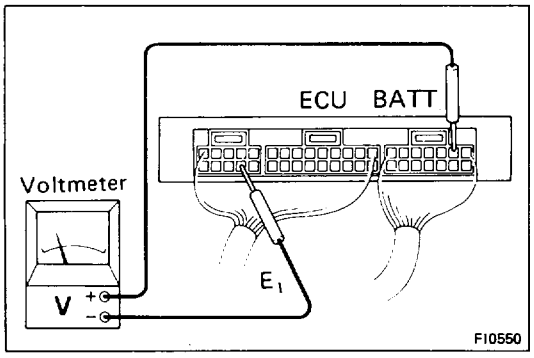
1. Remove the right kick panel.
2. Remove the ECU with the wire harness.

EFI SYSTEM CHECK PROCEDURE

NOTE:
- The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.
- Perform all voltage measurement with the connectors connected.
- Verify that the battery voltage is 11V or above when the ignition switch is ON.

Using a voltmeter with high impedance (10 kΩ/V minimum) measure the voltage at each terminal of the wiring connector.

NOTE: If there is any problems, see TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMETER.



*1 C&C (2WD A/T) only
*2 4WD A/T only
*3 A/T only

Connectors of ECU

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	Ox	OXYGEN SENSOR
E_{02}	ENGINE GROUND	V_F	CHECK CONNECTOR
No. 10	INJECTOR	Vcc	THROTTLE POSITION SENSOR
No. 20	INJECTOR	KNK	KNOCK SENSOR
STA	STARTER SWITCH	VTA	THROTTLE POSITION SENSOR
IGt	IGNITER	Ne	DISTRIBUTOR
STJ	COLD START INJECTOR	THW	WATER TEMP. SENSOR
E_1	ENGINE GROUND	*2 L_3	ECT COMPUTER
NSW	NEUTRAL START SWITCH	*3 ECT	ECT COMPUTER
Fpu	FUEL PRESSURE UP VSV	*2 L_1	ECT COMPUTER
ACV	A/C IDLE UP VSV	*2 L_2	ECT COMPUTER
W	CHECK ENGINE WARNING LIGHT	Vc	AIR FLOW METER
AS	AS VSV	E_{21}	SENSOR GROUND
TIL	TURBO INDICATOR LIGHT	Vs	AIR FLOW METER
T	CHECK CONNECTOR	4WD	4WD SWITCH
*1 HAC	ALTITUDE COMPENSATION SWITCH	THA	AIR TEMP. SENSOR
IDL	THROTTLE SENSOR	SPD	SPEED SENSOR
HT	OXYGEN SENSOR HEATER	BATT	BATTERY +B
IGf	IGNITER	B/K	STOP LIGHT SWITCH
E_2	SENSOR GROUND	$+B_1$	MAIN RELAY
THG	EGR GAS TEMP. SENSOR	+B	MAIN RELAY

22R-E

E_{01}	No.10	STA	STJ	NSW	Fpu	W	T	IDL	IGf	THG	V_F	KNK	Ne	L_3	L_1	Vc	Vs	THA	BATT	$+B_1$
E_{02}	No.20	IGt	E_1		ACV	AS	HAC	HT	E_2	Ox	Vcc	VTA	THW	ECT	L_2	E_{21}	4WD	SPD	B/K	+B

22R-TE

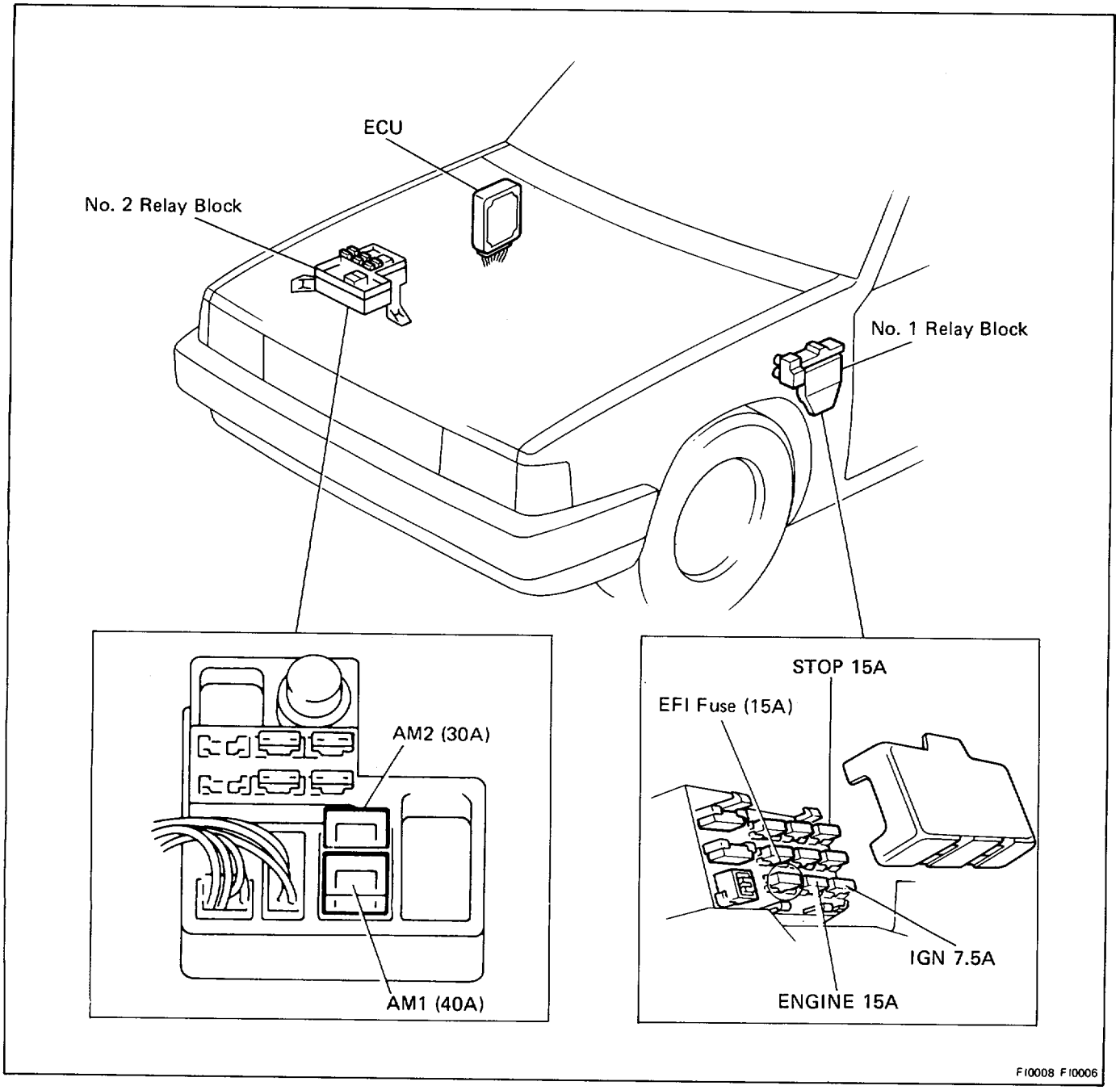
E_{01}	No.10	STA	V_F			W	T	IDL	IGf			KNK	Ne			Vc	Vs	THA	BATT	$+B_1$
E_{02}	No.20	IGt	E_1			TIL			E_2	Ox	Vcc	VTA	THW					SPD		+B

TROUBLESHOOTING FOR EFI ELECTRONIC CIRCUIT WITH VOLT/OHMMETER

NOTE: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat.
However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described.
For example, it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.

The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit in a component outside the computer or a short circuit within the computer.
If engine trouble occurs even though proper operating voltage is detected in the computer connector, then the ECU is faulty and should be replaced.

LOCATION OF FUSES AND FUSIBLE LINKS

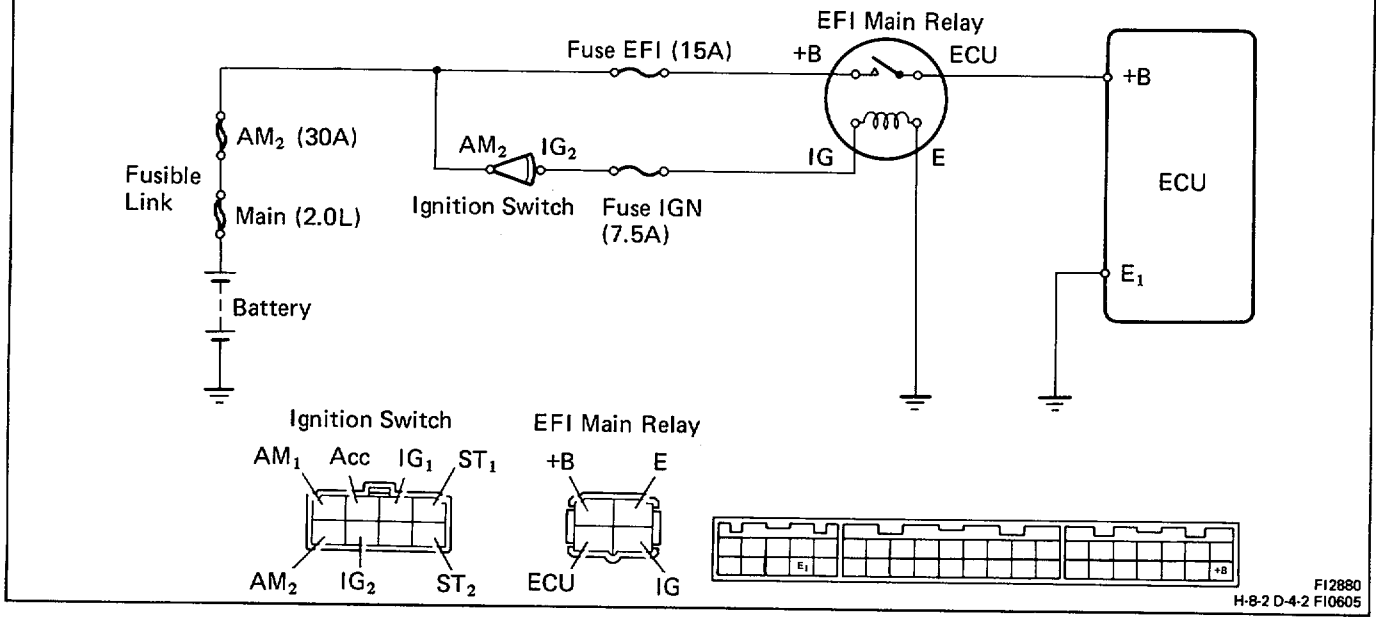


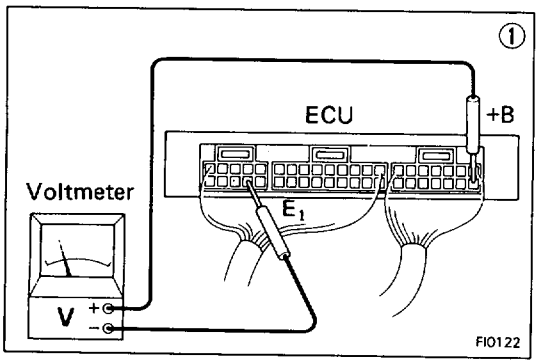
VOLTAGE AT ECU WIRING CONNECTORS

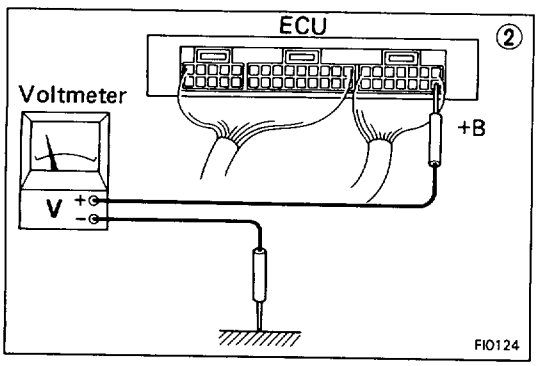
No.	Terminals	Condition		STD Voltage	See page
1	+B – E_1	Ignition switch ON		10 – 14	FI-33
2	BATT – E_1	–		10 – 14	FI-34
3	IDL – E_2	Ignition switch ON	Throttle valve open	8 – 14	FI-35
	Vcc – E_2		–	4 – 6	FI-36
	VTA – E_2		Throttle valve fully closed	0.1 – 1.0	
			Throttle valve fully open	4 – 5	
4	IGt – E_1	Idling		0.7 – 1.0	FI-37
5	STA – E_1	Ignition switch ST position		6 – 12	FI-38
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	FI-39
7	W – E_1	No trouble (CHECK ENGINE light off) and engine running		8 – 14	FI-40
8	Vc – E_2	Ignition switch ON	–	6 – 10	FI-41
	Vs – E_2		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 10	
		Idling		2 – 8	
9	THA – E_2	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3	FI-42
10	THW – E_2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0	FI-43
11	B/K – E_1	Stop light switch ON		8 – 14	FI-44
12	*1 HAC – E_2	Ignition switch ON	760 mmHg (29.92 in.Hg, 101.3 kPa)	Approx. 3.6	FI-45
13	*2 STJ – E_1	Ignition switch ST position	Coolant temperature 80°C (176°F)	6 – 12	FI-46

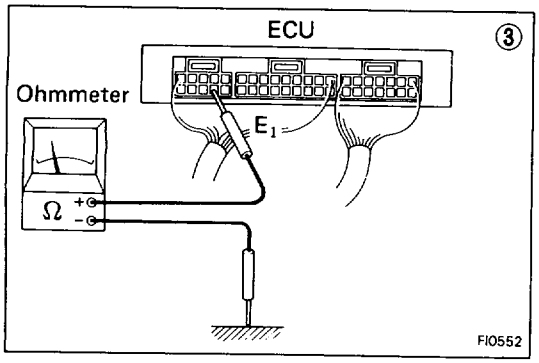
*1 C & C only
*2 22R-E only

No.	Terminals	Trouble	Condition	STD Voltage
1	+B – E_1	No voltage	IG S/W ON	10 – 14 V









① No voltage between ECU terminals +B and E_1. **(IG S/W ON)**

② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

NO

OK

③ Check wiring between ECU terminal E_1 and body ground.

OK

Try another ECU.

BAD

Repair or replace

Check fuse, fusible link and ignition switch.

BAD

Repair or replace

OK

Check EFI main relay.

BAD

Replace

OK

Check wiring between EFI main relay and battery.

BAD

Repair or replace

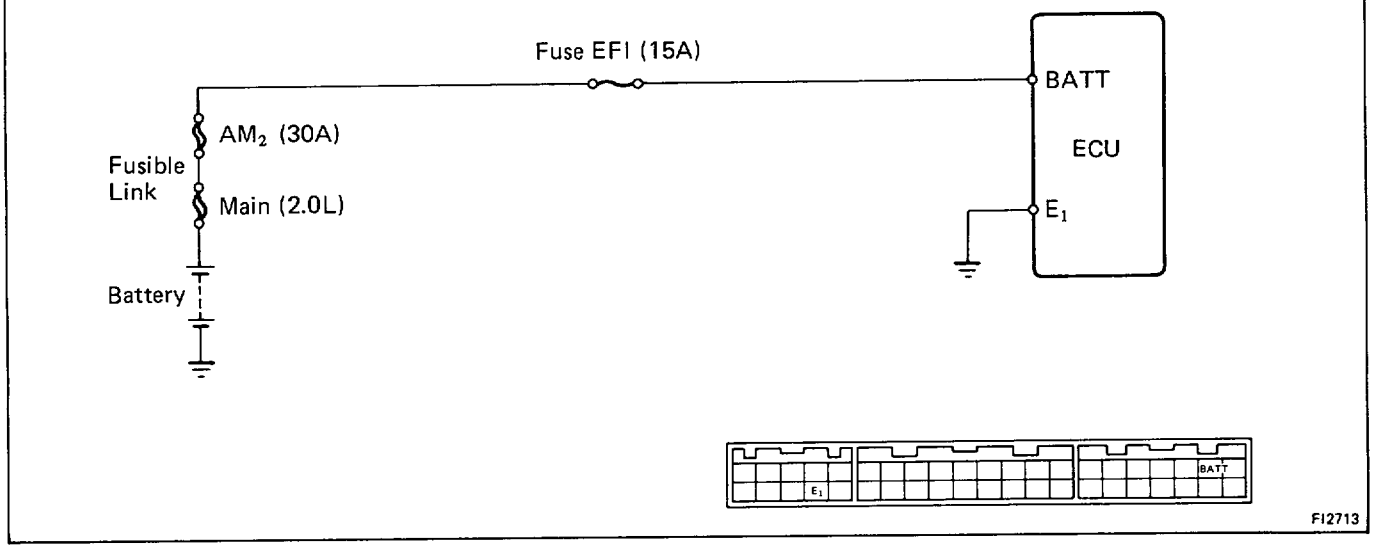
OK

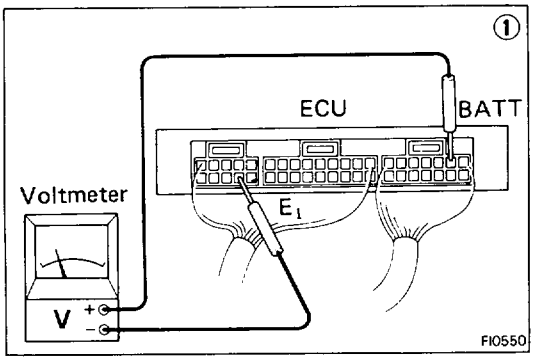
Check wiring between EFI main relay and ECU terminal +B.

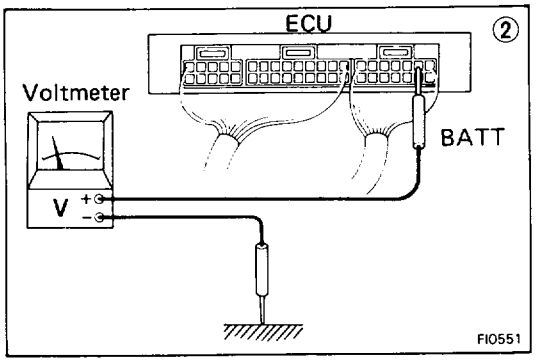
BAD

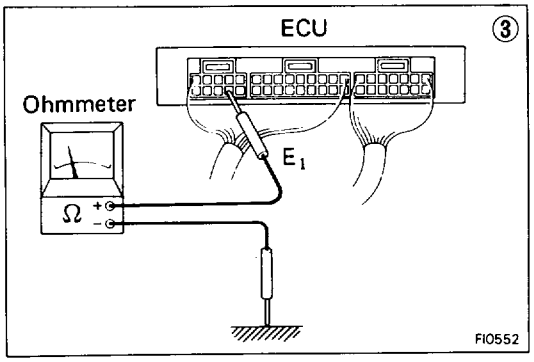
Repair or replace

No.	Terminals	Trouble	Condition	STD Voltage
2	BATT – E_1	No voltage	—	10 – 14 V









① No voltage between ECU terminals BATT and E_1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO

OK

③ Check wiring between ECU terminal E_1 and body ground.

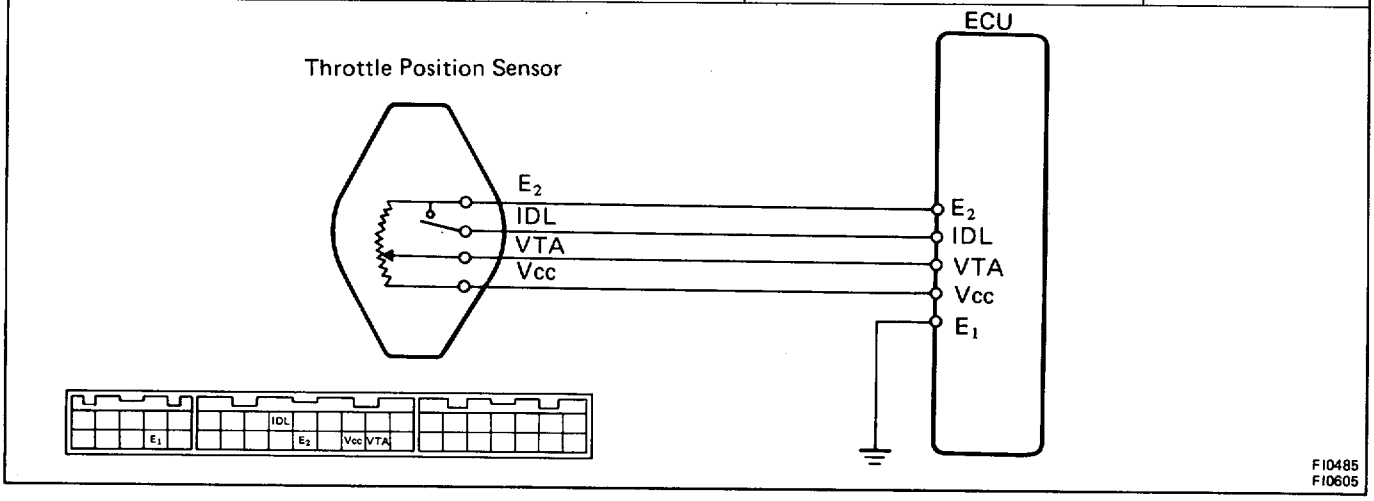
OK → Try another ECU.

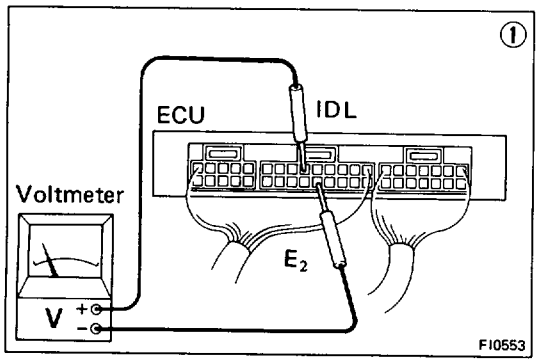
BAD → Repair or replace

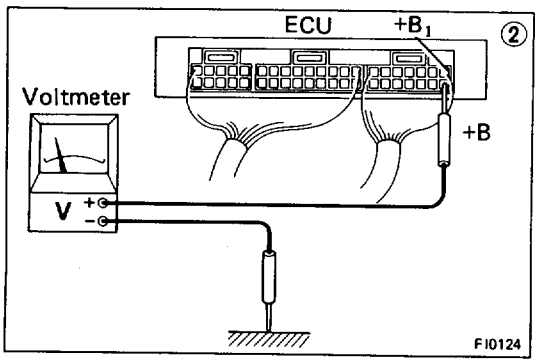
Check fuse and fusible link. — BAD → Replace

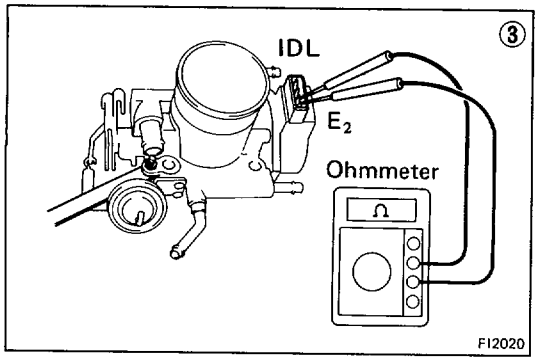
Check wiring between fuse and ECU. — BAD → Repair or replace

No.	Terminals	Trouble	Condition		STD Voltage
3	IDL – E_2	No voltage	Ignition switch ON	Throttle valve open	8 – 14 V
	Vcc – E_2			–	4 – 6 V
	VTA – E_2			Throttle valve fully closed	0.1 – 1.0 V
				Throttle valve fully open	4 – 5 V







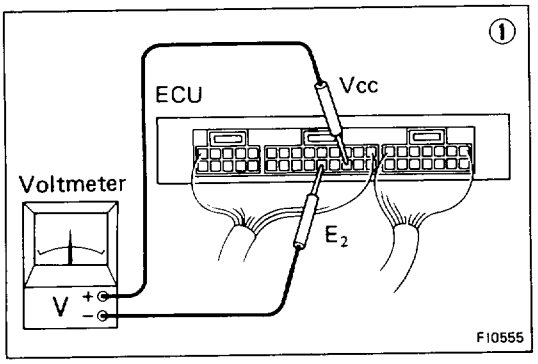


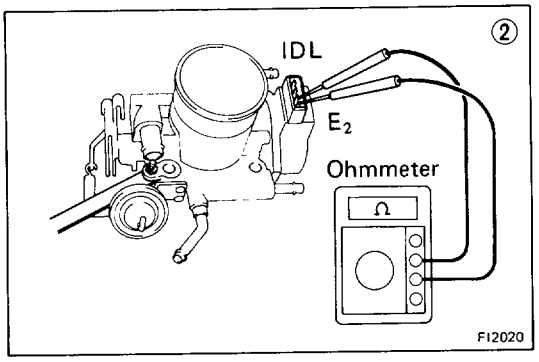
• IDL – E_2

① There is no voltage between ECU terminals IDL and E_2. **(IG S/W ON)** (Throttle valve open)

② Check that there is voltage between ECU terminal $+B_1$ or +B and body ground. **(IG S/W ON)**

- NO → Refer to No. 1
  - BAD → Replace or repair.
  - OK → ③ Check throttle position sensor.
    - BAD → Replace or repair throttle position sensor.
    - OK → Check wiring between ECU and throttle position sensor.
      - BAD → Replace or repair.
      - OK → Try another ECU.
- OK → Check wiring between ECU terminals E_1 and body ground.
  - OK → ③ Check throttle position sensor.
  - BAD → Replace or repair.





• $Vcc \leftrightarrow E_2$

① There is no voltage between ECU terminals Vcc and E_2. **(IG S/W ON)**

↓

Check that there is voltage between ECU terminal $+B_1$ or $+B$ and E_1. **(IG S/W ON)**

↓ OK — NO → Refer to No. 1.

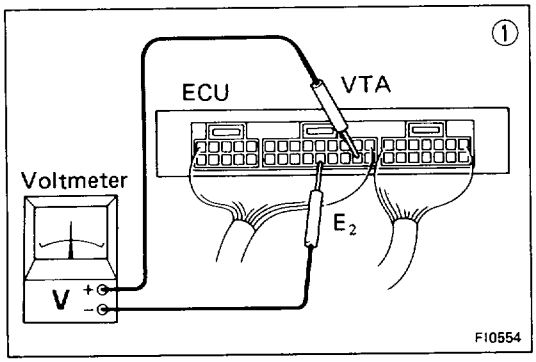
② Check throttle position sensor.

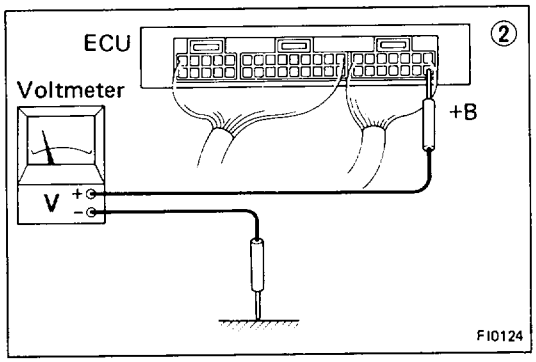
↓ BAD — Repair or replace.

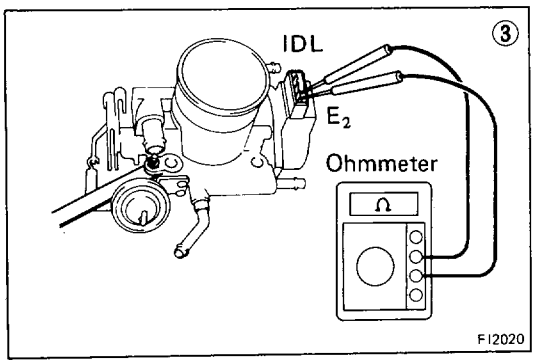
↓ OK — Check wiring between ECU and throttle position sensor.

↓ OK — Try another ECU.

↓ BAD — Repair or replace wiring.







• $VTA \leftrightarrow E_2$

① There is no specified voltage at ECU terminals VTA and E_2. **(IG S/W ON)**

↓

② Check that there is voltage between ECU terminals Vcc and E_2. **(IG S/W ON)**

↓ OK — NO → Perform inspection of Vcc ↔ E_2

③ Check throttle position sensor.

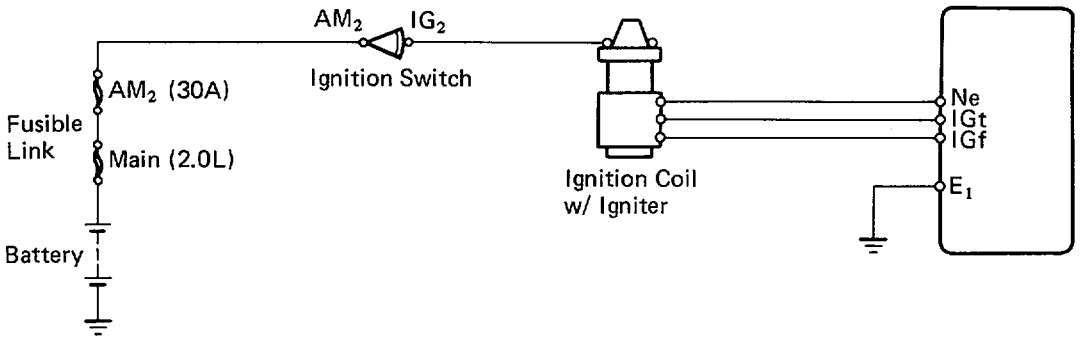
↓ BAD → Repair or replace.

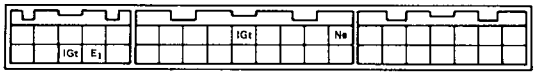
↓ OK — Check wiring between ECU and throttle position sensor.

↓ BAD → Repair or replace.

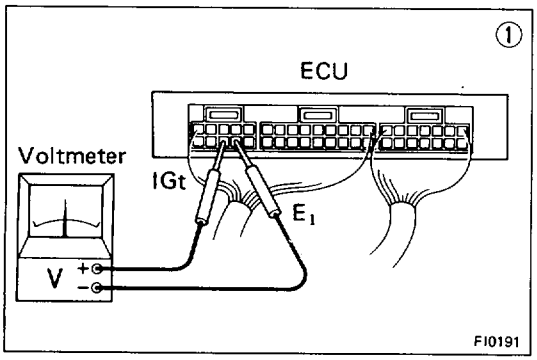
↓ OK — Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
4	IGt – E_1	No voltage	Idling	0.7 – 1.0 V

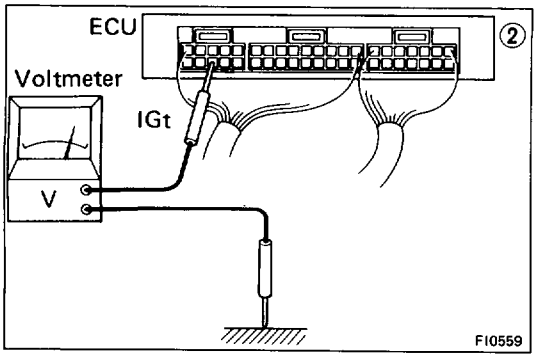




FI2720
FI0605



FI0191



FI0559

① There is no voltage between ECU terminals IGt and E_1. (Idling)

↓

② Check that there is voltage between ECU terminal IGt and body ground. (Idling)

↓ OK

Check wiring between ECU terminal E_1 and body ground.

↓ BAD

Repair or replace.

② → Refer to No. 1. → BAD → Repair or replace.

↓ OK

Check wiring between igniter and distributor. → BAD → Repair or replace.

↓ OK

Check distributor. → BAD → Replace.

↓ OK

Check wiring between ECU and igniter. → BAD → Repair or replace.

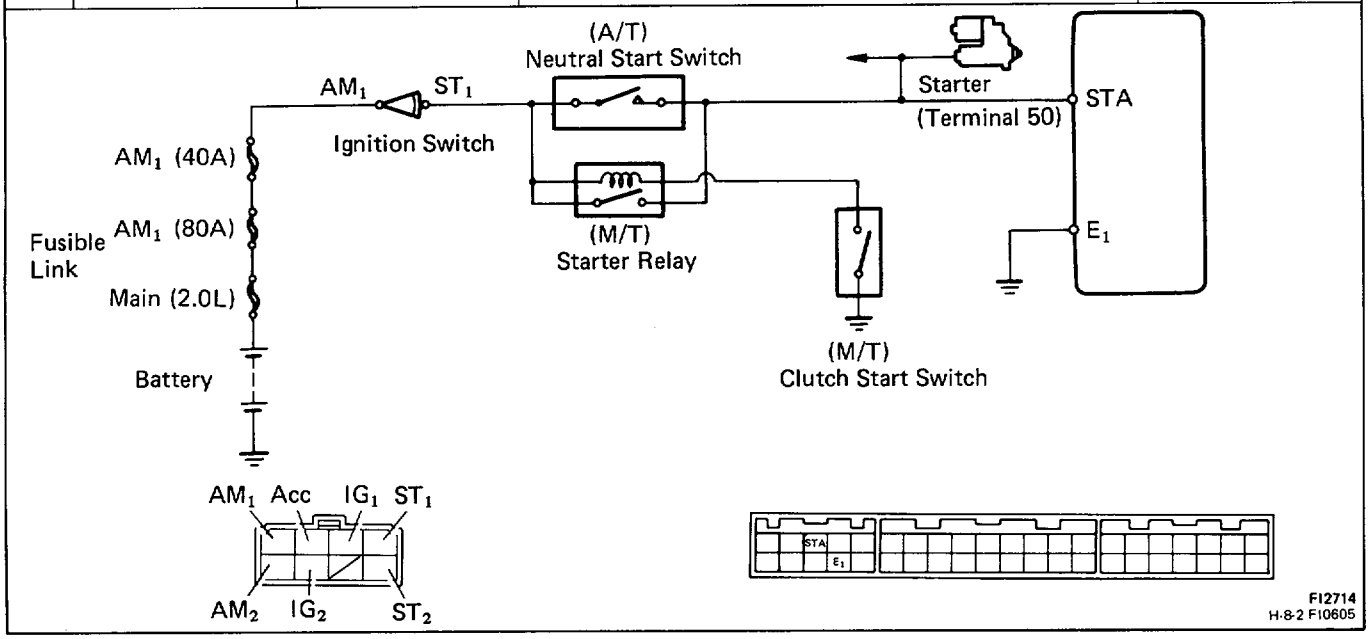
↓ OK

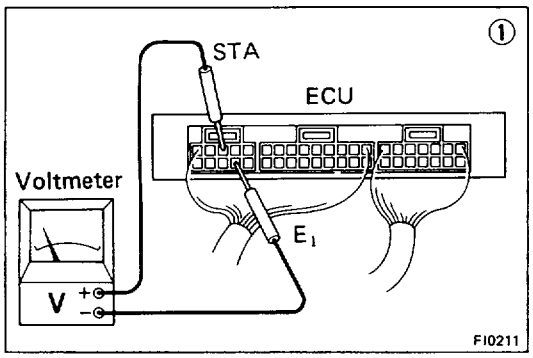
Check igniter. → BAD → Repair or replace.

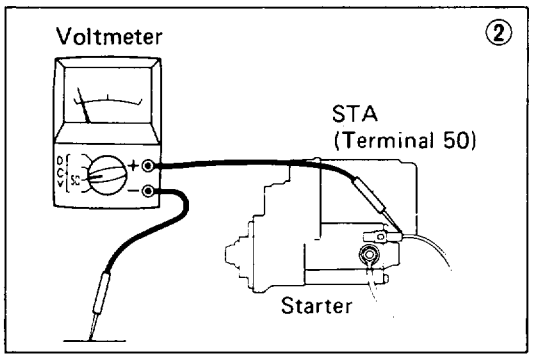
↓ OK

Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E_1	No voltage	Ignition switch ST position	6 – 12 V



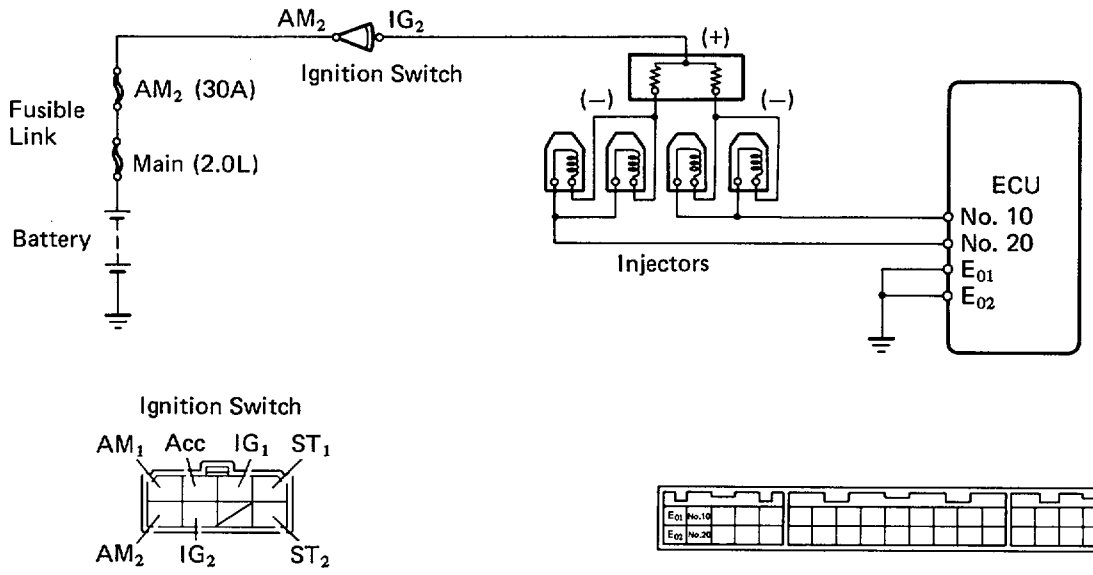


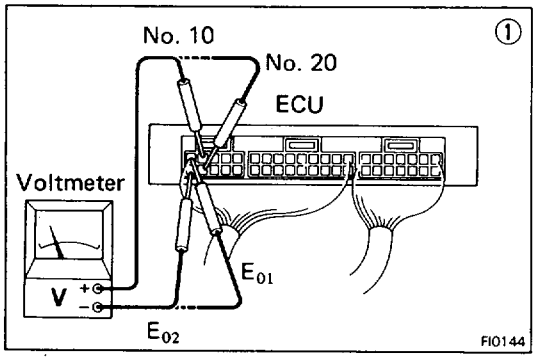


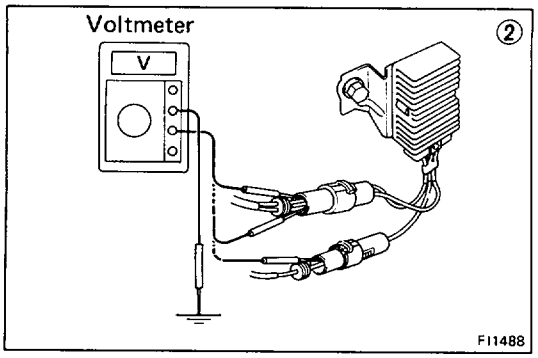
① No voltage between ECU terminals STA and E_1. **(IG S/W ST)**

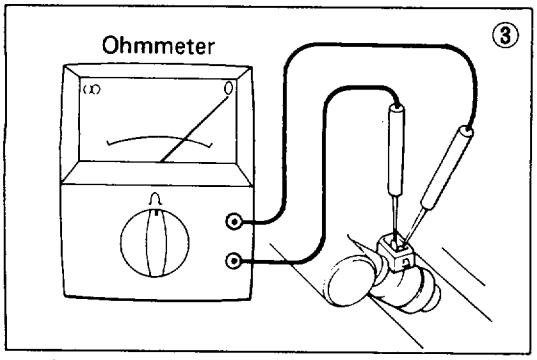
Check starter operation.
- OK → Check wiring between ECU and ignition switch terminal ST.
  - OK → Check wiring between ECU terminal E_1 and body ground.
    - OK → Try another ECU.
    - BAD → Repair or replace
  - BAD → Repair or replace
- BAD → Check fusible link, battery, wiring and ignition switch.
  - BAD → Repair or replace
  - OK → ② Check that there is voltage at STA (50) terminal of starter. **(IG S/W ST) STD voltage: 6 – 12 V**
    - OK → Check starter. (See page ST-3)
    - NO → Check wiring between ignition switch ST terminal and starter STA (50) terminal.

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E_{01} No. 20 – E_{02}	No voltage	Ignition switch ON	9 – 14 V









① No voltage between ECU terminals No. 10 and/or No. 20 and E_{01} and E_{01} or E_{02}. **(IG S/W ON)**

② Check that there is specified voltage between resistor terminal (+) and body ground. **STD voltage: 9 – 14 V**

OK → ② Check that there is specified voltage between resistor terminal (–) and body ground. **STD voltage: 9 – 14 V**

NO → Check fuse, fusible link and ignition switch. BAD → Repair or replace

OK → Check wiring between solenoid resistor and battery. BAD → Repair or replace

② OK → ③ Check resistance of magnetic coil in each injector. **STD resistance: 1.5 – 3.0 Ω**

② NO → Replace resistor.

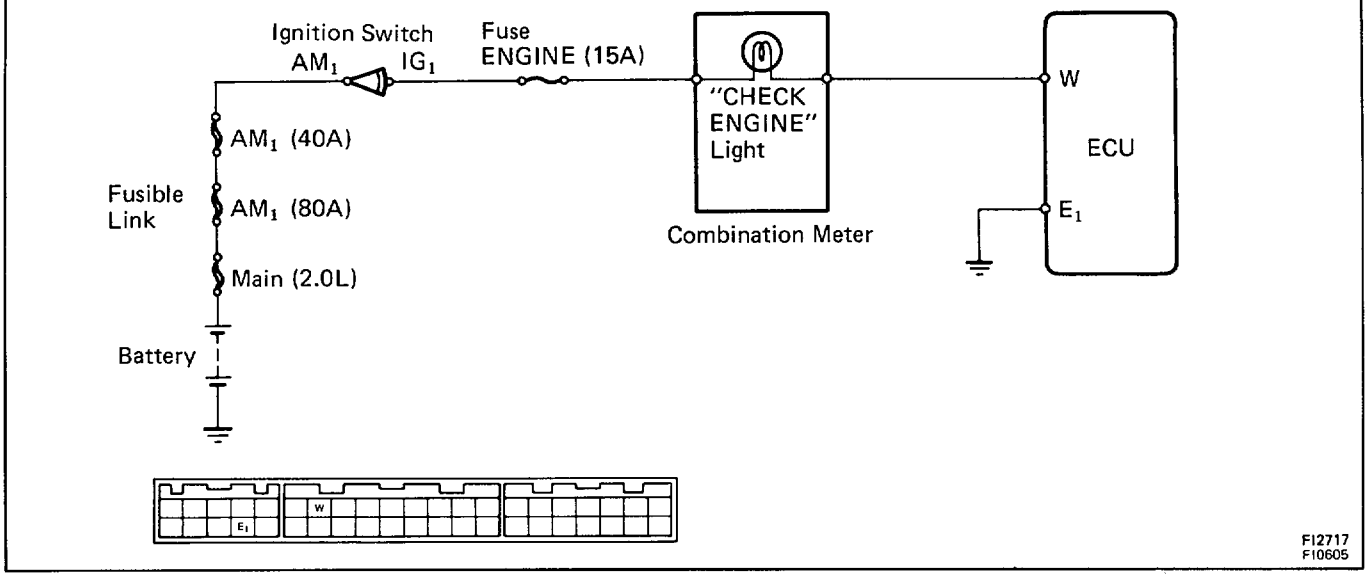
③ OK → Check wiring between ECU and resistor. BAD → Replace injector.

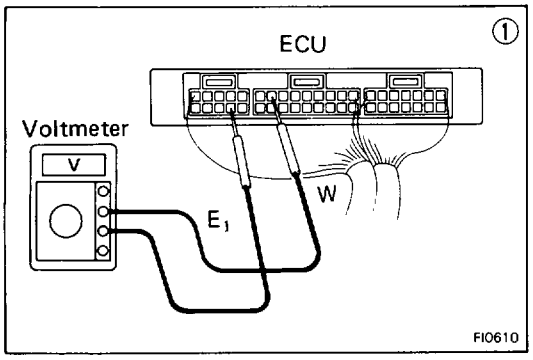
③ BAD → Replace injector.

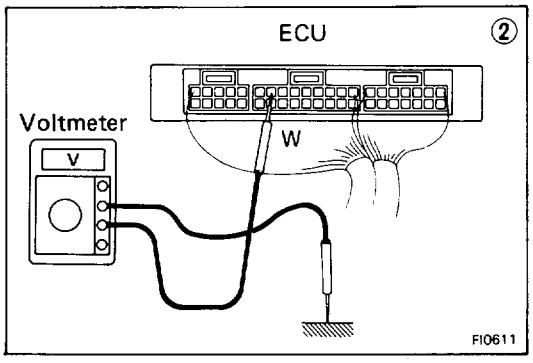
OK → Check wiring between E_{01} and body ground. BAD → Repair or replace.

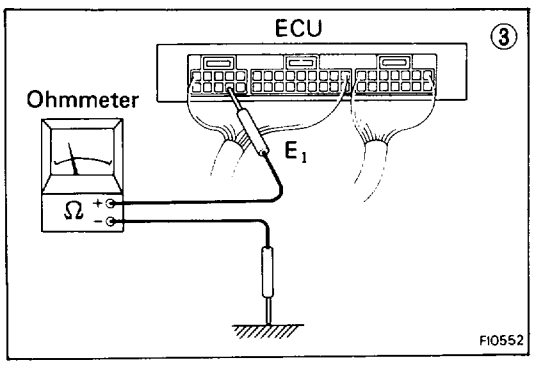
OK → Try another ECU.

No.	Terminals	Trouble	Condition	STD Voltage
7	W – E_1	No voltage	No trouble (CHECK ENGINE light off) and engine running	8 – 14 V









① No voltage between ECU terminal W and E_1. **(Idling)**

↓

② Check that there is voltage between ECU terminal W and body ground.

NO → ↓ OK

↓

③ Check wiring between ECU terminal E_1 and body ground.

OK → Try another ECU.

BAD → Repair or replace

↓

Check ENGINE fuse (15A) and Check Engine light.

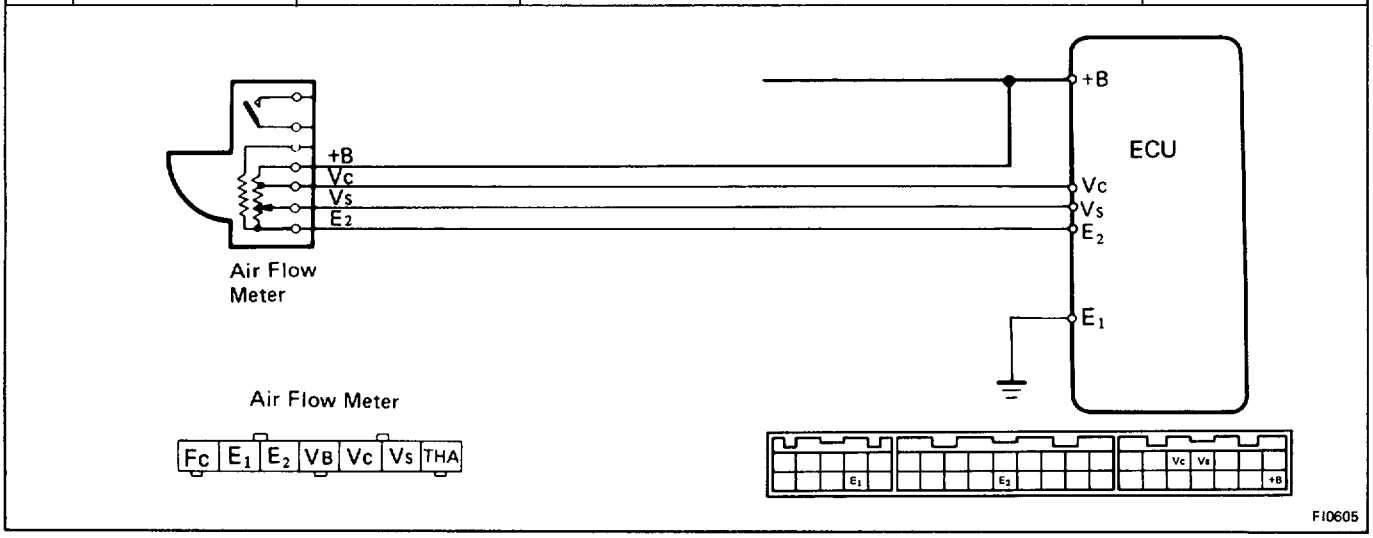
BAD → Repair or replace

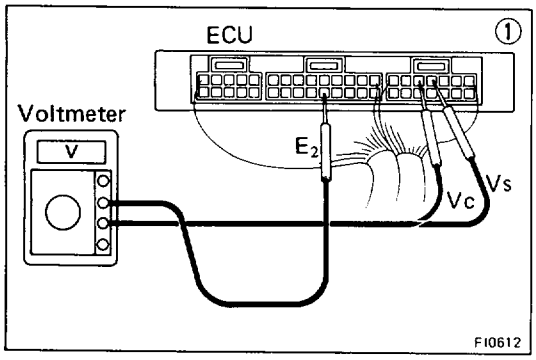
↓ OK

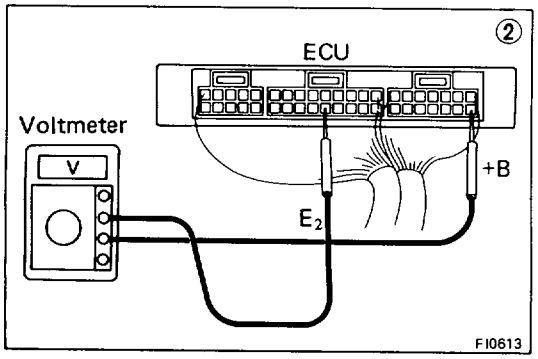
Check wiring between ECU terminal W and fuse.

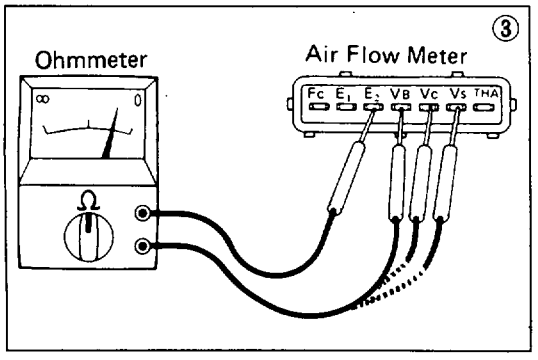
BAD → Repair or replace

No.	Terminals	Trouble	Condition		STD Voltage
8	Vc – E_2	No voltage	Ignition switch ON	–	6 – 10 V
	Vs – E_2			Measuring plate fully closed	0.5 – 2.5 V
	Vs – E_2			Measuring plate fully open	5 – 10 V
	Vs – E_2		Idling		2 – 8 V









- **Vc – E_2, Vs – E_2**

① No specified voltage at ECU terminals Vc or Vs and E_2. **(IG S/W ON)**

↓

② Check that there is voltage between ECU terminals +B and E_2. **(IG S/W ON)**

OK ↓ / NO → Refer to section 1.

③ Check air flow meter.

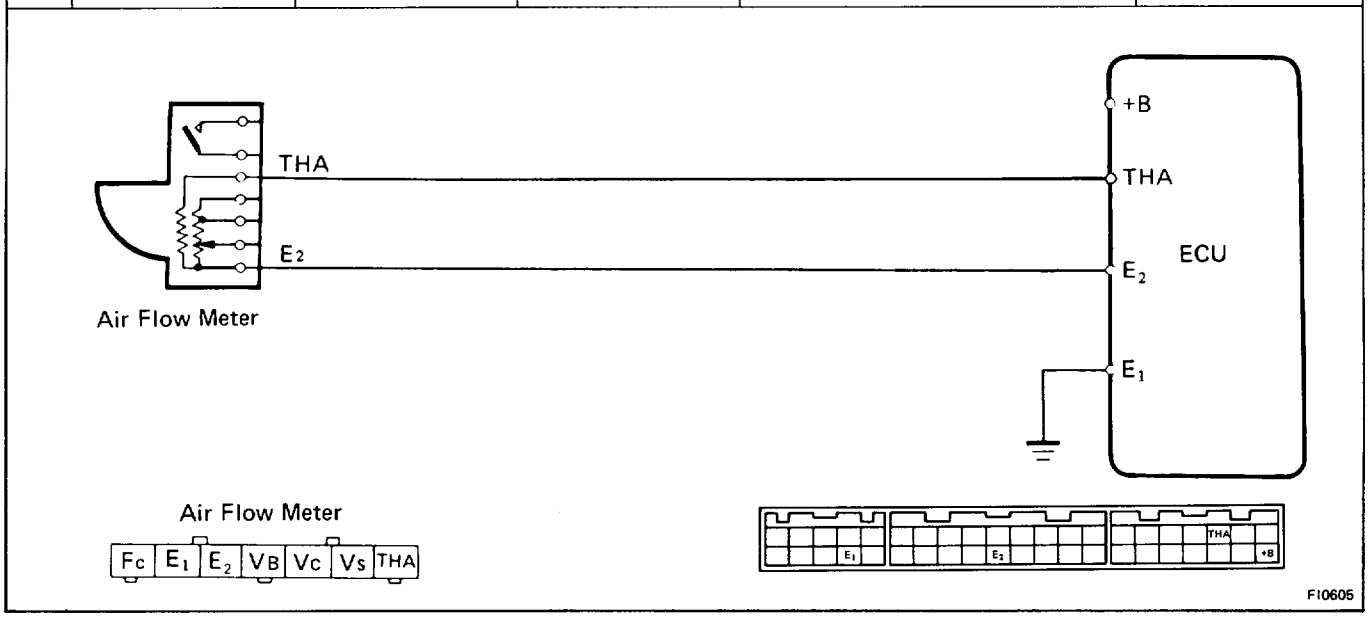
NO ↓ Replace or repair air flow meter.

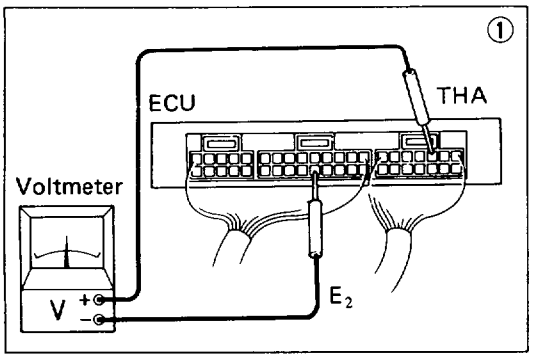
OK ↓ Check wiring between ECU and air flow meter.

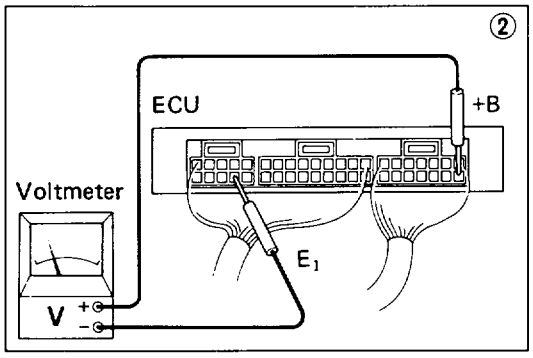
OK ↓ Try another ECU.

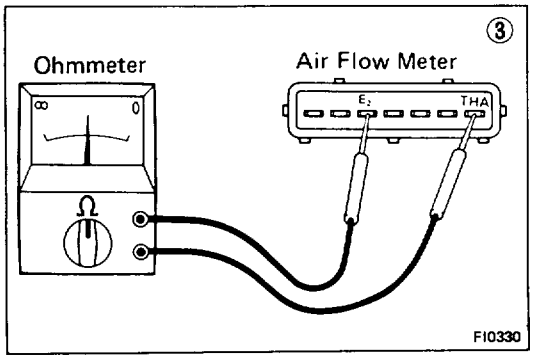
NO → Replace or repair wiring.

No.	Terminals	Trouble	Condition		STD Voltage
9	THA – E_2	No voltage	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3 V









① No voltage between ECU terminals THA and E_2. **(IG S/W ON)**

② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

OK → ③ Check air temp. sensor.

NO → Refer to No. 1

Check wiring between ECU terminal E_1 and body ground.

OK → ③ Check air temp. sensor.

BAD → Replace or repair.

③ Check air temp. sensor.

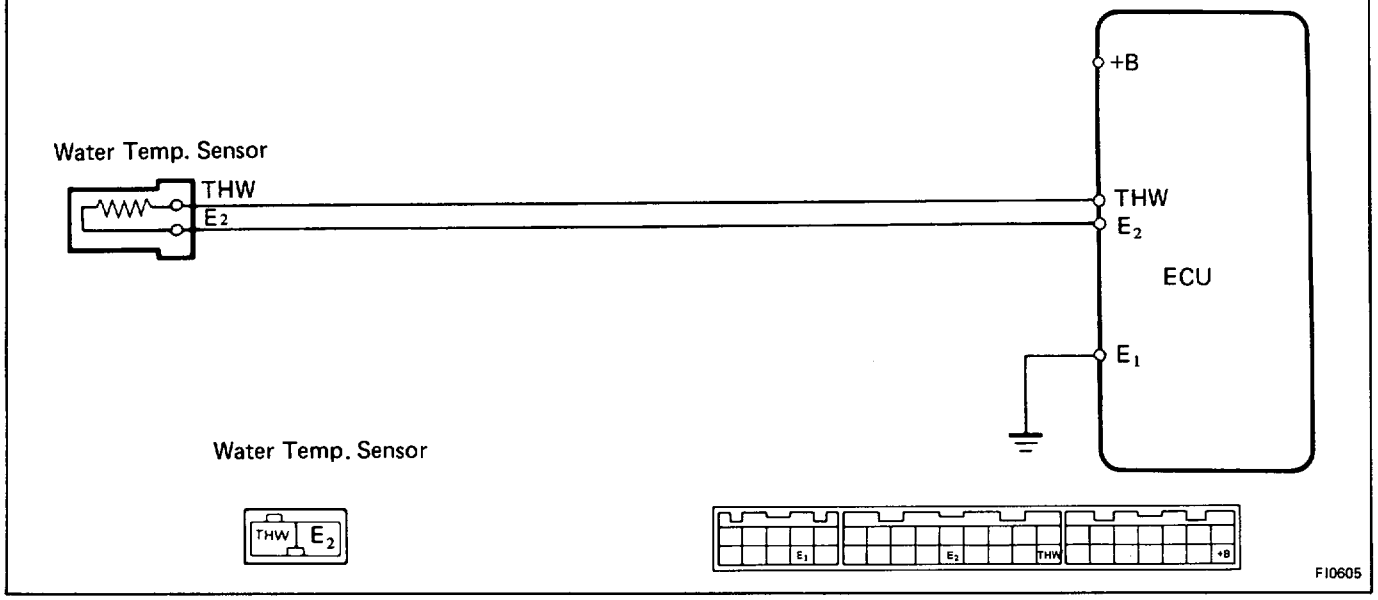
BAD → Replace air flow meter.

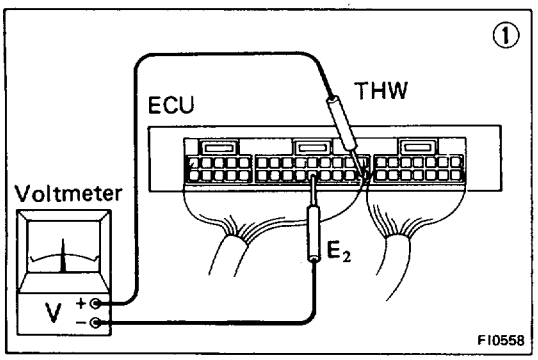
OK → Check wiring between ECU and air temp. sensor.

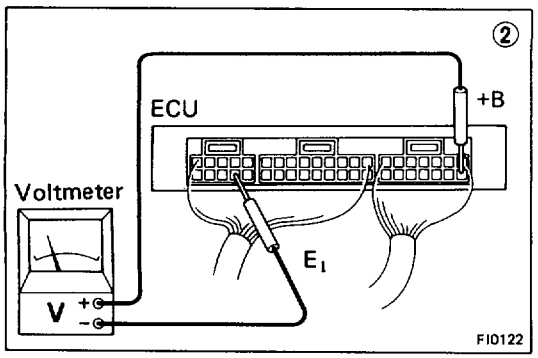
OK → Try another ECU.

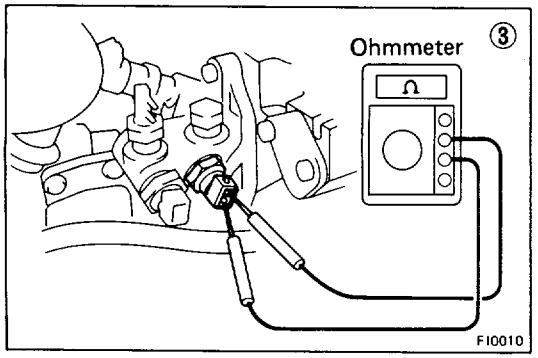
BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD Voltage
10	THW – E_2	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0 V









① No voltage between ECU terminals THW and E_2. **(IG S/W ON)**

② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

OK → Check wiring between ECU terminals E_1 and body ground.

NO → Refer to No. 1.

OK → ③ Check water temp. sensor.

BAD → Repair or replace.

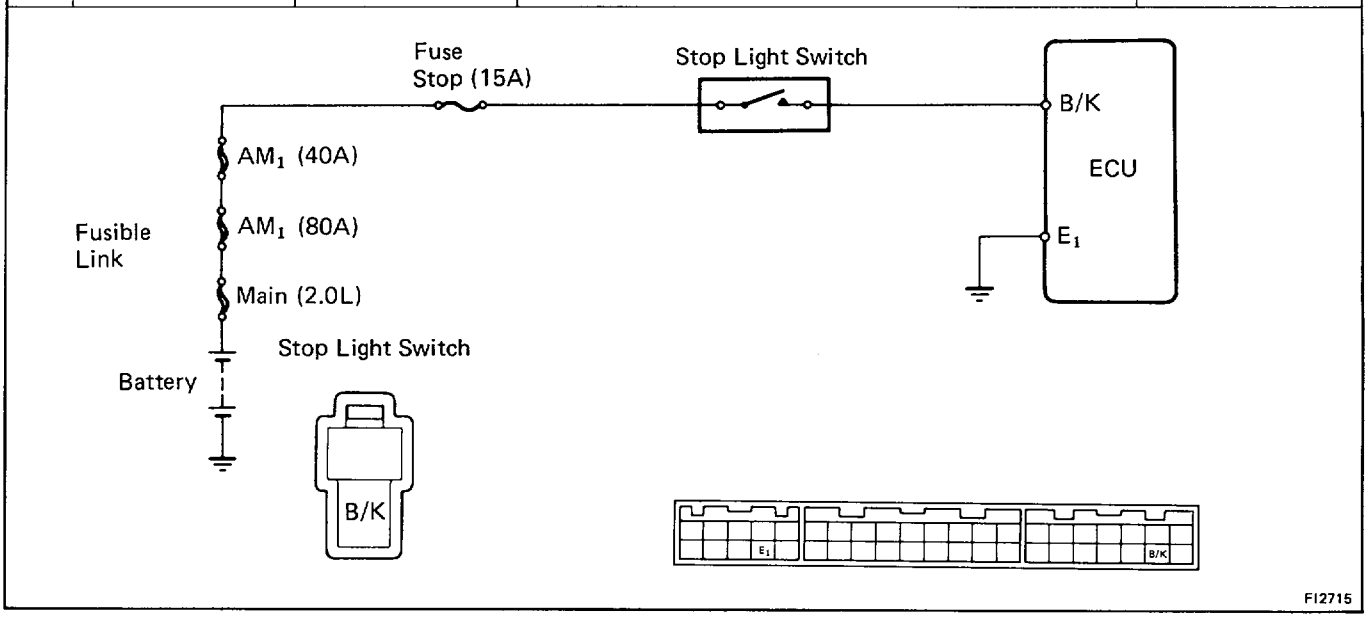
BAD → Replace water temp. sensor.

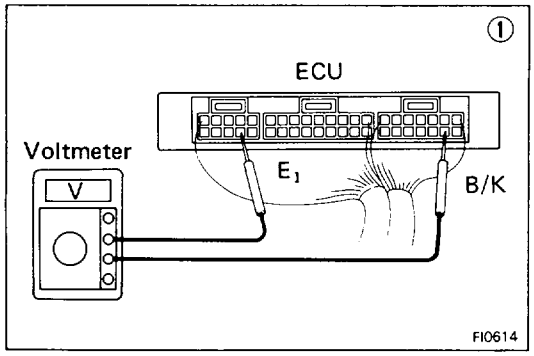
OK → Check wiring between ECU and water temp. sensor.

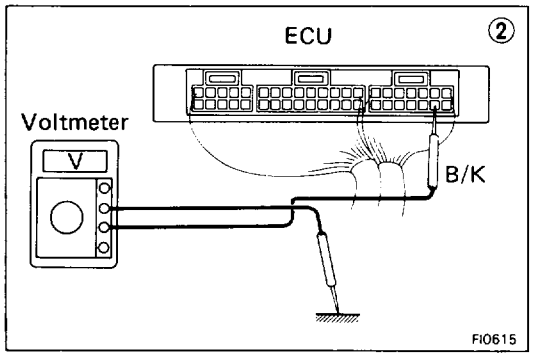
OK → Try another ECU.

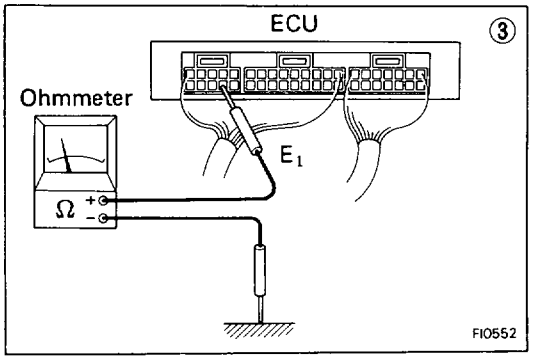
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
11	B/K – E_1	No voltage	Stop light switch ON	8 – 14 V









① No voltage between ECU terminals B/K and E_1.

② Check that there is voltage between ECU terminal B/K and body ground when the brake pedal is depressed.

NO

OK

③ Check wiring between ECU terminal E_1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check STOP fuse (15A) and stop light switch.

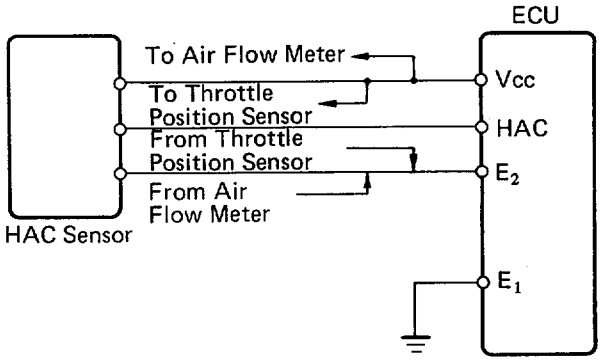
BAD → Repair or replace.

OK

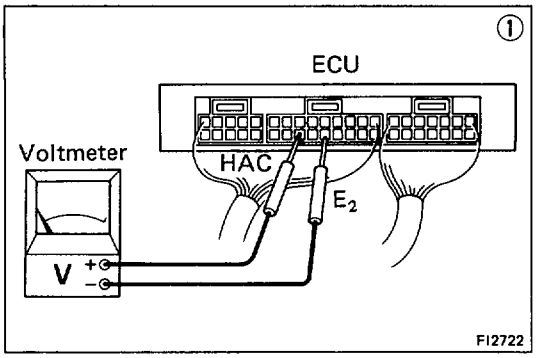
Check wiring between ECU terminal B/K and battery.

BAD → Repair or replace.

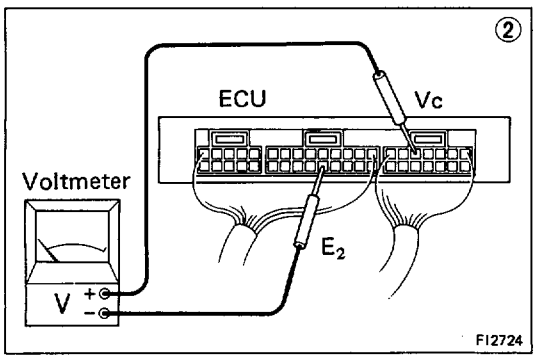
No.	Terminals	Trouble	Condition		STD Voltage
12	HAC – E_2 (C & C only)	No voltage	Ignition S/W ON	760 mmHg (29.92 in.Hg, 101.3 kPa)	Approx. 3.6 V



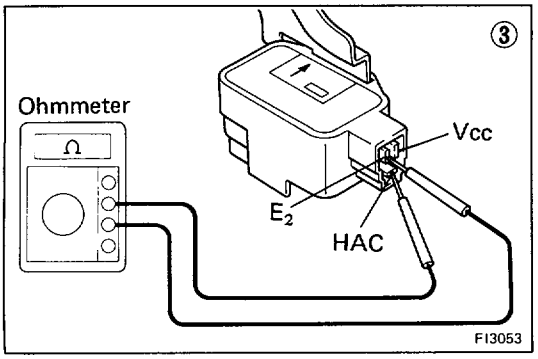
FI1995



FI2722



FI2724



FI3053

- **HAC – E_2**

① There is no specified voltage at ECU terminals HAC and E_2. **(IG S/W ON)**

② Check that there is voltage between ECU terminals Vcc and E_2 ground. **(IG S/W ON)**

NO → OK

Check wiring between ECU terminal E_2 and body ground.

BAD → Replace or repair.

Refer to Vcc – E_2 trouble section (No. 3).

BAD → Repair or replace.

OK

③ Check HAC sensor.

BAD → Repair or replace.

OK

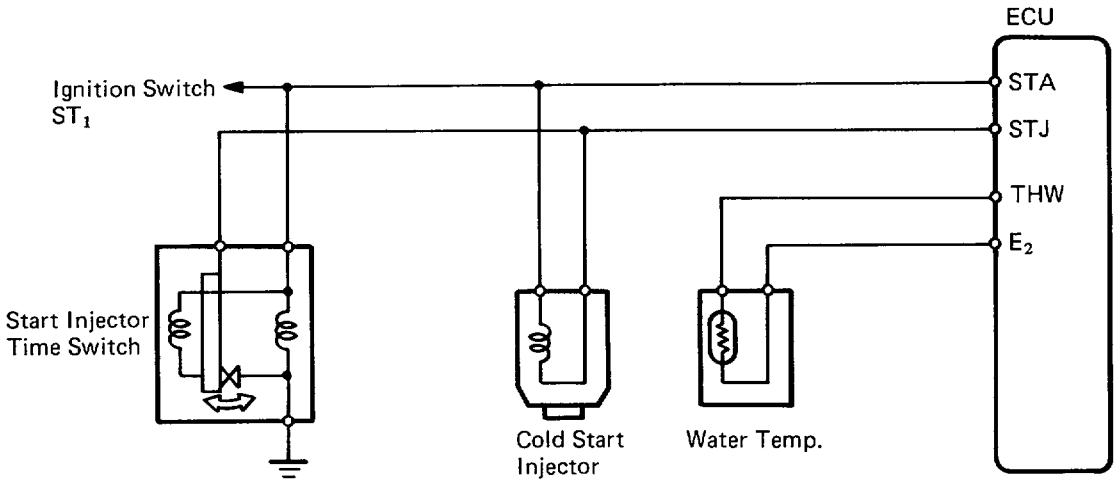
Check wiring between ECU and HAC sensor.

BAD → Repair or replace.

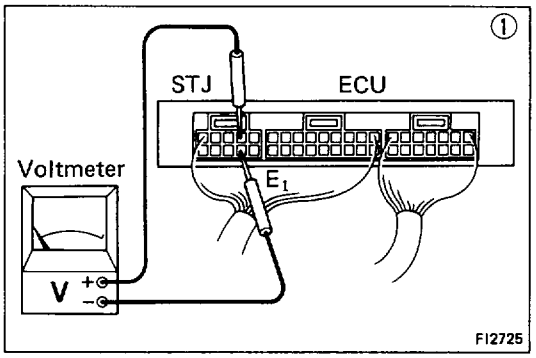
OK

Try another ECU.

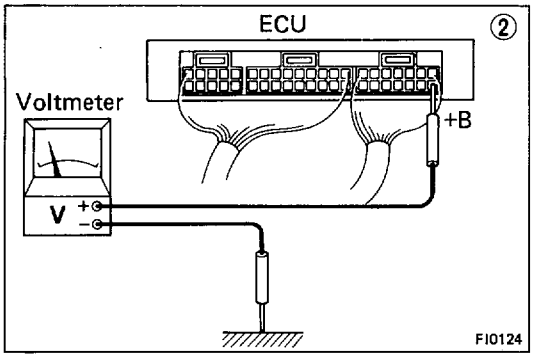
No.	Terminal	Trouble	Condition		STD Voltage
13	STJ – E (22R-E only)	No voltage	Ignition switch ST position	Coolant temperature 80°C (176°F)	6 – 12 V



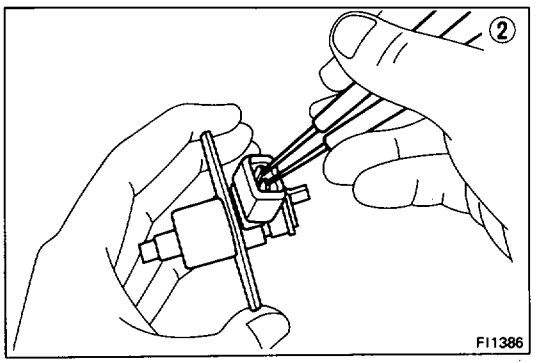
FI3028



FI2725



FI0124



FI1386

① No voltage between ECU terminals STJ and E_1. **(IG S/W ON)**

② Check that there is voltage between ECU terminal +B and body ground. **(IG S/W ON)**

OK → ③ Check cold start injector.

NO → Refer to section 1.

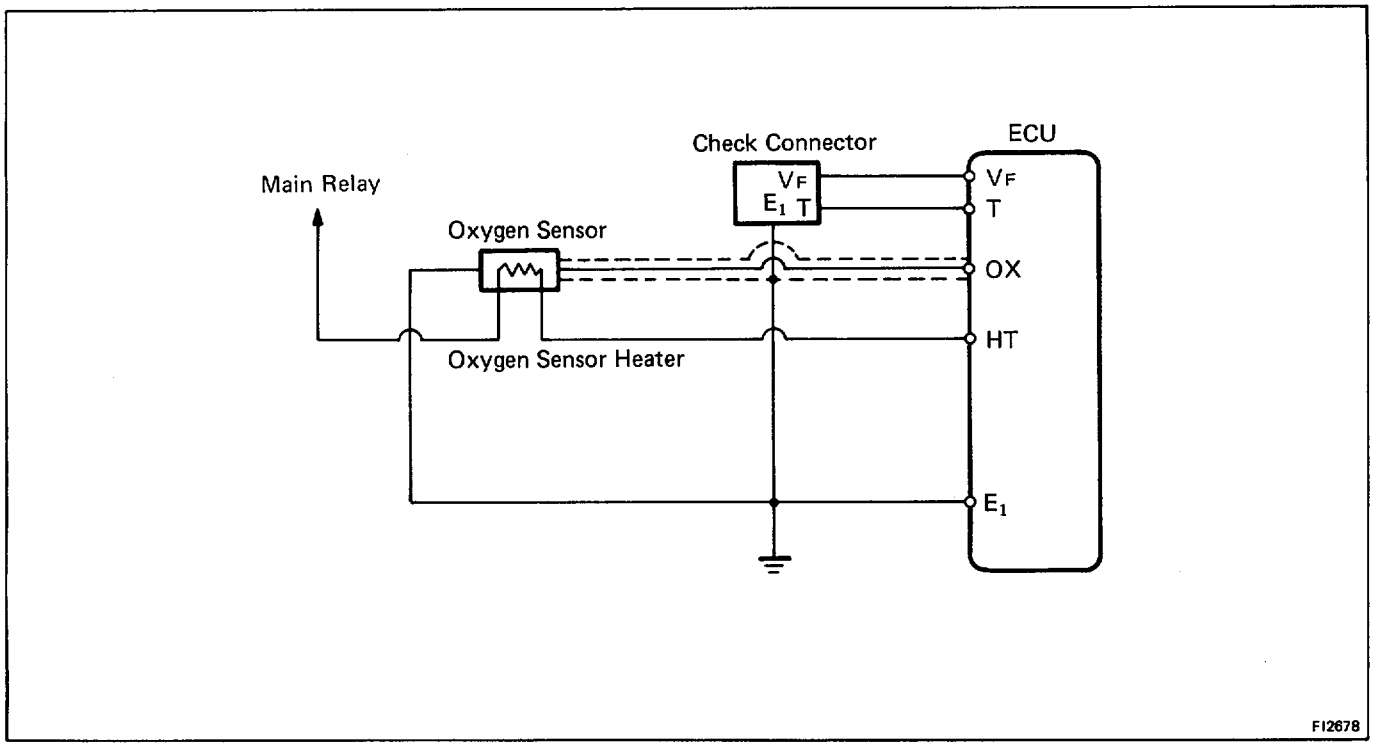
③ BAD → Replace cold start injector.

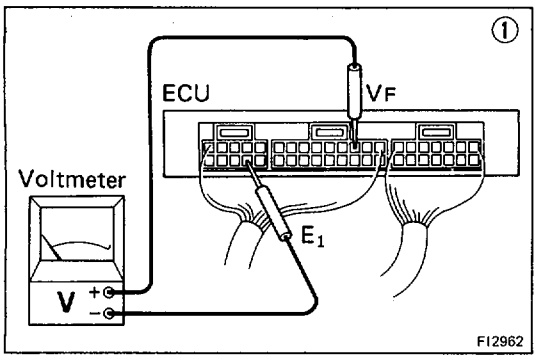
③ OK → Check wiring between ECU and cold start injector.

OK → Check wiring between ECU terminal E_1 and body ground.

BAD → Repair or replace wiring.

OK → Try another ECU.





① There is no voltage between ECU terminals VF and E_1.

Check that there is voltage between ECU terminal VF and body ground.

NO

OK

Check wiring between ECU terminal E_1 and body ground.

OK

BAD

Try another ECU.

Repair or replace.

Is air leaking into air intake system?

BAD

Repair air leak.

OK

Check spark plugs.

BAD

Repair or replace.

OK

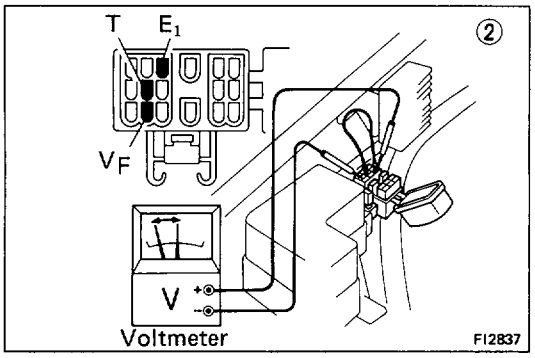
Check distributor and ignition system.

BAD

Repair or replace.

OK

CONTINUED ON PAGE FI-48



CONTINUED FROM PAGE FI-47

OK

Check fuel pressure. — BAD → Repair or replace.

OK

Check injector. — BAD → Repair or replace.

OK

Check cold start injector.* — BAD → Repair or replace.

OK

Check air flow meter. — BAD → Repair or replace.

OK

② Check operation of oxygen sensor. — OK → System normal.

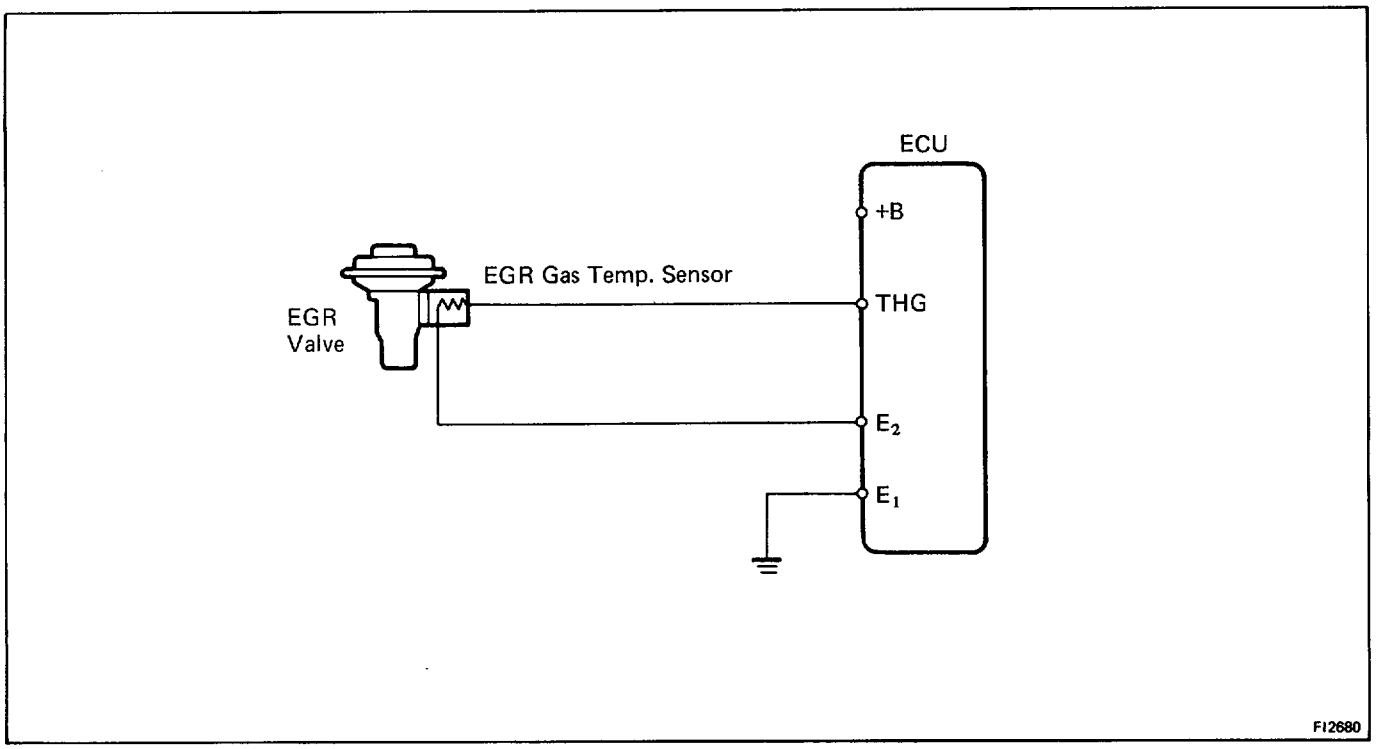
BAD

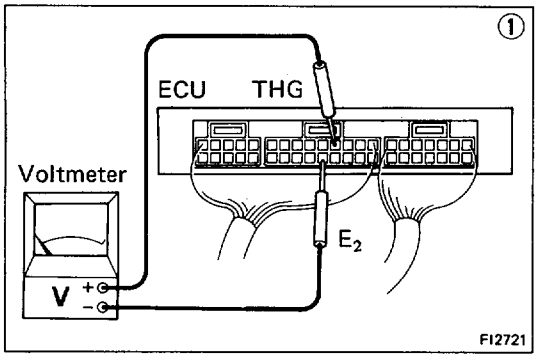
Check wiring between oxygen sensor and ECU connector. — BAD → Repair wiring.

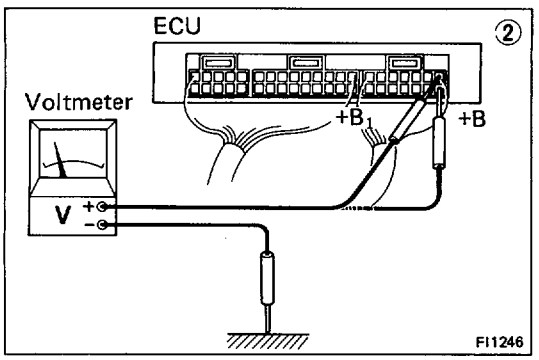
OK

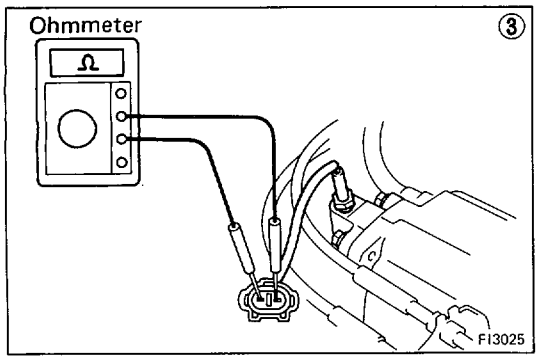
Replace oxygen sensor.

*Rich malfunction only.









① No voltage between ECU terminals THG and E_2.
(Engine running at 2,000 rpm)

② Check that there is voltage between ECU terminal +B or $+B_1$ and body ground. **(IG S/W ON)**

OK

NO → Refer to No. 1.

Check wiring between ECU terminal E_1 and body ground.

OK

BAD → Repair or replace.

Check EGR system.

BAD → Repair or replace.

OK

③ Check EGR gas temp. sensor.

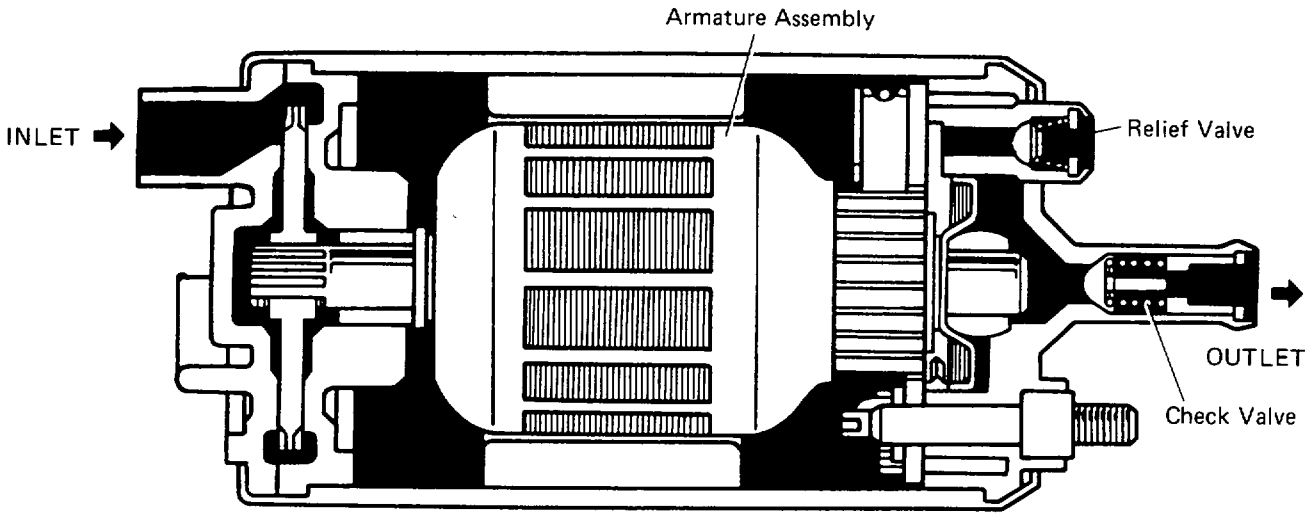
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECU and EGR gas temp. sensor.

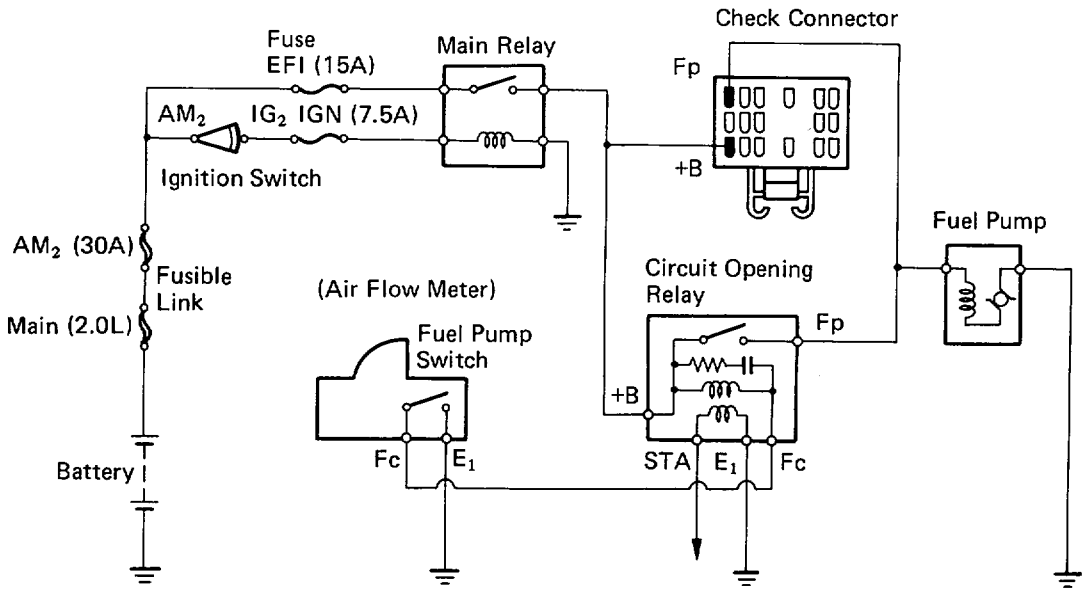
OK → Try another ECU.

BAD → Repair or replace.

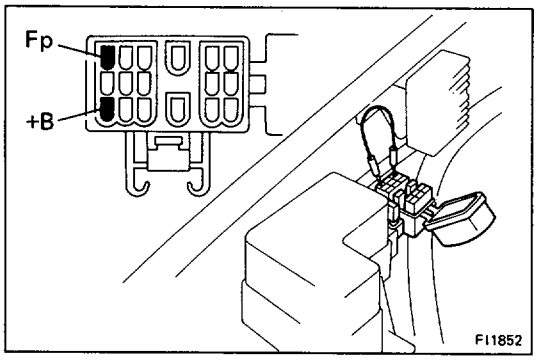
FUEL SYSTEM
Fuel Pump

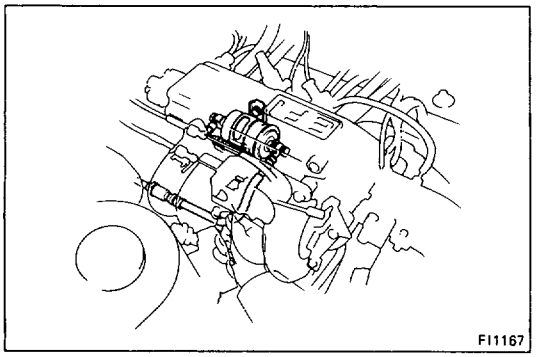


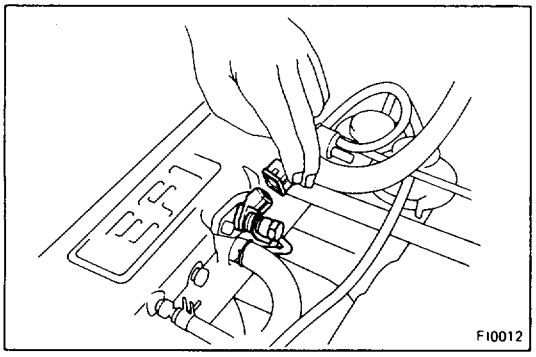
FI0530

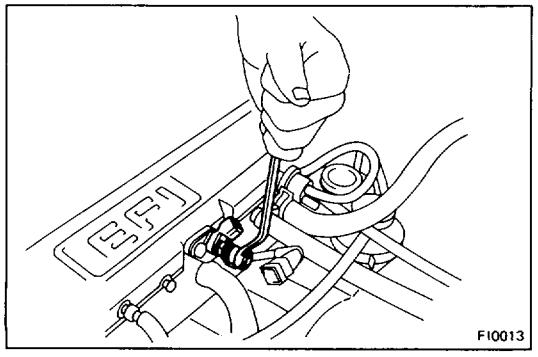


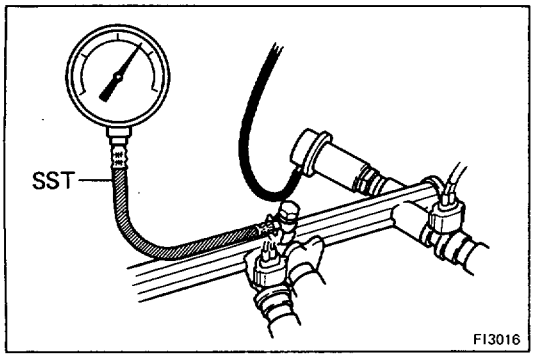
FI2716











ON-VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Turn on the ignition switch.

NOTE: Do not start the engine.

(b) Short terminals FP and +B of the check connector.

(c) Check that there is a pressure in the hose to the cold start injector.

NOTE: At this time, you will hear fuel return noise from the pressure regulator.

(d) Remove service wire.

(e) Turn off the ignition switch.

If there is no pressure, check the following parts.

- Fusible link
- Fuse (EFI 15A, IGN. 7.5A)
- Circuit opening relay
- Fuel pump
- Wiring connections

2. CHECK FUEL PRESSURE

(a) Check the battery voltage above 12 volts.

(b) Disconnect the cable from the negative terminal of the battery.

(c) Disconnect the wiring connector from the cold start injector.

(d) Put a suitable container or shop towel under rear end of the delivery pipe.

(e) Slowly loosen the union bolt of the cold start injector hose and remove the bolt and two gaskets from the delivery pipe.

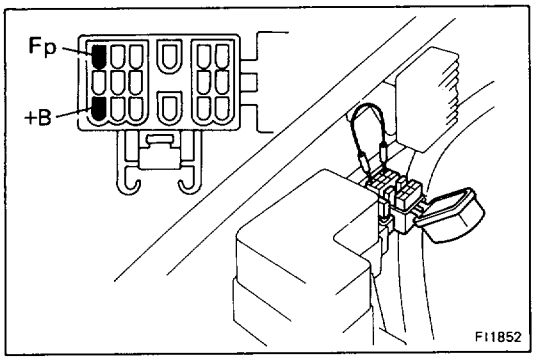
(f) Drain the fuel from the delivery pipe.

(g) Install a gasket, SST, another gasket and union bolt to the delivery pipe as shown in the figure.

SST 09268-45012

(h) Wipe off any splattered gasoline.

(i) Reconnect the battery cable.



(j) Short terminals Fp and +B of the check connector with a wire.

(k) Turn on the ignition switch.

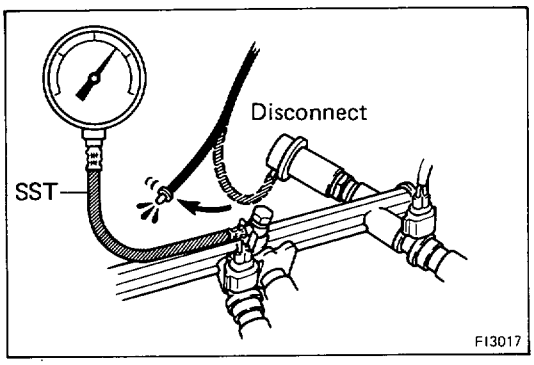
(l) Measure the fuel pressure.

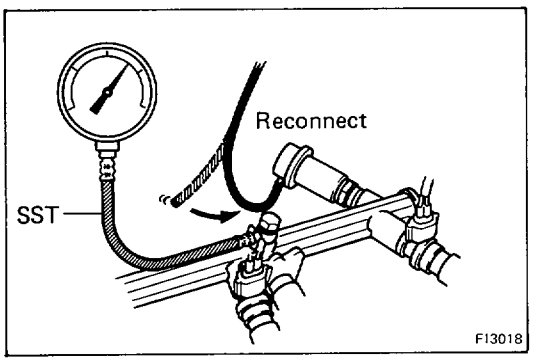
Fuel pressure:

22R-E	**2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)**
22R-TE	**2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)**

If high, replace the pressure regulator.
If low, check the following parts.

- Fuel hoses and connection
- Fuel pump
- Fuel filter
- Pressure regulator





(m) Remove the service wire from the check connector.

(n) Start the engine.

(o) Disconnect the vacuum sensing hose from the pressure regulator and plug it off.

(p) Measure the fuel pressure at idling.

Fuel Pressure:

22R-E	**2.7 – 3.1 kg/cm² (38 – 44 psi, 265 – 304 kPa)**
22R-TE	**2.3 – 2.7 kg/cm² (33 – 38 psi, 226 – 265 kPa)**

(q) Reconnect the vacuum sensing hose to the pressure regulator.

(r) Measure the fuel pressure at idling.

Fuel pressure:

22R-E	**2.3 – 2.6 kg/cm² (33 – 37 psi, 226 – 265 kPa)**
22R-TE	**1.9 – 2.2 kg/cm² (27 – 31 psi, 186 – 216 kPa)**

If no pressure, check the vacuum sensing hose and pressure regulator.

(s) Stop the engine. Check that the fuel pressure remains above 1.5 kg/cm² (21 psi, 147 kPa) for 5 minutes after the engine is turned off.

If not within specification, check the fuel pump, pressure regulator and/or injectors.

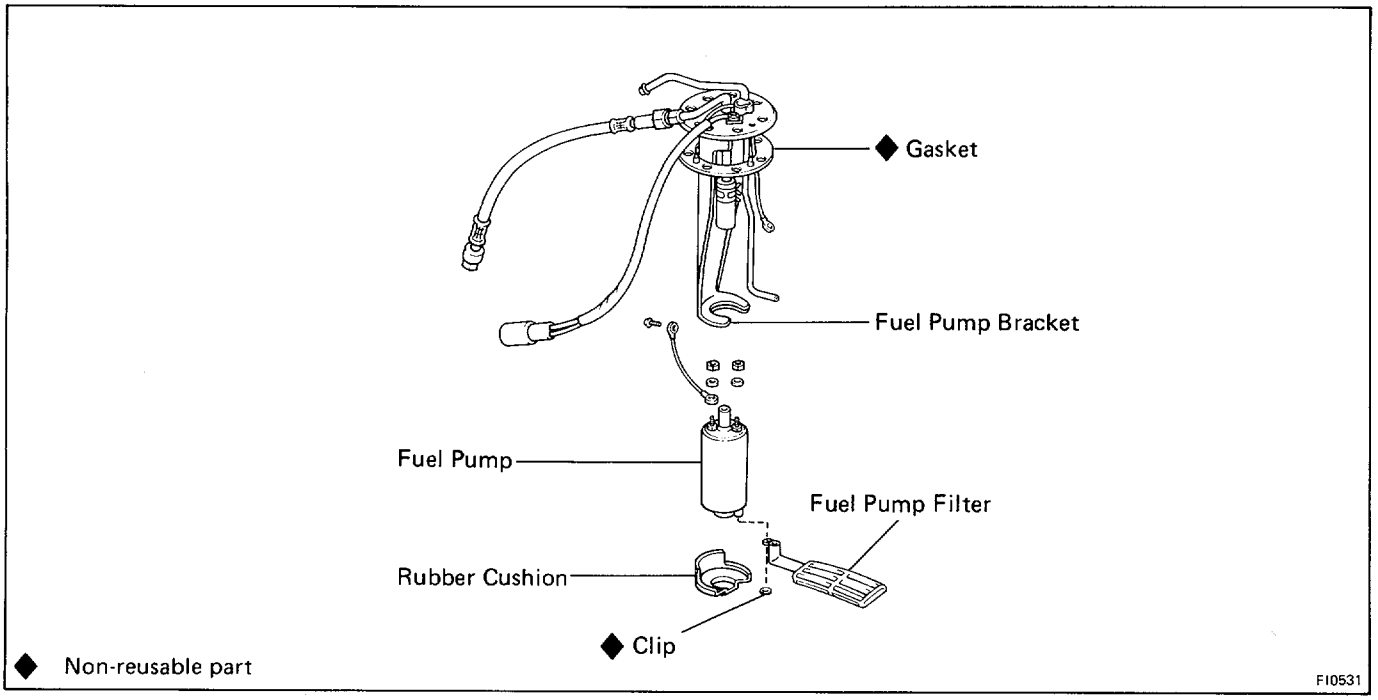
(t) After checking fuel pressure, disconnect the battery ground strap and carefully remove the SST to prevent gasoline from splashing.

(u) Using new gaskets, reconnect the cold start injector hose to the delivery pipe.

(v) Connect the wiring connector to the cold start injector.

(w) Check for fuel leakage.

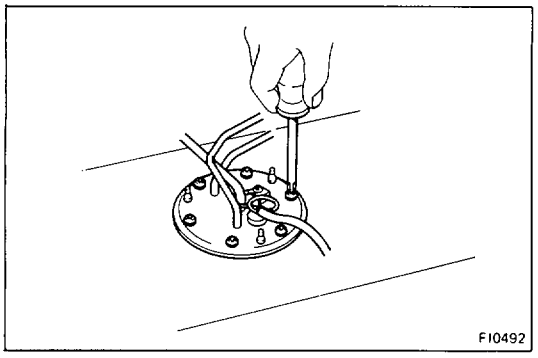
REMOVAL OF FUEL PUMP



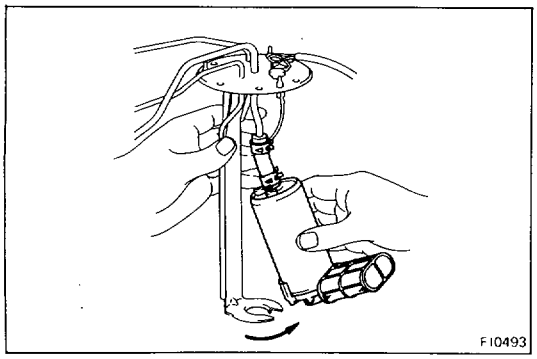
1. DRAIN FUEL FROM FUEL TANK

   WARNING: Do not smoke or work near an open flame when working on the fuel pump.

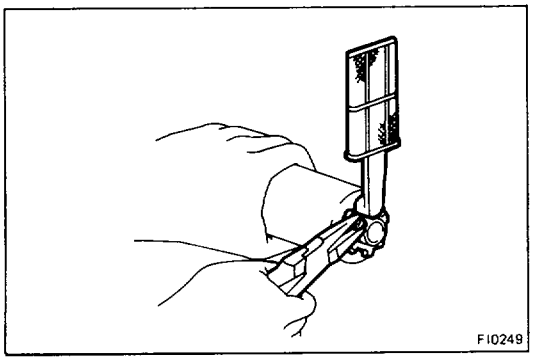
2. REMOVE FUEL TANK



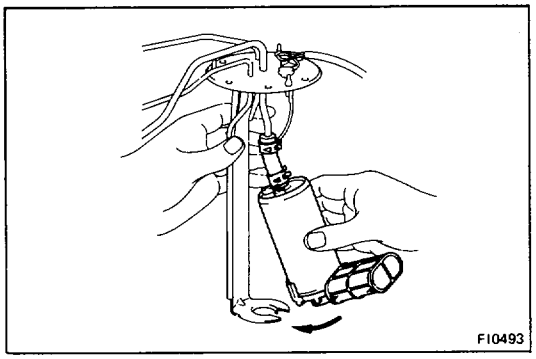
3. REMOVE FUEL PUMP BRACKET FROM FUEL TANK
   (a) Remove the seven bolts.
   (b) Pull out the fuel pump bracket.



4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET
   (a) Remove the two nuts and disconnect the wires from the fuel pump.
   (b) Pull off the bracket from the lower side of the fuel pump.
   (c) Remove the fuel pump from the fuel hose.



5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP
   (a) Remove the rubber cushion.
   (b) Remove the clip and pull out the filter.

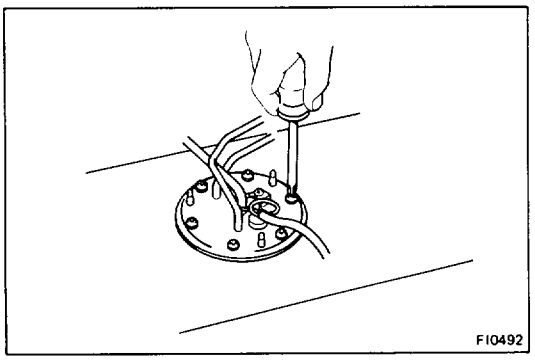


INSTALLATION OF FUEL PUMP

(See page FI-53)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP

2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET
   (a) Insert the outlet port of the fuel pump into the fuel hose.
   (b) Install the rubber cushion to the lower side of the fuel pump.
   (c) Push the lower side of the fuel pump, together with the rubber cushion, into the fuel pump bracket.



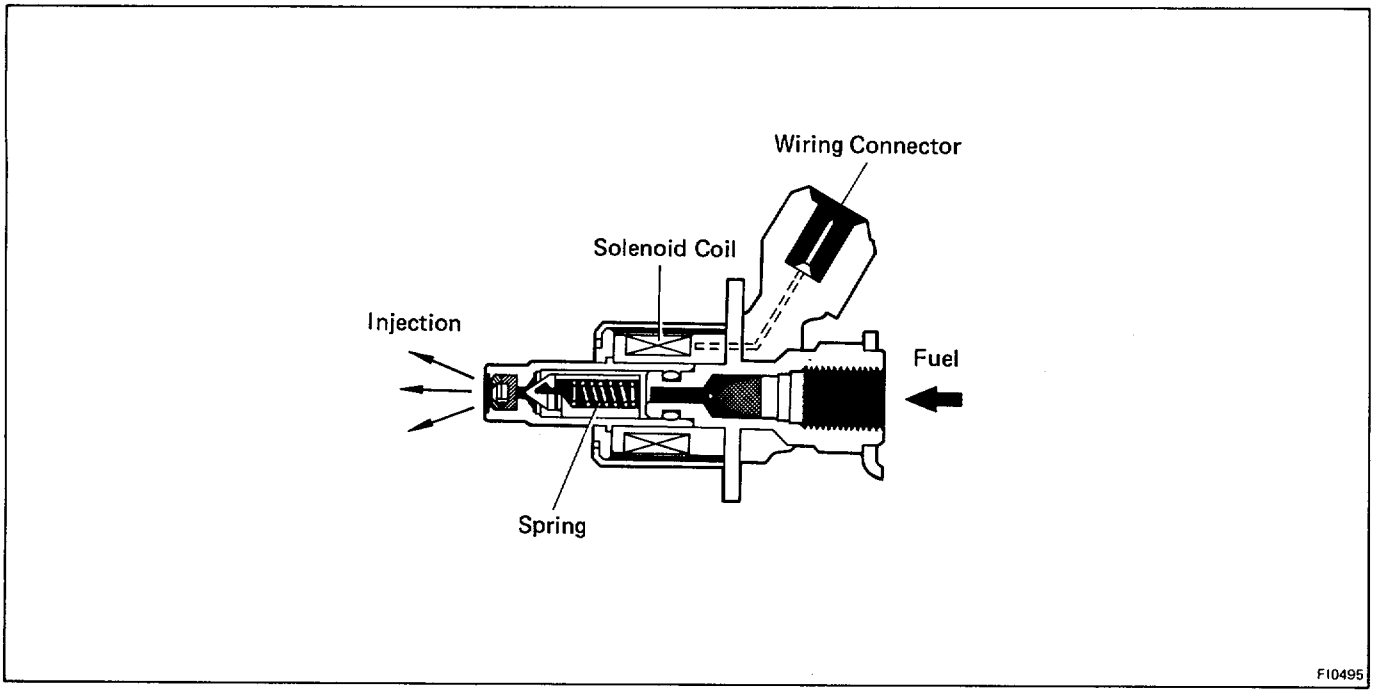
3. INSTALL FUEL PUMP BRACKET
   (a) Place the bracket with a new gasket on the fuel tank.
   (b) Install the tighten the seven bolts.

4. INSTALL FUEL TANK

   When installing the fuel tank, refer to FI-55 for the installation position of the protector and hose and the tightening torque.

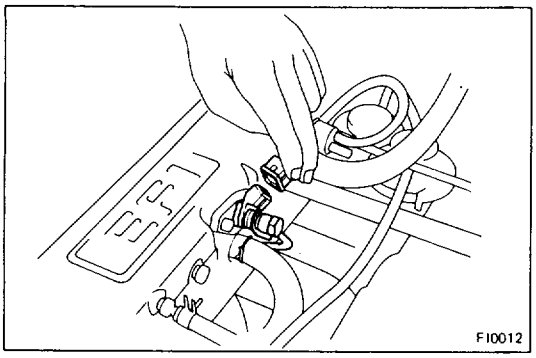
   After installation, check for leaks.

Cold Start Injector

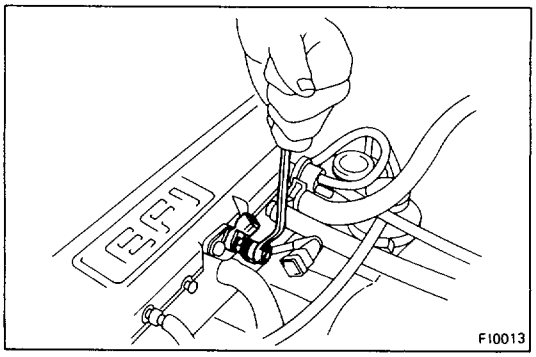


REMOVAL OF COLD START INJECTOR

REMOVE COLD START INJECTOR



(a) Disconnect the cold start injector wire.



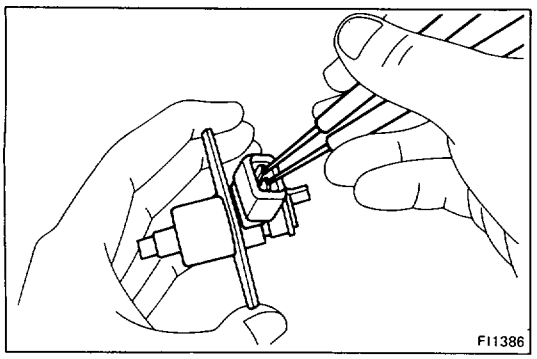
(b) Remove the fuel pipe between the cold start injector and fuel delivery pipe.

(c) Remove the cold start injector wire gasket.

(d) Put a suitable container or shop towel under rear end of the delivery pipe.

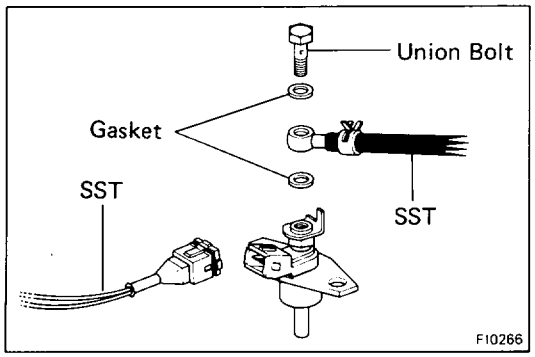
INSPECTION OF COLD START INJECTOR

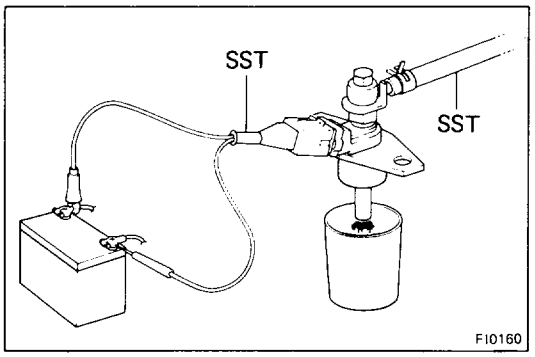
1. MEASURE RESISTANCE OF COLD START INJECTOR

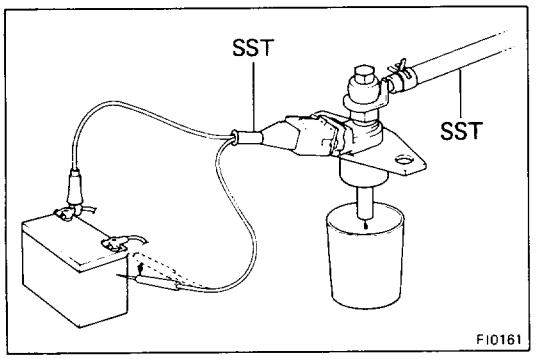


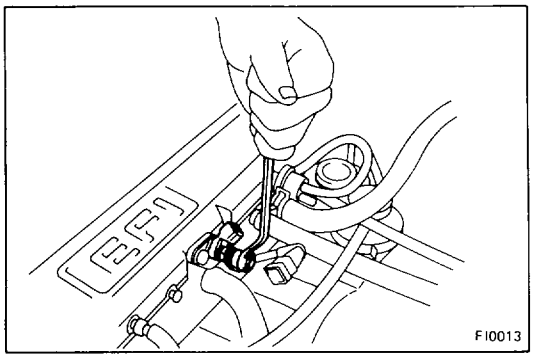
Using an ohmmeter, check the resistance of the injector.

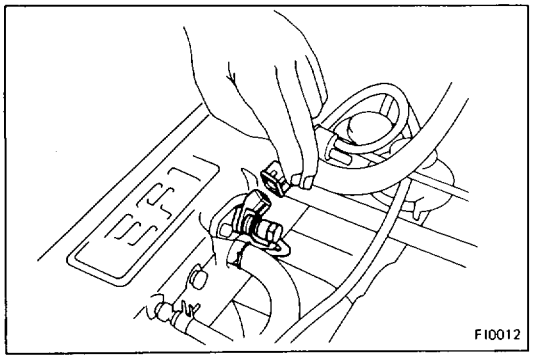
Resistance: 2 – 4 Ω











2. CHECK INJECTION OF COLD START INJECTOR

(a) Install the gasket, SST (two unions), another gasket and two union bolts to the delivery pipe and injector.

(b) Connect the SST (hose) from the unions.

SST 09268-41045

(c) Connect the SST (wire) to the injector.

SST 09842-30050

WARNING: Position the injector as far away from the battery as possible.

(d) Put a container under the injector.

(e) Turn on the ignition switch.

NOTE: Do not start the engine.

(f) Short terminals Fp and +B of the check connector with a service wire.

(g) Connect the test probes of the SST to the battery and check that the fuel spray is as shown.

SST 09842-30050

NOTE: Perform this check within the shortest possible time.

(h) Disconnect the test probes from the battery and check that there is less than one drop of fuel per minute from the injector.

Fuel drop: Less than one drop of fuel per minute

(i) After checking, remove SST and restore the following parts to their original condition.

- Fuel pump check connector
- Ignition switch
- Cold start injector
- Injector wiring

INSTALLATION OF COLD START INJECTOR

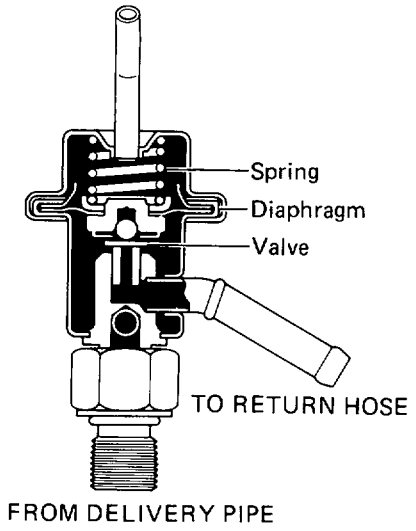
INSTALL COLD START INJECTOR

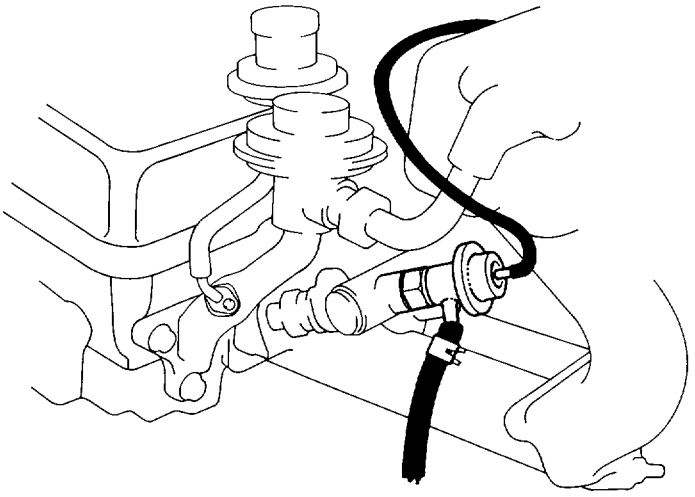
(a) Using new gaskets, install the cold start injector and two bolts.

(b) Install the fuel pipe between the cold start injector and fuel delivery pipe with new gaskets.

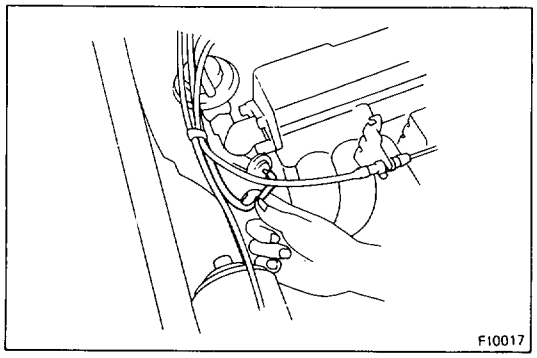
(c) Connect the cold start injector wire.

Pressure Regulator

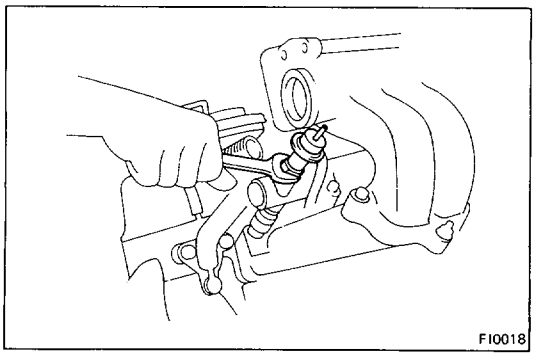




FI1447 FI0792



FI0017



FI0018

ON-VEHICLE INSPECTION

CHECK FUEL PRESSURE (See page FI-51)

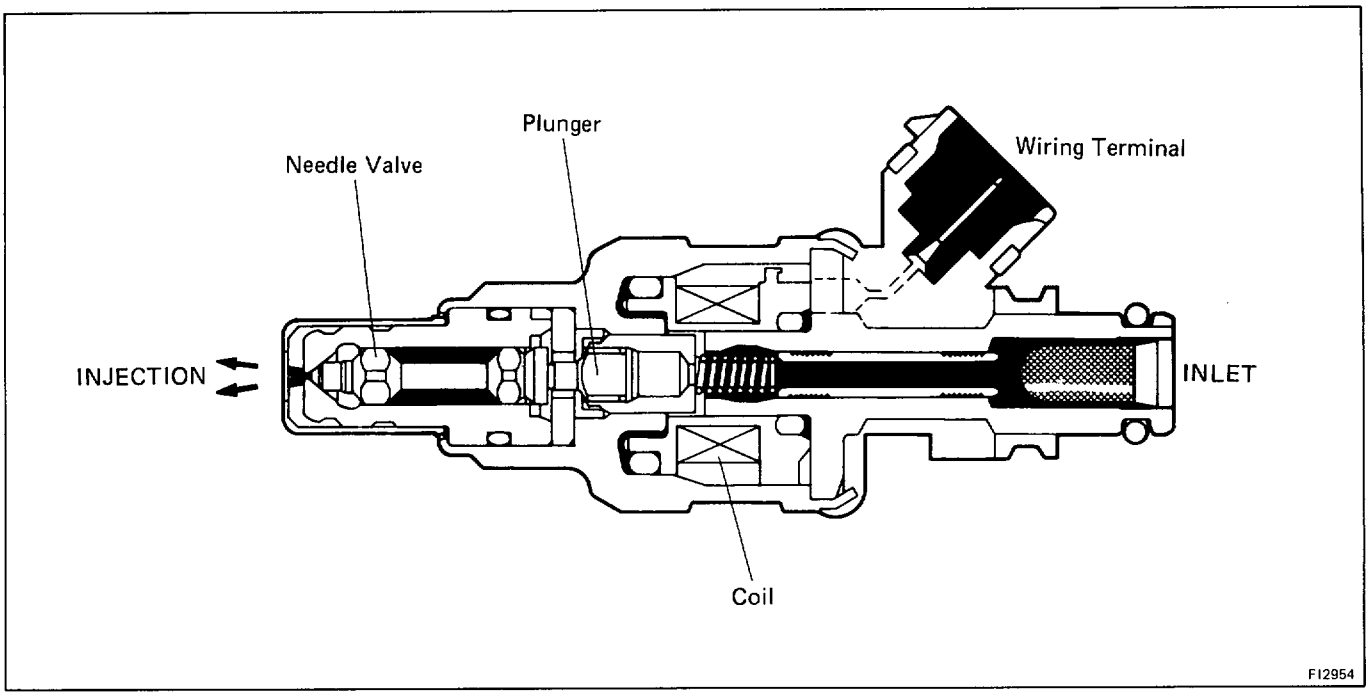
REMOVAL OF PRESSURE REGULATOR

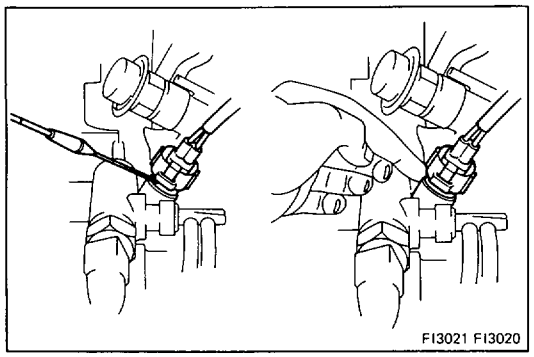
1. DISCONNECT VACUUM SENSING HOSE
2. REMOVE NO. 1 EGR PIPE
3. DISCONNECT FUEL HOSE
   (a) Put a suitable container or shop towel under the pressure regulator.
   (b) Disconnect the fuel hose from the pressure regulator.
4. REMOVE PRESSURE REGULATOR
   Loosen the lock nut, and remove pressure regulator.

INSTALLATION OF PRESSURE REGULATOR

1. INSTALL PRESSURE REGULATOR
   Install the pressure regulator and lock nut.
   Torque the lock nut.
   Torque: 300 kg-cm (22 ft-lb, 29 N·m)
2. CONNECT FUEL HOSE
3. INSTALL NO. 1 EGR PIPE
   Install a new gasket and No. 1 EGR pipe.
4. CONNECT VACUUM SENSING HOSE

Injector





ON-VEHICLE INSPECTION

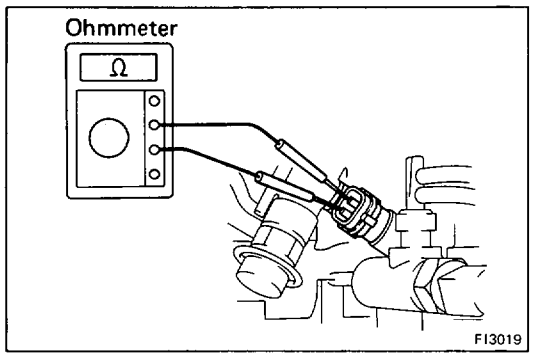
1. CHECK INJECTOR OPERATION

Check for operating sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.

(b) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or an unusual sound is heard, check the wiring connector, injector, resistor or injection signal from ECU.

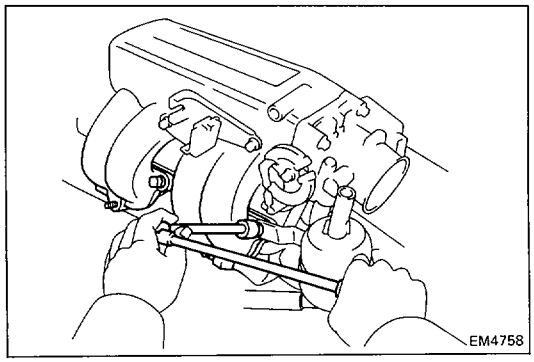


2. MEASURE RESISTANCE OF INJECTOR

(a) Unplug the wiring connector from the injector.

(b) Using an ohmmeter, check the continuity of both terminals.

Resistance: 22R-E 1.0 – 2.5 Ω
22R-TE 1.1 – 2.0 Ω

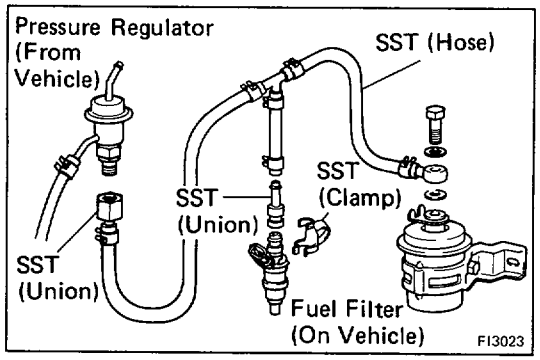


REMOVAL OF INJECTOR

1. REMOVE CHAMBER WITH THROTTLE BODY
(See steps 10 to 17 on pages EM-14, 15)

2. DISCONNECT WIRES
(See step 18 on page EM-15)

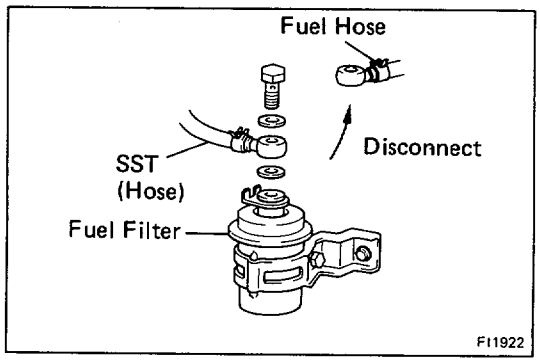
3. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
(See step 19 on page EM-15)



INSPECTION OF INJECTOR

1. TEST INJECTION OF INJECTORS

WARNING: Keep clear of sparks during the test.

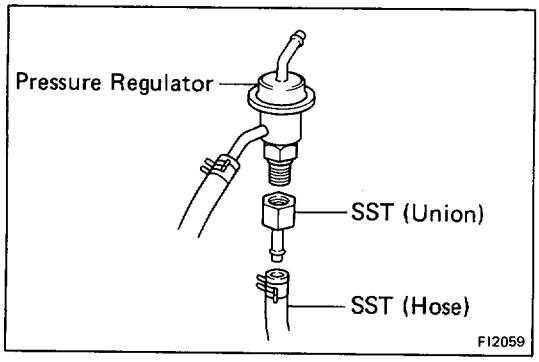


(a) Disconnect the fuel hose from the fuel filter outlet.

(b) Connect SST (Union) to the fuel filter outlet.

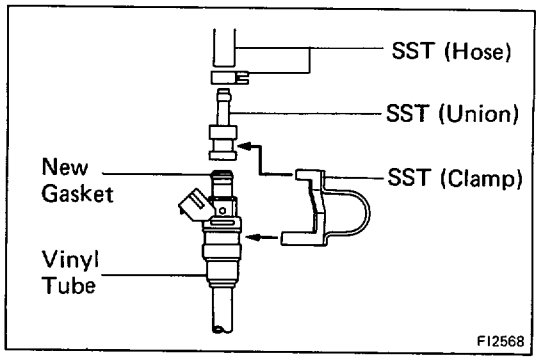
SST 09268-41045

NOTE: Use the vehicle's fuel filter.



(c) Install SST (Union) to the removed pressure regulator.

SST 09268-41045



(d) Install SST (Union) to the injector and hold the injector and union with SST (Clamp).

SST 09268-41045

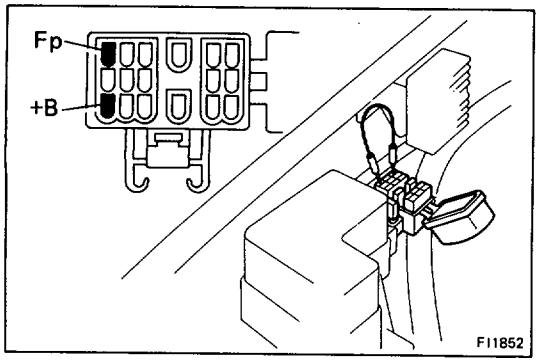
(e) Put the injector into the graduated cylinder.

NOTE: Install a suitable vinyl tube onto the injector to prevent gasoline from splashing out.

(f) Connect the battery cable.

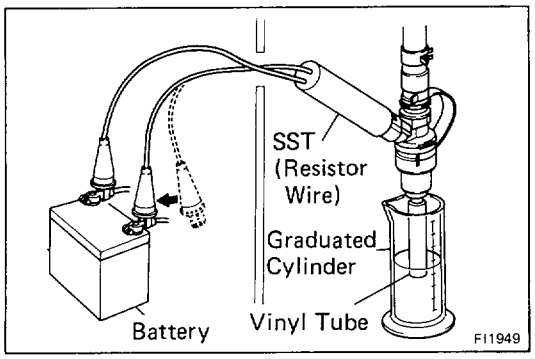
(g) Turn the ignition switch ON.

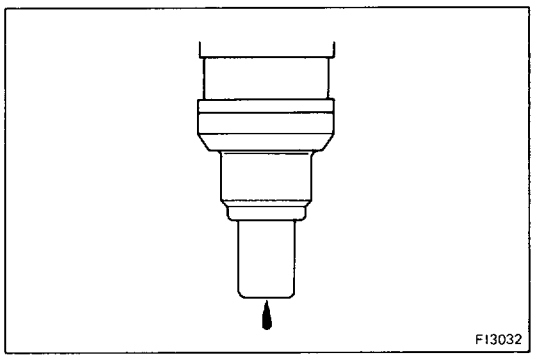
NOTE: Do not start the engine.



(h) Using a service wire, short terminals Fp and +B of the check connector.

NOTE: Fuel pump will operate.





(i) Connect the SST to the battery for 15 seconds and measure the injection volume with a graduated cylinder.
Test each injector two or three times. If not within specified volume, clean or replace.

SST 22R-E 09842-30060
22R-TE 09842-30020

Volume: 22R-E 40 – 50 cc/15 sec. (2.4 – 3.1 cu in.)
22R-TE 65 – 80 cc/15 sec. (4.0 – 4.9 cu in.)

Difference between each injector:
22R-E Less than 6 cc (0.4 cu in.)
22R-TE Less than 8 cc (0.5 cu in.)

2. TEST LEAKAGE

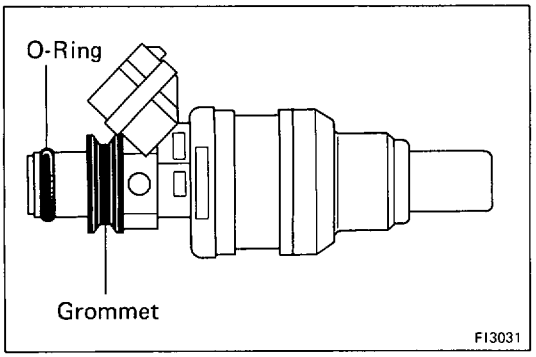
(a) From the previous condition, disconnect the SST from the battery and check the fuel leakage from the injection nozzle.

SST 22R-E 09842-30060
22R-TE 09842-30020

Fuel drop: Less than one fuel drop of fuel per minute

(b) Disconnect the battery ground strap.
Remove the SST and disconnect the service wire from the check connector.

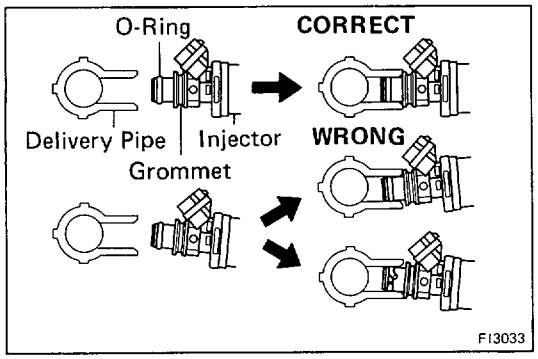
SST 09268-41045



INSTALLATION OF INJECTORS

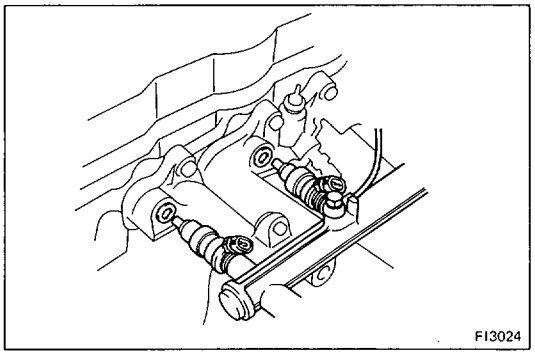
1. INSTALL INJECTORS INTO DELIVERY PIPE

(a) Install the grommet and a new O-ring to the injector.

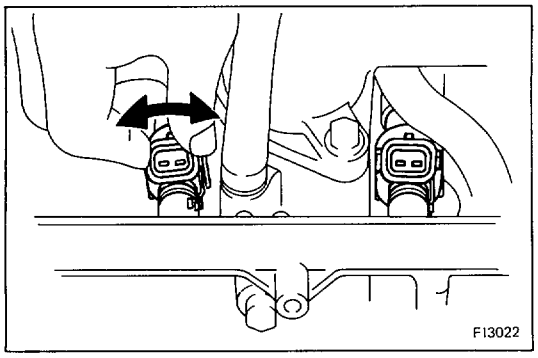


(b) Apply a thin coat of gasoline to the O-rings and install the injectors into the delivery pipe.

2. INSTALL DELIVERY PIPE WITH INJECTORS



(a) Install the four inuslators into the injector hole of the intake manifold.



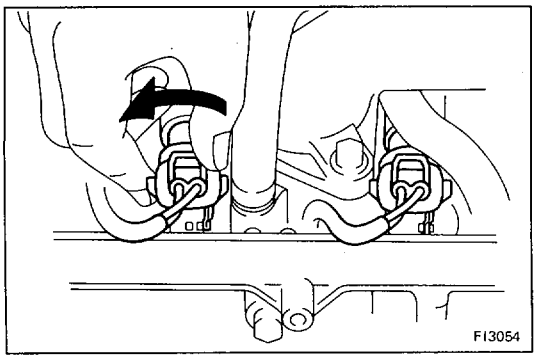
(b) Install the injectors together with the delivery pipe to the manifold.

(c) Make sure that the injectors rotate smoothly.

NOTE: If the injectors do not rotate smoothly, probable cause may be incorrect installation of O-rings. Replace O-rings again after removing the injectors.

(d) Install and torque the bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



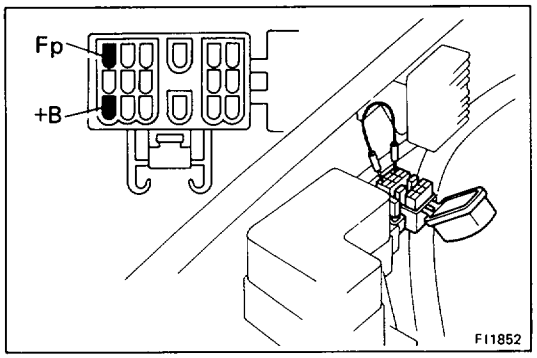
3. CONNECT WIRES

(See step 6 on page EM-35)

Turn the injector so the injector positioning guide is aligned with the positioning rib of the delivery pipe.

4. CONNECT FUEL HOSE TO DELIVERY PIPE
(See step 5 on page EM-35)

5. INSTALL CHAMBER WITH THROTTLE BODY
(See steps 7 to 14 on page EM-36)



6. CHECK FOR FUEL LEAKAGE

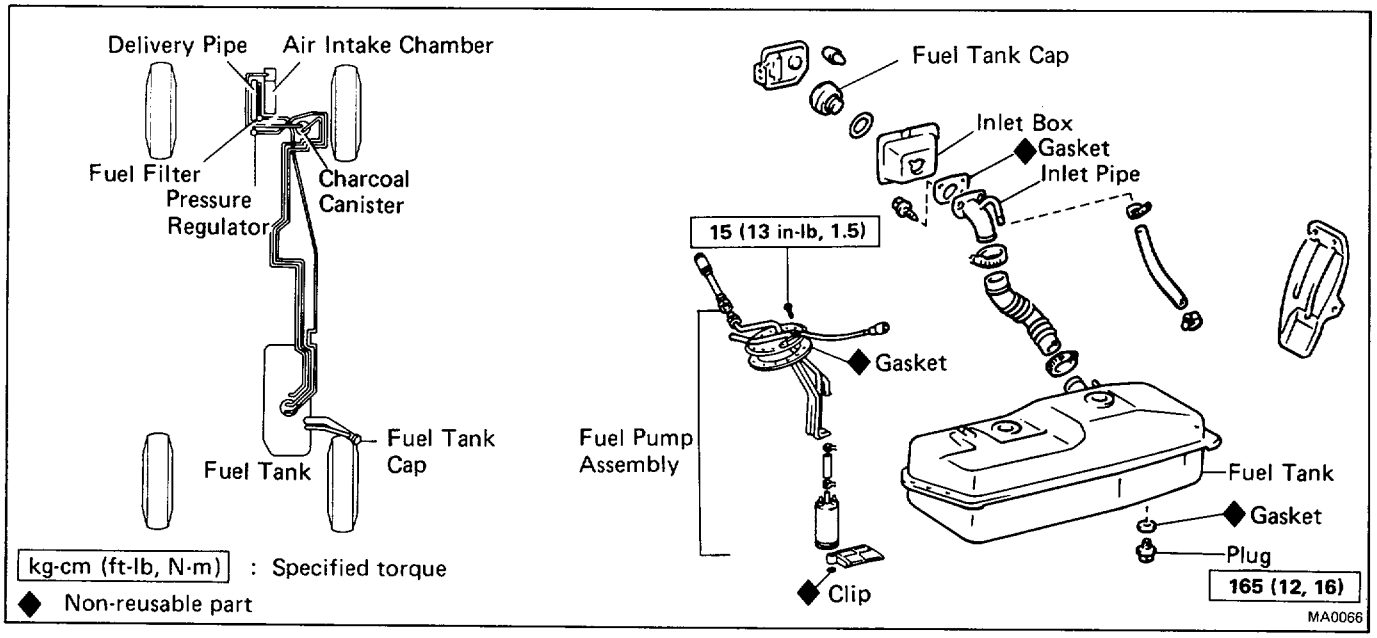
(a) With the ignition switch ON, use a service wire to short terminals Fp and +B of the check connector.

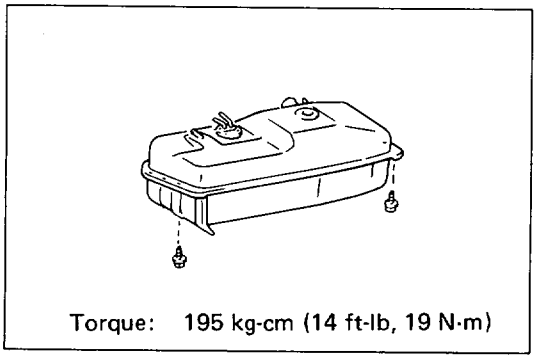
(b) Check for fuel leakage.

(c) Remove the service wire from the check connector.

Fuel Tank and Line

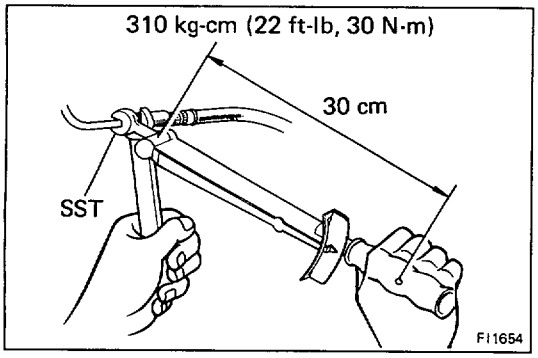
COMPONENTS





PRECAUTIONS

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **Apply the proper torque to all tightening parts.**



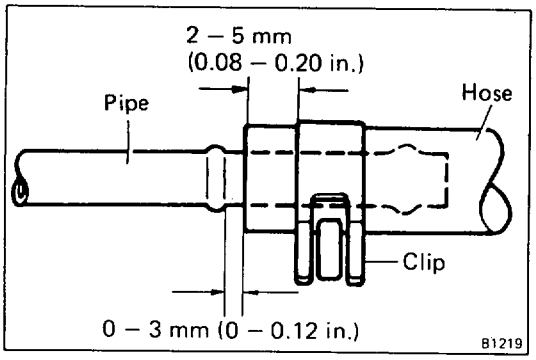
INSPECT FUEL LINES AND CONNECTIONS

(a) Inspect the fuel lines for cracks, or leakage and connections for deformation.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, kicks or damage.

(c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

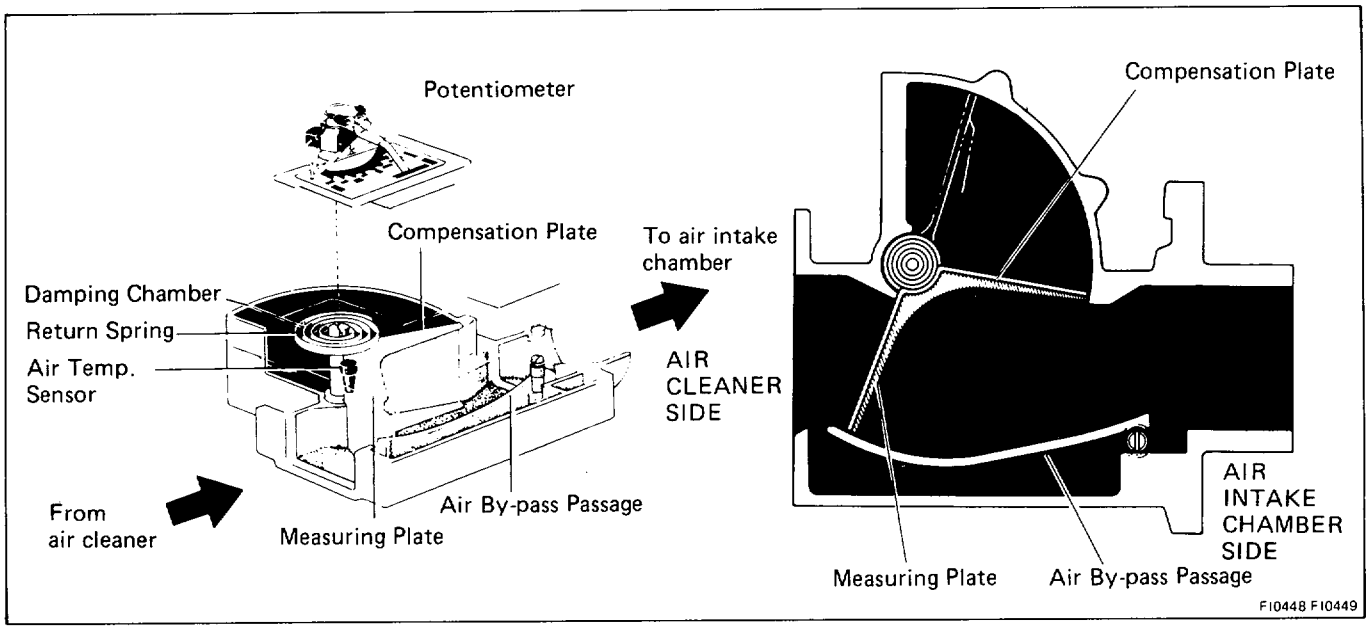
(d) Inspect the pipe for damage or fuel leakage.

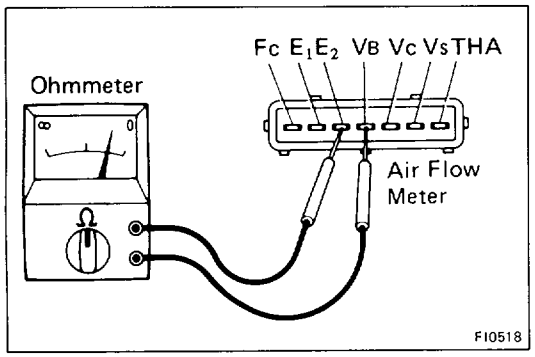


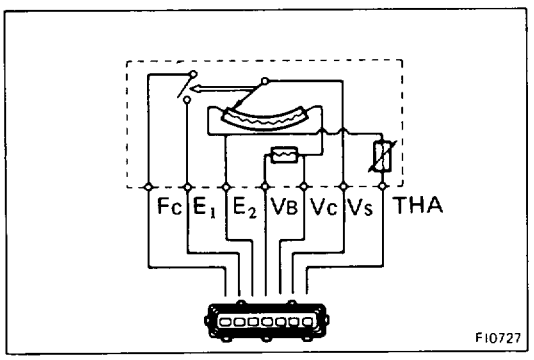
(e) The hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.

AIR INTAKE SYSTEM
Air Flow Meter







ON-VEHICLE INSPECTION

MEASURE RESISTANCE OF AIR FLOW METER

(a) Unplug the wiring connector from the air flow meter.

(b) Using an ohmmeter, measure the resistance between each terminal.

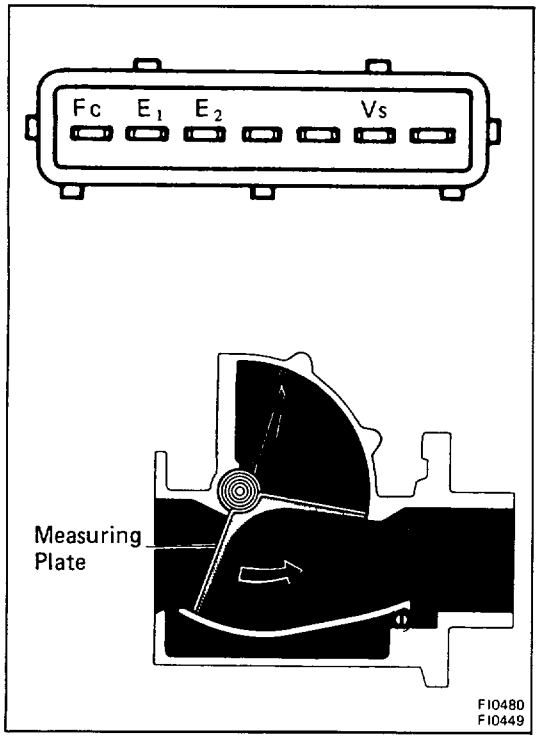
Between terminals	Resistance	Temperature
E_2 – Vs	20 – 400 Ω	–
E_2 – Vc	100 – 300 Ω	–
E_2 – VB	200 – 400 Ω	–
E_2 – THA	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ	–20°C (–4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)
E_1 – Fc	Infinity	–

If not within specification, replace the air flow meter.

REMOVAL OF AIR FLOW METER

1. DISCONNECT AIR HOSES
2. DISCONNECT AIR FLOW METER CONNECTOR
3. REMOVE AIR FLOW METER

Remove the bolt and three nuts.



INSPECTION OF AIR FLOW METER

MEASURE RESISTANCE OF AIR FLOW METER

Move the measuring plate and, using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance (Ω)	Measuring plate opening
E_1 – Fc	Infinity	Fully closed
	Zero	Other than closed position
E_2 – Vs	20 – 400	Fully closed
	20 – 1,200	Fully open

NOTE: Resistance between terminals E_2 and Vs will change in a wave pattern as the measuring plate slowly opens.

INSTALLATION OF AIR FLOW METER

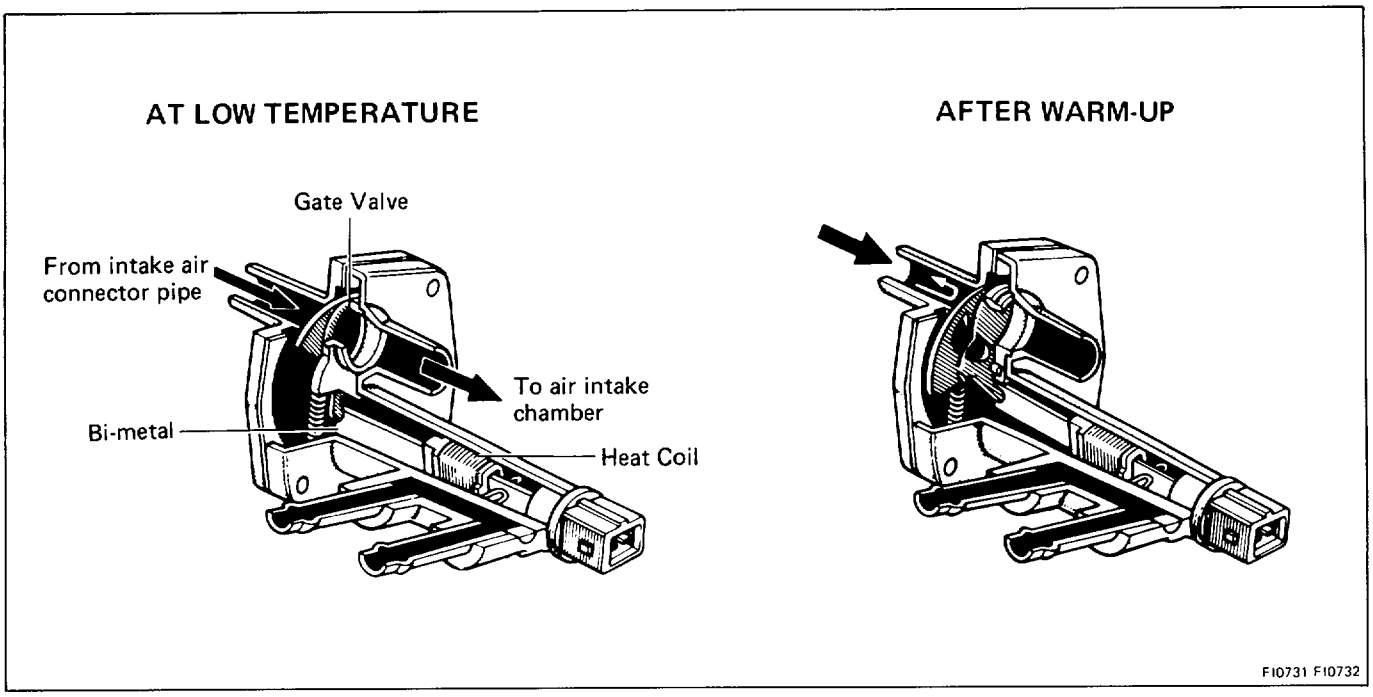
1. INSTALL AIR FLOW METER

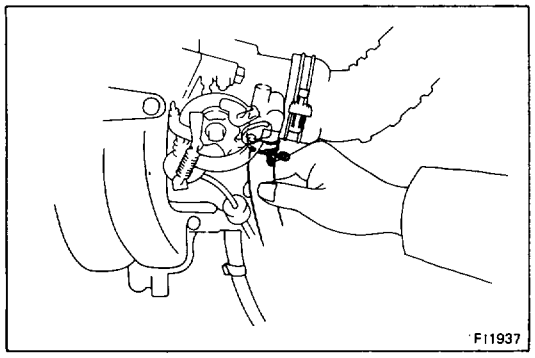
   Install the three nuts and a bolt.

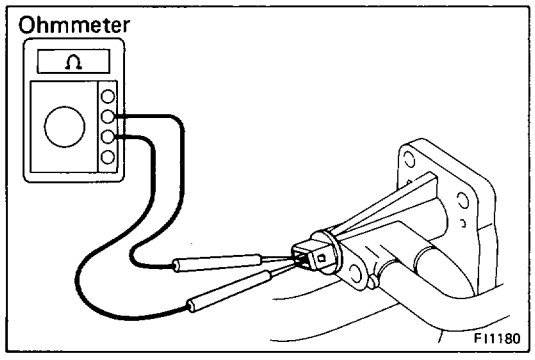
2. CONNECT AIR FLOW METER CONNECTOR

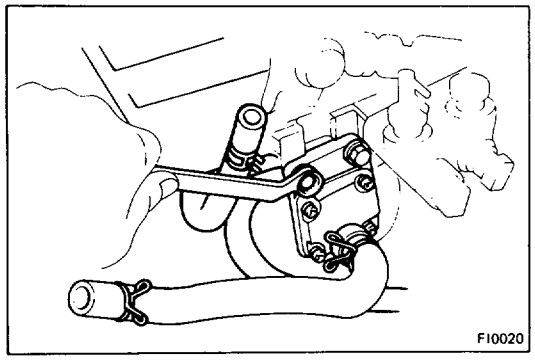
3. INSTALL AIR HOSE

Air Valve









ON-VEHICLE CHECK

1. CHECK OPERATION OF AIR VALVE

Check the engine RPM by pinching shut the air hose.

At Low Temp. (Coolant Temperature: below 60°C or 140°F)

- When the hose is pinched, the engine rpm should drop.

After warm-up

- When the hose is pinched, check that the engine rpm does not drop more than 50 rpm.

2. MEASURE RESISTANCE OF AIR VALVE

Using an ohmmeter, measure the heat coil resistance of the air valve.

Resistance (Ep–E_1): 39 – 59 Ω

REMOVAL OF AIR VALVE

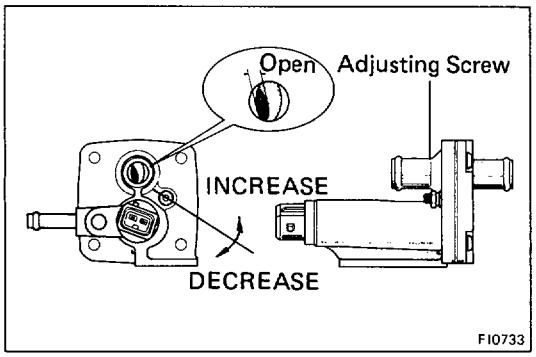
1. DISCONNECT TWO AIR VALVE HOSES

2. DISCONNECT AIR VALVE CONNECTOR

3. DISCONNECT WATER BY-PASS HOSE

4. REMOVE AIR VALVE

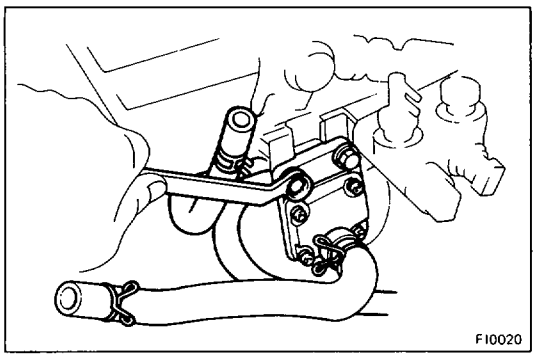
Remove the two bolts and the air valve and gasket.



INSTALLATION OF AIR VALVE

CHECK OPENING CONDITION OF AIR VALVE

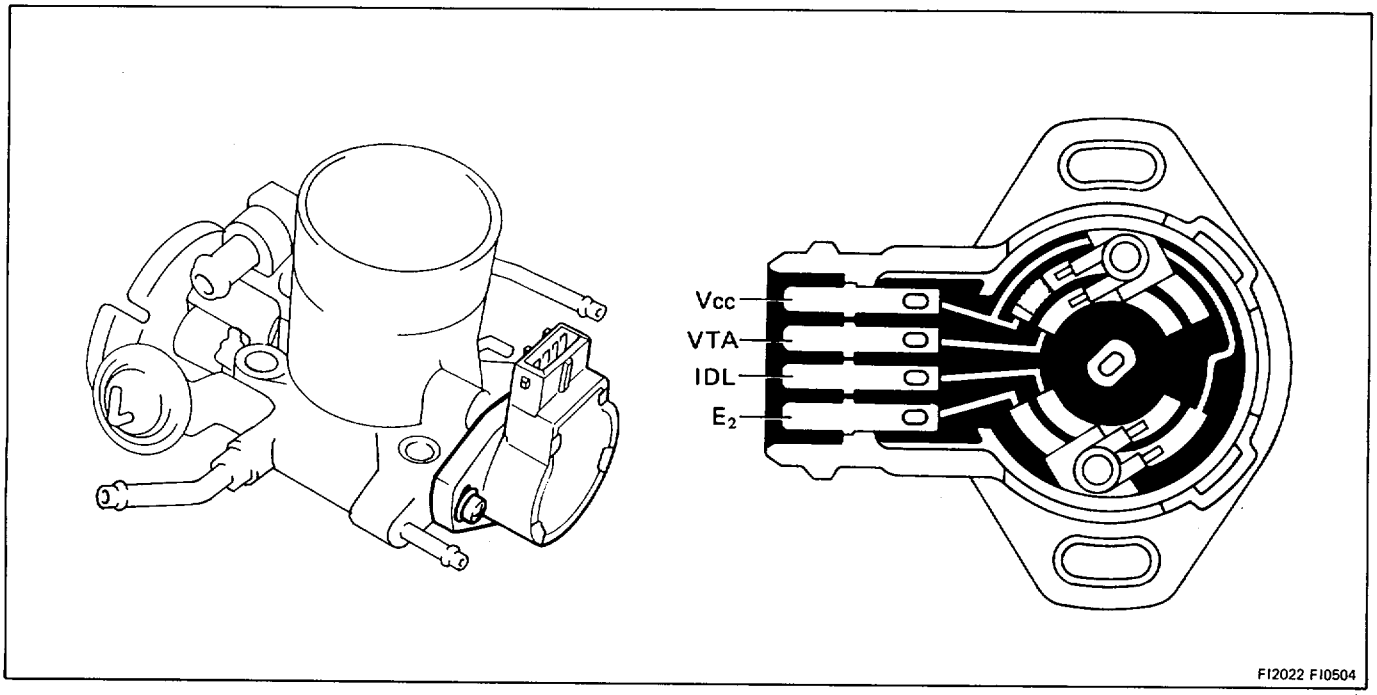
Check that the valve opens slightly, as illustrated, when room temperature is approx. 20°C (68°F).

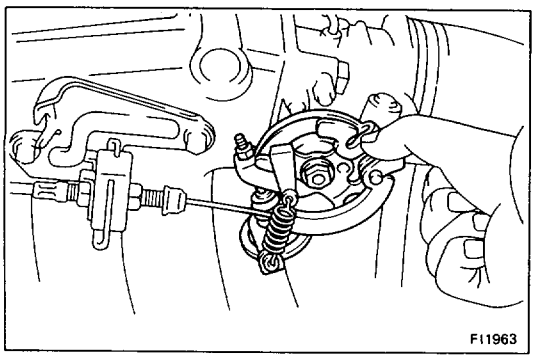


INSPECTION OF AIR VALVE

1. INSTALL AIR VALVE
   Use a new gasket and install the air valve and two bolts.
2. CONNECT WATER BY-PASS HOSE
3. CONNECT AIR VALVE CONNECTOR
4. CONNECT TWO AIR VALVE HOSES

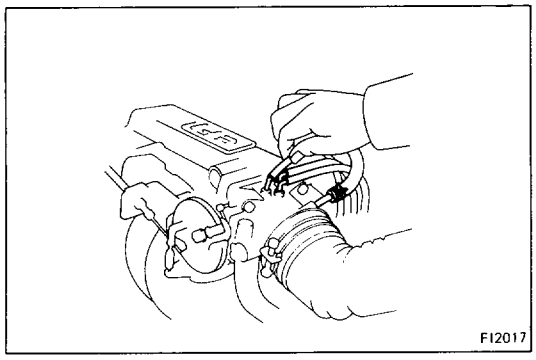
Throttle Body





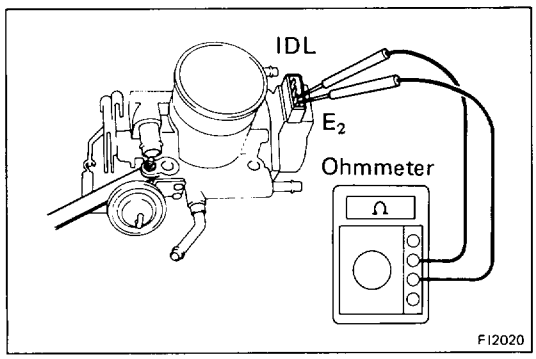
ON-VEHICLE CHECK

1. CHECK THROTTLE BODY
   (a) Check that the throttle linkage moves smoothly.



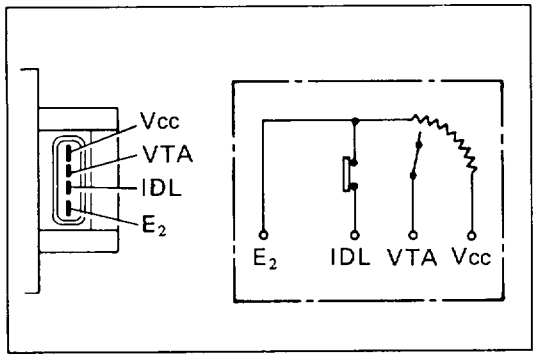
(b) Check the vacuum at each port.
- Start the engine.
- Check the vacuum with your finger.

Port No.	At idling	At 3,000 rpm
E	No vacuum	Vacuum
R	No vacuum	Vacuum
P	No vacuum	Vacuum



2. CHECK THROTTLE POSITION SENSOR

Check the resistance between the terminals.
- Unplug the connector from the sensor.
- Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, check the resistance between each terminal.



Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E_2	0.2 – 0.8 kΩ
0.57 mm (0.0224 in.)	IDL – E_2	Less than 2.3 kΩ
0.85 mm (0.0335 in.)	IDL – E_2	Infinity
Throttle valve fully opened position	VTA – E_2	3.3 – 10 kΩ
–	Vcc – E_2	3 – 7 kΩ

REMOVAL OF THROTTLE BODY

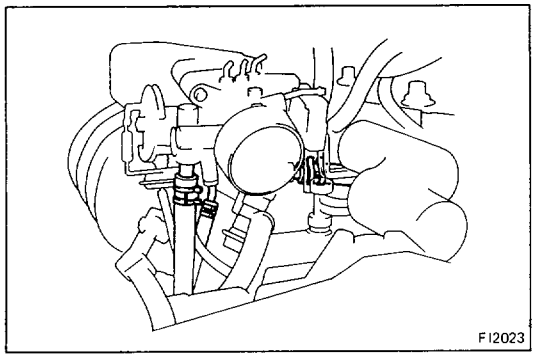
1. REMOVE AIR INTAKE CONNECTOR

2. DISCONNECT FOLLOWING HOSES:

(a) No. 1 and No. 2 water by-pass hoses

(b) Air valve hose from the throttle body

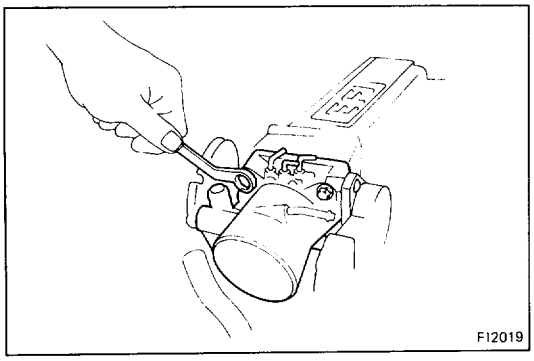
(c) Label and disconnect the emission control hoses.

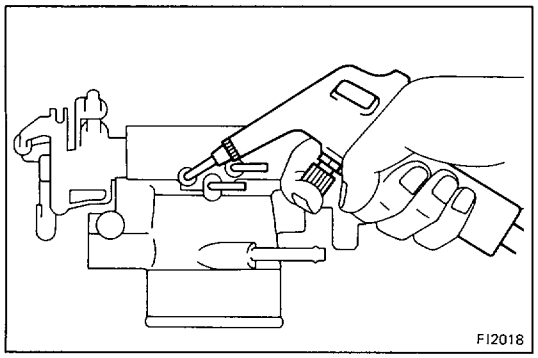


3. DISCONNECT THROTTLE SENSOR CONNECTOR

4. REMOVE THROTTLE BODY

Remove the three bolts and nut, and remove the throttle body and gasket.




FI2018

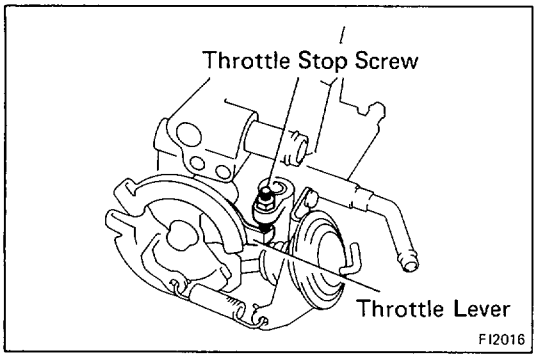
INSPECTION OF THROTTLE BODY

1. CLEAN THROTTLE BODY BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush in carburetor cleaner.

(b) Using compressed air, blow all passages and apertures in the throttle body.

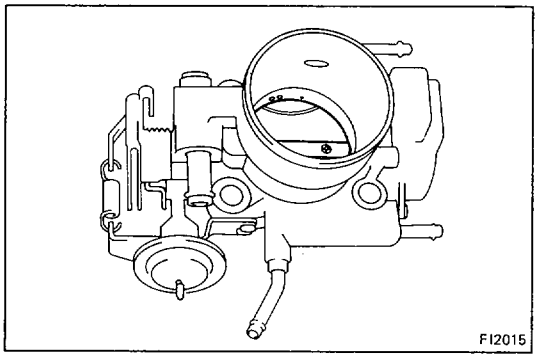
CAUTION: To prevent deterioration, do not clean the throttle position sensor.



FI2016

2. CHECK THROTTLE VALVE

(a) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.


FI2015

(b) When the throttle valve is fully closed, check that advancer port is located on the air cleaner side as shown in the figure.

If not, adjust the throttle valve closing angle.

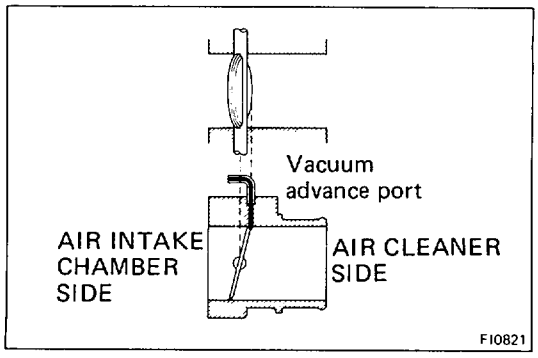
NOTE: Do not adjust the throttle valve closing angle if unnecessary.

3. IF NECESSARY, ADJUST THROTTLE STOP SCREW

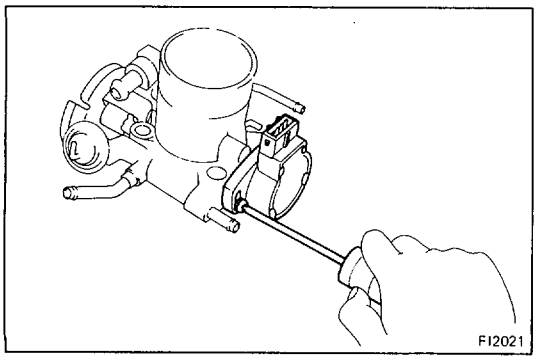
(a) After loosening the lock nut of the throttle stop screw, loosen the stop screw until it is about to touch at the lever.

(b) Have the throttle stopper screw touch the lever. Then screw it in 1/4 turns and lock it with the lock nut.

(c) After installation of the throttle body, make sure that engine rpm does not change even if the vacuum hose to the vacuum advance port is pinched.



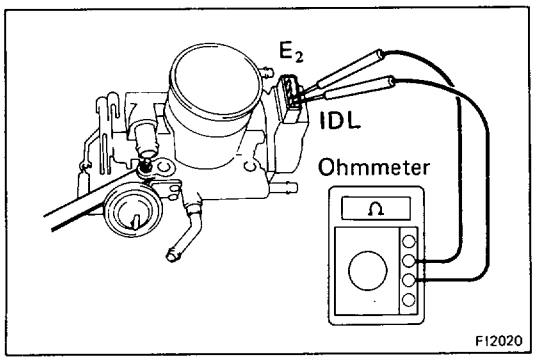
FI0821


FI2021

4. CHECK THROTTLE POSITION SENSOR
(See step 2 on page FI-68)

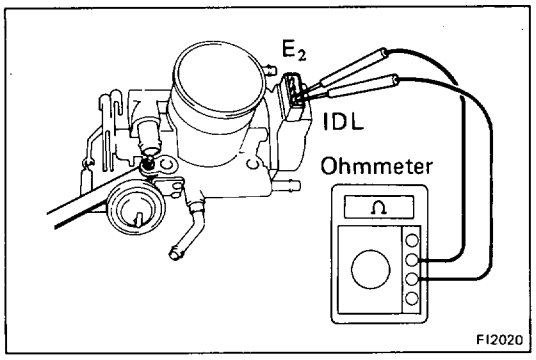
5. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two screws of the sensor.



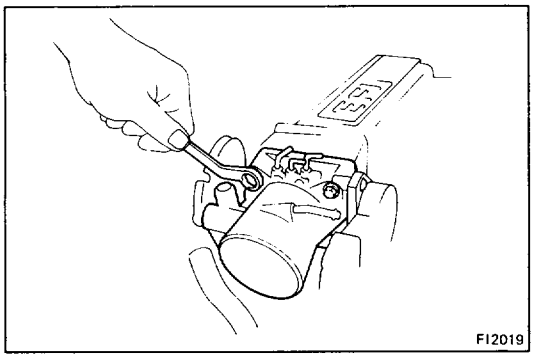
(b) Insert a thickness gauge (0.47 mm or 0.0185 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E_2.

Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with two screws.



(c) Using a thickness gauge, recheck the continuity between terminals IDL and E_2.

Clearance between lever and stop screw	Continuity (IDL – E_2)
0.57 mm (0.0224 in.)	Continuity
0.85 mm (0.0335 in.)	No continuity



INSTALLATION OF THROTTLE BODY

1. INSTALL THROTTLE BODY

Using new gaskets, install the throttle body, three bolts and nut.

2. CONNECT THROTTLE SENSOR CONNECTOR

3. CONNECT FOLLOWING HOSES:

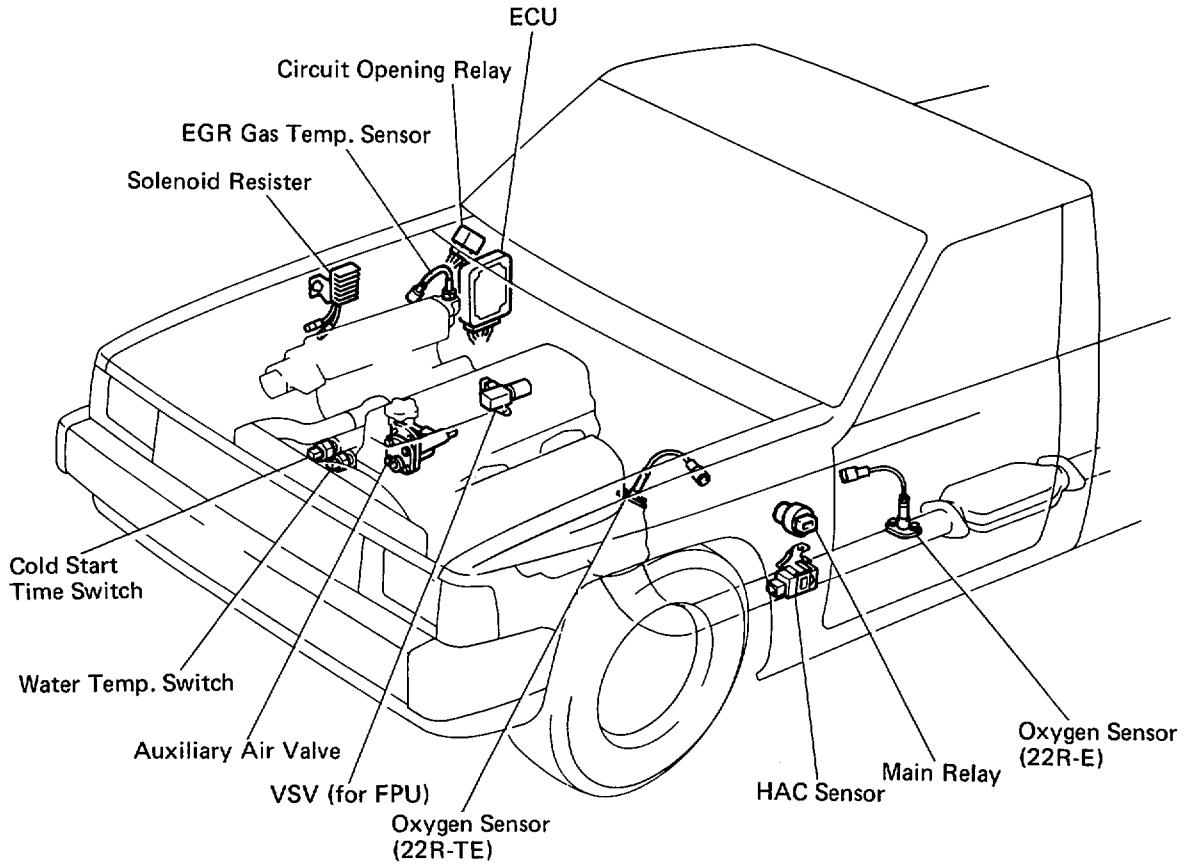
(a) Emission control hoses

(b) PCV hose to throttle body

(c) No. 1 and No. 2 water by-pass hoses.

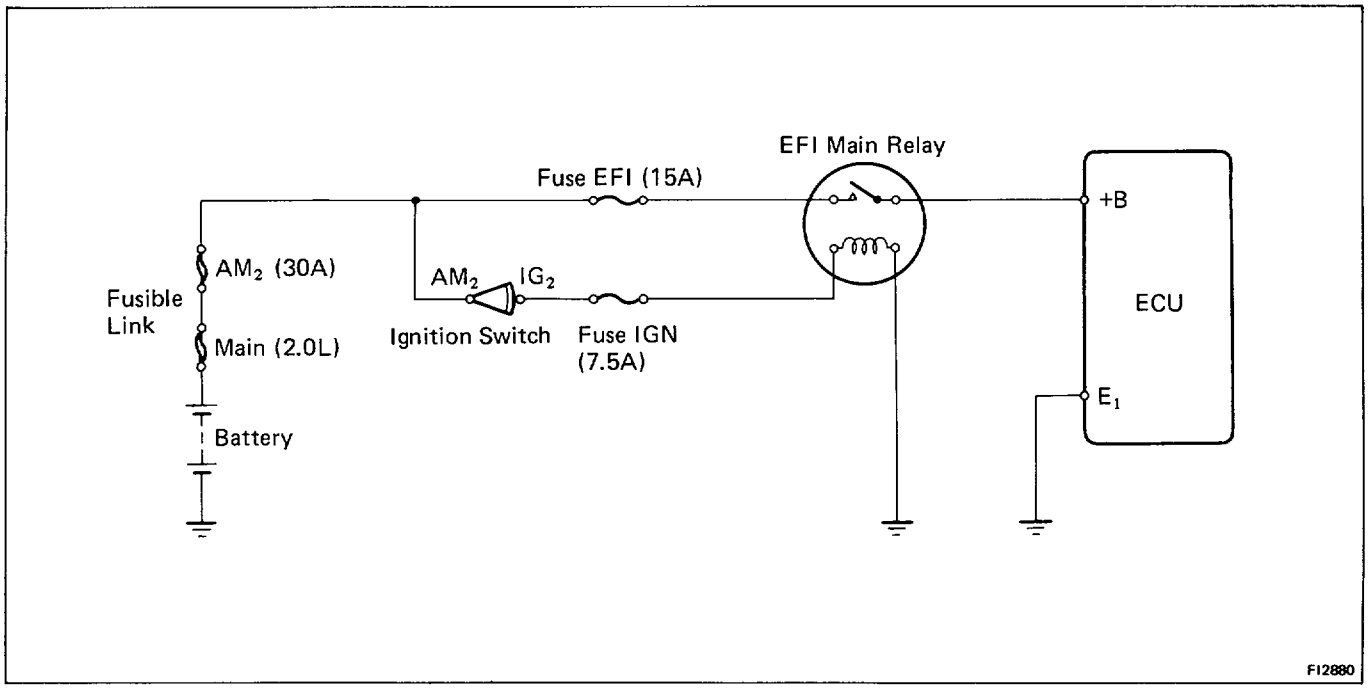
4. INSTALL AIR INTAKE CONNECTOR

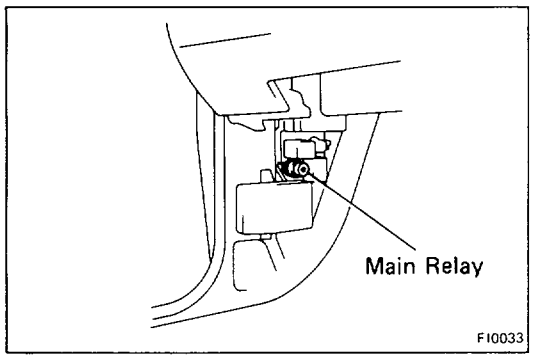
ELECTRONIC CONTROL SYSTEM
Location of Electronic Control Parts



FI1489

Main Relay



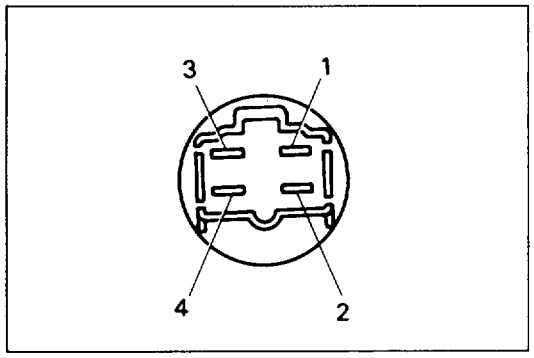


INSPECTION OF MAIN RELAY

1. CHECK MAIN RELAY OPERATION

(a) Turn on the ignition switch.

(b) At this time an operation noise will occur from the relay.



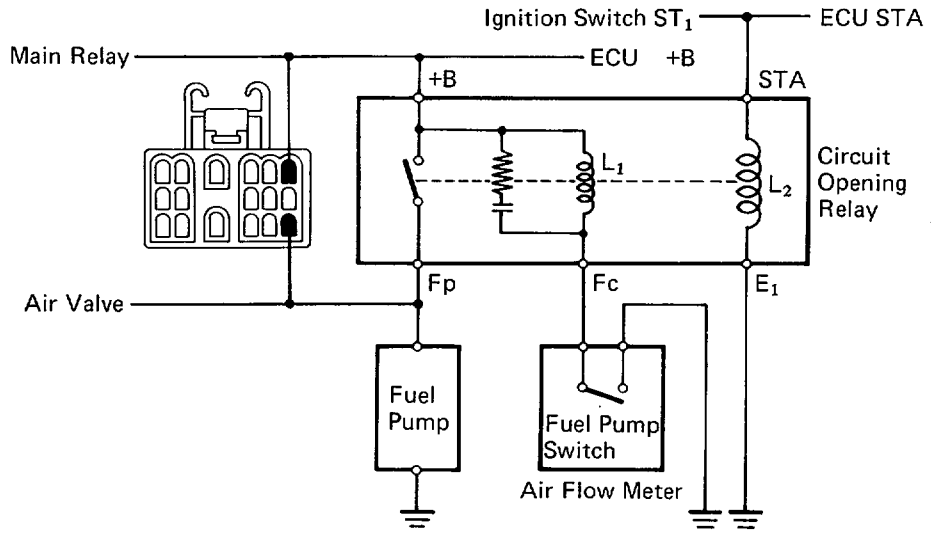
2. MEASURE RESISTANCE OF MAIN RELAYS

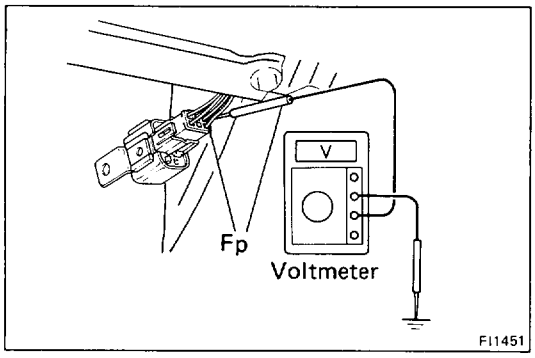
(a) Remove the main relay from the relay block.

(b) Measure the resistance between each terminal.

Between terminals	Resistance (Ω)
1 – 2	60 – 80
3 – 4	Infinity

Circuit Opening Relay





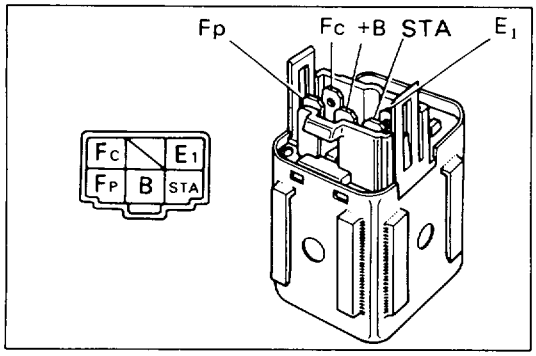
INSPECTION OF CIRCUIT OPENING RELAY

1. CHECK CIRCUIT OPENING RELAY OPERATION

(a) Remove the right kick panel, glove box and speaker.

(b) Using a voltmeter, check that the meter indicates voltage at Fp terminal during engine cranking and running.

(c) Stop the engine.



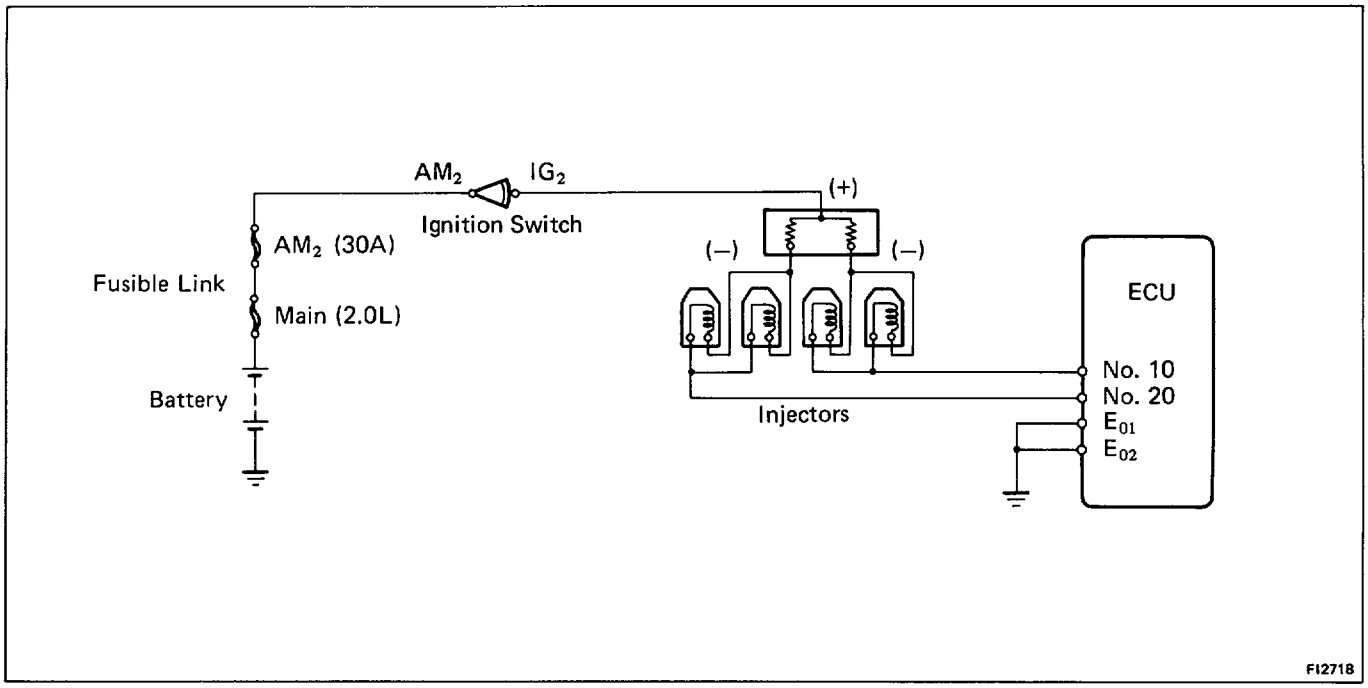
2. MEASURE RESISTANCE OF CIRCUIT OPENING RELAY

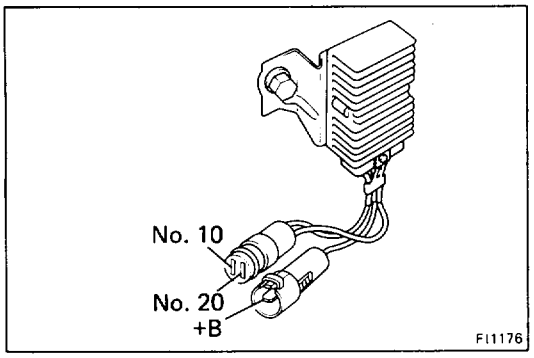
(a) Disconnect the connector.

(b) Measure the resistance between each terminal.

Between terminals	Resistance (Ω)
STA – E_1	17 – 25
+B – Fc	88 – 132
+B – Fp	Infinity

Solenoid Resistor





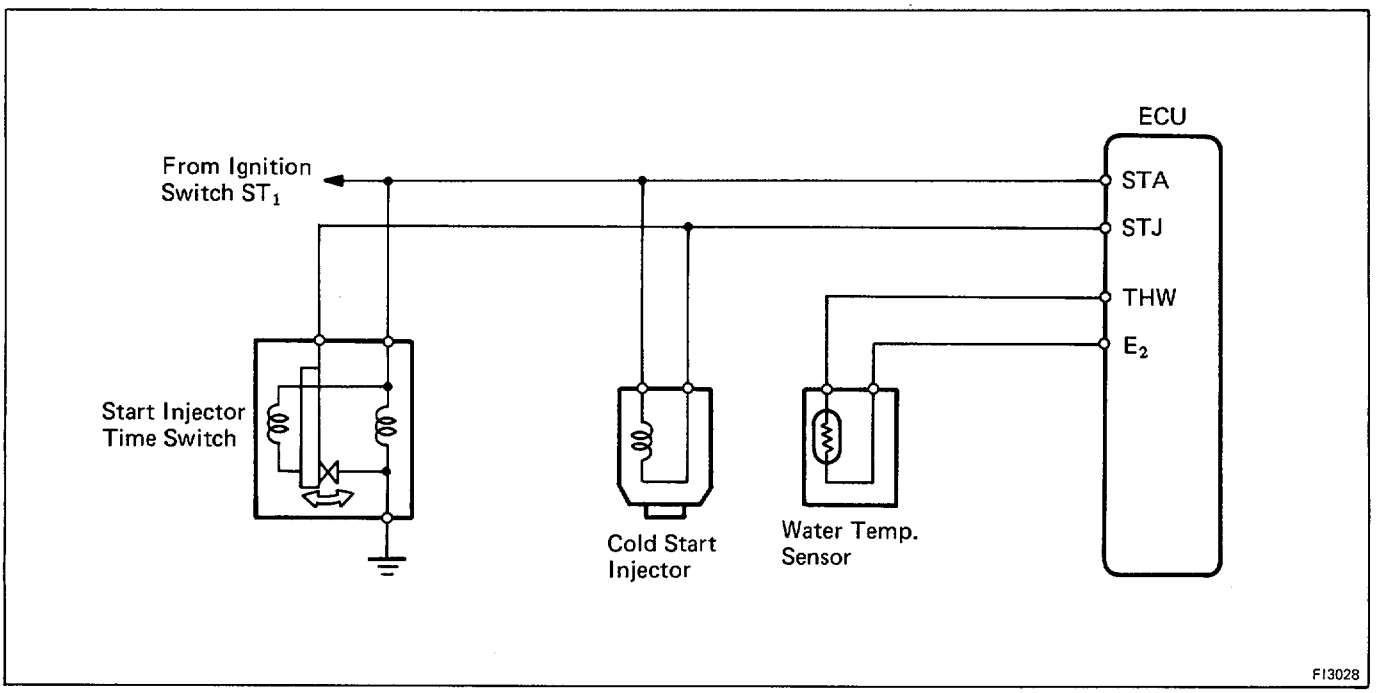
INSPECTION OF SOLENOID RESISTOR

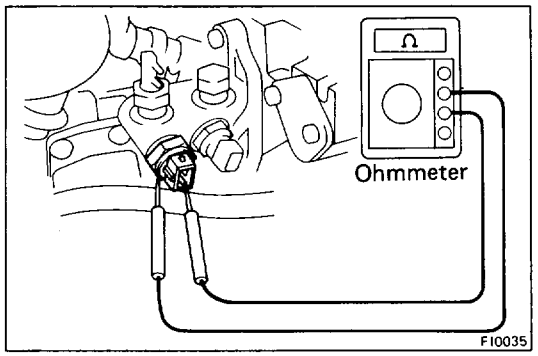
MEASURE RESISTANCE OF SOLENOID RESISTOR

Using an ohmmeter, measure the resistance between +B and other terminals.

Resistance: 2 – 3 Ω each

Start Injector Time Switch





INSPECTION OF START INJECTOR TIME SWITCH

MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

(a) Disconnect the connector.

(b) Using an ohmmeter, measure the resistance between each terminal.

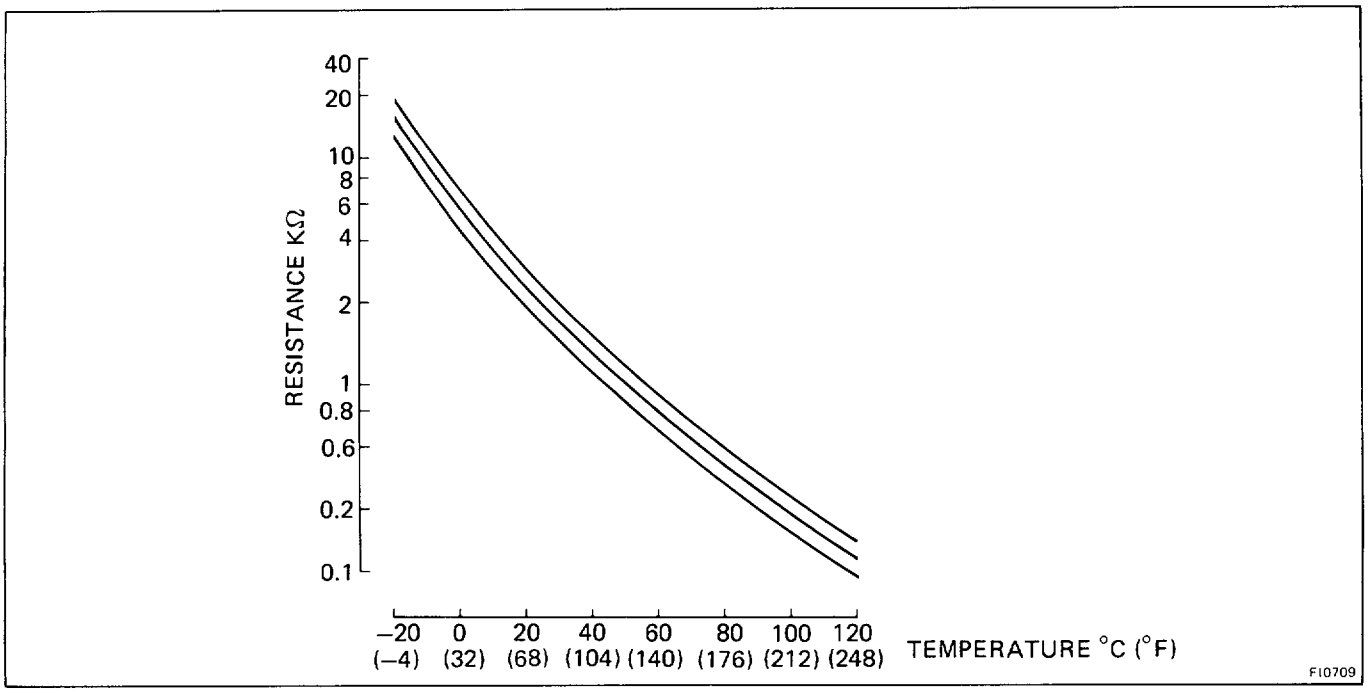
22R-E

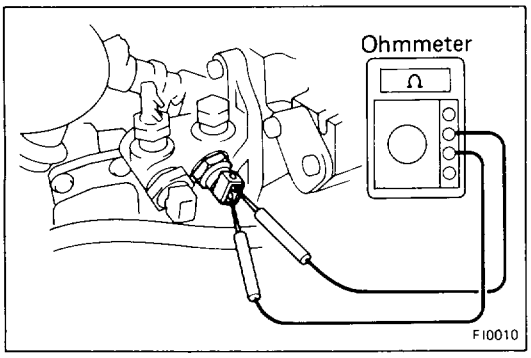
Between terminals	Resistance (Ω)	Coolant temperature
STA – STJ	30 – 50	below 10°C (50°F)
	70 – 90	above 25°C (77°F)
STA – Ground	30 – 90	–

22R-TE

Between terminals	Resistance (Ω)	Coolant temperature
STA – STJ	20 – 40	below 30°C (86°F)
	40 – 60	above 40°C (104°F)
STA – Ground	20 – 80	–

Water Temp. Sensor





INSPECTION OF WATER TEMP. SENSOR

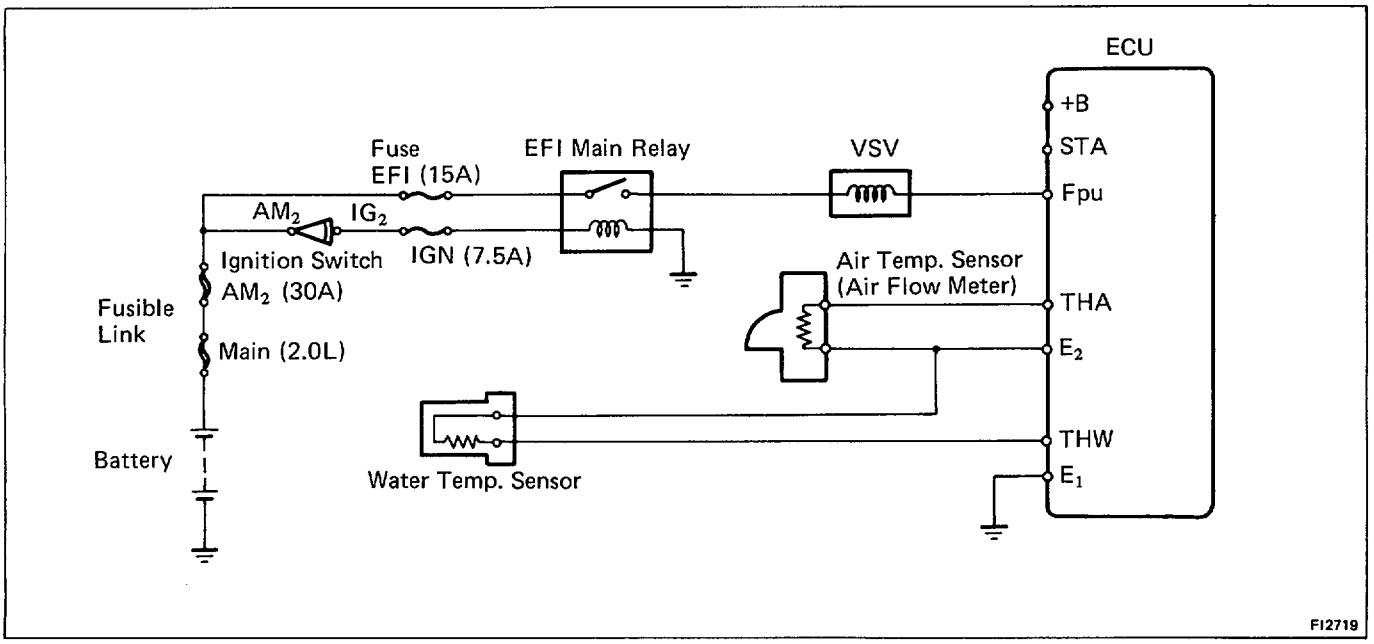
MEASURE RESISTANCE OF WATER TEMP. SENSOR

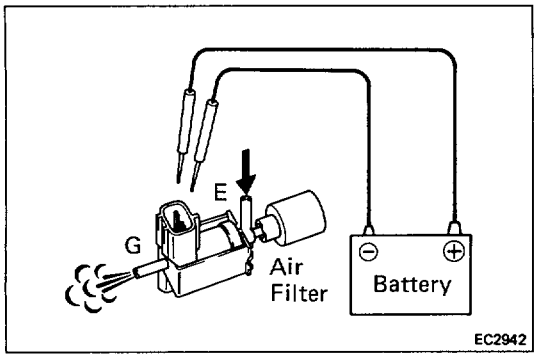
(a) Disconnect the connector.

(b) Using an ohmmeter, measure the resistance between both terminals.

Resistance: Refer to the chart

High Temp. Line Pressure Up System (22R-E)



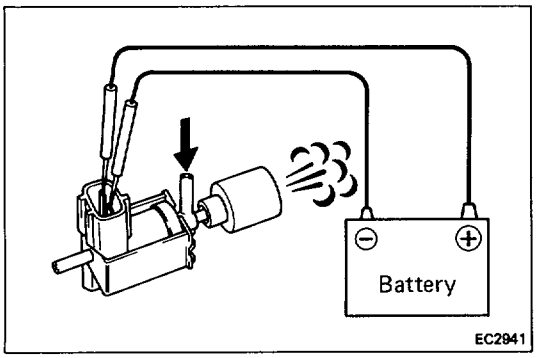


INSPECTION OF VSV

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

   (a) Connect the VSV terminals to the battery terminals as illustrated.

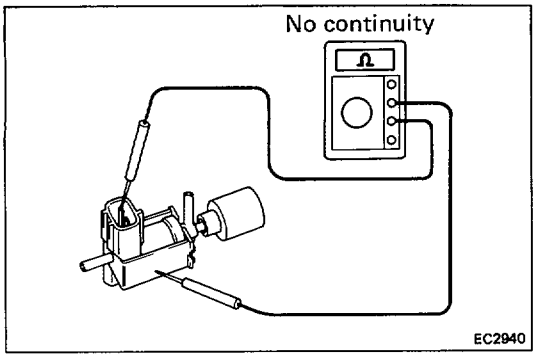
   (b) Blow into pipe E and check that air comes out of pipe G.



   (c) Disconnect the battery.

   (d) Blow into pipe E and check that air comes out of air filter.

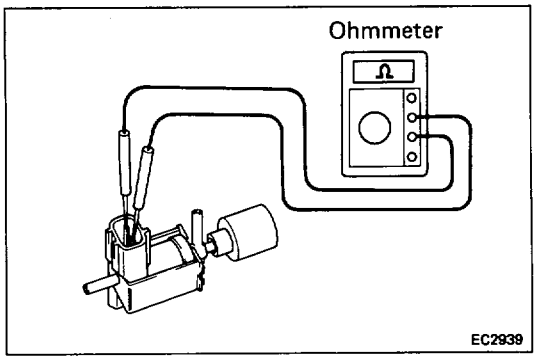
   If a problem is found, repair or replace the VSV.



2. CHECK FOR SHORT CIRCUIT

   Using an ohmmeter, check that there is no continuity between the terminal and the VSV body.

   If there is continuity, replace the VSV.



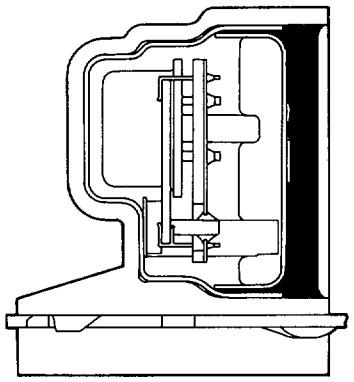
3. **CHECK FOR OPEN CIRCUIT**

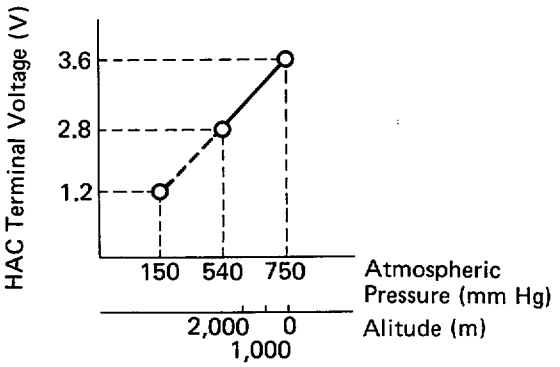
Using an ohmmeter, measure the resistance between the terminals as shown.

Specified resistance: 30 – 50 Ω at 20°C (68°F)

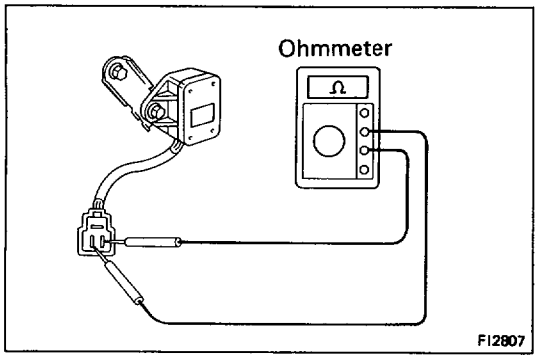
If resistance is not within specification, replace the VSV.

High Altitude Compensation (HAC) System





FI3052 FI1996

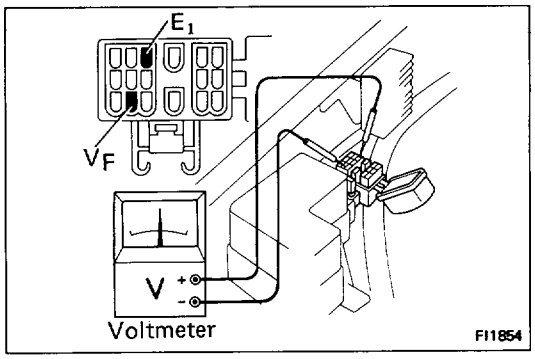


INSPECTION OF HAC SWITCH

MEASURE RESISTANCE OF HAC SWITCH

Using an ohmmeter, measure the resistance between each terminal.

Terminals	Resistance
Vcc – HAC	3 – 5 kΩ
Vcc – E_2	2 – 4 kΩ
HAC – E_2	0.4 – 1.2 kΩ



Oxygen Sensor

INSPECTION OF FEEDBACK VOLTAGE (V_F)

1. **Warm up the engine.**
2. **Connect the voltmeter to the check connector terminals V_F and E_1.**

Warm up the Oxygen sensor with the engine at 2,500 rpm for approx. 90 seconds.

Short terminals T and E_1 of the check connector. And maintain engine speed at 2,500 rpm.

Check the number of times the voltmeter needle fluctuates in 10 seconds.

- Less than 8 times
- 8 times or more
- Zero

Replace the ECU

After replacing the oxygen sensor

Normal

Warm up the Oxygen sensor with the engine at 2,500 rpm for approx. 90 seconds. And maintain engine at 2,500 rpm.

Check that the number of times the voltmeter needle fluctuates in 10 seconds.

- 8 times or more
- Zero
- Less than 8 times

Unshort terminals T and E_1 of the check connector. And maintain engine speed at 2,500 rpm.

Measure voltage between terminals V_F and E_1.

- More than 0 V
- 0 V

Read and record diagnostic codes.

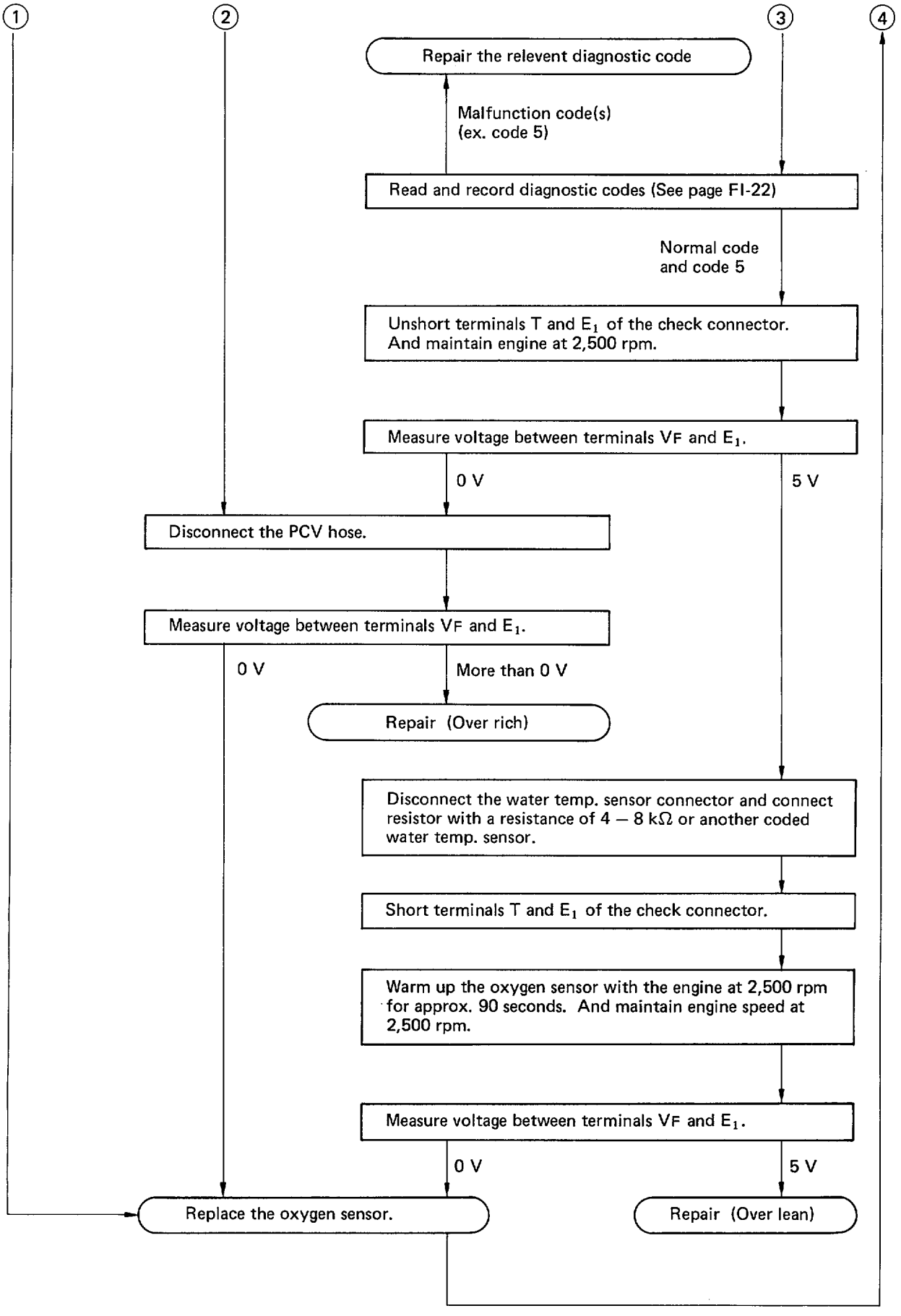
- Normal code and code 5
- Malfunction code(s) (ex. code 5)

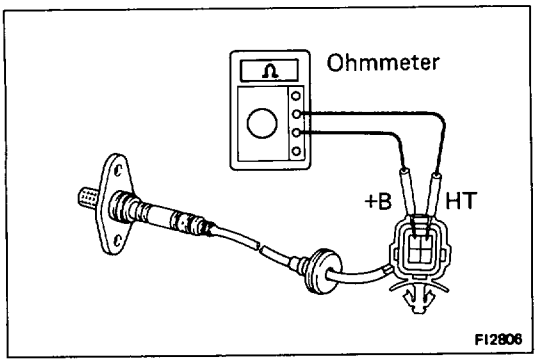
Repair the relevent diagnostic code.

(1) (2) (3) (4)

CONTINUED ON PAGE FI-81.

CONTINUED FROM PAGE FI-80.





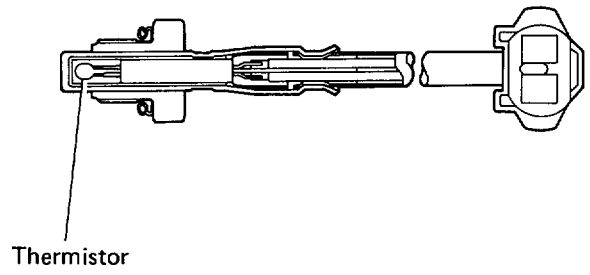
3. **INSPECT HEATER RESISTANCE OF OXYGEN SENSOR**

Using an ohmmeter, measure the resistance between the terminals +B and HT.

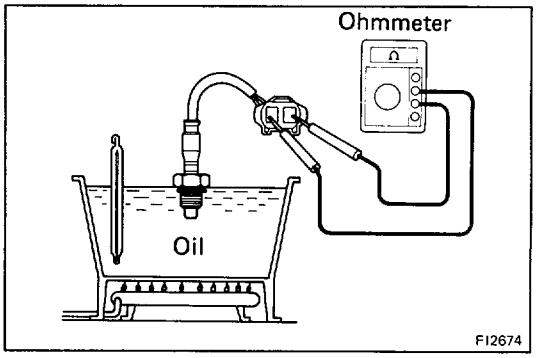
Resistance: 5.1 – 6.3 Ω at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

EGR Gas Temp. Sensor



FI2673



FI2674

INSPECTION OF EGR GAS TEMP. SENSOR

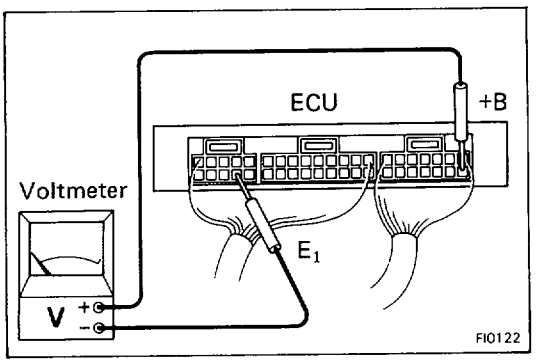
MEASURE RESISTANCE EGR GAS TEMP. SENSOR

Using an ohmmeter, measure the resistance between both terminals.

Resistance:

69.40 – 88.50 kΩ	**at 50°C (122°F)**
11.89 – 14.37 kΩ	**at 100°C (212°F)**
2.79 – 3.59 kΩ	**at 150°C (302° F)**

If the resistance is hot as specified, replace the sensor.



ECU

INSPECTION OF ECU

1. MEASURE VOLTAGE OF ECU

NOTE: The ECU itself cannot be checked directly. The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.

Check the voltage at the wiring connectors.

- Remove the right kick panel.
- Turn the ignition switch ON.
- Measure the voltage at each terminal.

NOTE: Pefform all voltage measurements with the connectors connected.
Verify that the battery voltage is 11V or above when the ignition switch is ON.

Voltage at ECU Wiring Connectors

Terminals	Condition		STD Voltage
+B – E_1	Ignition switch ON		10 – 14
BATT – E_1	–		10 – 14
IDL – E_2	Ignition switch ON	Throttle valve open	8 – 14
Vcc – E_2		–	4 – 6
VTA – E_2		Throttle valve fully closed	0.1 – 1.0
		Throttle valve fully open	4 – 5
IGt – E_1	Idling		0.7 – 1.0
STA – E_1	Ignition switch ST position		6 – 12
No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14
W – E_1	No trouble (CHECK ENGINE light off) and engine running		8 – 14
Vc – E_2	Ignition switch ON	–	6 – 10
Vs – E_2		Measuring plate fully closed	0.5 – 2.5
		Measuring plate fully open	5 – 10
	Idling		2 – 8
THA – E_2	Ignition switch ON	Intake air temperature 20°C (68°F)	1 – 3
THW – E_2	Ignition switch ON	Coolant temperature 80°C (176°F)	0.1 – 1.0
B/K – E_1	Stop light switch ON		8 – 14
*1 HAC – E_2	Ignition switch ON	760 mmHg (29.92 in.Hg, 101.3 kPa)	Approx. 3.6
*2 STJ – E_2	Ignition switch ST position	Coolant temperature 80°C (176°F)	6 – 12

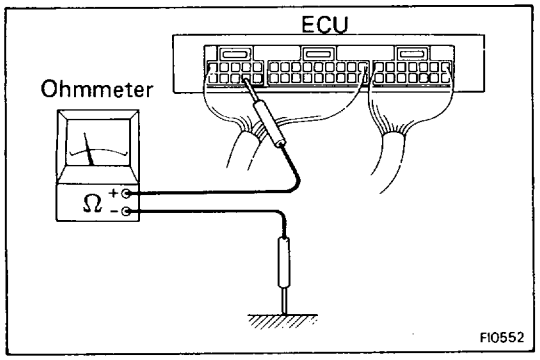
22R-E

E_{01}	No.10	STA	STJ	NSW	Fpu	W	T	IDL	IGf	THG	V_F	KNK	Ne	L_3	L_1	Vc	Vs	THA	BATT	$+B_1$
E_{02}	No.20	IGt	E_1		ACV	AS	HAC	HT	E_2	Ox	Vcc	VTA	THW	ECT	L_2	E_{21}	4WD	SPD	B/K	+B

22R-TE

E_{01}	No.10	STA	V_F			W	T	IDL	IGf			KNK	Ne			Vc	Vs	THA	BATT	$+B_1$
E_{02}	No.20	IGt	E_1			TIL			E_2	Ox	Vcc	VTA	THW					SPD		+B

*1: C & C only *2: 22R-E only



2. MEASURE RESISTANCE OF ECU

CAUTION:

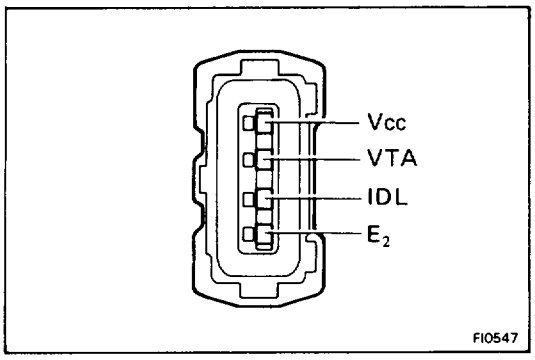
1. **Do not touch the ECU terminals.**
2. **The tester probe should be inserted into wiring connector from the wiring side.**

Check the resistance between each terminal of the wiring connector.

- Remove the right kick panel.
- Unplug the wiring connectors from the ECU.
- Measure the resistance between each terminal of the wiring connectors.

Resistance at ECU Wiring Connectors

Terminals	Condition	Resistance (kΩ)
IDL – E_2	Throttle valve open	Infinity
	Throttle valve fully closed	0 – 0.1
VTA – E_2	Throttle valve fully open	3.3 – 10
	Throttle valve fully closed	0.2 – 0.8
Vcc – E_2	–	3 – 7
THA – E_2	Intake air temperature 20°C (68°F)	2 – 3
THW – E_2	Coolant temperature 80°C (176°F)	0.2 – 0.4
+B – E_2	–	0.2 – 0.4
Vc – E_2	–	0.1 – 0.3
Vs – E_2	Measuring plate fully closed	0.02 – 0.1
	Measuring plate fully open	0.02 – 1
Ne – E_1	–	0.14 – 0.18
HAC – E_2	–	0.4 – 1.2
STJ – E_1	–	0.002 – 0.004



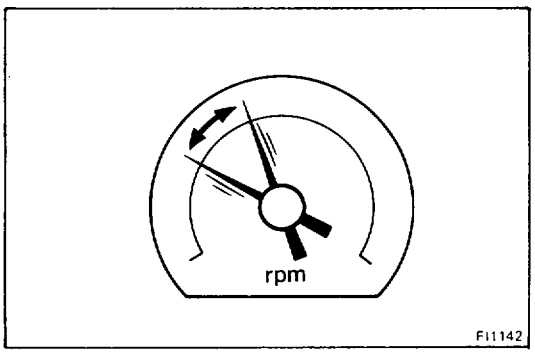
Fuel Cut RPM

INSPECTION OF FUEL CUT RPM

(a) Start and warm up the engine.

(b) Disconnect the throttle position sensor connector from the throttle position sensor.

(c) Short circuit terminals IDL and E_2 on wire connector side.



(d) Gradually raise the engine rpm and check that there is fluctuation between the fuel cut and fuel return points.

NOTE: The vehicle should be stopped.

22R-E **(M/T, 2WD or Stop light S/W ON)**
Fuel cut rpm: 1,300 rpm
Fuel return rpm: 1,000 rpm
(A/T, 4WD or Stop light S/W OFF)
Fuel cut rpm: 1,900 rpm
Fuel return rpm: 1,600 rpm

22R-TE **Fuel cut rpm: 1,800 rpm**
Fuel return rpm: 1,600 rpm

FUEL SYSTEM (22R)

	Page
PRECAUTIONS	FU-2
TROUBLESHOOTING	FU-2
ON-VEHICLE INSPECTION	FU-3
CARBURETOR	FU-4
FUEL PUMP	FU-27

PRECAUTIONS

1. **Before working on the fuel system, disconnect the cable from the negative battery terminal.**
2. **When working on the fuel system, keep away from possible fire hazards and do not smoke.**
3. **Keep gasoline off rubber or leather parts.**
4. **Work on only one component group at a time to avoid confusion between similar looking parts.**
5. **Keep work area clean to avoid contamination of the carburetor and components.**
6. **Be careful not to mix up or lose clips or springs.**

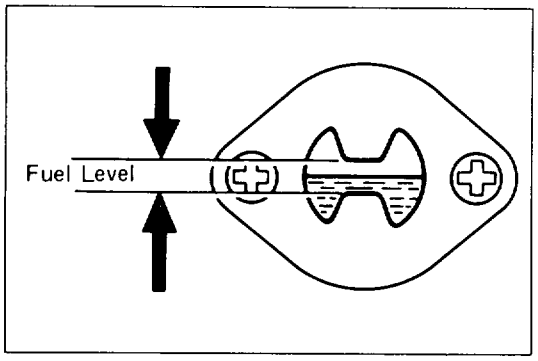
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ Hard to start (cranks ok)	Carburetor problems • Choke operating • Flooding • Needle valve sticking or clogged • Vacuum hose disconnected or damaged • Fuel cut solenoid valve not open	Repair as necessary	FU-4
Rough idle or stalls	Carburetor problems • Idle speed incorrect • Slow jet clogged • Idle mixture incorrect • Fuel cut solenoid valve not open • Fast idle speed setting incorrect (cold engine) • Choke system faulty • Secondary throttle valve not closed	Perform on-vehicle inspection of carburetor	FU-3
Engine hesitates/ Poor acceleration	Fuel line clogged Carburetor problems • Float level too low • Accelerator pump faulty • Power valve faulty • Choke valve closed (hot engine) • Choke system	Check fuel line Repair as necessary	FU-4
Engine dieseling (runs after ignition switch is turned off)	Carburetor problems • Linkage sticking • Idle speed or fast idle speed out of adjustment • Fuel cut solenoid faulty	Repair as necessary	FU-4
Poor fuel economy	Fuel leak Carburetor problems • Choke faulty • Idle speed too high • Deceleration fuel cut system faulty • Power valve always open	Repair as necessary Perform on-vehicle inspection of carburetor	FU-3
Insufficient fuel supply to carburetor	Fuel filter clogged Fuel pump faulty Fuel line clogged Fuel line bent or kinked	Replace fuel filter Replace fuel pump Check fuel line Replace fuel line	FU-28 FU-30

ON-VEHICLE INSPECTION

1. **REMOVE AIR CLEANER (See page FU-5)**

2. **CHECK CARBURETOR AND LINKAGE**
   (a) Check that the various set screws, plugs and union bolts are tight and installed correctly.
   (b) Check the linkage for excessive wear and missing snap rings.
   (c) Check that the throttle valves open fully when the accelerator pedal is fully depressed.



3. **CHECK FLOAT LEVEL**
   Check that the fuel level is about even with the correct level in the sight glass.
   If not, check the carburetor needle valve and float level, and adjust or repair, as necessary.

COLD ENGINE

4. **CHECK AUTOMATIC CHOKE (See page EC-61)**

5. **CHECK CHOKE OPENER (See page EC-63)**

6. **CHECK CHOKE BREAKER (See page EC-62)**

7. **CHECK AAP SYSTEM (See page EC-66)**

8. **CHECK OUTER VENT CONTROL VALVE**

HOT ENGINE

9. **CHECK AUTOMATIC CHOKE (See page EC-61)**

10. **CHECK CHOKE OPENER (See page EC-63)**

11. **CHECK AAP SYSTEM (See page EC-66)**

12. **CHECK ACCELERATION PUMP**
    Open the throttle valve, and check that gasoline spurts out from the acceleration nozzle.

13. **CHECK FUEL CUT SYSTEM (See page EC-68)**

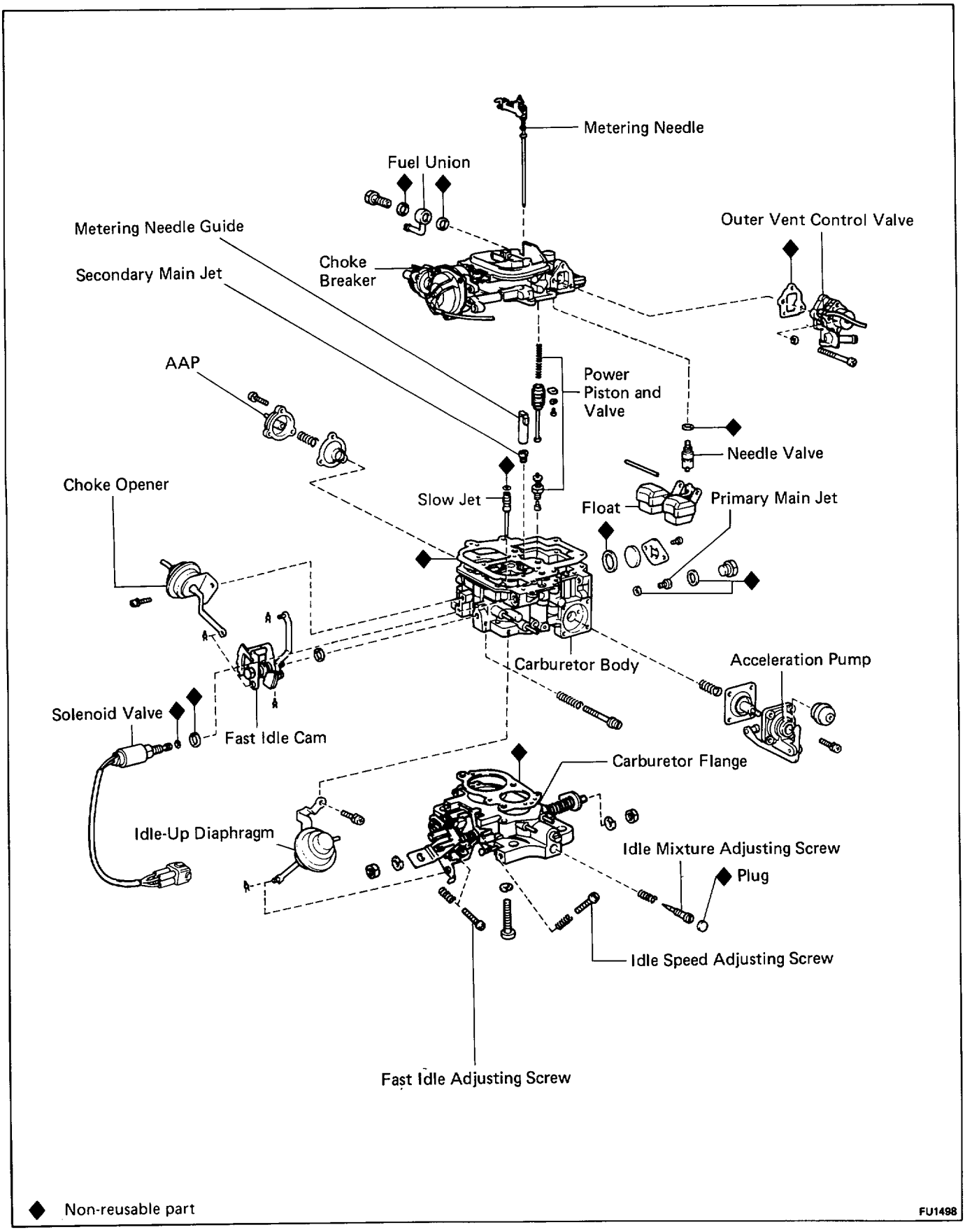
14. **INSTALL AIR CLEANER (See page FU-23)**

15. **CHECK AND ADJUST THE IDLE SPEED (See page FU-23)**

16. **CHECK AND ADJUST FAST IDLE SPEED (See page FU-22)**

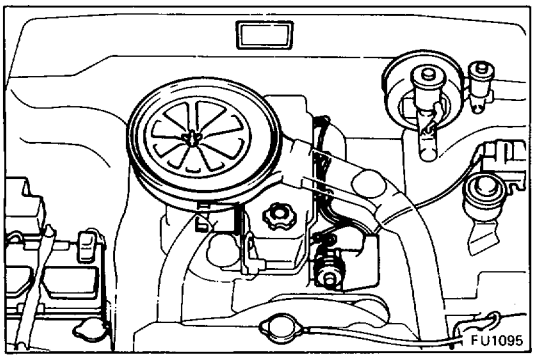
CARBURETOR

COMPONENTS



◆ Non-reusable part

FU1498



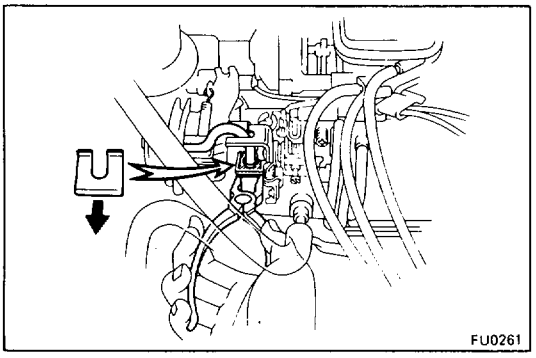
REMOVAL OF CARBURETOR

1. REMOVE AIR CLEANER

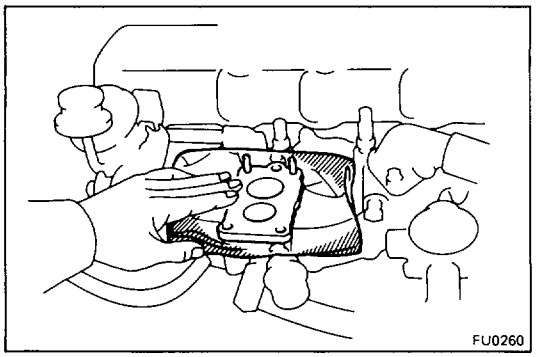
(a) Disconnect the emission control hoses.
(b) Disconnent the air intake hose.
(c) Remove the two mounting nuts and butterfly nut.
(d) Lift the air cleaner off the carburetor.

2. DISCONNECT FOLLOWING HOSES FROM CARBURETOR

(a) Emission control hoses
(b) PCV hose from the flange
(c) Fuel hose
(d) Wiring connector



3. DISCONNECT ACCELERATOR LINKAGE



4. REMOVE CARBURETOR

(a) Remove the carburetor mounting bolts and nuts.
(b) Lift out the carburetor.
(c) Cover the inlet hole of the intake manifold with a cloth.

DISASSEMBLY OF CARBURETOR

(See page FU-4)

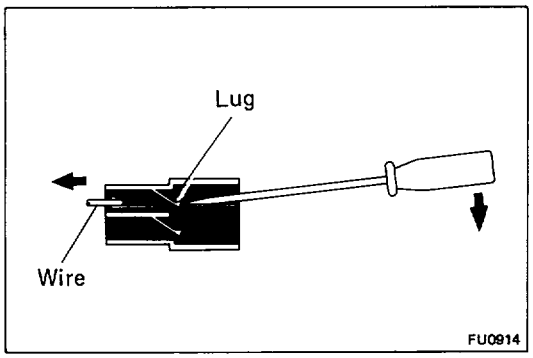
The following instructions are organized so that you work on only one component group at a time. This will help avoid confusion from similar looking parts from different sub-assemblies being on your workbench at the same time.

(a) To facilitate reassembly, arrange parts in order.

(b) Be careful not to mix up or lose clips or springs.

(c) Use SST (Carburetor Driver Set).

SST 09860-11011

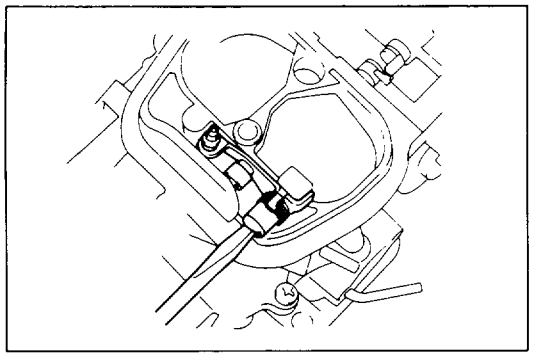


Disassembly of Air Horn

(See page FU-4)

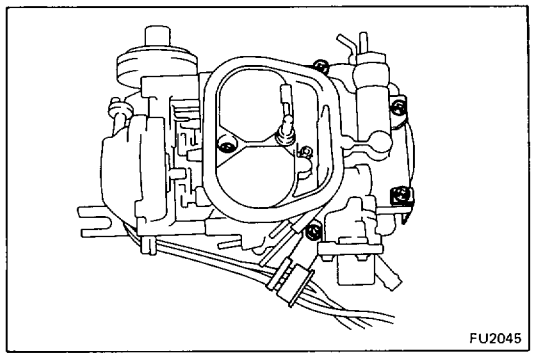
1. DISCONNECT TERMINAL FROM CONNECTOR

Pry up the locking lugs with a screwdriver and pull out the terminals.



2. REMOVE METERING NEEDLE

Loosen the screw and remove the metering needle.

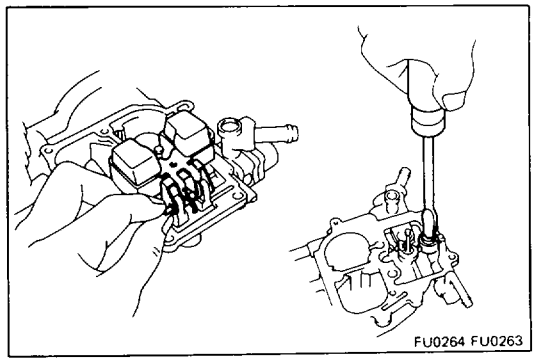


3. REMOVE AIR HORN ASSEMBLY

(a) Disconnect the fast idle link and air valve connecting rod.

(b) Remove the five air horn screws and lift the air horn from the body.

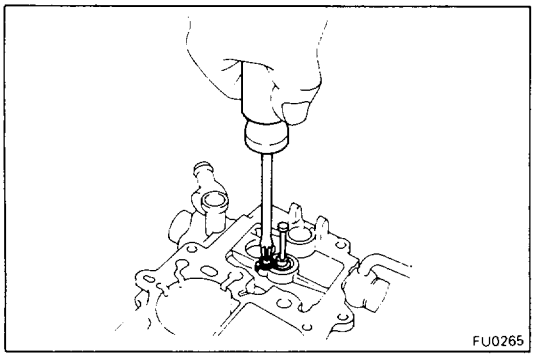
(c) Remove the air horn gasket.



4. REMOVE FLOAT AND NEEDLE VALVE

(a) Remove the pivot pin and float with the needle valve.

(b) Remove the needle valve seat.

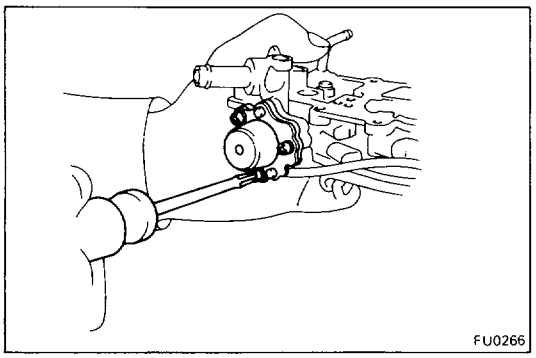

FU0265

5. REMOVE POWER PISTON

(a) Loosen the retainer screw.

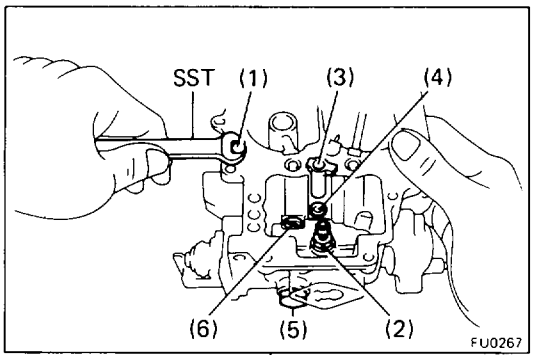
(b) While holding the piston, rotate the retainer.

(c) Remove the power piston and spring.


FU0266

6. REMOVE OUTER VENT CONTROL VALVE

Loosen the three screws and remove the outer vent control valve.



Disassembly of Carburetor Body

1. REMOVE JETS AND POWER VALVE

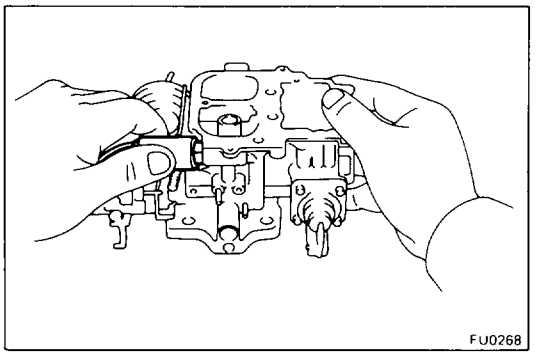
(a) Using SST, remove the slow jet (1).

SST 09922-00010

(b) Remove the power valve (2).

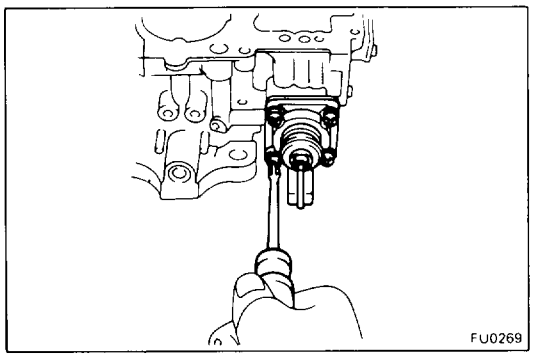
(c) Remove the metering needle guide (3) and secondary main jet (4).

(d) Remove the plug (5) and primary main jet (6).



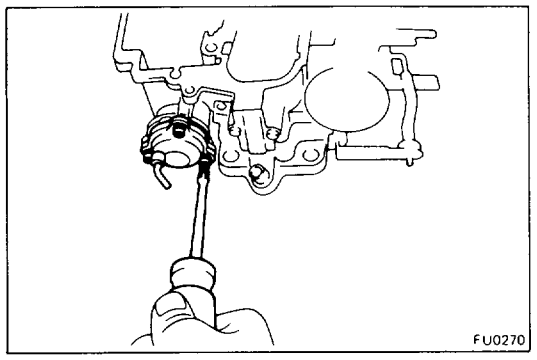
2. REMOVE FUEL CUT SOLENOID VALVE

Remove the solenoid valve from the carburetor body.



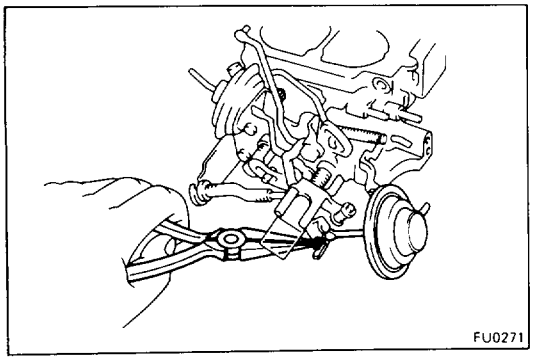
3. REMOVE ACCELERATION PUMP

Remove the four screws, pump housing, diaphragm and spring.



4. REMOVE AUXILIARY ACCELERATION PUMP

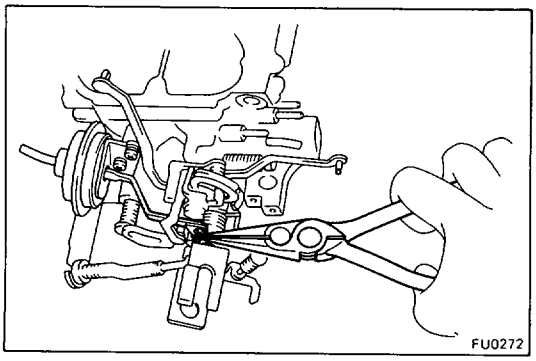
Remove the three screws, pump housing, spring and diaphragm.



5. REMOVE IDLE-UP DIAPHRAGM

(a) Disconnect the idle up diaphragm link.

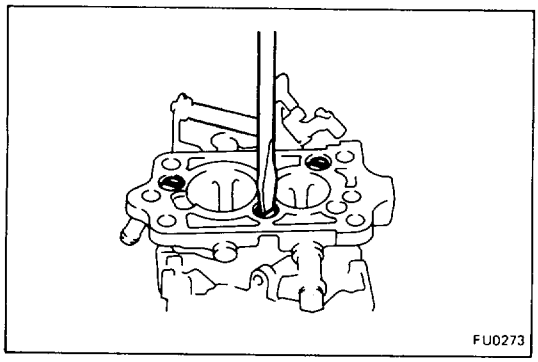
(b) Remove the idle up diaphragm.



6. REMOVE CHOKE OPENER

(a) Disconnect the choke opener link.

(b) Remove the choke opener.



7. SEPARATE BODY AND FLANGE

(a) Remove the three screws.

(b) Separate the body and flange.

GENERAL CLEANING PROCEDURE

CLEAN DISASSEMBLED PARTS BEFORE INSPECTION

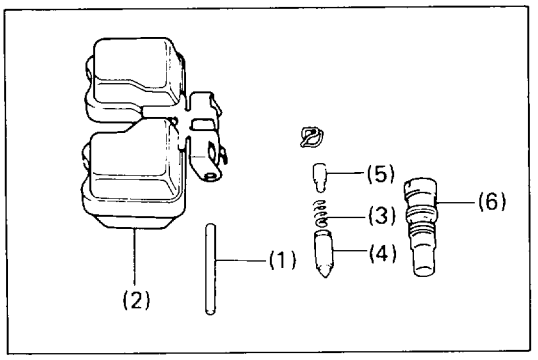
(a) Wash and clean the cast parts with a soft brush and carburetor cleaner.

(b) Clean off the carbon around the throttle valve.

(c) Wash the other parts thoroughly in carburetor cleaner.

(d) Blow all dirt and other foreign material from the jets, fuel passages and restrictions in the body.

INSPECTION OF CARBURETOR



1. INSPECT FLOAT AND NEEDLE VALVE

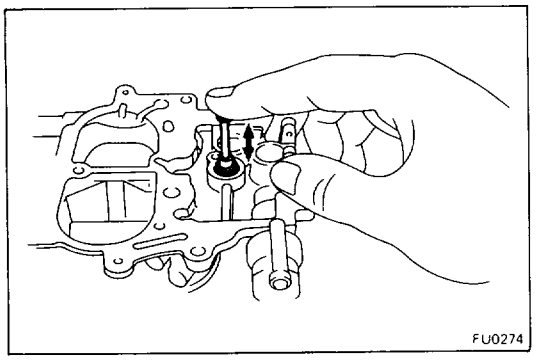
(a) Inspect the pivot pin (1) for scratches and excessive wear.

(b) Inspect the float (2) for broken lip or wear in the pivot pin holes.

(c) Inspect the spring (3) for breaks or deformation.

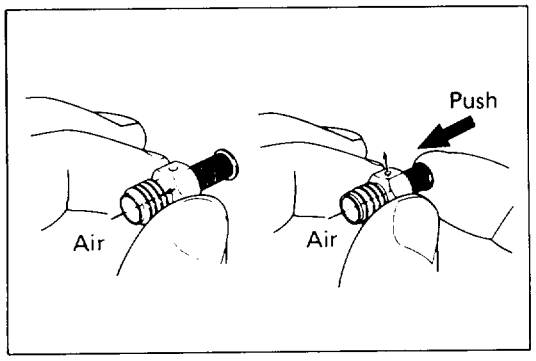
(d) Inspect the needle valve (4) and plunger (5) for wear or damage.

(e) Inspect the strainer (6) for rust or breaks.



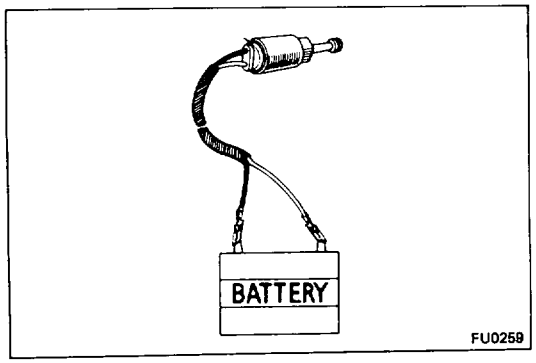
2. INSPECT POWER PISTON

Make sure that power piston moves smoothly.



3. INSPECT POWER VALVE

Check for faulty opening and closing action.



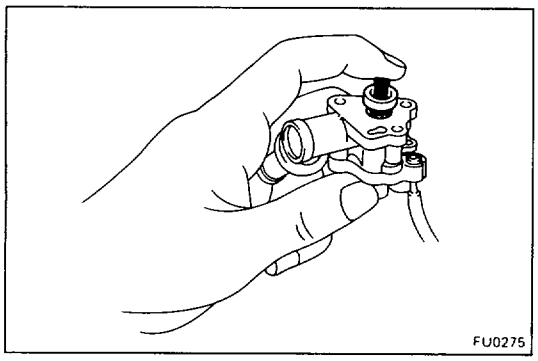
4. INSPECT FUEL CUT SOLENOID VALVE

(a) Connect the terminals to the battery terminals.

(b) You should feel a click from the solenoid valve when the battery power is connected and disconnected.

If the solenoid valve is not operating properly, replace it.

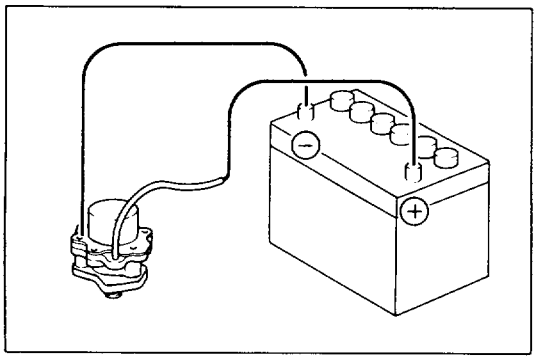
(c) Replace the O-ring.



5. INSPECT OUTER VENT CONTROL VALVE

(a) Check the valve and valve seats for damage.

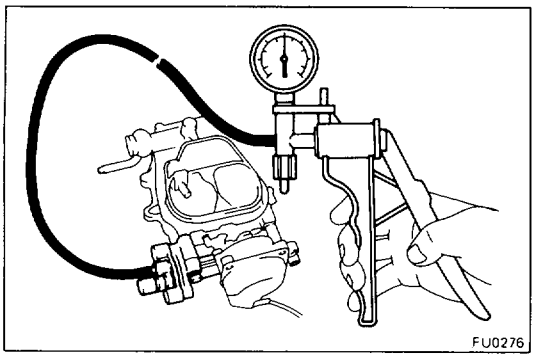
(b) Check that the valve rod moves smoothly.



(c) Connect the terminal to the battery terminal.

(d) You should feel a click from the control valve when battery power is connected and disconnected.

If the control valve is not operating properly, replace it.

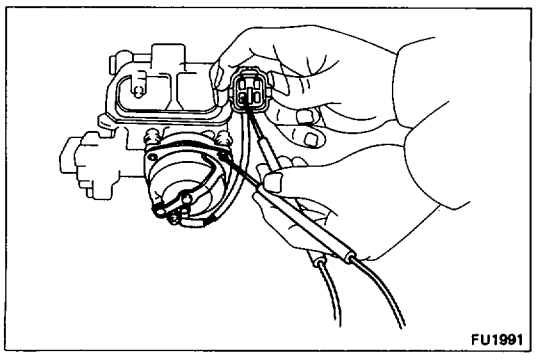


6. INSPECT CHOKE BREAKER DIAPHRAGM

(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

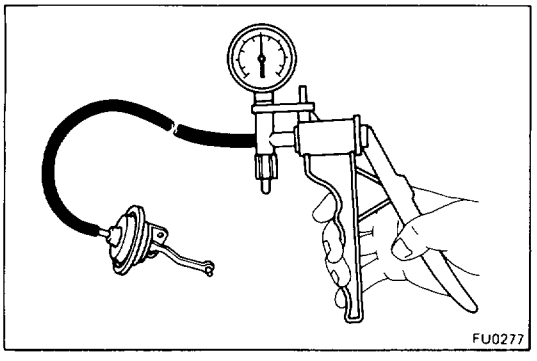
(c) Check that the choke valve opens slightly when vacuum is applied.



7. INSPECT CHOKE HEATER

Using an ohmmeter, measure the resistance, between the terminal and heater housing.

Resistance: 20 – 22Ω at 20°C (68°F)

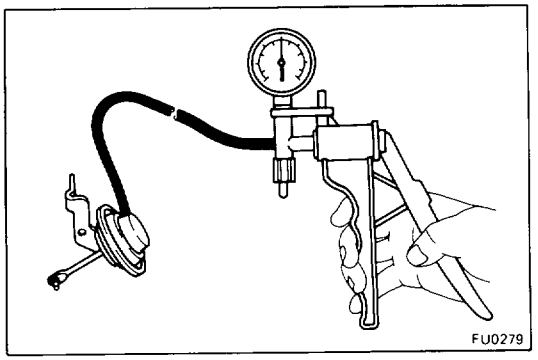


8. INSPECT CHOKE OPENER DIAPHRAGM

(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

(c) Check that the link moves when vacuum is applied.

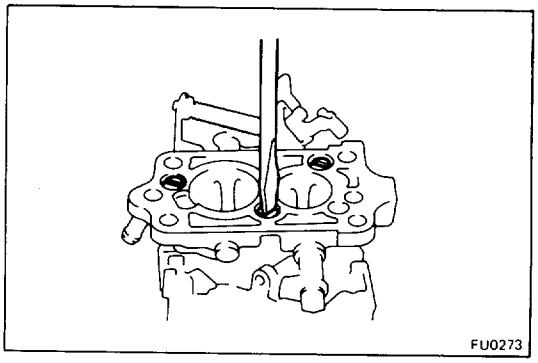


9. INSPECT IDLE-UP DIAPHRAGM

(a) Apply vacuum to the diaphragm.

(b) Check that the vacuum does not drop immediately.

(c) Check that the link moves when vacuum is applied.


FU0273

ASSEMBLY OF CARBURETOR

NOTE: Use new gaskets and O-rings throughout.

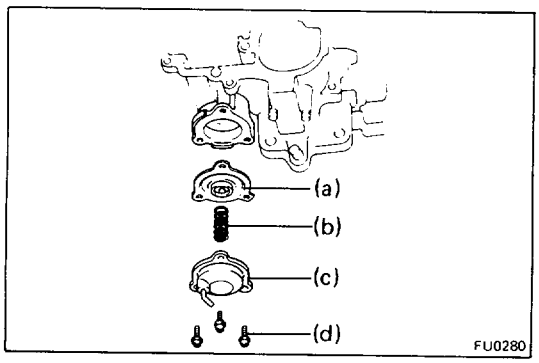
Assembly of Carburetor Body

(See page FU-4)

1. ASSEMBLE CARBURETOR BODY AND FLANGE

(a) Place a new gasket and flange in position on the body.

(b) Install the three screws.



FU0280

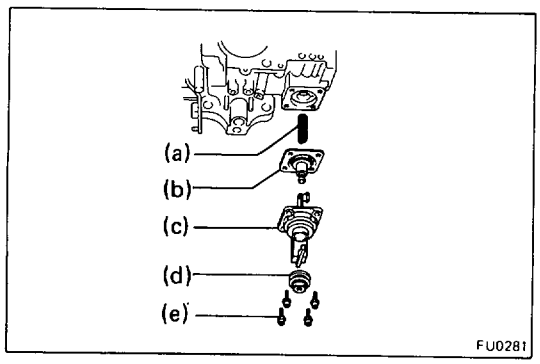
2. INSTALL AUXILIARY ACCELERATION PUMP IN ORDER, AS SHOWN:

(a) Diaphragm (with outer gasket)

(b) Spring

(c) Cover

(d) Screws



FU0281

3. INSTALL ACCELERATION PUMP IN ORDER AS SHOWN:

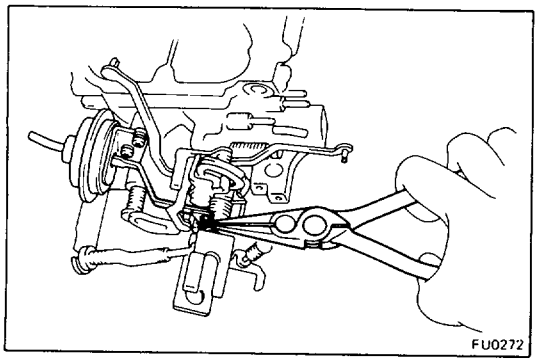
(a) Spring

(b) Diaphragm (with outer gasket)

(c) Cover

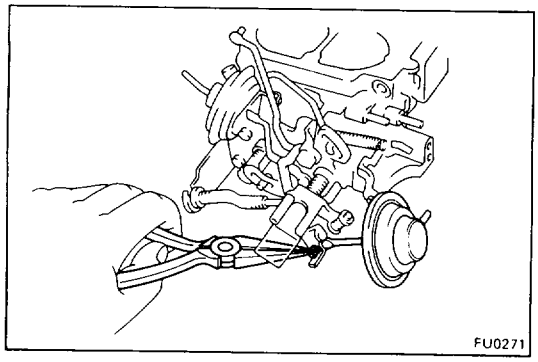
(d) Boot

(e) Screws


FU0272

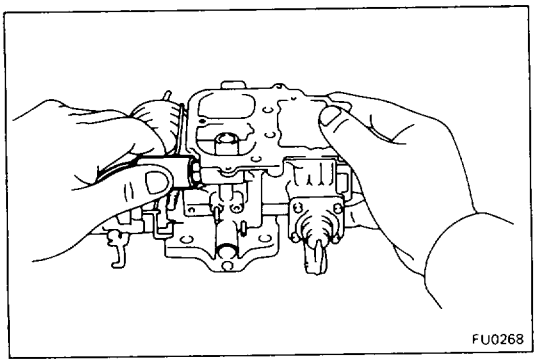
4. INSTALL CHOKE OPENER

Install the choke opener, and connect the link.


FU0271

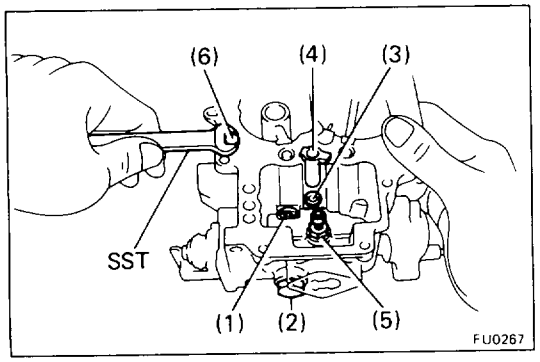
5. INSTALL IDLE-UP DIAPHRAGM

Install the idle-up diaphragm, and connect the link.



6. INSTALL FUEL CUT SOLENOID VALVE

Install the solenoid valve with a new gasket and new O-ring into the carburetor body.



7. INSTALL MAIN JETS, SLOW JET AND POWER VALVE

(a) Install the primary main jet (1) over a new gasket.

(b) Install the plug (2) over a new gasket.

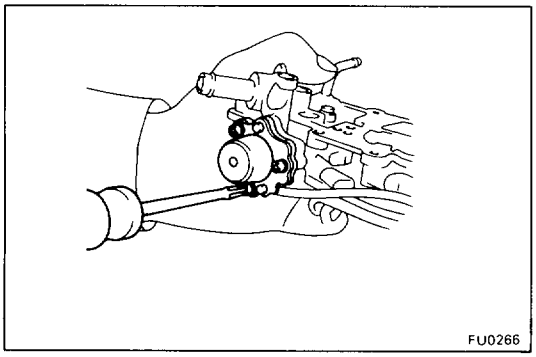
(c) Install the secondary main jet (3) and metering needle guide (4).

(d) Install the power valve (5).

(e) Assemble a new O-ring on the slow jet.

(f) Using SST, install the slow jet (6).

SST 09922-00010



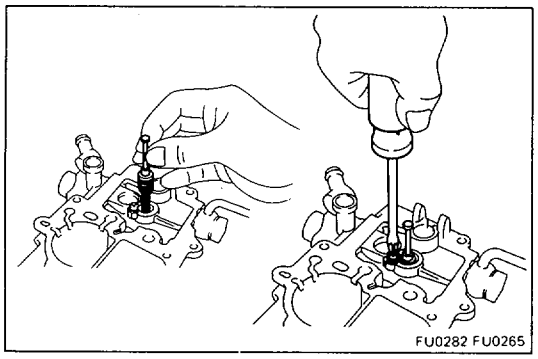
Assembly of Air Horn

(See page FU-4)

1. INSTALL OUTER VENT CONTROL VALVE

(a) Place a new gasket in position on the air horn.

(b) Install the outer vent control valve on the air horn with the three screws.

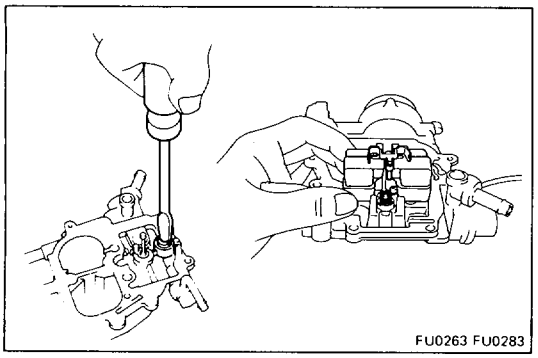


2. INSTALL POWER PISTON

(a) Place the power piston spring and piston into the bore.

(b) While pushing the piston, rotate the retainer over the piston.

(c) Tighten the retainer screw.



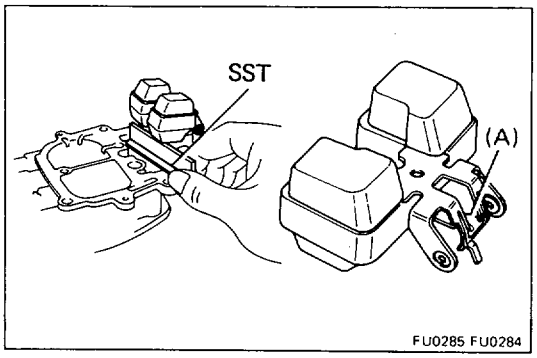
3. INSTALL FLOAT AND NEEDLE VALVE

(a) Install the valve seat over a new gasket into the fuel inlet.

(b) Install the needle valve onto the valve seat.

(c) Insert the lip of the float under the wire of the needle valve.

(d) Install the float and secure it with the pivot pin.



4. ADJUST FLOAT LEVEL

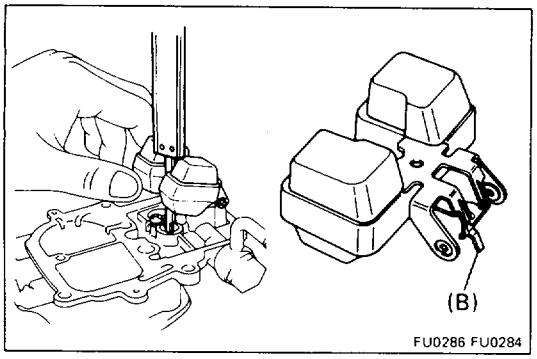
(a) Allow the float to hang down by its own weight. Using SST, check the clearance between the float top and air horn.

SST 09240-00014

NOTE: This measurement should be made without a gasket on the air horn.

Float level (raised position): 9.8 mm (0.386 in.)

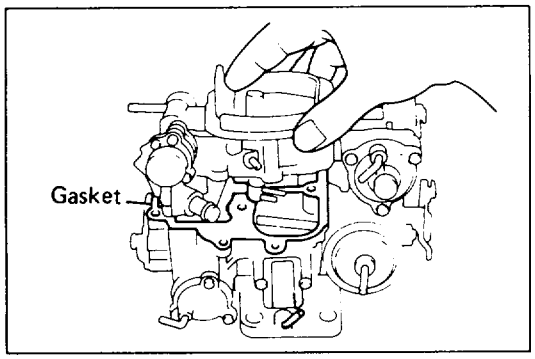
(b) Adjust by bending portion (A) of the float.



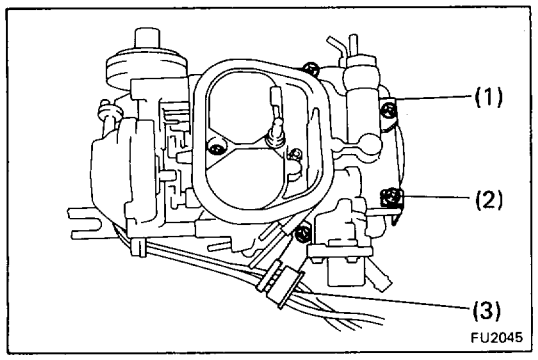
(c) Lift up the float and, using vernier calipers, check the distance between the air horn and the float bottom.

Float level (lowered position): 48 mm (1.89 in.)

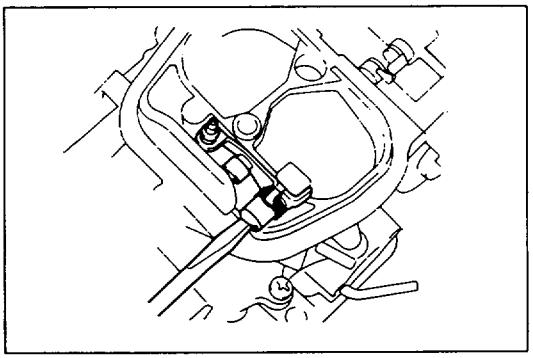
(d) Adjust by bending portion (B) of the float.



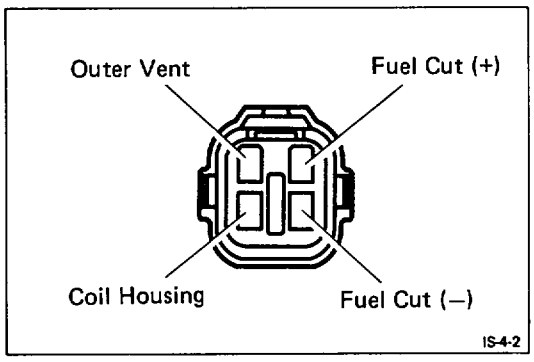
5. **ASSEMBLE AIR HORN AND BODY**
   (a) Put a new gasket on the body.
   (b) Carefully assemble the air horn and body.



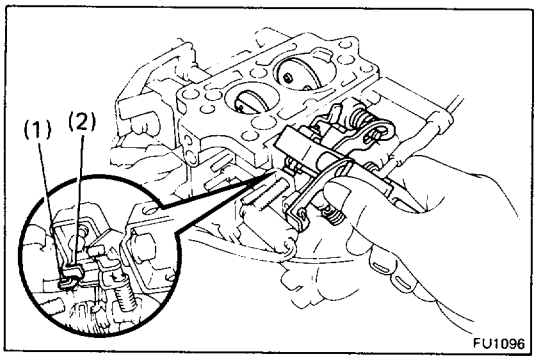
6. **INSTALL FIVE SCREWS WITH OTHER PARTS AS FOLLOWS:**
   (a) Install the fuel inlet bracket (1).
   (b) Install the number plate (2).
   (c) Install the wire clamp (3).
   (d) Connect the fast idle link and air valve connecting rod.



7. **INSTALL METERING NEEDLE**
   (a) Install the metering needle with a collar.
   (b) Hook the spring end into the hole.
   (c) Insert a washer and tighten the screw.



8. **INSTALL TERMINAL TO CONNECTOR**
   (a) Push in the terminal until it is securely locked in the connector lug.
   (b) Pull on the wire to confirm that it is securely locked.



ADJUSTMENT OF CARBURETOR

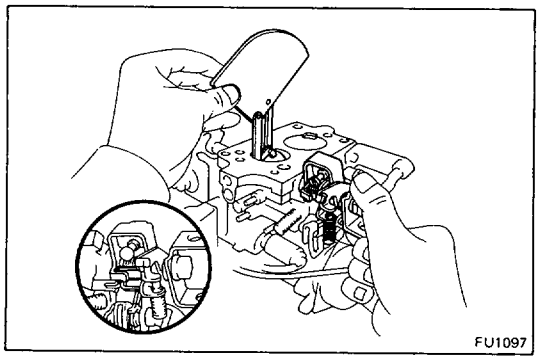
NOTE: Use SST 09240-00014 to make adjustment.

1. CHECK AND ADJUST THROTTLE VALVE OPENING

Check the full opening angle of the primary and secondary throttle valves.

Adjust by bending the respective first throttle arm levers for the primary (1) and secondary (2).

Standard angle:
Primary — 90° from horizontal plane
Secondary — 90° from horizontal plane

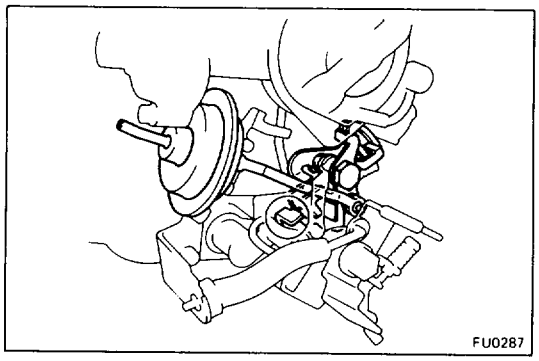


2. CHECK SECONDARY TOUCH ANGLE

Check the primary throttle valve opening at the same time the second throttle valve just starts to open.

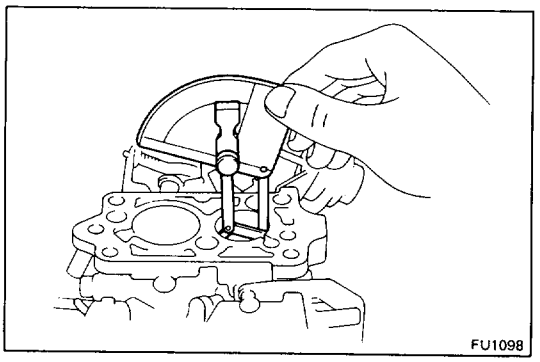
Standard angle: 59° from horizontal plane

NOTE: It is not necessary to adjust the secondary touch angle.



3. CHECK AND ADJUST FAST IDLE SETTING

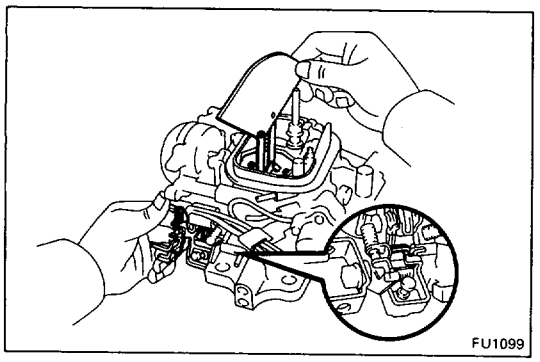
(a) Set the throttle shaft lever to the first step of the fast idle cam as shown.



(b) With the choke valve fully closed, check the primary throttle valve angle.

Adjust by turning the fast idle adjusting screw.

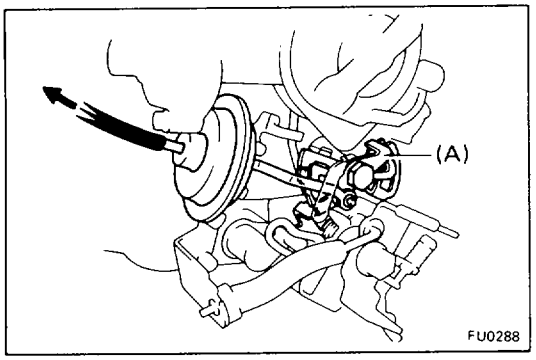
Standard angle: 23° from horizontal plane



4. CHECK AND ADJUST UNLOADER

With the primary throttle valve fully opened, check the choke valve angle. Adjust by bending the primary throttle arm.

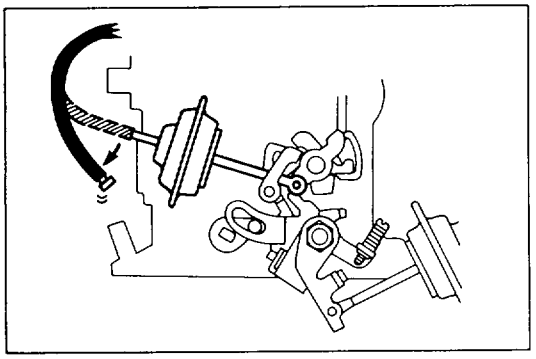
Standard angle: 45° from horizontal plane



5. CHECK AND ADJUST CHOKE OPENER

(a) Apply vacuum to the choke opener diaphragm.

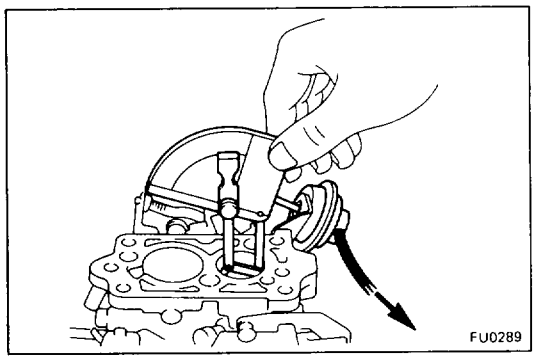
(b) Check that the fast idle cam is released to the fourth step. Adjust by bending choke opener lever A.



(c) Disconnect the vacuum hose.

(d) Close the choke valve and set the fast idle lever to the first step.

(e) Check that there is clearance between the choke opener lever and fast idle cam.

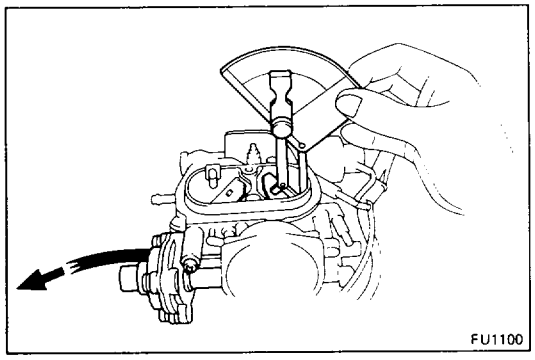


6. CHECK AND ADJUST IDLE-UP

(a) Apply vacuum to the idle-up diaphragm.

(b) Check the throttle valve opening angle. Adjust by turning the adjusting screw.

Standard angle: 16.5° from horizontal plane



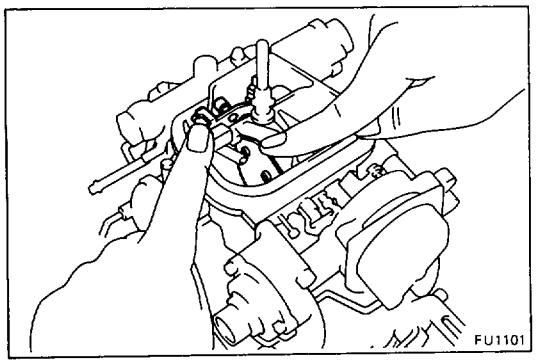
7. CHECK CHOKE BREAKER

(a) Apply vacuum to the choke breaker diaphragm.

(b) Close the choke valve by hand.

(c) Check the choke valve opening angle.

Standard angle: 42° from horizontal plane

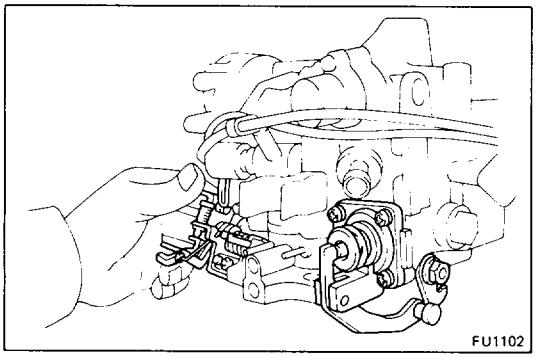


8. CHECK AIR VALVE AND METERING NEEDLE

(a) Check that the air valve and metering needle move smoothly together.

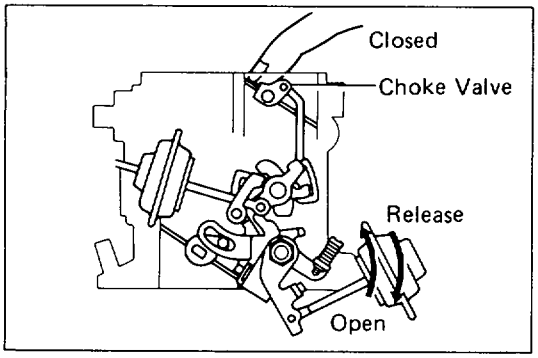
(b) While the primary throttle valve angle is idle position, check the air valve opening angle.

(c) While the primary throttle valve is full opening angle, check that there is clearance between the connecting rod and stopper.



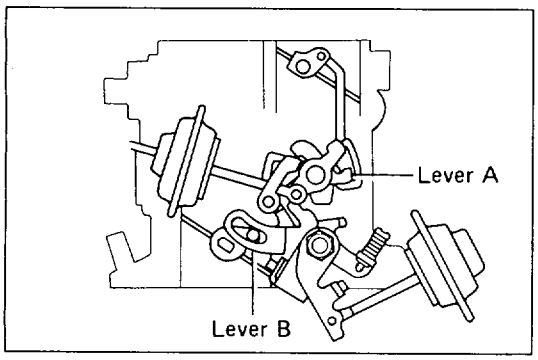
9. CHECK ACCELERATION PUMP

Rotate the throttle shaft and check that the pump lever and diaphragm rod move smoothly.

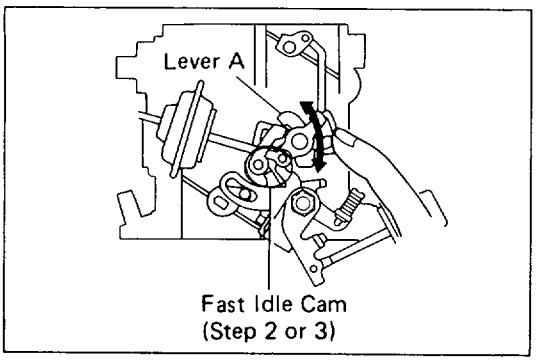


10. INSPECT AND ADJUST SECONDARY THROTTLE VALVE LOCK SYSTEM

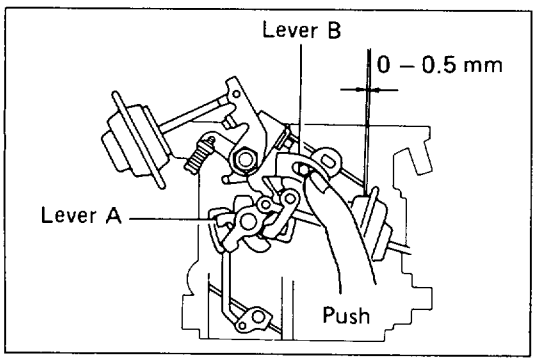
(a) While holding the throttle slightly open, push the choke valve closed, and hold it closed as you release the throttle valve.



(b) In condition (a), check that lever A is holding lever B locked as shown.

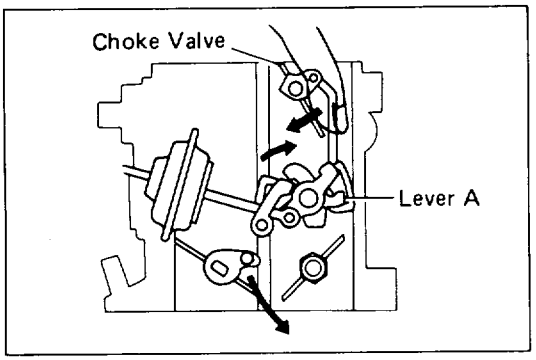


(c) Check that the lever A moves smoothly at step 2 or 3 of the fast idle cam. Adjust by bending the top of lever A.

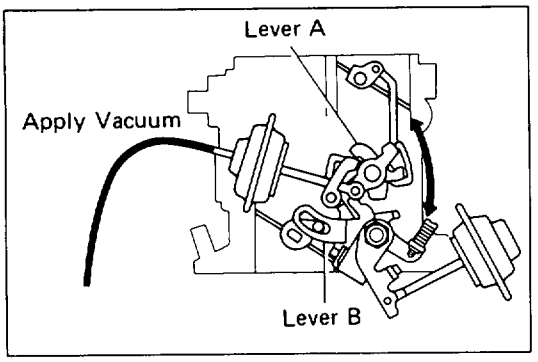


(d) In condition (a), rotate lever B to where it makes contact with lever A. In this position, measure the clearance between the secondary valve and bore. Adjust by bending the top of lever A.

Standard clearance: 0 — 0.5 mm (0 — 0.020 in.)

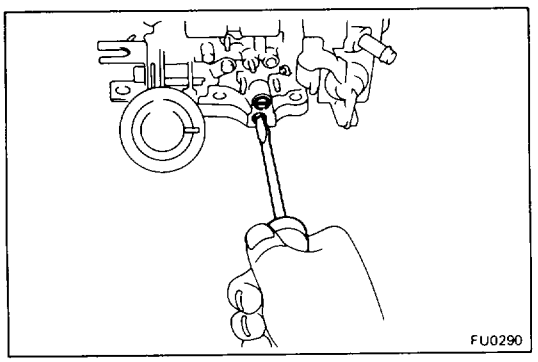


(e) With the choke valve opened (above 52°), check that lever A unlocks when the throttle valve is opened.



(f) Repeat step (a).

(g) Apply vacuum to the choke opener and check that lever A returns and that lever B unlocks.



11. PRESET IDLE MIXTURE ADJUSTING SCREW

If the idle mixture adjusting screw plug has been removed, fully screw in the idle mixture screw and then unscrew it to the following amount.

Standard: Return 3 1/2 turns from fully closed position

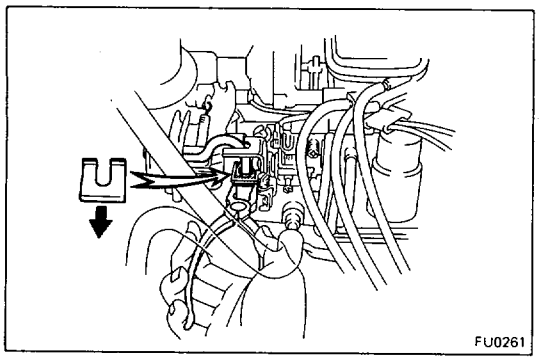
CAUTION: Use care not to screw it in too tightly and damage the screw tip.

INSTALLATION OF CARBURETOR

1. INSTALL CARBURETOR

(a) Place the insulator on the intake manifold.

(b) Install the carburetor. Tighten the bolts and nuts securely.



2. CONNECT ACCELERATOR LINKAGE

Connect the linkage and install the clip.

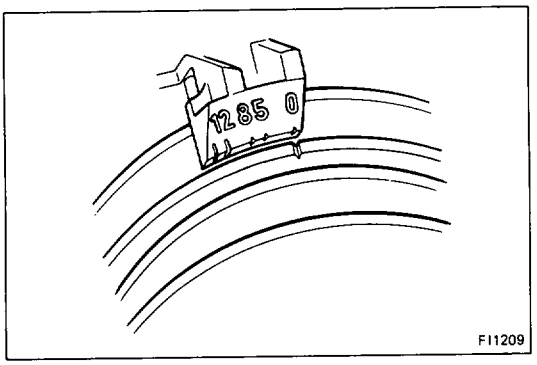
3. CONNECT FOLLOWING HOSES TO CARBURETOR:

(a) Fuel inlet hose

(b) PCV hose

(c) Emission control hoses (see system layout in the emission control section or the layout printed under the hood)

(d) Wiring connector



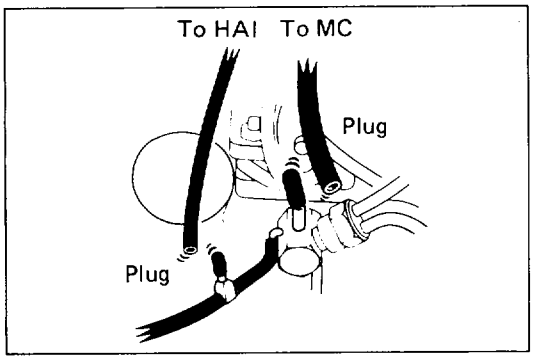
ADJUSTMENT OF CARBURETOR (ON-VEHICLE)

1. INITIAL CONDITIONS FOR CARBURETOR ADJUSTMENT

(a) All accessories switched off

(b) Ignition timing set correctly

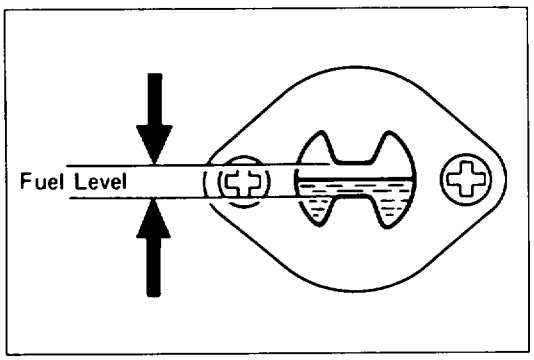
(c) Transmission in N range



2. START ENGINE

Start the engine and warm it up to normal operating temperature.

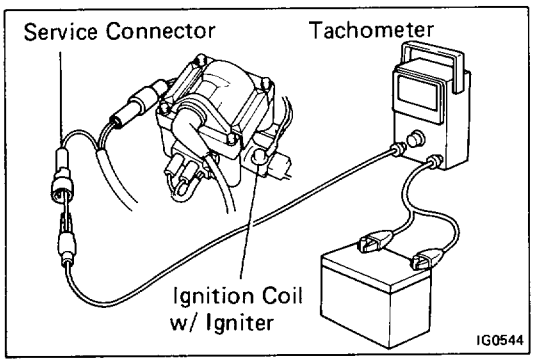
NOTE: Plug the hose connections for HAI and MC (for M/T) systems to prevent rough idling.



3. CHECK FLOAT LEVEL

Fuel level should be about even with the correct level in the sight glass.

4. CHECK THAT CHOKE VALVE OPENS FULLY

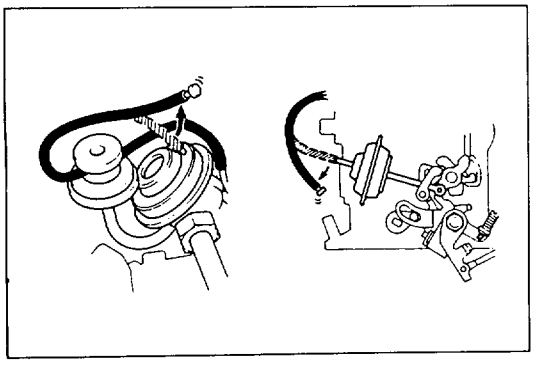


5. CONNECT TACHOMETER

Connect the tachometer test probe to the ignition coil negative terminal.

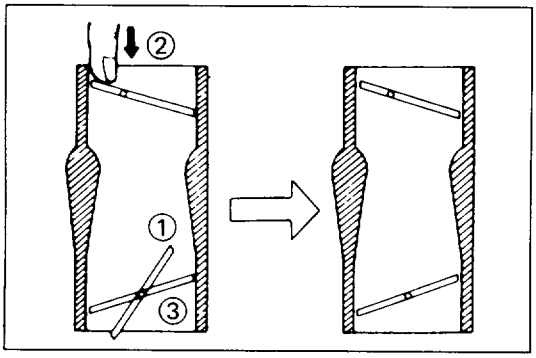
CAUTION:

1. **NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
2. **As some tachometers are not compatible with this ignition system, we recommended that you confirm the compatibility of your unit before using.**



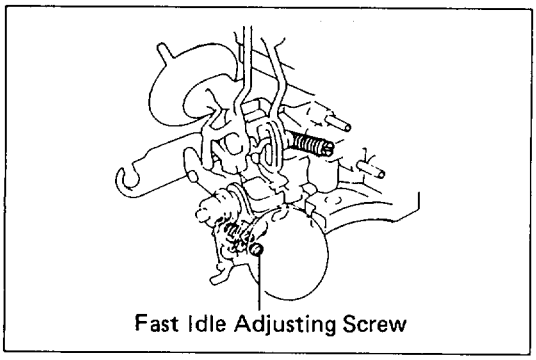
6. ADJUST FAST IDLE SPEED

(a) Disconnect the vacuum hose from the choke opener diaphragm and EGR valve, and plug the hose end.



(b) Set the fast idle cam.
While holding the throttle valve slightly open, push the choke valve closed and hold it closed as you release the throttle valve.

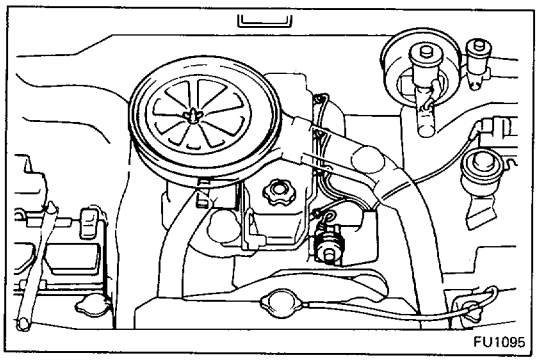
(c) Start the engine, but do NOT depress the accelerator pedal.


Fast Idle Adjusting Screw

(d) Adjust the fast idle speed by turning the fast idle adjusting screw.

Fast idle speed: 3,000rpm

(e) Reconnect the vacuum hoses to the proper locations.



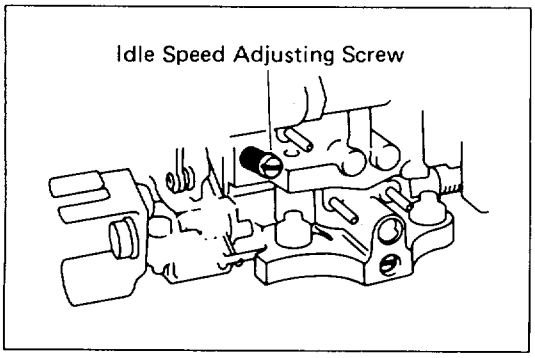
7. STOP ENGINE

8. INSTALL AIR CLEANER

(a) Place the air cleaner in position and install the two mounting nuts and butterfly nut.

(b) Connect the air intake hoses.

(c) Connect the emission control hoses.



9. ADJUST IDLE SPEED

Adjust the idle speed by turning the idle speed adjusting screw.

Idle speed: 700 rpm

10. IF NECESSARY, ADJUST IDLE MIXTURE
(See page FU-24)

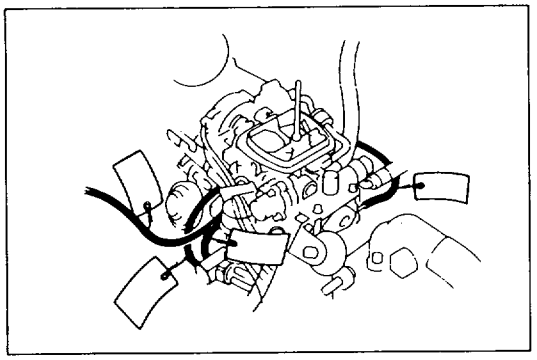
11. REMOVE TACHOMETER

Idle Mixture

ADJUSTMENT OF IDLE MIXTURE

NOTE:

- To conform with regulations, the idle mixture adjusting screw is adjusted and plugged with a steel plug by the manufacturer.
  Normally, this steel plug should not be removed.
- When troubleshooting rough idle, check all other possible causes before attempting to adjust the idle mixture. (See TROUBLESHOOTING on page FU-2)
  Only if no other factors are found to be at fault, should the idle mixture need to be adjusted remove the plug and follow the procedure described below.

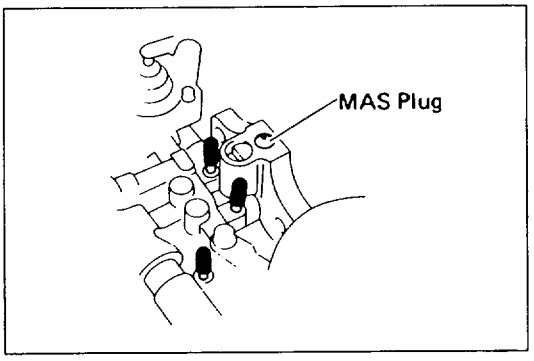


1. REMOVE CARBURETOR

(a) Before disconnecting the vacuum hoses, use tags to identify how they should be reconnected.

(b) Remove the carburetor from the engine.

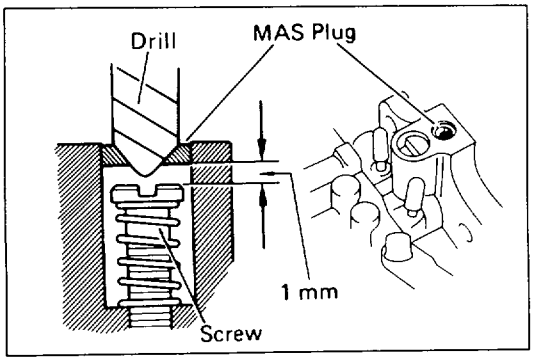
(c) After removing the carburetor, cover the intake manifold with a clean rag.



2. REMOVE MIXTURE ADJUSTING SCREW PLUG (MAS PLUG)

(a) Plug each carburetor vacuum port to prevent entry of steel particles when drilling.

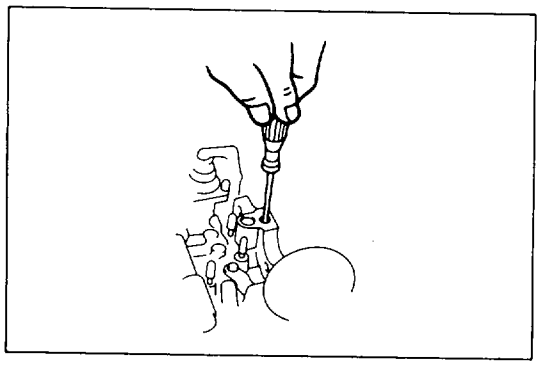
(b) Mark the center of the plug with a punch.



(c) Drill a 6.5mmϕ (0.256 in.ϕ)hole in the center of the plug.

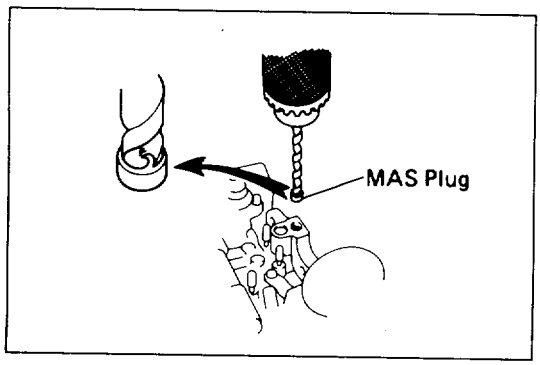
NOTE:

- As there is only 1 mm (0.04 in.) clearance between the plug and screw, drill carefully and slowly to avoid drilling onto the screw.
- The drill may force the plug off at this time.

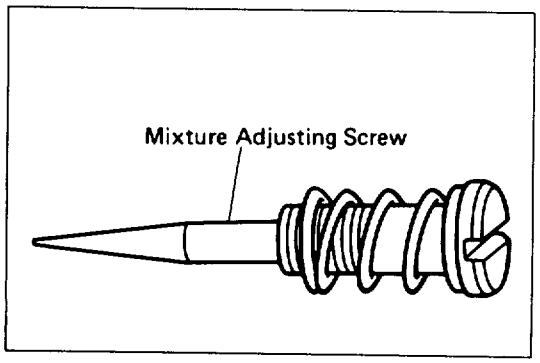


(d) Through the hole in the plug, fully screw in the mixture adjusting screw with a screwdriver.

NOTE: Be careful not to damage the screw tip by tightening the screw too tight.



(e) Use a 7.5mmϕ (0.295 in.ϕ) drill to force the plug off.

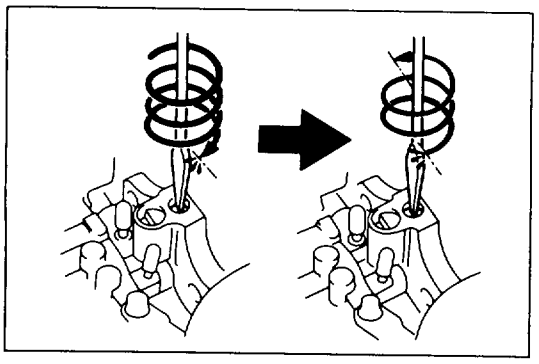


3. INSPECT MIXTURE ADJUSTING SCREW

(a) Blow off any steel particles with compressed air.

(b) Remove the screw and inspect it.

If the drill has gnawed into the screw top or if the tapered position is damaged, replace the screw.



4. REINSTALL MIXTURE ADJUSTING SCREW

Fully screw in the idle mixture adjusting screw and then unscrew it about 3 1/2 turns.

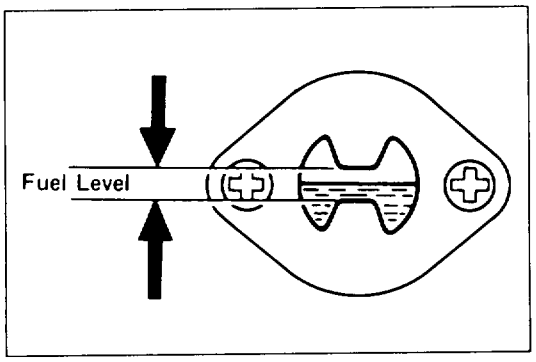
NOTE: Be careful not to damage the screw tip by tightening the screw too tight.

5. REINSTALL CARBURETOR

(a) Reinstall the carburetor on the engine.

(b) Reconnect the vacuum hoses to the proper locations. Refer to the information lable on the vacuum hose.

6. REINSTALL AIR CLEANER

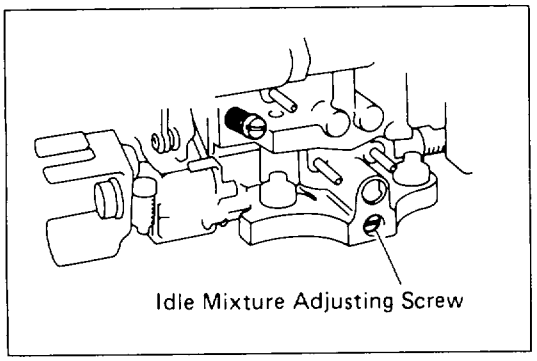


7. ADJUST IDLE SPEED AND IDLE MIXURE

(a) Initial conditions:
- Air cleaner installed
- Normal operating coolant temperature
- Choke fully open
- All accessories switched off
- All vacuum lines connected
- Ignition timing set correctly
- Transmission in N range
- Fuel level should be about even with the correct level in the sight glass.
- EBCV off (for Calif.)

(b) Start the engine.

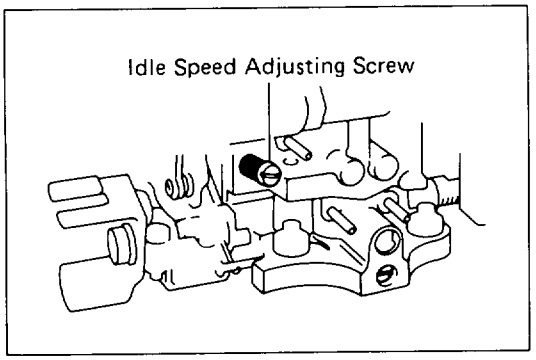
(c) Set to the maximum speed by turning the IDLE MIXTURE ADJUSTING SCREW.



(d) Set to the idle mixture speed by turning the IDLE SPEED ADJUSTING SCREW.

Idle mixture speed: 740 rpm

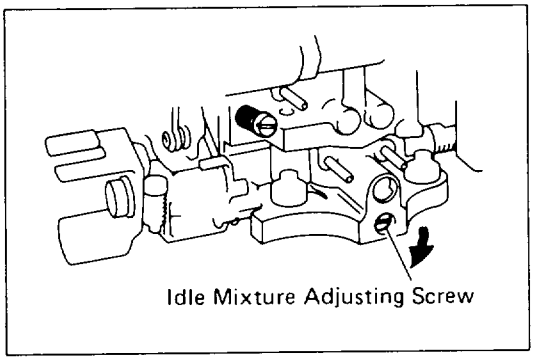
(e) Before moving to the next step,continue adjustments (c) and (d) until the maximum speed will not rise any further no matter how much the IDLE MIXTURE ADJUSTING SCREW is adjusted.



(f) Set to the idle speed by screwing in the IDLE MIXTURE ADJUSTING SCREW.

Idle speed: 700 rpm

NOTE: This is the Lean Drop Method for setting idle speed and mixture.

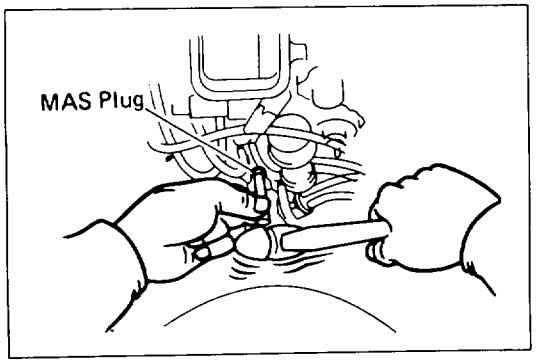


8. PLUG IDLE MIXTURE ADJUSTING SCREW

(a) Remove the air cleaner.

(b) Tap in new plug until it is even with carburetor surface.

(c) Reinstall the air cleaner.

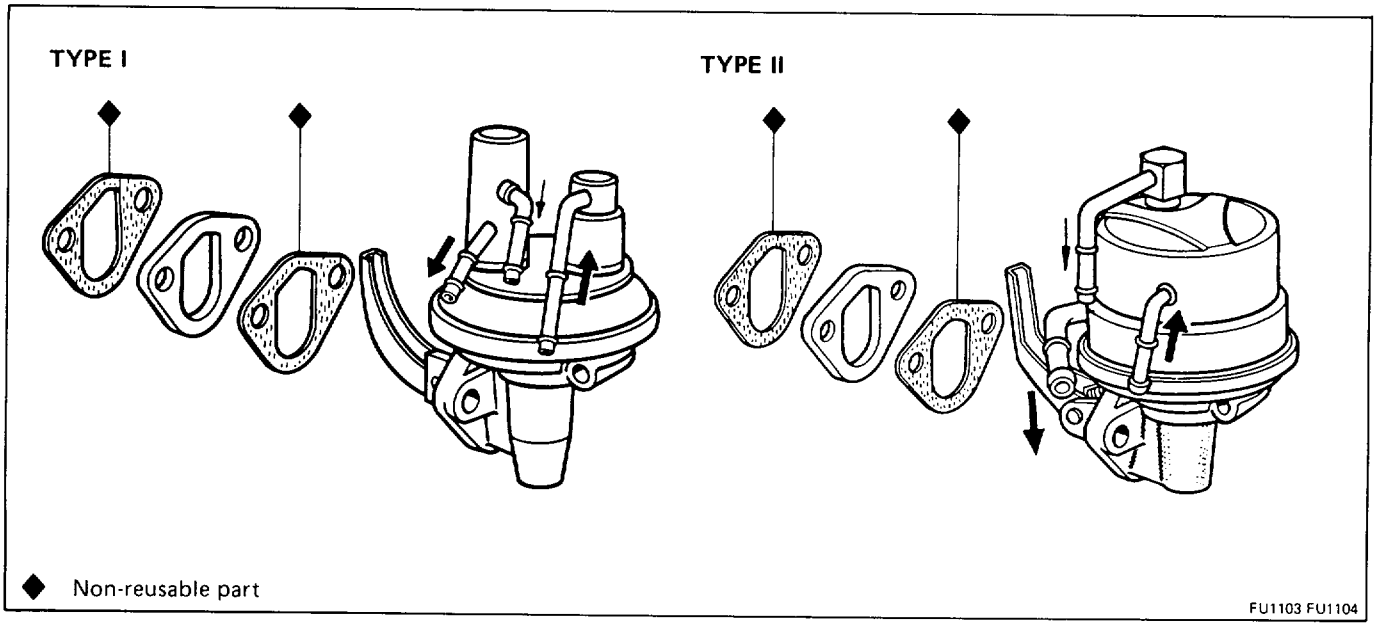


9. CHECK AND ADJUST FAST IDLE SPEED

(See step 6 on page FU-22)

FUEL PUMP

COMPONENTS



REMOVAL OF FUEL PUMP

1. **DRAIN COOLANT**

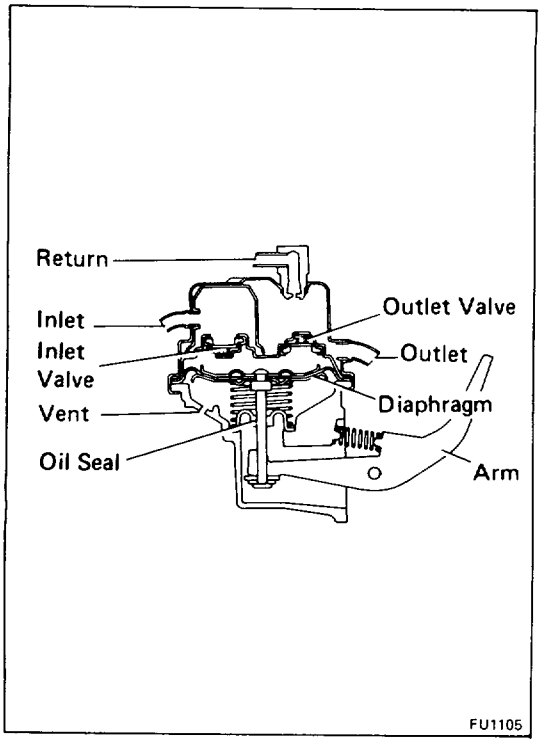
   Open the radiator drain cock and allow the coolant to drain into a suitable container.

2. **DISCONNECT UPPER RADIATOR HOSE**

3. **DISCONNECT THE THREE FUEL HOSES FROM FUEL PUMP**

4. **REMOVE FUEL PUMP**

   Remove the two bolts, fuel pump and gasket.



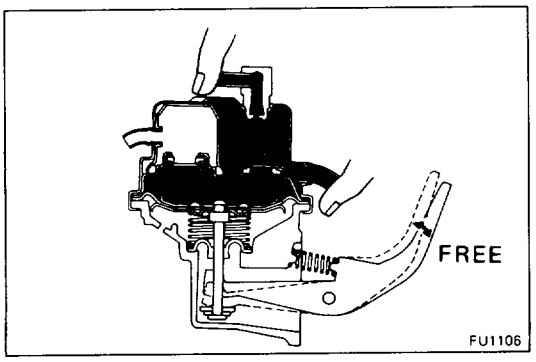
INSPECTION OF FUEL PUMP (Airtight Test)

PRECHECKS

Before preforming the following checks on the fuel pump:

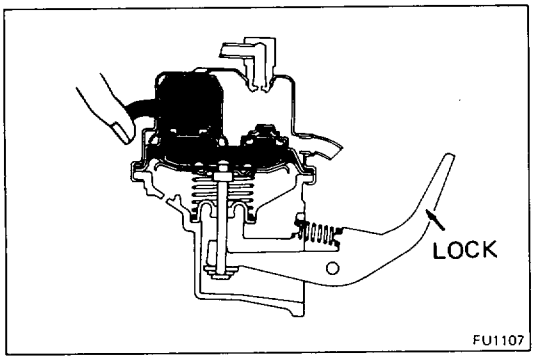
(a) Run some fuel through the pump to insure that the check valves seal tightly (a dry check valve may not seal properly).

(b) Without blocking off any pipe,operate the pump lever and check the amount of force necessary for operation and the amount of arm play.This same amount of force should be used in the checks.



1. **CHECK INLET VALVE**

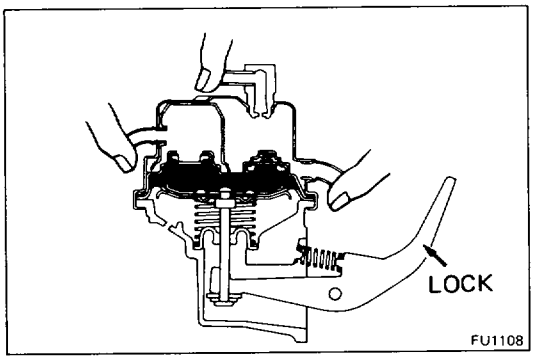
   Block off the outlet pipes with your finger and check that there is an increase in lever arm play and that the lever arm moves without tension.



2. **CHECK OUTLET VALVE**

   Block off the inlet pipe with your finger and check that the arm locks (does not operate with same amount of force used in the precheck above).

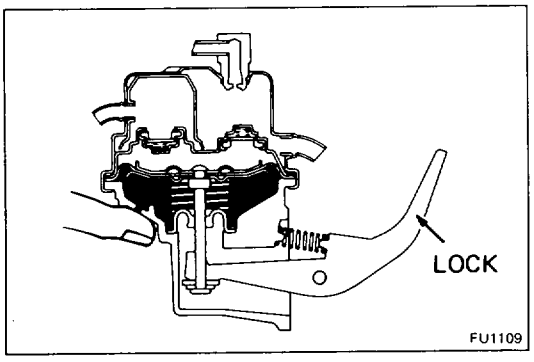
   NOTE: Never use more force than that used in the precheck (This applies to checks 3 and 4 also).



3. **CHECK DIAPHRAGM**

   Block off the inlet and outlet pipes and check that the pump arm locks.

   NOTE: If any of these checks are not as specified, the caulking (sealing) of the body and upper casing is defective.



4. **CHECK OIL SEAL**

   Block off the vent hole with your finger and check that the pump arm locks.

INSTALLATION OF FUEL PUMP

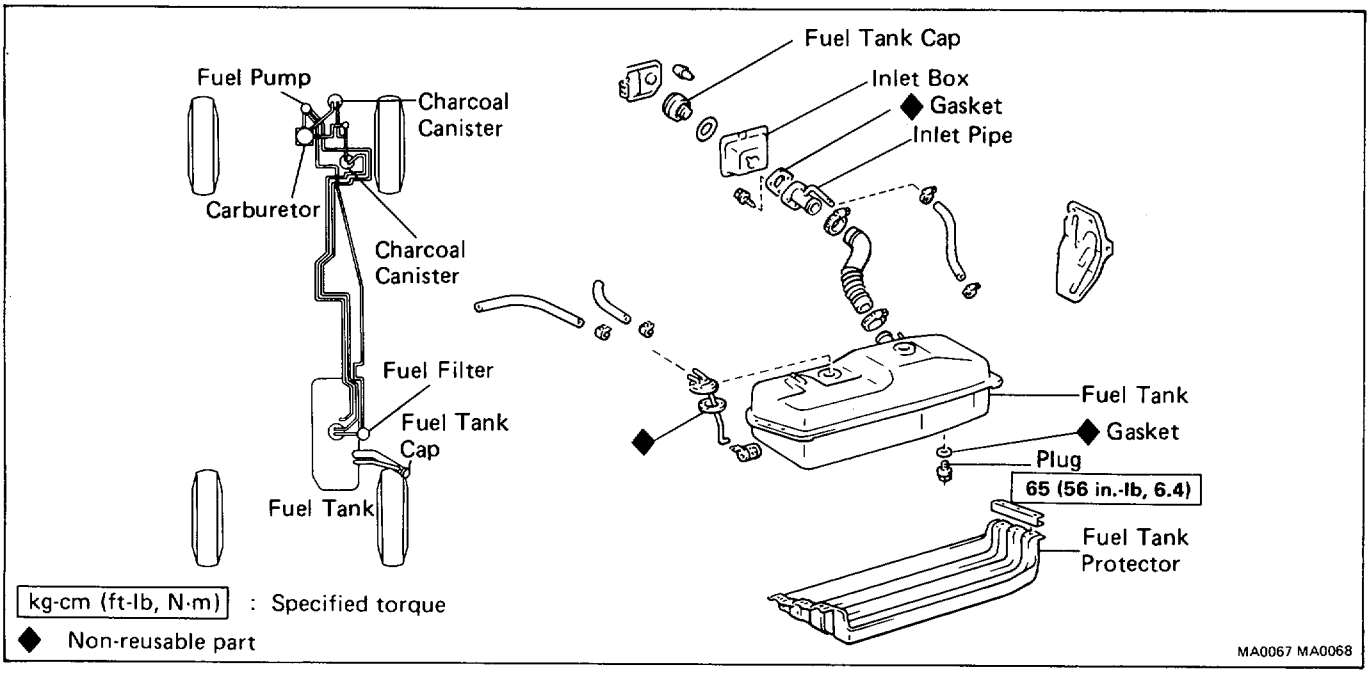
(See page FU-27)

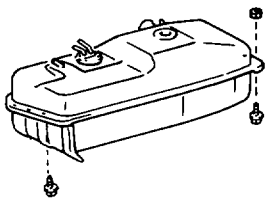
1. **INSTALL FUEL PUMP WITH NEW GASKET**
2. **INSTALL TWO BOLTS**
3. **CONNECT THREE FUEL HOSES TO FUEL PUMP**
4. **CONNECT UPPER RADIATOR HOSE**
5. **FILL WITH COOLANT**

   Close the radiator drain cock and fill the radiator with a good brand of ethylene-glycol coolant.

6. **START ENGINE AND CHECK FOR LEAKS**

Fuel Tank and Line





Torque: 195 kg-cm (14 ft-lb, 19 N·m)

PRECAUTIONS

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **When re-installing, be sure to include the rubber protectors on the upper surfaces of the fuel tank and tank band.**
3. **Apply the proper torque to all tightening parts.**

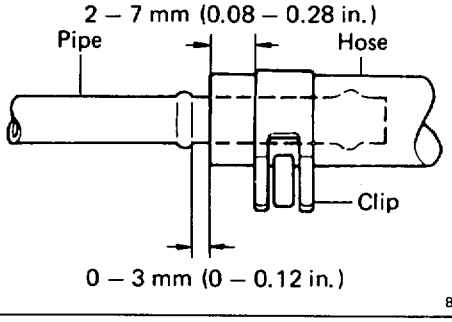
INSPECT FUEL LINES AND CONNECTIONS

(a) Inspect the fuel lines for cracks, or leakage and connections for deformation.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, kinks or damage.

(c) Inspect the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

(d) Inspect the inlet pipe for damage or fuel leakage.



(e) The hose and tube connections are as shown in the illustration.

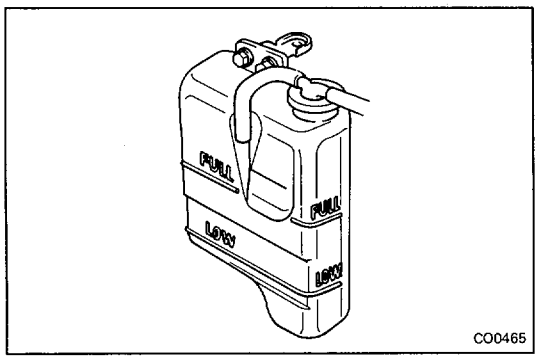
If a problem is found, repair or replace the parts as necessary.

COOLING SYSTEM

	Page
TROUBLESHOOTING	CO-2
CHECK AND REPLACEMENT OF ENGINE COOLANT	CO-3
WATER PUMP	CO-4
THERMOSTAT	CO-7
RADIATOR	CO-8

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine overheats	Radiator plugged or cap faulty	Check radiator	CO-8
	Alternator drive belt loose or missing	Adjust or replace belt	
	Dirt, leaves or insects on radiator or condenser	Clean radiator or condenser	CO-8
	Hoses, water pump, water outlet housing, radiator, heater, core plugs or head gasket leakage	Repair as necessary	
	Thermostat faulty	Check thermostat	CO-7
	Ignition timing retarded	Reset timing	IG-15
	Fluid coupling faulty	Replace fluid coupling	CO-5
	Radiator hose plugged or rotted	Replace hose	CO-8
	Water pump faulty	Replace water pump	CO-5
	Cylinder head or block cracked or plugged	Repair as necessary	

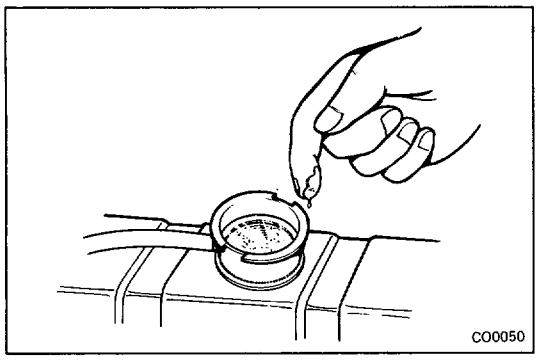


CHECK AND REPLACEMENT OF ENGINE COOLANT

1. CHECK ENGINE COOLANT LEVEL RESERVE TANK

The coolant level should be between the "LOW" and "FULL" lines.

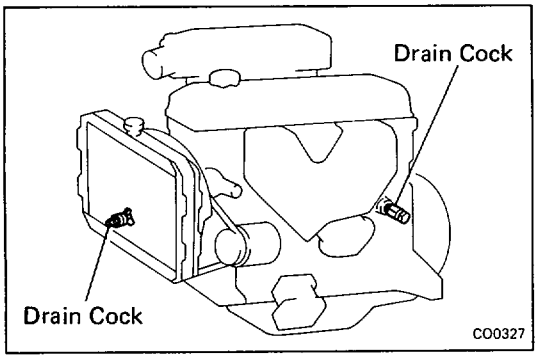
If low, check for leaks and add coolant up to the "FULL" line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

(b) Drain the coolant from the radiator and engine drain cocks. (Engine drain cock is at left rear of cylinder block.)

(c) Close the drain cocks.

(d) Fill the system with coolant.

Use a good brand of ethylene-glycol base coolant, mixed according to the manufacturer's directions.

Coolant capacity (w/ heater or air conditioner):

22R, 22R-E (ex. 4WD A/T)
8.4 liters (8.9 US qts, 7.4 Imp. qts)

22R-E (4WD A/T), 22R-TE
9.1 liters (9.6 US qts, 8.0 Imp. qts)

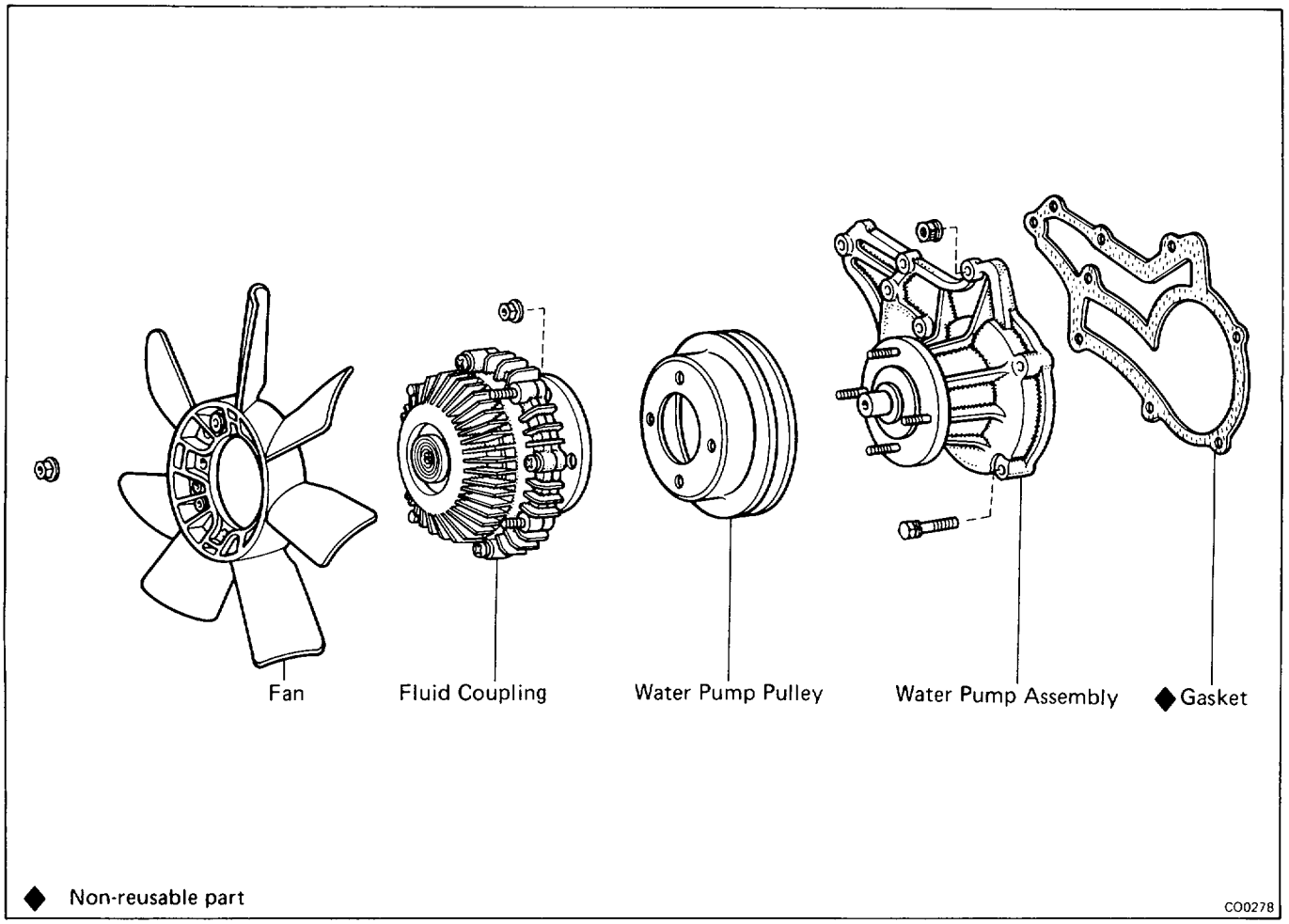
(e) Install the radiator cap.

(f) Start the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP

COMPONENTS

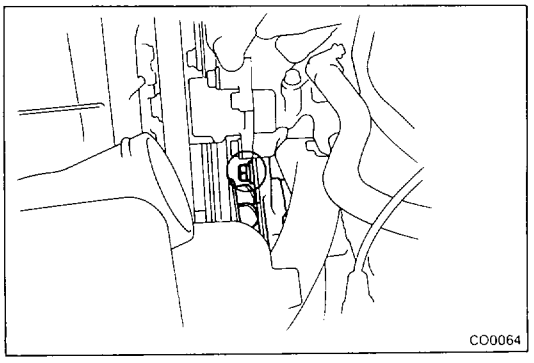


REMOVAL OF WATER PUMP

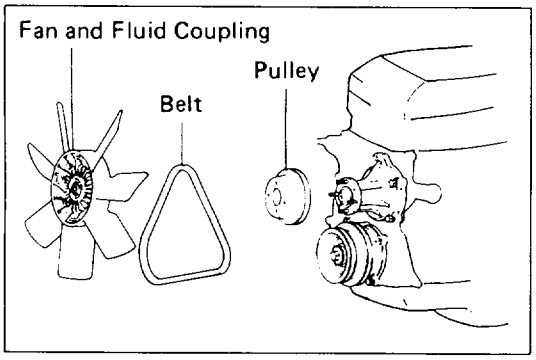
1. **DRAIN COOLANT**
   (See step 3 on page CO-3)

2. **(w/ PS)**
   REMOVE PS BELT

3. **(with A/C and/or AIR PUMP)**
   REMOVE A/C and/or AIR PUMP BELT



4. **LOOSEN ALTERNATOR DRIVE BELT**
   Loosen alternator pivot and adjusting bolts. Swing the alternator toward the engine.

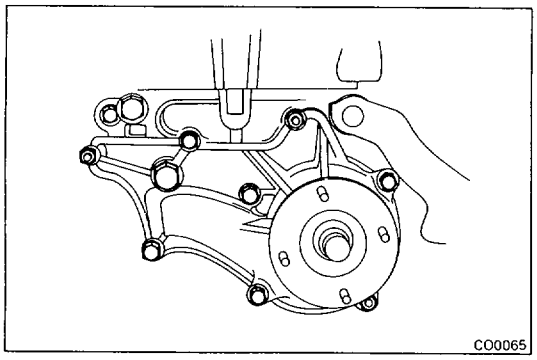


5. **REMOVE FLUID COUPLING, FAN AND WATER PUMP PULLEY**

(a) Remove the four nuts from the fluid coupling flange.

(b) Remove the fluid coupling, water pump pulley and fan belt.

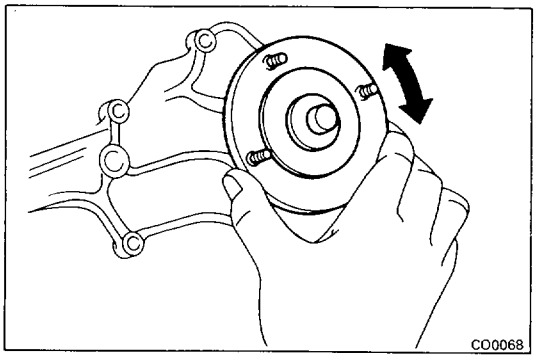
(c) Remove the fan from the fluid coupling.



6. **REMOVE WATER PUMP**

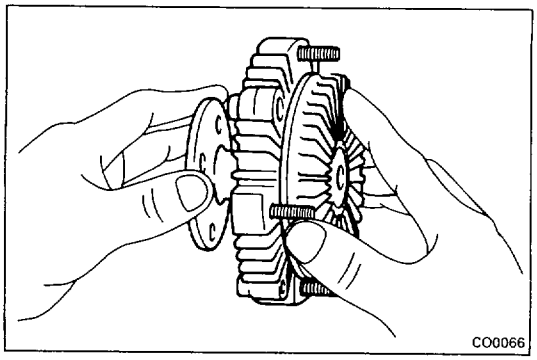
Remove the six bolts, three nuts, water pump and gasket.

INSPECTION OF WATER PUMP



1. **INSPECT WATER PUMP BEARING**

Check that water pump bearing moves smoothly and quietly.



2. **INSPECT FLUID COUPLING**

Check the fluid coupling for damage and silicone oil leakage.

INSTALLATION OF WATER PUMP

(See page CO-4)

1. INSTALL WATER PUMP OVER NEW GASKET

Install the water pump and a new gasket with six bolts and three nuts.

2. INSTALL FAN BELT AND PULLEY

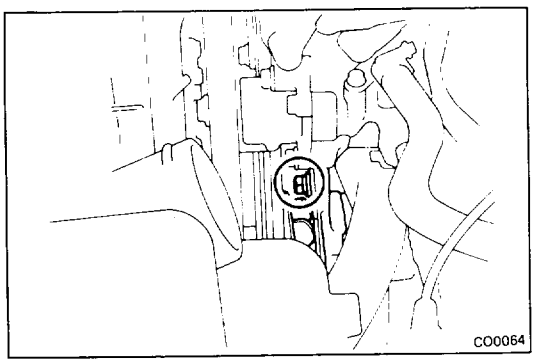
(a) Check the fan belt for cracks or damage.

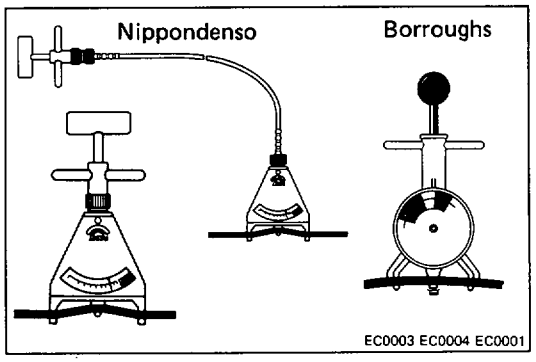
(b) Place the fan belt on the pulley and place the pulley on the water pump bolts.

3. INSTALL FAN ON FLUID COUPLING

4. INSTALL FLUID COUPLING

Install the fluid coupling on the pulley with four nuts.





5. ADJUST ALTERNATOR DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso	BTG-20 (95506-00020) or
Borroughs	No. BT-33-73F

Belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

NOTE:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly into the groove.
- After installing the belt, run the engine for approx. 5 minutes and then recheck the tension.

6. (with A/C and/or AIR PUMP)
INSTALL A/C and/or AIR PUMP BELT (See page MA-4)

7. (w/ PS)
INSTALL PS BELT (See page MA-4)

8. REFILL COOLANT

Close the radiator and engine drain cocks. Fill with a good brand of ethylene-glycol coolant.

Total capacity:

22R, 22R-E (ex. 4WD A/T)
8.4 liters (8.9 US qts, 7.4 Imp. qts)
22R-E (4WD A/T), 22R-TE
9.1 liters (9.6 US qts, 8.0 Imp. qts)

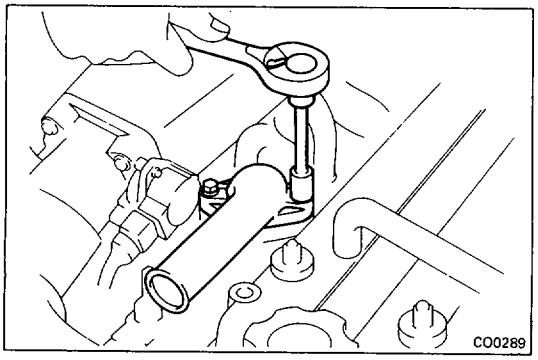
9. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT

REMOVAL OF THERMOSTAT

1. **DRAIN COOLANT**

   Drain the coolant from the radiator into a clean container. The coolant may be reused if specific gravity is within specifications.



2. **REMOVE WATER OUTLET**

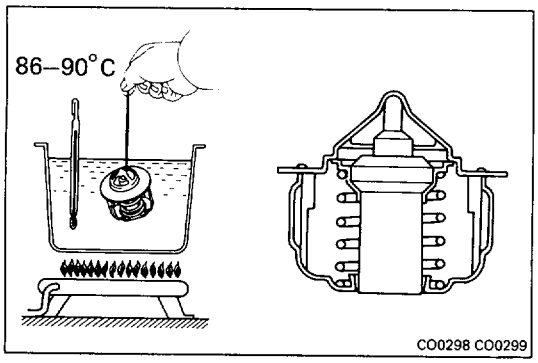
   Remove the two bolts and water outlet from the intake manifold.

3. **REMOVE THERMOSTAT WITH GASKET**

   (a) Remove the thermostat with gasket.

   (b) Remove the gasket from the thermostat.

INSPECTION OF THERMOSTAT



NOTE: The thermostat is marked with the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

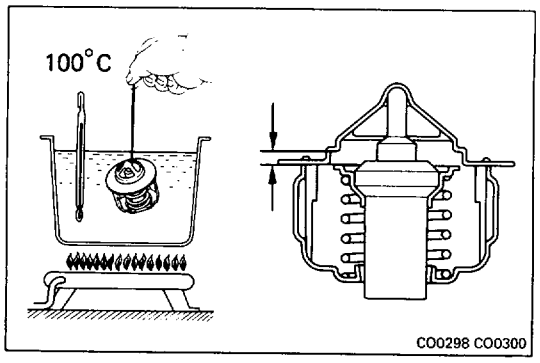
(b) Check the valve opening temperature and valve lift.

If the valve opening temperature and valve lift are out of following specifications, replace the thermostat.

Valve opening temperature: 86 — 90 °C (187 — 194 °F)

Valve lift: More than 8 mm (0.31 in.) at 100 °C (212 °F)

(c) Check that the valve spring is tight when the thermostat is fully closed, and replace if necessary.



INSTALLATION OF THERMOSTAT

1. **PLACE THERMOSTAT IN INTAKE MANIFOLD**

   (a) Install a new gasket to the thermostat.

   (b) Install the thermostat with gasket to the intake manifold.

2. **INSTALL WATER OUTLET**

   Install the water outlet on a new gasket with two bolts.

3. **REFILL COOLANT**

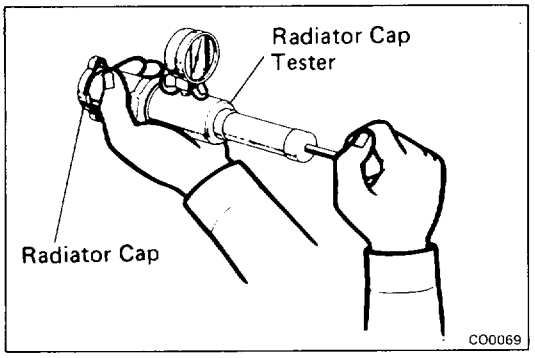
   Close the radiator drain cock. Fill with a good brand of ethylene-glycol coolant.

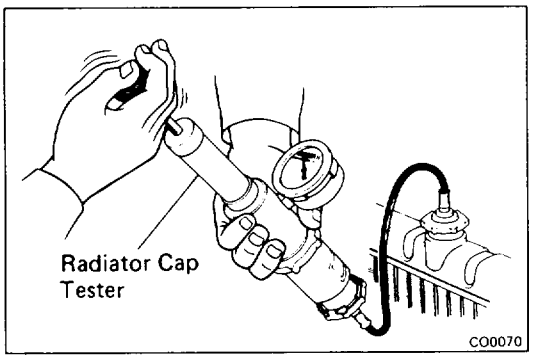
RADIATOR

CLEANING OF RADIATOR

Using water or a steam cleaner, remove mud and dust from radiator core.

CAUTION: If using high pressure type cleaner, be careful not to deform the radiator core fins. Keep a distance of at least 40 — 50 cm (15.75 — 19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 30 — 35 kg/cm² (427 — 498 psi, 2,942 — 3,432 kPa).





INSPECTION OF RADIATOR

1. CHECK RADIATOR CAP

Using a radiator cap tester, pump the tester until the relief valve opens.
Check that the valve opens between 0.75 kg/cm² (10.7 psi, 74 kPa) and 1.05 kg/cm² (15 psi, 103 kPa).

Check that the pressure gauge does not drop rapidly when pressure on the cap is below 0.6 kg/cm² (8.5 psi, 59 kPa).

If either check is not within limits, replace the cap.

2. CHECK COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 1.2 kg/cm² (17.1 psi, 118 kPa), check that pressure does not drop.

If the pressure drop, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, block and intake manifold.

REMOVAL OF RADIATOR

1. DRAIN COOLANT

Open radiator drain and engine drain cocks (located on the left of engine block). Drain the fluid into a suitable container.

2. DISCONNECT RADIATOR HOSES

3. (22R-TE)

DISCONNECT NO.1 TURBO WATER HOSE

4. REMOVE FAN SHROUD

5. DISCONNECT COOLANT RESERVOIR TUBE

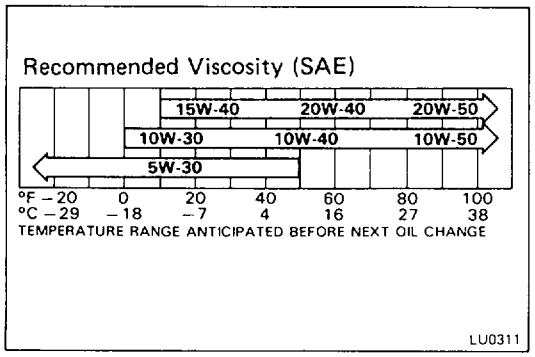
6. REMOVE THE FOUR RADIATOR MOUNTING BOLTS AND RADIATOR

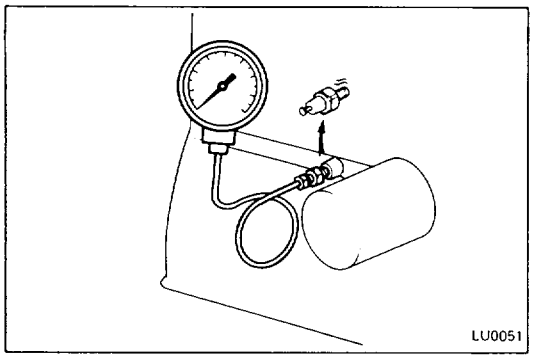
LUBRICATION SYSTEM

	Page
TROUBLESHOOTING	LU-2
OIL PRESSURE CHECK	LU-2
REPLACEMENT OF ENGINE OIL AND OIL FILTER	LU-3
OIL PUMP	LU-4

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leakage	Cylinder head, cylinder block or oil pump body damaged or cracked	Repair as necessary	
	Oil seal faulty	Replace oil seal	EM-79
	Gasket faulty	Replace gasket	
Low oil pressure	Oil leakage	Repair as necessary	
	Relief valve faulty	Repair relief valve	LU-4
	Oil pump faulty	Repair oil pump	LU-4
	Engine oil poor quality	Replace engine oil	LU-3
	Crankshaft bearing faulty	Replace bearing	EM-67
	Connecting rod bearing faulty	Replace bearing	EM-67
	Oil filter clogged	Replace oil filter	LU-3
High oil pressure	Relief valve faulty	Repair relief valve	LU-4





OIL PRESSURE CHECK

1. **CHECK OIL QUALITY**

   Check the oil for deterioration, entry of water, discoloring or thinning.

   If the quality is poor, change the oil.

   Use API grade SF or SF/CC multigrade, fuel-efficient and recommended viscosity oil.

2. **CHECK OIL LEVEL**

   The oil level should be between the L and F marks on the dipstick. If low, check for leakage and add oil up to the F mark.

3. **REMOVE OIL PRESSURE SWITCH OR SENDER GAUGE**

4. **INSTALL OIL PRESSURE GAUGE**

5. **START ENGINE**

   Start engine and warm it up to normal operating temperature.

6. **MEASURE OIL PRESSURE**

   Oil pressure:

At idle speed	**More than 0.3 kg/cm² (4.3 psi, 29 kPa)**
At 3,000 rpm	**2.5 — 5.0 kg/cm² (36 — 71 psi, 245 — 490 kPa)**

   NOTE: Check for oil leakage after reinstalling the oil pressure switch or sender gauge.

REPLACEMENT OF ENGINE OIL AND OIL FILTER

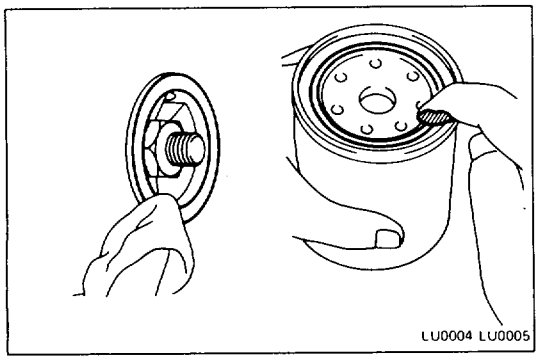
1. DRAIN ENGINE OIL

Remove the oil drain plug and drain the oil into a container.

2. REPLACE OIL FILTER

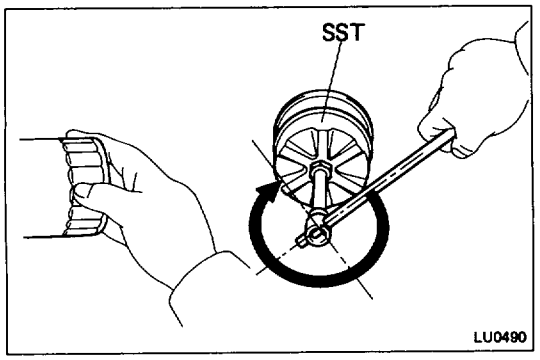
(a) Using SST, remove the oil filter (located on right side of the engine block).

SST 09228-07500



(b) Inspect and clean the oil filter installation surface.

(c) Apply clean engine oil to the gasket of the new oil filter.



(d) Lightly screw in the oil filter to where you feel resistance.

(e) Then, using SST, tighten the oil filter an extra 3/4 turn.

SST 09228-07500

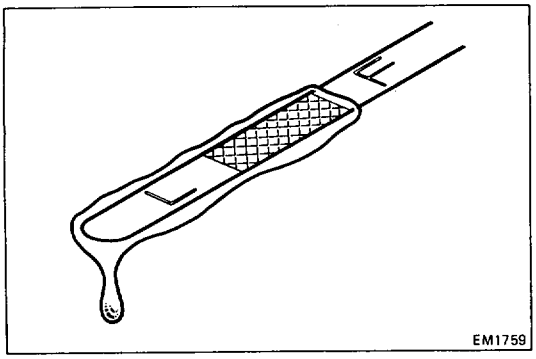
3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.

(b) Fill the engine with new oil API grade SF or SF/CC, multigrade, fuel efficient and recommended viscosity oil.

Oil capacity:

Dry fill	**4.8 liters (5.1 US qts, 4.2 Imp. qts)**
Drain and refill	
w/o Oil filter change	**3.8 liters (4.0 US qts, 3.3 Imp. qts)**
w/ Oil filter change	**4.3 liters (4.5 US qts, 3.8 Imp. qts)**



4. START ENGINE AND CHECK FOR LEAKS

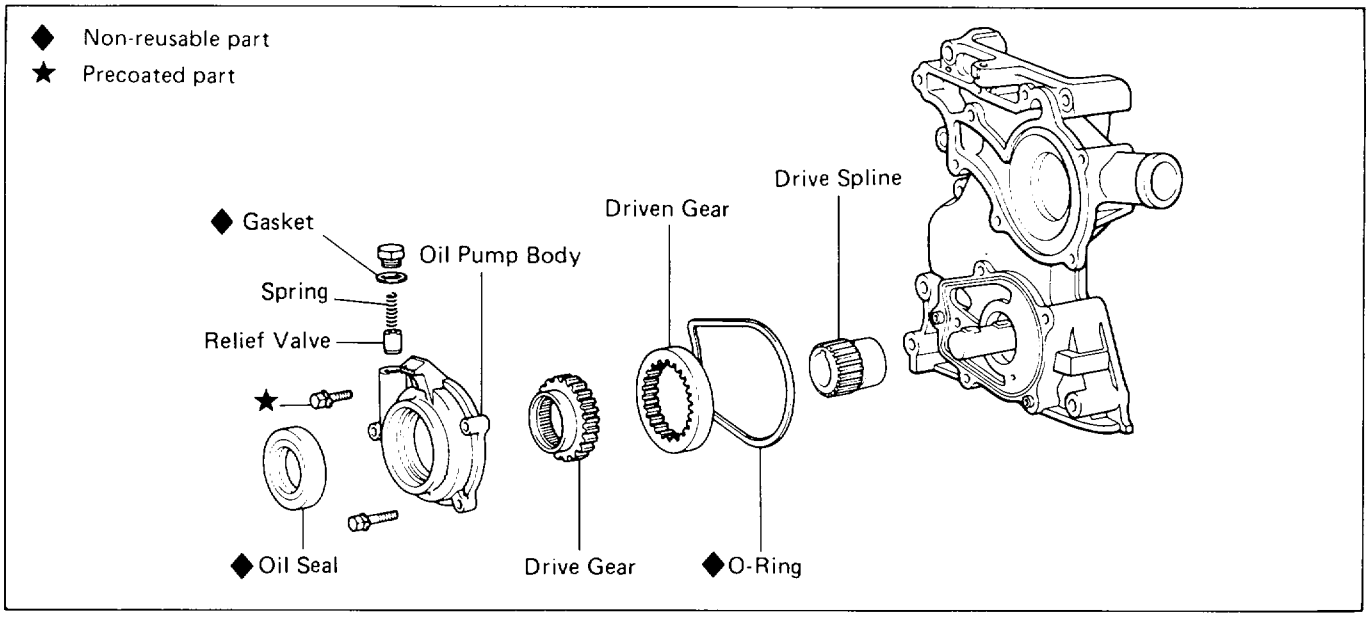
5. RECHECK ENGINE OIL LEVEL

Recheck the engine oil level and refill as necessary.

NOTE: Insert the oil dipstick with the curved tip pointed toward the engine.

OIL PUMP

COMPONENTS



REMOVAL AND DISASSEMBLY OF OIL PUMP

NOTE: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **REMOVE OIL PAN**
   (See step 3 on page EM-57)

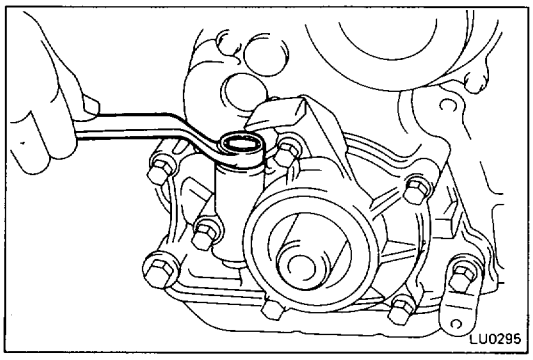
2. **REMOVE OIL STRAINER**
   Remove the four bolts holding the oil strainer.

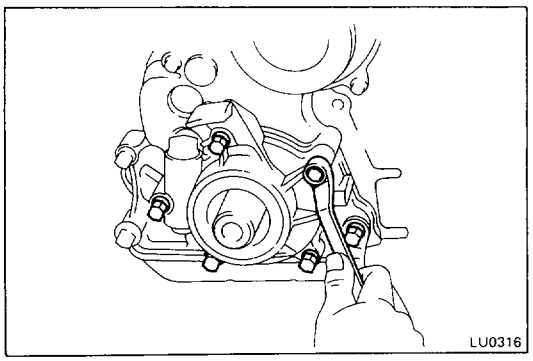
3. **REMOVE DRIVE BELTS**

4. **REMOVE CRANKSHAFT PULLEY**
   (See step 4 on page EM-58)

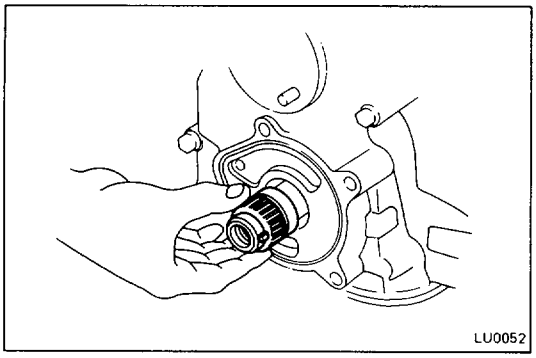
5. **(with A/C)**
   REMOVE A/C COMPRESSOR AND BRACKET

6. **REMOVE OIL PUMP ASSEMBLY**
   (a) Loosen the oil pump relief valve plug.





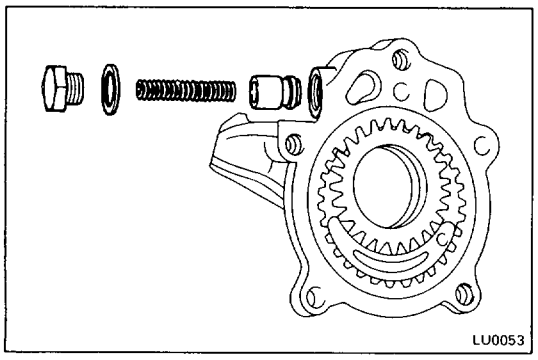
   (b) Remove the five bolts, the oil pump assembly and O-ring.



7. **REMOVE OIL PUMP DRIVE SPLINE**

NOTE: If the oil pump drive spline cannot be removed by hand, use SST. Use SST to remove them together.

SST 09213-36020

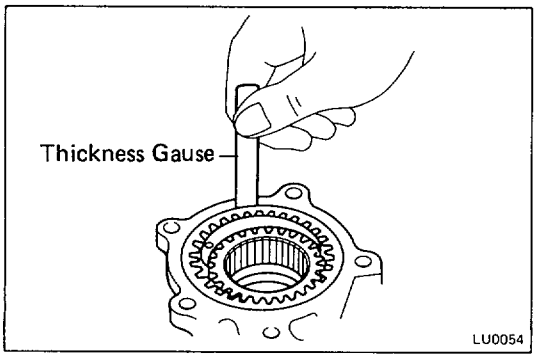


8. **DISASSEMBLE OIL PUMP ASSEMBLY**

(a) Unscrew the relief valve plug and gasket, and remove the spring and the relief valve.

(b) Remove the drive and the driven gears.

INSPECTION OF OIL PUMP

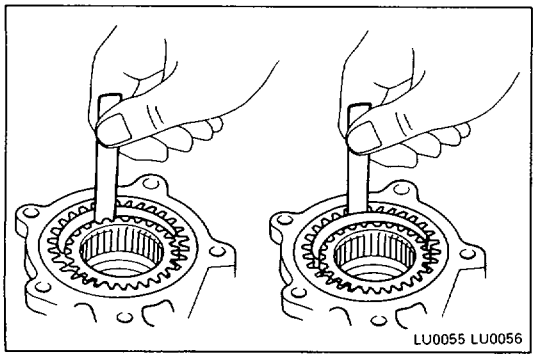


1. **MEASURE BODY CLEARANCE**

Using a thickness gauge, measure the clearance between the driven gear and body.

Maximum clearance: 0.2 mm (0.008 in.)

If the clearance is greater than maximum, replace the gear and/or body.

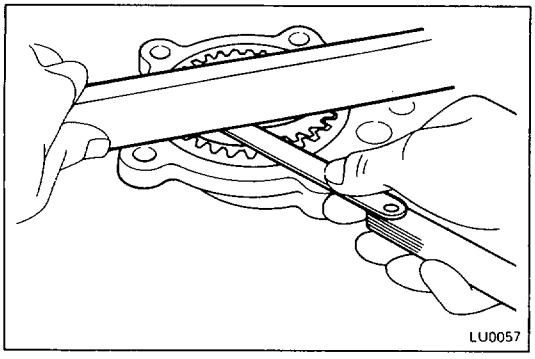


2. **MEASURE TIP CLEARANCE**

Using a thickness gauge, measure the clearance between both gear tips and crescent.

Maximum clearance: 0.3 mm (0.012 in.)

If the clearance is greater than the maximum, replace the gears and/or body.

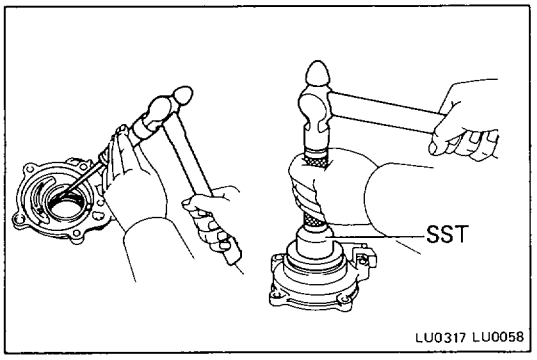


3. **MEASURE SIDE CLEARANCE**

Using a thickness gauge and a flat block, measure the side clearance as shown.

Maximum clearance: 0.15 mm (0.0059 in.)

If the clearance is greater than the maximum, replace the gears and/or body.



REPLACE FRONT OIL SEAL

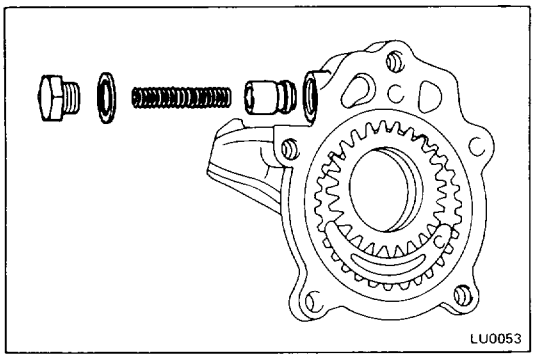
1. **REMOVE OIL SEAL**

   Remove the oil seal with a screwdriver.

2. **INSTALL OIL SEAL**

   Drive in the new oil seal with SST.

   SST 09223-50010



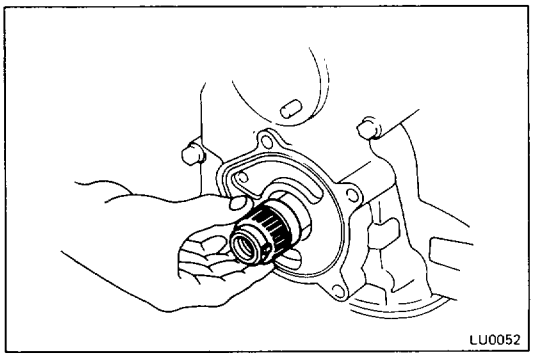
ASSEMBLY AND INSTALLATION OF OIL PUMP

(See page LU-4)

1. **ASSEMBLE OIL PUMP ASSEMBLY**

   (a) Install relief valve and the spring in the body, and screw on the relief valve plug with the new gasket.

   (b) Insert the drive and driven gears into the pump body.

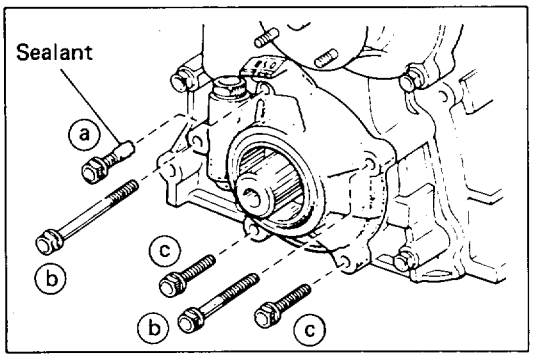


2. **INSTALL OIL PUMP DRIVE SPLINE AND O-RING**

   (a) Slide the pump drive spline onto the crankshaft.

   NOTE: If the oil pump drive spline cannot be installed by hand, use SST. (See page EM-61)

   (b) Place the O-ring into the groove.



3. **INSTALL OIL PUMP**

   (a) Clean the upper set bolt to most threads and timing chain cover bolt holes of any sealer, oil or foreign particles.
   Remove any oil with kerosene or gasoline.

   (b) Apply sealant to 2 or 3 threads of the bolt end (top most).

   Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

   - This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.

   (c) Torque the five bolts.

   Torque: ⓐ 250 kg-cm (18 ft-lb, 25 N·m)
   ⓑ 195 kg-cm (14 ft-lb, 19 N·m)
   ⓒ 130 kg-cm (9 ft-lb, 13 N·m)

   (d) Torque the relief valve plug.

   Torque: 375 kg-cm (27 ft-lb, 37 N·m)

4. **INSTALL FOLLOWING ITEMS:**

   (a) Clean oil strainer with four bolts.

   (b) Clean oil pan and cylinder block. (See step 13 on page EM-51)

   (c) Crankshaft pulley. (See step 8 on page EM-50)

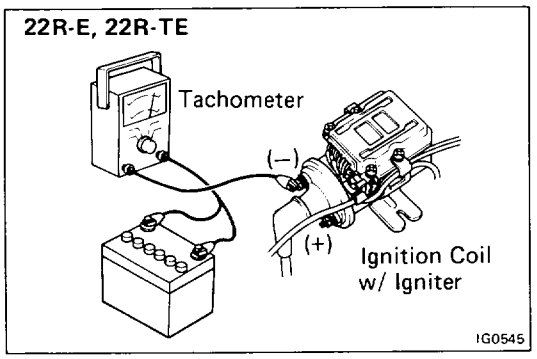
   (d) Drive belts. (See step 9 on page EM-50)

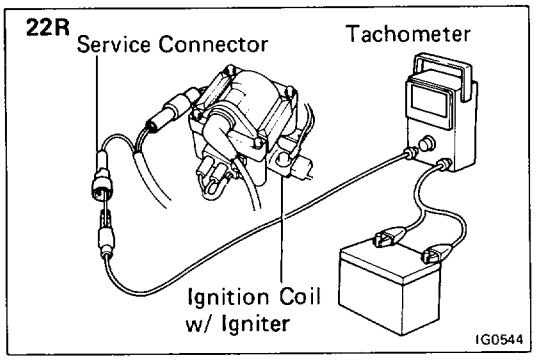
IGNITION SYSTEM

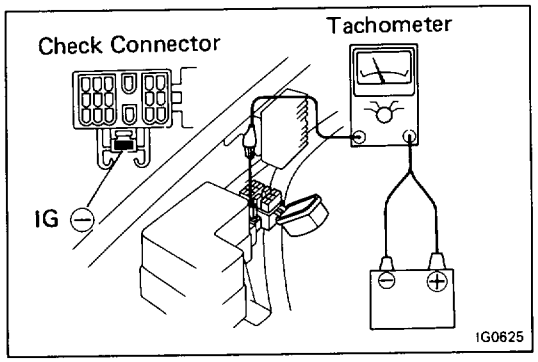
	Page
PRECAUTIONS	IG-2
TROUBLESHOOTING	IG-3
ELECTRONIC SPARK ADVANCE (ESA)	IG-4
ON-VEHICLE INSPECTION	IG-5
DISTRIBUTOR	IG-10

PRECAUTIONS

1. Do not allow the ignition switch to be ON for more than 10 minutes if the engine will not start.
2. As some tachometers are not compatible with this ignition system, we recommended that you cofirm the compatibility of your unit before using.
3. NEVER allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
4. Do not disconnect the battery when the engine is running.
5. Make sure that the igniter is properly grounded to the body.
6. When a tachometer is connected to the system, connect the tachometer test probe to the ignition coil negative terminal.







NOTE: The rpm signal for the 22R-E and 22R-TE can also be taken from the IG ⊖ terminal of the check connector.

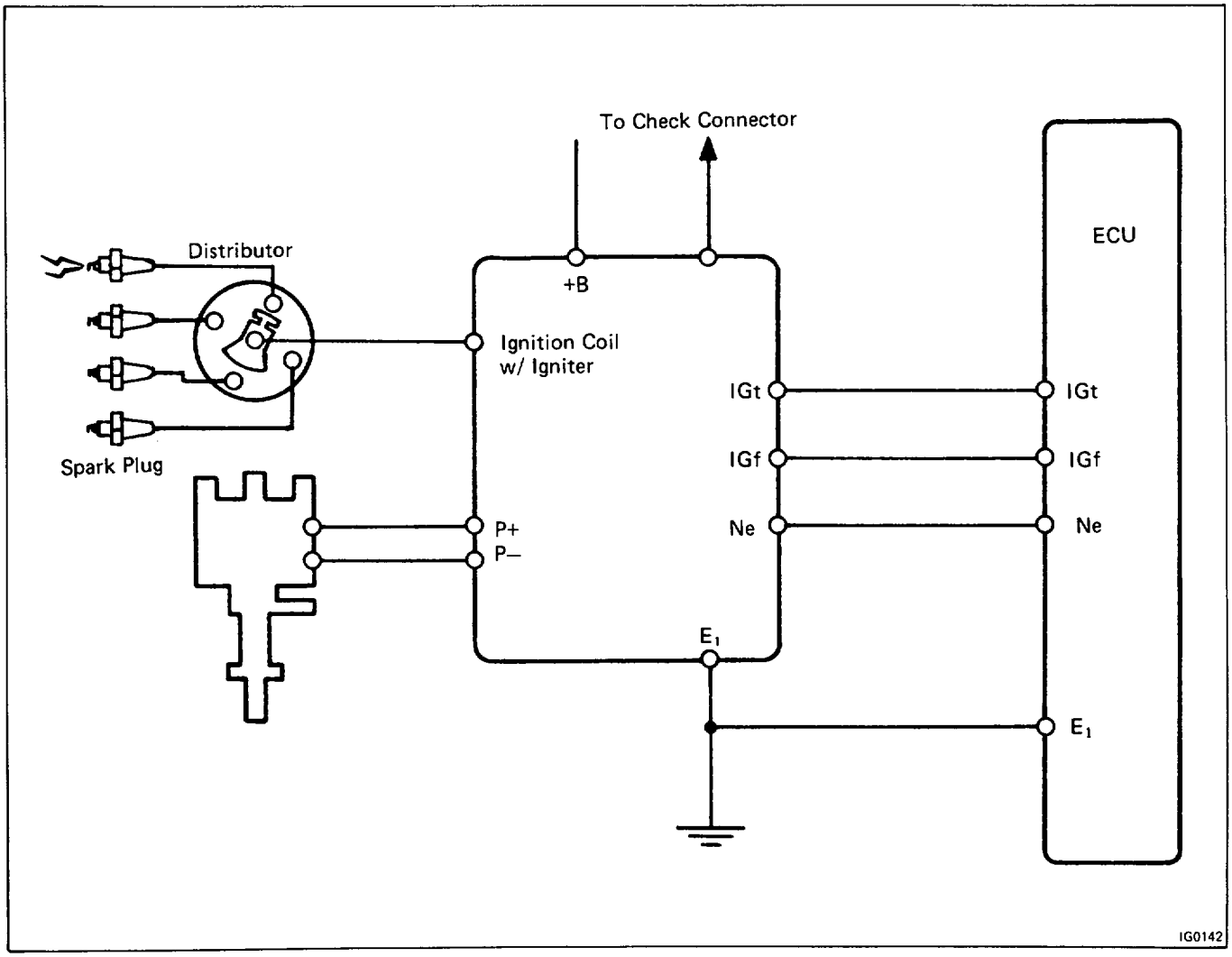
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ Hard to start (cranks ok)	Ignition problems • Ignition coil • Igniter • Distributor Spark plugs faulty High-tension cords disconnected or broken	Perform spark test Inspect coil Inspect distributor Inspect plugs Inspect cords	IG-5 IG-7,8 IG-9 IG-6 IG-6
Rough idle or stalls	Spark plugs faulty High-tension cords faulty Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor	Inspect plugs Inspect cords Reset timing Perform spark test Inspect coil Inspect distributor	IG-6 IG-6 IG-15 IG-5 IG-7,8 IG-9
Engine hesitates/ Poor acceleration	Spark plugs faulty High-tension cords faulty Incorrect ignition timing	Inspect plugs Inspect cords Reset timing	IG-6 IG-6 IG-15
Engine dieseling (22R) (runs after ignition switch is turned off)	Fuel cut system faulty	Repair fuel cut system	
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-15
Engine backfires	Incorrect ignition timing	Reset timing	IG-15
Poor fuel economy	Spark plugs faulty Incorrect ignition timing	Inspect plugs Reset timing	IG-6 IG-15
Engine overheats	Incorrect ignition timing	Reset timing	IG-15

ELECTRONIC SPARK ADVANCE (ESA) FOR 22R-E, 22R-TE

The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

ESA SYSTEM CIRCUIT



ON-VEHICLE INSPECTION

SPARK TEST

CHECK THAT SPARK OCCURS

(a) Disconnect high-tension cord from the distributor.

(b) Hold the end approx. 12.7 mm (0.50 in.) from body of car.

(c) Check if spark occurs while engine is being cranked.

NOTE(22R-E, 22R-TE): To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1-2 seconds at a time.

If the spark does not occur, perform the test as follows.

SPARK TEST

BAD

CHECK RESISTANCE OF HIGH-TENSION CORDS
(See page IG-5)

BAD → Replace the cord.

OK

CHECK POWER SUPPLY TO IGNITION COIL
1. Ignition switch turn to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

BAD → Check wiring between ignition switch to ignition coil.

OK

CHECK RESISTANCE OF IGNITION COIL
Resistance(cold) Primary:
22R 0.4 — 0.5 Ω
22R-E, 22R-TE 0.5 — 0.7 Ω
Secondary:
22R 8.5 — 11.5 kΩ
22R-E, 22R-TE 11.4 — 15.6 kΩ

BAD → Replace the ignition coil.

OK

CHECK RESISTANCE OF DISTRIBUTOR SIGNAL GENERATOR (PICKUP COIL)
Resistance: 140 — 180 Ω

BAD → (22R)
Replace the signal generator (pickup coil).
(Ex. 22R)
Replace the distributor.

OK

CHECK AIR GAP OF DISTRIBUTOR
(See page IG-9)
Air gap: 0.2 — 0.4 mm (0.008 — 0.016 in.)

BAD → Replace the distributor

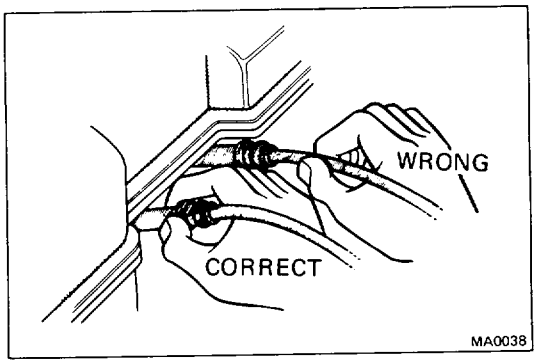
OK

CHECK IGt SIGNAL FROM ECU
(See page FI-34)

BAD → Check wiring between ECU and distributor, only then try another ECU

OK

TRY ANOTHER IGNITER



INSPECTION OF HIGH-TENSION CORD

1. **CAREFULLY REMOVE HIGH TENSION CORD BY RUBBER BOOT**

   CAUTION: DO NOT pull on or bend the cords to avoid damaging the conductor inside.

2. **INSPECT CORD TERMINALS**

   Check the terminals for corrosion, breaks or distortion. Replace cords as required.

3. **CHECK CORD RESISTANCE**

   Using an ohmmeter, check that the resistance does not exceed the maximum. Replace cords as required.

   Maximum resistance: 25 kΩ per cord

INSPECTION OF SPARK PLUGS

1. **REMOVE SPARK PLUGS**

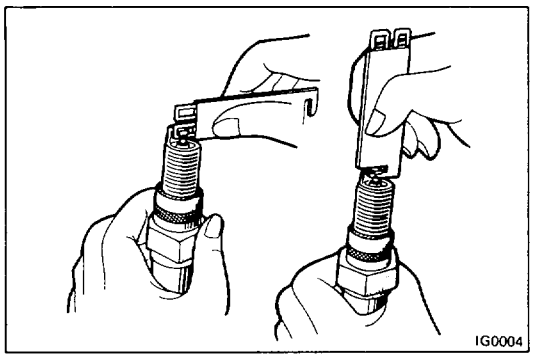
2. **CLEAN AND INSPECT SPARK PLUGS**

   (a) Clean the spark plugs with a spark plug cleaner or wire brush.

   (b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

   If a problem is found, replace the plugs.

   Spark plug: ND W16EXR-U
   NGK BPR5EY



3. **ADJUST ELECTRODE GAP**

   Carefully bend the outer electrode to obtain the correct electrode gap.

   Correct electrode gap: 0.8 mm (0.031 in.)

4. **INSTALL SPARK PLUGS**

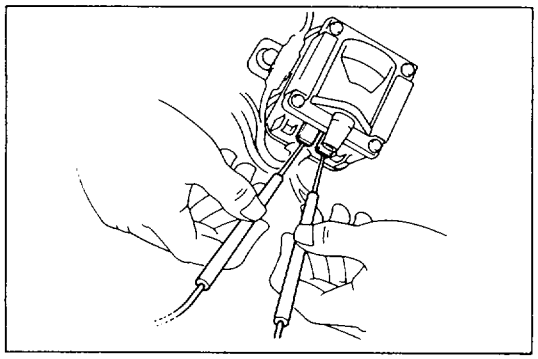
   Torque : 180 kg-cm (13 ft-lb, 18 N·m)

[22R]

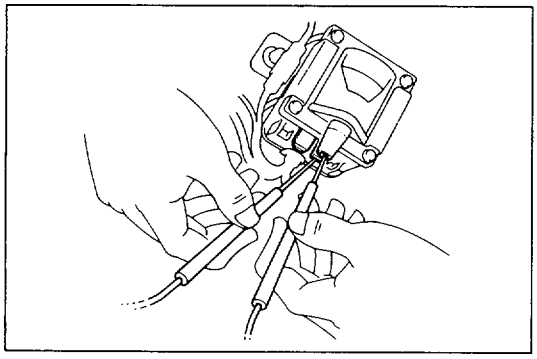
INSPECTION OF IGNITION COIL

1. **DISCONNECT HIGH-TENSION CORD AND IGNITION COIL CONNECTOR**

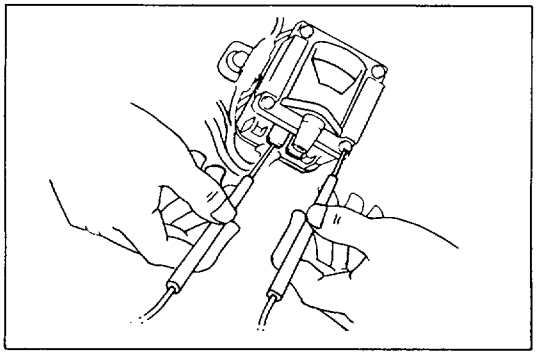
2. **CLEAN COIL AND CHECK FOLLOWING:**
   (a) Check for cracks or damage.
   (b) Check the terminals for carbon tracks.
   (c) Check the high-tension cord hole for carbon deposits and corrosion.



3. **MEASURE PRIMARY COIL RESISTANCE**
   Using an ohmmeter, measure the resistance between the positive (+) (brown side) and negative (—) (black side) terminals.
   Primary coil resistance (cold): 0.4 — 0.5 Ω



4. **MEASURE SECONDARY COIL RESISTANCE**
   Using an ohmmeter, measure the resistance between the positive (+) terminal (brown side) and the high-tension terminal.
   Secondary coil resistance (cold): 8.5 — 11.5 kΩ

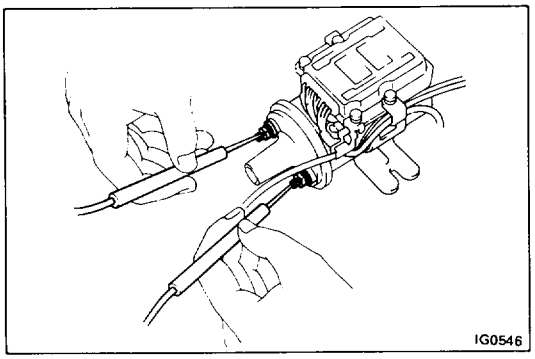


5. **MEASURE INSULATION RESISTANCE**
   Using an ohmmeter, measure the resistance between the positive (+) terminal and the igniter body.
   Insulation resistance: Infinity
   If a problem with the coil is found, replace it.

6. **CONNECT HIGH-TENSION CORD AND IGNITION COIL CONNECTOR**

[22R-E, 22R-TE]
INSPECTION OF IGNITION COIL

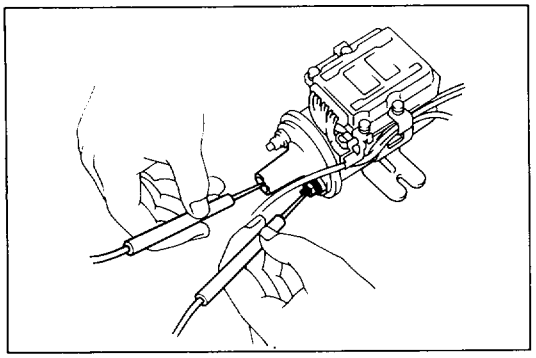
1. DISCONNECT HIGH-TENSION CORD



2. MEASURE PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (—) terminals.

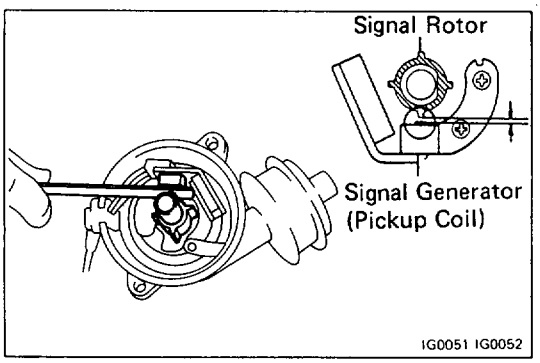
Primary coil resistance (cold): 0.5 — 0.7 Ω



3. MEASURE SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) terminal and high-tension terminal.

Secondary coil resistance (cold): 11.4 — 15.6 kΩ



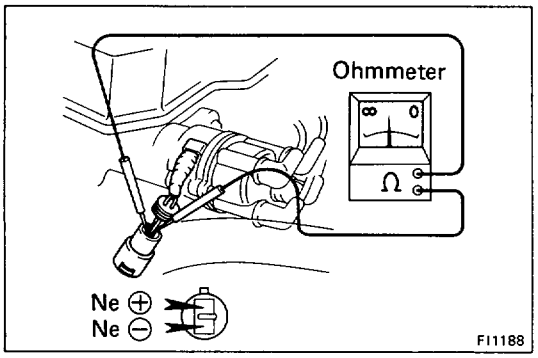
ON-VEHICLE INSPECTION OF DISTRIBUTOR

1. CHECK AIR GAP

Using a thickness gauge, measure the gap between the signal rotor and the signal generator (pickup coil) projection.

Air gap: 0.2 — 0.4 mm (0.008 — 0.016 in.)

If the air gap is not correct, replace the distributor.



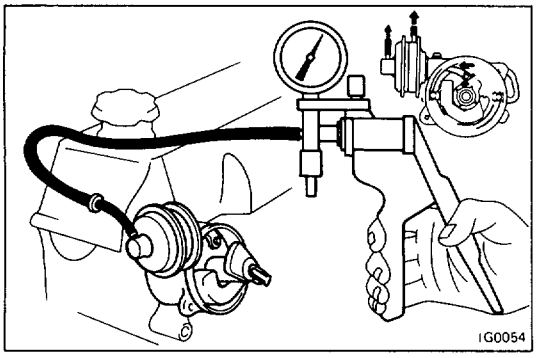
2. CHECK SIGNAL GENERATOR (PICKUP COIL)

Using an ohmmeter, check the resistance of the signal generator (pickup coil).

Generator resistance: 140 — 180Ω

(22R)
If the resistance is not correct, replace the signal generator (pickup coil).

(Ex. 22R)
If the resistance is not correct, replace the distributor assembly.

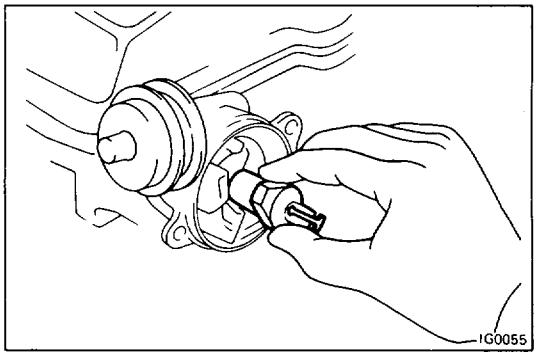


3. (22R) CHECK VACUUM ADVANCE

(a) Disconnect the vacuum hose and connect a vacuum pump to the diaphragms.

(b) Apply vacuum and check that the vacuum advance moves.

If the vacuum advance does not work, repair or replace as necessary.



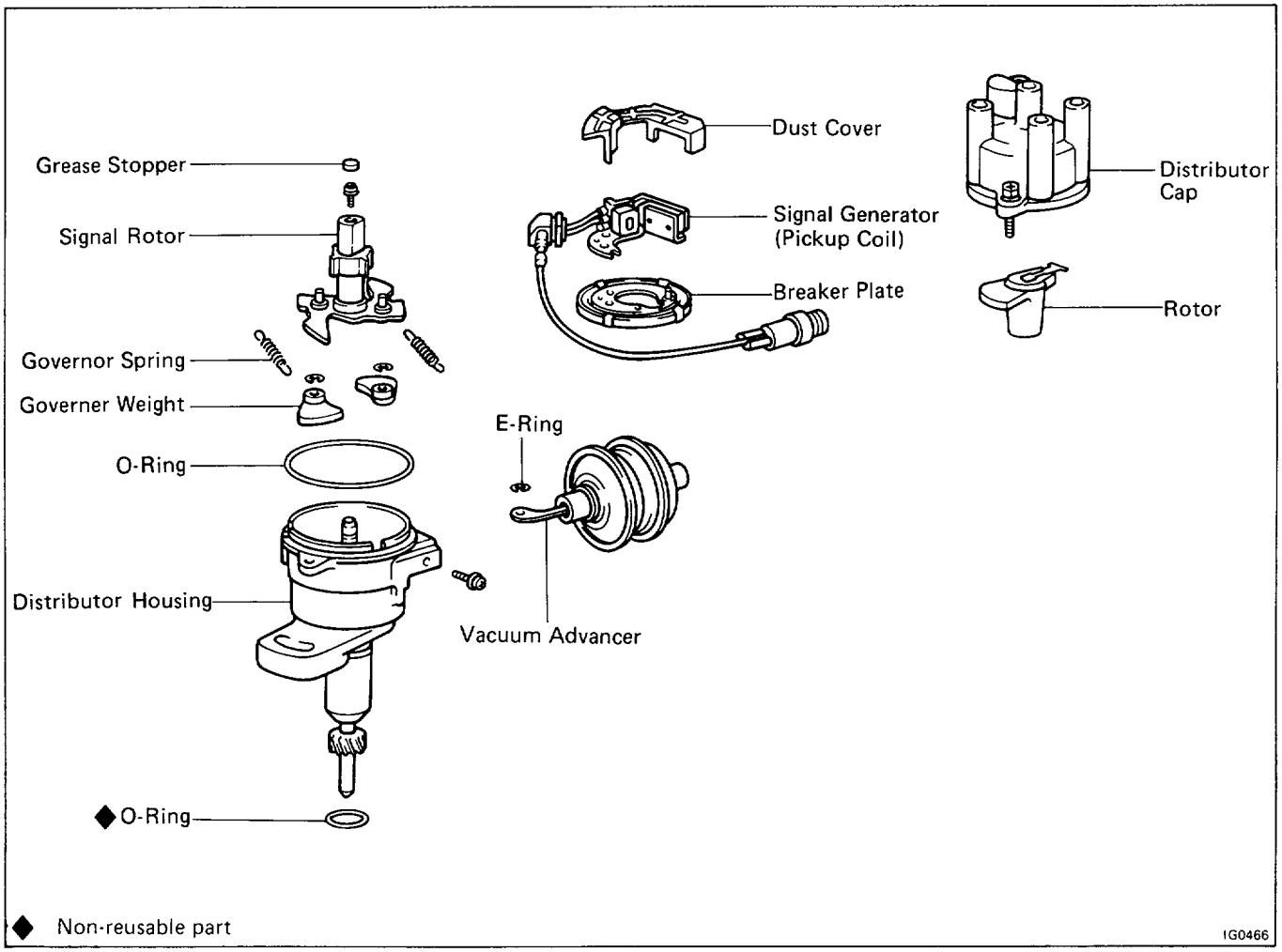
4. (22R) CHECK GOVERNOR ADVANCE

(a) Turn the rotor shaft clockwise, release it and check that the rotor returns slightly counterclockwise.

(b) Check that the rotor shaft is not excessively loose.

DISTRIBUTOR

COMPONENTS (22R)

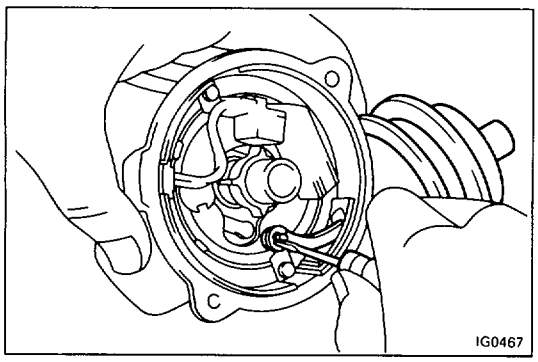


REMOVAL OF DISTRIBUTOR

1. DISCONNECT VACUUM HOSES (FOR 22R), HIGH-TENSION CORDS AND WIRING CONNECTOR
2. REMOVE TWO SCREWS AND PULL OFF DISTRIBUTOR CAP
3. REMOVE HOLD-DOWN BOLT AND PULL OUT DISTRIBUTOR

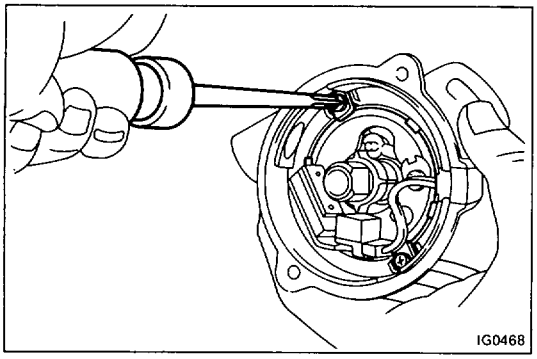
DISASSEMBLY OF DISTRIBUTOR (22R only)

1. REMOVE CAP, ROTOR, DUST COVER AND O-RING
2. REMOVE SIGNAL GENERATOR (PICKUP COIL)
   (a) Remove the screw and ground strap.
   (b) Remove two screws and pull out the signal generator (pickup coil).



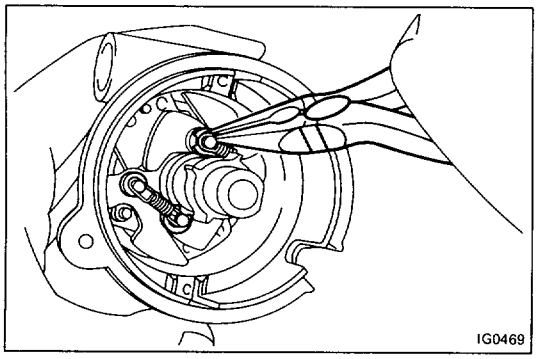
3. REMOVE VACUUM ADVANCE DIAPHRAGM

Remove the screw and E-Ring. Pull out the vacuum advance diaphragm.

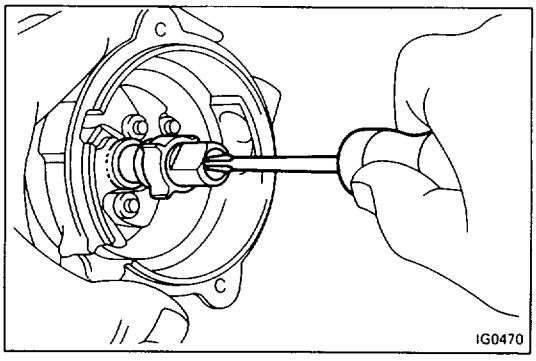


4. REMOVE STATIONARY PLATE WITH GENERATOR

Remove two screws and pull out the plate.



5. REMOVE GOVERNOR SPRINGS

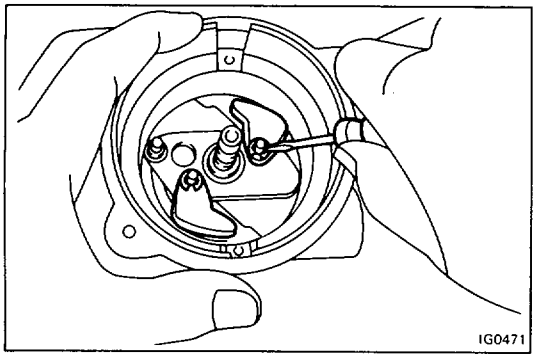


6. REMOVE SIGNAL ROTOR

(a) Pry out the grease stopper.

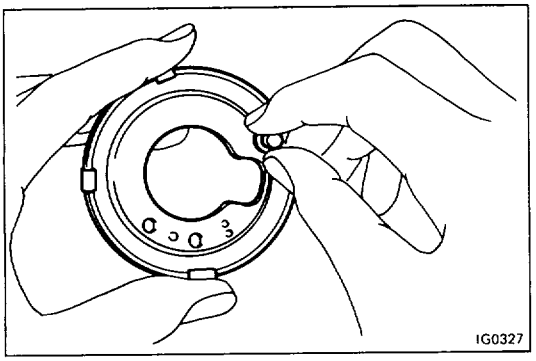
(b) Remove the screw at the end of the governor shaft.

(c) Pull off the signal rotor.



7. REMOVE GOVERNOR WEIGHTS

Using a screwdriver, remove the E-Rings and pull off the governor weights.

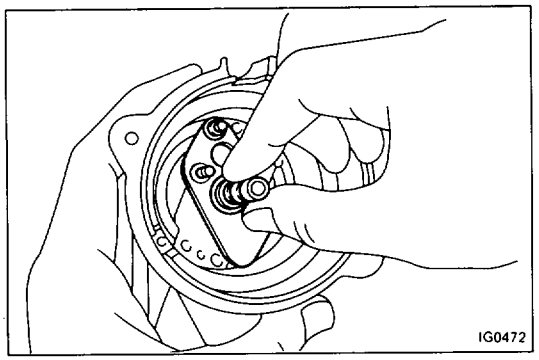


INSPECTION AND REPLACEMENT OF DISTRIBUTOR (22R only)

1. CHECK BREAKER PLATE

Turn the plate and check that it has a slight drag.

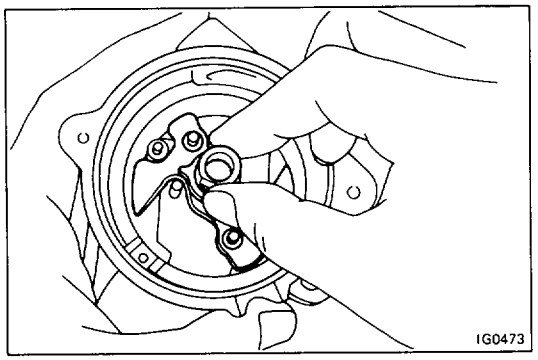
If strong resistance or sticking is felt, replace the plate.



2. INSPECT GOVERNOR SHAFT BEARING

Turn the governor shaft and check that the bearing is not rough or worn.

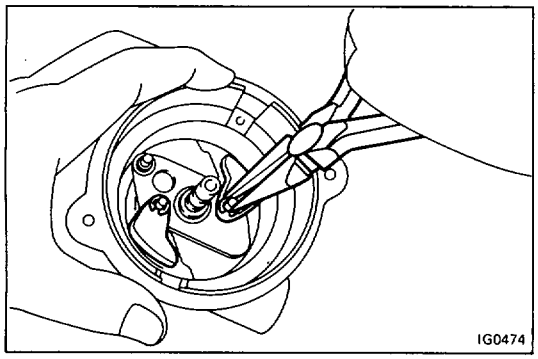
If necessary, replace the distributor assembly.



3. CHECK SIGNAL ROTOR

(a) Temporarily install the signal rotor.

(b) Check the signal rotor for damage and correct fit on the distributor shaft.



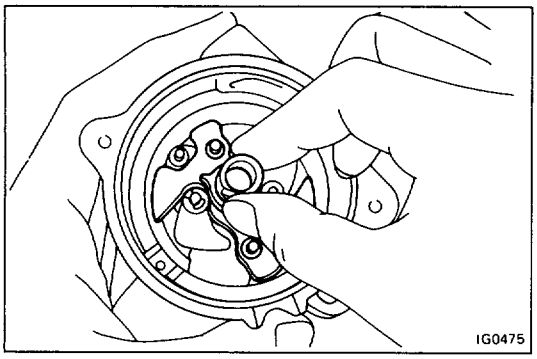
ASSEMBLY OF DISTRIBUTOR (22R only)

(See page IG-9)

1. LIGHTLY COAT GOVERNOR SHAFT WITH GREASE

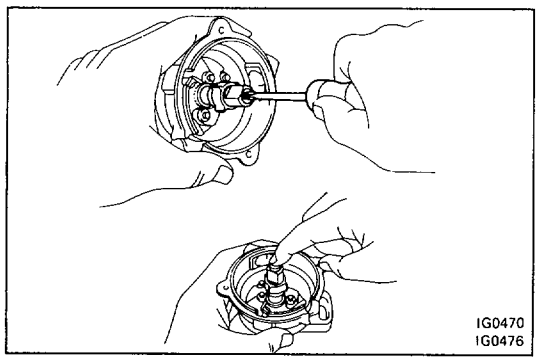
2. INSTALL GOVERNOR WEIGHTS

Using a screwdriver, install the governor weights with the E-rings.



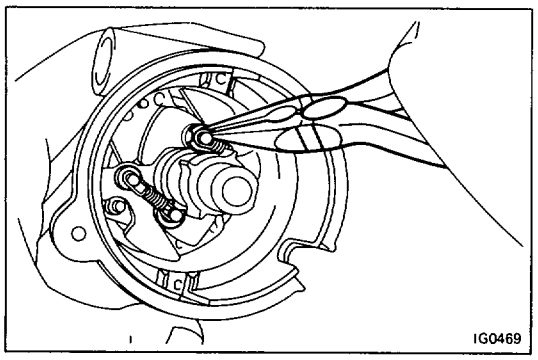
3. INSTALL SIGNAL ROTOR

Install the signal rotor on the governor shaft with the cutout part positioned at the right side of the governor shaft stopper pin.

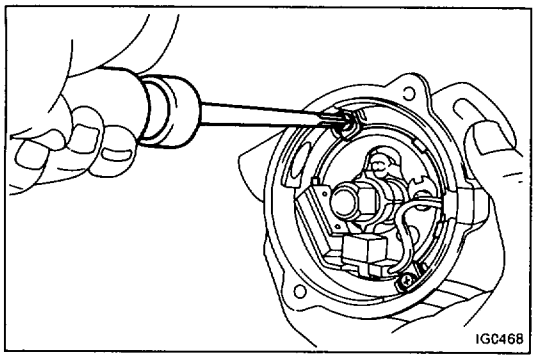


4. INSTALL SCREW AND GREASE STOPPER ON SIGNAL ROTOR

Apply grease to the end of the governor shaft and push on the grease stopper with your finger.



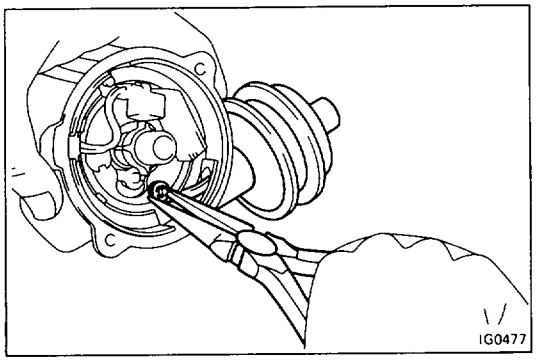
5. INSTALL GOVERNOR SPRINGS



6. INSTALL BREAKER PLATE

(a) Fit the four clips on the breaker plate into the housing slots.

(b) Install two hold-clips with two screws.

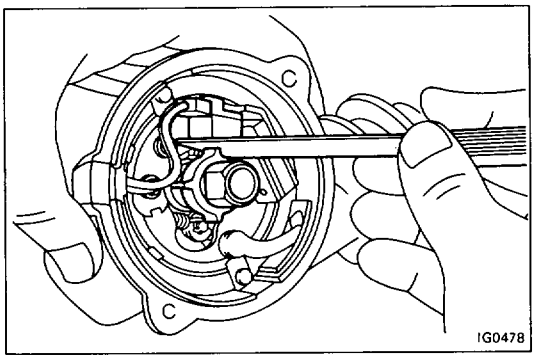


7. INSTALL VACUUM ADVANCE DIAPHRAGM

(a) Insert the vacuum advance diaphragm with a gasket into the distributor and place the lever hole over the plate pin.

(b) Install the E-ring on the pin.

(c) Install and tighten the vacuum advance diaphragm screw.



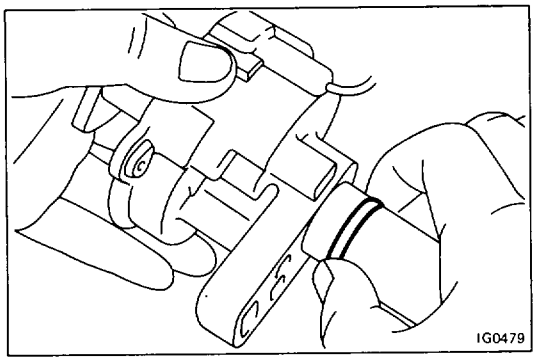
8. INSTALL SIGNAL GENERATOR (PICKUP COIL)

(a) Align the rotor tooth with the pickup coil.

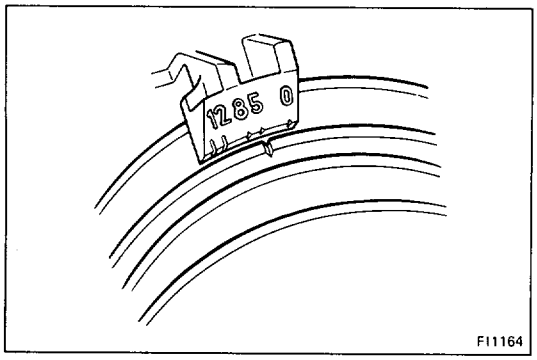
(b) Using a thickness gauge, measure the air gap.

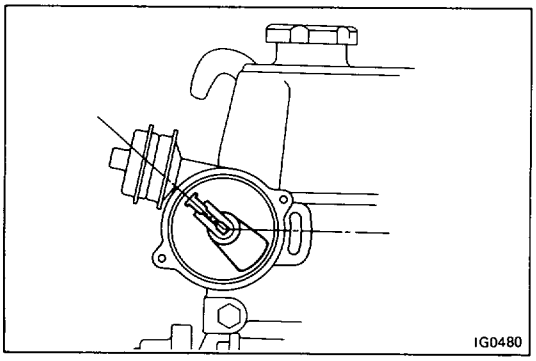
Air gap: 0.2 — 0.4 mm (0.008 — 0.016 in.)

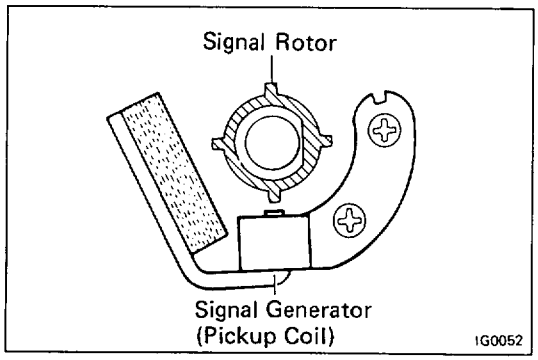
9. INSTALL DUST COVER, O-RING AND ROTOR

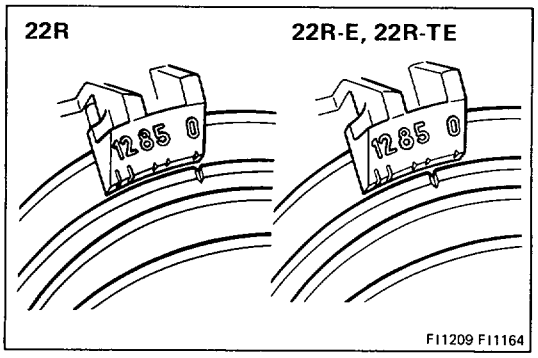


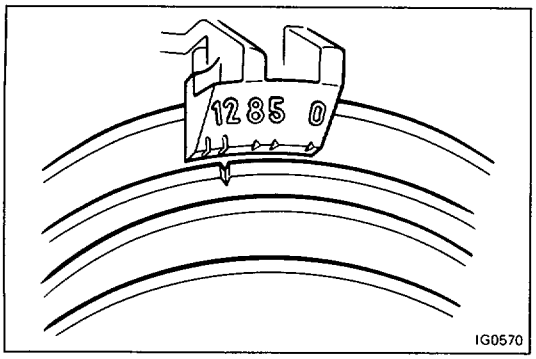
10. INSTALL NEW O-RING











INSTALLATION OF DISTRIBUTOR

1. INSTALL DISTRIBUTOR AND SET TIMING

(a) Turn the crankshaft pulley until the timing mark is aligned with 0° TDC (22R) and 5° BTDC (22R-E, 22R-TE) mark.

NOTE: Check that the rocker arms on the No.1 cylinder are loose. If not, turn the crankshaft one full turn.

(b) Temporarily install the rotor.

(c) Begin insertion of the distributor with the rotor pointing upward and the distributor mounting hole approximately at center position of the bolt hole.

(d) When fully installed, the rotor will rotate to the position shown.

(e) Align the rotor tooth with the signal generator (pick-up coil) projection.

(f) Install and torque the bolt.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

(g) Install the rotor and distributor cap with wires.

2. INSTALL FOLLOWING PARTS:

(a) (22R)
Vacuum hoses

(b) Wiring connector

3. ADJUST IGNITION TIMING

(a) Connect a timing light to the engine.

(b) Start the engine and run it at idle.

(c) (22R)
Disconnect the vacuum hose from the distributor sub-diaphragm and plug the hose end.

(22R-E, 22R-TE)
Short terminals T and E_1 of the check connector.

(d) Check the ignition timing.

Ignition timing:

22R	**0° TDC @ Max. 950 rpm**
22R-E, 22R-TE	**5° BTDC @ Idle**

If necessary, loosen the distributor bolt and turn the distributor to align the marks. Recheck the timing after tightening the distributor bolt.

(e) (22R)
Reconnect the vacuum hose to the distributor sub-diaphragm.

(22R-E, 22R-TE)
Unshort the check connector.

4. FURTHER CHECK IGNITION TIMING

Ignition timing: 10 — 14° BTDC

STARTING SYSTEM

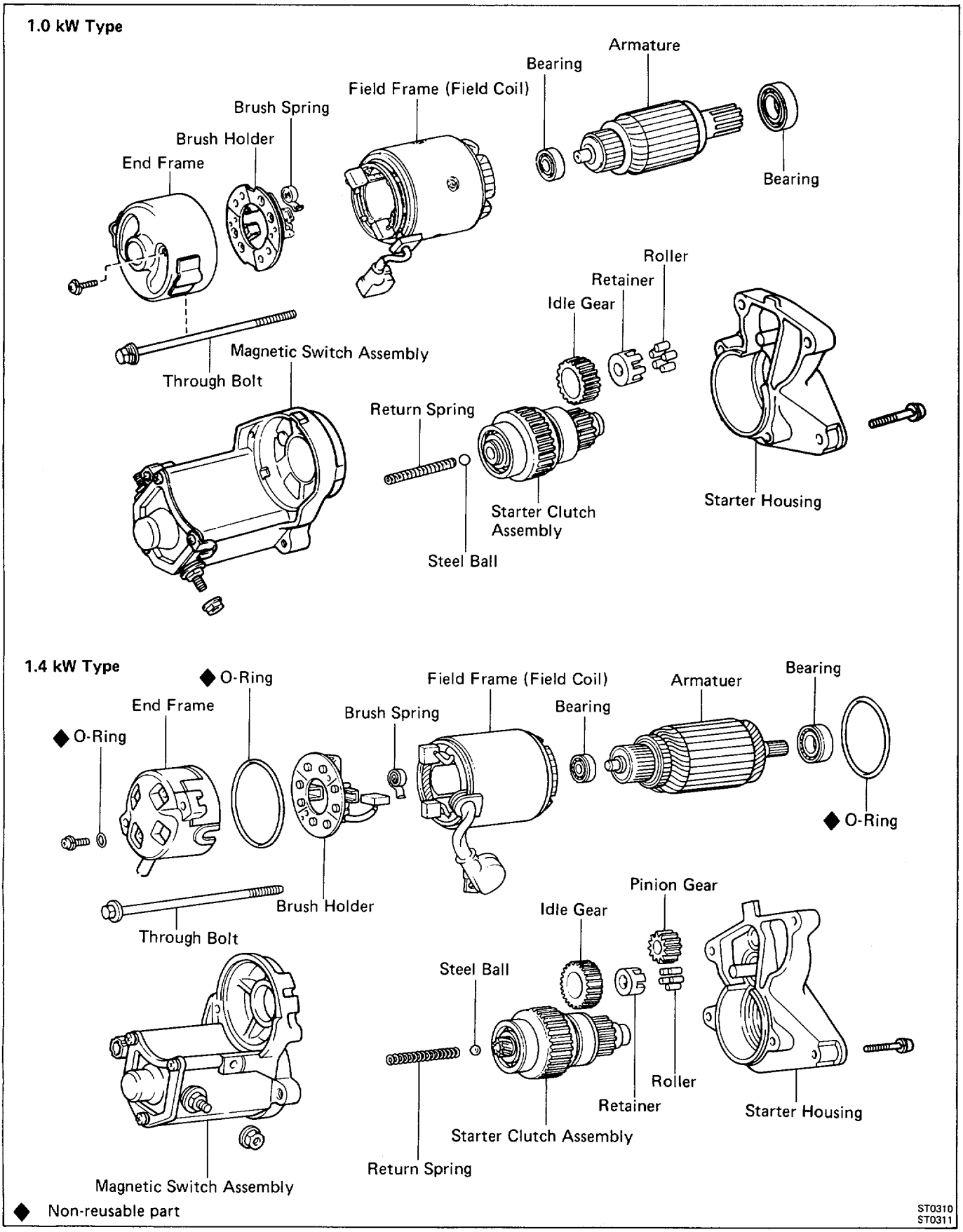
	Page
TROUBLESHOOTING	ST-2
STARTER	ST-3
STARTER RELAY	ST-12
CLUTCH START SWITCH	ST-12

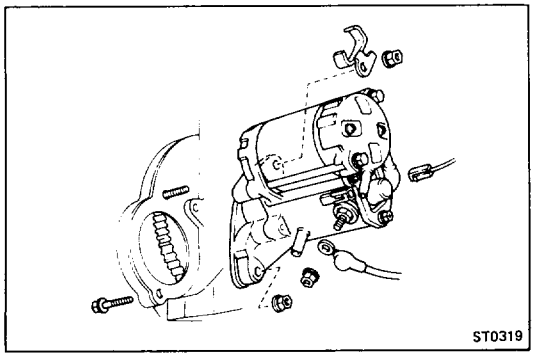
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not crank	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter relay faulty (M/T)	Replace relay	ST-12
	Clutch start switch faulty (M/T)	Adjust switch position or replace switch	CL-4
	Neutral start switch faulty (A/T)	Replace switch	
	Fusible link blown	Replace fusible link	
	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
Engine cranks slowly	Battery charge low	Check battery specific gravity Charge or replace battery	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Starter faulty	Repair starter	ST-3
Starter keeps running	Starter faulty	Repair starter	ST-3
	Ignition switch faulty	Replace ignition switch	
	Short in wiring	Repair wiring	
Starter spins — engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	ST-3
	Flywheel teeth broken	Replace flywheel	

STARTER

COMPONENTS



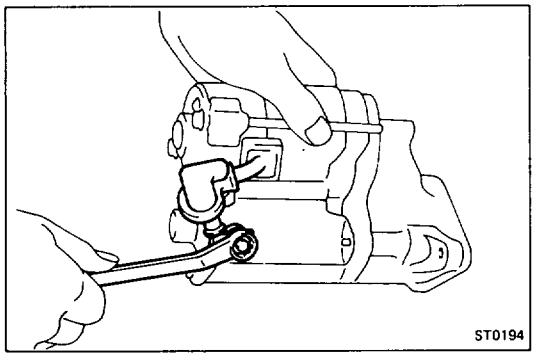


REMOVAL OF STARTER

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

2. **DISCONNECT TWO WIRES FROM STARTER**

   Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor. Disconnect the other wire from terminal 50.



3. **REMOVE STARTER MOTOR**

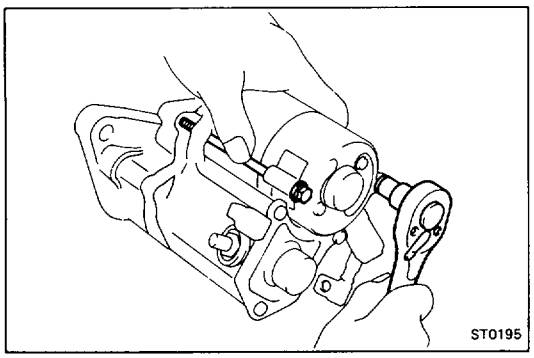
   Remove the nut and bolt, and remove the starter motor from the flywheel bellhousing.

DISASSEMBLY OF STARTER

(See page ST-3)

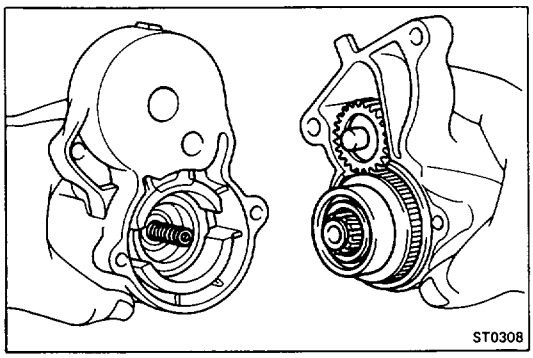
1. **REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY**

   (a) Disconnect the lead wire from the magnetic switch terminal.



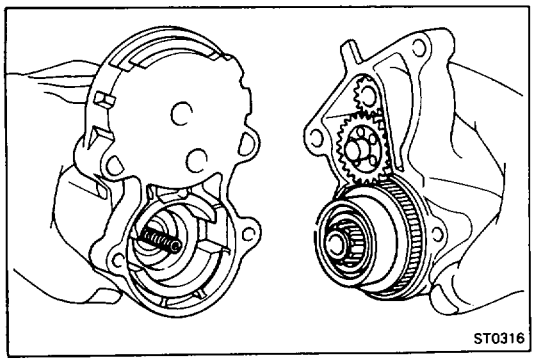
   (b) Remove the two through bolts. Pull out the field frame with the armature from the magnetic switch assembly.

   (c) Remove the O-ring. (1.4 kW type only)

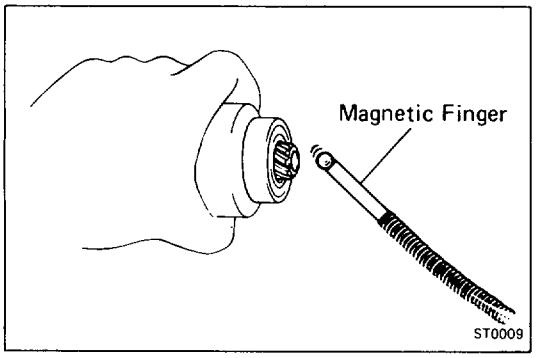


2. **REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY**

   [1.0 kW type]
   Remove the two screws and remove the starter housing with the idler gear and clutch assembly.

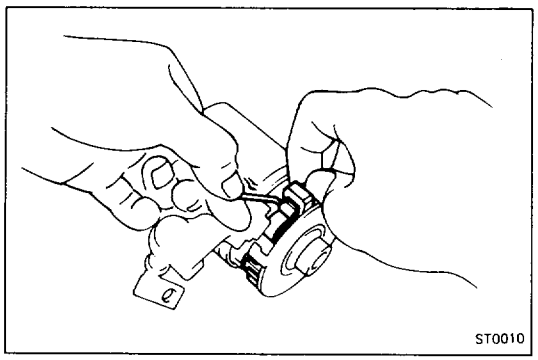


   [1.4 kW type]
   Remove the two screws and remove the starter housing with the pinion gear, idler gear and clutch assembly.



3. **REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING**

4. **REMOVE STEEL BALL AND SPRING**
   (a) Using a magnetic finger, remove the steel ball from the clutch shaft hole.
   (b) Remove the spring from the magnetic switch.

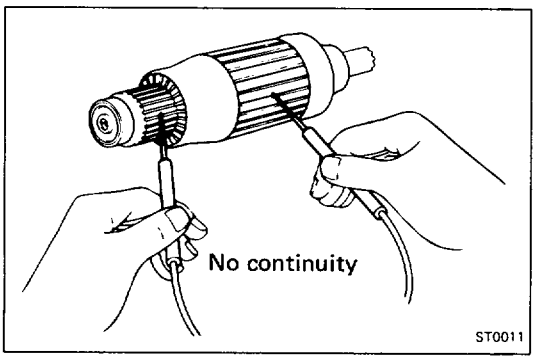


5. **REMOVE BRUSHES AND BRUSH HOLDER**
   (a) Remove the two screws and end frame from the field frame.
   (b) Remove the O-ring (1.4 kW type only).
   (c) Using a screwdriver or steel wire, separate the brush springs, and remove the brushes from the brush holder.
   (d) Pull the brush holder off the field frame.

6. **REMOVE ARMATURE FROM FIELD FRAME**

INSPECTION OF STARTER

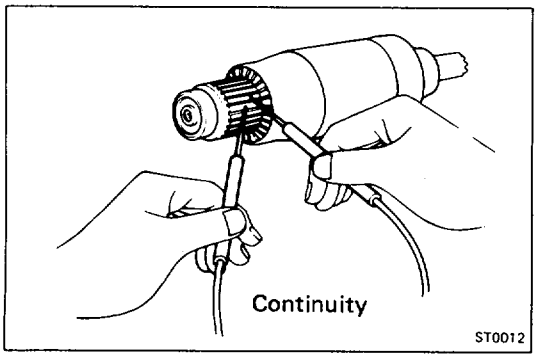
Armature Coil



1. **INSPECT THAT COMMUTATOR IS NOT GROUNDED**

   Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

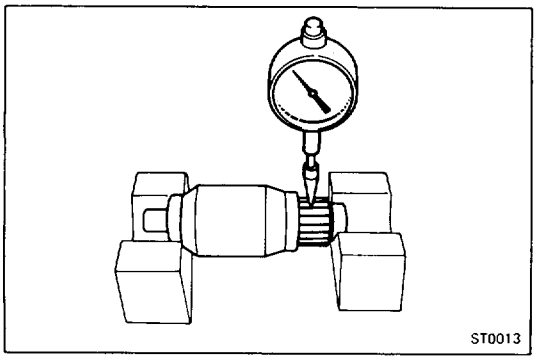
   If there is continuity, replace the armature.



2. **INSPECT COMMUTATOR FOR OPEN CIRCUIT**

   Using an ohmmeter, check for continuity between the segments of the commutator.
   If there is no continuity between any segment, replace the armature.

Commutator



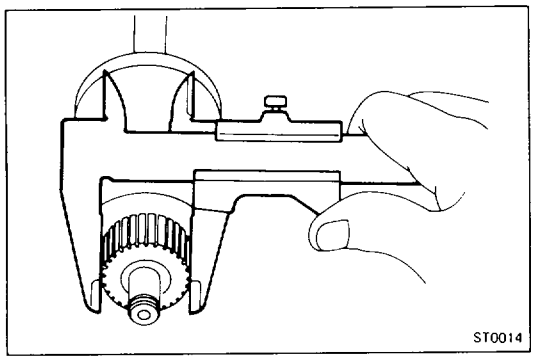
1. **INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES**

   If the surface is dirty or burnt, correct with sandpaper (No. 400) or a lathe.

2. **INSPECT COMMUTATOR CIRCLE RUNOUT**

   Maximum circle runout: 0.05 mm (0.0020 in.)

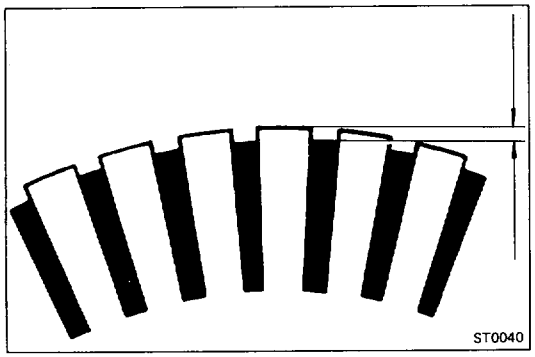
   If the circle runout is greater than maximum, correct with a lathe.



3. **MEASURE DIAMETER OF COMMUTATOR**

Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (1.14 in.)

If the diameter of the commutator is less than minimum, replace the armature.



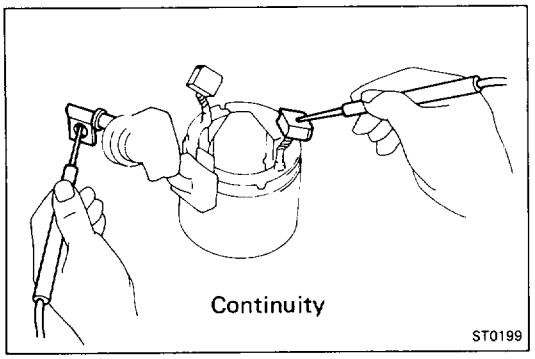
4. **INSPECT UNDERCUT DEPTH**

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw.

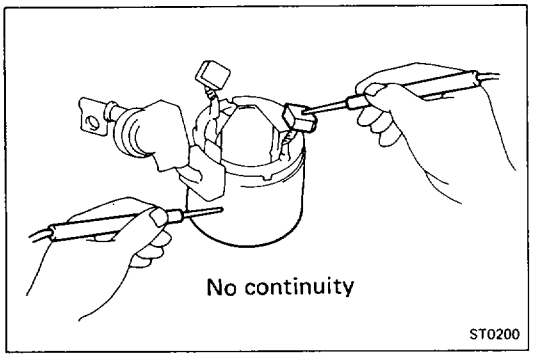
Field Frame (Field Coil)



1. **INSPECT FIELD COIL FOR OPEN CIRCUIT**

Using an ohmmeter, check for continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field frame.

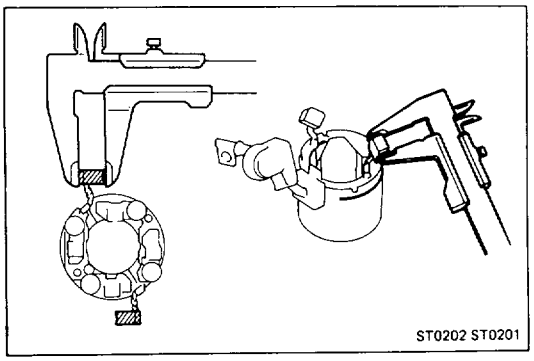


2. **INSPECT THAT FIELD COIL IS NOT GROUNDED**

Using an ohmmeter, check for no continuity between the field coil end and field frame.

If there is continuity, replace the field frame.

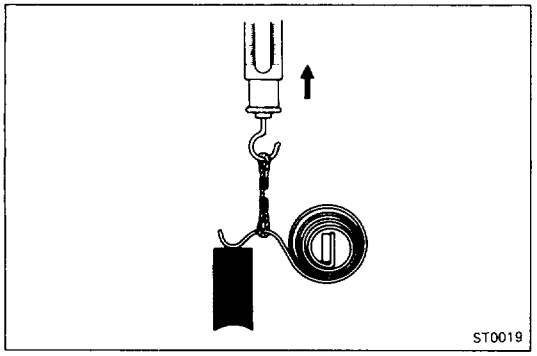
Brushes



MEASURE BRUSH LENGTH

Standard length:	**1.0 kW**	**13.5 mm (0.531 in.)**
	1.4 kW	**15.5 mm (0.610 in.)**
Minimum length:	**1.0 kW**	**8.5 mm (0.335 in.)**
	1.4 kW	**10.0 mm (0.394 in.)**

If length is less than minimum, replace the brush and dress with an emery cloth.



Brush Spring

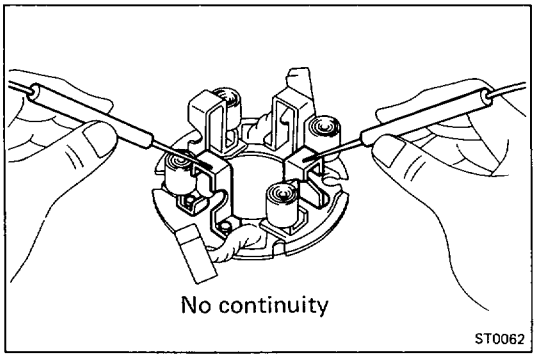
MEASURE BRUSH SPRING LOAD WITH A PULL SCALE

Standard installed load: 1.785 — 2.415 kg (3.9 — 5.3 lb, 18 — 24 N)

Minimum installed load: 1.2 kg (2.6 lb, 12 N)

If the installed load is less than minuimum, replace the brush springs.

NOTE: Take the pull scale reading the instant the brush spring separates from the brush.

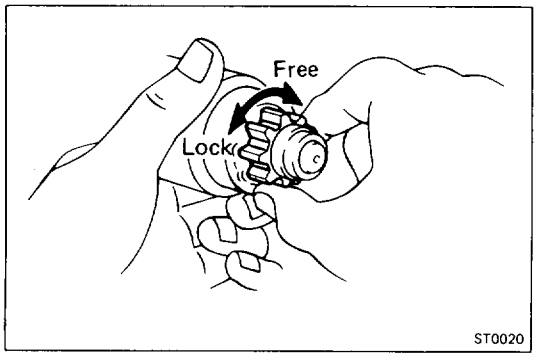


Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check for no continuity between the positive and negative brush holders.

If there is continuity, repair or replace the brush holder.



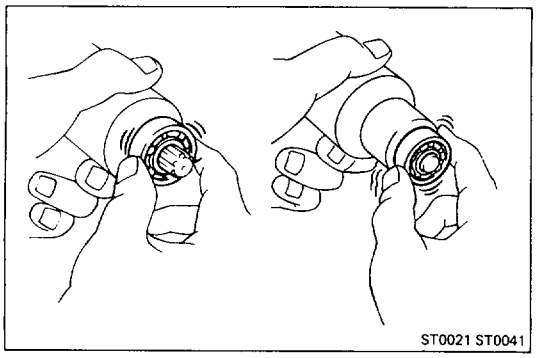
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage. Replace if damaged. If damaged, also check the flywheel ring gear for wear or damage.

2. INSPECT CLUTCH

Rotate the pinion clockwise and check that it turns freely. Try to rotate the pinion counterclockwise and check that it locks.

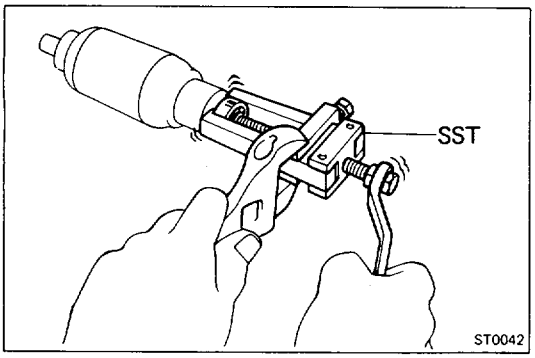


Bearings

1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force.

If resistance is felt or if the bearing sticks, replace the bearing.

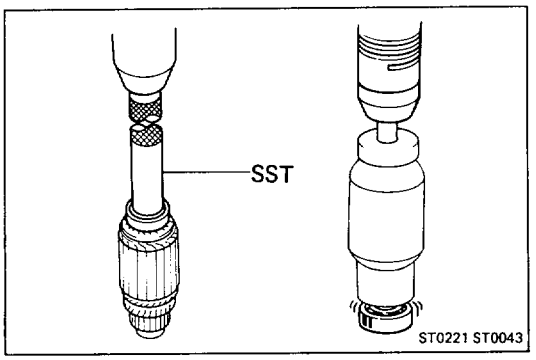


2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing from the armature shaft.

(b) Using SST, remove the other bearing on the opposite side.

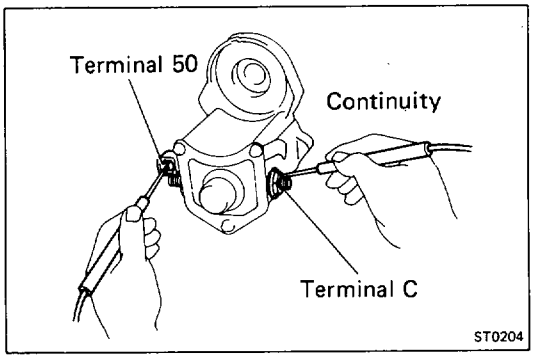
SST 09286-46011



(c) Using SST and Press, install a new large bearing onto the shaft.

SST 1.0 KW 09285-76010
1.4 KW 09201-41020

(d) Using a press, install a new small bearing onto the shaft.

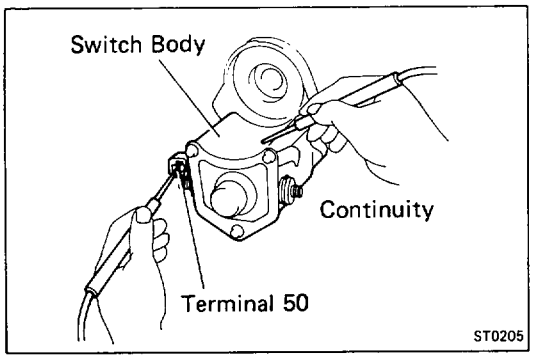


Magnetic Switch

1. PERFORM PULL-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and terminal C.

If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD-IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check for continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch.

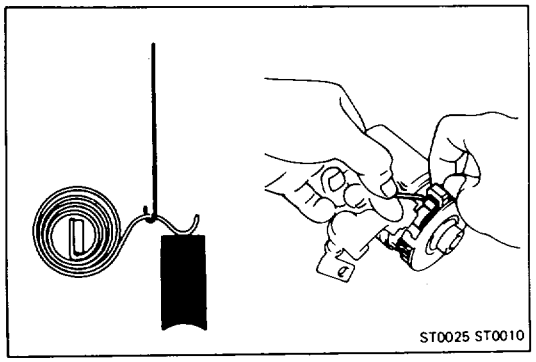
ASSEMBLY OF STARTER

(See page ST-3)

NOTE: Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings and insert the armature into the field frame.



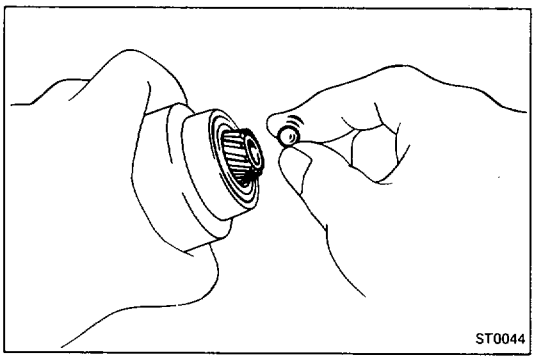
2. INSTALL BRUSH HOLDER AND BRUSHES

(a) Using a screwdriver or steel wire, hold the brush spring back, and install the brush into the brush holder. Install four brushes.

NOTE: Make sure that the positive lead wires are not grounded.

(b) Place the O-ring on the field frame (1.4 kW type only).

(c) Install the end frame to the field frame.

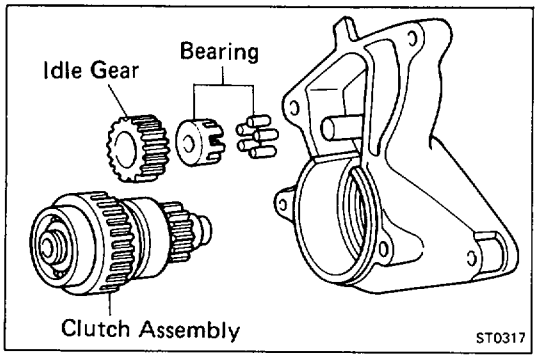


3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the ball and spring.

(b) Insert the steel ball into the cluch shaft hole.

(c) Insert the spring into the magnetic switch.

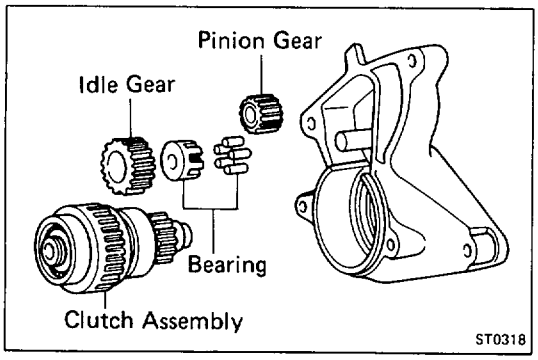


4. INSTALL GEARS AND CLUTCH ASSEMBLY TO STARTER HOUSING

[1.0 kW type]

(a) Apply grease to the gear and clutch assembly.

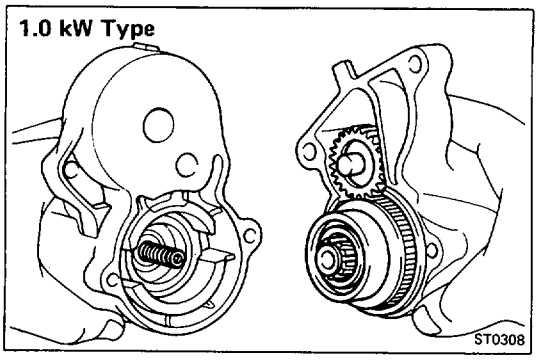
(b) Place the clutch assembly, idle gear and bearing in the starter housing.



[1.4 kW type]

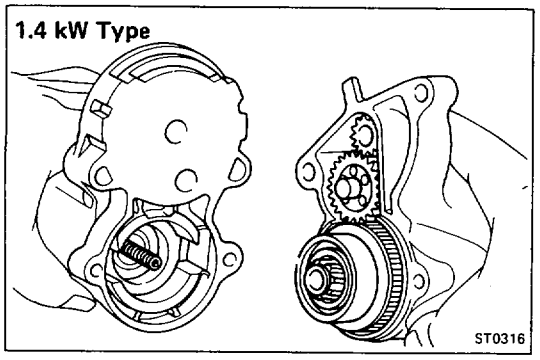
(a) Apply grease to the gears and clutch assembly.

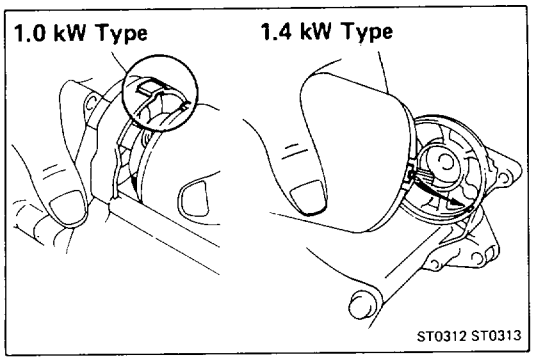
(b) Place the clutch assembly, idle gear, bearing and pinion gear in the starter housing.



5. INSTALL STARTER HOUSING

Place the starter housing on the magnetic switch and install the two screws.

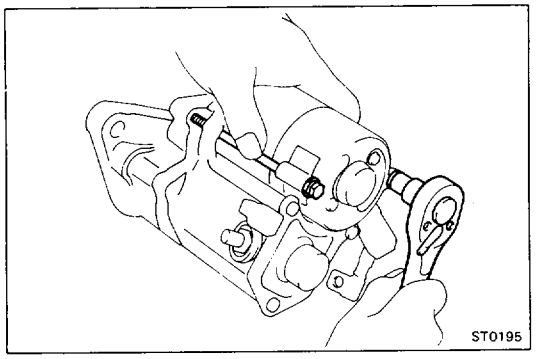




6. **INSTALL FIELD FRAME WITH ARMATURE IN MAGNETIC SWITCH ASSEMBLY**

(a) Place the O-ring on the field frame (1.4 kW type only).

(b) Match the protrusion of the field frame with the magnetic switch assembly.

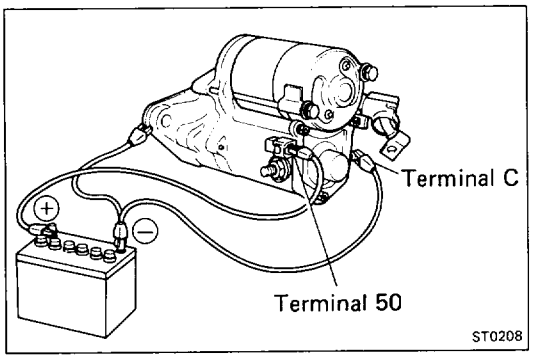


(c) Install the two through bolts.

(d) Connect the coil lead to the terminal on the magnetic switch assembly.

PERFORMANCE TEST OF STARTER

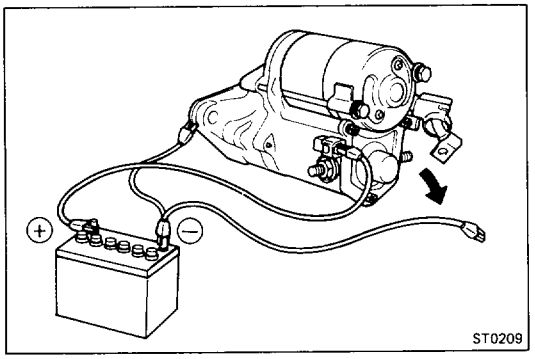
CAUTION: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



1. **PERFORM PULL-IN TEST**

(a) Disconnect the field coil lead from terminal C.

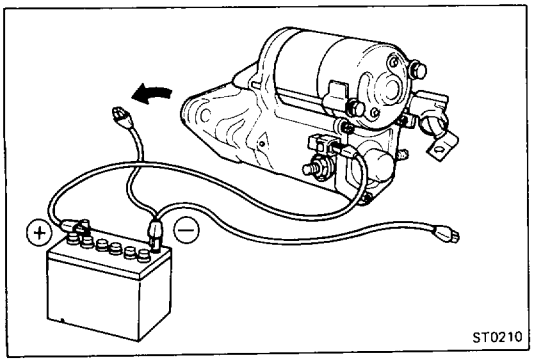
(b) Connect the battery to the magnetic switch as shown. Check that the plunger moves outward. If the plunger does not move, replace the magnetic switch.



2. **PERFORM HOLD-IN TEST**

While connected as above with the plunger out, disconnect the negative lead from terminal C. Check that the plunger remains out.

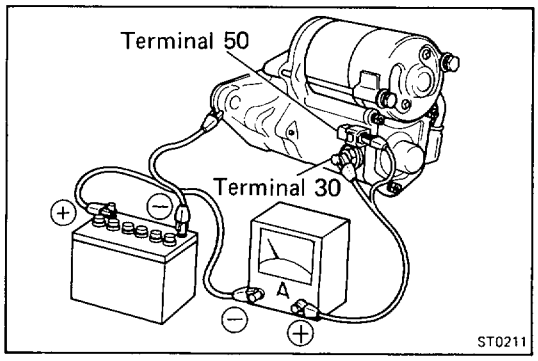
If the plunger returns inward, replace the magnetic switch.



3. **INSPECT PLUNGER RETURN**

Disconnect the negative lead from the switch body. Check that the plunger returns inward.

If the plunger does not return, replace the magnetic switch.

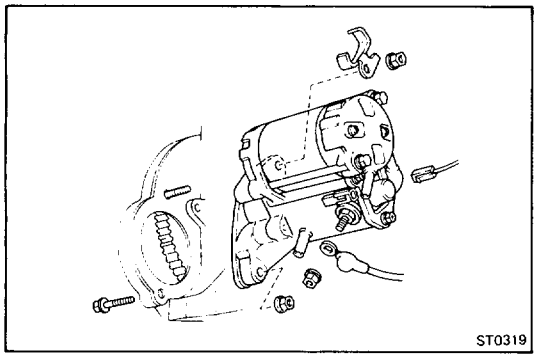


4. PERFORM NO-LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion moving out. Check that the ammeter reads the specified current.

Specified current: Less than 90 A at 11.5 V



INSTALLATION OF STARTER

1. INSTALL STARTER MOTOR IN FLYWHEEL BELL-HOUSING

Place the starter motor in the flywheel bellhousing. Install and torque the bolt and nut.

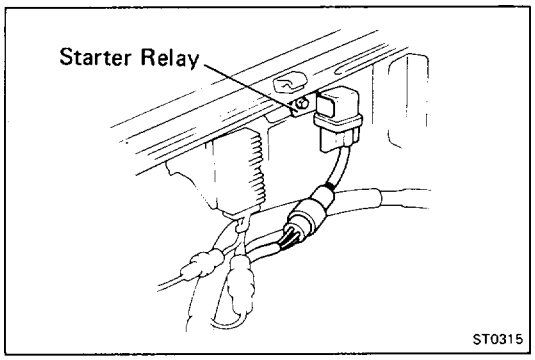
Torque: 400 kg-cm (29 ft-lb, 39 N·m)

2. CONNECT TWO WIRES TO STARTER

Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

Check that the car starts.

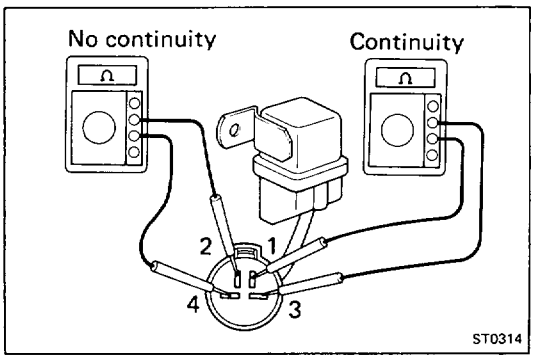


STARTER RELAY (M/T)

INSPECTION OF START RELAY

INSPECT CLUTCH START RELAY

NOTE: The relay located is near the solenoid resistor.

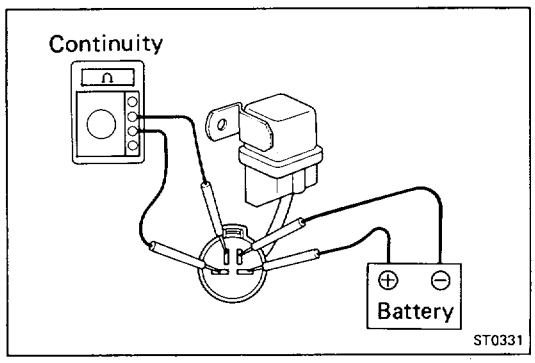


Inspect Relay Continuity

(a) Using an ohmmeter, check that there is continuity between terminals ST and E.

(b) Check that there is no coninuity between terminals tB and Mg.

If continuity is not as specified, replace the relay.



Inspect Relay Operation

(a) Apply battery voltage across terminals ST and E.

(b) Check that there is continuity between terminals tB and Mg.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH (M/T)

(See page CL-4)

CHARGING SYSTEM

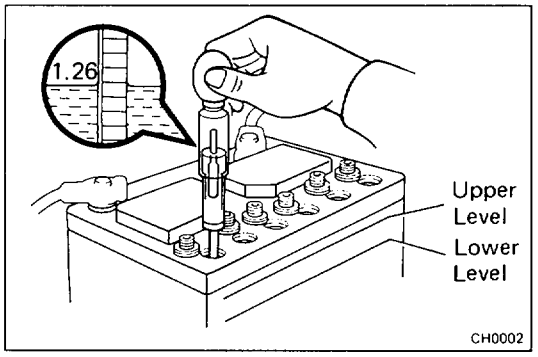
	Page
PRECAUTIONS	CH-2
TROUBLESHOOTING	CH-2
ON-VEHICLE INSPECTION	CH-3
ALTERNATOR	CH-5

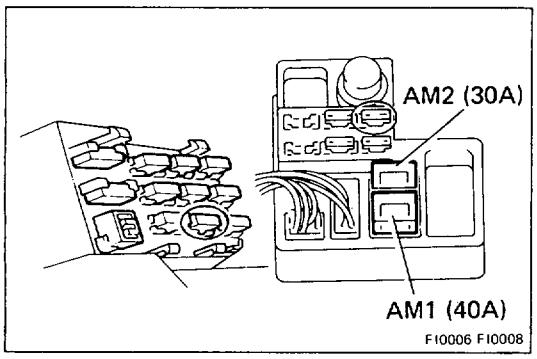
PRECAUTIONS

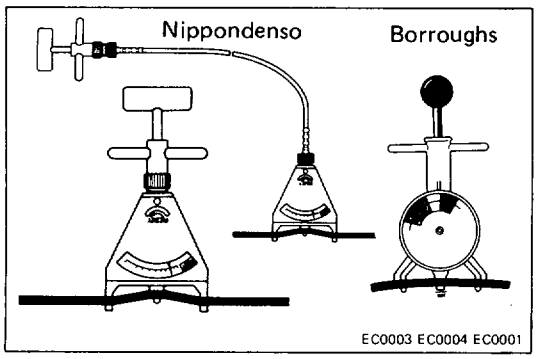
1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery when the engine is running.**

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Discharge warning light does not light with ignition ON and engine off	Fuse blown	Check "CHARGE" and "IGN" fuses	
	Light burned out	Replace light	
	Wiring connection loose	Tighten loose connections	
	IC regulator faulty	Replace IC regulator	CH-5
Discharge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	Adjust or replace drive belt	CH-3
	Battery cables loose, corroded or worn	Repair or replace cables	
	Fuse blown	Check "ENGINE" fuse	
	Fusible link blown	Replace fusible link	
	IC regulator or alternator faulty	Check charging system	CH-4
	Wiring faulty	Repair wiring	







ON-VEHICLE INSPECTION

1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the specific gravity of each cell.

Standard specific gravity

When fully charged at 20°C (68°F): 1.25 — 1.27

If not within specifications, charge the battery.

(b) Check the electrolyte quantity of each cell.

If insufficient, refill with distilled water (or purified water).

2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.

FUSIBLE LINK AM1, AM2
Fuse ENGINE (15A)
Fuse CHARGE (7.5A)

3. INSPECT DRIVE BELT

(a) Visually check the drive belt for cracks, oiliness or wear.
Check that the belt does not touch the bottom of the pulley groove.
If necessary, replace the drive belt.

(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

If necessary, adjust the drive belt tension.

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.

4. VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the alternator while the engine is running.

5. CHECK DISCHARGE WARNING LIGHT CIRCUIT

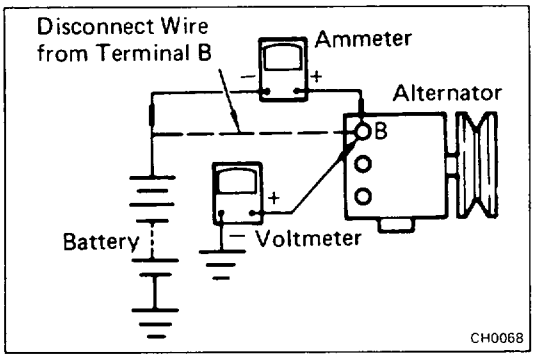
(a) Warm up the engine and then turn it off.

(b) Turn off all accessories.

(c) Turn the ignition switch to ON. Check that the discharge warning light is lit.

(d) Start the engine. Check that the light goes out.

If the light does not come on and go off as specified, troubleshoot the warning light circuit.

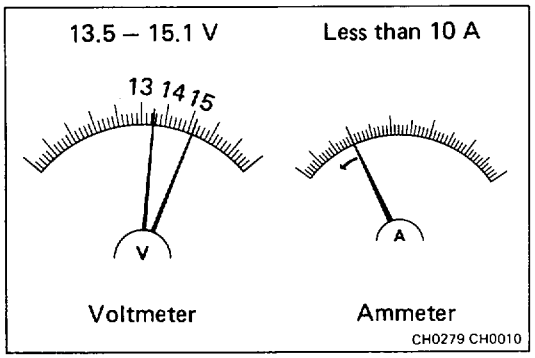


6. CHECK CHARGING CIRCUIT WITHOUT LOAD

NOTE: If a battery/alternator tester is available, connect the tester to the charging circuit according to the manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the alternator and connect it to the negative terminal of the ammeter.
- Connect the test lead from the positive terminal of the ammeter to terminal B of the alternator.
- Connect the positive lead of the voltmeter to terminal B of the alternator.
- Connect the negative lead of the voltmeter to ground.

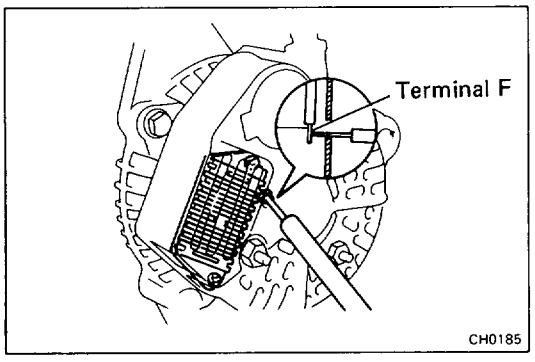


(b) Check the charging circuit as follows:

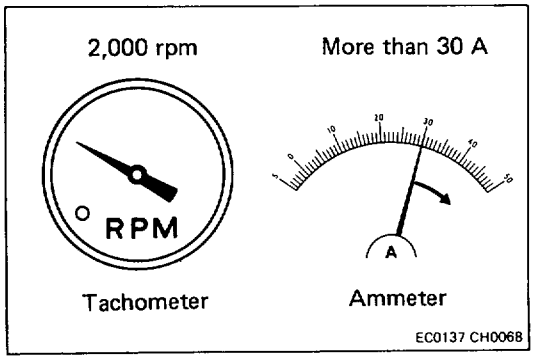
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: Less than 10 A
Standard voltage: 13.9 – 15.1 V at 25°C (77°F)
13.5 – 14.3 V at 115°C (239°F)

- If the voltage reading is greater than standard voltage, replace the IC regulator.



- If the voltage reading is less than standard voltage, check the IC regulator and alternator as follows: With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is greater than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, check the alternator.



7. CHECK CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at HI.

(b) Check the reading on the ammeter.

Standard amperage: More than 30 A

If the ammeter reading is less than 30 A, repair the alternator. (See page CH-5)

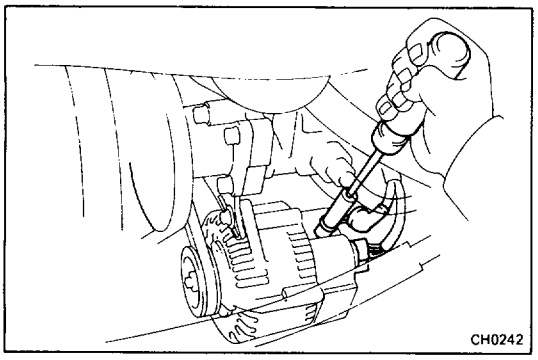
NOTE: With the battery fully charged, sometimes the indication will be less than 30 A.

ALTERNATOR

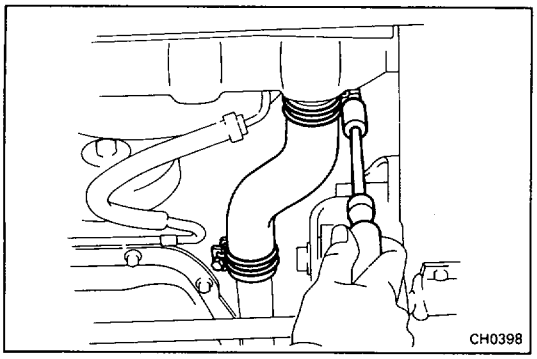
REMOVAL OF ALTERNATOR

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

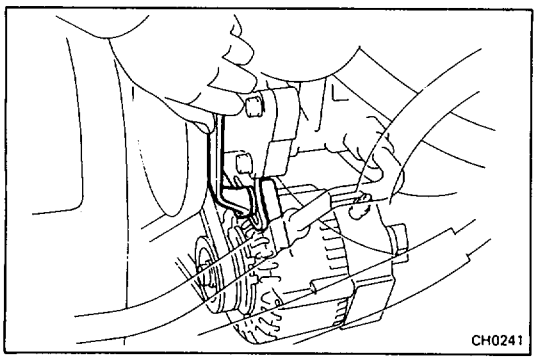
2. **(w/ PS)**
   DRAIN COOLANT



3. **DISCONNECT WIRING FROM ALTERNATOR**
   (a) Disconnect the connector from the alternator.
   (b) Remove the nut and wire from the alternator.



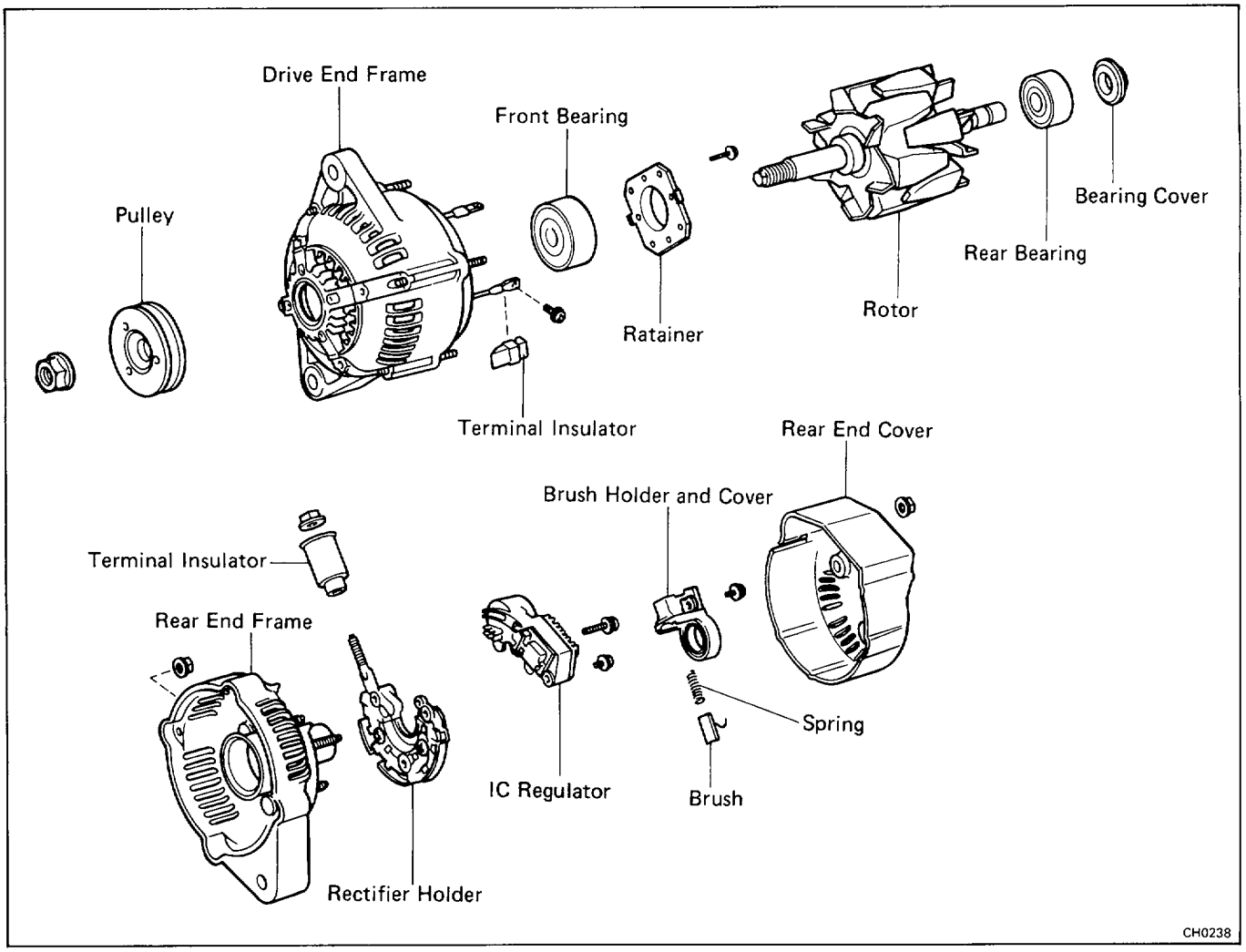
4. **(w/ PS)**
   REMOVE WATER INLET HOSE
   (a) Remove the engine under cover.
   (b) Remove the water inlet hose.
   (c) (with A/C)
   Remove the No.2 fan shroud.

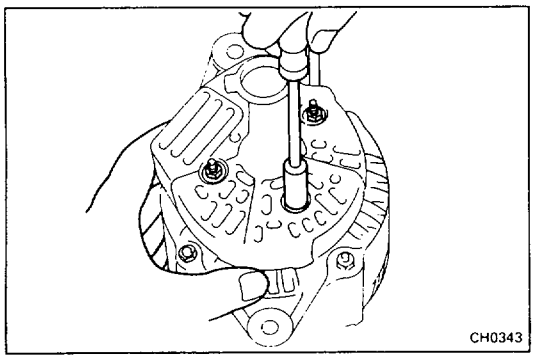


5. **REMOVE ALTERNATOR DRIVE BELT**
   (a) Loosen the alternator pivot and remove the adjust bolt.
   (b) Remove the drive belt.

6. **REMOVE ALTERNATOR**
   (a) Hold the alternator and remove the pivot.
   (b) Remove the alternator.

COMPONENTS



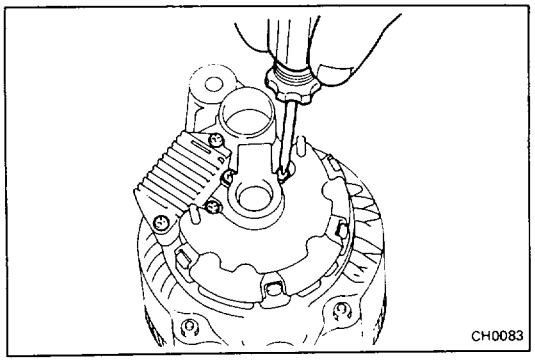


DISASSEMBLY OF ALTERNATOR

1. REMOVE REAR END COVER

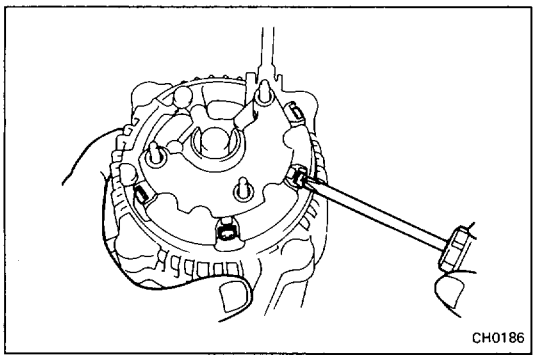
(a) Remove the nut and terminal insulator.

(b) Remove the three nuts and end cover.



2. REMOVE BRUSH HOLDER AND IC REGULATOR

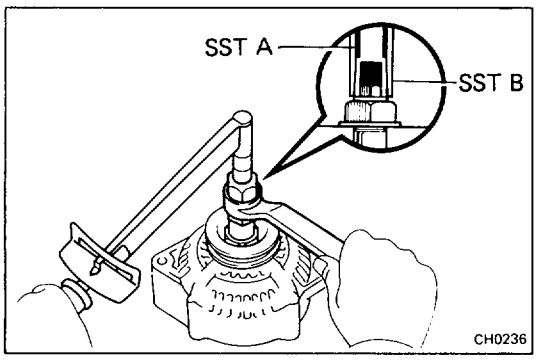
Remove the five screws, brush holder, brush holder cover and IC regulator.



3. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.

(b) Remove the four rubber terminal insulators.



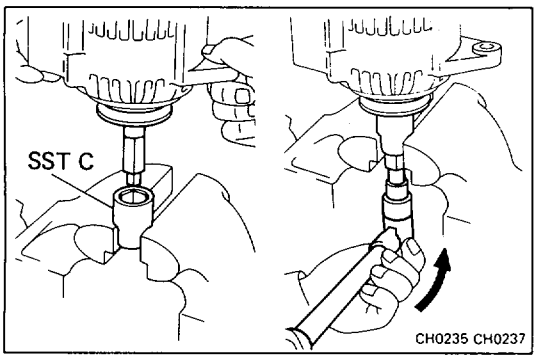
4. REMOVE PULLEY

(a) Hold SST A with a torque wrench and tighten SST B clockwise to the specified torque.

SST 09820-63010

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(b) Check that SST A is secured to the rotor shaft.



(c) As shown in the figure, mount SST C in a vise and then install the alternator to SST C.

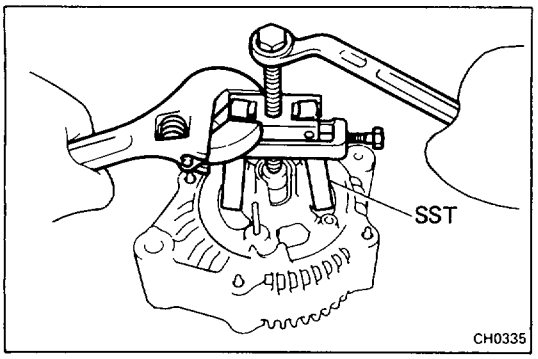
(d) To loosen the pulley nut, turn SST A in the direction shown in the figure.

CAUTION: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

(e) Remove the alternator from SST C.

(f) Turn SST B and remove SSTs A and B.

(g) Remove the pulley nut and pulley.



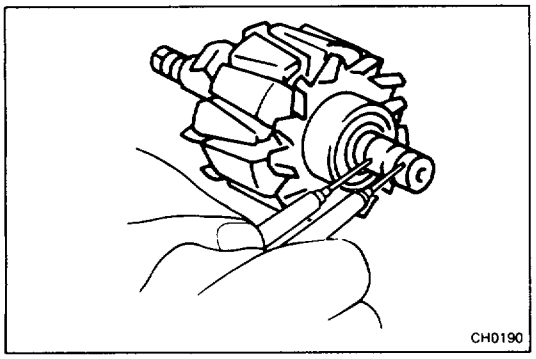
5. REMOVE REAR END FRAME

(a) Remove the four nuts.

(b) Using SST, remove the rear end frame.

SST 09286-46011

6. REMOVE ROTOR FROM DRIVE END FRAME


CH0190

INSPECTION AND REPAIR OF ALTERNATOR

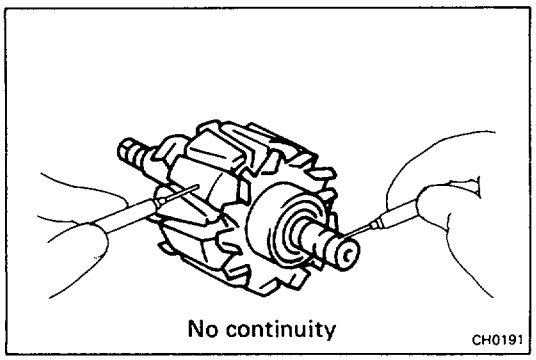
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the slip rings.

Standard resistance: 2.8 — 3.0 Ω

If the resistance is not within specification, replace the rotor.

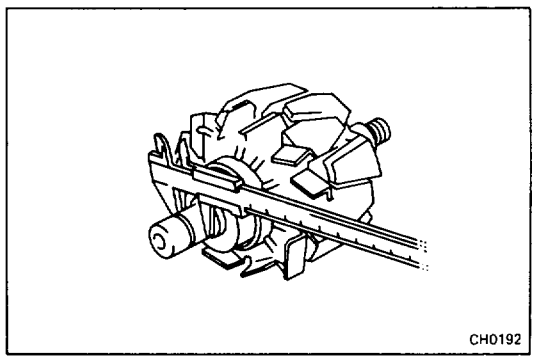


CH0191

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.


CH0192

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored. If necessary, replace the rotor.

(b) Using calipers, measure the slip ring diameter.

Standard diameter: 14.2 — 14.4 mm (0.559 — 0.567 in.)
Minimum diameter: 12.8 mm (0.504 in.)

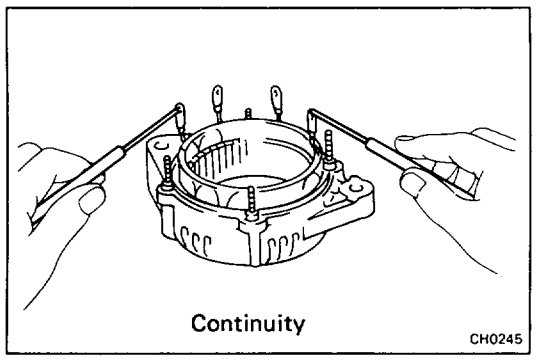
If the diameter of the slip ring is less than minimum, replace the rotor.

Stator

1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check all leads for continuity.

If there is no continuity, replace the drive end frame assembly.

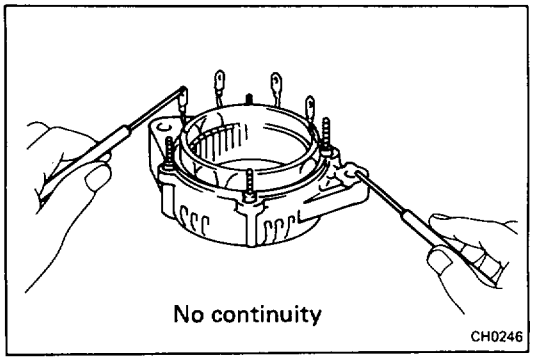


CH0245

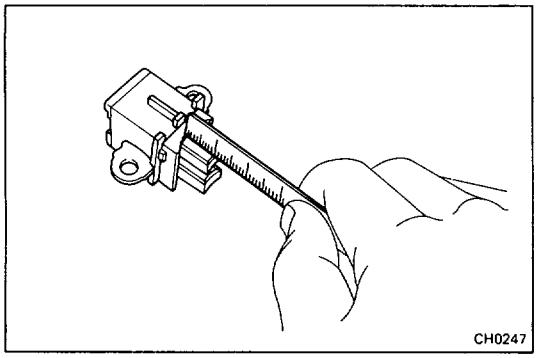
2. INSPECT THAT STATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame.

If there is continuity, replace the drive end frame assembly.



CH0246



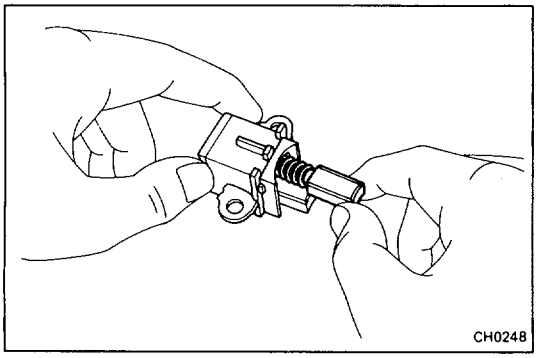
Brush and Brush Holder

1. MEASURE EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)
Minimum exposed length: 1.5 mm (0.059 in.)

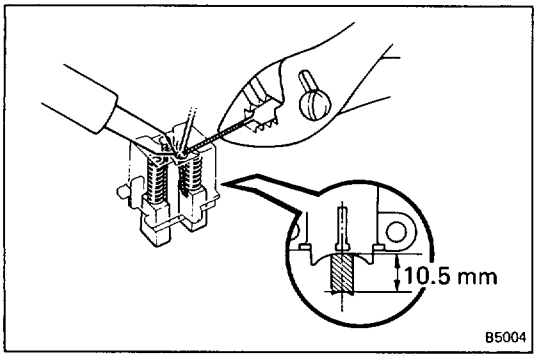
If the exposed length is less than minimum, replace the brush.



2. IF NECESSARY REPLACE BRUSHES

(a) Unsolder and remove the brush and the spring.

(b) Run the wire of the brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



(c) Solder the brush wire to the brush holder at the exposed length.

Standard exposed length: 10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

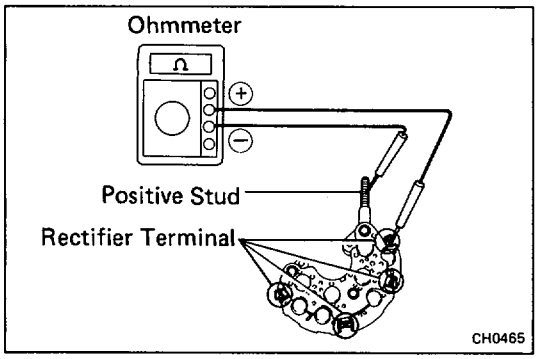
(e) Cut off the excess wire.

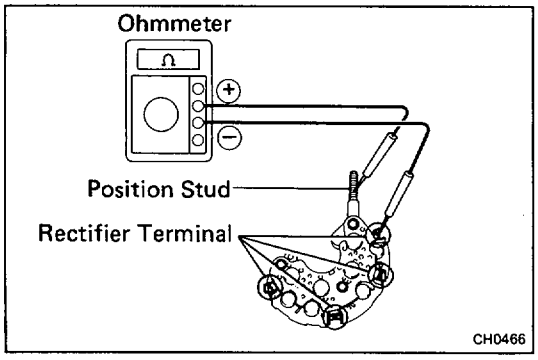
(f) Apply insulation paint to the soldered point.

Rectifier

1. INSPECT POSITIVE SIDE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive stud and other to each rectifier terminal.

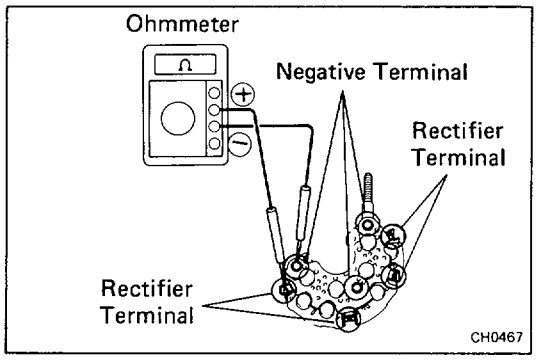




(b) Reverse the polarity of the tester probes and repeat step (a).

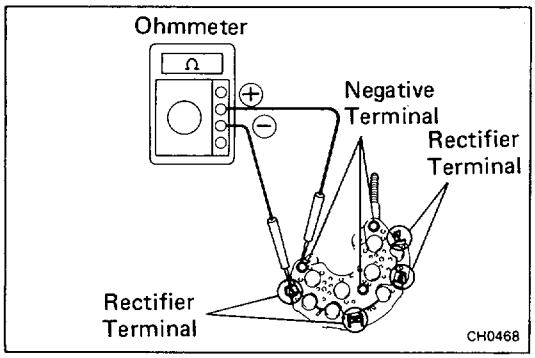
(c) Check that one shows continuity and the other shows no continuity.

If not, replace the rectifier holder.



2. INSPECT NEGATIVE SIDE RECTIFIER

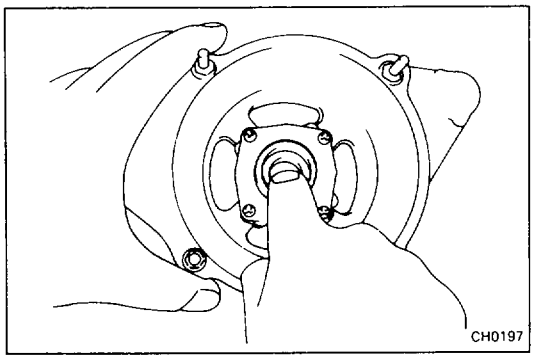
(a) Connect one tester probe to each rectifier terminal and the other to each rectifier negative terminal.



(b) Reverse the polarity of the tester probes.

(c) Check that one shows continuity and the other shows no continuity.

If not, replace the rectifier holder.

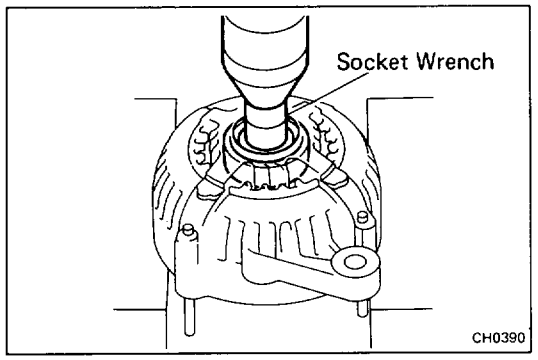


Bearings

1. INSPECT FRONT BEARING

Check that the front bearing is not rough or worn.

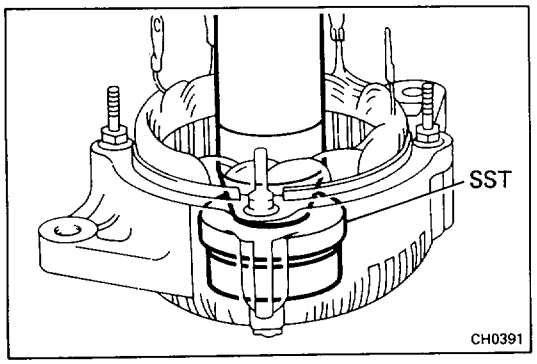
If necessary, replace the bearing.



2. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the four screws and bearing retainer.

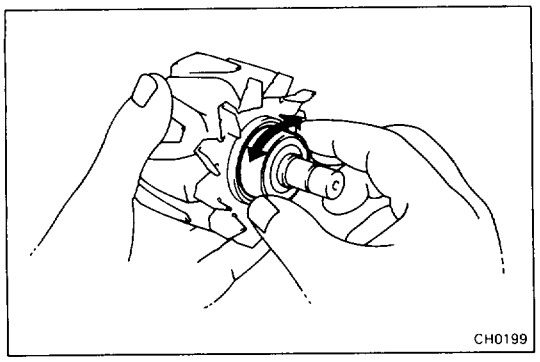
(b) Using a press and socket wrench, press out the front bearing.



(c) Using SST, install the front bearing into the drive end frame.

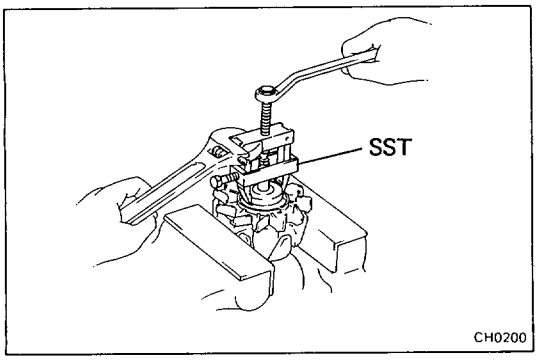
SST 09608-20012 (09608-00030)

(d) Install the bearing retainer with the four screws.



3. INSPECT REAR BEARING

Check that the rear bearing is not rough or worn. Replace if necessary.

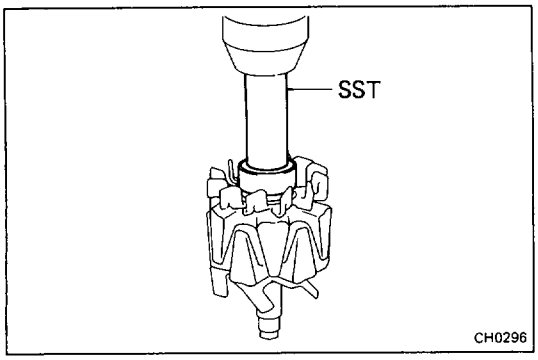


4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the rear bearing with the bearing cover from the rotor shaft.

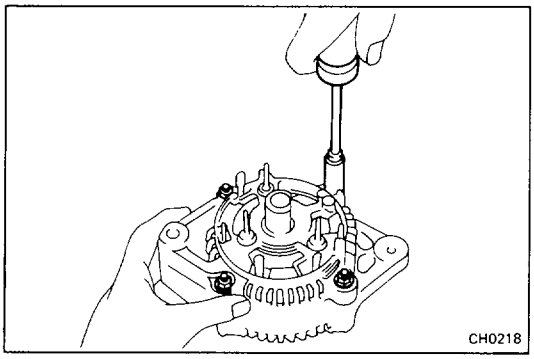
SST 09820-00021

CAUTION: Be careful not to damege the fan.



(b) Using SST and a press, press in a new rear bearing and bearing cover onto the rotor shaft.

SST 09820-00030



ASSEMBLY OF ALTERNATOR

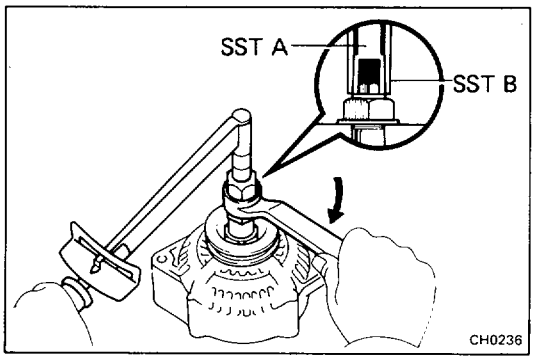
(See page CH-6)

1. INSTALL ROTOR TO DRIVE END FRAME

2. INSTALL REAR END FRAME

(a) Using a plastic hammer, lightly tap the rear end frame onto the drive end frame.

(b) Install the four nuts.



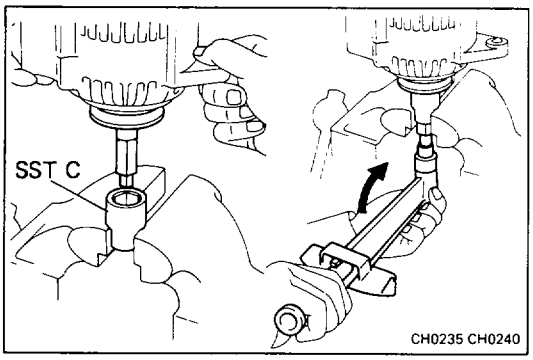
3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST A with a torque wrench and tighten SST B clockwise to the specified torque.

SST 09820-63010

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



(c) Check that SST A is secured to the pulley shaft.

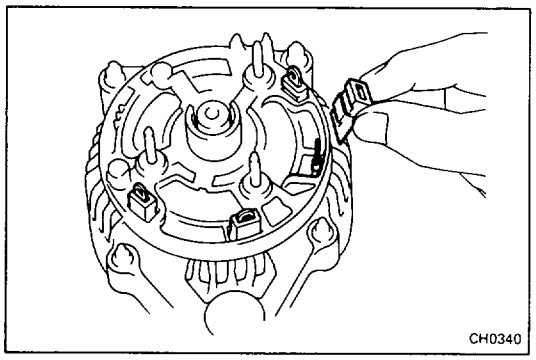
(d) As shown in the figure, mount SST C in a vise and then install the alternator to SST C.

(e) To torque the pulley, nut turn SST A in the direction shown in the figure.

Torque: 1,125 kg-cm (81 ft-lb, 110 N·m)

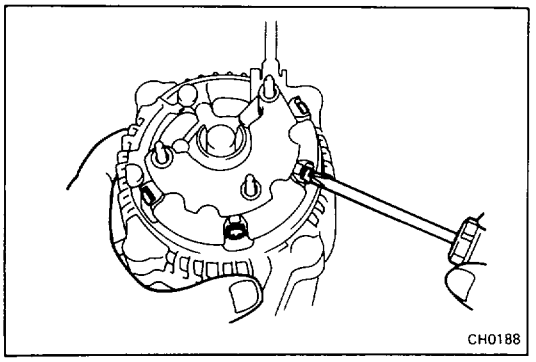
(f) Remove the alternator from SST C.

(g) Turn SST B and remove SSTs A and B.



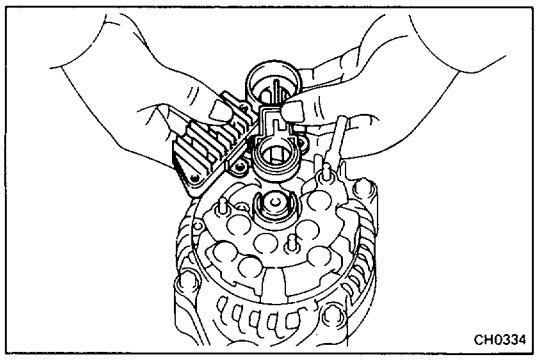
4. INSTALL RECTIFIER HOLDER

(a) Install the four rubber insulators on the lead wires.



5. INSTALL RECTIFIER HOLDER

Install the rectifier holder with the four screws.

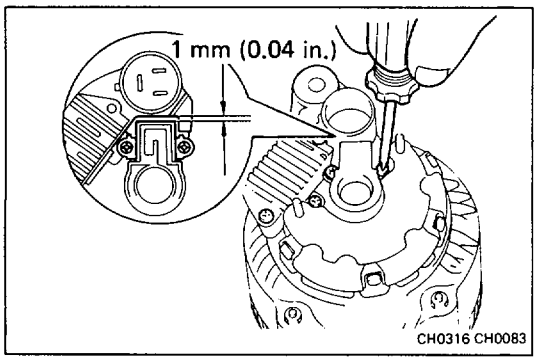


6. INSTALL BRUSH HOLDER WITH IC REGULATOR

(a) Place the brush holder cover to the brush holder.

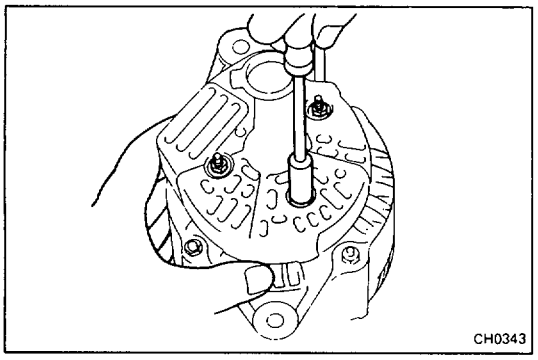
(b) Install the IC regulator and brush holder to the rear end frame horizontally as shown in the figure.

NOTE: Mark sure the brush holder's cover doesn't slip to one side during installation.



(c) Install and tighten the three screws.

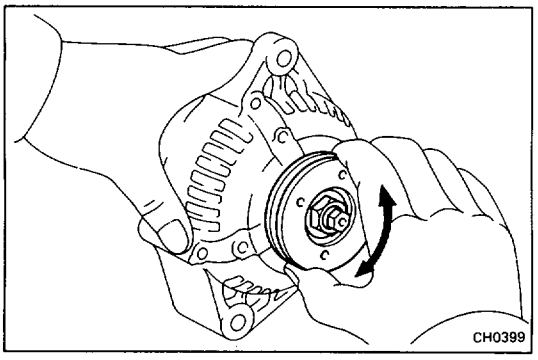
NOTE: Make sure the gap between the brush holder and connector is at least 1 mm (0.04 in.).



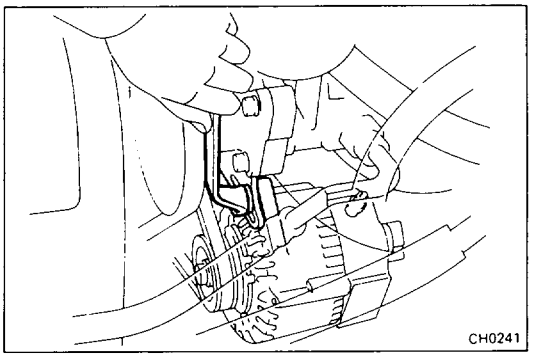
7. INSTALL REAR END COVER

(a) Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.



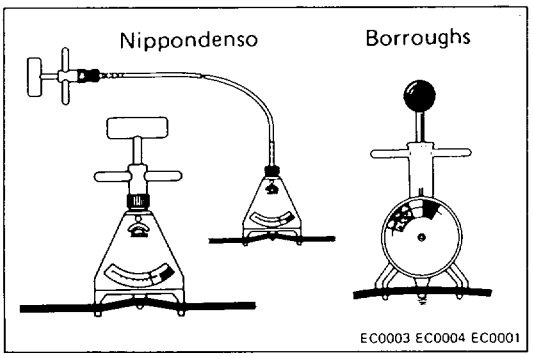
8. MAKE SURE ROTOR ROTATES SMOOTHLY



INSTALLATION OF ALTERNATOR

1. INSTALL ALTERNATOR

Mount the alternator on the bracket with the pivot and adjust bolt.



2. INSTALL DRIVE BELT

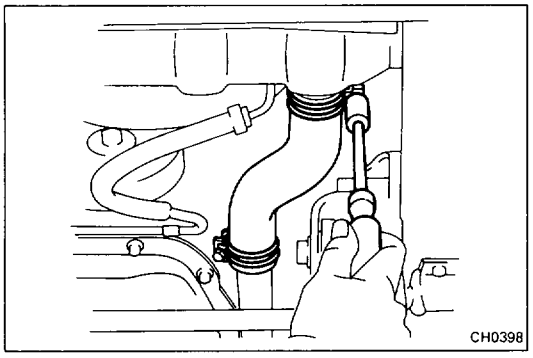
(a) Place the drive belt on the alternator, fan and crankshaft pulleys.

(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:

New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

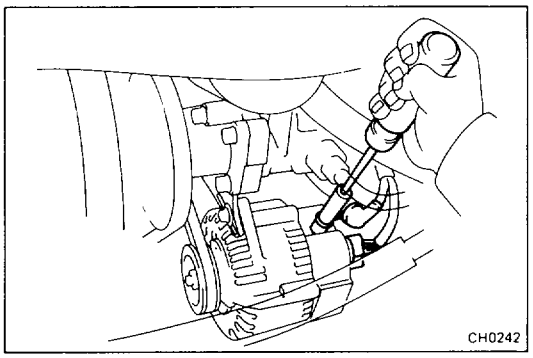


3. INSTALL WATER INLET HOSE

(a) Install the water inlet hose.

(b) Install the engine under cover.

(c) (with A/C)
Install the No. 2 fan shroud.



4. CONNECT WIRING TO ALTERNATOR

(a) Connect the wire to the alternator and install the nut.

(b) Connect the connector to the alternator.

5. FILL WITH COOLANT

Close the radiator drain cock and fill with coolant.

6. CONNECT NEGATIVE CABLE TO BATTERY

7. PERFORM ON-VEHICLE INSPECTION

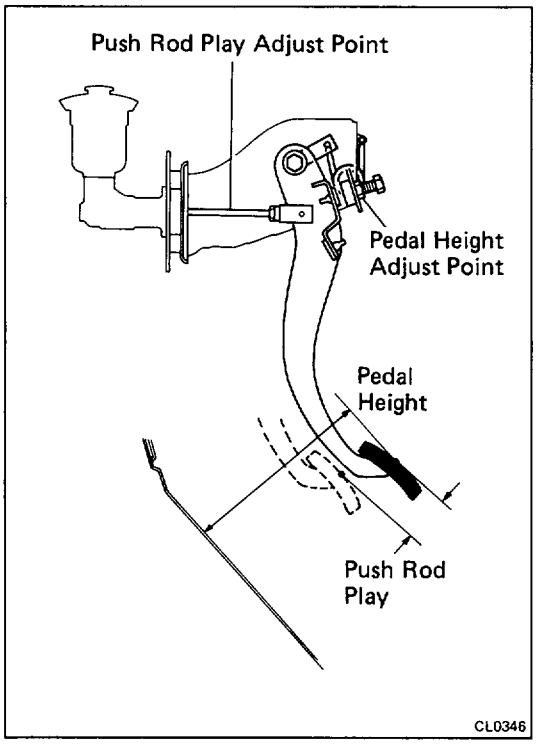
(See page CH-3)

CLUTCH

	Page
TROUBLESHOOTING	CL-2
CHECK AND ADJUSTMENT OF CLUTCH PEDAL	CL-3
BLEEDING OF CLUTCH SYSTEM	CL-3
INSPECTION OF CLUTCH START SYSTEM	CL-4
CLUTCH MASTER CYLINDER	CL-6
CLUTCH RELEASE CYLINDER	CL-8
CLUTCH UNIT	CL-10

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Clutch pedal freeplay excessive	Adjust pedal freeplay	CL-3
	Air in clutch lines	Bleed clutch system	CL-3
	Clutch release cylinder faulty	Repair release cylinder	CL-8
	Clutch master cylinder faulty	Repair master cylinder	CL-6
	Clutch disc out of true, runout is excessive or lining broken	Inspect clutch disc	CL-11
	Splines on input shaft or clutch disc dirty or burred	Repair as necessary	CL-10
	Clutch pressure plate faulty	Replace pressure plate	CL-12
Transmission jumps out of gear	Clutch pilot bearing worn	Replace pilot bearing	CL-12
Clutch slips	Clutch pedal freeplay insufficient	Adjust pedal freeplay	CL-3
	Clutch disc lining oily or worn out	Inspect clutch disc	CL-11
	Pressure plate faulty	Replace pressure plate	CL-12
	Release fork binding	Inspect release fork	
Clutch grabs/chatters	Clutch disc lining oily or worn out	Inspect clutch disc	CL-11
	Pressure plate faulty	Replace pressure plate	CL-12
	Clutch diaphragm spring bent	Align clutch diaphragm	CL-14
	Engine mounts loose	Repair as necessary	
Clutch pedal spongy	Air in clutch lines	Bleed clutch system	CL-3
	Clutch release cylinder faulty	Repair release cylinder	CL-8
	Clutch master cylinder faulty	Repair master cylinder	CL-6
Clutch noisy	Loose part inside housing	Repair as necessary	
	Release bearing worn or dirty	Replace release bearing	CL-13
	Pilot bearing worn	Replace pilot bearing	CL-12
	Release fork or linkage sticking	Repair as necessary	



CHECK AND ADJUSTMENT OF CLUTCH PEDAL

1. **CHECK THAT PEDAL HEIGHT AND PUSH ROD PLAY ARE CORRECT**

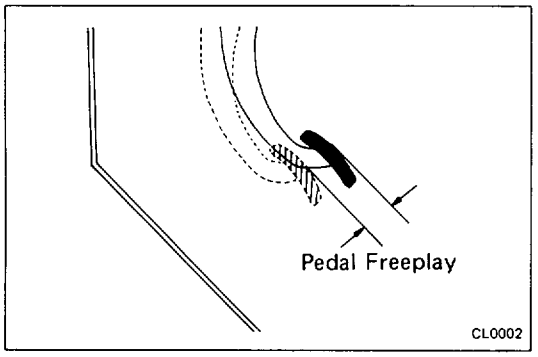
Pedal height
(from asphalt sheet): 155.5 mm (6.122 in.)
(from floor panel): 157.5 mm (6.201 in.)
Push rod play at pedal top: 1.0 — 5.0 mm (0.039 — 0.197 in.)

If incorrect, adjust the pedal height and push rod play.

2. **IF NECESSARY, ADJUST PEDAL HEIGHT AND PUSH ROD PLAY**

(a) Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.

(b) Loosen the lock nut and turn the push rod until the push rod play is correct. Tighten the lock nut.



3. **CHECK THAT PEDAL FREEPLAY IS CORRECT**

Push in on the pedal until the beginning of clutch resistance is felt.

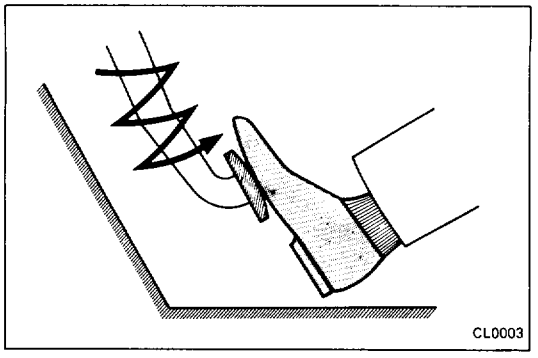
Pedal freeplay: 5 — 15 mm (0.20 — 0.59 in.)

4. **IF NECESSARY, ADJUST PEDAL FREEPLAY**

(a) Loosen the lock nut and turn the push rod until the freeplay is correct.

(b) Tighten the lock nut.

(c) After adjusting the pedal freeplay, check the pedal height.



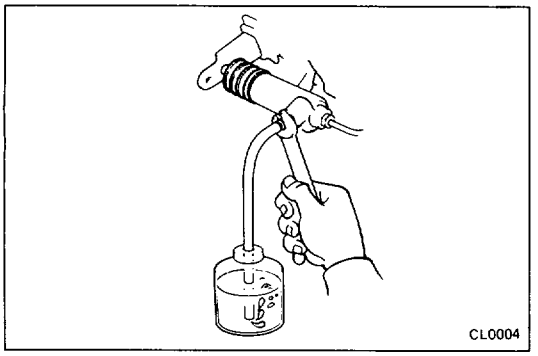
BLEEDING OF CLUTCH SYSTEM

NOTE: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. **FILL CLUTCH RESERVOIR WITH BRAKE FLUID**

Check the reservoir frequently. Add fluid if necessary.



2. **CONNECT VINYL TUBE TO BLEEDER PLUG**

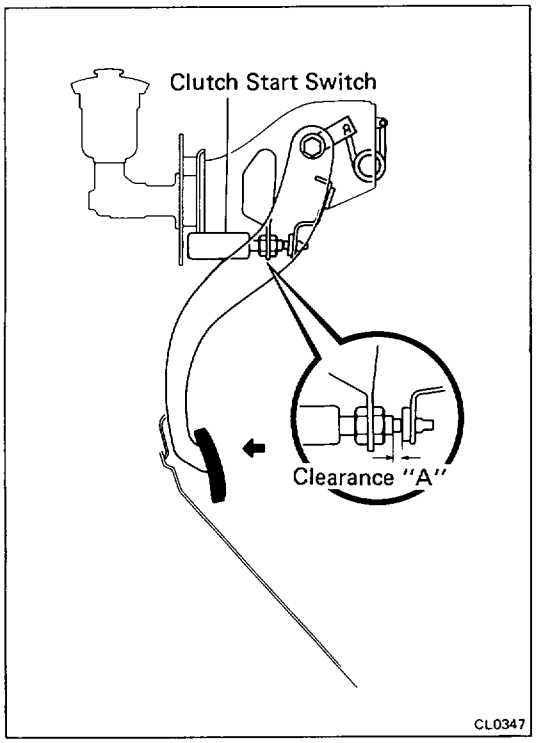
Insert the other end of the tube in a half-full container of brake fluid.

3. **BLEED CLUTCH LINE**

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.



INSPECTION OF CLUTCH START SYSTEM

CHECK CLUTCH PEDAL

1. **CHECK THAT PEDAL HEIGHT IS CORRECT**
(See page CL-3)

2. **CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT**
(See page CL-3)

CHECK CLUTCH START SYSTEM

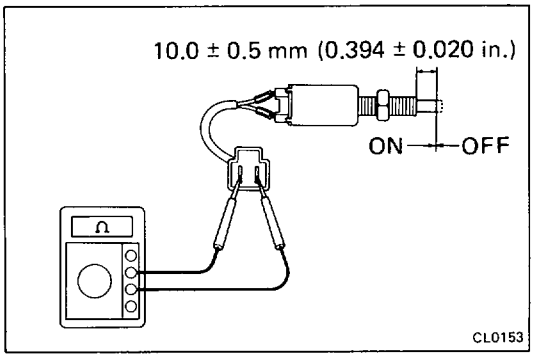
CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

(c) Check that clearance "A" is greater than 1 mm (0.04 in.) when the clutch is fully depressed.

If necessary, adjust or replace the clutch start switch.



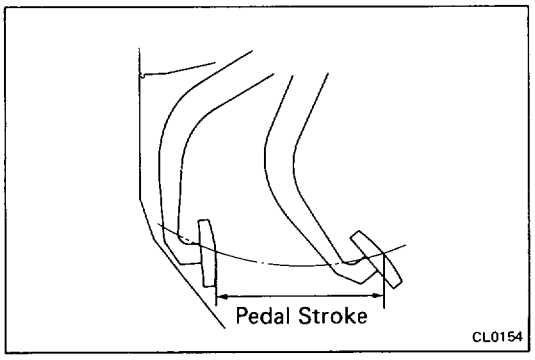
INSPECTION AND ADJUSTMENT OF CLUTCH START SWITCH

1. **INSPECT CONTINUITY OF CLUTCH START SWITCH**

(a) Check that there is continuity between terminals when the switch is ON (pushed).

(b) Check that there is no continuity between terminals when the switch is OFF (free).

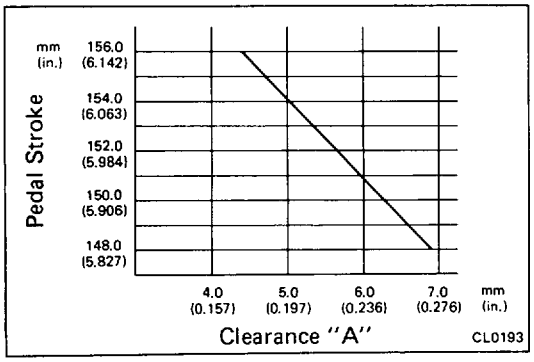
If continuity is not as specified, replace the switch.



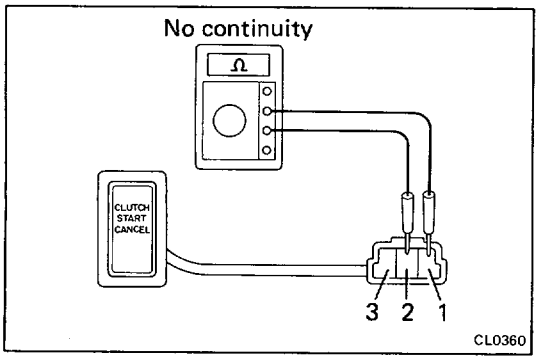
2. **ADJUST CLUTCH START SWITCH**

(a) Measure the pedal stroke, and check the switch clearance "A" using the chart left.

(b) Loosen and adjust the switch position.



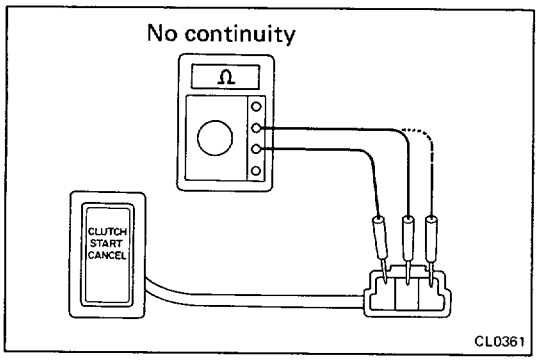
(c) Recheck that the engine does not start when the clutch pedal is released.



INSPECTION OF CLUTCH START CANCEL SWITCH

1. INSPECT CONTINUITY OF CLUTCH START CANCEL SWITCH

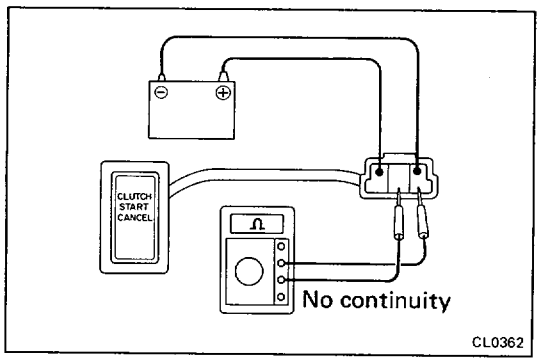
(a) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (−) lead to terminal 1.



(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 3 and the negative (−) lead to terminal 1.

(c) Check that there is no continuity between terminals 2 and 3.

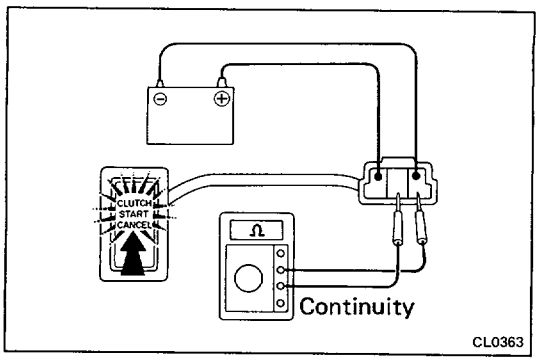
If continuity is not as specified, replace the clutch start cancel switch.



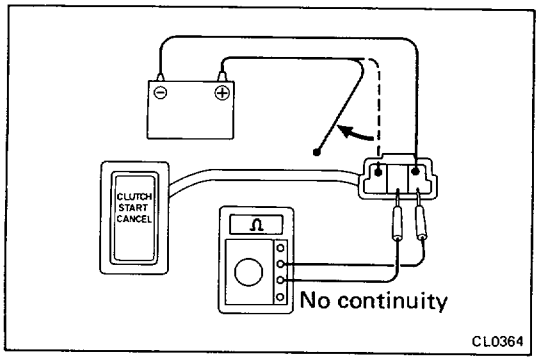
2. INSPECT OPERATION OF CLUTCH START CANCEL SWITCH

(a) Connect positive (+) lead from the battery to terminal 3 and connect negative (−) lead to terminal 1.

(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (−) lead to terminal 1.



(c) When pushing the switch, check that the indicator light comes on and there is continuity between terminals 1 and 2.

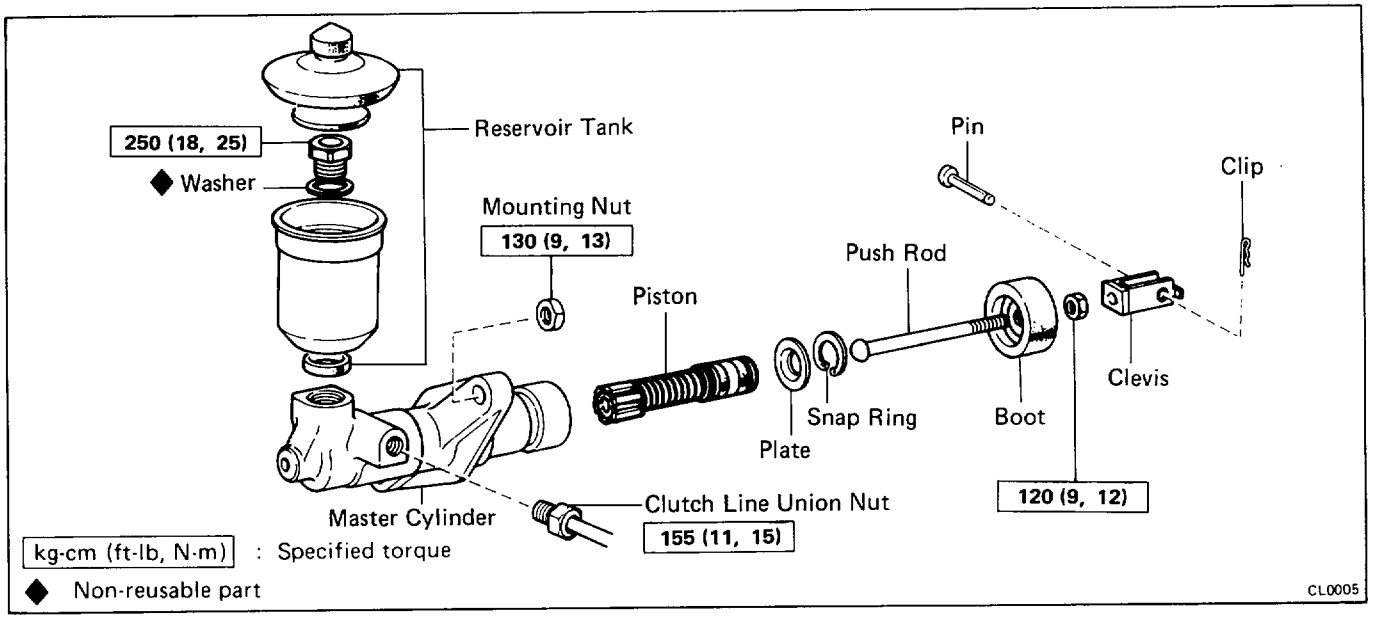


(d) Check that there is no continuity between terminals 1 and 2 when disconnect the battery lead.

If operation is not as specified, replace the clutch start cancel switch.

CLUTCH MASTER CYLINDER

COMPONENTS



REMOVAL OF MASTER CYLINDER

1. **REMOVE PUSH ROD PIN**

2. **DISCONNECT CLUTCH LINE UNION**

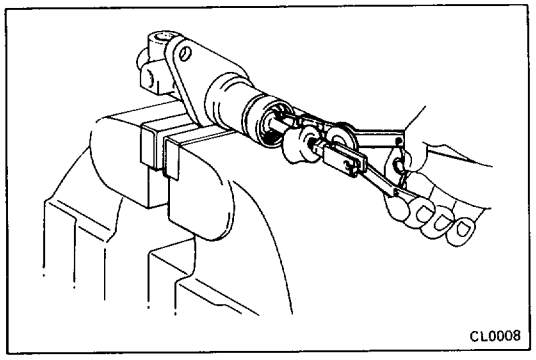
   Using SST, disconnect the union nut.

   SST 09751-36011

3. **REMOVE MASTER CYLINDER**

   (a) Remove the mounting nut and bolt.

   (b) Pull out the master cylinder.



DISASSEMBLY OF MASTER CYLINDER

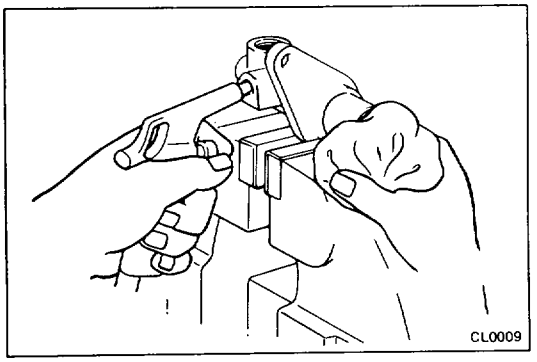
1. **REMOVE RESERVOIR TANK**

   Remove the hold-down bolt and pull off the reservoir tank.

2. **REMOVE PUSH ROD**

   (a) Pull back the boot and, using snap ring pliers, remove the snap ring.

   (b) Pull out the push rod and washer.



3. **REMOVE PISTON**

   Using compressed air, remove the piston from the cylinder.

INSPECTION OF MASTER CYLINDER

NOTE: Clean the disassembled parts with compressed air.

1. **INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION**

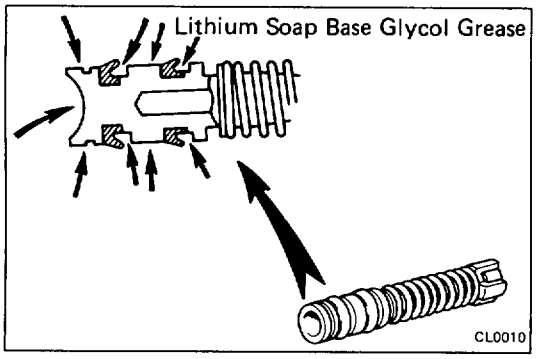
   If a problem is found, clean or replace the cylinder.

2. **INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING**

   If either one requires replacement, use the parts from the cylinder kit.

3. **INSPECT PUSH ROD FOR WEAR OR DAMAGE**

   If necessary, replace the push rod.



ASSEMBLY OF MASTER CYLINDER

1. **COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN**

2. **INSERT PISTON INTO CYLINDER**

3. **INSTALL PUSH ROD ASSEMBLY WITH SNAP RING**

4. **INSTALL RESERVOIR TANK**
   Torque: 250 kg-cm (18 ft-lb, 25 N·m)

INSTALLATION OF MASTER CYLINDER

(See page CL-6)

1. **INSTALL MASTER CYLINDER**

   Install the mounting nut and bolt, and torque them.

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)

2. **CONNECT CLUTCH LINE UNION**

   Using SST, connect the union.

   SST 09751-36011

3. **CONNECT PUSH ROD AND INSTALL PIN**

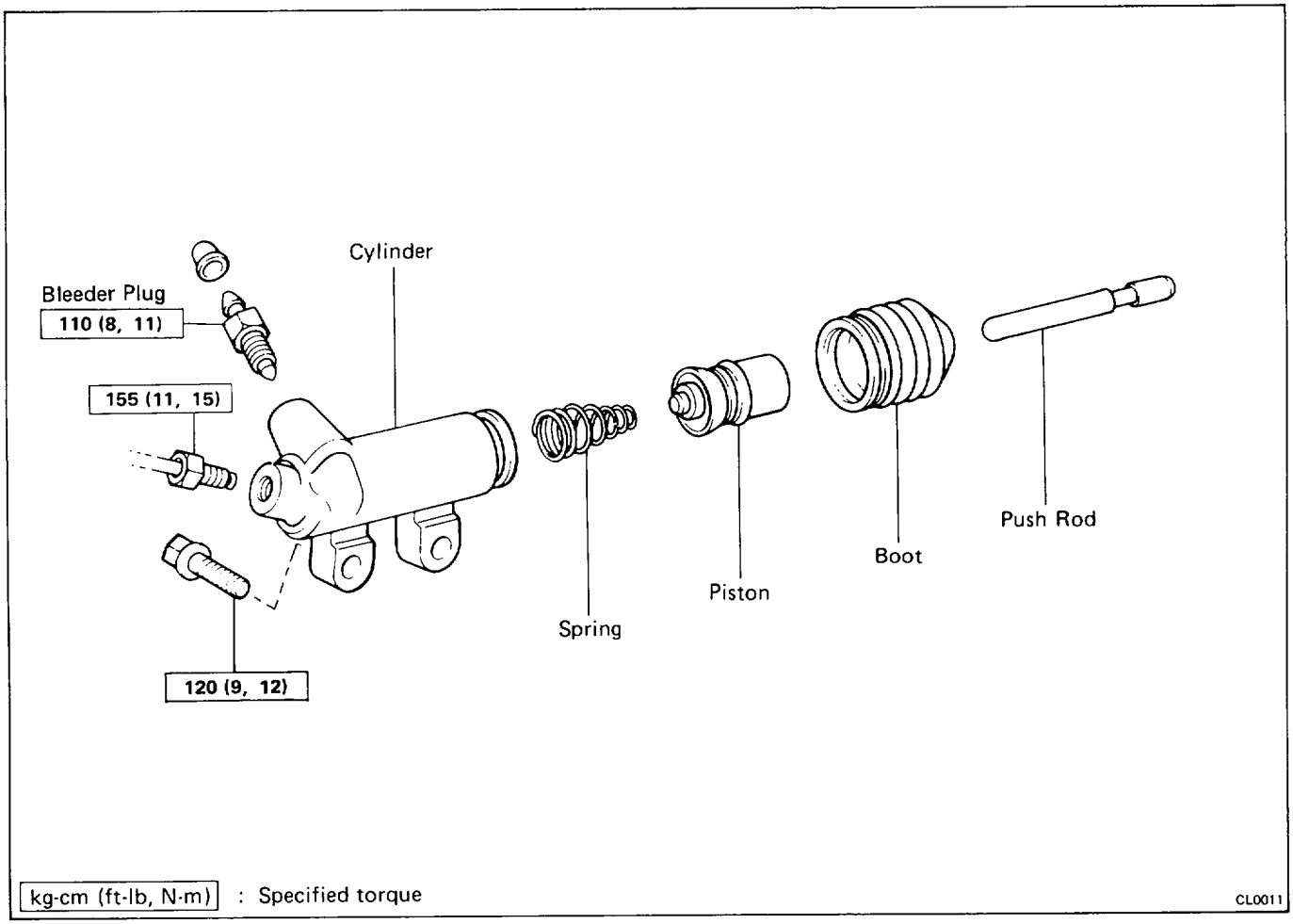
   Install the clip in the push rod pin.

4. **BLEED SYSTEM AND ADJUST CLUTCH PEDAL**

   (See page CL-3)

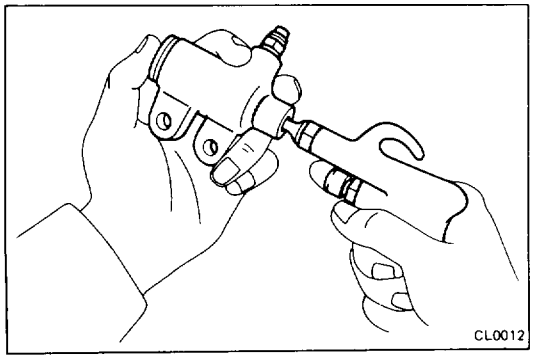
CLUTCH RELEASE CYLINDER

COMPONENTS



REMOVAL OF RELEASE CYLINDER

1. **DISCONNECT CLUTCH LINE UNION**
   Using SST, disconnect the union.
   SST 09751-36011
2. **REMOVE TWO BOLTS AND PULL OFF RELEASE CYLINDER**



DISASSEMBLY OF RELEASE CYLINDER

1. **PULL OUT PUSH ROD**
2. **REMOVE BOOT**
3. **REMOVE PISTON**

INSPECTION OF RELEASE CYLINDER

NOTE: Clean the disassembled parts with compressed air.

1. **INSPECT RELEASE CYLINDER BORE FOR SCORING OR CORROSION**

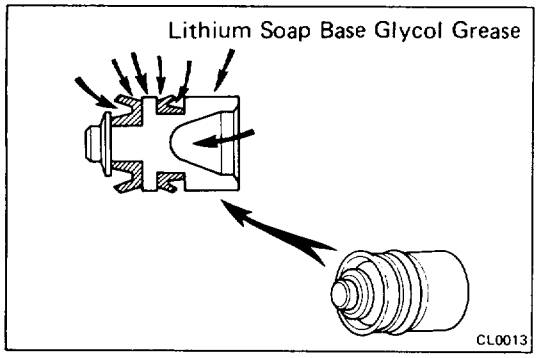
   If a problem is found, clean or replace the cylinder.

2. **INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING**

   If either one requires replacement, use the parts from the cylinder kit.

3. **INSPECT PUSH ROD FOR WEAR OR DAMAGE**

   If necessary, replace the push rod.



ASSEMBLY OF RELEASE CYLINDER

(See page CL-8)

1. **COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN**

2. **INSTALL PISTON**

3. **INSTALL BOOT AND INSERT PUSH ROD**

INSTALLATION OF RELEASE CYLINDER

(See page CL-8)

1. **INSTALL RELEASE CYLINDER WITH TWO BOLTS**

2. **CONNECT CLUTCH LINE UNION**

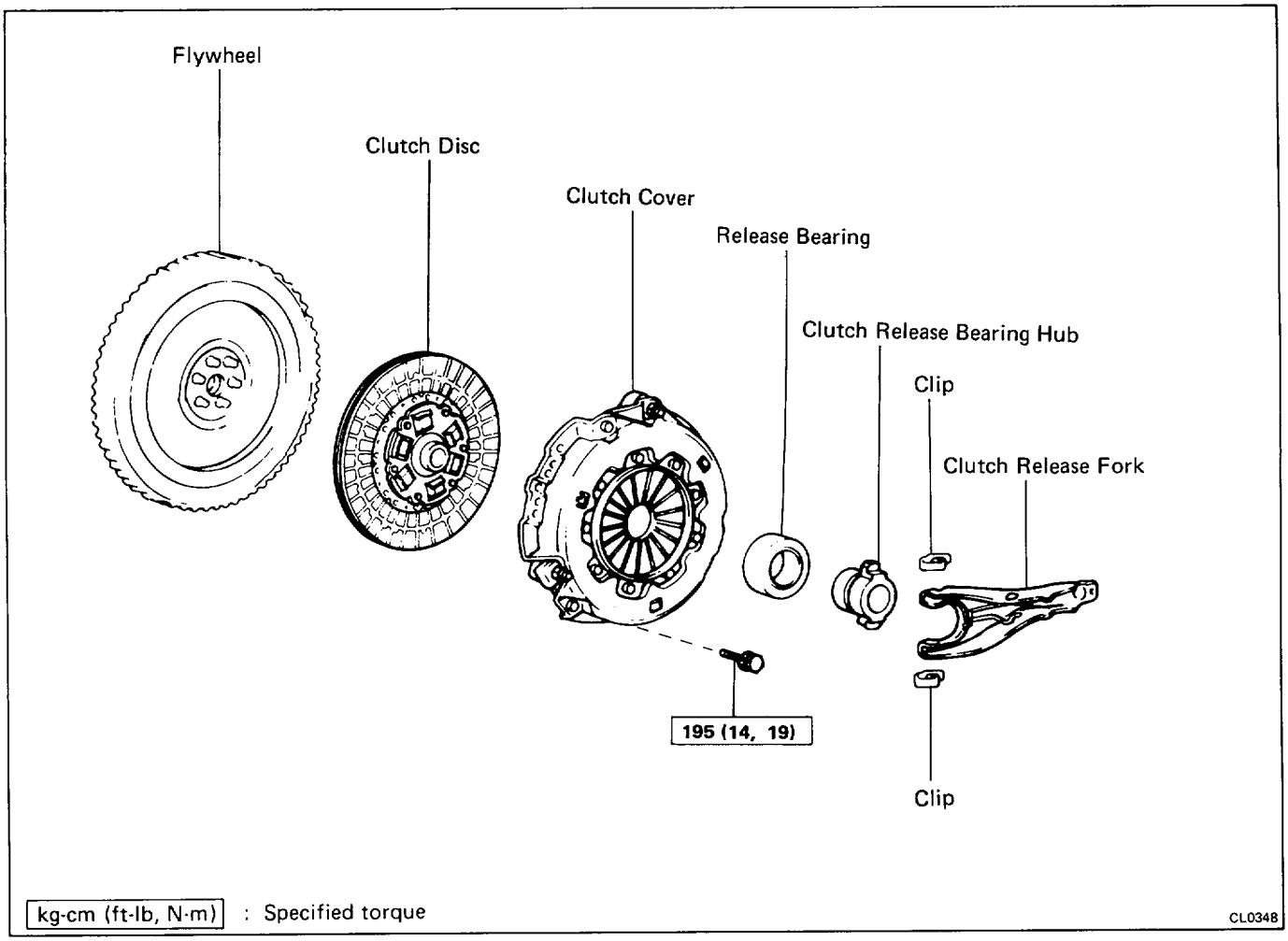
   Using SST, connect the union.

   SST 09751-36011

3. **BLEED CLUTCH SYSTEM**
   (See page CL-3)

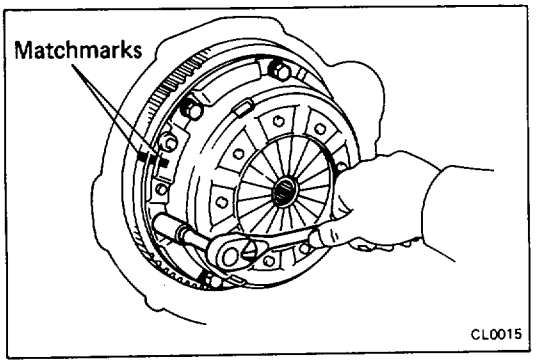
CLUTCH UNIT

COMPONENTS

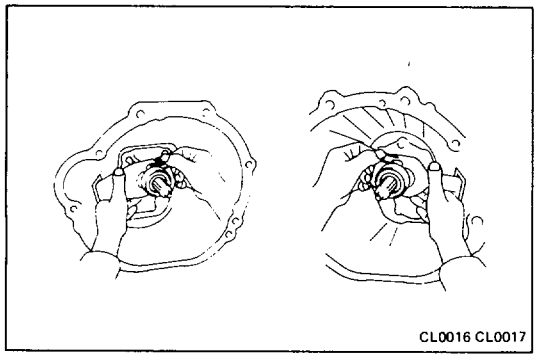


REMOVAL OF CLUTCH UNIT

1. **REMOVE TRANSMISSION (See pages MT-3, 4)**
   NOTE: Do not drain the transmission oil.



2. **REMOVE CLUTCH COVER AND DISC**
   (a) Put matchmarks on the clutch cover and flywheel.
   (b) Loosen the set bolts one turn at a time until spring tension is released.
   (c) Remove the set bolts and pull off the clutch cover and disc.

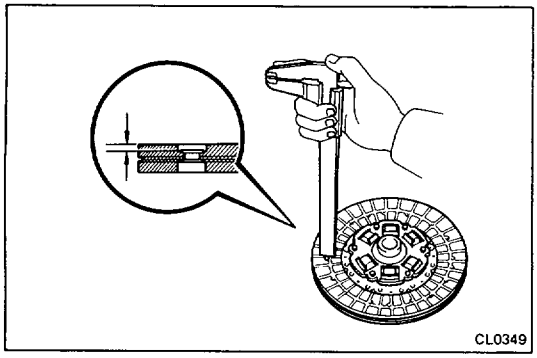


3. **REMOVE BEARING, HUB AND FORK FROM TRANSMISSION**

(a) Remove the retaining clip and pull off the bearing and hub.

(b) Remove the fork and boot.

INSPECTION OF CLUTCH PARTS

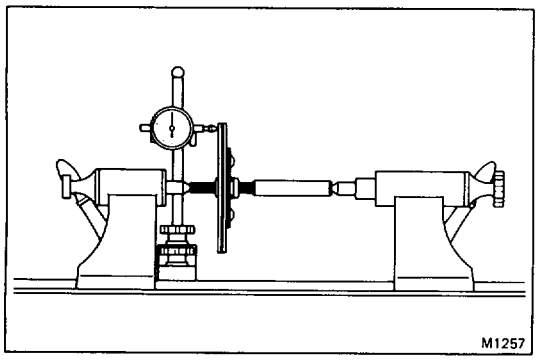


1. **INSPECT CLUTCH DISC FOR WEAR OR DAMAGE**

Using calipers, measure the rivet head depth.

Minimum rivet depth: 0.3 mm (0.012 in.)

If a problem is found, repair or replace the clutch disc.

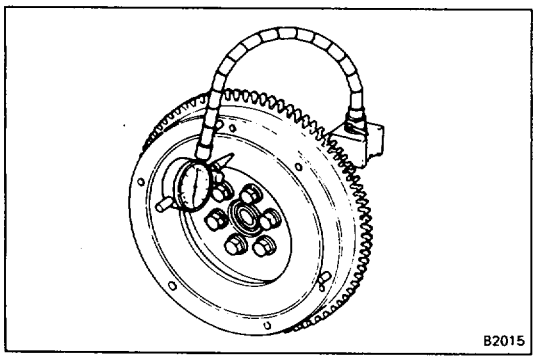


2. **INSPECT CLUTCH DISC RUNOUT**

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

If runout is excessive, replace the disc.

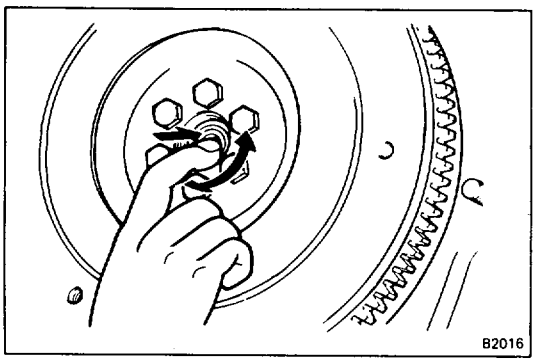


3. **INSPECT FLYWHEEL RUNOUT**

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.2 mm (0.008 in.)

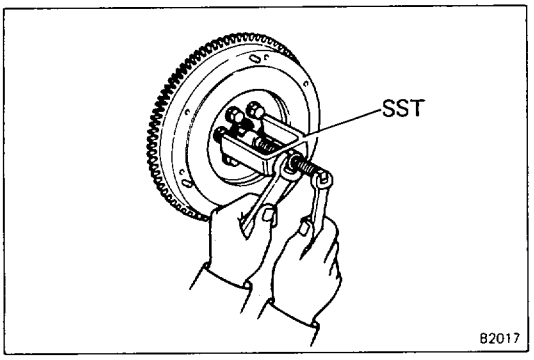
If runout is excessive, repair or replace the flywheel.



4. **INSPECT PILOT BEARING**

Turn the bearing by hand while applying force in the rotation direction.

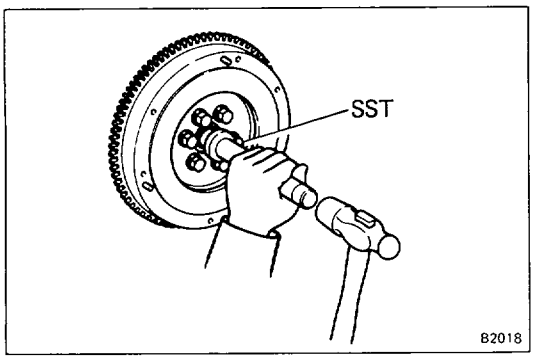
If the bearing sticks or has much resistance, replace the pilot bearing.



5. **IF NECESSARY, REPLACE PILOT BEARING**

(a) Using SST, remove the pilot bearing.

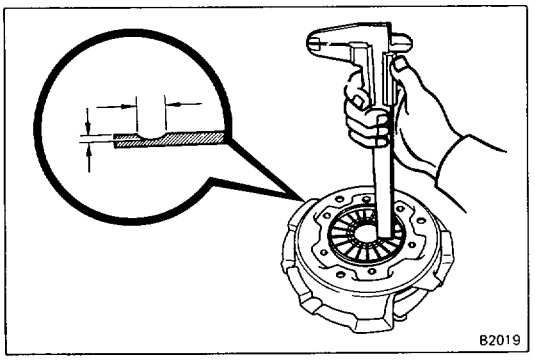
SST 09303-35011



(b) Using SST, install the pilot bearing.

SST 09304-30012

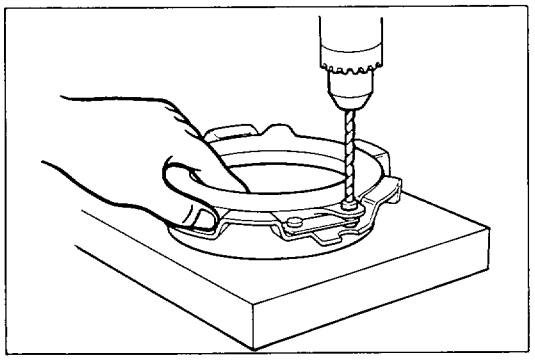
NOTE: After assembling the pilot bearing to the hub, insure that it rotates smoothly.



6. **INSPECT DIAPHRAGM SPRING FOR WEAR**

Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum: Depth 0.6 mm (0.024 in.)
Width 5.0 mm (0.197 in.)



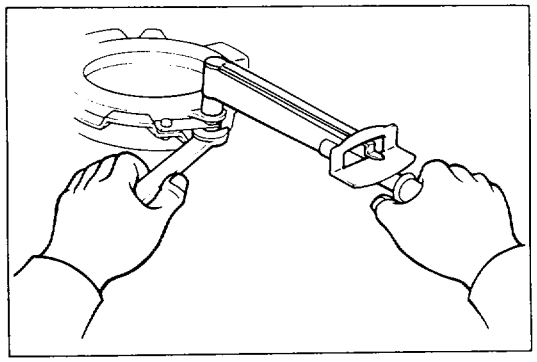
7. **IF NECESSARY, REPLACE PRESSURE PLATE**

(a) Remove the retracting spring.

(b) Drill out the rivet heads.

(c) Using a punch, drive out the rivets.

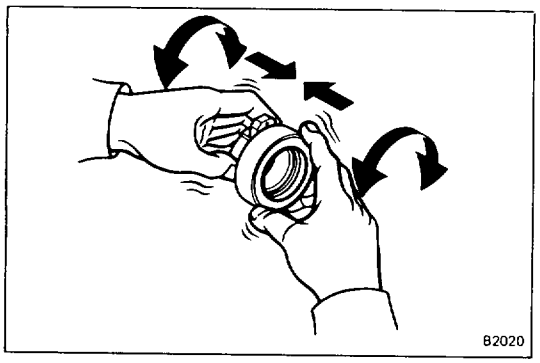
(d) Apply molybdenum disulphide lithium base grease (NLGI No.2) to the contact surface of the pressure plate and cover.



(e) Install a new pressure plate with the special pressure plate bolts and nuts. Torque the nuts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

(f) Using a punch, stake the nuts.

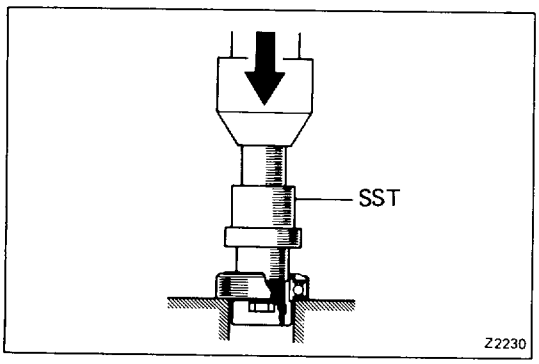


8. **INSPECT RELEASE BEARING**

Turn the bearing by hand while applying force in the rotation direction.

If the bearing sticks or has much resistance, replace the release bearing.

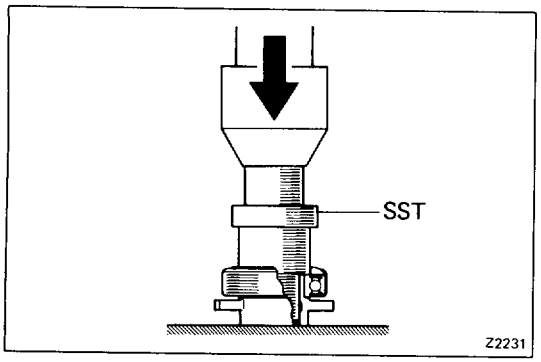
NOTE: The bearing is permanently lubricated and requires no cleaning or lubrication.



9. **IF NECESSARY, REPLACE RELEASE BEARING**

(a) Using a press and SST, press the release bearing from the hub.

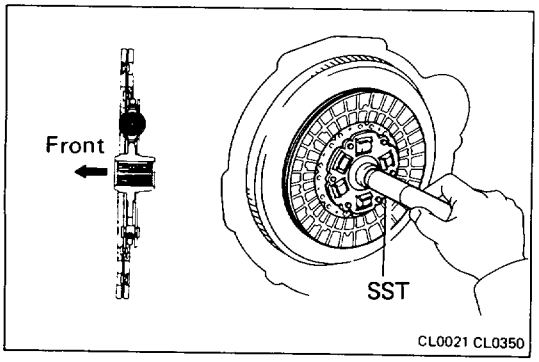
SST 09315-00010



(b) Using a press and SST, press a new release bearing into the hub.

SST 09315-00021

(c) After installing the bearing, check that there is no drag on the bearing when it is turned under pressure.



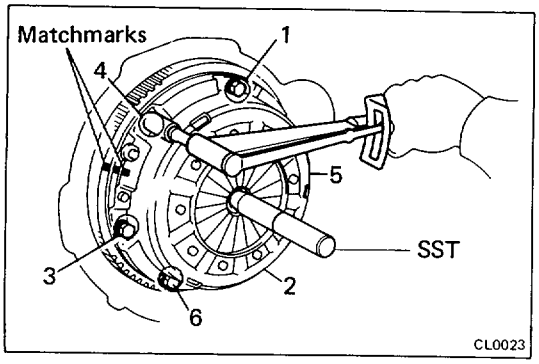
INSTALLATION OF CLUTCH UNIT

(See page CL-10)

1. **INSTALL DISC ON FLYWHEEL**

Using SST, install the disc on the flywheel.

SST 09301-20020



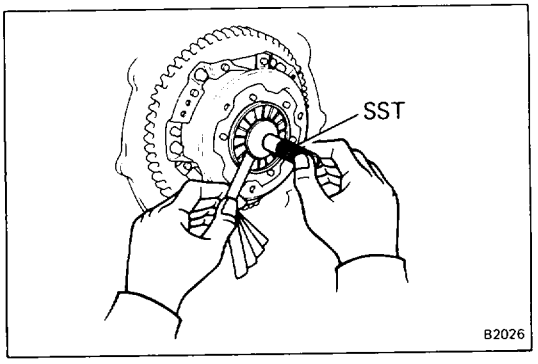
2. **INSTALL CLUTCH COVER**

(a) Align the matchmarks on the clutch cover and flywheel.

(b) Tighten the bolts evenly. Make several passes around the cover until it is snug. Torque the bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

NOTE: Tighten the topmost bolt from the three near the knock pins first.



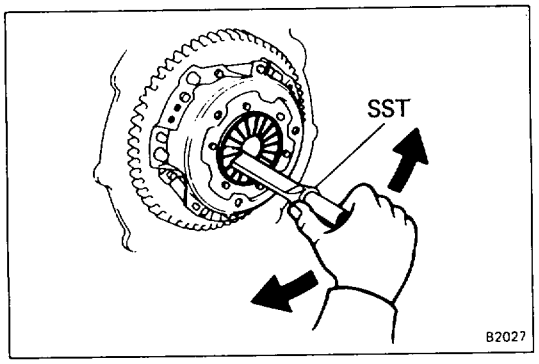
3. **CHECK DIAPHRAGM SPRING TIP ALIGNMENT**

Using a feeler gauge and SST, measure the gap between the spring tips and SST.

SST 09302-30031

Maximum gap: 0.5 mm (0.020 in.)

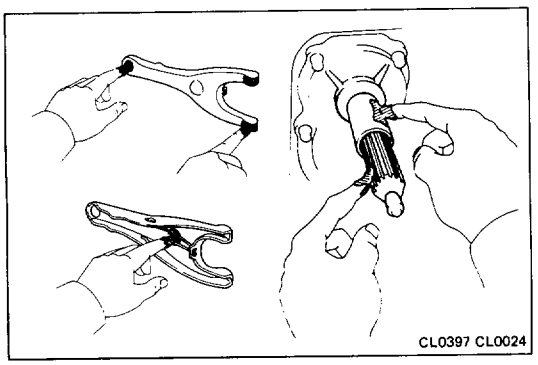
If the gap is excessive, adjust as follows.



4. **IF NECESSARY, ADJUST SPRINGS**

Using SST, bend the springs to correct alignment.

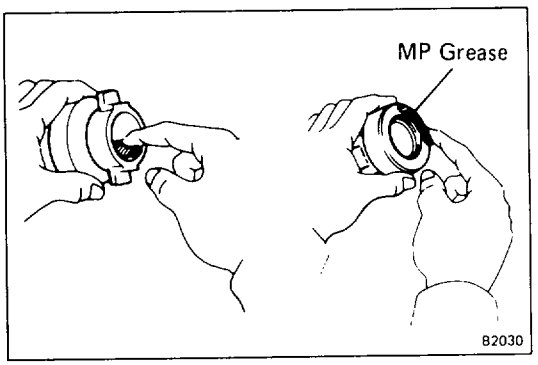
SST 09333-00013



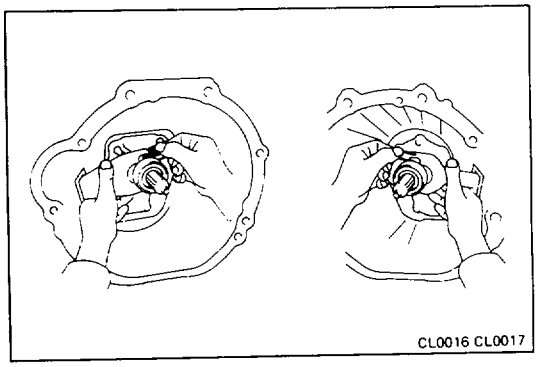
5. **APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) OR MP GREASE**

(a) Apply molybdenum disulphide lithium base grease to the following parts:

- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point
- Clutch disc spline
- Release bearing hub inside groove



(b) Apply MP grease to release bearing.



6. **INSTALL BOOT, FORK, HUB AND BEARING ON TRANSMISSION**

7. **INSTALL TRANSMISSION**

MANUAL TRANSMISSION

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INSTALLATION OF TRANSMISSION	MT-99

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non-residue solvent.**
- **Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.**

TROUBLESHOOTING

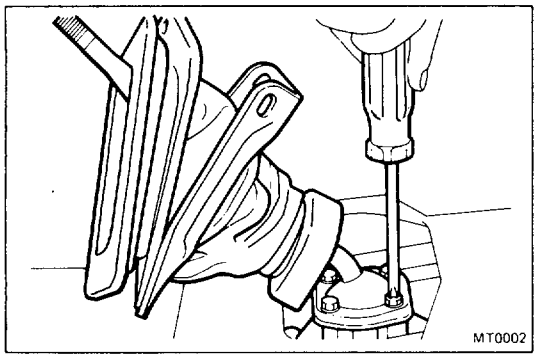
Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Splines on input shaft dirty or burred Transmission faulty	Repair as necessary Disassemble and inspect transmission	MT-3 MT-3
Transmission jumps out of gear	Transmission faulty	Disassemble and inspect transmission	MT-3

REMOVAL OF TRANSMISSION

NOTE: For the transmission with a transfer (4WD) refer to REMOVAL OF TRANSFER on page TF-3.

1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**

2. **REMOVE STARTER UPPER MOUNTING NUT**



3. **REMOVE SHIFT LEVER FROM INSIDE OF VEHICLE**

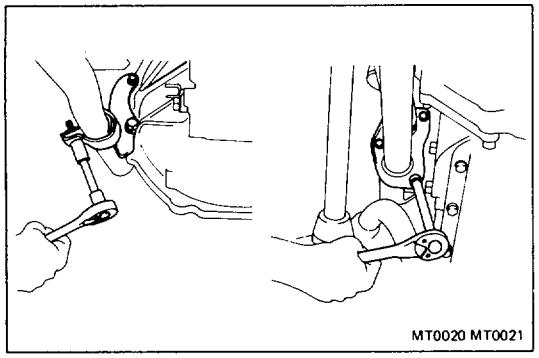
4. **(R150)**
   REMOVE SHIFT LEVER RETAINER

5. **RAISE VEHICLE AND DRAIN TRANSMISSION OIL**

   CAUTION: Be sure the vehicle is securely supported.

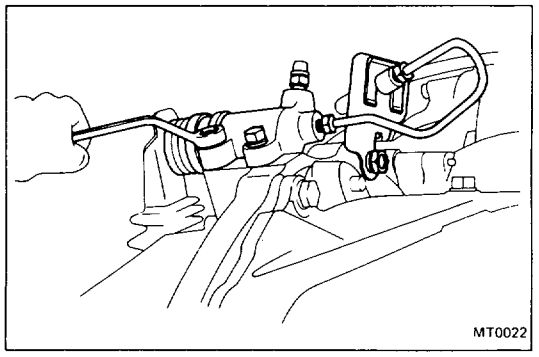
6. **DISCONNECT PROPELLER SHAFT**
   (See page PR-3)

   SST 09325-20010



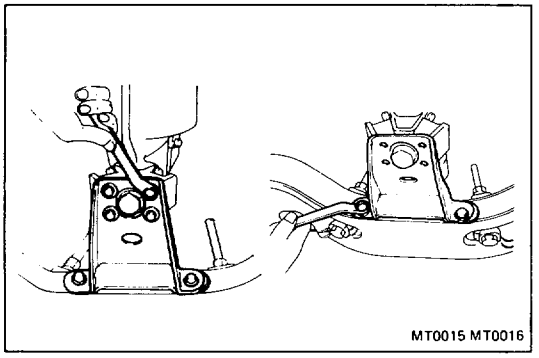
7. **DISCONNECT SPEEDOMETER CABLE AND BACK-UP LIGHT SWITCH CONNECTOR**

8. **REMOVE EXHAUST PIPE CLAMP AND EXHAUST PIPE**



9. **REMOVE CLUTCH RELEASE CYLINDER, TUBE BRACKET AND STARTER LOWER MOUNTING BOLT**

   Remove the mounting bolts and lay the starter and release cylinder alongside the engine.

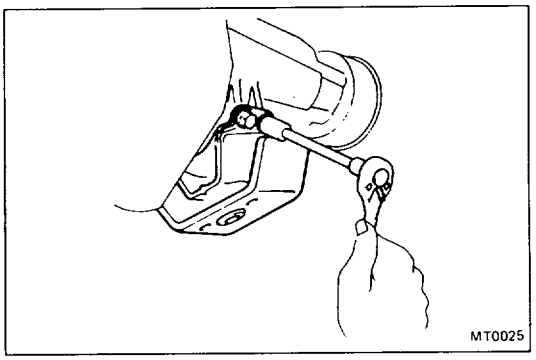


10. **REMOVE ENGINE REAR MOUNTING AND BRACKET**

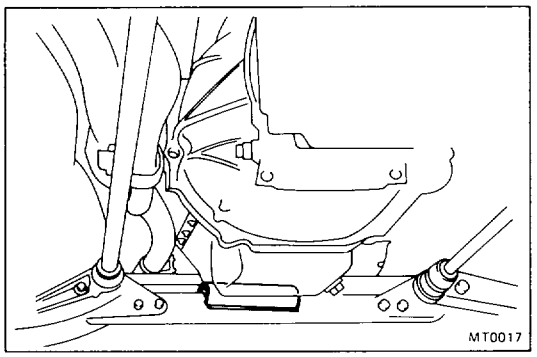
    (a) Remove the four bolts from the engine rear mounting.

    (b) Raise the transmission slightly by raising the engine with a jack.

    (c) Remove the four bolts from the support member and remove the rear mounting bracket.



(d) Remove the engine rear mounting from the transmission.



11. PLACE PIECE OF WOOD BETWEEN ENGINE OIL PAN AND FRONT CROSSMEMBER

NOTE: Tape a piece of wood or such about 20 mm (0.79 in.) thick on the front crossmember.

12. LOWER TRANSMISSION

13. REMOVE EXHAUST PIPE BRACKET AND STIFFENER PLATE BOLTS

14. REMOVE REMAINING TRANSMISSION BOLTS

15. REMOVE TRANSMISSION

(a) Draw out the transmission toward the rear.

(b) Lower the transmission front and remove the transmission from the vehicle.

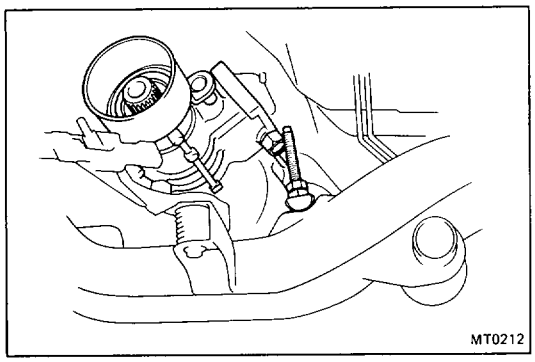
NOTE: Be careful not to damage the extension housing dust deflector.

(R150 only)

(a) Turn the transmission clockwise about 45 degrees.

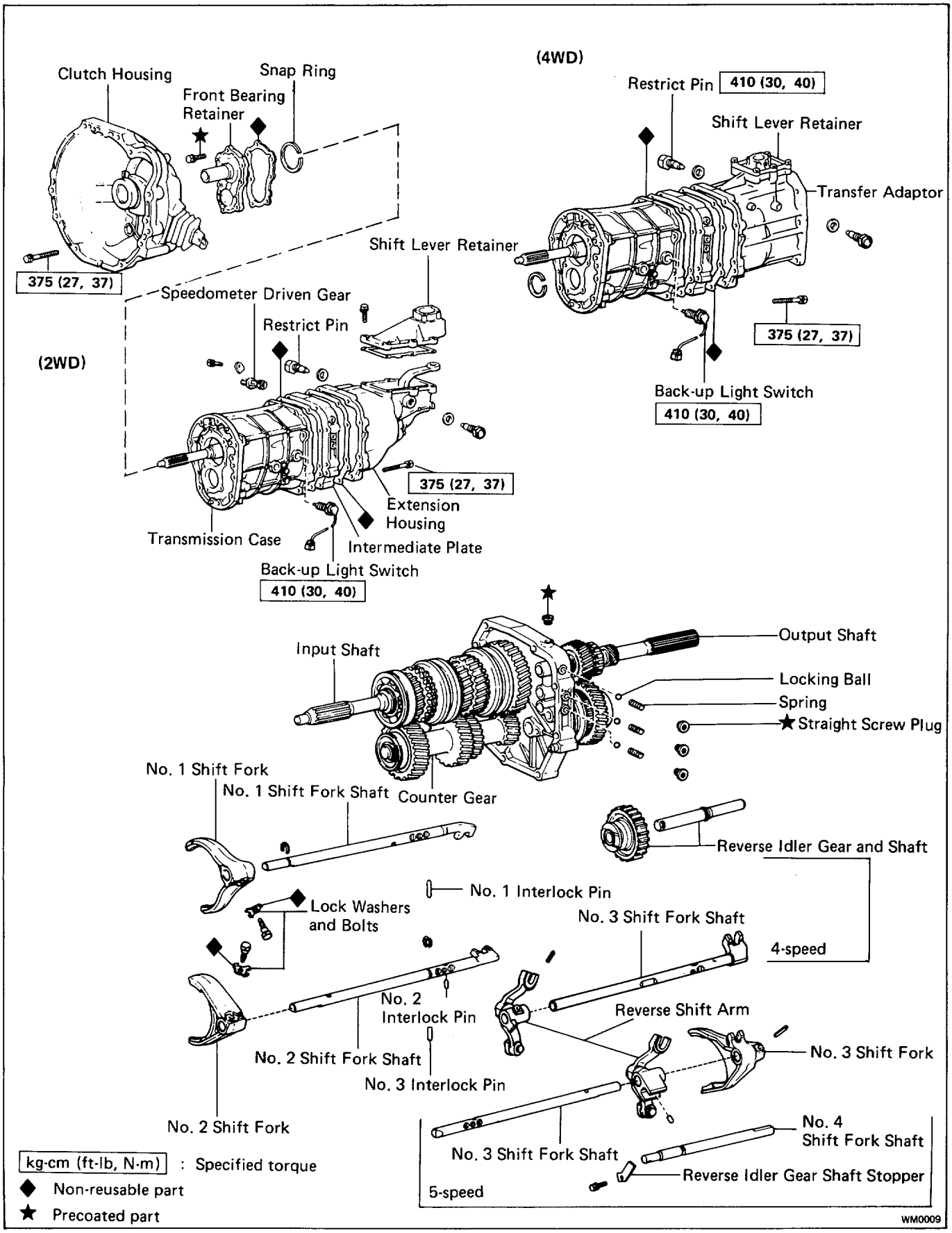
(b) Slide the transmission toward the rear as shown in the figure.

(c) Lower the transmission front and remove the transmission from the vehicle.

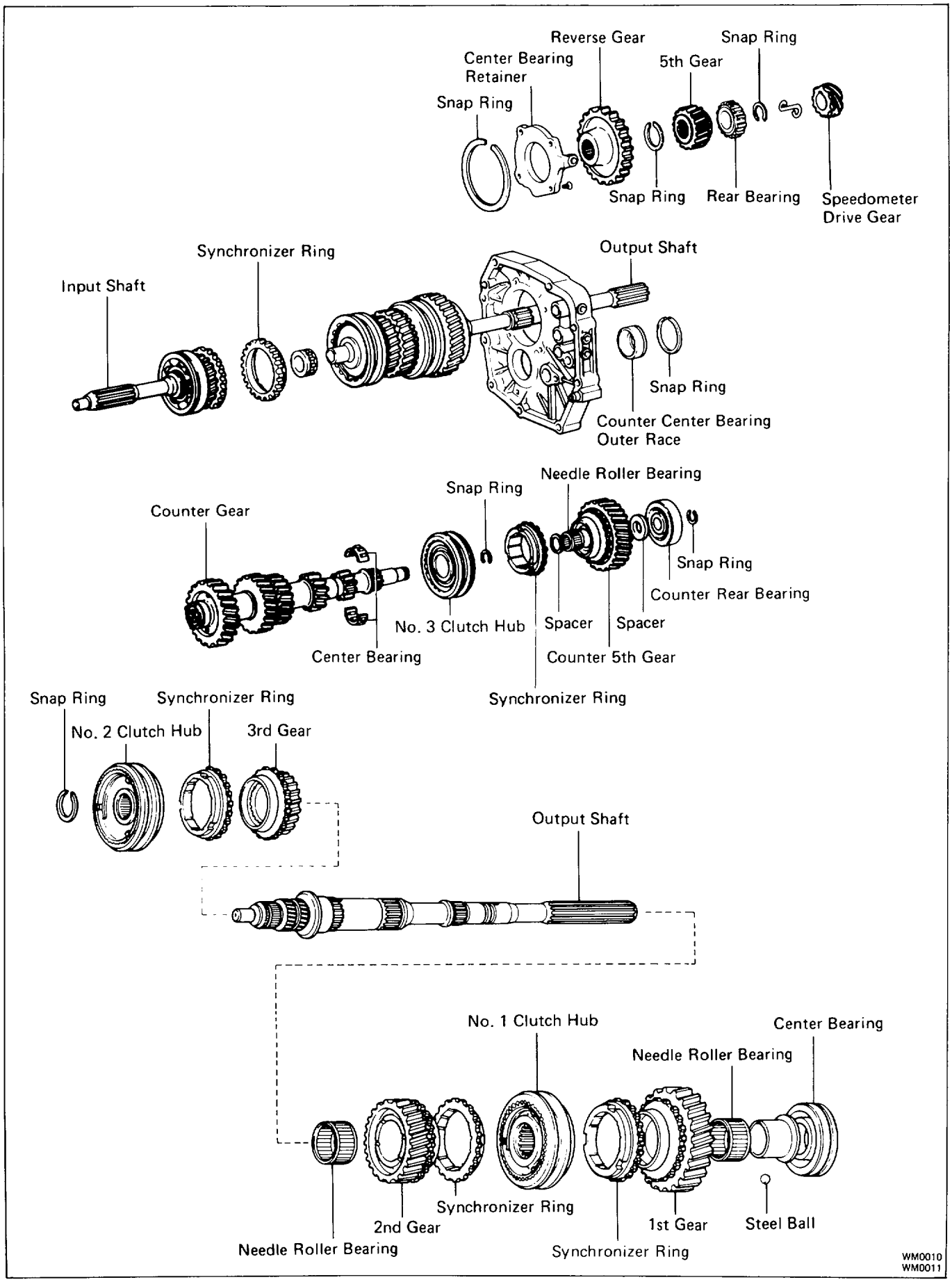


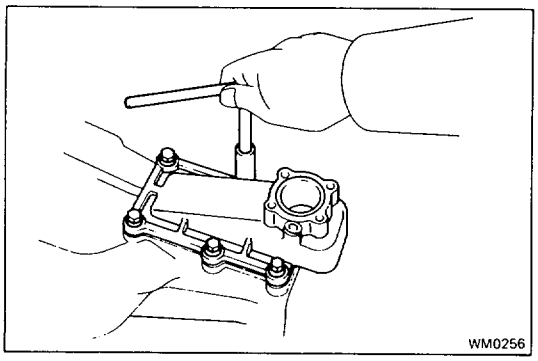
W46, 55 AND 56 TRANSMISSIONS

COMPONENTS



COMPONENTS (Cont'd)

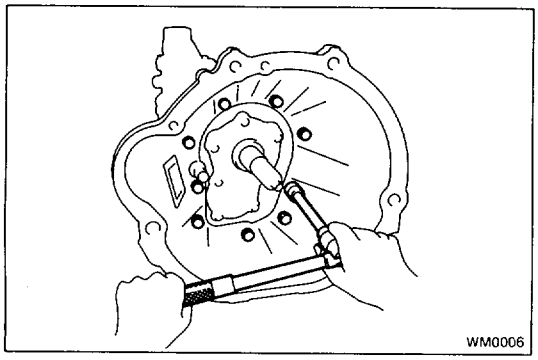



WM0256

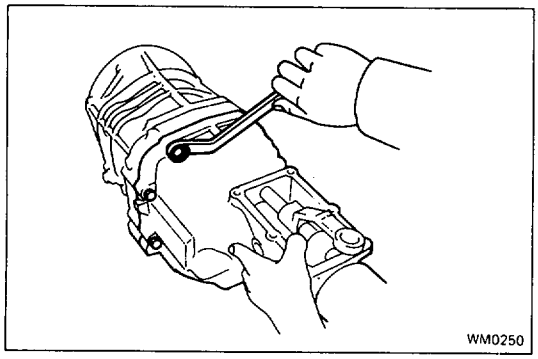
DISASSEMBLY OF TRANSMISSION

(See pages MT-5, 6)

1. **REMOVE BACK-UP LIGHT SWITCH, SPEEDOMETER DRIVEN GEAR (2WD), SHIFT LEVER RETAINER AND RESTRICT PINS**

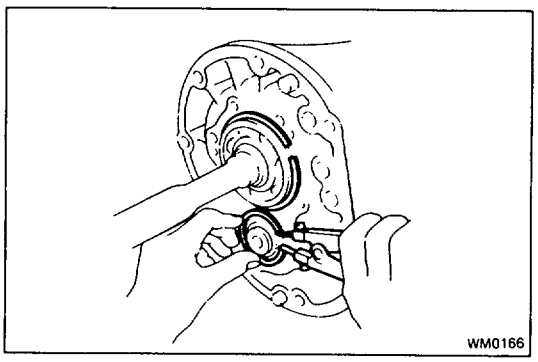

WM0006

2. **REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE**

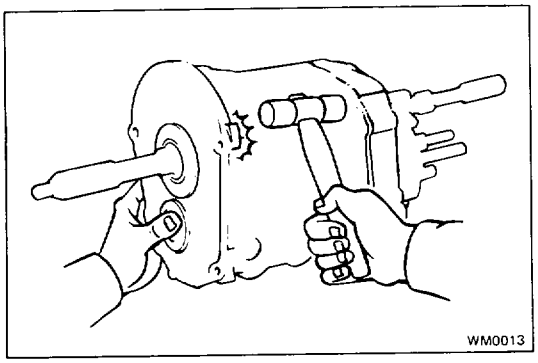

WM0250

3. **REMOVE EXTENSION HOUSING (2WD) OR TRANSFER ADAPTOR (4WD)**
   (a) Remove the shift lever housing set bolt.
   (b) Remove the nine bolts.
   (c) Using a plastic hammer, tap the extension housing (2WD) or the transfer adaptor (4WD).
   (d) Disengage the shift and select lever from the shift head.
   (e) Pull out the extension housing (2WD) or the transfer adaptor (4WD).

   NOTE: Leave the gasket attached to the intermediate plate.


WM0166

4. **REMOVE FRONT BEARING RETAINER AND BEARING SNAP RINGS**

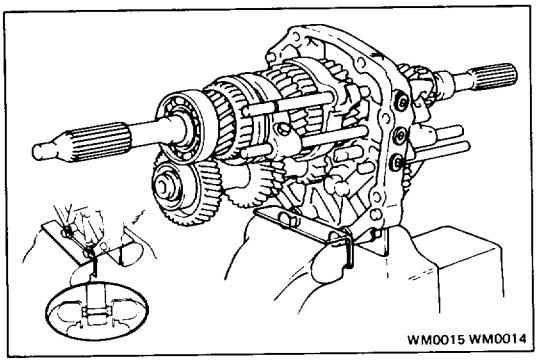


5. **SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE**

(a) Using a plastic hammer, carefully tap the transmission case.

(b) Pull the transmission case from the intermediate plate.

NOTE: Leave the gasket attached to the intermediate plate.

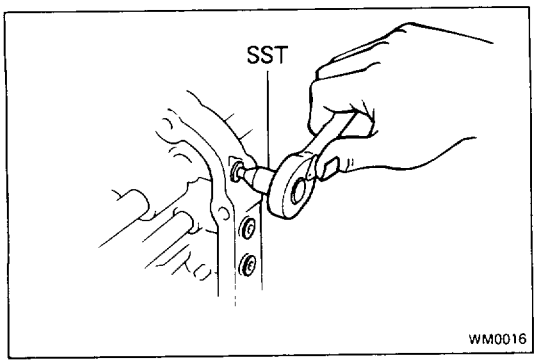


6. **MOUNT INTERMEDIATE PLATE IN VISE**

(a) Use two long clutch housing bolts, plate washers and suitable nuts as shown.

CAUTION: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and the front tip surface of the nut are aligned.

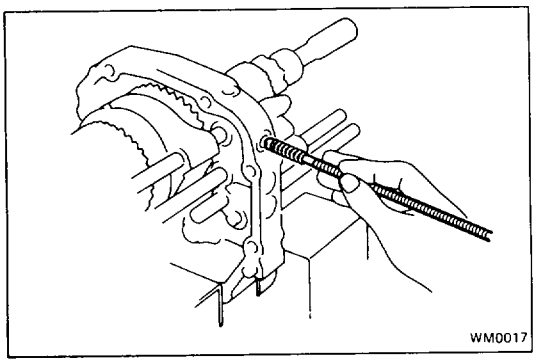
(b) Mount the intermediate plate in a vise.



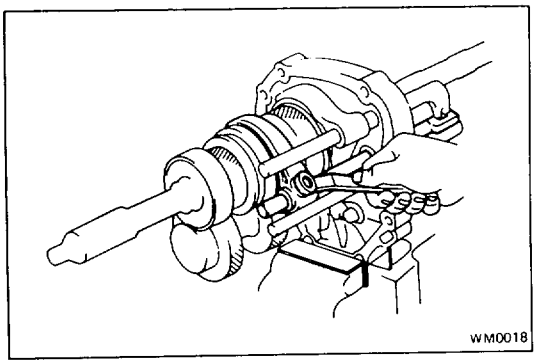
7. **REMOVE LOCKING BALL AND SPRING**

(a) Using SST, remove the four plugs.

SST 09313-30021

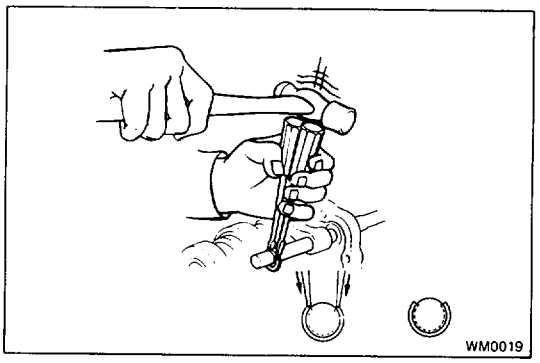


(b) Using a magnetic finger, remove the three springs and balls.

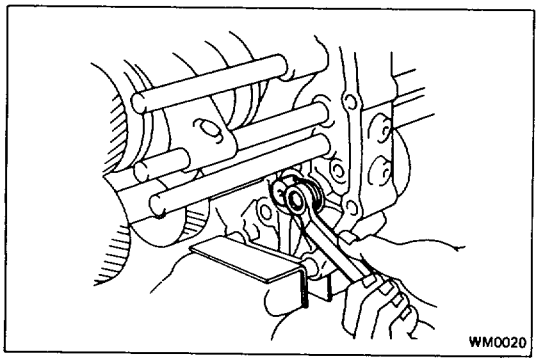


8.-1 (4-Speed)
REMOVE SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

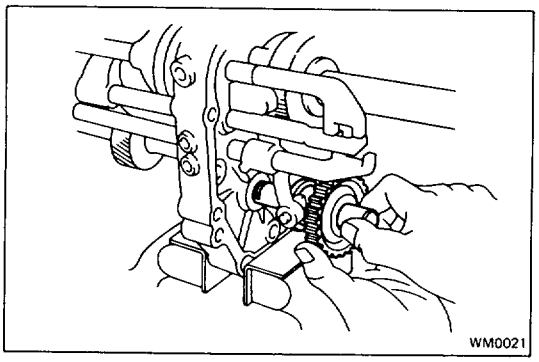
(a) Pry out the lock washers of No. 1 and No. 2 shift forks, and remove the two set bolts.



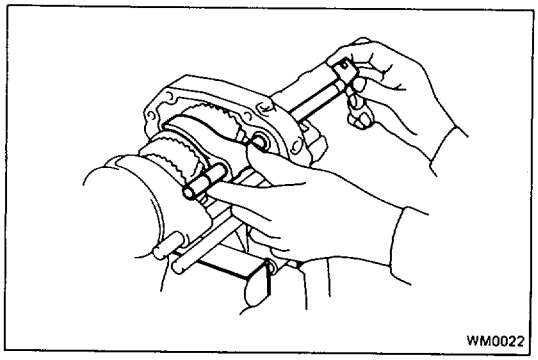
(b) Using two screwdrivers and a hammer, tap out the two snap rings of No. 1 and No. 2 fork shafts.



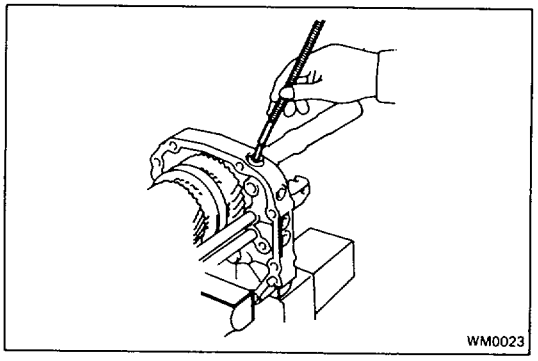
(c) Remove the reverse idler gear shaft stopper.



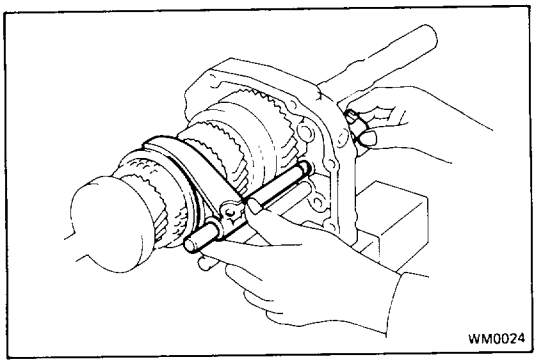
(d) Remove the reverse idler gear and shaft.



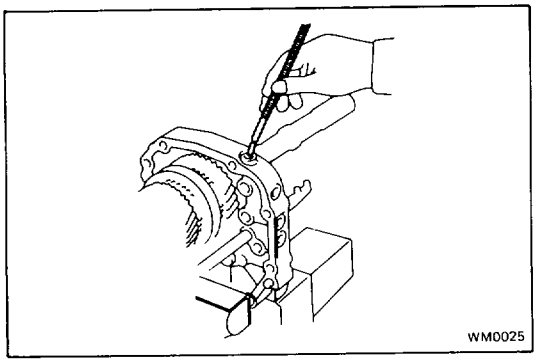
(e) Remove No. 1 shift fork and shaft.



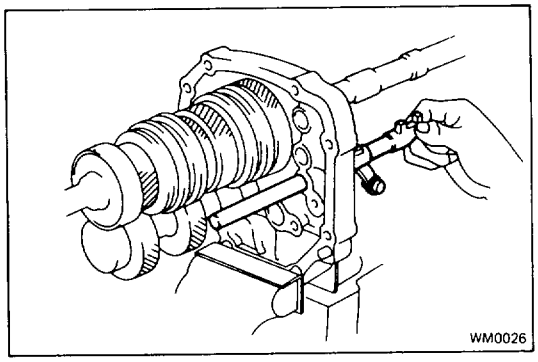
(f) Using a magnetic finger, remove No. 1 and No. 2 interlock pins.



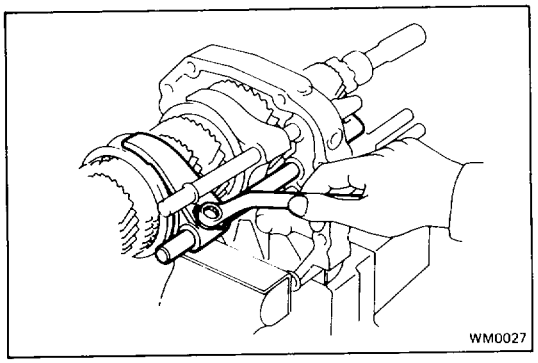
(g) Remove No. 2 shift fork and shaft.



(h) Using a magnetic finger, remove No. 3 interlock pin.

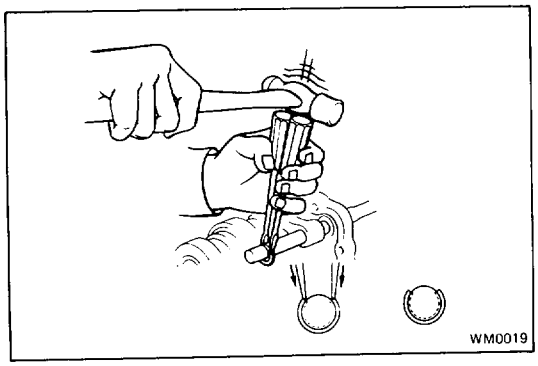


(i) Remove No. 3 fork shaft with reverse shift arm.

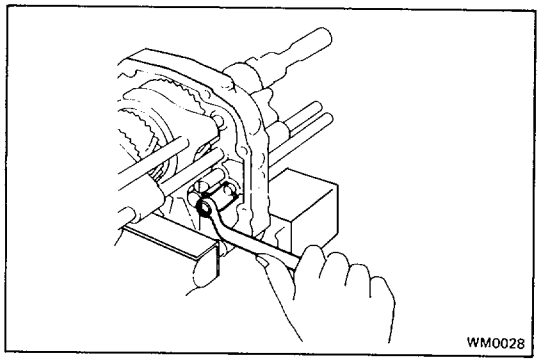


8.-2 (5-Speed)
REMOVE SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

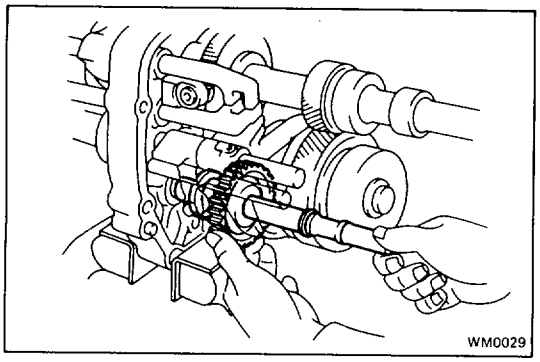
(a) Pry out the lock washers of No. 1 and No. 2 shift forks, and remove the two set bolts.



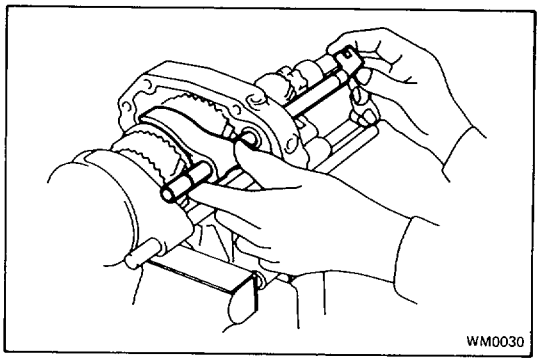
(b) Using two screwdrivers and a hammer, tap out the two snap rings of No. 1 and No. 2 fork shafts.



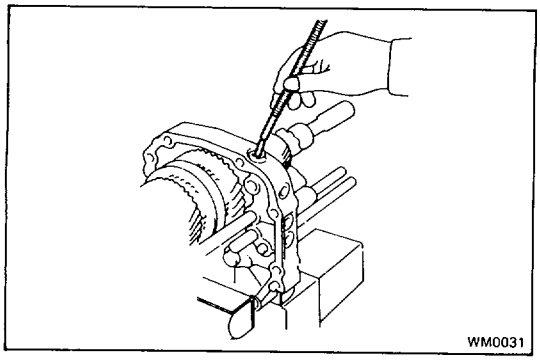
(c) Remove the reverse idler gear shaft stopper.



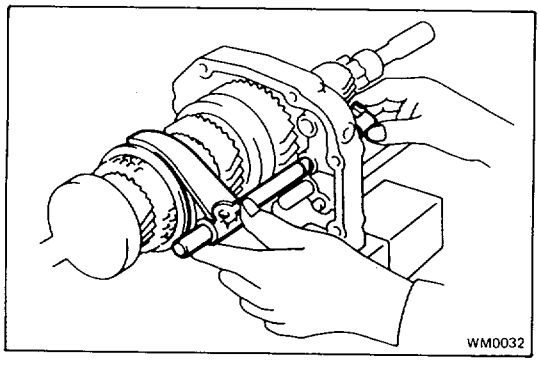
(d) Remove the reverse idler gear and shaft.



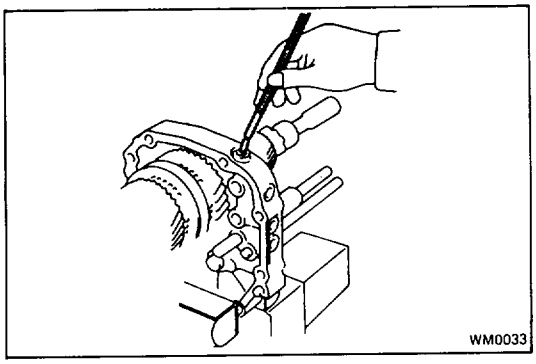
(e) Remove No. 1 shift fork and shaft.



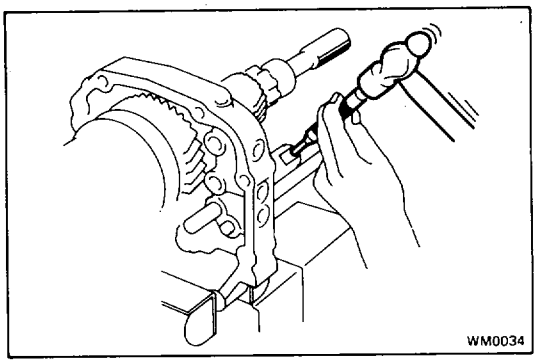
(f) Using a magnetic finger, remove No. 1 and No. 2 interlock pins.



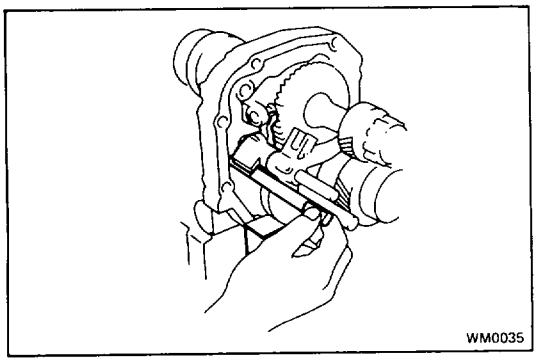
(g) Remove No. 2 shift fork and shaft.



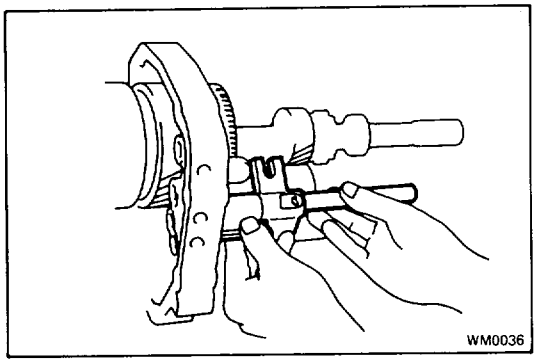
(h) Using a magnetic finger, remove No. 3 interlock pin.



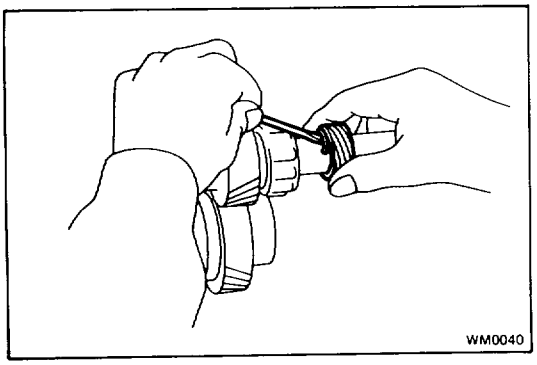
(i) Using a pin punch and hammer, drive out No. 3 fork shaft pin.



(j) Pull out No. 4 shift fork shaft.

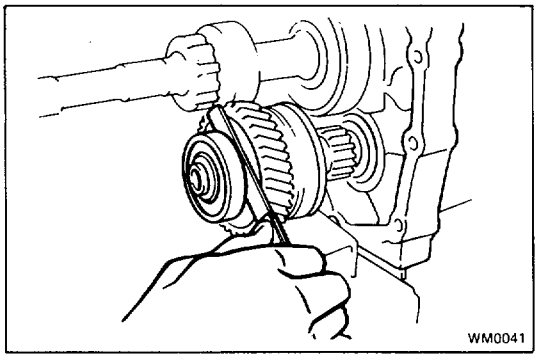


(k) Remove No. 3 shift fork, fork shaft and reverse shift arm with the pin.



9. (2WD)
REMOVE SPEEDOMETER DRIVE GEAR

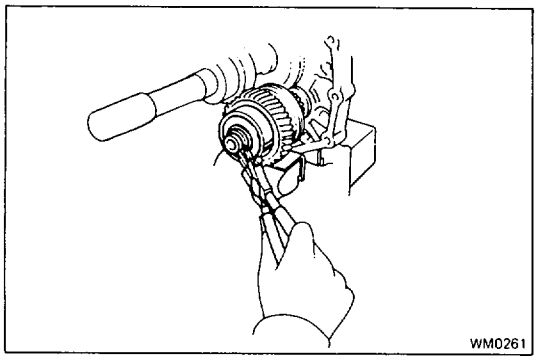
Pry out both ends of the clip and remove the drive gear.



10. (5-Speed)
MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

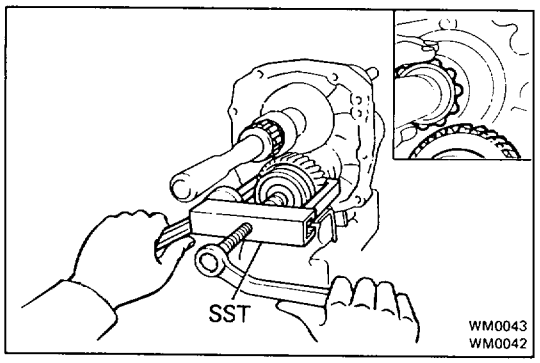
Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance: **0.10 — 0.41 mm (0.0039 — 0.0161 in.)**
Maximum clearance: **0.46 mm (0.0181 in.)**



11. (5-Speed)
REMOVE COUNTER REAR BEARING, SPACER, COUNTER FIFTH GEAR AND NEEDLE ROLLER BEARING

(a) Using snap ring pliers, remove the snap ring.

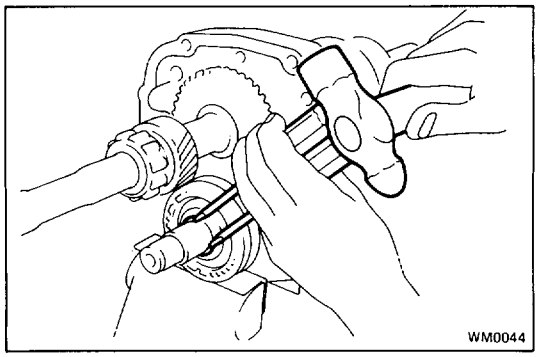


(b) Using SST, remove the rear bearing, spacer, 5th gear and bearing.

SST 09213-36020

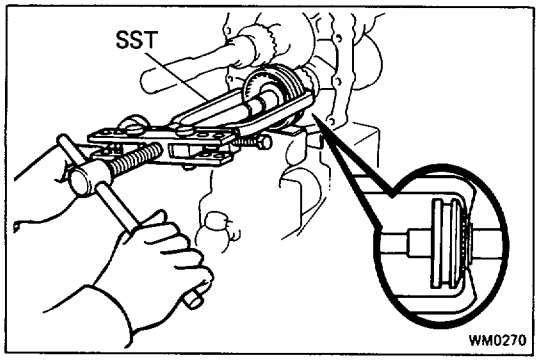
CAUTION: Be careful not to catch the output shaft rear bearing roller on the counter 5th gear.

(c) Remove the spacer.



12. (5-Speed)
REMOVE NO. 3 HUB SLEEVE ASSEMBLY

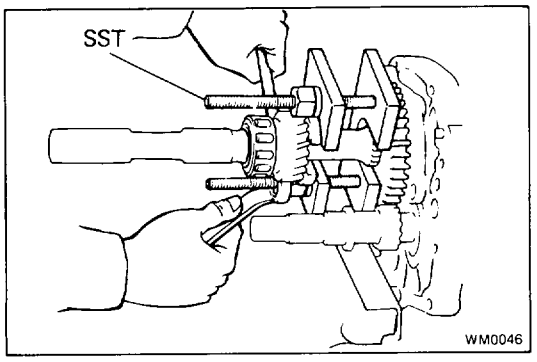
(a) Using two screwdrivers and a hammer, tap out the snap ring.



(b) Using SST, remove No. 3 clutch hub.

SST 09950-20017

CAUTION: Latch the claw of the SST onto the clutch hub, not the shifting key retainer.

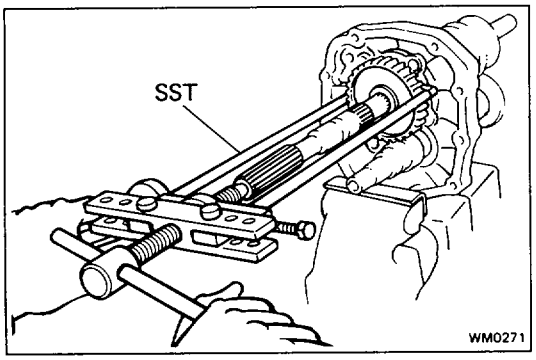


13. (5-Speed)
REMOVE OUTPUT SHAFT REAR BEARING AND FIFTH GEAR

(a) Using two screwdrivers and a hammer, tap out the snap ring.

(b) Using SST, remove the rear bearing and 5th gear.

SST 09312-20011

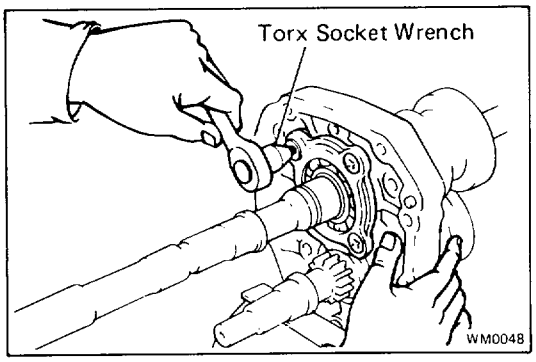


14. **REMOVE REVERSE GEAR**

(a) Using snap ring pliers, remove the snap ring.

(b) Using SST, remove the reverse gear.

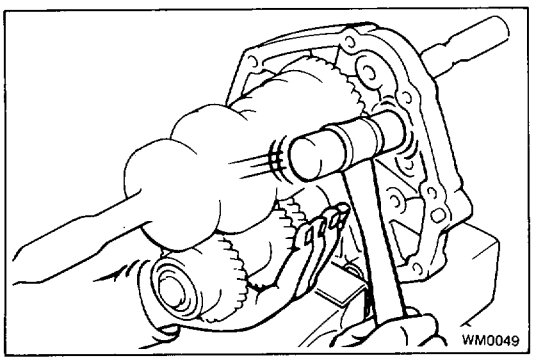
SST 09950-20017



15. **REMOVE CENTER BEARING RETAINER**

(a) Using a torx socket wrench, unscrew the torx screws and remove the retainer.

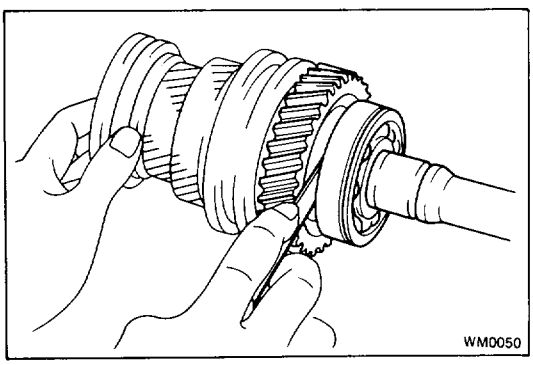
(b) Using snap ring pliers, remove the snap ring.



16. **REMOVE OUTPUT SHAFT AND COUNTER GEAR AS A UNIT FROM INTERMEDIATE PLATE**

(a) Remove the output shaft, input shaft and counter gear as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

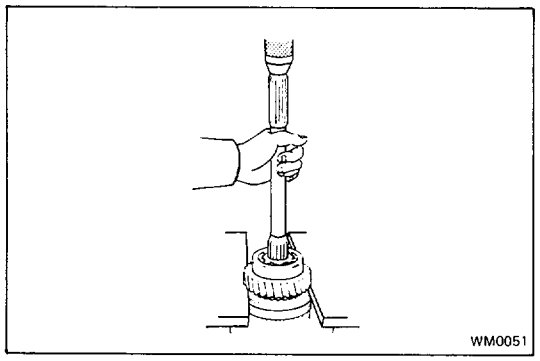
(b) Remove the input shaft from output shaft.



17. **MEASURE EACH GEAR THRUST CLEARANCE**

Using a feeler gauge, measure the thrust clearance of each gear.

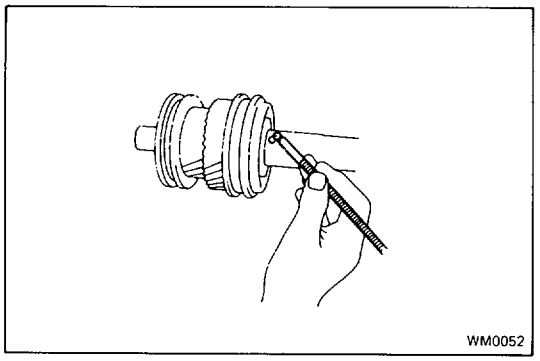
Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)


WM0051

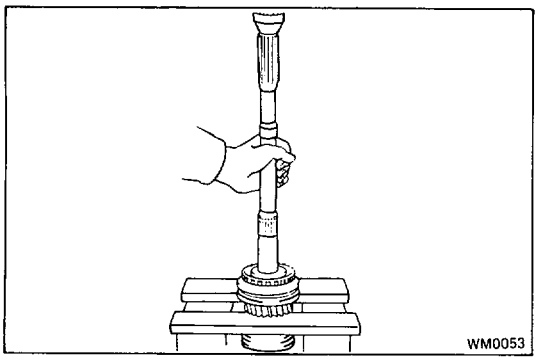
18. REMOVE OUTPUT SHAFT CENTER BEARING AND FIRST GEAR ASSEMBLY

(a) Shift No. 1 hub sleeve onto the 2nd gear.

(b) Using a press, remove the center bearing, 1st gear, needle roller bearing, inner race and synchronizer ring.

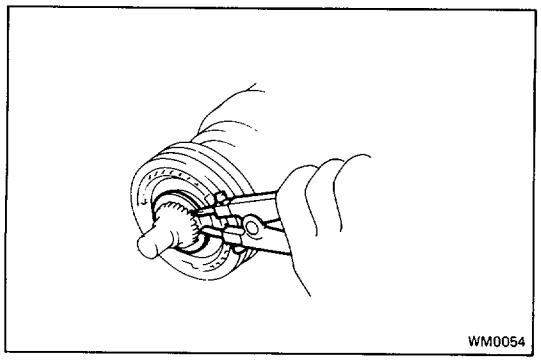

WM0052

19. REMOVE LOCKING BALL


WM0053

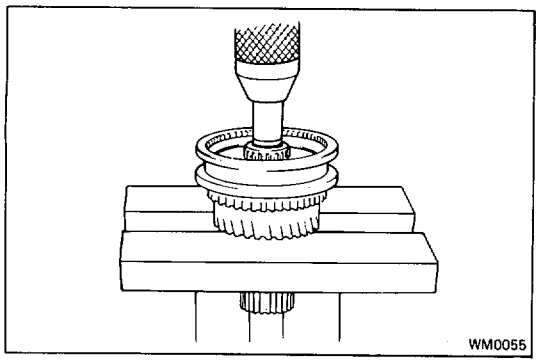
20. REMOVE NO. 1 HUB SLEEVE ASSEMBLY, SECOND GEAR AND NEEDLE ROLLER BEARING

Using a press, remove the parts from the shaft as an assembly.

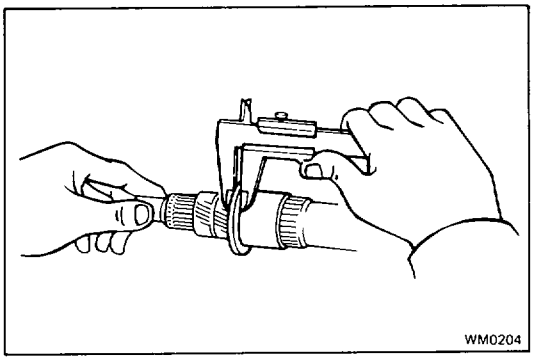

WM0054

21. REMOVE NO. 2 HUB SLEEVE ASSEMBLY AND THIRD GEAR

(a) Using snap ring pliers, remove the snap ring.


WM0055

(b) Using a press, remove No. 2 hub sleeve, synchronizer ring and 3rd gear.

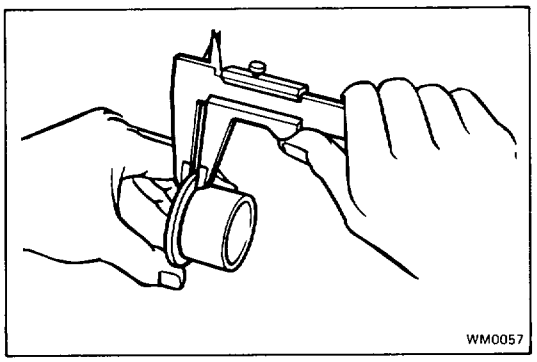

WM0204

INSPECTION OF TRANSMISSION COMPONENTS

1. INSPECT OUTPUT SHAFT AND INNER RACE

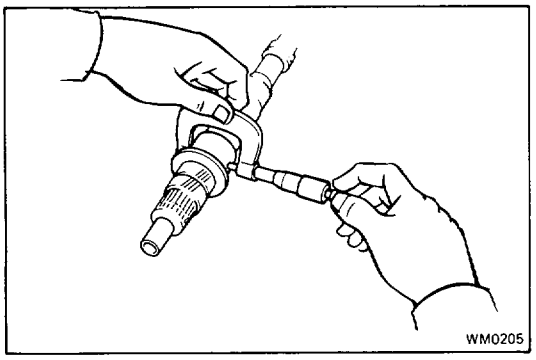
(a) Using calipers, measure the output shaft flange thickness.

Minimum thickness: 5.60 mm (0.2205 in.)


WM0057

(b) Using calipers, measure the inner race flange thickness.

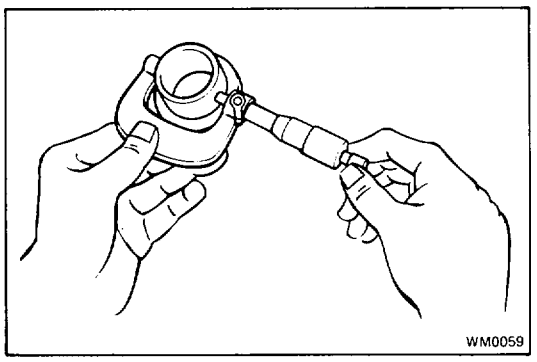
Minimum thickness: 4.70 mm (0.1850 in.)


WM0205

(c) Using a micrometer, measure the outer diameter of the output shaft journal.

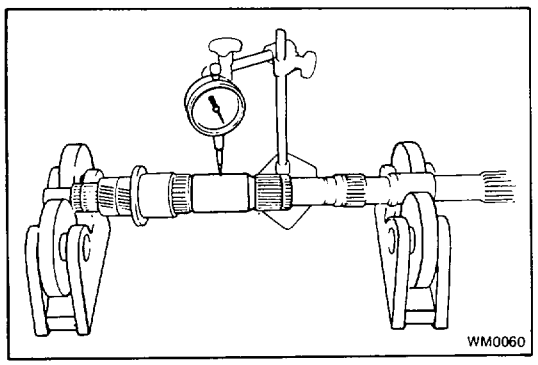
Minimum diameter:

2nd gear	**42.85 mm (1.6870 in.)**
3rd gear	**37.80 mm (1.4882 in.)**


WM0059

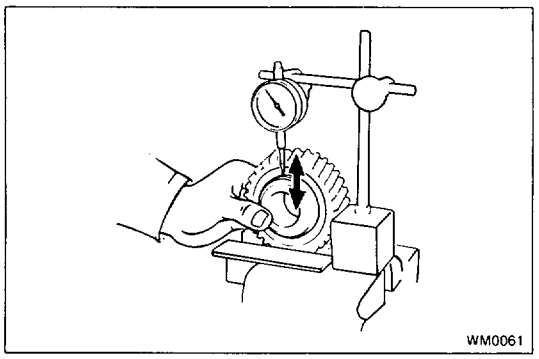
(d) Using a micrometer, measure the outer diameter of the inner race.

Minimum diameter: 42.85 mm (1.6870 in.)


WM0060

(e) Using a dial indicator, check the shaft runout.

Maximum runout: 0.06 mm (0.0024 in.)

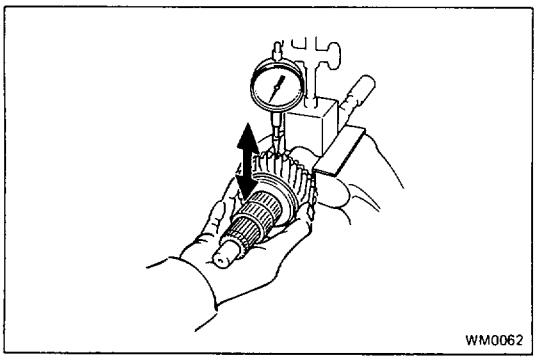


2. CHECK OIL CLEARANCE OF FIRST GEAR

Using a dial indicator, measure the oil clearance between the gear and inner race with the needle roller bearing installed.

Standard clearance: 0.009 — 0.060 mm (0.0004 — 0.0024 in.)
Maximum clearance: 0.15 mm (0.0059 in.)

If the clearance exceeds the limit, replace the gear, inner race or needle roller bearing.

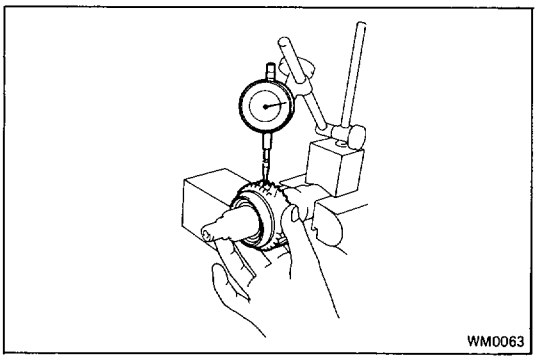


3. CHECK OIL CLEARANCE OF SECOND AND COUNTER FIFTH GEAR

Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed. stalled.

Standard clearance:
2nd gear 0.009 — 0.060 mm (0.0004 — 0.0024 in.)
5th gear 0.009 — 0.062 mm (0.0004 — 0.0024 in.)
Maximum clearance: 0.15 mm (0.0059 in.)

If the clearance exceeds the limit, replace the gear, shaft or needle roller bearing.

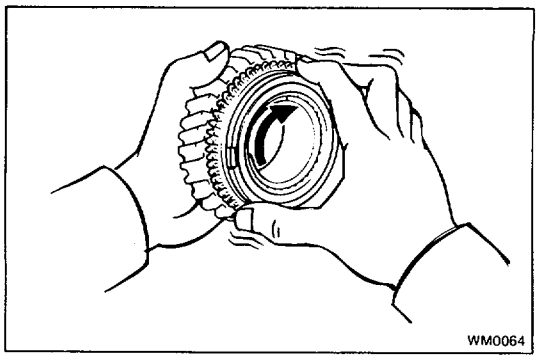


4. CHECK OIL CLEARANCE OF THIRD GEAR

Using a dial indicator, measure the oil clearance between the gear and output shaft.

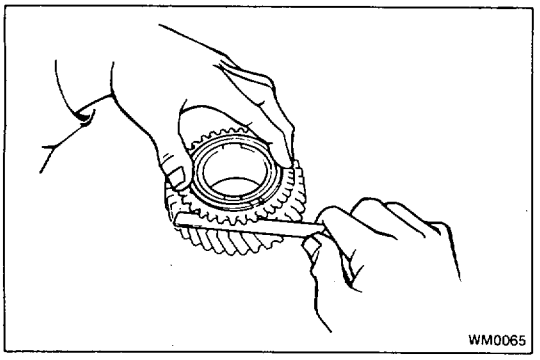
Standard clearance: 0.060 — 0.103 mm (0.0024 — 0.0041 in.)
Maximum clearance: 0.20 mm (0.0079 in.)

If the clearance exceeds the limit, replace the gear or output shaft.



5. INSPECT SYNCHRONIZER RINGS

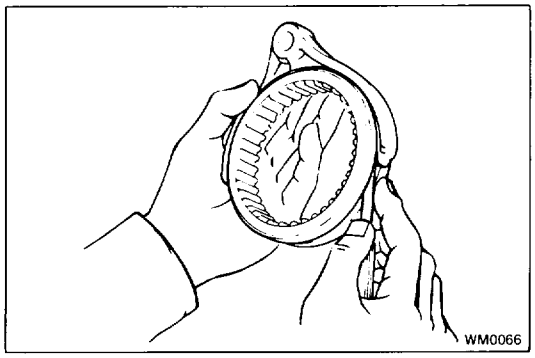
(a) Turn the ring and push it in to check the braking action.



(b) Measure the clearance between the synchronizer ring back and the gear spline end.

Standard clearance: 0.7 — 1.7 mm (0.028 — 0.067 in.)
Minimum clearance: 0.5 mm (0.020 in.)

If the clearance is less than the limit, replace the synchronizer ring.

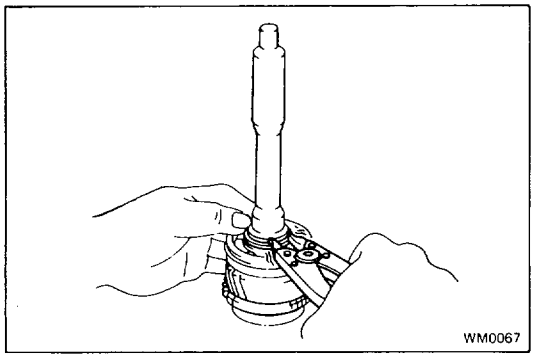

WM0066

6. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

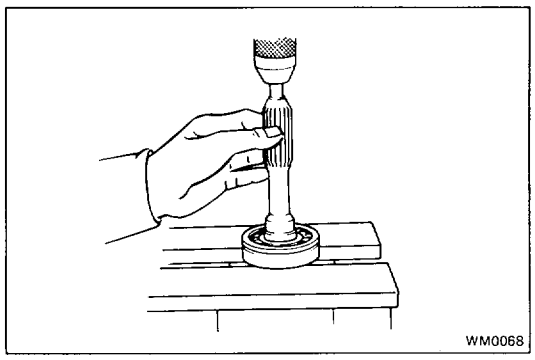
Maximum clearance: 1.0 mm (0.039 in)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

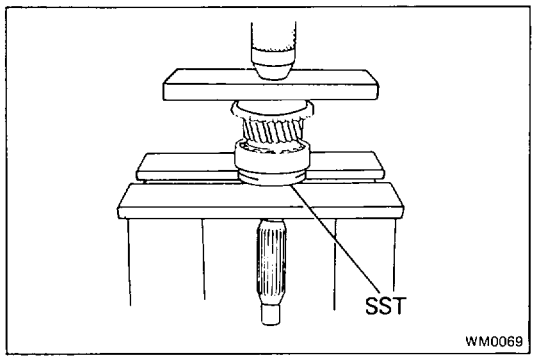

WM0067

7. IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.


WM0068

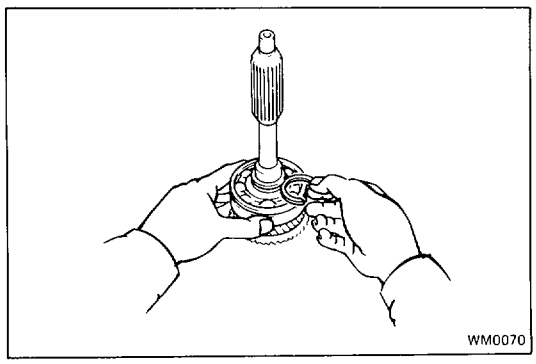
(b) Using a press, remove the bearing.



WM0069

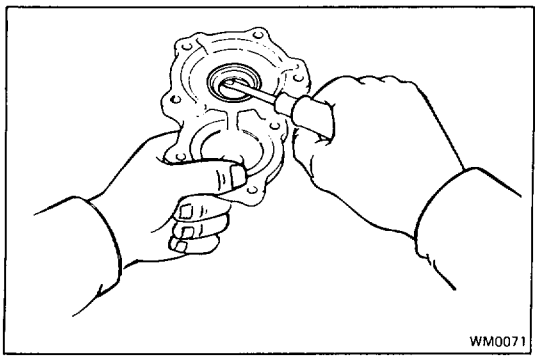
(c) Using a press and SST, install a new bearing.

SST 09506-35010


WM0070

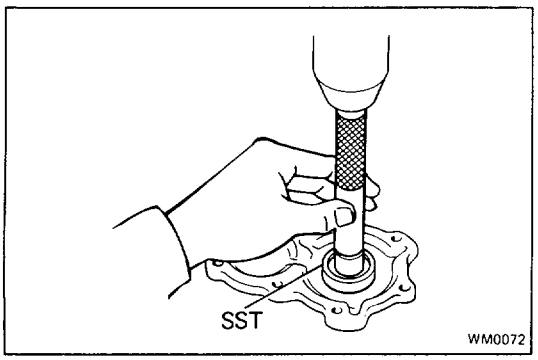
(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness	mm (in.)
1	2.05 — 2.10	(0.0807 — 0.0827)
2	2.10 — 2.15	(0.0827 — 0.0846)
3	2.15 — 2.20	(0.0846 — 0.0866)
4	2.20 — 2.25	(0.0866 — 0.0886)
5	2.25 — 2.30	(0.0886 — 0.0906)
11	2.30 — 2.35	(0.0906 — 0.0925)
12	2.35 — 2.40	(0.0925 — 0.0945)



8. IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

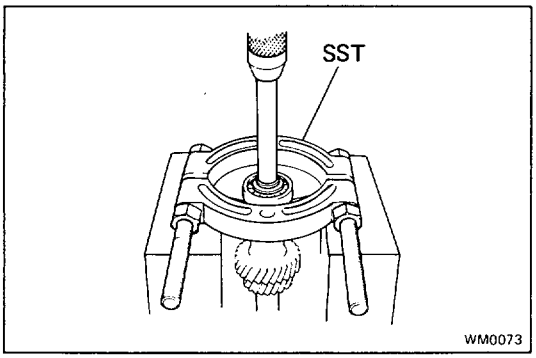
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST, press in a new oil seal.

SST 09608-20012 (09608-03020, 09608-00080)

Drive in depth: 11.4 — 12.0 mm from retainer end (0.449 — 0.472 in.)



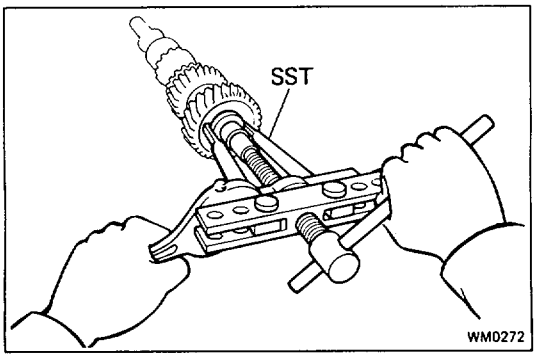
9. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SIDE RACE

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press and SST, press out the bearing.

SST 09950-00020

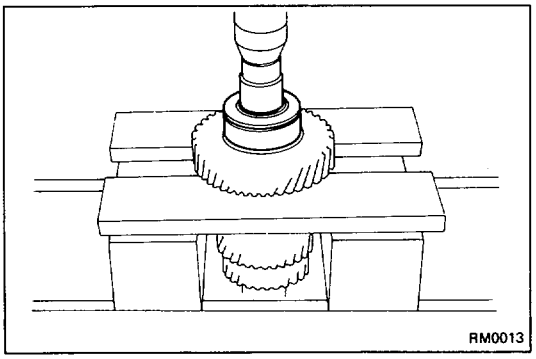
(c) Check the side race for wear or damage.



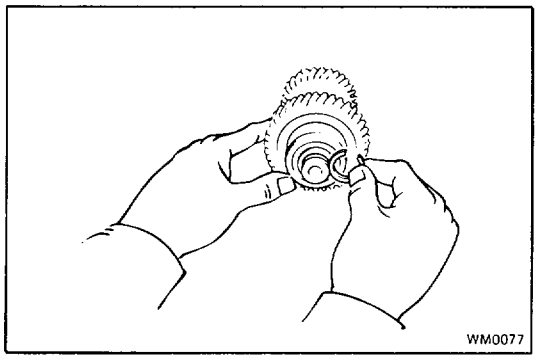
(d) If necessary, remove the side race.

- Using SST and socket wrench, remove the side race.

SST 09950-20017

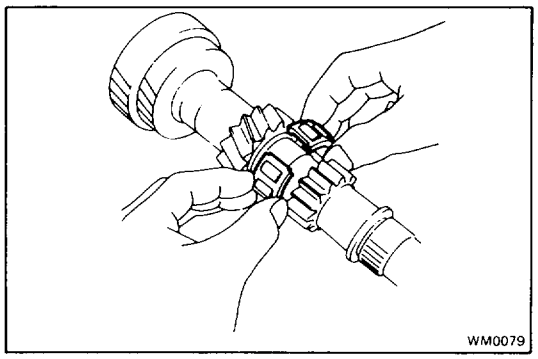


(e) Using a socket wrench, press in a new bearing, side race and inner race.


WM0077

(f) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness	mm (in.)
1	2.05 — 2.10	(0.0807 — 0.0827)
2	2.10 — 2.15	(0.0827 — 0.0846)
3	2.15 — 2.20	(0.0846 — 0.0866)
4	2.20 — 2.25	(0.0866 — 0.0886)
5	2.25 — 2.30	(0.0886 — 0.0906)
6	2.30 — 2.35	(0.0906 — 0.0925)
7	2.35 — 2.40	(0.0925 — 0.0945)

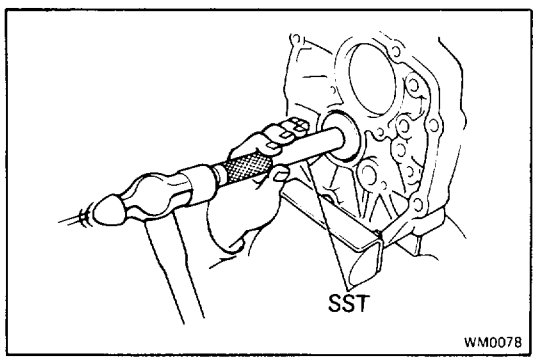

WM0079

10. IF NECESSARY, REPLACE COUNTER GEAR CENTER BEARING

(a) Remove the bearing from the counter gear.

(b) Install a new bearing on the counter gear.

NOTE: Engage the roller cages.

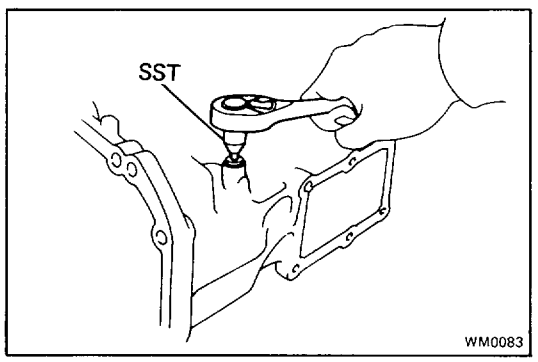


WM0078

(c) Using SST, tap out the bearing outer race.

SST 09608-35014 (09608-06020, 09608-06090)

NOTE: The outer race will be installed later, as the transmission is assembled.

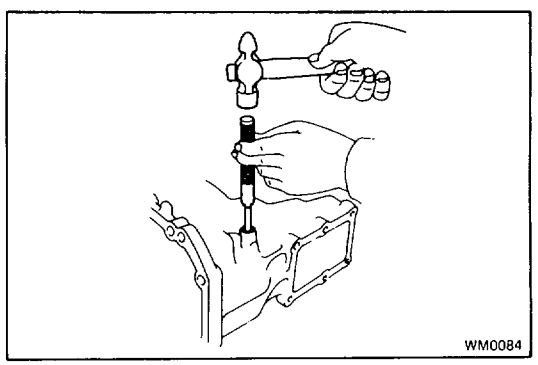


WM0083

11. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using SST, remove the screw plug.

SST 09313-30021


WM0084

(b) Using a pin punch and hammer, drive out the slotted spring pin.

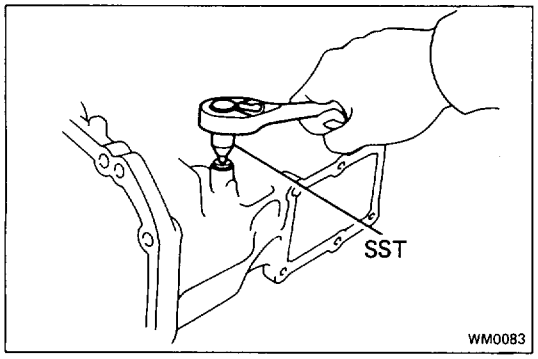
(c) Pull off the lever housing and slide out the shaft.

(d) Install the lever housing.

(e) Using a pin punch and hammer, drive in the slotted spring pin.

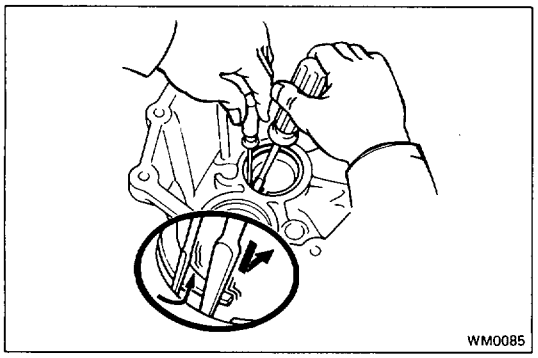
(f) Apply liquid sealer to the plug.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



(g) Install and torque the screw plug.

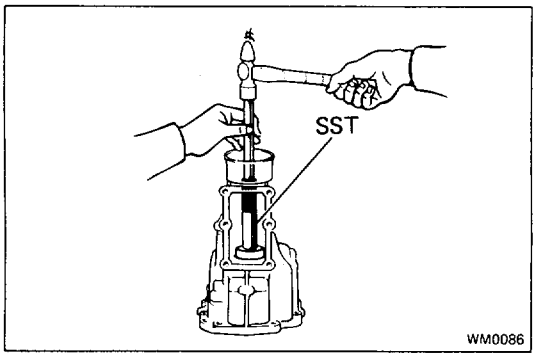
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



12. (5-Speed)
IF NECESSARY, REPLACE REAR BEARING OUTER RACE

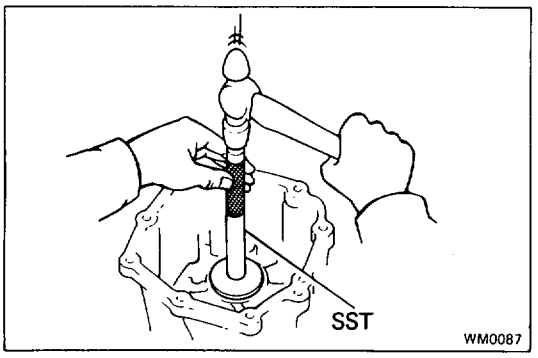
(a) Remove the outer race from the extension housing.

(1) Using two screwdrivers, remove the snap ring.



(2) Using SST, tap out the outer race.

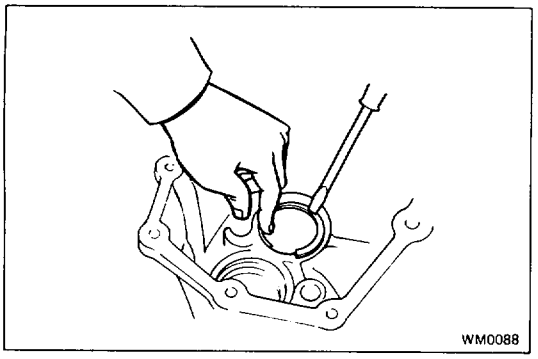
SST 09608-12010 (09608-00020, 09608-00050)



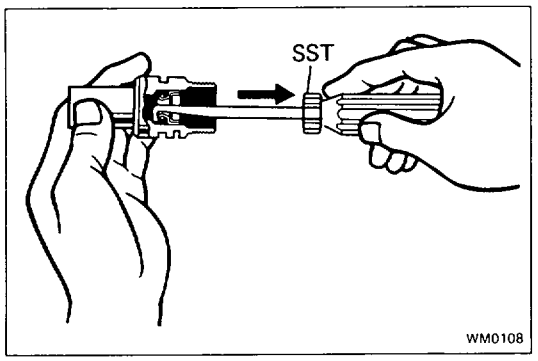
(b) Install the bearing outer race.

(1) Using SST, install a new outer race.

SST 09608-35014 (09608-06020, 09608-06100)



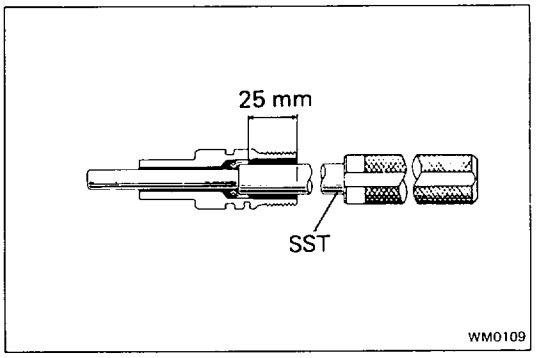
(2) Install the snap ring.



13. (2WD)
IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, remove the oil seal.

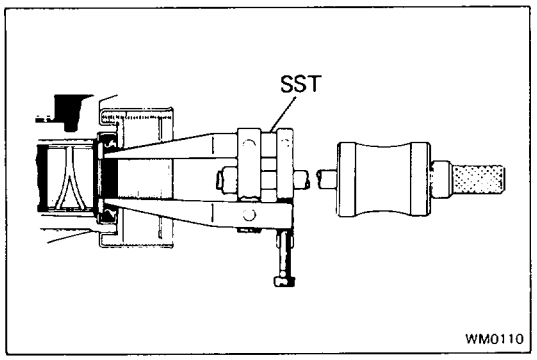
SST 09921-00010



(b) Using SST, install a new oil seal.

SST 09201-60011

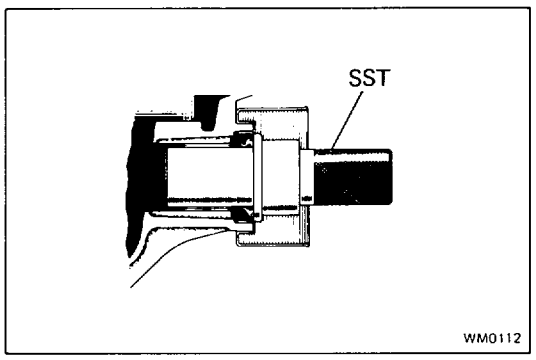
Drive in depth: 25 mm (0.98 in.)



14.-1 (2WD)
IF NECESSARY, REPLACE OIL SEAL

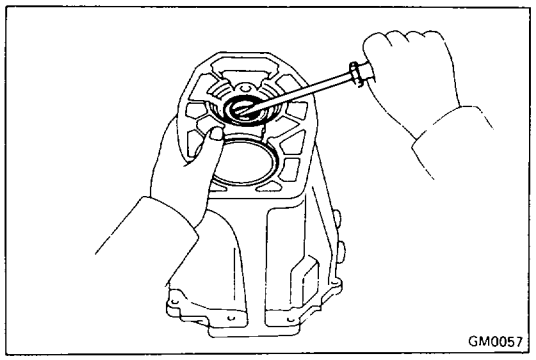
(a) Using SST, remove the oil seal.

SST 09308-00010 or
09308-10010 w/ output shaft installed



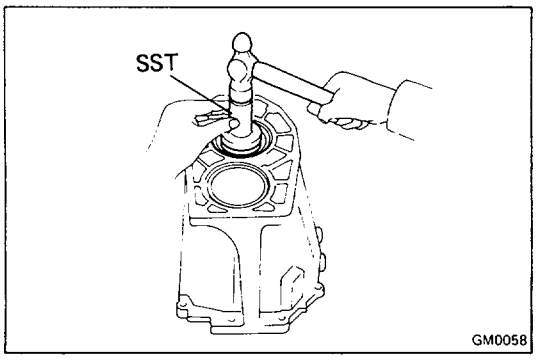
(b) Using SST, drive in a new oil seal.

SST 09325-20010

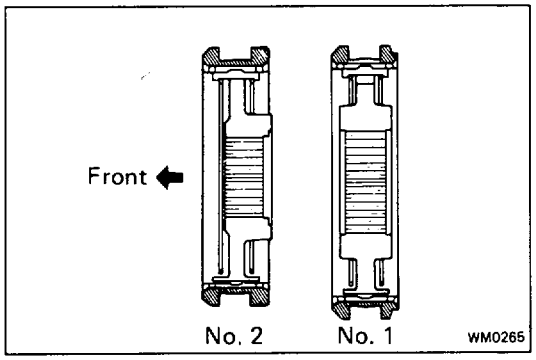


14.-2 (4WD)
IF NECESSARY, RAPLACE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST, drive in a new oil seal.
SST 09325-12010



ASSEMBLY OF TRANSMISSION

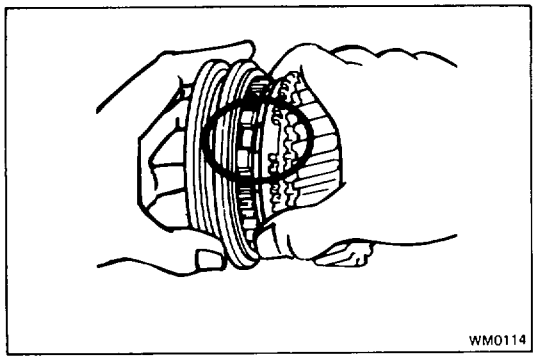
(See pages MT-5, 6)

1. INSERT NO. 1 AND NO. 2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

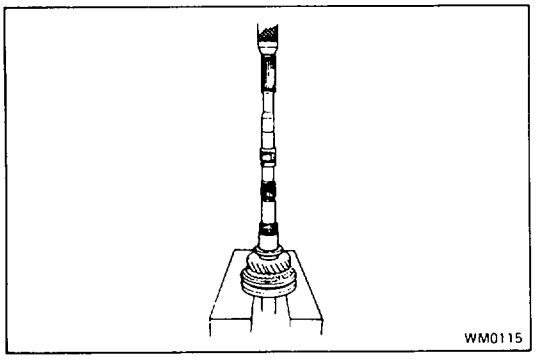
CAUTION: Install the key springs positioned so that their end gaps are not in line.



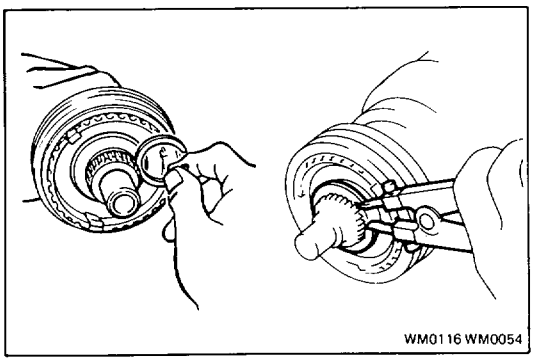
2. INSTALL THIRD GEAR AND NO. 2 CLUTCH HUB ON OUTPUT SHAFT

(a) Apply gear oil to the shaft.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



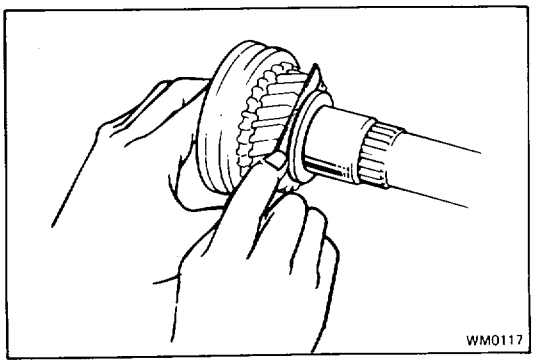
(c) Using a press, install the 3rd gear and No. 2 clutch hub.



3. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play, and install it on the shaft.

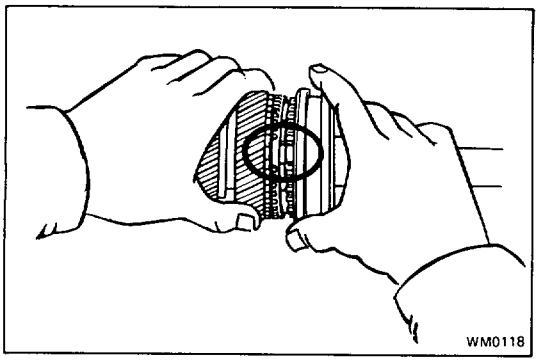
Mark	Thickness	mm (in.)
D	1.80 – 1.85	(0.0709 – 0.0728)
11	1.86 – 1.91	(0.0732 – 0.0752)
12	1.92 – 1.97	(0.0756 – 0.0776)
13	1.98 – 2.03	(0.0780 – 0.0799)
14	2.04 – 2.09	(0.0803 – 0.0823)
15	2.10 – 2.15	(0.0827 – 0.0846)



4. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

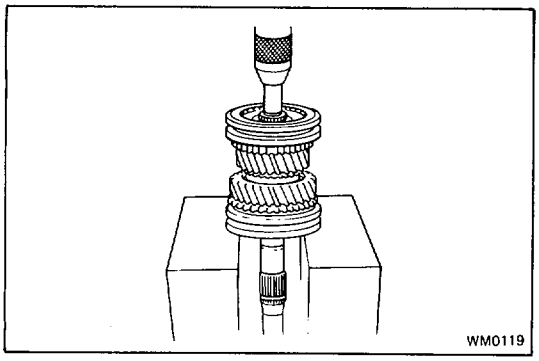


5. INSTALL SECOND GEAR AND NO. 1 CLUTCH HUB

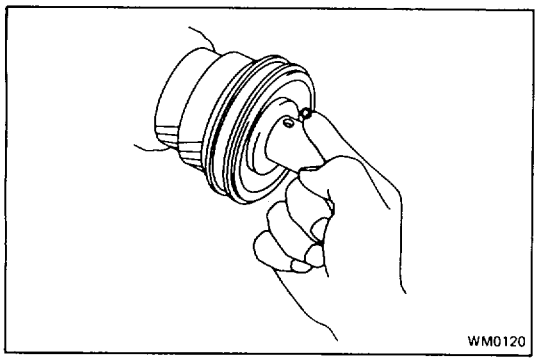
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 2nd gear.



(d) Using a press, install the 2nd gear and No. 1 clutch hub.

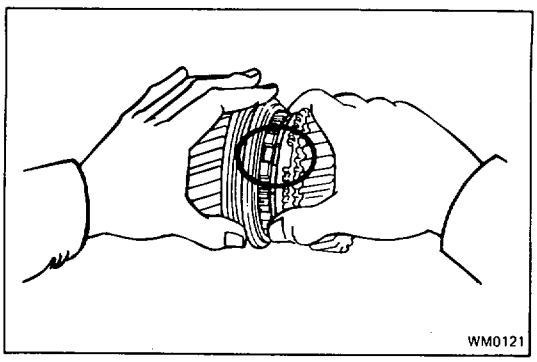


6. INSTALL LOCKING BALL AND FIRST GEAR ASSEMBLY

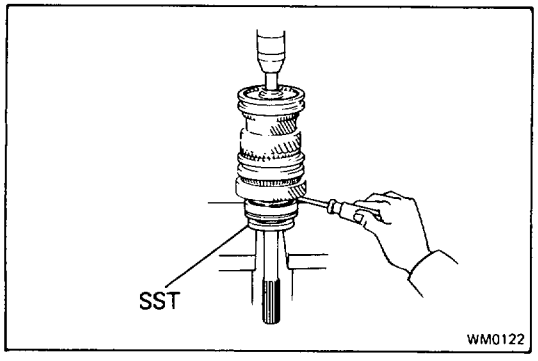
(a) Install the locking ball in the shaft.

(b) Apply gear oil to the bearing.

(c) Assemble the 1st gear, synchronizer ring, needle roller bearing and bearing inner race.



(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys and turn the inner race to align it with the locking ball.

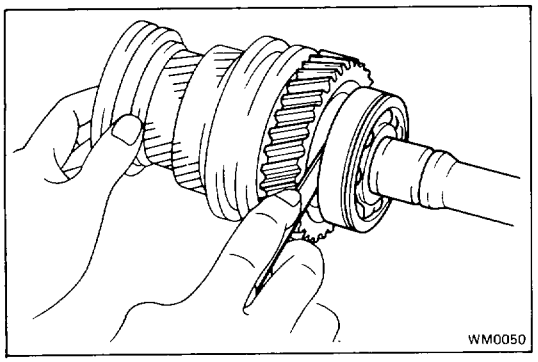


7. INSTALL OUTPUT SHAFT CENTER BEARING

Using SST and a press, install the bearing on the output shaft with the outer race snap ring groove toward the rear.

NOTE: Hold the 1st gear inner race to prevent it from falling.

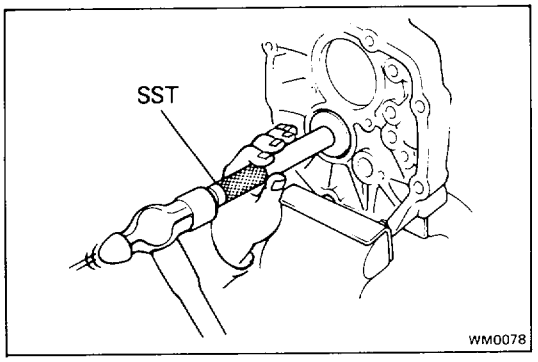
SST 09506-35010



8. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st and 2nd gear thrust clearance.

Standard clearance: **0.10 — 0.25 mm (0.0039 — 0.0098 in.)**

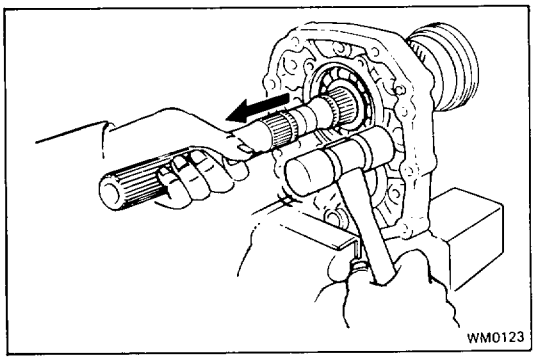


9. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

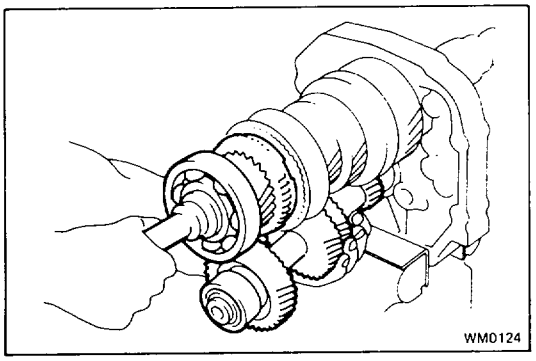
(a) Before installing the output shaft, use SST to remove the counter gear center bearing outer race.

SST 09608-35014 (09608-06020, 09608-06090)

NOTE: Install the outer race after installing the counter gear.

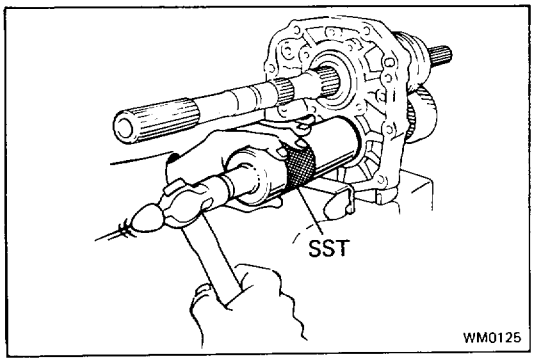


(b) Install the output shaft into the intermediate plate by pulling on the output shaft and tapping on the intermediate plate.



10. INSTALL INPUT SHAFT AND COUNTER GEAR

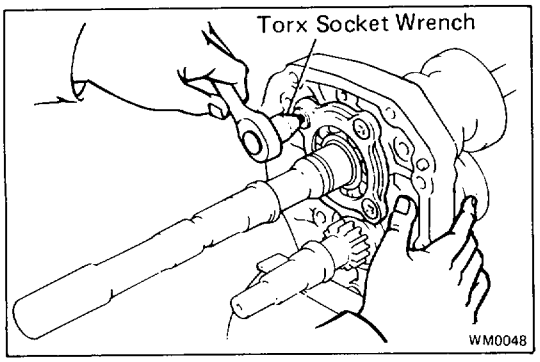
(a) Install the input shaft and counter gear together.



(b) Using SST, install the counter gear center bearing outer race.

SST 09316-60010 (09316-00010)

NOTE: Be careful not to damage the bearing rollers.



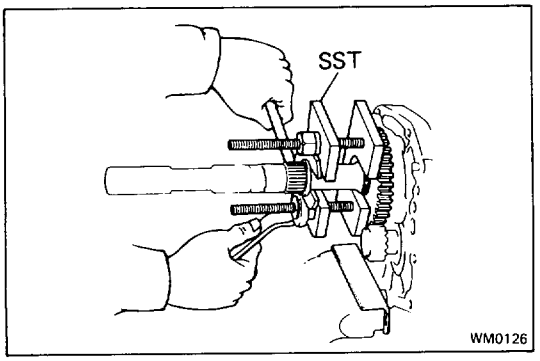
11. INSTALL BEARING RETAINER

(a) Using snap ring pliers, install the bearing snap ring.

NOTE: Be sure the snap ring is flush with the intermediate plate surface.

(b) Using a torx socket wrench, tighten the screws.

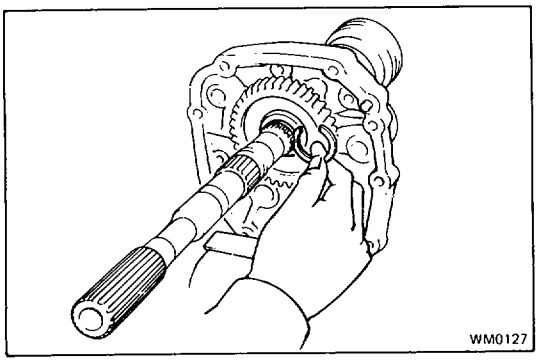
Torque: 130 kg-cm (9 ft-lb, 13 N·m)



12. INSTALL REVERSE GEAR

Using SST, install the reverse gear.

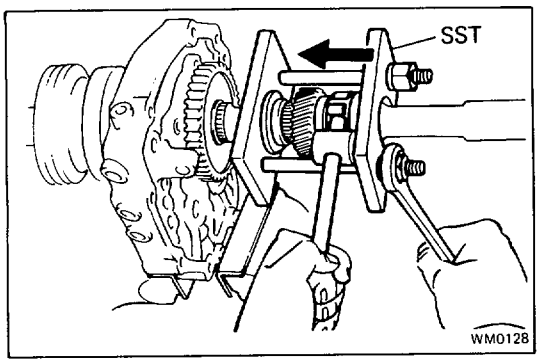
SST 09312-20011



13. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

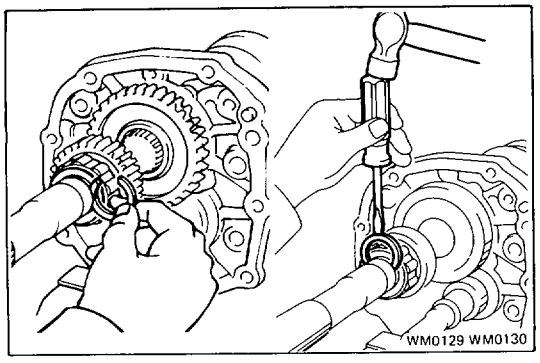
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
5	2.25–2.30 (0.0886–0.0906)	17	2.61–2.66 (0.1028–0.1047)
11	2.30–2.35 (0.0906–0.0925)	18	2.67–2.72 (0.1051–0.1071)
12	2.35–2.40 (0.0925–0.0945)	19	2.73–2.78 (0.1075–0.1094)
13	2.40–2.45 (0.0945–0.0965)	20	2.79–2.84 (0.1098–0.1118)
14	2.45–2.50 (0.0965–0.0984)	21	2.85–2.90 (0.1122–0.1142)
15	2.50–2.55 (0.0984–0.1004)	22	2.91–2.96 (0.1146–0.1165)
16	2.55–2.60 (0.1004–0.1024)	23	2.97–3.02 (0.1169–0.1189)



14. (5-Speed) INSTALL FIFTH GEAR AND OUTPUT SHAFT REAR BEARING

Using SST, install the 5th gear and rear bearing.

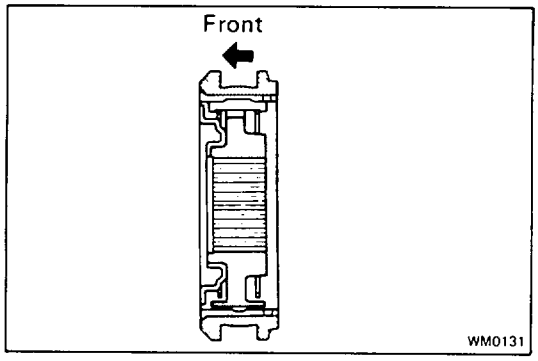
SST 09312-20011



15. (5-Speed) INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
8	2.31–2.36 (0.0909–0.0929)	12	2.55–2.60 (0.1004–0.1024)
9	2.37–2.42 (0.0933–0.0953)	13	2.61–2.66 (0.1028–0.1047)
10	2.43–2.48 (0.0957–0.0976)	14	2.68–2.73 (0.1055–0.1075)
11	2:49–2.54 (0.0980–0.1000)	15	2.74–2.79 (0.1079–0.1098)

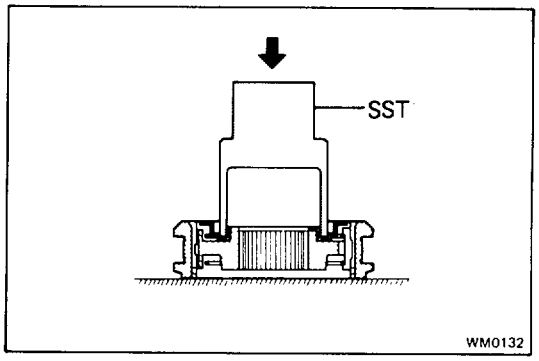


16. (5-Speed)
INSERT NO. 3 CLUTCH HUB INTO HUB SLEEVE

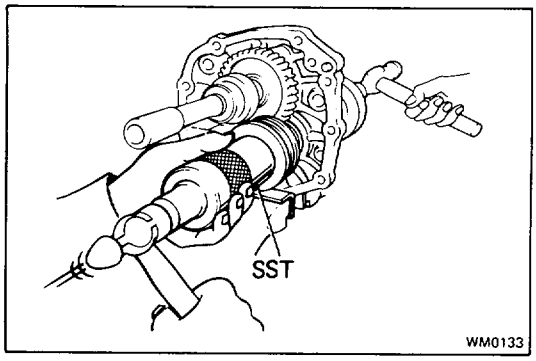
(a) Install No. 3 clutch hub and the shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

CAUTION: Install the key springs positioned so that their end gaps are not in line.



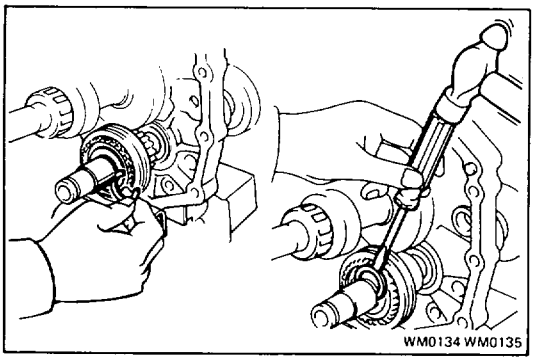
(c) Using SST, install the shifting key retainer.
SST 09238-47012



17. (5-Speed)
INSTALL NO. 3 CLUTCH HUB

Using SST, drive in No. 3 clutch hub.
SST 09316-60010 (09316-00010, 09316-00070)

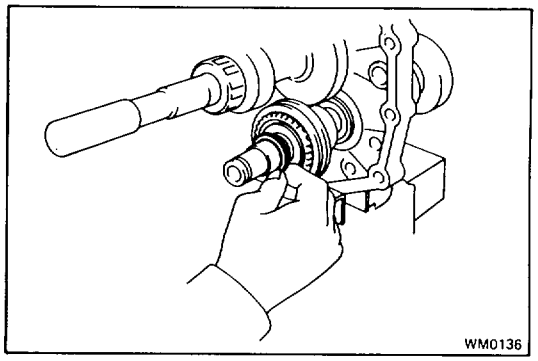
NOTE: When installing the clutch hub, support the countershaft in front with a 3-5 lb hammer or equivalent.



18. (5-Speed)
INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness	mm (in.)
2	2.06 — 2.11	(0.0811 — 0.0831)
3	2.12 — 2.17	(0.0835 — 0.0854)
4	2.18 — 2.23	(0.0858 — 0.0878)
5	2.24 — 2.29	(0.0882 — 0.0902)

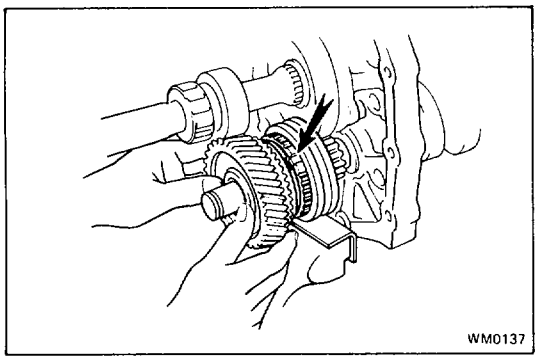


19. (5-Speed)
INSTALL SPACER, SYNCHRONIZER RING, NEEDLE ROLLER BEARING AND COUNTER FIFTH GEAR

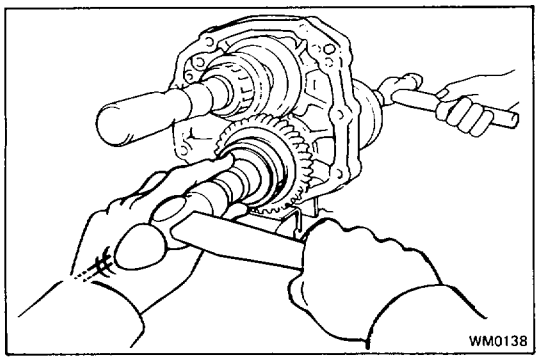
(a) Install the bearing spacer.

(b) Apply gear oil to the needle roller bearings.

(c) Assemble the counter 5th gear, synchronizer ring and needle roller bearings.



(d) Install the 5th gear assembly with the synchronizer ring slots aligned with the shifting keys.



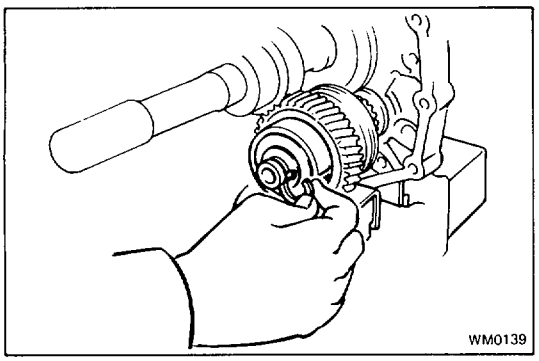
20. (5-Speed)
INSTALL SPACER AND BEARING

(a) Install the spacer.

(b) Install the bearing with the ball shield toward the rear.

(c) Using a hammer and socket wrench, drive in the bearing.

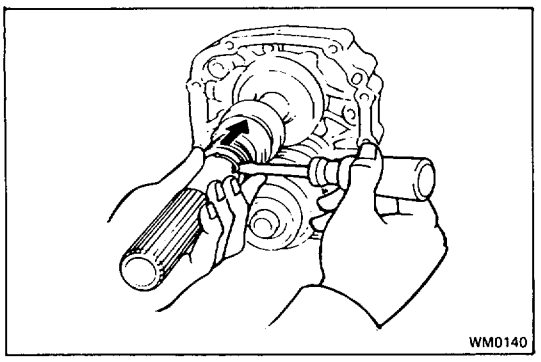
NOTE: When driving in the bearing, support the counter-shaft in front with a 3-5 lb hammer or equivalent.



21. (5-Speed)
INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it on the shaft.

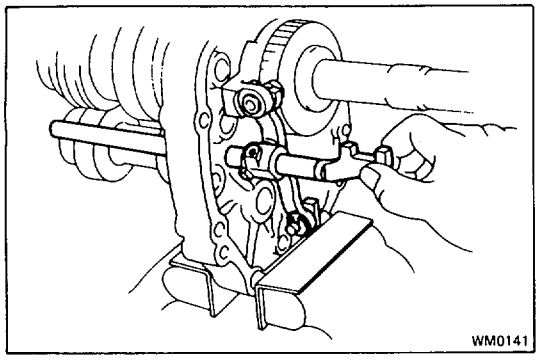
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	1.90—1.95 (0.0748—0.0768)	5	2.14—2.19 (0.0843—0.0862)
2	1.96—2.01 (0.0772—0.0791)	6	2.20—2.25 (0.0866—0.0886)
3	2.02—2.07 (0.0795—0.0815)	7	2.26—2.31 (0.0890—0.0909)
4	2.08—2.13 (0.0819—0.0839)		



22. (2WD)
INSTALL SPEEDOMETER DRIVE GEAR

(a) Put a clip on the output shaft and install the drive gear clip into the slot.

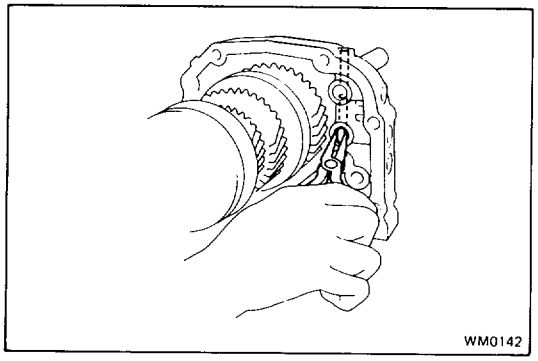
(b) Slide the drive gear with clip and fit the clip into the holes.



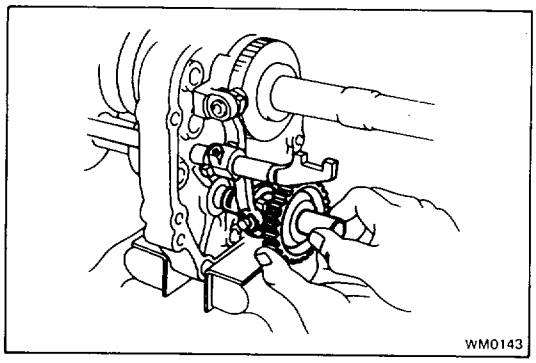
23.-1 (4-Speed)
INSTALL SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

(a) Install the reverse shift arm and No. 3 shift fork shaft.

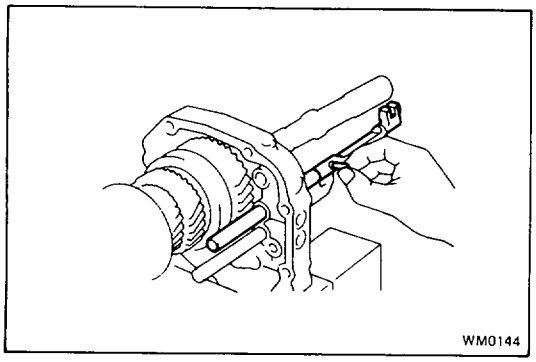
(1) Put the reverse shift arm into the pivot of the bearing retainer and install No. 3 shift fork shaft to the intermediate plate.



(2) Apply MP grease to No. 3 interlock pin and install the pin into the intermediate plate hole.

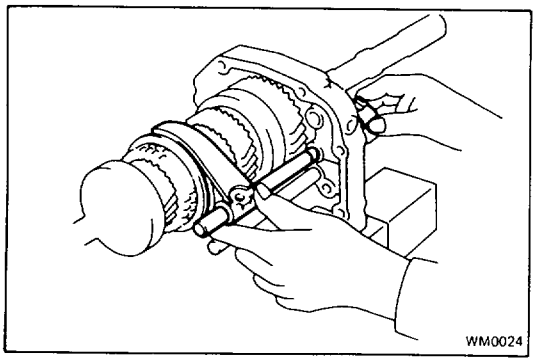


(b) Install the reverse idler gear and shaft.
Align the reverse idler gear groove to the reverse shift arm shoe and install the reverse idler gear shaft to the intermediate plate.



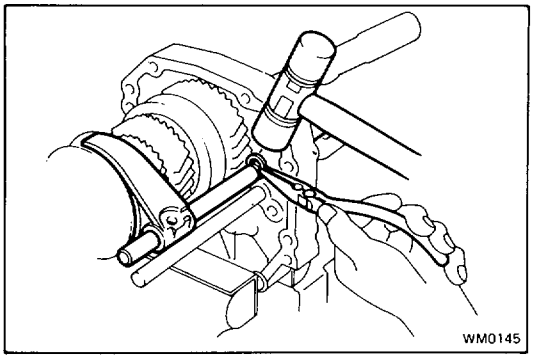
(c) Install No. 2 shift fork and fork shaft.

(1) Apply MP grease to No. 2 interlock pin and install the pin into the shaft hole.

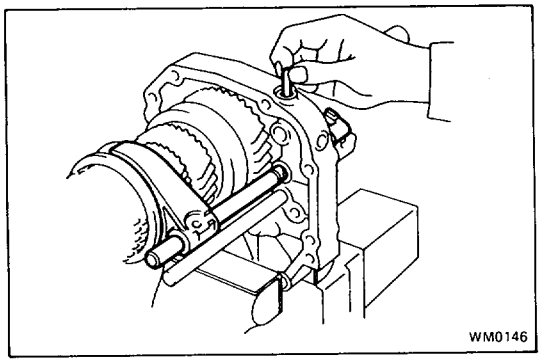


(2) Place No. 2 shift fork into the groove of No. 2 hub sleeve.

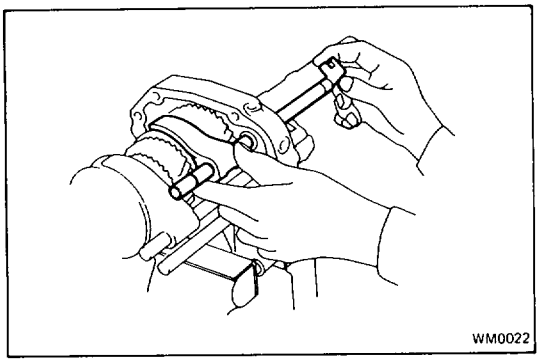
(3) Install No. 2 fork shaft to the shift fork through the intermediate plate.



(d) Install the snap ring of No. 2 fork shaft.



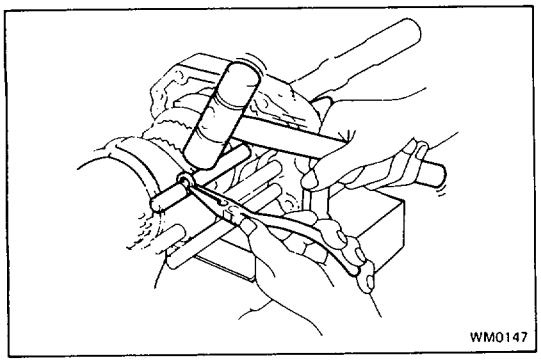
(e) Apply MP grease to No. 1 interlock pin and install the pin into the intermediate plate.



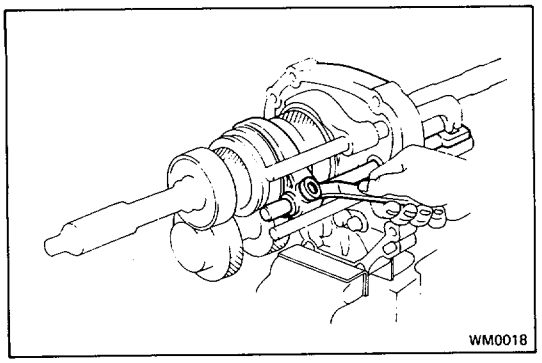
(f) Install No. 1 shift fork and fork shaft.

(1) Install No. 1 shift fork into the groove of No. 1 hub sleeve.

(2) Insert No. 1 fork shaft to the shift fork through the intermediate plate.

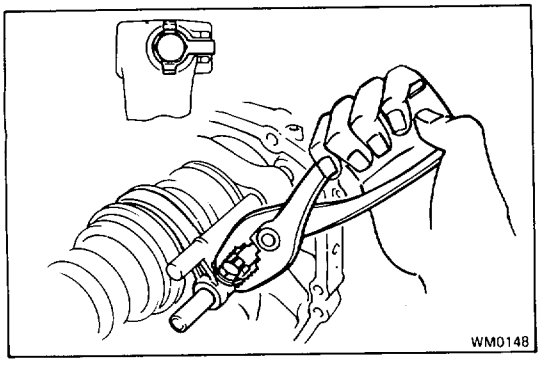


(g) Install the snap ring of No. 1 fork shaft.

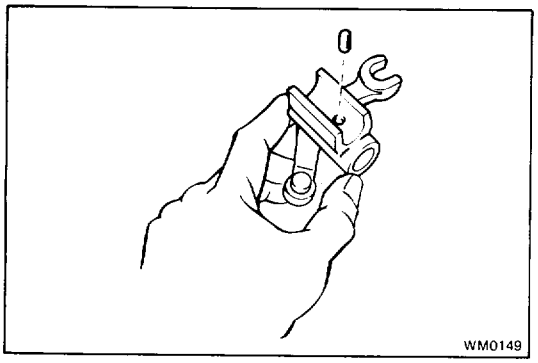


(h) Install the shift fork set bolts with lock washers.

Torque: 125 kg-cm (9 ft-lb, 12 N·m)



(i) Using pliers, stake the bolts with lock washers.


WM0149

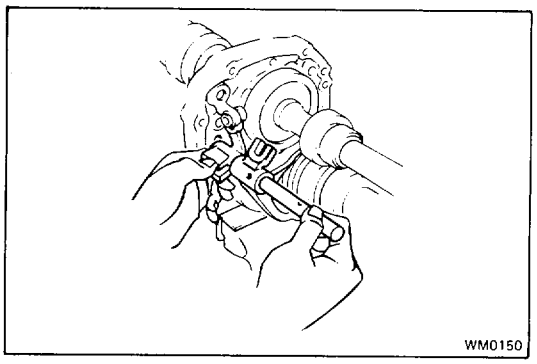
23.-2 (5-Speed)

INSTALL SHIFT FORKS, SHIFT FORK SHAFTS AND REVERSE IDLER GEAR

(a) Install the reverse idler gear and shaft.

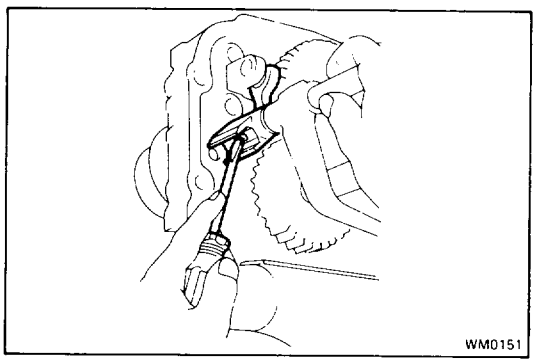
(b) Install No. 3 shift fork, No. 3 fork shaft and reverse shift arm.

(1) Coat the pin with MP grease and insert it into the reverse shift head hole.


WM0150

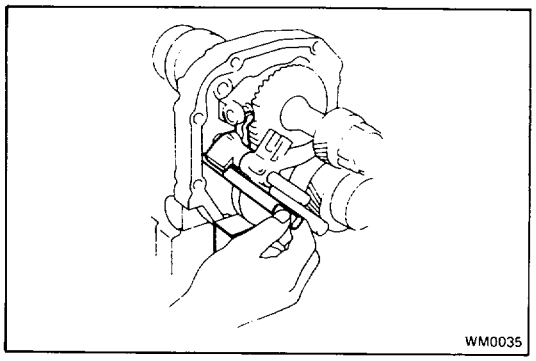
(2) Insert No. 3 shift fork shaft through No. 3 shift fork and the reverse shift arm.

(3) Align No. 3 shift fork with the No. 3 hub sleeve groove, put the reverse shift arm into the pivot of bearing retainer and align the reverse shift arm shoe with the reverse idler gear groove. Install No. 3 shift fork shaft to the intermediate plate.

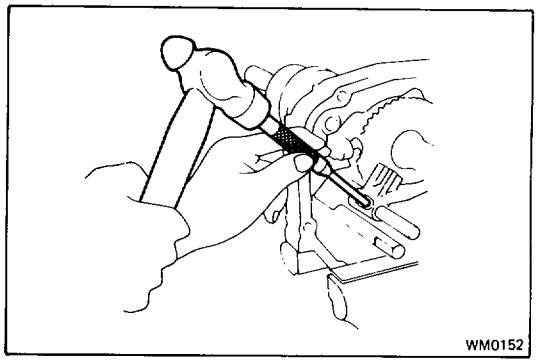

WM0151

(c) Install No. 4 shift fork shaft.

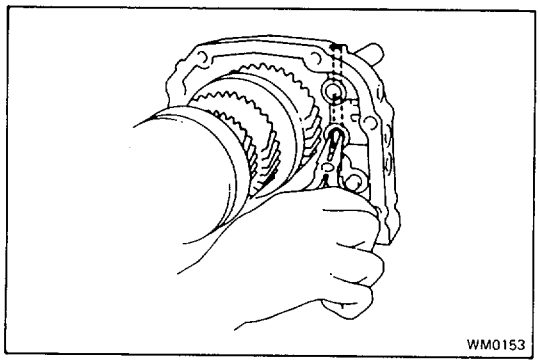
(1) Push the pin, which was inserted into the reverse shift arm hole, into the groove of No. 3 shift fork shaft.


WM0035

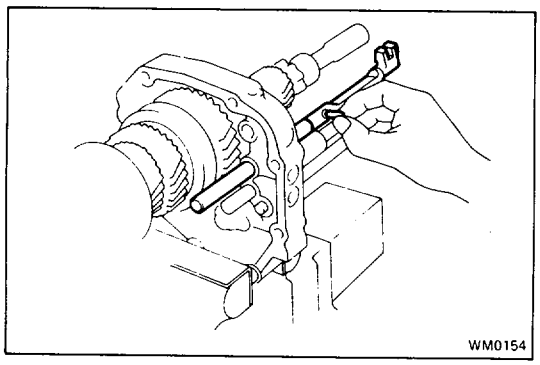
(2) Install No. 4 shift fork shaft to the intermediate plate over the reverse shift arm.


WM0152

(d) Using a pin punch and hammer, drive in the slotted spring pin until it is flush with the fork.

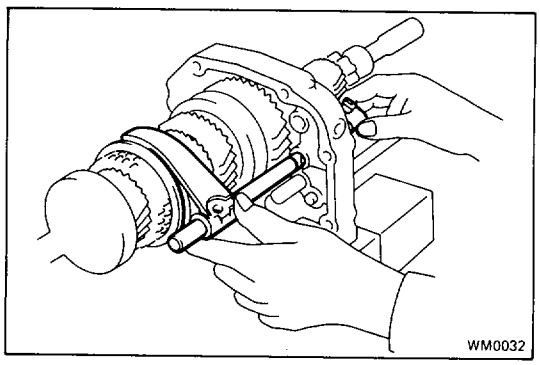


(e) Apply MP grease to No. 3 interlock pin and install the pin into the intermediate plate hole.



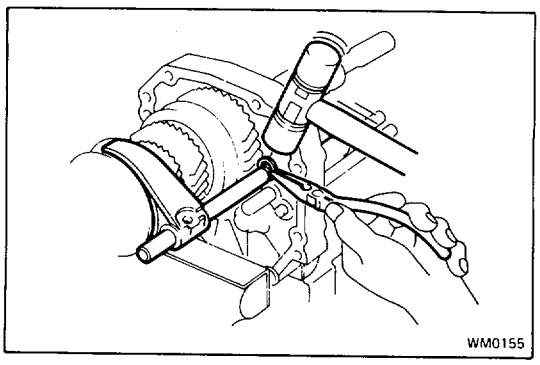
(f) Install No. 2 shift fork and fork shaft.

(1) Apply MP grease to No. 2 interlock pin and install the pin into the shaft hole.

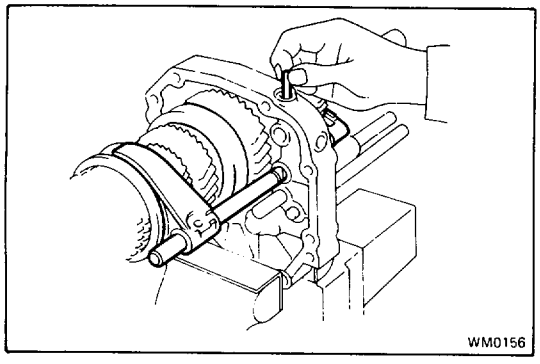


(2) Place No. 2 shift fork into the groove of No. 2 hub sleeve.

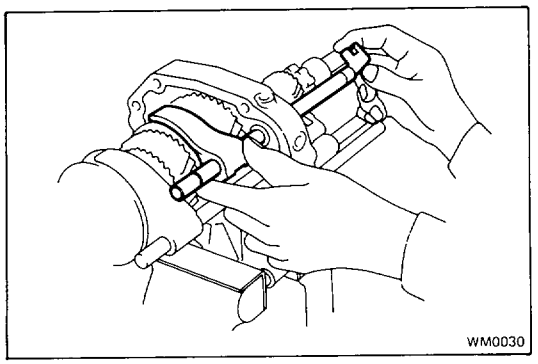
(3) Install No. 2 fork shaft to the shift fork through the intermediate plate.



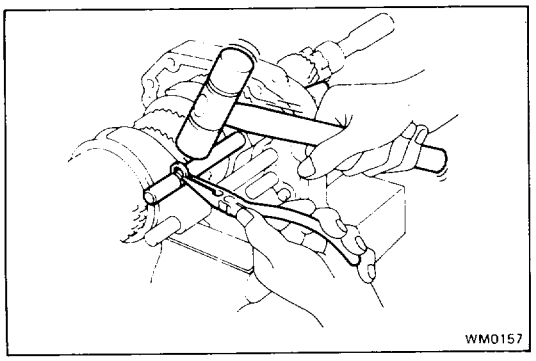
(g) Install the snap ring of No. 2 fork shaft.



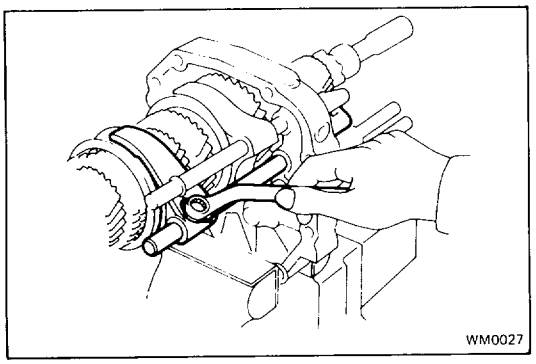
(h) Apply MP grease to No. 1 interlock pin and install the pin into the intermediate plate.


WM0030

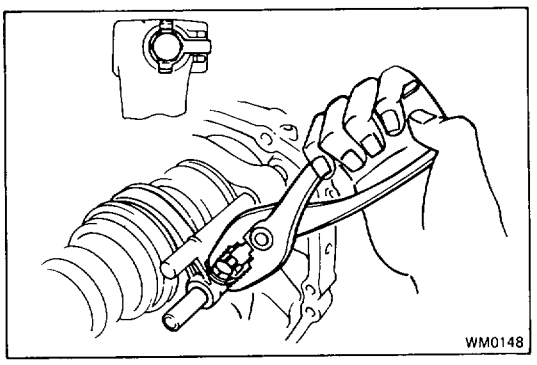
(i) Install No. 1 shift fork and fork shaft.
(1) Install No. 1 shift fork into the groove of No. 1 hub sleeve.
(2) Insert No. 1 fork shaft to the shift fork through the intermediate plate.


WM0157

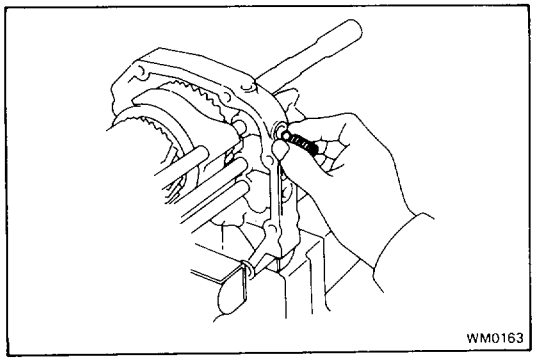
(j) Install the snap ring of No. 1 fork shaft.


WM0027

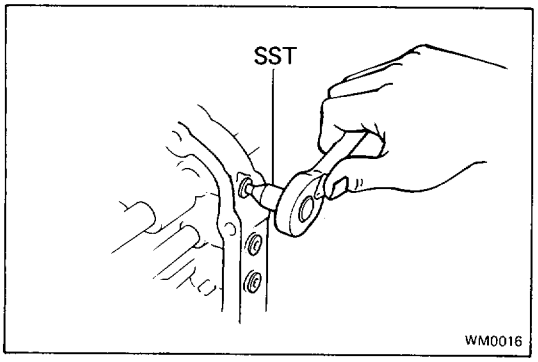
(k) Install the shift fork set bolts with lock washers.
Torque: 125 kg-cm (9 ft-lb, 12 N·m)


WM0148

(l) Using pliers, stake the bolts with lock washers.


WM0163

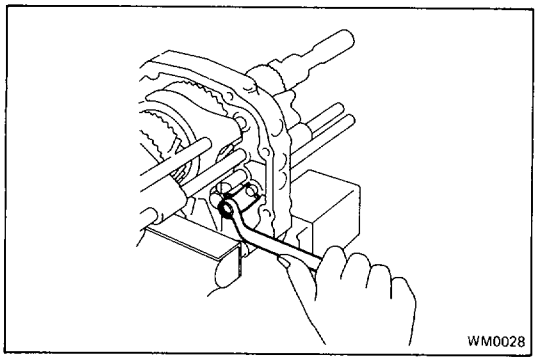
24. INSTALL LOCKING BALL AND SPRING
(a) Install the balls and springs into each hole.
(b) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



(c) Using SST, tighten the four plugs.

SST 09313-30021

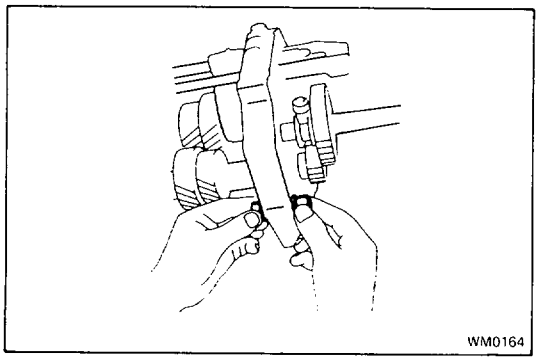
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



25. INSTALL REVERSE IDLER GEAR SHAFT STOPPER

Install the reverse idler gear shaft stopper and tighten the bolt.

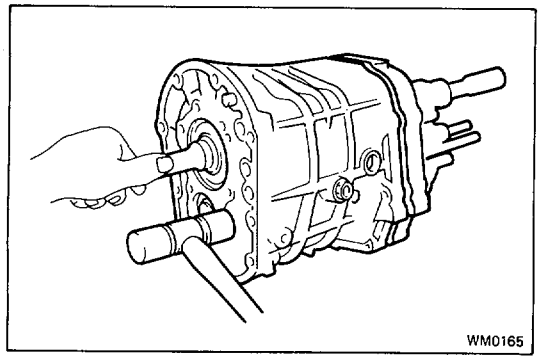
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



26. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

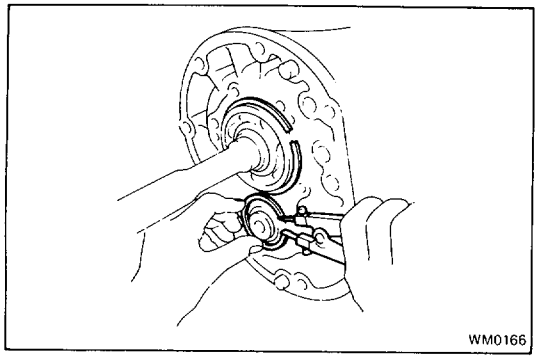
(b) Remove the bolts, nuts, plate washers and gasket.



27. INSTALL TRANSMISSION CASE TO INTERMEDIATE PLATE

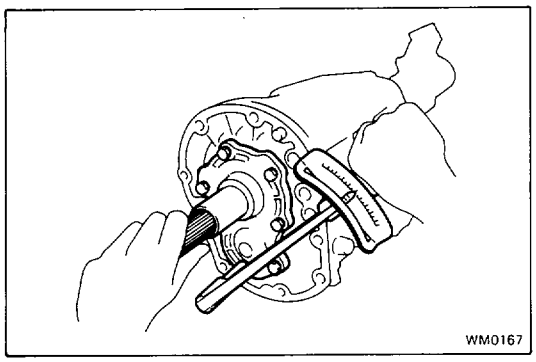
(a) Align each bearing outer race and each shift fork shaft end with the case holes.

(b) Using a plastic hammer, tap on the case to install it.



28. INSTALL BEARING SNAP RINGS

Using snap ring pliers, install the two snap rings.



29. INSTALL FRONT BEARING RETAINER

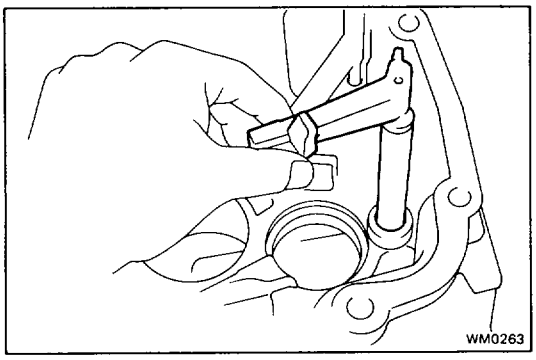
(a) Install the bearing retainer with a new gasket.

(b) Apply liquid sealer to the bolt threads.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install and torque the bolts.

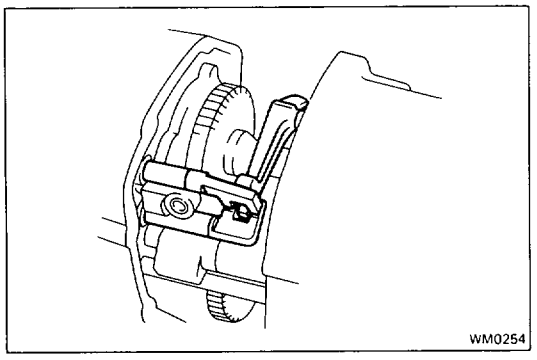
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



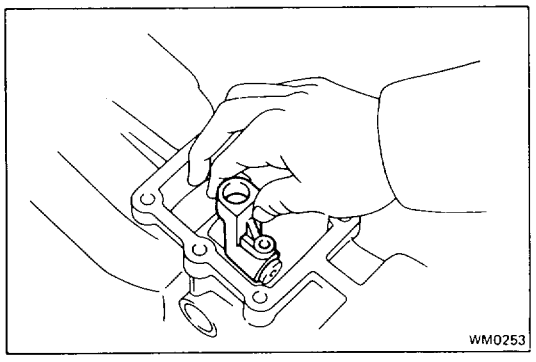
30. INSTALL EXTENSION HOUSING (2WD) OR TRANSFER ADAPTOR (4WD)

(a) Place a new gasket in position on the intermediate plate.

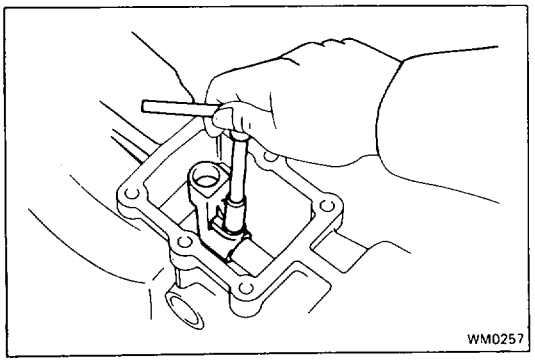
(b) Insert shift and select lever into the extension housing (2WD) or the transfer adaptor (4WD).



(c) Connect the shift and select lever to the shift fork shaft.

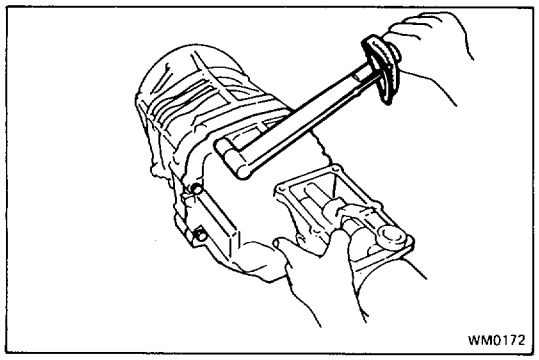


(d) Install shift lever housing to shift and select lever shaft, push in the extension housing (2WD) or the transfer adaptor (4WD).



(e) Install and torque the bolt.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



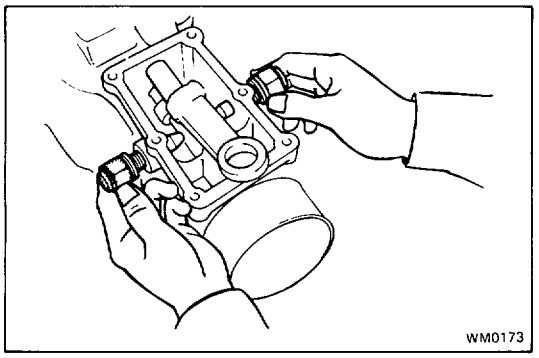
31. INSTALL AND TORQUE EXTENSION HOUSING BOLTS (2WD) OR TRANSFER ADAPTOR BOLTS (4WD)

Torque: 375 kg-cm (27 ft-lb, 37 N·m)

32. AFTER INSTALLING EXTENSION HOUSING (2WD) OR TRANSFER ADAPTOR (4WD), CHECK FOLLOWING ITEMS:

(a) Check to see that input shaft and output shaft rotate smoothly.

(b) Check to see that shifting can be made smoothly to all positions.



33. INSTALL RESTRICT PINS

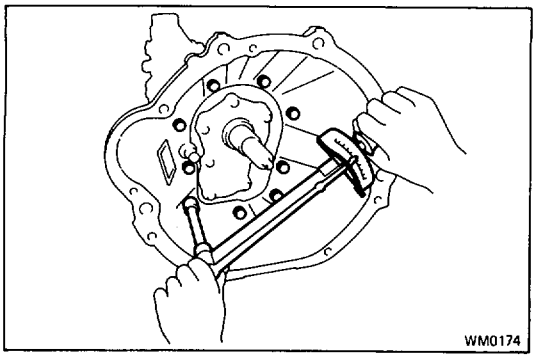
(a) Install the restrict pins together with a gasket.

NOTE: (4-Speed)
Install the screw plug on the reverse gear side.

(5-Speed)
Install the black pin on the reverse gear/5th gear side.

(b) Torque the restrict pins.

Torque: 410 kg-cm (30 ft-lb, 40 N·m)



34. INSTALL CLUTCH HOUSING

(a) Install the clutch housing.

(b) Install and torque the bolts.

Torque: 375 kg-cm (27 ft-lb, 37 N·m)

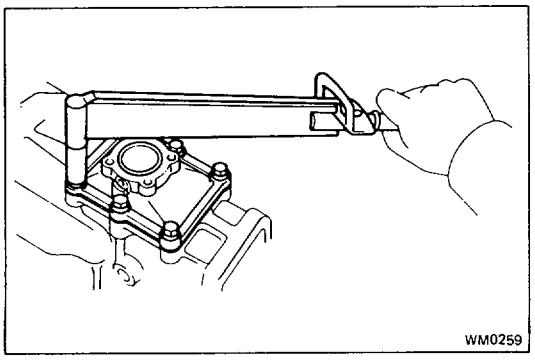


35. INSTALL RELEASE FORK AND BEARING

Apply molybdenum disulphide lithium base grease to the following parts:

- Release bearing hub inside groove
- Input shaft spline
- Release fork contact surface

Apply MP grease to the clutch diaphragm spring contacting surface of the release bearing.



36. INSTALL SHIFT LEVER RETAINER

(a) Install the shift lever retainer with a new gasket.

(b) Install and torque the six bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

37. (2WD)
INSTALL SPEEDOMETER DRIVEN GEAR

(a) Install the speedometer driven gear.

(b) Install the bolt with lock plate.

(c) Torque the bolt.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

38. INSTALL BACK-UP LIGHT SWITCH

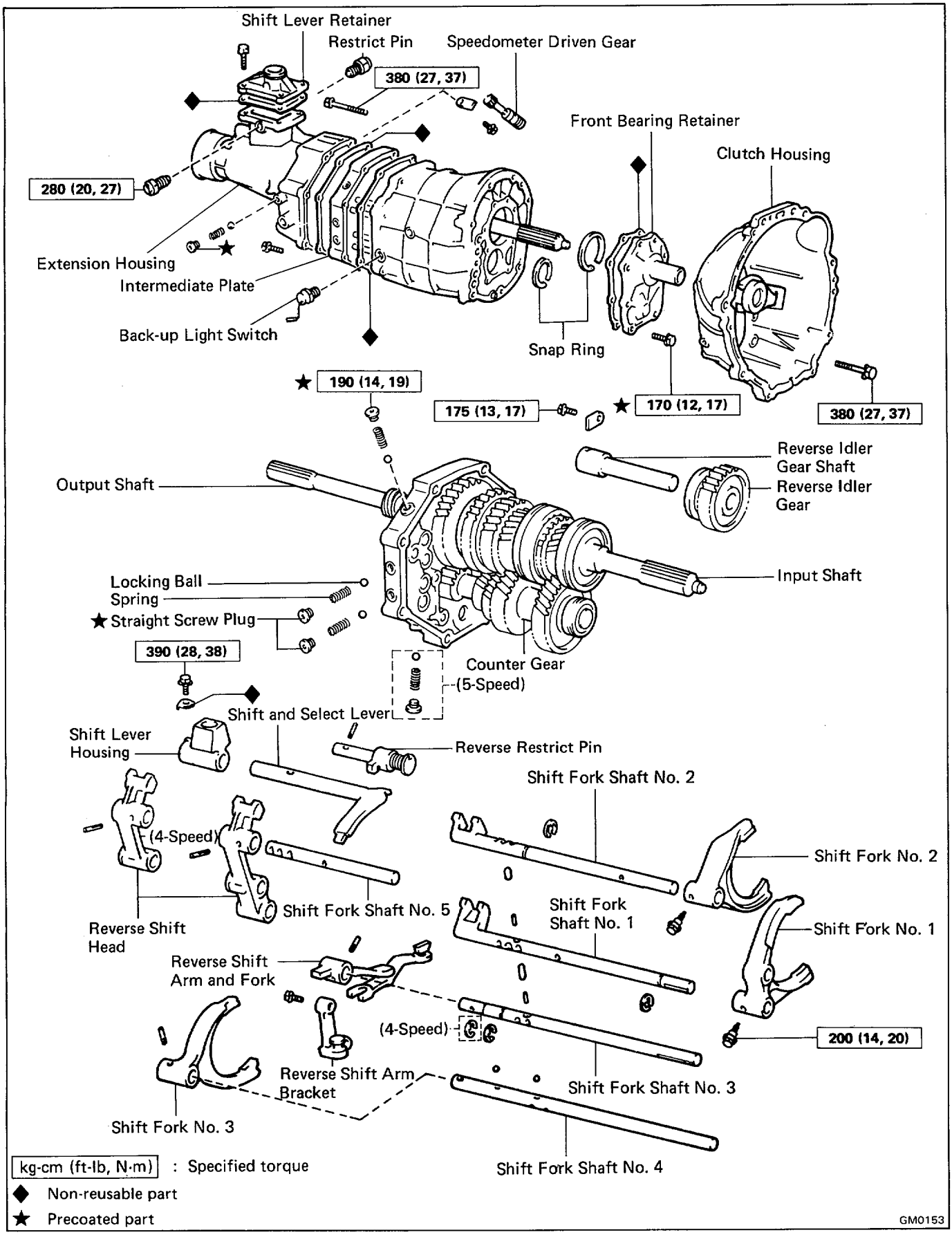
(a) Install and torque the back-up light switch.

Torque: 410 kg-cm (30 ft-lb, 40 N·m)

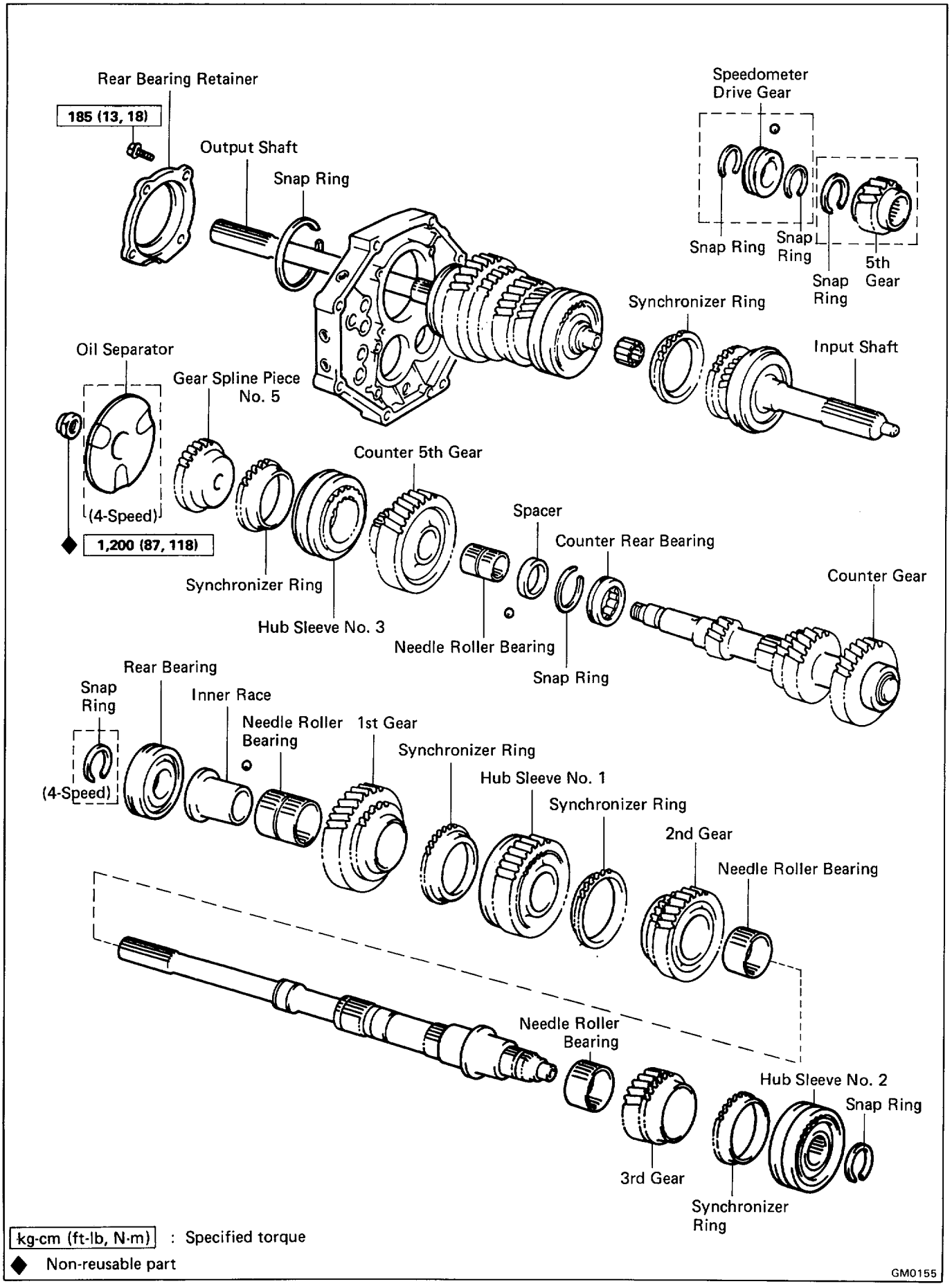
(b) Install the wire clamp.

G40 AND G57 TRANSMISSIONS

COMPONENTS



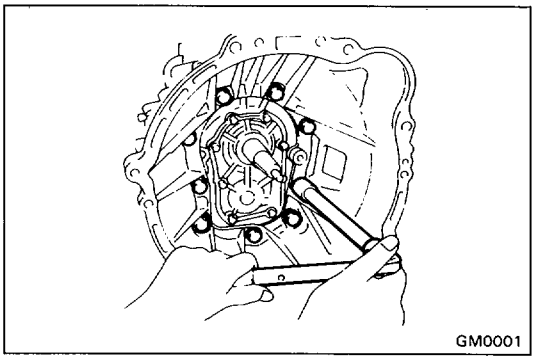
COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

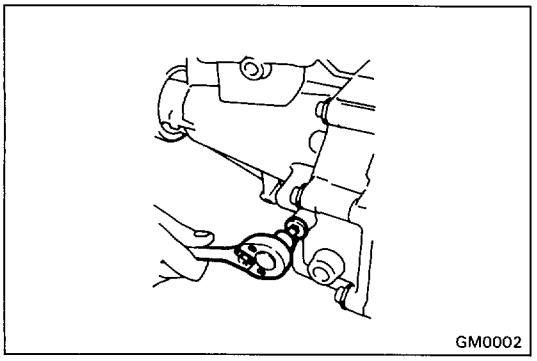
GM0155


GM0001

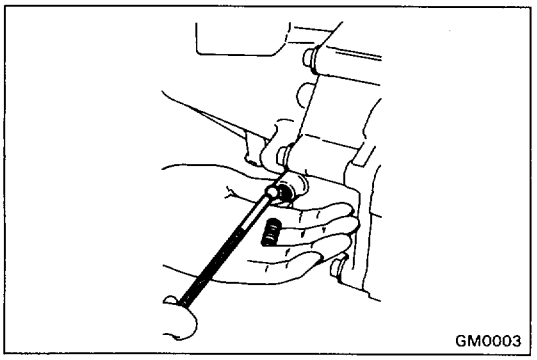
DISASSEMBLY OF TRANSMISSION

(See pages MT-39, 40)

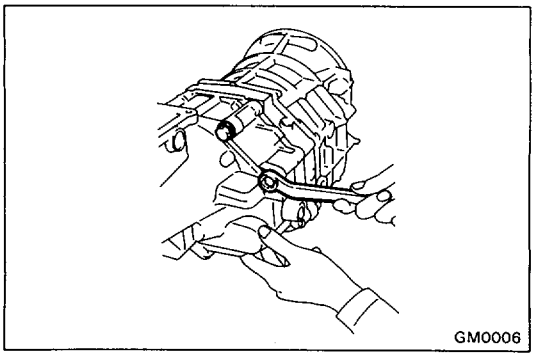
1. **REMOVE RELEASE FORK AND BEARING**
2. **REMOVE BACK-UP LIGHT SWITCH, SPEEDOMETER DRIVEN GEAR, SHIFT LEVER RETAINER AND RESTRICT PINS**
3. **REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE**


GM0002

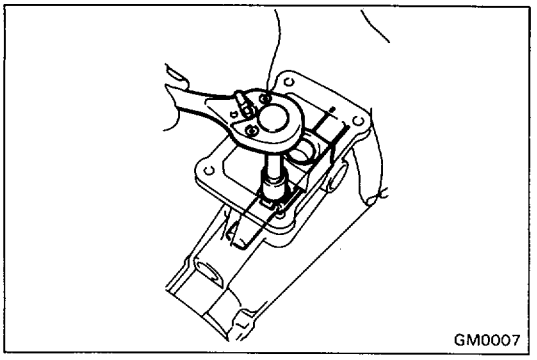
4. **REMOVE STRAIGHT SCREW PLUG, SPRING AND BALL**
   (a) Using a torx socket wrench, remove the screw plug from the extension housing.


GM0003

   (b) Using a magnetic finger, remove the spring and ball.

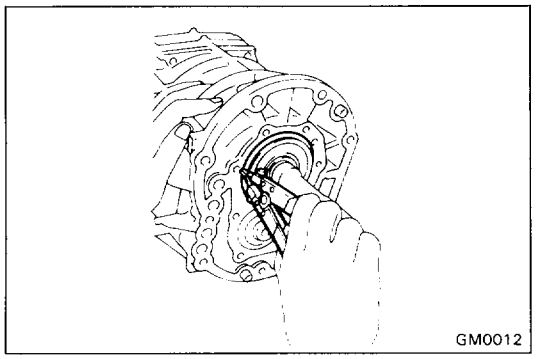

GM0006

5. **REMOVE EXTENSION HOUSING**
   (a) Remove the eight bolts.

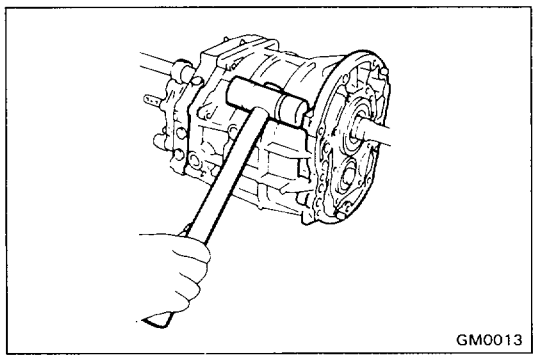

GM0007

   (b) Remove the shift lever housing set bolt and lock washer.
   (c) Using a plastic hammer, tap the extension housing and remove the shift lever housing and the shift and select lever.

NOTE: Leave the gasket attached to the intermediate plate.


GM0012

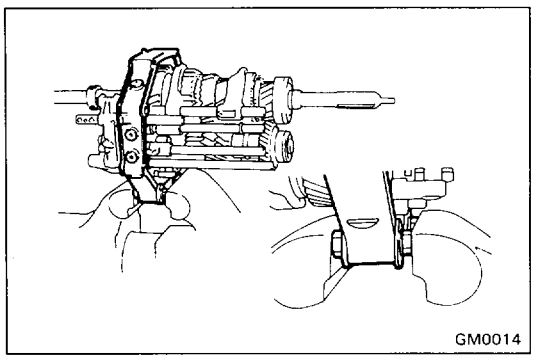
6. REMOVE FRONT BEARING RETAINER AND TWO BEARING SNAP RINGS


GM0013

7. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

(a) Using a plastic hammer, carefully tap off the transmission case.

(b) Remove the transmission case from the intermediate plate.

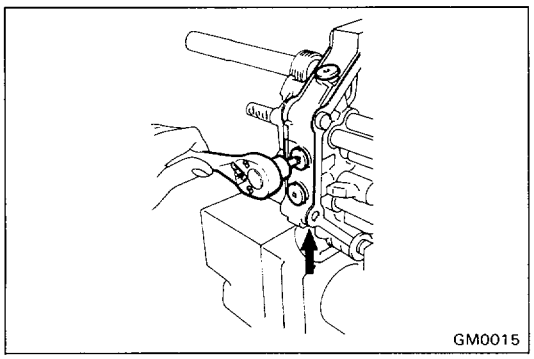

GM0014

8. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use two clutch housing bolts, plate washers and suitable nuts as shown.

CAUTION: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and front tip surface of the nut are aligned.

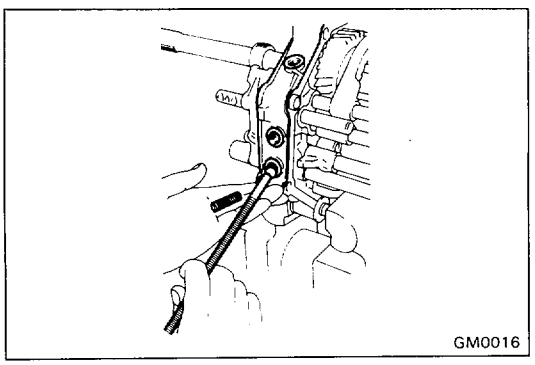
(b) Mount the intermediate plate in a vise.


GM0015

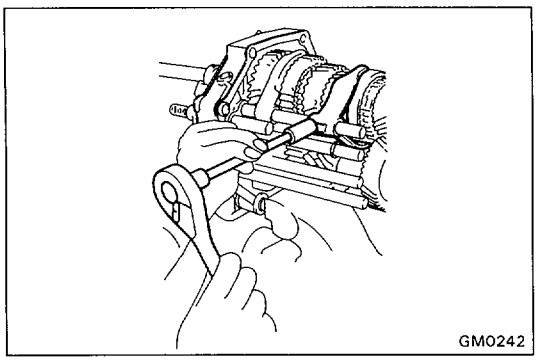
9. REMOVE STRAIGHT SCREW PLUGS, LOCKING BALLS AND SPRINGS

(a) Using a torx socket wrench, remove the plugs.

4-Speed: Three plugs
5-Speed: Four plugs


GM0016

(b) Using a magnetic finger, remove the springs and balls.

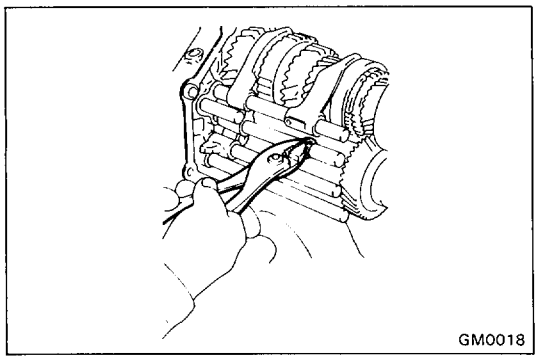

GM0242

10. REMOVE BOLTS AND SLOTTED SPRING PINS

(a) Remove the bolts from the shift fork No.1 and No.2.

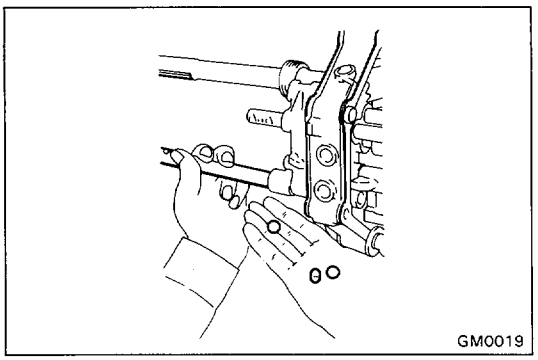
(b) Using a pin punch and hammer, drive out the pins.

4-Speed: Two pins
5-Speed: Three pins


GM0018

11. REMOVE E-RINGS

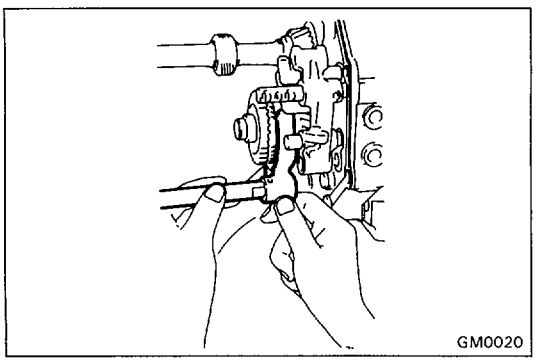
4-Speed: Four E-rings
5-Speed: Three E-rings


GM0019

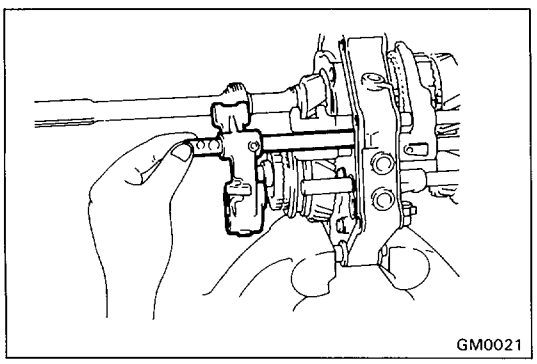
12. (5-speed)
REMOVE SHIFT FORK SHAFT NO.4 AND SHIFT FORK NO.3

(a) Pull out shift fork shaft No.4 from the intermediate plate.

CAUTION: The locking balls and interlock pin will fall from the holes so be sure to catch them by hand. If they do not come out, remove them with a magnetic finger.

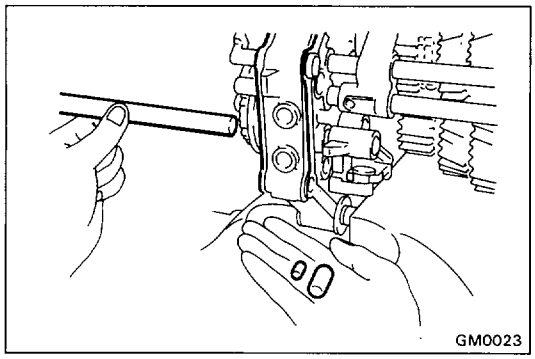

GM0020

(b) Remove shift fork shaft No.4 and shift fork No.3.


GM0021

13. REMOVE REVERSE SHIFT HEAD AND SHIFT FORK SHAFT NO.5

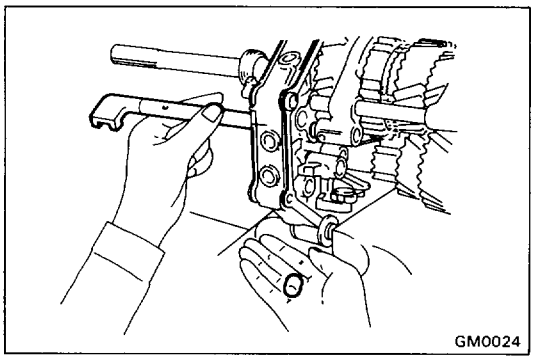
Pull out shift fork shaft No.5 from the intermediate plate, and remove it with the reverse shift head.


GM0023

14. REMOVE SHIFT FORK SHAFT NO.3

Pull out shift fork shaft No.3 from the intermediate plate.

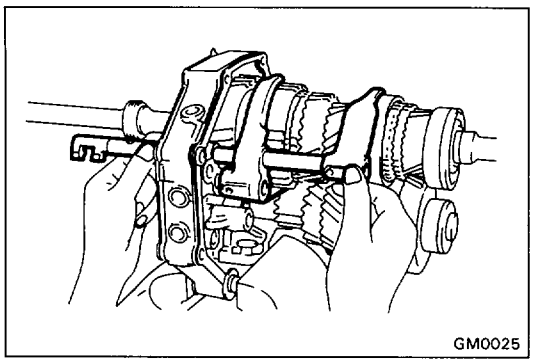
CAUTION: The interlock pins will fall from the hole so be sure to catch them by hand. If they do not come out, remove them with a magnetic finger.


GM0024

15. REMOVE SHIFT FORK SHAFT NO.1

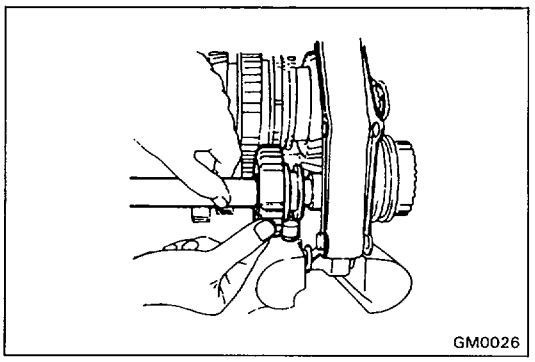
Pull out shift fork shaft No.1 from the intermediate plate.

CAUTION: The interlock pin will fall from the hole so be sure to catch it by hand. If it does not come out remove it with a magnetic finger.


GM0025

16. REMOVE SHIFT FORK SHAFT NO. 2, SHIFT FORK NO. 2 AND SHIFT FORK NO.1

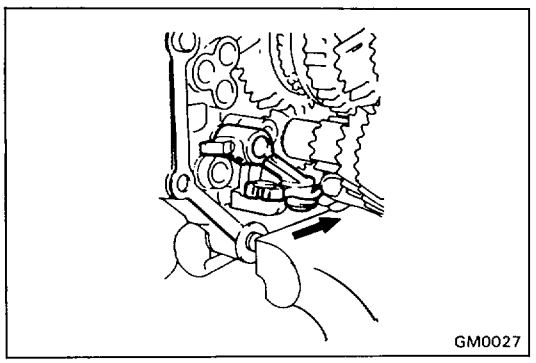
Pull out shift fork shaft No.2 and remove shift fork No.2 and No.1.


GM0026

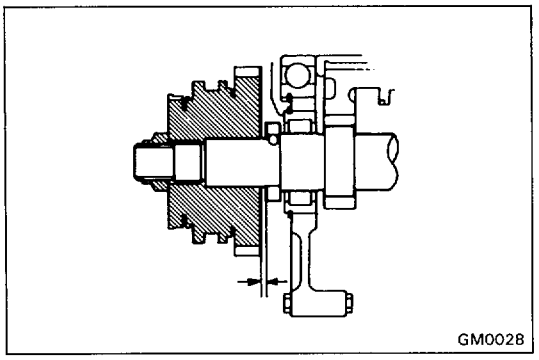
17. REMOVE REVERSE IDLER GEAR AND SHAFT

(a) Remove the reverse idler gear shaft stopper.

(b) Remove the reverse idler gear and shaft.


GM0027

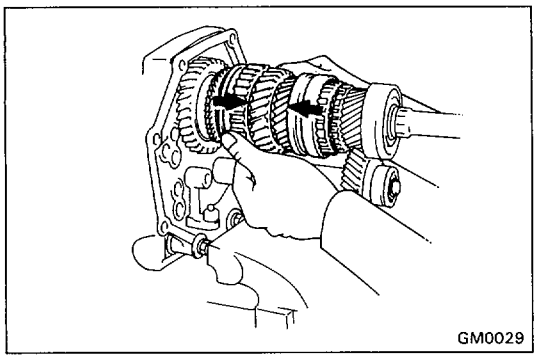
18. REMOVE REVERSE SHIFT ARM FROM REVERSE SHIFT ARM BRACKET


GM0028

19. **(5-Speed)**
MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

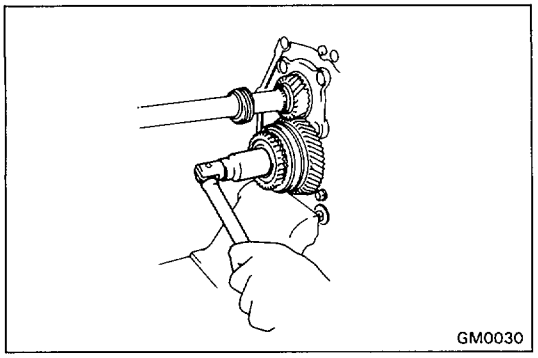
Standard clearance: 0.10 — 0.30 mm (0.0039 — 0.0118 in.)
Maximum clearance: 0.30 mm (0.0118 in.)


GM0029

20. **(5-Speed)**
REMOVE GEAR SPLINE PIECE NO.5, SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS AND COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3

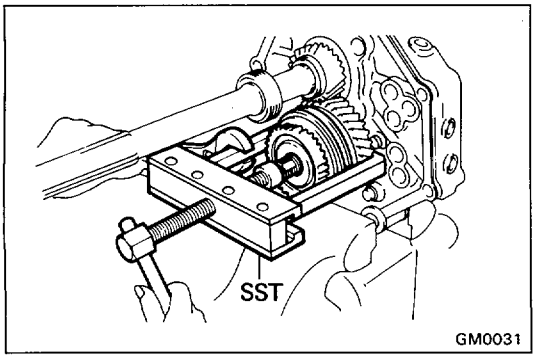
(a) Engage the gear double meshing.

(b) Using a hammer and chisel, loosen the staked part of the nut.


GM0030

(c) Remove the lock nut.

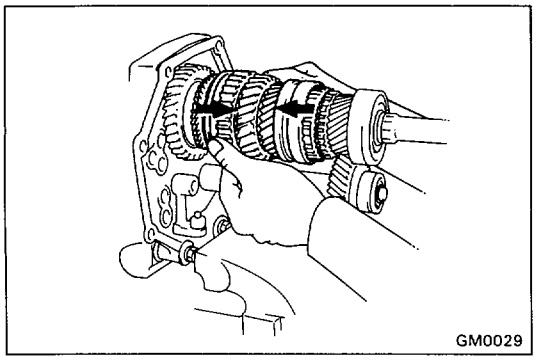
(d) Disengage the gear double meshing.



GM0031

(e) Using SST, remove gear spline piece No.5, synchronizer ring, needle roller bearing and counter 5th gear.

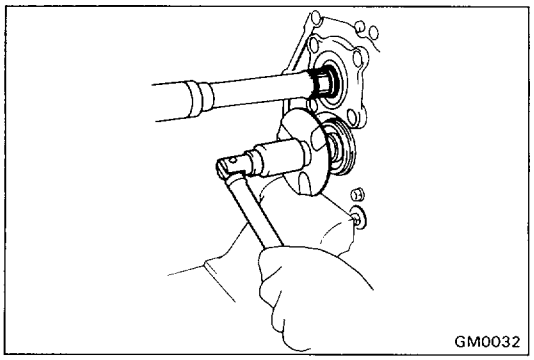
SST 09213-27010


GM0029

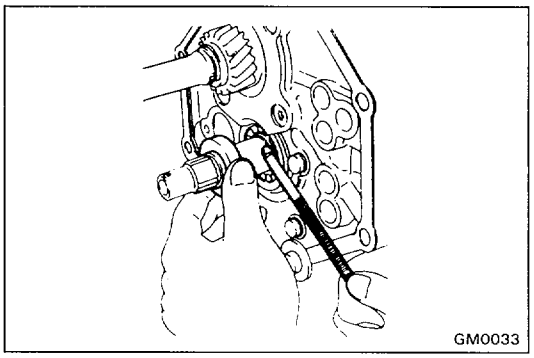
(4-Speed)
REMOVE OIL SEPARATOR

(a) Engage the gear double meshing.

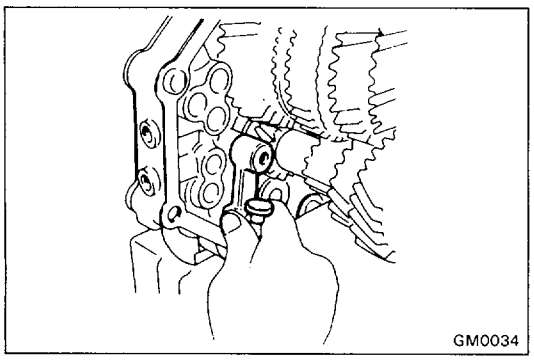
(b) Using a hammer and chisel, loosen the staked part of the nut.


GM0032

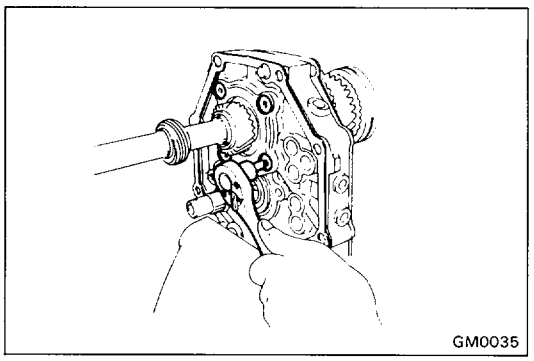
(c) Remove the nut.
(d) Remove the oil separator.
(e) Disengage the gear double meshing.


GM0033

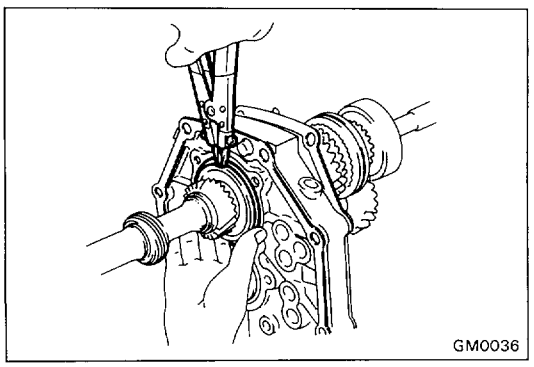
21. (5-Speed)
REMOVE SPACER AND BALL
(a) Remove the spacer.
(b) Using a magnetic finger, remove the ball.


GM0034

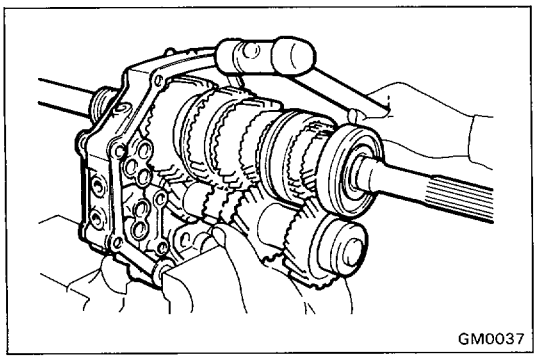
22. REMOVE REVERSE SHIFT ARM BRACKET
Remove the two bolts and the reverse shift arm bracket.


GM0035

23. REMOVE REAR BEARING RETAINER
Using a torx socket wrench, remove the four bolts.


GM0036

24. REMOVE BEARING SNAP RING
Using snap ring pliers, remove the snap ring.

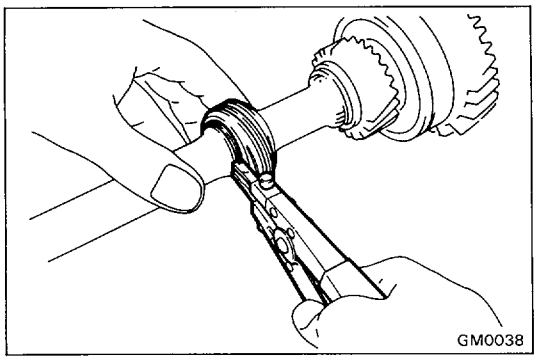

GM0037

25. REMOVE OUTPUT SHAFT, COUNTER GEAR AND INPUT SHAFT AS A UNIT FROM INTERMEDIATE PLATE

Remove the output shaft, counter gear and input shaft as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

26. REMOVE INPUT SHAFT FROM OUTPUT SHAFT

Remove the input shaft with the 13-needle roller bearings from the output shaft.


GM0038

27. REMOVE COUNTER REAR BEARING FROM INTERMEDIATE PLATE

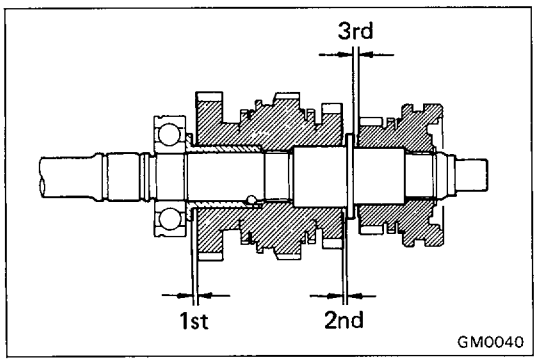
28. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the speedometer drive gear and ball.

(c) Using a magnetic finger, remove the steel ball.

(d) Using snap ring pliers, remove the snap ring.



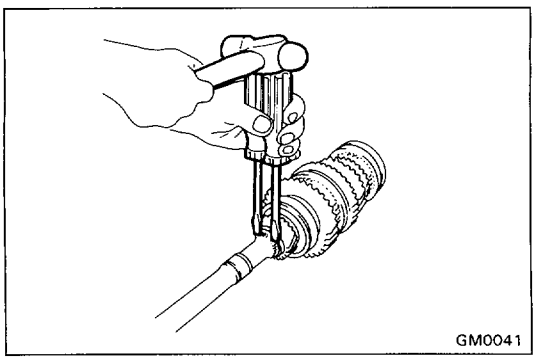
GM0040

29. MEASURE EACH GEAR THRUST CLEARANCE

Measure the thrust clearance of each gear.

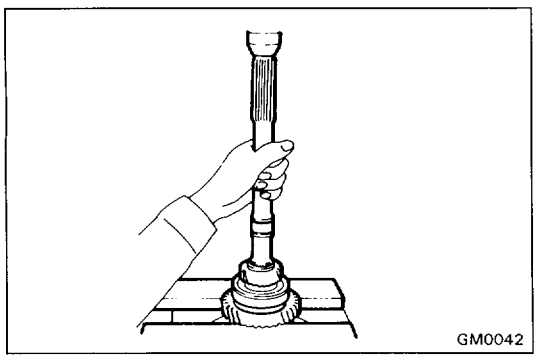
Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)


GM0041

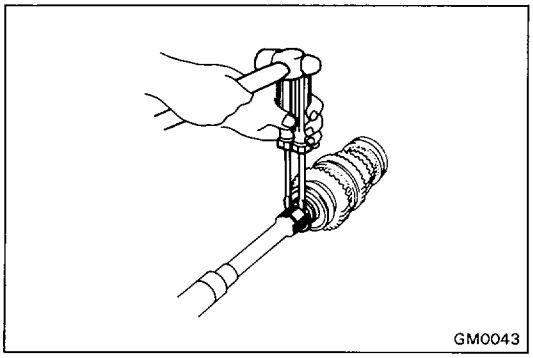
30. (5-Speed) REMOVE FIFTH GEAR, REAR BEARING AND FIRST GEAR ASSEMBLY

(a) Using two screwdrivers and a hammer, tap out the snap ring.


GM0042

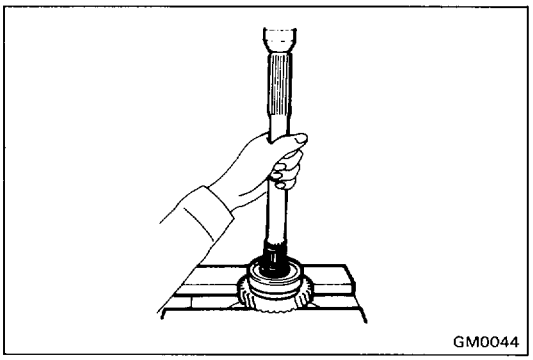
(b) Using a press, remove the 5th gear, rear bearing, 1st gear and inner race.

(c) Remove the needle roller bearing.


GM0043

(4-Speed)
REMOVE REAR BEARING, FIRST GEAR, INNER RACE AND NEEDLE ROLLER BEARING

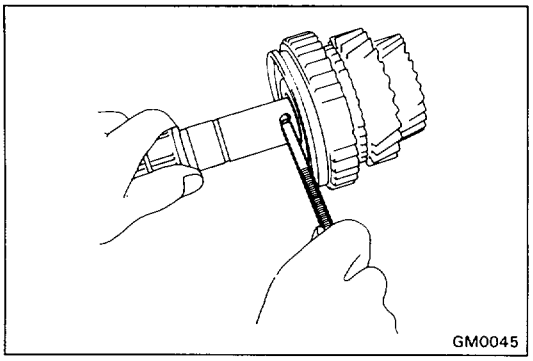
(a) Using two screwdrivers and a hammer, tap out the snap ring.


GM0044

(b) Using a press, remove the rear bearing, 1st gear and inner race.

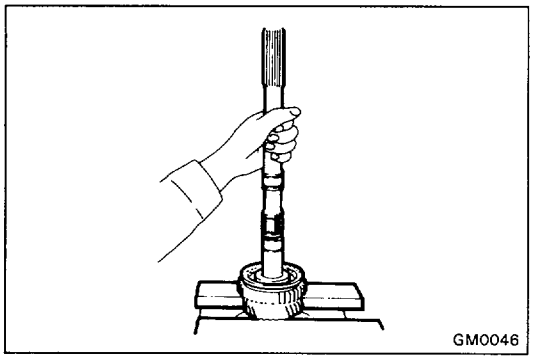
(c) Remove the needle roller bearing.

31. REMOVE SYNCHRONIZER RING


GM0045

32. REMOVE LOCKING BALL

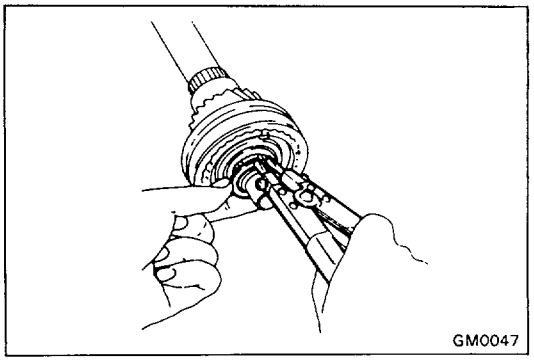
Using a magnetic finger, remove the locking ball.


GM0046

33. REMOVE HUB SLEEVE NO.1 ASSEMBLY AND SECOND GEAR ASSEMBLY

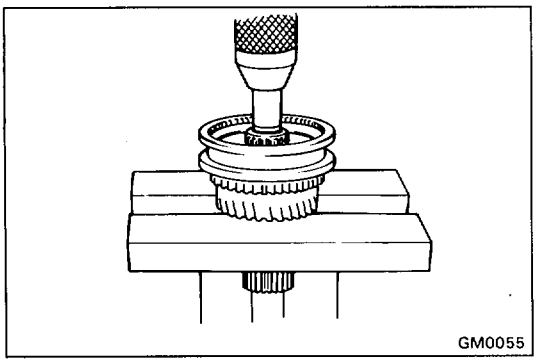
(a) Using a press, remove the hub sleeve No.1, synchronizer ring and 2nd gear.

(b) Remove the needle roller bearing.


GM0047

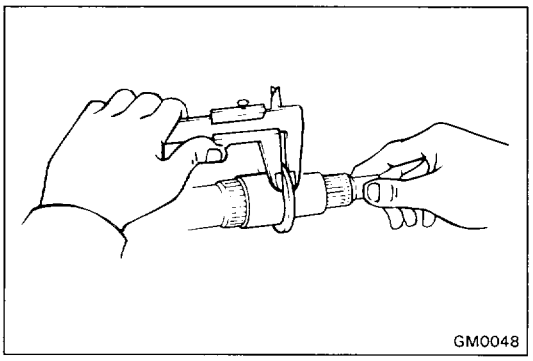
34. REMOVE HUB SLEEVE NO.2 ASSEMBLY AND THIRD GEAR ASSEMBLY

(a) Using snap ring pliers, remove the snap ring.



(b) Using a press, remove the hub sleeve No.2, synchronizer ring and 3rd gear.

(c) Remove the needle roller bearing.

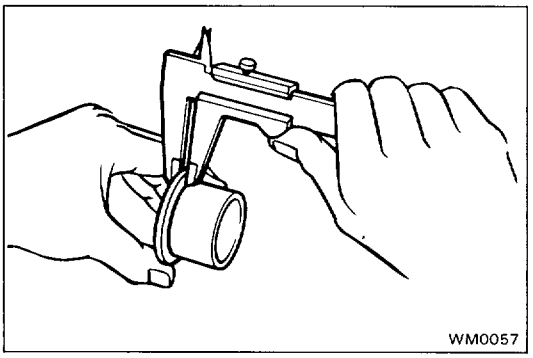

GM0048

INSPECTION OF TRANSMISSION COMPONENTS

1. INSPECT OUTPUT SHAFT AND INNER RACE

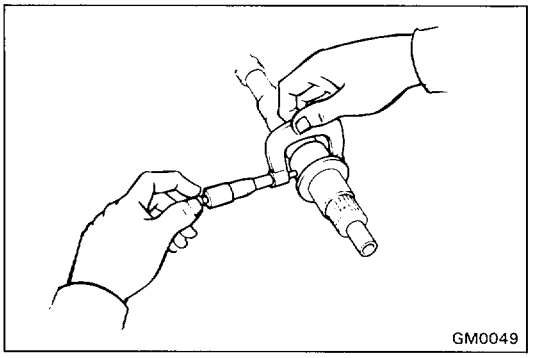
(a) Using calipers, measure the output shaft flange thickness.

Minimum thickness: 4.80 mm (0.1890 in.)


WM0057

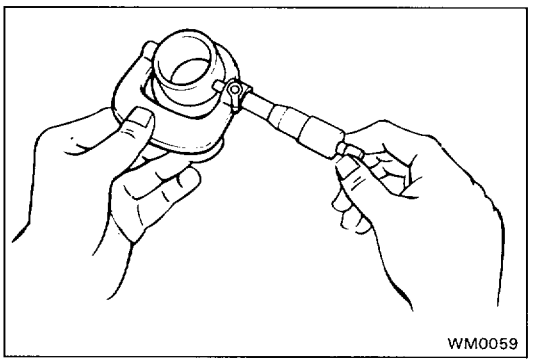
(b) Using calipers, measure the inner race flange thickness.

Minimum thickness: 3.99 mm (0.1571 in.)


GM0049

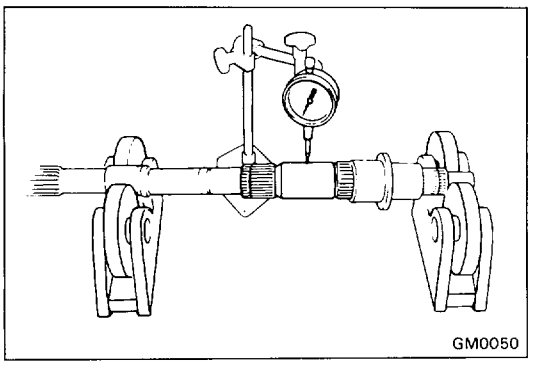
(c) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum diameter:
2nd gear 37.984 mm (1.4954 in.)
3rd gear 34.984 mm (1.3773 in.)


WM0059

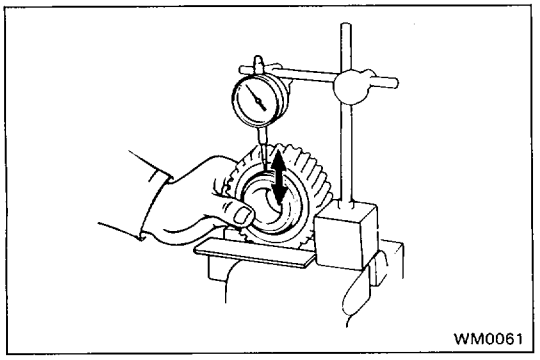
(d) Using a micrometer, measure the outer diameter of the inner race.

Minimum diameter: 38.985 mm (1.5348 in.)


GM0050

(e) Using a dial indicator, check the shaft runout.

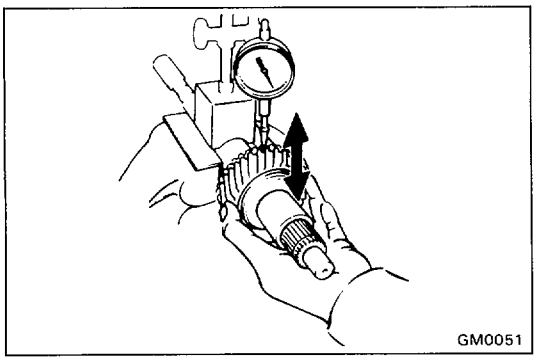
Maximum runout: 0.05 mm (0.0020 in.)


WM0061

2. CHECK OIL CLEARANCE OF FIRST GEAR

Using a dial indicator, measure the oil clearance between the gear and inner race with the needle roller bearing installed.

Standard clearance: 0.009 — 0.032 mm (0.0004 — 0.0013 in.)
Maximum clearance: 0.032 mm (0.0013 in.)

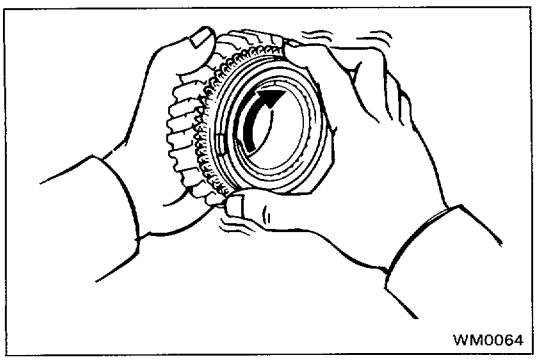

GM0051

3. CHECK OIL CLEARANCE OF SECOND, THIRD AND COUNTER FIFTH GEARS

Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

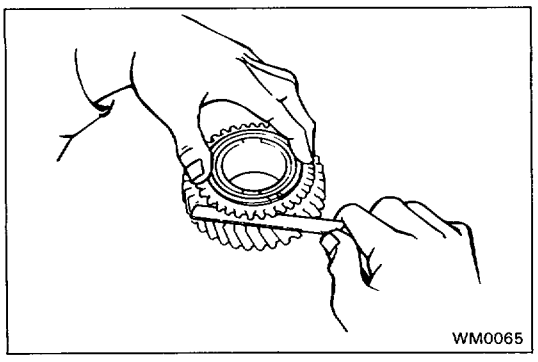
Standard clearance:
2nd and 3rd gears 0.009 — 0.033 mm (0.0004 — 0.0013 in.)
Counter 5th gear 0.009 — 0.032 mm (0.0004 — 0.0013 in.)

Maximum clearance:
2nd and 3rd gears 0.033 mm (0.0013 in.)
Counter 5th gear 0.032 mm (0.0013 in.)


WM0064

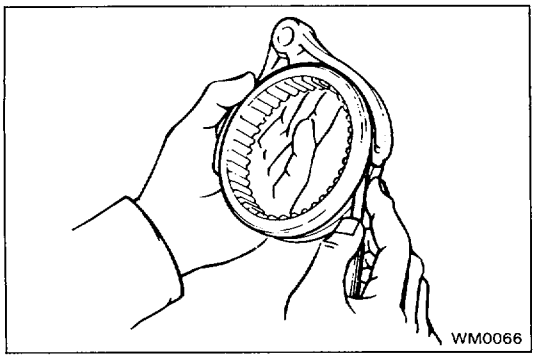
4. INSPECT SYNCHRONIZER RINGS

(a) Turn the ring and push it in to check the braking action.


WM0065

(b) Measure the clearance between the synchronizer ring back and the gear spline end.

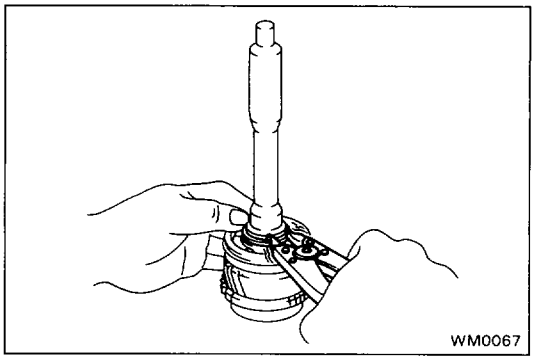
Standard clearance: 1.0 — 2.0 mm (0.039 — 0.079 in.)
Minimum clearance: 0.8 mm (0.031 in.)


WM0066

5. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

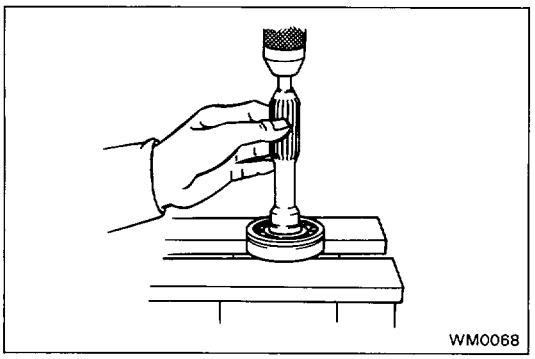
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

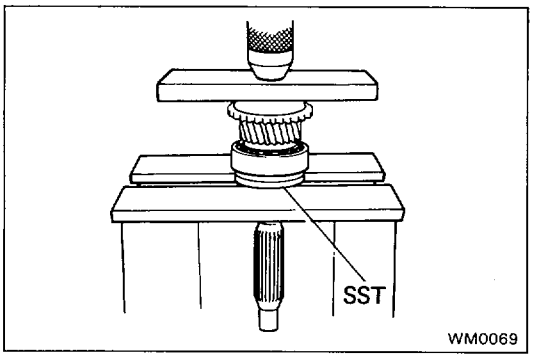

WM0067

6. IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

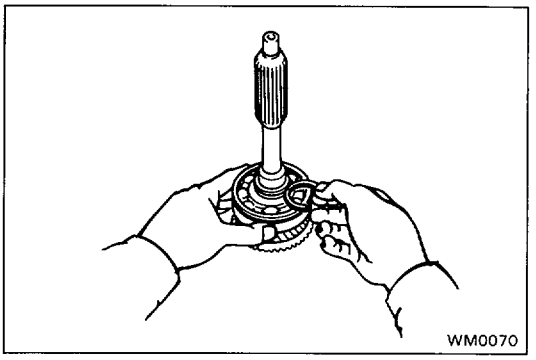

WM0068

(b) Using a press, remove the bearing.



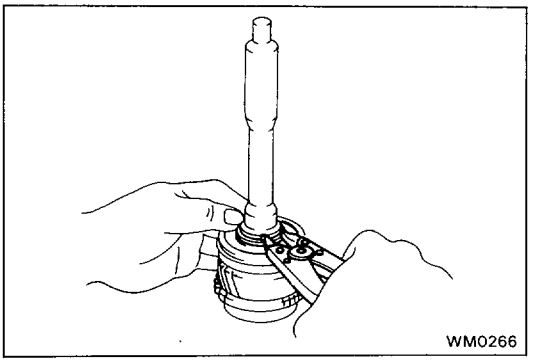
WM0069

(c) Using a press and SST, install a new bearing.
SST 09506-35010

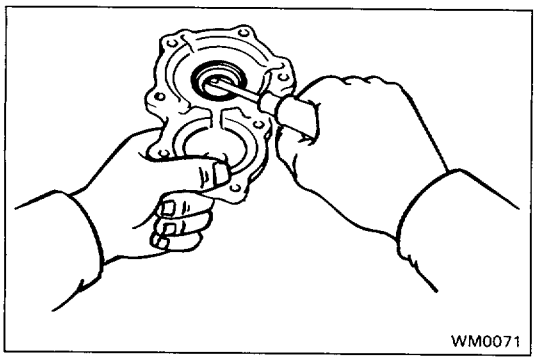

WM0070

(d) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
0	2.05 – 2.10 (0.0807 – 0.0827)
1	2.10 – 2.15 (0.0827 – 0.0846)
2	2.15 – 2.20 (0.0846 – 0.0866)
3	2.20 – 2.25 (0.0866 – 0.0886)
4	2.25 – 2.30 (0.0886 – 0.0906)
5	2.30 – 2.35 (0.0906 – 0.0925)

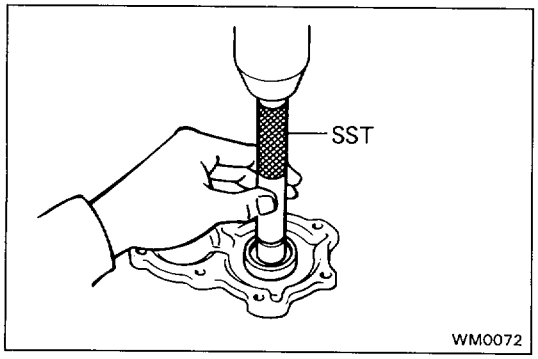

WM0266

(e) Using snap ring pliers, install the snap ring.



7. IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

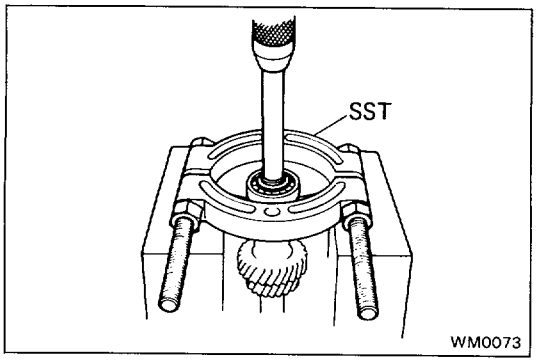
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST, press in a new oil seal.

SST 09223-50010

Oil seal depth: 12.2 — 13.2 mm (0.480 — 0.520 in.)
Transmission case installation surface



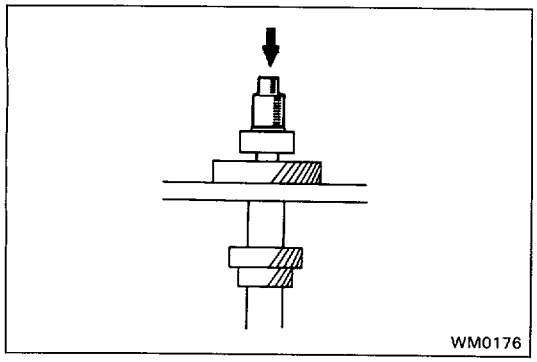
8. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING

(a) Using snap ring pliers, remove the snap ring.

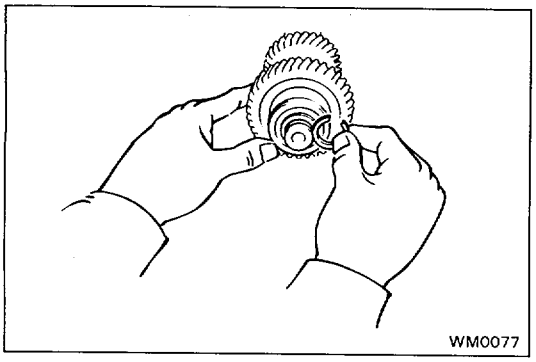
(b) Using SST, press out the bearing.

SST 09950-00020

(c) Replace the side race.

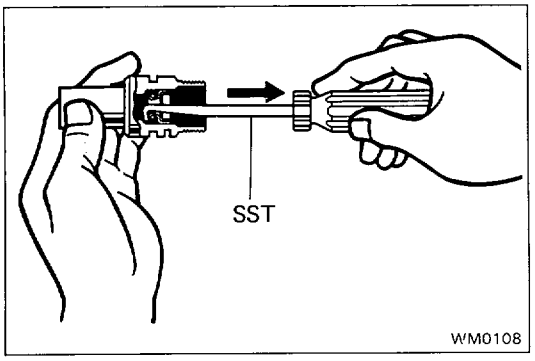


(d) Using a socket wrench, press in the bearing, side race and inner race.



(e) Select a snap ring that will allow minimum axial play and install it on the shaft.

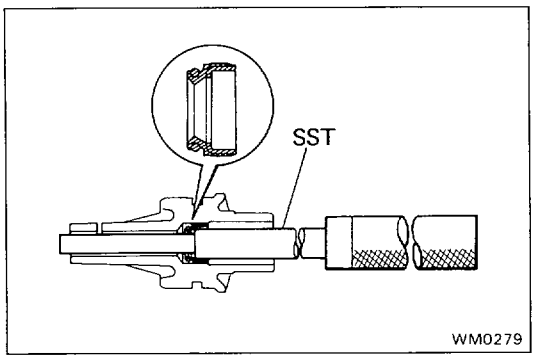
Mark	Thickness mm (in.)
0	2.05 — 2.10 (0.0807 — 0.0827)
1	2.10 — 2.15 (0.0827 — 0.0846)
2	2.15 — 2.20 (0.0846 — 0.0866)
3	2.20 — 2.25 (0.0866 — 0.0886)
4	2.25 — 2.30 (0.0886 — 0.0906)
5	2.30 — 2.35 (0.0906 — 0.0925)



9. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, pull out the oil seal.

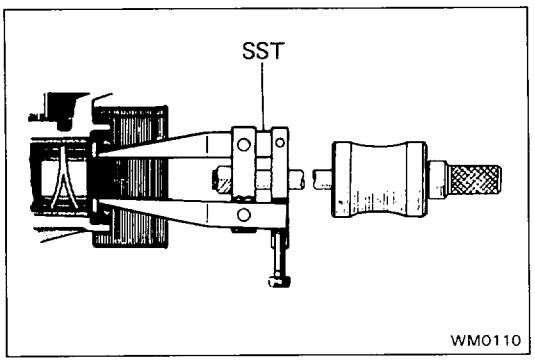
SST 09921-00010



(b) Using SST, drive in a new oil seal into the sleeve.

SST 09201-60011

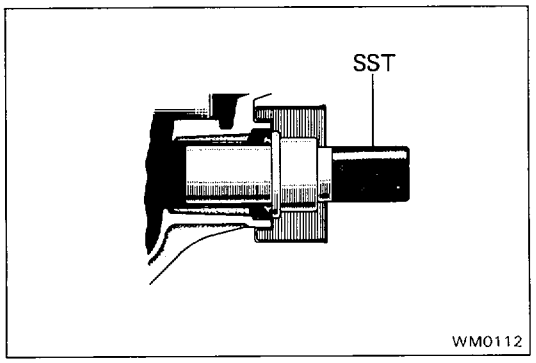
Oil seal depth: 20 mm (0.79 in.)



10. IF NECESSARY, REPLACE OIL SEAL

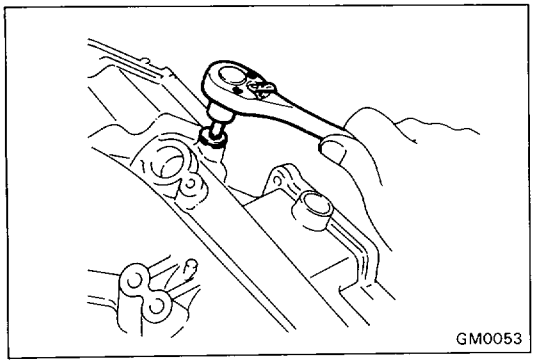
(a) Using SST, remove the oil seal.

SST 09308-00010 or 09308-10010 with output shaft installed



(b) Using SST, drive in a new oil seal.

SST 09325-20010



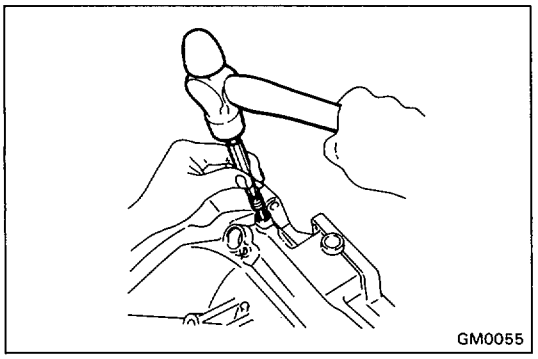
11. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using a torx socket wrench, remove the screw plug.

(b) Using a pin punch and hammer, drive out the slotted spring pin.

(c) Pull off the lever housing and slide out the shaft.

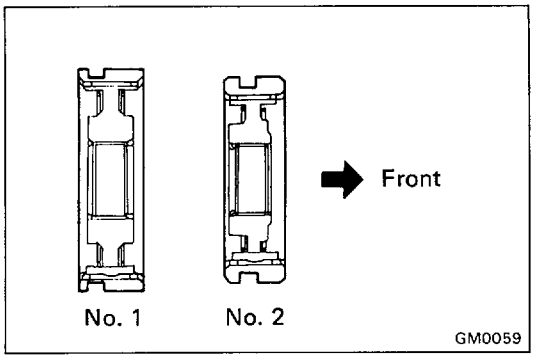
(d) Install the lever housing.



(e) Using a pin punch and hammer, drive in the slotted spring pin.

(f) Using a torx socket wrench, install and torque the screw plug.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)



ASSEMBLY OF TRANSMISSION

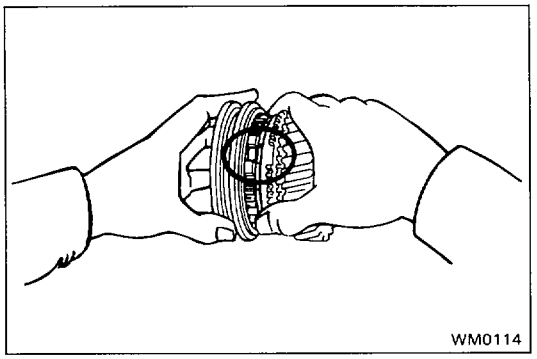
(See pages MT-39, 40)

1. INSERT CLUTCH HUB NO.1 AND NO.2 INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the sifting key springs under the shifting keys.

CAUTION: Install the key springs positioned so that their end gaps are not in line.

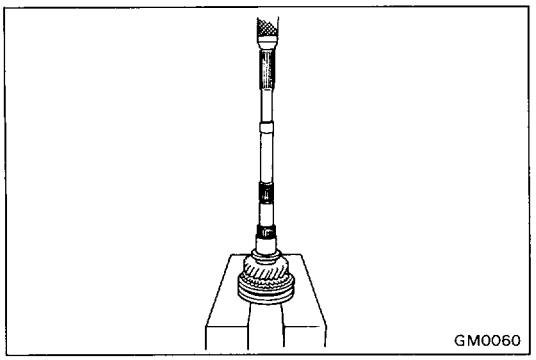


2. INSTALL THIRD GEAR AND HUB SLEEVE NO.2 ON OUTPUT SHAFT

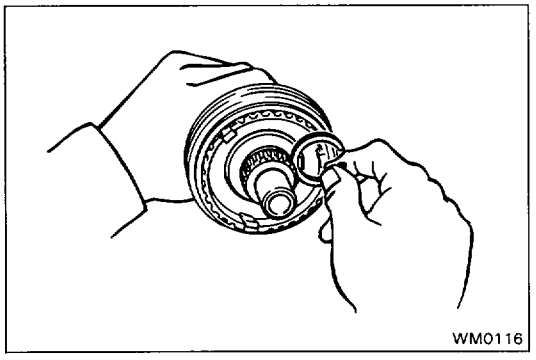
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 3rd gear.



(d) Using a press, install the 3rd gear and hub sleeve No.2.

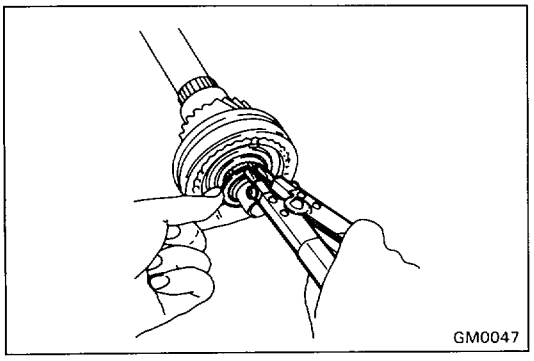


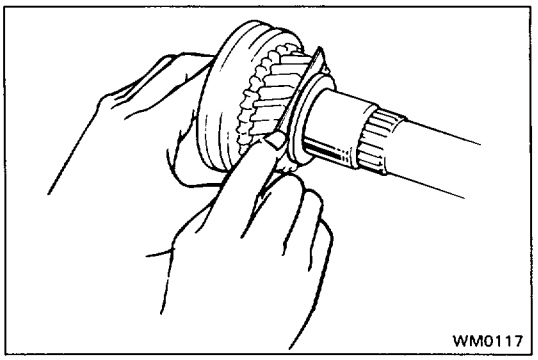
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
C-1	1.75 — 1.80 (0.0689 — 0.0709)
D	1.80 — 1.85 (0.0709 — 0.0728)
D-1	1.85 — 1.90 (0.0728 — 0.0748)
E	1.90 — 1.95 (0.0748 — 0.0768)
E-1	1.95 — 2.00 (0.0768 — 0.0787)
F	2.00 — 2.05 (0.0787 — 0.0807)
F-1	2.05 — 2.10 (0.0807 — 0.0827)

(b) Using snap ring pliers, install the snap ring.

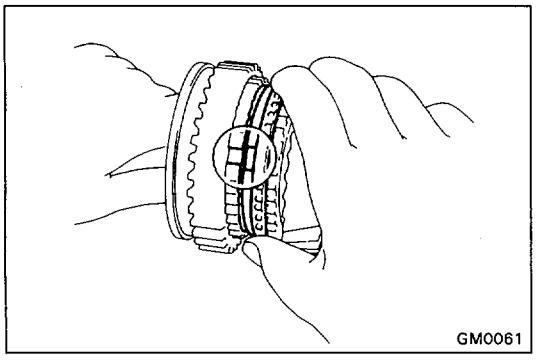



WM0117

4. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)
Maximum clearance: 0.25 mm (0.0098 in.)

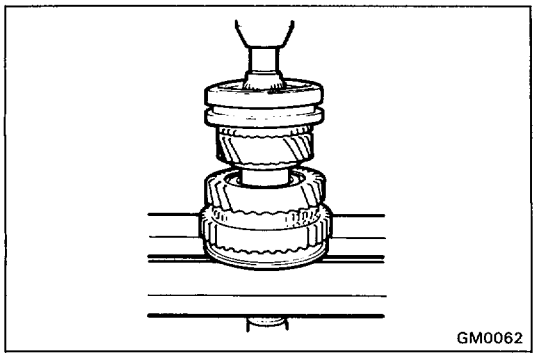

GM0061

5. INSTALL SECOND GEAR AND HUB SLEEVE NO.1

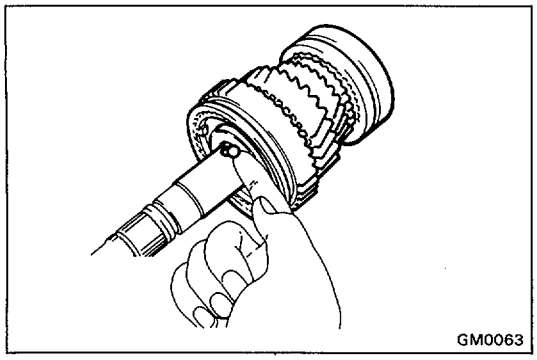
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 2nd gear.


GM0062

(d) Using a press, install the 2nd gear and hub sleeve No.1.

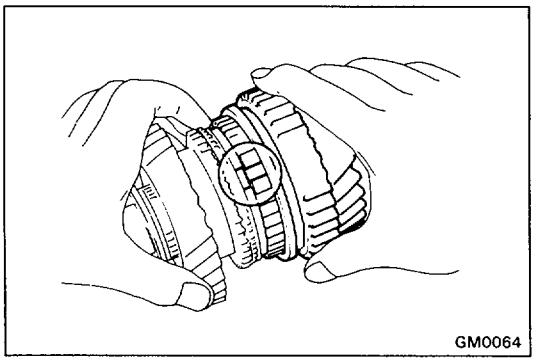

GM0063

6. INSTALL LOCKING BALL AND FIRST GEAR ASSEMBLY

(a) Install the locking ball in the shaft.

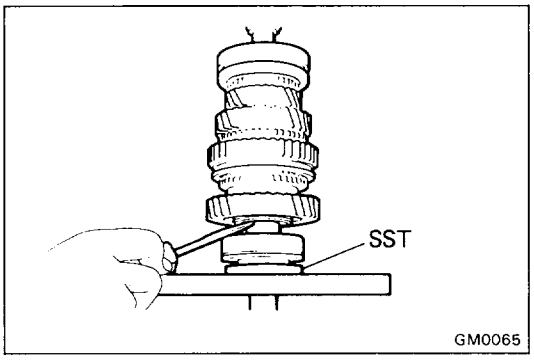
(b) Apply gear oil to the needle roller bearing.

(c) Assemble the 1st gear, synchronizer ring, needle roller bearing and bearing inner race.


GM0064

(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.

(e) Turn the inner race to align it with the locking ball.

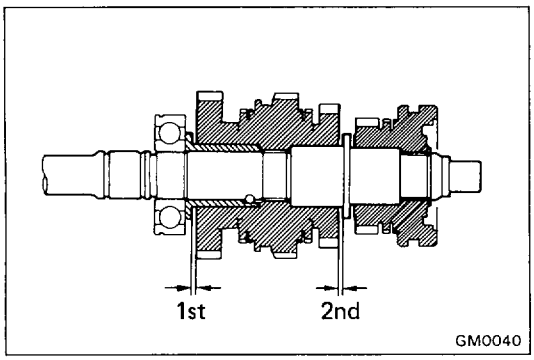


7. INSTALL OUTPUT SHAFT REAR BEARING

Using SST and a press, install the bearing on the output shaft with the outer race snap ring groove toward the rear.

NOTE: Hold the 1st gear inner race to prevent it from falling.

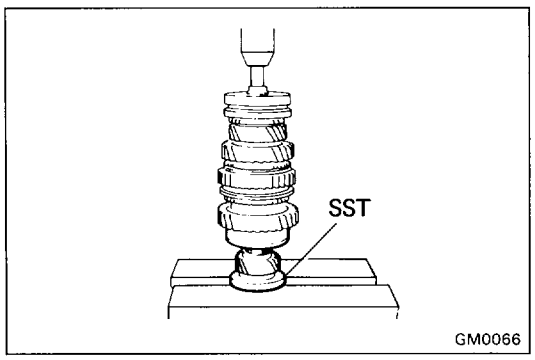
SST 09506-35010



8. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st and 2nd gear thrust clearance.

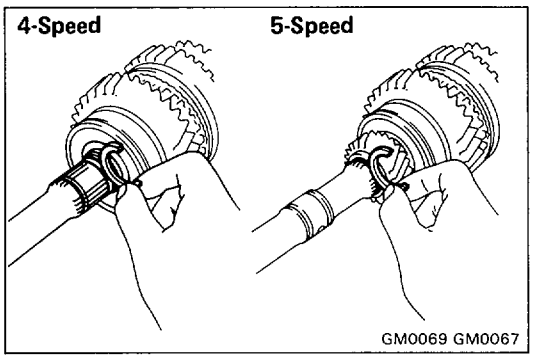
Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)
Maximum clearance: 0.25 mm (0.0098 in.)



9. (5-Speed) INSTALL FIFTH GEAR

Using SST and a press, install the 5th gear.

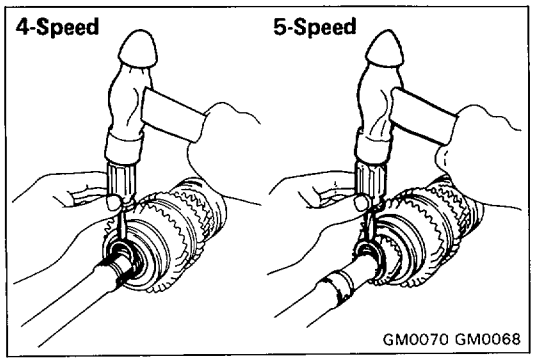
SST 09506-35010



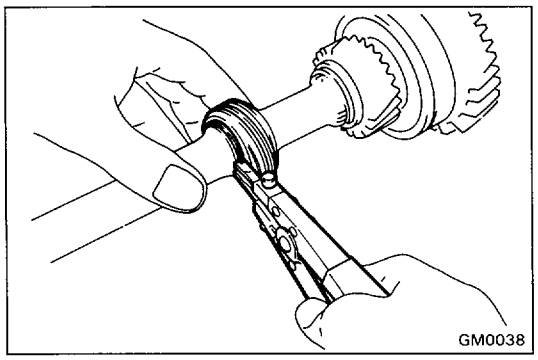
10. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.67—2.72 (0.1051—0.1071)	G	3.03—3.08 (0.1193—0.1213)
B	2.73—2.78 (0.1075—0.1094)	H	3.09—3.14 (0.1217—0.1236)
C	2.79—2.84 (0.1098—0.1118)	J	3.15—3.20 (0.1240—0.1260)
D	2.85—2.90 (0.1122—0.1142)	K	3.21—3.26 (0.1264—0.1283)
E	2.91—2.96 (0.1146—0.1165)	L	3.27—3.32 (0.1287—0.1307)
F	2.97—3.02 (0.1169—0.1189)		



(b) Using a screwdriver and hammer, install the snap ring.

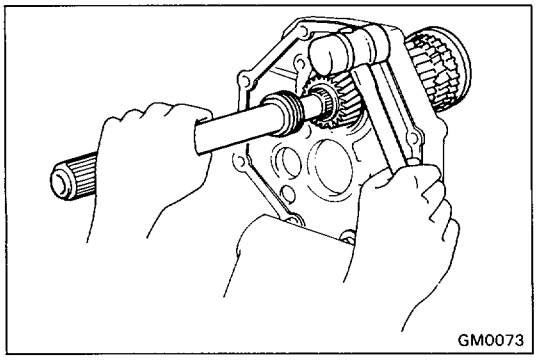


11. INSTALL SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, install the snap ring.

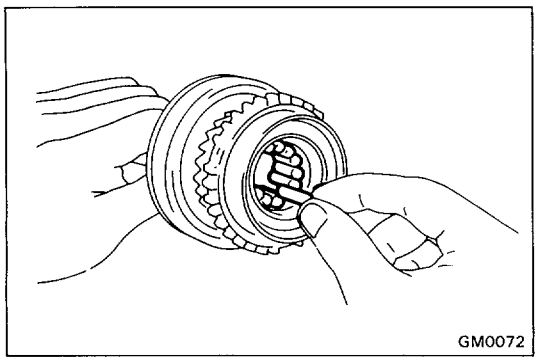
(b) Install the ball and drive gear.

(c) Using snap ring pliers, install the snap ring.



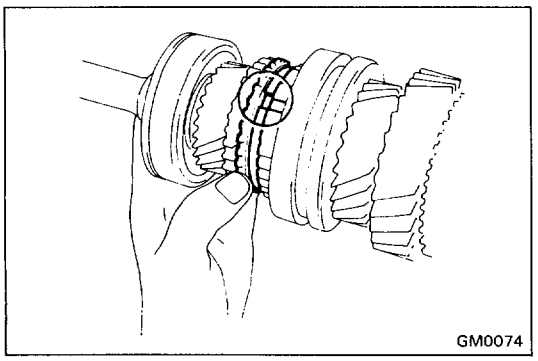
12. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

Install the output shaft into the intermediate plate by pulling on the output shaft and tapping on the intermediate plate.

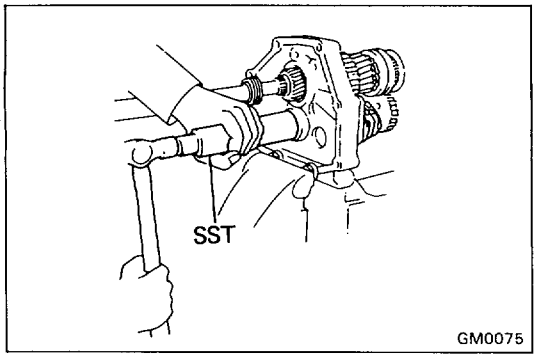


13. INSTALL INPUT SHAFT

(a) Apply MP grease to the 13-needle roller bearings and install them into the input shaft.



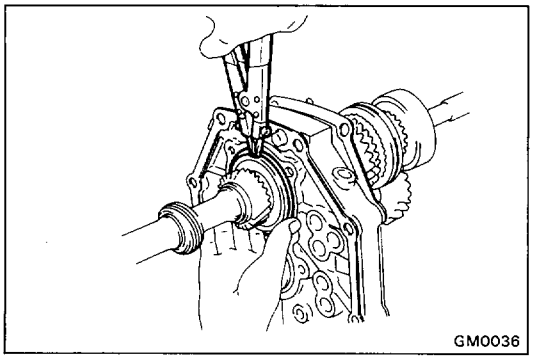
(b) Install the input shaft to the output shaft with the synchronizer ring slots aligned with the shifting keys.



14. INSTALL COUNTER GEAR

Install the counter gear into the intermediate plate while holding the counter gear, and install the counter rear bearing with SST.

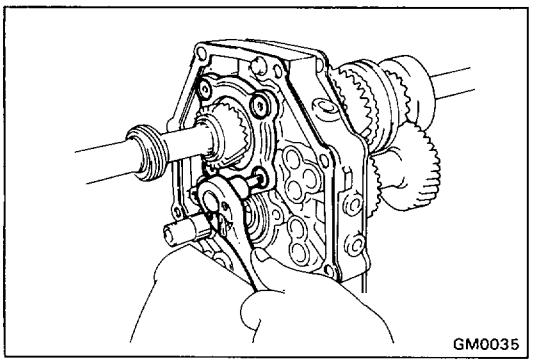
SST 09316-60010


GM0036

15. INSTALL BEARING SNAP RING

Using snap ring pliers, install the snap ring.

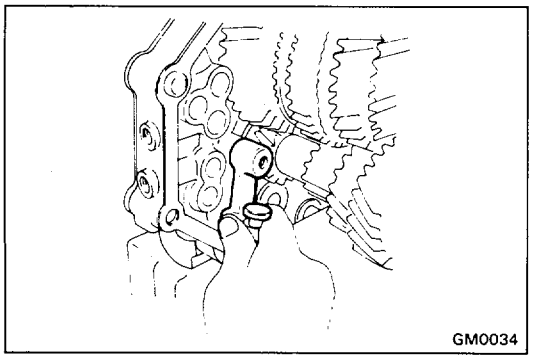
NOTE: Be sure the snap ring is flush with the intermediate plate surface.


GM0035

16. INSTALL REAR BEARING RETAINER

Using a torx socket wrench, install and torque the screws.

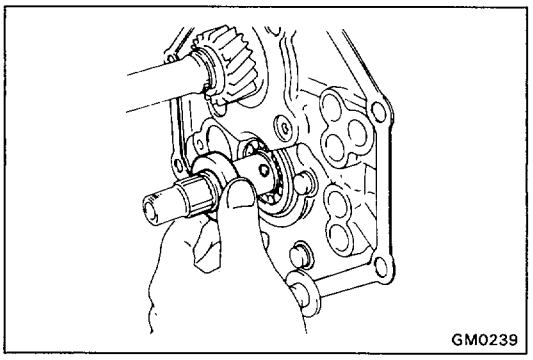
Torque: 185 kg-cm (13 ft-lb, 18 N·m)


GM0034

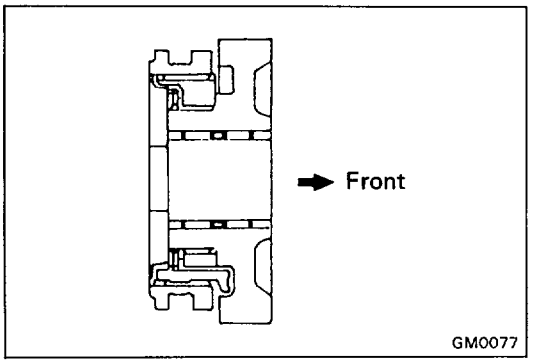
17. INSTALL REVERSE SHIFT ARM BRACKET

Install the reverse shift arm bracket and torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)


GM0239

18. (5-Speed)
INSTALL BALL AND SPACER



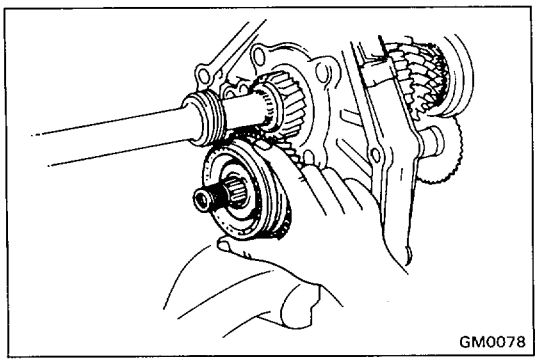
GM0077

19. (5-Speed)
INSTALL COUNTER FIFTH GEAR INTO HUB SLEEVE NO.3

(a) Install the shifting keys and hub sleeve No.3 onto the counter 5th gear.

(b) Install the shifting key springs under the shifting keys.

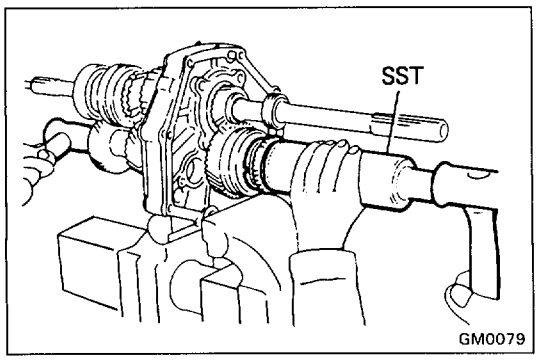
CAUTION: Install the key springs positioned so that their end gaps are not in line.


GM0078

20. (5-Speed)
INSTALL COUNTER FIFTH GEAR WITH HUB SLEEVE NO.3 ASSEMBLY AND NEEDLE ROLLER BEARINGS

(a) Apply gear oil to the needle roller bearings.

(b) Install the counter 5th gear with hub sleeve No.3 and needle roller bearings.



GM0079

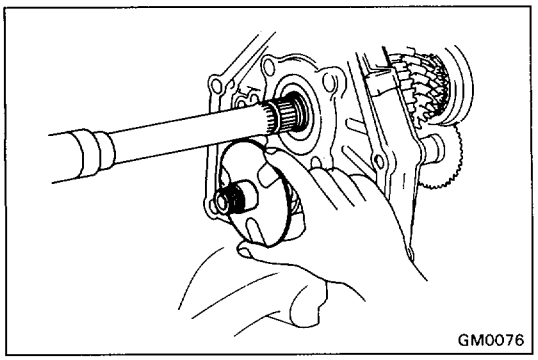
21. (5-Speed)
INSTALL SYNCHRONIZER RING AND GEAR SPLINE PIECE NO.5

(a) Install the synchronizer ring onto gear spline piece No.5.

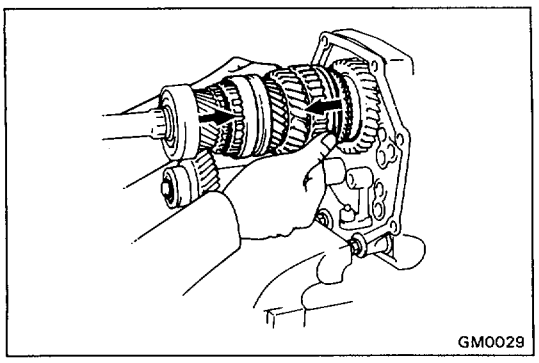
(b) Using SST, drive in gear spline piece No.5 with the synchronizer ring slots aligned with the shifting keys.

SST 09316-60010

NOTE: When installing gear spline piece No.5, support the counter gear in front with a 3-5 lb hammer or equivalent.

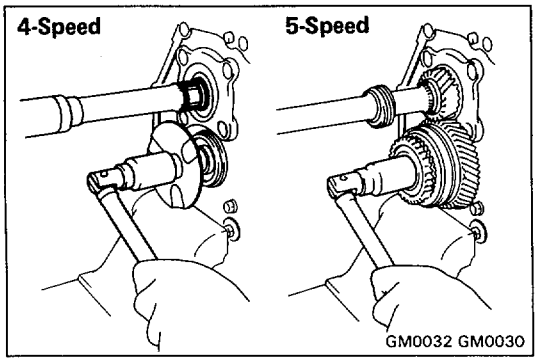

GM0076

(4-Speed)
INSTALL OIL SEPARATOR


GM0029

22. INSTALL LOCK NUT

(a) Engage the gear double meshing.

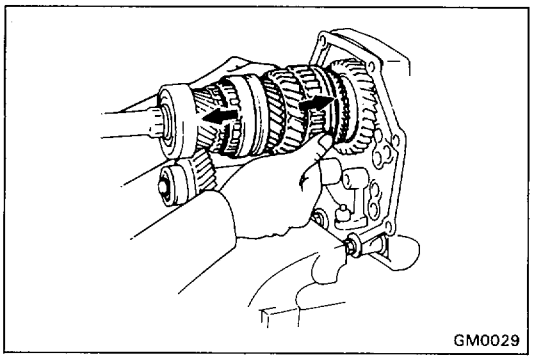


GM0032 GM0030

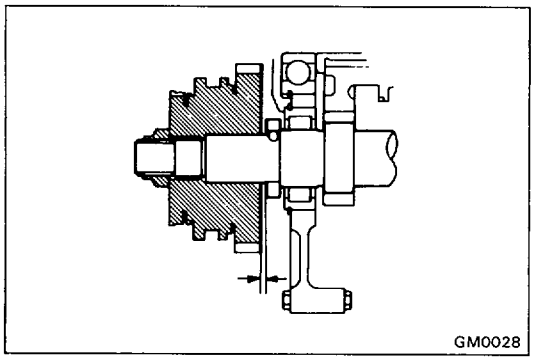
(b) Install and torque the lock nut.

Torque: 1,200 kg-cm (87 ft-lb, 118 N·m)

(c) Stake the lock nut.


GM0029

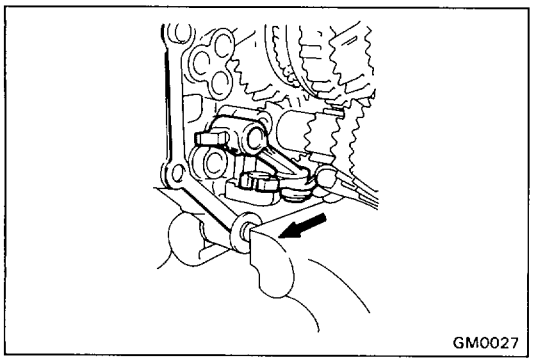
(d) Disengage the gear double meshing.


GM0028

23. (5-Speed)
MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

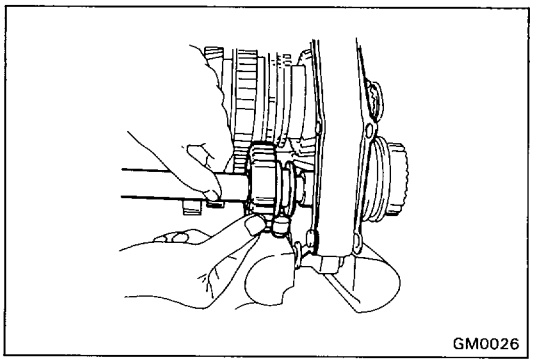
Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance: 0.10 — 0.30 mm (0.0039 — 0.0118 in.)
Maximum clearance: 0.30 mm (0.0118 in.)


GM0027

24. INSTALL REVERSE SHIFT ARM TO REVERSE SHIFT ARM BRACKET

Install the reverse shift arm to the pivot of the reverse shift arm bracket.


GM0026

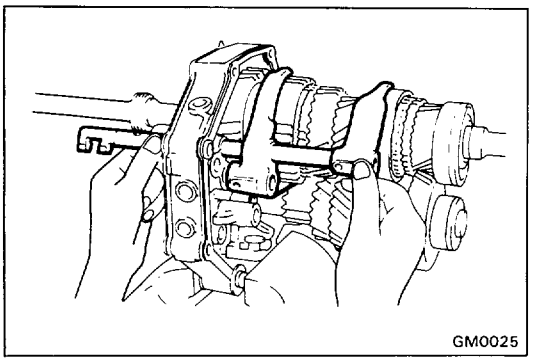
25. INSTALL REVERSE IDLER GEAR AND SHAFT

(a) Install the reverse idler gear on the shaft.

(b) Align the reverse shift arm shoe to the reverse idler gear groove and insert the reverse idler gear shaft to the intermediate plate.

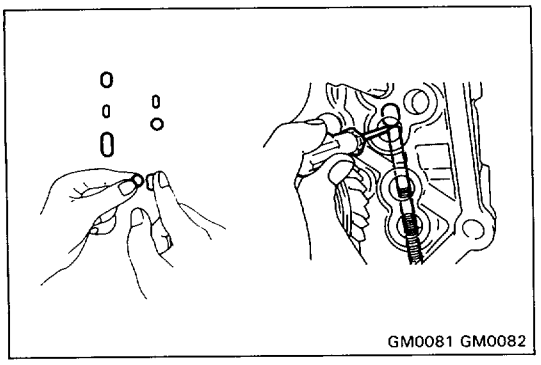
(c) Install the reverse idler gear shaft stopper and torque the bolt.

Torque: 175 kg-cm (13 ft-lb, 17 N·m)


GM0025

26. INSTALL SHIFT FORK SHAFT NO.2, SHIFT FORK NO.1 AND NO.2

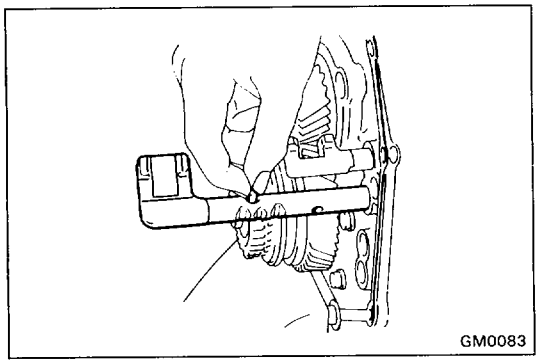
Place shift forks No.1 and No.2 into the groove of hub sleeves No.1 and No.2 and install fork shaft No.2 to shift forks No.1 and No.2 through the intermediate plate.


GM0081 GM0082

27. INSTALL INTERLOCK PIN

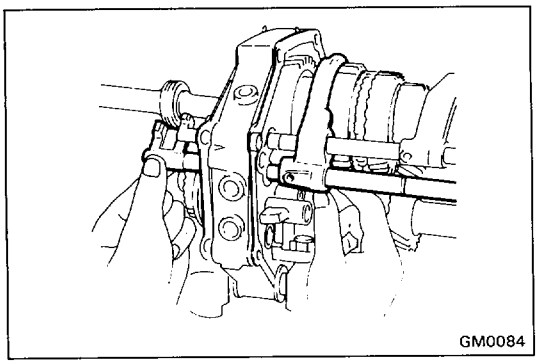
(a) Apply MP grease to the interlock pins.

(b) Using a magnetic finger and screwdriver, install the interlock pin into the intermediate plate.

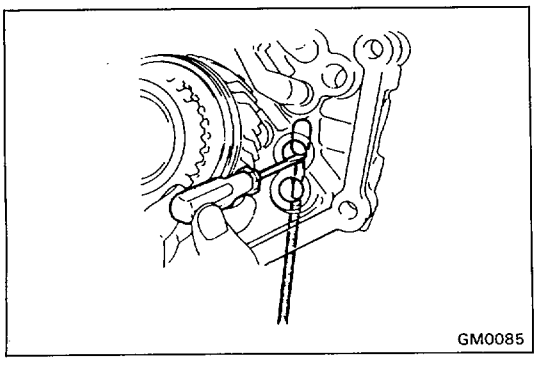

GM0083

28. INSTALL SHIFT FORK SHAFT NO.1

(a) Install the interlock pin into the shaft hole.

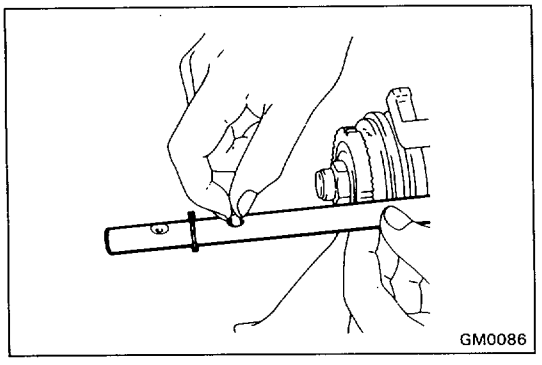

GM0084

(b) Install fork shaft No.1 to shift fork No.1 through the intermediate plate.


GM0085

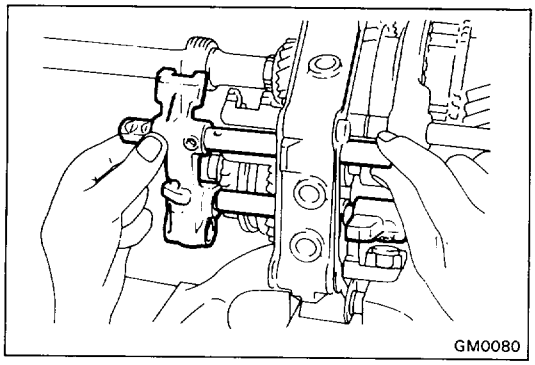
29. INSTALL INTERLOCK PIN

Using a magnetic finger and screwdriver, install the interlock pin into the intermediate plate.


GM0086

30. INSTALL SHIFT FORK SHAFT NO.3

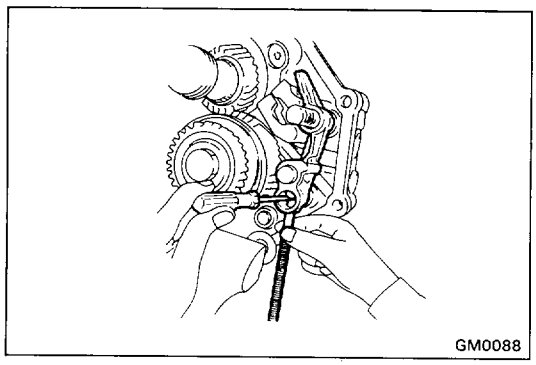
Install the interlock pin into the shaft hole.


GM0080

31. INSTALL SHIFT FORK SHAFT NO.5 AND REVERSE SHIFT HEAD

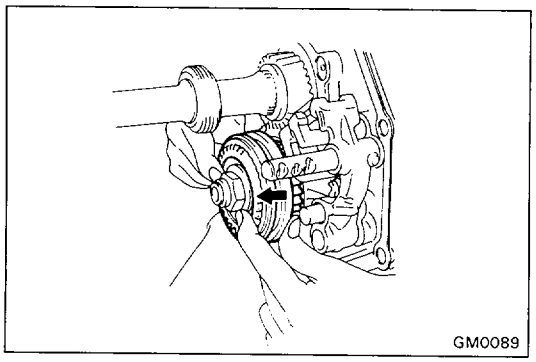
(a) Install the reverse shift head to fork shaft No.5.

(b) Insert fork shaft No.5 to the intermediate plate and put in the reverse shift head to shift fork shaft No.3.

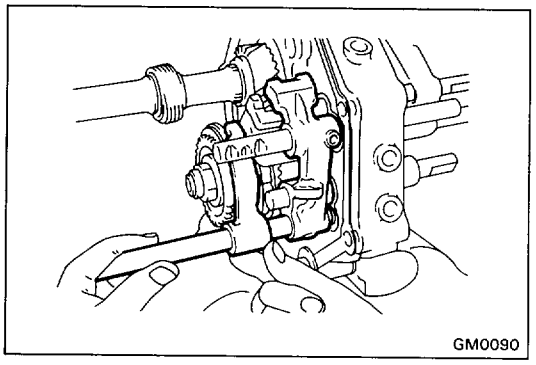

GM0088

32. (5-Speed)
INSTALL SHIFT FORK SHAFT NO.4, SHIFT FORK NO.3 AND TWO LOCKING BALLS

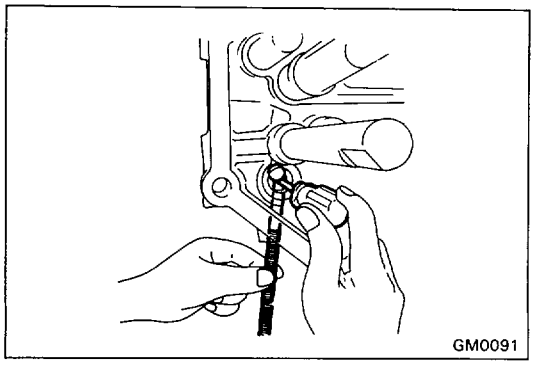
(a) Using a magnetic finger and screwdriver, install the locking ball into the reverse shift head hole.


GM0089

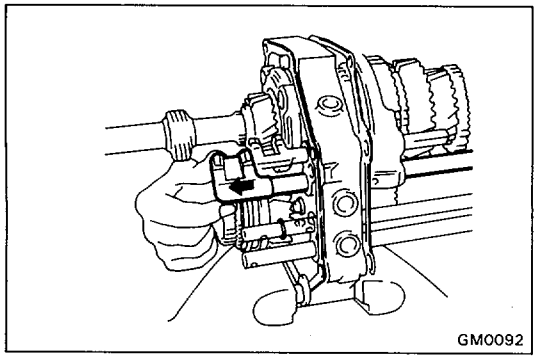
(b) Shift hub sleeve No.3 to the 5th speed position.


GM0090

(c) Place shift fork No.3 into the groove of hub sleeve No.3 and install fork shaft No.4 to shift fork No.3 and reverse shift arm.

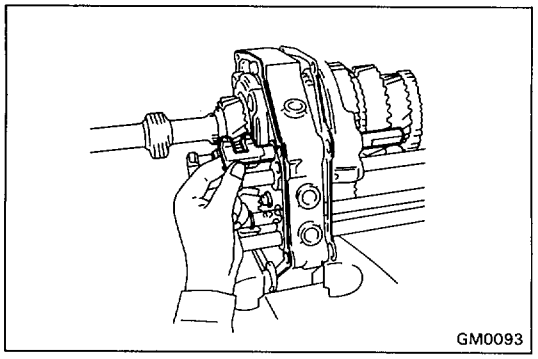

GM0091

(d) Using a magnetic finger and screwdriver, install the locking ball into the intermediate plate and insert fork shaft No.4 to the intermediate plate.

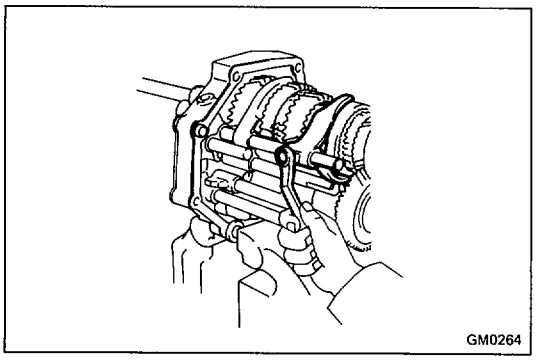

GM0092

33. CHECK INTERLOCK

(a) Shift the fork shaft No.1 to the 1st speed position.


GM0093

(b) Fork shafts No.2, No.3, No.4 and No.5 should not move.

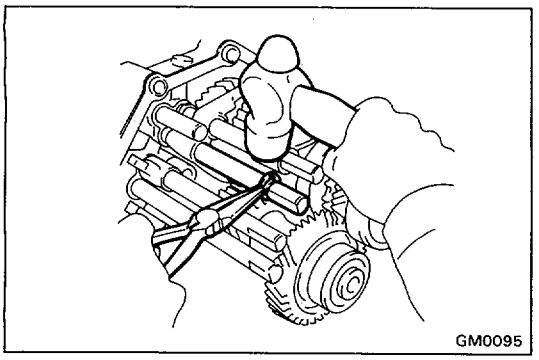

GM0264

34. INSTALL BOLTS AND SLOTTED SPRING PINS

(a) Install the bolts to the shift fork No.1 and No.2.

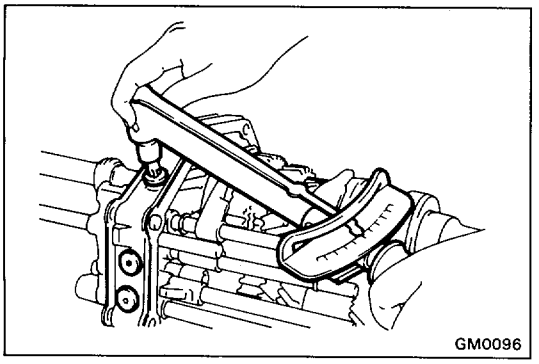
Torque: 200 kg-cm (14 ft-lb, 20 N·m)

(b) Using a pin punch and hammer, drive in the slotted spring pins into the reverse shift arm, reverse shift head and shift fork No.3 (5-Speed).


GM0095

35. INSTALL E-RINGS

4-Speed: Four E-rings
5-Speed: Three E-rings


GM0096

36. INSTALL LOCKING BALLS, SPRINGS AND SCREW PLUGS

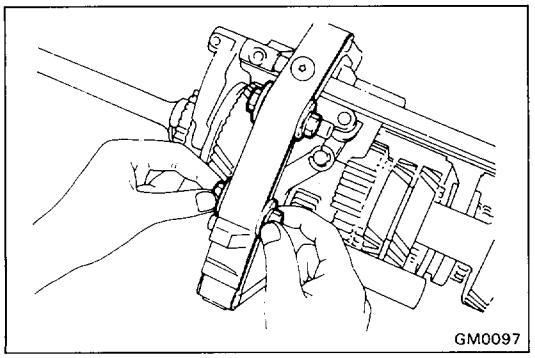
(a) Apply liquid sealer to the plug threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the locking balls, springs and screw plugs and torque the screw plugs with a torx socket wrench.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)

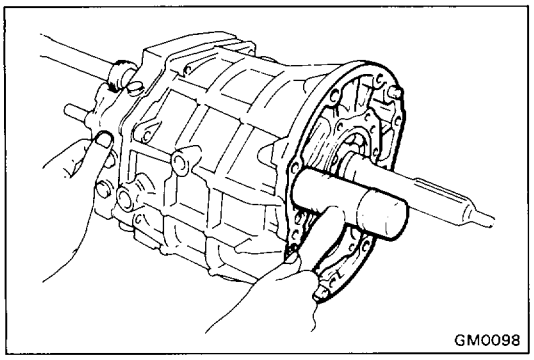
NOTE: Install the short spring into the bottom of the intermediate plate (5-Speed).



37. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

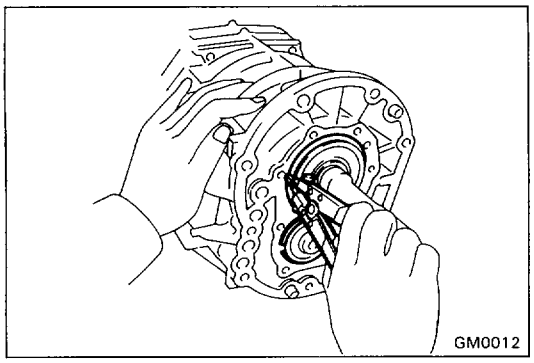
(b) Remove the bolts, nuts, plate washers and gasket.



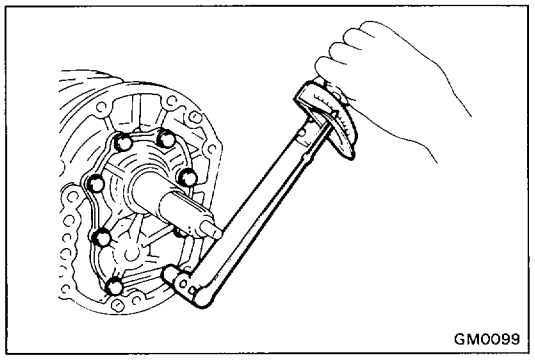
38. INSTALL TRANSMISSION CASE WITH NEW GASKET TO INTERMEDIATE PLATE

Align each bearing outer race, each fork shaft end and reverse idler gear shaft end with the case installation holes, and install the case.

If necessary, tap on the case with a plastic hammer.



39. INSTALL TWO BEARING SNAP RINGS



40. INSTALL FRONT BEARING RETAINER WITH NEW GASKET

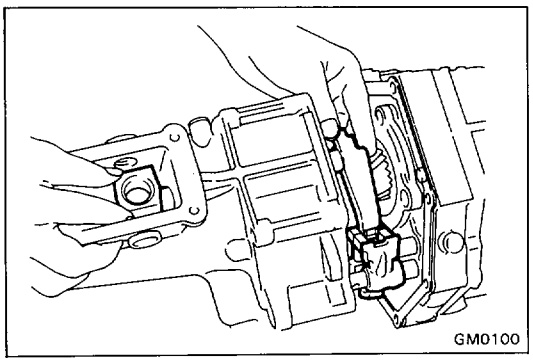
(a) Install the bearing retainer with a new gasket.

(b) Apply liquid sealer to the bolt threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install and torque the bolts.

Torque: 170 kg-cm (12 ft-lb, 17 N·m)

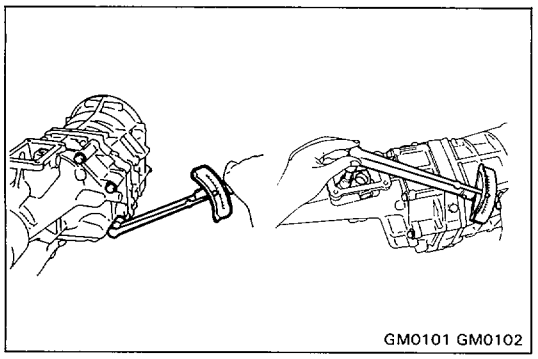


41. INSTALL EXTENSION HOUSING, NEW GASKET, SHIFT AND SELECT LEVER AND SHIFT LEVER HOUSING

(a) Install a new gasket to the intermediate plate.

(b) Insert the shift and select lever into the extension housing.

(c) Connect the shift and select lever to the fork shaft and put in the shift lever housing.


GM0101 GM0102

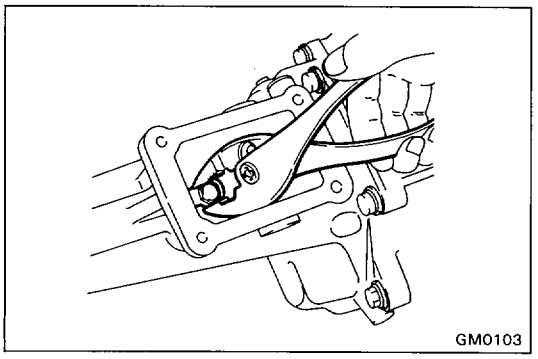
(d) Align fork shaft No.5 to the extension housing installation hole and push in the extension housing.

(e) Install and torque the extension housing bolts.

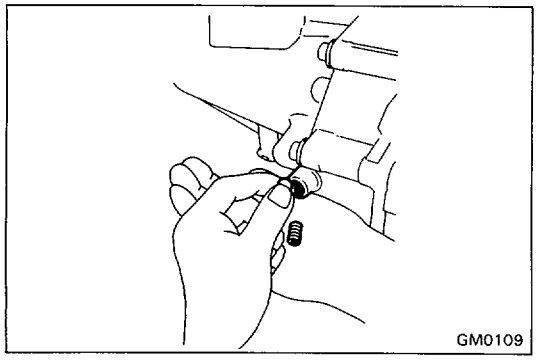
Torque: 380 kg-cm (27 ft-lb, 37 N·m)

(f) Install and torque the shift lever housing bolt with a lock washer.

Torque: 390 kg-cm (28 ft-lb, 38 N·m)


GM0103

(g) Stake the lock washer.

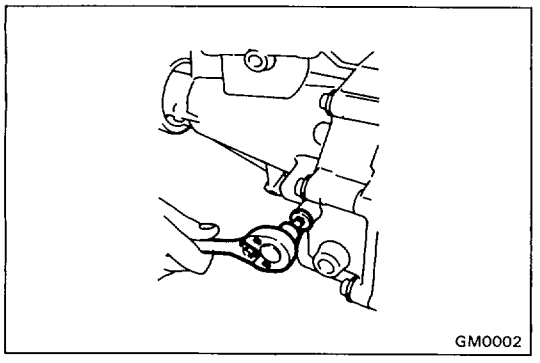

GM0109

42. INSTALL LOCKING BALL, SPRING AND SCREW PLUG

(a) Apply liquid sealer to the plug threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the locking ball, spring and plug.


GM0002

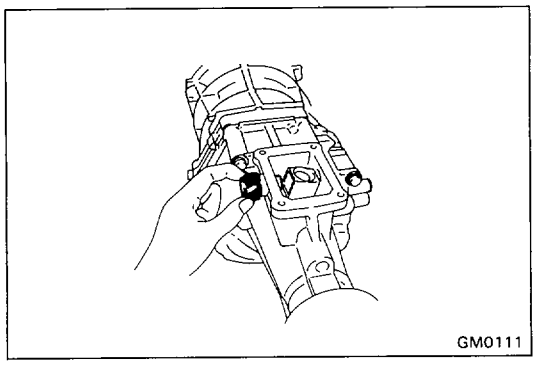
(c) Torque the plug.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)

43. AFTER INSTALLING EXTENSION HOUSING CHECK FOLLOWING ITEMS

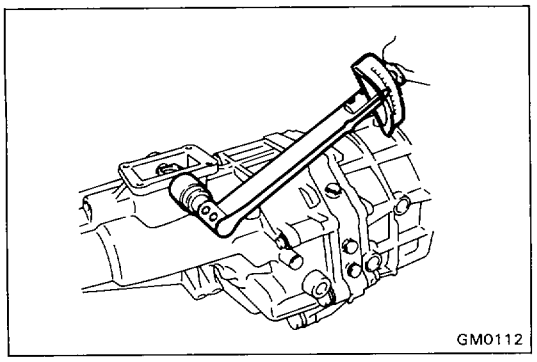
(a) Check to see that the input and output shafts rotate smoothly.

(b) Check to see that shifting can be made smoothly to all positions.


GM0111

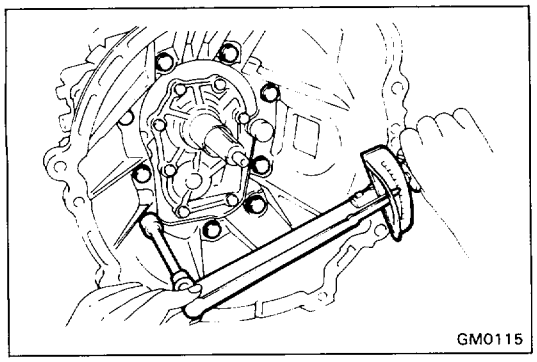
44. INSTALL RESTRICT PINS

(a) Install the black pin on the reverse gear/5th gear side.


GM0112

(b) Install another pin and torque the pins.

Torque: 280 kg-cm (20 ft-lb, 27 N·m)


GM0115

45. INSTALL CLUTCH HOUSING

(a) Install the clutch housing.

(b) Install and torque the bolts.

Torque: 380 kg-cm (27 ft-lb, 37 N·m)

46. INSTALL SHIFT LEVER RETAINER WITH NEW GASKET

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

47. INSTALL BACK-UP LIGHT SWITCH

Torque: 380 kg-cm (27 ft-lb, 37 N·m)

48. INSTALL SPEEDOMETER DRIVEN GEAR

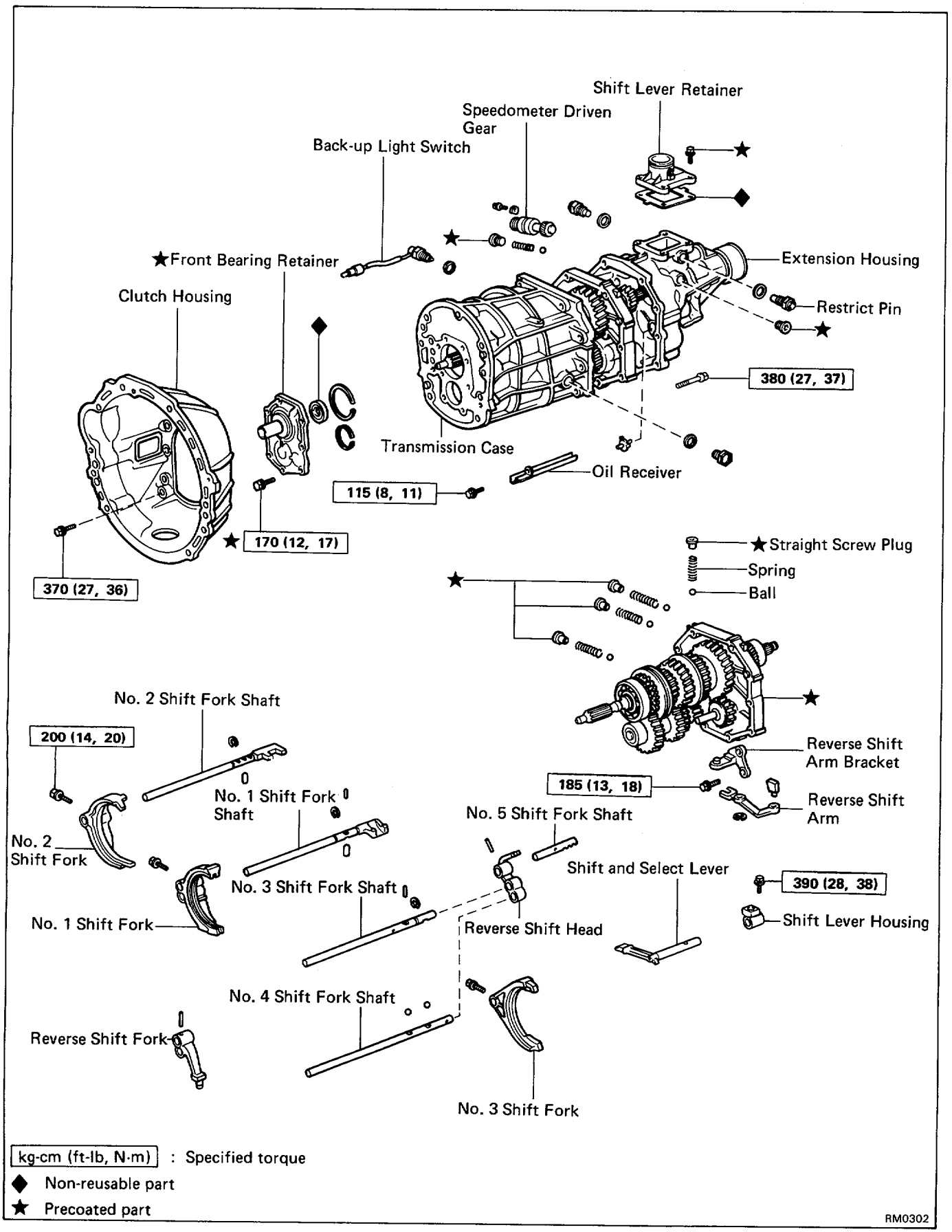
49. INSTALL RELEASE FORK AND BEARING

Apply Molybdenum disulphide lithium base grease to the following parts:

- Release bearing hub inside groove
- Input shaft spline
- Release fork contact surface

R150 TRANSMISSION

COMPONENTS



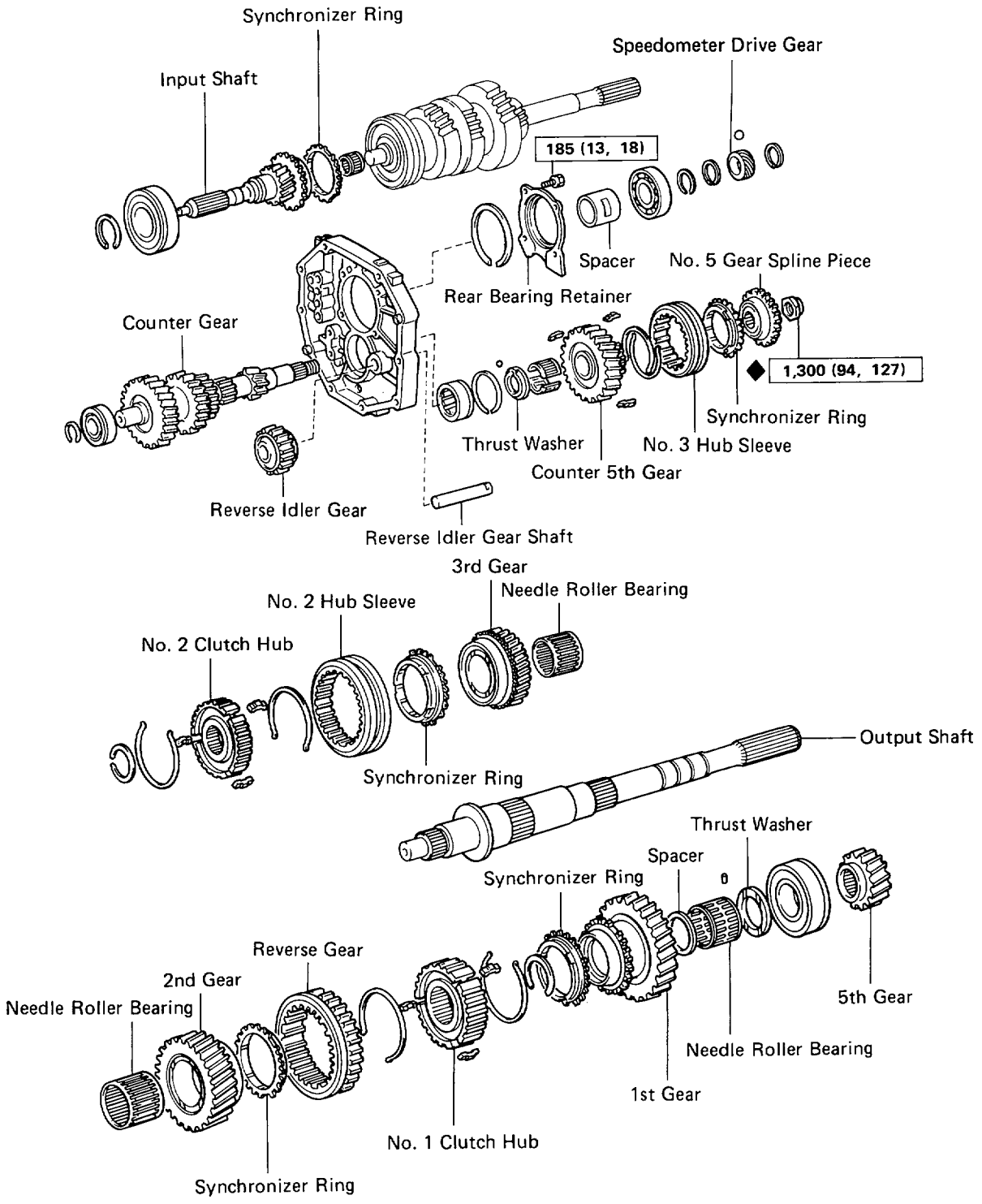
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

★ Precoated part

RM0302

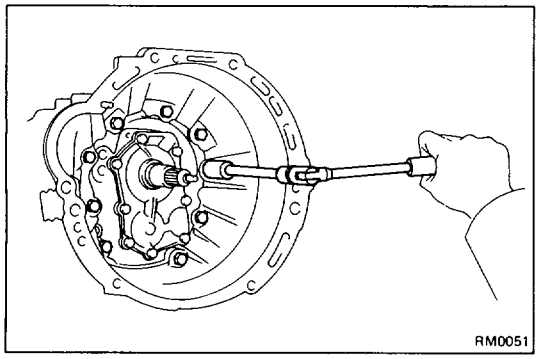
COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

RM0303



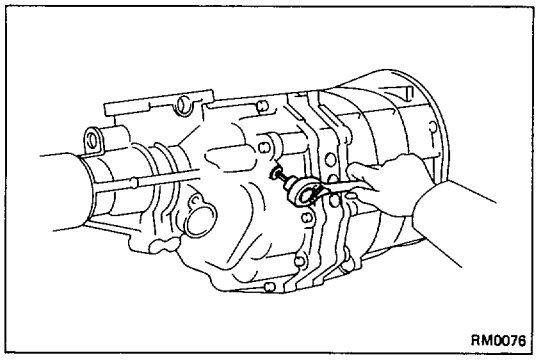
DISASSEMBLY OF TRANSMISSION

(See pages MT-69, 70)

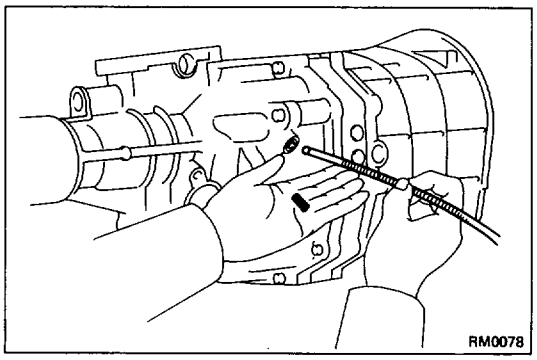
1. **REMOVE RELEASE FORK AND BEARING**

2. **REMOVE BACK-UP LIGHT SWITCH, SPEEDOMETER DRIVEN GEAR, SHIFT LEVER RETAINER AND RESTRICT PINS**

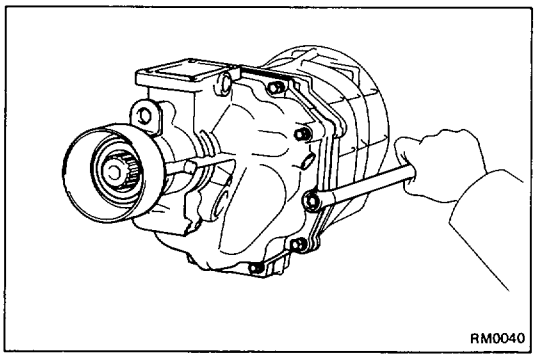
3. **REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE**



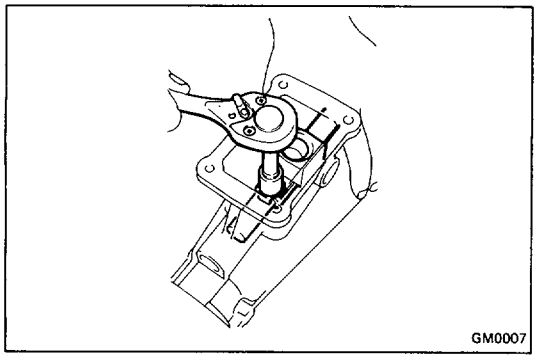
4. **REMOVE STRAIGHT SCREW PLUG, SPRING AND BALL**
   (a) Using a torx socket wrench, remove the screw plug from the extension housing.



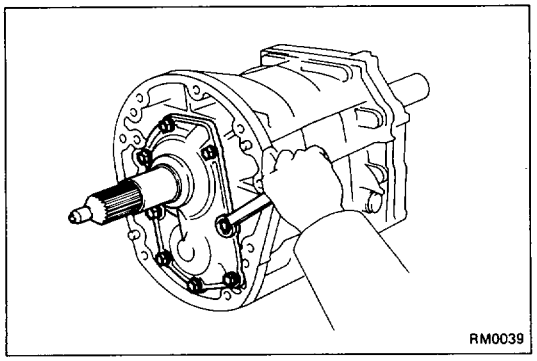
   (b) Using a magnetic finger, remove the spring and ball.



5. **REMOVE EXTENSION HOUSING**
   (a) Remove the ten bolts.



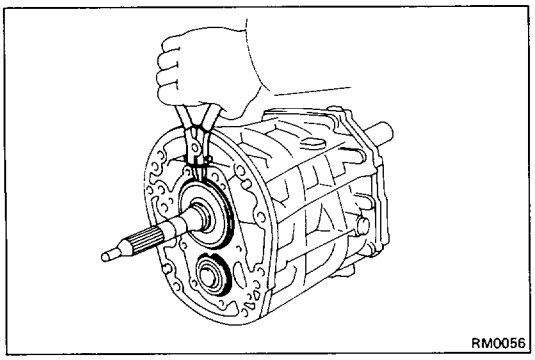
   (b) Remove the shift lever housing set bolt.
   (c) Using a plastic hammer, tap the extension housing and remove the shift lever housing and shift and select lever.



6. REMOVE FRONT BEARING RETAINER

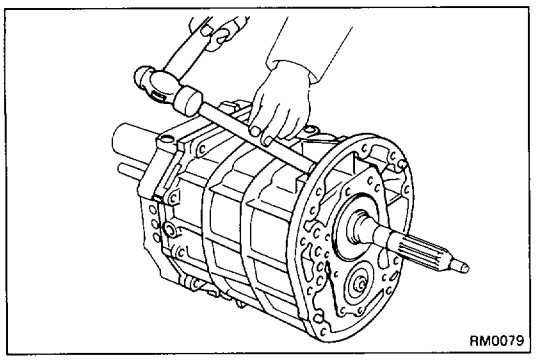
(a) Remove the eight bolts.

(b) Using a plastic hammer, tap the front bearing retainer.



7. REMOVE BEARING SNAP RINGS

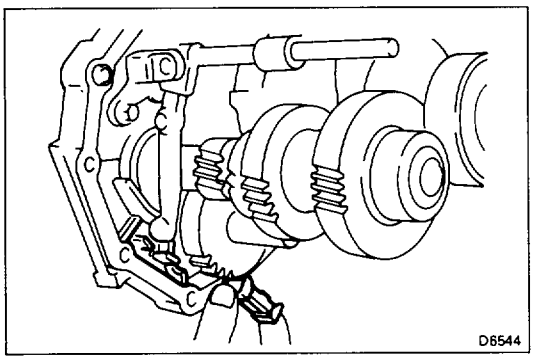
Using snap ring pliers, remove the two snap rings.



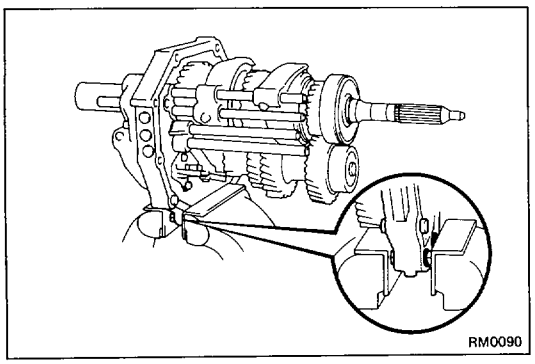
8. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

(a) Using a brass bar and hammer, carefully tap off the transmission case.

(b) Remove the transmission case from the intermediate plate.



9. REMOVE MAGNET FROM INTERMEDIATE PLATE

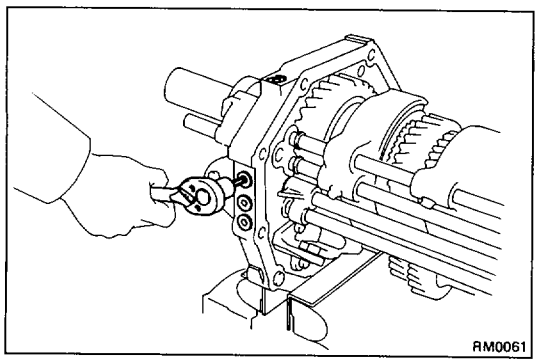


10. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use two clutch housing bolts, plate washers and suitable nuts as shown.

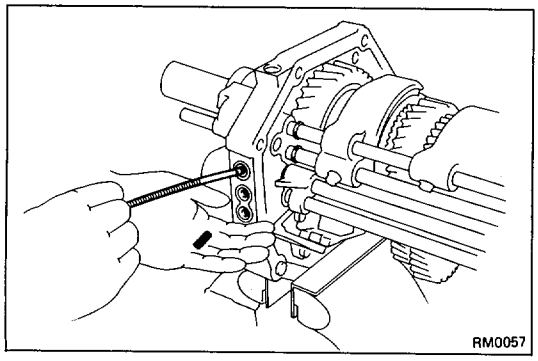
CAUTION: Install the plate washers in reverse of normal. Increase or decrease plate washers so that the bolt tip and front tip surface of the nut are aligned.

(b) Mount the intermediate plate in a vise.

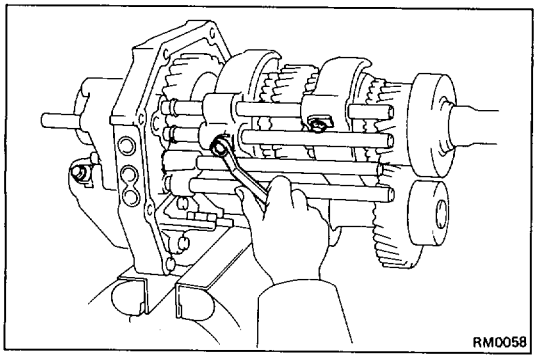


11. REMOVE STRAIGHT SCREW PLUGS, LOCKING BALLS AND SPRINGS

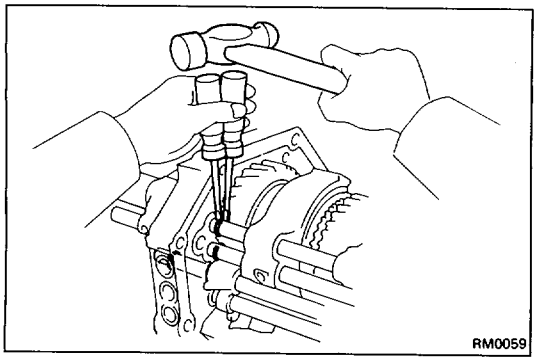
(a) Using a torx socket wrench, remove the four plugs.



(b) Using a magnetic finger, remove the four springs and balls.

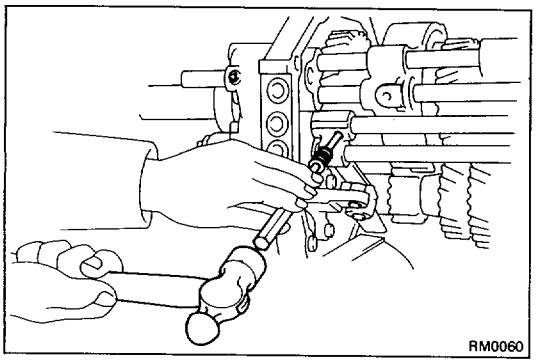


12. REMOVE SET BOLTS



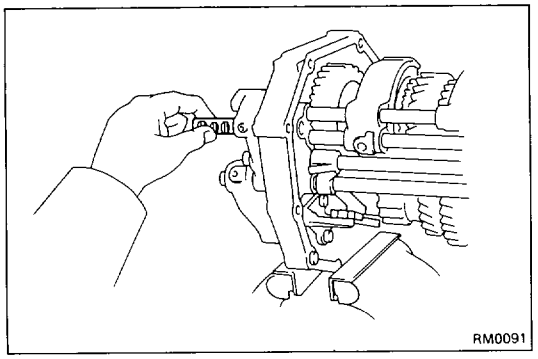
13. REMOVE SNAP RINGS

Using two screwdrivers and a hammer, remove the three snap rings.



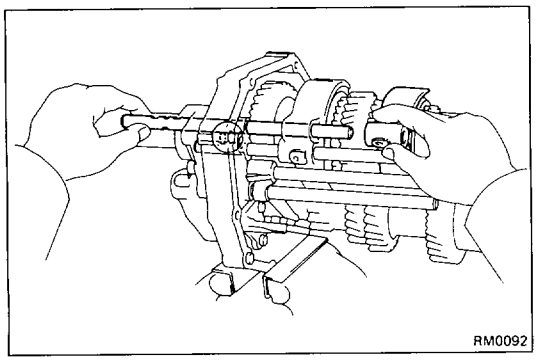
14. REMOVE SLOTTED SPRING PINS

Using a pin punch and hammer, drive out the two pins.



15. REMOVE NO. 5 SHIFT FORK SHAFT

Pull out No. 5 shift fork shaft from the intermediate plate.

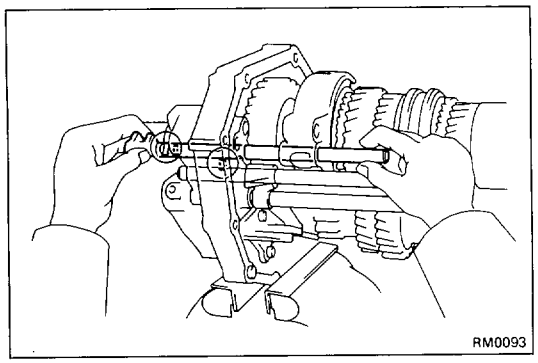


16. REMOVE NO. 2 SHIFT FORK SHAFT AND SHIFT FORK

(a) Pull out No. 2 shift fork shaft from the intermediate plate.

(b) Remove No. 2 shift fork.

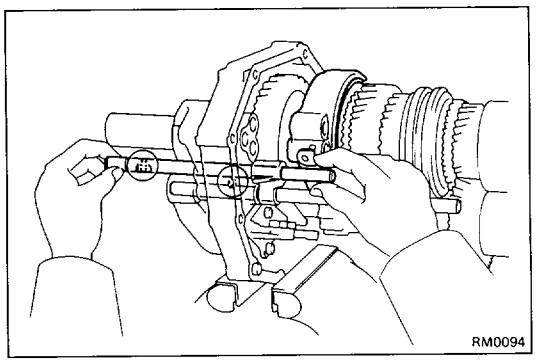
(c) Using a magnetic finger, remove the interlock pin from the intermediate plate.



17. REMOVE NO. 1 SHIFT FORK SHAFT

(a) Pull out No. 1 shift fork shaft from the intermediate plate.

(b) Using a magnetic finger, remove the interlock pins from the shaft hole and intermediate plate.

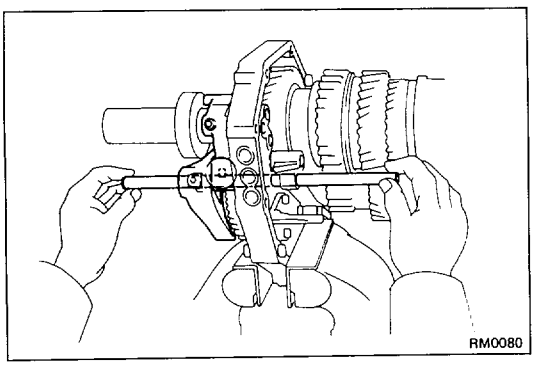


18. REMOVE NO. 3 SHIFT FORK SHAFT AND NO. 1 SHIFT FORK

(a) Pull out No. 3 shift fork shaft from the intermediate plate.

(b) Remove No. 1 shift fork.

(c) Using a magnetic finger, remove the interlock pin and locking ball from the shaft hole and intermediate plate.

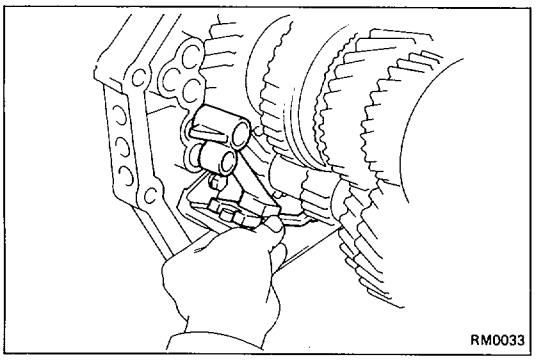


19. REMOVE NO. 4 SHIFT FORK SHAFT, NO. 3 SHIFT FORK AND REVERSE SHIFT HEAD

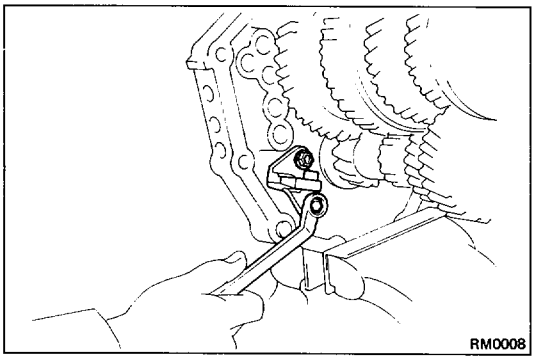
(a) Pull out No. 4 shift fork shaft from the intermediate plate.

(b) Remove the reverse shift head and locking ball.

(c) Remove No. 3 shift fork.

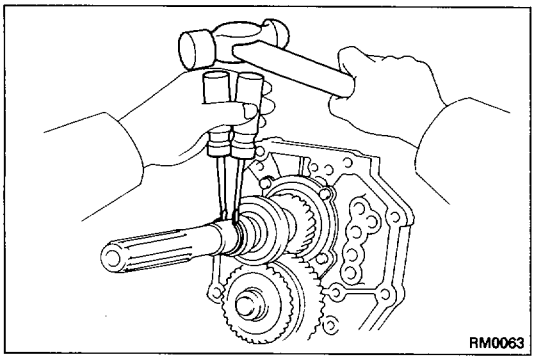


20. REMOVE REVERSE SHIFT ARM FROM REVERSE SHIFT ARM BRACKET



21. REMOVE REVERSE SHIFT ARM BRACKET

Remove the two bolts and the reverse shift arm bracket.

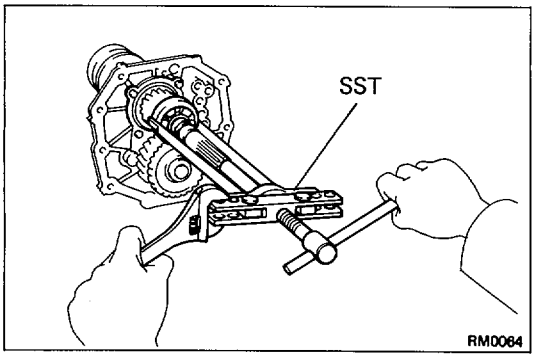


22. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using two screwdrivers and a hammer, tap out the rear snap ring.

(b) Remove the speedometer drive gear and ball.

(c) Using two screwdrivers and a hammer, tap out the front snap ring.

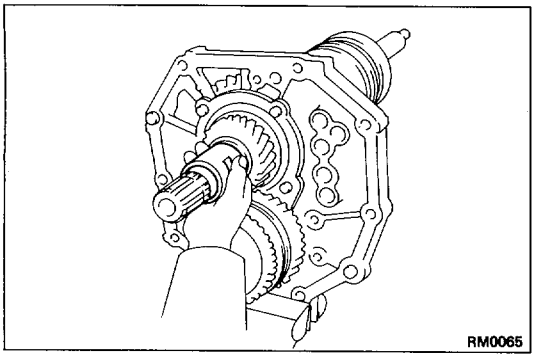


23. REMOVE OUTPUT SHAFT REAR BEARING

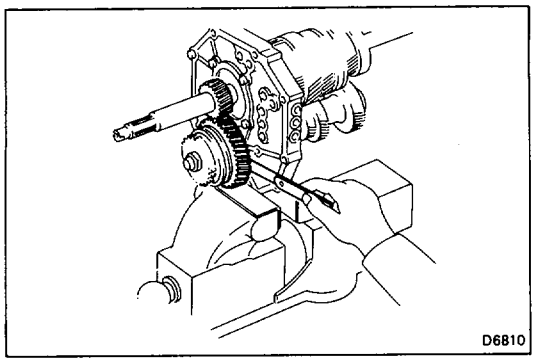
(a) Using two screwdrivers and a hammer, tap out the snap ring.

(b) Using SST, remove the rear bearing.

SST 09950-20017



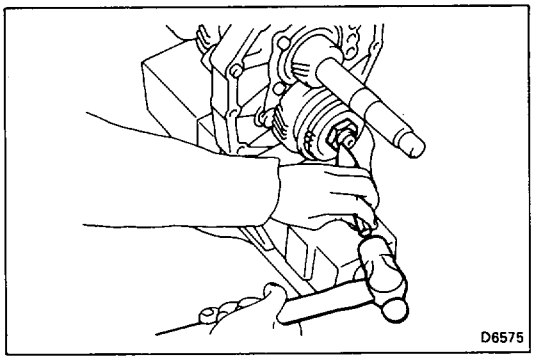
24. REMOVE SPACER



25. MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

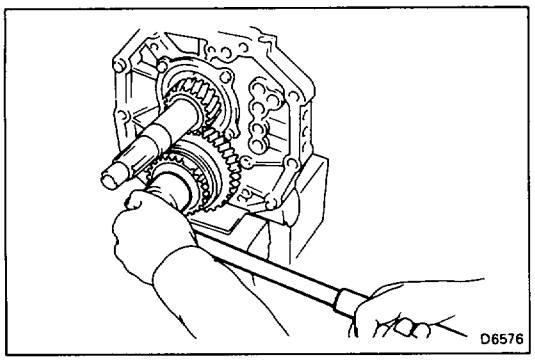
Standard clearance: **0.10 — 0.35 mm (0.0039 — 0.0138 in.)**
Maximum clearance: **0.40 mm (0.0157 in.)**



26. REMOVE NO. 5 GEAR SPLINE PIECE, SYNCHRONIZER RING, NEEDLE ROLLER BEARING AND COUNTER FIFTH GEAR WITH NO. 3 HUB SLEEVE

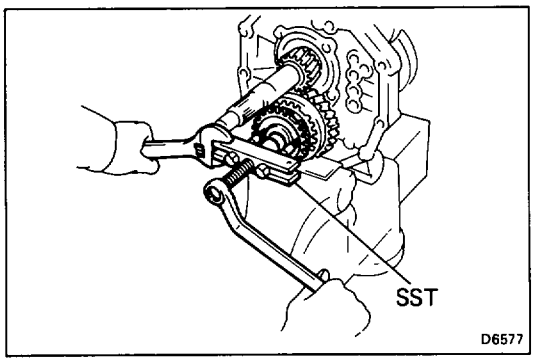
(a) Engage the gear double meshing.

(b) Using a hammer and chisel, loosen the staked part of the nut.



(c) Remove the lock nut.

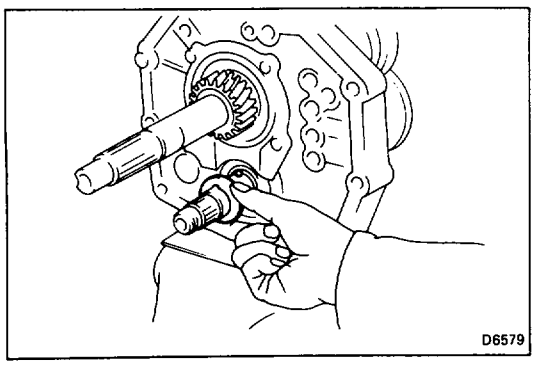
(d) Disengage the gear double meshing.



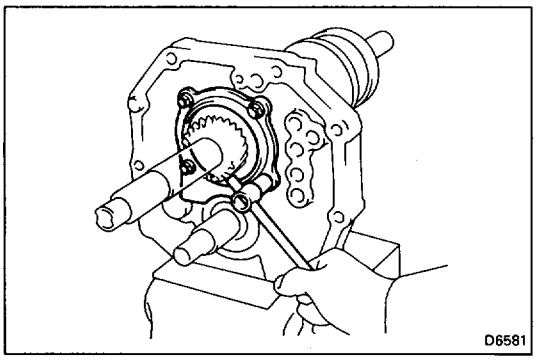
(e) Using SST, remove No. 5 gear spline piece.

SST 09213-31021

(f) Remove the counter 5th gear with No. 3 hub sleeve.

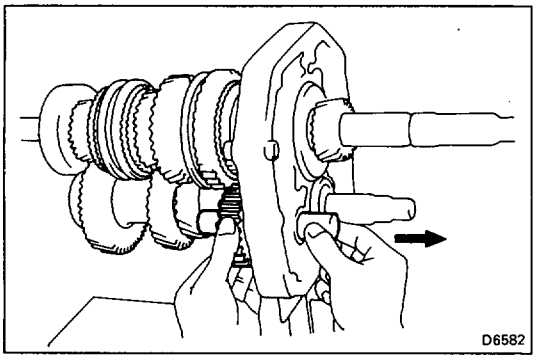


27. REMOVE THRUST WASHER AND BALL



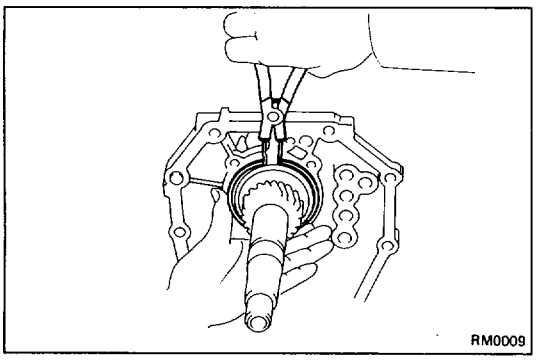
28. REMOVE REAR BEARING RETAINER

Remove the four bolts and rear bearing retainer.



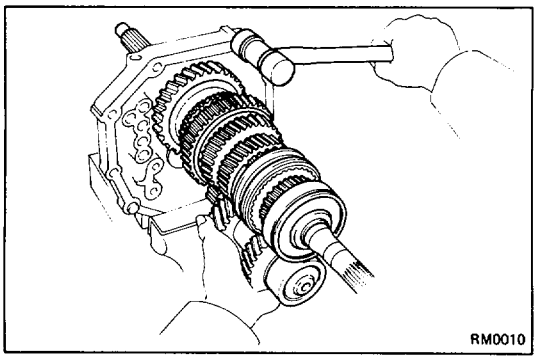
29. REMOVE REVERSE IDLER GEAR AND SHAFT

Pull out the shaft toward the rear.



30. REMOVE BEARING SNAP RING

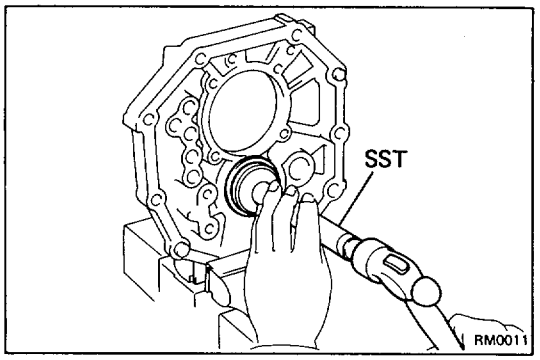
Using snap ring pliers, remove the snap ring.



31. REMOVE OUTPUT SHAFT, COUNTER GEAR AND INPUT SHAFT AS A UNIT FROM INTERMEDIATE PLATE

(a) Remove the output shaft, counter gear and input shaft as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

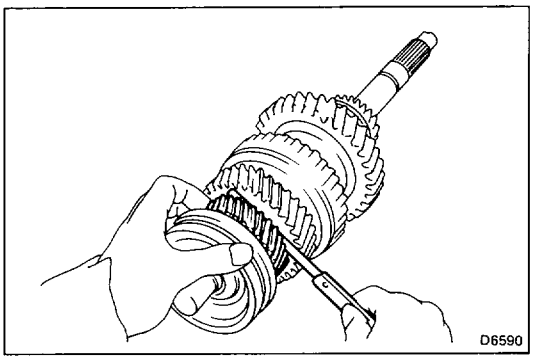
(b) Remove the input shaft with the needle roller bearing from the output shaft.



32. REMOVE COUNTER REAR BEARING FROM INTERMEDIATE PLATE

Using SST, remove the counter rear bearing.

SST 09608-12010 (09608-00020, 09608-00050)



33. MEASURE EACH GEAR THRUST CLEARANCE

Measure the thrust clearance of each gear.

1st gear

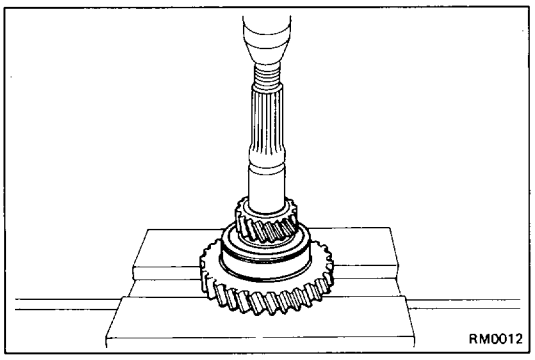
Standard clearance: 0.10 — 0.45 mm (0.0039 — 0.0177 in.)

Maximum clearance: 0.50 mm (0.0197 in.)

2nd and 3rd gears

Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)

Maximum clearance: 0.30 mm (0.0118 in.)

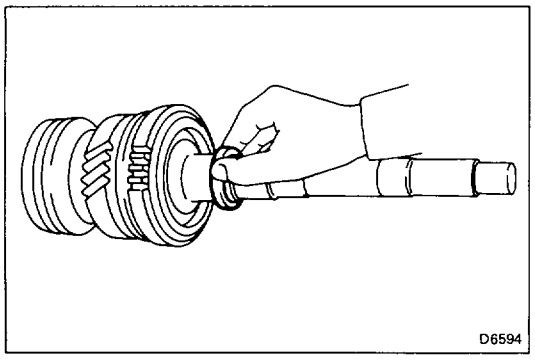


34. REMOVE FIFTH GEAR, CENTER BEARING AND FIRST GEAR ASSEMBLY

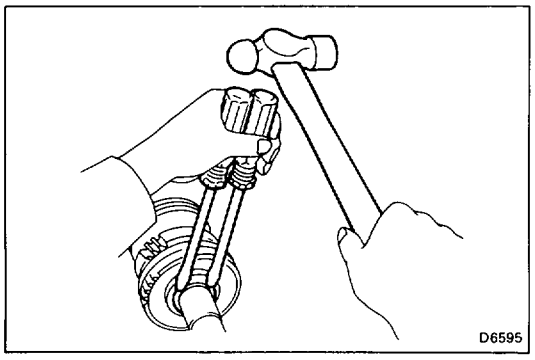
(a) Using a press, remove the 5th gear, center bearing, thrust washer and 1st gear.

(b) Remove the synchronizer ring.

(c) Remove the straight pin and needle roller bearing.

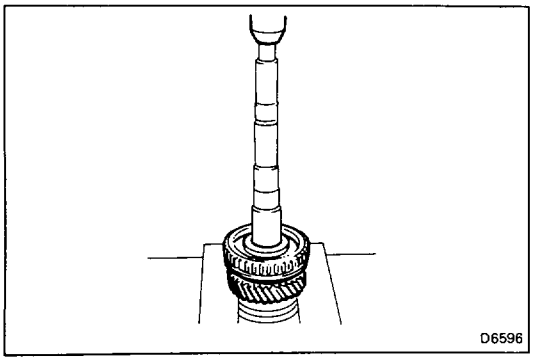


(d) Remove the spacer.



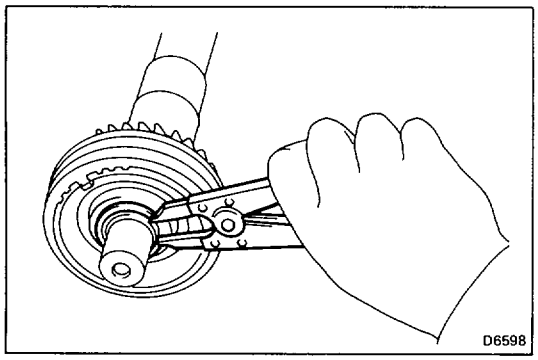
35. REMOVE NO. 1 HUB SLEEVE ASSEMBLY AND SECOND GEAR ASSEMBLY

(a) Using two screwdrivers and a hammer, tap out the snap ring.



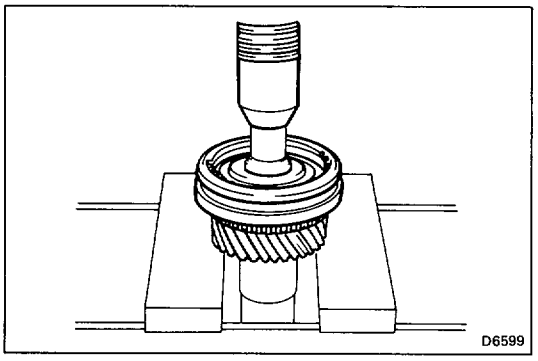
(b) Using a press, remove No. 1 hub sleeve, synchronizer ring and 2nd gear.

(c) Remove the needle roller bearing.



36. REMOVE NO. 2 HUB SLEEVE ASSEMBLY AND THIRD GEAR ASSEMBLY

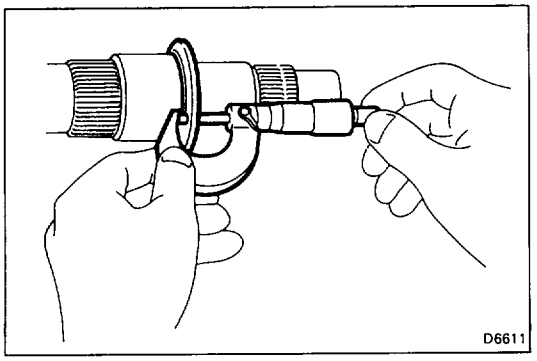
(a) Using snap ring pliers, remove the snap ring.



(b) Using a press, remove No. 2 hub sleeve, synchronizer ring and 3rd gear.

(c) Remove the needle roller bearing.

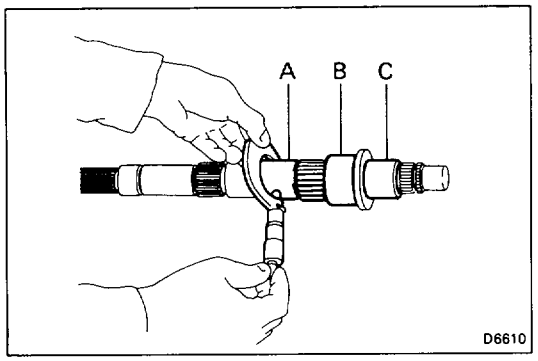
INSPECTION OF TRANSMISSION COMPONENTS



1. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the output shaft flange thickness.

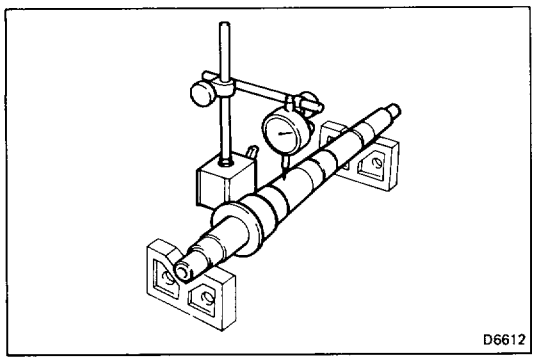
Minimum thickness: 4.70 mm (0.1850 in.)



(b) Using a micrometer, measure the outer diameter of the output shaft journal.

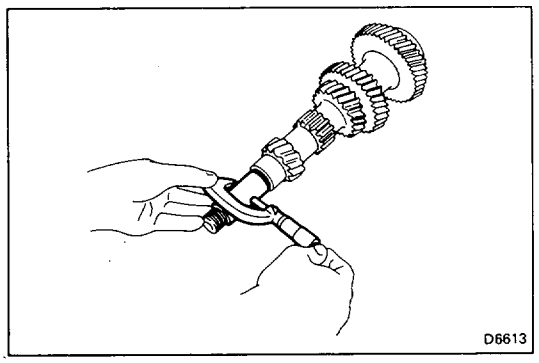
Minimum diameter:

A 1st gear 38.860 mm (1.5299 in.)
B 2nd gear 46.860 mm (1.8449 in.)
C 3rd gear 37.860 mm (1.4905 in.)



(c) Using a dial indicator, check the shaft runout.

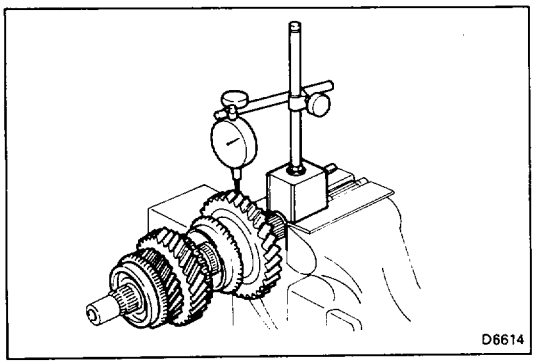
Maximum runout: 0.06 mm (0.0024 in.)



2. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of the counter gear journal.

Minimum diameter: 27.860 mm (1.0968 in.)

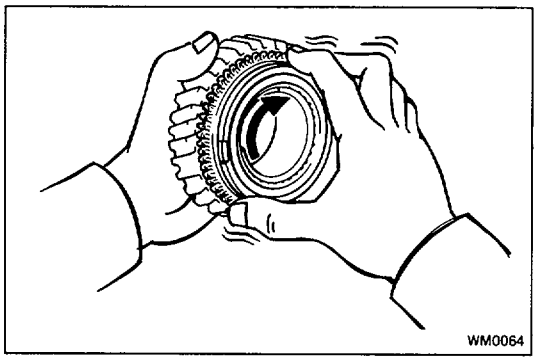


3. CHECK OIL CLEARANCE OF EACH GEAR

Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

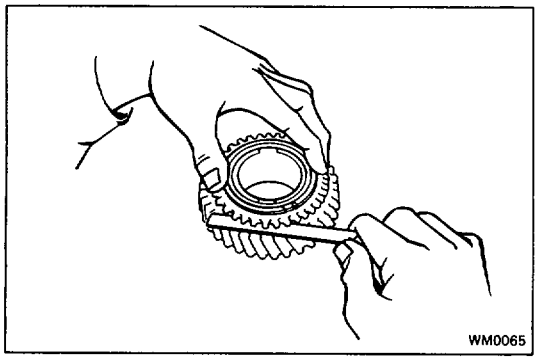
Standard clearance: 0.015 — 0.068 mm (0.0006 — 0.0027 in.)
Maximum clearance: 0.16 mm (0.0063 in.)

If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



4. INSPECT SYNCHRONIZER RINGS

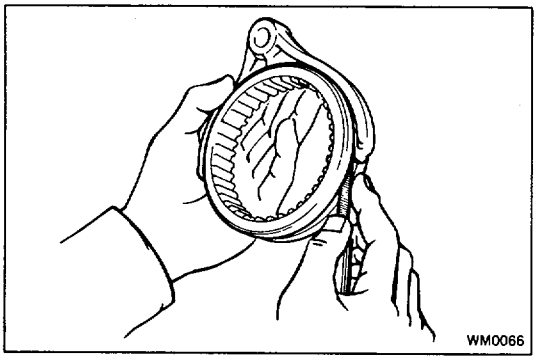
(a) Turn the ring and push it in to check the braking action.



(b) Measure the clearance between the synchronizer ring back and the gear spline end.

Standard clearance: 0.8 – 1.6 mm (0.031 – 0.063 in.)
Minimum clearance: 0.6 mm (0.024 in.)

If the clearance is less than the limit, replace the synchronizer ring.

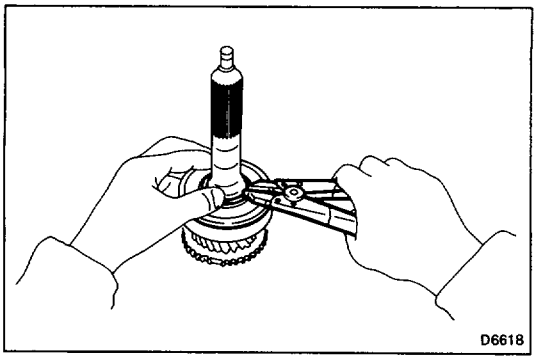


5. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

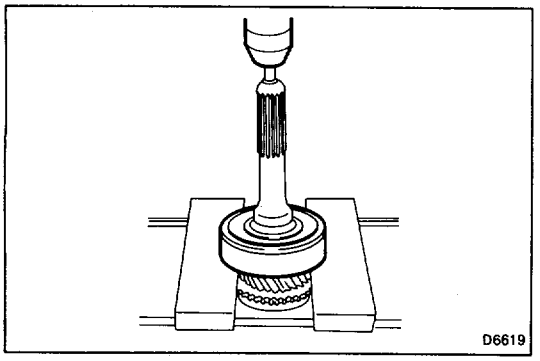
Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

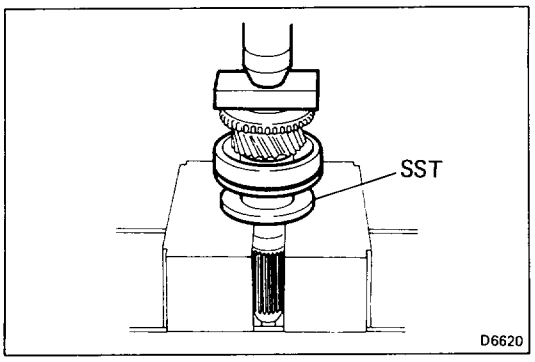


6. IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

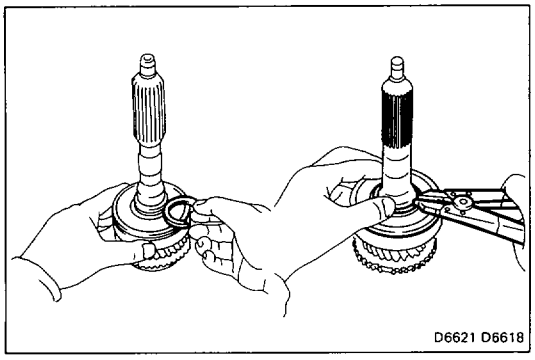


(b) Using a press, remove the bearing.



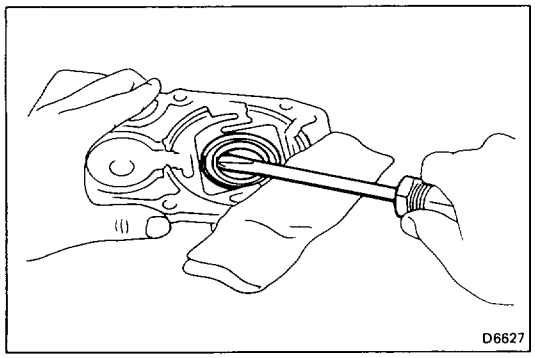
(c) Using a press and SST, install a new bearing.

SST 09506-35010



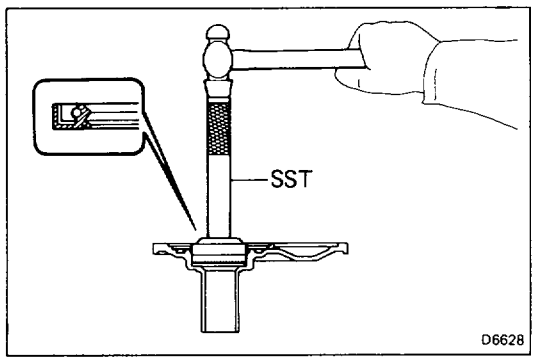
(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)



7. IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

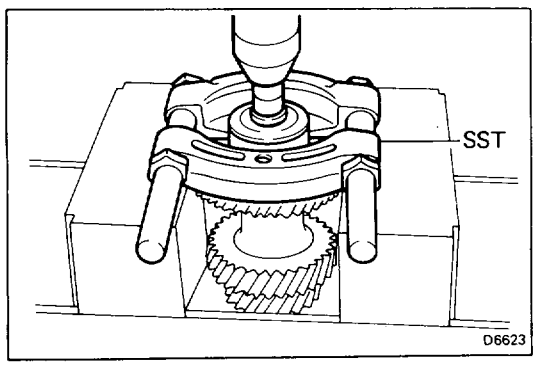
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST, drive in a new oil seal.

SST 09608-35014 (09608-06020, 09608-06090)

Drive in depth: 11.2 – 12.2 mm (0.444 – 0.484 in.)
Transmission case installation surface



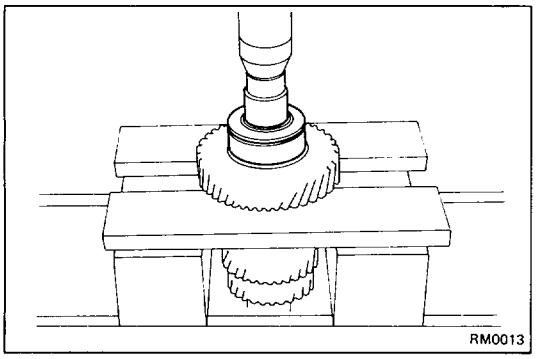
8. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING

(a) Using snap ring pliers, remove the snap ring.

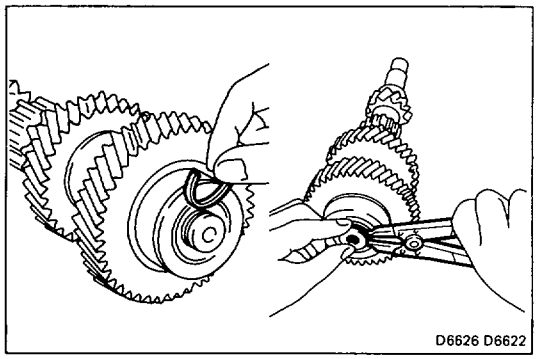
(b) Using SST, press out the bearing.

SST 09950-00020

(c) Replace the side race.

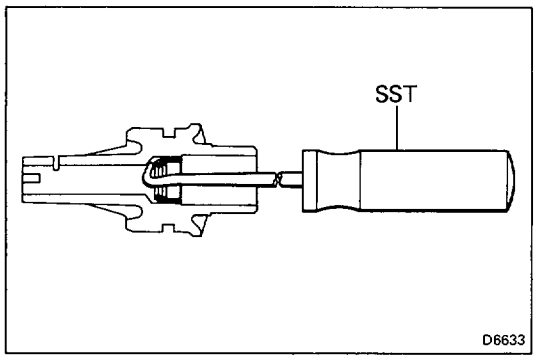


(d) Using a 24-mm socket wrench, press in the bearing and inner race.



(e) Select a snap ring that will allow minimum axial play and install it on the shaft.

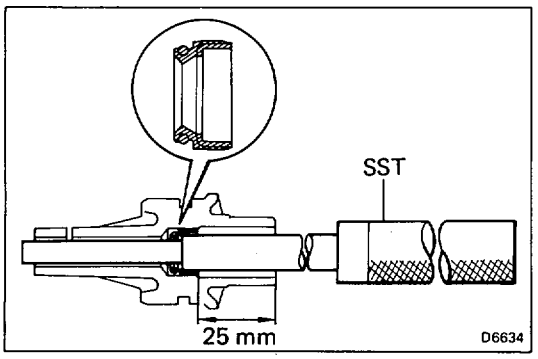
Mark	Thickness mm (in.)
A	2.00 – 2.05 (0.0787 – 0.0807)
B	2.05 – 2.10 (0.0807 – 0.0827)
C	2.10 – 2.15 (0.0827 – 0.0846)
D	2.15 – 2.20 (0.0846 – 0.0866)
E	2.20 – 2.25 (0.0866 – 0.0886)



9. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, pull out the oil seal.

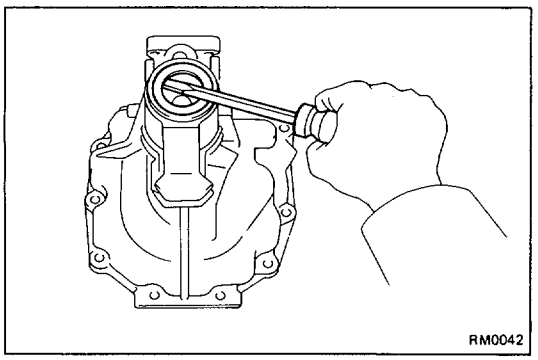
SST 09921-00010



(b) Using SST, drive in a new oil seal into the sleeve.

SST 09201-60011

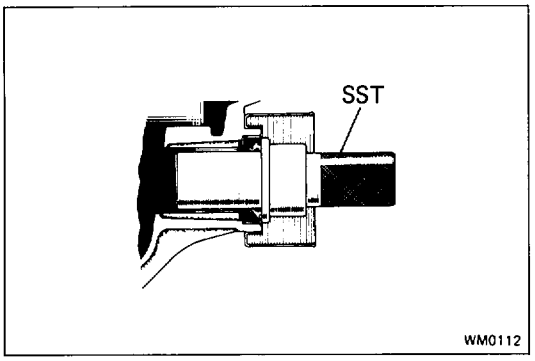
Drive in depth: 25 mm (0.98 in.)



10. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Remove the dust deflector.

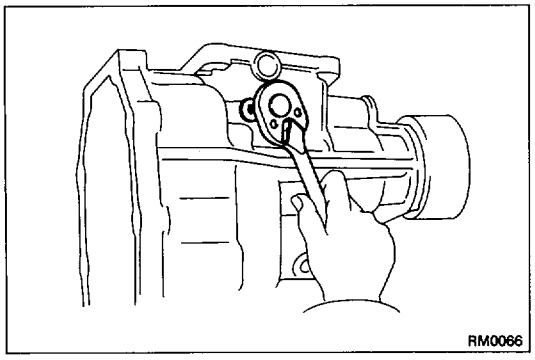
(b) Using a screwdriver, pry out the oil seal.



(c) Using SST, drive in a new oil seal.

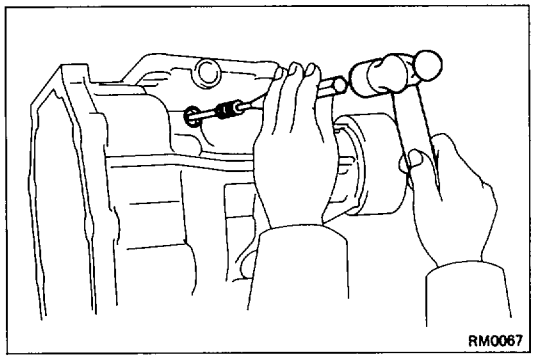
SST 09325-20010

(d) Install the dust deflector.



11. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Using a torx socket wrench, remove the screw plug.



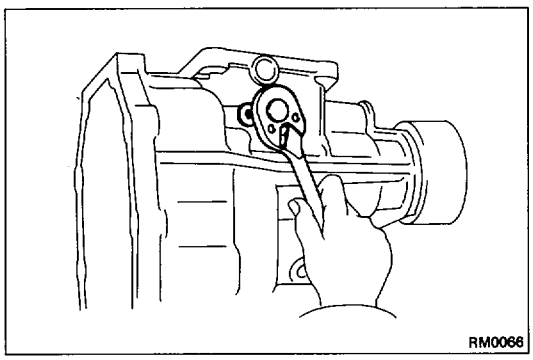
(b) Using a pin punch and hammer, drive out the slotted spring pin.

(c) Replace the reverse restrict pin.

(d) Using a pin punch and hammer, drive in the slotted spring pin.

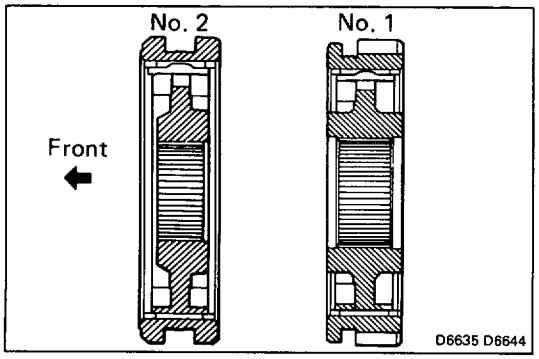
(e) Apply liquid sealer to the plug threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



(f) Using a torx socket wrench, install and torque the screw plug.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)



ASSEMBLY OF TRANSMISSION

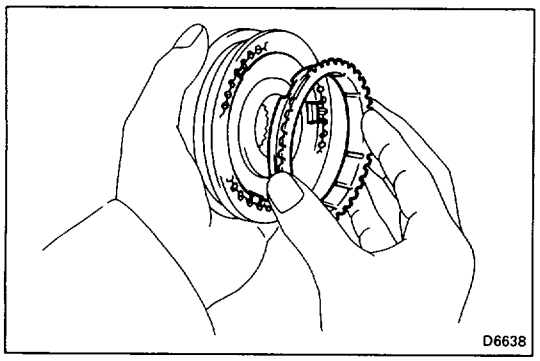
(See pages MT-69, 70)

1. INSERT NO. 1 AND NO. 2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

CAUTION: Install the key springs positioned so that their end gaps are not in line.

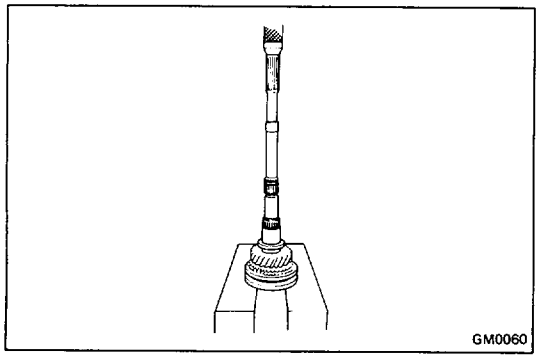


2. INSTALL THIRD GEAR AND NO. 2 HUB SLEEVE ON OUTPUT SHAFT

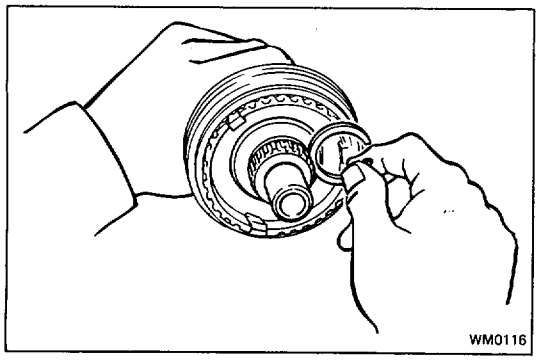
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 3rd gear.



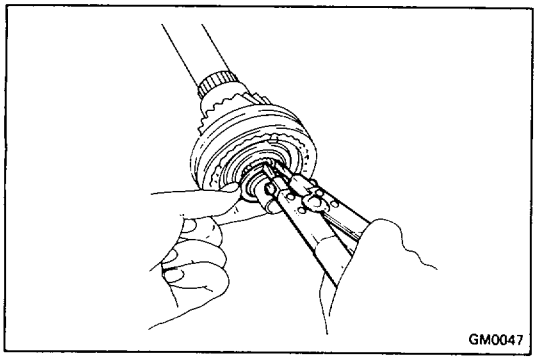
(d) Using a press, install the 3rd gear and No. 2 hub sleeve.



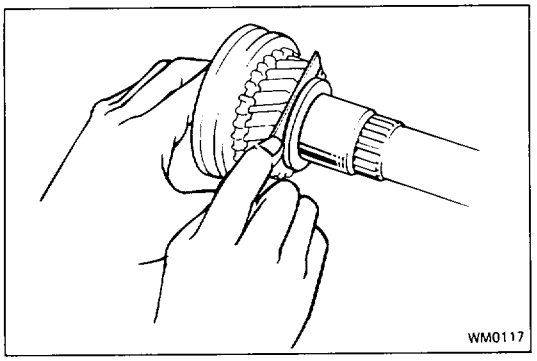
3. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	1.80 – 1.85 (0.0709 – 0.0728)
B	1.85 – 1.90 (0.0728 – 0.0748)
C	1.90 – 1.95 (0.0748 – 0.0768)
D	1.95 – 2.00 (0.0768 – 0.0787)
E	2.00 – 2.05 (0.0787 – 0.0807)
F	2.05 – 2.10 (0.0807 – 0.0827)
G	2.10 – 2.15 (0.0827 – 0.0846)



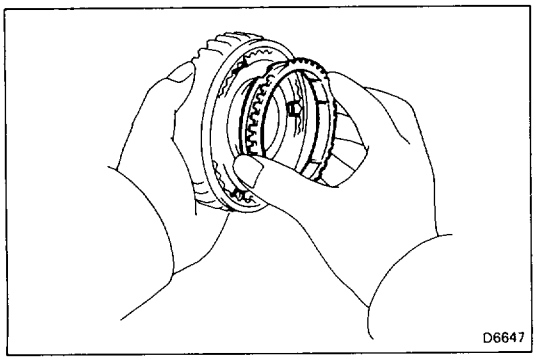
(b) Using snap ring pliers, install the snap ring.



4. MEASURE THIRD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)

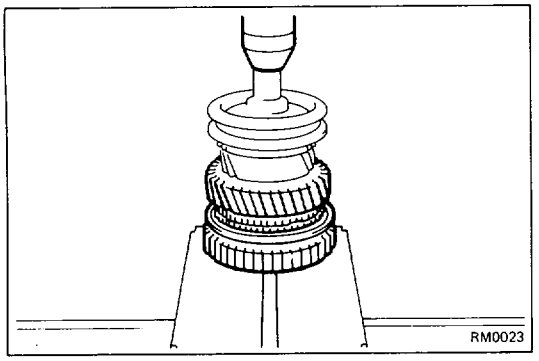


5. INSTALL SECOND GEAR AND NO. 1 HUB SLEEVE

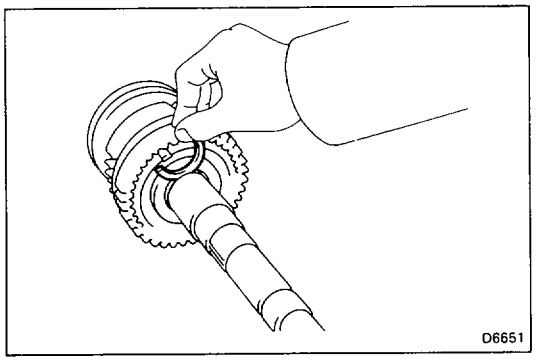
(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 2nd gear.



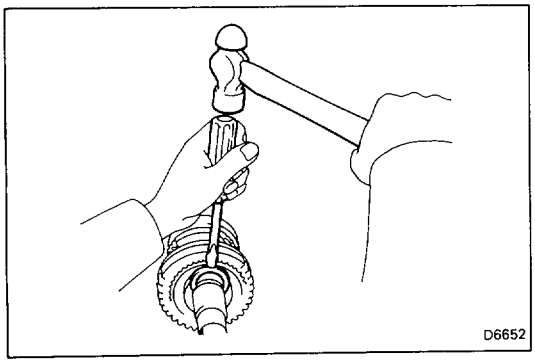
(d) Using a press, install the 2nd gear and No. 1 hub sleeve.



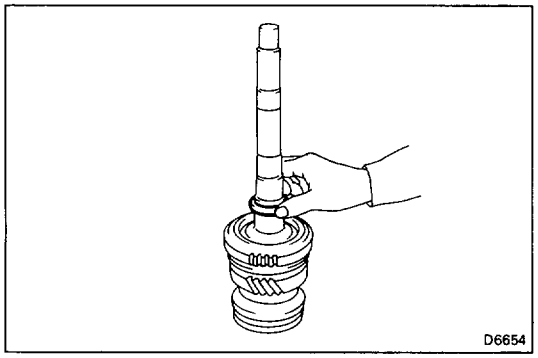
6. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.30 — 2.35 (0.0906 — 0.0925)
B	2.35 — 2.40 (0.0925 — 0.0945)
C	2.40 — 2.45 (0.0945 — 0.0965)
D	2.45 — 2.50 (0.0965 — 0.0984)
E	2.50 — 2.55 (0.0984 — 0.1004)
F	2.55 — 2.60 (0.1004 — 0.1024)
G	2.60 — 2.65 (0.1024 — 0.1043)

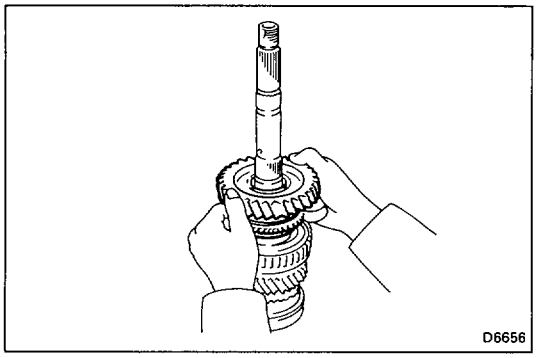


(b) Using a screwdriver and hammer, install the snap ring.



7. INSTALL SPACER AND FIRST GEAR ASSEMBLY

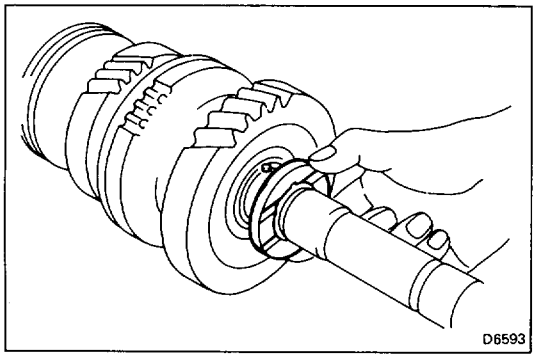
(a) Install the spacer on the output shaft.



(b) Apply gear oil to the needle roller bearing.

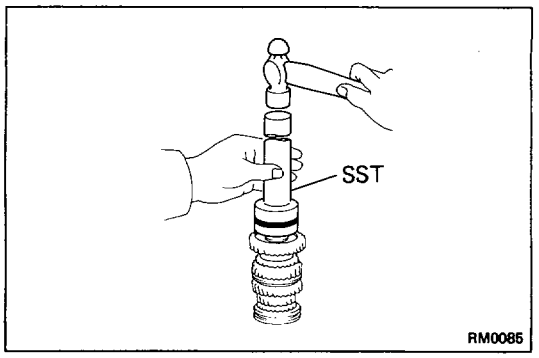
(c) Assemble the 1st gear, synchronizer ring and needle roller bearing.

(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.



8. INSTALL STRAIGHT PIN AND FIRST GEAR THRUST WASHER

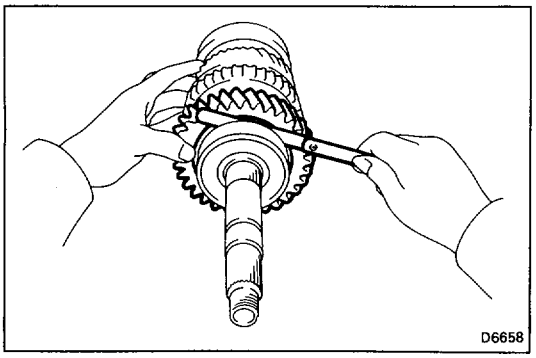
Install the 1st gear thrust washer onto the output shaft with the straight pin aligned with the 1st gear thrust washer.



9. INSTALL OUTPUT SHAFT CENTER BEARING

Using SST, drive in the bearing with the outer race snap ring groove toward the rear.

SST 09309-35010

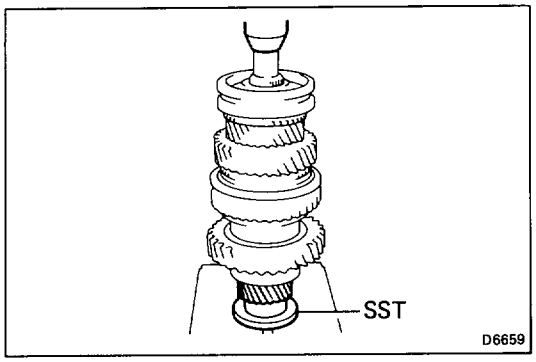


10. MEASURE FIRST AND SECOND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st and 2nd gear thrust clearance.

Standard clearance:

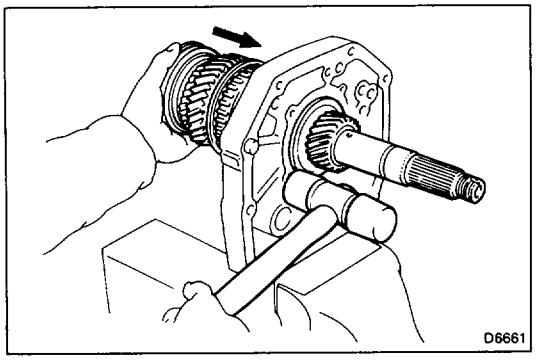
1st gear 0.10 — 0.45 mm (0.0039 — 0.0177 in.)
2nd gear 0.10 — 0.25 mm (0.0039 — 0.0098 in.)



11. INSTALL FIFTH GEAR

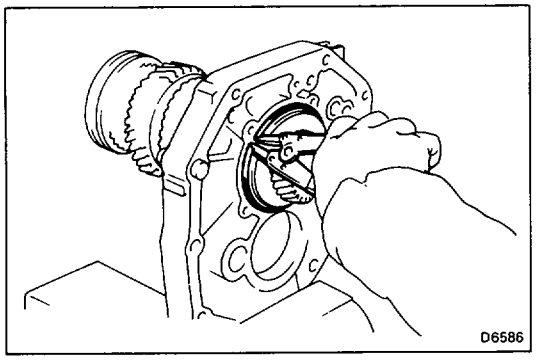
Using SST and a press, install the 5th gear.

SST 09316-60010 (09316-00030)

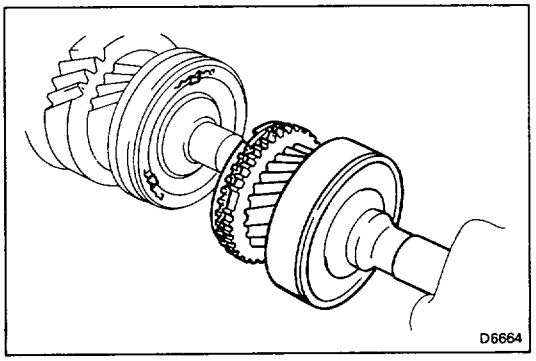


12. INSTALL OUTPUT SHAFT TO INTERMEDIATE PLATE

(a) Install the output shaft into the intermediate plate by pushing on the output shaft and tapping on the intermediate plate.



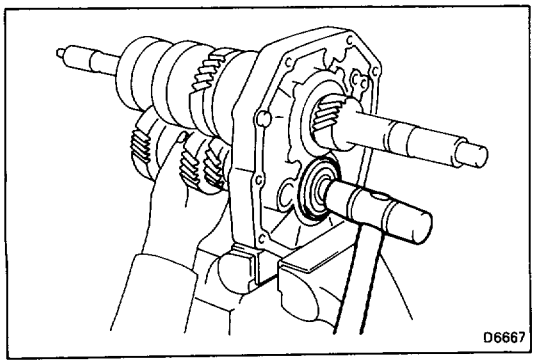
(b) Using snap ring pliers, install the snap ring.



13. INSTALL INPUT SHAFT

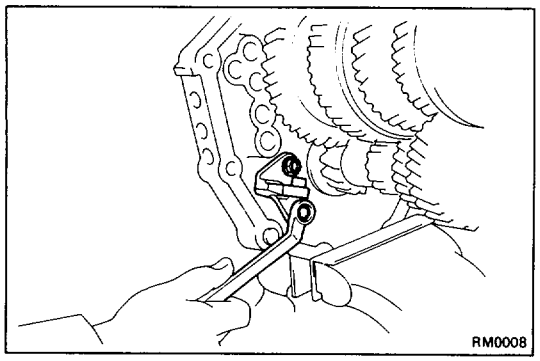
(a) Apply gear oil to the needle roller bearing and install it into the input shaft.

(b) Install the input shaft to the output shaft with the synchronizer ring slots aligned with the shifting keys.



14. INSTALL COUNTER GEAR

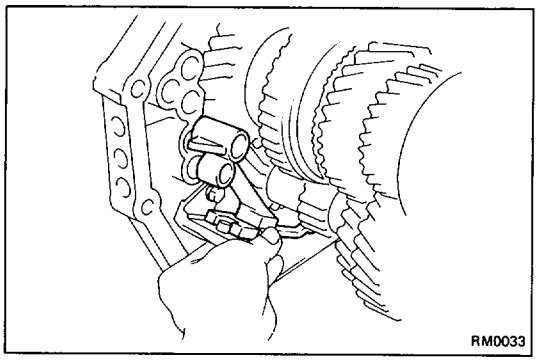
Install the counter gear into the intermediate plate while holding the counter gear, and install the counter rear bearing with a plastic hammer.



15. INSTALL REVERSE SHIFT ARM BRACKET

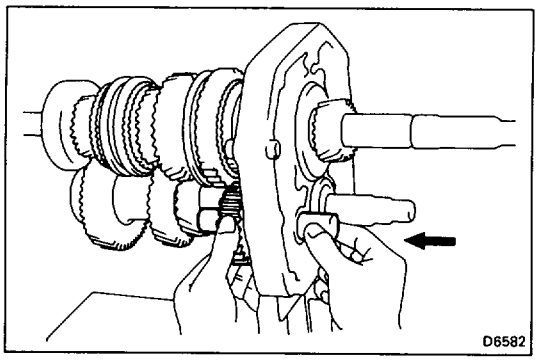
Install the reverse shift arm bracket and torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)



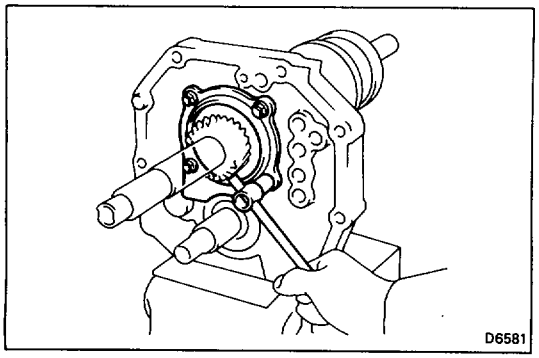
16. INSTALL REVERSE SHIFT ARM TO REVERSE SHIFT ARM BRACKET

Install the reverse shift arm to the pivot of the reverse shift arm bracket.



17. INSTALL REVERSE IDLER GEAR AND SHAFT

Align the reverse shift arm shoe to the reverse idler gear groove and insert the reverse idler gear shaft to the intermediate plate.

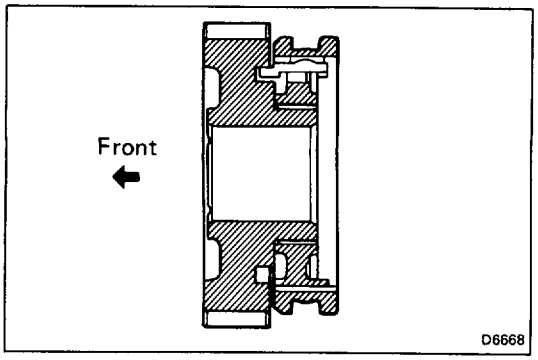


18. INSTALL REAR BEARING RETAINER

(a) Align the rear bearing retainer to the reverse idler gear shaft groove.

(b) Install and torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

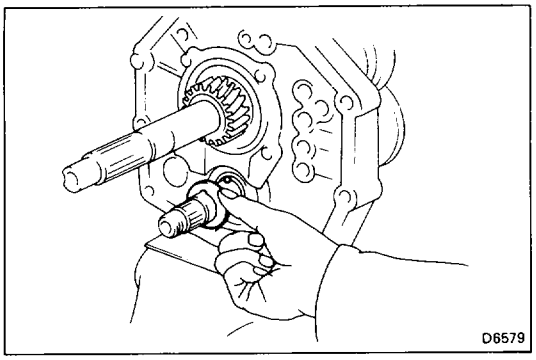


19. INSERT COUNTER FIFTH GEAR INTO NO. 3 HUB SLEEVE

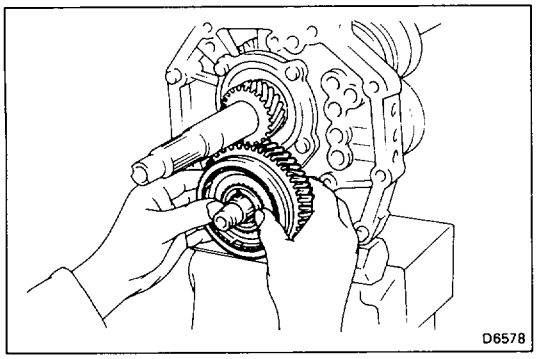
(a) Install the shifting keys and No. 3 hub sleeve onto the counter 5th gear.

(b) Install the shifting key springs under the shifting keys.

CAUTION: Install the key springs positioned so that their end gaps are not in line.



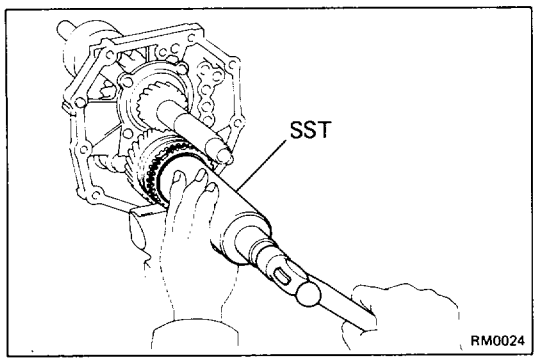
20. INSTALL BALL AND THRUST WASHER



21. INSTALL COUNTER FIFTH GEAR WITH NO. 3 HUB SLEEVE ASSEMBLY AND NEEDLE ROLLER BEARINGS

(a) Apply gear oil to the needle roller bearings.

(b) Install the counter 5th gear with No. 3 hub sleeve and needle roller bearings.



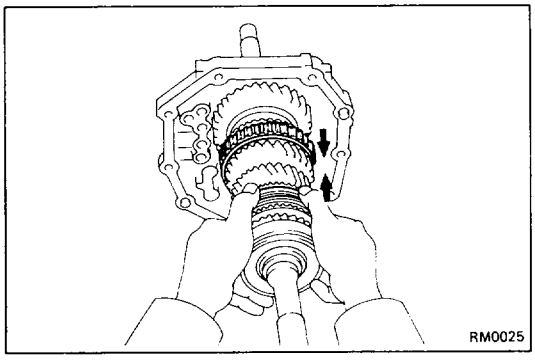
22. INSTALL SYNCHRONIZER RING AND NO. 5 GEAR SPLINE PIECE

(a) Install the synchronizer ring on No. 5 gear spline piece.

(b) Using SST, drive in No. 5 gear spline piece with the synchronizer ring slots aligned with the shifting keys.

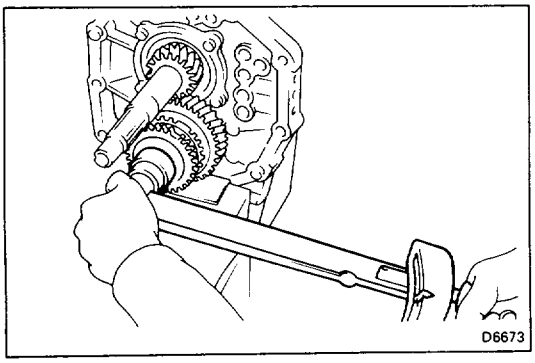
SST 09316-60010 (09316-00010)

NOTE: When installing No. 5 gear spline piece, support the counter gear in front with a 3-5 lb hammer or equivalent.



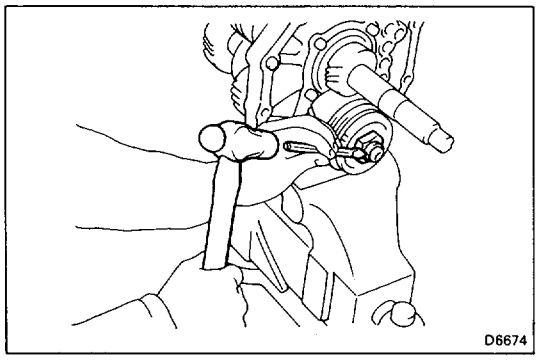
23. INSTALL LOCK NUT

(a) Engage the gear double meshing.



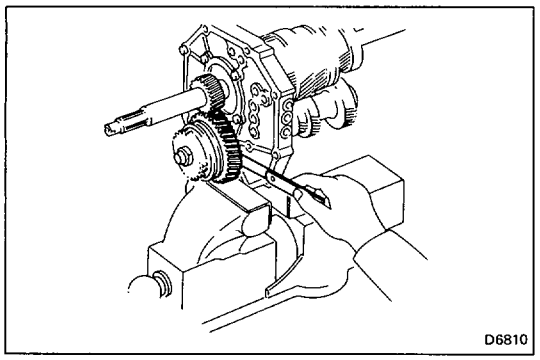
(b) Install and torque the lock nut.

Torque: 1,300 kg-cm (94 ft-lb, 127 N·m)


D6674

(c) Stake the lock nut.

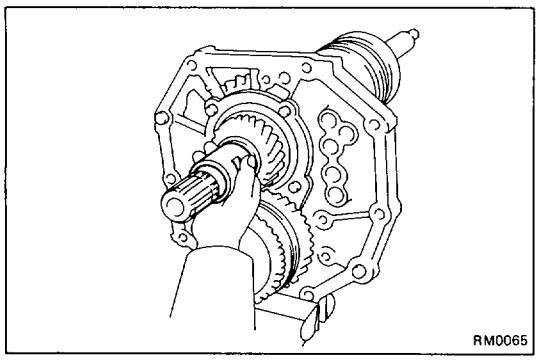
(d) Disengage the gear double meshing.


D6810

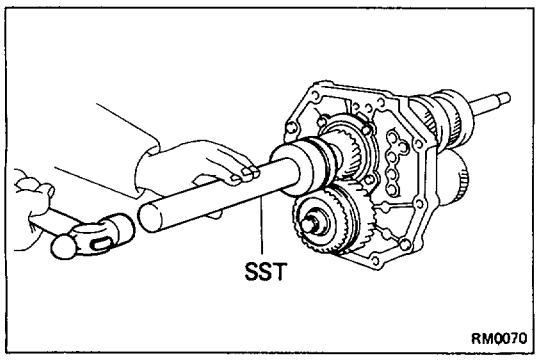
24. MEASURE COUNTER FIFTH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance: 0.10 — 0.35 mm (0.0039 — 0.0138 in.)


RM0065

25. INSTALL SPACER

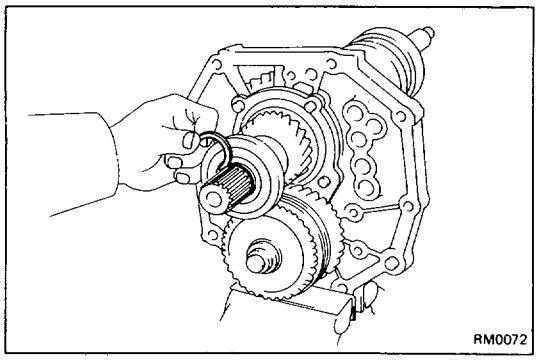


RM0070

26. INSTALL OUTPUT SHAFT REAR BEARING

Using SST, drive in the rear bearing.

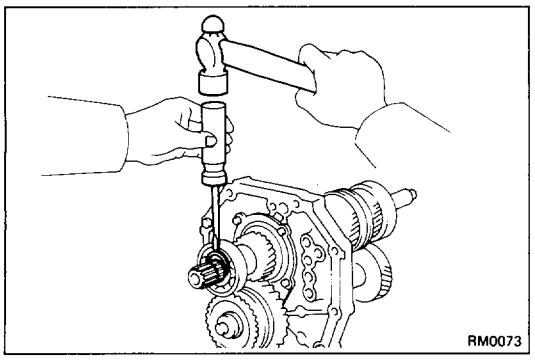
SST 09309-35010


RM0072

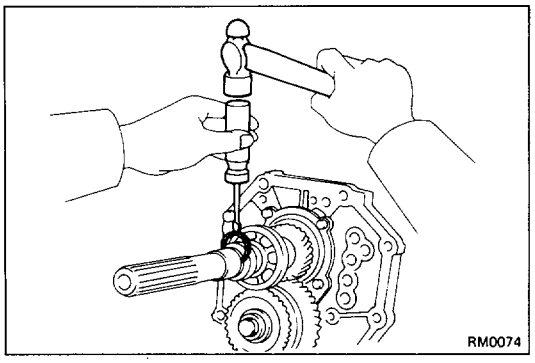
27. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.65 — 2.70 (0.1043 — 0.1063)	K	3.10 — 3.15 (0.1220 — 0.1240)
B	2.70 — 2.75 (0.1063 — 0.1083)	L	3.15 — 3.20 (0.1240 — 0.1260)
C	2.75 — 2.80 (0.1083 — 0.1102)	M	3.20 — 3.25 (0.1260 — 0.1280)
D	2.80 — 2.85 (0.1102 — 0.1122)	N	3.25 — 3.30 (0.1280 — 0.1299)
E	2.85 — 2.90 (0.1122 — 0.1142)	P	3.30 — 3.35 (0.1299 — 0.1319)
F	2.90 — 2.95 (0.1142 — 0.1161)	Q	3.35 — 3.40 (0.1319 — 0.1339)
G	2.95 — 3.00 (0.1161 — 0.1181)	R	3.40 — 3.45 (0.1339 — 0.1358)
H	3.00 — 3.05 (0.1181 — 0.1201)	S	3.45 — 3.50 (0.1358 — 0.1378)
J	3.05 — 3.10 (0.1201 — 0.1220)		



(b) Using a screwdriver and hammer, install the snap ring.

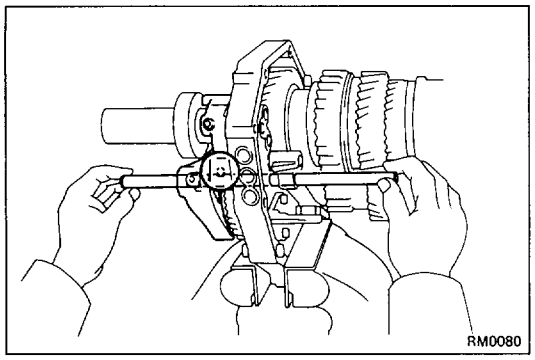


28. INSTALL SPEEDOMETER DRIVE GEAR

(a) Using a screwdriver and hammer, install the front snap ring.

(b) Install the ball and drive gear.

(c) Using a screwdriver and hammer, install the rear snap ring.

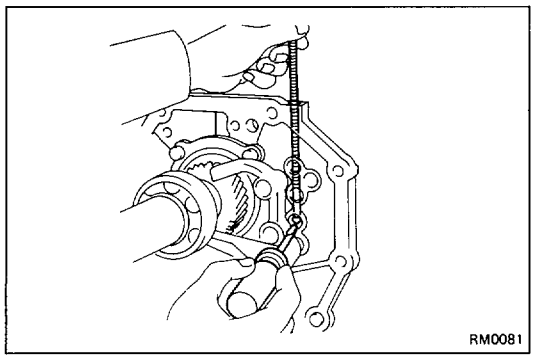


29. INSTALL NO. 4 SHIFT FORK SHAFT, REVERSE SHIFT HEAD AND NO. 3 SHIFT FORK

(a) Place No. 3 shift fork into the groove of No. 3 hub sleeve.

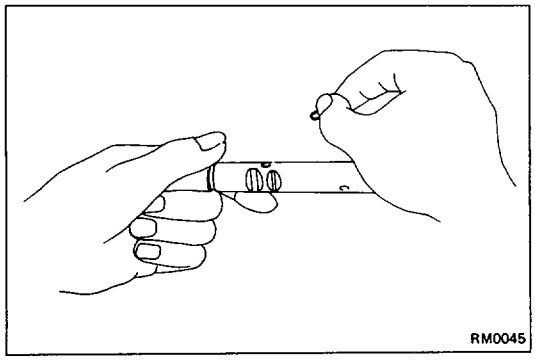
(b) Install No. 4 shift fork shaft to No. 3 shift fork, reverse shift head and shift fork through the intermediate plate.

(c) Install the locking ball into the reverse shift head.

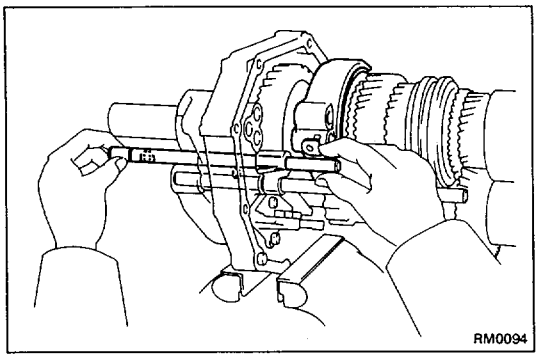


30. INSTALL NO. 3 SHIFT FORK SHAFT AND NO. 1 SHIFT FORK

(a) Using a magnetic finger and screwdriver, install the locking ball into the intermediate plate.

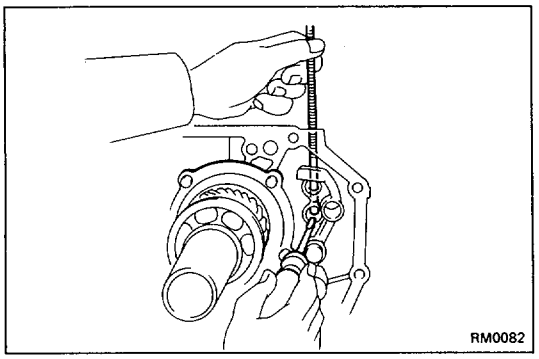


(b) Install the interlock pin into the shaft hole.



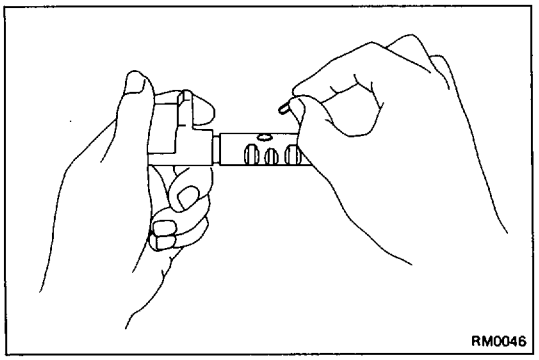
(c) Place No. 1 shift fork into the groove of No. 1 hub sleeve.

(d) Install No. 3 fork shaft to the reverse shift fork and shift head through the intermediate plate.

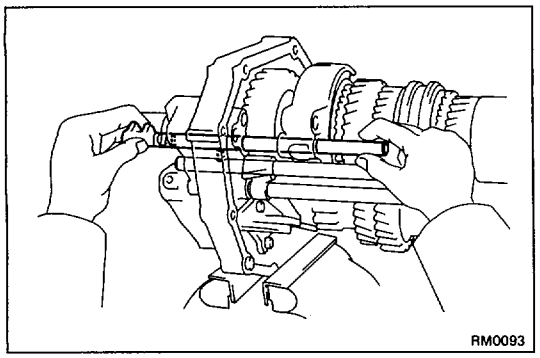


31. INSTALL NO. 1 SHIFT FORK SHAFT

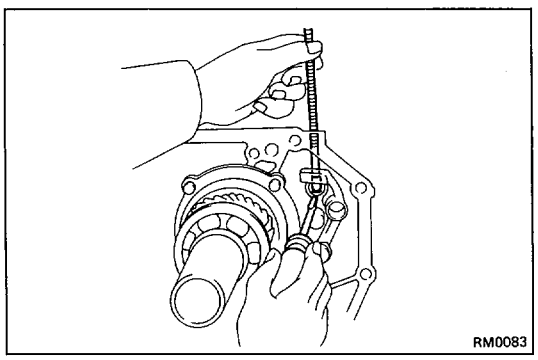
(a) Using a magnetic finger and screwdriver, install the interlock pin into the intermediate plate.



(b) Install the interlock pin into the shaft hole.

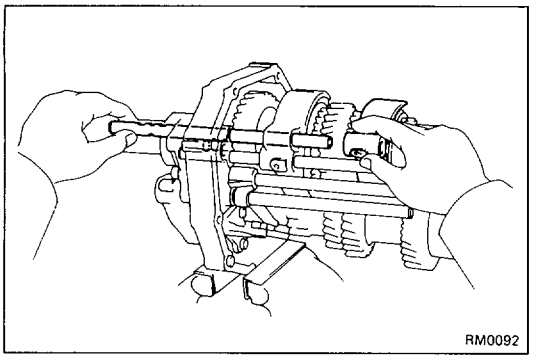


(c) Install No. 1 fork shaft to No. 1 shift fork through the intermediate plate.



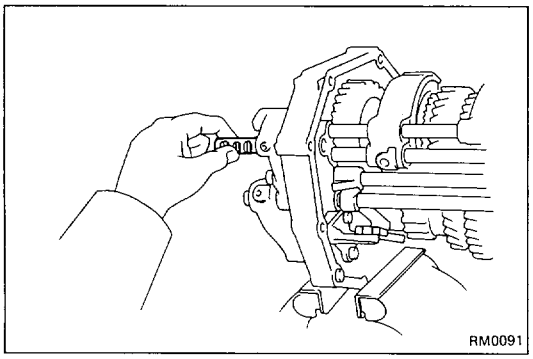
32. INSTALL NO. 2 SHIFT FORK SHAFT AND SHIFT FORK

(a) Using a magnetic finger and screwdriver, install the interlock pin into the intermediate plate.



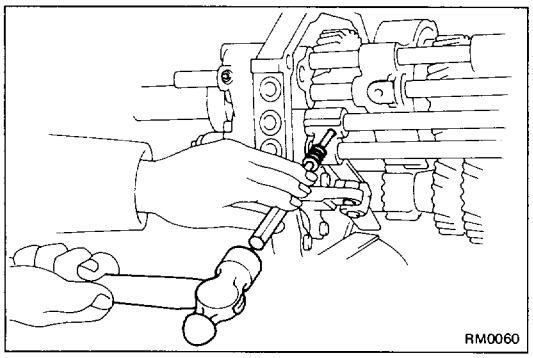
(b) Place No. 2 shift fork into the groove of No. 2 hub sleeve.

(c) Install No. 2 fork shaft to No. 1 and No. 2 shift forks through the intermediate plate.



33. INSTALL NO. 5 SHIFT FORK SHAFT

Install No. 5 shift fork shaft to the reverse shift head through the intermediate plate.



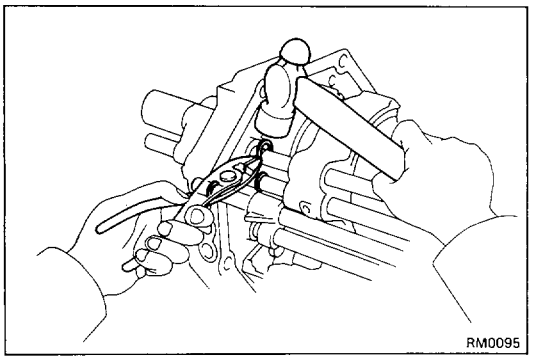
34. INSTALL SLOTTED SPRING PINS

Using a pin punch and hammer, drive in the two slotted spring pins to the reverse shift head and shift fork.

35. CHECK INTERLOCK

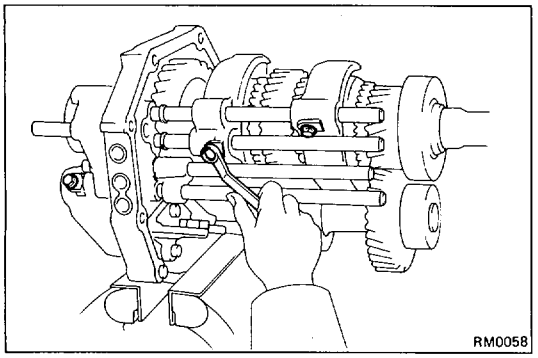
(a) Shift No. 1 fork shaft to the 1st speed position.

(b) No. 2, No. 3, No. 4 and No. 5 fork shafts should not move.



36. INSTALL SNAP RINGS

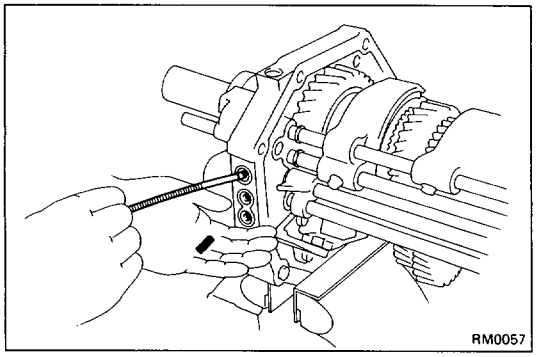
Using pliers and a hammer, install the three snap rings.



37. INSTALL SET BOLTS

Install and torque the three bolts.

Torque: 200 kg-cm (14 ft-lb, 20 N·m)

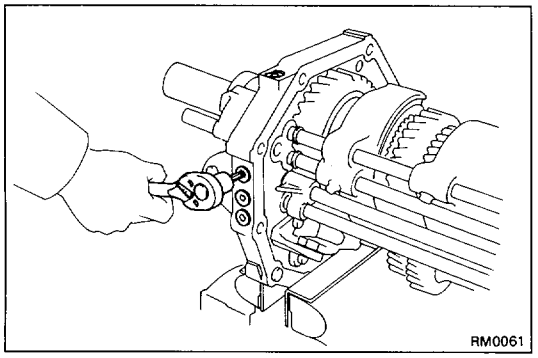


38. INSTALL LOCKING BALLS, SPRINGS AND SCREW PLUGS

(a) Apply liquid sealer to the plug threads.

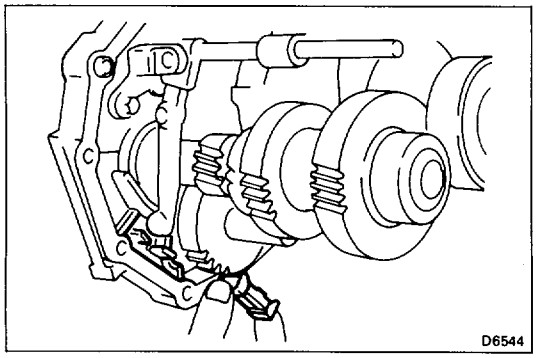
Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the four locking balls, springs and screw plugs.



(c) Using a torx socket wrench, torque the screw plugs.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)

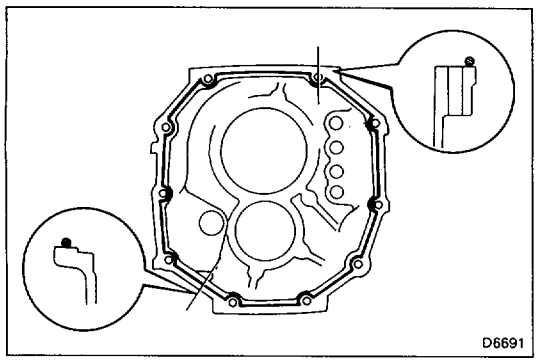


39. INSTALL MAGNET TO INTERMEDIATE PLATE

40. DISMOUNT INTERMEDIATE PLATE FROM VISE

(a) Dismount the intermediate plate from the vise.

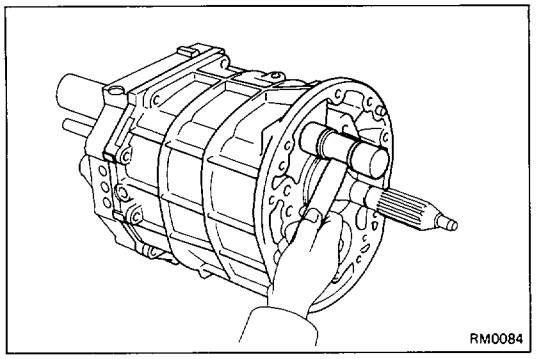
(b) Remove the bolts, nuts and plate washers.



41. INSTALL TRANSMISSION CASE

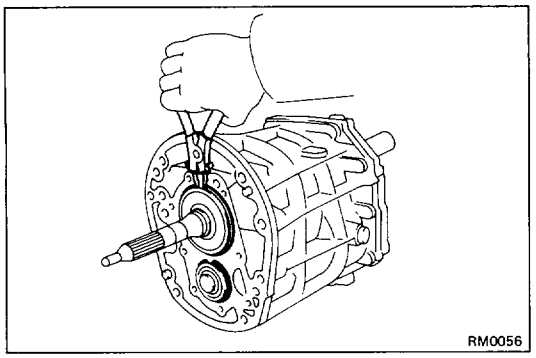
(a) Apply seal packing to the transmission case as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent



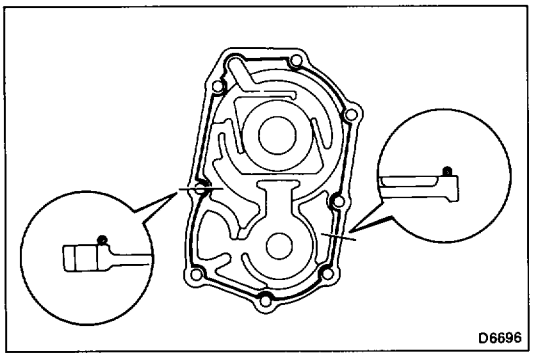
(b) Align each bearing outer race, each fork shaft end and reverse idler gear shaft end with the case installation holes, and install the case.

If necessary, tap on the case with a plastic hammer.



42. INSTALL BEARING SNAP RINGS

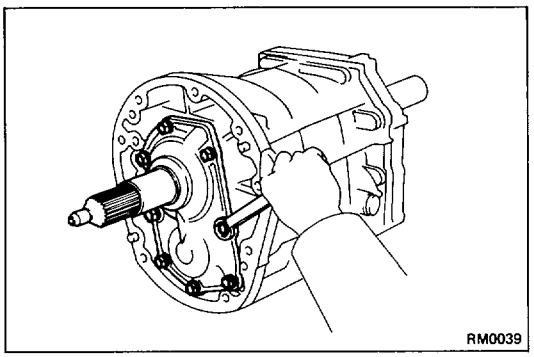
Using snap ring pliers, install the two snap rings to the input shaft bearing and counter gear front bearing.



43. INSTALL FRONT BEARING RETAINER

(a) Apply seal packing to the retainer as shown in the figure, and install it to the transmission case.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

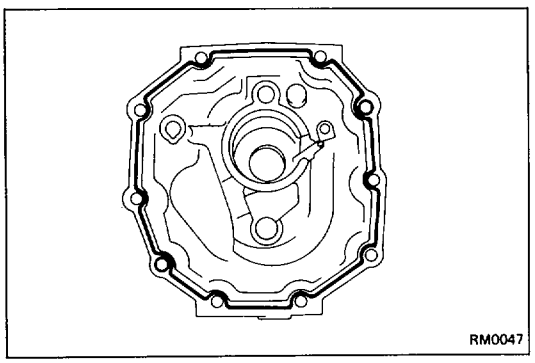


(b) Apply liquid sealer to the bolt threads.

Sealant: Part NO.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install and torque the bolts.

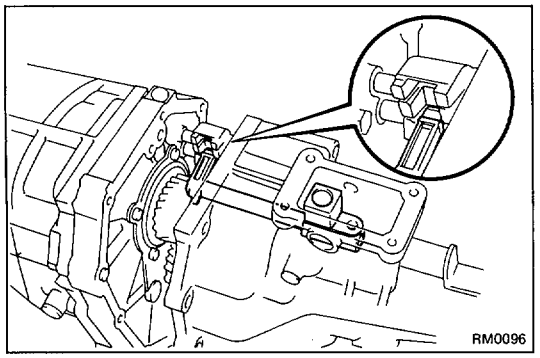
Torque: 170 kg-cm (12 ft-lb, 17 N·m)



44. INSTALL EXTENSION HOUSING, SHIFT AND SELECT LEVER AND SHIFT LEVER HOUSING

(a) Apply seal packing to the extension housing as shown.

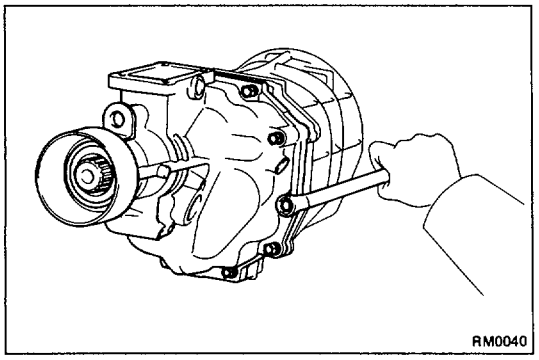
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent



(b) Insert the shift and select lever into the extension housing.

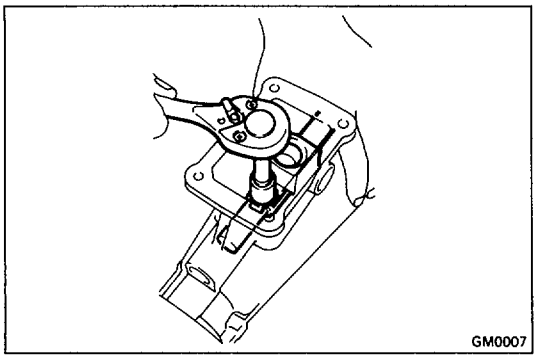
(c) Connect the shift and select lever to the fork shaft and put in the shift lever housing.

(d) Align No. 5 fork shaft to the extension housing installation hole and push in the extension housing.



(e) Install and torque the extension housing bolts.

Torque: 380 kg-cm (27 ft-lb, 37 N·m)



(f) Install and torque the shift lever housing bolt.

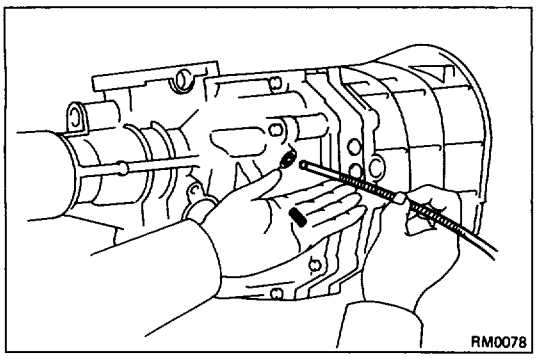
Torque: 390 kg-cm (28 ft-lb, 38 N·m)

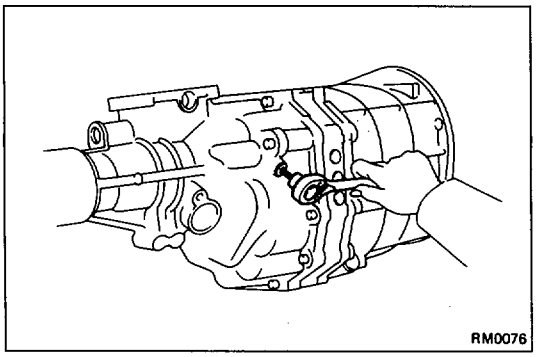
45. INSTALL LOCKING BALL, SPRING AND SCREW PLUG

(a) Apply liquid sealer to the plug threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the locking ball, spring and plug.





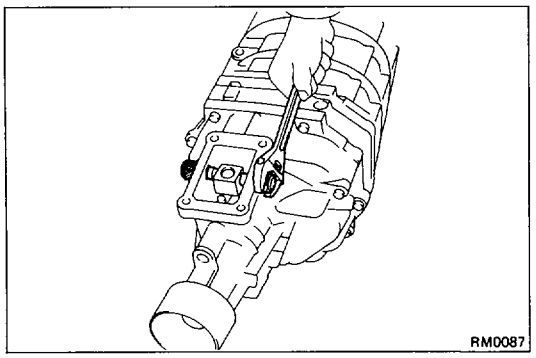
(c) Torque the plug.

Torque: 190 kg-cm (14 ft-lb, 19 N·m)

46. AFTER INSTALLING EXTENSION HOUSING CHECK FOLLOWING ITEMS

(a) Check to see that the input and output shafts rotate smoothly.

(b) Check to see that shifting can be made smoothly to all positions.

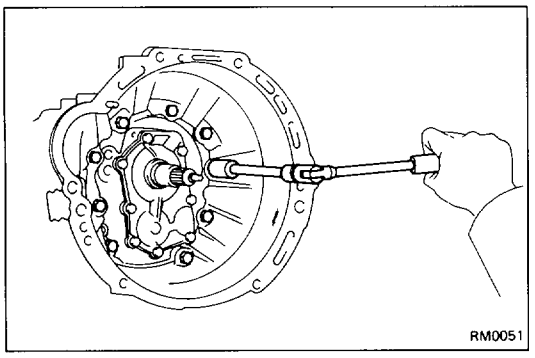


47. INSTALL RESTRICT PINS

(a) Install the black pin on the reverse gear/5th gear side.

(b) Install another pin and torque the pins.

Torque: 380 kg-cm (27 ft-lb, 37 N·m)

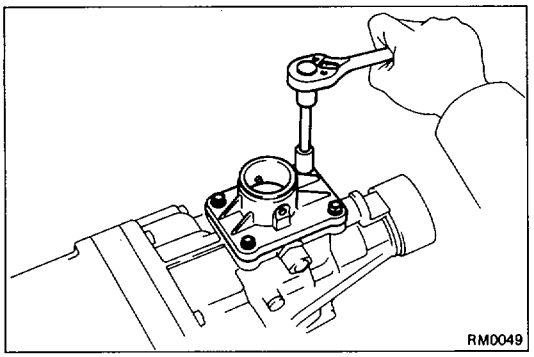


48. INSTALL CLUTCH HOUSING

(a) Install the clutch housing.

(b) Install and torque the bolt.

Torque: 370 kg-cm (27 ft-lb, 36 N·m)



49. INSTALL SHIFT LEVER RETAINER WITH NEW GASKET

(a) Apply liquid sealer to the bolt threads.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install and torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

50. INSTALL BACK-UP LIGHT SWITCH

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

51. INSTALL SPEEDOMETER DRIVEN GEAR

52. INSTALL RELEASE FORK AND BEARING

Apply molybdenum disulphide lithium base grease to the following parts:

- Release bearing hub inside groove
- Input shaft spline
- Release fork contact surface

Apply MP grease to the clutch diaphragm spring contacting surface of the release bearing.

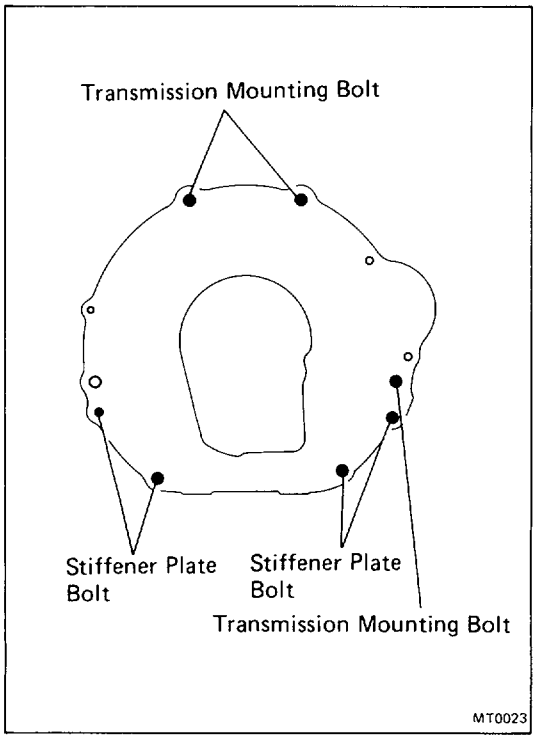
INSTALLATION OF TRANSMISSION

NOTE: For the transmission with a transfer (4WD) refer to INSTALLATION OF TRANSFER on page TF-25.

1. PLACE TRANSMISSION AT INSTALLATION POSITION

Insert the extension housing between the member and floor and then slide the transmission forward.

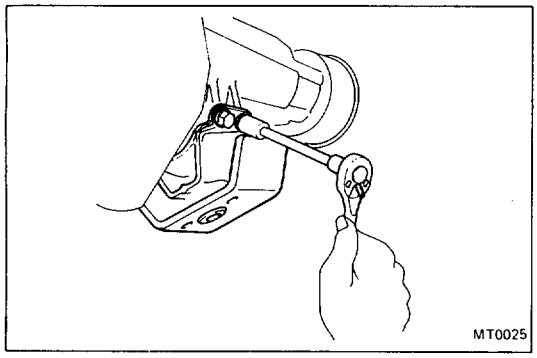
Align the input shaft spline with the clutch disc, and push the transmission fully into position.



2. INSTALL TRANSMISSION BOLTS AND STIFFENER BOLTS

Torque:

Transmission mounting bolt	**730 kg-cm (53 ft-lb, 72 N·m)**
Stiffener plate bolt	**380 kg-cm (27 ft-lb, 37 N·m)**

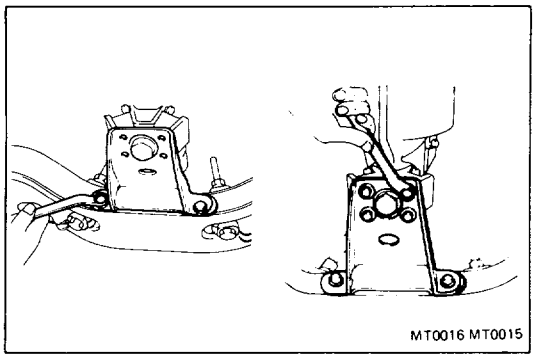


3. INSTALL ENGINE REAR MOUNTING AND BRACKET

(a) Install the engine rear mounting. Torque the bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

(b) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.



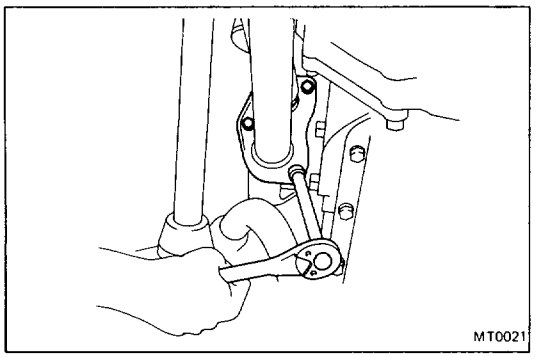
(c) Install the engine rear mounting bracket to the support member. Torque the bolts.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)

(d) Lower the transmission and rest it on the extension housing.

(e) Install the bracket to the mounting. Torque the bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

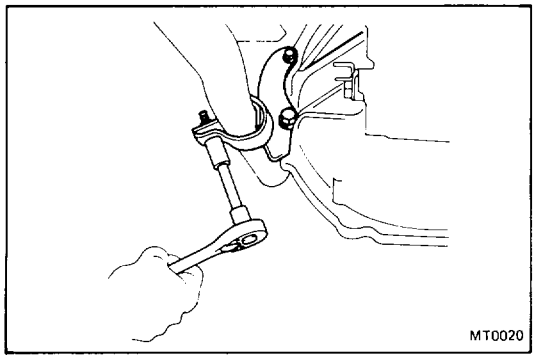


4. REMOVE PIECE OF WOOD FROM FRONT CROSSMEMBER

5. INSTALL EXHAUST PIPE, BRACKET AND CLAMP

(a) Install the exhaust pipe to the manifold.

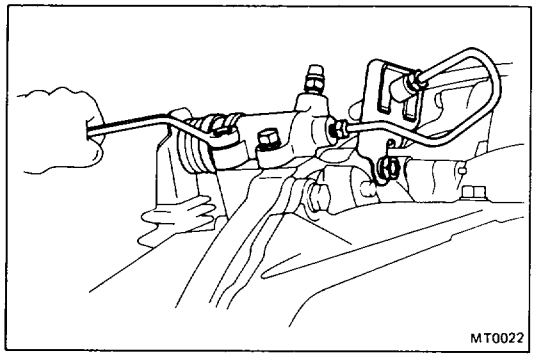
Torque: 630 kg-cm (46 ft-lb, 62 N·m)



(b) Install the pipe bracket to the clutch housing.

Torque: Upper 380 kg-cm (27 ft-lb, 37 N·m)
Lower 700 kg-cm (51 ft-lb, 69 N·m)

(c) Install the exhaust pipe clamp.



6. INSTALL STARTER LOWER MOUNTING BOLT AND RELEASE CYLINDER TUBE BRACKET

7. INSTALL CLUTCH RELEASE CYLINDER

Torque: 120 kg-cm (9 ft-lb, 12 N·m)

8. CONNECT SPEEDOMETER CABLE AND BACK-UP LIGHT SWITCH

9. CONNECT PROPELLER SHAFT
(See page PR-2)

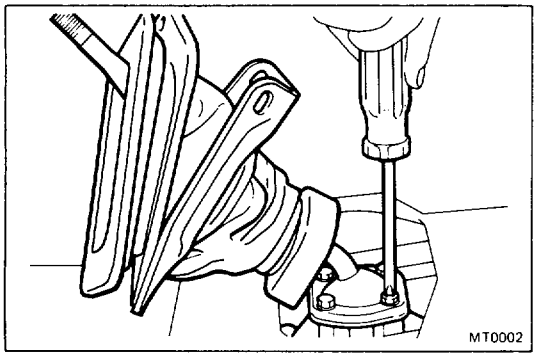
10. FILL TANSMISSION WITH OIL

Oil grade: API GL-4 or GL-5
Viscosity:

W46, 55, 56, G40, 57	**SAE 75W-90 or 80W-90**
R150	**SAE 75W-90**

Capacity:

2WD	
W46, 55, 56	**2.4 liters (2.5 US qts, 2.1 Imp. qts)**
G40, 57	**3.9 liters (4.1 US qts, 3.4 Imp.qts)**
R150	**2.6 liters (2.7 US qts, 2.3 Imp. qts)**
4WD	
W56	**3.0 liters (3.2 US qts, 2.6 Imp. qts)**



11. LOWER VEHICLE

12. INSTALL STARTER UPPER MOUNTING NUT

13. (R150)
INSTALL SHIFT LEVER RETAINER

14. INSTALL SHIFT LEVER

(a) Apply MP grease to the shift lever.

(b) Install the shift lever to the transmission.

15. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL

16. PERFORM ROAD TEST

Check for abnormal noise and smooth operation.

AUTOMATIC TRANSMISSION

(A43D/2WD)

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(A340H/4WD)

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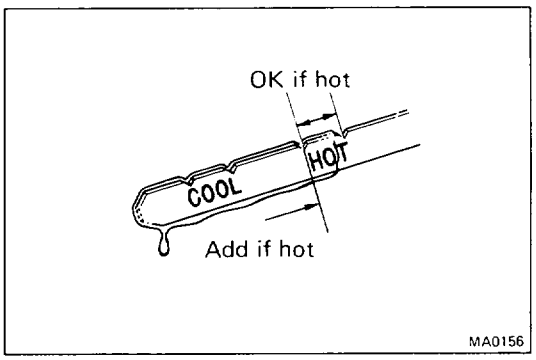
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	MA-14
	Torque converter faulty	Replace torque converter	AT-28,103
	Transmission faulty	Disassemble and inspect transmission	AT-29
Vehicle does not move in any drive range	Manual shift linkage out of adjustment	Adjust shift linkage	AT-4
	Valve body or primary regulator faulty	Inspect valve body	AT-68
	Parking lock pawl faulty	Inspect parking lock pawl	AT-22
	Torque converter faulty	Replace torque converter	AT-28,103
	Converter drive plate broken	Replace torque converter	AT-28,103
	Oil pump intake strainer blocked	Clean strainer	AT-17
Shift lever position incorrect	Manual shift linkage out of adjustment	Adjust shift linkage	AT-4
	Manual valve and lever faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Valve body or primary regulator faulty	Inspect valve body	AT-68
	Accumulator pistons faulty	Inspect accumulator pistons	A-17
	Transmission faulty	Disassemble and inspect transmission	AT-29
Delayed 1-2, 2-3 or 3-OD up-shift, or down-shifts from OD-3 or 3-2 then shifts back to OD or 3	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT-21
	Governor faulty	Inspect governor	AT-90
	Valve body faulty	Inspect valve body	AT-68
Slips on 1-2, 2-3 or 3-OD up-shift, or slips or shudders on take-off	Manual shift linkage out of adjustment	Adjust shift linkage	AT-4
	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Valve body faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29
Drag, binding or tie-up on 1-2,2-3 or 3-OD up-shift	Manual shift linkage out of adjustment	Adjust shift linkage	AT-4
	Valve body faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT-21
	Accumulator pistons faulty	Inspect accumulator pistons	A-17
	Valve body faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29
No down-shift when coasting	Governor faulty	Inspect governor	AT-90
	Valve body faulty	Inspect valve body	AT-68
Down-shift occurs too quick or too late while coasting	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Throttle cable faulty	Inspect throttle cable	AT-21
	Governor faulty	Inspect governor	AT-90
	Valve body faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29
No OD-3, 3-2 or 2-1 kick-down	Throttle cable out of adjustment	Adjust throttle cable	AT-4
	Governor faulty	Inspect governor	AT-90
	Valve body faulty	Inspect valve body	AT-68
No engine braking in "2" range	Valve body faulty	Inspect valve body	AT-68
	Transmission faulty	Disassemble and inspect transmission	AT-29
Vehicle does not hold in "P"	Manual shift linkage out of adjustment	Adjust shift linkage	AT-4
	Parking lock pawl cam and spring faulty	Inspect cam and spring	AT-22

NOTE: See page AT-15 for inspection procedures for electrical controls of automatic transmission with overdrive.

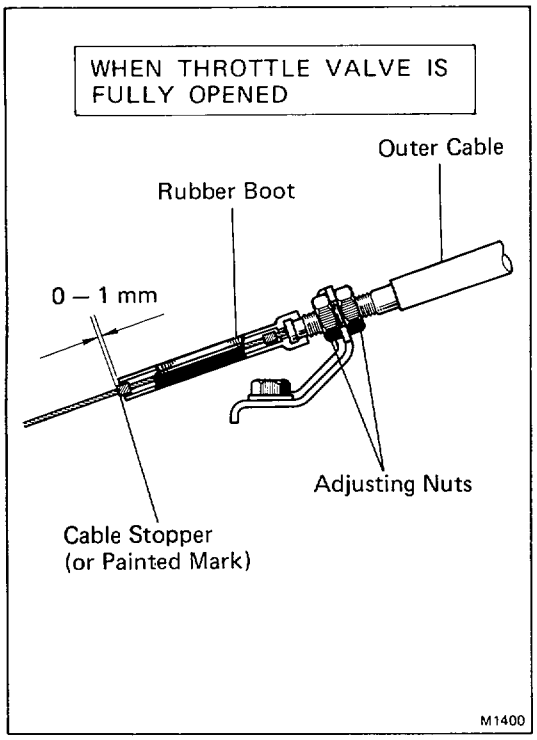


ATF INSPECTION

1. **CHECK FLUID LEVEL (See page MA-13)**
2. **CHECK FLUID CONDITION**
   If the ATF smells burnt or is black, replace it.
3. **REPLACE ATF (See page MA-15)**

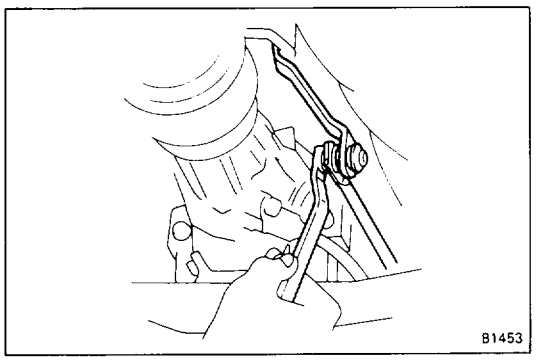
ADJUSTMENTS

ADJUSTMENT OF THROTTLE CABLE



1. **DEPRESS ACCELERATOR PEDAL ALL THE WAY AND CHECK THAT THROTTLE VALVE OPENS FULLY**
   If the throttle valve does not open fully, adjust the accelerator link.
2. **FULLY DEPRESS ACCELERATOR**
3. **LOOSEN ADJUSTMENT NUTS**
4. **ADJUST THROTTLE CABLE**
   (a) Adjust the cable housing so that the distance between the end of the boot and the stopper on the cable is correct.
   Distance: 0 – 1 mm (0 – 0.04 in.)
   (b) Tighten the adjusting nuts.
   (c) Recheck the adjustments.

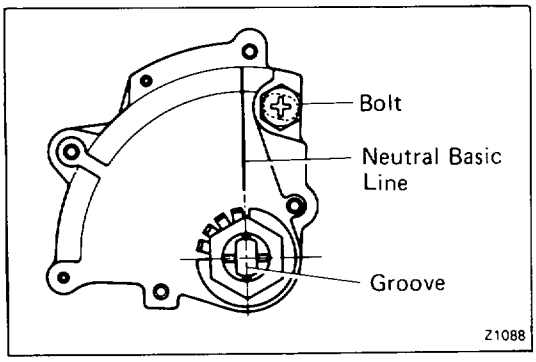
ADJUSTMENT OF FLOOR SHIFT LINKAGE



ADJUST SHIFT LINKAGE

(a) Loosen the nut on the shift linkage.
(b) Push the manual lever fully rearward.
(c) Return the lever two notches to the NEUTRAL position.
(d) Set the shift selector in "N".
(e) While holding the selector lightly toward the "R" range side, tighten the shift linkage nut.

ADJUSTMENT OF NEUTRAL START SWITCH



If the engine will start with the shift selector in any range other than "N" or "P", adjustment is required.

1. **LOOSEN NEUTRAL START SWITCH BOLT AND SET SHIFT SELECTOR IN "N" RANGE**
2. **ADJUST NEUTRAL START SWITCH**
   (a) Align the groove and neutral basic line.
   (b) Hold in position and tighten the bolt.
3. **TORQUE NEUTRAL START SWITCH BOLT**
   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

TEST

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the maximum engine speeds in the "D" and "R" ranges.

CAUTION:

(a) Perform this test at normal operation fluid temperature (50 — 80°C or 122 — 176°F).

(b) Do not continuously run this test longer than 5 seconds.

MEASURE STALL SPEED

(a) Chock the front and rear wheels.

(b) Mount an engine tachometer.

(c) Fully apply the parking brake.

(d) Step down strongly on the brake pedal with your left foot.

(e) Start the engine.

(f) Shift into "D" range. Step all the way down on the accelerator pedal with your right foot. Quickly read the highest engine rpm at this time.

Stall speed:

22R-E Engine 1,900 ± 150 rpm

(g) Perform the same test in "R" range.

EVALUATION

(a) If the engine speed is the same for both ranges but lower than specified value:

- Engine output is insufficient.
- Stator one-way clutch is not operating properly.

NOTE: If more than 600 rpm below the specified value, the torque converter could be at fault.

(b) If the stall speed in "D" range is higher than specified:

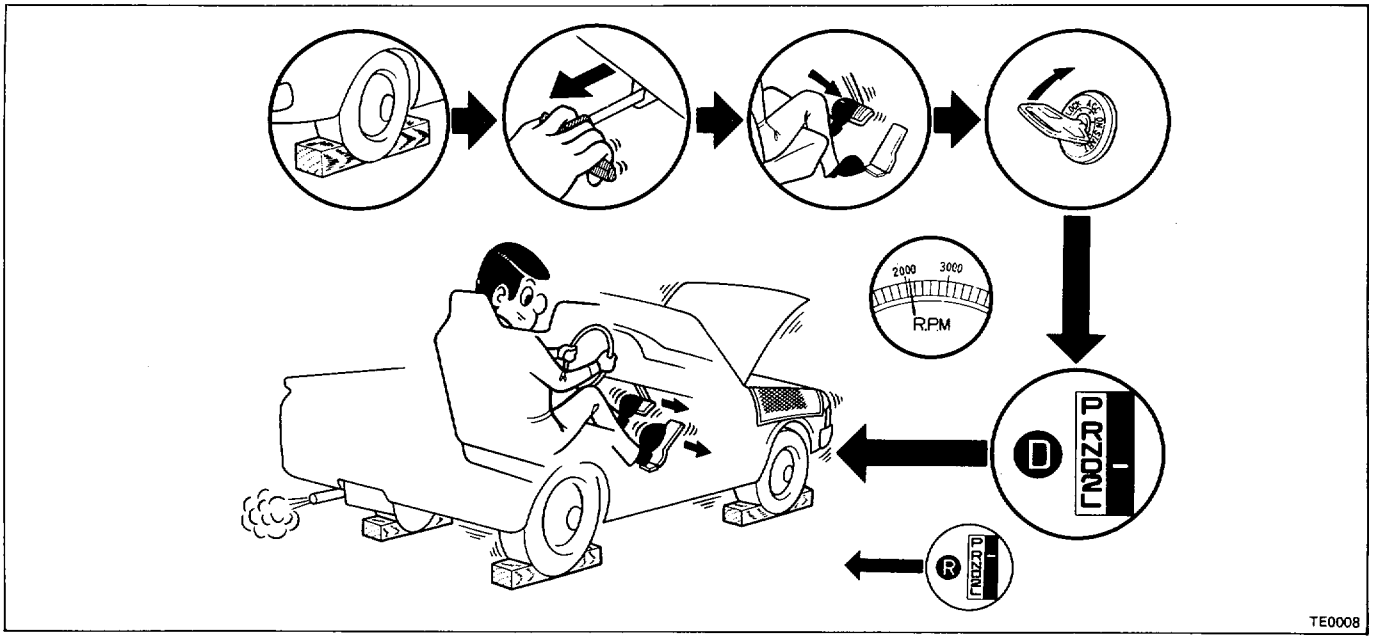
- Line pressure too low
- Front clutch slipping
- One-way clutch No.2 not operating properly.
- OD one-way clutch not operating properly

(c) If the stall speed in "R" range is higher than specified:

- Line pressure too low
- Rear clutch slipping
- Brake No.3 slipping
- OD one-way clutch not operating properly

(d) If the stall speed at "R" and "D" range is higher than specified:

- Line pressure too low
- Improper fluid level
- OD one-way clutch not operating properly



TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the OD clutch, front clutch, rear clutch and brake No.3.

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed (A/C OFF)
22R-E Engine: "N" range 750 rpm

(c) Shift the shift lever from "N" to "D" range. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(d) In the same manner, measure the time lag for "N" → "R".

Time lag: Less than 1.5 seconds

CAUTION:

(a) Perform this test at normal operation fluid temperature (50 — 80°C or 122 — 176°F).

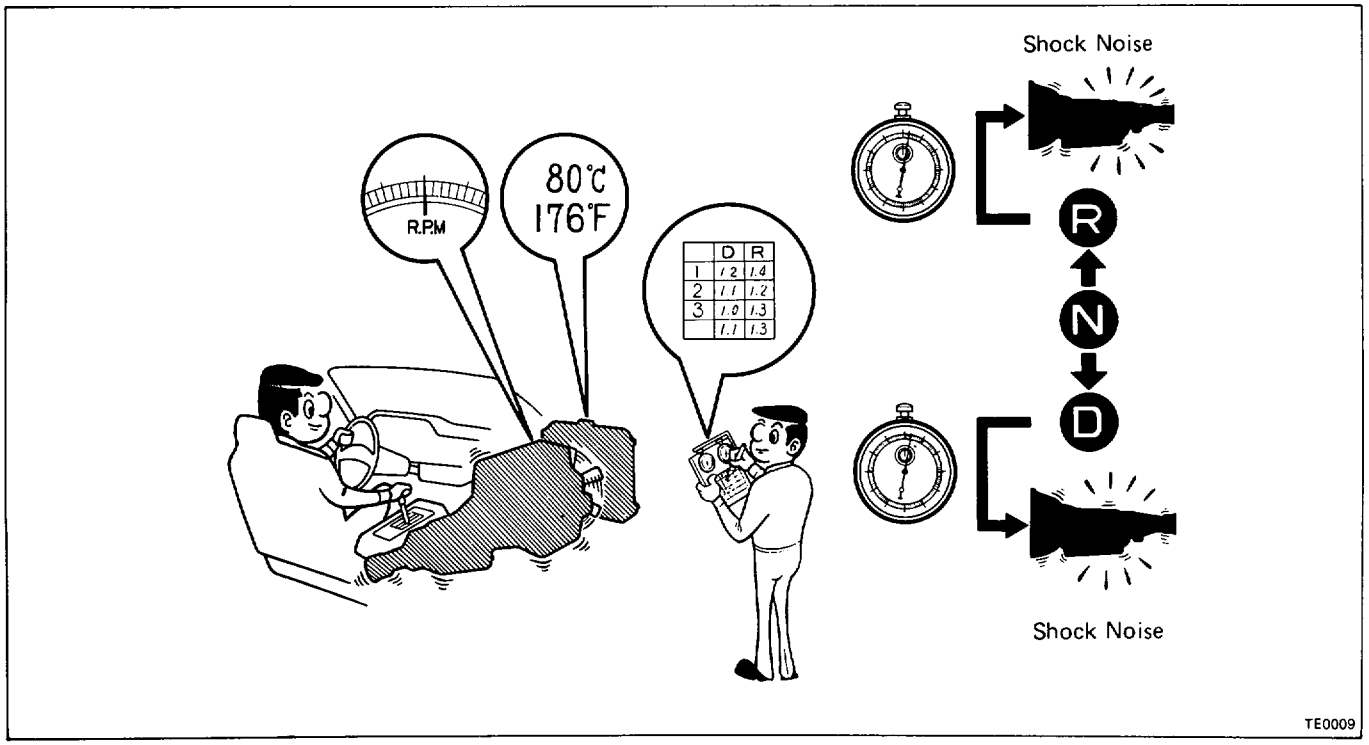
(b) Be sure to allow a one minute interval between tests.

(c) Make three measurements and take the average value.

EVALUATION

(a) If "N" → "D" time lag is longer than specified:
- Line pressure too low
- Front clutch worn
- OD one-way clutch not operating properly

(b) If "N" → "R" time lag is longer than specified:
- Line pressure too low
- Rear clutch worn
- Brake No.3 worn
- OD one-way clutch not operating properly



HYDRAULIC TEST

1. PREPARATION

(a) Warm up the transmission fluid.

(b) Chock the front wheels.

(c) Jack up rear of the vehicle and support it on stands.

(d) Remove the transmission case test the plugs and mount hydraulic pressure gauges.

SST 09992-00094

CAUTION:

(a) Perform this test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).

(b) Measurement can be made with a 1,000 rpm test, but if tests are to be made at 1,800 and 3,500 rpm, it would be safer to road test or on a chassis dynamometer because an on-stand test could be hazardous.

2. MEASURE GOVERNOR PRESSURE

(a) Check that the parking brake is not applied.

(b) Start the engine.

(c) Shift into "D" range and measure the governor pressures at the speeds specified in the table.

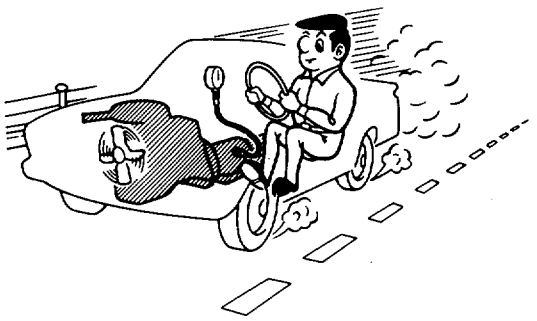
EVALUATION

If governor pressure is defective:

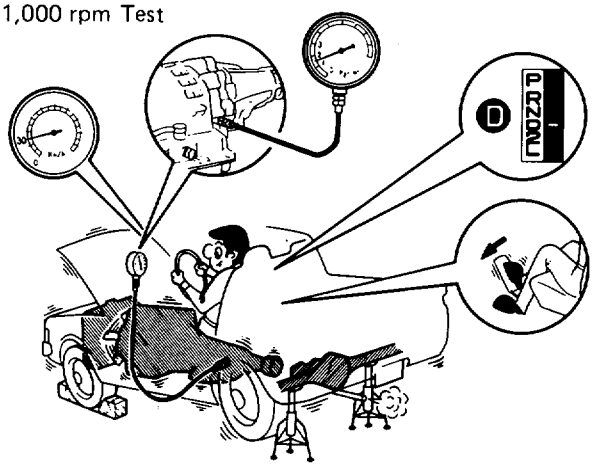
- Line pressure defective
- Fluid leakage in governor pressure circuit
- Governor valve operation defective

Output shaft rpm	Vehicle speed (Reference)		Governor pressure		
	22R-E Engine		kg/cm²	psi	kPa
	Ex. C & C	C & C			
1,000	33 km/h (21 mph)	29 km/h (18 mph)	0.9 – 1.5	13 – 21	88 – 147
1,800	59 km/h (37 mph)	52 km/h (32 mph)	1.6 – 2.2	23 – 31	157 – 216
3,500	115 km/h (71 mph)	100 km/h (62 mph)	4.1 – 5.3	58 – 75	402 – 520

1,800 and 3,500 rpm Test



1,000 rpm Test



TE0010 TE0011

3. MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and shift into "D" range.

(c) Step down strongly on the brake pedal with your left foot and, while manipulating the accelerator pedal with the right foot, measure the line pressures at the engine speeds specified in the table below.

(d) In the same manner, perform the test in "R" range.

[22R-E Engine]

Engine speed	Line pressure kg/cm² (psi, kPa)	
	"D" range	"R" range
Idling	4.5 – 5.1 (64 – 73, 441 – 500)	6.8 – 7.6 (97 – 108, 667 – 745)
Stall	10.1 – 11.9 (144 – 169, 990 – 1,167)	15.0 – 15.8 (213 – 224, 1,471 – 1,549)

(e) If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

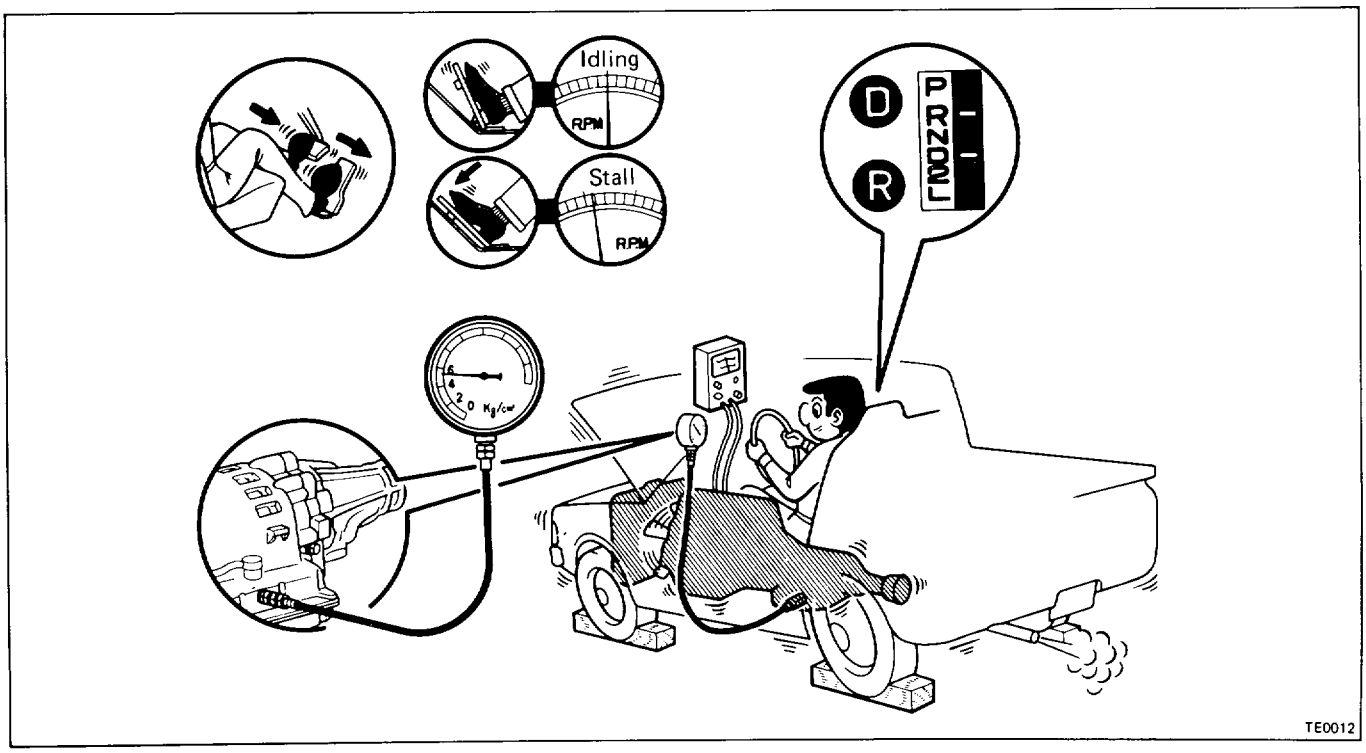
EVALUATION

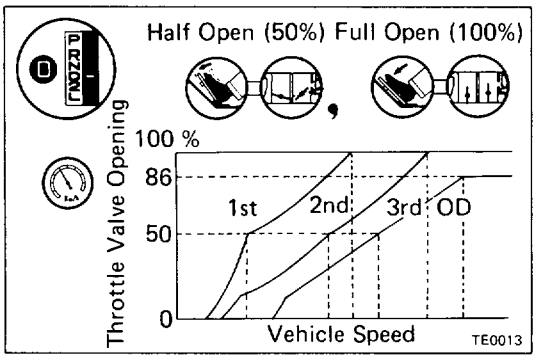
(a) If the measured values at all ranges are higher than specified:
- Throttle cable out-of-adjustment
- Throttle valve defective
- Regulator valve defective

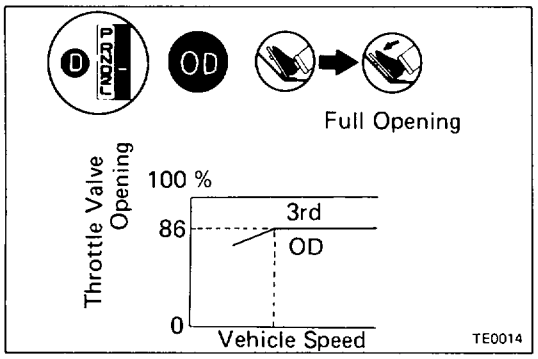
(b) If the measured values at all ranges are lower than specified:
- Throttle cable out-of-adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- OD clutch defective

(c) If pressure is low in "D" range only:
- "D" range circuit fluid leakage
- Front clutch defective
- OD clutch defective

(d) If pressure is low in "R" range only:
- "R" range circuit fluid leakage
- Rear clutch defective
- Brake No.3 defective
- OD clutch defective







ROAD TEST

CAUTION: Perform the test at normal operation fluid temperature(50 — 80°C or 122 — 176°F).

1. "D" RANGE TEST

Shift into "D" range and while driving with the accelerator pedal held constant at a specified point(throttle valve opening 50 % and 100 %)and the OD swith "ON", check the following points.

(a) At each of the above throttle openings, check to see that 1→2, 2→3 and 3→OD up-shift take place and also that the shift points conform to those shown in the automatic shift diagram.

NOTE: 3→OD up-shift does not take place with a throttle valve opening of more than 86 % or coolant temperature below 50°C (122°F).

(C & C model only)
3→OD up-shift does not take place at altitudes of more than approx. 1,000 m (3,280 ft).

EVALUATION

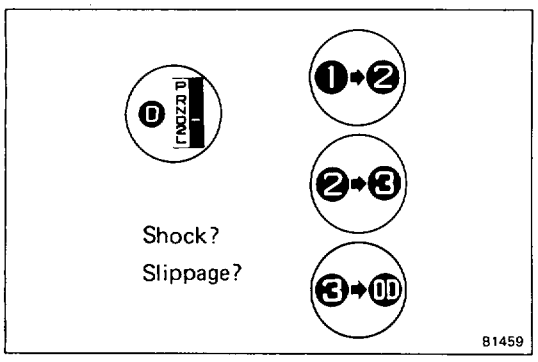
(1) If there is no 1→2 up-shift:
- Governor valve is defective
- 1-2 shift valve is stuck

(2) If there is no 2→3 up-shift:
- 2-3 shift valve is stuck

(3) If there is no 3→OD up-shift (throttle valve opening of less than 86 %):
- 3-OD shift valve is stuck

(4) If the shift point is defective:
- Throttle cable is out-of-adjustment
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-OD shift valve etc., are defective

(b) In the same manner, check the shock and the slip at 1→2, 2→3 and 3→OD shifts.

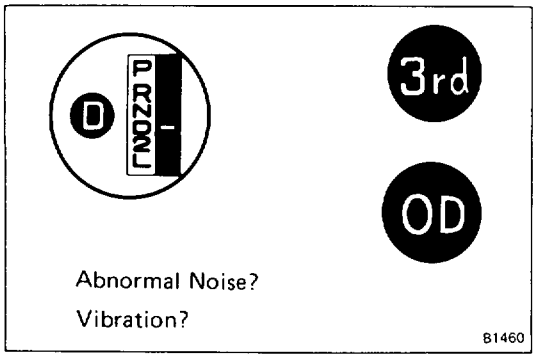


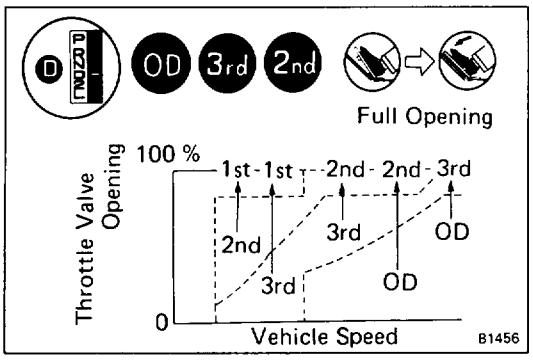
EVALUATION

If the shock is servere,
- Line pressure is too high
- Accumulator is defective
- Check ball is defective

(c) In "D" range 3rd gear or OD, check for abnormal noise and vibration.

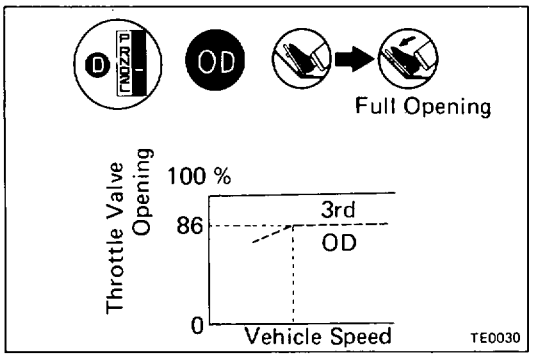
NOTE: Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in propeller shaft, differential, tire, torque converter, etc. or insufficient bending rigidity, etc., in the power train.



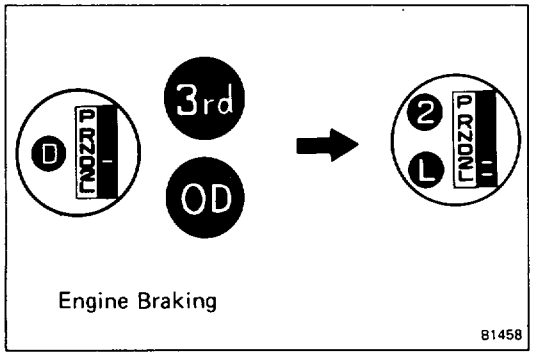


(d) While running in "D" range 2nd, 3rd gears and OD, check to see that the possible kick-down vehicle speed limits for 2→1, 3→1, 3→2, OD→3 and OD→2 kick-downs conform to those indicated in the automatic shift diagram.

(e) Check for abnormal shock and slip at kick-down.



NOTE: OD→3 kick-down is always possible with a throttle valve opening of more than 86 %.

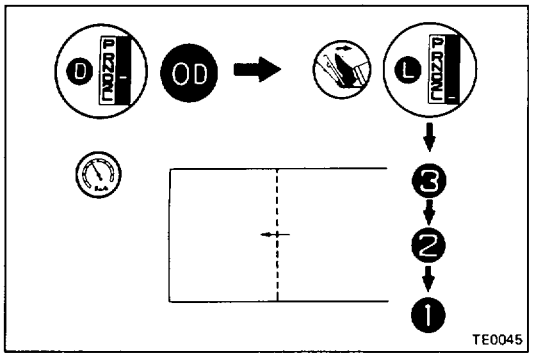


(f) While running in "D" range 3rd gear or OD gear, shift to "2" and "L" ranges and check the engine braking effect at each of these ranges.

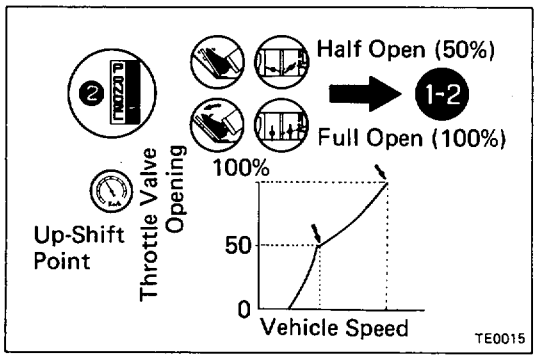
EVALUATION

(1) If there is no engine braking effect in "2" range:
- Brake No.1 is defective

(2) If there is no engine braking effect in "L" range:
- Brake No.3 is defective

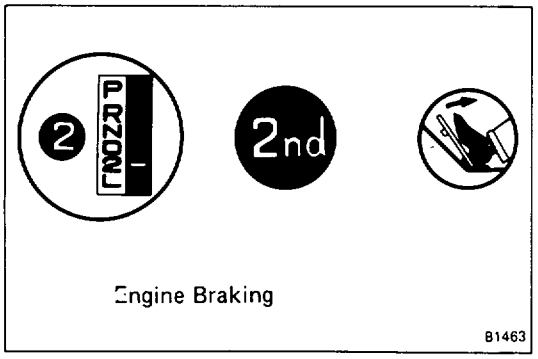


(g) While running in "D" range, release your foot from the accelerator pedal and shift into "L" range. Then check to see if OD→3, 3→2 and 2→1 down-shift points conform to those indicated in the automatic shift diagram.

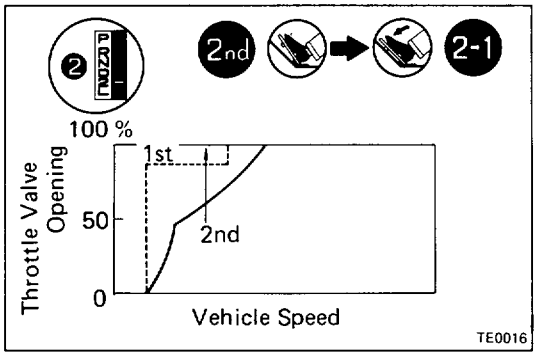


2. "2" RANGE TEST

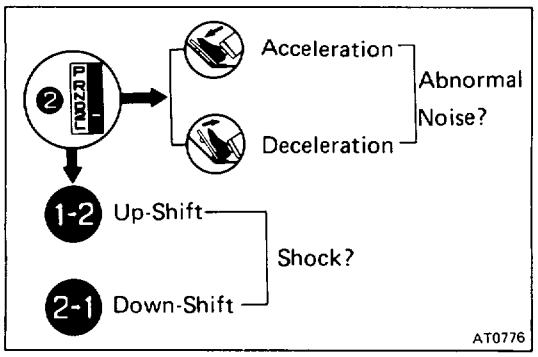
(a) Shift to "2" range and run with the throttle valve opening at 50 % and 100 % respectively. Then check the 1 → 2 up-shift points at each of the throttle valve openings to see that it conforms to those indicated in the automatic shift diagram.



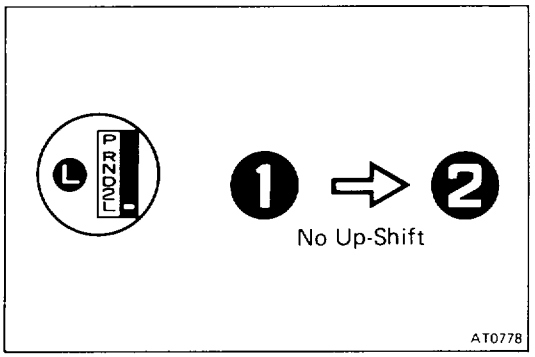
(b) While running in "2" range, 2nd gear, release the accelerator pedal and check the engine braking effect.



(c) Perform a kick-down from the "2" range and check the possible 2 → 1 kick-down vehicle speed limit to see if it conforms to that indicated in the automatic shift diagram.

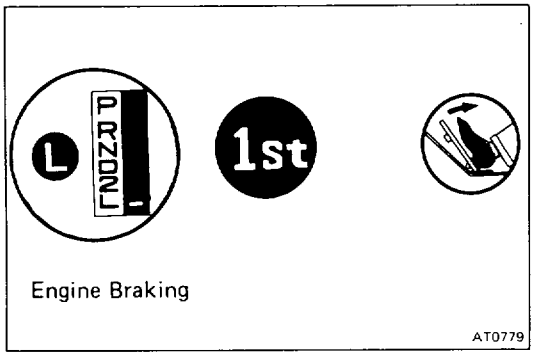


(d) Check for abnorml noise at acceleration and deceleration, and for shock at up-shift and down-shift.

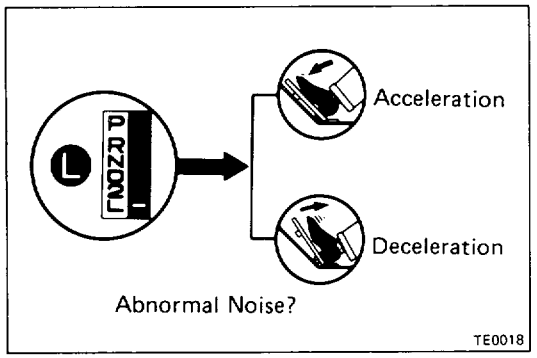


3. "L" RANGE TEST

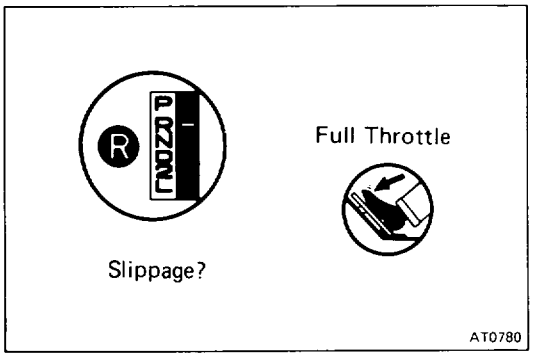
(a) While running in "L" range, check to see that there is no up-shift to 2nd gear.



(b) While running in "L" range, release the accelerator pedal and check the engine braking effect.

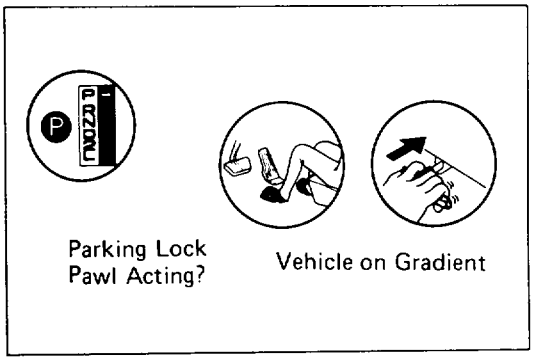


(c) Check for abnormal noise at acceleration and deceleration.



4. "R" RANGE TEST

Shift into "R" range and, while starting at full throttle, check for slipping.

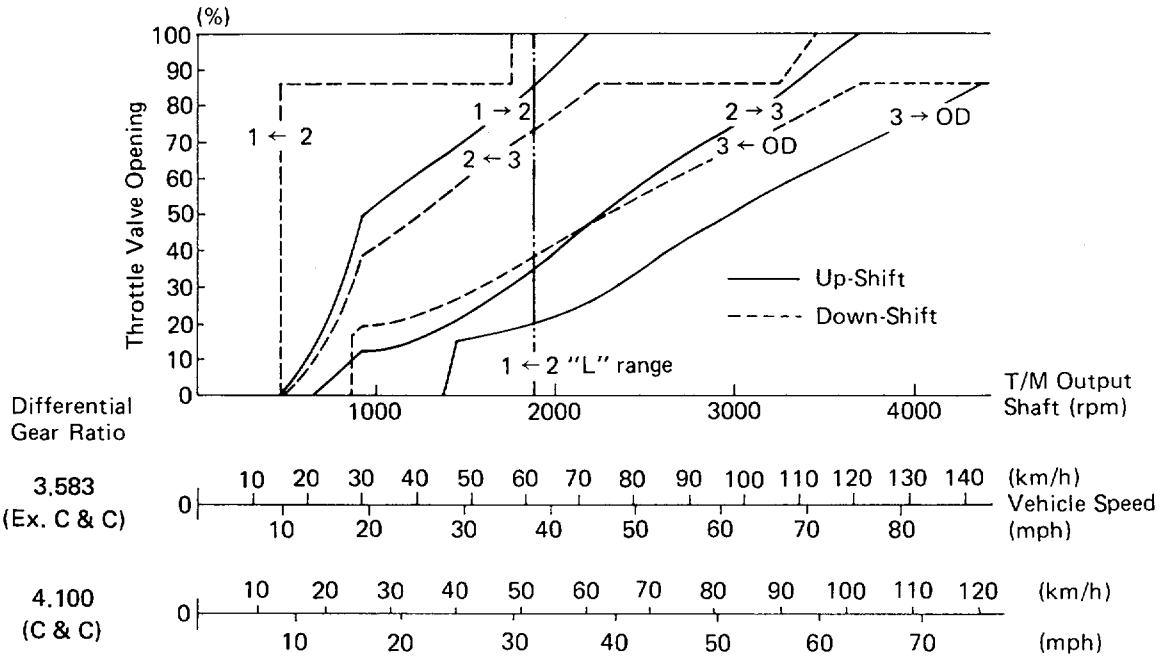


5. "P" RANGE TEST

Stop the vehicle on a gradient (more than 9 %) and after shifting into "P" range, release the parking brake. Then check that the parking lock pawl holds the vehicle in place.

AUTOMATIC SHIFT DIAGRAM

A43D 22R-E Engine



km/h (mph)

Differential gear ratio	"D" range (throttle valve fully open)						"L" range
	1 → 2	2 → 3	3 → OD	OD → 3	3 → 2	2 → 1	2 → 1
3.583 (Ex. C & C)	59 – 76 (37 – 47)	110 – 127 (68 – 79)	No shift *1	*2	100 – 117 (62 – 73)	41 – 56 (25 – 35)	47 – 64 (29 – 40)
4.100 (C & C)	51 – 66 (32 – 41)	95 – 111 (59 – 69)	No shift *3	*2	86 – 102 (53 – 63)	35 – 48 (22 – 30)	41 – 56 (25 – 35)

*1 3 → OD shift up point with closed throttle valve is at 39 – 54 km/h (24 – 34 mph).

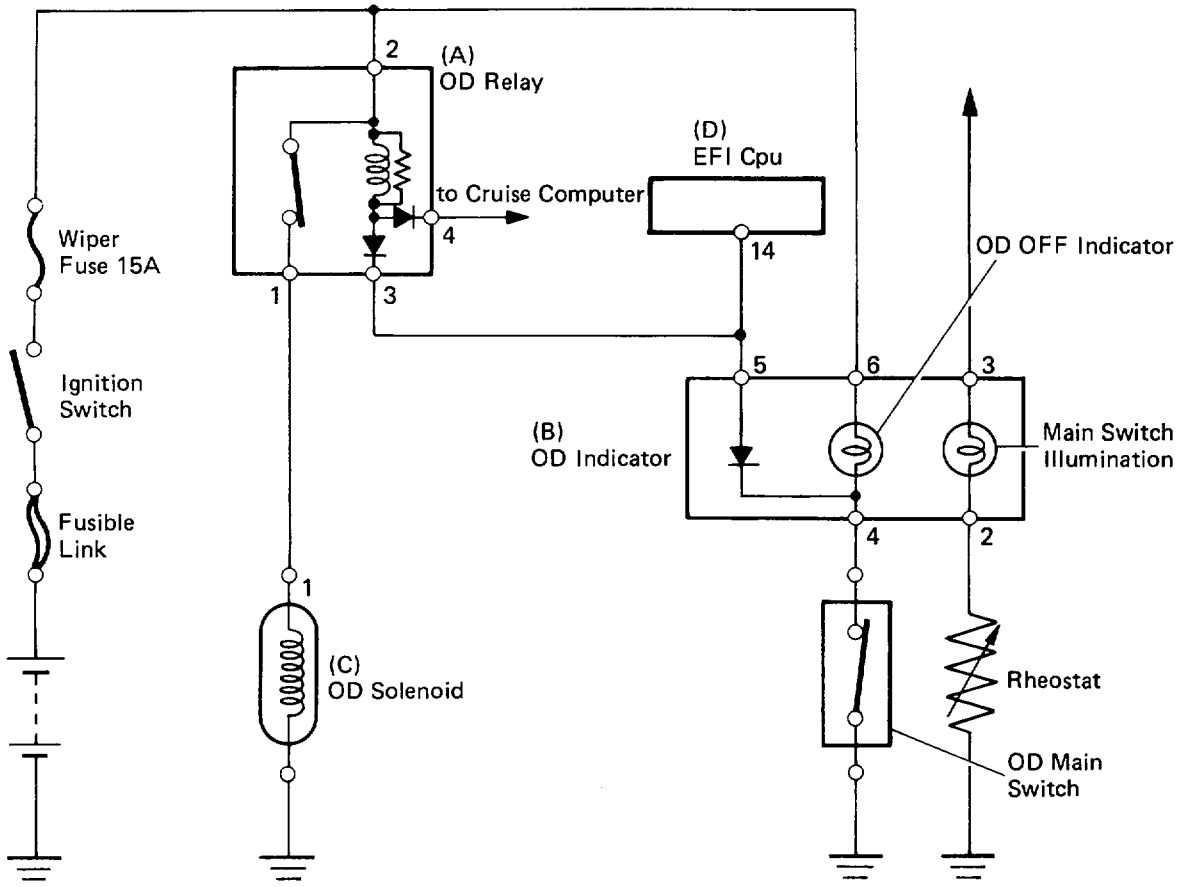
*2 OD → 3 down-shift is possible up to maximum speed.

*3 3 → OD shift up point with closed throttle valve is at 34 – 47 km/h (21 – 29 mph).

TE0005

ELECTRIC CONTROL

CIRCUIT





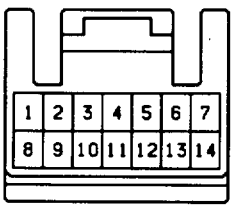
(A) OD Relay



(B) OD Indicator



(C) OD Solenoid



(D) EFI Cpu

AT3257
H-4-2 F-6-2-A IC-2-2 R-14-1

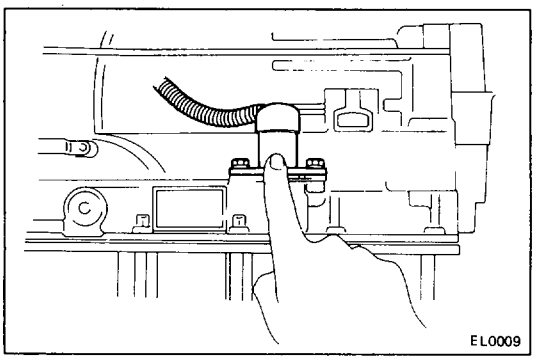
INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT OVERDRIVE RELAY AND SOLENOID

(a) Turn on the ignition switch and the main switch.

(b) Disconnect the connector from the thermo switch.

(c) Repeatedly ground the side of connector with a sub-wire.

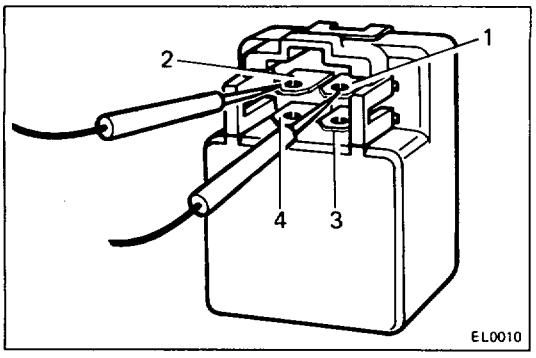


(d) At this time, confirm that an operation sound from the solenoid and overdrive relay can be heard.

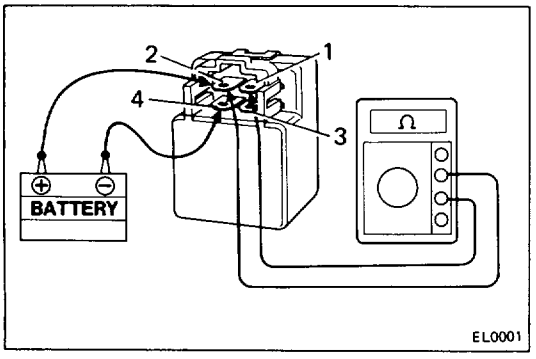
If there is no sound from either the solenoid or relay, check them.

2. INSPECT OVERDRIVE RELAY

(a) Remove the overdrive relay from the pedal bracket.



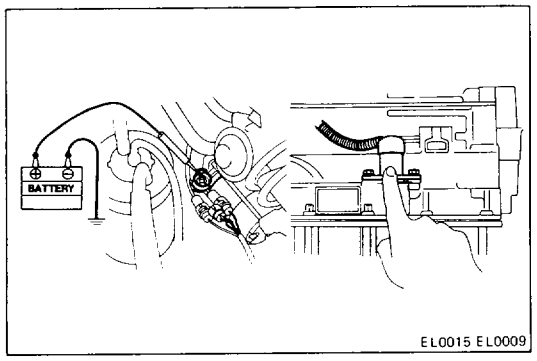
(b) Using an ohmmeter, check that there is continuity between terminals 1 and 2.



(c) Apply 12 V battery voltage across terminals 2 and 4.

Using an ohmmeter, check that there is no continuity between terminals 1 and 2.

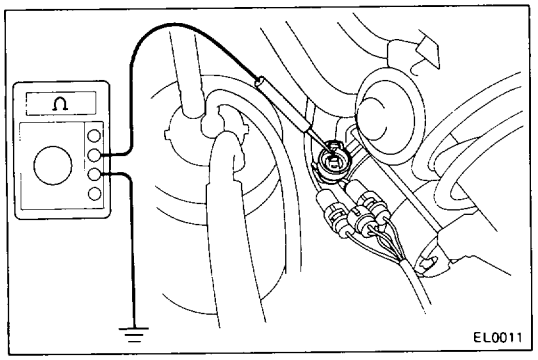
(d) Install the overdrive relay, to the pedal bracket.



3. INSPECT OVERDRIVE SOLENOID

(a) Disconnect the solenoid wire and apply a 12 V battery voltage to the solenoid.

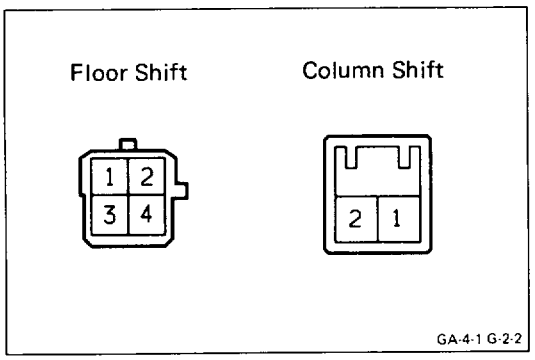
Confirm that the solenoid operation sound is heard.



(b) Using an ohmmeter, measure the solenoid coil resistance between the terminal and ground.

Resistance: 13 Ω

(c) Connect the solenoid wire.



4. INSPECT OVERDRIVE MAIN SWITCH

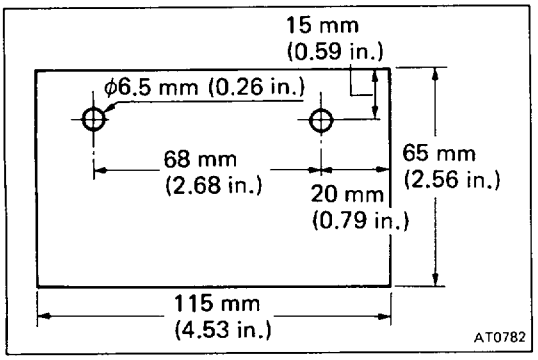
Using an ohmmeter, check the continuity of the terminals for each switch position.

Floor Shift

Terminal / S/W position	2	4
ON		
OFF	○—○	

Column Shift

Terminal / S/W position	1	2
ON		
OFF	○—○	

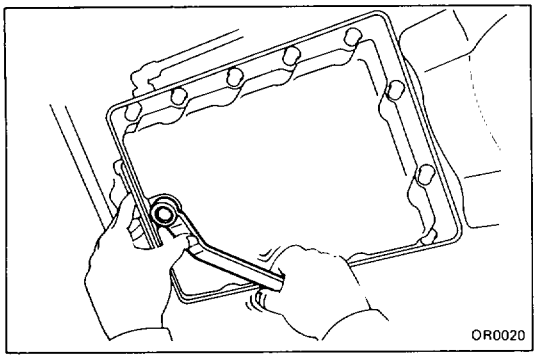


ON-VEHICLE REPAIR

REMOVAL OF VALVE BODY

1. MAKE PLATE TO RETAIN ACCUMULATOR PISTONS

A retainer is helpful for holding accumulator pistons in the case during removal and installation of the valve body. The plate may be made from aluminum or plastic.

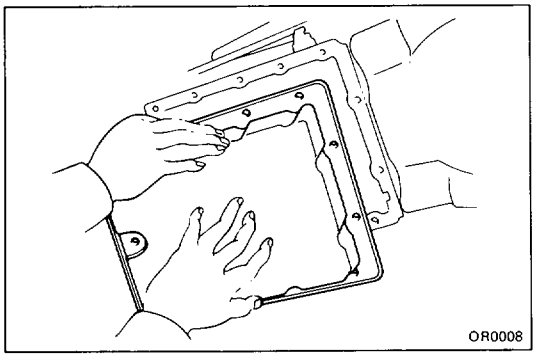


2. CLEAN TRANSMISSION EXTERIOR

To help prevent contamination, clean the exterior of the transmission.

3. DRAIN TRANSMISSION FLUID

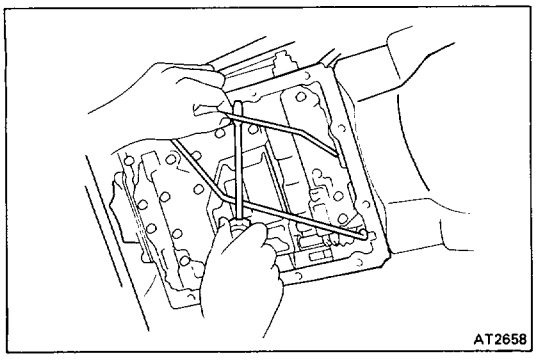
Remove the drain play and drain the fluid into a suitable container.



4. REMOVE OIL PAN, FILLER TUBE AND GASKET

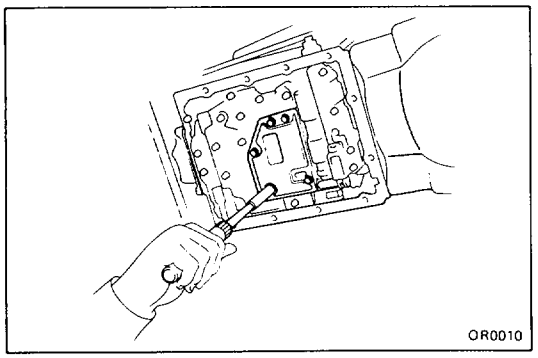
CAUTION: Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O-ring.

Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.



5. REMOVE OIL TUBES

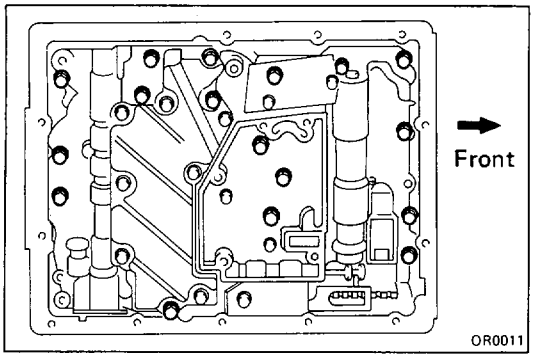
Pry up both tube ends with a large screwdriver and remove the tubes.



6. REMOVE OIL STRAINER AND GASKET

Remove the five bolts, retainer, oil strainer, and the gasket.

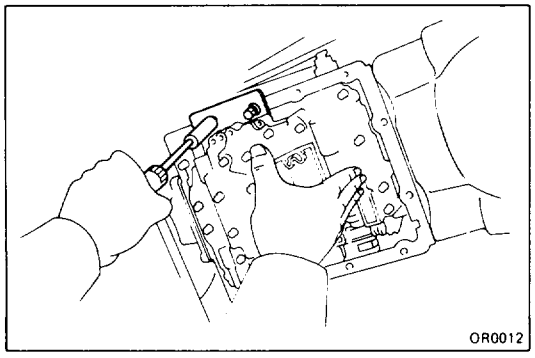
CAUTION: Be careful as some oil will come out with the filter.



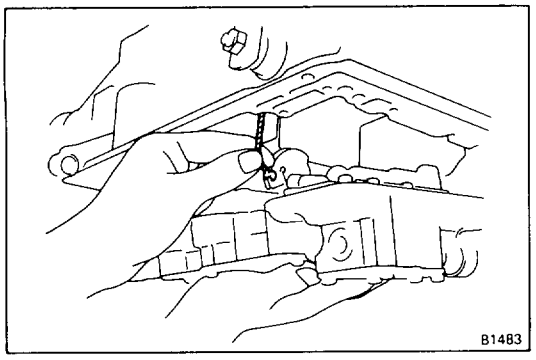
7. REMOVE VALVE BODY

(a) Remove the seventeen bolts.

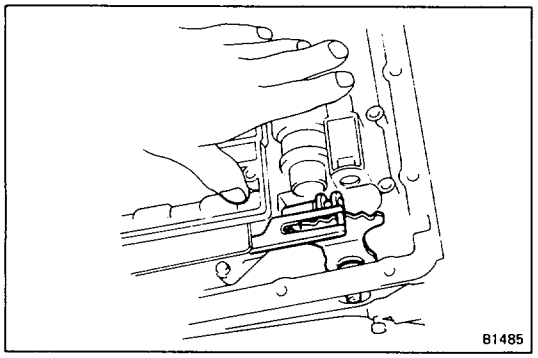
NOTE: Bolt lengths will be shown for installation, so there is no need to mark them now.



(b) Lower the valve body slightly, and install the accumulator piston retaining plate. Hold it in place with two pan bolts. Hand tighten the bolts with a socket driver.



(c) Disconnect the throttle cable from the cam and remove the valve body.



DISASSEMBLY, INSPECTION AND ASSEMBLY OF VALVE BODY

(See page AT-68)

INSTALLATION OF VALVE BODY

1. **CONNECT THROTTLE CABLE TO CAM**

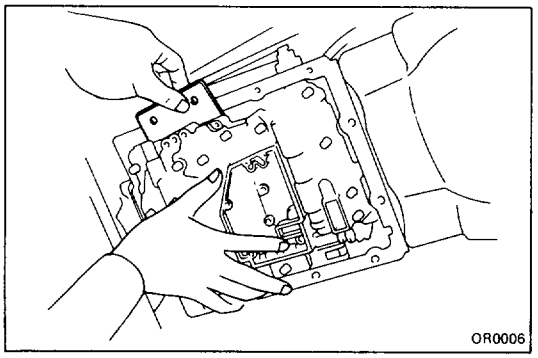
   Push the cable fitting into the cam.

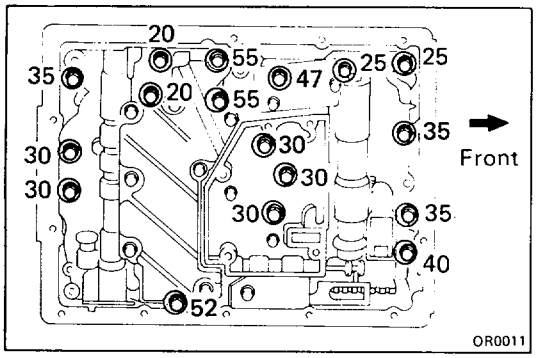
2. **ALIGN MANUAL VALVE LEVER WITH MANUAL VALVE AND LOOSELY INSTALL SEVERAL BOLTS IN VALVE BODY**

   Leave the bolts loose so that the accumulator retaining plate can be removed.

3. **REMOVE ACCUMULATOR RETAINING PLATE**

   Remove the two pan bolts, and slide out the plate.



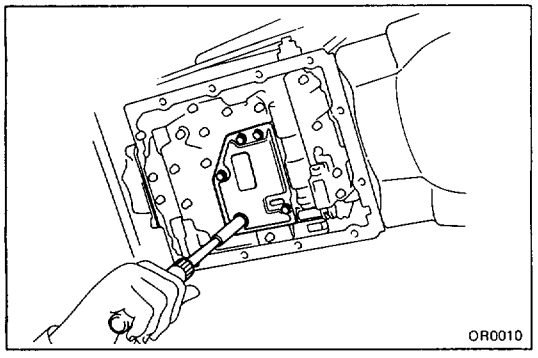


4. **INSTALL VALVE BODY BOLTS**

   Install the bolts as shown. Tighten the bolts evenly.

   NOTE: Each bolt length (mm) is indicated in the illustration.

   Torque: 100 kg-cm (7 ft-lb, 10 N·m)

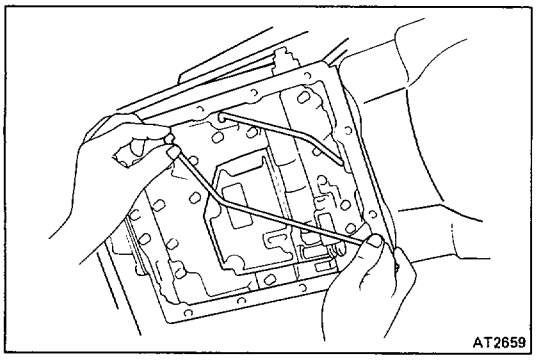


5. **INSTALL GASKET AND OIL STRAINER**

   (a) Install the gasket.

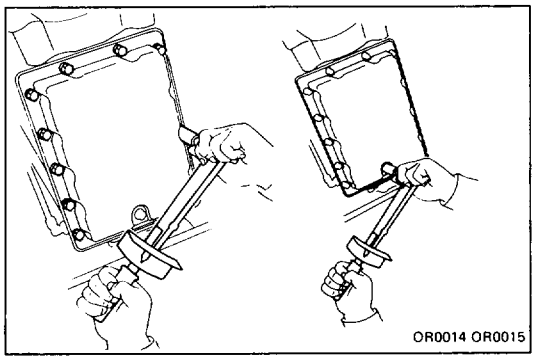
   (b) Be sure the strainer is clean. Torque the bolts.

   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



6. **INSTALL OIL TUBES**

   Press the tubes by hand into the positions indicated in the illustration.



7. **INSTALL PAN WITH NEW GASKET**

   Be sure the pan is clean and the magnet is in place.

   CAUTION: Do not use gasket sealer.

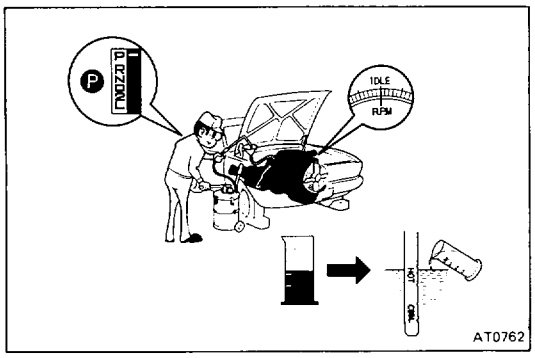
   Tighten the bolts evenly.

   Torque: 45 kg-cm (39 in.-lb, 4.4 N·m)

8. **INSTALL DRAIN PLUG**

   Torque the drain plug.

   Torque: 205 kg-cm (15 ft-lb, 20 N·m)



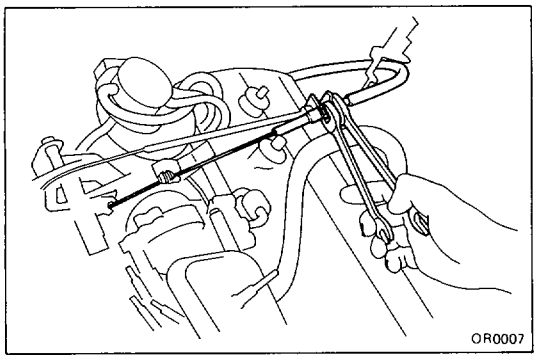
9. **FILL TRANSMISSION WITH ATF**

   Add only about four liters of ATF.

   Fluid type: ATF DEXRON® II

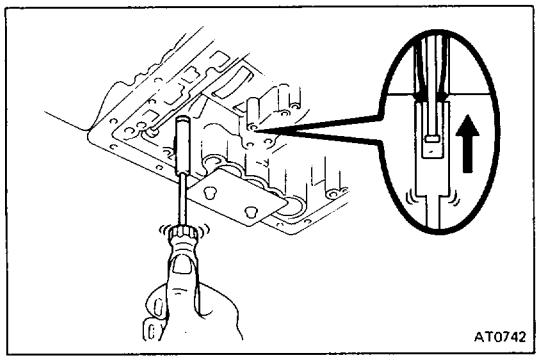
   CAUTION: Do not overfill.

10. **CHECK FLUID LEVEL (See page MA-15)**

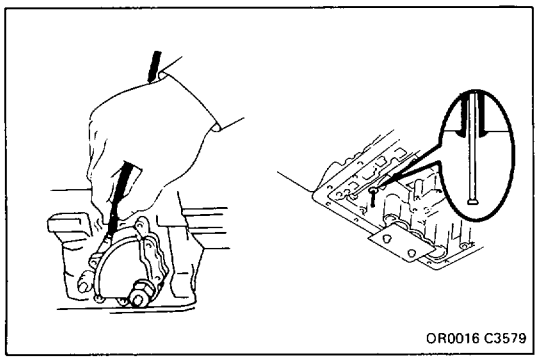


REMOVAL OF THROTTLE CABLE

1. **DISCONNECT THROTTLE CABLE**
   (a) Disconnect the cable housing from the bracket.
   (b) Disconnect the cable from the carburetor linkage.

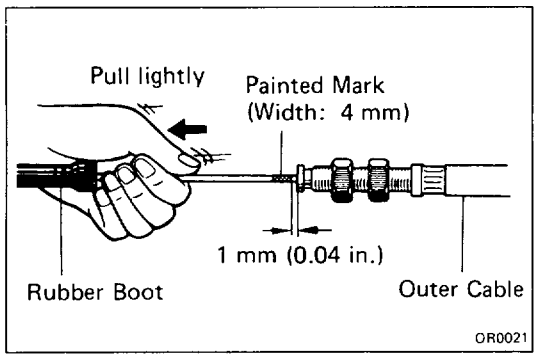


2. **REMOVE VALVE BODY (See page AT-18)**
3. **PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE**
   Using a 10- mm socket, push the throttle cable out.

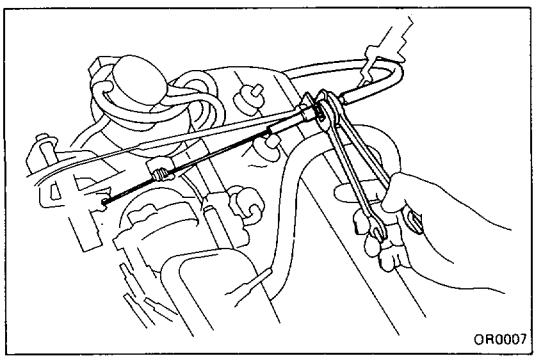


INSTALLATION OF THROTTLE CABLE

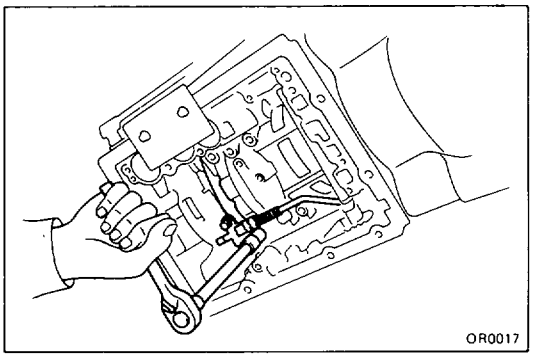
1. **INSTALL CABLE IN TRANSMISSION CASE**
   Be sure to push it in all the way.
2. **INSTALL VALVE BODY (See page AT-19)**



3. **IF THROTTLE CABLE IS NEW, PAINT MARK ON INNER CABLE**
   NOTE: New cables do not have a cable stopper installed. Therefore, to make adjustment possible, paint a mark as described below.
   (a) Pull the inner cable lightly until a slight resistance is felt, and hold it.
   (b) Paint a mark as shown, about 4 mm (0.16 in.) in width.

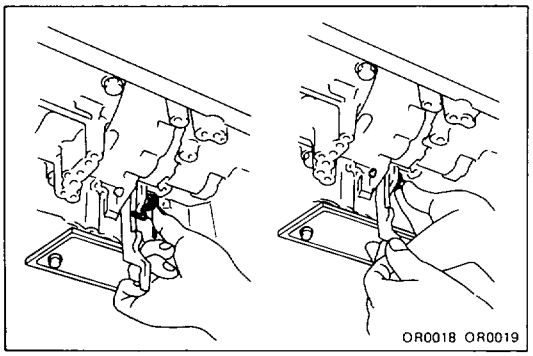


4. **CONNECT THROTTLE CABLE**
   (a) Connect the cable to the carburetor linkage.
   (b) Connect the cable housing to the bracket.
5. **ADJUST THROTTLE CABLE (See page AT-4)**
6. **TEST DRIVE VEHICLE**


OR0017

REMOVAL OF PARKING LOCK PAWL

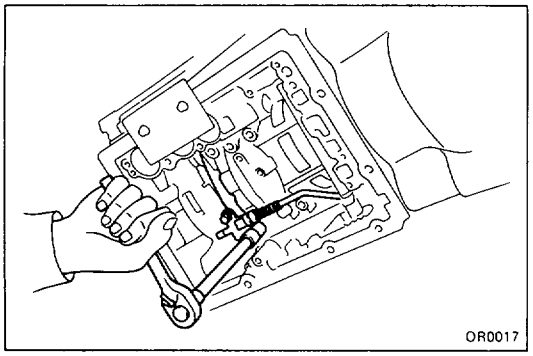
1. **REMOVE VALVE BODY (See page AT-18)**
2. **REMOVE PARKING LOCK PAWL BRACKET**
   Remove the two bolts and the bracket.


OR0018 OR0019

3. **REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN**
4. **REMOVE PIVOT PIN AND PARKING LOCK PAWL**

INSTALLATION OF PARKING LOCK PAWL

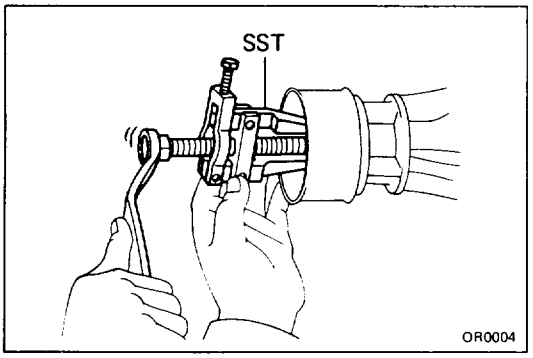
1. **INSTALL PARKING LOCK PAWL AND PIVOT PIN**
2. **INSTALL PIVOT SPRING**
3. **INSTALL PARKING LOCK PAWL BRACKET**
   (a) Push the lock rod fully forward.
   (b) Install the two bolts finger tight.
   (c) Check that the pawl operates smoothly.
   (d) Torque the bolts.
   Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)


OR0017

4. **INSTALL VALVE BODY (See page AT-19)**

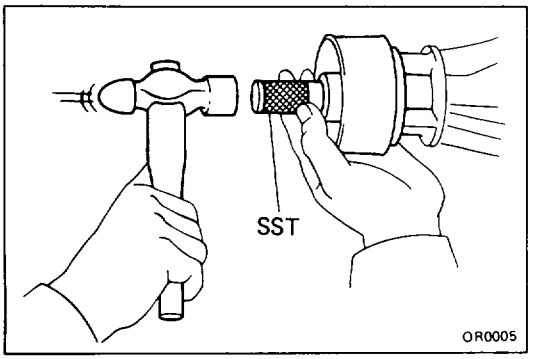
REPLACEMENT OF REAR OIL SEAL

1. **RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**
2. **REMOVE PROPELLER SHAFT**
3. **REMOVE REAR DUST SEAL AND OIL SEAL**
   CAUTION: Clean the rear extension housing before removing the seal.
   Using SST, remove the two seals.
   SST 09308-10010



OR0004

4. **INSTALL NEW OIL SEAL AND DUST SEAL**
   Using SST, drive in the oil seal as far as it will go. Drive in the dust seal flush with the housing.
   SST 09325-20010

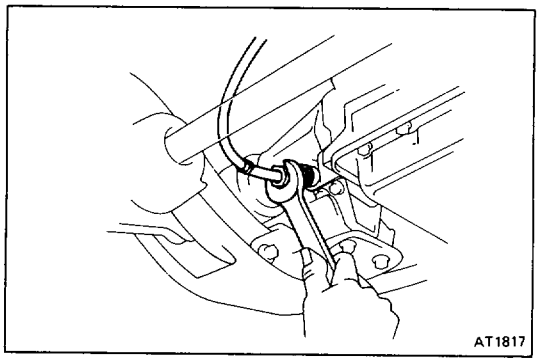


OR0005

5. **INSTALL PROPELLER SHAFT**
6. **LOWER VEHICLE AND CHECK FLUID LEVEL (See page MA-15)**
   Add fluid as necessary.
   Fluid type: ATF DEXRON® II
   CAUTION: Do not overfill.

REMOVAL OF GOVERNOR ASSEMBLY

1. **RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**
2. **REMOVE PROPELLER SHAFT**

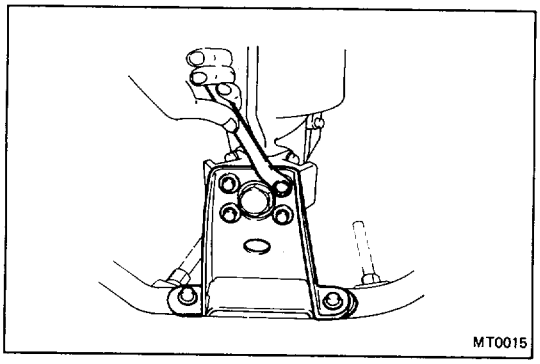


3. **DISCONNECT SPEEDOMETER CABLE**

   Loosen serrated collar with water pump pliers. Do not lose the felt dust protector and washer.

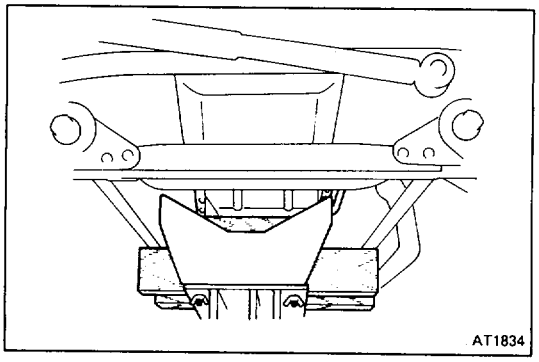
4. **REMOVE SPEEDOMETER DRIVEN GEAR**

   Remove one bolt and locking tab. Pry out the speedometer gear with a screwdriver.



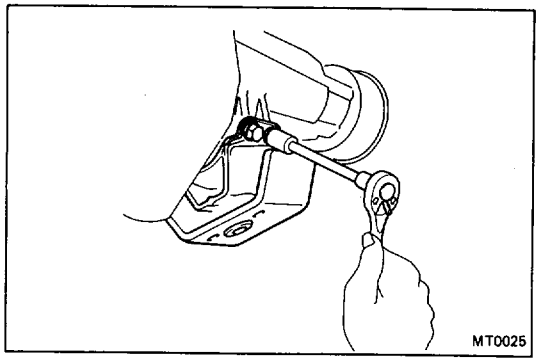
5. **DISCONNECT ENGINE REAR MOUNTING FROM BRACKET**

   Remove four bolts from the bracket.



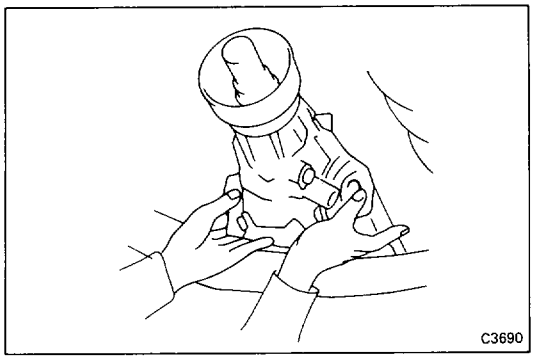
6. **JACK UP TRANSMISSION SLIGHTLY**

   Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.



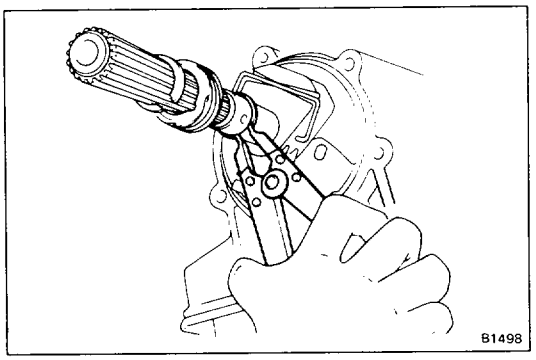
7. **REMOVE ENGINE REAR MOUNTING FROM EXTENTION HOUSING**

   Remove four bolts and the engine rear mounting from the extension housing.



8. REMOVE EXTENSION HOUSING AND GASKET

Remove six bolts. If necessary, tap the extension housing with a plastic hammer to loosen it.

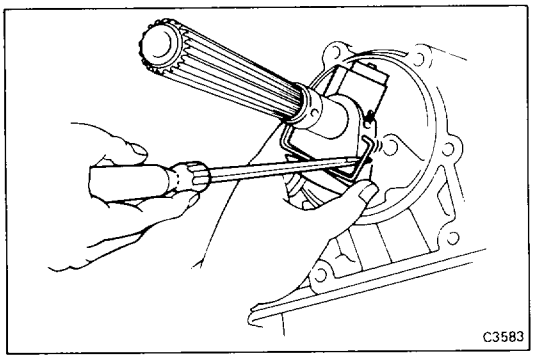


9. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.

(b) Slide off the speedometer gear.

(c) Remove the lock ball and the other snap ring.



10. REMOVE GOVERNOR FROM OUTPUT SHAFT

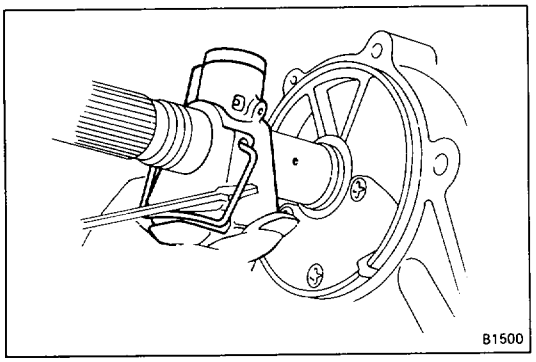
(a) Remove the lock plate and bolt.

(b) Using a larger screwdriver, lift the retaining clip on the square side and slide the governor off the shaft.

INSPECTION AND REPAIR OF GOVERNOR ASSEMBLY

(See page AT-90)

INSTALLATION OF GOVERNOR ASSEMBLY

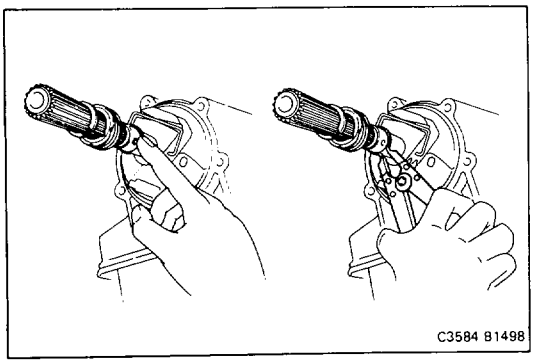


1. INSTALL GOVERNOR ON OUTPUT SHAFT

(a) Using a large screwdriver, lift the retaining clip, and slide the governor body onto the shaft with the retaining clip facing the end of the shaft.

(b) Insert the retaining clip into the hole in the output shaft. Check that the governor assembly is secure.

(c) Install the lock plate and bolt.

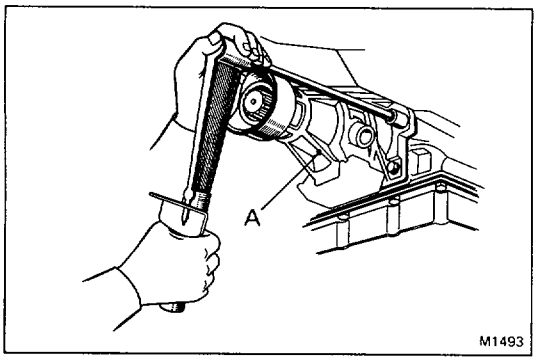


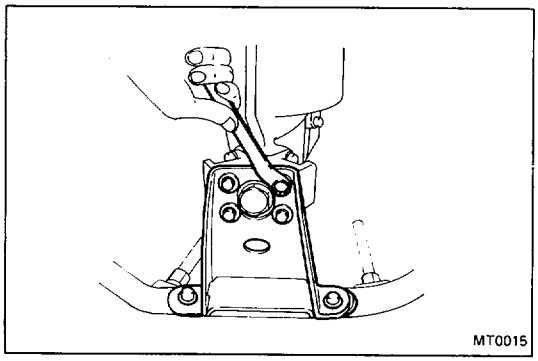
2. INSTALL SPEEDOMETER DRIVE GEAR

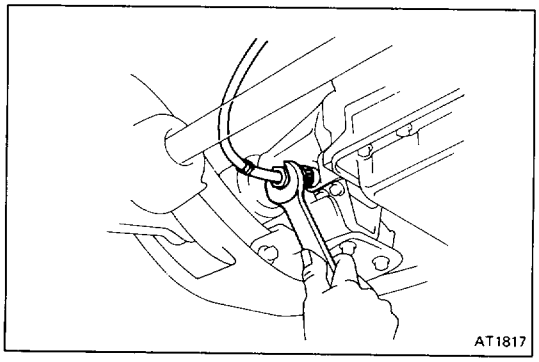
(a) Install the snap ring and lock ball.

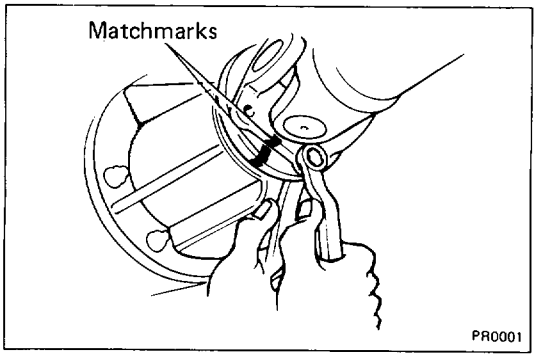
(b) Slide the speedometer gear on the shaft.

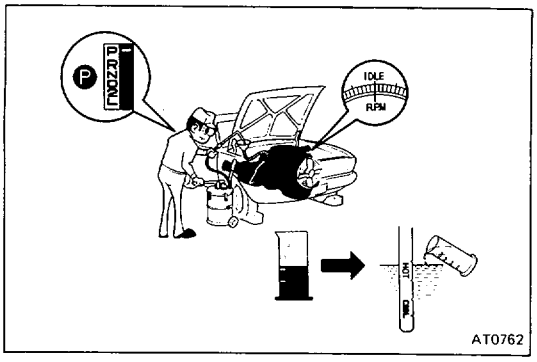
(c) Using snap ring pliers, install the outer snap ring.











3. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the A bolt and bolt hole with white gasoline.

(b) Coat the threads of the A bolt with sealant.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

NOTE: The two lower bolts are shorter.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)

4. INSTALL ENGINE REAR MOUNTING

(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

(b) Lower and rest the transmission on the mounting bracket.

(c) Connect the mounting to the bracket. Tighten the four bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

5. INSTALL SPEEDOMETER DRIVEN GEAR

(a) Install a new O-ring on the shaft sleeve.

(b) Install the lock plate with a bolt and washer.

6. CONNECT SPEEDOMETER CABLE

Place felt dust protector and washer on the end of the cable. Tighten the collar with pliers.

7. INSTALL PROPELLER SHAFT

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

8. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the selector into each gear, then check the fluid level with the transmission in "P" range. Add fluid as necessary.

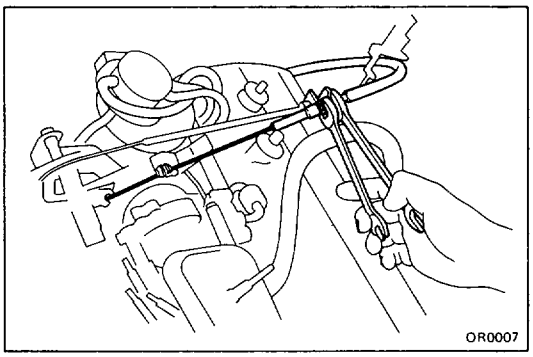
Fluid type: ATF DEXRON® II

CAUTION: Do not overfill.

REMOVAL OF TRANSMISSION

1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**

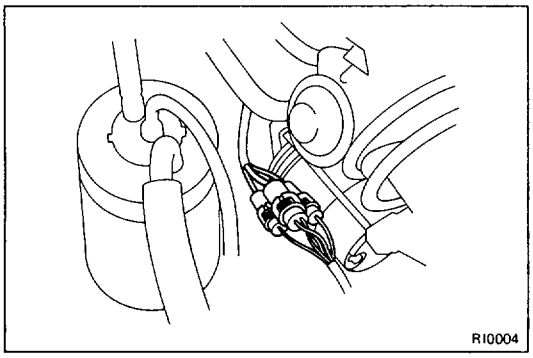
2. **REMOVE AIR CLEANER ASSEMBLY**



3. **DISCONNECT TRANSMISSION THROTTLE CABLE**
   (a) Loosen the adjusting nuts, and disconnect the cable housing from the bracket.
   (b) Disconnect the cable from the carburetor linkage.

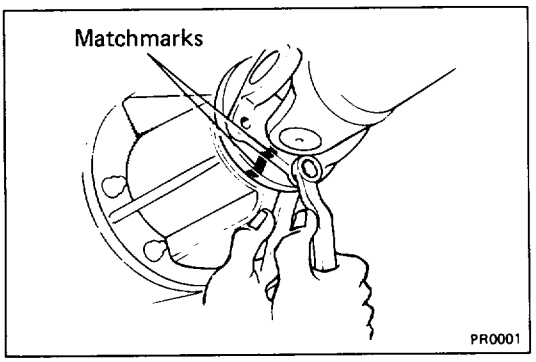
4. **REMOVE UPPER MOUNTING NUT ON STARTER**

5. **RAISE VEHICLE AND DRAIN TRANSMISSION**
   CAUTION: Be sure the vehicle is securely supported.

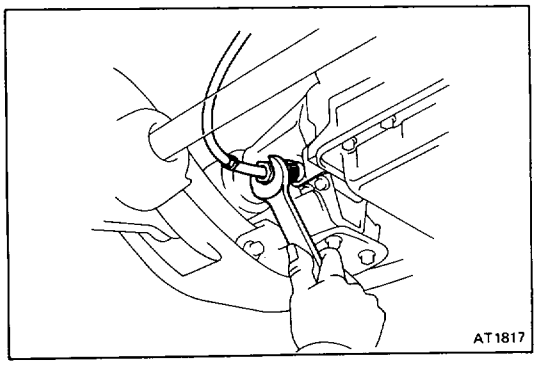


6. **DISCONNECT WIRING CONNECTORS TO SOLENOID, NEUTRAL START AND BACK-UP LIGHT SWITCHES**
   Disconnect the connectors located near the starter.

7. **REMOVE STARTER**
   (a) Remove the lower mounting bolt, and pull the starter toward the front of the vehicle.
   (b) Lay the starter alongside the engine.

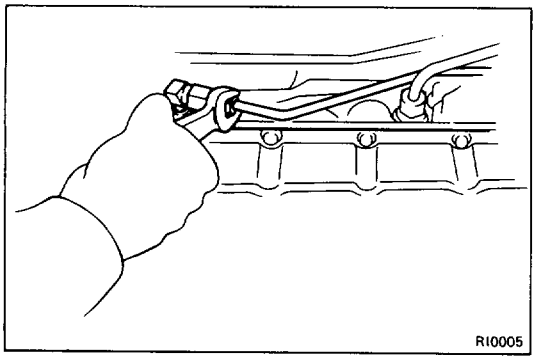


8. **REMOVE PROPELLER SHAFT**

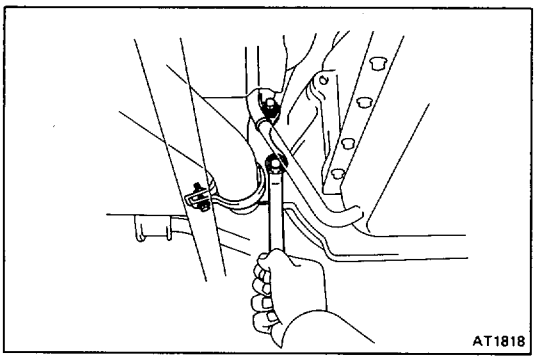


9. **DISCONNECT SPEEDOMETER CABLE**

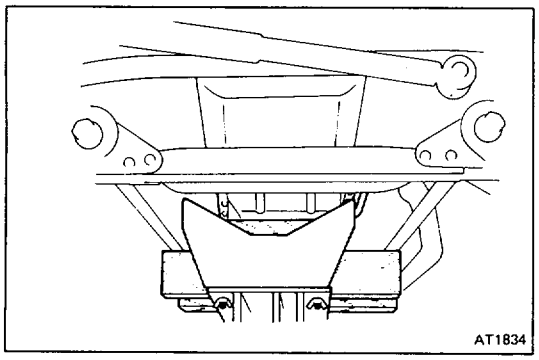
10. **DISCONNECT MANUAL SHIFT LINKAGE**
    Disconnect the shift linkage at the rear connection.



11. DISCONNECT TWO OIL COOLER LINES



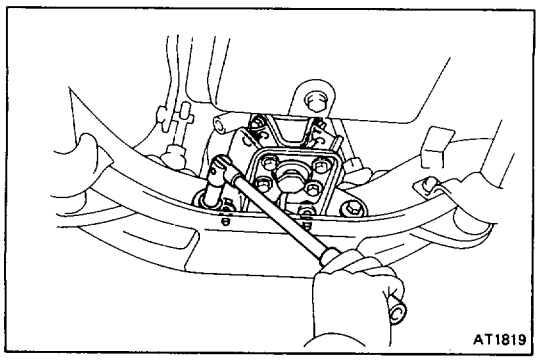
12. DISCONNECT EXHAUST PIPE CLAMP AND REMOVE OIL FILLER TUBE



13. JACK UP TRANSMISSION SLIGHTLY

If a transmission jack is not available, be sure to put a wooden block between the jack and the transmission pan to prevent damage.

Raise the transmission enough to remove the weight from the engine rear mounting.

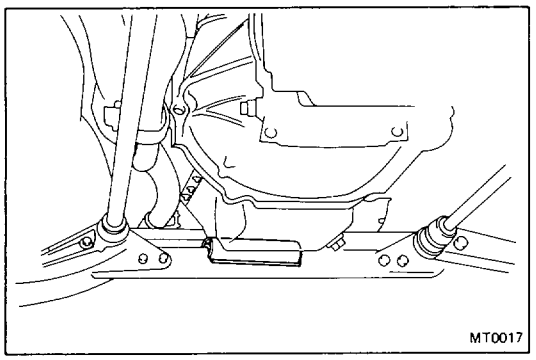


14. REMOVE ENGINE REAR MOUNTING WITH BRACKET

Remove eight bolts and the engine rear mounting with bracket.

15. REMOVE ENGINE UNDERCOVER

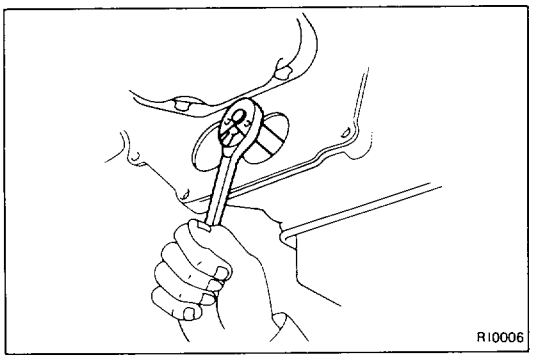
For rotating the engine and torque converter, remove the engine undercover to gain access to the crankshaft pulley.



16. INSERT WOODEN PIECE BETWEEN ENGINE OIL PAN AND MEMBER

(a) Insert wooden piece between the engine oil pan and member.

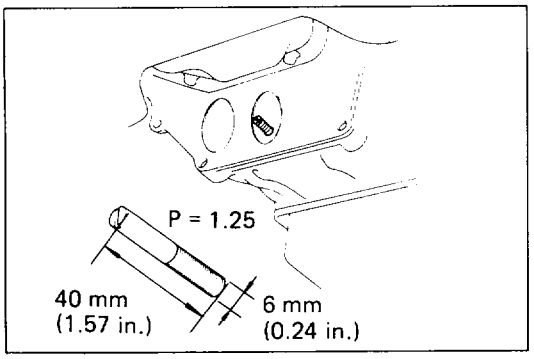
(b) Lower the transmission and rest the engine on the member.



17. REMOVE SIX TORQUE CONVERTER MOUNTING BOLTS

(a) Pry out the service hole covers from the service holes at the rear of the engine.

(b) Turn the crankshaft to gain access to each bolt. Remove the six bolts.



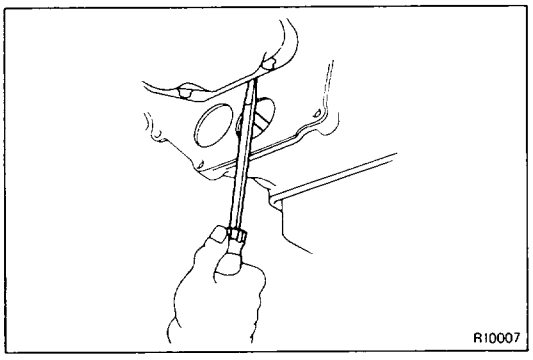
18. INSTALL GUIDE PIN IN TORQUE CONVERTER

Install the guide pin in one of the torque converter bolt holes.

If necessary, a guide pin can be made by cutting off the head of a bolt.

19. REMOVE BOTH SIDE STIFFENER PLATES

20. REMOVE CONVERTER HOUSING MOUNTING BOLTS



21. PRY ON END OF GUIDE PIN TO BEGIN MOVING TRANSMISSION WITH CONVERTER TOWARD REAR

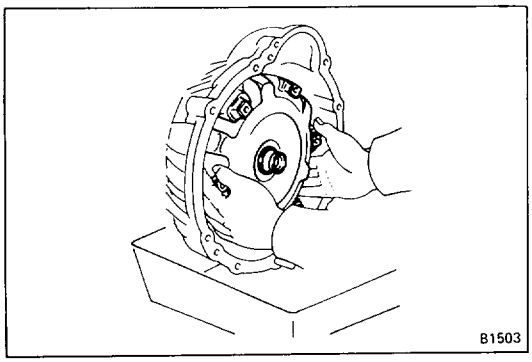
The guide pin helps keep the converter with the transmission.

22. REMOVE TRANSMISSION ASSEMBLY

(a) Draw out the transmission toward the rear.

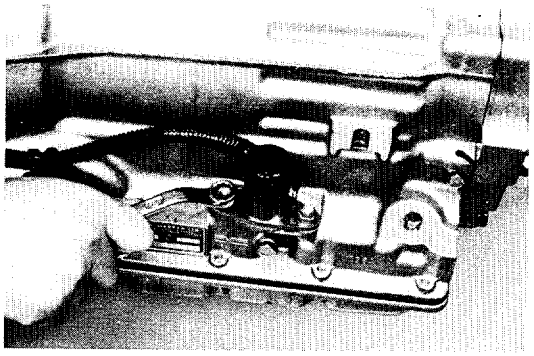
(b) Draw down the transmission toward the front.

CAUTION: Do not let the throttle cable or neutral start switch cable catch on anything. Keep the oil pan positioned down.
Be careful not to let the torque converter slide out.



23. PLACE PAN UNDER CONVERTER HOUSING AND REMOVE CONVERTER

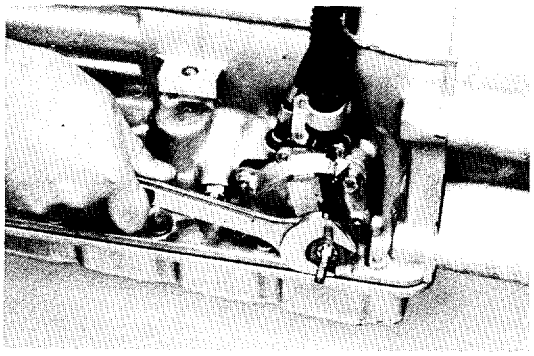
Pull the converter straight off, and allow fluid to drain into the pan.



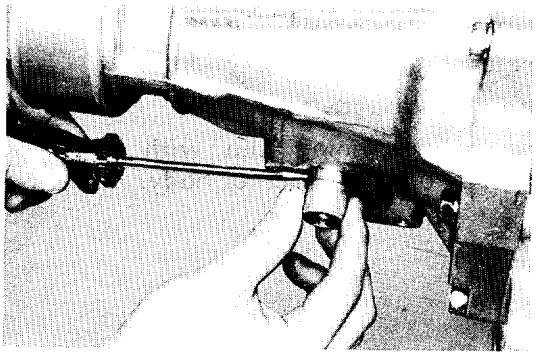
DISASSEMBLY OF TRANSMISSION

SEPARATE BASIC SUBASSEMBLY

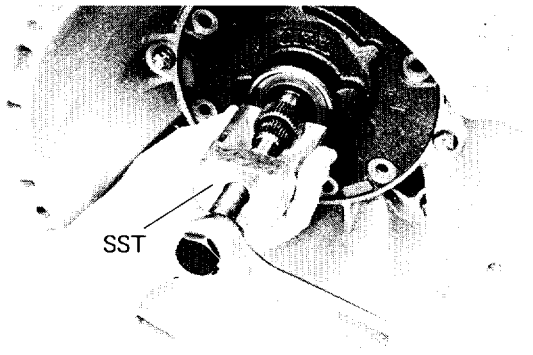
1. REMOVE CLAMP FOR WIRING AND THROTTLE CABLE
2. REMOVE SOLENOID AND O-RINGS
3. REMOVE SHIFT HANDLE



4. REMOVE NEUTRAL START SWITCH



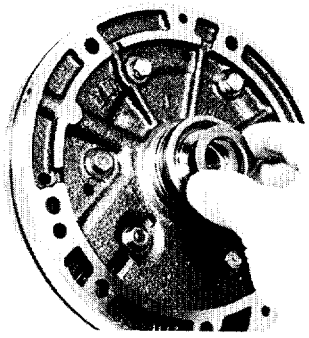
5. REMOVE SPEEDOMETER DRIVEN GEAR



6. REMOVE OIL PUMP
   (a) Remove the seven bolts.
   (b) Position SST on the shaft in back of the spline.

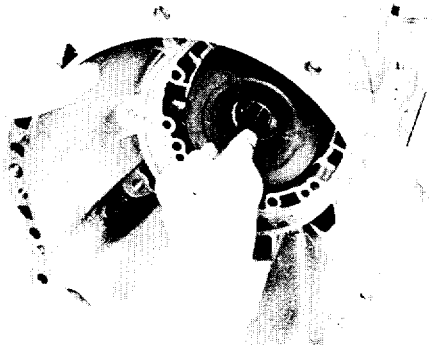
   SST 09610-20012

   CAUTION: Do not damage the shaft bushing surface. Turn the end bolt of SST to free the pump.



   (c) Grasp the front pump stator shaft and pull the pump from the case.

7. WATCH FOR RACE BEHIND OIL PUMP



8. REMOVE CONVERTER HOUSING

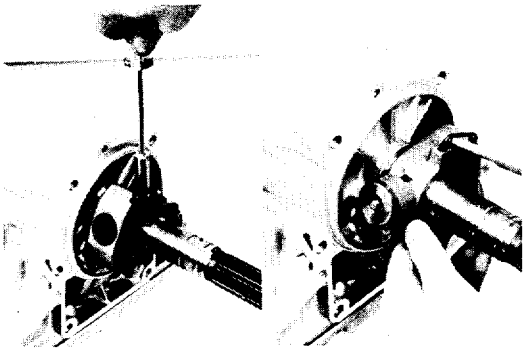
(a) Remove the two 12-mm bolts and four 10-mm bolts.

(b) While holding the input shaft,remove the converter housing.

9. REMOVE EXTENSION HOUSING AND GASKET



10. REMOVE SPEEDOMETER DRIVE GEAR



11. REMOVE GOVERNOR BODY FROM OUTPUT SHAFT

(a) Loosen the staked part of the lock plate.

(b) Remove the governor body lock bolt.

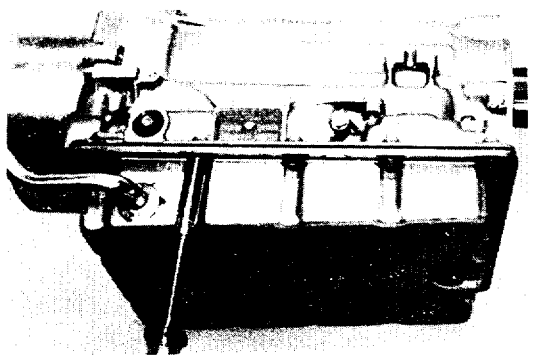
(c) While lifting the retaining clip with a larger screwdriver, slide off the governor body.



12. IF NECESSARY, REMOVE GOVERNOR STRAINER

(a) Remove the four screws and plate.

(b) Remove the strainer from the case.

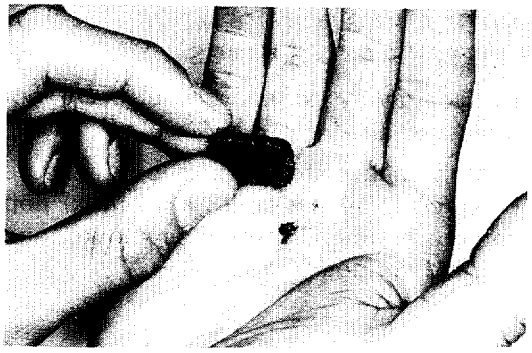


13. REMOVE PAN AND GASKET

(a) Remove the fourteen bolts.

(b) Remove the pan with lifting the transmission case.

CAUTION: Do not turn the transmission over as this will contaminate the valve body with foreign materials in the bottom of the pan.

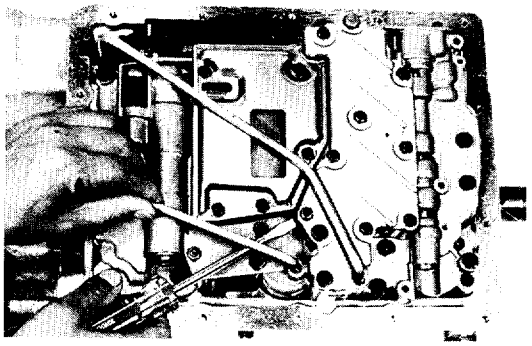


14. EXAMINE PARTICLES IN PAN

Remove the magnets and use it to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnets to anticipate what type of wear you will find in the transmission:

Steel (magnetic) = bearing, gear and clutch plate wear.

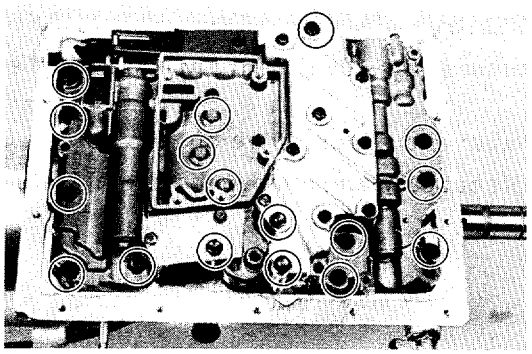
Brass (nonmagnetic) = bushing wear.



15. TURN TRANSMISSION OVER AND REMOVE TUBES

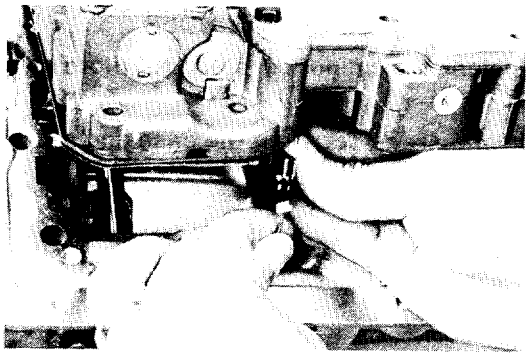
Pry up both tube ends with a large screwdriver and remove the tubes.

16. REMOVE STRAINER AND GASKET

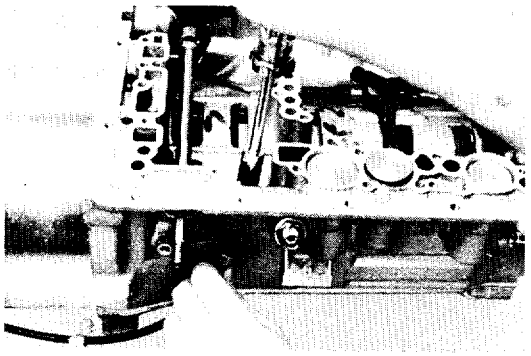


17. REMOVE VALVE BODY

(a) Remove the seventeen bolts.

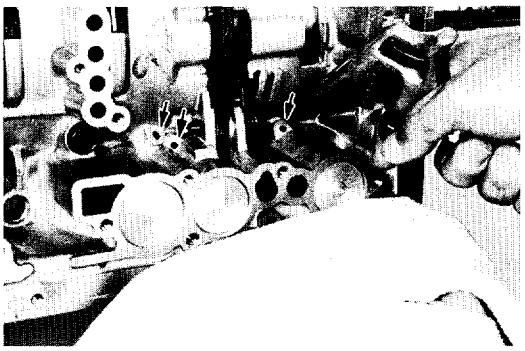


(b) Disconnect the throttle cable from the cam and remove the valve body.



18. REMOVE THROTTLE CABLE AND RETAINER

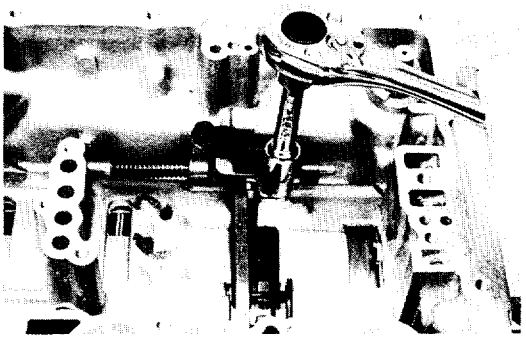
Using a 10-mm socket, push the plastic throttle cable retainer out of the transmission case.



19. COVER PISTON WITH A RAG AND, REMOVE ACCUMULATOR PISTONS AND SPRINGS

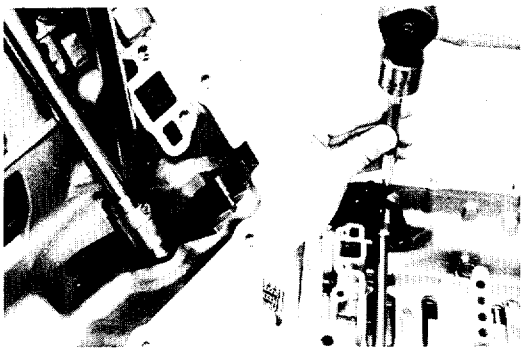
WARNING: Keep face away to avoid injury. Do not use regular high-pressure air.

Position a rag to catch each piston. Using low-pressure compressed air (1 kg/cm², 14 psi or 98 kPa, max) pop each piston into the rag. Force air into holes shown, and remove the pistons and springs.



20. REMOVE PARKING LOCK ROD

21. REMOVE SPRING, PIVOT PIN AND PARKING LOCK PAWL

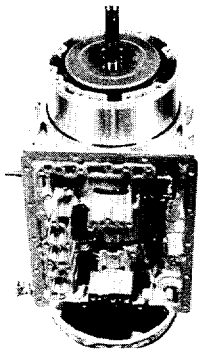


22. IF NECESSARY REMOVE MANUAL LEVER AND SHAFT

(a) Using a hammer and screwdriver, pry and shift the collar.

(b) Using a hammer and punch, drive out the pin.

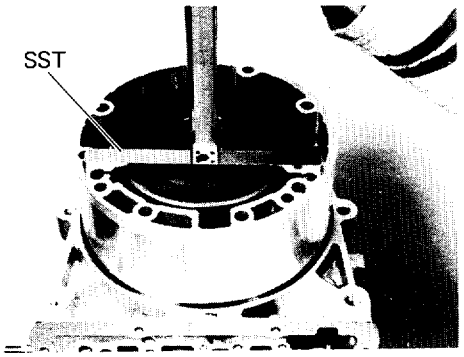
(c) Slide the shaft out case and remove the detent plate.



23. PLACE TRANSMISSION CASE ON CYLINDER

Place the transmission on a cylindrical stand for more efficient work.

CAUTION: Place shop rags between the case and stand to avoid damaging the case.

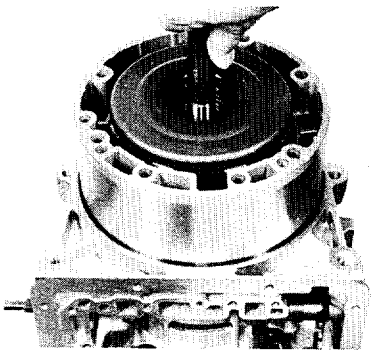


24. MEASURE DISTANCE BETWEEN TOP OF CASE AND CLUTCH DRUM

Set SST on the case as shown in the figure.

SST 09350-20015 (09370-12010)

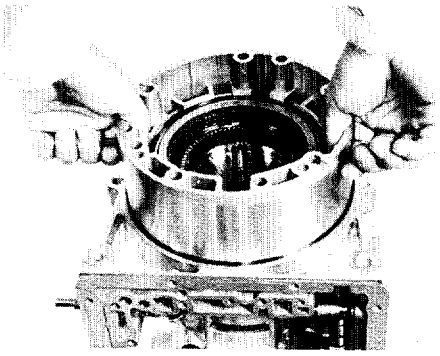
Make a note of the distance for reassembly.



25. REMOVE OVERDRIVE CLUTCH

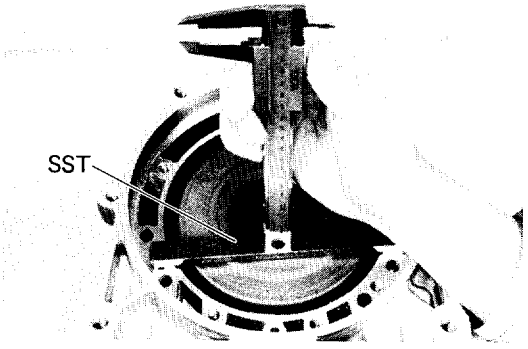
Grasp the shaft and pull out the overdrive clutch assembly.

Watch for bearings and races on both sides of assembly.



26. REMOVE OVERDRIVE CASE AND BRAKE

Hold both sides of the overdrive case and pull it out from the transmission case. Watch for bearings and races on both sides of the assembly.

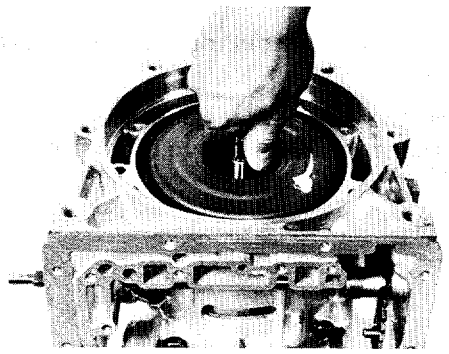


27. MEASURE DISTANCE BETWEEN TOP OF CASE FLANGE AND CLUTCH DRUM

Set SST in the case as shown in the figure.

SST 09350-20015 (09370-12010)

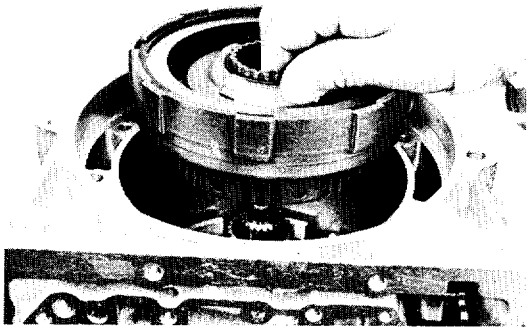
Make a note of the finding for reassembly.



28. REMOVE FRONT CLUTCH AND BEARINGS

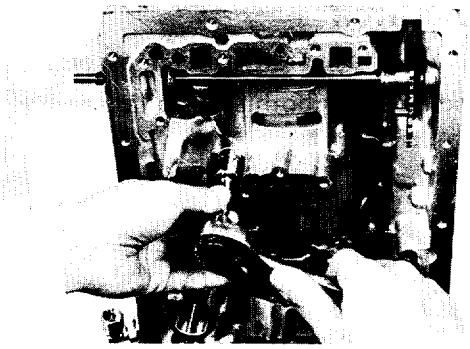
Grasp the shaft and pull out the front clutch assembly. Watch for bearings and races on both sides of the assembly.

29. REMOVE BEARING AND RACE



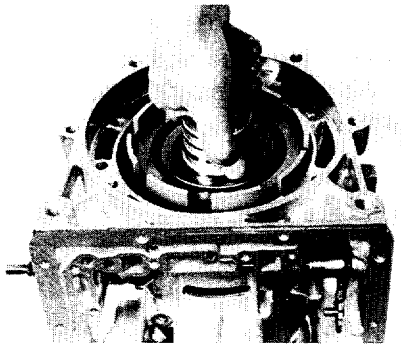
30. REMOVE REAR CLUTCH

Grasp the clutch hub and pull it out from the case.

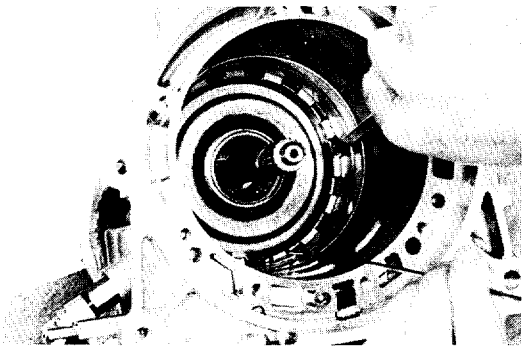


31. REMOVE CENTER SUPPORT AND SUN GEAR

(a) Remove the two center support bolts.

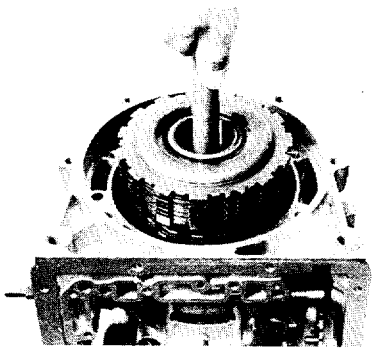


(b) Grasp the assembly and pull out the center support with the sun gear.



32. REMOVE REACTION PLATE RETAINING RING

Using a long screwdriver, compress the snap ring and then lift it above the groove with a wire hook.



33. REMOVE REAR PARTS GROUP

Grasp the intermediate shaft and pull out the rear parts group.

If the brake apply tube and rear thrust bearing and races do not come out with the assembly, remove them from the case.

34. BASIC DISASSEMBLY IS COMPLETE

The transmission in now in basic component subassemblies. Next, you will disassemble, clean, inspect, repair and assemble each of these component groups.

COMPONENT GROUP DISASSEMBLY, INSPECTION AND ASSEMBLY

The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion of similar-looking parts from different subassemblies being on your workbench at the same time.
The component groups are inspected and repaired from the converter housing side.

As much as possible, complete the inspection, repair, assembly before proceeding to the next component group. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean and the fluid passages and holes blown through with compressed air to make sure that they are not clogged.
2. The cleaning solvent used should be the recommended automatic transmission fluid or kerosene.
3. When using compressed air to dry parts, avoid spraying ATF or kerosene in your face.

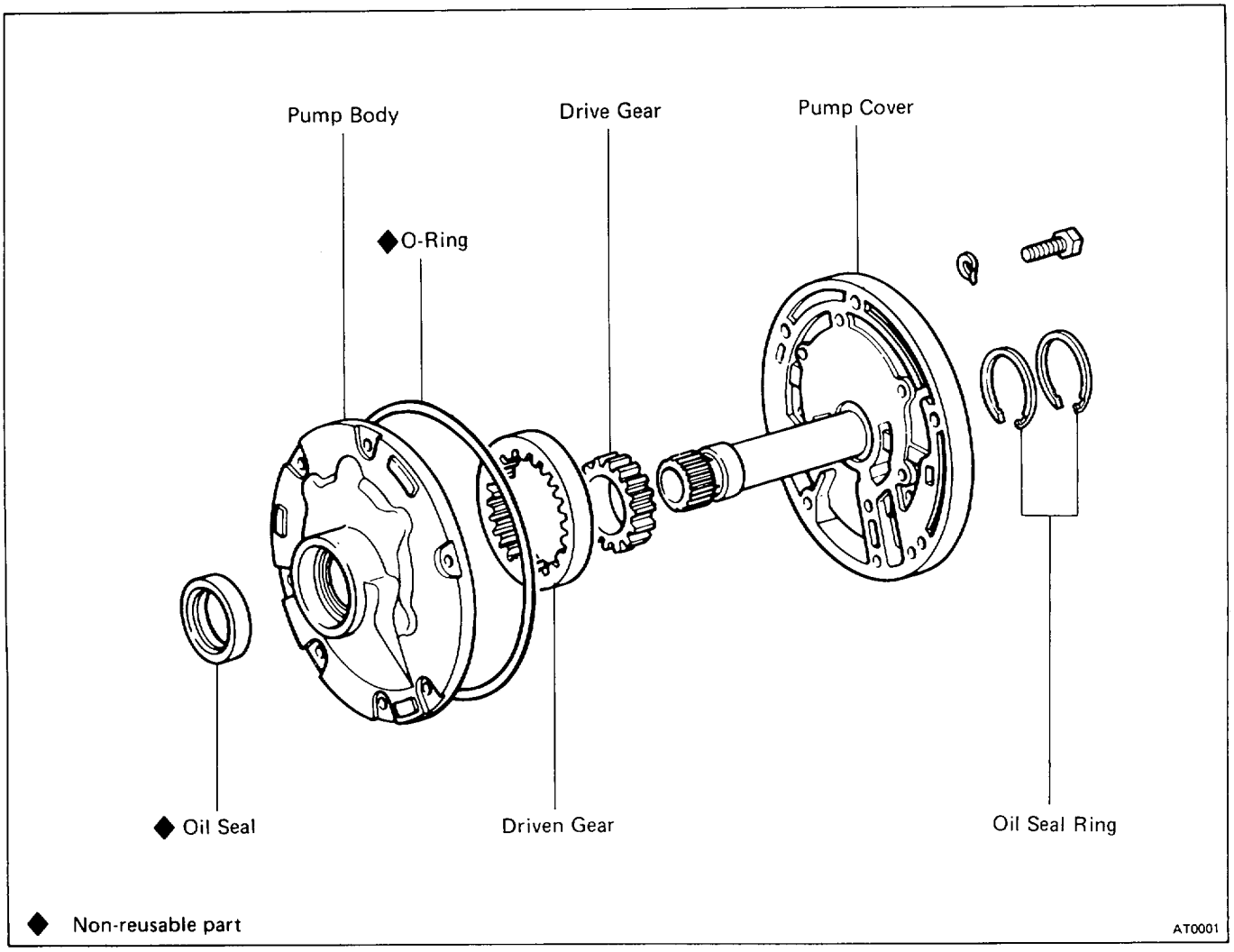
HANDLING NOTES:

1. After cleaning, the parts should be arranged in proper order to allow performing the inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with corresponded spring.
3. New brakes and clutches that are to be used for replacement must be soaked in transmission fluid for at least two hours before assembly.

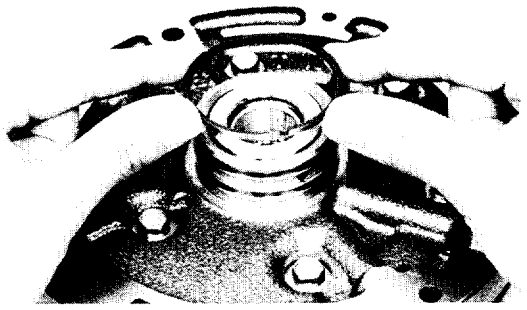
GENERAL ASSEMBLY NOTES:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O-rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the replacement must be made with the subassembly containing that bushing.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in their places.

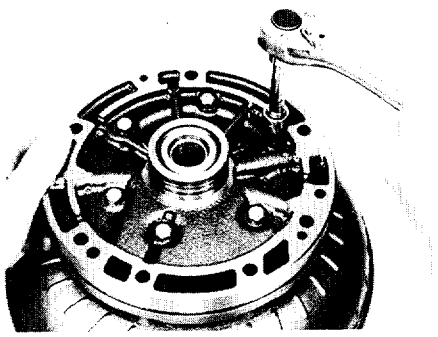
Oil Pump



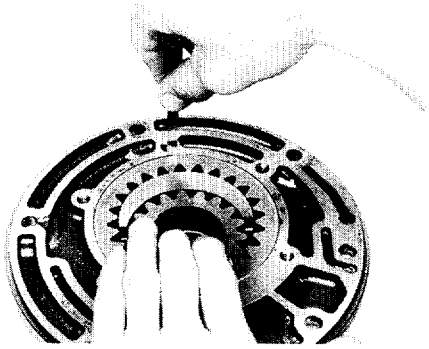
DISASSEMBLY OF OIL PUMP



1. **USE TORQUE CONVERTER AS WORK STAND**
2. **REMOVE TWO OIL SEAL RINGS FROM PUMP COVER**



3. **REMOVE PUMP COVER**
   (a) Remove the six bolts.
   (b) Remove the pump cover.
4. **REMOVE O-RING FROM PUMP**
5. **LIFT PUMP OFF CONVERTER AND REMOVE OIL PUMP DRIVE GEAR AND DRIVEN GEAR**
   Identify the top and bottom and keep them in assembly order.



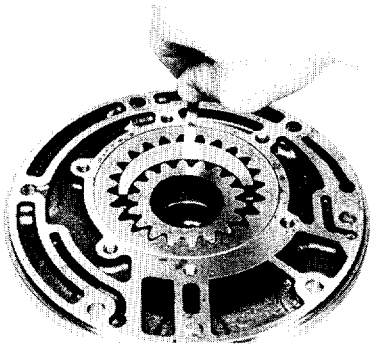
INSPECTION OF OIL PUMP

1. CHECK BODY CLEARANCE OF DRIVEN GEAR

Push the driven gear to one side of the body. Using a feeler gauge, measure the clearance.

Standard body clearance: **0.07 — 0.15 mm (0.0028 — 0.0059 in.)**
Maximum body clearance: **0.3 mm (0.012 in.)**

If the body clearance is greater than the maximum, replace the drive gear, driven gear or pump body.

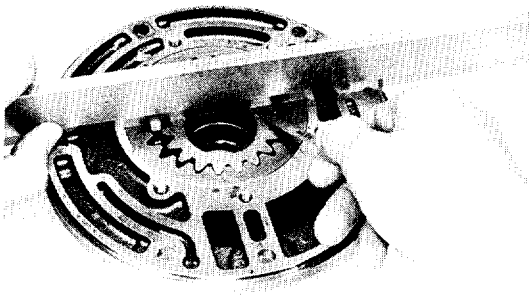


2. CHECK TIP CLEARANCE OF BOTH GEARS

Measure between the gear teeth and the cresent-shaped part of the pump body.

Standard tip clearance: **0.11 — 0.14 mm (0.0043 — 0.0055 in.)**
Maximum tip clearance: **0.3 mm (0.012 in.)**

If the tip clearance is greater than the maximum, replace the drive gear, driven gear or pump body.

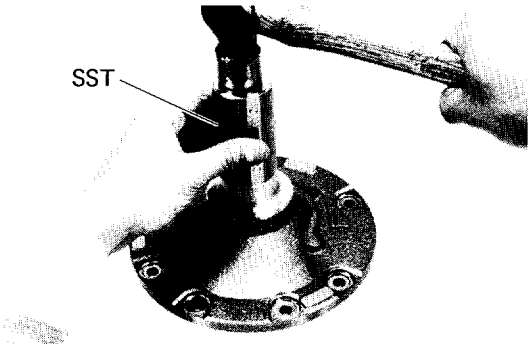


3. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: **0.02 — 0.05 mm (0.0008 — 0.0020 in.)**
Maximum side clearance: **0.1 mm (0.004 in.)**

If the side clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



4. INSPECT FRONT OIL SEAL

Check for wear, damage or cracks.

If necessary, replace the oil seal as follows.

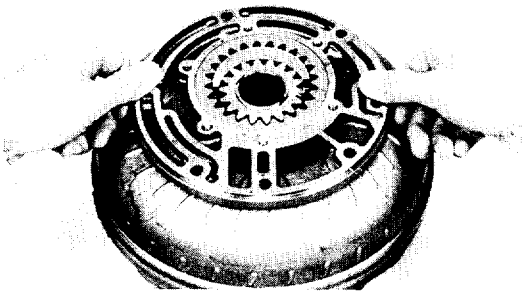
(a) Pry off the oil seal with a screwdriver.

(b) Using SST and a hammer, install a new oil seal. The seal end should be flush with outer edge of pump body.

SST 09350-20015 (09388-20010)

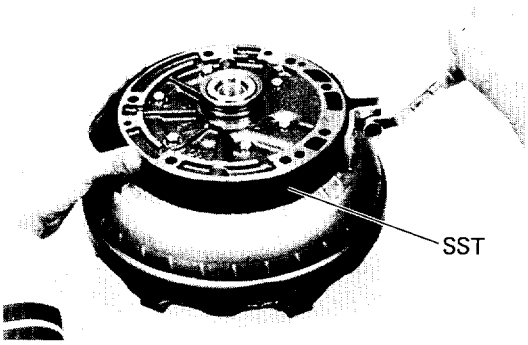
ASSEMBLY OF OIL PUMP

(See page AT-36)



1. **INSTALL DRIVEN GEAR AND DRIVE GEAR AND SET PUMP BODY ON TORQUE CONVERTER**

   Make sure the tops of the gears are facing up ward.



2. **LOOSELY INSTALL PUMP COVER**

   Align the bolt holes and drop the pump cover into place.
   Install the six bolts with wave washers finger tight.

3. **ALIGN PUMP BODY AND PUMP COVER**

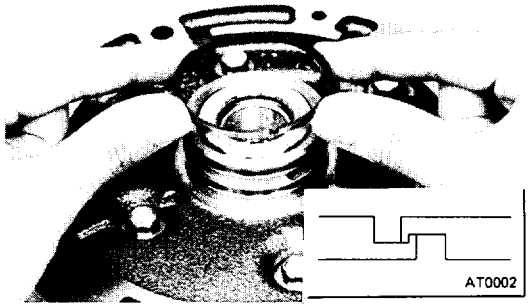
   Install the SST around the body and cover.
   Tighten SST to align the body and cover.

   SST 09350-20015 (09363-20010)

4. **TIGHTEN SIX PUMP COVER BOLTS**

   Torque: 75 kg-cm (65 in.-lb, 7 N·m)

5. **REMOVE SST**



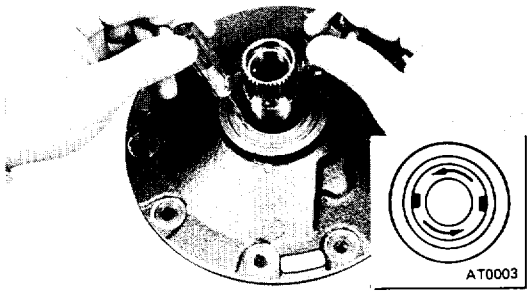
6. **INSTALL TWO OIL SEAL RINGS ON PUMP COVER**

   Spread apart and slide them into the groove.
   Hook both ends by hand.
   Wipe off excess petroleum jelly.

   NOTE: After installing the oil seal rings, check that they move smoothly.

7. **INSTALL NEW O-RING ON PUMP**

   Make sure the O-ring is not twisted and is fully seated in the groove.

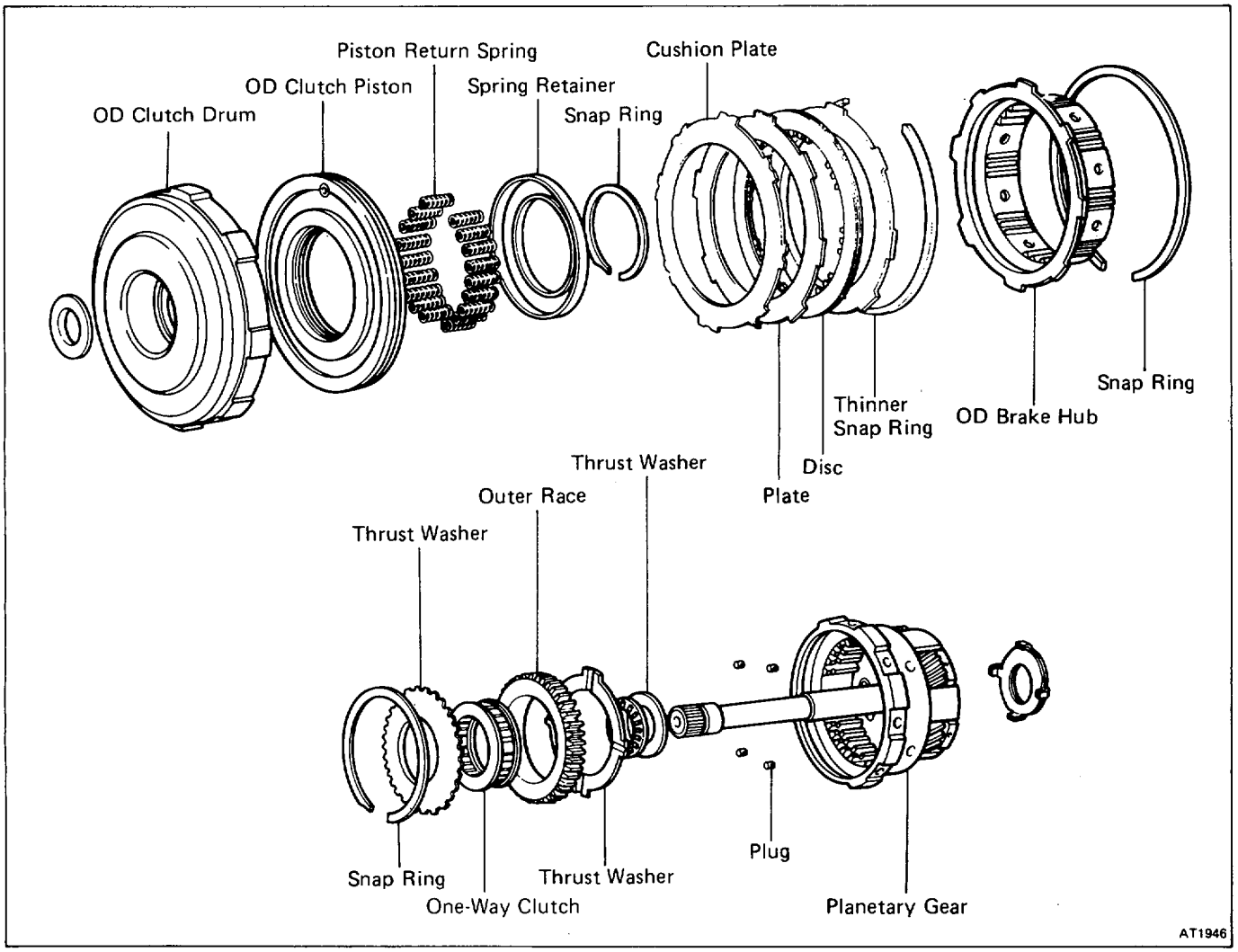


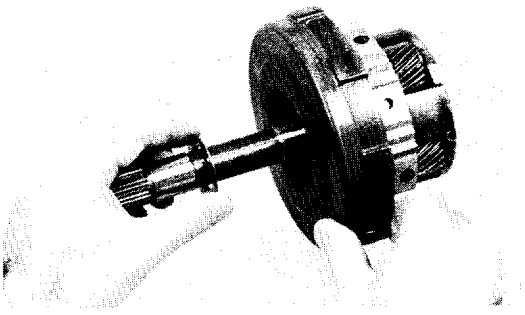
8. **CHECK DRIVE GEAR ROTATION**

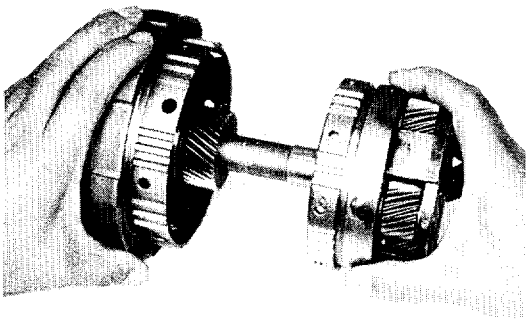
   Turn the drive gear with a screwdriver and make sure it rotates smoothly.

   CAUTION: Do not damage the oil seal lip.

Overdrive Input Shaft and Clutch





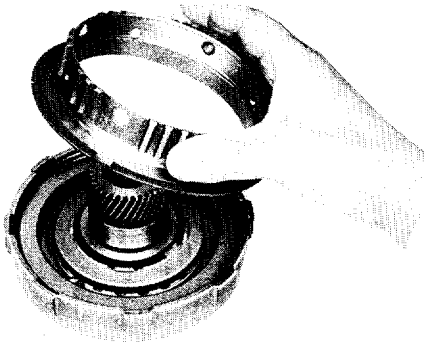


DISASSEMBLY OF OVERDRIVE INPUT SHAFT AND CLUTCH

1. **REMOVE THRUST BEARINGS AND RACES FROM OVERDRIVE INPUT SHAFT**
   (a) Slide off the thrust bearing and race from the clutch side by hand. Note the position of the races.
   (b) Using a screwdriver, pry off the thrust washer from the planetary gear side.

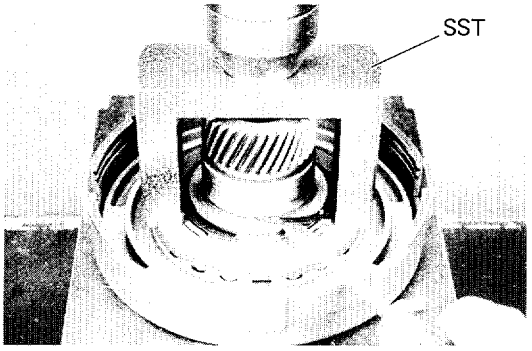
2. **PULL OVERDRIVE CLUTCH ASSEMBLY FROM INPUT SHAFT**
   CAUTION: Be careful that the thrust bearing and race do not fall out.

3. **REMOVE THRUST BEARING AND RACE**
   Note the position of the race.



4. **REMOVE SNAP RING AND HUB FROM OVERDRIVE CLUTCH ASSEMBLY**

5. **REMOVE THINNER SNAP RING, FLANGE, DISC, PLATE AND CUSHION PLATE**

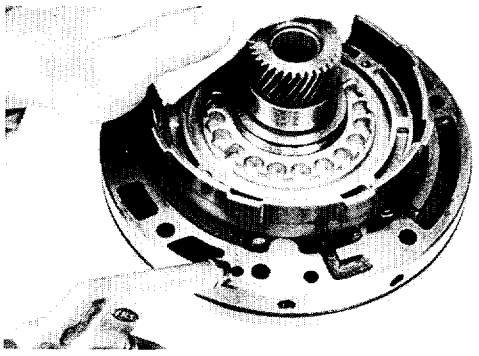


6. **COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING**

   Place SST on the spring retainer and compress springs with a shop press. Using a screwdriver, remove the snap ring.

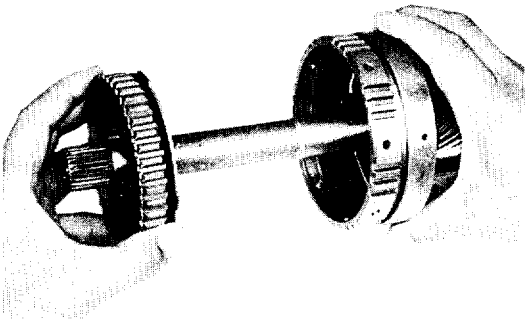
   SST 09350-20015 (09369-20040)

7. **REMOVE SPRING RETAINER AND EIGHTEEN SPRINGS**



8. **ASSEMBLE OVERDRIVE CLUTCH ON OIL PUMP AND BLOW OUT PISTON**
   (a) Slide the overdrive clutch onto the oil pump.
   (b) Apply compressed air to the oil pump to remove the piston.
   (If the piston does not come out completely, use needle nose pliers to remove it.)
   (c) Remove the overdrive clutch from the oil pump.

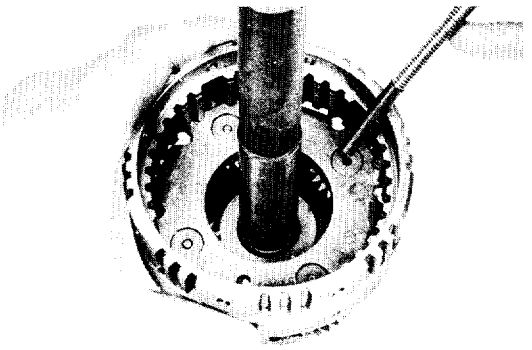
9. **REMOVE CLUTCH PISTON O-RINGS**



10. **REMOVE SNAP RING FROM OVERDRIVE PLANETARY GEAR ASSEMBLY**

11. **REMOVE THRUST WASHERS AND ONE-WAY CLUTCH FROM PLANETARY GEAR ASSEMBLY**

    CAUTION: Be careful not to lose the four plugs.



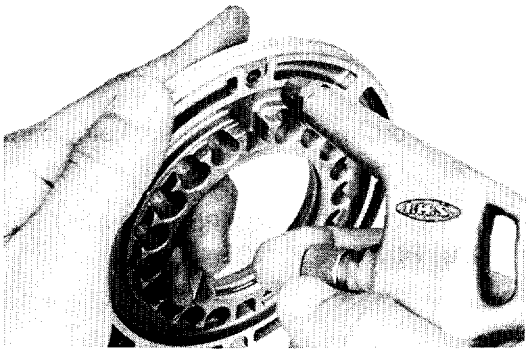
12. **REMOVE FOUR PLUGS BY MAGNET FINGER**

    CAUTION: Keep the four plugs together to prevent losing them.



13. REMOVE ONE-WAY CLUTCH FROM OUTER RACE

Note the direction of the one-way clutch.

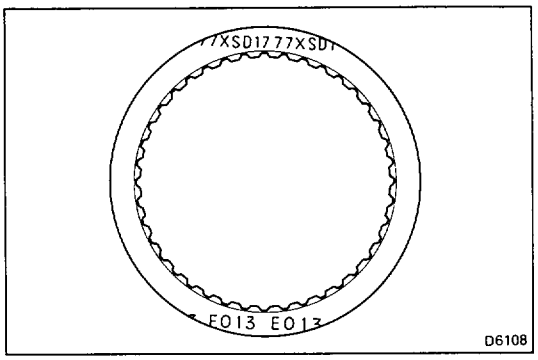


INSPECTION OF OVERDRIVE INPUT SHAFT AND CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

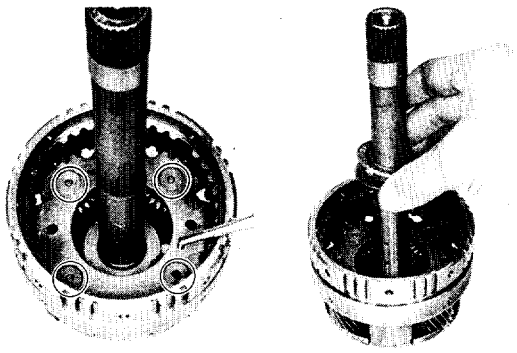
(b) Check that the valve does not leak by applying low-pressure compressed air.



2. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace it.
Then check that the sliding surfaces of plate and flange are not worn or burnt.
If necessary, replace them.

NOTE: Do not allow the discs to dry out.
Prepare new discs by soaking them at least two hours in ATF.



ASSEMBLY OF OVERDRIVE INPUT SHAFT AND CLUTCH

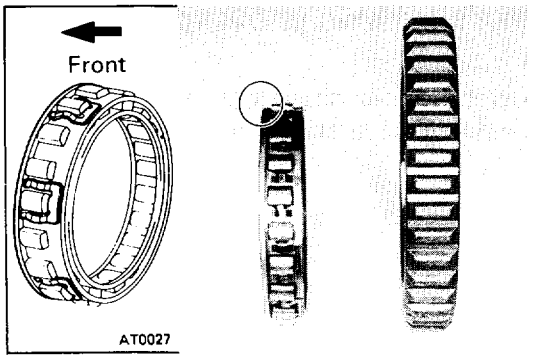
(See page AT-39)

1. INSTALL FOUR PLUGS

2. INSTALL THRUST WASHER AND BEARING

(a) Coat parts with petroleum jelly to keep them in place.

(b) Slip on the bearing and then the thrust washer facing the lip outward.

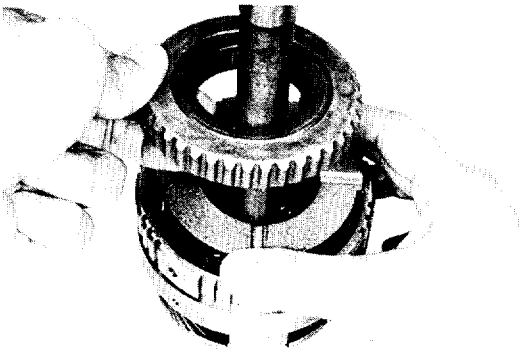


3. INSTALL ONE-WAY CLUTCH

(a) Install the one-way clutch into the outer race.

(b) Install the retainer on both sides of the one-way clutch.

NOTE: Remember that the spring cage side of the one-way clutch faces toward the front of the transmission.



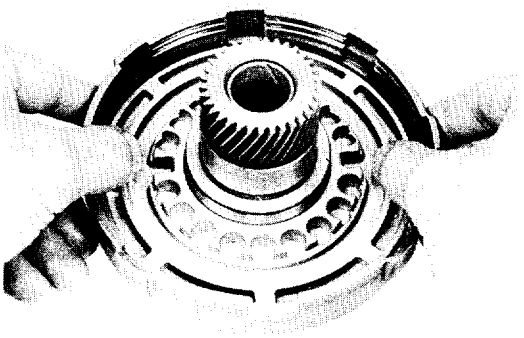
4. INSTALL THRUST WASHER AND ONE-WAY CLUTCH

(a) Install the thrust washer, facing the grooves upward.

(b) Install the one-way clutch in correct direction.

(c) Install the thrust washer.

(d) Install the snap ring.

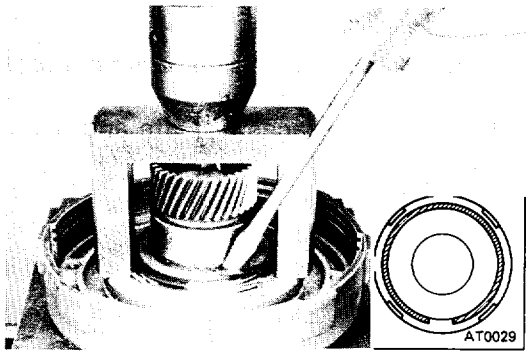


5. INSTALL CLUTCH PISTON IN OVERDRIVE CLUTCH DRUM

(a) Install a new O-ring on the piston. Coat the O-ring with ATF.

(b) Press piston into the drum with the side up, being careful not to damage the O-ring.

6. INSTALL EIGHTEEN PISTON RETURN SPRINGS AND SET RETAINER AND SNAP RING IN PLACE

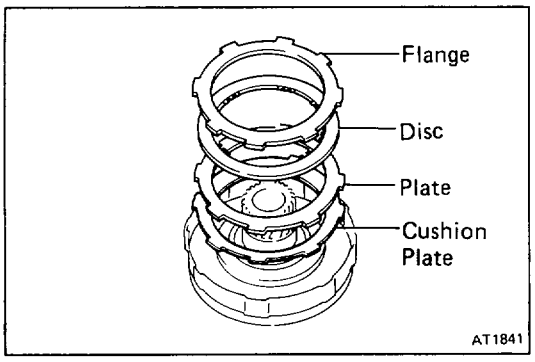


7. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place SST on the spring retainer, and compress the springs on shop press.

SST 09350-20015 (09369-20040)

(b) Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

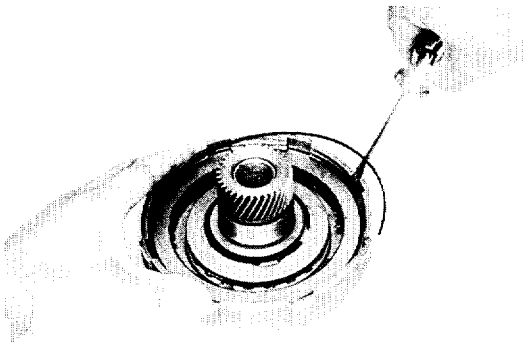


8. INSTALL CUSHION PLATE, PLATE, DISC AND FLANGE

(a) Using low-pressure compressed air, blow all excess ATF from the disc.

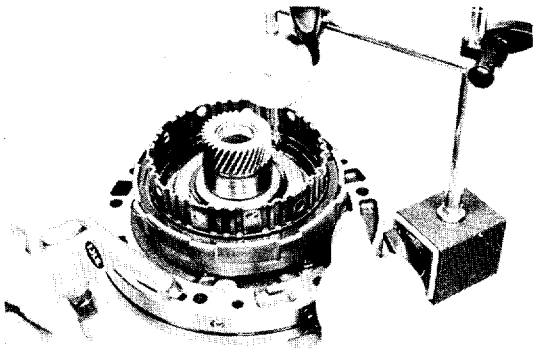
CAUTION: High-pressure air will damage the disc.

(b) Install in order: Cushion plate-plate-disc-flange (flat end down)



9. INSTALL THINNER SNAP RING IN OVERDRIVE CLUTCH DRUM

Compress and lower the snap ring into the groove by hand. Check that the ends of the snap ring are not aligned with one of the cutouts.



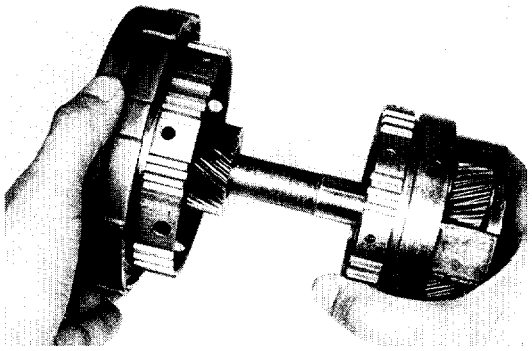
10. CHECK PISTON STROKE OF OVERDRIVE CLUTCH

(a) Install the overdrive clutch hub and outer snap ring.

(b) Install the front clutch drum onto the oil pump body. Using a dial indicator, measure the stroke applying and releasing the compressed air (4—8 kg/cm², 57—114 psi or 392—785 kPa) as shown.

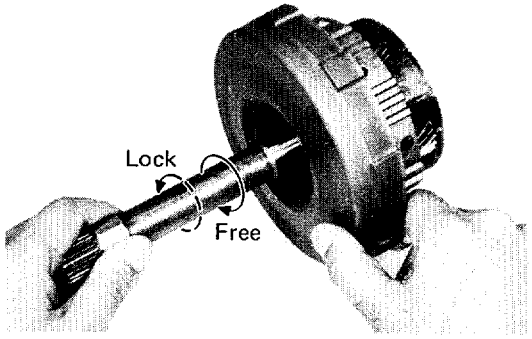
Standard piston stroke: **1.77—2.58 mm (0.0697—0.1016 in.)**

If stroke exceeds the limit, the clutch pack is probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.



11. ASSEMBLE OVERDRIVE CLUTCH DRUM AND OVERDRIVE PLANETARY GEAR

Mesh the hub with the disc, twisting and jiggling the hub as required.

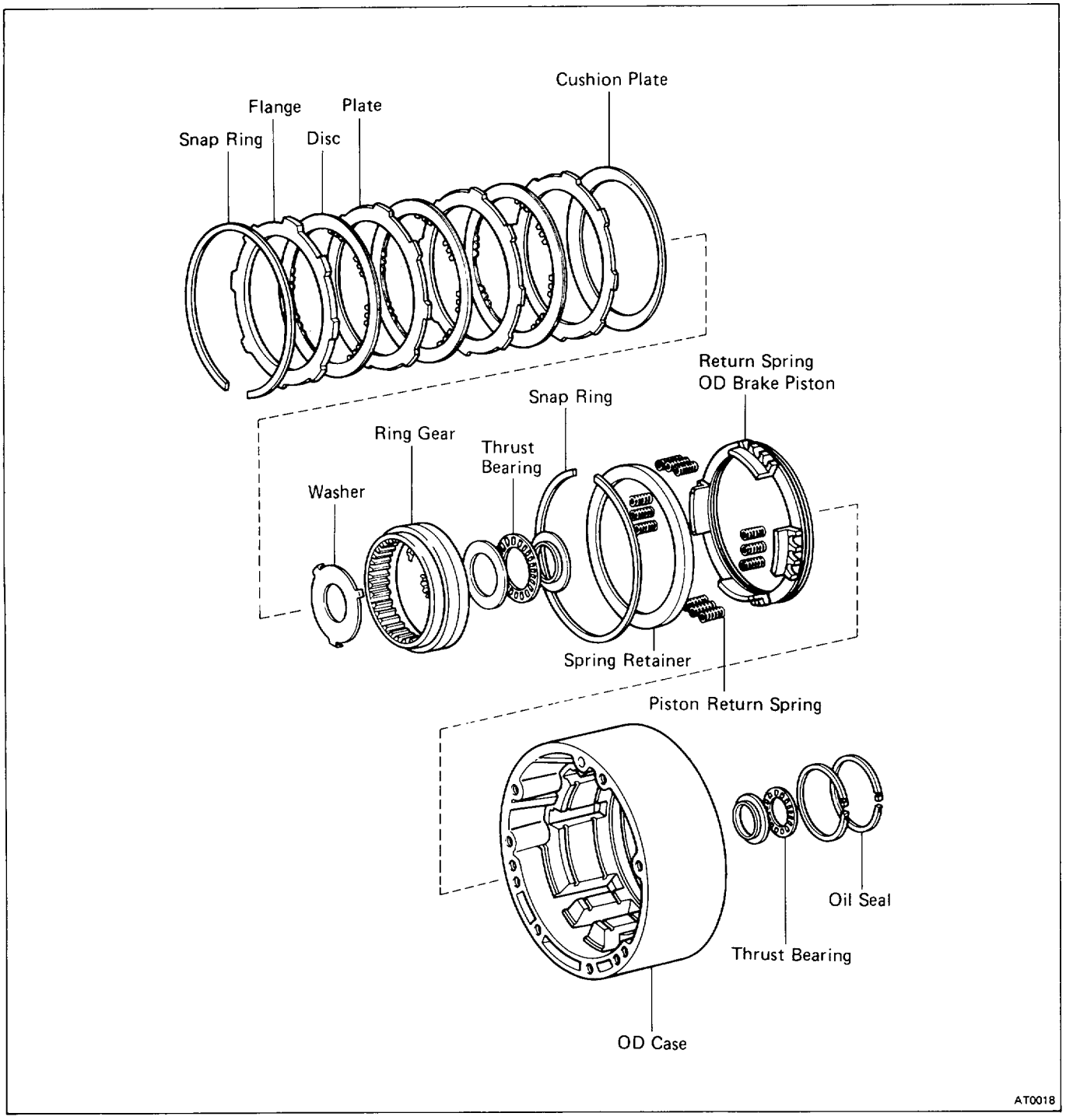


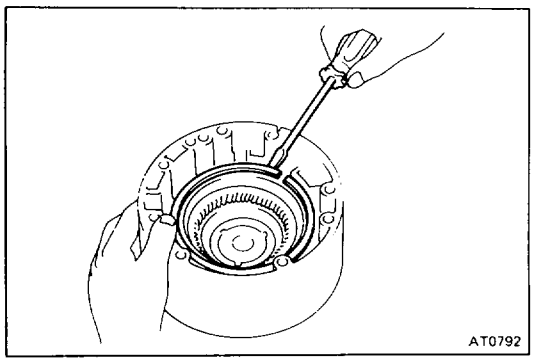
12. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the clutch drum and turn the input shaft. The input shaft should turn freely clockwise and should lock counterclockwise.

13. KEEP THRUST WASHER, THRUST BEARINGS AND RACE TOGETHER

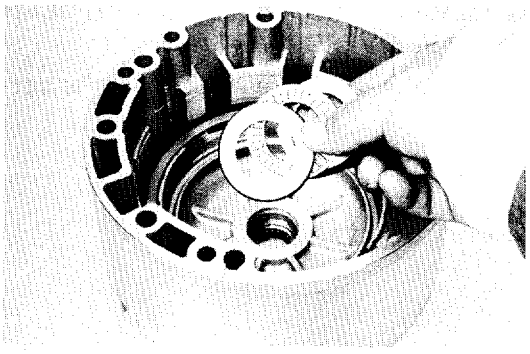
Overdrive Case and Brake





DISASSEMBLY OF OVERDRIVE CASE AND BRAKE

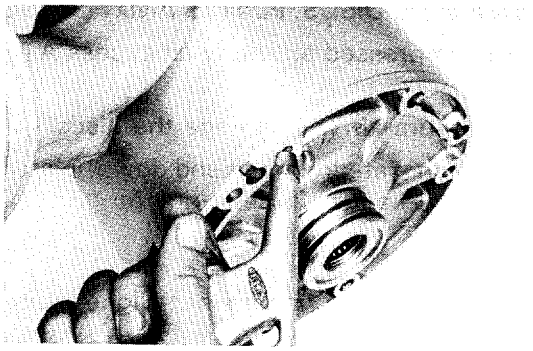
1. REMOVE OUTER SNAP RING FROM OVERDRIVE CASE
2. REMOVE CLUTCH FLANGE, DISCS PLATES AND CUSHION PLATE
3. REMOVE RING GEAR AND THRUST WASHER



4. **REMOVE THRUST BEARING AND RACES FROM OVERDRIVE CASE**

   Note the position of the races.

5. **REMOVE SNAP RING, SPRING RETAINER AND RETURN SPRINGS**



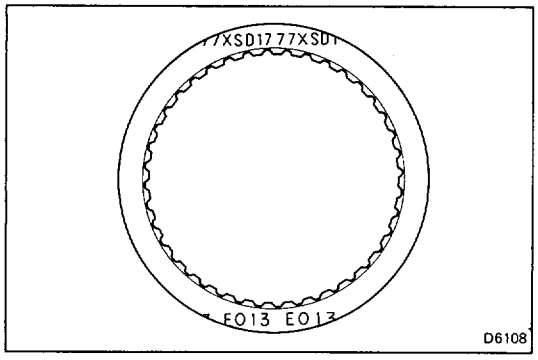
6. **REMOVE BRAKE PISTON**

   Blow compressed air through the case hole indicated in the figure to pop out the brake piston.

   If piston does not pop out, lift it out with needle-nose pliers.

7. **REMOVE TWO OIL SEAL RINGS FROM OVERDRIVE CASE**

8. **REMOVE O-RINGS FROM PISTON**

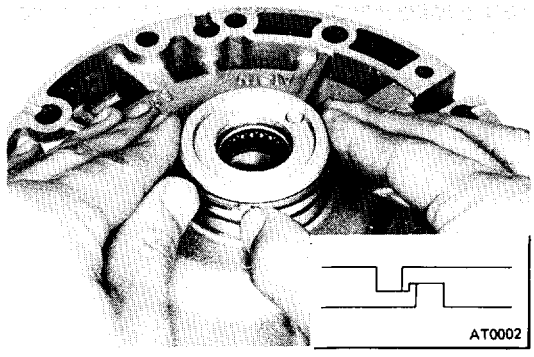


INSPECTION OF OVERDRIVE CASE AND BRAKE

INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace all discs.
Then check that the sliding surfaces of plate and flange are not worn or burnt.
If necessary, replace them.

NOTE: Do not allow the discs to dry out.
Prepare new discs by soaking them at least two hours in ATF.



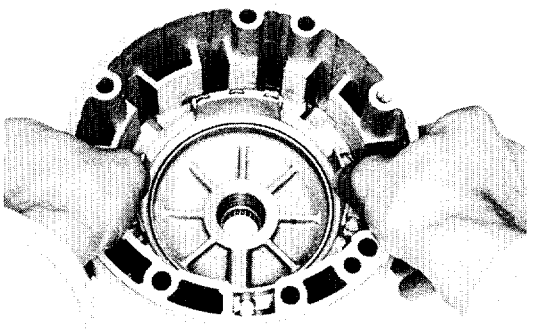
ASSEMBLY OF OVERDRIVE CASE AND BRAKE

(See page AT-44)

1. **INSTALL TWO OIL SEAL RINGS ON OVERDRIVE CASE**

   Spread apart and slide them into the groove. Hook both ends by hand.

   NOTE: After installing the oil seal rings, check that they move smoothly.



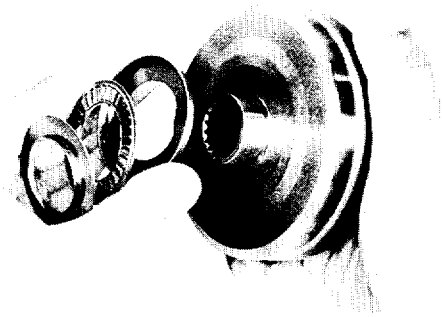
2. **INSTALL NEW O-RINGS ON PISTON**

3. **INSTALL BRAKE PISTON IN OVERDRIVE CASE**

   Install the piston with the cup side up, being careful not to damage the O-rings.

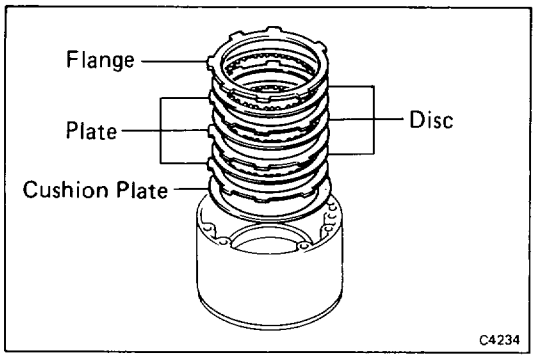
4. **INSTALL RETURN SPRINGS AND SET RETAINER AND SNAP RING IN PLACE**

   Check that the ends of the snap ring are not aligned with one of the cutouts.



5. INSTALL THRUST BEARING AND RACES TO RING GEAR AND SET RING GEAR IN OVERDRIVE CASE

NOTE: Make sure that the races are installed in the correct direction.



6. INSTALL CUSHION PLATE, DISCS, PLATES AND FLANGE

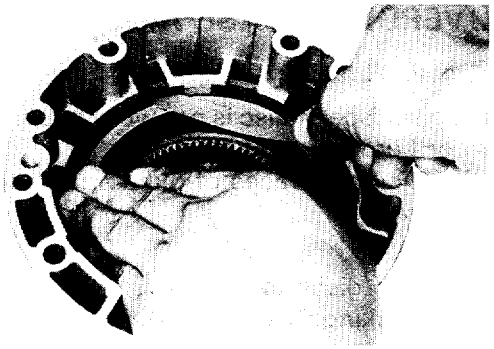
Using low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Cushion plate (rounded end down)-plate-disc-plate-disc-plate-disc-flange (flat end down)

7. INSTALL SNAP RING

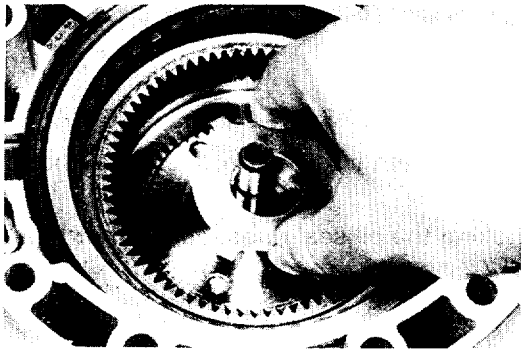
Check that the ends of the snap ring are not aligned with one of the cutouts.



8. MEASURE BRAKE CLEARANCE

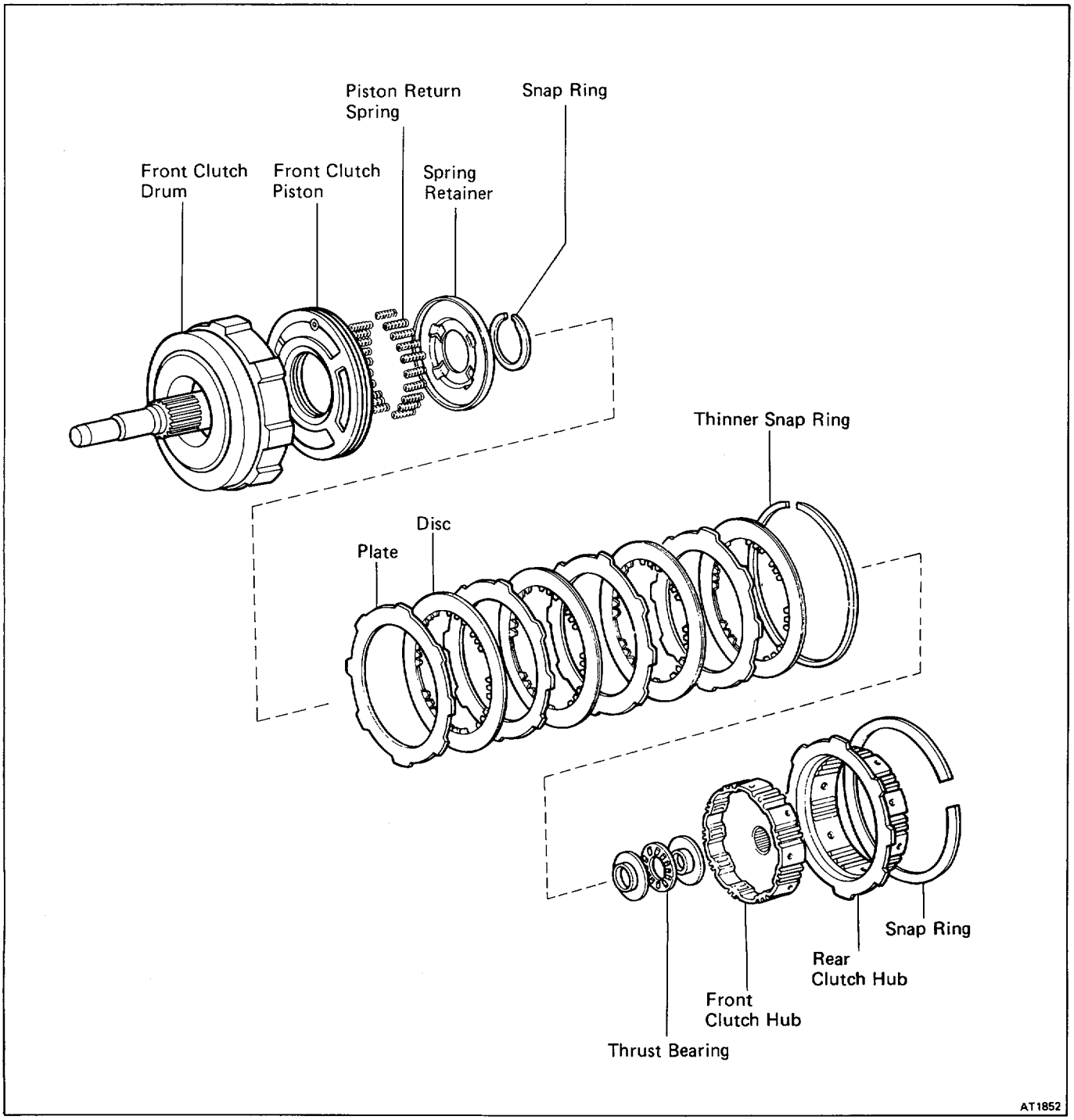
Measure the distance between snap ring and flange.

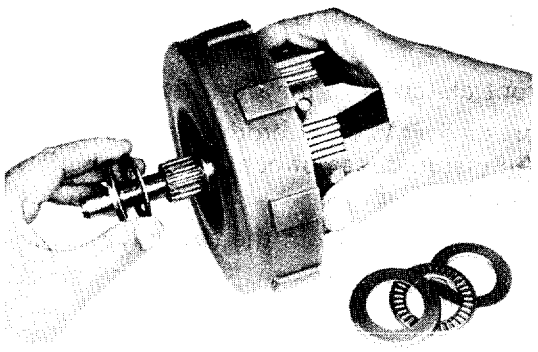
Standard clearance: 0.65 — 2.21 mm (0.0256 — 0.0870 in.)



9. INSTALL WASHER ONTO RING GEAR

Front Clutch

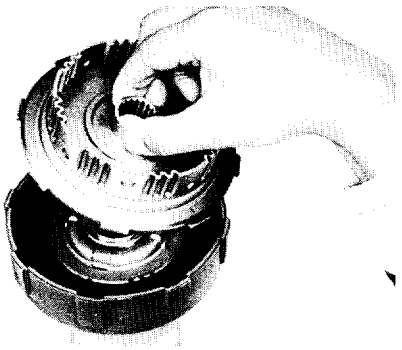




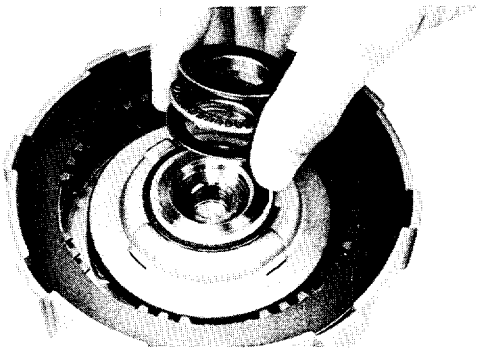
DISASSEMBLY OF FRONT CLUTCH

1. **REMOVE THRUST BEARING AND RACES FROM BOTH SIDES OF CLUTCH**

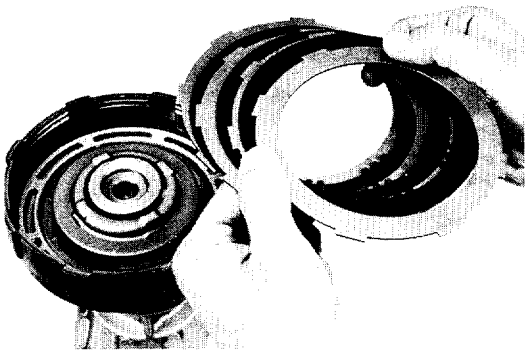
   Note the position of the races.



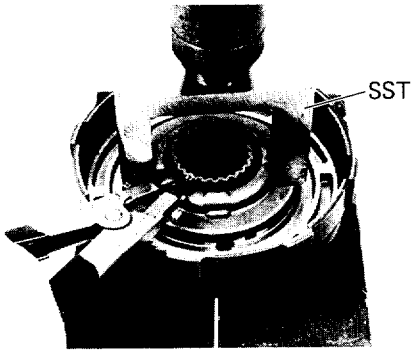
2. **USE EXTENSION HOUSING AS WORK STAND**
3. **REMOVE SNAP RING FROM FRONT CLUTCH DRUM**
4. **REMOVE FRONT AND REAR CLUTCH HUB**
   Lift out the two clutch hubs together.



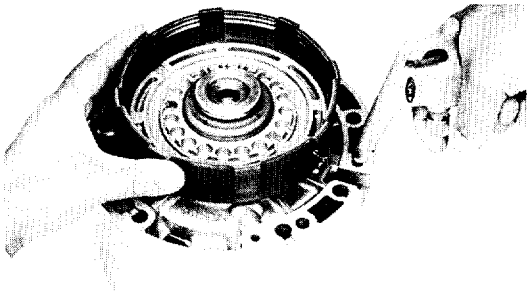
5. **REMOVE THRUST BEARING AND RACES**
   Note the position of the races.
6. **REMOVE DISC**



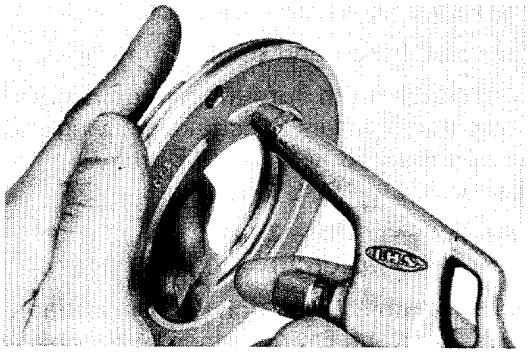
7. **REMOVE THINNER SNAP RING**
8. **REMOVE REMAINING CLUTCH PLATES AND DISCS**



9. **COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING**
   Place SST on the spring retainer and compress the springs with a shop press.
   Using a screwdriver, remove the snap ring.
   SST 09350-20015 (09369-20040)
10. **REMOVE SPRING RETAINER AND TWENTY SPRINGS**



11. **ASSEMBLE FRONT CLUTCH ON OVERDRIVE CASE AND BLOW PISTON**
    (a) Slide the front clutch onto the overdrive case.
    (b) Apply compressed air to the overdrive case to remove the piston. (If piston does not come out completely, use pliers to remove it.)
    (c) Remove the front clutch from the overdrive case.
12. **REMOVE O-RINGS FROM PISTON**

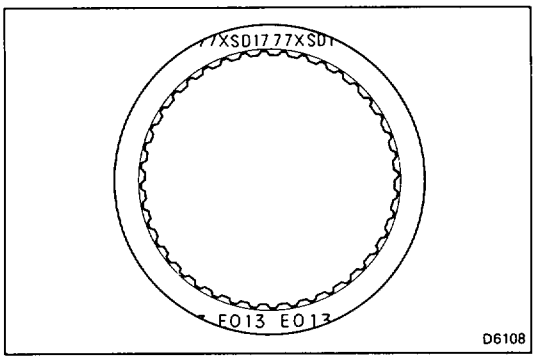


INSPECTION OF FRONT CLUTCH

1. INSPECT FRONT CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

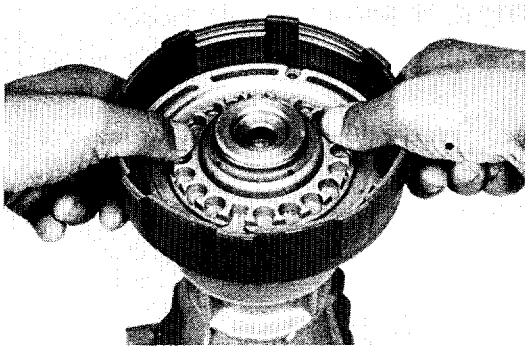
(b) Check that the valve does not leak by applying low-pressure compressed air.



2. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace all discs.
Then check that the sliding surfaces of plate and flange are not worn or burnt.
If necessary, replace them.

NOTE: Do not allow the discs to dry out. Prepare new discs by soaking them at least two hours in ATF.



ASSEMBLY OF FRONT CLUTCH

(See page AT-47)

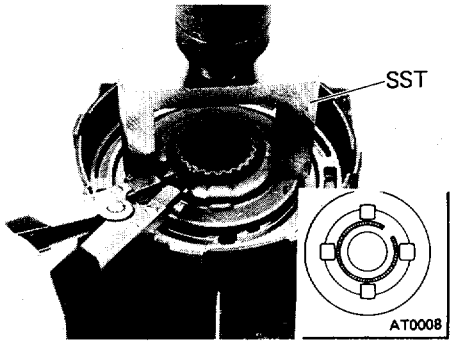
1. INSTALL NEW O-RINGS ON PISTON

2. INSTALL PISTON IN FRONT CLUTCH DRUM

Press the piston into the housing with the cup side up (check ball down).

Be careful not to damage the O-rings.

3. INSTALL TWENTY PISTON RETURN SPRINGS, SPRING RETAINER AND SNAP RING IN PLACE

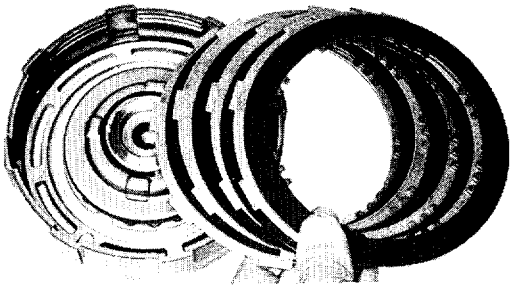


4. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place SST on the spring retainer, and compress the spring on a shop press.

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(b) Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



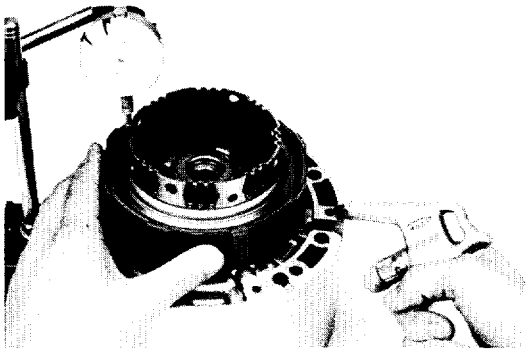
5. INSTALL DISCS AND PLATES WITHOUT ASSEMBLING THINNER SNAP RING

(a) Do not assemble the thinner snap ring yet.

(b) Using low-pressure compressed air, blow all excess ATF from the discs. For measurement of the clutch pack, install all plates and discs (temporarily without thinner snap ring):

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-plate-disc-plate-disc-plate-(no snap ring)-disc



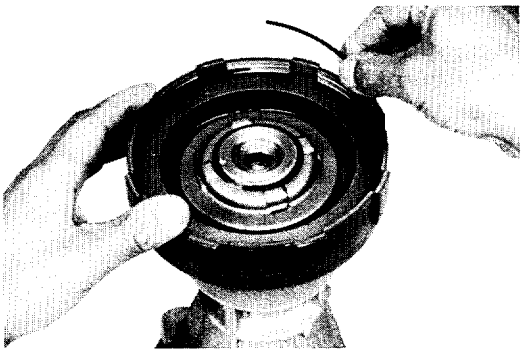
6. CHECK PISTON STROKE OF FRONT CLUTCH

(a) Install the rear clutch hub and outer snap ring.

(b) Install the front clutch drum onto the overdrive case. Using a dial indicator, measure the stroke applying and releasing the compressed air (4 — 8 Kg/cm², 57 — 114 psi or 392 — 785 kPa).

Standard piston stroke: 1.32—2.66 mm (0.0520 — 0.1047 in.)

If the stroke exceeds the limit, the clutch pack is probably worn. If stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.

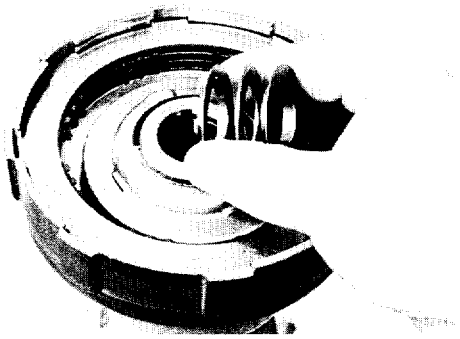


7. INSTALL THINNER SNAP RING IN CLUTCH DRUM

(a) Remove the snap ring, rear clutch hub and one disc to allow installation of the inner shap ring.

(b) Compress and lower the snap ring into the groove by hand. Check that the ends of the snap ring are not aligned with one of the cutouts.

8. INSTALL DISC

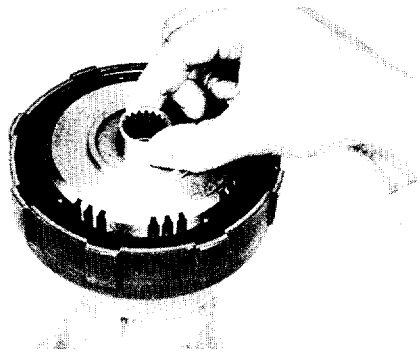


9. INSTALL INNER THRUST BEARING AND RACES

IMPORTANT: Coat parts with petroleum jelly to keep them in place.

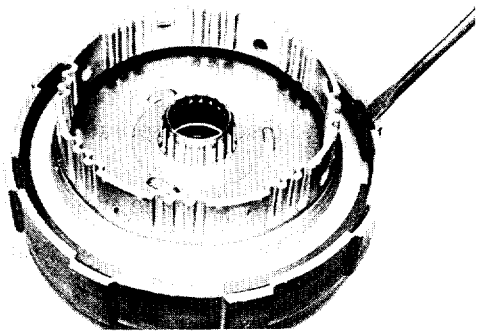
Install the inner race, needle bearing and outer race. Press them into place.

NOTE: Face the lip of race toward the front clutch body.



10. INSTALL FRONT CLUTCH HUB

Align the disc lugs with the hub teeth. Make sure the hub meshes with all the discs and is fully inserted.



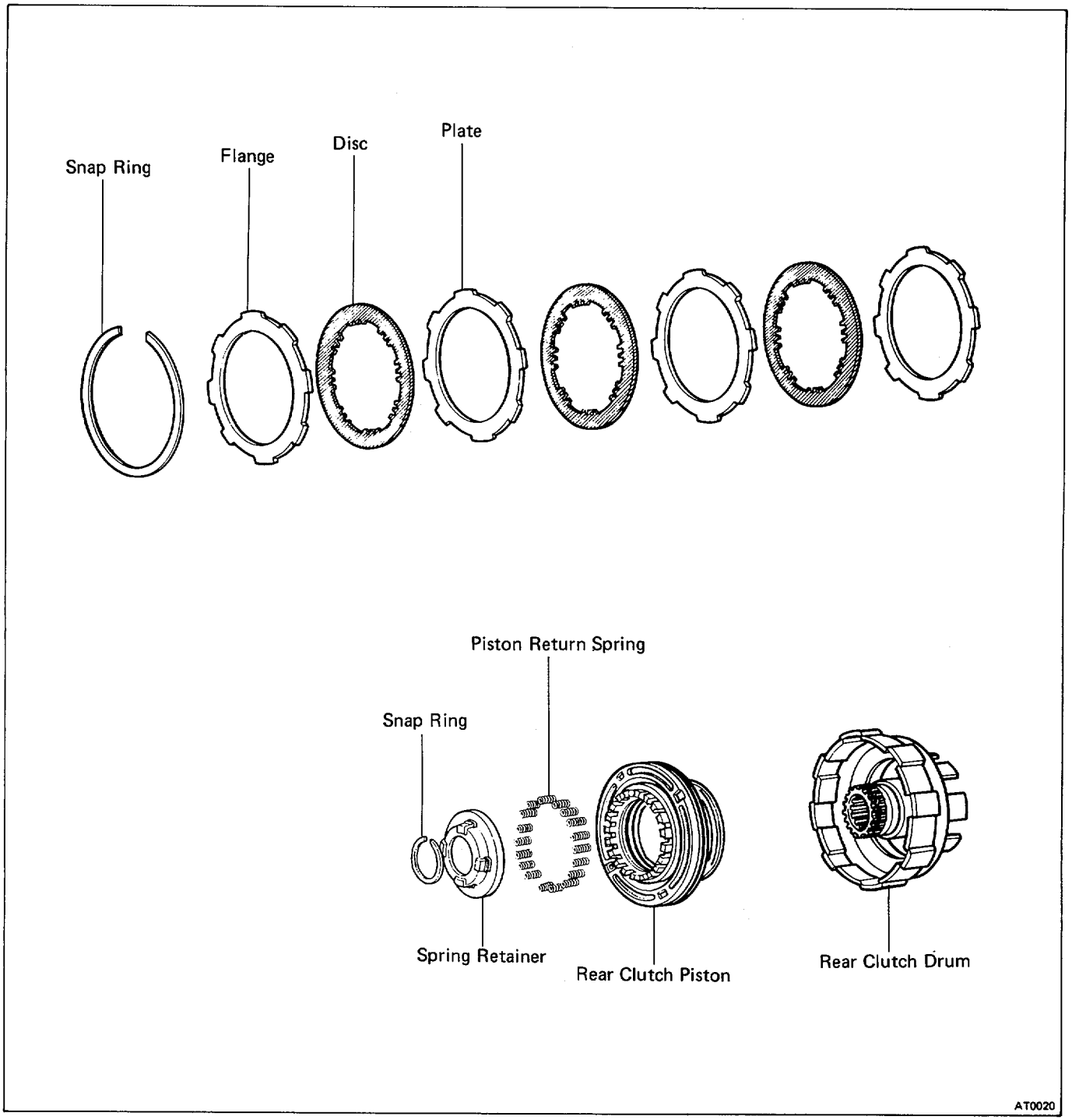
11. INSTALL REAR CLUTCH HUB AND OUTER SNAP RING

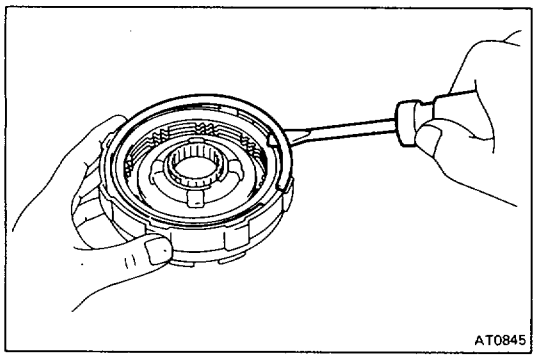
Check that the snap ring ends are not aligned with one the cutouts.

NOTE: Note the position of the thrust bearing and races, and keep them together until assembly.

12. KEEP THRUST BEARINGS AND RACES TOGETHER

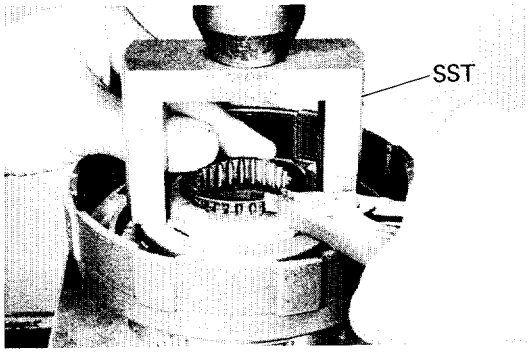
Rear Clutch





DISASSEMBLY OF REAR CLUTCH

1. **REMOVE SNAP RING FROM DRUM**
2. **REMOVE CLUTCH FLANGE, DISCS AND PLATES**



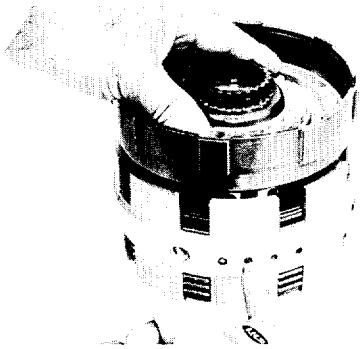
3. **COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING**

Place SST on the spring retainer and compress the springs with a shop press.

Using snap ring pliers, remove the snap ring.

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4. **REMOVE SPRING RETAINER AND EIGHTEEN RETURN SPRINGS**



5. **ASSEMBLE REAR CLUTCH ON CENTER SUPPORT AND BLOW OUT PISTON**

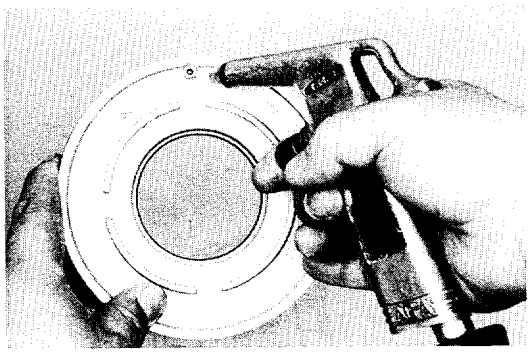
(a) Slide the rear clutch onto the center support.

(b) Apply compressed air to the center support to remove the piston. (If the piston does not come out completely, use pliers to remove it.)

(c) Remove the rear clutch from the center support.

6. **REMOVE O-RINGS FROM REAR CLUTCH PISTON**

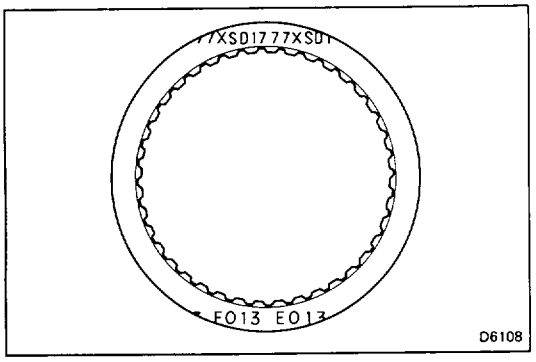
INSPECTION OF REAR CLUTCH



1. **INSPECT REAR CLUTCH PISTON**

(a) Check that the check ball is free by shaking each piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.



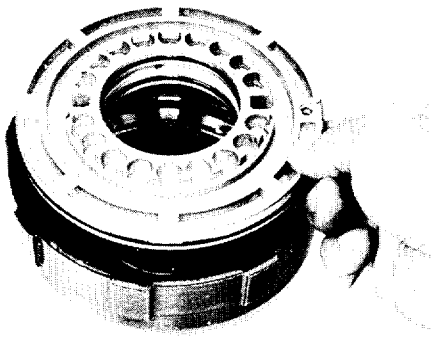
2. **INSPECT DISC, PLATE AND FLANGE**

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace all discs.
Then check that sliding surfaces of plate and flange are not worn or burnt.
If necessary replace them.

NOTE: Do not allow the discs to dry out. Prepare new discs by soaking them at least two hours in ATF.

ASSEMBLY OF REAR CLUTCH

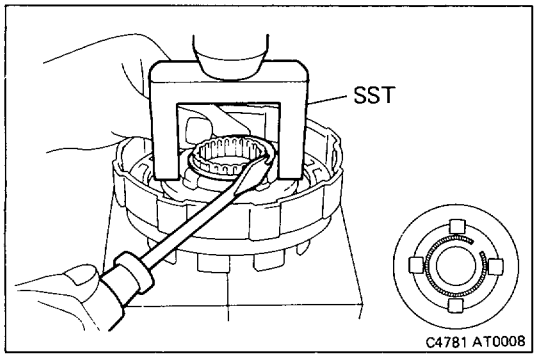
(See page AT-51)

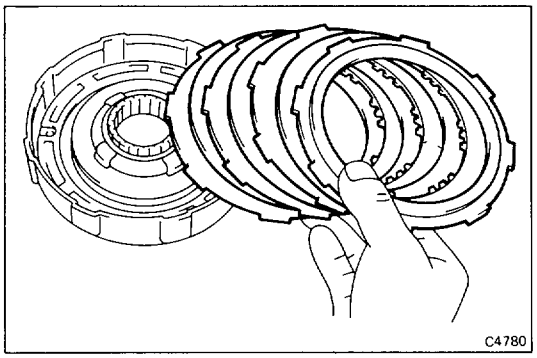


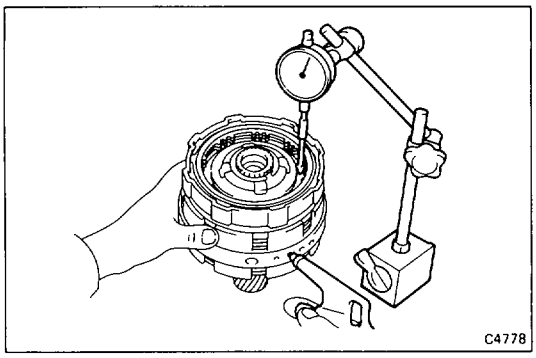
1. **INSTALL NEW O-RINGS ON PISTON**

2. **INSTALL REAR CLUTCH PISTON IN DRUM**

Press the rear clutch piston into the drum with the cup side up, being careful not to damage the O-rings.







3. INSTALL EIGHTEEN PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP RING IN PLACE

4. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE

(a) Place SST on the spring retainer, and compress the spring on a shop press.

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(b) Install the snap ring with snap ring pliers.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

5. INSTALL DISCS, PLATES AND FLANGE

Using low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-plate-disc-plate-disc-flange (flat end down)

6. INSTALL SNAP RING

Check that the snap ring ends are not aligned with one of the cutouts.

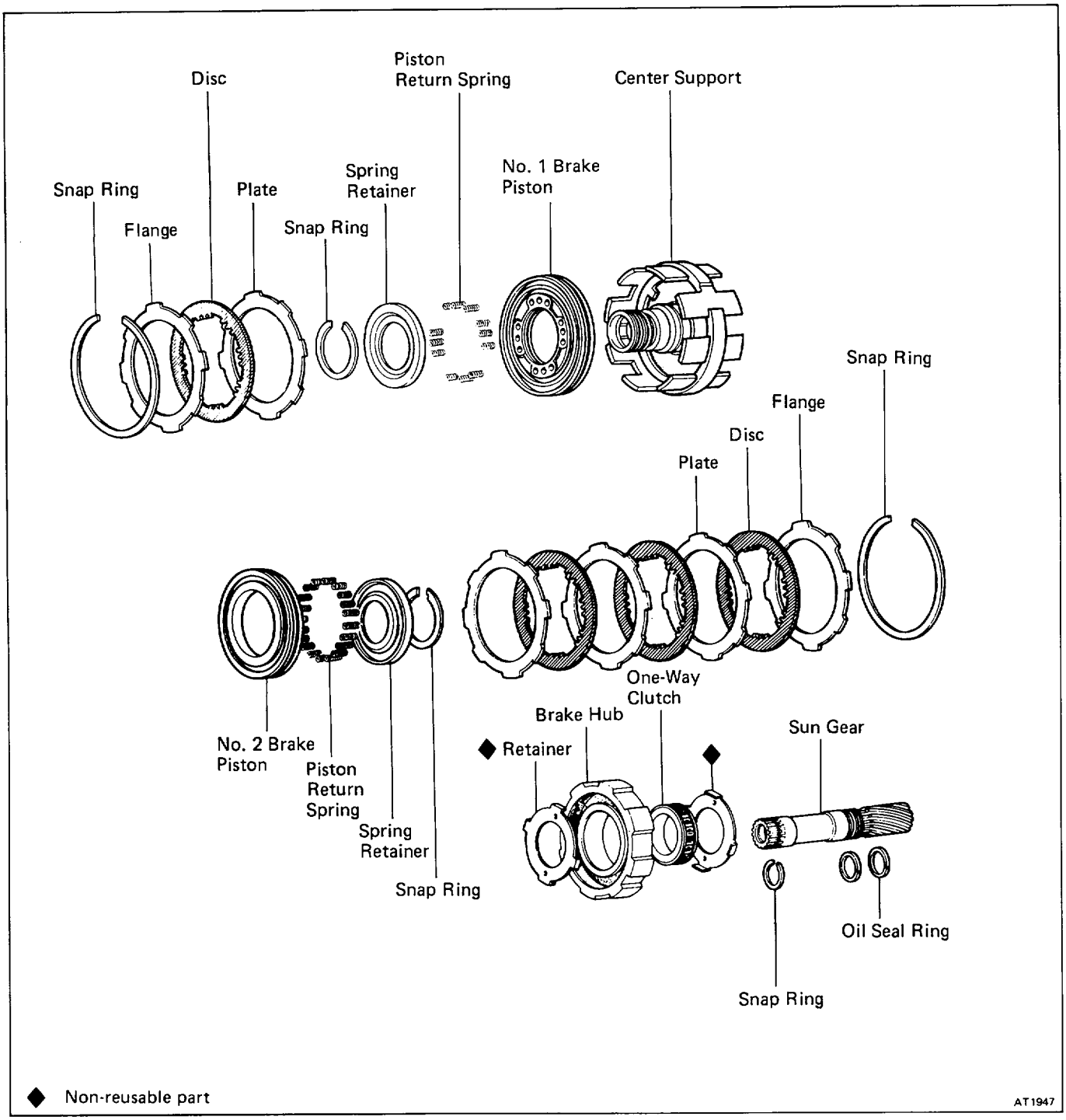
7. CHECK PISTON STROKE OF REAR CLUTCH

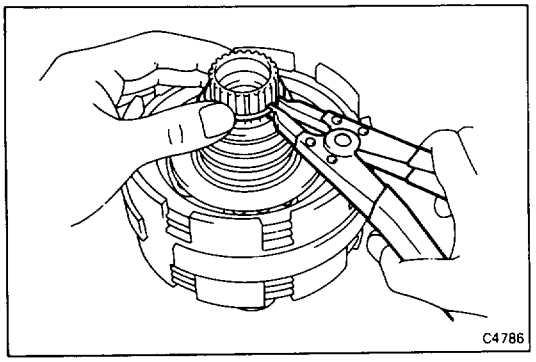
Install the rear clutch onto the center support. Using a dial indicator, measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

Standard piston stroke: 0.91 — 1.99 mm (0.0358 — 0.0783 in.)

If the stroke exceeds the limit, the clutch pack is probably worn. If the stroke is less than the limit, parts may be mis-assembled or there may be excess ATF on the discs.

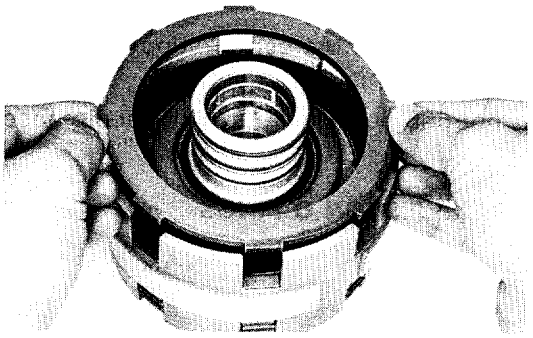
Center Support Assembly





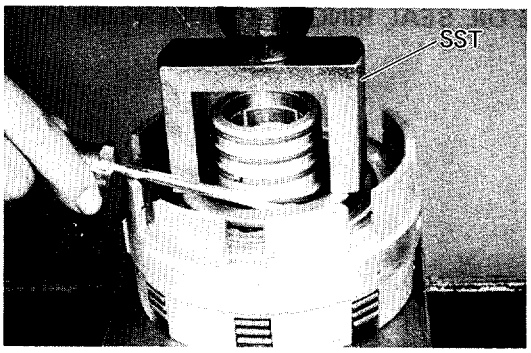
DISASSEMBLY OF CENTER SUPPORT ASSEMBLY

1. REMOVE SNAP RING FROM END OF SUN GEAR SHAFT
2. PULL CENTER SUPPORT ASSEMBLY FROM SUN GEAR



3. **REMOVE SNAP RING FROM FRONT OF CENTER SUPPORT ASSEMBLY (NO.1 BRAKE)**

4. **REMOVE CLUTCH FLANGE, DISC AND PLATE (NO.1 BRAKE)**

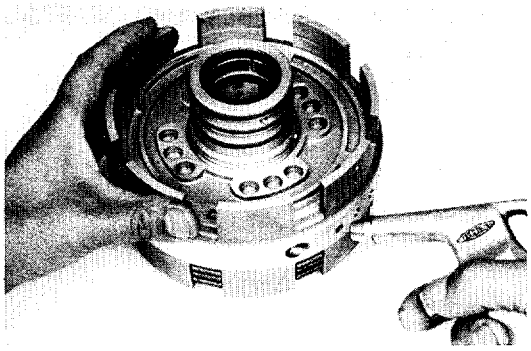


5. **COMPRESS PISTON RETURN SPRING AND REMOVE SNAP RING**

   Place SST on the spring retainer and compress the springs with a shop press.
   Using a screwdriver, remove the snap ring.

   SST 09350-20015 (09369-20040)

6. **REMOVE SPRING RETAINER AND TWELVE SPRINGS**

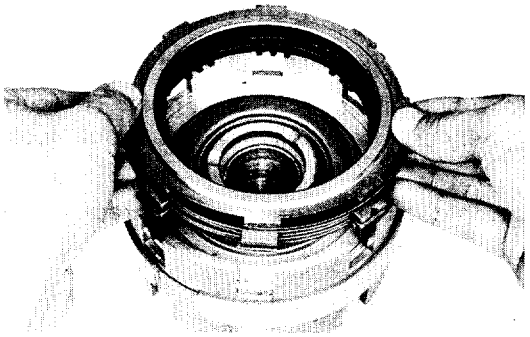


7. **REMOVE NO.1 BRAKE PISTON**

   Blow compressed air through the center support oil hole to remove the No. 1 brake piston.

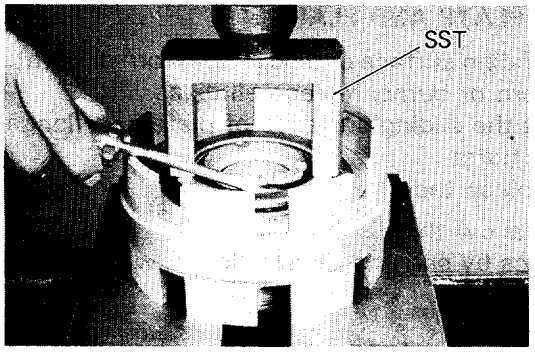
   If piston does not pop out, lift it out with needle-nose pliers.

8. **REMOVE NO.1 BRAKE PISTON O-RINGS**



9. **TURN CENTER SUPPORT ASSEMBLY OVER AND REMOVE REAR SNAP RING (NO.2 BRAKE)**

10. **REMOVE CLUTCH FLANGE, DISCS AND PLATES (NO.2 BRAKE)**



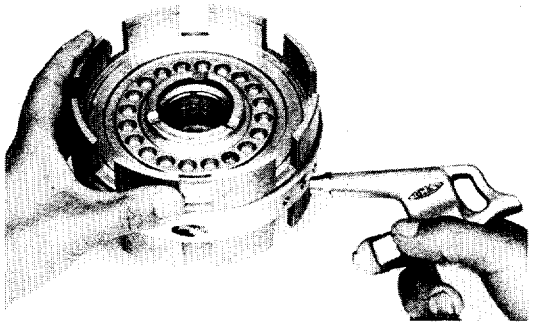
11. **COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING**

    Place SST on the spring retainer and compress the springs with a shop press.

    Using a screwdriver, remove the snap ring.

    SST 09350-20015 (09369-20040)

12. **REMOVE SPRING RETAINER AND SPRINGS**

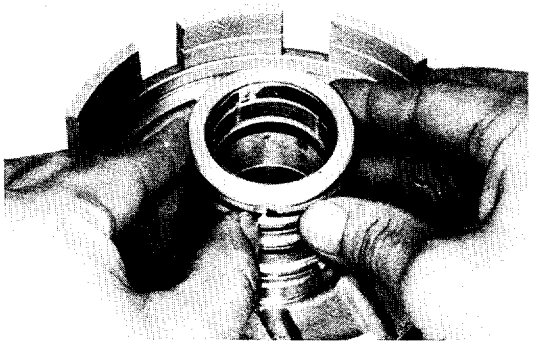


13. **REMOVE NO.2 BRAKE PISTON**

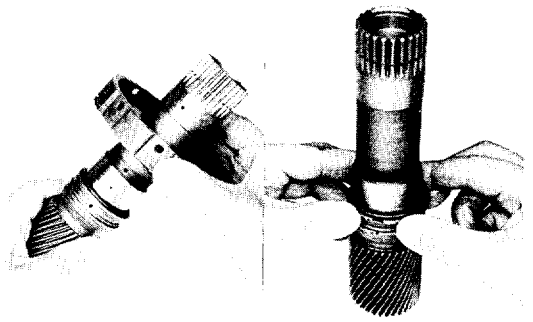
Blow compressed air through the center support oil hole to remove the No.2 brake piston.

If the piston does not pop out, lift if out with needle-nose pliers.

14. **REMOVE NO.2 BRAKE PISTON O-RINGS**

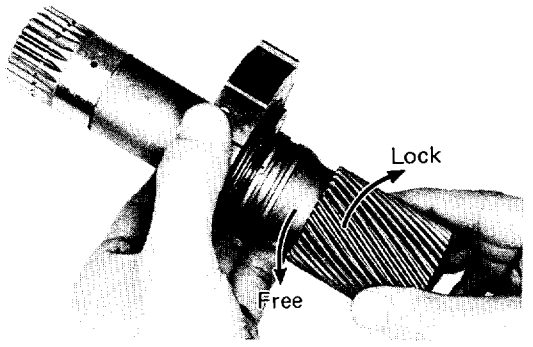


15. **REMOVE THREE OIL SEAL RINGS FROM CENTER SUPPORT**



16. **REMOVE ONE-WAY CLUTCH ASSEMBLY AND OIL SEAL RINGS FROM SUN GEAR**

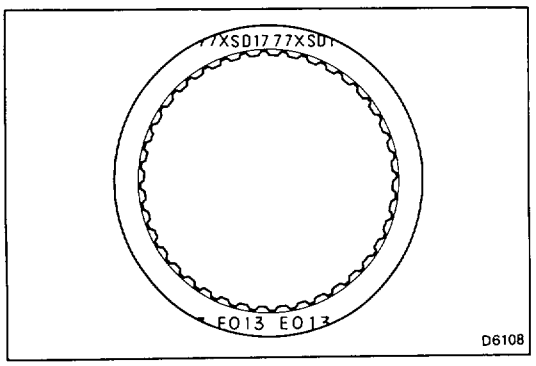
INSPECTION OF CENTER SUPPORT ASSEMBLY



1. **CHECK OPERATION OF ONE-WAY CLUTCH**

Hold the No.2 brake hub and turn the sun gear. The sun gear should turn freely counterclockwise and should lock clockwise.

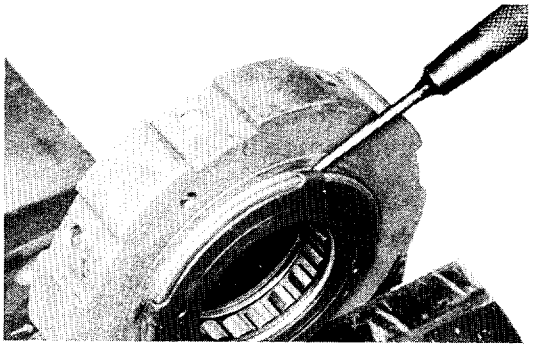
If the one-way clutch does not work properly, replace it.



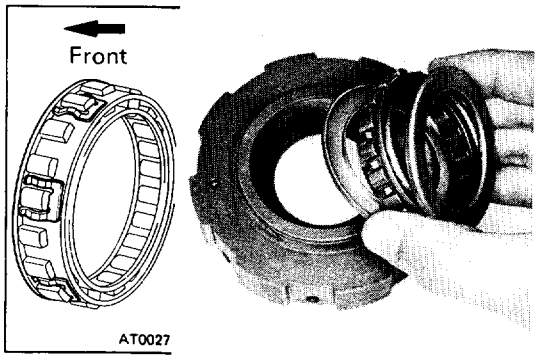
2. **INSPECT DISC, PLATE AND FLANGE**

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace all discs.
Then check that the sliding surfaces of plate and flange are not worn or burnt.
If necessary, replace them.

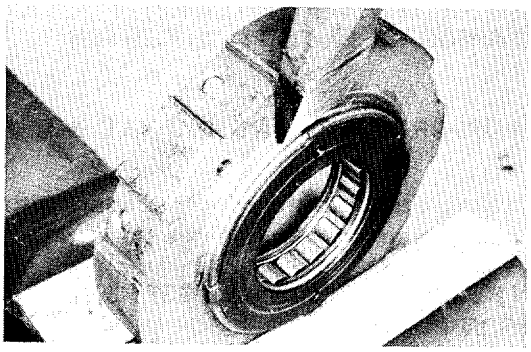
NOTE: Do not allow the discs to dry out.
Prepare new discs by soaking them at least two hours in ATF.



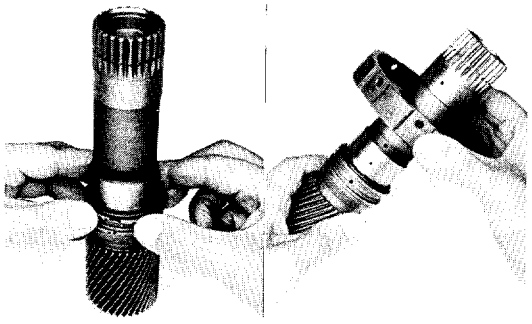
3. **IF NECESSARY, REPLACE ONE-WAY CLUTCH**
   (a) Bend several tabs back with a tapered punch.
   (b) Pry off the retainer with a screwdriver. Leave the other retainer on the hub.
   (c) Remove the one-way clutch.



   (d) Install the one-way clutch into the brake hub facing the spring cage toward the front.



   (e) Hold the brake hub in vise with soft jaws, and flatten the ears with a chisel.
   (f) Check to make sure that the retainer is centered.

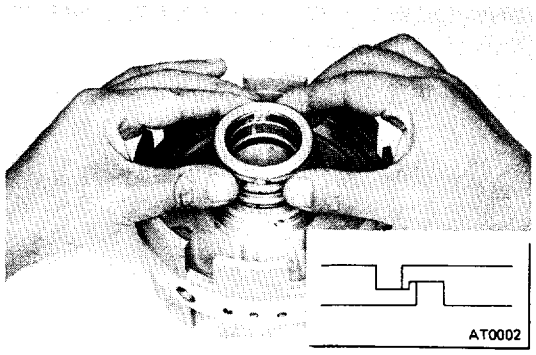


ASSEMBLY OF CENTER SUPPORT ASSEMBLY

(See page AT-54)

1. **INSTALL TWO OIL SEAL RINGS AND ONE-WAY CLUTCH ASSEMBLY ON SUN GEAR**

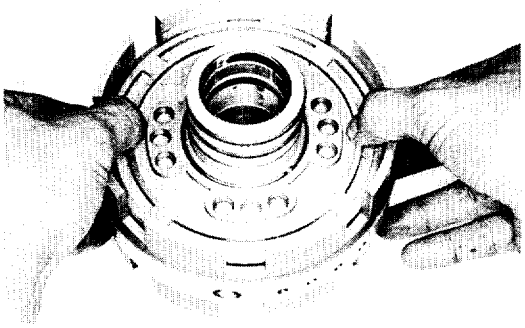
   NOTE: After installing the oil seal rings, check that they move smoothly.



2. **INSTALL THREE OIL SEAL RINGS ON CENTER SUPPORT**

   Spread apart and slip them into the groove.
   Hook both ends by hand.

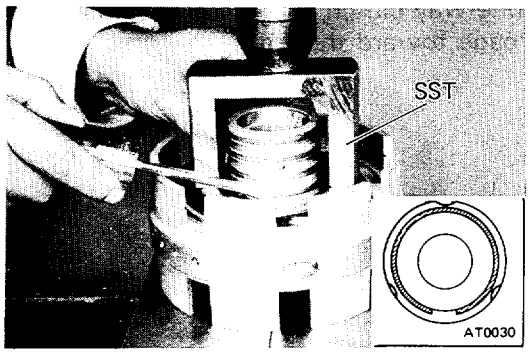
   NOTE: After installing the oil seal rings, check that they move smoothly.



3. **INSTALL NEW O-RINGS ON PISTON**

4. **INSTALL NO.1 BRAKE PISTON IN CENTER SUPPORT**

Press the No.1 brake piston into the center support with the cup side up, being careful not to damage the O-rings.



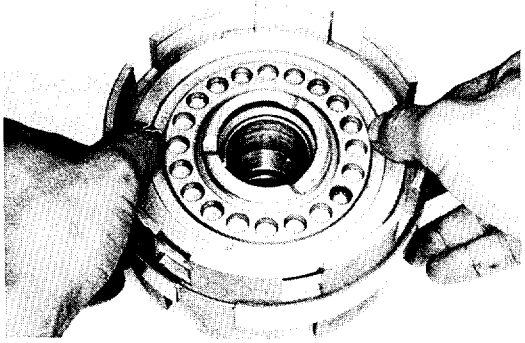
5. **INSTALL TWELVE PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP RING IN PLACE**

6. **COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE**

(a) Place SST on the spring retainer, and compress the springs on a shop press.

SST 09350-20015 (09369-20040)

(b) Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

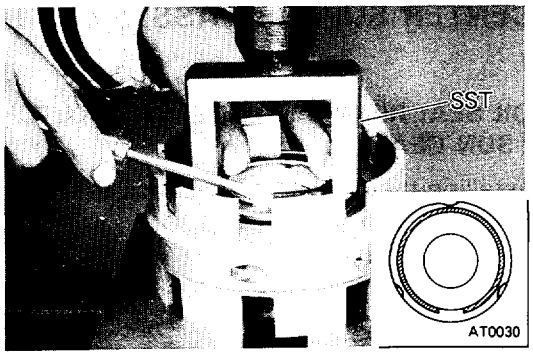


7. **INSTALL NEW O-RINGS ON PISTON AND CENTER SUPPORT**

8. **TURN CENTER SUPPORT OVER AND INSTALL NO. 2 BRAKE PISTON**

Press the No. 2 brake piston into the center support with the cup side up, being careful not to damage the O-rings.

9. **INSTALL PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP PING IN PLACE**

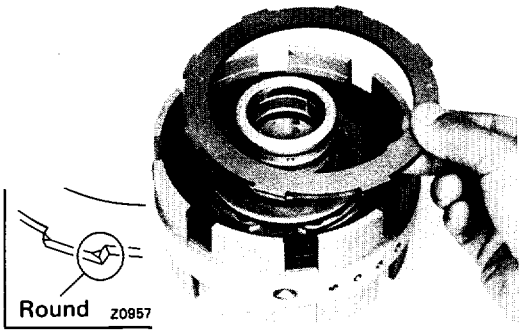


10. **COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE**

(a) Place SST on the spring retainer, and compress the springs on a shop press.

SST 09350-20015 (09369-20040)

(b) Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



11. **TURN CENTER SUPPORT OVER AND INSTALL NO. 1 BRAKE PISTON PLATE, DISC AND FLANGE**

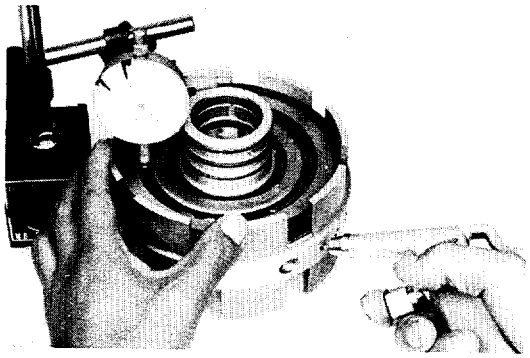
Using low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-flange (rounded edge down)

12. **INSTALL SNAP RING IN CENTER SUPPORT**

Chek that the snap ring ends are not aligned with one of the cutouts.

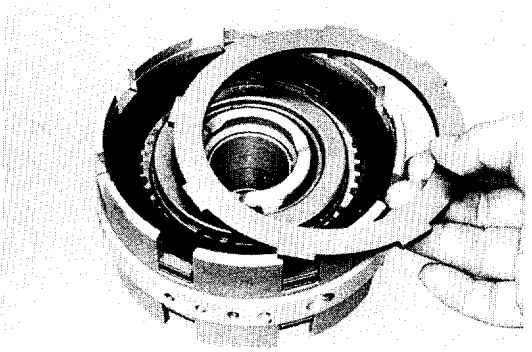


13. CHECK PISTON STROKE OF NO. 1 BRAKE

Using a dial indicator, measure the stroke applying and releasing compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

Standard piston stroke: 0.58 — 1.30 mm (0.0228 — 0.0512 in.)

If the stroke exceeds the limit, the clutch pack is probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.



14. TURN CENTER SUPPORT OVER AND INSTALL NO. 2 BRAKE PLATES, DISCS AND FLANGE

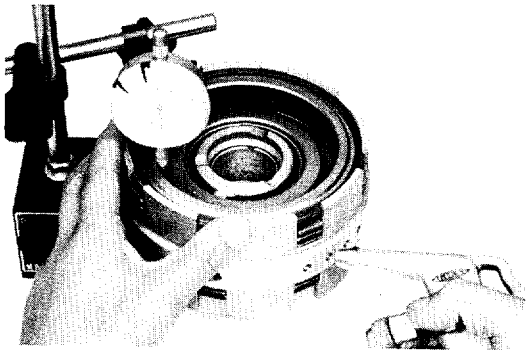
Using the low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Plate-disc-plate-disc-plate-disc-flange

15. INSTALL SNAP RING IN CENTER SUPPORT

Check that the snap ring ends are not aligned with one of the cutouts.

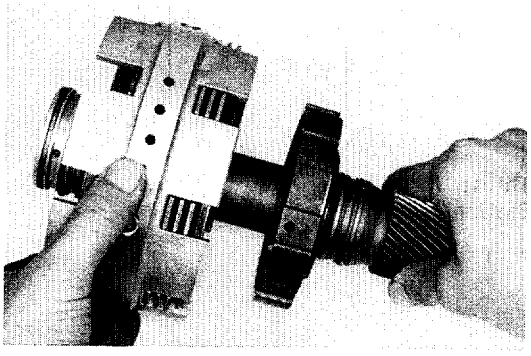


16. CHECK PISTON STROKE OF NO. 2 BRAKE

Using a dial indicator, measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

Standard piston stroke: 1.01 — 2.25 mm (0.0398 — 0.0886 in.)

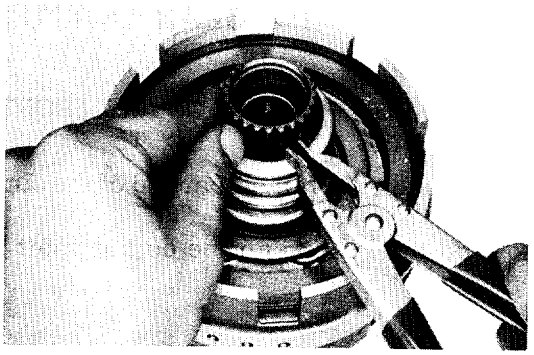
If the stroke exceeds the limit, the clutch pack is probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.



17. ASSEMBLE CENTER SUPPORT AND SUN GEAR

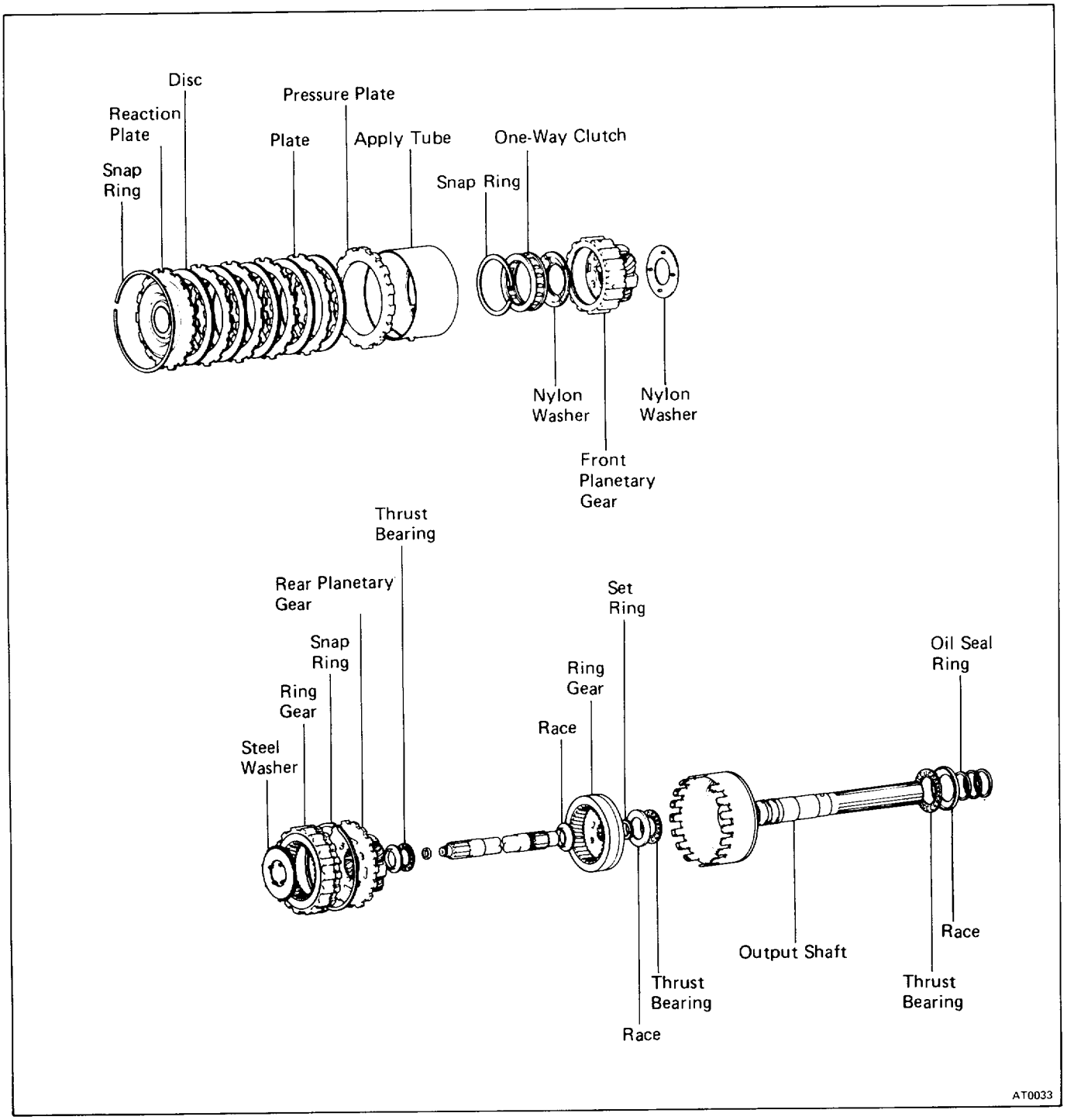
(a) Align the brake No. 2 disc flukes.

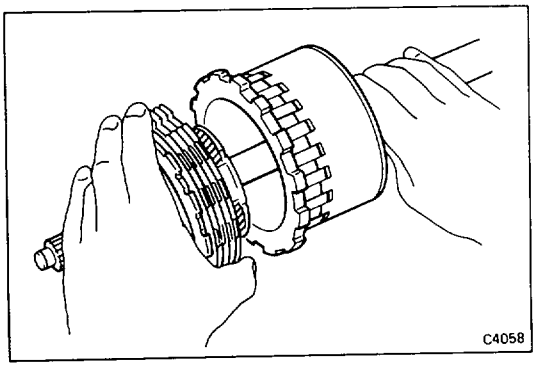
(b) Mesh the brake hub with the discs, twisting and jiggling the hub as required.



18. INSTALL SNAP RING ON END OF SUN GEAR

Planetary Gear Output Shaft

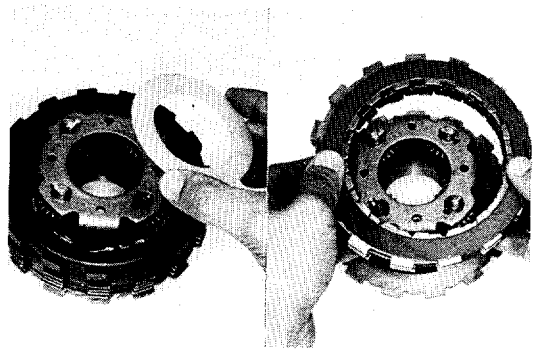




DISASSEMBLY OF PLANETARY GEAR OUTPUT SHAFT

1. **REMOVE NO. 3 BRAKE DISC/PLATE PACK AND FRONT PLANETARY PINION GEARS**

   Grasp the components and pull off the front end of the output shaft.
   Be careful not to drop the bearing on the output shaft.

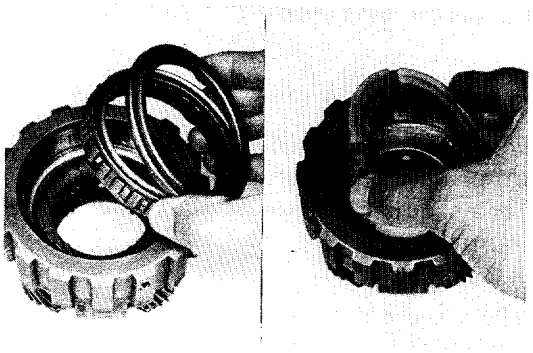


2. **REMOVE THRUST WASHER FROM PLANETARY GEARS**

   NOTE: The thrust washer may have stuck to the inside of the planetary gear case.

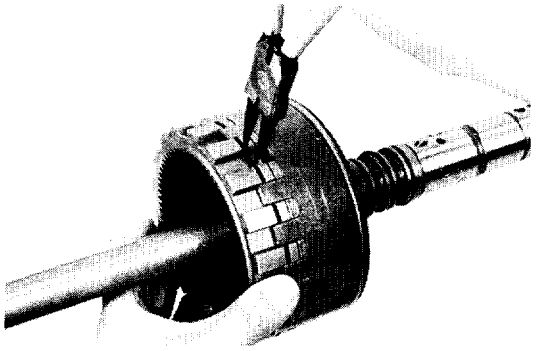
3. **REMOVE BRAKE DISCS AND PLATES FROM PLANETARY GEARS**

4. **REMOVE REACTION PLATE FROM PLANETARY GEARS**



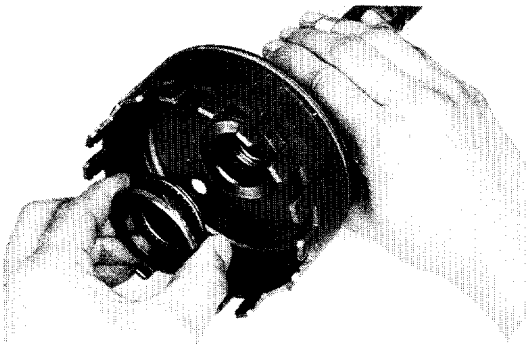
5. **REMOVE SNAP RING AND ONE-WAY CLUTCH FROM PLANETARY GEARS**

6. **REMOVE NYLON THRUST WASHER FROM PLANETARY GEARS**



7. **REMOVE APPLY TUBE AND CLUTCH PRESSURE PLATE**

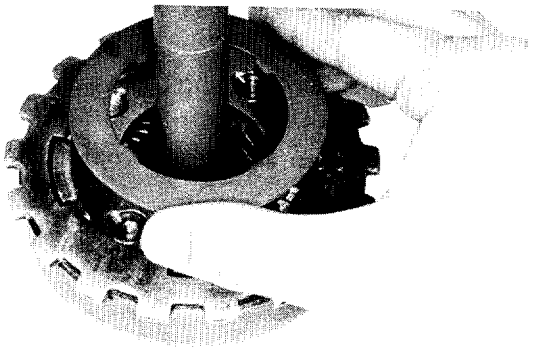
8. **COMPRESS SHAFT SNAP RING AND REMOVE FRONT PLANETARY RING GEAR**
   (a) While pulling up the ring gear, compress the snap ring with needle-nose pliers and remove it from the groove.
   (b) Pull out the ring gear by hand.



9. **REMOVE INTERMEDIATE SHAFT FROM OUTPUT SHAFT ASSEMBLY**

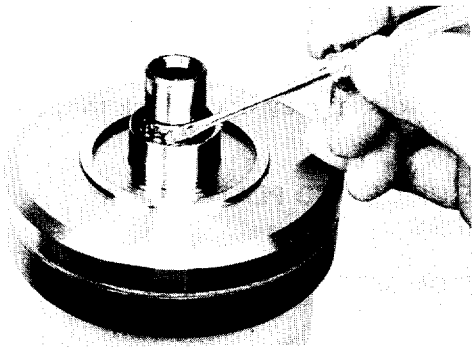
10. **REMOVE THRUST BEARING AND RACES FROM OUTPUT SHAFT ASSEMBLY**
    Note the position of the races.

11. **REMOVE THREE OIL SEAL RINGS FROM OUTPUT SHAFT**



12. **REMOVE THRUST WASHER AND REAR PINION GEARS FROM INTERMEDIATE SHAFT ASSEMBLY**

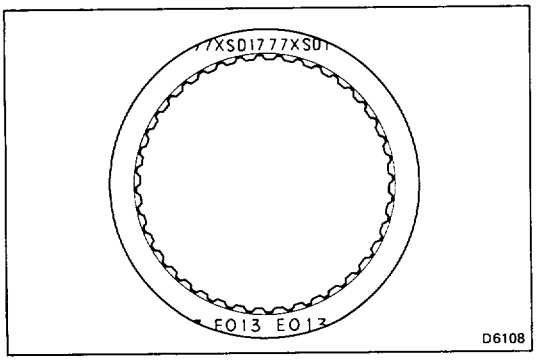
13. **REMOVE RACE AND THRUST BEARING FROM INTERMEDIATE SHAFT**
    Note the position of the race.



14. **INVERT INTERMEDIATE SHAFT AND REMOVE SET RING**

15. **REMOVE REAR PLANETARY RING GEAR AND BEARING RACE FROM INTERMEDIATE SHAFT**

    Note the position of the race.

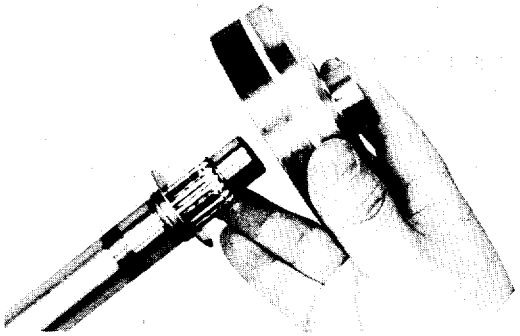


INSPECTON OF PLANETARY GEAR OUTPUT SHAFT

INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc is not worn or burnt.
If the disc is worn or burnt, replace all discs.
Then check that the sliding surfaces of plate and flange are not worn or burnt.
If necessary, replace them.

NOTE: Do not allow the discs to dry out. Prepare new discs by soaking them at least two hours in ATF.



ASSEMBLY OF PLANETARY GEAR OUTPUT SHAFT

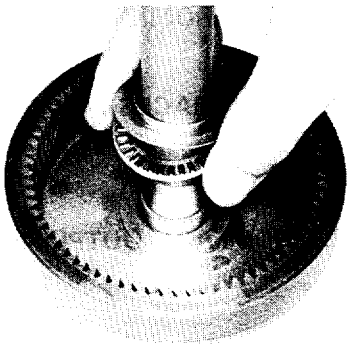
(See page AT-60)

1. **INSTALL THRUST BEARING RACE AND REAR PLANETARY RING GEAR ON INTERMEDIATE SHAFT**

   Slip the thrust bearing race and ring gear onto the shaft with the exterior splines up, as shown.

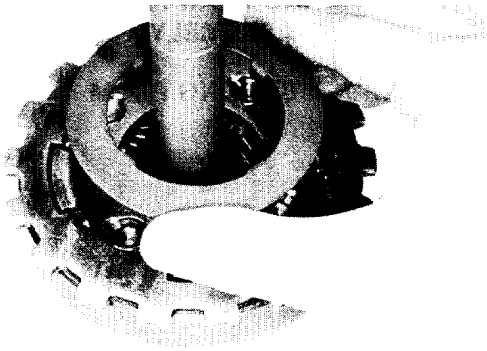
2. **INSTALL SET RING ON INTERMEDIATE SHAFT**

   Push down and wind the set ring into place. Check to make sure it is secure.



3. **TURN OVER INTERMEDIATE SHAFT AND INSTALL THRUST BEARING AND RACE**

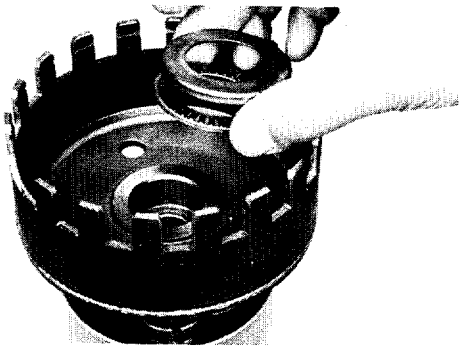
   Make sure the flat side of race is against the bearing.



4. **INSTALL PINION GEAR ASSEMBLY THRUST WASHER ON REAR PLANETARY CARRIER**

   Install the washer with the lugs down, fitting them into the rear planetary gear carrier.

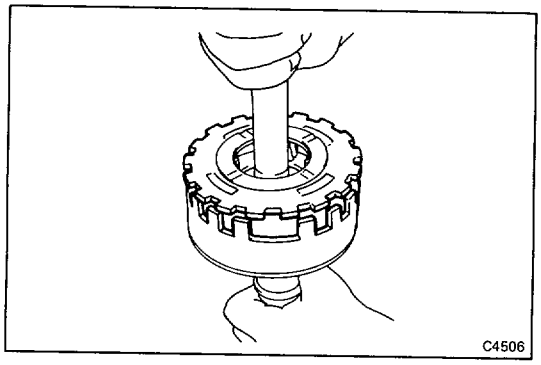
   CAUTION: Make sure the different lug shapes match the openings on the plate.



5. **INSTALL THREE OIL SEAL RINGS ON OUTPUT SHAFT**
   Spread apart and slide them into the groove.
   Hook both ends by hand.

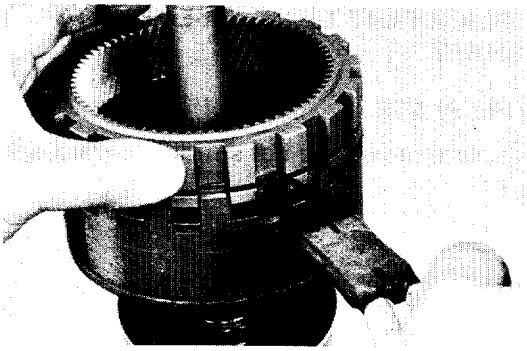
6. **USE EXTENSION HOUSING AS ASSEMBLY STAND**

7. **INSTALL THRUST BEARING AND RACE ON OUTPUT SHAFT**
   Hold the cup of the race toward the bearing.



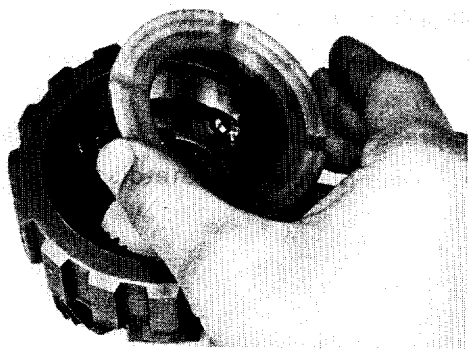
8. **INSTALL INTERMEDIATE SHAFT ASSEMBLY IN OUTPUT SHAFT**

9. **INSTALL REAR PLANETARY CARRIER IN OUTPUT SHAFT**
   Slide it into place, and make sure the lugs interlock.

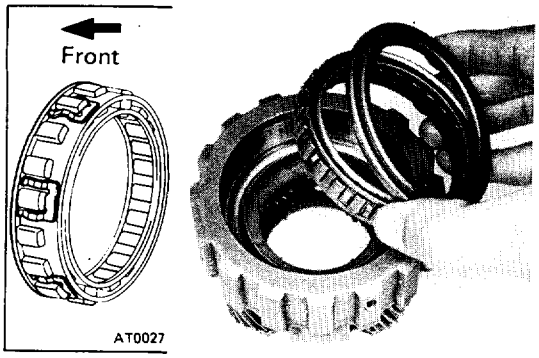


10. **SET FRONT PLANETARY RING GEAR IN PLACE**
    Slide the snap ring downward, and align the lugs with the notches.
    Align the ends of the snap ring with the wide gap between the teeth.

11. **INSTALL FRONT PLANETARY RING GEAR WITH SNAP RING**
    While pushing down the ring gear, squeeze the snap ring end with needle-nose pliers and install it into the groove.
    NOTE: When the snap ring is fully seated, the gap is the width of one lug.

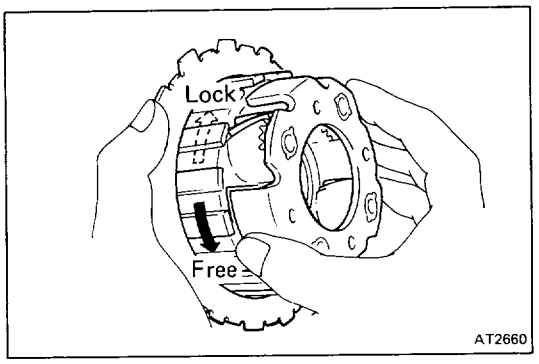


12. **INSTALL NYLON THRUST WASHER IN FRONT PLANETARY PINION GEAR**
    Face the lugs downward and match them with the slots in back of the planetary gear.



13. **INSTALL ONE-WAY CLUTCH**
    Install the one-way clutch into the outer race, facing the spring cage toward the front.

14. **INSTALL SNAP RING**



15. TEMPORARILY INSTALL REACTION PLATE ON PLANETARY

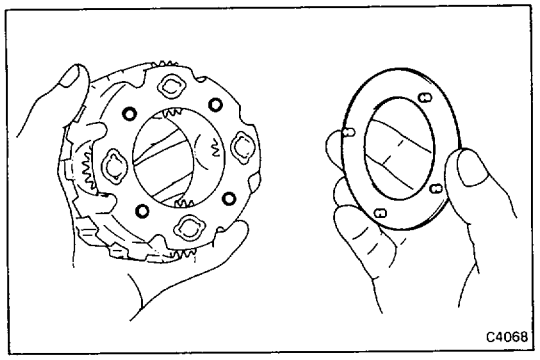
Insert it into place for test of the one-way clutch.

16. TEST ONE-WAY CLUTCH

The planetary gear must rotate freely counterclockwise and lock clockwise.

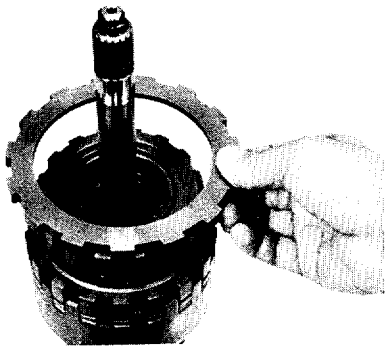
If the clutch does not work correctly, it must be replaced.

17. REMOVE REACTION PLATE



18. INSTALL THRUST WASHER ON FRONT PLANETARY CARRIER

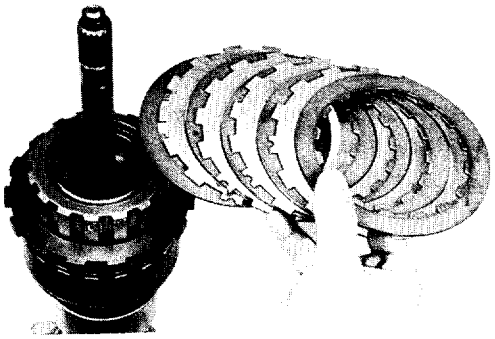
Apply petroleum jelly to the washer to hold it in place during assembly later. Match the lugs with the planetary carrier when installing.



19. INSTALL FRONT PLANETARY GEAR ASSEMBLY TO INTERMEDIATE SHAFT

20. INSTALL PRESSURE PLATE

Install the pressure plate facing the flat surface toward the intermediate shaft.



21. INSTALL NO.3 BRAKE CLUTCH PACK

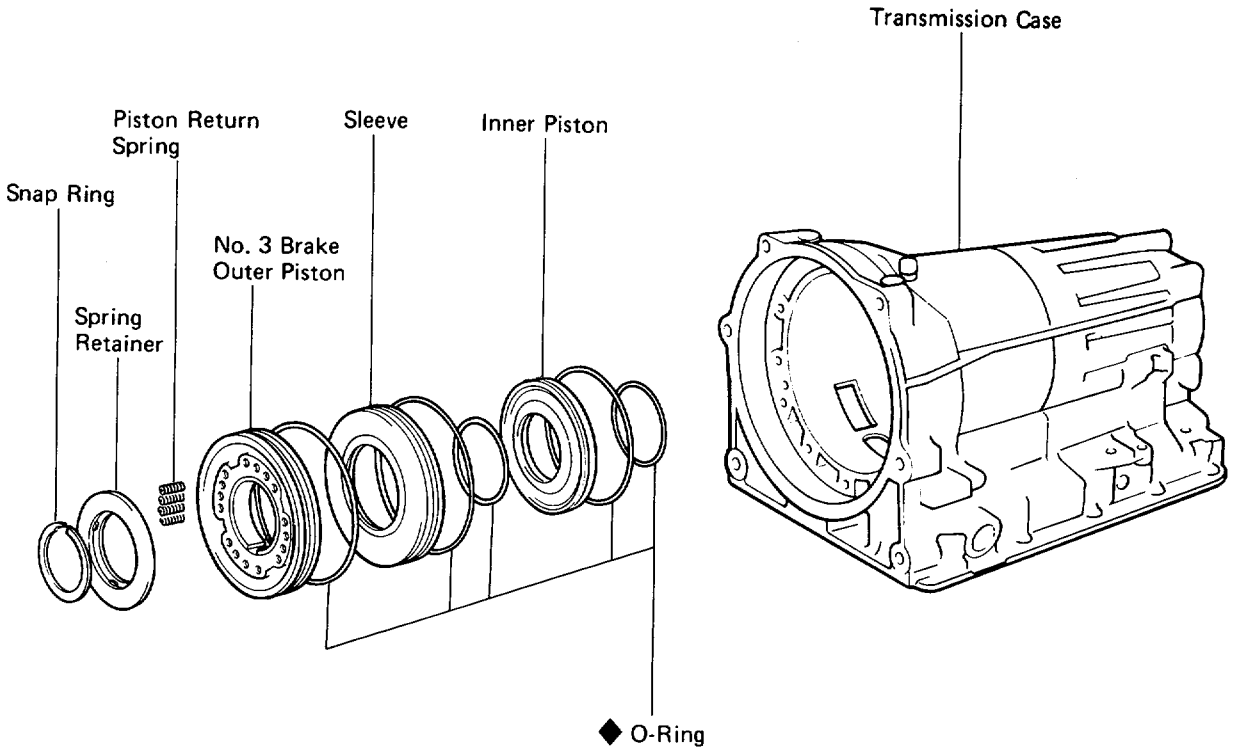
Using the low-pressure compressed air, blow all excess ATF from the discs.

CAUTION: High-pressure air will damage the discs.

Install in order: Disc-plate-disc-plate-disc-plate-disc-plate-disc

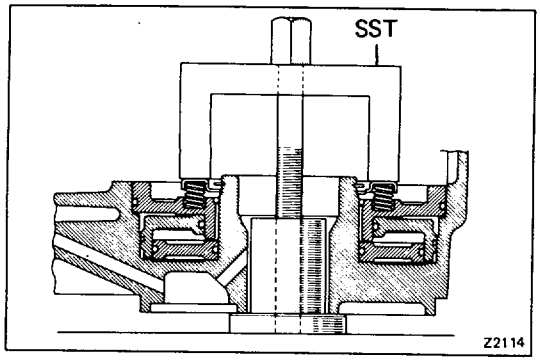
22. KEEP REACTION PLATE, APPLY TUBE, THRUST BEARING AND RACE TOGETHER

Transmission Case and Rear Brake Pistons



◆ Non-reusable part

AT0012



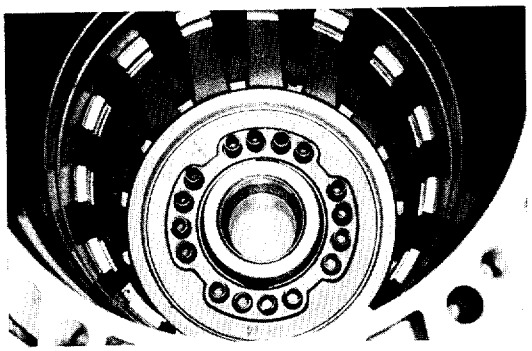
DISASSEMBLY OF TRANSMISSION CASE AND REAR BRAKE PISTONS

1. **COMPRESS RETURN SPRINGS AND REMOVE SPRING RETAINER SNAP RING**

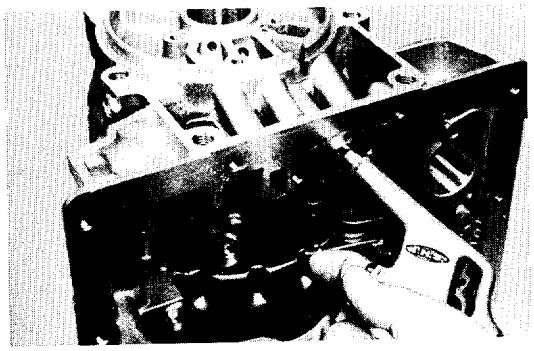
   (a) Install the SST. Gradually and evenly tighten the bolt to compress the springs, being careful not to damage the transmission case with SST.

   SST 09350-20015 (09369-20040)

   (b) Using snap ring pliers and a hook, remove the snap ring.

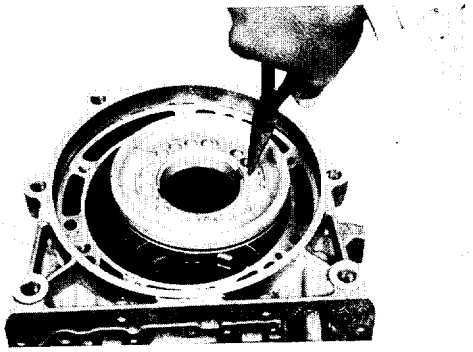


2. **REMOVE SPRING RETAINER AND SIXTEEN SPRINGS**



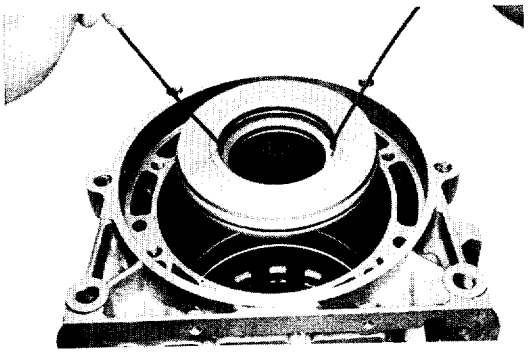
3. **REMOVE OUTER PISTON AND REACTION SLEEVE WITH COMPRESSED AIR**

(a) Turn the case over face down on a workbench. Place several clean shop rags under the case to catch the piston and sleeve. To pop them out, apply compressed air to the outer and inner piston oil holes.



If the piston and sleeve do not pop out with the compressed air.

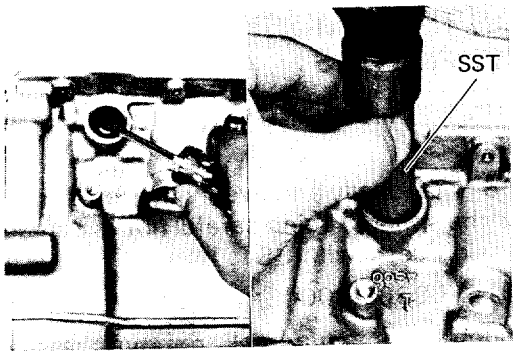
(b) Using needle-nose pliers, lift the outer piston from the case.



(c) Insert two long hooks behind the reaction sleeve and gradually lift it out of the case.

(d) Using hooks, lift the inner piston out of case in the same manner.

4. **REMOVE O-RINGS FROM OUTER AND INNER PISTONS AND REACTION SLEEVE**



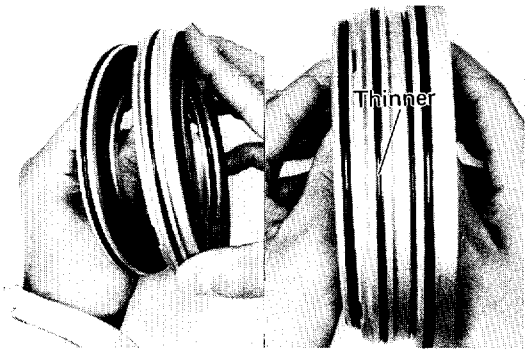
INSPECTION OF CASE COMPONENT GROUP

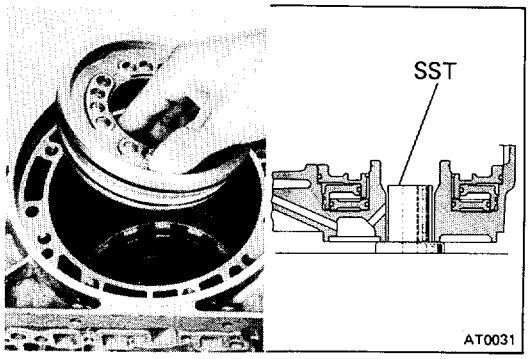
REPLACEMENT OF MANUAL SHAFT OIL SEALS

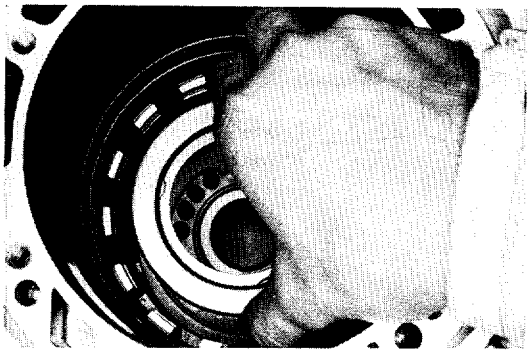
(a) Remove the manual shaft oil seals with a screwdriver.

(b) Drive in new left and right oil seals with SST.

SST 09350-20015 (09361-30011)







ASSEMBLY OF TRANSMISSION CASE AND REAR BRAKE PISTONS

(See page AT-65)

1. **INSTALL NEW O-RINGS ON REACTION SLEEVE AND PISTONS**

   CAUTION: The thinner O-ring goes on the outside of the reaction sleeve.

2. **INSTALL INNER AND OUTER PISTONS IN REACTION SLEEVE**

   (a) Push the inner piston into the cupped side of the reaction sleeve.

   (b) Push the outer piston onto the other side of the reaction sleeve.

3. **INSTALL PISTONS AND SLEEVE IN CASE**

   CAUTION: Be careful not to damage the O-rings.

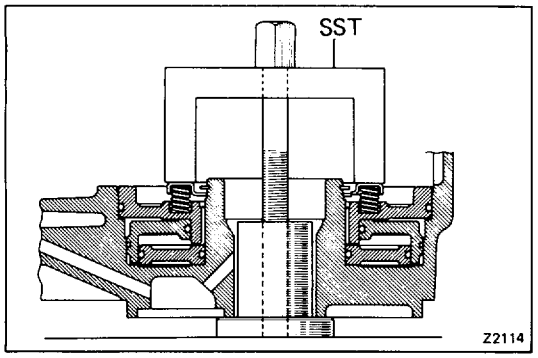
   Hold the assembly with the outer piston up (spring seats visible), and push the assembly into its bore in the case.

4. **INSTALL SST BASE UNDER CASE**

   SST 09350-20015 (09369-20040)

5. **INSTALL SIXTEEN PISTON RETURN SPRINGS AND SET RETAINER WITH SNAP RING IN PLACE**

   NOTE: The springs are visible through the cutout in the case, which helps position them more easily.



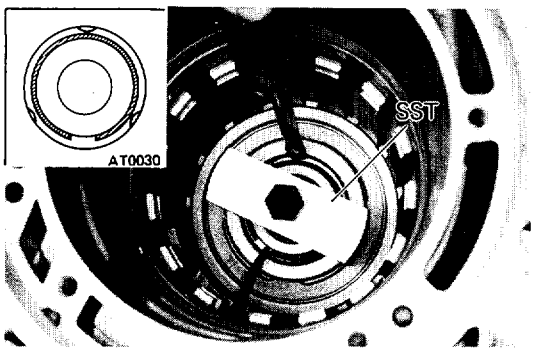
6. **COMPRESS PISTON RETURN SPRINGS TO ALLOW INSTALLATION OF SNAP RING**

   CAUTION: Avoid bending the spring retainer by overtightening the bolts.

   (a) Carefully position the spring compressor on the spring retainer.

   (b) Gradually and evenly tighten the bolt to compress the springs, being careful not to damage the transmission case with SST.

   SST 09350-20015 (09369-20040)



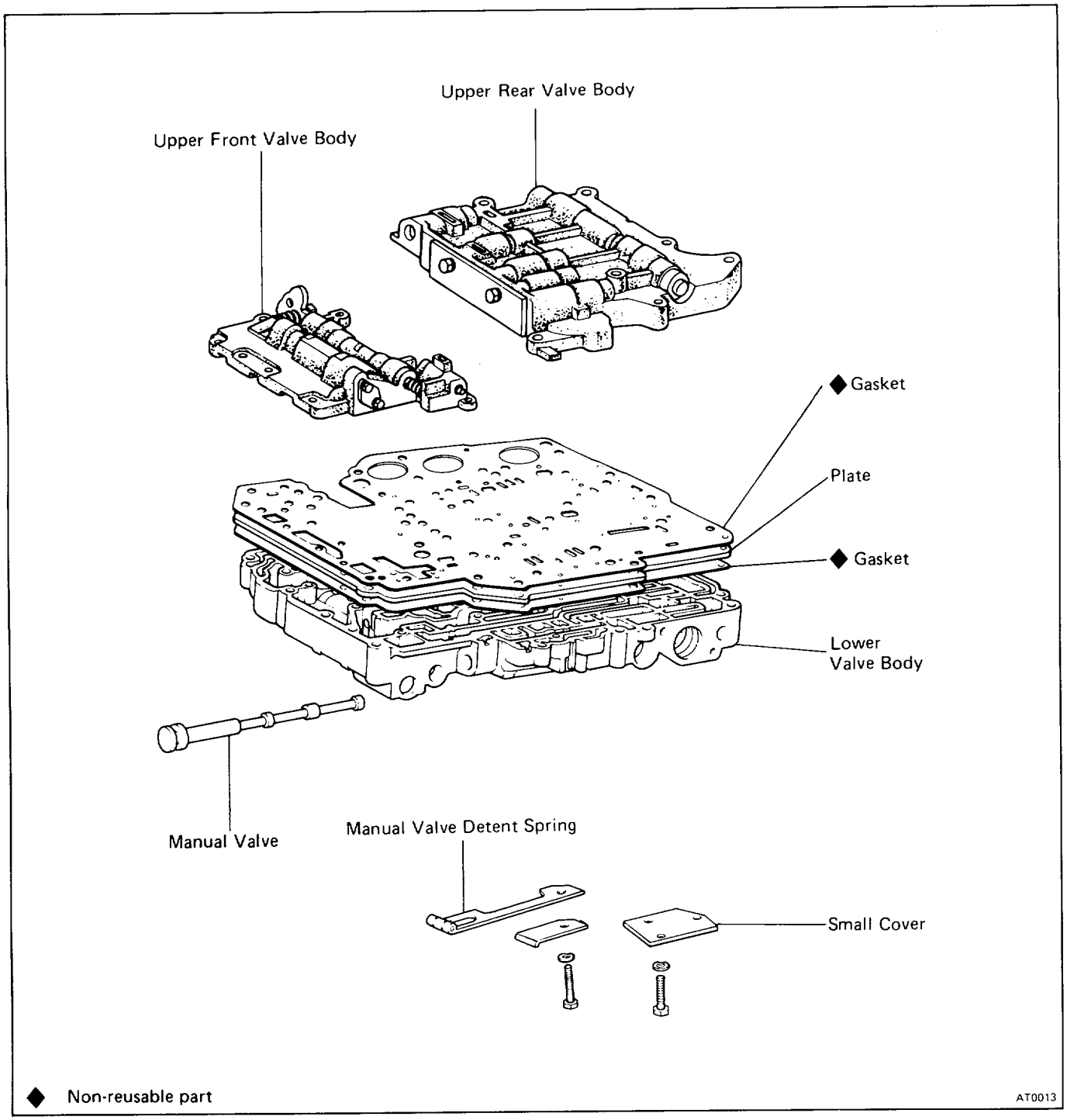
7. **INSTALL SNAP RING**

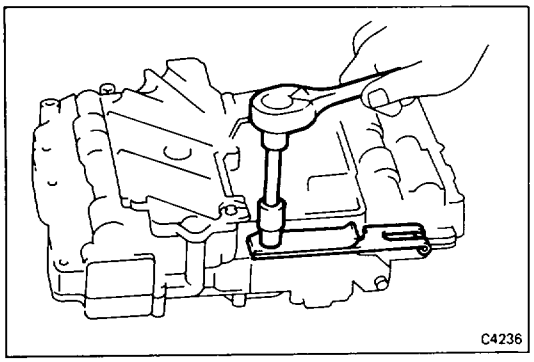
   (a) Push the snap ring by hand into place. Visually check to make sure it is fully seated and centered by the three lugs on the spring retainer.

   (b) Remove the SST.

   SST 09350-20015 (09369-20040)

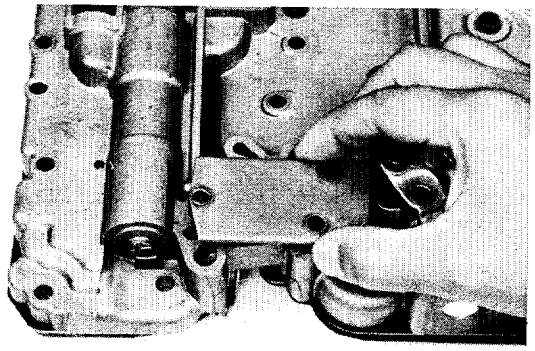
Valve Body



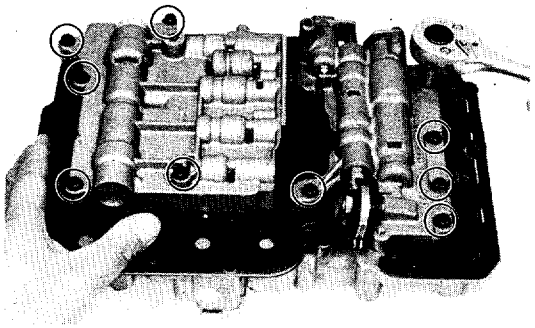


(Disassembly of Valve Body)

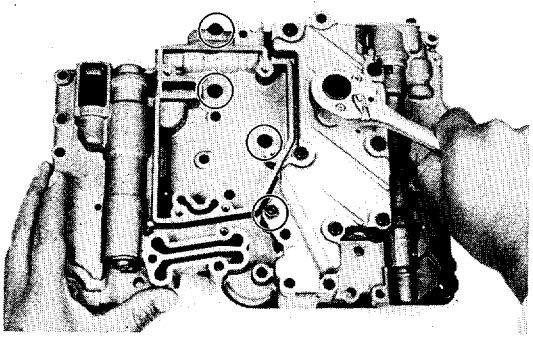
1. **REMOVE DETENT SPRING**
2. **REMOVE MANUAL VALVE**



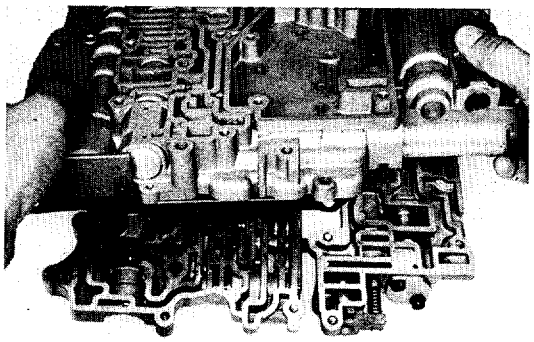
3. **REMOVE SMALL COVER**



4. **TURN ASSEMBLY OVER AND REMOVE TEN BOLTS FROM UPPER FRONT VALVE BODY AND UPPER REAR VALVE BODY**



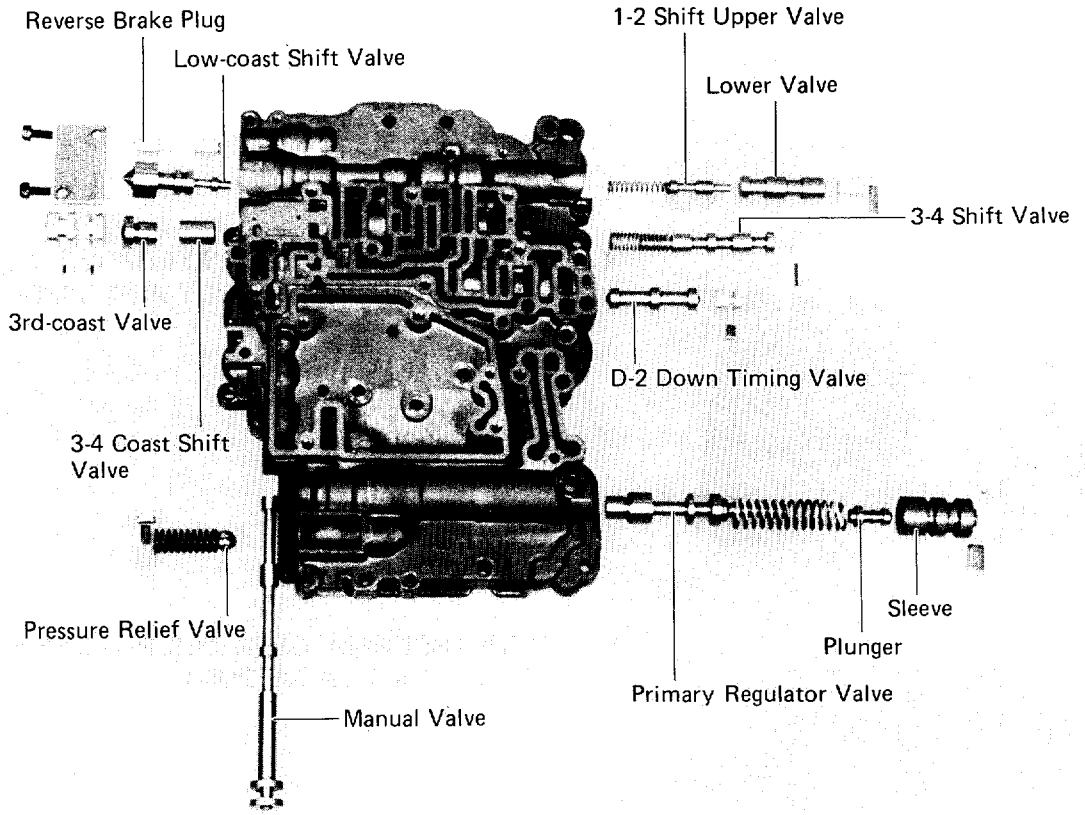
5. **TURN ASSEMBLY OVER AND REMOVE SET BOLTS FROM LOWER VALVE BODY**



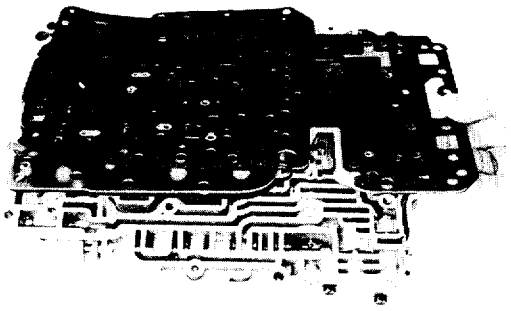
6. **LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT**

   NOTE: Be careful that the check valve and balls do not fall out.

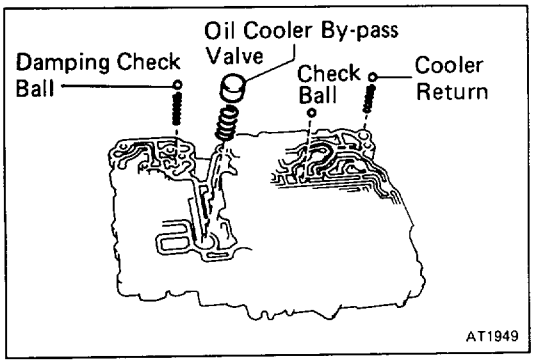
(Lower Valve Body)



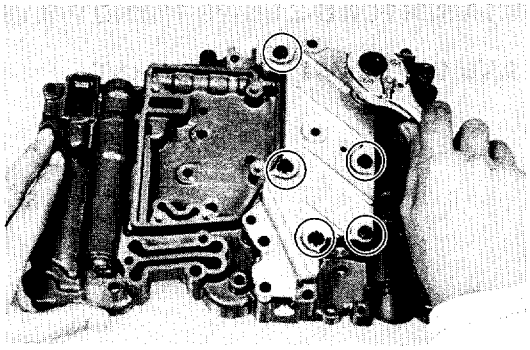
DISASSEMBLY OF LOWER VALVE BODY



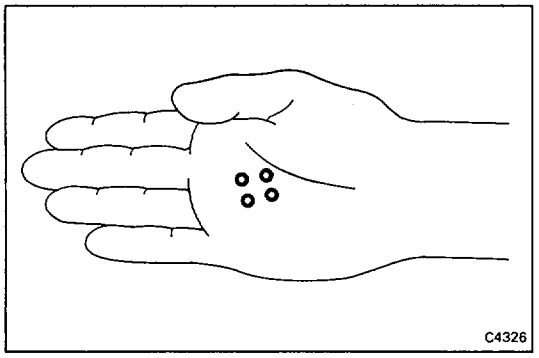
1. **REMOVE LOWER VALVE BODY PLATE AND GASKETS**



2. **REMOVE CHECK BALLS, COOLER RETURN SPRING, DAMPING CHECK VALVE SPRING, OIL COOLER BY-PASS VALVE AND SPRING**

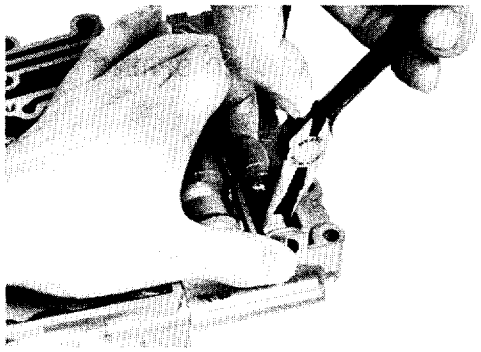


3. **TURN ASSEMBLY OVER, REMOVE SET BOLT AND REMOVE LOWER BODY COVER, PLATE AND GASKETS**



4. **REMOVE CHECK BALLS**

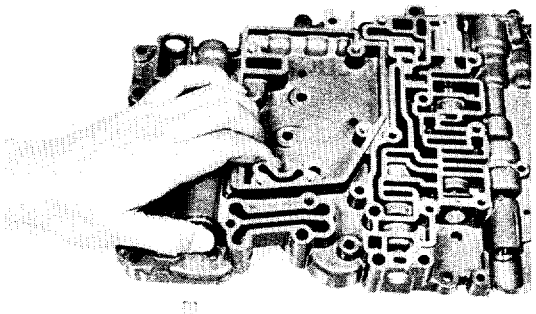
Remove the check balls being careful not to scratch grooves.
Keep the balls together to prevent losing them.



5. **REMOVE SPRING RETAINER FROM PRESSURE RELIEF ASSEMBLY**

CAUTION: Cover the spring by hand. Then, with needle-nose pliers, slowly pull out the spring seat, being careful not to bend the spring.

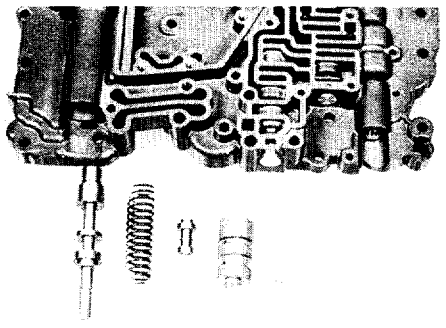
6. **REMOVE PRESSURE RELIEF SPRING AND BALL**



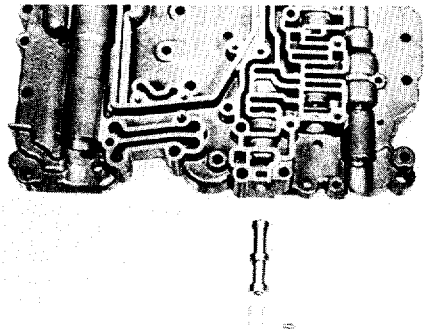
7. **REMOVE SPRING RETAINER FROM PRIMARY REGULATOR VALVE**

WARNING: Highly compressed spring inside — keep away from face.

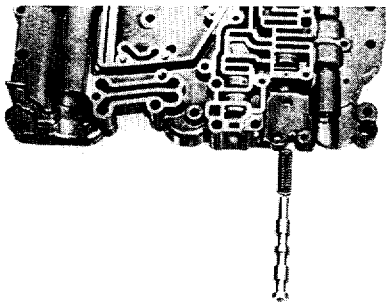
To remove the retainer, hold the valve body face down, and press in on the valve sleeve. The retainer will drop out. Slowly relieve spring compression.



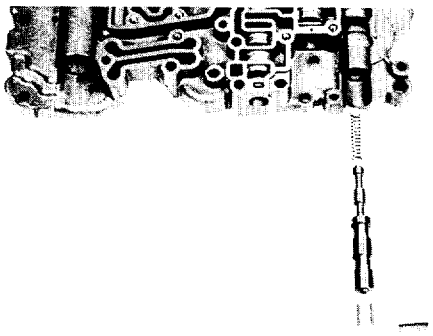
8. **REMOVE SLEEVE, PLUNGER, SPRING AND PRIMARY REGULATOR VALVE**



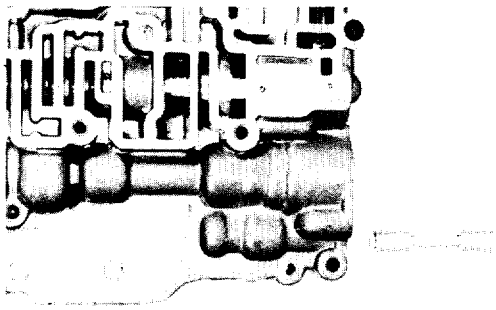
9. REMOVE PLUG RETAINER FOR D-2 DOWN TIMING VALVE
10. REMOVE PLUG AND D-2 DOWN TIMING VALVE



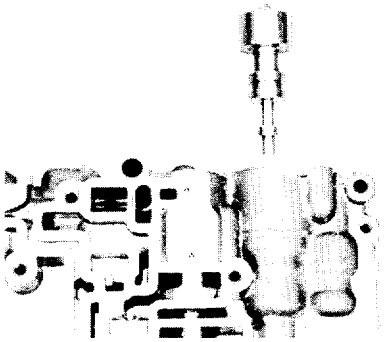
11. REMOVE PLUG LOCATING PIN FOR 3-4 SHIFT VALVE
12. REMOVE PLUG, 3-4 SHIFT VALVE AND SPRING



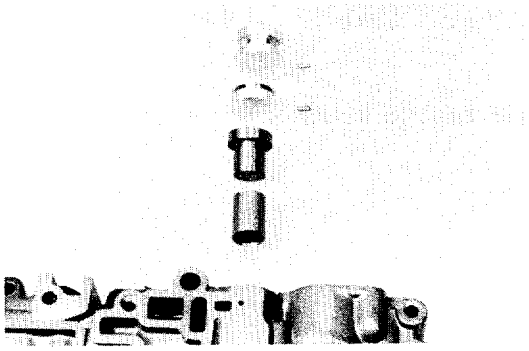
13. REMOVE PLUG RETAINER FOR 1-2 SHIFT VALVE
14. REMOVE PLUG, 1-2 SHIFT VALVE AND SPRING



15. REMOVE COVER PLATE
16. REMOVE REVERSE BRAKE PLUG



17. REMOVE LOW-COAST SHIFT VALVE



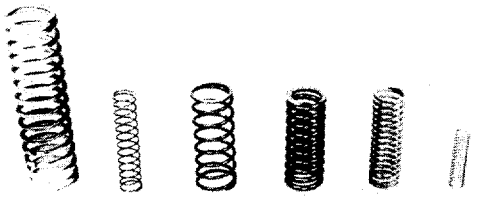
18. REMOVE LOCATING PINS FOR THIRD-COAST VALVE

19. REMOVE PLUGS, THIRD-COAST VALVE AND 3-4 CONTROL VALVE

INSPECTION OF LOWER VALVE BODY

INSPECT VALVE SPRINGS

Check for damage, squareness, rust and distorted coils. Measure the spring free height and replace if less than that shown below.

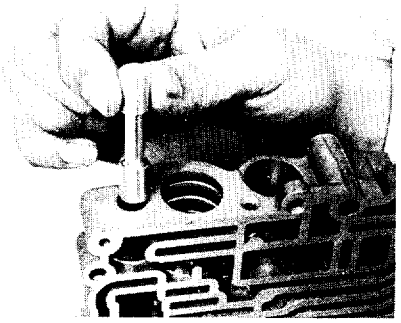


(1) (2) (3) (4) (5) (6)

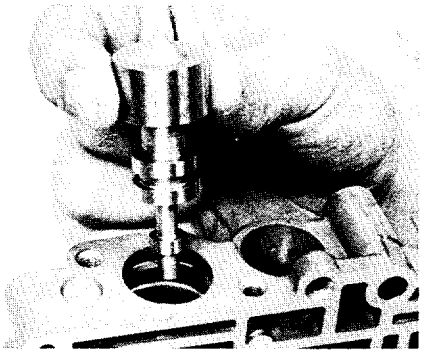
Spring	Free length mm (in.)	Remarks
(1) Primary regulator valve	61.20 (2.4094)	
(2) 1-2 shift valve	34.62 (1.3630)	
(3) 3-4 shift valve	33.65 (1.3248)	
(4) Oil cooler by-pass valve	28.90 (1.1378)	C & C
	33.32 (1.3118)	Others
(5) Pressure relief valve	32.14 (1.2654)	
(6) Damping check ball	20.00 (0.7874)	
Cooler return check ball	13.70 (0.5394)	

ASSEMBLY OF LOWER VALVE BODY

(See page AT-70)

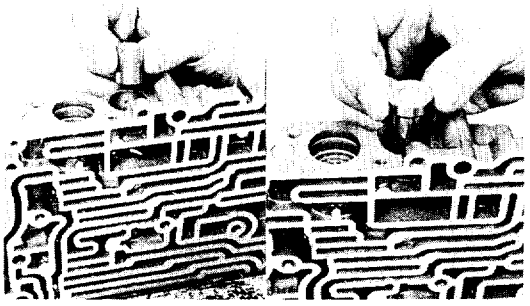


1. **INSTALL REVERSE BRAKE PLUG**



2. **INSTALL LOW-COAST SHIFT VALVE**

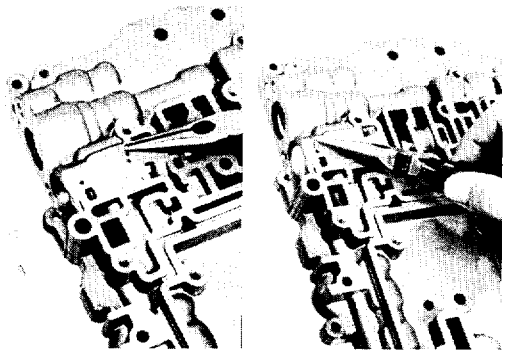
   Carefully insert the low-coast shift valve with the small end first.



3. **INSTALL 3-4 COAST SHIFT VALVE AND THIRD-COAST VALVE**

   (a) Insert the 3-4 coast shift valve with the cup side first.

   (b) Insert the 3rd-coast valve with the small end first.

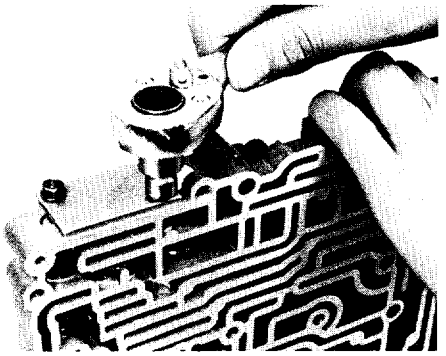


4. **INSTALL TWO PLUGS AND LOCATING PIN**

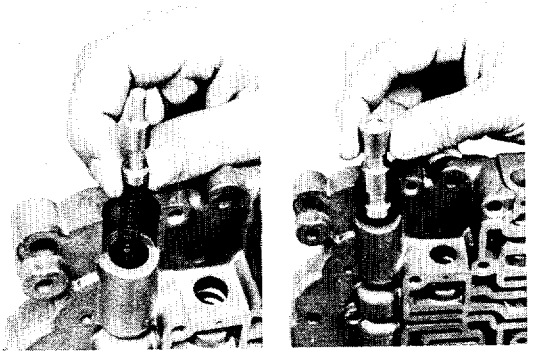
   (a) Insert the inside plug with the thick face first.

   (b) Using needle-nose pliers, insert the locating pin.

   (c) Insert the outside plug, and then insert the locating pin.



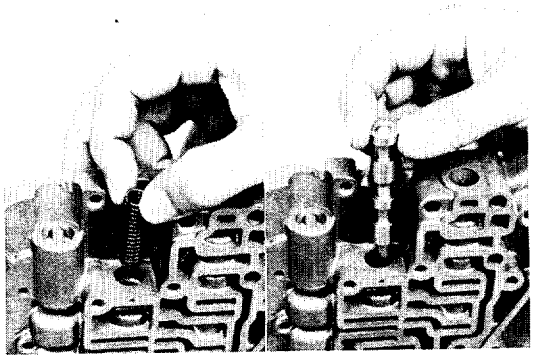
5. **INSTALL COVER PLATE**



6. **INSERT SPRING, 1-2 SHIFT UPPER VALVE, LOWER VALVE AND PLUG**

   Set the valve body on edge and carefully insert the spring, 1-2 shift upper valve, lower valve and plug.

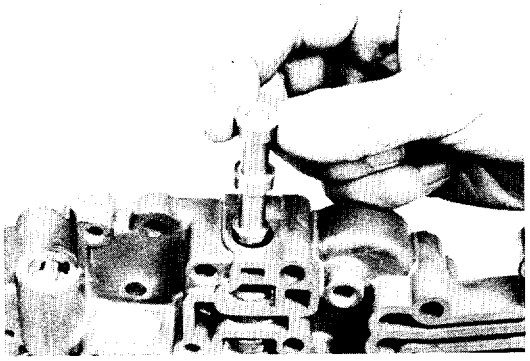
7. **INSTALL 1-2 SHIFT VALVE PLUG RETAINER**



8. **INSERT SPRING, 3-4 SHIFT VALVE AND PLUG**

   Set the valve body on edge and carefully insert the spring, 3-4 shift valve (small end first) and plug.

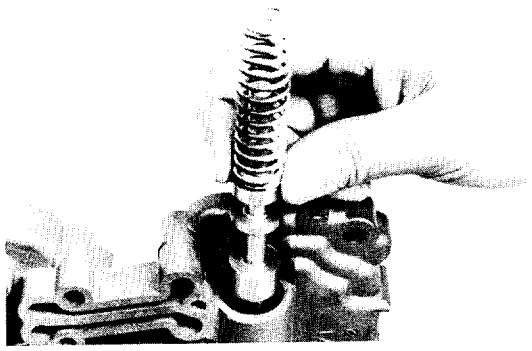
9. **INSTALL 3-4 SHIFT VALVE PLUG LOCATING PIN**



10. **INSTALL D-2 DOWN TIMING VALVE AND PLUG**

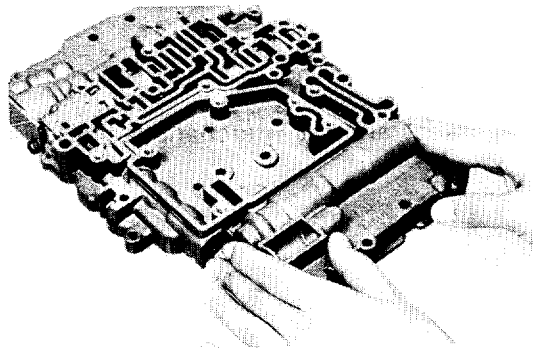
    Insert the D-2 down timing valve with the small end first and then the plug with the large end first.

11. **INSTALL D-2 DOWN TIMING VALVE RETAINER**



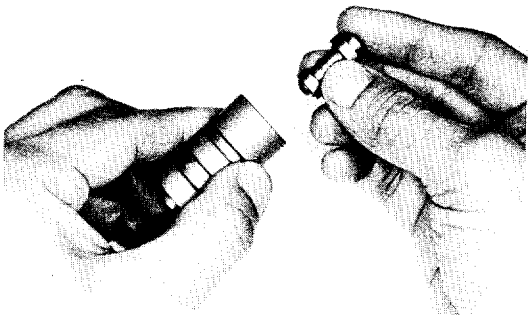
12. **INSERT PRIMARY REGULATOR VALVE AND SPRING**

    Set the valve body on edge and drop in the valve with the large end first and the spring.



13. **CHECK VALVE POSITION**

    Make sure that the primary regulator valve fits flush with the valve body.

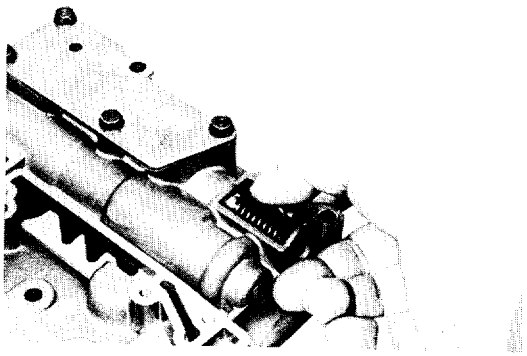


14. INSERT REGULATOR VALVE PLUNGER INTO SLEEVE

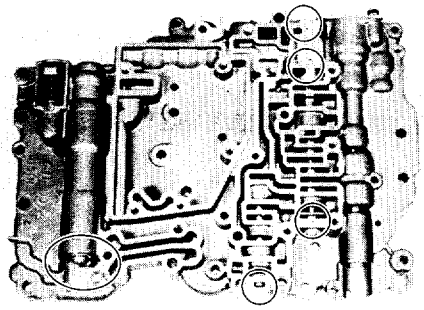
Insert with the rounded end first. Make sure that it is fully inserted: the plunger should be recessed inside the sleeve.

15. INSERT SLEEVE WITH PLUNGER

16. INSTALL REGULATOR VALVE SPRING RETAINER

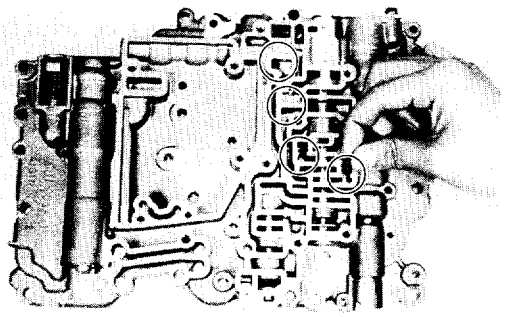


17. INSTALL PRESSURE RELIEF BALL, SPRING AND RETAINER



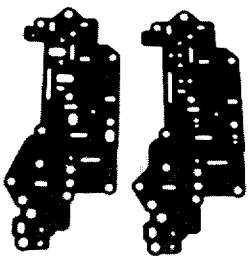
18. CHECK RETAINERS AND LOCATING PINS

Make sure that the retainers and pins are installed correctly.



19. INSTALL CHECK BALLS

Body Side

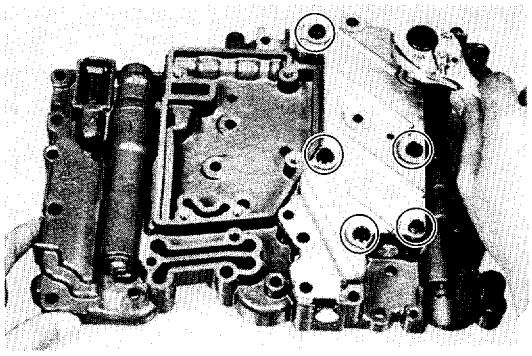


20. INSTALL LOWER BODY COVER

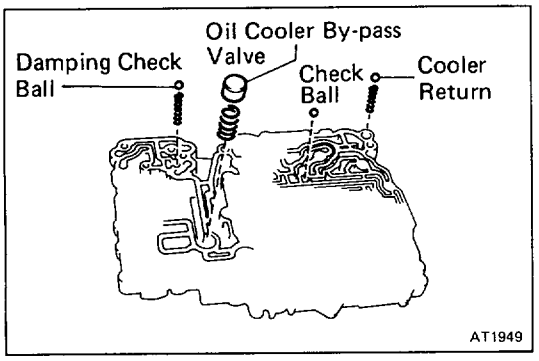
Install in following order.

Gasket-plate-gasket-cover.

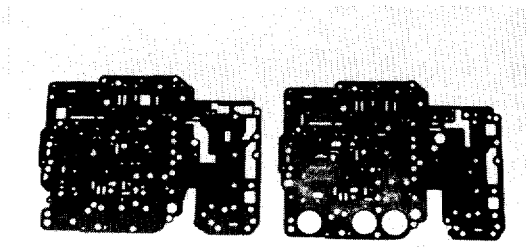
NOTE: The two gaskets are not interchangeable.



21. INSTALL LOWER BODY COVER SET BOLTS



22. INSTALL CHECK BALL, DAMPING CHECK BALL, SPRING, OIL COOLER BY-PASS VALVE, SPRING, COOLER RETURN CHECK BALL AND SPRING

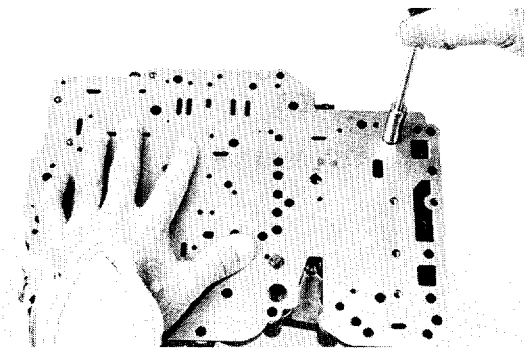


Lower Valve Body Side

23. INSTALL LOWER VALVE BODY GASKET

Note that the two gaskets are not interchangeable. The gasket must lay flat on the valve body.

CAUTION: Make sure that new gasket matches the old one.

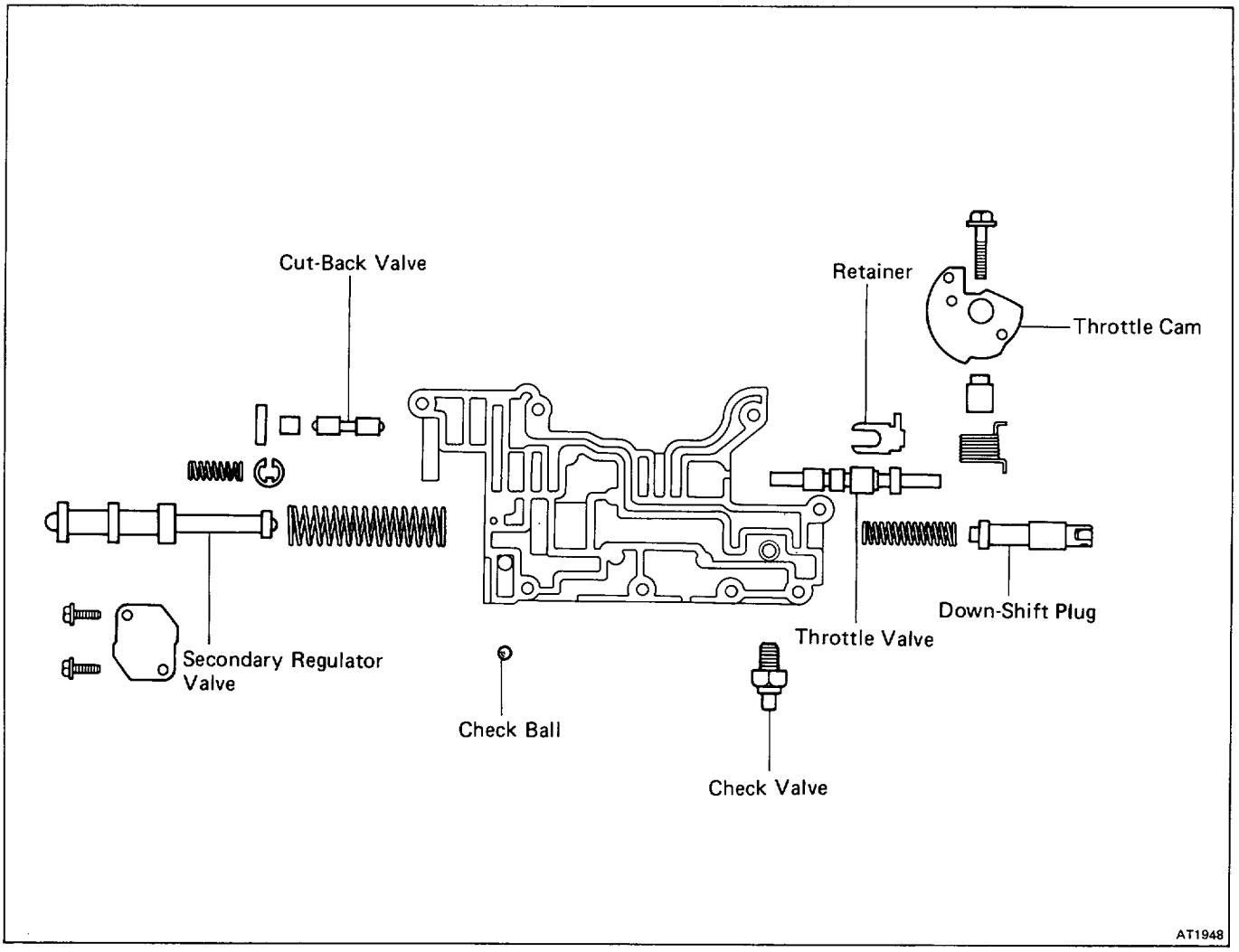


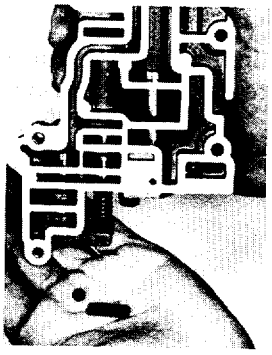
24. INSTALL LOWER VALVE BODY PLATE

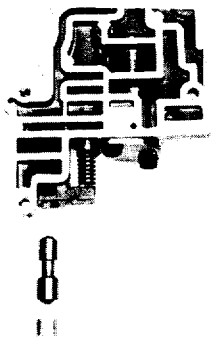
Set the plate into place. Temporarily install the two short bolts finger tight to compress the plate against the spring-loaded check valve.

NOTE: Use the bolt for the oil strainer.

(Upper Front Valve Body)



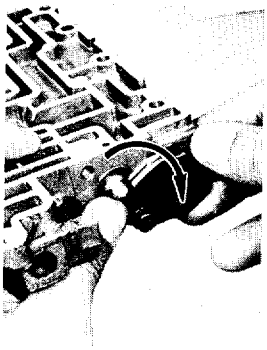


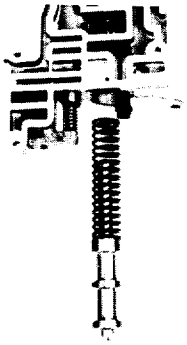


DISASSEMBLY OF UPPER FRONT VALVE BODY

1. **REMOVE CHECK BALL, RETAINER FOR CUT-BACK PLUG AND THROTTLE VALVE RETAINER**

2. **REMOVE PLUG AND CUT-BACK VALVE**





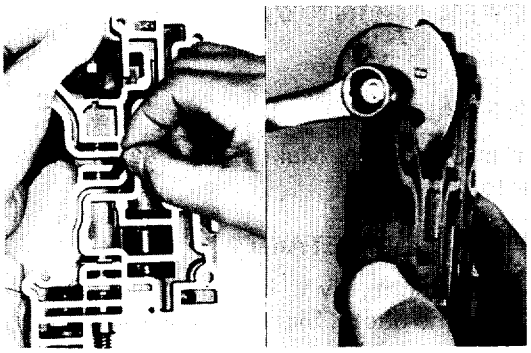
3. **REMOVE SECONDARY REGULATOR VALVE AND SPRING**

   (a) Remove one bolt from the plate over the valve and loosen the other one. Slowly rotate the plate to uncover the valve.

   WARNING: The valve is spring loaded.

   (b) Remove the valve and spring. Keep the spring with the valve.

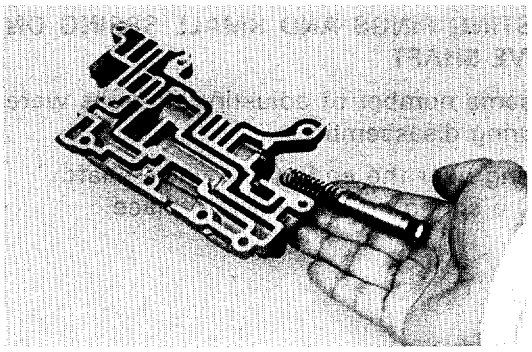
   (c) Remove the other bolt and remove the cover plate.



4. **PUSH DOWN-SHIFT PLUG INTO VALVE BODY AND TEMPORARILY HOLD IN THROTTLE VALVE**

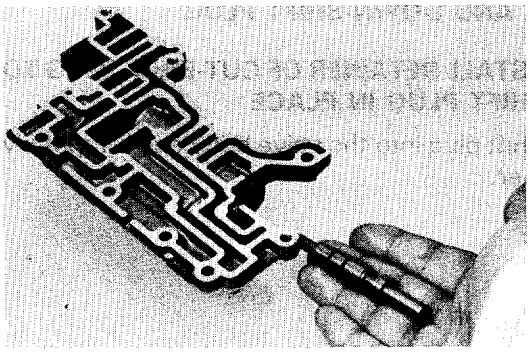
   Temporarily hold the throttle valve in position with the cut-back valve plug retainer.

5. **REMOVE THROTTLE CAM**



6. **REMOVE DOWN-SHIFT PLUG AND SPRING**

   Press on the down-shift plug so that the temporary retainer falls out.



7. **REMOVE THROTTLE VALVE**

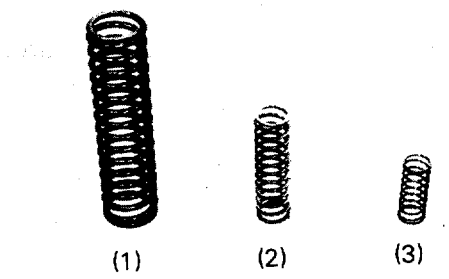
8. **REMOVE SPRING AND ADJUSTING RINGS**

   Note the number of adjusting rings installed.

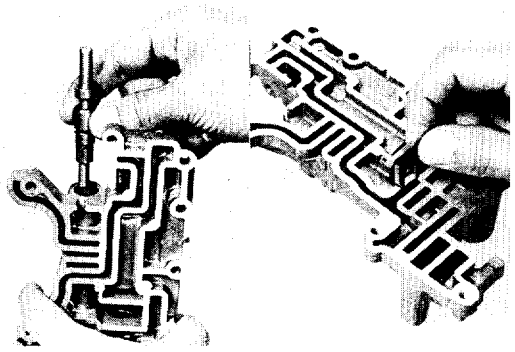
INSPECTION OF UPPER FRONT VALVE BODY

INSPECT VALVE SPRING

Check for damage, squareness, rust and collapsed coils. Measure the spring free height and replace it if less than that shown below.



	Free length mm (in.)
(1) Secondary regulator valve	71.27 (2.8059)
(2) Down-shift plug	39.76 (1.5654)
(3) Throttle valve	21.94 (0.8638)



ASSEMBLY OF UPPER FRONT VALVE BODY

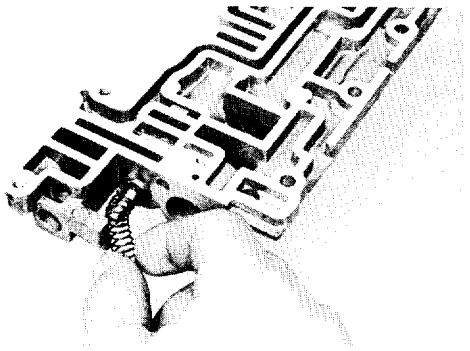
(See page AT-78)

1. **INSERT THROTTLE VALVE**

   Note arrangement in the photo. Make sure that the valve is inserted fully into the bore.

2. **INSTALL THROTTLE VALVE RETAINER**

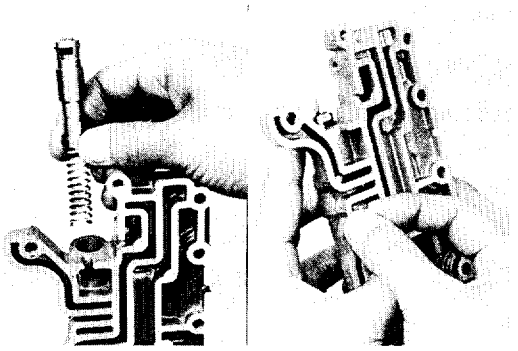
   Coat the clip with petroleum jelly to keep it in place. Note position on two tabs in the photo. Slip the retainer into place in the valve body.



3. **INSTALL ADJUSTING RINGS AND SMALL SPRING ON THROTTLE VALVE SHAFT**

   (a) Install the same number of adjusting rings as were removed during disassembly.

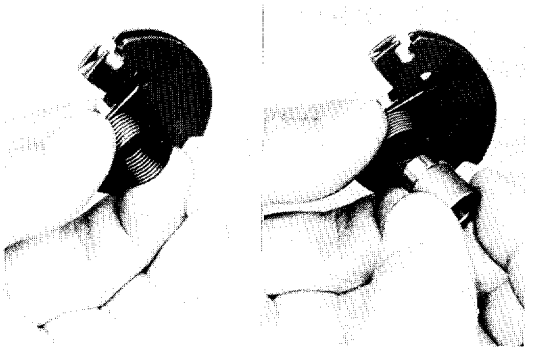
   (b) Slip the spring over the end of the valve shaft. Compress the spring and slide it into place.



4. **INSERT SPRING AND DOWN-SHIFT PLUG**

5. **TEMPORAILY INSTALL RETAINER OF CUT-BACK PLUG TO HOLD DOWN-SHIFT PLUG IN PLACE**

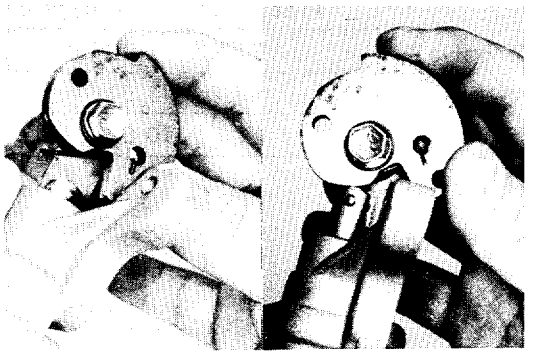
   Push the down-shift plug into the valve body and temporaily install the retainer.



6. **ASSEMBLE THROTTLE CAM**

   (a) Install the spring with the hook through the hole in the cam.

   (b) Insert the sleeve through one side of the cam.



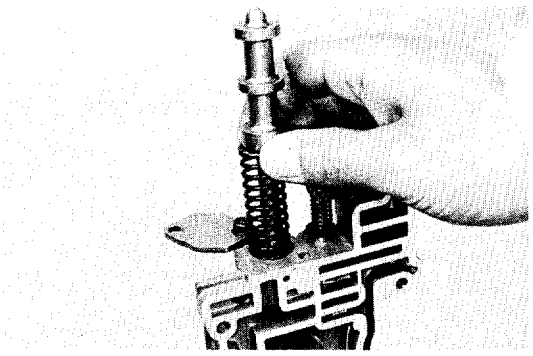
7. **INSTALL CAM ASSEMBLY ON UPPER FRONT VALVE BODY**

   Check the position of the spring ends against the photo. Tighten the bolt.

   Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)

8. **REMOVE TEMPORARILY INSTALLED RETAINER**

   Check that the cam rotates smoothly throughout its full stroke.



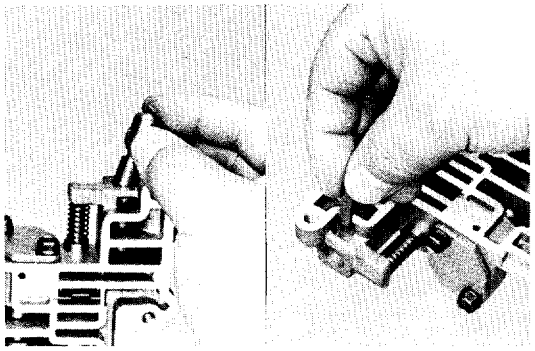
9. INSTALL SECONDARY REGULATOR VALVE

(a) Partially install the cover plate and insert the spring and secondary regulator valve.

(b) Compress the spring and swing the cover plate into place.

(c) Install the second bolt in the cover plate and tighten both bolts.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



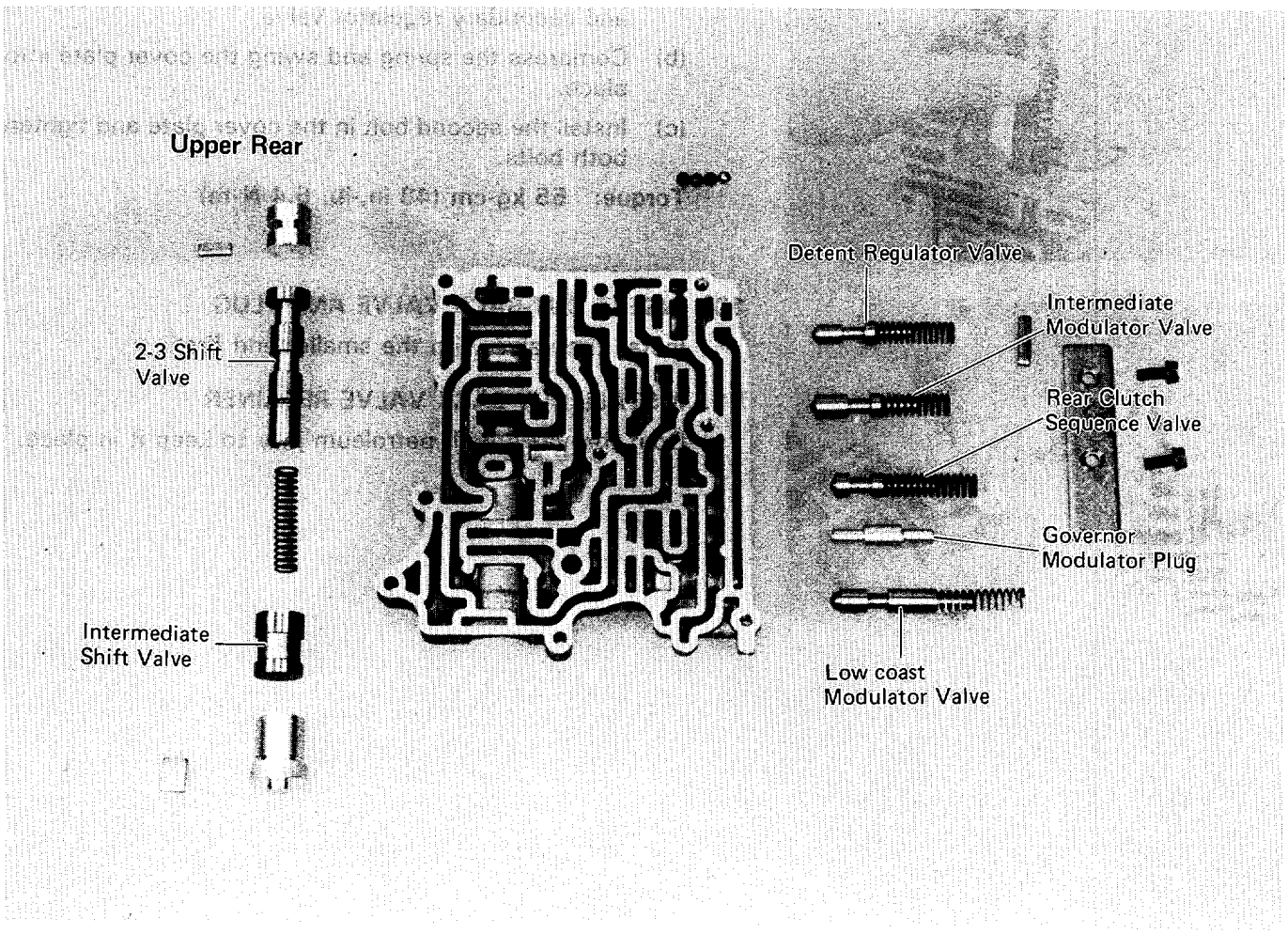
10. INSERT CUT-BACK VALVE AND PLUG

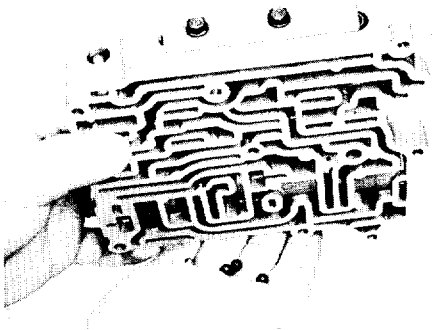
Install the valve with the smaller end first.

11. INSTALL CUT-BACK VALVE RETAINER

Coat the valve with petroleum jelly to keep it in place.

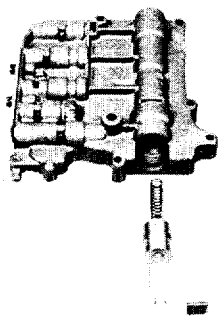
(Upper Rear Valve Body)



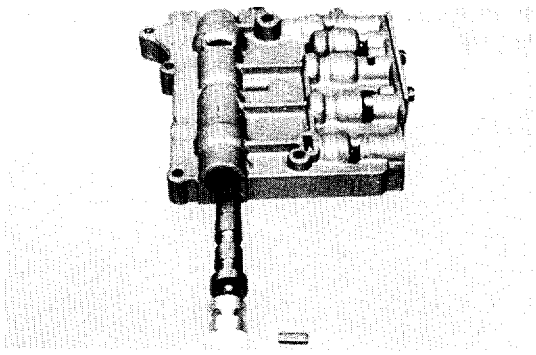


DISASSEMBLY OF UPPER REAR VALVE BODY

1. **REMOVE CHECK BALLS WITH TWEEZERS**
   3 rubber balls and 1 steel ball



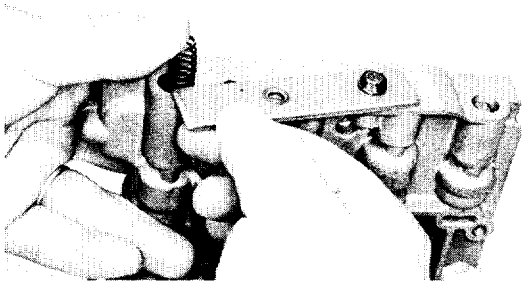
2. **REMOVE INTERMEDIATE SHIFT VALVE RETAINER**
3. **REMOVE PLUG, INTERMEDIATE SHIFT VALVE AND SPRING**

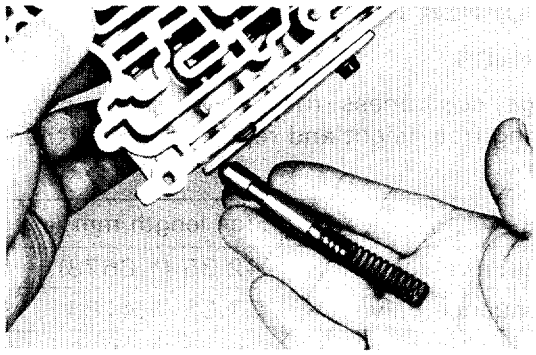


4. **REMOVE 2-3 SHIFT VALVE**
   (a) Remove the 2-3 shift valve retainer.
   (b) Remove the plug and 2-3 shift valve.

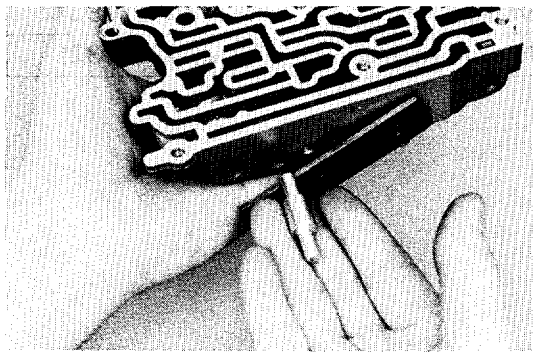
5. **REMOVE ONE BOLT FROM VALVE BODY SIDE COVER**

6. **SLIGHTLY ROTATE COVER TO RELEASE LOW-COAST MODULATOR VALVE ONLY**

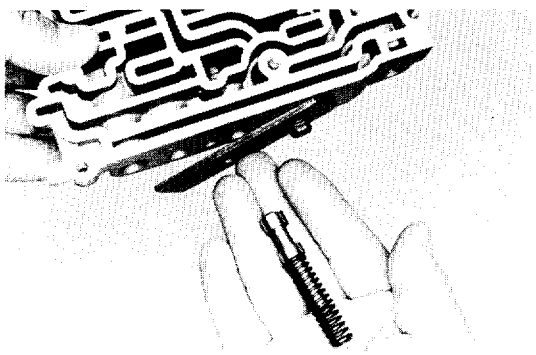




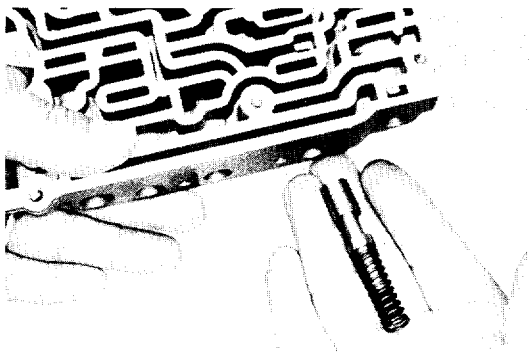
7. **REMOVE SPRING AND LOW-COAST MODULATOR VALVE**



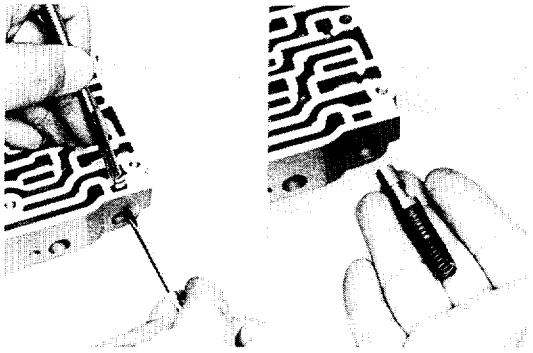
8. **ROTATE COVER FURTHER AND REMOVE GOVERNOR MODULATOR PLUG**



9. **ROTATE COVER FURTHER AND REMOVE SPRING AND REAR CLUTCH SEQUENCE VALVE**



10. REMOVE COVER PLATE, SPRING AND INTERMEDIATE MODULATOR VALVE

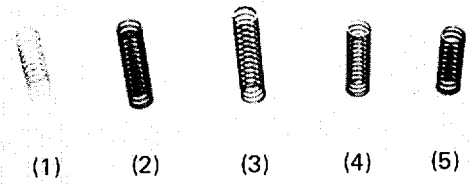


11. REMOVE DETENT REGULATOR VALVE RETAINER
12. REMOVE SPRING AND DETENT REGULATOR VALVE

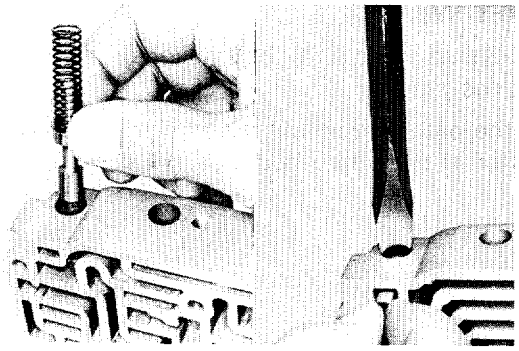
INSPECTION OF UPPER REAR VALVE BODY

INSPECT VALVE SPRINGS

Check for damage, squareness, rust and collapsed coils. Measure the spring free height and replace it if less than that shown below.



	Free length mm (in.)
(1) Low-coast modulator valve	42.35 (1.6673)
(2) Reverse clutch sequence valve	37.55 (1.4783)
(3) 2-3 shift valve	35.10 (1.3819)
(4) Detent regulator valve	29.93 (1.1783)
(5) Intermediate modulator valve	27.26 (1.0732)



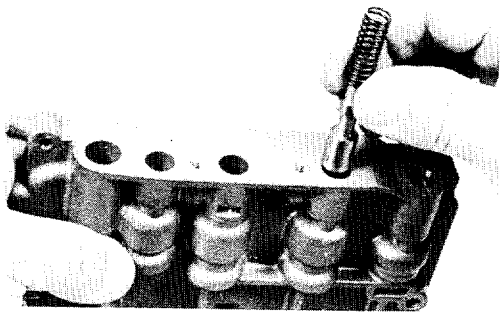
ASSEMBLY OF UPPER REAR VALVE BODY

(See page AT-82)

1. **INSTALL DETENT REGULATOR VALVE, SPRING AND RETAINER**

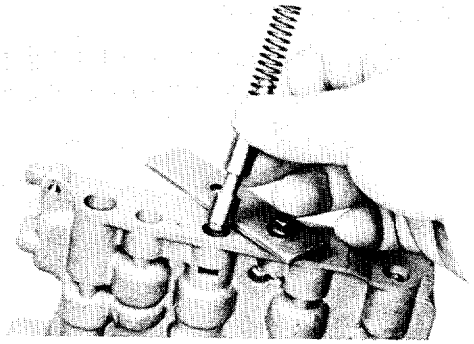
   Insert the valve (round end first)and spring into the bore. Compress the spring with a large screwdriver and slip the retainer over the edge of the spring. Then compress the spring and allow the retainer to fall into place.

   NOTE: Make sure that the retainer fully covers the end of the spring.



2. **INSERT INTERMEDIATE MODULATOR VALVE AND SPRING**

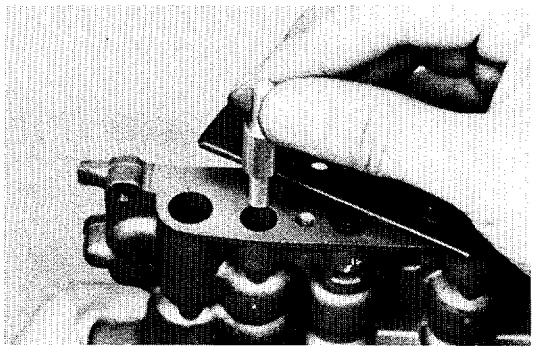
   Insert the valve with round end first, and then insert the spring.



3. **INSTALL VALVE BODY SIDE COVER WITH ONE BOLT**

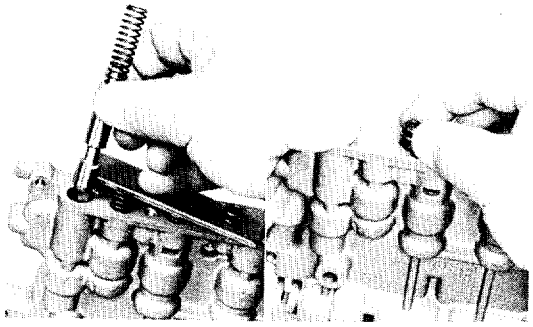
4. **INSERT REAR CLUTCH SEQUENCE VALVE AND SPRING**

   Insert the valve with the round end first. Then insert the spring.



5. **INSERT GOVERNOR MODULATOR PLUG**

   Insert the valve with the round end first. Then insert the spring.



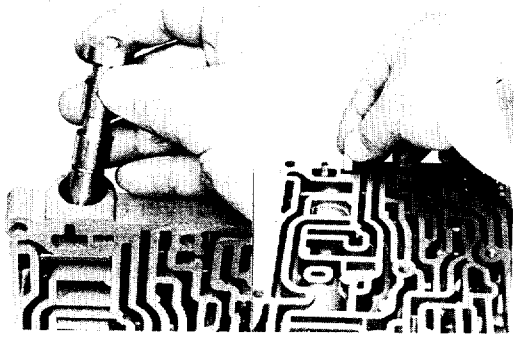
6. **INSERT LOW MODULATOR VALVE AND SPRING**

   Insert the valve with the round end first. Then insert the spring.

7. **POSITION COVER AND INSTALL SECOND BOLT**

   Install the 2nd bolt, and tighten both bolts.

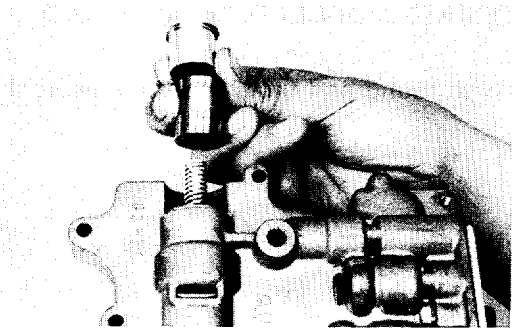
   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



8. INSERT 2-3 SHIFT VALVE

(a) Insert the 2-3 shitf valve with the smaller end first, and then insert the plug.

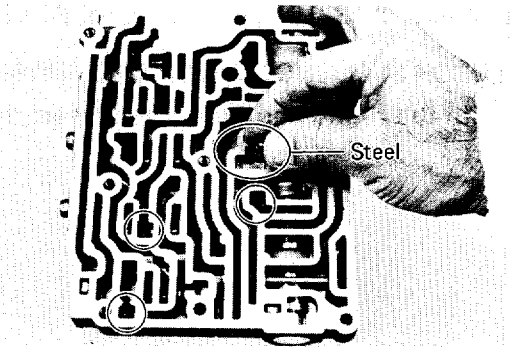
(b) Compress the plug and install the intermediate shift valve retainer in the valve body.



9. INSERT SPRING AND INTERMEDIATE SHIFT VALVE INTO BORE

Insert the valve with the round end up.

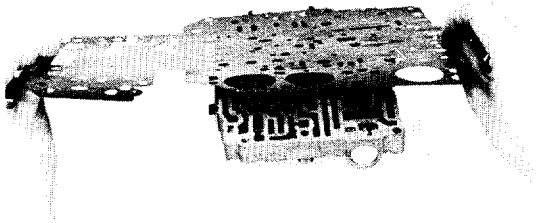
10. INSERT PLUG AND RETAINER



11. INSTALL CHECK BALLS AS SHOWN

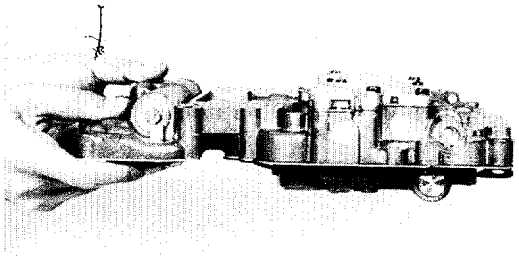
Install the steel ball in the position shown in the figure. The three rubber balls are identical and may be installed in any other position.

(Assembly of Valve Body)



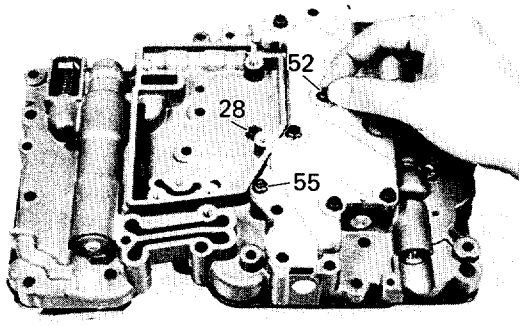
1. **POSITION NEW GASKET ON UPPER REAR VALVE BODY**

   Make sure that the new gasket matches the old gasket before installation. Align the gasket at the lower right corner.



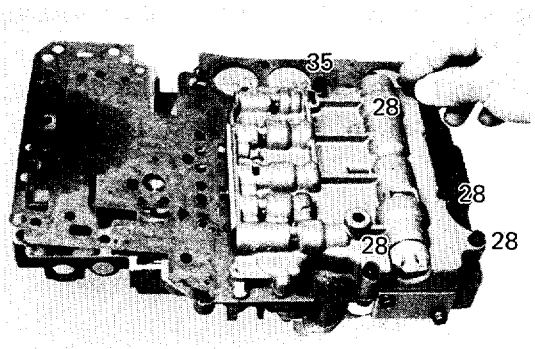
2. **PLACE LOWER VALVE BODY WITH PLATE ON TOP OF UPPER REAR VALVE BODY**

   Align the right edge.



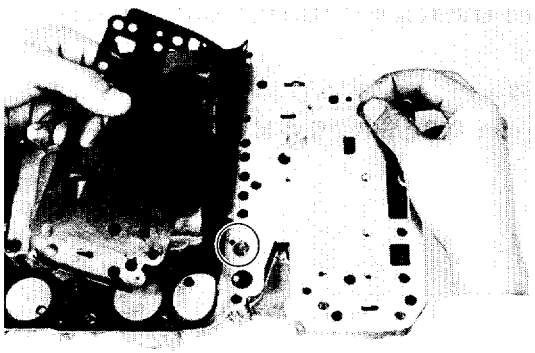
3. **INSTALL AND FINGER TIGHTEN THREE BOLTS IN LOWER VALVE BODY TO SECURE UPPER REAR VALVE BODY**

   NOTE: Each bolt length (mm) is indicated in the figure.

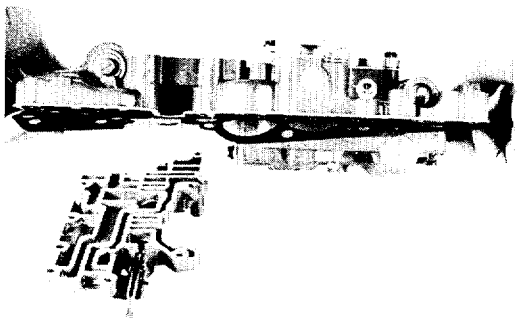


4. **TURN ASSEMBLY OVER, CHECK GASKET ALIGNMENT AND FINGER TIGHTEN FIVE BOLTS IN UPPER REAR VALVE BODY**

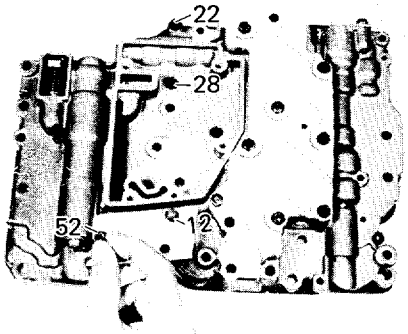
   NOTE: Each bolt length (mm) is indicated in the figure.



5. **REMOVE TEMPORARY BOLTS FROM PLATE**



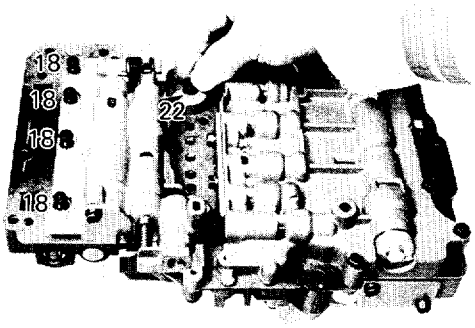
6. **PLACE LOWER AND UPPER REAR VALVE BODY ASSEMBLY ON TOP OF UPPER FRONT VALVE BODY**



7. **INSTALL SMALL COVER**

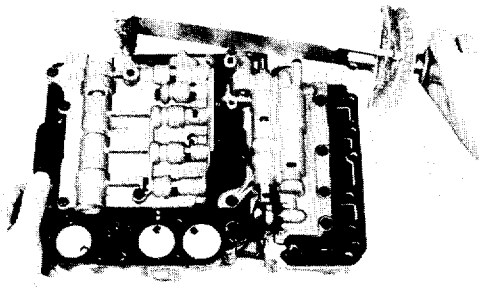
8. **FINGER TIGHTEN SET BOLTS IN LOWER VALVE BODY TO SECURE UPPER FRONT VALVE BODY**

   NOTE: Each bolt length (mm) is indicated in the figure.



9. **TURN ASSEMBLY OVER AND FINGER TIGHTEN FIVE BOLTS IN UPPER FRONT VALVE BODY**

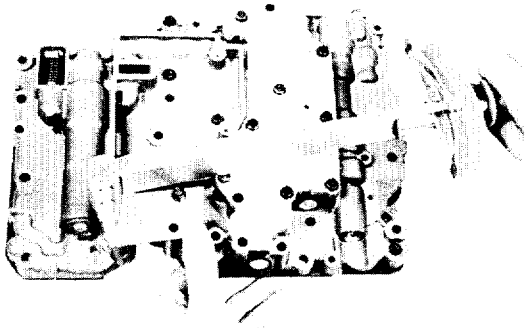
   NOTE: Each bolt length (mm) is indicated in the figure.



10. **TIGHTEN BOLTS IN UPPER FRONT AND REAR VALVE BODIES**

    Recheck alignment of the gaskets. Tighten the bolts.

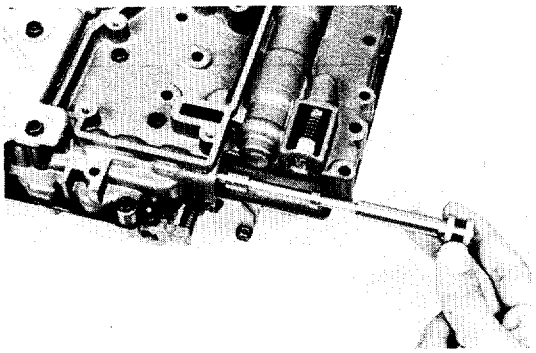
    Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



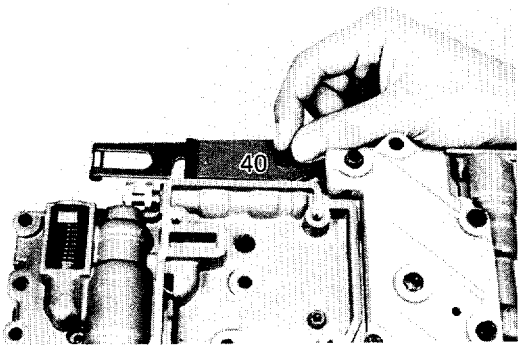
11. **TURN ASSEMBLY OVER AND TIGHTEN BOLTS IN LOWER VALVE BODY**

    Tighten the bolts.

    Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



12. INSERT MANUAL VALVE

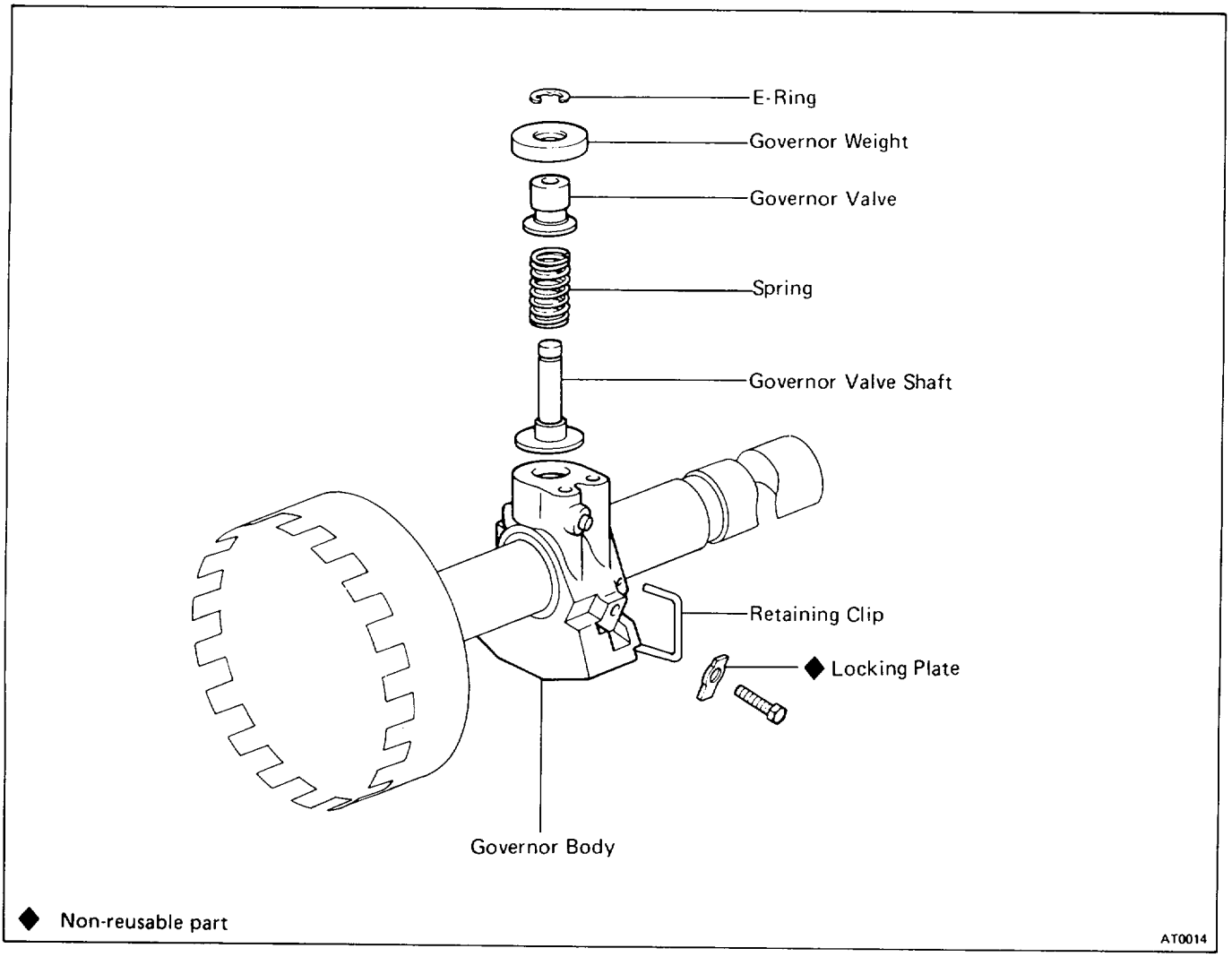


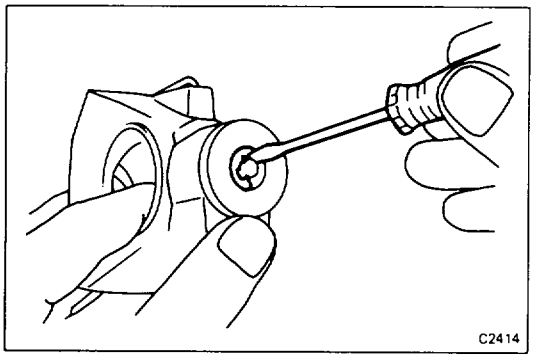
13. INSTALL DETENT SPRING

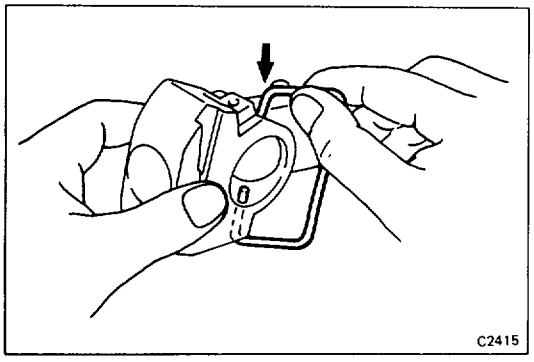
Tighten the bolts.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

Governor Body







DISASSEMBLY OF GOVERNOR BODY

1. REMOVE E-RING AND GOVERNOR WEIGHT

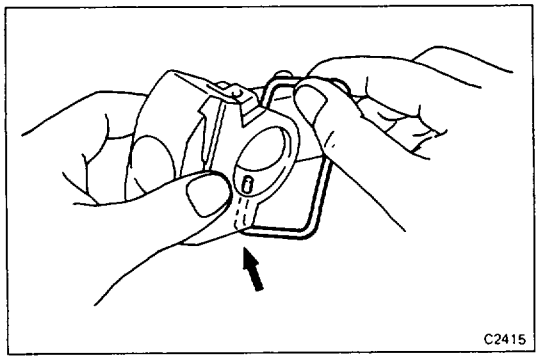
Compress the spring by pushing up on the shaft and down on the weight. Remove the E-ring with a screwdriver. Lift off the governor weight.

2. REMOVE GOVERNOR VALVE

Slide it down through the bore.

3. REMOVE RETAINING CLIP

Remove the end, indicated by an arrow, being careful not to scratch the governor body.

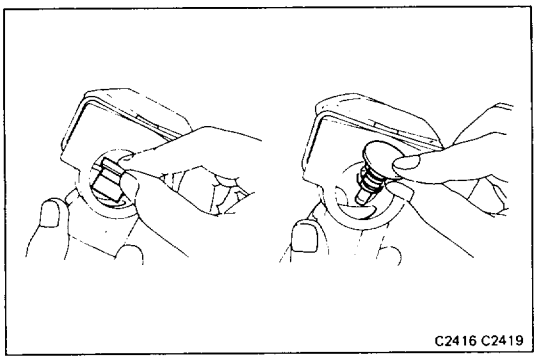


ASSEMBLY OF GOVERNOR BODY

(See page AT-90)

1. **INSTALL RETAINING CLIP**

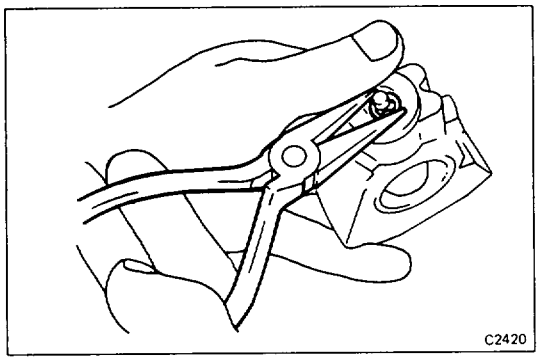
   Install the clip end, indicated by an arrow, being careful not to scratch the governor body.



2. **INSTALL GOVERNOR VALVE, SPRING AND SHAFT**

   (a) Slide down the governor valve through the bore.

   (b) Slide down the spring and shaft through the bore.

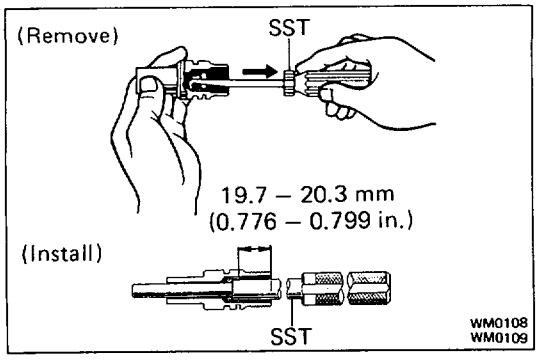


3. **INSTALL GOVERNOR WEIGHT AND E-RING ON SHAFT**

   (a) Install the governor weight.

   (b) Compress the spring, and install the E-ring on the shaft with needle-nose pliers. Make sure that it is fully seated in the groove.

   NOTE: Make sure that the valve moves smoothly.



Extension Housing

INSPECTION OF SPEEDOMETER GEAR AND EXTENSION HOUSING

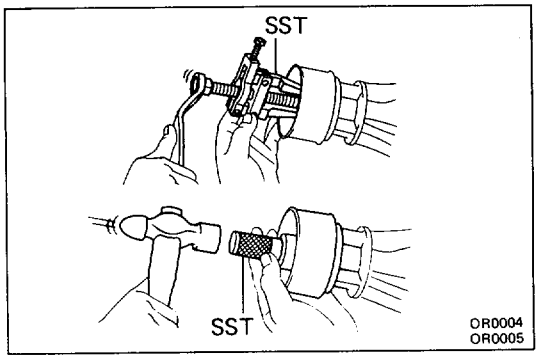
1. **IF NECESSARY, REPLACE SPEEDOMETER GEAR OIL SEAL**

   (a) Using SST, remove the oil seal.

   SST 09921-00010

   (b) Using SST, install a new oil seal.

   SST 09201-60011



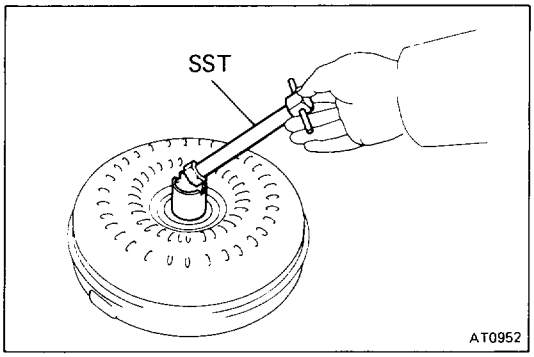
2. **IF NECESSARY, REPLACE OIL SEAL AND DUST SEAL**

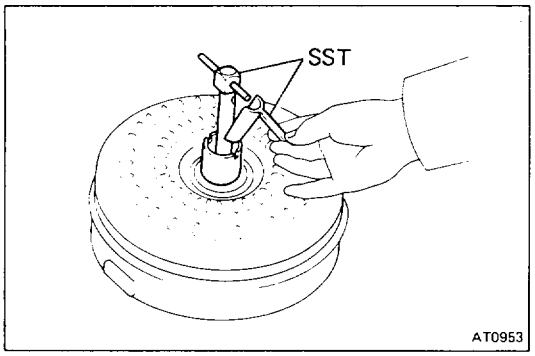
   (a) Using SST, remove the oil seal.

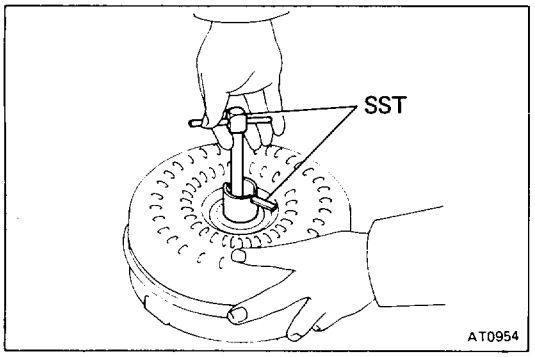
   SST 09308-10010

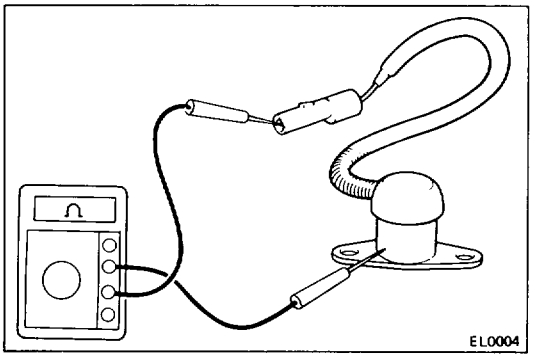
   (b) Using SST, drive in a new oil seal and dust seal.

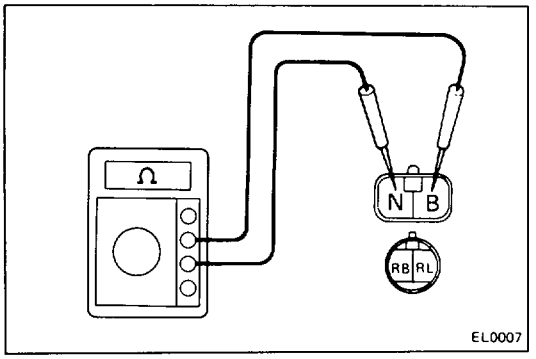
   SST 09325-20010











Torque Converter

CLEAN TORQUE CONVERTER

If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed, using Toyota Transmission Cleaner.

INSPECTION OF TORQUE CONVERTER

1. **INSERT SST IN END OF TORQUE CONVERTER**

   (a) Insert a turning tool in to the inner race of the one-way clutch.

   (b) Insert the stopper so that it fits in the notch of the converter hub and other race of the one-way clutch.

   SST 09350-20015 (09397-22020)

2. **TEST ONE-WAY CLUTCH**

   The clutch should lock when turned counterclockwise, and should rotate freely and smoothly clockwise. Less than 25 kg-cm (22 in.-lb, 2.5 N·m) of torque should be required to rotate the clutch clockwise. If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.

Electrical Parts

1. **INSPECT OVERDRIVE SOLENOID**

   Check the resistance between the terminal and body.

   Standard resistance: About 13 Ω

2. **INSPECT NEUTRAL START SWITCH**

   Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below.

   If continuity between the terminals is not as specified, replace the switch.

Terminal / Shift Position	B	N	RB	RL
P range	○—○			
R range			○—○	
N range	○—○			

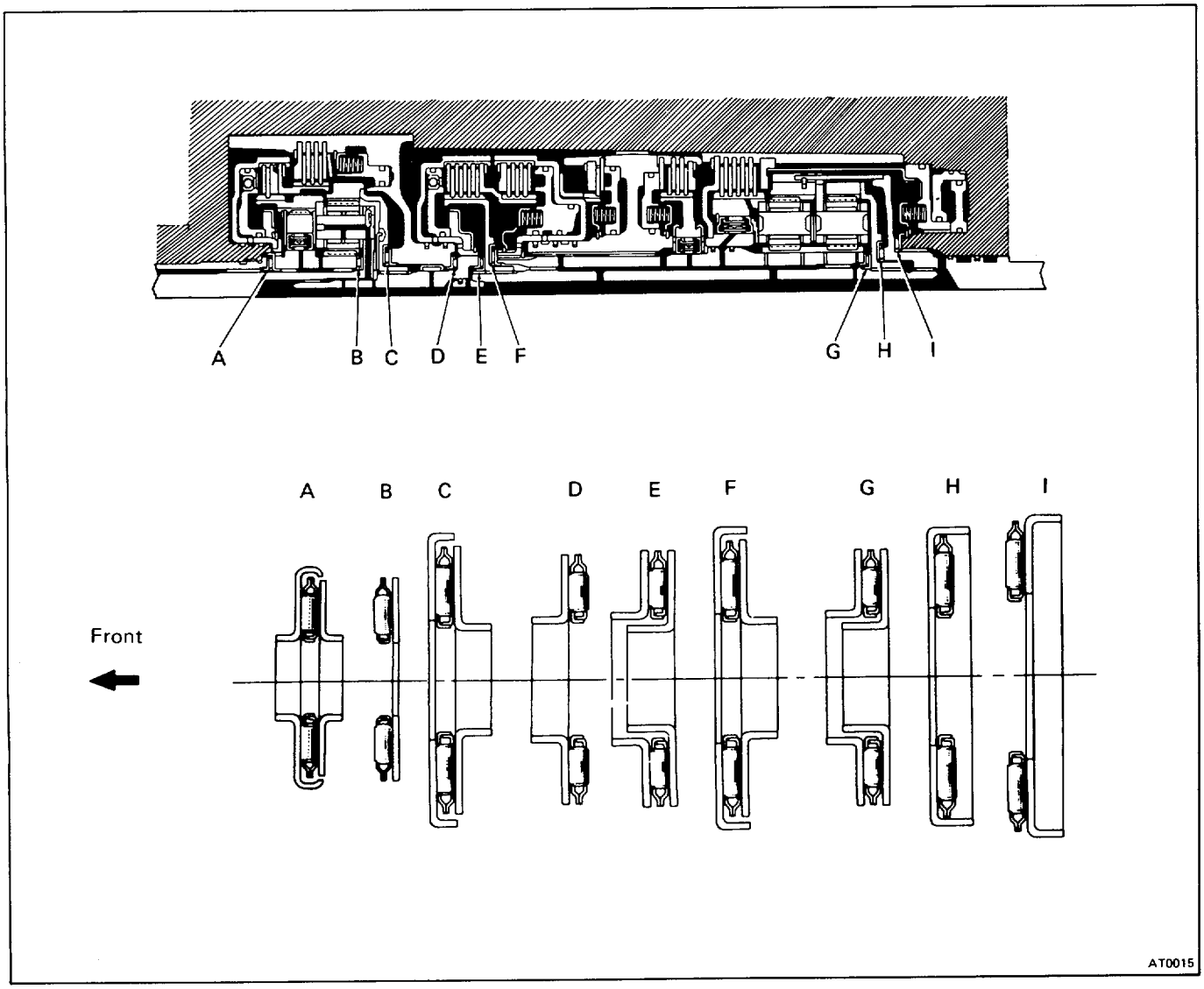
ASSEMBLY OF TRANSMISSION

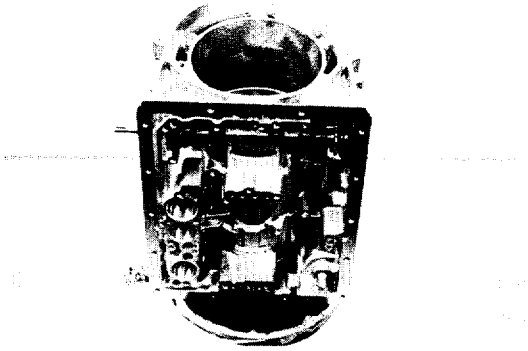
Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure again that all component groups are assembled correctly.

If something wrong is found in a certain component group while assembly, inspect and repair this group immediately.

GENERAL ASSEMBLY NOTES:

1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transmission fluid for at least two hours.
3. Apply automatic transmission fluid on sliding or rotating surfaces of the parts before assembly.
4. Use petroleum jelly to keep the small parts in their places.
5. Do not use adhesive cements on gaskets and similar parts.
6. When assembling the transmission, be sure to use new gaskets and O-rings.
7. Dry all parts by blowing with compressed air. Never use shop rags.
8. Be sure to install the thrust bearings and races in the correct direction and position.

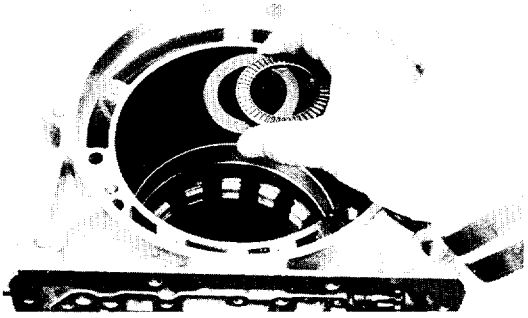




1. **PLACE TRANSMISSION CASE ON CYLINDER**

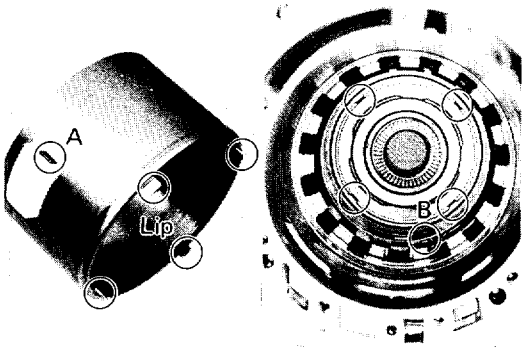
Place the transmission on a cylindrical stand for more efficient work.

CAUTION: Place shop rags between the case and stand to avoid damaging the case.



2. **INSTALL THRUST WASHER AND BEARING**

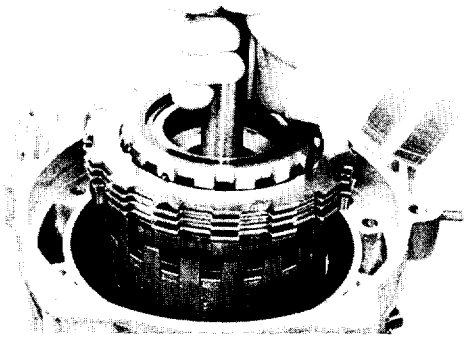
Install the thrust washer, facing the cup side downward.



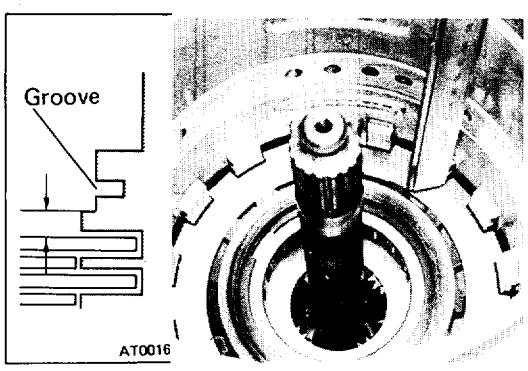
3. **INSTALL APPLY TUBE ONTO OUTER PISTON OF REAR BRAKE PISTONS**

Install the tube, aligning its locking tab (part A) with part B of the case.

NOTE: Make sure that the lips of the tube end are completely inserted onto the outer piston.



4. **PARTIALLY INSERT OUTPUT SHAFT ASSEMBLY INTO CASE**

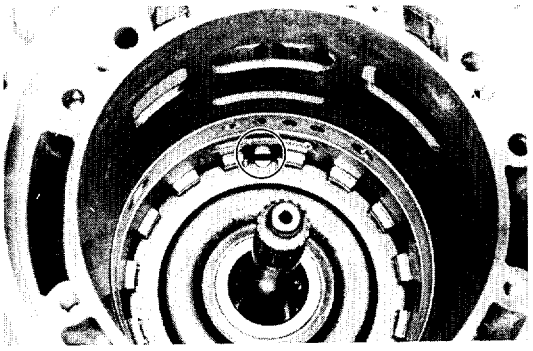


5. **CHECK CLUTCH PACK CLEARANCE**

With the case in upright position, make sure that the clutch pack is lower than the ledge below the snap ring groove.

If the clutch pack is not lower than the ledge, components may be misassembled or there may be excess ATF on the discs.

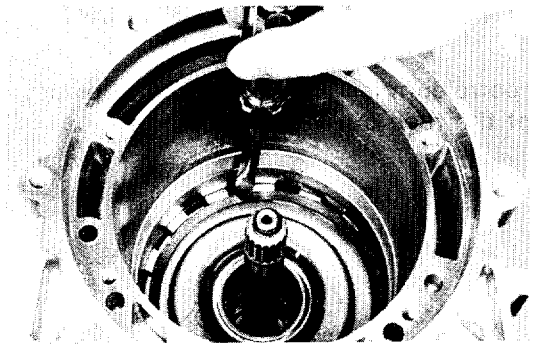
Standard clearance: 0.61 — 2.64 mm (0.0240 — 0.1039 in.)



6. INSTALL REACTION PLATE

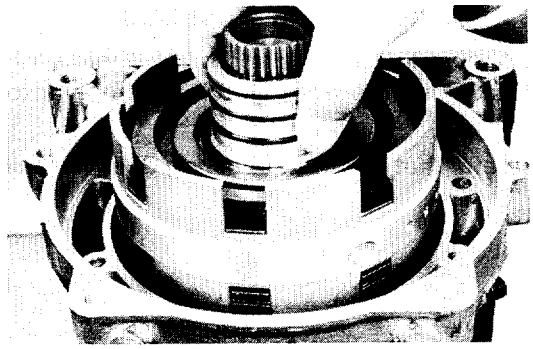
Position the notched tooth of the reaction plate toward the valve body side of the case. Push it into place.

NOTE: The reaction plate is correctly installed if the snap ring groove is fully visible.



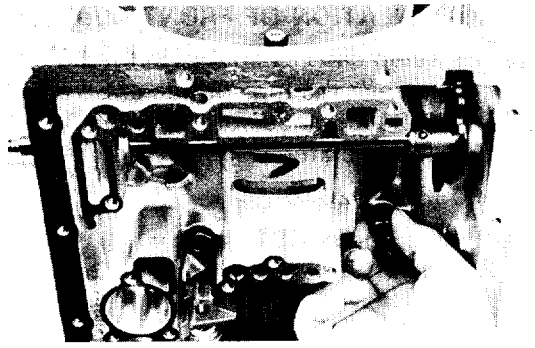
7. INSTALL SNAP RING

Use a large screwdriver to compress the snap ring. Push it into place by hand. Work around the case. Visually check to make sure that the ring is fully seated. Make sure that the ends of the snap ring are between the lugs.



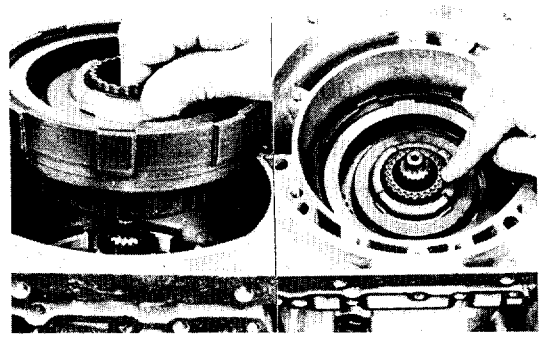
8. PUSH CENTER SUPPORT ASSEMBLY INTO CASE

Align the oil hole and bolt hole of the center support with those of the body side and insert the center support.



9. INSTALL TWO CENTER SUPPORT BOLTS WITH WAVE WASHERS

Align the center support with holes in the case and install the two bolts finger tight.

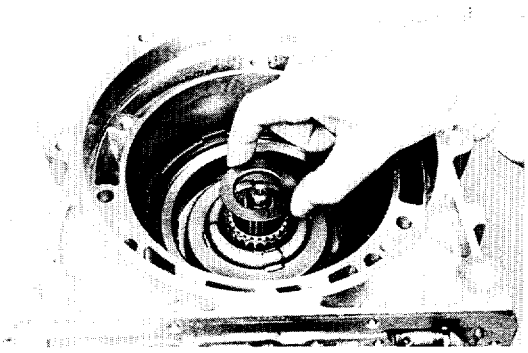


10. INSTALL REAR CLUTCH IN CASE

Rotate the clutch to mesh the hub with the center support.

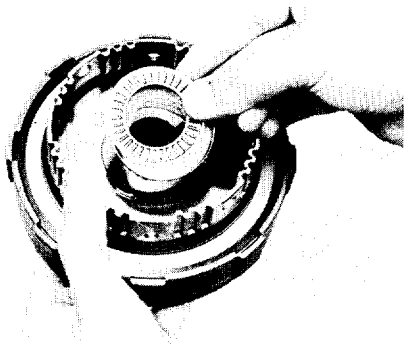
11. CHECK FOR CORRECT INSTALLATION OF REAR CLUTCH

If the rear clutch is fully meshed with the center support, the splined center of the clutch will be flush with the end of the sun gear shaft.



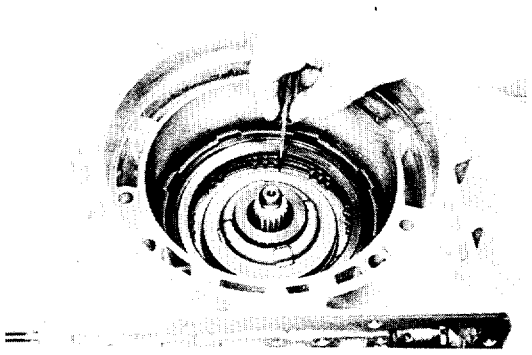
12. INSTALL THRUST BEARING RACE OVER SPLINED END OF REAR CLUTCH IN CASE

Coat parts with petroleum jelly to keep them in place. Position the lip of the race toward the rear clutch.



13. INSTALL THRUST BEARING AND RACE ON FRONT CLUTCH

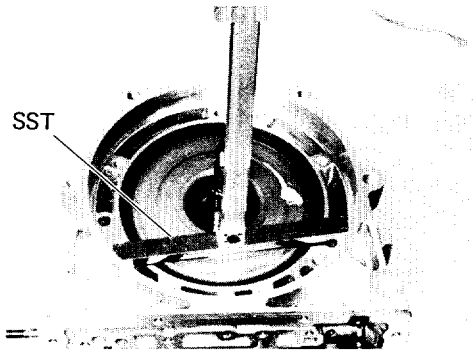
Coat parts with petroleum jelly to keep them in place. Position the lip of the race outward.



14. INSTALL FRONT CLUTCH ASSEMBLY IN CASE

Align flukes of the rear clutch discs and mesh them with the front clutch hub. Push the front clutch assembly into the case.

CAUTION: Be careful that the thrust bearing does not fall out.

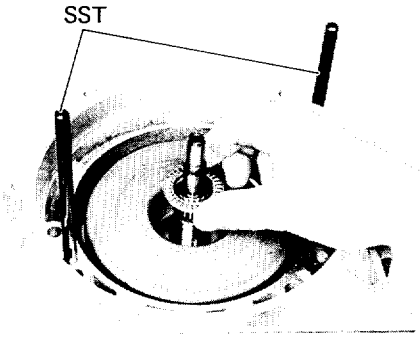


15. CHECK CORRECT INSTALLATION OF FRONT CLUTCH

Set SST on the transmission case as shown in the figure. Measure the distance between the top surface of SST and front clutch assembly. If the distance corresponds to that during disassembly, the front clutch is installed correctly.

SST 09350-20015 (09370-12010)

Height: Measured value minus SST width = Approx. 2 mm (0.08 in.)



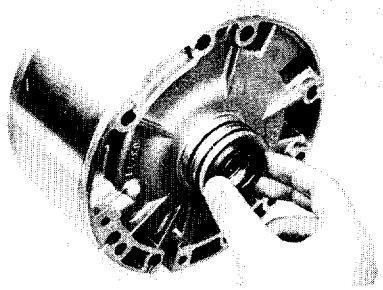
16. INSTALL SST ON CASE

Finger tighten the SST on the transmission case.

SST 09350-20015 (09362-30011)

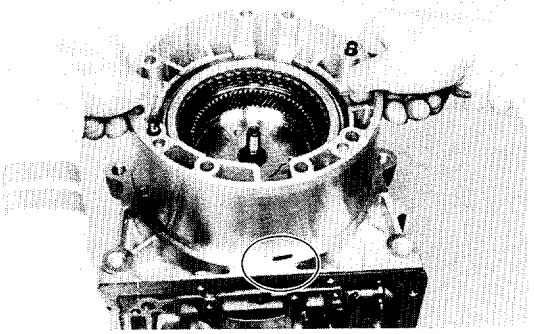
17. INSTALL THRUST BEARING ON FRONT CLUTCH

Coat the thrust bearing with petroleum jelly and set it into place.



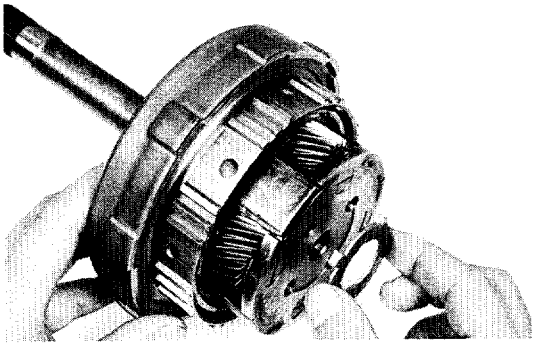
18. INSTALL THRUST WASHER ON OVERDRIVE CASE END

Coat the thrust washer with petroleum jelly and set it into place, facing the lip side toward the overdrive case.



19. INSERT OVERDRIVE CASE INTO TRANSMISSION CASE

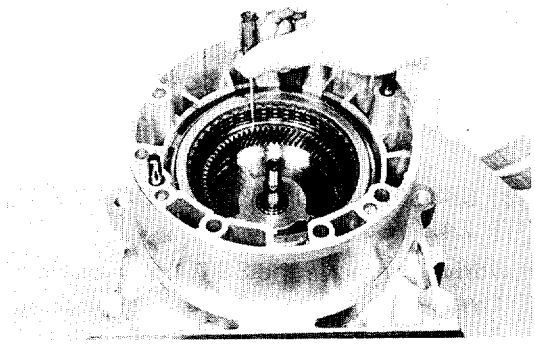
Insert the overdrive case gently through the two guide pins with the circled part in the figure facing in the direction indicated.



20. INSTALL THRUST WASHER

Coat the thrust washers with petroleum jelly. Install the thrust washer on the overdrive planetary carrier.

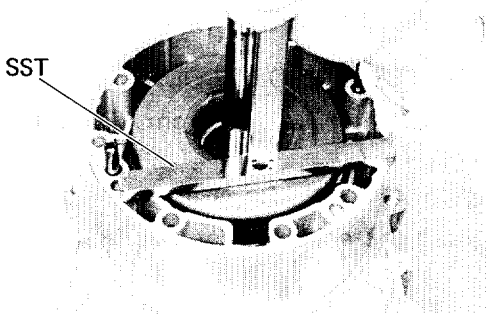
NOTE: The washer lugs should be inserted in the holes.



21. INSTALL OVERDRIVE CLUTCH IN CASE

Align of discs the flukes in the overdrive case. Align the flukes with the slots of the overdrive clutch and press the overdrive clutch into the overdrive case.

CAUTION: Be careful that the thrust washer does not fall out.

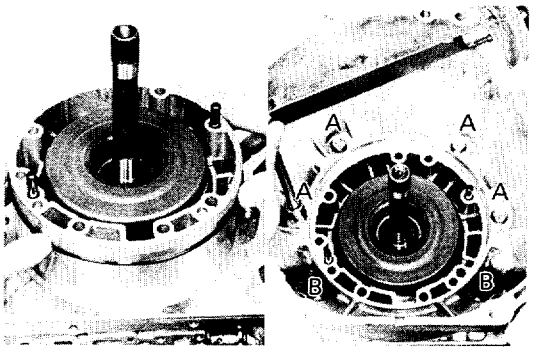


22. CHECK CORRECT INSTALLATION OF OVERDRIVE CLUTCH

Set SST on the overdrive case as shown in the figure. Measure the distance between the top surface of SST and overdrive clutch. If the distance corresponds to that during disassembly, the overdrive clutch is installed correctly.

SST 09350-20015 (09370-12010)

Height: Measured value minus SST width =
(Others) Approx. 3.5 mm (0.138 in.)

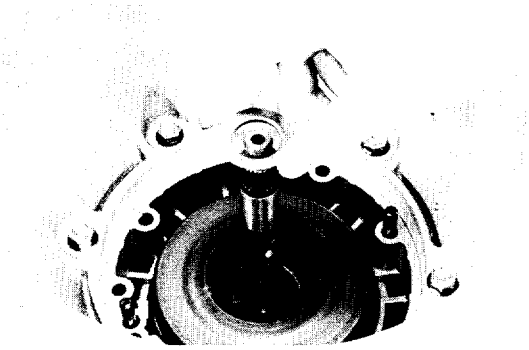


23. INSTALL O-RING ON OVERDRIVE CASE

24. INSTALL CONVERTER HOUSING

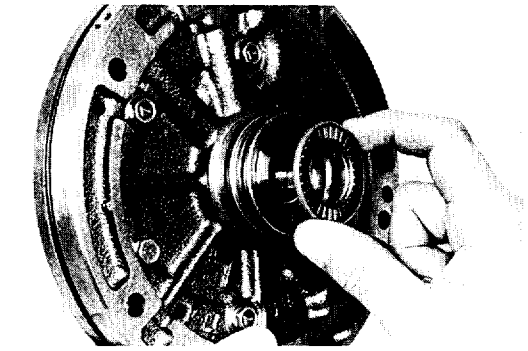
Torque: A bolts 345 kg-cm (25 ft-lb, 34 N·m)
B bolts 580 kg-cm (42 ft-lb, 57 N·m)

Install the two 12 — mm bolts (B) and four 10 — mm bolts (A), and tighten them.



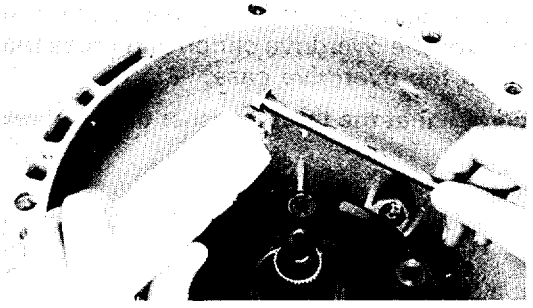
25. INSTALL THRUST WASHER AND BEARING ON OVERDRIVE CLUTCH

Coat the thrust washer with petroleum jelly. Install the thrust washer facing the lip side outward together with the bearing.



26. INSTALL THRUST WASHER ON OIL PUMP

Coat the thrust washer with petroleum jelly and install the lip side toward the pump body.



27. INSTALL OIL PUMP

(a) Install the oil pump gently through the two guide bolts, being careful that the thrust washer does not fall out.

(b) Coat the five set bolts with sealant, and finger tighten them.

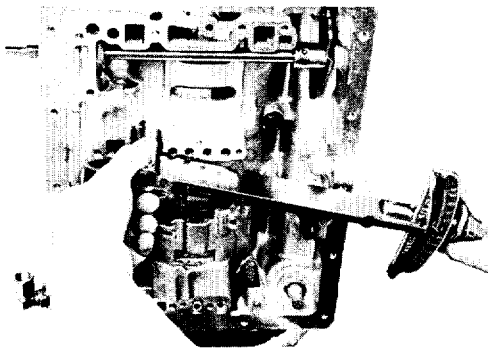
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent.

(c) Using a screwdriver, remove the SST. In the place of it, install the two set bolts coated with seal packing.

SST 09350-20015 (09362-30011)

(d) Tighten the set bolts gradually and evenly.

Torque: 215 kg-cm (16 ft-lb, 21 N·m)

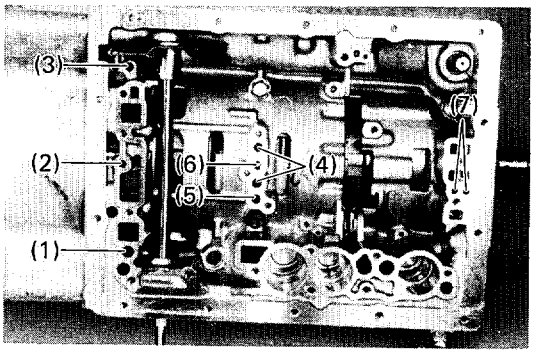


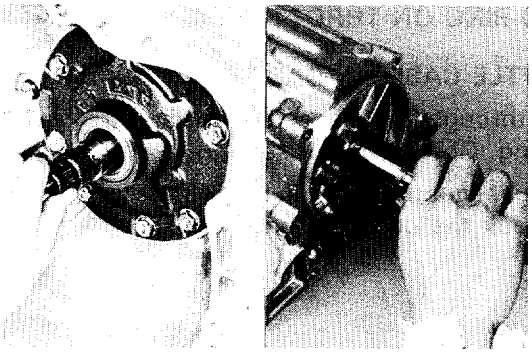
28. TIGHTEN TWO CENTER SUPPORT BOLTS

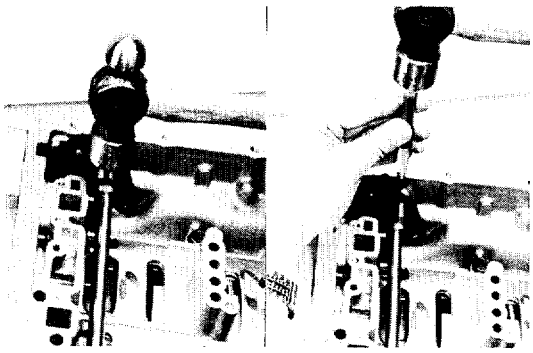
Tighten the bolts alternately in 70 kg-cm (61 in.-lb, 6.9 N·m) increments.

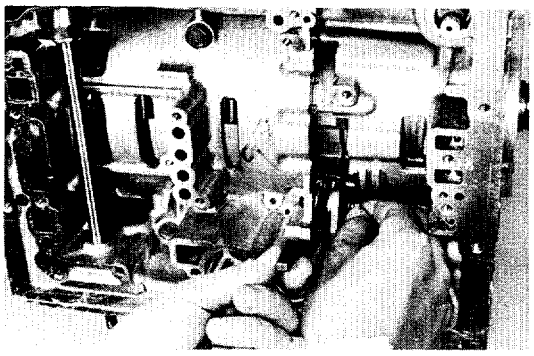
Torque: 260 kg-cm (19 ft-lb, 25 N·m)

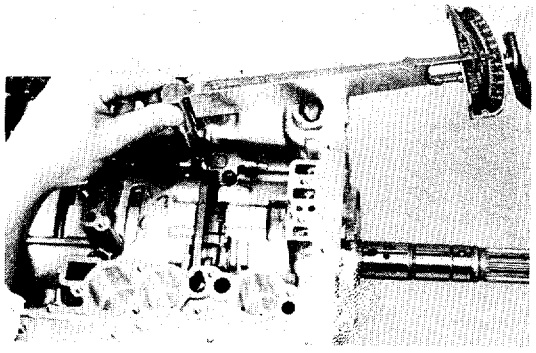
NOTE: First tighten the accumulator side bolt.











29. CHECK OPERATION OF PISTONS

Blow low-pressure compressed air into the passages indicated in the photo and listen for noise from piston movement.

(1) Overdrive clutch
(2) Overdrive brake
(3) Front clutch
(4) Rear clutch
(5) Brake No.1
(6) Brake No.2
(7) Brake No.3

If the pistons do not move, disassemble and inspect them.

30. CHECK INPUT SHAFT AND OUTPUT SHAFT

(a) Make sure that the input shaft has play in axial direction and that it turns.

(b) Make sure that the output shaft has thrust play in axial direction.

Thrust play: 0.3 — 0.9 mm (0.012 — 0.035 in.)

31. IF NECESSARY, INSTALL MANUAL VALVE LEVER SHAFT INTO CASE

(a) Assemble the new collar to the manual valve lever.

NOTE: Always replace the collar and roll pin with a new one. Never reuse a pin after it has been removed.

(b) Install the manual valve lever shaft to the transmission case through the manual valve lever.

(c) Drive in a new roll pin with the slot at a right angle to the shaft.

(d) Match the collar hole to the lever calking hollow and calk the collar to the lever.

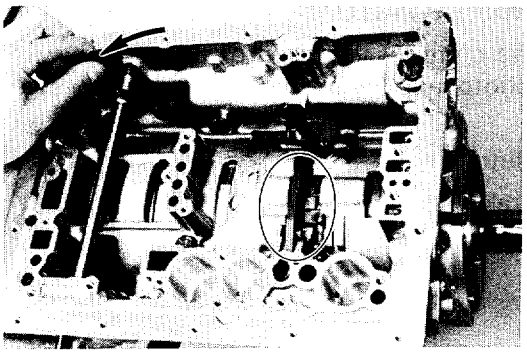
32. INSTALL PARKING LOCK PAWL, PIVOT PIN AND SPRING IN CASE

33. INSTALL PARKING LOCK PAWL BRACKET ON CASE

Make sure the collar on the control rod is toward the front of the transmission.
Tighten the two bolts. Make sure the pawl moves freely.

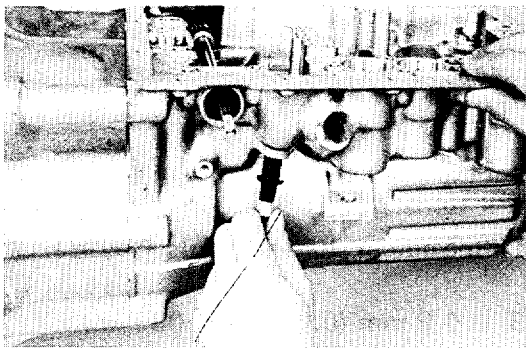
NOTE: Be careful, as it is possible for bracket to be installed too far forward, where it will bind the pawl.

Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)



34. CHECK OPERATION OF PARKING LOCK PAWL

Make sure the planetary gear output shaft is locked when the manual valve lever is in the "P" range.

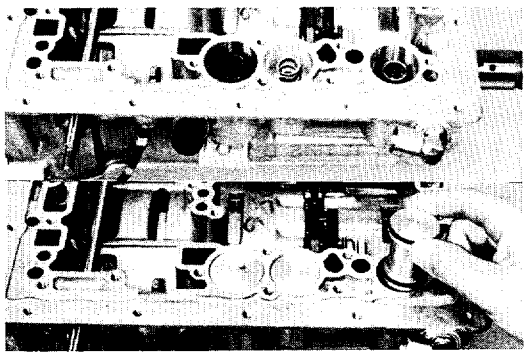


35. INSTALL NEW O-RING ON THROTTLE CABLE FITTING

36. INSTALL THROTTLE CABLE IN CASE

Push the cable through the case, being careful not to damage the O-ring. Check for full seating.

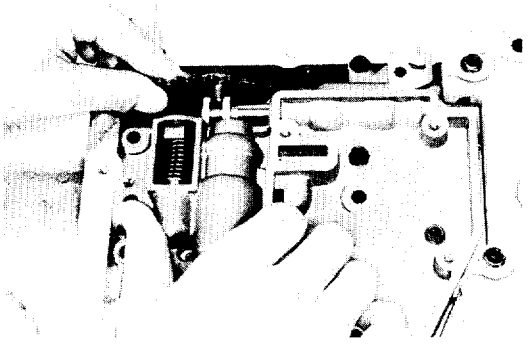
CAUTION: In subsequent work, do not roll the case over the cable and break the cable fitting.



37. INSTALL ACCUMULATOR PISTON AND SPRINGS

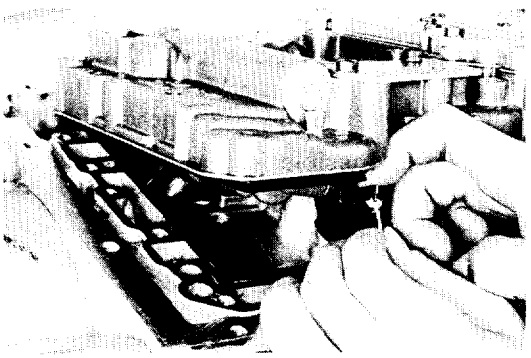
Spring mm (in.)

	Free length	Outer diameter	No. of coils	Wire diameter
B_2	66.68 (2.6252)	16.36 (0.6441)	14.5	2.60 (0.1024)
C_2	55.18 (2.1724)	15.87 (0.6248)	8.5	2.00 (0.0787)
C_1	64.68 (2.5465)	17.50 (0.6890)	18.5	2.00 (0.0787)



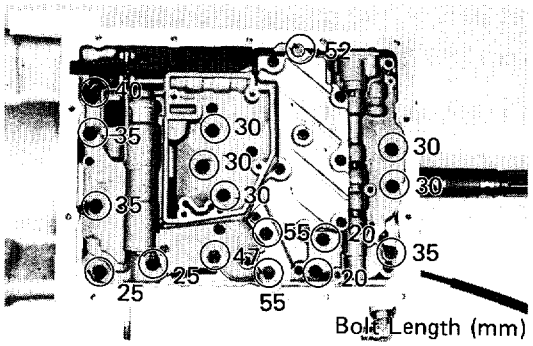
38. PLACE VALVE BODY ON TRANSMISSION

Make sure the accumulator pistons are pressed fully into the bore. Align the manual valve with the pin on the manual valve lever, and lower valve body into place.



39. LIFT SIDE OF VALVE BODY AND ATTACH THROTTLE CABLE

While holding the cam down by hand, slip the cable end into the slot.

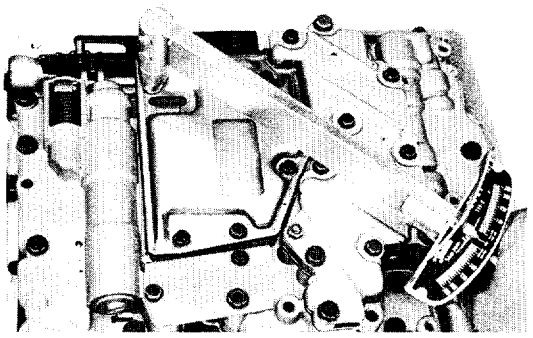


40. INSTALL BOLTS IN VALVE BODY

Install the bolts as shown.

NOTE: Each bolt length (mm) is indicated in the figure.

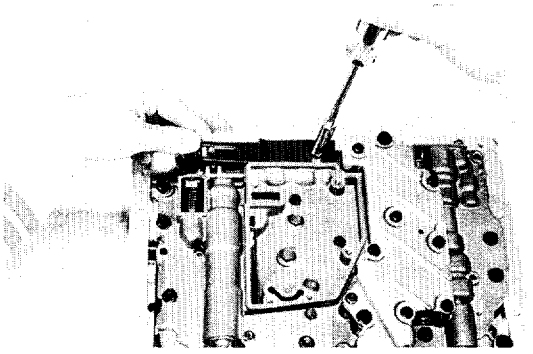
Torque: 100 kg-cm (7 ft-lb, 10 N·m)



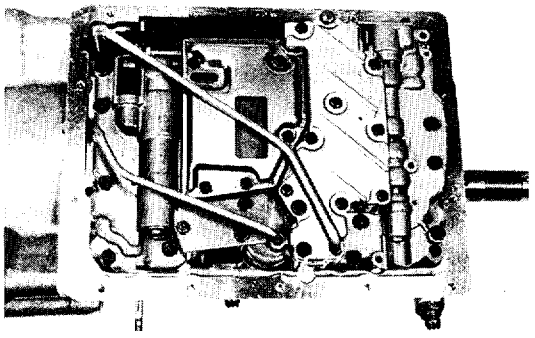
41. INSTALL OIL STRAINER AND BOLTS

Install the small plate and oil strainer.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)



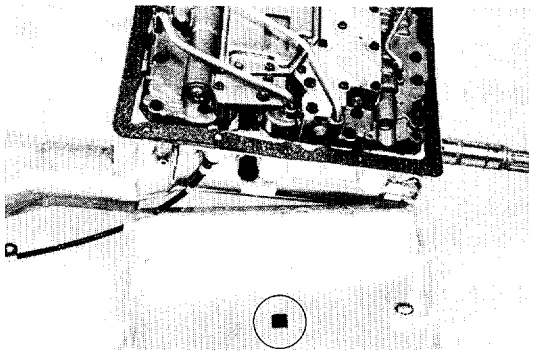
42. INSTALL DETENT SPRING



43. INSTALL OIL TUBES

Using a plastic hammer, install the tubes into the position indicated in the photo.

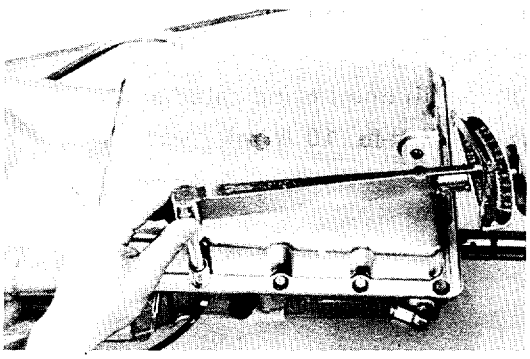
CAUTION: Be careful not to bend or damage the tubes.



44. INSTALL MAGNETS IN PAN AND INSTALL OIL PAN WITH NEW GASKET

(a) Install the magnets in the pan.

CAUTION: Make sure that the magnets do not interfere with the oil tubes.

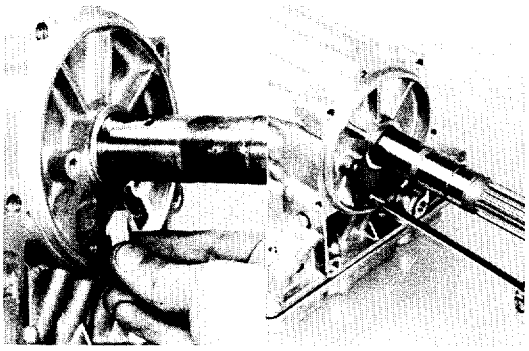


(b) Align the cut part of the gasket and case.

Torque: 45 kg-cm (39 in.-lb, 4.4 N·m)

45. INSTALL DRAIN PLUG WITH NEW GASKET

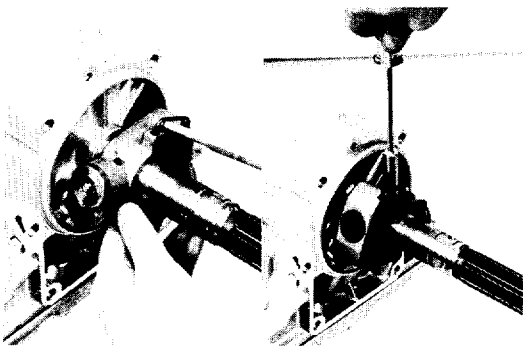
Torque: 205 kg-cm (15 ft-lb, 20 N·m)



46. INSTALL GOVERNOR LINE STRAINER

(a) Install the strainer onto the case.

(b) Install the plate.



47. INSTALL GOVERNOR BODY AND SPEEDOMETER DRIVE GEAR ON OUTPUT SHAFT

(a) While lifting the retaining clip with a large screwdriver, slide the governor body and insert the retaining clip end into the hole on the output shaft.

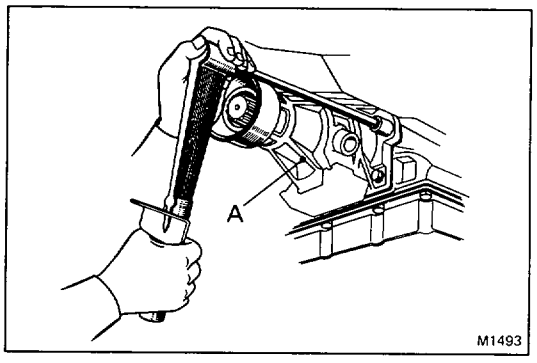
(b) Install the lock plate and bolt, and then stake the lock plate.

Torque: 40 kg-cm (35 in.-lb, 3.9 N·m)

(c) Install the snap ring and lock ball.

(d) Slide the speedometer gear on to the shaft.

(e) Using snap ring pliers, install the outer snap ring.



48. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the A bolt and bolt hole with white gasoline.

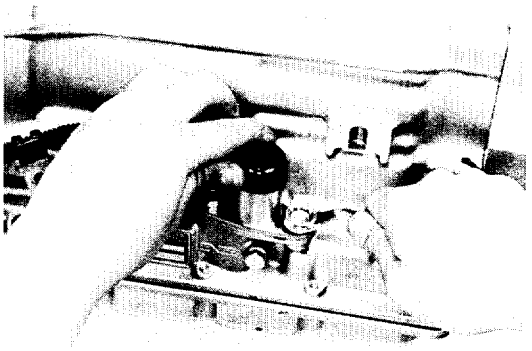
(b) Coat the threads of the A bolt with sealant.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

NOTE: The two lower bolts are shorter.

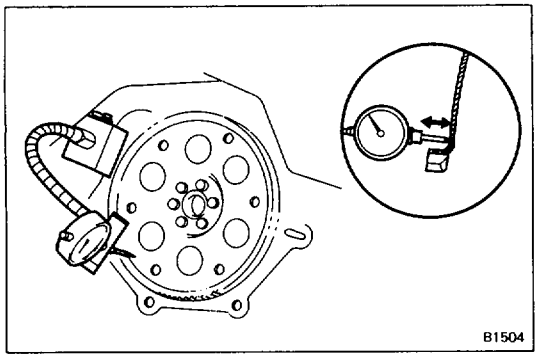
Torque: 345 kg-cm (25 ft-lb, 34 N·m)



49. INSTALL SPEEDOMETER DRIVEN GEAR

50. INSTALL NEUTRAL START SWITCH AND SHIFT SELECTOR (See page AT-4)

51. INSTALL SOLENOID

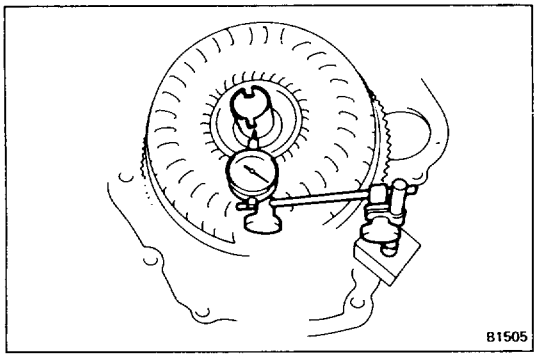


INSTALLATION OF TRANSMISSION

1. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure drive plate runout. If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace drive plate. If installing new drive plate, note the orientation of spacers and tighten the bolts.

Runout: 0.20 mm (0.0079 in.) or less
Torque: 850 kg-cm (61 ft-lb, 83 N·m)



2. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

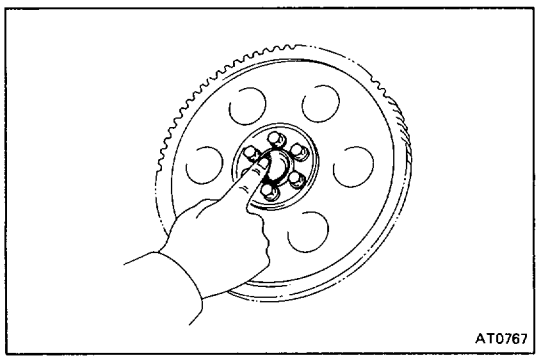
(a) Temporarily mount the torque converter to the drive plate. Set up a dial indicator.

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.

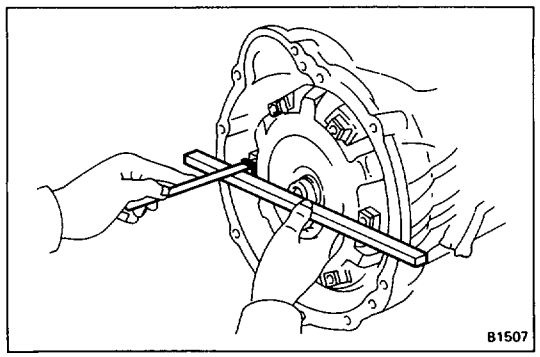
Runout: 0.30 mm (0.0118 in.) or less
Torque: 280 kg-cm (20 ft-lb, 27 N·m)

NOTE: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter.



3. APPLY GREASE TO CENTER HUB OF TORQUE CONVERTER AND PILOT HOLE IN CRANKSHAFT

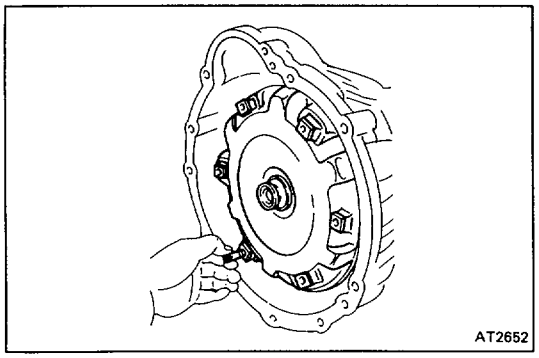


4. INSTALL TORQUE CONVERTER IN TRANSMISSION

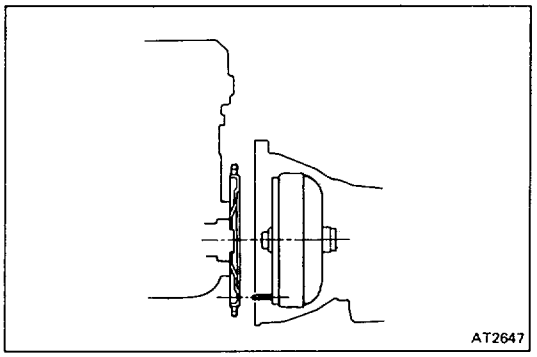
5. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the center hub to the front surface of the converter housing.

Correct distance: 20 mm (0.79 in.)



6. INSTALL GUIDE PIN IN TORQUE CONVERTER

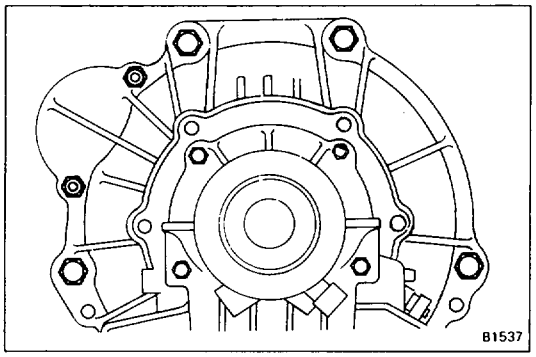


7. **ALIGN TRANSMISSION AT INSTALLATION POSITION**

CAUTION: Be careful not to tilt the transmission forward because the torque converter could slide out.

(a) Align the guide pin with a drive plate hole.

(b) Align the two sleeves on the block with the converter housing.



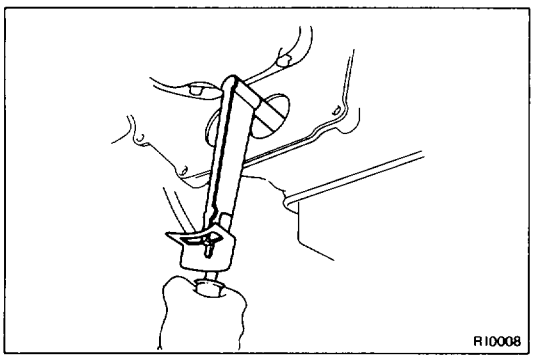
8. **INSTALL CONVERTER HOUSING MOUNTING BOLTS**

Install the filler tube bracket with the upper right-hand bolt and tighten both bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)

9. **INSTALL STARTER**

10. **INSTALL BOTH SIDE STIFFENER PLATES**



11. **INSTALL SIX TORQUE CONVERTER BOLTS**

(a) Remove the guide pin.

(b) Install the six bolts finger tight. Turn the crankshaft to gain access.

(c) Tighten the bolts evenly.

Torque: 280 kg-cm (20 ft-lb, 27 N·m)

12. **INSTALL SERVICE HOLE COVERS AT REAR OF ENGINE**

13. **JACK UP TRANSMISSION SLIGHTLY AND REMOVE WOODEN PIECE BETWEEN ENGINE OIL PAN AND MEMBER**

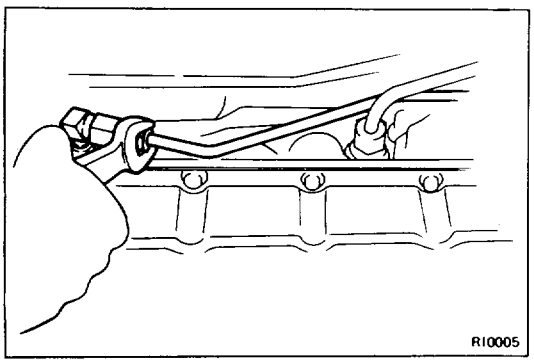
14. **INSTALL ENGINE REAR MOUNTING WITH BRACKET**

(a) Install the engine rear mounting with bracket to the member.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(b) Lower the transmission and connect the mounting to the extension housing.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

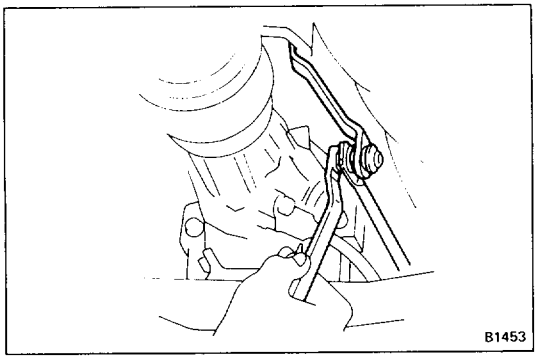


15. **INSTALL OIL FILLER TUBE AND CONNECT EXHAUST PIPE CLAMP**

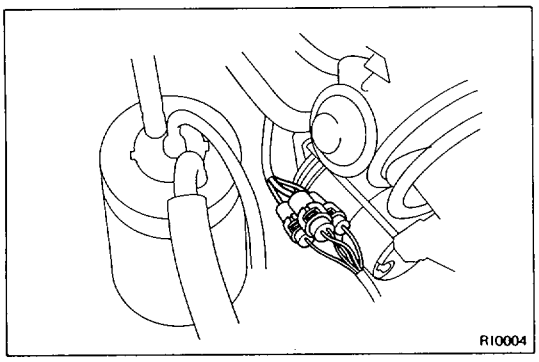
16. **INSTALL ENGINE UNDER COVER**

17. **CONNECT OIL COOLER LINES**

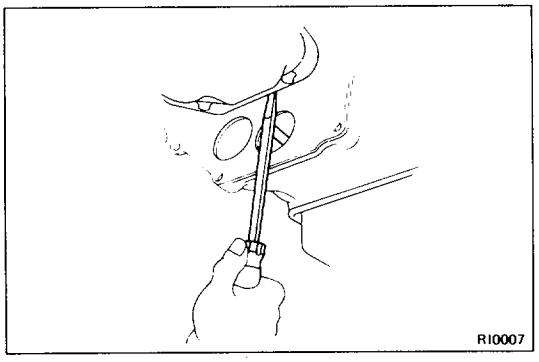
Torque: 350 kg-cm (25 ft-lb, 34 N·m)



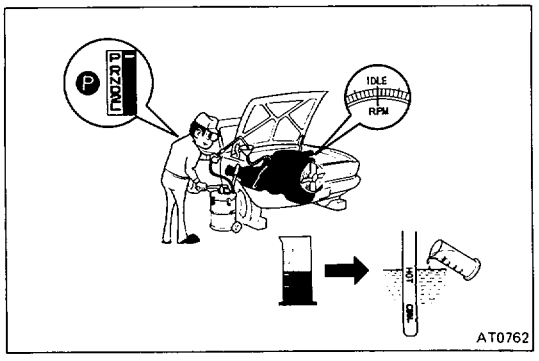
18. CONNECT MANUAL SHIFT LINKAGE
19. CONNECT SPEEDOMETER CABLE
20. INSTALL PROPELLER SHAFT
    Torque: 750 kg-cm (54 ft-lb, 74 N·m)



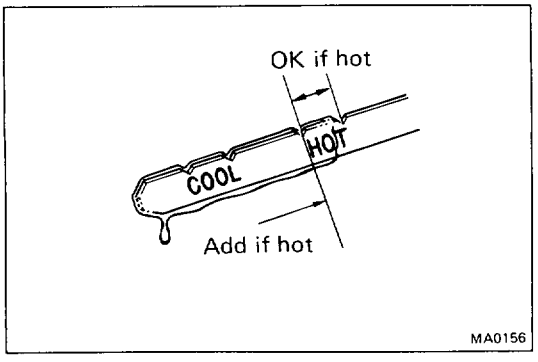
21. CONNECT WIRING CONNECTORS TO SOLENOID, NEUTRAL START AND BACK-UP LIGHT SWITCHES
    Connect the connectors located near the starter.



22. CONNECT TRANSMISSION THROTTLE CABLE (See page AT-21)
23. ADJUST THROTTLE CABLE (See page AT-4)
24. INSTALL AIR CLEANER ASSEMBLY
25. CONNECT BATTERY CABLE TO NEGATIVE TERMINAL



26. FILL TRANSMISSION WITH ATF
    Add about 4.0 liters (4.2 US qts, 3.5 Imp.qts) of ATF.
    Fluid type: ATF DEXRON® II
    Total Capacity: 6.5 liters (6.9 US qts, 5.7 Imp.qts)



27. CHECK ATF LEVEL (See page MA-19)
28. PERFORM ROAD TEST (See page AT-9)

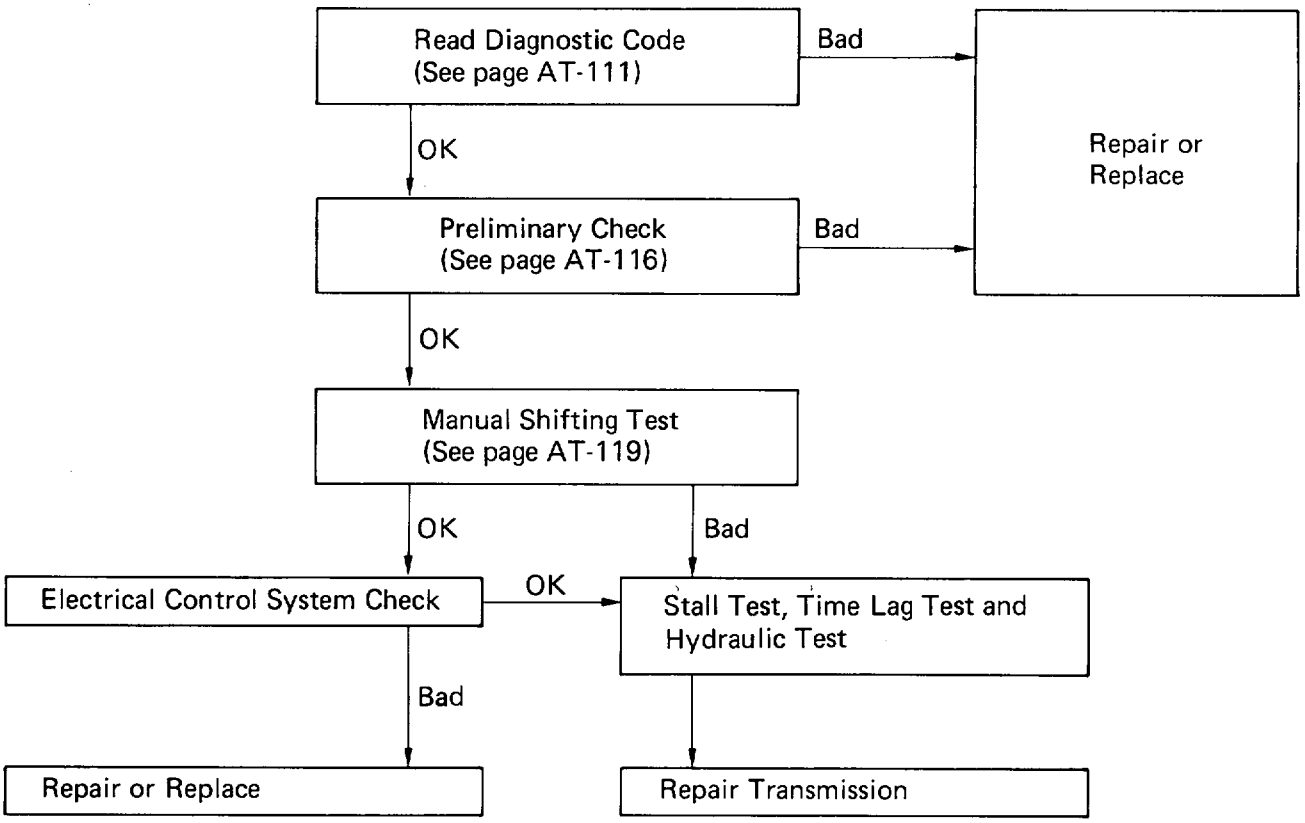
SYSTEM DESCRIPTION

Trouble occurring in the ECT can stem from one of three sources: the engine, the ECT electronic control unit or the transmission itself. Before troubleshooting, determine in which these three sources the problem lies, and begin troubleshooting with the simplest operation, gradually working up in order of difficulty.

TROUBLESHOOTING

Basic Troubleshooting

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow-chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



General Troubleshooting

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT-116
	Torque converter faulty	Replace torque converter	AT-144
	Transmission faulty	Disassemble and inspect transmission	AT-154
Vehicle does not move in any forward range or reverse	Manual linkage out of adjustment	Adjust linkage	AT-118
	Valve body or primary regulator faulty	Inspect valve body	AT-226
	Parking lock pawl faulty	Inspect parking lock pawl	AT-143
	Torque converter faulty	Replace torque converter	AT-144
	Converter drive plate broken	Replace drive plate	AT-144
	Oil pump intake screen blocked	Clean screen	AT-162
	Transmission faulty	Disassemble and inspect transmission	AT-154
Shift lever position incorrect	Manual linkage out of adjustment	Adjust linkage	AT-118
	Manual valve and lever faulty	Inspect valve body	AT-226, 249
	Transmission faulty	Disassemble and inspect transmission	AT-154
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT-117
	Valve body or primary regulator faulty	Inspect valve body	AT-226
	Accumulator pistons faulty	Inspect accumulator pistons	AT-300
	Transmission faulty	Disassemble and inspect transmission	AT-154
Delayed 1-2, 2-3 or 3-O/D up-shift, or down-shifts from O/D-3 or 3-2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT-120
	Valve body faulty	Inspect valve body	AT-226
	Solenoid valve faulty	Inspect solenoid valve	AT-130
Slips on 1-2, 2-3 or 3-O/D up-shift, or slips or shudders on acceleration	Manual linkage out of adjustment	Adjust linkage	AT-118
	Throttle cable out of adjustment	Adjust throttle cable	AT-117
	Valve body faulty	Inspect valve body	AT-226
	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Transmission faulty	Disassemble and inspect transmission	AT-154
Drag, binding or tie-up on 1-2, 2-3 or 3-O/D up-shift	Manual linkage out of adjustment	Adjust linkage	AT-118
	Valve body faulty	Inspect valve body	AT-226
	Transmission faulty	Disassemble and inspect transmission	AT-154

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
No lock-up in 2nd, 3rd or O/D	Electronic control faulty	Inspect electronic control	AT-120
	Valve body faulty	Inspect valve body	AT-226
	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Transmission faulty	Disassemble and inspect transmission	AT-154
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable	AT-117
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT-301
	Accumulator pistons faulty	Inspect accumulator pistons	AT-300
	Valve body faulty	Inspect valve body	AT-226
	Transmission faulty	Disassemble and inspect transmission	AT-154
No down-shift when coasting	Valve body faulty	Inspect valve body	AT-226
	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Electronic control faulty	Inspect electronic control	AT-120
Down-shift occurs too quickly or too late while coasting	Throttle cable faulty	Inspect throttle cable	AT-117
	Valve body faulty	Inspect valve body	AT-226
	Transmission faulty	Disassemble and inspect transmission	AT-154
	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Electronic control faulty	Inspect electronic control	AT-120
No O/D-3, 3-2 or 2-1 kick-down	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Electronic control faulty	Inspect electronic control	AT-120
	Valve body faulty	Inspect valve body	AT-226
No engine braking in 2 or L range	Solenoid valve faulty	Inspect solenoid valve	AT-130
	Electronic control faulty	Inspect electronic control	AT-120
	Valve body faulty	Inspect valve body	AT-226
	Transmission faulty	Disassemble and inspect transmission	AT-154
Vehicle does not hold in P	Manual linkage out of adjustment	Adjust linkage	AT-118
	Parking lock pawl cam and spring faulty	Inspect cam and spring	AT-143
No H2-H4, H4-L4, L4-H4 or H4-H2 change gear position of transfer	Transfer linkage out of adjustment	Adjust linkage	AT-118
	Electronic control faulty	Inspect electronic control	AT-120
	Transfer valve body faulty	Inspect valve body	AT-249
	Transfer faulty	Disassemble and inspect transfer	AT-154

Operating Mechanism for Each Gear

TRANSMISSION

1. CLUTCH, BRAKE AND ONE-WAY CLUTCH

○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3		F_0	F_1	F_2
								I.P.	O.P.			
P	Parking	○										
R	Reverse	○		○				○	○	○		
N	Neutral	○										
D	1st	○	○							○		○
	2nd	○	○				○			○	○	
	3rd	○	○	○			○			○		
	O/D		○	○	○		○					
2	1st	○	○							○		○
	2nd	○	○			○	○			○	○	
	3rd	○	○	○			○			○		
L	1st	○	○					○	○	○		○
	*2nd	○	○			○	○			○	○	

* Down-shift only in the L range and 2nd gear – no up-shift.

I.P. ..... Inner Piston
O.P. .... Outer Piston

2. SOLENOID

Possible gear positions in accordance with solenoid operating conditions.

Range	NORMAL			NO.1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear	Solenoid Valve		Gear	Solenoid Valve		Gear	Solenoid Valve		Gear
	No.1	No.2	Position	No.1	No.2	Position	No.1	No.2	Position	No.1	No.2	Position
D range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	O/D (1st)	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	X	X	O/D
2 range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	3rd (1st)	X	X	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	X	X	3rd
L range	ON	OFF	1st	X	OFF	1st	ON	X	1st	X	X	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	X	X	1st

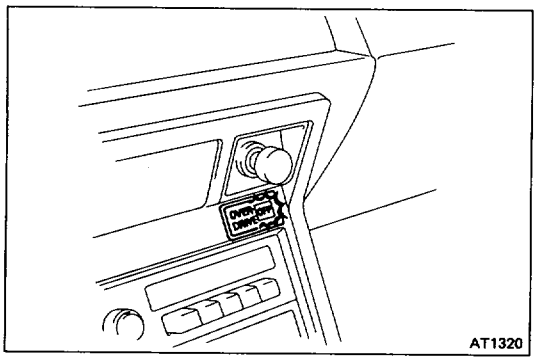
( ): No fail-safe function X : Malfunctions

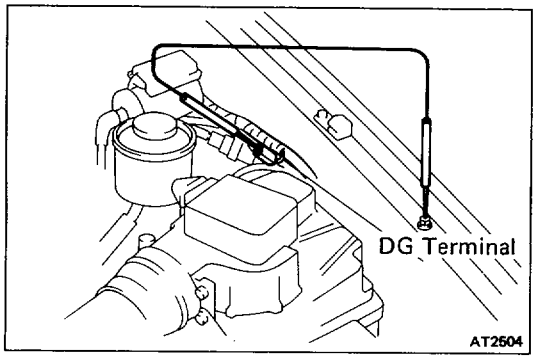
TRANSFER

CLUTCH, BRAKE AND SOLENOID

Transfer gear position	No. 4 Solenoid	C_3	C_4	B_4
H2	OFF	○		
H4	OFF	○	○	
L4	ON		○	○

○ ... Operating





Diagnosis System

DESCRIPTION

1. A self-diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.

   NOTE: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

   (a) If a malfunction occurs within the speed sensors (No. 1 or 2) or solenoids (No. 1, 2 or 4), the overdrive OFF light will blink to warn the driver.

   However, there will be no warning of a malfunction with lock-up solenoid.

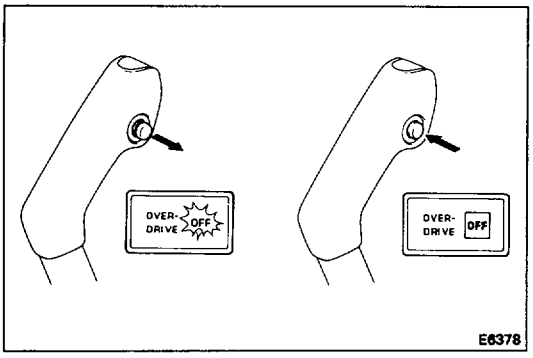
   (b) The diagnostic code can be read by the number of blinks of the overdrive OFF indicator light when terminal DG and body ground are short-circuited. (See page AT-111)

   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal DG.

   (d) The signals to each gear can be checked by measuring the voltage at terminal DG while driving.

2. The diagnostic code (trouble code) is retained in memory by the CPU (of ECT ECU) and due to back-up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the fuse STOP (15A) or disconnect the ECT ECU connector to cancel out the diagnostic (trouble) code. (See page AT-112)

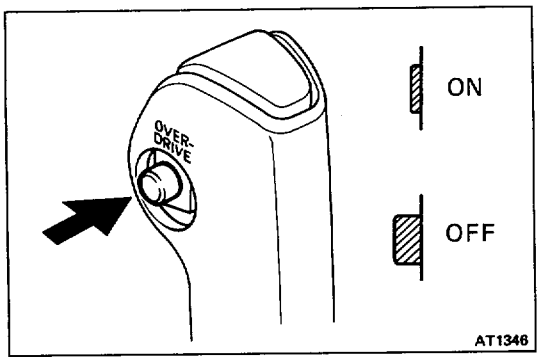
   NOTE:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/V.



CHECK "O/D OFF" INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The "O/D OFF" light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the "O/D OFF" light should go out.

If the "O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.

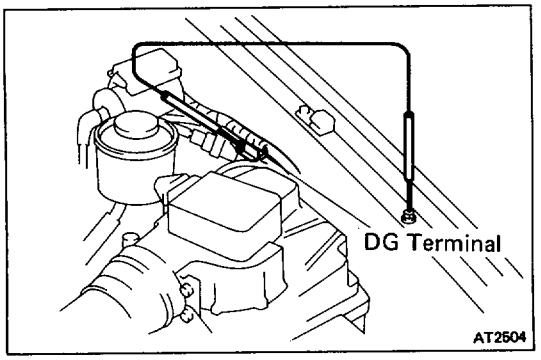


READ DIAGNOSTIC CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

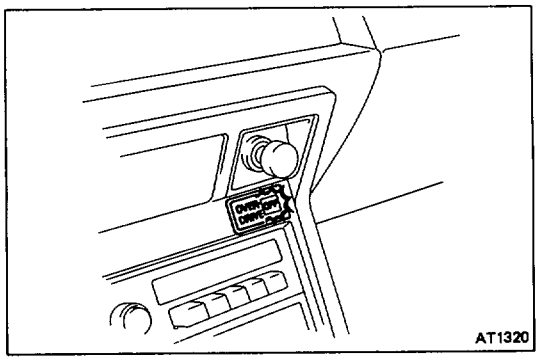
Do not start the engine.

NOTE: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



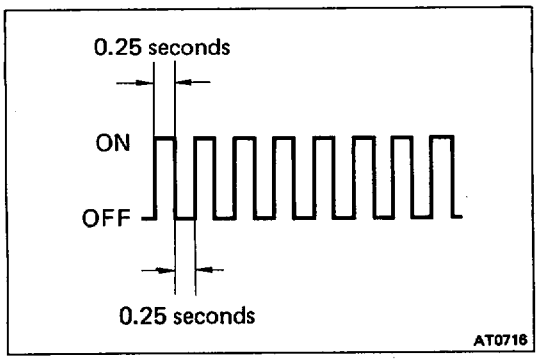
2. SHORT DG TERMINAL CIRCUIT

Using a service wire, short the DG terminal and body ground.



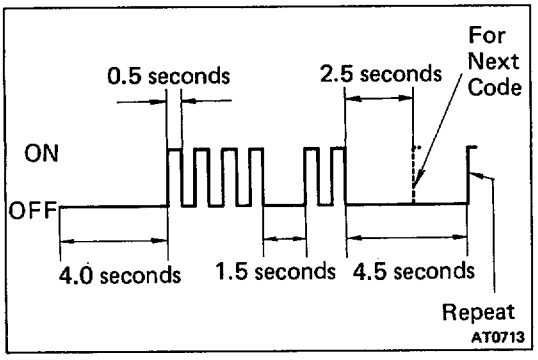
3. READ DIAGNOSTIC CODE

Read the diagnostic code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Code Indication)

- If the system is operating normally, the light will blink once every 0.25 seconds.

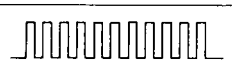
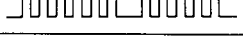


- In the event of a malfunction, the light will blink once every 0.5 seconds. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

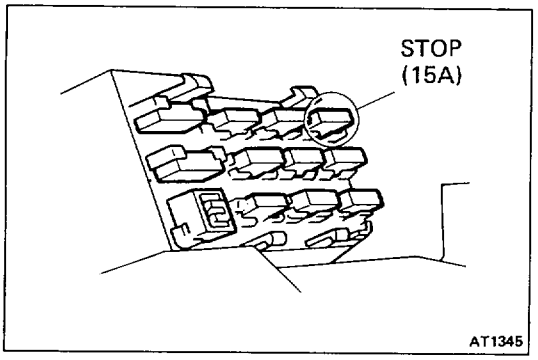
NOTE: In the event of several trouble codes occuring simultaneously, indication will begin from the smaller value and continue to the larger.

4. REMOVE SERVICE WIRE

DIAGNOSTIC CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 speed sensor (in combination meter) – severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock-up solenoid or short circuit – severed wire harness or short circuit
65		Severed No. 4 solenoid or short circuit – severed wire harness or short circuit

NOTE: If codes 62, 63, 64 or 65 appear, there is an electrical malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.



CANCEL OUT DIAGNOSTIC CODE

1. After repair of the trouble area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the fuse STOP (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

   NOTE:
   - Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems (TCCS diagnosis memory, etc.) will be also canceled out.
   - The diagnostic code can be also canceled out by disconnecting the ECT ECU connector.
   - If the diagnostic code is not canceled out, it will be retained by the ECT ECU and appear along with a new code in event of future trouble.

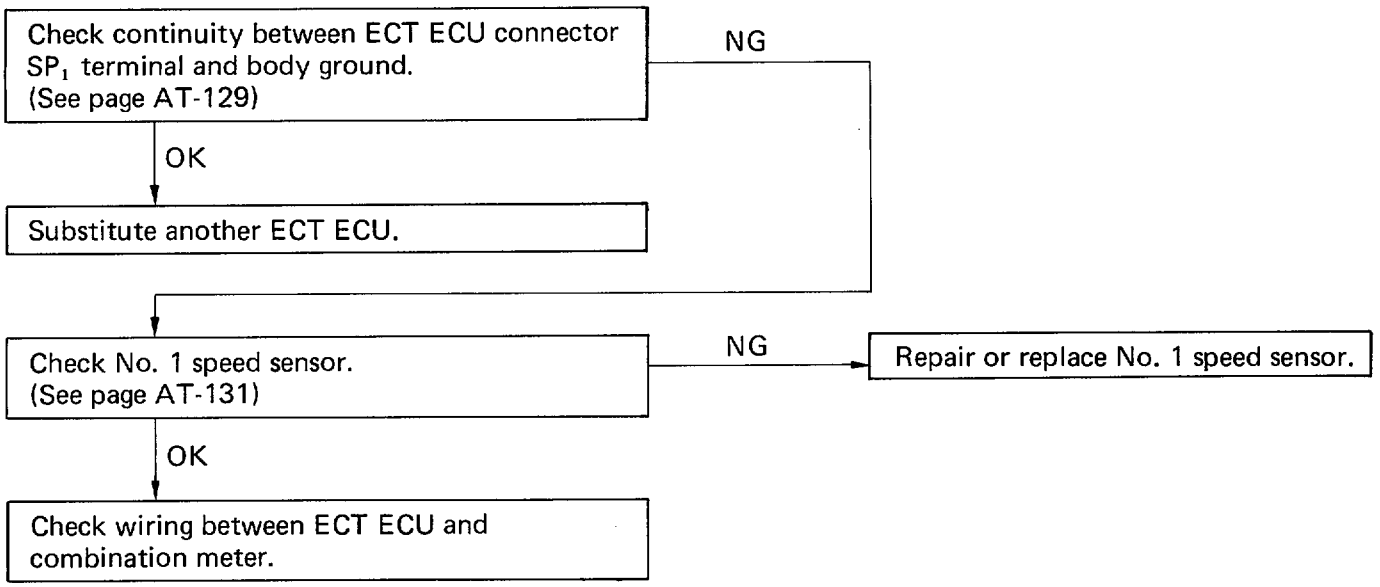
2. After cancellation, perform a road test to confirm that a "normal code" is now read on the O/D OFF light.

TROUBLESHOOTING FLOW-CHART

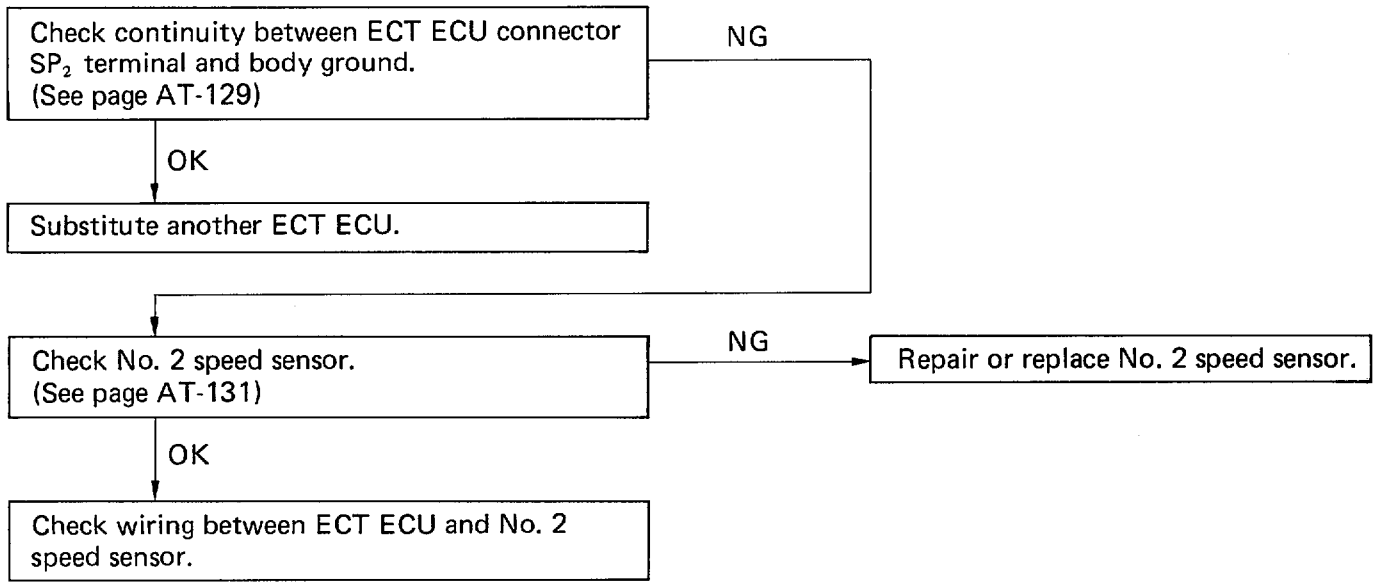
NOTE:

- If diagnostic code Nos. 42, 61, 62, 63 or 65 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 speed sensors, no diagnostic code will appear and the fail-safe system will not function. However, when driving in the D range, the transmission will not up-shift from first gear, regardless of the vehicle speed.

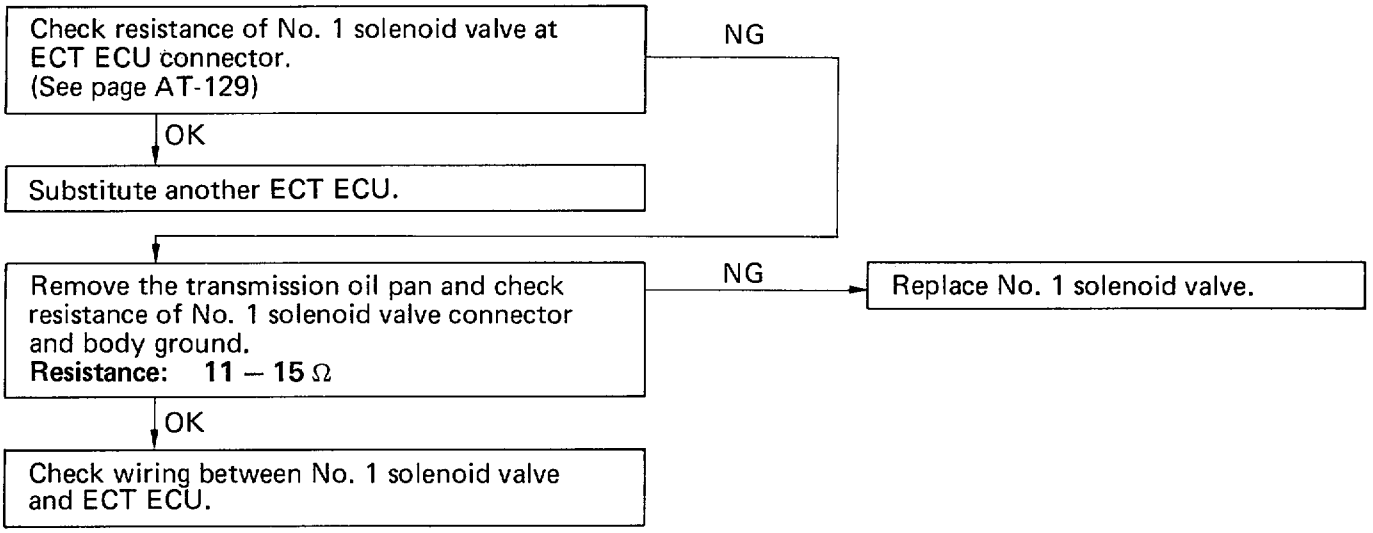
Diagnostic code 42 (No. 1 speed sensor circuitry)



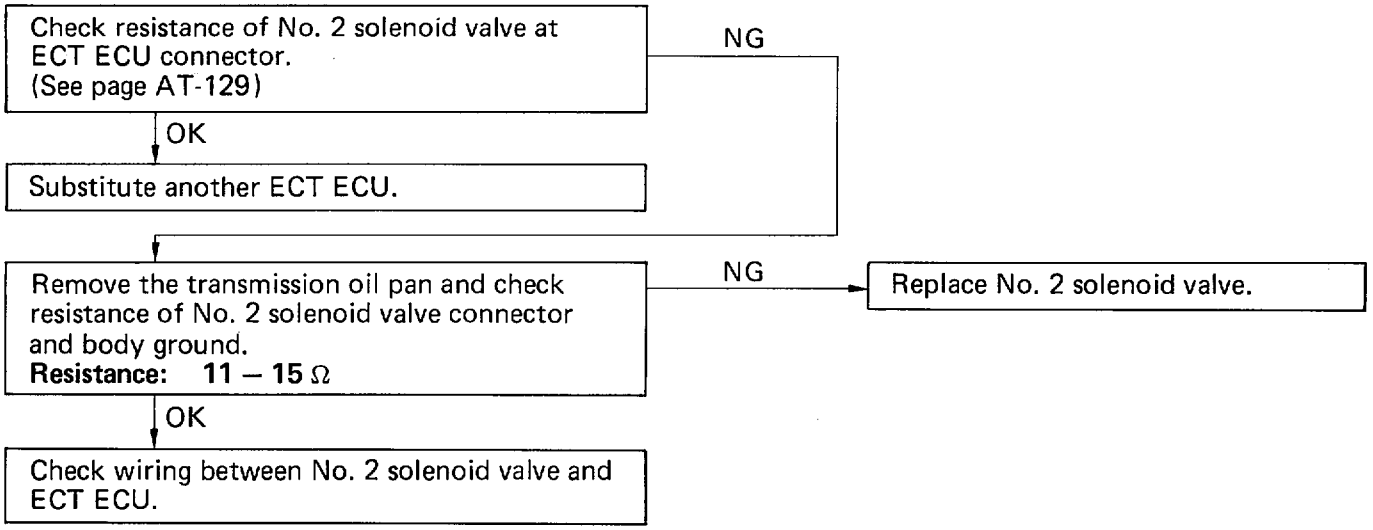
Diagnostic code 61 (No. 2 speed sensor circuitry)



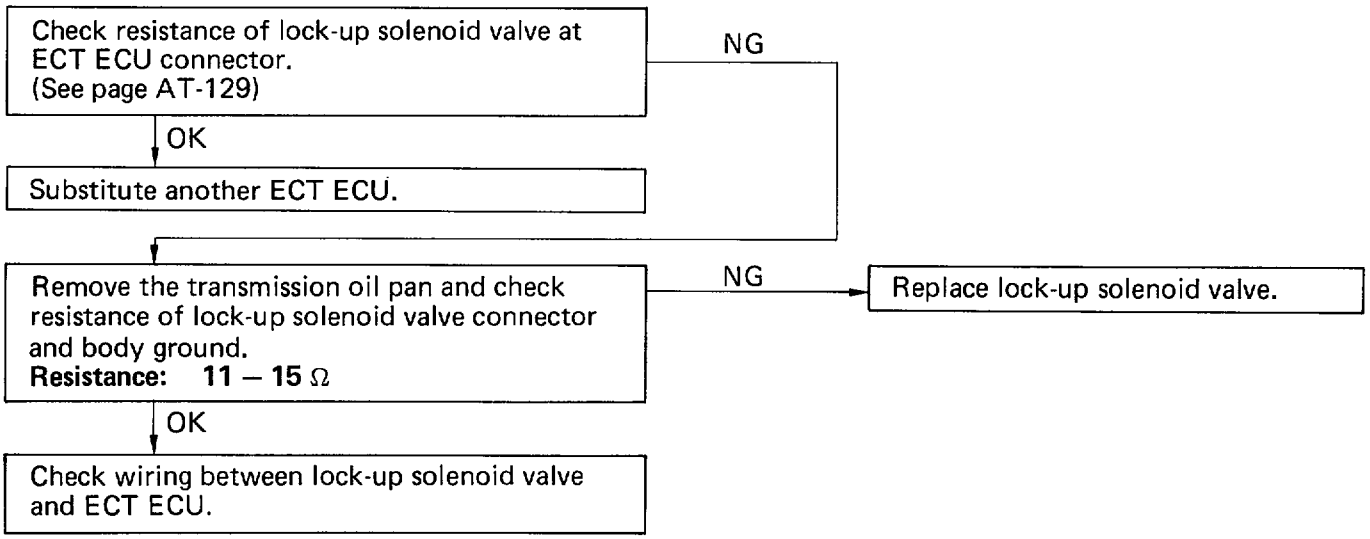
Diagnostic code 62 (No. 1 solenoid valve circuitry)



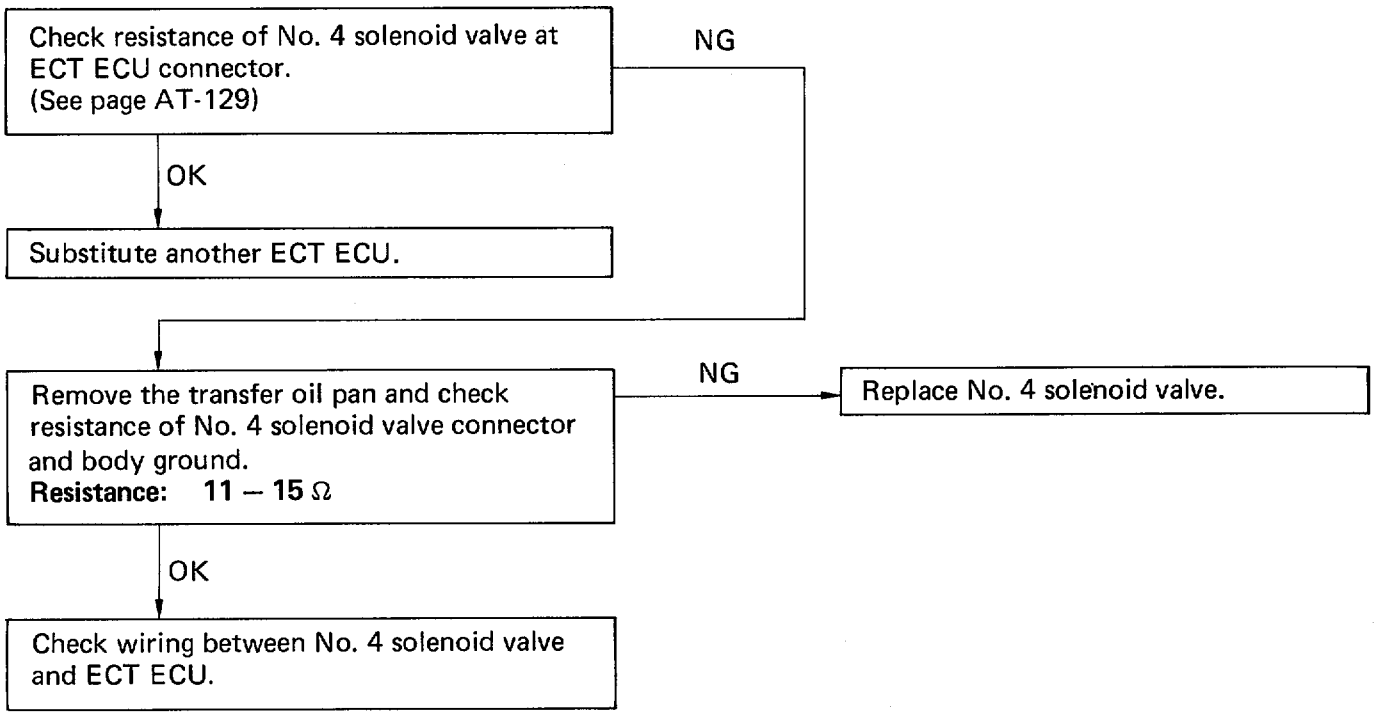
Diagnostic code 63 (No. 2 solenoid valve circuitry)



Diagnostic code 64 (Lock-up solenoid valve circuitry)



Diagnostic code 65 (No. 4 solenoid valve circuitry)



Preliminary Check

1. CHECK FLUID LEVEL

(Transmission and transfer case)

NOTE:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature.
  (Fluid temperature: 70 – 80°C or 158 – 176°F)
- Only use the COOL range on the dipstick as a rough referance when the fluid is replaced or the engine does not run.

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

(c) Pull out the transmission dipstick and wipe it clean.

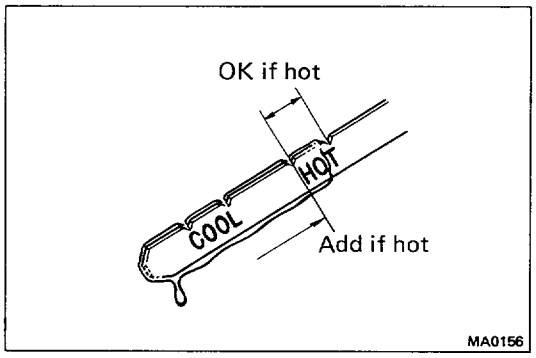
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON® II

CAUTION: Do not overfill.

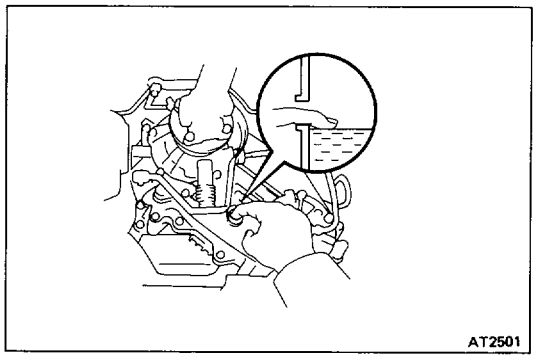


(Transfer chain case)

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 10 mm (0.39 in.) of the bottom edge of the hole.

If the level is low, add fluid until it begins to run out of the filler hole.

Fluid type: ATF DEXRON® II



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

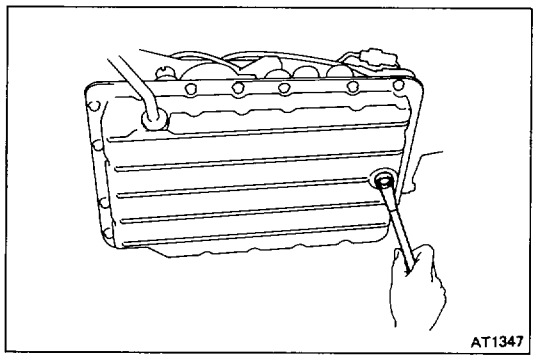
(Transmission and transfer case)

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type: ATF DEXRON® II



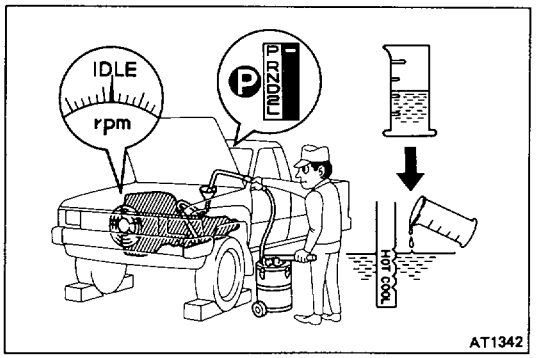
Capacity: liter (US qts, Imp. qts)

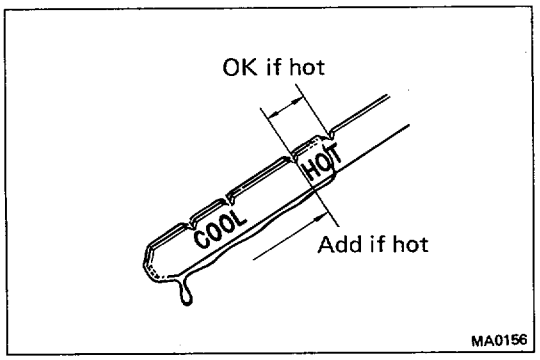
	Transmission	Transfer
Drain and refill	4.5 (4.8, 4.0)	
	*3.8 (4.0, 3.3)	*1.2 (1.3, 1.1)
Total	10.3 (10.9, 9.1)	

*: Reference capacity when replacing transmission or transfer valve body.

(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

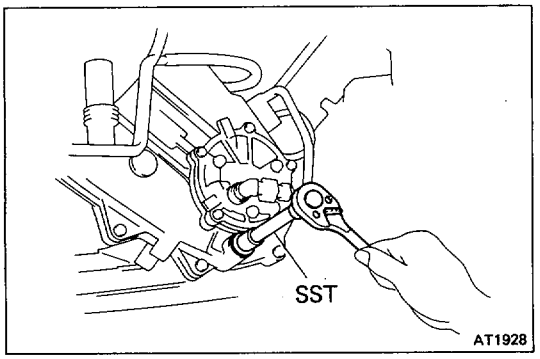
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.





(f) Check the fluid level with the normal operating temperature (70 – 80°C or 158 – 176°F) and add as necessary.

CAUTION: Do not overfill.



(Transfer chain case)

(a) Remove the drain plug with SST and drain the fluid.

SST 09043-38100

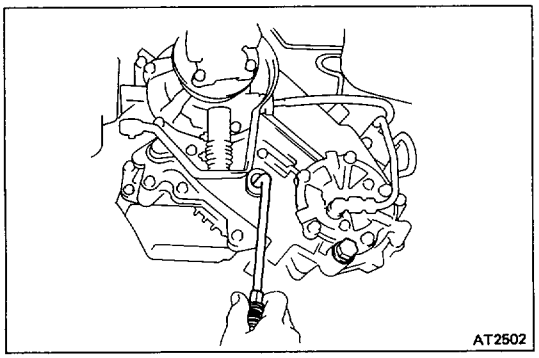
(b) Reinstall the drain plug securely with SST.

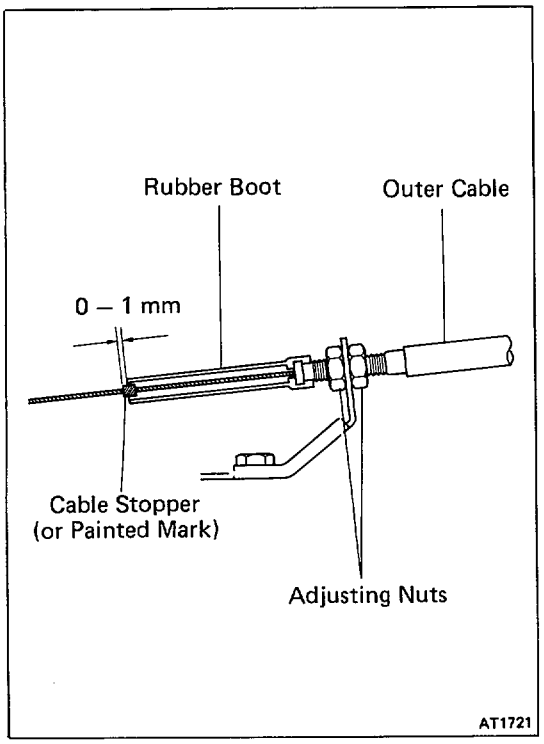
(c) With the engine OFF, add new fluid through the filler hole.

Fluid type: ATF DEXRON® II

Capacity:
Total 1.1 liters (1.2 US qts, 1.0 Imp. qts)
Drain and refill
0.8 liters (0.8 US qts, 0.7 Imp. qts)

(d) Check the fluid level.





3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

NOTE: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.

4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the shift lever.

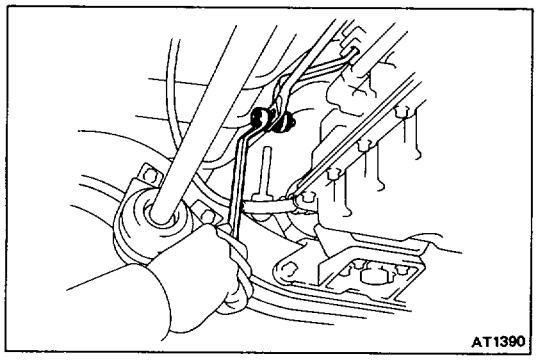
(b) Push the control shaft lever fully rearward.

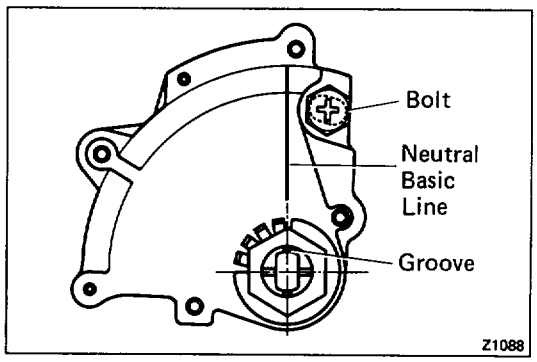
(c) Return the control shaft lever two notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.





5. INSPECT NEUTRAL START SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.
If not as stated above, carry out the following adjustment procedures.

(a) Loosen the neutral start switch bolt and set the shift lever to the N range.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

6. INSPECT TRANSFER SHIFT LEVER POSITION

When shifting the shift lever from H2 position to H4 and L4 positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

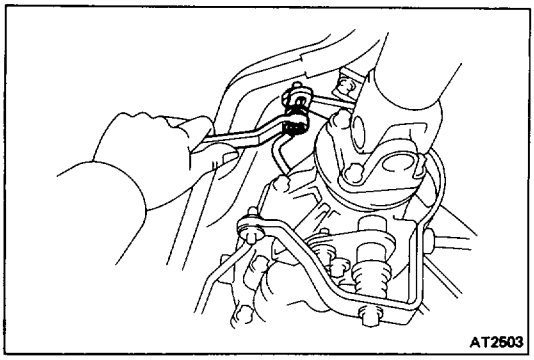
(a) Loosen the nut on the cross shaft.

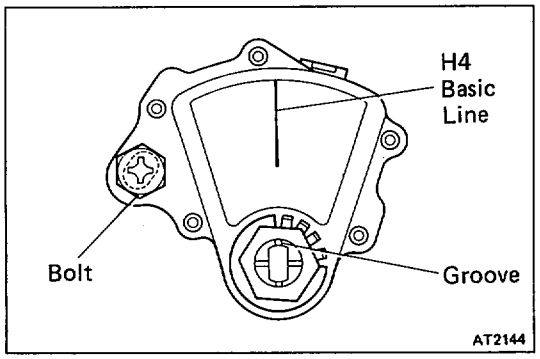
(b) Push the control shaft lever fully forward.

(c) Return the control shaft lever one notch to H4 position.

(d) Set the shift lever H4 position.

(e) While holding the shift lever lightly toward the L4 position side, tighten the nut.





7. INSPECT TRANSFER POSITION SWITCH

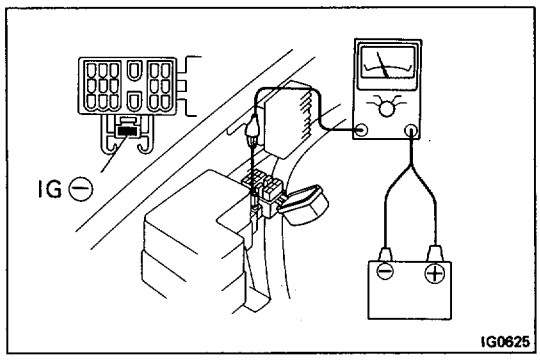
If necessary, carry out the following adjustment procedures.

(a) Loosen the transfer position switch bolt and set the transfer shift lever to the H4 position.

(b) Align the groove and H4 basic line.

(c) Hold in position and tighten the bolt.

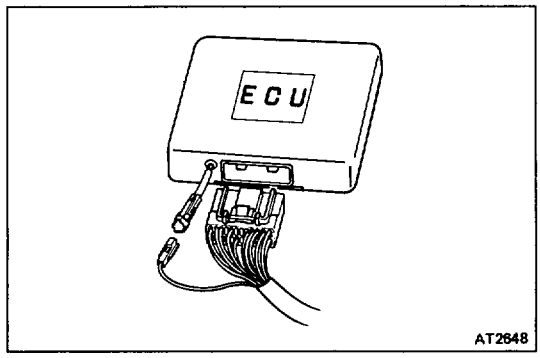
Torque: 130 kg-cm (9 ft-lb, 13 N·m)



8. INSPECT IDLE SPEED (N RANGE)

Connect a tachometer test probe to the check connector terminal IG ⊖, inspect the idle speed.

Idle speed: 750 rpm



Manual Shifting Test

NOTE: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT ECT ECU CONNECTOR

(a) Remove the center console box.

(b) With the engine OFF, disconnect the ECT ECU connector.

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Transmission						*Transfer		
Shift position	D range	2 range	L range	R range	P range	H2 position	H4 position	L4 position
Gear position	O/D	3rd	1st	Reverse	Pawl Lock	High Gear 2WD	High Gear 4WD	Low Gear 4WD

*: Reference

NOTE: If the L, 2 and D range gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D ranges. Check that the gear change corresponds to the shift position.

If any abnormality is found in the above test, the problem lies in transmission itself.

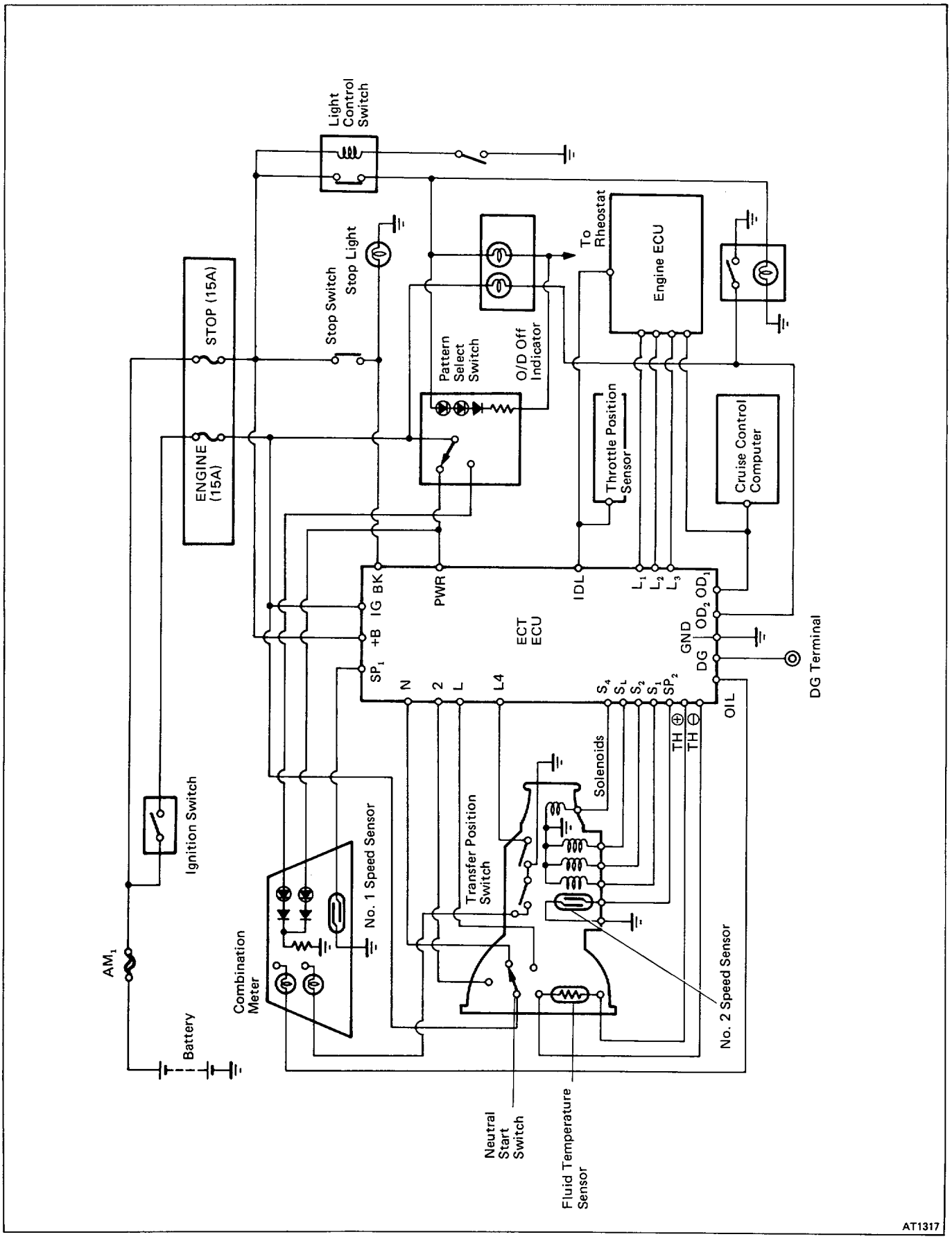
3. CONNECT ECT ECU CONNECTOR

(a) Connect the ECT ECU connector.

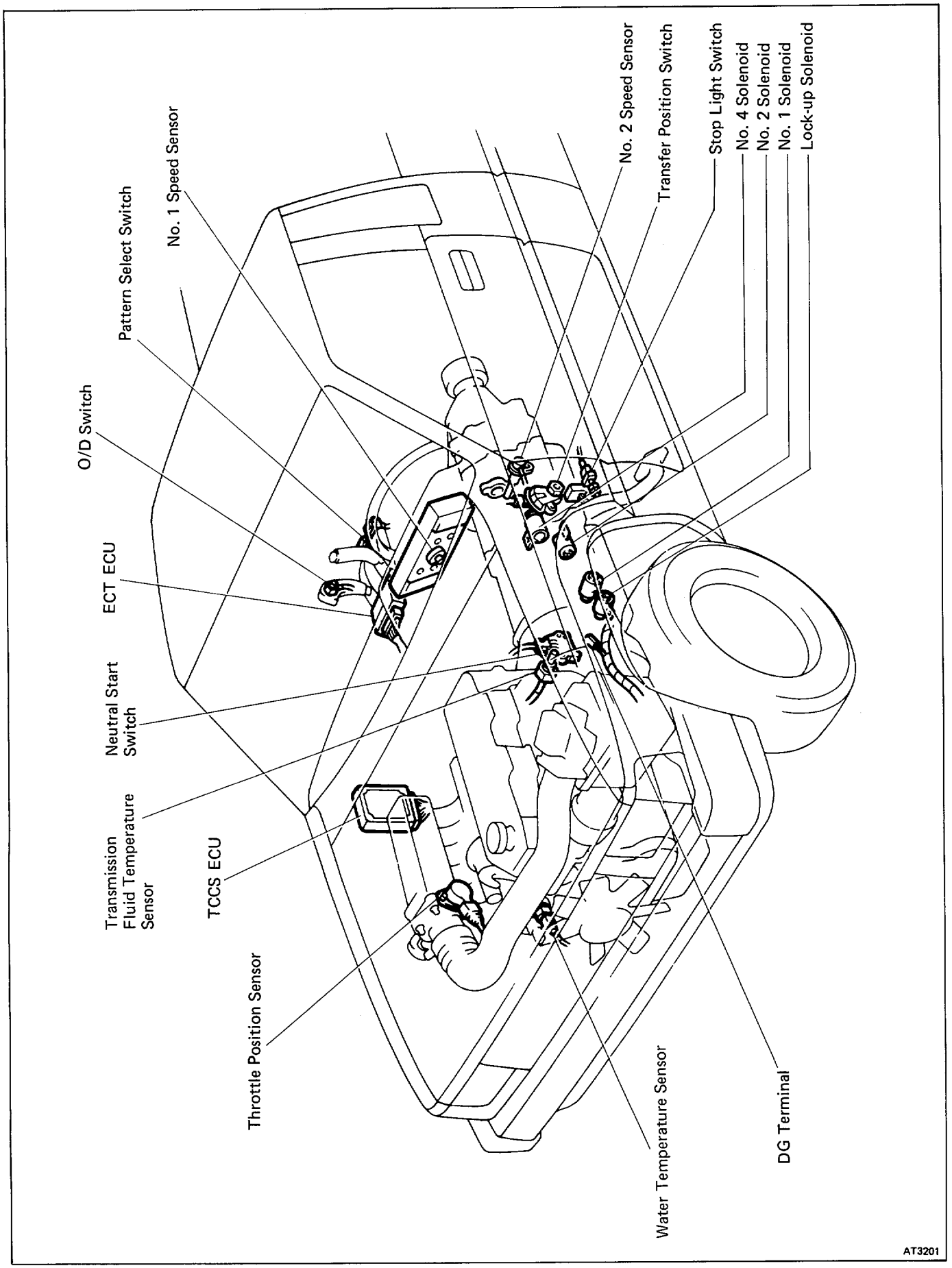
(b) Install the center console box.

Electronic Control System

ELECTRONIC CONTROL CIRCUIT

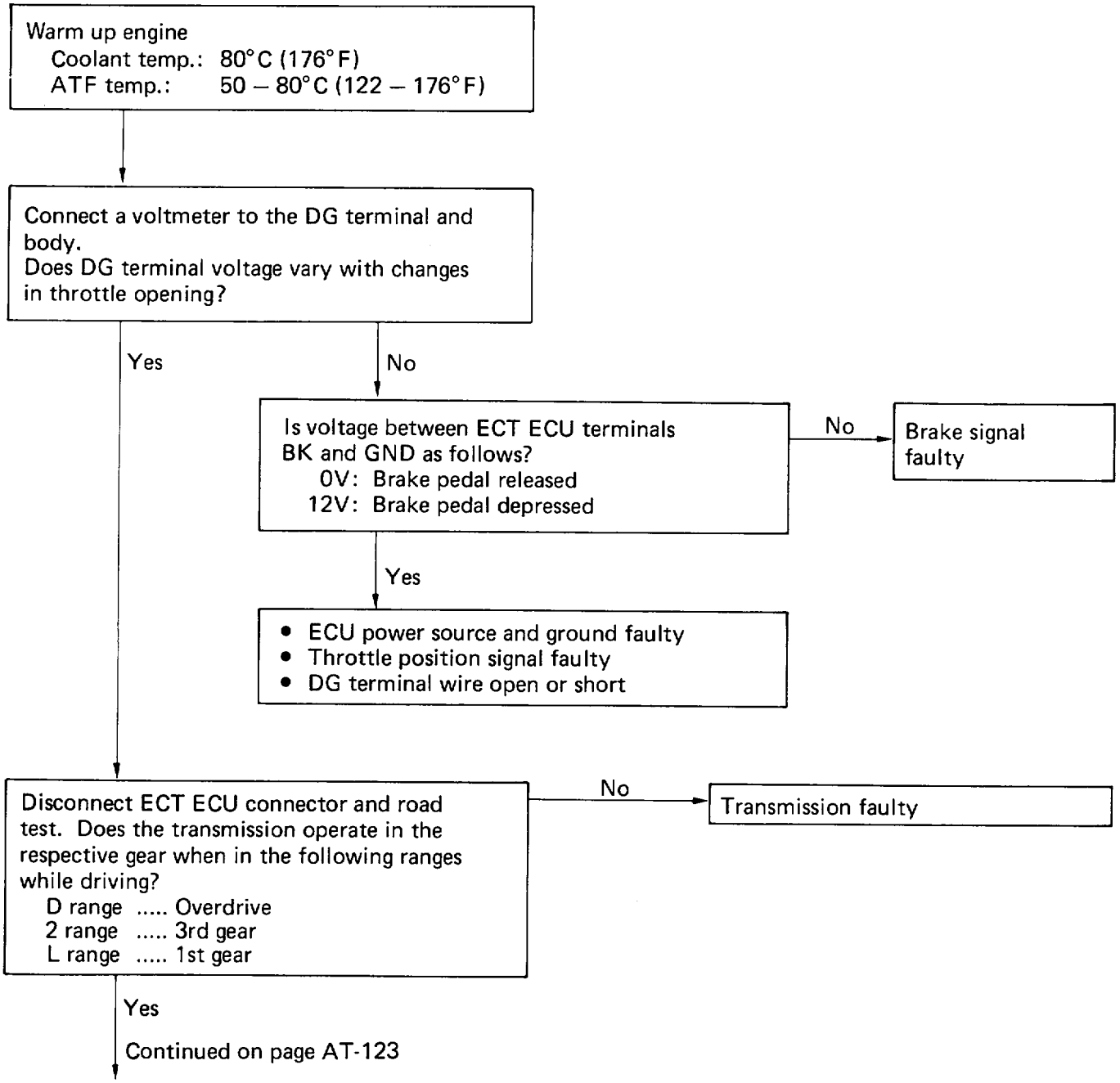


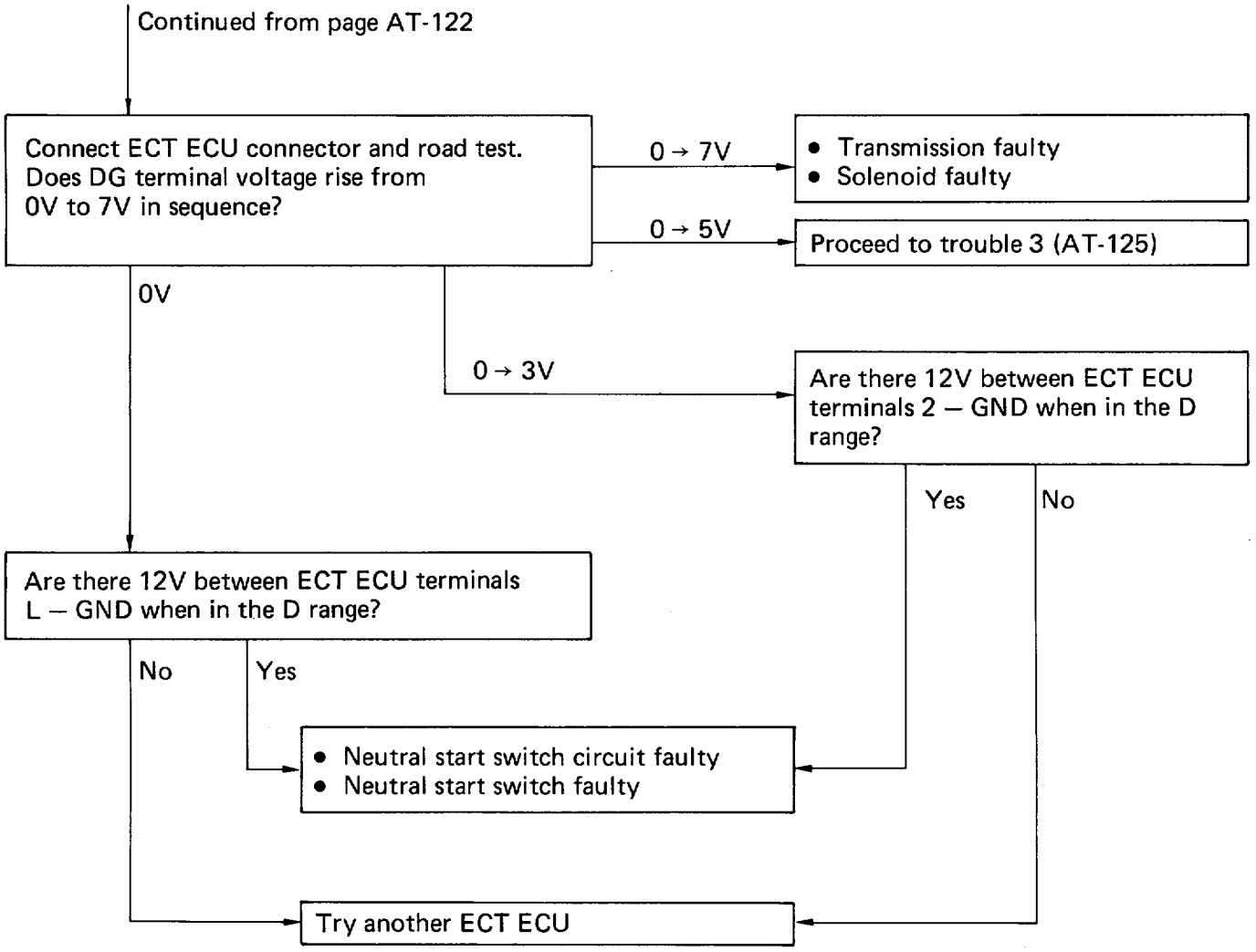
ELECTRONIC CONTROL COMPONENTS



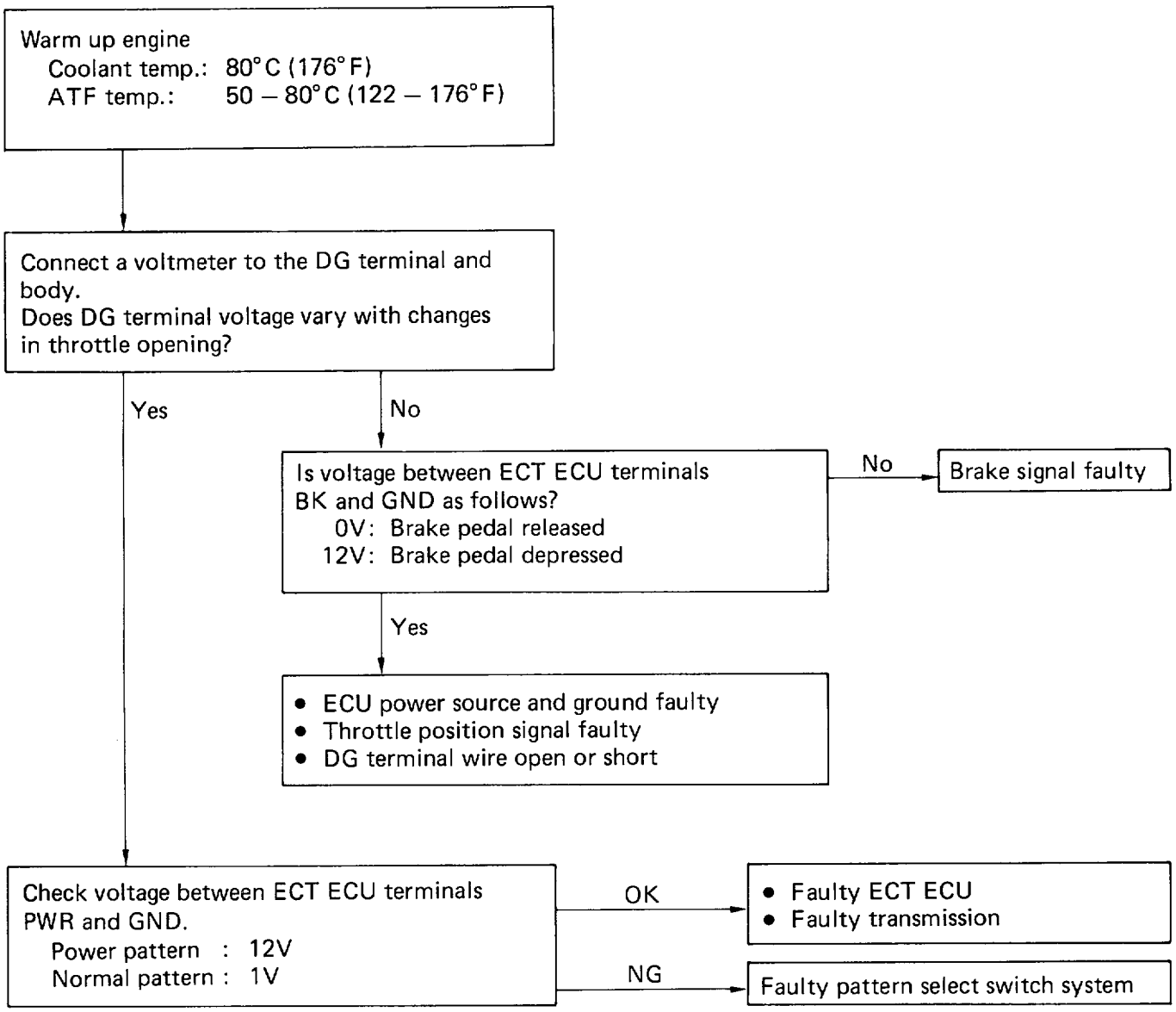
TROUBLESHOOTING FLOW-CHART

Trouble No. 1 No Shifting

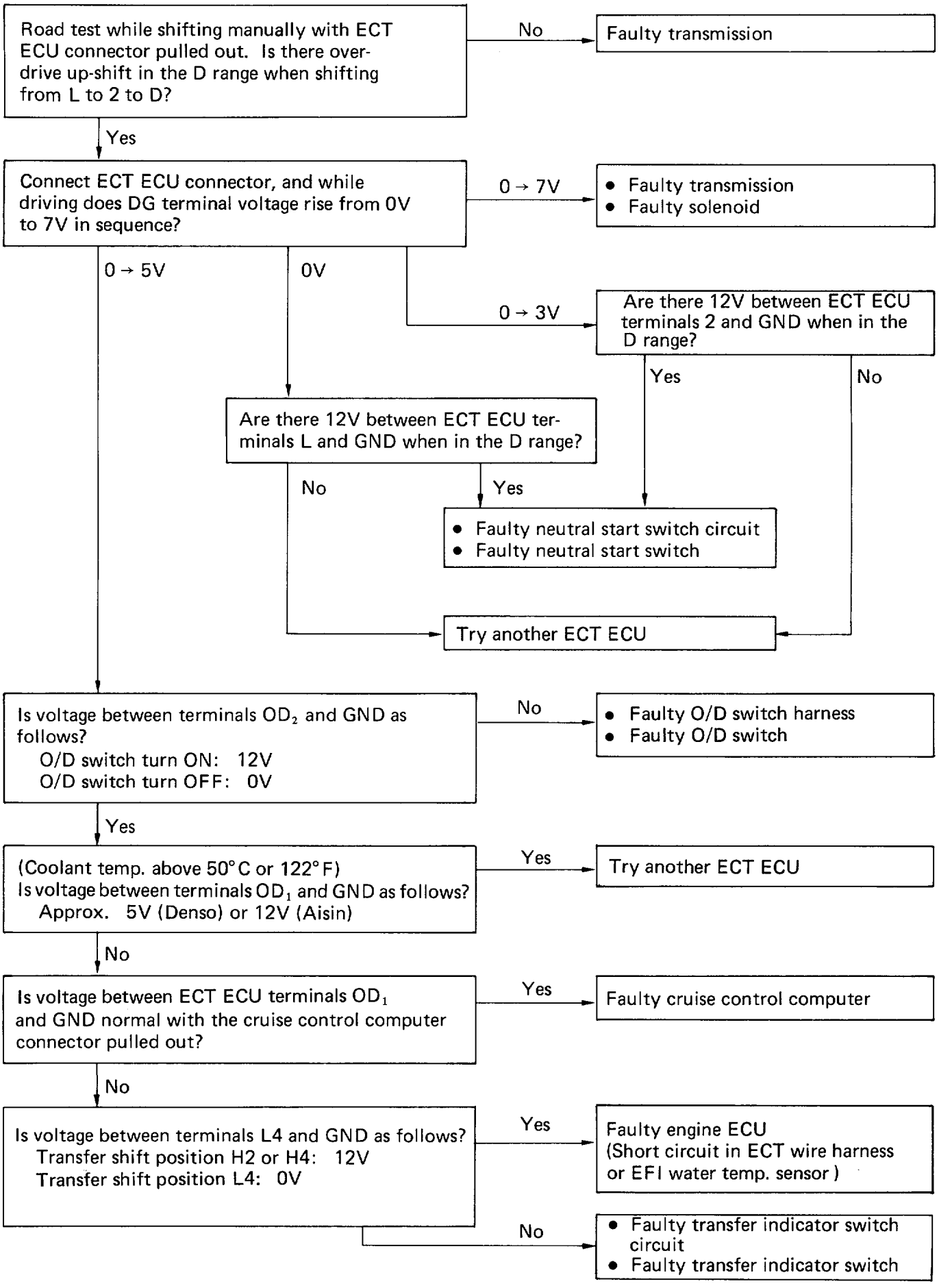



Continued from page AT-122
Connect ECT ECU connector and road test.
Does DG terminal voltage rise from
0V to 7V in sequence?
0 → 7V
• Transmission faulty
• Solenoid faulty
0 → 5V
Proceed to trouble 3 (AT-125)
0V
0 → 3V
Are there 12V between ECT ECU terminals 2 – GND when in the D range?
Yes
No
Are there 12V between ECT ECU terminals L – GND when in the D range?
No
Yes
• Neutral start switch circuit faulty
• Neutral start switch faulty
Try another ECT ECU

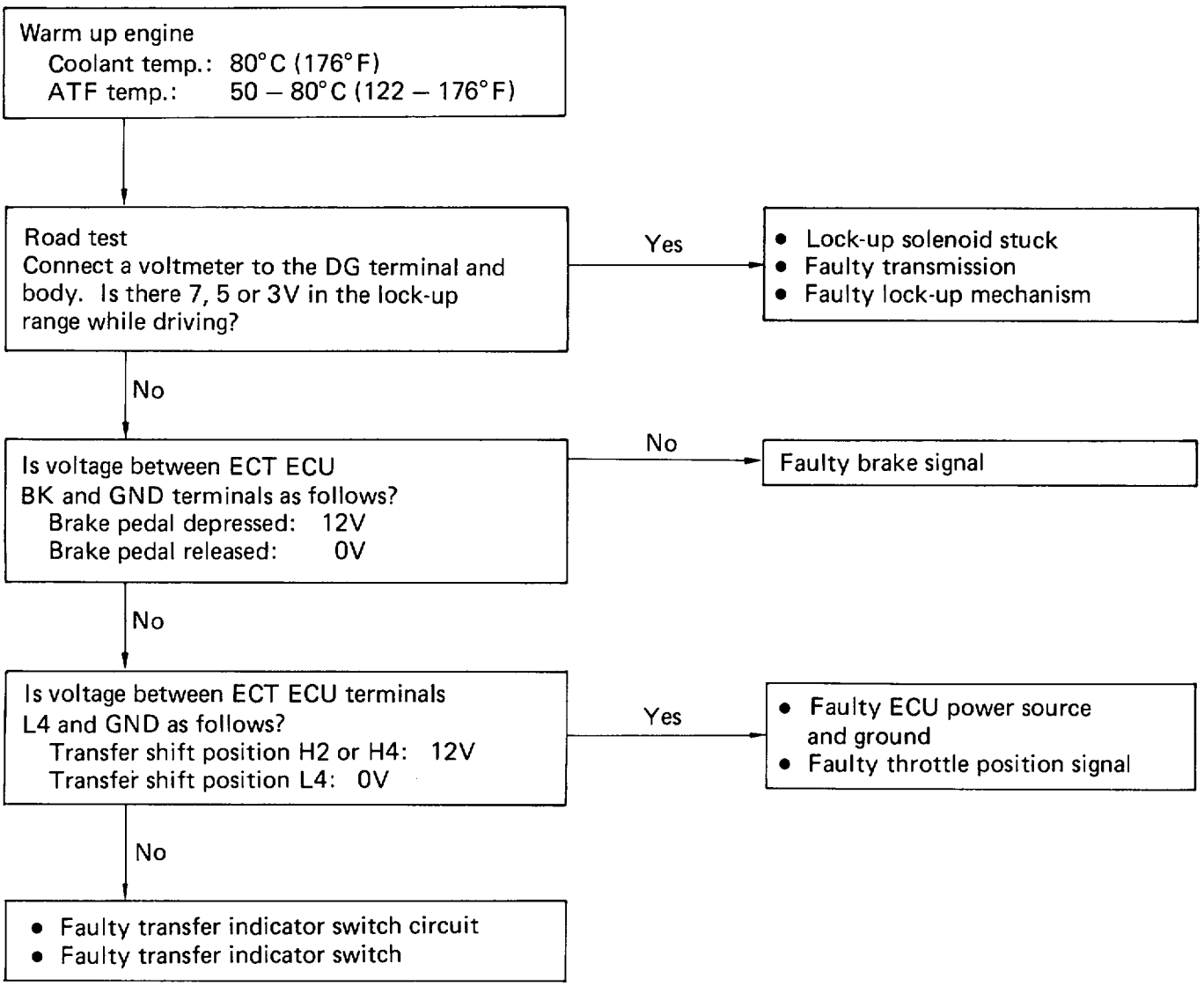
Trouble No. 2 Shift point too high or too low



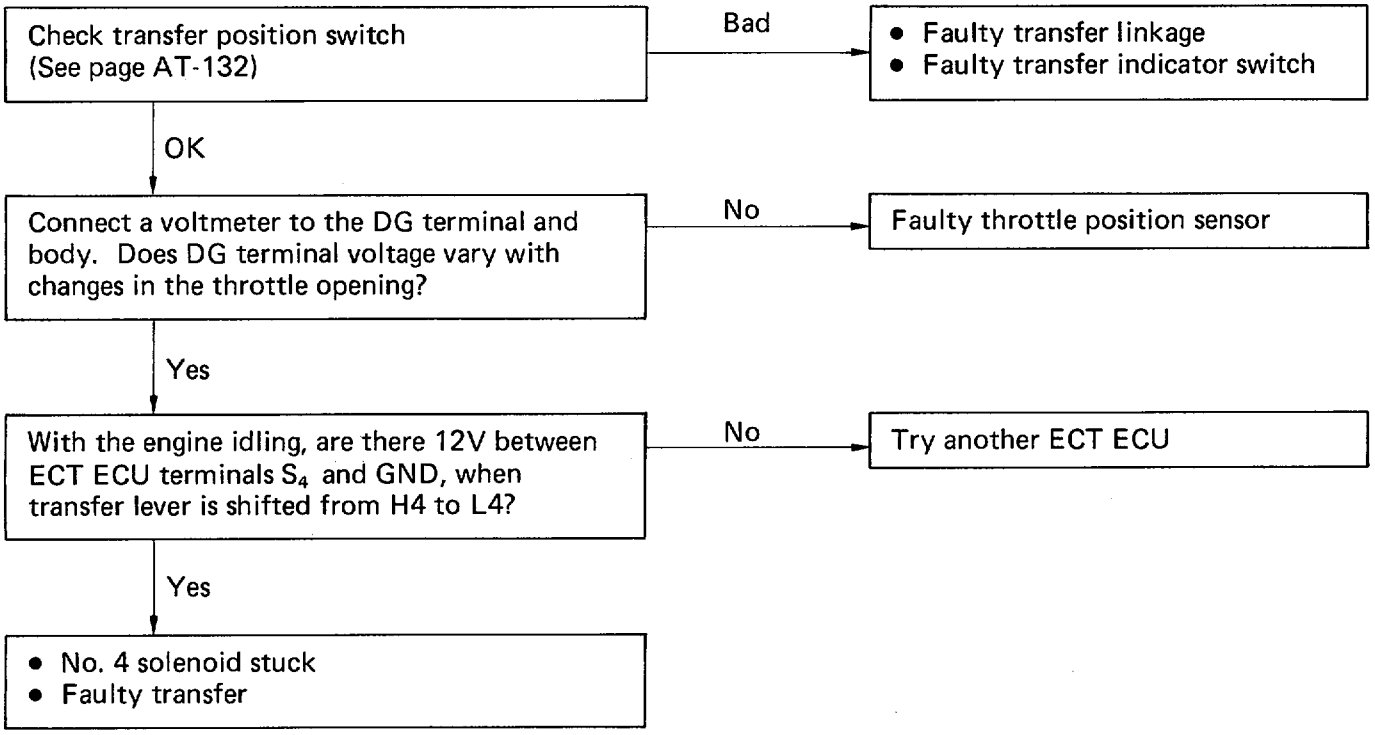
Trouble No. 3 **No up-shift to overdrive (After warm-up)**

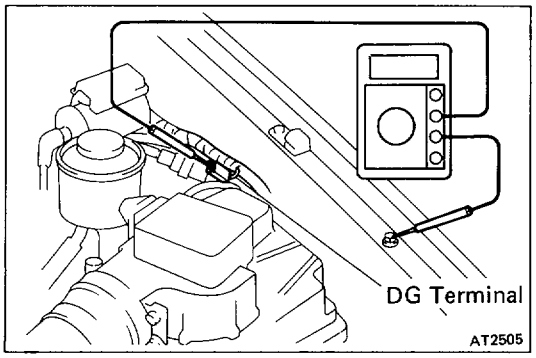


Trouble No. 4 No lock-up (After warm-up)



Trouble No. 5 Transfer gear no change L4 from H4



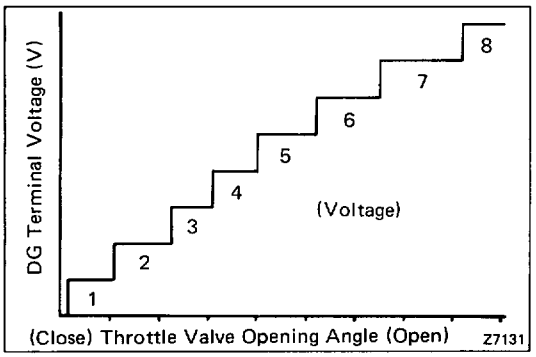


INSPECTION OF DG TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to the DG terminal and body ground.



(c) While slowly depressing the accelerator pedal, check that DG terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

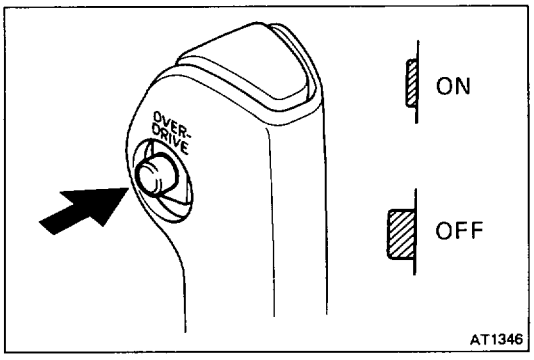
2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal unitl the DG terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the DG terminal.

Brake pedal depressed 0V
Brake pedal released 8V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



DG Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

3. INSPECT EACH UP-SHIFT POSITION

(a) Warm up the engine.

Coolant temperature: 80°C (176°F)

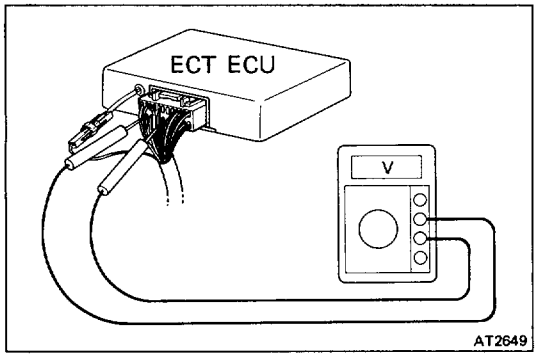
(b) Turn the O/D switch to "ON".

(c) Place the pattern select switch in "Normal" and the shift lever into the D range.

(d) During a road test (above 10 km/h or 6 mph) check that voltage at the DG terminal is as indicated below for each up-shift position.

If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.
The chart on the left shows the voltmeter reading and corresponding gears.

NOTE: Deptermine the gear position by a light shock or change in engine rpm when shifting. The lock-up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2V – 4V – 6V – 7V.



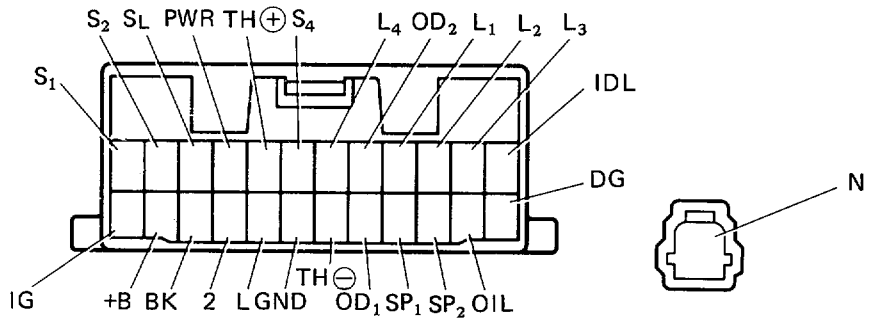
INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECT ECU CONNECTOR

(a) Remove the center console box.

(b) Turn on the ignition switch.

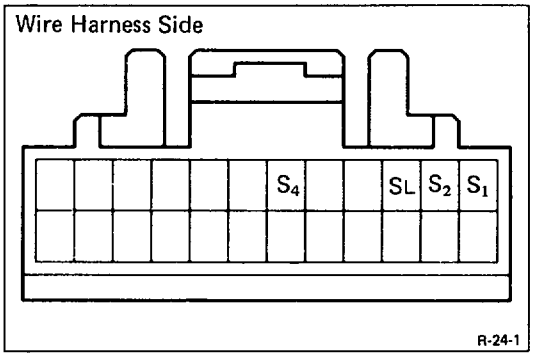
(c) Measure the voltage at each terminal.



R-24-2 GA-1-2

Terminal	Measuring condition	Voltage (V)	
		DENSO type ECU	AISIN type ECU
L_1 – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0	12 to 0
	Throttle valve fully open	0	0
L_2 – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5	12 to 0 to 12
	Throttle valve fully open	5	12
L_3 – GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5	12 to 0 to 12 to 0 to 12
	Throttle valve fully open	5	12
IDL – GND	Throttle valve fully closed	0	0
	Throttle valve opening above 1.5°	12	12
SP_1 – GND	Standing still (Cruise control OFF)	5 or 0	12 or 0
	Engine running, vehicle moving (Cruise control OFF)	2.5	6
BK – GND	When brake pedal is depressed	12	12
	When brake pedal is not depressed	0	0
2 – GND	"2" range	10 – 16	10 – 16
	Except "2" range	0 – 2	0 – 2
L – GND	"L" range	10 – 16	10 – 16
	Except "L" range	0 – 2	0 – 2
N – GND	"N" range	10 – 16	10 – 16
	Except "N" range	0 – 2	0 – 2

Terminal	Measuring condition	Voltage (V)	
		DENSO type ECU	AISIN type ECU
S_1 – GND	–	12	12
S_2,SL – GND	–	0	0
OD_1 – GND	Coolant temp. below 50°C (122°F)	0	0
	Coolant temp. above 50°C (122°F)	5	12
OD_2 – GND	O/D main switch turned ON	12	12
	O/D main switch turned OFF	0	0
IG – GND	Ignition switch ON	12	12
SP_2 – GND	Standing still	5 or 0	5 or 0
	Vehicle moving	4	4
PWR – GND	PWR pattern	12	12
	NORM pattern	0 – 2	0 – 2
+B – GND	–	12	12
S_4 – GND	Transfer gear position "H2" or "H4"	0	0
	Transfer gear position "L4"	12	12
L4 – GND	Transfer shift position "H2" or "H4"	12	12
	Transfer shift position "L4"	0	0
TH⊕ – TH⊖	–	12	12
OIL – GND	–	0	0



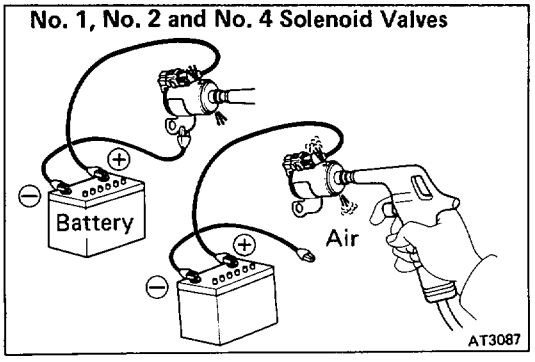
2. INSPECT SOLENOID

(a) Disconnect the connector from the ECT ECU.

(b) Measure the resistance between S_1, S_2, SL, S_4 and ground.

STD: 11 – 15 Ω

(c) Apply battery voltage to the solenoid. Check that an operation noise can be heard from the solenoid.

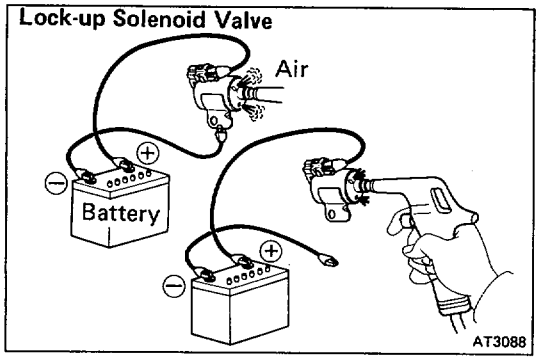


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

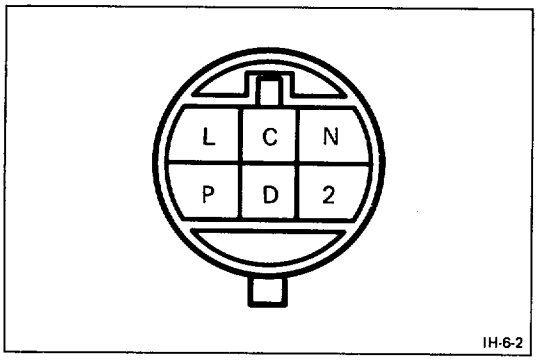
(a) Check No. 1, No. 2 and No. 4 solenoid valves.

- Applying 5 kg/cm² (71 psi, 490 kPa) of compressed air, check that the solenoid valves open.
- When supply battery voltage to the solenoids, check that the solenoid valves do not leak the air.



(b) Check the lock-up solenoid valve.
- Check that the solenoid valve does not leak when low-pressure compressed air is applied.
- When supply battery voltage to the solenoid, check that the solenoid valve opens.

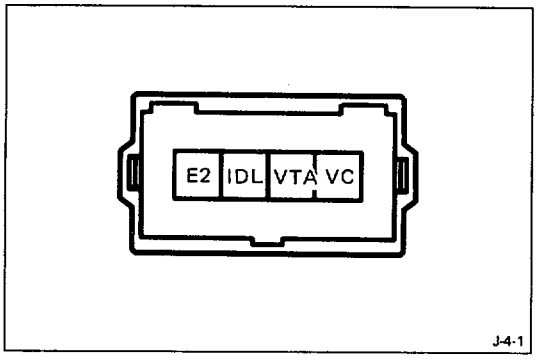
If a malfunction is found during voltage inspection (step 1.), inspect the componets listed below.



4. INSPECT NEUTRAL START SWITCH

Inspect that there is continuity between terminals L–C, 2–C and N–C.

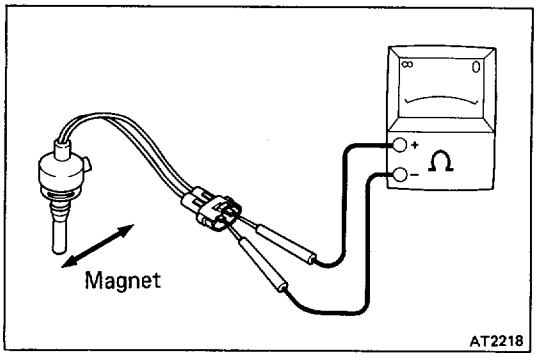
Shift position \ Terminal	L	2	N	C
N range			○——	——○
2 range		○——	——	——○
L range	○——	——	——	——○



5. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL – E_2	Fully closed	0 – 0.1
	Open	Infinity
VC – E_2	–	3 – 7
VTA – E_2	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10

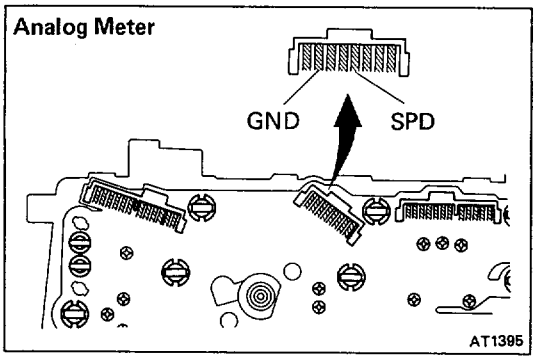


6. INSPECT NO. 2 SPEED SENSOR

(a) Remove No. 2 speed sensor.

(b) Connect an ohmmeter between the terminals.

(c) Bring a magnet close to then away from the sensor tip and check that the meter needle deflects from 0 Ω to ∞ Ω.



7. INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER

(Analog Meter)

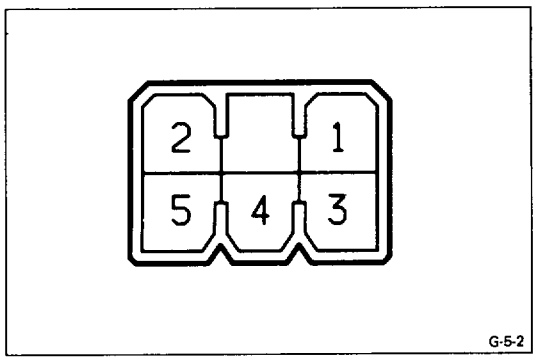
(a) Remove the combination meter.

(b) Connect an ohmmeter between terminals SPD and GND.

(c) Revolve the meter shaft and check that the meter needle repeatedly deflects from 0 Ω to ∞ Ω.

(Digital Meter)

(See page BE-104)

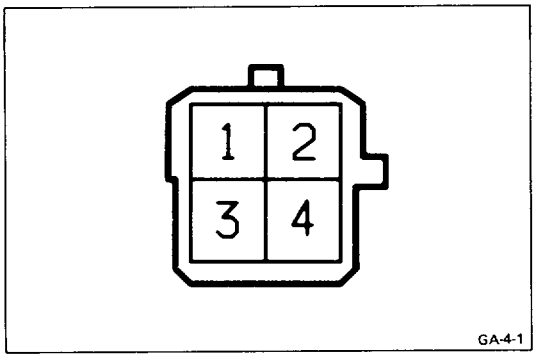


8. INSPECT PATTERN SELECT SWITCH

Inspect that there is continuity between 5 and each terminal.

NOTE: As there are diodes inside, be careful of the tester probe polarity.

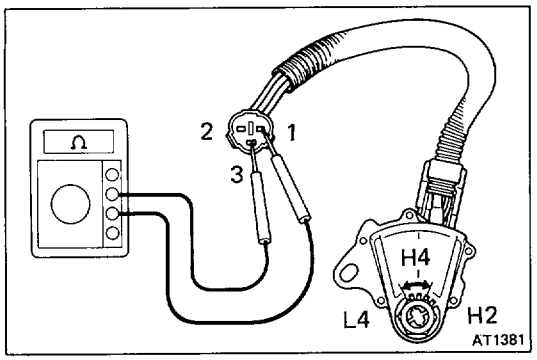
Pattern \ Terminal	5	4	3
NORM	○——	——○	
PWR	○——	——	——○



9. INSPECT O/D SWITCH

Inspect that there is continuity between terminals 1 and 3.

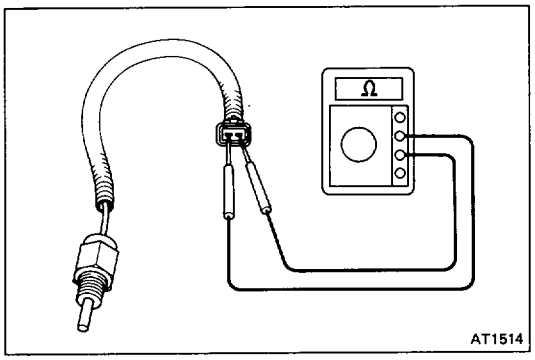
S/W position \ Terminal	1	3
ON		
OFF	○——	——○



10. INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal.

Shift position \ Terminal	1	2	3
H4		○——	——○
L4	○——	——○	——○
H2			



11. INSPECT TRANSMISSION FLUID TEMPERATURE SENSOR

Measure the resistance between terminals.

Oil Temperature	Resistance (Ω)
20°C (68°F)	5k – 20k
120°C (248°F)	540 – 690
150°C (302°F)	300 – 340

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R ranges.

CAUTION:

- **Perform the test at normal operating fluid temperature (50 – 80°C or 122 – 176°F).**
- **Do not continuously run this test longer than 5 seconds.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.

(b) Connect a tachometer to the engine.

(c) Fully apply the parking brake.

(d) Step down strongly on the brake pedal with your left foot.

(e) Shift the transfer lever to the H2 position.

(f) Start the engine.

(g) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,200 ± 150 rpm

(h) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both ranges but lower than specified value:

- Engine output may be insufficient
- Stator one-way clutch is not operating properly

NOTE: If more than 600 rpm below the specified value, the torque converter could be faulty.

(b) If the stall speed in D range is higher than specified:

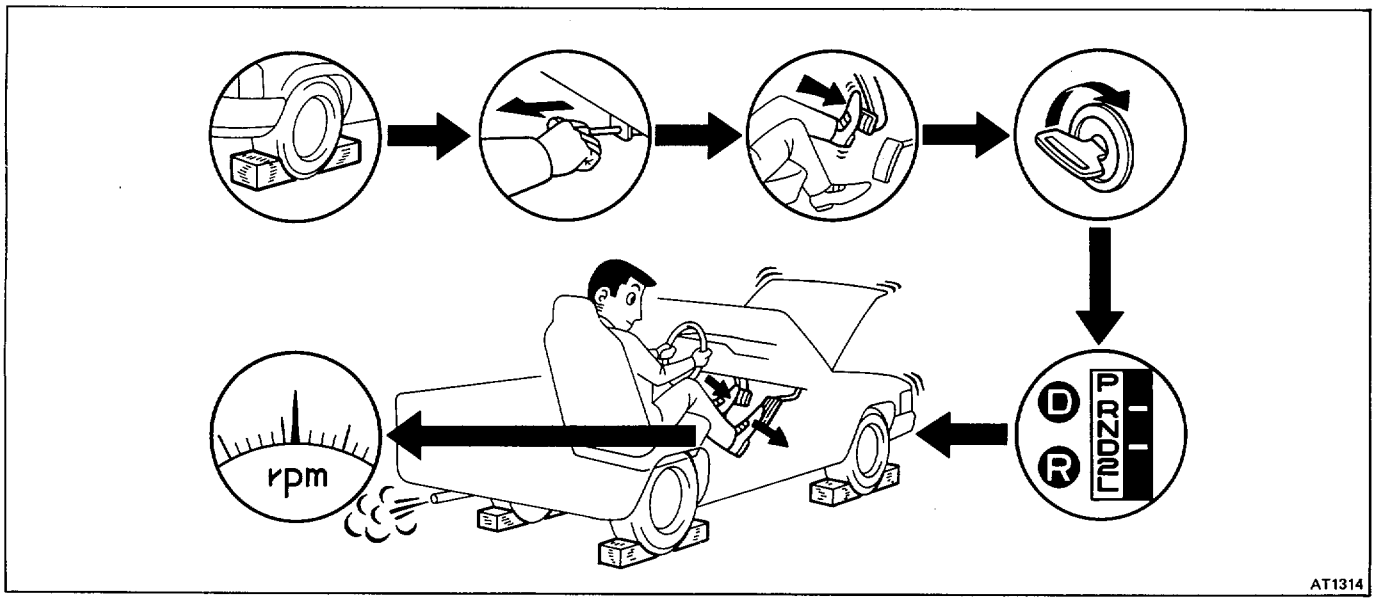
- Line pressure too low
- Forward clutch slipping
- No. 2 one-way clutch not operating properly
- O/D one-way clutch not operating properly
- Transfer direct clutch slipping

(c) If the stall speed in R range is higher than specified:

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one-way clutch not operating properly
- Transfer direct clutch slipping

(d) If the stall speed in both R and D ranges are higher than specified:

- Line pressure too low
- Improper fluid level
- O/D one-way clutch not operating properly
- Transfer direct clutch slipping



TIME LAG TEST

If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

CAUTION:

- **Perform the test at normal operating fluid temperature (50 – 80°C or 122 – 176° F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Shift the transfer shift lever to the H2 position.

(c) Start the engine and check the idle speed.

Idle speed: 750 rpm (N range)

(d) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(e) In same manner, measure the time lag for N → R.

Time lag: Less than 1.5 seconds

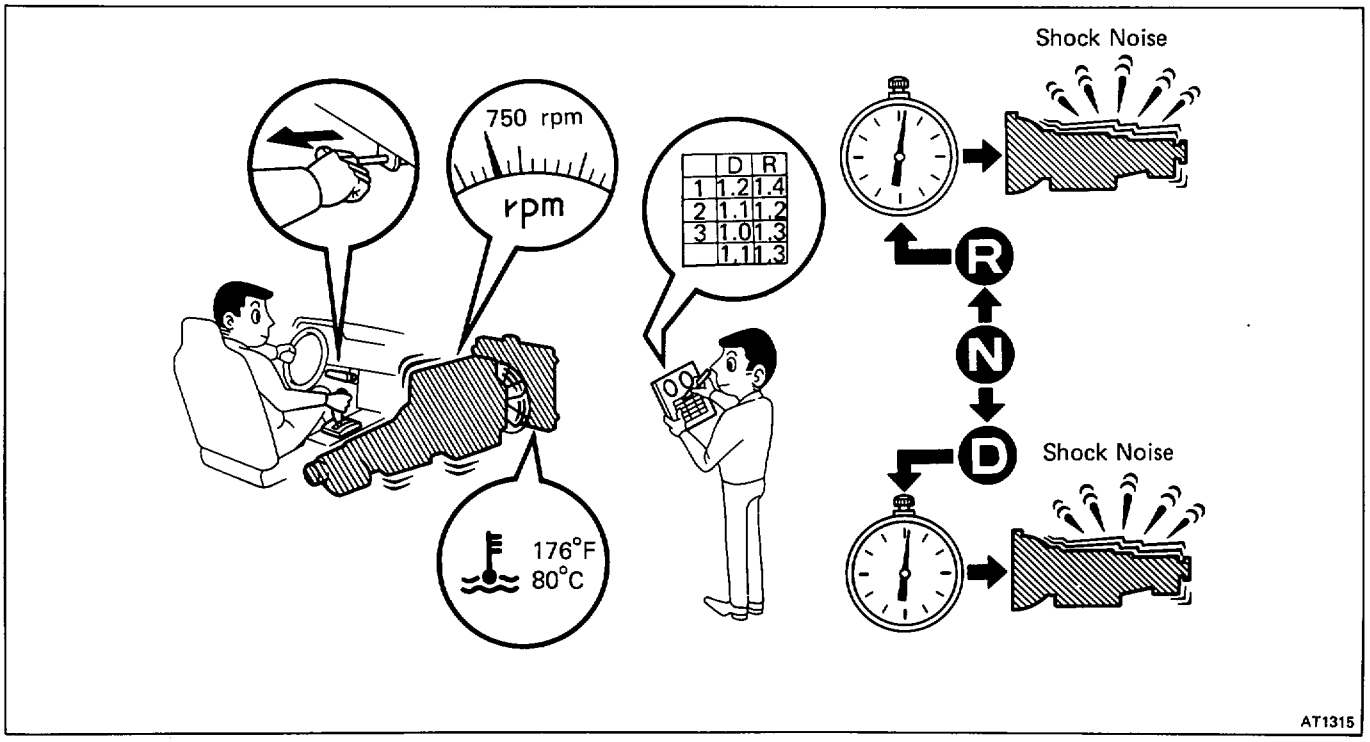
EVALUATION

(a) If N → D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one-way clutch not operating properly

(b) If N → R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one-way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.
(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.

SST 09992-00094 (Oil pressure gauge)

CAUTION: Perform the test at normal operating fluid temperature (50 – 80°C or 122 – 176°F).

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.
(b) Start the engine and check idling rpm.
(c) Step down strongly on the brake pedal with your left foot and shift into D range.
(d) Measure the line pressure when the engine is idling.
(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(f) In the same manner, perform the test in R range.

kg/cm^2 (psi, kPa)

D range		R range	
Idling	Stall	Idling	Stall
3.7 – 4.3 (53 – 61, 363 – 422)	9.5 – 12.0 (135–171, 932–1,177)	5.1 – 6.1 (73 – 87, 500 – 598)	13.2 – 16.7 (188–238, 1,294–1,638)

If the measured pressure are not up to specified values, recheck the throttle cable adjustment and perform a retest.

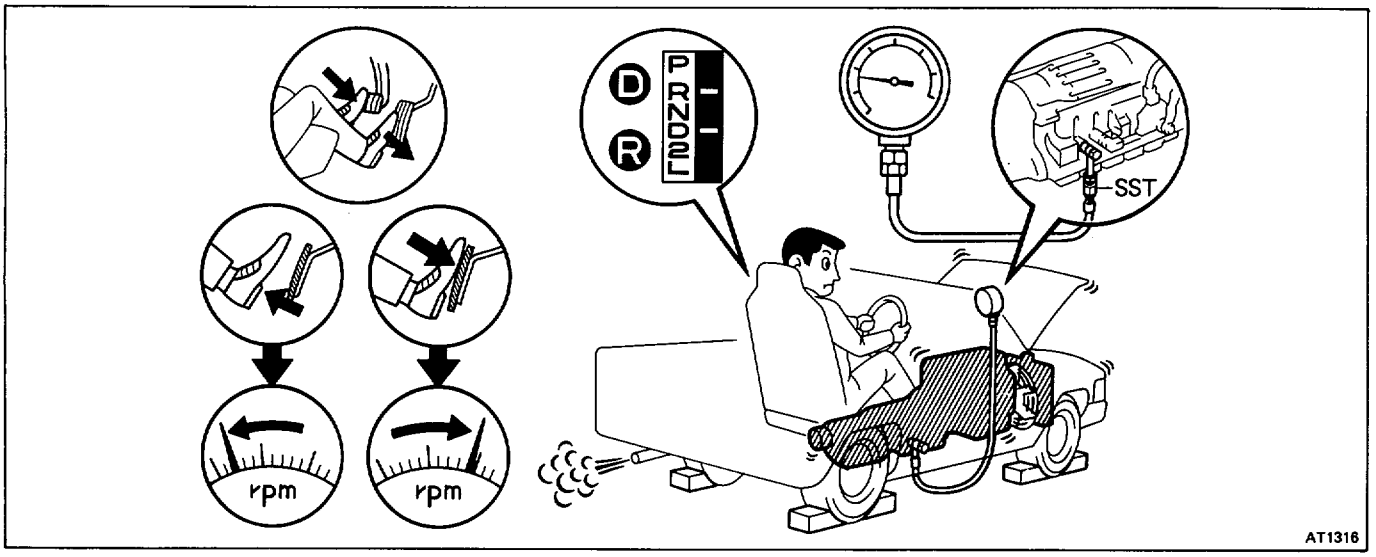
EVALUATION

(a) If the measured values at all ranges are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all ranges are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective
- Transfer direct clutch defective (H4)
- Transfer front drive clutch defective (H4)
- Transfer low speed brake defective (L4)

(c) If pressure is low in the D range only:
- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:
- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective



ROAD TEST

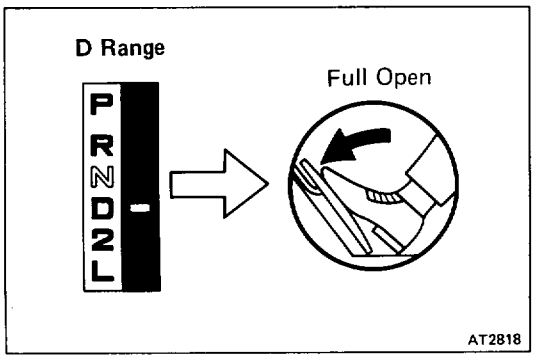
CAUTION: Perform the test at normal operating fluid temperature (50 — 80°C or 122 — 176°F).

NOTE: The transmission shift points for the H2, H4 and L4 transfer positions are different. Also, the O/D gear and lock-up are canceled when L4 is engaged.

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.
Check the following:

(a) 1-2, 2-3 and 3-O/D up-shifts should take place, and shift points should conform to those shown in the automatic shift schedule.



Conduct a test under both Normal and Power patterns.

NOTE: There is no O/D up-shift or lock-up when the coolant temp. is below 50°C (122°F), or if there is a 10 km/h (6 mph) difference between the set cruise control speed.

EVALUATION

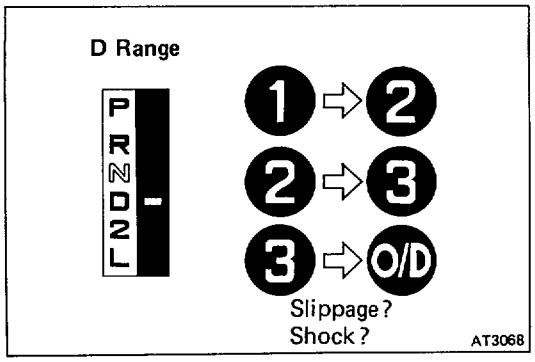
(1) If there is no 1 → 2 up-shift:
- No. 2 solenoid is stuck
- 1-2 shift valve is stuck

(2) If there is no 2 → 3 up-shift:
- No. 1 solenoid is stuck
- 2-3 shift valve is stuck

(3) If there is no 3 → O/D up-shift:
- 3-4 shift valve is stuck

(4) If the shift point is defective:
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve etc., are defective

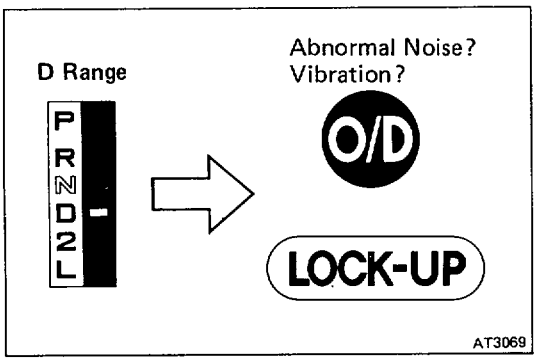
(5) If the lock-up is defective:
- Lock-up solenoid is stuck
- Lock-up relay valve is stuck



(b) In the same manner, check the shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up-shifts.

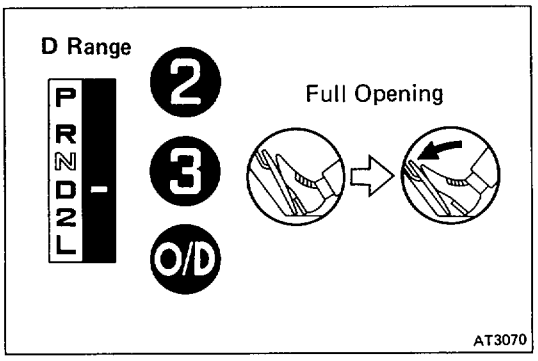
EVALUATION

If the shock is excessive:
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



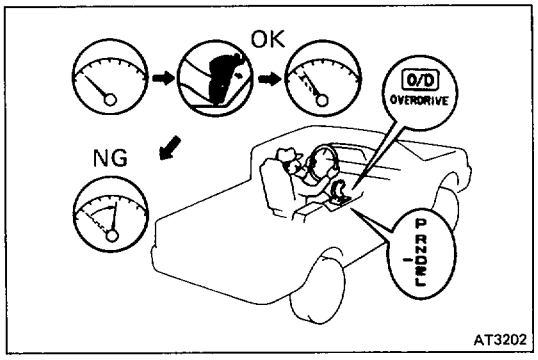
(c) Run at the D range lock-up or O/D gear and check for abnormal noise and vibration.

NOTE: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter, etc.



(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick-downs conform to those indicated on the automatic shift schedule.

(e) Check for abnormal shock and slip at kick-down.

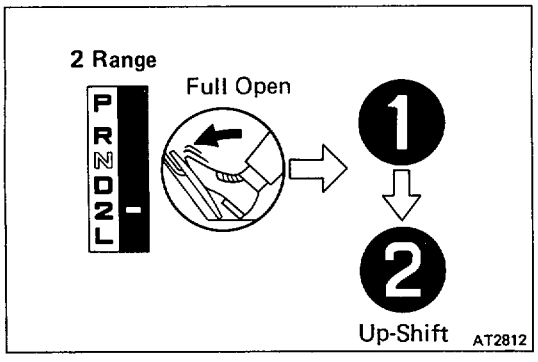


(f) Check for the lock-up mechanism.

(1) Drive in D range, O/D gear, at a steady speed (lock-up ON) of about 75 km/h (47 mph).

(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly.

If there is a big jump in engine rpm, there is no lock-up.



2. 2 RANGE TEST

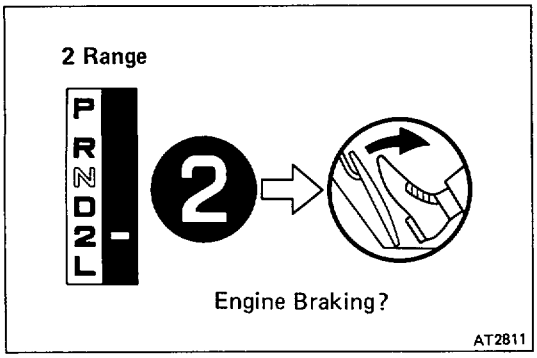
Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 → 2 up-shift takes place and that the shift point conforms to it shown on the automatic shift schedule.

NOTE:

- There is no O/D up-shift and lock-up in the 2 range.
- To prevent overrun, the transmission up-shifts into 3rd gear at around 113 km/h (70 mph).

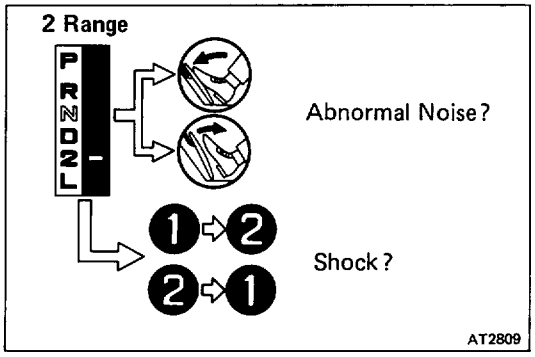
(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.



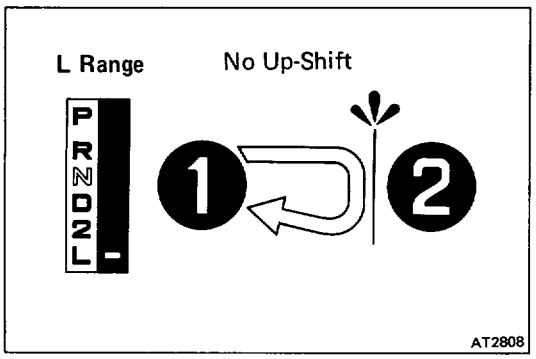
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective

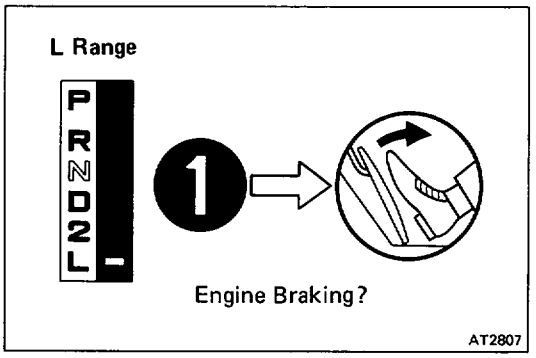


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up-shift and down-shift.



3. L RANGE TEST

(a) While running in the L range, check to see that there is no up-shift to 2nd gear.

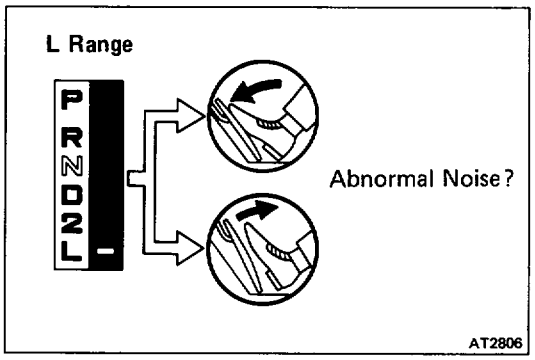


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

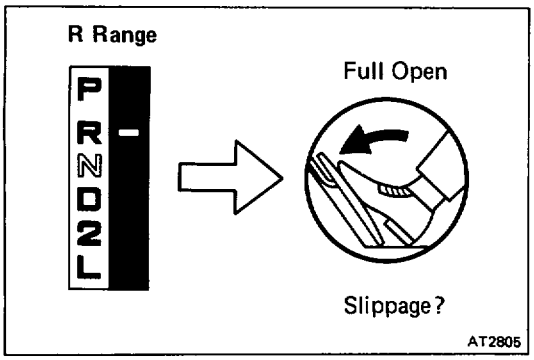
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

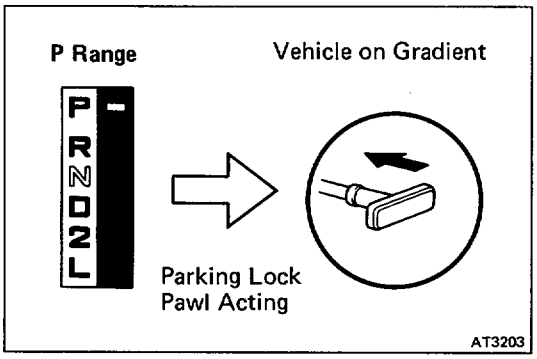


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

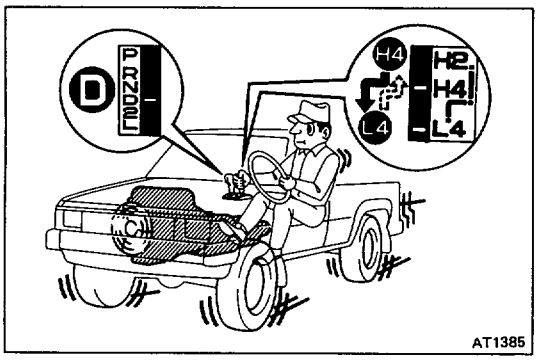
Shift into the R range and, while starting at full throttle, check for slipping.



5. P RANGE TEST

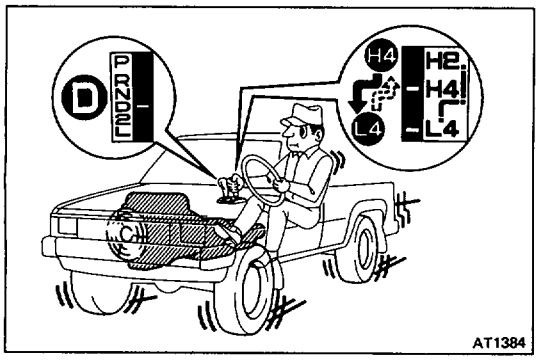
Stop the vehicle on a gradient (more than 5°) and after shifting into the P range, release the parking brake.

Then check to see that the parking lock pawl holds the vehicle in place.



6. TRANSFER TEST

(a) When the shift lever is shifted from the H2 to H4, confirm that the vehicle changes from 2 to 4 wheel drive. If it does not, the transfer is faulty.



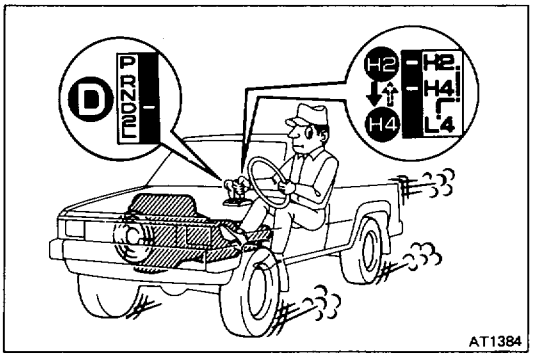
(b) When the transfer lever is shifted from H4 to L4, confirm that the gear changes according to the shifted diagram (See page AT-141). If it does not, the No. 4 solenoid, ECT ECU or transfer faulty.

Automatic Shift Schedule

Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	46–50 (29–31)	90–98 (56–61)	136–144 (85–89)	37–42 (23–26)	28–33 (17–21)	130–138 (81–86)	81–86 (50–53)	41–45 (25–28)
	PWR	50–57 (31–35)	97–108 (60–67)	155–167 (96–104)	51–58 (32–36)	27–34 (17–21)	149–161 (93–100)	91–102 (57–63)	42–49 (26–30)
2 range	NORM PWR	46–50 (29–31)	109–117 (68–73)	–	–	–	–	87–110 (54–68)	37–42 (23–26)
L range	NORM PWR	–	–	–	–	–	–	–	50–54 (31–34)

Transfer shift position "H2" or "H4"		Throttle valve opening 5% km/h (mph)					
		Lock-up ON			Lock-up OFF		
		2nd	3rd	O/D	2nd	3rd	O/D
D range	NORM	–	–	63–67 (39–42)	–	–	59–63 (37–39)
	PWR	–	–	80–84 (50–52)	–	–	74–78 (46–48)

NOTE: (1) There is no lock-up in the 2 and L ranges.
(2) In the following cases, the lock-up will be released regardless of the lock-up pattern.
- When the throttle is completely closed.
- When the brake light switch is ON.



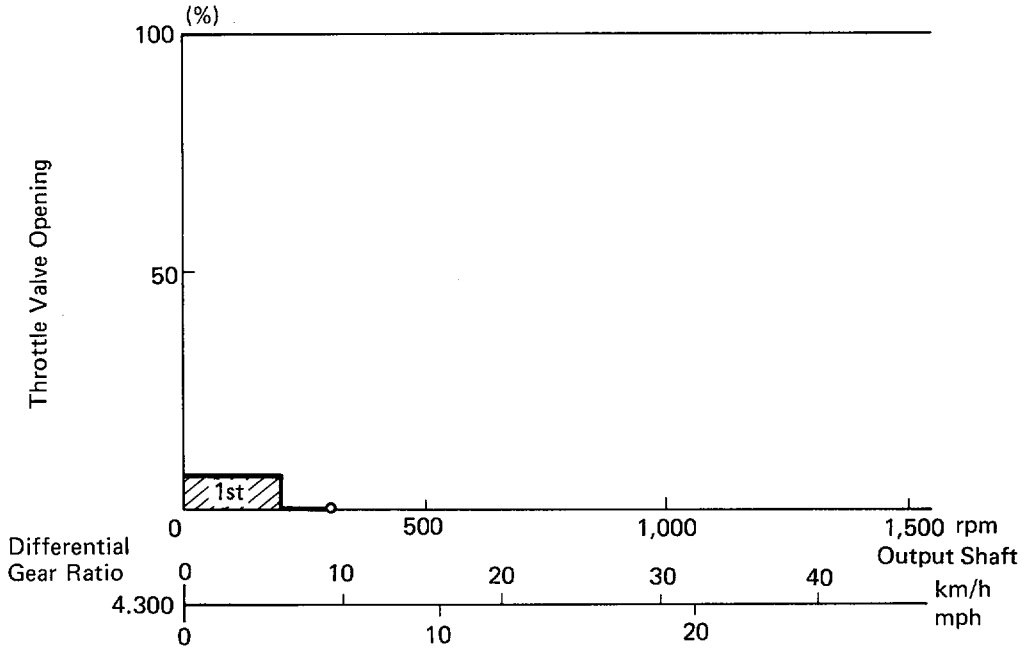
TRANSFER HIGH-LOW SHIFT RANGE

The A340H transfer differs from previous manual transfer in that high-low shifting is possible while the vehicle is in motion, though it is not possible at all vehicle speeds or throttle opening angles. The shifting possibility ranges for high-low shifting have been adopted with the idea of improving shifting performance and transfer conditions, and preventing engine overrun.
The shifting possibility ranges are controlled by ECT ECU and when a high-low shift change is made within these ranges, the ECT ECU operates the No. 4 solenoid which carries out the high-low transfer shift. However, if a transfer is attempted outside the shifting possibility range, the high-low shift will not take place until the vehicle speed and throttle opening angle come within the appropriate range. The high-low shifting possibility ranges are shown in the diagrams on the following pages.

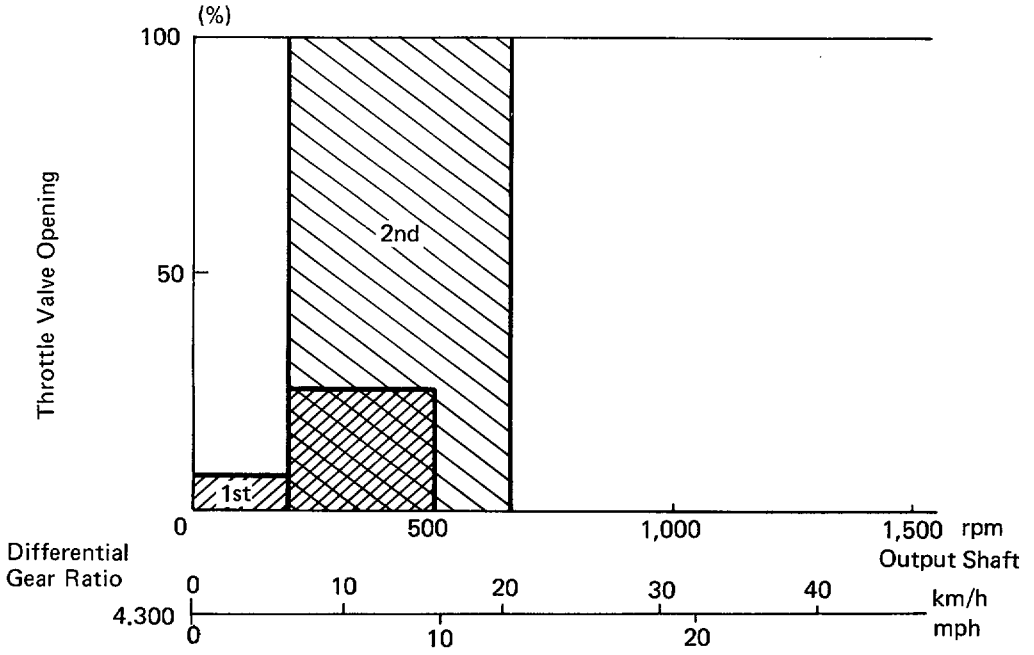
There are three shifting possibility ranges for when the transmission gear is in first, second or third gear, which combine with the respective transmission shift ranges (L, 2, D).
Although the high → low shift takes place in the 1st gear, 2nd gear and 3rd gear shifting ranges with the gears in 1st gear, 2nd gear and 3rd gear respectively, when a high → low shift change is made in 1st gear while in the 2nd gear shifting possibility range, only after the transmission has shifted up into second gear does the high → low shift take place.
In the 2 range and D range high → low shifting possibility ranges where the 1st and 2nd ranges overlap, the high → low shift will take place in first gear if the transmission is in first gear, or in second gear if the transmission is in second gear.

L Range: High → Low Shift Possibility Range

* : This transfer shift is only possible when the IDL contact points of the throttle position sensor are ON.

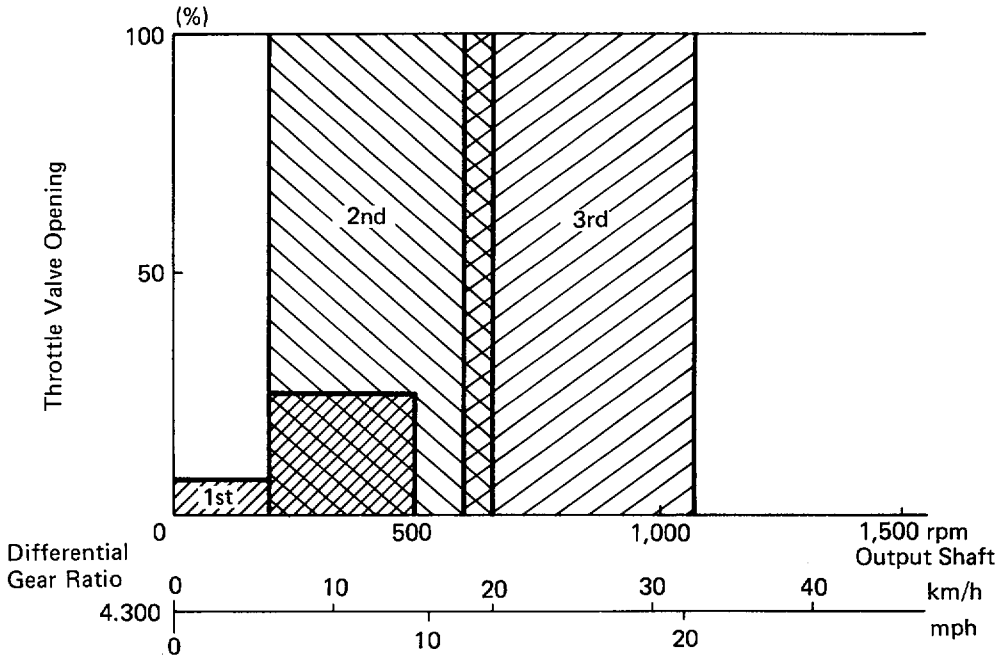


2 Range: High → Low Shift Possibility Range

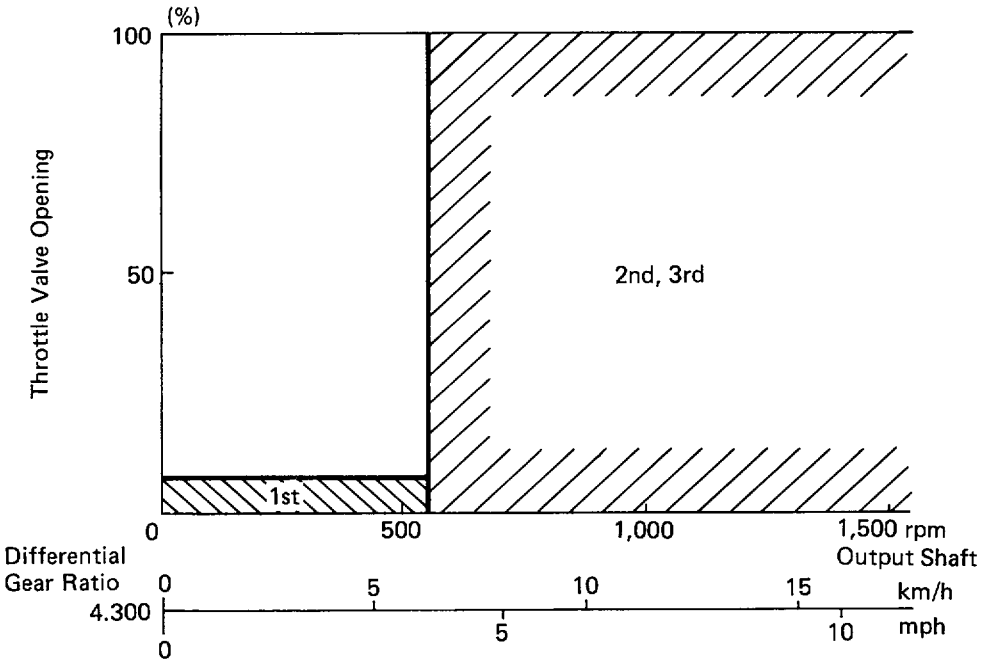


AT1920
AT1921

D Range: High → Low Shift Possibility Range



Low → High Shift Possibility Range (L, 2, D Range)

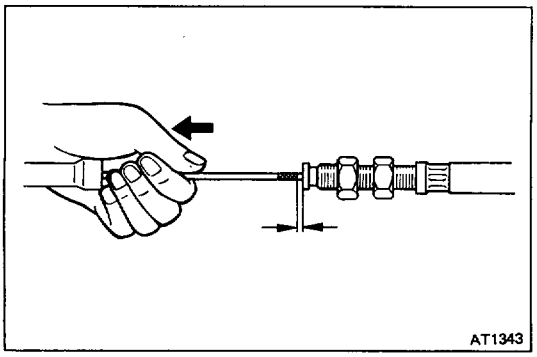


AT1922
AT1923

ON-VEHICLE REPAIR

NOTE: The components mentioned below can be replaced on the vehicle as they are without any necessity for removal of the transmission.
For the respective operating procedures refer to the following pages:

Components		Removal	Installation	Remarks
Valve Body, Solenoid Valve	Trans-mission	Steps 13 and 18 to 21 on pages AT-160 to 162	Steps 52 to 57 and 62 on pages AT-300 to 304	
	Transfer	Steps 14 to 16 on pages AT-161 to 162	Steps 60 to 61 on pages AT-303 to 304	Remove the rear support member and mounting.
Throttle Cable		Steps 21 and 23 on pages AT-163 and 165	Steps 51 and 54 on pages AT-300 and 301	• Adjust the throttle cable after installing. (See page AT-117) • If the throttle cable is new, see the note below.
Parking Lock Pawl		Step 17 on page AT-162 and step 3 on page AT-261	Step 2 on page AT-262 and step 58 on page AT-302	Remove the parking lock pawl after removing the transfer valve body.
Speedometer Driven Gear Oil Seal		See page TF-18	See page TF-18	



NOTE: New cables do not have a cable stopper installed. Therefore, to make adjustment possible, paint a mark as described below.

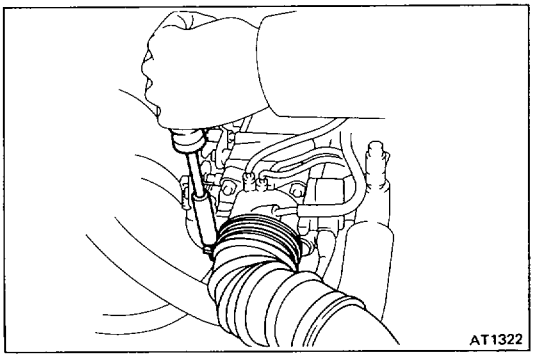
(a) Pull the inner cable lightly until slight resistance is felt and hold it.

(b) Paint a mark about 4 mm (0.16 in.) wide, as shown width.

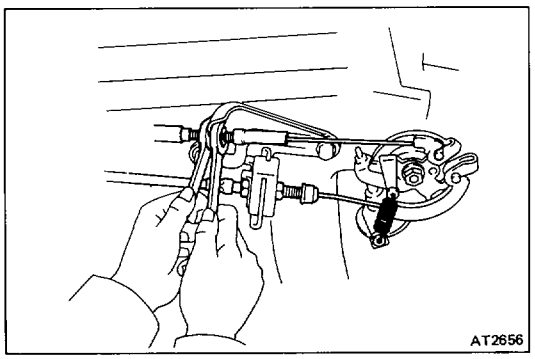
REMOVAL AND INSTALLATION OF TRANSMISSION

REMOVAL OF TRANSMISSION

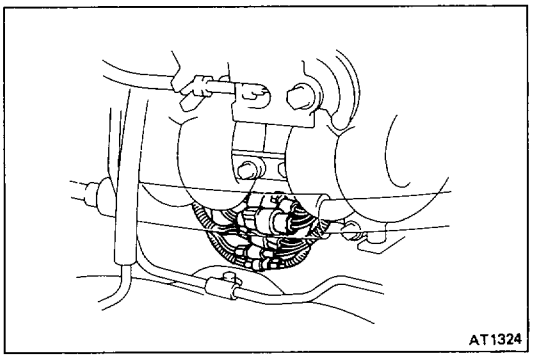
1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL


AT1322

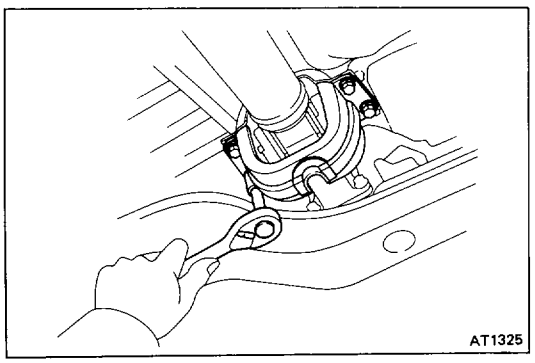
2. DISCONNECT AIR INTAKE CONNECTOR


AT2656

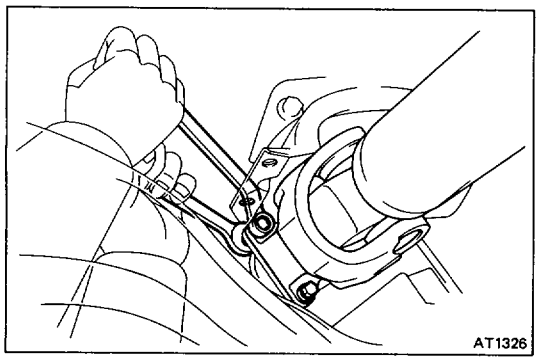
3. DISCONNECT TRANSMISSION THROTTLE CABLE
   (a) Loosen the adjusting nuts, and disconnect the cable housing from the bracket.
   (b) Disconnect the cable from the throttle linkage.
   (c) Disconnect the throttle cable from the engine rear end.


AT1324

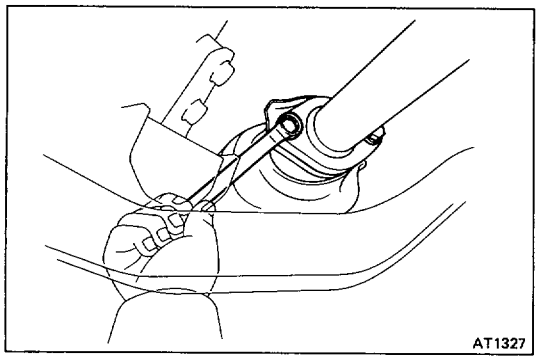
4. DISCONNECT TRANSMISSION CONNECTORS
   Disconnect the five connectors located under the air intake chamber.
5. REMOVE STARTER UPPER MOUNTING NUT
6. RAISE VEHICLE AND DRAIN TRANSMISSION FLUID
   CAUTION: **Be sure the vehicle is securely supported.**


AT1325

7. REMOVE FRONT AND REAR PROPELLER SHAFTS
   (a) Place the matchmarks on the flanges.
   (b) Remove the joint cover.



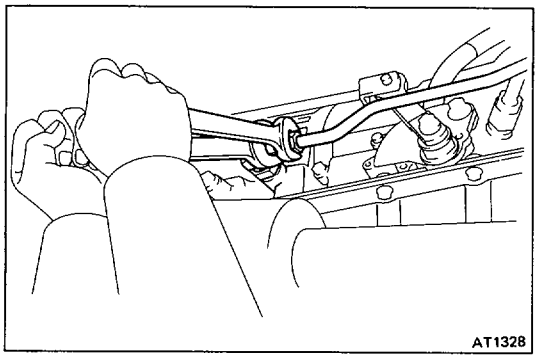
(c) Remove the front and rear propeller shafts from the transfer.



8. DISCONNECT EXHAUST PIPE FROM TAIL PIPE

(a) Remove the two bolts and bracket.

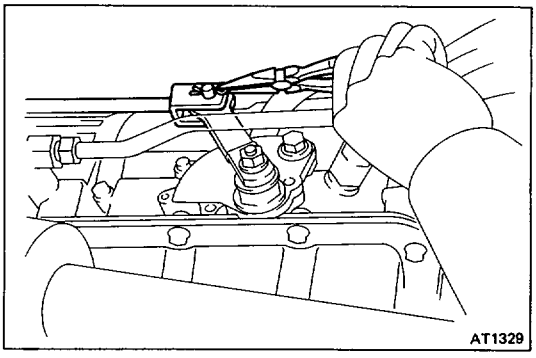
(b) Remove the pipe clamp from the transmission case.



9. DISCONNECT OIL COOLER LINES

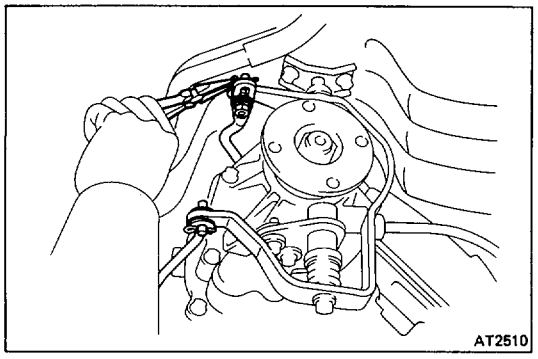
(a) Remove the oil cooler pipe clamp from the transmission case.

(b) Disconnect the two oil cooler pipes from the transmission case.



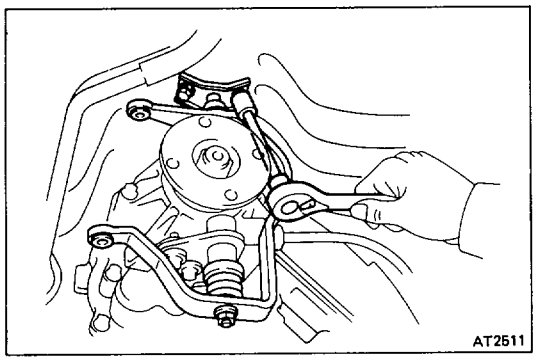
10. DISCONNECT MANUAL SHIFT LINKAGE

Disconnect the manual shift linkage from the neutral start switch.

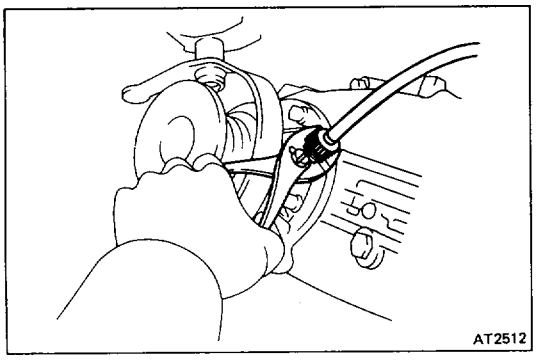


11. DISCONNECT TRANSFER SHIFT LINKAGE

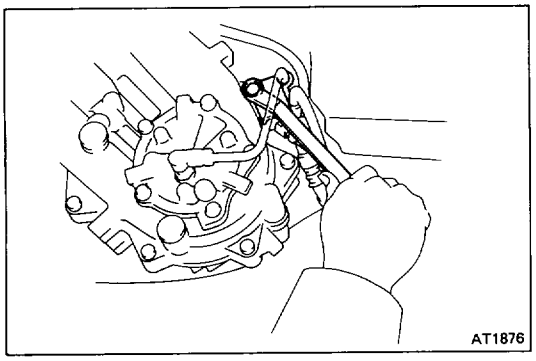
(a) Disconnect the No. 1 and No. 2 transfer shift linkages from the cross shaft.



(b) Remove the cross shaft from the body.

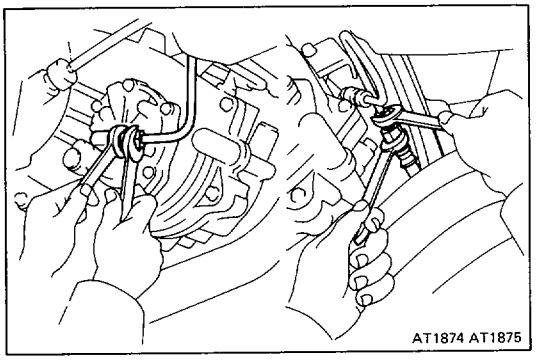


12. DISCONNECT SPEEDOMETER CABLE



13. DISCONNECT TRANSFER OIL COOLER LINES

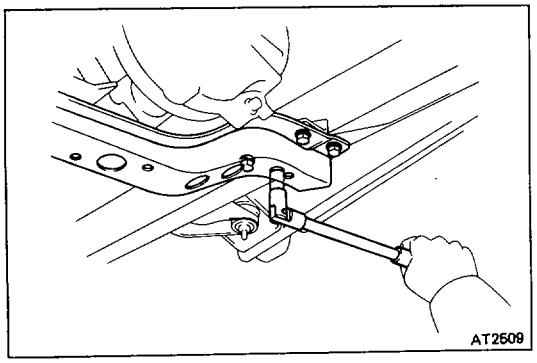
(a) Remove the oil cooler clamp from the transfer chain case.



(b) Disconnect the two oil cooler pipes from the transfer chain case.

14. JACK UP TRANSMISSION SLIGHTLY

If a transmission jack is not available, be sure to put a wooden block between the jack and the transmission pan to prevent damage. Raise the transmission enough to remove the weight from the rear support member.

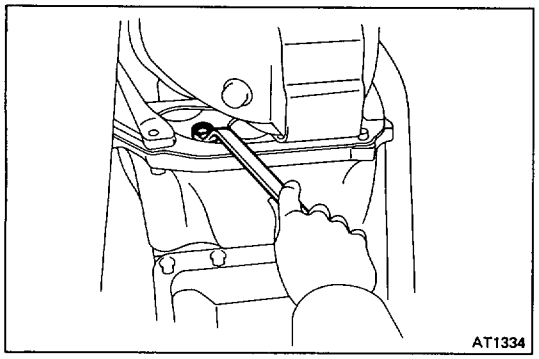


15. REMOVE REAR SUPPORT MEMBER

(a) Install a wooden block between cowl panel and cylinder head rear end.

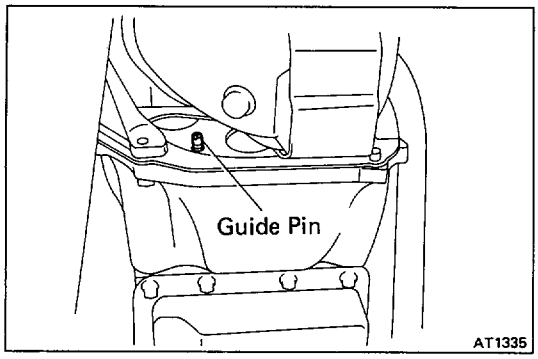
(b) Remove the eight bolts.

16. REMOVE ENGINE UNDER COVER



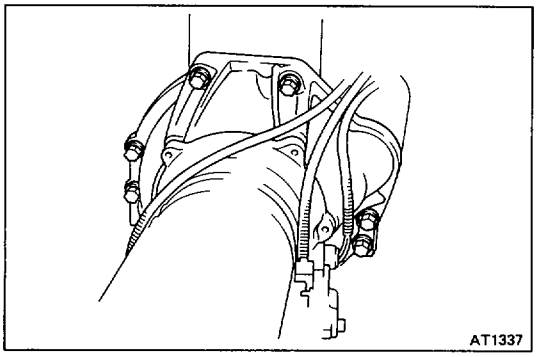
17. REMOVE TROQUE CONVERTER MOUNTING BOLTS

Turn the crankshaft to gain access to each bolt. Remove the six bolts.



18. INSTALL GUIDE PIN IN TORQUE CONVERTER

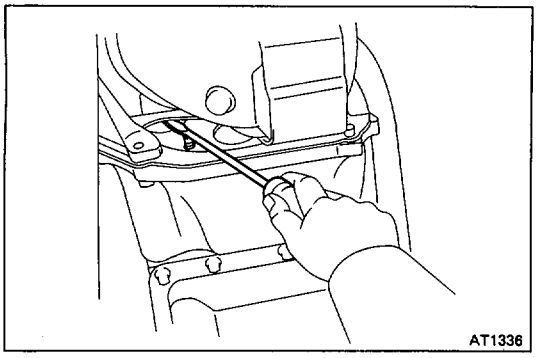
Install the guide pin in one of the torque converter bolt holes. If necessary, a guide pin can be made by cutting off the head of a bolt.



19. REMOVE TRANSMISSION HOUSING MOUNTING BOLTS

(a) Remove the starter.

(b) Remove the transmission housing mounting bolts.



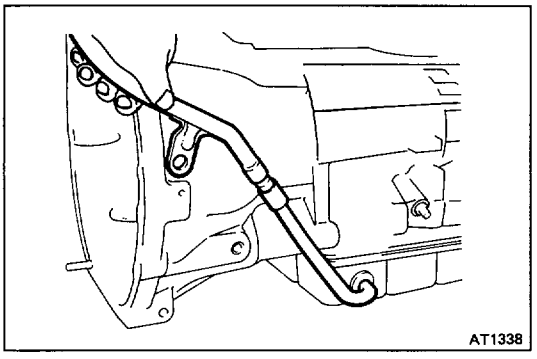
20. PRY ON END OF GUIDE PIN TO BEGIN MOVING TRANSMISSION WITH CONVERTER TOWARD REAR

The guide pin helps keep the converter with the transmission.

21. REMOVE TRANSMISSION ASSEMBLY

Draw the transmission out and down toward the rear.

CAUTION: Be careful not to snag the throttle cable or neutral start switch wiring. Keep the oil pan positioned downward.



22. PLACE PAN UNDER TRANSMISSION HOUSING, AND REMOVE CONVERTER

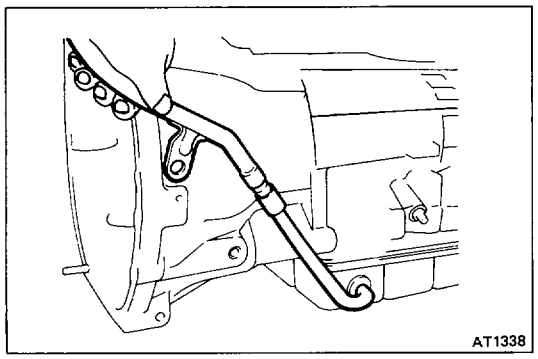
Pull straight off, and allow the fluid to drain into the pan.

23. REMOVE FILLER TUBE

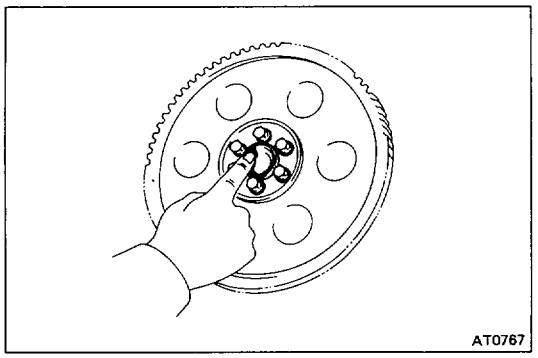
24. REMOVE ENGINE REAR MOUNTING FROM TRANSFER

INSTALLATION OF TRANSMISSION

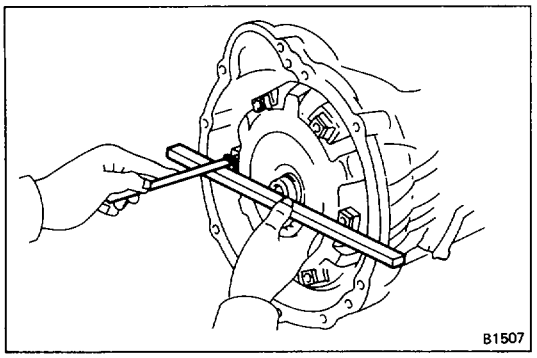
1. INSTALL ENGINE REAR MOUNTING TO TRANSFER
   (a) Inspect the insulator for deterioration and replace if necessary.
   (b) Install the ground strap between mount and case.


AT1338

2. INSTALL FILLER TUBE
   Replace the O-ring and push the tube into place.

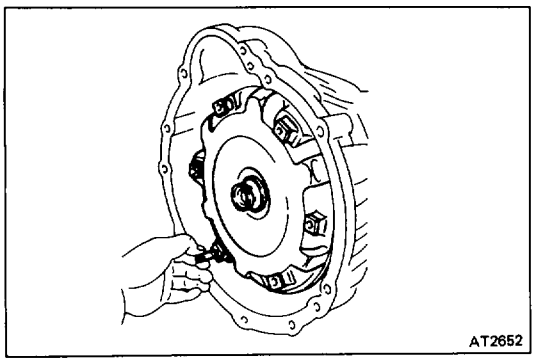

AT0767

3. APPLY GREASE TO CENTER HUB OF TORQUE CONVERTER AND PILOT HOLE IN CRANKSHAFT

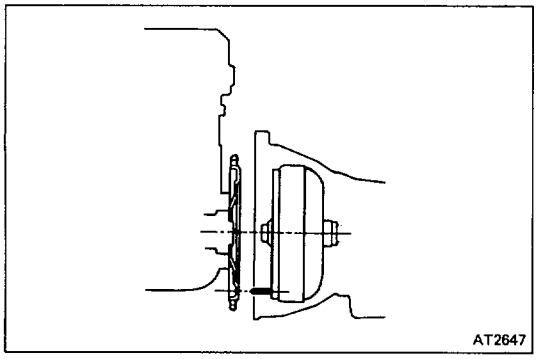

B1507

4. INSTALL TORQUE CONVERTER IN TRANSMISSION

5. CHECK TORQUE CONVERTER INSTALLATION
   Using calipers and a straight edge, measure from the installed surface of the torque converter to the front surface of the transmission housing.
   Correct distance: 26 mm (1.02 in.)
   If the distance is less than the standard, check for an improper installation.


AT2652

6. INSTALL GUIDE PIN IN TORQUE CONVERTER



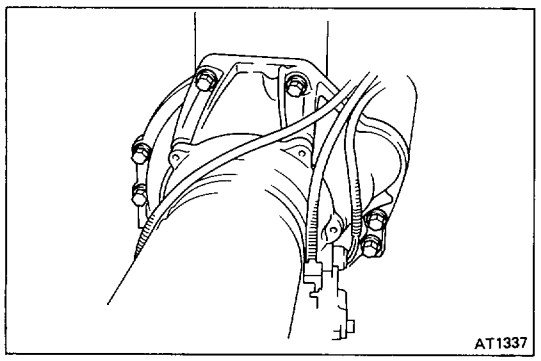
7. ALIGN TRANSMISSION AT INSTALLATION POSITION

CAUTION: Be careful not to tilt the transmission forward because the torque converter could slide out.

(a) Align the guide pin with one of the drive plate holes.

(b) Align the two knock pins on the block with the transmission housing.

(c) Temporarily install one bolt.

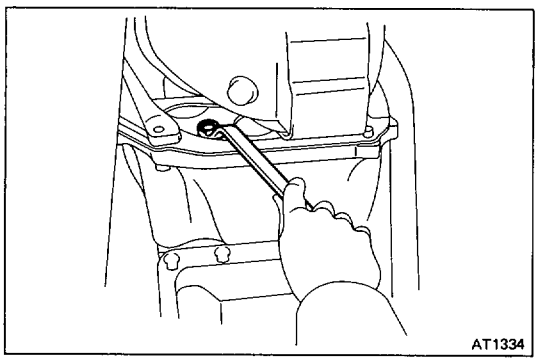


8. INSTALL TRANSMISSION HOUSING MOUNTING BOLTS

(a) Install the starter.

(b) Install the transmission housing mounting bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)



9. INSTALL TORQUE CONVERTER BOLTS

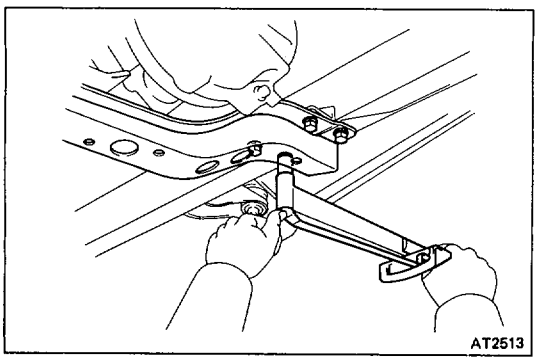
(a) Remove the guide pin.

(b) Install the six bolts finger tight. Turn the crankshaft to gain access.

(c) Tighten the bolts evenly.

Torque: 280 kg-cm (20 ft-lb, 27 N·m)

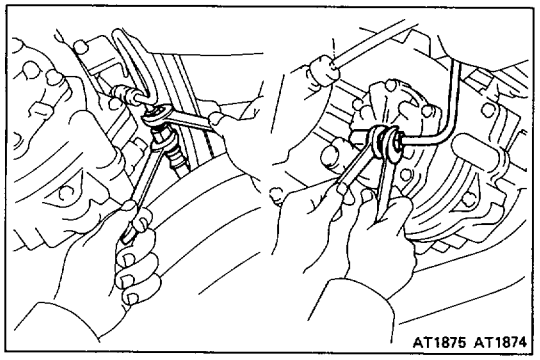
10. INSTALL ENGINE UNDER COVER



11. INSTALL REAR SUPPORT MEMBER ON BODY

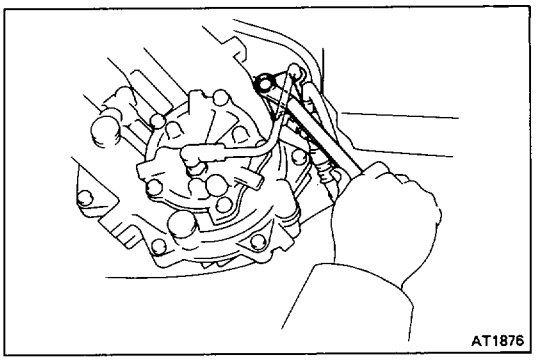
Install the eight bolts at each end of the support.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)

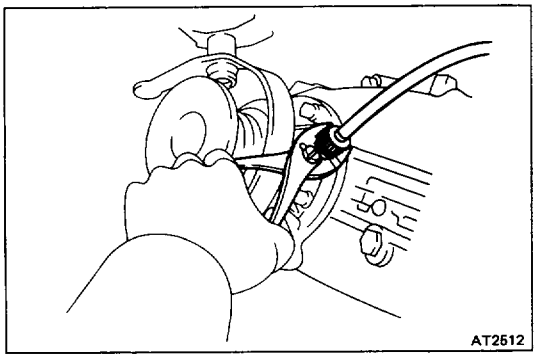


12. CONNECT TRANSFER OIL COOLER PIPES

(a) Connect the two oil cooler pipes.

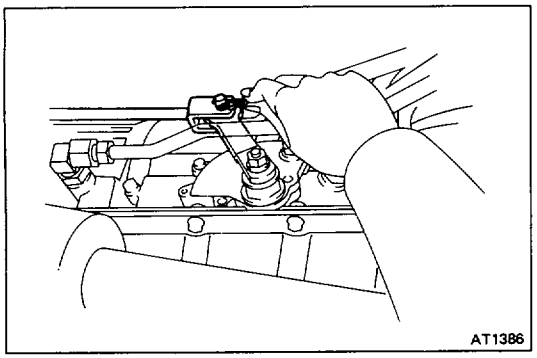


(b) Install the oil cooler pipe bracket.

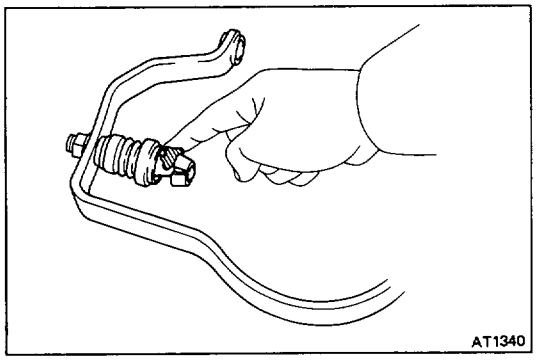


13. CONNECT SPEEDOMETER CABLE

Be sure the felt dust protector and washer are on the end of the cable. Tighten the collar with pliers.

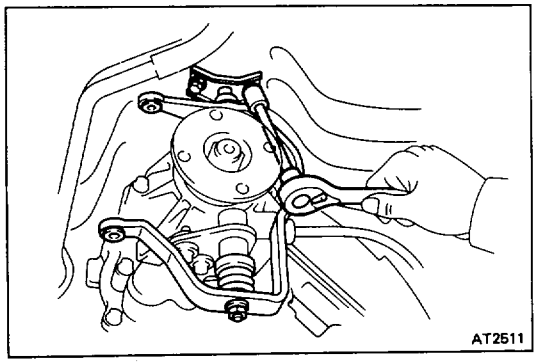


14. CONNECT MANUAL SHIFT LINKAGE TO NEUTRAL START SWITCH

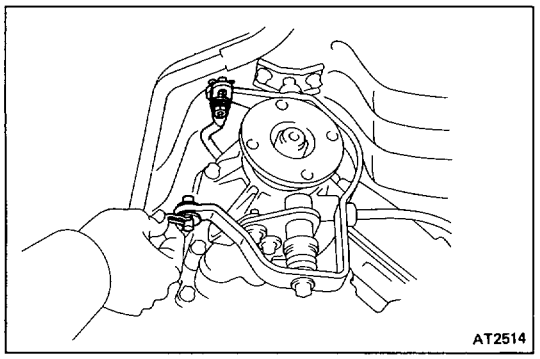


15. INSTALL CROSS SHAFT TO BODY

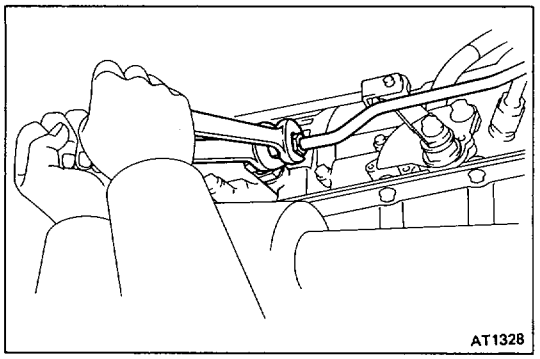
(a) Apply MP grease to the cross shaft joint.



(b) Install the cross shaft to the body.

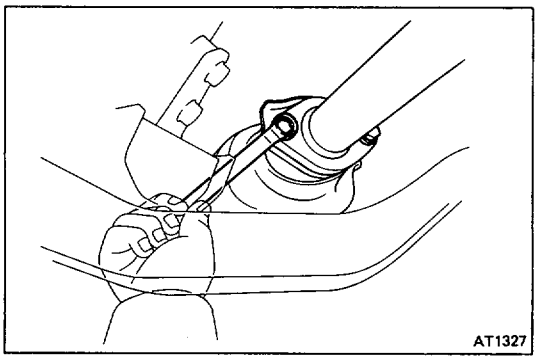


16. CONNECT NO. 1 AND NO. 2 TRANSFER SHIFT LINKAGE TO CROSS SHAFT

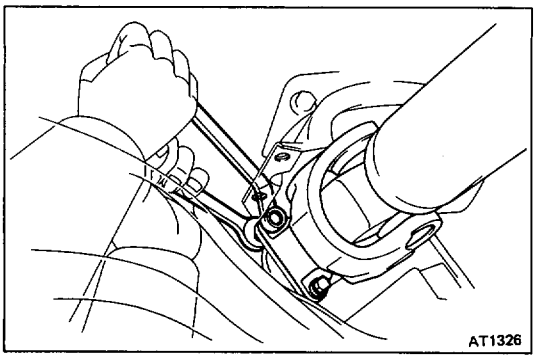


17. CONNECT OIL COOLER PIPES

18. INSTALL COOLER PIPE CLAMP

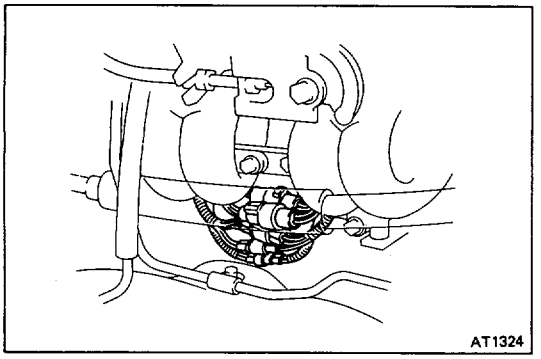


19. CONNECT TAIL PIPE AND FRONT PIPE
    (a) Connect the front pipe to the tail pipe.
    Torque: 440 kg-cm (32 ft-lb, 43 N·m)
    (b) Install the pipe clamp to the transmission case.
    Torque : 440 kg-cm (32 ft-lb, 43 N·m)



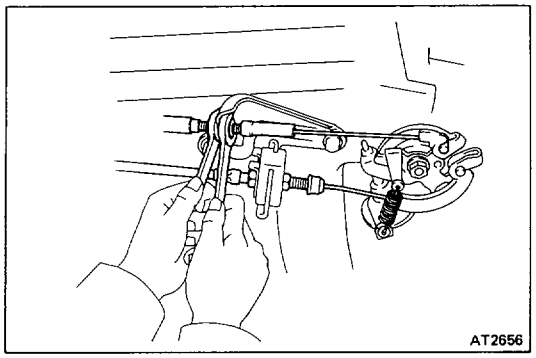
20. INSTALL FRONT AND REAR PROPELLER SHAFTS
    Torque: 750 kg-cm (54 ft-lb, 74 N·m)

21. INSTALL PROPELLER SHAFT JOINT COVER



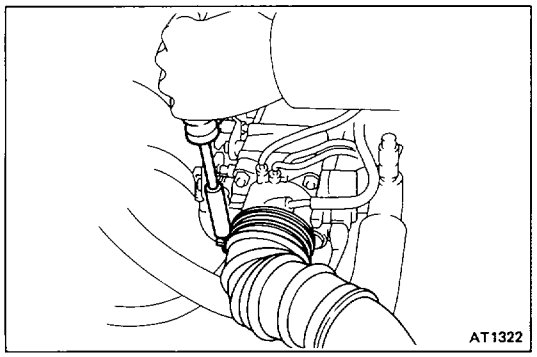
22. CONNECT TRANSMISSION CONNECTORS

23. INSTALL STARTER UPPER MOUNTING NUT



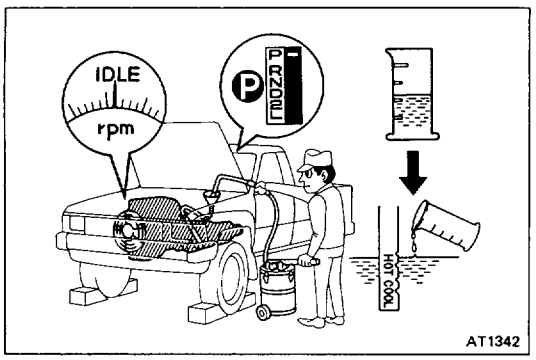
24. CONNECT TRANSMISSION THROTTLE CABLE
    (a) Connect the cable to the throttle linkage.
    (b) Connect the cable housing to the bracket.
    (c) Clamp the throttle cable to the engine rear end.

25. ADJUST TRANSMISSION THROTTLE CABLE
    (See page AT-117)



26. CONNECT AIR INTAKE CONNECTOR

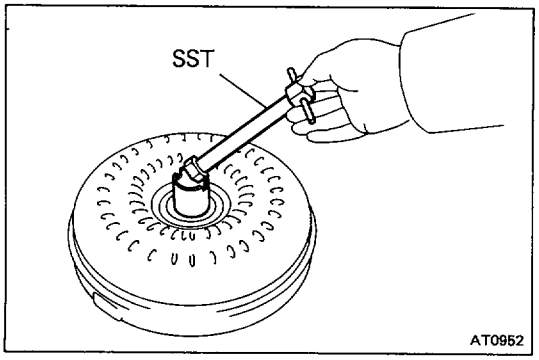
27. CONNECT BATTERY CABLE TO NEGATIVE (–) TERMINAL



28. FILL TRANSMISSION WITH ATF
    (See page AT-116)
    CAUTION: Do not overfill.
    Fluid type: ATF DEXRON® II

29. CHECK FLUID LEVEL

30. PERFORM ROAD TEST
    Check for abnormal noise, shock, slippage, correct shift points and smooth operation.



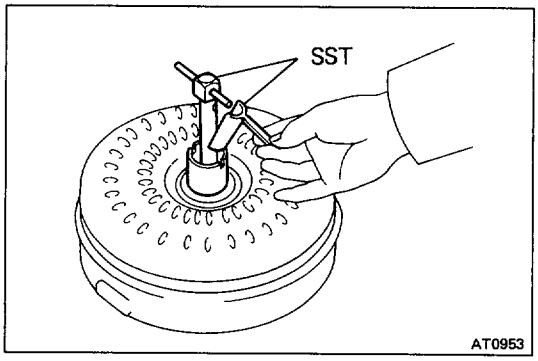
TORQUE CONVERTER AND DRIVE PLATE

INSPECTION OF TORQUE CONVERTER AND DRIVE PLATE

1. INSPECT ONE-WAY CLUTCH

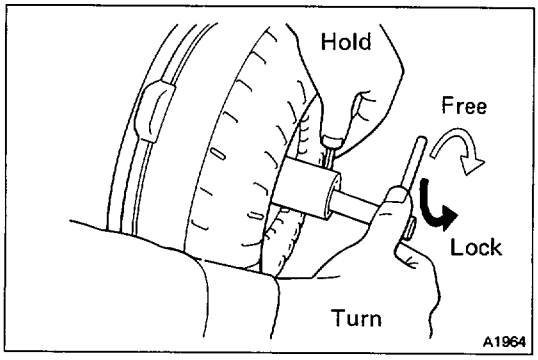
(a) Insert SST into the inner race of the one-way clutch.

SST 09350-30020 (09351-32010)



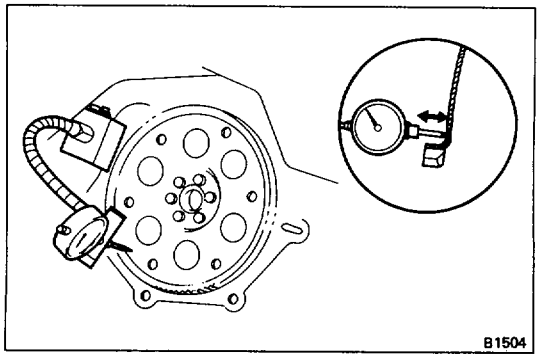
(b) Insert SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.

SST 09350-30020 (09351-32020)



(c) With the torque converter made stand, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.

If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.

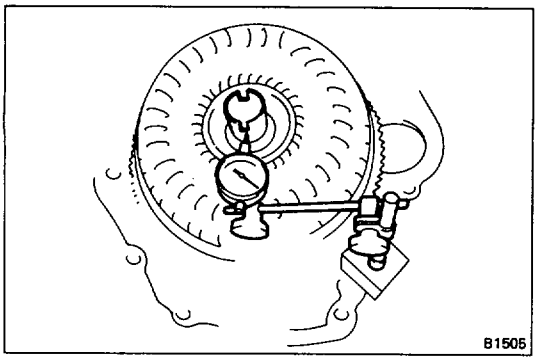


2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 850 kg-cm (61 ft-lb, 83 N·m)



3. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

(a) Temporarily mount the torque converter to the drive plate. Set up a dial indicator.

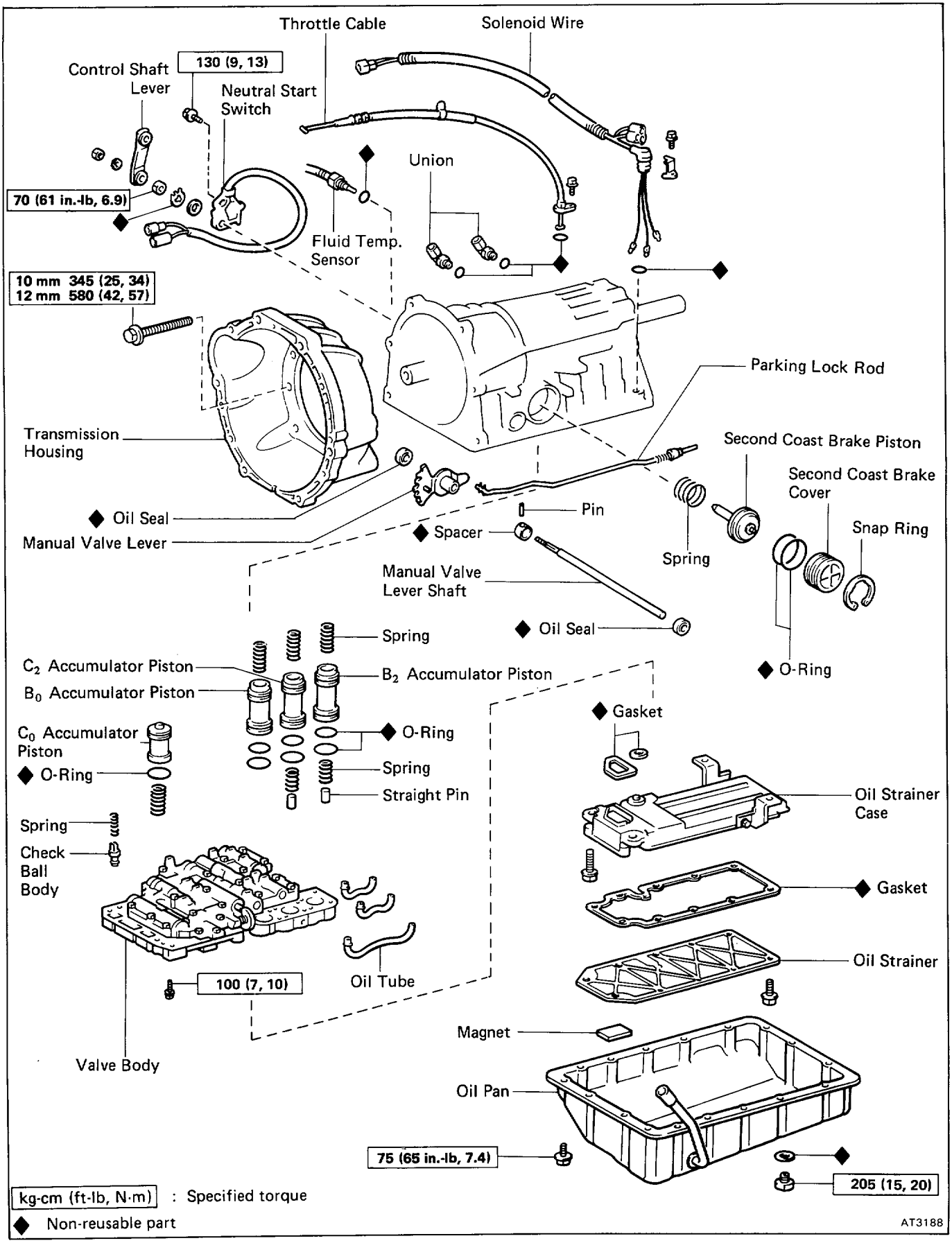
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.

NOTE: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter.

REMOVAL OF COMPONENT PARTS

COMPONENTS

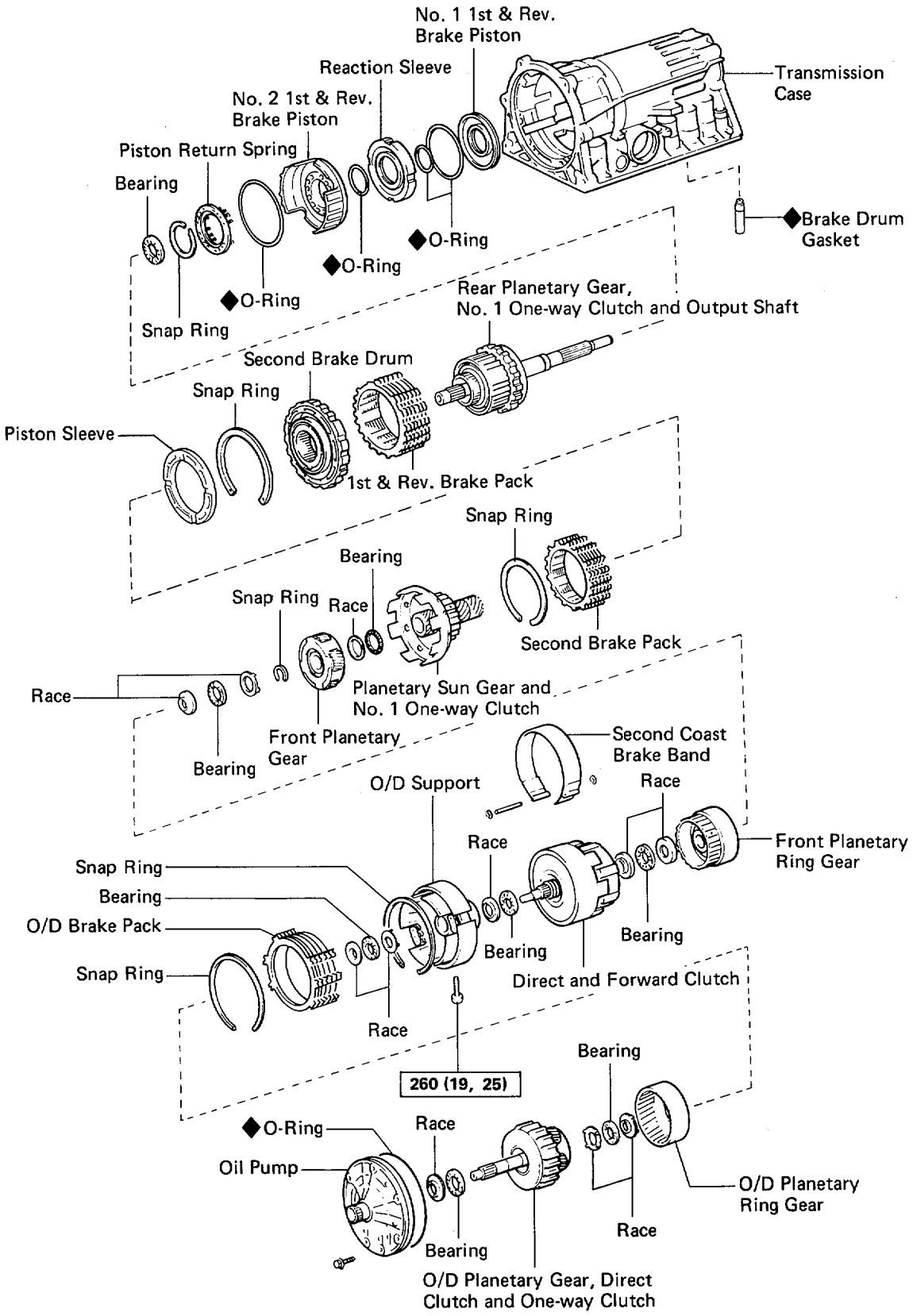


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

AT3188

COMPONENTS (Cont'd)

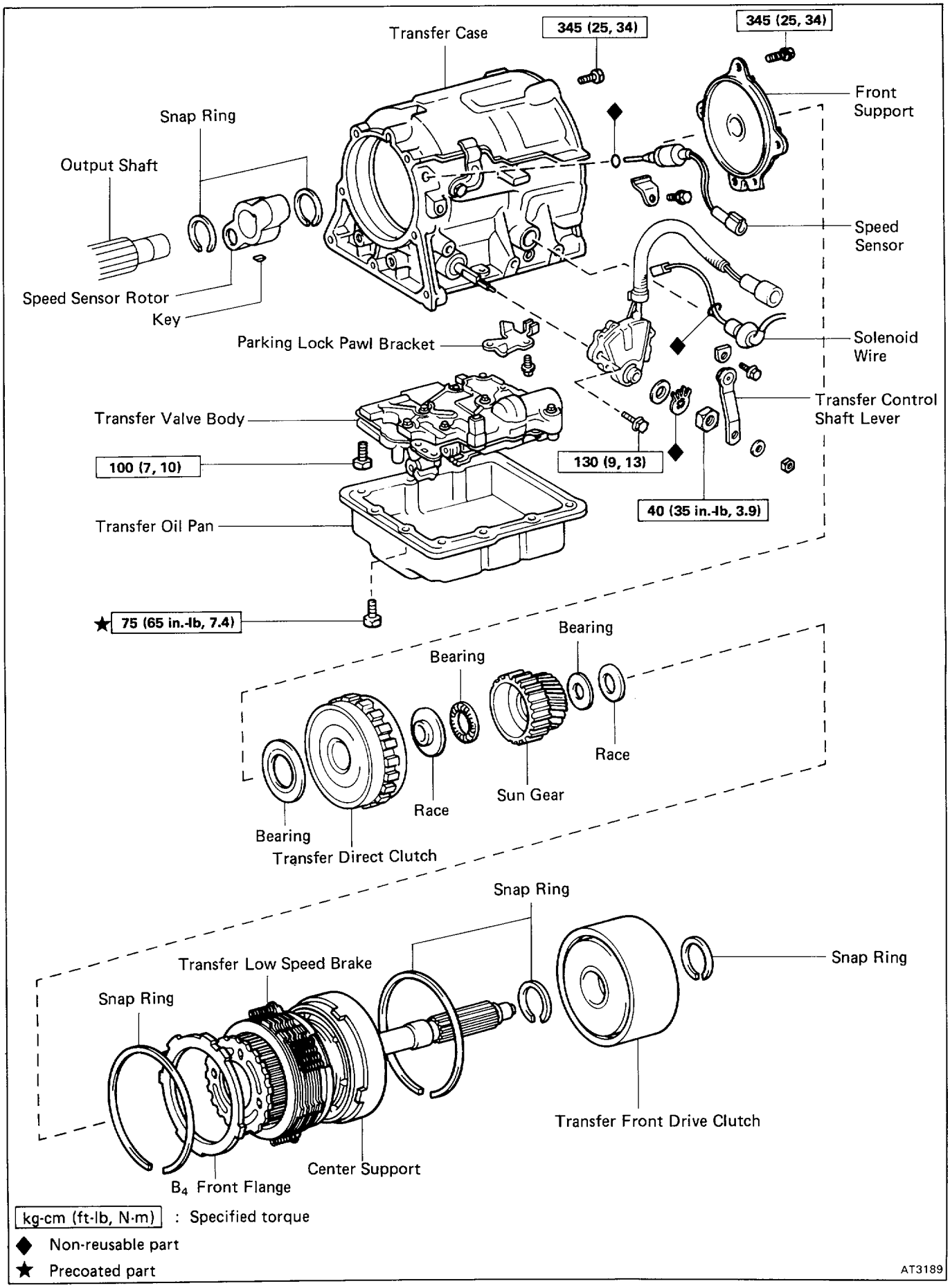


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

AT3258

COMPONENTS (Cont'd)



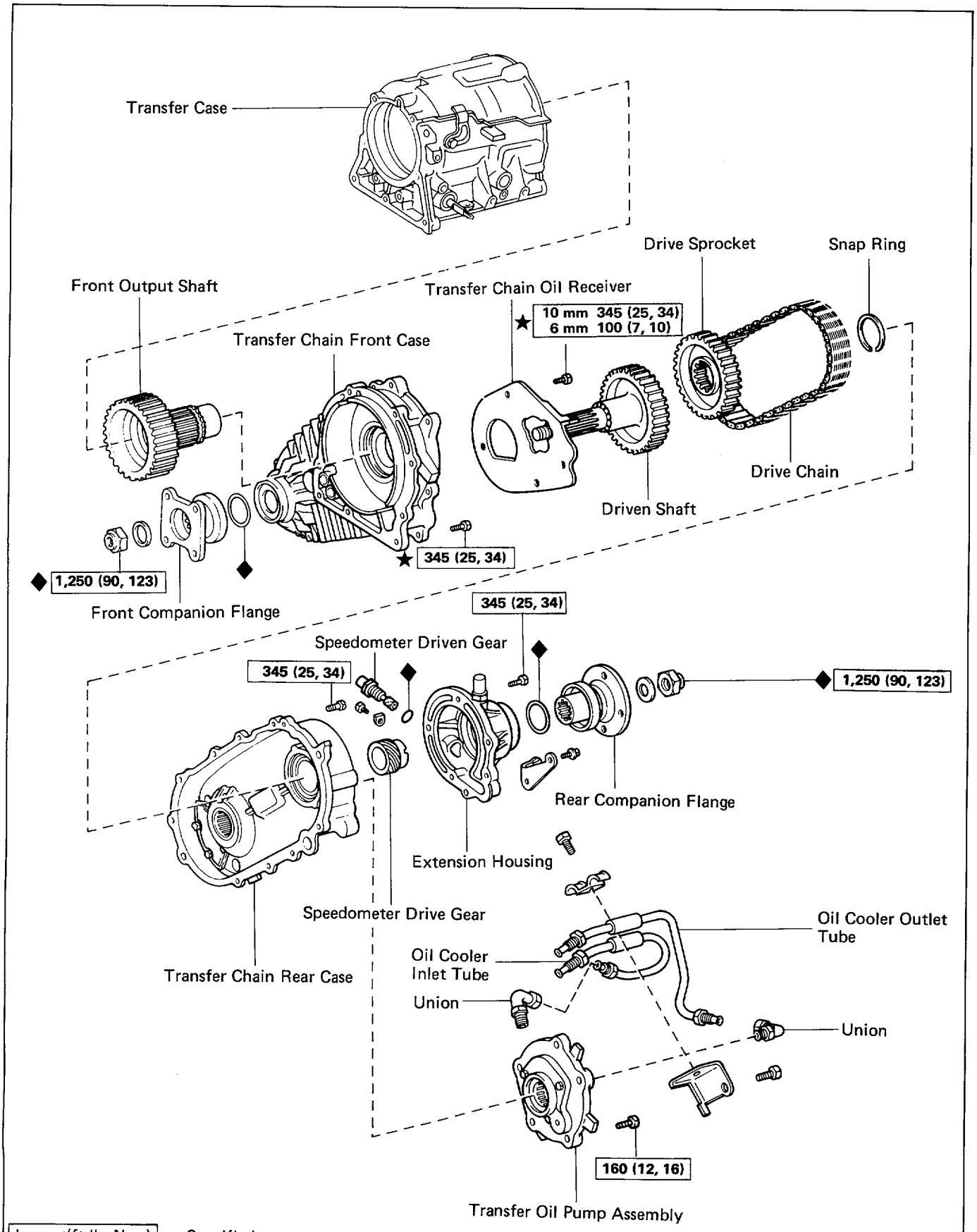
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

★ Precoated part

AT3189

COMPONENTS (Cont'd)

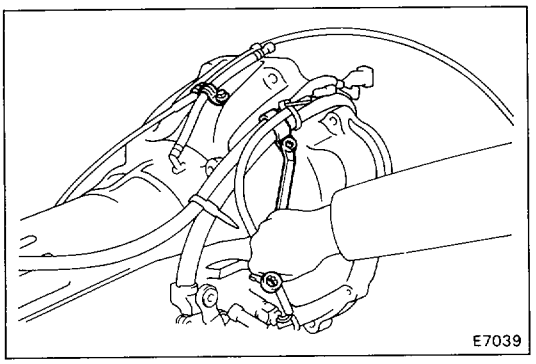


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

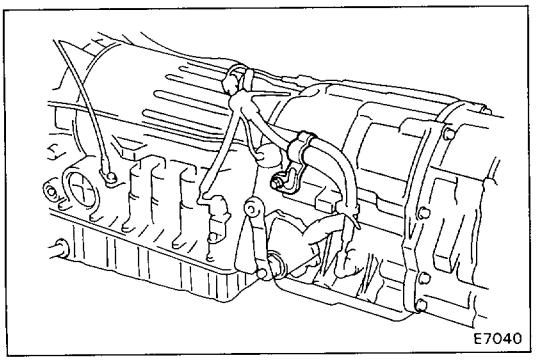
★ Precoated part

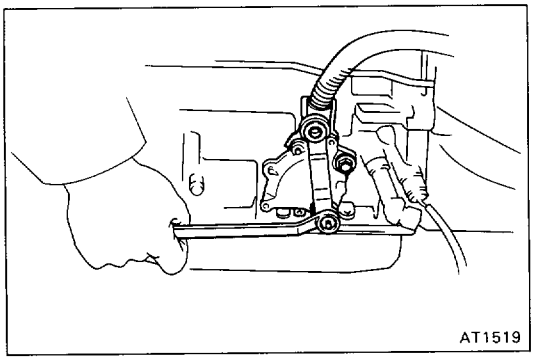
AT3190



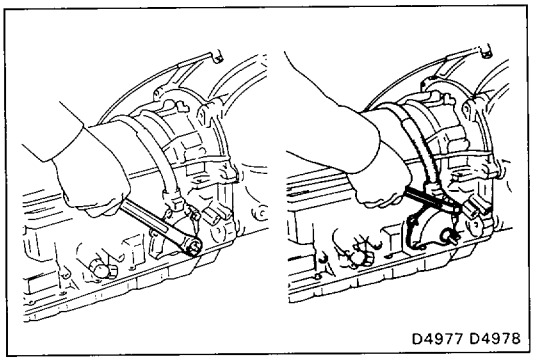
SEPARATE BASIC SUBASSEMBLY

1. **REMOVE WIRE HARNESS CLAMPS AND THROTTLE CABLE CLAMP**

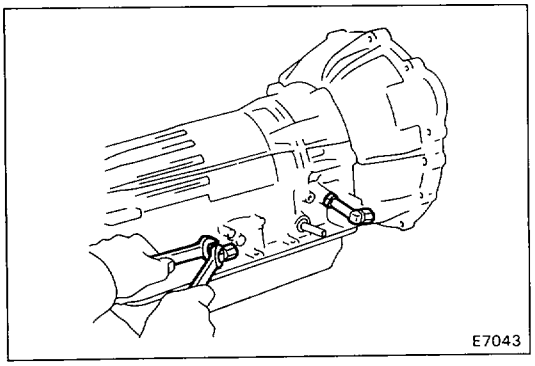




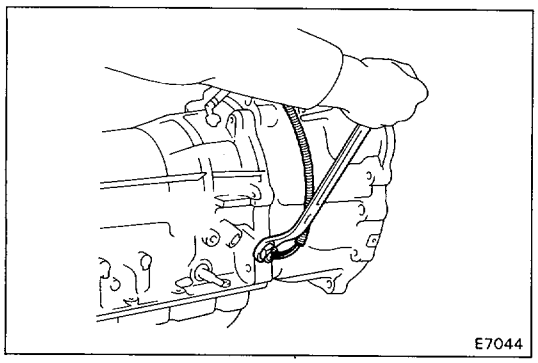
2. **REMOVE TRANSMISSION CONTROL SHAFT LEVER**



3. **REMOVE NEUTRAL START SWITCH**
   (a) Unstake the lock washer.
   (b) Remove the nut and bolt, and then remove the neutral start switch.
   (c) Remove the lock washer and grommet.



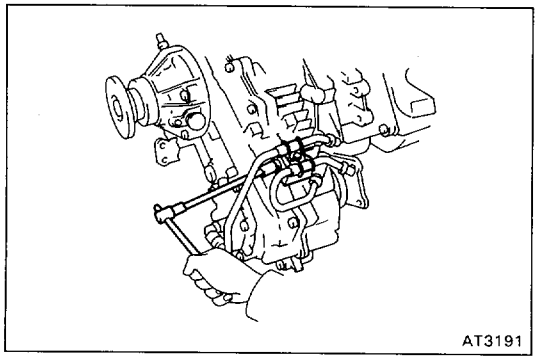
4. **REMOVE TRANSMISSION SIDE UNIONS**
   (a) Remove the two unions.
   (b) Remove the O-ring from the both unions.


E7044

5. REMOVE TRANSMISSION FLUID TEMPERATURE SENSOR

(a) Remove the temperature sensor.

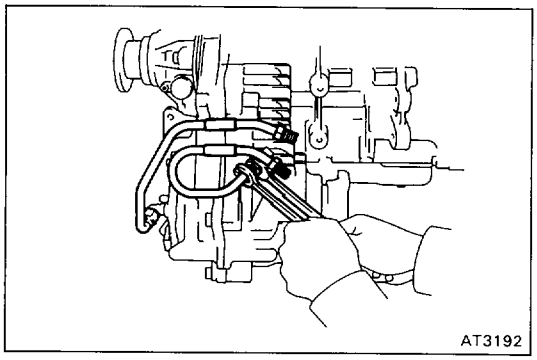
(b) Remove the O-ring from the sensor.


AT3191

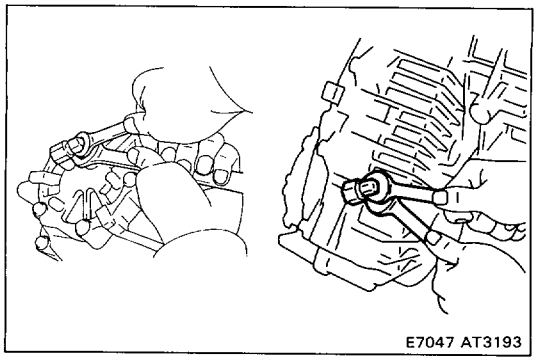
6. REMOVE TRANSFER OIL COOLER TUBES

(a) Remove the two bolts.

(b) Remove the tube clamp and bracket.


AT3192

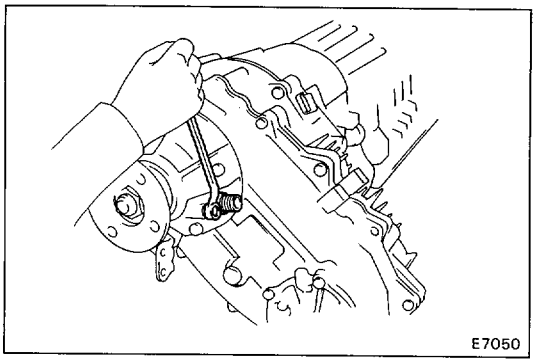
(c) Remove the two oil cooler tubes.


E7047 AT3193

7. REMOVE TRANSFER SIDE UNIONS

(a) Remove the two unions.

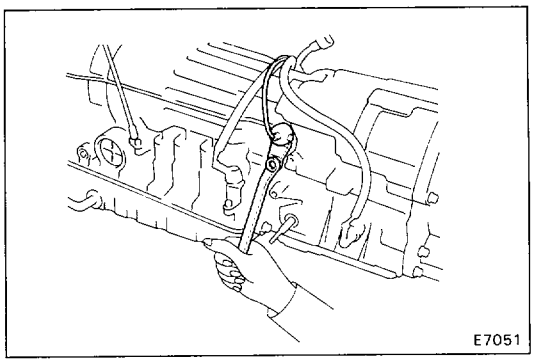
(b) Remove the O-ring from the both unions.


E7050

8. REMOVE SPEEDOMETER DRIVEN GEAR

(a) Remove the speedometer driven gear.

(b) Remove the O-ring from it.

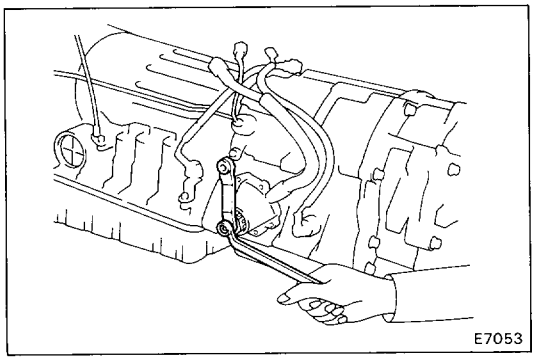


9. REMOVE SPEED SENSOR

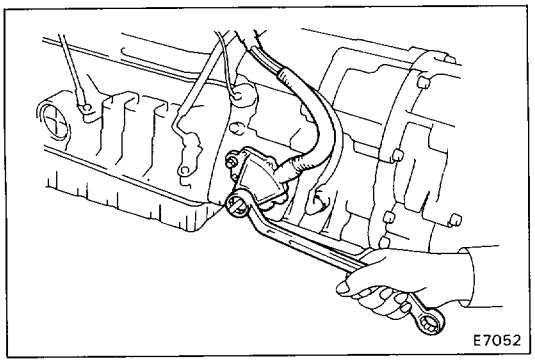
(a) Disconnect the connector.

(b) Remove the speed sensor.

(c) Remove the O-ring from it.



10. REMOVE TRANSFER CONTROL SHAFT LEVER

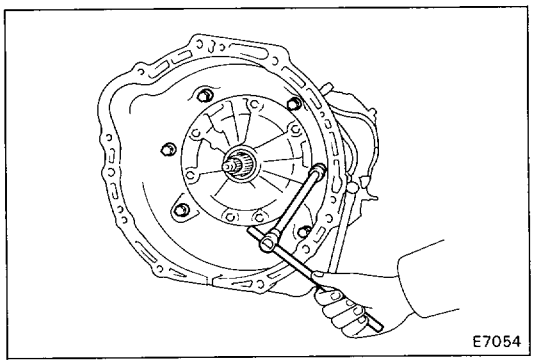


11. REMOVE TRANSFER POSITION SWITCH

(a) Unstake the lock washer.

(b) Remove the nut and bolt, and then remove the transfer position switch.

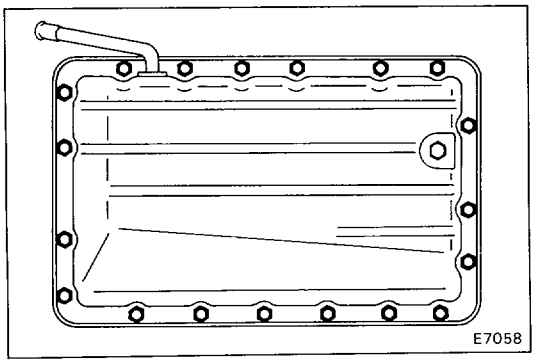
(c) Remove the lock washer and grommet.



12. REMOVE TRANSMISSION HOUSING

(a) Remove the six bolts.

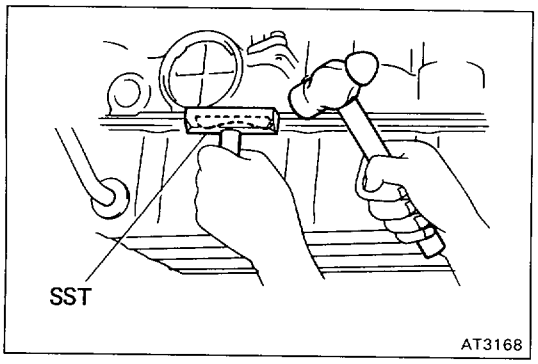
(b) Remove the transmission housing.



13. REMOVE TRANSMISSION OIL PAN

CAUTION: Do not turn over the transmission as this will contaminate the valve body with the foreign material in the bottom of the pan.

(a) Remove the nineteen bolts.

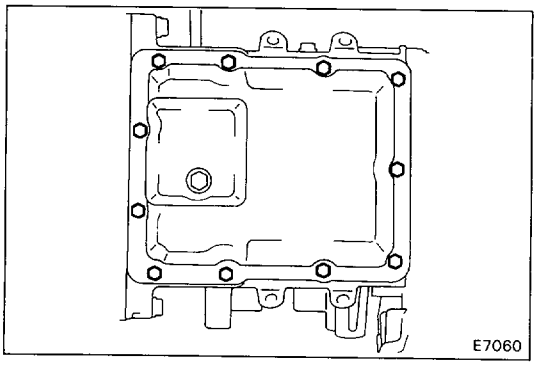


(b) Insert the blade of SST between the transmission case and oil pan, cut off applied sealer.

SST 09032-00100

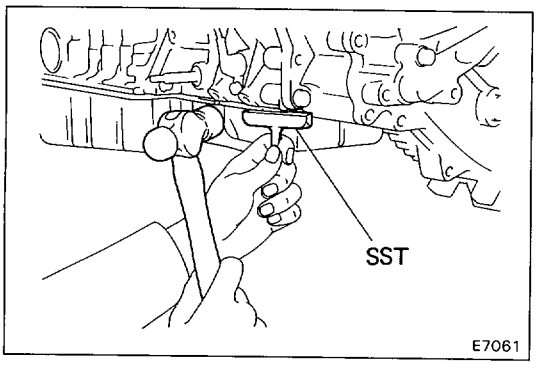
CAUTION: Be careful not to damage the oil pan flange.

(c) Remove pan by lifting the transmission case.



14. REMOVE TRANSFER OIL PAN

(a) Remove the eleven bolts.

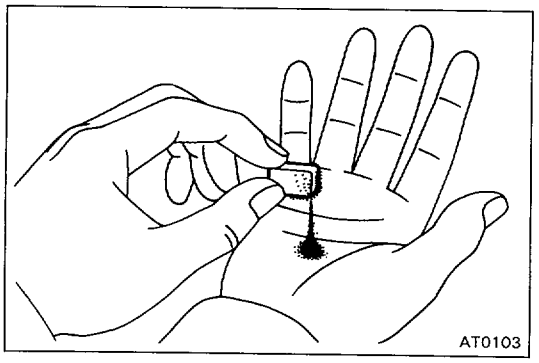


(b) Insert the blade of SST between the transfer case and oil pan, cut off applied sealer.

SST 09032-00100

CAUTION: Be careful not to damage the oil pan flange.

(c) Remove the transfer oil pan.

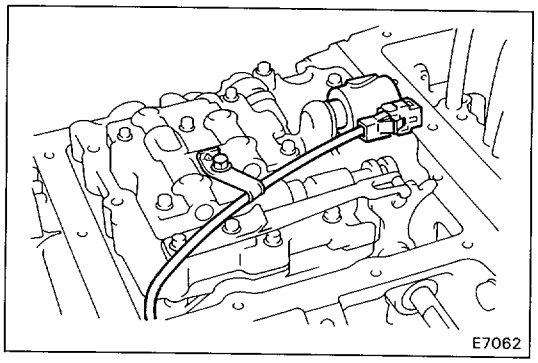


15. EXAMINE PARTICLES IN PANS

Remove the magnets and use them to collect any steel chips.

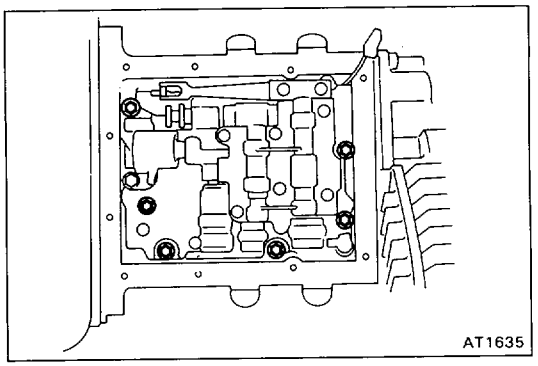
Look carefully at the chips and particles in the pans and on the magnets to anticipate what type of wear you will find in the transmission and transfer:

Steel (magnetic) ..... bearing, gear and clutch plate wear
Brass (non-magnetic) .... bushing wear

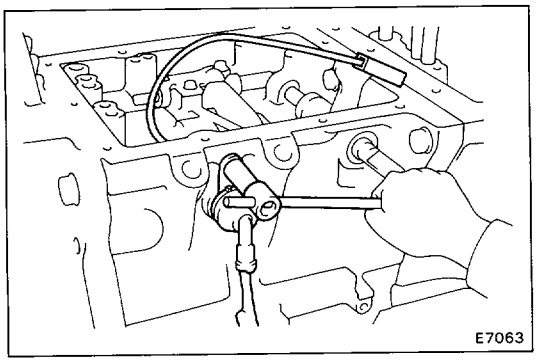


16. REMOVE TRANSFER VALVE BODY AND SOLENOID WIRING

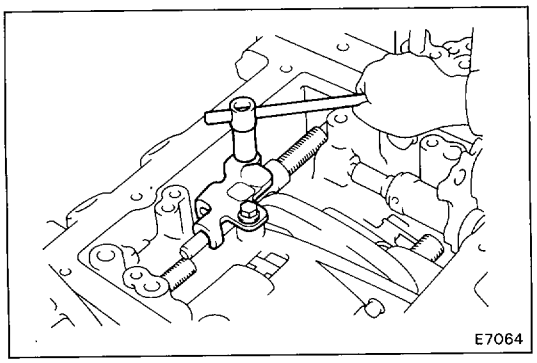
(a) Disconnect the connector from No. 4 solenoid.



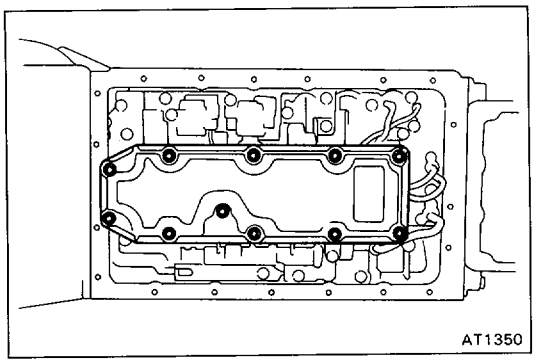
(b) Remove the six bolts and valve body.



(c) Remove the solenoid wiring stopper plate.
(d) Pull out the solenoid wiring from the transfer case.
(e) Remove the O-ring from the grommet.

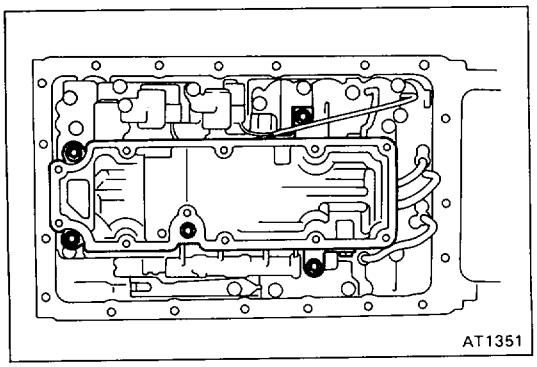


17. REMOVE PARKING LOCK PAWL BRACKET

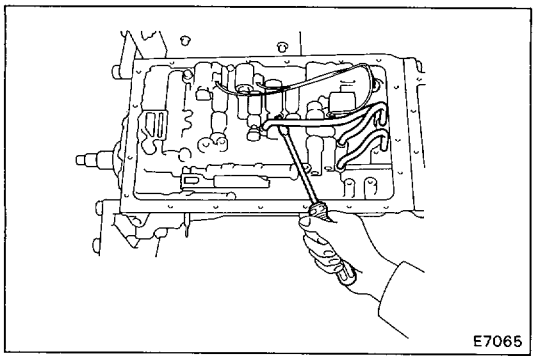


18. REMOVE OIL STRAINER AND GASKETS

(a) Remove the eleven bolts holding the oil strainer to the oil strainer case.
(b) Remove the gasket.

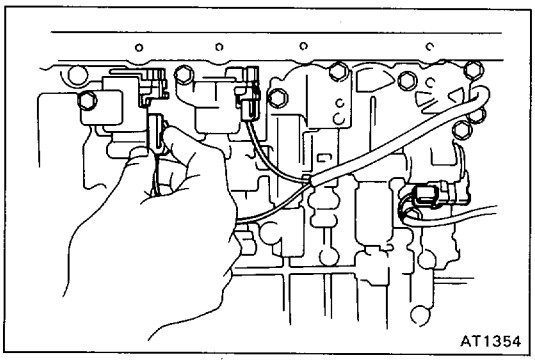


(c) Remove the five bolts and oil strainer case.
(d) Remove the two gaskets from the case.



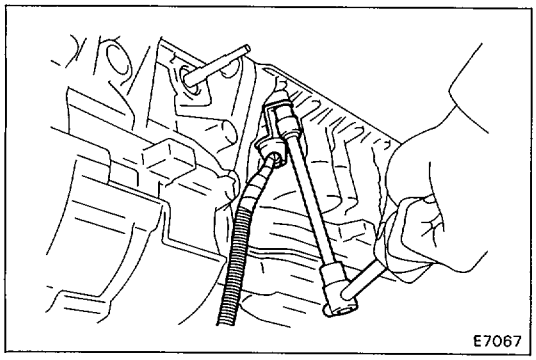
19. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the three tubes.



20. REMOVE TRANSMISSION SOLENOID WIRING

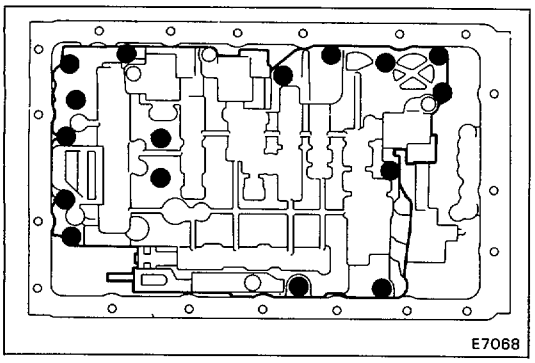
(a) Disconnect the three connectors from No. 1, No. 2 and lock-up solenoids.



(b) Remove the stopper plate from the case.

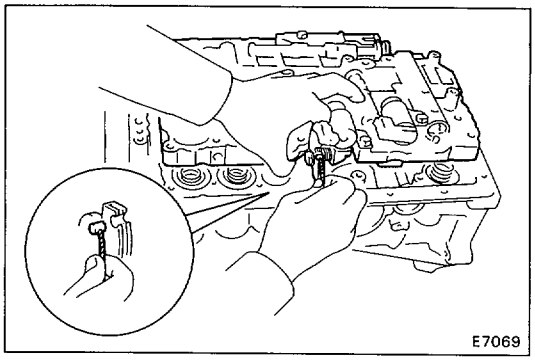
(c) Pull out the solenoid wiring from the transmission case.

(d) Remove the O-ring from the grommet.

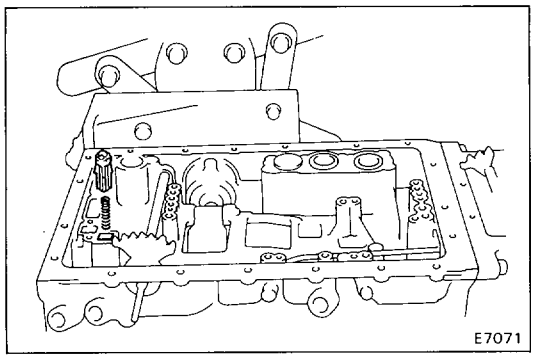


21. REMOVE TRANSMISSION VALVE BODY

(a) Remove the sixteen bolts.

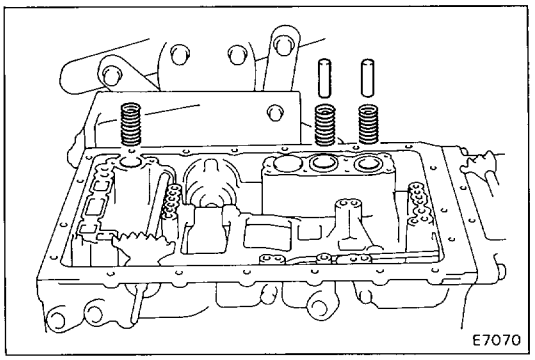


(b) Disconnect the throttle cable from the cam and remove the valve body.

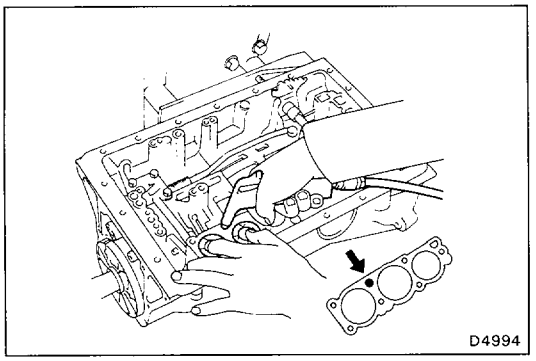


22. REMOVE CHECK BALL BODY, ACCUMULATOR SPRINGS, PINS AND PISTONS

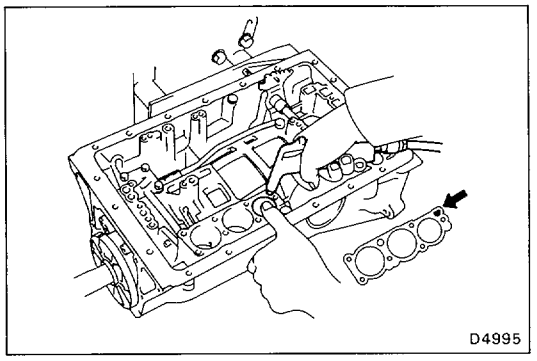
(a) Remove the check ball body and spring.



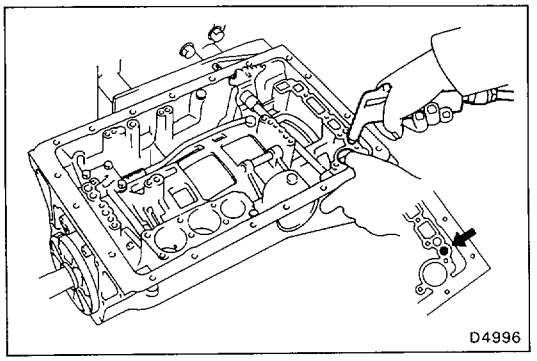
(b) Remove the three springs and two pins from the accumulator pistons.



(c) Applying compressed air to the oil hole, remove the B_2 and C_2 accumulator pistons and two springs.

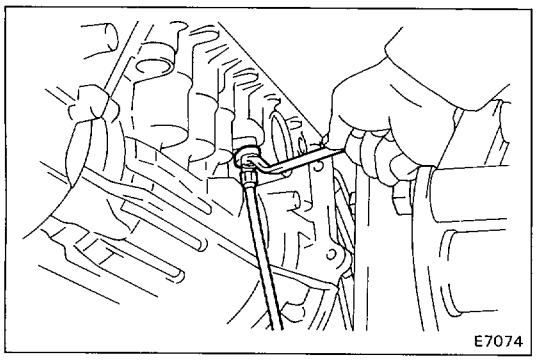


(d) Applying compressed air to the oil hole, remove the B_0 accumulator piston and spring.



(e) Applying compressed air to the oil hole, remove the C_0 accumulator piston.

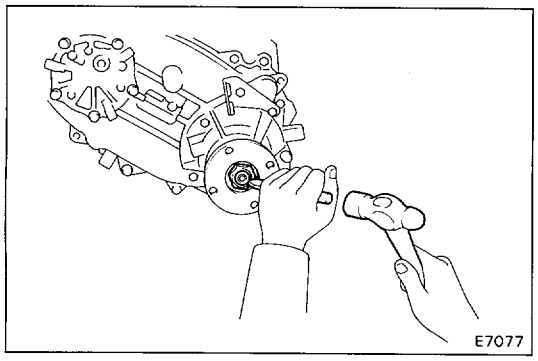
(f) Remove the O-rings from each piston.



23. REMOVE THROTTLE CABLE

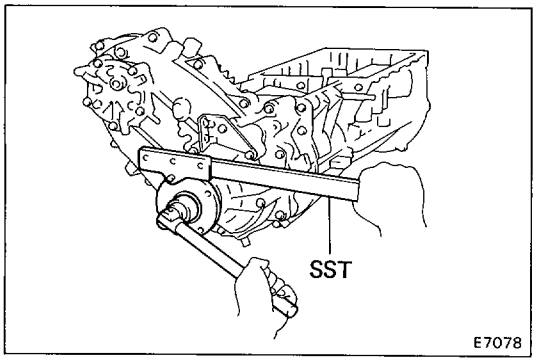
(a) Remove the retaining bolt and pull out the throttle cable.

(b) Remove the O-ring from the cable.



24. REMOVE REAR COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and washer.

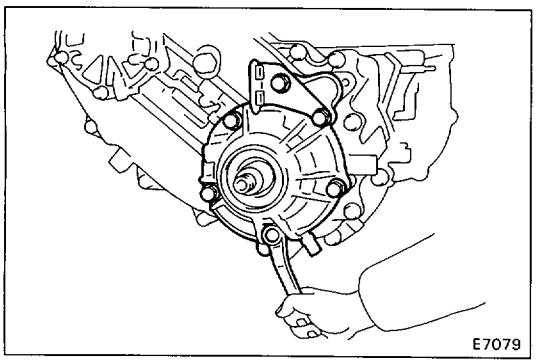
SST 09330-00021

(c) Remove the companion flange.

(d) Remove the O-ring from the companion flange.

25. REMOVE FRONT COMPANION FLANGE

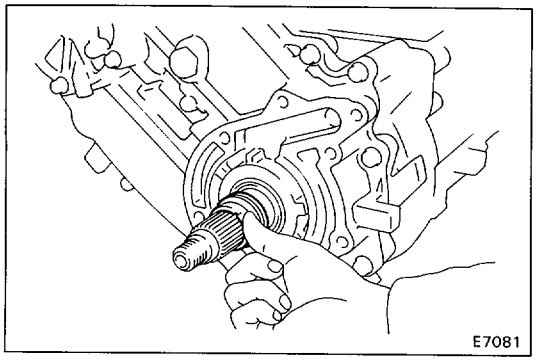
Remove the front companion flange in the same way as the rear companion flange.



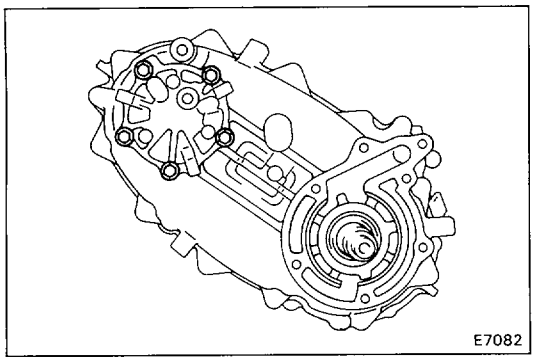
26. REMOVE TRANSFER EXTENSION HOUSING

(a) Remove the six bolts.

(b) Separate the extension housing.



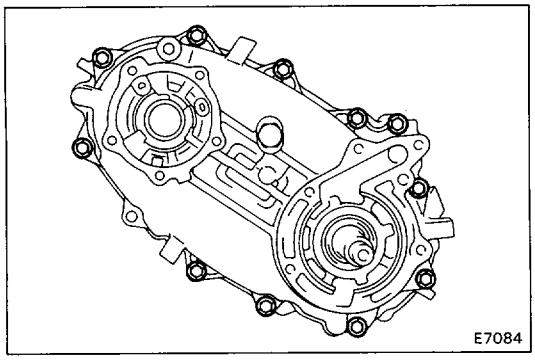
27. REMOVE SPEEDOMETER DRIVE GEAR



28. REMOVE OIL PUMP ASSEMBLY

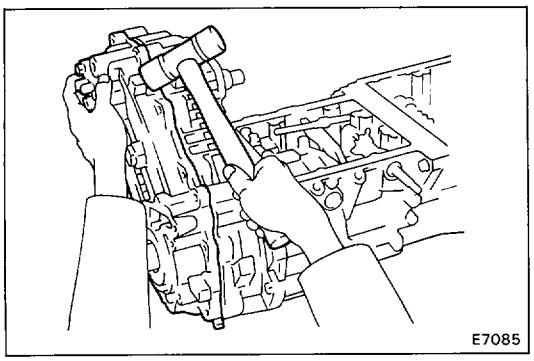
(a) Remove the five bolts.

(b) Separate the oil pump assembly.

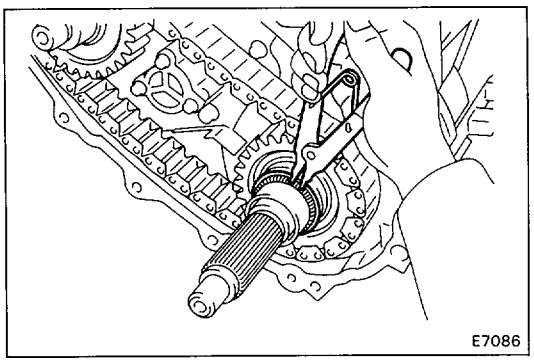


29. REMOVE TRANSFER CHAIN REAR CASE

(a) Remove the eleven bolts.

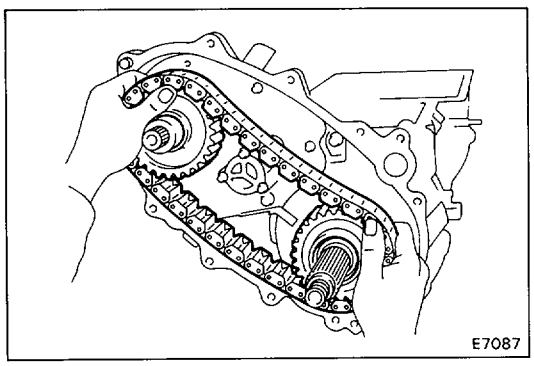


(b) Using a plastic hammer, separate the transfer chain rear case from the transfer chain front case.

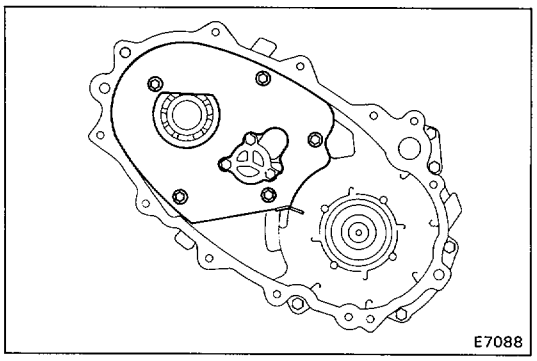


30. REMOVE DRIVE CHAIN WITH DRIVE SPROCKET AND DRIVEN SHAFT

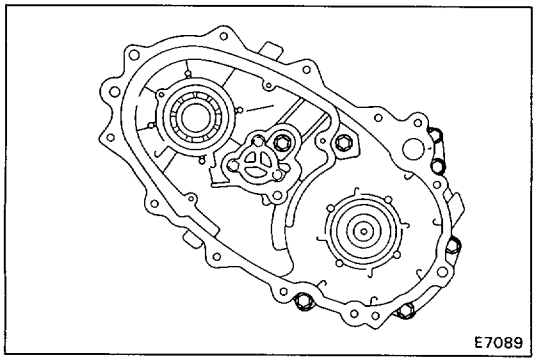
(a) Remove the snap ring.



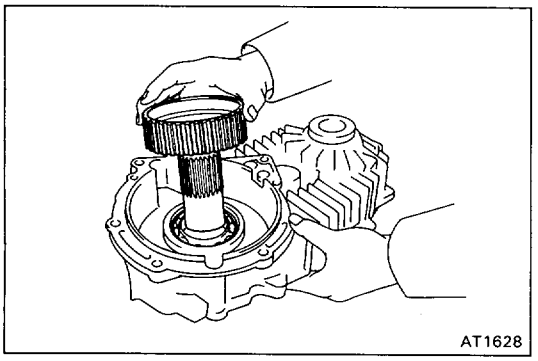
(b) Pull out the chain with the drive sprocket and driven shaft.



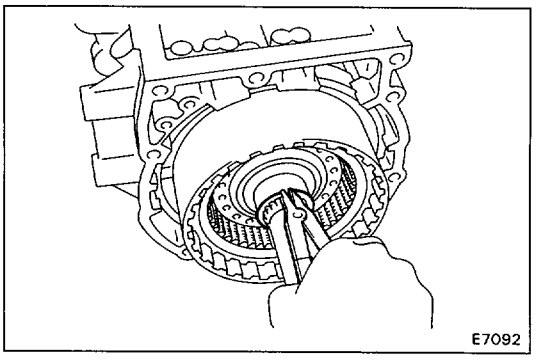
31. REMOVE TRANSFER CHAIN OIL RECEIVER



32. REMOVE TRANSFER CHAIN FRONT CASE WITH FRONT OUTPUT SHAFT

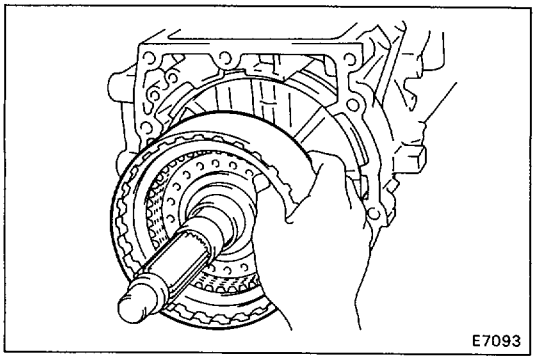


33. REMOVE FRONT OUTPUT SHAFT FROM TRANSFER CHAIN FRONT CASE

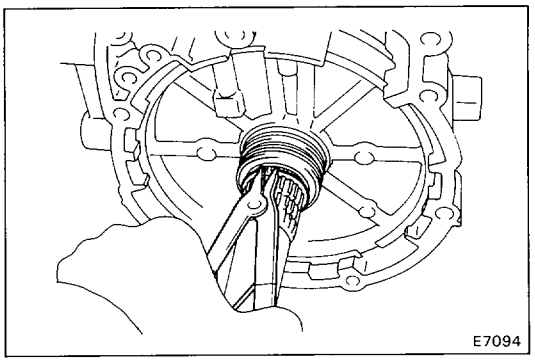


34. REMOVE TRANSFER FRONT DRIVE CLUTCH

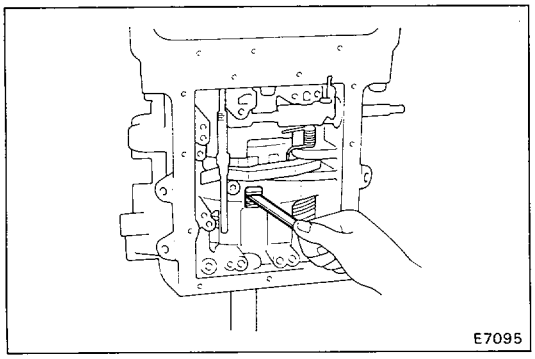
(a) Remove the snap ring.



(b) Grasp and pull out the transfer front drive clutch.



(c) Remove the snap ring from the output shaft.

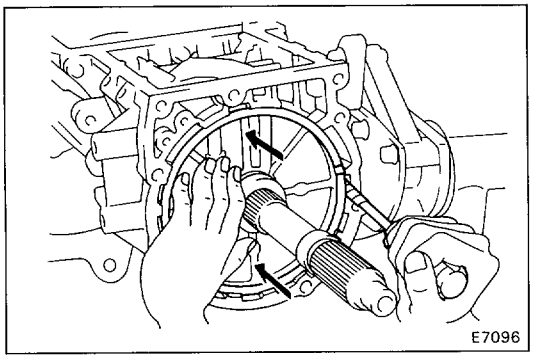


35. CHECK PACK CLEARANCE OF TRANSFER LOW SPEED BRAKE

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

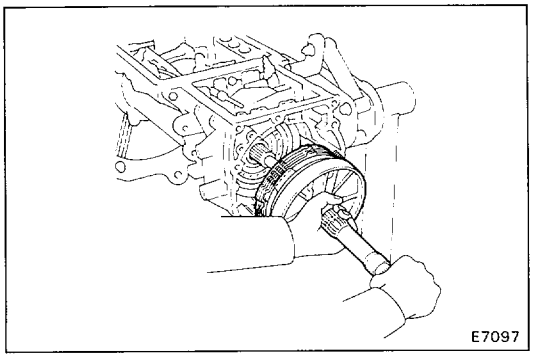
Clearance: 0.91 — 2.10 mm (0.0358 — 0.0827 in.)

If the values are nonstandard, inspect the discs.
(See page AT-242)

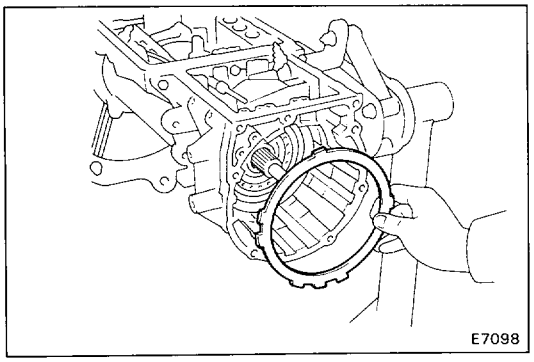


36. REMOVE TRANSFER CENTER SUPPORT AND TRANSFER LOW SPEED BRAKE

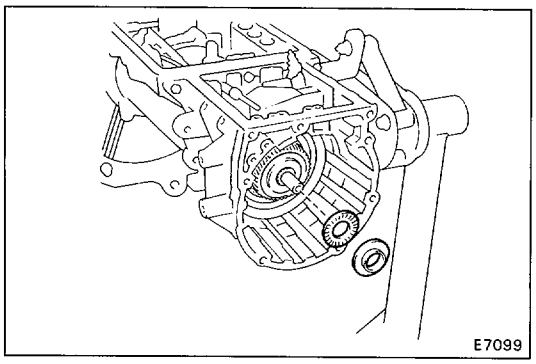
(a) Pushing the center support forward, remove the snap ring.



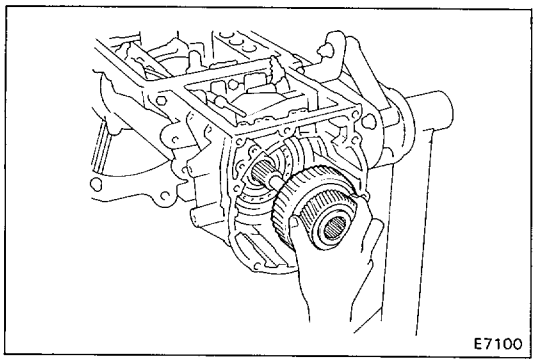
(b) Grasp the shaft and pull out the transfer center support with transfer low speed brake assembly.



(c) Remove the B_4 front flange from the case.

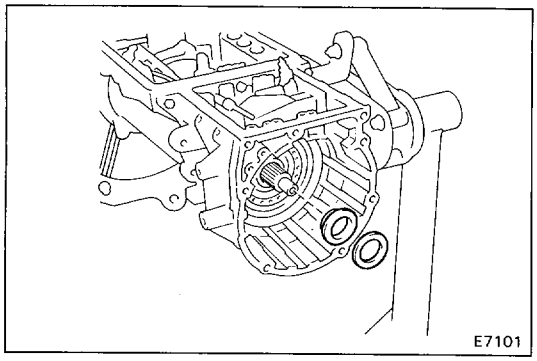


(d) Remove the race and assembled bearing and race from the sun gear.

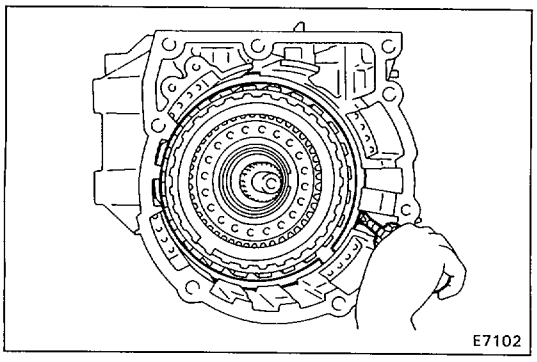


37. REMOVE SUN GEAR

(a) Pull out the sun gear.

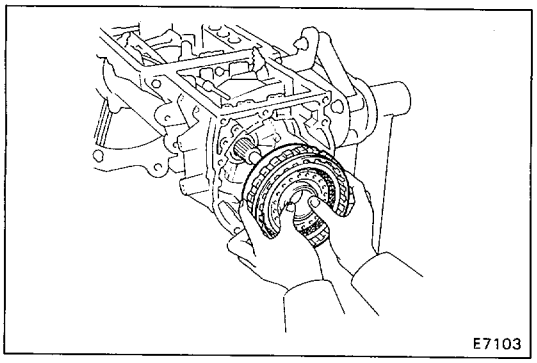


(b) Remove the race and assembled bearing and race from the transfer direct clutch.

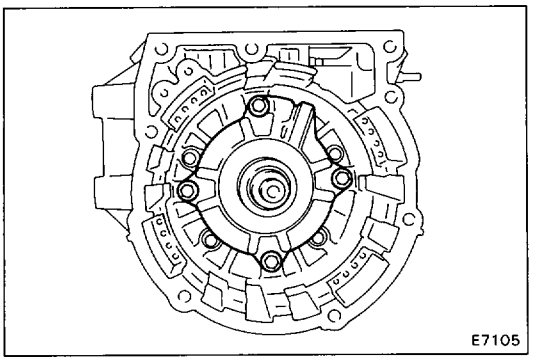


38. REMOVE TRANSFER DIRECT CLUTCH

(a) Remove the snap ring.

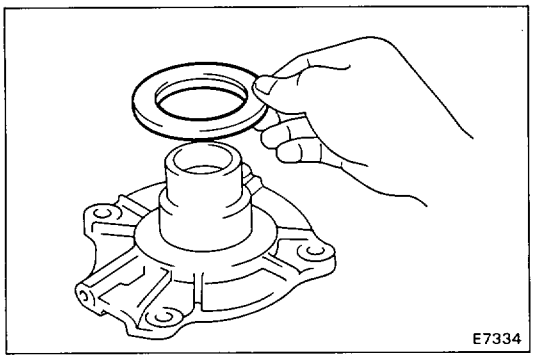


(b) Remove the transfer direct clutch from the transfer case.

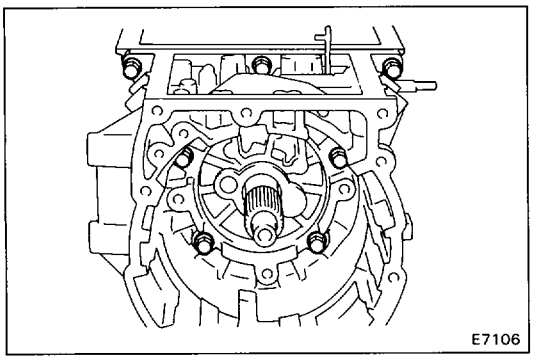


39. REMOVE FRONT SUPPORT

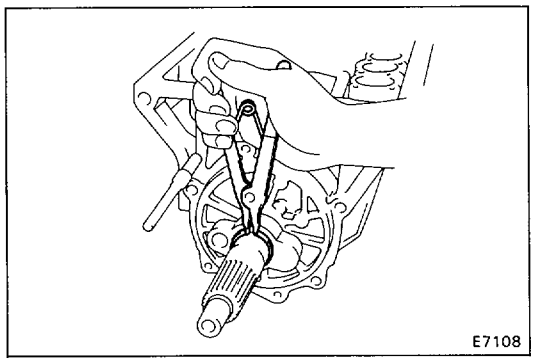
(a) Remove the front support from the transfer case.



(b) Remove the assembled bearing and race from the front support.

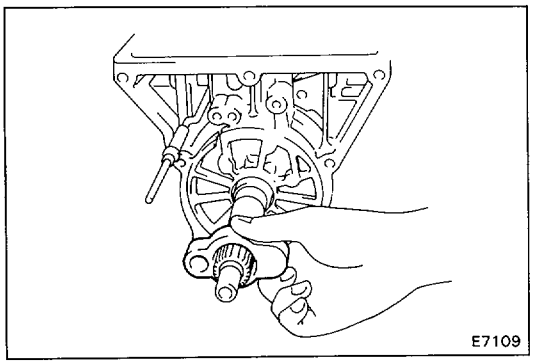


40. REMOVE TRANSFER CASE



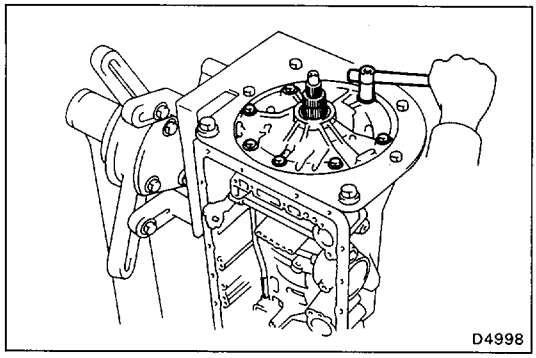
41. REMOVE SPEED SENSOR ROTOR AND KEY

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the sensor rotor and key.

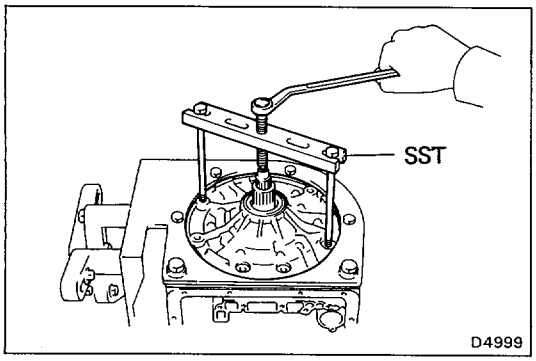
(c) Using snap ring pliers, remove the front snap ring.



42. REMOVE OIL PUMP

(a) Stand up the transmission.

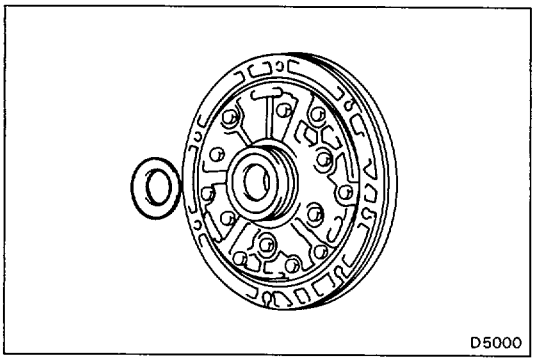
(b) Remove the seven bolts holding the oil pump to the transmission case.



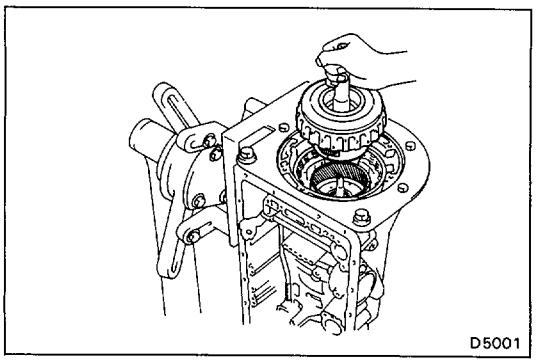
(c) Using SST, remove the oil pump.

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(d) Remove the O-ring from it.

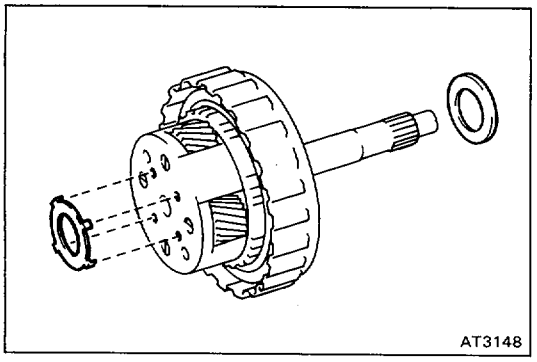


(e) Remove the race from the oil pump.

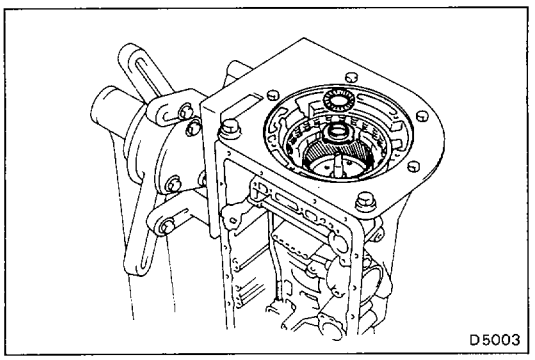


43. REMOVE OVERDRIVE PLANETARY GEAR UNIT WITH OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH

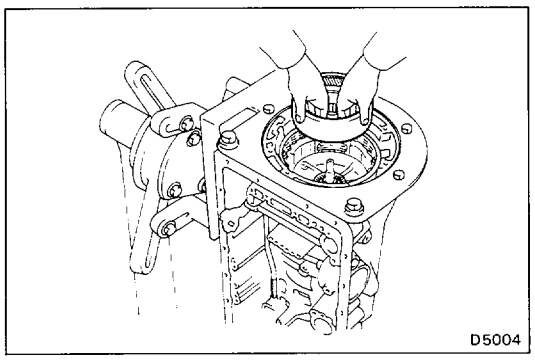
(a) Remove the overdrive planetary gear with the overdrive direct clutch and one-way clutch from the transmission case.



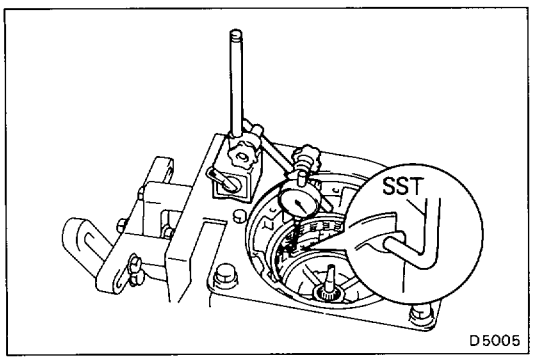
(b) Remove the race and assembled bearing and race.



(c) Remove the bearing and race.



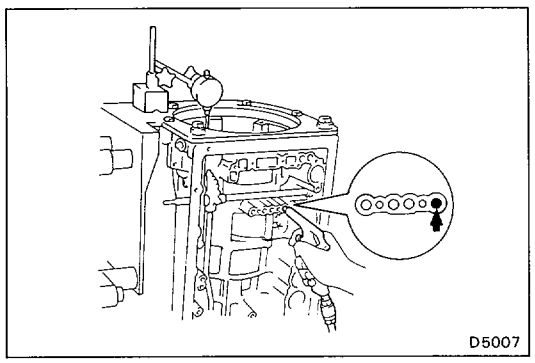
(d) Remove the overdrive planetary ring gear from the transmission case.



44. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the figure.

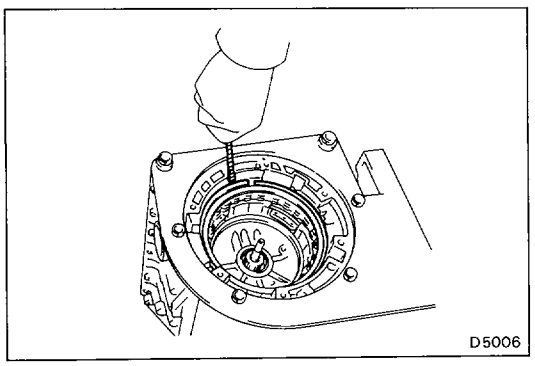
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(b) Measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

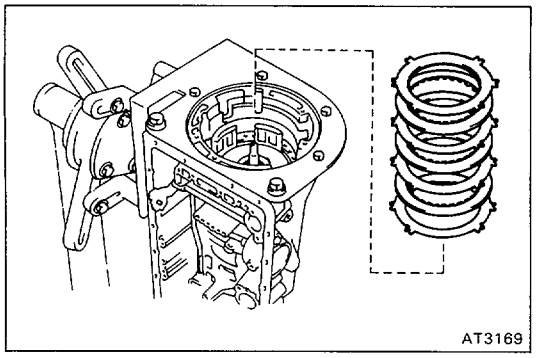
Piston stroke: 1.32 — 1.62 mm (0.0520 — 0.0638 in.)

If the values are nonstandard, inspect the discs.
(See page AT-197)



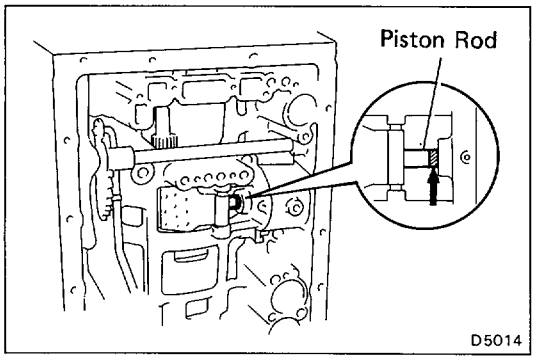
45. REMOVE FLANGES, PLATES AND DISCS OF OVERDRIVE BRAKE

(a) Remove the snap ring.



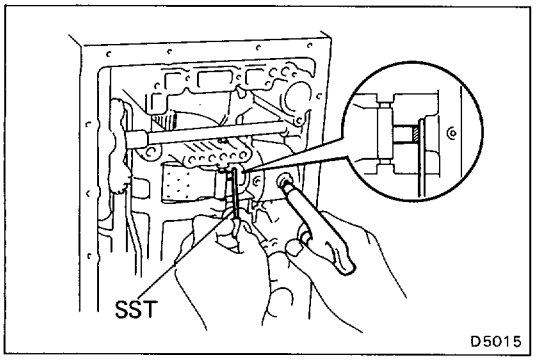
(b) Remove the two flanges, two plates and three discs as a set.

The method of inspection, refer to AT-197.



46. CHECK PISTON ROD STROKE OF SECOND COAST BRAKE

(a) Place a mark on the second coast brake piston rod as shown in the figure.

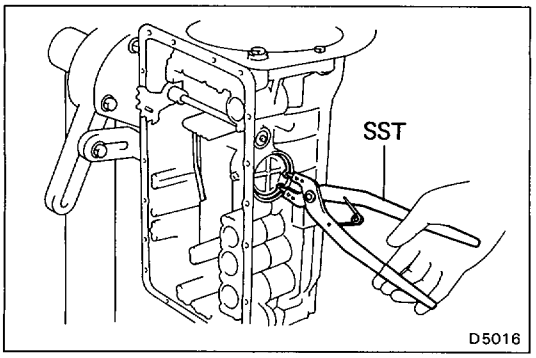


(b) Using SST, measure the stroke applying the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

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Piston rod stroke: 1.5 — 3.0 mm (0.059 — 0.118 in.)

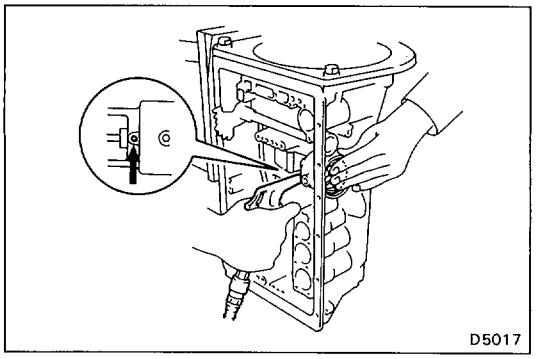
If the values are nonstandard, inspect the brake band. (See page AT-210)



47. REMOVE SECOND COAST BRAKE COVER, PISTON ASSEMBLY AND SPRING

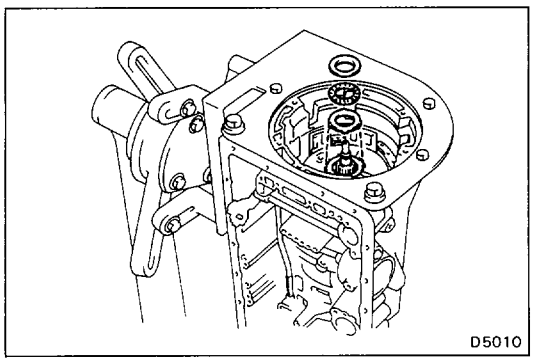
(a) Using SST, remove the snap ring.

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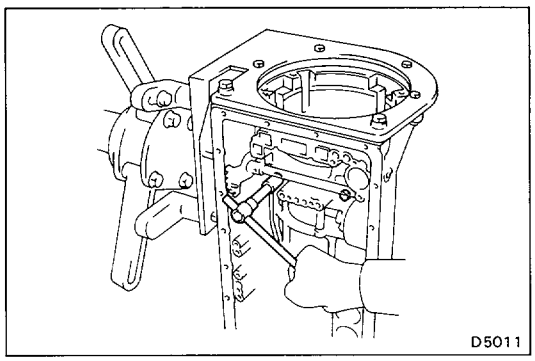
(b) Applying compressed air to the oil hole, remove the second coast brake cover, piston assembly and spring.

(c) Remove the two O-rings from the cover.

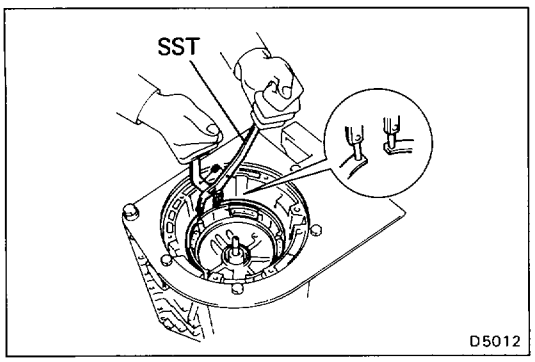


48. REMOVE OVERDRIVE SUPPORT ASSEMBLY

(a) Remove the bearing and two races.

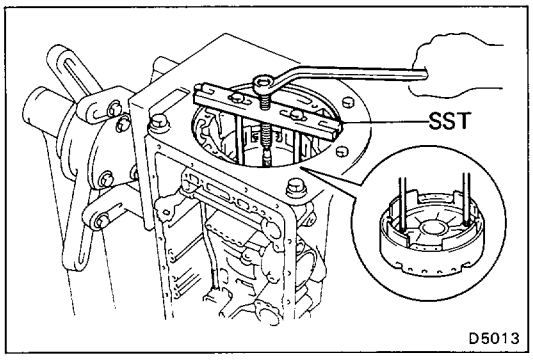


(b) Remove the two bolts holding the overdrive support assembly to the case.



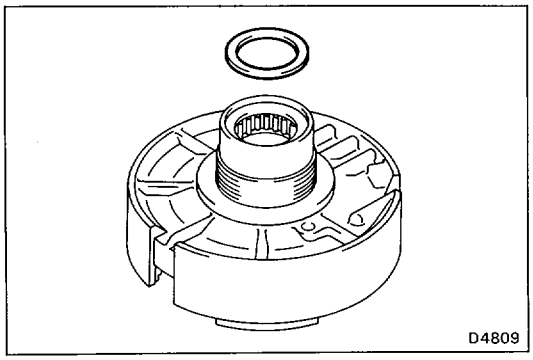
(c) Using SST, remove the snap ring.

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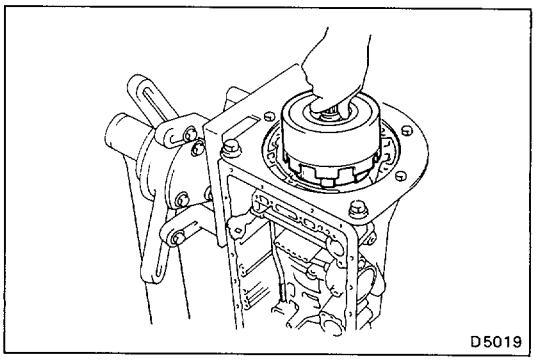


(d) Using SST, remove the overdrive support assembly.

SST 09350-30020 (09350-07020)

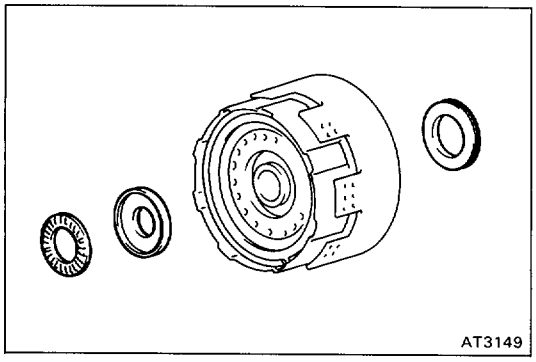


(e) Remove the race.

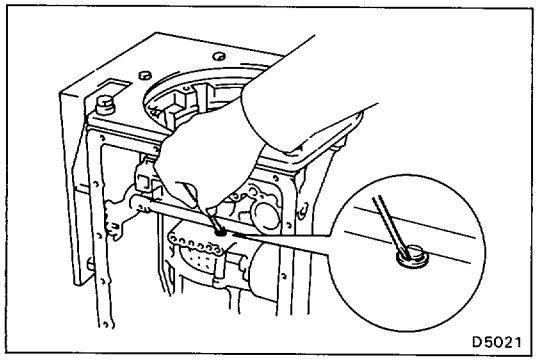


49. REMOVE DIRECT CLUTCH WITH FORWARD CLUTCH

(a) Remove the direct clutch with forward clutch from the case.



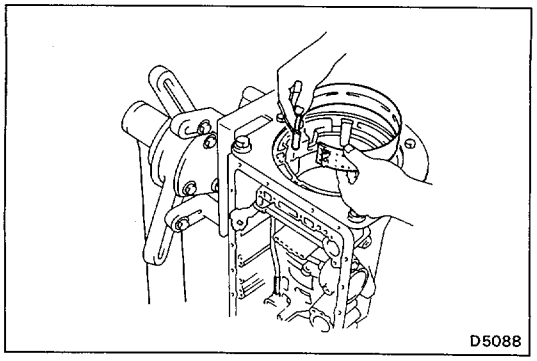
(b) Remove the two bearings and race.



50. REMOVE SECOND COAST BRAKE BAND

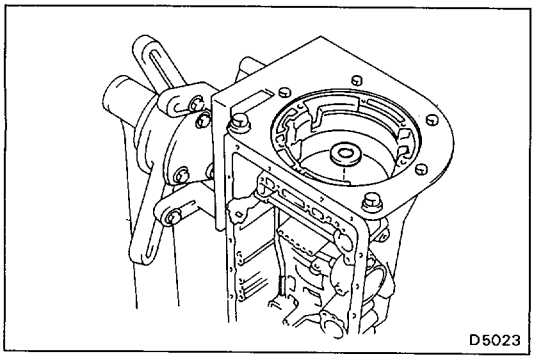
(a) Remove the E-ring from the pin.

(b) Remove the pin from the brake band.



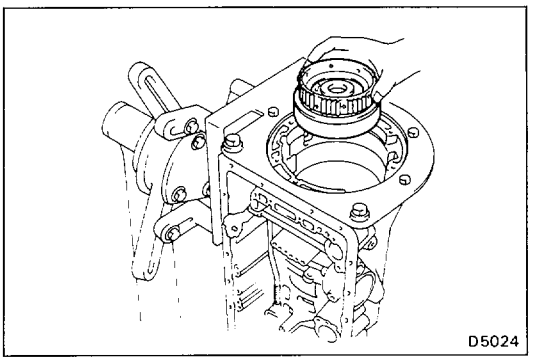
(c) Remove the second coast brake band from the case.

The method of inspection, refer to AT-210.

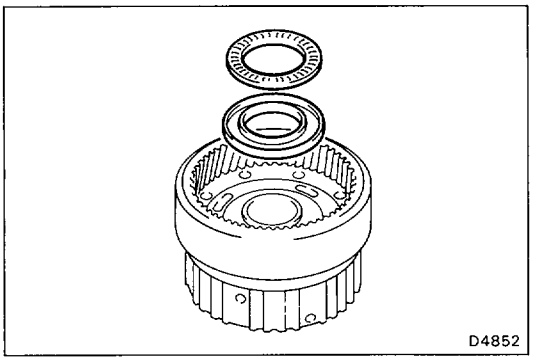


51. REMOVE FRONT PLANETARY GEAR UNIT

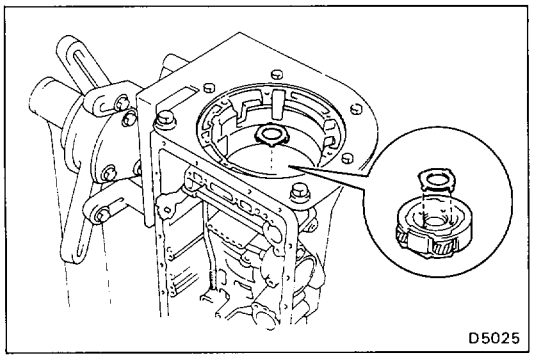
(a) Remove the race.



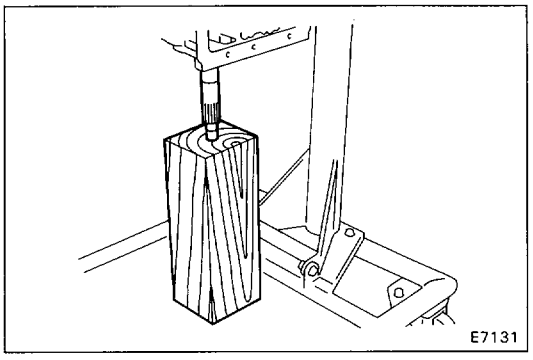
(b) Remove the front planetary ring gear from the case.



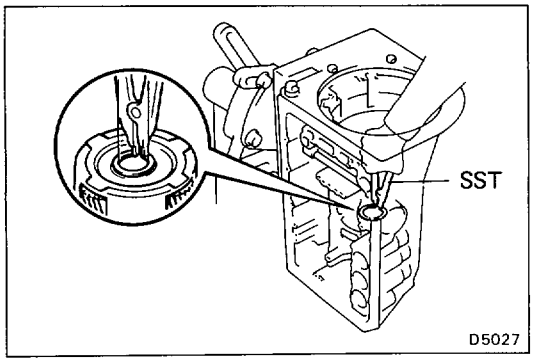
(c) Remove the bearing and race.



(d) Remove the race.

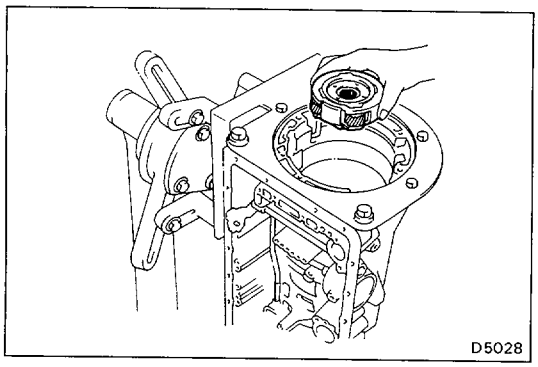


(e) With wooden blocks under the output shaft, stand the transmission on the output shaft.

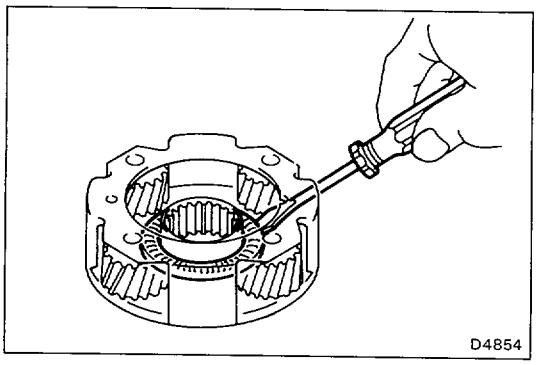


(f) Using SST, remove the snap ring.

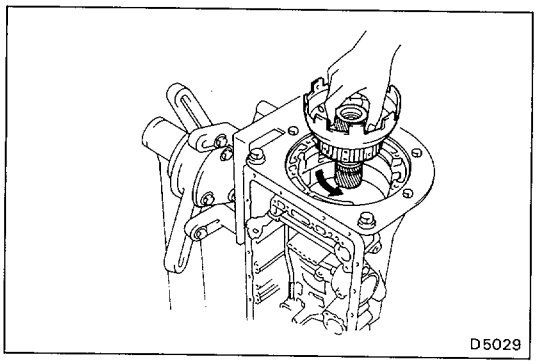
SST 09350-30020 (09350-07070)



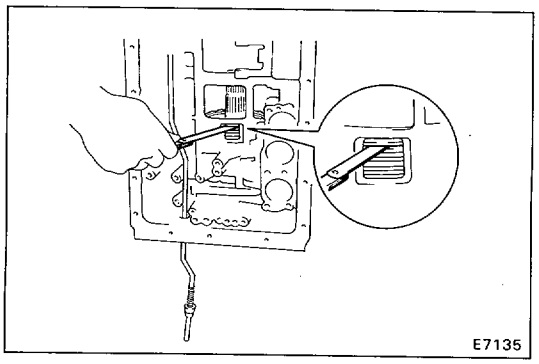
(g) Remove the front planetary gear from the case.



(h) Remove the bearing and race from the front planetary gear.



52. REMOVE PLANETARY SUN GEAR WITH NO. 1 ONE-WAY CLUTCH

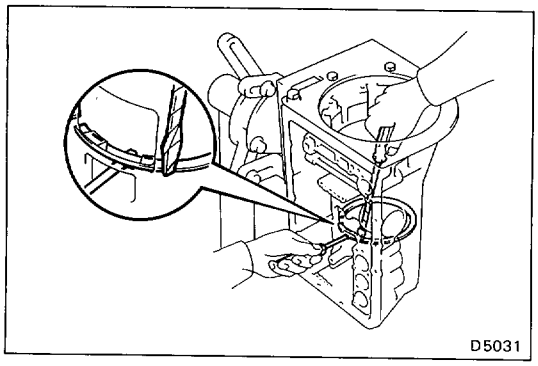


53. CHECK PACK CLEARANCE OF SECOND BRAKE

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

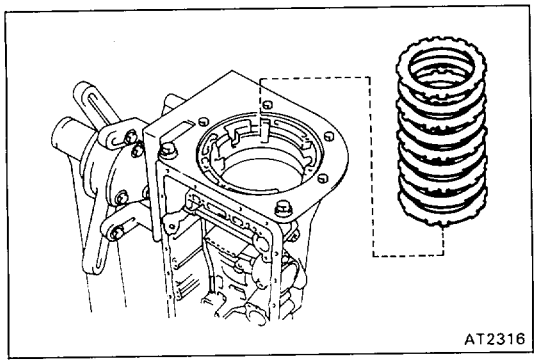
Clearance: 0.50 — 1.76 mm (0.0197 — 0.0693 in.)

If the values are nonstandard, inspect the discs.
(See page AT-218)



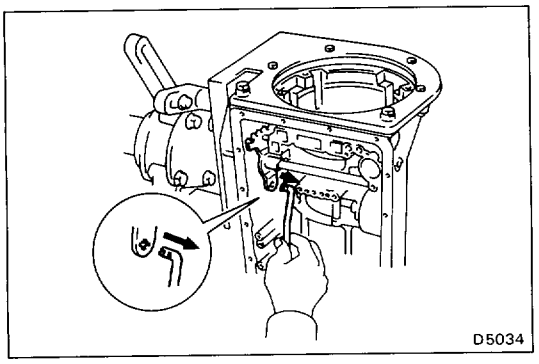
54. REMOVE FLANGE, PLATES AND DISCS OF SECOND BRAKE

(a) Remove the snap ring.



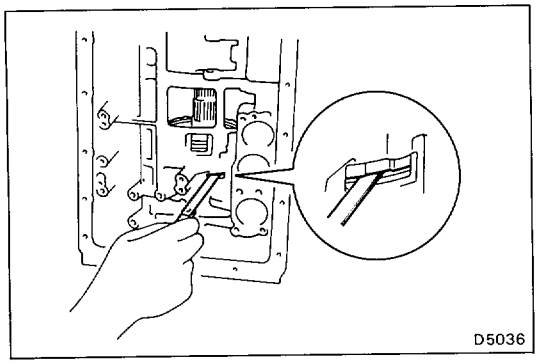
(b) Remove the flange, four plates and four discs as a set.

The method of inspection, refer to AT-218.



55. REMOVE PARKING LOCK ROD

Remove the parking lock rod from the manual valve lever.

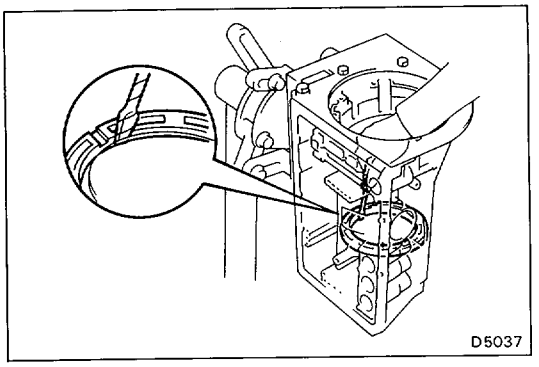


56. CHECK PACK CLEARANCE OF FIRST AND REVERSE BRAKE

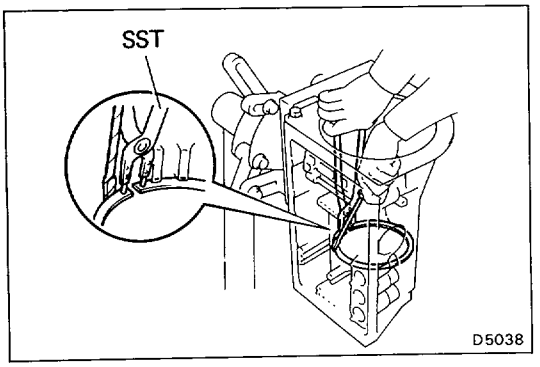
Using a thickness gauge, measure the clearance between the plate and second brake drum as shown in the figure.

Clearance: 0.58 — 2.06 mm (0.0228 — 0.0811 in.)

If the values are nonstandard, inspect the discs.
(See page AT-220)



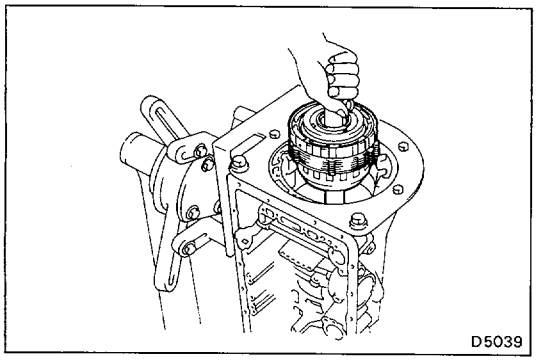
57. REMOVE SECOND BRAKE PISTON SLEEVE



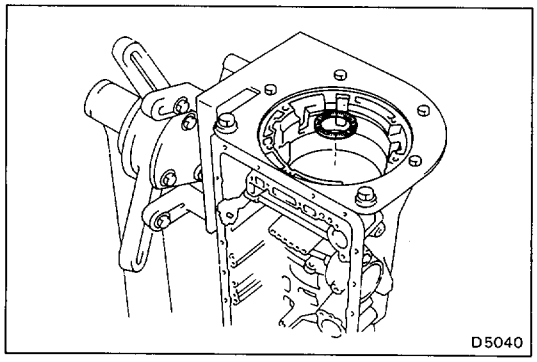
58. REMOVE REAR PLANETARY GEAR UNIT WITH SECOND BRAKE DRUM, FIRST AND REVERSE BRAKE PACK AND OUTPUT SHAFT

(a) Using SST, remove the snap ring.

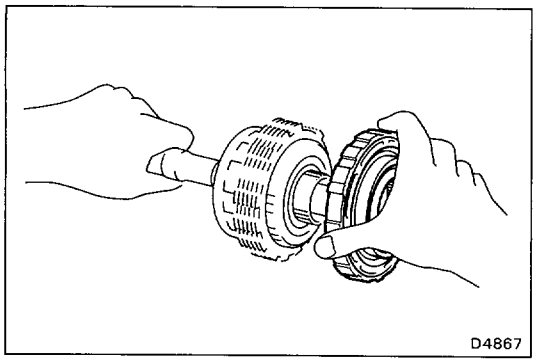
SST 09350-30020 (09350-07060)



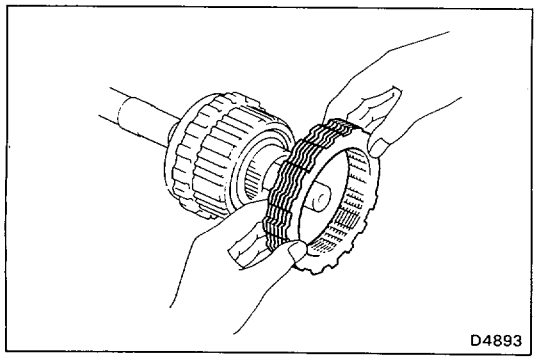
(b) Remove the rear planetary gear, second brake drum, first and reverse brake pack and output shaft as an assembly.



(c) Remove the assembled thrust bearing and race from the case.

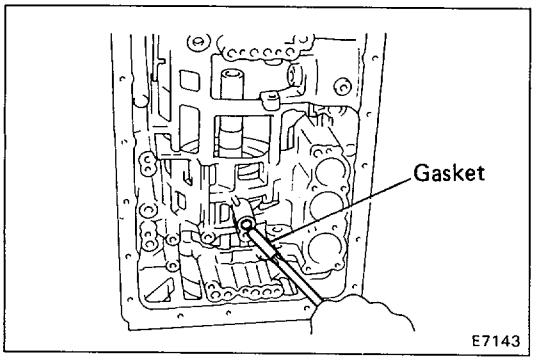


(d) Remove the second brake drum assembly.



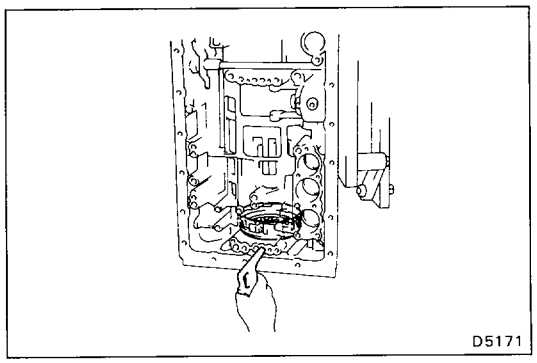
(e) Remove the cushion plate, flange, six plates and five discs of the first and reverse brake.

The method of inspection, refer to AT-220.



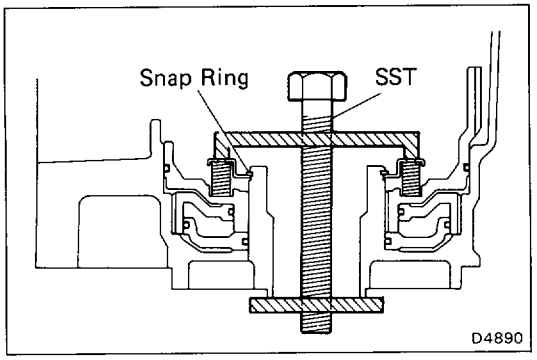
59. REMOVE BRAKE DRUM GASKET

Using a screwdriver, remove the gasket.



60. CHECK FIRST AND REVERSE BRAKE PISTON MOVING

Make sure the first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



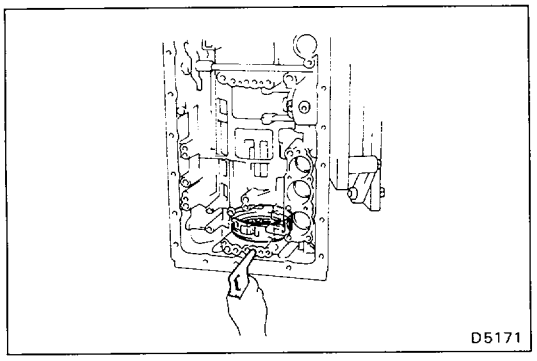
61. REMOVE COMPANIONS OF FIRST AND REVERSE BRAKE PISTON

(a) Set SST on the spring retainer, and compress the return spring.

SST 09350-30020 (09350-07050)

(b) Remove the snap ring with snap ring pliers.

(c) Remove the piston return spring.

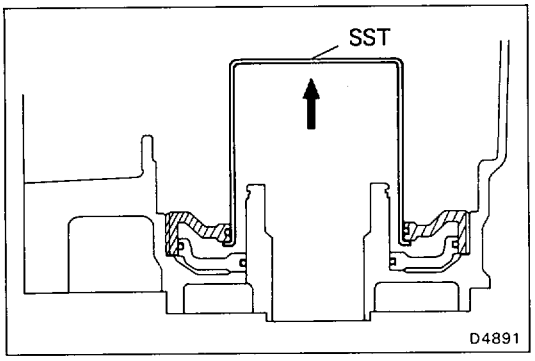


(d) Hold No. 2 first and reverse brake piston by hand, apply compressed air to transmission case to remove No. 2 first and reverse brake piston.

(e) Remove No. 2 first and reverse brake piston.

If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

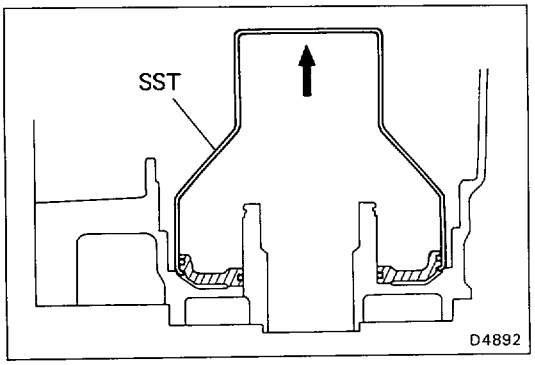
(f) Remove the O-ring from No. 2 piston.



(g) Insert SST behind the reaction sleeve and gradually lift it out of the transmission case.

SST 09350-30020 (09350-07080)

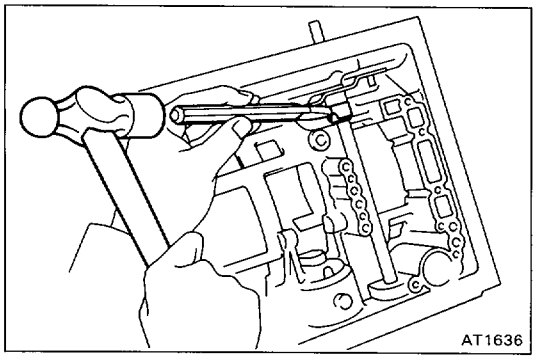
(h) Remove the O-ring from the reaction sleeve.



(i) Insert SST behind No. 1 brake piston and gradually lift it out of the transmission case.

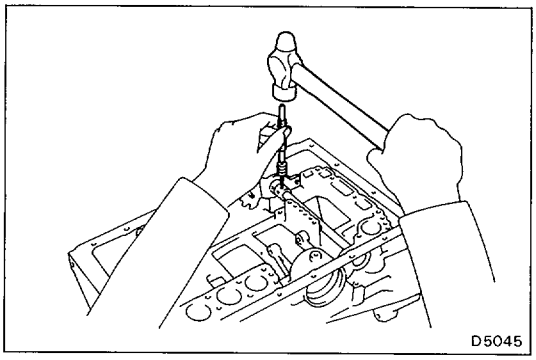
SST 09350-30020 (09350-07090)

(j) Remove the two O-rings from No. 1 piston.



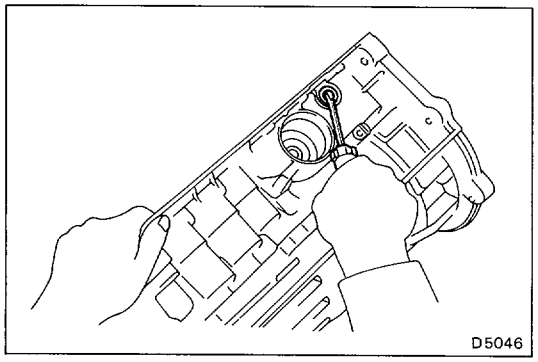
62. REMOVE MANUAL VALVE LEVER, SHAFT AND OIL SEALS

(a) Using a chisel, cut off the spacer and remove it from the shaft.



(b) Using a pin punch, drive out the pin.

(c) Pull the manual valve lever shaft out through the case.



(d) Using a screwdriver, remove the two oil seals.

COMPONENT PARTS

General Notes

The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion from similar-looking parts of different subassemblies being on your workbench at the same time.
The component groups are inspected and repaired from the converter housing side.
As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.
Recommended ATF type DEXRON® II.

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean with any fluid passages and holes blown through with compressed air.
2. When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying automatic transmission fluid or kerosene in your face.
3. The recommended automatic transmission fluid or kerosene should be used for cleaning.

PARTS ARRANGEMENT:

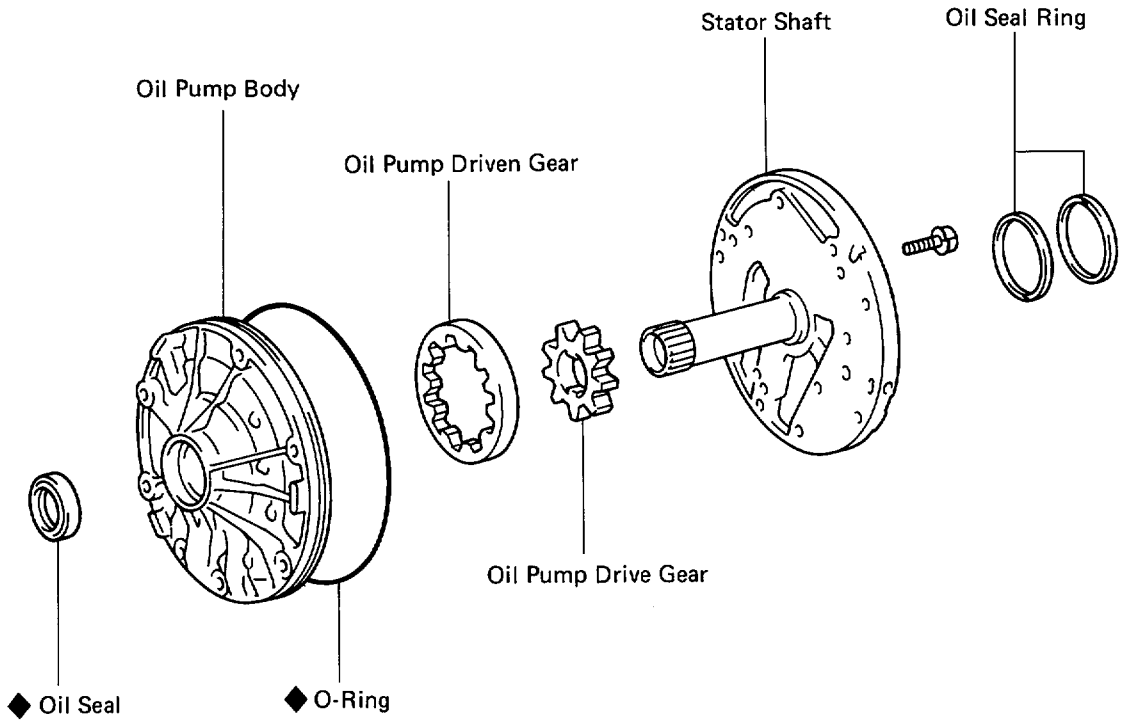
1. After cleaning, the parts should be arranged in proper order to allow performing inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement must be soaked in transmission fluid for at least two hours before assembly.

GENERAL ASSEMBLY:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O-rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the subassembly containing that bushing must be replaced.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in place.

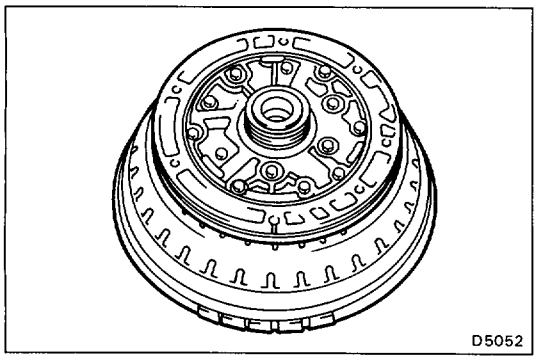
Oil Pump

COMPONENTS



◆ Non-reusable part

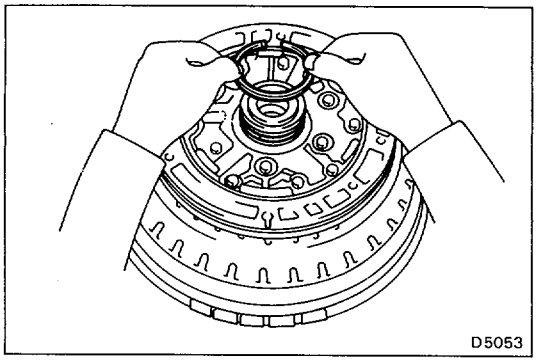
D5051



D5052

DISASSEMBLY OF OIL PUMP

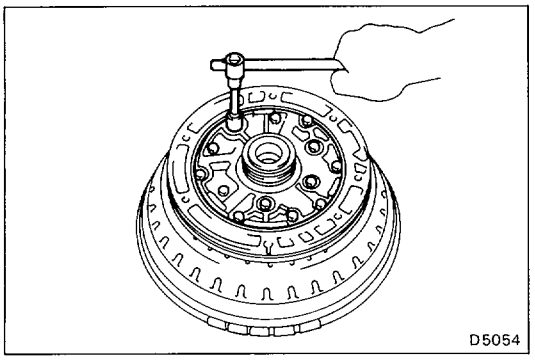
1. **USE TORQUE CONVERTER AS WORK STAND**



D5053

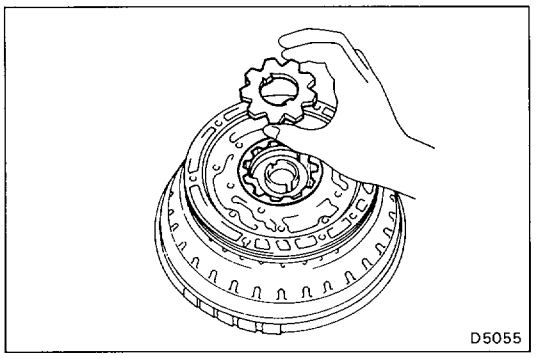
2. **REMOVE OIL SEAL RINGS**

Remove the two oil seal rings.



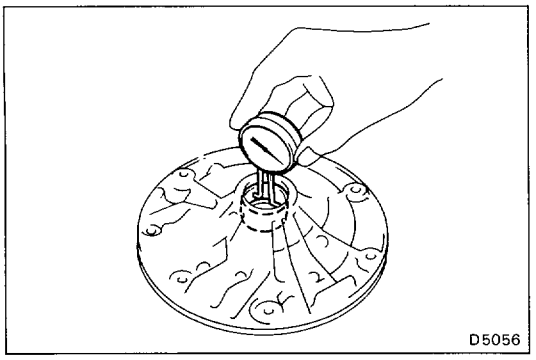
3. REMOVE STATOR SHAFT

Remove the thirteen bolts, and then remove the stator shaft from the oil pump body.



4. REMOVE OIL PUMP DRIVE GEAR AND DRIVEN GEAR

INSPECTION OF OIL PUMP

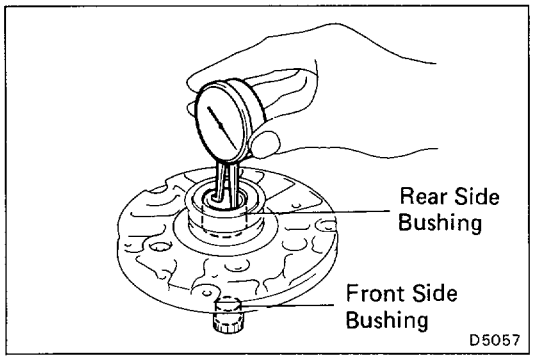


1. CHECK OIL PUMP BODY BUSHING

Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.19 mm (1.5035 in.)

If the inside diameter is greater than the maximum, replace the oil pump body.

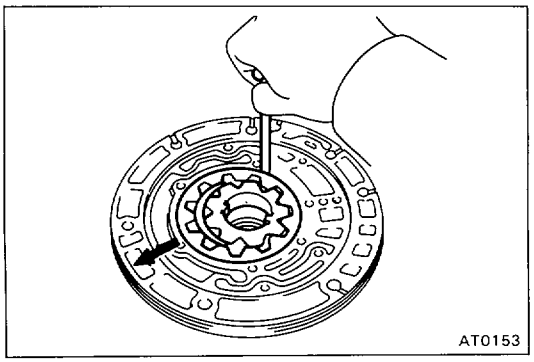


2. CHECK STATOR SHAFT BUSHING

Using a dial indicator, measure the inside diameter of the stator shaft bushing.

Maximum inside diameter:
Front side 21.58 mm (0.8496 in.)
Rear side 27.08 mm (1.0661 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.



3. CHECK BODY CLEARANCE OF DRIVEN GEAR

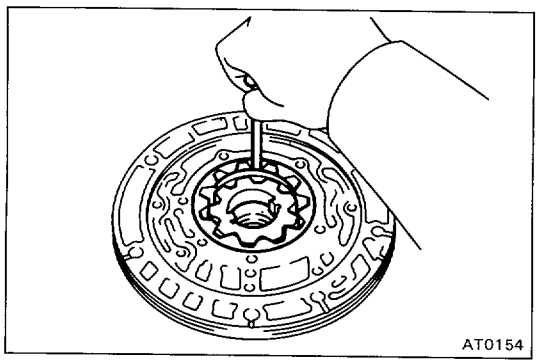
Push the driven gear to one side of the body.

Using a feeler gauge, measure the clearance.

Standard body clearance: 0.07 — 0.15 mm (0.0028 — 0.0059 in.)

Maximum body clearance: 0.3 mm (0.012 in.)

If the body clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



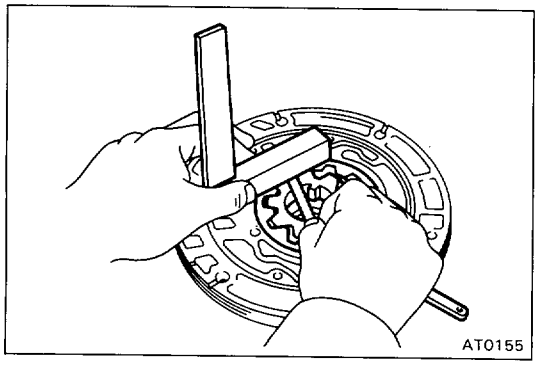
4. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent-shaped part of the pump body.

Standard tip clearance: 0.11 — 0.14 mm (0.0043 — 0.0055 in.)

Maximum tip clearance: 0.3 mm (0.012 in.)

If the tip clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



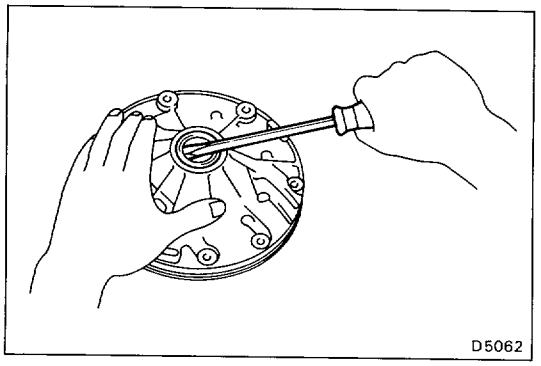
5. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straight edge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: 0.02 — 0.05 mm (0.0008 — 0.0020 in.)

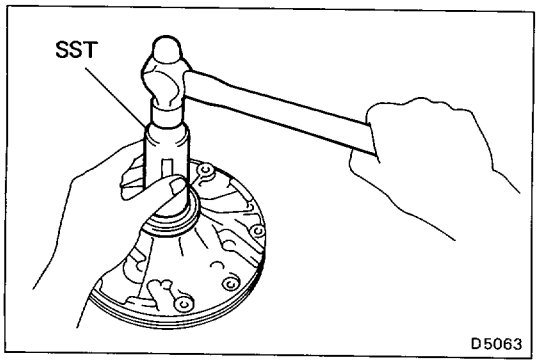
Maximum side clearance: 0.1 mm (0.004 in.)

If the side clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



6. IF NECESSARY, REPLACE OIL SEAL

(a) Pry off the oil seal with a screwdriver.

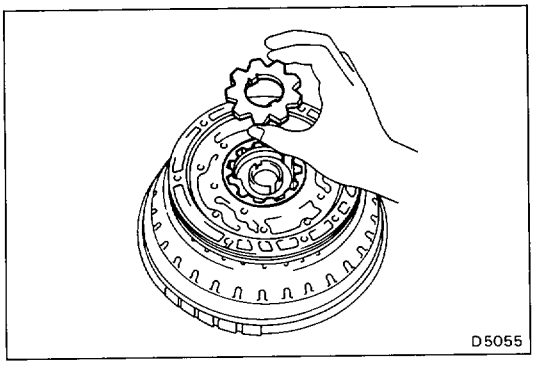


(b) Using SST, install a new oil seal.

The oil seal end should be flush with the outer edge of the pump body.

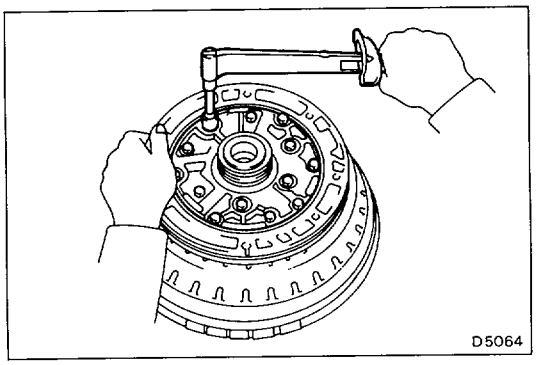
SST 09350-30020 (09351-32140)

(c) Coat the oil seal lip with MP grease.

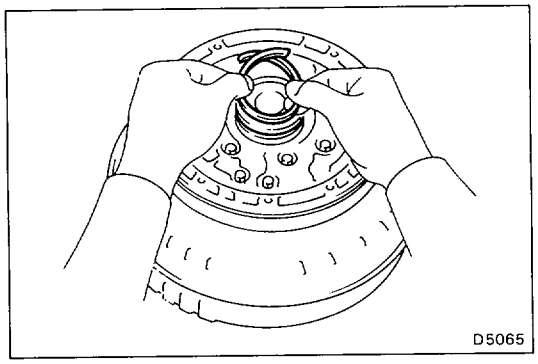


ASSEMBLY OF OIL PUMP

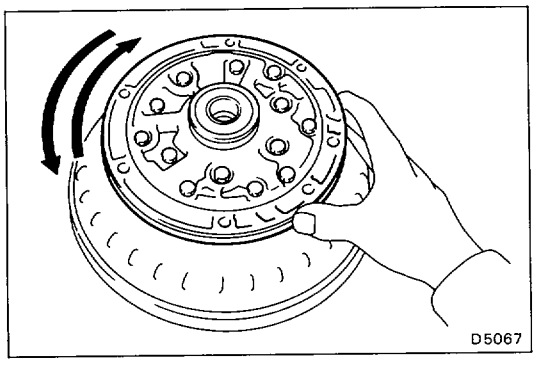
1. **INSTALL DRIVEN GEAR AND DRIVE GEAR TO OIL PUMP BODY**
   (a) Place the oil pump body on the torque converter.
   (b) Coat the driven gear and drive gear with ATF.
   (c) Install the driven gear and drive gear.



2. **INSTALL STATOR SHAFT TO OIL PUMP BODY**
   (a) Align the stator shaft with each bolt hole.
   (b) Tighten the thirteen bolts.
   Torque: 100 kg-cm (7 ft-lb, 10 N·m)



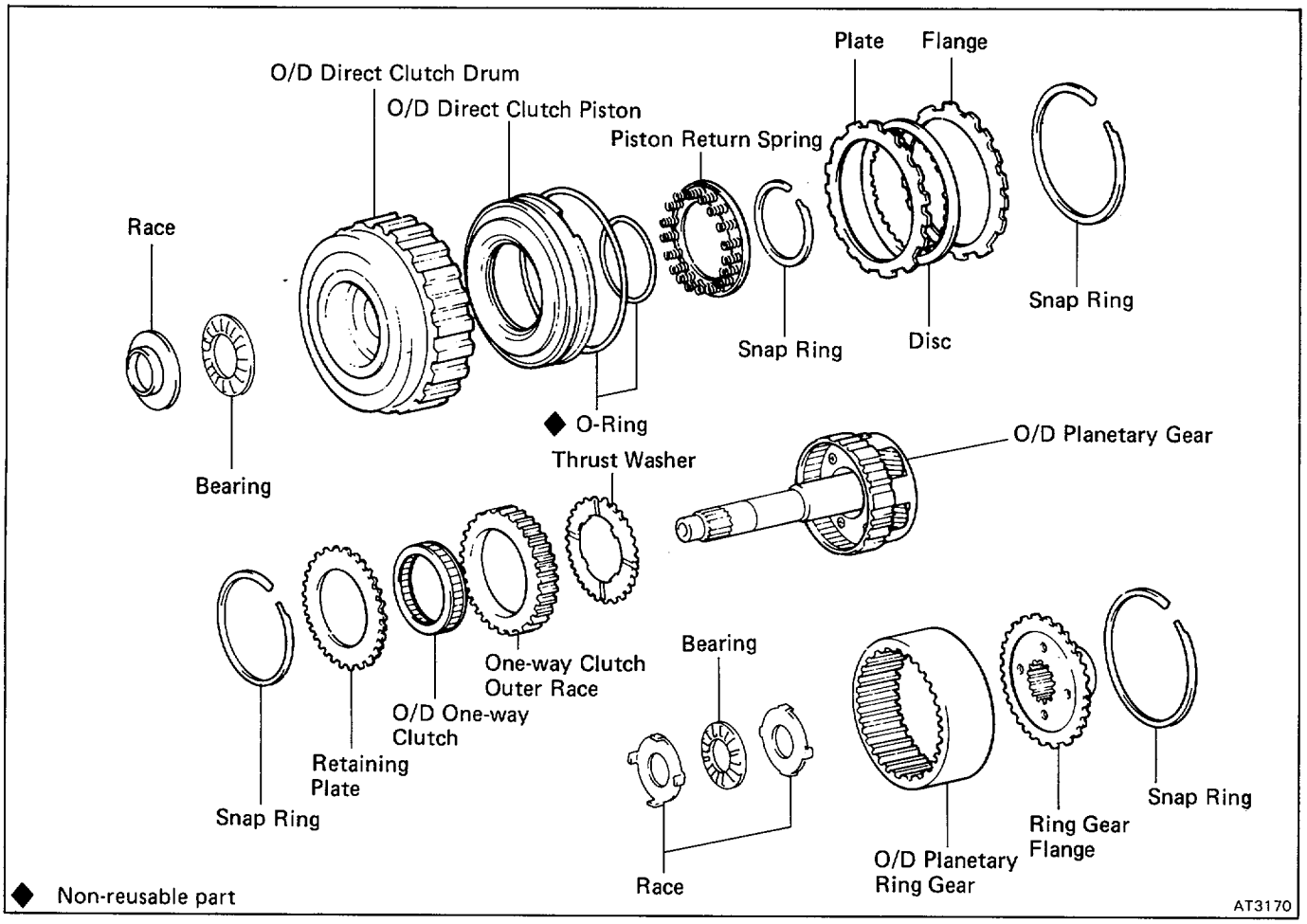
3. **INSTALL OIL SEAL RINGS**
   (a) Coat the two oil seal rings with ATF.
   (b) Contract the oil seal rings as shown, and install them onto the stator shaft.
   CAUTION: Do not spread the ring ends too much.
   NOTE: After installing the oil seal rings, check that they rotate smoothly.

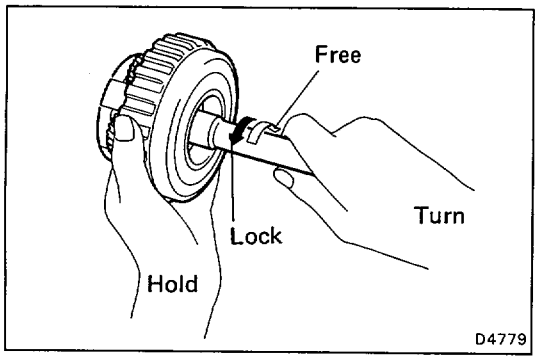


4. **CHECK OIL PUMP DRIVE GEAR ROTATION**
   Make sure the drive gear rotates smoothly when installed to the torque converter.

Overdrive Planetary Gear, Overdrive Direct Clutch and Overdrive One-way Clutch

COMPONENTS

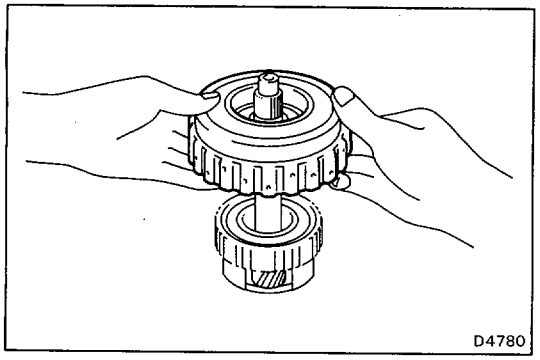




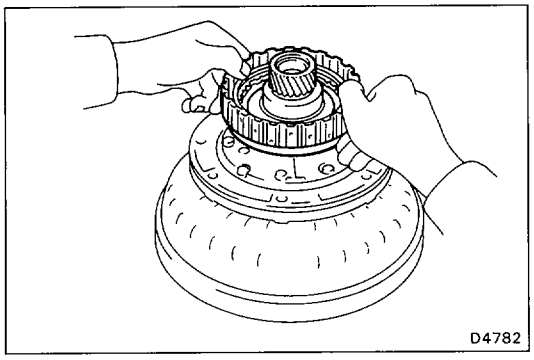
DISASSEMBLY OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND OVERDRIVE ONE-WAY CLUTCH

1. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the O/D direct clutch drum and turn the input shaft. The input shaft should turn freely clockwise and should lock counterclockwise.

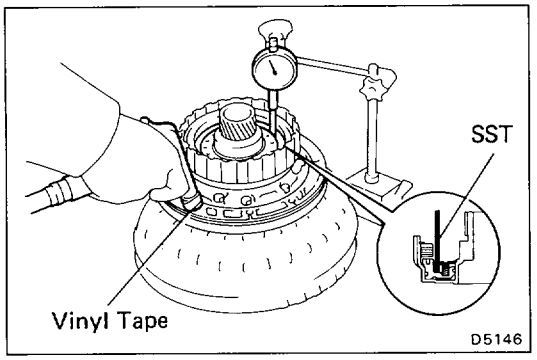


2. REMOVE OVERDRIVE DIRECT CLUTCH ASSEMBLY FROM OVERDRIVE PLANETARY GEAR



3. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

(a) Place the oil pump onto the torque converter, and then place the O/D direct clutch assembly onto the oil pump.

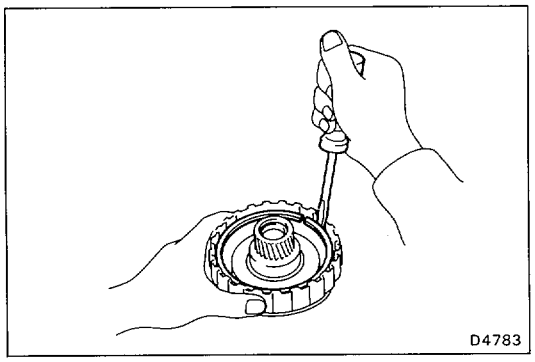


(b) Using SST and a dial indicator, measure the O/D direct clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 1.77 — 2.07 mm (0.0697 — 0.0815 in.)

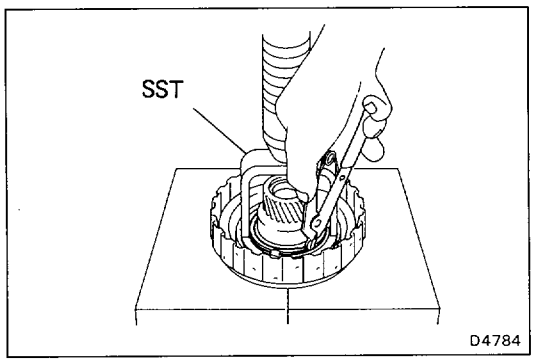
If the values are nonstandard, inspect the discs.



4. REMOVE FLANGE, PLATE AND DISC

(a) Remove the snap ring from the O/D direct clutch drum.

(b) Remove the flange, plate and disc.



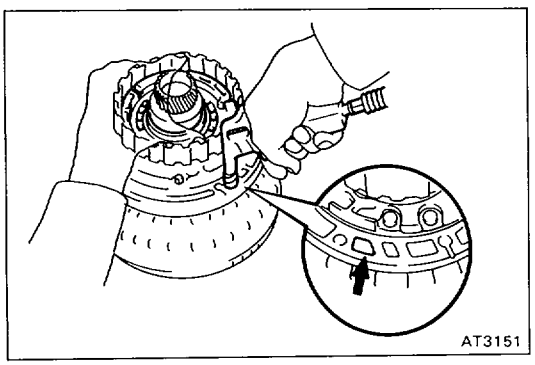
5. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the piston return spring.



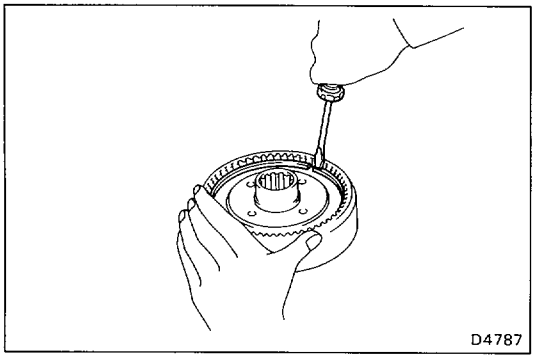
6. REMOVE OVERDRIVE DIRECT CLUTCH PISTON

(a) Place the oil pump onto the torque converter and then place the O/D direct clutch onto the oil pump.

(b) Hold the O/D direct clutch piston by hand, apply compressed air to the oil pump to remove the O/D direct clutch piston.

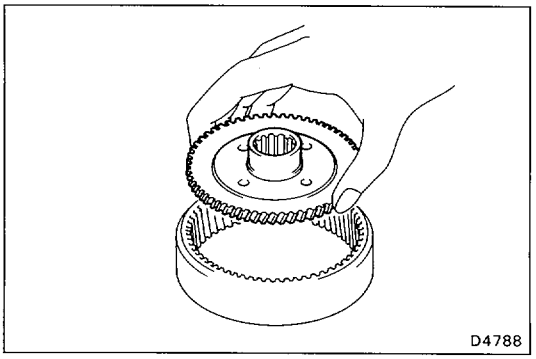
(c) Remove the O/D direct clutch piston.

(d) Remove the two O-rings from the piston.

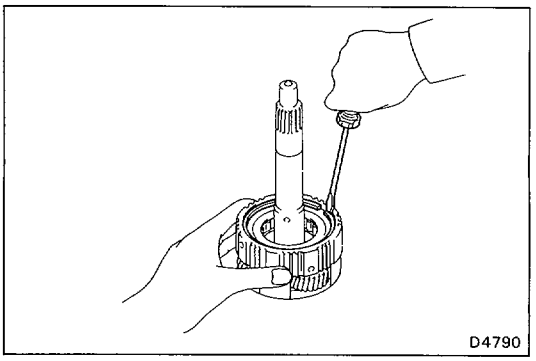


7. REMOVE RING GEAR FLANGE

(a) Remove the snap ring.

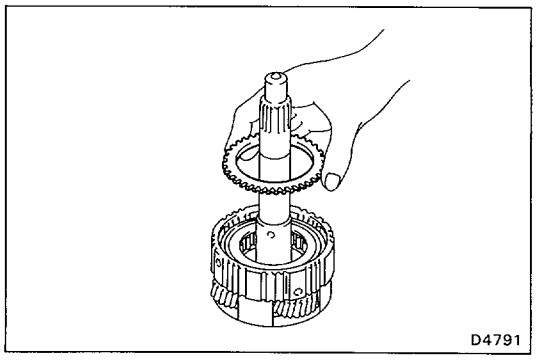


(b) Remove the ring gear flange.

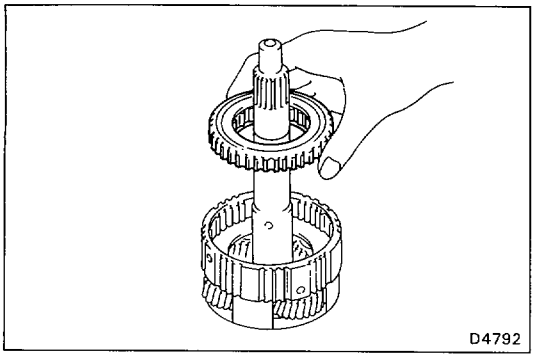


8. REMOVE RETAINING PLATE

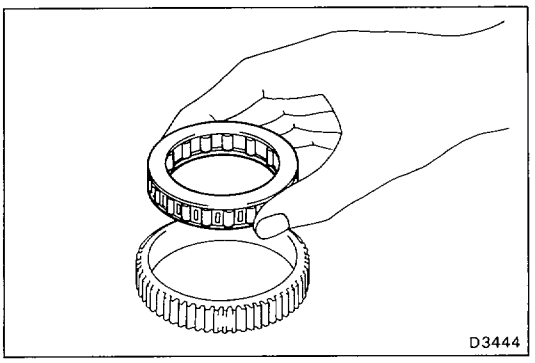
(a) Remove the snap ring.



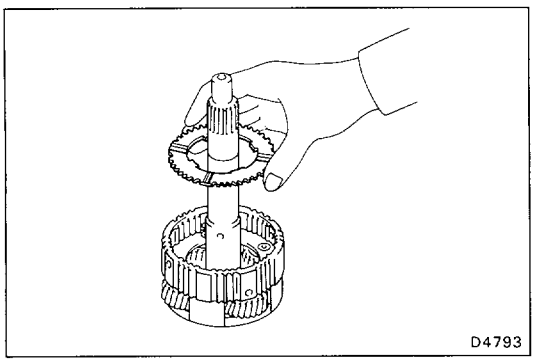
(b) Remove the retaining plate.



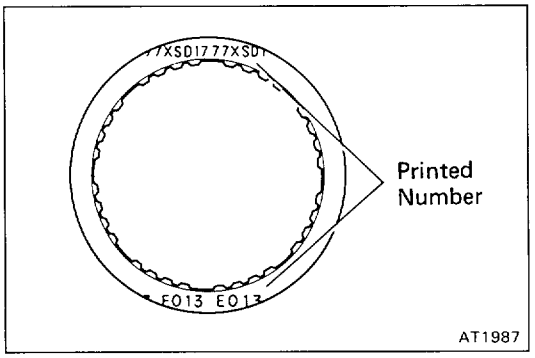
9. REMOVE OVERDRIVE ONE-WAY CLUTCH WITH OUTER RACE


D3444

10. REMOVE ONE-WAY CLUTCH FROM OUTER RACE


D4793

11. REMOVE THRUST WASHER



AT1987

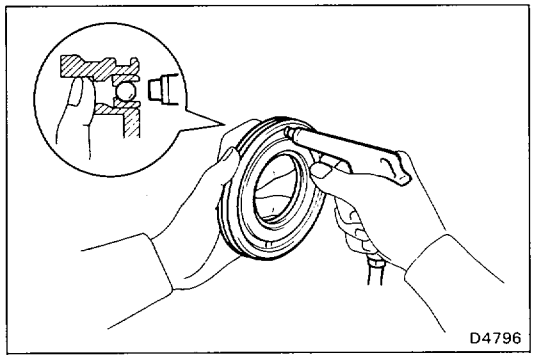
INSPECTION OF OVERDRIVE PLANETARY GEAR AND OVERDRIVE DIRECT CLUTCH

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

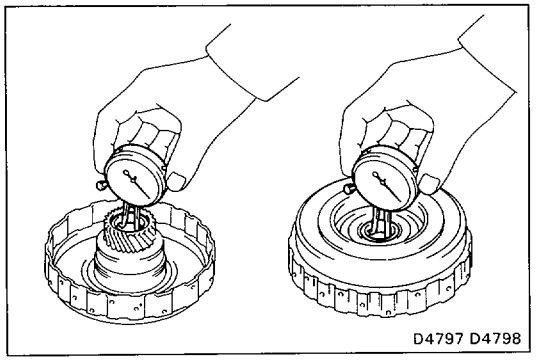
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace disc.
- Before assembling new disc, soak it in ATF for at least two hours.


D4796

2. CHECK OVERDRIVE DIRECT CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

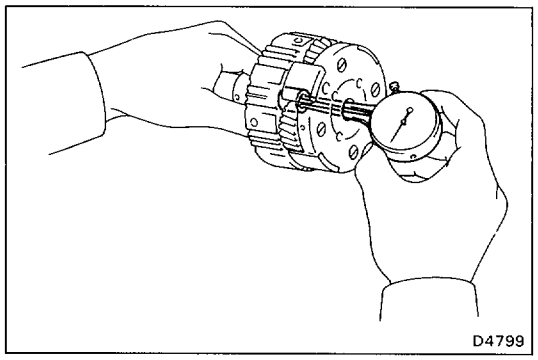

D4797 D4798

3. CHECK OVERDRIVE DIRECT CLUTCH DRUM BUSHINGS

Using a dial indicator, measure the inside diameter of the clutch drum bushings.

Maximum inside diameter: 27.11 mm (1.0673 in.)

If the inside diameter is greater than the maximum, replace the clutch drum.

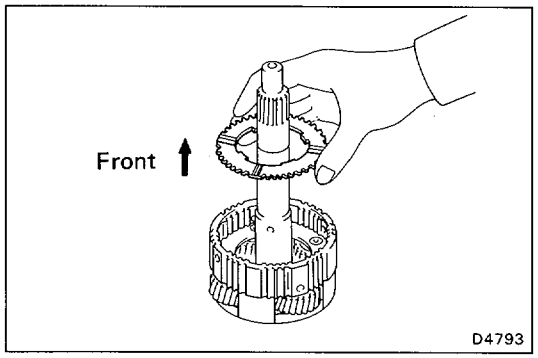


4. **CHECK OVERDRIVE PLANETARY GEAR BUSHING**

Using a dial indicator, measure the inside diameter of the planetary gear bushing.

Maximum inside diameter: 11.27 mm (0.4437 in.)

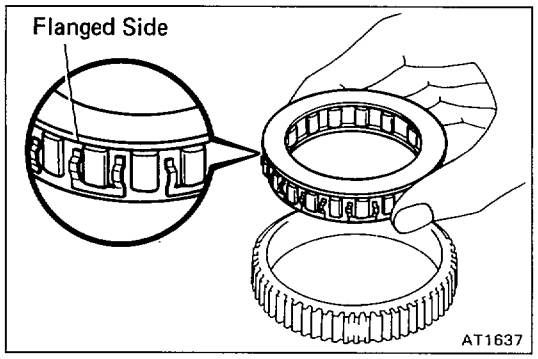
If the inside diameter is greater than the maximum, replace the planetary gear.



ASSEMBLY OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND OVERDRIVE ONE-WAY CLUTCH

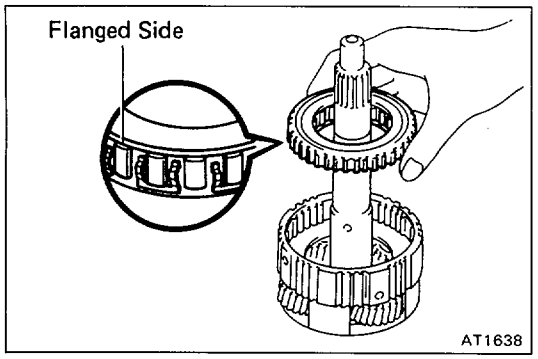
1. **INSTALL THRUST WASHER TO OVERDRIVE PLANETARY GEAR**

Install the thrust washer to the overdrive planetary gear, facing the grooved side upward.

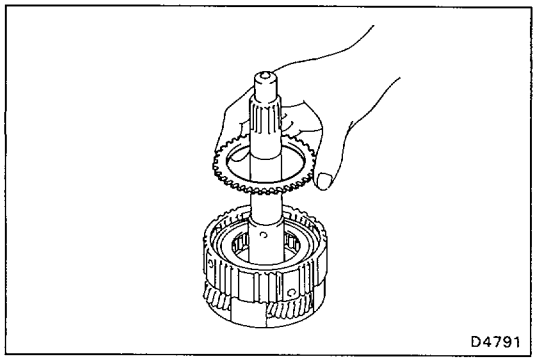


2. **INSTALL OVERDRIVE ONE-WAY CLUTCH**

(a) Install the one-way clutch into the outer race, facing the flanged side of the one-way clutch upward.

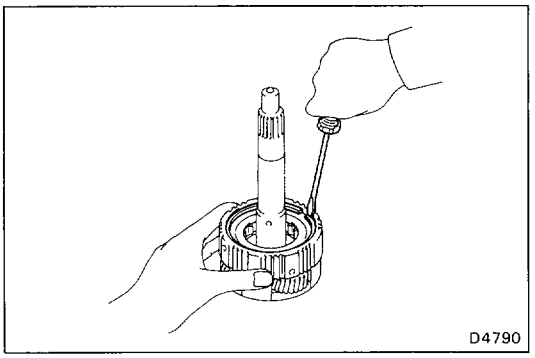


(b) Install the overdrive one-way clutch with the outer race to the overdrive planetary gear.

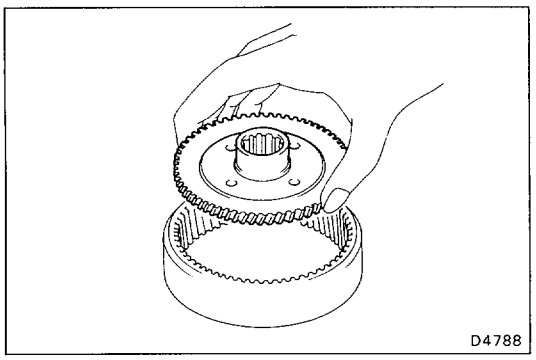


3. **INSTALL RETAINING PLATE**

(a) Install the retaining plate.

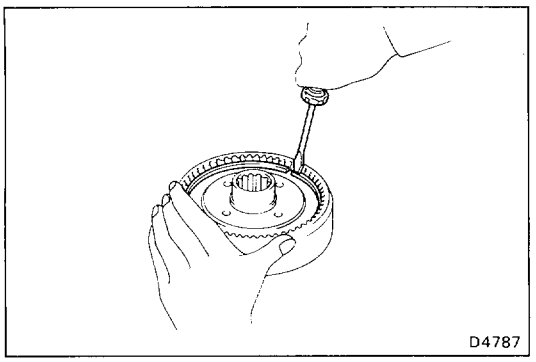


(b) Install the snap ring.

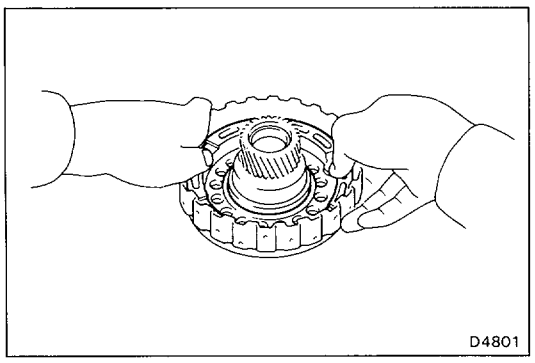


4. INSTALL RING GEAR FLANGE TO OVERDRIVE PLANETARY RING GEAR

(a) Install the ring gear flange as shown.



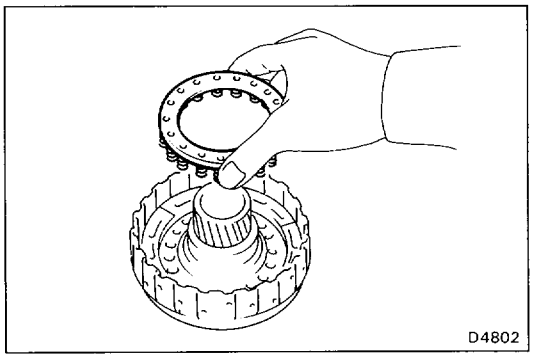
(b) Install the snap ring.



5. INSTALL OVERDRIVE DIRECT CLUTCH PISTON

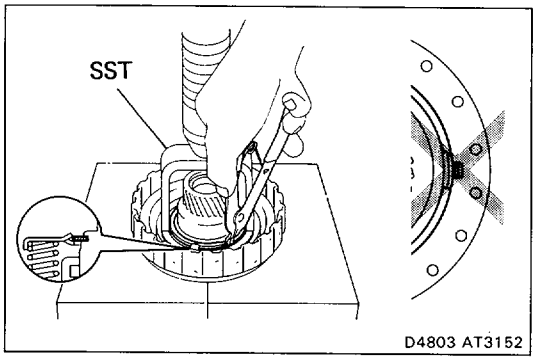
(a) Coat new O-rings with ATF and install them on the O/D direct clutch piston.

(b) Being careful not to damage the O-rings, press in the direct clutch piston into the clutch drum by both hands.



6. INSTALL PISTON RETURN SPRING

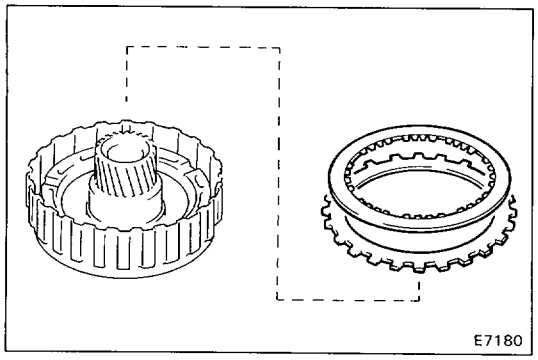
(a) Install the piston return spring to the piston.



(b) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

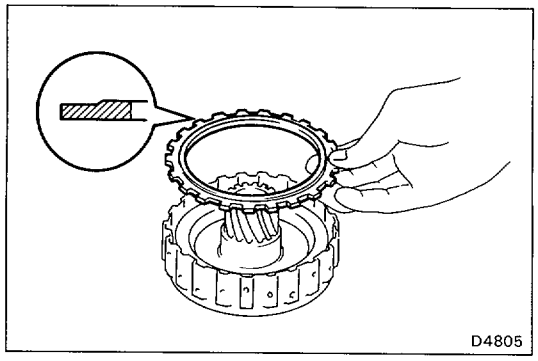
(c) Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



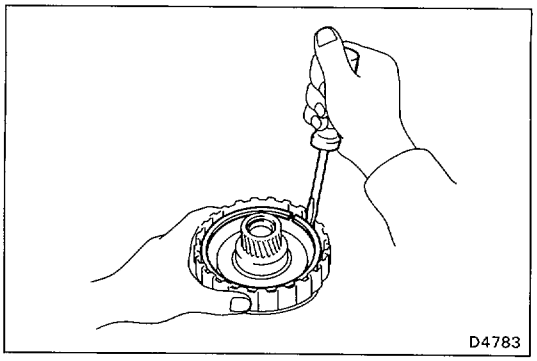
7. INSTALL PLATE, DISC AND FLANGE

(a) Install the plate and disc.

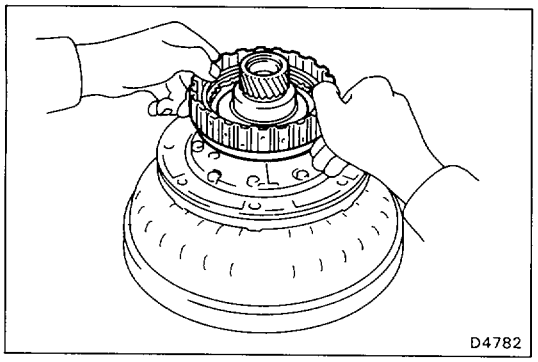
Install in order: P = Plate D = Disc
P—D



(b) Install the flange, facing the flat end downward.

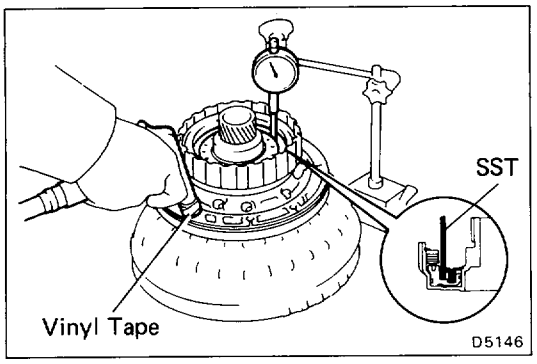


(c) Install the snap ring.



8. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

(a) Place the oil pump onto the torque converter, and then place the O/D direct clutch assembly onto the oil pump.



(b) Using SST and a dial indicator, measure the overdrive direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm², 57 – 114 psi or 392 – 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 1.77 – 2.07 mm (0.0697 – 0.0815 in.)

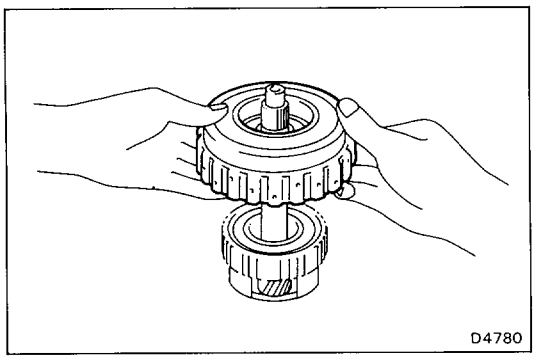
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke is nonstandard, select another flange.

NOTE: There are six different thicknesses for flange.

Flange thickness mm (in.)

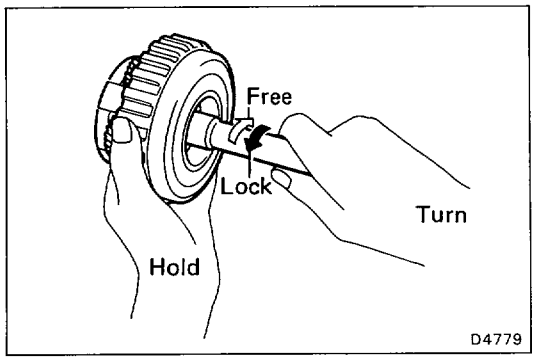
No.	Thickness	No.	Thickness
16	3.6 (0.142)	19	3.3 (0.130)
17	3.5 (0.138)	20	3.2 (0.126)
18	3.4 (0.134)	21	3.1 (0.122)



9. INSTALL OVERDRIVE DIRECT CLUTCH ASSEMBLY

(a) Align the flukes of discs in the direct clutch.

(b) Install the direct clutch assembly onto the O/D planetary gear.

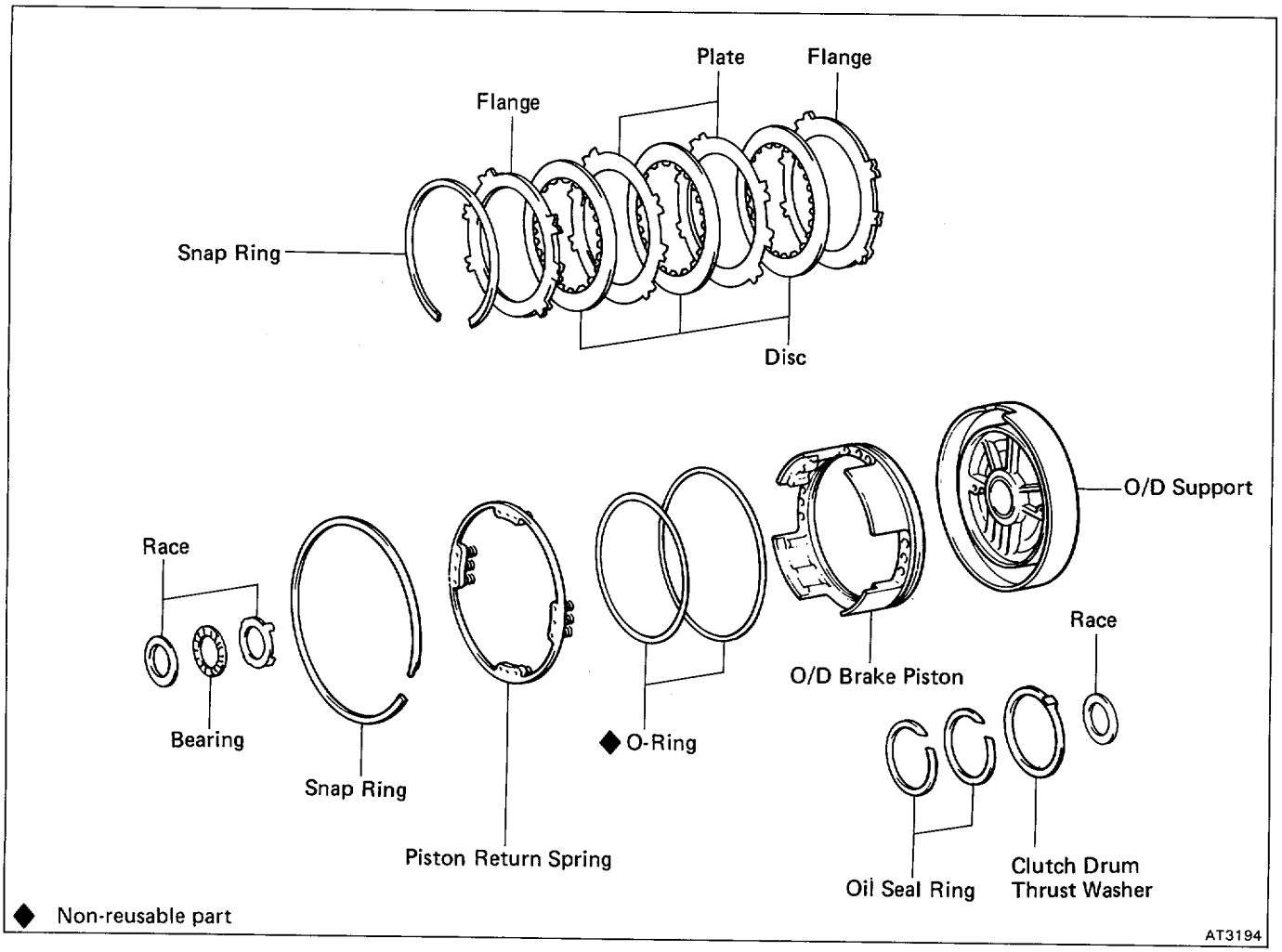


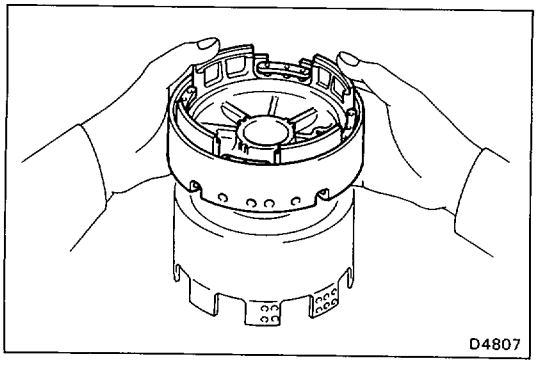
10. CHECK OPERATION OF ONE-WAY CLUTCH

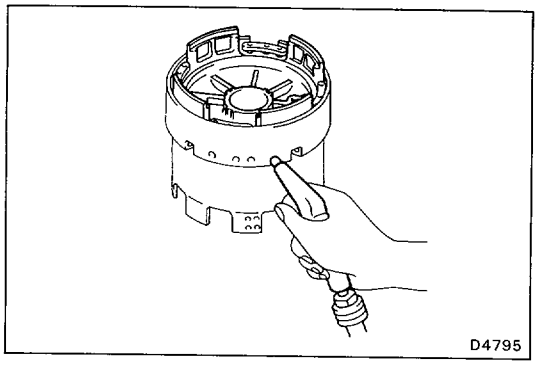
Hold the O/D direct clutch drum and turn the input shaft. The input shaft should turn freely clockwise and should lock counterclockwise.

Overdrive Brake

COMPONENTS





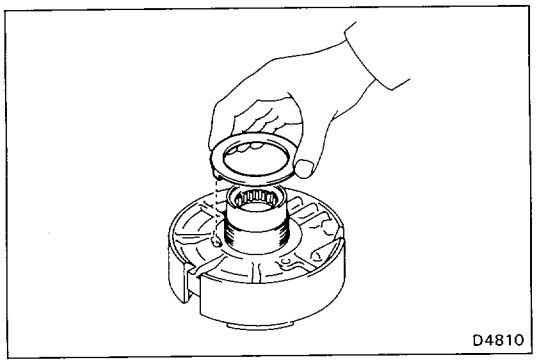


DISASSEMBLY OF OVERDRIVE BRAKE

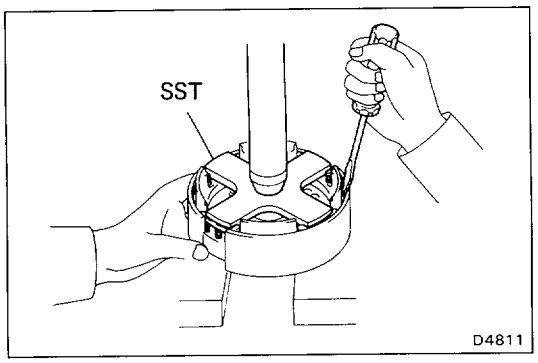
1. CHECK OVERDRIVE BRAKE PISTON MOVING

(a) Place the O/D support assembly onto the direct clutch assembly.

(b) Apply compressed air into the oil passage as shown, and be sure that the O/D brake piston moves smoothly.



2. **REMOVE CLUTCH DRUM THRUST WASHER FROM OVERDRIVE SUPPORT**



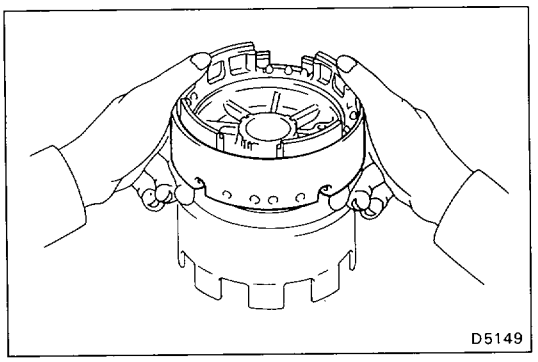
3. **REMOVE PISTON RETURN SPRING**

(a) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-30020 (09350-07030)

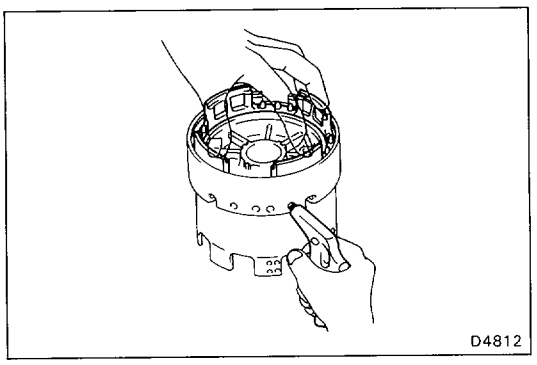
(b) Remove the snap ring with a screwdriver.

(c) Remove the piston return spring.



4. **REMOVE OVERDRIVE BRAKE PISTON**

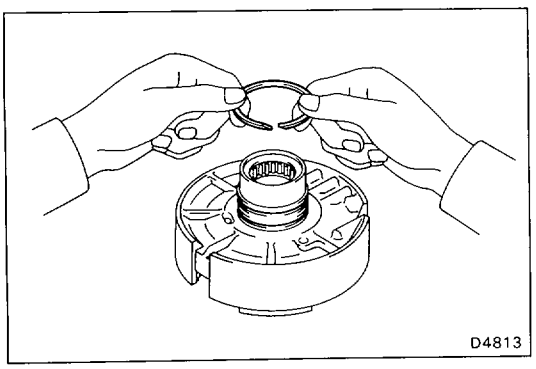
(a) Place the O/D support onto the direct clutch assembly.



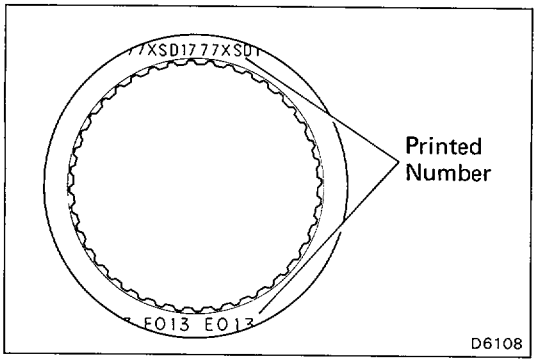
(b) Hold the O/D brake piston so it is not slanted and apply compressed air into the passage to remove the O/D brake piston.

(c) Remove the O/D brake piston.

(d) Remove the two O-rings from the piston.



5. **REMOVE OIL SEAL RINGS**



INSPECTION OF OVERDRIVE BRAKE

INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

ASSEMBLY OF OVERDRIVE BRAKE

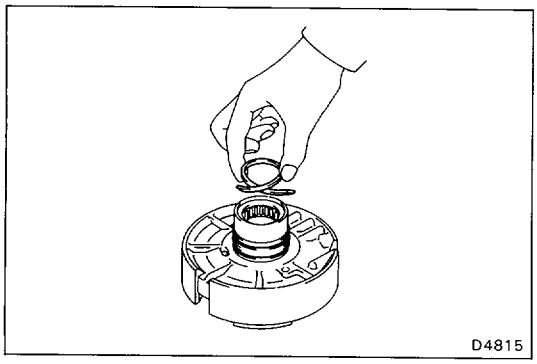
1. INSTALL OIL SEAL RINGS

(a) Coat the two oil seal rings with ATF.

(b) Contract the oil seal rings as shown, and install them onto the O/D support.

CAUTION: Do not spread the ring ends more than necessary.

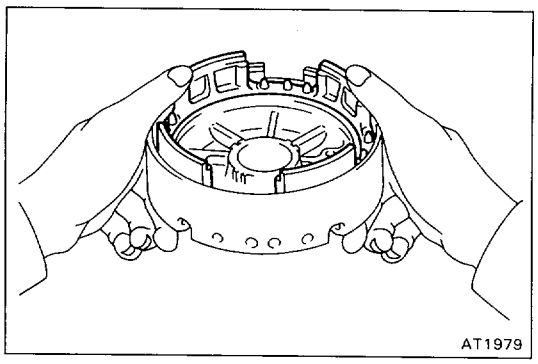
NOTE: After installing the oil seal rings, check that they rotate smoothly.



2. INSTALL OVERDRIVE BRAKE PISTON

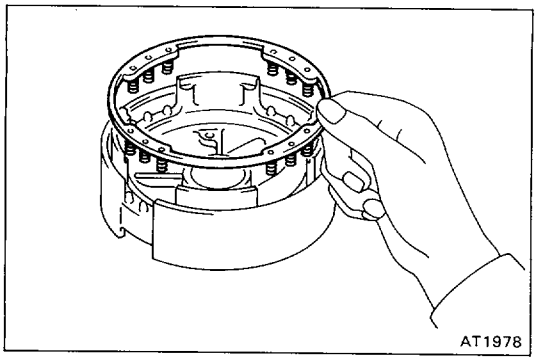
(a) Coat two new O-rings with ATF and install them on the O/D brake piston.

(b) Being careful not to damage the O-rings, press in the brake piston into the O/D support by both hands.



3. INSTALL PISTON RETURN SPRING

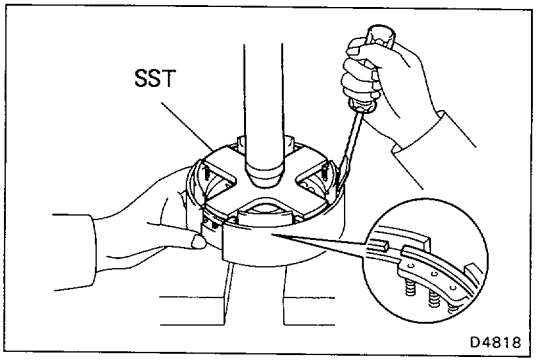
(a) Install the piston return spring.

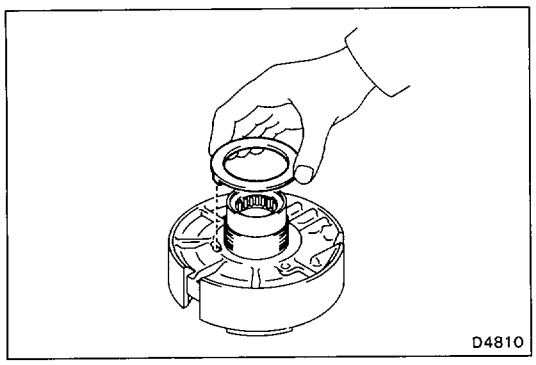


(b) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-30020 (09350-07030)

(c) Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with cutout portion of the O/D support.

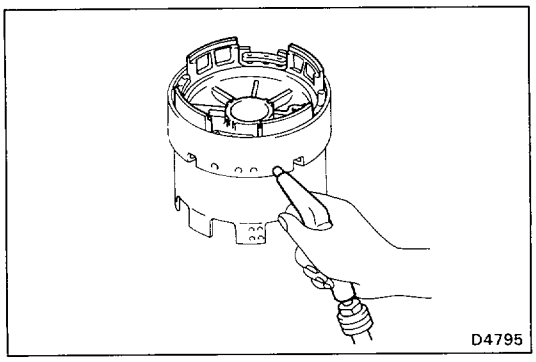




4. INSTALL CLUTCH DRUM THRUST WASHER

Coat the thrust washer with petroleum jelly and install it onto the O/D support.

NOTE: Make sure that the lug shape matches the hole on the O/D support.



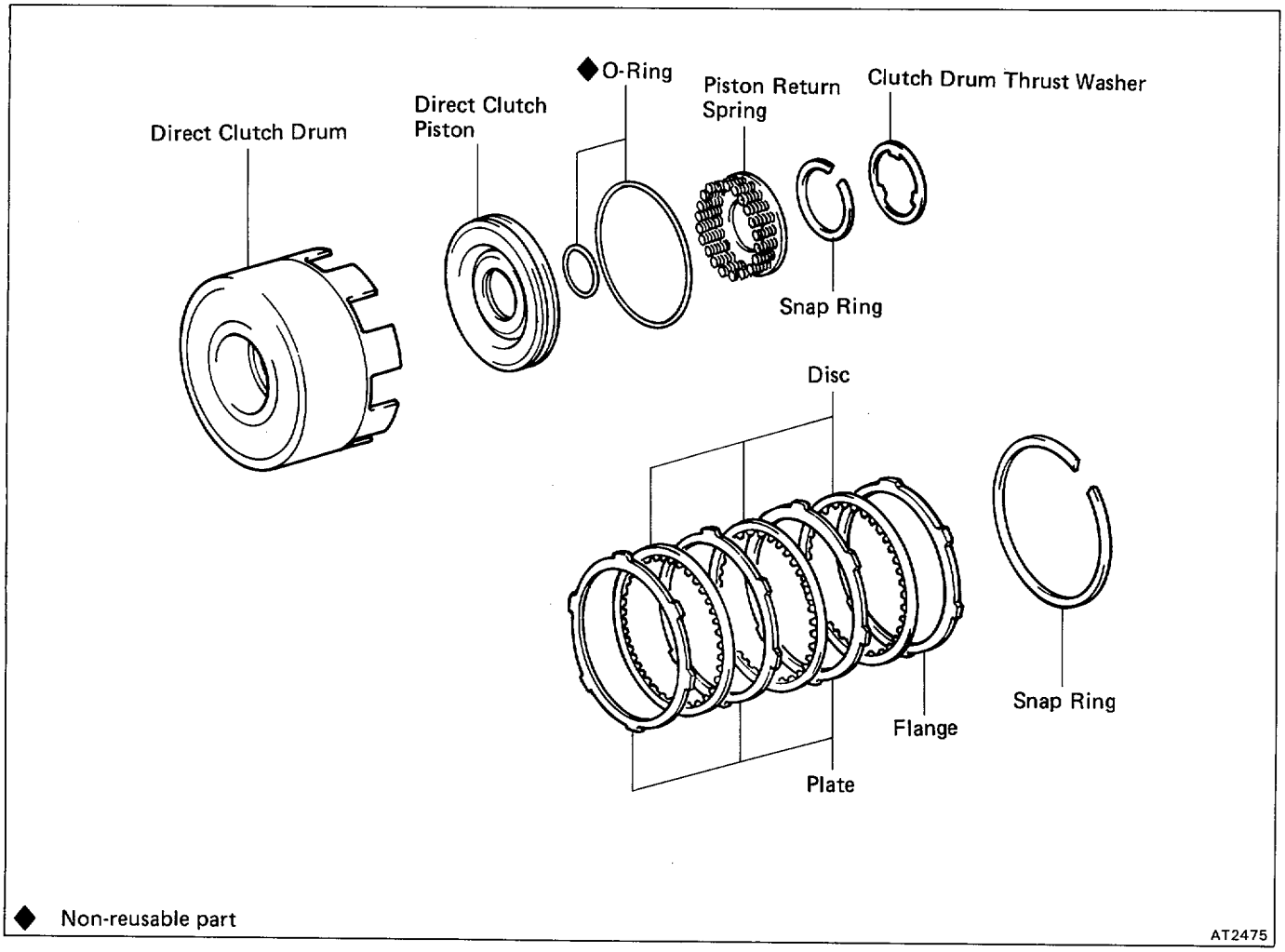
5. CHECK OVERDRIVE BRAKE PISTON MOVING

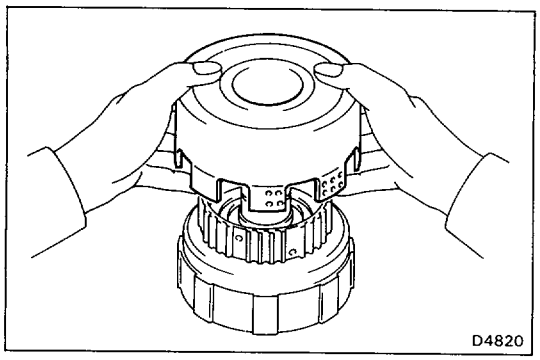
(a) Place the O/D support assembly onto the direct clutch assembly.

(b) Apply compressed air into the oil passage as shown, and be sure that the O/D brake piston moves smoothly.

Direct Clutch

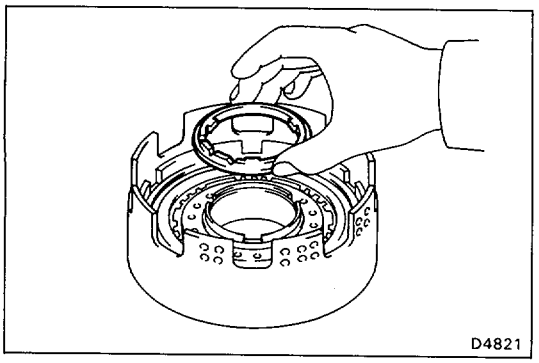
COMPONENTS



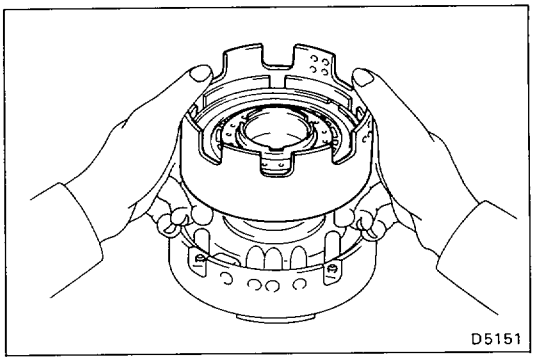


DISASSEMBLY OF DIRECT CLUTCH

1. **REMOVE DIRECT CLUTCH DRUM ASSEMBLY FROM FORWARD CLUTCH ASSEMBLY**

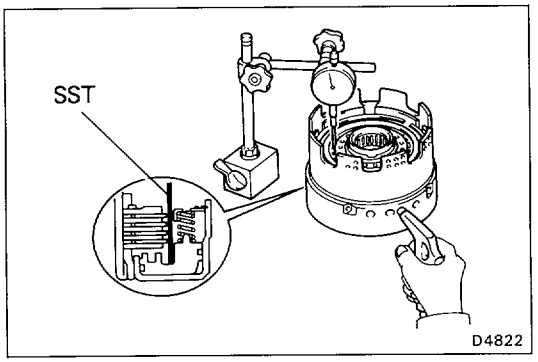


2. **REMOVE CLUTCH DRUM THRUST WASHER FROM DIRECT CLUTCH ASSEMBLY**



3. CHECK PISTON STROKE OF DIRECT CLUTCH

(a) Place the direct clutch assembly onto the O/D support assembly.

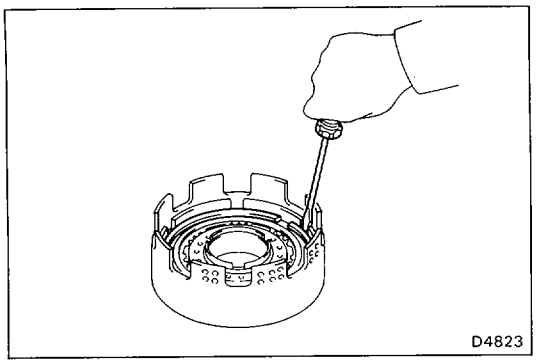


(b) Using SST and a dial indicator, measure the direct clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 1.03 — 1.33 mm (0.0406 — 0.0524 in.)

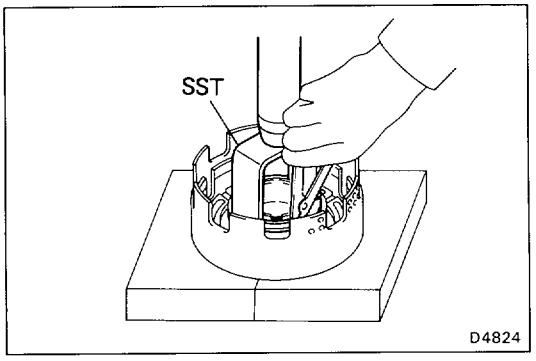
If the values are nonstandard, inspect the discs.



4. REMOVE FLANGE, PLATES AND DISCS

(a) Remove the snap ring from the direct clutch drum.

(b) Remove the flange, three plates and three discs.



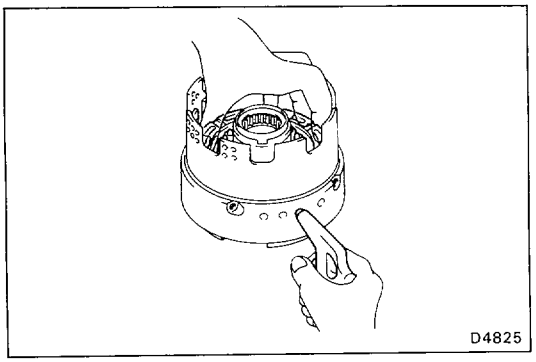
5. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the piston return spring.



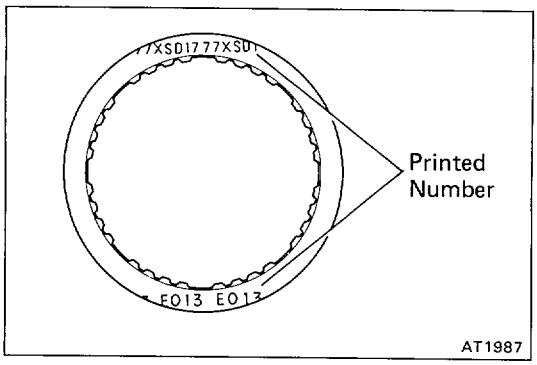
6. REMOVE DIRECT CLUTCH PISTON

(a) Place the direct clutch drum onto the O/D support.

(b) Hold the direct clutch piston by hand, apply compressed air to the O/D support to remove the direct clutch piston.

(c) Remove the direct clutch piston.

(d) Remove the two O-rings from the piston.



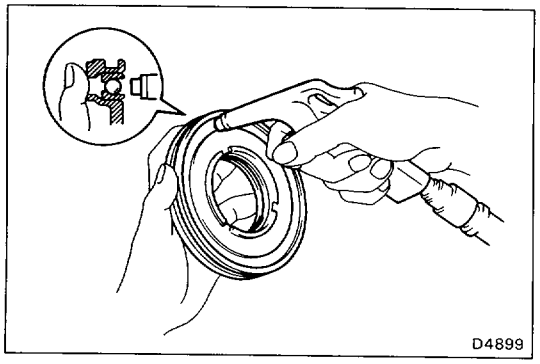
INSPECTION OF DIRECT CLUTCH

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

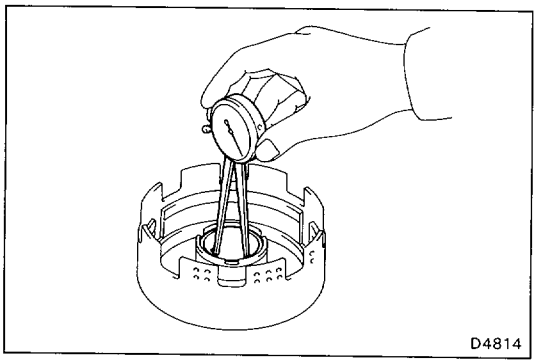
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



2. CHECK DIRECT CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

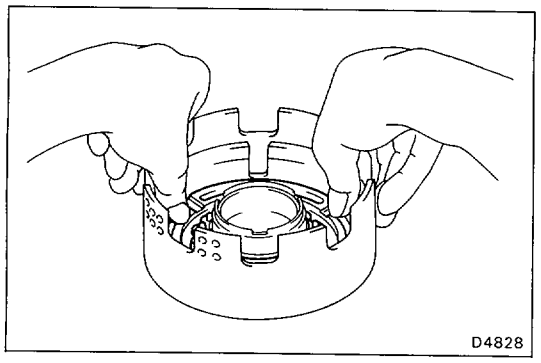


3. CHECK DIRECT CLUTCH DRUM BUSHING

Using a dial indicator, measure the inside diameter of the clutch drum bushing.

Maximum inside diameter: 53.97 mm (2.1248 in.)

If the inside diameter is greater than the maximum, replace the clutch drum.

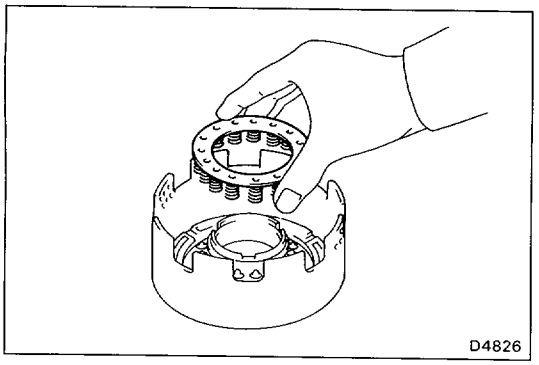


ASSEMBLY OF DIRECT CLUTCH

1. INSTALL DIRECT CLUTCH PISTON TO DIRECT CLUTCH DRUM

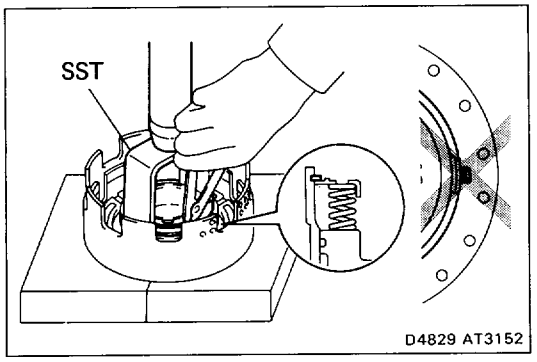
(a) Coat new O-rings with ATF and install them on the direct clutch piston.

(b) Being careful not to damage the O-rings, press in the direct clutch piston into the clutch drum by both hands.



2. INSTALL PISTON RETURN SPRING

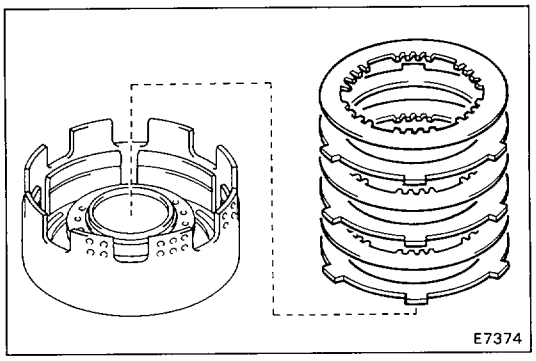
(a) Install the piston return spring.



(b) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

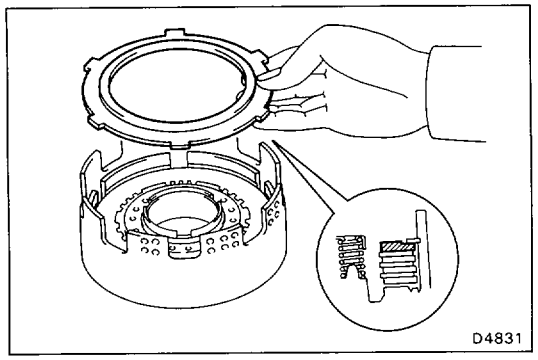
(c) Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



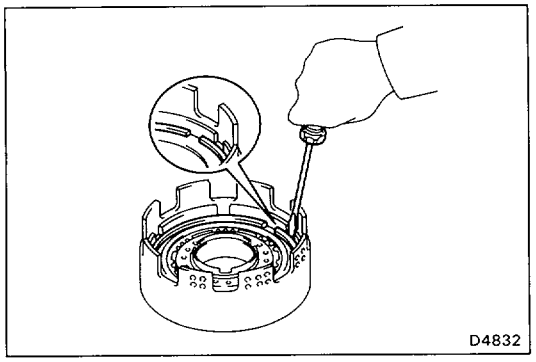
3. INSTALL PLATES, DISCS AND FLANGE

(a) Install the plates and discs.

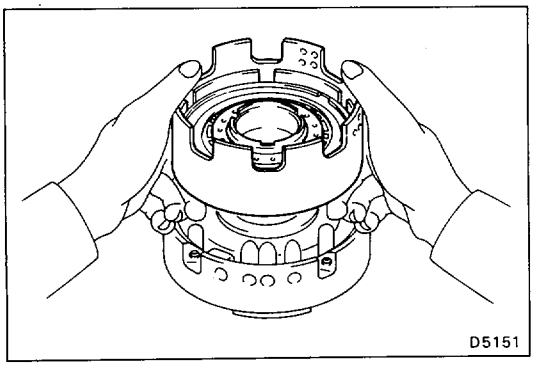
Install in order: P = Plate D = Disc
P—D—P—D—P—D



(b) Install the flange, facing the flat end downward.

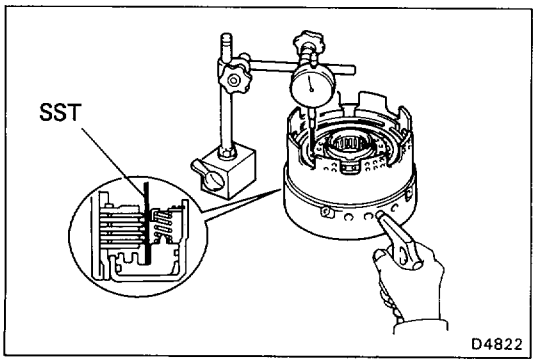


(c) Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with the cutout portion of the direct clutch drum.



4. CHECK PISTON STROKE OF DIRECT CLUTCH

(a) Place the direct clutch assembly onto the O/D support assembly.



(b) Using SST and a dial indicator, measure the direct clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 1.03 — 1.33 mm (0.0406 — 0.0524 in.)

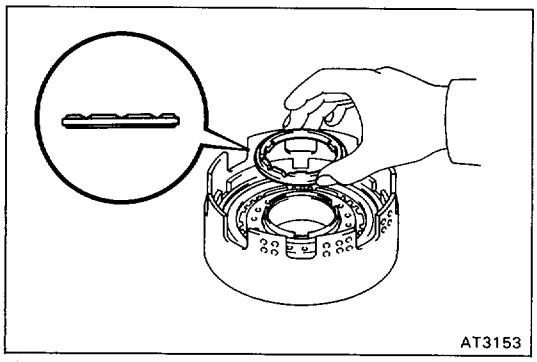
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke is nonstandard, select another flange.

NOTE: There are eight different thicknesses for flange.

Flange thickness mm (in.)

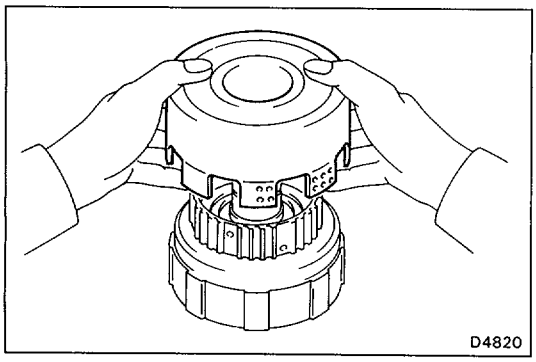
No.	Thickness	No.	Thickness
33	3.0 (0.118)	29	3.4 (0.134)
32	3.1 (0.122)	28	3.5 (0.138)
31	3.2 (0.126)	27	3.6 (0.142)
30	3.3 (0.130)	34	3.7 (0.146)



5. INSTALL CLUTCH DRUM THRUST WASHER

Coat the thrust washer with petroleum jelly and install it onto the direct clutch.

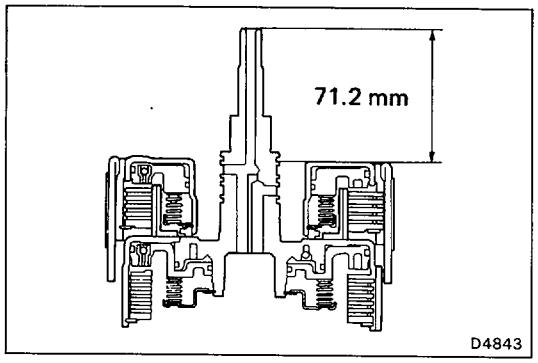
NOTE: Make sure that the lug shapes match the cutout portions on the direct clutch.



6. INSTALL DIRECT CLUTCH ASSEMBLY TO FORWARD CLUTCH ASSEMBLY

(a) Align the flukes of discs in the direct clutch.

(b) Install the direct clutch assembly onto the forward clutch assembly.

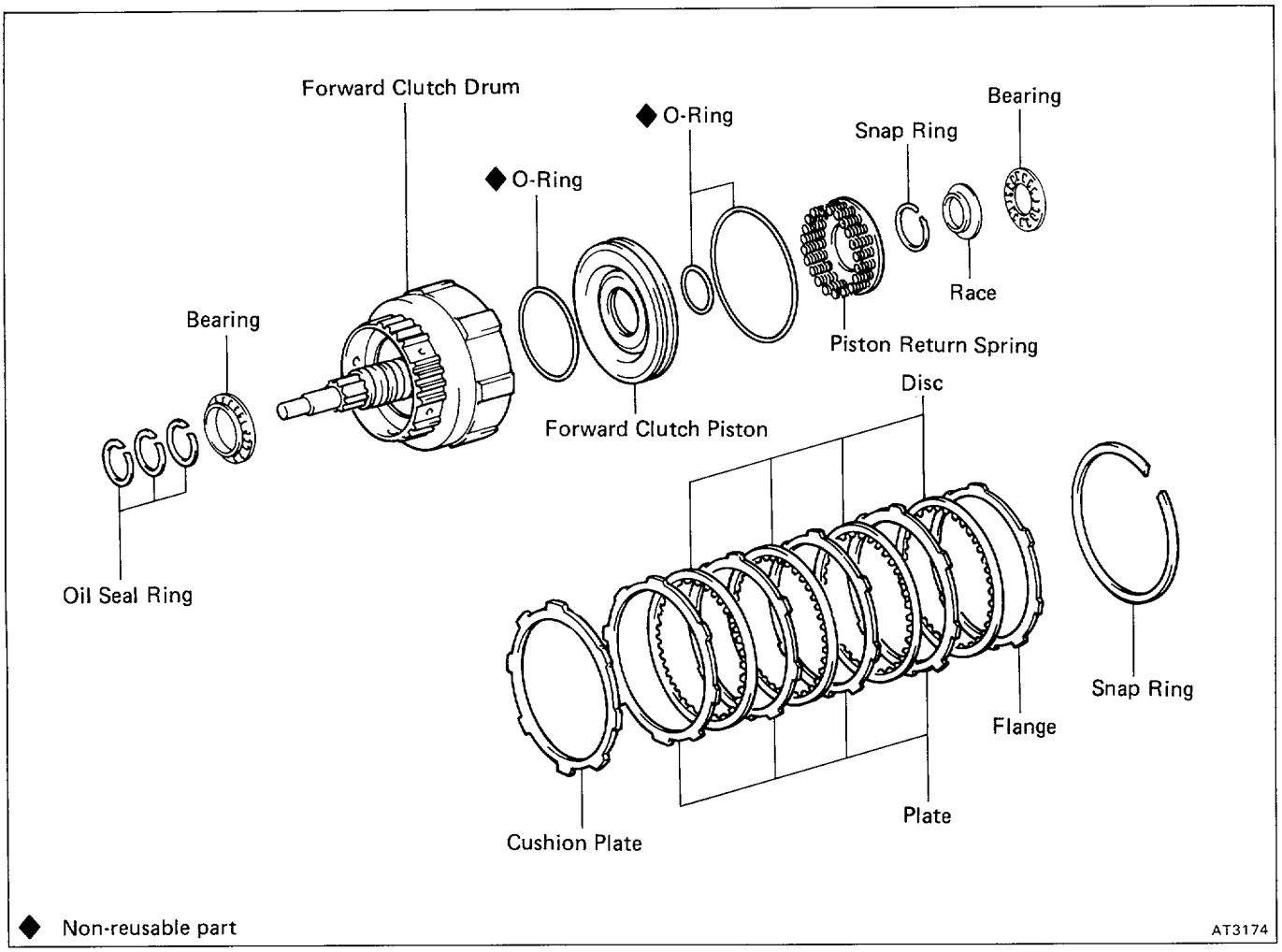


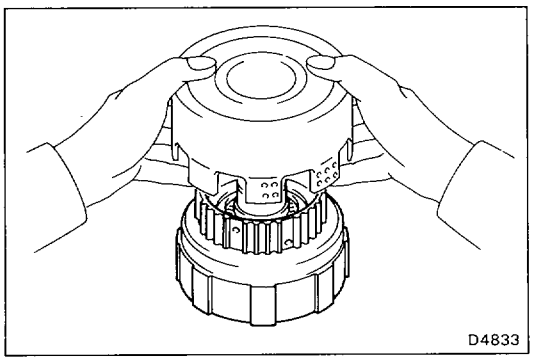
(c) Check that the distance from the direct clutch end to the forward clutch end should be 71.2 mm (2.803 in.).

If the distance is less than the above value, parts may be misassembled and reinstall them.

Forward Clutch

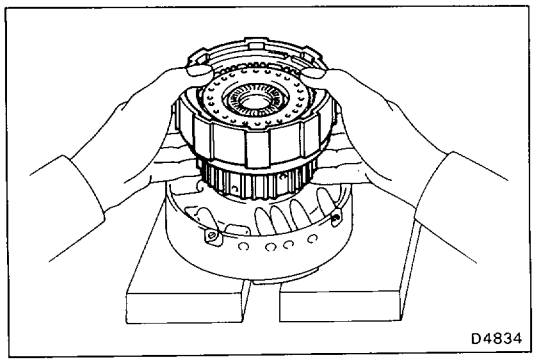
COMPONENTS





DISASSEMBLY OF FORWARD CLUTCH

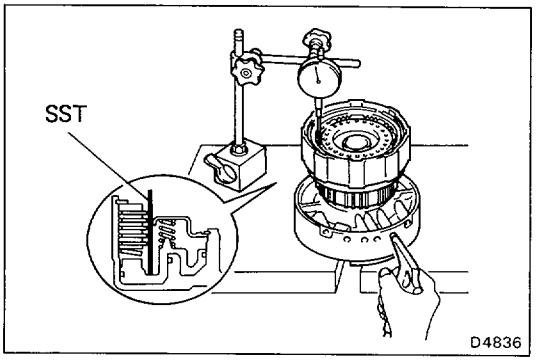
1. REMOVE FORWARD CLUTCH ASSEMBLY FROM DIRECT CLUTCH ASSEMBLY



2. PLACE FORWARD CLUTCH ONTO OVERDRIVE SUPPORT

(a) Place wooden blocks, etc. to prevent forward clutch shaft from touching the work stand, and place the O/D support on them.

(b) Place the forward clutch onto the O/D support.



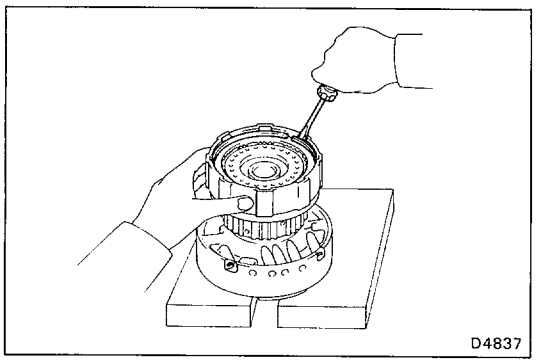
3. CHECK PISTON STROKE OF FORWARD CLUTCH

Using SST and a dial indicator, measure the forward clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 3.11 — 3.89 mm (0.1224 — 0.1531 in.)

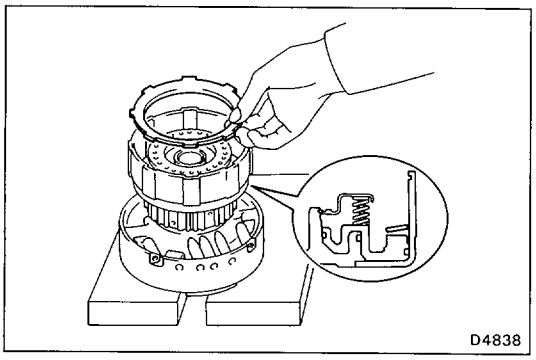
If the values are nonstandard, inspect the discs.



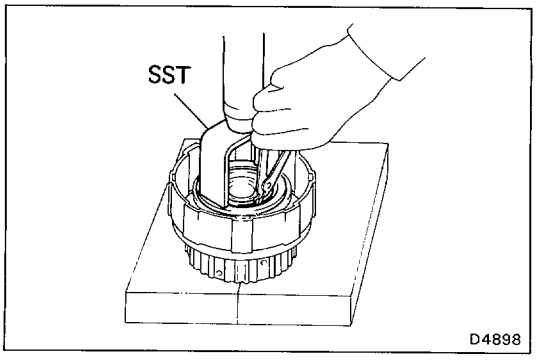
4. REMOVE FLANGE, PLATES AND DISCS

(a) Remove the snap ring from the forward clutch drum.

(b) Remove the flange, four plates and four discs.



5. REMOVE CUSHION PLATE



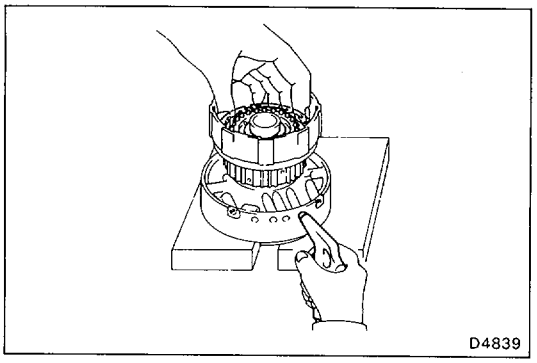
6. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the piston return spring.



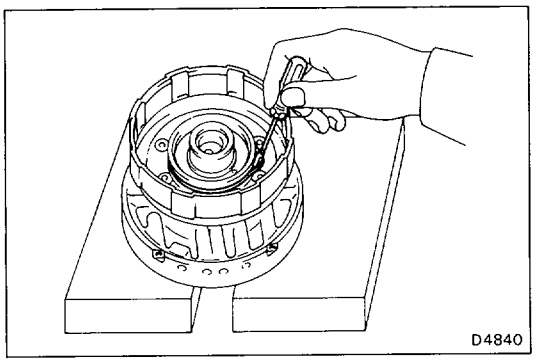
7. REMOVE FORWARD CLUTCH PISTON

(a) Place the forward clutch drum onto the O/D support.

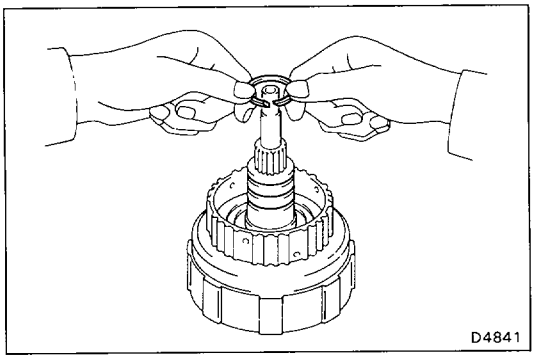
(b) Hold the forward clutch piston by hand, apply compressed air to the O/D support to remove the forward clutch piston.

(c) Remove the forward clutch piston.

(d) Remove the two O-rings from the piston.



8. REMOVE O-RING FROM FORWARD CLUTCH DRUM



9. REMOVE OIL SEAL RINGS

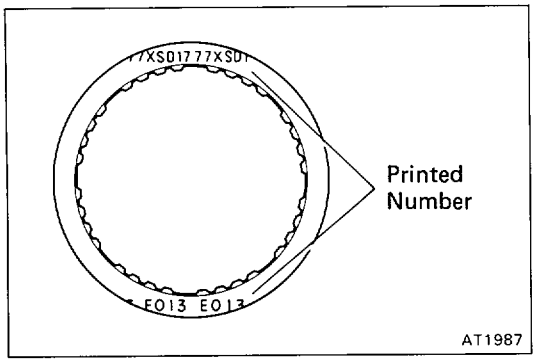
INSPECTION OF FORWARD CLUTCH

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

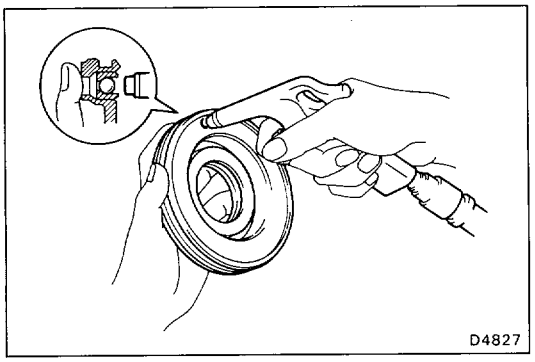
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



2. CHECK FORWARD CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

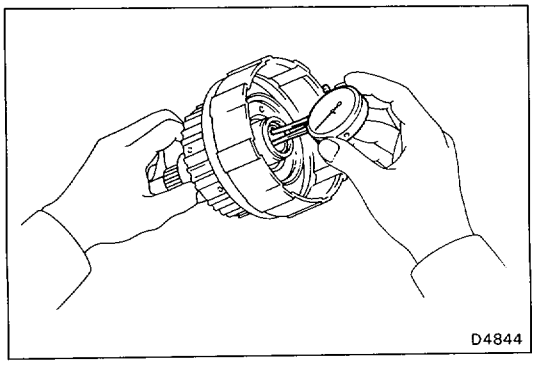


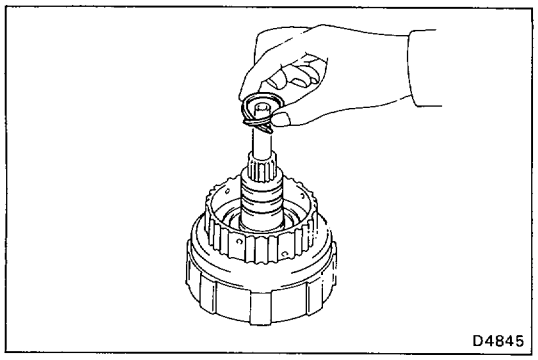
3. CHECK FORWARD CLUTCH DRUM BUSHING

Using a dial indicator, measure the inside diameter of the forward clutch drum bushing.

Maximum inside diameter: 24.08 mm (0.9480 in.)

If the inside diameter is greater than the maximum, replace the forward clutch drum.





ASSEMBLY OF FORWARD CLUTCH

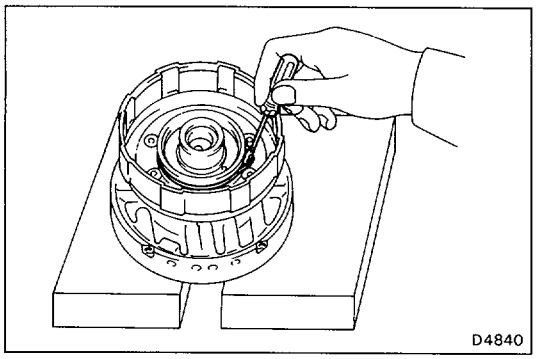
1. INSTALL OIL SEAL RINGS

(a) Coat the three oil seal rings with ATF.

(b) Contract the oil seal rings as shown, and install them onto the forward clutch drum.

CAUTION: Do not spread the ring ends more than necessary.

NOTE: After installing the oil seal rings, check that they rotate smoothly.

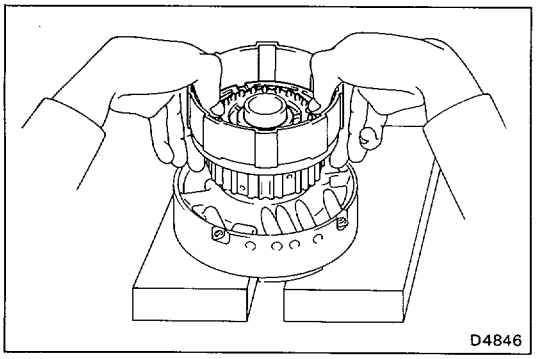


2. INSTALL NEW O-RING TO FORWARD CLUTCH DRUM

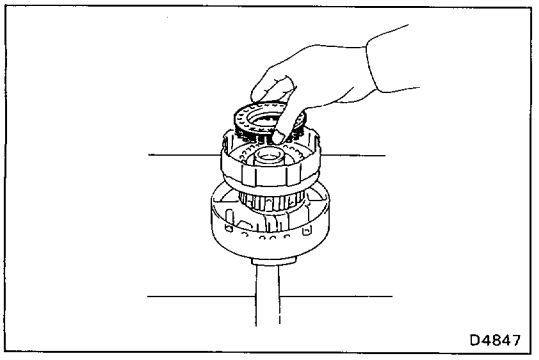
Coat a new O-ring with ATF and install it on the forward clutch drum.

3. INSTALL FORWARD CLUTCH PISTON

(a) Coat new O-rings with ATF and install them on the forward clutch piston.

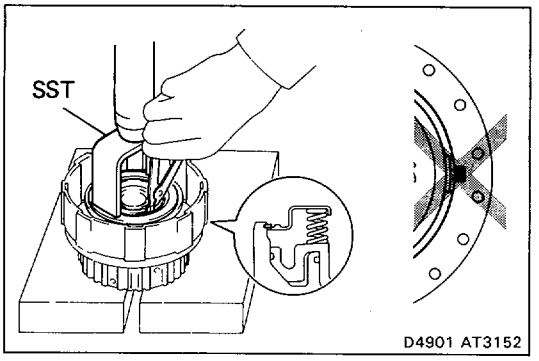


(b) Being careful not to damage the O-rings, press the clutch piston into the forward clutch drum by both hands.



4. INSTALL PISTON RETURN SPRING

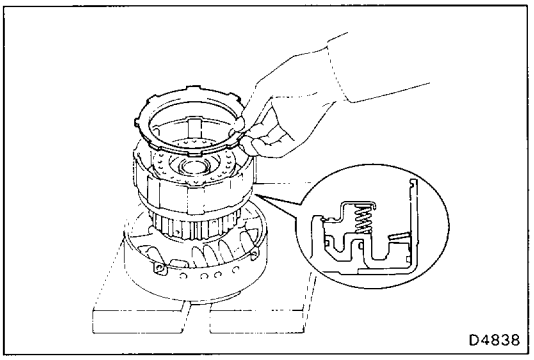
(a) Install the piston return spring.



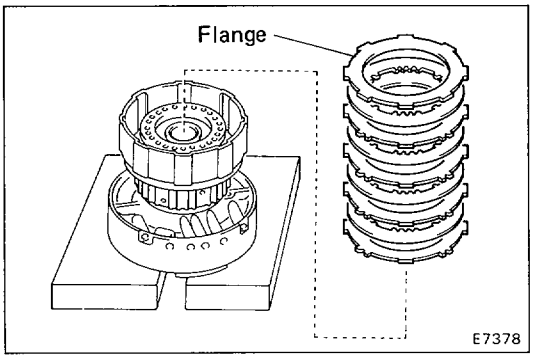
(b) Place SST on the spring retainer, and compress the return spring with a shop press.

SST 09350-30020 (09350-07040)

(c) Install the snap ring with snap ring pliers. Be sure the end gap of the ring is not aligned with the spring retainer claw.



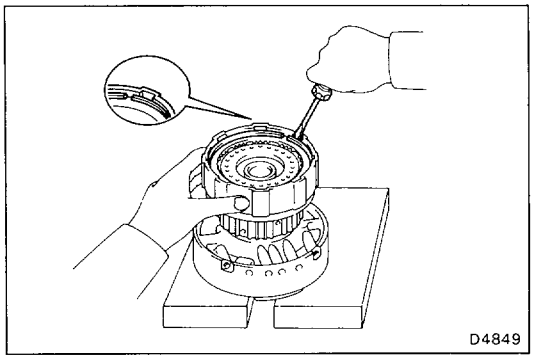
5. INSTALL CUSHION PLATE ROUNDED END DOWN AS SHOWN



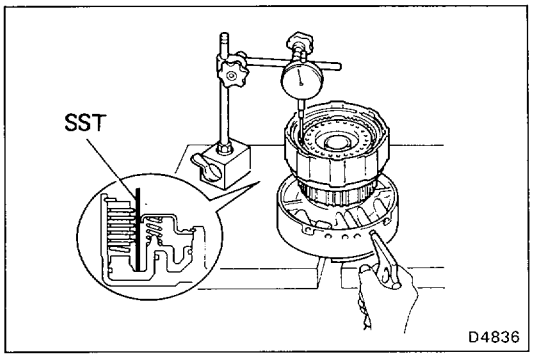
6. INSTALL PLATES, DISCS AND FLANGE

(a) Install in order: P = Plate D = Disc
P—D—P—D—P—D—P—D

(b) And then install the flange, facing the rounded edge downward.



(c) Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with the cutout portion of the forward clutch drum.



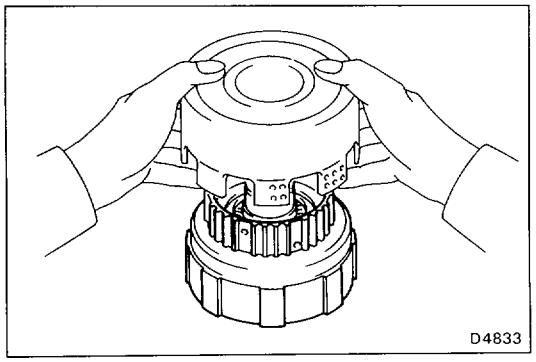
7. CHECK PISTON STROKE OF FORWARD CLUTCH

Using SST and a dial indicator, measure the forward clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 3.11 — 3.89 mm (0.1224 — 0.1531 in.)

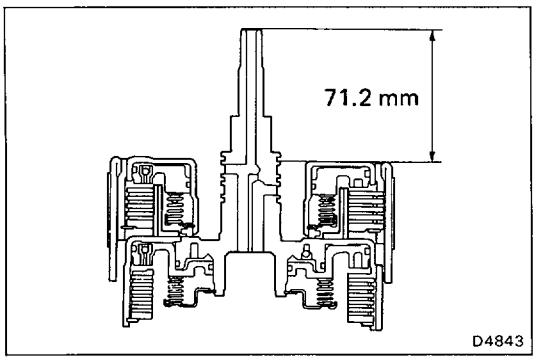
If the piston stroke is less than the limit, parts may be mis-assembled and reinstall them.



8. INSTALL DIRECT CLUTCH ASSEMBLY TO FORWARD CLUTCH ASSEMBLY

(a) Align the flukes of discs in the direct clutch.

(b) Install the direct clutch assembly onto the forward clutch assembly.

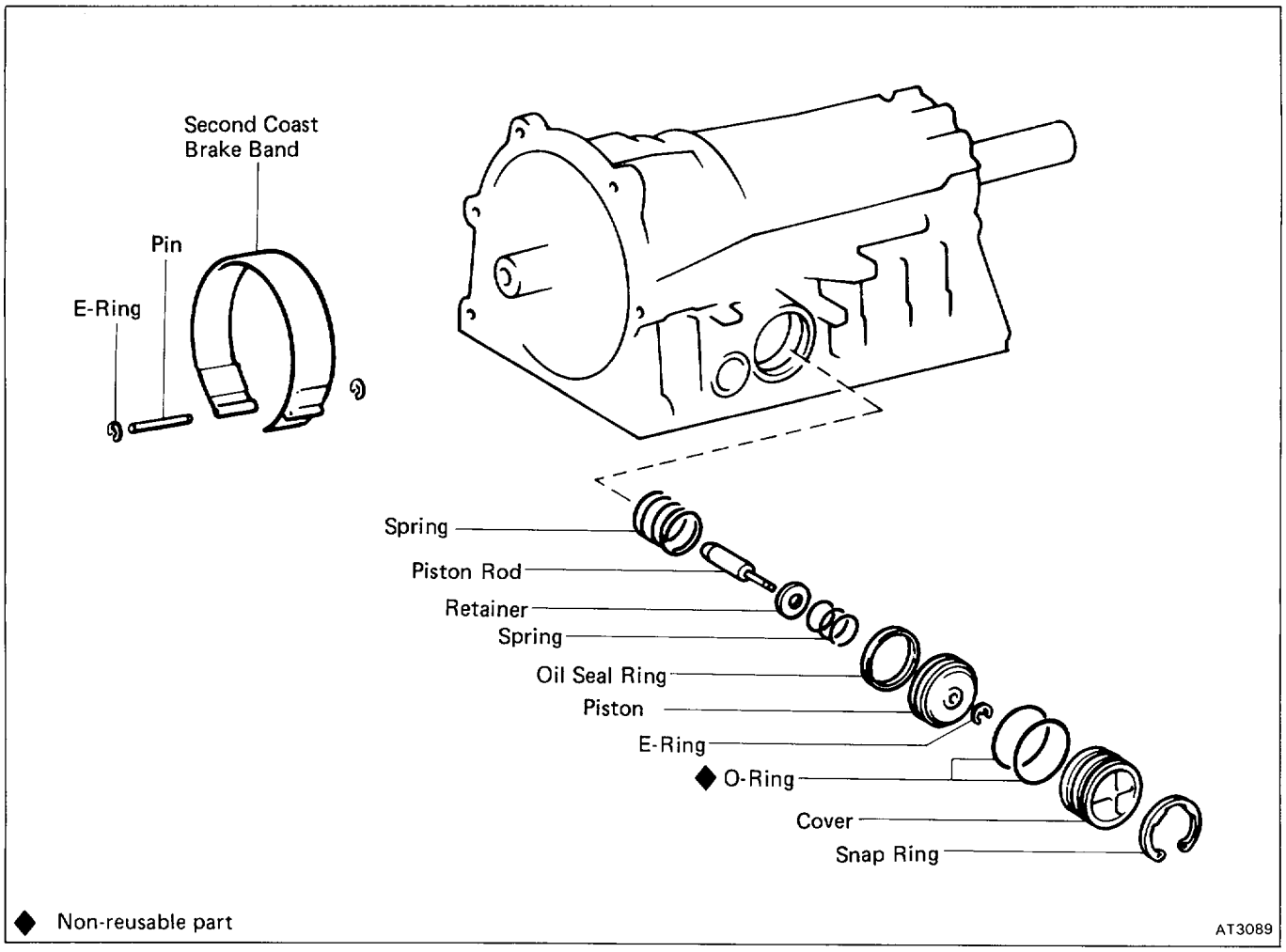


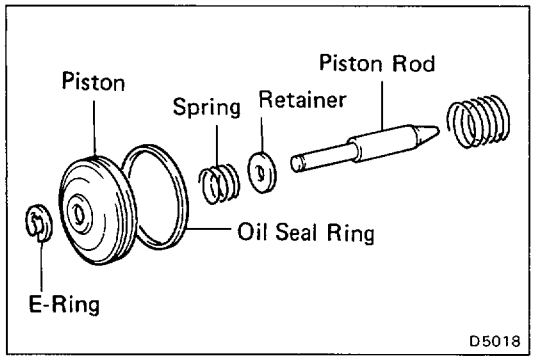
(c) Check that the distance from the direct clutch end to the forward clutch end should be 71.2 mm (2.803 in.).

If the distance is less than the above value, parts may be misassembled and reinstall them.

Second Coast Brake

COMPONENTS





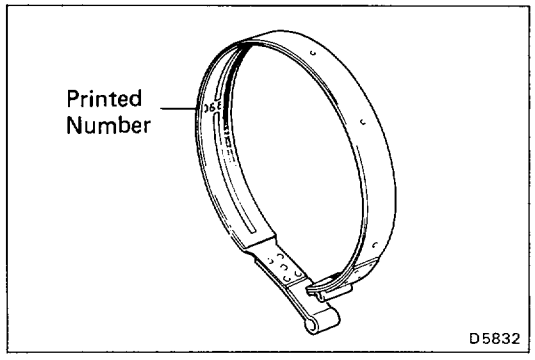
DISASSEMBLY OF SECOND COAST BRAKE PISTON

DISASSEMBLE SECOND COAST BRAKE PISTON

(a) Remove the E-ring.

(b) Remove the piston, spring and retainer from the piston rod.

(c) Remove the oil seal ring form the piston.

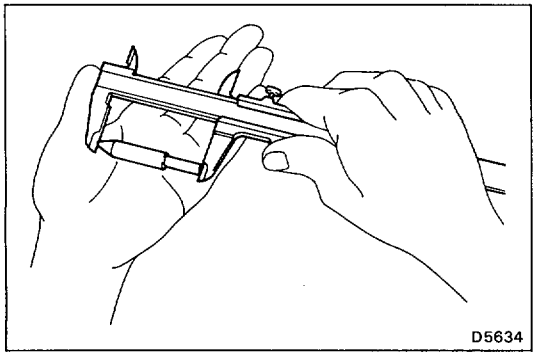


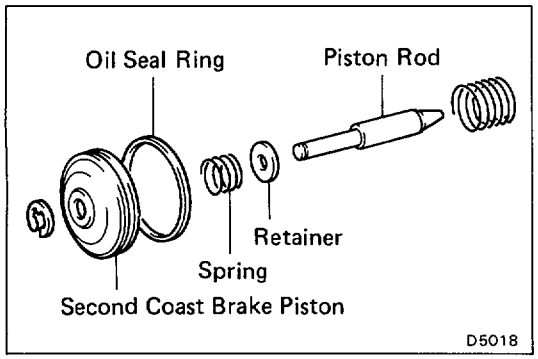
INSPECTION OF SECOND COAST BRAKE BAND

INSPECT BRAKE BAND

If the lining of the brake band is exfoliated or discolored, or even a part of the printed numbers are defaced, replace the brake band.

NOTE: Before assembling new band, soak it in ATF for at least two hours.





ASSEMBLY OF SECOND COAST BRAKE PISTON

1. SELECT PISTON ROD

If the band is OK with piston rod stroke not within the standard value, select the piston rod.

There are two different lengths for piston rod.

Piston rod length: 71.4 mm (2.811 in.)
72.9 mm (2.870 in.)

2. ASSEMBLE SECOND COAST BRAKE PISTON

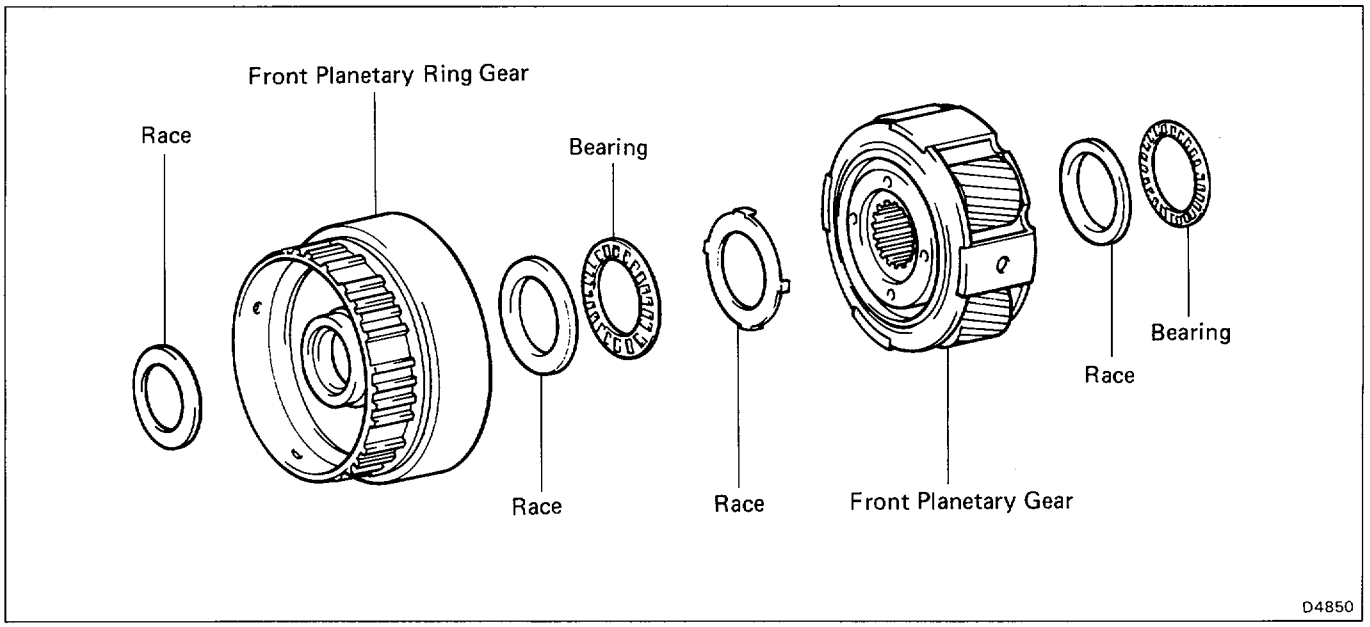
(a) Coat the oil seal ring with ATF and install it to the second coast brake piston.

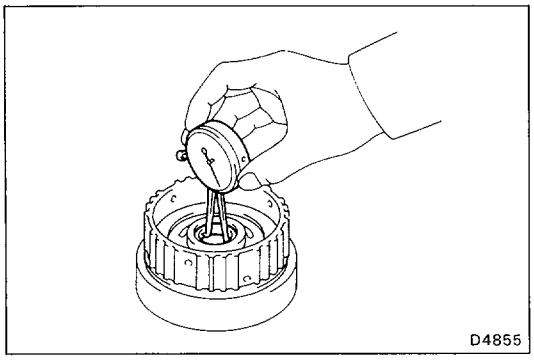
(b) Install the retainer, spring and piston to the piston rod.

(c) Install the E-ring.

Front Planetary Gear

COMPONENTS





INSPECTION OF FRONT PLANETARY GEAR

CHECK FRONT PLANETARY RING GEAR BUSHING

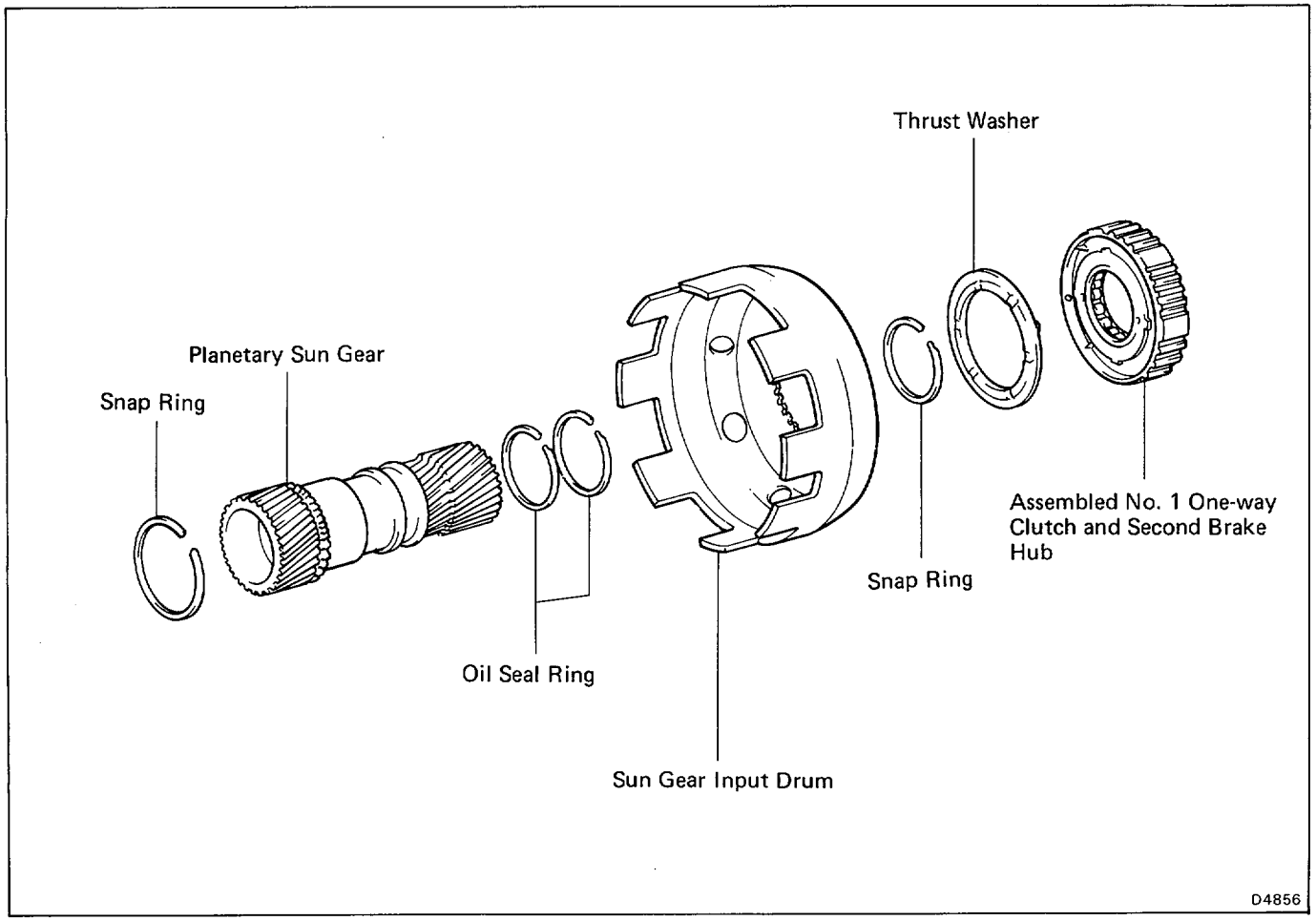
Using a dial indicator, measure the inside diameter of the planetary ring gear bushing.

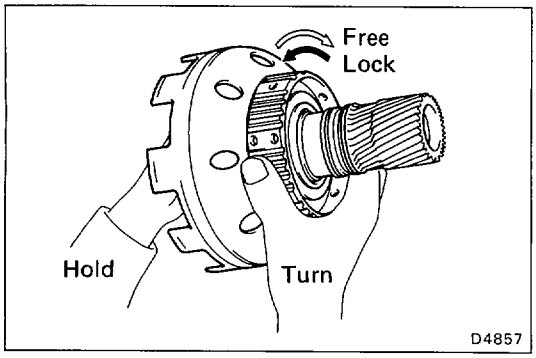
Maximum inside diameter: 24.08 mm (0.9480 in.)

If the inside diameter is greater than the maximum, replace the planetary ring gear.

Planetary Sun Gear and No. 1 One-way Clutch

COMPONENTS

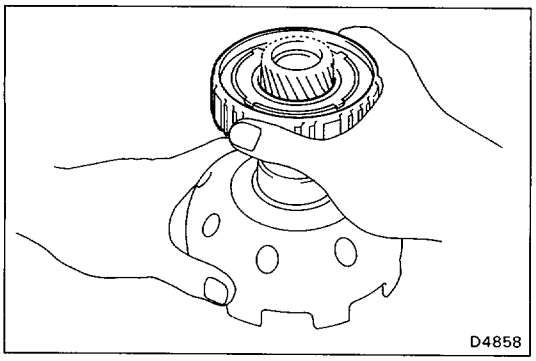




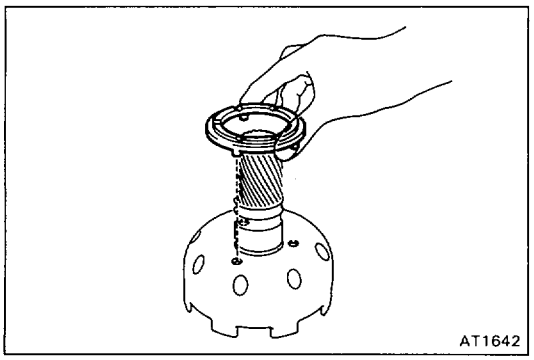
DISASSEMBLY OF PLANETARY SUN GEAR AND NO. 1 ONE-WAY CLUTCH

1. CHECK OPERATION OF NO. 1 ONE-WAY CLUTCH

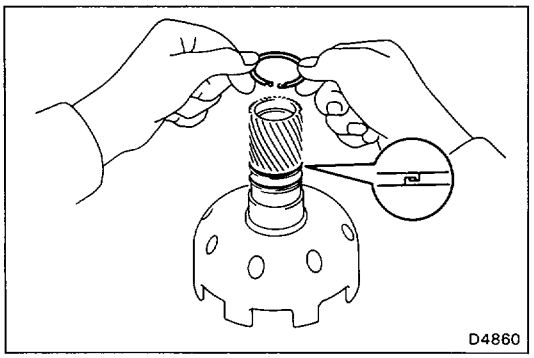
Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterclockwise.



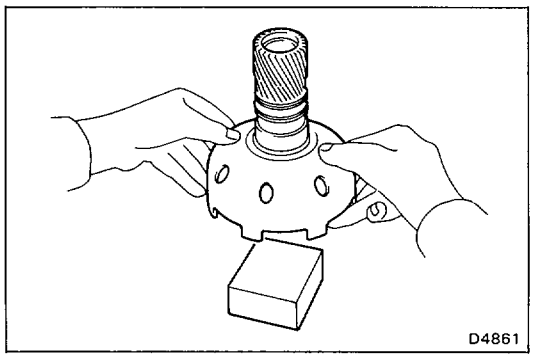
2. REMOVE ASSEMBLED NO. 1 ONE-WAY CLUTCH AND SECOND BRAKE HUB



3. **REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM**

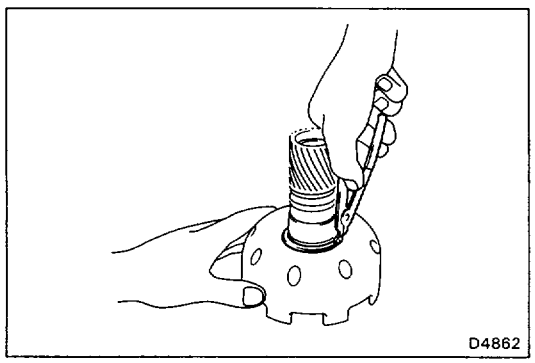


4. **REMOVE OIL SEAL RINGS**



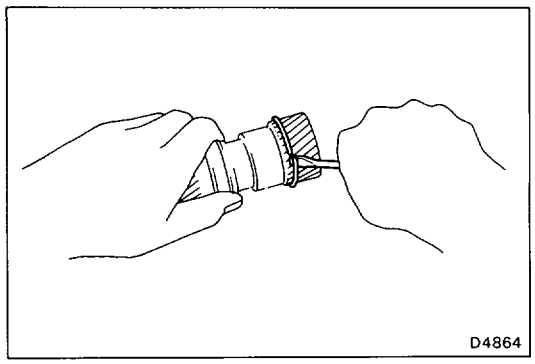
5. **REMOVE SUN GEAR INPUT DRUM FROM PLANETARY SUN GEAR**

(a) Use a wooden block, etc. as work stand.

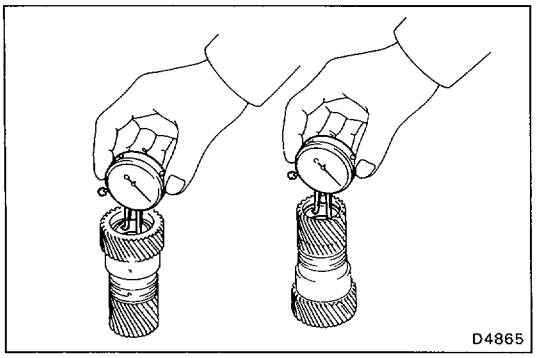


(b) Using snap ring pliers, remove the snap ring.

(c) Remove the sun gear input drum from the planetary sun gear.



6. **REMOVE SNAP RING FROM PLANETARY SUN GEAR**



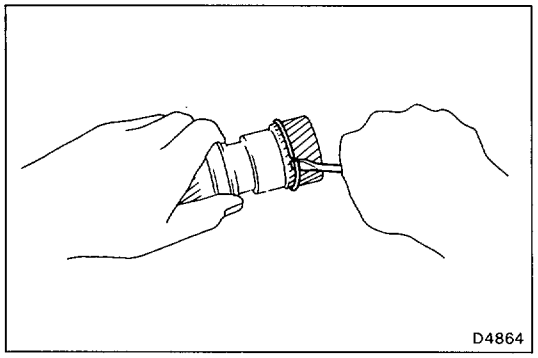
INSPECTION OF PLANETARY SUN GEAR

CHECK PLANETARY SUN GEAR BUSHINGS

Using a dial indicator, measure the inside diameter of the planetary sun gear bushings.

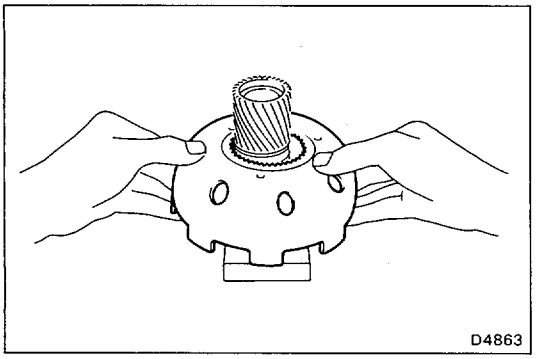
Maximum inside diameter: 27.08 mm (1.0661 in.)

If the inside diameter is greater than the maximum, replace the planetary sun gear.



ASSEMBLY OF PLANETARY SUN GEAR AND NO. 1 ONE-WAY CLUTCH

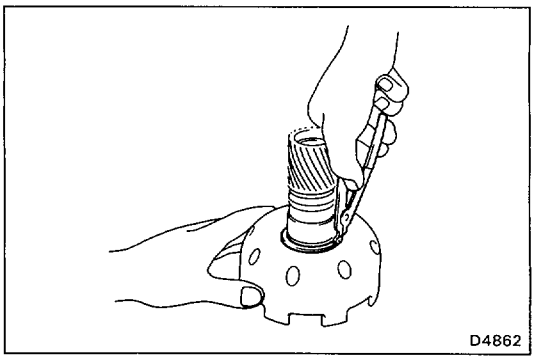
1. INSTALL SNAP RING TO PLANETARY SUN GEAR



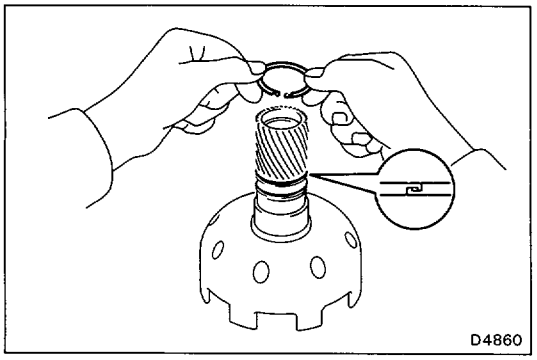
2. INSTALL SUN GEAR INPUT DRUM

(a) Place a wooden block, etc. as a work stand and place the planetary sun gear onto it.

(b) Install the sun gear input drum onto the planetary sun gear.



(c) Install the snap ring with snap ring pliers.



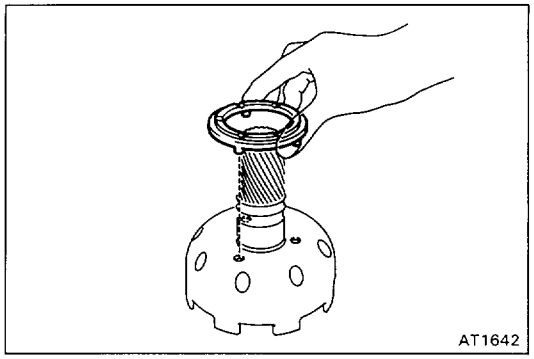
3. INSTALL OIL SEAL RINGS

(a) Coat the two oil seal rings with ATF.

(b) Install the two oil seal rings onto the planetary sun gear.

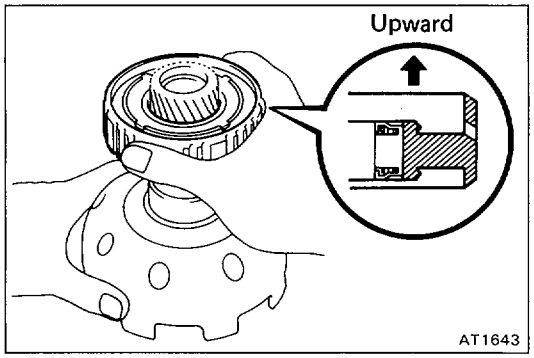
CAUTION: Do not spread the ring ends too much.

NOTE: After installing the oil seal rings, check that they rotate smoothly.

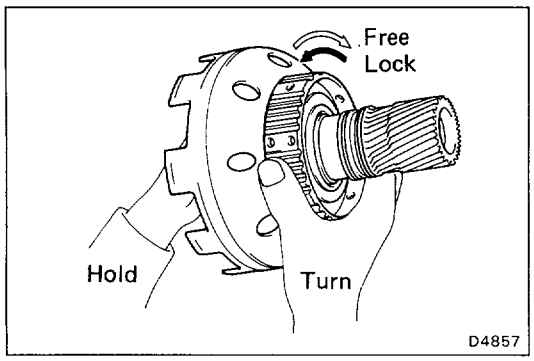


4. **INSTALL THRUST WASHER**

NOTE: Make sure that the lug shapes match the holes on the sun gear input drum.



5. **INSTALL ASSEMBLED NO. 1 ONE-WAY CLUTCH AND SECOND BRAKE HUB ONTO PLANETARY SUN GEAR AS SHOWN**

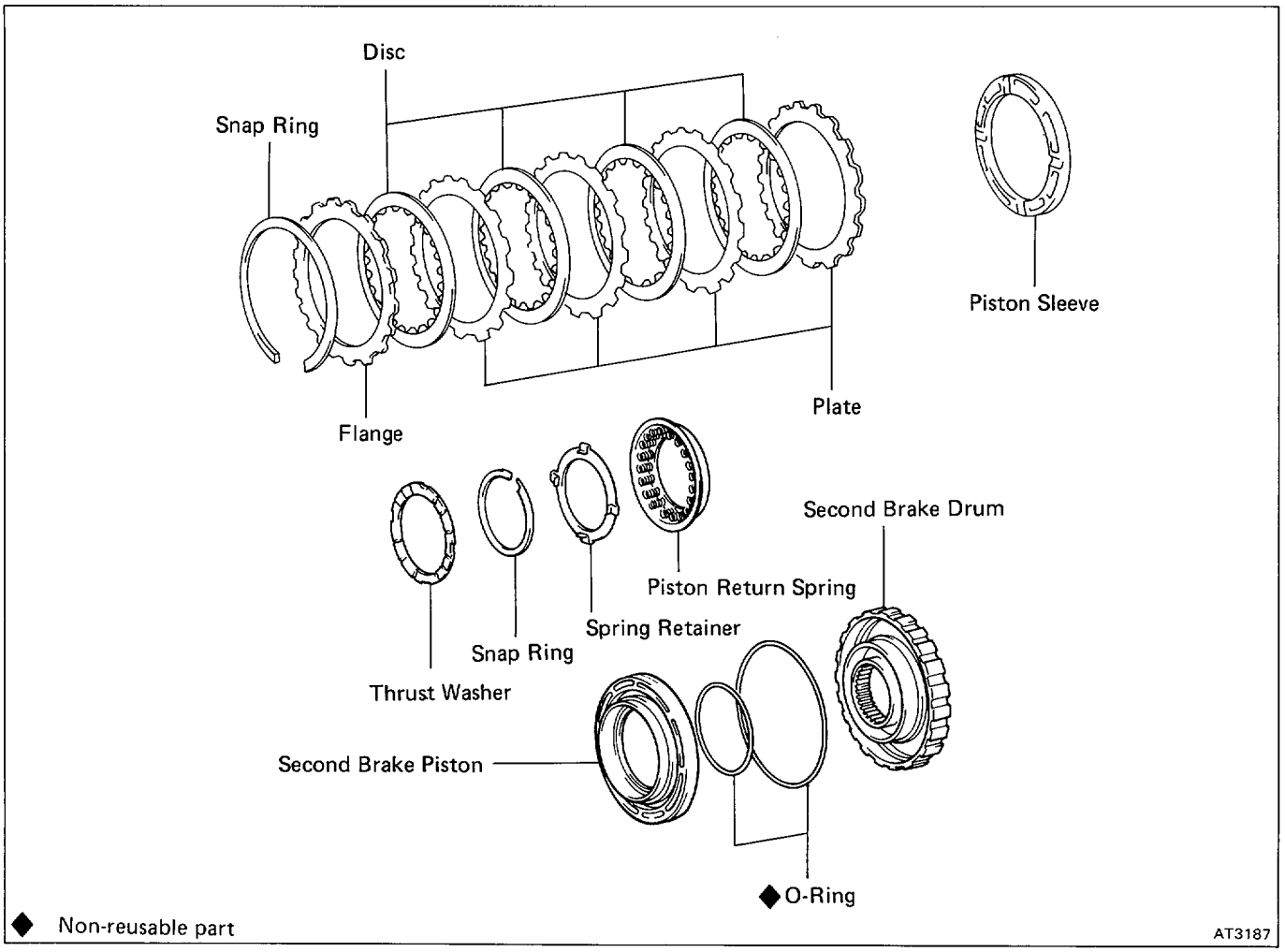


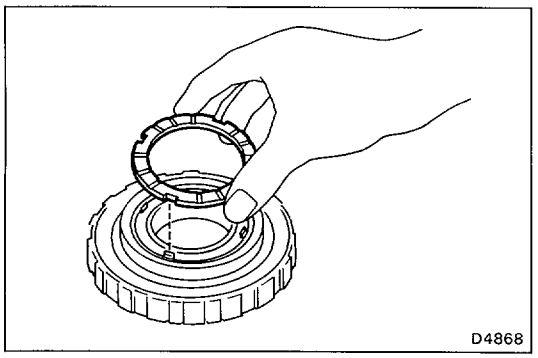
6. **CHECK OPERATION OF NO. 1 ONE-WAY CLUTCH**

Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterclockwise.

Second Brake

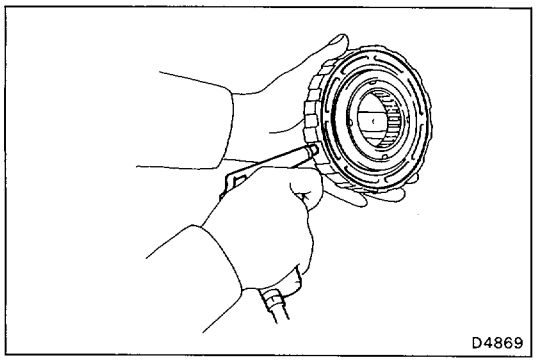
COMPONENTS





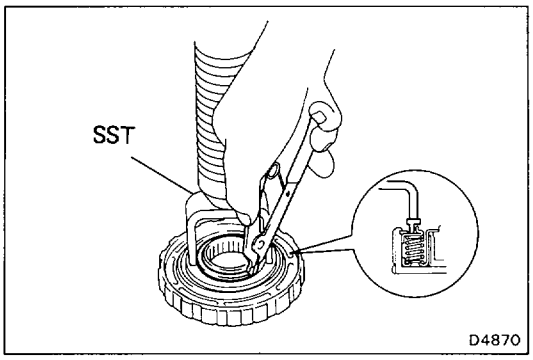
DISASSEMBLY OF SECOND BRAKE

1. **REMOVE THRUST WASHER FROM SECOND BRAKE DRUM**



2. **CHECK SECOND BRAKE PISTON MOVING**

   Make sure the second brake piston moves smoothly when applying and releasing low-pressure compressed air to the second brake drum.



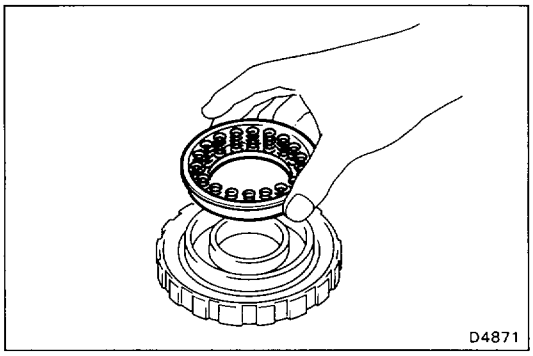
3. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer, and compress the return spring with a shop press.

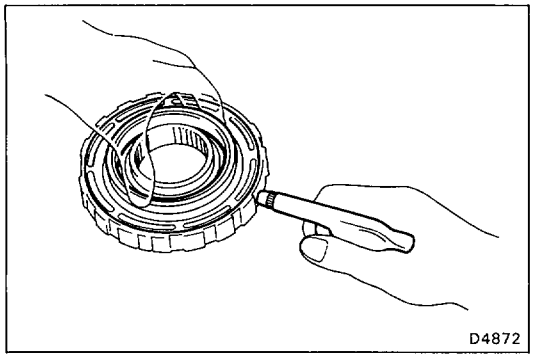
SST 09350-30020 (09350-07040)

(b) Remove the snap ring with snap ring pliers.

(c) Remove the spring retainer.



(d) Remove the piston return spring.

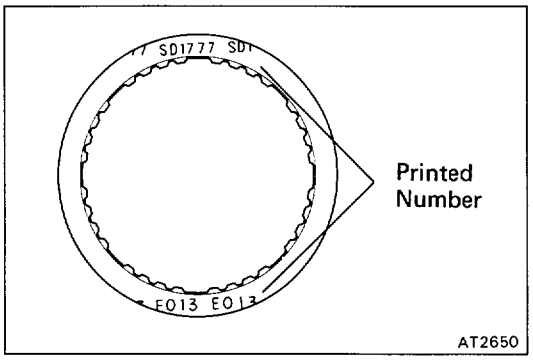


4. REMOVE SECOND BRAKE PISTON

(a) Hold the second brake piston by hand, apply compressed air to the second brake drum to remove the second brake piston.

(b) Remove the second brake piston.

(c) Remove the two O-rings from the piston.



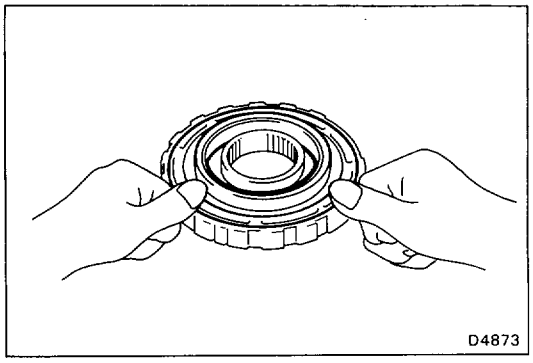
INSPECTION OF SECOND BRAKE

INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

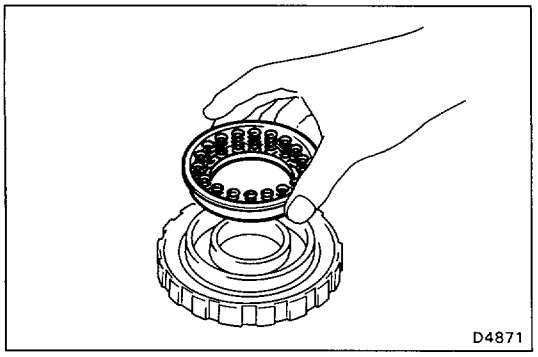


ASSEMBLY OF SECOND BRAKE

1. INSTALL SECOND BRAKE PISTON

(a) Coat new O-rings with ATF and install them on the second brake piston.

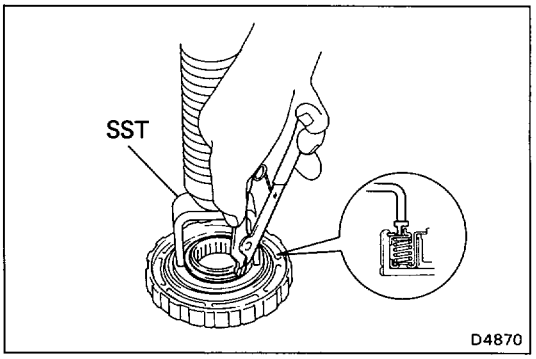
(b) Being careful not to damage the O-rings, press in the second brake piston into the second brake drum by both hands.



2. INSTALL PISTON RETURN SPRING

(a) Install the piston return spring.

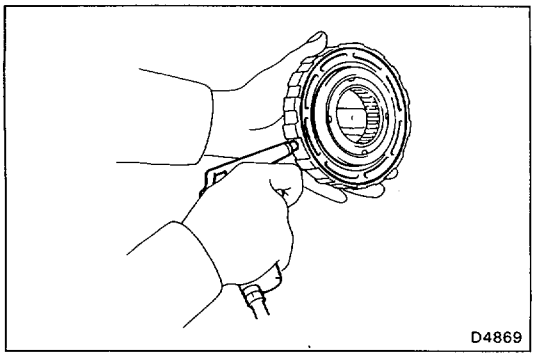
(b) Install the spring retainer.



(c) Place SST on the spring retainer, and compress the return spring with a shop press.

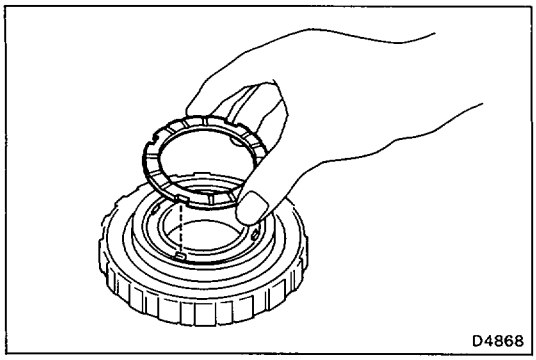
SST 09350-30020 (09350-07040)

(d) Install the snap ring with snap ring pliers.



3. CHECK SECOND BRAKE PISTON MOVING

Make sure the second brake piston moves smoothly when applying and releasing low-pressure compressed air to the second brake drum.



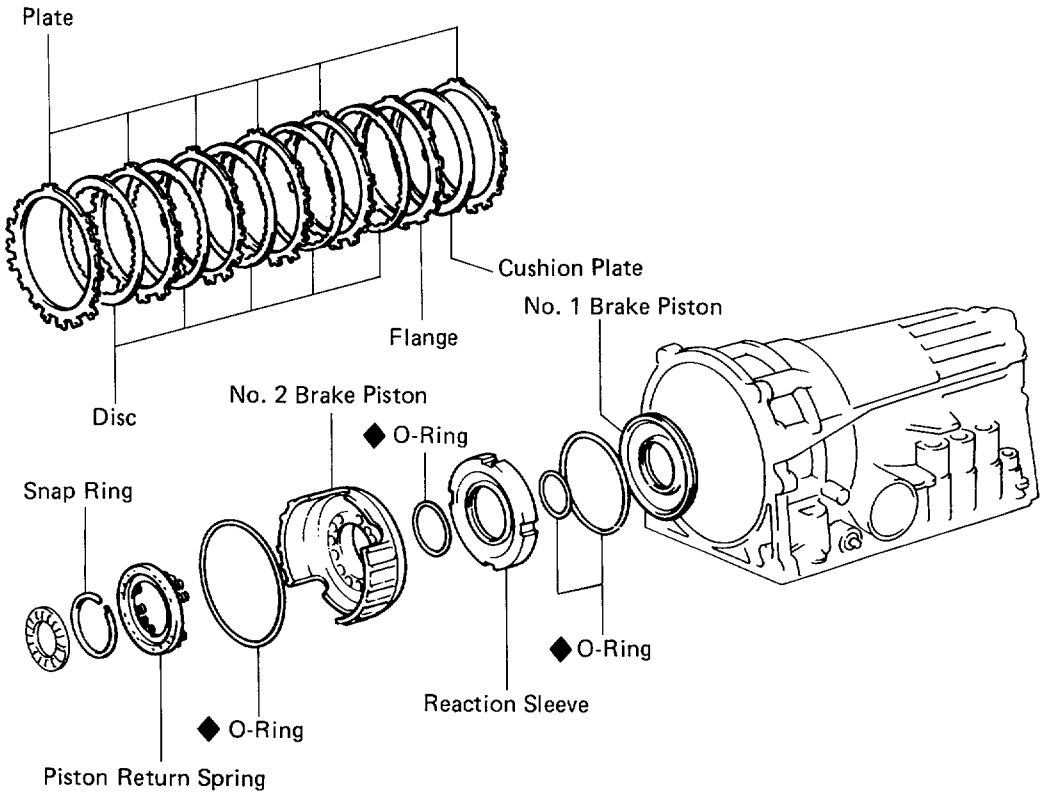
4. INSTALL THRUST WASHER

Coat the thrust washer with petroleum jelly and install it.

NOTE: Make sure that the cutout portions of thrust washer match teeth of the spring retainer.

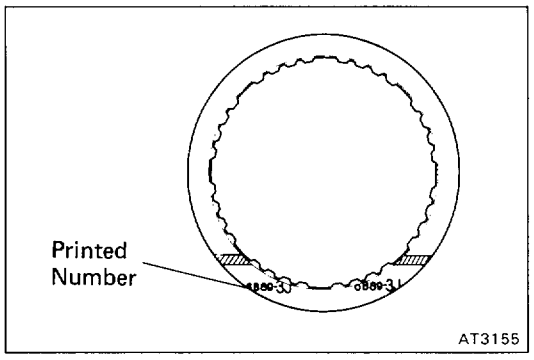
First and Reverse Brake

COMPONENTS



◆ Non-reusable part

AT3175



INSPECTION OF FIRST AND REVERSE BRAKE

INSPECT DISC, PLATE AND FLANGE

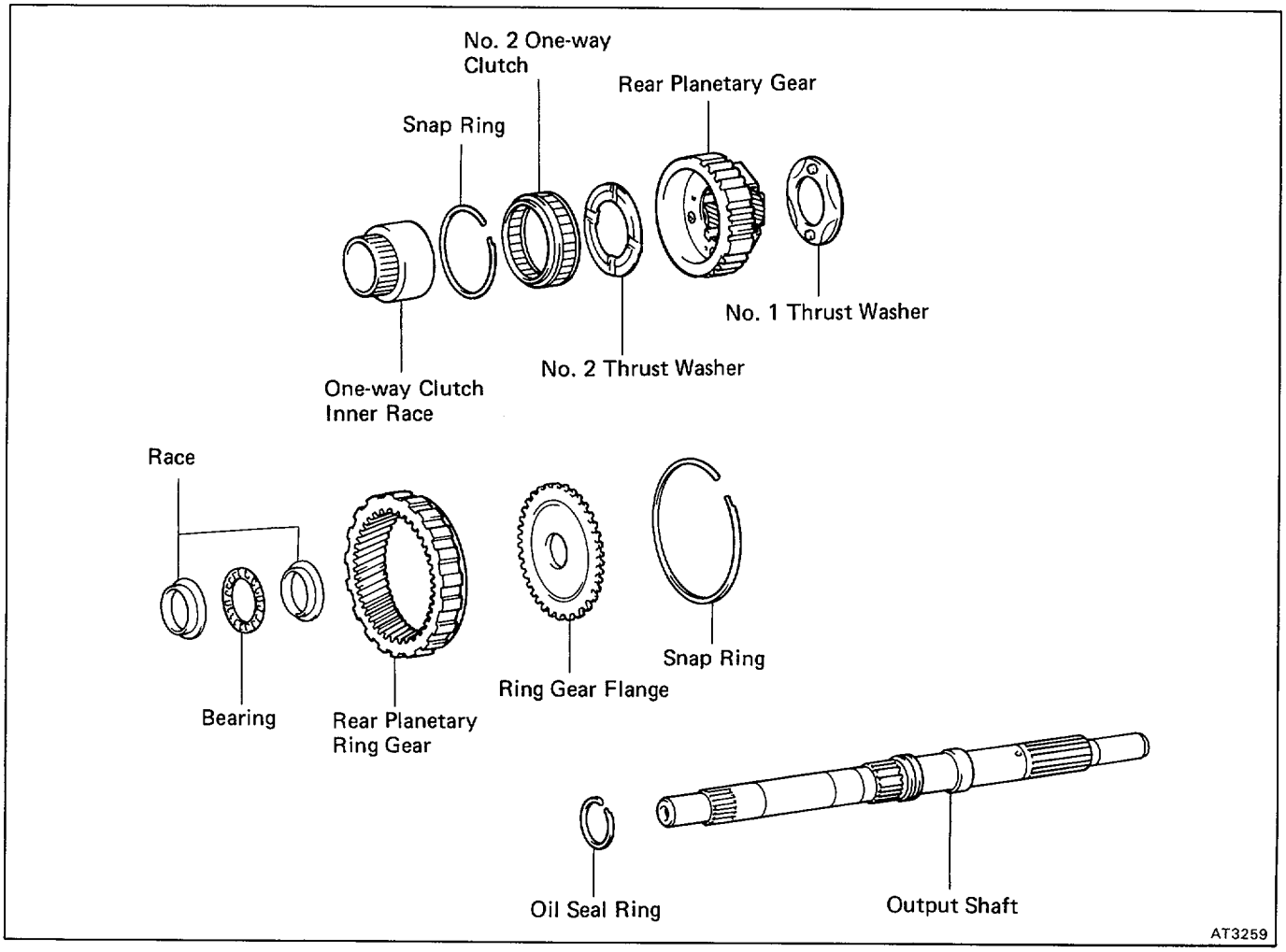
Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

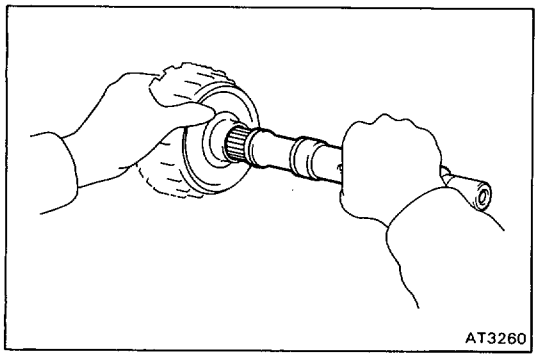
NOTE:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

Rear Planetary Gear, No. 2 One-way Clutch and Output Shaft

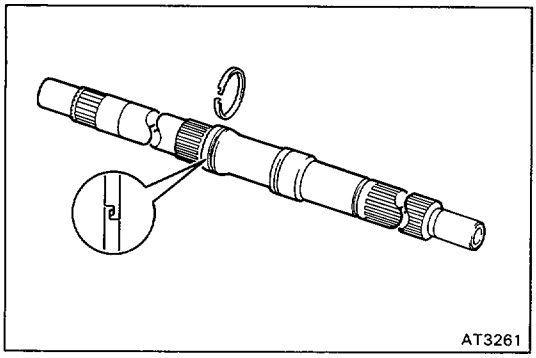
COMPONENTS



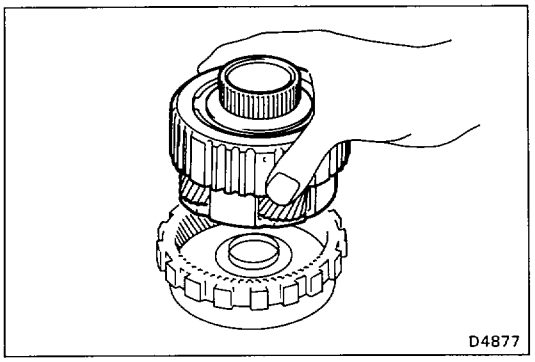


DISASSEMBLY OF REAR PLANETARY GEAR, NO. 2 ONE-WAY CLUTCH AND OUTPUT SHAFT

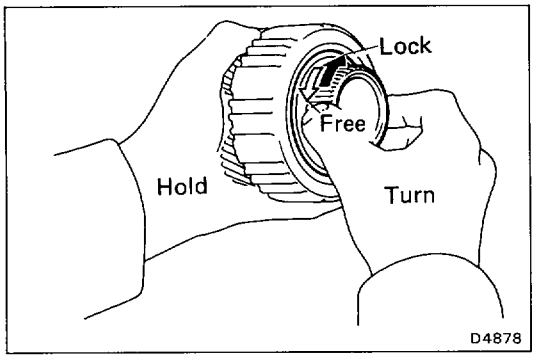
1. REMOVE OUTPUT SHAFT FROM REAR PLANETARY GEAR ASSEMBLY



2. REMOVE OIL SEAL RING FROM OUTPUT SHAFT

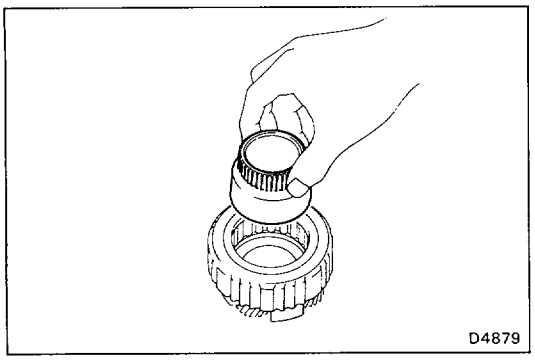


3. **REMOVE REAR PLANETARY GEAR FROM REAR PLANETARY RING GEAR**



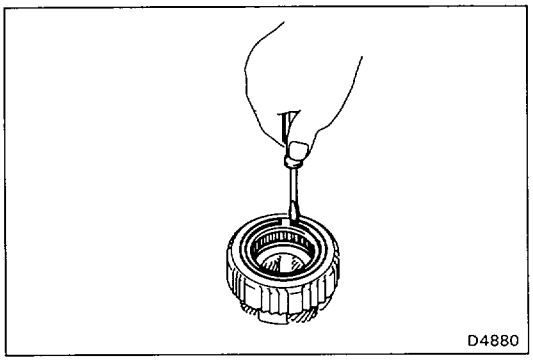
4. **CHECK OPERATION OF NO. 2 ONE-WAY CLUTCH**

Hold the planetary gear and turn the one-way clutch inner race. The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.

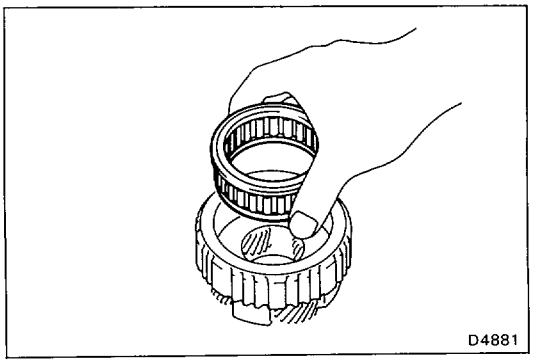


5. **REMOVE NO. 2 ONE-WAY CLUTCH**

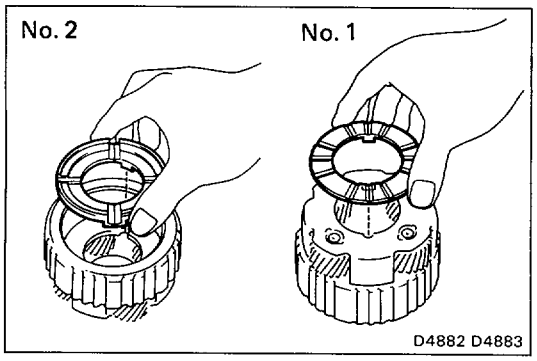
(a) Remove the one-way clutch inner race from the rear planetary gear.



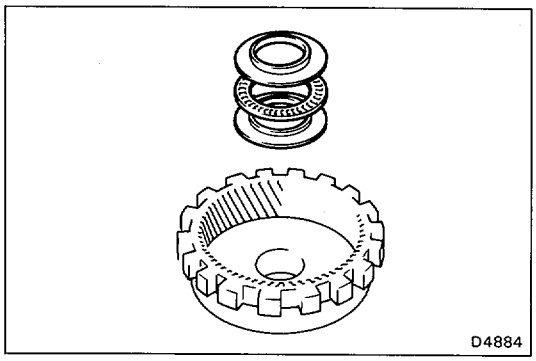
(b) Remove the snap ring with a screwdriver.



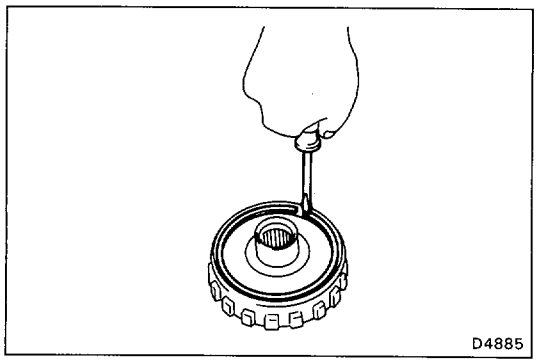
(c) Remove No. 2 one-way clutch with retainers from the planetary gear.



6. **REMOVE NO. 2 AND NO. 1 THRUST WASHERS**

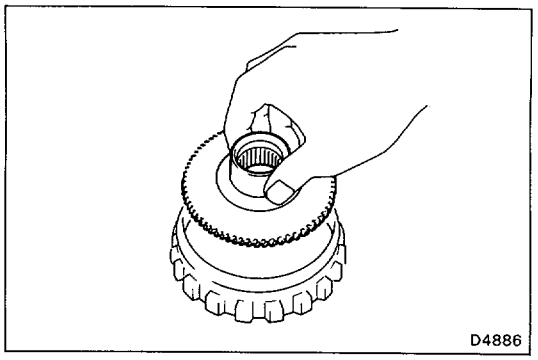


7. **REMOVE RACES AND BEARING FROM REAR PLANETARY RING GEAR**

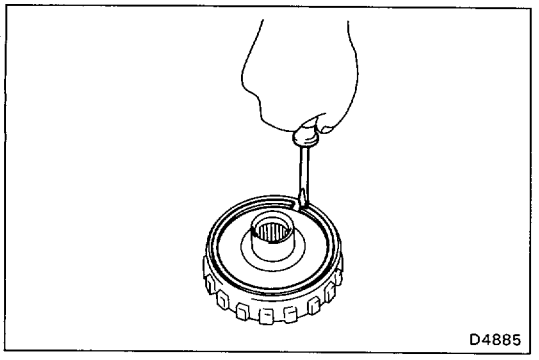


8. **REMOVE RING GEAR FLANGE**

(a) Remove the snap ring with a screwdriver.



(b) Remove the ring gear flange.

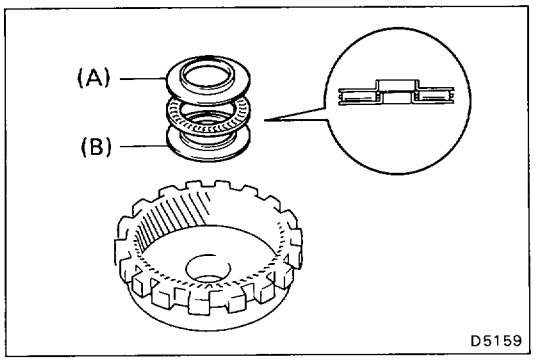


ASSEMBLY OF REAR PLANETARY GEAR, NO. 2 ONE-WAY CLUTCH AND OUTPUT SHAFT

1. **INSTALL RING GEAR FLANGE**

(a) Install the ring gear flange.

(b) Install the snap ring.



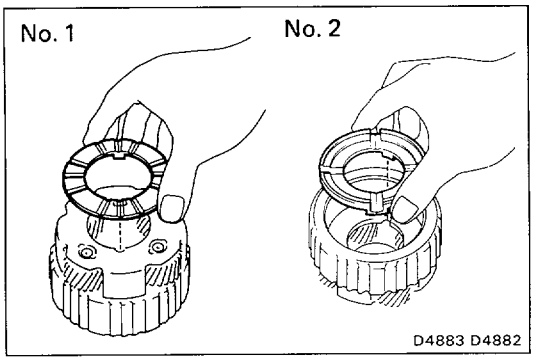
2. INSTALL RACES AND BEARING

Coat the races and bearing with petroleum jelly, and install them onto the rear planetary ring gear.

NOTE: Races and bearing diameter

mm (in.)

	Inside	Outside
Race (A)	28.8 (1.134)	44.8 (1.764)
Bearing	30.1 (1.185)	44.7 (1.760)
Race (B)	27.8 (1.094)	44.8 (1.764)

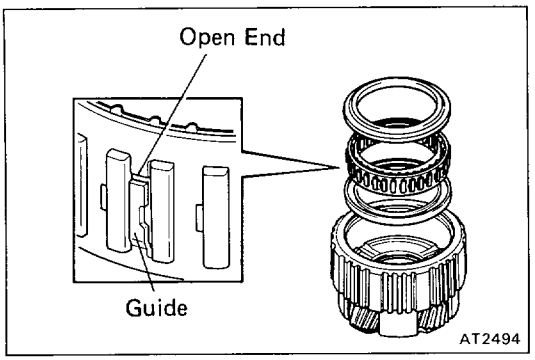


3. INSTALL NO. 1 AND NO. 2 THRUST WASHERS

(a) Coat the thrust washers with petroleum jelly.

(b) Install the thrust washers onto both sides of the rear planetary gear.

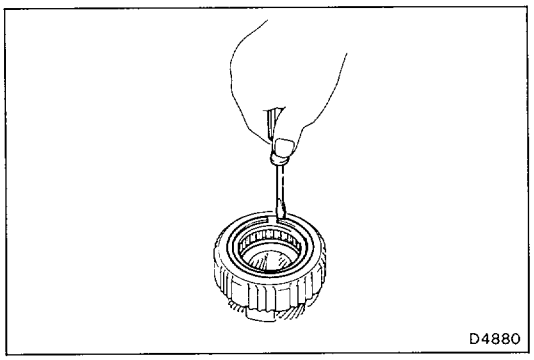
NOTE: Make sure that the lug shapes match the cutout portions on the rear planetary gear.



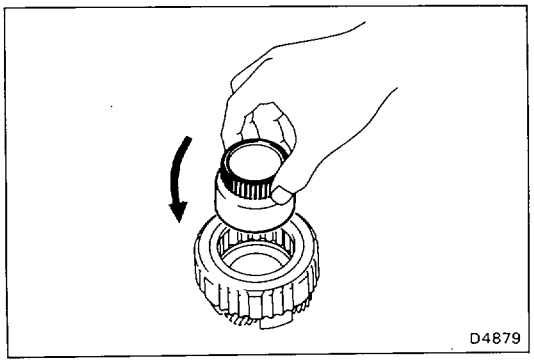
4. INSTALL NO. 2 ONE-WAY CLUTCH

(a) Install the one-way clutch and two retainers into the rear planetary gear as shown in the figure.

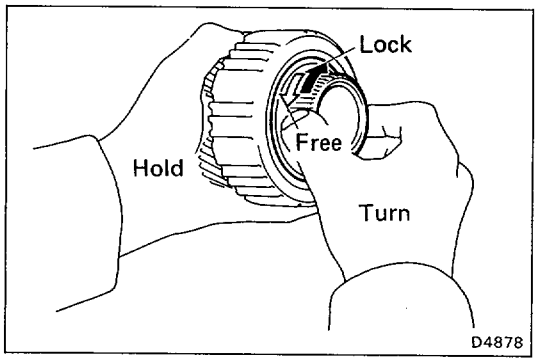
NOTE: Make sure that the open ends of the guides on the one-way clutch are faced upward.



(b) Install the snap ring.

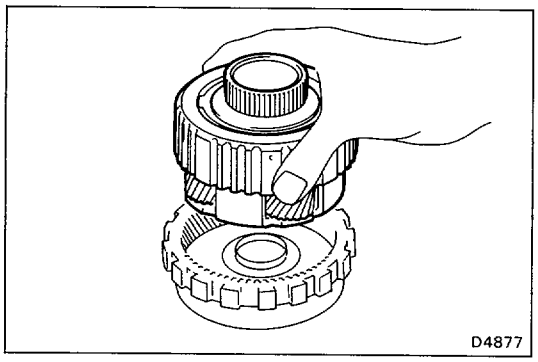


(c) While turning counterclockwise, install the one-way clutch inner race to the rear planetary gear.

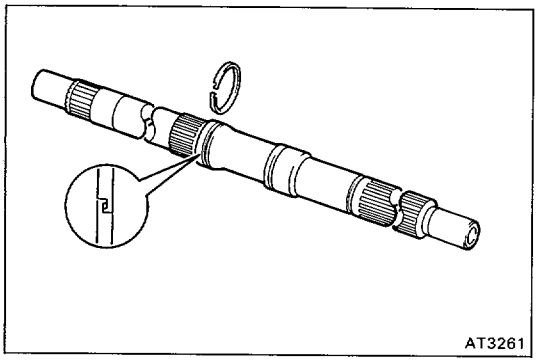


5. CHECK OPERATION OF NO. 2 ONE-WAY CLUTCH

Hold the planetary gear and turn the one-way clutch inner race. The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.



6. INSTALL REAR PLANETARY GEAR ONTO REAR PLANETARY RING GEAR

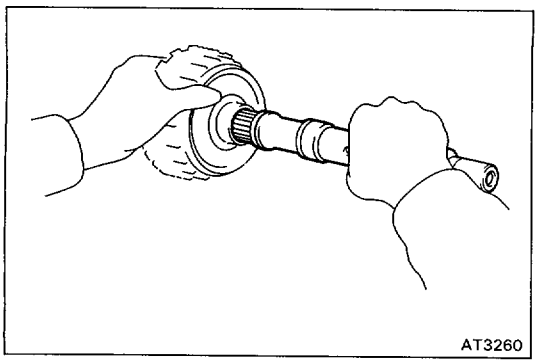


7. INSTALL OIL SEAL RING

Coat the oil seal ring with ATF and install it to the output shaft.

CAUTION: Do not spread the ring ends too match.

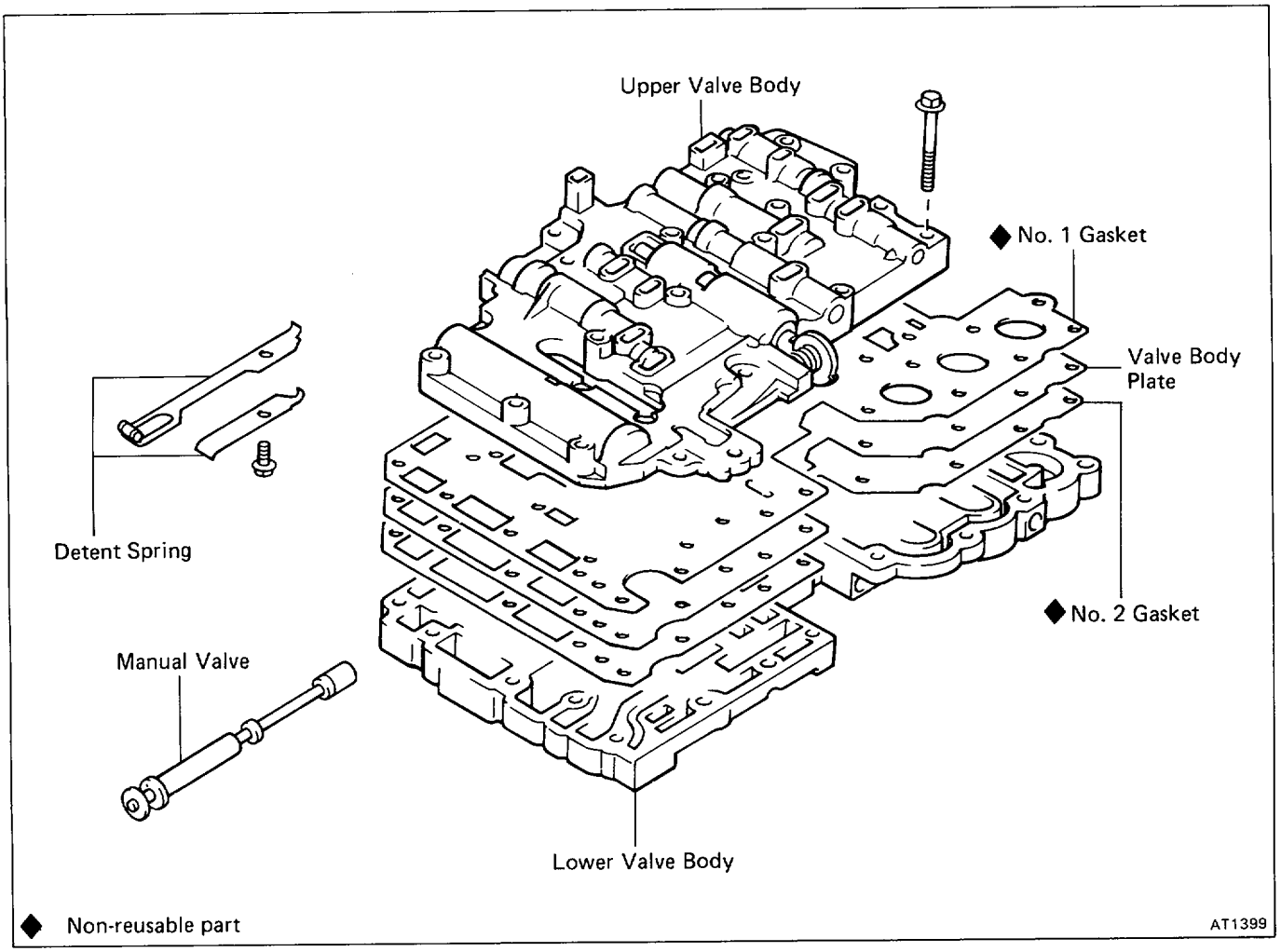
NOTE: After installing the oil seal ring, check that it rotates smoothly.

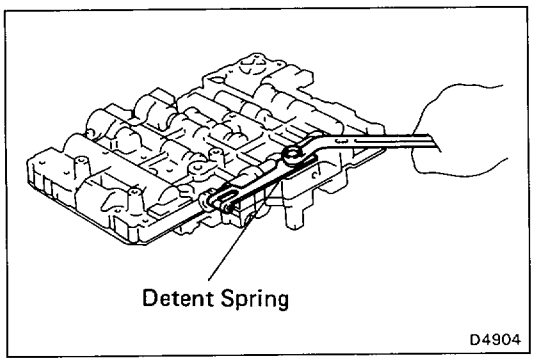


8. INSTALL OUTPUT SHAFT INTO REAR PLANETARY GEAR ASSEMBLY

Transmission Valve Body

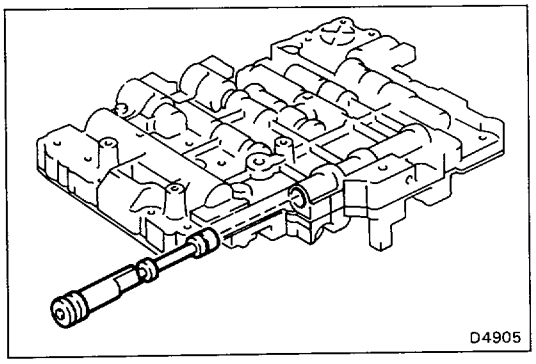
COMPONENTS



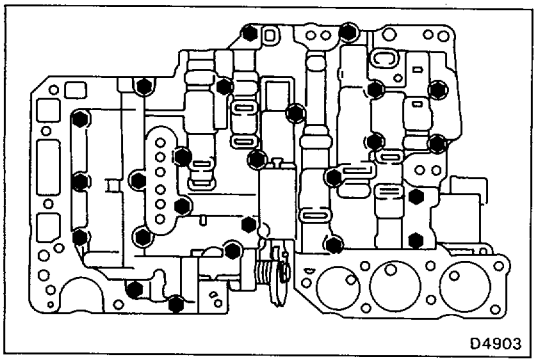


(Disassembly of Transmission Valve Body)

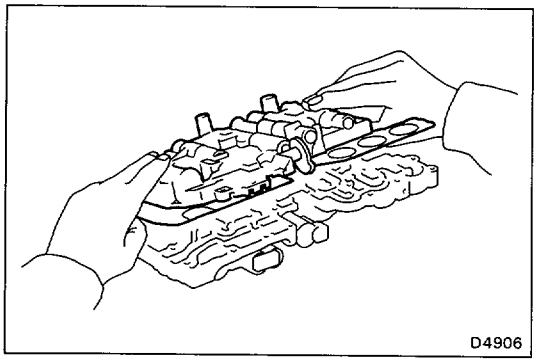
1. UNBOLT AND REMOVE DETENT SPRING



2. REMOVE MANUAL VALVE



3. **TURN OVER ASSEMBLY AND REMOVE TWENTY-FIVE BOLTS**



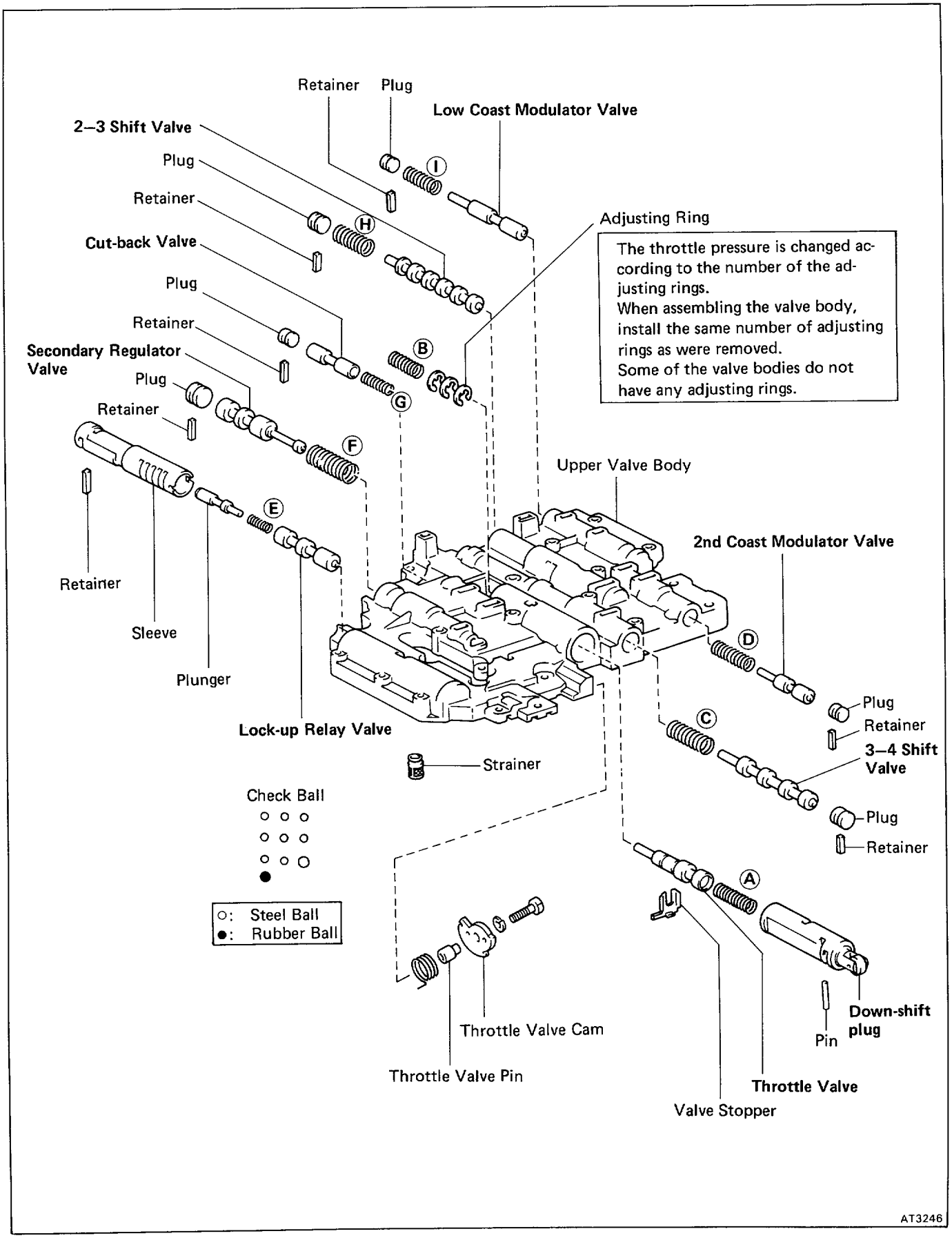
4. **LIFT OFF UPPER VALVE BODY AND PLATE AS A SINGLE UNIT**

Hold the valve body plate to the upper valve body.

NOTE: Be careful that the check balls and strainer do not fall out.

(Upper Valve Body)

COMPONENTS

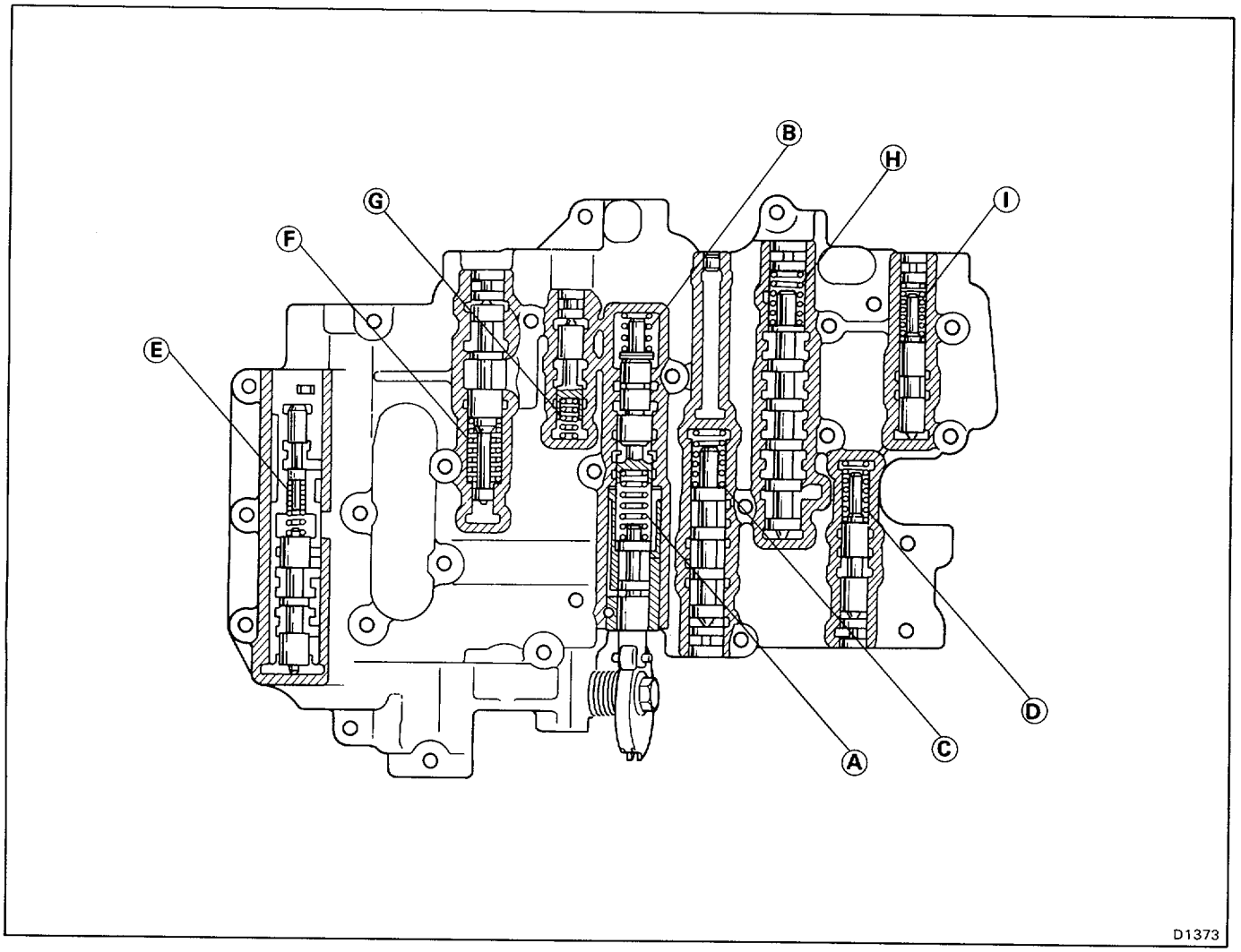


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Number of coils	Color
Ⓐ	Down-shift plug	27.3 (1.075)	8.7 (0.343)	10.5	Yellow
Ⓑ	Throttle valve	20.6 (0.811) or 23.3 (0.917)	9.2 (0.362) 9.2 (0.362)	7.5 7.5	Blue White
Ⓒ	3 – 4 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
Ⓓ	Second coast modulator valve	25.3 (0.996)	8.6 (0.339)	9.5	Orange
Ⓔ	Lock-up relay valve	21.4 (0.843)	5.5 (0.217)	15.5	Light Gray
Ⓕ	Secondary regulator valve	30.9 (1.217)	11.2 (0.441)	8.5	Blue
Ⓖ	Cut-back valve	21.8 (0.858)	6.0 (0.236)	11.5	None
Ⓗ	2 – 3 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
Ⓘ	Low coast modulator valve	30.4 (1.197)	8.3 (0.327)	8.5	Light Green

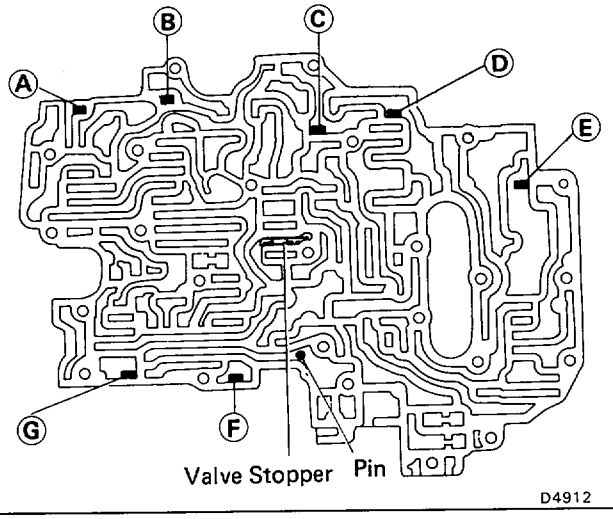
NOTE: During reassembly please refer to the spring specifications above to help discrimination between the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS, PIN, STOPPER, CHECK BALLS AND STRAINER

1. RETAINER, STOPPER AND PIN

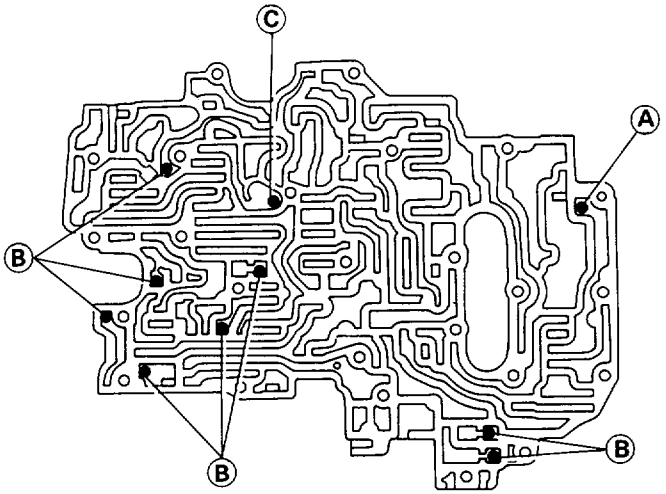


D4912

mm (in.)

Retainer		Height	Width	Thickness
Ⓐ	Low coast modulator valve	14.5 (0.571)	5.0 (0.197)	3.2 (0.126)
Ⓑ	2–3 shift valve	14.0 (0.551)	5.0 (0.197)	3.2 (0.126)
Ⓒ	Cut-back valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
Ⓓ	Secondary regulator valve	14.0 (0.551)	5.0 (0.197)	3.2 (0.126)
Ⓔ	Lock-up relay valve	21.2 (0.835)	5.0 (0.197)	3.2 (0.126)
Ⓕ	3–4 shift valve	16.5 (0.650)	6.0 (0.236)	3.2 (0.126)
Ⓖ	2nd coast modulator valve	16.5 (0.650)	6.0 (0.236)	3.2 (0.126)

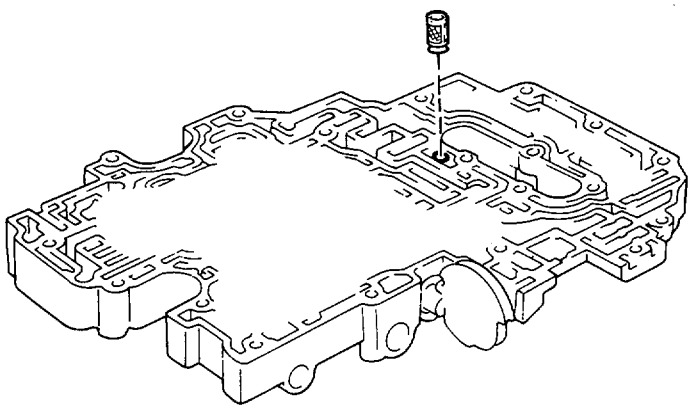
2. CHECK BALL



AT3247

Check ball		Diameter mm (in.)
Ⓐ	Rubber ball	6.35 (0.2500)
Ⓑ	Steel ball	5.56 (0.2189)
Ⓒ	Steel ball	7.14 (0.2811)

3. STRAINER



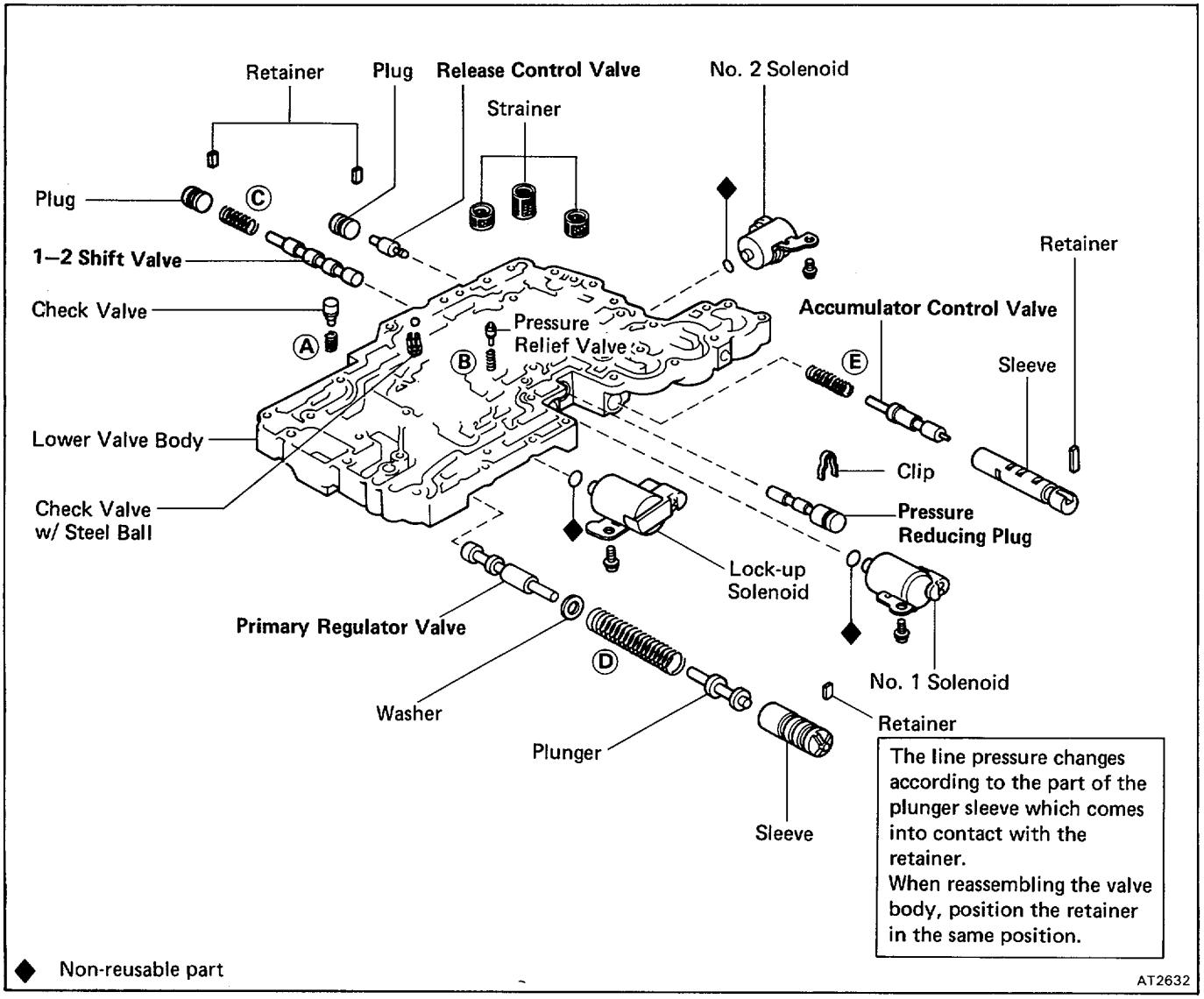
AT3243

mm (in.)

Height	Diameter
12.4 (0.488)	8.3 (0.327)

(Lower Valve Body)

COMPONENTS

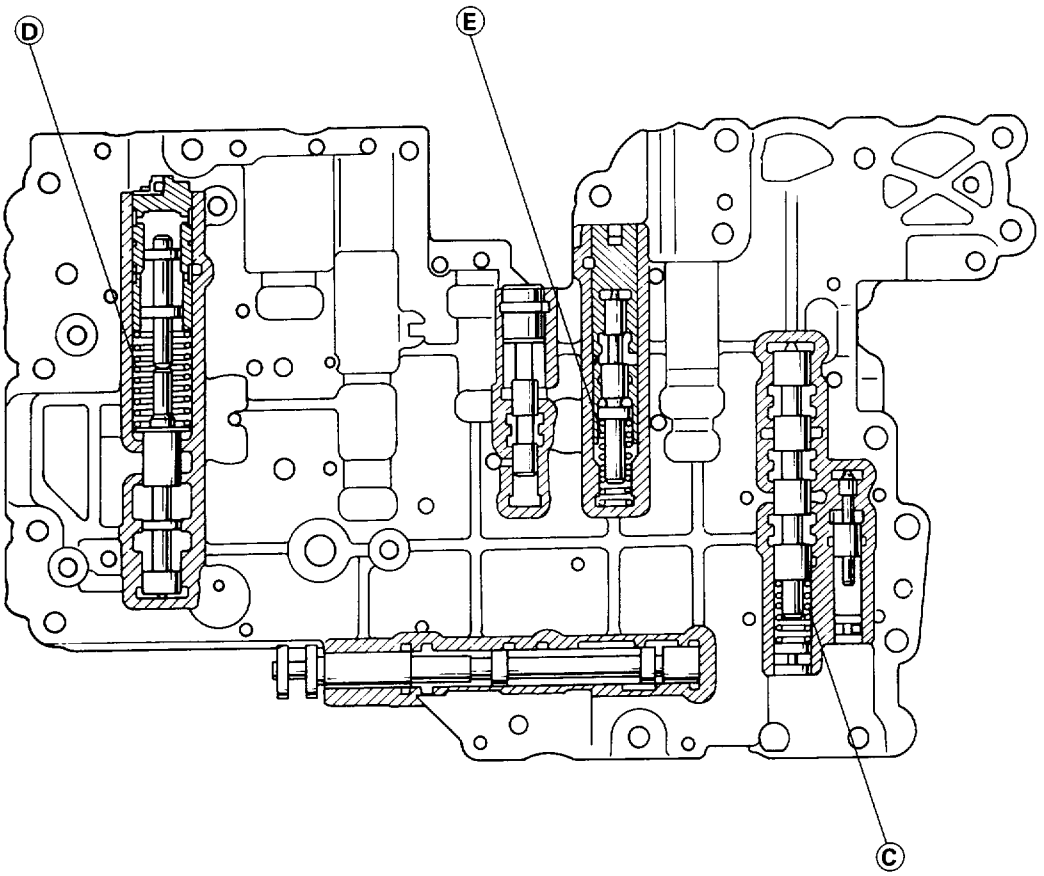


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Number of coils	Color
Ⓐ	Check valve	20.2 (0.795)	12.1 (0.476)	4.5	None
Ⓑ	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	5.5	None
Ⓒ	1–2 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
Ⓓ	Primary regulator valve	66.7 (2.626)	18.6 (0.732)	10.5	None
Ⓔ	Accumulator control valve	33.9 (1.335)	8.8 (0.346)	10.0	Pink

NOTE: During reassembly please refer to the spring specifications above to help discrimination between the different springs.

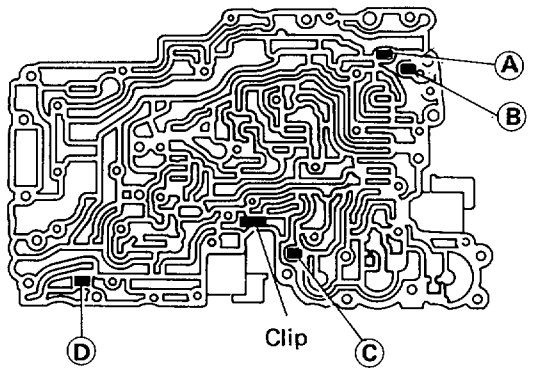
SECTIONAL VIEW OF VALVE BODY



D4956

LOCATION OF RETAINERS, CLIP, CHECK BALLS, STRAINERS, SPRINGS AND VALVES

1. RETAINER AND CLIP

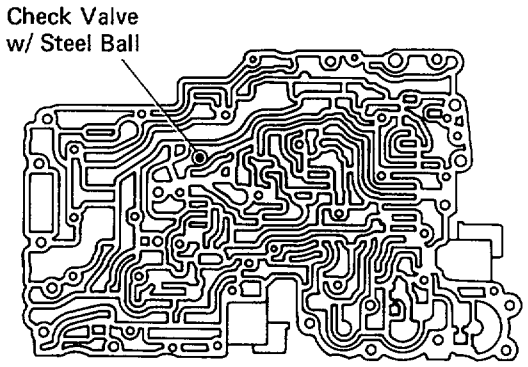


AT2347

mm (in.)

Retainer		Height	Width	Thickness
A	1–2 shift valve	16.5 (0.650)	6.0 (0.236)	3.2 (0.126)
B	Release control valve	14.5 (0.571)	5.0 (0.197)	3.2 (0.126)
C	Accumulator control valve	21.2 (0.835)	5.0 (0.197)	3.2 (0.126)
D	Primary regulator valve	16.2 (0.638)	5.0 (0.197)	3.2 (0.126)

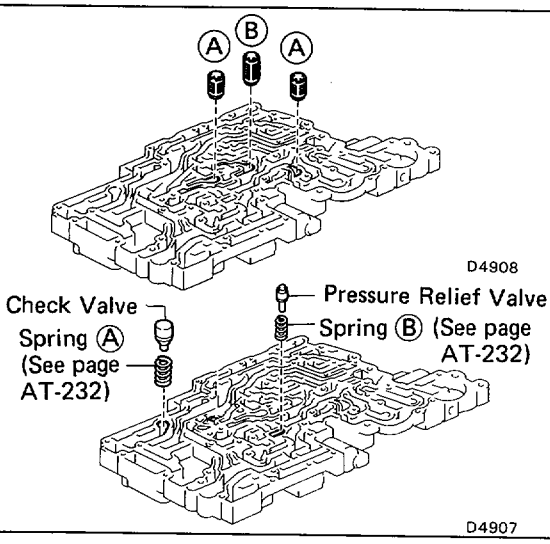
2. CHECK BALL

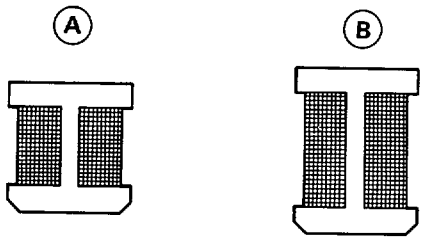


AT2631

Check ball	Diameter mm (in.)
Steel ball	6.35 (0.2500)

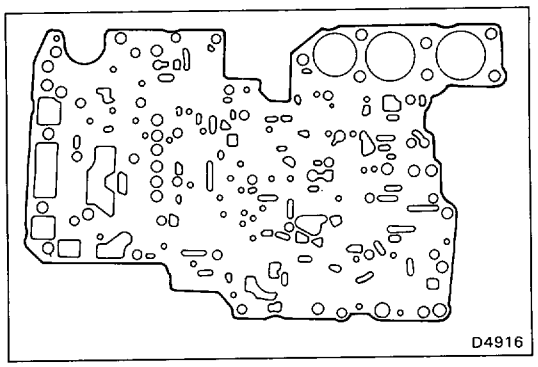
3. STRAINER, SPRING AND VALVE





mm (in.)

Strainer		Height	Diameter
A	Solenoid oil strainer	11.0 (0.433)	10.3 (0.406)
B	Throttle oil strainer	19.5 (0.768)	10.3 (0.406)

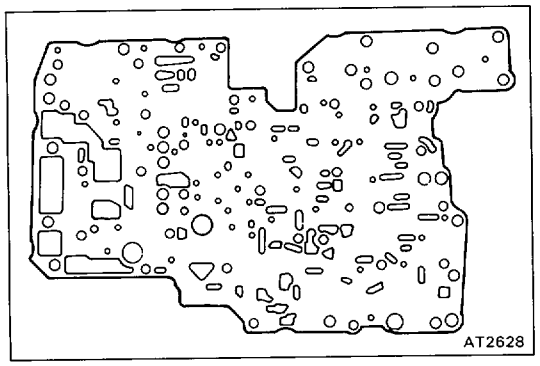


(Assembly of Transmission Valve Body)

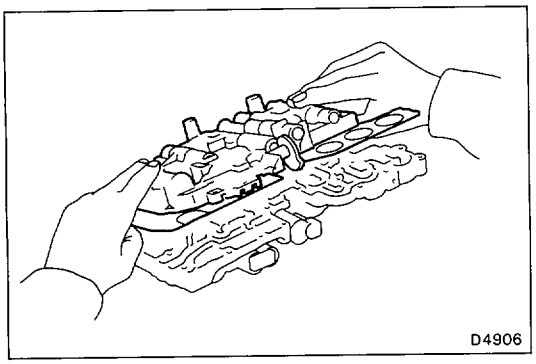
(See page AT-226)

1. **POSITION NEW NO. 1 GASKET ON UPPER VALVE BODY**
   Align a new No. 1 gasket at each bolt hole.

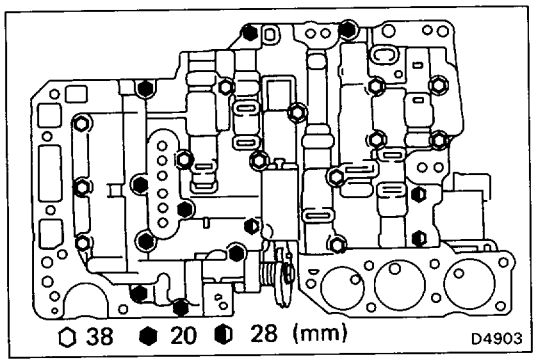
2. **POSITION VALVE BODY PLATE ON NO. 1 GASKET**
   Align the plate at each bolt hole.



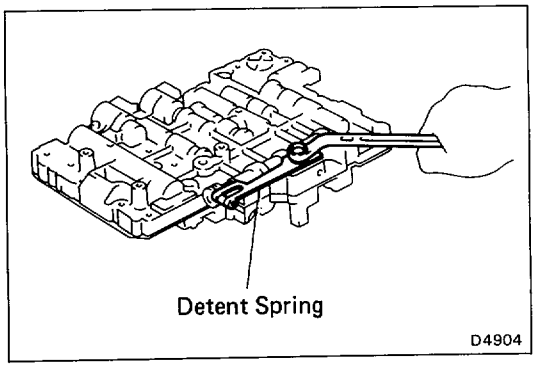
3. **POSITION NEW NO. 2 GASKET ON PLATE**
   Align a new No. 2 gasket at each bolt hole.



4. **PLACE UPPER VALVE BODY WITH PLATE AND GASKETS ON TOP OF LOWER VALVE BODY**
   Align each bolt hole and gasket in the valve body.

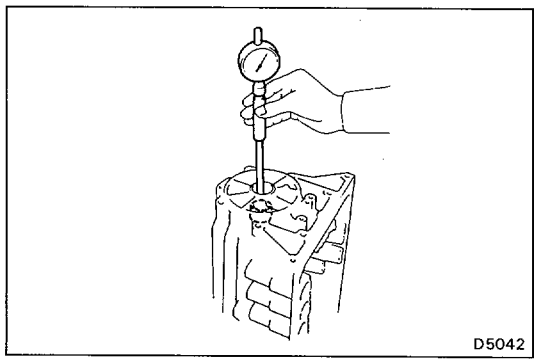


5. **INSTALL THE TWENTY-FIVE BOLTS TO UPPER VALVE BODY**
   NOTE: Each bolt length (mm) is indicated in the figure.
   Torque: 65 kg-cm (56 in.-lb, 6.4 N·m)



6. **INSTALL MANUAL VALVE**

7. **INSTALL DETENT SPRING**
   Torque: 100 kg-cm (7 ft-lb, 10 N·m)



Transmission Case

INSPECTION OF TRANSMISSION CASE

INSPECT TRANSMISSION CASE BUSHING

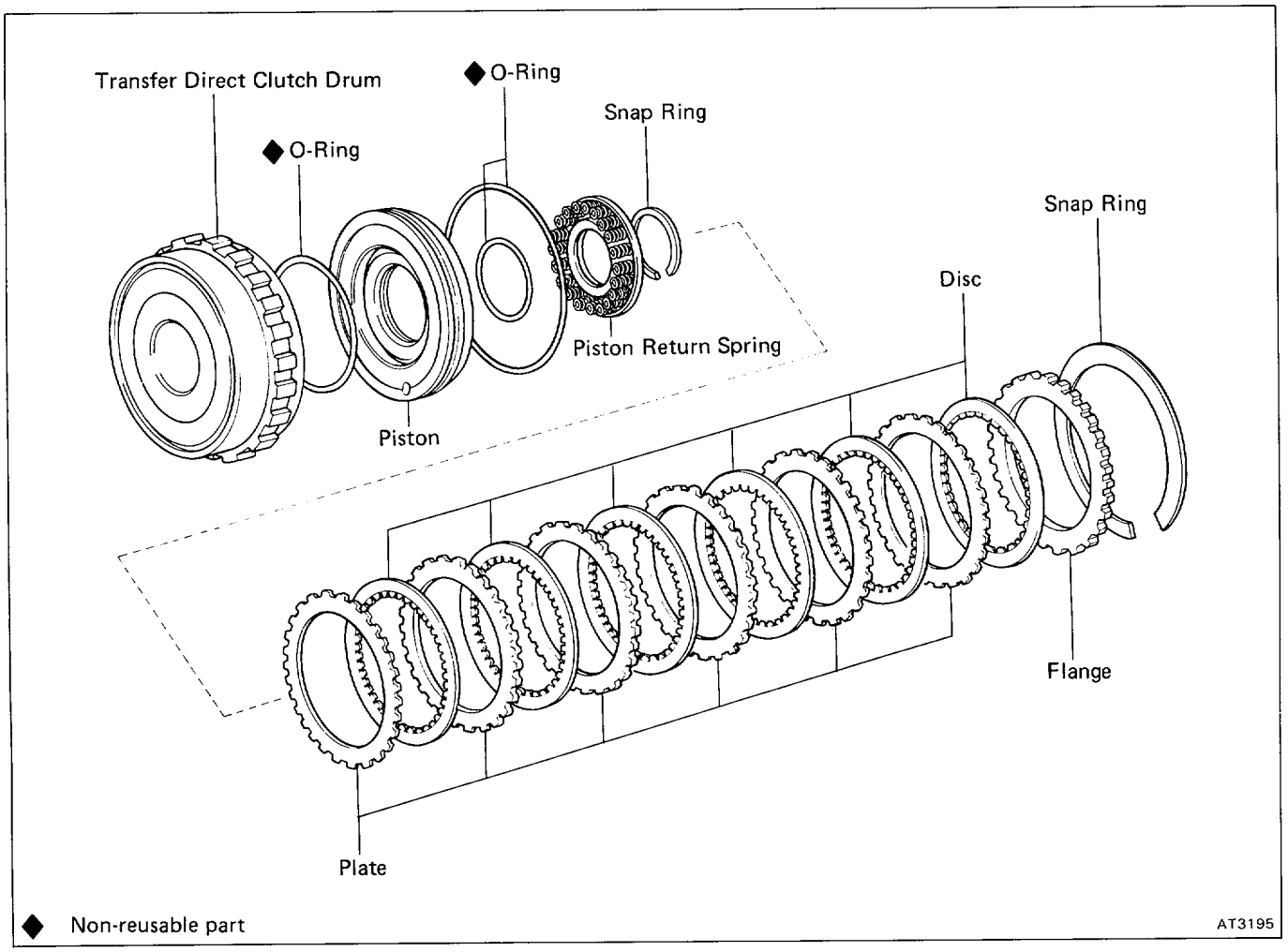
Using a cylinder gauge, measure the inside diameter of the transmission case rear bushing.

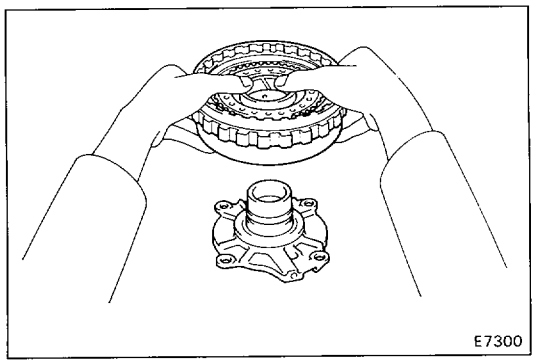
Maximum inside diameter: 38.19 mm (1.5035 in.)

If the inside diameter is greater than the maximum, replace the transmission case.

Transfer Direct Clutch

COMPONENTS

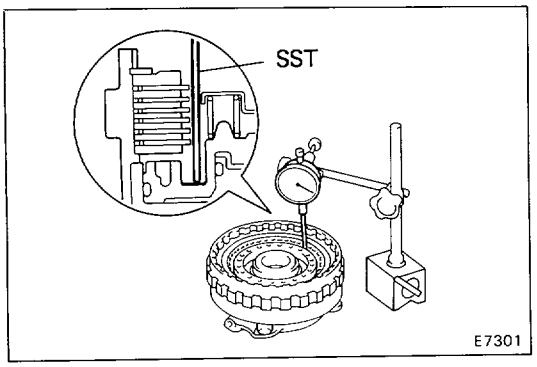




DISASSEMBLY OF TRANSFER DIRECT CLUTCH

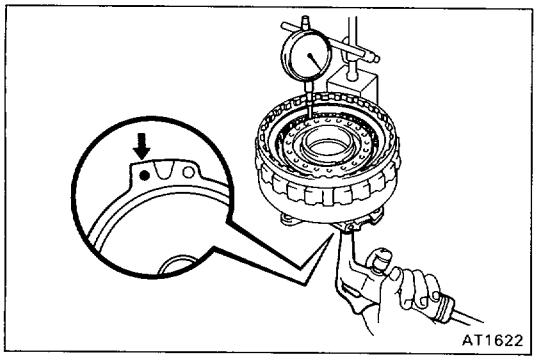
1. CHECK PISTON STROKE OF TRANSFER DIRECT CLUTCH

(a) Install the direct clutch onto the transfer front support.



(b) Place SST and a dial indicator onto the transfer direct clutch piston as shown in the figure.

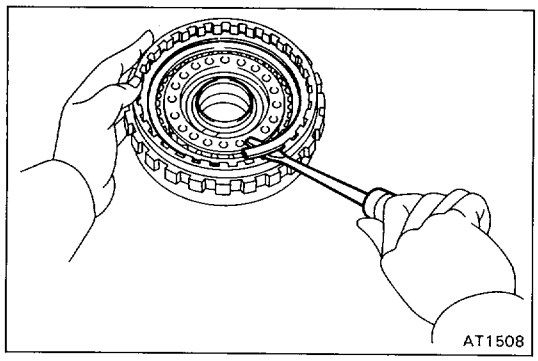
SST 09350-30020 (09350-06120)



(c) Measure the piston stroke while applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

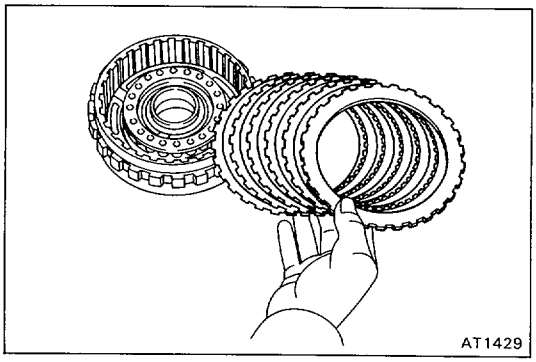
Piston stroke: 2.28 — 2.68 mm (0.0898 — 0.1055 in.)

If the values are nonstandard, inspect the discs.

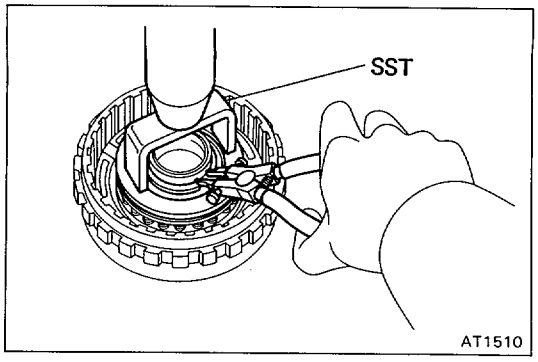


2. REMOVE FLANGE, PLATES AND DISCS

(a) Remove the snap ring from the clutch drum.



(b) Remove the flange, six plates and six discs.



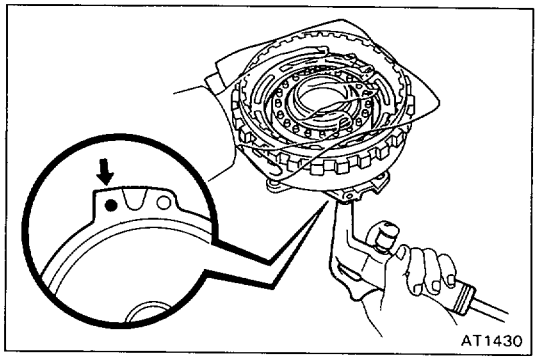
3. REMOVE PISTON RETURN SPRING

(a) Place SST on the return spring and compress the spring with a shop press.

SST 09320-89010

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the piston return spring.



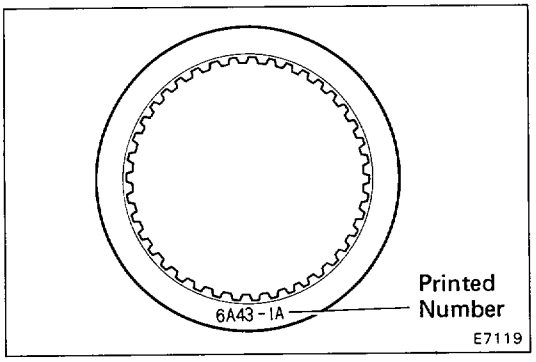
4. REMOVE TRANSFER DIRECT CLUTCH PISTON

(a) Place the direct clutch on the transfer front support.

(b) Hold the transfer direct clutch piston by hand, apply compressed air to the front support to remove the piston.

(c) Remove the transfer direct clutch piston.

(d) Remove the O-rings from the piston and drum.



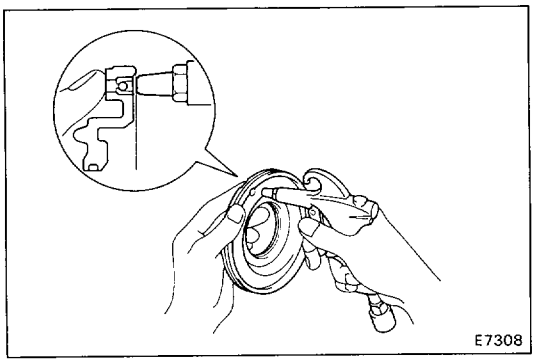
INSPECTION OF TRANSFER DIRECT CLUTCH

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

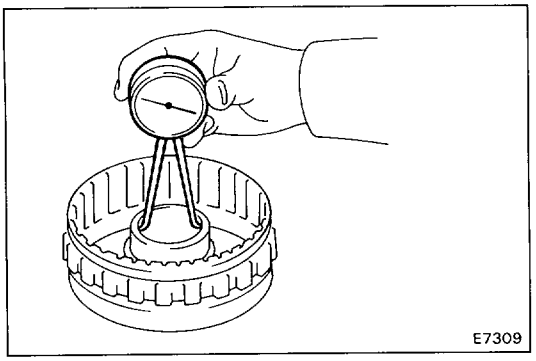
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



2. CHECK TRANSFER DIRECT CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

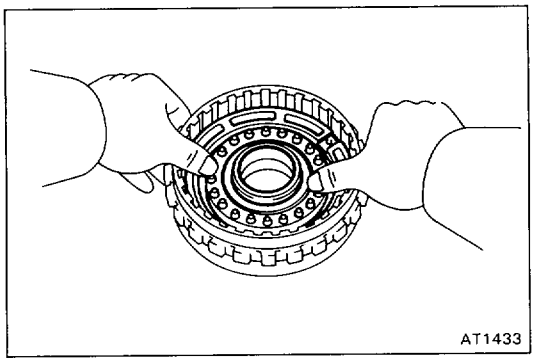


3. CHECK TRANSFER DIRECT CLUTCH DRUM BUSHING

Using a dial indicator, measure the inside diameter of the clutch drum bushing.

Maximum inside diameter: 47.65 mm (1.8760 in.)

If the inside diameter is greater than the maximum, replace the clutch drum.



ASSEMBLY OF TRANSFER DIRECT CLUTCH

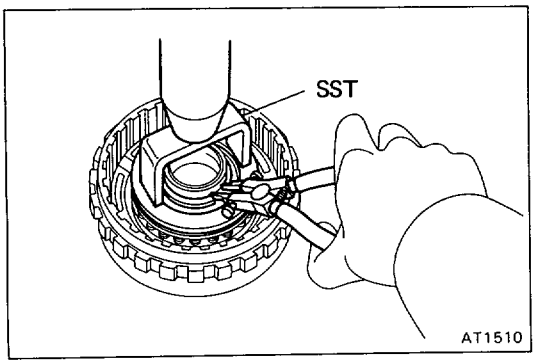
1. INSTALL PISTON TO TRANSFER DIRECT CLUTCH DRUM

(a) Coat new O-rings with ATF and install them on the piston and drum.

(b) Being careful not to damage the O-rings, press the piston into the drum by both hands.

2. INSTALL PISTON RETURN SPRING

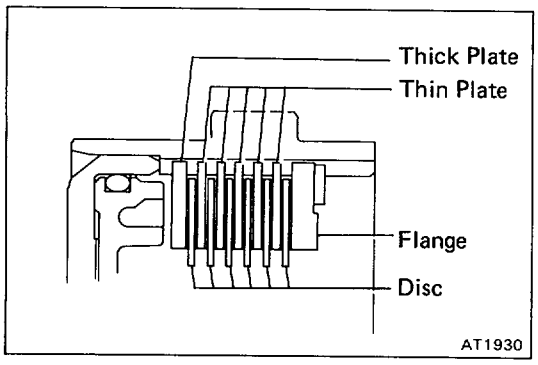
(a) Install the piston return spring.



(b) Place SST on the spring retainer, and compress the spring with a shop press.

SST 09320-89010

(c) Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

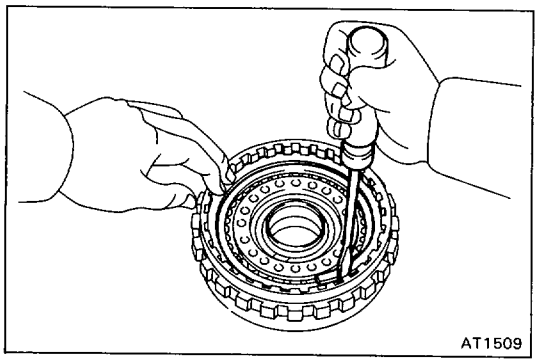


3. INSTALL PLATES, DISCS AND FLANGE

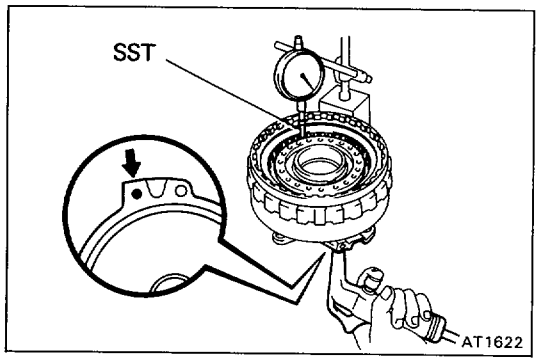
(a) Install the plates and discs.

Install in order: P = Plate D = Disc
P(Thick) — D — P(Thin) — D — P(Thin) — D —
P(Thin) — D — P(Thin) — D — P(Thin) — D

(b) Install the flange, facing the flat end downward.



(c) Install the snap ring with a screwdriver.



4. CHECK PISTON STROKE OF TRANSFER DIRECT CLUTCH

(a) Install the direct clutch onto the transfer front support.

(b) Using SST and a dial indicator, measure the piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-30020 (09350-06120)

Piston stroke: 2.28 — 2.68 mm (0.0898 — 0.1055 in.)

If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke is nonstandard, select another flange.

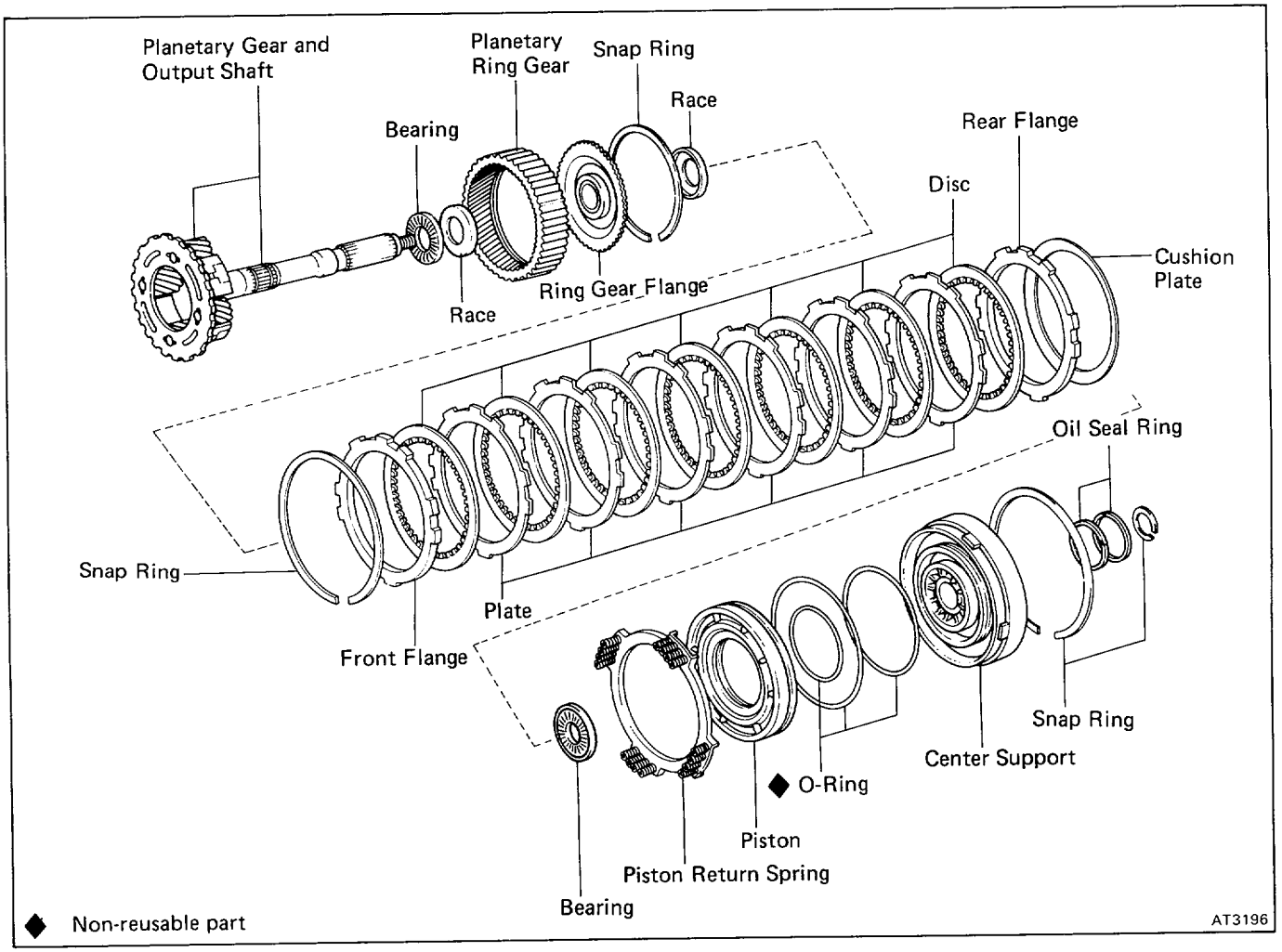
NOTE: There are four different thicknesses for flange.

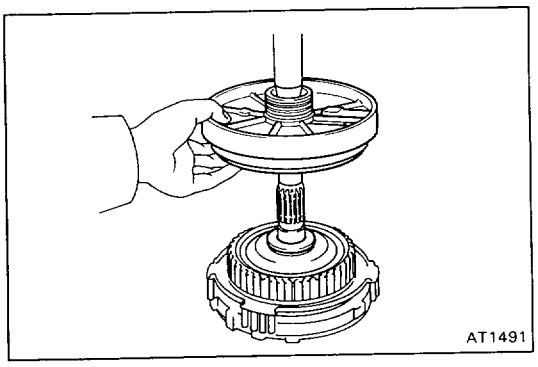
Flange thickness mm (in.)

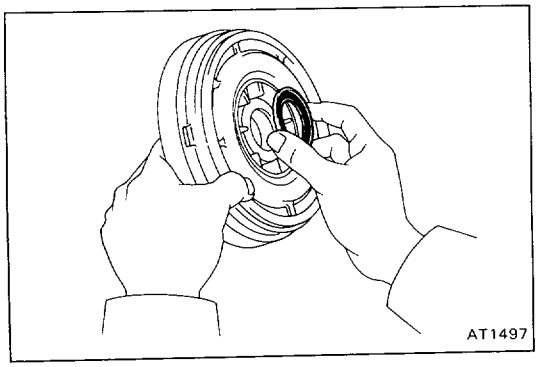
3.9 (0.154)	4.3 (0.169)
4.1 (0.161)	4.5 (0.177)

Transfer Low Speed Brake and Center Support

COMPONENTS





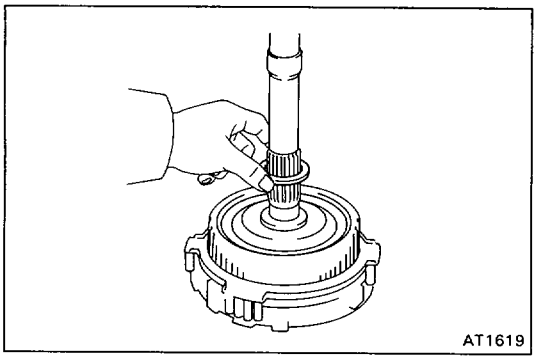


DISASSEMBLY OF TRANSFER LOW SPEED BRAKE AND CENTER SUPPORT

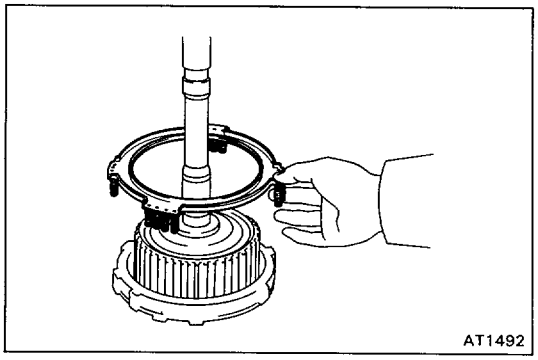
1. **REMOVE TRANSFER CENTER SUPPORT**

(a) Remove the center support from the output shaft.

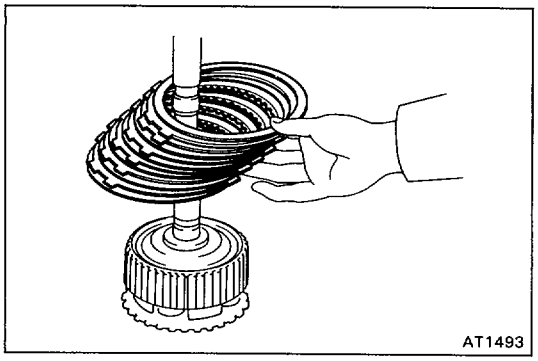
(b) Remove the assembled bearing and race from the center support.



(c) Remove the race from the output shaft.

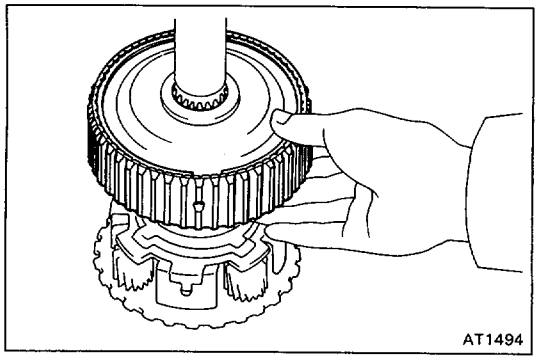


2. REMOVE PISTON RETURN SPRING

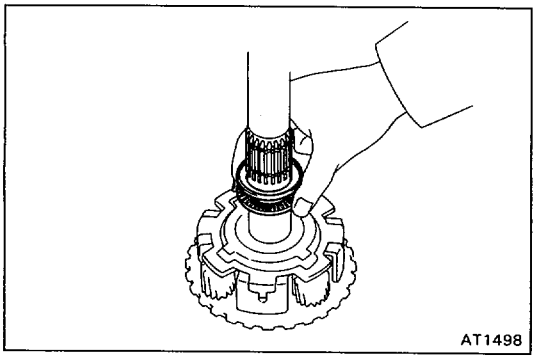


3. REMOVE CUSHION PLATE, REAR FLANGE, PLATES AND DISCS

Remove the cushion plate, rear flange, six plates and seven discs.

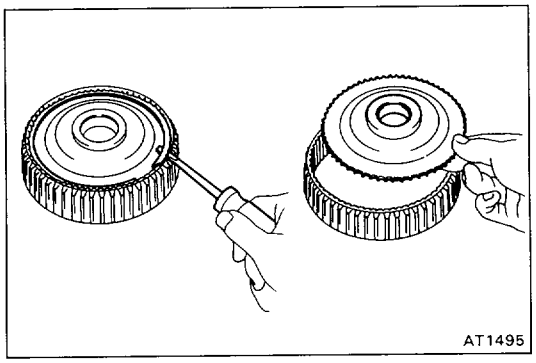


4. REMOVE PLANETARY RING GEAR FROM OUTPUT SHAFT



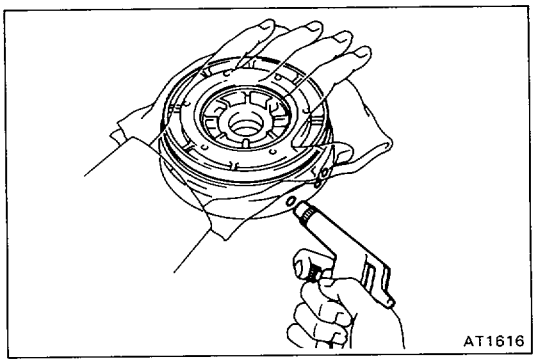
5. REMOVE RACE AND BEARING FROM PLANETARY GEAR

Remove the race and bearing from rear side of the planetary gear.



6. REMOVE PLANETARY RING GEAR FLANGE

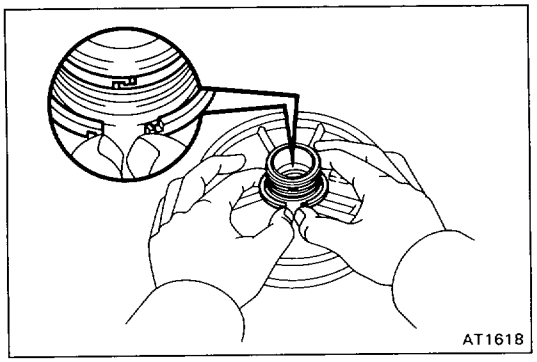
Remove the snap ring and ring gear flange.



7. REMOVE TRANSFER LOW SPEED BRAKE PISTON

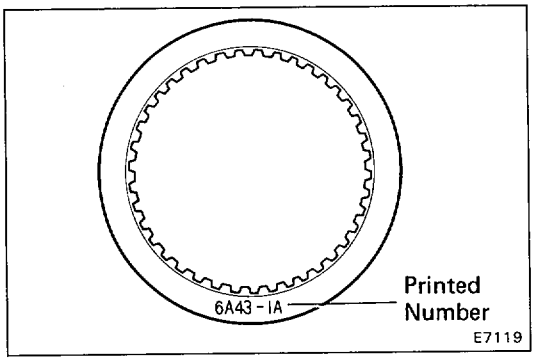
(a) Hold the low speed brake piston by hand, apply compressed air into the center support and remove the piston.

(b) Remove the O-rings from the piston and center support.



8. REMOVE OIL SEAL RINGS FROM CENTER SUPPORT

Push one end of the ring into the groove and unhook both ends of the ring by hands. Spread the ring apart and remove it.



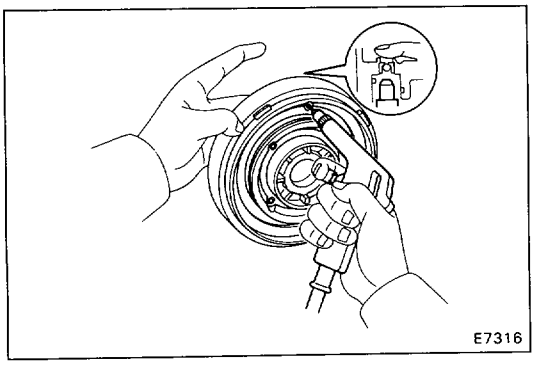
INSPECTION OF TRANSFER LOW SPEED BRAKE AND CENTER SUPPORT

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

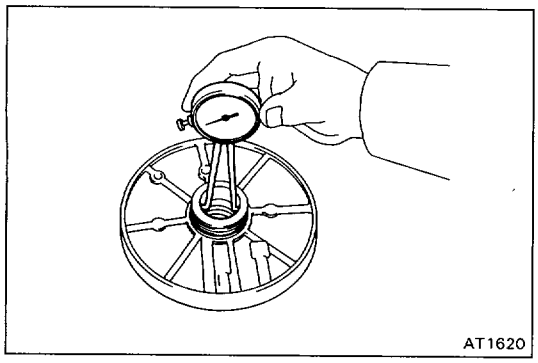
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



2. CHECK CENTER SUPPORT

(a) Check that check ball is free by shaking the center support.

(b) Check that the valve does not leak by applying low-pressure compressed air.

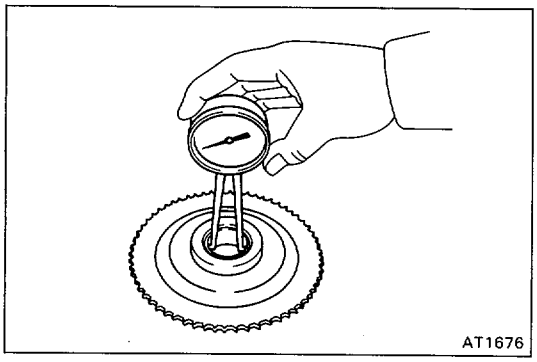

AT1620

3. CHECK CENTER SUPPORT BUSHING

Using a dial indicator, measure the inside diameter of the center support bushing.

Maximum inside diameter: 35.08 mm (1.3811 in.)

If the inside diameter is greater than the maximum, replace the center support.

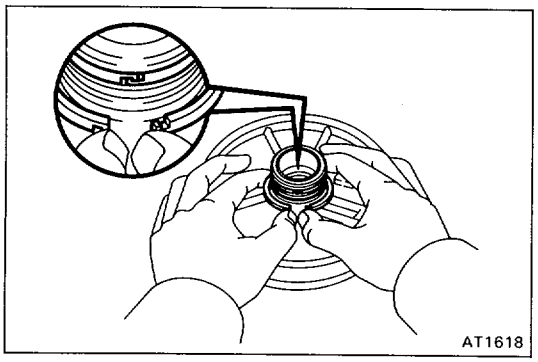

AT1676

4. CHECK RING GEAR FLANGE BUSHING

Using a dial indicator, measure the inside diameter of the ring gear flange bushing.

Maximum inside diameter: 35.08 mm (1.3811 in.)

If the inside diameter is greater than the maximum, replace the flange.


AT1618

ASSEMBLY OF TRANSFER LOW SPEED BRAKE AND CENTER SUPPORT

1. INSTALL OIL SEAL RINGS TO CENTER SUPPORT

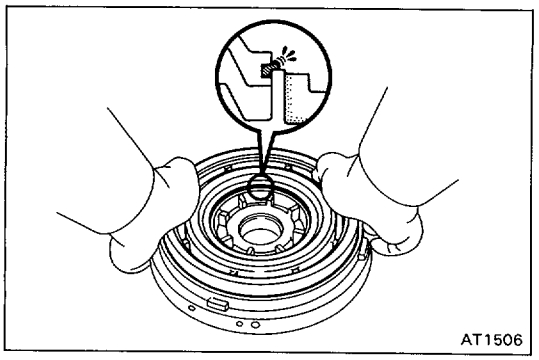
(a) Coat the two oil seal rings with ATF.

(b) Spread the ring apart and install it into the groove on the center support.

CAUTION : Do not spread the ring ends too much.

(c) Push the one end of the ring into the groove and hook both ends by hands.

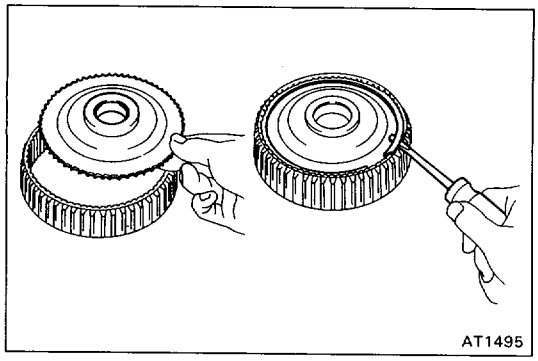
NOTE: After installing the oil seal rings, check that they rotate smoothly.


AT1506

2. INSTALL TRANSFER LOW SPEED BRAKE PISTON TO CENTER SUPPORT

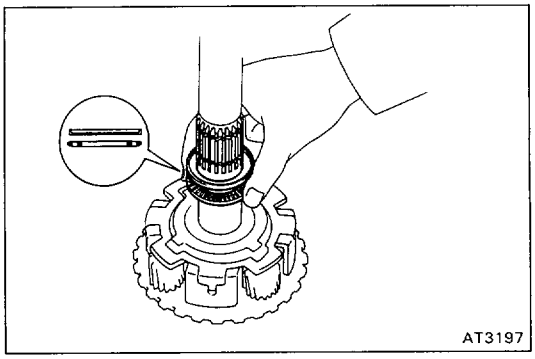
(a) Coat new O-rings with ATF and install them on the piston and center support.

(b) Being careful not to damage the O-rings, press in the low speed brake piston into the center support by both hands.


AT1495

3. INSTALL PLANETARY RING GEAR FLANGE

Install the flange into the ring gear and install the snap ring.


AT3197

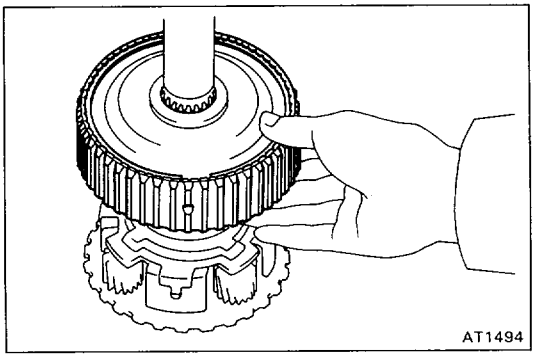
4. INSTALL BEARING AND RACE TO PLANETARY GEAR

Coat the bearing and race with petroleum jelly and install them onto the planetary gear.

NOTE: Bearing and race diameter

mm (in.)

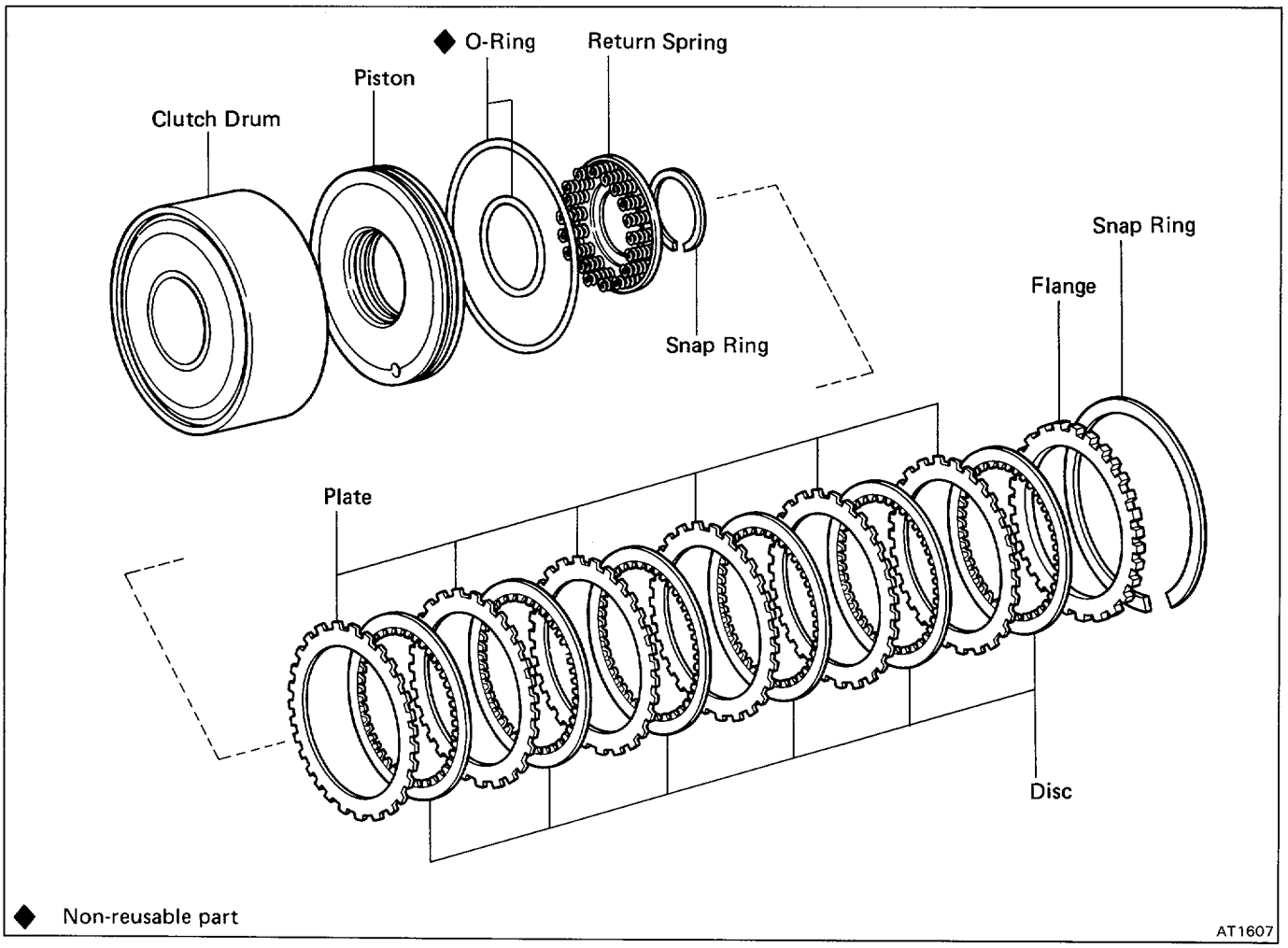
	Inside	Outside
Bearing	35.0 (1.378)	54.4 (2.142)
Race	36.3 (1.429)	53.9 (2.122)

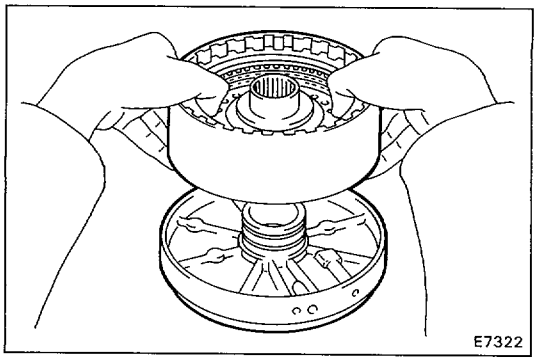

AT1494

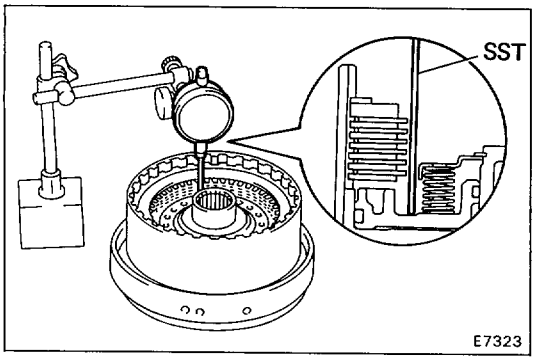
5. INSTALL PLANETARY RING GEAR TO OUTPUT SHAFT

Transfer Front Drive Clutch

COMPONENTS







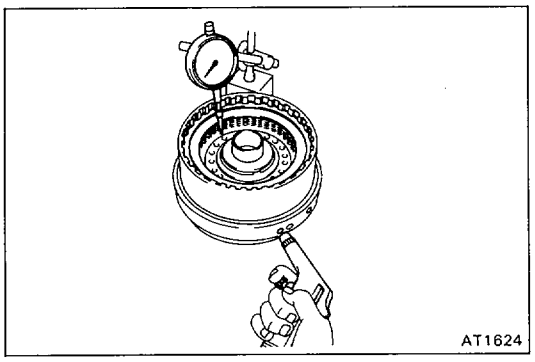
DISASSEMBLY OF TRANSFER FRONT DRIVE CLUTCH

1. **CHECK PISTON STROKE OF TRANSFER FRONT DRIVE CLUTCH**

   (a) Install the front drive clutch onto the transfer center support.

   (b) Place SST and a dial indicator onto the transfer front drive clutch piston as shown in the figure.

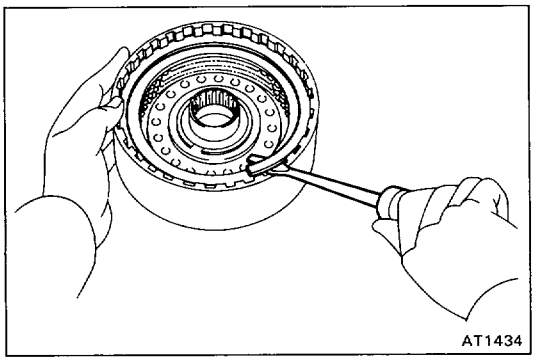
   SST 09350-30020 (09350-06120)



(c) Measure the piston stroke while applying and releasing compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

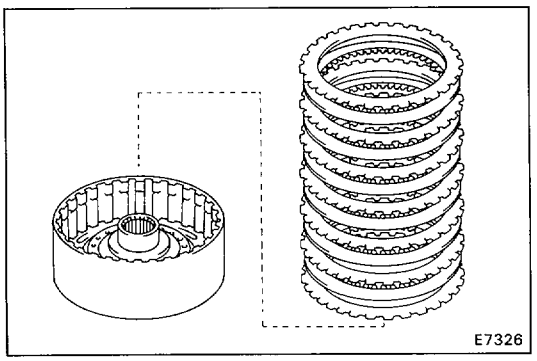
Piston stroke: 2.39 — 3.21 mm (0.0941 — 0.1264 in.)

If the values are nonstandard, inspect the discs.

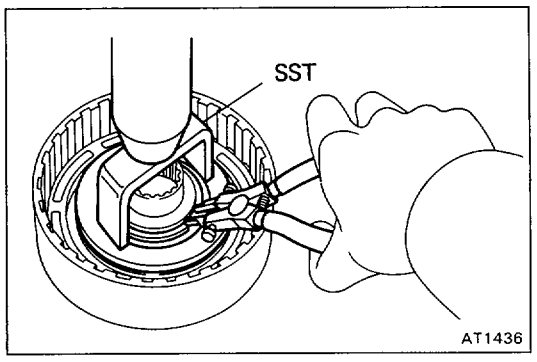


2. REMOVE FLANGE, PLATES AND DISCS

(a) Using a screwdriver, remove the snap ring from the clutch drum.



(b) Remove the flange, six plates and six discs.



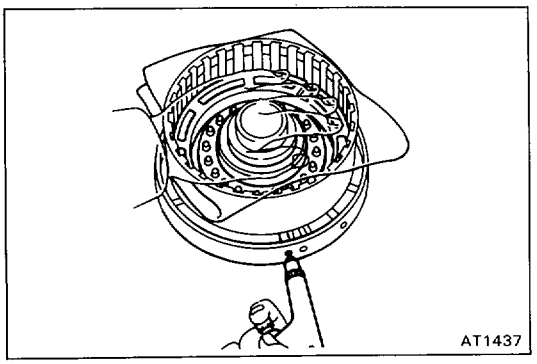
3. REMOVE PISTON RETURN SPRING

(a) Place SST on the return spring and compress the spring with a shop press.

SST 09320-89010

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the piston return spring.



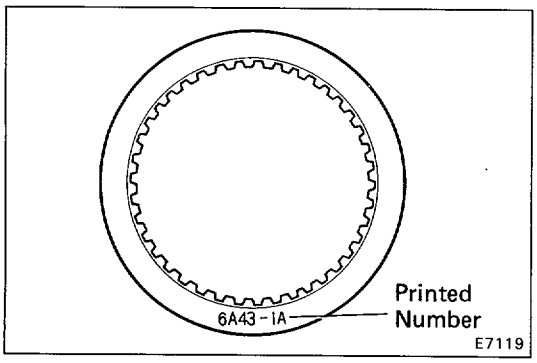
4. REMOVE TRANSFER FRONT DRIVE CLUTCH PISTON

(a) Place the front drive clutch on the transfer center support.

(b) Hold the front drive clutch piston by hand, apply compressed air to the center support to remove the piston.

(c) Remove the front drive clutch piston.

(d) Remove the O-rings from the piston.



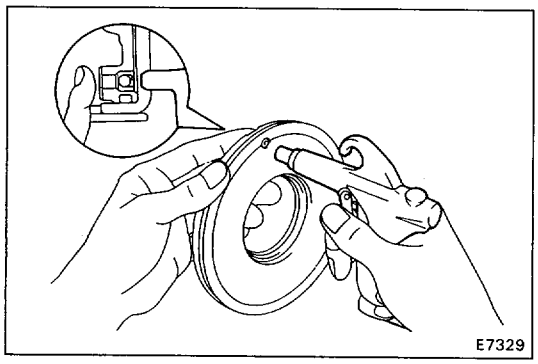
INSPECTION OF TRANSFER FRONT DRIVE CLUTCH

1. INSPECT DISC, PLATE AND FLANGE

Check that the sliding surface of disc, plate and flange worn or burnt. If necessary, replace them.

NOTE:

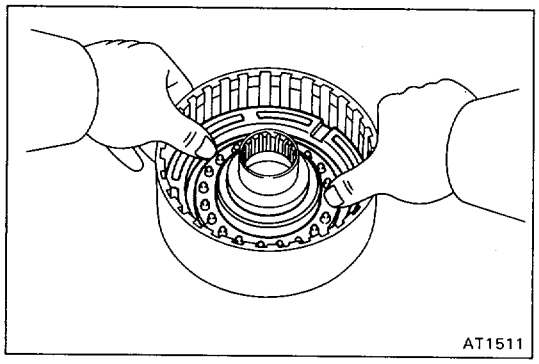
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



2. CHECK FRONT DRIVE CLUTCH PISTON

(a) Check that check ball is free by shaking the piston.

(b) Check that the valve does not leak by applying low-pressure compressed air.

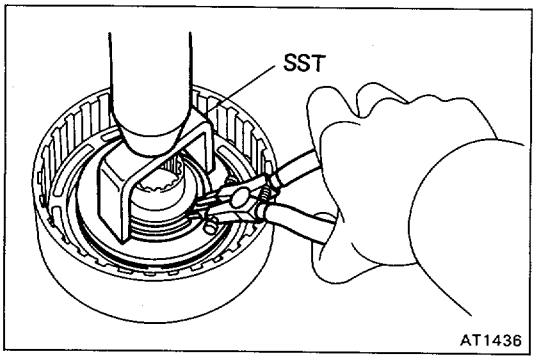


ASSEMBLY OF TRANSFER FRONT DRIVE CLUTCH

1. INSTALL PISTON TO TRANSFER FRONT DRIVE CLUTCH DRUM

(a) Coat new O-rings with ATF and install them on the piston.

(b) Being careful not to damage the O-rings, press the piston into the drum by both hands.



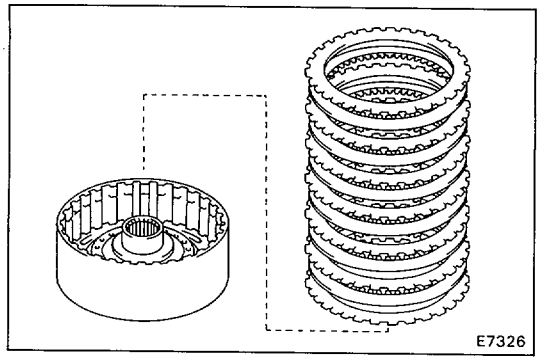
2. INSTALL PISTON RETURN SPRING

(a) Install the piston return spring.

(b) Place SST on the return spring, and compress the spring with a shop press.

SST 09320-89010

(c) Install the snap ring with snap ring pliers.



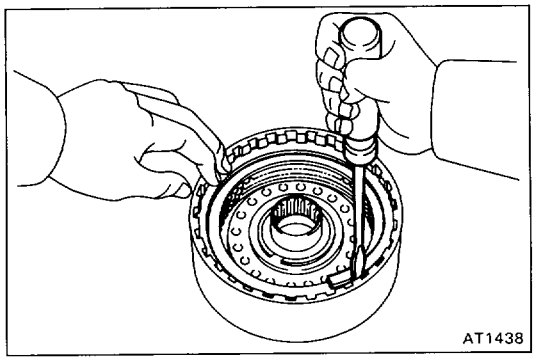
3. INSTALL PLATES, DISCS AND FLANGE

(a) Install the plates and discs.

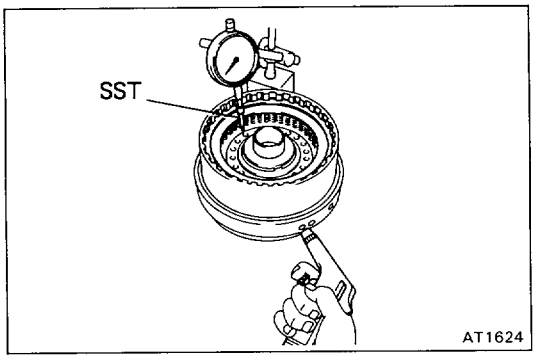
Install in order: P = Plate D = Disc

P—D—P—D—P—D—P—D—P—D—P—D

(b) Install the flange, facing the flat end downward.



(c) Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with one of cutouts.



4. CHECK PISTON STROKE OF TRANSFER FRONT DRIVE CLUTCH

(a) Install the front drive clutch onto the transfer center support.

(b) Using SST and a dial indicator, measure the piston stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

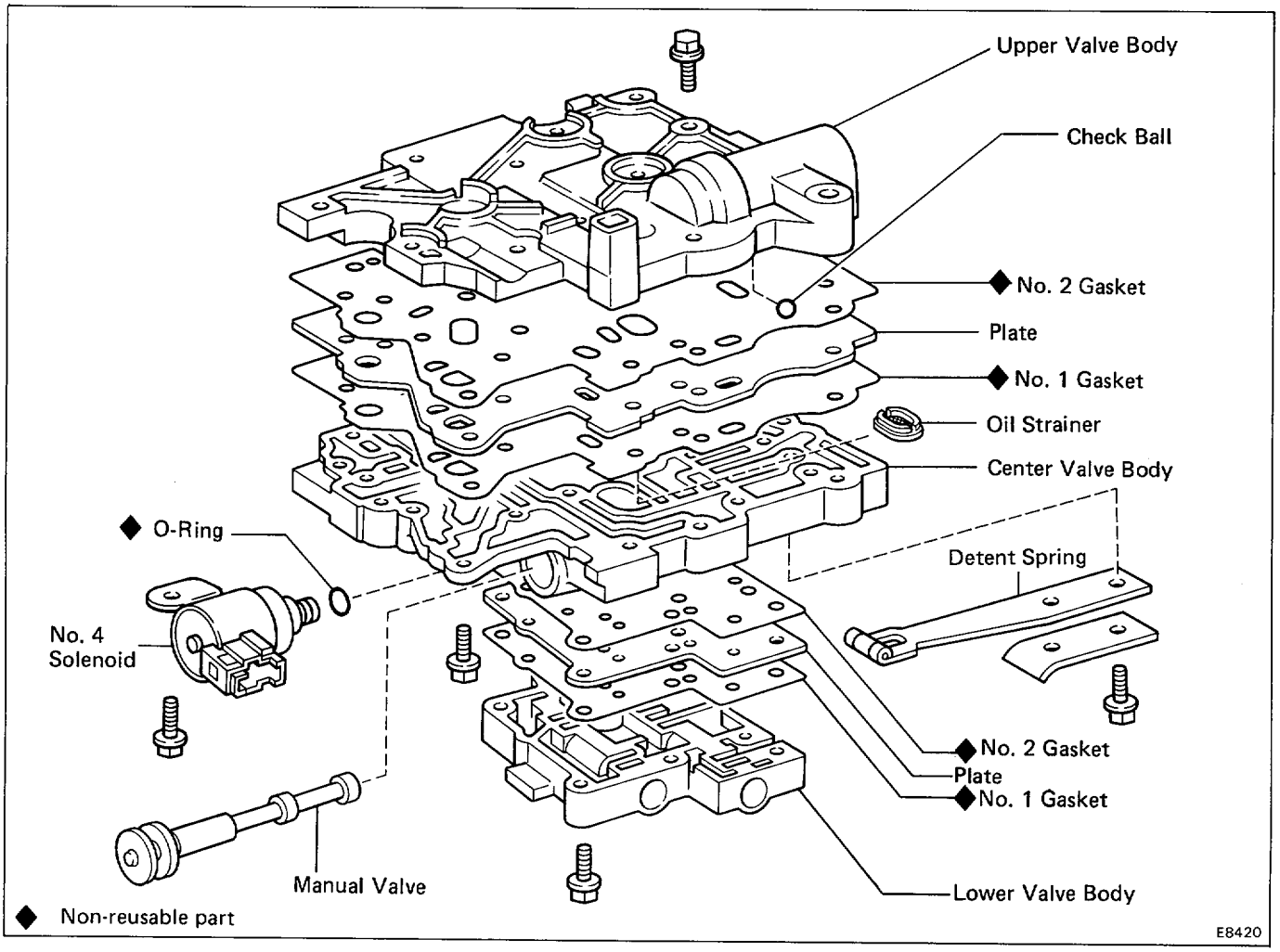
SST 09350-30020 (09350-06120)

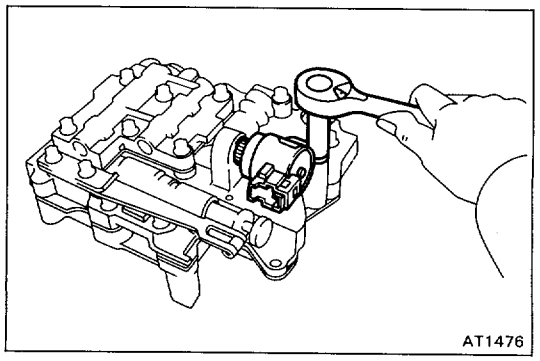
Piston stroke: 2.39 — 3.21 mm (0.0941 — 0.1264 in.)

If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

Transfer Valve Body

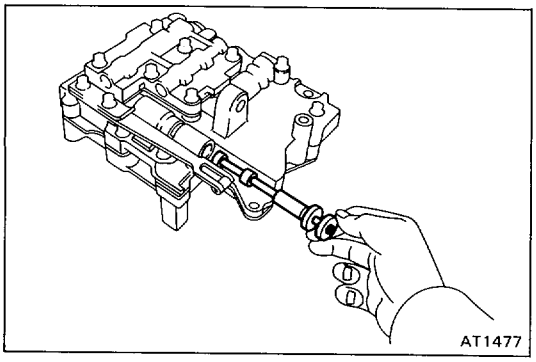
COMPONENTS



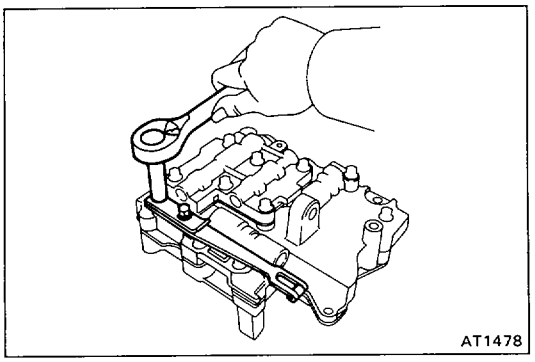


(Disassembly of Transfer Valve Body)

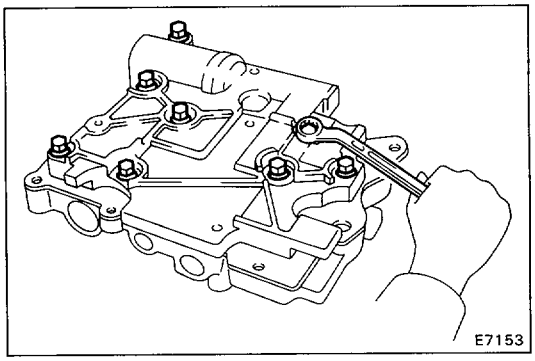
1. **REMOVE NO. 4 SOLENOID**
   (a) Remove the bolt and No. 4 solenoid.
   (b) Remove the O-ring from the solenoid.



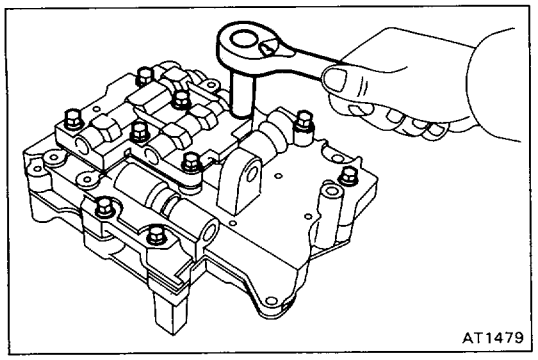
2. **REMOVE MANUAL VALVE**



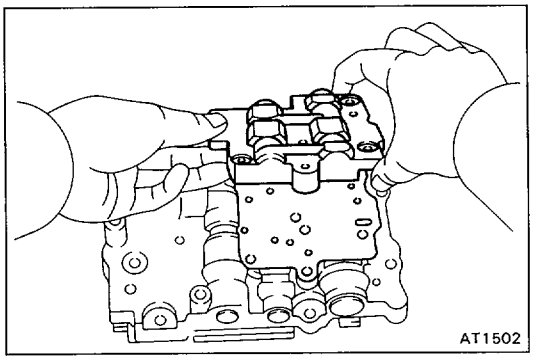
3. **REMOVE DETENT SPRING**



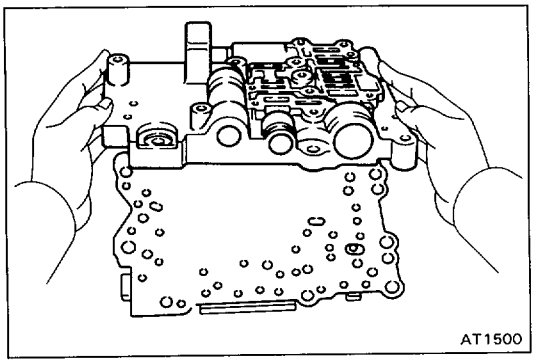
4. **REMOVE EIGHT BOLTS FROM UPPER VALVE BODY**



5. **TURN ASSEMBLY OVER AND REMOVE TEN BOLTS FROM LOWER AND CENTER VALVE BODY**



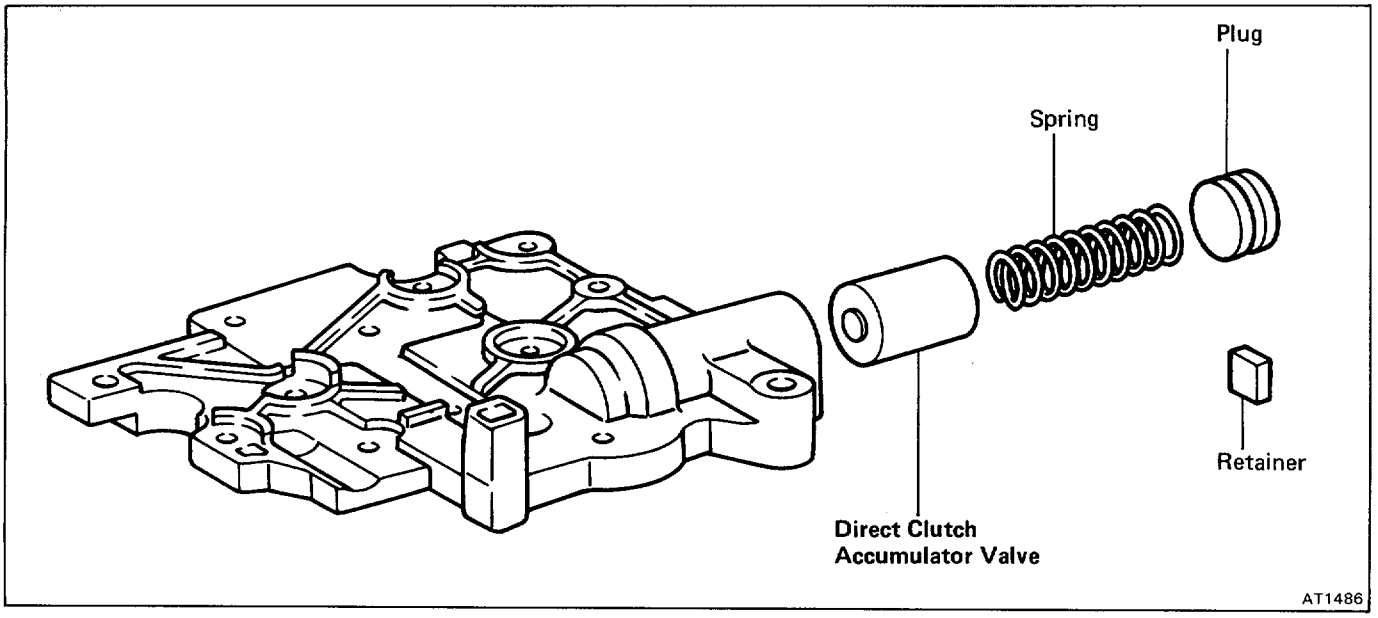
6. **LIFT OFF LOWER VALVE BODY**
   (a) Remove the lower valve body.
   (b) Remove the plate and two gaskets.



7. **LIFT OFF CENTER VALVE BODY**
   (a) Remove the center valve body.
   (b) Remove the plate and two gaskets.

(Upper Valve Body)

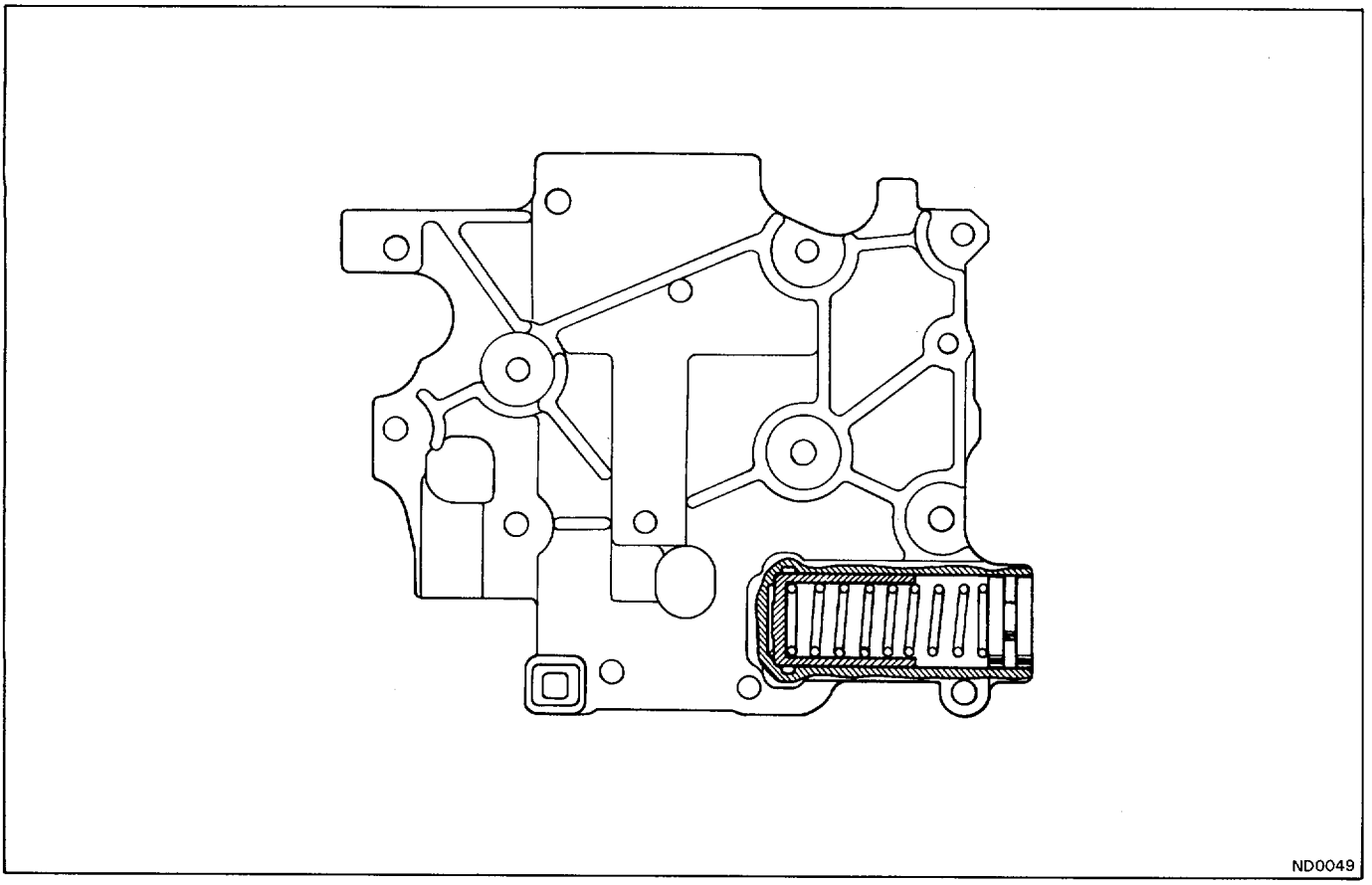
COMPONENTS



SPECIFICATIONS OF VALVE BODY SPRING

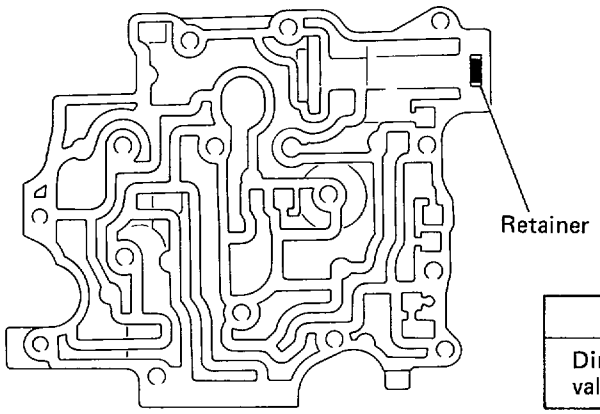
Spring	Free length mm (in.)	Coil outer diameter mm (in.)	Number of coils	Color
Direct clutch accumulator valve	55.7 (2.193)	18.3 (0.720)	9.1	Blue

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINER, CHECK BALLS AND STRAINERS

1. RETAINER

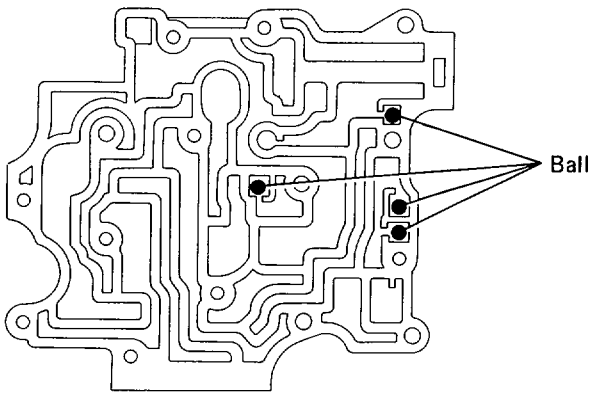


mm (in.)

Retainer	Height	Width	Thickness
Direct clutch accumulator valve	9.5 (0.374)	9.5 (0.374)	3.2 (0.126)

E7157

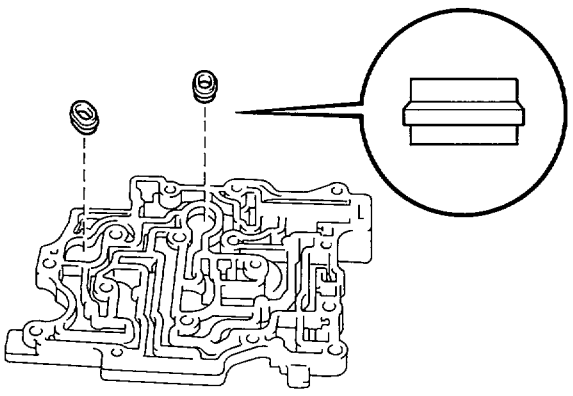
2. CHECK BALL



Check ball	Diameter mm (in.)
Rubber ball	5.54 (0.2181)

E7161

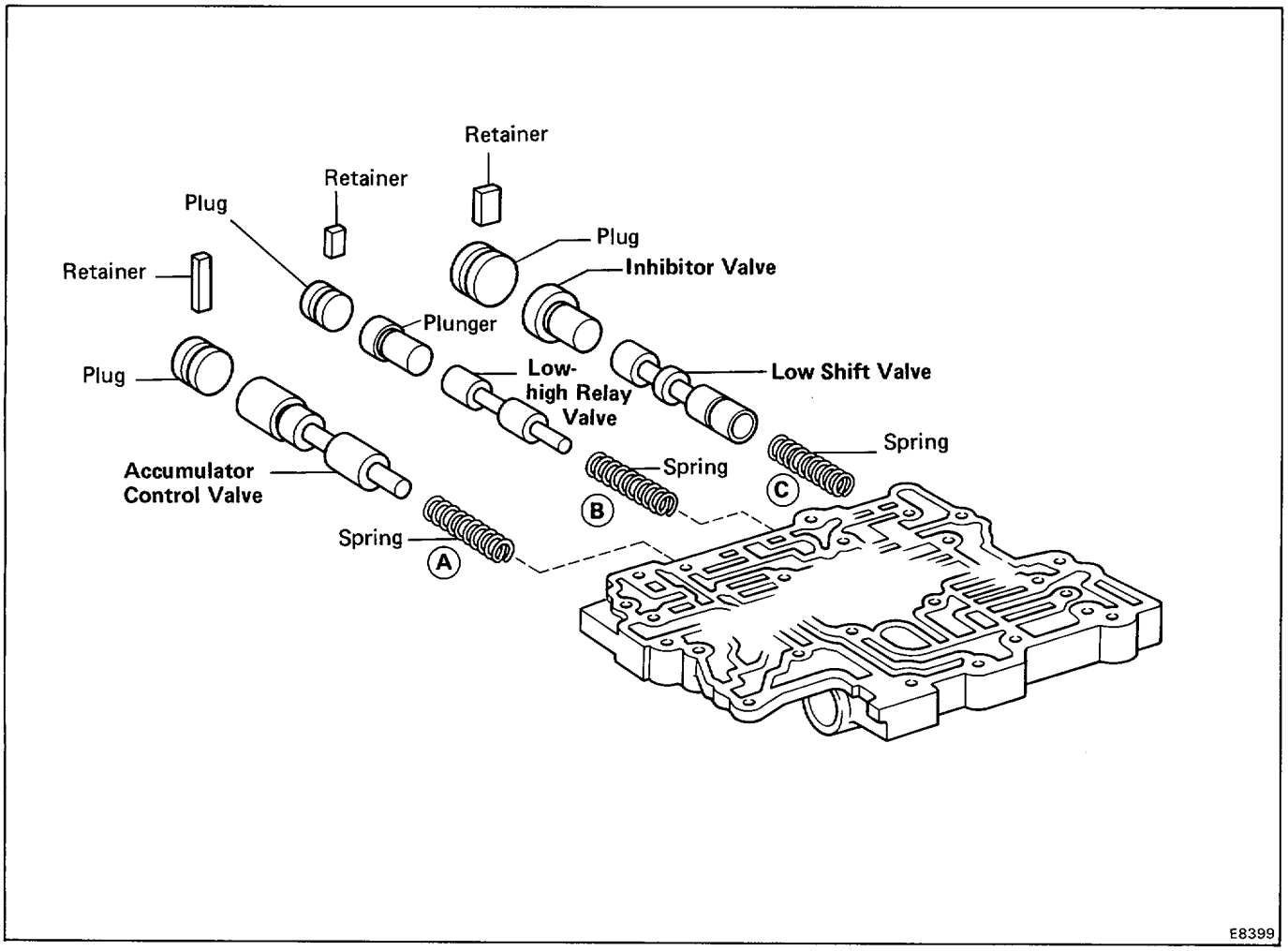
3. STRAINER



E7160

(Center Valve Body)

COMPONENTS

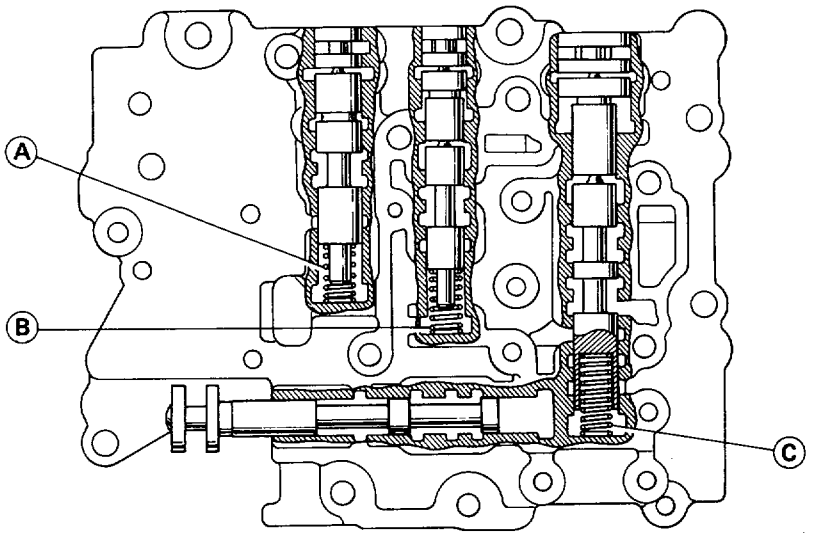


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Number of coils	Color
(A)	Accumulator control valve	29.3 (1.154)	8.2 (0.323)	9.8	White
(B)	Low-high relay valve	31.7 (1.248)	8.5 (0.335)	9.2	Light Blue
(C)	Low shift valve	29.2 (1.150)	8.2 (0.323)	11.0	Yellow

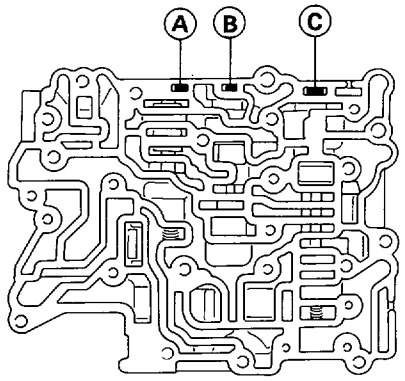
NOTE: During reassembly please refer to the spring specifications above to help discrimination between the different springs.

SECTIONAL VIEW OF VALVE BODY



ND0050

LOCATION OF RETAINERS



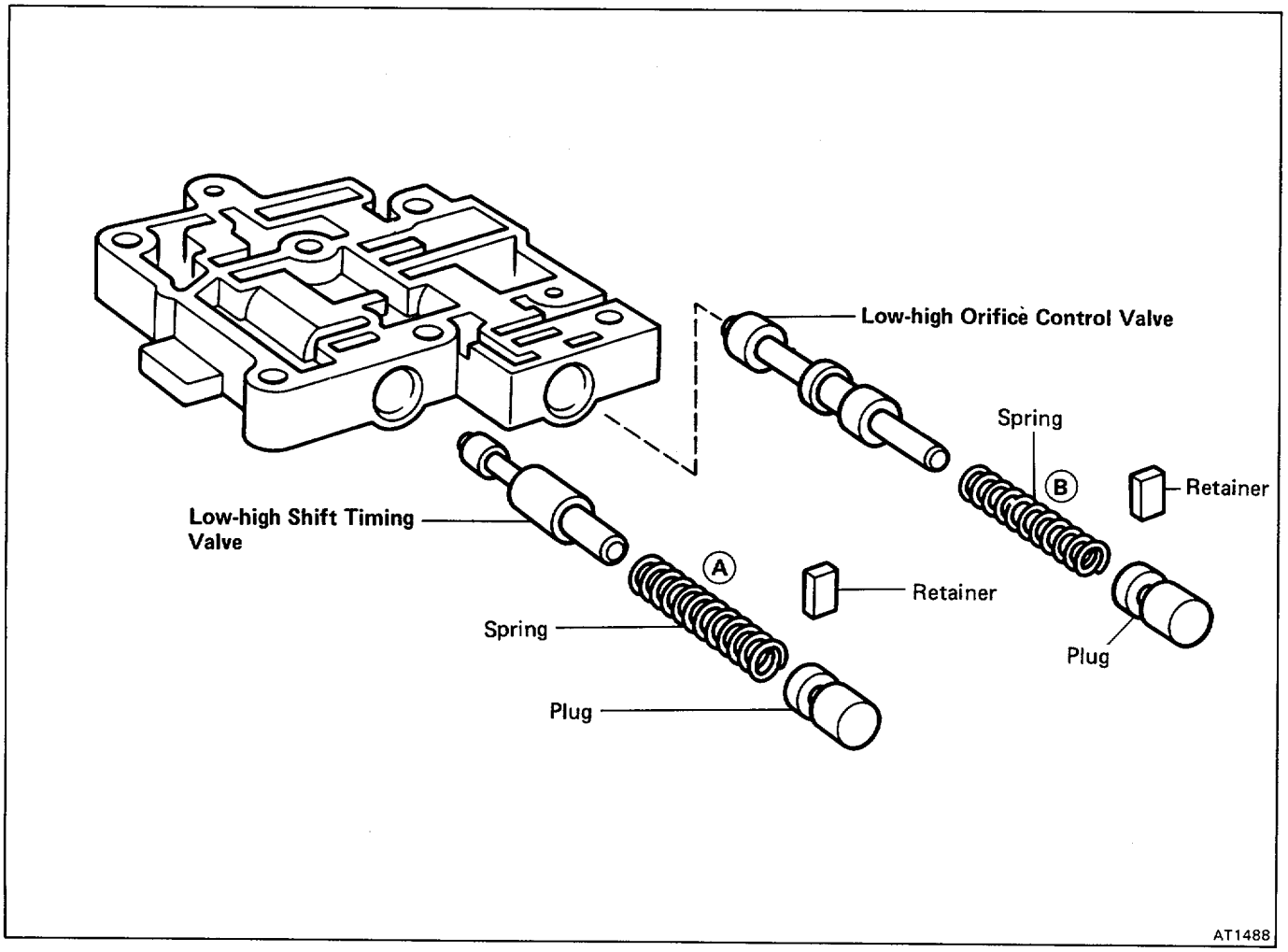
mm (in.)

Retainer		Height	Width	Thickness
A	Accumulator control valve	21.2 (0.835)	5.0 (0.197)	3.2 (0.126)
B	Low-high relay valve	8.5 (0.335)	5.0 (0.197)	3.2 (0.126)
C	Low shift valve	9.5 (0.374)	9.5 (0.374)	3.2 (0.126)

E7158

(Lower Valve Body)

COMPONENTS

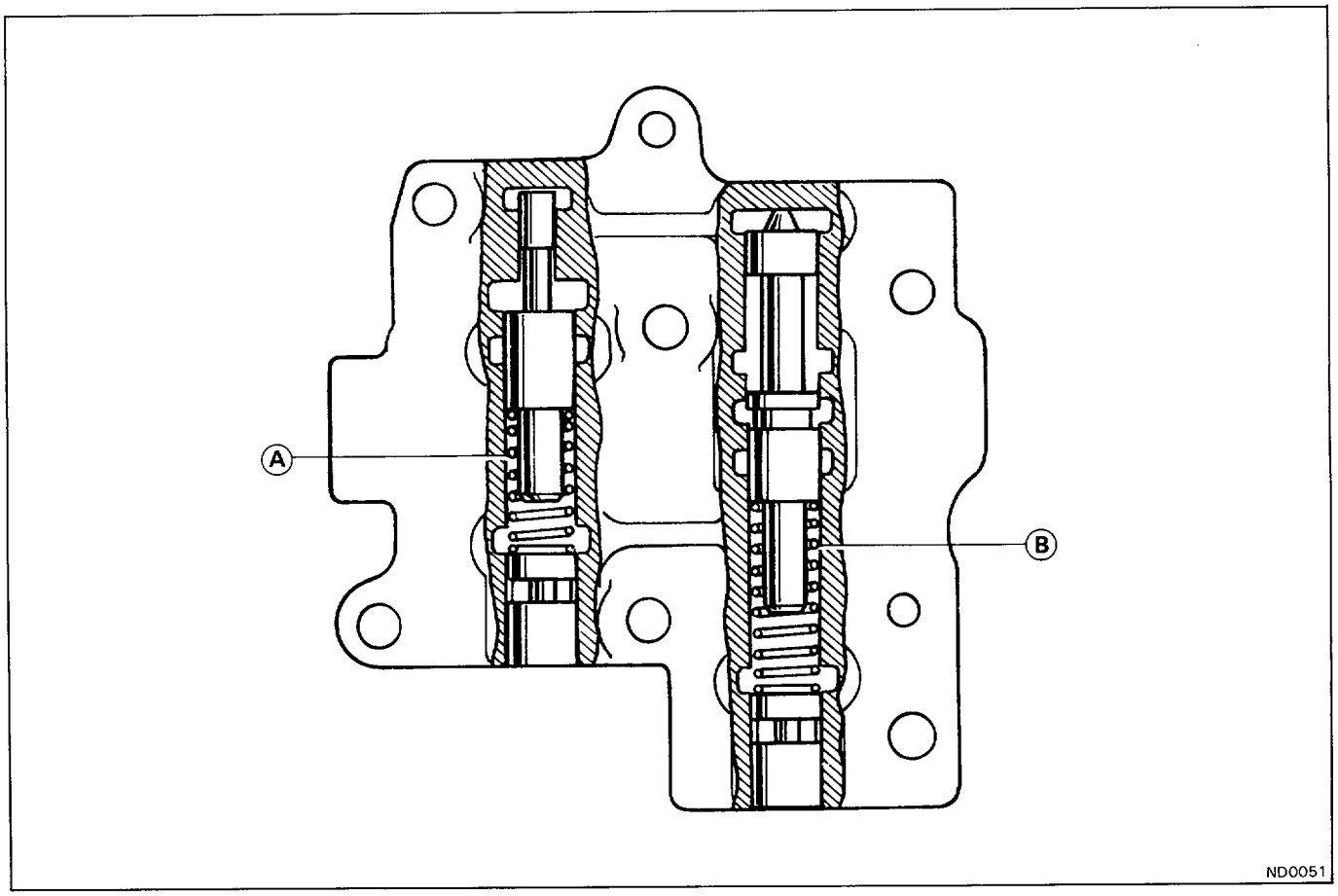


SPECIFICATIONS OF VALVE BODY SPRINGS

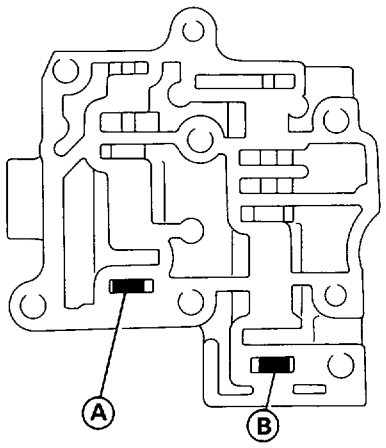
Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Number of coils	Color
(A)	Low-high shift timing valve	31.7 (1.248)	8.6 (0.339)	7.0	Purple
(B)	Low-high orifice control valve	29.7 (1.169)	9.0 (0.354)	10.3	Green

NOTE: During reassembly please refer to the spring specifications above to help discrimination between the different springs.

SECTIONAL VIEW OF VALVE BODY

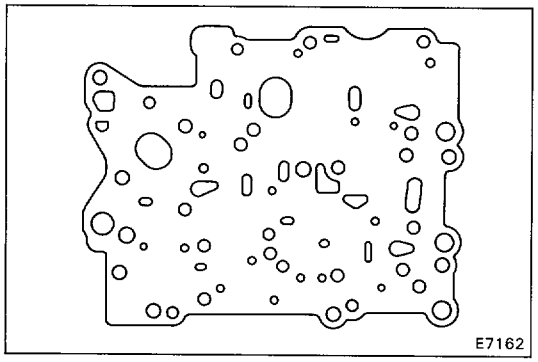


LOCATION OF RETAINERS



mm (in.)

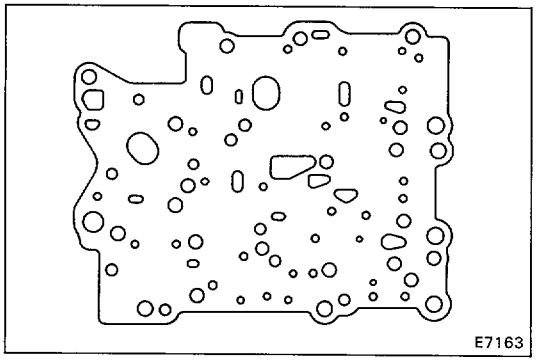
Retainer		Height	Width	Thickness
Ⓐ	Low-high shift timing valve	8.5 (0.335)	5.0 (0.197)	3.2 (0.126)
Ⓑ	Low-high orifice control valve	8.5 (0.335)	5.0 (0.197)	3.2 (0.126)



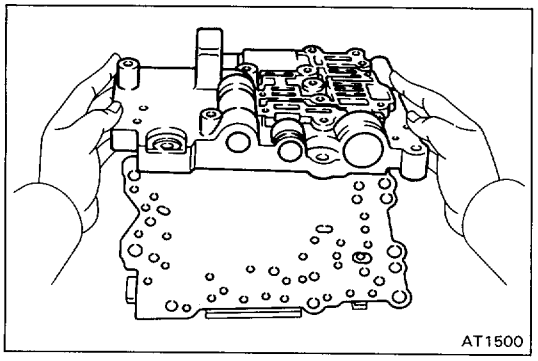
(Assembly of Transfer Valve Body)

(See page AT-249)

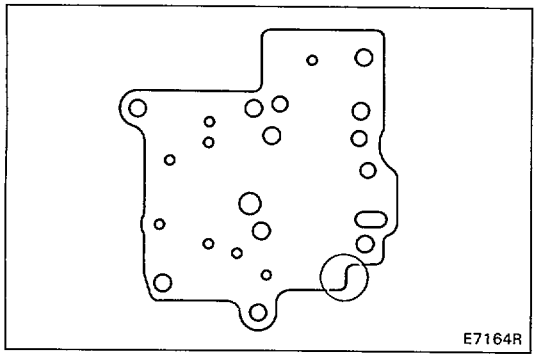
1. **POSITION NEW NO. 2 GASKET ON UPPER VALVE BODY**
   Align a new No. 2 gasket at each bolt hole.
2. **POSITION VALVE BODY PLATE ON NO. 2 GASKET**
   Align the plate at each bolt hole.



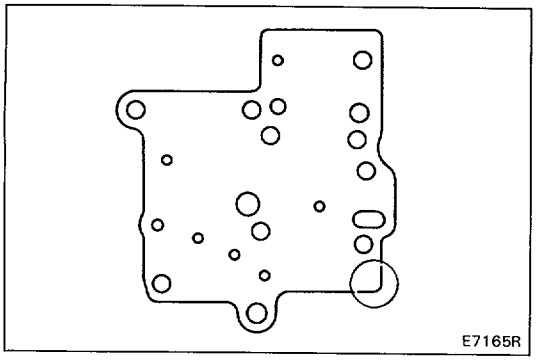
3. **POSITION NEW NO. 1 GASKET ON PLATE**
   Align a new No. 1 gasket at each bolt hole.



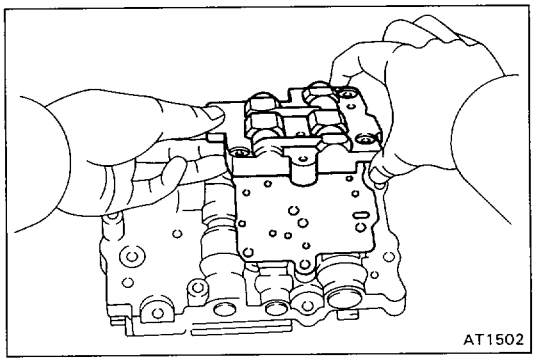
4. **PLACE CENTER VALVE BODY ON TOP OF UPPER VALVE BODY**



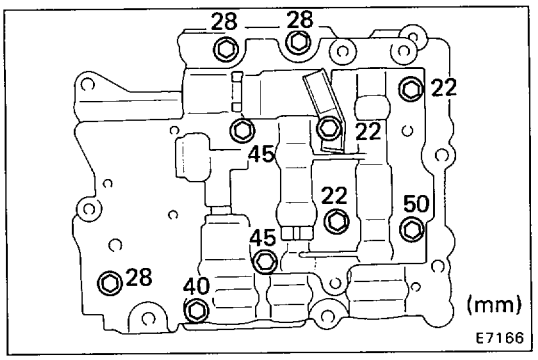
5. **POSITION NEW NO. 2 GASKET ON CENTER VALVE BODY**
   Align a new No. 2 gasket at each bolt hole.
6. **POSITION VALVE BODY PLATE ON NO. 2 GASKET**
   Align the plate at each bolt hole.



7. **POSITION NEW NO. 1 GASKET ON PLATE**
   Align a new No. 1 gasket at each bolt hole.

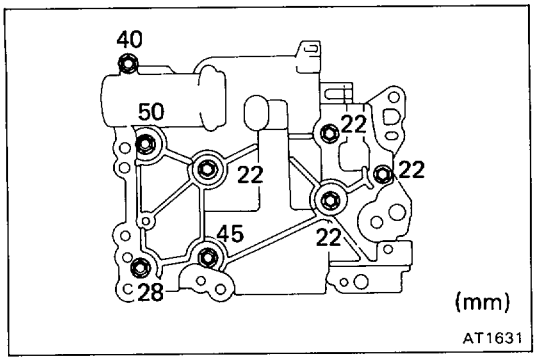


8. **PLACE LOWER VALVE BODY ON TOP OF CENTER VALVE BODY**



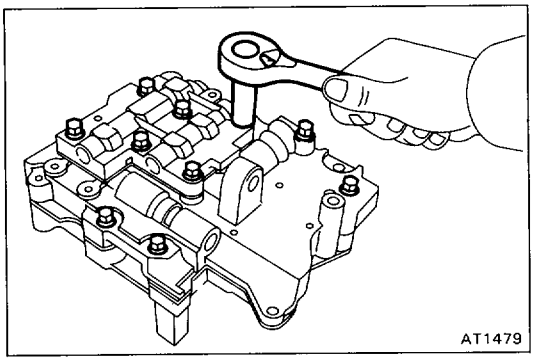
9. **INSTALL AND FINGER TIGHTEN TEN BOLTS IN LOWER AND CENTER VALVE BODYS TO SECURE UPPER VALVE BODY**

NOTE: Each bolt length (mm) is indicated in the figure.



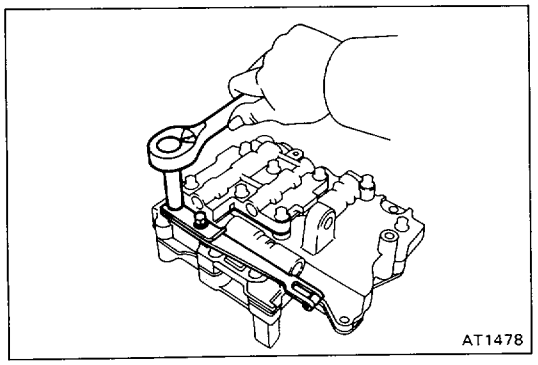
10. **TURN ASSEMBLY OVER, CHECK GASKET ALIGNMENT AND FINGER TIGHTEN EIGHT BOLTS IN UPPER VALVE BODY**

NOTE: Each bolt length (mm) is indicated in the figure.



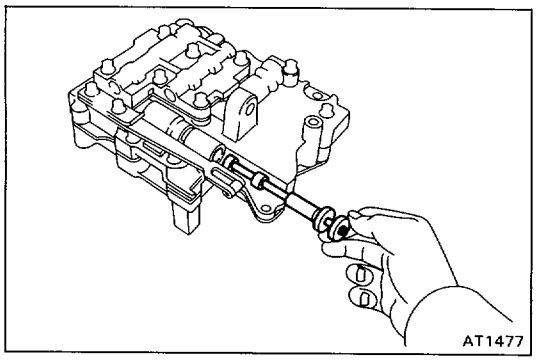
11. **TIGHTEN BOLTS ON BOTH SIDES**

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)

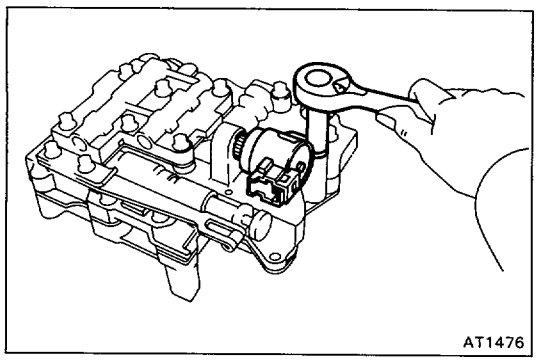


12. **INSTALL DETENT SPRING**

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)



13. INSERT MANUAL VALVE



14. INSTALL NO. 4 SOLENOID

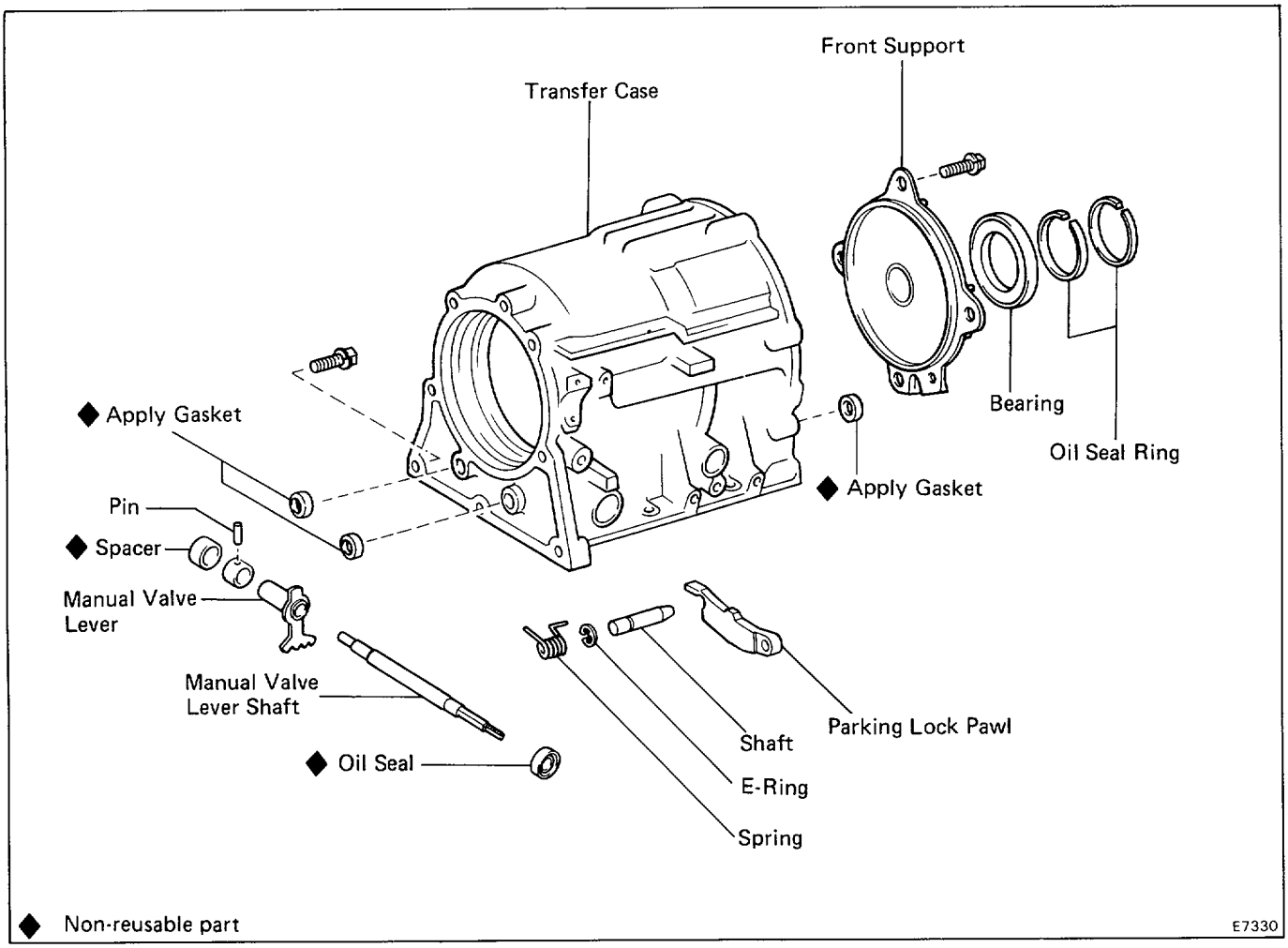
(a) Install a new O-ring to the solenoid.

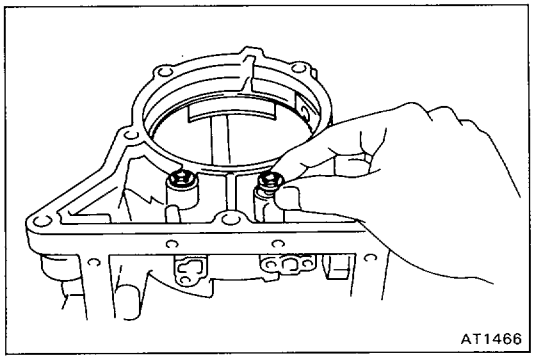
(b) Install the solenoid and torque the bolt.

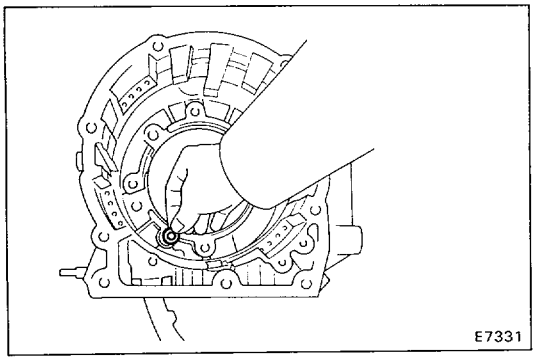
Torque: 100 kg-cm (7 ft-lb, 10 N·m)

Transfer Case and Front Support

COMPONENTS





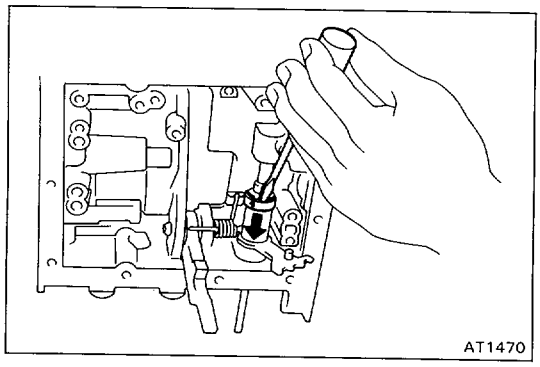


DISASSEMBLY OF TRANSFER CASE AND FRONT SUPPORT

1. REMOVE APPLY GASKETS

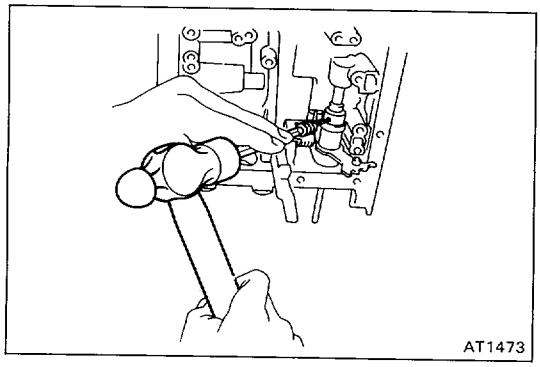
(a) Remove the two apply gaskets from the transfer case front side.

(b) Remove the apply gasket from the transfer case inner side.

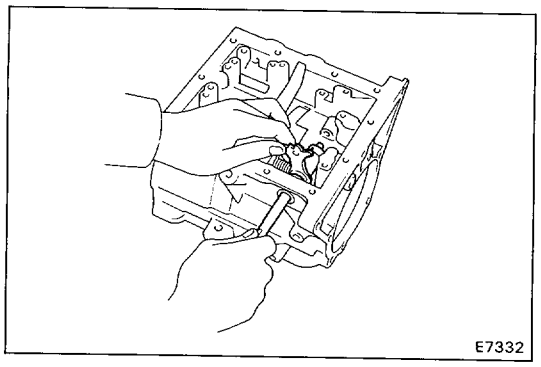


2. REMOVE TRANSFER MANUAL VALVE LEVER AND SHAFT

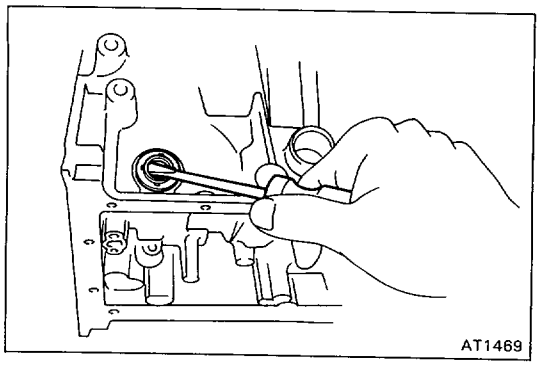
(a) Using a hammer and screwdriver, pry and shift the spacer.



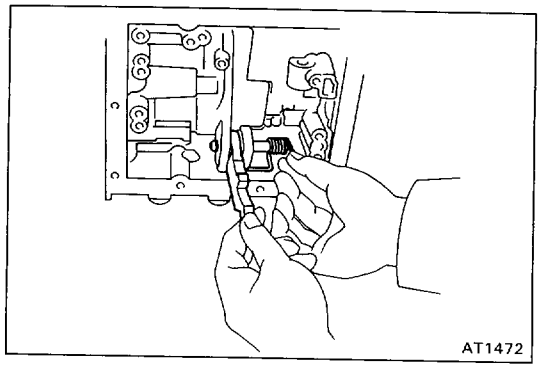
(b) Using a pin punch and hammer, drive out the pin.



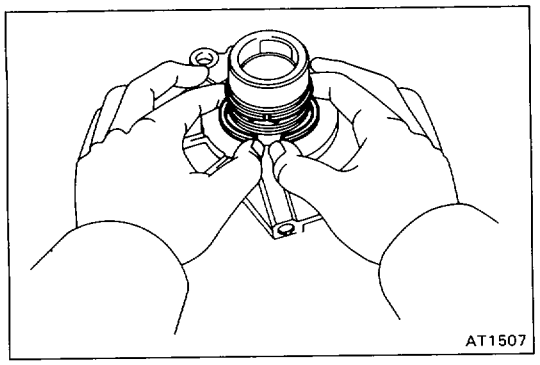
(c) Slide the shaft out through the case and remove the manual valve lever.



(d) Using a screwdriver, remove the oil seal from the case.

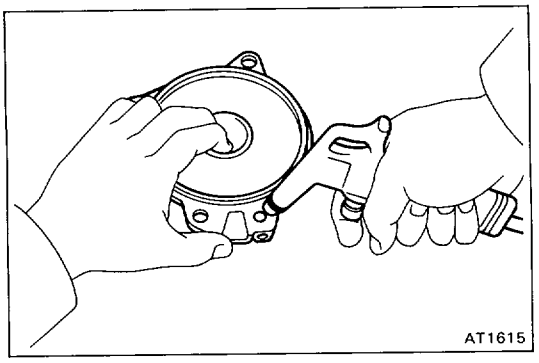


3. REMOVE SPRING, SHAFT AND PARKING LOCK PAWL



4. **REMOVE OIL SEAL RINGS FROM FRONT SUPPORT**

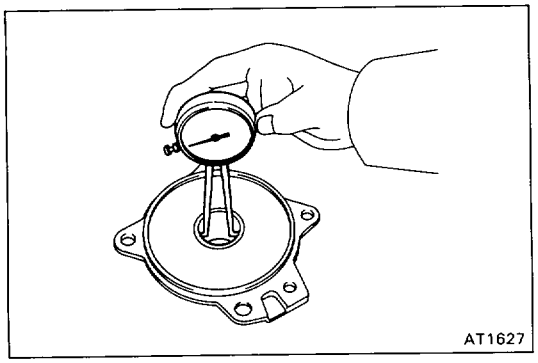
INSPECTION OF FRONT SUPPORT



INSPECT FRONT SUPPORT

(a) Check that check ball is not free by shaking the front support.

(b) Check that the valve does not leak by applying low-pressure compressed air.

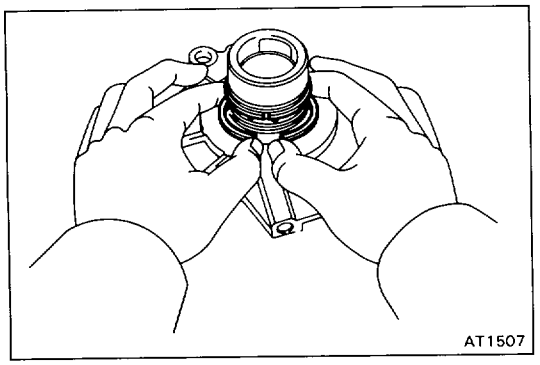


(c) Using a dial indicator, measure the inside diameter of the front support bushing.

Maximum inside diameter: 31.35 mm (1.2342 in.)

If the inside diameter is greater than the maximum, replace the front support.

ASSEMBLY OF TRANSFER CASE AND FRONT SUPPORT

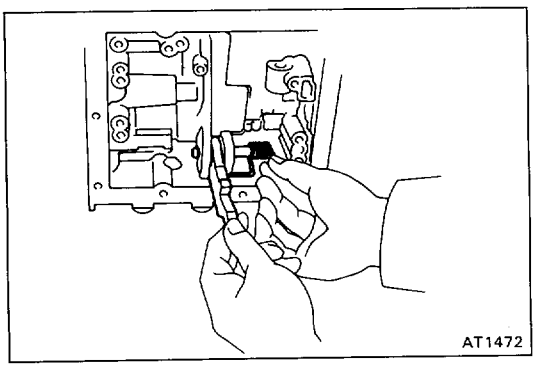


1. **INSTALL OIL SEAL RINGS TO FRONT SUPPORT**

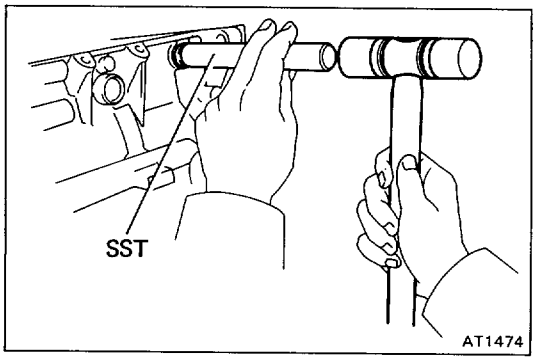
Coat the two oil seal rings with ATF and install them onto the front support.

CAUTION: Do not spread the ring ends more than necessary.

NOTE: After installing the oil seal rings, check that they rotate smoothly.



2. **INSTALL PARKING LOCK PAWL, SHAFT AND SPRING IN CASE**

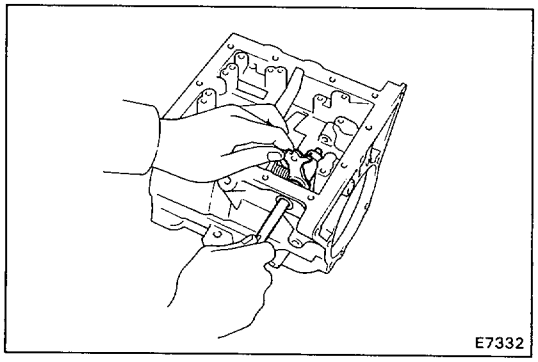


3. INSTALL MANUAL VALVE LEVER AND SHAFT

(a) Using SST and a hammer, drive in a new oil seal to the case.

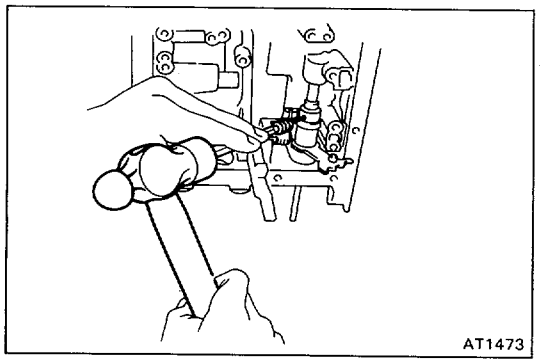
SST 09350-30020 (09350-07110)

(b) Coat the oil seal lip with MP grease.



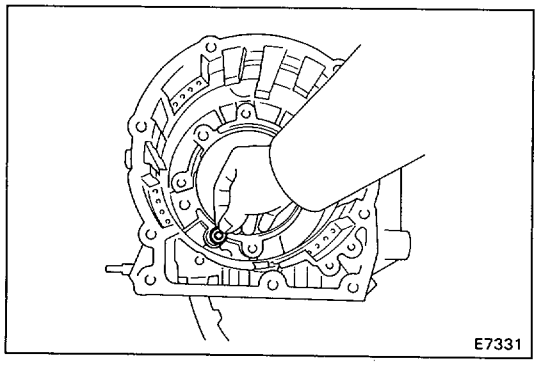
(c) Assemble a new spacer to the manual valve lever.

(d) Install the manual valve lever shaft to the transfer case through the manual valve lever.



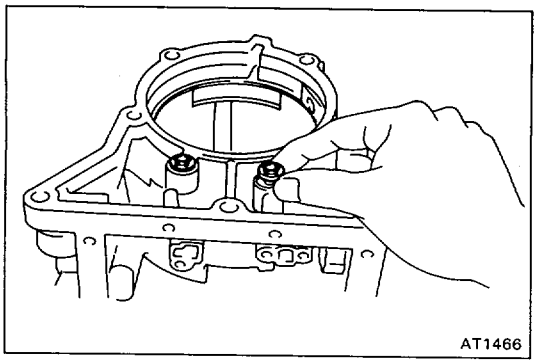
(e) Drive in the roll pin with the slot at a right angle to the shaft.

(f) Match the spacer hole to the lever calking hollow and calk the spacer to the lever.



4. INSTALL APPLY GASKETS

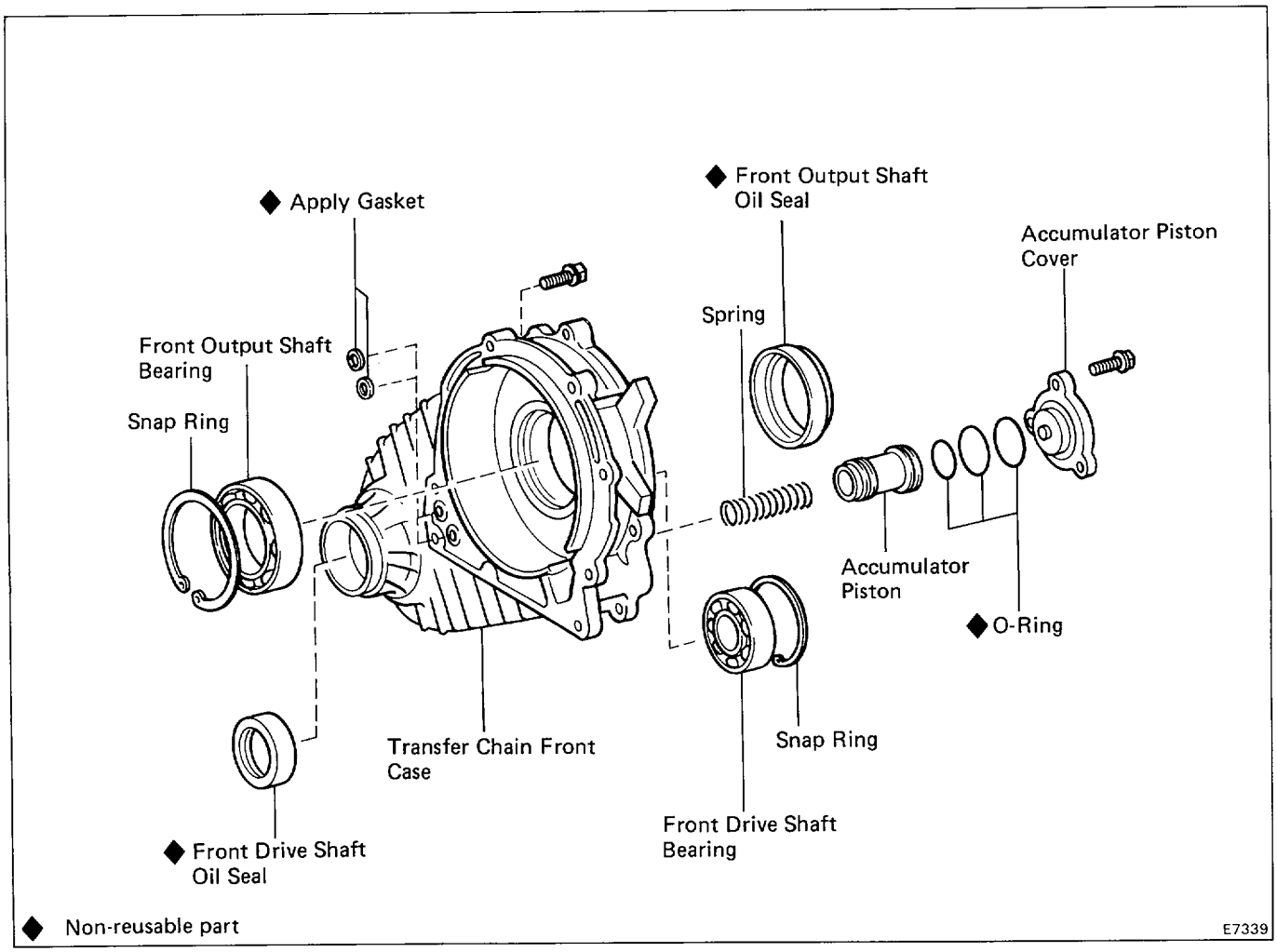
(a) Install a new apply gasket to the transfer case inner side.

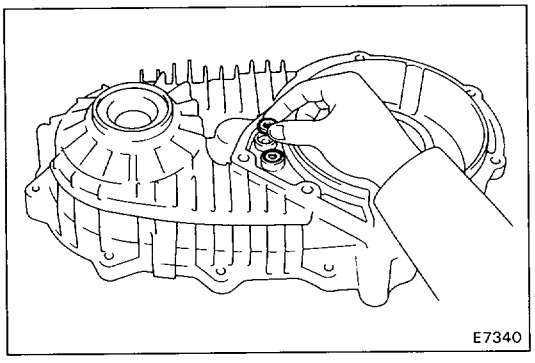


(b) Install new two apply gaskets to the transfer case front side.

Transfer Chain Front Case

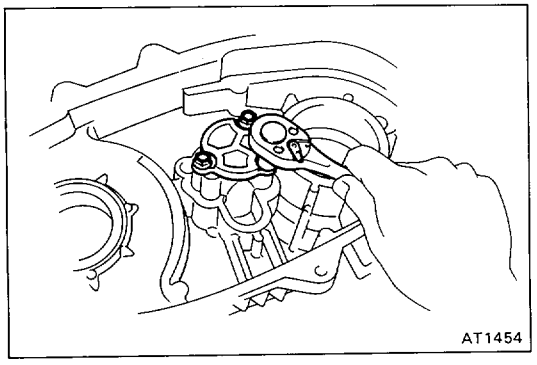
COMPONENTS





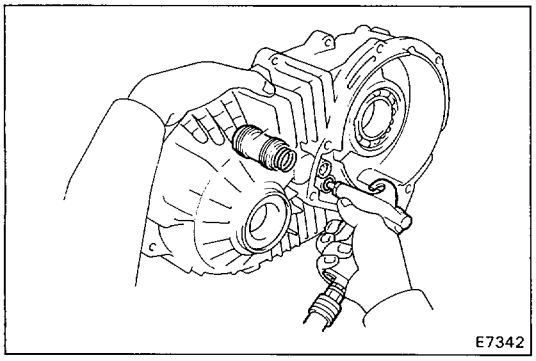
DISASSEMBLY OF TRANSFER CHAIN FRONT CASE

1. REMOVE APPLY GASKETS

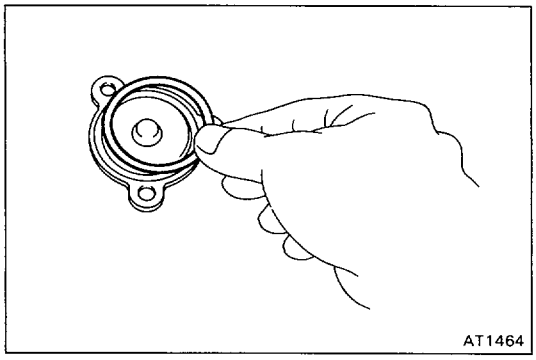


2. REMOVE B4 ACCUMULATOR PISTON

(a) Remove the three bolts and accumulator piston cover.

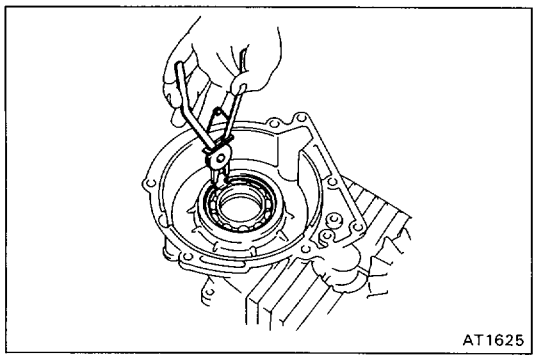


(b) Position a rag to catch piston. Using low- pressure compressed air (1 kg/cm², 14 psi or 98 kPa max.), pop the piston into the rag. Force air holes shown, and remove the piston and spring.



(c) Remove the O-ring from the accumulator piston cover.

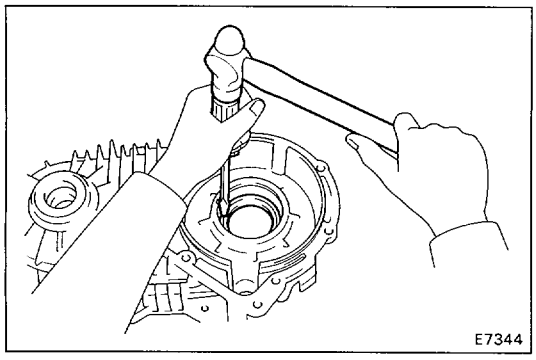
(d) Remove the O-rings from the accumulator piston.



3. REMOVE FRONT OUTPUT SHAFT BEARING

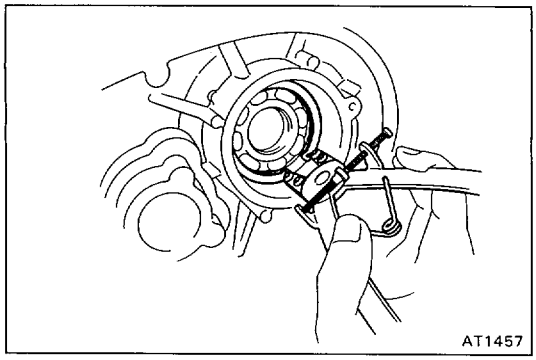
(a) Using snap ring pliers, remove the snap ring.

(b) Remove the bearing.



4. REMOVE FRONT OUTPUT SHAFT OIL SEAL

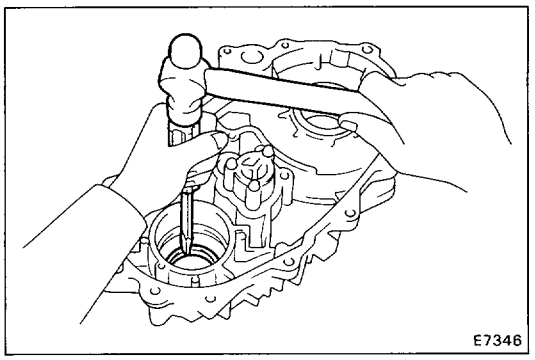
Using a screwdriver and hammer, drive out the oil seal from the transfer chain front case.



5. REMOVE TRANSFER FRONT DRIVE SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

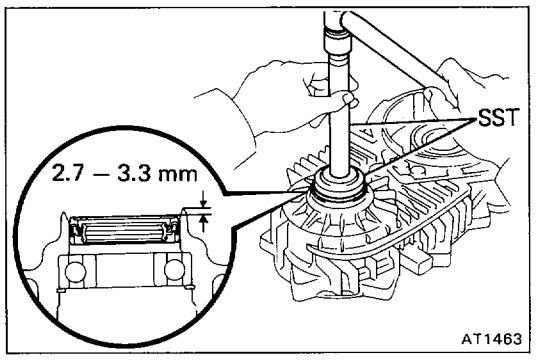
(b) Remove the bearing.



6. REMOVE TRANSFER FRONT DRIVE SHAFT OIL SEAL

Using a screwdriver and hammer, drive out the oil seal from the transfer chain front case.

ASSEMBLY OF TRANSFER CHAIN FRONT CASE



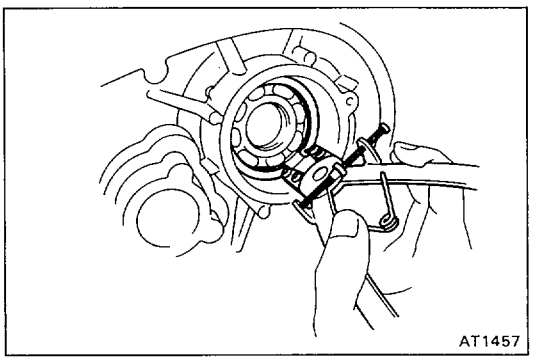
1. INSTALL TRANSFER FRONT DRIVE SHAFT OIL SEAL

(a) Using SST and a hammer, drive in a new oil seal.

SST 09608-35014 (09608-06020, 09608-06100)

Oil seal depth: 2.7 – 3.3 mm (0.106 – 0.130 in.)

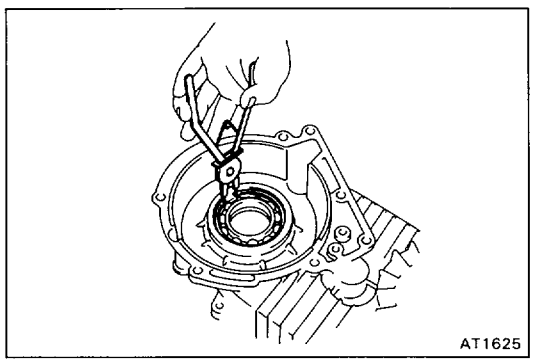
(b) Coat the oil seal lip with MP grease.



2. INSTALL TRANSFER FRONT DRIVE SHAFT BEARING

(a) Install the bearing to the transfer chain front case.

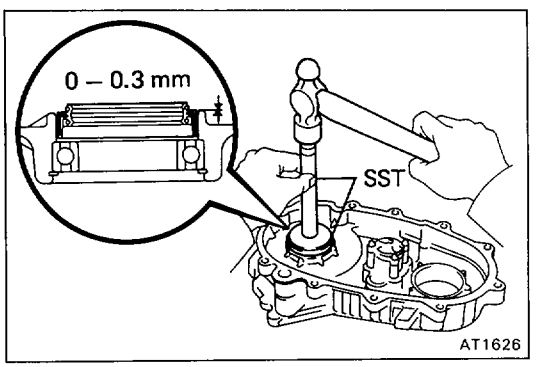
(b) Using snap ring pliers, install the snap ring.



3. INSTALL FRONT OUTPUT SHAFT BEARING

(a) Install the bearing.

(b) Using snap ring pliers, install the snap ring.



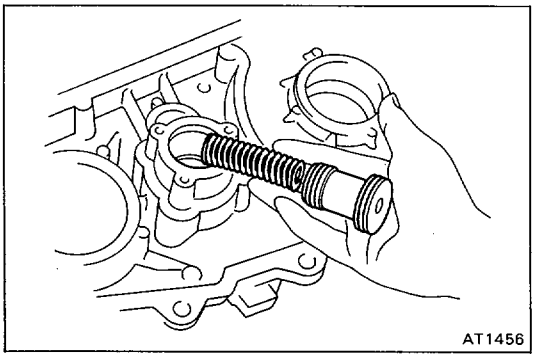
4. INSTALL FRONT OUTPUT SHAFT OIL SEAL

(a) Using SST and a hammer, drive in a new oil seal to the transfer chain front case.

SST 09608-32010 and 09608-35014 (09608-06020)

Oil seal depth: 0 – 0.3 mm (0 – 0.118 in.)

(b) Coat the oil seal lip with MP grease.



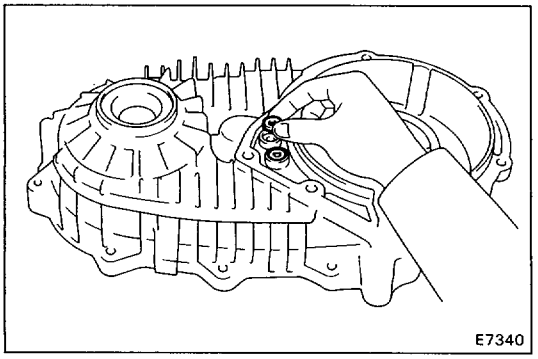
5. INSTALL B_4 ACCUMULATOR PISTON

(a) Coat new O-rings with ATF and install them to the piston.

(b) Install a new O-ring to the accumulator piston cover.

(c) Install the spring and accumulator piston.

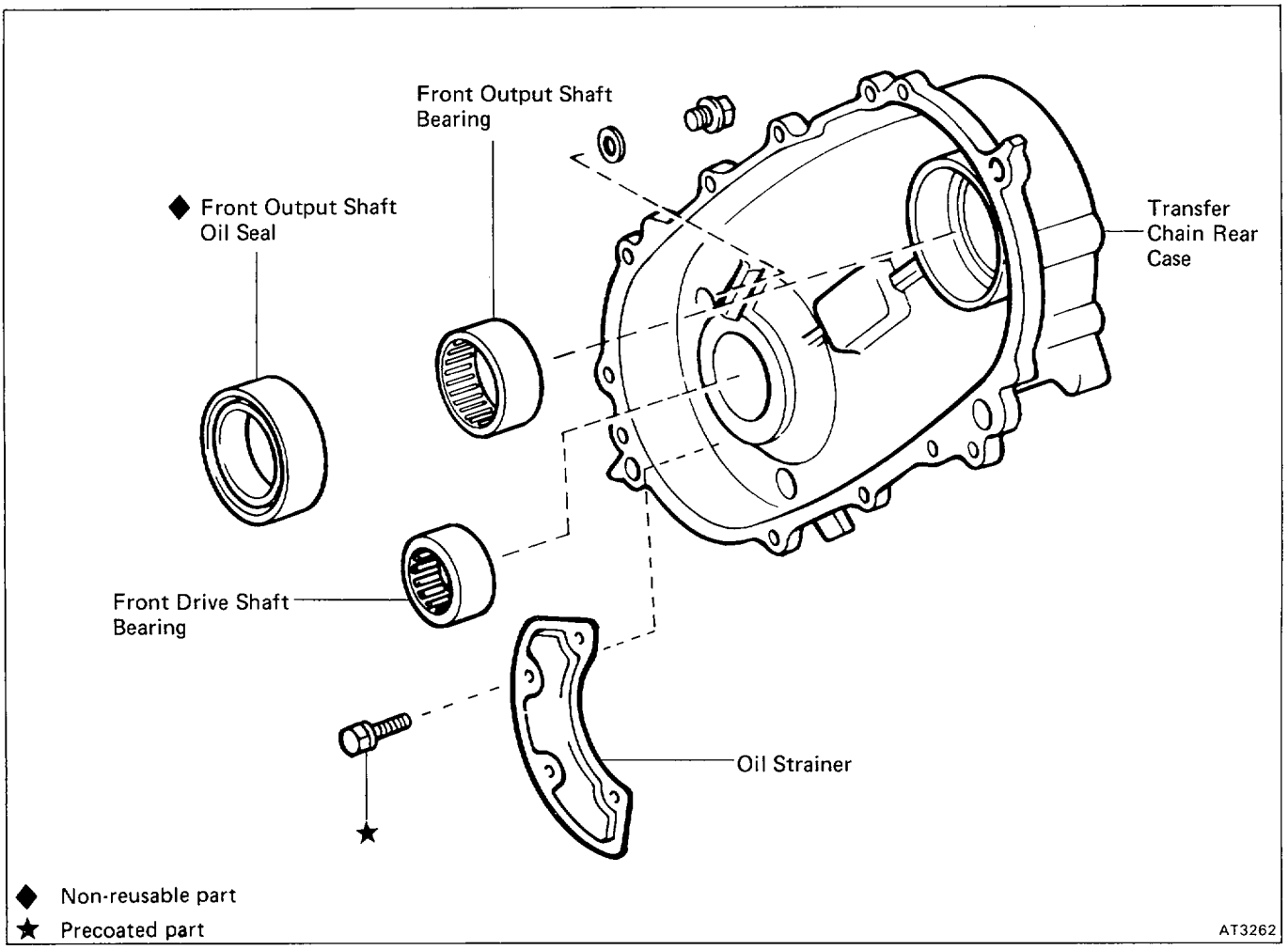
(d) Install the accumulator piston cover and torque the three bolts.

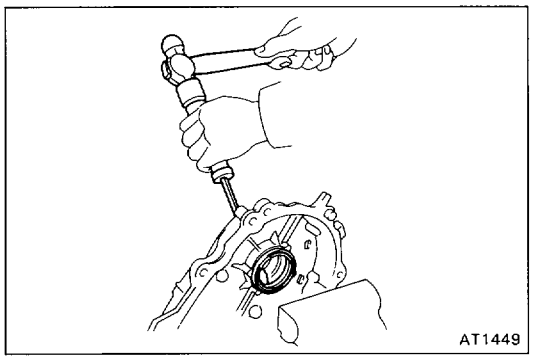


6. INSTALL APPLY GASKETS

Transfer Chain Rear Case

COMPONENTS

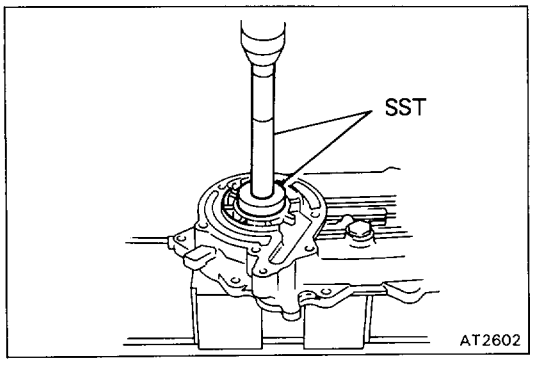




DISASSEMBLY OF TRANSFER CHAIN REAR CASE

1. **REMOVE FRONT OUTPUT SHAFT OIL SEAL**

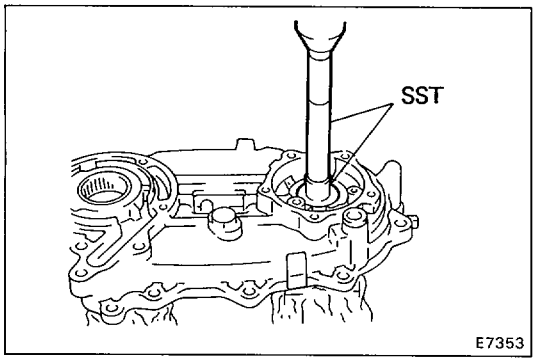
   Using a screwdriver, drive out the oil seal.



2. **REMOVE FRONT OUTPUT SHAFT BEARING**

   Using SST and a press, press out the bearing.

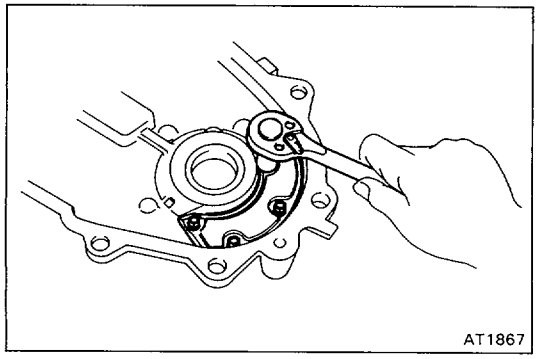
   SST 09608-12010 (09608-00020, 09608-00050)



3. REMOVE FRONT DRIVE SHAFT BEARING

Using SST and a press, press out the bearing.

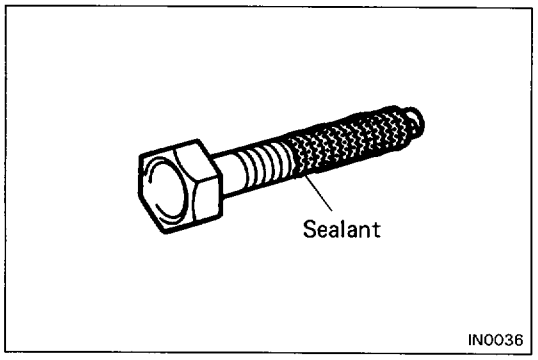
SST 09608-12010 (09608-00020, 09608-00040)



4. REMOVE OIL STRAINER

Remove the four bolts and strainer from the chain rear case.

ASSEMBLY OF TRANSFER CHAIN REAR CASE

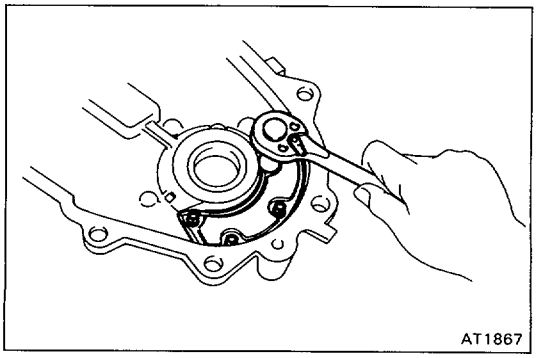


1. INSTALL OIL STRAINER

(a) Apply sealant to 2 or 3 threads of the bolt end.

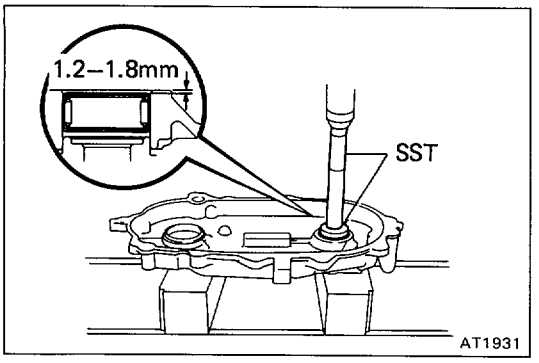
Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.



(b) Install the oil strainer with four bolts.

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)

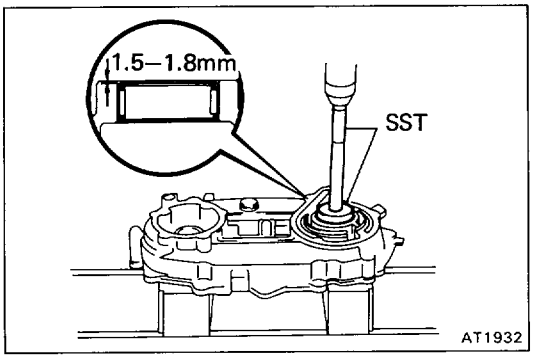


2. INSTALL FRONT DRIVE SHAFT BEARING

Using SST, press in the bearing.

SST 09608-12010 (09608-00020, 09608-00040)

Bearing depth: 1.2 — 1.8 mm (0.047 — 0.071 in.)

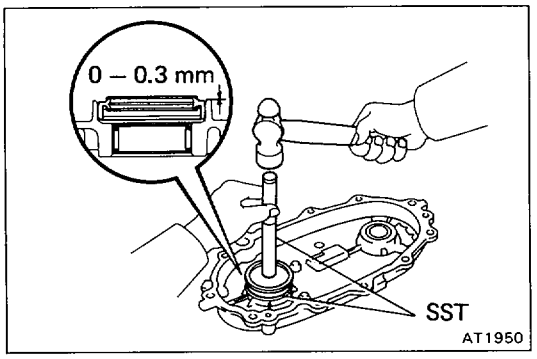


3. **INSTALL FRONT OUTPUT SHAFT BEARING**

Using SST, press in the bearing.

SST 09608-12010 (09608-00020, 09608-00050)

Bearing depth: 1.5 — 1.8 mm (0.059 — 0.071 in.)



4. **INSTALL FRONT OUTPUT SHAFT OIL SEAL**

(a) Using SST and a hammer, drive in a new oil seal.

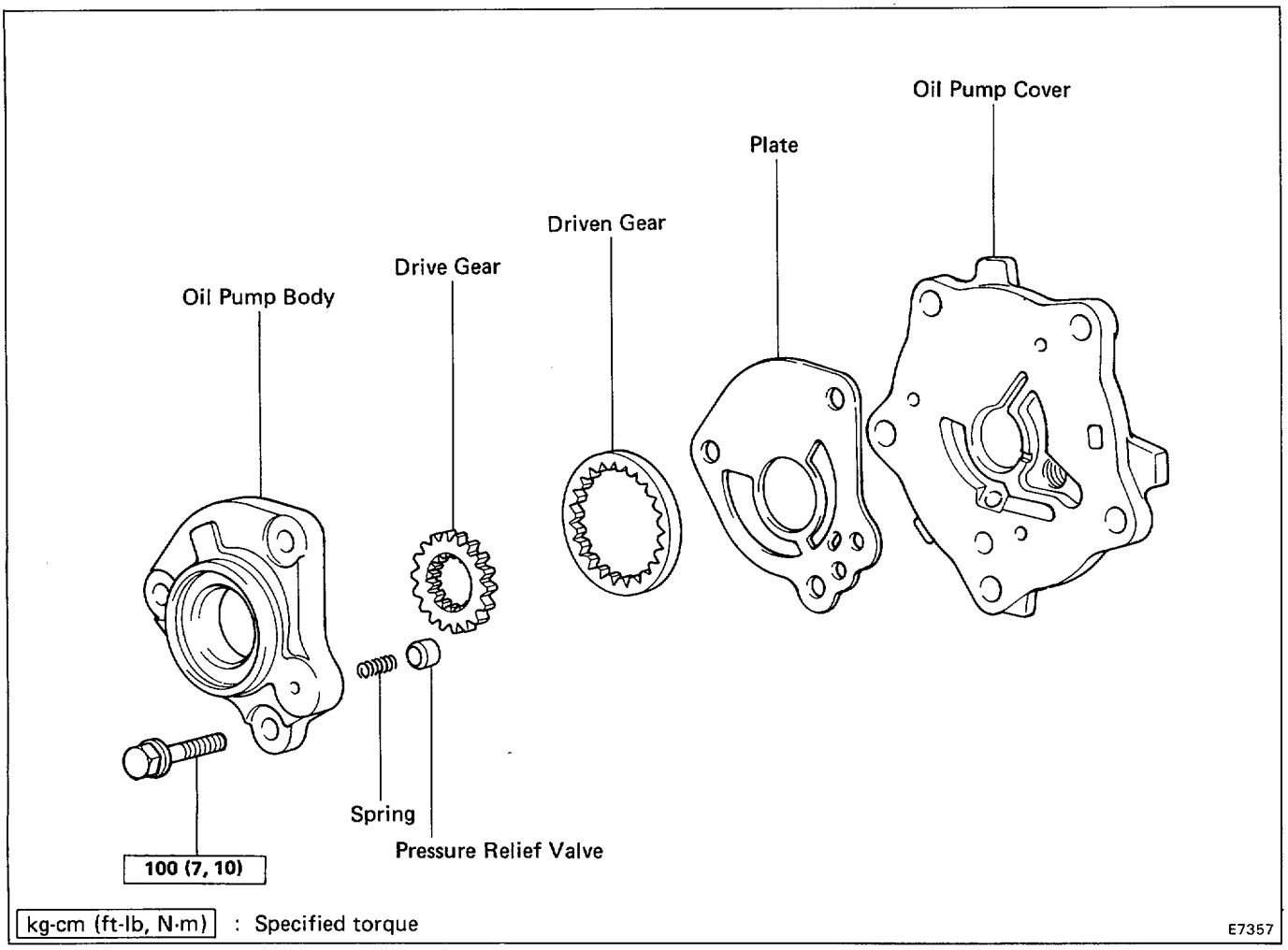
SST 09608-12010 (09608-00020) and 09608-32010

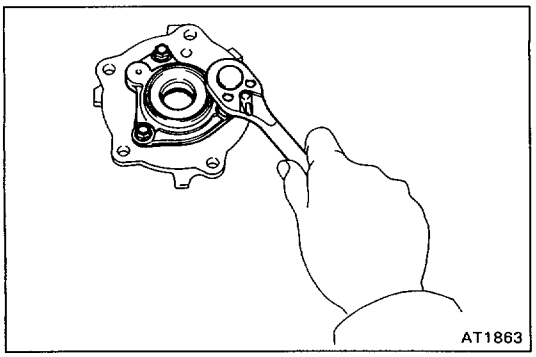
Oil seal depth: 0 — 0.3 mm (0 — 0.118 in.)

(b) Coat the oil seal lip with MP grease.

Transfer Oil Pump

COMPONENTS

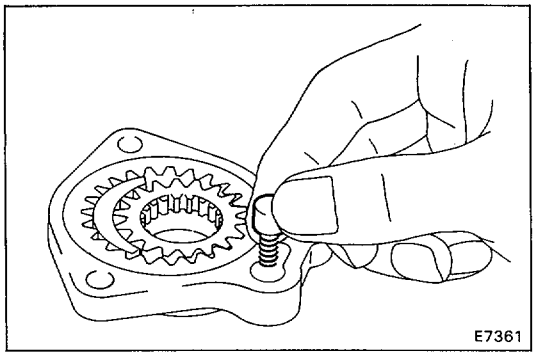




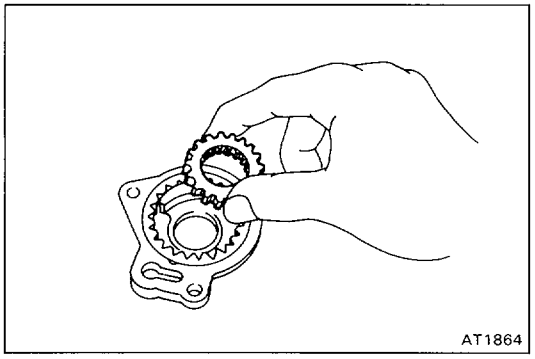
DISASSEMBLY OF TRANSFER OIL PUMP

DISASSEMBLE TRANSFER OIL PUMP ASSEMBLY

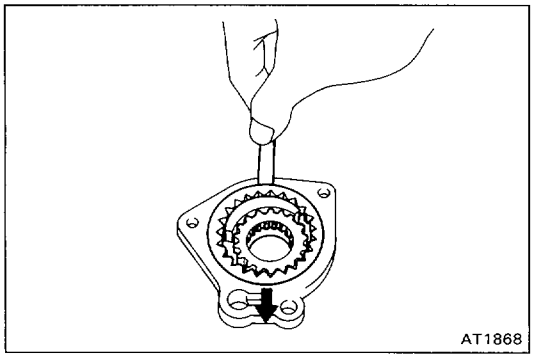
(a) Remove the three bolts, oil pump body and plate from the oil pump cover.



(b) Remove the pressure relief valve and spring.



(c) Remove the drive gear and driven gear.



INSPECTION OF TRANSFER OIL PUMP

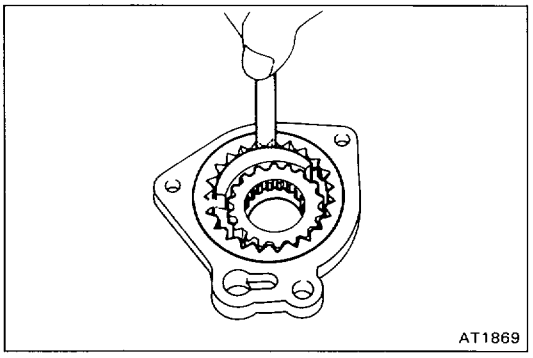
1. CHECK BODY CLEARANCE OF DRIVEN GEAR

Push the driven gear to one side of the body. Using a feeler gauge, measure the clearance.

Standard body clearance: **0.07 — 0.15 mm (0.0028 — 0.0059 in.)**

Maximum body clearance: **0.3 mm (0.012 in.)**

If the body clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



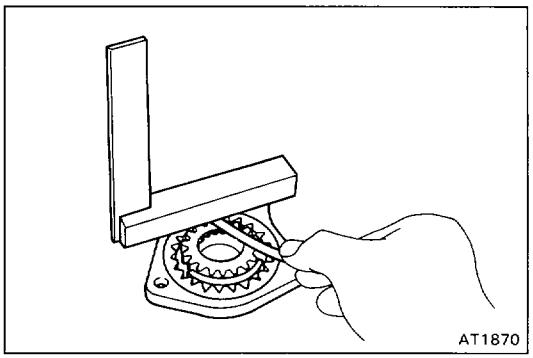
2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent-shaped part of the pump body.

Standard tip clearance: **0.15 — 0.42 mm (0.0059 — 0.0165 in.)**

Maximum tip clearance: **0.6 mm (0.024 in.)**

If the tip clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



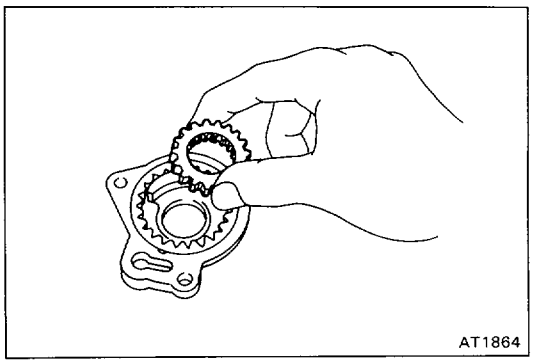
3. CHECK SIDE CLEARANCE OF BOTH GEARS

Using a steel straight edge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: **0.04 — 0.15 mm (0.0016 — 0.0059 in.)**

Maximum side clearance: **0.3 mm (0.012 in.)**

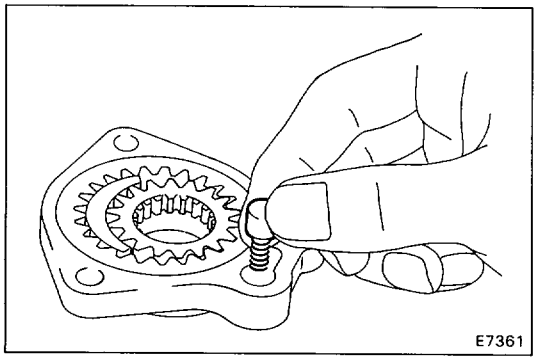
If the side clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



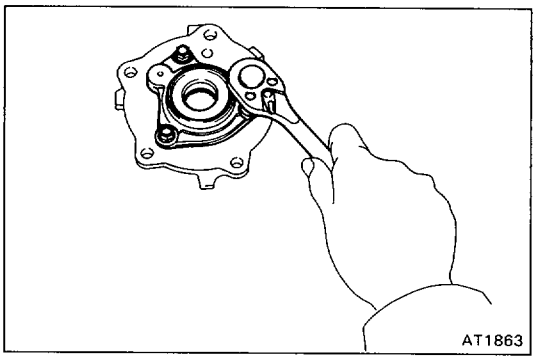
ASSEMBLY OF TRANSFER OIL PUMP

ASSEMBLE TRANSFER OIL PUMP ASSEMBLY

(a) Install the driven gear and drive gear.



(b) Install the pressure relief valve and spring.

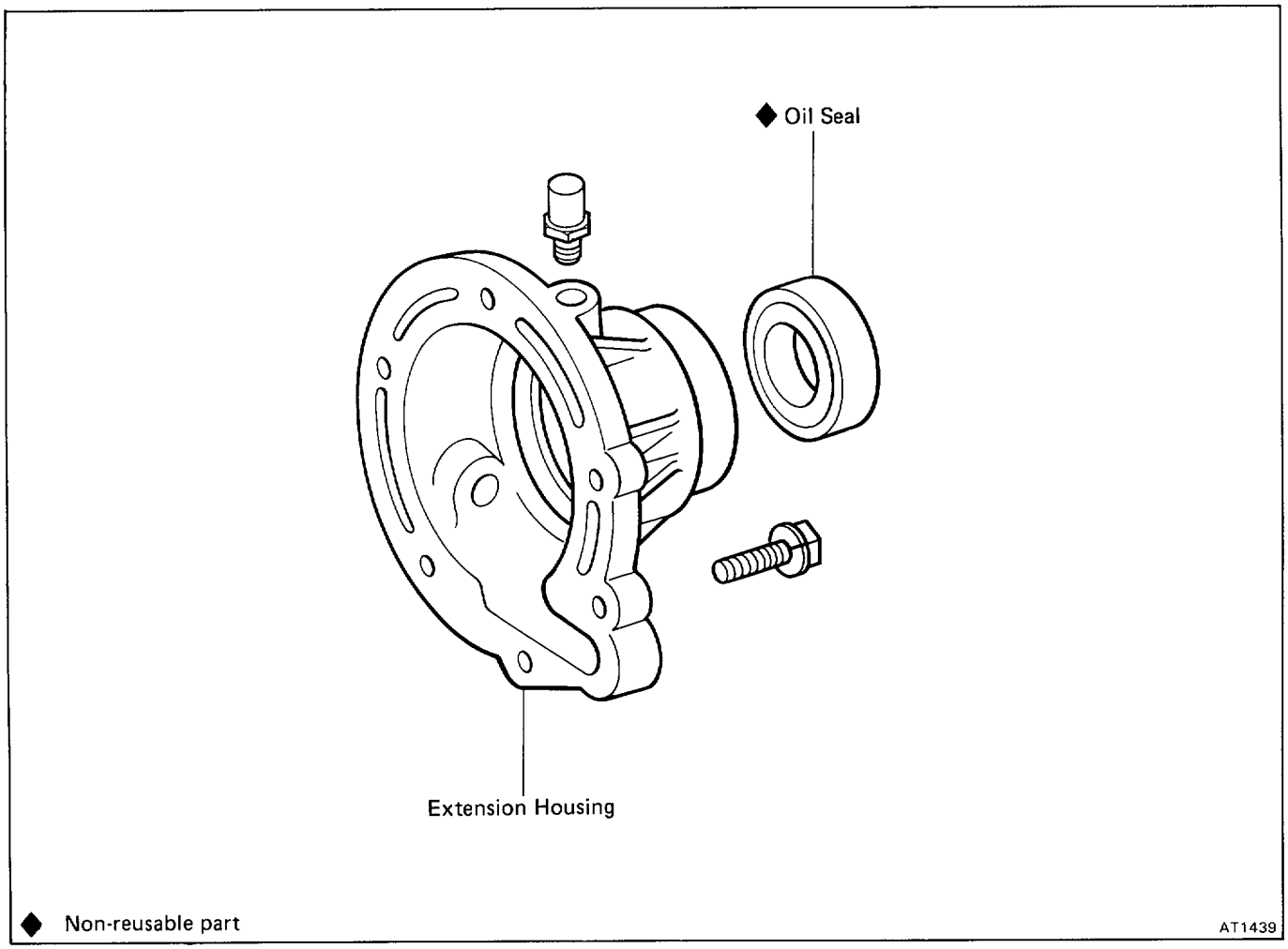


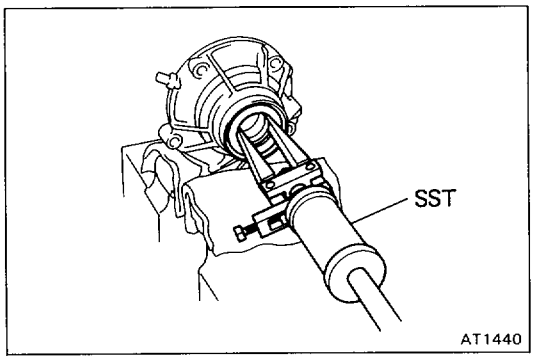
(c) Install the plate and oil pump body and torque the three bolts.

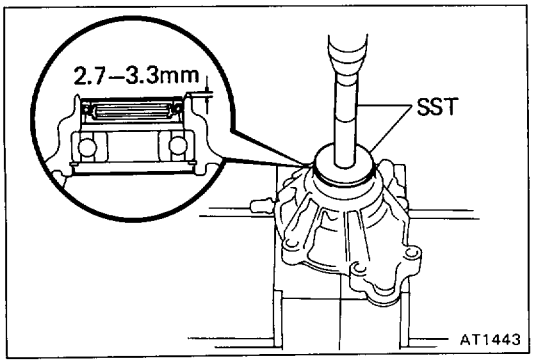
Torque: 100 kg-cm (7 ft-lb, 10 N·m)

Transfer Extension Housing

COMPONENTS







INSPECTION OF TRANSFER EXTENSION HOUSING

NOTE: If the bearing is worn, replace the extension housing assembly.

IF NECESSARY, REPLACE OIL SEAL

(a) Using SST, remove the oil seal.

SST 09308-00010

(b) Using SST and a press, install a new oil seal to the extension housing.

SST 09608-35014 (09608-06020, 09608-06100)

Oil seal depth: 2.7 — 3.3 mm (0.106 — 0.130 in.)

(c) Coat the oil seal lip with MP grease.

INSTALLATION OF COMPONENT PARTS

(See pages AT-154 to 157)

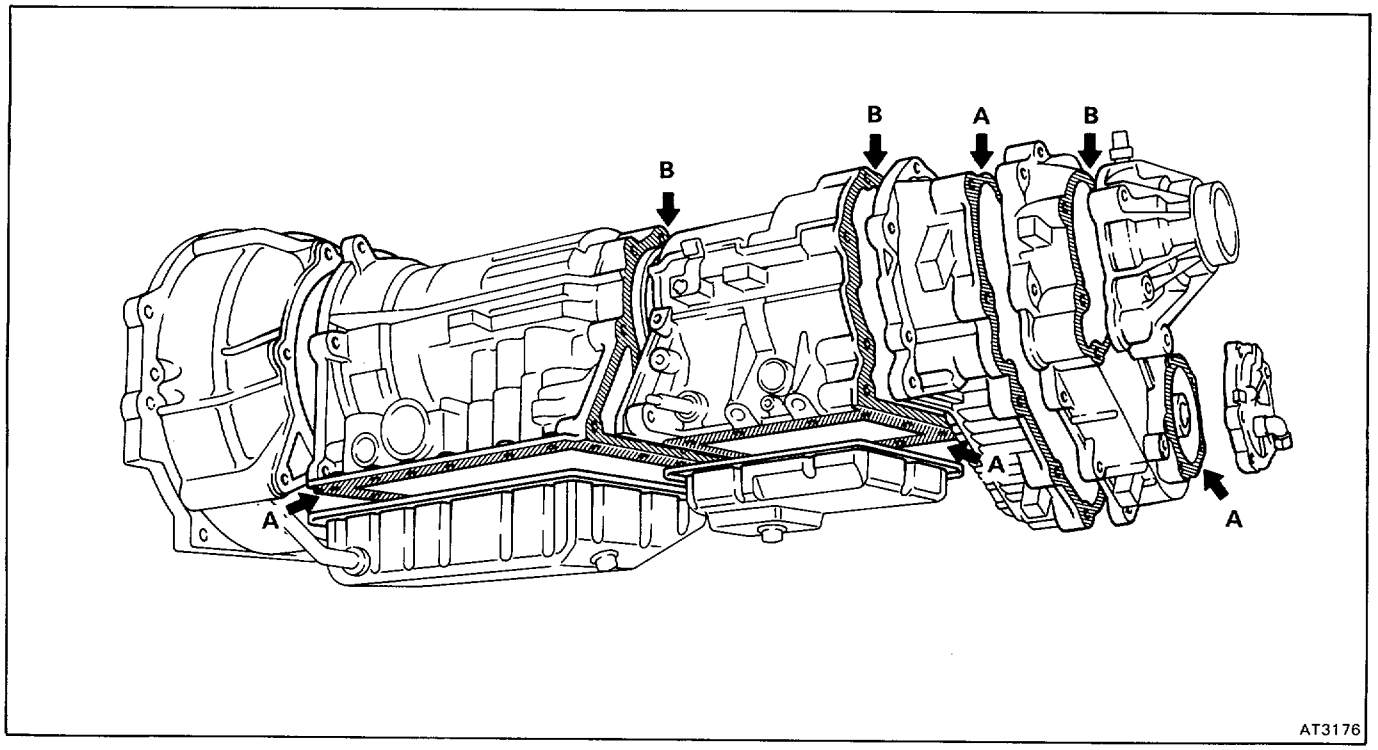
Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, make sure again that all component groups are assembled correctly.

If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

Recommended ATF: DEXRON® II

GENERAL NOTES:

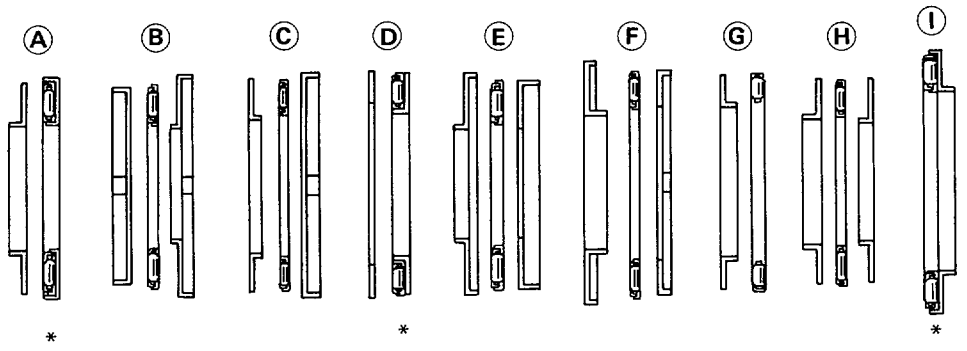
1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transmission fluid for at least two hours.
3. Apply automatic transmission fluid on the sliding or rotating surfaces of parts before assembly.
4. Use petroleum jelly to keep small parts in their places.
5. Do not use adhesive cements on gaskets and similar parts.
6. When assembling the transmission, be sure to use new gaskets and O-rings.
7. Dry all parts with compressed air — never use shop rags.
8. When working with FIPG material, you must be observe the following.
   - Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
   - Thoroughly clean all components to remove all the loose material.
   - Clean both sealing surfaces with a non-residue solvent.
   - Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.
9. There are 2 types of seal packing on the A340H transmission. There are not interchangeable and care should be taken in selecting them.
   A: Part No. 08826-00090, THREE BOND 1281 or equivalent
   B: Part No. 08833-00090, THREE BOND 1131, LOCTITE 518 or equivalent



AT3176

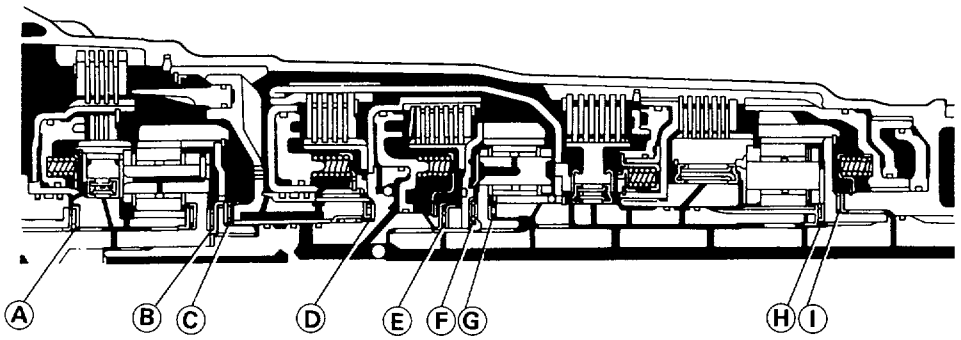
INSTALLATION POSITION AND DIRECTION OF BEARINGS AND RACES

(TRANSMISSION)



* Assembled type bearing and race

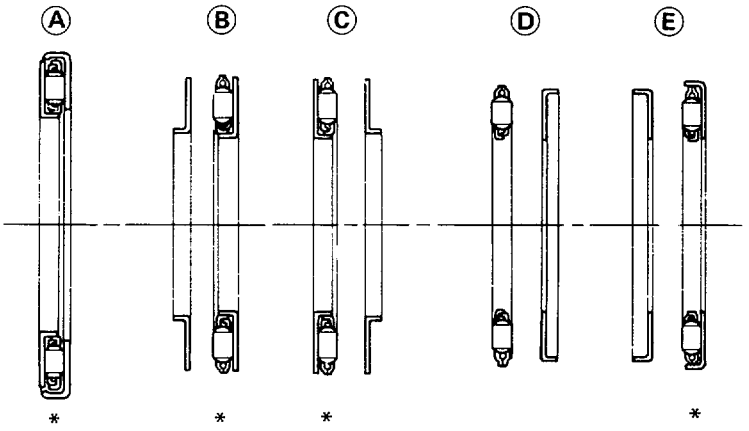
Front



mm (in.) AT3199 D5069

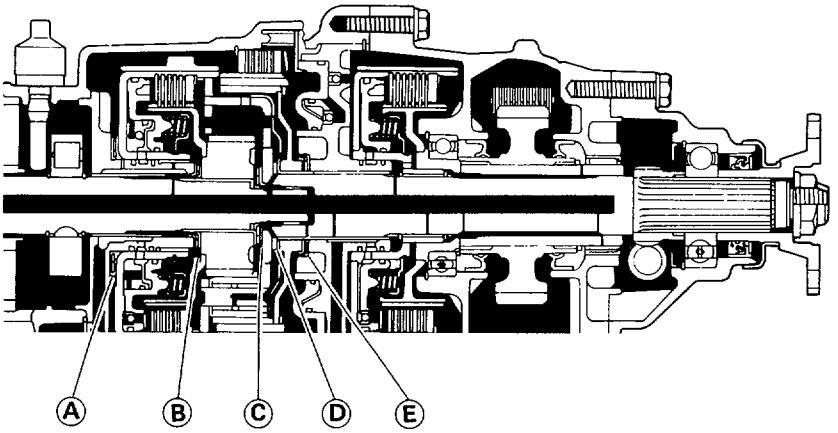
	Front Bearing Race		Thrust Bearing		Rear Bearing Race	
	Inner Diameter	Outer Diameter	Inner Diameter	Outer Diameter	Inner Diameter	Outer Diameter
Ⓐ	28.1 (1.106)	47.3 (1.862)	28.9 (1.138)	50.2 (1.976)	–	–
Ⓑ	27.1 (1.067)	41.8 (1.646)	26.0 (1.024)	46.8 (1.843)	24.2 (0.953)	47.8 (1.882)
Ⓒ	30.7 (1.209)	47.8 (1.882)	32.6 (1.283)	47.7 (1.878)	34.3 (1.350)	47.8 (1.882)
Ⓓ	36.8 (1.449)	50.9 (2.004)	33.7 (1.327)	47.6 (1.874)	–	–
Ⓔ	26.0 (1.024)	48.9 (1.925)	26.0 (1.024)	46.7 (1.839)	26.8 (1.055)	47.0 (1.850)
Ⓕ	30.6 (1.205)	53.6 (2.110)	32.6 (1.283)	47.7 (1.878)	34.3 (1.350)	47.8 (1.882)
Ⓖ	33.7 (1.327)	47.6 (1.874)	35.5 (1.398)	47.7 (1.878)	–	–
Ⓗ	28.8 (1.134)	44.8 (1.764)	30.1 (1.185)	44.7 (1.760)	27.8 (1.094)	44.8 (1.764)
Ⓘ	–	–	39.2 (1.543)	57.7 (2.272)	–	–

(TRANSFER)



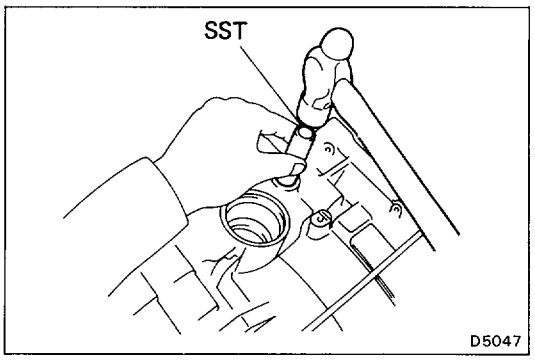
Front ⬅

* Assembled type bearing and race



mm (in.) AT1499

	Front Bearing Race		Thrust Bearing		Rear Bearing Race	
	Inner Diameter	Outer Diameter	Inner Diameter	Outer Diameter	Inner Diameter	Outer Diameter
Ⓐ	–	–	51.1 (2.012)	78.6 (3.094)	–	–
Ⓑ	33.5 (1.319)	47.8 (1.882)	30.5 (1.201)	48.0 (1.890)	–	–
Ⓒ	–	–	19.0 (0.748)	45.0 (1.772)	23.1 (0.909)	45.0 (1.772)
Ⓓ	–	–	35.0 (1.378)	54.4 (2.142)	36.3 (1.429)	53.9 (2.122)
Ⓔ	36.3 (1.429)	53.9 (2.122)	38.0 (1.496)	57.3 (2.256)	–	–

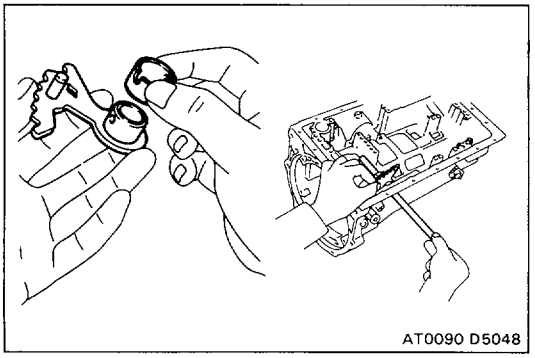


1. **INSTALL MANUAL VALVE LEVER, SHAFT AND OIL SEALS**

(a) Using SST, drive in two new oil seals.

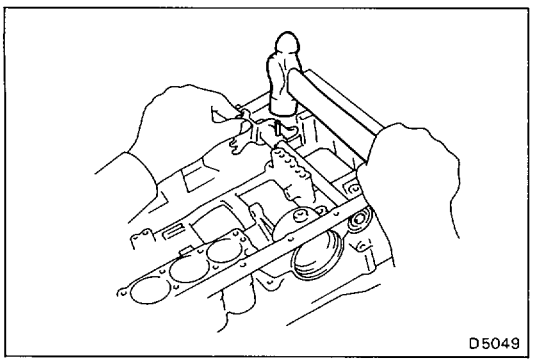
SST 09350-30020 (09350-07110)

(b) Coat the oil seal lip with MP grease.

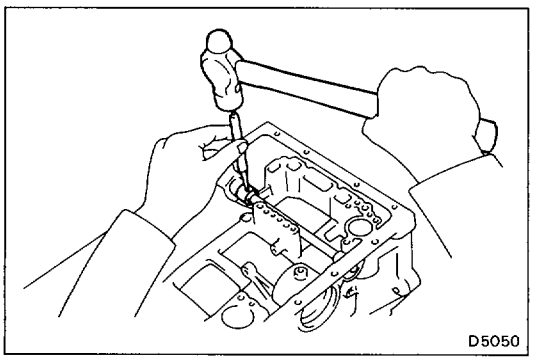


(c) Assemble a new spacer to the manual valve lever.

(d) Install the manual valve lever shaft to the transmission case through the manual valve lever by the threads.



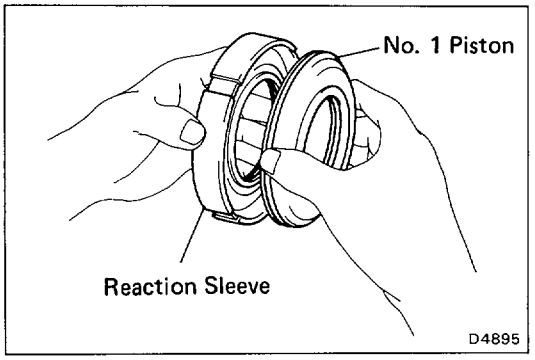
(e) Drive in the pin with the slot at a right angle to the shaft.



(f) Match the spacer hole to the lever calking hollow and calk the spacer to the lever.

(g) Make sure the manual valve lever shaft turns smoothly.

2. **INSTALL COMPONENTS OF FIRST AND REVERSE BRAKE PISTON**

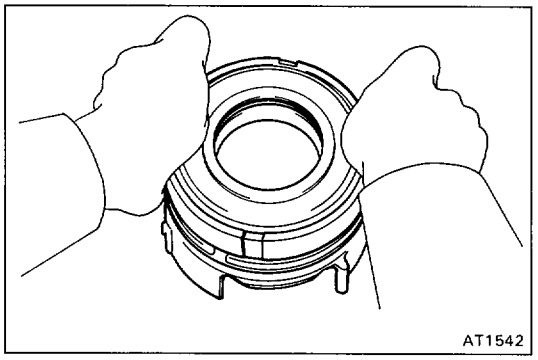


(a) Coat three new O-rings with ATF.

(b) Install the two O-rings on No. 1 piston.

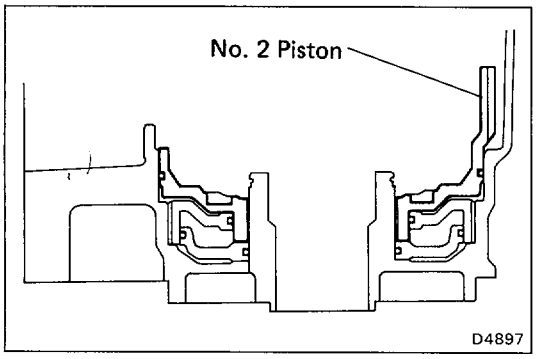
(c) Install the O-ring on the reaction sleeve.

(d) Install No. 1 piston to the reaction sleeve.



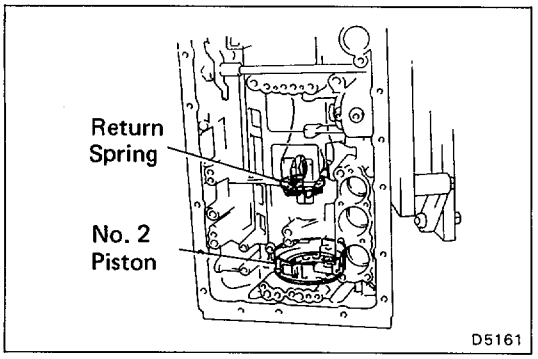
(e) Coat a new O-ring with ATF and install it on No. 2 piston.

(f) Install No. 1 piston with reaction sleeve onto No. 2 piston.

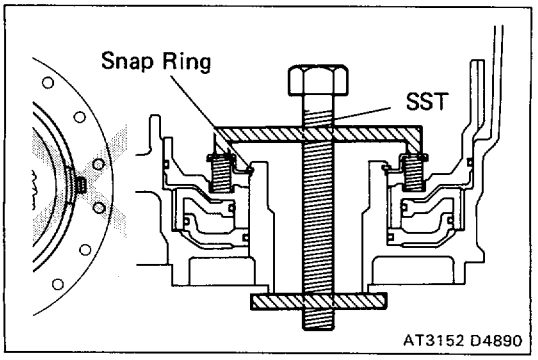


(g) Align the teeth of No. 2 piston into the proper grooves.

(h) Being careful not to damage the O-rings, press in No. 2 and No. 1 first and reverse brake pistons into the transmission case.



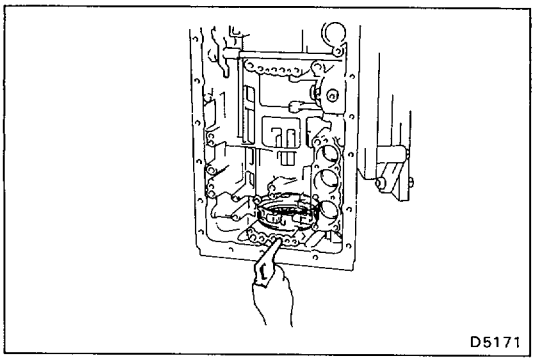
(i) Place the piston return spring onto No. 2 piston.



(j) Set SST as shown, and compress the return spring with SST.

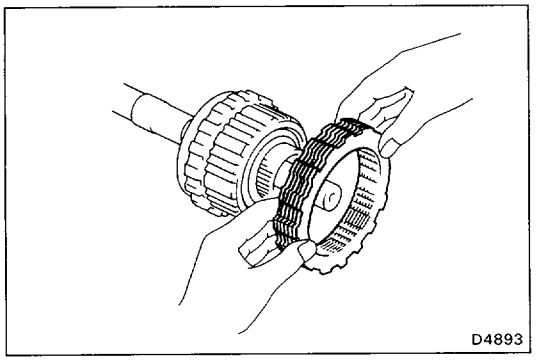
SST 09350-30020 (09350-07050)

(k) Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



3. CHECK FIRST AND REVERSE BRAKE PISTON MOVING

Make sure the first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.


D4893

4. INSTALL REAR PLANETARY GEAR UNIT WITH SECOND BRAKE DRUM, FIRST AND REVERSE BRAKE PACK AND OUTPUT SHAFT

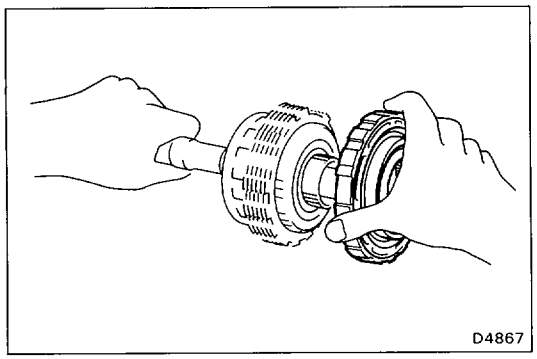
(a) Install the one plate.

(b) Install the cushion plate rounded end toward you.

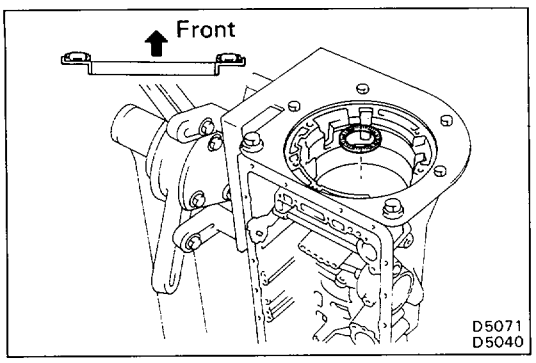
(c) Install the flange, facing the rounded edge rearward.

(d) Install the plates and discs.

Install in order: P = Plate D = Disc
D—P—D—P—D—P—D—P—D—P


D4867

(e) Install the second brake drum assembly.



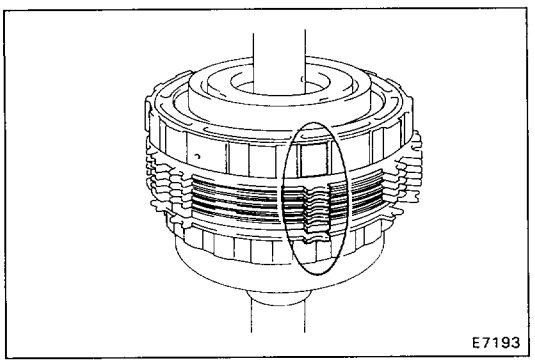
D5071
D5040

(f) Coat the assembled bearing and race with petroleum jelly and install it onto the case.

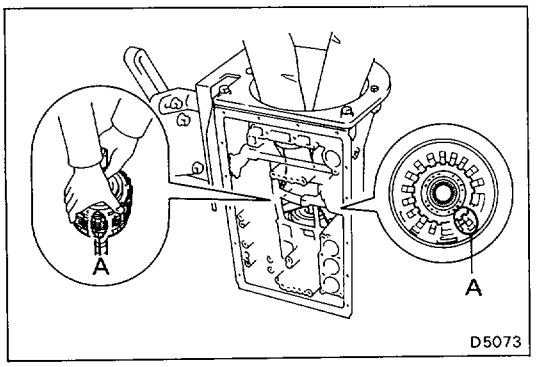
NOTE: Assembled bearing and race diameter

mm (in.)

	Inside	Outside
Bearing and race	39.2 (1.543)	57.7 (2.272)

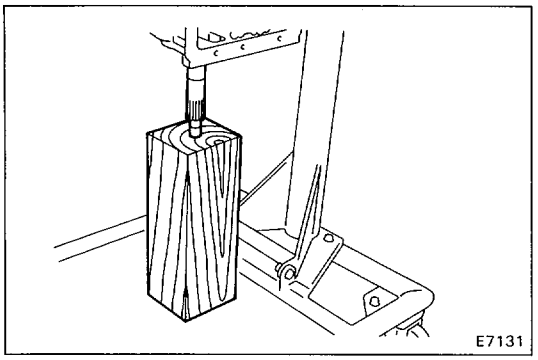

E7193

(g) Align the teeth of the second brake drum, flange, discs and plates as shown in the figure.

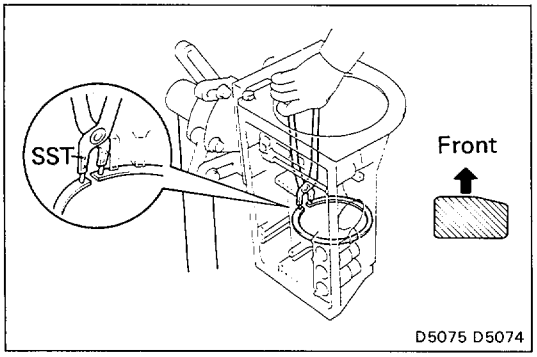


D5073

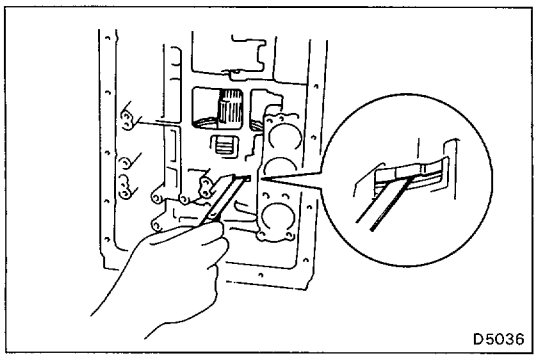
(h) Align the splines of the transmission case and the assembled rear planetary gear, second brake drum, first and reverse brake pack and output shaft, indicated by A.



(i) Hold the output shaft with wooden blocks.



(j) Using SST, install the snap ring.
SST 09350-30020 (09350-07060)

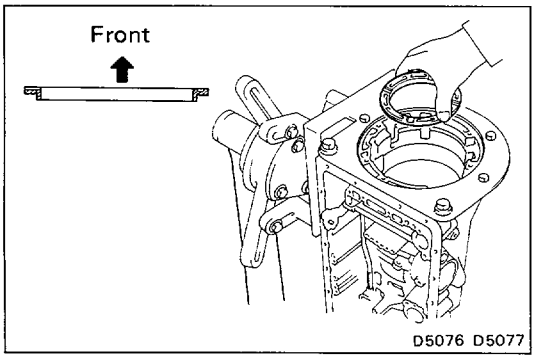


5. CHECK PACK CLEARANCE OF FIRST AND REVERSE BRAKE

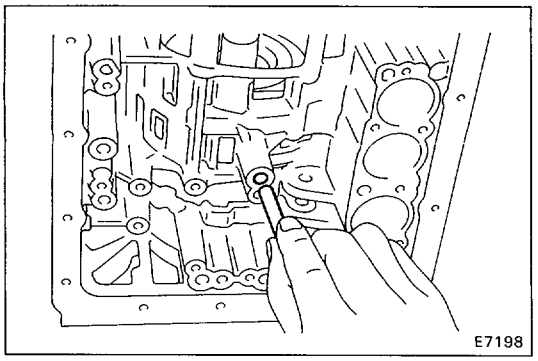
Using a thickness gauge, measure the clearance between the plate and second brake drum as shown in the figure.

Clearance: 0.58 — 2.06 mm (0.0228 — 0.0811 in.)

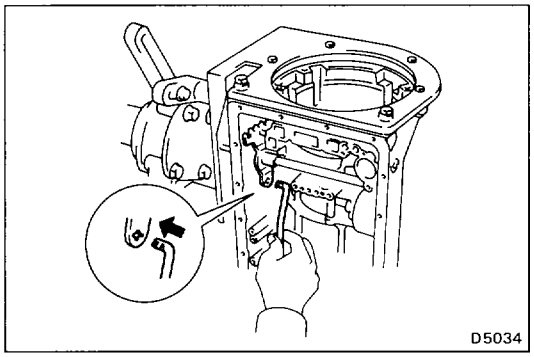
If the values are nonstandard, check for an improper installation.



6. INSTALL SECOND BRAKE PISTON SLEEVE

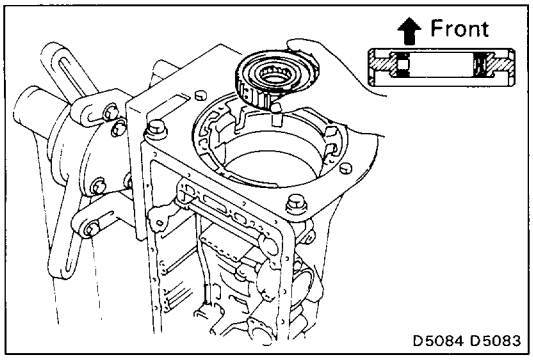


7. INSTALL NEW BRAKE DRUM GASKET


D5034

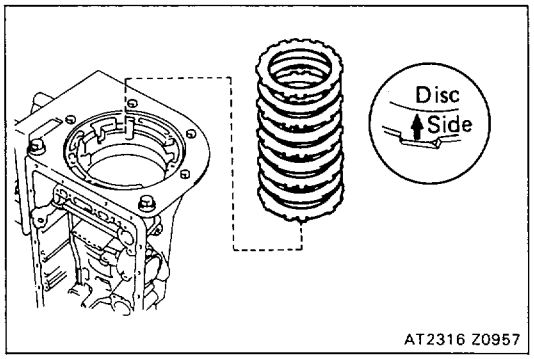
8. INSTALL PARKING LOCK ROD

Connect the parking lock rod to the manual valve lever.



D5084 D5083

9. INSTALL NO. 1 ONE-WAY CLUTCH



AT2316 Z0957

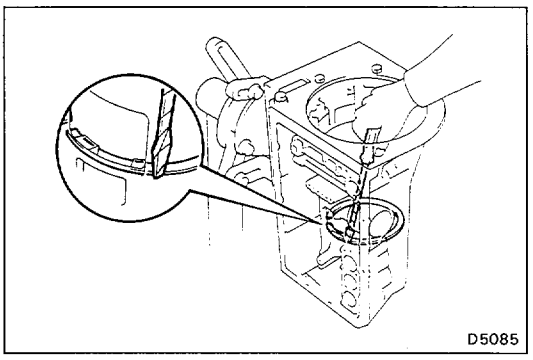
10. INSTALL FLANGE, PLATES AND DISCS OF SECOND BRAKE

(a) Install the 2.5 mm (0.098 in.) thick plate with the rounded edge side of the plate facing the disc.

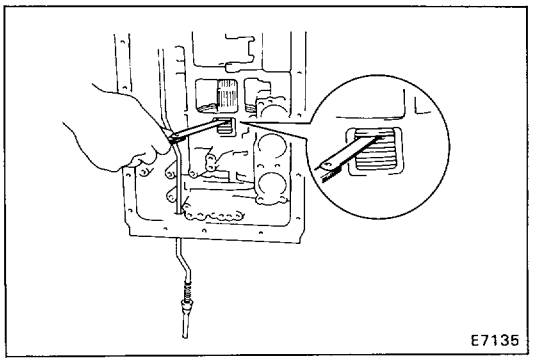
(b) Install the plates and discs.

Install in order: P = Plate D = Disc
D—P—D—P—D—P—D

(c) Install the flange with the rounded edge of the flange facing the disc.


D5085

(d) Install the snap ring.

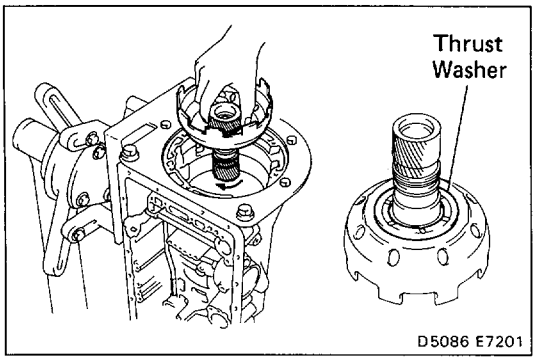

E7135

11. CHECK PACK CLEARANCE OF SECOND BRAKE

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

Clearance: 0.50 — 1.76 mm (0.0197 — 0.0693 in.)

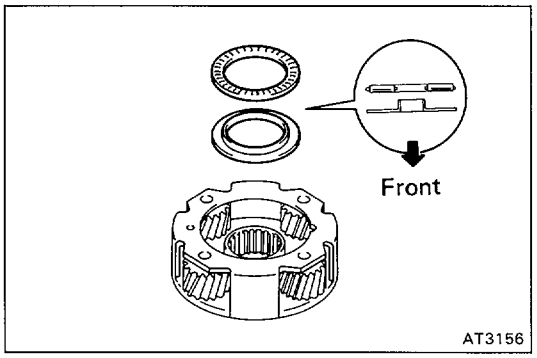
If the values are nonstandard, check for an improper installation.



12. INSTALL PLANETARY SUN GEAR

While turning the planetary sun gear clockwise, install it into No. 1 one-way clutch.

NOTE: Confirm the thrust washer is installed correctly.



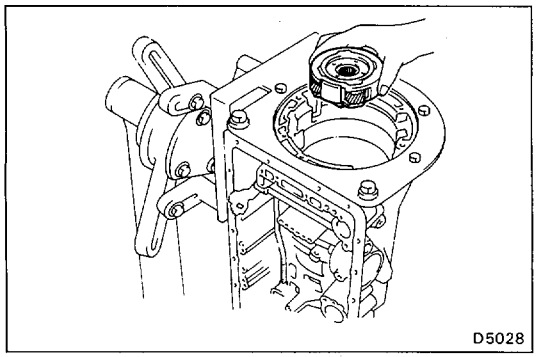
13. INSTALL FRONT PLANETARY GEAR

(a) Coat the bearing and race with petroleum jelly and install them onto the front planetary gear.

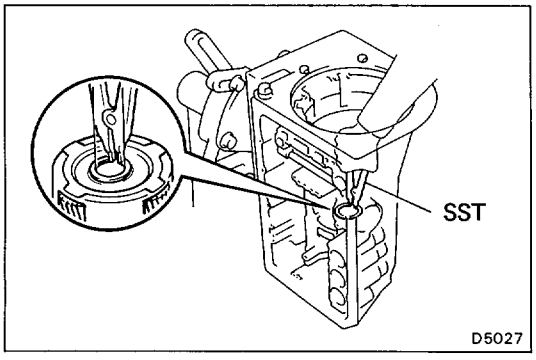
NOTE: Bearing and race diameter

mm (in.)

	Inside	Outside
Bearing	35.5 (1.398)	47.7 (1.878)
Race	33.7 (1.327)	47.6 (1.874)



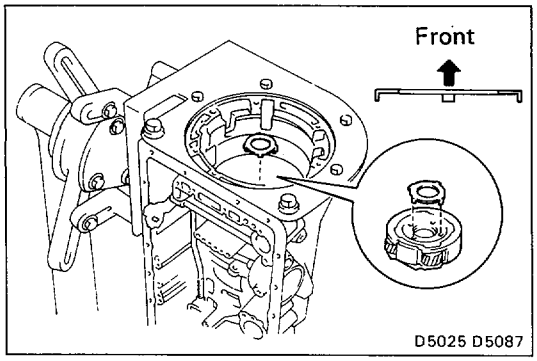
(b) Install the front planetary gear to the sun gear.



(c) Using SST, install a new snap ring.

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(d) Remove the wooden blocks under the output shaft.

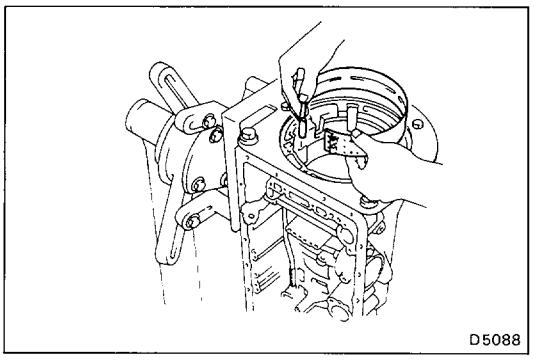


(e) Coat the bearing race with petroleum jelly and install it onto the front planetary gear.

NOTE: Race diameter

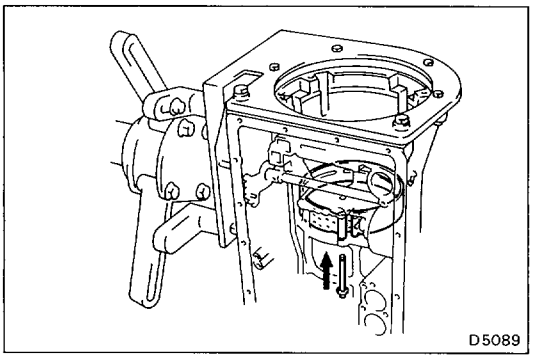
mm (in.)

	Inside	Outside
Race	34.3 (1.350)	47.8 (1.882)

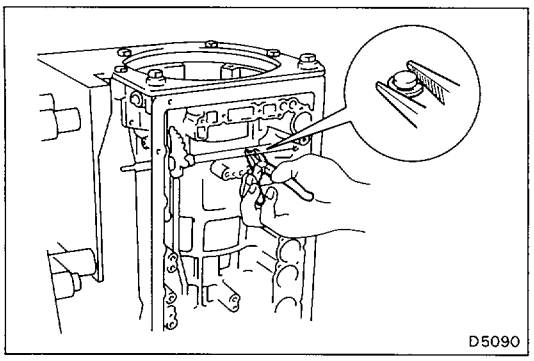

D5088

14. INSTALL SECOND COAST BRAKE BAND

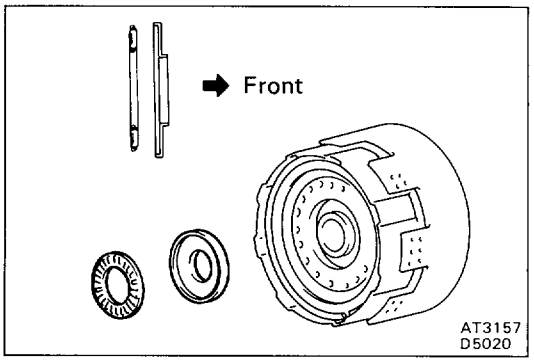
(a) Insert the second coast brake band to the case.


D5089

(b) Install the pin through the brake band.


D5090

(c) Install the E-ring to the pin.



AT3157
D5020

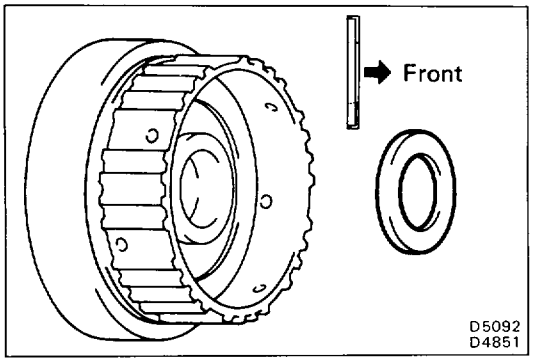
15. INSTALL FRONT PLANETARY RING GEAR TO FORWARD AND DIRECT CLUTCH

(a) Coat the bearing and race with petroleum jelly and install them onto the forward clutch.

NOTE: Bearing and race diameter

mm (in.)

	Inside	Outside
Bearing	26.0 (1.024)	46.7 (1.839)
Race	26.0 (1.024)	48.9 (1.925)



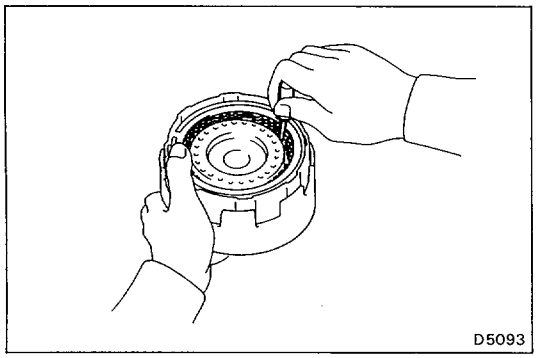
D5092
D4851

(b) Coat the race with petroleum jelly and install it onto the front planetary ring gear.

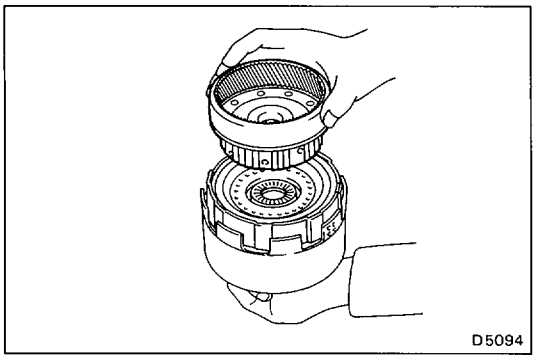
NOTE: Race diameter

mm (in.)

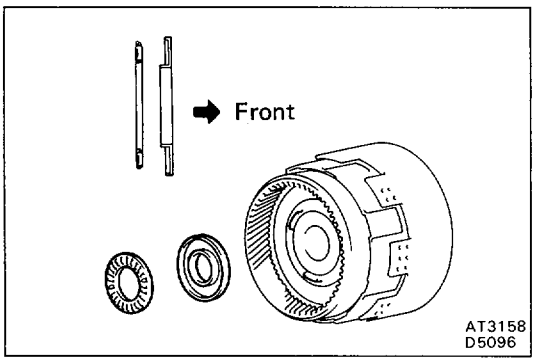
	Inside	Outside
Race	26.8 (1.055)	47.0 (1.850)



(c) Align the flukes of the discs in the forward clutch.



(d) Align the splines of the front planetary ring gear with the flukes of the discs and install the front planetary ring gear to the forward clutch.



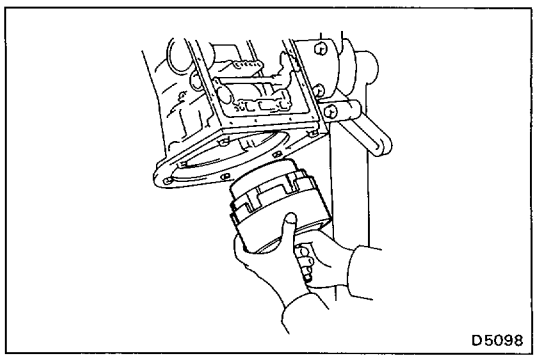
16. INSTALL ASSEMBLED DIRECT CLUTCH, FORWARD CLUTCH AND FRONT PLANETARY RING GEAR INTO CASE

(a) Coat the bearing and race with petroleum jelly and install them onto the ring gear.

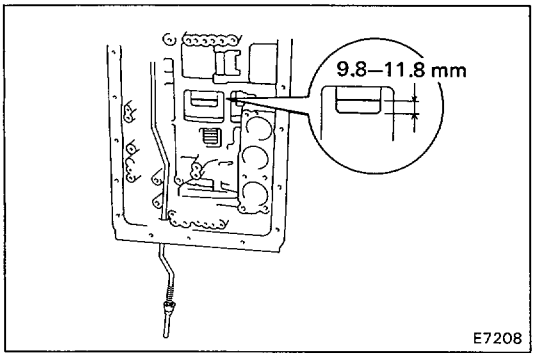
NOTE: Bearing and race diameter

mm (in.)

	Inside	Outside
Bearing	32.6 (1.283)	47.7 (1.878)
Race	30.6 (1.205)	53.6 (2.110)



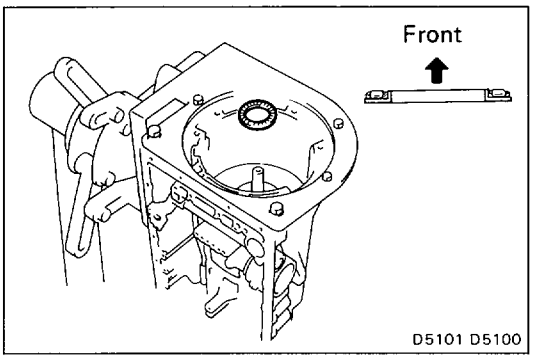
(b) Install the assembled direct clutch, forward clutch and front planetary ring gear into the transmission case.



(c) Using vernier calipers, measure the distance between the sun gear input drum and direct clutch drum as shown in the figure.

Height: 9.8 — 11.8 mm (0.386 — 0.465 in.)

If the values are nonstandard, check for an improper installation.

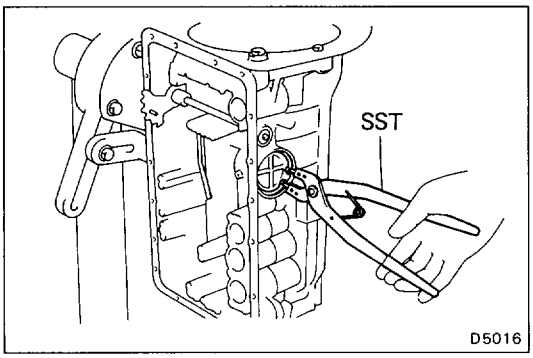


(d) Coat the assembled bearing and race with petroleum jelly and install it onto the forward clutch.

NOTE: Assembled bearing and race diameter

mm (in.)

	Inside	Outside
Bearing and race	33.7 (1.327)	47.6 (1.874)



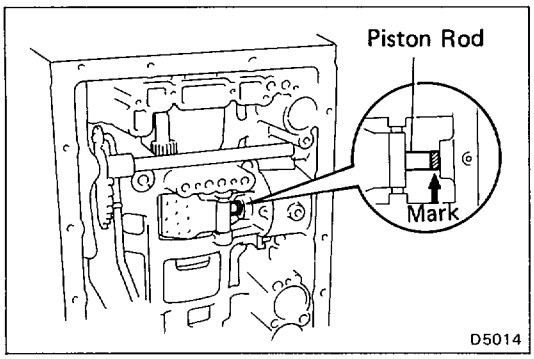
17. INSTALL SECOND COAST BRAKE COVER, PISTON ASSEMBLY AND SPRING

(a) Coat two new O-rings with ATF and install them to the cover.

(b) Install the spring, piston assembly and cover to the case.

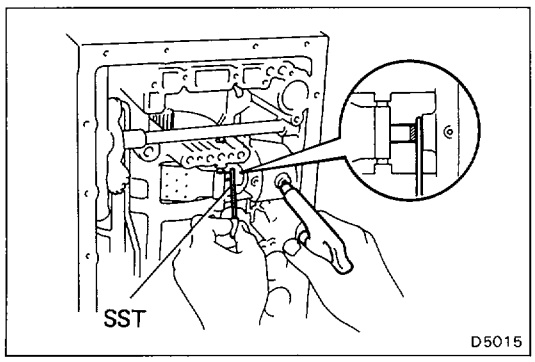
(c) Using SST, install the snap ring.

SST 09350-30020 (09350-07060)



18. CHECK PISTON ROD STROKE OF SECOND COAST BRAKE

(a) Place a mark on the second coast brake piston rod as shown in the figure.

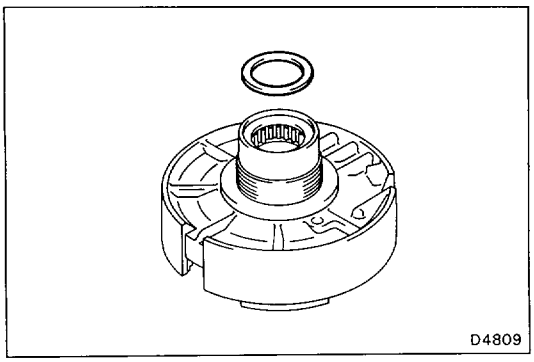


(b) Using SST, measure the stroke applying the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

SST 09240-00020

Piston rod stroke: 1.5 — 3.0 mm (0.059 — 0.118 in.)

If it is still more than standard value, replace the brake band with a new one.



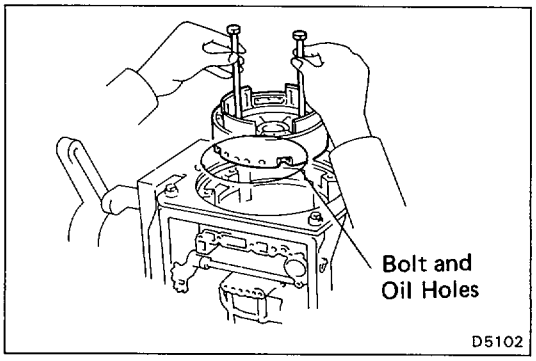
19. INSTALL OVERDRIVE SUPPORT ASSEMBLY

(a) Coat the race with petroleum jelly and install it onto the overdrive support assembly.

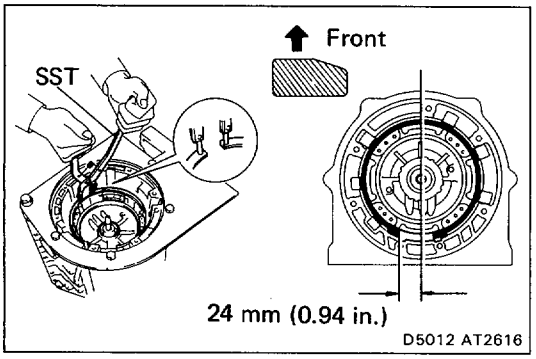
NOTE: Race diameter

mm (in.)

	Inside	Outside
Race	36.8 (1.449)	50.9 (2.004)

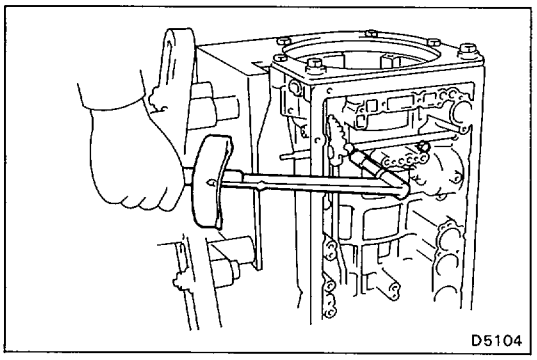


(b) Aim the bolt and oil holes of the overdrive support toward the valve body side, and align them with the bolt holes of the transmission case and insert.



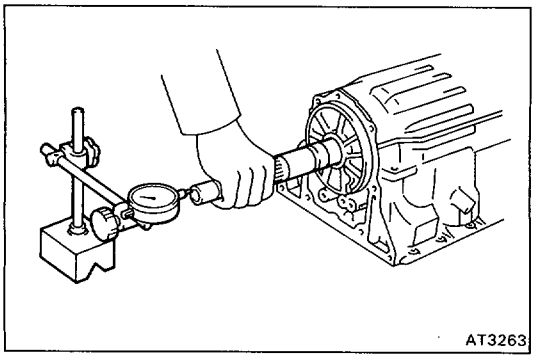
(c) Using SST, install the snap ring as shown in the figure.

SST 09350-30020 (09350-07060)



(d) Install and torque the two bolts.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



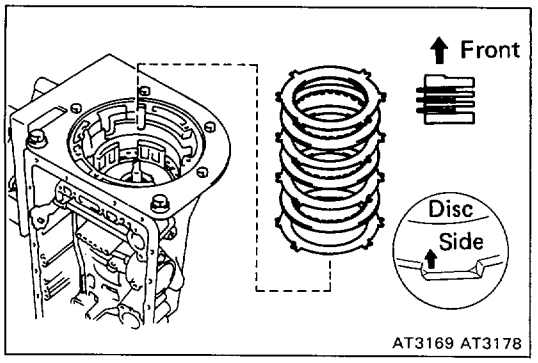
20. CHECK OUTPUT SHAFT

(a) Using a dial indicator, measure the end play of the output shaft by hand.

End play: 0.27 — 0.86 mm (0.0106 — 0.0339 in.)

If the values are nonstandard, check for an improper installation.

(b) Check to see that output shaft rotates smoothly.



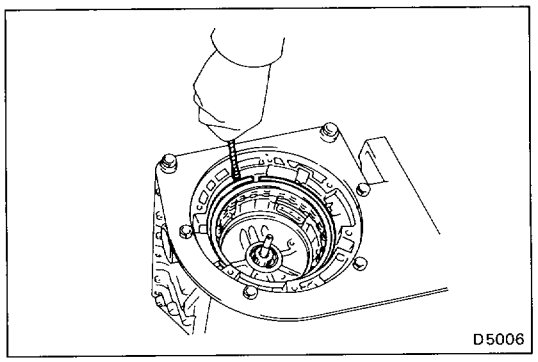
21. INSTALL FLANGES, PLATES AND DISCS OF OVERDRIVE BRAKE

(a) Install the 4.0 mm (0.157 in.) thick flange (flat ring) with the rounded edge side of the flange facing the disc.

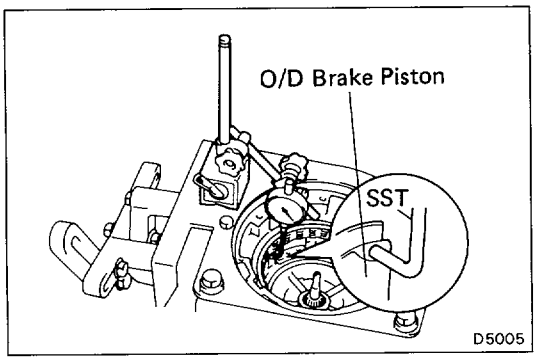
(b) Install the plates and discs.

Install in order: P = Plate D = Disc
D—P—D—P—D

(c) Install the flange (stepped ring) with the flat side of the flange facing the disc.



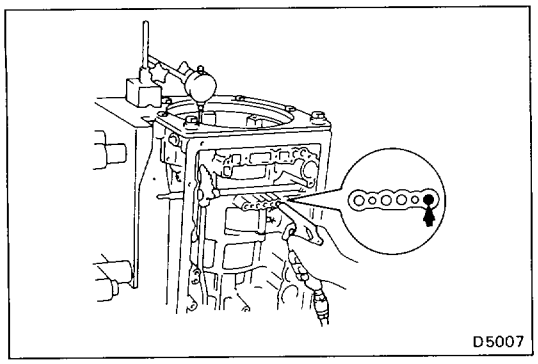
(d) Install the snap ring.



22. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the figure.

SST 09350-30020 (09350-06120)



(b) Measure the stroke applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

Piston stroke: 1.32 — 1.62 mm (0.0520 — 0.0638 in.)

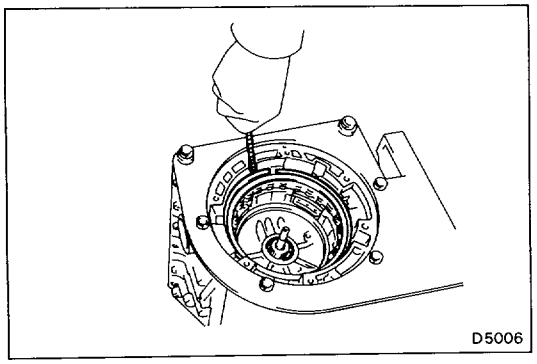
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke is nonstandard, select another flange.

NOTE: There are seven different thicknesses for flange.

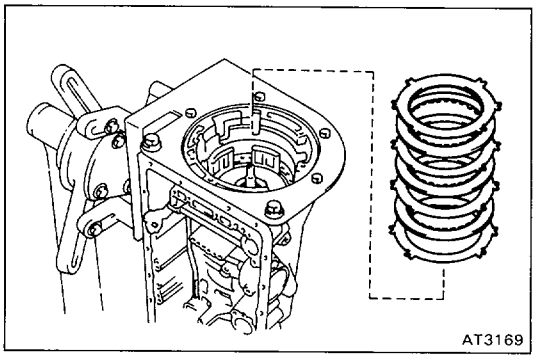
Flange thickness mm (in.)

No.	Thickness	No.	Thickness
26	3.3 (0.130)	11	3.8 (0.150)
25	3.5 (0.138)	23	3.9 (0.154)
12	3.6 (0.142)	None	4.0 (0.157)
24	3.7 (0.146)		

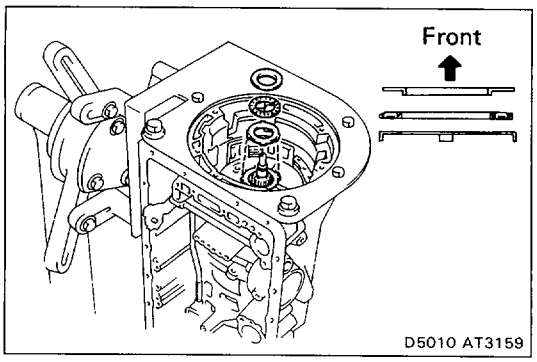


23. REMOVE FLANGES, PLATES AND DISCS OF OVERDRIVE BRAKE

(a) Remove the snap ring.



(b) Remove the flanges, plates and discs.



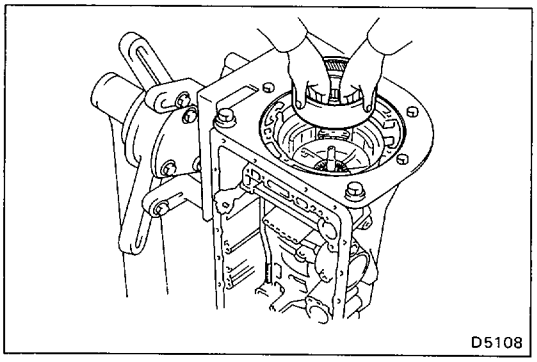
24. INSTALL OVERDRIVE PLANETARY GEAR UNIT WITH OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH

(a) Coat the bearing and races with petroleum jelly and install them onto the overdrive support.

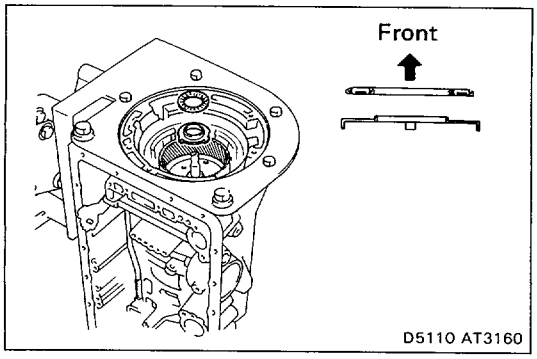
NOTE: Bearing and races diameter

mm (in.)

	Inside	Outside
Bearing	32.6 (1.283)	47.7 (1.878)
Race (Front)	30.7 (1.209)	47.8 (1.882)
Race (Rear)	34.3 (1.350)	47.8 (1.882)



(b) Install the overdrive planetary ring gear.

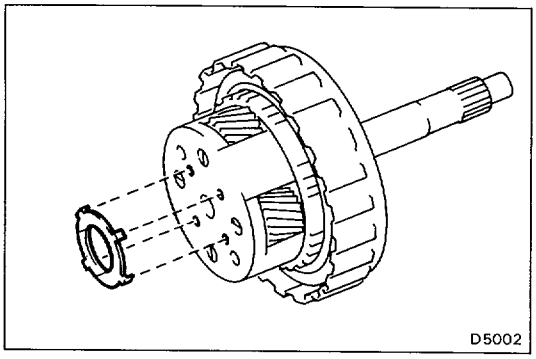


(c) Coat the bearing and race with petroleum jelly and install them onto the planetary ring gear.

NOTE: Bearing and race diameter

mm (in.)

	Inside	Outside
Bearing	26.0 (1.024)	46.8 (1.843)
Race	24.2 (0.953)	47.8 (1.882)

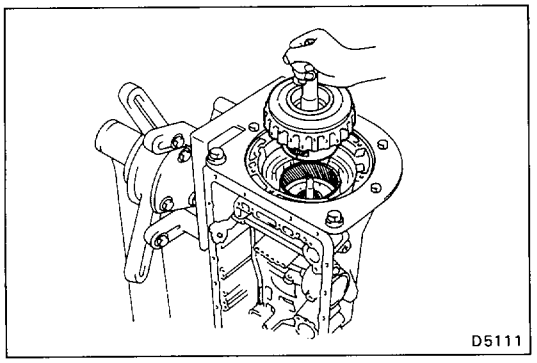


(d) Coat the race with petroleum jelly and install it onto the planetary gear.

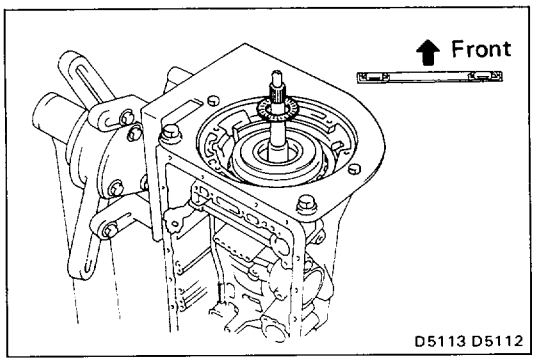
NOTE: Race diameter

mm (in.)

	Inside	Outside
Race	27.1 (1.067)	41.8 (1.646)


D5111

(e) Install the overdrive planetary gear with the overdrive direct clutch and one-way clutch.



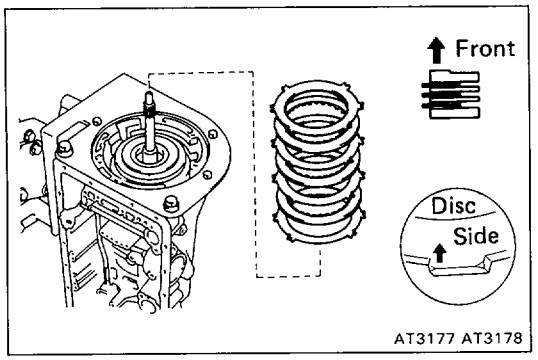
D5113 D5112

(f) Coat the assembled bearing and race with petroleum jelly and install it onto the O/D direct clutch.

NOTE: Assembled bearing and race diameter

mm (in.)

	Inside	Outside
Bearing and race	28.9 (1.138)	50.2 (1.976)



AT3177 AT3178

25. INSTALL FLANGES, PLATES AND DISCS OF OVERDRIVE BRAKE

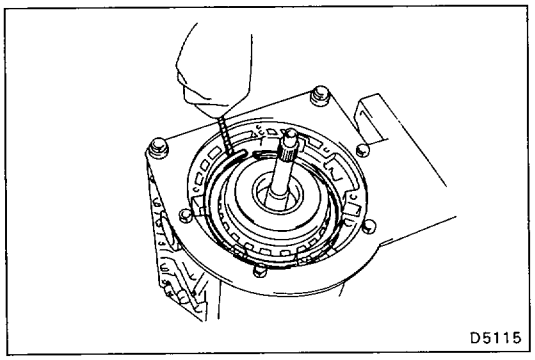
(a) Install the 4.0 mm (0.157 in.) thick flange (flat ring) with the rounded edge side of the flange facing the disc.

(b) Install the plates and discs.

Install in order: P = Plate D = Disc
D—P—D—P—D

(c) Install the flange (stepped ring) with the flat side of the flange facing the disc.

(d) Install the snap ring.


D5115

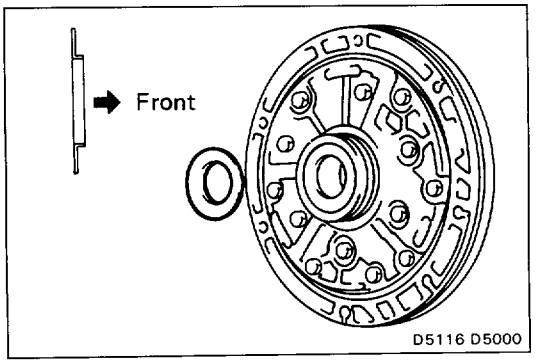
26. INSTALL OIL PUMP INTO CASE

(a) Coat the race with petroleum jelly and install it onto the oil pump.

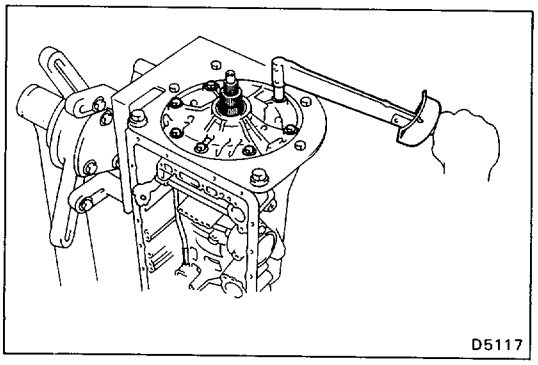
NOTE: Race diameter

mm (in.)

	Inside	Outside
Race	28.1 (1.106)	47.3 (1.862)



D5116 D5000


D5117

(b) Coat a new O-ring with ATF and install it around the pump body.

(c) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

(d) Hold the input shaft, and lightly press the oil pump body to slide the oil seal rings into the O/D direct clutch drum.

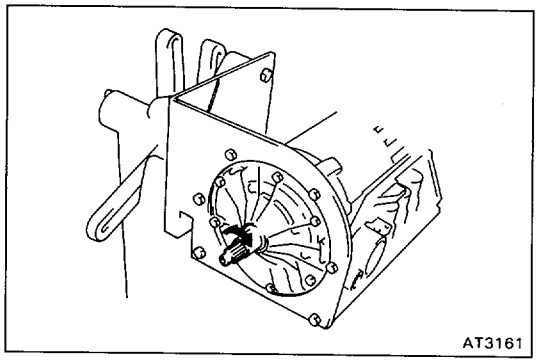
CAUTION: Do not push on the oil pump strongly, or the oil seal ring will stick to the direct clutch drum.

(e) Install the seven bolts.

Torque: 220 kg-cm (16 ft-lb, 22 N·m)

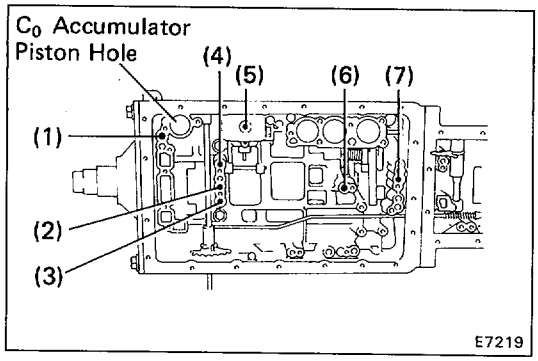
27. CHECK INPUT SHAFT ROTATION

Make sure the input shaft rotates smoothly.


AT3161

28. INDIVIDUAL PISTON OPERATION INSPECTION

Check for the sound of operation while applying compressed air into the oil hole indicated in the figure.

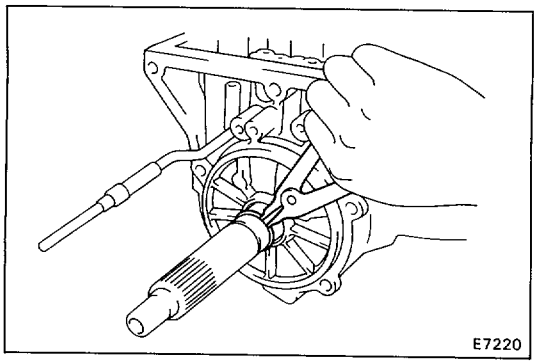


E7219

(1) O/D direct clutch
(2) Direct clutch
(3) Forward clutch
(4) O/D brake
(5) Second coast brake
(6) Second brake
(7) First and reverse brake

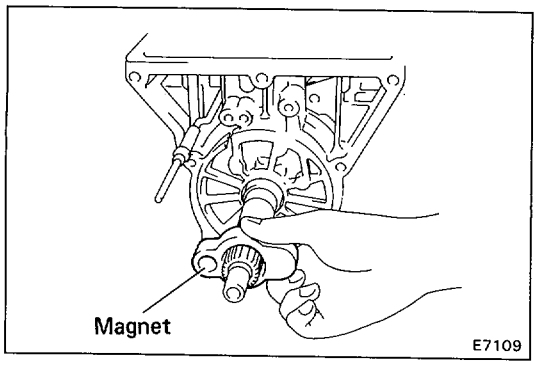
NOTE: When inspecting the O/D direct clutch, check with the C_0 accumulator piston hole closed.

If there is no noise, disassemble and check the installation condition of the parts.


E7220

29. INSTALL SPEED SENSOR ROTOR AND KEY

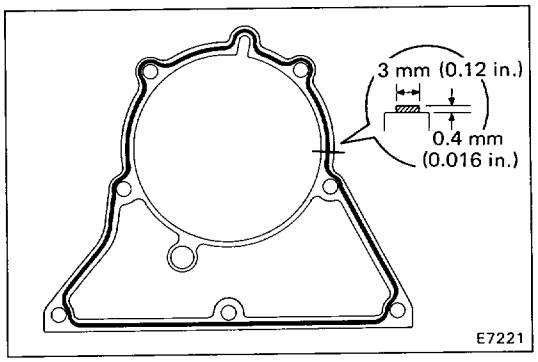
(a) Using snap ring pliers, install the snap ring.



E7109

(b) Install the key and sensor rotor to the output shaft.

(c) Using snap ring pliers, install the snap ring.

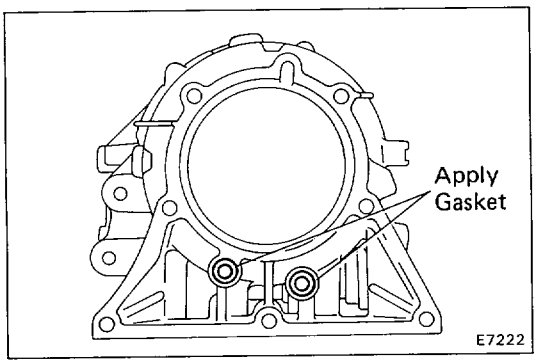


30. INSTALL TRANSFER CASE

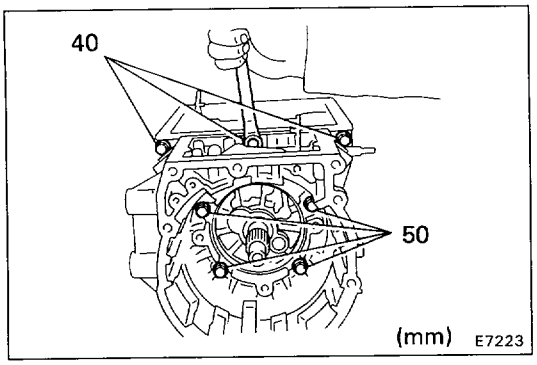
(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the case as shown in the figure.

Seal packing: Part No. 08833-00090, THREE BOND 1131, LOCTITE 518 or equivalent



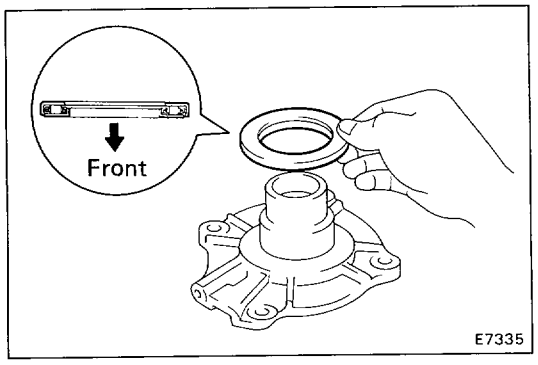
(c) Confirm the two apply gaskets are installed correctly.



(d) Install the case and torque the seven bolts.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)

NOTE: Each bolt length (mm) is indicated in the figure.



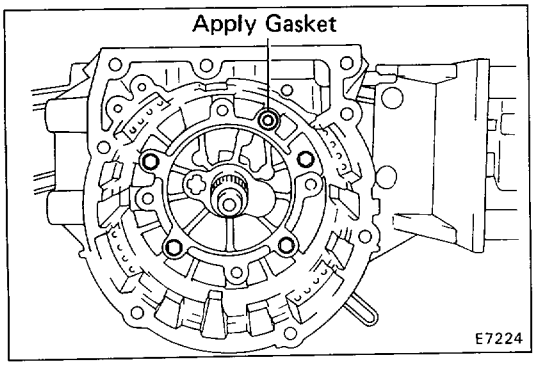
31. INSTALL FRONT SUPPORT TO TRANSFER CASE

(a) Coat the assembled bearing and race with petroleum jelly and install it onto the front support.

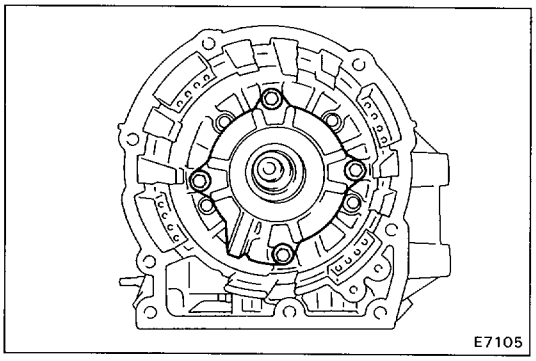
NOTE: Assembled bearing and race diameter

mm (in.)

	Inside	Outside
Bearing and race	51.1 (2.012)	78.6 (3.094)

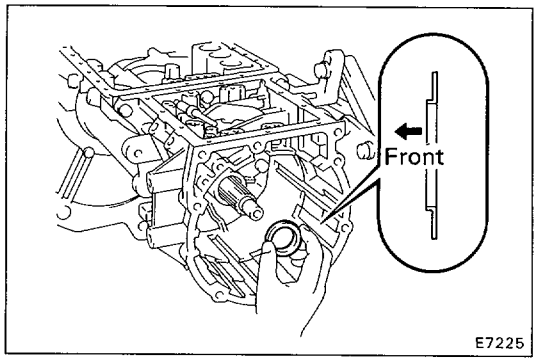


(b) Confirm the apply gasket is installed correctly.


E7105

(c) Install the front support and torque the bolts.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)



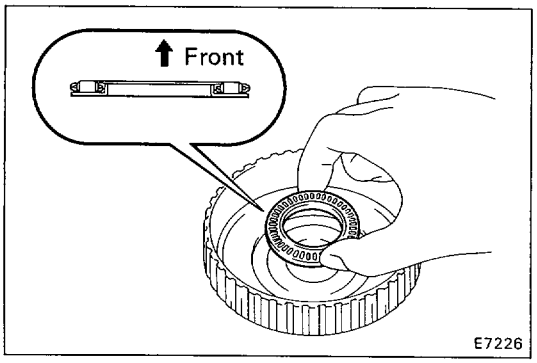
E7225

(d) Coat the race with petroleum jelly and install it onto the front support.

NOTE: Race diameter

mm (in.)

	Inside	Outside
Race	33.5 (1.319)	47.8 (1.882)



E7226

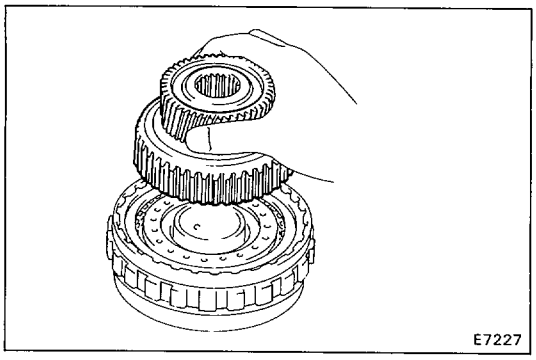
32. INSTALL SUN GEAR TO TRANSFER DIRECT CLUTCH

(a) Coat the assembled bearing and race with petroleum jelly and install it onto the sun gear.

NOTE: Assembled bearing and race diameter

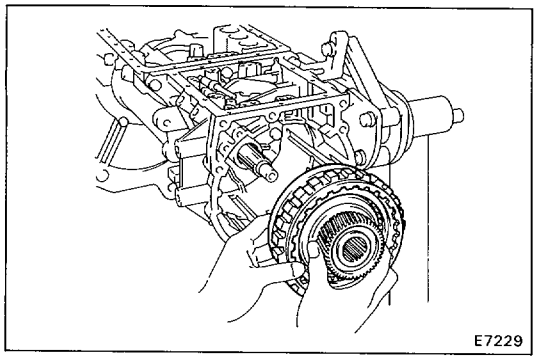
mm (in.)

	Inside	Outside
Bearing and race	30.5 (1.201)	48.0 (1.890)


E7227

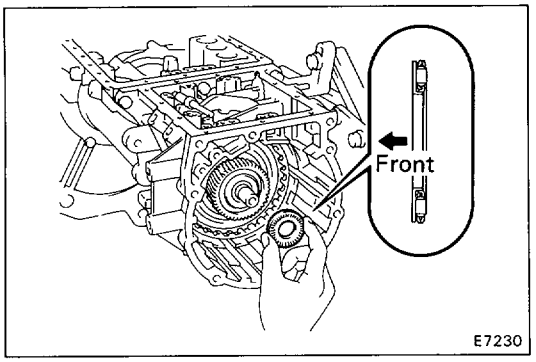
(b) Align the flukes of discs in the transfer direct clutch.

(c) Install the sun gear into the transfer direct clutch.


E7229

33. INSTALL TRANSFER DIRECT CLUTCH WITH SUN GEAR

(a) Install the transfer direct clutch with sun gear.

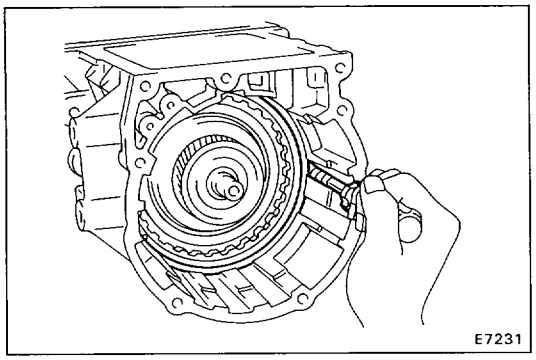


(b) Coat the assembled bearing and race with petroleum jelly and install it onto the sun gear.

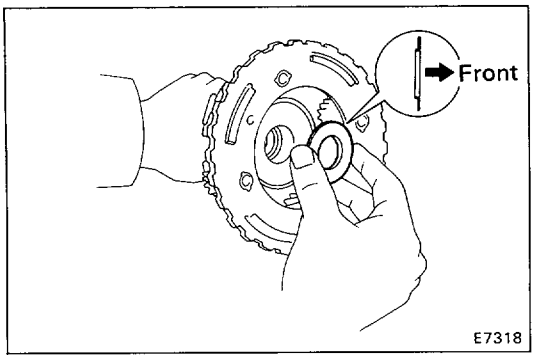
NOTE: Assembled bearing and race diameter

mm (in.)

	Inside	Outside
Bearing and race	19.0 (0.748)	45.0 (1.772)



(c) Install the snap ring.



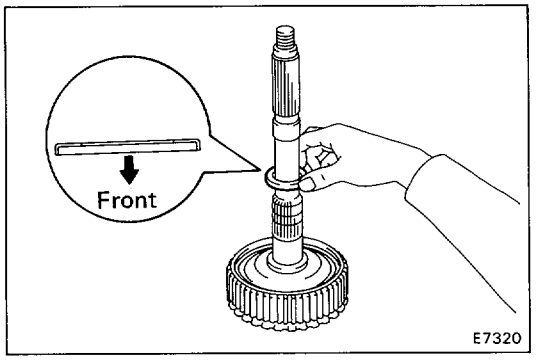
34. INSTALL OUTPUT SHAFT WITH PLANETARY RING GEAR

(a) Coat the races with petroleum jelly and install them onto the planetary gear and planetary ring gear.

NOTE: Race diameter

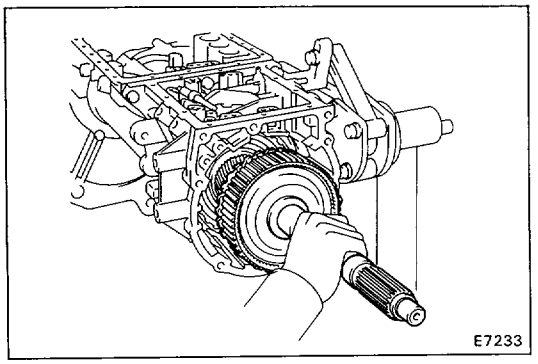
mm (in.)

	Inside	Outside
Race	23.1 (0.909)	45.0 (1.772)

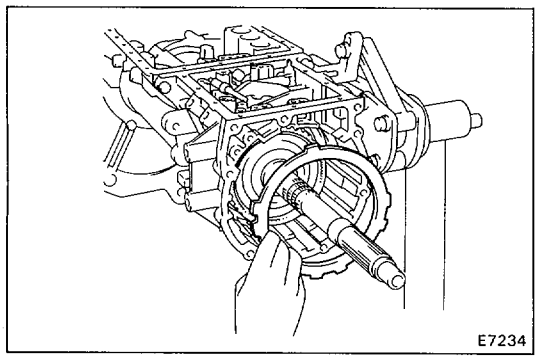


mm (in.)

	Inside	Outside
Race	36.3 (1.429)	53.9 (2.122)

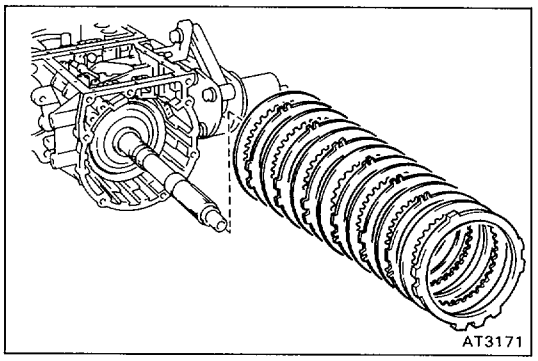


(b) Install the output shaft with planetary ring gear.



35. INSTALL FLANGES, PLATES, DISCS AND CUSHION PLATE OF TRANSFER LOW SPEED BRAKE

(a) Install the front flange to the case.

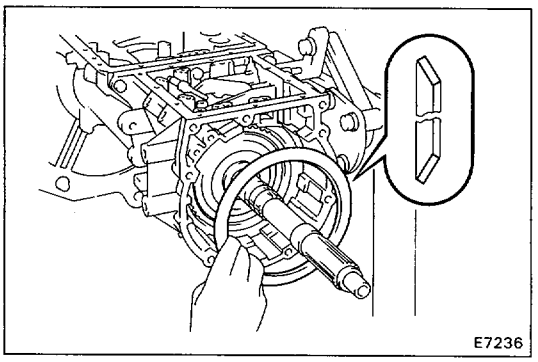


(b) Install the plates and discs.

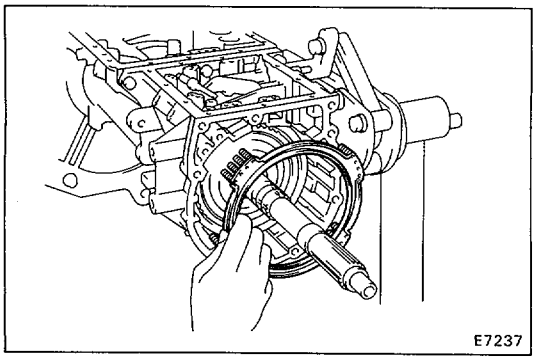
Install in order: P = Plate D = Disc

D—P—D—P—D—P—D—P—D—P—D—P—D

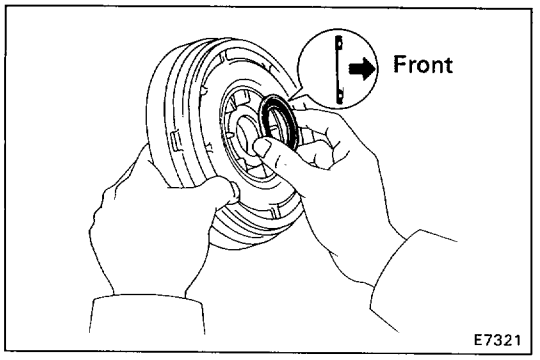
(c) Install the rear flange.



(d) Install the cushion plate, facing the rounded end rearward.



36. INSTALL PISTON RETURN SPRING OF TRANSFER LOW SPEED BRAKE



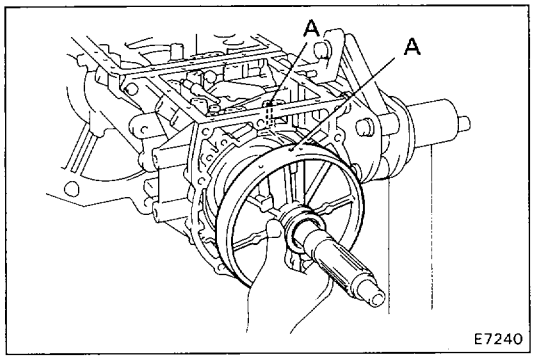
37. INSTALL TRANSFER CENTER SUPPORT

(a) Coat the assembled bearing and race with petroleum jelly and install it onto the center support.

NOTE: Assembled bearing and race diameter

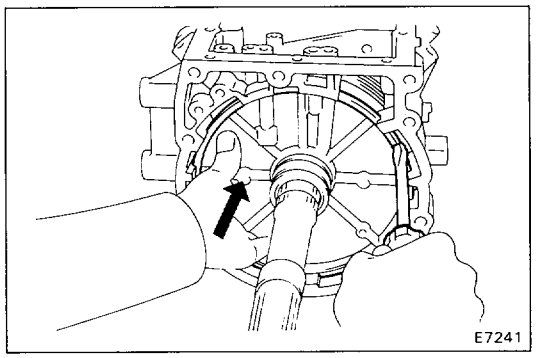
mm (in.)

	Inside	Outside
Bearing and race	38.0 (1.496)	57.3 (2.256)

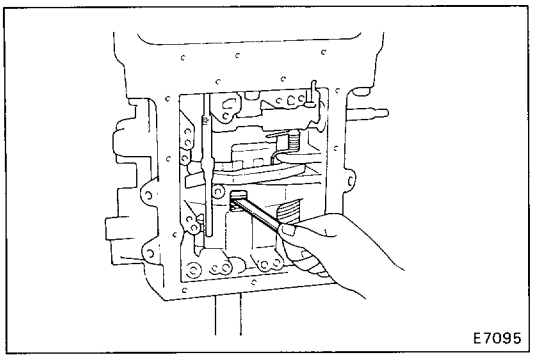


(b) Install the center support to the case.

NOTE: Align the oil holes and bolt hole of the center support with those of the case side and insert.



(c) Pushing the center support forward, install the snap ring.



38. CHECK PACK CLEARANCE OF TRANSFER LOW SPEED BRAKE

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

Clearance: 0.91 — 2.10 mm (0.0358 — 0.0827 in.)

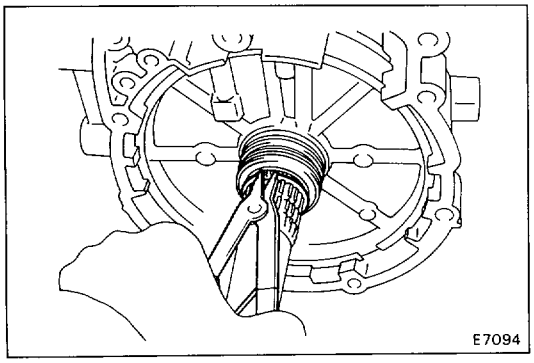
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke is nonstandard, select another flange.

NOTE: There are five different thicknesses for flange.

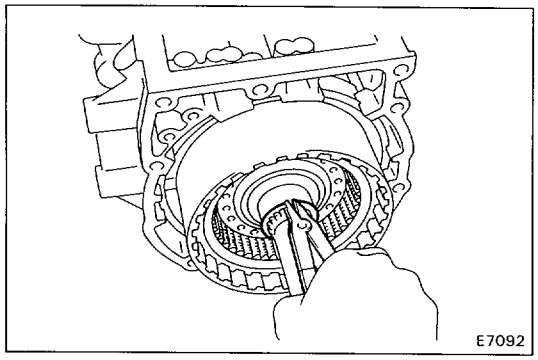
Flange thickness mm (in.)

3.8 (0.150)	4.4 (0.173)
4.0 (0.157)	4.6 (0.181)
4.2 (0.165)	



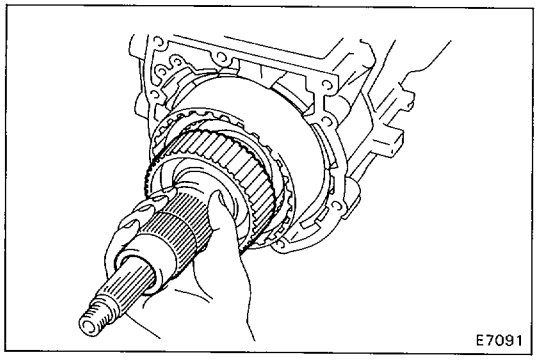
39. INSTALL TRANSFER FRONT DRIVE CLUTCH

(a) Install the snap ring to the output shaft.



(b) Install the front drive clutch.

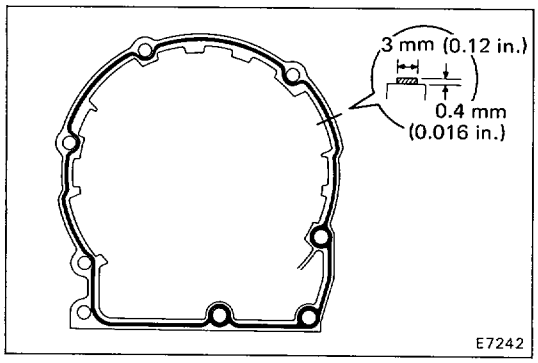
(c) Install the snap ring.



40. INSTALL FRONT OUTPUT SHAFT

(a) Align the flukes of discs in the transfer front drive clutch.

(b) Install the front output shaft into the transfer front drive clutch.

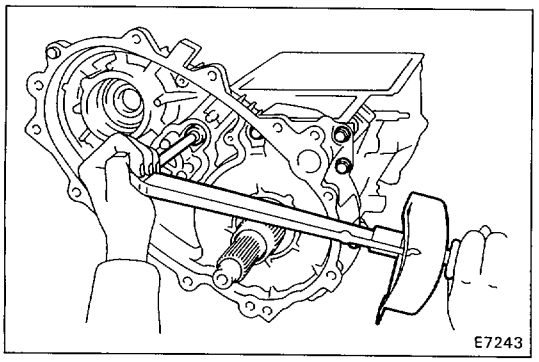


41. INSTALL TRANSFER CHAIN FRONT CASE

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the transfer chain front case as shown in the figure.

Seal packing: Part No. 08833-00090, THREE BOND 1131, LOCTITE 518 or equivalent



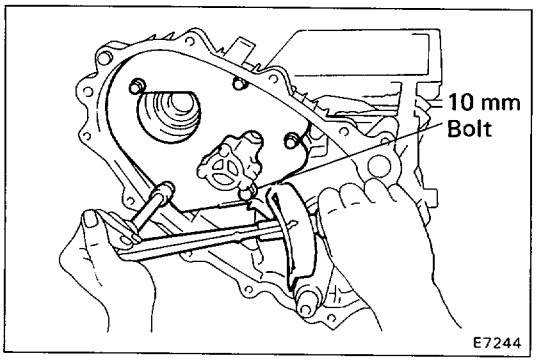
(c) Install the transfer chain front case to the transfer case.

(d) Apply sealant to the threads of the bolts.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

(e) Install and torque the bolts.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)



42. INSTALL TRANSFER CHAIN OIL RESEIVER

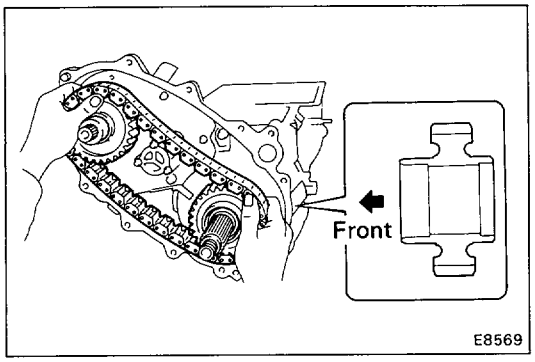
(a) Apply sealant to the threads of the bolts.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

(b) Install the oil reseiver to the transfer chain front case.

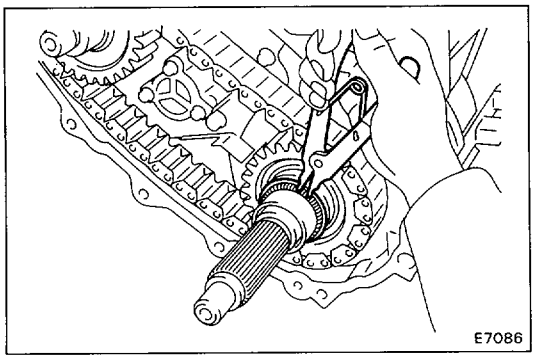
(c) Install and torque the bolts.

Torque: 10 mm bolt 345 kg-cm (25 ft-lb, 34 N·m)
6 mm bolt 100 kg-cm (7 ft-lb, 10 N·m)

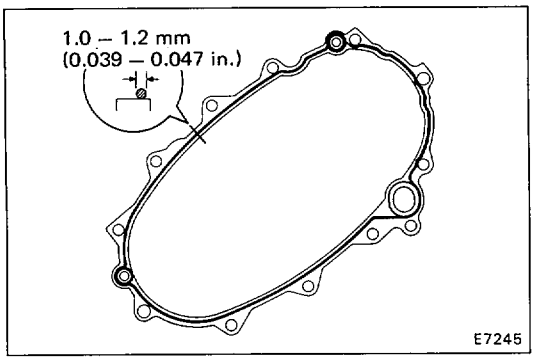


43. INSTALL DRIVE CHAIN WITH DRIVE SPROCKET AND DRIVEN SHAFT

(a) Install the chain with the drive sprocket and driven shaft.



(b) Install the snap ring.

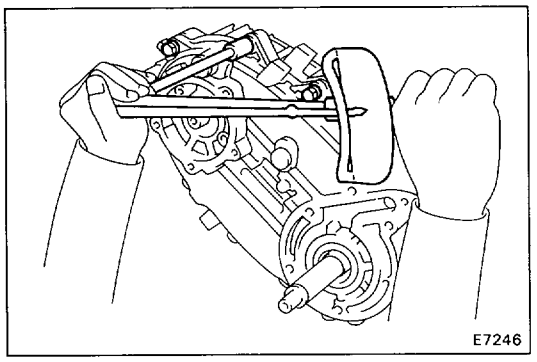


44. INSTALL TRANSFER CHAIN REAR CASE

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the chain rear case as shown in the figure.

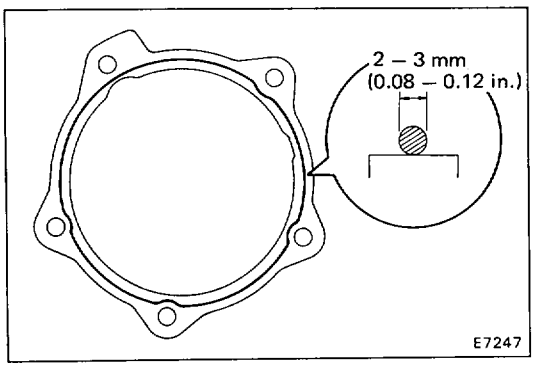
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent



(c) Install the chain rear case to the front case.

(d) Install and torque the bolts.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)

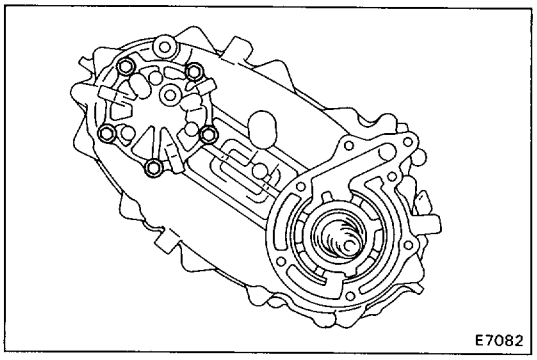


45. INSTALL OIL PUMP ASSEMBLY

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

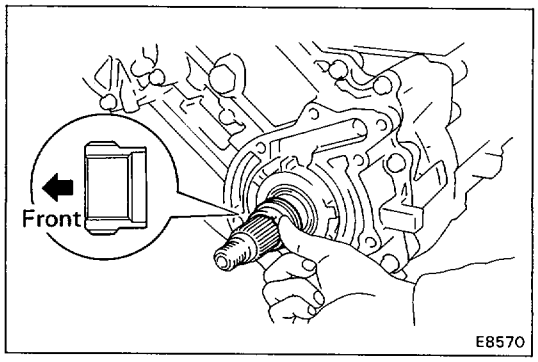
(b) Apply seal packing to the oil pump cover as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent

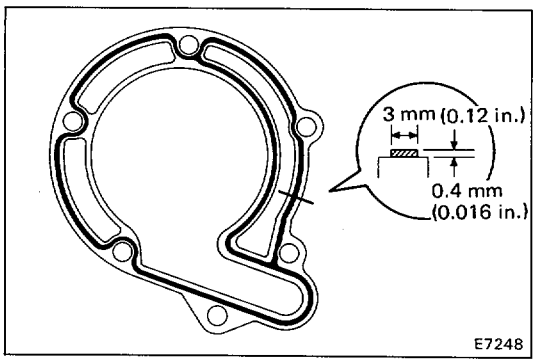


(c) Install the oil pump assembly and torque the bolts.

Torque: 160 kg-cm (12 ft-lb, 16 N·m)



46. INSTALL SPEEDOMETER DRIVE GEAR

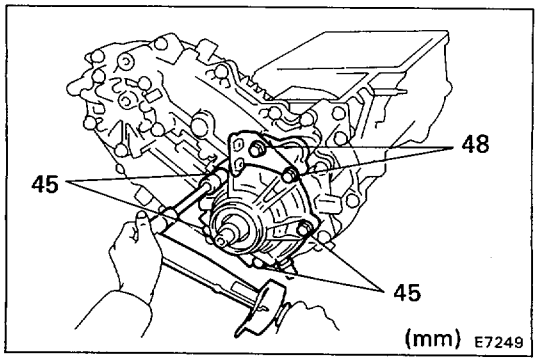


47. INSTALL EXTENSION HOUSING

(a) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

(b) Apply seal packing to the extension housing as shown in the figure.

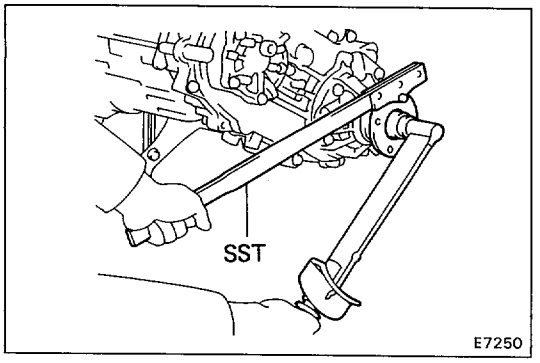
Seal packing: Part No. 08833-00090, THREE BOND 1131, LOCTITE 518 or equivalent



(c) Install the extension housing to the chain rear case.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)

NOTE: Each bolt length (mm) is indicated in the figure.



48. INSTALL REAR COMPANION FLANGE

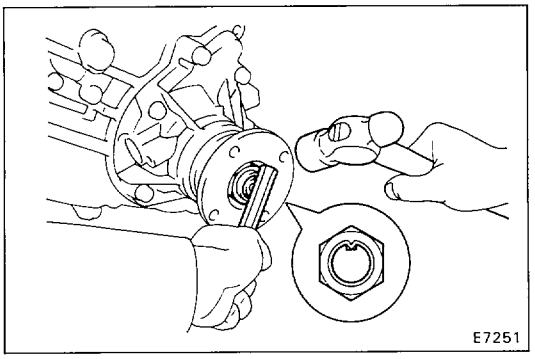
(a) Coat a new O-ring with ATF and install it to the companion flange.

(b) Install the companion flange and washer to the shaft.

(c) Using SST to hold the flange, torque a new nut.

SST 09330-00021

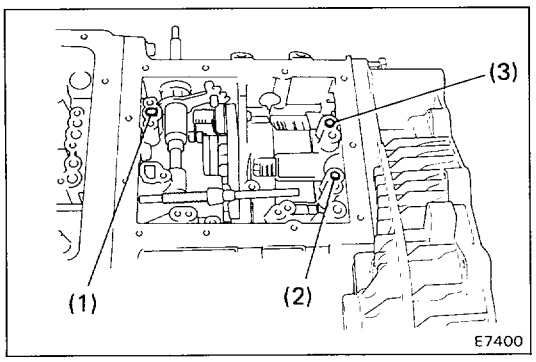
Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)



(d) Using a hammer and punch, stake the nut.

49. INSTALL FRONT COMPANION FLANGE

Install the front companion flange in the same way as the rear companion flange.

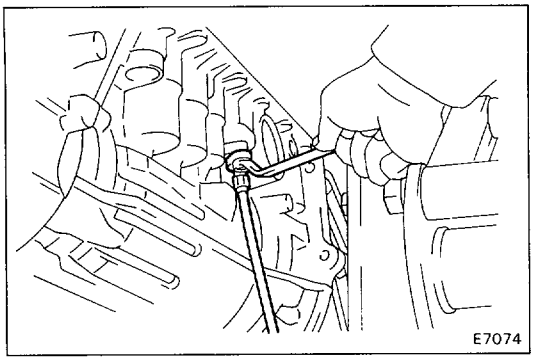


50. INDIVIDUAL PISTON OPERATION INSPECTION

Check for the sound of operation while applying compressed air into the oil hole indicated in the figure.

(1) Transfer Direct Clutch
(2) Transfer Low Speed Brake
(3) Transfer Front Drive Clutch

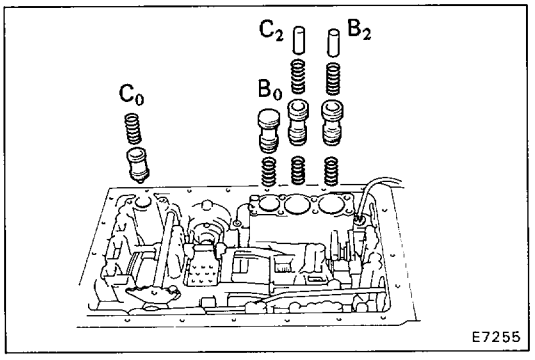
If there is no noise, disassemble and check the installation condition of the parts.



51. INSTALL THROTTLE CABLE

(a) Coat a new O-ring with ATF and install it to the cable.

(b) Install the cable to the case.

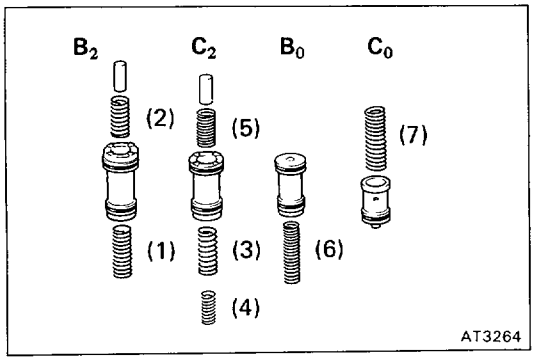


52. INSTALL ACCUMULATOR SPRINGS, PISTONS AND PINS

(a) Coat new O-rings with ATF and install them to the pistons.

(b) Install the six springs, four accumulator pistons and two pins to the bore as shown in the figure.

NOTE: The pistons are marked in relief with either C_0, B_0, C_2 or B_2 to discriminate between them.

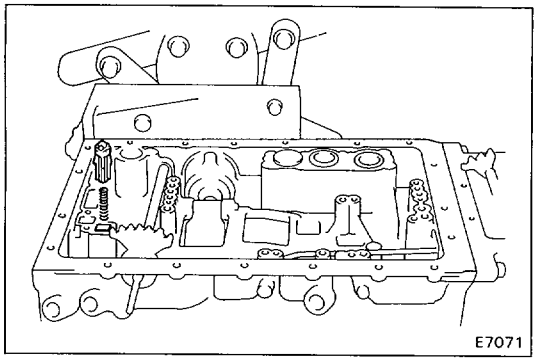


- **Pin** mm (in.)

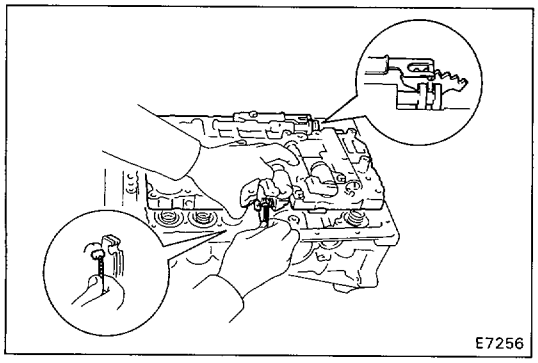
Pin	Outer diameter	Height
B_2	12.0 (0.472)	35.2 (1.386)
C_2	13.7 (0.539)	33.2 (1.307)

- **Spring** mm (in.)

Spring			Free length	Outer diameter	Color
(1)	B_2	Upper	53.5 (2.106)	19.7 (0.776)	Red
(2)		Lower	38.0 (1.496)	19.4 (0.764)	Light Gray
(3)	C_2	Upper (Outer)	51.0 (2.008)	20.0 (0.787)	None
(4)		Upper (Inner)	32.1 (1.264)	14.3 (0.563)	Red
(5)		Lower	39.0 (1.535)	20.8 (0.819)	Blue
(6)	B_0		69.7 (2.744)	16.7 (0.657)	Light Green
(7)	C_0		67.0 (2.638)	17.8 (0.701)	White



53. INSTALL CHECK BALL BODY AND SPRING

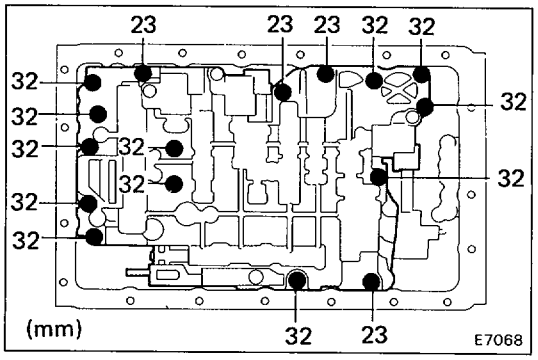


54. INSTALL TRANSMISSION VALVE BODY

(a) Align the groove of the manual valve to the pin of the lever.

(b) Connect the throttle cable to the cam.

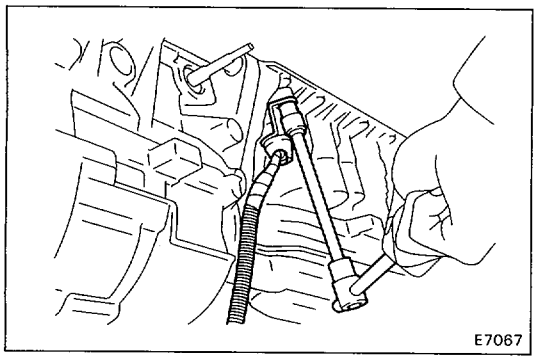
(c) Confirm the springs into the accumulator pistons are installed correctly.



(d) Install the sixteen bolts.

NOTE: Each bolt length (mm) is indicated in the figure.

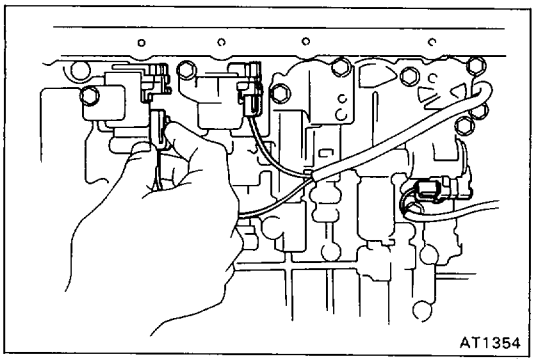
Torque: 100 kg-cm (7 ft-lb, 10 N·m)



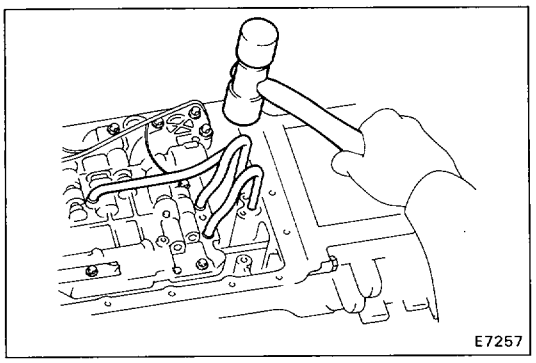
55. INSTALL TRANSMISSION SOLENOID WIRING

(a) Coat a new O-ring with ATF and install it to the grommet.

(b) Insert the solenoid wiring to the case and install the stopper plate.



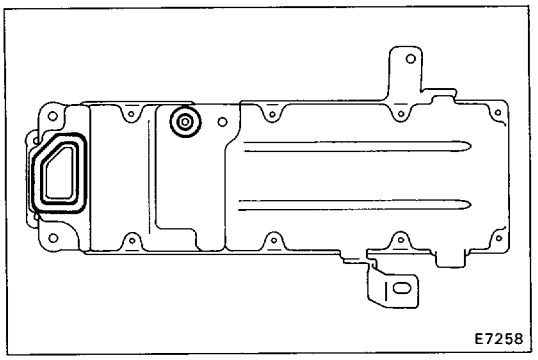
(c) Connect the connectors to No. 1, No. 2 and lock-up solenoids.


E7257

56. INSTALL OIL TUBES

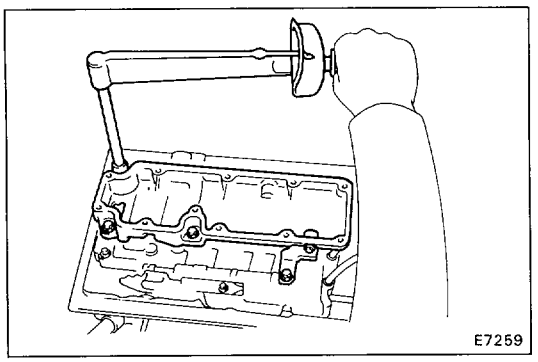
Using a plastic hammer, install the three tubes into the positions shown in the figure.

CAUTION: Be careful not to bend or damage the tubes.


E7258

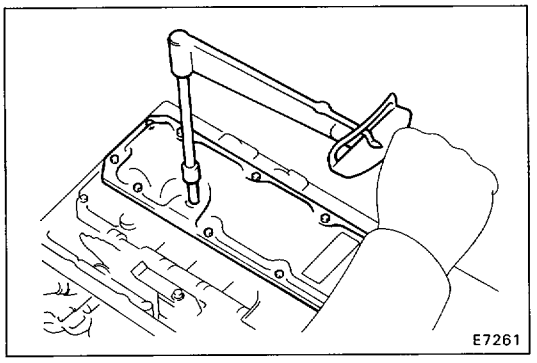
57. INSTALL OIL STRAINER AND GASKETS

(a) Install two new gaskets to the oil strainer case.


E7259

(b) Install the oil strainer case and torque the five bolts.

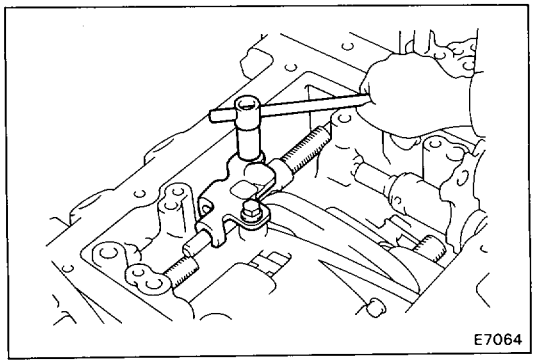
Torque: 100 kg-cm (7 ft-lb, 10 N·m)


E7261

(c) Install a new gasket to the oil strainer case.

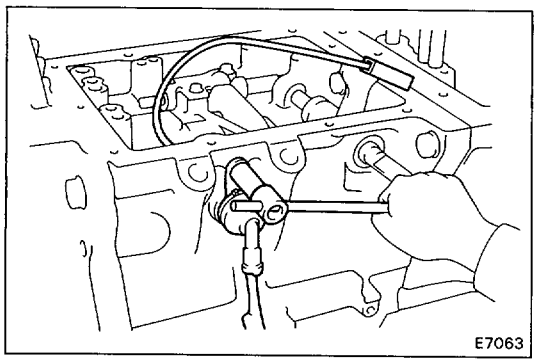
(d) Install the oil strainer and torque the eleven bolts.

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)


E7064

58. INSTALL PARKING LOCK PAWL BRACKET

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)

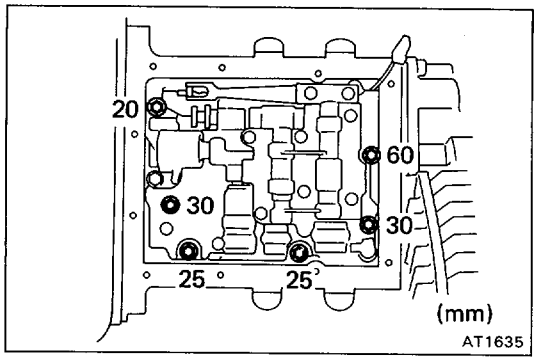


59. INSTALL TRANSFER SOLENOID WIRING

(a) Coat a new O-ring with ATF and install it to the grommet.

(b) Install solenoid wiring into the transfer case.

(c) Install the stopper plate.

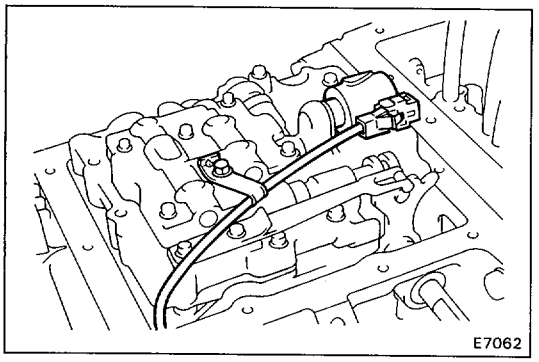


60. INSTALL TRANSFER VALVE BODY

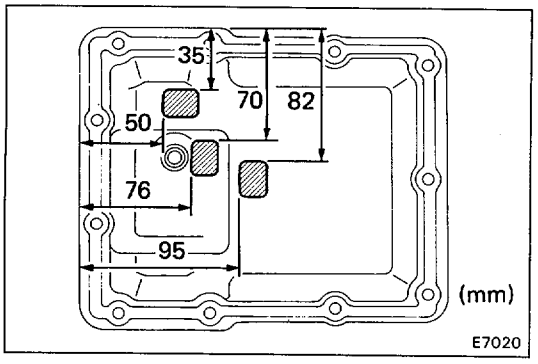
(a) Install and torque the six bolts.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)

NOTE: Each bolt length (mm) is indicated in the figure.

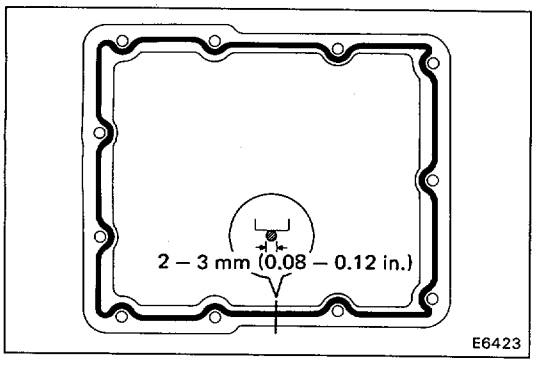


(b) Connect the connector to No. 4 solenoid and clamp the wiring.



61. INSTALL TRANSFER OIL PAN

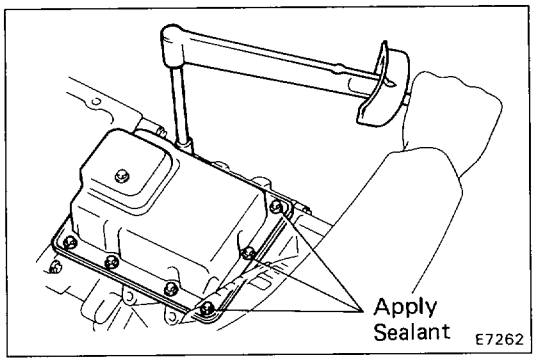
(a) Install the three magnets as shown in the figure.



(b) Remove any packing material and be careful not to drop the oil on the contacting surfaces of the oil pan and transfer case.

(c) Apply seal packing to the oil pan as shown in the figure.

Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent



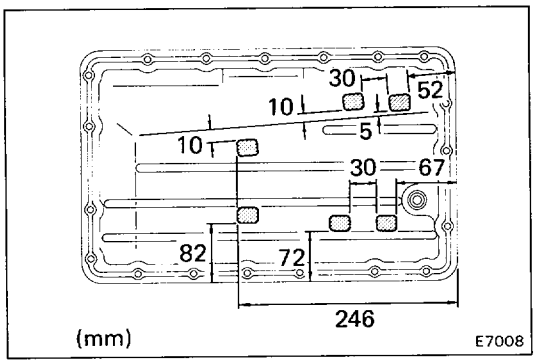
(d) Apply sealant to the threads of the three bolts.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

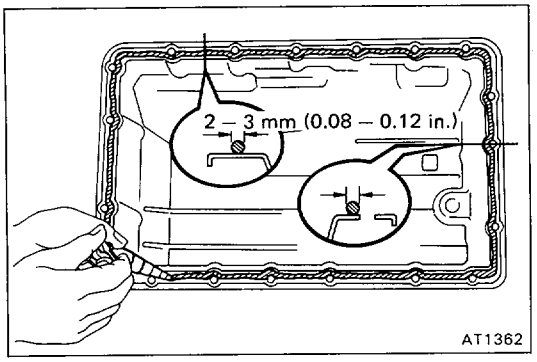
(e) Install the oil pan and torque the eleven bolts.

Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)

62. INSTALL TRANSMISSION OIL PAN



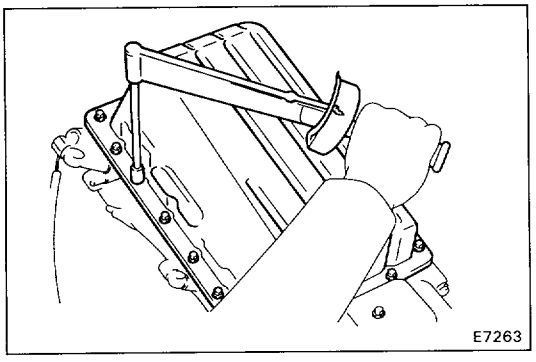
(a) Install the six magnets as shown in the figure.



(b) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case and oil pan.

(c) Apply seal packing to the oil pan as shown in the figure.

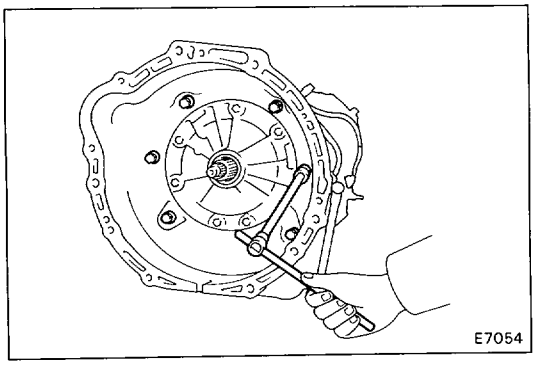
Seal packing: Part No. 08826-00090, THREE BOND 1281 or equivalent



(d) Install and torque the nineteen bolts.

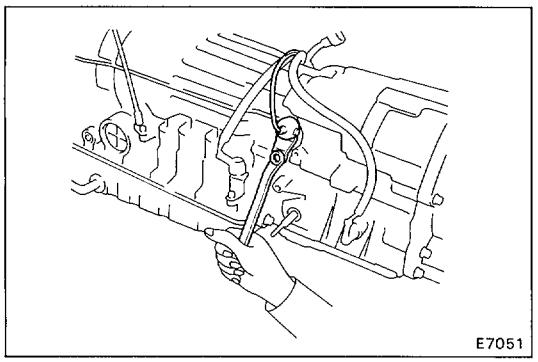
Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)

63. INSTALL TRANSMISSION HOUSING



Install and torque the six bolts.

Torque: 10 mm bolt 345 kg-cm (25 ft-lb, 34 N·m)
12 mm bolt 580 kg-cm (42 ft-lb, 57 N·m)

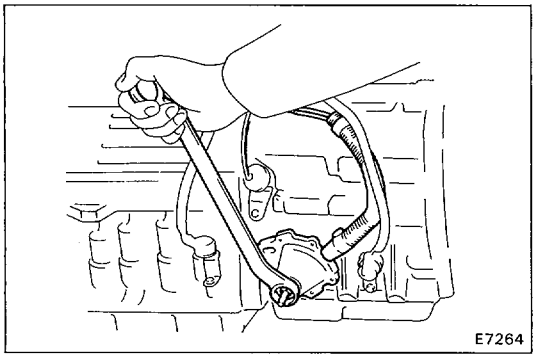


64. INSTALL SPEED SENSOR

(a) Coat a new O-ring with ATF and install it to the speed sensor.

(b) Install the speed sensor and stopper plate.

(c) Connect the wiring connector.

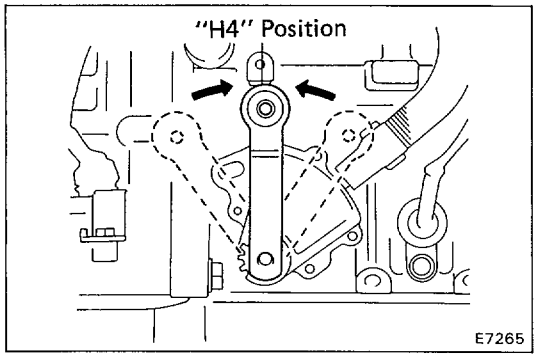


65. INSTALL TRANSFER POSITION SWITCH

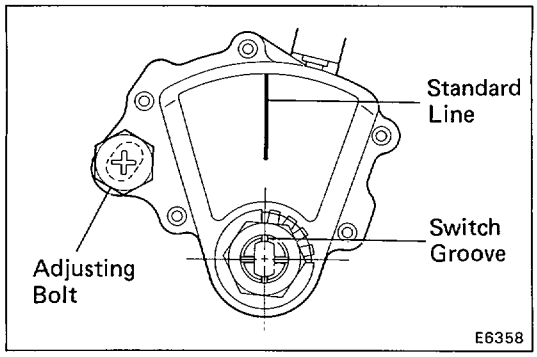
(a) Insert the transfer position switch onto the manual valve lever shaft.

(b) Install the grommet and a new lock washer. Install and torque the nut.

Torque: 40 kg-cm (35 in.-lb, 3.9 N·m)



(c) Using the control shaft lever, shift the lever into the "H4" position.

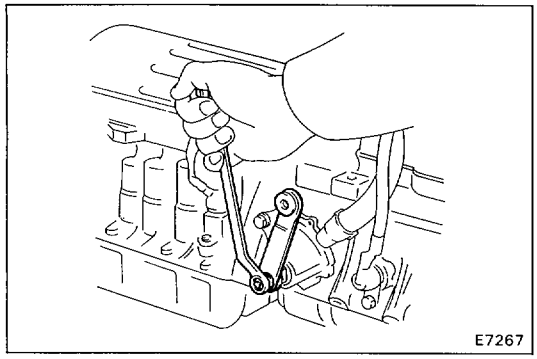


(d) Align the standard line and the switch groove, and tighten the bolt.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

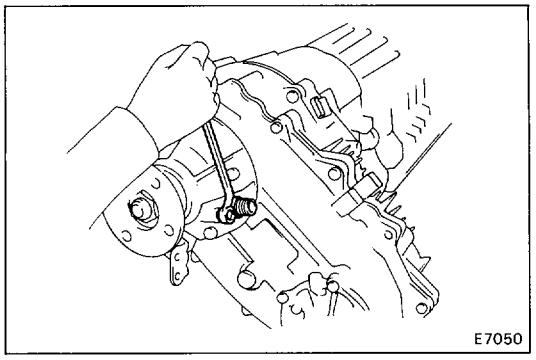
(e) Bend the tabs of the lock washer.

NOTE: Bend at least two of the lock washer tabs.



66. INSTALL TRANSFER CONTROL SHAFT LEVER

Torque: 160 kg-cm (12 ft-lb, 16 N·m)

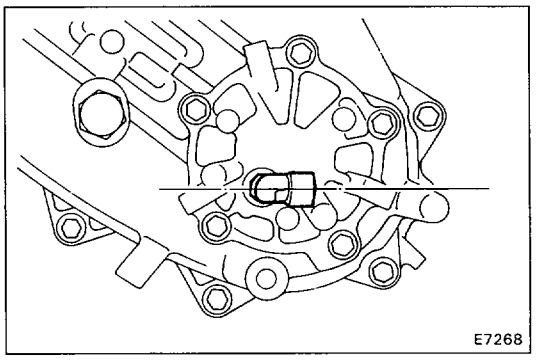


67. INSTALL SPEEDOMETER DRIVEN GEAR

(a) Coat a new O-ring with ATF and install it to the speedometer driven gear.

(b) Install the driven gear. Install and torque the bolts.

Torque: 160 kg-cm (12 ft-lb, 16 N·m)

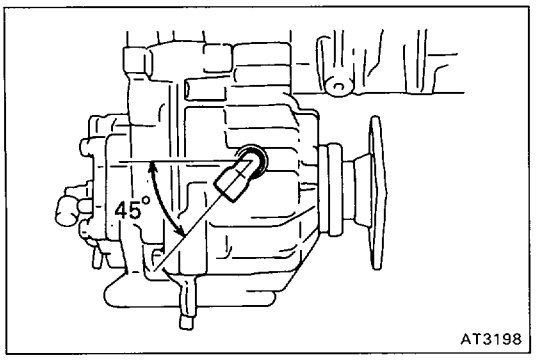


68. INSTALL TRANSFER SIDE UNIONS

(a) Coat new two O-rings with ATF and install them to each union.

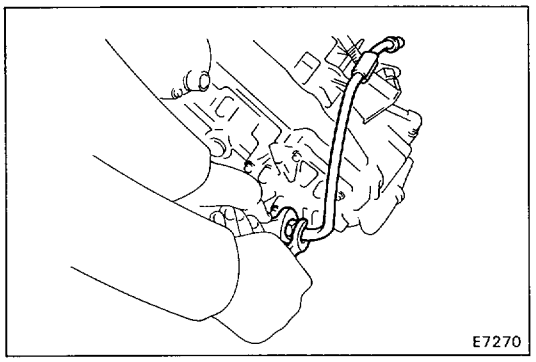
(b) Install the outlet union as shown in the figure.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



(c) Install the inlet union as shown in the figure.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



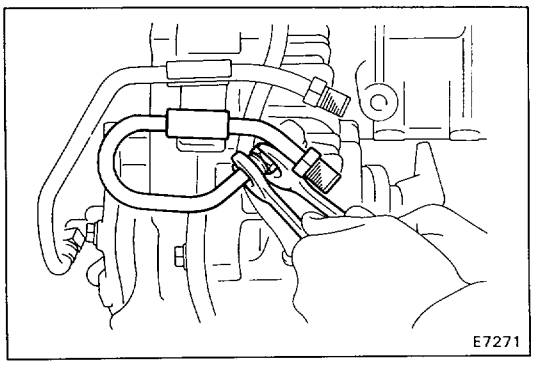
69. INSTALL TRANSFER OIL COOLER TUBES

(a) Install the tube clamp bracket.

Torque: 345 kg-cm (25 ft-lb, 34 N·m)

(b) Install the outlet tube.

Torque: 350 kg-cm (25 ft-lb, 34 N·m)

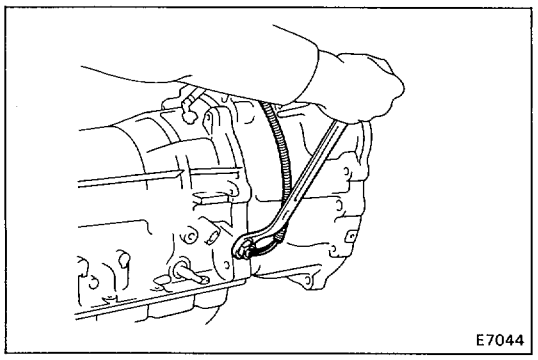


(c) Install the inlet tube.

Torque: 350 kg-cm (25 ft-lb, 34 N·m)

(d) Install the tube clamp.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)

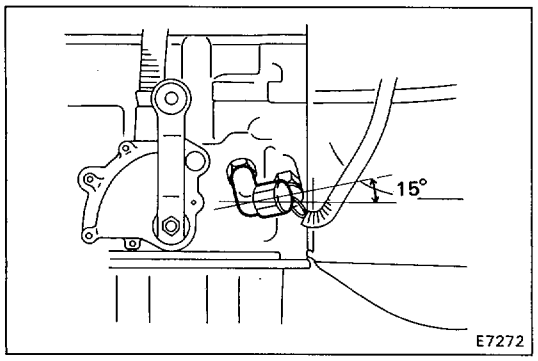


70. INSTALL TRANSMISSION FLUID TEMPERATURE SENSOR

(a) Coat a new O-ring with ATF and install it to the sensor.

(b) Install and torque the transmission fluid temperature sensor.

Torque: 150 kg-cm (11 ft-lb, 15 N·m)

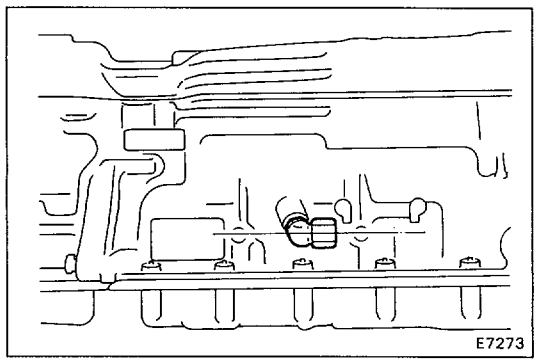


71. INSTALL TRANSMISSION SIDE UNIONS

(a) Coat new two O-rings with ATF and install them to each union.

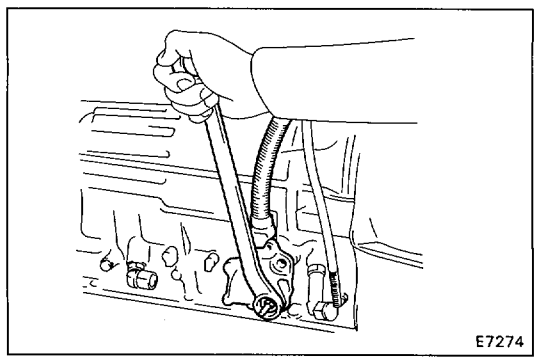
(b) Install the front union as shown in the figure.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)



(c) Install the rear union as shown in the figure.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

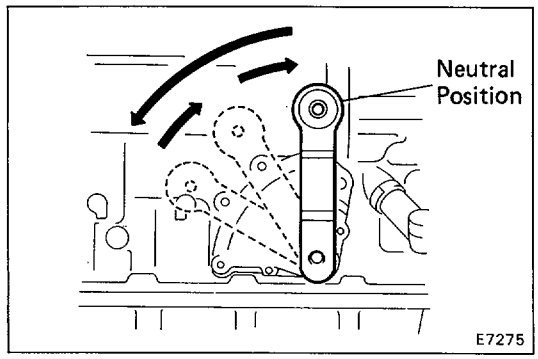


72. INSTALL NEUTRAL START SWITCH

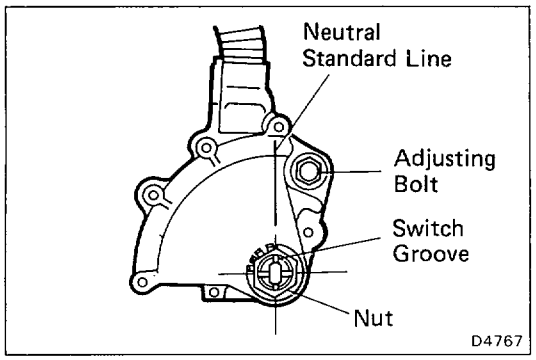
(a) Insert the neutral start switch onto the manual valve lever shaft.

(b) Install the grommet and a new lock washer. Install and torque the nut.

Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)



(c) Using the control shaft lever, fully turn the manual lever shaft back and return two notches. It is now in neutral.

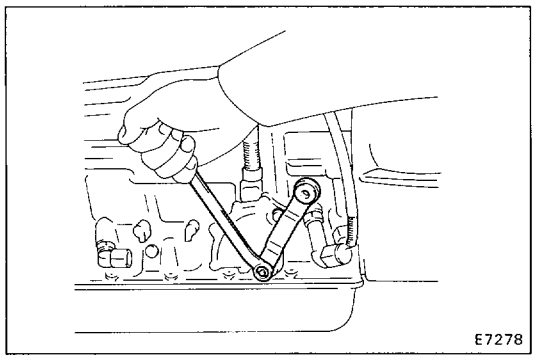


(d) Align the neutral standard line and the switch groove, and tighten the adjusting bolt.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

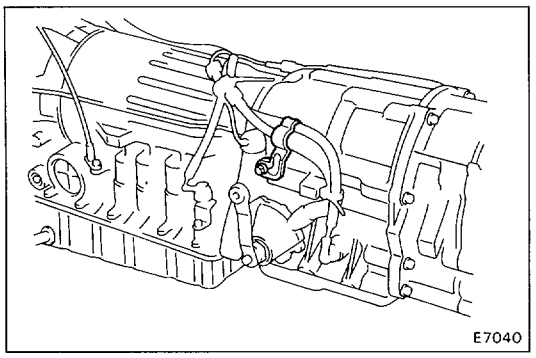
(e) Bend the tabs of the lock washer.

NOTE: Bend at least two of the lock washer tabs.

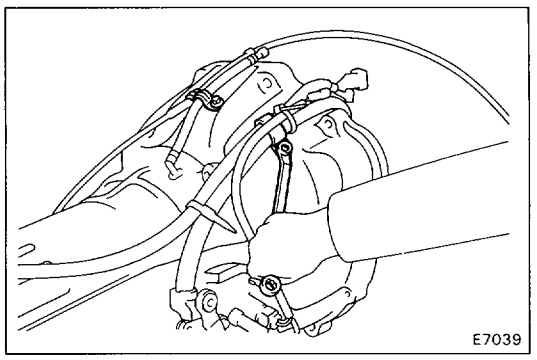


73. INSTALL TRANSMISSION CONTROL SHAFT LEVER

Torque: 160 kg-cm (12 ft-lb, 16 N·m)



74. INSTALL WIRE HARNESS CLAMPS AND THROTTLE CABLE CLAMP



TRANSFER

	Page
TROUBLESHOOTING	TF-2
TRANSFER (MT)	TF-3
Removal of Transfer	TF-3
Components	TF-5
Disassembly of Transfer	TF-7
Inspection of Transfer Components	TF-12
Assembly of Transfer	TF-20
Installation of Transfer	TF-25
TRANSFER (AT)	TF-28

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TF-3
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TF-3

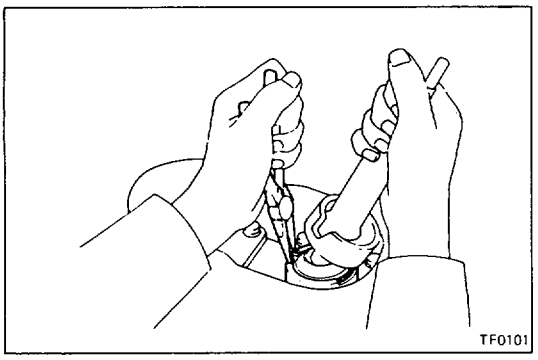
TRANSFER (MT)

REMOVAL OF TRANSFER

1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**

2. **REMOVE STARTER UPPER MOUNTING NUT**

3. **REMOVE TRANSMISSION SHIFT LEVER FROM INSIDE OF VEHICLE**
   (a) Remove the six screws and remove the shift lever boot retainer.
   (b) Pull up the shift lever boot.
   (c) Remove the four bolts and pull out the shift lever with lever retainer from the transmission.

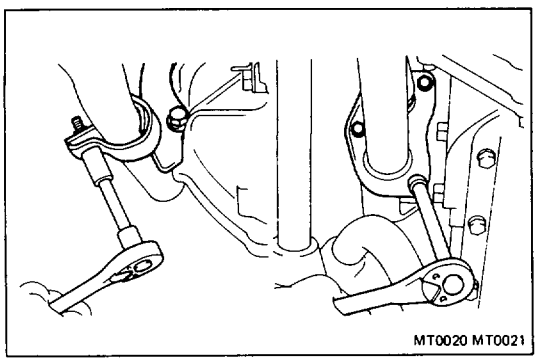

TF0101

4. **REMOVE TRANSFER SHIFT LEVER FROM INSIDE OF VEHICLE**
   Using pliers, remove the snap ring and pull out the shift lever from the transfer.

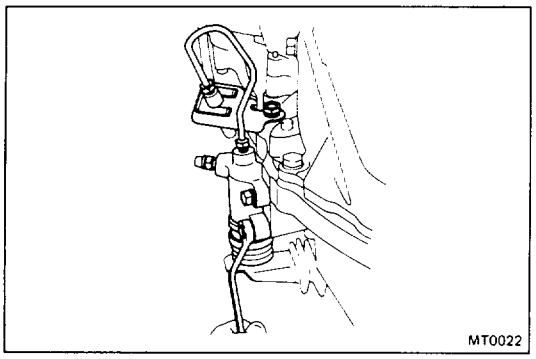
5. **RAISE VEHICLE AND DRAIN TRANSMISSION AND TRANSFER OIL**
   CAUTION: Be sure the vehicle is securely supported.

6. **DISCONNECT FRONT AND REAR PROPELLER SHAFTS (See page PR-4)**

7. **DISCONNECT SPEEDOMETER CABLE, BACK-UP LIGHT SWITCH CONNECTOR AND TRANSFER INDICATOR SWITCH CONNECTOR**


MT0020 MT0021

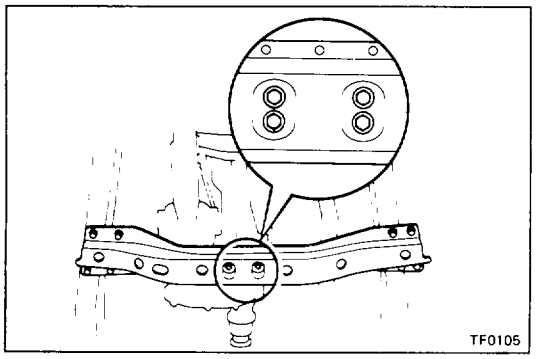
8. **REMOVE EXHAUST PIPE CLAMP AND EXHAUST PIPE**



9. REMOVE CLUTCH RELEASE CYLINDER, TUBE BRACKET AND STARTER LOWER MOUNTING BOLT

Remove the mounting bolts and lay the starter and release cylinder alongside the engine.

NOTE: Do not disconnect the clutch line.



10. REMOVE NO.2 FRAME CROSSMEMBER FROM SIDE FRAME

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly with a jack.

(c) Remove the eight bolts from the side frame and remove the No.2 frame crossmember.

11. PLACE PIECE OF WOOD BETWEEN ENGINE OIL PAN AND FRONT AXLE

12. LOWER TRANSMISSION WITH TRANSFER

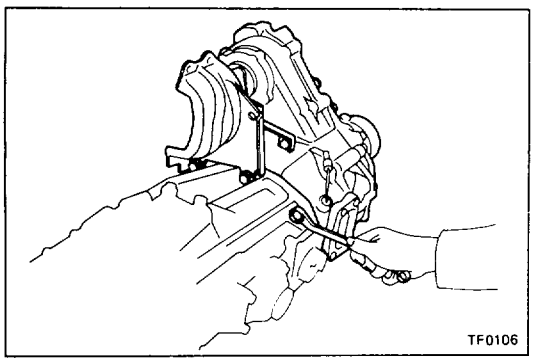
13. REMOVE EXHAUST PIPE BRACKET AND STIFFENER PLATE BOLTS

14. REMOVE REMAINING TRANSMISSION BOLTS

15. REMOVE TRANSMISSION WITH TRANSFER

(a) Draw out the transmission with the transfer toward the rear.

(b) Lower the transmission with the transfer front and remove it from the vehicle.



16. REMOVE ENGINE REAR MOUNTING

17. REMOVE PROPELLER SHAFT UPPER DUST COVER AND TRANSFER FROM TRANSMISSION

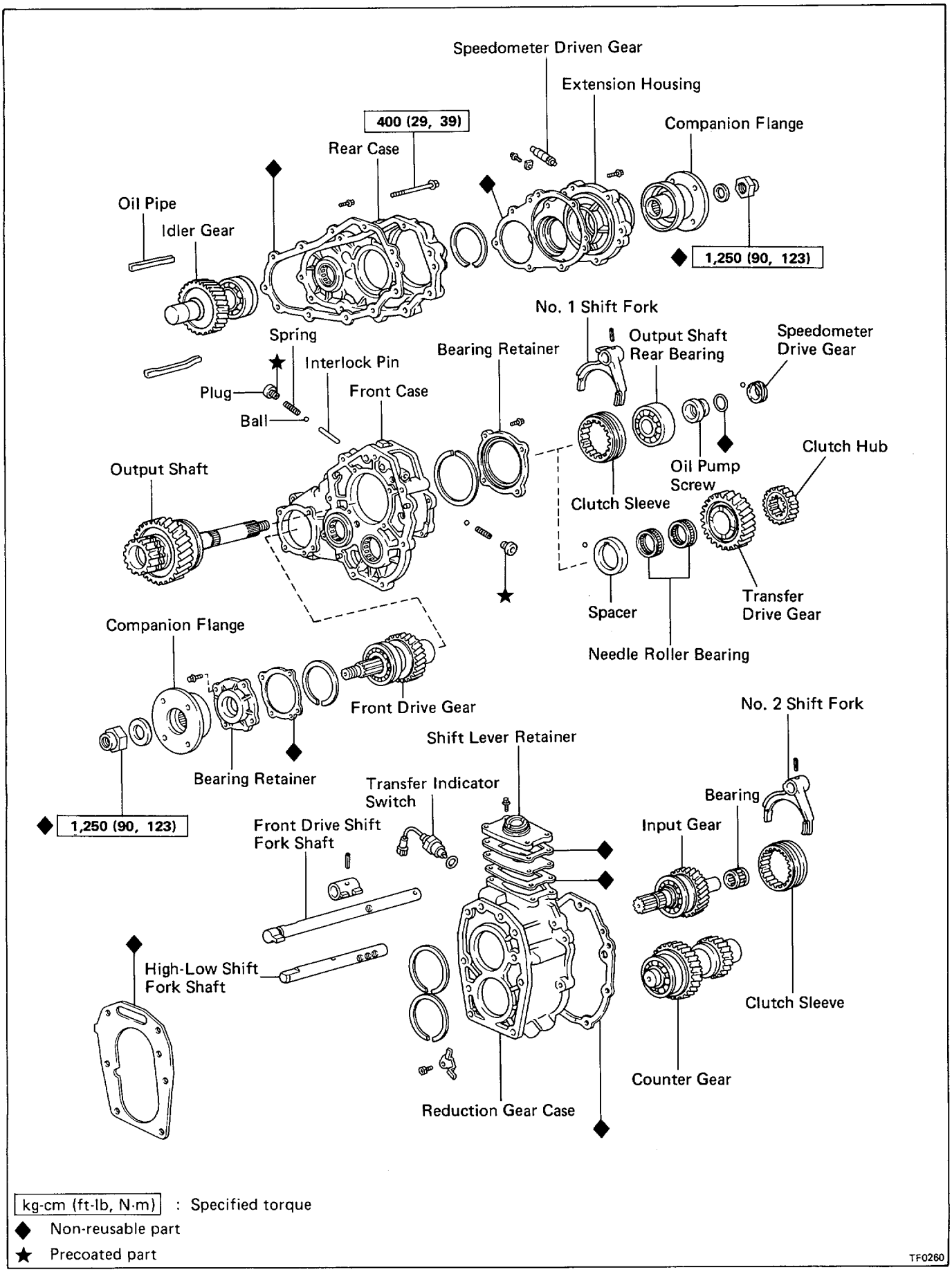
(a) Remove the dust cover bolt from the bracket.

(b) Remove the transfer adaptor rear mounting bolts.

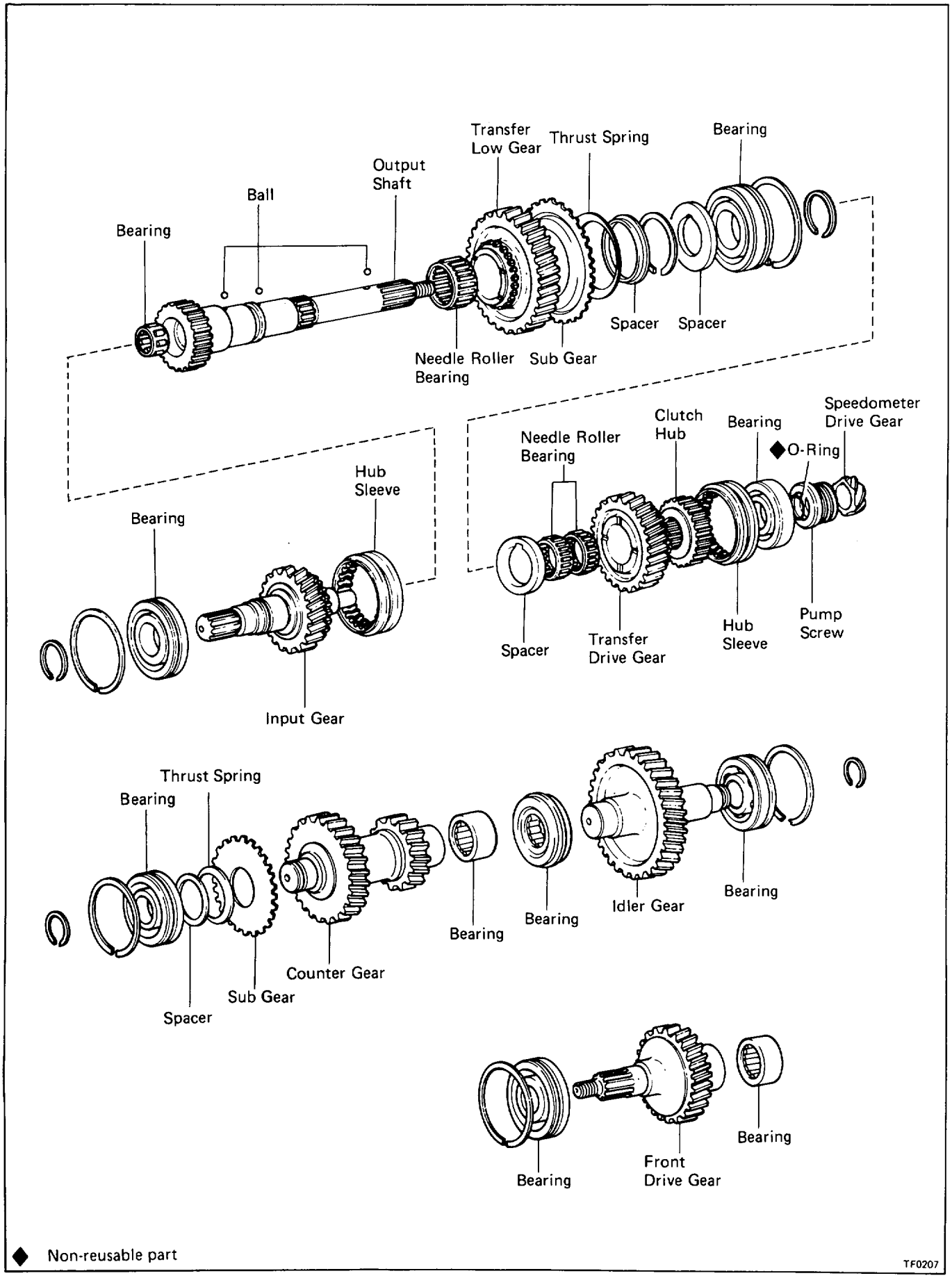
(c) Pull the transfer straight up and remove it from the transmission.

NOTE: Take care not to damage the adaptor rear oil seal with the transfer input gear spline.

COMPONENTS


Speedometer Driven Gear
Extension Housing
400 (29, 39)
Companion Flange
Rear Case
Oil Pipe
Idler Gear
1,250 (90, 123)
No. 1 Shift Fork
Spring
Output Shaft Rear Bearing
Speedometer Drive Gear
Bearing Retainer
Interlock Pin
Plug
Front Case
Ball
Clutch Hub
Output Shaft
Oil Pump Screw
Clutch Sleeve
Spacer
Transfer Drive Gear
Needle Roller Bearing
Companion Flange
Front Drive Gear
No. 2 Shift Fork
Shift Lever Retainer
Bearing Retainer
Transfer Indicator Switch
Bearing
1,250 (90, 123)
Front Drive Shift Fork Shaft
Input Gear
High-Low Shift Fork Shaft
Clutch Sleeve
Counter Gear
Reduction Gear Case
kg-cm (ft-lb, N·m) : Specified torque
Non-reusable part
Precoated part
TF0260

COMPONENTS (Cont'd)



◆ Non-reusable part

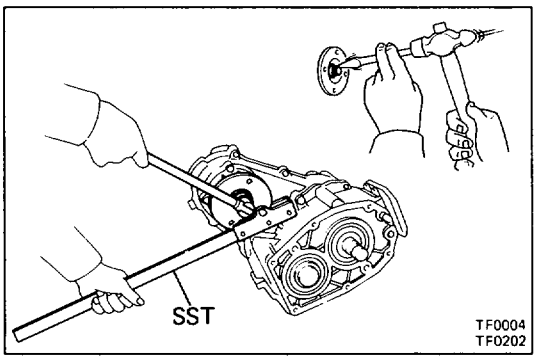
TF0207

DISASSEMBLY OF TRANSFER

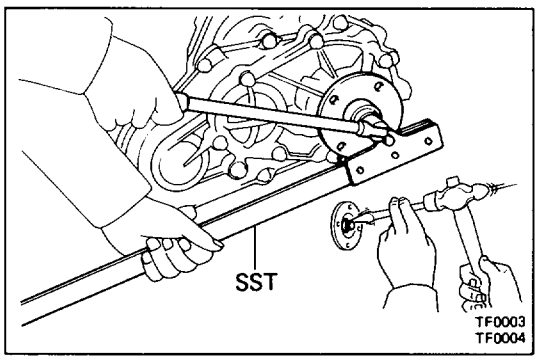
(See pages TF-5,6)

1. **REMOVE SPEEDOMETER DRIVEN GEAR**

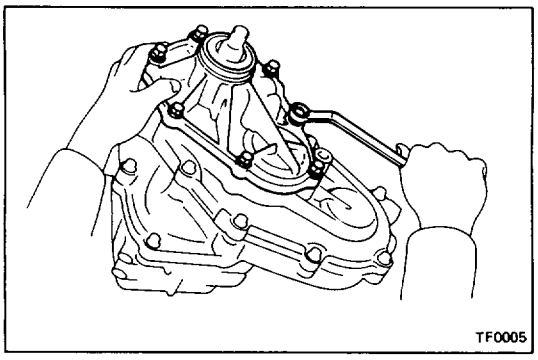
2. **REMOVE TRANSFER INDICATOR SWITCH**



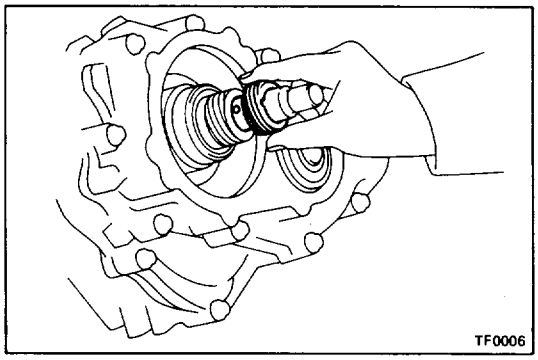
3. **REMOVE FRONT COMPANION FLANGE**
   (a) Using a hammer and chisel, loosen the staked part of the nut.
   (b) Using SST to hold the flange, remove the nut and washer.
   SST 09330-00021
   (c) Remove the companion flange.



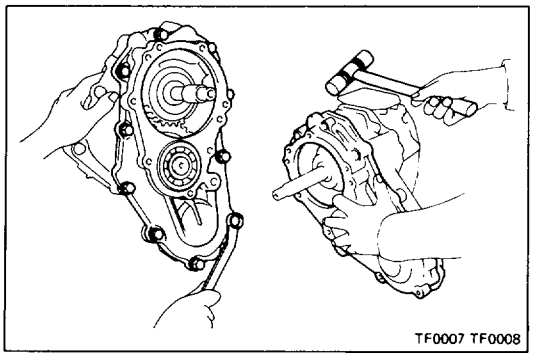
4. **REMOVE REAR COMPANION FLANGE**
   (a) Using a hammer and chisel, loosen the staked part of the nut.
   (b) Using SST to hold the flange, remove the nut and washer.
   SST 09330-00021
   (c) Remove the companion flange.



5. **REMOVE EXTENSION HOUSING**
   Remove the seven bolts and remove the extension housing.



6. **REMOVE SPEEDOMETER DRIVE GEAR, STEEL BALL, OIL PUMP SCREW AND BEARING**

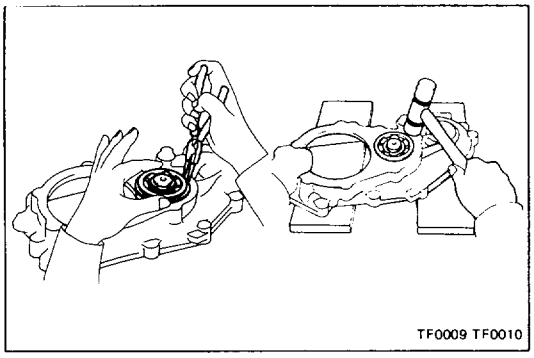


7. REMOVE REAR CASE

(a) Remove the ten bolts.

(b) Using a plastic hammer, remove the rear case with the idler gear.

NOTE: Hold the front case so the rear does not descend. If it descends, the clutch hub and steel ball may fall out.

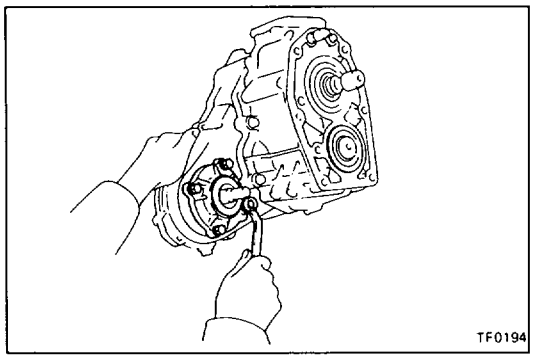


8. REMOVE IDLER GEAR FROM REAR CASE

(a) Using snap ring pliers, remove the snap ring.

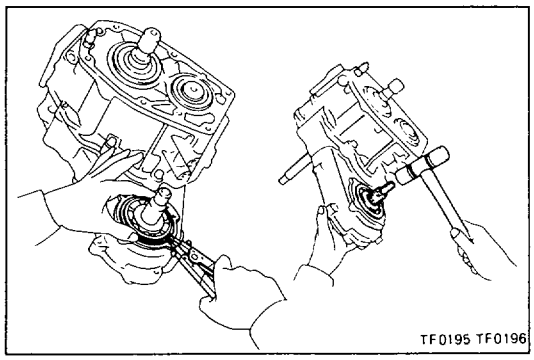
(b) Using a plastic hammer, tap out the idler gear from the rear case.

NOTE: Place the rear case on something soft such as wooden blocks.



9. REMOVE BEARING RETAINER

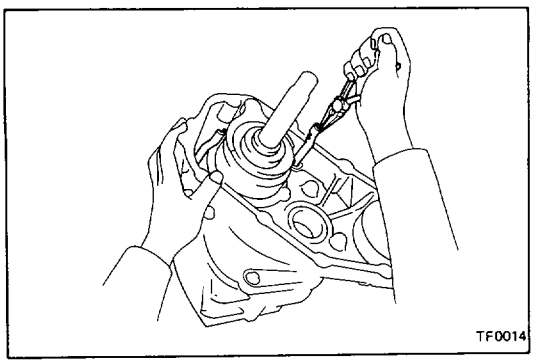
Remove the four bolts and remove the bearing retainer.



10. REMOVE FRONT DRIVE GEAR

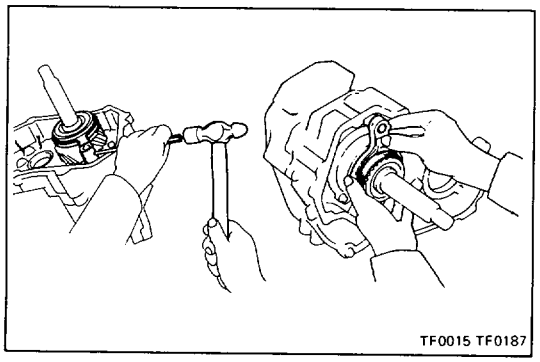
(a) Using snap ring pliers, remove the snap ring.

(b) Using a plastic hammer, tap out the front drive gear from the front case.



11. REMOVE OIL PIPES

Using pliers, remove the two oil pipes.

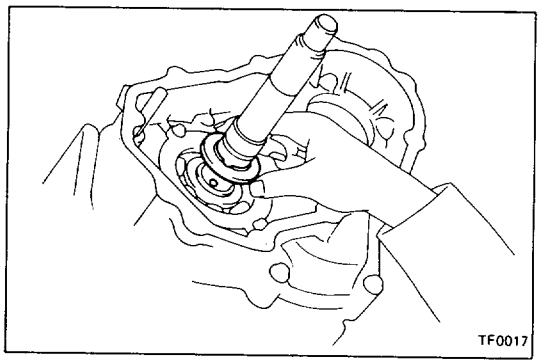


12. REMOVE NO.1 SHIFT FORK AND CLUTCH SLEEVE

(a) Shift the fork shaft into front drive position.

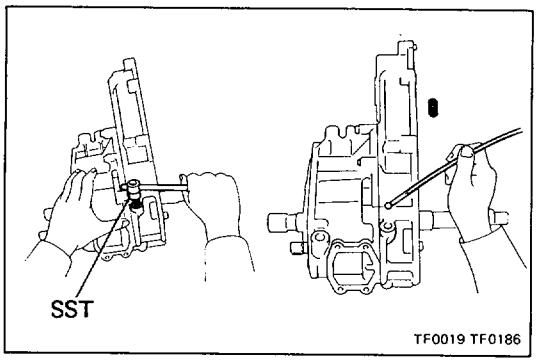
(b) Using a pin punch and hammer, drive out the slotted spring pin.

(c) Remove No.1 shift fork together with the clutch sleeve.



13. REMOVE CLUTCH HUB AND TRANSFER DRIVE GEAR

14. REMOVE NEEDLE ROLLER BEARINGS, NO.2 SPACER AND STEEL BALL



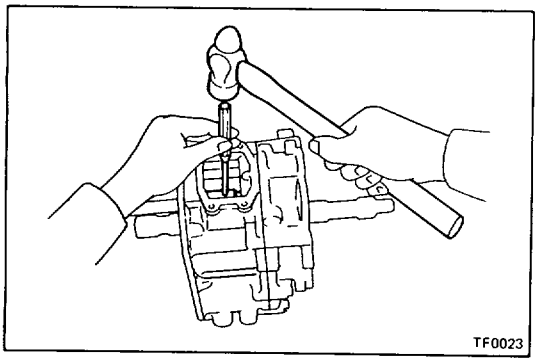
15. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

(a) Using SST, remove the plug on the right side.

SST 09313-30021

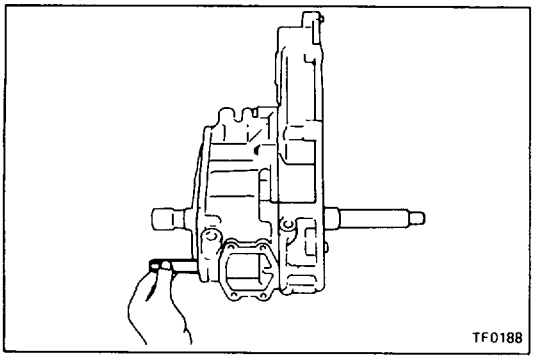
(b) Using a magnetic finger, remove the spring and ball.

(c) Remove the plug, spring and ball on the left side in the same procedure.

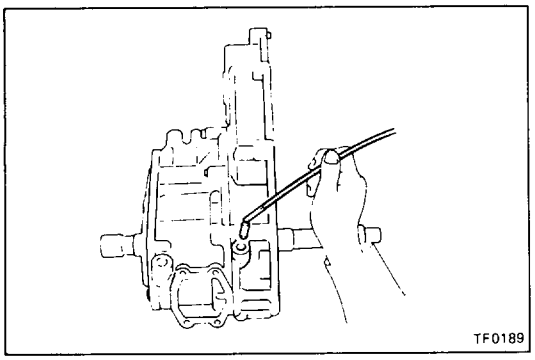


16. REMOVE SLOTTED SPRING PIN

Using a pin punch and hammer, drive out the two slotted spring pins from shift fork shaft.

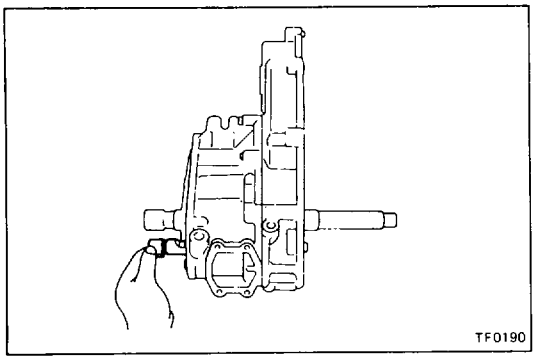


17. REMOVE FRONT DRIVE SHIFT FORK SHAFT

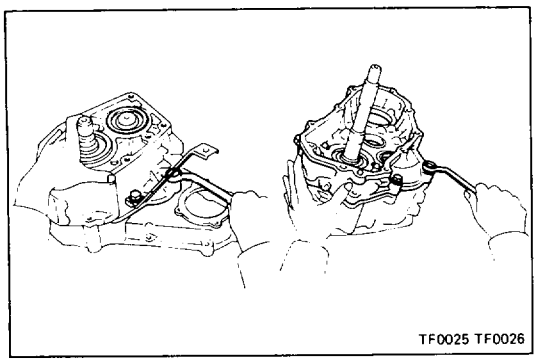

TF0189

18. REMOVE INTERLOCK PIN

Using a magnetic finger, remove the interlock pin.

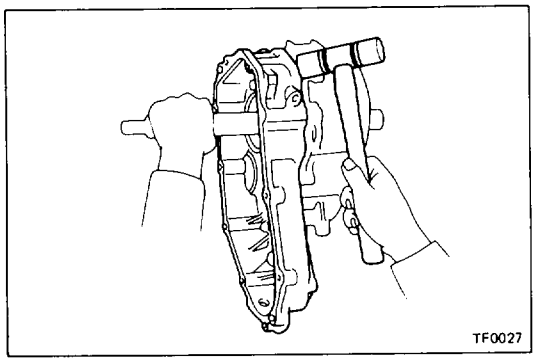

TF0190

19. REMOVE HIGH-LOW SHIFT FORK SHAFT

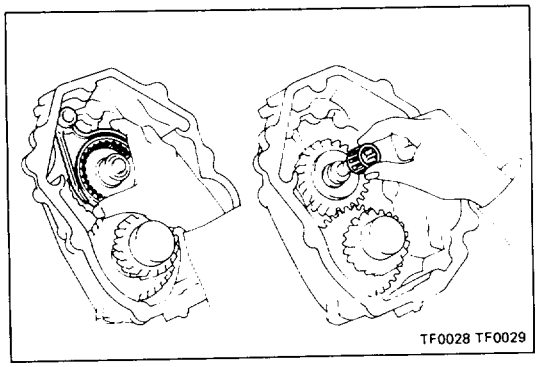

TF0025 TF0026

20. REMOVE FRONT CASE

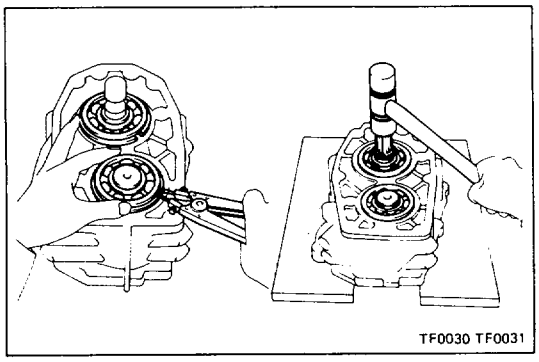
(a) Remove the four bolts.


TF0027

(b) Using a plastic hammer, remove the front case with the output shaft.


TF0028 TF0029

21. REMOVE NO.2 FORK WITH CLUTCH SLEEVE AND NEEDLE ROLLER BEARING FROM INPUT SHAFT

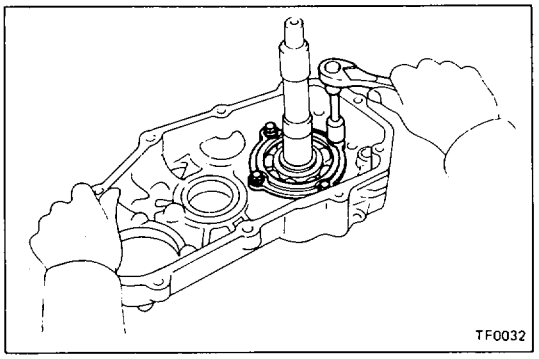

TF0030 TF0031

22. REMOVE INPUT GEAR AND COUNTER GEAR FROM REDUCTION GEAR CASE

(a) Using snap ring pliers, remove the two snap rings.

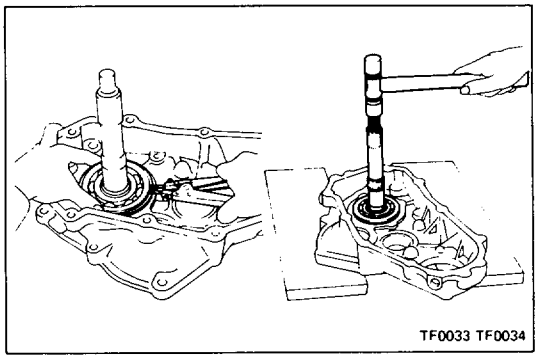
(b) Using a plastic hammer, tap out the input gear and counter gear from the reduction gear case.

NOTE: Place the reduction gear case on something soft such as wooden blocks.


TF0032

23. REMOVE OUTPUT SHAFT FROM FRONT CASE

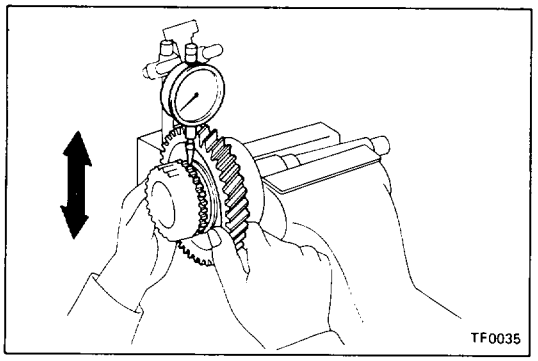
(a) Remove the four bolts and remove the bearing retainer.

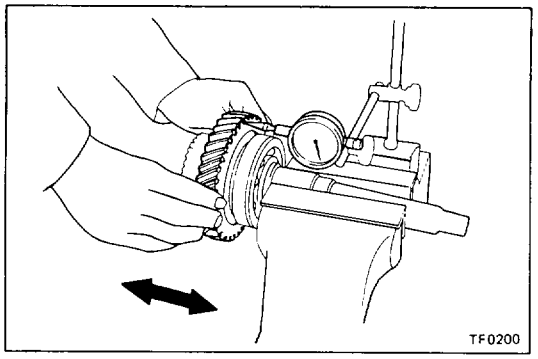

TF0033 TF0034

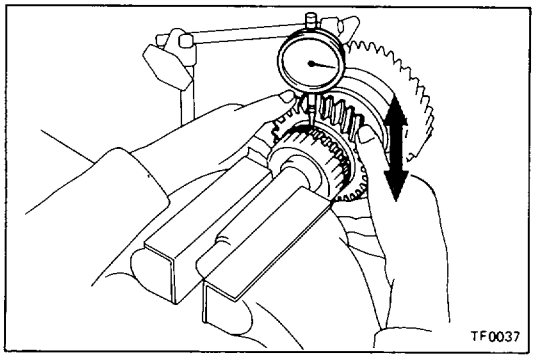
(b) Using snap ring pliers, remove the snap ring.

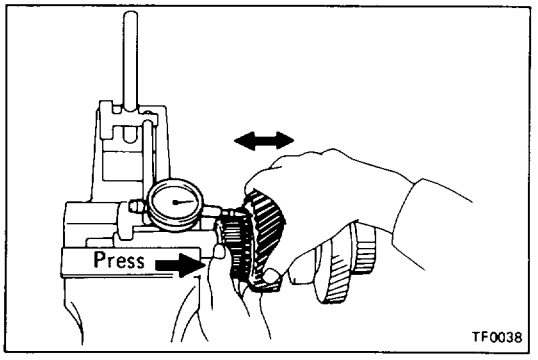
(c) Using a plastic hammer, tap out the output shaft from the front case.

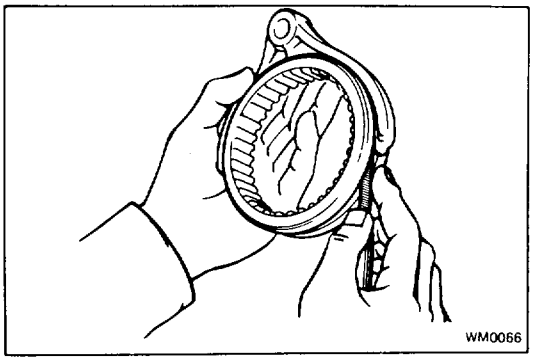
NOTE: Place the front case on something soft such as wooden blocks.











INSPECTION OF TRANSFER COMPONENTS

1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER LOW GEAR

(a) Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard clearance: 0.010 — 0.055 mm (0.0004 — 0.0022 in.)
Maximum clearance: 0.075 mm (0.0030 in.)

If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.

(b) Using a dial indicator, measure the thrust clearance with the spacer and bearing installed.

NOTE: Do not touch the shaft end of the dial indicator to the sub gear.

Standard clearance: 0.10 — 0.25 mm (0.0039 — 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

If the clearance exceeds the limit, replace the spacer.

2. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER DRIVE GEAR

(a) Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard clearance: 0.009 — 0.051 mm (0.0004 — 0.0020 in.)
Maximum clearance: 0.071 mm (0.0028 in.)

If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.

(b) Using a dial indicator, measure the thrust clearance with the clutch hub and spacer installed.

Standard clearance: 0.09 — 0.27 mm (0.0035 — 0.0106 in.)
Maximum clearance: 0.32 mm (0.0126 in.)

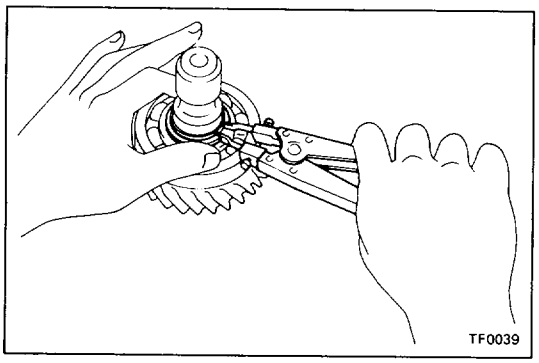
If the clearance exceeds the limit, replace the spacer.

3. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

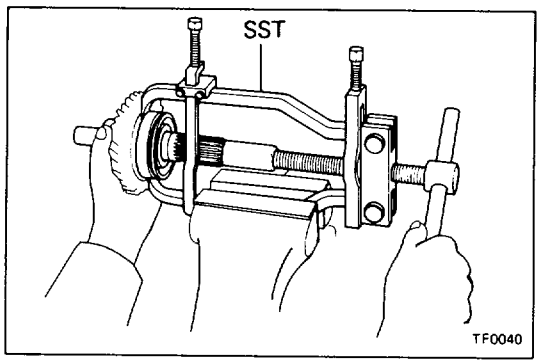
Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.



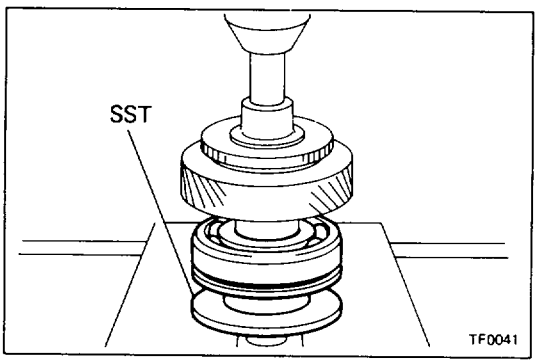
4. IF NECESSARY, REPLACE INPUT GEAR BEARING

(a) Using snap ring pliers, remove the snap ring.



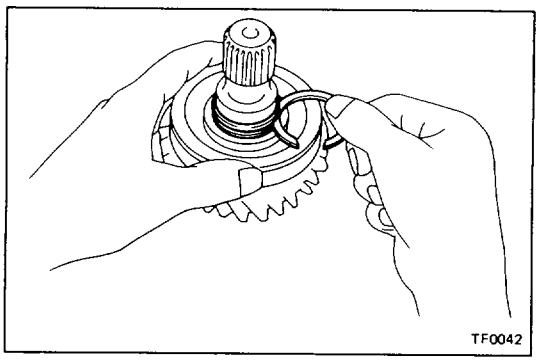
(b) Using SST, remove the bearing.

SST 09950-20017



(c) Using SST, press in a new bearing.

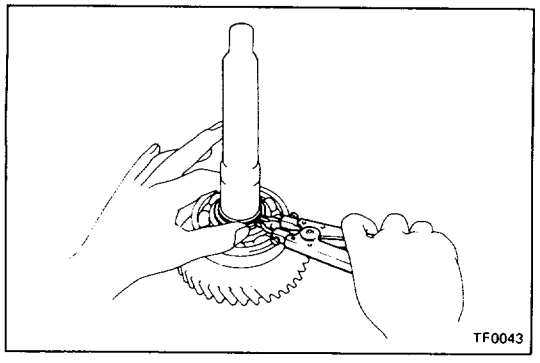
SST 09316-60010 (09316-00070)



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

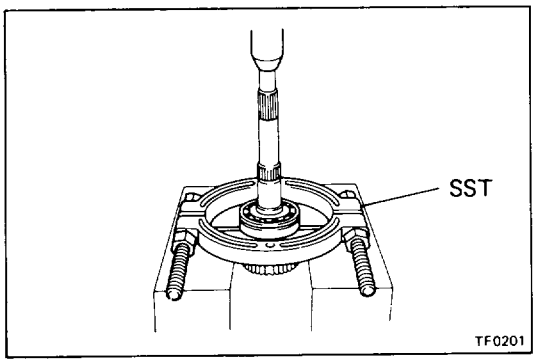
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
1	2.05 — 2.10 (0.0807 — 0.0827)
3	2.15 — 2.20 (0.0846 — 0.0866)
5	2.25 — 2.30 (0.0886 — 0.0906)



5. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING, LOW GEAR AND SUB GEAR

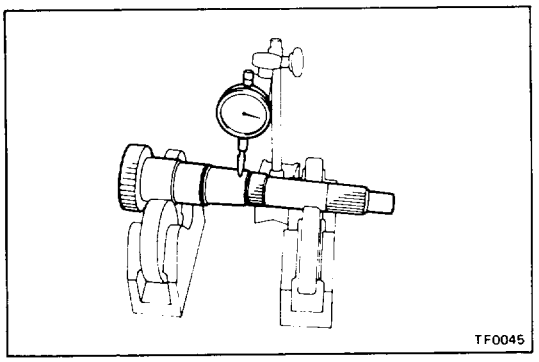
(a) Using snap ring pliers, remove the snap ring.



(b) Using a press, remove the bearing, No.1 spacer and low gear.

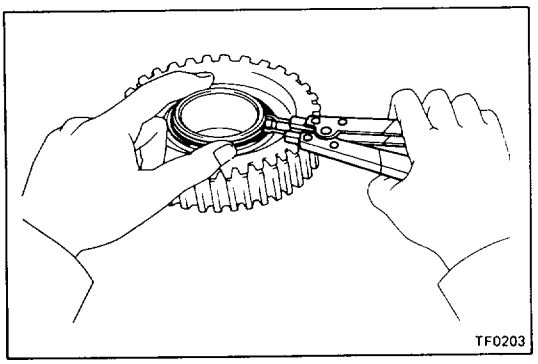
SST 09950-00020

(c) Remove the steel ball and needle roller bearing.



(d) Using a dial indicator, measure the shaft runout.

Maximum runout: 0.03 mm (0.0012 in.)

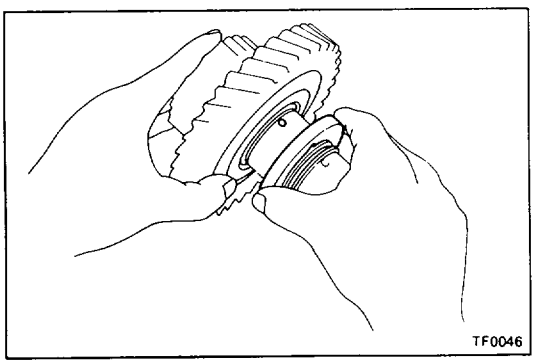


(e) Using snap ring pliers, remove the snap ring from the low gear.

(f) Remove the spacer, thrust spring and sub gear.

(g) Install the sub gear, thrust spring and spacer.

(h) Using snap ring pliers, install the snap ring.

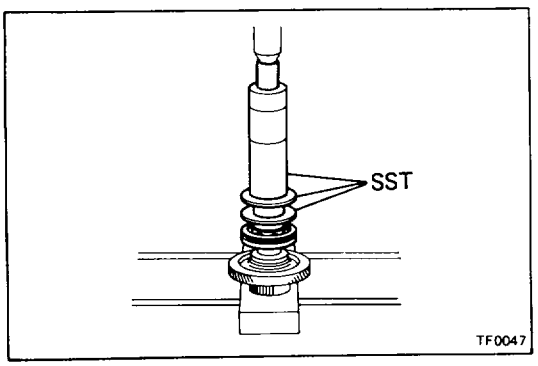


(i) Apply MP grease to the needle roller bearing.

(j) Install the low gear with needle roller bearing to the output shaft.

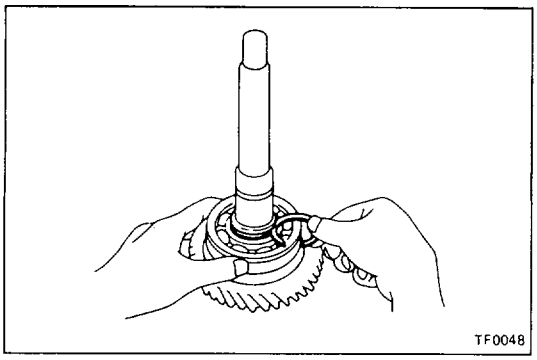
(k) Install the steel ball on the output shaft.

(l) Install the No.1 spacer.



(m) Using a press and SST, install a new bearing.

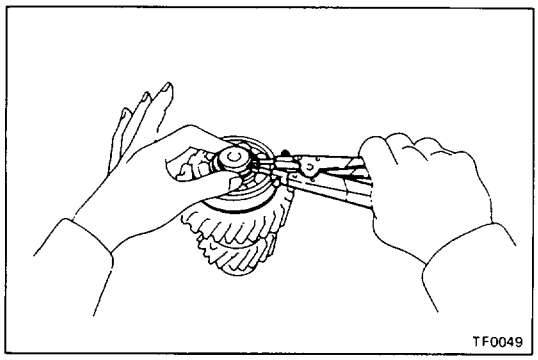
SST 09316-60010 (09316-00010, 09316-00040, 09316-00050)



(n) Select a snap ring that will allow minimum axial play and install it on the shaft.

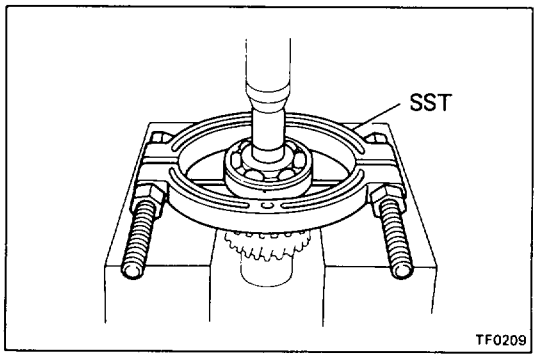
Maximum play: 0.10 mm (0.0039 in.)

Mark	Thickness	mm (in.)
0	2.40 — 2.45	(0.0945 — 0.0965)
1	2.45 — 2.50	(0.0965 — 0.0984)
2	2.50 — 2.55	(0.0984 — 0.1004)
3	2.55 — 2.60	(0.1004 — 0.1024)
4	2.60 — 2.65	(0.1024 — 0.1043)
5	2.65 — 2.70	(0.1043 — 0.1063)



6. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SUB GEAR

(a) Using snap ring pliers, remove the snap ring.

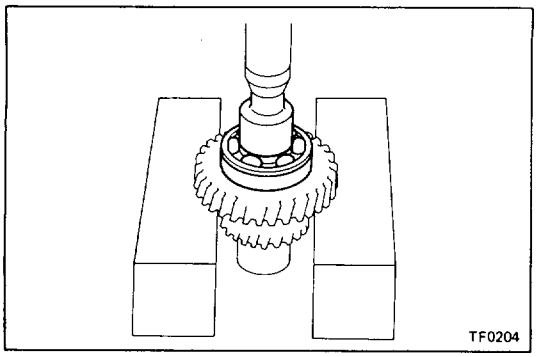


(b) Using SST and a press, remove the bearing.

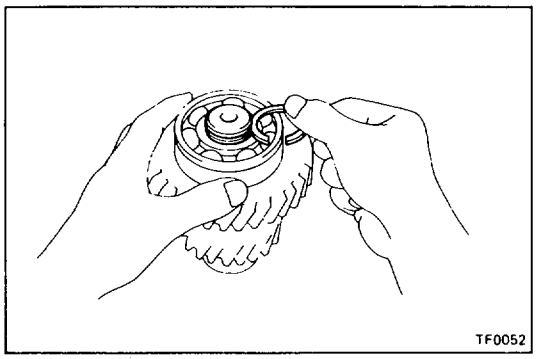
SST 09950-00020

(c) Remove the spacer, thrust spring and sub gear.

(d) Install the sub gear, thrust spring and spacer on the counter gear.



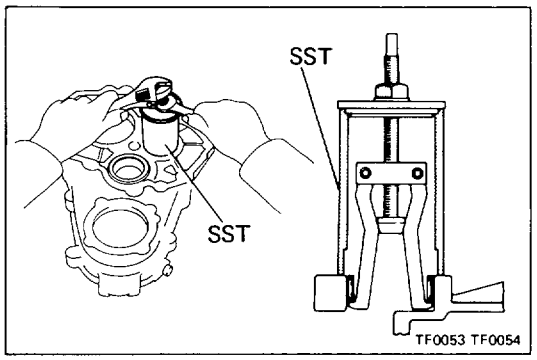
(e) Using a press and 32-mm socket wrench, install a new bearing.



(f) Select a snap ring that will allow minimum axial play and install it on the shaft.

Maximum play: 0.15 mm (0.0059 in.)

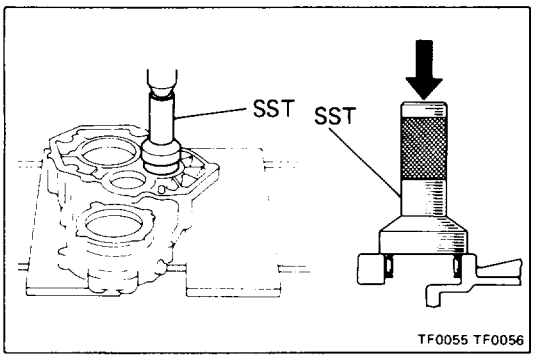
Mark	Thickness	mm (in.)
1	2.10 — 2.15	(0.0827 — 0.0846)
3	2.20 — 2.25	(0.0866 — 0.0886)



7. **IF NECESSARY, REPLACE COUNTER GEAR REAR BEARING**

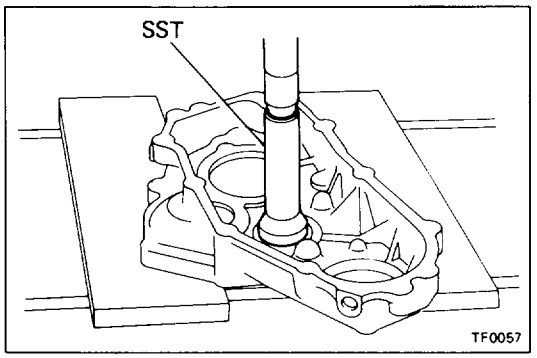
(a) Using SST, remove the bearing.

SST 09612-30012



(b) Using SST, press in a new bearing.

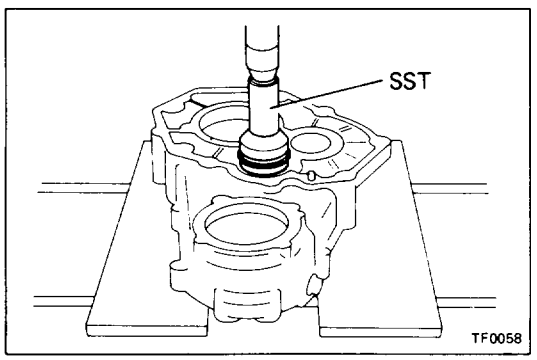
SST 09310-35010



8. **IF NECESSARY, REPLACE IDLER GEAR FRONT BEARING**

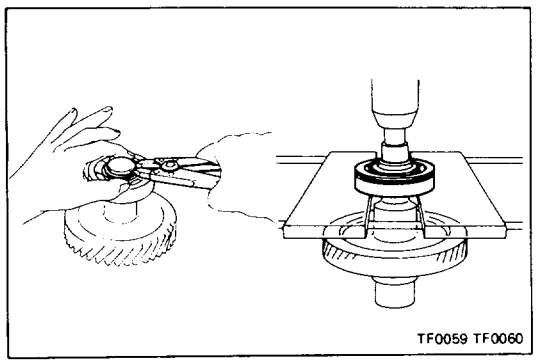
(a) Using SST, press out the bearing.

SST 09310-35010



(b) Using SST, press in a new bearing up to the position of the snap ring.

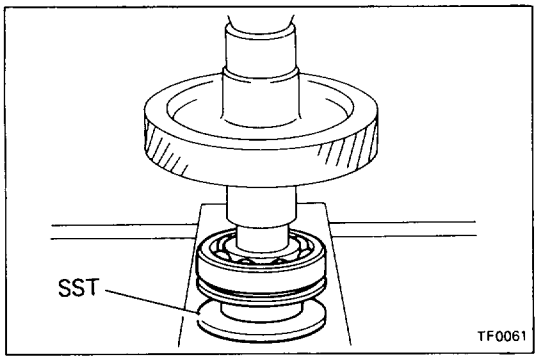
SST 09310-35010



9. **IF NECESSARY, REPLACE IDLER GEAR REAR BEARING**

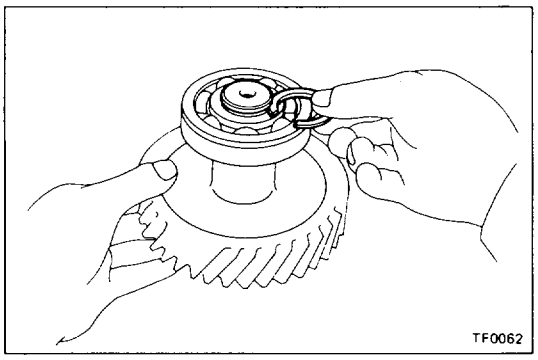
(a) Using snap ring pliers, remove the snap ring.

(b) Press out the bearing.



(c) Using SST, press in a new bearing.

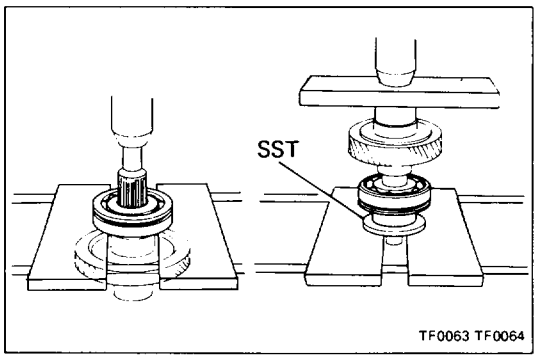
SST 09316-60010 (09316-00020)



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
A	1.50 – 1.55 (0.0591 – 0.0610)
B	1.60 – 1.65 (0.0630 – 0.0650)

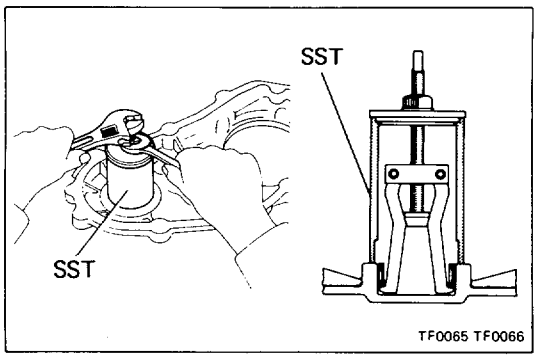


10. IF NECESSARY, REPLACE FRONT DRIVE GEAR FRONT BEARING

(a) Press out the bearing.

(b) Using SST, press in a new bearing.

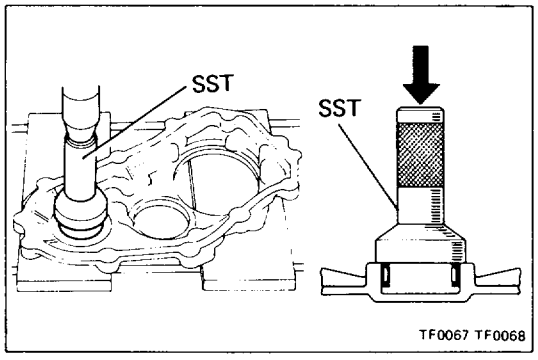
SST 09316-60010 (09316-00020)



11. IF NECESSARY, REPLACE FRONT DRIVE GEAR REAR BEARING

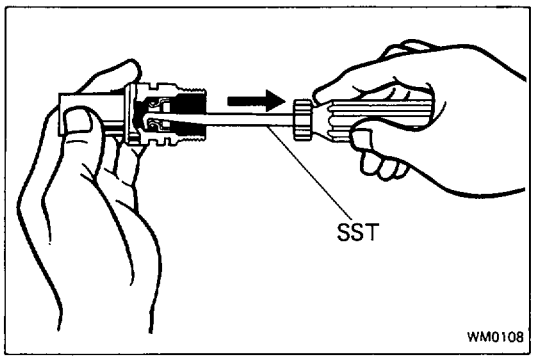
(a) Using SST, remove the bearing.

SST 09612-30012



(b) Using SST, press in a new bearing.

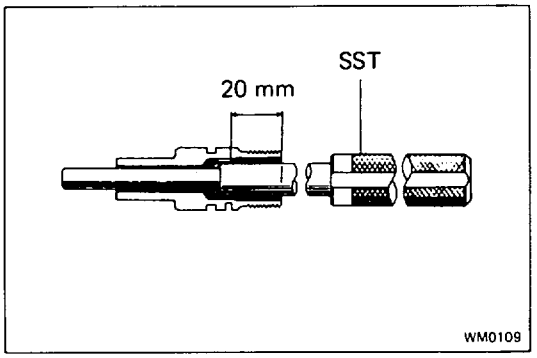
SST 09310-35010



12. IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, pull out the oil seal.

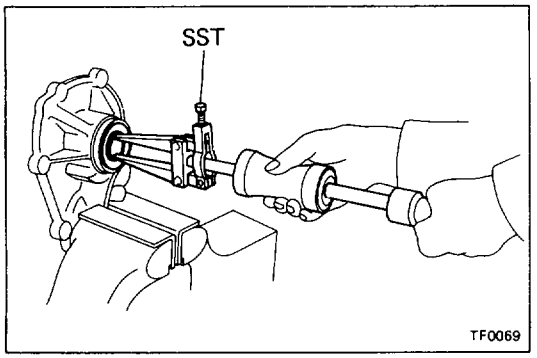
SST 09921-00010



(b) Using SST, drive a new oil seal into the sleeve.

SST 09201-60011

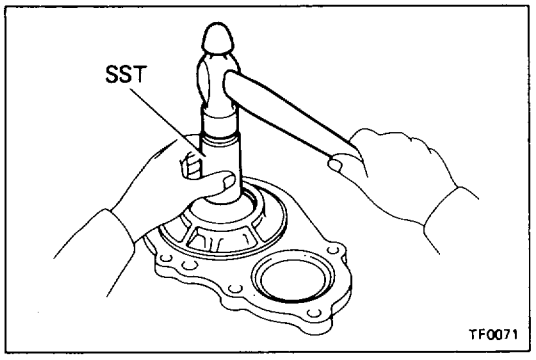
Oil seal depth: 20 mm (0.79 in.)



13. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using SST, remove the two oil seals.

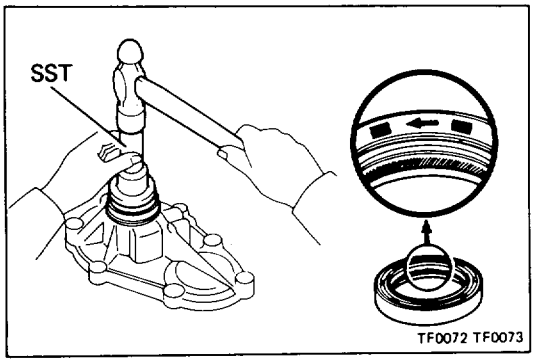
SST 09308-00010



(b) Using SST, drive in a new oil seal.

SST 09310-35010

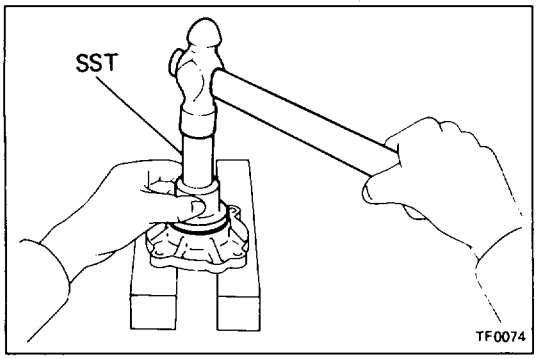
NOTE: When assembling a new oil seal for the oil pump screw, position the flat surface upward.



(c) Using SST, drive in a new oil seal.

SST 09325-20010

NOTE: Take note of the groove direction and be careful not to interchange this seal with the front drive gear oil seal. This oil seal has one arrow mark pointing counterclockwise to distinguish it from the front drive gear oil seal.

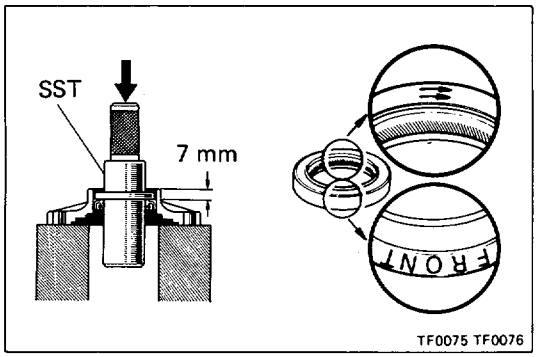


14. IF NECESSARY, REPLACE FRONT DRIVE GEAR OIL SEAL

(a) Using SST, drive out the oil seal and dust cover.

SST 09325-20010

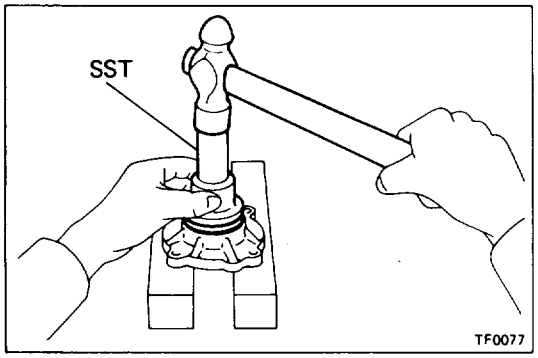
NOTE: Place the bearing retainer on something soft such as wooden blocks.



(b) Using SST, drive in a new oil seal to a depth of 7 mm (0.28 in.) from the end.

SST 09325-20010

NOTE: Take note of the groove direction and be careful not to interchange this seal with the output shaft oil seal. This oil seal has two arrow marks pointing clockwise and the word FRONT to distinguish it from the output shaft.



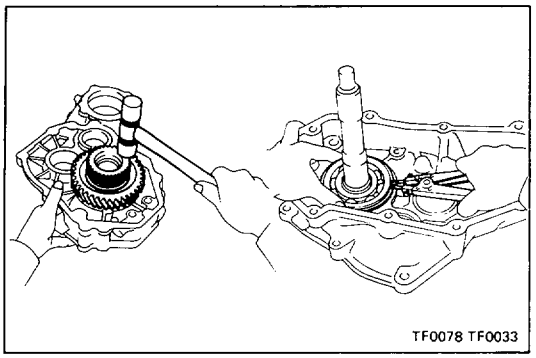
(c) Using SST, drive in a new dust cover.

SST 09325-20010

15. INSPECT TRANSFER INDICATOR SWITCH

Using an ohmmeter, check the continuity between both terminals when the plunger is pushed in.

If there is no continuity, replace the switch.


TF0078 TF0033

ASSEMBLY OF TRANSFER

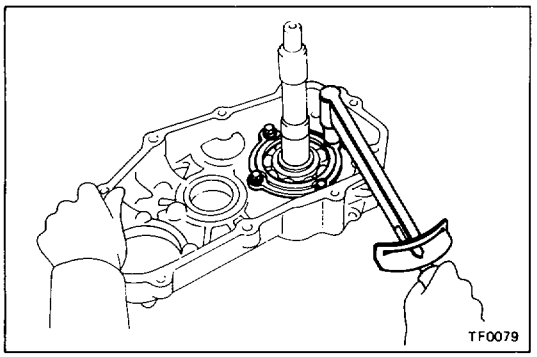
(See pages TF-5, 6)

1. INSTALL OUTPUT SHAFT TO FRONT CASE

(a) Using a plastic hammer, install the output shaft to the front case.

NOTE: Place the front case on something soft such as wooden blocks.

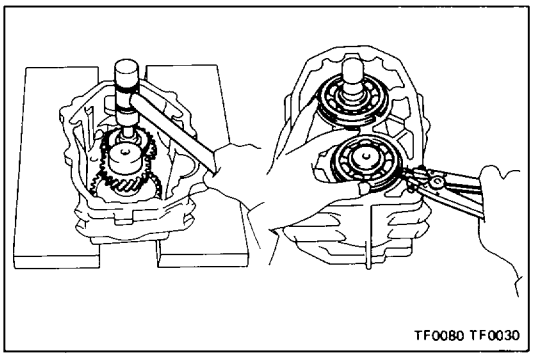
(b) Using snap ring pliers, install the snap ring.


TF0079

2. INSTALL BEARING RETAINER TO FRONT CASE

Install the bearing retainer with four bolts. Torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

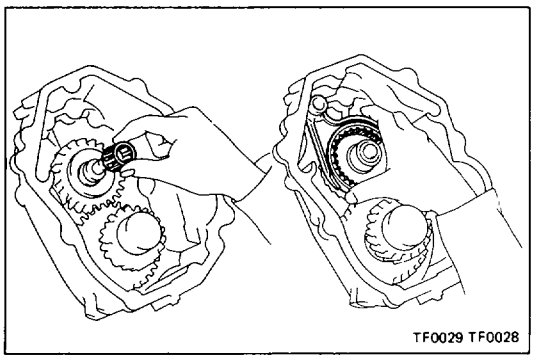

TF0080 TF0030

3. INSTALL INPUT GEAR AND COUNTER GEAR TO REDUCTION GEAR CASE

(a) Using a plastic hammer, install the input gear and counter gear to the reduction gear case.

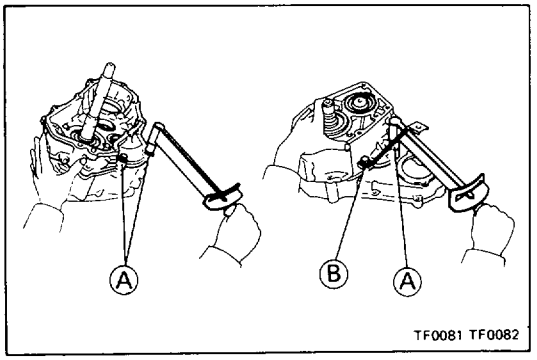
NOTE: Place the reduction gear case on something soft such as wooden blocks.

(b) Using snap ring pliers, install the snap rings.


TF0029 TF0028

4. INSTALL ROLLER BEARING ON INPUT SHAFT

5. INSTALL NO.2 HUB SLEEVE AND NO.2 SHIFT FORK ON INPUT SHAFT



TF0081 TF0082

6. INSTALL REDUCTION GEAR CASE WITH NEW GASKET TO FRONT CASE

(a) Place a new gasket on the front case.

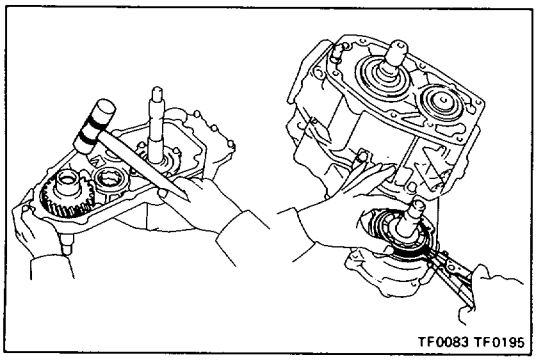
(b) Install the reduction gear case together with the input gear and counter gear.

(c) Install and torque the bolts as shown in the figure.

Torque:

Ⓐ Bolt length 47 mm (1.85 in.)
400 kg-cm (29 ft-lb, 39 N·m)

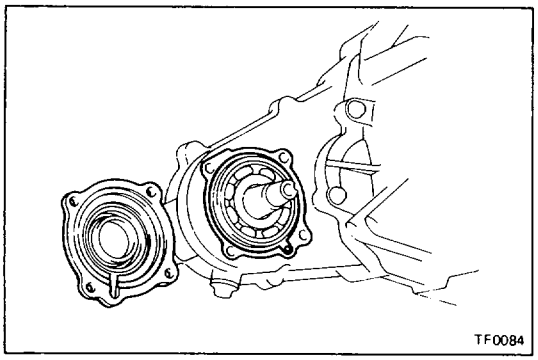
Ⓑ Bolt length 49 mm (1.93 in.)
400 kg-cm (29 ft-lb, 39 N·m)



7. INSTALL FRONT DRIVE GEAR

(a) Using a plastic hammer, install the front drive gear.

(b) Using snap ring pliers, install the snap ring.

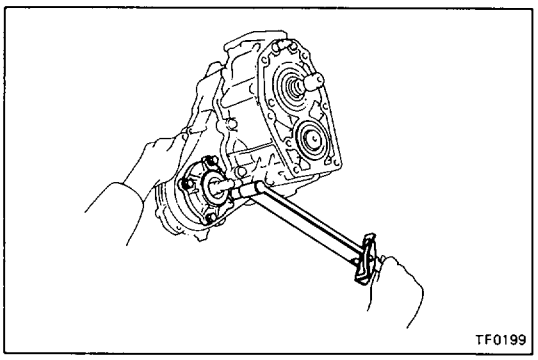


8. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place a new gasket on the front case.

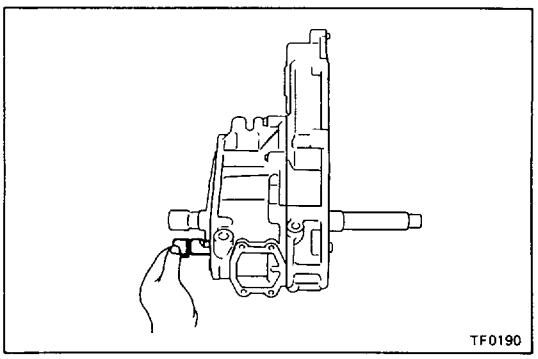
(b) Apply MP grease to the oil seal.

(c) Install the bearing retainer.



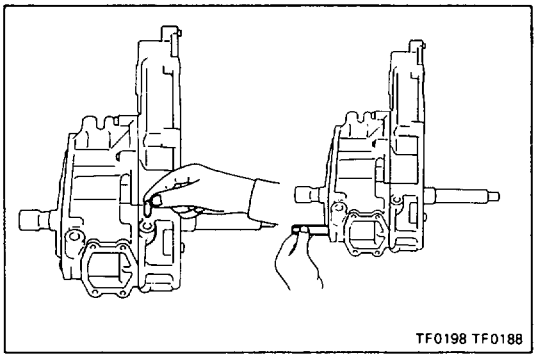
(d) Install and torque the bolts.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)



9. INSTALL HIGH-LOW SHIFT FORK SHAFT

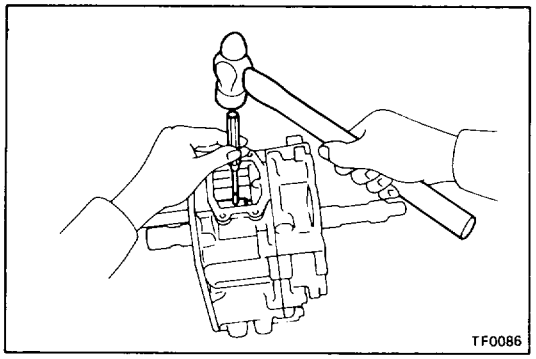
Insert the high-low shift fork shaft to No.2 shift fork.



10. INSTALL INTERLOCK PIN AND FRONT DRIVE SHIFT FORK SHAFT

(a) Install the interlock pin.

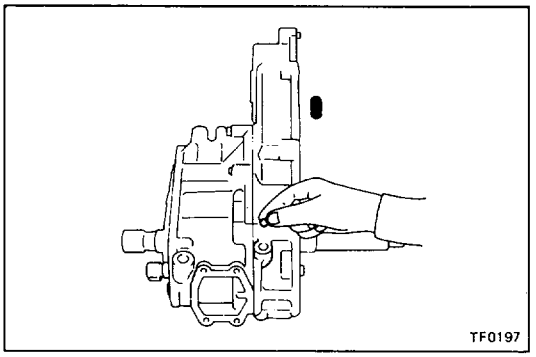
(b) Install the front drive shift fork shaft with the two grooves facing outward.



11. INSTALL SLOTTED SPRING PIN

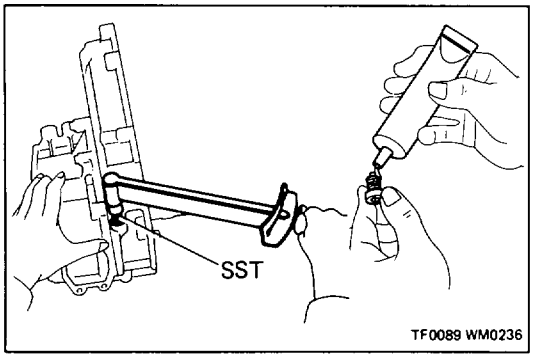
(a) Align slotted spring hole in the fork with the hole in the shaft.

(b) Using a pin punch and hammer, drive in the two slotted spring pins.



12. INSTALL TWO BALLS, SPRINGS AND PLUGS

(a) Install the ball and spring.



(b) Apply liquid sealer to the plug threads.

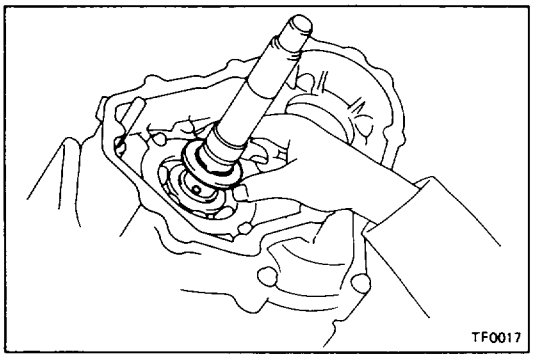
Sealant: Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Using SST, install and torque the plug.

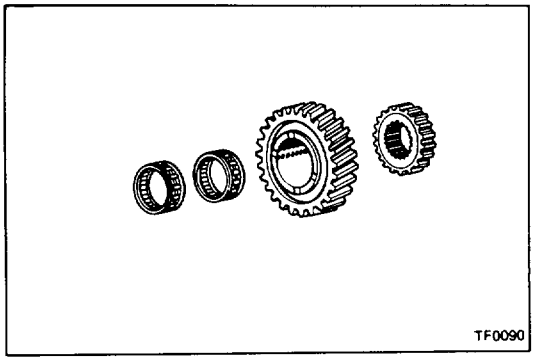
SST 09313-30021

Torque: 120 kg-cm (9 ft-lb, 12 N·m)

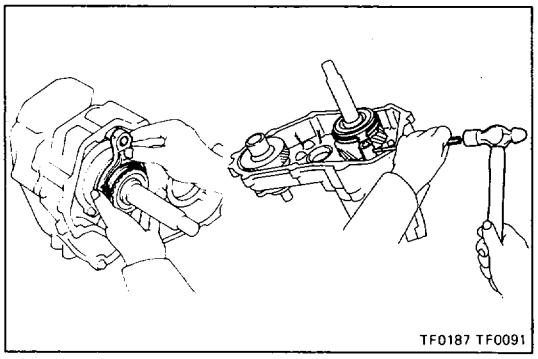
(d) Install the ball, spring and plug to the opposite side.



13. INSTALL LOCKING BALL AND NO.2 SPACER



14. INSTALL NEEDLE ROLLER BEARINGS, TRANSFER LOW GEAR AND CLUTCH HUB

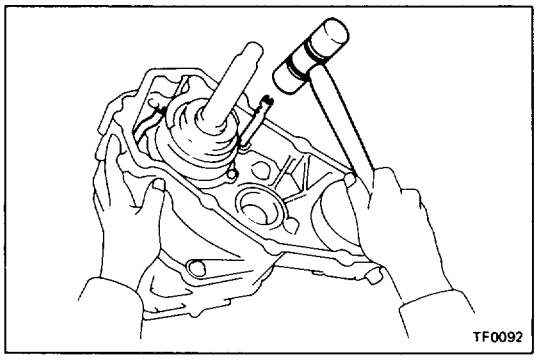


15. INSTALL NO.1 SHIFT FORK AND HUB SLEEVE

(a) Install No.1 shift fork together with the hub sleeve to the front drive shift fork shaft.

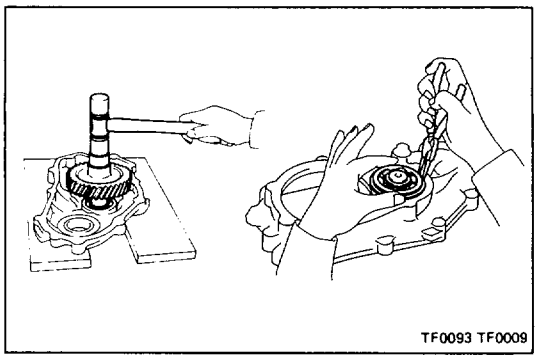
(b) Align the slotted pin hole in the fork with the hole in the shaft.

(c) Using a pin punch and hammer, install the slotted spring pin.



16. INSTALL OIL PIPES

Install the two oil pipes with the cutout side positioned upward.

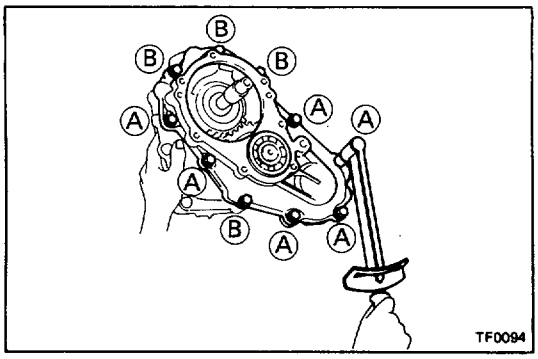


17. INSTALL IDLER GEAR TO REAR CASE

(a) Using a plastic hammer, install the idler gear to the rear case.

NOTE: Place the rear case on something soft such as wooden blocks.

(b) Using snap ring pliers, install the snap ring.



18. INSTALL REAR CASE WITH NEW GASKET

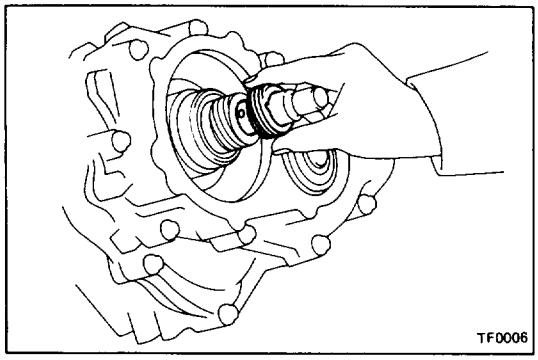
(a) Place a new gasket on the front case.

(b) Install the rear case together with the idler gear.

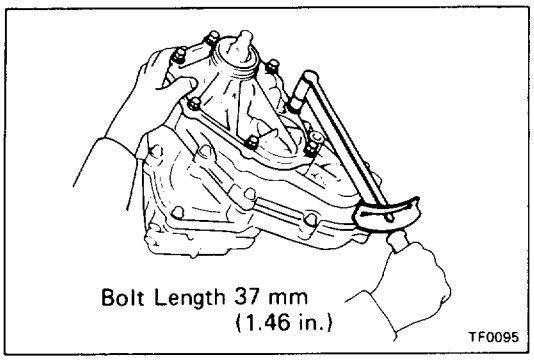
(c) Install and torque the bolts as shown in the figure.

Torque:

Ⓐ	**Bolt length**	**47 mm (1.85 in.)** **400 kg-cm (29 ft-lb, 39 N·m)**
Ⓑ	**Bolt length**	**112 mm (4.41 in.)** **400 kg-cm (29 ft-lb, 39 N·m)**



19. INSTALL BEARING, OIL PUMP SCREW, LOCKING BALL AND SPEEDOMETER DRIVE GEAR



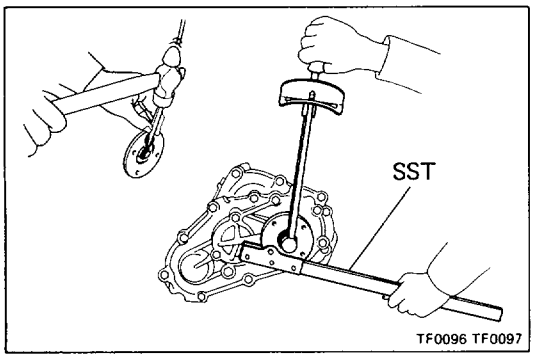
20. INSTALL EXTENSION HOUSING WITH NEW GASKET

(a) Place a new gasket to the rear case.

(b) Apply MP grease to the two oil seals.

(c) Install the extension housing with seven bolts. Torque the bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



21. INSTALL REAR COMPANION FLANGE

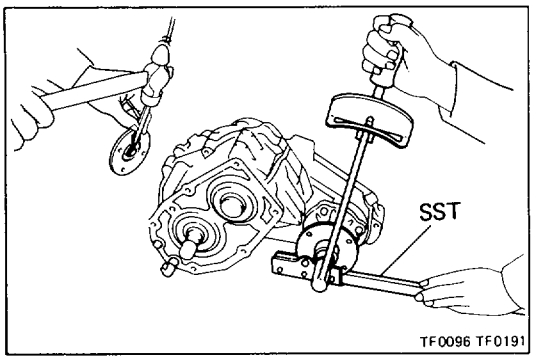
(a) Install the companion flange to the output shaft.

(b) Using SST to hold the flange, install the washer and nut. Torque the nut.

SST 09330-00021

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

(c) Stake the nut.



22. INSTALL FRONT COMPANION FLANGE

(a) Install the companion flange to the front drive gear.

(b) Using SST to hold the flange, install the washer and nut. Torque the nut.

SST 09330-00021

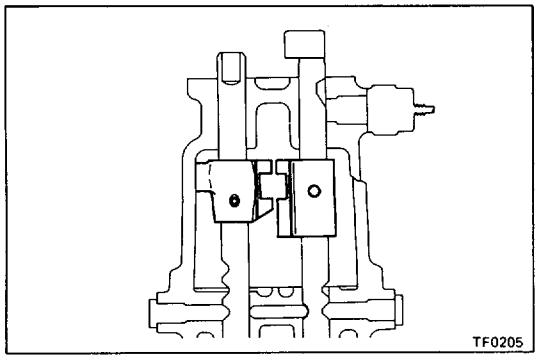
Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

(c) Stake the nut.

23. INSTALL TRANSFER INDICATOR SWITCH WITH WASHER

24. INSTALL SPEEDOMETER DRIVEN GEAR

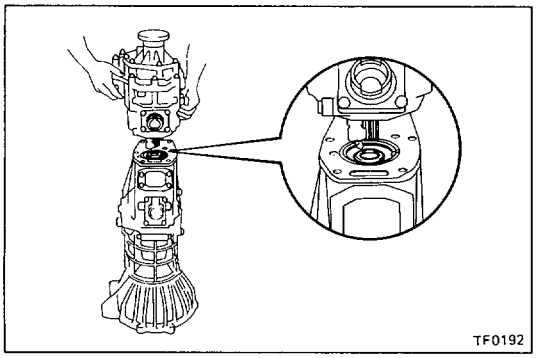
Secure the gear with the lock plate and bolt.



INSTALLATION OF TRANSFER

1. **INSTALL TRANSFER AND PROPELLER SHAFT UPPER DUST COVER TO TRANSMISSION WITH NEW GASKET**

(a) Shift the two shift fork shafts to the high-four position.

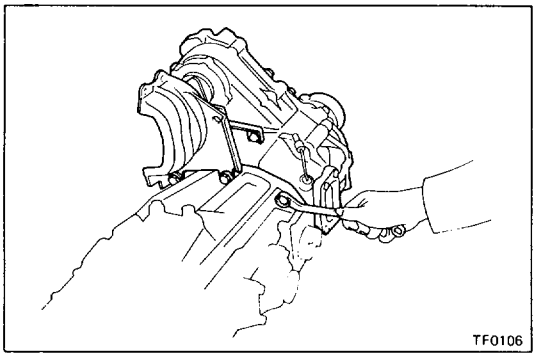


(b) Apply MP grease to the adaptor oil seal.

(c) Place a new gasket to the transfer adaptor.

(d) Install the transfer to the transmission.

NOTE: Take care not to damage the oil seal by the input gear spline when installing the transfer.

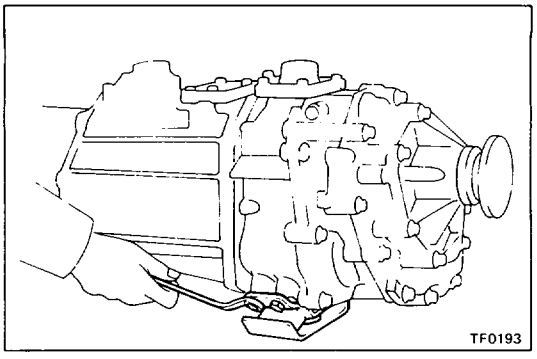


(e) Install and torque the bolts with the propeller shaft upper dust cover.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

(f) Install the dust cover bolt to the bracket.

NOTE: There are two bolt lengths, 43 mm (used for the dust cover) and 39 mm.



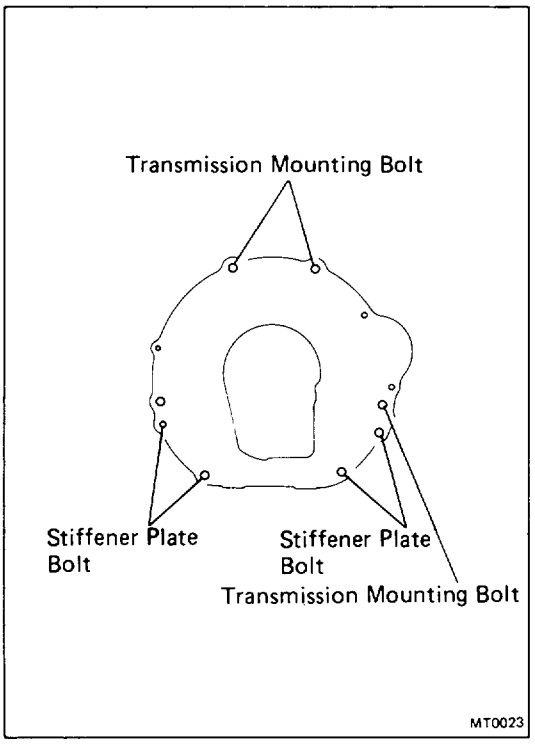
2. **INSTALL ENGINE REAR MOUNTING**

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

3. **PLACE TRANSMISSION WITH TRANSFER AT INSTALLATION POSITION**

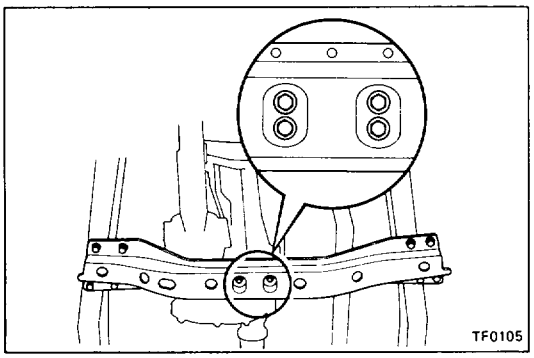
(a) Support the transmission with a jack.

(b) Align the input shaft spline with the clutch disc, and push the transmission with the transfer fully into position.



4. **INSTALL TRANSMISSION BOLTS AND STIFFENER BOLTS**

Torque:
Transmission mounting bolt
730 kg-cm (53 ft-lb, 72 N·m)
Stiffener plate bolt
380 kg-cm (27 ft-lb, 37 N·m)



5. **INSTALL NO.2 FRAME CROSSMEMBER**

(a) Raise the transmission slightly with a jack.

(b) Install the No.2 frame crossmember to the side frame with the bolts. Torque the bolts.

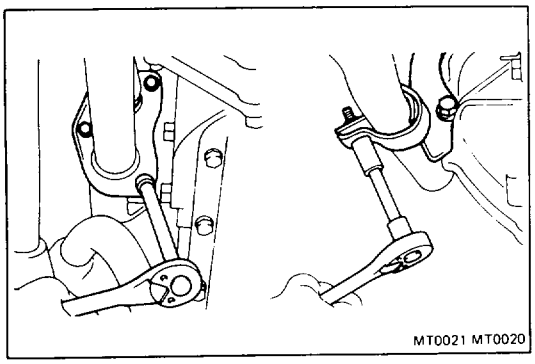
Torque: 970 kg-cm (70 ft-lb, 95 N·m)

(c) Lower the transmission and transfer.

(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

6. **REMOVE PIECE OF WOOD FROM FRONT AXLE**



7. **INSTALL EXHAUST PIPE, BRACKET AND CLAMP**

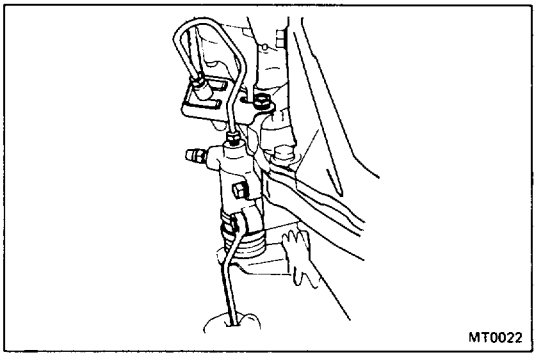
(a) Install the exhaust pipe to the manifold.

Torque: 630 kg-cm (46 ft-lb, 62 N·m)

(b) Install the pipe bracket to the clutch housing. Torque the bolts.

Torque: Upper 380 kg-cm (27 ft-lb, 37 N·m)
Lower 700 kg-cm (51 ft-lb, 69 N·m)

(c) Install the exhaust pipe clamp.



8. INSTALL STARTER LOWER MOUNTING BOLT AND RELEASE CYLINDER TUBE BRACKET

9. INSTALL CLUTCH RELEASE CYLINDER
   Torque: 120 kg-cm (9 ft-lb, 12 N·m)

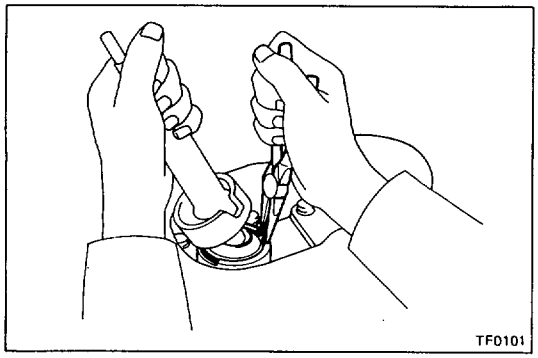
10. CONNECT SPEEDOMETER CABLE, BACK-UP LIGHT SWITCH CONNECTOR AND TRANSFER INDICATOR SWITCH CONNECTOR

11. CONNECT PROPELLER SHAFT
    (See page PR-11)

12. FILL TRANSMISSION AND TRANSFER WITH OIL
    Oil grade: API GL-4 or GL-5
    Viscosity: SAE 75W-90 or 80W-90
    Capacity:
    Transmission 3.0 liters (3.2 US qts, 2.6 Imp. qts)
    Transfer 1.6 liters (1.7 US qts, 1.4 Imp. qts)

13. LOWER VEHICLE

14. INSTALL STARTER UPPER MOUNTING NUT



15. INSTALL TRANSFER SHIFT LEVER
    (a) Apply MP grease to the transfer shift lever.
    (b) Using pliers, install the shift lever.

16. **INSTALL TRANSMISSION SHIFT LEVER**
    (a) Apply MP grease to the transmission shift lever.
    (b) Install the shift lever with four bolts, and install the shift lever boot and retainer with six screws.

    Torque: 130 kg-cm (9 ft-lb, 13 N·m)

17. **CONNECT BATTERY CABLE TO NEGATIVE TERMINAL**

18. **PERFORM ROAD TEST**
    Check for abnormal noise and smooth operation.

TRANSFER (AT)

(See AT Section)

PROPELLER SHAFT

	Page
PRECAUTION	PR-2
TROUBLESHOOTING	PR-2
PROPELLER SHAFT	PR-2

PRECAUTION

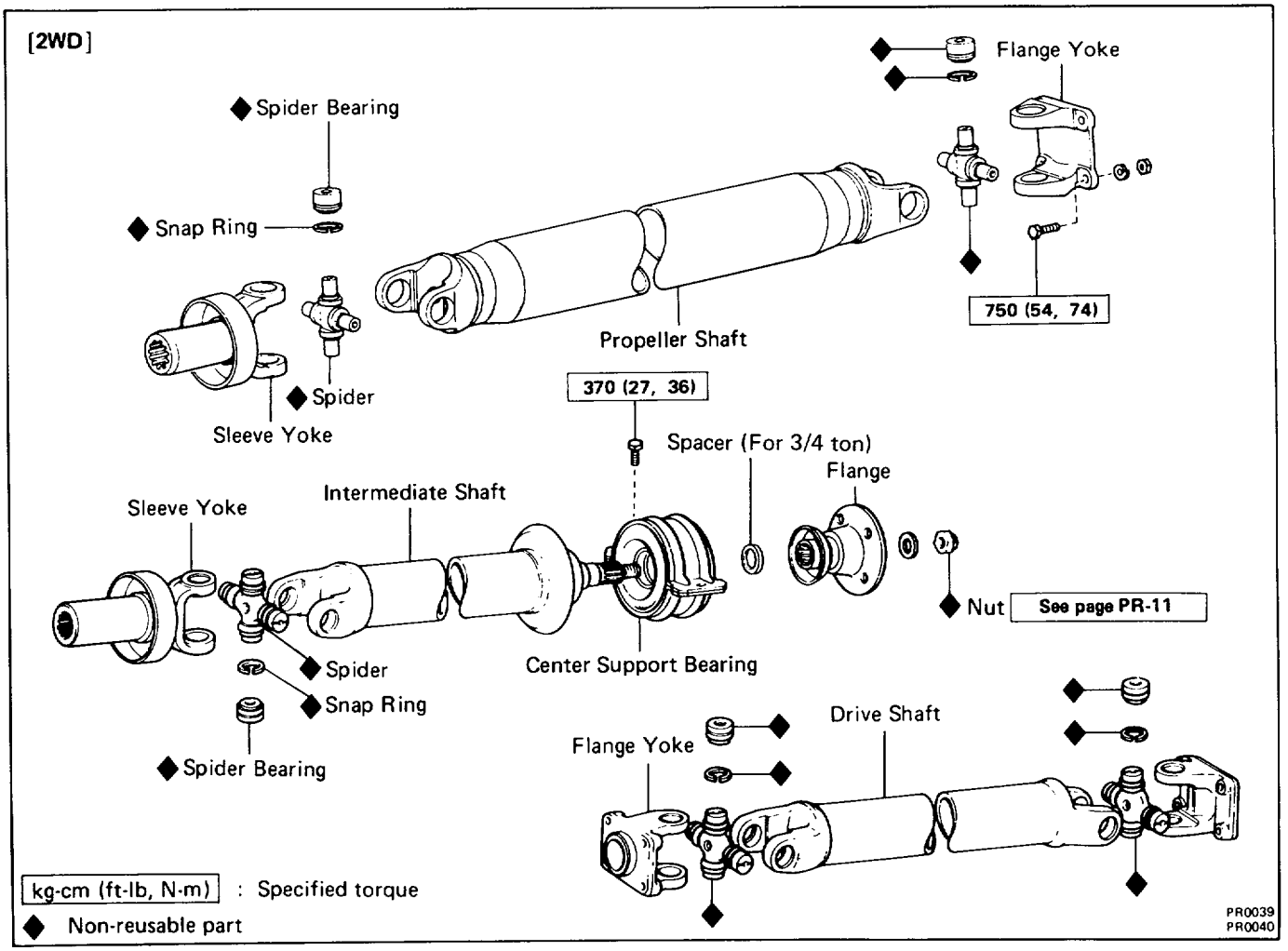
Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Noise	Sleeve yoke spline worn	Replace sleeve yoke	PR-6, 8
	Center bearing worn	Replace center bearing	PR-6
	Spider bearing worn or stuck	Replace spider bearing	PR-8
Vibration	Propeller shaft runout	Replace propeller shaft	PR-3
	Propeller shaft imbalance	Balance propeller shaft	
	Transmission extension housing rear bushing worn	Replace bushing	MT-3
	Sleeve yoke spline stuck	Replace sleeve yoke	PR-6, 8

PROPELLER SHAFT

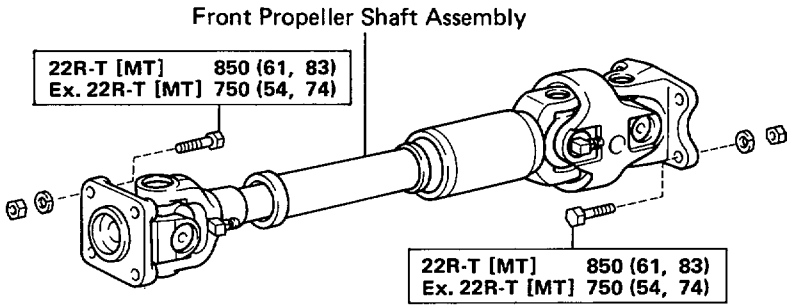
COMPONENTS



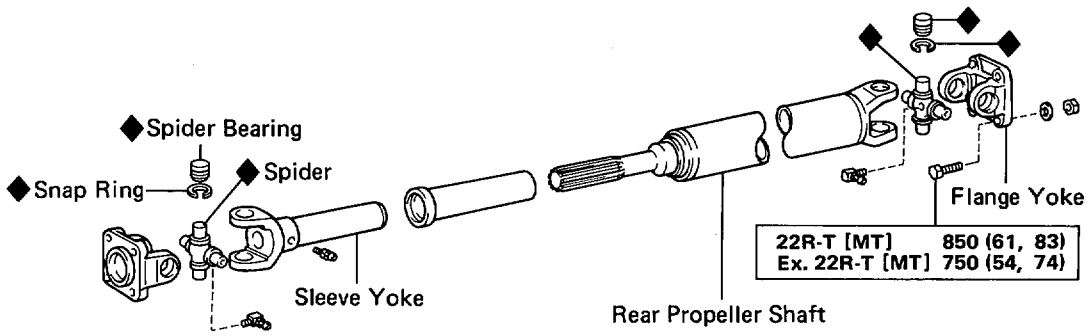
COMPONENTS (Cont'd)

[4WD]

Front Propeller Shaft



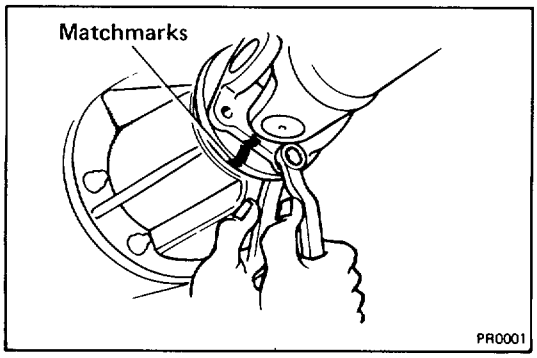
Rear Propeller Shaft



kg-cm (ft-lb, N-m) : Specified torque

◆ Non-reusable part

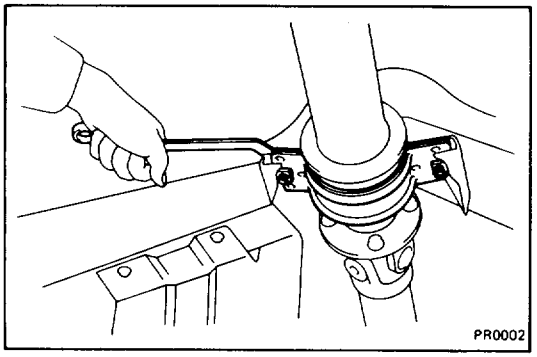
PR0043
PR0042



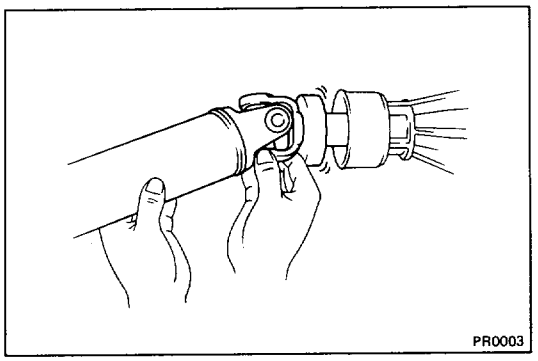
REMOVAL OF PROPELLER SHAFT

(2WD)

1. **DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL**
   (a) Put matchmarks on the flanges.
   (b) Remove the four bolts and nuts.

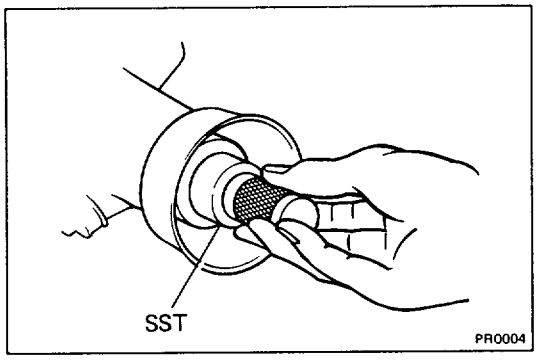


2. **REMOVE CENTER SUPPORT BEARING FROM FRAME CROSSMEMBER (THREE-JOINT TYPE)**

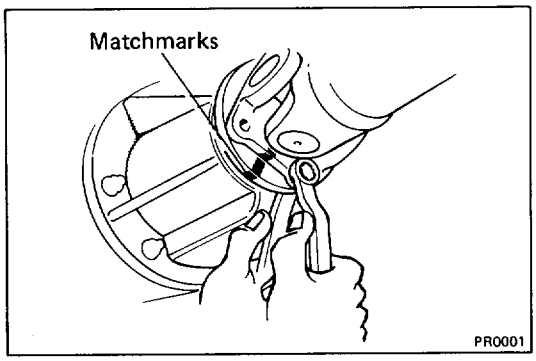


3. **REMOVE PROPELLER SHAFT FROM TRANSMISSION**

(a) Pull the yoke from the transmission.



(b) Insert SST in the transmission to prevent oil leakage.
SST 09325-20010

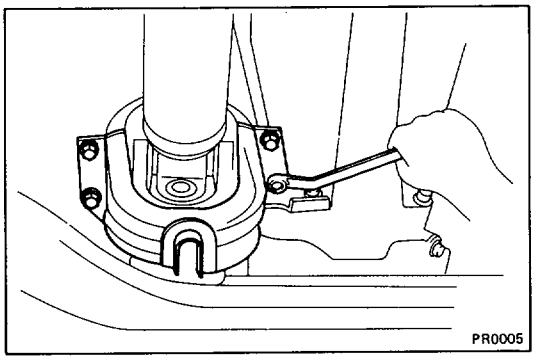


(4WD)

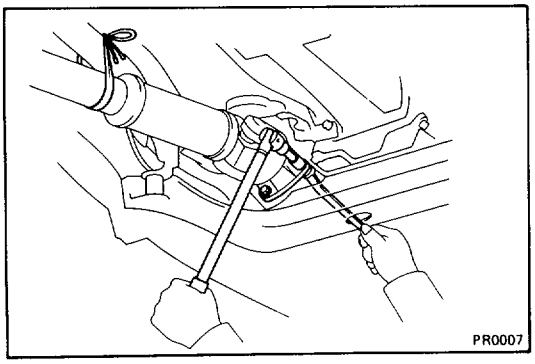
1. **DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON FRONT DIFFERENTIAL**

(a) Put matchmarks on the flanges.

(b) Remove the four bolts and nuts.



2. **REMOVE FRONT PROPELLER SHAFT NO.2 DUST COVER**



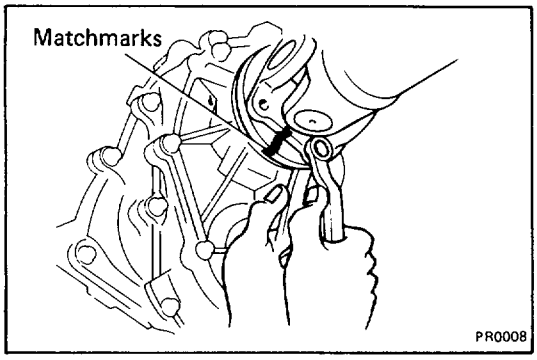
3. **REMOVE FRONT PROPELLR SHAFT**

(a) Suspend the front side of the propeller shaft to the exhaust pipe.

(b) Put matchmarks on the flanges.

(c) Remove the four bolts and nuts.

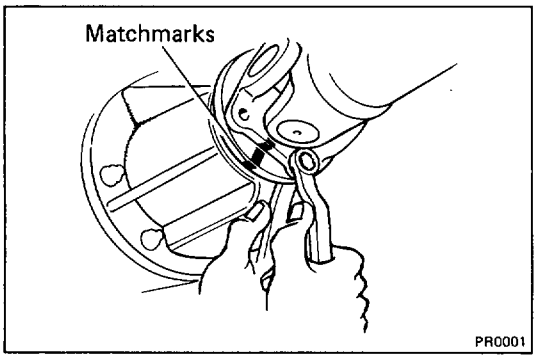
(d) Remove the front propeller shaft.



4. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER

(a) Put matchmarcks on the flanges.

(b) Remove the four bolts and nuts.

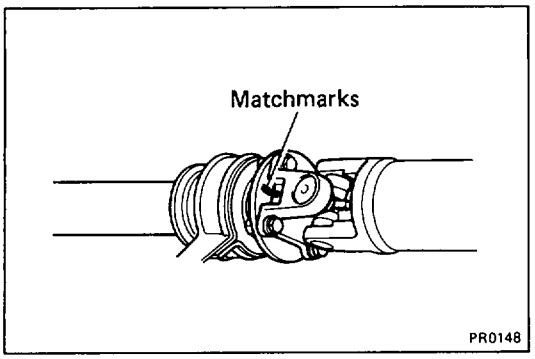


5. REMOVE REAR PROPELLER SHAFT

(a) Put matchmarks on the flanges.

(b) Remove the four bolts and nuts.

(c) Remove the rear propeller shaft.

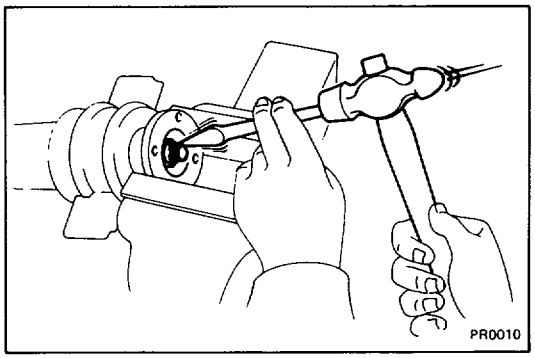


DISASSEMBLY OF PROPELLER SHAFT

1. SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

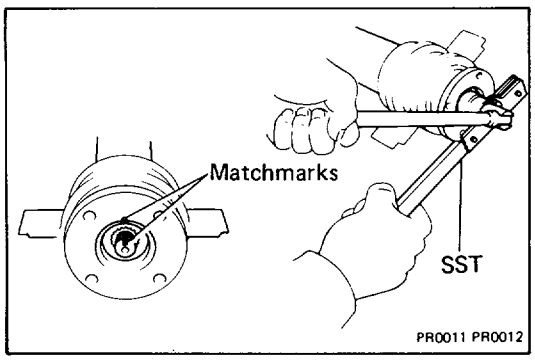
(a) Put matchmarks on the flanges.

(b) Remove the four bolts and nuts.



2. REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

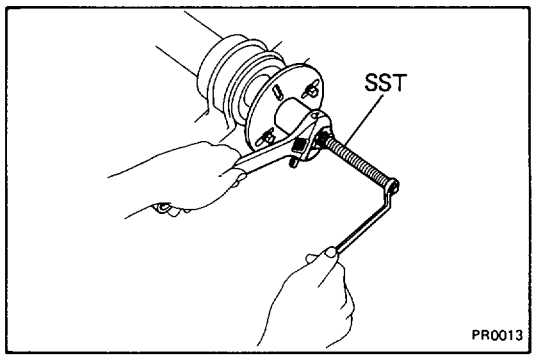
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.

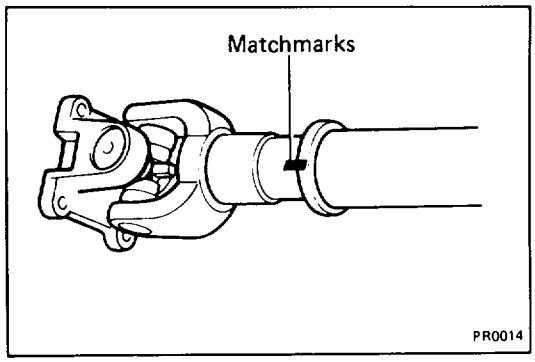
SST 09330-00021

(c) Put matchmarks on the flange and shaft.



(d) Using SST, remove the flange from the intermediate shaft.

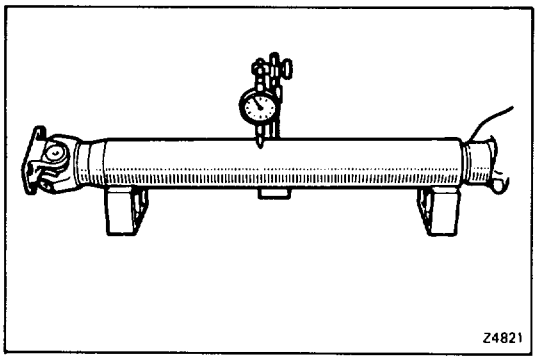
SST 09557-22022



3. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT (4WD)

(a) Place matchmarks on the sleeve yoke and shaft.

(b) Pull out the sleeve yoke from the shaft.

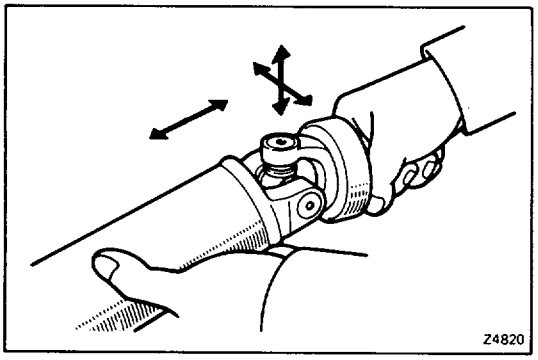


INSPECTION OF PROPELLER SHAFT COMPONENTS

1. INSPECT PROPELLER AND INTERMEDIATE SHAFTS FOR DAMAGE OR RUNOUT

If shaft runout is greater than maximum, replace the shaft.

Maximum runout: 0.8 mm (0.031 in.)



2. INSPECT SPIDER BEARINGS

(a) Inspect the spider bearings for wear or damage.

(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

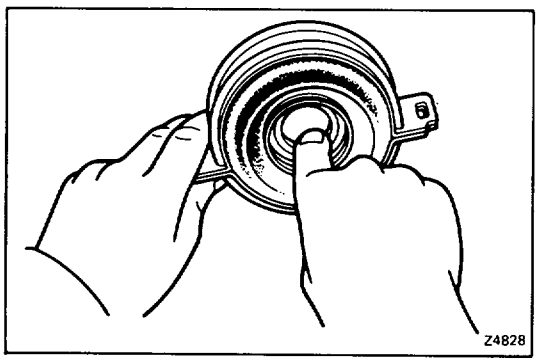
Bearing axial play:

Ex.Front propeller shaft	**Less than 0.05 mm (0.0020 in.)**

If necessary, replace the spider bearing.

Front propeller shaft	**Less than 0.05 mm (0.0020 in.)**

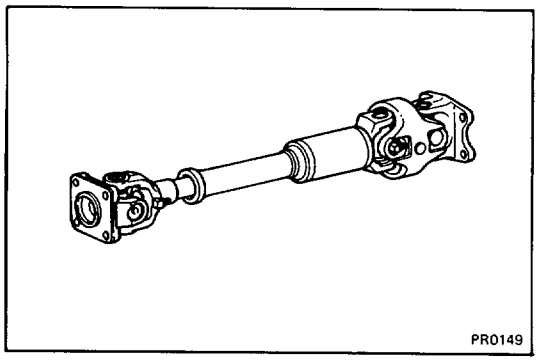
If necessary, replace the propeller shaft.



3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn freely, replace it.



4. INSPECT FRONT PROPELLER SHAFT

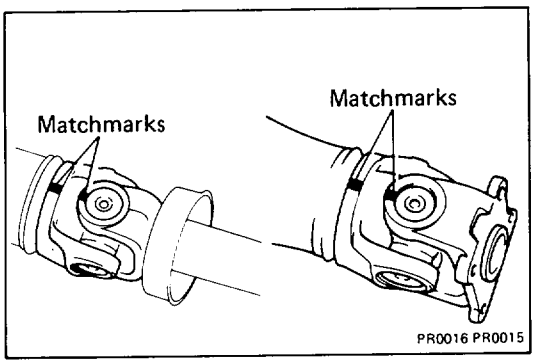
(a) Inspect the shaft for wear or damage.

(b) Inspect the double cardan joint for wear or damage.

NOTE: If any problem is found, replace the front propeller shaft assembly.

REPLACEMENT OF SPIDER BEARING

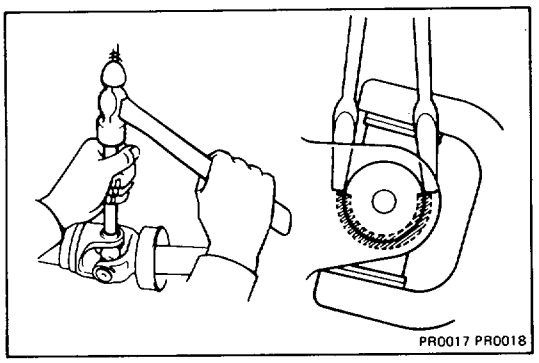
1. PLACE MATCHMARKS ON SHAFT AND YOKE



2. REMOVE SNAP RINGS

(a) Slightly tap in the bearing outer races.

(b) Using two screwdrivers, remove the four snap rings from the grooves.

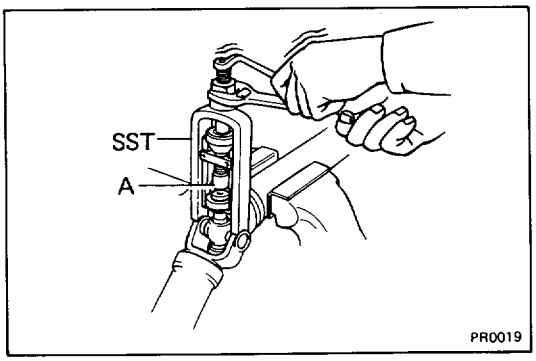


3. REMOVE SPIDER BEARINGS

(a) Using SST, push out the bearing from the propeller shaft.

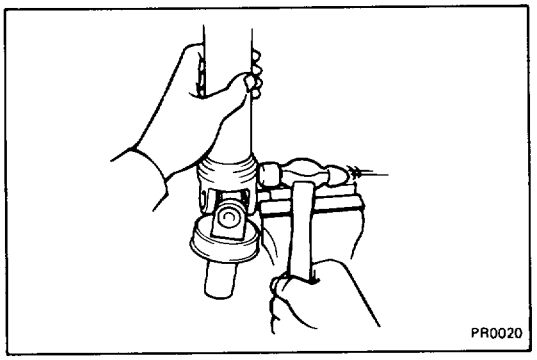
SST 09332-25010

NOTE: Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.



(b) Clamp the bearing outer race in a vise and tap off the propeller shaft with a hammer.

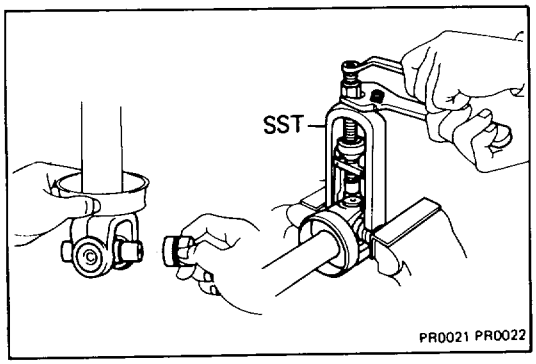
NOTE: Remove the bearing on the opposite side in the same procedure.

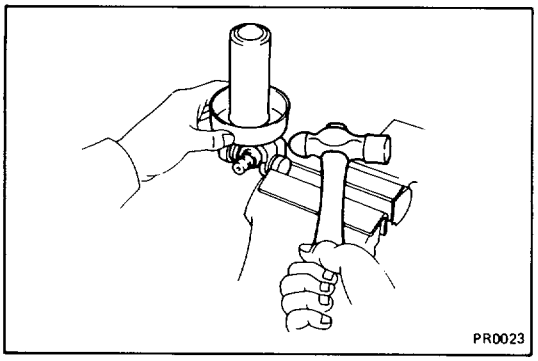


(c) Install the two removed bearing outer races to the spider.

(d) Using SST, push out the bearing from the yoke.

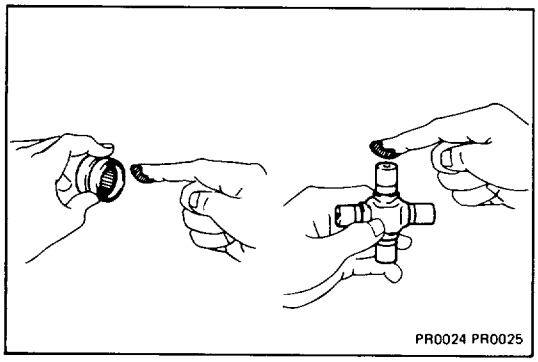
SST 09332-25010





(e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

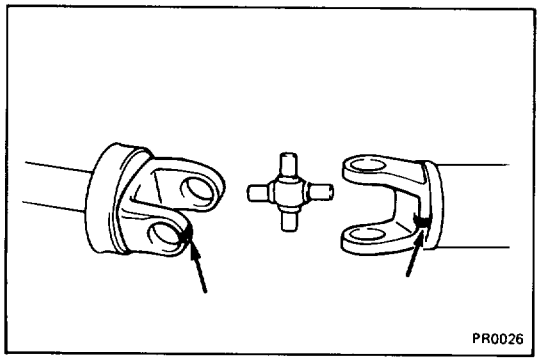
NOTE: Remove the bearing on the opposite side in the same procedure.



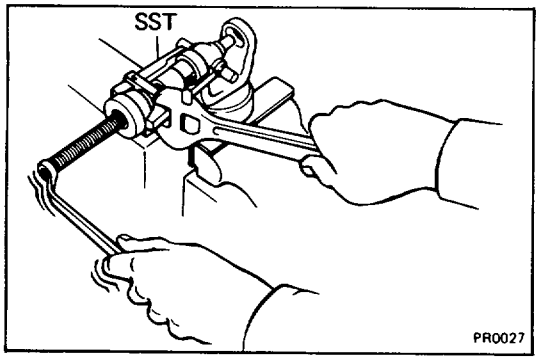
4. INSTALL SPIDER BEARINGS

(a) Apply MP grease to the spider and bearings.

NOTE: Be careful not to apply too much grease.



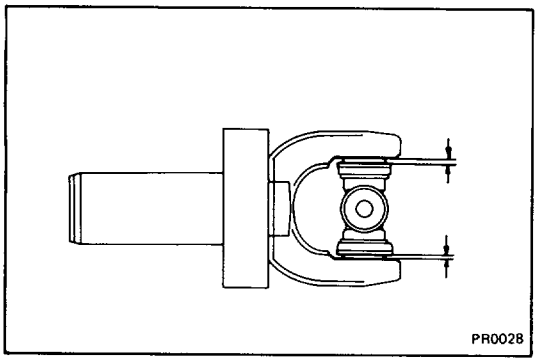
(b) Align the matchmarks on the yoke and shaft.



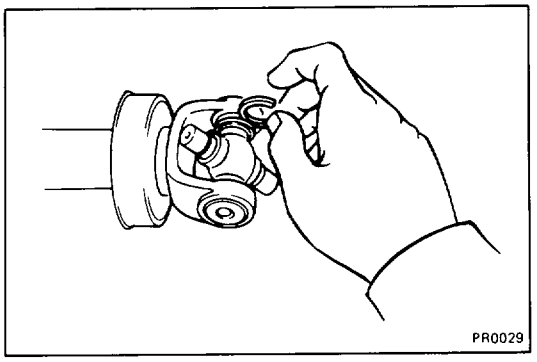
(c) Fit the new spider into the yoke.

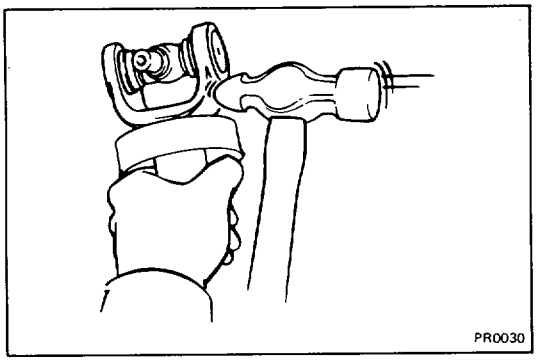
(d) Using SST, install the new bearings on the spider.

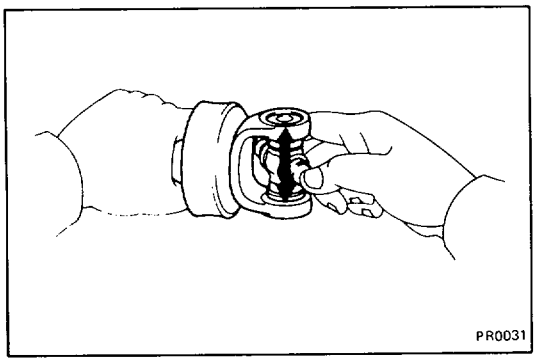
SST 09332-25010



(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths.







5. INSTALL SNAP RINGS

(a) Install two snap rings of equal thickness which will allow 0 — 0.05 mm (0 — 0.0020 in.) axial play.

NOTE: Do not reuse the snap rings.

Thickness of snap ring

	Color	Thickness mm (in.)
RN50L-KRA	—	2.375—2.425 (0.0935—0.0955)
	Brown	2.425—2.475 (0.0955—0.0974)
	Blue	2.475—2.525 (0.0974—0.0994)
Ex. RN50L-KRA	—	1.475—1.525 (0.0581—0.0600)
	Brown	1.525—1.575 (0.0600—0.0620)
	Blue	1.575—1.625 (0.0620—0.0640)

(b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.

6. CHECK SPIDER BEARING

(a) Check that the spider bearing moves smoothly.

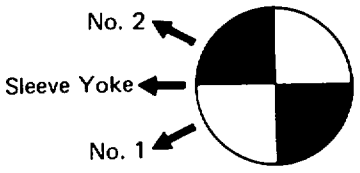
(b) Check the spider bearing axial play.

Bearing axial play: Less than 0.05 mm (0.0020 in.)

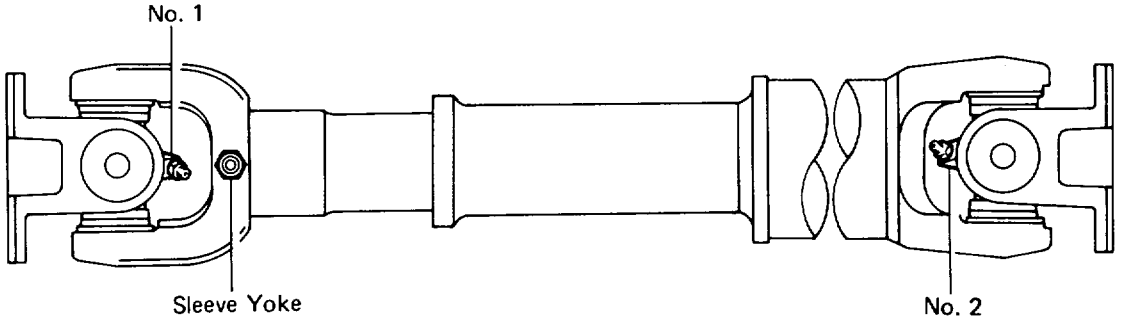
NOTE: Install new spider bearings on the shaft side in the procedure described above.

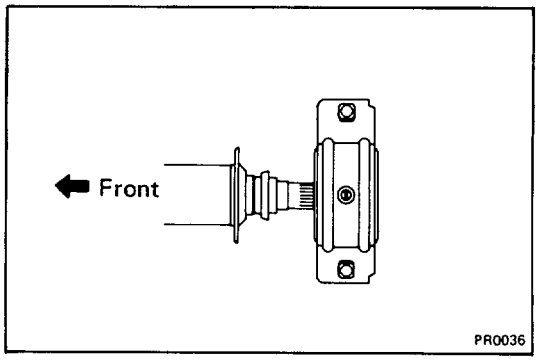
NOTE: When replacing the rear propeller shaft spider on 4WD vehicles, be sure that the grease fitting assembly hole is facing in the direction shown in the figure.

SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD REAR PROPELLER SHAFT



The figure at left shows the locations of the grease fittings as seen from the rear.

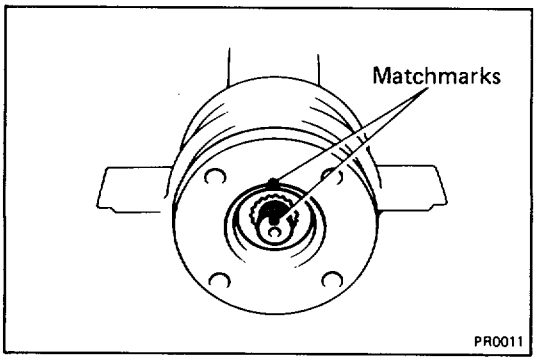




ASSEMBLY OF PROPELLER SHAFT

1. INSTALL CENTER SUPPORT BEARING ON INTERMEDIATE SHAFT

NOTE: Install the center support bearing with the cutout toward the rear.

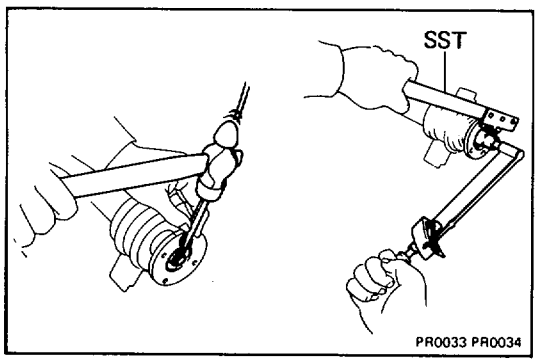


2. INSTALL FLANGE ON INTERMEDIATE SHAFT

(a) Coat the splines of the intermediate shaft with MP grease.

(b) Place the flange on the shaft and align the matchmarks.

NOTE: If replacing either the center flange or intermediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.



(c) Using SST to hold the flange, press the bearing into position by tightening down a new nut.

SST 09330-00021

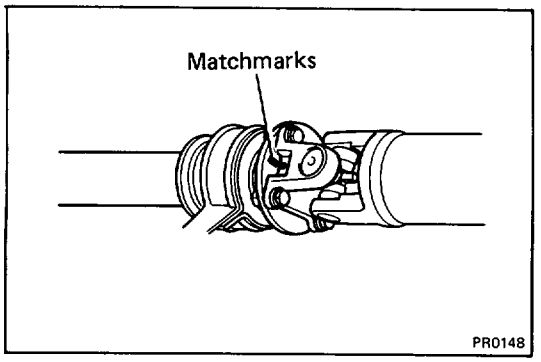
Torque: 1,850 kg-cm (134 ft-lb, 181 N·m)

(d) Loosen the nut.

(e) Torque the nut again.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

(f) Using a hammer and punch, stake the nut.



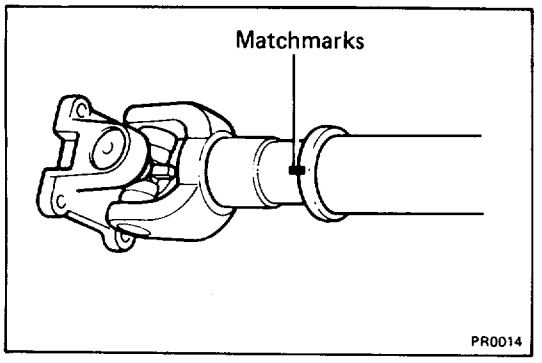
3. INSTALL PROPELLER SHAFT

(a) Align the machmarks on the flanges and connect the flanges with four bolts and nuts.

NOTE: If replacing either the center flange or intermediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

(b) Torque the bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

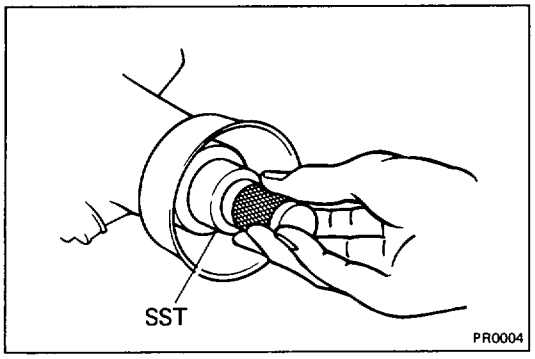


4. INSERT SLEEVE YOKE INTO PROPELLER SHAFT (4WD)

(a) Apply MP grease to the propeller shaft spline and sleeve yoke sliding surface.

(b) Align the matchmarks on the sleeve yoke and propeller shaft.

(c) Insert the sleeve yoke into the propeller shaft.



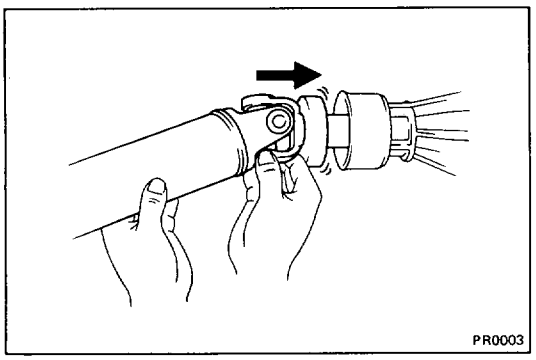
INSTALLATION OF PROPELLER SHAFT

(2WD)

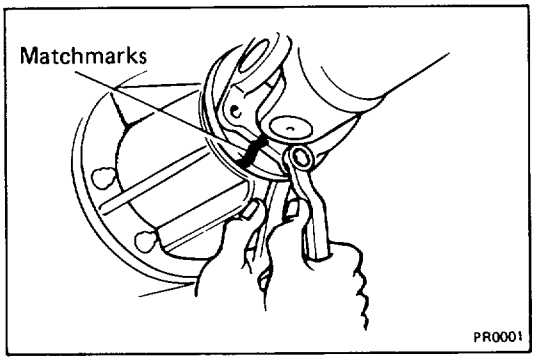
1. INSERT YOKE IN TRANSMISSION

(a) Remove SST.

SST 09325-20010



(b) Push the yoke into the transmission.

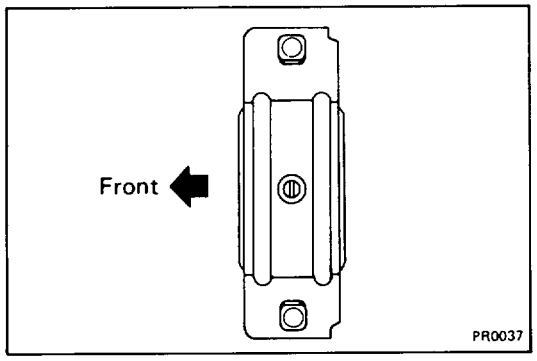


2. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

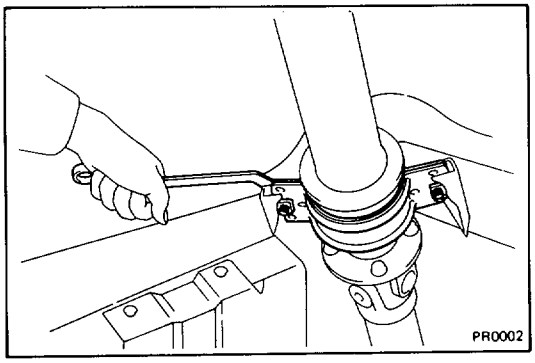


3. INSTALL CENTER SUPPORT BEARING TO FRAME CROSSMEMBER (THREE-JOINT TYPE)

(a) Install the center support bearing to the frame crossmember with two mount bolts finger tight.

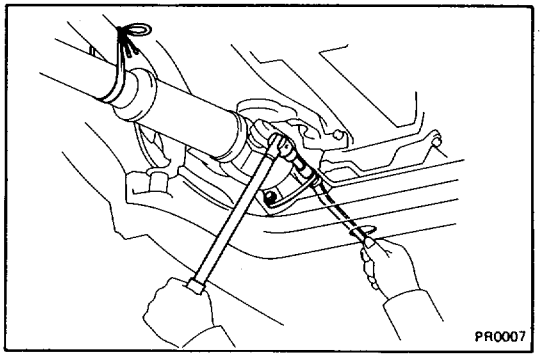
(b) Check that the bearing bracket is at right angle to the propeller shaft. Adjust the bracket if necessary.

(c) Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is in a no-load condition. Adjust the bracket if necessary.



(d) Torque the mount bolts.

Torque: 370 kg-cm (27 ft-lb, 36 N·m)



(4WD)

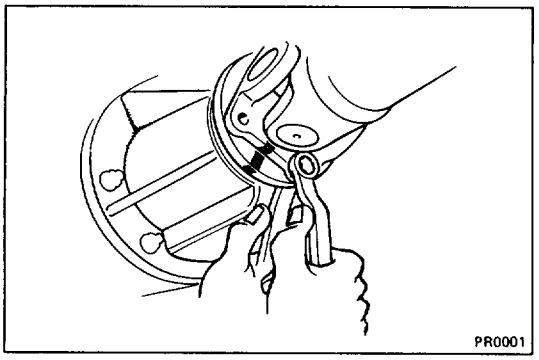
1. **CONNECT FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER**

   (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

   (b) Torque the bolts and nuts.

   Torque:

22R-T (MT)	**850 kg-cm (61 ft-lb, 83 N·m)**
Ex. 22R-T (MT)	**750 kg-cm (54 ft-lb, 74 N·m)**



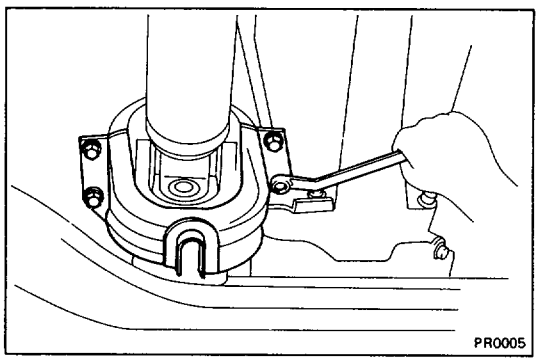
2. **CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON FRONT DIFFERENTIAL**

   (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

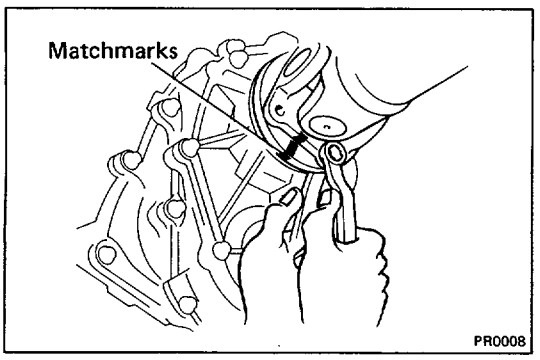
   (b) Torque the bolts and nuts.

   Torque:

22R-T (MT)	**850 kg-cm (61 ft-lb, 83 N·m)**
Ex. 22R-T (MT)	**750 kg-cm (54 ft-lb, 74 N·m)**



3. **INSTALL FRONT PROPELLER SHAFT NO.2 DUST COVER**



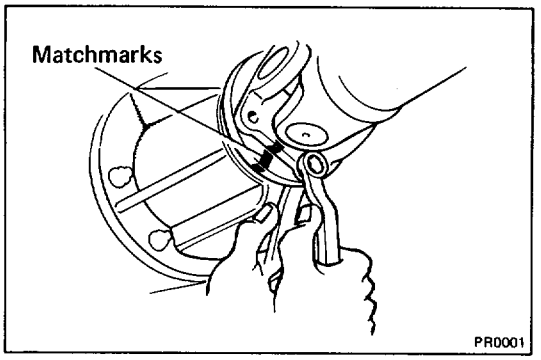
4. **CONNECT REAR PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER**

   (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

   (b) Torque the bolts and nuts.

   Torque:

22R-T (MT)	**850 kg-cm (61 ft-lb, 83 N·m)**
Ex. 22R-T (MT)	**750 kg-cm (54 ft-lb, 74 N·m)**



5. **CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON REAR DIFFERENTIAL**

   (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

   (b) Torque the bolts and nuts.

   Torque:

22R-T (MT)	**850 kg-cm (61 ft-lb, 83 N·m)**
Ex. 22R-T (MT)	**750 kg-cm (54 ft-lb, 74 N·m)**

FRONT AXLE AND SUSPENSION

(2WD) Page

TROUBLESHOOTING FA-2
FRONT WHEEL ALIGNMENT FA-3
FRONT AXLE HUB AND STEERING KNUCKLE FA-6
- Front Axle Hub FA-7
- Steering Knuckle FA-10

FRONT SUSPENSION FA-12
- Ball Joints FA-13
- Torsion Bar Spring FA-15
- Lower Suspension Arm and Shock Absorber FA-17
- Upper Suspension Arm FA-20
- Strut Bar FA-22
- Stabilizer Bar FA-23

(4WD)

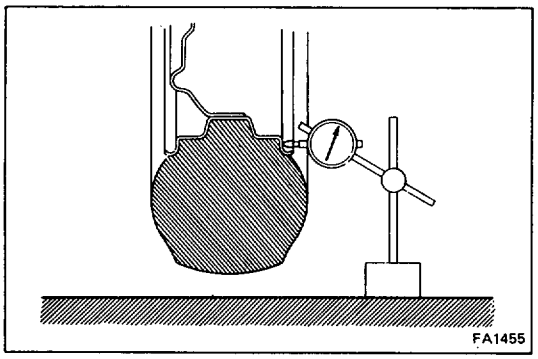
TROUBLESHOOTING FA-24
FRONT WHEEL ALIGNMENT FA-25
FREE WHEELING HUB FA-30
AUTOMATIC LOCKING HUB FA-36
FRONT AXLE HUB AND STEERING KNUCKLE FA-45
- Front Axle Hub FA-46
- Steering Knuckle FA-49

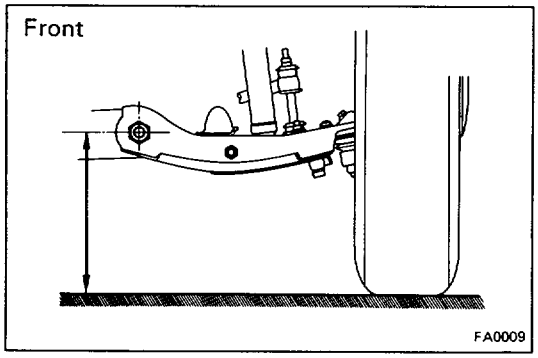
FRONT DRIVE SHAFT FA-55
FRONT DIFFERENTIAL FA-62
FRONT SUSPENSION FA-86
- Ball Joints FA-87
- Torsion Bar Spring FA-89
- Lower Suspension Arm and Shock Absorber FA-91
- Upper Suspension Arm FA-94
- Stabilizer Bar FA-97

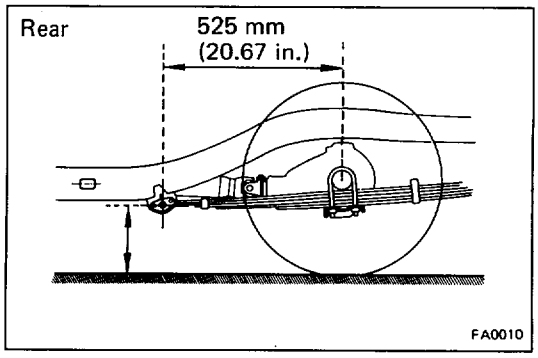
TROUBLESHOOTING (2WD)

Problem	Possible cause	Remedy	Page
Wanders/pulls	Tires worn or improperly inflated	Inflate tires to proper pressure or replace tires	FA-3
	Alignment incorrect	Check front alignment	FA-3
	Wheel bearing adjusted too tight	Adjust wheel bearing	FA-8
	Front or rear suspension parts loose or broken	Tighten or replace suspension parts	
	Steering linkage loose or worn	Tighten or replace steering linkage	SR-97
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-31, 39
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	FA-17
	Springs weak	Replace spring	FA-15
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Stabilizer bar bent or broken	Inspect stabilizer bar	FA-23
	Shock absorber worn out	Replace shock absorber	FA-17
Front wheel shimmy	Tires worn or improperly inflated	Replace tire or inflate tires to proper pressure	FA-3
	Wheels out of balance	Balance wheels	
	Shimmy damper worn out	Replace steering damper	SR-101
	Shock absorber worn out	Replace shock absorber	FA-17
	Alignment incorrect	Check front alignment	FA-3
	Wheel bearings worn or improperly adjusted	Replace or adjust wheel bearings	FA-8
	Ball joints or bushings worn	Inspect ball joints and bushings	FA-13, 18 20
	Steering linkage loose or worn	Tighten or replace steering linkage	SR-97
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-31, 39
Abnormal tire wear	Tires improperly inflated	Inflate tires to proper pressure	FA-3
	Shock absorbers worn out	Replace shock absorber	FA-17
	Alignment incorrect	Check toe-in	FA-5
	Suspension parts worn	Replace suspension parts	

FRONT WHEEL ALIGNMENT (2WD)







1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.

Cold tire inflation pressure:

kg/cm² (psi, kPa)

Tire Size	Front	Rear
7.00 – 14 – 6 PR	1.7 (24, 170)	2.5 (36, 250)
P195/75 R 14	2.0 (29, 200)	2.4 (35, 240)
205/70 SR 14	1.9 (28, 190)	2.2 (32, 220)
185 R 14 LT – 8 PR	1.8 (26, 180)	4.5 (65, 450)
185 R 14 LT – 6 PR	2.0 (29, 200)	2.0 (29, 200)

(b) Check the wheel runout.

Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

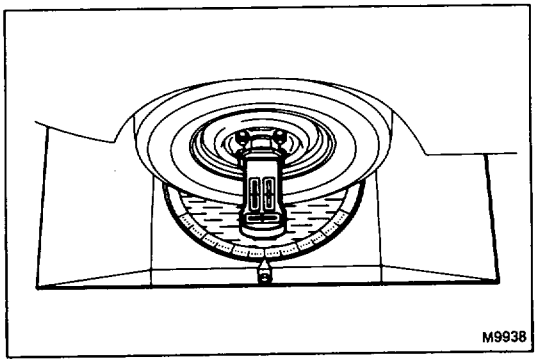
(e) Check the steering linkage for looseness.

(f) Use the standard bounce test to check that the front absorbers work properly.

2. MEASURE CHASSIS GROUND CLEARANCE

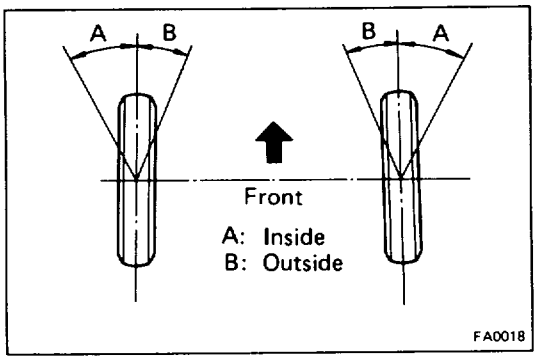
If clearance of the vehicle is not as specified, try to level the vehicle by shaking it down. If it is still not correct, check for bad springs and worn or loose suspension parts.

Chassis ground clearance: See page A-34


M9938

3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.

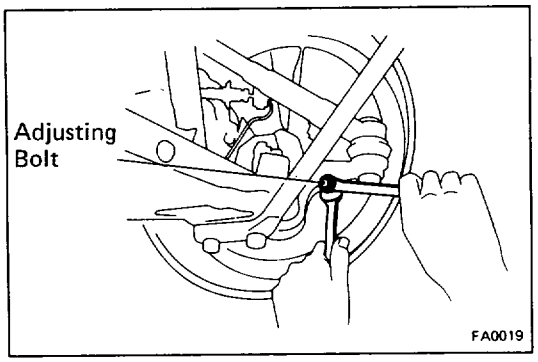


FA0018

4. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	34° +1° −2°
	Outside wheel	30°
at 20° (outside wheel)	Inside wheel	22°15′



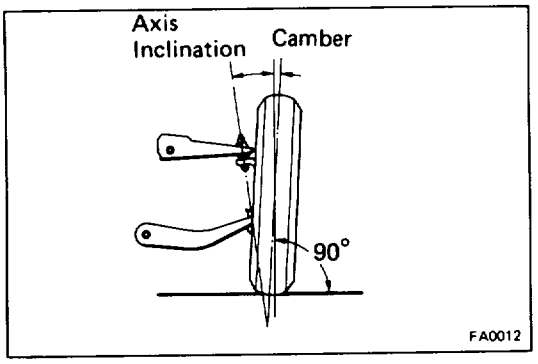
FA0019

NOTE: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

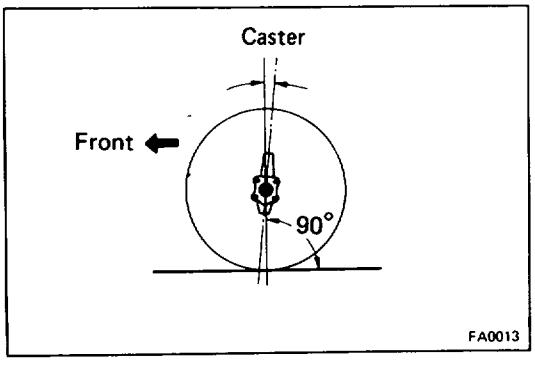
If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 350 kg-cm (25 ft-lb, 34 N·m)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



FA0012

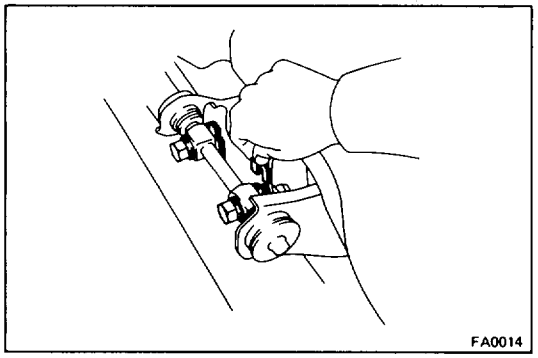


FA0013

5. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

	Inspection STD	Adjustment STD
Camber Left-right error	0°30′ ± 45′ 30′ or less	0°30′ ± 30′ 30′ or less
Steering axis inclination Left-right error	10°00′ ± 45′ 30′ or less	—
Caster 1/2 ton short 1/2 ton Long 1/2 ton extra long 1 ton C&C long (SRW) C&C long (DRW) C&C super long (DRW) Left-right error	 0°40′ ± 45′ 1°10′ ± 45′ 1°00′ ± 45′ 0°35′ ± 45′ 0°05′ ± 45′ 0°35′ ± 45′ 0°50′ ± 45′ 30′ or less	 0°40′ ± 30′ 1°10′ ± 30′ 1°00′ ± 30′ 0°35′ ± 30′ 0°05′ ± 30′ 0°35′ ± 30′ 0°50′ ± 30′ 30′ or less

SRW: Single Rear Wheel
DRW: Double Rear Wheel

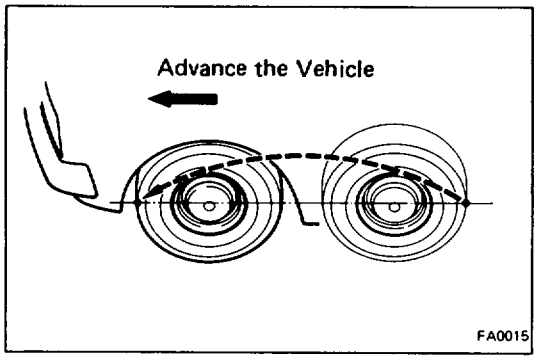

FA0014

If camber caster is not within specification, adjust by adding or removing shims on the upper arm.

Shim thickness mm (in.)

Thickness	
4.0	(0.157)
1.6	(0.063)
1.2	(0.047)

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



FA0015

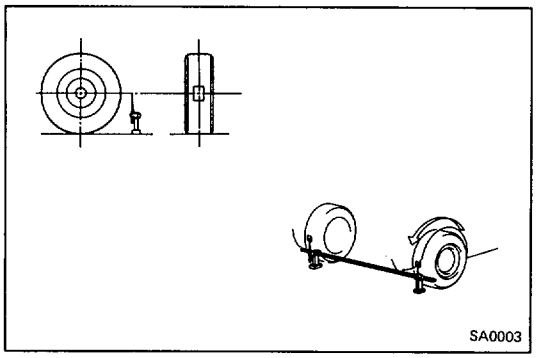
6. ADJUST TOE-IN

(a) Make sure the wheels are positioned straight ahead.

(b) Mark the center of each rear tread at spindle height and measure the distance between the marks on the right and left tires.

(c) Advance the vehicle until the marks on the rear side of the tires come to the front.

NOTE: The toe-in should be measured at the same point on the tire and at the same level.

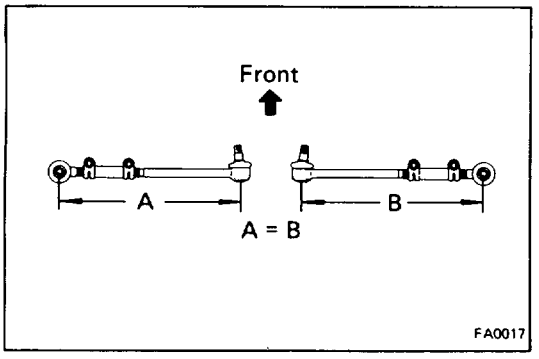

SA0003

(d) Measure the distance between the marks on the front side of the tires.

Toe-in:

mm (in.)

	Tire	Inspection STD	Adjustment STD
1/2 ton Short	Bias	4 ± 2 (0.16 ± 0.08)	4 ± 1 (0.16 ± 0.04)
	Radial	1 ± 2 (0.04 ± 0.08)	1 ± 1 (0.04 ± 0.04)
1/2 ton Long	Bias	6 ± 2 (0.24 ± 0.08)	6 ± 1 (0.24 ± 0.04)
	Radial	3 ± 2 (0.12 ± 0.08)	3 ± 1 (0.12 ± 0.04)
1 ton, C & C, 1/2 ton extra long	Radial	4 ± 2 (0.16 ± 0.08)	4 ± 1 (0.16 ± 0.04)



FA0017

(e) Loosen the clamp bolts.

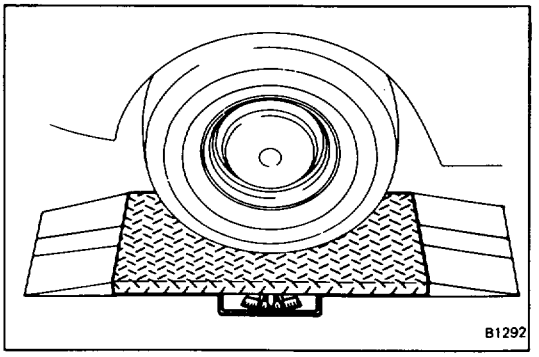
(f) Adjust toe-in by turning the left and right tie rod tubes an equal amount.

NOTE: Make sure that the tie rods are the same length.

Left-right error: 3.0 mm (0.118 in.) or less

(g) Tighten the clamp bolts and torque them.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)


B1292

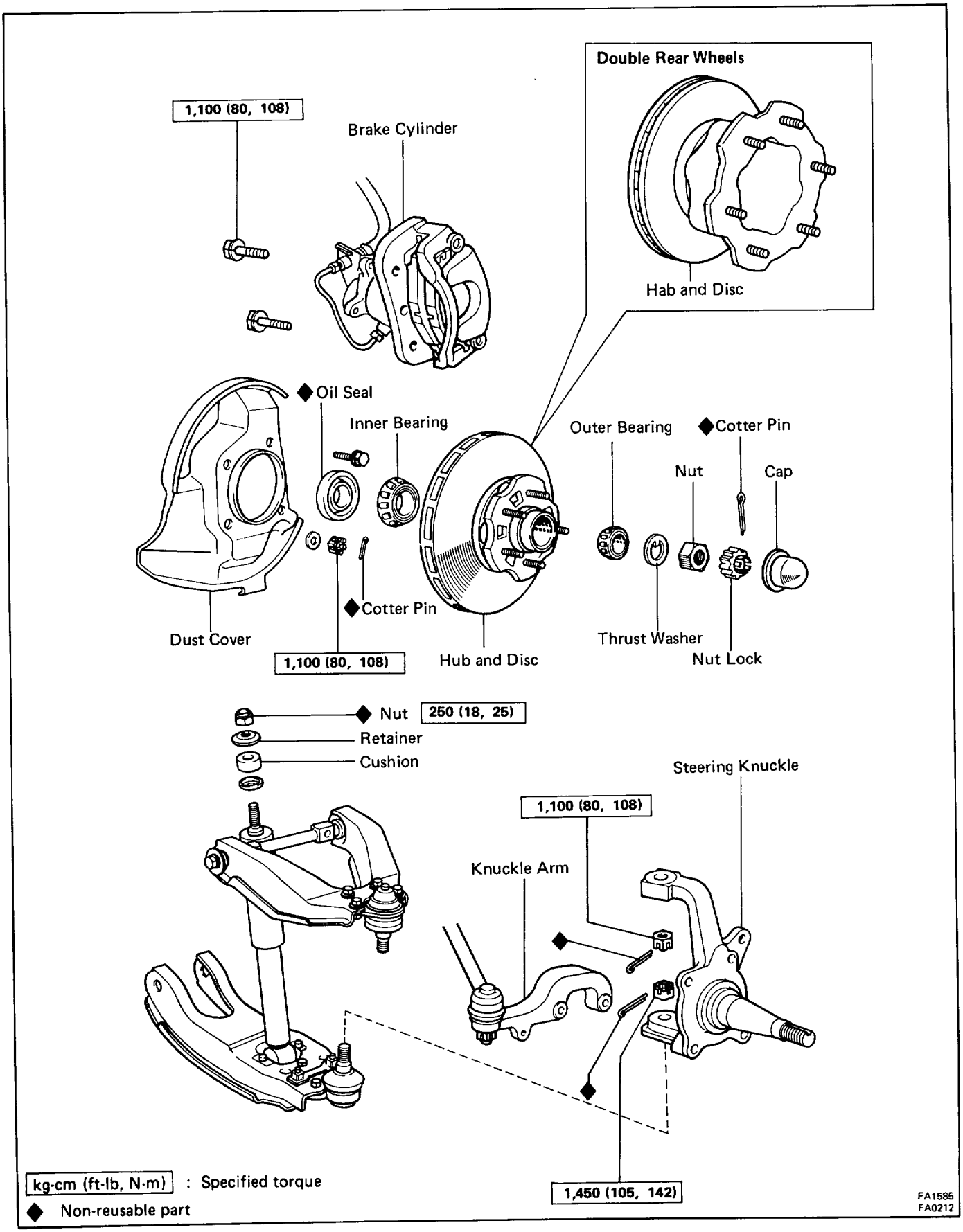
7. INSPECT SIDE SLIP WITH SIDE SLIP TESTER

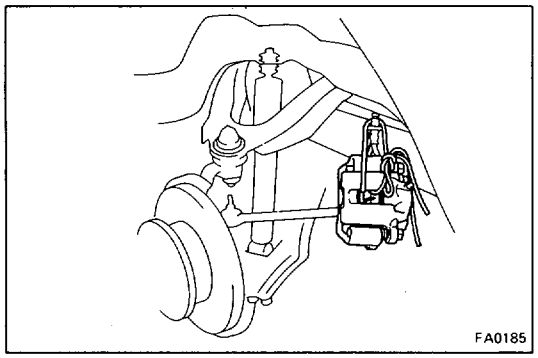
Side slip: 3.0 mm/m (0.118 in. /3.3 ft) or less

If the side slip exceeds the limit, the toe-in or other front wheel alignment may not be correct.

FRONT AXLE HUB AND STEERING KNUCKLE (2WD)

COMPONENTS





Front Axle Hub

(See page FA-6)

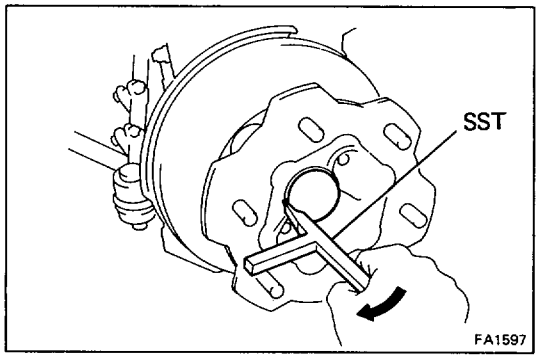
DISASSEMBLY OF FRONT AXLE HUB

1. REMOVE DISC BRAKE CYLINDER AND TORQUE PLATE

(a) Remove the brake cylinder and suspend it with wire.

(b) Remove the torque plate.

NOTE: Do not disconnect the brake tube and hose.

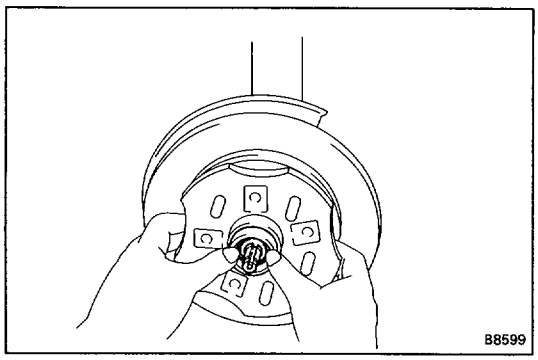


2. REMOVE AXLE HUB WITH DISC

(a) (Single rear wheel)
Remove the cap.

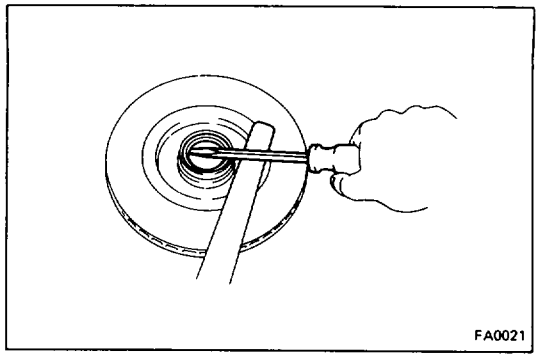
(Double rear wheels)
Using SST, pry off the cap.

SST 09504-22011



(b) Remove the hub and disc together with the outer bearing and thrust washer.

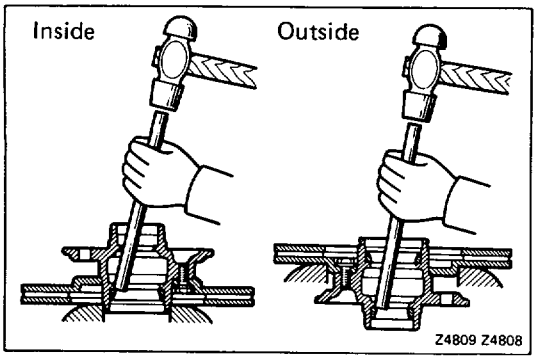
NOTE: Be careful not to drop the outer bearing.



3. REMOVE INNER BEARING AND OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

(b) Remove the inner bearing from the hub.



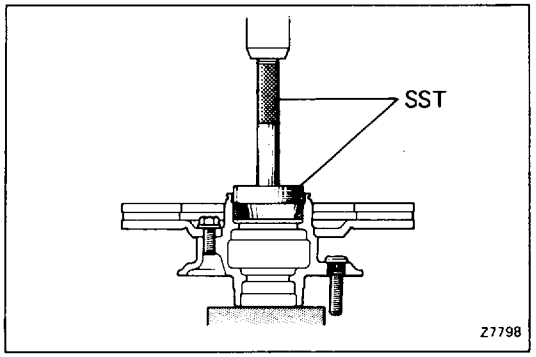
INSPECTION AND REPAIR OF FRONT AXLE HUB

1. INSPECT BEARING

Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race.

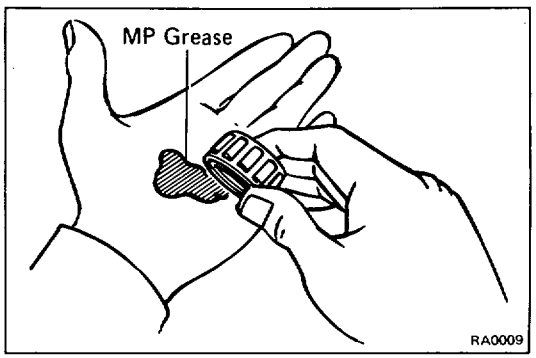


(b) Using SST, carefully drive in a new bearing outer race.

SST 09608-30012
Inside race 09608-04020, 09608-04100
Outside race 09608-04020, 09608-04060

ASSEMBLY OF FRONT AXLE HUB

1. PACK BEARINGS WITH MP GREASE

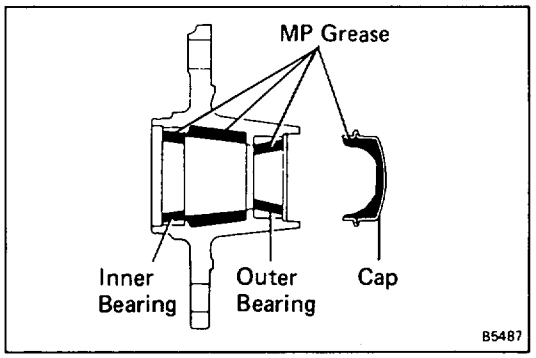


(a) Place MP grease in the palm of your hand.

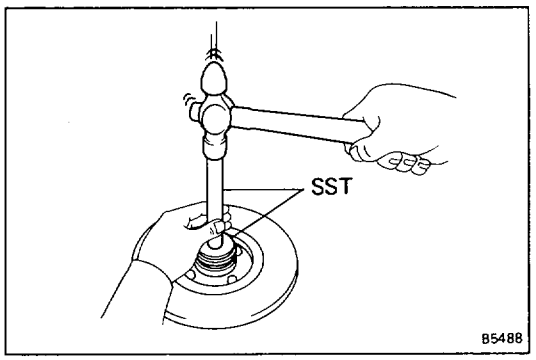
(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.

(c) Do the same around the bearing circumference.

2. COAT INSIDE OF HUB AND CAP WITH MP GREASE



3. INSTALL INNER BEARING AND OIL SEAL



Place inner bearing into the hub. Using SST, drive the oil seal into the hub. Coat the oil seal with MP grease.

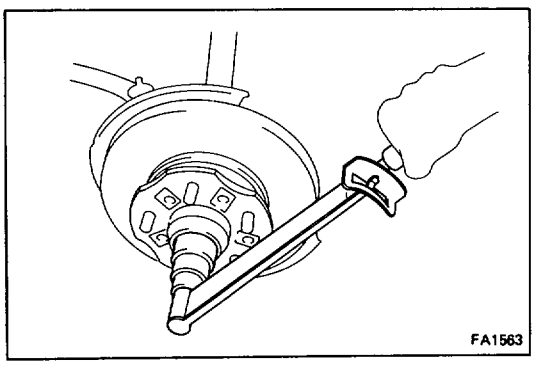
SST 09608-30012 (09608-04020, 09608-04100)

4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.

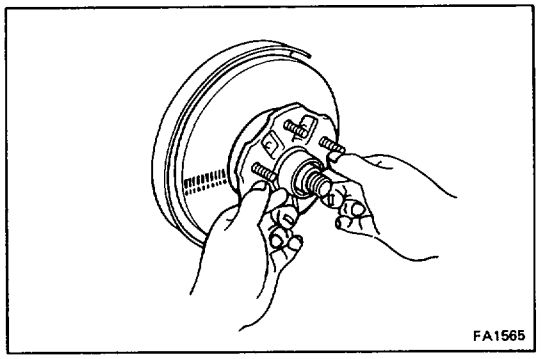
(b) Install the outer bearing and thrust washer.

5. ADJUST PRELOAD

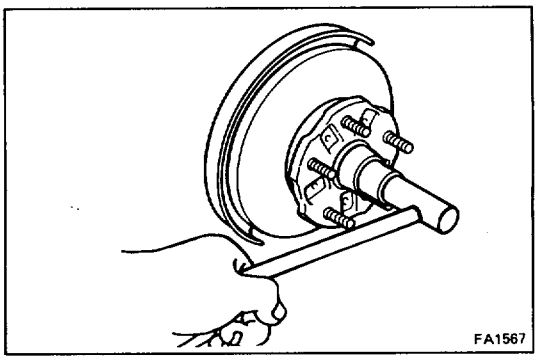


(a) Install and torque the nut.

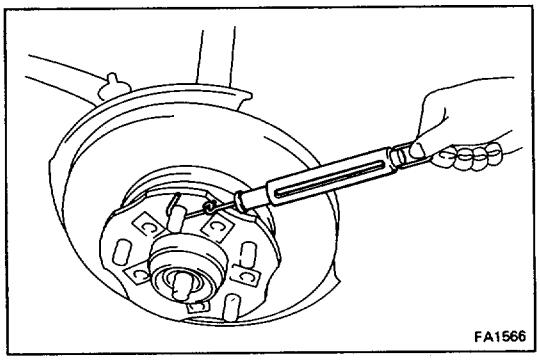
Torque: 350 kg-cm (25 ft-lb, 34 N·m)



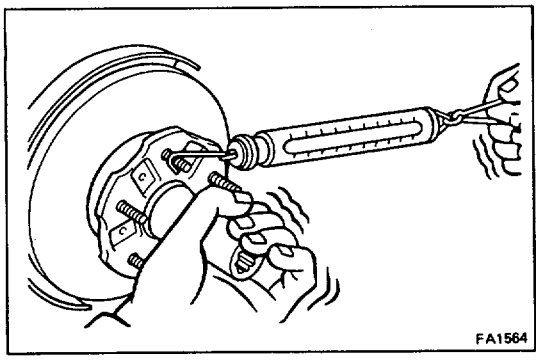
(b) Snug down the bearing by turning the hub several times.



(c) Loosen the nut until it can be turned by hand.

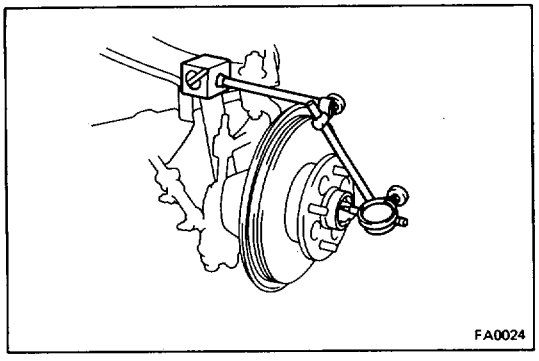


(d) Using a spring tension gauge, measure and make a note of the frictional force of the oil seal.



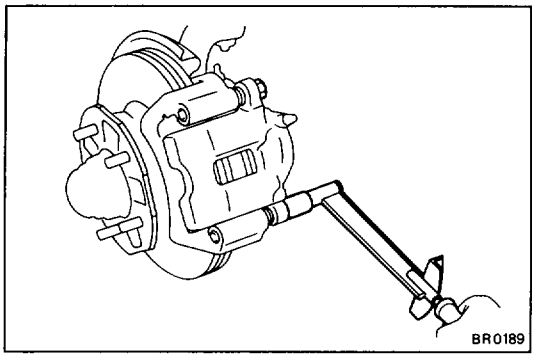
(e) Tighten the nut until the preload is within specification.

Preload (starting):
Add oil seal frictional force
Single rear wheel
0.6 — 1.8 kg (1.3 — 4.0 lb, 5.9 — 17.7 N)
Double rear wheels
0.4 — 1.0 kg (0.9 — 2.2 lb, 3.9 — 9.8 N)

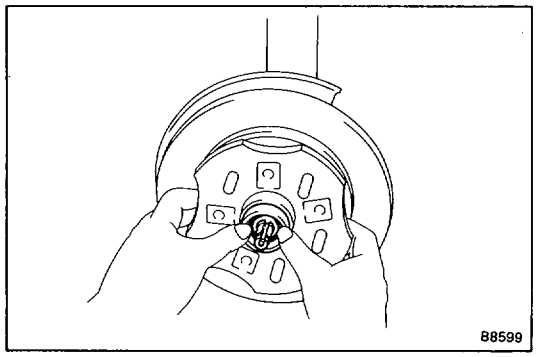


(f) Measure the hub axial play.

Axial play: 0.05 mm (0.0020 in.) or less



6. **INSTALL LOCK NUT, COTTER PIN AND HUB GREASE CAP**
7. **INSTALL TORQUE PLATE ONTO STEERING KNUCKLE**
   Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)
8. **INSTALL BRAKE CYLINDER ONTO TORQUE PLATE**
   Torque: 900 kg-cm (65 ft-lb, 88 N·m)

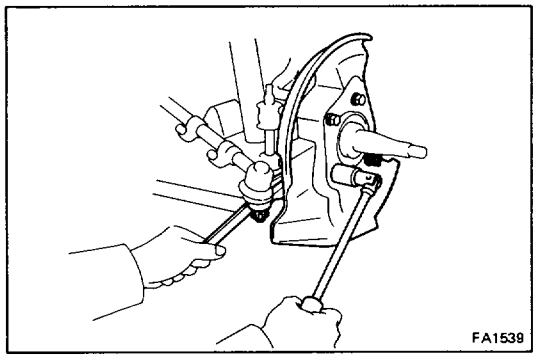


Steering Knuckle

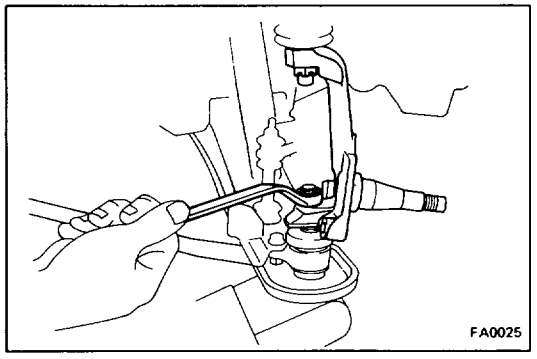
(See page FA-6)

REMOVAL OF STEERING KNUCKLE

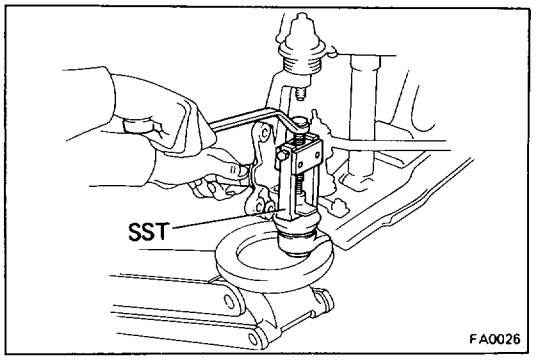
1. **REMOVE FRONT AXLE HUB AND BRAKE CALIPER**
   (See page FA-7)



2. **REMOVE DUST COVER**
   (a) Remove the two bolts.
   (b) Remove the two cotter pins, nuts and bolts and remove the dust cover.
   (c) Remove the knuckle arm from the steering knuckle.



3. **REMOVE STEERING KNUCKLE**
   (a) Support the lower arm with a jack.
   (b) Remove the two cotter pins and two nuts.



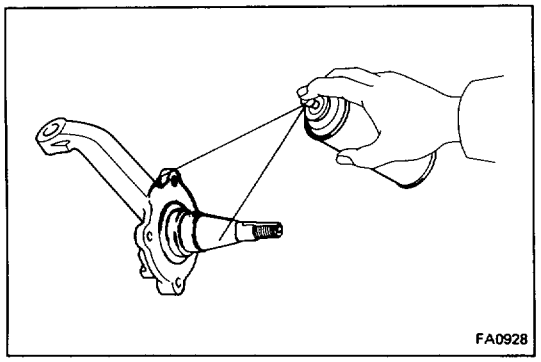
   (c) Using SST, disconnect the steering knuckle from the lower ball joint.

   SST 09628-62011

   (d) Using SST, disconnect the steering knuckle from the upper ball joint.

   SST 09628-62011

   (e) Remove the steering knuckle.

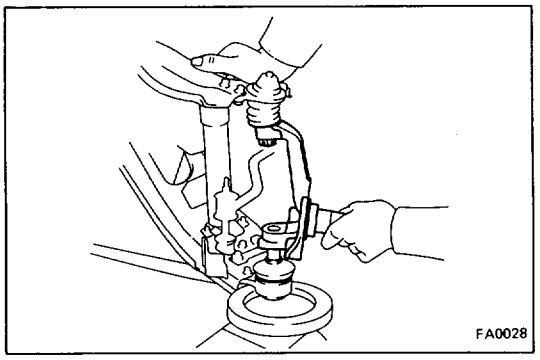


INSPECTION OF STEERING KNUCKLE

INSPECT STEERING KNUCKLE

Using a dye penetrant, check the steering knuckle for cracks.

If a crack is found, replace the steering knuckle.



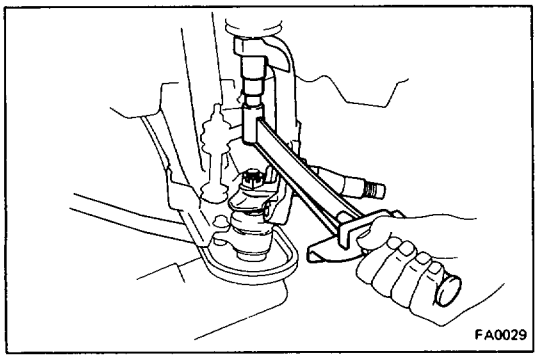
INSTALLATION OF STEERING KNUCKLE

1. INSTALL STEERING KNUCKLE

(a) Support the lower arm with a jack.

(b) Install the steering knuckle to the upper ball joint and install the nut.

(c) Push the upper arm and steering knuckle down and install the steering knuckle to the lower ball joint and install the nut.



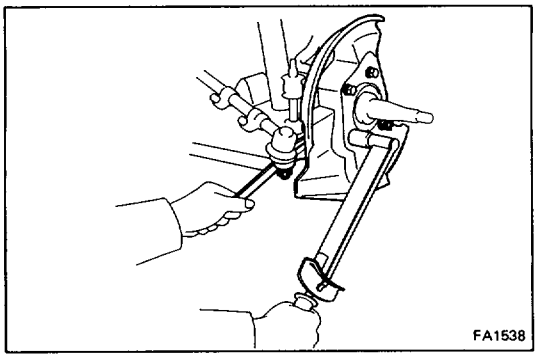
(d) Torque the upper ball joint nut.

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)

(e) Torque the lower ball joint nut.

Torque: 1,450 kg-cm (105 ft-lb, 142 N·m)

(f) Install new cotter pins.



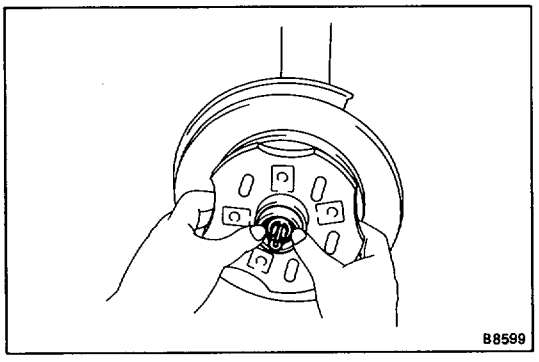
2. INSTALL KNUCKLE ARM AND DUST COVER

(a) Install the knuckle arm and the dust cover.

(b) Torque the bolts and nuts.

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)

(c) Secure the nuts with new cotter pins.



3. INSTALL FRONT AXLE HUB AND BRAKE CALIPER

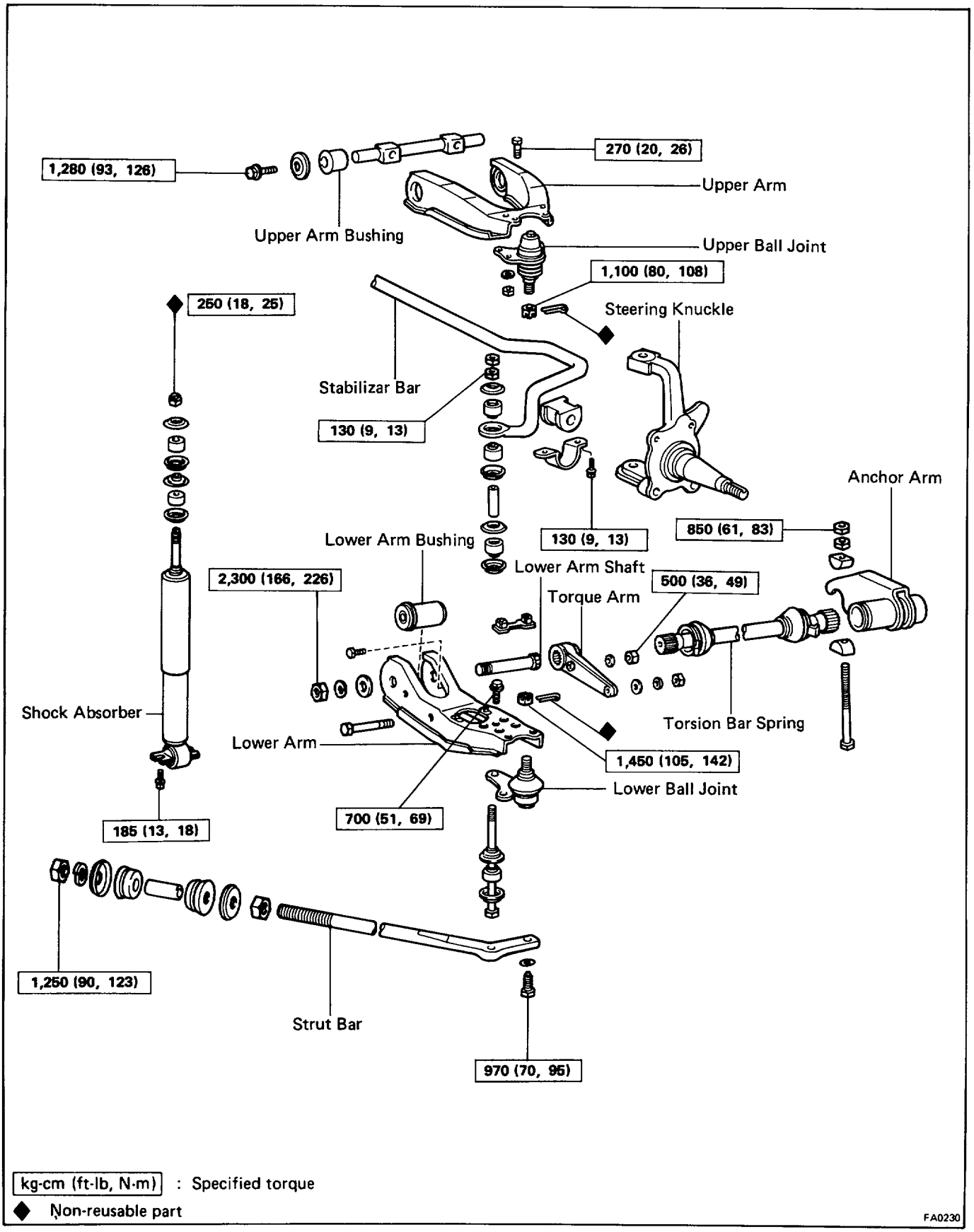
(See pages FA-8, 9)

4. CHECK FRONT WHEEL ALIGNMENT

(See page FA-3)

FRONT SUSPENSION (2WD)

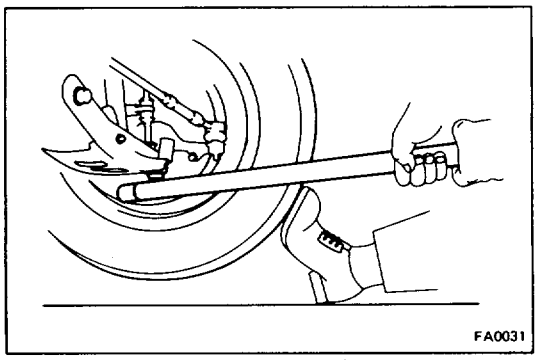
COMPONENTS

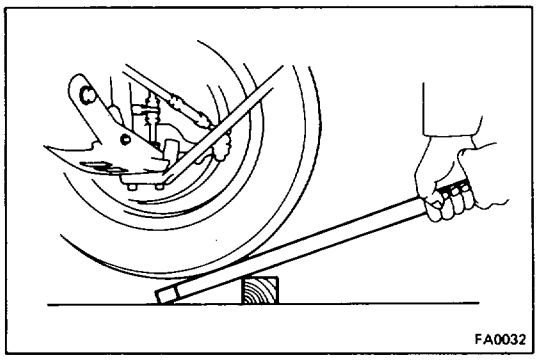


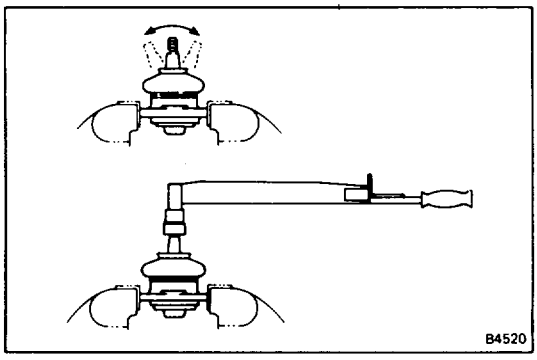
kg-cm (ft-lb, N·m) : Specified torque

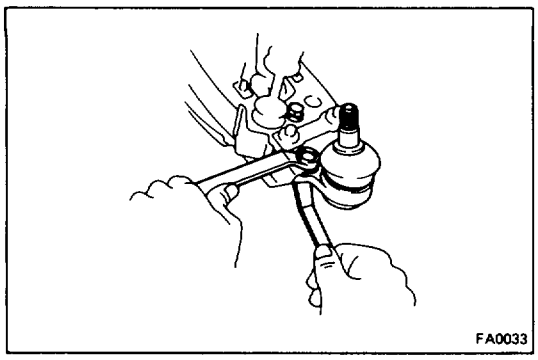
◆ Non-reusable part

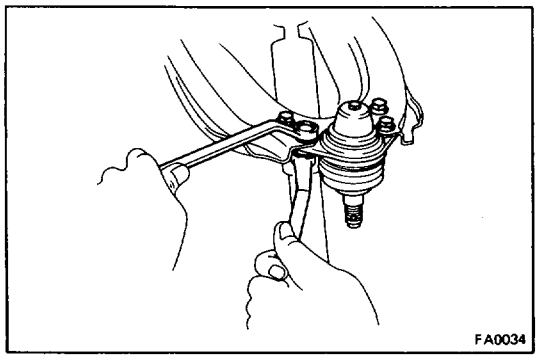
FA0230











Ball Joints

(See page FA-12)

INSPECTION OF BALL JOINTS

1. **INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSENESS**
   (a) Jack up the front of the vehicle and support it with stands.
   (b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.
   (c) Move the lower arm up and down and check that the lower ball joint has no excessive play.

   Maximum vertical play: 2.3 mm (0.091 in.)

2. **INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSENESS**
   Move the wheel up and down and check that the upper ball joint has no excessive play.

   Maximum vertical play: 2.3 mm (0.091 in.)

3. **INSPECT BALL JOINT ROTATION CONDITION**
   (a) Remove the ball joint. (See pages FA-9)
   (b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.
   (c) Using a torque gauge, turn the nut continuously one turn every 2-4 seconds and take the torque reading on the 5th turn.

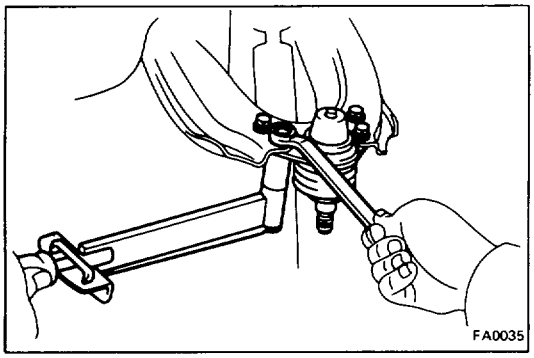
   Torque (turning):
   Lower ball joint 25-50 kg-cm (22-43 in.-lb, 2.5-4.9 N·m)
   Upper ball joint 20-40 kg-cm (18-34 in.-lb, 2.0-3.9 N·m)

REMOVAL OF BALL JOINTS

1. **REMOVE STEERING KNUCKLE**
   (See page FA-9)

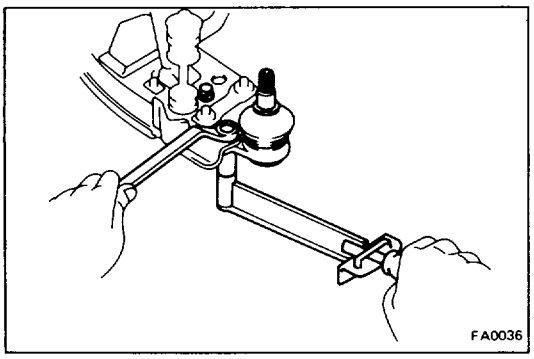
2. **REMOVE LOWER BALL JOINT FROM LOWER ARM**

3. **REMOVE UPPER BALL JOINT FROM UPPER ARM**

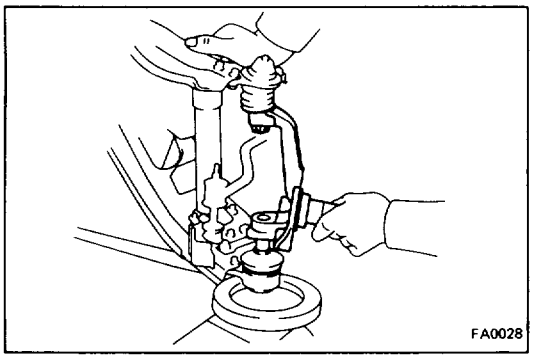


INSTALLATION OF BALL JOINTS

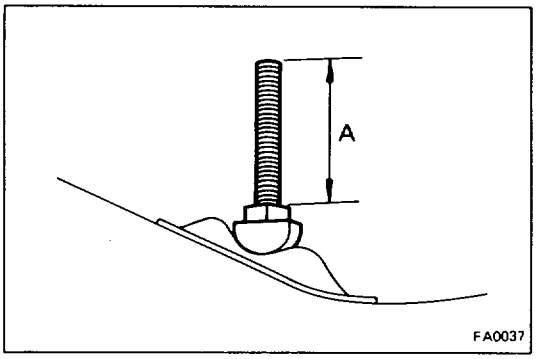
1. **INSTALL UPPER BALL JOINT TO UPPER ARM**
   Torque: 270 kg-cm (20 ft-lb, 26 N·m)



2. **INSTALL LOWER BALL JOINT TO LOWER ARM**
   Torque: 700 kg-cm (51 ft-lb, 69 N·m)



3. **INSTALL STEERING KNUCKLE**
   (See page FA-11)



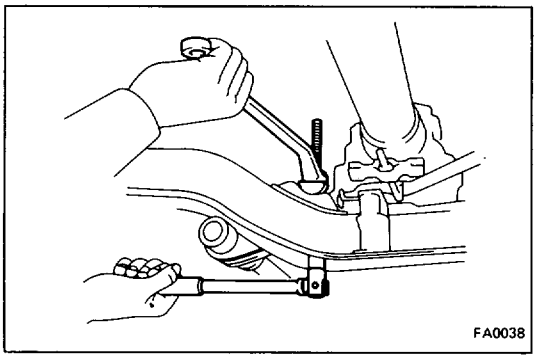
Torsion Bar Spring

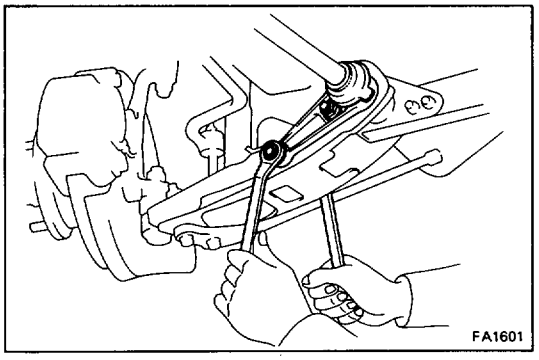
(See page FA-12)

REMOVAL OF TORSION BAR SPRING

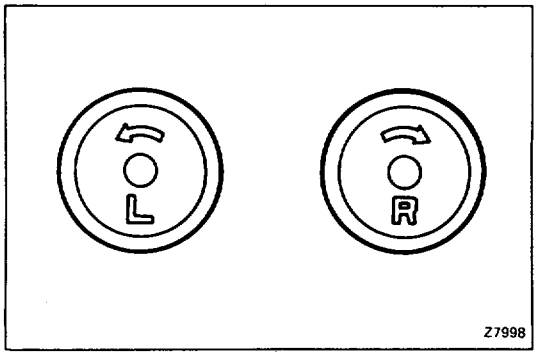
1. **JACK UP AND SUPPORT FRAME ON STANDS**
2. **REMOVE LOCK NUT AND MEASURE PROTRUDING BOLT END "A", AS SHOWN**

   NOTE: Use this measurement for reference when adjusting the chassis ground clearance.
3. **REMOVE DUST COVER**
4. **LOOSEN ADJUSTING NUT UNTIL NO TENSION ON TORSION BAR**





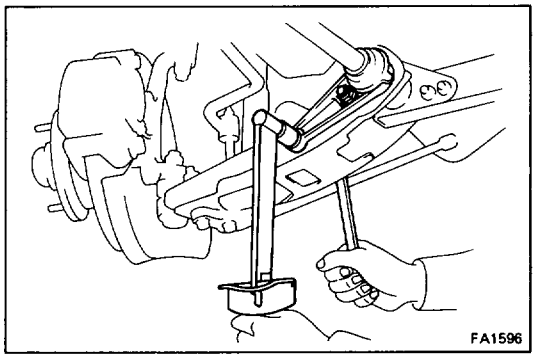
5. **REMOVE TORQUE ARM, TORSION BAR SPRING AND ANCHOR ARM**
   (a) Remove the torque arm mounting nuts.
   (b) Remove the anchor arm from the adjusting bolt and then remove the torsion bar together with the torque arm and anchor arm.



INSTALLATION OF TORSION BAR SPRING

NOTE: There are left and right identification marks on the rear end of the torsion bar springs.
Be careful not to interchange the torsion bar springs.

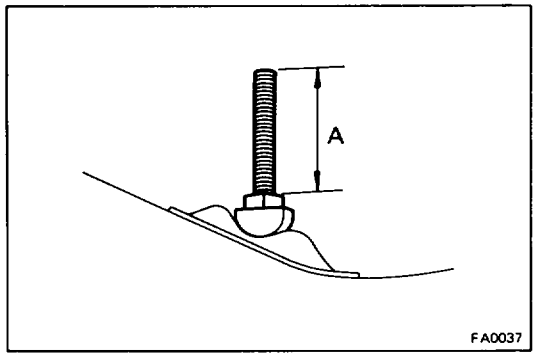
1. **INSTALL TORSION BAR SPRING AND ANCHOR ARM AND TORQUE ARM**
   (a) Apply a light coat of MP grease to the spline of the torsion bar spring.
   (b) Align the toothless portion and install the anchor arm to the torsion bar spring.
   (c) Align the toothless portion and install the torque arm to the torsion bar spring.



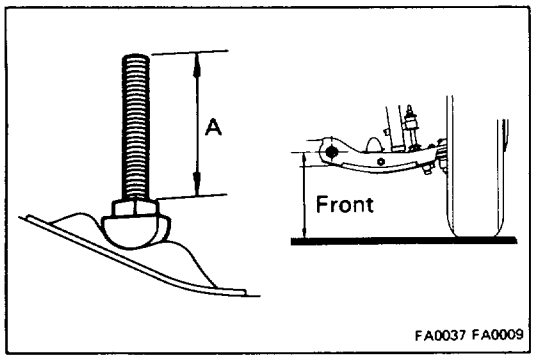
(d) Install the torsion bar spring torque arm side and install the anchor arm to the adjusting bolt.

(e) Torque the torque arm nuts.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)



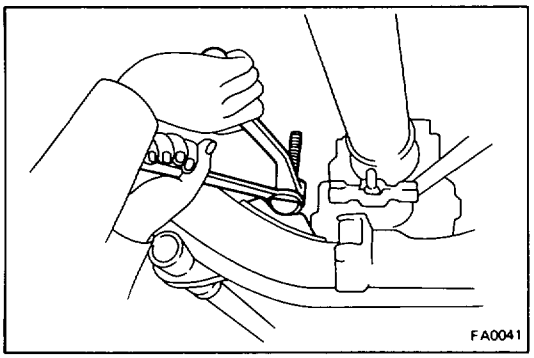
(f) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.



(g) Install the wheel and remove the stands. Bounce the vehicle to settle the suspension.

(h) Adjust the chassis ground clearance by turning the adjusting nut.

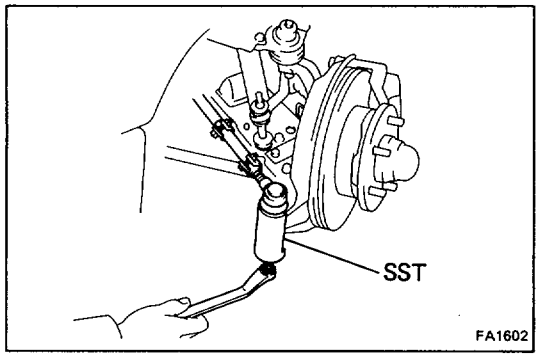
Chassis ground clearance: See page A-34



2. TORQUE LOCK NUT

Torque: 850 kg-cm (61 ft-lb, 83 N·m)

3. INSTALL DUST COVER

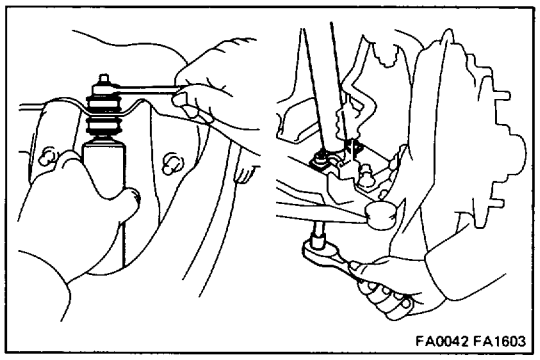


Lower Suspension Arm and Shock Absorber

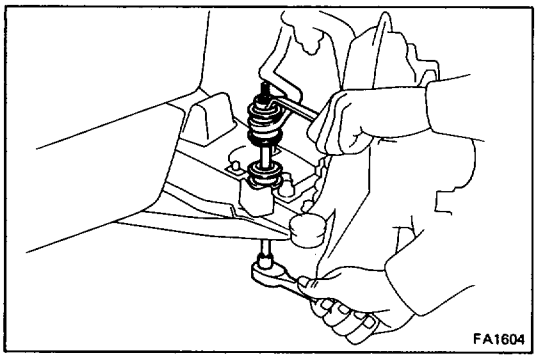
(See page FA-12)

1. **REMOVE TORSION BAR SPRING (See page FA-15)**

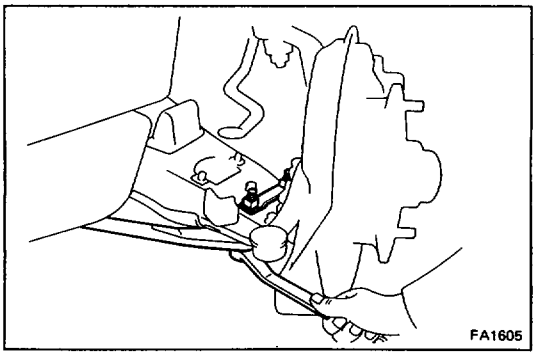
2. **DISCONNECT TIE ROD END**
   (a) Remove the cotter pin and nut.
   (b) Using SST, disconnect the tie rod end.
   SST 09610-20012



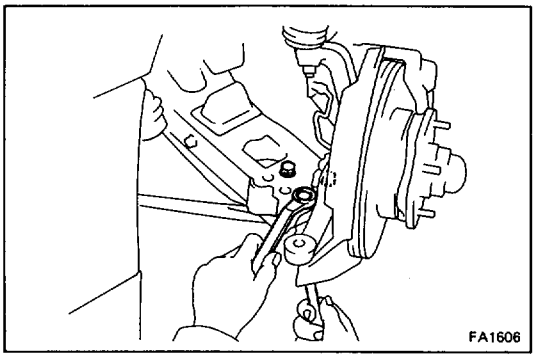
3. **REMOVE SHOCK ABSORBER**



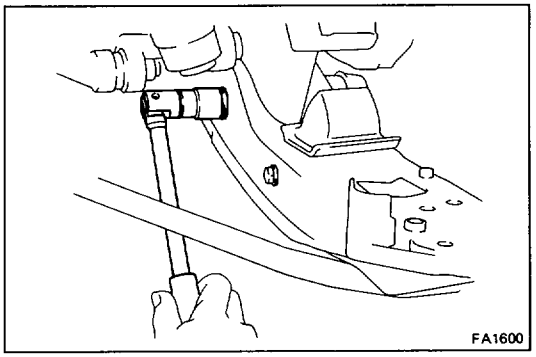
4. **DISCONNECT STABILIZER BAR FROM LOWER ARM**



5. **DISCONNECT STRUT BAR FROM LOWER ARM**



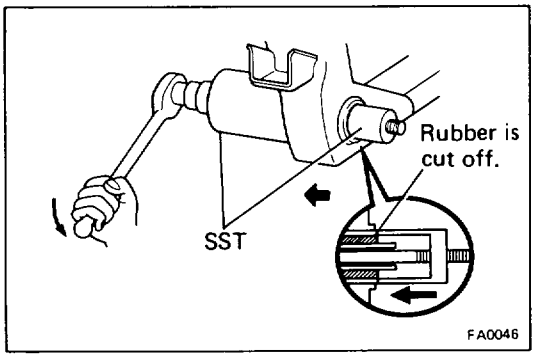
6. **DISCONNECT LOWER BALL JOINT**
   Remove the three bolts and disconnect the lower ball joint.



7. REMOVE LOWER SUSPENSION ARM

Remove the nut and lower suspension arm.

REPLACEMENT OF LOWER ARM BUSHING

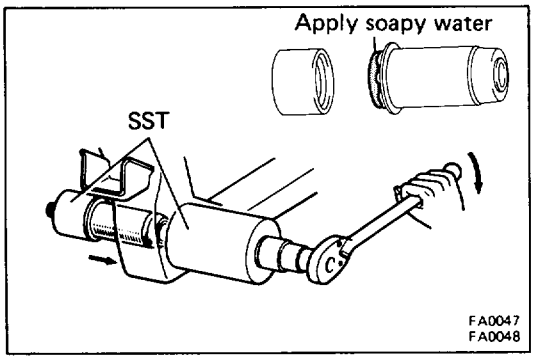


1. REMOVE BUSHING

(a) Cut off the bushing rubber as shown in the figure.

(b) Using SST, remove the bushing.

SST 09726-35010



2. INSTALL BUSHING

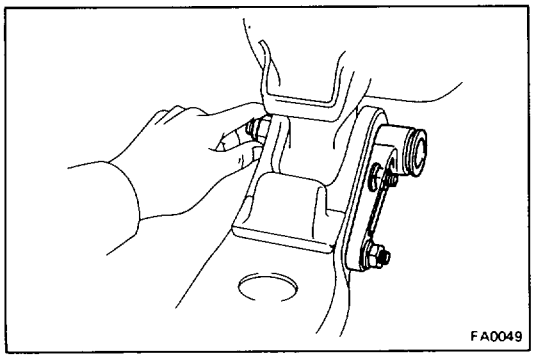
(a) Apply soapy water on the front rubber part of the bushing and fit SST on the new bushing.

SST 09726-35010

(b) Using SST, install the new bushing.

SST 09726-35010

INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER



1. INSTALL LOWER SUSPENSION ARM

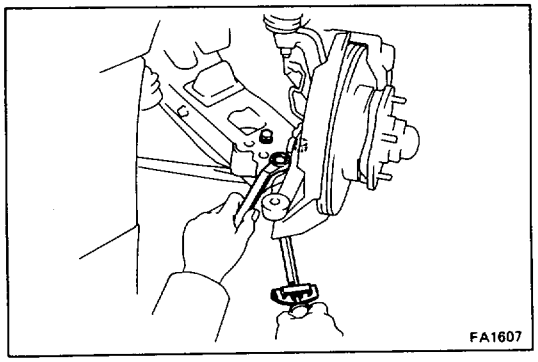
(a) Install the torque arm mounting bolts to the lower arm.

(b) Place the torque arm on the lower arm shaft. Set the lower arm in installation position, and insert the lower arm shaft and torque arm.

(c) Temporarily install the torque arm.

(d) Finger tighten the lower arm, and remove the torque arm.

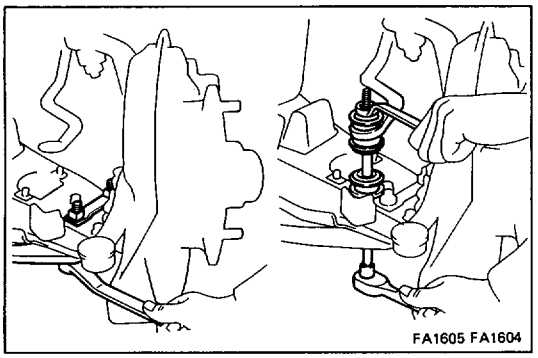
NOTE: Do not torque the nut.



2. CONNECT LOWER BALL JOINT

Connect the lower ball joint to the lower suspension arm with the three bolts.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

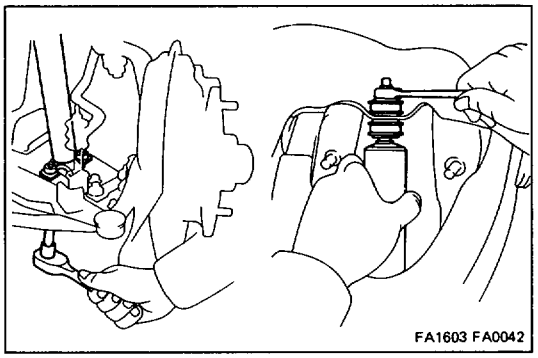


3. **CONNECT STRUT BAR TO LOWER ARM**

   Torque: 970 kg-cm (70 ft-lb, 95 N·m)

4. **CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM**

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



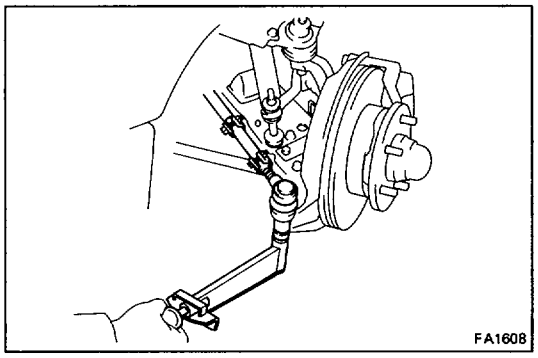
5. **INSTALL SHOCK ABSORBER**

   (a) Install the shock absorber to the lower suspension arm.

   Torque: 185 kg-cm (13 ft-lb, 18 N·m)

   (b) Install the shock absorber to the upper bracket.

   Torque: 250 kg-cm (18 ft-lb, 25 N·m)



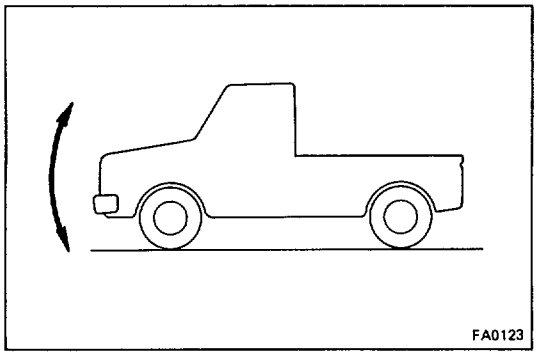
6. **CONNECT TIE ROD END**

   (a) Connect the tie rod end to the steering knuckle arm and install and torque the nut.

   Torque: 920 kg-cm (67 ft-lb, 90 N·m)

   (b) Secure the nut with a new cotter pin.

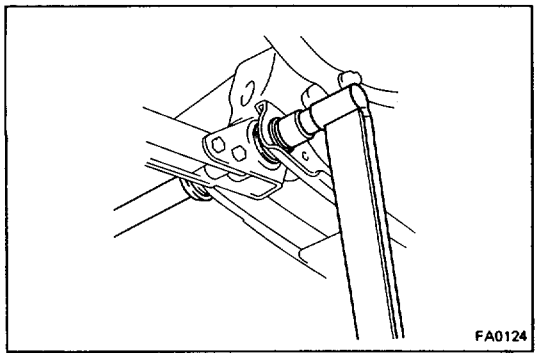
7. **INSTALL TORSION BAR SPRING**
   (See page FA-15)



8. **TORQUE LOWER SUSPENSION ARM SHAFT NUT**

   (a) Install the wheel.

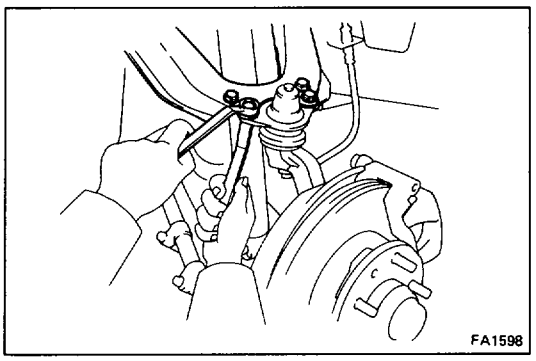
   (b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



   (c) Torque the nut.

   Torque: 2,300 kg-cm (166 ft-lb, 226 N·m)

9. **CHECK FRONT WHEEL ALIGNMENT**
   (See page FA-3)


FA1598

Upper Suspension Arm

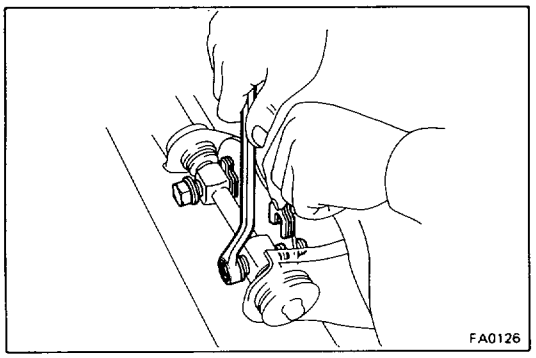
(See page FA-12)

REMOVAL OF UPPER SUSPENSION ARM

1. DISCONNECT UPPER BALL JOINT FROM UPPER ARM

(a) Support the lower arm with a jack.

(b) Remove the four bolts and nuts, and disconnect the upper arm.


FA0126

2. REMOVE UPPER SUSPENSION ARM

(a) Remove the bolts and camber adjusting shims.

(b) Remove the upper arm.

NOTE: Do not loose the camber adjusting shims. Record the position, and the thickness of camber adjusting shims so that these can be reinstalled to their original location.

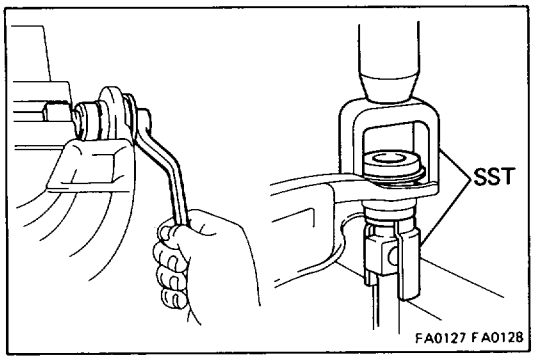
REPLACEMENT OF UPPER ARM BUSHING

1. REMOVE BUSHING

(a) Remove the bolts and washers.

(b) Using SST, push out the bushings.

SST 09710-30020 (09710-03030, 09710-03040)



FA0127 FA0128

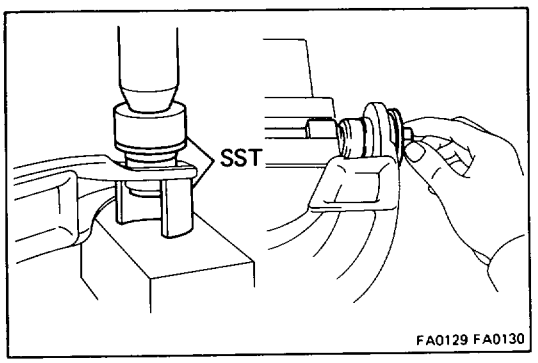
2. INSTALL BUSHING

(a) Using SST, push in the bushings.

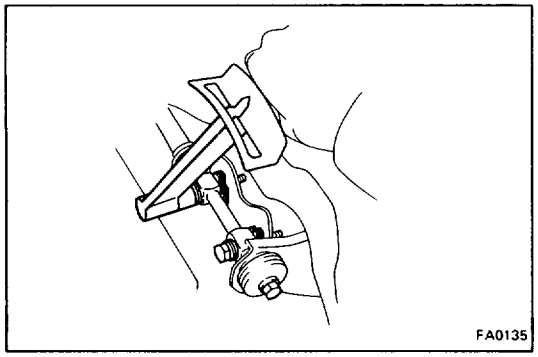
SST 09710-30020 (09710-03060, 09710-03100)

(b) Install the washers, and finger tighten the bolts.

NOTE: Do not torque the bolts.



FA0129 FA0130



INSTALLATION OF UPPER SUSPENSION ARM

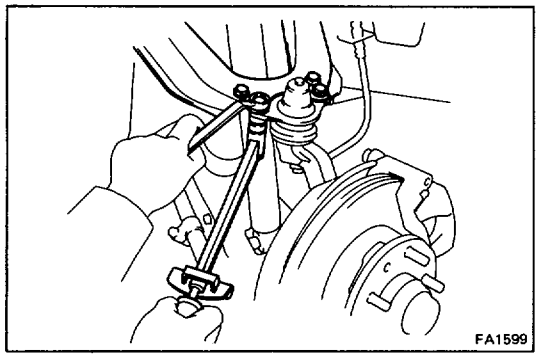
1. INSTALL UPPER ARM

(a) Install the upper arm together with the camber adjusting shims.

(b) Torque the bolts.

Torque: 1,000 kg-cm (72 ft-lb, 98 N·m)

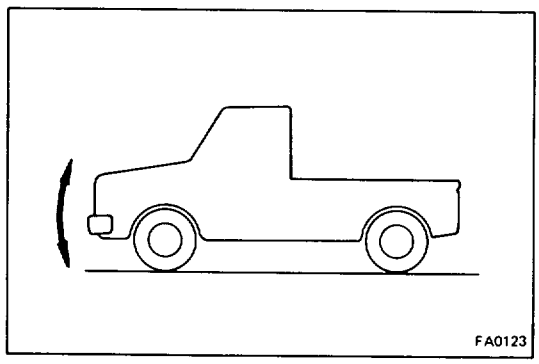
NOTE: Install an equal number and thickness of shims in their original position.



2. CONNECT UPPER ARM

Connect the upper arm with the four bolts and nuts.

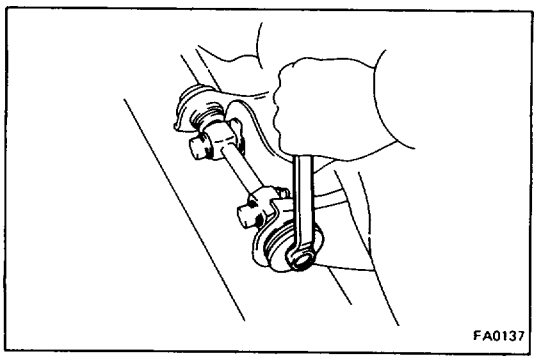
Torque: 270 kg-cm (20 ft-lb, 26 N·m)



3. TORQUE UPPER ARM SHAFT BOLTS

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

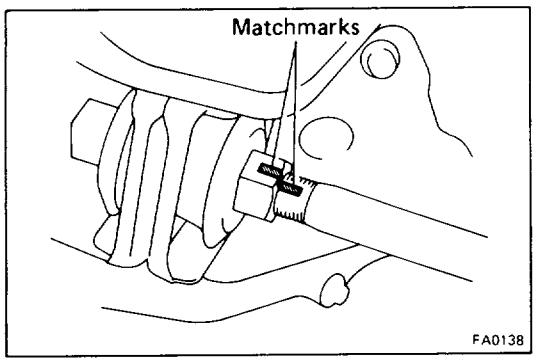


(c) Torque the upper arm shaft bolts.

Torque: 1,280 kg-cm (93 ft-lb, 126 N·m)

4. CHECK FRONT WHEEL ALIGNMENT

(See page FA-3)

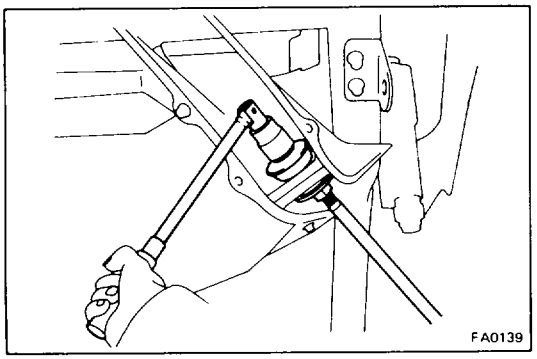


Strut Bar

(See page FA-12)

REMOVAL OF STRUT BAR

1. **PLACE MATCHMARKS ON STRUT BAR**

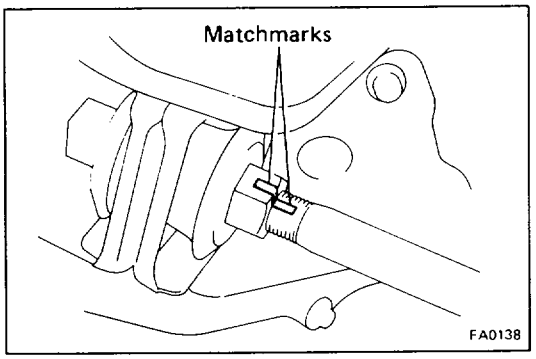


2. **REMOVE FRONT NUT FROM STRUT BAR**

3. **REMOVE STRUT BAR FROM LOWER ARM**

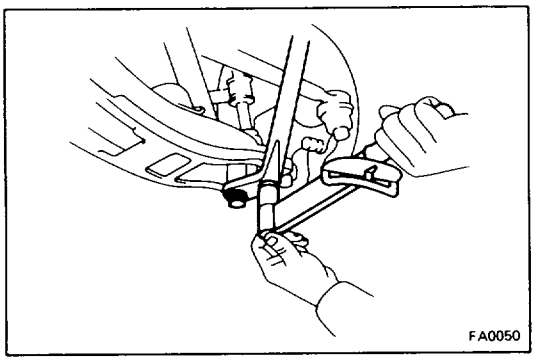
   Remove the nuts holding the strut bar to the lower arm, and remove the strut bar.

INSTALLATION OF STRUT BAR



1. **INSTALL FRONT NUT**

   Install the front nut and align the matchmarks on the strut bar.



2. **INSTALL STRUT BAR TO BRACKET**

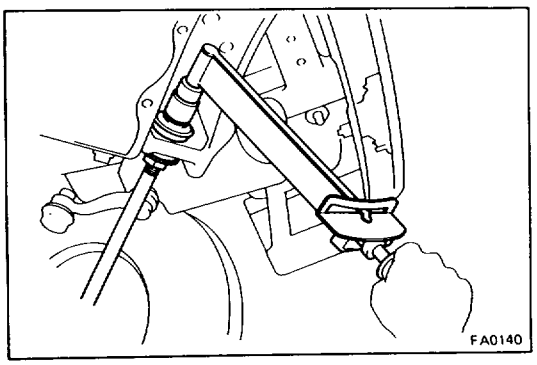
   (a) Install the washer and bushing to the strut bar and install it to the bracket.

   (b) Install the collar, bushing and washer to the strut bar.

   (c) Finger tighten the front nut.

3. **CONNECT STRUT BAR TO LOWER ARM**

   Torque: 970 kg-cm (70 ft-lb, 95 N·m)



4. **TORQUE FRONT NUT**

   (a) Remove the stands and the vehicle to stabilize the suspension.

   (b) Torque the front nut.

   Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

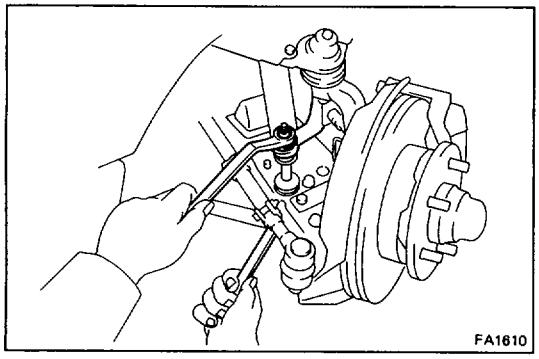
5. **CHECK FRONT WHEEL ALIGNMENT**
   (See page FA-3)

Stabilizer Bar

(See page FA-12)

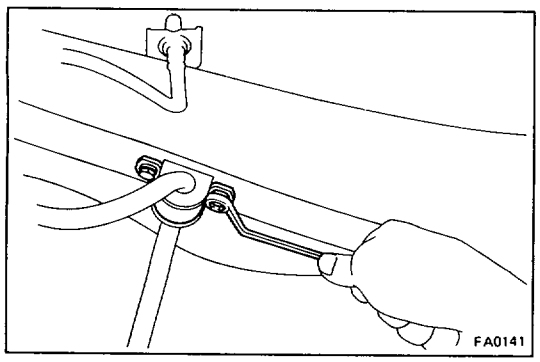
REMOVAL OF STABILIZER BAR

1. REMOVE ONE TORSION BAR SPRING
(See page FA-15)

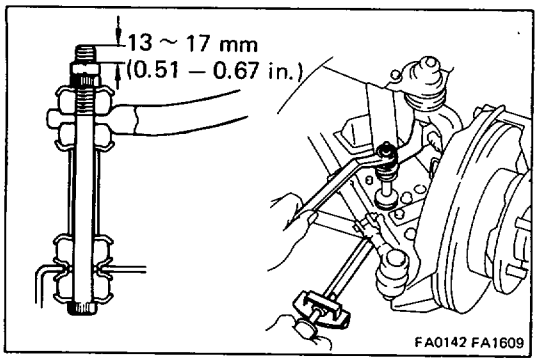


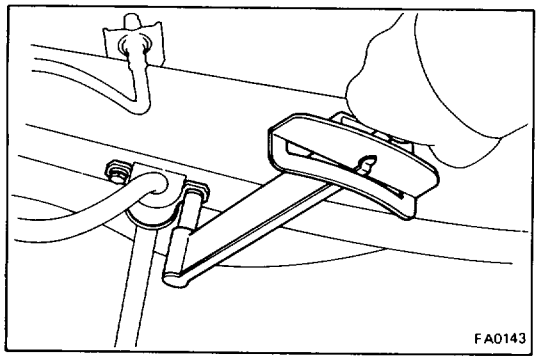
2. REMOVE STABILIZER BAR FROM LOWER ARMS

(a) Remove the nuts and cushions holding both sides of the stabilizer bar from the lower arms, and disconnect the stabilizer bar.



(b) Remove both stabilizer bar bushings and brackets, and remove the stabilizer bar.





INSTALLATION OF STABILIZER BAR

1. PLACE STABILIZER BAR TO FRAME

Place the stabilizer bar in position and install both stabilizer bar bushings and brackets to the frame.
Finger tighten the bolts.

2. CONNECT STABILIZER BAR TO LOWER ARMS

Connect the stabilizer bar on both sides to the lower arms with bolts, cushions and new nuts as shown. Torque the nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

3. TORQUE BRACKET SET BOLTS

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

4. INSTALL TORSION BAR SPRING
(See page FA-15)

TROUBLESHOOTING (4WD)

Problem	Possible cause	Remedy	Page
Wanders/pulls	Tires worn or improperly inflated	Inflate to proper pressure or replace tires	FA-25
	Alignment incorrect	Check front alignment	FA-25
	Wheel bearing adjusted too tight	Adjust wheel bearing	FA-47
	Front or rear suspension parts loose or broken	Tighten or replace suspension parts	
	Steering linkage loose or worn	Tighten or replace steering linkage	SR-104
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-65, 77
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	FA-88
	Spring weak	Replace spring	FA-88
Sways/pitches	Tires improperly inflated	Inflate tires to proper pressure	FA-25
	Stabilizer bar bent or broken	Inspect stabilizer bar	FA-88
	Shock absorber worn out	Replace shock absorber	FA-88
Front wheel shimmy	Tires worn or improperly inflated	Replace tires or inflate to proper pressure	FA-25
	Wheels out of balance	Balance wheels	
	Shock absorber worn out	Replace shock absorber	FA-88
	Alignment incorrect	Check front alignment	FA-25
	Wheel bearing worn	Replace wheel bearings	FA-47
	Ball joints or bushings worn	Inspect ball joints and bushings	FA-88
	Steering linkage loose or worn	Tighten or replace steering linkage	SR-104
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-65, 77
Abnormal tire wear	Tires impropery inflated	Inflate tires to proper pressure	FA-25
	Shock absorbers worn out	Replace shock absorber	FA-88
	Alignment incorrect	Check toe-in	FA-25
	Suspension parts worn	Replace suspension parts	

FRONT WHEEL ALIGNMENT (4WD)

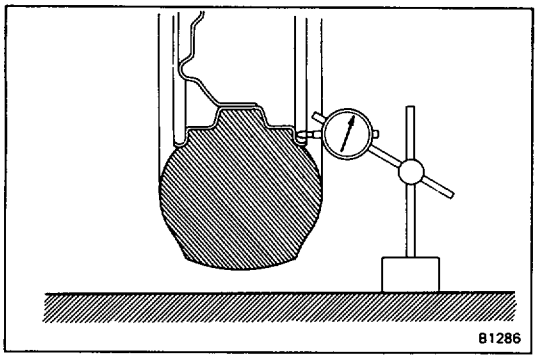
1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.

Cold tire inflation pressure:

kg/cm² (psi, kPa)

Tire size	Front	Rear
P 225/75 R 15	1.8 (26, 180)	2.0 (29, 200)



(b) Check the wheel runout.

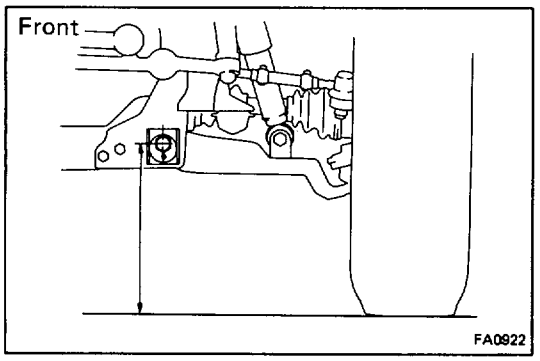
Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check that the front absorbers work properly by using the standard bounce test.



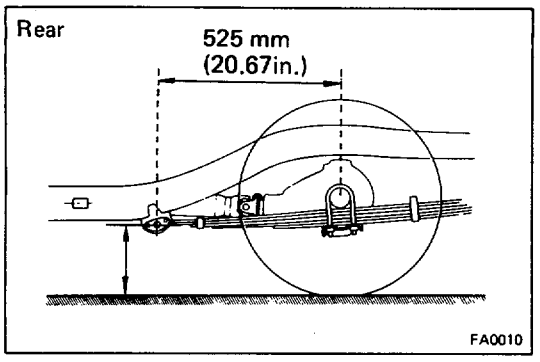
2. MEASURE CHASSIS GROUND CLEARANCE

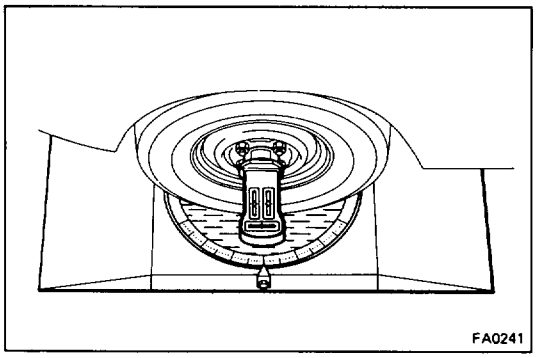
Chassis ground clearance: See pages A-36, 37

If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down.

If still not correct, check for bad springs or suspension parts.

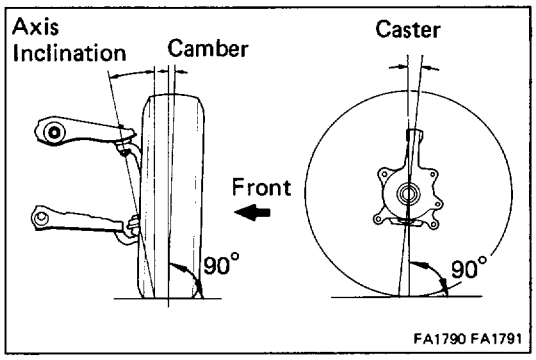
NOTE: When measuring the chassis ground clearance, measure from the ground to the center of the lower suspension arm front mounting bolt.





3. INSTALL WHEEL ALIGNMENT EQUIPMENT

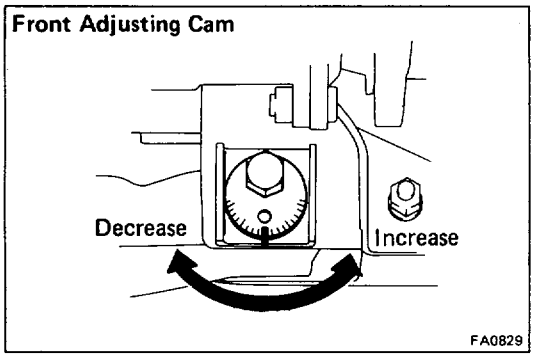
Follow the specific instructions of the equipment manufacturer.



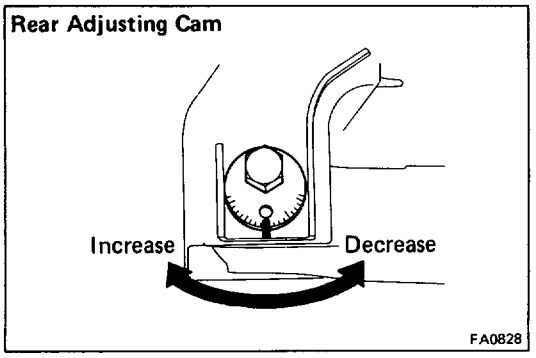
4. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

Camber: See pages A-36, 37
Steering axis inclination: See pages A-36, 37
Caster: See pages A-36, 37

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



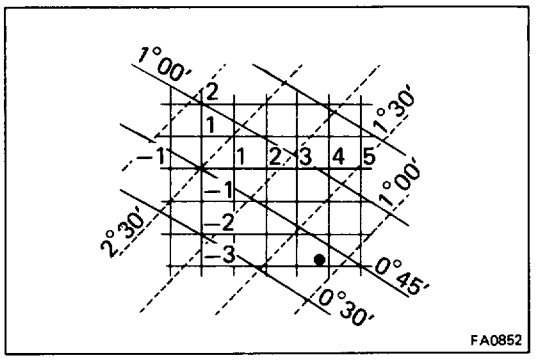
If camber and/or caster are not within specification, adjust by front and/or rear adjusting cams.
(See Adjustment Chart)



How to Read Chart

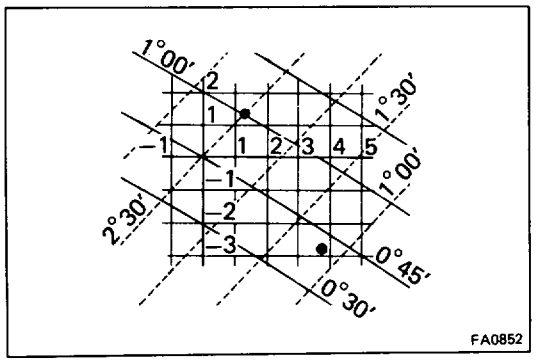
(a) Refer to the service specifications chart on page A- for the adjustment standards and then mark them on the graph.

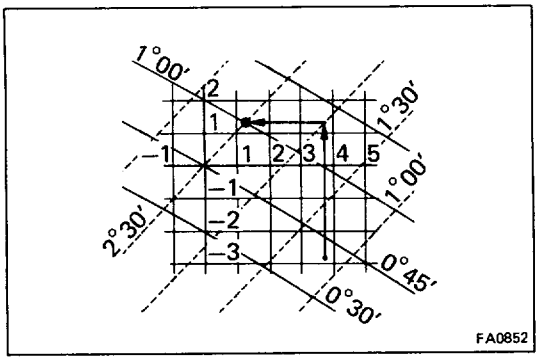
Example: Camber 0°40'
Caster 1°10'



(b) Then mark on the graph the measurements taken from the vehicle.

Example: Camber 1°00'
Caster 2°30'





(c) As shown the illustration, read from the graph the amounts by which the front and/or rear cams are to be adjusted.

Example: Front cam +4.3
Rear cam −2.3

(d) Loosen and adjust the front and/or rear cam.

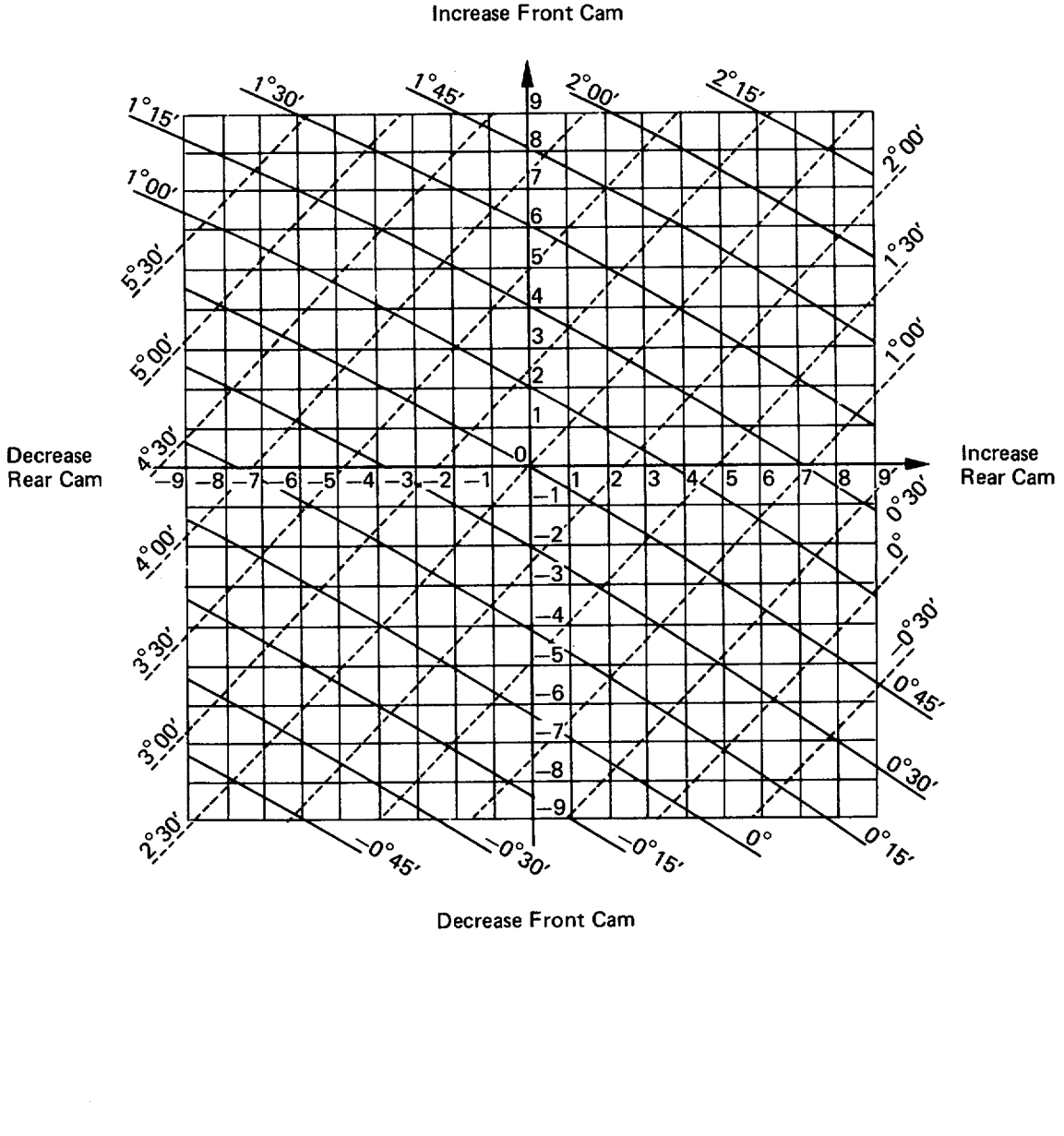
(e) Torque the front and/or rear cam nuts.

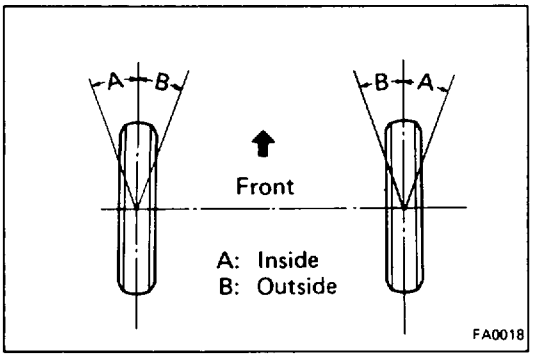
Torque: 2,800 kg-cm (203 ft-lb, 275 N·m)

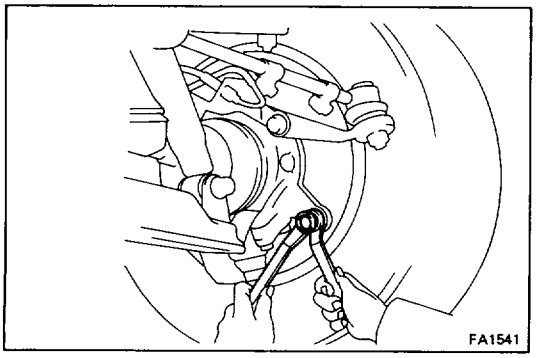
Adjustment Chart

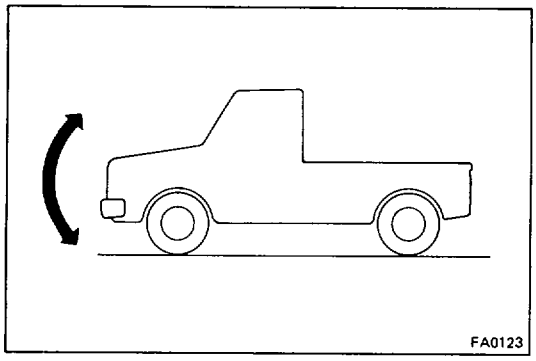
——— Camber

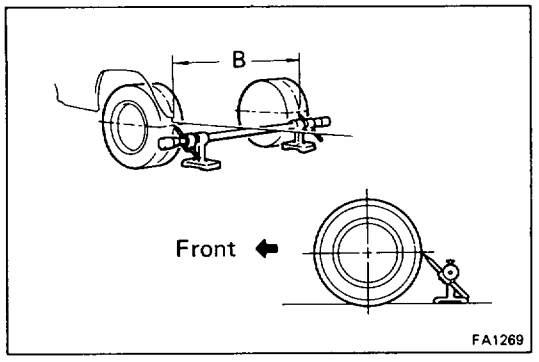
– – – – – Caster

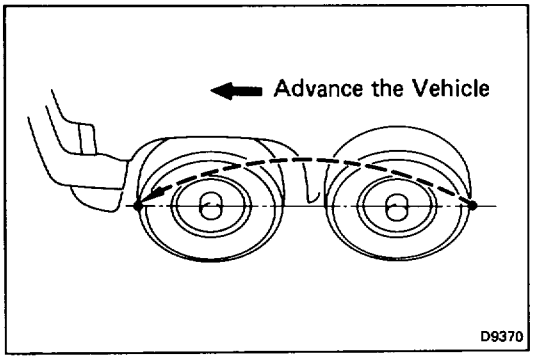












5. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	$32°00' {}^{+1°}_{-2°}$
	Outside wheel	31°
at 20° (outside wheel)	Inside wheel	21°10'

NOTE: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 480 kg-cm (35 ft-lb, 47 N·m)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

6. ADJUST TOE-IN

Adjust toe-in with a toe-in gauge in the following procedure.

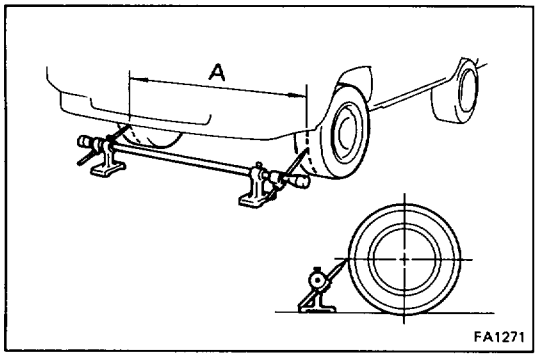
(a) Rock the vehicle up and down to stabilize the suspension.

(b) Move the vehicle forward about 5 m (16.4 ft) with the front wheel in the straight-ahead position on a level place.

(c) Mark the center of each rear tread and measure the distance "B" between the marks of the right and left tires.

(d) Advance the vehicle until the marks on the rear sides of the tires come to the measuring heights of the gauge on the front side.

NOTE: If the tire rolls too far, repeat from step (b).



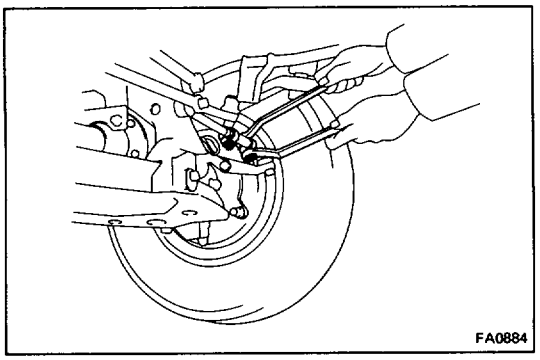
(e) Measure the distance "A" between the marks on the front of the tires.

(f) Measure the toe-in.

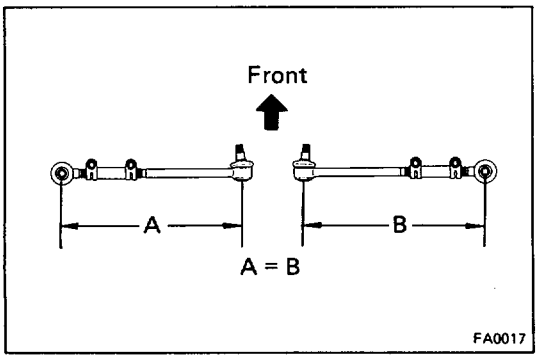
Toe-in = B — A

Inspection standard: See pages A-36, 37

If toe-in is not specification, adjust by left and right tie rods.



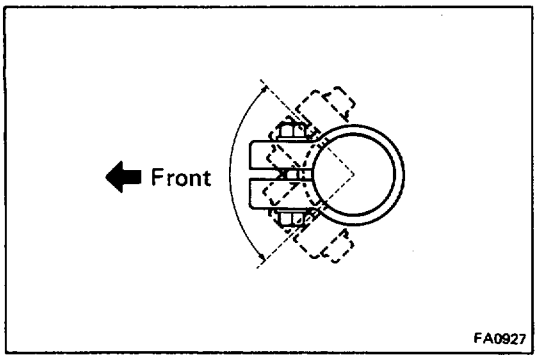
(g) Loosen the clamp bolts and nuts.



(h) Adjust toe-in by turning the left and right tie rod tubes an equal amount.

Adjustment standard: See page A-32,33

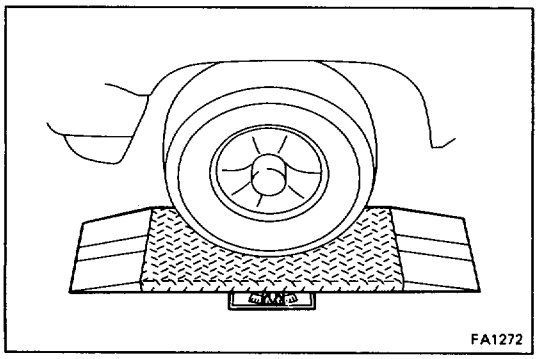
(i) Insure that the lengths of the left and right tie rods are equal.



(j) Torque the tie rod.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

NOTE: Face the clamp bolt toward the front of the vehicle.



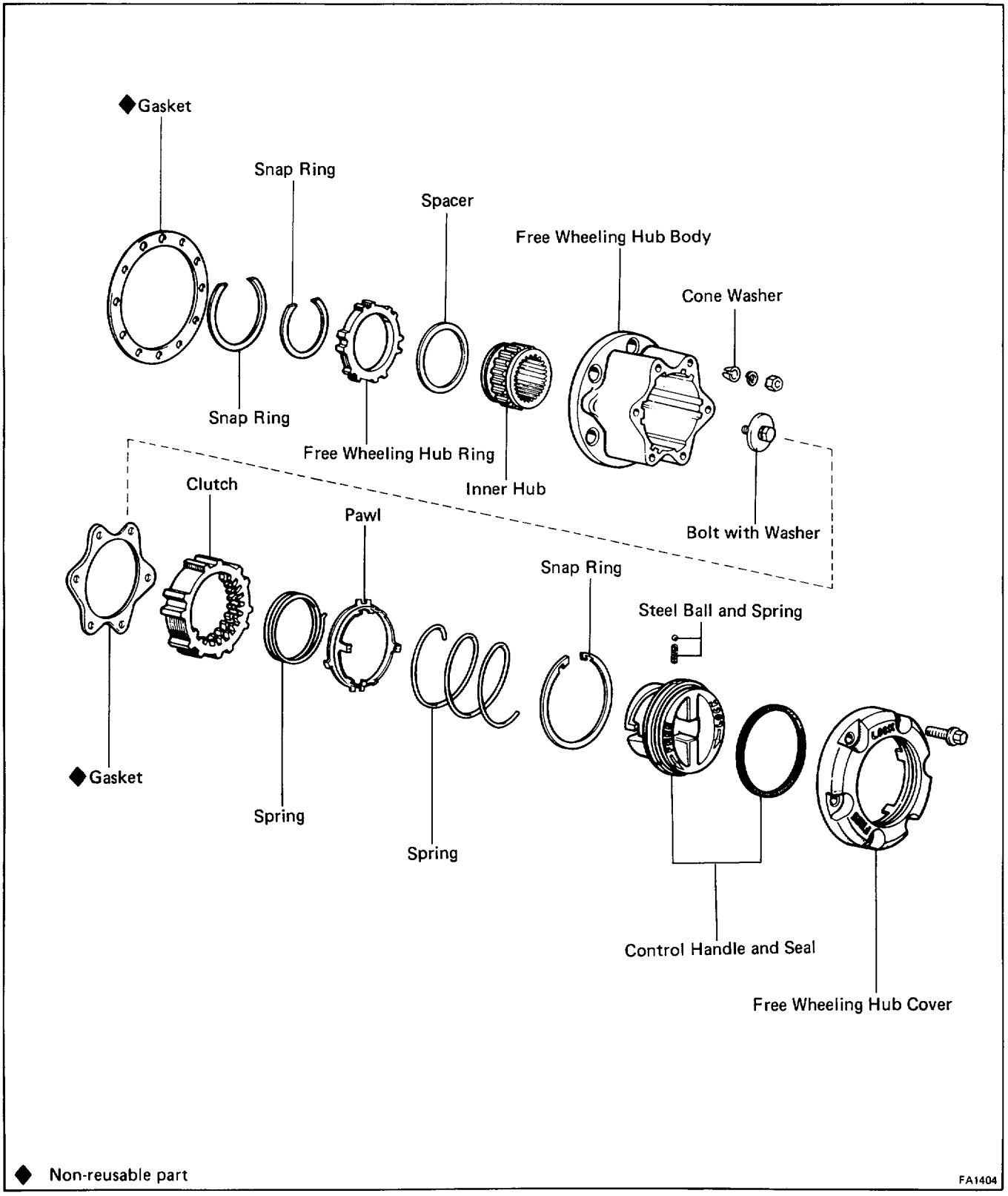
7. INSPECT SIDE SLIP WITH SIDE SLIP TESTER

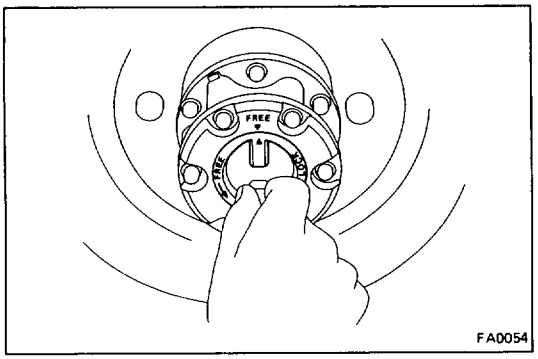
Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less

If the side slip exceeds the limit, the toe-in or other front wheel alignment may not be correct.

FREE WHEELING HUB (4WD)

COMPONENTS



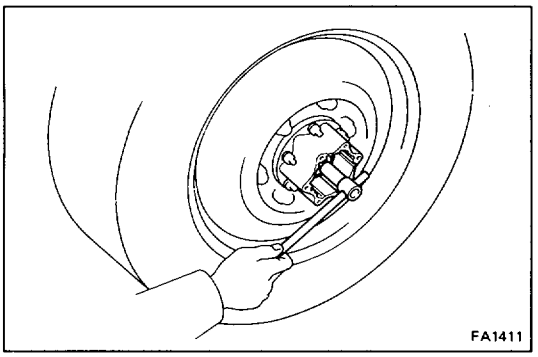


REMOVAL OF FREE WHEELING HUB

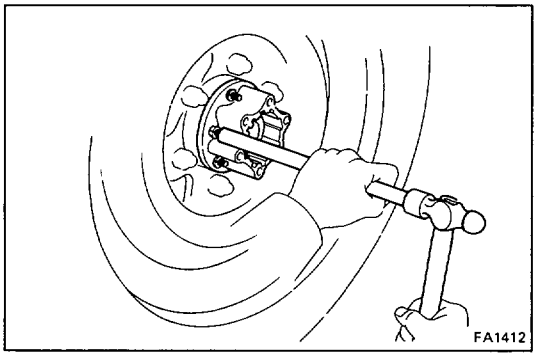
1. REMOVE FREE WHEELING HUB COVER

(a) Set the control handle to FREE.

(b) Remove the cover mounting bolts and pull off the cover.



2. REMOVE BOLT WITH WASHER

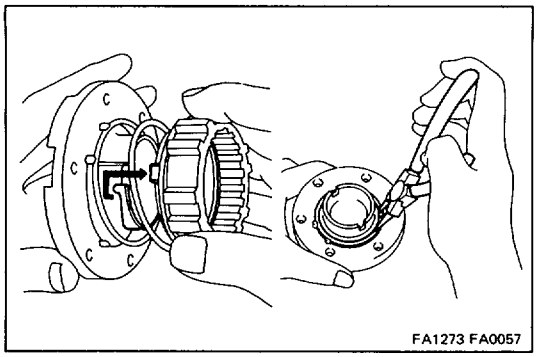


3. REMOVE FREE WHEELING HUB BODY

(a) Remove the mounting nuts and washers.

(b) Using a brass bar and hammer, tap on the bolts head and remove the cone washers.

(c) Pull off the free wheeling hub body.



DISASSEMBLY OF FREE WHEELING HUB

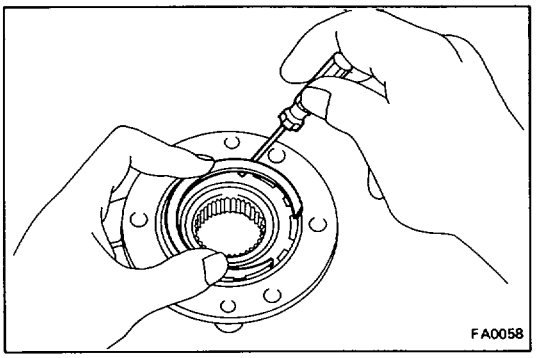
1. REMOVE CONTROL HANDLE FROM FREE WHEELING HUB COVER

(a) Compressing the spring, remove the pawl tab from the handle cam, and remove the clutch.

(b) Using snap ring pliers, remove the snap ring.

(c) Remove the control handle.

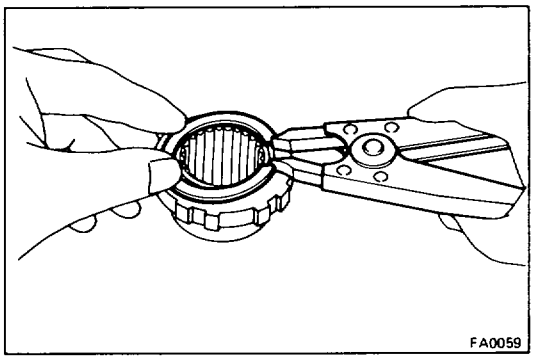
(d) Remove the steel ball and spring from the control handle.



2. REMOVE INNER HUB AND FREE WHEELING HUB RING FROM FREE WHEELING HUB BODY

(a) Using a screwdriver, remove the snap ring.

(b) Remove the inner hub and free wheeling hub ring.

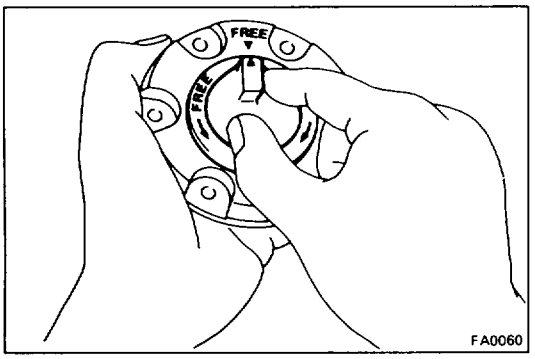

FA0059

3. REMOVE FREE WHEELING HUB RING FROM INNER HUB

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the free wheeling hub ring and spacer.

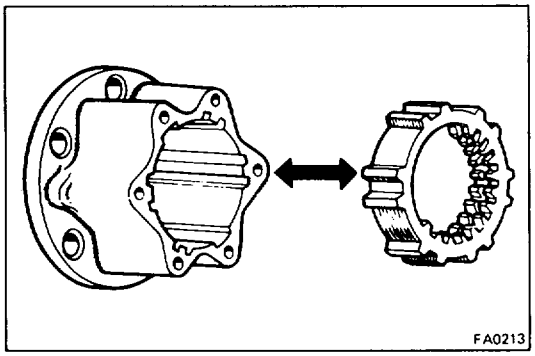
INSPECTION OF FREE WHEELING HUB



FA0060

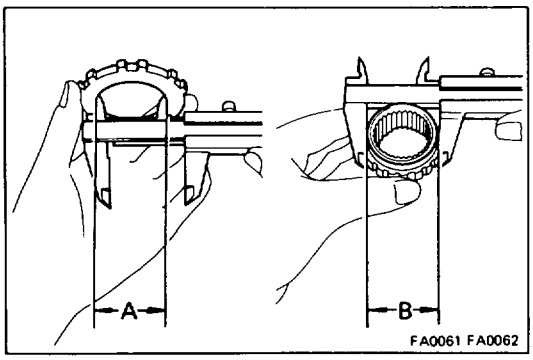
1. INSPECT COVER, HANDLE AND SEAL

Temporarily install the handle in the cover and check that the handle moves smoothly and freely.


FA0213

2. INSPECT BODY AND CLUTCH

Check that the clutch moves smoothly in the body.



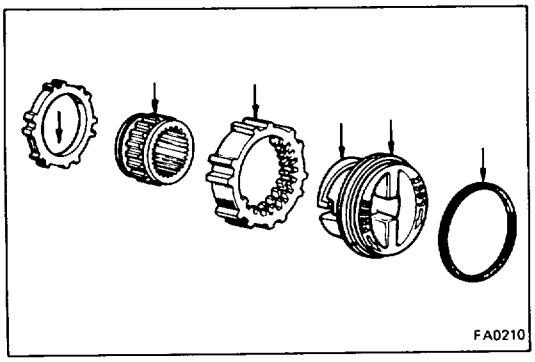
FA0061 FA0062

3. MEASURE THE OIL CLEARANCE BETWEEN THE INNER HUB AND FREE WHEELING HUB RING

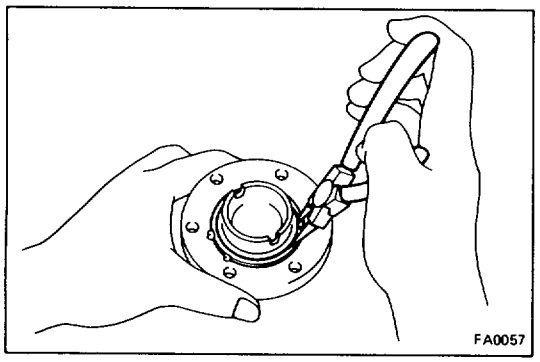
Oil clearance (A — B): 0.3 mm (0.012 in.)

ASSEMBLY OF FREE WHEELING HUB

(See page FA-30)


FA0210

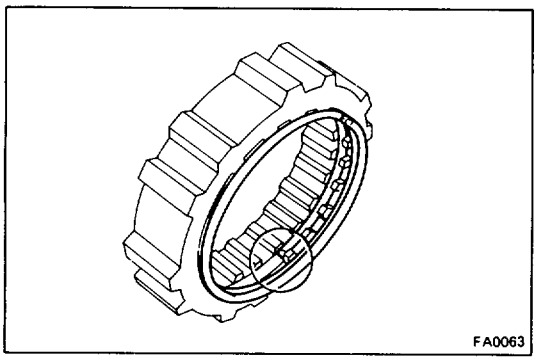
1. APPLY MP GREASE TO SLIDING SURFACE OF PARTS



2. INSTALL CONTROL HANDLE TO COVER

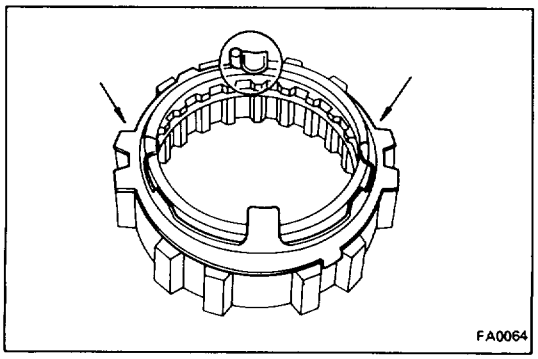
(a) Install the seal, spring and steel ball to the handle.

(b) Insert the handle in the cover and install the snap ring with snap ring pliers.



3. INSTALL TENSION SPRING IN CLUTCH

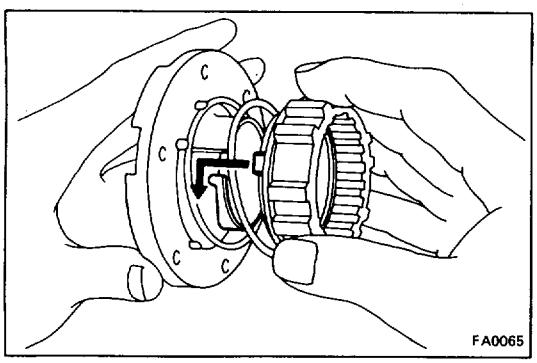
Install the tension spring in the clutch with the spring end aligned with the initial groove.



4. INSTALL FOLLOWER PAWL TO CLUTCH

(a) Place the follower pawl on the tension spring with one of the large tabs against the bent spring end.

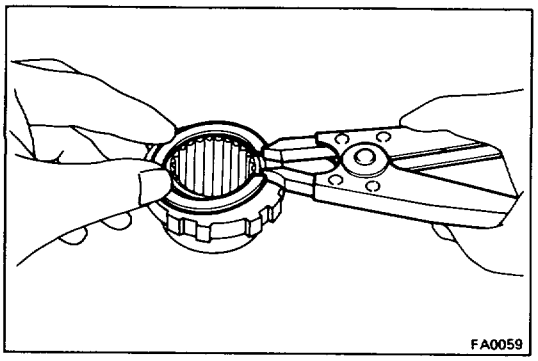
(b) Place the top ring of the spring on the small tabs.



5. INSTALL CLUTCH AND SPRING INTO COVER

(a) Place the spring between the cover and clutch with the large spring end toward the cover.

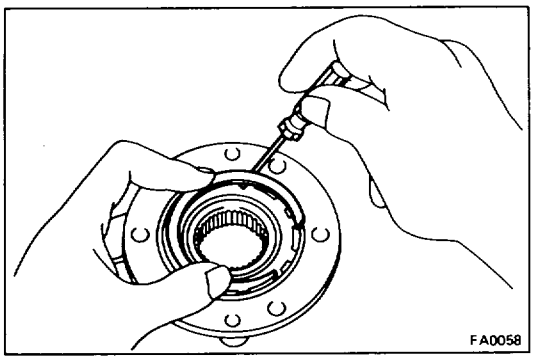
(b) Compress the spring and install the clutch with the pawl tab fit to the handle cam.



6. INSTALL SPACER AND FREE WHEELING HUB RING TO INNER HUB

(a) Install the spacer and free wheeling hub ring to the inner hub.

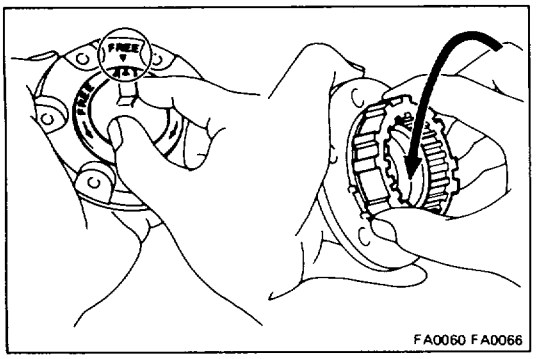
(b) Using snap ring pliers, install the snap ring.



7. **INSTALL INNER HUB AND FREE WHEELING HUB RING IN FREE WHEELING HUB BODY**

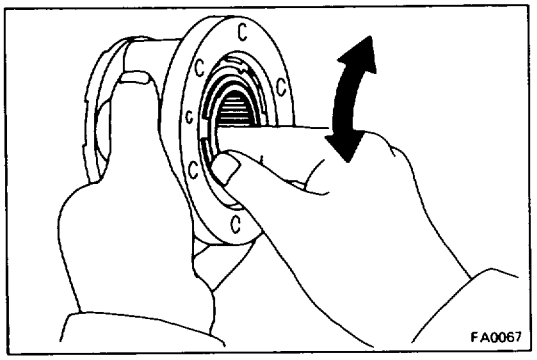
(a) Insert the inner hub and free wheeling hub ring in the body.

(b) Using a screwdriver, install the snap ring.



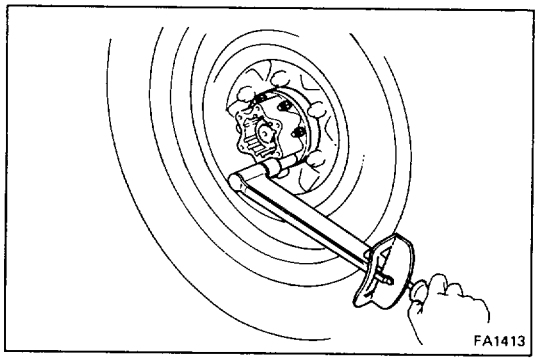
8. **TEMPORARILY INSTALL COVER TO BODY AND CHECK FREE WHEELING HUB**

(a) Set the control handle and clutch to the FREE position.



(b) Insert the cover in the body and verify that the inner hub turns smoothly.

(c) Remove the cover from the body.



INSTALLATION OF FREE WHEELING HUB

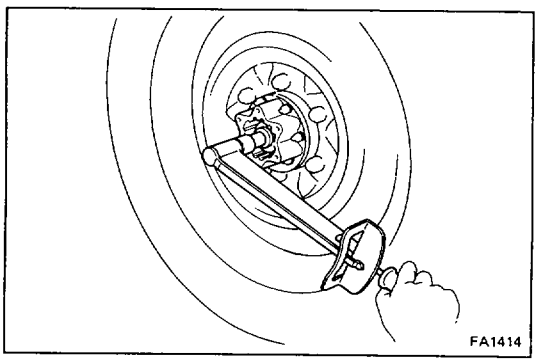
(See page FA-30)

1. INSTALL FREE WHEELING HUB BODY

(a) Place a new gasket in position on the front axle hub.

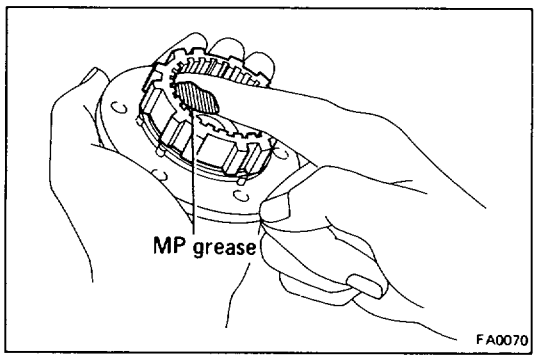
(b) Install the free wheeling hub body with six cone washers and nuts. Tighten the nuts.

Torque: 315 kg-cm (23 ft-lb, 31 N·m)

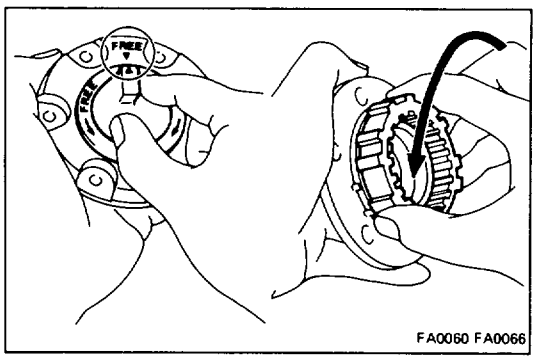


2. INSTALL BOLT WITH WASHER

Torque: 185 kg-cm (13 ft-lb, 18 N·m)



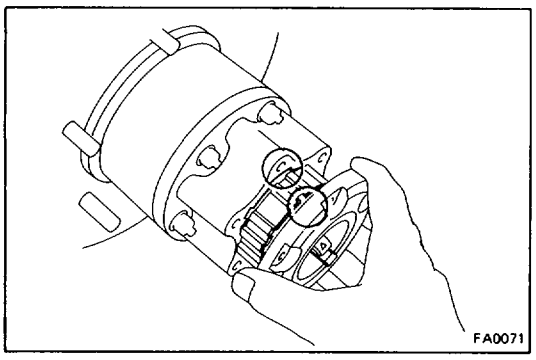
3. APPLY MP GREASE TO INNER HUB SPLINES



4. INSTALL FREE WHEELING HUB COVER WITH NEW GASKET

(a) Set the control handle and clutch to the FREE position.

(b) Place a new gasket in position on the cover.



(c) Install the cover to the body with the follower pawl tabs aligned with the non-toothed portions of the body.

(d) Tighten the cover mounting bolts.

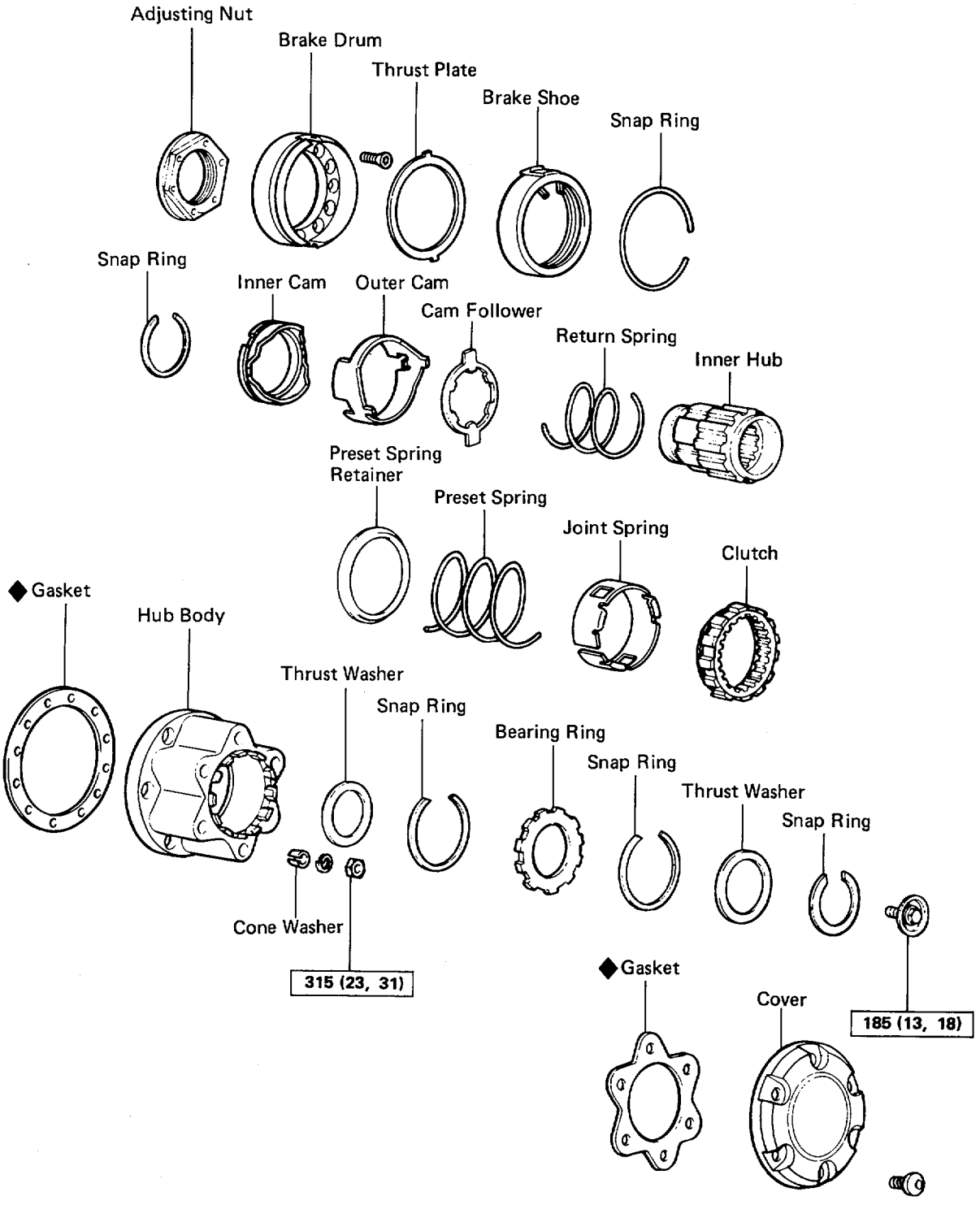
Torque: 100 kg-cm (7 ft-lb, 10 N·m)

AUTOMATIC LOCKING HUB (4WD)

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Will not lock	Brake shoe worn or damaged	Replace brake assembly	FA-37
Will not unlock	Brake spring weak	Replace brake assembly	FA-37
	Rubbing between the inner hub and clutch	Replace hub assembly	FA-37
	Engage/disengagement between the clutch and hub body not smooth	Replace hub assembly	FA-37
Abnormal noise	Body and clutch loose or damaged	Replace hub assembly	FA-37
	Loose set bolt on axle shaft and inner hub	Tighten or replace hub assembly	FA-37
	Loose brake assembly set screw	Replace brake assembly	FA-37
Brake drag (ALH)	Outer cam worn or damaged	Replace hub assembly	FA-37
	Front brake dragging	Replace hub assembly	FA-37

COMPONENTS



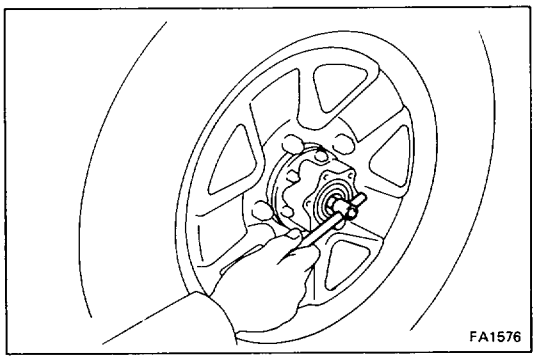
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

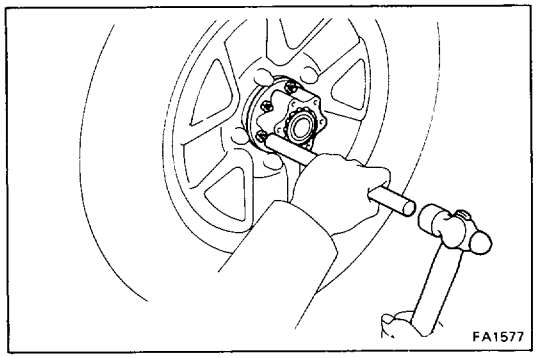
FA1584

REMOVAL OF AUTOMATIC LOCKING HUB

CAUTION: The brake shoe and brake drum grease is a special type and should not be substituted when it is necessary to change the grease, replace the hub body and brake assembly and/or brake drum.



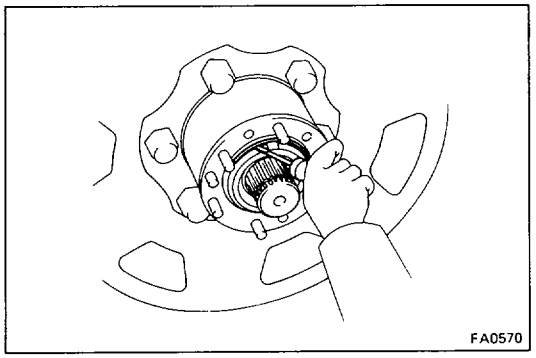
1. **REMOVE HUB COVER**
2. **REMOVE BOLT WITH WASHER**



3. **REMOVE HUB BODY**
   (a) Remove the mounting nuts.
   (b) Using a brass bar and hammer, tap on the bolt heads and remove the cone washers.

   CAUTION: Do not tap the hub body when removing the cone washer. If the stud bolt is damaged or deformed, replace with a new one.

   (c) Pull off the hub body.

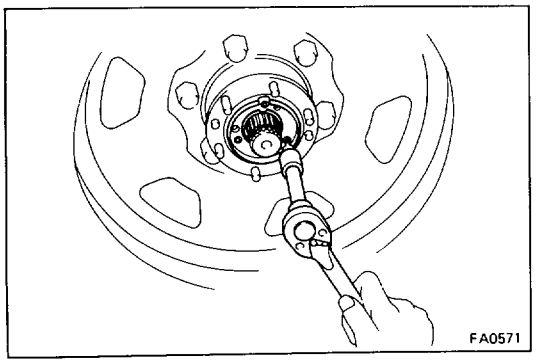


4. **REMOVE BRAKE SUBASSEMBLY**
   (a) Using a screwdriver, pry out the snap ring.

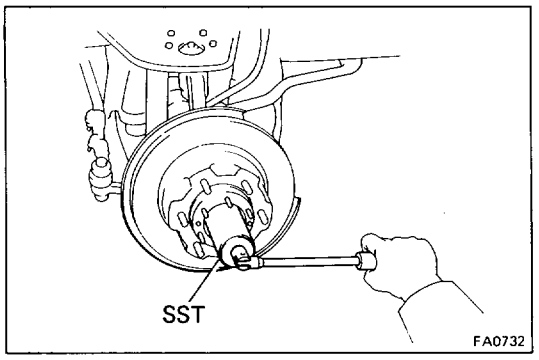
   CAUTION: Never strike brake shoe with the screwdriver; always apply the screwdriver to the brake drum to remove the snap ring.

   (b) Remove the brake subassembly.

   CAUTION: Do not drop the brake shoe subassembly.



5. **REMOVE BRAKE DRUM**
   Using a torx socket, remove the screws and the drum.

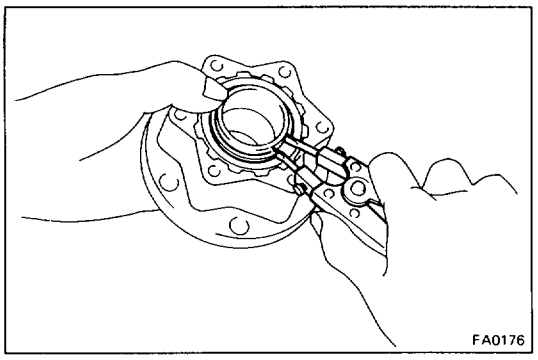


6. IF NECESSARY, REMOVE ADJUSTING NUT

Using SST, remove the adjusting nut.

SST 09607-60020

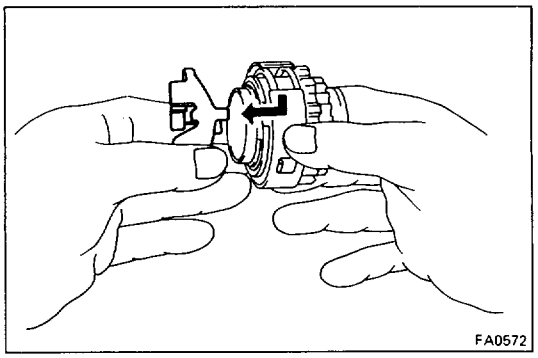
DISASSEMBLY OF AUTOMATIC LOCKING HUB



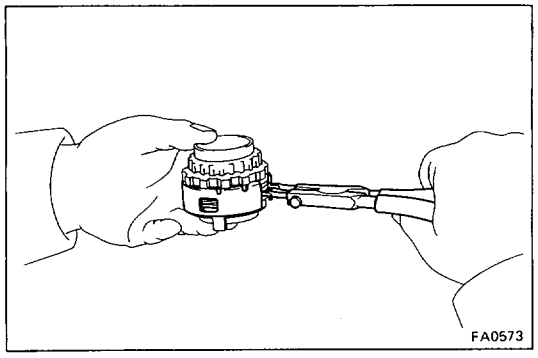
1. REMOVE INNER HUB SUBASSEMBLY FROM HUB BODY

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the inner hub subassembly from the hub.



2. REMOVE OUTER CAM

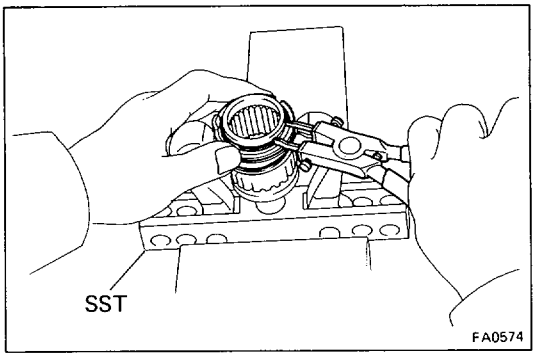


3. REMOVE CLUTCH WITH JOINT SPRING, PRESET SPRING AND SPRING RETAINER

(a) Using snap ring pliers, extend the joint spring and release it from the cam follower claw.

NOTE: Do not stretch the spring more than necessary.

(b) Remove the clutch with the joint spring, preset spring and spring retainer.



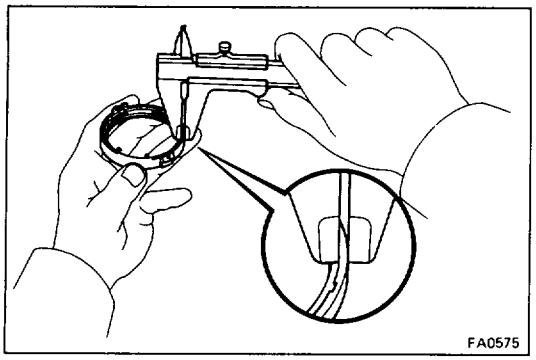
4. REMOVE INNER CAM, CAM FOLLOWER AND RETURN SPRING

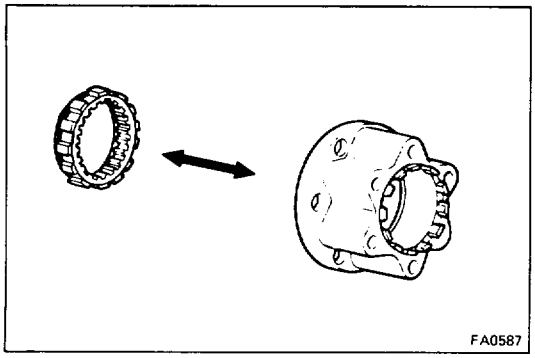
(a) Using SST, attach SST to the cam follower claw and compress the return spring.

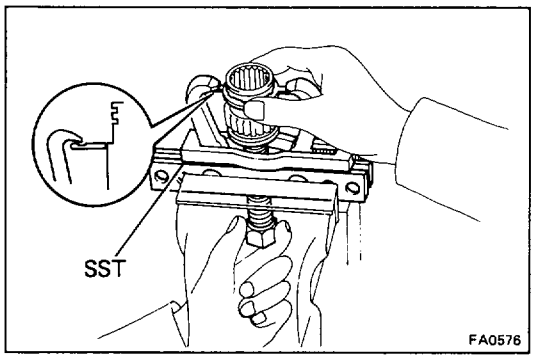
SST 09950-20017

(b) Using snap ring pliers, remove the snap ring.

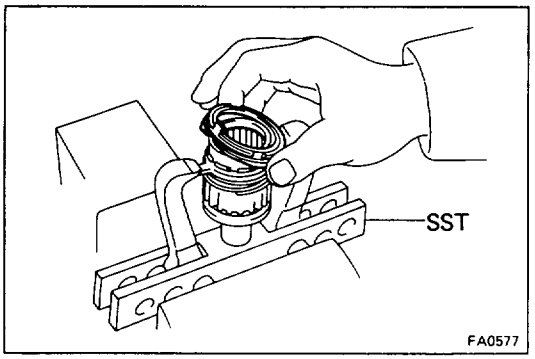
(c) Remove the inner cam, cam follower and return spring.


FA0575

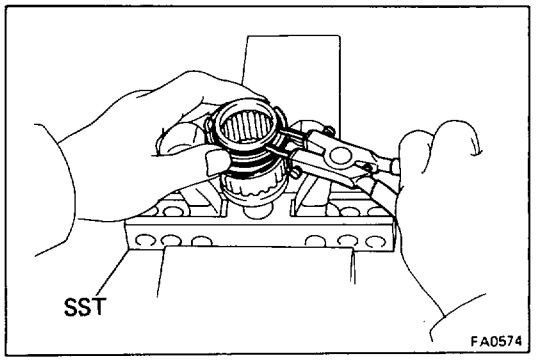

FA0587



FA0576



FA0577



FA0574

INSPECTION OF AUTOMATIC LOCKING HUB

1. MEASURE BRAKE SHOE THICKNESS

(a) Remove the thrust plate from the brake subassembly.

NOTE:

- Do not wipe off the grease on the brake drum or brake shoe.
- Do not remove the spring inside the brake shoe.

(b) Measure the shoe thickness.

Minimum thickness: 1.5 mm (0.059 in.)

If the shoe thickness is less than minimum, replace the brake drum assembly.

2. INSPECT HUB BODY AND CLUTCH

(a) Check to see that the hub body and clutch engage and disengage smoothly.

(b) If engage/disengagement are not smooth, replace the hub assembly.

3. INSPECT OTHER PARTS

(a) Check for abnormal wear or scratches on each part.

(b) If there is abnormal wear or scratches, replace the hub assembly.

ASSEMBLY OF AUTOMATIC LOCKING HUB

(See page FA-37)

1. ADJUST HEIGHT OF SST

(a) Position SST, place the clutch hub above it and insert the cam follower.

SST 09950-20017

(b) Adjust the height of the SST so the cam follower meshes with the inner hub spline and also so the cam follower claw aligns with the claw of SST.

(c) Remove the cam follower.

2. ASSEMBLE RETURN SPRING, CAM FOLLOWER AND INNER CAM TO INNER HUB

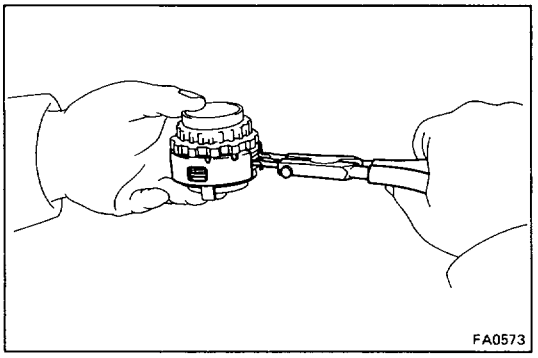
(a) Install the return spring.

NOTE: Set the follower claw to the spring end of the return spring.

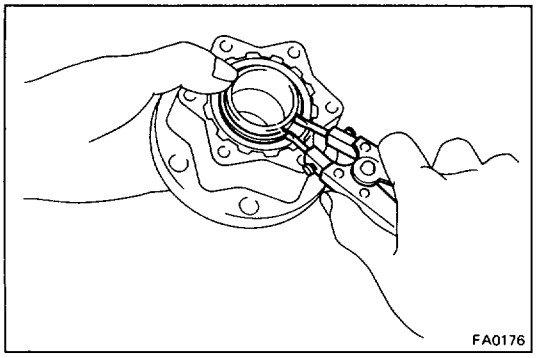
(b) Compress the return spring and attach the cam follower claw to SST.

SST 09950-20017

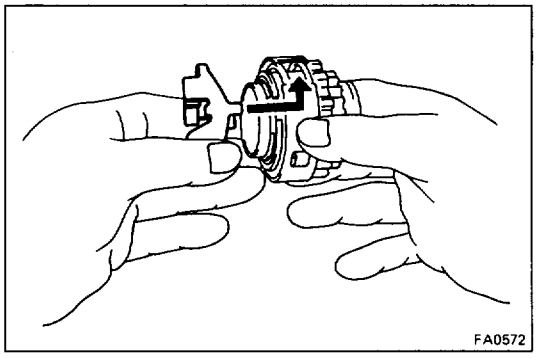
(c) Using snap ring pliers, secure the snap ring.



3. **INSTALL CLUTCH, JOINT SPRING, PRESET SPRING, SPRING RETAINER TO INNER HUB**
   (a) Install the joint spring to the clutch.
   (b) Install the spring retainer and preset spring to the clutch.
   (c) Install the joint spring with the clutch to the inner hub. Using snap ring pliers, expand the spring and attach it to the cam follower.



4. **INSTALL INNER HUB ASSEMBLY TO HUB BODY**
   (a) Install the thrust washer to the inner hub.
   (b) Install the hub body to the inner hub.
   (c) Install the thrust washer.
   (d) Using snap ring pliers, secure the snap ring.



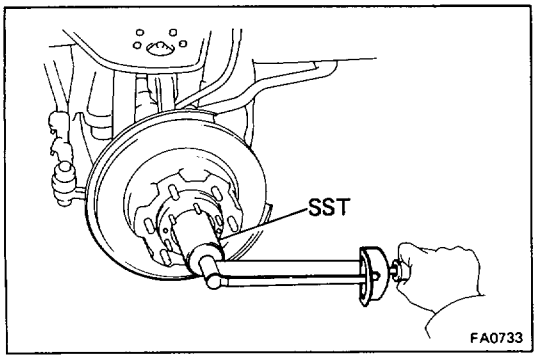
5. **INSTALL OUTER CAM TO INNER CAM**

INSTALLATION OF AUTOMATIC LOCKING HUB

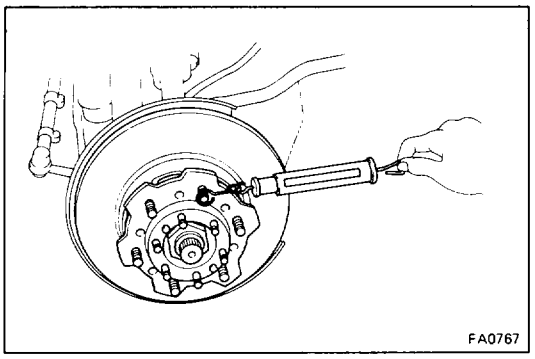
(See page FA-37)

1. **IF NECESSARY, INSTALL ADJUSTING NUT**

   CAUTION: When converting to an automatic locking type from a type without free wheeling hubs or a manual locking type, a thrust washer must not be installed.



2. **ADJUST PRELOAD**
   (a) Using SST, torque the adjusting nut.
   SST 09607-60020
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)
   (b) Turn the hub right and left two or three times.
   (c) Loosen the nut until it can be turned by hand.


FA0767

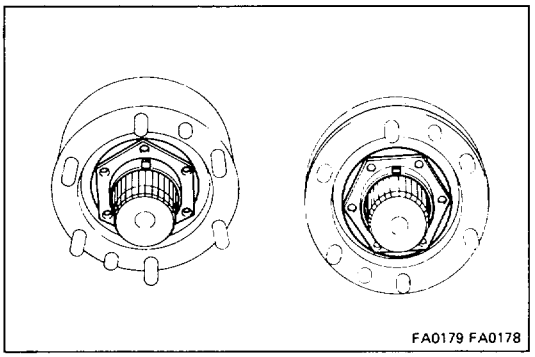
(d) Using SST, retighten the adjusting nut.

SST 09607-60020

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

(e) Using a spring tension gauge, check the preload.

Preload (starting): 2.9 — 5.7 kg (6.4 — 12.6 lb, 28 — 56 N)

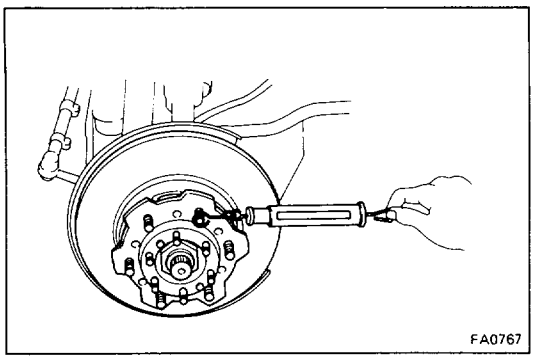

FA0179 FA0178

3. INSTALL BRAKE ASSEMBLY

(a) Tighten the adjusting nut by the smallest amount possible and align it in either position shown left.

(b) Align the brake hub with the spindle groove and insert it until it is up against the adjusting nut.

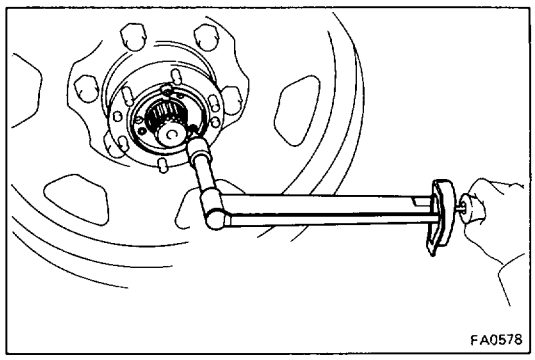
Then confirm that the holes of the brake hub and adjusting nut are aligned.


FA0767

(c) Using a spring tension gauge, check the preload.

Preload (starting): 2.9 — 5.7 kg (6.4 — 12.6 lb, 28 — 56 N)

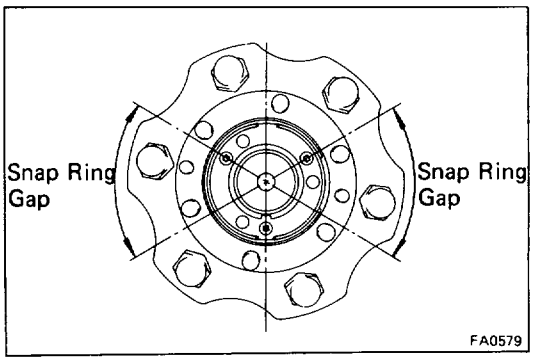
If not within specification, adjust with the adjusting nut.


FA0578

(d) Install the brake drum.

(e) Using a torx socket, torque the three screws.

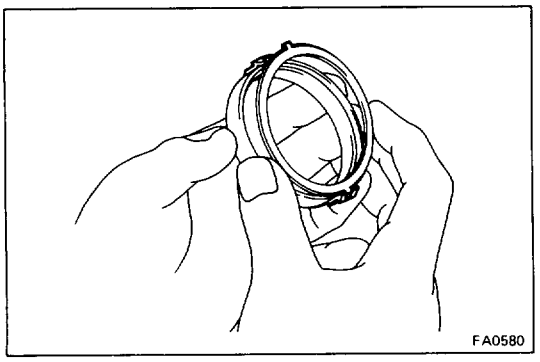
Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)



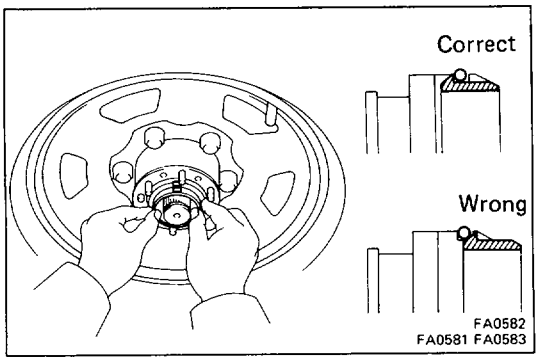
FA0579

(f) Install the snap ring.

NOTE: Do not align the snap ring gap and the notch of the brake drum.

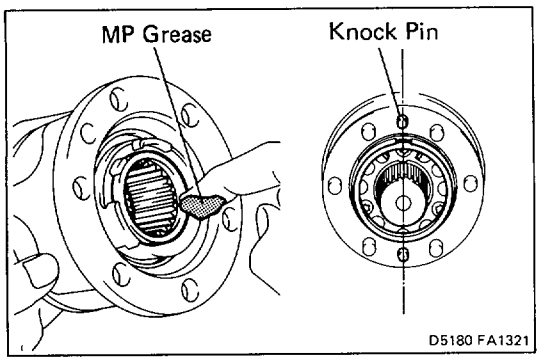

FA0580

(g) Align the tabs of the thrust plate with the groove of the thrust plate and assemble.



FA0582
FA0581 FA0583

(h) Install the brake subassembly to the brake drum.



D5180 FA1321

4. INSTALL AUTOMATIC LOCKING HUB

(a) Install a new gasket to the axle hub.

(b) Apply MP grease to the splines of the automatic locking hub body.

(c) Align the spring ends of the brake assembly with the knock pin.

(d) Check that the outer cam stopper is securely in the inner cam groove.

(e) Position the inner cam protrusion so it is centered between the outer cam protrusions and aligned with the knock pin hole of the hub body.

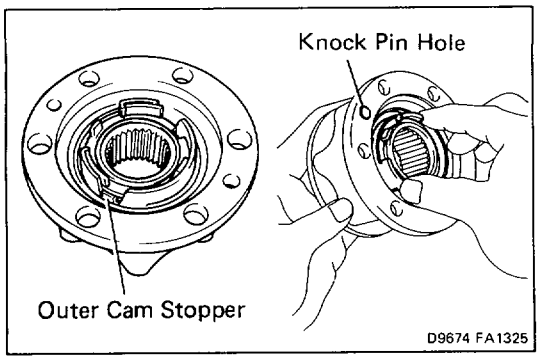
(f) Install the automatic locking hub body to the axle hub so that the inner cam protrusion is set between the ends of the brake spring. Then install to the drive shaft splines.

(g) Check that the hub body fits perfectly on the axle hub, and install the six cone washers and nuts.

Torque: 315 kg-cm (23 ft-lb, 31 N·m)

NOTE: If the hub body and axle hub do not fit perfectly, reinstall them.

If the splines are not aligned, turn the propeller shaft to align them.

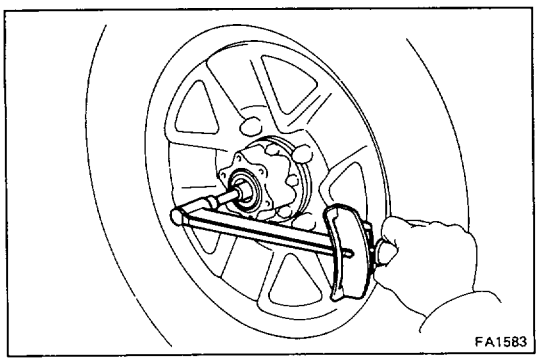


D9674 FA1325

5. INSTALL BOLT WITH WASHER

Torque the bolt.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)


FA1583

6. INSTALL COVER

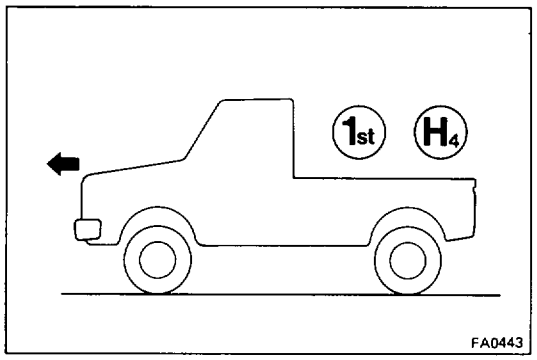
Install a new gasket and cover with the screws.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)

CAUTION: When assembling the automatic locking hub, the locking of the left and right hubs may not be identical, so shift to "H4" in the first run after assembly.

OPERATION CHECK

Perform this check with two persons.

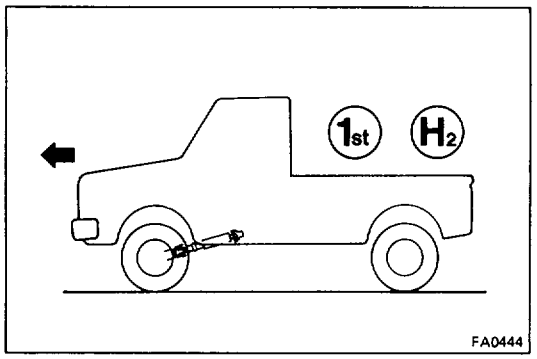


CONFIRMATION OF FORWARD MOTION

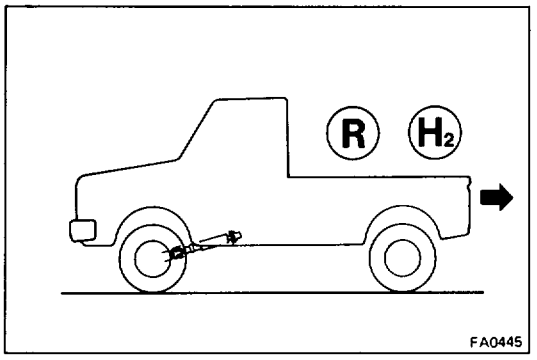
1. CHECK LOCK OPERATION

(a) Shift into "H4" and "1st" and slowly proceed for several meters.

(b) Stop the vehicle.



(c) For transfer, shift to "H2" and proceed slowly while an assistant checks under the vehicle to see that the propeller shaft is rotating. If the propeller shaft rotates, the automatic locking hub is locked.



2. CHECK FREE OPERATION

(a) Transfer is done in "H2", shifting to reverse position and backing up several meters.

While shifting, have an assistant check under the vehicle to see that the propeller shaft is not rotating.

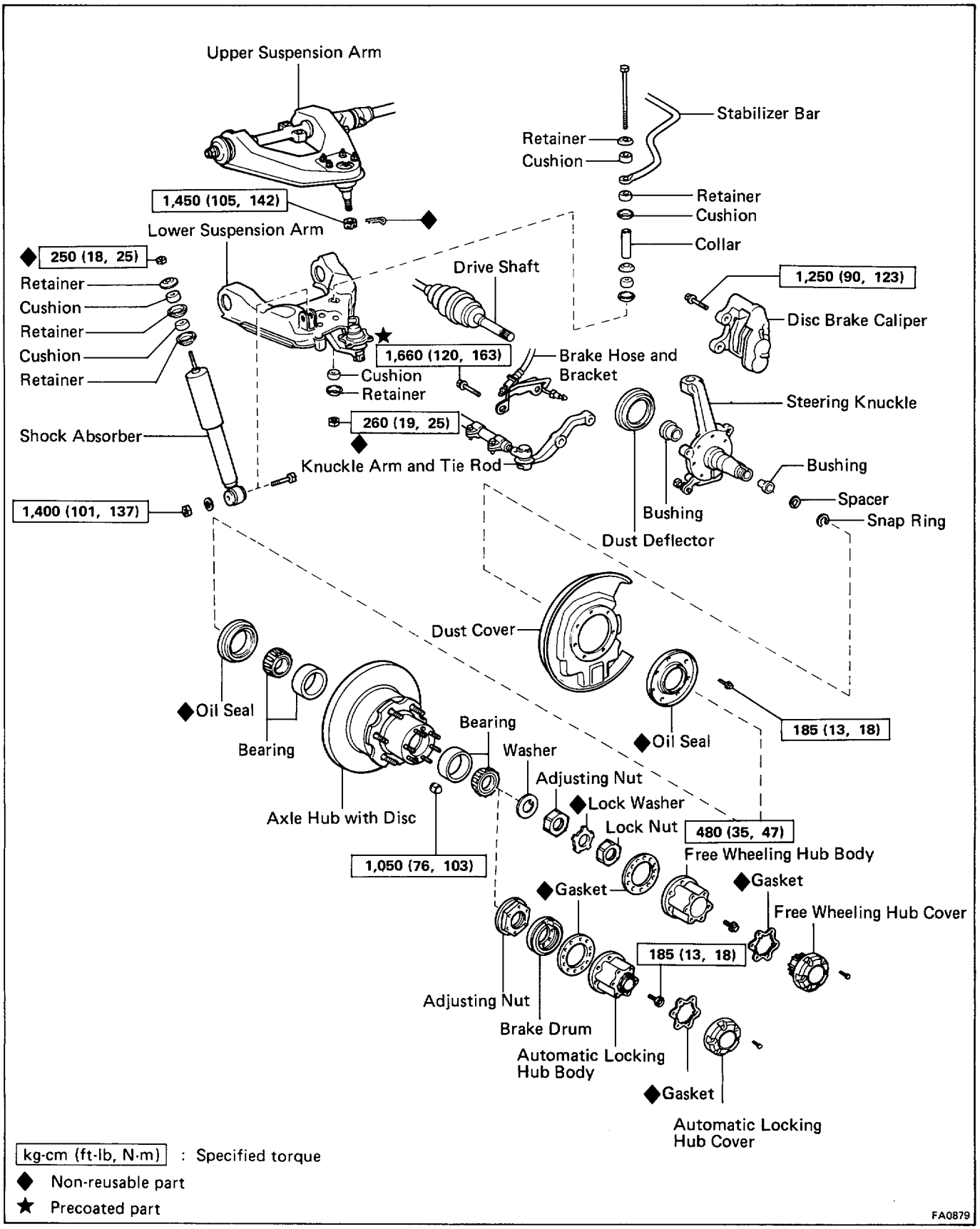
CONFIRMATION OF REVERSE MOTION

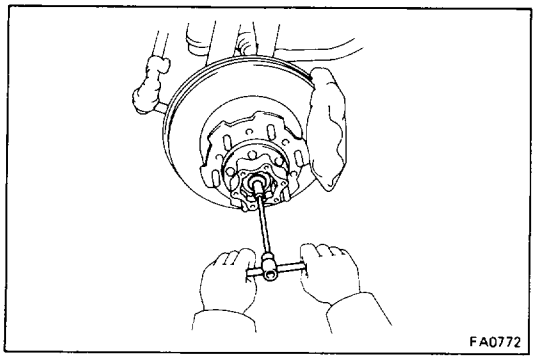
Reverse is checked in the same manner as forward motion.

In the event of any abnormalities, recheck the assembly and/or installation.

FRONT AXLE HUB AND STEERING KNUCKLE (4WD)

COMPONENTS



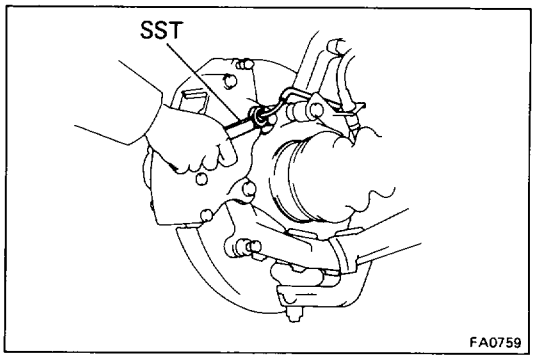


Front Axle Hub

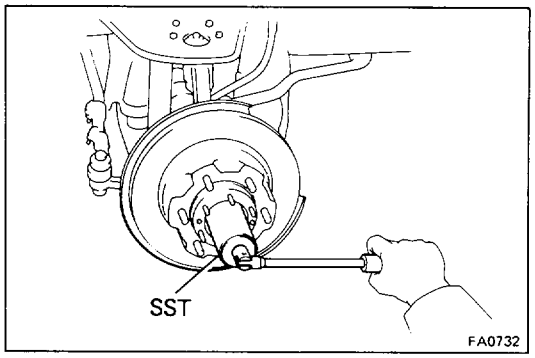
(See page FA-45)

DISASSEMBLY OF FRONT AXLE HUB

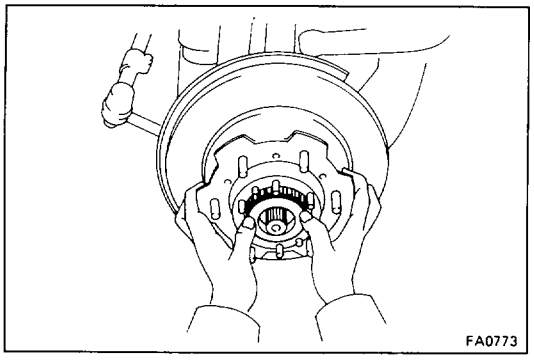
1. **REMOVE FLEE WHEELING HUB OR AUTOMATIC LOCKING HUB**
   (Free wheeling hub See page FA-30
   Automatic locking hub See page FA-37)

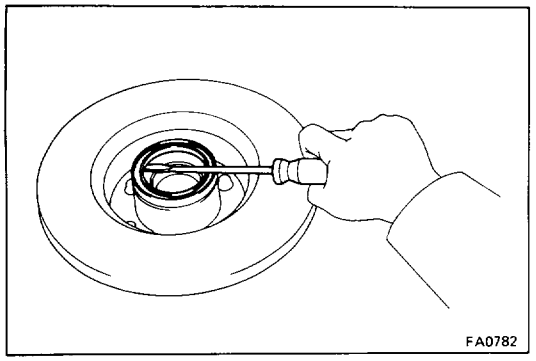


2. **REMOVE DISC BRAKE CYLINDER**
   (a) Using SST, disconnect the brake tube from the disc brake.
   SST 09751-36011
   (b) Drain the brake fluid to a container.
   (c) Remove the disc brake cylinder from the steering knuckle.

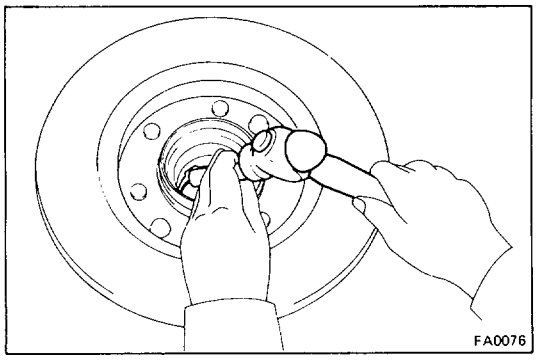


3. **REMOVE AXLE HUB WITH DISC**
   (a) (w/ Free wheeling hub)
   Using a screwdriver, release the lock washer.
   (b) (w/ Free wheeling hub)
   Using SST, remove the lock nut and lock washer.
   SST 09607-60020
   (c) Using SST, remove the adjusting nut.
   SST 09607-60020
   (d) (w/ Free wheeling hub)
   Remove the thrust washer.
   (e) Remove the hub and disc together with the outer bearing.





4. **REMOVE OIL SEAL AND INNER BEARING**
   (a) Using a screwdriver, pry out the oil seal.
   (b) Remove the inner bearing from the hub.



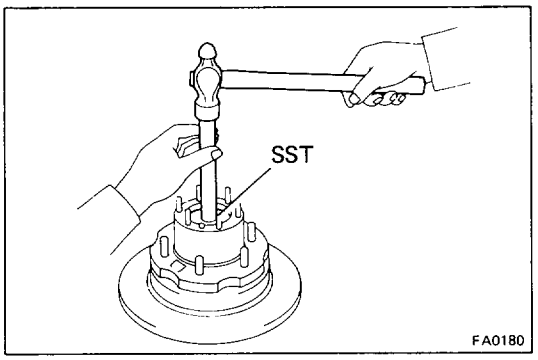
INSPECTION AND REPAIR OF FRONT AXLE HUB

1. INSPECT BEARINGS

Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACES

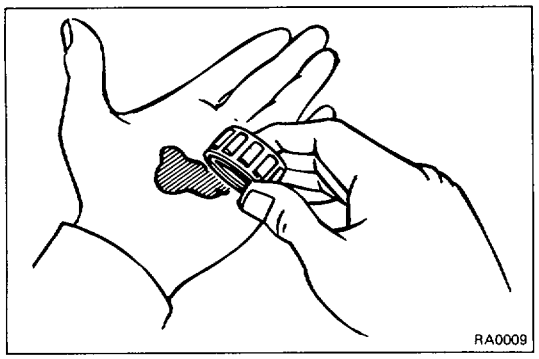
(a) Using a brass bar and hammer, drive out the bearing outer race.



(b) Using SST, carefully drive in a new bearing outer race.

SST 09608-35014

Outside race (09608-06020, 09608-06200)
Inside race (09608-06020, 09608-06210)



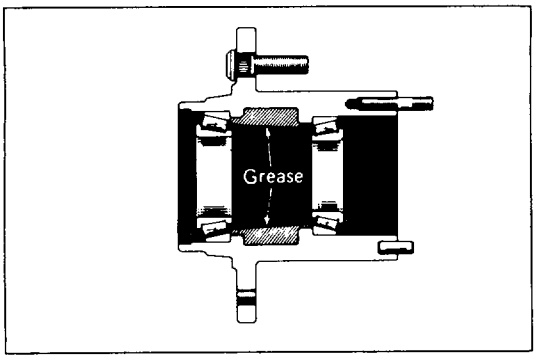
ASSEMBLY OF FRONT AXLE HUB

1. PACK BEARING WITH MP GREASE

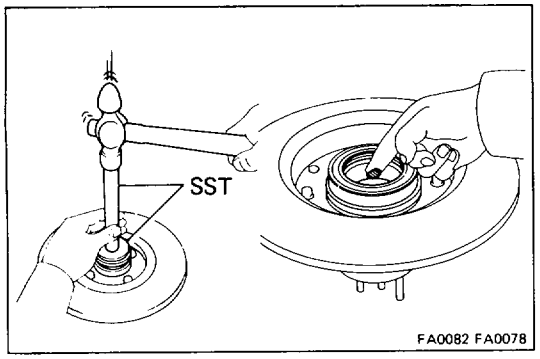
(a) Place MP grease in the palm of your hand.

(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.

(c) Do the same around the bearing circumference.



2. COAT INSIDE OF HUB WITH MP GREASE



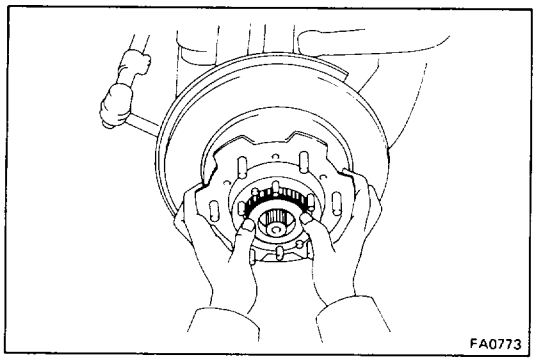
3. INSTALL INNER BEARING AND OIL SEAL

(a) Place the inner bearing into the hub.

(b) Using SST, drive in a new oil seal into the hub.

SST 09608-35014 (09608-06020, 09608-06150)

(c) Coat the oil seal lip with MP grease.

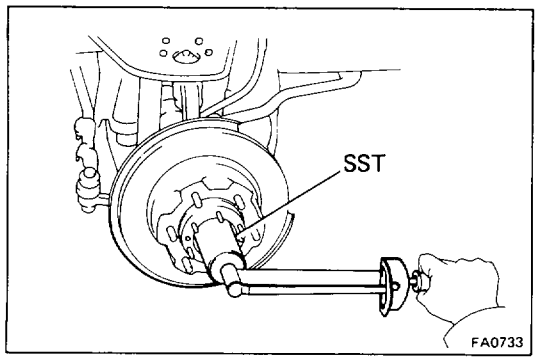


4. INSTALL AXLE HUB TO STEERING KNUCKLE

(a) Place the axle hub to the steering knuckle.

(b) Install the outer bearing.

(c) (w/ Free wheeling hub)
Install the thrust washer.



5. ADJUST PRELOAD

(a) Using SST, torque the adjusting nut.

SST 09607-60020

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

(b) Turn the hub right and left two or three times.

(c) Loosen the nut until it can be turned by hand.

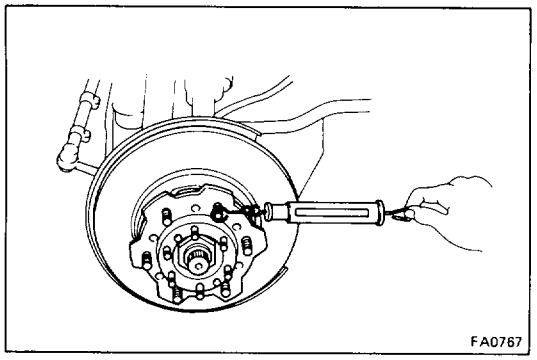
(d) Using SST, retighten the adjusting nut.

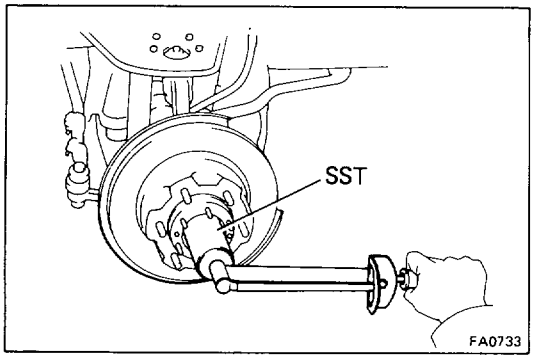
SST 09607-60020

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

(e) Using a spring tension gauge, check the preload.

Preload (starting): 2.9 — 5.7 kg (6.4 — 12.6 lb, 28 — 56 N)





6. (w/ Free wheeling hub)
INSTALL LOCK WASHER AND LOCK NUT

(a) Install a new lock washer and the lock nut.

(b) Using SST, torque the lock nut.

SST 09607-60020

Torque: 480 kg-cm (35 ft-lb, 47 N·m)

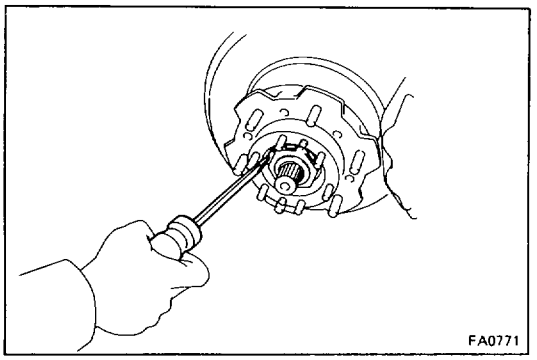
(c) Check that the bearing has no play.

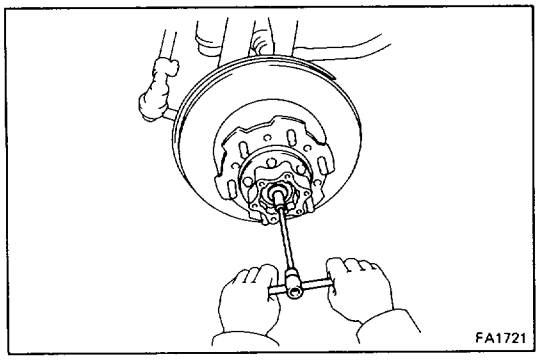
(d) Using a spring tension gauge, recheck the preload.

Preload (starting): 2.9 — 5.7 kg (6.4 — 12.6 lb, 28 — 56 N)

If not within specification, adjust with the adjusting nut.

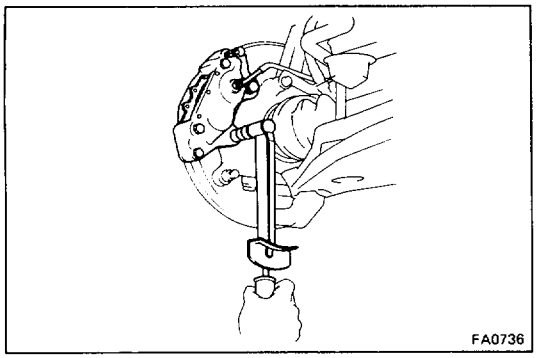
(e) Secure the lock nut by bending one of the lock washer teeth inward and the other lock washer teeth outward.





7. **INSTALL FLEE WHEELING HUB OR AUTOMATIC LOCKING HUB**

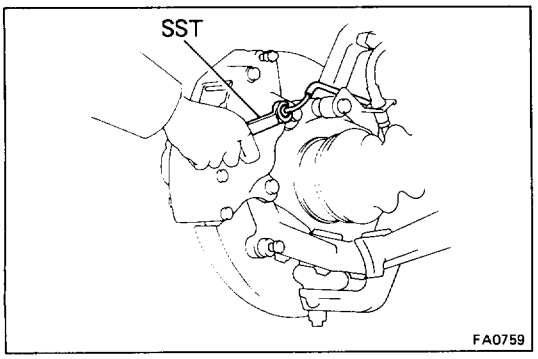
(**Free wheeling hub** **See page FA-35**
Automatic locking hub **See page FA-41**)



8. **INSTALL DISC BRAKE CYLINDER**

(a) Install the disc brake cylinder to the steering knuckle and torque the bolts.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

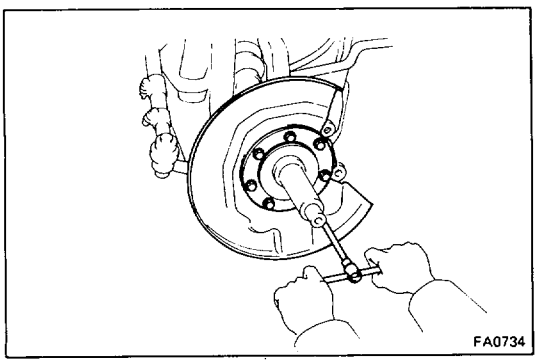


(b) Using SST, connect the brake tube.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

9. **BLEED BRAKE SYSTEM**
(See page BR-6)



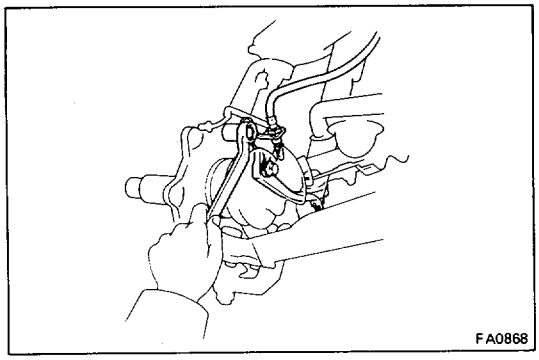
Steering Knuckle

(See page FA-45)

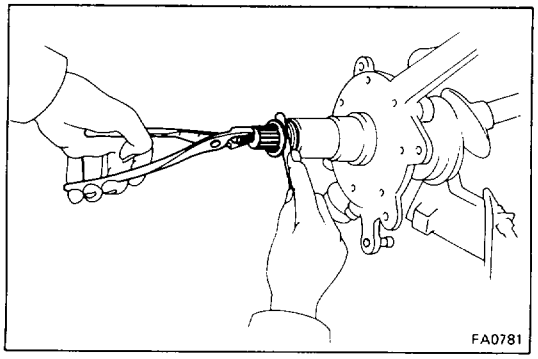
REMOVAL OF STEERING KNUCKLE

1. **REMOVE DISC BRAKE CYLINDER AND FRONT AXLE HUB**
(See page FA-46)

2. **REMOVE DUST COVER AND OIL SEAL**



3. **DISCONNECT KNUCKLE ARM FROM STEERING KNUCKLE**



4. MEASURE STEERING KNUCKLE BUSHING THRUST CLEARANCE

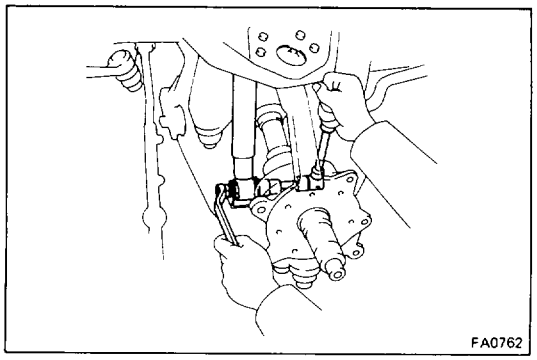
(a) Install a bolt in the drive shaft.

(b) Using a feeler gauge, measure the front drive shaft thrust clearance between the steering knuckle outside bushing and spacer, by pulling the bolt and applying 10 kg (22.0 lb, 98 N) of pressure.

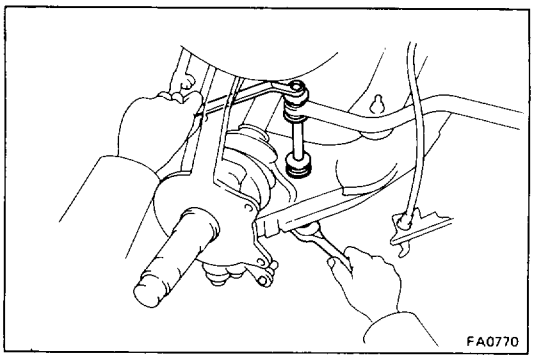
Front drive shaft thrust clearance:

Standard clearance	**0.075 — 0.690 mm (0.0030 — 0.0272 in.)**
Maximum clearance	**1.0 mm (0.039 in.)**

If the measurement more than maximum, replace the steering knuckle outside and inside bushings.

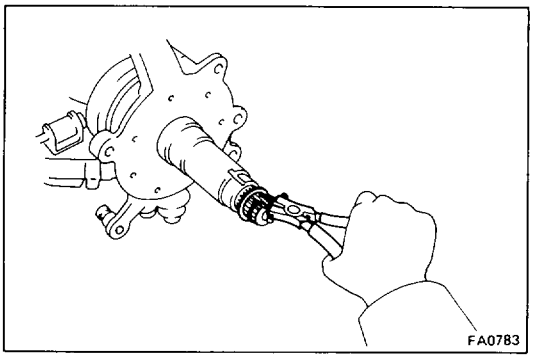


5. DISCONNECT FRONT SHOCK ABSORBER FROM LOWER SUSPENSION ARM



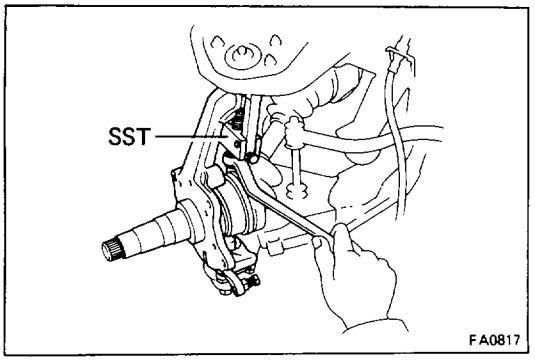
6. DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM

Remove the nut, bolt, retainers, cushions and collar, and disconnect the stabilizer bar from the lower suspension arm.



7. REMOVE SNAP RING AND SPACER

Using snap pliers, remove the snap ring and spacer.

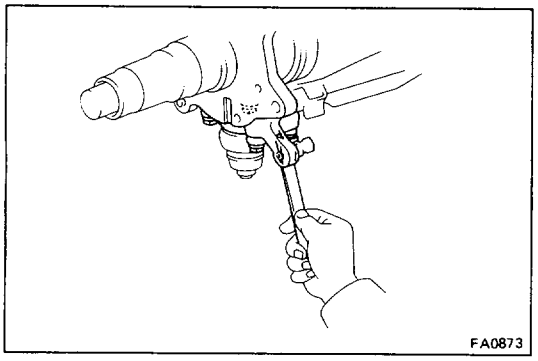


8. REMOVE STEERING KNUCKLE

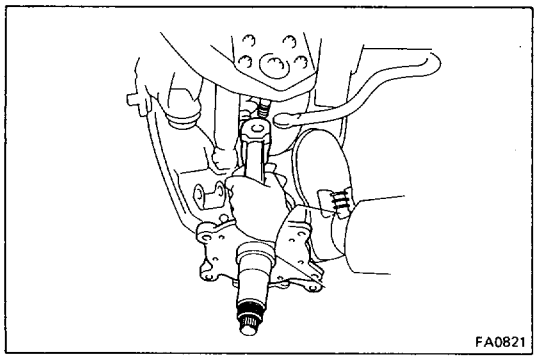
(a) Remove the cotter pin and nut from the upper ball joint.

(b) Using SST, disconnect the steering knuckle from the upper ball joint.

SST 09628-62011



(c) Remove the four bolts from the lower ball joint and disconnect the steering knuckle from the lower ball joint.



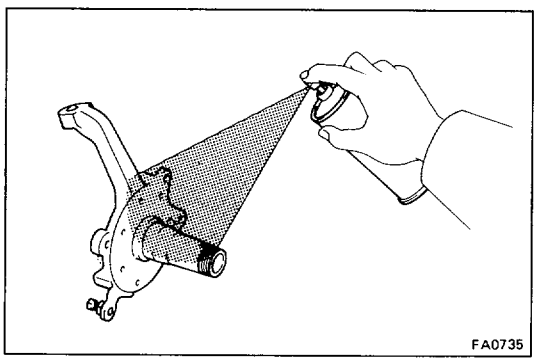
(d) Push the lower suspension arm down and remove the steering knuckle.

INSPECTION AND REPLACEMENT OF STEERING KNUCKLE

1. INSPECT STEERING KNUCKLE

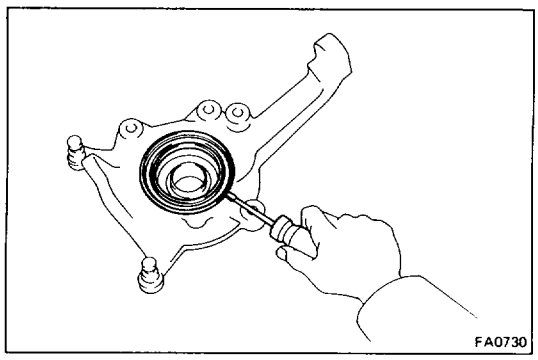
Using a dye penetrant, check the steering knuckle for cracks.

If crack is found, replace the steering knuckle.



2. REMOVE DUST DEFLECTOR

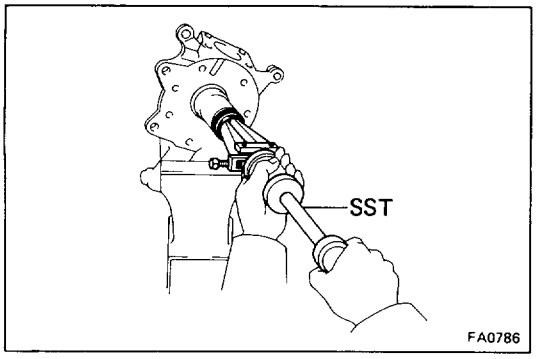
Using a screwdriver, pry out the dust deflector from the steering knuckle.

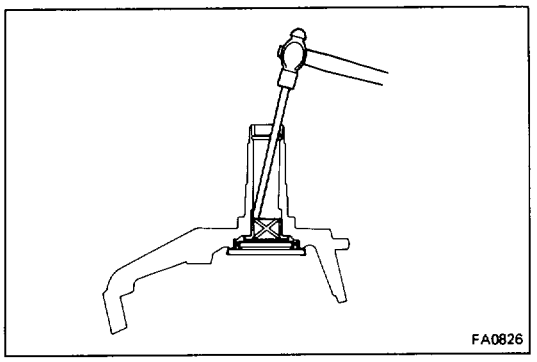


3. REMOVE STEERING KNUCKLE BUSHING

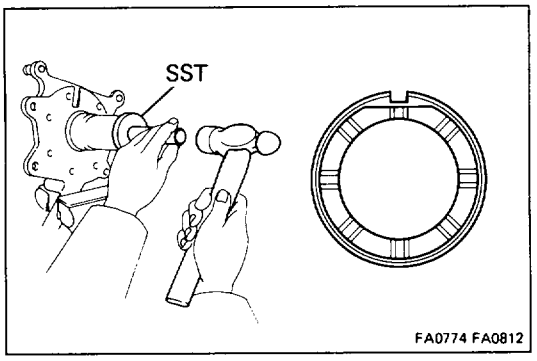
(a) Using SST, pull out the steering knuckle outside bushing.

SST 09308-00010




FA0826

(b) Using a brass bar and hammer, drive out the steering knuckle inside bushing.



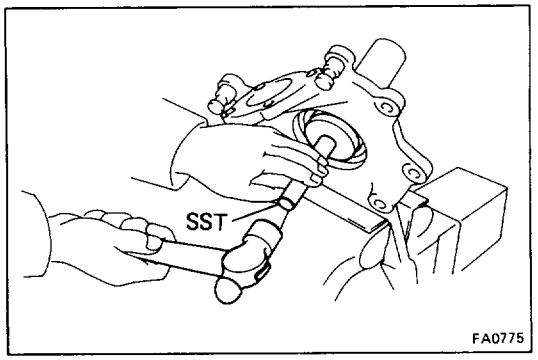
FA0774 FA0812

4. INSTALL STEERING KNUCKLE BUSHING

(a) Using SST and a hammer, tap in a new steering knuckle outside bushing.

SST 09550-10012 (09252-10010, 09555-10010)

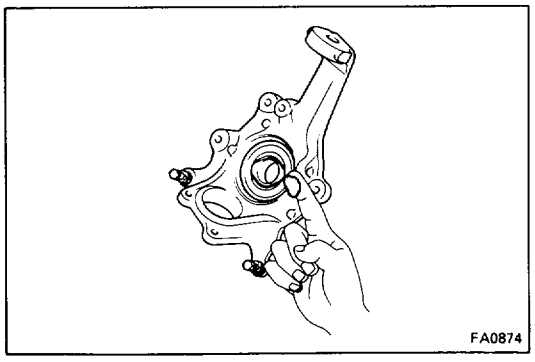
NOTE: When installing the bushing to the spindle, make sure the flat portion of the bushing is aligned with the spindle groove as shown in the figure.



FA0775

(b) Using SST and a hammer, tap in a new steering knuckle inside bushing.

SST 09550-10012 (09252-10010, 09555-10010)

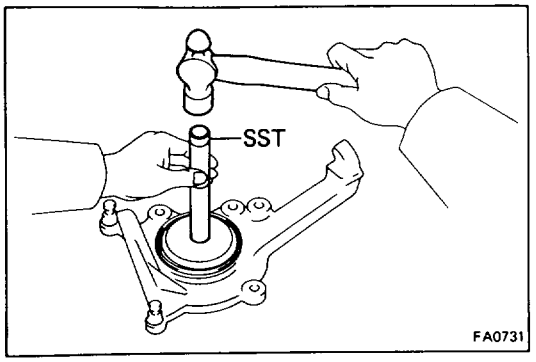

FA0874

(c) Apply molybdenum disulphide lithium base grease to the steering knuckle bushings.

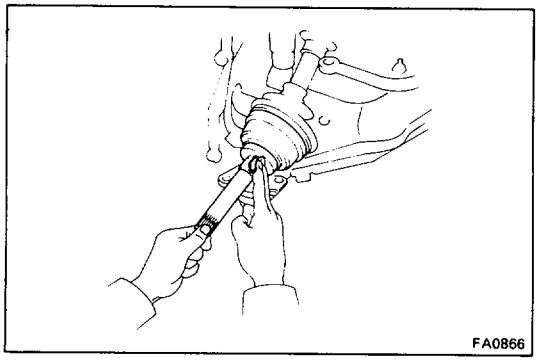
5. INSTALL DUST DEFLECTOR TO STEERING KNUCKLE

Using SST and a hammer, tap in a new dust deflector.

SST 09608-35014 (09608-06020, 09608-06180)



FA0731

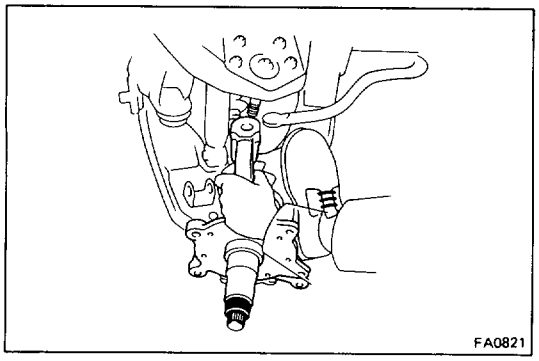


INSTALLATION OF STEERING KNUCKLE

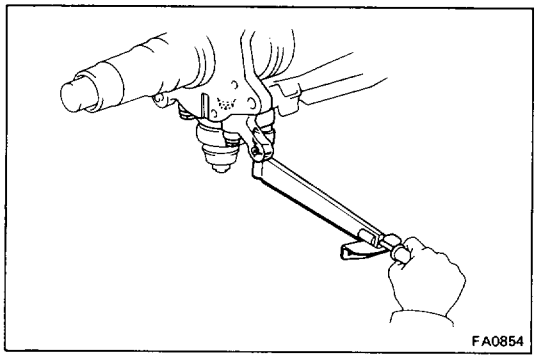
(See page FA-45)

1. INSTALL STEERING KNUCKLE

(a) Apply molybdenum disulphide lithium base grease to the drive shaft.

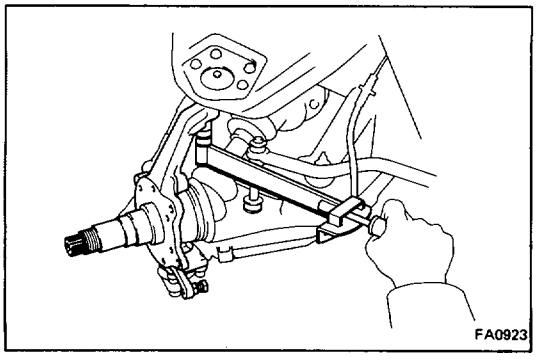


(b) Push the lower suspension arm down and install the steering knuckle.



(c) Connect the lower ball joint to the steering knuckle and install and torque the four bolts.

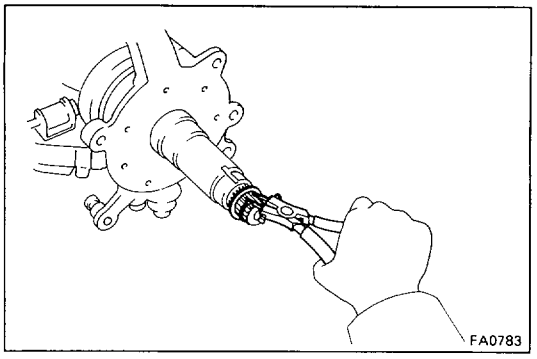
Torque: 590 kg-cm (43 ft-lb, 58 N·m)



(d) Connect the upper ball joint to the steering knuckle and install and torque the nut.

Torque: 1,450 kg-cm (105 ft-lb, 142 N·m)

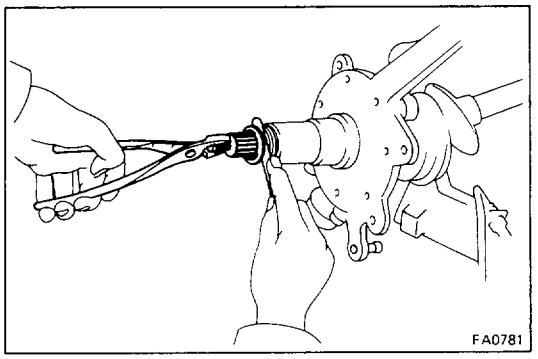
(e) Install a new cotter pin.



2. INSTALL SPACER AND SNAP RING

Install the spacer to the front drive shaft, and using snap ring pliers, install the snap ring.
If you replace the steering knuckle bushing, recheck the front drive shaft thrust clearance.

(a) Install the bolt in the shaft.

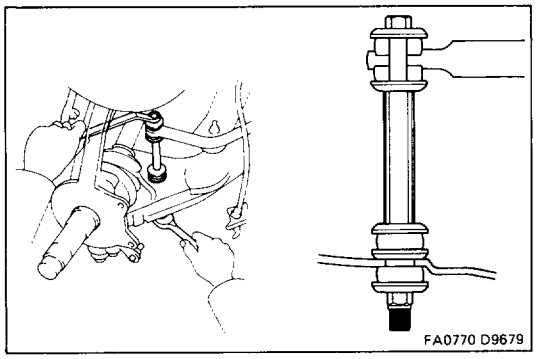


(b) Using a feeler gauge, measure the front drive shaft thrust clearance between the steering knuckle outside bushing and spacer, by pulling the bolt and applying 10 kg (22.0 lb, 98 N) of pressure.

Front drive shaft thrust clearance:
Standard clearance 0.075 — 0.690 mm (0.0030 — 0.0272 in.)

If the clearance is not within specification, replace the spacer.

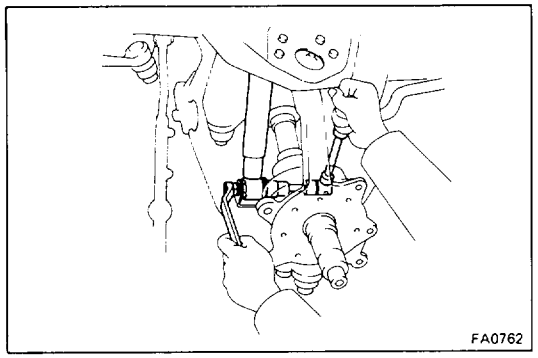
Spacer thickness	
1.80 mm	(0.0709 in.)
2.25 mm	(0.0886 in.)



3. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

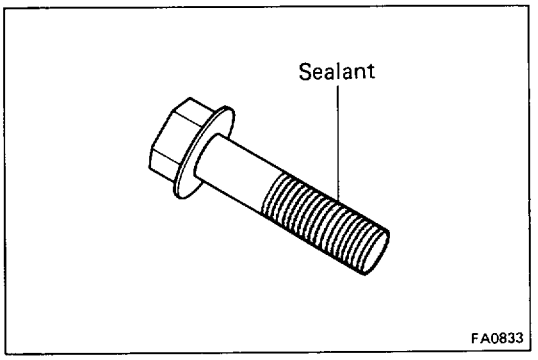
Jack up the stabilizer bar and install the retainers, cushions and collar as shown in the figure, and torque the nut.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



4. CONNECT FRONT SHOCK ABSORBER TO LOWER SUSPENSION ARM

Torque: 1,400 kg-cm (101 ft-lb, 137 N·m)



5. CONNECT KNUCKLE ARM TO STEERING KNUCKLE

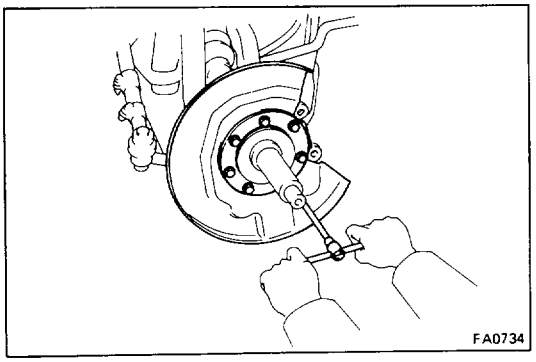
(a) Clean the threads of the bolts and steering knuckle with toluene or trichloroethylene.

(b) Apply sealant to the bolt threads.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent.

(c) Connect the knuckle arm to the steering knuckle with brake hose bracket and torque the bolts.

Torque: 1,660 kg-cm (120 ft-lb, 163 N·m)



6. INSTALL DUST COVER AND NEW OIL SEAL

Torque: 185 kg-cm (13 ft-lb, 18 N·m)

7. INSTALL FRONT AXLE HUB AND DISC BRAKE CYLINDER

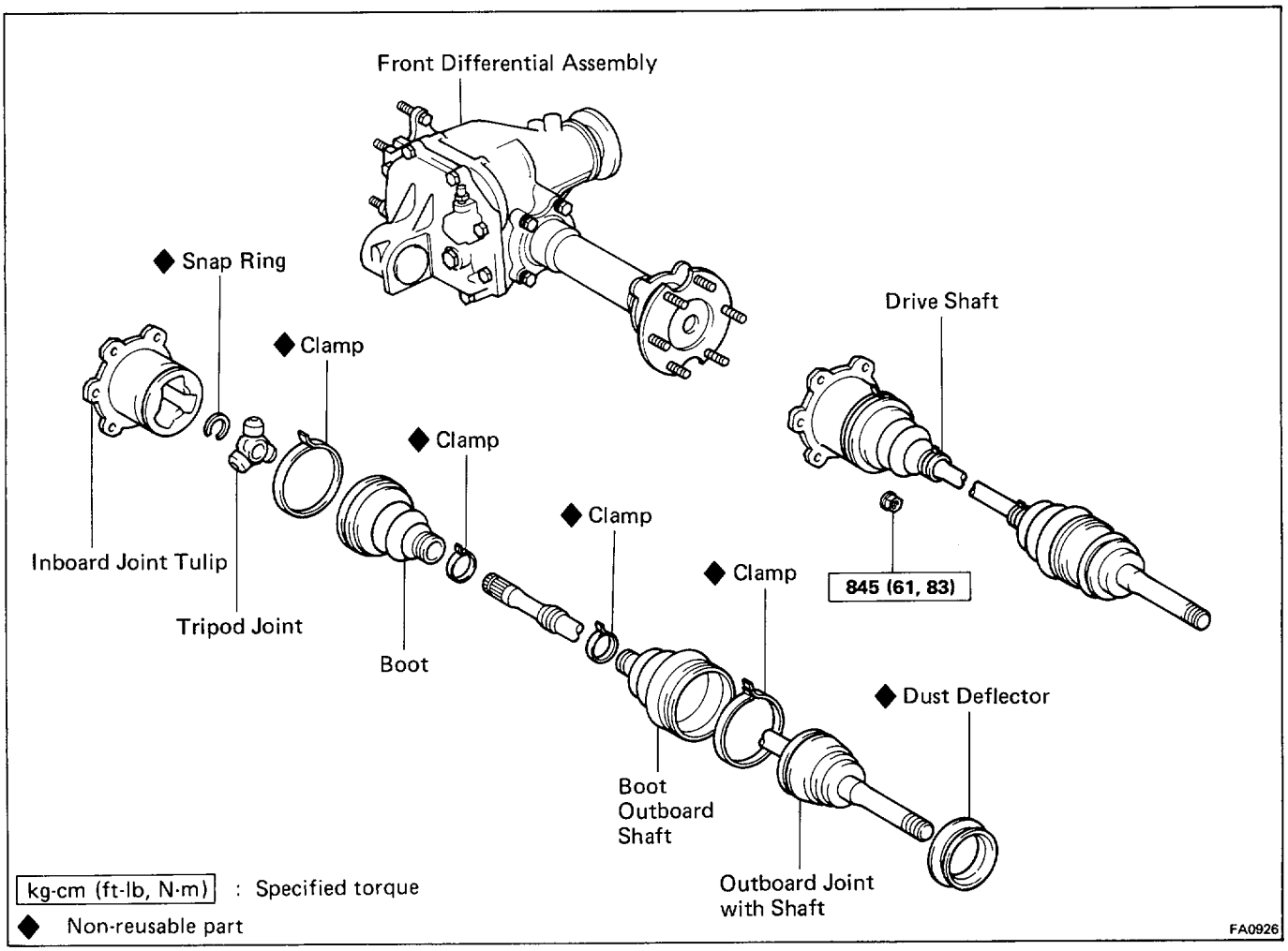
(See page FA-47)

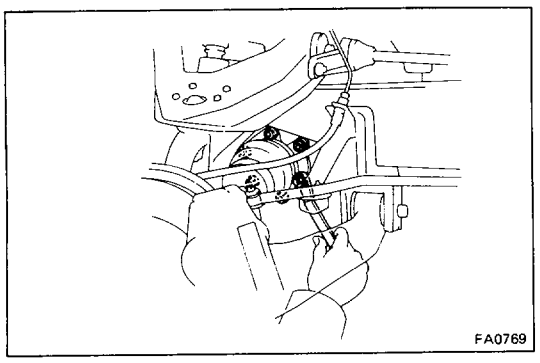
8. BLEED BRAKE SYSTEM

(See page BR-6)

FRONT DRIVE SHAFT (4WD)

COMPONENTS

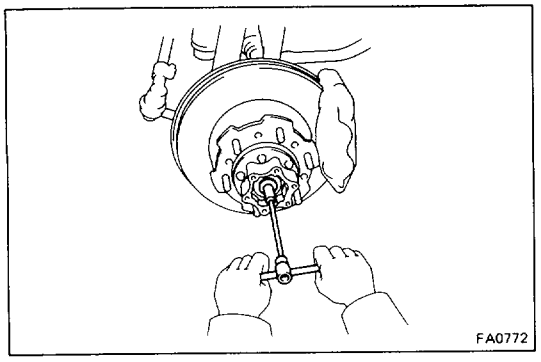




REMOVAL OF FRONT DRIVE SHAFT

1. **LOOSEN NUTS HOLDING FRONT DRIVE SHAFT**

   Loosen the six nuts, while depressing the brake pedal.

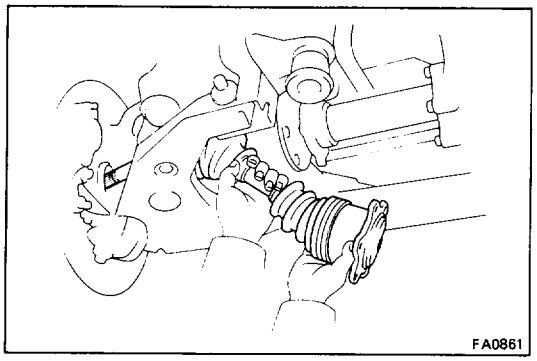


2. **REMOVE FREE WHEELING HUB OR AUTOMATIC LOCKING HUB**

   (**Free wheeling hub** **See page FA-30**
   Automatic locking hub **See page FA-37**)

3. **REMOVE SNAP RING AND SPACER**

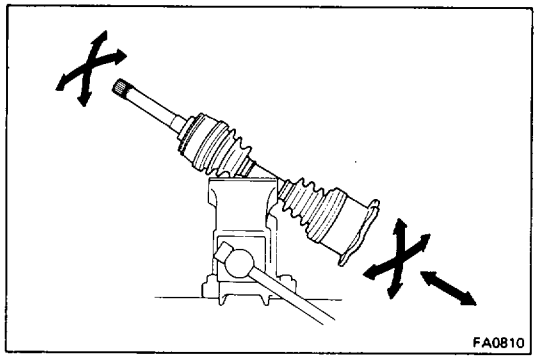
   Using snap ring pliers, remove the snap ring from the drive shaft.


FA0861

4. REMOVE FRONT DRIVE SHAFT

First pull the front drive shaft inboard joint tulip from the side gear shaft, and then pull it out from the steering knuckle.

DISASSEMBLY OF FRONT DRIVE SHAFT


FA0810

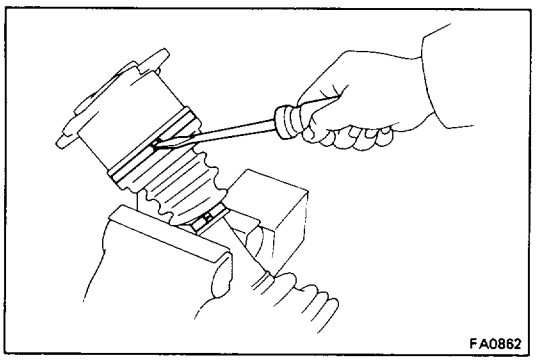
1. CHECK DRIVE SHAFT

(a) Check to see there is no play in the inboard and outboard joints.

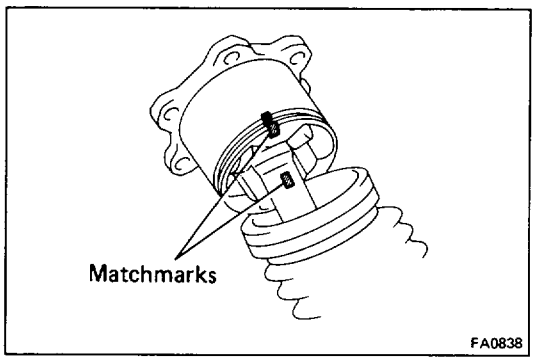
(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is no noticeable play in the radial direction of the universal joints.

(d) Check for damage to the boots.


FA0862

2. REMOVE INBOARD JOINT BOOT CLAMPS



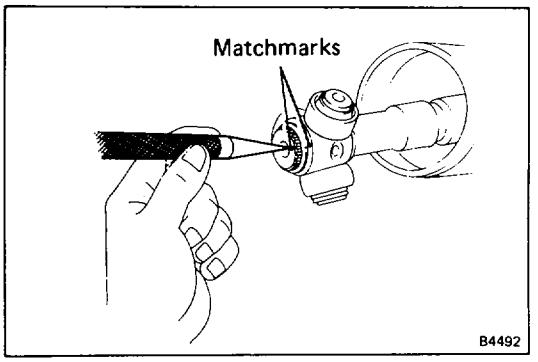
FA0838

3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the inboard joint tulip and tripod.

CAUTION: Do not punch the marks.

(b) Remove the inboard joint tulip from the drive shaft.

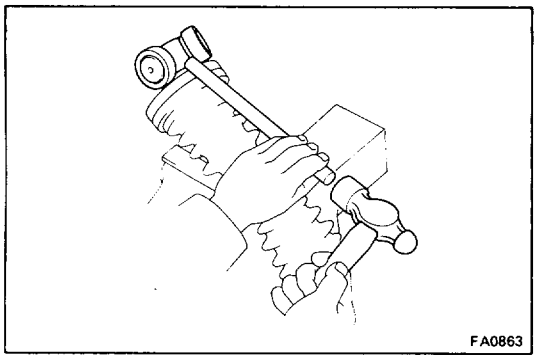


B4492

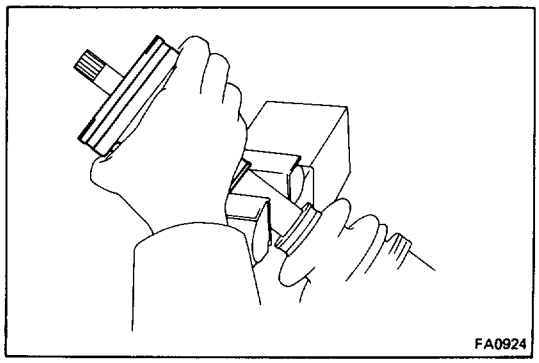
4. DISASSEMBLE TRIPOD JOINT

(a) Using snap ring pliers, remove the snap ring.

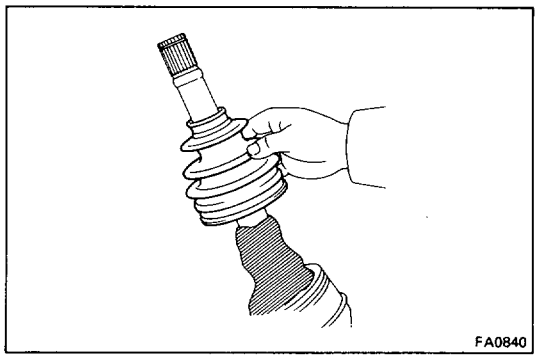
(b) Using a punch and hammer, place matchmarks on the shaft and tripod.



(c) Using a brass bar and hammer, remove the tripod joint from the drive shaft.

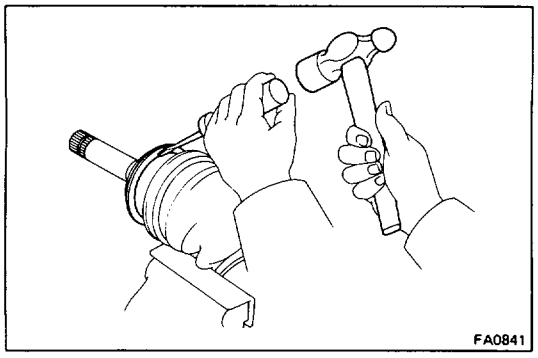


5. REMOVE INBOARD JOINT BOOT



6. REMOVE OUTBOARD JOINT BOOT CLAMPS AND BOOT

CAUTION: Do not disassemble the outboard joint.

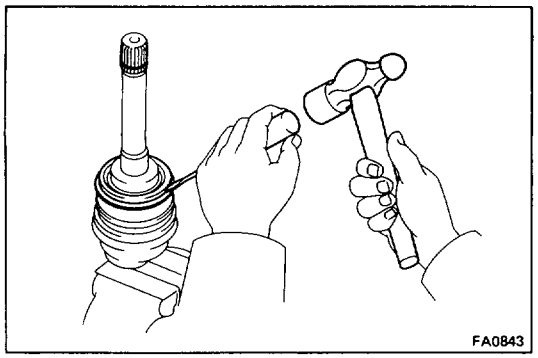


7. REMOVE DUST DEFLECTOR

Using a screwdriver and hammer, remove the dust deflector.

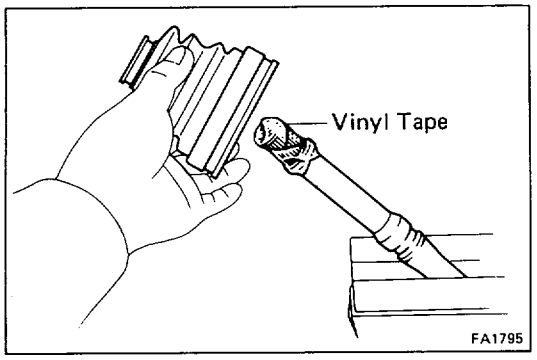
ASSEMBLY OF FRONT DRIVE SHAFT

(See page FA-55)



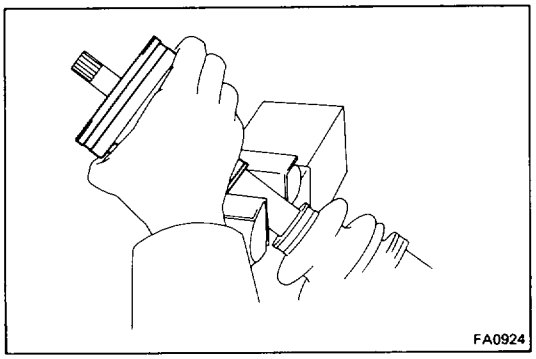
1. INSTALL DUST DEFLECTOR

Using a hammer and screwdriver, install a new dust deflector.

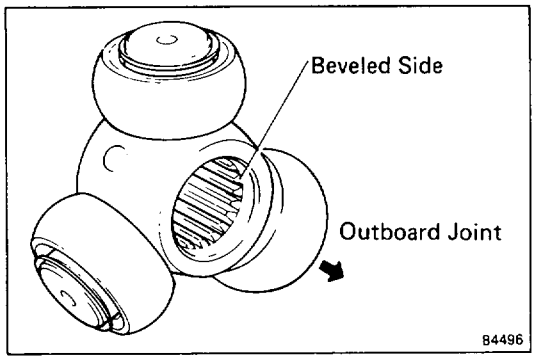


2. **TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS TO OUTBOARD JOINT**

NOTE: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

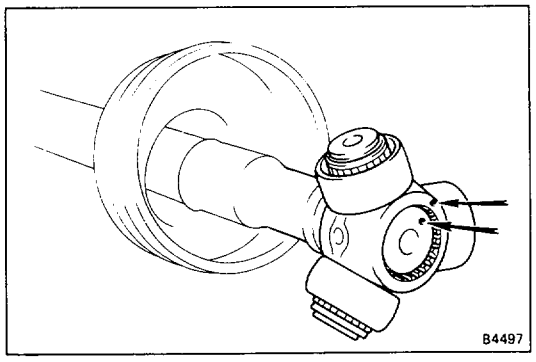


3. **TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS FOR INBOARD JOINT TO DRIVE SHAFT**

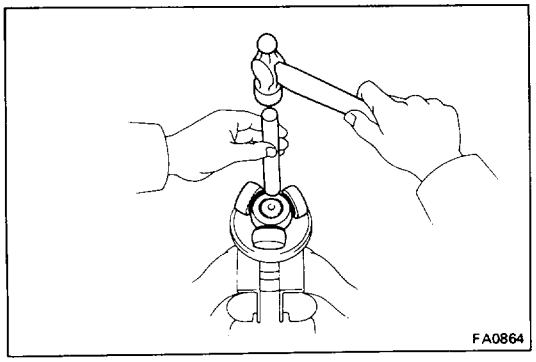


4. **ASSEMBLE TRIPOD JOINT**

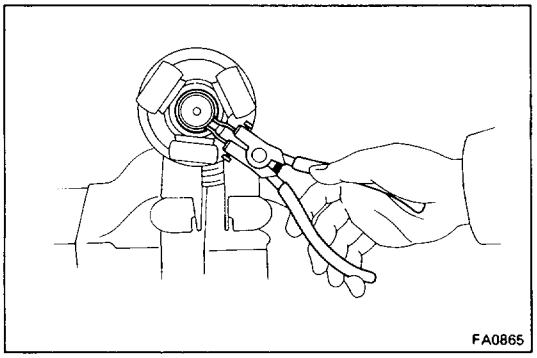
(a) Place the beveled side of the tripod axial spline toward the outboard joint.



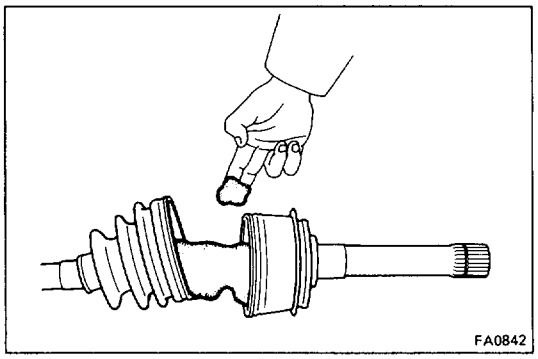
(b) Align the matchmarks placed before disassembly.



(c) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.



(d) Using snap ring pliers, install a new snap ring.

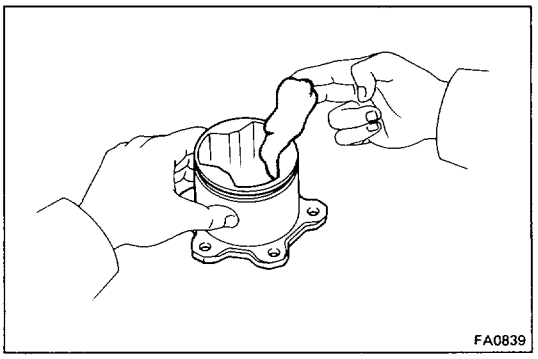


5. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, pack in grease.

NOTE: Use the grease supplied in the boot kit.

Grease capacity: 195 — 205 g (0.43 — 0.45 lb)

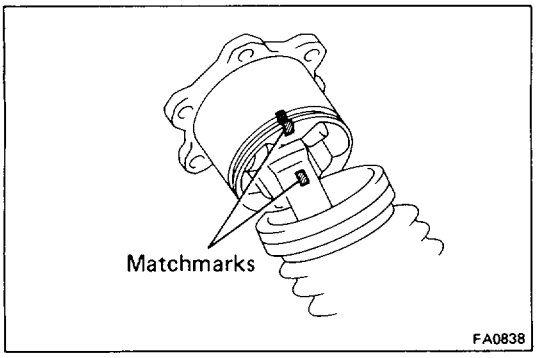


6. ASSEMBLE INBOARD JOINT TO INBOARD JOINT TULIP

(a) Pack in grease to the inboard tulip and boot.

NOTE: Use the grease supplied in the boot kit.

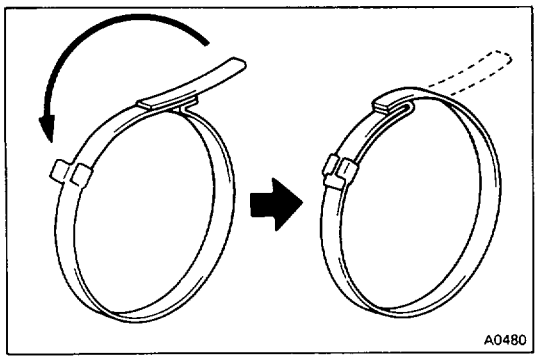
Grease capacity: 270 — 280 g (0.60 — 0.62 lb)



(b) Align the matchmarks placed before disassembly.

(c) Install the inboard tulip to the drive shaft.

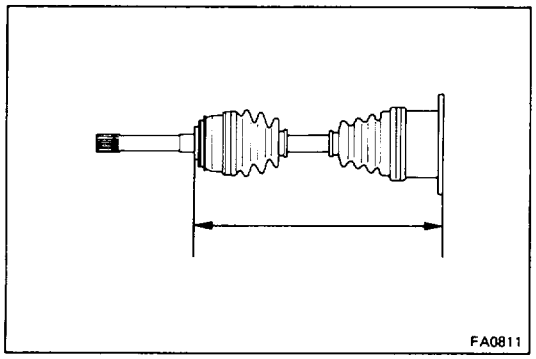
(d) Temporarily install the boot to the inboard tulip.



7. ASSEMBLE NEW BOOT CLAMPS TO BOTH BOOTS

(a) Be sure the boot is on the shaft groove.

(b) Bend the band and lock it as shown in the figure.

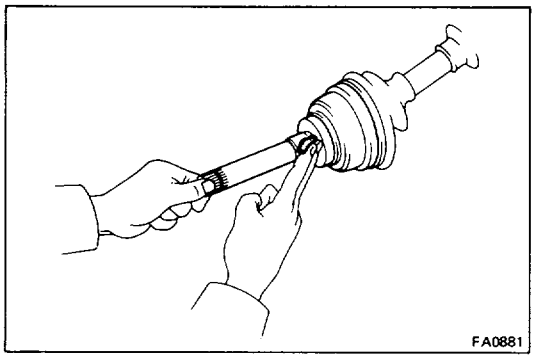

FA0811

(c) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.

Standard length:
393.9 — 403.9 mm (15.508 — 15.902 in.)

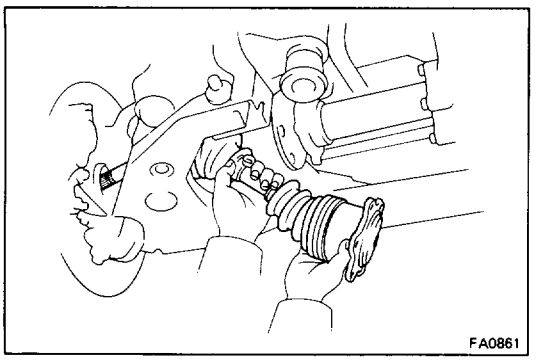
INSTALLATION OF FRONT DRIVE SHAFT

(See page FA-55)


FA0881

1. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

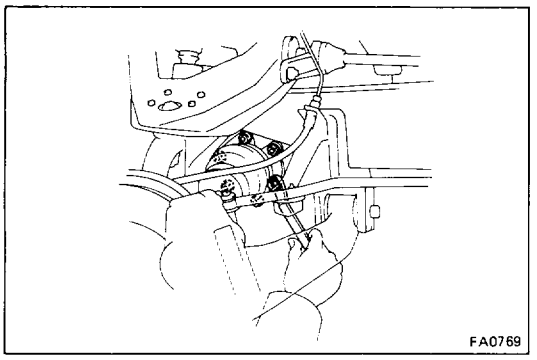
Apply molibdenum disulphide lithium base grease to the outboard joint shaft.


FA0861

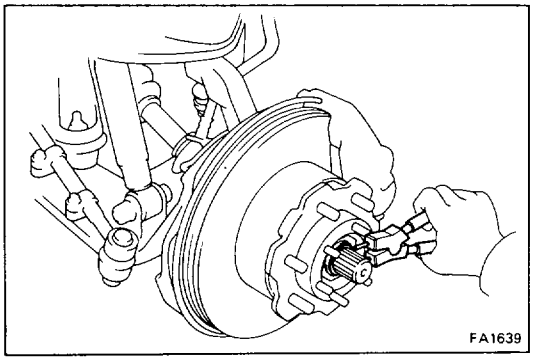
2. INSTALL FRONT DRIVE SHAFT

(a) First insert the outboard joint shaft to the steering knuckle, and then install it to the side gear shaft.

NOTE: Do not damage the boots.

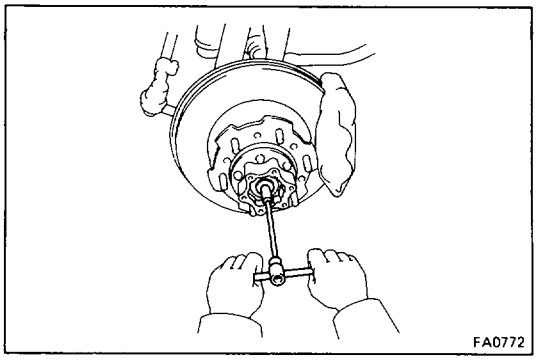

FA0769

(b) Temporarily install the six nuts.


FA1639

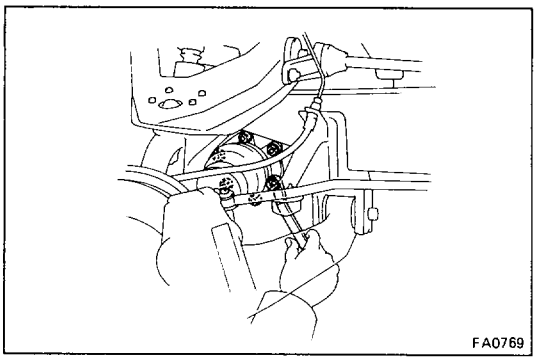
3. INSTALL SPACER AND SNAP RING

Install the spacer, and using snap ring pliers install the snap ring to the outboard joint shaft.


FA0772

4. **INSTALL FREE WHEELING HUB OR AUTOMATIC LOCKING HUB**

(**Free wheeling hub** **See page FA-35**
Automatic locking hub **See page FA-41**)


FA0769

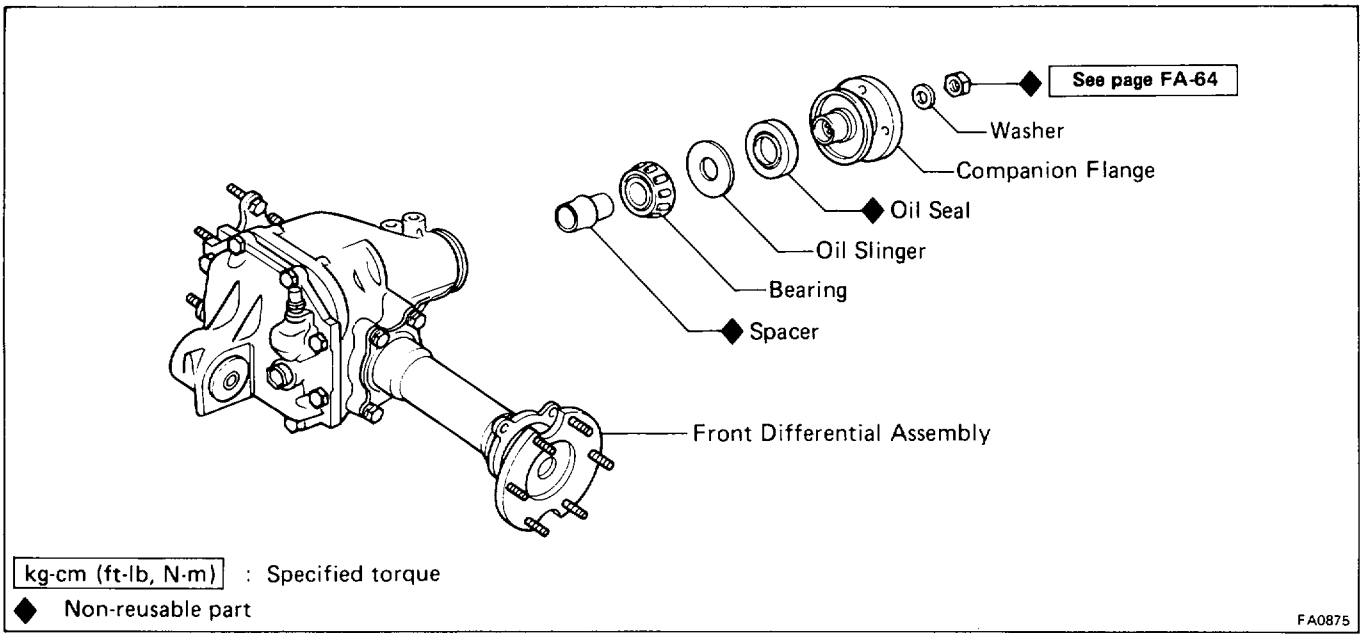
5. **TORQUE FRONT DRIVE SHAFT INSTALLATION NUTS**

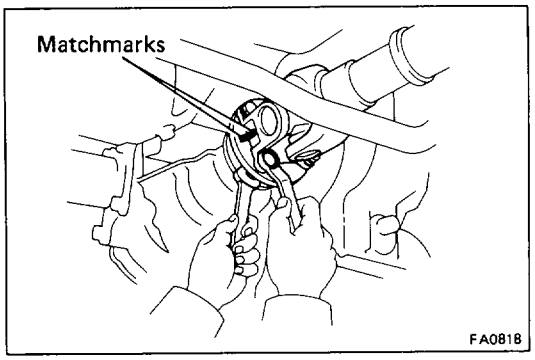
Torque the six nuts, while depressing the brake pedal.

Torque: 845 kg-cm (61 ft-lb, 83 N·m)

FRONT DIFFERENTIAL (4WD)

ON-VEHICLE REPLACEMENT OF REAR OIL SEAL

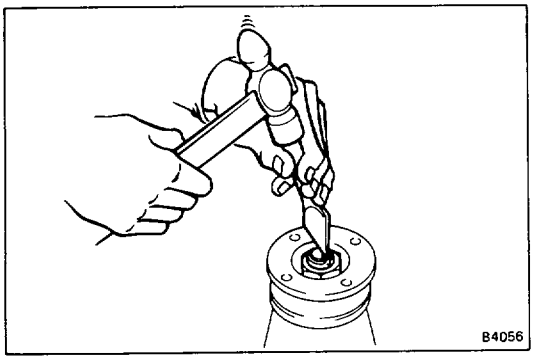




1. DRAIN DIFFERENTIAL OIL

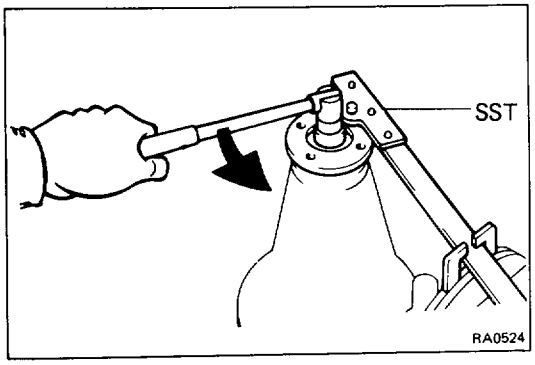
2. DISCONNECT PROPELLER SHAFT

Before disconnecting the propeller shaft from the front differential, place matchmarks on them.



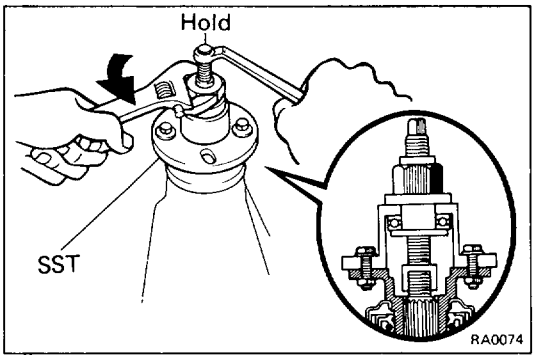
3. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.



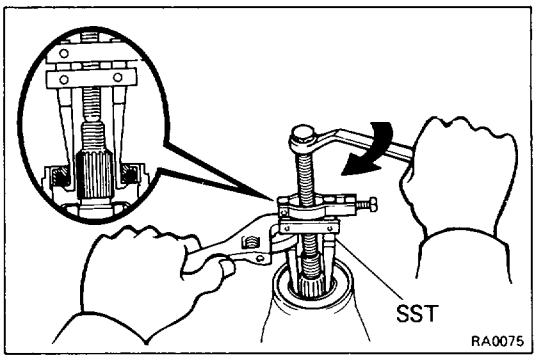
(b) Using SST, to hold the flange, remove the nut and washer.

SST 09330-00021



(c) Using SST, remove the companion flange.

SST 09557-22022

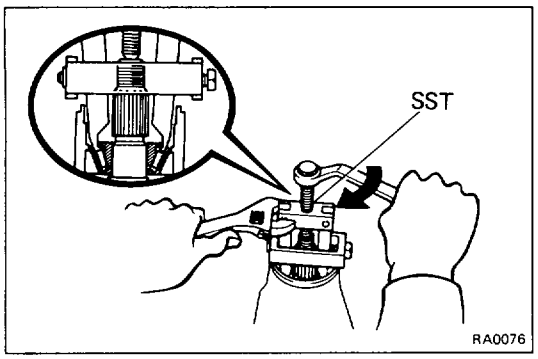


4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal.

SST 09308-10010

(b) Remove the oil slinger.

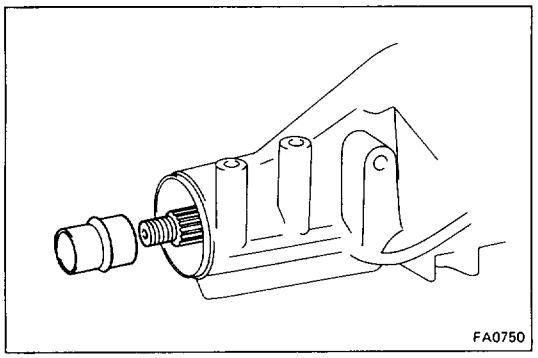


5. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.

SST 09556-30010

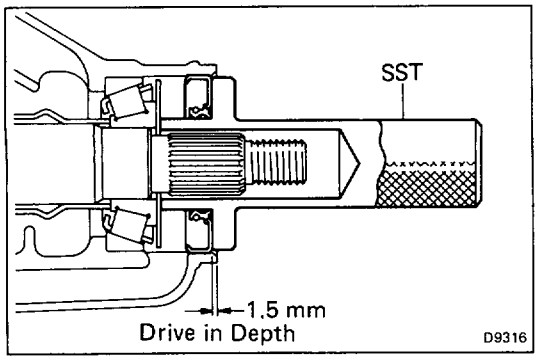
(b) Remove the bearing spacer.



6. INSTALL NEW BEARING SPACER AND REAR BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the rear bearing on the drive pinion.



7. INSTALL OIL SLINGER AND NEW OIL SEAL

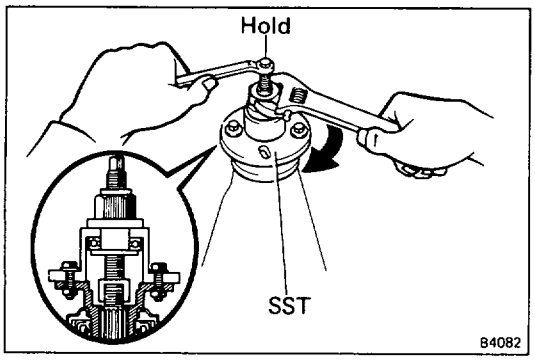
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554-30011

Oil seal drive in depth: 1.5 mm (0.059 in.)

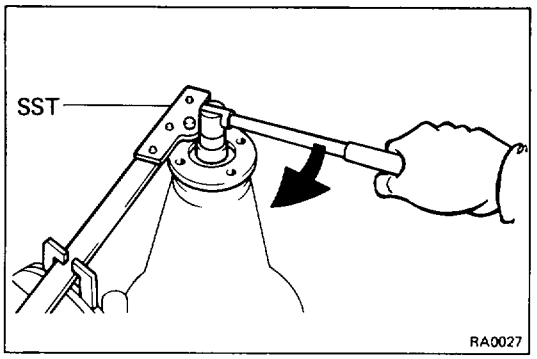
(c) Apply MP grease to the oil seal lip.



8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion.

SST 09557-22022

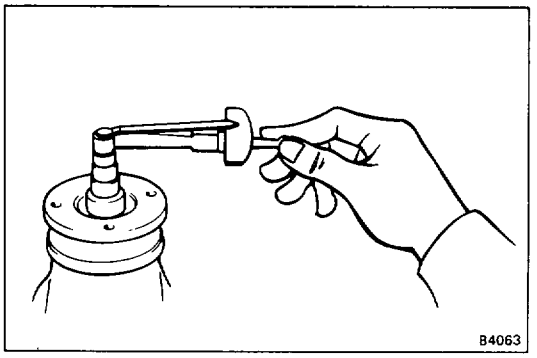


(b) Coat the threads of the new nut with MP grease.

(c) Using SST to hold the flange, torque the nut.

SST 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



9. ADJUST DRIVE PINION BEARING PRELOAD

Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

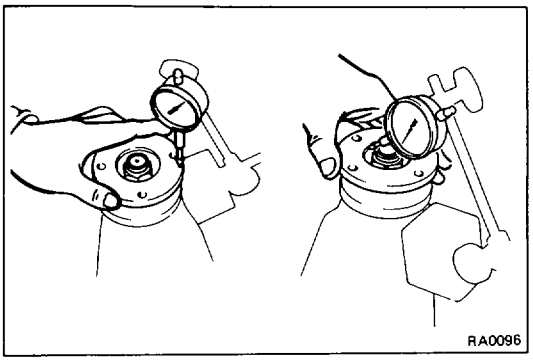
Preload (starting):
New bearing
12 — 19 kg-cm
(10.4 — 16.5 in.-lb, 1.2 — 1.9 N·m)
Reused bearing
6 — 10 kg-cm
(5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)

(a) If the preload is greater than specification, replace the bearing spacer.

(b) If the preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) a little at a time until the specified preload is reached.

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg-cm (174 ft-lb, 235 N·m)

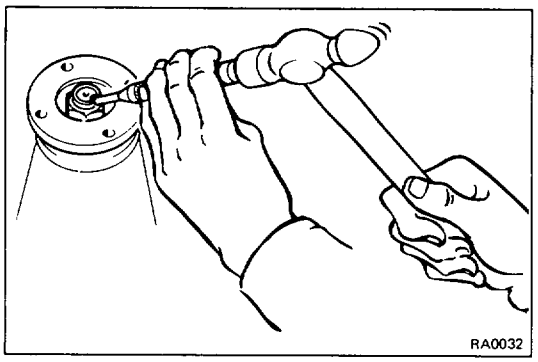


10. CHECK DEVIATION OF COMPANION FLANGE

Using a dial indicator, measure the longitudinal and latitudinal deviation of the companion flange.

Maximum longitudinal deviation: 0.10 mm (0.0039 in.)
Maximum latitudinal deviation: 0.10 mm (0.0039 in.)

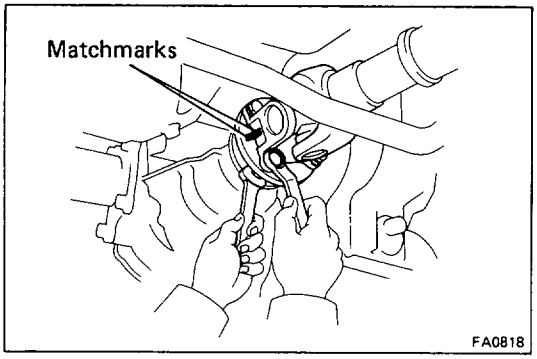
If the deviation is greater than maximum, inspect the bearings.



11. STAKE DRIVE PINION NUT

12. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Oil type: Hypoid gear oil API GL-5
Recommended oil viscosity:
Above −18°C (0°F) SAE 90
Below −18°C (0°F) SAE 80W or 80W-90
Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)



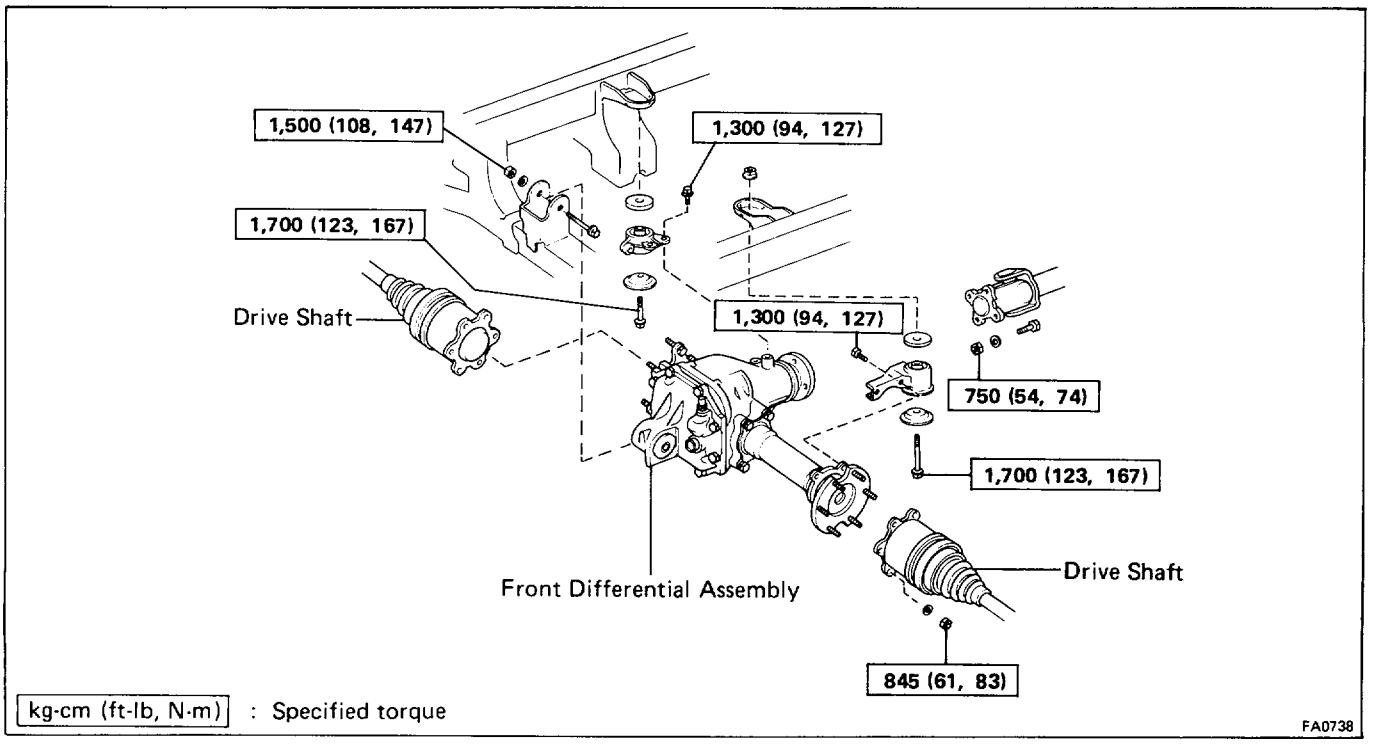
13. CONNECT PROPELLER SHAFT TO COMPANION FLANGE

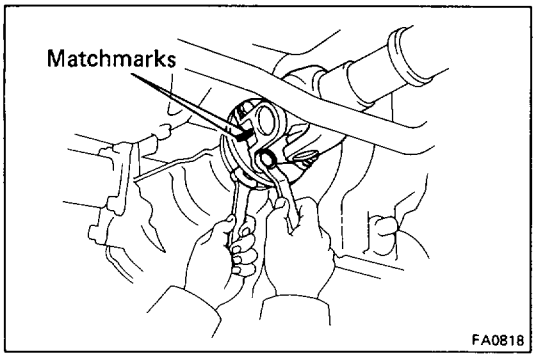
(a) Align the matchmarks and connect the propeller shaft to the companion flange with four bolts and nuts.

(b) Torque the nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)

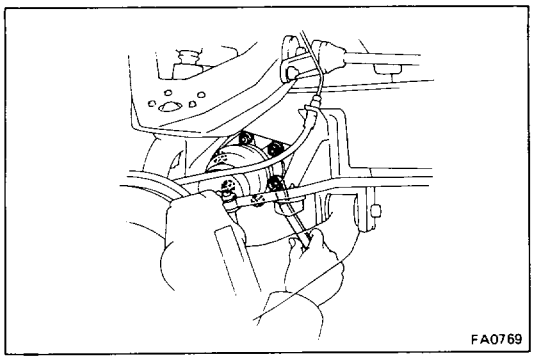
REMOVAL OF FRONT DIFFERENTIAL





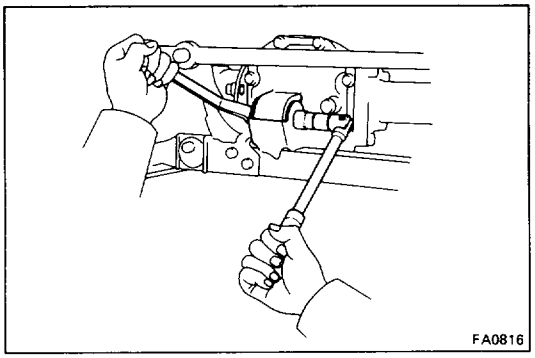
1. DRAIN DIFFERENTIAL OIL

2. DISCONNECT PROPELLER SHAFT

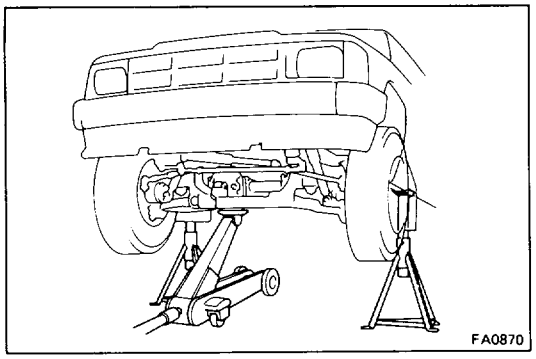


3. DISCONNECT DRIVE SHAFTS FROM SIDE GEAR SHAFT

Loosen the six nuts, while depressing the brake pedal, and disconnect the drive shafts from the side gear shaft.

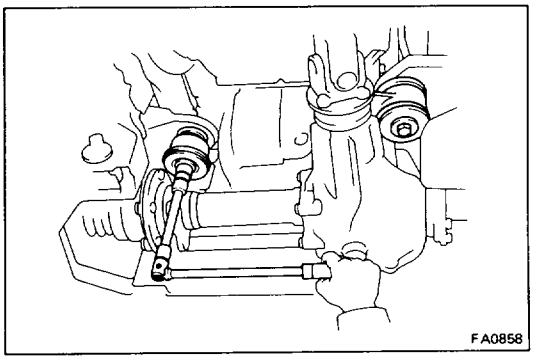


4. REMOVE FRONT DIFFERENTIAL FRONT MOUNTING BOLT AND NUT



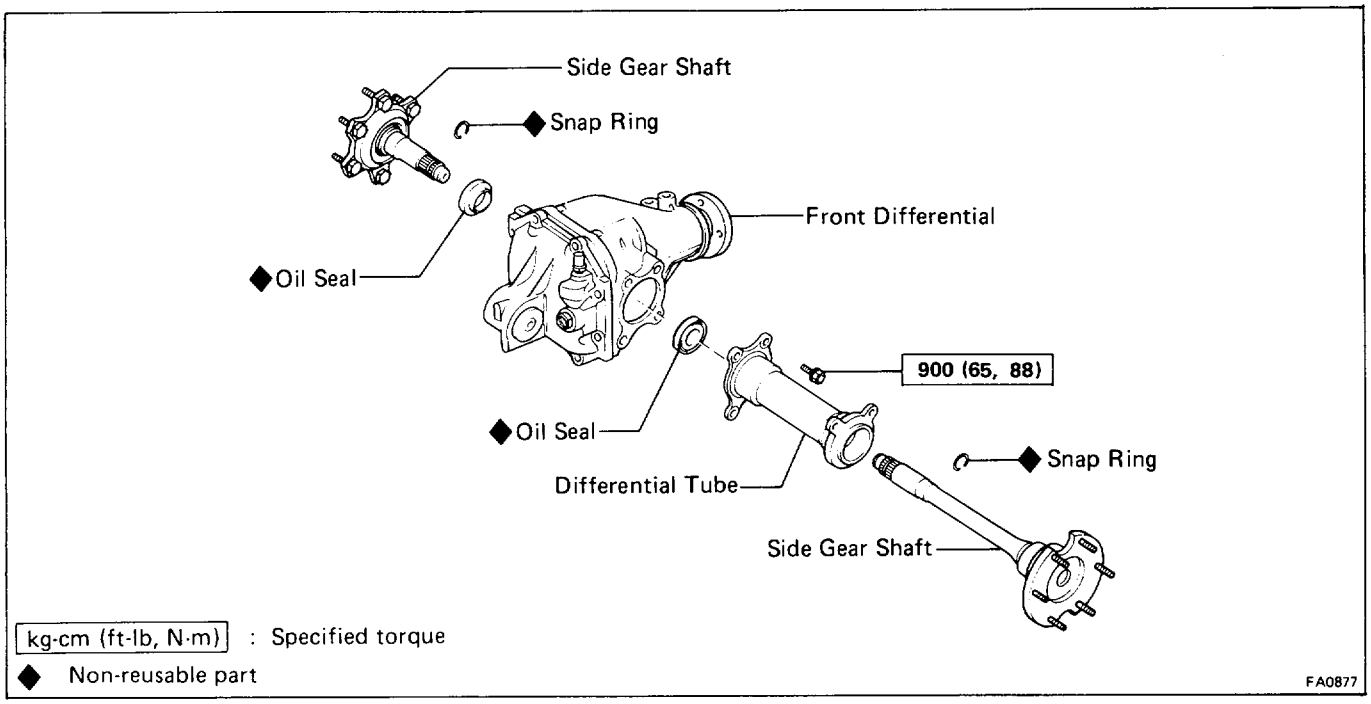
5. REMOVE FRONT DIFFERENTIAL

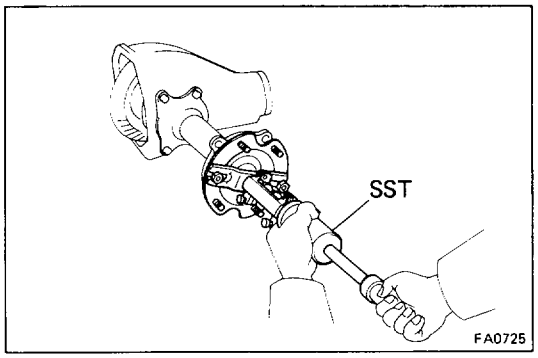
(a) Hold the front differential with a jack.



(b) Remove the left and right rear mounting bolts, and remove the front differential.

REPLACEMENT OF SIDE GEAR SHAFT OIL SEAL

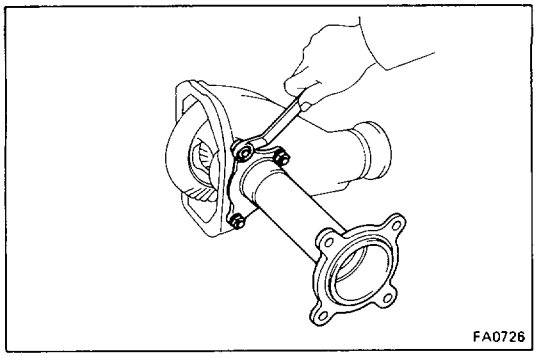




1. REMOVE SIDE GEAR SHAFT

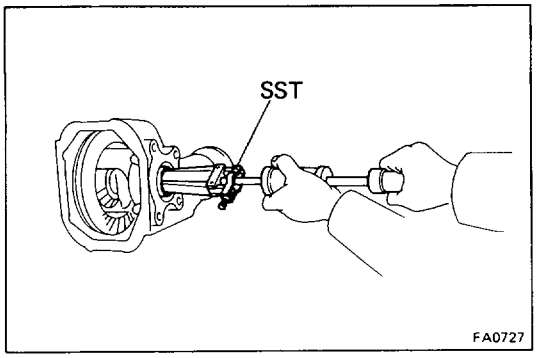
Using SST, pull off the side gear shaft from the front differential.

SST 09910-00015



2. REMOVE FRONT DIFFERENTIAL TUBE

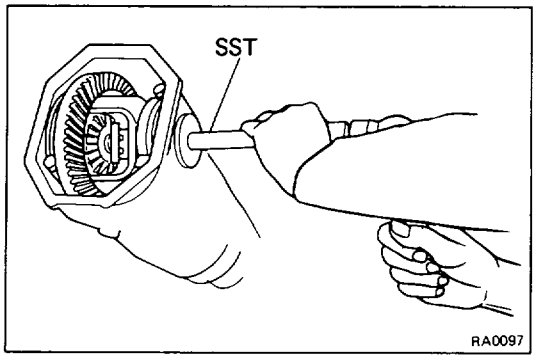
Remove the four bolts, and using a plastic-faced hammer, remove the differential tube.



3. REMOVE SIDE GEAR SHAFT OIL SEAL

Using SST, remove the side gear shaft oil seal.

SST 09308-00010



4. INSTALL NEW SIDE GEAR SHAFT OIL SEAL

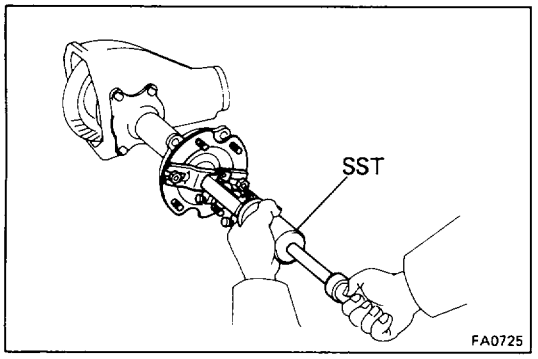
(a) Apply MP grease to the oil seal.

(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.

SST 09550-22011 (09550-00020, 09550-00031)

5. INSTALL DIFFERENTIAL TUBE

Torque: 900 kg-cm (65 ft-lb, 88 N·m)

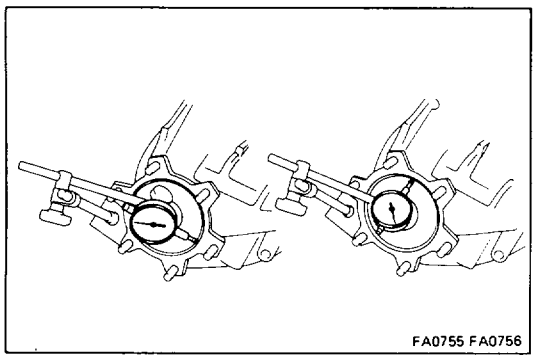


6. INSTALL SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.

(b) Using SST, insert the side gear shaft until it contacts the pinion shaft.

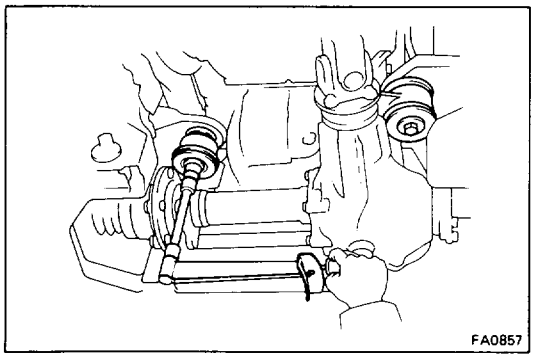
SST 09910-00015



7. MEASURE SIDE GEAR SHAFT DEVIATION

Maximum longitudinal deviation:
0.20 mm (0.0079 in.)
Maximum latitudinal deviation:
0.20 mm (0.0079 in.)

If the deviation is greater than maximum, replace the side gear shaft.

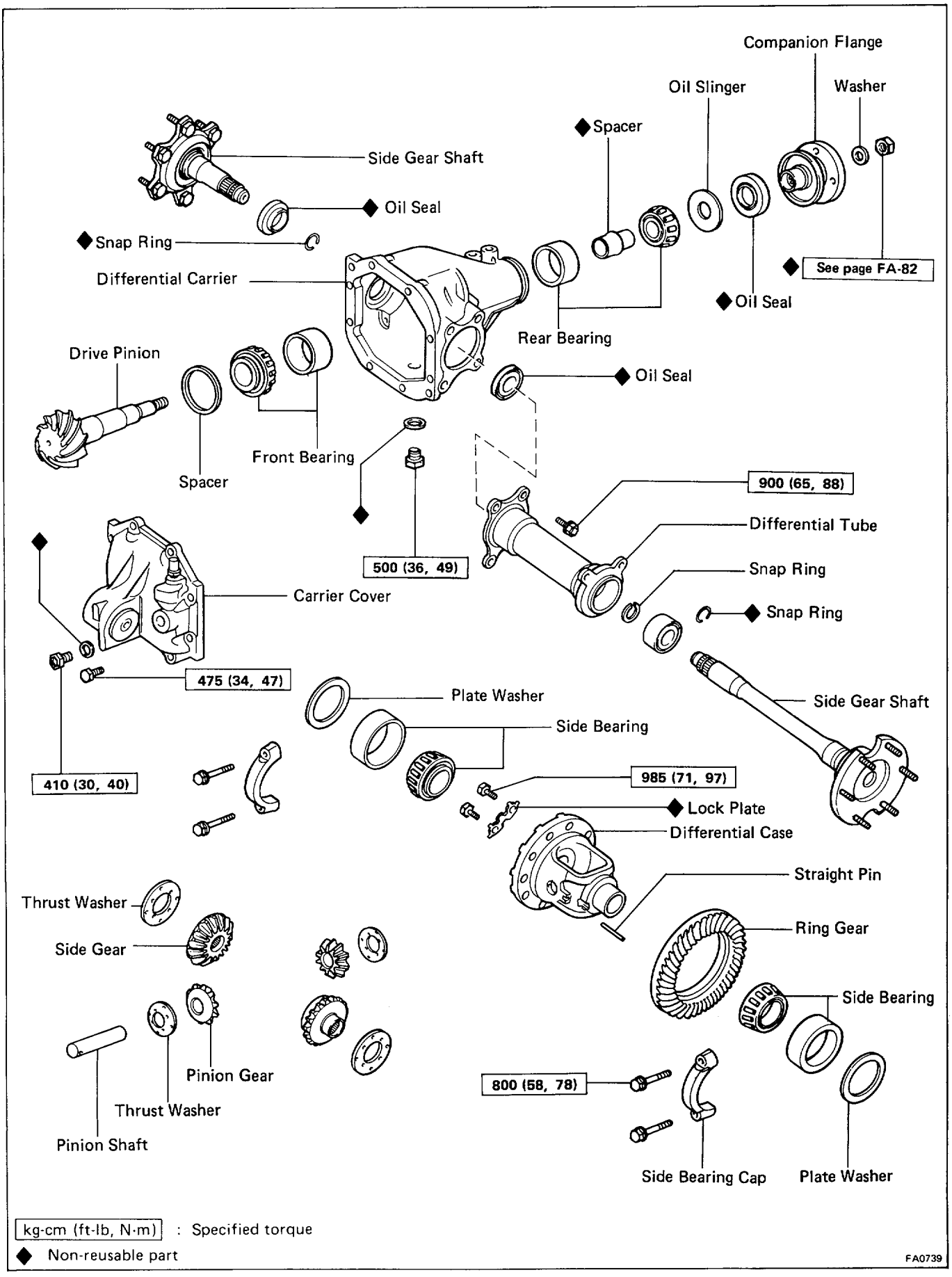


8. INSTALL FRONT DIFFERENTIAL
(See page FA-85)

9. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Oil type: Hypoid gear oil API GL-5
Recommended oil viscosity:
Above −18°C (0°F) SAE 90
Below −18°C (0°F) SAE 80W or 80W-90
Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)

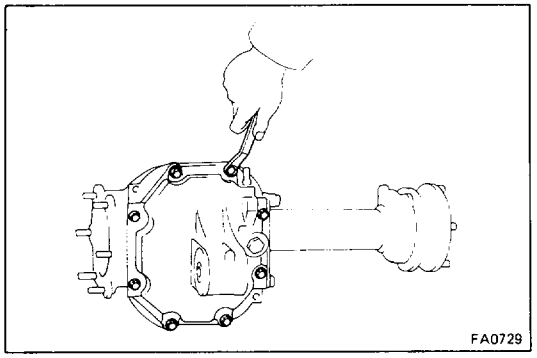
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

FA0739

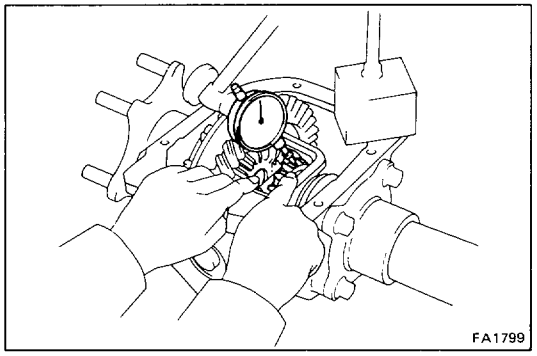


DISASSEMBLY OF FRONT DIFFERENTIAL

(See page FA-69)

1. REMOVE DIFFERENTIAL COVER

Remove the eight bolts and tap off the cover with a plastic-faced hammer.

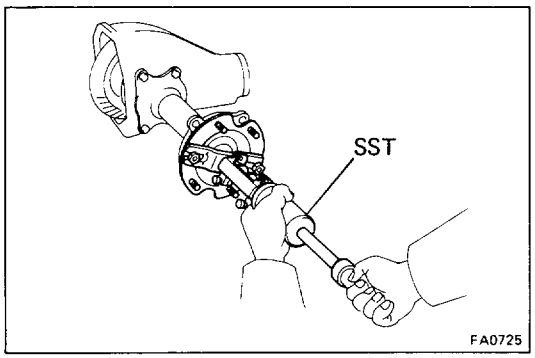


2. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

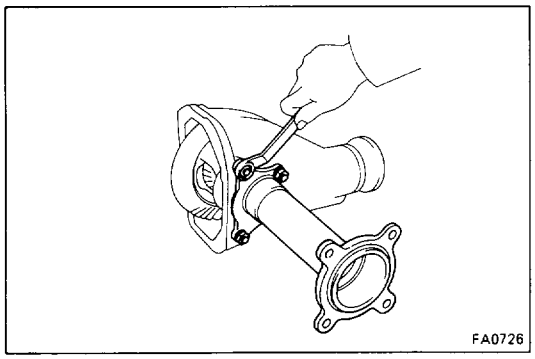
If the backlash is out of specification, install the correct thrust washers. (See page FA-78)



3. REMOVE SIDE GEAR SHAFTS

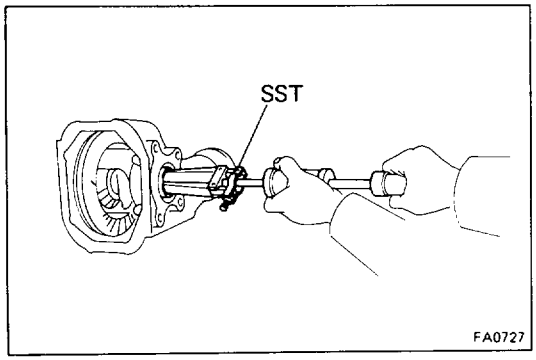
Using SST, remove the side gear shafts from the differential.

SST 09910-00015



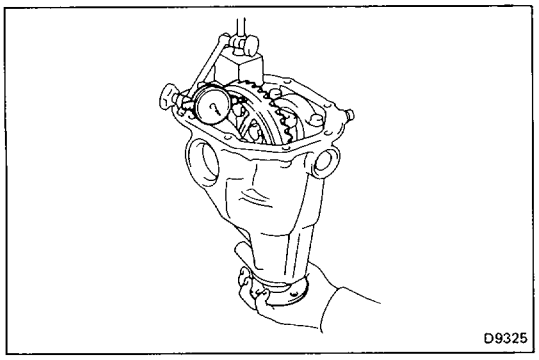
4. REMOVE DIFFERENTIAL TUBE

Remove the four bolts and tap off the cover with a plastic-faced hammer.



5. REMOVE SIDE GEAR SHAFT OIL SEALS

Using SST, remove the oil seals.

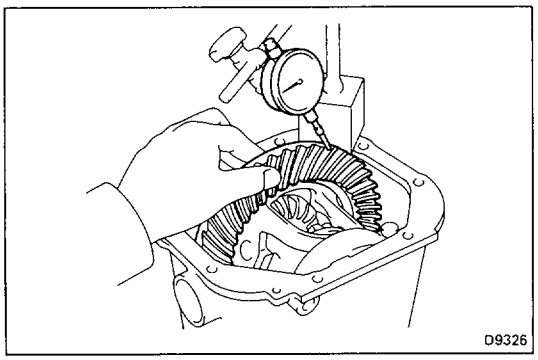


6. **CHECK RING GEAR RUNOUT**

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than maximum, replace the ring gear and drive pinion as a set.



7. **CHECK RING GEAR BACKLASH**

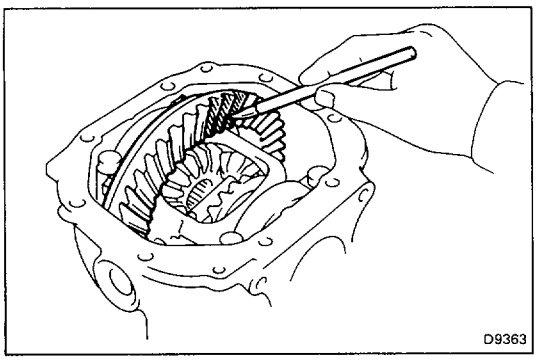
(a) Fix the dial indicator on the tooth surface at a 90° angle.

(b) Holding the drive pinion flange, measure the ring gear backlash.

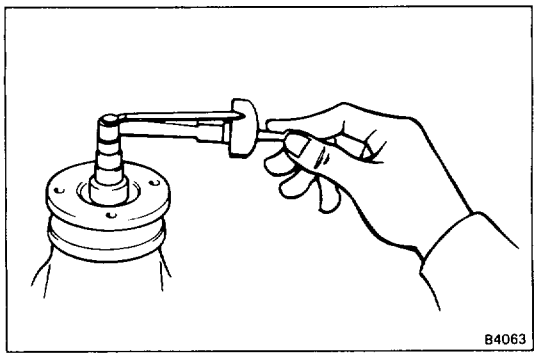
Ring gear backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

If the backlash is not within specification, adjust the ring gear backlash.

NOTE: Measure from three or more places on the circumference of the ring gear.



8. **INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 7 on page FA-81)**



9. **MEASURE DRIVE PINION PRELOAD**

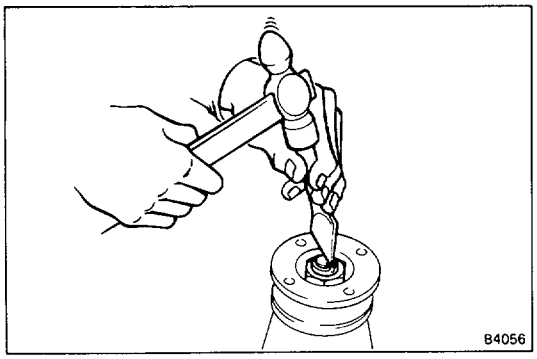
Using a torque gauge, measure the preload of the backlash between the drive pinion and ring gear.

Preload (starting):
6 — 10 kg-cm (5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)

10. **CHECK TOTAL PRELOAD**

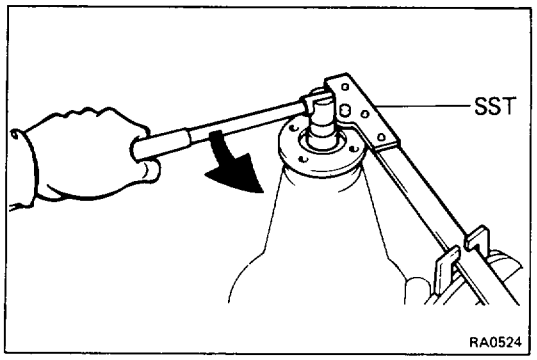
Using a torque gauge, measure the total preload.

Total preload (starting):
Add drive pinion preload
4 — 6 kg-cm (3.5 — 5.2 in.-lb, 0.4 — 0.6 N·m)

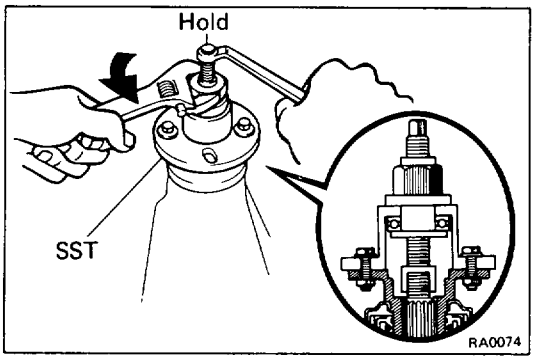


11. **REMOVE COMPANION FLANGE**

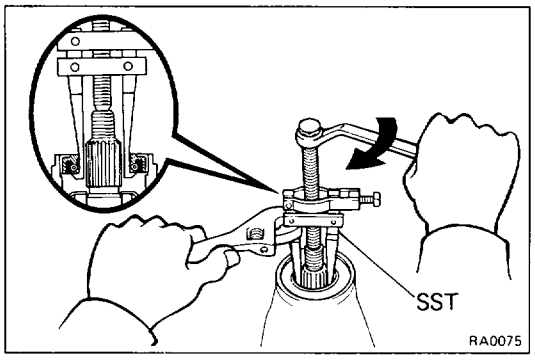
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09330-00021



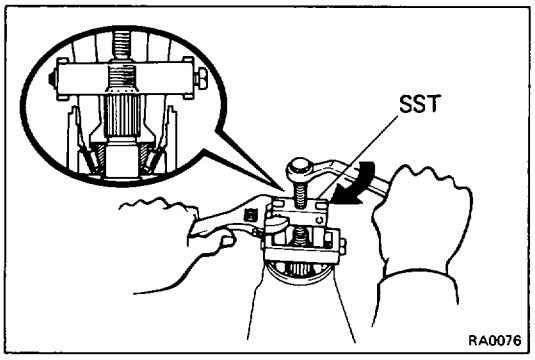
(c) Using SST, remove the companion flange.
SST 09557-22022



12. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.
SST 09308-10010

(b) Remove the oil slinger.

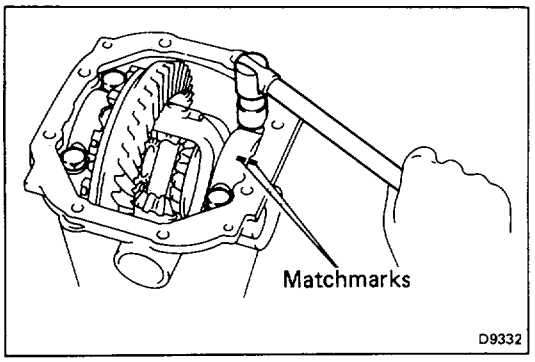


13. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from drive pinion.
SST 09556-30010

(b) Remove the bearing spacer.

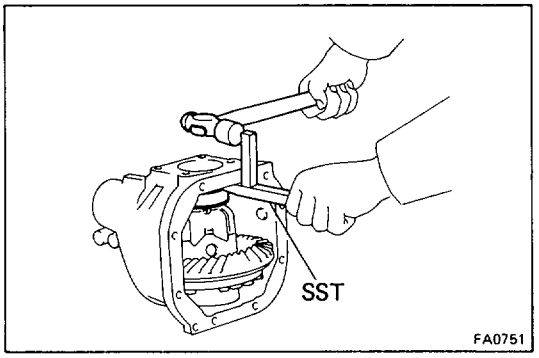
If the rear bearing is damaged or worn, replace the bearing.



14. REMOVE DIFFERENTIAL CASE AND RING GEAR

(a) Place matchmarks on the bearing cap and differential carrier.

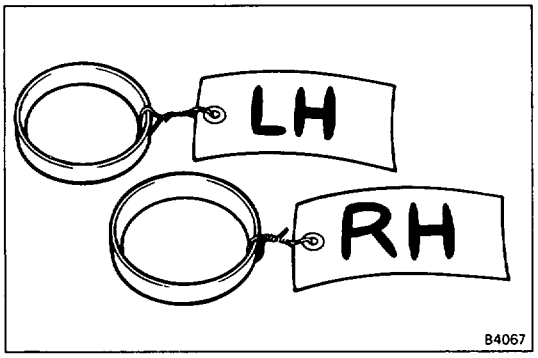
(b) Remove the two bearing caps.



(c) Using SST and a hammer, remove the two side bearing preload adjusting plate washers.

SST 09504-22011

NOTE: Measure the adjusting plate washer and note the thickness.

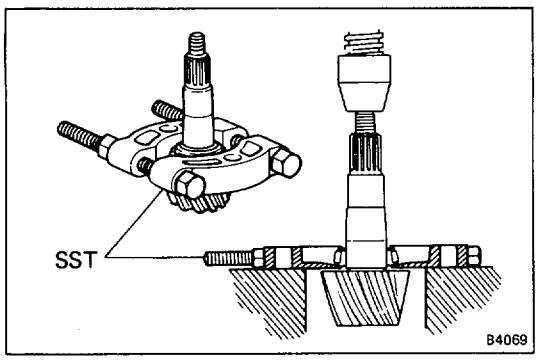


(d) Remove the differential case with bearing outer race from the carrier.

NOTE: Tag the bearing outer races to show the location for reassembly.

15. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

INSPECTION AND REPLACEMENT OF DIFFERENTIAL

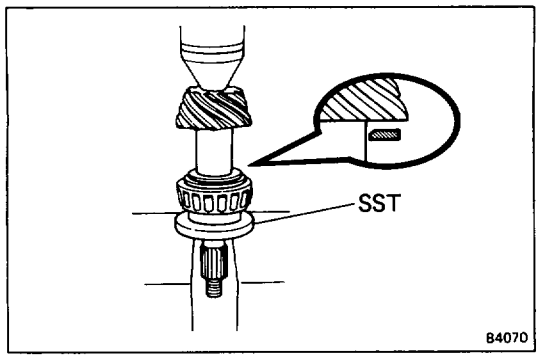


1. REPLACE DRIVE PINION FRONT BEARING

(a) Using SST, press out the front bearing from the drive pinion.

SST 09950-00020

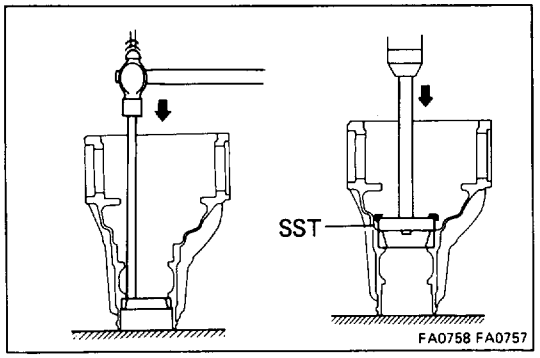
NOTE: If the drive pinion or ring gear are damaged, replace them as a set.



(b) Install the washer on the drive pinion with the chamfered end facing the pinion gear.

(c) Using SST, press in the front bearing onto the drive pinion.

SST 09506-30012

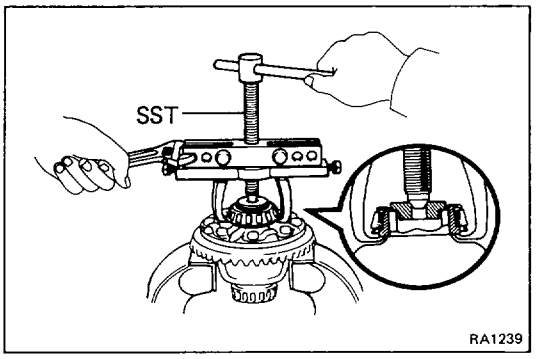


2. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a brass bar and hammer, drive out the outer race.

(b) Using SST, drive in a new outer race.

SST 09608-35014
Front outer race (09608-06020, 09608-06120)
Rear outer race (09608-06020, 09608-06110)

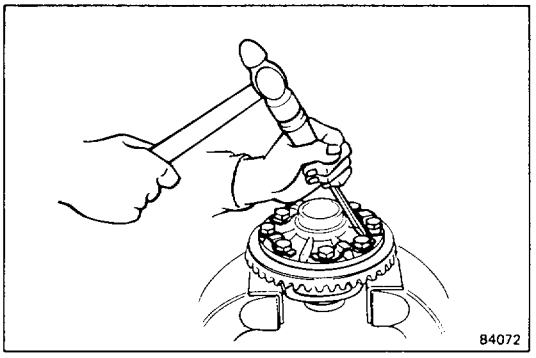


3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.

SST 09950-20017

NOTE: Fix the claws of SST to the notches in the differential case.

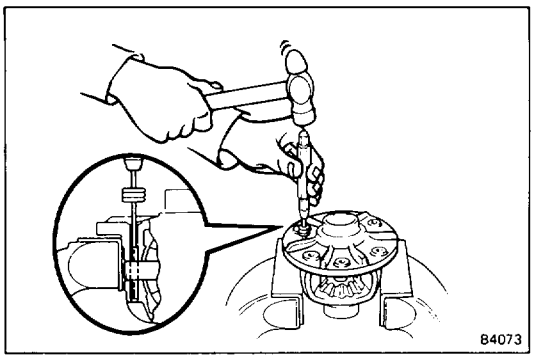


4. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

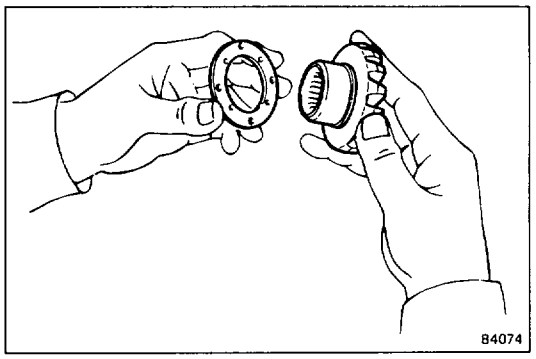
(b) Place matchmarks on the ring gear and differential case.

(c) Using a plastic-faced hammer, tap on the ring gear to separate it from the differential case.



5. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and four thrust washers.



6. ASSEMBLE DIFFERENTIAL CASE

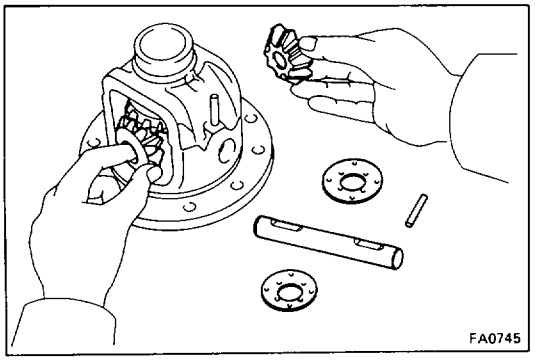
(a) Install the correct thrust washers and side gears. From the table below select thrust washers that will ensure the backlash is within specification. Try to select washers of the same thickness for both sides.

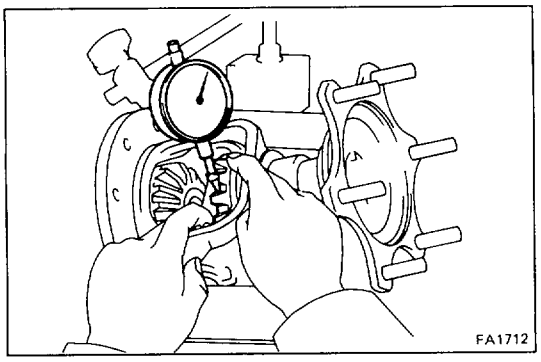
Standard backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

Thrust washer thickness

Thickness	mm (in.)
0.96 — 1.04	(0.0378 — 0.0409)
1.06 — 1.14	(0.0417 — 0.0449)
1.16 — 1.24	(0.0457 — 0.0488)
1.26 — 1.34	(0.0496 — 0.0528)

Install the thrust washers and side gears in the differential case.



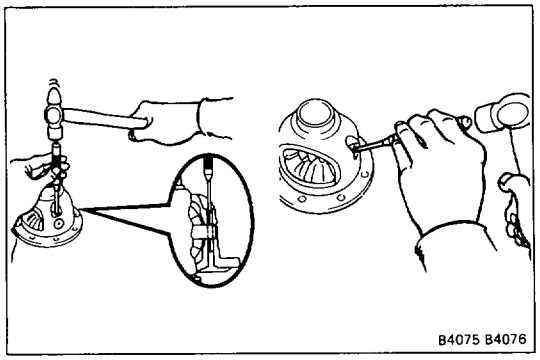


(b) Check the side gear backlash.

- Temporarily install the side gear shaft.
- Measure the side gear backlash while holding one pinion gear toward the case.

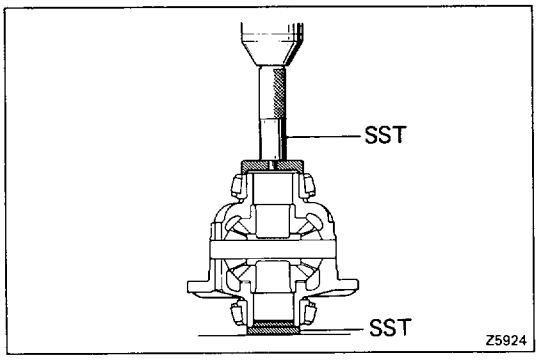
Side gear backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

If the backlash is not within specification, replace the thrust washers.



(c) Install straight pin.

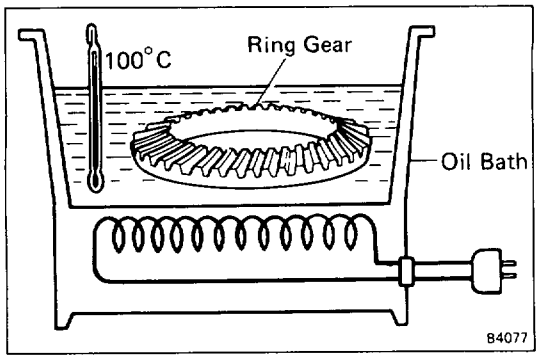
- Using a hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.



7. INSTALL NEW SIDE BEARING

Using a press and SST, drive new side bearings into the differential case.

SST 09550-10012
(09252-10010, 09557-10010, 09559-10010)



8. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to about 100°C (212°F) in an oil bath.

(c) Clean the contact surface of the ring gear with cleaning solvent.

(d) Then quickly install the ring gear on the differential case.

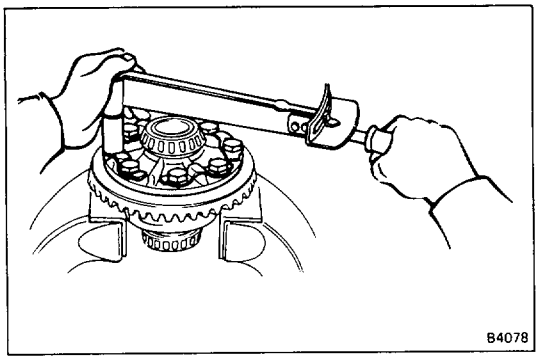
(e) Align the matchmarks on the ring gear and differential case.

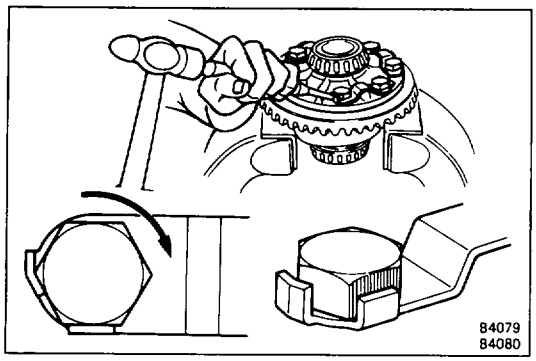
CAUTION: Do not heat the ring gear above 110°C (230°F).

(f) Coat the ring gear set bolts with gear oil.

(g) Install the lock plates and set bolts. Tighten the set bolts uniformly and a little at a time. Torque the bolts.

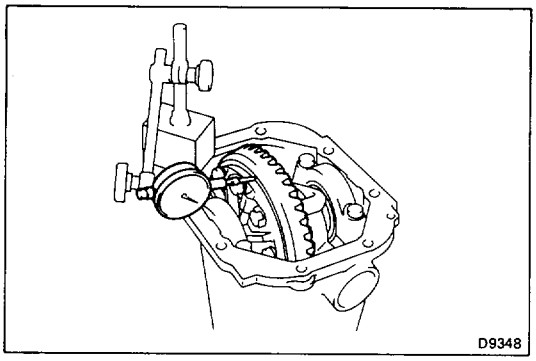
Torque: 985 kg-cm (71 ft-lb, 97 N·m)





(h) Using a hammer and drift punch, stake the lock plates.

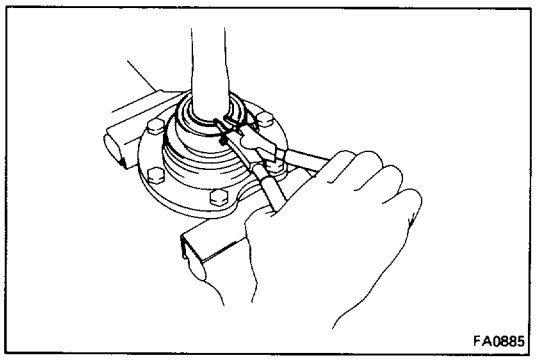
NOTE: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



(i) Check the ring gear runout.

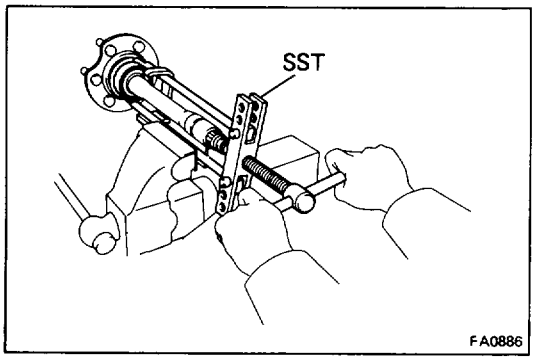
Maximum runout: 0.07 mm (0.0028 in.)

Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearing.



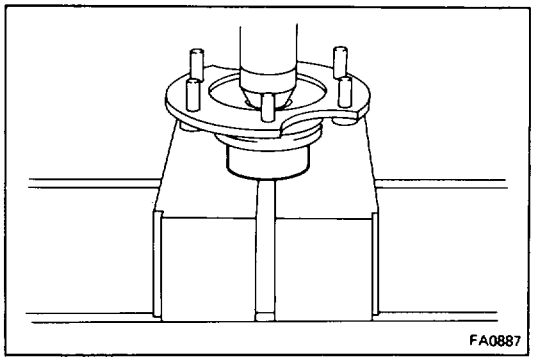
9. REPLACE LH SIDE GEAR SHAFT BEARING

(a) Using a snap ring pliers, remove the snap ring.



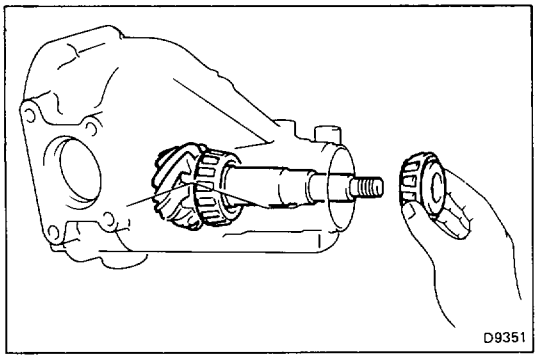
(b) Using SST, remove the bearing from the LH side gear shaft.

SST 09950-20017



(c) Install a new bearing to the LH side gear shaft.

(d) Using snap ring pliers, install the snap ring.



ASSEMBLY OF DIFFERENTIAL

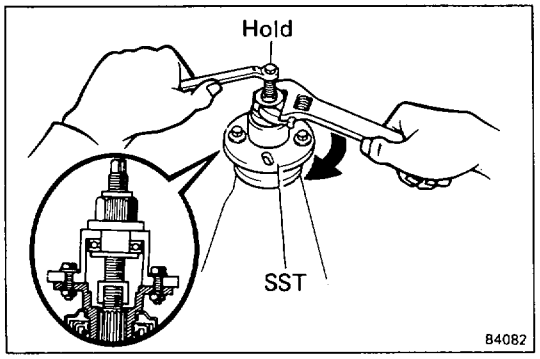
(See page FA-69)

1. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the following parts.

- Drive pinion
- Front bearing

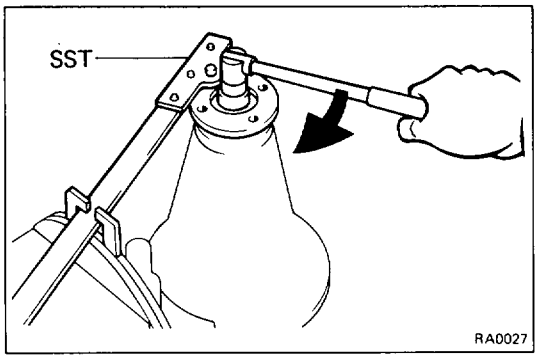
NOTE: Assemble the spacer and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.

Coat the threads of the nut with MP grease.

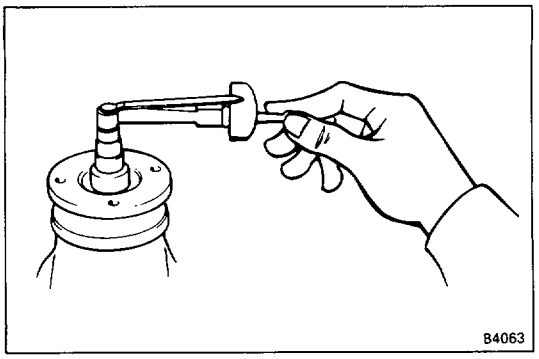
SST 09557-22022



(c) Adjust the drive pinion preload by tightening the companion flange nut.

Using SST to hold the flange, tighten the nut.

SST 09330-00021



(d) Using a torque meter, measure the preload.

Preload (starting):

New bearing

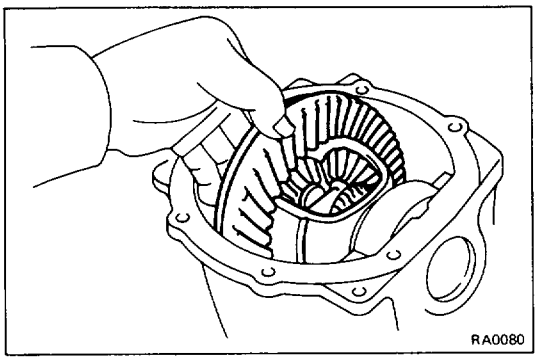
12 — 19 kg-cm

(10.4 — 16.5 in.-lb, 1.2 — 1.9 N·m)

Reused bearing

6 — 10 kg-cm

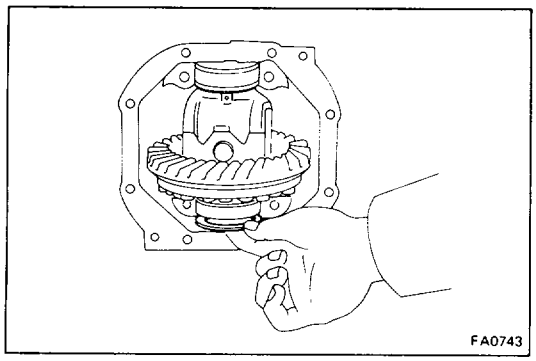
(5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)



2. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

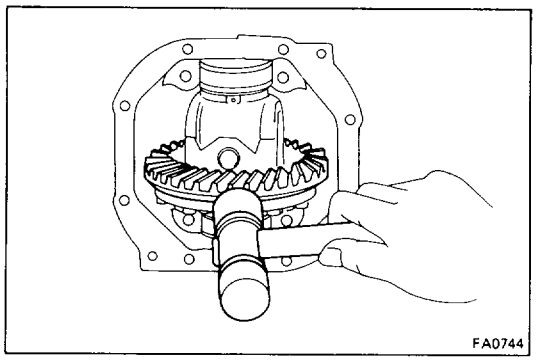
(b) Install the differential case in the carrier.



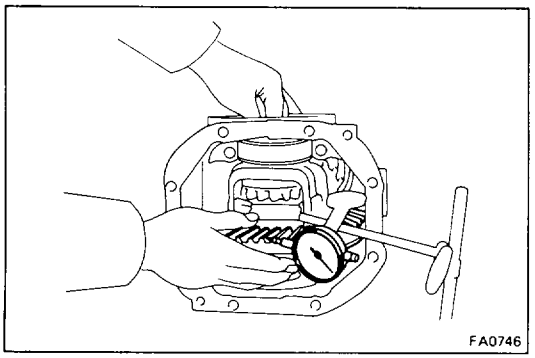
3. ADJUST RING GEAR BACKLASH

(a) Install only the plate washer on the ring gear back side.

NOTE: Insure that the ring gear has backlash.

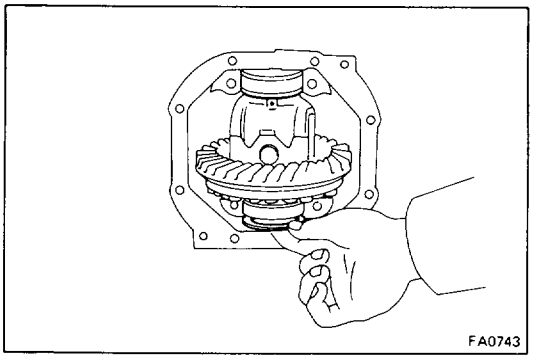


(b) Snug down the washer and bearing by tapping on the ring gear with a plastic-faced hammer.

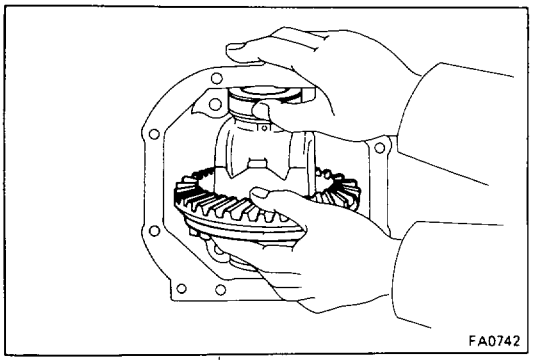


(c) Hold the side bearing boss on the teeth surface of the ring gear and measure the backlash.

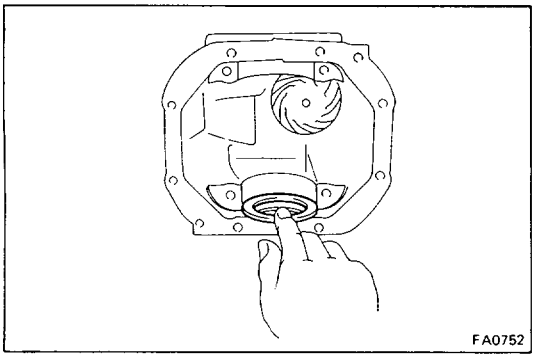
Backlash (reference): 0.13 mm (0.0051 in.)



(d) Select a ring gear back plate washer, using the backlash as reference. (See page FA-80)

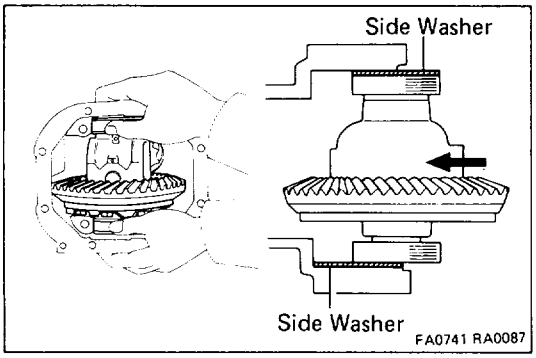


(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

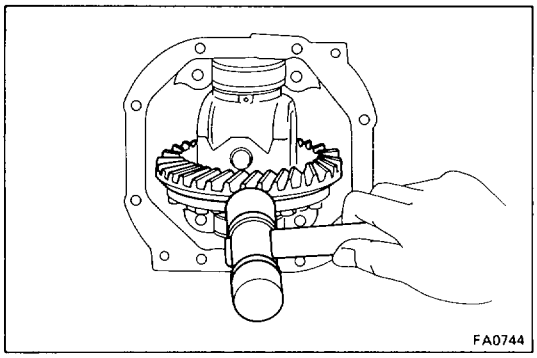


(f) Remove the plate washers and differential case.

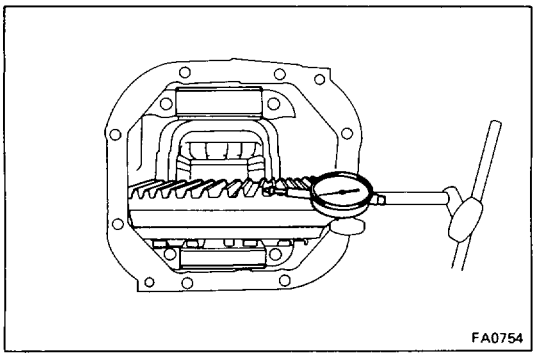
(g) Install the plate washer into the lower part of the carrier.



(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.

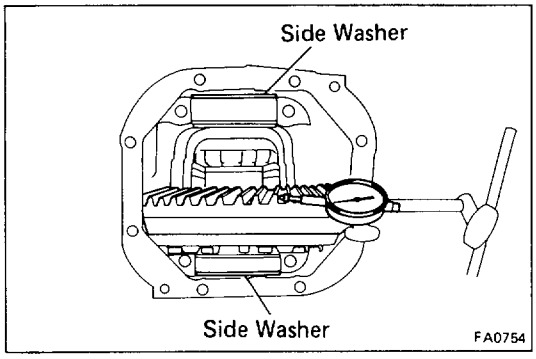


(i) Using a plastic-faced hammer, snug down the washer and bearing by tapping the ring gear.



(j) Using a dial indicator, measure the ring gear backlash.

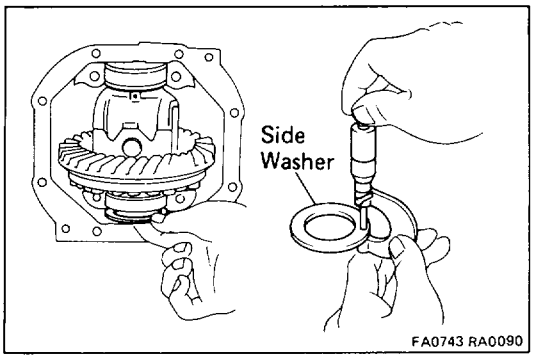
Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)



(k) If not within specification, adjust by either increasing or decreasing the number of washers on both sides by an equal amount.

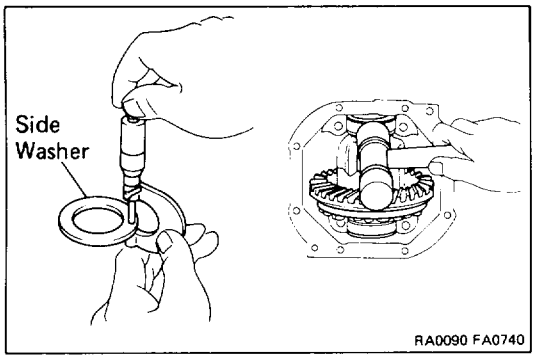
NOTE: There should be no clearance between the plate washer and case.

Insure that there is ring gear backlash.



4. ADJUST SIDE BEARING PRELOAD

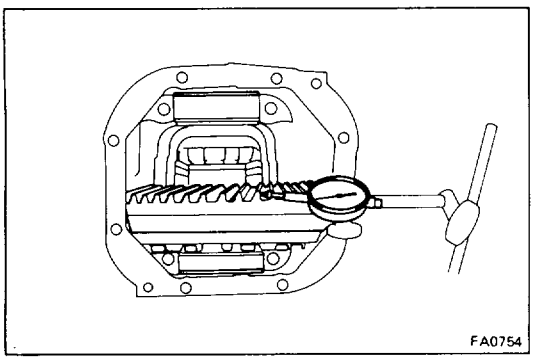
(a) Remove the ring gear teeth plate washer and measure the thickness.



(b) Using the backlash as a reference, install a new washer of 0.06 — 0.09 mm (0.0024 — 0.0035 in.) thicker than the washer removed.

NOTE: Select a washer which can be pressed in 2/3 of the way with your finger.

(c) Using a plastic-faced hammer, tap in the side washer.

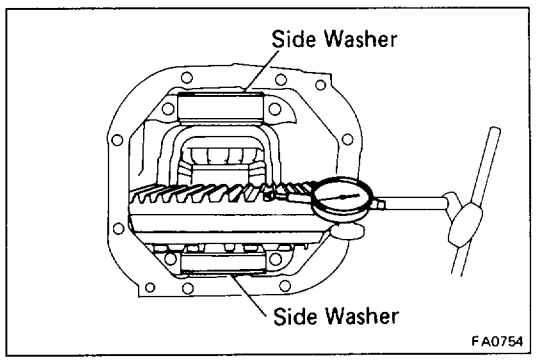


(d) Recheck the ring gear backlash.

Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

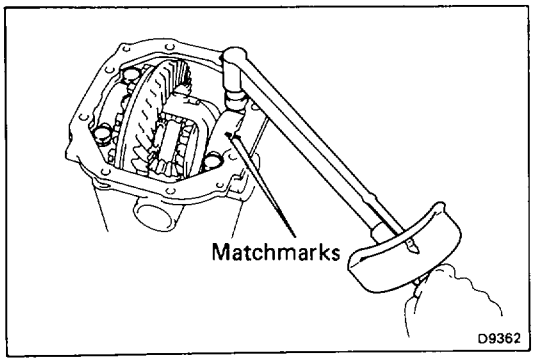
(e) If not within standard, adjust by either increasing or decreasing the washers on both sides by an equal amount.

NOTE: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (0.0012 in.) alteration of the side washer.



Washer thickness

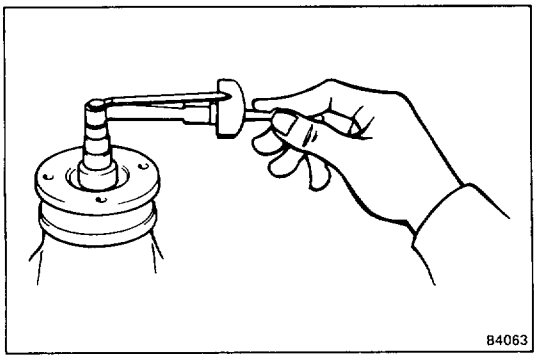
Thickness	mm (in.)
2.57–2.59 (0.1012–0.1020)	2.93–2.95 (0.1154–0.1161)
2.60–2.62 (0.1024–0.1031)	2.96–2.98 (0.1165–0.1173)
2.63–2.65 (0.1035–0.1043)	2.99–3.01 (0.1177–0.1185)
2.66–2.68 (0.1047–0.1055)	3.02–3.04 (0.1189–0.1197)
2.69–2.71 (0.1059–0.1067)	3.05–3.07 (0.1201–0.1209)
2.72–2.74 (0.1071–0.1079)	3.08–3.10 (0.1213–0.1220)
2.75–2.77 (0.1083–0.1091)	3.11–3.13 (0.1224–0.1232)
2.78–2.80 (0.1094–0.1102)	3.14–3.16 (0.1236–0.1244)
2.81–2.83 (0.1106–0.1114)	3.17–3.19 (0.1248–0.1256)
2.84–2.86 (0.1118–0.1126)	3.20–3.22 (0.1260–0.1268)
2.87–2.89 (0.1130–0.1138)	3.23–3.25 (0.1272–0.1280)
2.90–2.92 (0.1142–0.1150)	



5. INSTALL SIDE BEARING CAPS

Align the matchmarks on the cap and carrier.

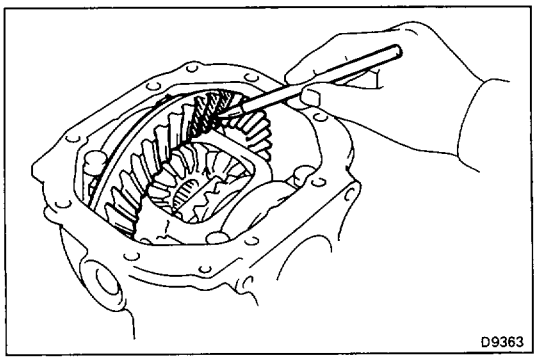
Torque: 800 kg-cm (58 ft-lb, 78 N·m)



6. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (starting):
Add drive pinion preload
4 — 6 kg-cm (3.5 — 5.2 in.-lb, 0.4 — 0.6 N·m)



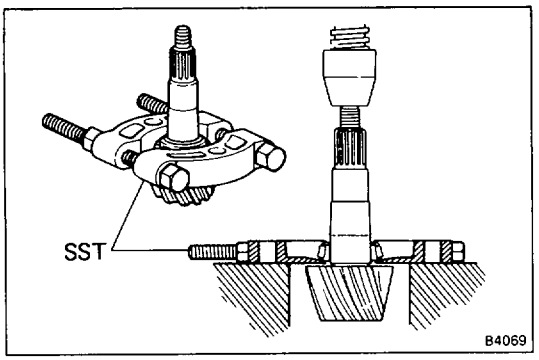
7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

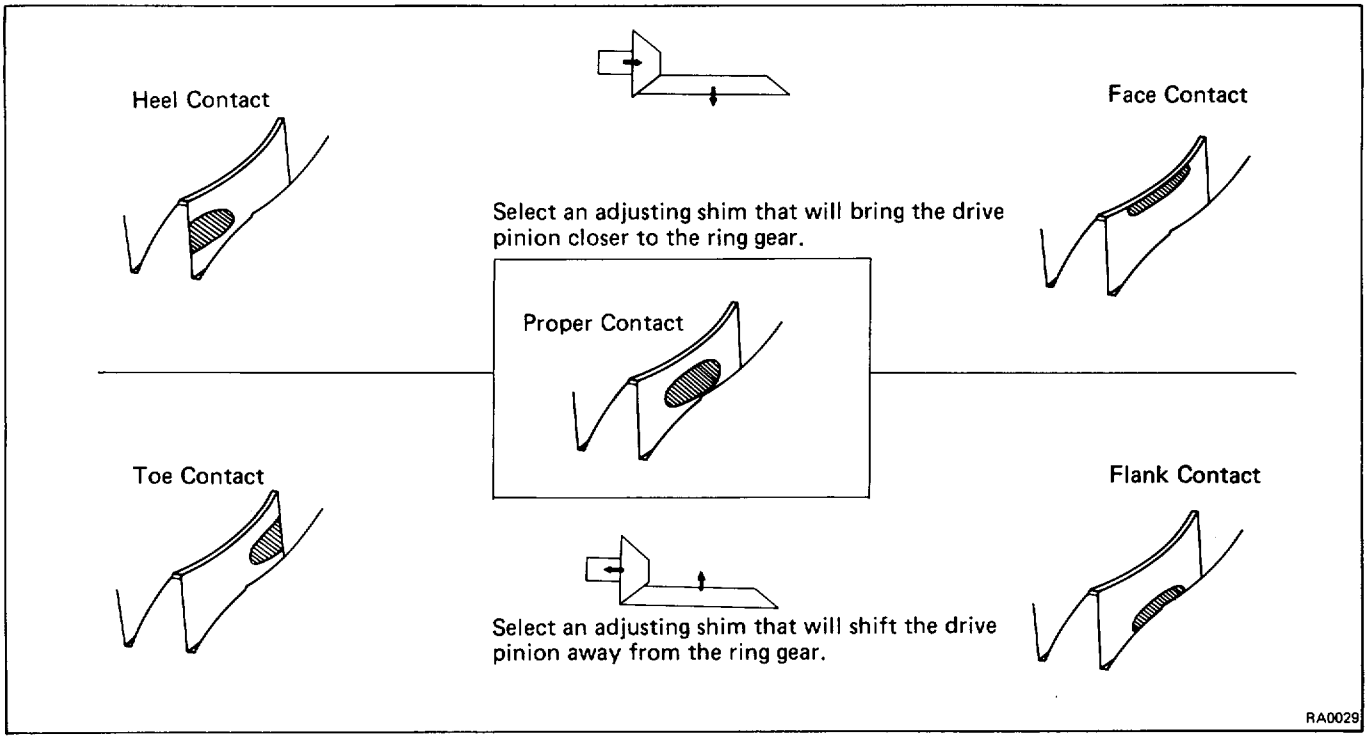
(c) Inspect the tooth pattern.

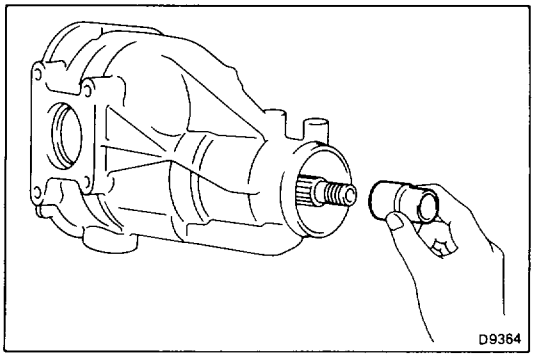
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.



Washer thickness

Thickness	mm (in.)		
2.24	(0.0882)	2.51	(0.0988)
2.27	(0.0894)	2.54	(0.1000)
2.30	(0.0906)	2.57	(0.1012)
2.33	(0.0917)	2.60	(0.1024)
2.36	(0.0929)	2.63	(0.1035)
2.39	(0.0941)	2.66	(0.1047)
2.42	(0.0953)	2.69	(0.1059)
2.45	(0.0965)	2.72	(0.1071)
2.48	(0.0976)		





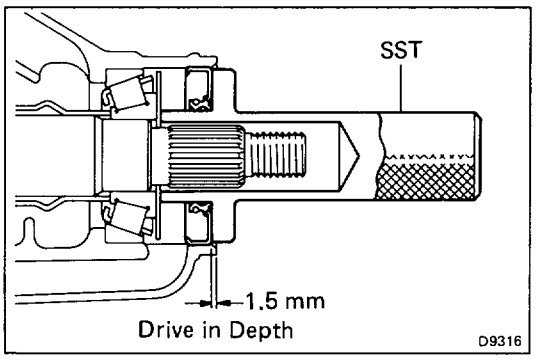
8. **REMOVE COMPANION FLANGE**
(See step 11 on pages FA-71, 72)

9. **REMOVE FRONT BEARING**
(See step 12 on page FA-72)

10. **INSTALL NEW BEARING SPACER AND FRONT BEARING**

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



11. **INSTALL OIL SLINGER AND NEW OIL SEAL**

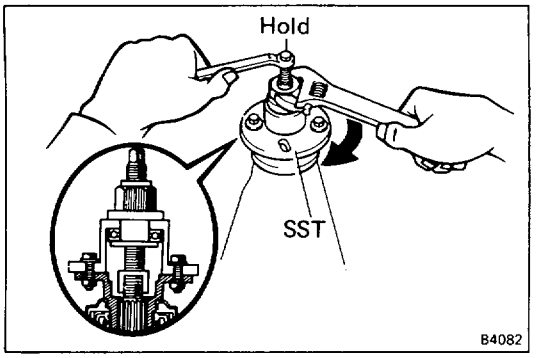
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554-30011

Oil seal drive in depth: 1.5 mm (0.059 in.)

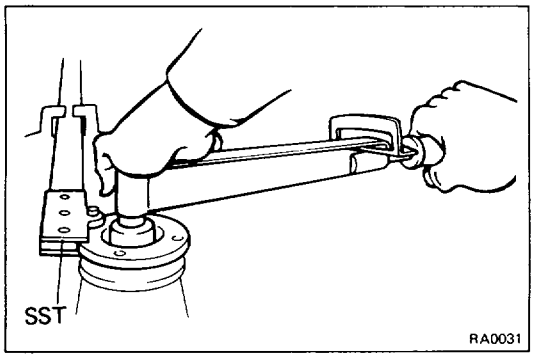
(c) Apply MP grease to the oil seal lip.



12. **INSTALL COMPANION FLANGE**

(a) Using SST, install the companion flange on the shaft.

SST 09557-22022

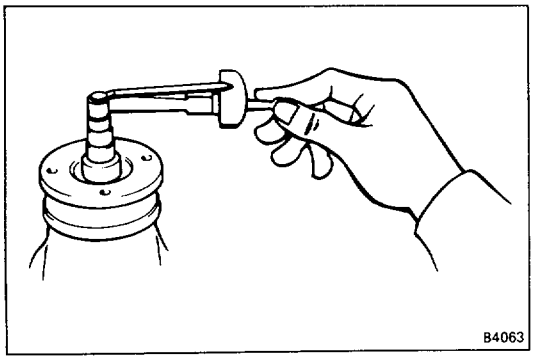


(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut. Torque the nut.

SST 09330-00021

Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



13. **CHECK FRONT BEARING PRELOAD**

Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

Preload (starting):

New bearing

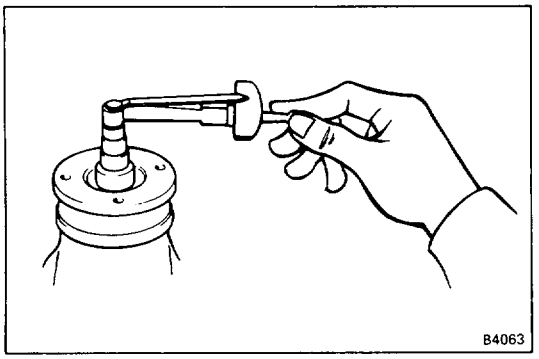
12 — 19 kg-cm

(10.4 — 16.5 in.-lb, 1.2 — 1.9 N·m)

Reused bearing

6 — 10 kg-cm

(5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)

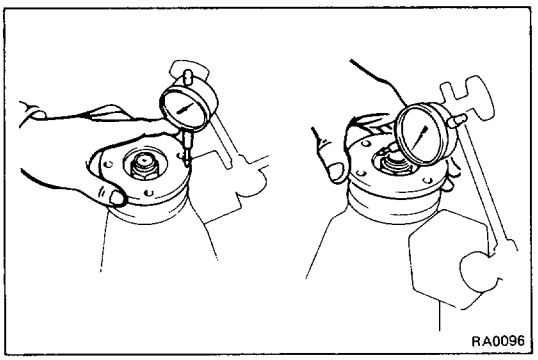


(a) If the preload is greater than specification, replace the bearing spacer.

(b) If the preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) a little at a time until the specified preload is reached.

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg-cm (174 ft-lb, 235 N·m)



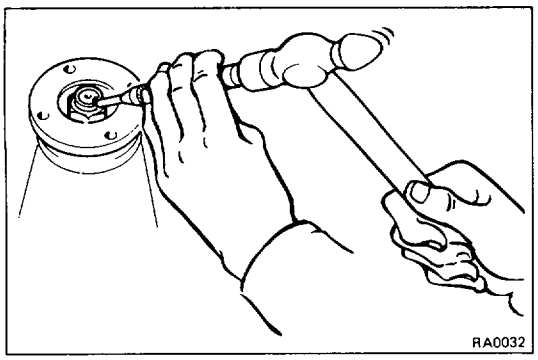
14. CHECK DEVIATION OF COMPANION FLANGE

Using a dial indicator, measure the longitudinal and latitudinal deviation of the companion flange.

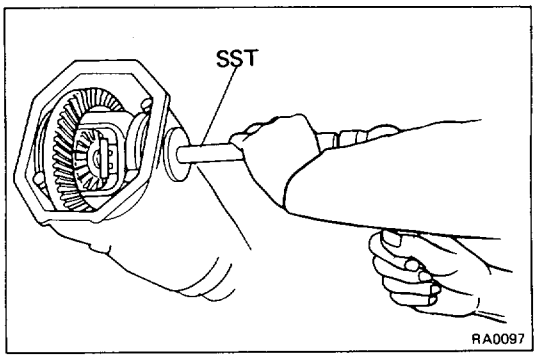
If the deviation is greater than maximum, inspect the bearings.

Maximum longitudinal deviation: 0.10 mm (0.0039 in.)

Maximum latitudinal deviation: 0.10 mm (0.0039 in.)



15. STAKE DRIVE PINION NUT

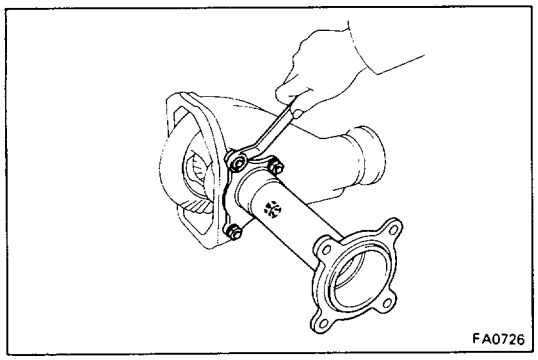


16. INSTALL NEW SIDE GEAR SHAFT OIL SEAL

(a) Coat the oil seal lip with MP grease.

(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.

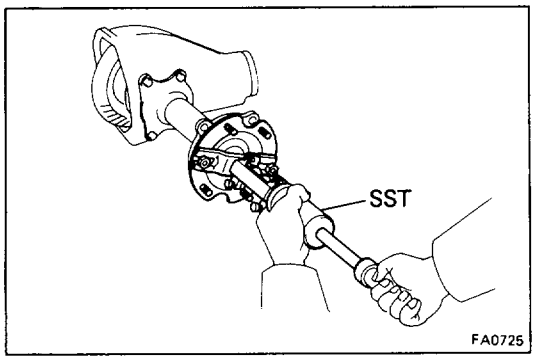
SST 09550-22011 (09550-00020, 09550-00031)



17. INSTALL DIFFERENTIAL TUBE

Install the differential tube to the differential carrier with the four bolts.

Torque: 900 kg-cm (65 ft-lb, 88 N·m)

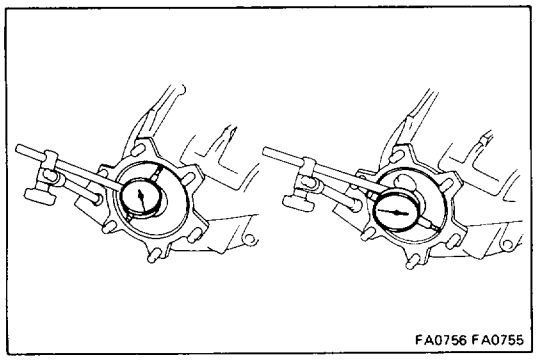


18. INSTALL SIDE GEAR SHAFTS

(a) Before installing the shafts, replace the snap ring.

(b) Using SST, install the side gear shafts to the differential carrier.

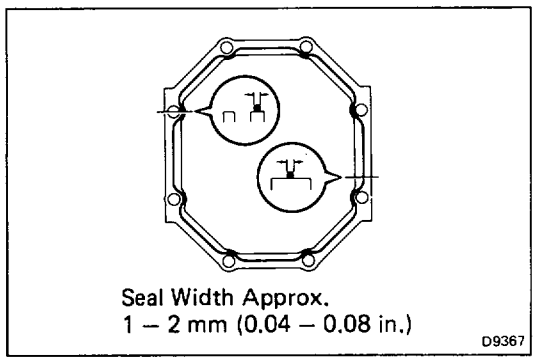
SST 09910-00015



19. MEASURE SIDE GEAR SHAFT DEVISION

Maximum longitudinal deviation:
0.20 mm (0.0079 in.)
Maximum latitudinal deviation:
0.20 mm (0.0079 in.)

If the deviation is greater than maximum, replace the side gear shaft.



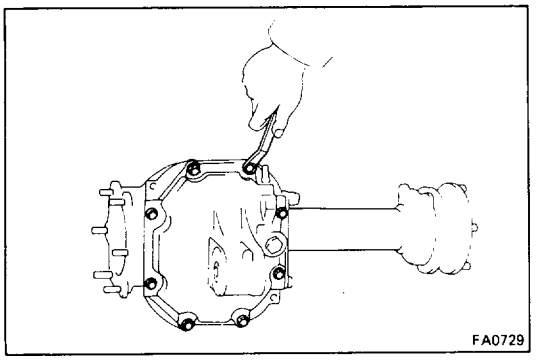
20. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier or carrier cover.

(b) Apply seal packing to the carrier cover.

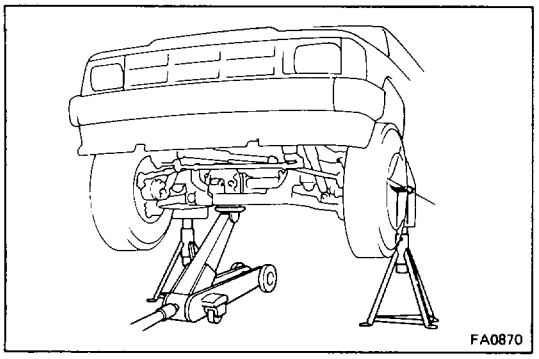
Seal packing: Part No.08826-00090, THREE BOND 1281 or equivalent

NOTE: Install the carrier cover as soon as the seal packing is applied.



(c) Install and torque the bolts.

Torque: 475 kg-cm (34 ft-lb, 47 N·m)

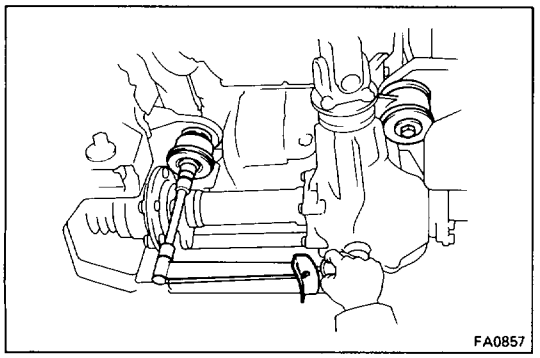

FA0870

INSTALLATION OF FRONT DIFFERENTIAL

(See page FA-65)

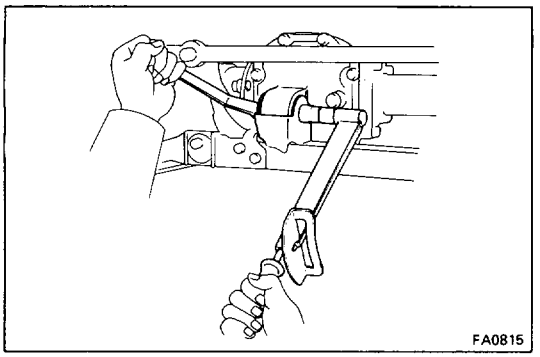
1. **INSTALL FRONT DIFFERENTIAL**

   (a) Install the front differential to the frame, and support it with a jack.


FA0857

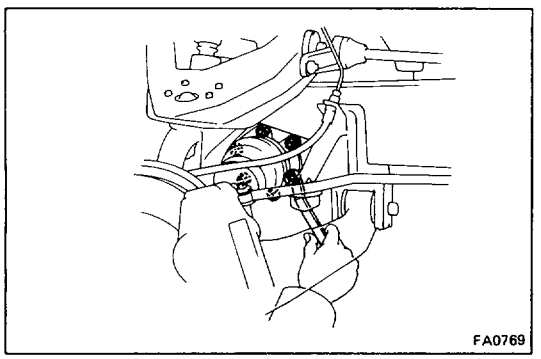
   (b) Install and torque the left and right rear mounting bolts.

   Torque: 1,700 kg-cm (123 ft-lb, 167 N·m)


FA0815

2. **INSTALL FRONT DIFFERENTIAL FRONT MOUNTING BOLT**

   Torque: 1,500 kg-cm (108 ft-lb, 147 N·m)


FA0769

3. **CONNECT DRIVE SHAFTS TO SIDE GEAR SHAFT**

   Connect the drive shafts to the side gear shaft, and install and torque the nuts while depressing the brake pedal.

   Torque: 845 kg-cm (61 ft-lb, 83 N·m)

4. **CONNECT PROPELLER SHAFT TO COMPANION FLANGE**

   (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

   (b) Torque the nuts.

   Torque: 750 kg-cm (54 ft-lb, 74 N·m)

5. **INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL**

   Oil type: Hypoid gear oil API GL-5

   Recommended oil viscosity:

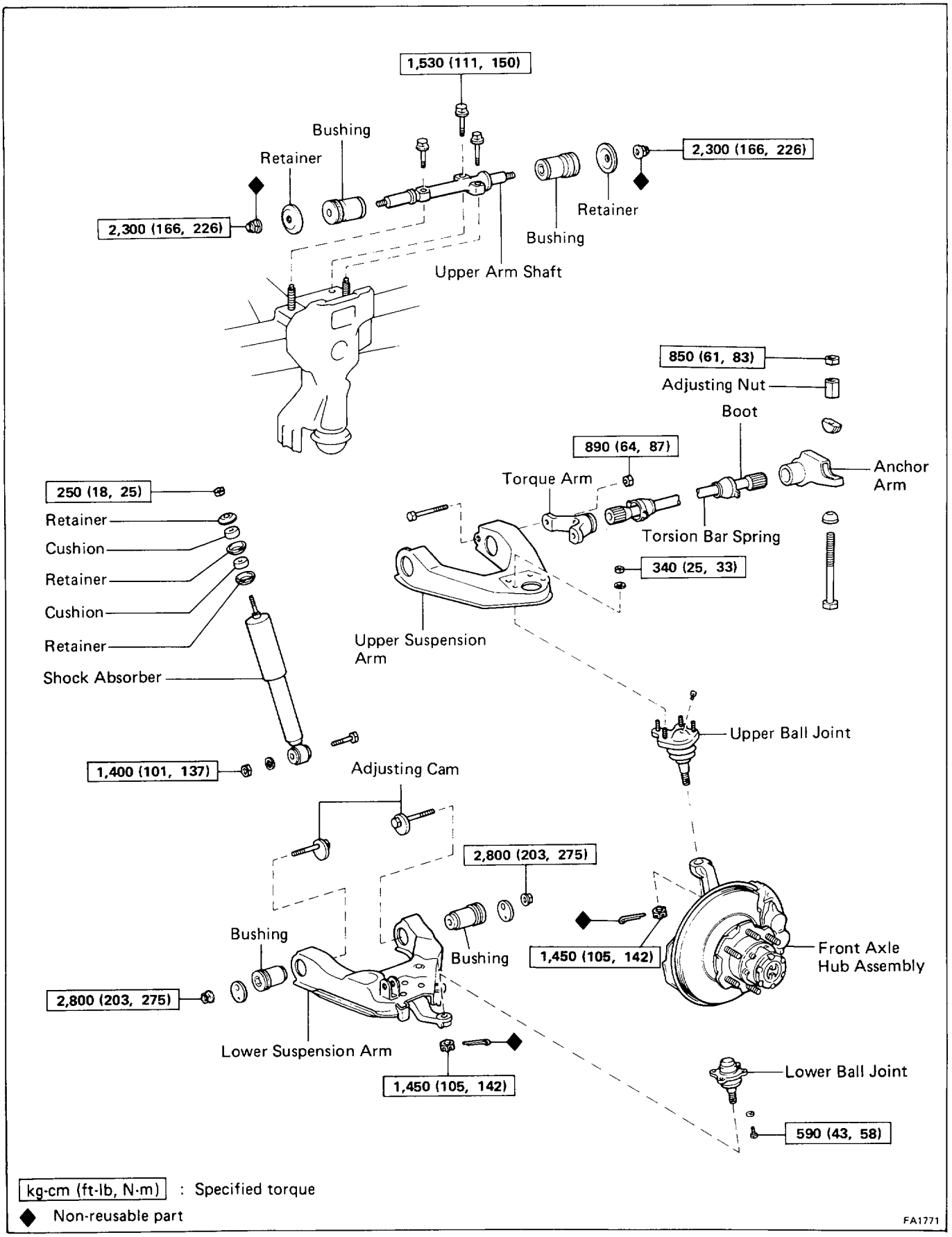
   Above −18°C (0°F) SAE 90

   Below −18°C (0°F) SAE 80W or 80W-90

   Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)

FRONT SUSPENSION (4WD)

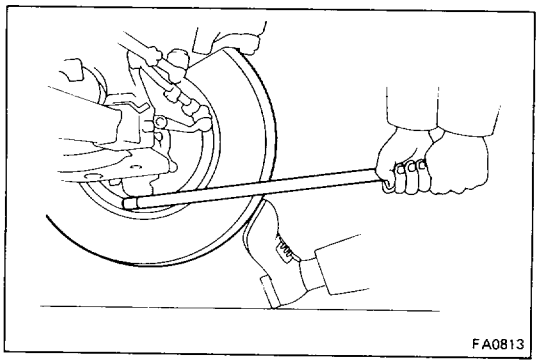
COMPONENTS

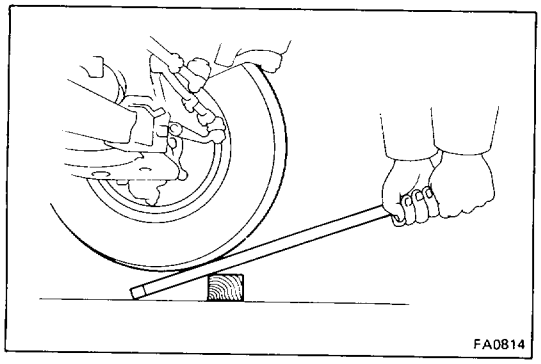


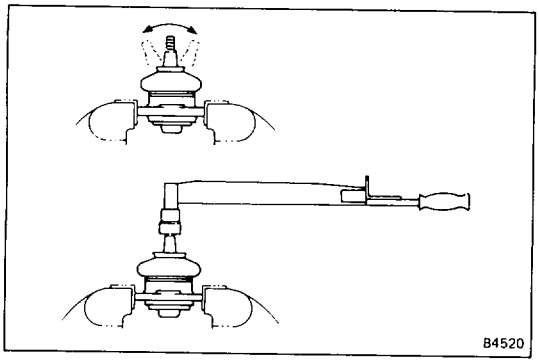
kg-cm (ft-lb, N·m) : Specified torque

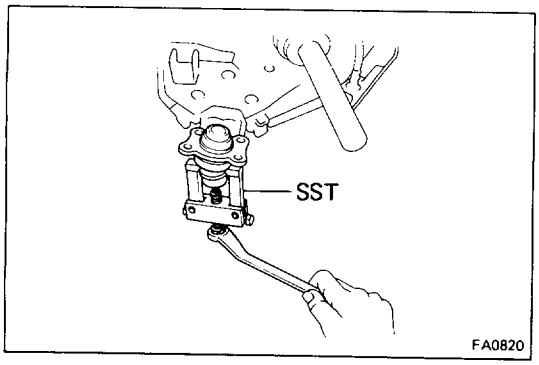
◆ Non-reusable part

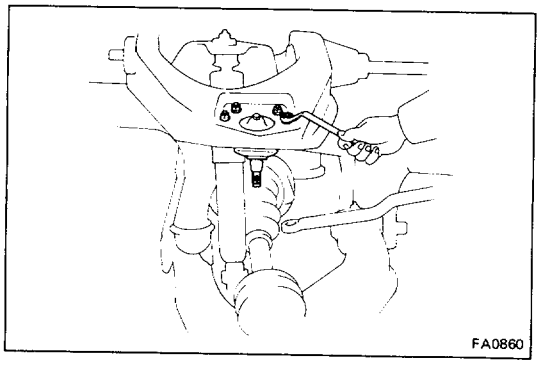
FA1771











Ball Joints

(See page FA-86)

INSPECTION OF BALL JOINTS

1. **INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSENESS**
   (a) Jack up the front of the vehicle and support it with stands.
   (b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.
   (c) Move the lower suspension arm up and down and check that the lower ball joint has no excessive play.

   Maximum vertical play: 0 mm (0 in.)

2. **INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSNESS**
   Move the vehicle up and down and check that the upper ball joint has no excessive play.

   Maximum vertical play: 2.3 mm (0.091 in.)

3. **INSPECT BALL JOINT FOR ROTATION CONDITION**
   (a) Remove the ball joints.
   (b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.
   (c) Using a torque gauge, turn the nut continuously one turn every 2-4 seconds and take the torque reading on the 5th turn.

   Torque (turning):
   Lower ball joint
   30 — 60 kg-cm (26 — 52 in.-lb, 3.0 — 5.9 N·m)

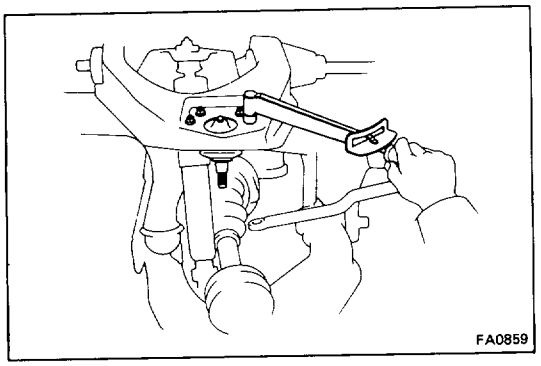
REMOVAL OF BALL JOINTS

1. **REMOVE STEERING KNUCKLE**
   (See page FA-49)

2. **REMOVE LOWER BALL JOINT FROM LOWER SUSPENSION ARM**
   (a) Remove the cotter pin and nut.
   (b) Using SST, remove the lower ball joint from the lower suspension arm.

   SST 09628-62011

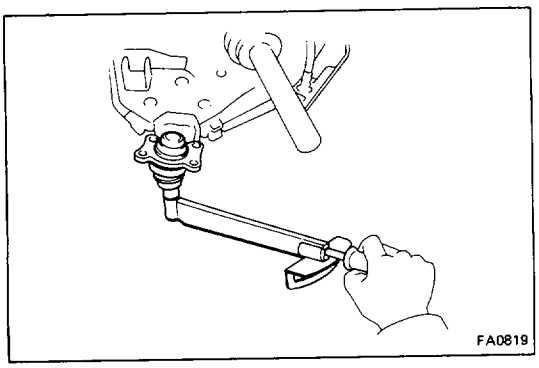
3. **REMOVE UPPER BALL JOINT FROM UPPER SUSPENSION ARM**



INSTALLATION OF BALL JOINTS

1. **INSTALL UPPER BALL JOINT TO UPPER SUSPENSION ARM**

   Torque: 340 kg-cm (25 ft-lb, 33 N·m)

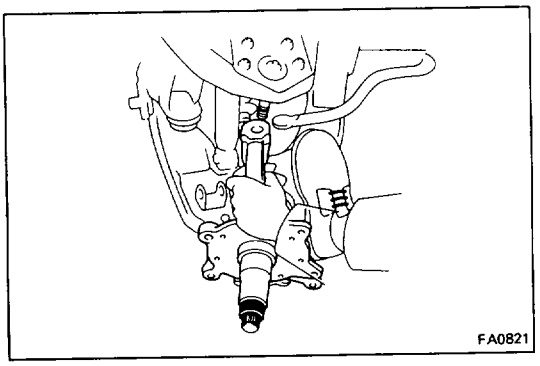


2. **INSTALL LOWER BALL JOINT TO LOWER SUSPENSION ARM**

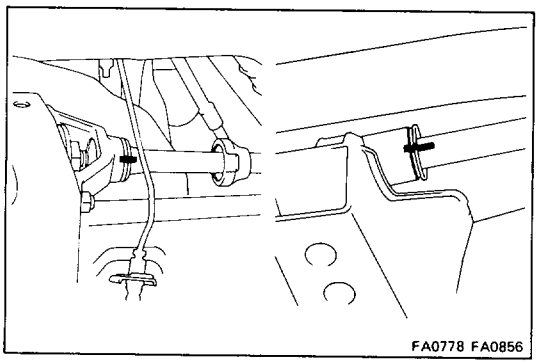
   (a) Install the lower ball joint to the lower suspension arm.

   (b) Torque the nut and install a new cotter pin.

   Torque: 1,450 kg-cm (105 ft-lb, 142 N·m)



3. **INSTALL STEERING KNUCKLE**
   (See page FA-53)



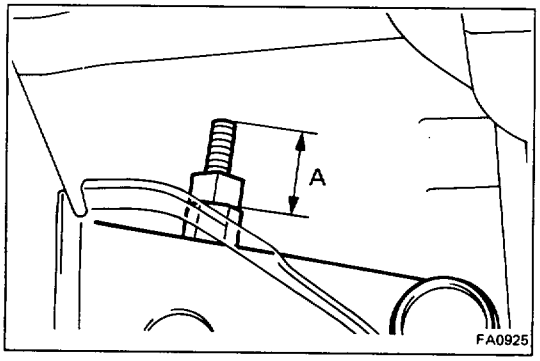
Torsion Bar Spring

(See page FA-86)

REMOVAL OF TORSION BAR SPRING

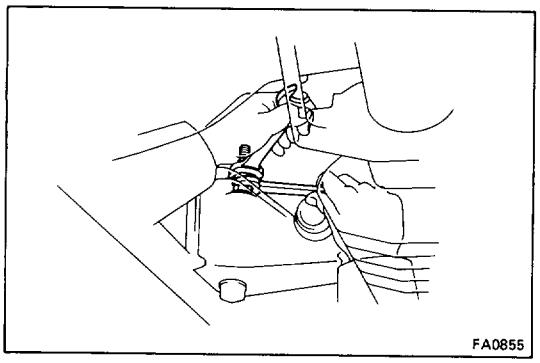
1. **PLACE MATCHMARKS ON TORSION BAR SPRING, ANCHOR ARM AND TORQUE ARM**

   Remove the boots and place matchmarks on the torsion bar spring, anchor arm and torque arm.



2. **MEASURE PROTRUDING BOLT END "A", AS SHOWN**

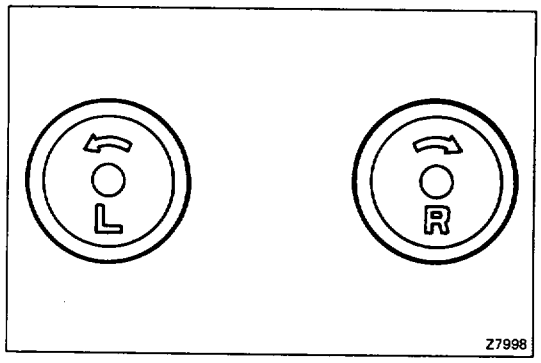
   NOTE: Use this measurement for reference when adjusting the chassis ground clearance.

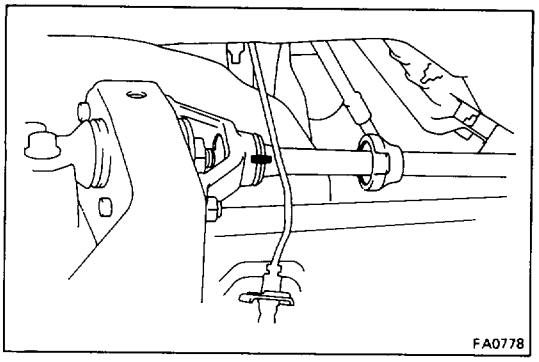


3. **LOOSEN ADJUSTING NUT AND REMOVE ANCHOR ARM AND TORSION BAR SPRING**

INSTALLATION OF TORSION BAR SPRING

NOTE: There are left and right indication marks on the rear end of the torsion bar spring. Be careful not to interchange them.





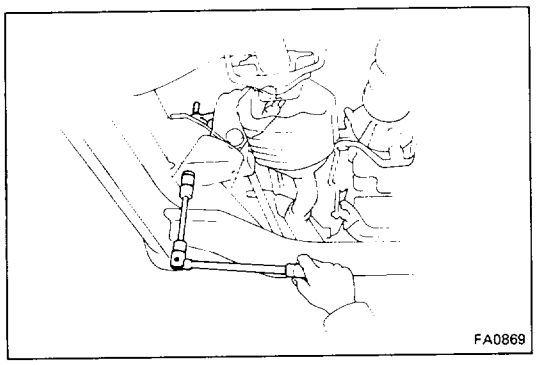
1. **INSTALL TORSION BAR SPRING AND ANCHOR ARM**

   If Reusing Torsion Bar Spring

   (a) Apply a light coat of molybdenum disulphide lithium base grease to the spline of the torsion bar spring.

   (b) Align the matchmarks and install the torsion bar spring to the torque arm.

   (c) Align the matchmarks and install the anchor arm to the torsion bar spring.


FA0869

(d) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.

If Using a New Torsion Bar Spring

(a) Remove the wheel.

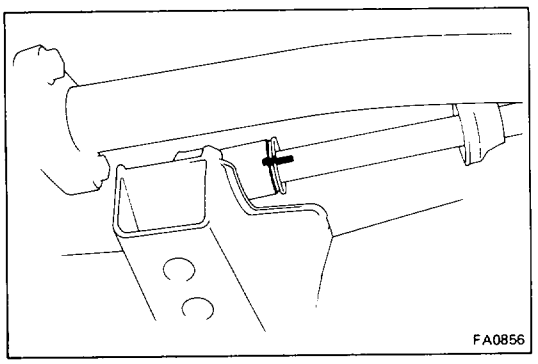
(b) Install the two boots to the torsion bar spring.

(c) Apply a light coat of the molybdenum disulphide lithium base grease to the spline of the torsion bar spring.

(d) Temporarily install the anchor arm to the small end of the torsion bar spring and place the matchmarks on the torsion bar spring and anchor arm.

NOTE

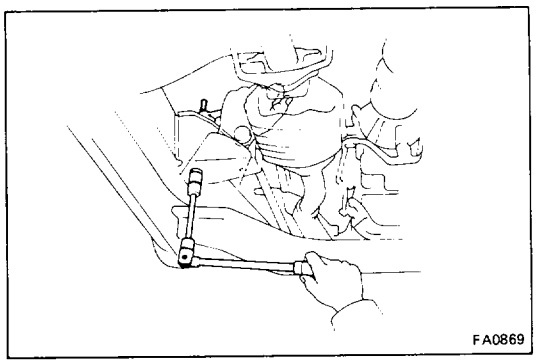
- There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the anchor arm by slowly turning the anchor arm until you feel the large spline enter the matching point in the anchor arm.
- Place matchmarks on the torsion bar spring and anchor arm on the bottom of each.


FA0856

(e) Remove the anchor arm from the torsion bar spring.

(f) Install the torsion bar spring into the torque arm.

NOTE: There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the torque arm by slowly turning the torsion bar spring until you feel the large spline enter the matching point in the torque arm.


FA0869

(g) Align the matchmarks and install the anchor arm to the torsion bar spring.

(h) Torque the adjusting nut.

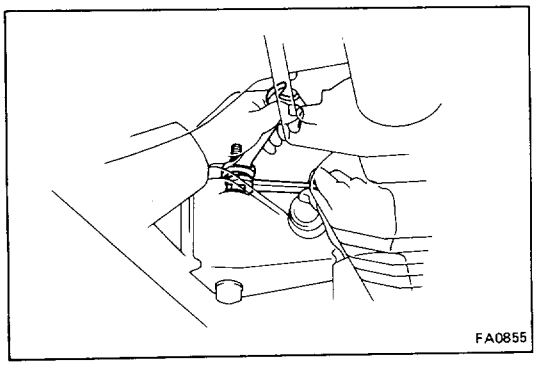
Nut tightening limit : A = 87 mm (3.43 in.)

(i) Temporarily install the lock nut.

(j) Install the wheel and remove the stands, bounce the vehicle to settle the suspension.

(k) Adjust the chassis ground clearance by turning the adjusting nut.

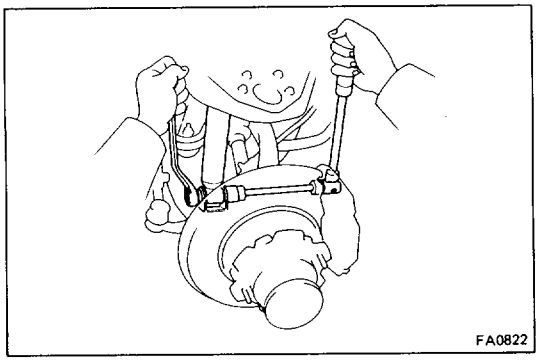
Chassis ground clearance: See pages A-36, 37


FA0855

2. TORQUE LOCK NUT

Torque: 850 kg-cm (61 ft-lb, 83 N·m)

3. ASSEMBLE BOOTS

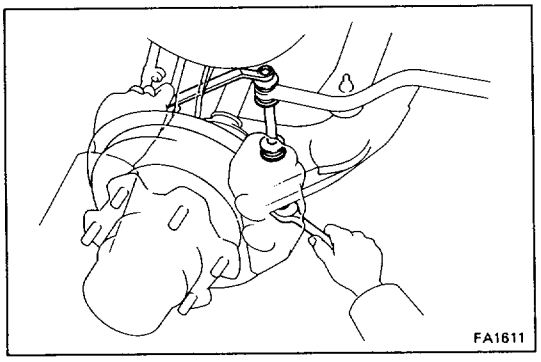


Lower Suspension Arm and Shock Absorber

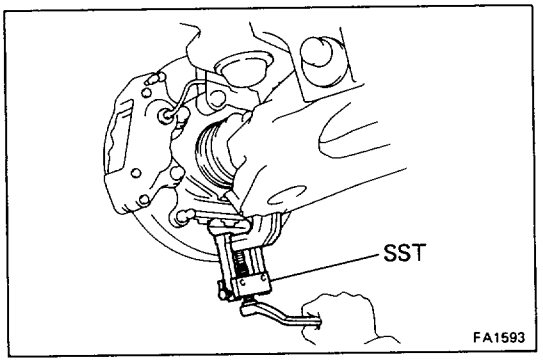
(See page FA-86)

REMOVAL OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. **REMOVE SHOCK ABSORBER**

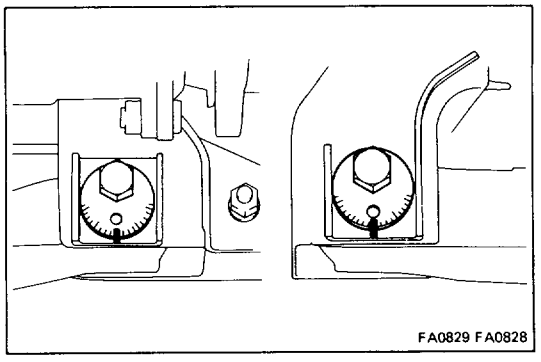


2. **DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM**

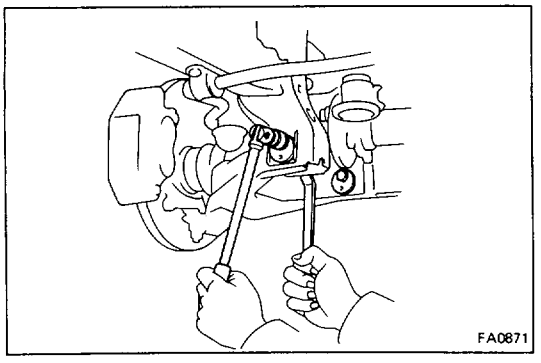


3. **DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT**
   (a) Remove the cotter pin and loosen the nut.
   (b) Using SST, disconnect the lower suspension arm from the lower ball joint.

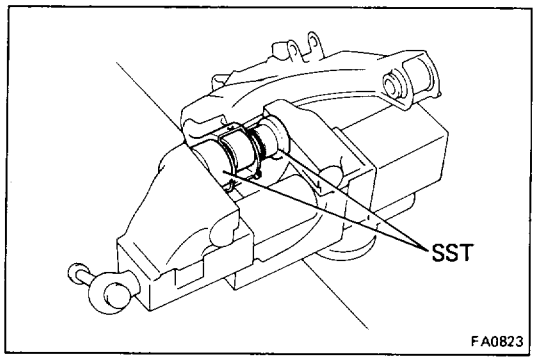
   SST 09628-62011



4. **REMOVE LOWER SUSPENSION ARM**
   (a) Place matchmarks on the front and rear adjusting cams.



   (b) Remove the nuts and adjusting cams, and remove the lower suspension arm.

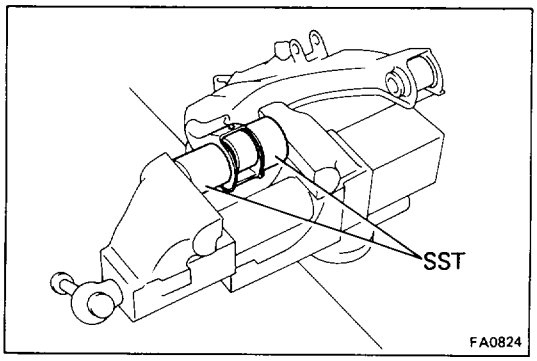


PLACEMENT OF LOWER SUSPENSION ARM BUSHING

1. REMOVE FRONT AND REAR BUSHINGS

Using SST, press out the bushings from the lower suspension arm.

SST 09726-27011 (09726-02050, 09726-02060)

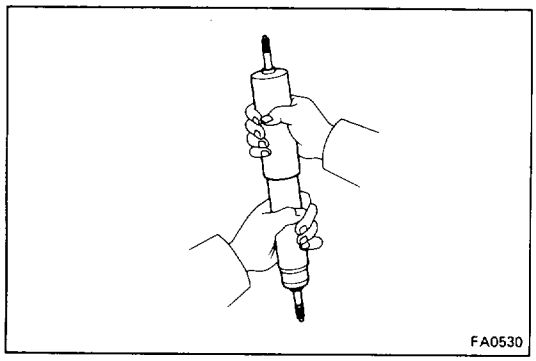


2. INSTALL FRONT AND REAR BUSHINGS

Using SST, press in new bushings to the lower suspension arm.

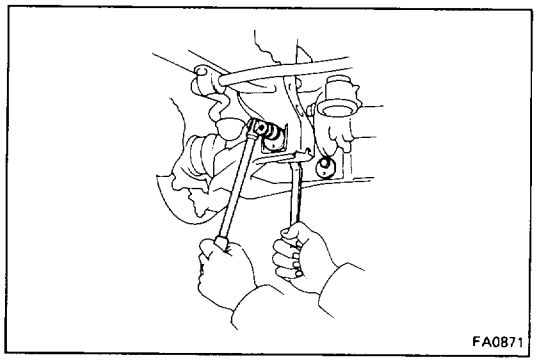
SST 09726-27011 (09726-02040, 09726-02060)

NOTE: Do not apply grease or oil to the bushing.



INSPECTION OF SHOCK ABSORBER

INSPECT OPERATION OF SHOCK ABSORBER

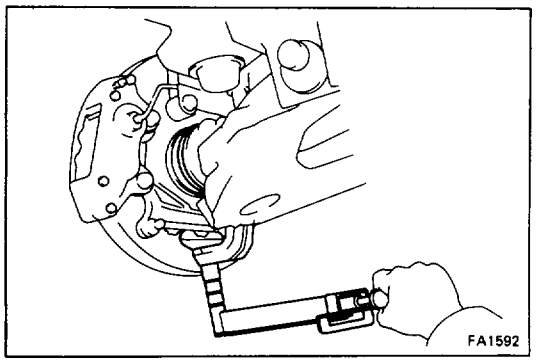


INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. INSTALL LOWER SUSPENSION ARM

(a) Install the lower suspension arm to the frame with adjusting cams.

(b) Temporarily install the two nuts to the front and rear adjusting cams.

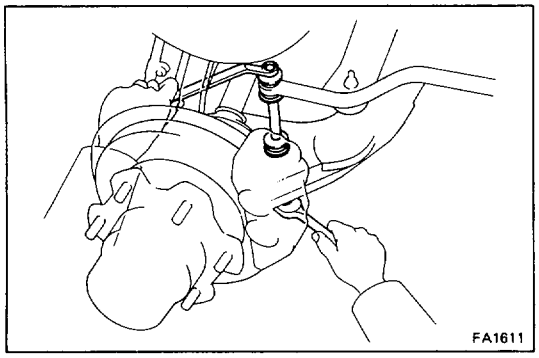


2. CONNECT LOWER SUSPENSION ARM TO LOWER BALL JOINT

(a) Connect the lower suspension arm to the lower ball joint and torque the nut.

Torque: 1,450 kg-cm (105 ft-lb, 142 N·m)

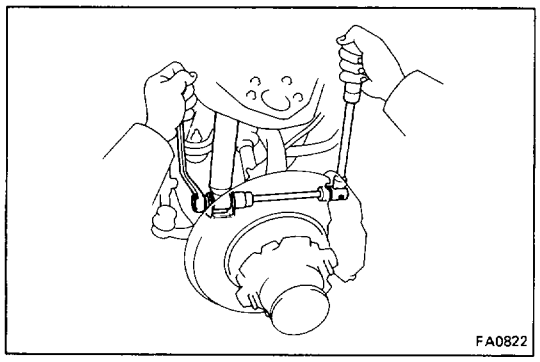
(b) Install a new cotter pin.



3. **CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM**

Jack up the stabilizer bar and install the cushions, retainers, collar and bolt, and install and torque the nut.

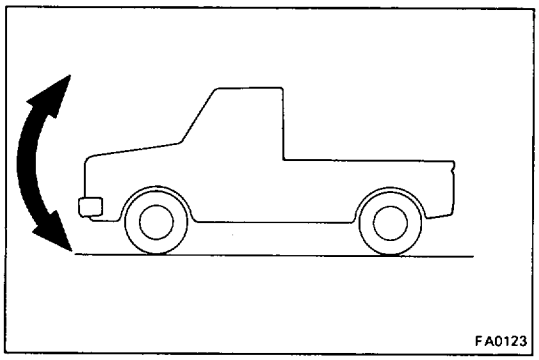
Torque: 260 kg-cm (19 ft-lb, 25 N·m)



4. **INSTALL SHOCK ABSORBER TO LOWER SUSPENSION ARM**

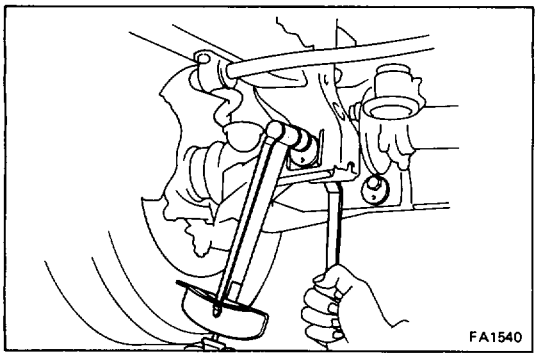
Install the shock absorber to lower suspension arm bracket.

Torque: 1,400 kg-cm (101 ft-lb, 137 N·m)



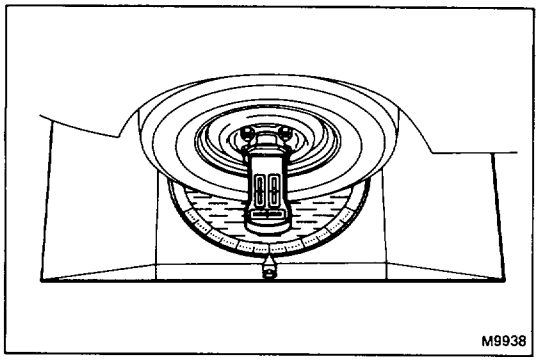
5. **TORQUE ADJUSTING CAM NUTS**

(a) Install the wheel, and remove the stands and bounce the vehicle up and down to stabilize the suspension.

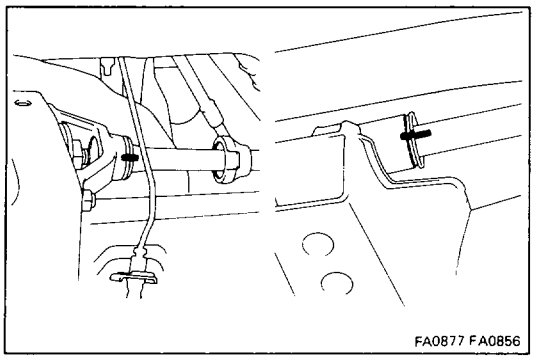


(b) Align the matchmarks and torque the nuts.

Torque: 2,800 kg-cm (203 ft-lb, 275 N·m)



6. **CHECK FRONT WHEEL ALIGNMENT**
(See page FA-25)

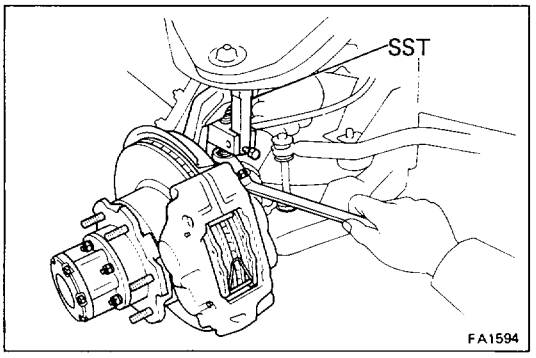


Upper Suspension Arm

(See page FA-86)

REMOVAL OF UPPER SUSPENSION ARM

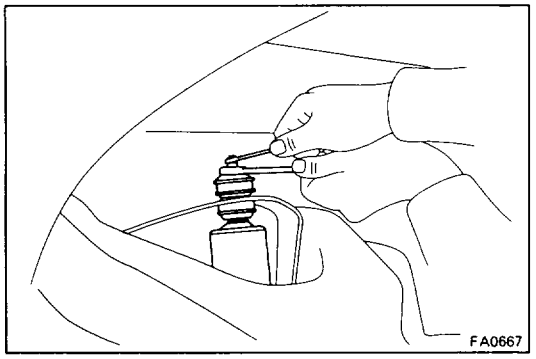
1. **REMOVE TORSION BAR SPRING**
(See page FA-89)



2. **DISCONNECT UPPER SUSPENSION ARM FROM UPPER BALL JOINT**

Remove the cotter pin and nut, and using SST disconnect the upper ball joint from the steering knuckle.

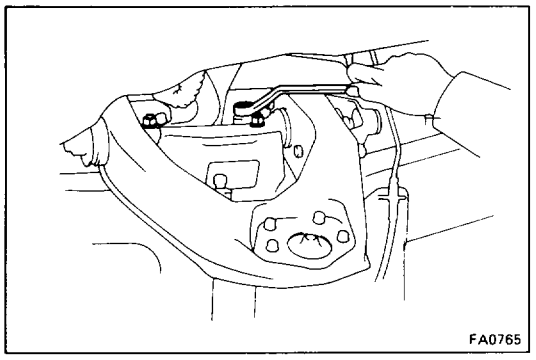
SST 09628-62011



3. **DISCONNECT SHOCK ABSORBER FROM FRAME**

Remove the nut, cushion and retainer, and disconnect the shock absorber from the frame.

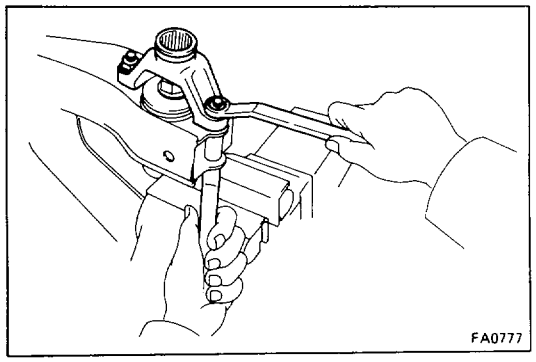
NOTE: Do not disconnect the shock absorber from the lower suspension arm.



4. **REMOVE UPPER SUSPENSION ARM**

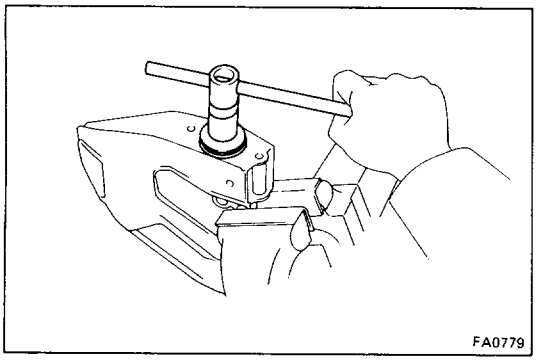
(a) Disconnect the intermediate shaft from the steering gear housing.

(b) Remove the three bolts, and remove the upper suspension arm from the frame.



REPLACEMENT OF UPPER ARM BUSHING

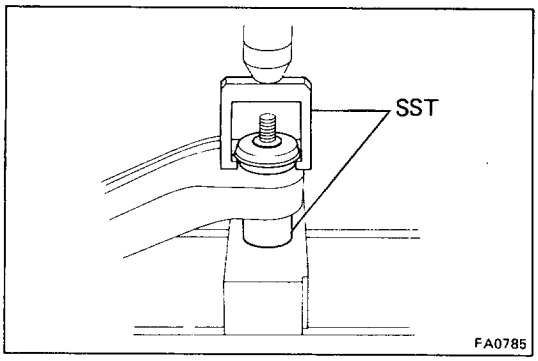
1. **REMOVE TORQUE ARM**



2. REMOVE FRONT BUSHING

(a) Using a chisel and hammer, loosen the staked part of the nut.

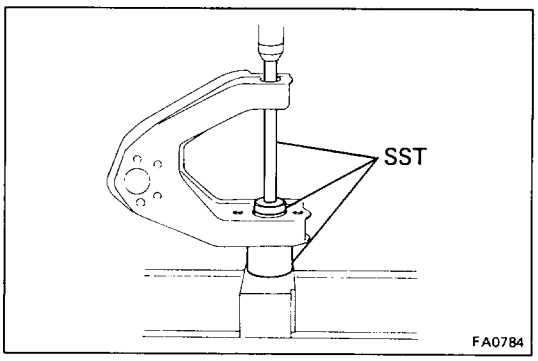
(b) Remove the nut.



(c) Using SST, push out the front bushing.

SST 09710-26010 (09710-05040, 09710-05050)

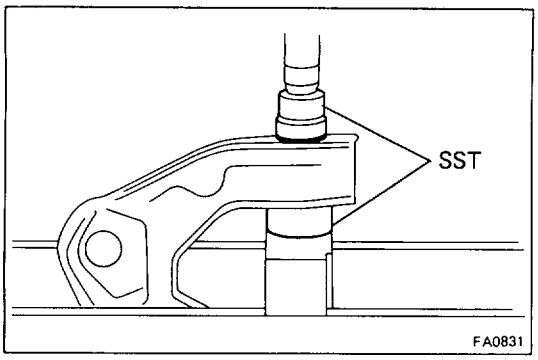
3. REMOVE UPPER ARM SHAFT



4. REMOVE REAR BUSHING

Using SST, push out the rear bushing.

SST 09710-26010
(09710-05020, 09710-05030, 09710-05080)



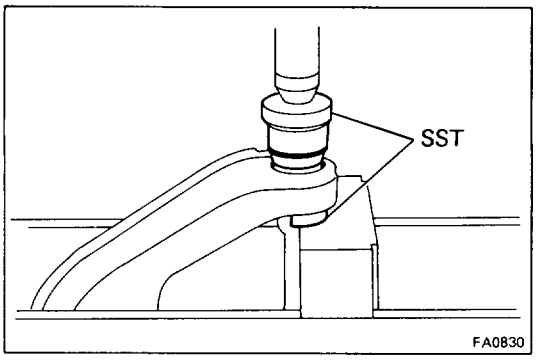
5. INSTALL REAR BUSHING

(a) Using SST, push in a new rear bushing.

SST 09710-26010 (09710-05060, 09710-05080)

NOTE: Do not apply grease or oil to the bushing.

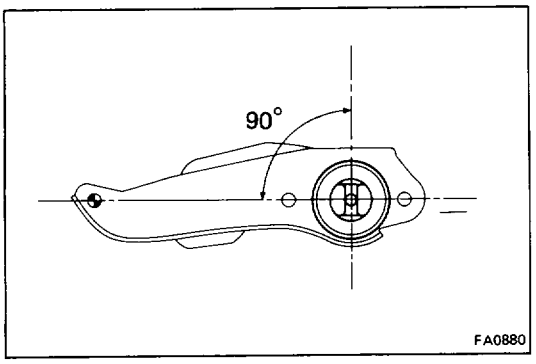
(b) Install the upper arm shaft.



6. INSTALL FRONT BUSHING

Using SST, push in a new front bushing.

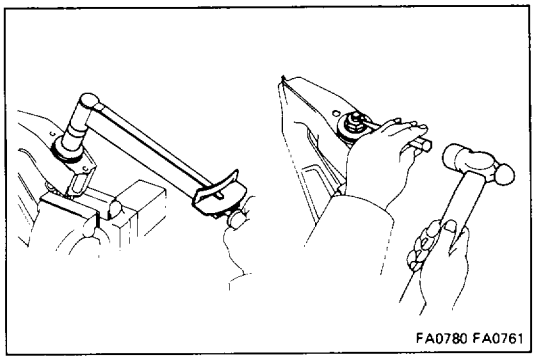
SST 09710-26010 (09710-05060, 09710-05080)



7. TORQUE UPPER ARM SHAFT

(a) Install the retainers and new nuts.

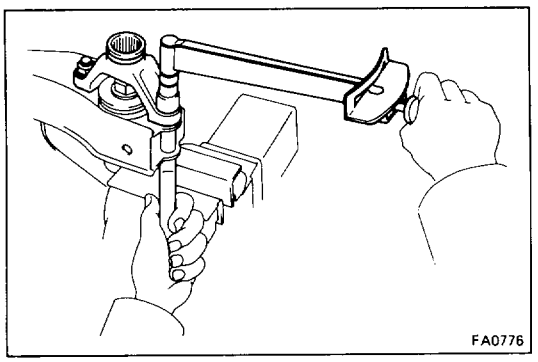
NOTE: Position the upper arm shaft so that the frame installation surface is level with the arm.



(b) Torque the shaft nuts.

Torque: 2,300 kg-cm (166 ft-lb, 226 N·m)

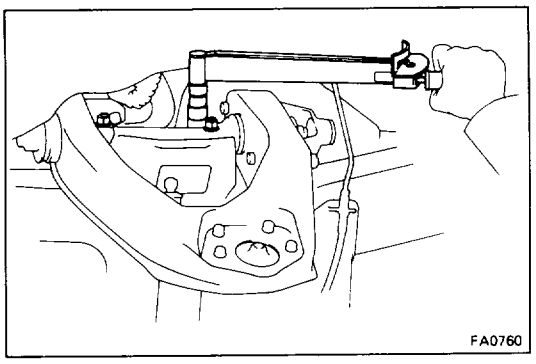
(c) Stake the nuts with a hammer and chisel.



8. INSTALL TORQUE ARM TO UPPER ARM

Torque: 890 kg-cm (61 ft-lb, 83 N·m)

INSTALLATION OF UPPER SUSPENSION ARM

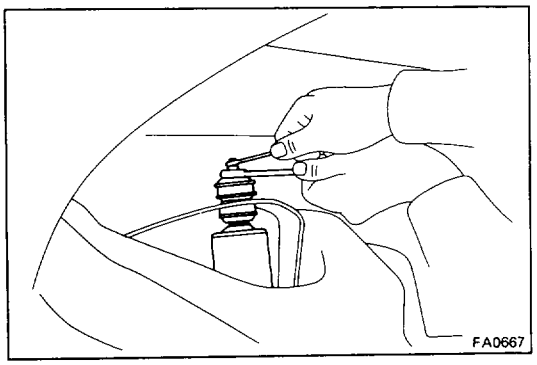


1. INSTALL UPPER SUSPENSION ARM TO FRAME

(a) Install the lower suspension arm to the frame and torque the mounting bolts.

Torque: 1,530 kg-cm (111 ft-lb, 150 N·m)

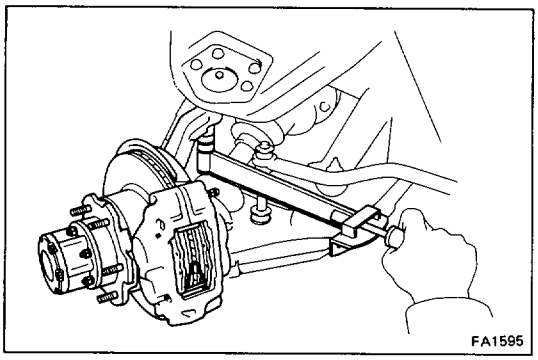
(b) Connect the intermediate shaft to the steering gear housing.



2. CONNECT SHOCK ABSORBER TO FRAME

Connect the shock absorber to frame with cushion and retainer and install and torque a new nut as shown in the figure.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)



3. **CONNECT UPPER SUSPENSION ARM TO UPPER BALL JOINT**

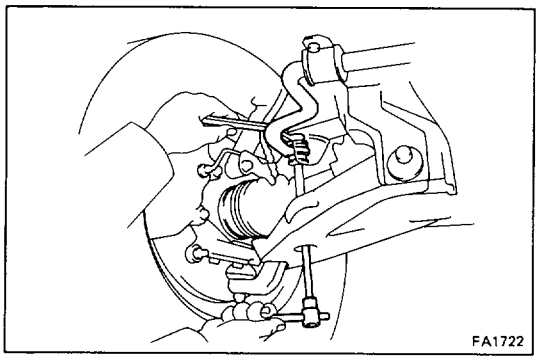
   (a) Connect the upper ball joint to the steering knuckle and install and torque the nut.

   Torque: 1,450 kg-cm (105 ft-lb, 142 N·m)

   (b) Install a new cotter pin.

4. **INSTALL TORSION BAR SPRING**

5. **CHECK FRONT WHEEL ALIGNMENT**
   (See page FA-25)



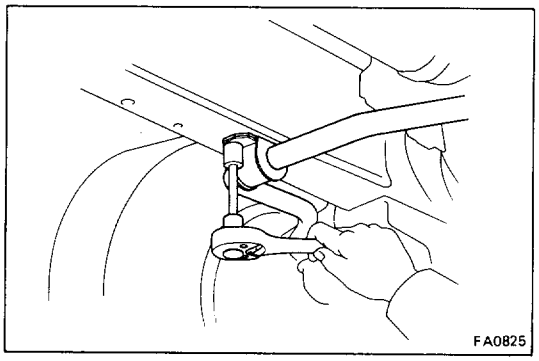
Stabilizer Bar

(See page FA-86)

REMOVAL OF STABILIZER BAR

REMOVE STABILIZER BAR

(a) Remove the nut, cushions and retainers holding both sides of the stabilizer bar from the lower suspension arms, and disconnect the stabilizer bar.

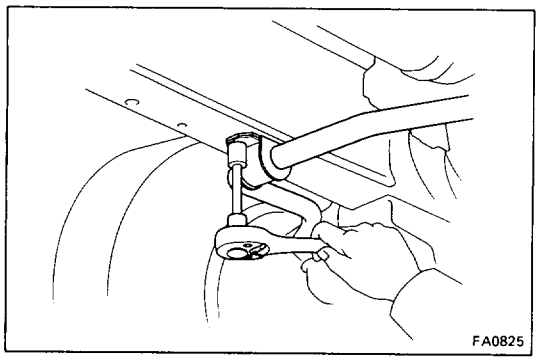


(b) Remove both stabilizer bar brackets and cushions, and remove the stabilizer bar.

INSTALLATION OF STABILIZER BAR

1. **PLACE STABILIZER BAR TO FRAME**

   Place the stabilizer bar in position and install the both stabilizer bar cushion and brackets to the frame. Temporarily install the bolts.



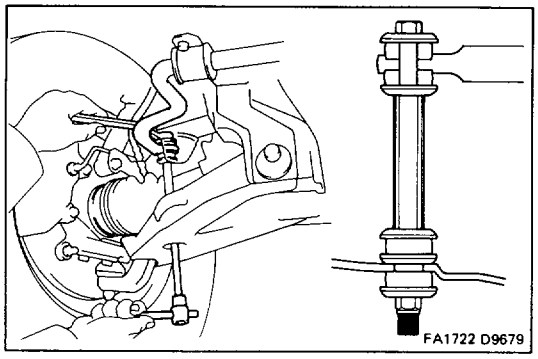
2. **CONNECT STABILIZER BAR TO LOWER SUSPENSION ARMS**

   Connect the stabilizer bar on both sides to the lower arms with bolts, cushion, retainers and a new nut as shown. Torque the nut.

   Torque: 260 kg-cm (19 ft-lb, 25 N·m)

3. **TORQUE BRACKET SET BOLTS**

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



REAR AXLE AND SUSPENSION

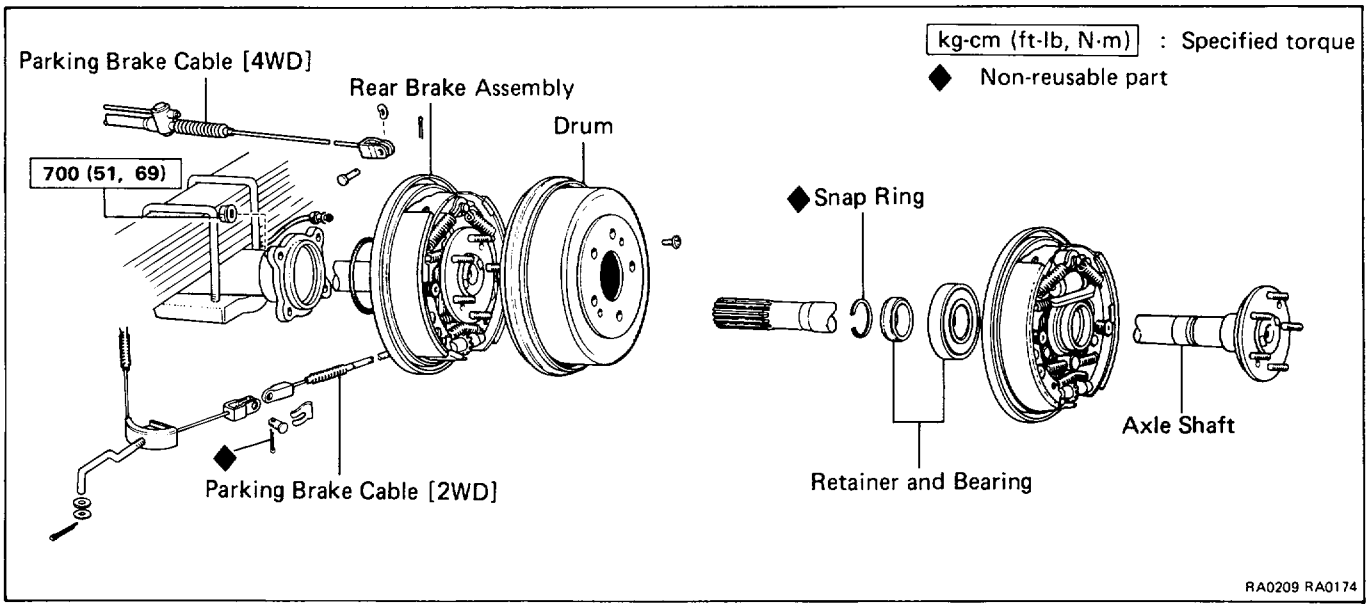
	Page
TROUBLESHOOTING	RA-2
REAR AXLE SHAFT (Single Tire)	RA-3
REAR AXLE SHAFT AND AXLE HUB (Double Tire)	RA-6
DIFFERENTIAL	RA-13
REAR SUSPENSION	RA-31
Leaf Spring and Shock Absorber	RA-31
Stabillizer Bar	RA-35

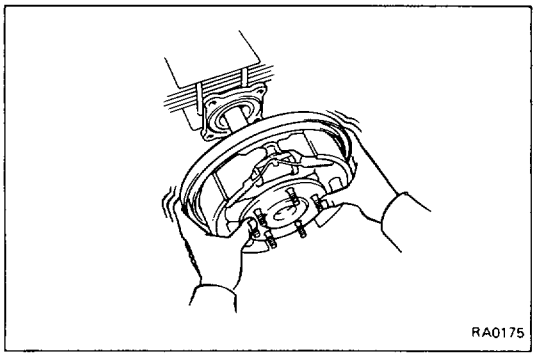
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Oil leak from rear axle	Oil seals worn or damaged	Replace oil seal	RA-3,6
	Bearing retainer loose	Replace retainer	RA-3
	Rear axle housing cracked	Repair as necessary	
Oil leak from pinion shaft	Oil level too high or wrong grade	Drain and replace oil	RA-14
	Oil seal worn or damaged	Replace oil seal	RA-13
	Companion flange loose or damaged	Tighten or replace flange	RA-13
Noises in rear axle	Oil level low or wrong grade	Drain and replace oil	
	Excessive backlash between pinion and ring or side gear	Check backlash	RA-16
	Ring, pinion or side gears worn or chipped	Inspect gears	RA-16
	Pinion shaft bearing worn	Replace bearing	RA-16
	Axle shaft bearing worn	Replace bearing	RA-3,8
	Differential bearing loose or worn	Tighten or replace bearings	RA-18
Bottoming	Vehicle overloaded	Check loading	
	Shock absorber worn out	Replace shock absorber	RA-31
	Springs weak	Replace spring	RA-31

REAR AXLE SHAFT (Single Tire)

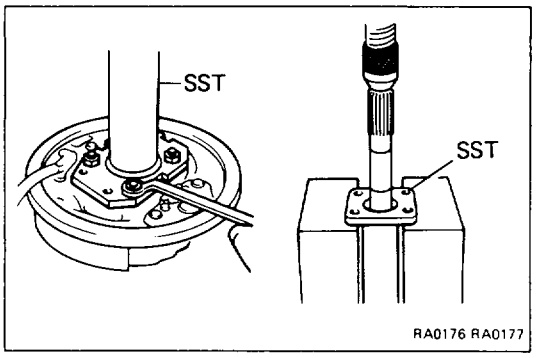
COMPONENTS



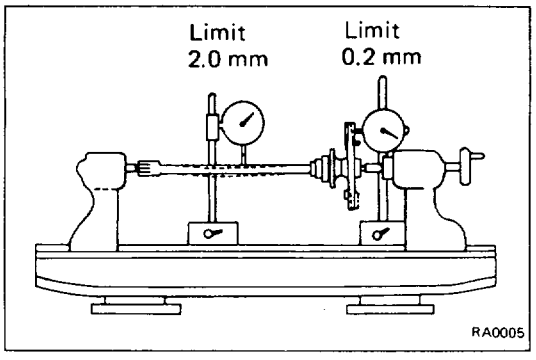


REMOVAL OF REAR AXLE SHAFT

1. **REMOVE WHEEL AND BRAKE DRUM**
2. **DISCONNECT BRAKE TUBE AND PARKING BRAKE CABLE**
3. **REMOVE FOUR BACKING PLATE MOUTING NUTS**
4. **REMOVE SNAP RING**

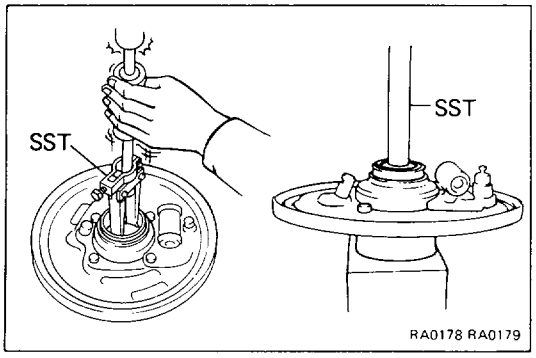


5. **REMOVE REAR AXLE SHAFT FROM BACKING PLATE**
   (a) Attach SST to the backing plate.
   SST 09521-25011
   (b) Press out the rear axle shaft from the backing plate.
   CAUTION: When pulling out the rear axle, be careful not to damage the oil seal.



INSPECTION AND REPAIR OF REAR AXLE SHAFT COMPONENTS

1. **INSPECT REAR AXLE SHAFT AND FLANGE FOR WEAR, DAMAGE OR RUNOUT**
   Maximum shaft runout: 2.0 mm (0.079 in.)
   Maximum flange runout: 0.2 mm (0.008 in.)
   If the rear axle shaft or flange is damaged or worn, or if runout is greater than maximum, replace the rear axle shaft.



2. INSPECT OUTER OIL SEAL

(a) Check for damage.

(b) Check the oil seal lip for wear or damage.

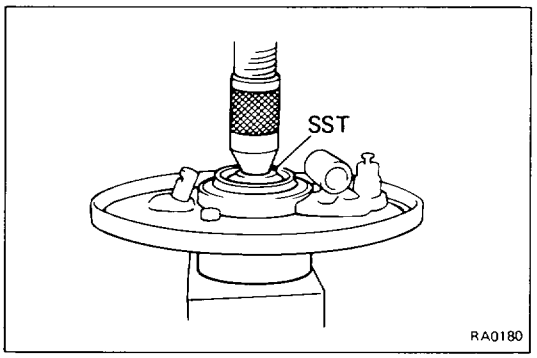
3. IF NECESSARY, REPLACE OUTER OIL SEAL

(a) Using SST, remove the oil seal.

SST 09308-00010

(b) Using SST, install a new oil seal.

SST 09608-30012 (09608-04070)



4. INSPECT REAR AXLE BEARING

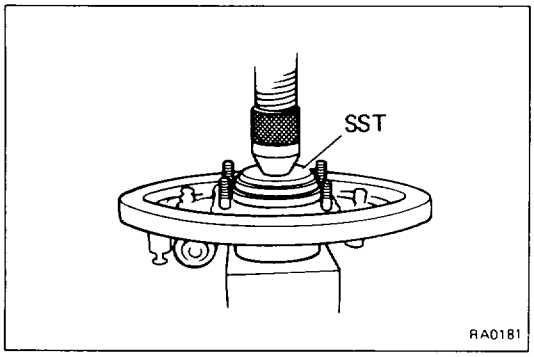
Check for wear or damage.

5. IF NECESSARY, REPLACE REAR AXLE BEARING

(a) Remove the bearing oil seal.

(b) Using SST, press out the bearing.

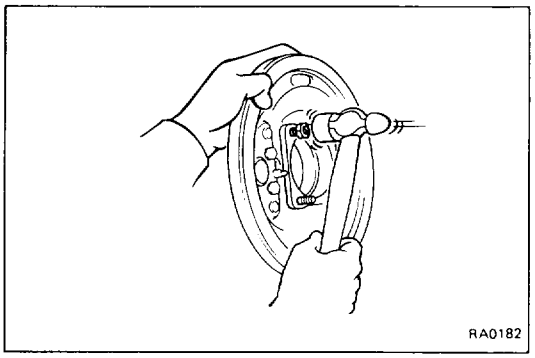
SST 09608-35014 (09608-06100)



(c) Using SST, press in a new bearing.

SST 09515-30010 and 09608-35014 (09608-06180)

(d) Install a new oil seal.



6. INSPECT BEARING CASE

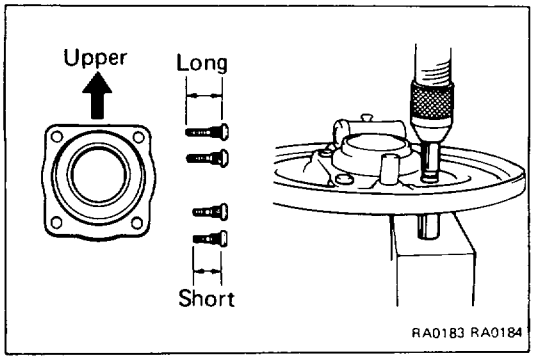
Check for wear or damage.

7. IF NECESSARY, REPLACE BEARING CASE

(a) Remove the oil seal and bearing.

(b) Install nuts to the serration bolts.

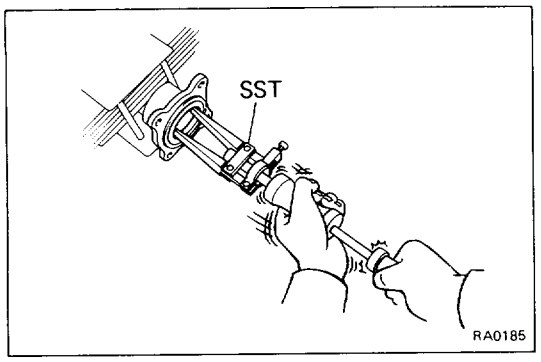
(c) Using a hammer, tap out the serration bolts and remove the bearing case.



(d) Position the backing plate on the new bearing case and, using two sockets, press in the serration bolts.

NOTE: Position the flat side of the bearing case and the two long serration bolts at the upper side of the backing plate.

(e) Install a new bearing and oil seal.



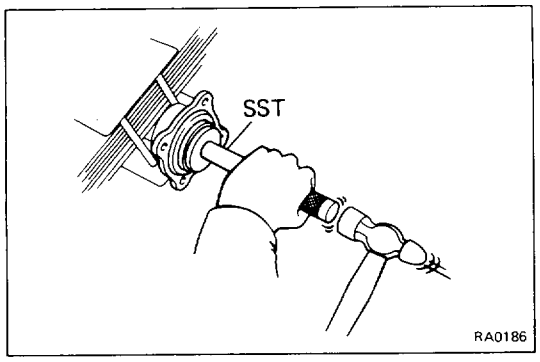
8. **INSPECT OIL SEAL FOR WEAR OR DAMAGE**

If the seal is damaged or worn, replace it.

9. **IF NECESSARY, REPLACE OIL SEAL**

(a) Using SST, remove the oil seal.

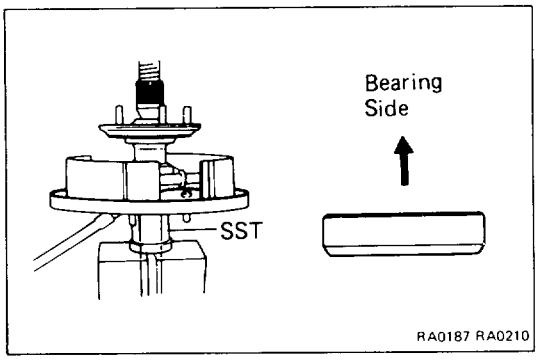
SST 09308-00010

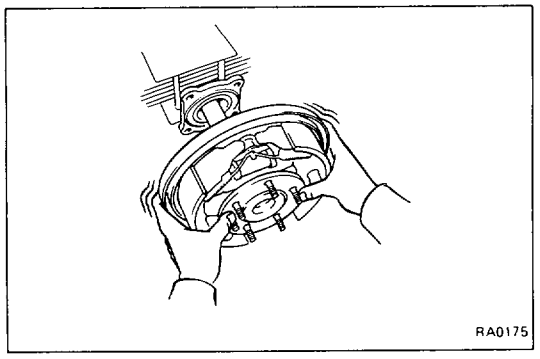


(b) Apply MP grease to the oil seal.

(c) Using SST, drive in a new oil seal.

SST 09608-30012 (09608-04020, 09608-04100)





INSTALLATION OF REAR AXLE SHAFT

(See page RA-3)

1. **INSTALL REAR AXLE SHAFT IN BACKING PLATE**

(a) Apply MP grease to the oil seal lip.

(b) Insert the backing plate and bearing retainer on the rear axle shaft.

(c) Using SST, press the rear axle shaft in to the backing plate.

SST 09515-30010

(d) Using snap ring pliers, install the snap ring.

2. **INSTALL REAR AXLE IN HOUSING**

Install the rear axle with four nuts.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

NOTE:

- Be careful not to damage the oil seal.
- When inserting the axle shaft, be careful not to hit or deform the oil deflector inside the axle housing.

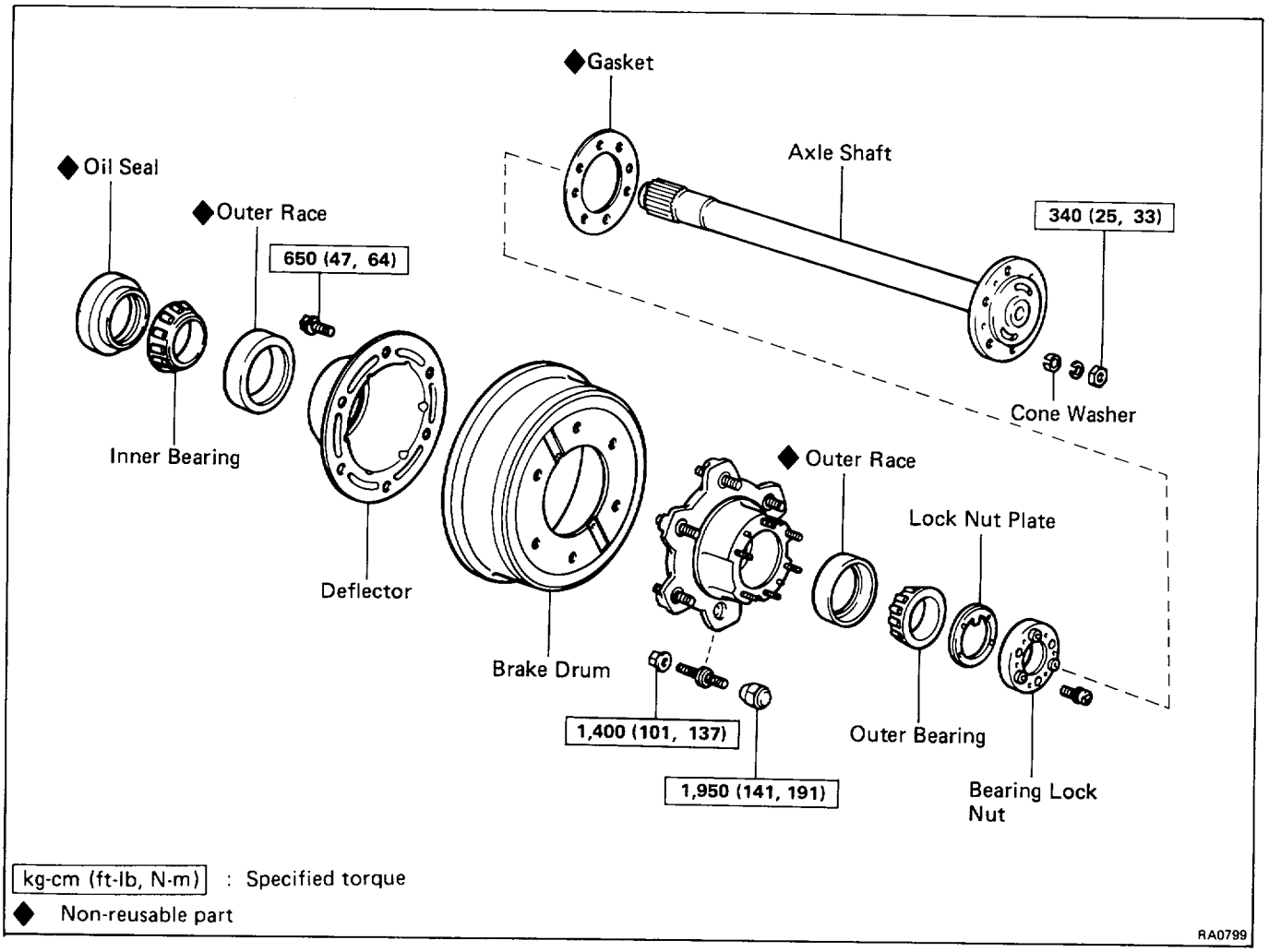
3. **CONNECT BRAKE TUBE AND PARKING BRAKE CABLE**

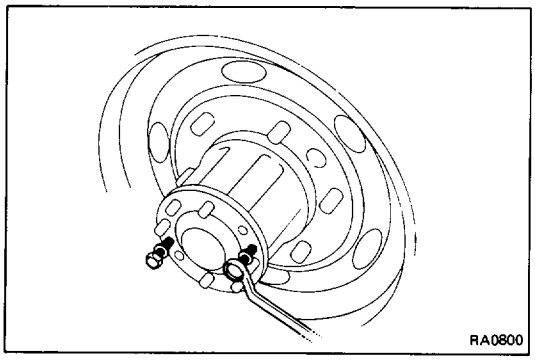
4. **INSTALL BRAKE DRUM AND WHEEL**

5. **BLEED BRAKE SYSTEM**

(See page BR-6)

REAR AXLE SHAFT AND AXLE HUB (Double Tire)





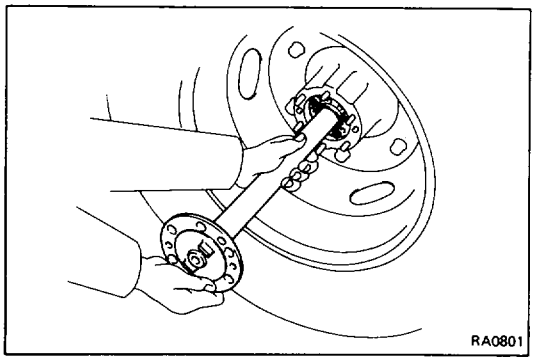
REMOVAL OF REAR AXLE SHAFT

1. REMOVE CONE WASHERS

(a) Remove the six nuts and washers.

(b) Insert two service bolts and one turn.

(c) Tap on the shaft and remove the six cone washers.



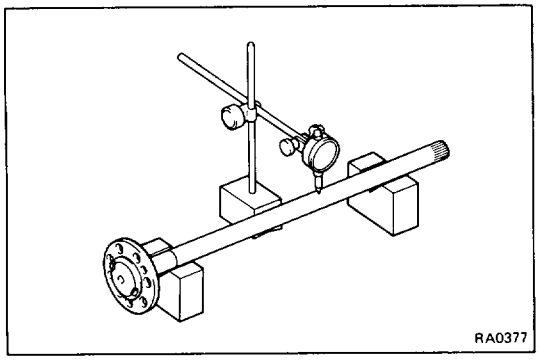
2. REMOVE REAR AXLE SHAFT

(a) Tighten the two service bolts and separate the axle shaft.

(b) Remove the axle shaft with the gasket.

(c) Remove the two service bolts.

NOTE: Be careful not to damage the oil seal with the splines.

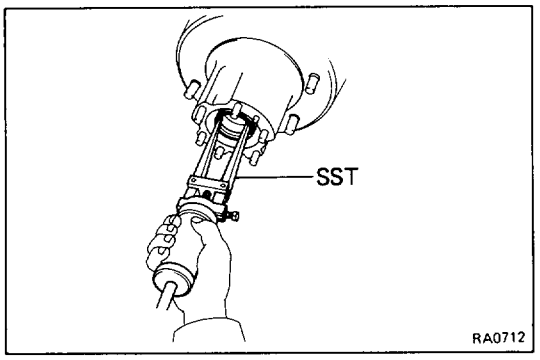


INSPECTION OF REAR AXLE SHAFT COMPONENTS

1. **INSPECT REAR AXLE SHAFT**

   Check for wear or damage.

   Maximum runout: 2.0 mm (0.079 in.)



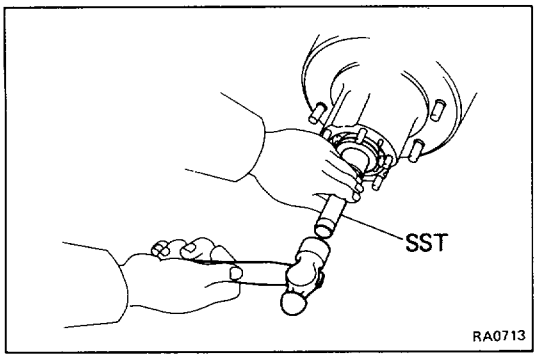
2. **INSPECT OIL SEAL FOR WEAR OR DAMAGE**

   If the oil seal is damaged or worn, replace it.

3. **REPLACE OIL SEAL**

   (a) Using SST, remove the oil seal.

   SST 09308-00010



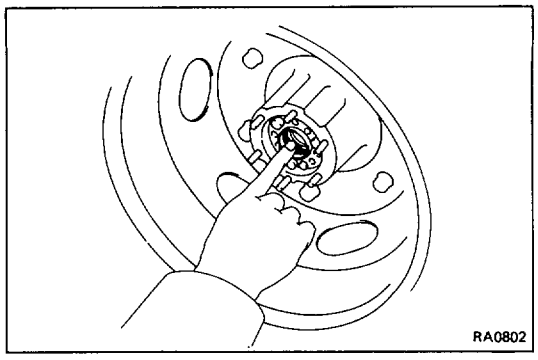
   (b) Using SST, drive in the oil seal.

   SST 09517-12010

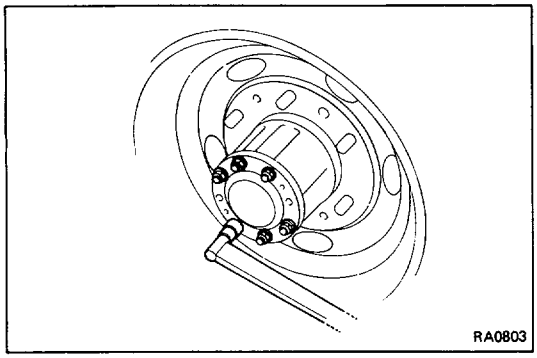
   (c) Apply MP grease to the oil seal lip.

INSTALLATION OF REAR AXLE SHAFT

(See page RA-6)



1. **APPLY MP GREASE TO OIL SEAL LIP**

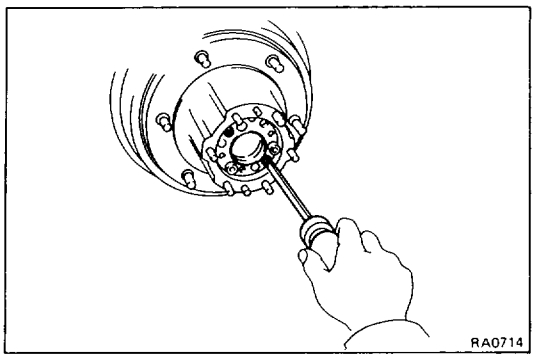


2. **INSTALL REAR AXLE SHAFT**

   Install the rear axle shaft, six cone washers and spring washers with nuts.

   Torque: 340 kg-cm (25 ft-lb, 33 N·m)

   NOTE: Be careful not to damage the oil seal with the splines.

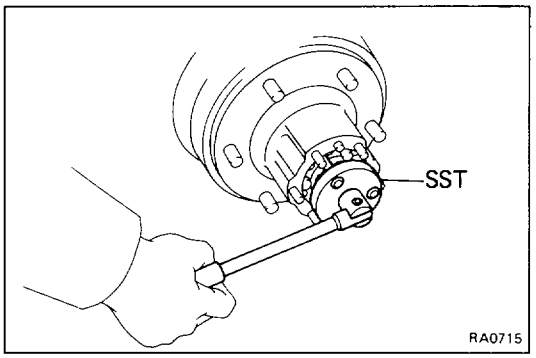


DISASSEMBLY OF REAR AXLE HUB

1. **REMOVE REAR WHEEL AND REAR AXLE SHAFT (See page RA-6)**

2. **REMOVE BEARING LOCK NUT**

   (a) Remove the two bolts from the bearing lock nut.

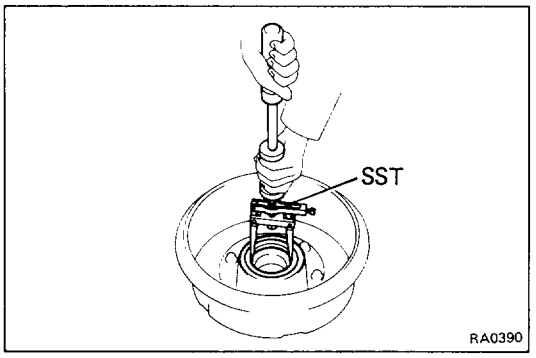


   (b) Using SST, remove the bearing lock nut.

   SST 09509-25011

   (c) Remove the bearing lock plate.

3. **REMOVE AXLE HUB FROM AXLE**



4. **REMOVE OIL SEAL AND INNER BEARING**

   (a) Using SST, remove the oil seal from the axle hub.

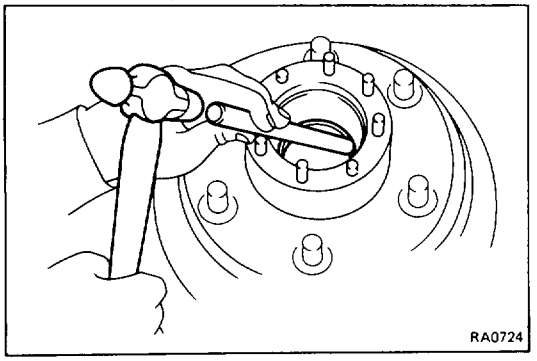
   SST 09308-00010

   (b) Remove the inner bearing from the axle hub.

INSPECTION AND REPAIR OF REAR AXLE HUB

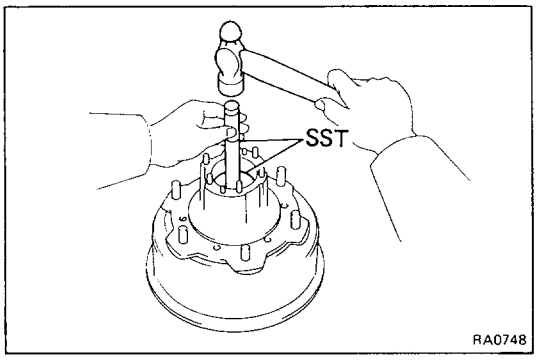
1. **INSPECT AXLE HOUSING**

   Using a magnetic flaw detector or flaw detecting penetrant, check for damage or cracks.



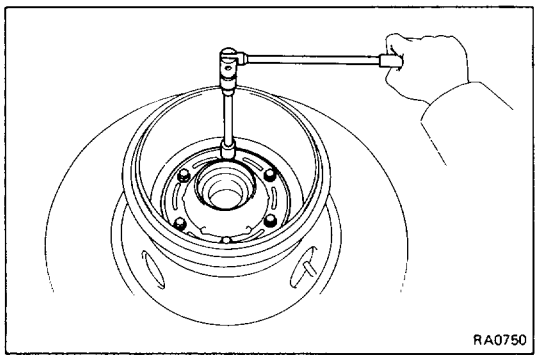
2. **REPLACE BEARING OUTER RACE**

   (a) Using a hammer and brass bar, drive out the outer race.



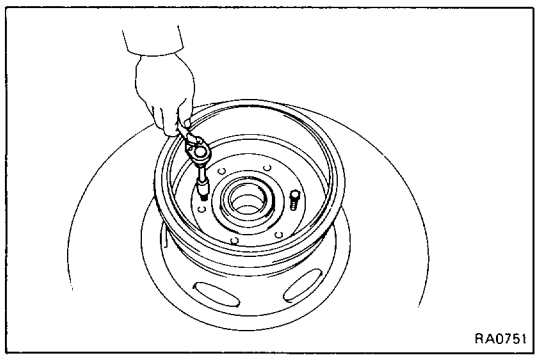
(b) Using SST, carefully tap in a new bearing outer race.

SST Inner side 09608-35014
(09608-06020, 09608-06210)
Outer side 09608-35014
(09608-06020, 09608-06200)

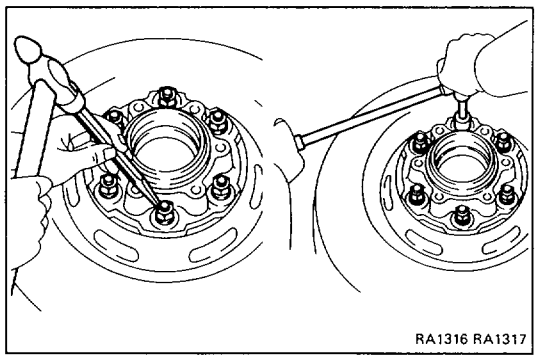


3. REPLACE HUB BOLT

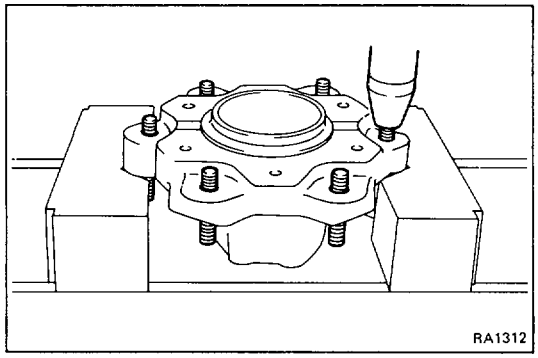
(a) Remove the six bolts and deflector.



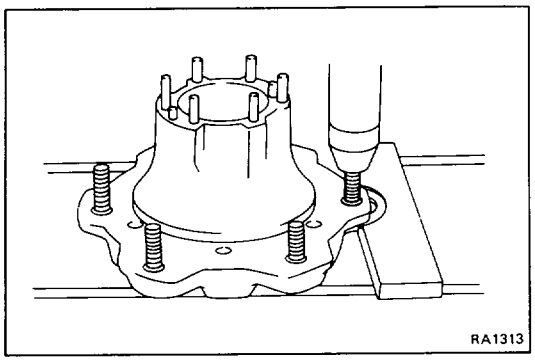
(b) Using the two service bolts, separate the hub and brake drum.



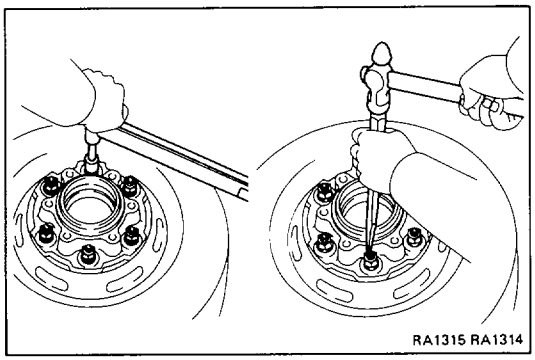
(c) Unstake the bolt and remove the nut.



(d) Using a press, press out the hub bolt.

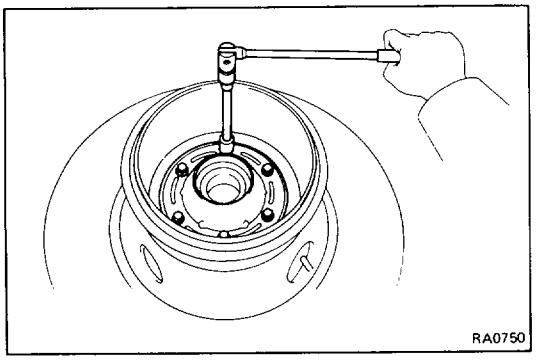


(e) Using a press, press in a new hub bolt.



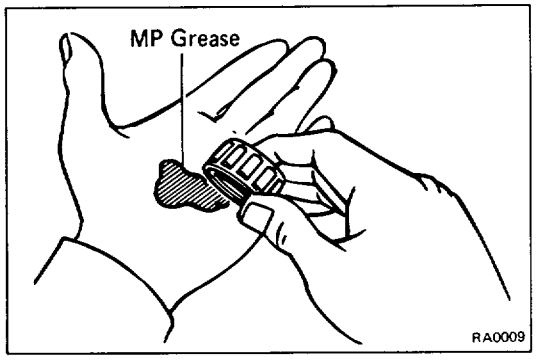
(f) Install and tighten the nut and stake the bolt.

Torque: 1,400 kg-cm (101 ft-lb, 137 N·m)



(g) Install the deflector and torque the six bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)



ASSEMBLY OF REAR AXLE HUB

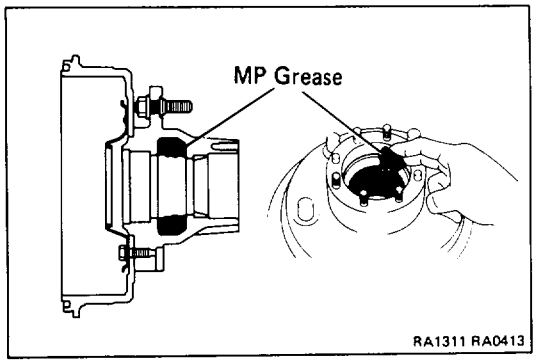
(See page RA-6)

1. PACK BEARING WITH MP GREASE

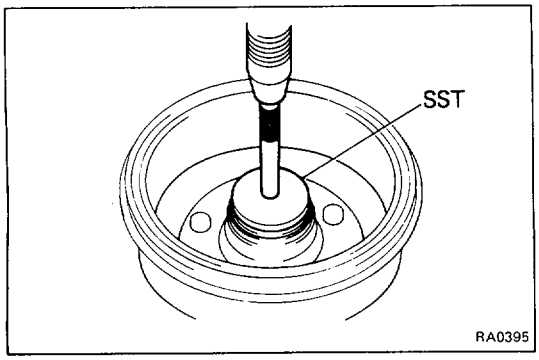
(a) Place MP grease in the palm of your hand.

(b) Pack grease into the bearing, and continuing until the grease oozes out from the other side.

(c) Do the same around the bearing circumference.



2. COAT SIDE HUB WITH MP GREASE

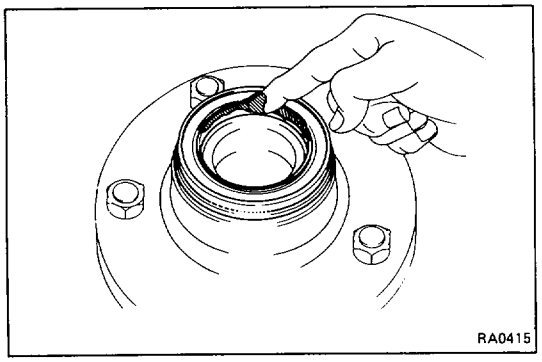


3. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the hub.

(b) Using SST, press in a new oil seal to the hub.

SST 09608-35014 (09608-06020 and 09608-06180)

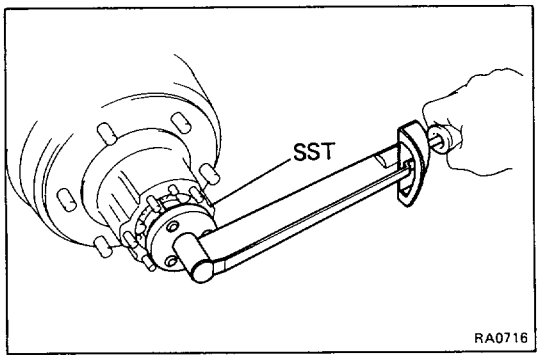


(c) Apply MP grease to the oil seal lip.

4. INSTALL AXLE HUB ON AXLE HOUSING

(a) Place the axle hub on the axle housing.

(b) Install the outer bearing into the axle hub.



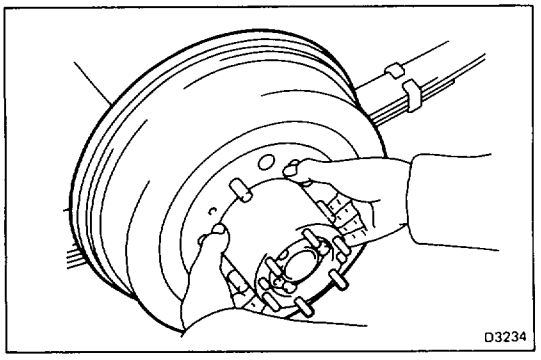
5. ADJUST PRELOAD

(a) Install the lock plate.

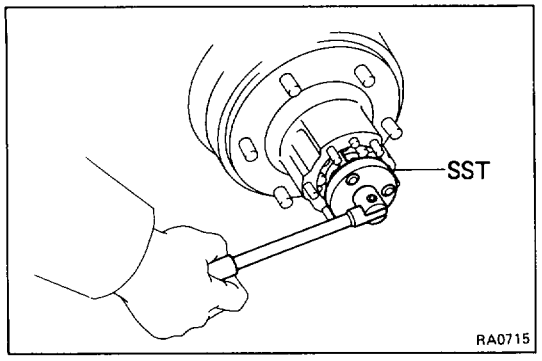
(b) Using SST, torque the bearing lock nut.

SST 09509-25011

Torque: 600 kg-cm (43 ft-lb, 59 N·m)



(c) Snug down the bearing by turning the hub several times.



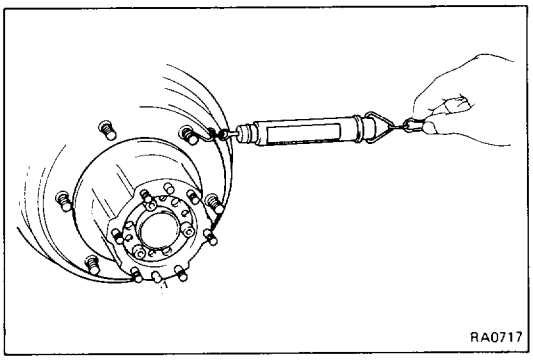
(d) Using SST, retighten the bearing lock nut.

SST 09509-25011

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

(e) Using SST, loosen the bearing lock nut until you can rotate it by hand.

SST 09509-25011

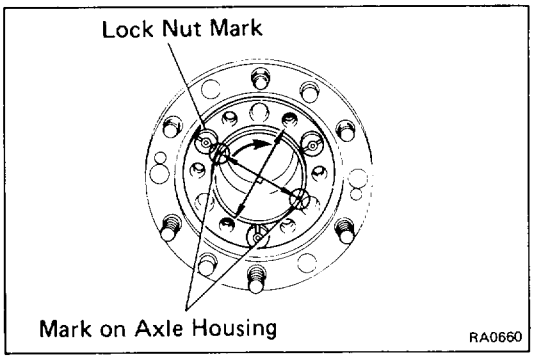


(f) Using a spring tension gauge, measure and note friction force of the oil seal. (starting)

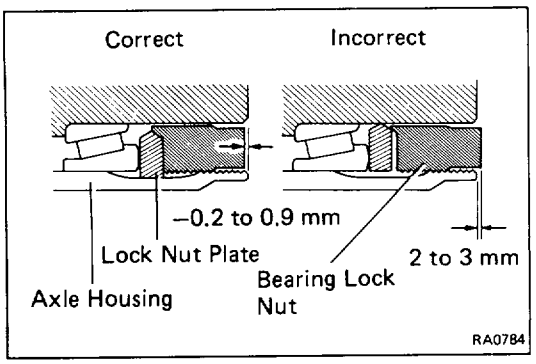
(g) Using SST, tighten the bearing lock nut until the preload is within the specification below.

SST 09509-25011

Preload (starting):
Add oil seal frictional force
0.1 — 1.5 kg (0.2 — 3.3 lb, 1.0 — 14.7 N)



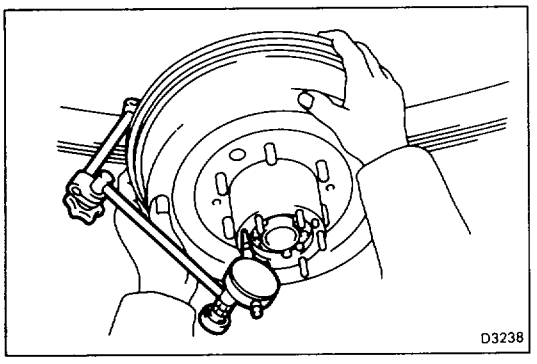
(h) Align the lock nut mark with one of the marks on the axle housing, and place lock bolts in the holes at right angles to the lock nut.



(i) Measure the distance between the top surface of axle housing and the lock nut.

Standard distance: −0.2 to 0.9 mm (−0.008 to 0.035 in.)

If not within specification, reinstall the axle hub.



(j) Check the movement of the drum.

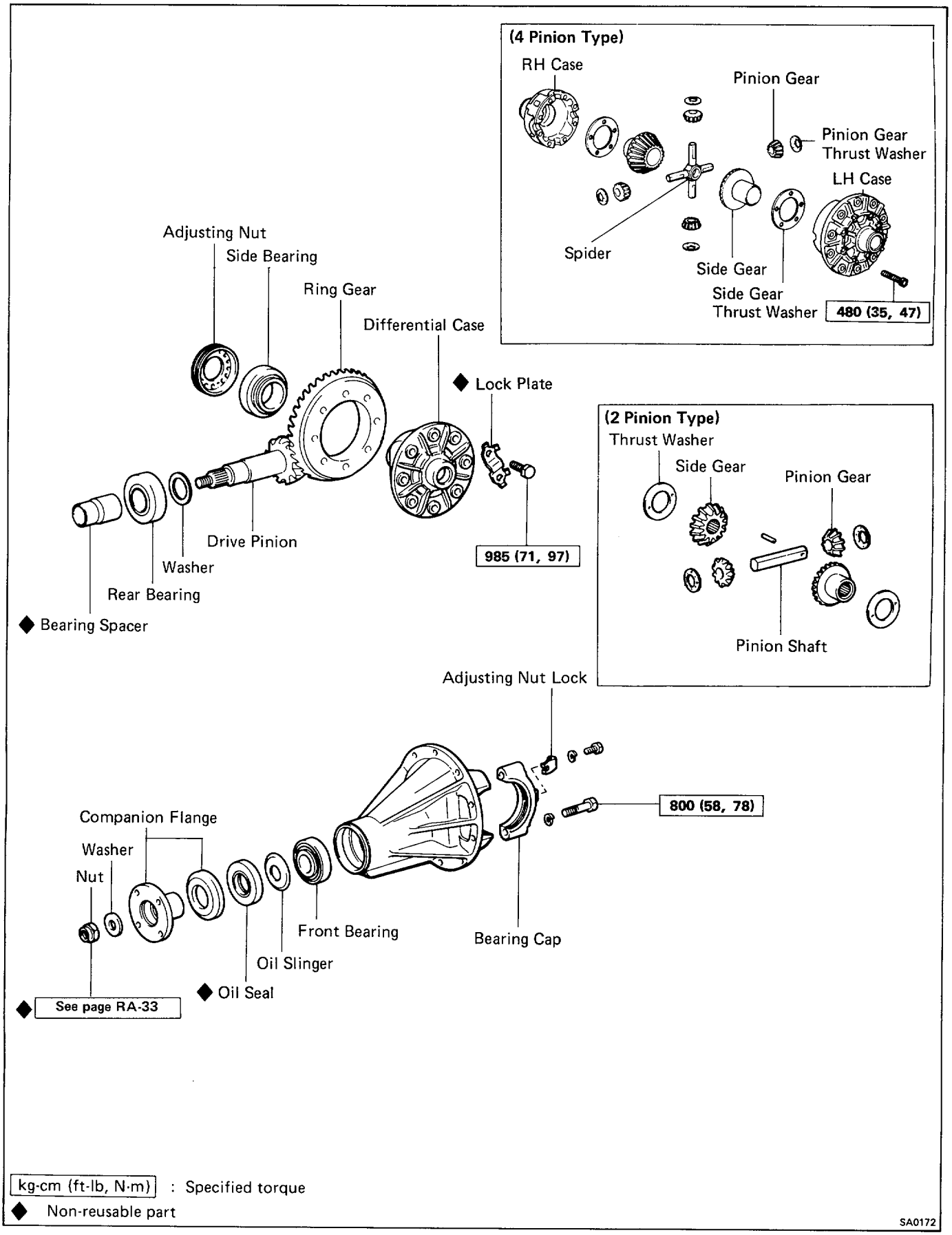
(k) Check that has no axial play.

6. INSTALL REAR AXLE SHAFT
(See page RA-7)

7. INSTALL WHEEL AND LOWER VEHICLE

DIFFERENTIAL

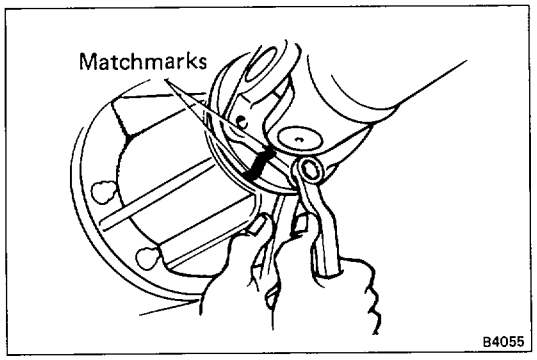
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

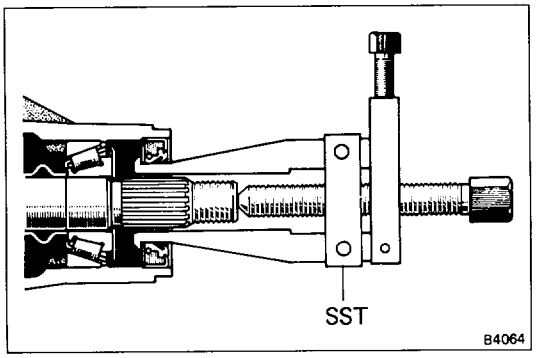
SA0172



ON-VEHICLE REPLACEMENT OF OIL SEAL

1. **DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL**
   (a) Place matchmarks on the flanges.
   (b) Remove the four bolts and nuts.

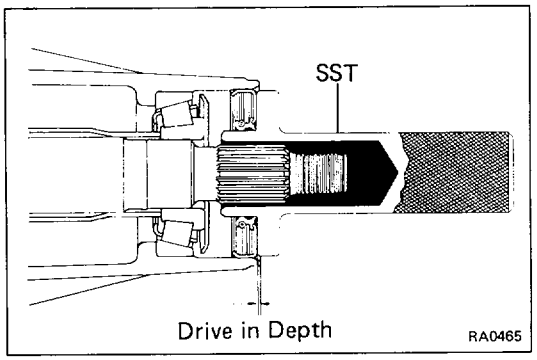
2. **REMOVE COMPANION FLANGE**
   (See step 7 on page RA-17)



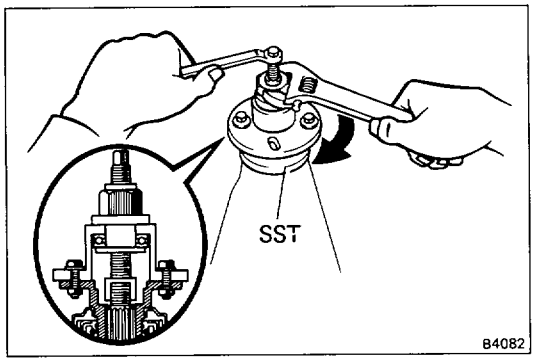
3. **REMOVE OIL SEAL AND OIL SLINGER**
   (a) Using SST, remove the oil seal from the housing.
   SST 09308-10010
   (b) Remove the oil slinger.

4. **REMOVE FRONT BEARING AND BEARING SPACER**
   (See step 9 on page RA-17)

5. **INSTALL NEW BEARING SPACER AND FRONT BEARING (See step 11 on page RA-28)**



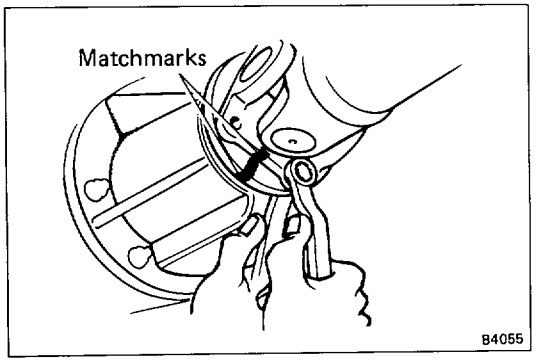
6. **INSTALL OIL SLINGER AND NEW OIL SEAL**
   (a) Install the oil slinger facing as shown.
   (b) Using SST, drive in a new oil seal as shown.
   SST 09554-30011
   Oil seal drive in depth:
   7.5 in. 1.5 mm (0.059 in.)
   8 in. 1.0 mm (0.039 in.)
   (c) Apply MP grease to the oil seal lip.



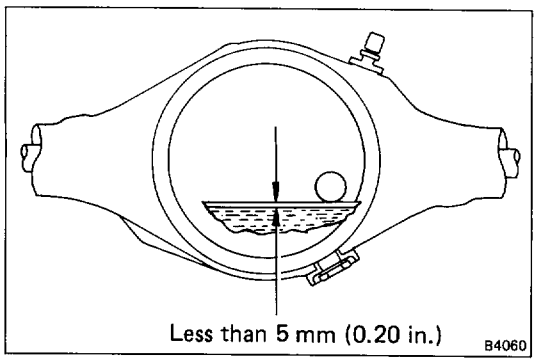
7. **INSTALL COMPANION FLANGE**
   (See step 13 on page RA-28)

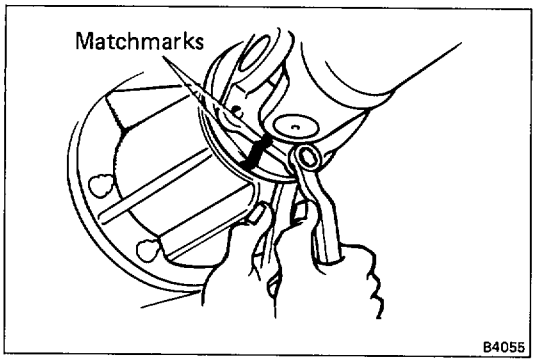
8. **ADJUST DRIVE PINION BEARING PRELOAD**
   (See step 14 on page RA-28)

9. **STAKE DRIVE PINION NUT**



10. **CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE**
    (a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
    (b) Torque the four bolts and nuts.
    Torque: 750 kg-cm (54 ft-lb, 74 N·m)





11. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoid gear oil if necessary.

Oil type: API GL-5 hypoid gear oil
Viscosity: Above −18°C (0°F) SAE 90
Below −18°C (0°F) SAE 80W or 80W-90

Capacity:
2WD
(7.5 in.) 1.35 liters (1.43 US qts, 1.19 Imp. qts)
(8 in.) 1.8 liters (1.9 US qts, 1.6 Imp. qts)
4WD
(22R, 22R-E) 2.2 liters (2.3 US qts, 1.9 Imp. qts)
(22R-TE) 2.35 liters (2.48 US qts, 2.07 Imp. qts)

REMOVAL OF DIFFERENTIAL

(See page RA-13)

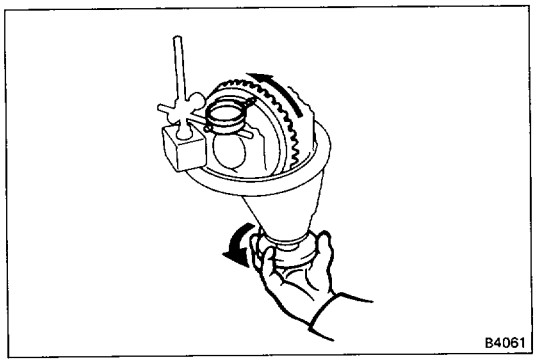
1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL
2. REMOVE REAR AXLE SHAFT (See page RA-3)
3. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL (See page RA-14)
4. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

DISASSEMBLY OF DIFFERENTIAL

(See page RA-13)

NOTE: If the differential is noisy, perform the following preinspection before disassembly to determine the cause.

If the differential has severe problems, disassemble and repair it as necessary.

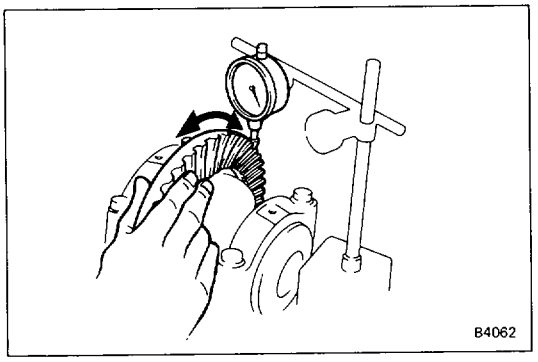


1. **CHECK RING GEAR RUNOUT**

If the runout is greater than maximum, install a new ring gear.

Maximum runout:

7.5 in. 0.07 mm (0.0028 in.)
8 in. 0.10 mm (0.0039 in.)



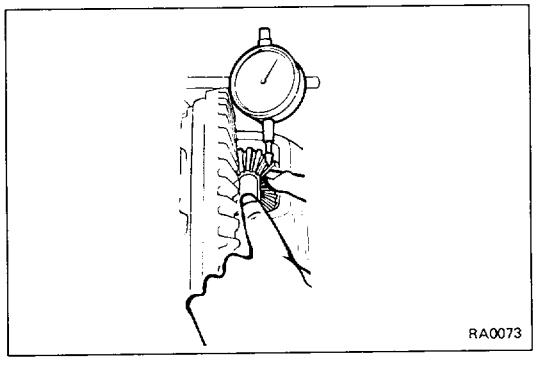
2. **CHECK RING GEAR BACKLASH**

If the backlash is not within specifications, adjust the side bearing preload or repair as necessary. (See step 7 on page RA-25)

Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

3. **INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 6 on page RA-16)**

Note the tooth contact position.



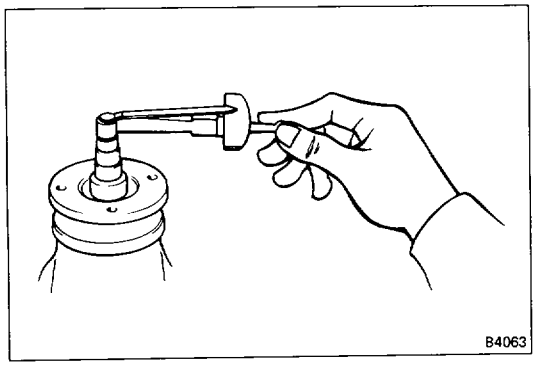
4. **(2 PINION TYPE)**
CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:

0.05 — 0.20 mm (0.0020 — 0.0079 in.)

If the backlash is not within specification, install the proper thrust washers.



5. **MEASURE DRIVE PINION PRELOAD**

Using a torque meter, measure the preload of backlash between the drive pinion and ring gear.

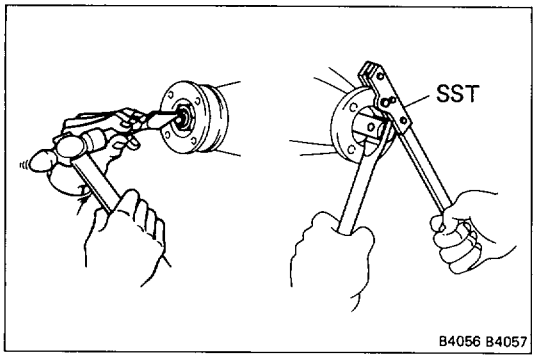
Preload (starting):

7.5 in.
6 — 10 kg-cm (5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)
8 in.
(22R, 22R-E engine)
9 — 13 kg-cm (7.8 — 11.3 in.-lb, 0.9 — 1.3 N·m)
(22R-TE engine)
5 — 8 kg-cm (4.3 — 6.9 in.-lb, 0.5 — 0.8 N·m)

6. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload (starting):
Add drive pinion preload
4 — 6 kg-cm (3.5 — 5.2 in.-lb, 0.4 — 0.6 N·m)

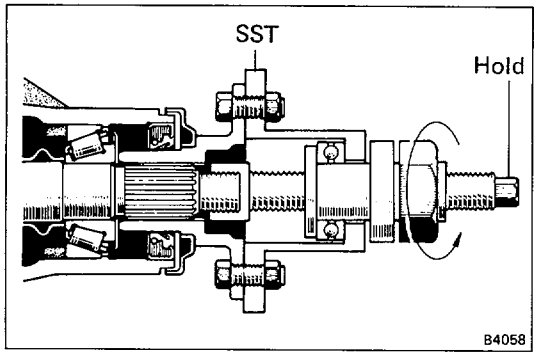


7. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

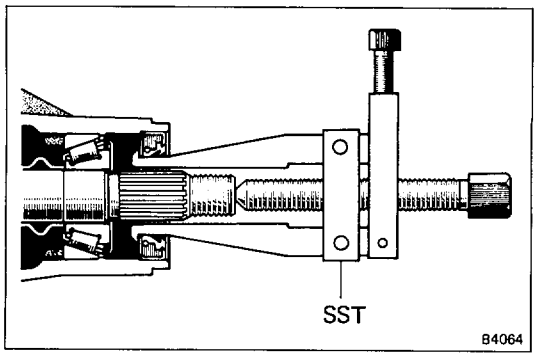
(b) Using SST to hold the flange, remove the nut.

SST 09330-00021



(c) Using SST, remove the companion flange.

SST 09557-22022

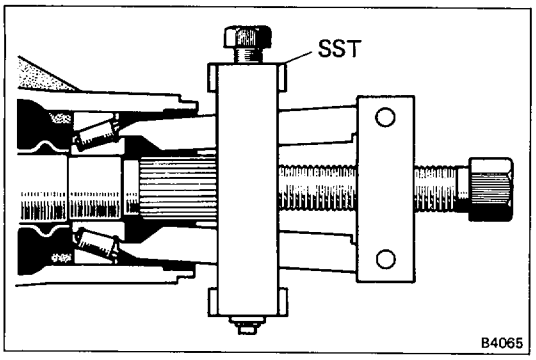


8. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.

SST 09308-10010

(b) Remove the oil slinger.



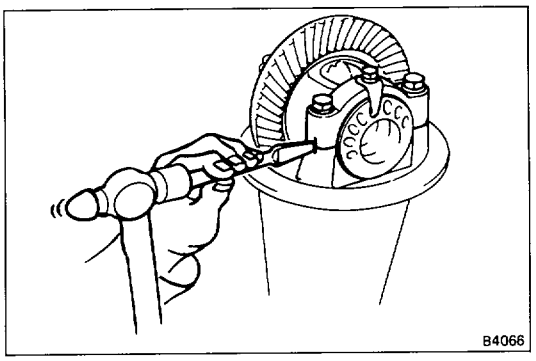
9. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the front bearing from the drive pinion.

SST 09556-30010

(b) Remove the bearing spacer.

If the front bearing is damaged or worn, replace the bearing.



10. REMOVE DIFFERENTIAL CASE AND RING GEAR

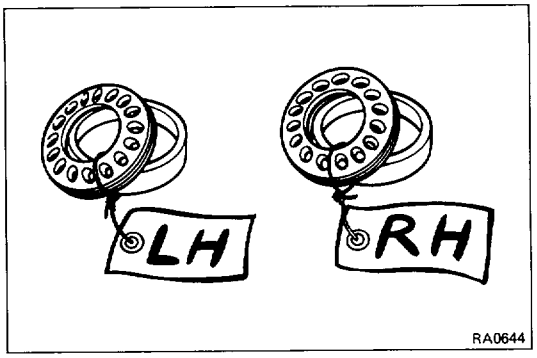
(a) Place matchmarks on the bearing cap and differential carrier.

(b) Remove the two adjusting nut locks.

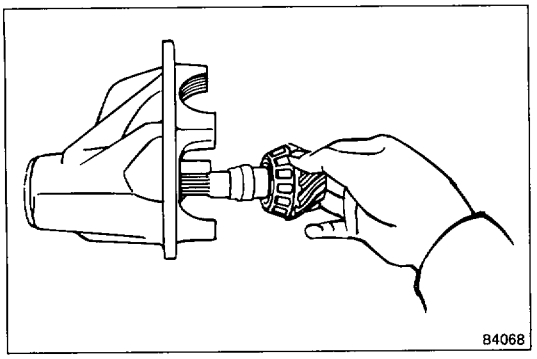
(c) Remove the two bearing caps and two adjusting nuts.

(d) Remove the bearing outer races.

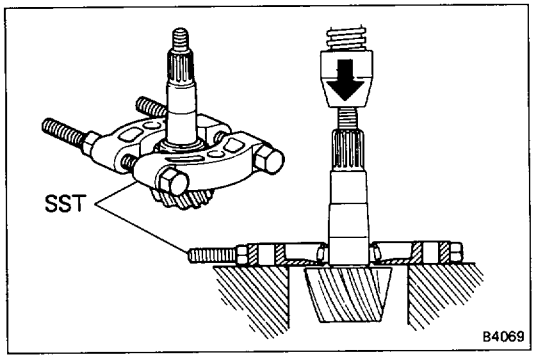
(e) Remove the differential case from the carrier.



NOTE: Tag the disassembled parts to show the location for reassembly.



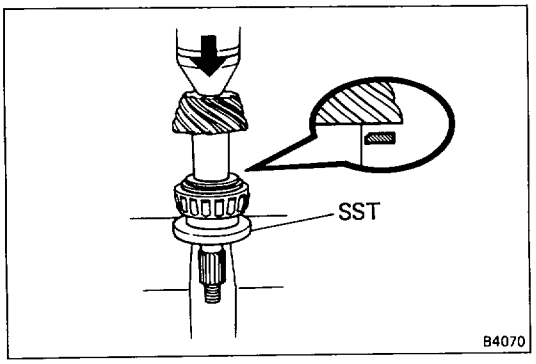
11. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER



12. REPLACE DRIVE PINION REAR BEARING

(a) Using a press and SST, pull out the rear bearing from the drive pinion.

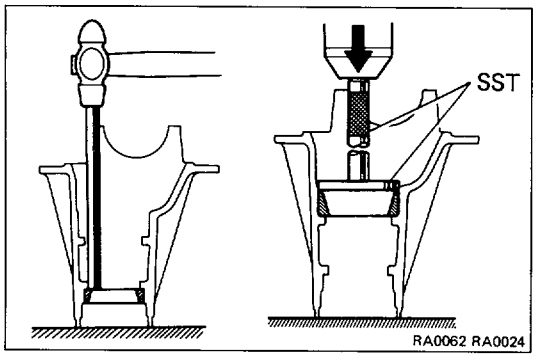
SST 09950-00020



(b) Install the washer on the drive pinion with the chamfered end facing the pinion gear.

(c) Using a press and SST, press the reused washer and new rear bearing on the drive pinion.

SST 09506-30012



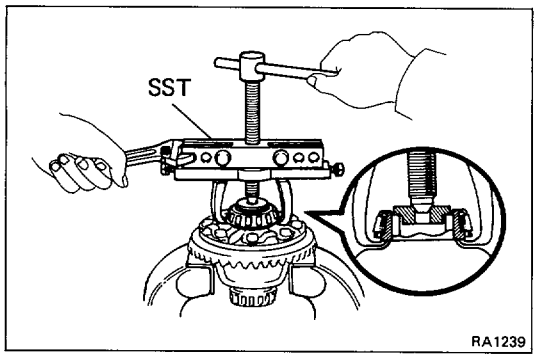
13. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a hammer and brass bar, drive out the outer race.

(b) Using a press and SST, drive in a new outer race.

SST

Front side 09608-30012 (09608-04020, 09608-04100)
Rear side 09608-30012 (09608-04020, 09608-04110)

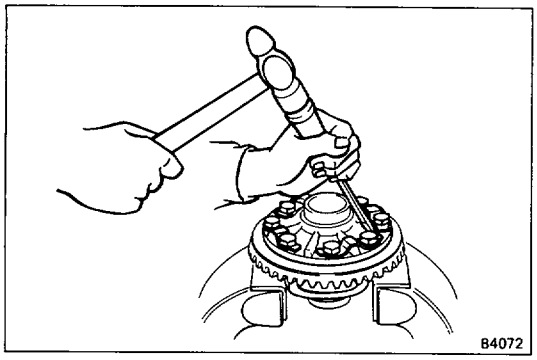


14. REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE

Using SST, pull the side bearing from the differential case.

SST 09950-20017

NOTE: Fix the claws of SST to the notches in the differential case.

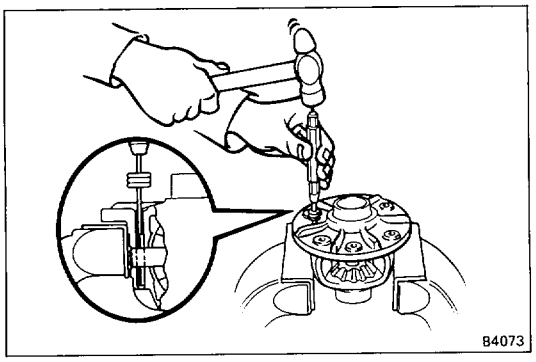


15. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

(b) Place alignment marks on the ring gear and differential case.

(c) Using plastic or copper hammer, tap on the ring gear to separate it from the differential case.

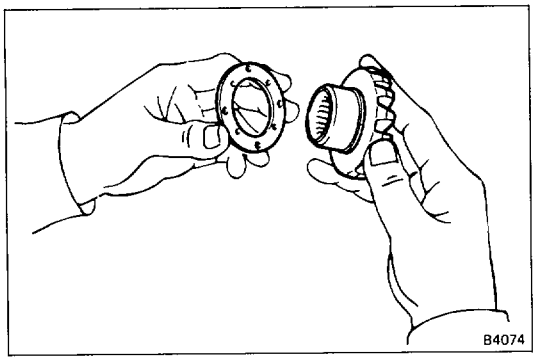


REPLACEMENT OF DIFFERENTIAL CASE COMPONENT PARTS

(2 Pinion Type)

1. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and two thrust washers.



2. ASSEMBLE DIFFERENTIAL CASE

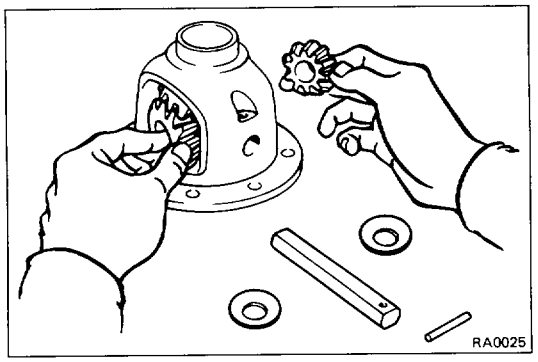
(a) Install the proper thrust washers and side gears.

Using the table below, select thrust washers which will ensure that the backlash is within specification.
Try to select washers of the same size for both sides.

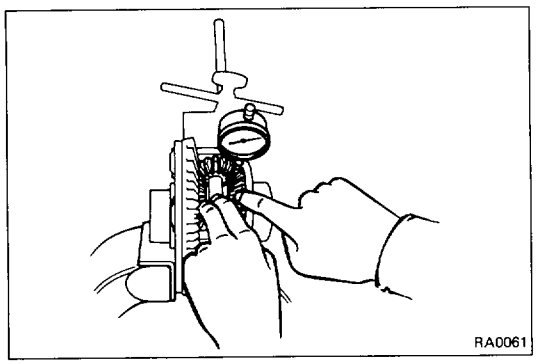
Standard backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

Thrust washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
1.0	(0.039)	1.6	(0.063)
1.1	(0.043)	1.7	(0.067)
1.2	(0.047)	1.8	(0.071)
1.3	(0.051)		



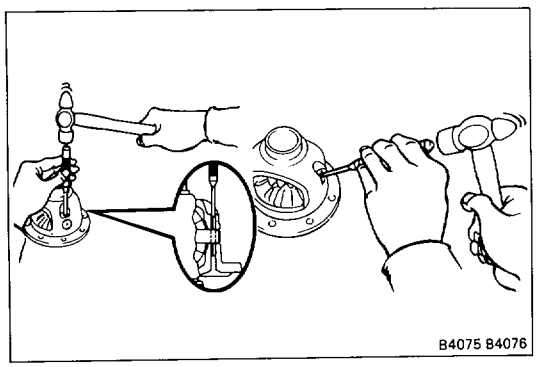
Install thrust washers and side gears in the differential case.



(b) Check the side gear backlash.
Measure the side gear backlash while holding one pinion gear toward the case.

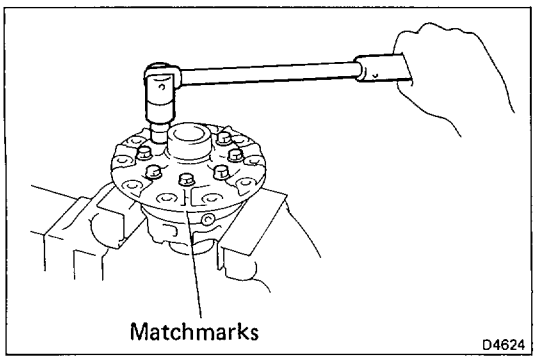
Standard backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

If the backlash is not within specification, install a thrust washer of different thickness.



(c) Install the straight pin.

- Using the hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.

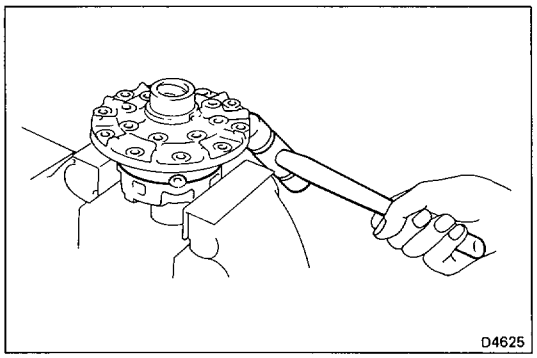


(4 Pinion Type)

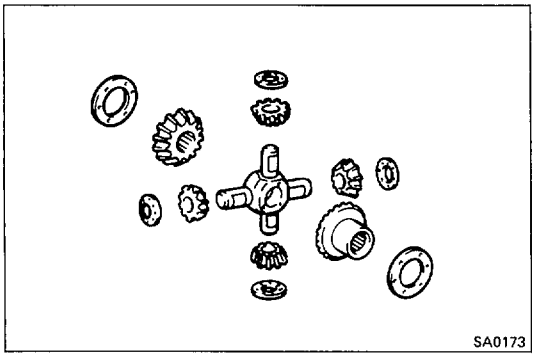
1. DISASSEMBLE DIFFERENTIAL CASE

(a) Place the matchmarks on the LH and RH cases.

(b) Remove the eight bolts.

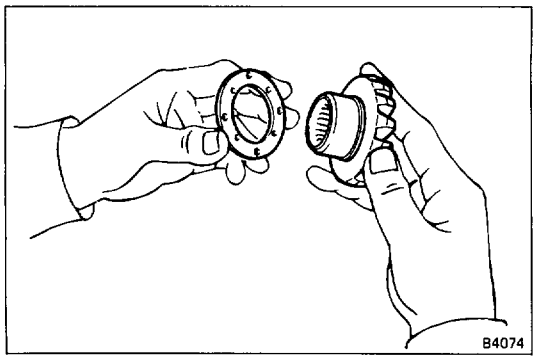


(c) Using a plastic hammer, separate the LH and RH cases.



2. REMOVE FOLLOWING PARTS FROM CASE:

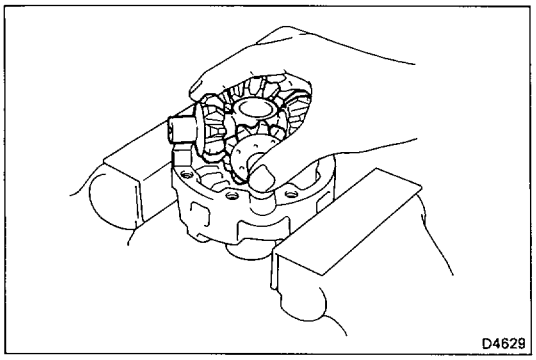
- Two side gears
- Two side gear thrust washers
- Spider
- Four pinion gears
- Four pinion gear thrust washers



3. MEASURE SIDE GEAR BACKLASH

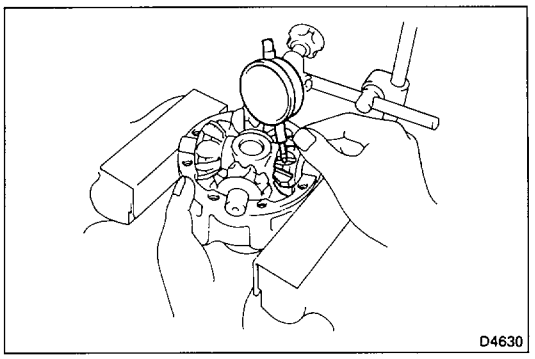
(a) Install the thrust washer to the side gear.

(b) Install the side gear to the RH case.



(c) Install the four pinion gears and thrust washers to the spider.

(d) Install the pinion gear and spider to the RH case.



(e) Hold the side gear, measure the side gear backlash.

Backlash: 0.05 — 0.20 mm (0.0020 — 0.0079 in.)

NOTE: Measure the backlash at the RH case at the LH case.

(f) If the backlash is not within specification, install a thrust washer of a different thickness.

NOTE: Use washer of the same thickness on both the right and left sides.

Thickness	mm (in.)		
0.9	(0.035)	1.2	(0.047)
1.0	(0.039)	1.3	(0.051)
1.1	(0.043)		

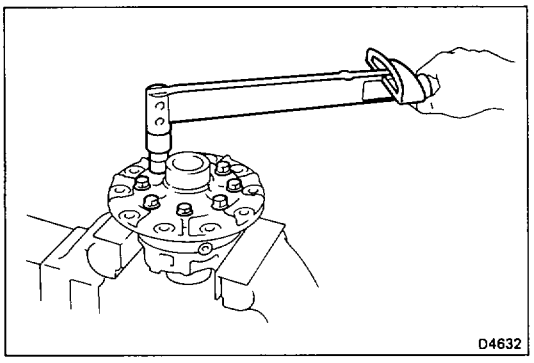
4. ASSEMBLE DIFFERENTIAL CASE

(a) Install the side gear and thrust washer to the RH case.

(b) Install the pinion gears and spider to the RH case.

(c) Install the side gear and thrust washer to the LH case.

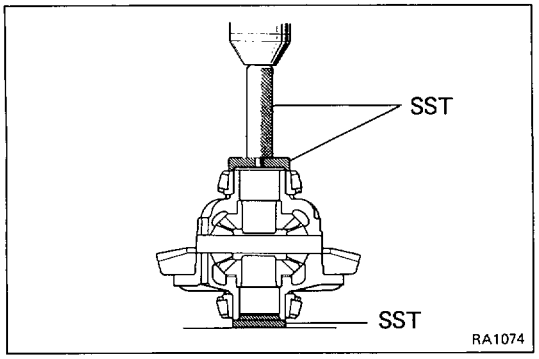
(d) Apply gear oil to the each parts.



(e) Align the matchmarks on the LH and RH case.

(f) Torque the eight bolts.

Torque: 480 kg-cm (35 ft-lb, 47 N·m)



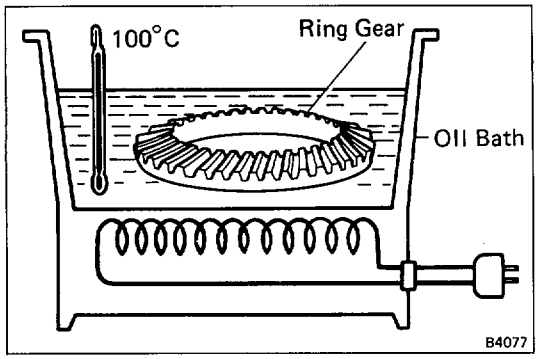
ASSEMBLY OF DIFFERENTIAL

(See page RA-13)

1. INSTALL SIDE BEARINGS

Using a press and SST, press the side bearings on the differential case.

SST 09608-30012
(09608-04020, 09608-04060, 09608-00060)



2. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case.

(b) Heat the ring gear to about 100°C (212°F) in an oil bath.

CAUTION: Do not heat the ring gear above 110°C (230°F).

(c) Clean the contact surface of the ring gear with cleaning solvent.

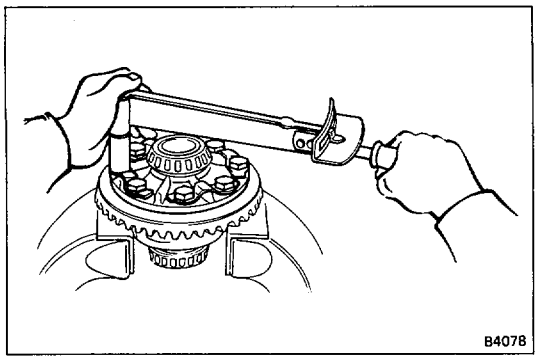
(d) Then quickly install the ring gear on the differential case.

(e) Align the marks on the ring gear and differential case.

(f) Coat the ring gear set bolts with gear oil.

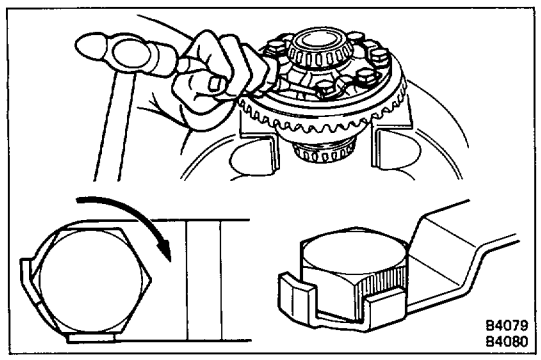
(g) Install the lock plates and set bolts. Tighten the set bolts uniformly and a little at a time. Torque the bolts.

Torque: 985 kg-cm (71 ft-lb, 97 N·m)



(h) Using a hammer and drift punch, stake the lock plates.

NOTE: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.

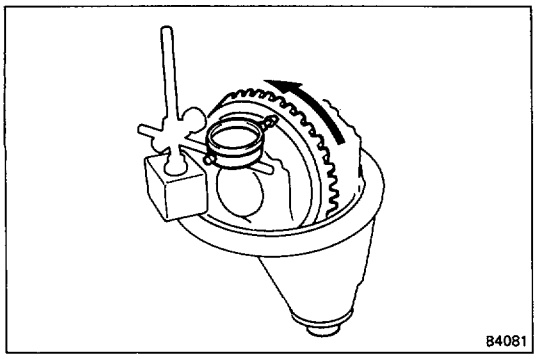


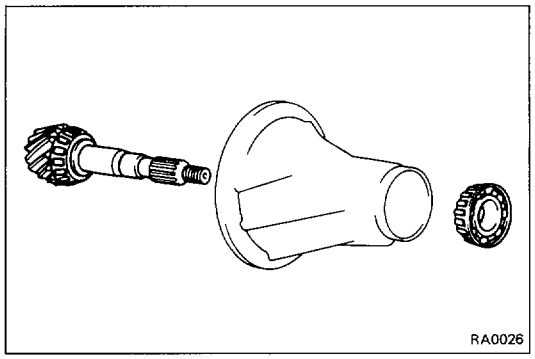
(i) Check the ring gear runout.

Maximum runout:

7.5 in.	**0.07 mm (0.0028 in.)**
8 in.	**0.10 mm (0.0039 in.)**

Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearing.



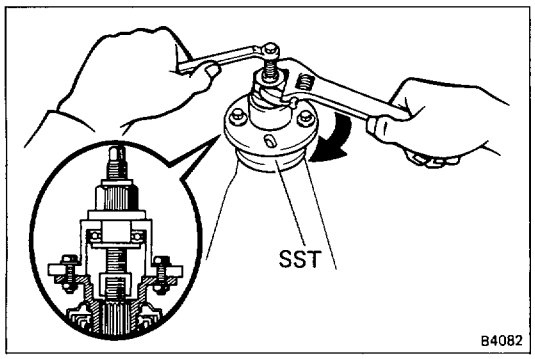


3. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the following parts.

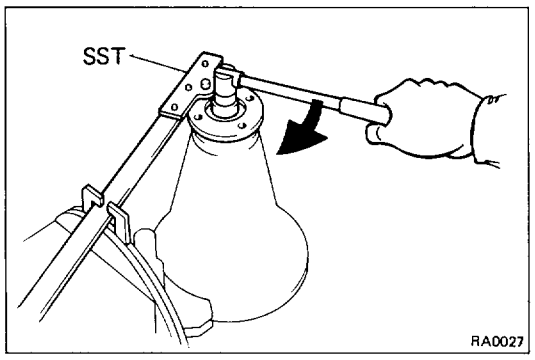
- Drive pinion
- Front bearing

NOTE: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.

SST 09557-22022

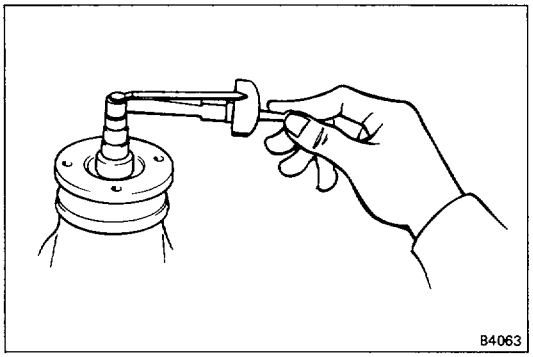


(c) Adjust the drive pinion preload by tightening the companion flange nut.

Using SST to hold the flange, tighten the nut.

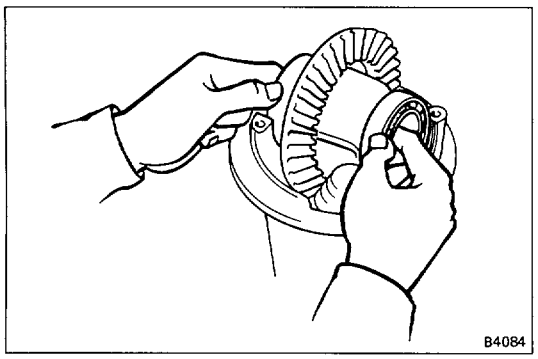
SST 09330-00021

CAUTION: As there is no spacer, tighten a little at a time, being careful not to overtighten.



(d) Using a torque meter, measure the preload.

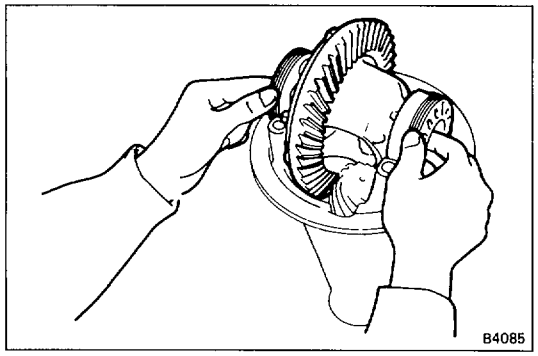
Preload (starting):
New bearing
7.5 in.
12 — 19 kg-cm (10.4 — 16.5 in.-lb, 1.2 — 1.9 N·m)
8 in.
(22R, 22R-E engine)
19 — 26 kg-cm (16.5 — 22.6 in.-lb, 1.9 — 2.5 N·m)
(22R-TE engine)
10 — 16 kg-cm (8.7 — 13.9 in.-lb, 1.0 — 1.6 N·m)
Reused bearing
7.5 in.
6 — 10 kg-cm (5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)
8 in.
(22R, 22R-E engine)
9 — 13 kg-cm (7.8 — 11.3 in.-lb, 0.9 — 1.3 N·m)
(22R-TE engine)
5 — 8 kg-cm (4.3 — 6.9 in.-lb, 0.5 — 0.8 N·m)



4. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

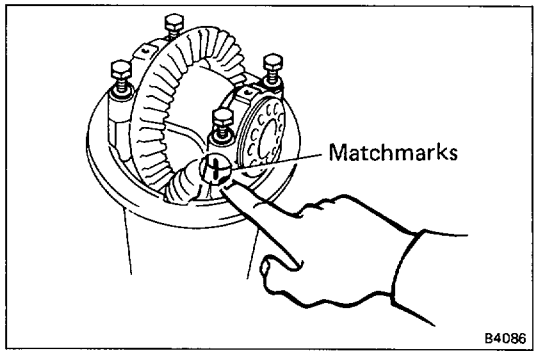
(b) Install the case in the carrier.



5. INSTALL ADJUSTING NUTS

Install the adjusting nuts on their respective carrier, making sure the nuts are threaded properly.

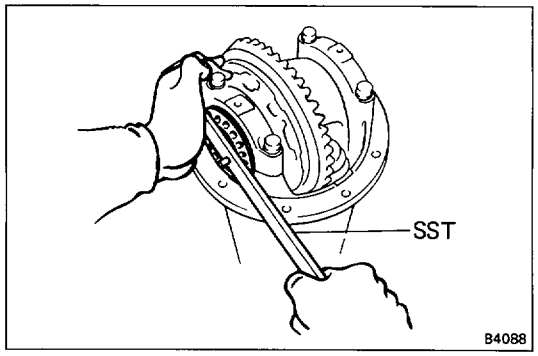
NOTE: Make sure that there is backlash between the ring gear and drive pinion.



6. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

NOTE: If the bearing cap does not fit tightly on the carrier, the adjusting nuts is not threaded properly. Reinstall the adjusting nuts if necessary.

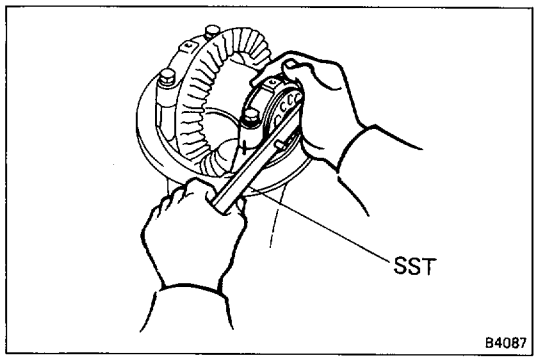


7. ADJUST SIDE BEARING PRELOAD

(a) Tighten the bearing cap bolts until the spring washers are slightly compressed.

(b) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.).

SST 09504-00011

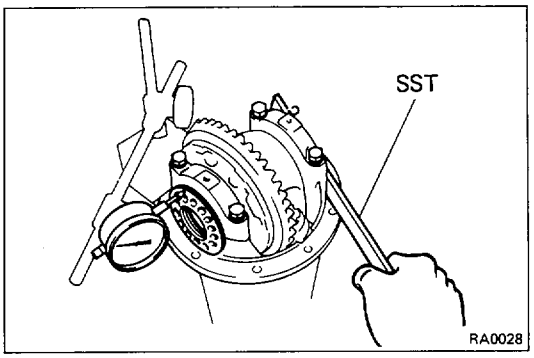


(c) Using SST, firmly tighten the adjusting nut on the drive pinion side.

SST 09504-00011

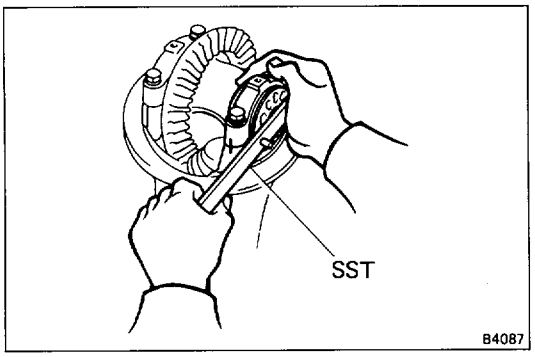
(d) Check the ring gear backlash.

If tightening the adjusting nut creates ring gear backlash, loosen the nut so that backlash is eliminated.

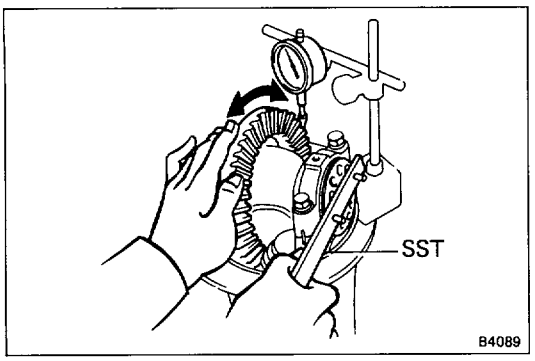


(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.

(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



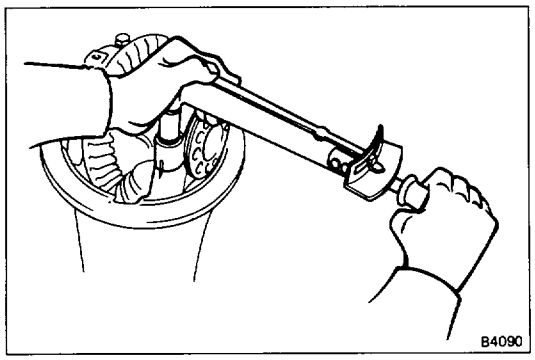
(g) Tighten the adjusting nut 1 — 1 1/2 notches from the zero preload position.



(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.

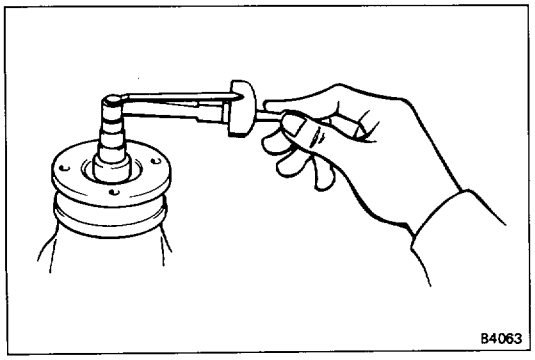
Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

NOTE: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.



(i) Torque the bearing cap bolts.

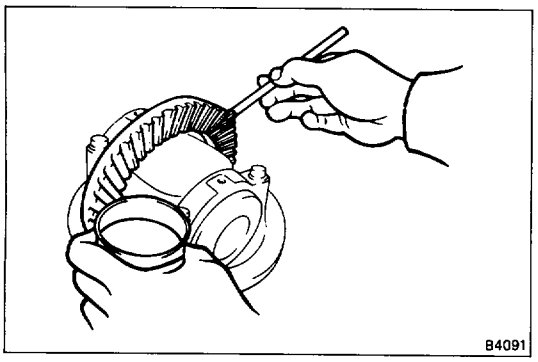
Torque: 800 kg-cm (58 ft-lb, 78 N·m)



(j) Recheck the ring gear backlash.

(k) Using a torque meter, measure the total preload.

Total preload (starting):
Add drive pinion preload
4 — 6 kg-cm (3.5 — 5.2 in.-lb, 0.4 — 0.6 N·m)
Backlash: 0.13 — 0.18 mm (0.0051 — 0.0071 in.)

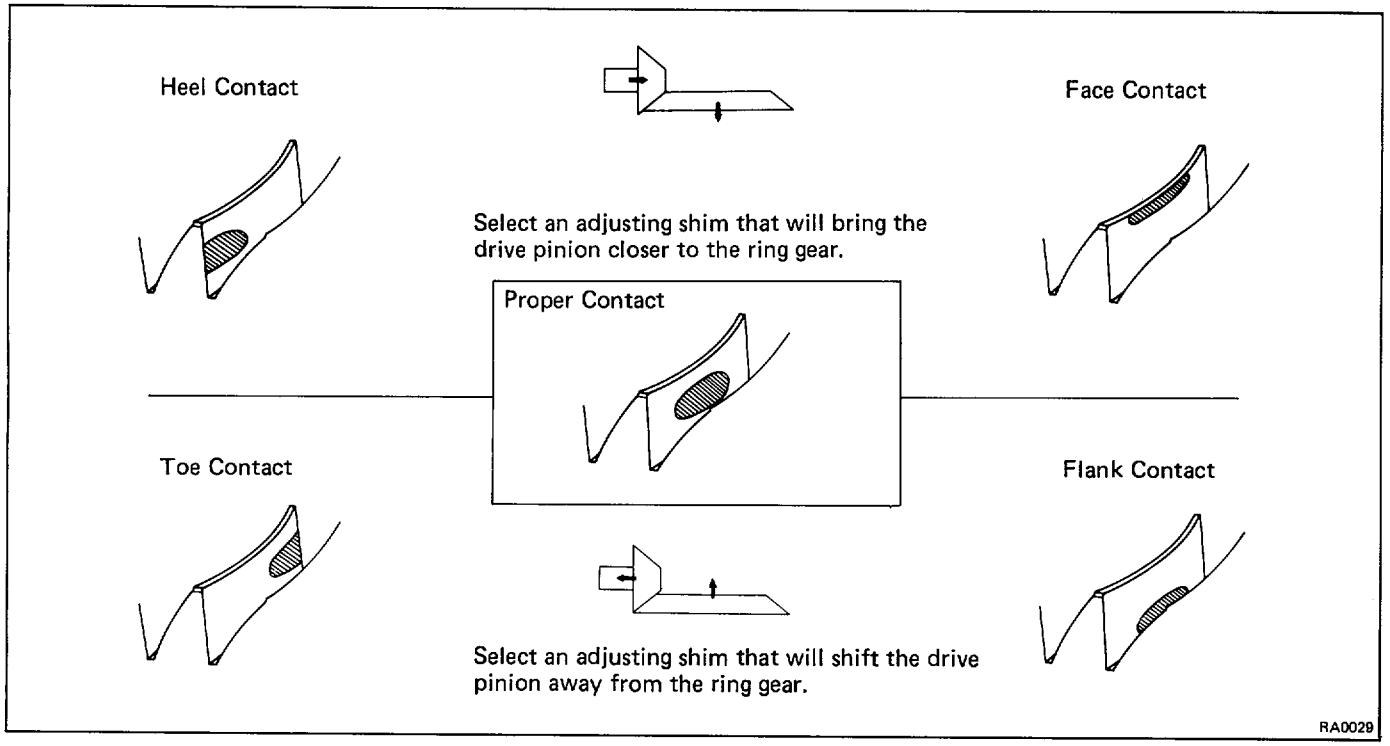


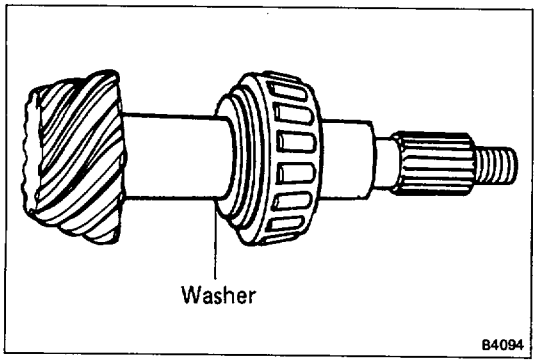
8. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

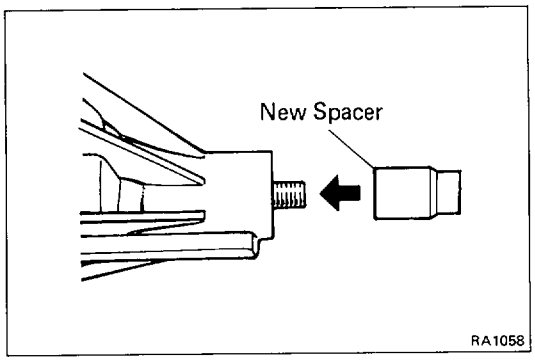




If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

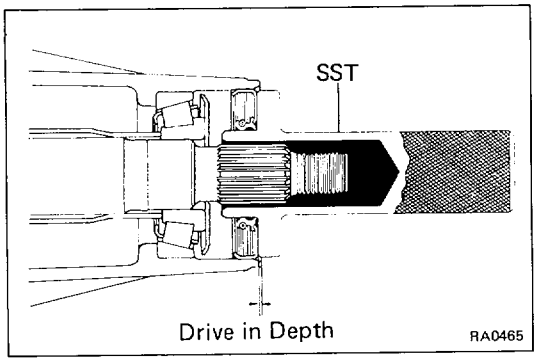
7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
2.24	(0.0882)	1.70	(0.0669)
2.27	(0.0894)	1.73	(0.0681)
2.30	(0.0906)	1.76	(0.0693)
2.33	(0.0917)	1.79	(0.0705)
2.36	(0.0929)	1.82	(0.0717)
2.39	(0.0941)	1.85	(0.0728)
2.42	(0.0953)	1.88	(0.0740)
2.45	(0.0965)	1.91	(0.0752)
2.48	(0.0976)	1.94	(0.0764)
2.51	(0.0988)	1.97	(0.0776)
2.54	(0.1000)	2.00	(0.0787)
2.57	(0.1012)	2.03	(0.0799)
2.60	(0.1024)	2.06	(0.0811)
2.63	(0.1035)	2.09	(0.0823)
2.66	(0.1047)	2.12	(0.0835)
2.69	(0.1059)	2.15	(0.0846)
2.72	(0.1071)	2.18	(0.0858)
		2.21	(0.0870)
		2.24	(0.0882)
		2.27	(0.0894)
		2.30	(0.0906)
		2.33	(0.0917)



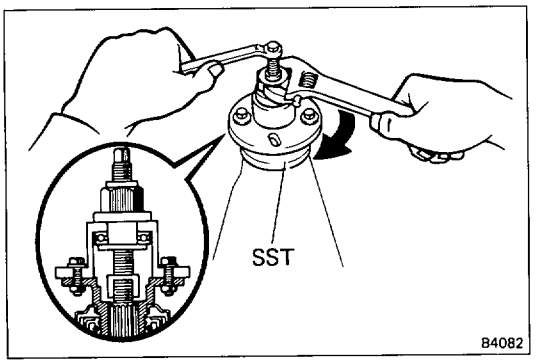
9. REMOVE COMPANION FLANGE
(See step 7 on page RA-17)

10. REMOVE FRONT BEARING
(See step 9 on page RA-17)

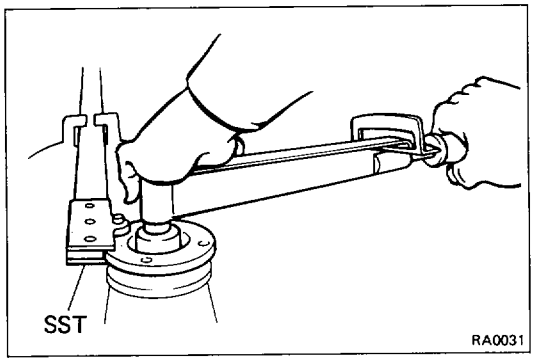
11. INSTALL NEW BEARING SPACER AND FRONT BEARING
(a) Install a new bearing spacer on the shaft.
(b) Install the front bearing on the shaft.



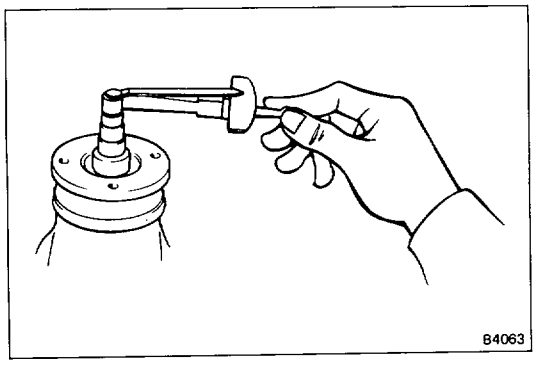
12. INSTALL OIL SLINGER AND NEW OIL SEAL
(a) Install the oil slinger facing as shown.
(b) Using SST, drive in a new oil seal as shown.
SST 09554-30011
Oil seal drive in depth:
7.5 in. 1.5 mm (0.059 in.)
8 in. 1.0 mm (0.039 in.)
(c) Apply MP grease to the oil seal lip.



13. INSTALL COMPANION FLANGE
(a) Install the companion flange with SST.
SST 09557-22022



(b) Coat the threads of a new nut with MP grease.
(c) Using SST to hold the flange, tighten the nut.
SST 09330-00021
Torque:
7.5 in.
1,100 – 2,400 kg-cm
(80 – 173 ft-lb, 108 – 235 N·m)
8 in.
2,000 – 3,500 kg-cm
(145 – 253 ft-lb, 196 – 343 N·m)



14. ADJUST DRIVE PINION PRELOAD
Using a torque meter, measure the preload of the backlash between the drive pinion and ring gear.

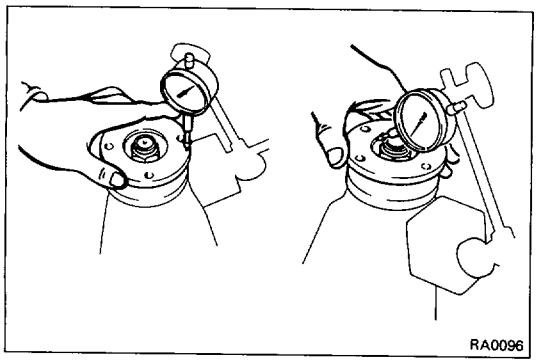
Preload (starting):
New bearing
7.5 in.
12 — 19 kg-cm (10.4 — 16.5 in.-lb, 1.2 — 1.9 N·m)
8 in.
(22R, 22R-E engine)
19 — 26 kg-cm (16.5 — 22.6 in.-lb, 1.9 — 2.5 N·m)
(22R-TE engine)
10 — 16 kg-cm (8.7 — 13.9 in.-lb, 1.0 — 1.6 N·m)
Reused bearing
7.5 in.
6 — 10 kg-cm (5.2 — 8.7 in.-lb, 0.6 — 1.0 N·m)
8 in.
(22R, 22R-E engine)
9 — 13 kg-cm (7.8 — 11.3 in.-lb, 0.9 — 1.3 N·m)
(22R-TE engine)
5 — 8 kg-cm (4.3 — 6.9 in.-lb, 0.5 — 0.8 N·m)

(a) If preload is greater than specification, replace the bearing spacer.

(b) If preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) a little at a time until the specified preload is reached.

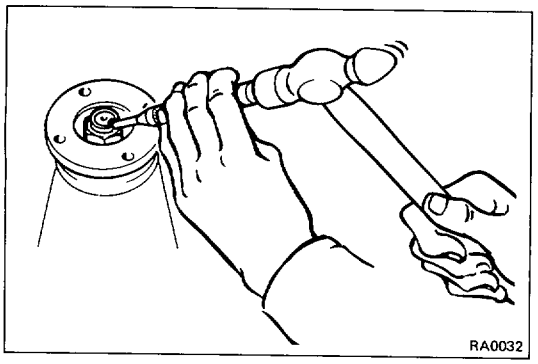
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

Maximum torque:
7.5 in.
2,400 kg-cm (174 ft-lb, 235 N·m)
8 in.
3,500 kg-cm (253 ft-lb, 343 N·m)

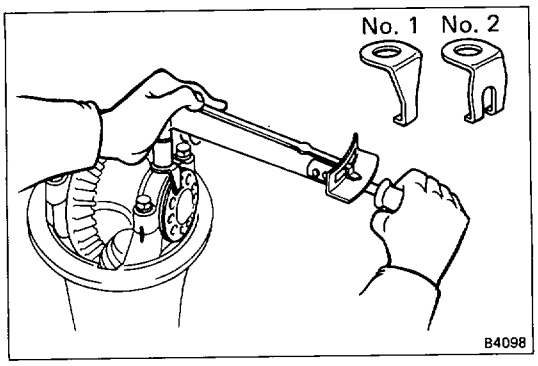


15. CHECK DEVIATION OF COMPANION FLANGE

Maximum longitudinal deviation:
0.10 mm (0.0039 in.)
Maximum latitudinal deviation:
0.10 mm (0.0039 in.)



16. STAKE DRIVE PINION NUT



17. **INSTALL ADJUSTING NUT LOCKS**

(a) Select either a lock No.1 or No.2, whichever will fit the adjusting nuts.

(b) Install the lock on the bearing caps.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

INSTALLATION OF DIFFERENTIAL

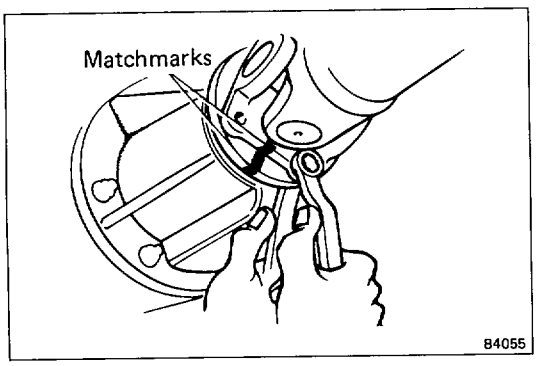
(See page RA-13)

1. **INSTALL A NEW GASKET**

2. **INSTALL DIFFERENTIAL CARRIER ASSEMBLY**

Install the differential carrier assembly in the axle and install the 10 nuts. Torque the nuts.

Torque: Single tire 250 kg-cm (18 ft-lb, 25 N·m)
Double tire 315 kg-cm (23 ft-lb, 31 N·m)

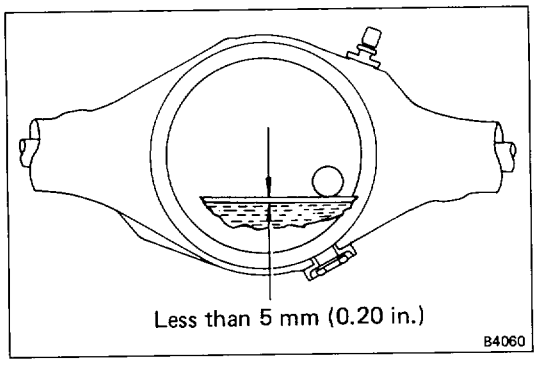


3. **CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE**

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 750 kg-cm (54 ft-lb, 74 N·m)



4. **INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL**

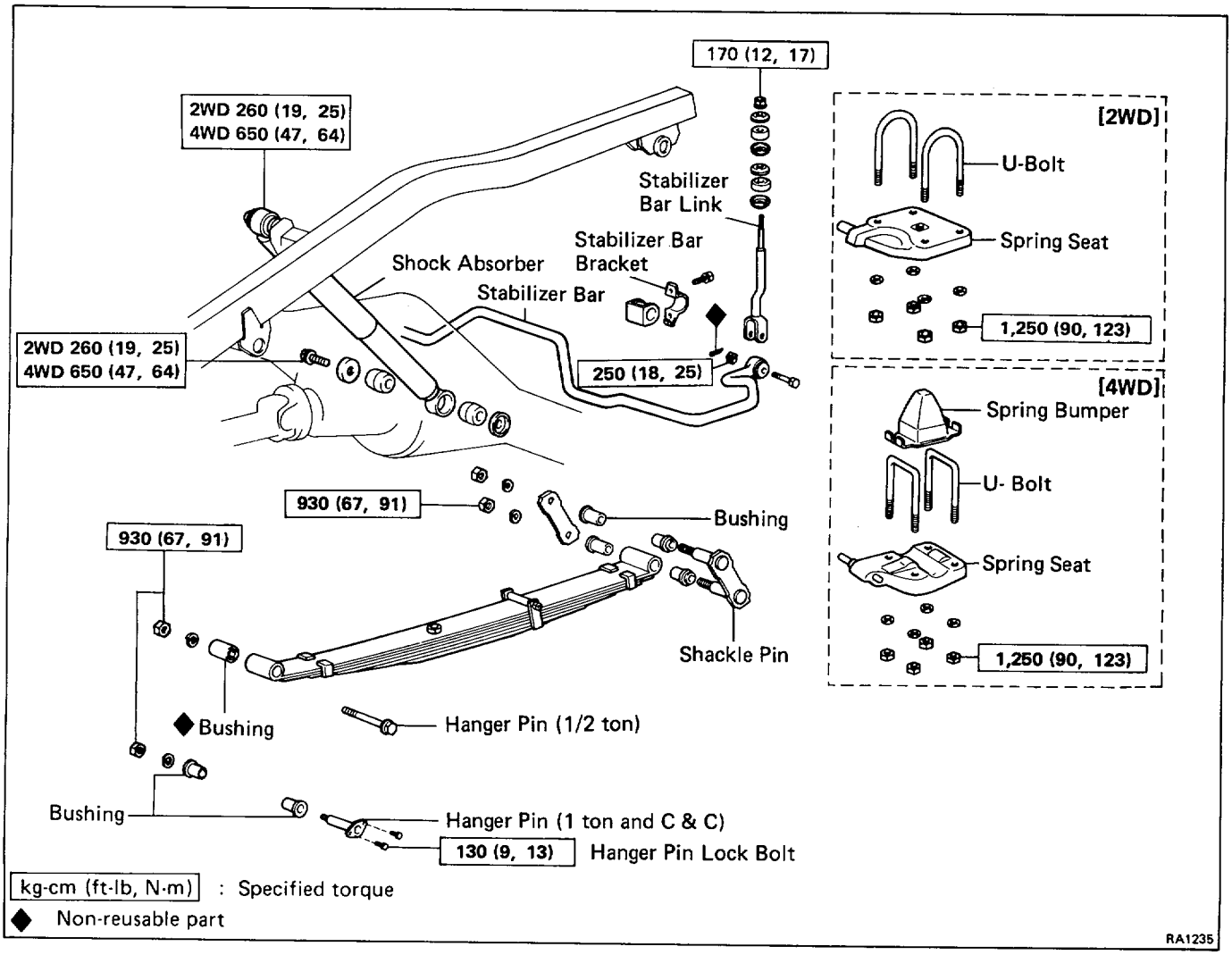
Oil type: API GL-5 hypoid gear oil
Viscosity: Above −18°C (0°F) SAE90
Below −18°C (0°F) SAE 80W or 80W-90

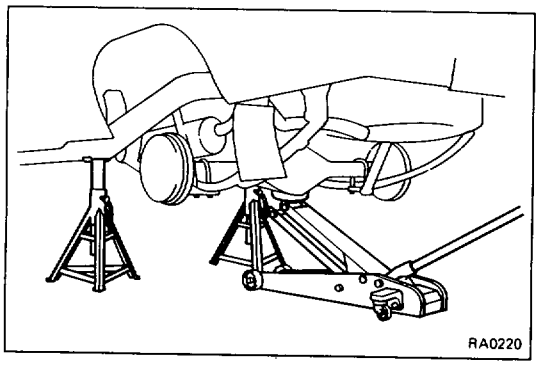
Capacity:
2WD
(7.5 in.) 1.35 liters (1.4 US qts, 1.2 Imp.qts)
(8 in.) 1.8 liters (1.9 US qts, 1.6 Imp.qts)
4WD
(22R, 22R-E) 2.2 liters (2.3 US qts, 1.9 Imp.qts)
(22R-TE) 2.35 liters (2.5 US qts, 2.1 Imp.qts)

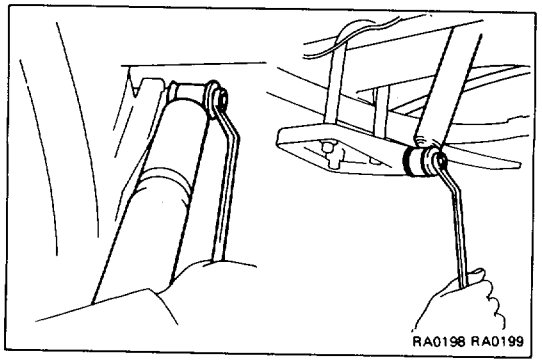
Torque the filler plug.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

REAR SUSPENSION







Leaf Spring and Shock Absorber

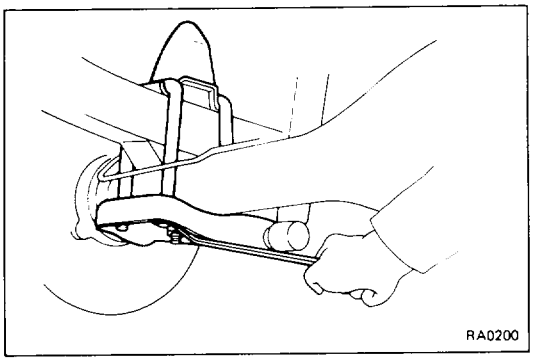
REMOVAL OF LEAF SPRING AND SHOCK ABSORBER

1. JACK UP AND SUPPORT BODY

(a) Jack up and support the body on the stands.

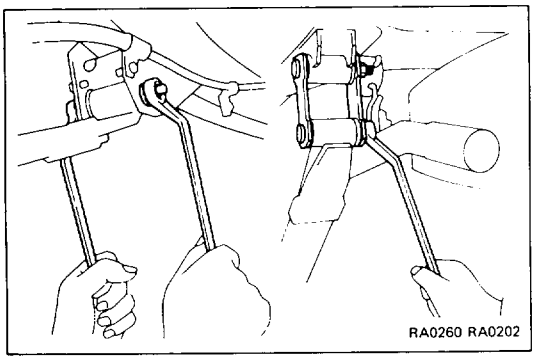
(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.

2. REMOVE SHOCK ABSORBER



3. REMOVE U-BOLTS

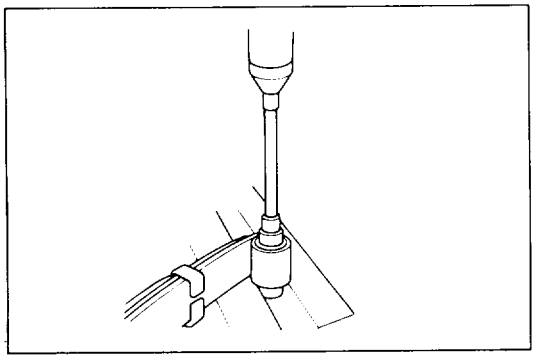
(a) Remove the U-bolt mounting nuts.
(b) Remove the spring lower seat and pad.
(c) Remove the U-bolt.
(d) Remove the spring bumper. (4WD only)



4. REMOVE LEAF SPRING

(a) Remove the hanger pin bolt.
(b) Remove the hanger pin lock bolt. (1 ton and C&C)
(c) Disconnect the leaf from the bracket.
(d) Remove the shackle pin mounting nuts.
(e) Remove the shackle pin and plate and remove the leaf spring.

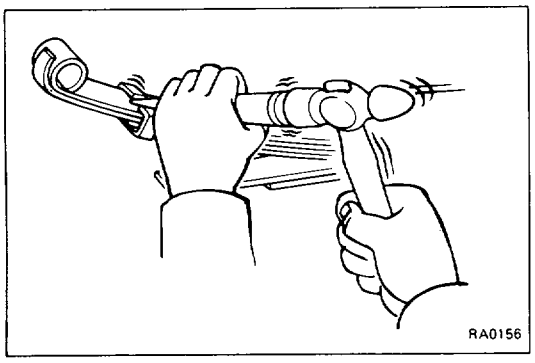
REPLACEMENT OF EYE BUSHING



REPLACE EYE BUSHINGS WITH PRESS (1/2 ton)

Using a press and socket wrench, replace the eye bushings.

REPLACEMENT OF LEAF SPRING

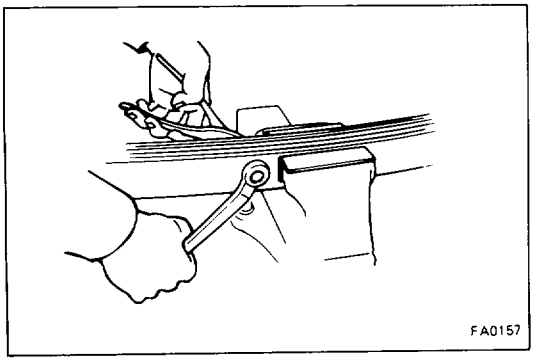


1. BEND OPEN SPRING CLIP

Using a chisel, pry up the spring clip.

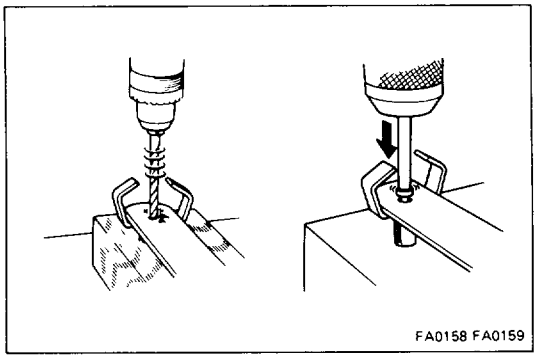
2. REMOVE CLIP BOLT (4WD only)

Remove the clip bolt and collar from the clip.



3. REMOVE CENTER BOLT

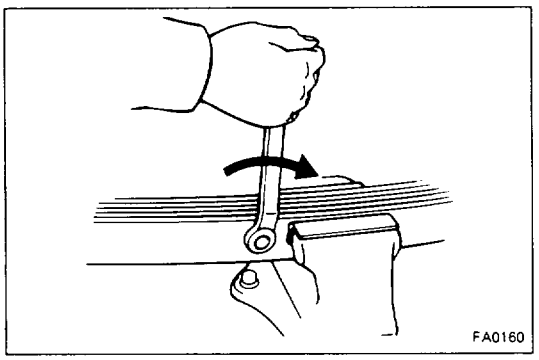
Hold the spring near the center bolt in a vise and remove the center bolt.



4. IF NECESSARY, REPLACE SPRING CLIP

(a) Drill off the head of the rivet, and drive it out.

(b) Install a new rivet into the holes of the spring leaf and clip. Then rivet with a press.



5. INSTALL SPRING CENTER BOLT

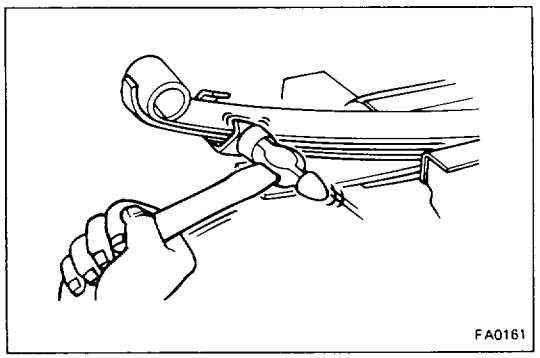
(a) Align the leaf holes and secure the leaves with a vise.

(b) Install and tighten the spring center bolt.

Torque: 450 kg-cm (33 ft-lb, 44 N·m)

6. INSTALL CLIP BOLT (4WD only)

Position the collar and install the clip bolt.
Torque the bolt.

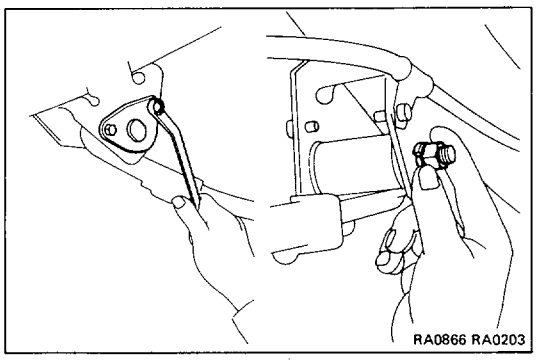


7. BEND SPRING CLIP

Using a hammer, bend the spring clip into position.

INSTALLATION OF LEAF SPRING

(See page RA-31)



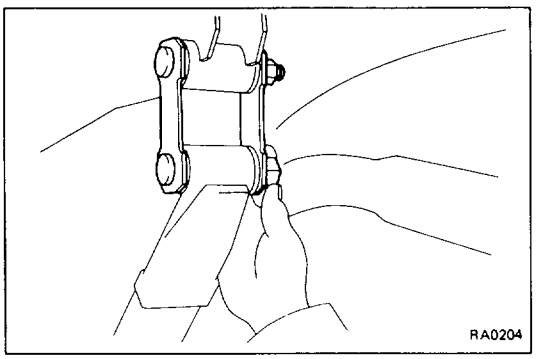
1. INSTALL LEAF SPRING

(a) Place the front end of leaf spring in the front bracket and install the hanger pin bolt.

(b) Install and tighten the hanger pin lock bolt.
(1 ton and C&C)

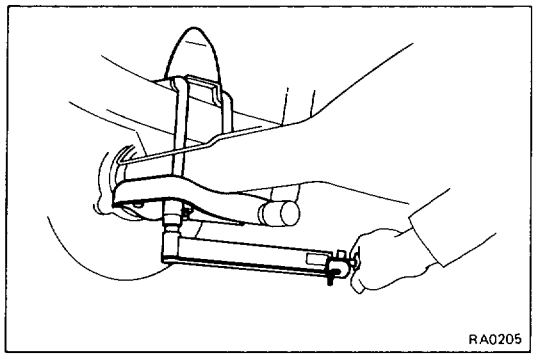
Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(c) Finger tighten the hanger pin nut.



(d) Place the rear end of leaf spring in the rear bracket, and install the shackle pin.

(e) Install the plate and finger tighten the nuts.


RA0205

2. INSTALL U-BOLTS

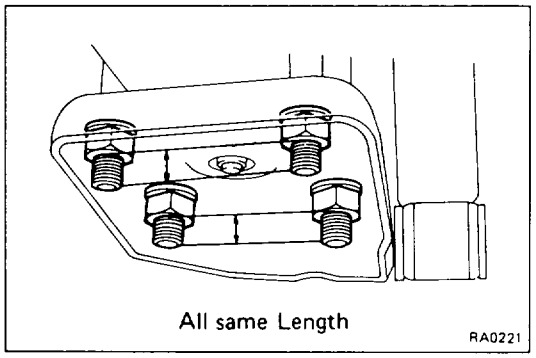
(a) Install the spring bumper onto the leaf spring. (4WD only)

(b) Install the U-bolts onto the axle housing or leaf spring.

(c) Install the spring seat and nuts under the leaf spring or axle housing.

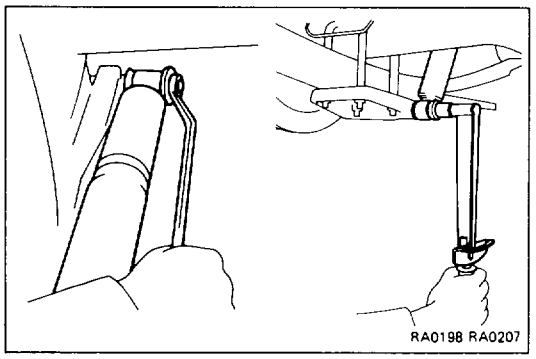
(d) Tighten the U-bolt mounting nuts.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)



RA0221

NOTE: Tighten the U-bolts so that the length of all the U-bolts under the spring seat are the same.


RA0198 RA0207

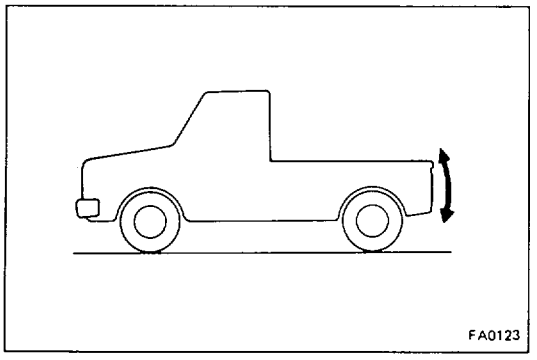
3. INSTALL REAR SHOCK ABSORBER

(a) Connect the shock absorber to the frame with the bolt. Tighten the bolt.

Torque: 2WD 260 kg-cm (19 ft-lb, 25 N·m)
4WD 650 kg-cm (47 ft-lb, 64 N·m)

(b) Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.

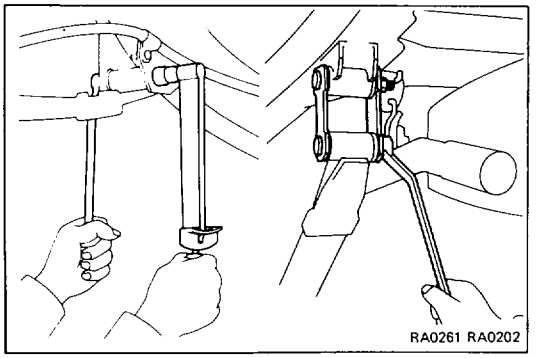
Torque: 2WD 260 kg-cm (19 ft-lb, 25 N·m)
4WD 650 kg-cm (47 ft-lb, 64 N·m)


FA0123

4. STABILIZE SUSPENSION

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.


RA0261 RA0202

5. TIGHTEN HANGER PIN AND SHACKLE PIN

Tighten the hanger pin nut.

Torque: 930 kg-cm (67 ft-lb, 91 N·m)

Tighten the shackle pin nuts.

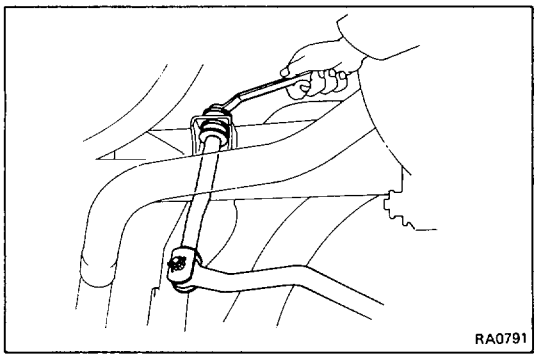
Torque: 930 kg-cm (67 ft-lb, 91 N·m)

Stabilizer Bar

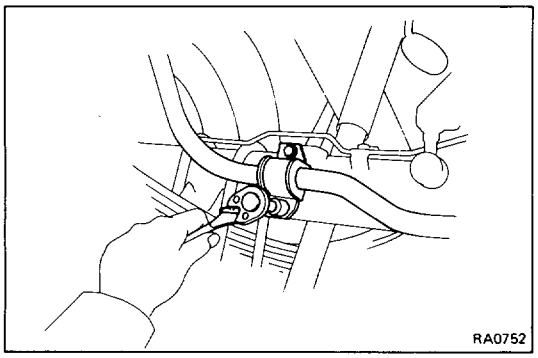
(See page RA-31)

REMOVAL OF STABILIZER BAR

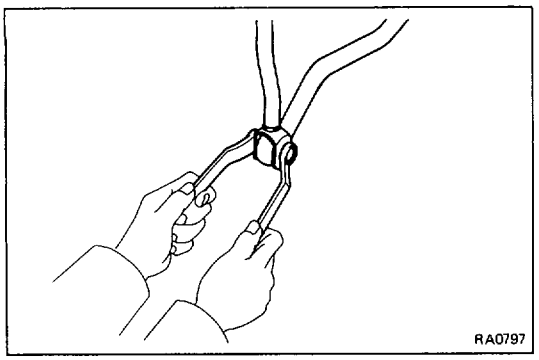
1. JACK UP AND SUPPORT VEHICLE



2. DISCONNECT STABILIZER BAR LINK FROM BODY
   (a) Disconnect the stabilizer bar link from the body.
   (b) Remove the retainers and cushion from the link.



3. REMOVE STABILIZER BAR
   (a) Remove the stabilizer bar bracket with cushion from the rear axle housing.
   (b) Remove the stabilizer bar.



4. REMOVE STABILIZER BAR LINK
   (a) Remove the retainers and cushion from the link.
   (b) Remove the cotter pin.
   (c) Remove the bolt and nut.
   (d) Remove the stabilizer bar link from the stabilizer bar.

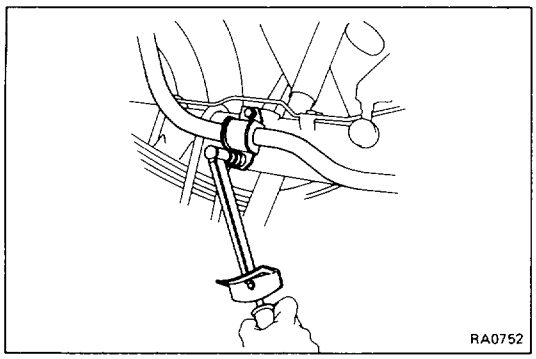
INSTALLATION OF STABILIZER BAR

(See page RA-31)

1. INSTALL STABILIZER BAR LINK
   (a) Install the retainers and cushion to the link.
   (b) Connect the link to the stabilizer bar and torque the bolt and nut.

   Torque: 250 kg-cm (18 ft-lb, 25 N·m)

   (c) Install a new cotter pin.

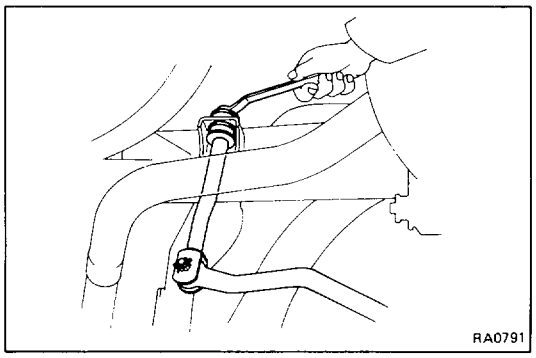


2. INSTALL STABILIZER BAR

(a) Place the stabilizer bar to the rear axle housing.

(b) Install the cushion and bracket.

Torque: 115 kg-cm (8 ft-lb, 11 N·m)



3. CONNECT STABILIZER BAR LINK

(a) Position the link to the body.

(b) Install the retainers and cushion to the link.

(c) Torque the nut.

Torque: 170 kg-cm (12 ft-lb, 17 N·m)

4. LOWER VEHICLE

BRAKE SYSTEM

	Page
PRECAUTIONS	BR-2
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BRAKE BOOSTER	BR-11
FRONT BRAKE	BR-13
2WD	BR-13
4WD	BR-29
REAR BRAKE	BR-36
2WD	BR-36
4WD	BR-50
LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)	BR-59
BRAKE HOSES AND TUBES	BR-66

PRECAUTIONS

1. **Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.**

2. **It is very important to keep parts and area clean when repairing the brake system.**

TROUBLESHOOTING

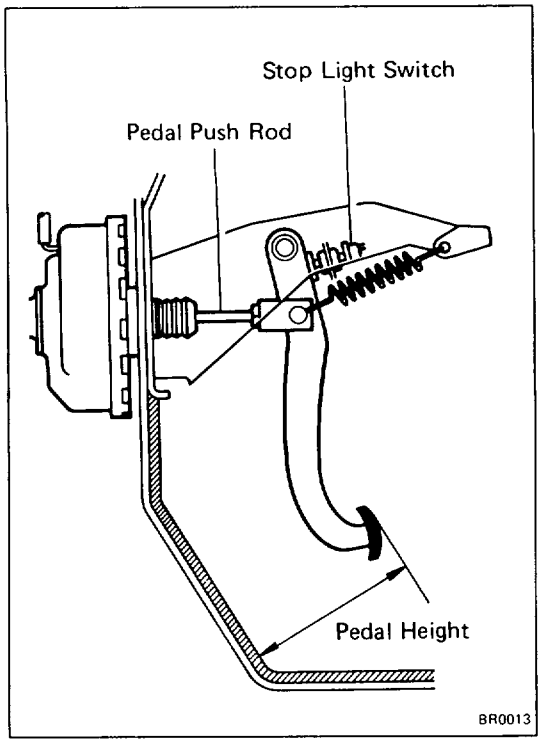
Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake linings	BR-36,44,50
	Brake pads worn	Replace pads	BR-13,29
	Leak in brake system	Repair leak	
	Master cylinder faulty	Repair or replace master cylinder	BR-8
	Air in brake system	Bleed brake system	BR-6
	Wheel cylinder faulty	Repair wheel cylinder	BR-36,44,50
	Brake cylinder faulty	Repair cylinder	BR-13,21,29
	Piston seals worn or damaged	Repair brake cylinder	BR-13,21,29
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR-7
	Binding parking brake wire	Repair as necessary	
	Booster push rod out of adjustment	Adjust push rod	BR-12
	Return spring faulty	Replace spring	
	Brake line restricted	Repair as necessary	
	Lining or pads cracked or distorted	Replace brake linings or pads	BR-13,36
	Wheel cylinder or caliper piston sticking	Repair as necessary	BR-13,36
	Master cylinder faulty	Repair or replace master cylinder	BR-8
Brakes pull	Incorrect front wheel alignment	Adjust front wheel alignment	FA-3
	Unmatched tires on same axle	Correct	
	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on linings	Check for cause. Replace linings	BR-13,36
	Brake shoes or pads distorted	Replace brake shoes	BR-13,36
	Linings worn or glazed	Replace linings	BR-13,36
	Drum or disc out of round	Replace drums	BR-13,36
	Return spring faulty	Replace spring	
	Wheel cylinder faulty	Repair wheel cylinder	BR-36,44,50
	Piston frozen in brake cylinder	Repair cylinder	BR-13,21,29
	Brake pad sticking	Replace pads	BR-13,21,29
Brakes grab/chatter	Drum or disc out of round	Replace drums	BR-13,36
	Scored brake discs	Replace discs	BR-13,21,29
	Scored brake drums	Replace drums	BR-36,44,50
	Brake shoes or pads distorted	Replace brake shoes or pads	BR-13,36
	Linings worn or glazed	Replace linings	BR-13,36
	Oil or grease on linings	Check for cause. Replace linings	BR-13,36
	Wheel cylinder faulty	Repair wheel cylinder	BR-36,44,50
	Brake booster faulty	Repair booster	BR-11

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Hard pedal but brakes inefficient	Oil or grease on linings	Check for cause. Replace linings	BR-13,36
	Brake shoes or pads distorted	Replace brake shoes or pads	BR-13,36
	Linings worn or glazed	Replace linings	BR-13,36
	Brake booster faulty	Repair booster	BR-11
	Brake line restricted	Repair as necessary	
	Piston frozen in brake cylinder	Repair cylinder	BR-13,21,29
Snapping or clicking noise when brakes are applied	(Drum brake)		
	Brake shoes binding at backing plate ledges	Lubricate	BR-36,44,50
	Backing plate ledges worn	Replace and lubricate ledges	BR-36,44,50
	Loose or missing shoe hold-down spring	Replace shoe hold-down spring	BR-36,44,50
	Loose set bolt at backing plate	Tighten	BR-36,44,50
	(Disk brake)		
	Loose or missing pad support plate	Replace pad support plate	BR-13,21,29
	Loose installation bolt	Tighten	BR-13,21,29
	Wear on slide bushing	Replace slide bushing	BR-13,21,29
Scraping or grinding noise when brakes are applied	Worn brake lining or pads	Replace refinish drums if heavily scored	BR-13,36
	Caliper to wheel or rotor interference	Replace as required	
	Dust cover to drum interference	Correct or replace	
	Other brake system components:	Inspect or repair	BR-13,36
	Warped or bent brake backing plate cracked drums		
	Tires rubbing against chassis and body	Inspect or repair	
Squeaking, squealing groaning or chattering noise when brakes are applied Note: Brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, occasional squeal is normal and is aggravated by severe environmental conditions such as cold, heat, wetness, snow, salt, mud, etc. This occasional squeal is not a functional problem and does not indicate any loss of brake effectiveness	Brake drums and linings, rotors and pads worn or scored	Inspect, repair or replace	BR-13,36
	Dirty, greasy, contaminated or glazed linings	Clean or replace	BR-13,36
	Improper linings or pads using	Inspect for correct usage replace	BR-13,36
	Maladjustment of brake pedal or booster push-rod	Inspect and adjust	BR-5, 12
	(Disc brake)		
	Missing or damaged brake pad anti-squeal shim	Replace	BR-13,21,29
	Pad wear and pad wear indicator making contact with the rotor	Replace	BR-13,21
	Burred or rusted calipers	Clean or deburr	BR-13,21,29
	(Drum brake)		
	Weak damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down spring pins and springs and grooved baking plate ledges	Inspect, repair or replace	BR-36,44,50

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Squealing and squeaking noise when brakes are not applied	Mal-adjustment of brake pedal or booster push rod	Inspect and adjust	BR-5,12
	Poor return of brake booster or master cylinder or wheel cylinder	Inspect, repair or replace	BR-8,11,36, 44,50
	(Disc brake)		
	Rusted or stuck piston	Inspect and lubricate as necessary	BR-13,21,29
	Improper positioning of pad in caliper		
	Rotor rubbing against caliper housing		
	Improper installation of disc brake pad support plate		BR-13,21,29
	Pad wear and pad wear indicator making contact with the rotor	Replace	BR-13,21
	(Drum brake)		
	Weak, damaged or incorrect shoe hold-down springs		
	Grooved backing plate ledges		
	Bent or warped backing plate causing interference with drum	Repair or replace	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum	
	Other brake system components: Loose or extra parts in brakes Rear drum adjustment too tight causing lining to glaze Worn, damaged or insufficiently lubricated wheel bearings	Inspect, repair or replace as necessary	
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque Replace if stud holes are elongated	
	Mal-adjustment of brake pedal or booster push rod	Inspect and adjust	BR-5, 12
	Worn, damaged or dry wheel bearings	Inspect and lubricate or replace	
	(Disc brake)		
	Loose or missing anti-rattle spring or pad support plate or crimping on outer pad	Inspect, repair or replace	BR-13,21,29
	Failure of shim	Inspect and replace if necessary	BR-13,21,29
	Wear on slide bushing	Inspect and replace if necessary	BR-13,21,29
	Loose installation bolt	Inspect and tighten if necessary	BR-13,21,29
	Poor return of piston	Inspect and repair or replace	BR-13,21,29
	(Drum brake)		
	Loose or extra parts	Inspect and repair	BR-36,44,50



CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height:
Truck 4WD 144 — 149 mm (5.67 — 5.87 in.)
Truck 2WD and 4 Runner
150 — 155 mm (5.91 — 6.10 in.)

If incorrect, adjust the pedal height.

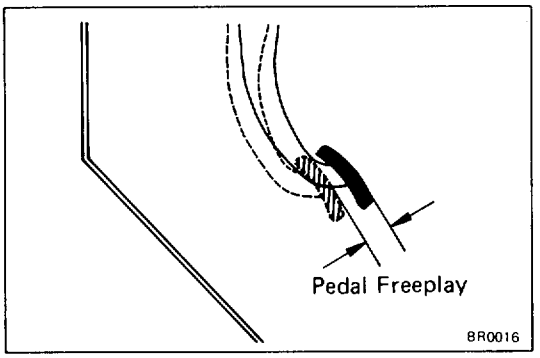
2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Sufficiently loosen the stop light switch.

(b) Adjust the pedal height by turning the pedal push rod.

(c) Return the stop light switch until its body lightly contacts the pedal stopper.

NOTE: After adjusting the pedal height, check and adjust the pedal freeplay.



3. CHECK AND ADJUST PEDAL FREEPLAY

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.

Pedal freeplay: 3 — 6 mm (0.12 — 0.24 in.)

NOTE: The pedal freeplay is the amount of the stroke until the booster air valve is moved by the pedal push rod.

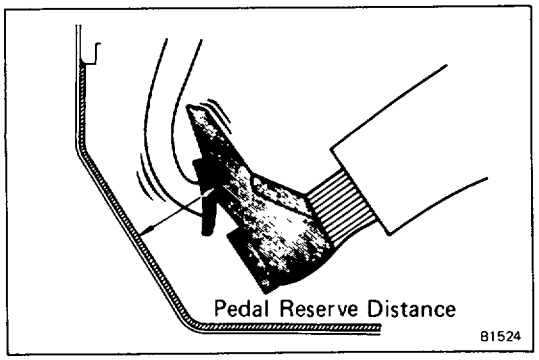
(c) If incorrect, adjust the pedal freeplay by turning the pedal push rod.

(d) Start the engine and confirm that the pedal freeplay exists.

NOTE: Afer adjusting the pedal freeplay, check the pedal height.

4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT

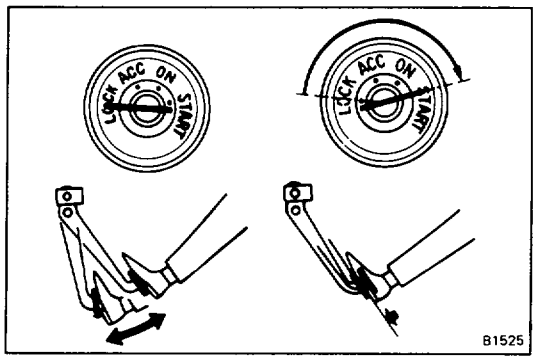
Depress the pedal and measure the pedal reserve distance, as shown.



Pedal reserve distance from asphalt sheet at 50 kg (110.2 lb, 490 N):

(2WD)	
1/2 ton	**More than 65 mm (2.56 in.)**
22R-TE engine	**More than 75 mm (2.95 in.)**
1 ton, C&C	**More than 55 mm (2.17 in.)**
(Include double tire vehicle)	
(4WD)	
22R series engine	**More than 55 mm (2.17 in.)**
22R-TE engine	**More than 50 mm (1.97 in.)**

If incorrect, troubleshoot the brake system.



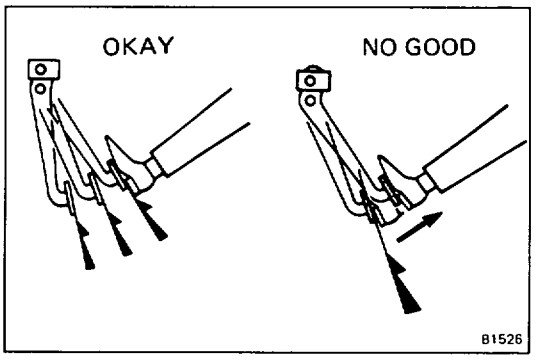
OPERATIONAL TEST OF BRAKE BOOSTER

NOTE: If there is leakage or lack of vacuum, repair before testing.

1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

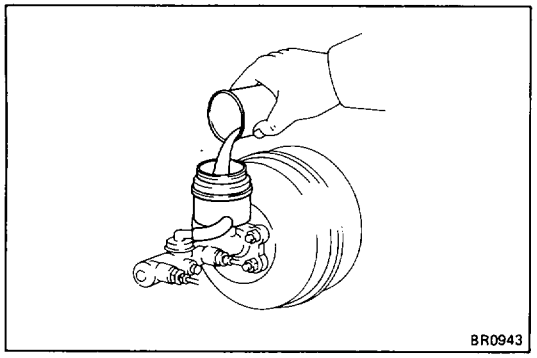
(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.



2. AIR TIGHTNESS

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down fartherest the first time, but gradually rises after the second or third time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for thirty seconds, the booster is air tight.



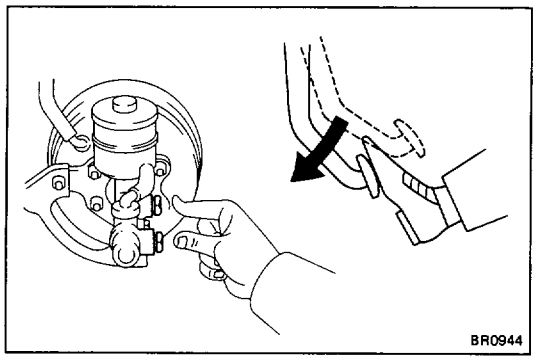
BLEEDING OF BRAKE SYSTEM

NOTE: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIRS WITH BRAKE FLUID

Check the reservoir after bleeding each wheel. Add fluid, if necessary.

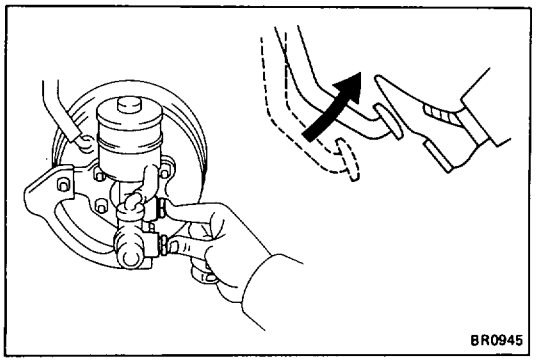


2. BLEED MASTER CYLINDER (FOR 2WD 1/2 TON, 4WD 22R-TE)

NOTE: If the master cylinder was disassembled or if the reservoir tank becomes empty, bleed the air from the master cylinder.

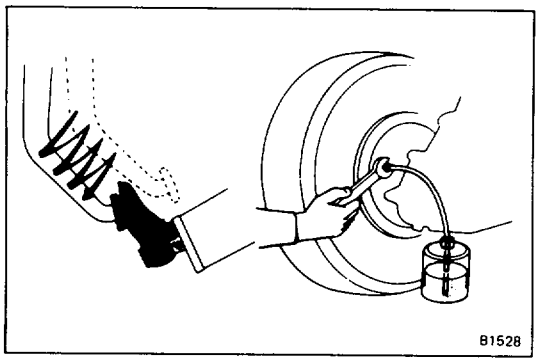
(a) Disconnect the brake tubes from the master cylinder.

(b) Depress the brake pedal and hold it.



(c) Block off the outlet plug with your finger, and release the brake pedal.

(d) Repeat (b) and (c) three or four times.



3. **CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG**

Insert the other end of the tube in a half-full container of brake fluid.

NOTE: Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. **BLEED BRAKE LINE**

(a) Slowly pump the brake pedal several times.

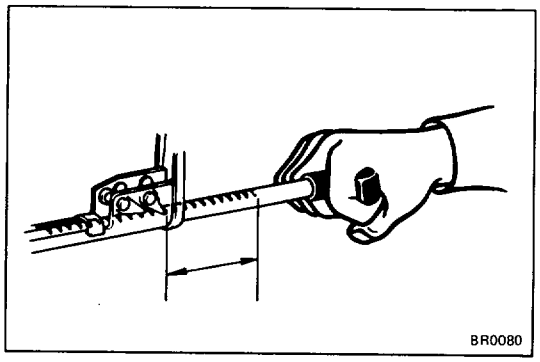
(b) While having an assistant press on the pedal, loosen the bleeder plug until fluid starts to runout. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.

Bleeder plug tightening torque:
110 kg-cm (8 ft-lb, 11 N·m)

5. **REPEAT PROCEDURE FOR EACH WHEEL**

6. **BLEED LSP & BV**



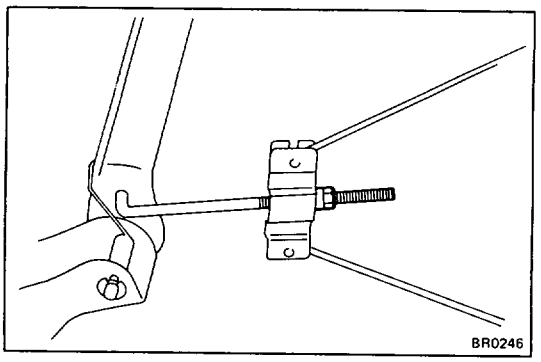
CHECK AND ADJUSTMENT OF PARKING BRAKE

1. **CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT**

Pull the parking brake lever all the way, and count the notches of lever travel.

Lever travel at 20 kg (44.1 lb, 196 N):
2WD 10 — 16 clicks
4WD 9 — 17 clicks

If incorrect, adjust the parking brake.



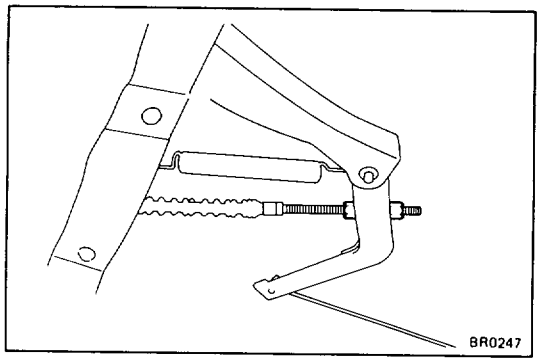
2. **IF NECESSARY, ADJUST PARKING BRAKE**

NOTE: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

(2WD)

(a) Tighten the adjusting nut until the travel is correct.

(b) After adjusting the parking brake, confirm that the rear brakes are not dragging.



(4WD)

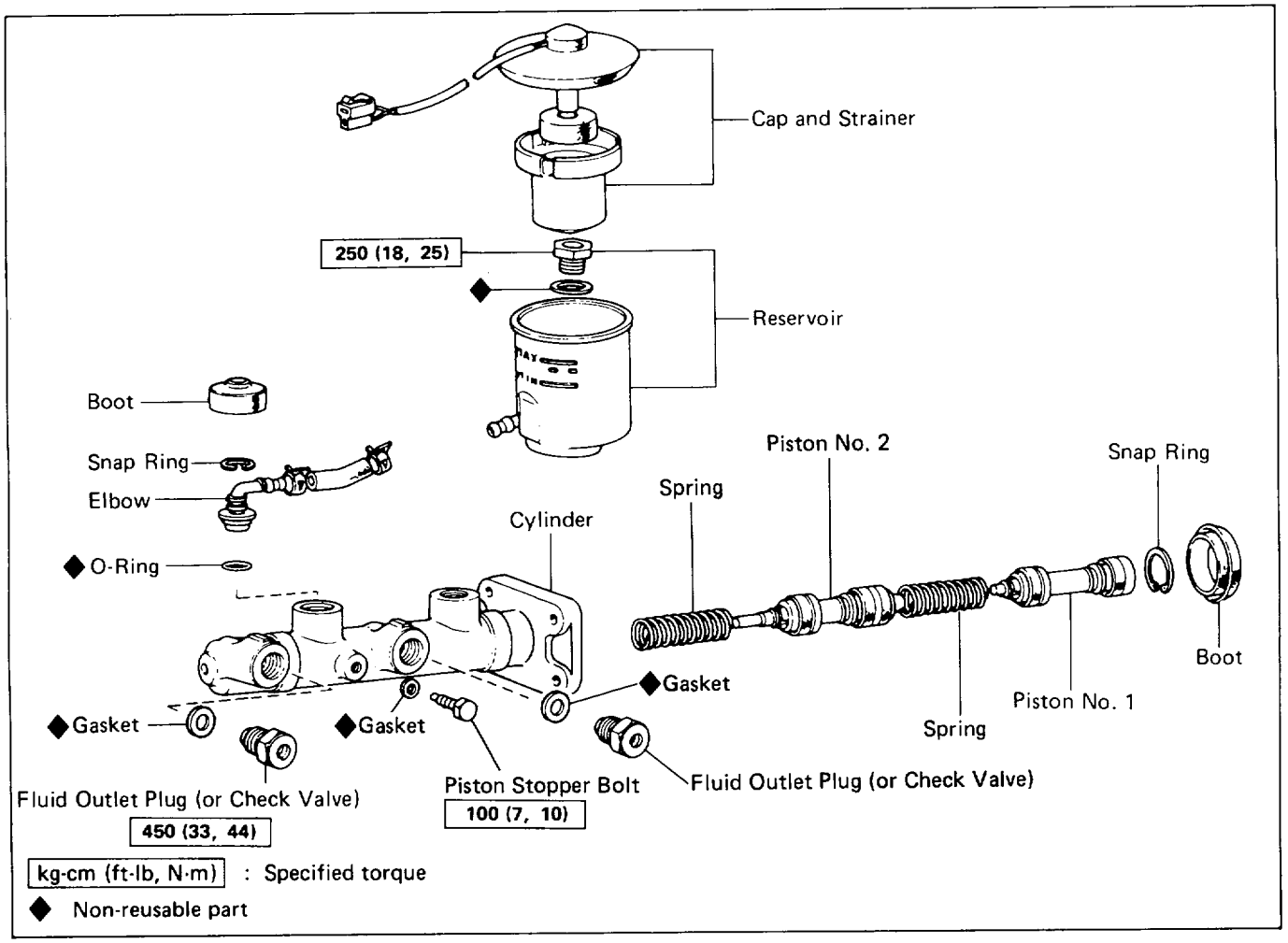
(a) Tighten the bellcrank stopper screw until the play of the rear brake links become zero, and then loosen the screw one turn. Tighten the screw lock nut.

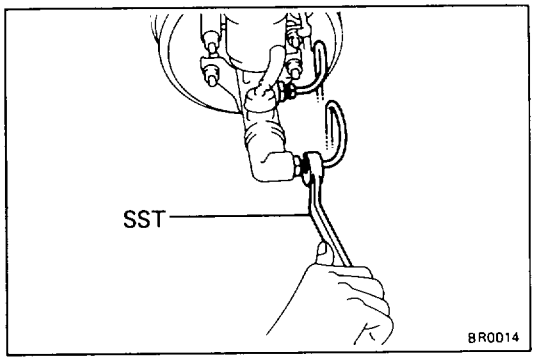
(b) Tighten one of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the two adjusting nuts.

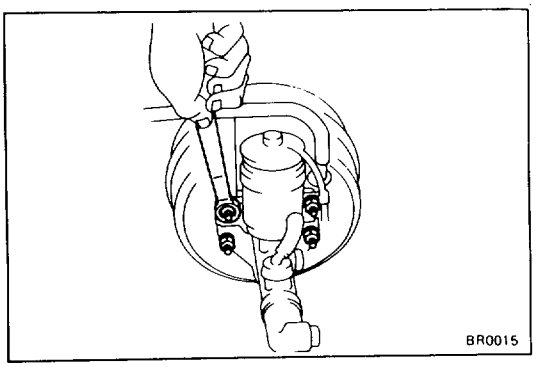
(c) After adjusting the parking brake, confirm that the bellcrank stopper screw comes in contact with the backing plate.

MASTER CYLINDER

COMPONENTS







REMOVAL OF MASTER CYLINDER

CAUTION: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. **DISCONNECT LEVEL WARNING SWITCH CONNECTOR**

2. **DISCONNECT TWO BRAKE TUBES**

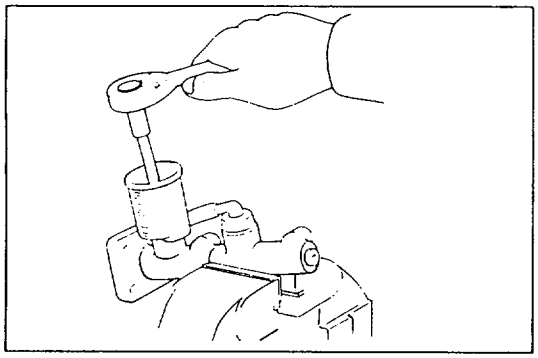
   Using SST, disconnect the two brake tubes from the master cylinder.

   SST 09751-36011

3. **REMOVE MASTER CYLINDER**

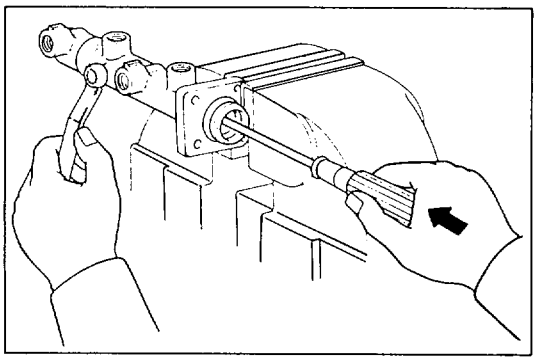
   (a) Remove the four nuts.

   (b) Remove the master cylinder and gasket from the brake booster.

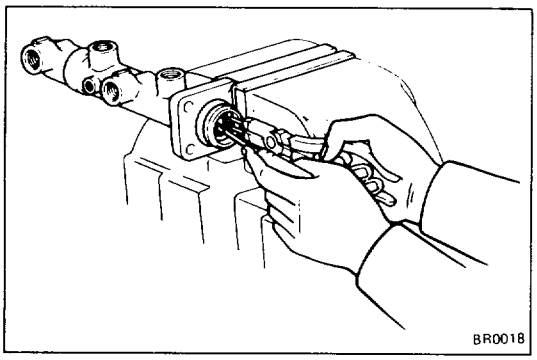


DISASSEMBLY OF MASTER CYLINDER

1. **PLACE CYLINDER IN VISE**
2. **DISCONNECT RESERVOIR AND HOSE**
   Remove the cap, strainer, bolt and hose.
3. **REMOVE SNAP RING AND ELBOW**
4. **REMOVE TWO FLUID OUTLET PLUGS OR CHECK VALVES**

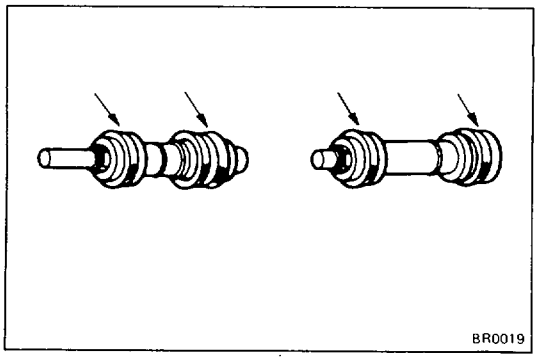


5. **REMOVE PISTON STOPPER BOLT**
   Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt.



6. **REMOVE TWO PISTONS AND SPRINGS**
   (a) Using snap ring pliers, remove the snap ring.
   (b) Remove the two pistons and springs from the master cylinder.

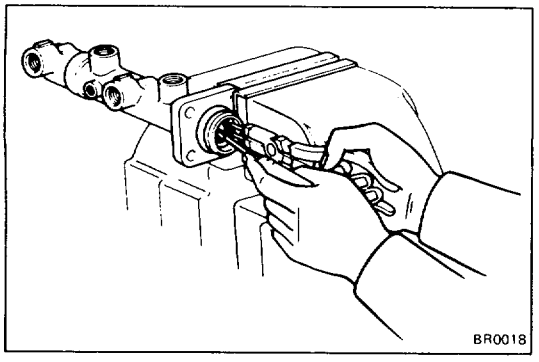
   NOTE: It may be necessary to inject compressed air in the check valve hole to force out the No. 2 piston.



ASSEMBLY OF MASTER CYLINDER

(See page BR-8)

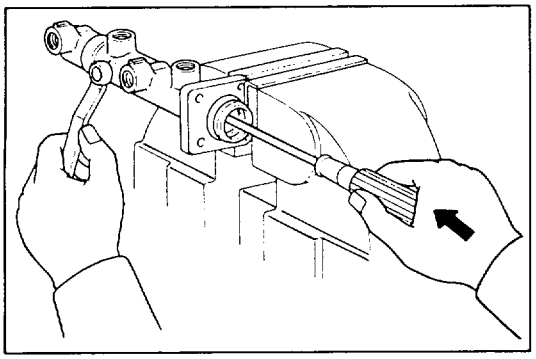
1. **APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS OF PISTON**



2. **INSTALL TWO SPRINGS AND PISTONS**

   CAUTION: Be careful not to damage the rubber lips on the pistons.

   (a) Insert the two springs and pistons in the master cylinder housing as shown.
   (b) Using snap ring pliers, install the snap ring.



3. **INSTALL PISTON STOPPER BOLT**

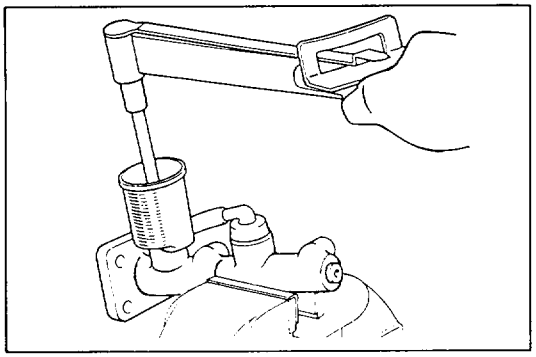
Using a screwdriver, push the pistons in all the way and install the piston stopper bolt. Torque the bolt.

Torque: 100 kg-cm (7 ft-lb, 10 N·m)

4. **INSTALL TWO FLUID OUTLET PLUGS OR CHECK VALVES**

Torque two plugs or check valves.

Torque: 16 mm plug 450 kg-cm (33 ft-lb, 44 N·m)
18 mm plug 685 kg-cm (50 ft-lb, 67 N·m)



5. **INSTALL RESERVOIR**

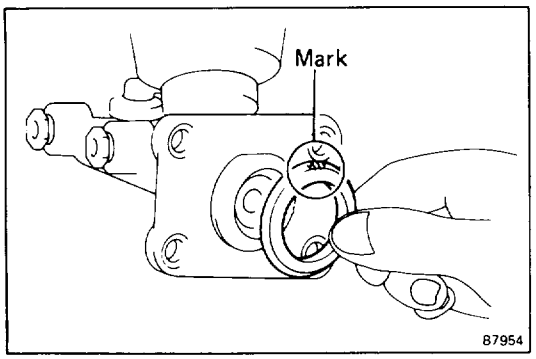
(a) Install the reservoir on the master cylinder. Torque the bolt.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

(b) Install the strainer and cap.

6. **INSTALL ELBOW AND SNAP RING**

7. **CONNECT RESERVOIR HOSE**

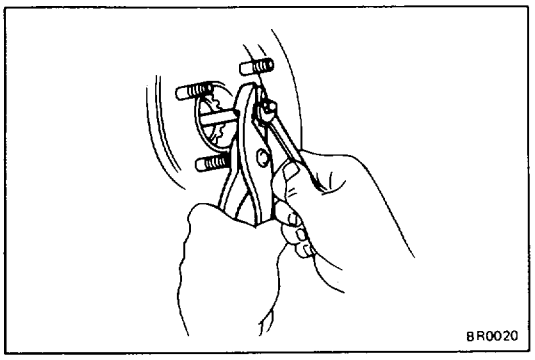


INSTALLATION OF MASTER CYLINDER

(See page BR-8)

1. **CLEAN OUT GROOVE ON LOWER INSTALLATION SURFACE OF MASTER CYLINDER**

2. **CONFIRM THAT "UP" MARK ON MASTER CYLINDER BOOT IS IN CORRECT POSITION**



3. **ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER**
(See page BR-12)

4. **INSTALL MASTER CYLINDER**

Install the master cylinder and gasket on the brake booster with four nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

5. **CONNECT TWO BRAKE TUBES**

Using SST, connect the two brake tubes to the master cylinder. Torque the nuts.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

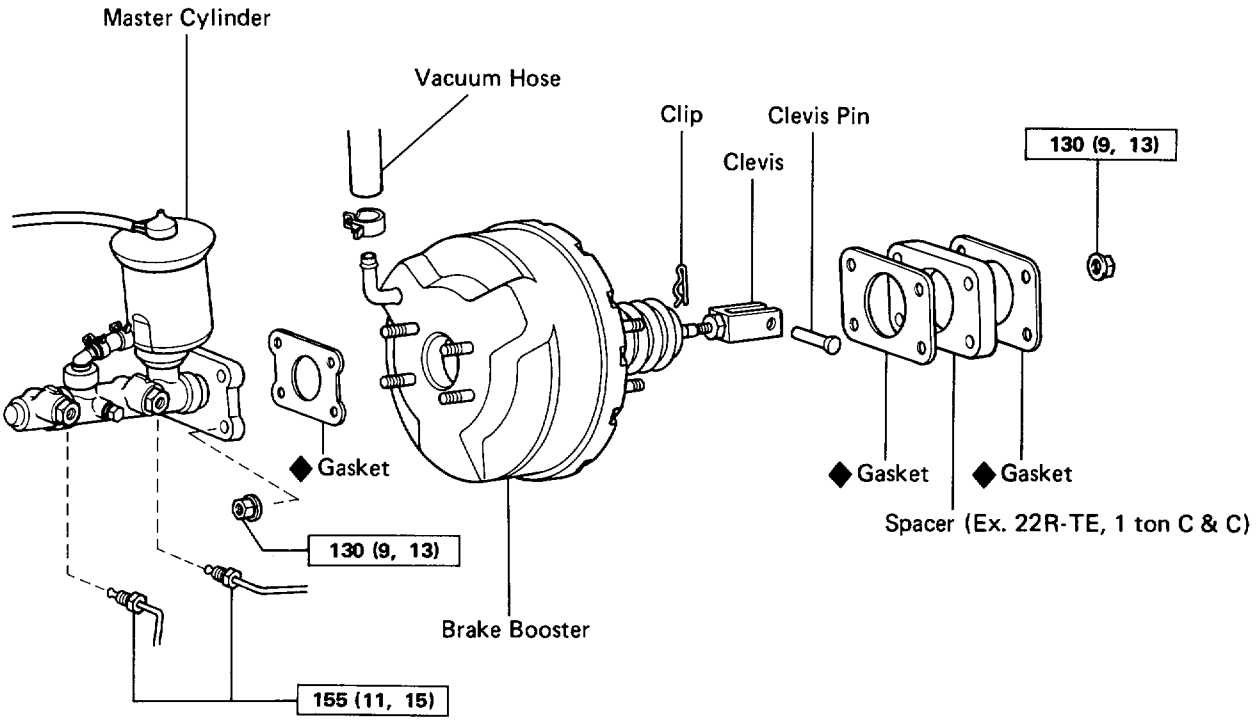
6. **CONNECT LEVEL WARNING SWITCH CONNECTOR**

7. **ADJUST BRAKE PEDAL (See page BR-5)**

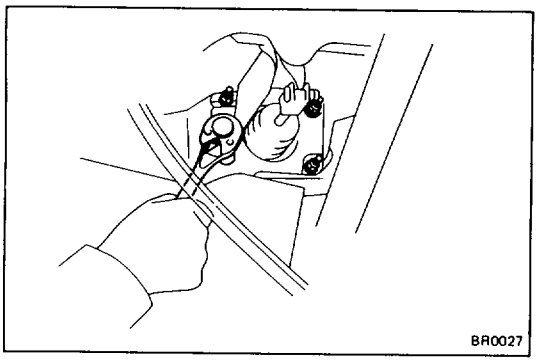
8. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR-6)**

BRAKE BOOSTER

REMOVAL OF BRAKE BOOSTER

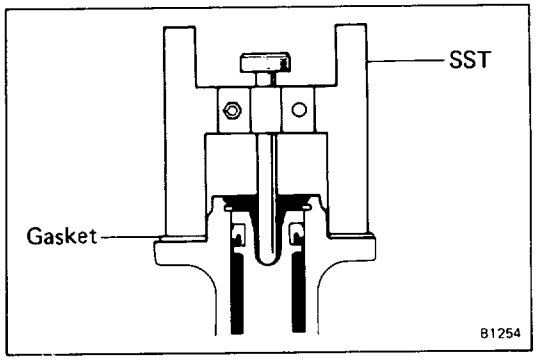


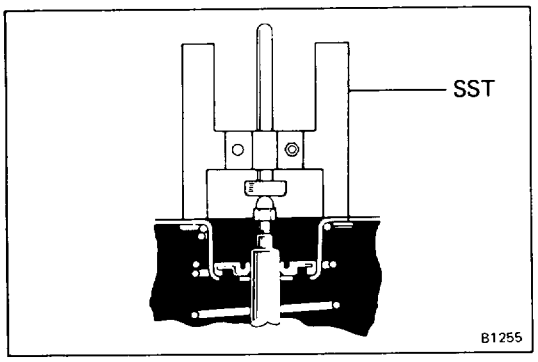
1. **REMOVE MASTER CYLINDER (See page BR-8)**
2. **DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER**
3. **DISCONNECT STOP LIGHT SWITCH CONNECTOR**
4. **REMOVE PEDAL RETURN SPRING**
5. **REMOVE CLIP AND CLEVIS PIN**

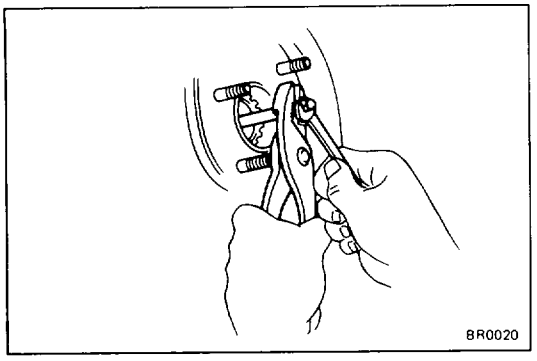


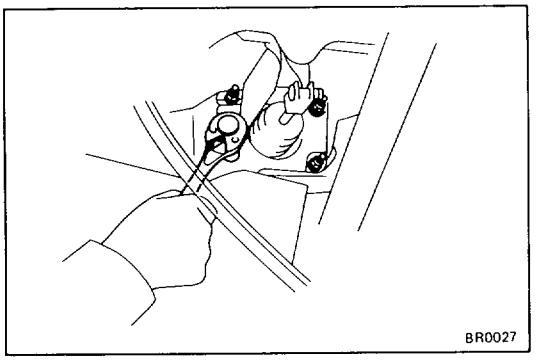
6. **REMOVE BRAKE BOOSTER, GASKETS AND SPACER**

   Remove the four nuts, and pull out the brake booster, two gaskets and spacer.









INSTALLATION OF BRAKE BOOSTER

(See page BR-11)

1. **ADJUST LENGTH OF BOOSTER PUSH ROD**

   (a) Set SST on the master cylinder, and lower the pin until its tip slightly touches the piston.

   SST 09737-00010

   NOTE: Take the measurement with the gasket in place.

   (b) Turn SST upside down, and set it on the booster.

   SST 09737-00010

   (c) Adjust the booster push rod length until the push rod lightly touches the pin head.

   Clearance: 0 mm (0 in.)

   NOTE: Before adjusting the clearance, push the the pedal push rod for more than ten times.

2. **INSTALL BRAKE BOOSTER, GASKETS AND SPACER**

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)

3. **CONNECT CLEVIS TO BRAKE PEDAL**

   Insert the push rod pin into the clevis and brake pedal and install the clip to the pin.

4. **INSTALL PEDAL RETURN SPRING**

5. **CONNECT STOP LIGHT SWITCH CONNECTOR**

6. **INSTALL MASTER CYLINDER**
   (See page BR-10)

7. **CONNECT HOSE TO BRAKE BOOSTER**

8. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR-6)**

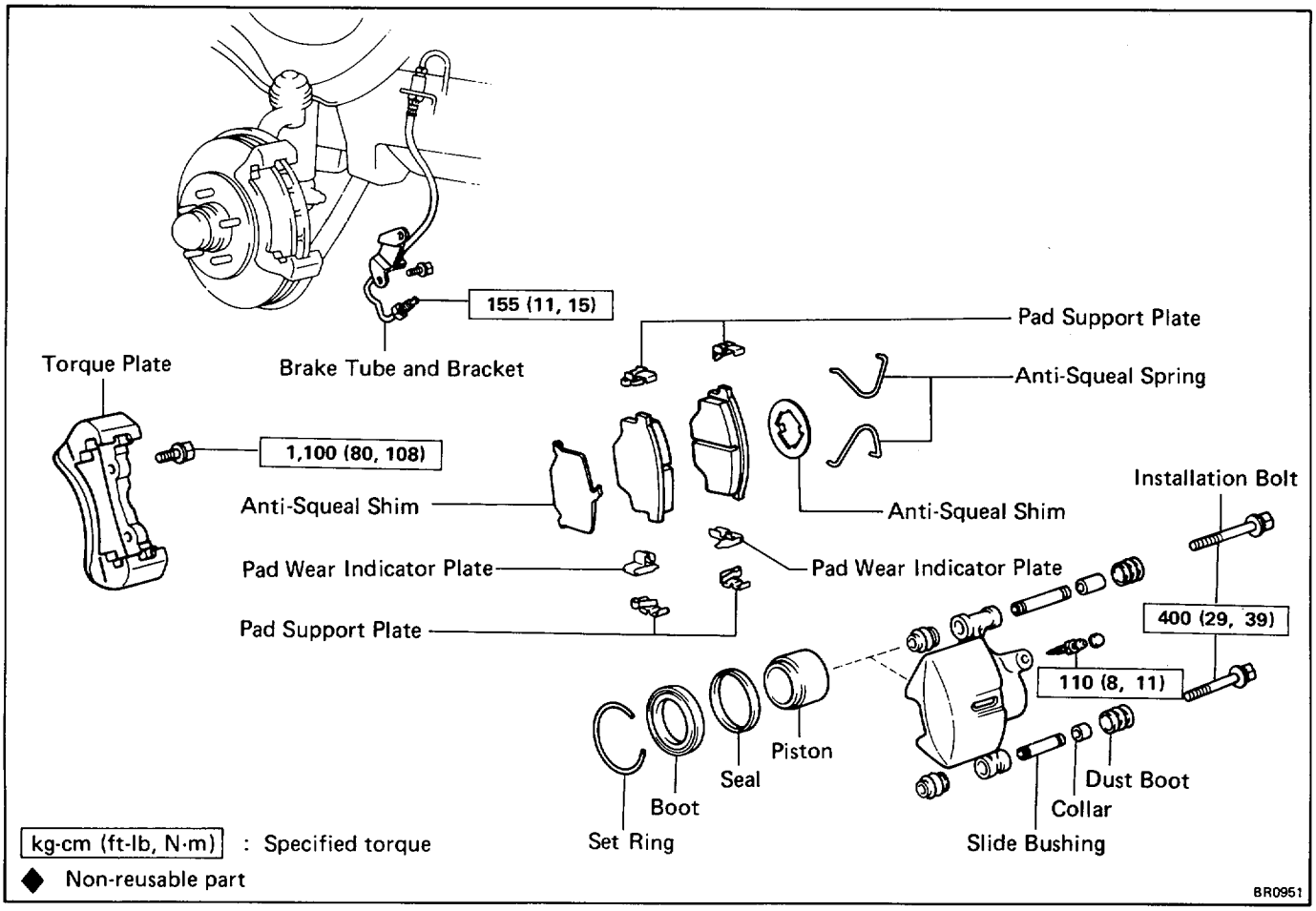
9. **CHECK FLUID LEAKAGE**

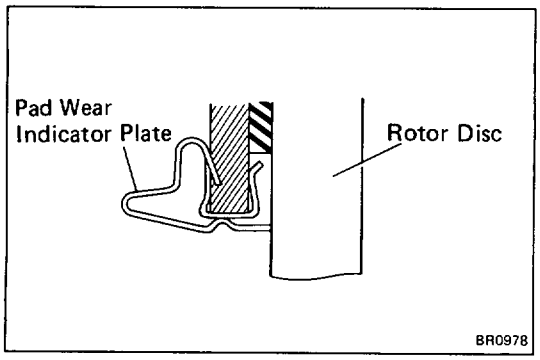
10. **CHECK AND ADJUST BRAKE PEDAL**
    (See page BR-5)

11. **PERFORM OPERATIONAL CHECK**
    (See page BR-6)

FRONT BRAKE — 2WD (PD60 Type Disc)

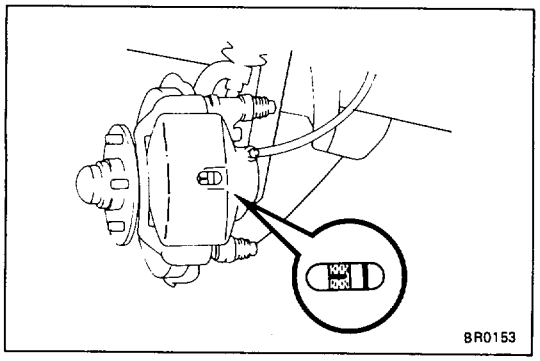
COMPONENTS





REPLACEMENT OF BRAKE PADS

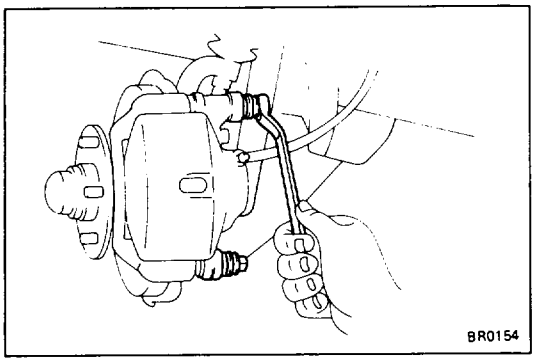
NOTE: If a squealing noise occurs from the front brakes while driving, check the pad wear indicator plate. If there are traces of the indicator plate the contacting the rotor disc, the brake pad should be replaced.



1. INSPECT PAD LINING THICKNESS

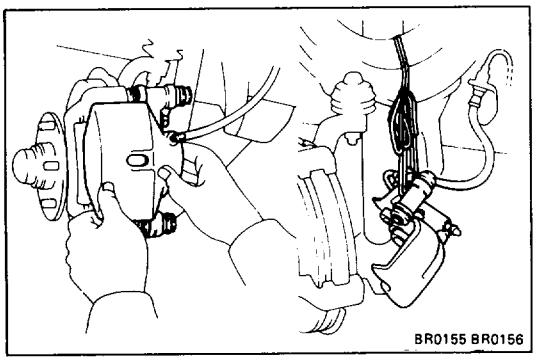
Check the pad thickness through the cylinder inspection hole and replace the pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)



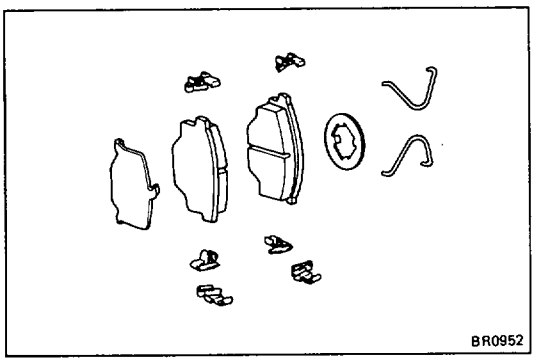
2. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove the two installation bolts from the torque plate.



(b) Remove the brake cylinder and suspend it so the hose is not streched.

NOTE: Do not disconnect the brake hose.

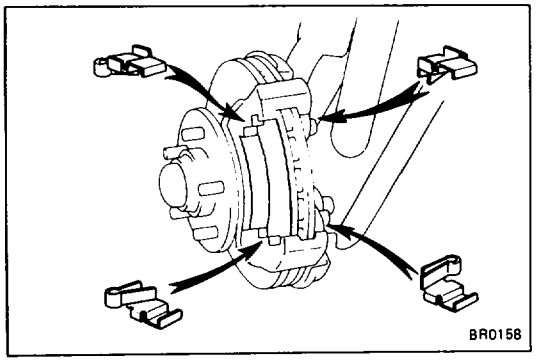


3. REMOVE FOLLOWING PARTS:

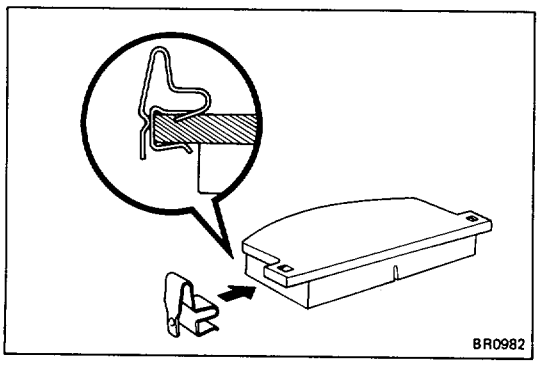
(a) Two anti-squeal springs
(b) Two brake pads
(c) Anti-squeal shim
(d) Four support plates
(e) Two pad wear indicator plates

4. CHECK ROTOR DISC THICKNESS
(See step 2 on page BR-18)

5. CHECK ROTOR DISC RUNOUT
(See step 3 on page BR-18)



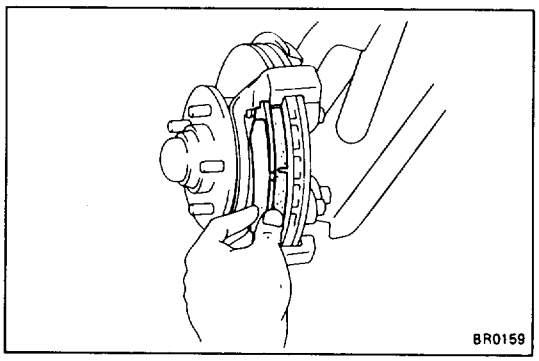
6. INSTALL PAD SUPPORT PLATES



7. INSTALL NEW PADS

(a) Install a new pad wear indicator plate to the lower side of the each pad.

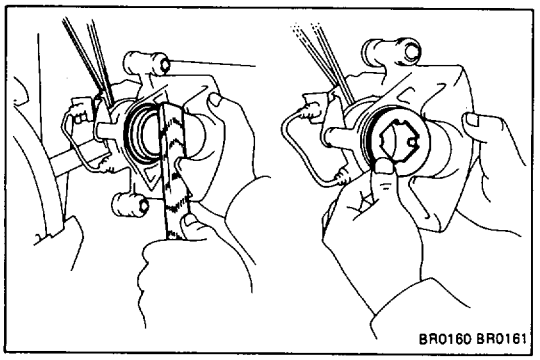
(b) Install the anti-squeal shim toward the backside of the outside pad.



(c) Install the pads onto each support plate.

CAUTION: Do not allow oil or grease to get on the rubbing face.

(d) Install the anti-squeal springs.



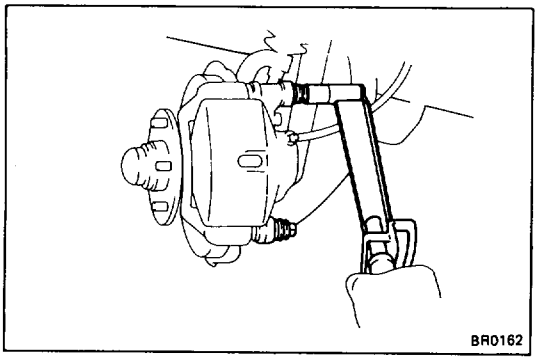
8. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or such.

NOTE: Always change the pad on one wheel at a time as there is possibility of the opposite piston flying out.

(c) Assemble the anti-squeal shim to the piston

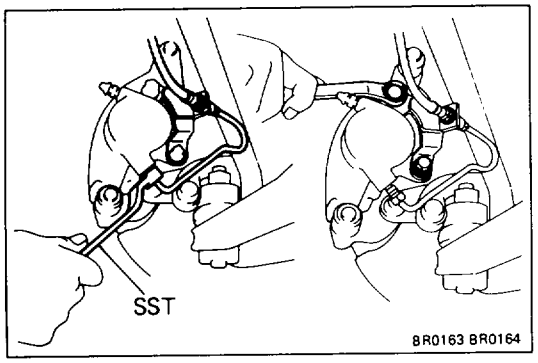


(d) Insert the brake cylinder carefully so the dust boot is not wedged.

(e) Install and torque the two mount bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

9. CHECK THAT FLUID LEVEL IS MAX AT LINE



REMOVAL OF CYLINDER

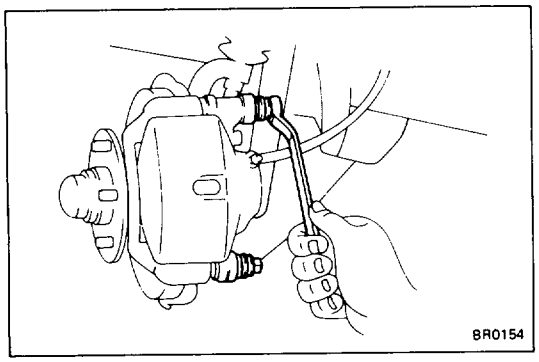
(See page BR-13)

1. **DISCONNECT BRAKE LINE**

   (a) Using SST, disconnect the brake line.
   Use a container to catch the brake fluid.

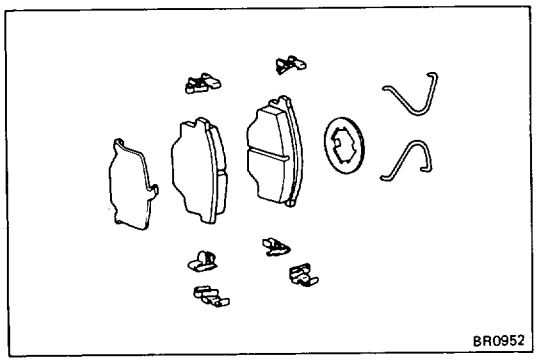
   SST 09751-36011

   (b) Remove the bracket from the cylinder.

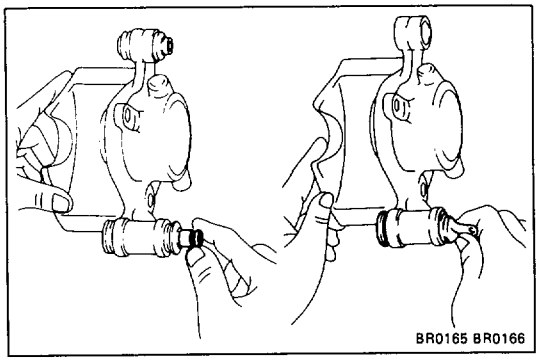


2. **REMOVE CYLINDER**

   Remove the two installation bolts and cylinder.



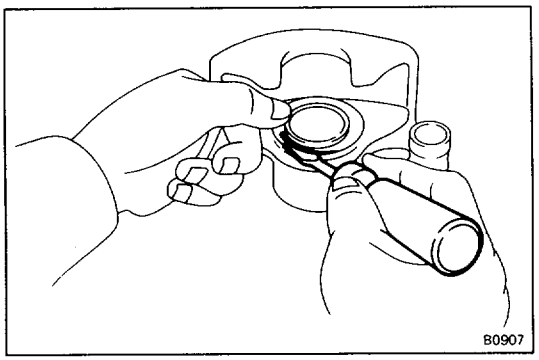
3. **REMOVE ANTI-RATTLE SPRINGS**
4. **REMOVE BRAKE PADS**
5. **REMOVE PAD WEAR INDICATOR PLATES**
6. **REMOVE ANTI-SQUEAL SHIMS**
7. **REMOVE SUPPORT PLATES**



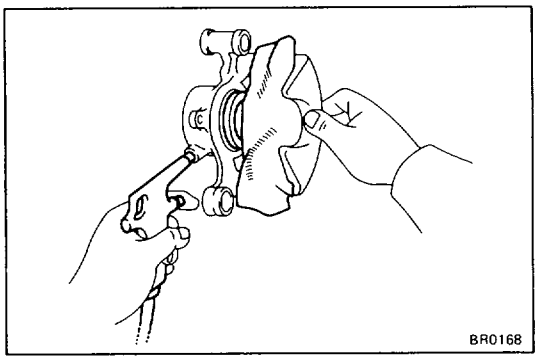
DISASSEMBLY OF CYLINDER

(See page BR-13)

1. **REMOVE FOLLOWING PARTS**
   (a) Two cylinder slide bushings
   (b) Four dust boots
   (c) Two collars

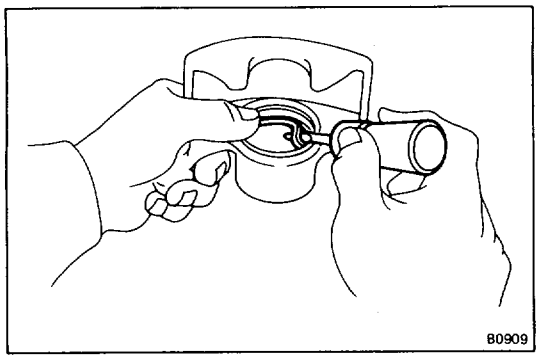


2. **REMOVE CYLINDER BOOT SET RING AND BOOT**
   Using a screwdriver, remove the cylinder boot set ring and boot.

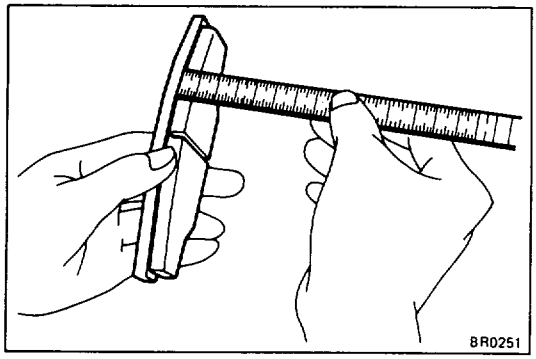


3. **REMOVE PISTON FROM CYLINDER**
   (a) Put a piece of cloth or such between the piston and cylinder.
   (b) Use compressed air to remove the piston from the cylinder.

   WARNING: Do not place your fingers in front of the piston when using compressed air.



4. **REMOVE PISTON SEAL FROM BRAKE CYLINDER**
   Using a screwdriver, remove the piston seal.

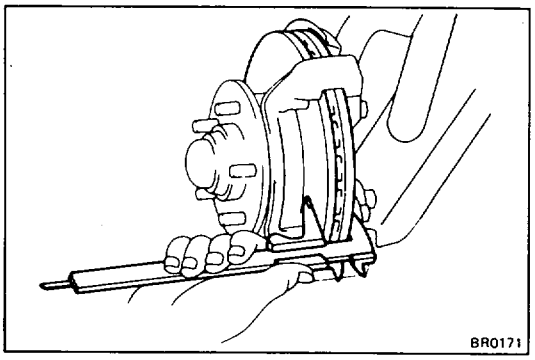


INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)
Standard thickness: 10.0 mm (0.394 in.)

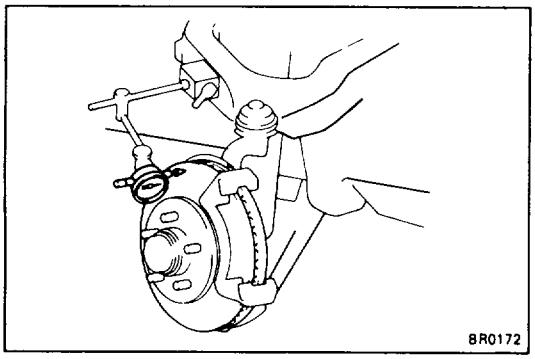
Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible)or if it shows sign of uneven wear.



2. MEASURE ROTOR DISC THICKNESS

Minimum thickness: 24.0 mm (0.945 in.)
Standard thickness: 25.0 mm (0.984 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



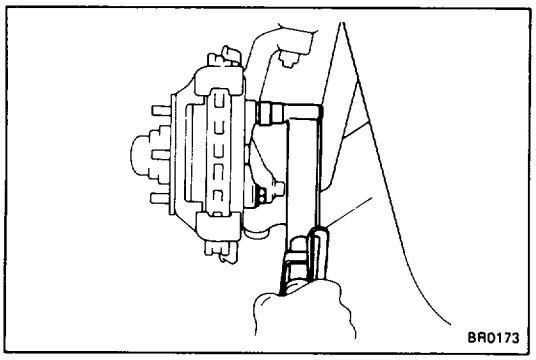
3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

NOTE: Before measuring the runout, confirm that the front bearing play is within specification.



4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the torque plate from the knuckle.

(b) Remove the axle hub. (See page FA-7)

(c) Remove the disc from the axle hub.

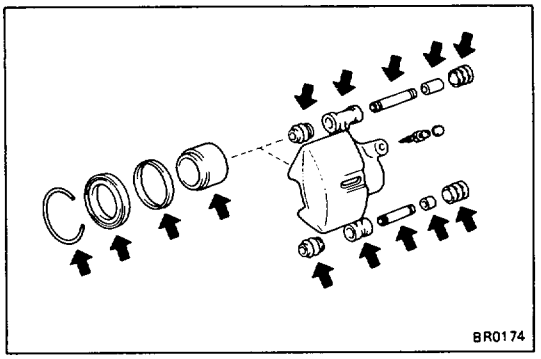
(d) Install a new rotor disc. Torque the bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)

(e) Install the axle hub and adjust the front bearing preload. (See page FA-8)

(f) Install the torque plate onto the knuckle.

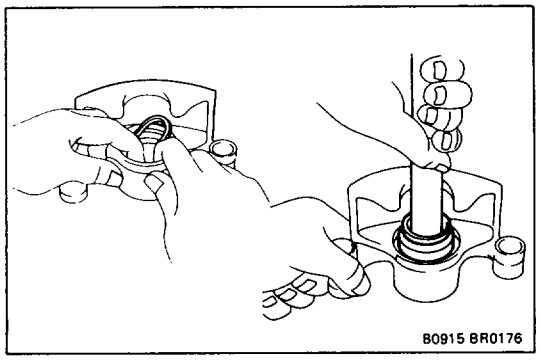
Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



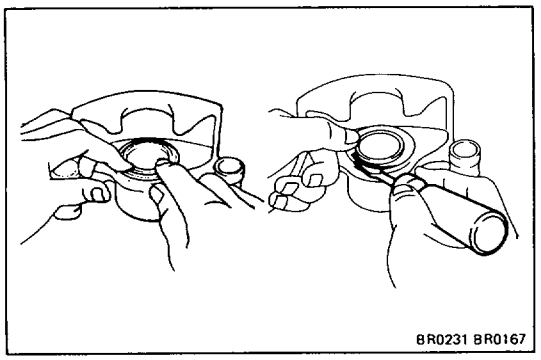
ASSEMBLY OF CYLINDER

(See page BR-13)

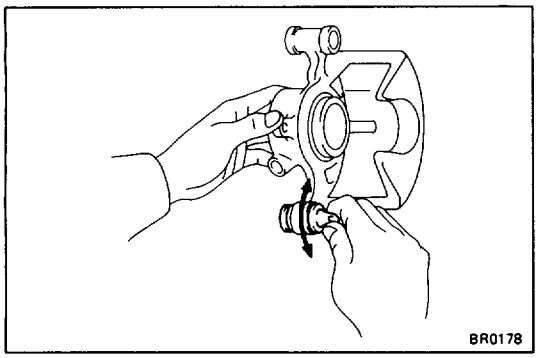
1. **APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS**



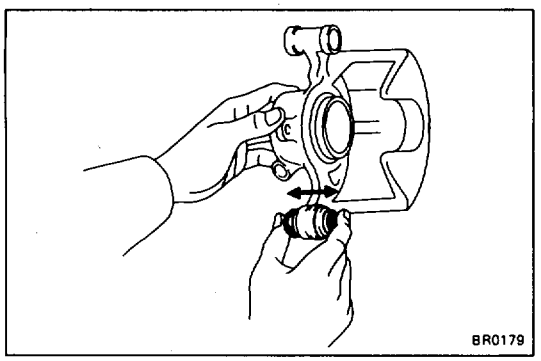
2. **INSTALL PISTON SEAL AND PISTON IN CYLINDER**



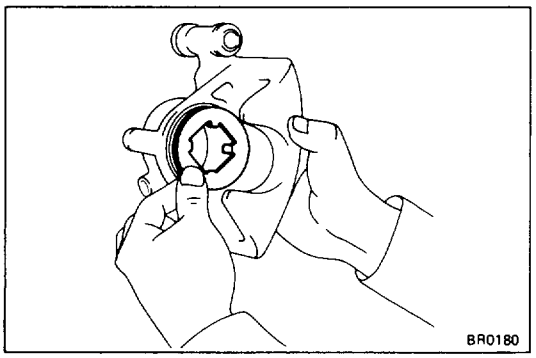
3. **INSTALL CYLINDER BOOT AND SET RING IN CYLINDER**



4. **INSTALL COLLAR, DUST BOOT AND CYLINDER SLIDE BUSHING**
   (a) Install the collar and dust boots to the brake cylinder.
   (b) Insure that the boots are secured firmly to each brake cylinder groove.



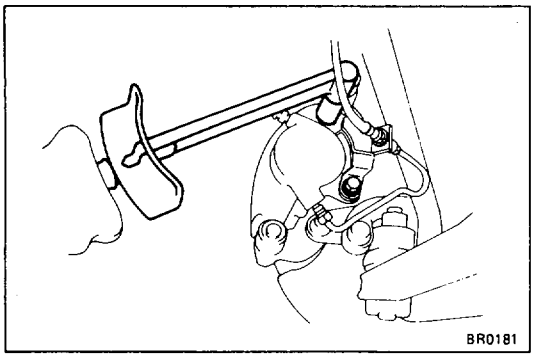
   (c) Install the bushing into the boots.
   (d) Insure that the boots are secured firmly to each bushing groove.



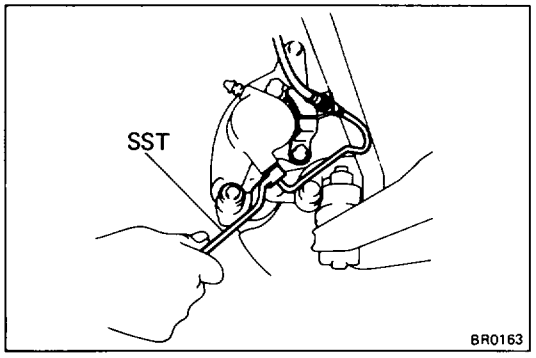
INSTALLATION OF CYLINDER

(See page BR-13)

1. INSTALL ANTI-SQUEAL SHIM TO PISTON
2. INSTALL PADS, ANTI-SQUEAL SPRINGS AND PAD SUPPORT PLATES (See steps 6 and 7 on page BR-14)
3. INSTALL CYLINDER
   (See step 8 on page BR-15)



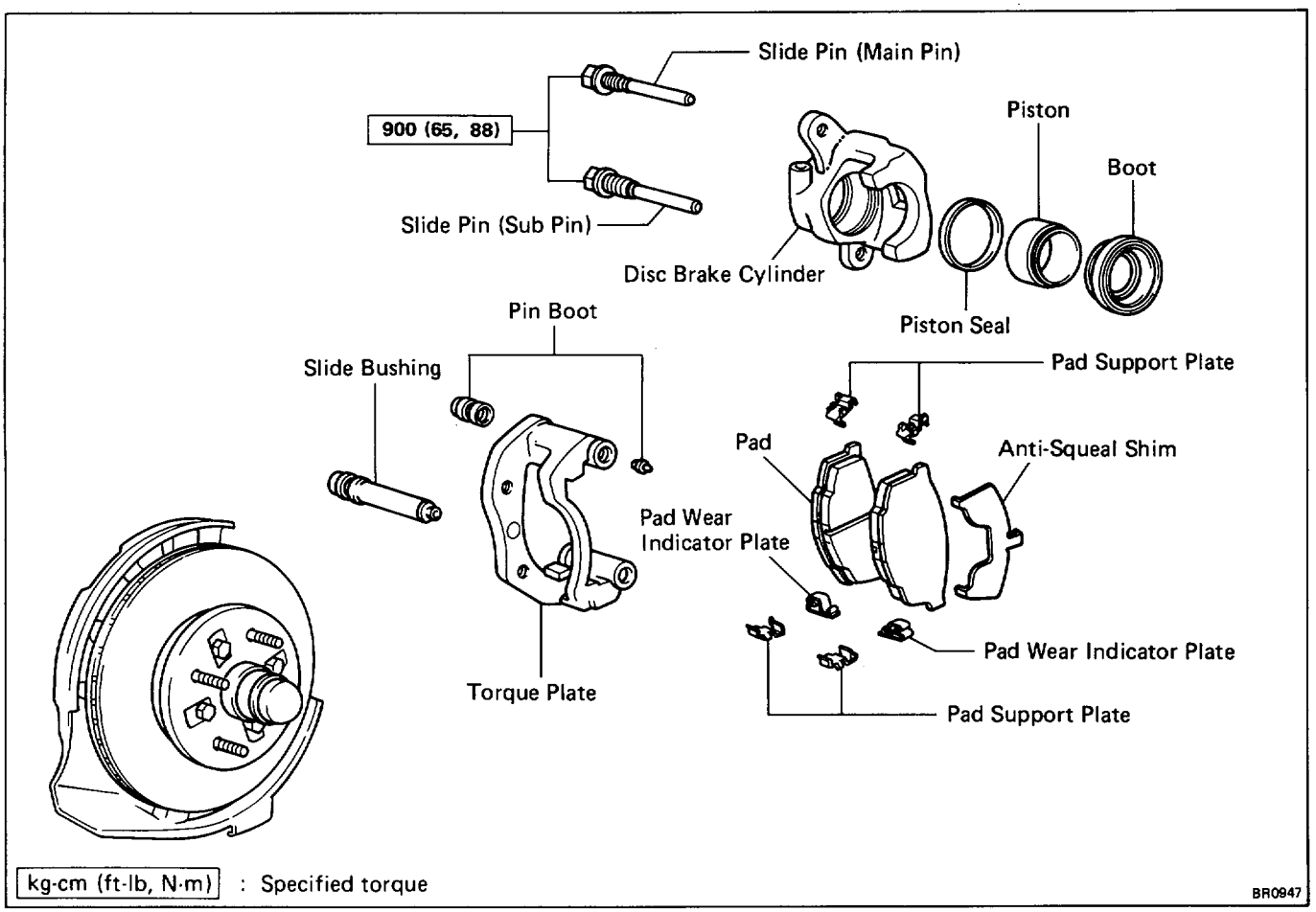
4. INSTALL BRACKET TO CYLINDER
   Torque: 185 kg-cm (13 ft-lb, 18 N·m)

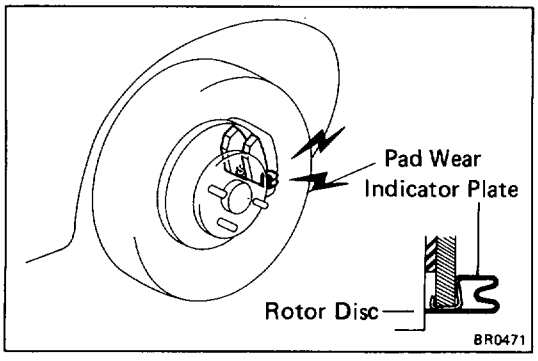


5. CONNECT BRAKE LINE
   Using SST, connect the brake line.
   SST 09751-36011
   Torque: 155 kg-cm (11 ft-lb, 15 N·m)
6. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR-6)
7. CHECK FOR FLUID LEAKAGE

FRONT BRAKE — 2WD (FS17 Type Disc)

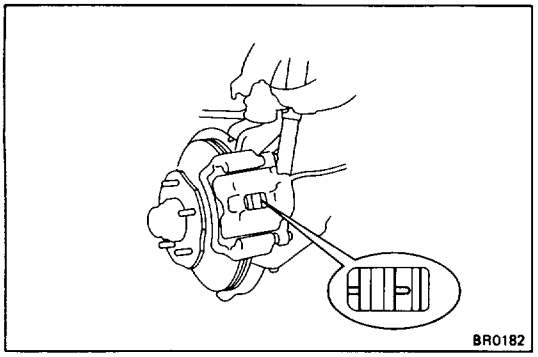
COMPONENTS





REPLACEMENT OF BRAKE PADS

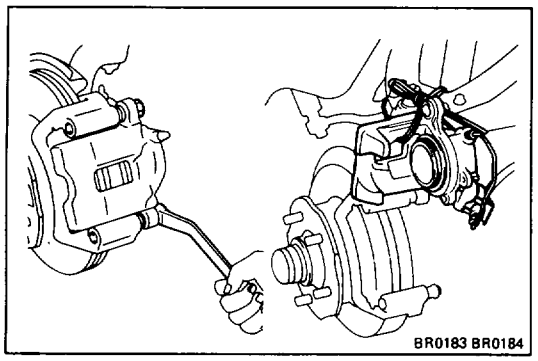
NOTE: If a squealing noise occurs from the front brakes while driving, check the pad wear indicator plate. If there are traces of the indicator plate contacting the rotor disc, the brake pad should be replaced.



1. INSPECT PAD LINING THICKNESS

Check the pad thickness through the cylinder inspection hole and replace the pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)



2. REMOVE CYLINDER SLIDE PIN ON SUB PIN SIDE

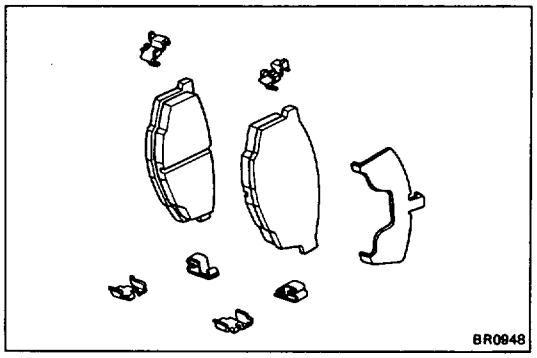
(a) Remove the cylinder slide pin on the sub-pin side.

(b) Lift up the cylinder and support it.

NOTE:

(1) Do not remove the cylinder slide pin on the main side unless necessary.

(2) Do not disconnect the brake hose.



3. REMOVE FOLLOWING PARTS:

(a) Two brake pads

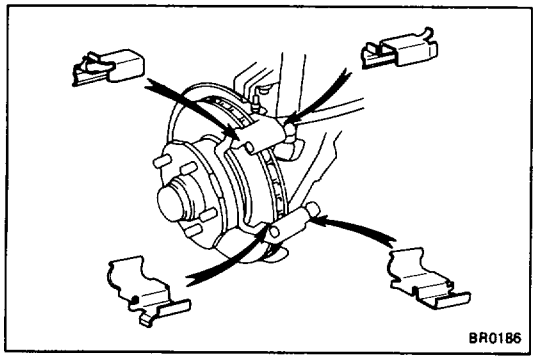
(b) Anti-squeal shim

(c) Four pad support plates

(d) Two pad wear indicator plates

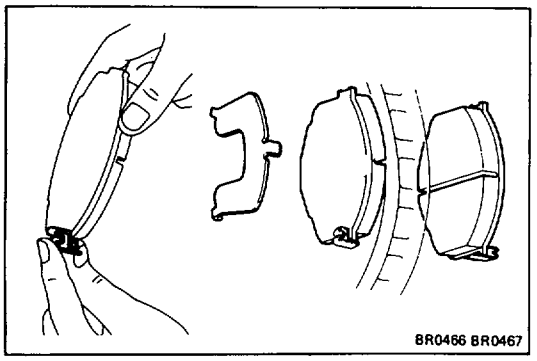
4. CHECK ROTOR DISC THICKNESS
(See step 2 on page BR-26)

5. CHECK ROTOR DISC RUNOUT
(See step 3 on page BR-26)



6. INSTALL PAD SUPPORT PLATES

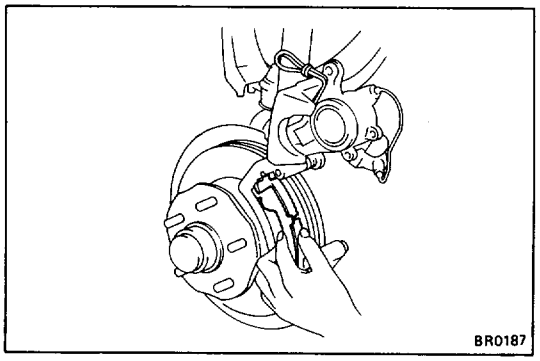
Install the four pad support plates onto the torque plate.



7. INSTALL NEW PADS

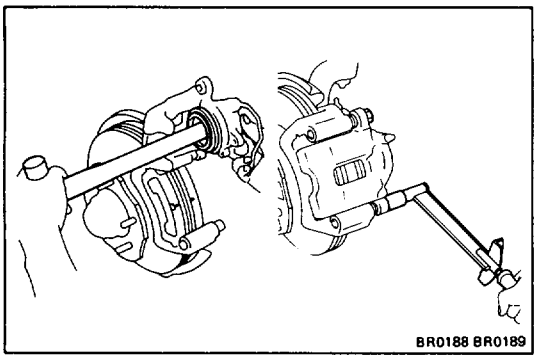
(a) Install a new pad wear indicator plate to the lower side of the each pad.

(b) Install the anti-squeal shim toward the backside of the outside pad.


BR0187

(c) Install the pads onto each support plate.

CAUTION: Do not allow oil or grease to get on the rubbing face.


BR0188 BR0189

8. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or such.

NOTE: Always change the pad on one wheel at a time as there is possibility of the opposite piston flying out.

(c) Insert the brake cylinder carefully so the dust boot is not wedged.

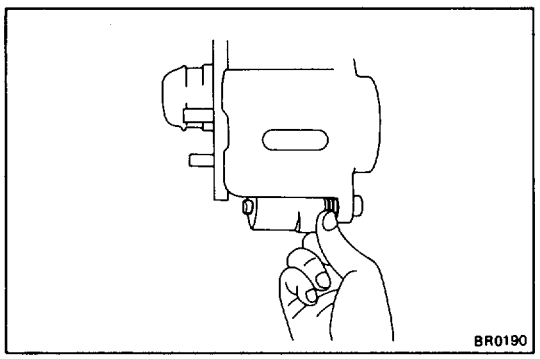
(d) Install and torque the slide pin on the sub pin side.

Torque: 900 kg-cm (65 ft-lb, 88 N·m)

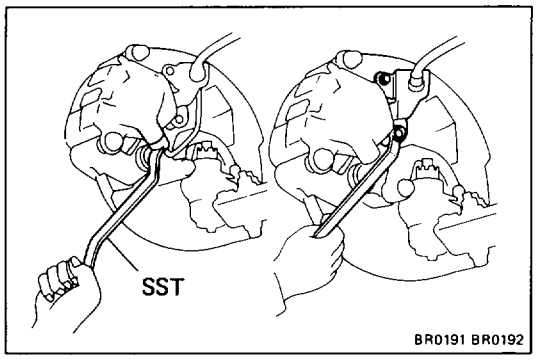
NOTE:

(1) Confirm the condition of the cylinder side bushing boot and pull on the boot to relieve the air from the cylinder side pin mounting area.

(2) Confirm that the hole plug on the main pin side is installed and push on the center of the plug to relieve the air from the inner portion of the main pin.


BR0190

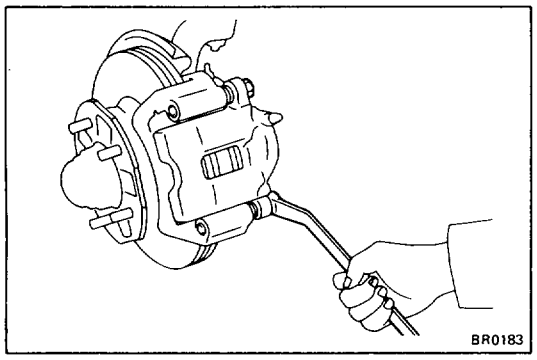
9. CHECK THAT FLUID LEVEL IS AT MAX LINE



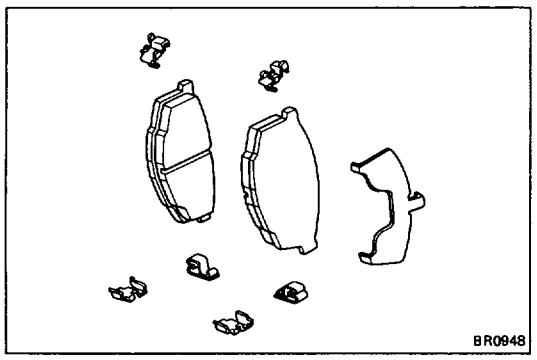
REMOVAL OF CYLINDER

(See page BR-21)

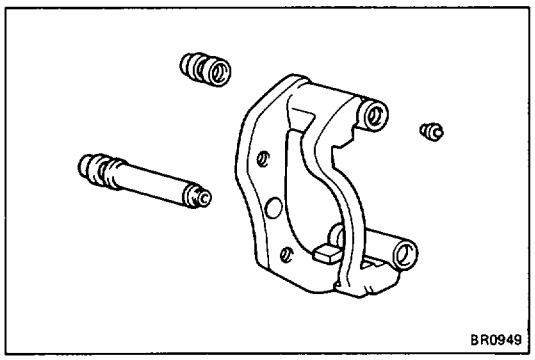
1. **DISCONNECT BRAKE LINE**
   (a) Using SST, disconnect the brake line.
   Use a container to catch the brake fluid.
   SST 09751-36011
   (b) Remove the bracket from the cylinder.



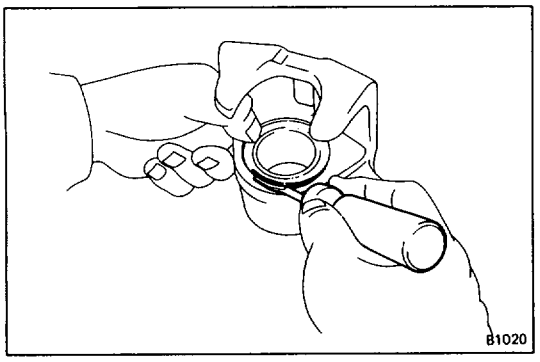
2. **REMOVE CYLINDER**
   Remove the two slide pins and cylinder.



3. **REMOVE BRAKE PADS**
4. **REMOVE PAD WEAR INDICATOR PLATES**
5. **REMOVE ANTI-SQUEAL SHIM**
6. **REMOVE PAD SUPPORT PLATES**



7. **IF NECESSARY, REMOVE FOLLOWING PARTS:**
   (a) Slide bushing
   (b) Pin boots

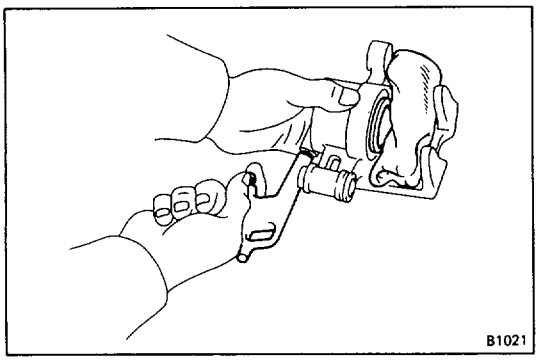


DISASSEMBLY OF CYLINDER

(See page BR-21)

1. **REMOVE CYLINDER BOOT SET RING AND BOOT**

   Using a screwdriver, remove the cylinder boot set ring and boot.

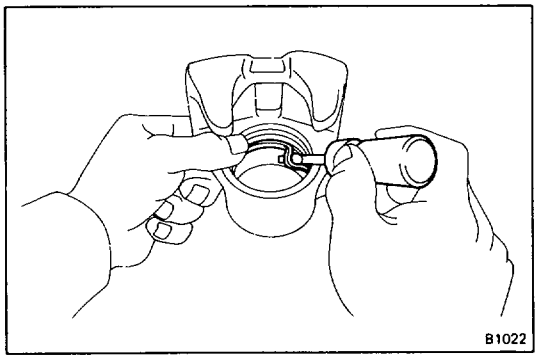


2. **REMOVE PISTON FROM CYLINDER**

   (a) Put a piece of cloth or such between the piston and cylinder.

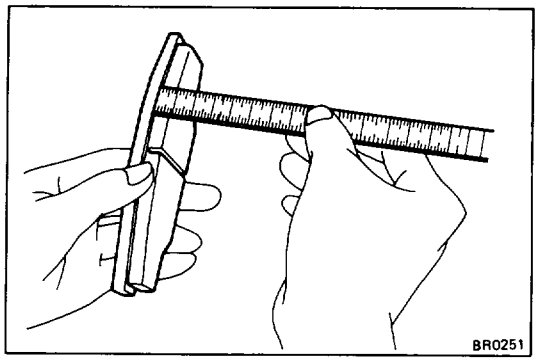
   (b) Use compressed air to remove the piston from the cylinder.

   WARNING: Do not place your fingers in front of the piston when using compressed air.



3. **REMOVE PISTON SEAL FROM BRAKE CYLINDER**

   Using a screwdriver, remove the piston seal.

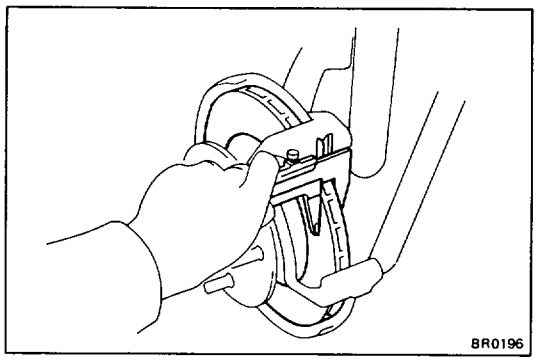


INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)
Standard thickness: 10.0 mm (0.394 in.)

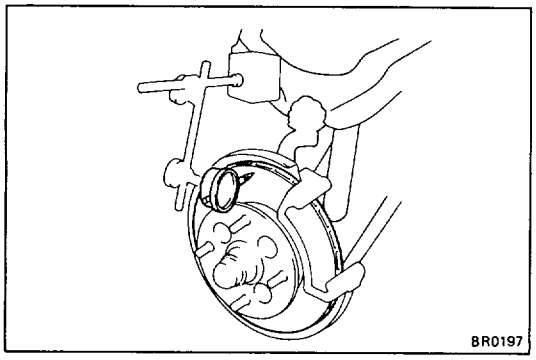
Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible) or if it shows sign of uneven wear.



2. MEASURE ROTOR DISC THICKNESS

Minimum thickness: 21.0 mm (0.827 in.)
Standard thickness: 22.0 mm (0.866 in.)

If the disc thickness is less than minimum, replace the disc.



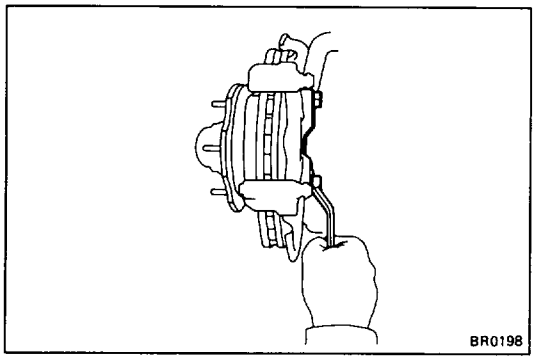
3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of rotor disc.

Maximum disc runout: 0.15 mm (0.0059 in.)

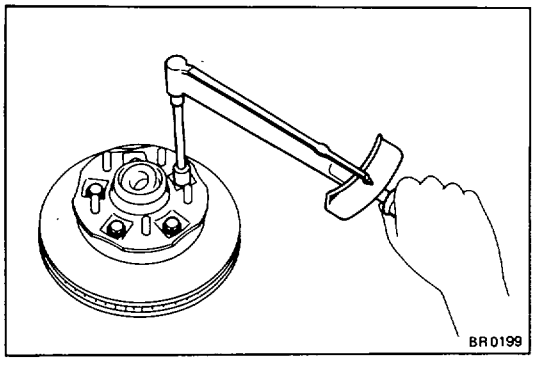
If the runout is greater than the maximum, replace the disc.

NOTE: Make sure the front bearing is adjusted correctly before measuring the slit.



4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the torque plate from the knuckle.
(b) Remove the axle hub. (See page FA-7)
(c) Remove the disc from the axle hub.

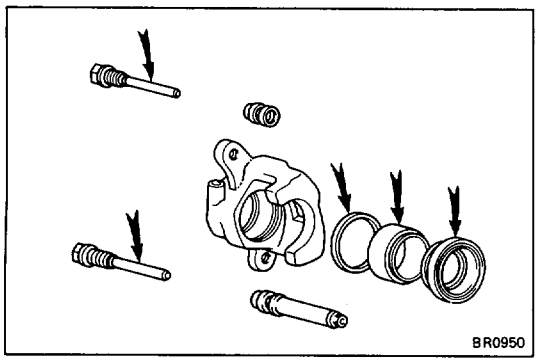


(d) Install a new rotor disc. Torque the bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)

(e) Install the axle hub and adjust the front bearing preload. (See page FA-8)
(f) Install the torque plate onto the knuckle.

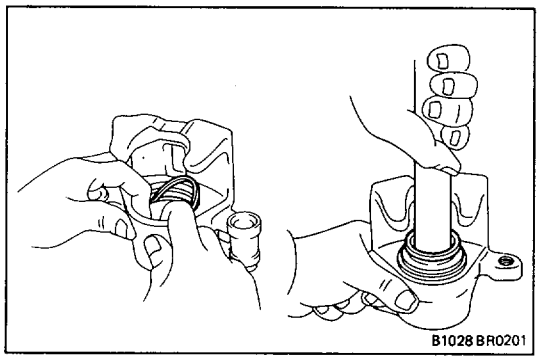
Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)



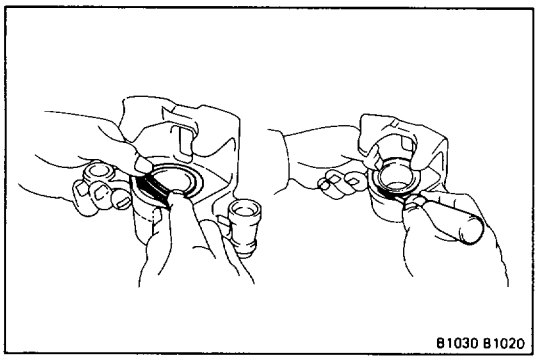
ASSEMBLY OF CYLINDER

(See page BR-21)

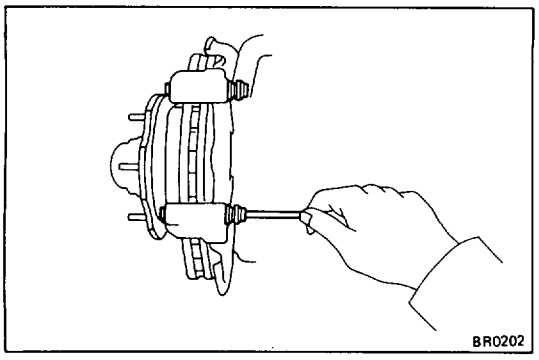
1. **APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS**



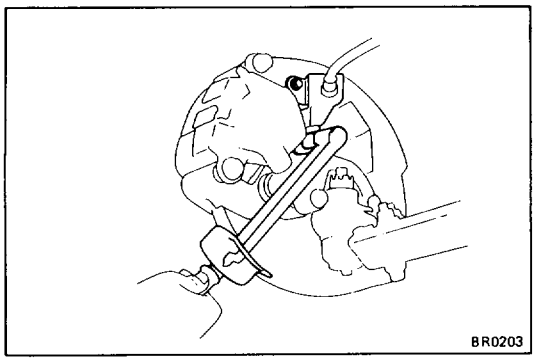
2. **INSTALL PISTON SEAL AND PISTON IN CYLINDER**

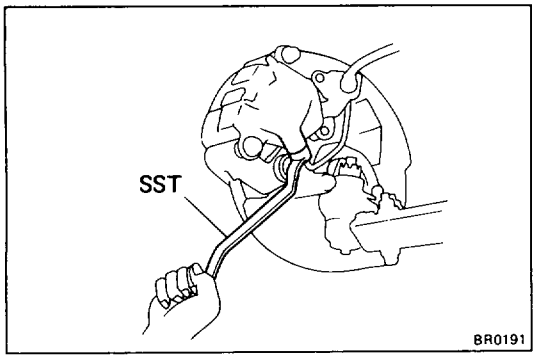


3. **INSTALL CYLINDER BOOT AND SET RING IN CYLINDER**



4. **INSTALL PIN BOOTS AND SLIDE BUSHING**
   (a) Install the pin boots to the torque plate of the main pin side.
   (b) Using a plastic bar, install the slide bushing into the torque plate of the sub pin side.





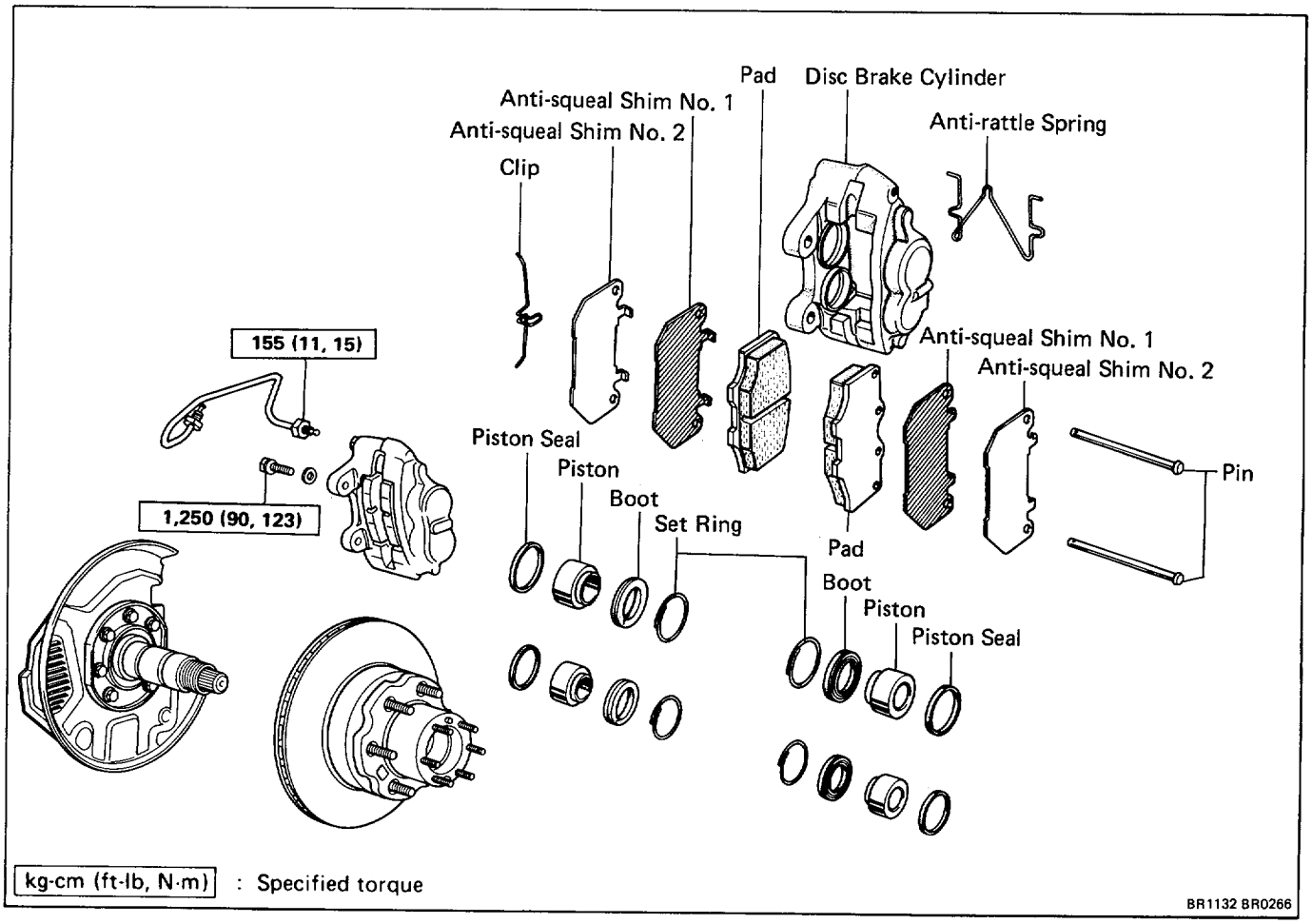
INSTALLATION OF CYLINDER

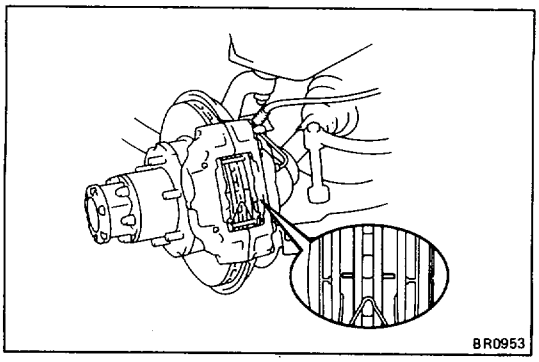
(See page BR-21)

1. **INSTALL PADS (See step 7 on page BR-22)**
2. **INSTALL CYLINDER**
   (See step 8 on page BR-23)
3. **INSTALL BRACKET TO CYLINDER**
   Torque: 185 kg-cm (13 ft-lb, 18 N·m)
4. **CONNECT BRAKE LINE**
   Using SST, connect the brake line.
   SST 09751-36011
   Torque: 155 kg-cm (11 ft-lb, 15 N·m)
5. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR-6)**
6. **CHECK FOR FLUID LEAKAGE**

FRONT BRAKE-4WD (S12 + 8 Type Disc)

COMPONENTS





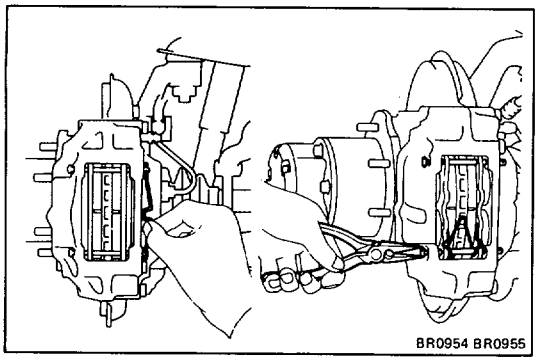
PLACEMENT OF BRAKE PADS

1. **REMOVE FRONT WHEEL**

2. **INSPECT PAD LINING THICKNESS**

   Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

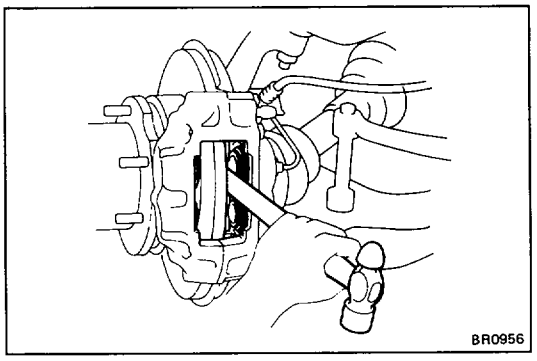
   Minimum thickness: 1.0 mm (0.039 in.)



3. **REMOVE FOLLOWING PARTS:**
   - (a) Clip
   - (b) Two pins
   - (c) Anti-rattle spring
   - (d) Two pads
   - (e) Four anti-squeal shims
     - Two anti-squeal shims No.1 (Black)
     - Two anti-squeal shims No.2 (Silver)

4. **CHECK ROTOR DISC THICKNESS**
(See step 2 on page BR-33)

5. **CHECK ROTOR DISC RUNOUT**
(See step 3 on page BR-33)


BR0956

6. **INSTALL NEW PADS**

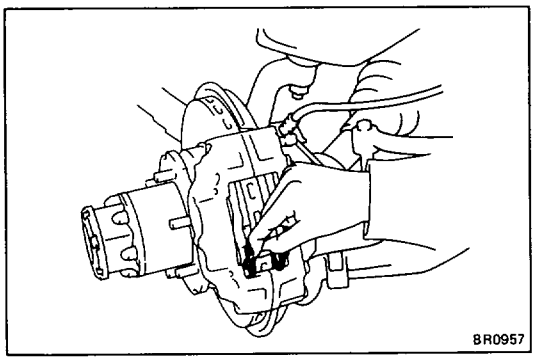
(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in the piston with a hammer handle or an equivalent.

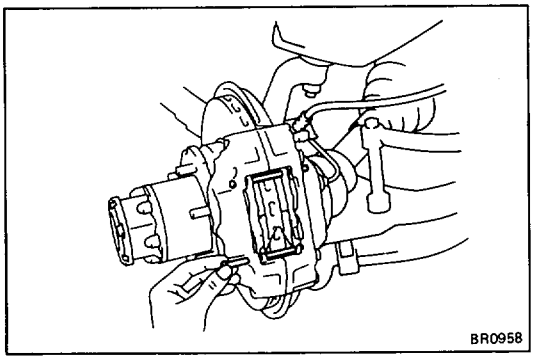
NOTE: Always change the pad on one wheel at a time as there is possibility of the opposite piston flying out.

(c) Install the new pads and shims into the cylinder.

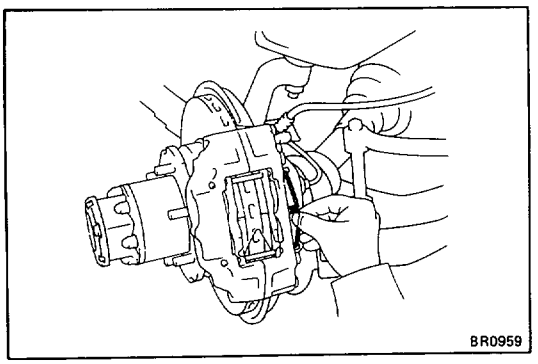
CAUTION: Do not allow oil or grease to get on the rubbing face.


BR0957

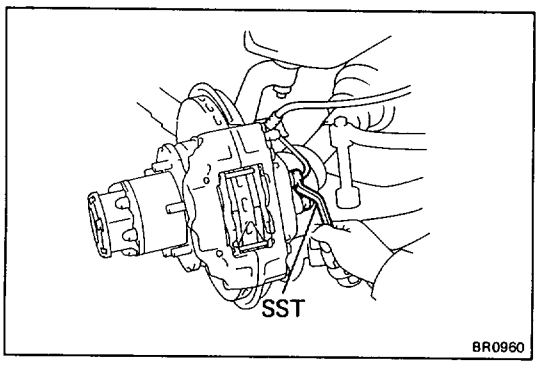
7. **INSTALL ANTI-RATTLE SPRING**


BR0958

8. **INSTALL TWO PINS**


BR0959

9. **INSTALL CLIP**



REMOVAL OF CYLINDER

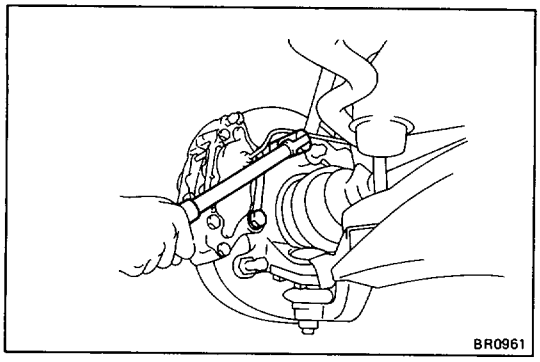
(See page BR-29)

1. **REMOVE FRONT WHEEL**

2. **DISCONNECT BRAKE LINE**

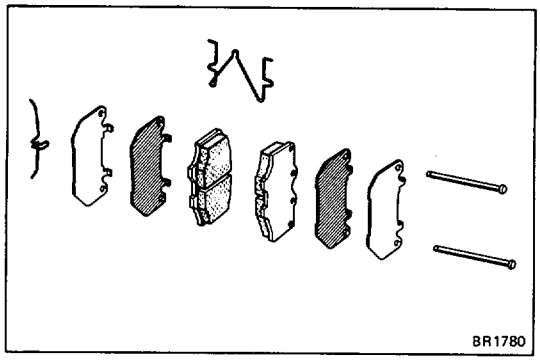
   Using SST, disconnect the brake line.
   Use a container to catch the brake fluid.

   SST 09751-36011



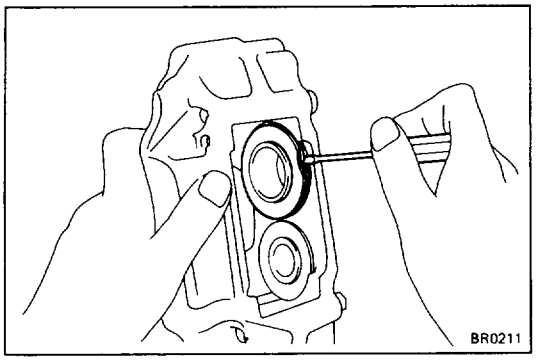
3. **REMOVE CYLINDER**

   Remove the two mounting bolts and cylinder.



4. **REMOVE FOLLOWING PARTS:**

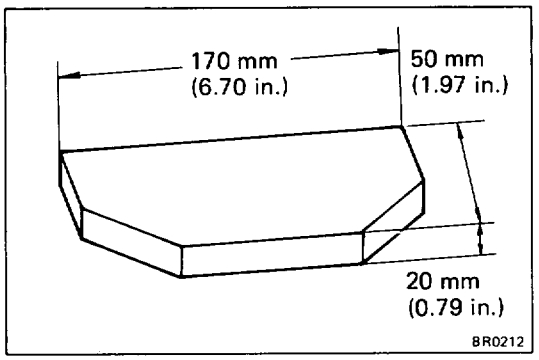
   (a) Clip
   (b) Two pins
   (c) Anti-rattle spring
   (d) Two pads
   (e) Four anti-squeal shims
   - Two anti-squeal shims No.1 (Black)
   - Two anti-squeal shims No.2 (Silver)



DISASSEMBLY OF CYLINDER

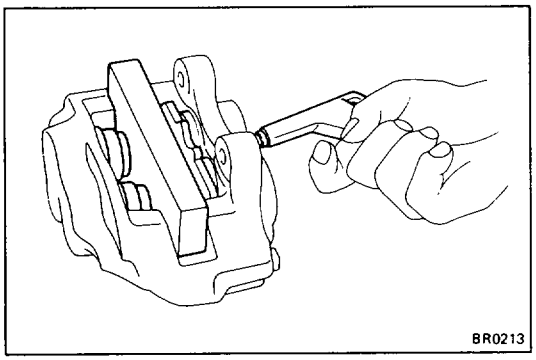
1. REMOVE CYLINDER BOOT SET RING AND BOOT

Using a screwdriver, remove the cylinder boot set ring and boot.



2. REMOVE PISTON FROM CYLINDER

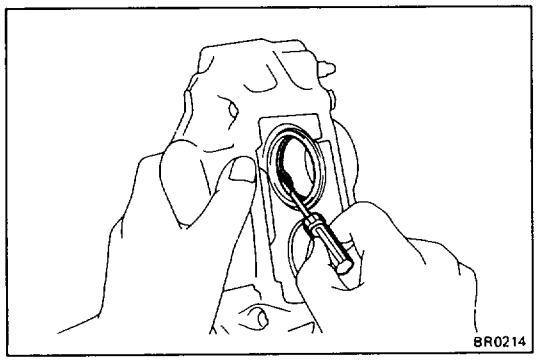
(a) Prepare the wooden plate as shown in the figure to hold the piston.



(b) Place the plate between the pistons and insert a pad at one side.

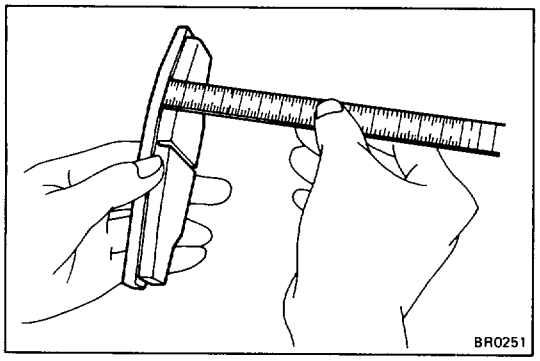
(c) Use compressed air to remove the pistons alternately from the cylinder.

WARNING: Do not place your fingers in front of the piston when using compressed air.



3. REMOVE PISTON SEAL

Using a screwdriver, remove the seal from the cylinder.

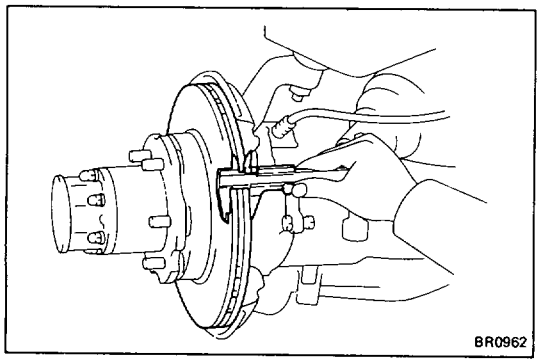


INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 9.5 mm (0.374 in.)
Minimum thickness: 1.0 mm (0.039 in.)

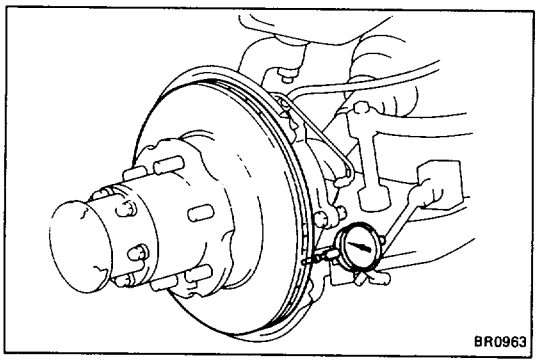
Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible) or if it shows sign of uneven wear.



2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 20.0 mm (0.787 in.)
Minimum thickness: 19.0 mm (0.748 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.15 mm (0.0059 in.)

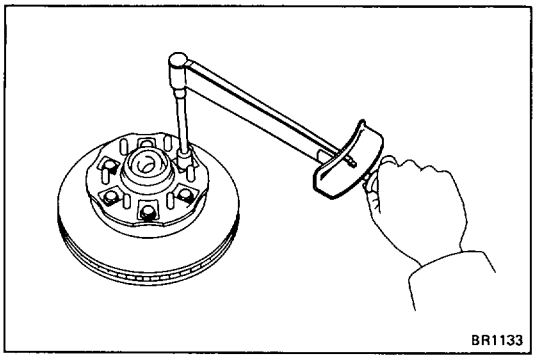
If the runout is greater than the maximum, replace the disc.

NOTE: Before measureing the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the axle hub. (See page FA-7)

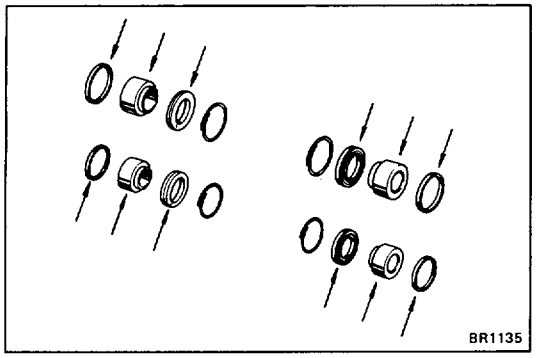
(b) Remove the disc from the axle hub.



(c) Install a new rotor disc. Torque the bolts.

Torque: 650 kg-cm (47 ft-lb, 64 N·m)

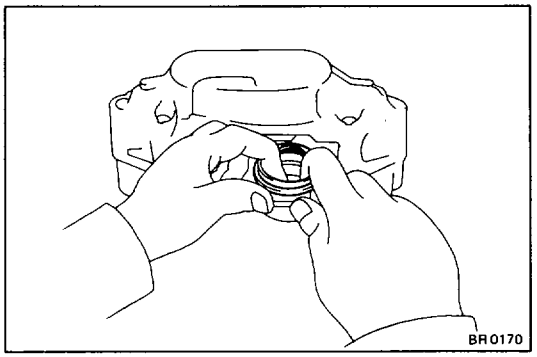
(d) Install the axle hub and adjust the front bearing preload. (See page FA-8)



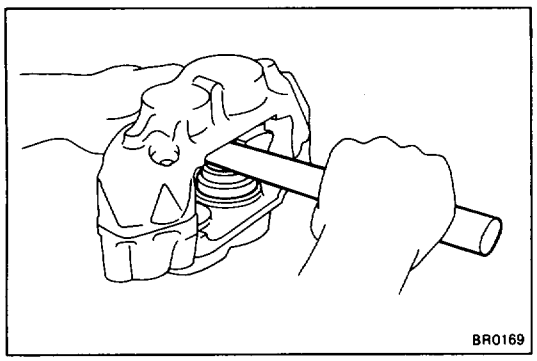
ASSEMBLY OF CYLINDER

(See page BR-29)

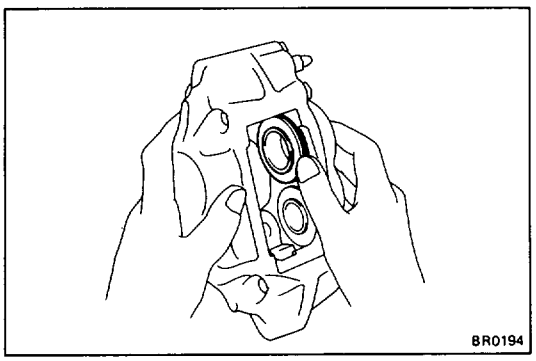
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS



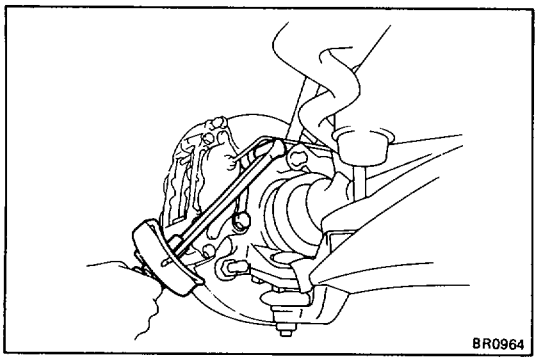
2. INSTALL PISTON SEAL IN CYLINDER



3. INSTALL PISTON IN CYLINDER



4. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER



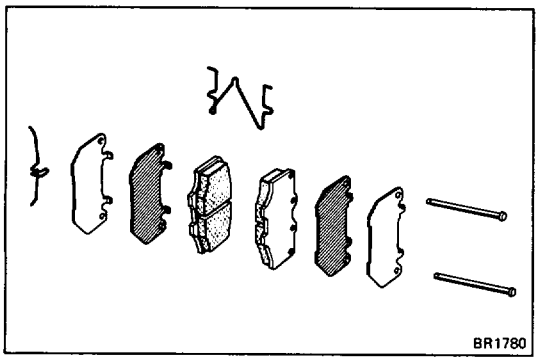
INSTALLATION OF CYLINDER

(See page BR-29)

1. **INSTALL CYLINDER**

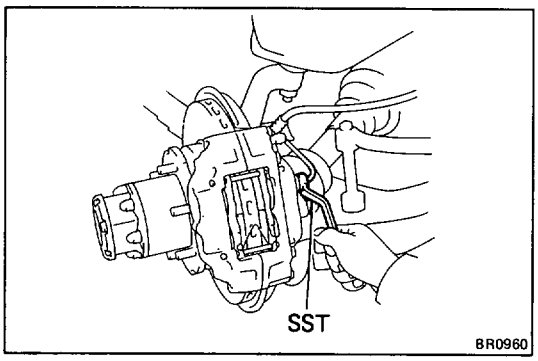
   Install and torque the mounting bolts.

   Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)



2. **INSTALL FOLLOWING PARTS:**
   (a) Two pads
   (b) Four anti-squeal shims
   - Two anti-squeal shims No.1 (Black)
   - Two anti-squeal shims No.2 (Silver)

   (c) Anti-rattle spring
   (d) Two pins
   (e) Clip



3. **CONNECT BRAKE LINE**

   Using SST, connect the brake line.

   SST 09751-36011

   Torque: 155 kg-cm (11 ft-lb, 15 N·m)

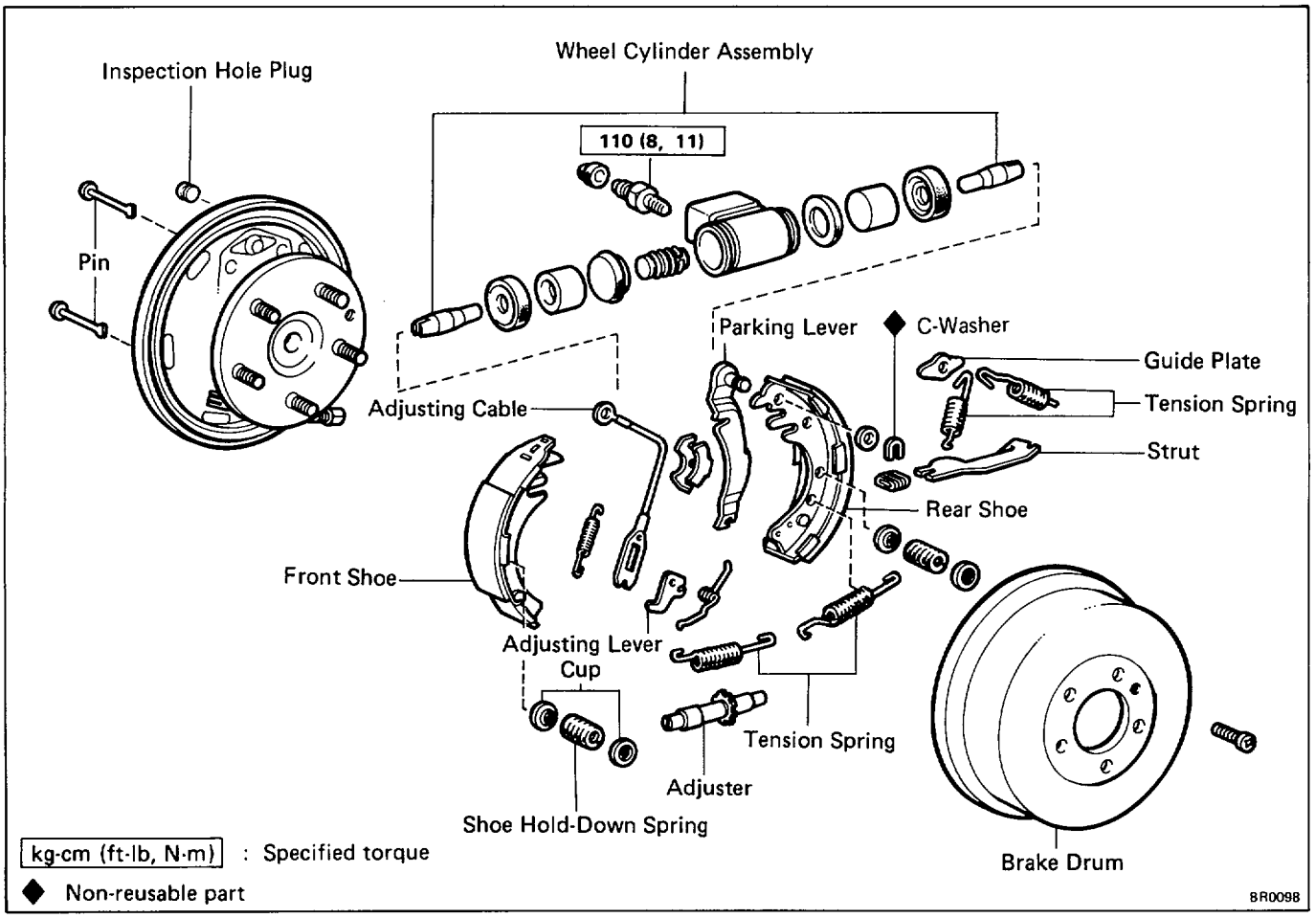
4. **FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM**
   (See page BR-6)

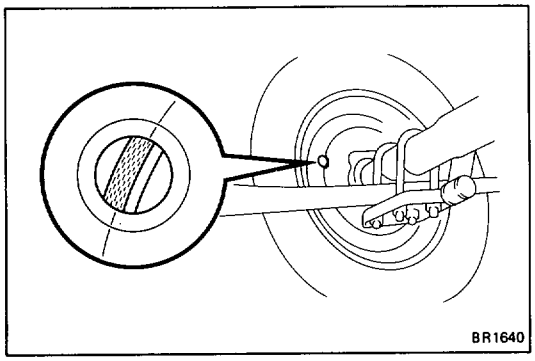
5. **CHECK FOR FLUID LEAKAGE**

6. **INSTALL FRONT WHEEL**

REAR BRAKE—2WD (Duo-Servo Type)

COMPONENTS





REMOVAL OF REAR DRUM BRAKE

1. INSPECT SHOE LINING THICKNESS

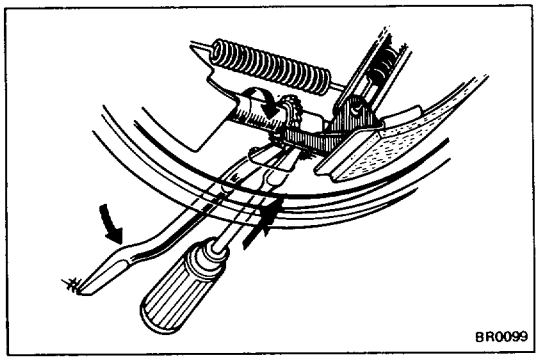
Remove the inspection hole plug, and check the shoe lining thickness through the hole.
If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL AND BRAKE DRUM

(Single tire)
Remove the brake drum.

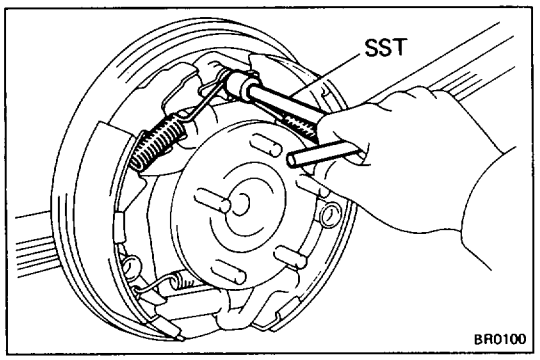
(Double tire)
Remove the rear axle shaft and remove the drum with axle hub. (See page RA-6)



NOTE: If the brake drum cannot be removed easily, perform the following steps.

(a) Insert a screwdriver through the hole in the backing plate, and hold the adjuster lever away from the adjuster.

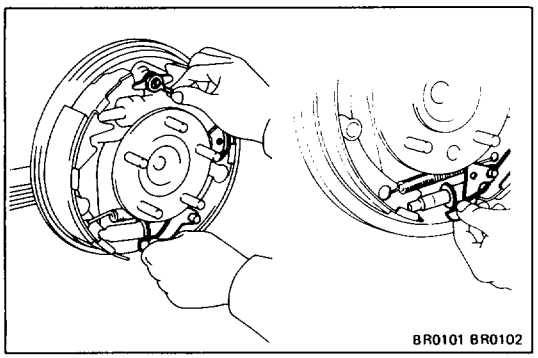
(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



3. REMOVE TWO SHOE RETURN SPRINGS

Using SST, remove the two return springs.

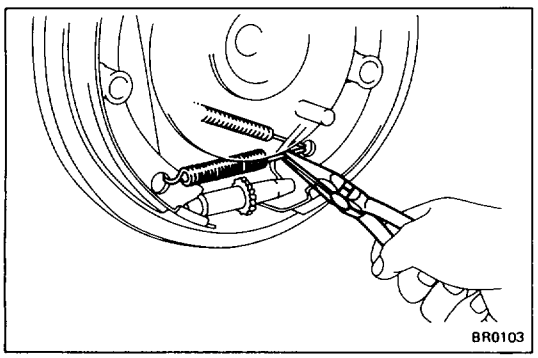
SST 09717-20010



4. REMOVE ADJUSTING CABLE, SHOE GUIDE PLATE, CABLE GUIDE AND ADJUSTING LEVER

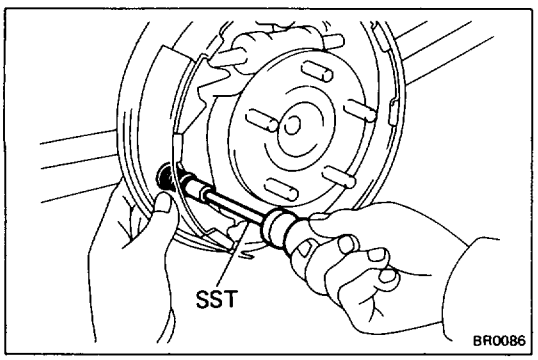
(a) Push up the lever and remove the cable, shoe guide plate and cable guide.

(b) Take off the spring from the lever and remove the lever and spring.



5. REMOVE TWO TENSION SPRINGS

Using pliers, remove the two tension springs.

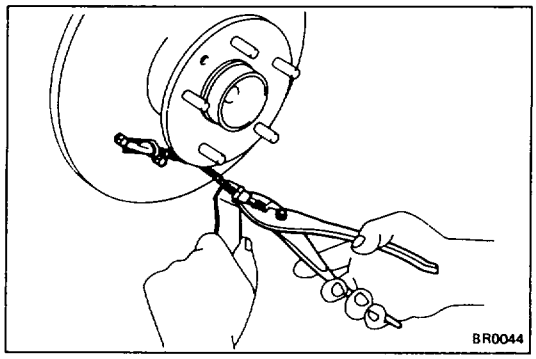


6. REMOVE SHOES, ADJUSTER AND STRUT

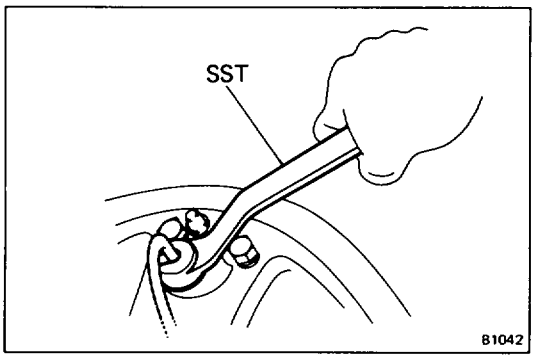
(a) Using SST, remove the shoe hold-down springs, cups and pins.

SST 09718-00010

(b) Remove the shoes, adjuster and strut.



(c) Disconnect the parking brake cable from the parking brake lever.



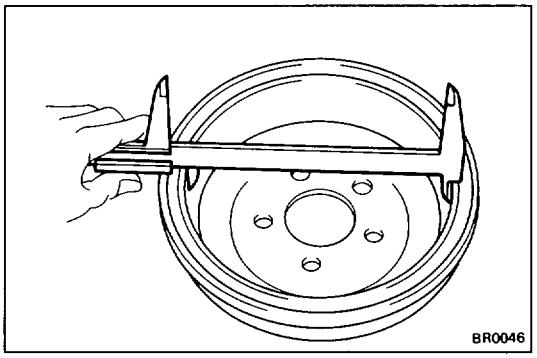
7. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Using SST, disconnect the line.
Use a container to catch the brake fluid.

SST 09751-36011

(b) Remove the two bolts and the wheel cylinder.

(c) Remove the two rods, boots, pistons, piston cups and one spring from the cylinder.

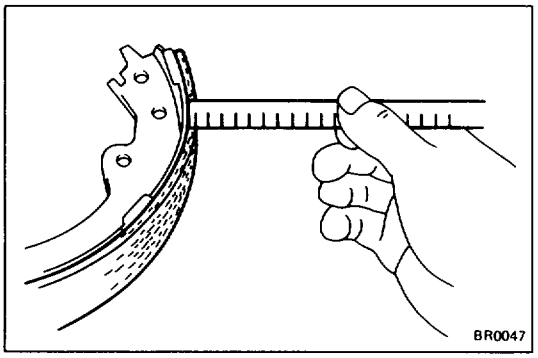


INSPECTION OF REAR BRAKE COMPONENTS

1. MEASURE BRAKE DRUM INSIDE DIAMETER

Maximum inside diameter: 256.0 mm (10.079 in.)
Standard inside diameter: 254.0 mm (10.000 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

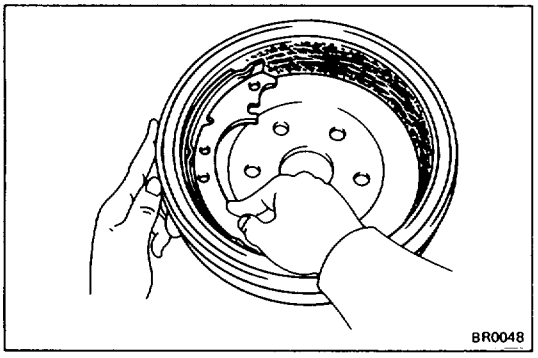


2. MEASURE BRAKE SHOE LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)
Standard thickness: 5.0 mm (0.197 in.)

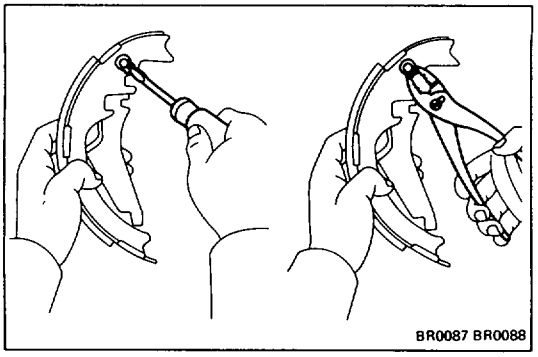
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

NOTE: If any brake shoe has to be replaced, replace all the rear brake shoes to maintain effective brakes.



3. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

Replace the brake shoe or turn the brake drum, as necessary.



4. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever from the front shoe.

(b) Using pliers, install the parking brake lever with a new C-washer.

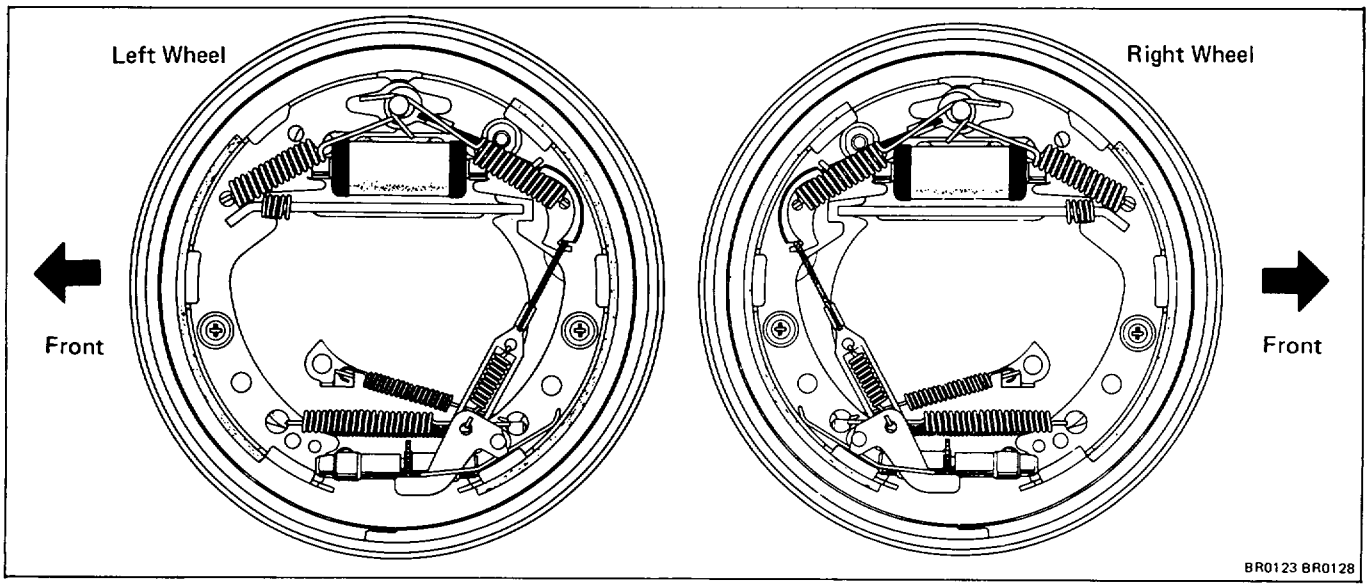
5. INSPECT WHEEL CYLINDER FOR CORROSION OR DAMAGE

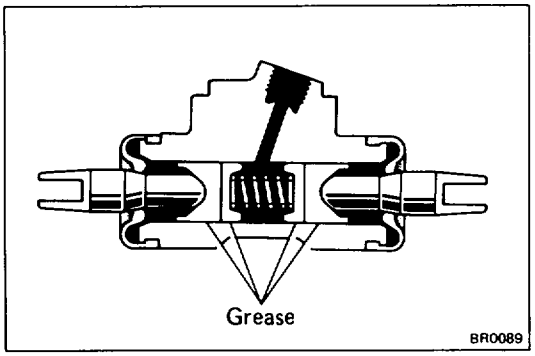
6. INSPECT BACKING PLATE FOR WEAR OR DAMAGE

ASSEMBLY OF REAR BRAKES

(See page BR-36)

NOTE: Assemble the parts in the correct direction as shown.





1. **IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER**

(a) Apply lithium soap base glycol grease to the piston cups and piston.
Install the spring and two piston cups in the wheel cylinder.
Make sure flanges of the cups are pointed inward.

(b) Install the two pistons, boots and rods in the cylinder.

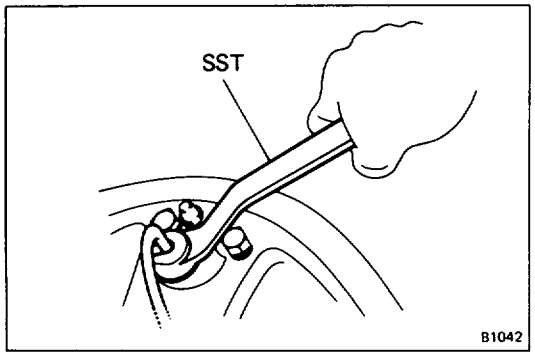
(c) Install the wheel cylinder on the backing plate with two bolts.

Torque: 145 kg-cm (10 ft-lb, 14 N·m)

(d) Using SST, connect the brake line.

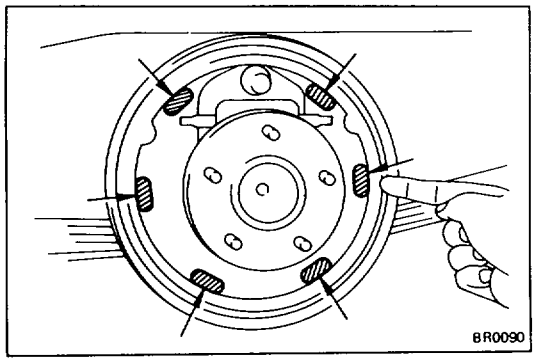
SST 09751-36011

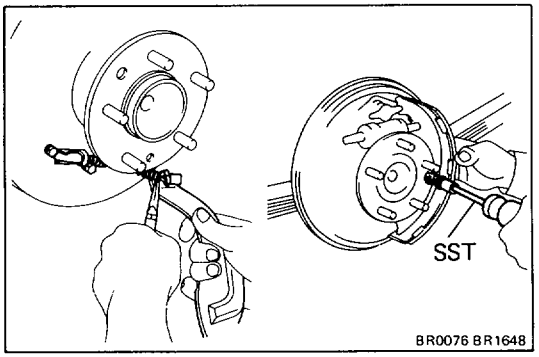
Torque: 155 kg-cm (11 ft-lb, 15 N·m)



2. **APPLY GREASE ON BACKING PLATE, AS SHOWN**

Use high temperature grease.



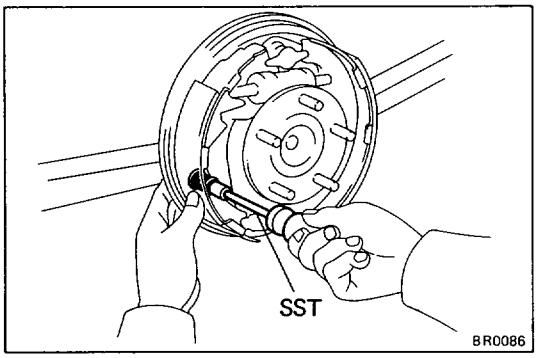


3. INSTALL REAR SHOE

(a) Install the parking brake cable to the parking brake lever.

(b) Set the rear brake shoe in place with the end of the shoe inserted in the piston rod.
Using SST, install the shoe hold-down spring and pin.

SST 09718-00010

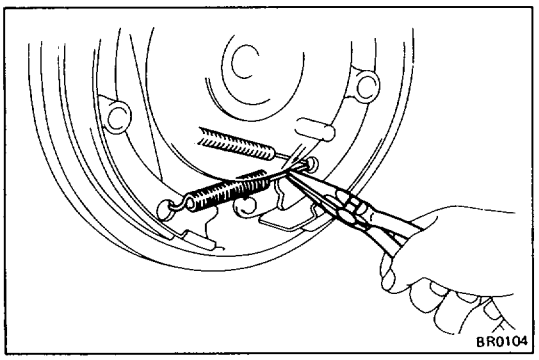


4. INSTALL STRUT AND FRONT SHOE

(a) Install the strut with the spring rearward.

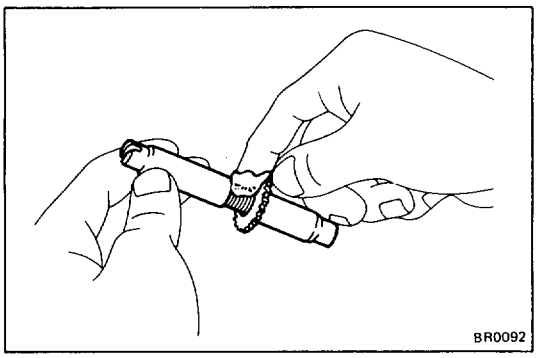
(b) Set the front brake shoe in place with the end of the shoe inserted in the piston rod and the strut in place.
Using SST, install the shoe hold-down spring and pin.

SST 09718-00010



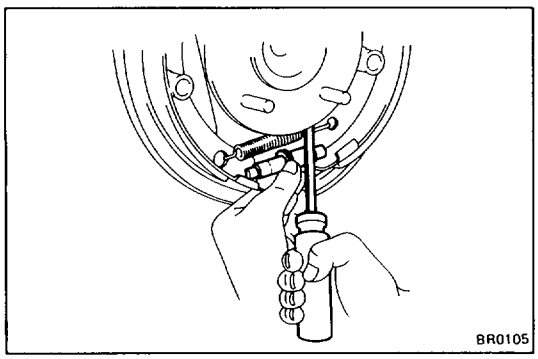
5. INSTALL TWO TENSION SPRINGS

Using pliers, install the two tension springs.



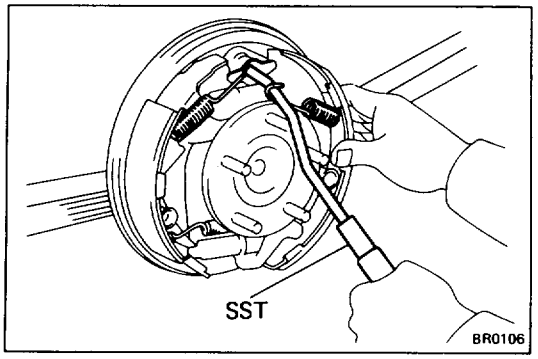
6. APPLY GREASE TO ADJUSTER BOLT THREADS AND END

Use high temperature grease.



7. INSTALL ADJUSTER

Using a screwdriver, open the shoes and install the adjuster.

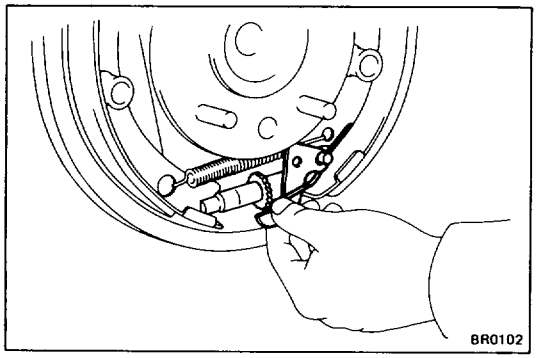


8. INSTALL SHOE GUIDE PLATE, CABLE GUIDE, ADJUSTING CABLE AND RETURN SPRINGS

(a) Install the shoe guide plate, cable guide and adjusting cable.

(b) Using SST, install the front return spring and then install the rear return spring.

SST 09718-20010

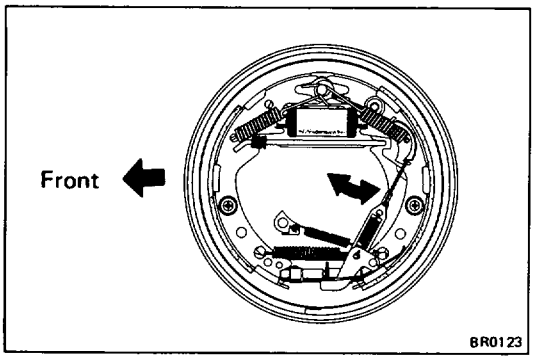


9. INSTALL ADJUSTING LEVER

(a) Install the tension spring to the rear shoe.

(b) Hook the adjusting lever with the cable and install the lever.

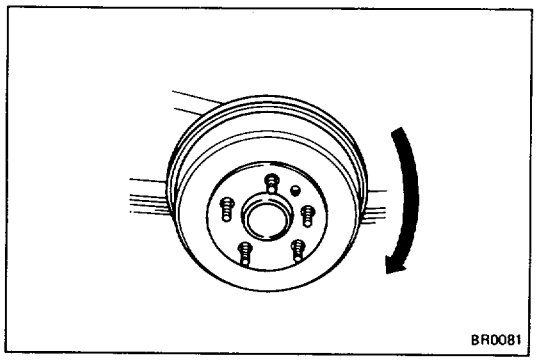
(c) Hold the adjusting lever with the tension spring.



10. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Pull the adjusting cable backward as shown, and release.
Check that the adjusting bolt turns.

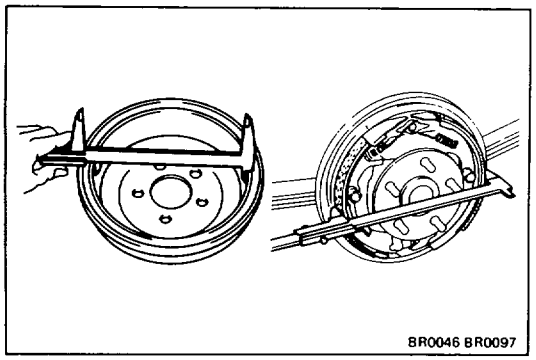
If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the adjuster to the shortest possible length.

(c) Install the drum.

(d) Turn the brake drum in reverse direction and depress the brake pedal. Repeat this procedure until a clicking sound can no loger be heard.



11. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

12. INSTALL BRAKE DRUM

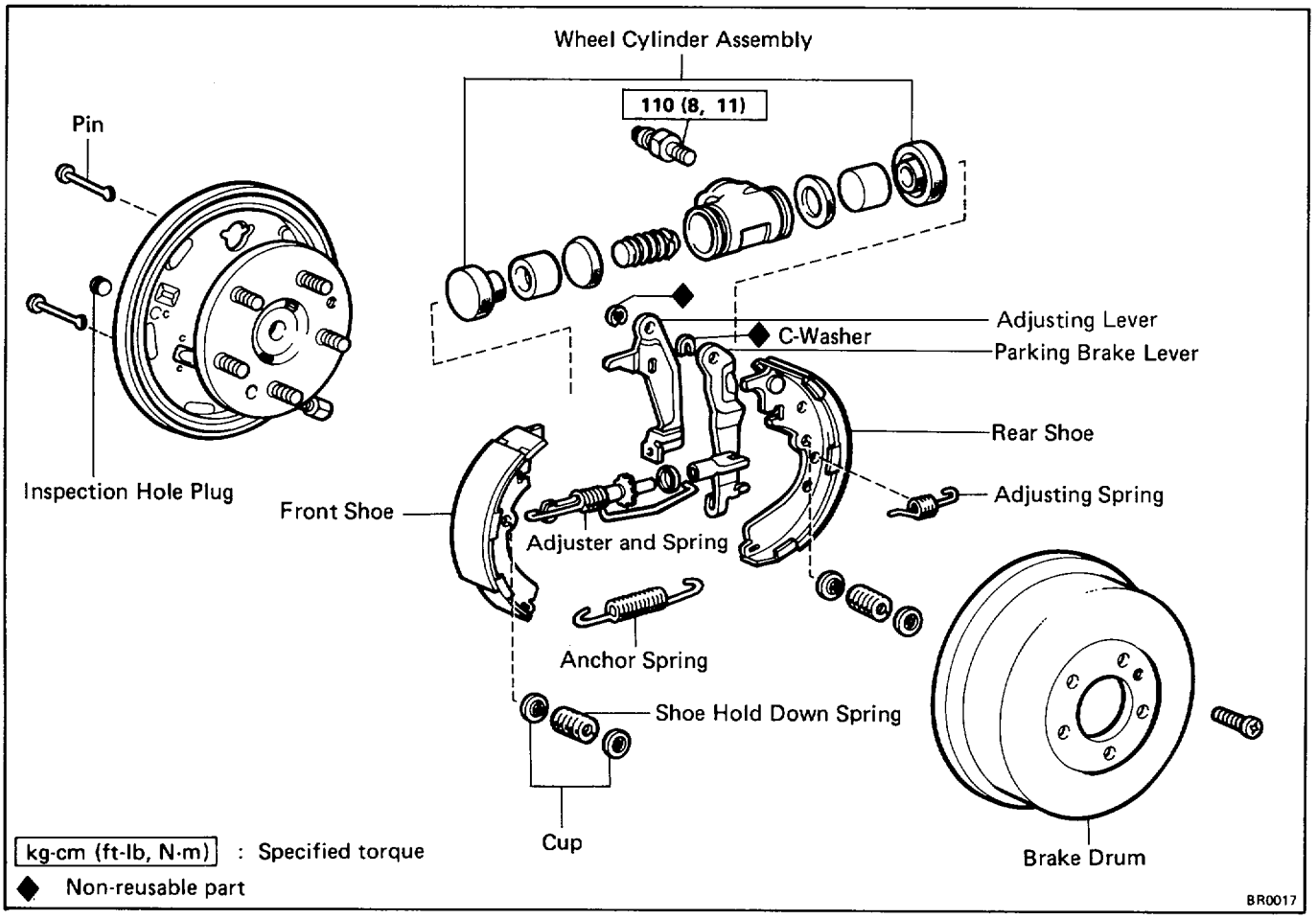
(Single tire)
Install the brake drum.

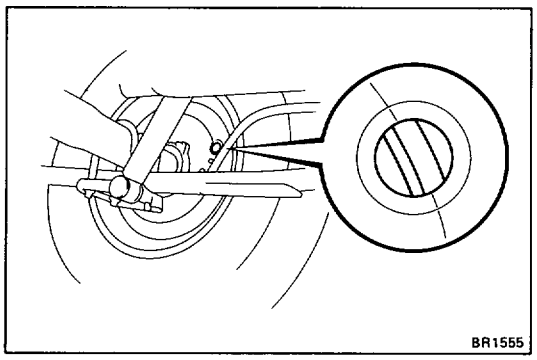
(Double tire)
Install the brake drum with axlehub and install the rear axle shaft. (See page RA-10)

13. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR-6)

REAR BRAKE—2WD (Leading-Trailing Type)

COMPONENTS



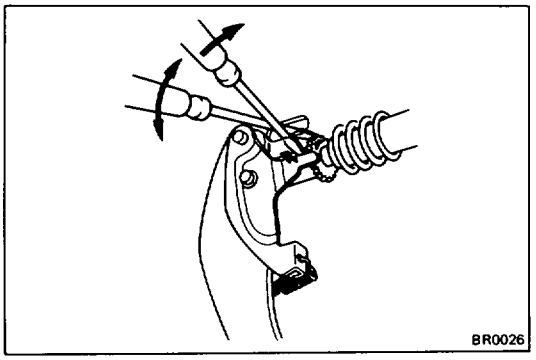


REMOVAL OF REAR DRUM BRAKE

1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.
If less than minimun, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

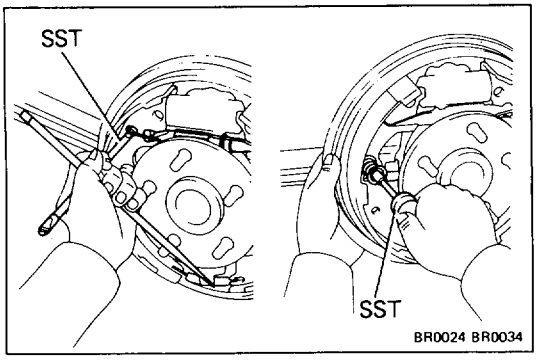


2. REMOVE BRAKE DRUM

NOTE: If the brake drum cannot be removed easily, perform the following steps.

(a) Insert a screwdriver through the hole in the backing plate, and hold the adjusting lever away from the adjuster.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjuster.



3. REMOVE FRONT BRAKE SHOE

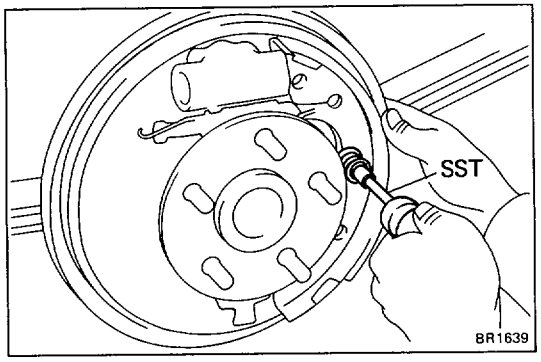
(a) Using SST, remove the return spring.

SST 09703-30010

(b) Using SST, remove the front shoe hold-down spring and pin.

SST 09718-00010

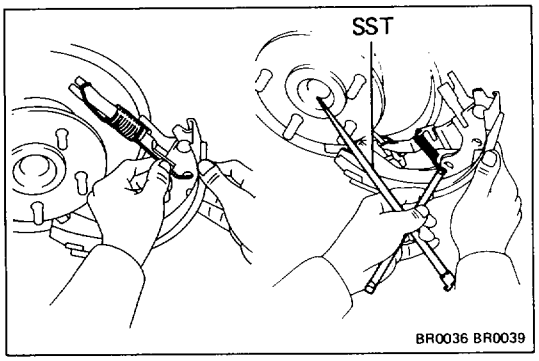
(c) Remove the front brake shoe and anchor spring.



4. REMOVE REAR BRAKE SHOE, LEVER AND STRUT

(a) Using SST, remove the hold-down spring and pin, and remove the rear shoe.

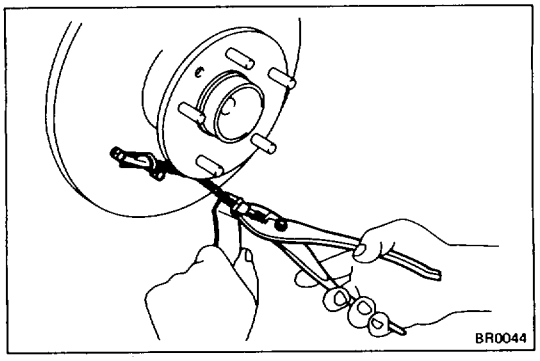
SST 09718-00010



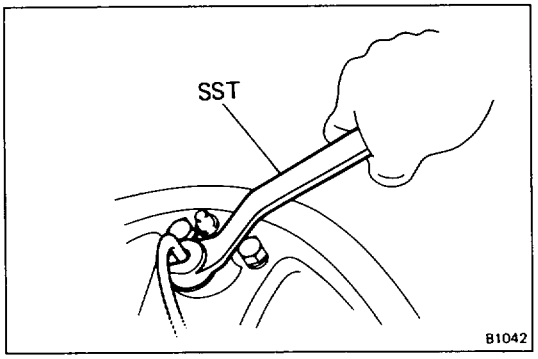
(b) Remove the adjuster and spring from the parking brake lever.

(c) Using SST, remove the adjusting lever spring.

SST 09703-30010



(d) Remove the parking brake cable from the parking brake lever.



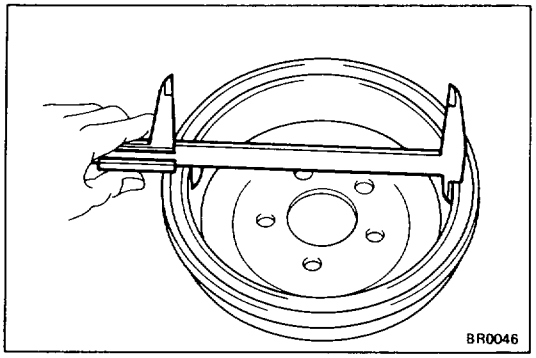
5. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Using SST, disconnect the line.
Use a container to catch the brake fluid.

SST 09751-36011

(b) Remove the two bolts and the wheel cylinder.

(c) Remove the two boots, two pistons, two piston cups and spring from the cylinder.

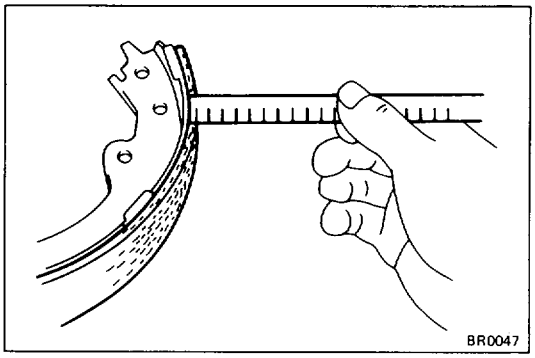


INSPECTION OF REAR BRAKE COMPONENTS

1. MEASURE BRAKE DRUM INSIDE DIAMETER

Maximum inside diameter: 256.0 mm (10.079 in.)
Standard inside diameter: 254.0 mm (10.000 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

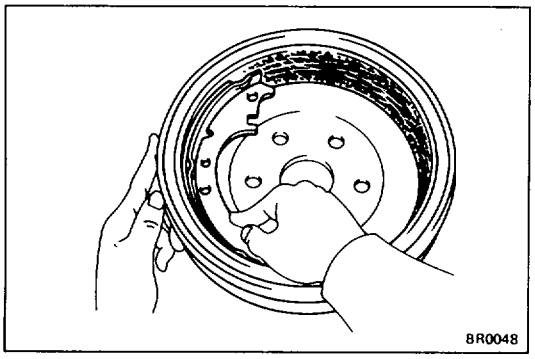


2. MEASURE BRAKE SHOE LINING THICKNESS

Minimum thickness: 1.0 mm (0.039 in.)
Standard thickness: 5.0 mm (0.197 in.)

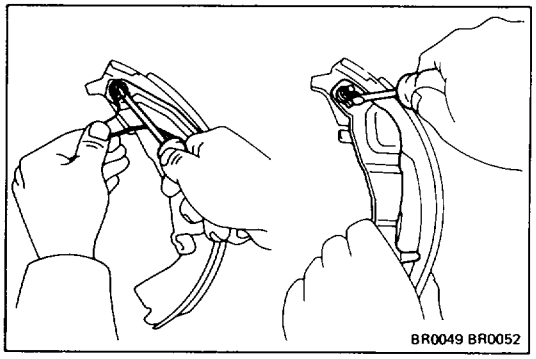
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

NOTE: If any brake shoe has to be replaced, replace all the rear brake shoes to maintain effective brakes.



3. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

Replace the brake shoe or turn the brake drum, as necessary.



4. IF NECESSARY, REPLACE BRAKE SHOES

(a) Using a screwdriver, remove the parking brake lever and automatic adjusting lever from the front shoe.

(b) Using pliers, install the parking brake lever with a new C-washer, and install the automatic adjusting lever with an E-ring.

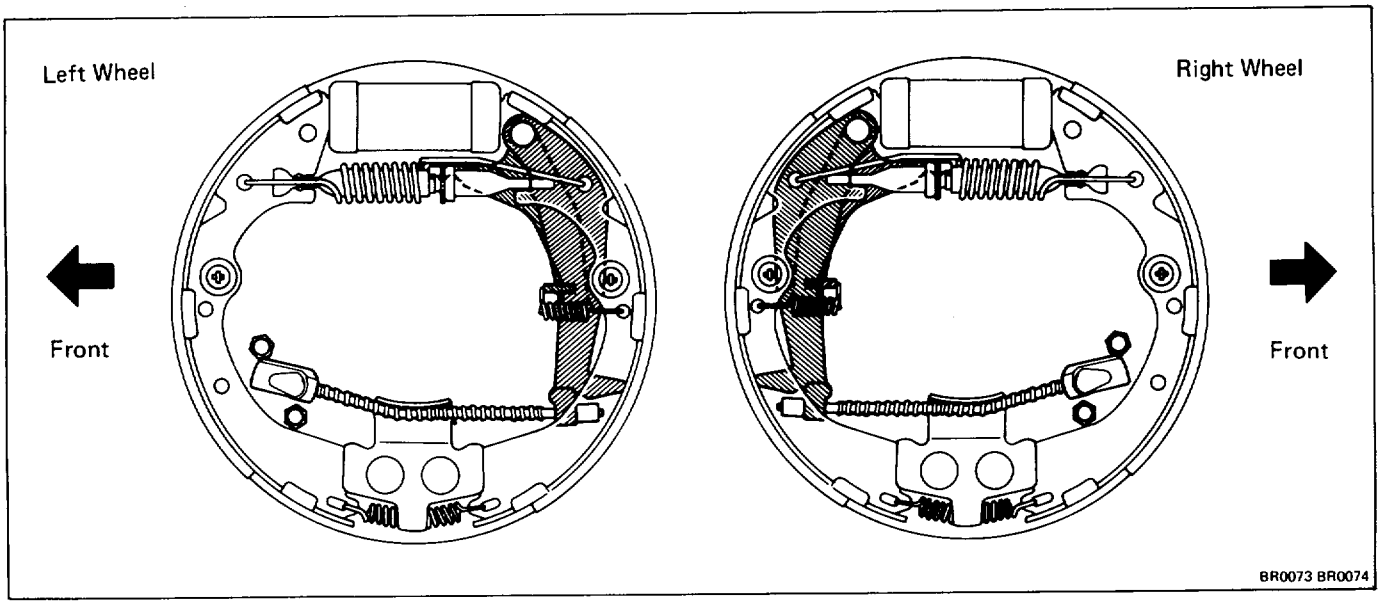
5. INSPECT WHEEL CYLINDER FOR CORROSION OR DAMAGE

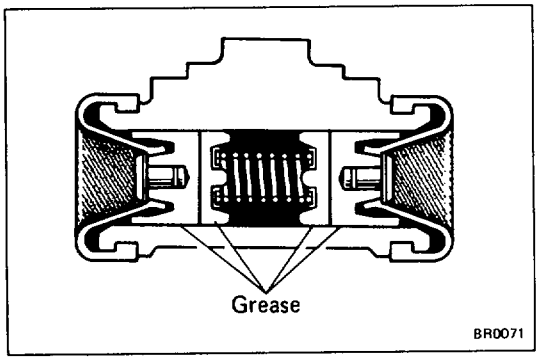
6. INSPECT BACKING PLATE FOR WEAR OR DAMAGE

ASSEMBLY OF REAR BRAKE

(See page BR-44)

NOTE: Assemble the parts in the correct direction as shown.





1. **IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER**

(a) Apply lithium soap base glycol grease to the piston cups and piston.
Install the spring and two piston cups in the wheel cylinder.
Make sure the flanges of the cups are pointed inward.

(b) Install two pistons. Apply lithium soap base glycol grease as shown, and install the two boots.

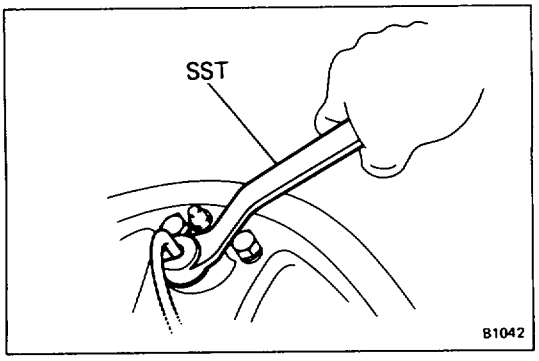
(c) Install the wheel cylinder on the backing plate with two bolts.

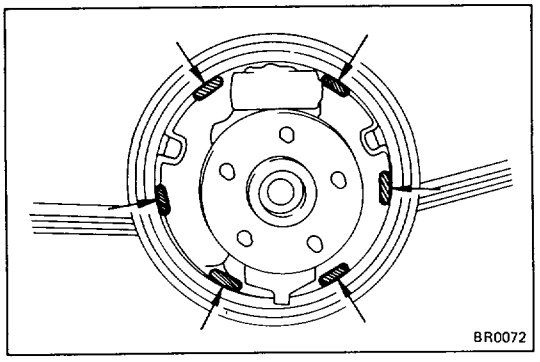
Torque: 100 kg-cm (7 ft-lb, 10 N·m)

(d) Using SST, connect the brake line.

SST 09751-36011

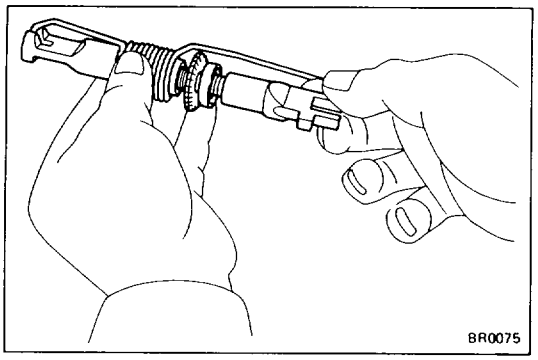
Torque: 155 kg-cm (11 ft-lb, 15 N·m)





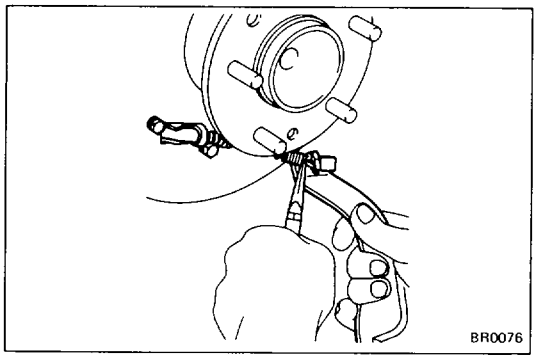
2. **APPLY GREASE ON BACKING PLATE, AS SHOWN**

Use high temperature grease.

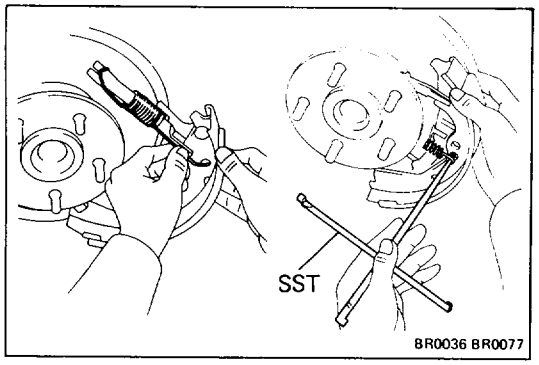


3. **APPLY GREASE TO ADJUSTER BOLT THREADS AND END**

Use high temperature grease.



4. **CONNECT PARKING BRAKE CABLE TO PARKING BRAKE LEVER**

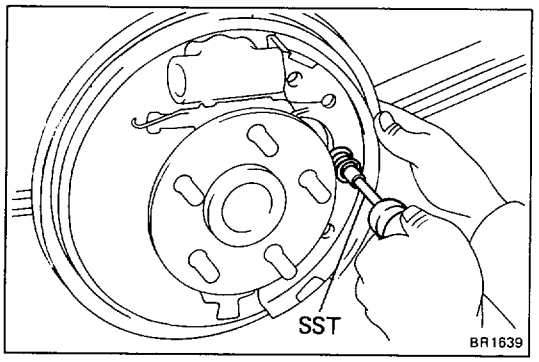


5. **INSTALL ADJUSTER ONTO REAR SHOE**

(a) Install the adjuster and return spring to lever.

(b) Using SST, install the adjusting lever spring.

SST 09703-30010

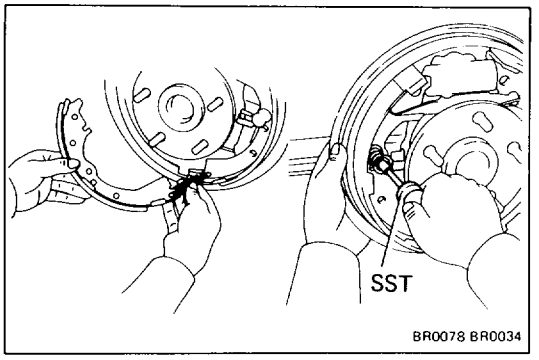


6. **INSTALL REAR SHOE**

(a) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the other end in the anchor plate.

(b) Using SST, install the pin and shoe hold-down spring.

SST 09718-00010



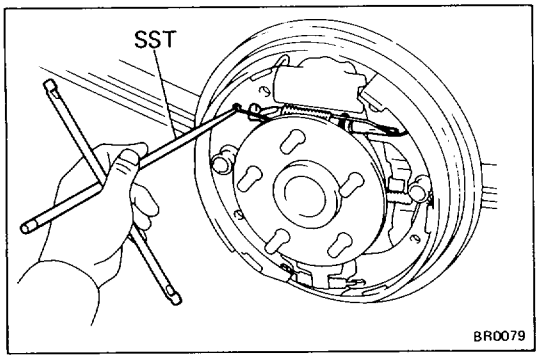
7. **INSTALL FRONT SHOE**

(a) Install the anchor spring between the front and rear shoes.

(b) Set the front shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.

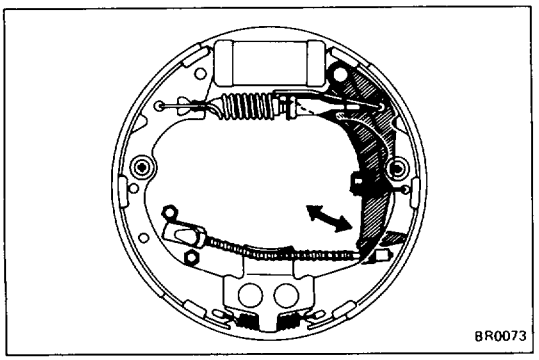
(c) Using SST, install the pin and shoe hold-down spring.

SST 09718-00010



(d) Using SST, install the return spring.

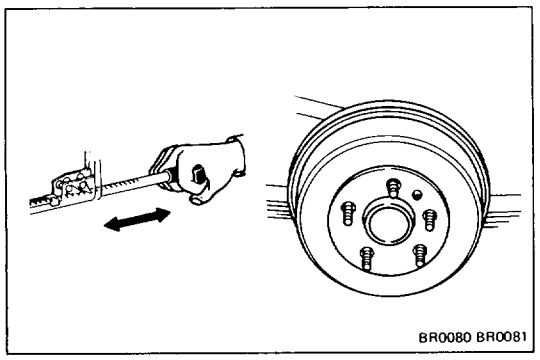
SST 09703-30010



8. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Check that the adjusting bolt turns while pulling the parking brake lever up.

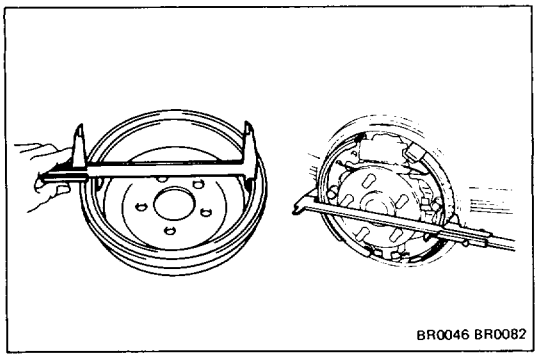
If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the adjuster to the shortest possible length.

(c) Install the drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



9. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

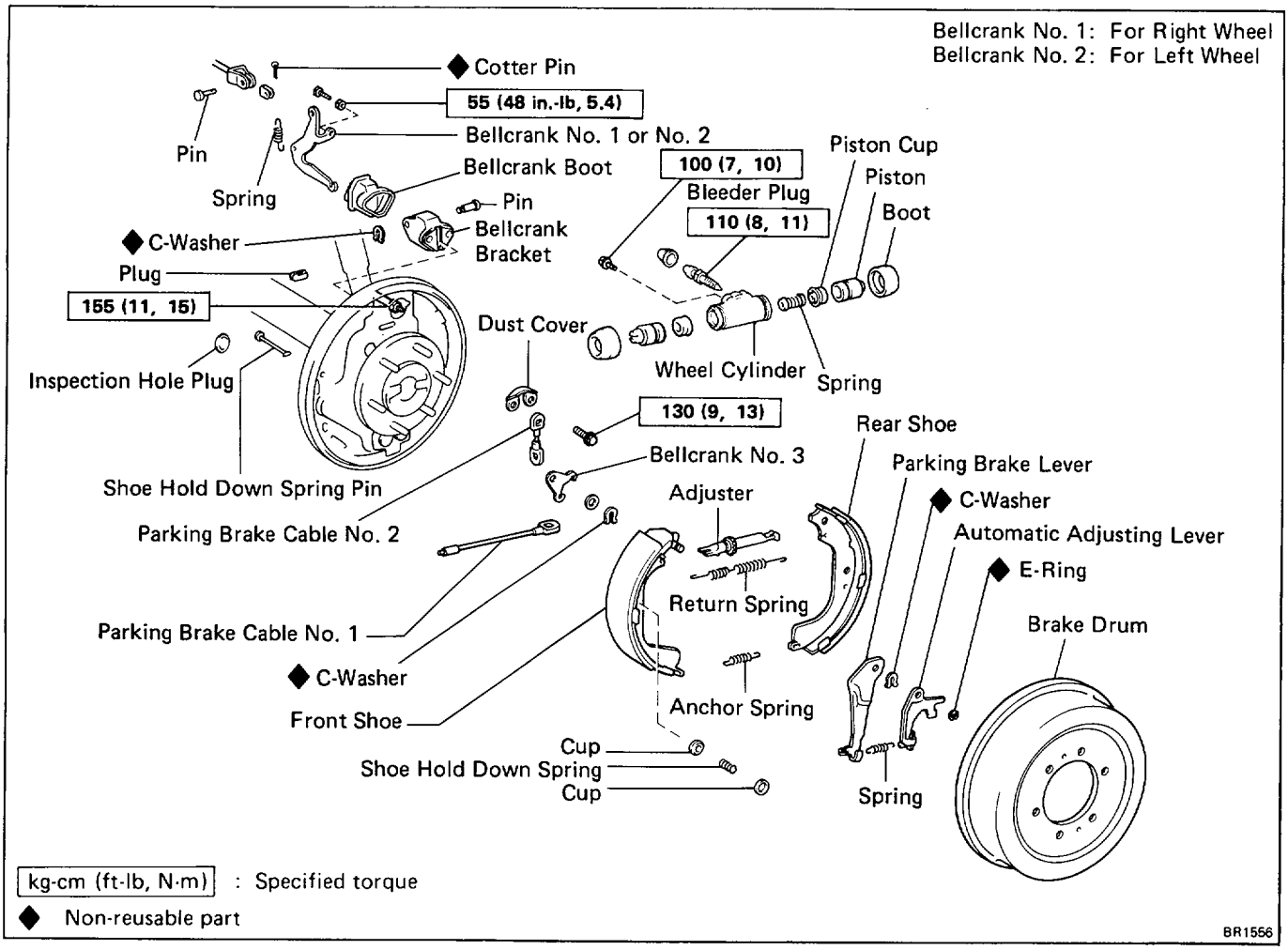
10. INSTALL BRAKE DRUM AND REAR WHEEL

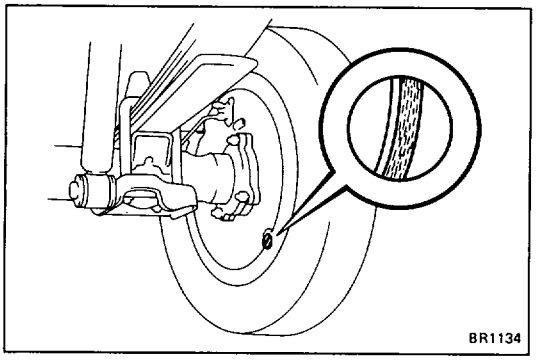
11. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR-6)

REAR BRAKE—4WD

COMPONENTS



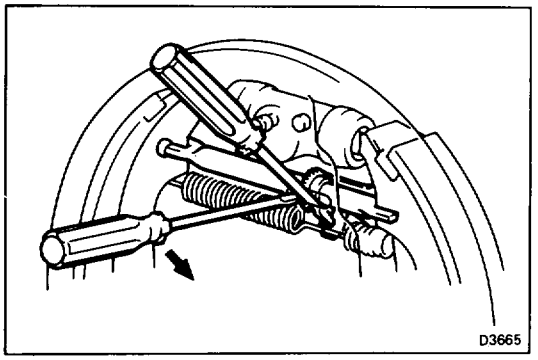


REMOVAL OF REAR DRUM BRAKE

1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.
If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

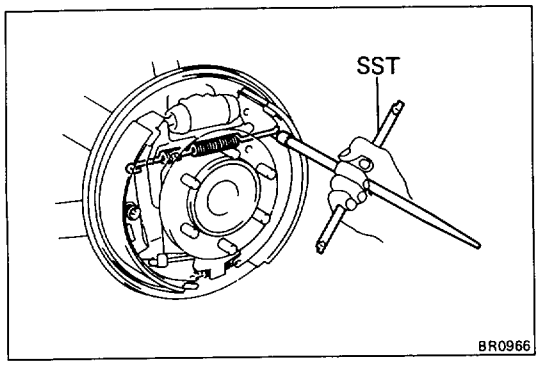


2. REMOVE REAR WHEEL AND BRAKE DRUM

NOTE: If the brake drum cannot be removed easily, perform the following.

(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

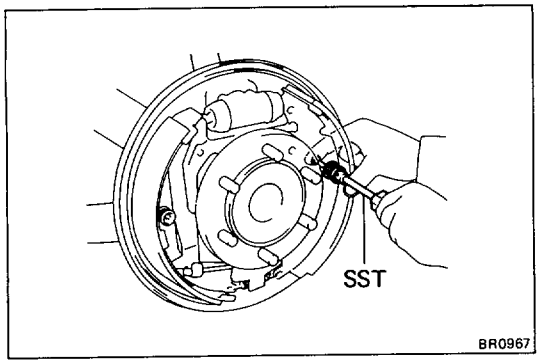
(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt clockwise.



3. REMOVE REAR SHOE

(a) Using SST, remove the tension spring.

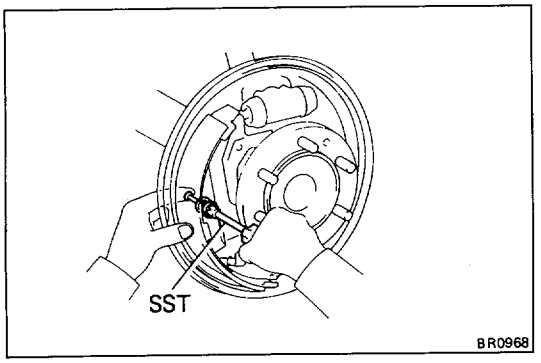
SST 09703-30010



(b) Using SST, remove the rear shoe hold-down spring and pin.

SST 09718-00010

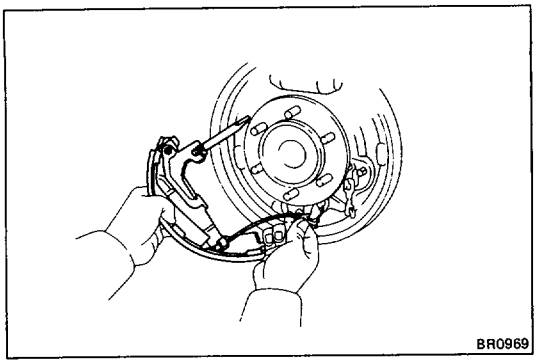
(c) Remove the rear brake shoe and anchor spring.



4. REMOVE FRONT SHOE

(a) Using SST, remove the hold-down spring and pin.

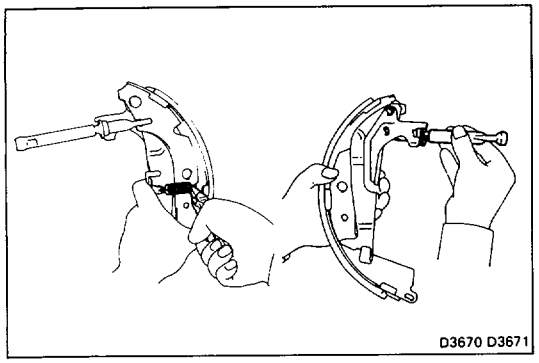
SST 09718-00010



(b) Disconnect the parking brake cable No.1 from the parking brake bellcrank No.3.

(c) Remove the front shoe with adjuster.

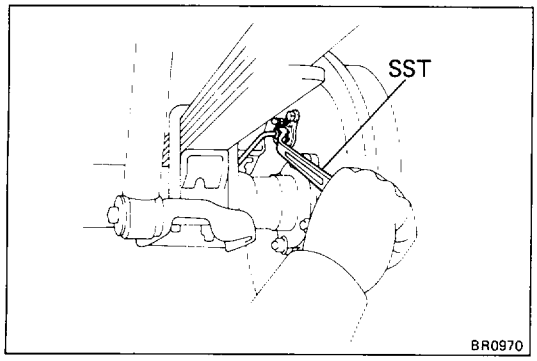
(d) Disconnect the parking brake cable from the front shoe.



5. REMOVE ADJUSTER FROM FRONT SHOE

(a) Remove the adjusting lever spring.

(b) Remove the adjuster.

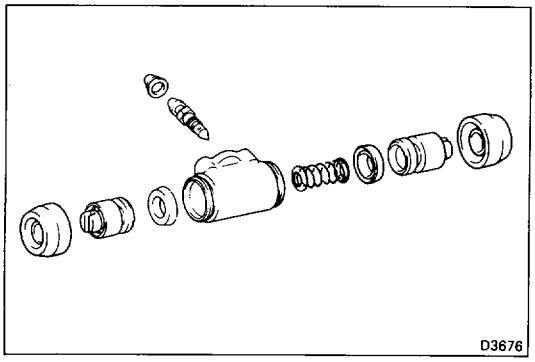


6. IF NECESSARY, REMOVE AND DISASSEMBLE WHEEL CYLINDER

(a) Using SST, disconnect the brake tube.

SST 09751-36011

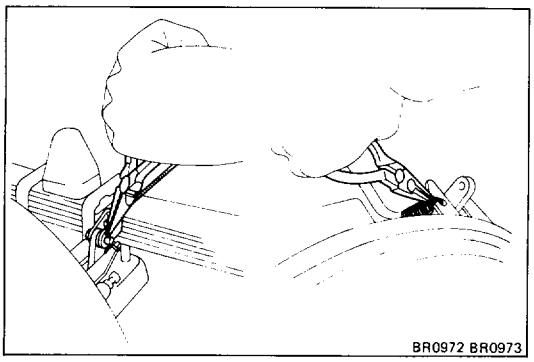
(b) Remove two bolts and the wheel cylinder.



7. DISASSEMBLE WHEEL CYLINDER

Remove the following parts from the wheel cylinder.

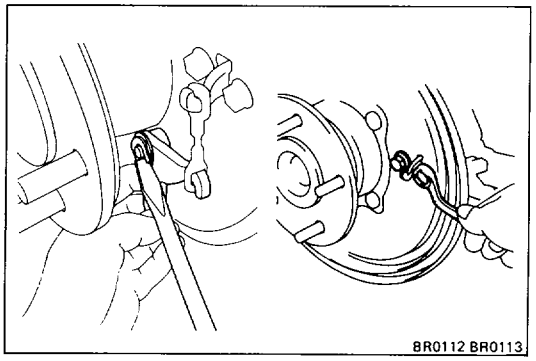
- Two boots
- Two pistons
- Two piston cups
- Spring



8. IF NECESSARY, REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK ASSEMBLY

(a) Remove the cotter pin and disconnect the parking brake cable.

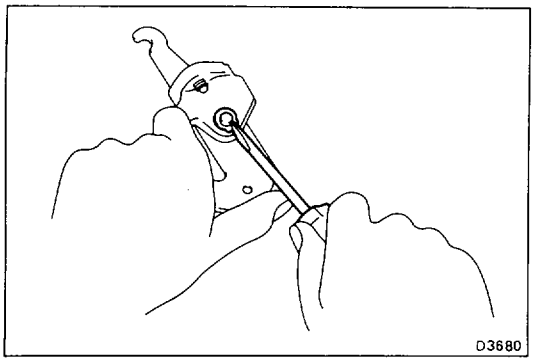
(b) Remove the tension spring.



(c) Using a screwdriver, remove the bellcrank No.3 from the backing plate with parking brake cable No.2.

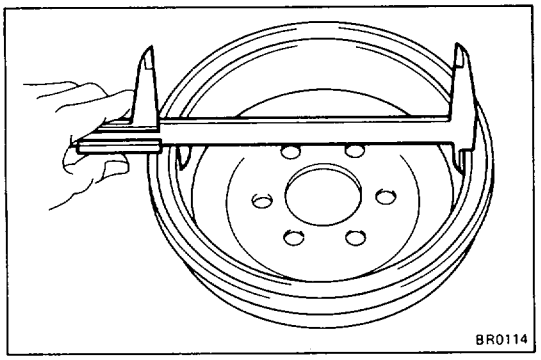
(d) Remove the parking brake bellcrank No.1 or No.2 and dust cover with the two bolts.

(e) Remove the boot from the parking brake bellcrank assembly.



(f) Using a screwdriver, remove the C-washer and pin.

(g) Remove the parking brake bellcrank from the bellcrank bracket.

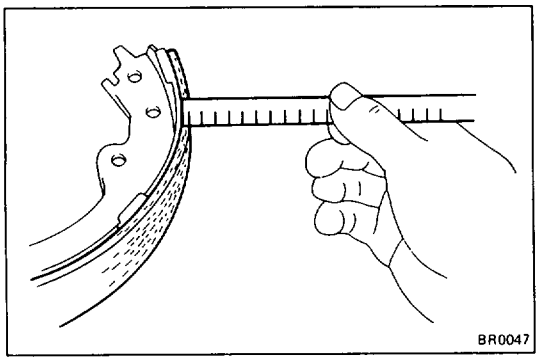


INSPECTION OF REAR BRAKE COMPONENTS

1. **MEASURE BRAKE DRUM INSIDE DIAMETER**

Standard inside diameter: 295.0 mm (11.614 in.)
Maximum inside diameter: 297.0 mm (11.693 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

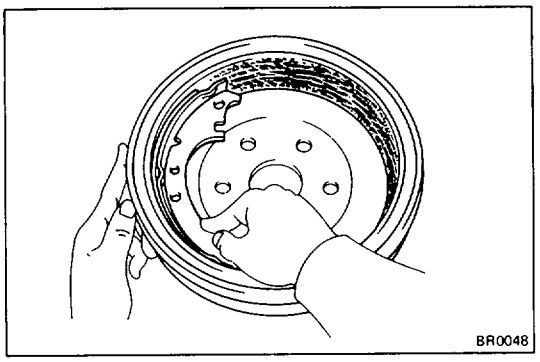


2. **MEASURE BRAKE SHOE LINING THICKNESS**

Standard thickness: 6.0 mm (0.236 in.)
Minimum thickness: 1.0 mm (0.039 in.)

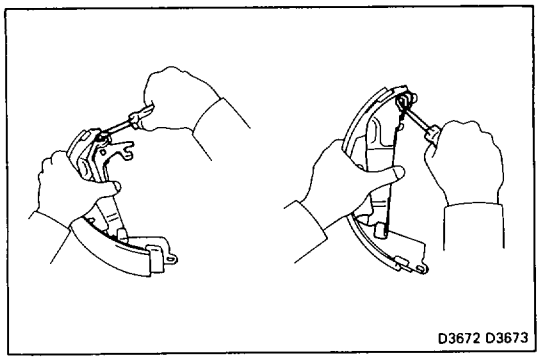
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

NOTE: If any brake shoe have to be replaced, replace all the rear brake shoes to maintain effective brakes.



3. **INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT**

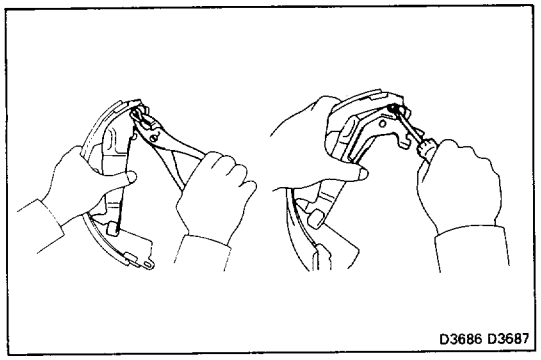
Replace the brake shoe or turn the brake drum, as necessary.



4. **IF NECESSARY, REPLACE BRAKE SHOES**

(a) Using a screwdriver, remove the automatic adjusting lever from the front shoe.

(b) Using a screwdriver, remove the parking brake lever from the front shoe.



(c) Using pliers, install the parking brake lever with a new C-washer.

(d) Install the automatic adjusting lever with a new E-ring.

5. **INSPECT WHEEL CYLINDER FOR CORROSION OR DAMAGE**

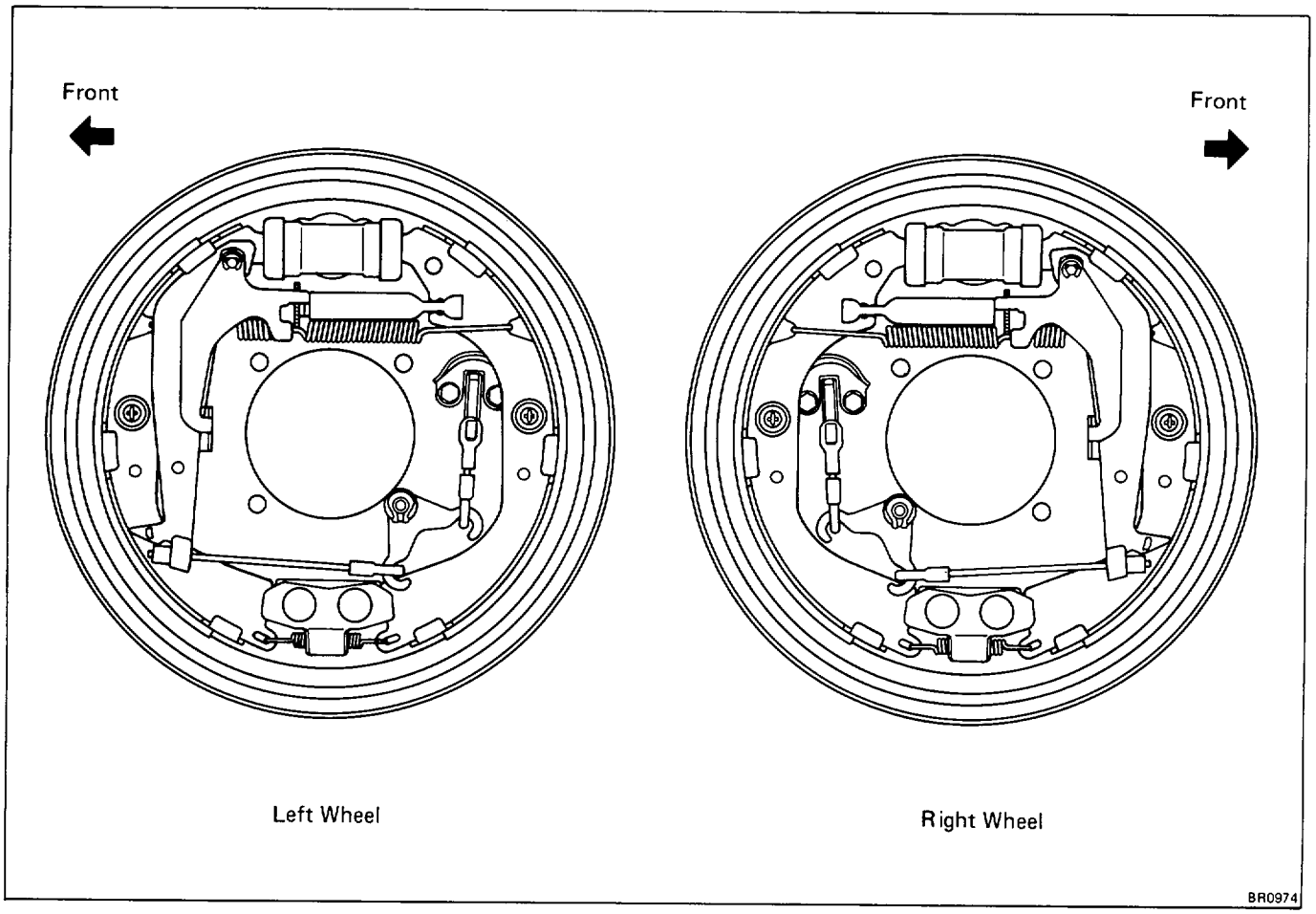
6. **INSPECT BACKING PLATE FOR WEAR OR DAMAGE**

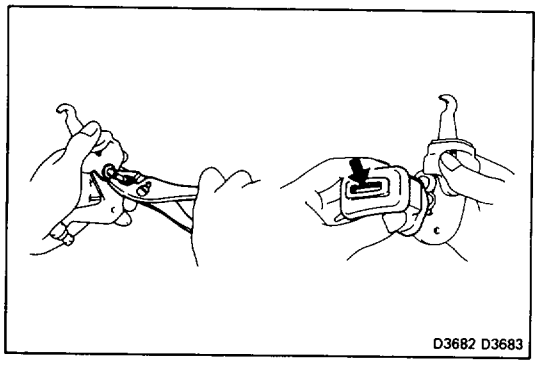
7. **INSPECT BELLCRANK PARTS FOR BENDING, WEAR OR DAMAGE**

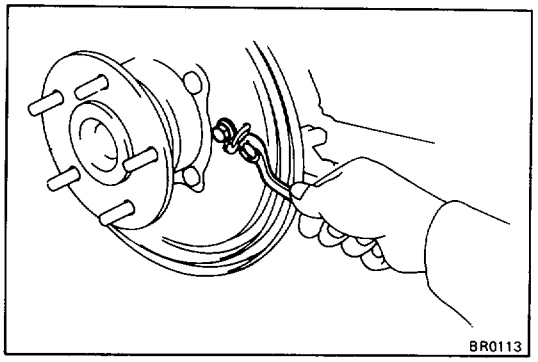
ASSEMBLY OF REAR BRAKES

(See page BR-50)

NOTE: Assemble the parts in the correct direction as shown.

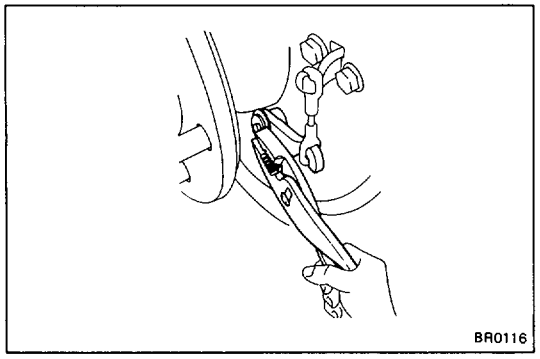






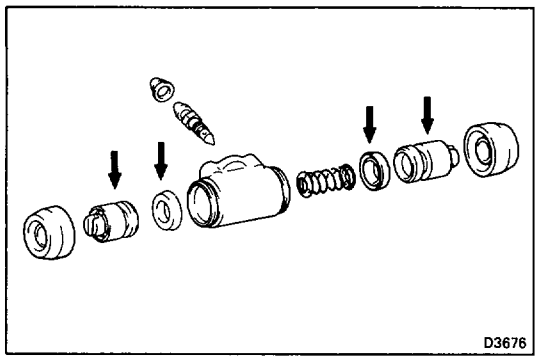
1. **IF NECESSARY, ASSEMBLE AND INSTALL PARKING BRAKE BELLCRANK ASSEMBLY**
   (a) Apply high temperature grease to the roating parts of the bellcrank.
   (b) Install the parking brake bellcrank to the bellcrank bracket.
   (c) Install the pin with the new C-washer.
   (d) Apply lithium soap base glycol grease to the boot and install it to the bellcrank No.1 or No.2.
   (e) Install the parking brake bellcrank No.1 or No.2 and dust cover on the backing plate with two bolts.
   (f) Torque the bolts.

   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



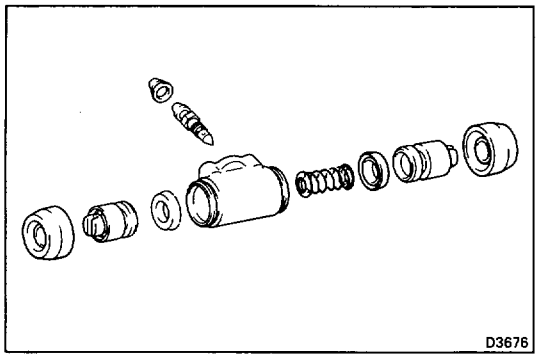
(g) Install the parking brake cable No.2 to bellcrank No.1 or No.2.

(h) Hook the bellcrank No.3 to the cable No.2, and then install the bellcrank No.3 with a new C-washer.



2. IF NECESSARY, ASSEMBLE AND INSTALL WHEEL CYLINDER

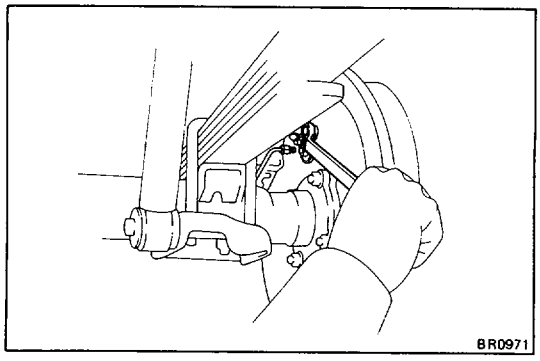
(a) Apply lithium soap base glycol grease to the piston cups and pistons.



(b) Install the spring and two piston cups in the wheel cylinder.

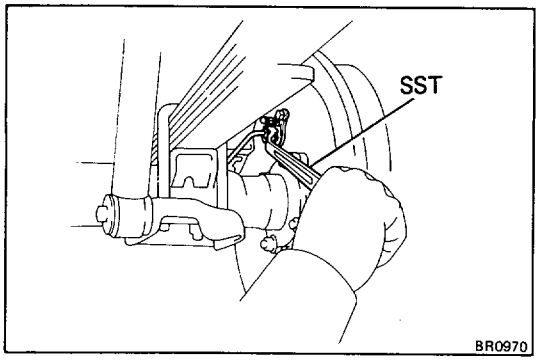
Make sure flanges of the cups are pointed inward.

(c) Install the two pistons, boots and spring in the cylinder.



(d) Install the wheel cylinder on the backing plate with two bolts.

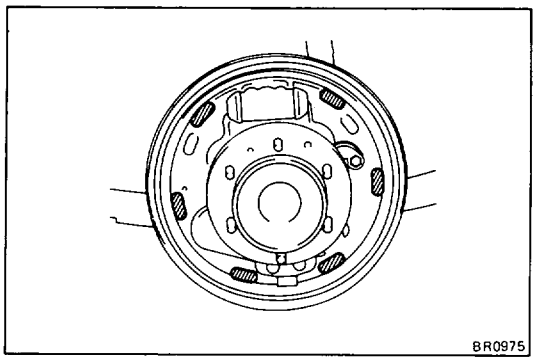
Torque: 100 kg-cm (7 ft-lb, 10 N·m)



(e) Using SST, connect the brake line.

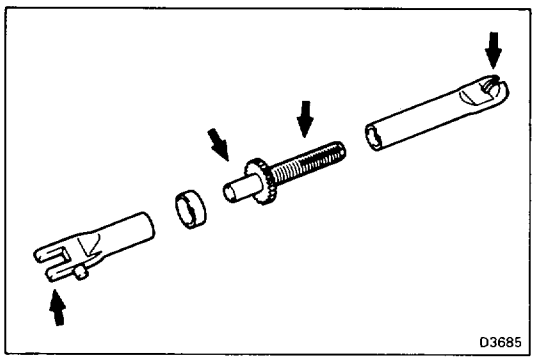
SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)



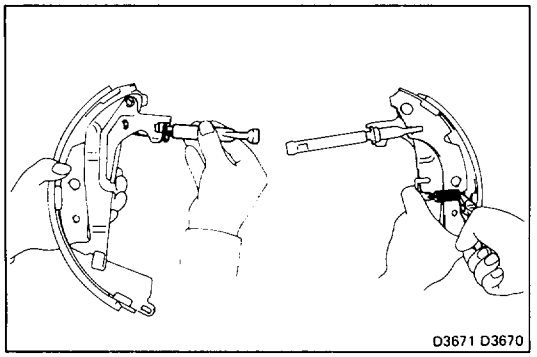
3. **APPLY GREASE ON BACKING PLATE, AS SHOWN**

Use high temperature grease.



4. **APPLY GREASE TO ADJUSTER BOLT THREADS AND END**

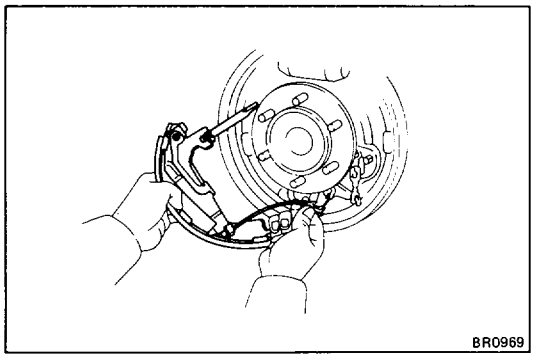
Use high temperature grease.



5. **INSTALL ADJUSTER TO FRONT SHOE**

(a) Install the adjuster to the adjust lever.

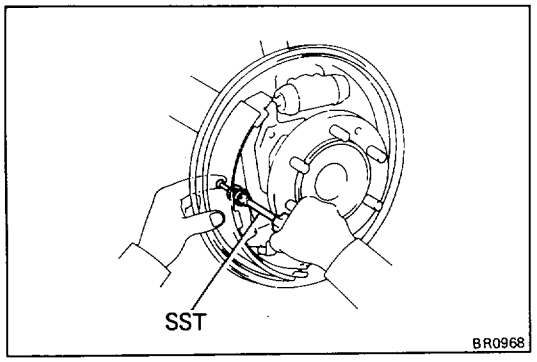
(b) Install the adjust lever spring.



6. **INSTALL FRONT SHOE**

(a) Install the parking brake cable No.1 to the parking brake shoe lever.

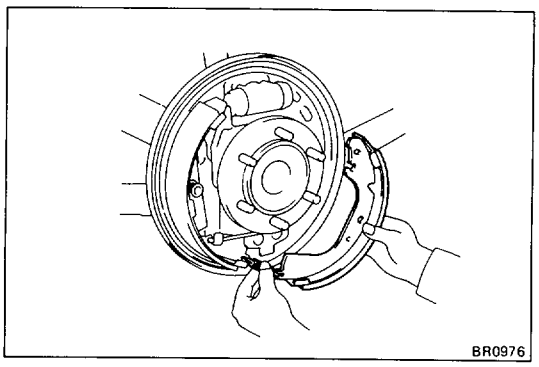
(b) Hook the another side of the cable No.1 to the bell-crank No.3.



(c) Set the front shoe in place with the end of the shoe inserted in the piston.

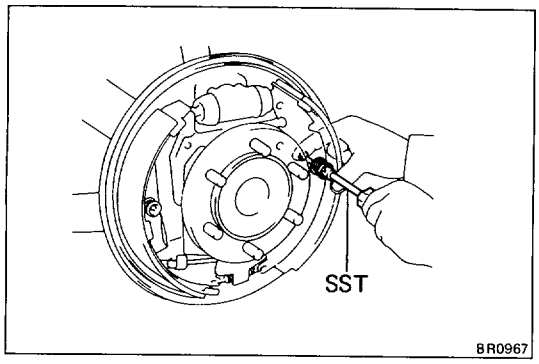
(d) Using SST, install the shoe hold-down spring and pin.

SST 09718-00010



7. INSTALL REAR SHOE

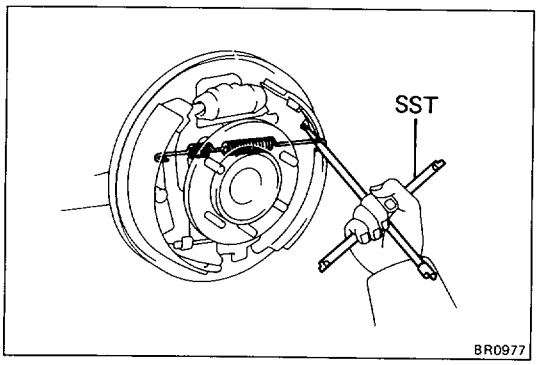
(a) Install the anchor spring to the front shoe and rear shoe.



(b) Set the rear shoe in place with the end of the shoe inserted in the piston.

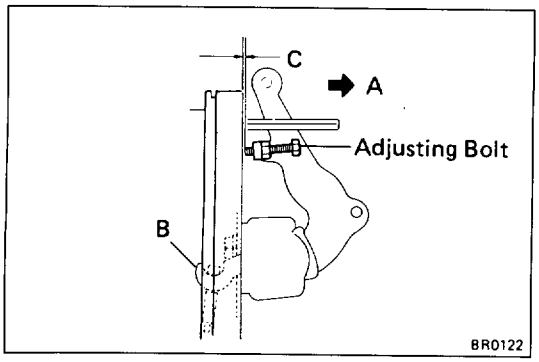
(c) Using SST, install the shoe hold-down spring and pin.

SST 09718-00010



(d) Using SST, install the tension spring.

SST 09703-30010

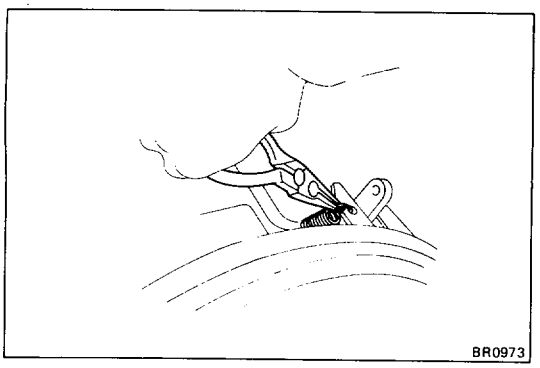


8. IF NECESSARY, ADJUST BELLCRANK

(a) Lightly pull the bellcrank in direction A until there is no slack at part B.

(b) In this condition, turn the adjusting bolt so that dimension C will be 0.4 — 0.8 mm (0.016 — 0.031 in.).

(c) Lock the adjust bolt with the lock nut.



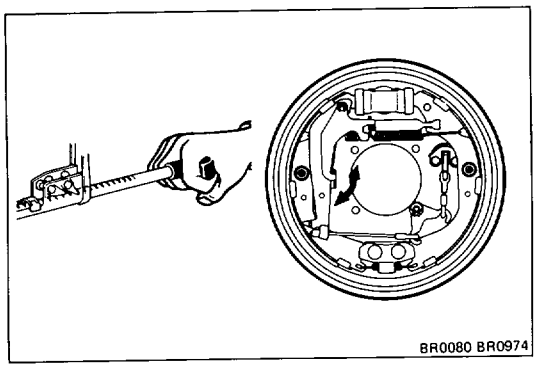
(d) Connect the parking brake cable to the bellcrank.

(e) Install the tension spring.

9. CHECK PARKING BRAKE LEVER TRAVEL

Check that the parking brake lever travel is correct. If necessary, adjust the lever travel.

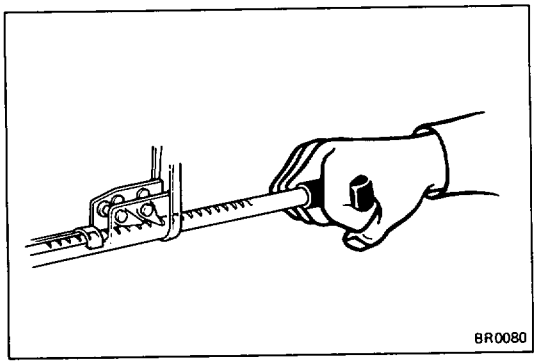
(See page BR-7)



10. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Check that the adjusting bolt turns while pulling the parking brake lever up.

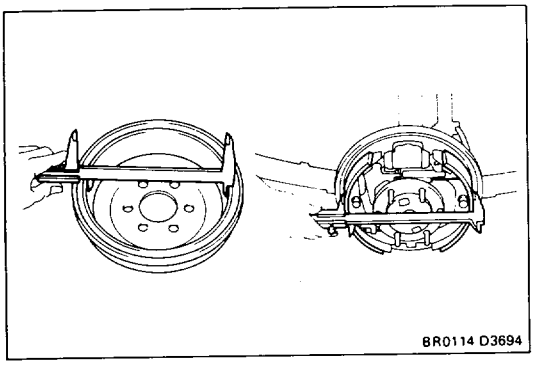
If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the adjuster to the shortest possible length.

(c) Install the drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



11. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.

(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

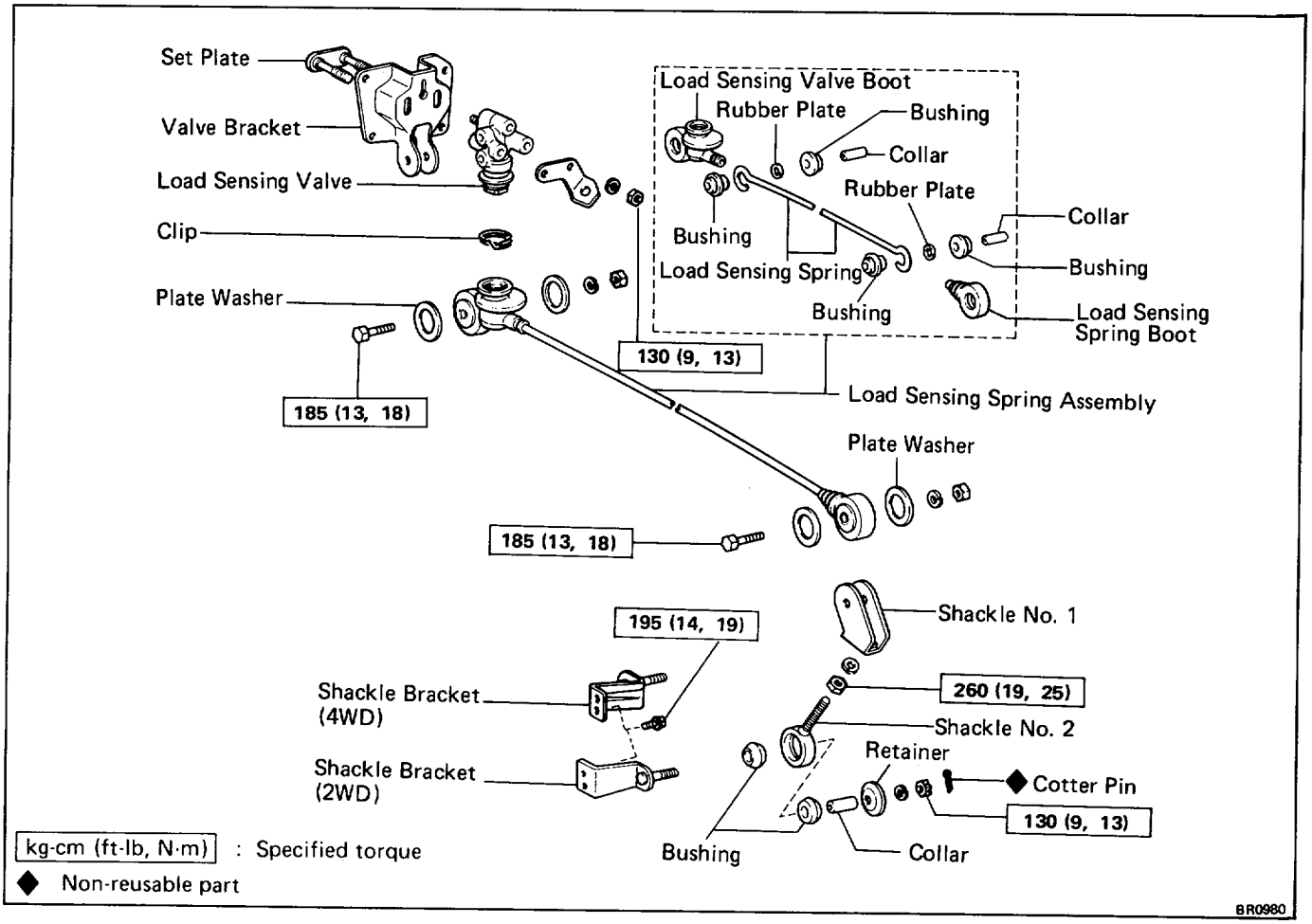
If incorrect, check the parking brake system.

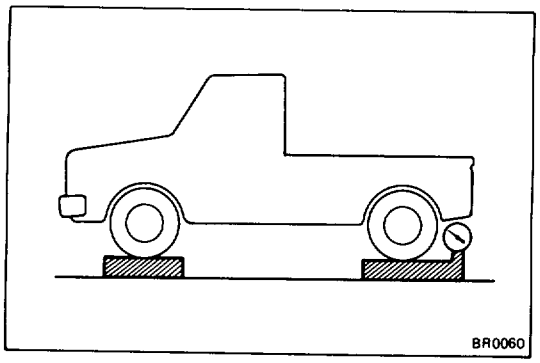
12. INSTALL BRAKE DRUM AND REAR WHEEL

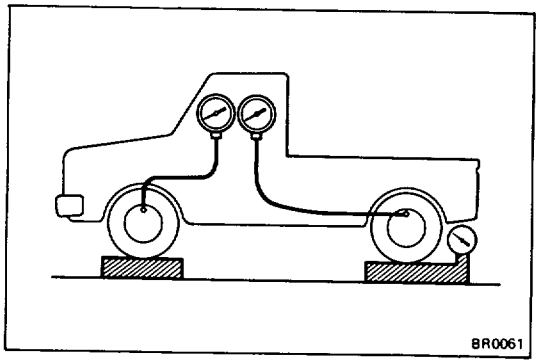
13. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR-6)

LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)

COMPONENTS







CHECK AND ADJUSTMENT OF FLUID PRESSURE

1. SET REAR AXLE LOAD

Rear axle load (includes vehicle weight):

2WD	**1 ton, C & C (Long)**	**700 kg (1,543 lb)**
	1/2 ton	**800 kg (1,764 lb)**
	C & C (Super long)	**930 kg (2,050 lb)**
4WD		**900 kg (1,984 lb)**

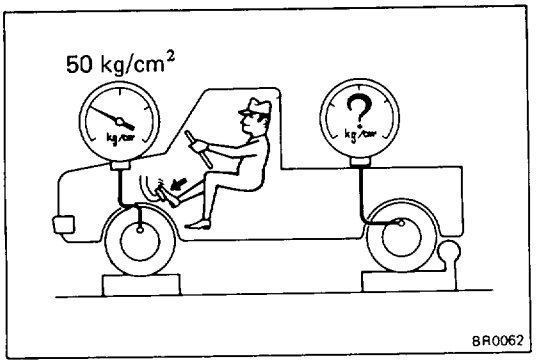
NOTE: (For C & C)
If the vehicle unladen weight exceeds the specification above, set the rear axle load to the specification shown below. (See steps 5 to 6 on pages BR-60 to BR-61)

Rear axle load (includes vehicle weight):

Long (Single tire)	**1,390 kg (3,064 lb)**
(Double tire)	**1,270 kg (2,800 lb)**
Super long (Double tire)	**1,470 kg (3,241 lb)**

2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709-29017



3. **RAISE FRONT BRAKE PRESSURE TO 50 kg/cm² (711 psi, 4,903 kPa) AND CHECK REAR BRAKE PRESSURE**

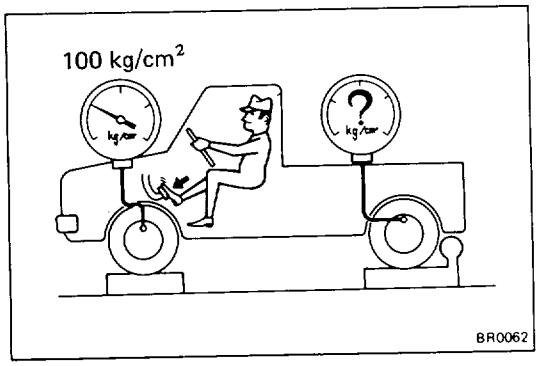
Rear brake pressure:

2WD	1 ton, C & C (Long)	37 ± 5 kg/cm² (526 ± 71 psi, 3,628 ± 490 kPa)
	1/2 ton	34 ± 5 kg/cm² (484 ± 71 psi, 3,334 ± 490 kPa)
	C & C (Super long)	45 ± 5 kg/cm² (640 ± 71 psi, 4,413 ± 490 kPa)
4WD		32 ± 5 kg/cm² (455 ± 71 psi, 3,138 ± 490 kPa)

NOTE: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure.

Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.

If the brake pressure is incorrect, adjust the fluid pressure.



4. **RAISE FRONT BRAKE PRESSURE TO 100 kg/cm² (1,422 psi, 9,807 kPa) AND CHECK REAR BRAKE PRESSURE**

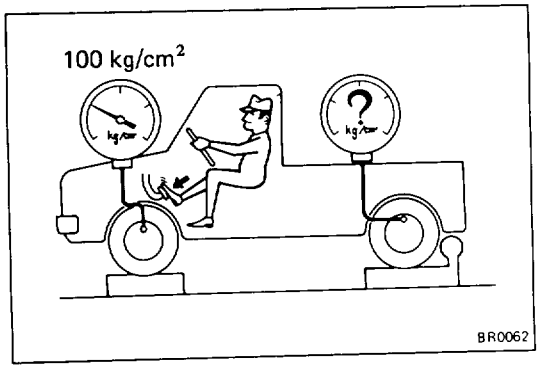
Rear brake pressure:

2WD	1ton, C & C (Long)	56 ± 7 kg/cm² (796 ± 100 psi, 5,492 ± 686 kPa)
	1/2 ton	44 ± 7 kg/cm² (626 ± 100 psi, 4,315 ± 686 kPa)
	C & C (Super long)	64 ± 7 kg/cm² (910 ± 100 psi, 6,276 ± 686 kPa)
4WD		45 ± 7 kg/cm² (640 ± 100 psi, 4,413 ± 686 kPa)

NOTE: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure.

Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.

If the brake pressure is incorrect, adjust the fluid pressure.



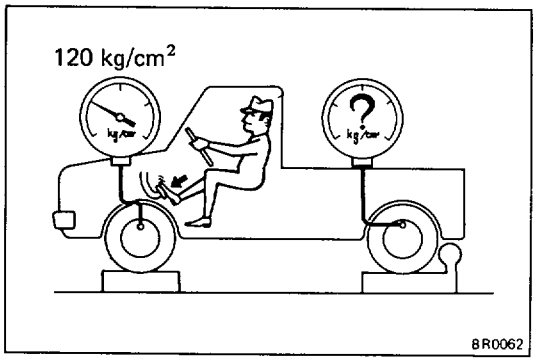
5. (C & C)
RAISE FRONT BRAKE PRESSURE TO 100 kg/cm² (1,422 psi, 9,807 kPa) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure: 87 ± 5 kg/cm² (1,237 ± 71 psi, 8,531 ± 490 kPa)

NOTE: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure.

Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.

If the brake pressure is incorrect, adjust the fluid pressure.



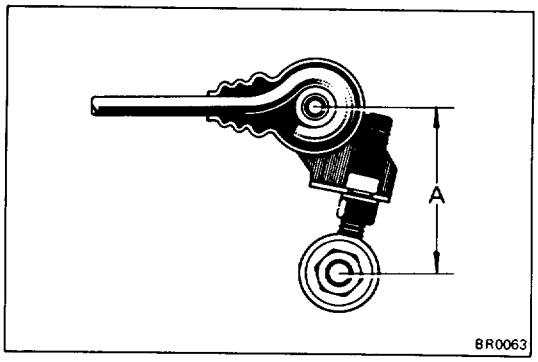
6. **(C & C)**
RAISE FRONT BRAKE PRESSURE TO 120 kg/cm² (1,707 psi, 11,768 kPa) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure: 95 ± 6 kg/cm² (1,351 ± 85 psi, 9,316 ± 588 kPa)

NOTE: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure.

Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.

If the brake pressure is incorrect, adjust the fluid pressure.



7. **IF NECESSARY, ADJUST FLUID PRESSURE**

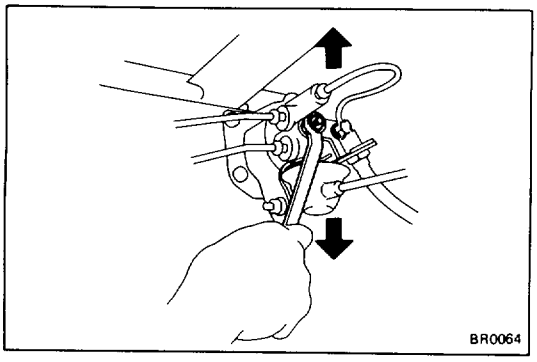
(a) Adjust the length of the No.2 shackle.

Low pressure — Lengthen A
High pressure — Shorten A

Initial set:
2WD 78 mm (3.07 in.)
4WD 120 mm (4.72 in.)

Adjusting range:
2WD 72 — 84 mm (2.83 — 3.31 in.)
4WD 114 — 126 mm (4.49 — 4.96 in.)

NOTE: One turn of the No.2 shackle changes the fluid pressure about 0.6 kg/cm² (8.5 psi, 59 kPa).



(b) In event the pressure cannot be adjusted by the No.2 shackle, raise or lower the valve body.

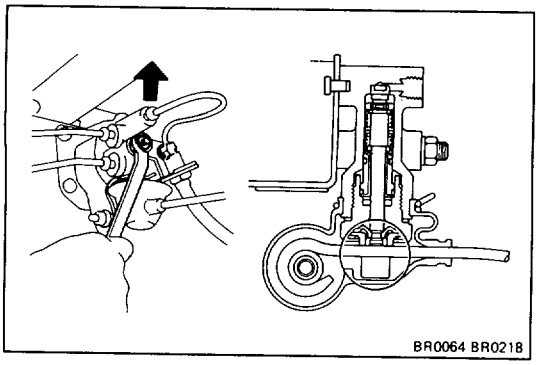
Low pressure — Lower
High pressure — Raise

(c) Torque the nuts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

(d) Adjust the length of the No.2 shackle again.

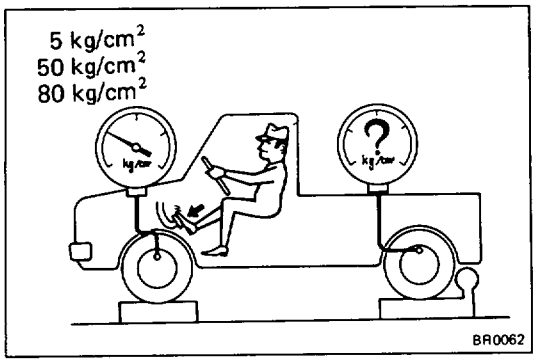
If it cannot be adjusted, inspect the valve housing.



8. **IF NECESSARY, CHECK VALVE BODY**

(a) Assemble the valve body in the uppermost position.

NOTE: When the brakes are applied, the piston will move down about 1 mm (0.04 in.). Even at this time, the piston should not make contact with or move the load sensing spring.



(b) In this position, check the rear brake pressure.

2WD 1 ton, C&C kg/cm² (psi,kPa)

Front brake pressure	Rear brake pressure
5 (71, 490)	5 (71, 490)
50 (711, 4,903)	19.7–23.7 (280–337, 1,932–2,324)
80 (1,138, 7,845)	29.8–35.8 (424–509, 2,922–3,511)

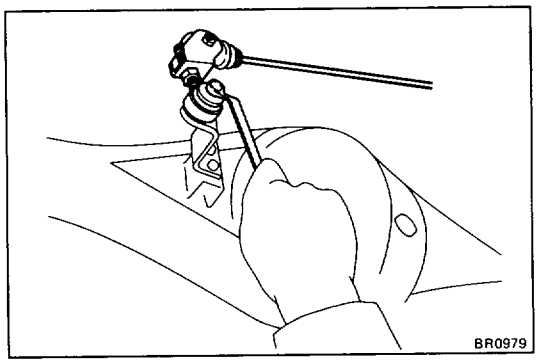
2WD 1/2 ton kg/cm² (psi, kPa)

Front brake pressure	Rear brake pressure
5 (71, 490)	5 (71, 490)
50 (711, 4,903)	16.0–20.0 (228–284, 1,569–1,961)
80 (1,138, 7,845)	21.0–27.0 (299–384, 2,059–2,648)

4WD kg/cm² (psi,kPa)

Front brake pressure	Rear brake pressure
5 (71, 490)	5 (71,490)
50 (711, 4,903)	14.3–18.3 (203-260, 1,402–1,795)
80 (1,138, 7,845)	20.8–26.8 (296-381, 2,040–2,628)

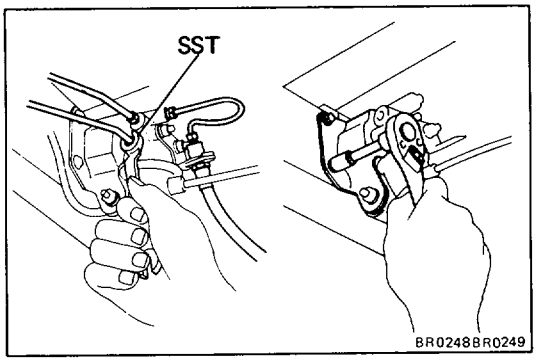
If the measured value is not within standard, replace the valve body.



REMOVAL OF LSP & BV

(See page BR-59)

1. DISCONNECT SHACKLE NO.2 FROM BRACKET

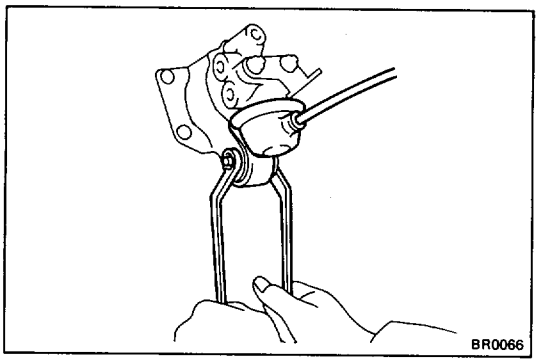


2. REMOVE LSP & BV ASSEMBLY

(a) Using SST, disconnect the brake tube from the valve body.

SST 09751-36011

(b) Remove the valve bracket mounting bolts and remove the LSP & BV (LSPV) assembly.

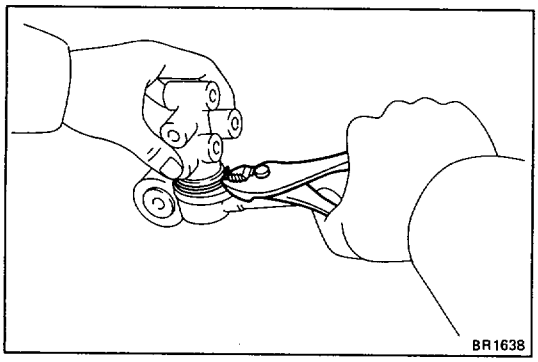


DISASSEMBLY OF LSP & BV ASSEMBLY

1. REMOVE VALVE BRACKET

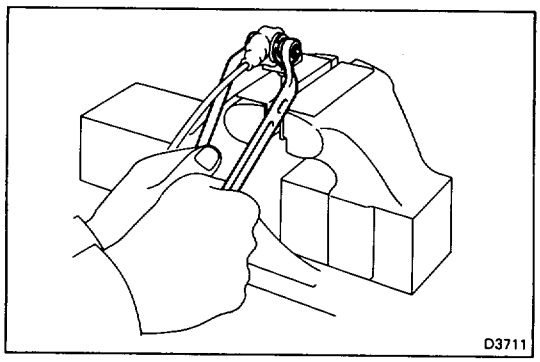
(a) Remove the nut and bolt as shown.

(b) Remove the two nuts, and remove the bracket and set plate from the valve body.



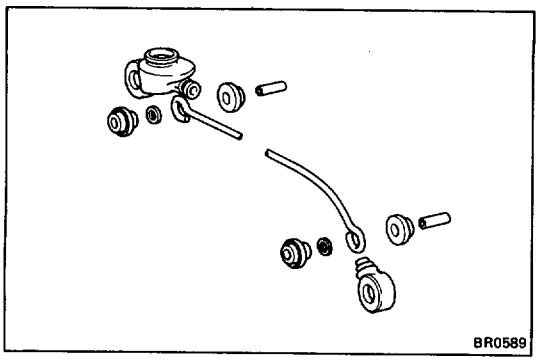
2. DISCONNECT SPRING FROM VALVE

Using a pliers, remove the clip, and remove the spring from the valve.



3. REMOVE SHACKLE NO.1 AND NO.2

Remove the nut and bolt, and then remove the shackle No.1 and No.2, and two plate washers from the load sensing spring assembly.



4. DISASSEMBLE LOAD SENSING SPRING

Disassemble the following parts.

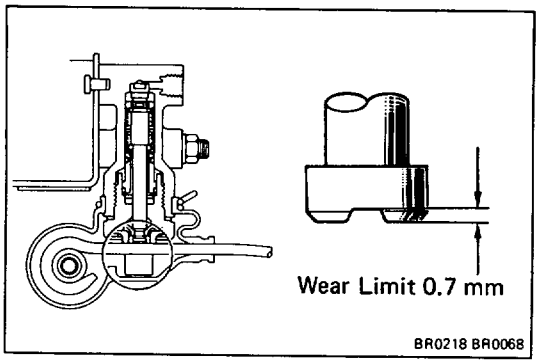
(a) Bushings

(b) Collars

(c) Rubber plates

(d) Load sensing valve boot

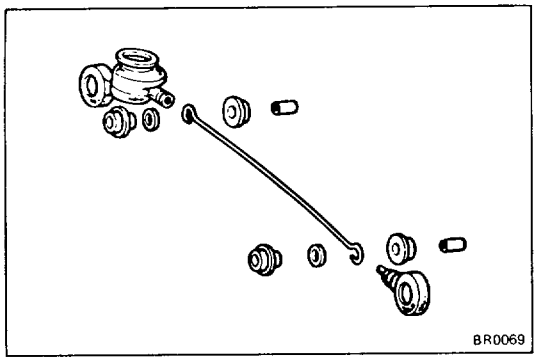
(e) Load sensing spring boot

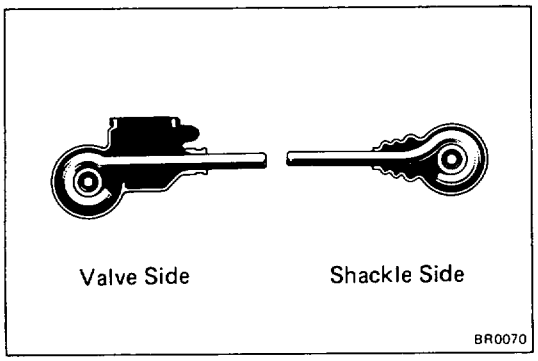


INSPECTION OF LSP & BV

INSPECT VALVE PISTON PIN AND LOAD SENSING SPRING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)



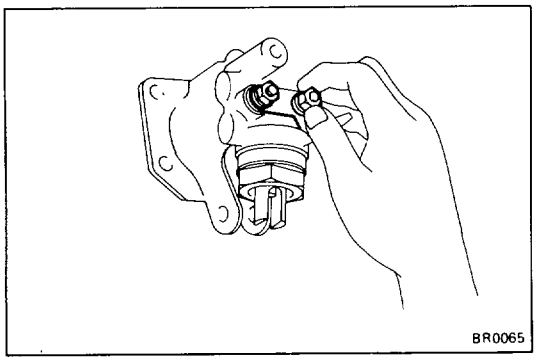


ASSEMBLY OF LSP & BV

(See page BR-59)

1. **ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING**
   - (a) Load sensing valve boot
   - (b) Load sensing spring boot
   - (c) Bushings
   - (d) Rubber plates
   - (e) Bushings
   - (f) Collars

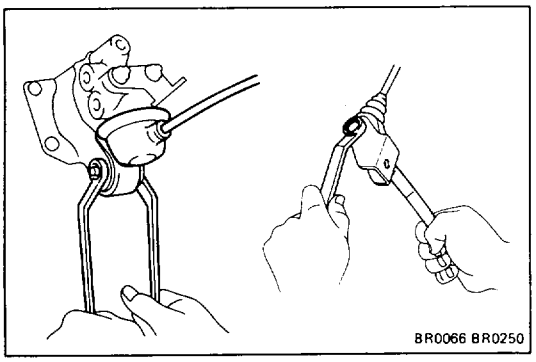
   NOTE: Apply lithium soap base glycol grease to all rubbing areas.
   Do not mistake the valve side for the shackle side of the load sensing spring.



2. **ASSEMBLE VALVE BODY TO BRACKET**

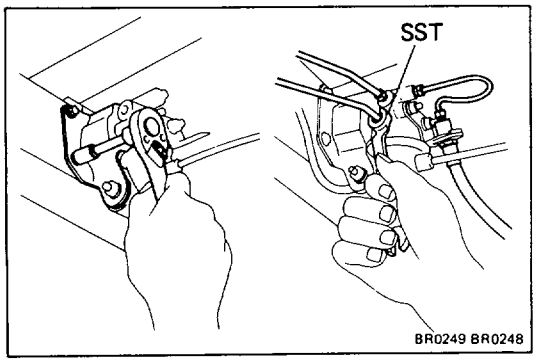
   Assemble the valve body to the valve body bracket.

   NOTE: Finger tighten the valve body mounting nuts.



3. **CONNECT VALVE BODY AND NO.1 SHACKLE TO LOAD SENSING SPRING**

   CAUTION: When connecting the shackle to the load sensing spring with a bolt and nut, insert the bolt from the front side of the vehicle.



INSTALLATION OF LSP & BV

1. **INSTALL LSP & BV ASSEMBLY TO FRAME**

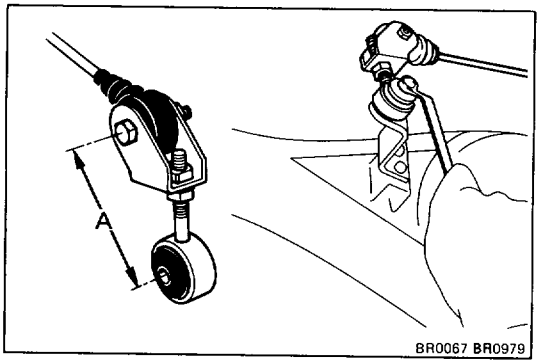
   Torque: 195 kg-cm (14 ft-lb, 19 N·m)

2. **CONNECT BRAKE TUBE**

   Using SST, connect the brake tubes.

   SST 09751-36011

   Torque: 155 kg-cm (11 ft-lb, 15 N·m)



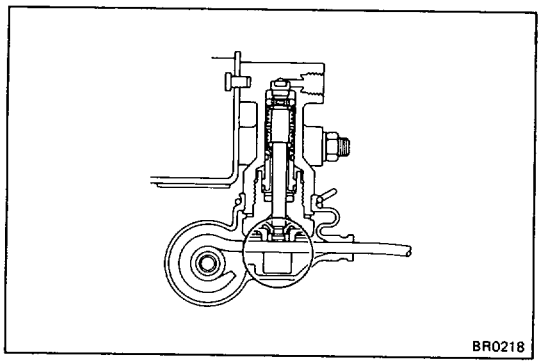
3. CONNECT SHACKLE NO.2 TO BRACKET

(a) Install shackle No.1 and shackle No.2 to the load sensing spring.

(b) Set dimension A by turning shackle No.2.

Initial set: 2WD 78 mm (3.07 in.)
4WD 120 mm (4.72 in.)

(c) Connect shackle NO.2 to the shackle bracket.



4. SET REAR AXLE LOAD (See page BR-59)

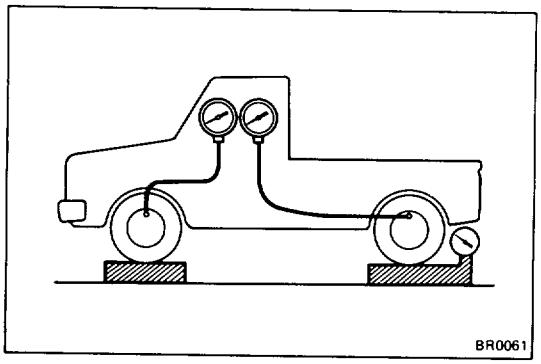
5. SET VALVE BODY

(a) When pulling down the load sensing spring,confirm that the valve piston moves down smoothly.

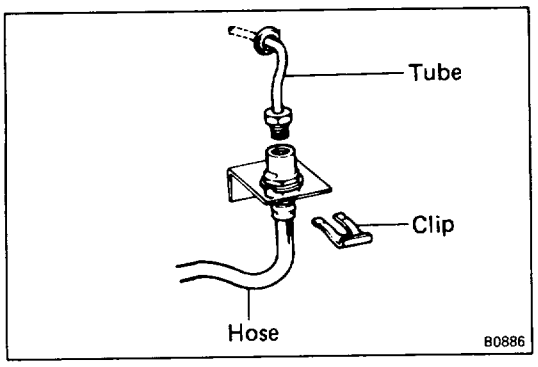
(b) Position the valve body so that the valve piston lightly contacts load sensing spring.

(c) Tighten the valve body mounting nuts.

6. BLEED BRAKE LINE (See page BR-6)



7. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page BR-59)



BRAKE HOSES AND TUBES

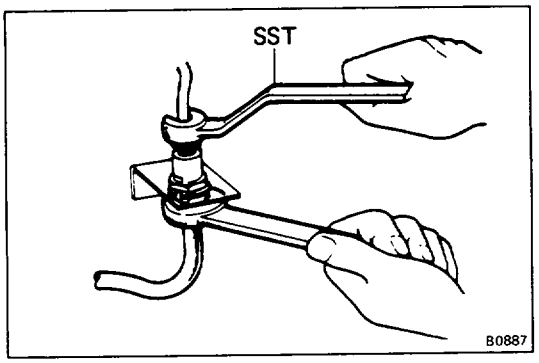
DISCONNECT AND CONNECT HOSE AND TUBE

1. DISCONNECT HOSE AND TUBE

(a) Disconnect the clip.

(b) Using a wrench to hold the hose and SST to hold the tube, disconnect the tube and hose.

SST 09751-36011



2. CONNECT HOSE AND TUBE

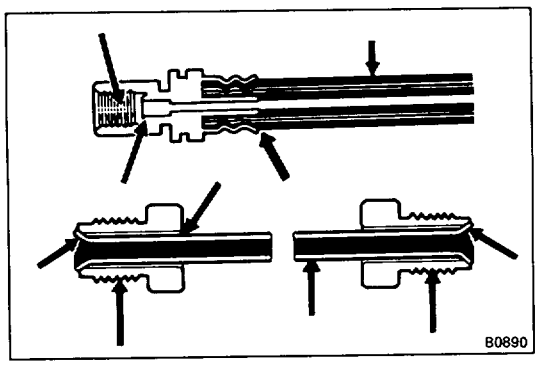
(a) Connect the hose and tube by hand.

(b) Using a wrench to hold the hose and SST to hold the tube, torque the connection.

SST 09751-36011

Torque: 155 kg-cm (11 ft-lb, 15 N·m)

(c) Install a hose clip.



INSPECTION OF BRAKE HOSES AND TUBES

1. INSPECT BRAKE HOSES

(a) Inspect the hose for damage, cracks or swelling.

(b) Inspect the threads for damage.

2. INSPECT BRAKE TUBES

(a) Inspect the tube for damage, cracks, dents or corrosion.

(b) Inspect the threads for damage.

STEERING

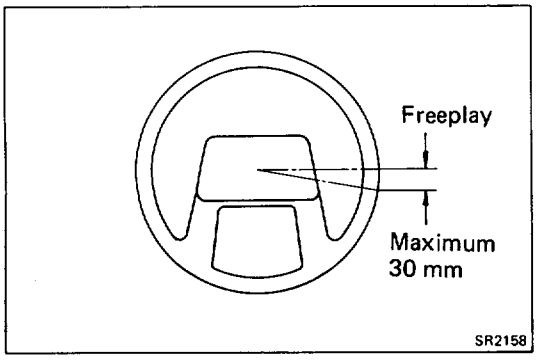
	Page
PRECAUTIONS	SR-2
TROUBLESHOOTING	SR-2
ON-VEHICLE INSPECTION	SR-3
STEERING COLUMN ASSEMBLY (2WD)	SR-4
STEERING COLUMN ASSEMBLY (Column Shift)	SR-11
STEERING COLUMN ASSEMBLY (4WD)	SR-18
STEERING COLUMN ASSEMBLY WITH TILT STEERING	SR-24
STEERING GEAR HOUSING (2WD)	SR-31
STEERING GEAR HOUSING (4WD)	SR-39
POWER STEERING	SR-51
On-Vehicle Inspection	SR-51
Bleeding of Power Steering System	SR-53
Oil Pressure Check	SR-53
Power Steering Pump	SR-56
Gear Housing (2WD)	SR-65
Gear Housing (4WD)	SR-77
Progressive Power Steering (PPS)	SR-91
STEERING LINKAGE (2WD)	SR-97
Pitman Arm	SR-97
Tie Rod	SR-98
Relay Rod	SR-99
Knuckle Arm	SR-100
Steering Damper	SR-101
Idler Arm Bracket	SR-102
STEERING LINKAGE (4WD)	SR-104
Pitman Arm	SR-105
Tie Rod	SR-106
Relay Rod	SR-108
Knuckle Arm	SR-109
Idler Arm Bracket	SR-110
Steering Damper	SR-113

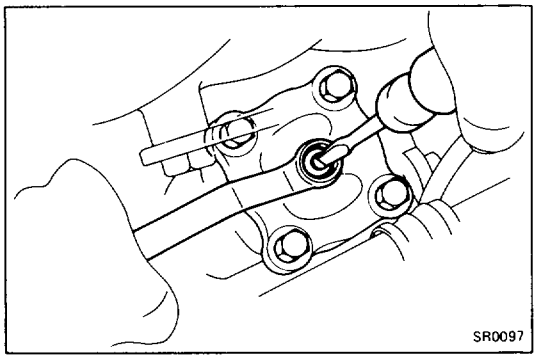
PRECAUTIONS

Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard steering	Tires improperly inflated	Inflate tires to proper pressure	FA-3,25
	Excessive caster	Check front wheel alignment	FA-4,26
	Ball joints worn	Replace ball joints	FA-13,87
	Insufficient lubricant	Lubricate suspension and steering linkage	
	Steering linkage worn or bent	Check linkage	SR-97,104
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-3,31,65
	Power steering belt loose	Tighten belt	SR-51
	Fluid level in reservoir low	Check reservoir	SR-51
	Power steering fluid foaming	Check power steering fluid	SR-51
	Power steering unit faulty	Check power steering unit	SR-51
	Steering column binding	Check steering column	SR-4
Poor return	Tire improperly inflated	Inflate tires to proper pressure	FA-3,25
	Wheel alignment incorrect	Check front wheel alignment	FA-4,26
	Steering column binding	Check steering column	SR-4
	Insufficient lubricant	Lubricate suspension and steering linkage	
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-3,31,65
Excessive play	Steering linkage worn	Check linkage	SR-97,104
	Steering gear loose	Tighten gear bolts	
	Steering shaft coupling worn	Inspect coupling	
	Ball joints worn	Replace ball joint	FA-13,87
	Steering gear out of adjustment or broken	Adjust or repair steering gear	SR-3,31,65





ON-VEHICLE INSPECTION

STEERING WHEEL FREEPLAY

1. **CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT**

   With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure. Freeplay should not exceed the maximum limit.

   Maximum play: 30 mm (1.18 in.)

   If incorrect, adjust or repair as required.

2. **POINT WHEELS STRAIGHT AHEAD**

3. **ADJUST STEERING GEAR HOUSING**

   (a) Loosen the lock nut.

   (b) Turn the adjusting screw clockwise to decrease wheel freeplay and counterclockwise to increase it.

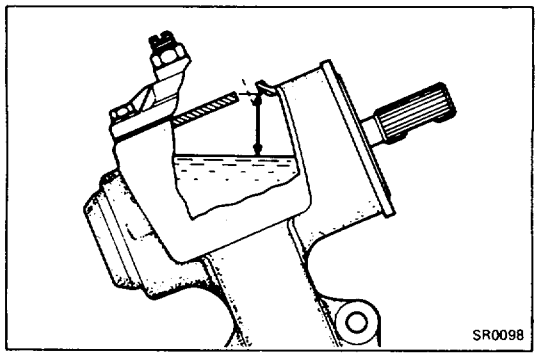
   NOTE: Turn the adjusting screw in small increments and check the wheel freeplay between each adjustment.

4. **CHECK THAT STEERING DOES NOT BIND**

   Turn the steering wheel half way around in both directions.

   Check that the freeplay is correct and steering is smooth and without rough spots.

5. **HOLD ADJUSTING SCREW AND TIGHTEN LOCK NUT**



OIL LEVEL

CHECK STEERING GEAR HOUSING OIL LEVEL

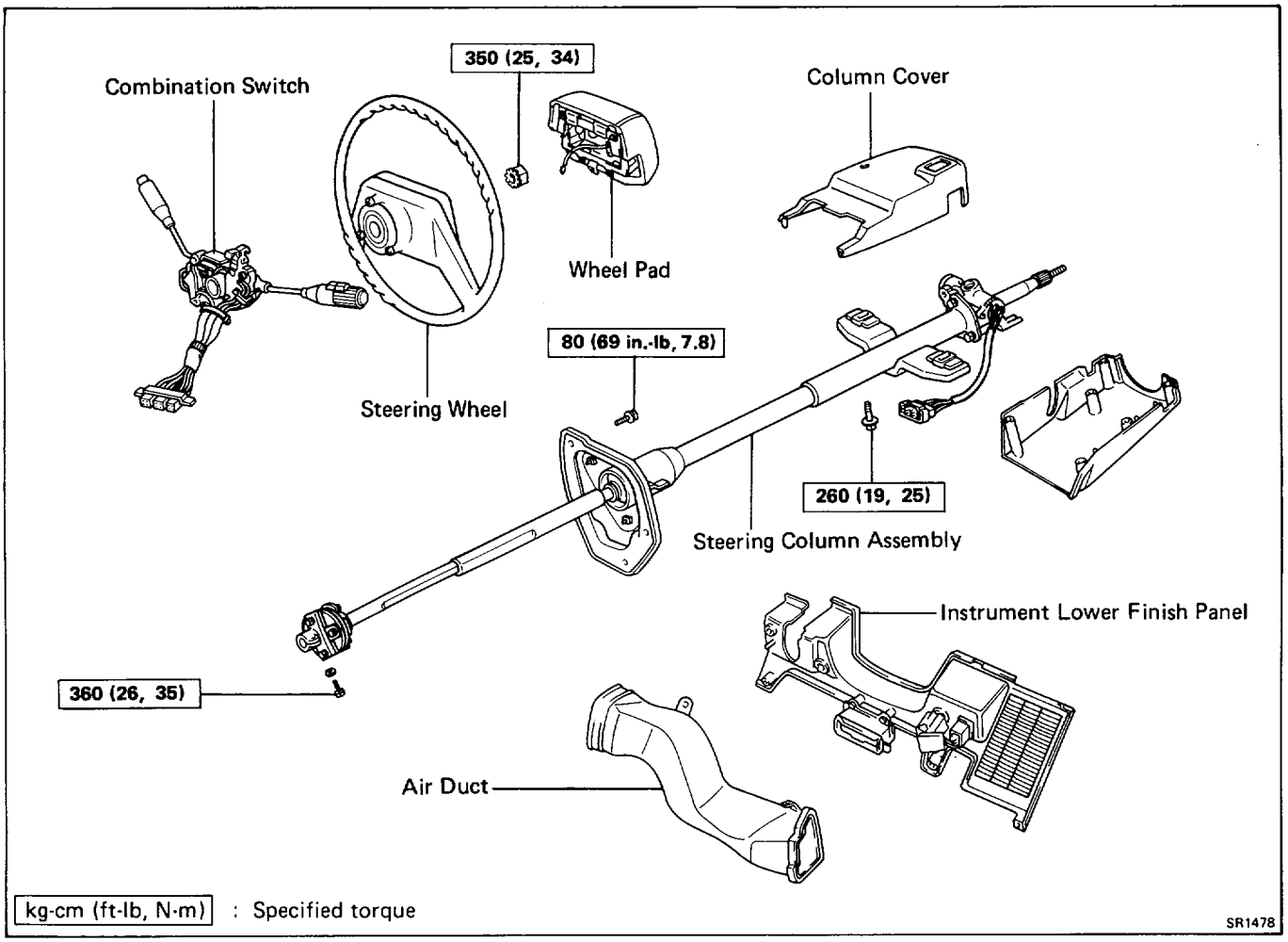
Oil level:

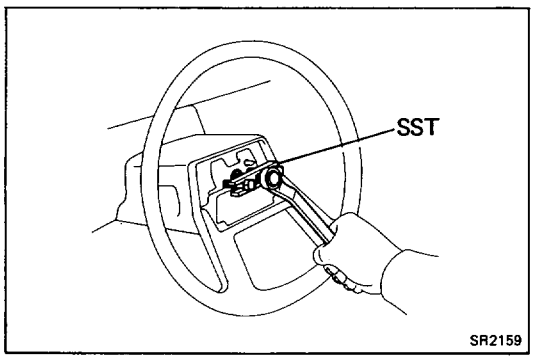
2WD 18 — 28 mm (0.71 — 1.10 in.) from top
4WD 14 — 17 mm (0.55 — 0.67 in.) from top

If low, fill with gear oil and check for oil leaks.

STEERING COLUMN ASSEMBLY (2WD)

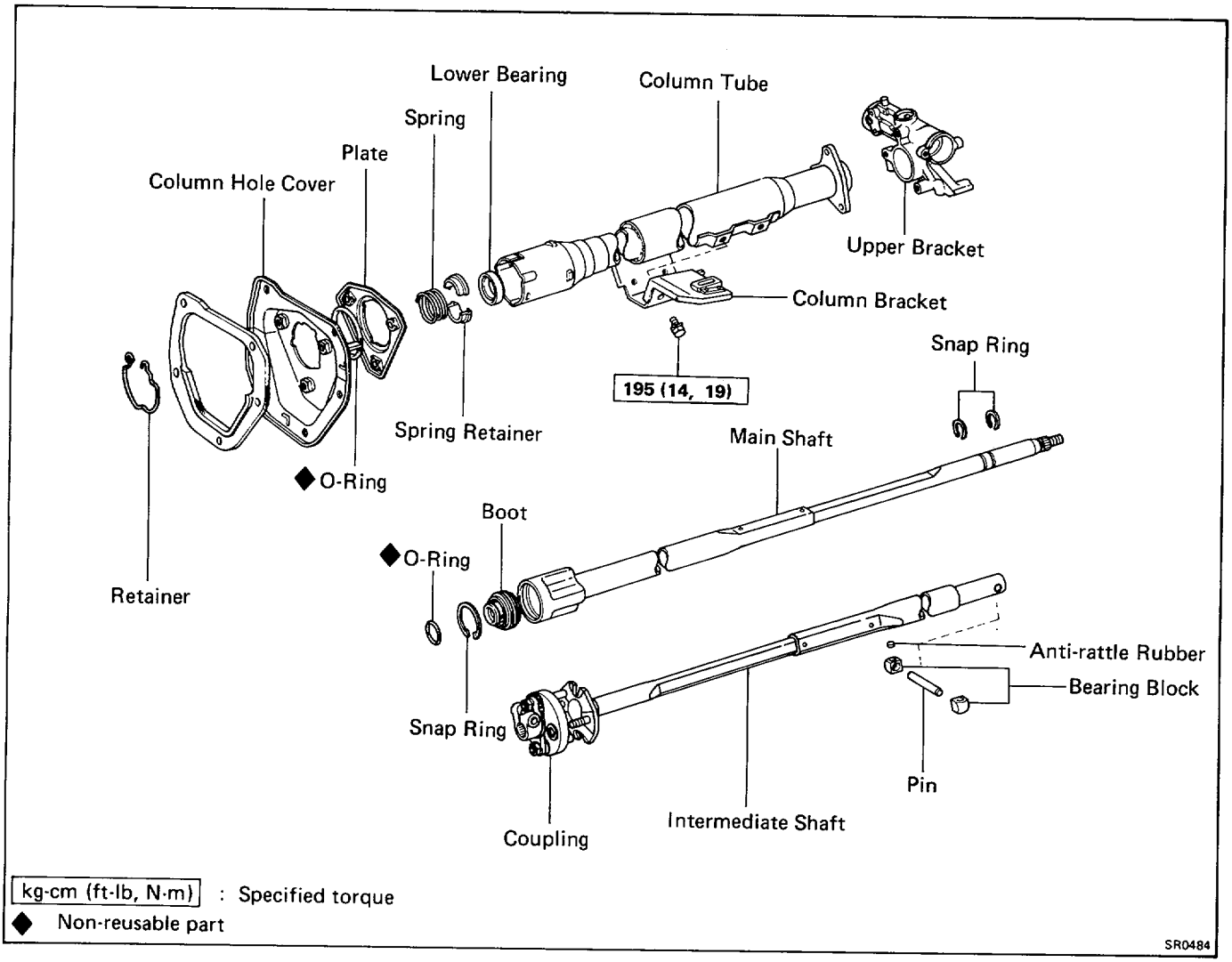
REMOVAL OF STEERING COLUMN ASSEMBLY

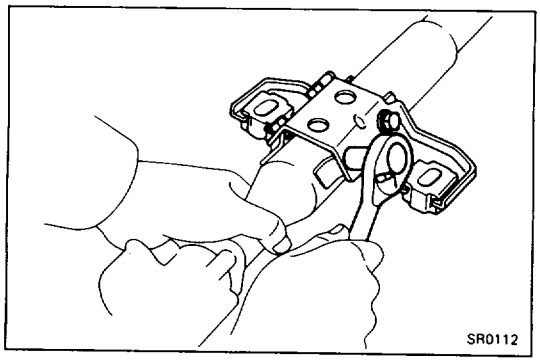




1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE COUPLING SET BOLT**
3. **REMOVE STEERING WHEEL**
   (a) Remove the steering wheel pad.
   (b) Remove the steering wheel nut.
   (c) Using SST, remove the steering wheel.
   SST 09609-20011
4. **REMOVE INSTRUMENT LOWER FINISH PANEL AND AIR DUCT**
5. **REMOVE COLUMN COVER AND COMBINATION SWITCH**
6. **REMOVE FIVE BOLTS FROM COLUMN HOLE COVER**
7. **REMOVE MAIN SHAFT**
   Remove the mount bolts and pull out the main shaft.

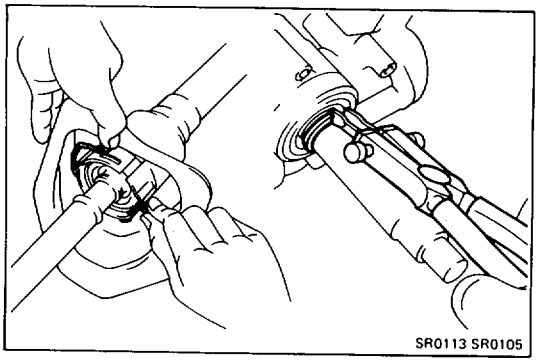
COMPONENTS





DISASSEMBLY OF STEERING COLUMN ASSEMBLY

1. REMOVE STEERING COLUMN BRACKET

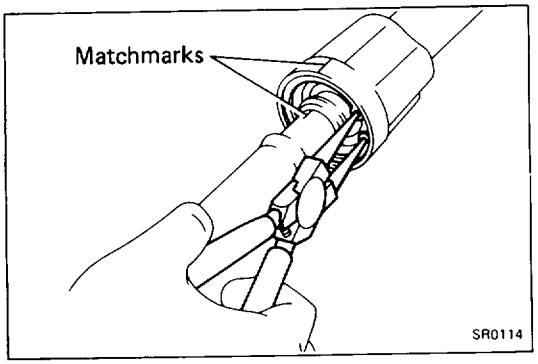


2. REMOVE STEERING MAIN SHAFT

(a) Remove the retainer.

(b) Using snap ring pliers, remove the snap ring.

(c) Pull out the steering main shaft with intermediate shaft.

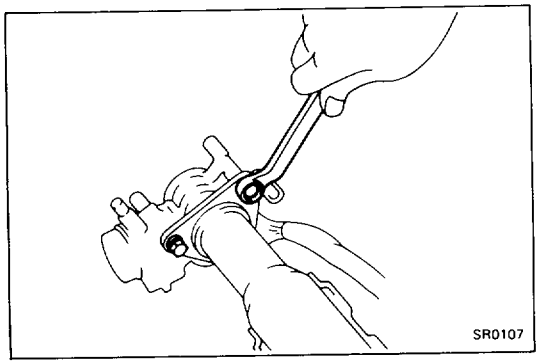


3. REMOVE INTERMEDIATE SHAFT FROM MAIN SHAFT

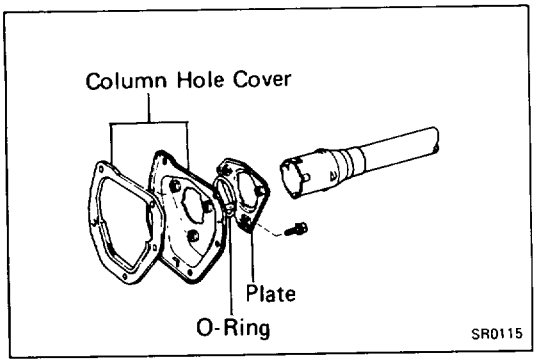
(a) Place matchmarks on the main shaft and intermediate shaft.

(b) Using snap ring pliers, remove the snap ring.

(c) Pull the intermediate shaft out of the main shaft.



4. REMOVE UPPER BRACKET FROM COLUMN TUBE



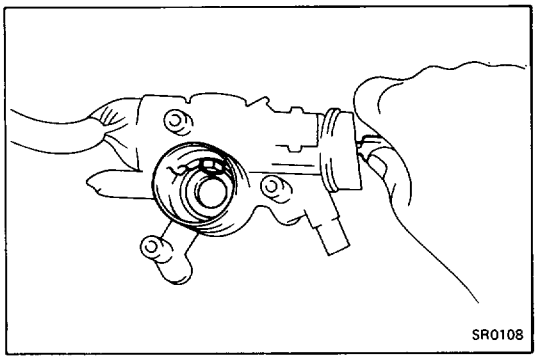
5. REMOVE COLUMN HOLE COVER FROM COLUMN TUBE

Remove the following parts from the column tube.

(a) Column hole cover

(b) O-ring

(c) Plate

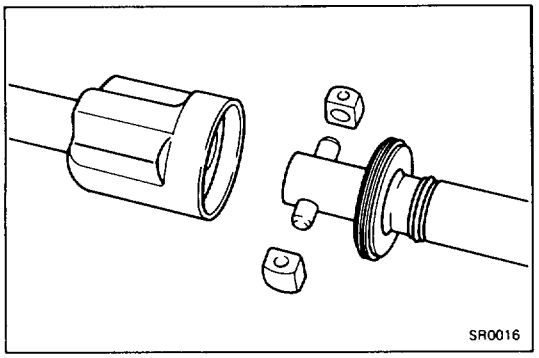


INSPECTION AND REPAIR OF STEERING COLUMN ASSEMBLY

1. INSPECT UPPER BRACKET

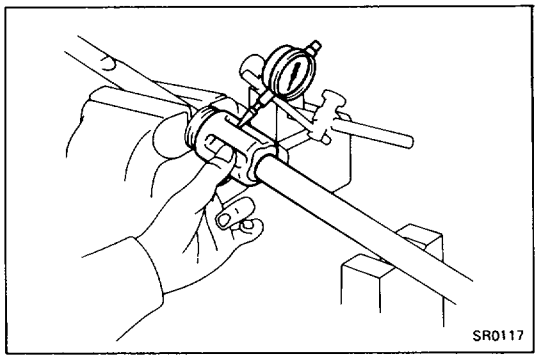
(a) Check that the steering lock mechanism operates properly.

(b) Check the upper bearing rotation condition and check for abnormal noise.
If the bearing is worn or damaged, replace the upper bracket.



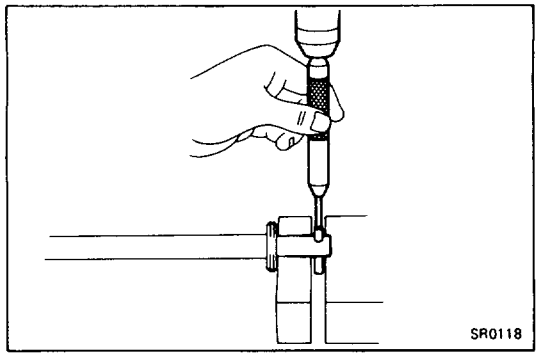
2. INSPECT TRUNNION JOINT

(a) Check the joint parts for wear or damage.



(b) Temporarily assemble the joint and measure the joint radial play with a dial indicator.

Maximum radial play: 0.06 mm (0.0024 in.)

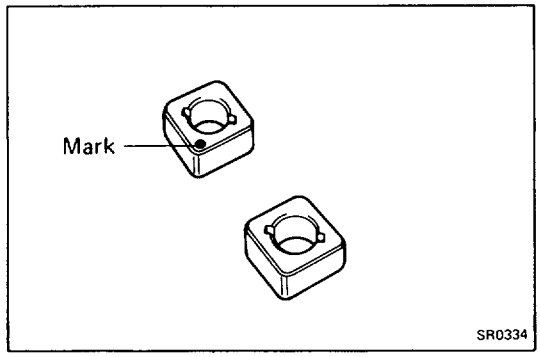


3. IF NECESSARY, REPLACE TRUNNION JOINT PARTS

(a) Using a press, remove the pin from the intermediate shaft.

(b) Replace the boot with a new one.

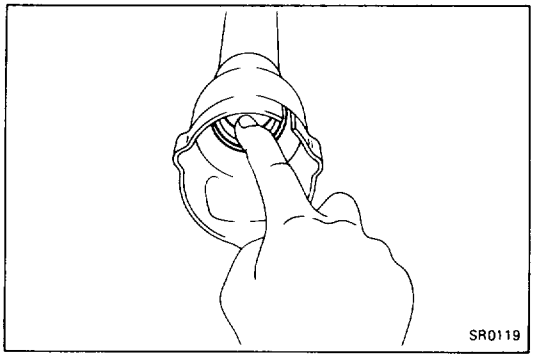
(c) Using a press, install the pin to the shaft until both protrusions are equal.



(d) Select a bearing block that will allow minimum radial play.

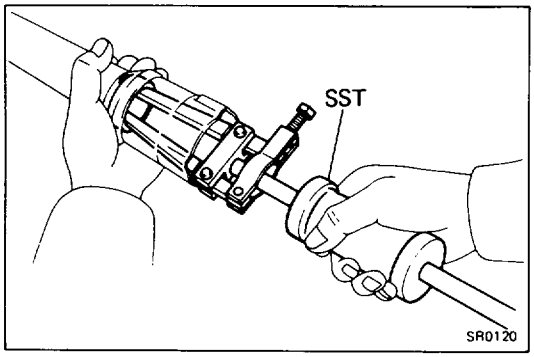
Bearing block width

Punch mark	width	mm (in.)
Yes	15.97 — 16.00	(0.6287 — 0.6299)
No	16.00 — 16.03	(0.6299 — 0.6311)



4. INSPECT MAIN SHAFT LOWER BEARING

Check the lower bearing for wear or damage.

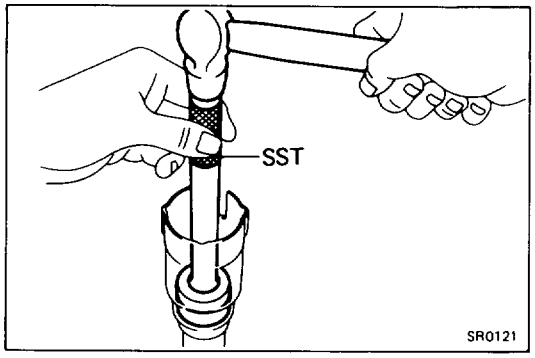


5. IF NECESSARY, REPLACE MAIN SHAFT LOWER BEARING

(a) Using SST, remove the lower bearing from the column tube.

SST 09308-00010

(b) Pack a new bearing with MP grease.

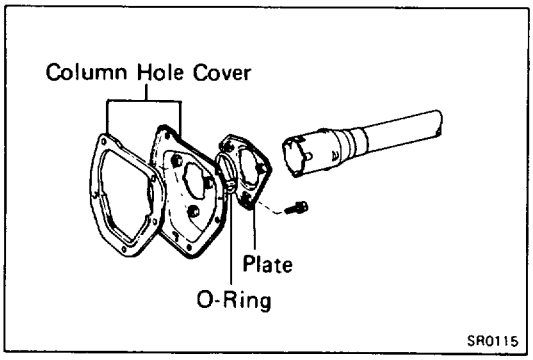


(c) Using SST, tap in a new bearing.

SST 09620-30010 (09624-30010, 09631-00020)

ASSEMBLY OF STEERING COLUMN ASSEMBLY

(See page SR-5)



1. INSTALL COLUMN HOLE COVER TO COLUMN TUBE

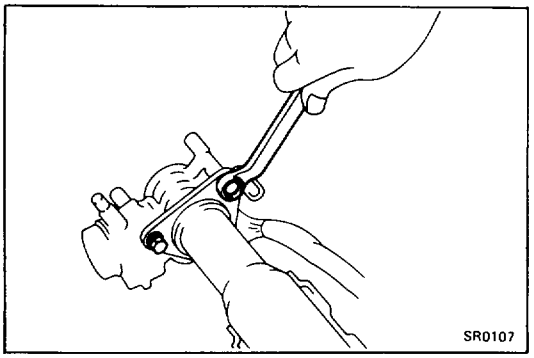
Install the following parts on the column tube.

(a) Plate

(b) O-ring

(c) Column hole cover

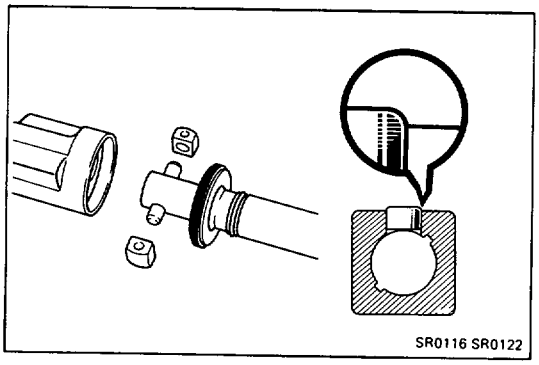
NOTE: Align the protrusion so that it fits into the column tube groove.



2. INSTALL UPPER BRACKET TO COLUMN TUBE

Install the upper bracket and torque the bolts.

Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

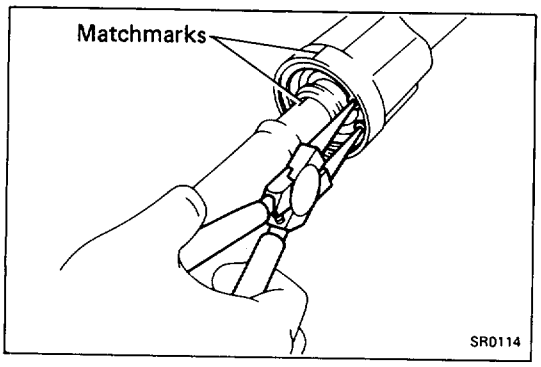


3. INSTALL INTERMEDIATE SHAFT TO MAIN SHAFT

(a) Pack MP grease on the bearing blocks and inner main shaft housing.

(b) Install the bearing blocks on the intermediate shaft.

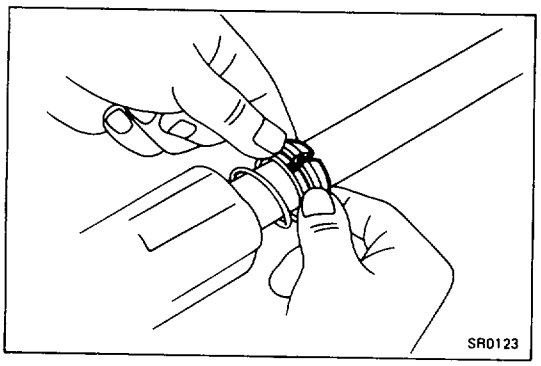
(c) Insert the anti-rattle rubbers in the bearing blocks with the chamfered edge facing outward.



(d) Align the matchmarks on the intermediate shaft and main shaft.

(e) Insert the intermediate shaft in the main shaft housing with the anti-rattle rubbers positioned at right angle to the shaft and both facing same direction.

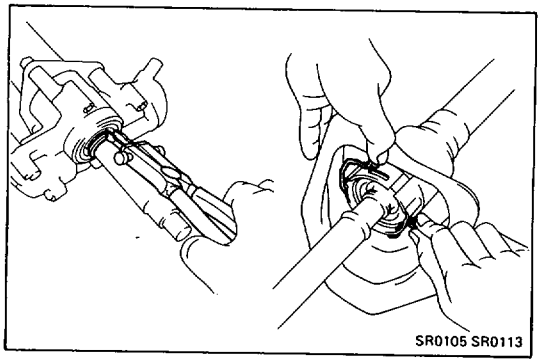
(f) Push in the boot and install the snap ring with snap ring pliers.



4. INSTALL SPRING AND SPRING RETAINER TO MAIN SHAFT

5. INSERT MAIN SHAFT IN COLUMN TUBE

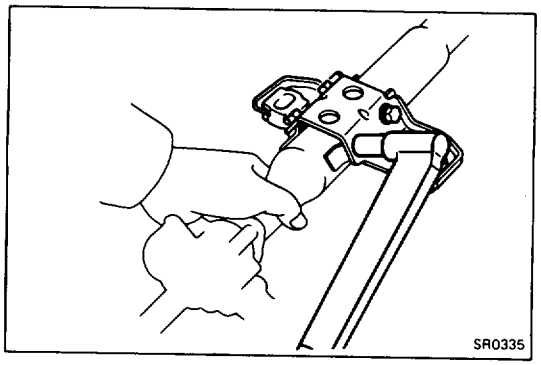
Push the main shaft into the column tube.



6. INSTALL SNAP RING

Using snap ring pliers, install the snap ring.

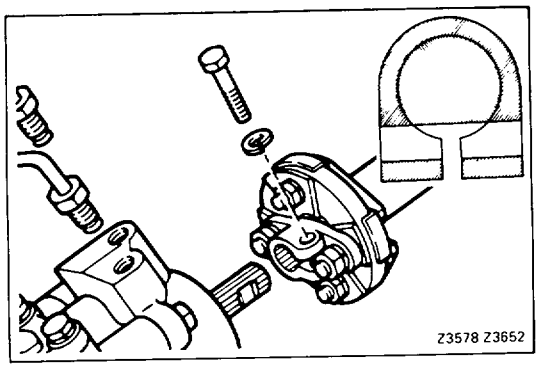
7. INSTALL RETAINER



8. INSTALL COLUMN TUBE BRACKET

Tighten the column tube bracket mount bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



INSTALLATION OF STEERING COLUMN ASSEMBLY

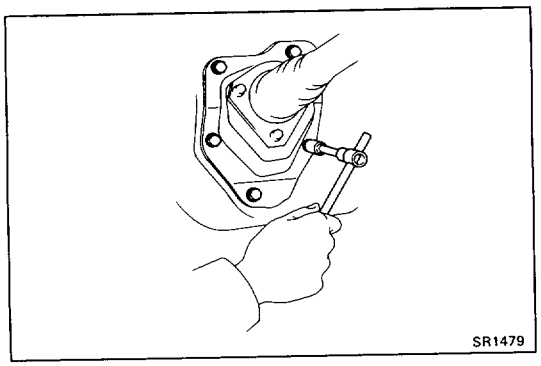
(See page SR-4)

1. **PLACE COLUMN AND MAIN SHAFT IN INSTALLED POSITION**

2. **INSTALL COUPLING ON WORM SHAFT**

   Line up the marks on the coupling and worm shaft.

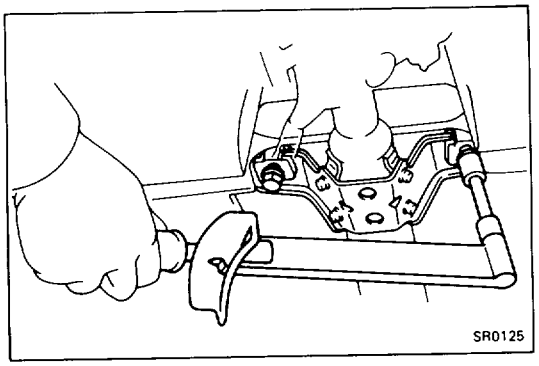
3. **INSTALL COLUMN BRACKET MOUNT BOLTS BY HAND**



4. **INSTALL STEERING COLUMN HOLE COVER**

   Torque the five bolts.

   Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)



5. **TORQUE TWO COLUMN BRACKET MOUNT BOLTS**

   Torque: 260 kg-cm (19 ft-lb, 25 N·m)

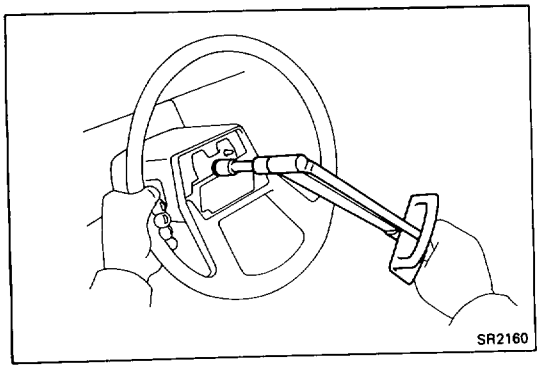
6. **INSTALL COUPLING SET BOLT**

   Install and torque the coupling set bolt.

   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

7. **INSTALL COMBINATION SWITCH AND COLUMN COVER**

8. **INSTALL AIR DUCT AND INSTRUMENT LOWER FINISH PANEL**



9. **INSTALL STEERING WHEEL**

   (a) Position the front wheels straight ahead and install the steering wheel in neutral position.

   (b) Torque the nut.

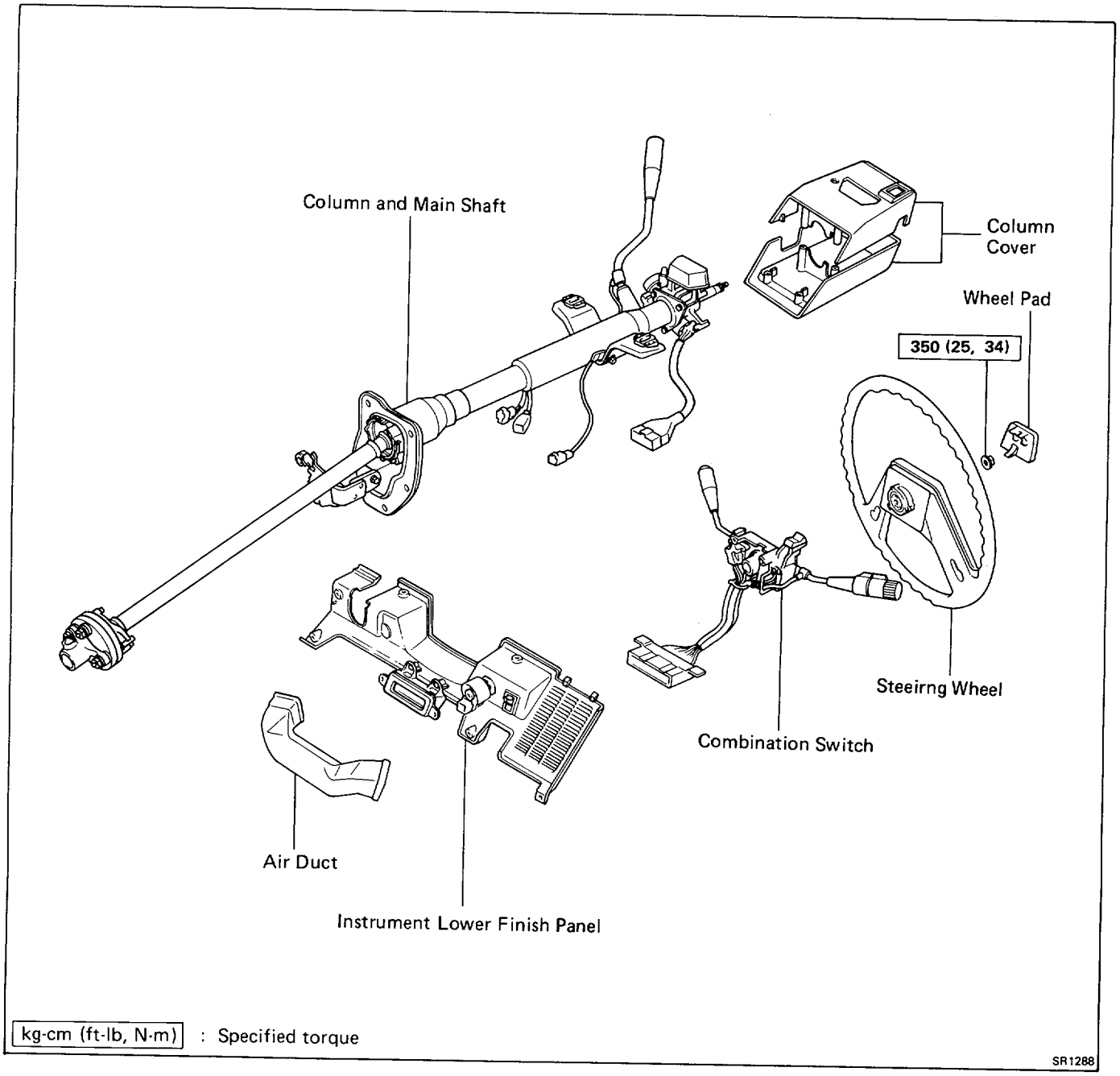
   Torque: 350 kg-cm (25 ft-lb, 34 N·m)

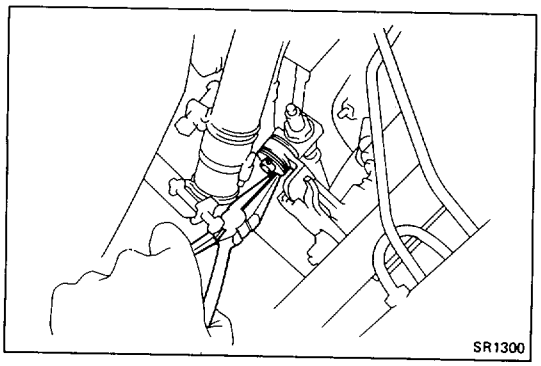
   (c) Install the steering wheel pad.

10. **CONNECT NEGATIVE CABLE TO BATTERY**

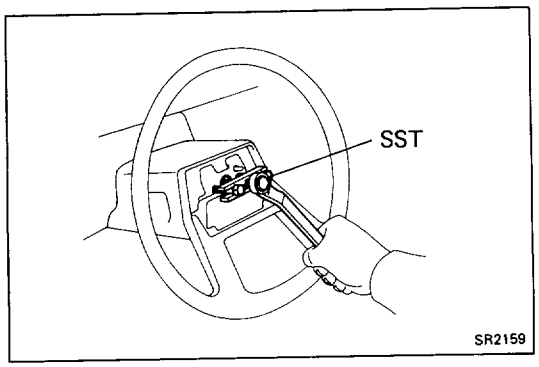
STEERING COLUMN ASSEMBLY (Column Shift)

REMOVAL OF STEERING COLUMN ASSEMBLY

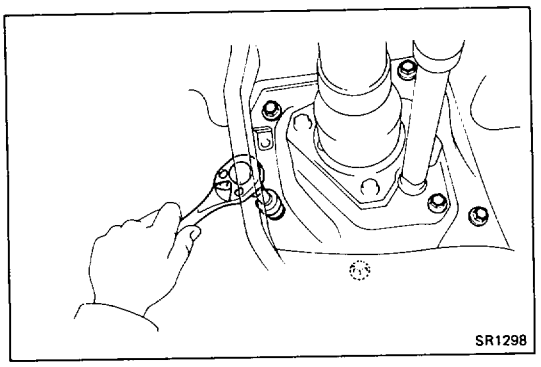




1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE COUPLING SET BOLT**
3. **DISCONNECT TRANSMISSION LINKAGE**
   Remove the cotter pin and plate.



4. **REMOVE STEERING WHEEL**
   (a) Remove the steering wheel pad.
   (b) Remove the steering wheel nut.
   (c) Using SST, remove the steering wheel.
   SST 09609-20011

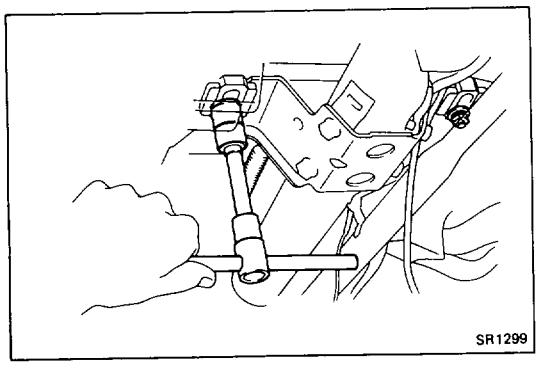


5. **REMOVE INSTRUMENT LOWER FINISH PANEL AND AIR DUCT**

6. **REMOVE COLUMN COVER AND COMBINATION SWITCH**

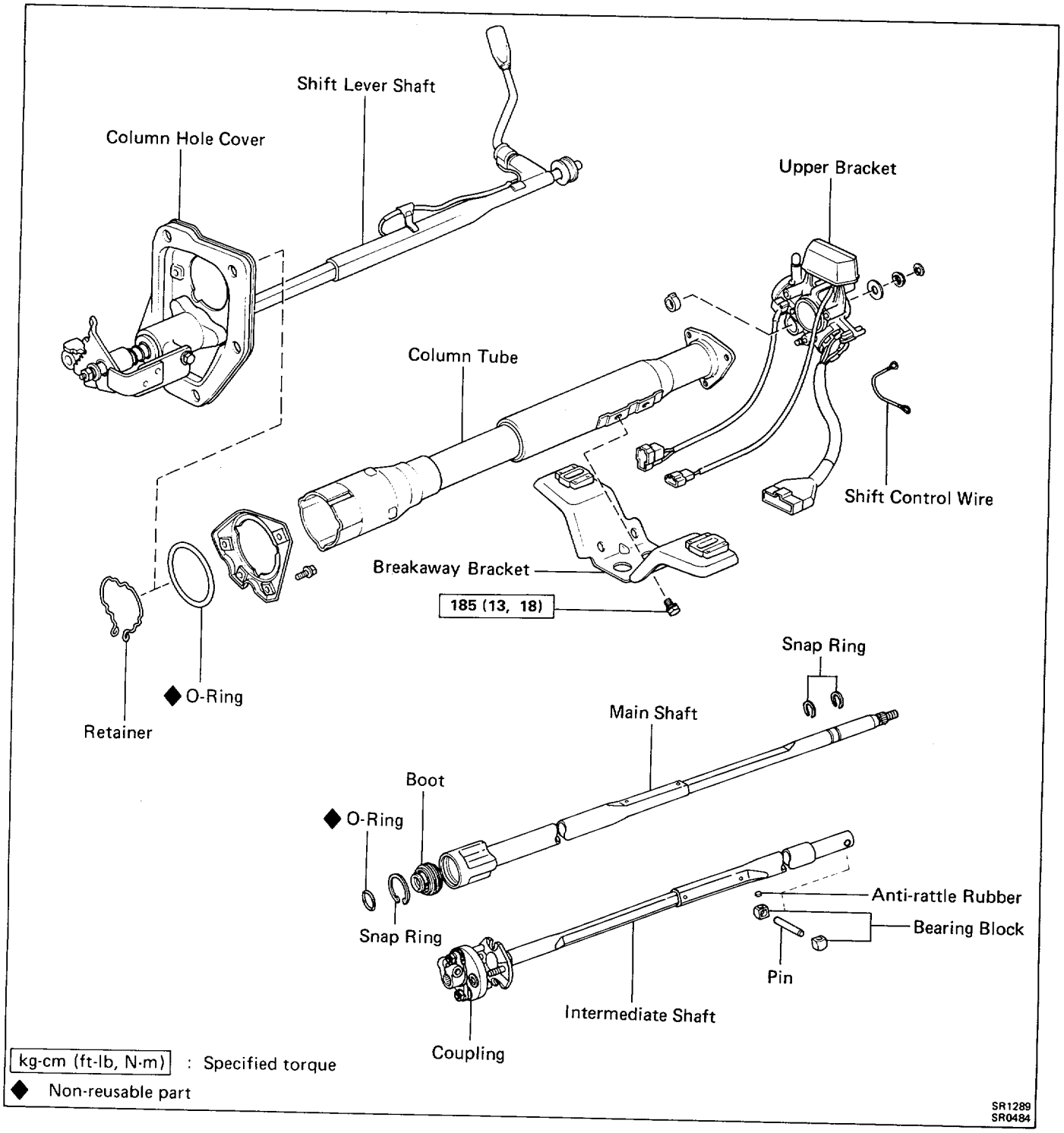
7. **REMOVE BRAKE PEDAL**

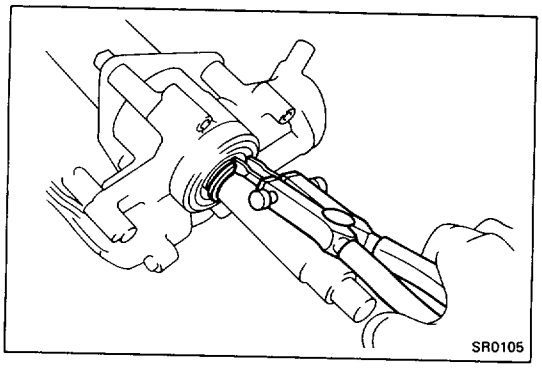
8. **REMOVE FIVE BOLTS FROM COLUMN HOLE COVER**



9. **REMOVE STEERING COLUMN**
   Remove the two breakaway bracket bolts and pull out the steering column.

COMPONENTS





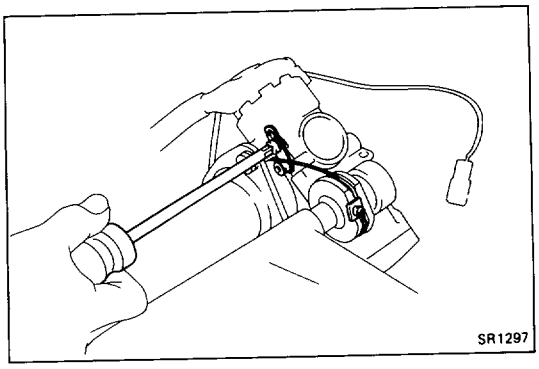
DISASSEMBLY OF STEERING COLUMN ASSEMBLY

1. REMOVE MAIN SHAFT

(a) Using snap ring pliers, remove the snap ring.

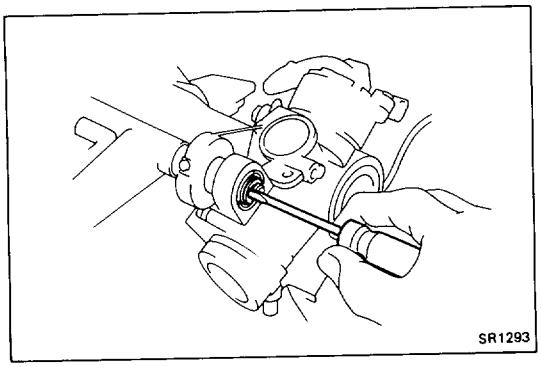
(b) Remove the retainer from column tube.

(c) Pull out the main shaft.



2. **REMOVE SHIFT CONTROL WIRE**

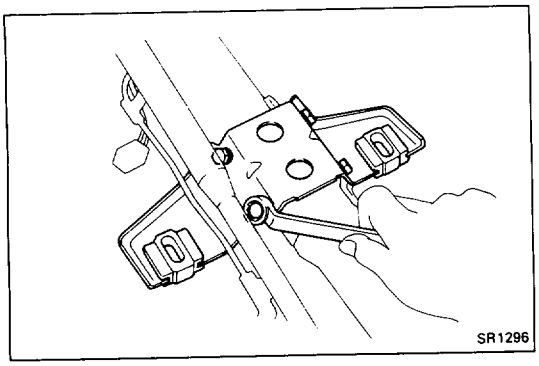
Loosen the two screw and remove the wire.



3. **REMOVE UPPER BRACKET**

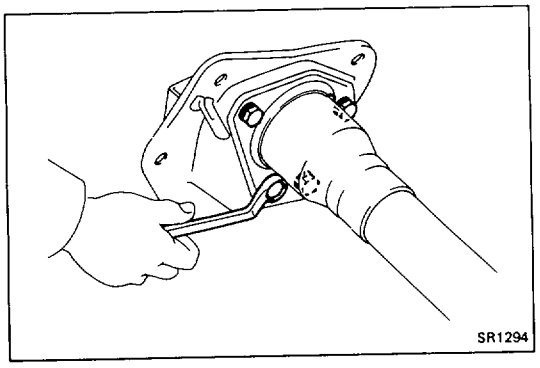
(a) Using a screwdriver, remove the E-ring and plate.

(b) Remove the three bolts and pull out the upper bracket.



4. **REMOVE BREAKAWAY BRACKET**

Remove the four bolts and bracket.



5. **REMOVE COLUMN TUBE FROM COLUMN HOLE COVER**

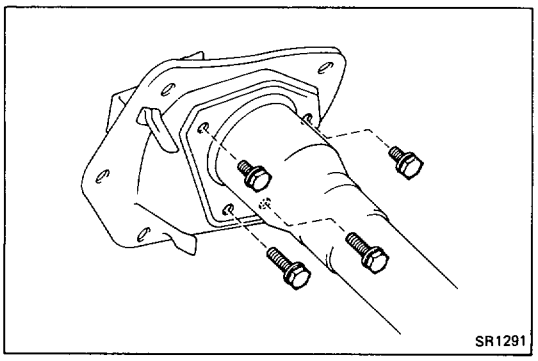
(a) Remove the four bolts.

(b) Turn the column tube clockwise and pull out it.

(c) Remove the plate and O-ring.

INSPECTION AND REPAIR OF STEERING COLUMN ASSEMBLY

(See page SR-7)



ASSEMBLY OF STEERING COLUMN ASSEMBLY

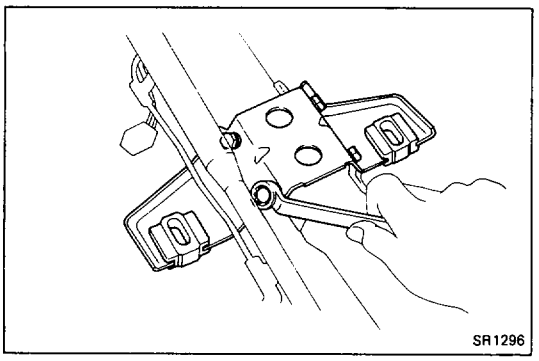
(See page SR-13)

1. INSTALL COLUMN TUBE TO COLUMN HOLE COVER

(a) Install the plate and O-ring.

(b) Install the column tube to the column hole cover with four bolts.

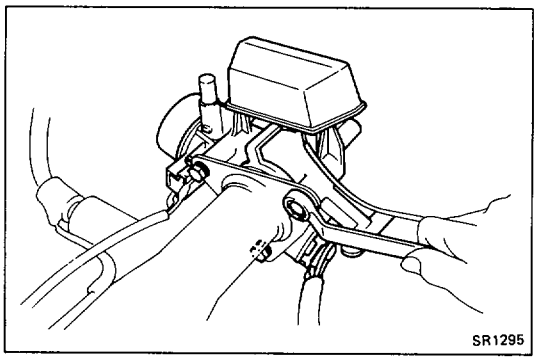
NOTE: Align the protrusion so that it fits into the column tube groove.



2. INSTALL BREAKAWAY BRACKET TO COLUMN TUBE

Install and torque the breakaway bracket with four bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

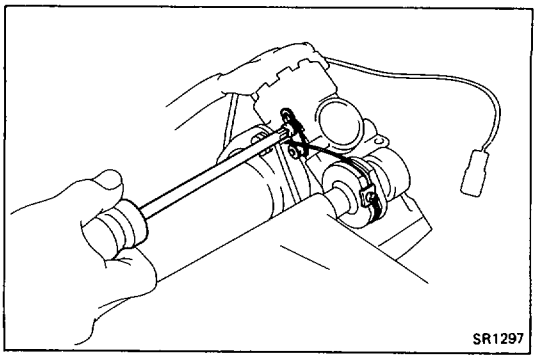


3. INSTALL UPPER BRACKET TO COLUMN TUBE

(a) Install the upper bracket with three bolts.

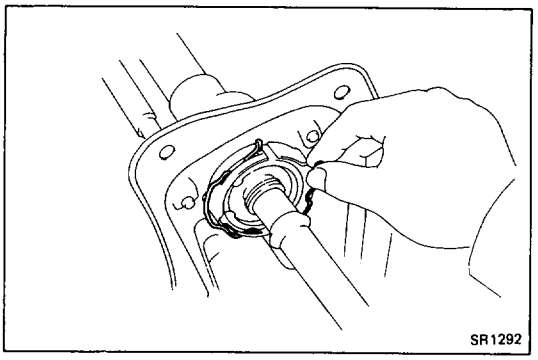
Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

(b) Install the plate and E-ring.



4. INSTALL SHIFT CONTROL WIRE

Install the wire and tighten the two screws.



5. INSTALL MAIN SHAFT

(a) Insert the main shaft to the column tube.

(b) Install the retainer to the column tube slits.

(c) Using snap ring pliers, install the snap ring to the main shaft.

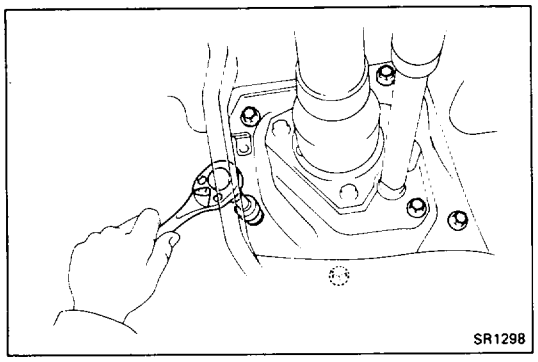
INSTALLATION OF STEERING COLUMN ASSEMBLY

(See page SR-11)

1. PLACE STEERING COLUMN ASSEMBLY IN INSTALLED POSITION

2. CONNECT COUPLING AND WORM SHAFT

   Line up the marks on the coupling and worm shaft.

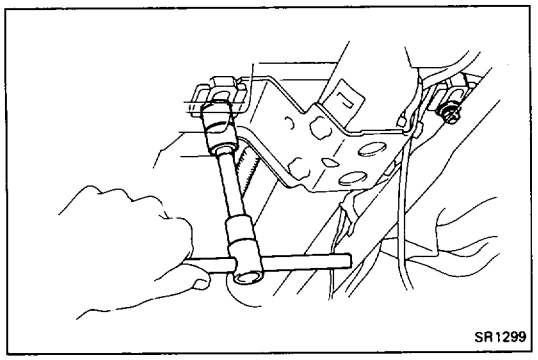


3. TEMPORARILY INSTALL TWO BREAKAWAY BRACKET BOLTS

4. INSTALL STEERING COLUMN HOLE COVER

   Install the column hole cover with five bolts and torque the five bolts.

   Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)



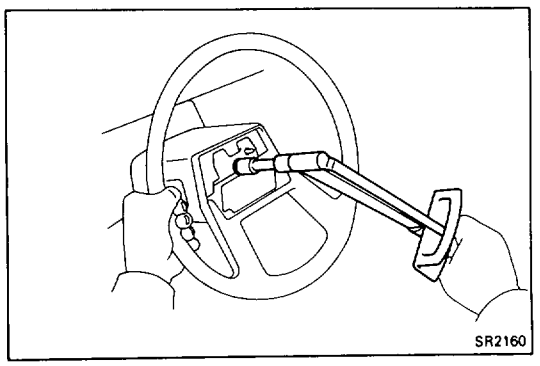
5. TORQUE TWO BREAKAWAY BRACKET BOLTS

   Torque: 260 kg-cm (19 ft-lb, 25 N·m)

6. INSTALL BRAKE PEDAL

7. INSTALL COMBINATION SWITCH AND COLUMN COVER

8. INSTALL AIR DUCT AND INSTRUMENT LOWER FINISH PANEL



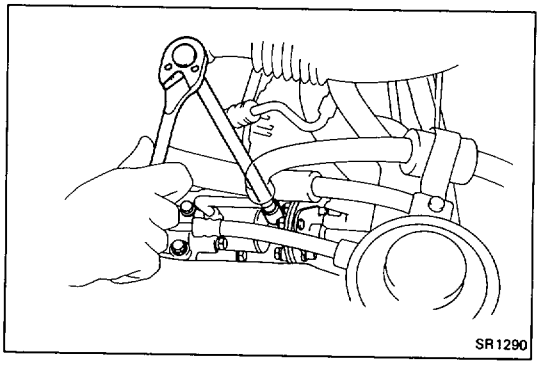
9. INSTALL STEERING WHEEL

   (a) Align the matchmarks on the main shaft and steering wheel.

   (b) Torque the nut.

   Torque: 350 kg-cm (25 ft-lb, 34 N·m)

   (c) Install the steering wheel pad.



10. INSTALL COUPLING SET BOLTS

Install and torque the coupling set bolts.

Torque: 360 kg-cm (26 ft-lb, 35 N·m)

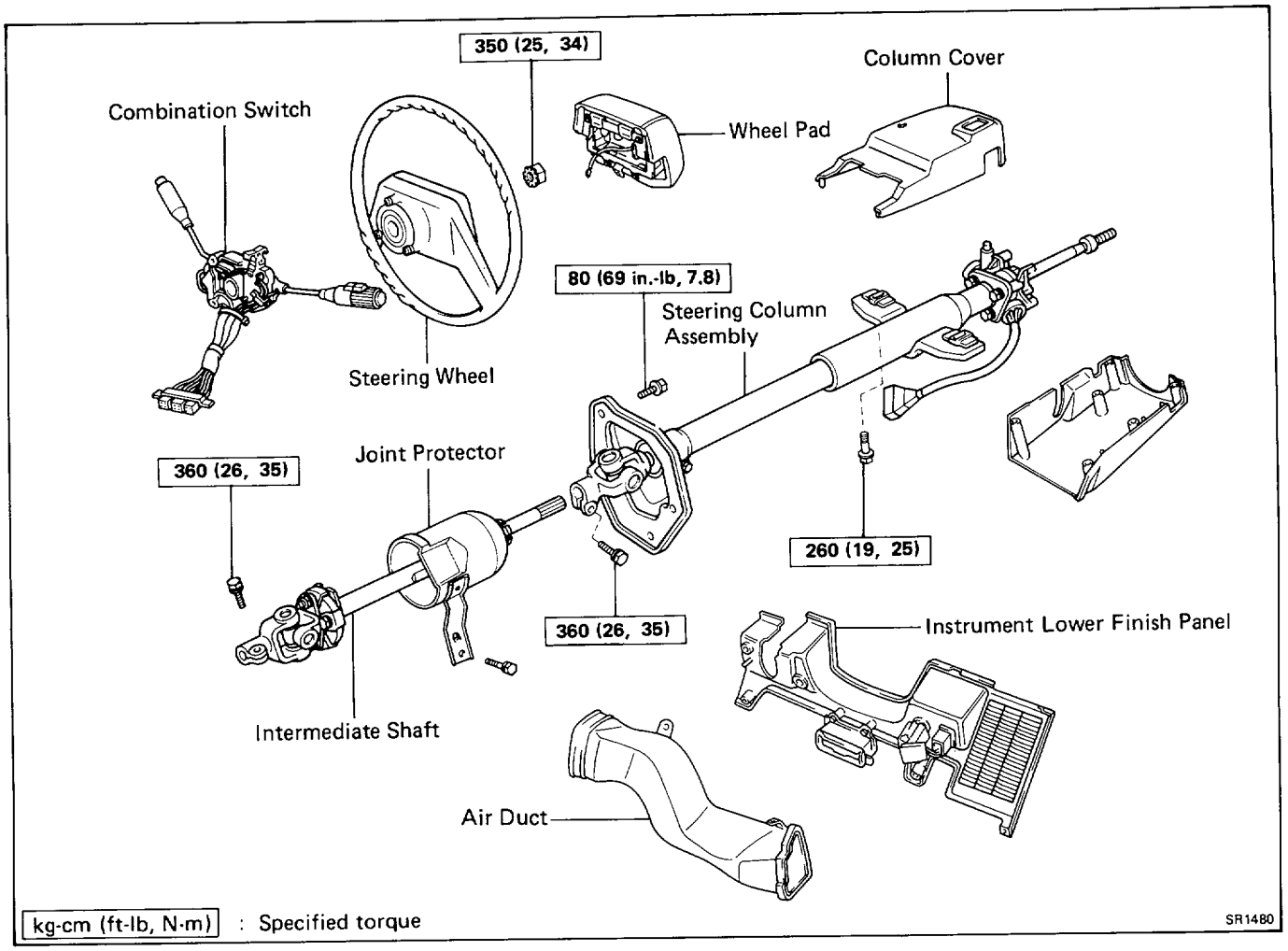
11. CONNECT TRANSMISSION LINKAGE

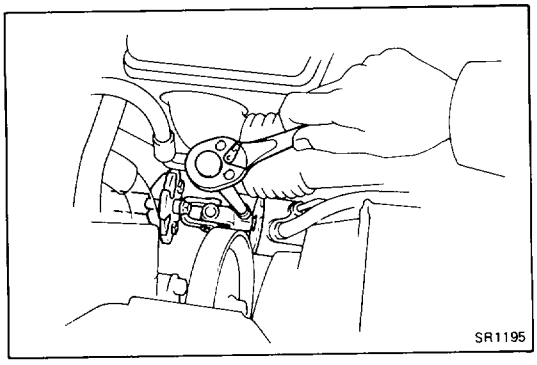
Connect transmission linkage and install the plate and cotter pin.

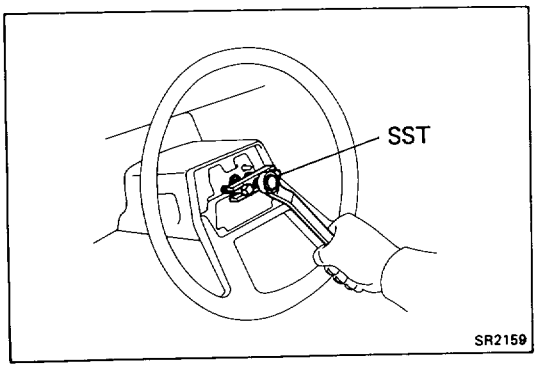
12. CONNECT NEGATIVE CABLE TO BATTERY

STEERING COLUMN ASSEMBLY(4WD)

REMOVAL OF STEERING COLUMN ASSEMBLY







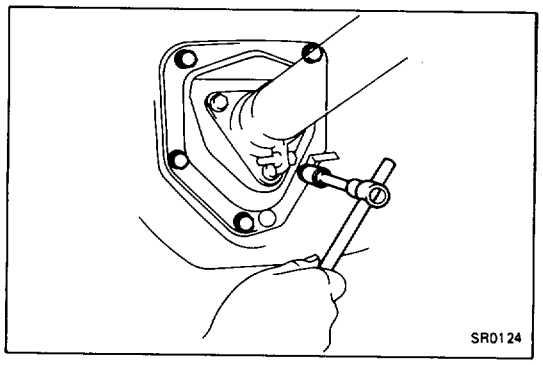
1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**

2. **REMOVE INTERMEDIATE SHAFT**
   (a) Remove the joint protector from the gear housing.
   (b) Place matchmarks on the joint yoke and worm shaft.
   (c) Remove the two mount bolts.
   (d) First pull the intermediate shaft from the gear housing, and then pull it out from the main shaft.

3. **REMOVE STEERING WHEEL**
   (a) Remove the steering wheel pad.
   (b) Remove the steering wheel nut.
   (c) Using SST, remove the steering wheel.
   SST 09609-20011

4. **REMOVE INSTRUMENT LOWER FINISH PANEL AND AIR DUCT**

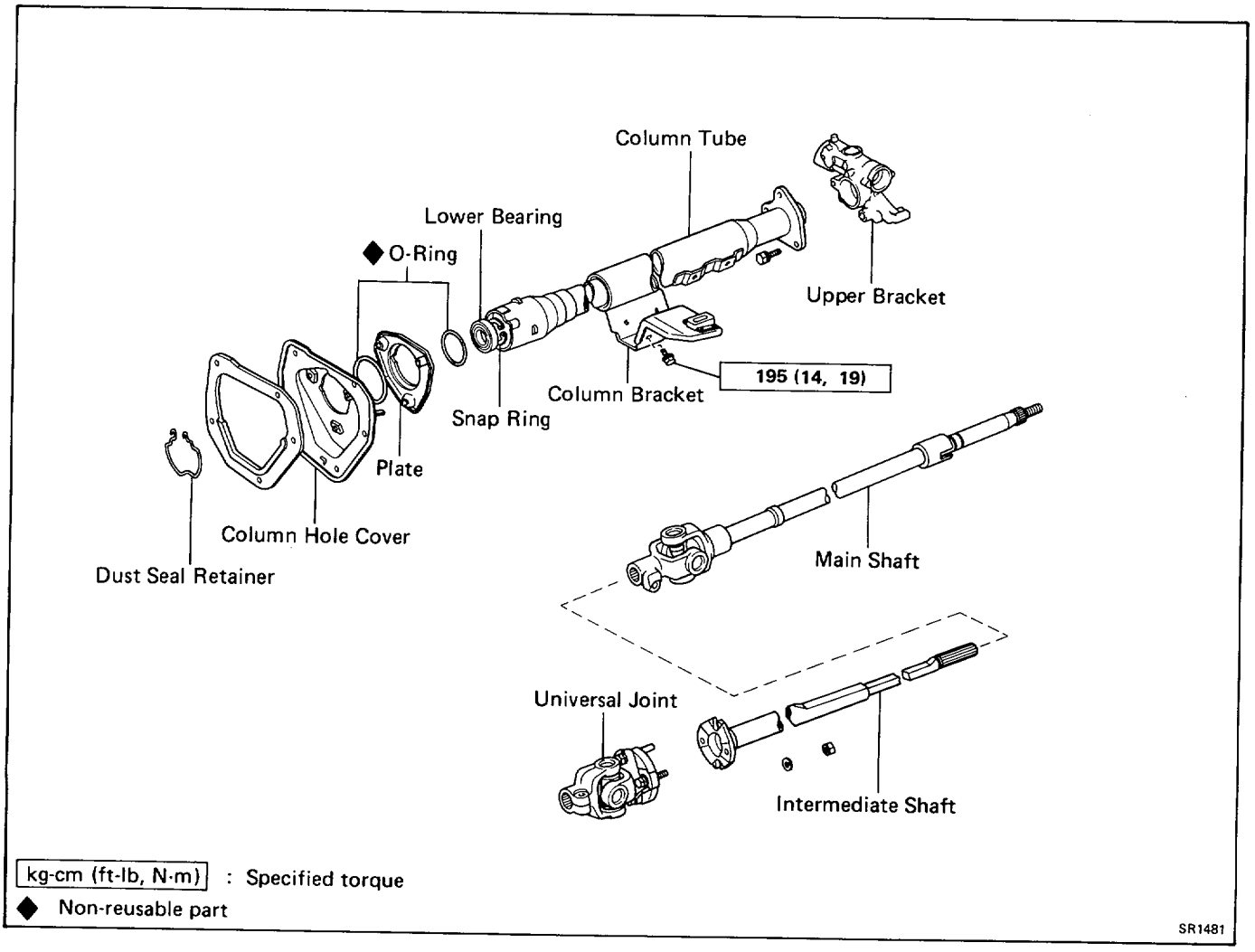
5. **REMOVE COLUMN COVER AND COMBINATION SWITCH**

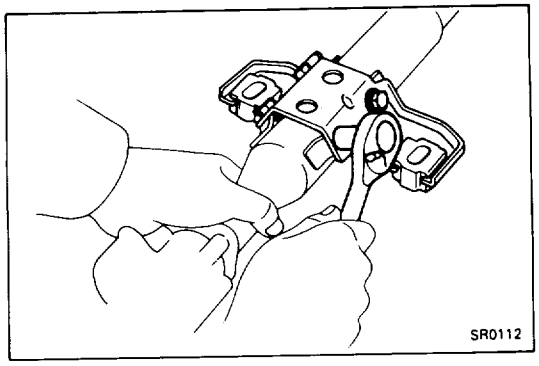


6. **REMOVE FIVE BOLTS FROM COLUMN HOLE COVER**

7. **REMOVE MAIN SHAFT**
   (a) Remove the mount bolts.
   (b) Pull out the main shaft.

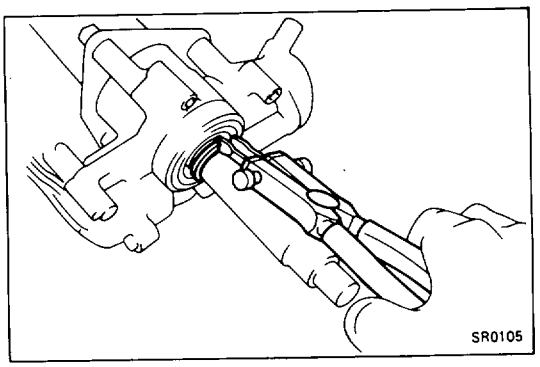
COMPONENTS





DISASSEMBLY OF STEERING COLUMN ASSEMBLY

1. REMOVE STEERING COLUMN BRACKET

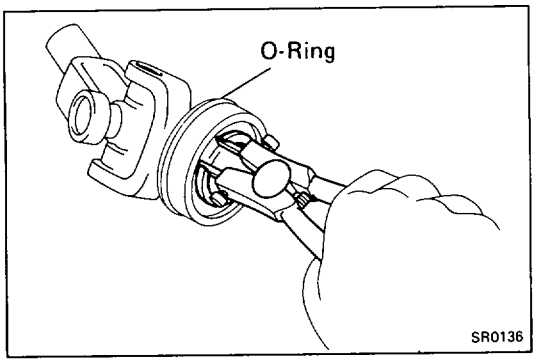


2. REMOVE STEERING MAIN SHAFT

(a) Using snap ring pliers, remove the snap ring.

(b) Remove the dust seal retainer.

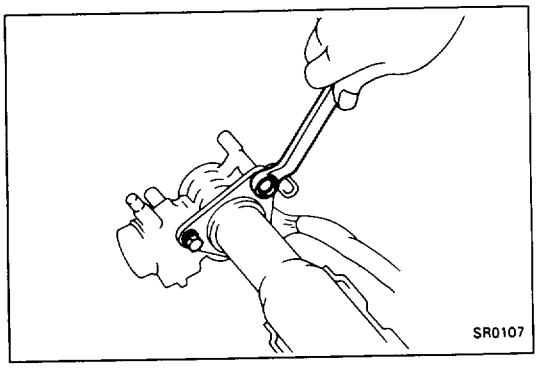
(c) Pull out the main shaft.



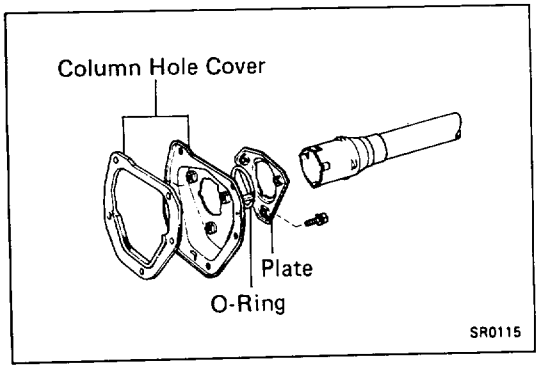
3. REMOVE LOWER BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Pull out the lower bearing with the O-ring from the main shaft.



4. REMOVE UPPER BRACKET FROM COLUMN TUBE



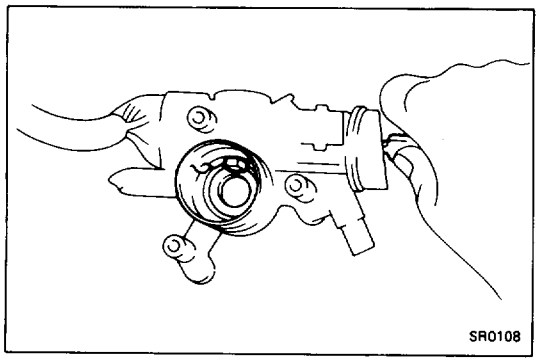
5. REMOVE COLUMN HOLE COVER FROM COLUMN TUBE

Remove the following parts from the column tube.

(a) Column hole cover

(b) O-ring

(c) Plate



INSPECTION OF STEERING COLUMN ASSEMBLY

1. INSPECT UPPER BRACKET

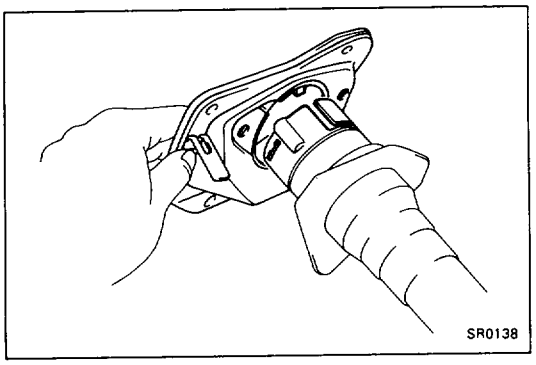
(a) Check that the steering lock mechanism operates properly.

(b) Check the upper bearing rotation condition and check for abnormal noise.

if the bearing is worn or damaged, replace the upper bracket.

2. INSPECT LOWER BEARING

Check the lower bearing for wear or damage.
If the bearing is worn or damaged, replace it.



ASSEMBLY OF STEERING COLUMN ASSEMBLY

(See page SR-19)

1. INSTALL COLUMN HOLE COVER ON COLUMN TUBE

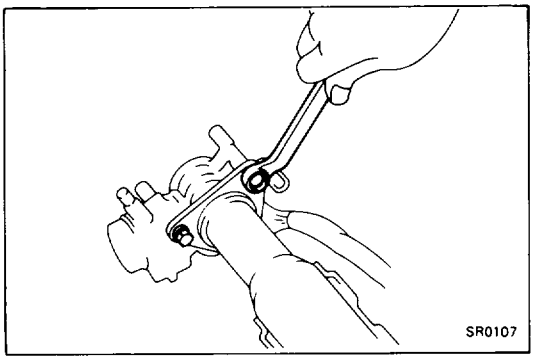
Install the following parts on the column tube.

(a) Plate

(b) O-ring

(c) Column hole cover

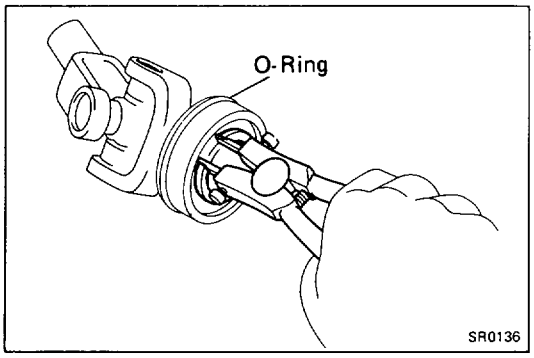
NOTE: Align the protrusion so that it fits into the column tube groove.



2. INSTALL UPPER BRACKET TO COLUMN TUBE

Install the upper bracket and the bolts.

Torque: 55 kg-cm (48 in-lb, 5.4 N·m)

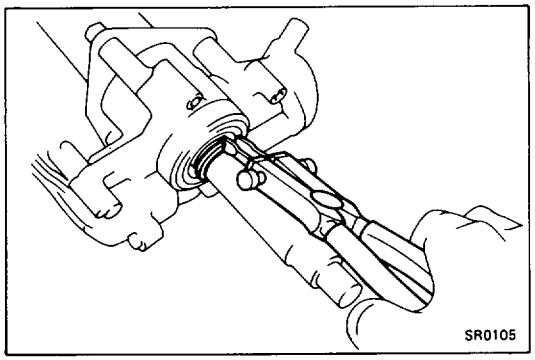


3. INSTALL LOWER BEARING TO MAIN SHAFT

(a) Apply MP grease to the main shaft.

(b) Install the lower bearing with the O-ring to the main shaft.

(c) Using snap ring pliers, install the snap ring.

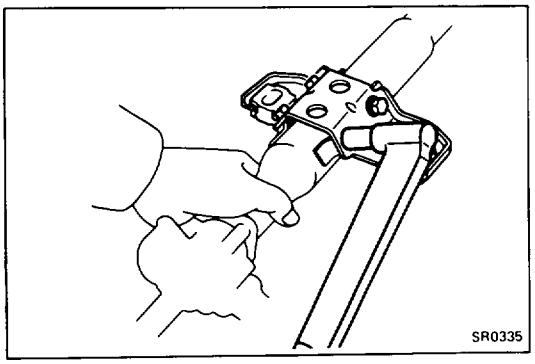


4. INSTALL MAIN SHAFT TO COLUMN TUBE

(a) Insert the main shaft in the column tube.

(b) Install the dust seal retainer to the column tube.

(c) Using snap ring pliers, install the snap ring.



5. INSTALL COLUMN TUBE BRACKET

Torque the four mount bolts.

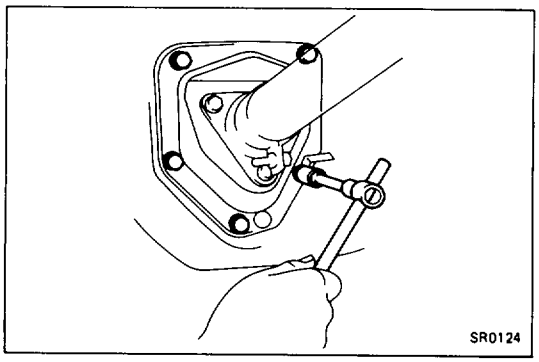
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

INSTALLATION OF STEERING COLUMN ASSEMBLY

(See page SR-18)

1. **PLACE COLUMN AND MAIN SHAFT IN INSTALLED POSITION**

2. **INSTALL COLUMN BRACKET MOUNT BOLTS BY HAND**



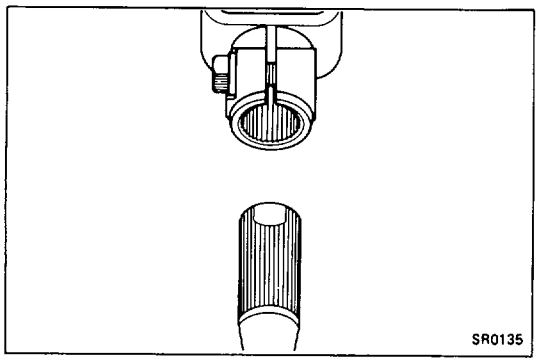
3. **INSTALL STEERING COLUMN HOLE COVER**

   Torque the five bolts.

   Torque: 80 kg-cm (69 in-lb, 7.8 N·m)

4. **TORQUE TWO COLUMN BRACKET MOUNT BOLTS**

   Torque: 260 kg-cm (19 ft-lb, 25 N·m)



5. **INSTALL INTERMEDIATE SHAFT**

   (a) Align the non-toothed portions of the intermediate shaft and the joint yoke.

   (b) Insert the intermediate shaft in the joint yoke.

   (c) Align the matchmarks on the intermediate shaft and worm shaft.

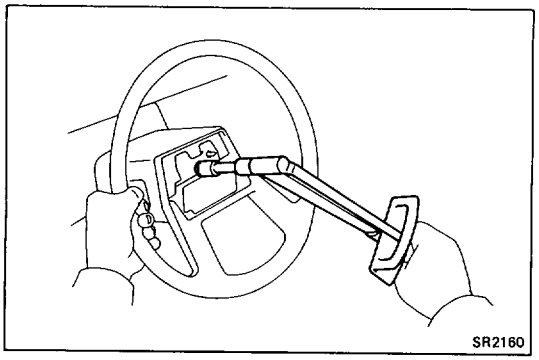
   (d) Torque the coupling set bolt.

   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

   (e) Torque the joint yoke bolt.

   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

   (f) Install the joint protector to the gear housing.



6. **INSTALL COMBINATION SWITCH AND COLUMN COVER**

7. **INSTALL AIR DUCT AND LOWER FINISH PANEL**

8. **INSTALL STEERING WHEEL**

   (a) Torque the mount nut.

   Torque: 350 kg-cm (25 ft-lb, 34 N·m)

   (b) Install the steering wheel pad.

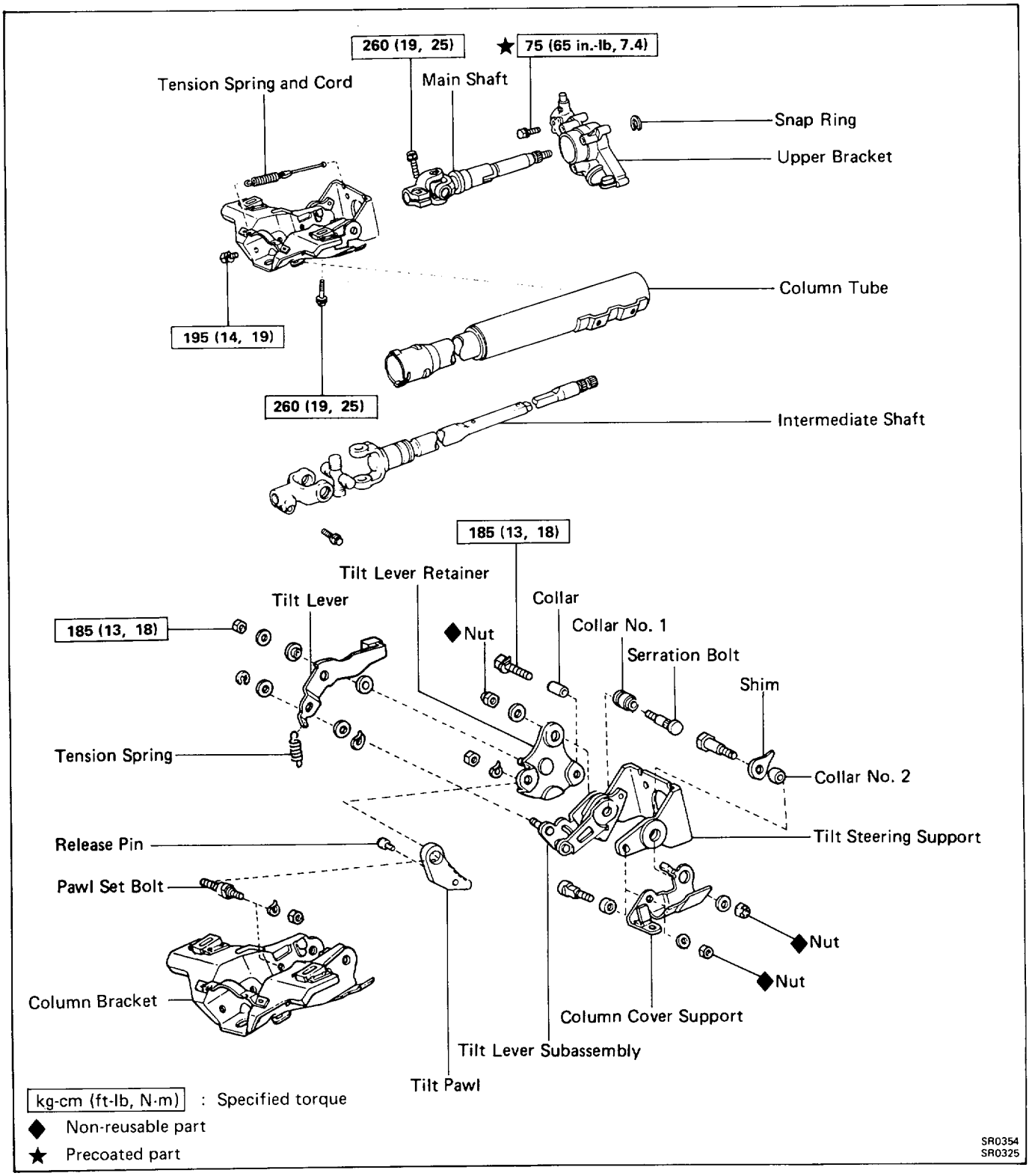
9. **CONNECT NEGATIVE CABLE TO BATTERY**

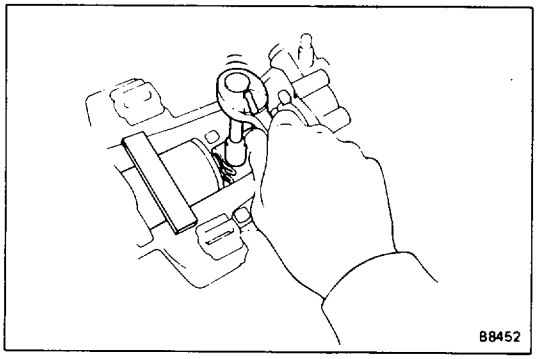
STEERING COLUMN ASSEMBLY WITH TILT STEERING

REMOVAL OF STEERING COLUMN ASSEMBLY

(See page SR-4 or SR-18)

COMPONENTS

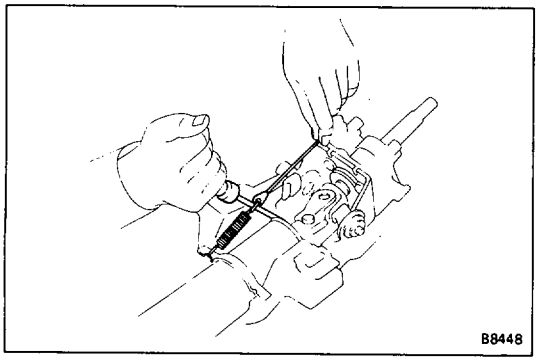




DISASSEMBLY OF STEERING COLUMN ASSEMBY AND TILT MECHANISM

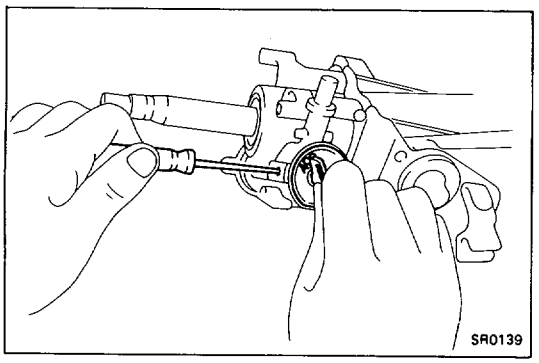
(See page SR-24)

1. **DISCONNECT INTERMEDIATE SHAFT FROM MAIN SHAFT**
   (a) Place matchmarks on the intermediate shaft and universal joint.
   (b) Remove the bolt.
   (c) Remove the dust seal retainer.
   (d) Pull out the intermediate shaft from the main shaft.



2. **REMOVE TENSION SPRINGS AND CORDS**
   (a) Fully tilt the main shaft upward.
   (b) Release the cord from the hook.
   (c) Using a screwdriver, pry out the cord tip and remove the spring and cord.

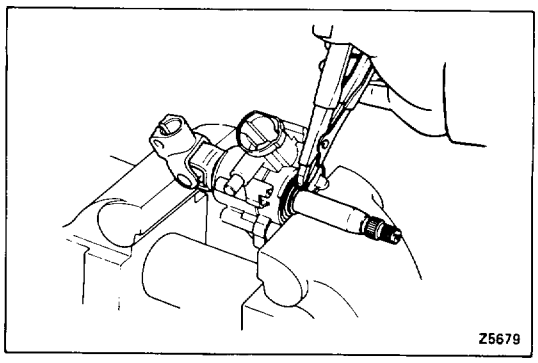
3. **REMOVE COLUMN TUBE FROM COLUMN BRACKET**



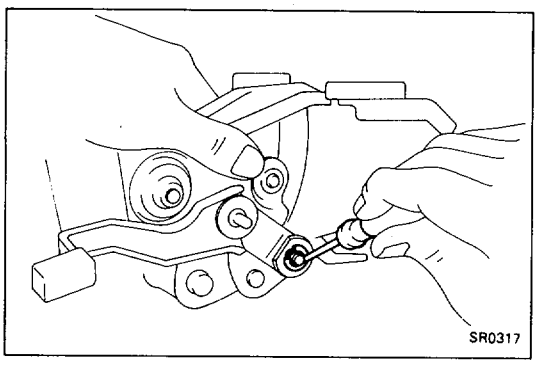
4. **REMOVE IGNITION KEY CYLINDER**
   (a) Place the ignition key at the ACC position.
   (b) Push down the stop key with a thin rod, and pull out the key cylinder.

5. **REMOVE UPPER BRACKET WITH MAIN SHAFT FROM COLUMN BRACKET**

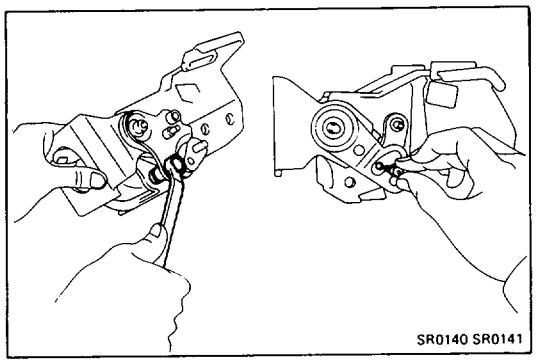
6. **REMOVE IGNITION SWITCH**



7. **REMOVE MAIN SHAFT FROM UPPER BRACKET**
   (a) Using a soft jaws vise and snap ring pliers, remove the snap ring.
   (b) Pull out the main shaft from the bracket.



8. **REMOVE TILT LEVER**
   (a) Remove the tension spring.
   (b) Remove the E-ring and bushing.
   (c) Remove the nut, plate washer and nylon bushing.
   (d) Remove the lever, bushing, wave washer and nylon bushing.

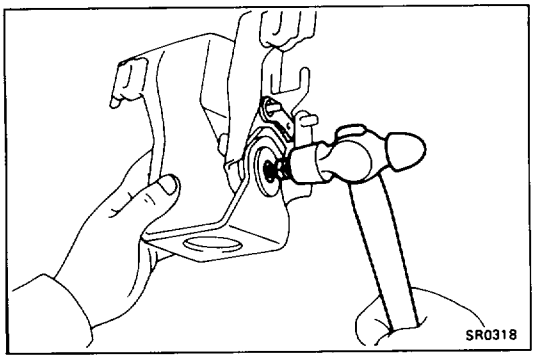


9. REMOVE TILT LEVER RETAINER

(a) Remove the bolt, two nuts and two washers.

(b) Remove the lever retainer and collar.

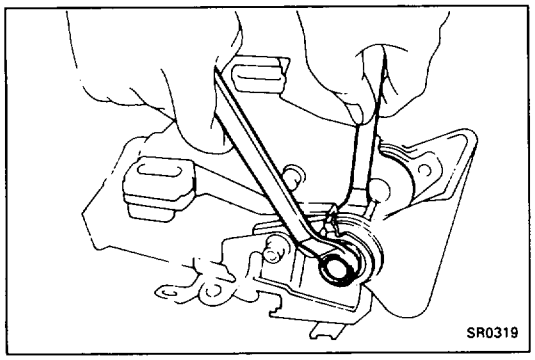
10. REMOVE RELEASE PIN



11. REMOVE SERRATION BOLT

Temporarily install another nut flat with the end of the bolt and tap it in with a hammer.

12. REMOVE TILT PAWL



13. REMOVE COLUMN COVER SUPPORT

Remove the following parts:

(a) Nuts

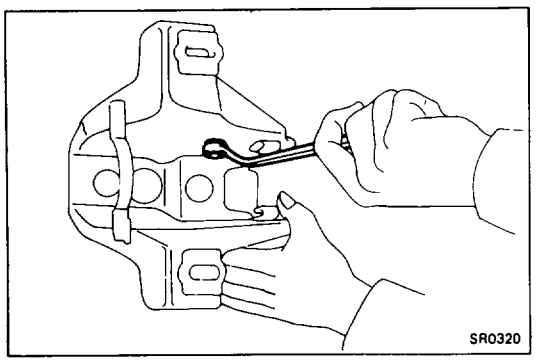
(b) Bolts

(c) Collars

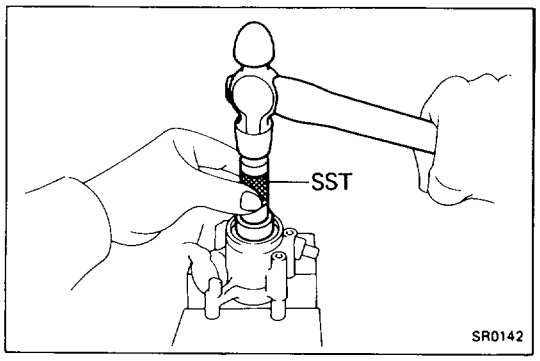
(d) Washers

(e) Shim

14. REMOVE TILT STEERING SUPPORT WITH TILT LEVER SUBASSEMBLY



15. REMOVE PAWL SET BOLT

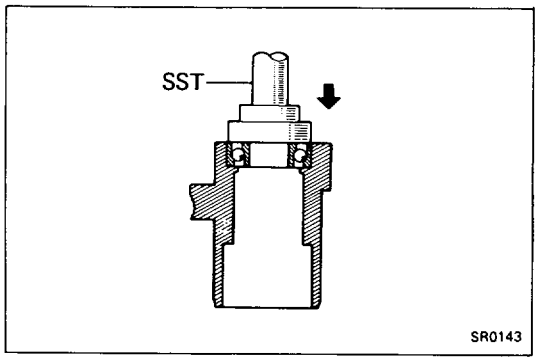


INSPECTION AND REPAIR OF STEERING COLUMN ASSEMBLY

1. IF NECESSARY, REPLACE BEARING IN UPPER BRACKET

(a) Using a hammer and SST, remove the bearing.

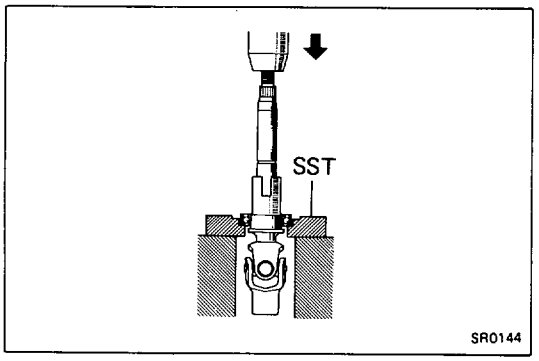
SST 09620-30010 (09623-30010)



(b) Pack MP grease into the bearing.

(c) Using a hammer and SST, drive the bearing into the bracket.

SST 09620-30010 (09624-30010, 09631-00020)

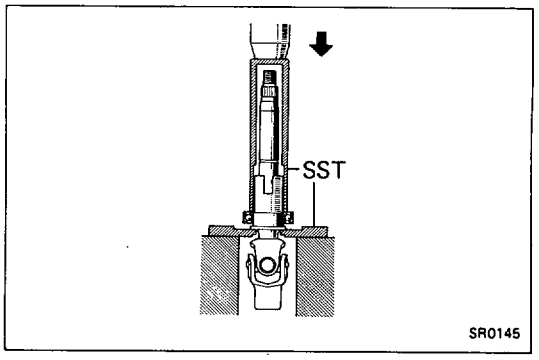


2. IF NECESSARY, REPLACE LOWER BEARING

(a) Using a press and SST, remove the lower bearing from the main shaft.

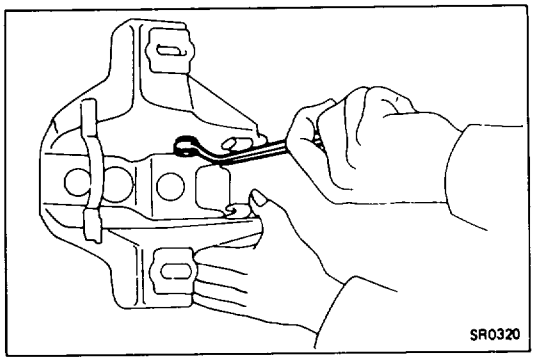
SST 09527-20011

(b) Pack MP grease into the bearing.



(c) Using a press and SST, assemble the lower bearing and main shaft.

SST 09236-00101 (09237-00010)
09612-22011


SR0320

ASSEMBLY OF STEERING COLUMN ASSEMBLY AND TILT MECHANISM

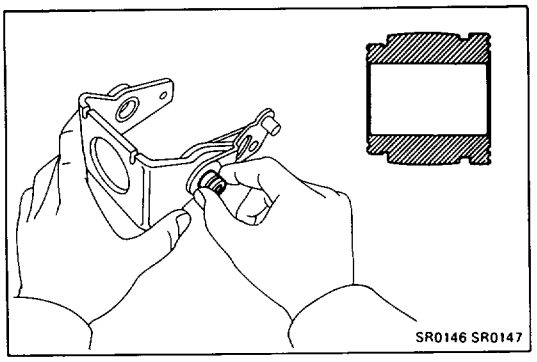
(See page SR-24)

1. APPLY MP GREASE TO ALL RUBBING PARTS

2. INSTALL PAWL SET BOLT

Install the bolt and torque the nut.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)


SR0146 SR0147

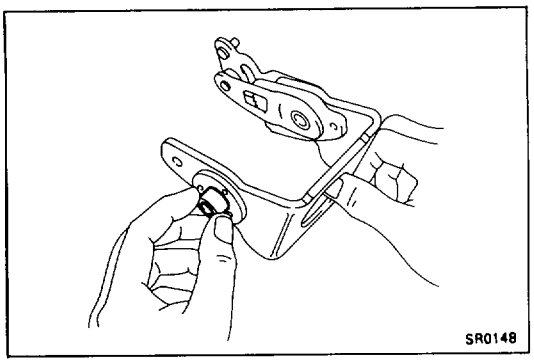
3. ASSEMBLE TILT LEVER SUBASSEMBLY, COLLAR NO.1 AND NO.2

(a) Select a collar No.1 which will eliminate all play.

Outer diameter	mm (in.)
17.998 — 18.005	(0.7086 — 0.7089)
18.005 — 18.012	(0.7089 — 0.7091)
18.012 — 18.019	(0.7091 — 0.7094)
18.019 — 18.026	(0.7094 — 0.7097)
18.026 — 18.033	(0.7097 — 0.7100)

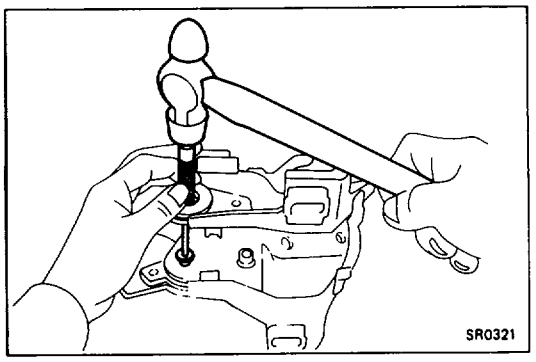
(b) Install the tilt lever subassembly and collar No.1 to the support.

(c) Select a collar No.2 which will eliminate all play.


SR0148

Outer diameter	mm (in.)
18.005 — 18.020	(0.7089 — 0.7094)
18.020 — 18.035	(0.7094 — 0.7100)

(d) Install collar No.2 to the support.


SR0321

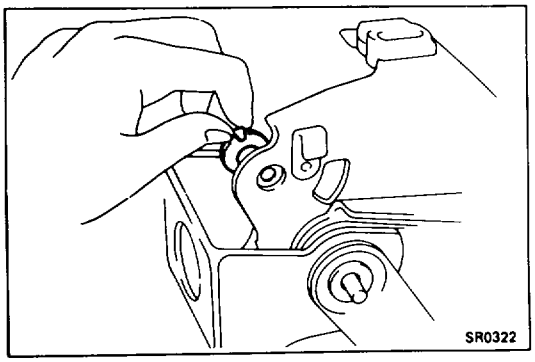
4. INSTALL TILT PAWL

5. INSTALL TILT STEERING SUPPORT TO COLUMN BRACKET

Install the tilt steering support to the column bracket and drive in the serration bolt.

6. INSTALL SHIM AND BOLT

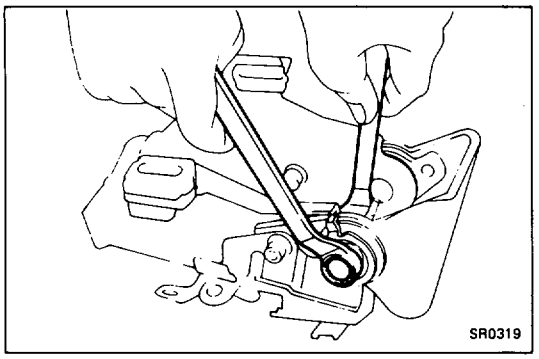
(a) Select a shim which fits snugly when pressed in by hand.


SR0322

Shim thickness

Mark	Thickness	mm (in.)
None	0.193 — 0.203	(0.0078 — 0.0080)
5	0.495 — 0.505	(0.0195 — 0.0199)
8	0.795 — 0.805	(0.0313 — 0.0317)
14	1.395 — 1.405	(0.0549 — 0.0553)
18	1.795 — 1.805	(0.0707 — 0.0711)

(b) Install the shim and bolt.



7. INSTALL COLUMN COVER SUPPORT

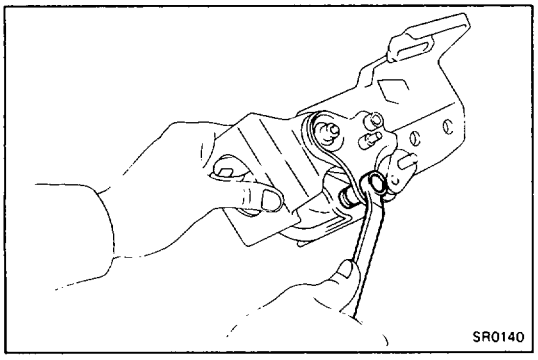
Install the following parts:

(a) Column cover support

(b) Bolt and collar

(c) Washers and nuts

8. INSTALL RELEASE PIN TO TILT PAWL

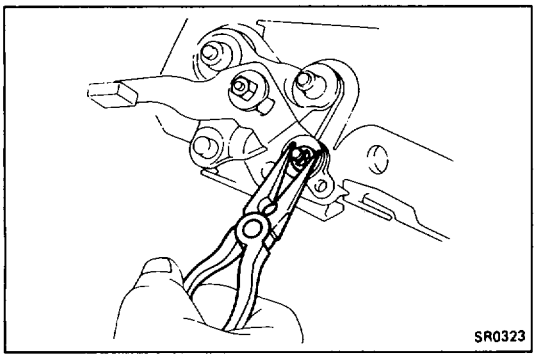


9. INSTALL TILT LEVER RETAINER

(a) Install the collar and lever retainer.

(b) Install the bolt, two nuts and washers.

Torque: 185 kg-cm (13 ft-lb, 18 N·m)



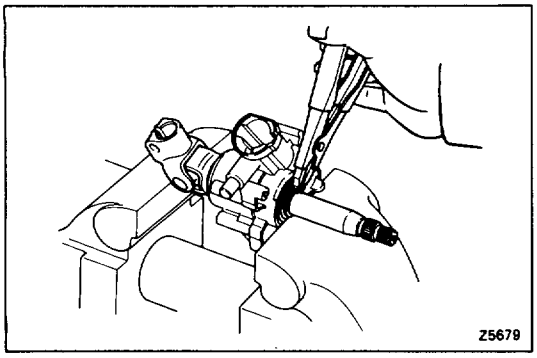
10. INSTALL TILT LEVER

(a) Install the nylon bushing, wave washer, bushing and lever.

(b) Install the nylon bushing, plate washer and nut.

(c) Install the bushing and E-ring.

(d) Install the tension spring.



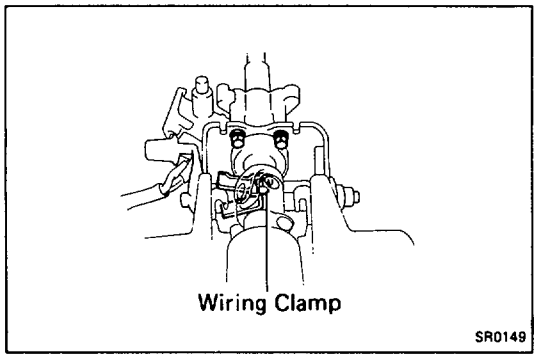
11. INSTALL MAIN SHAFT TO UPPER BRACKET

(a) Insert the main shaft to the upper bracket.

(b) Using a soft-jaw vise and snap ring pliers, install the snap ring.

12. INSTALL IGNITION SWITCH

13. INSTALL IGNITION KEY CYLINDER



14. INSTALL UPPER BRACKET WITH MAIN SHAFT TO COLUMN BRACKET

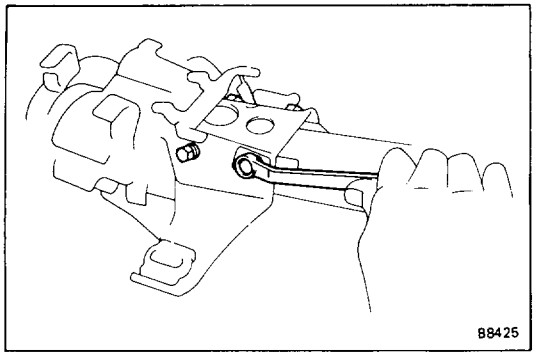
(a) Apply sealant to 1 or 2 threads of the bolt end.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

NOTE: This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.

(b) Install the two bolts; one with a wiring clamp.

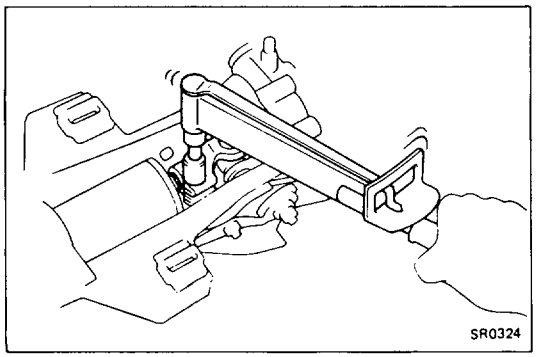
Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)



15. INSTALL COLUMN TUBE TO COLUMN BRACKET

Install the four bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)



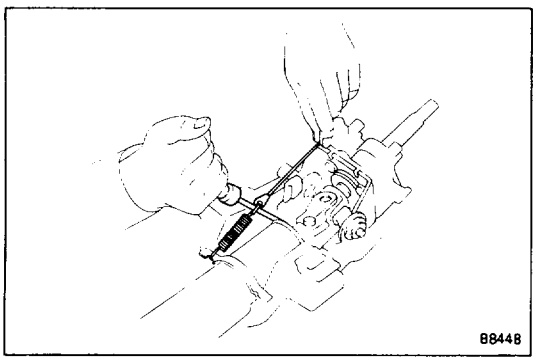
16. CONNECT INTERMEDIATE SHAFT

(a) Align the matchmarks on the universal joint and intermediate shaft.

(b) Torque the bolt.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

(c) Install the dust cover retainer.



17. INSTALL TENSION SPRINGS AND CORDS

(a) Connect the spring and cord, and hook the spring to the hanger.

(b) Hook the cord end to the tilt steering support.

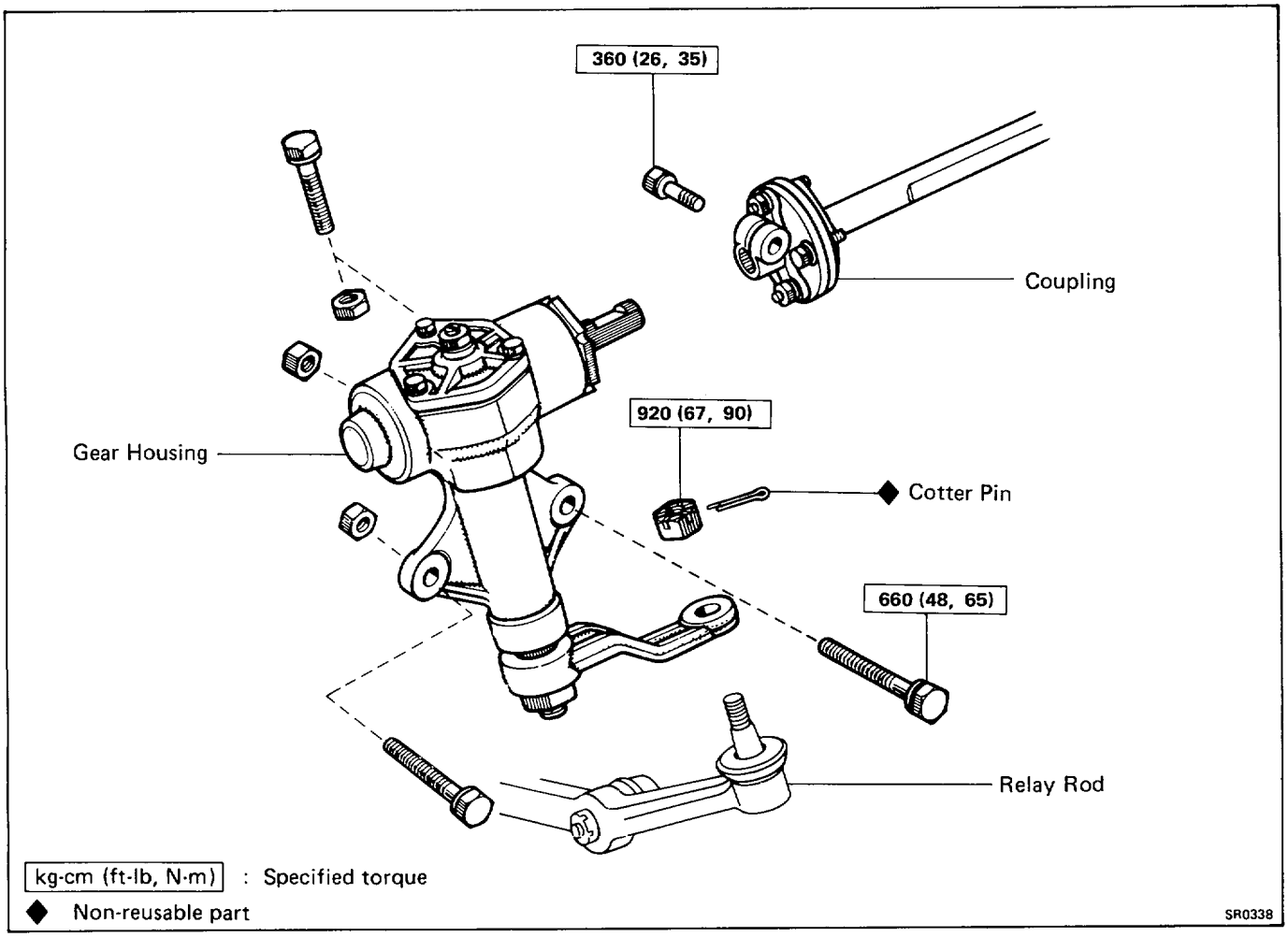
(c) Hook the cord to the tilt steering support hook.

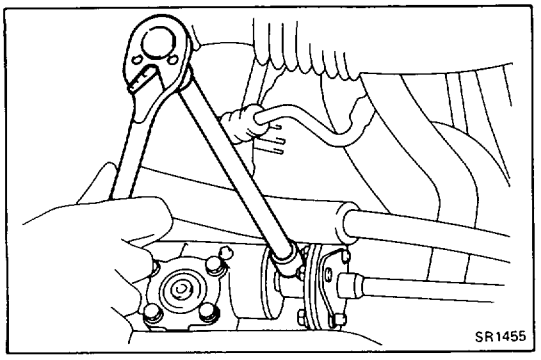
INSTALLATION OF STEERING COLUMN ASSEMBLY

(See page SR-10 or 23)

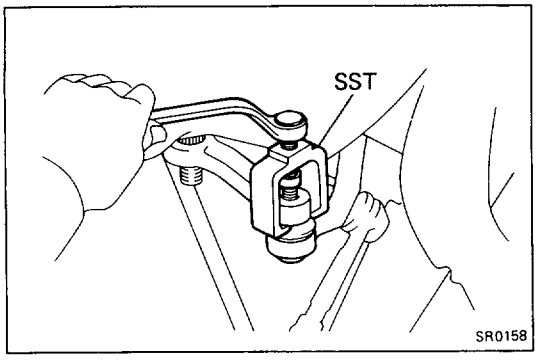
STEERING GEAR HOUSING (2WD)

REMOVAL OF GEAR HOUSING





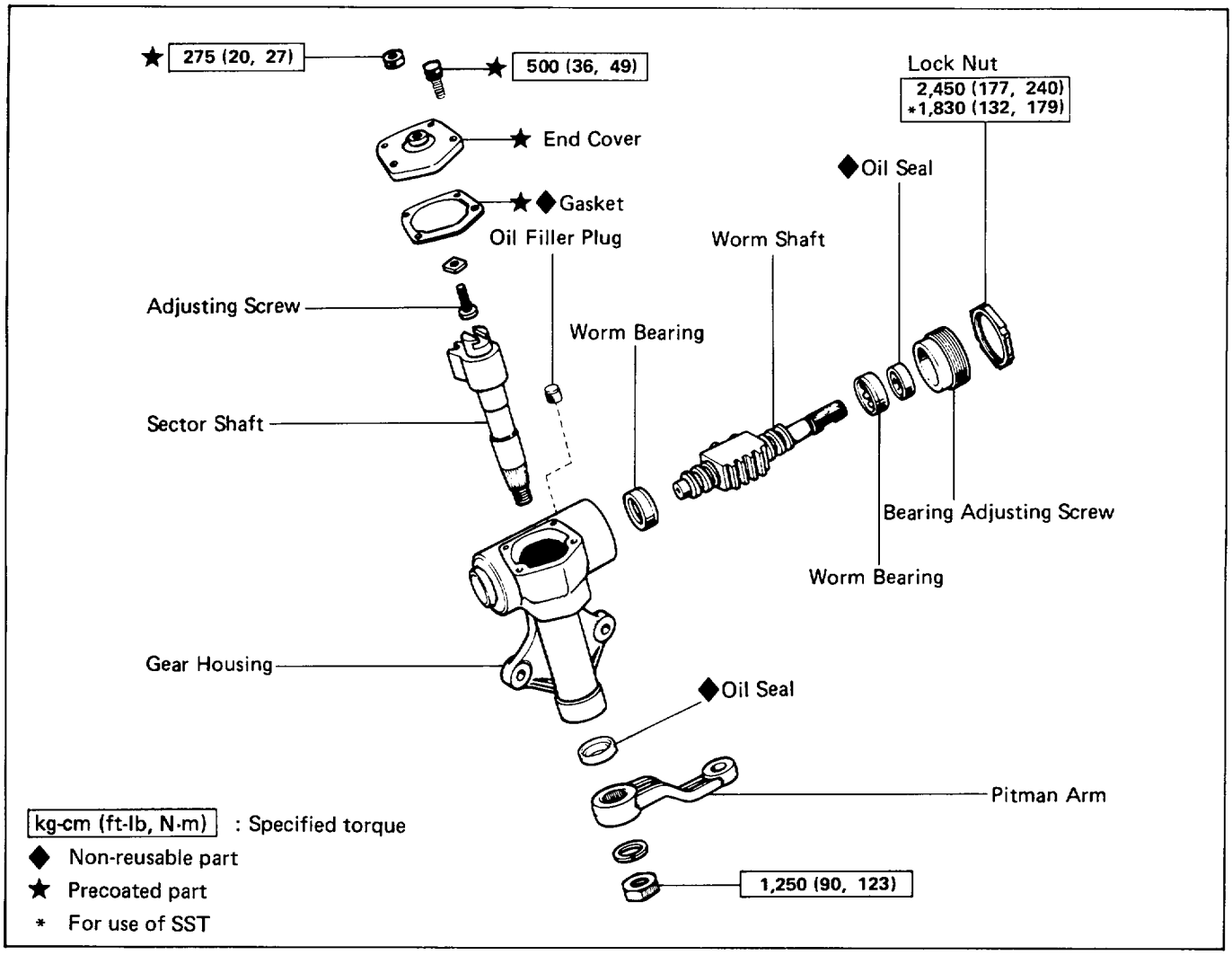
1. **REMOVE COUPLING SET BOLT**

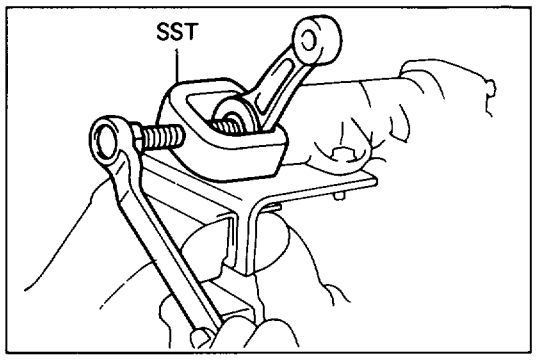


2. **DISCONNECT RELAY ROD FROM PITMAN ARM**
   (a) Loosen the pitman arm mount nut.
   (b) Using SST, disconnect the relay rod from the pitman arm.
   SST 09611-22012

3. **REMOVE GEAR HOUSING**
   Remove the three bolts and the gear housing.

COMPONENTS



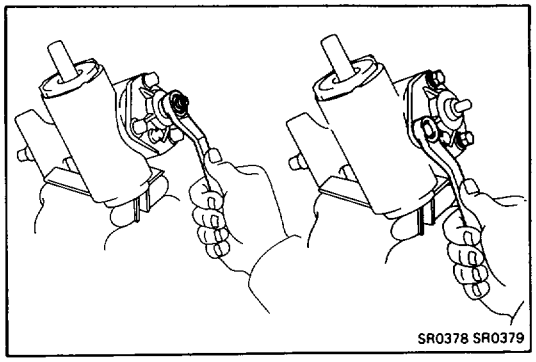


DISASSEMBLY OF STEERING GEAR HOUSING

1. REMOVE OIL FILLER PLUG AND DRAIN GEAR OIL

2. REMOVE PITMAN ARM

Using SST, pull the pitman arm off the sector shaft.
SST 09610-55012



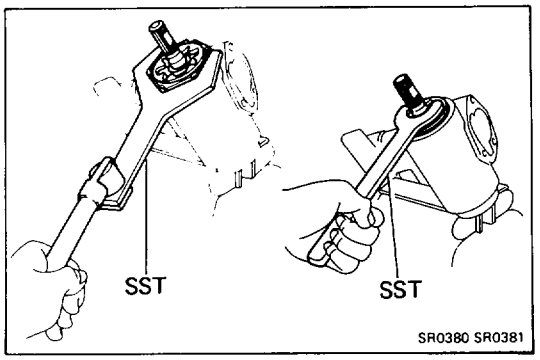
3. REMOVE END COVER AND SECTOR SHAFT

(a) Remove the adjusting screw lock nut and four bolts.

(b) Remove the end cover by turning the adjusting screw clockwise.

(c) Pull out the sector shaft and adjusting screw from the gear housing.

(d) Remove the needle rollers.



4. **REMOVE LOCK NUT**

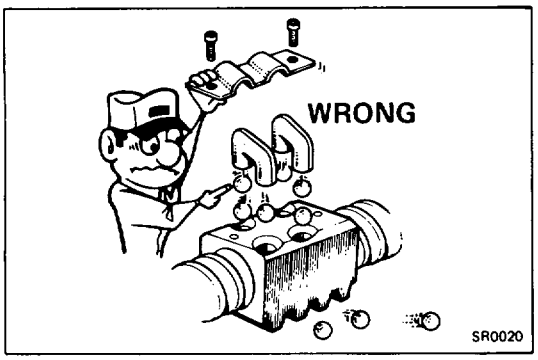
Using SST, remove the lock nut.

SST 09617-30040

5. **REMOVE BEARING ADJUSTING SCREW**

Using SST, remove the adjusting screw.

SST 09616-22010

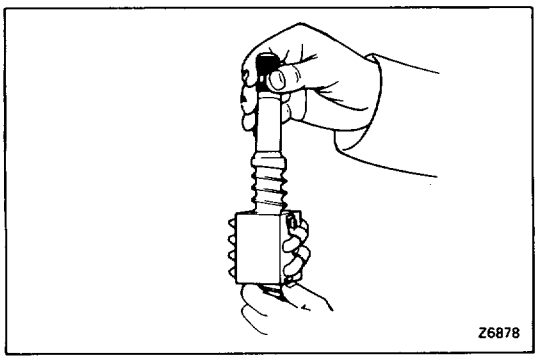


6. **REMOVE WORM SHAFT**

Pull the worm shaft out of the gear housing.

CAUTION: Do not disassemble the ball nut from the steering worm shaft.

INSPECTION AND REPAIR OF STEERING GEAR HOUSING

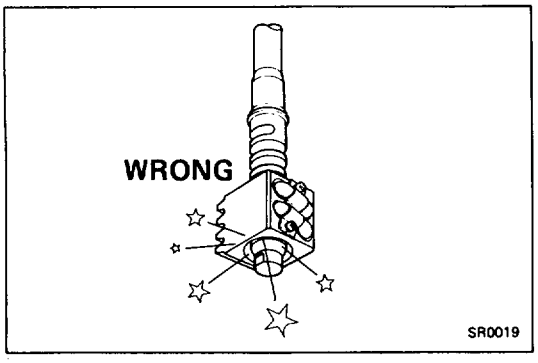


1. **INSPECT WORM AND BALL NUT**

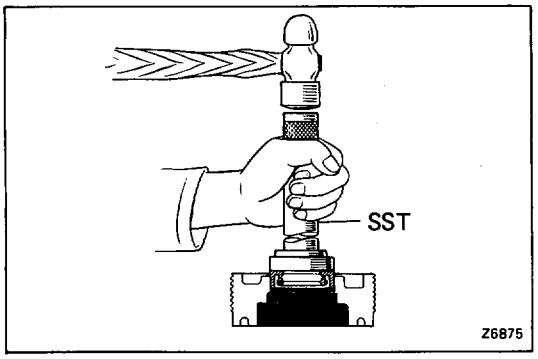
(a) Check the worm and ball nut for wear or damage.

(b) Check that the nut rotates smoothly down the shaft by its own weight.

If a problem is found, repair or replace the worm.



CAUTION: Do not allow the ball nut to hit the end of the worm shaft.



2. **INSPECT WORM BEARINGS AND OIL SEAL**

Check for wear or damage.

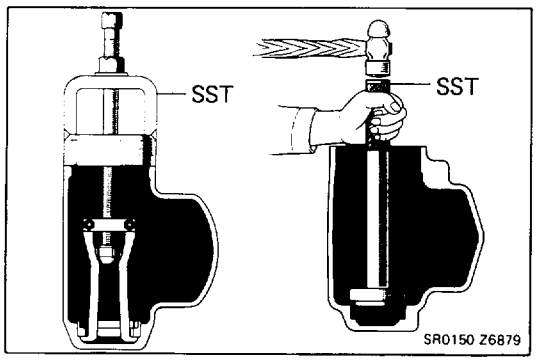
If a problem is found, replace the bearings, bearing races and oil seal.

3. **IF NECESSARY, REPLACE OIL SEAL**

(a) Remove the oil seal with a screwdriver.

(b) Using SST, install a new oil seal.

SST 09620-30010 (09627-30010, 09631-00020)



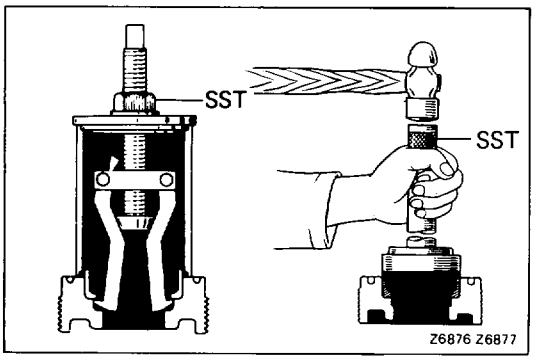
4. IF NECESSARY, REPLACE OUTER RACE IN GEAR HOUSING

(a) Using SST, remove the outer race from the housing.

SST 09612-65014

(b) Using SST, install the outer race into the housing.

SST 09620-30010 (09626-30010, 09631-00020)



5. IF NECESSARY, REPLACE OUTER RACE IN ADJUSTING NUT

(a) Remove the oil seal with a screwdriver.

(b) Using SST, remove the outer race from the nut.

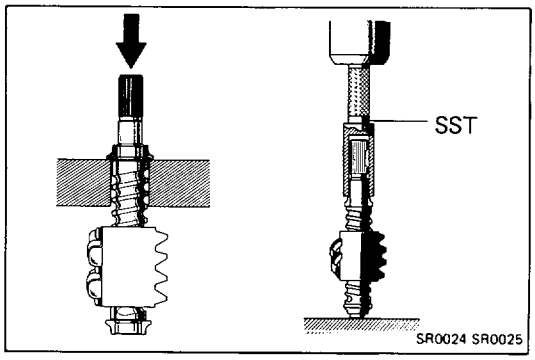
SST 09612-30012

(c) Using SST, install the race into the nut.

SST 09620-30010 (09626-30010, 09631-00020)

(d) Using SST, install a new oil seal into the nut.

SST 09620-30010

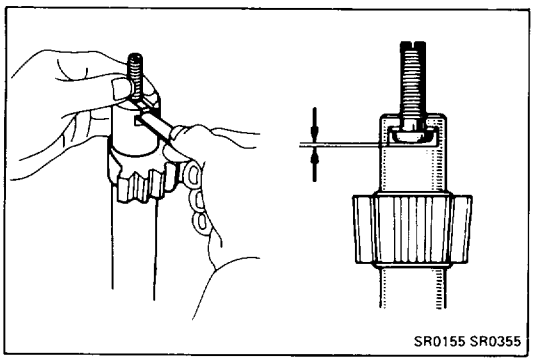


6. IF NECESSARY, REPLACE INNER RACE ON WORM SHAFT

(a) Using a press, remove the inner races from the shaft.

(b) Using SST, press the inner races into the shaft.

SST 09620-30010 (09623-30010)



7. INSPECT SECTOR SHAFT

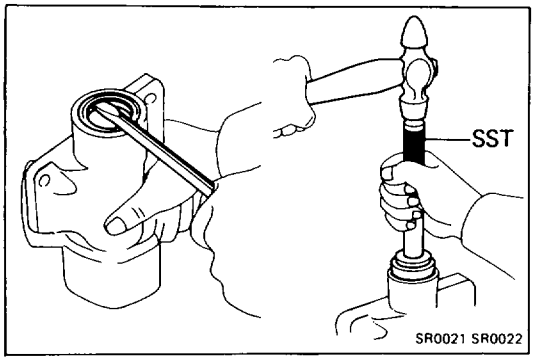
Measure shaft thrust clearance with a feeler gauge.

Maximum clearance: 0.05 mm (0.0020 in.) or less

If necessary, install a new thrust washer which will provide the minimum clearance between the sector shaft and the adjusting screw.

Thrust washer thickness

Thickness mm (in.)		Thickness mm (in.)	
2.00	(0.0787)	2.12	(0.0835)
2.04	(0.0803)	2.16	(0.0850)
2.08	(0.0819)	2.20	(0.0866)

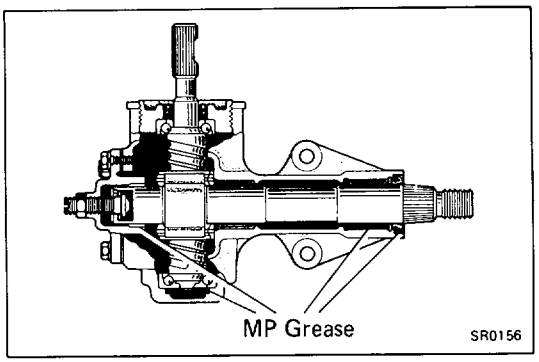


8. IF NECESSARY, REPLACE OIL SEAL

(a) Remove the oil seal with a screwdriver from the gear housing.

(b) Using SST and hammer, install a new oil seal.

SST 09620-30010 (09624-30010, 09631-00020)



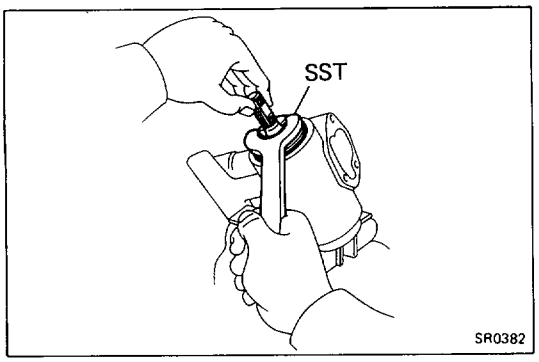
ASSEMBLY OF STEERING GEAR HOUSING

(See page SR-32)

1. **APPLY MP GREASE TO BUSHING,NEEDLE ROLLER BEARINGS AND OIL SEALS**

2. **INSERT WORM SHAFT INTO GEAR HOUSING**

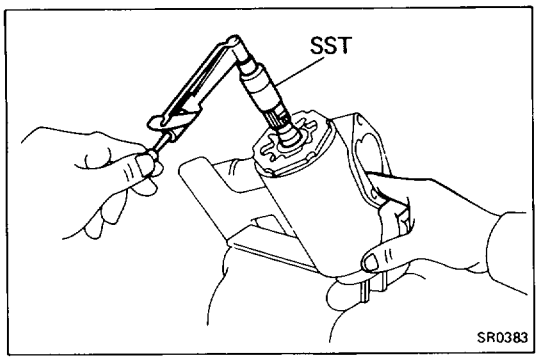
   Place the worm bearings on the shaft and insert the shaft into the housing.



3. **INSTALL AND ADJUST BEARING ADJUSTING SCREW**

   (a) Using SST, gradually tighten the adjusting screw until it is snug.

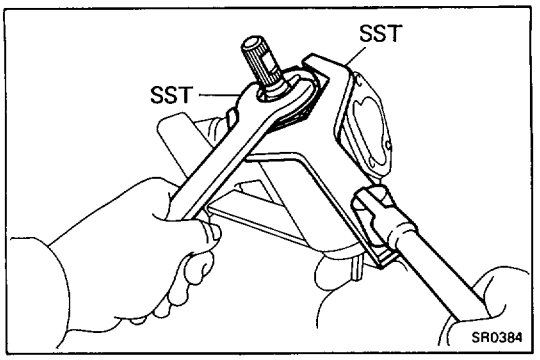
   SST 09616-22010



   (b) Using a torque wrench and SST, measure the bearing preload in both directions. Turn the adjusting screw until the preload is correct.

   Preload (starting): 3 — 5 kg-cm (2.6 — 4.3 in.-lb, 0.3 — 0.5 N·m)

   SST 09616-00010

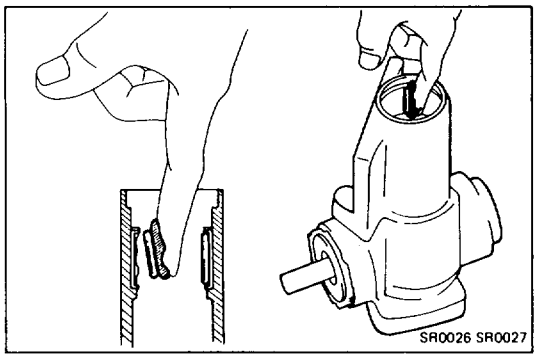


   (c) Hold the adjusting screw in position with SST and tighten the lock nut with SST.

   Torque: 1,830 kg-cm (132 ft-lb, 179 N·m)

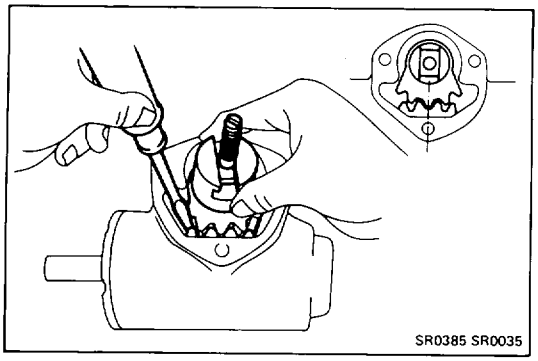
   SST 09616-22010 and 09617-30040

   NOTE:
   - Check that the bearing preload is still correct.
   - Use a torque wrench with a fulcrum length of 425 mm (16.73 in.).



4. **INSTALL NEEDLE ROLLER BEARING**

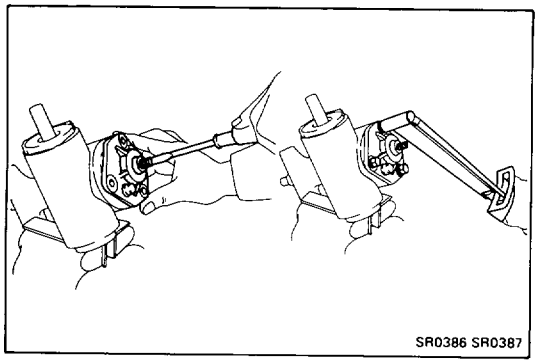
   Apply MP grease to the needle rollers and install them into the housing.



5. INSTALL SECTOR SHAFT

(a) Install the adjusting screw and thrust washer onto the sector shaft.

(b) Set the ball nut at the center of the worm shaft. Insert the sector shaft into the gear housing so that the center teeth mesh together.



6. INSTALL END COVER

(a) Apply liquid sealer to the gasket and end cover.

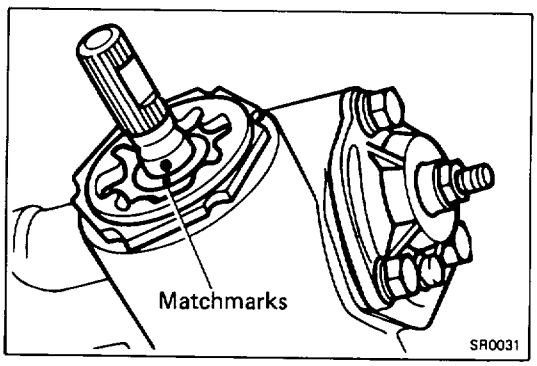
Sealant: Part No. 08826-00090, THREE BOND 1281 or equivalent

(b) Install the end cover over the gasket.

(c) Loosen the adjusting screw as far as possible.

(d) Torque the four cover bolts.

Torque: 500 kg-cm (36 ft-lb, 49 N·m)

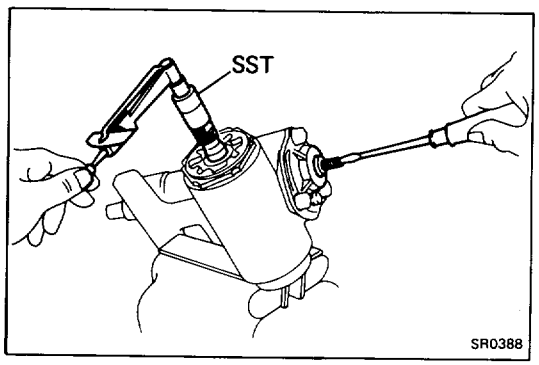


7. PLACE WORM SHAFT IN NEUTRAL POSITION

(a) Count the total shaft rotations and turn the shaft back half of that number.

(b) The worm shaft is now in neutral position.

(c) Place matchmarks on the worm shaft and housing to show neutral position.



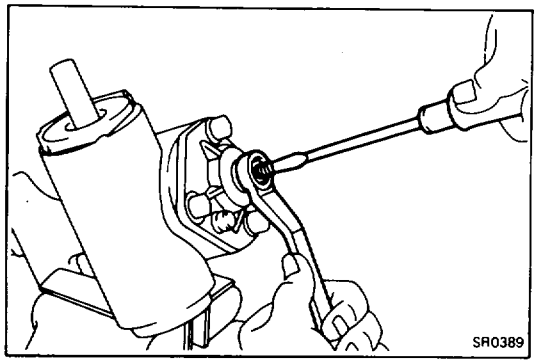
8. ADJUST TOTAL PRELOAD

Using a torque wrench and SST, turn the adjusting screw while measuring the preload until it is correct.

NOTE: Be sure that the worm shaft is in neutral position.

Preload (starting): 8 — 10.5 kg-cm (6.9 — 9.1 in.-lb, 0.8 — 1.0 N·m)

SST 09616-00010



9. TIGHTEN ADJUSTING SCREW LOCK NUT

(a) Apply liquid sealer to the lock nut.

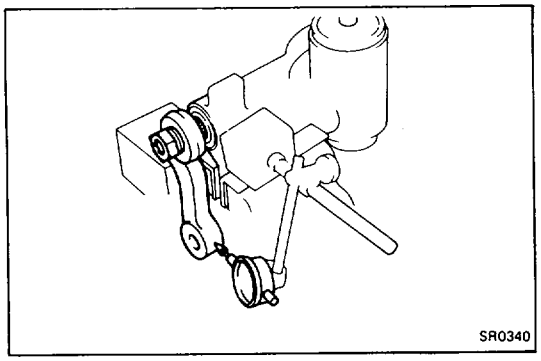
Sealant: Part No. 08826-00090, THREE BOND 1281 or equivalent

(b) Hold the screw with a screwdriver while tightening the lock nut.

(c) Torque the lock nut.

Torque: 275 kg-cm (20 ft-lb, 27 N·m)

NOTE: Check that the preload is still correct.



10. INSTALL PITMAN ARM

Align the marks on the sector shaft with the pitman arm. Install the pitman arm and tighten the nut finger tight.

11. MEASURE SECTOR SHAFT BACKLASH

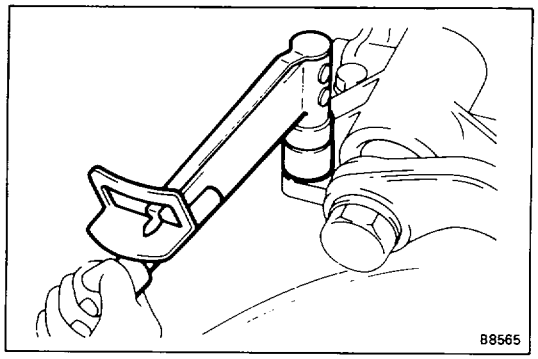
Install a backlash gauge. Check that the sector shaft has no backlash within 100 degrees of the left and right sides from neutral position.

12. REPLENISH WITH GEAR OIL

Oil type: API GL-4, SAE 90

Capacity: 380 — 400 cc (23.2 — 24.4 cu in.)

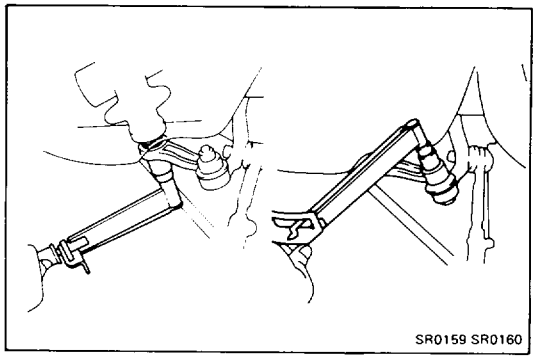
13. INSTALL OIL FILLER PLUG



INSTALLATION OF GEAR HOUSING

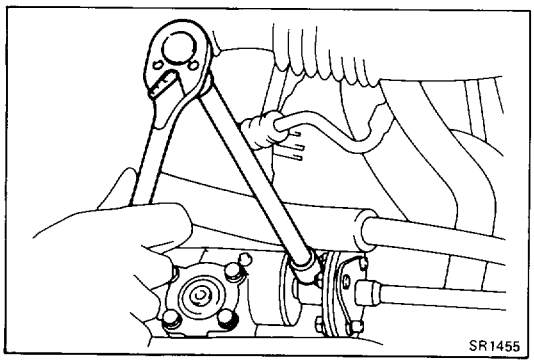
(See page SR-31)

1. **INSTALL GEAR HOUSING**
   (a) Line up the marks on the coupling and worm shaft.
   (b) Torque the three mount bolts.
   Torque: 660 kg-cm (48 ft-lb, 65 N·m)

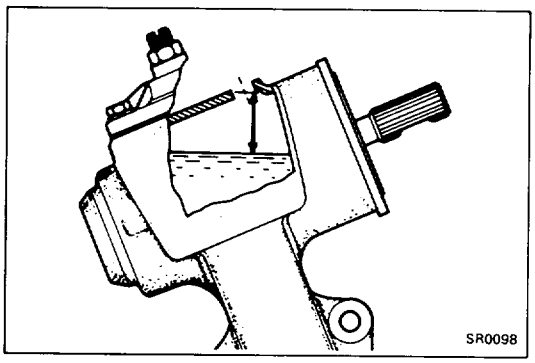


2. **TORQUE PITMAN ARM MOUNT NUT**
   Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

3. **CONNECT PITMAN ARM TO RELAY ROD**
   Connect the pitman arm to the relay rod and torque the mount nut.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)



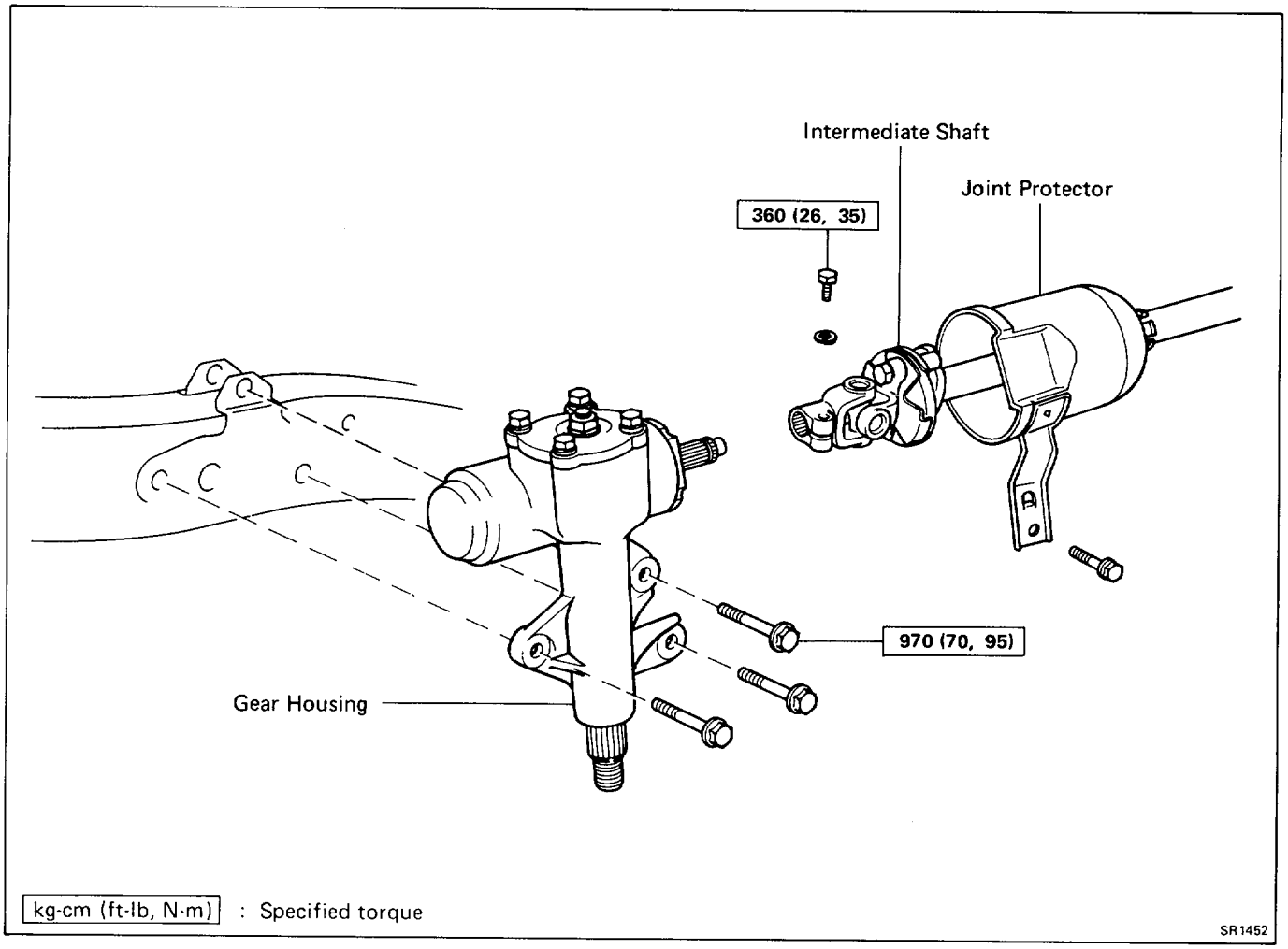
4. **TORQUE COUPLING SET BOLT**
   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

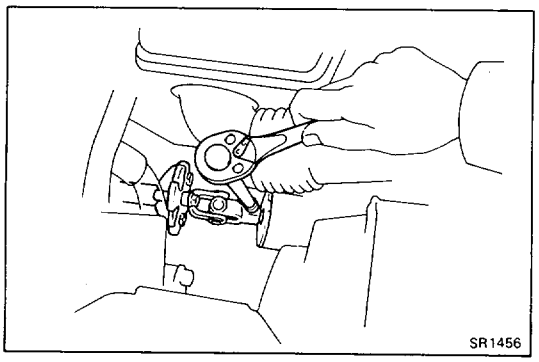


5. **FILL GEAR HOUSING WITH GEAR OIL**
   Oil type: API GL-4, SAE 90
   Oil level: 18 — 28 mm (0.71 — 1.10 in.) from top
   Capacity: 380 — 400 cc (23.2 — 24.4 cu in.)

STEERING GEAR HOUSING (4WD)

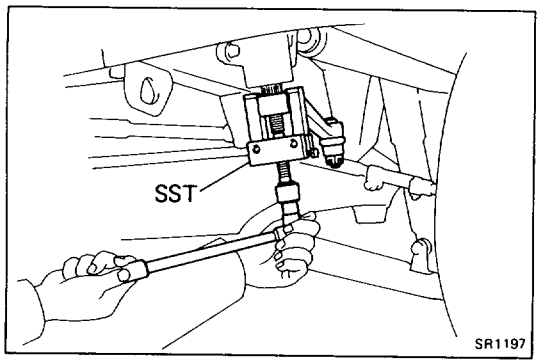
REMOVAL OF GEAR HOUSING





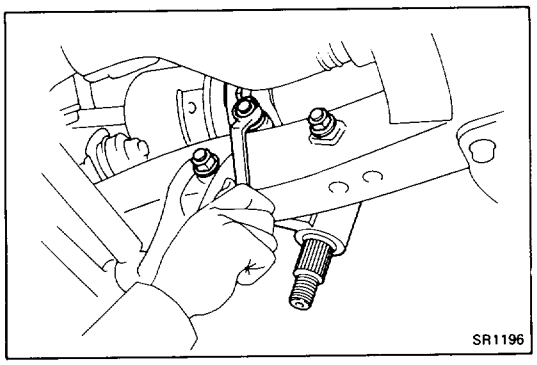
1. **REMOVE JOINT PROTECTOR SET BOLT**

2. **DISCONNECT UNIVERSAL JOINT**
   (a) Place matchmarks on the universal joint and worm shaft.
   (b) Remove the two universal joint bolts.
   (c) Disconnect the universal joint from the worm shaft.



3. **DISCONNECT PITMAN ARM FROM GEAR HOUSING**
   (a) Remove the pitman arm set nut.
   (b) Using SST, disconnect the pitman arm from the gear housing.

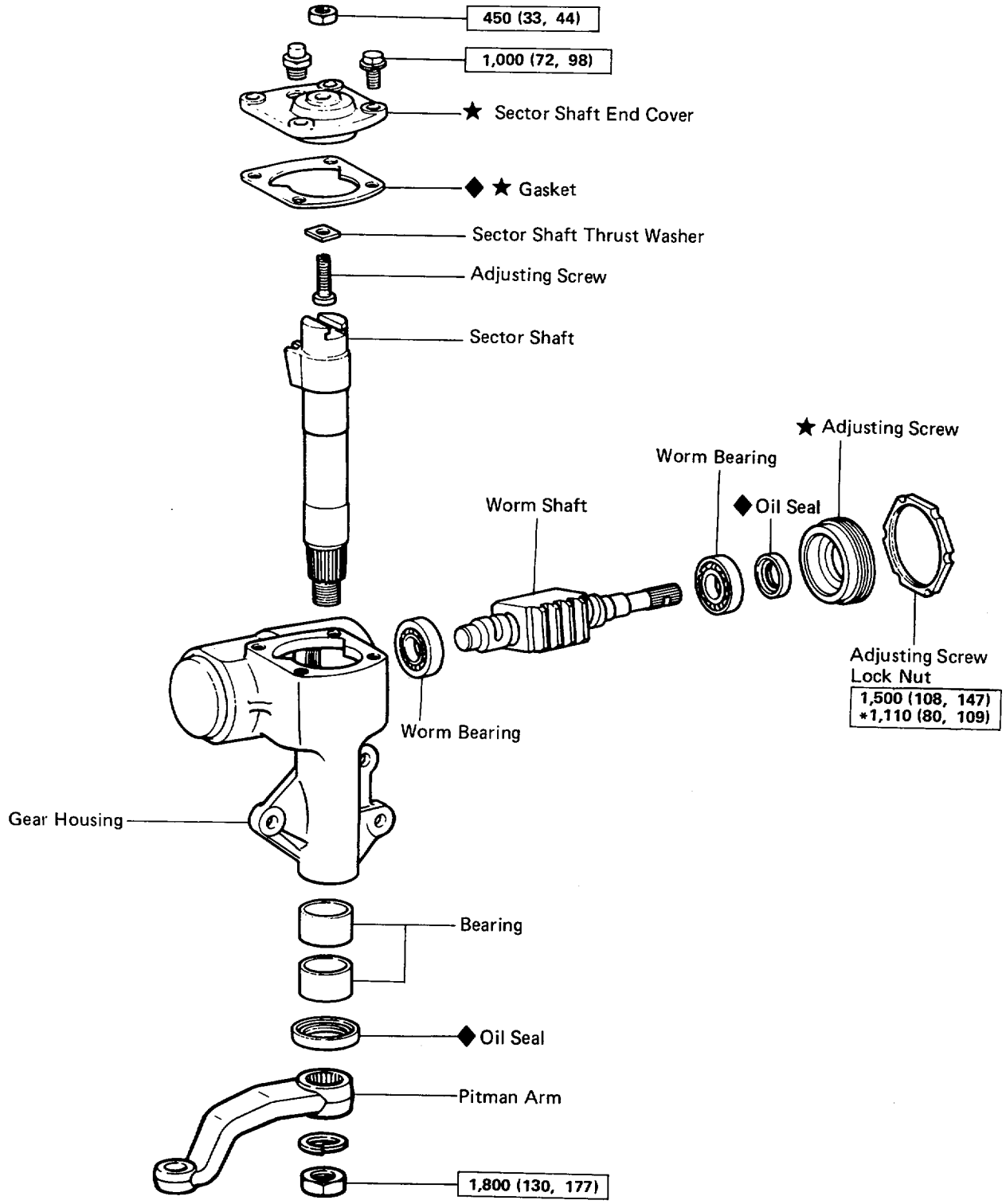
   SST 09628-62011



4. REMOVE GEAR HOUSING

Remove the three bolts and the gear housing.

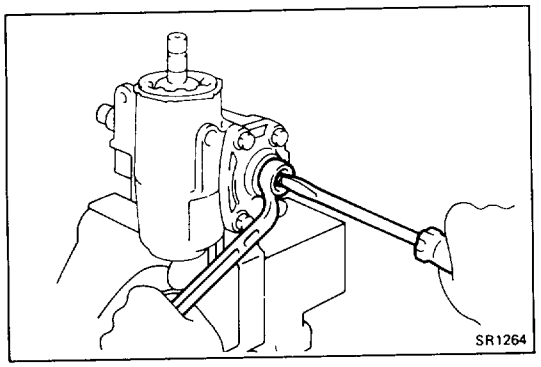
COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part
★ Precoated part
* For use of SST

SR1482

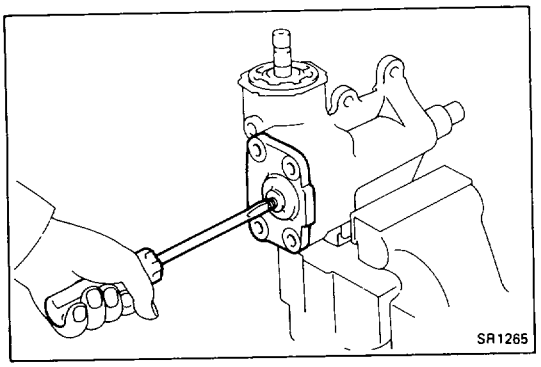
DISASSEMBLY OF GEAR HOUSING



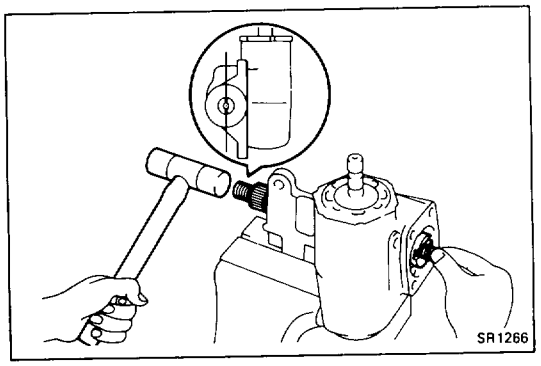
1. REMOVE BREATHER PLUG AND DRAIN GEAR OIL

2. REMOVE END COVER

(a) Remove the adjusting screw lock nut and four nuts.



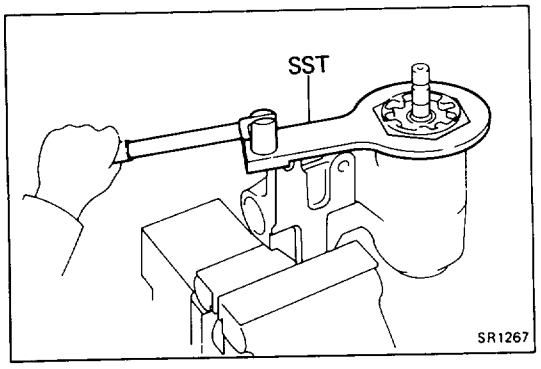
(b) Remove the end cover by turning the adjusting screw clockwise.



3. REMOVE SECTOR SHAFT

(a) Using a plastic hammer, tap out the sector shaft.

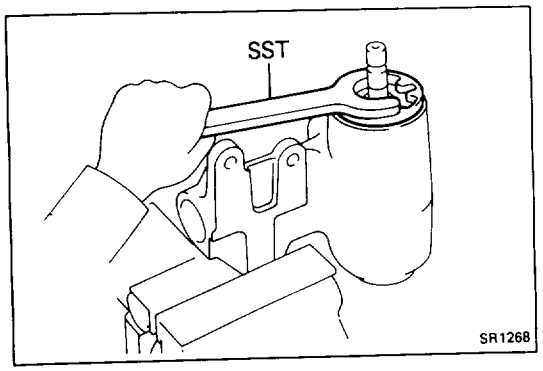
(b) Remove the sector shaft.



4. REMOVE WORM BEARING ADJUSTING SCREW LOCK NUT

Using SST, remove the lock nut.

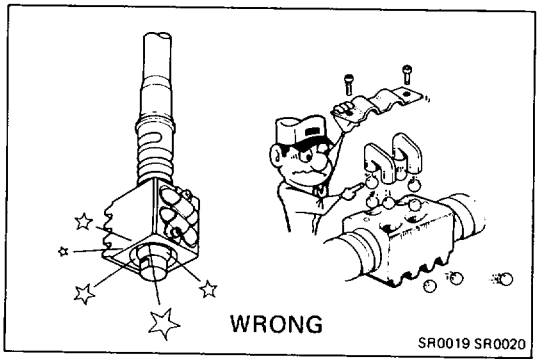
SST 09617-60010



5. REMOVE WORM BEARING ADJUSTING SCREW

Using SST, remove the adjusting screw.

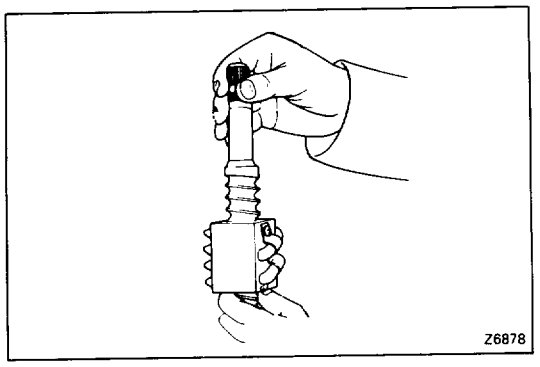
SST 09616-25010



6. **REMOVE WORM SHAFT**

Pull the worm shaft out of the gear housing.

CAUTION: Do not disassemble the ball nut from the steering worm shaft. Do not allow the ball nut to hit the end of the worm shaft.



INSPECTION AND REPAIR OF STEERING GEAR HOUSING

1. INSPECT WORM AND BALL NUT

(a) Check the worm and ball nut for wear or damage.

(b) Check that the nut rotates smoothly down the shaft by its own weight.

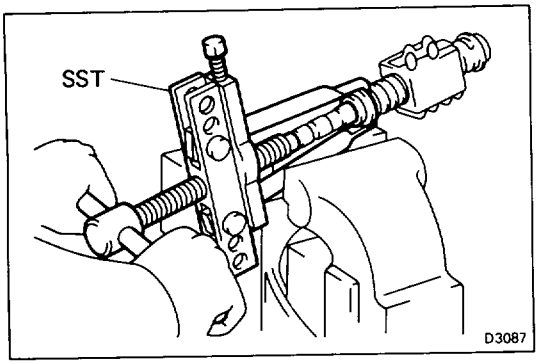
If a problem is found, repair or replace the worm.

CAUTION: Do not allow the ball nut to hit the end of the worm shaft.

2. IF NECESSARY, REPLACE WORM BEARING

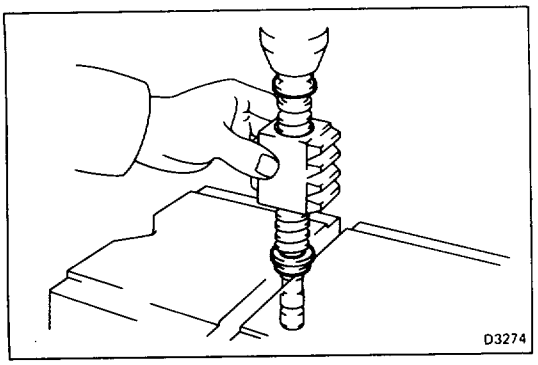
(a) Using SST, remove the both side bearings.

SST 09950-20017



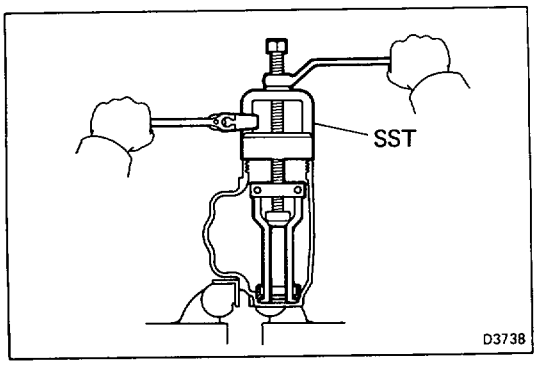
(b) Using a press, install the both side bearings.

CAUTION: Be careful not to damage the ball nut while holding it by hand.



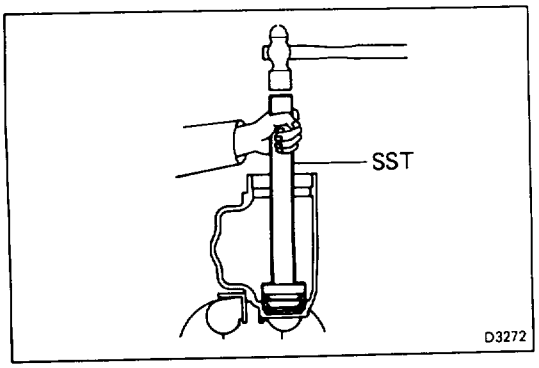
(c) Using SST, remove the outer race from the gear housing.

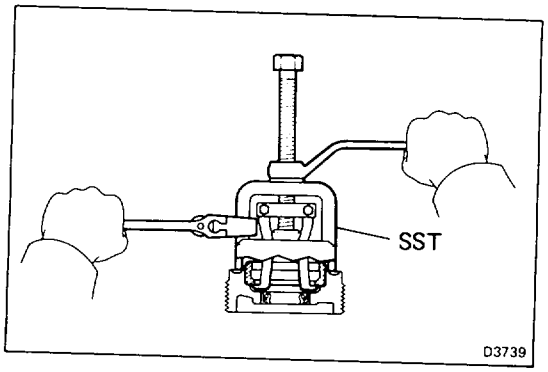
SST 09612-65014



(d) Using SST, press in the outer race into the gear housing.

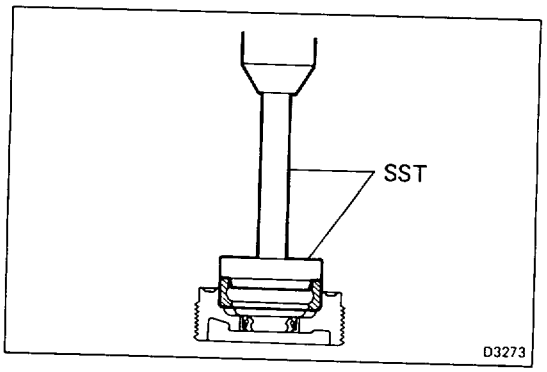
SST 09550-10012 (09552-10010, 09559-10010)





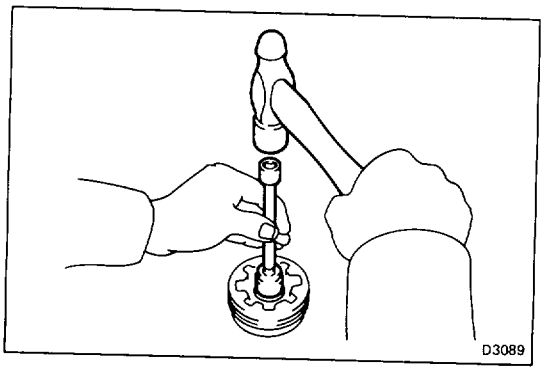
(e) Using SST, remove the outer race from the adjusting screw.

SST 09612-65014



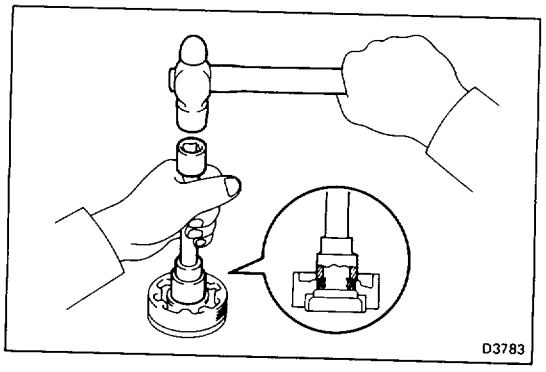
(f) Using SST, press in the outer race into the adjusting screw.

SST 09550-10012 (09552-10010, 09559-10010)

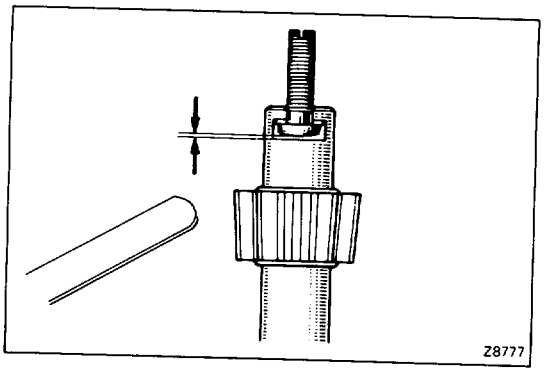


3. IF NECESSARY, REPLACE ADJUSTING SCREW OIL SEAL

(a) Using a socket wrench, drive out the oil seal.



(b) Using a socket wrench, drive in a new oil seal.



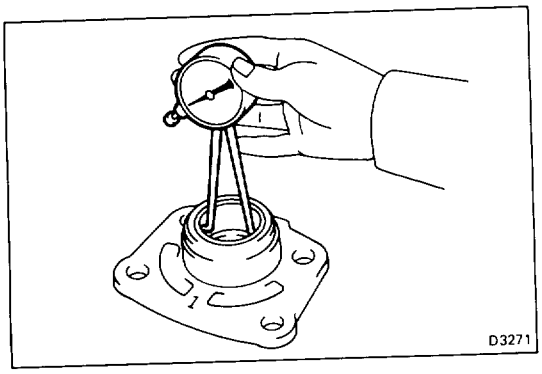
4. MEASURE SECTOR SHAFT THRUST CLEARANCE

Using a feeler gauge, measure the shaft oil clearance.

Maximum clearance: 0.05 mm (0.0020 in.) or less

If necessary, install a new thrust washer to provide the minimum clearance between the sector shaft and adjusting screw.

Thrust washer thickness	mm (in.)
1.95 (0.0768) 2.00 (0.0787)	2.05 (0.0807)



5. **INSPECT SECTOR SHAFT END COVER**

(a) Check for damage.

(b) Check the bushing for wear or damage.

(c) Measure the bushing inside diameter.

Inside diameter: 32.000 – 32.025 mm (1.2598 – 1.2608 in.)

If necessary, replace the end cover.

6. **INSPECT GEAR HOUSING**

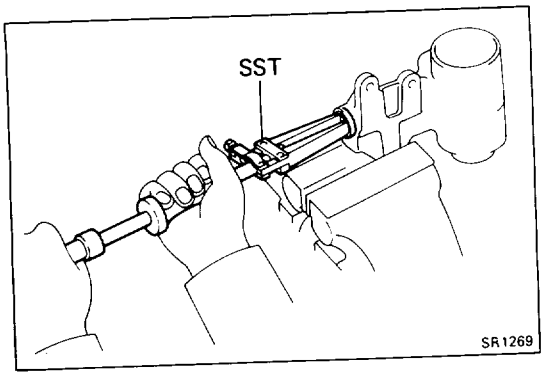
(a) Check for damage.

(b) Check the bushing for wear or damage.

(c) Measure the bushing inside diameter.

Inside diameter: 32.000 – 32.025 mm (1.2598 – 1.2608 in.)

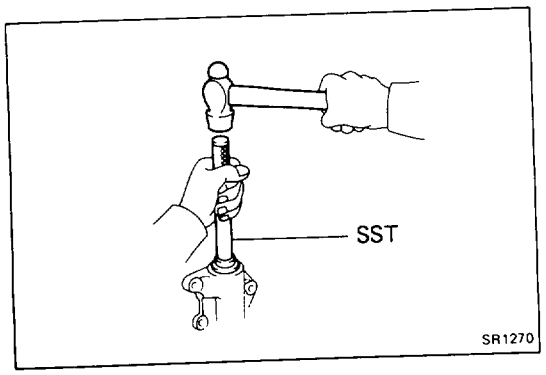
If necessary, replace the gear housing.



7. **IF NECESSARY, REPLACE GEAR HOUSING OIL SEAL**

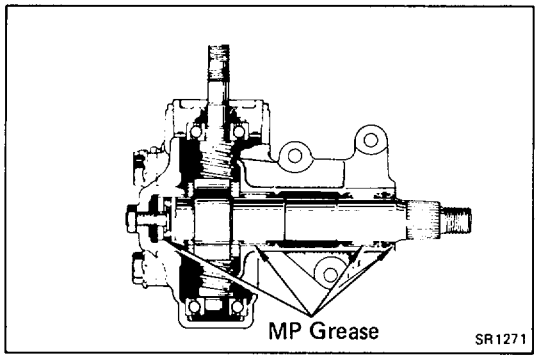
(a) Using SST, remove the oil seal.

SST 09308-00010



(b) Using SST, drive in a new oil seal.

SST 09550-10012 (09552-10010, 09559-10010)



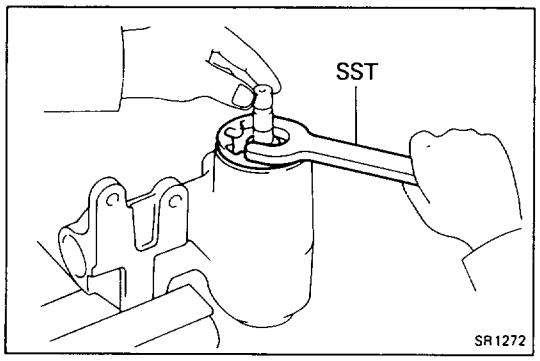
ASSEMBLY OF STEERING GEAR HOUSING

(See page SR-41)

1. **APPLY MP GREASE TO BUSHING, NEEDLE ROLLER BEARING AND OIL SEALS**

2. **INSERT WORM SHAFT INTO GEAR HOUSING**

   Place the worm bearing on the shaft and insert the shaft into the housing.



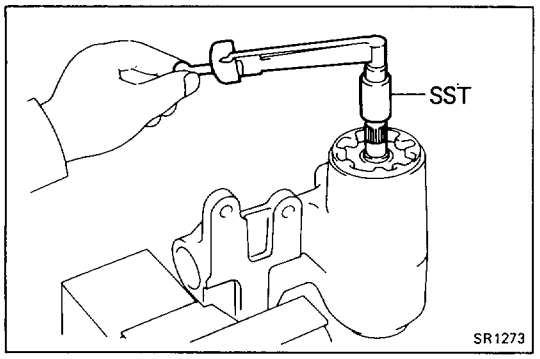
3. **INSTALL AND ADJUST BEARING ADJUSTING SCREW**

   (a) Apply liquid sealer to the adjusting screw.

   Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

   (b) Using SST, gradually tighten the adjusting screw until it is snug.

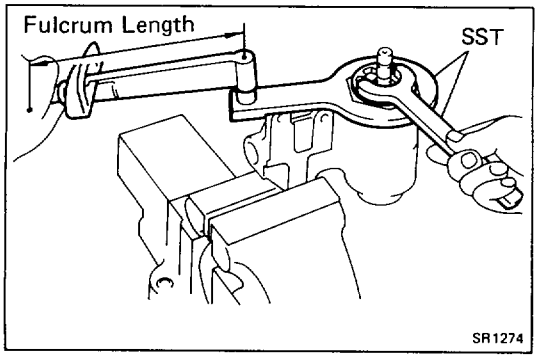
   SST 09616-25010



   (b) Using a torque meter and SST, measure the bearing preload in both directions. Turn the adjusting screw until the preload is correct.

   Preload (starting): 3.5 — 5 kg-cm (3.0 — 4.3 in.-lb, 0.3 — 0.5 N·m)

   SST 09616-00010



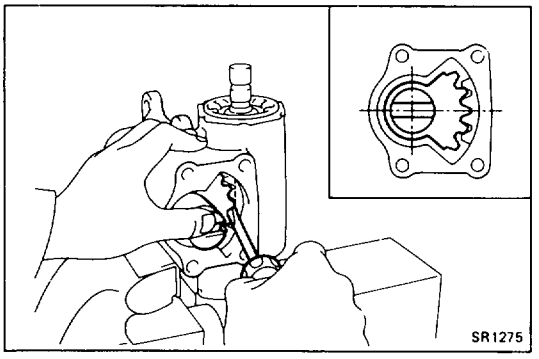
   (c) Hold the adjusting screw in position with SST and tighten the lock nut with SST.

   Torque: 1,110 kg-cm (80 ft-lb, 109 N·m)

   SST 09616-25010, 09617-60010

   NOTE:

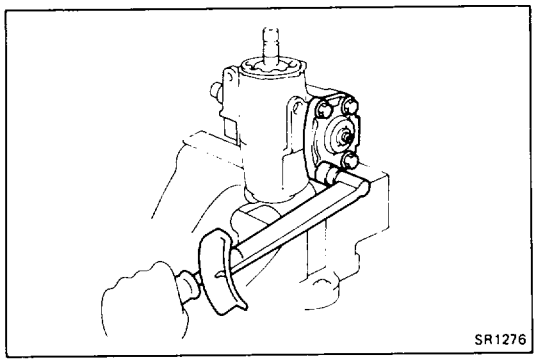
   - Check that the bearing preload is still correct.
   - Use a torque wrench with a fulcrum length of 425 mm (16.73 in.).



4. **INSTALL SECTOR SHAFT**

   (a) Install the adjusting screw and thrust washer onto the sector shaft.

   (b) Set the ball nut at the center of the worm shaft. Insert the sector shaft into the gear housing so that the center teeth mesh together.



6. INSTALL END COVER

(a) Apply liquid sealer to the gasket and end cover.

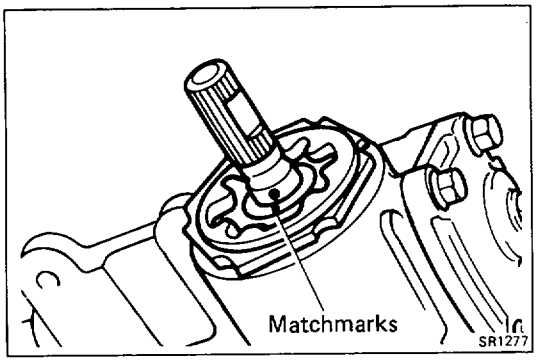
Sealant: Part No. 08826-00090, THREE BOND 1281 or equivalent

(b) Install the end cover over the gasket.

(c) Loosen the adjusting screw as far as possible.

(d) Torque the four cover bolts.

Torque: 1,000 kg-cm (72 ft-lb, 98 N·m)

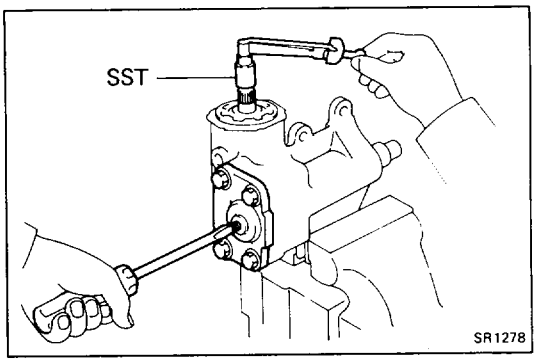


7. PLACE WORM SHAFT IN NEUTRAL POSITION

(a) Count the total shaft rotation and turn the shaft back half of that number.

(b) The worm shaft is now in neutral position.

(c) Place matchmarks on the worm shaft and housing to show neutral position.



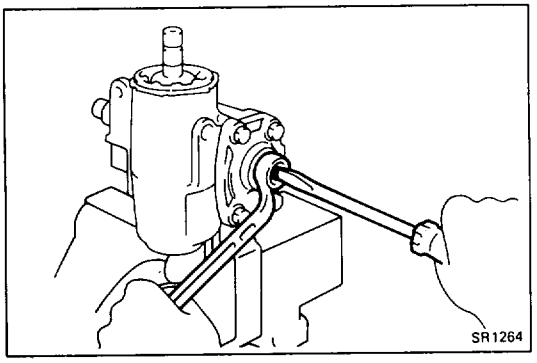
8. ADJUST TOTAL PRELOAD

Using a torque meter and SST, turn the adjusting screw while measuring the preload until the preload is correct.

NOTE: Be sure that the worm shaft is in neutral position.

Preload (starting): 8 — 11 kg-cm (6.9 — 9.5 in.-lb, 0.8 — 1.1 N·m)

SST 09616-00010



9. TIGHTEN ADJUSTING SCREW LOCK NUT

(a) Hold the screw with a screwdriver while tightening the lock nut.

(b) Torque the lock nut.

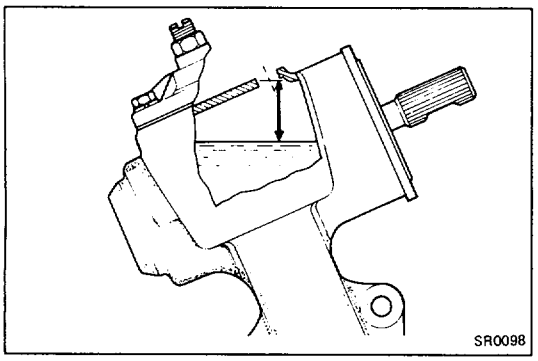
Torque: 450 kg-cm (33 ft-lb, 44 N·m)

NOTE: Check that the preload is still correct.

10. MEASURE SECTOR SHAFT BACKLASH

(a) Align the marks on the sector shaft with the pitman arm.

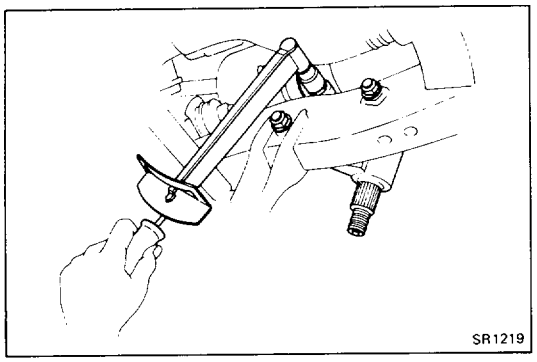
(b) Check that the sector shaft has no backlash within 100 degrees of the left and right side from neutral position.



11. REPLENISH WITH GEAR OIL

Oil level: 14 — 17 mm (0.55 — 0.67 in.) from top

Capacity: 400 cc (24.4 cu in.)



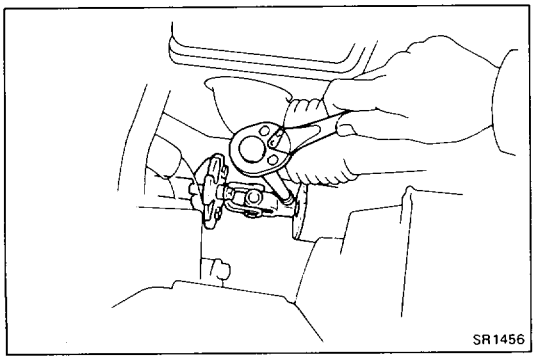
INSTALLATION OF GEAR HOUSING

(See page SR-39)

1. INSTALL GEAR HOUSING

Install the gear housing with the three bolts and nuts.

Torque: 970 kg-cm (70 ft-lb, 95 N·m)



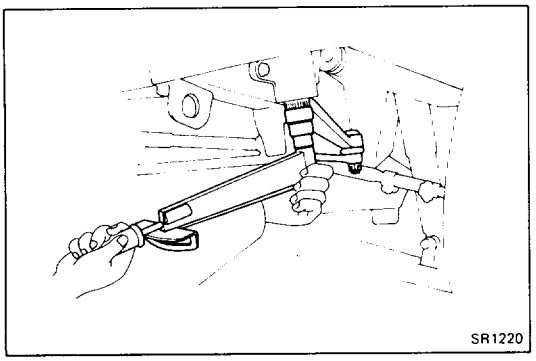
2. CONNECT INTERMEDIATE SHAFT

(a) Align matchmarks on the worm shaft and universal joint, and connect them.

(b) Install and torque the two bolts.

Torque: 360 kg-cm (26 ft-lb, 35 N·m)

(c) Install joint protector set bolt.

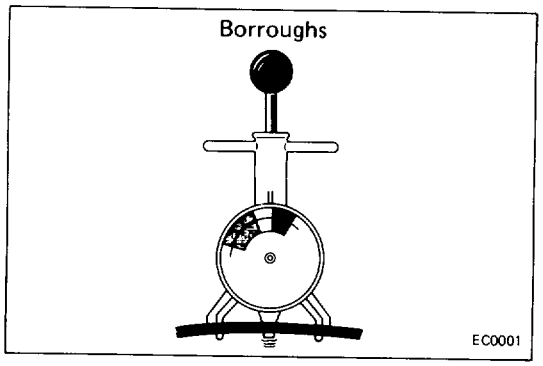


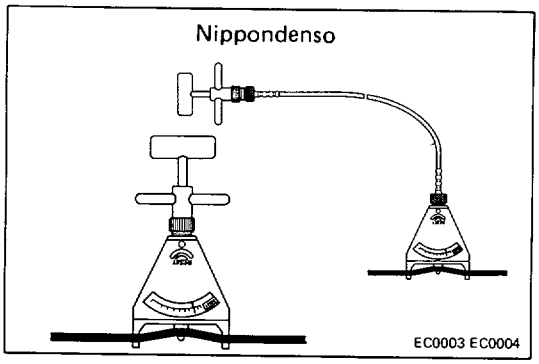
3. CONNECT PITMAN ARM

(a) Align the marks on the pitman arm and cross shaft.

(b) Install and torque the pitman arm set nut.

Torque: 1,800 kg-cm (130 ft-lb, 177 N·m)





POWER STEERING

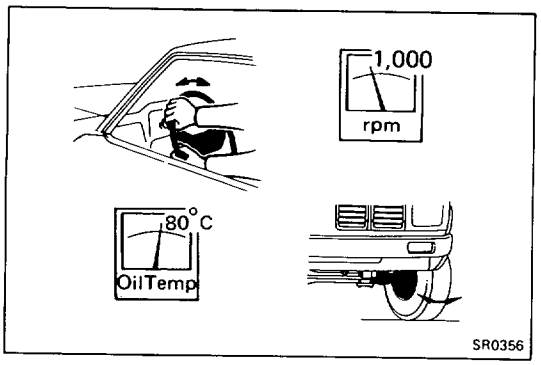
On-Vehicle Inspection

CHECK OF DRIVE BELT TENSION

Using a belt tension gage, check the drive belt tension.
Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:
New belt 125 ± 25 lb
Used belt 80 ± 20 lb

NOTE:
- "New belt" refers to a belt which has been less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.



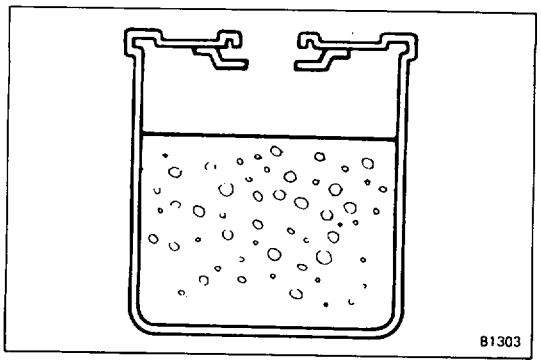
FLUID LEVEL CHECK

1. **KEEP VEHICLE LEVEL**

2. **BOOST FLUID TEMPERATURE**

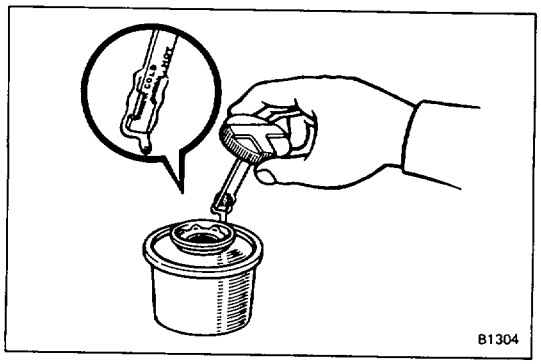
With the engine idling at 1,000 rpm or less,turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80°C (176°F)



3. **CHECK FOR FOAMING OR EMULSIFICATION**

NOTE: Foaming and emulsification indicate the existence of air in the system or that the fluid level is too low.



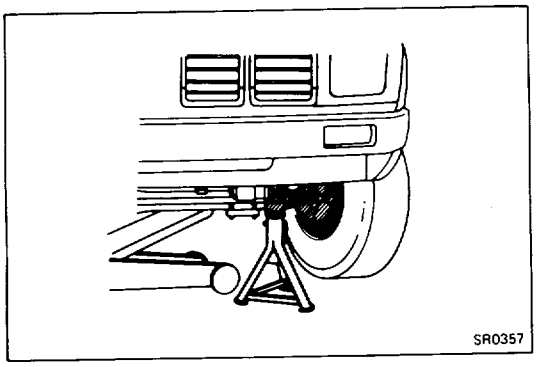
4. **CHECK FLUID LEVEL IN RESERVOIR**

Check the fluid level and add fluid if necessary.

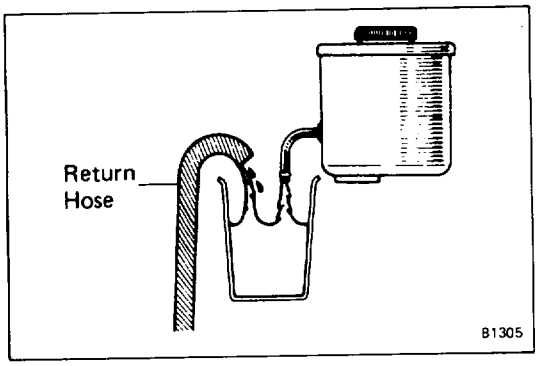
Fluid: ATF DEXRON® or DEXRON® II

NOTE: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.

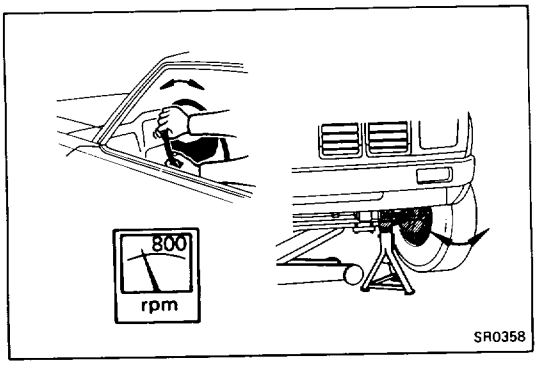
REPLACEMENT OF POWER STEERING FLUID



1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS

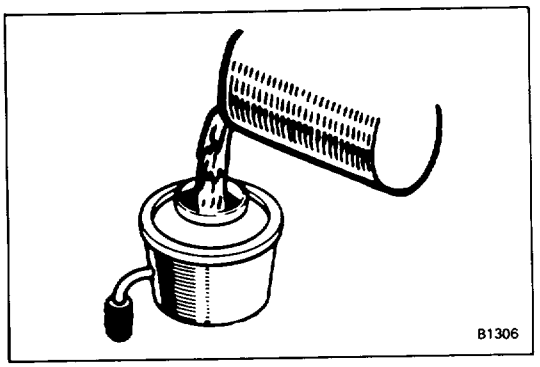


2. REMOVE FLUID RETURN HOSE FROM RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER



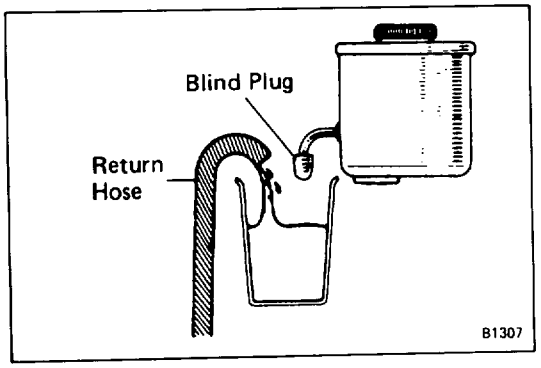
3. WITH ENGINE IDLING, TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID

4. STOP ENGINE



5. FILL RESERVOIR TANK WITH FRESH FLUID

Fluid: ATF DEXRON® or DEXRON® II



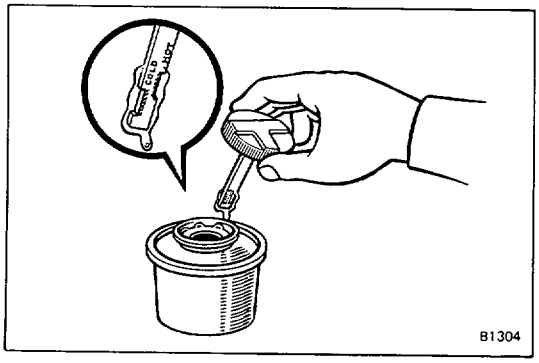
6. START ENGINE AND RUN IT AT 1,000 RPM

After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

7. REPEAT STEPS 5 AND 6 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

8. CONNECT RETURN HOSE TO RESERVOIR TANK

9. BLEED POWER STEERING SYSTEM



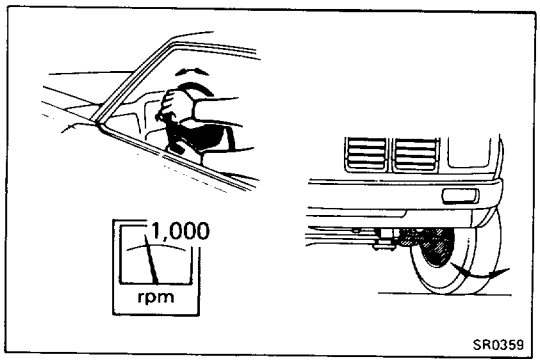
Bleeding of Power Steering System

1. **CHECK FLUID LEVEL IN RESERVOIR TANK**

   Check the fluid level and add fluid if necessary.

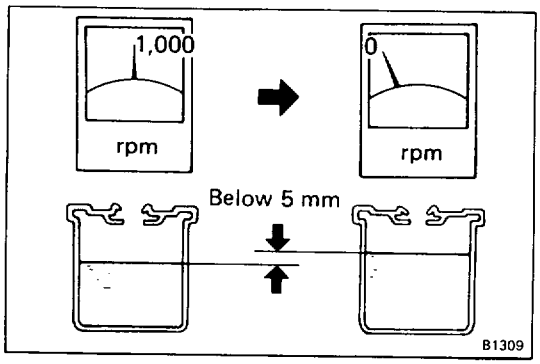
   Fluid: ATF DEXRON® or DEXRON® II

   NOTE: Check that the fluid level is within the HOT LEVEL of the dipstick. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.



2. **START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK THREE OR FOUR TIMES**

   Run the engine at 1,000 rpm or less.

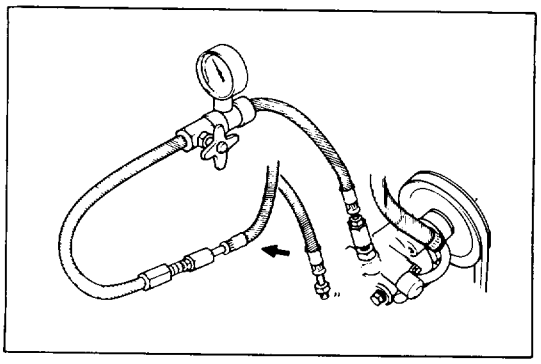


3. **CHECK THAT FLUID IN RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED**

   Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

   Maximum rise: 5 mm (0.20 in.)

   If a problem is found, repeat steps 7 and 8 on page SR-52. Repair the PS pump if the problem persists.



Oil Pressure Check

1. **CONNECT PRESSURE GAUGE**

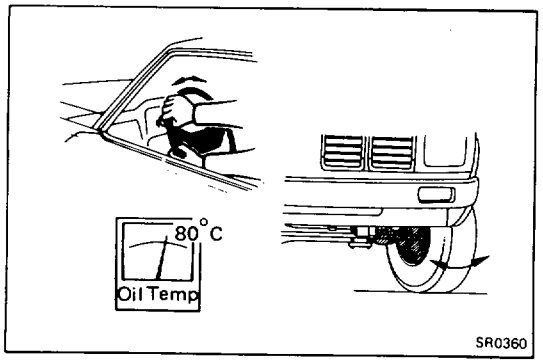
   (a) Using SST, remove the pressure line from the PS pump.

   SST 09631-22020

   (b) Connect the gauge side of the pressure gauge to the PS pump and the valve side to the pressure line.

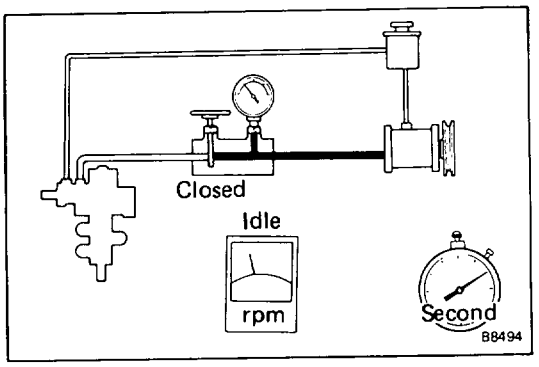
   (c) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.

   (d) Check that the fluid level is correct.



2. **CHECK THAT FLUID TEMPERATURE IS AT LEAST 80°C (176°F)**

3. **START ENGINE AND RUN IT AT IDLE**



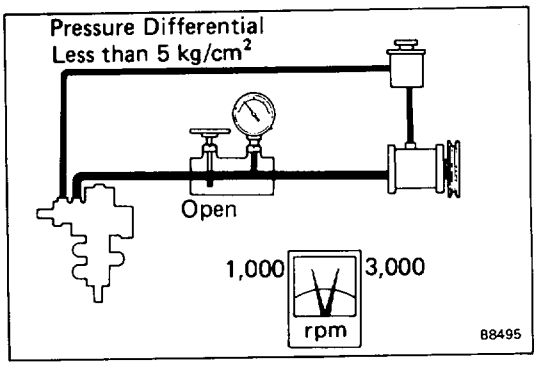
4. **CHECK FLUID PRESSURE READING WITH VALVE CLOSED**

Close the pressure gauge valve and observe the reading on the gauge.

Minimum pressure:
2WD 75 kg/cm² (1,067 psi, 7,355 kPa)
4WD 65 kg/cm² (924 psi, 6,374 kPa)

NOTE: Do not keep the valve closed for more than 10 seconds.

If pressure is low, repair or replace the PS pump.



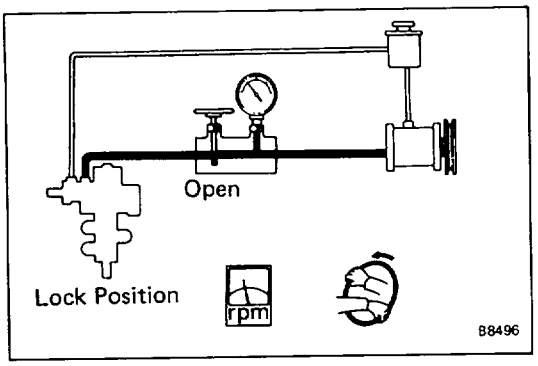
5. **OPEN VALVE FULLY**

6. **CHECK AND RECORD PRESSURE READING AT 1,000 RPM**

7. **CHECK AND RECORD PRESSURE READING AT 3,000 RPM**

Check that there is less than 5 kg/cm² (71 psi, 490 kPa) difference in pressure between the 1,000 rpm and 3,000 rpm checks.

If the difference is greater, repair or replace the PS pump flow control valve.



8. **CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK**

[Non progressive power steering]

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:
2WD 75 kg/cm² (1,067 psi, 7,355 kPa)
4WD 65 kg/cm² (924 psi, 6,374 kPa)

If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

[Progressive power steering]

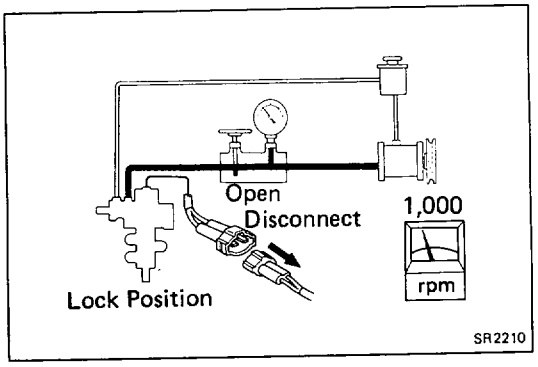
(a) Turn the steering wheel to full lock position.

(b) Disconnect the solenoid connector.

(c) Be sure the pressure gauge valve is fully opened and the engine is running at 1,000 rpm.

Minimum pressure: 75 kg/cm² (1,067 psi, 7,355 kPa)

If pressure is low, the gear housing has an internal leak or the solenoid is faulty.



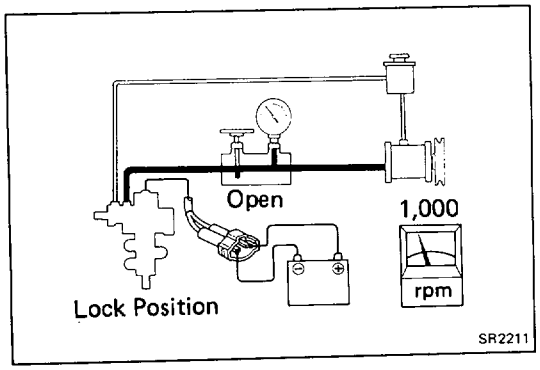
(d) Apply battery voltage to the solenoid coil.

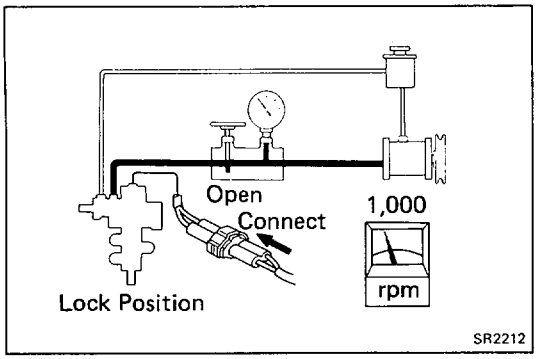
CAUTION:
- **Do not apply voltage more than 30 seconds to avoid burning out the solenoid.**
- **If repeating this step, wait until the solenoid cools down enough that it can be touched by hand.**

(e) Check the oil pressure.

(Reference)
Maximum pressure: Approx. 40 kg/cm² (569 psi, 3,923 kPa)

If pressure is high, check the solenoid.

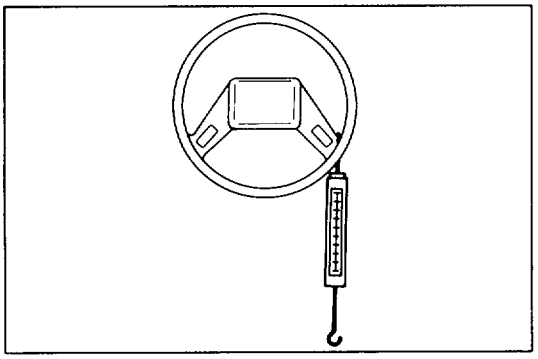




(f) Connect the solenoid connector and check the oil pressure.

Minimum pressure: 75 kg/cm² (1,067 psi, 7,355 kPa)

If pressure is low, the progressive power steering system is faulty.



9. MEASURE STEERING EFFORT

[Non progressive power steering]

(a) Center the steering wheel and run the engine at idle.

(b) Using a scale, measure the steering effort in both directions.

Maximum steering effort: 4 kg (8.8 lb, 39 N)

(c) If steering effort is excessive, repair the power steering unit.

NOTE: Be sure to consider tire type, pressure and contact surface before making your diagnosis.

[Progressive power steering]

(a) Center the steering wheel and run the engine at idle.

(b) Using a scale, measure the steering effort in both directions.

Maximum steering effort: 4 kg (8.8 lb, 39 N)

(c) If steering effort is excessive, repair the power steering unit.

(d) Apply battery voltage to the solenoid coil.

CAUTION:

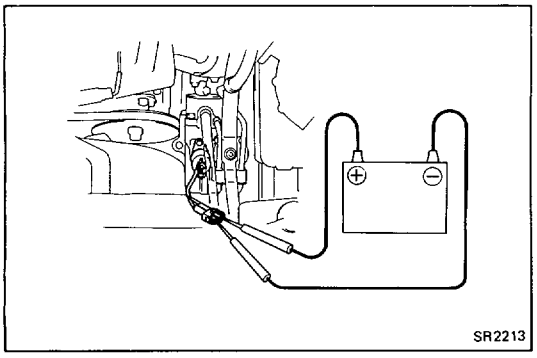
- **Do not apply voltage more than 30 seconds to avoid burning out the solenoid.**
- **If repeating this step, wait until the solenoid cools down enough that it can be touched by hand.**

(e) Check that the steering effort is heavier than it was before battery voltage was applied to the solenoid.

(Reference)
Maximum steering effort: 12 kg (26 lb, 118 N)

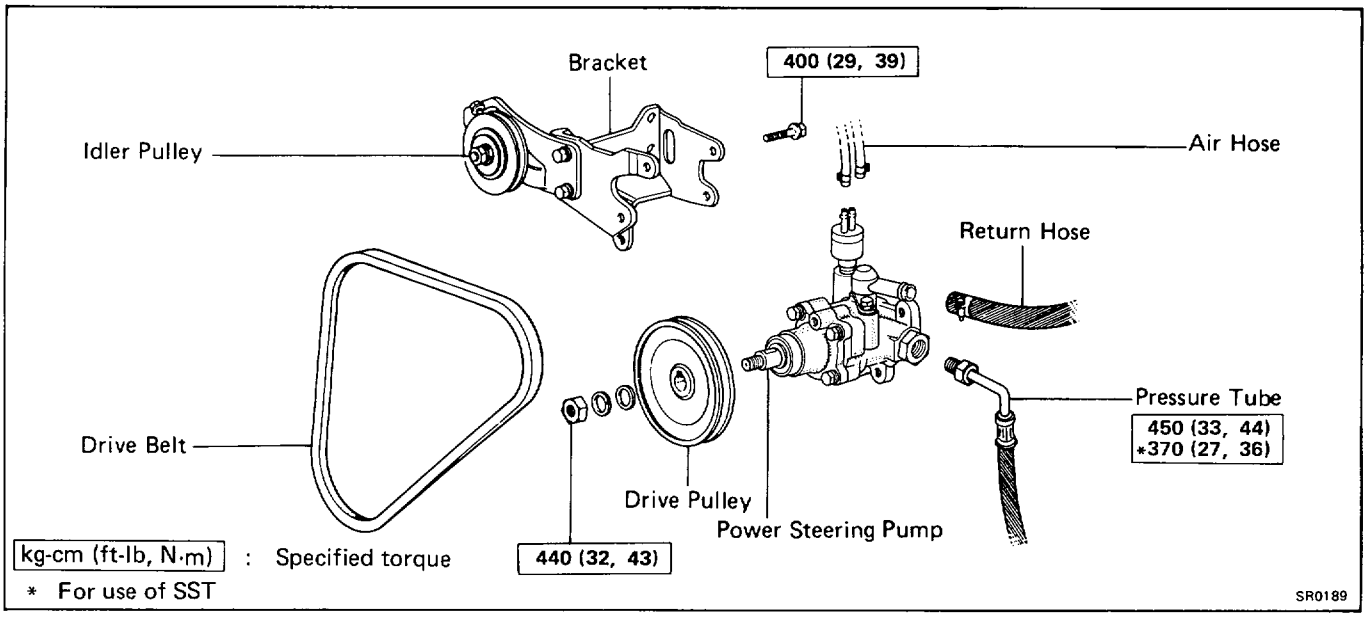
(f) If steering effort is not heavier, check the solenoid.

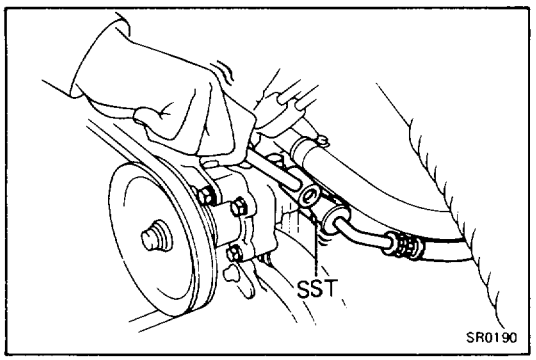
NOTE: Be sure to consider tire type, pressure and contact surface before making your diagnosis.



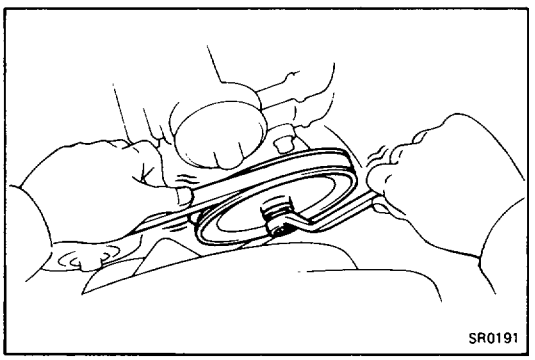
Power Steering Pump

REMOVAL OF PS PUMP

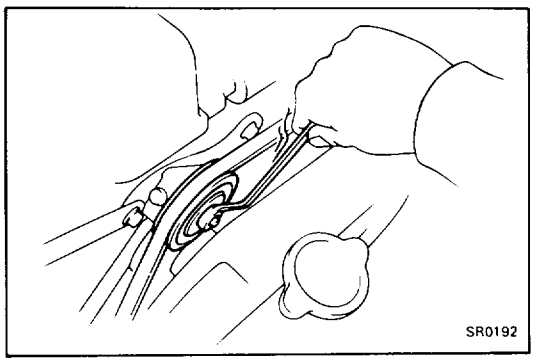




1. **DISCONNECT AIR HOSES FROM AIR CONTROL VALVE**
   (a) Disconnect the high tension cords from the distributor.
   (b) Disconnect the air hoses from the air valve.
2. **DRAW OUT FLUID FROM RESERVOIR TANK**
3. **DISCONNECT RETURN HOSE FROM PS PUMP**
4. **DISCONNECT PRESSURE TUBE FROM PS PUMP**
   Using SST, loosen and disconnect the pressure tube.
   SST 09631-22020

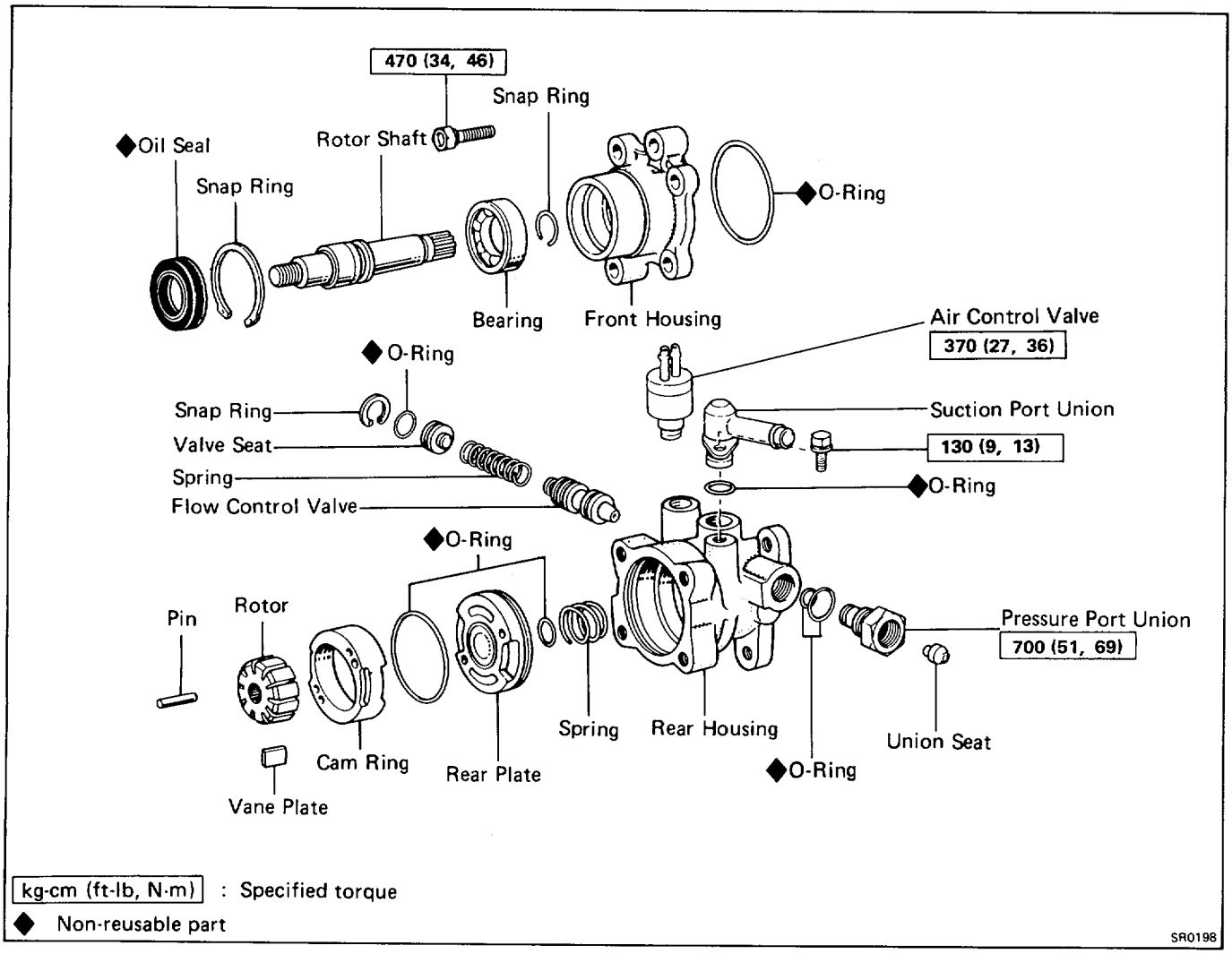


5. **LOOSEN DRIVE PULLEY NUT**
   Push on the drive belt to hold the pulley in place and loosen the pulley nut.



6. **REMOVE DRIVE BELT**
   (a) Loosen the idler pulley nut.
   (b) Loosen the adjusting bolt and remove the drive belt.
7. **REMOVE DRIVE PULLEY AND WOODRUFF KEY**
8. **REMOVE PS PUMP**
   Remove the PS pump mount bolts, and remove the PS pump from the bracket.

COMPONENTS



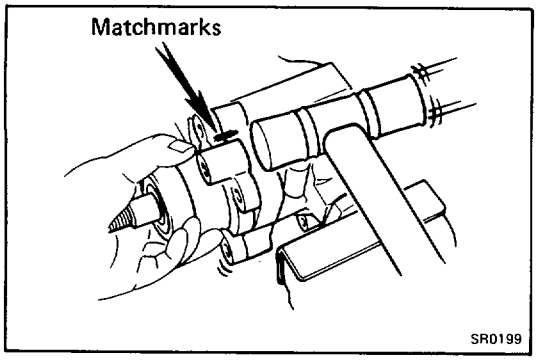
DISASSEMBLY OF PS PUMP

1. **CLAMP PS PUMP IN VISE**

   CAUTION: Do not tighten the vise too tight.

2. **REMOVE AIR CONTROL VALVE FROM REAR HOUSING (22R-E only)**

3. **REMOVE SUCTION PORT UNION FROM REAR HOUSING**



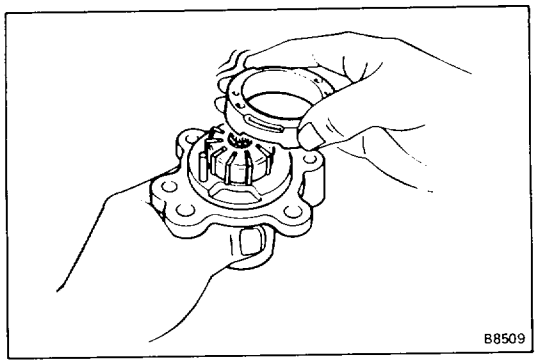
4. **REMOVE FRONT HOUSING**

   (a) Place matchmarks on the front and rear housing.

   (b) Remove the four front housing bolts.

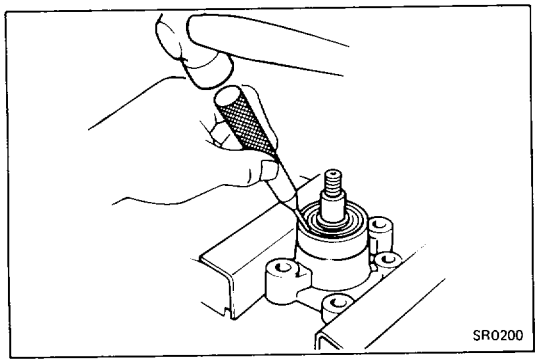
   (c) Using a plastic hammer, tap off the front housing.

   CAUTION: Be careful that the vane plates, rotor and cam ring do not fall out.



5. **REMOVE CAM RING, ROTOR AND VANE PLATES**

CAUTION: Be careful not to scratch the cam ring, rotor or vane plates.



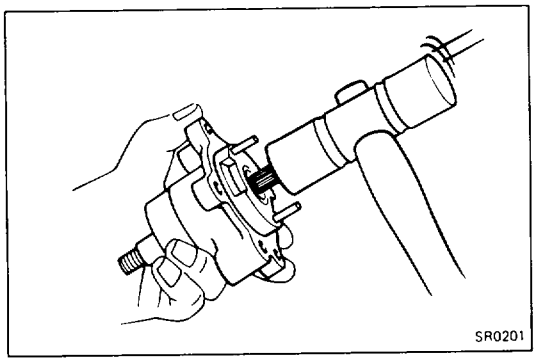
6. **REMOVE ROTOR SHAFT**

(a) Clamp the front housing in a vise.

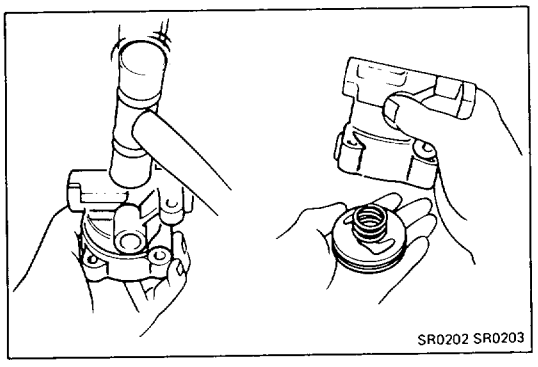
CAUTION: Do not tighten the vise too tight.

(b) Using a chisel and hammer, pry off the oil seal.

(c) Using snap ring pliers, remove the snap ring.



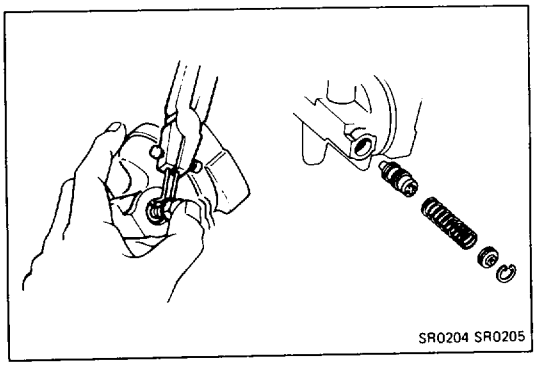
(d) Using a plastic hammer, lightly tap the rotor shaft out of the front housing.



7. **REMOVE REAR PLATE AND SPRING**

Using a plastic hammer, tap the bottom end of the rear housing, and remove the rear plate and spring.

CAUTION: Avoid gripping the rear plate with pliers as this could damage it.



8. **REMOVE FLOW CONTROL VALVE**

(a) Temporarily install a bolt to the plug.

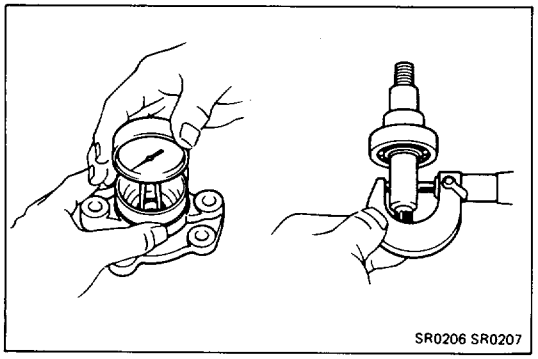
(b) Push the bolt and remove the snap ring with snap ring pliers.

(c) Pull out the bolt and remove the plug.

(d) Remove the spring and flow control valve by hand.

CAUTION: Use care not to drop, scratch or nick this valve.

9. **REMOVE PRESSURE PORT UNION**


SR0206 SR0207

INSPECTION OF PS PUMP

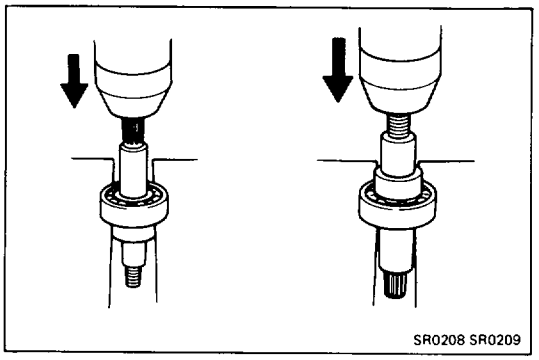
1. INSPECT BUSHING AND MEASURE BUSHING OIL CLEARANCE

(a) Check the bushing for wear or damage. The bushing cannot be replaced separately.

If wear or damage is found, replace entire housing.

(b) Check the oil clearance between the bushing and rotor shaft.

Maximum oil clearance: 0.07 mm (0.0028 in.)


SR0208 SR0209

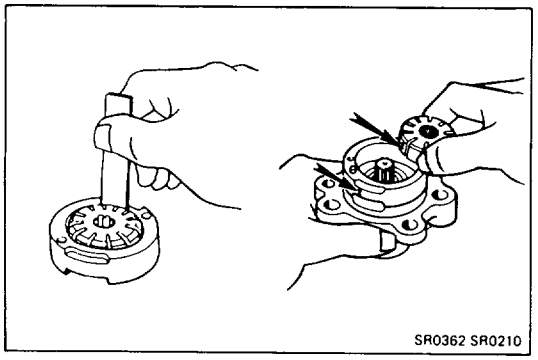
2. IF NECESSARY, REPLACE ROTOR SHAFT BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press, press out the bearing.

(c) Using a press, press in the bearing.

(d) Using snap ring pliers, install the snap ring.

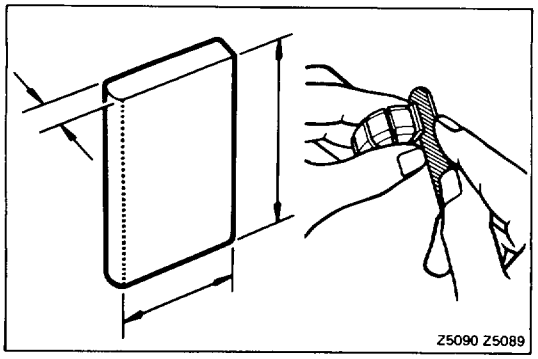

SR0362 SR0210

3. INSPECT ROTOR AND CAM RING

Measure the cam ring thickness. Check that the difference between the rotor and cam ring measurement is less than maximum.

Maximum difference: 0.06 mm (0.0024 in.)

If the difference is excessive, replace the cam ring with one having the same letter as on the rotor.


Z5090 Z5089

4. INSPECT AND MEASURE VANE PLATES

(a) Check the vane plates for wear or scratches.

(b) Measure the length, height and thickness of the vane plates.

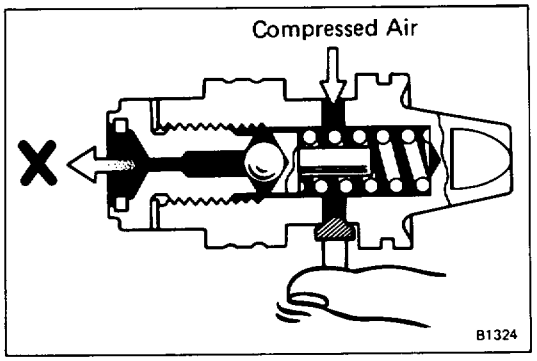
Minimum length: 14.97 mm (0.5894 in.)
Minimum height: 7.8 mm (0.307 in.)
Minimum thickness: 1.7 mm (0.067 in.)

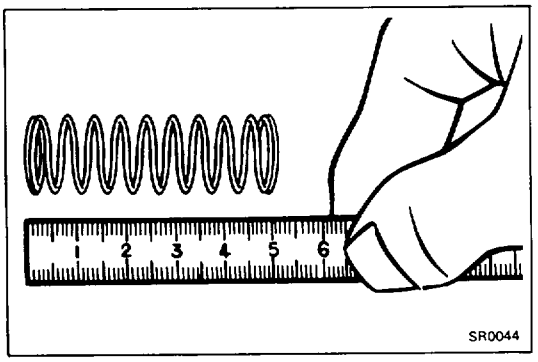
(c) Measure the clearance between the vane plate and rotor groove.

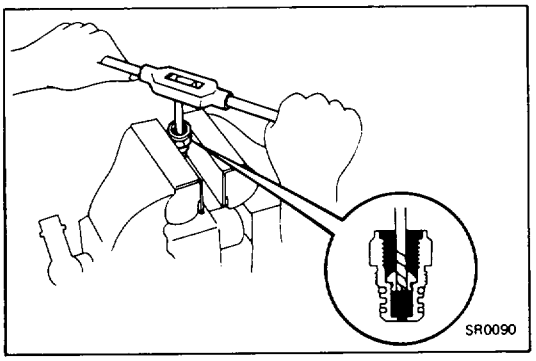
Maximum clearance: 0.06 mm (0.0024 in.)

NOTE: There are five vane lengths with the following rotor and cam ring numbers:

Rotor and cam ring number	Vane length mm (in.)
None	14.996 – 14.998 (0.5904 – 0.5905)
1	14.994 – 14.996 (0.5903 – 0.5904)
2	14.992 – 14.994 (0.5902 – 0.5903)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.5901 – 0.5902)







5. INSPECT FLOW CONTROL VALVE

(a) Check the flow control valve for wear or damage.

(b) Apply fluid to the valve and check that if falls smoothly into the valve hole by its own weight.

(c) Check the flow control valve for leakage.

- Close one of the holes and apply compressed air [4 or 5 kg/cm² (57 or 71 psi, 392 or 490 kPa)] into the opposite side.
- Confirm that air does not come out from the end hole.

If necessary, replace the valve with one having the same letter on the rear housing.

6. INSPECT FLOW CONTROL VALVE SPRING

Check that the spring is within specification.

Spring length: 47 — 50 mm (1.85 — 1.97 in.)

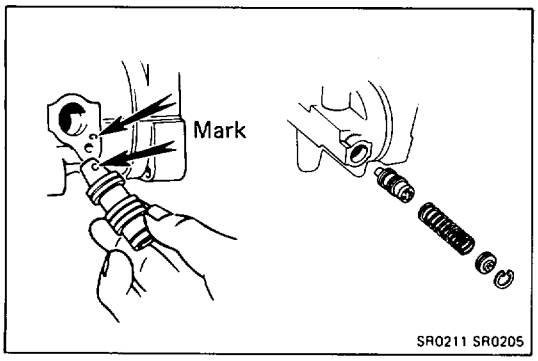
If the spring is not within specification, replace it.

7. IF NECESSARY, REPLACE UNION SEAT

(a) Using a screw extractor, remove the union seat.

(b) Install a new floating type union seat.

NOTE: Only floating type parts are available.



ASSEMBLY OF PS PUMP

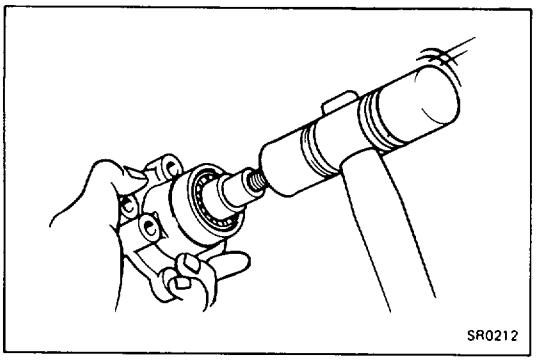
(See page SR-57)

1. INSTALL FLOW CONTROL VALVE

NOTE: Be sure the letter inscribed on the flow control valve matches the letter stamped on the rear of the pump body.

Inscribed mark: A, B, C, D, E or F

Install the flow control valve, spring, plug and snap ring.



2. INSTALL PRESSURE PORT UNION

Install and torque the union.

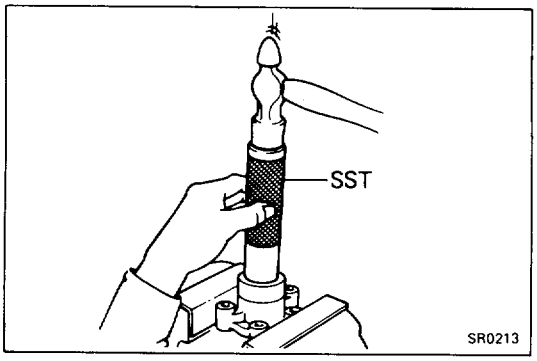
Torque: 700 kg-cm (51 ft-lb, 69 N·m)

3. INSTALL ROTOR SHAFT TO FRONT HOUSING

Install the rotor shaft into the front housing by tapping it in with a plastic hammer.

4. INSTALL SNAP RING

Using snap ring pliers, install the snap ring to the front housing.

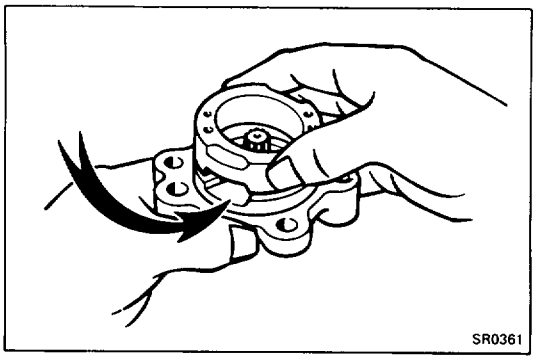


5. INSTALL OIL SEAL

(a) Apply a light coat of MP grease to a new oil seal lip.

(b) Using SST and hammer, install the oil seal.

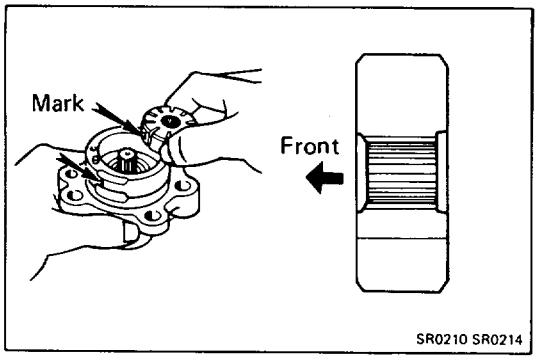
SST 09608-30012 (09608-04030)



6. INSTALL O-RING

7. INSTALL CAM RING

Align the fluid passages of the cam ring and front housing, and install the cam ring.

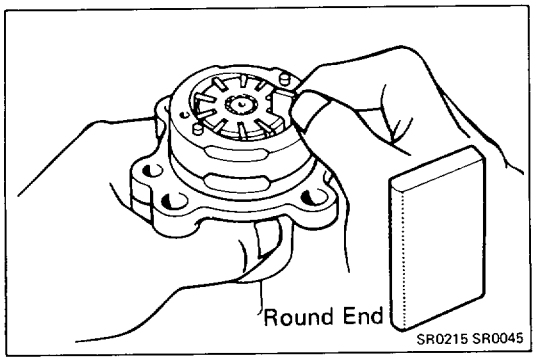


8. INSTALL ROTOR

Install the rotor with the chamfered end facing toward the front.

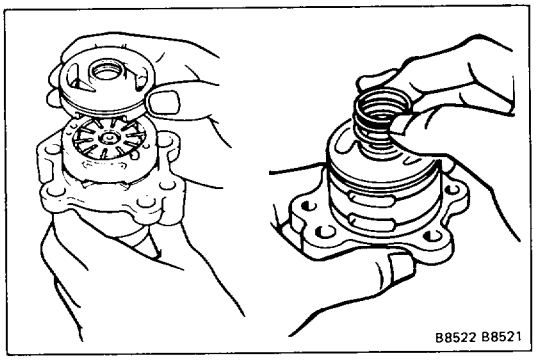
NOTE: Be sure the letters inscribed on the cam ring and rotor match.

Inscribed mark: 1, 2, 3, 4 or None



9. INSTALL VANE PLATES

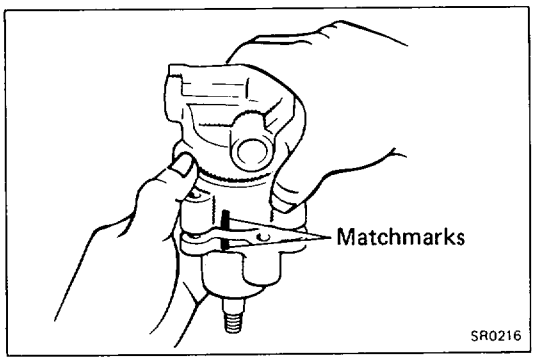
Install the vane plates with the round end facing outward.



10. INSTALL REAR PLATE AND SPRING

(a) Align the fluid passages of the rear plate and cam ring, and install the rear plate with the spring.

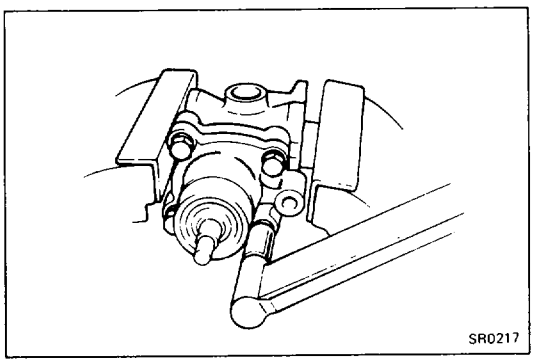
(b) Place the spring on the rear plate.



11. INSTALL REAR HOUSING

(a) Align the matchmarks on the front and rear housing, and assemble them.

(b) Tighten the front and rear housing mounting bolts by hand.



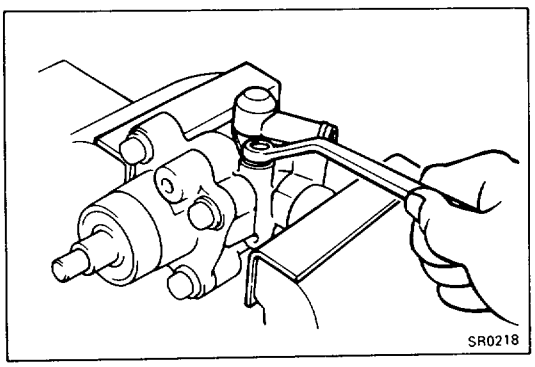
12. TIGHTEN FOUR HOUSING BOLTS

(a) Clamp the rear housing in a vise.

CAUTION: Do not tighten the vise too tight.

(b) Tighten the four housing bolts evenly in 3 or 4 passes.

Torque: 470 kg-cm (34 ft-lb, 46 N·m)



13. INSTALL UNION TO REAR HOUSING

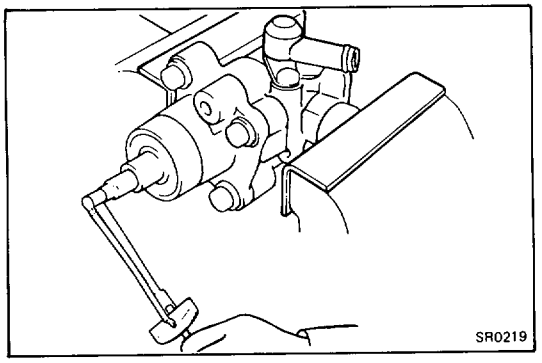
Insert and tighten the union.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)

14. INSTALL AIR CONTROL VALVE TO REAR HOUSING (22R-E only)

Install and tighten the air control valve.

Torque: 370 kg-cm (27 ft-lb, 36 N·m)

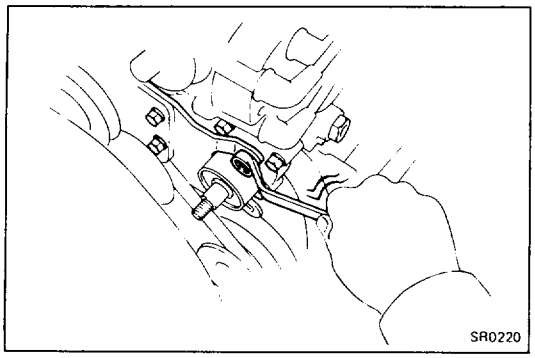


15. CHECK ROTOR SHAFT ROTATION CONDITION

(a) Check that the rotor shaft rotates smoothly without abnormal noise.

(b) Provisionally install the pulley nut and check the rotating torque.

Rotating torque: Less than 2.8 kg-cm (2.4 in.-lb, 0.3 N·m)



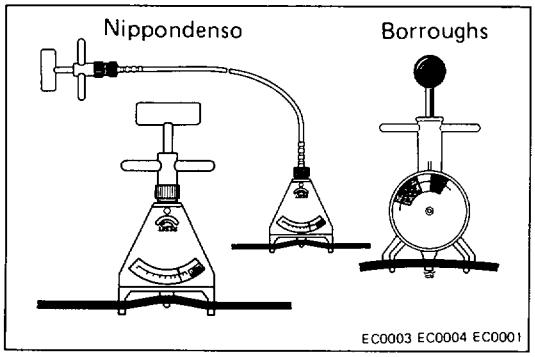
INSTALLATION OF PS PUMP

(See page SR-56)

1. **INSTALL PS PUMP**

Place the PS pump in position and torque the mount bolts.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)



2. **INSTALL PULLEY AND DRIVE BELT**

(a) Install the woodruff key, pulley and set nut.

(b) Install the drive belt.

(c) Turn the adjusting bolt until the belt tension is at specified value.

Belt tension gauge:

Nippondenso	BTG-20 (95506-00020) or
Borroughs	No. BT-33-73F

Drive belt tension:

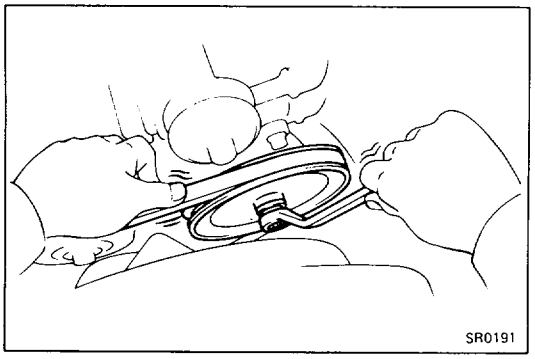
New belt	**125 ± 25 lb**
Used belt	**80 ± 20 lb**

NOTE:
- "New belt" refers to a belt which has been less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.

(d) Tighten the idler pulley nut and adjusting bolt.

(e) Push down on the drive belt to hold the pulley in place and torque the pulley set nut.

Torque: 440 kg-cm (32 ft-lb, 43 N·m)



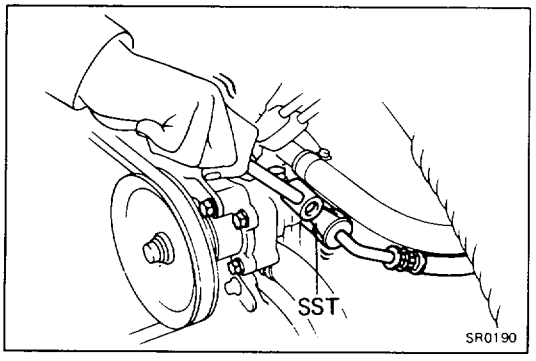
3. **CONNECT PRESSURE TUBE TO PS PUMP**

Using SST, torque the flare nut.

SST 09631-22020

Torque: 370 kg-cm (27 ft-lb, 36 N·m)

NOTE: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).

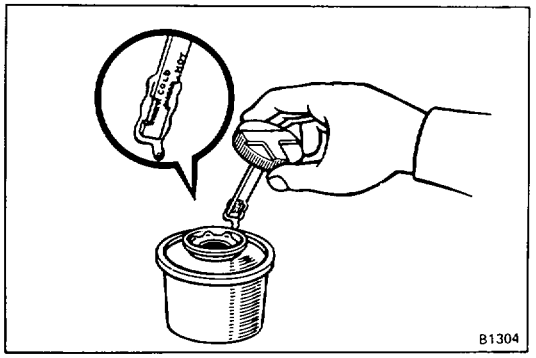


4. **CONNECT RETURN HOSE TO PS PUMP**

5. **CONNECT AIR HOSES TO AIR CONTROL VALVE**

(a) Connect the air hoses to the air control valve.

(b) Connect the high tension cords to the distributor.



6. **FILL RESERVOIR WITH FLUID**

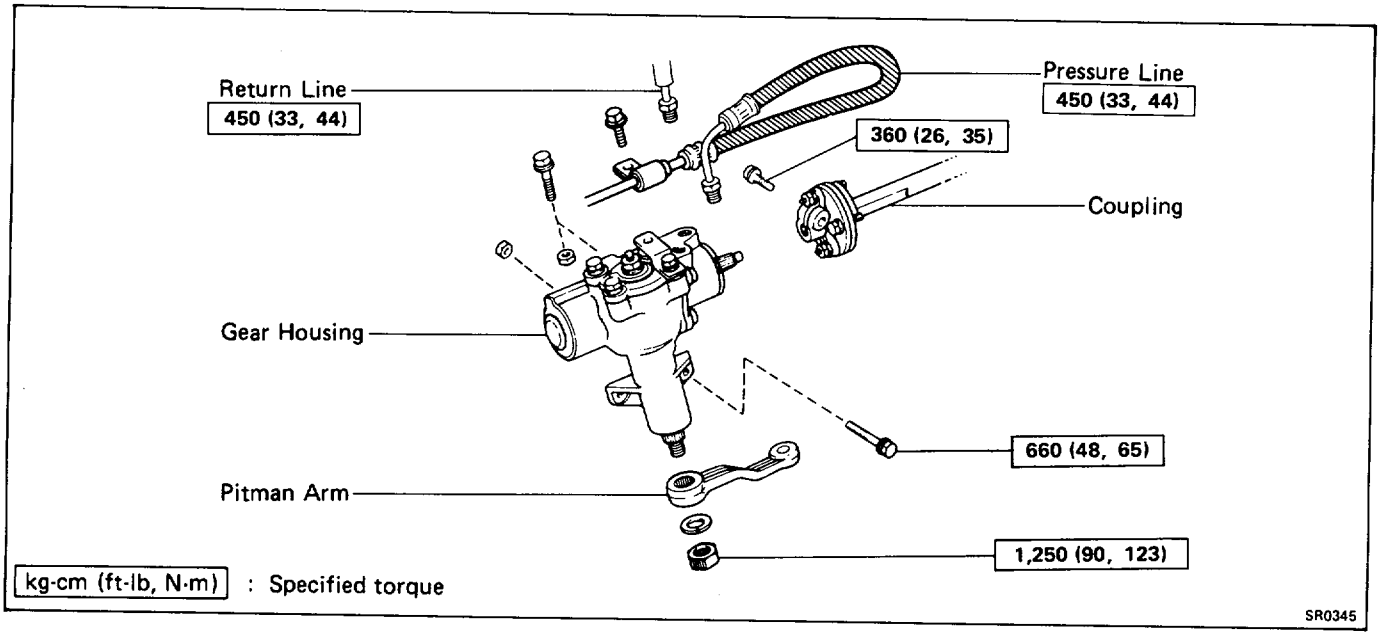
Fluid: ATF DEXRON® or DEXRON® II

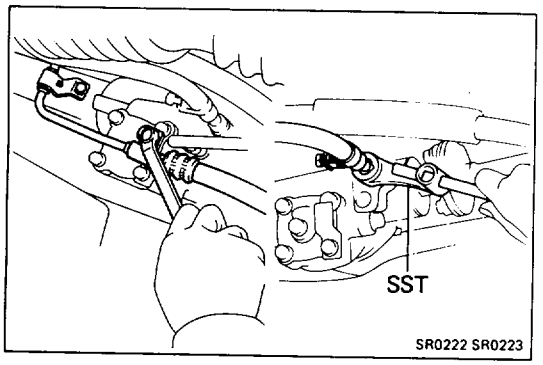
7. **BLEED POWER STEERING**

8. **CHECK FOR FLUID LEAKS**

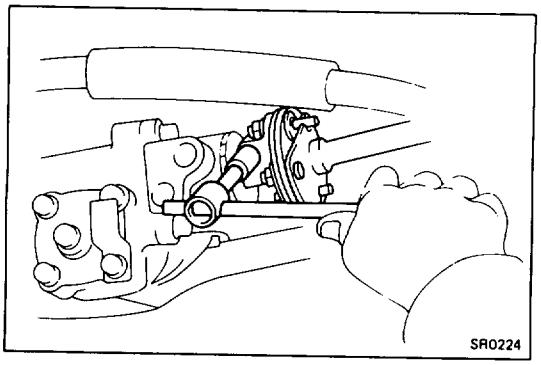
Gear Housing (2WD)

REMOVAL OF GEAR HOUSING

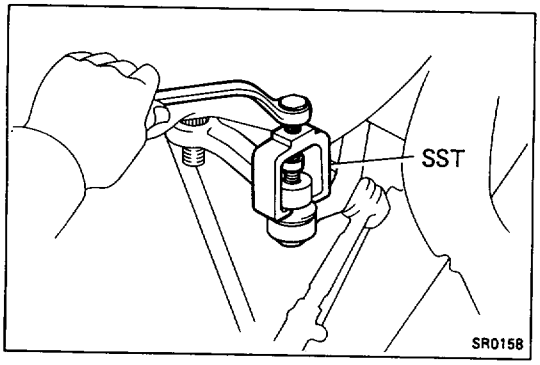




1. **DISCONNECT RETURN LINE AND PRESSURE LINE**
   (a) Remove the pressure line clamp bolts.
   (b) Using SST, disconnect the pressure and return lines.
   SST 09631-22020
2. **DISCONNECT SOLENOID VALVE CONNECTOR (w/ PPS)**

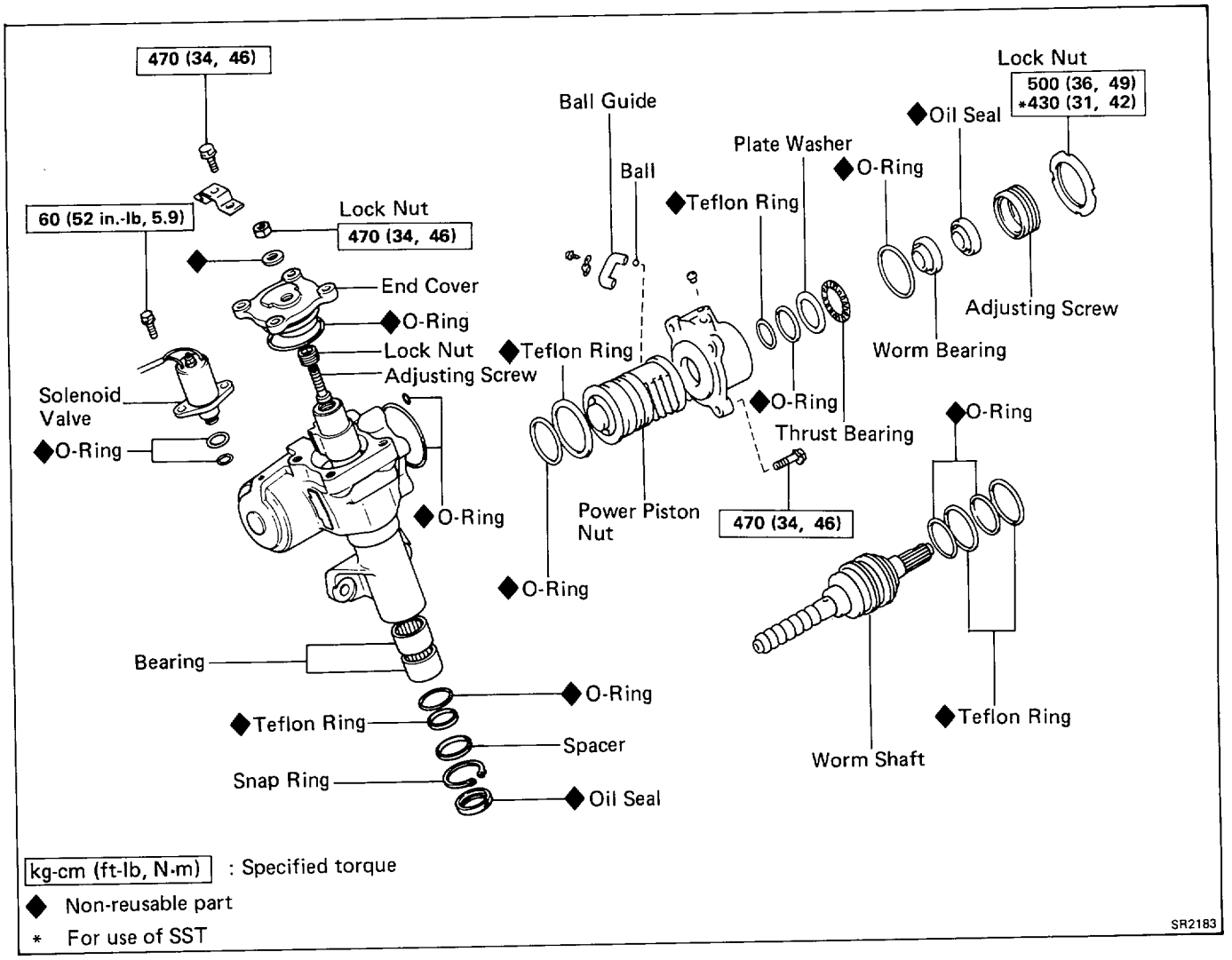


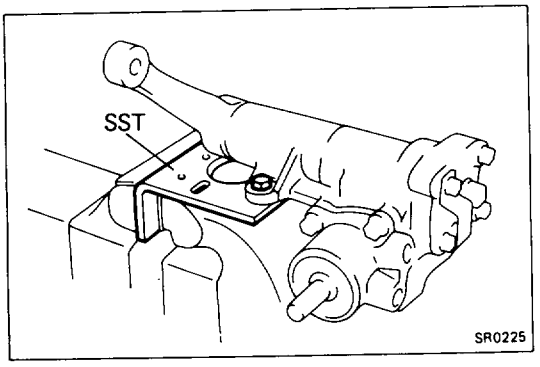
3. **REMOVE COUPLING SET BOLT**
   (a) Place matchmarks on the coupling and worm shaft.
   (b) Remove the set bolt.
4. **REMOVE PITMAN ARM MOUNT NUT**

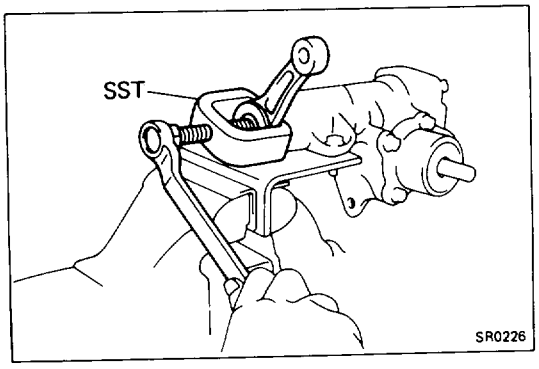


5. **DISCONNECT RELAY ROD FROM PITMAN ARM**
   (a) Remove the relay rod mount nut.
   (b) Using SST, disconnect the relay rod from the pitman arm.
   SST 09611-22012
6. **REMOVE GEAR HOUSING**
   Remove the three bolts and take out the gear housing.

COMPONENTS







DISASSEMBLY OF GEAR HOUSING

1. MOUNT HOUSING ON STAND

Mount the gear housing on SST and clamp SST in a vise.

SST 09630-00011 (09631-00140)

2. REMOVE SOLENOID VALVE (w/ PPS)

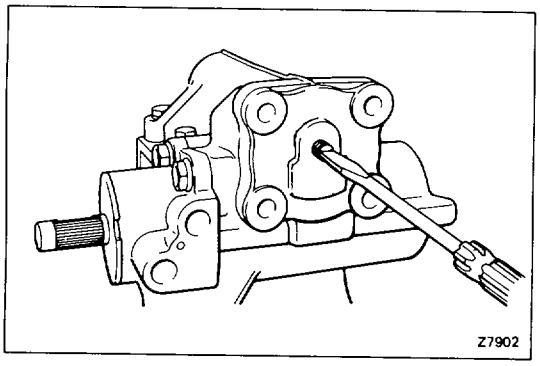
(a) Remove the two bolts and solenoid valve.

(b) Remove the O-rings.

3. REMOVE PITMAN ARM

Using SST, remove the pitman arm.

SST 09610-55012

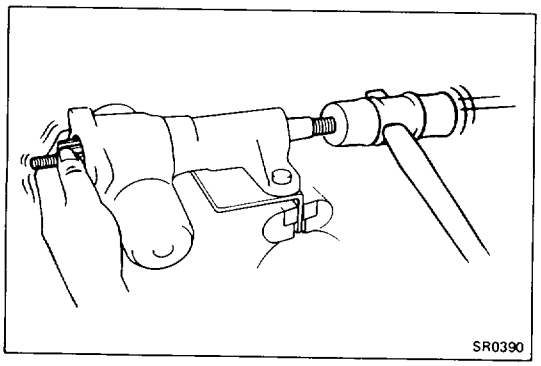


4. REMOVE END COVER

(a) Remove the adjusting screw lock nut.

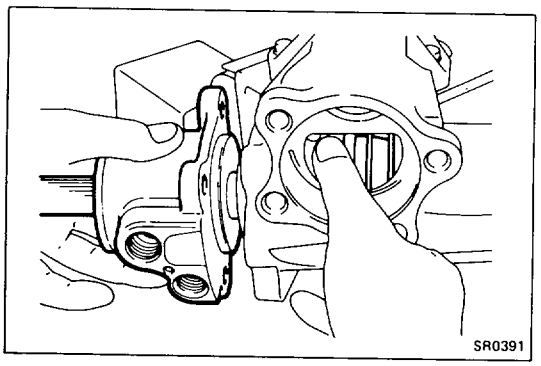
(b) Remove the four bolts.

(c) Screw in the adjusting screw until the cover comes off.



5. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.



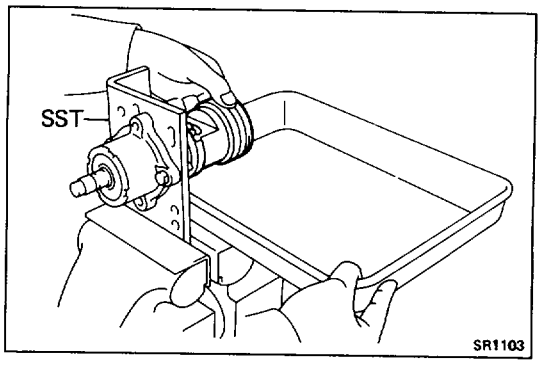
6. REMOVE WORM GEAR VALVE BODY ASSEMBLY

(a) Remove the four cap screws from the housing.

(b) Hold the power piston nut with your thumb so it cannot move, and turn the worm shaft clockwise. Then, withdraw the valve body and power piston assembly.

CAUTION: Ensure that the power piston nut does not come off the worm shaft.

(c) Remove the O-ring.



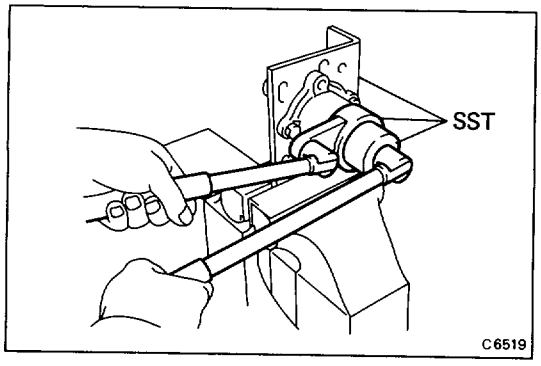
7. REMOVE POWER PISTON NUT

(a) Mount the valve body on SST and clamp SST in vise.

SST 09630-00011 (09631-00140)

(b) Pull out the power piston nut.

CAUTION: Do not lose the ball.



8. REMOVE LOCK NUT

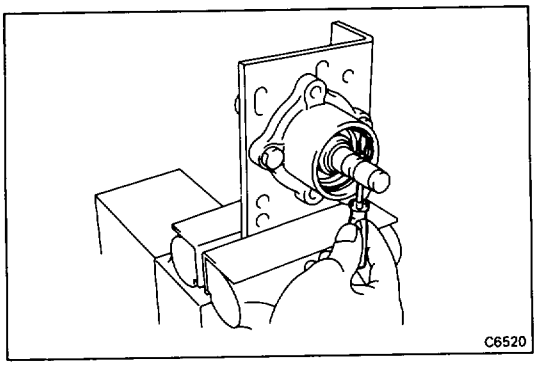
(a) Using SST, hold the adjusting screw and remove the lock nut with SST.

SST 09630-00011 (09631-00030, 09631-00040)

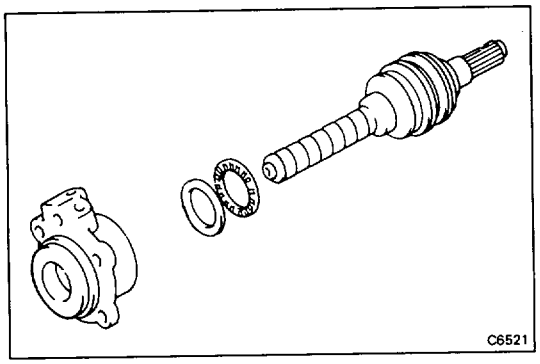
(b) Using SST, remove the adjust screw.

SST 09630-00011 (09631-00030)

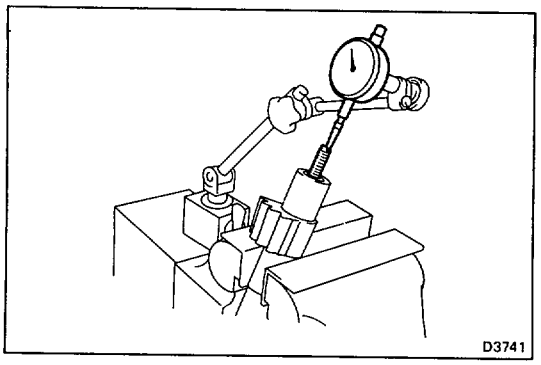
(c) Remove the bearing.



9. **REMOVE O-RING**



10. **REMOVE FOLLOWING PARTS:**
    (a) Worm shaft
    (b) Thrust bearing
    (c) Plate washer
    (d) Teflon ring
    (e) O-ring



INSPECTION AND REPAIR OF STEERING GEAR HOUSING

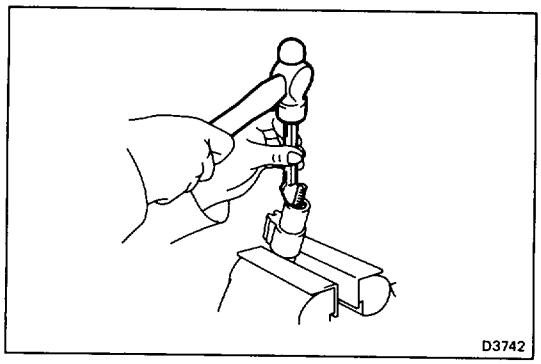
1. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Clamp the cross shaft in a vise.

(b) Using a dial indicator, measure the thrust clearance.

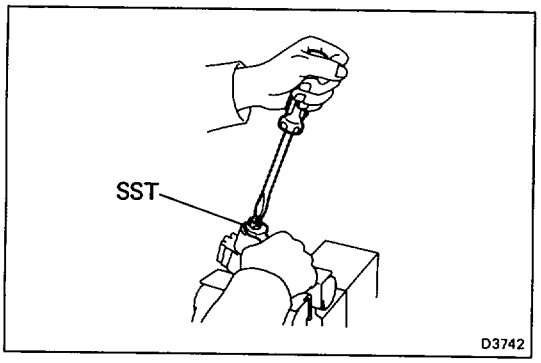
Thrust clearance: 0.03 — 0.05 mm (0.0012 — 0.0020 in.)

If thrust clearance is not correct, adjust the thrust clearance.



2. IF NECESSARY, ADJUST THRUST CLEARANCE

(a) Using a chisel and hammer, remove the lock nut stake.

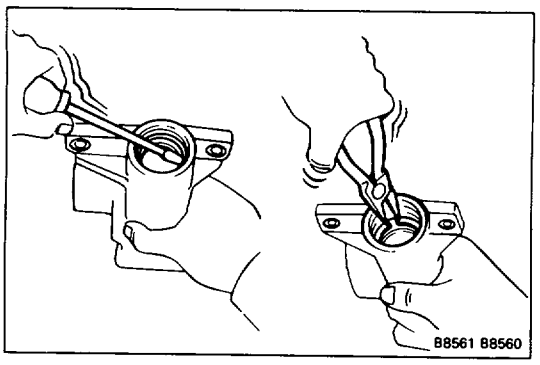


(b) Using SST, loosen the lock nut.

SST 09630-00011 (09631-00050)

(c) Adjust the adjusting screw for correct thrust clearance and tighten the lock nut.

(d) Stake the lock nut.

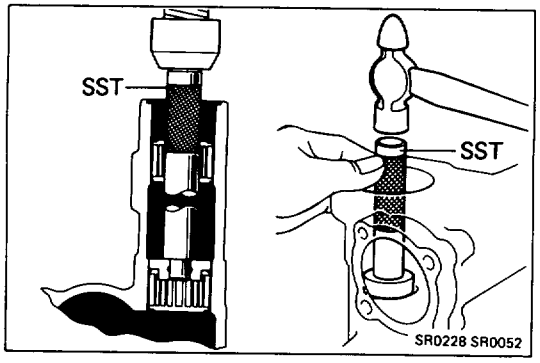


3. REPLACE TEFLON RING AND NEEDLE ROLLER BEARINGS

(a) Pry out the oil seal from the pitman arm end of the housing.

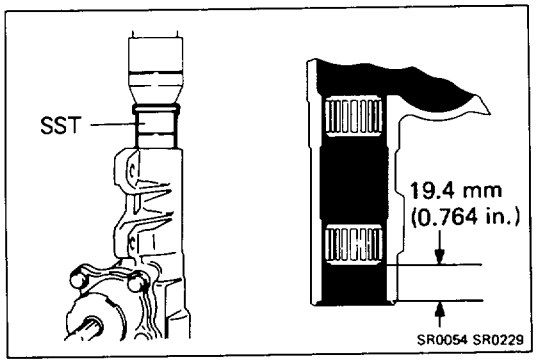
(b) Using snap ring pliers, remove the snap ring.

(c) Remove the metal spacer, teflon ring and O-ring.



(d) Using SST, drive out the bearings.

SST 09630-00011 (09631-00020, 09631-00070)

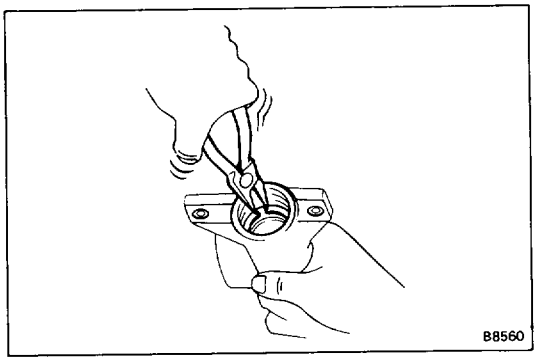


(e) Using SST, install the top bearing with the long flange out. Drive the bearing in flush with the inside casting surface.

SST 09630-00011 (09631-00090)

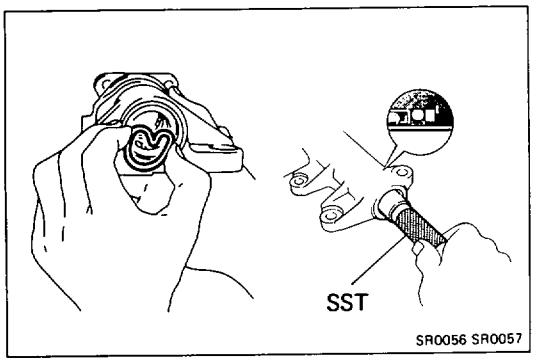
(f) Using SST, install the lower bearing with the long flange out. The SST will bottom and correctly position the bearing.

SST 09630-00011(09631-00170)



(g) Install a new O-ring and metal spacer.

(h) Using snap ring pliers, install the snap ring.

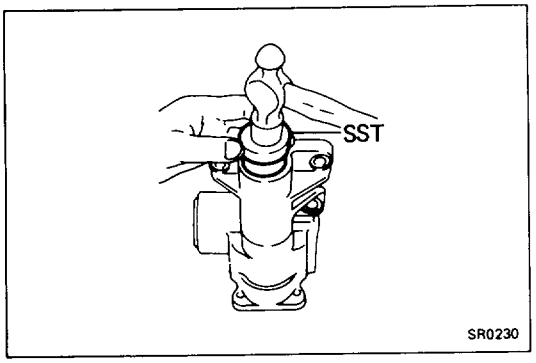


(i) Form the teflon ring into a heart shape and install it by hand.

(j) Using SST, form the teflon ring.

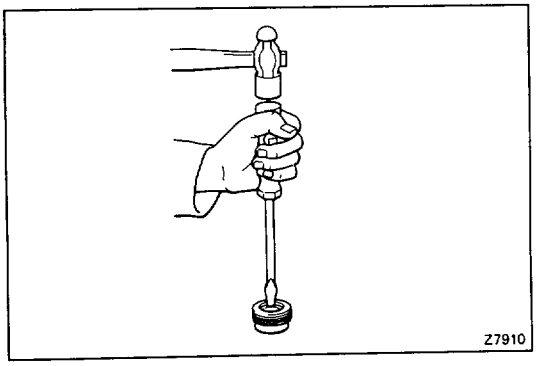
CAUTION: The teflon ring must squeezed before inserting the sector shaft or damage will result.

SST 09630-00011 (09631-00120)



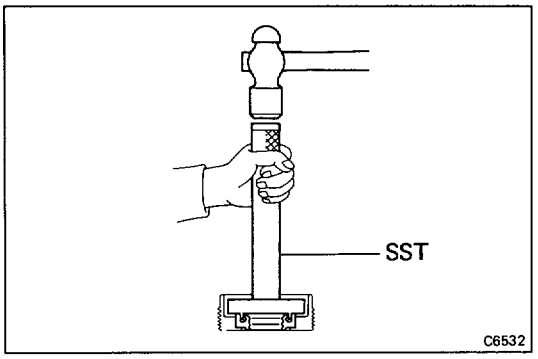
(k) Using SST, drive a new oil seal into the gear housing.

SST 09630-00011 (09631-00090, 09631-00100)



4. IF NECESSARY, REPLACE ADJUSTING SCREW OIL SEAL

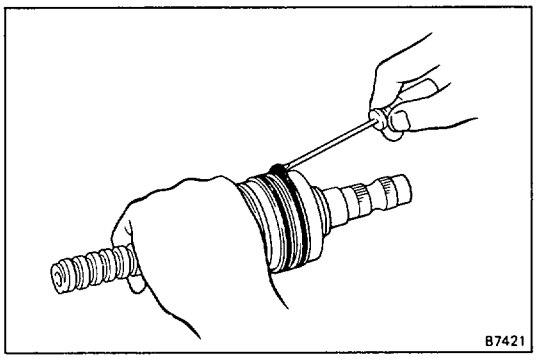
(a) Using a screwdriver, drive out the oil seal.



(b) Using SST, install a new oil seal.

SST 09630-00011 (09631-00020, 09631-00080)

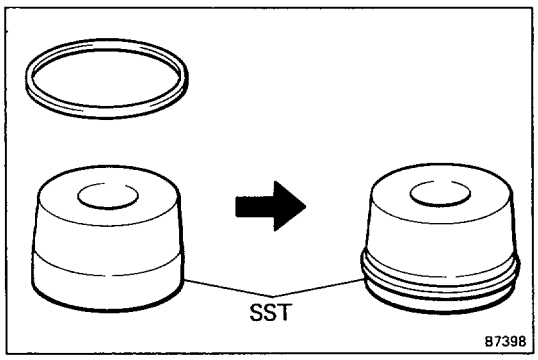
(c) Apply MP grease to the oil seal lip.



5. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING

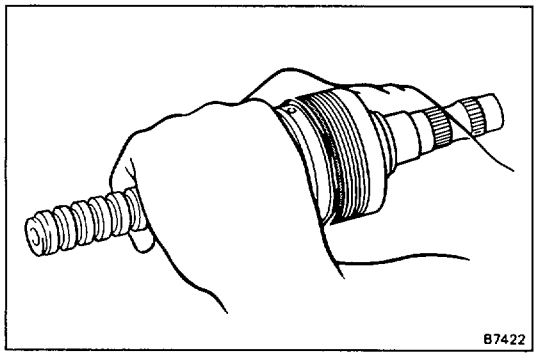
(a) Using a screwdriver, remove the two teflon rings.

CAUTION: Be careful not to damage the control valve.



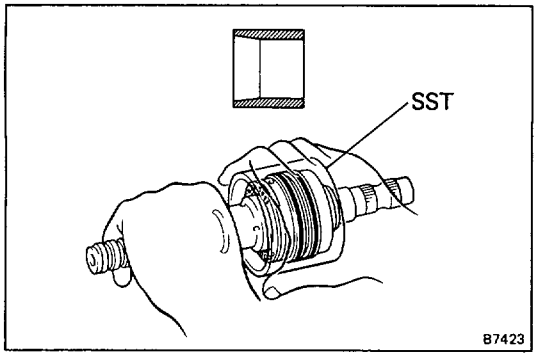
(b) Install the teflon ring to SST and expand it.

SST 09630-00011 (09631-00150)



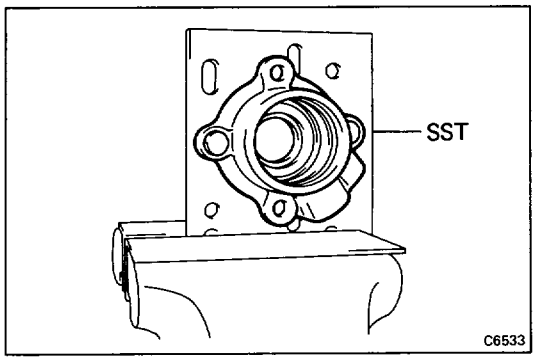
(c) Install the expanded teflon ring to the control valve and snug down it by hand.

CAUTION: Be careful not to damage the teflon rings.



(d) Coat the teflon rings with power steering fluid and snug down it with SST.

SST 09630-00011 (09631-00160)



ASSEMBLY OF GEAR HOUSING

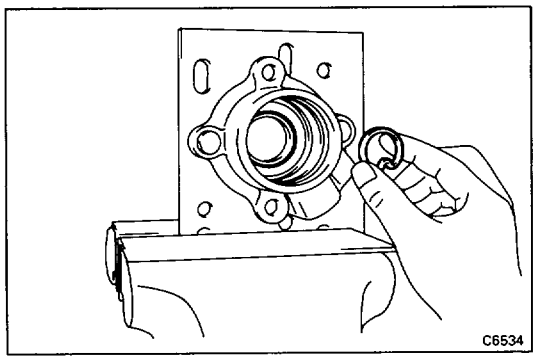
(See page SR-66)

1. **COAT ALL PARTS WITH POWER STEERING FLUID**

2. **MOUNT VALVE BODY IN VISE**

   Mount the valve body on SST and clamp SST in vise.

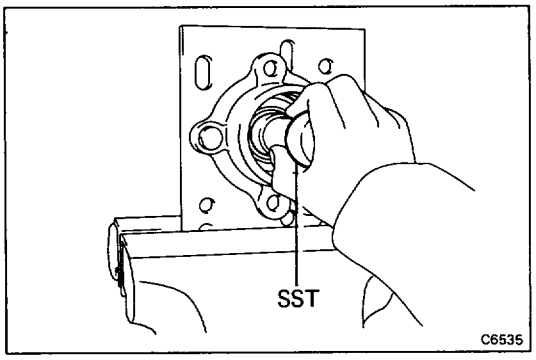
   SST 09630-00011 (09631-00140)



3. **INSTALL O-RING AND TEFLON RING**

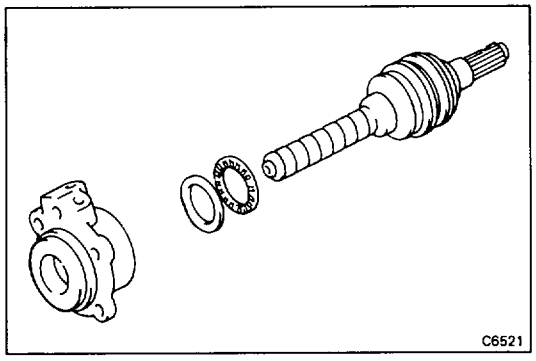
   (a) Install a new O-ring.

   (b) Form the teflon ring into a heart shape and install it with your finger.



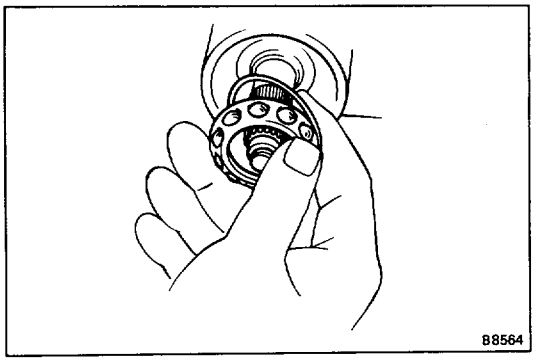
   (c) Using SST, form the teflon ring.

   SST 09630-00011 (09631-00120)

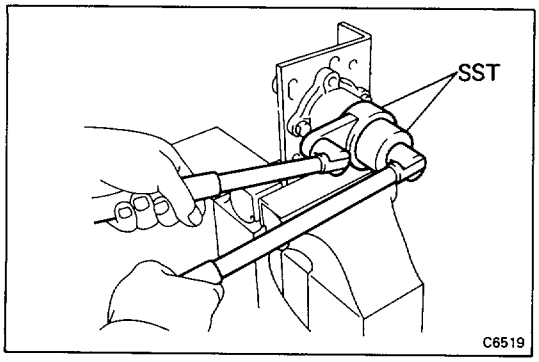


4. **INSTALL WORM SHAFT**

   Install the worm shaft with the thrust bearing and the plate washer to the valve body.



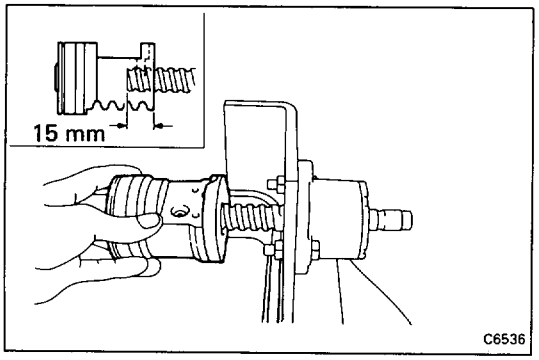
5. **INSTALL O-RING AND BEARING TO CONTROL VALVE**



6. INSTALL ADJUSTING SCREW AND LOCK NUT

Using SST, temporarily tighten the adjusting screw and lock nut.

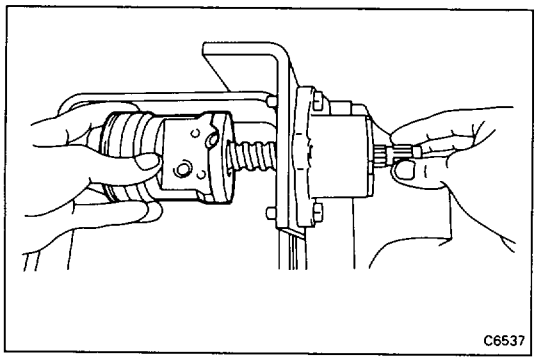
SST 09630-00011 (09631-00030, 09631-00040)



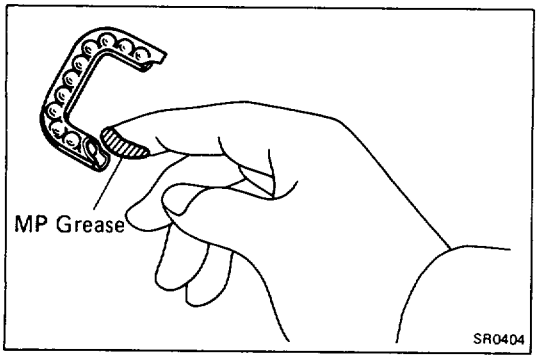
7. INSTALL POWER PISTON NUT AND BALLS

(a) Clean all parts with power steering fluid.

(b) Insert the power piston nut about 15 mm (0.59 in.) from the worm shaft end, and align the ball transfer surface with the ball hole.



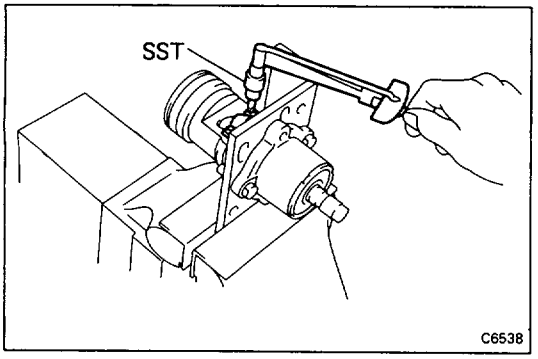
(c) Insert the balls one at a time into the holes, and turn the worm shaft a little with each insertion. Then securely insert the 33 balls into the piston.



(d) Install eleven new balls to the ball guide, and apply MP grease to the ball guide lips so the balls do not fall out.

(e) Install the ball guide to the power piston nut.

NOTE: Be careful not to damage the ball guide.



(f) Using SST, install the ball guide clamp.

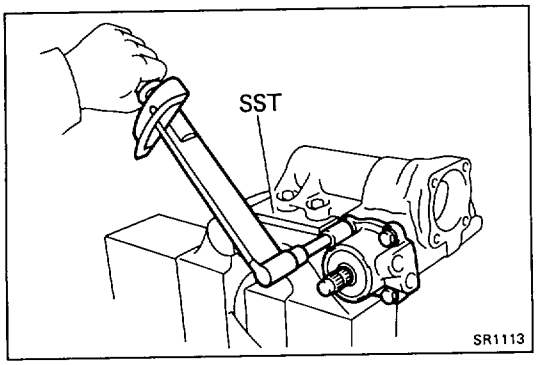
SST 09060-20010

Torque: 30 kg-cm (26 in.-lb, 2.9 N·m)

(g) Check that the power piston nut rotates smoothly.

(h) Turn the power piston nut, and insure that it is adhered to the tip surface of the valve body.

NOTE: If a ball has fallen out, there will be a gap.



8. INSTALL WORM GEAR VALVE BODY ASSEMBLY

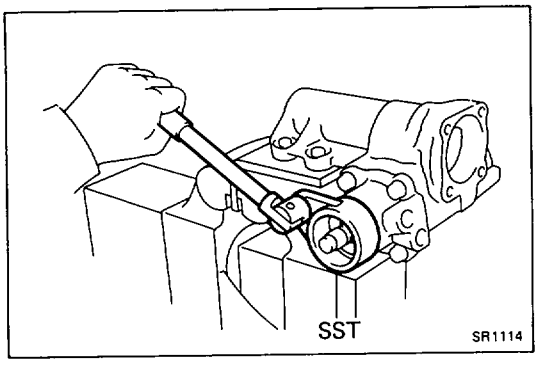
(a) Install the two O-rings to the gear housing and valve body.

(b) Mount the gear housing on SST and clamp SST in vise.

SST 09630-00011 (09631-00140)

(c) Install and torque the four bolts.

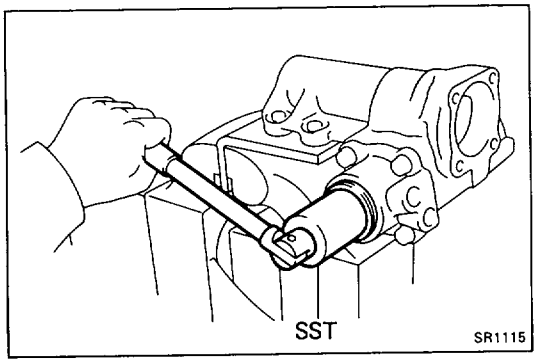
Torque: 470 kg-cm (34 ft-lb, 46 N·m)



9. ADJUST WORM BEARING PRELOAD

(a) Using SST, remove the lock nut.

SST 09630-00011 (09631-00040)

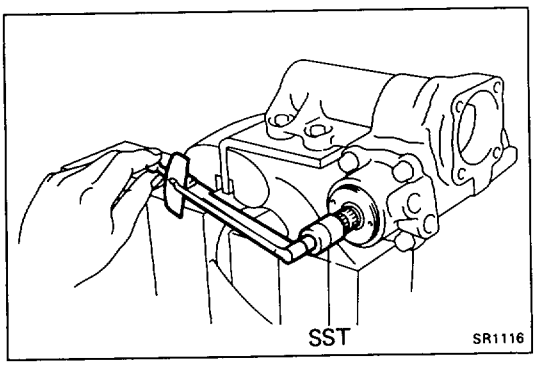


(b) Using SST, tighten the adjusting screw.

SST 09630-00011 (09631-00030)

(c) Turn the worm shaft to right and left and snug down the bearing.

(d) Slightly loosen the adjusting screw.



(e) Using SST, slightly tighten the adjusting screw until the preload is correct.

SST 09616-00010
09630-00011 (09631-00030)

(f) Using SST and torque meter, check the preload of the bearing.

SST 09616-00010

Preload: 4.0 — 6.5 kg-cm (3.5 — 5.6 in.-lb, 0.4 — 0.6 N·m)

NOTE: Hold the power piston nut to prevent it from turning.

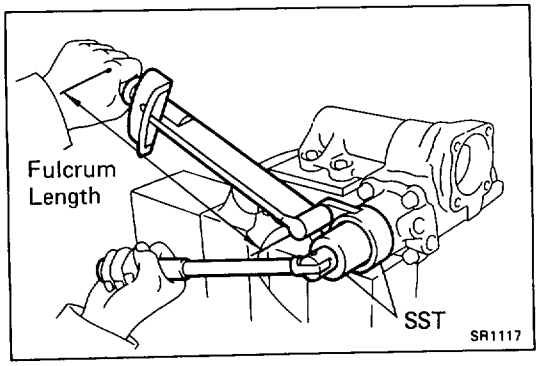
(g) Using SST, torque the lock nut while holding the adjusting nut with SST.

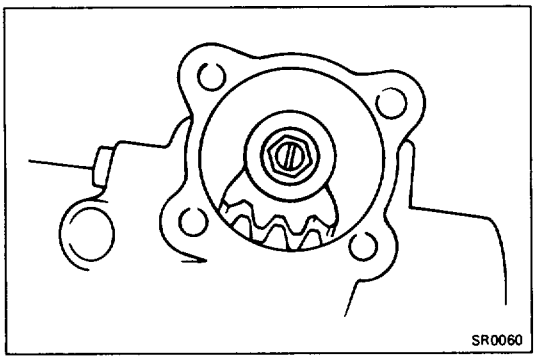
SST 09630-00011 (09631-00030, 09631-00040)

Torque: 430 kg-cm (31 ft-lb, 42 N·m)

NOTE: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

(h) Recheck the preload.





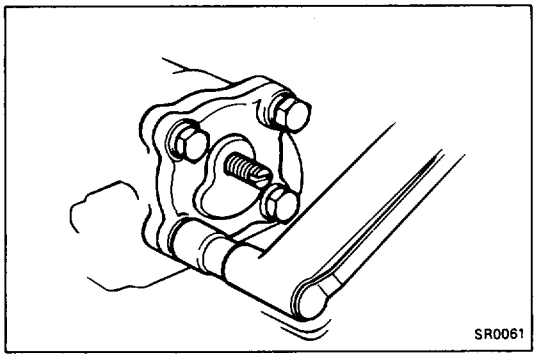
10. INSTALL CROSS SHAFT AND END COVER

(a) Install a new O-ring on the end cover.

(b) Assemble the cross shaft to the end cover.

NOTE: Fully loosen the adjusting screw.

(c) Set the worm gear at the center of the gear housing.



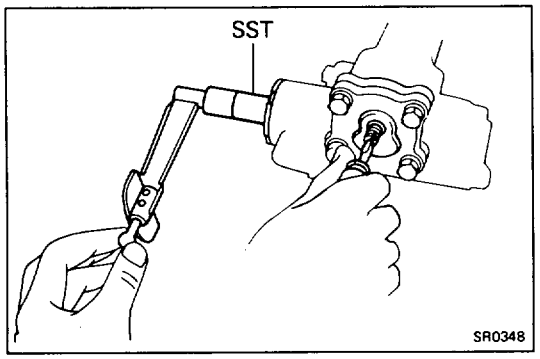
(d) Insert and push the cross shaft into the gear housing so that the center teeth mesh together.

(e) Install the four cap bolts. Torque the bolts in a diagonal pattern.

Torque: 470 kg-cm (34 ft-lb, 46 N·m)

11. DETERMINE CENTER POSITION OF GEAR HOUSING

Turn the worm shaft so full lock in both directions and determine the exact center.



12. ADJUST TOTAL PRELOAD

(a) Install SST with a torque meter on the center worm shaft.

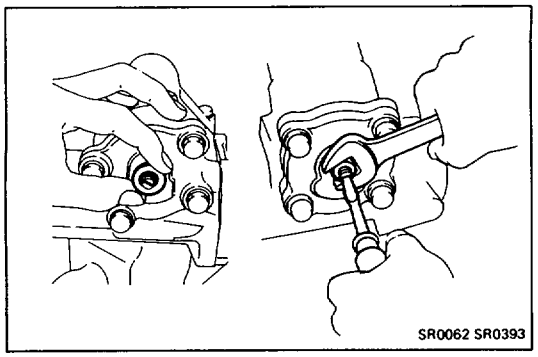
SST 09616-00010

(b) Turn the adjusting screw while measuring the preload until it is correct.

Total preload:

Add worm bearing preload

2 — 3 kg-cm (1.7 — 2.6 in.-lb, 0.2 — 0.3 N·m)



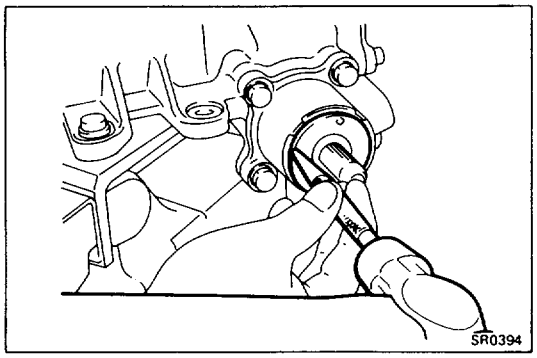
13. INSTALL NEW WASHER

14. INSTALL AND TIGHTEN LOCK NUT

Torque the lock nut while holding the adjusting screw.

Torque: 470 kg-cm (34 ft-lb,46 N·m)

15. RECHECK TOTAL PRELOAD



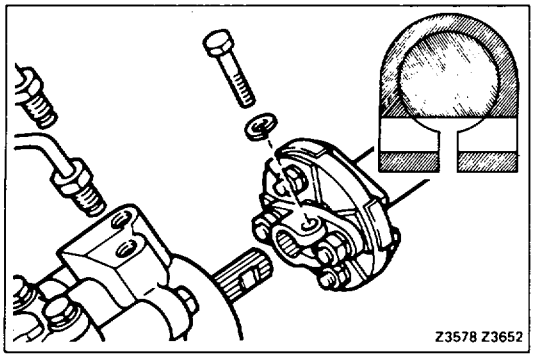
16. STAKE LOCK NUT

Using a punch and hammer, stake the lock nut at three places.

17. INSTALL SOLENOID VALVE (w/ PPS)

(a) Install new O-rings to the solenoid valve.

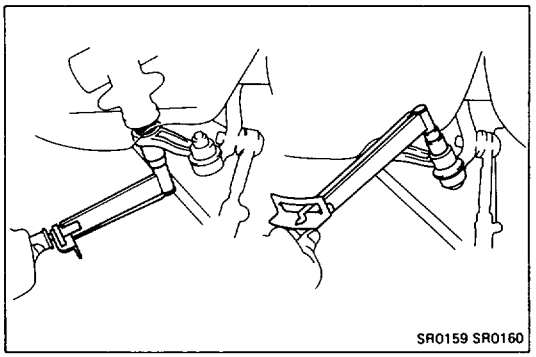
(b) Install the solenoid valve with the two bolts.



INSTALLATION OF GEAR HOUSING

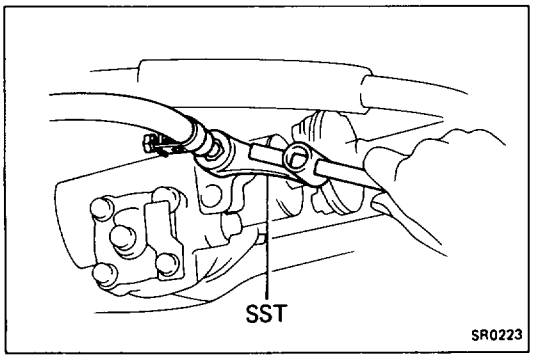
(See page SR-65)

1. **INSTALL GEAR HOUSING**
   (a) Line up the marks on the coupling and worm shaft.
   (b) Torque the three mounting bolts.
   Torque: 660 kg-cm (48 ft-lb, 65 N·m)



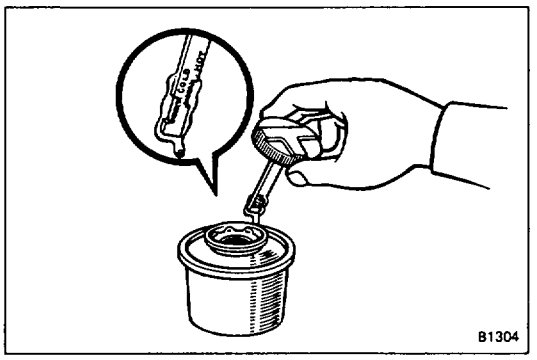
2. **CONNECT PITMAN ARM TO GEAR HOUSING**
   (a) Align the marks on the pitman arm and cross shaft.
   (b) Torque the pitman arm nut.
   Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

3. **CONNECT PITMAN ARM TO RELAY ROD**
   Connect the pitman arm to the relay rod and torque the mount nut.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)



4. **TORQUE COUPLING SET BOLT**
   Torque the coupling set bolt.
   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

5. **CONNECT PRESSURE LINE AND RETURN LINE**
   (a) Using SST, install and torque the union nuts.
   Torque: 450 kg-cm (33 ft-lb, 44 N·m)
   SST 09631-22020
   NOTE: Be sure the hose is not touching the fender.
   (b) Install the pressure line clamp bolts.



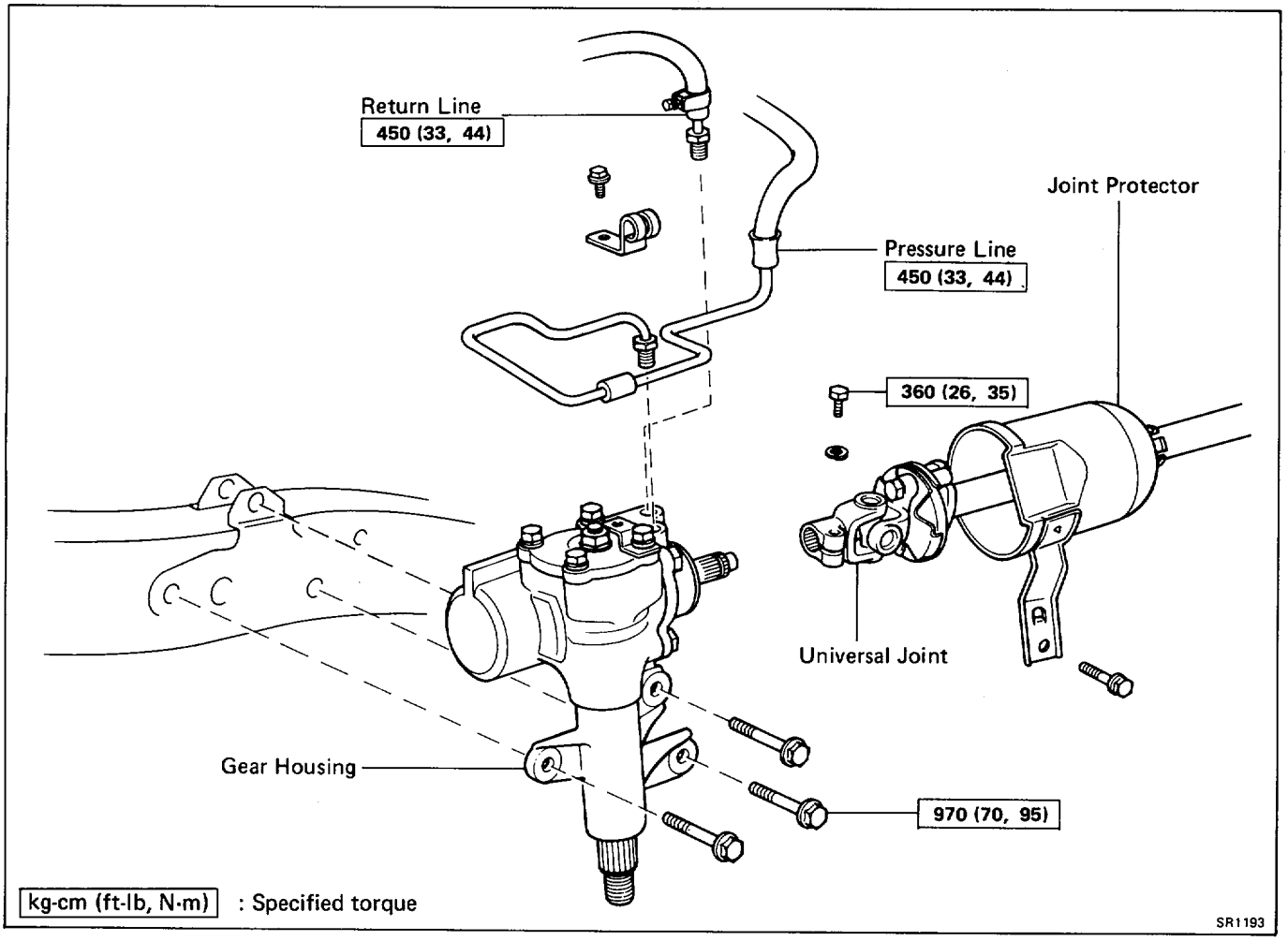
6. **CONNECT SOLENOID VALVE CONNECTOR (w/ PPS)**

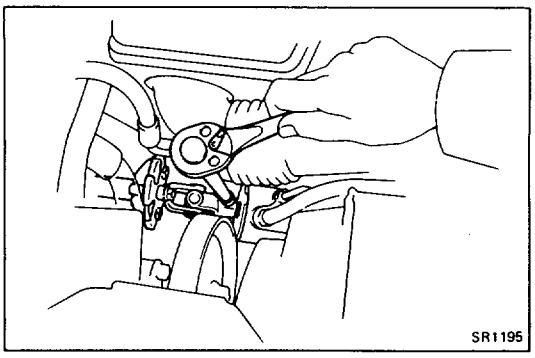
7. **FILL RESERVOIR TANK WITH FLUID**
   Fluid: ATF DEXRON® or DEXRON® II

8. **BLEED SYSTEM AND PERFORM PRESSURE CHECK**
   (See page SR-53)

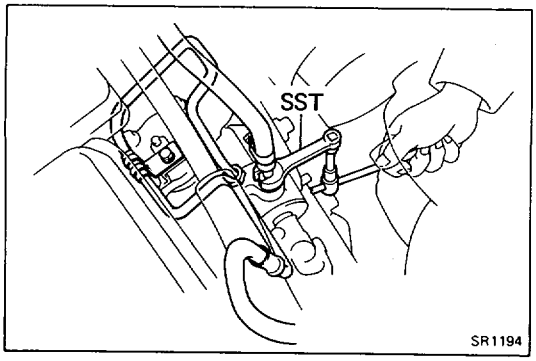
Gear Housing (4WD)

REMOVAL OF GEAR HOUSING

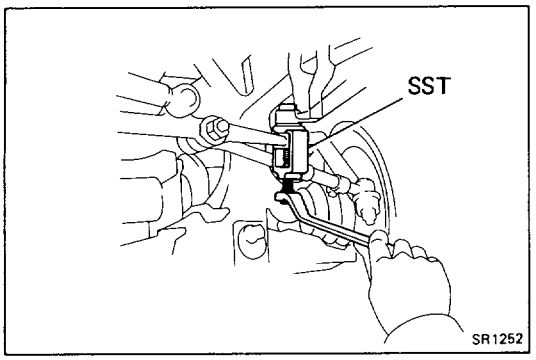




1. **REMOVE JOINT PROTECTOR SET BOLT**
2. **DISCONNECT UNIVERSAL JOINT**
   (a) Place matchmarks on the universal joint and worm shaft.
   (b) Remove the two universal joint bolts.
   (c) Disconnect the universal joint from the worm shaft.



3. **DISCONNECT RETURN LINE AND PRESSURE LINE**
   (a) Remove the pressure line clamp bolts.
   (b) Using SST, disconnect the pressure and return lines.
   SST 09631-22020



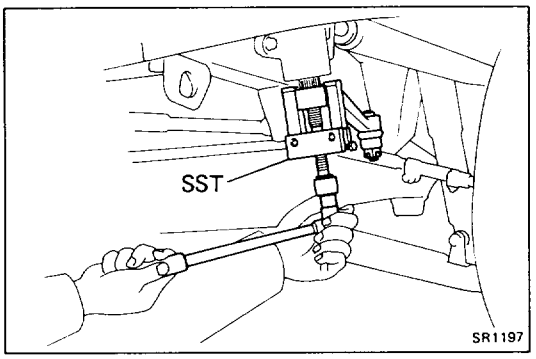
4. DISCONNECT PITMAN ARM FROM RELAY ROD

(a) Remove the cotter pin.

(b) Remove the set nut.

(c) Using SST, disconnect the pitman arm from the relay rod.

SST 09611-22012

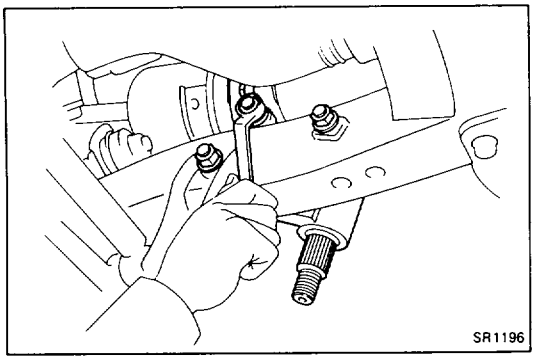


5. DISCONNECT PITMAN ARM FROM GEAR HOUSING

(a) Remove the pitman arm set nut.

(b) Using SST, disconnect the pitman arm from the gear housing.

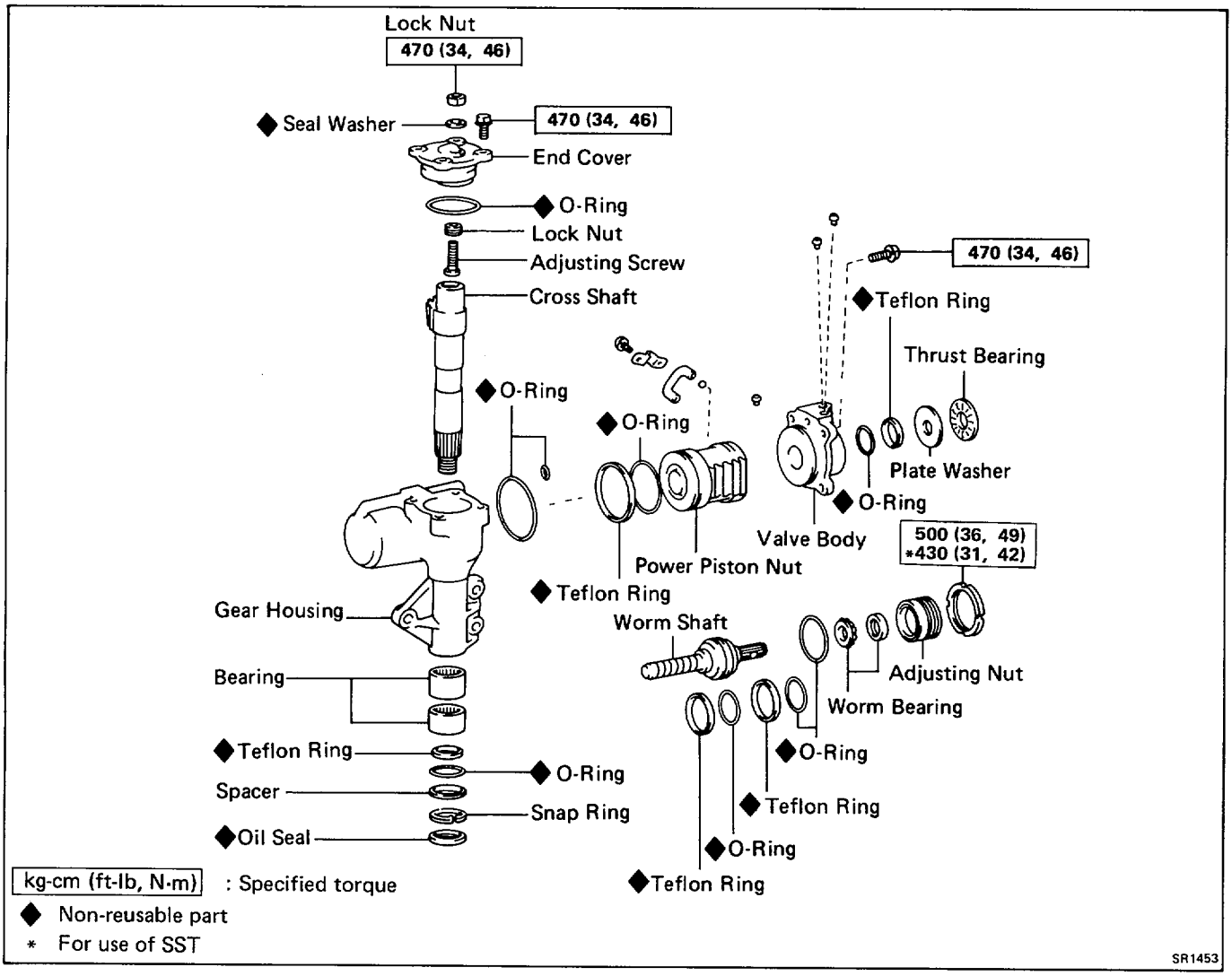
SST 09628-62011

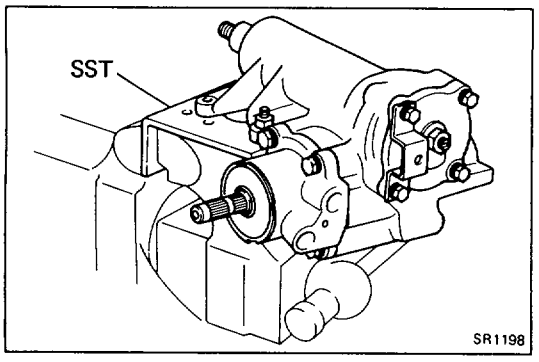


6. REMOVE GEAR HOUSING

Remove the three bolts and the gear housing.

COMPONENTS



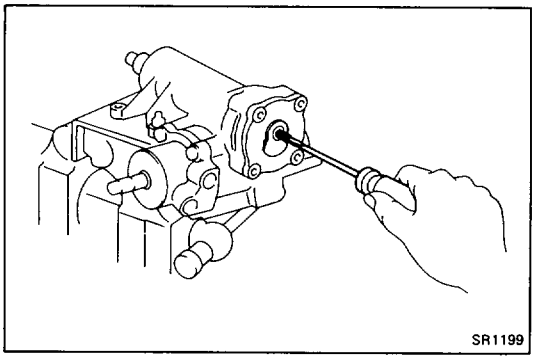


DISASSEMBLY OF GEAR HOUSING

1. MOUNT GEAR HOUSING IN VISE

Mount the gear housing on SST and clamp SST in vise.

SST 09630-00011 (09631-00140)

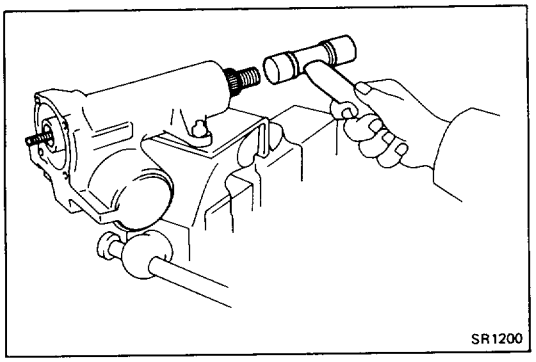


2. REMOVE END COVER

(a) Remove the adjusting screw lock nut.

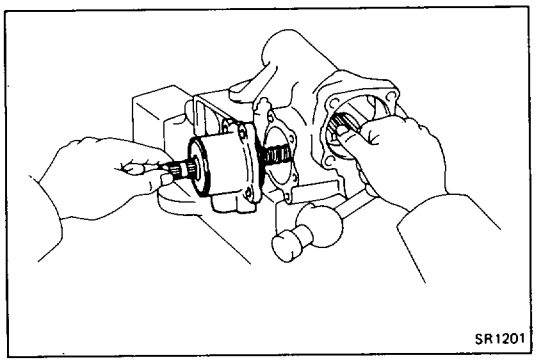
(b) Remove the four bolts.

(c) Screw in the adjusting screw until the cover is removed.



3. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.



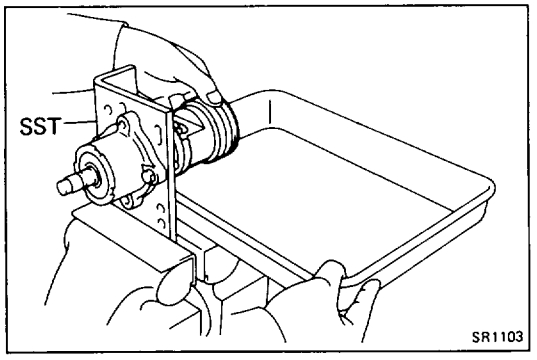
4. REMOVE WORM GEAR VALVE BODY ASSEMBLY

(a) Remove the four cap screws from the housing.

(b) Hold the power piston nut with your thumb so it cannot move, and turn the worm shaft clock wise. Then, withdraw the valve body and power piston assembly.

CAUTION: Ensure that the power piston nut does not come off the worm shaft.

(c) Remove the O-ring.



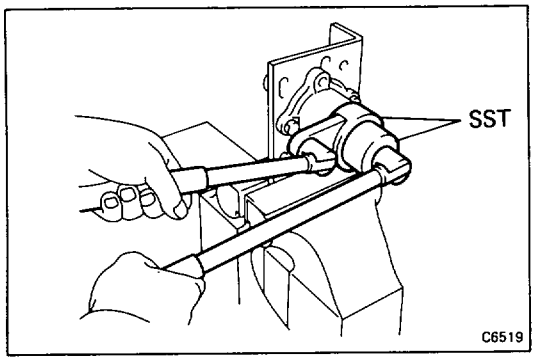
5. REMOVE POWER PISTON NUT

(a) Mount the valve body on SST and clamp SST in vise.

SST 09630-00011 (09631-00140)

(b) Pull out the power piston nut.

CAUTION: Do not lose the ball.



6. REMOVE LOCK NUT

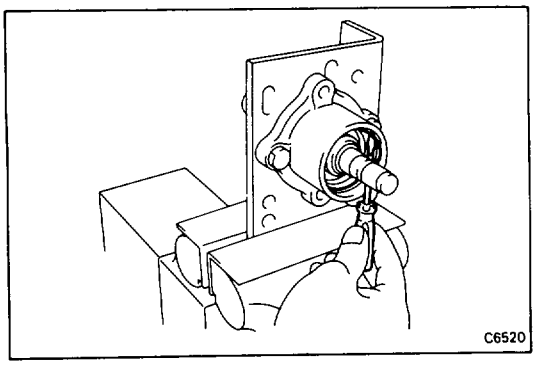
(a) Using SST, hold the adjusting screw and remove the lock nut with SST.

SST 09630-00011 (09631-00030, 09631-00040)

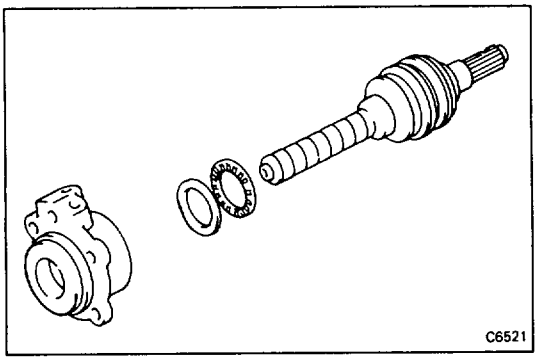
(b) Using SST, remove the adjust screw.

SST 09630-00011 (09631-00030)

(c) Remove the bearing.

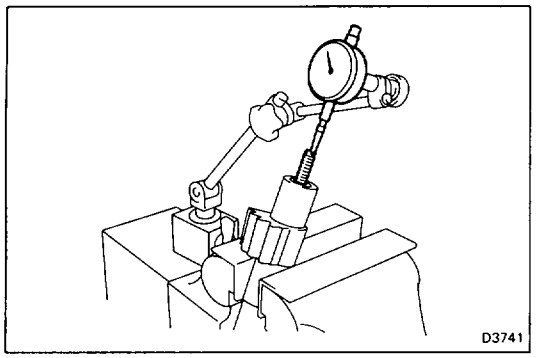


7. REMOVE O-RING



8. REMOVE FOLLOWING PARTS:

(a) Worm shaft
(b) Thrust bearing
(c) Plate washer
(d) Teflon ring
(e) O-ring



INSPECTION AND REPAIR OF STEERING GEAR HOUSING

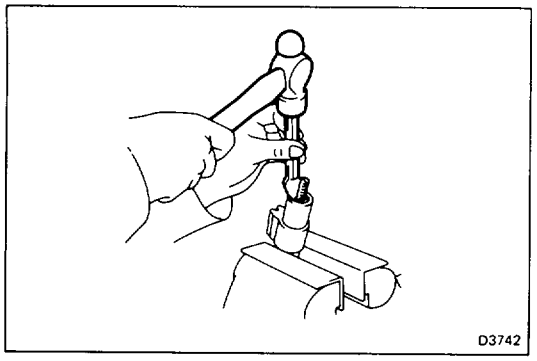
1. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Clamp the cross shaft in a vise.

(b) Using a dial indicator, measure the thrust clearance.

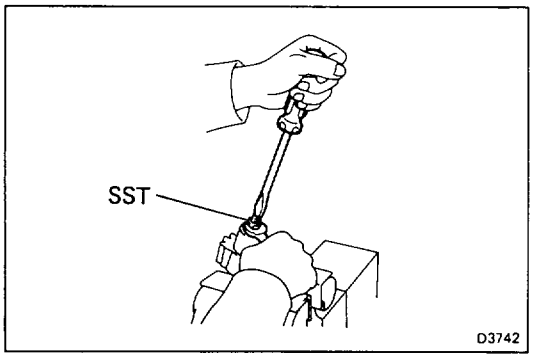
Thrust clearance: 0.03 — 0.05 mm (0.0012 — 0.0020 in.)

If thrust clearance is not correct, adjust the thrust clearance.



2. IF NECESSARY, ADJUST THRUST CLEARANCE

(a) Using a chisel and hammer, remove the lock nut stake.

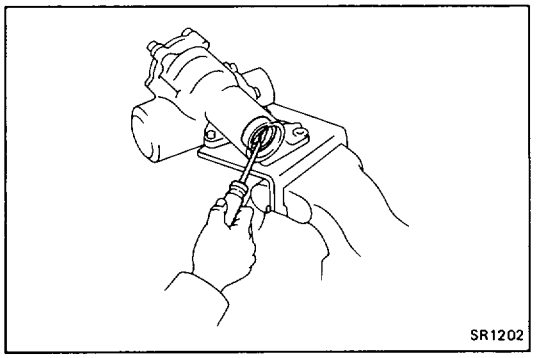


(b) Using SST, loosen the lock nut.

SST 09630-00011 (09631-00050)

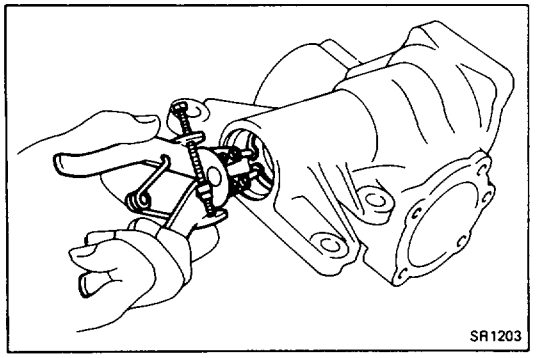
(c) Adjust the adjusting screw for correct thrust clearance and tighten the lock nut.

(d) Stake the lock nut.



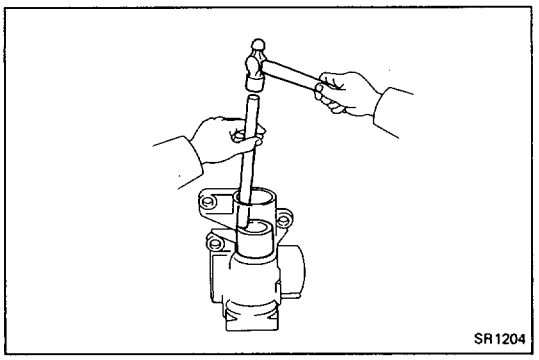
3. REPLACE NEEDLE ROLLER BEARING

(a) Using a screwdriver, pry out the oil seal.

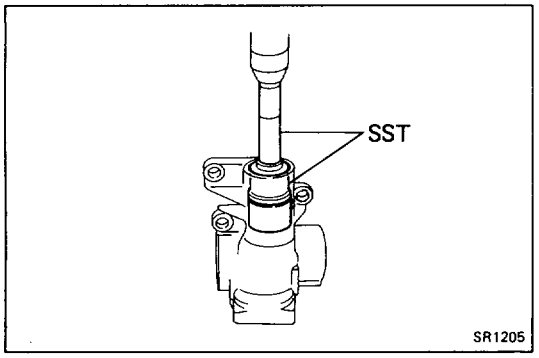


(b) Using snap ring pliers, remove the snap ring.

(c) Remove the metal spacer, teflon ring and O-ring.


SR1204

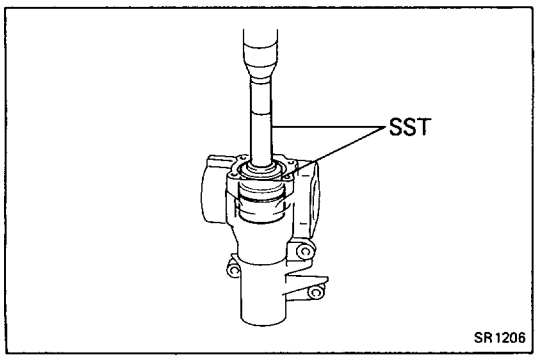
(d) Using a brass bar and hammer, drive out the upper bearing.



SR1205

(e) Using SST, press out the lower bearing.

SST 09630-00011 (09631-00020, 09631-00090)

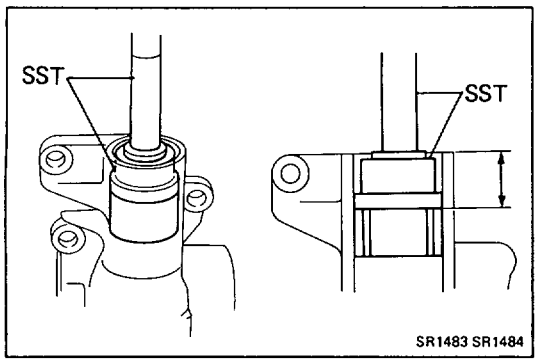


SR1206

(f) Using SST, press in the upper bearing.

SST 09630-00011 (09631-00020, 09631-00090)

NOTE: The bearing top end should be install so that it aligns with the housing end surface.

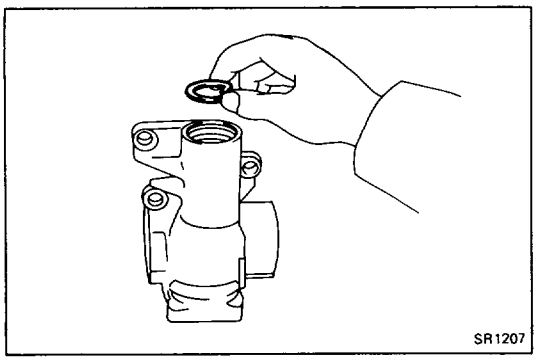


SR1483 SR1484

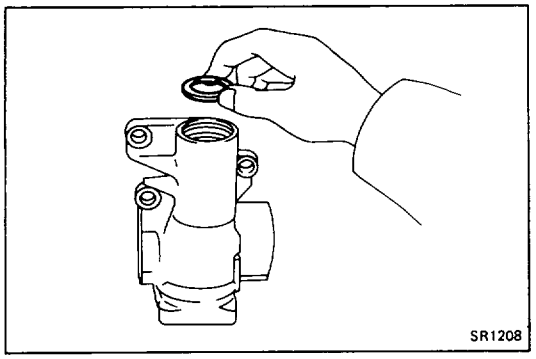
(g) Using SST, install the bearing so that it is positioned 23.1 mm (0.909 in.) away from the housing inner end surface.

SST 09630-00011 (09631-00020, 09631-00090)

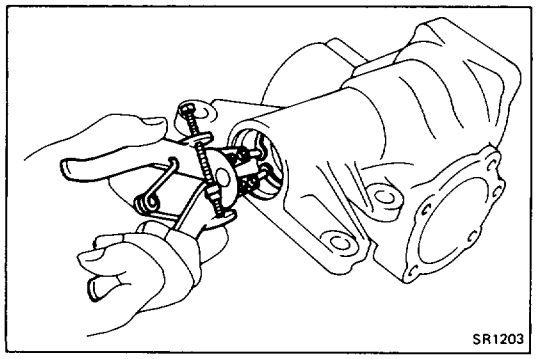
(h) Install a new O-ring.


SR1207

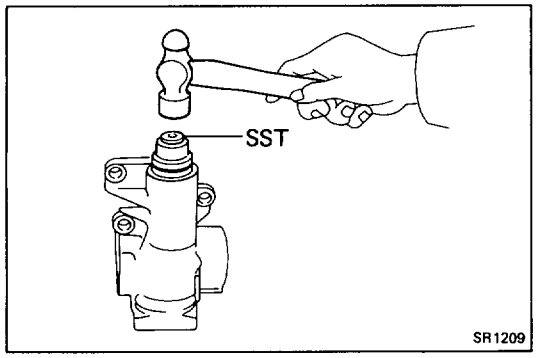
(i) Form the teflon ring into a heart shape and install it with your finger.



(j) Install the metal spacer.



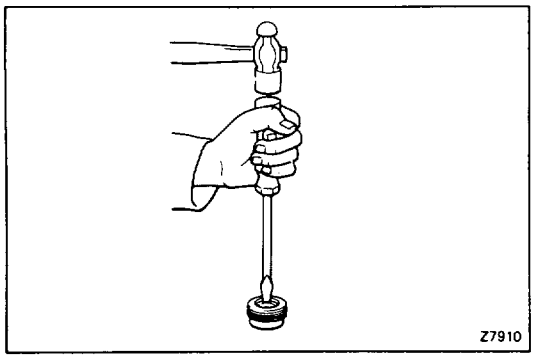
(k) Using snap ring pliers, install the snap ring.



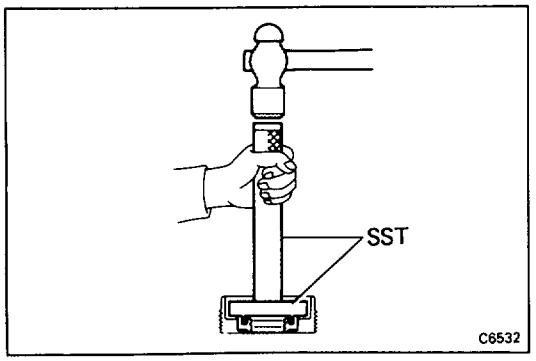
(l) Using SST, drive in a new oil seal.

SST 09630-00011 (09631-00090, 09631-00100)

4. IF NECESSARY, REPLACE ADJUSTING SCREW OIL SEAL



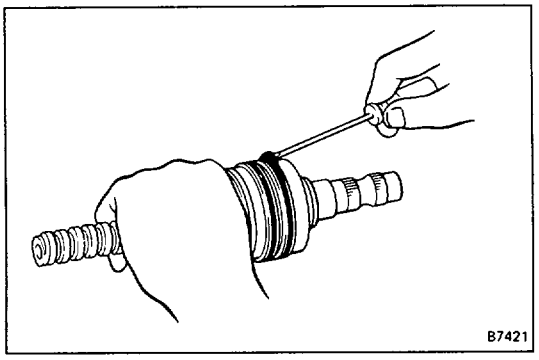
(a) Using a screwdriver, drive out the oil seal.



(b) Using SST, install a new oil seal.

SST 09630-00011 (09631-00020, 09631-00080)

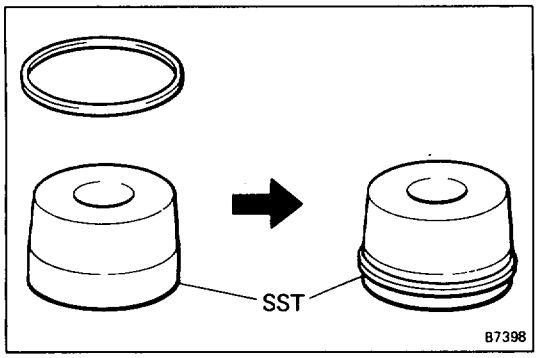
(c) Apply MP grease to the oil seal lip.



5. **IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING**

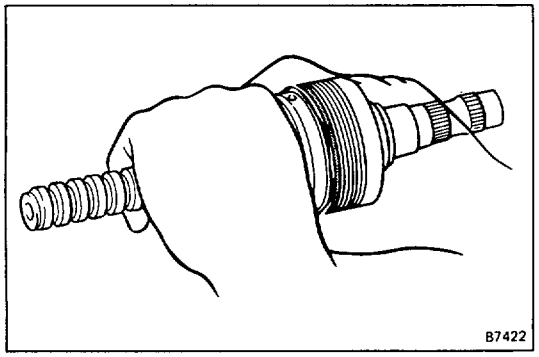
(a) Using a screwdriver, remove the two teflon rings.

CAUTION: Be careful not to damage the control valve.



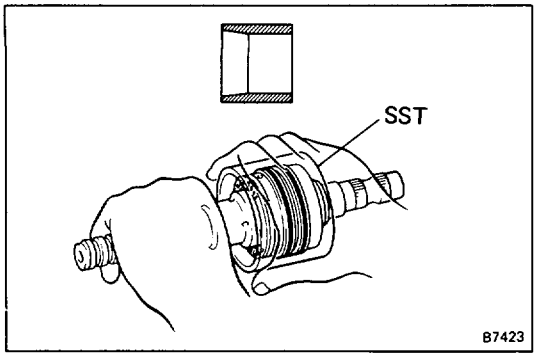
(b) Install the teflon ring to SST and expand it.

SST 09630-00011 (09631-00150)



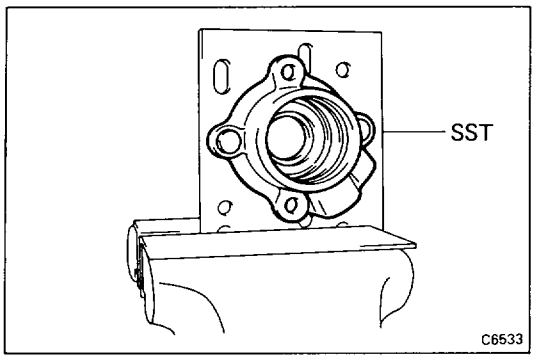
(c) Install the expanded teflon ring to the control valve and snug down it by hand.

CAUTION: Be careful not to damage the teflon rings.



(d) Coat the teflon rings with power steering fluid and snug down it with SST.

SST 09630-00011 (09631-00160)



ASSEMBLY OF GEAR HOUSING

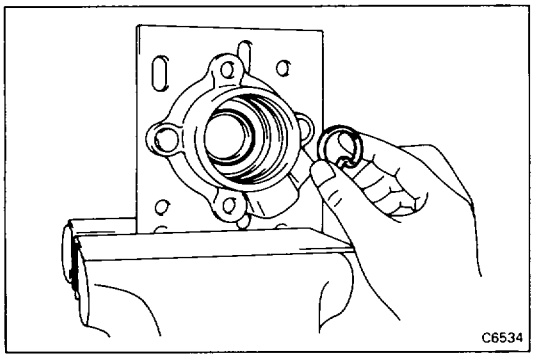
(See page SR-79)

1. **COAT ALL PARTS WITH POWER STEERING FLUID**

2. **MOUNT VALVE BODY IN VISE**

   Mount the valve body on SST and clamp SST in vise.

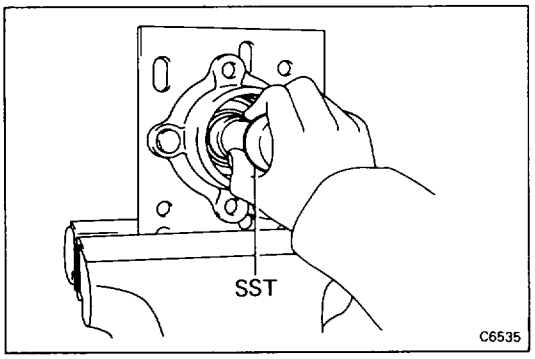
   SST 09630-00011 (09631-00140)



3. **INSTALL O-RING AND TEFLON RING**

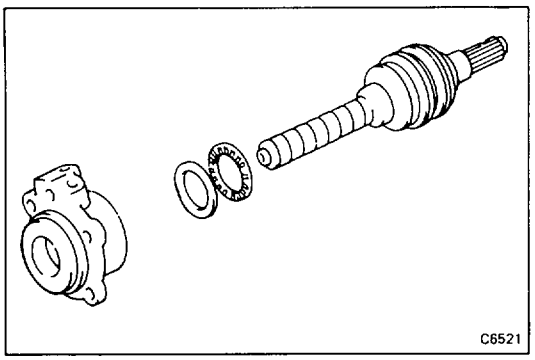
   (a) Install a new O-ring.

   (b) Form the teflon ring into a heart shape and install it with your finger.



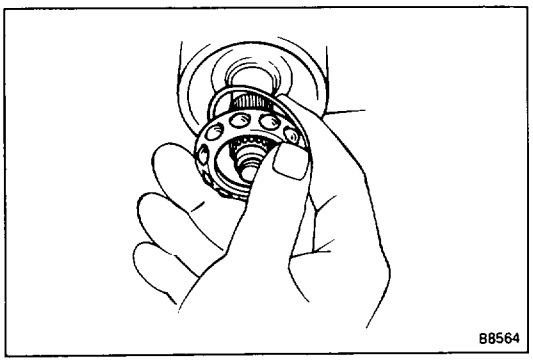
   (c) Using SST, form the teflon ring.

   SST 09630-00011 (09631-00120)

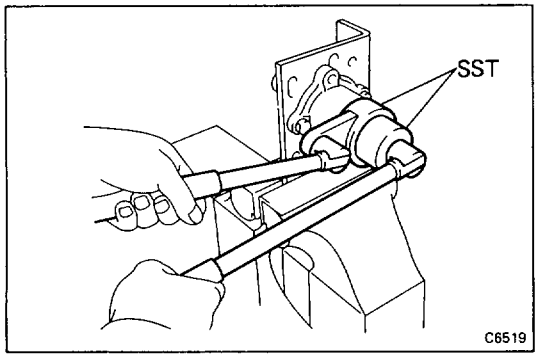


4. **INSTALL WORM SHAFT**

   Install the worm shaft with the thrust bearing and the plate washer to the valve body.



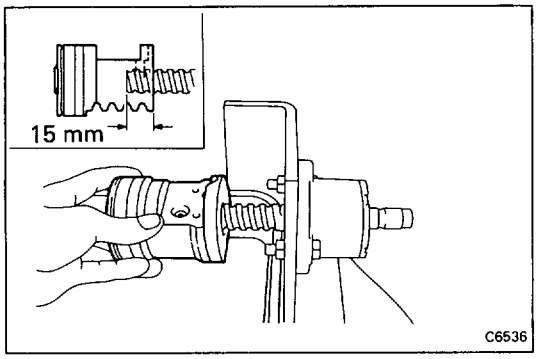
5. **INSTALL O-RING AND BEARING TO CONTROL VALVE**



6. INSTALL ADJUSTING SCREW AND LOCK NUT

Using SST, temporarily tighten the adjusting screw and lock nut.

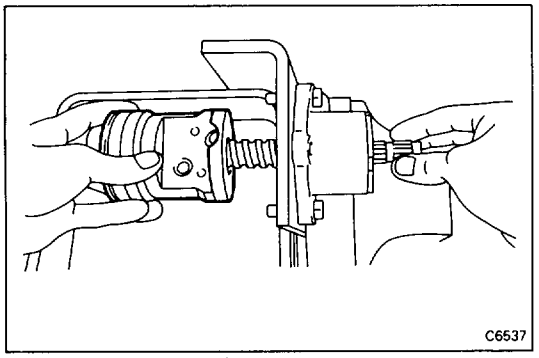
SST 09630-00011 (09631-00030, 09631-00040)



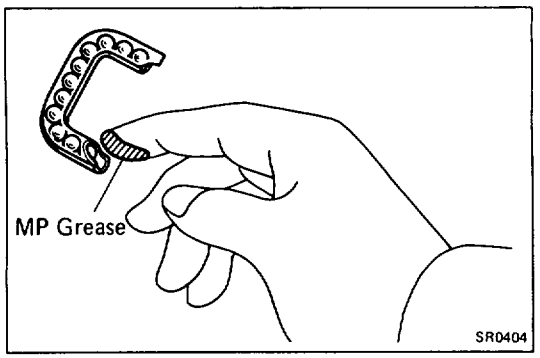
7. INSTALL POWER PISTON NUT AND BALLS

(a) Clean all parts with power steering fluid.

(b) Insert the power piston nut about 15 mm (0.59 in.) from the worm shaft end, and align the ball transfer surface with the ball hole.



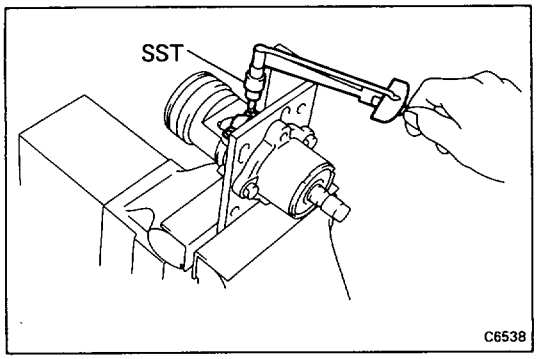
(c) Insert the balls one at a time into the holes, and turn the worm shaft a little with each insertion. Then securely insert the 33 balls into the piston.



(d) Install eleven new balls to the ball guide, and apply MP grease to the ball guide lips so the balls do not fall out.

(e) Install the ball guide to the power piston nut.

NOTE: Be careful not to damage the ball guide.



(f) Using SST, install the ball guide clamp.

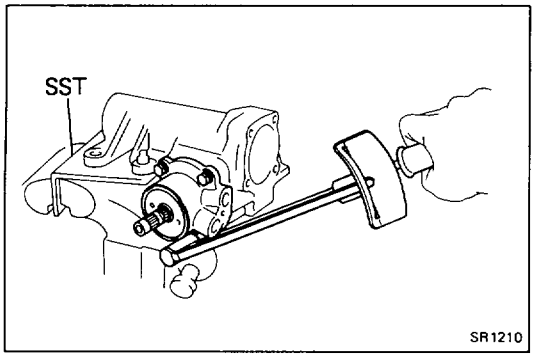
SST 09060-20010

Torque: 30 kg-cm (26 in.-lb, 2.9 N·m)

(g) Check that the power piston nut rotates smoothly.

(h) Turn the power piston nut, and insure that it is adhered to the tip surface of the valve body.

NOTE: If a ball has fallen out, there will be a gap.



8. INSTALL WORM GEAR VALVE BODY ASSEMBLY

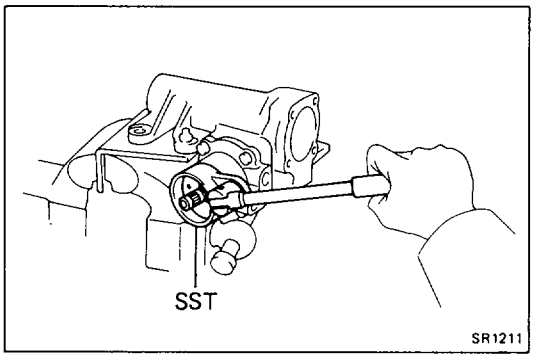
(a) Install the two O-rings to the gear housing and valve body.

(b) Mount the gear housing on SST and clamp SST in vise.

SST 09630-00011 (09631-00140)

(c) Install and torque the four bolts.

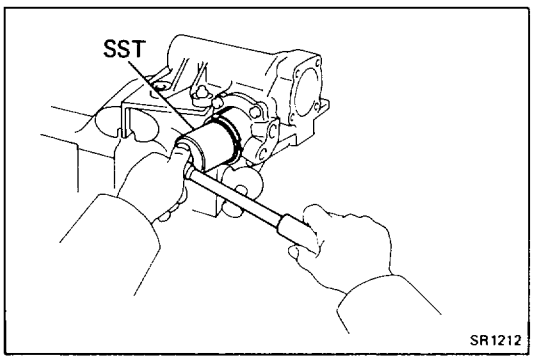
Torque: 470 kg-cm (34 ft-lb, 46 N·m)



9. ADJUST WORM BEARING PRELOAD

(a) Using SST, remove the lock nut.

SST 09630-00011 (09631-00040)

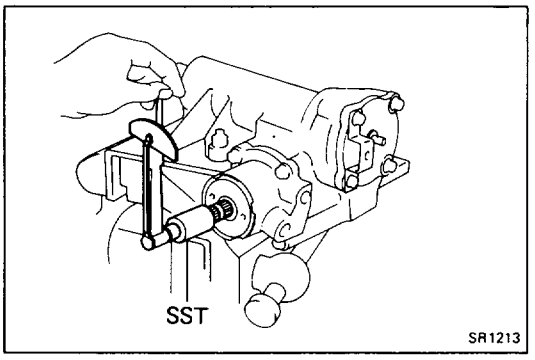


(b) Using SST, tighten the adjusting screw.

SST 09630-00011 (09631-00030)

(c) Turn the worm shaft to right and left and snug down the bearing.

(d) Slightly loosen the adjusting screw.



(e) Using SST, slightly tighten the adjusting screw until the preload is correct.

SST 09616-00010
09630-00011 (09631-00030)

(f) Using SST and torque meter, check the preload of the bearing.

SST 09616-00010

Preload: 4.0 — 6.5 kg-cm (3.5 — 5.6 in.-lb, 0.4 — 0.6 N·m)

NOTE: Hold the power piston nut to prevent it from turning.

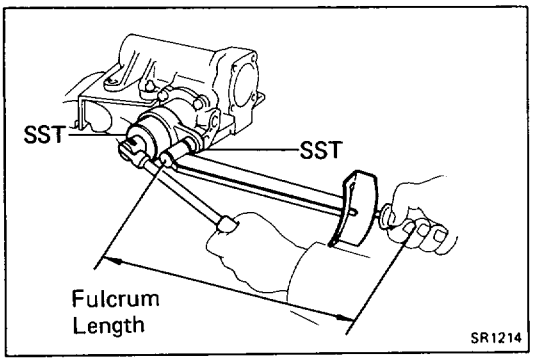
(g) Using SST, torque the lock nut while holding the adjusting nut with SST.

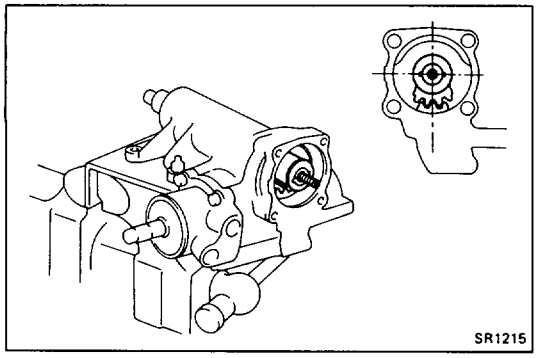
SST 09630-00011 (09631-00030, 09631-00040)

Torque: 430 kg-cm (31 ft-lb, 42 N·m)

NOTE: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

(h) Recheck the preload.





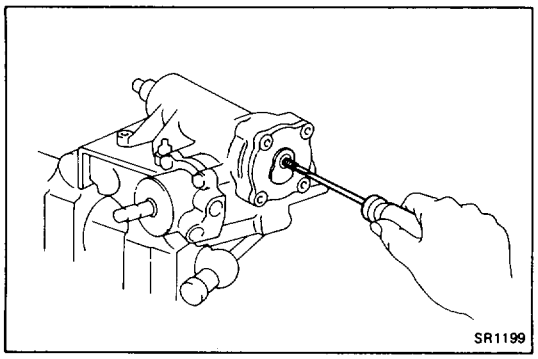
10. INSTALL CROSS SHAFT AND END COVER

(a) Install a new O-ring on the end cover.

(b) Wrap the tape to the serration of the cross shaft.

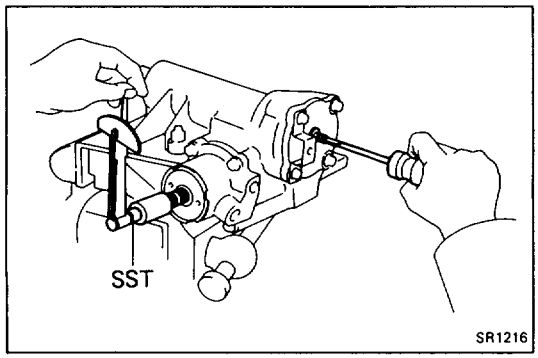
(c) Set the worm gear at the center of the gear housing.

(d) Insert and push the cross shaft into the gear housing so that the center teeth mesh.



(e) Fully loosen the adjusting screw and install the end cover with four bolts.

Torque: 470 kg-cm (34 ft-lb, 46 N·m)



11. ADJUST TOTAL PRELOAD

(a) Turn the worm shaft to full lock in both directions and determine the exact center.

(b) Install SST with a torque meter on the center worm shaft.

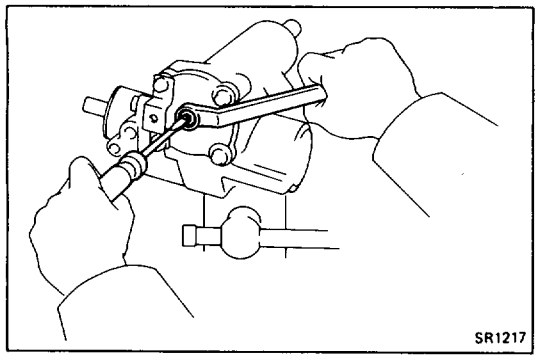
SST 09616-00010

(c) Turn the adjusting screw while measuring the preload until it is correct.

Total preload:

Add worm bearing preload

2 — 3 kg-cm (1.7 — 2.6 in.-lb, 0.2 — 0.3 N·m)

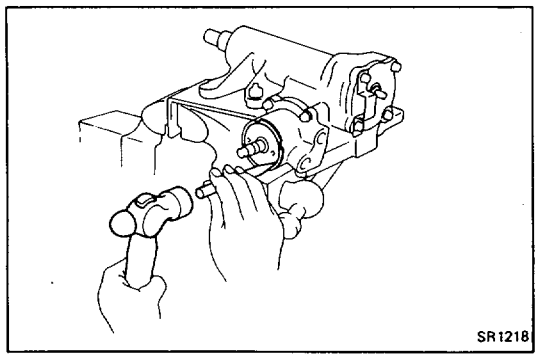


(d) Install a new washer.

(e) Install and torque the lock nut while holding the adjusting screw.

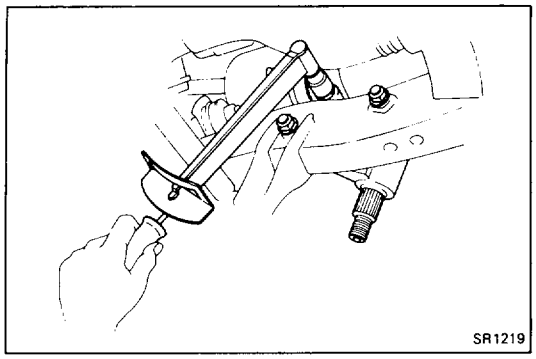
Torque: 470 kg-cm (34 ft-lb, 46 N·m)

(f) Recheck the total preload.



12. STAKE LOCK NUT

Using a punch and hammer, stake the lock nut.



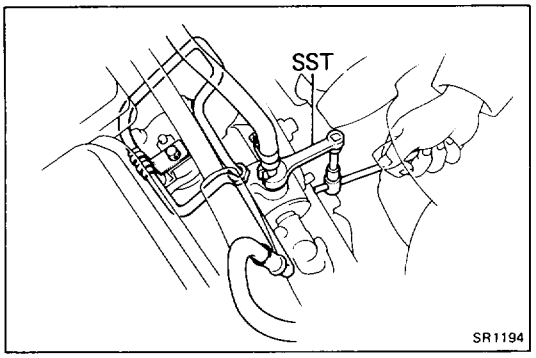
INSTALLATION OF GEAR HOUSING

(See page SR-77)

1. **INSTALL GEAR HOUSING**

   Install the gear housing with the three bolts and nuts.

   Torque: 970 kg-cm (70 ft-lb, 95 N·m)



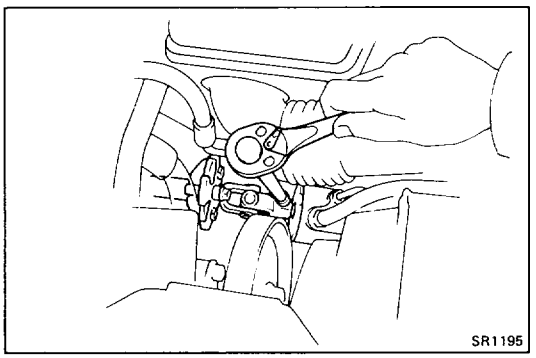
2. **CONNECT PRESSURE AND RETURN LINE**

   (a) Using SST, install and torque the union nut.

   SST 09631-22020

   Torque: 450 kg-cm (33 ft-lb, 44 N·m)

   (b) Install the pressure line clamp bolt.



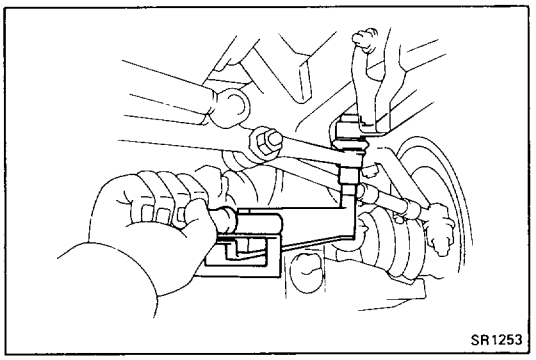
3. **CONNECT INTERMEDIATE SHAFT**

   (a) Align matchmarks on the worm shaft and universal joint, and connect them.

   (b) Install and torque the two bolts.

   Torque: 360 kg-cm (26 ft-lb, 35 N·m)

   (c) Install joint protector set bolt.

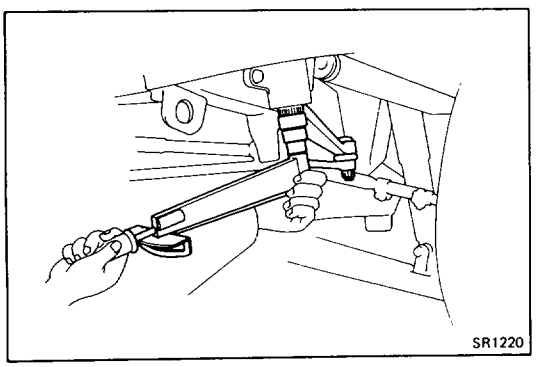


4. **CONNECT PITMAN ARM TO RELAY ROD**

   (a) Connect the pitman arm to the relay rod and install the set nut.

   Torque: 920 kg-cm (67 ft-lb, 90 N·m)

   (b) Install a new cotter pin.



5. **CONNECT PITMAN ARM**

   (a) Align the marks on the pitman arm and cross shaft.

   (b) Install and torque the pitman arm set nut.

   Torque: 1,800 kg-cm (130 ft-lb, 177 N·m)

6. **FILL RESERVOIR WITH FLUID**

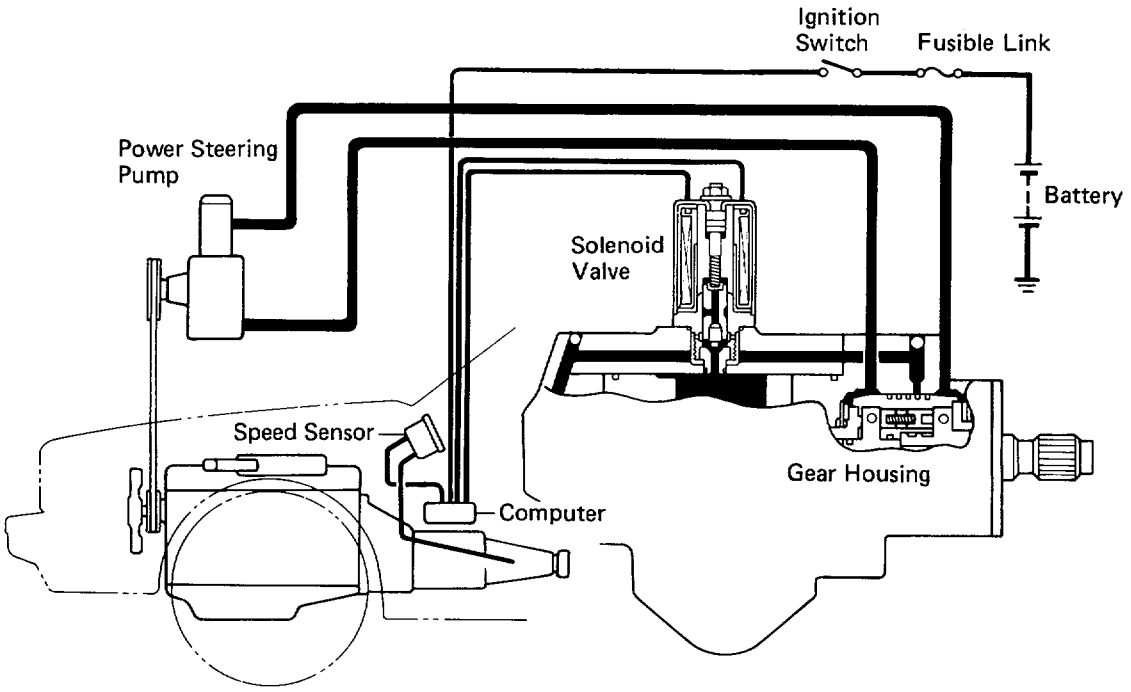
   Fluid: ATF DEXRON® or DEXRON® II

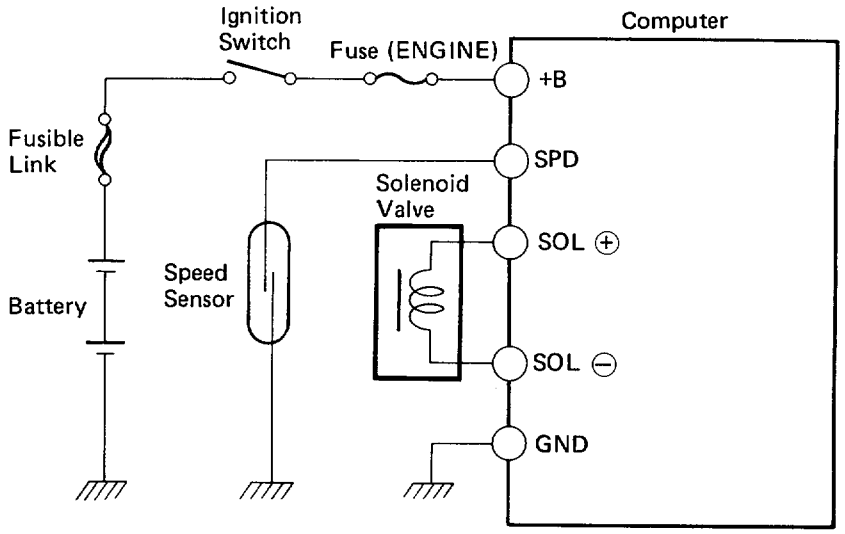
7. **BLEED SYSTEM AND PERFORM PRESSURE CHECK**

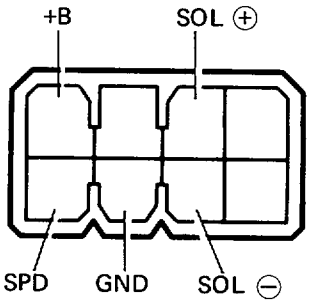
(See page SR-53)

Progressive Power Steering (PPS)

DISCRIPTION AND ELECTRONIC CIRCUIT







88577
88578
G-7-2

TROUBLESHOOTING

Trouble

- Hard steering at idle or low-speed driving.
- Steering too sensitive during high-speed driving.

Preliminary Check

- Check tire pressure.
- Check lubrication of suspension and steering linkage.
- Check front wheel alignment.
- Check steering system joint and suspension arm ball joint.
- Check for bent steering column.
- Check that all connectors are secure.
- Check PS pump fluid pressure. (See page SR-53)

Turn ignition switch on.

Is ENGINE fuse normal?

No

Replace fuse.
Is operation normal?

No

Short circuit in wire harness between fuse and computer terminal +B.

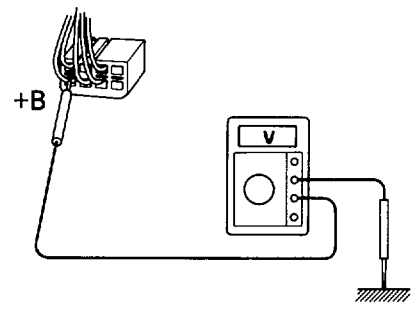
Yes

Yes

Fuse faulty.

Yes

Disconnect the computer connector.



Check 1.
Check that there is the battery voltage between the computer terminal +B and body ground.

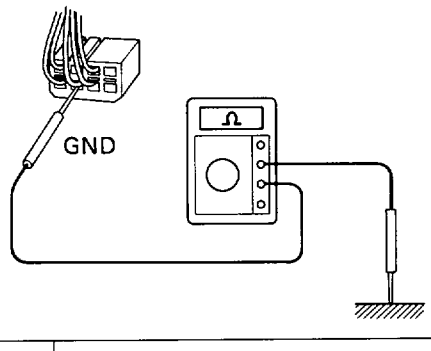
Yes

No

Open circuit in wire harness between the fuse and computer terminal +B.

CONTINUED ON NEXT PAGE

Yes CONTINUED FROM PREVIOUS PAGE

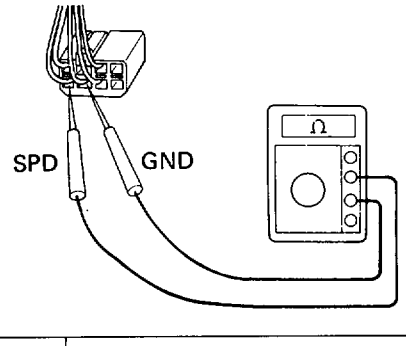


Check 2.
Check that there is continuity between the computer terminal GND and body ground.

Yes

No

- Open circuit in wire harness between the computer terminal GND and body ground.
- Body ground faulty.

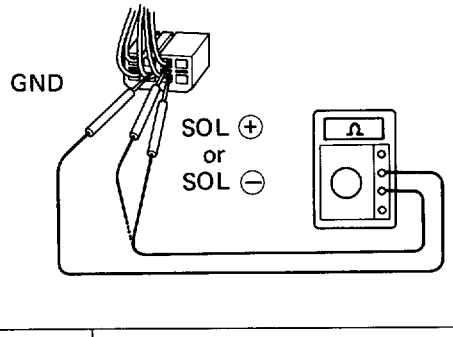


Check 3.
(a) Jack up the vehicle.
(b) Connect an ohmmeter between the computer connector terminals SPD and GND.
(c) Spin the rear wheel and check the resistance 0 → ∞ → 0 Ω.

Yes

No

- Open or short circuit in wire harness between the computer terminal SPD and speed sensor.
- Speed sensor faulty (See page BE-73).



Check 4.
Check that there is no continuity between terminals SOL ⊕ or SOL ⊖ and GND.

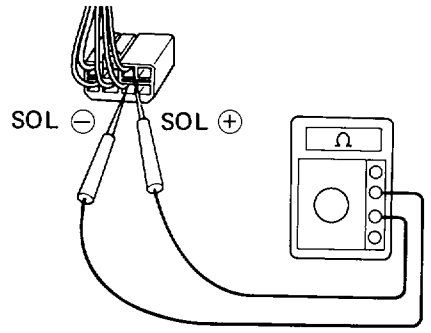
Yes

No

- Short circuit in wire harness between the terminals SOL ⊕ and SOL ⊖.
- Solenoid valve faulty.

CONTINUED ON NEXT PAGE

Yes CONTINUED FROM PREVIOUS PAGE



Check 5.
Measure the resistance between terminals SOL ⊕ and SOL ⊖.
Standard resistance: 7.4 – 8.0 Ω

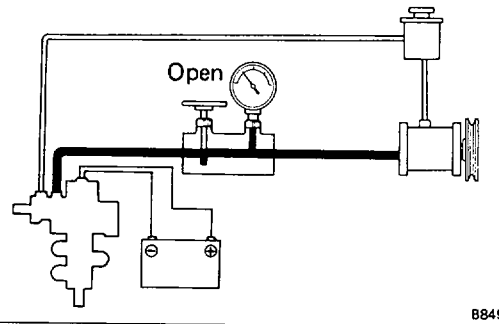
Yes

No

- Open circuit in wire harness between the terminals SOL ⊕ and SOL ⊖.
- Solenoid valve faulty.

Check 6.
Inspect computer.

Bad → Replace computer.



Check 7.
(a) Turn the steering wheel full lock position.
(b) Apply battery voltage between terminals SOL ⊕ and SOL ⊖ and turn the solenoid ON and OFF. Is there a change in gear housing fluid pressure when the solenoid is ON or OFF ?

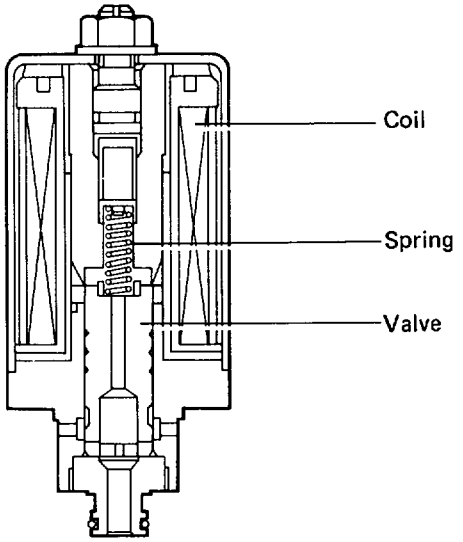
Yes

Steering gear housing faulty.

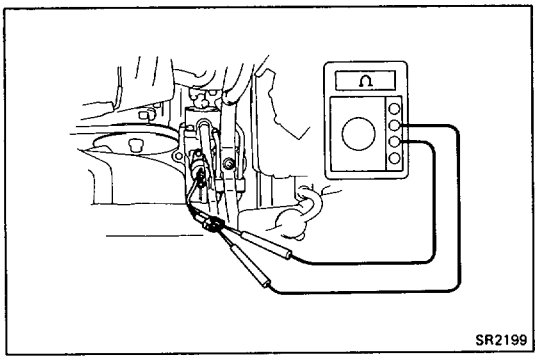
No

- By-pass or return line clogged.
- Fluid level low.
- Solenoid valve faulty.

ELECTRONIC CONTROL SYSTEM
Solenoid Valve

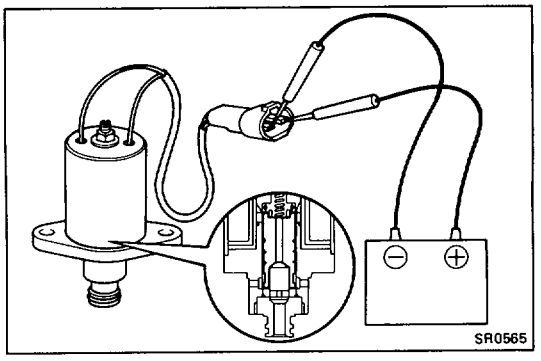


SR0564


SR2199

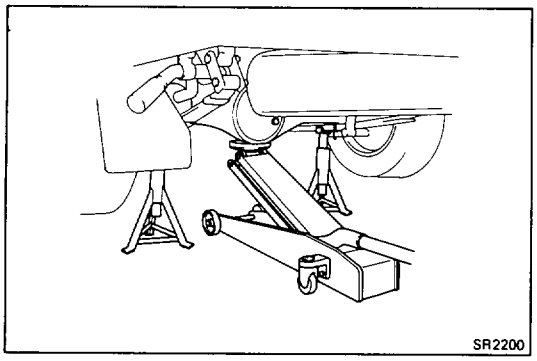
ON-VEHICLE INSPECTION

1. **DISCONNECT WIRING CONNECTOR**
2. **MEASURE RESISTANCE**
   Measure the resistance between SOL ⊕ and SOL ⊖.
   Resistance: 7.4 — 8.0 Ω
3. **CONNECT WIRING CONNECTOR**


SR0565

CHECK SOLENOID OPERATION

1. **REMOVE SOLENOID VALVE FROM GEAR HOUSING**
2. **CHECK SOLENOID OPERATION**
   (a) Connect the battery positive terminal to the solenoid terminal SOL ⊕.
   (b) Connect the battery negative terminal to the solenoid terminal SOL ⊖.
   Confirm that the needle valve has withdrawn about 2 mm (0.079 in.).
   If not, replace the solenoid valve.
3. **INSTALL SOLENOID VALVE TO GEAR HOUSING**
4. **BLEEDING OF POWER STEERING LINE**


SR2200

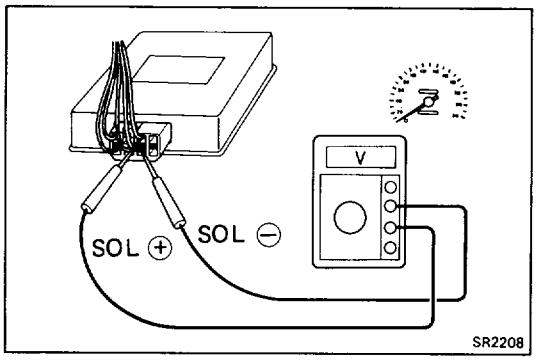
Computer

INSPECTION OF COMPUTER

1. **JACK UP VEHICLE AND SUPPORT IT ON STANDS**

2. **REMOVE GLOVE BOX**

   NOTE: Do not disconnect the computer connector.

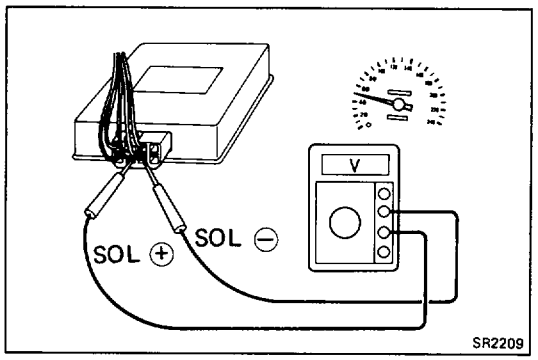


SR2208

3. **START ENGINE**

4. **MEASURE VOLTAGE OF COMPUTER**

   (a) Using a voltmeter, check that there is no voltage between computer terminals SOL ⊕ and SOL ⊖ while the engine is idling.



SR2209

   (b) Place the transmission in gear and while traveling at about 50 km/h (31 mph), measure the voltage between the computer terminals SOL ⊕ and SOL ⊖.

   Standard voltage: 3.1 ± 1V

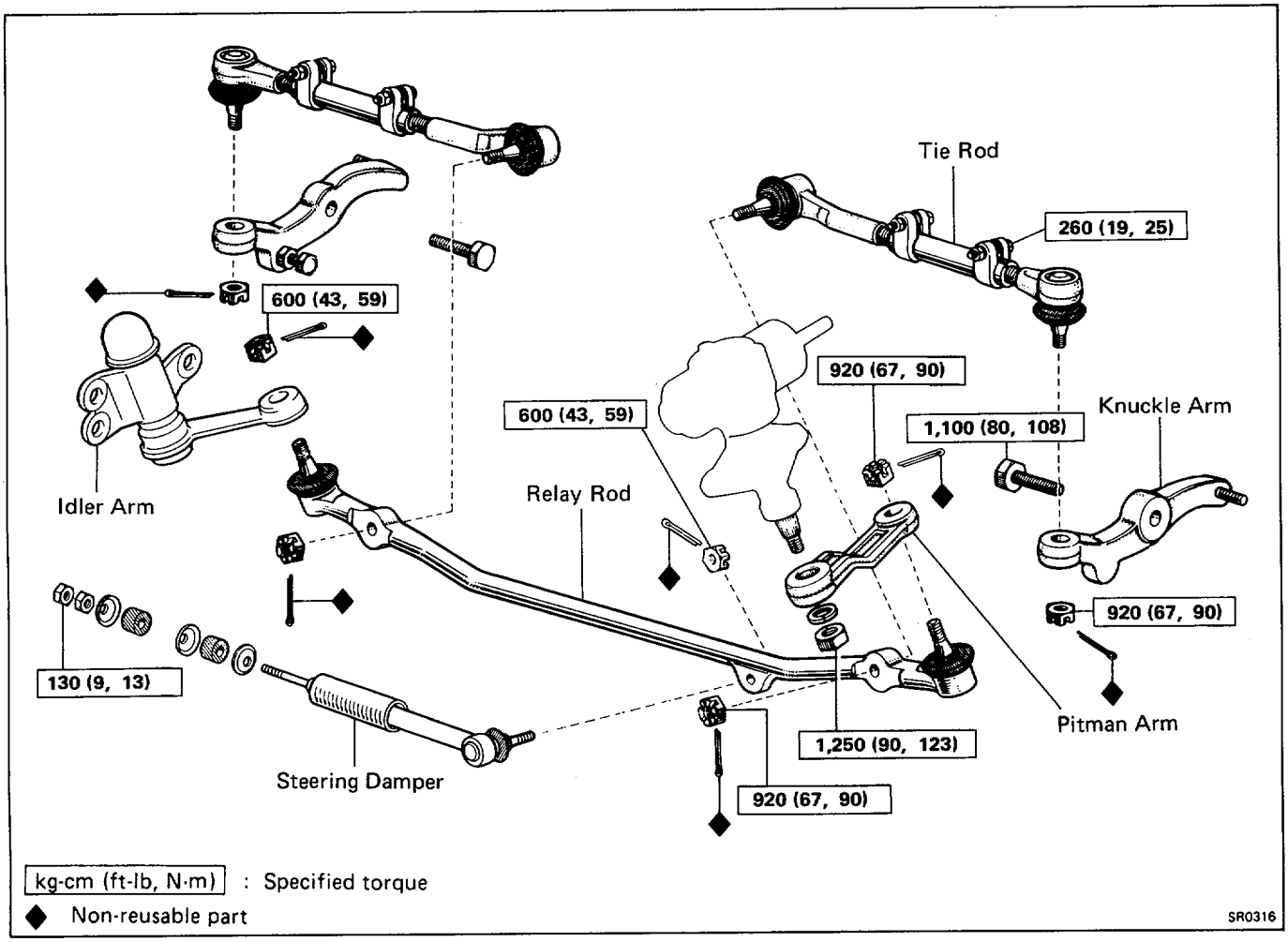
   If no voltage, try another computer.

6. **INSTALL GLOVE BOX**

7. **LOWER VEHICLE**

STEERING LINKAGE (2WD)

COMPONENTS



NOTE:

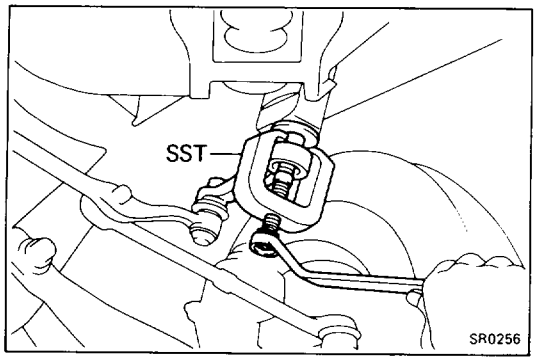
- Before connecting the ball stud to the arm or rod, remove the grease on the joint surfaces.
- After torquing the ball stud nut to specified torque, advance the nut just enough to insert the cotter pin. Secure the nut.
- After installing any of the steering linkage components, check the front wheel alignment and side slip. (See page FA-3)

Pitman Arm

REMOVAL AND INSPECTION OF PITMAN ARM

1. **REMOVE STRUT BAR**
   (See page FA-22)

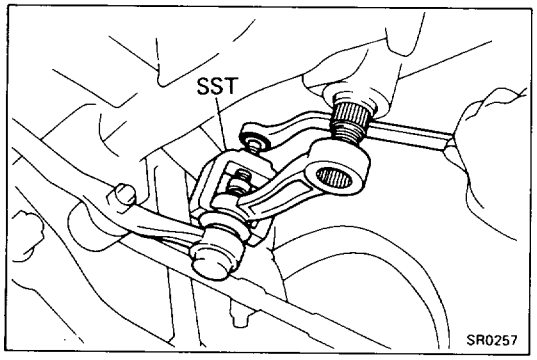
2. **LOOSEN PITMAN ARM NUT**



3. **DISCONNECT PITMAN ARM FROM SECTOR SHAFT**

Using SST, disconnect the pitman arm from the sector shaft.

SST 09610-55012

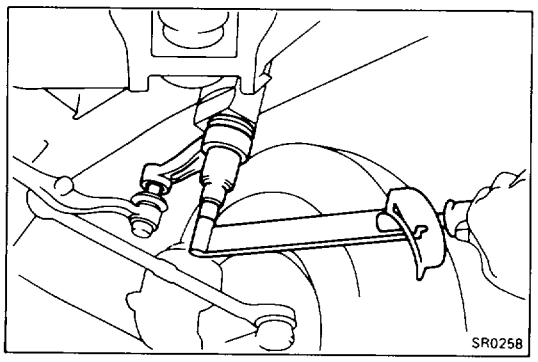


4. **DISCONNECT PITMAN ARM FROM RELAY ROD**

Using SST, disconnect the pitman arm from the relay rod.

SST 09611-22012

5. **INSPECT ARM FOR WEAR, DAMAGE OR CRACKS**



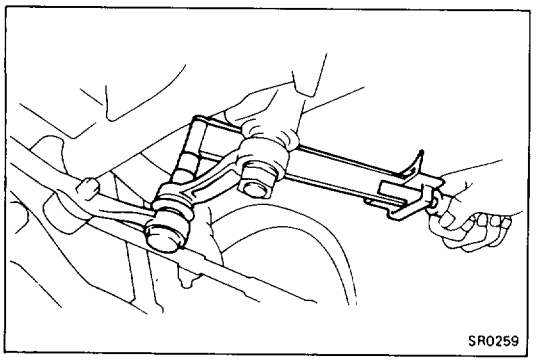
INSTALLATION OF PITMAN ARM

1. **CONNECT PITMAN ARM TO SECTOR SHAFT**

(a) Align marks on the pitman arm and the sector shaft.

(b) Torque the pitman arm nut.

Torque: 1,250 kg-cm (90 ft-lb, 123 N·m)

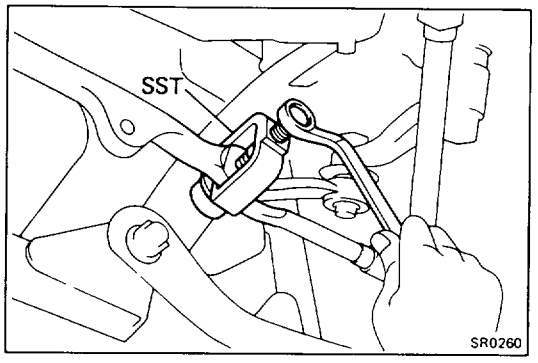


2. **CONNECT PITMAN ARM TO RELAY ROD**

Torque the mounting nut.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

3. **INSTALL STRUT BAR**
(See page FA-22)



Tie Rod

REMOVAL AND INSPECTION OF TIE ROD

(See page SR-97)

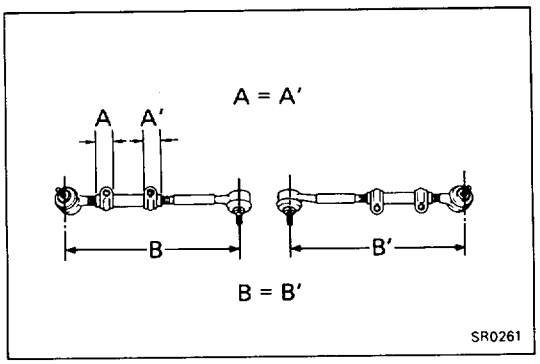
1. **DISCONNECT TIE ROD FROM RELAY ROD AND KNUCKLE ARM**

Using SST, disconnect the tie rod from the relay rod and knuckle arm.

SST 09611-22012

2. **INSPECT TIE ROD FOR WEAR, DAMAGE OR CRACKS**

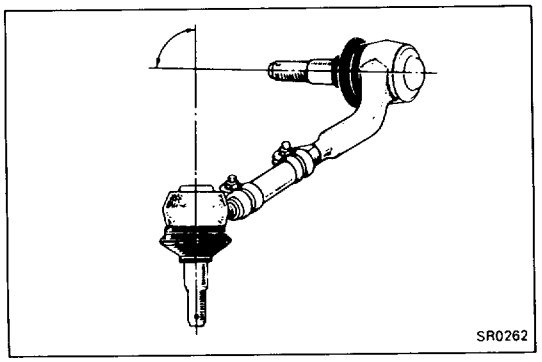
Check for cracks with flaw detecting penetrant.



INSTALLATION OF TIE ROD

1. **ASSEMBLE TIE ROD**

Screw the tie rod ends into the tie rod.
The tie rod length should be approximately 314.5 mm (12.382 in.), and the remaining length of threads on both tie rod ends should be equal.



2. **ADJUST TIE ROD END ANGLE**

(a) Turn the tie rods so they cross at about 90 degrees.

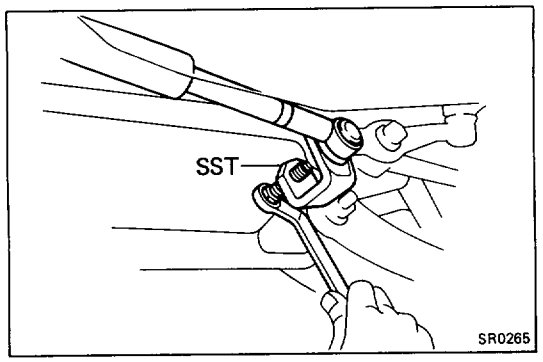
(b) Tighten the tie rod clamps to lock the tie rod ends in position.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

3. **CONNECT TIE ROD TO RELAY ROD AND KNUCKLE ARM**

Torque the mounting nuts.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)



Relay Rod

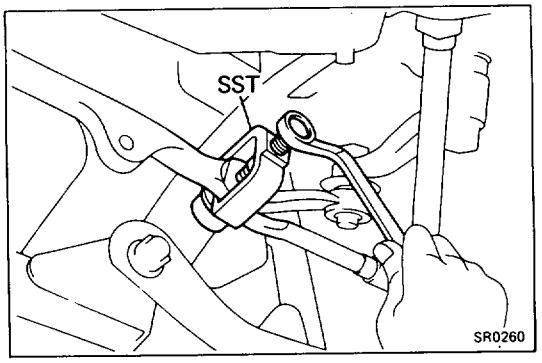
REMOVAL AND INSPECTION OF RELAY ROD

(See page SR-97)

1. **DISCONNECT STEERING DAMPER FROM RELAY ROD**

Using SST, disconnect the steering damper from the relay rod.

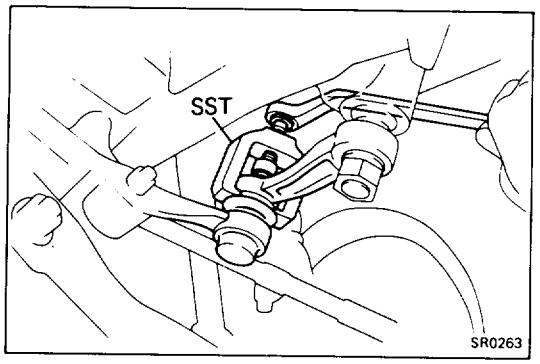
SST 09611-12010



2. **DISCONNECT TIE ROD ENDS FROM RELAY ROD**

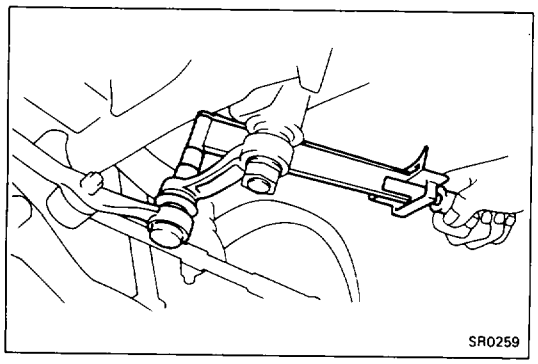
Using SST, disconnect the tie rod ends from the relay rod.

SST 09611-22012



3. **DISCONNECT RELAY ROD FROM PITMAN ARM AND IDLER ARM**
   Using SST, disconnect and remove the relay rod.
   SST 09611-22012

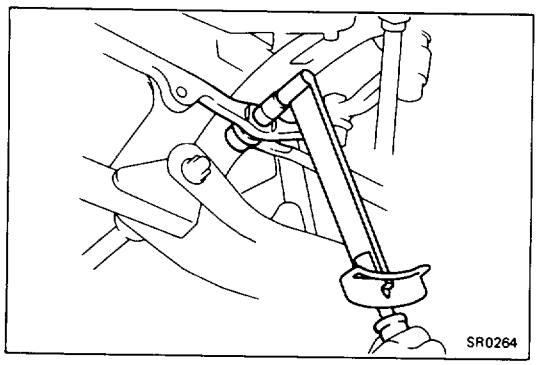
4. **INSPECT RELAY ROD FOR DAMAGE OR CRACKS**
   Check for cracks with flaw detecting penetrant.



INSTALLATION OF RELAY ROD

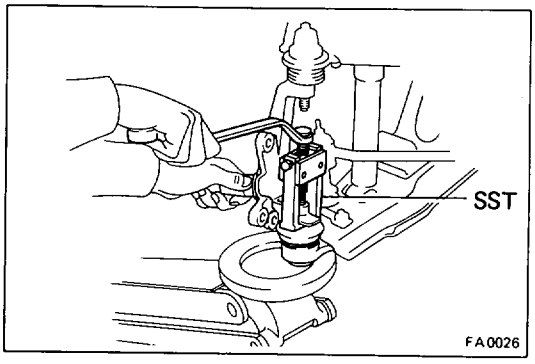
1. **CONNECT RELAY ROD TO IDLER ARM**
   Torque the mount nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)

2. **CONNECT RELAY ROD TO PITMAN ARM**
   Torque the mount nut.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)



3. **CONNECT RELAY ROD TO TIE ROD ENDS**
   Torque the mount nuts.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)

4 **CONNECT STEERING DAMPER TO RELAY ROD**
   Torque the mount nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)



Knuckle Arm

REMOVAL AND INSPECTION OF KNUCKLE ARM

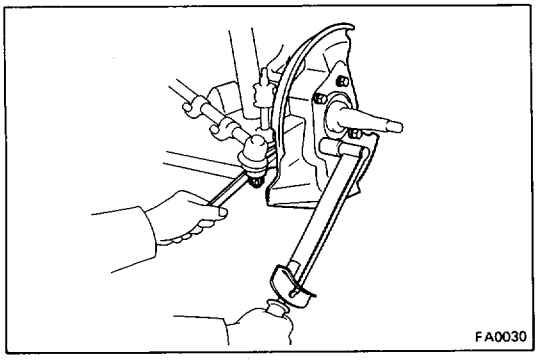
(See page SR-97)

1. **REMOVE FRONT AXLE HUB**
   (See page FA-7)

2. **DISCONNECT TIE ROD FROM KNUCKLE ARM**
   Using SST, disconnect the tie rod from the knuckle arm.
   SST 09628-62011

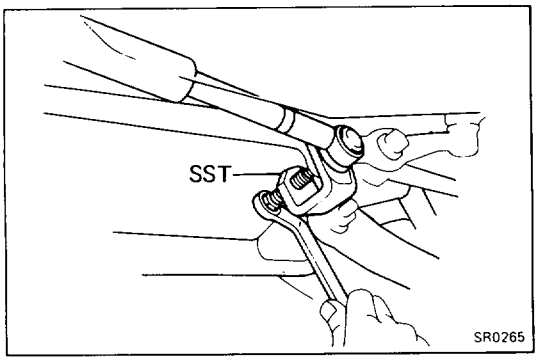
3. **REMOVE KNUCKLE ARM**

4. **INSPECT KNUCKLE ARM FOR DAMAGE OR CRACKS**
   Check for cracks with flaw detecting penetrant.



INSTALLATION OF KNUCKLE ARM

1. **INSTALL KNUCKLE ARM TO STEERING KNUCKLE**
   Torque: 1,100 kg-cm (80 ft-lb, 108 N·m)
2. **CONNECT TIE ROD TO KNUCKLE ARM**
   Torque the nuts.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)
3. **INSTALL FRONT AXLE HUB**
   (See page FA-8)

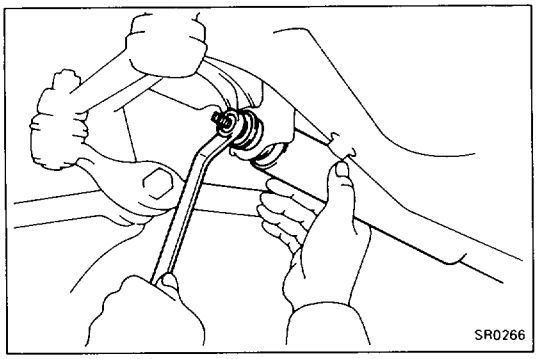


Steering Damper

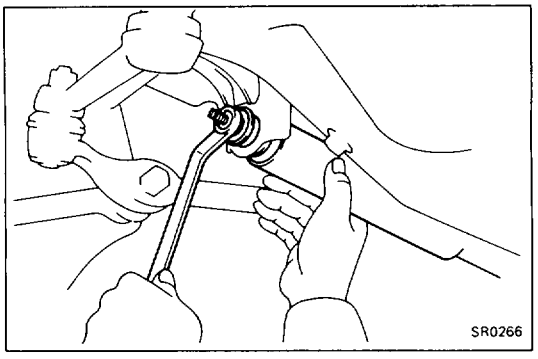
REMOVAL AND INSPECTION OF STEERING DAMPER

(See page SR-97)

1. **DISCONNECT STEERING DAMPER FROM RELAY ROD**
   Using SST, disconnect the steering damper from the relay rod.
   SST 09611-12010

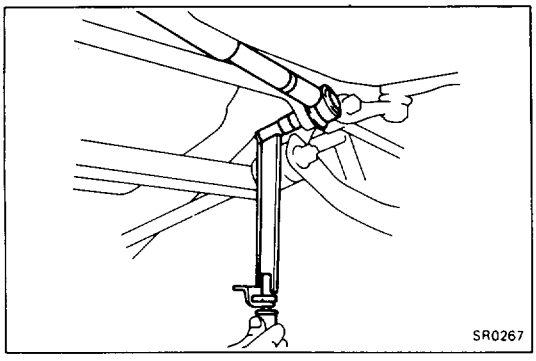


2. **REMOVE STEERING DAMPER**
   Remove the nut, washers, cushions and the steering damper.
3. **INSPECT STEERING DAMPER FOR DAMAGE OR OIL LEAKAGE**

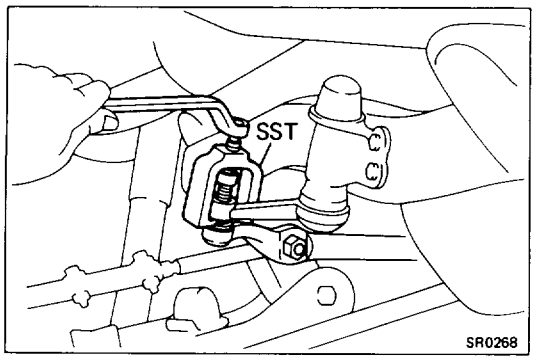


INSTALLATION OF STEERING DAMPER

1. **INSTALL STEERING DAMPER**
   (a) Install the cushions and washers, and torque the mount nut.
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



   (b) Connect the steering damper to the relay rod, and torque the mount nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)



Idler Arm Bracket

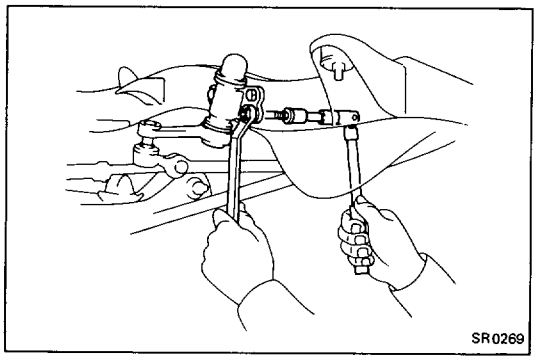
REMOVAL OF IDLER ARM BRACKET

(See page SR-97)

1. **DISCONNECT RELAY ROD FROM IDLER ARM**

   Using SST, disconnect the relay rod from the idler arm.

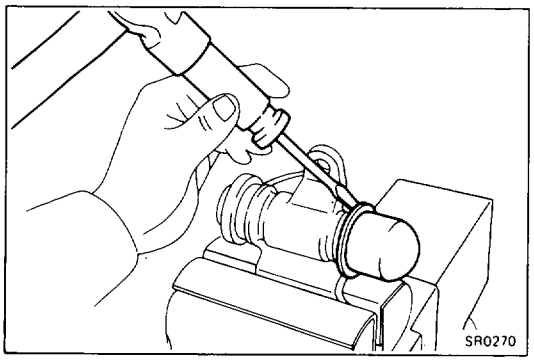
   SST 09611-22012



2. **REMOVE IDLER ARM BRACKET**

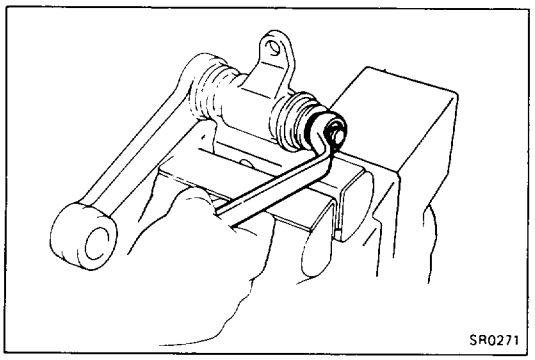
   Remove the three bolts and nuts.

DISASSEMBLY OF IDLER ARM BRACKET



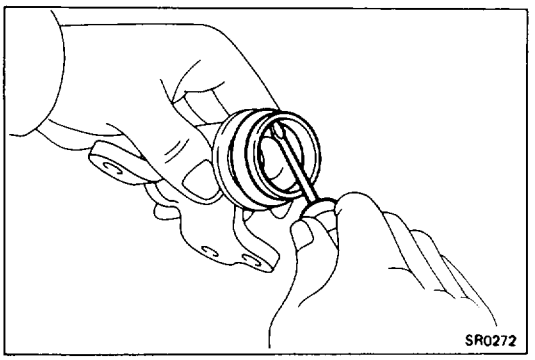
1. **REMOVE IDLER ARM BRACKET CAP**

   Using a screwdriver and hammer, remove the idler arm bracket cap.



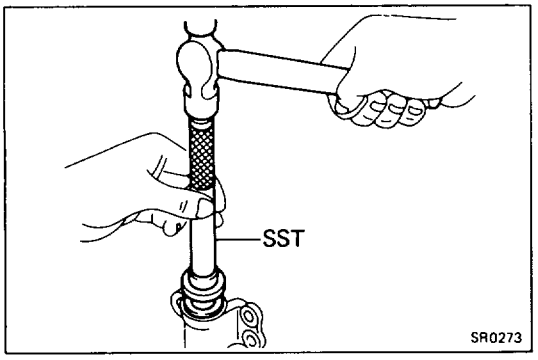
2. **REMOVE IDLER ARM WITH SHAFT**

   Remove the nut and pull the idler arm with the shaft off the idler arm bracket.



3. **REMOVE OIL SEAL AND BUSHINGS**

   Using a screwdriver, remove the oil seal and the two bushings.



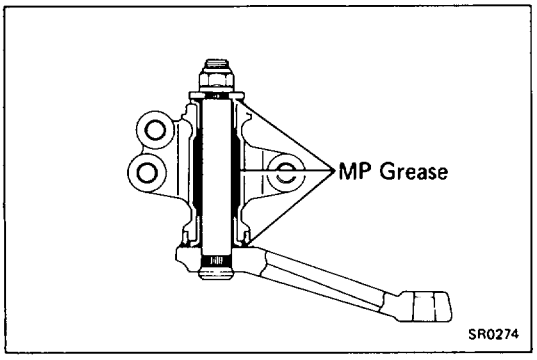
ASSEMBLY OF IDLER ARM BRACKET

1. INSTALL BUSHING AND OIL SEAL

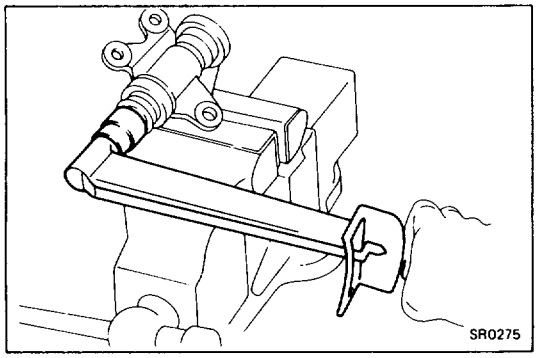
(a) Using SST, install new bushings to the idler arm bracket.

SST 09620-30010 (09627-30010, 09631-00020)

(b) Using a screwdriver, install a new oil seal.



2. APPLY MP GREASE

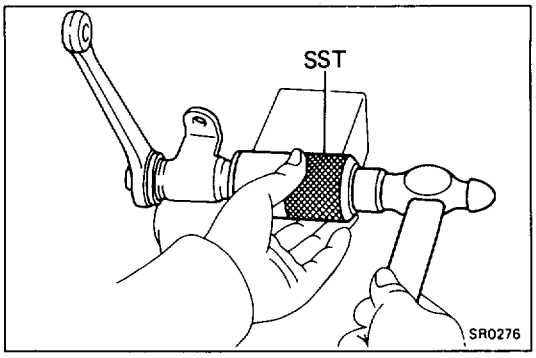


3. INSTALL IDLER ARM WITH SHAFT

(a) Insert the idler arm shaft to the bracket.

(b) Install the washer and nut.

Torque: 800 kg-cm (58 ft-lb, 78 N·m)



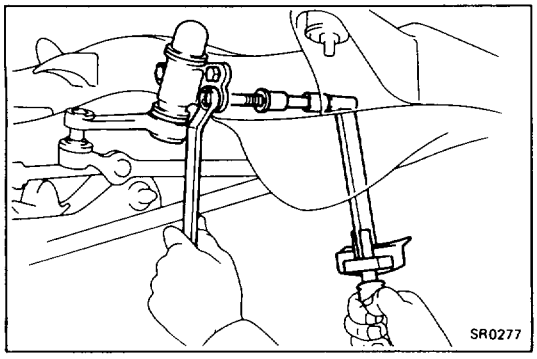
4. INSTALL IDLER ARM BRACKET CAP

(a) Apply liquid sealer to the cap end.

Sealant: Part No. 08826-00090, THREE BOND 1281 or equivalent

(b) Using SST, install the idler arm bracket cap.

SST 09636-20010



INSTALLATION OF IDLER ARM BRACKET

(See page SR-97)

1. INSTALL IDLER ARM BRACKET

Torque the three bolts and nuts.

Torque: 660 kg-cm (48 ft-lb, 65 N·m)

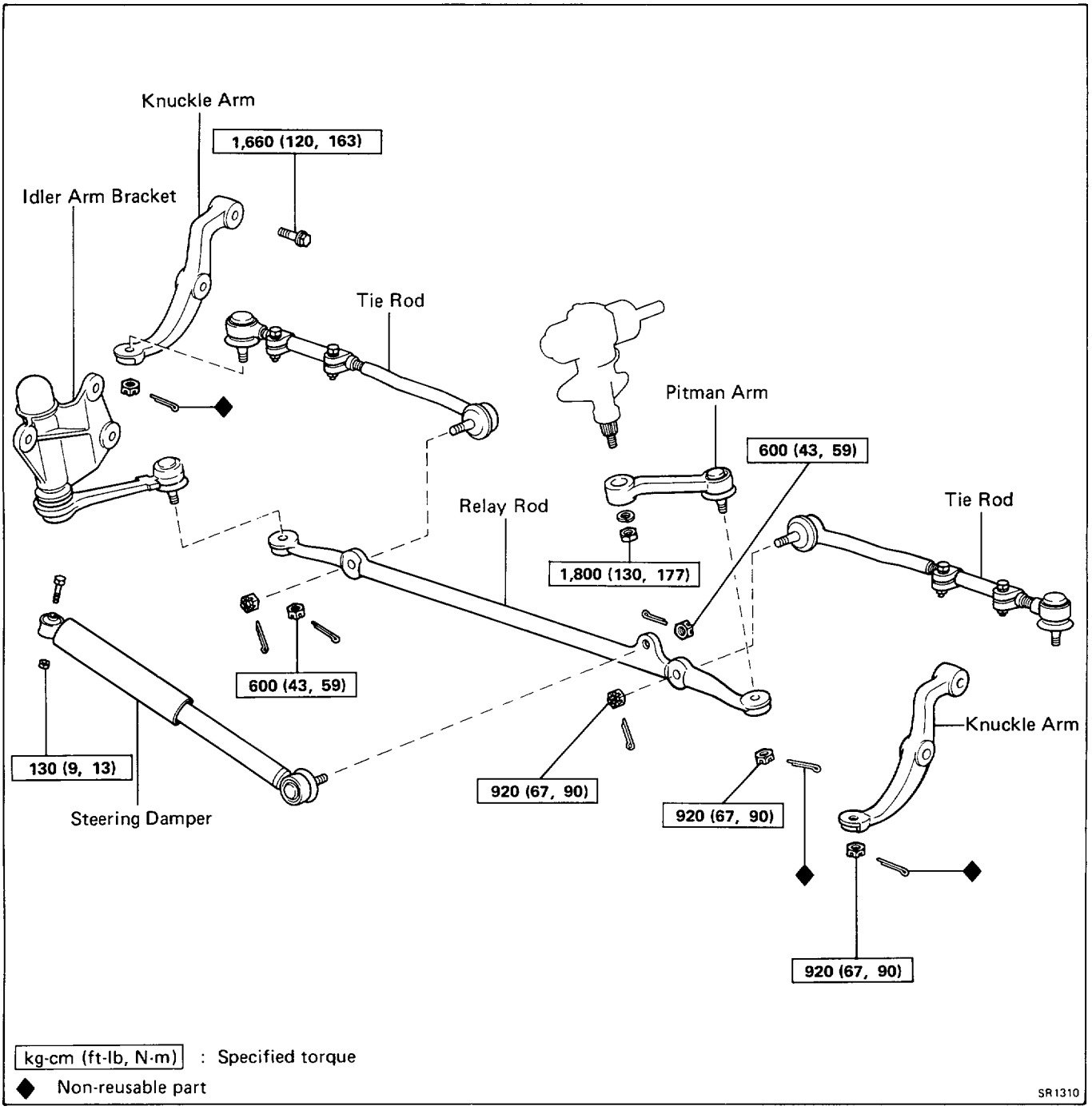
2. CONNECT IDLER ARM TO RELAY ROD

Torque the mount nut.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

STEERING LINKAGE (4WD)

COMPONENTS



NOTE:

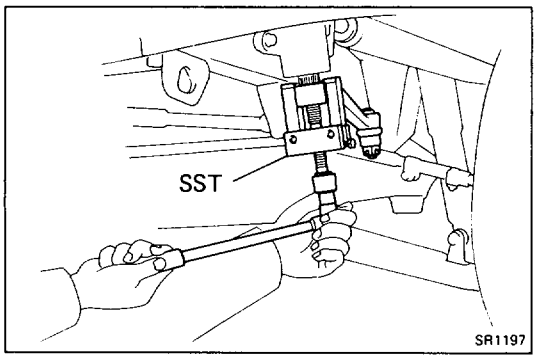
- Before connecting the ball stud to the arm or rod, remove the grease on the joint surfaces.
- After torquing the ball stud nut to specified torque, advance the nut just enough to insert the cotter pin. Secure the nut.
- After installing any of the steering linkage components, check the front wheel alignment.

Pitman Arm

REMOVAL AND INSPECTION OF PITMAN ARM

1. REMOVE PITMAN ARM SET NUT

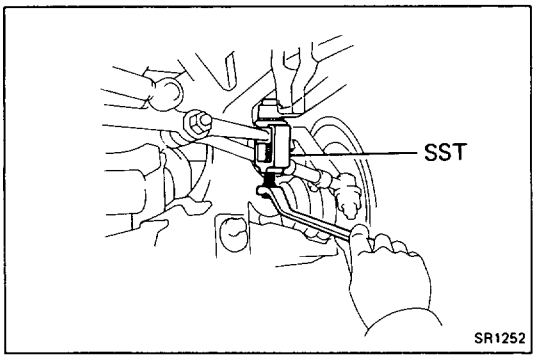
Remove the set nut and washer.



2. DISCONNECT PITMAN ARM FROM SECTOR SHAFT

Using SST, disconnect the pitman arm from the sector shaft.

SST 09628-62011



3. DISCONNECT PITMAN ARM FROM RELAY ROD

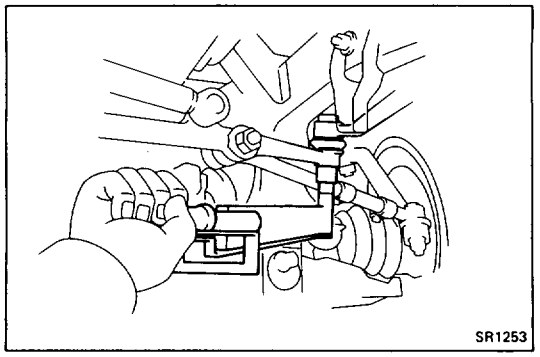
(a) Remove the cotter pin and set nut.

(b) Using SST, disconnect the pitman arm from the relay rod.

SST 09611-22012

4. INSPECT PITMAN ARM FOR WEAR, DAMAGE OR CRACKS

INSTALLATION OF PITMAN ARM

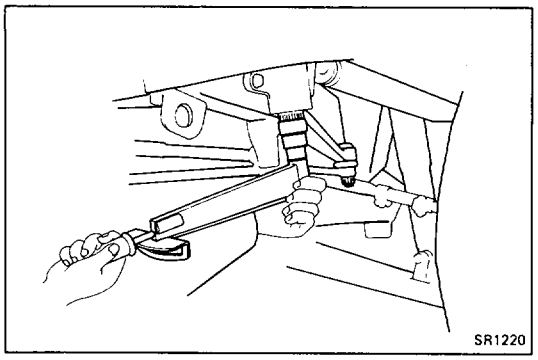


1. CONNECT PITMAN ARM TO SECTOR SHAFT

(a) Align marks on the pitman arm and the sector shaft.

(b) Install and torque the pitman arm set nut.

Torque: 1,800 kg-cm (130 ft-lb, 177 N·m)

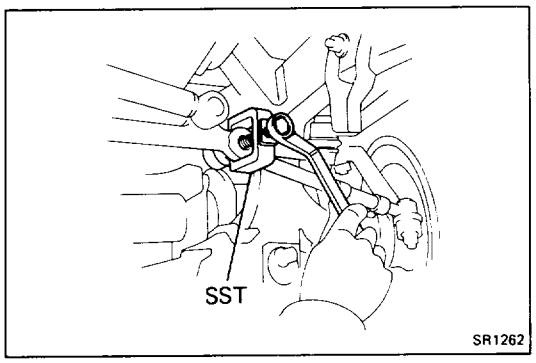


2. CONNECT PITMAN ARM TO RELAY ROD

(a) Install and torque the set nut.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

(b) Install a new cotter pin.



Tie Rod

REMOVAL AND INSPECTION OF TIE ROD

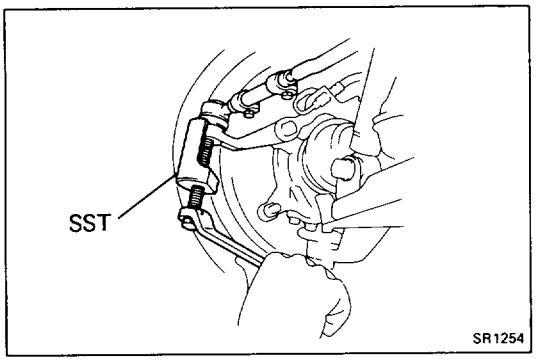
(See page SR-104)

1. DISCONNECT TIE ROD FROM RELAY ROD

(a) Remove the cotter pin and set nut.

(b) Using SST, disconnect the tie rod from the relay rod.

SST 09611-22012



2. DISCONNECT TIE ROD FROM KNUCKLE ARM

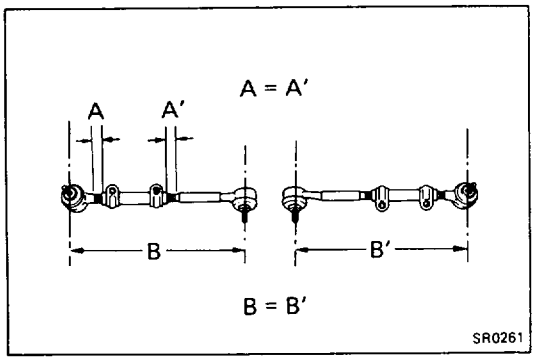
(a) Remove the cotter pin and set nut.

(b) Using SST, disconnect the tie rod from the knuckle arm.

SST 09610-20012

3. INSPECT TIE ROD FOR WEAR, DAMAGE OR CRACKS

Check for cracks with flaw detecting penetrant.

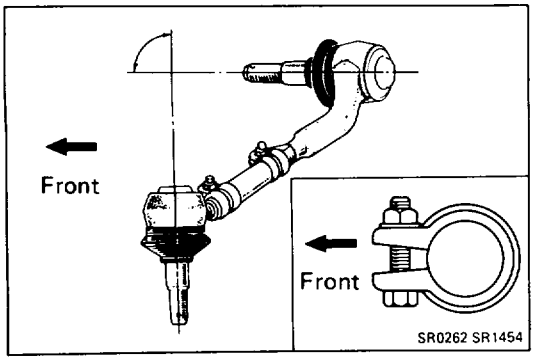


INSTALLATION OF TIE ROD

1. ASSEMBLE TIE ROD

Screw the tie rod ends into the tie rod.

The tie rod length should be approximately 314.5 mm(12.382 in.), and the remaining length of threads on both tie rod ends should be equal.

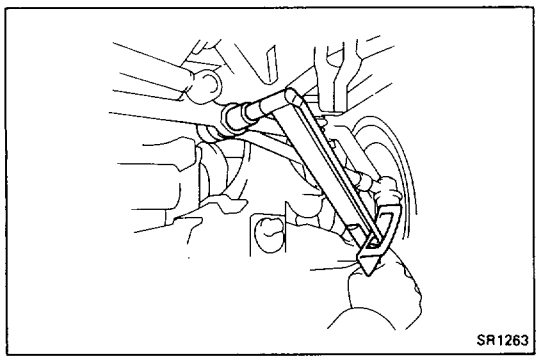


2. ADJUST TIE ROD END ANGLE

(a) Turn the tie rods so they cross at about 90 degrees.

(b) Tighten the tie rod clamps to lock the tie rod ends in position.

Torque: 260 kg-cm (19 ft-lb, 25 N·m)



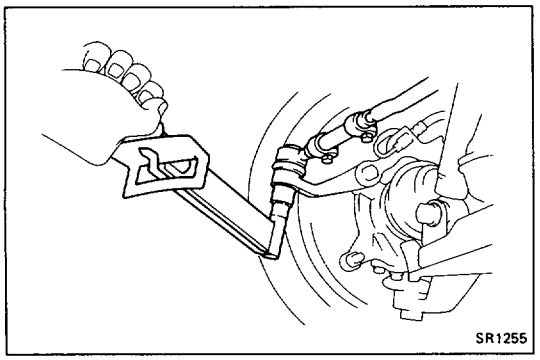
3. CONNECT TIE ROD TO RELAY ROD

(a) Connect the tie rod to the relay rod.

(b) Install and torque the set nut.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

(c) Install a new cotter pin.



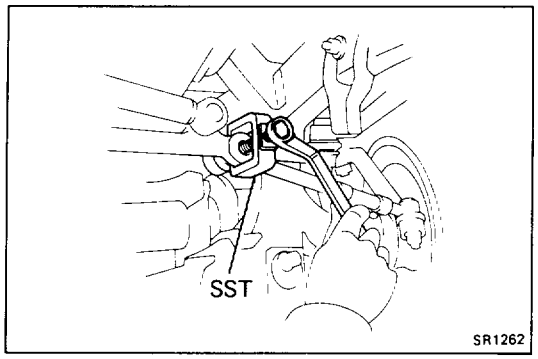
4. CONNECT TIE ROD TO KNUCKLE ARM

(a) Connect the tie rod to the knuckle arm.

(b) Install and torque the set nut.

Torque: 920 kg-cm (67 ft-lb, 90 N·m)

(c) Install a new cotter pin.

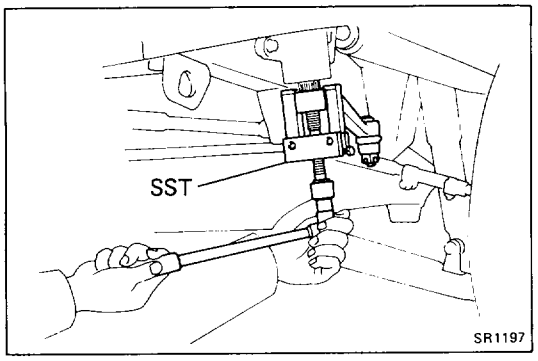


Relay Rod

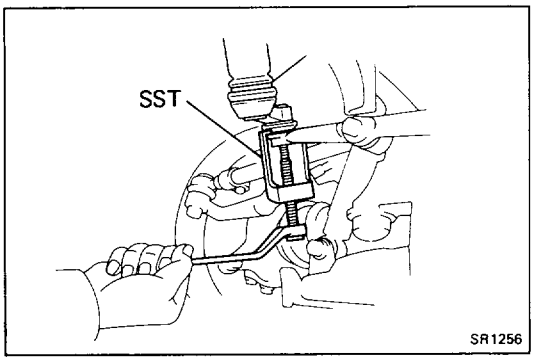
REMOVAL AND INSPECTION OF RELAY ROD

(See page SR-104)

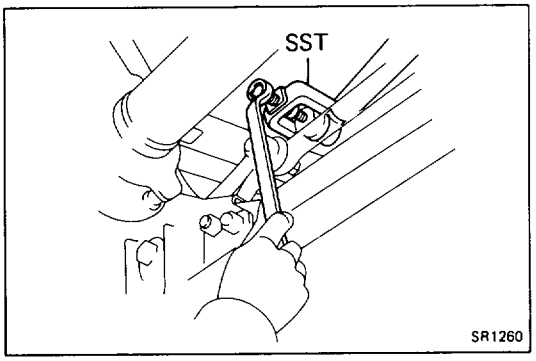
1. **DISCONNECT TIE ROD ENDS FROM RELAY ROD**
   (a) Remove the cotter pin and set nut.
   (b) Using SST, disconnect the tie rod ends from the relay rod.
   SST 09611-22012



2. **DISCONNECT RELAY ROD FROM PITMAN ARM**
   (a) Remove the cotter pin and set nut.
   (b) Using SST, disconnect the relay rod from the pitman arm.
   SST 09611-22012

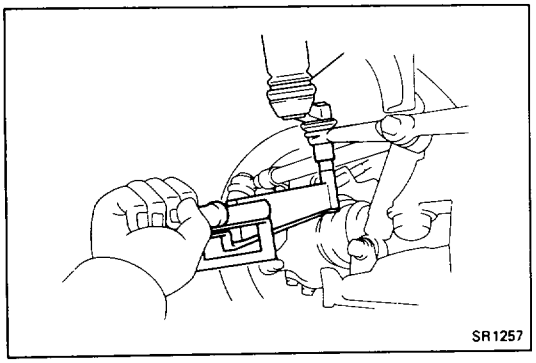


3. **DISCONNECT RELAY ROD FROM IDLER ARM**
   (a) Remove the cotter pin and set nut.
   (b) Using SST, disconnect the relay rod from the idler arm.
   SST 09610-20012



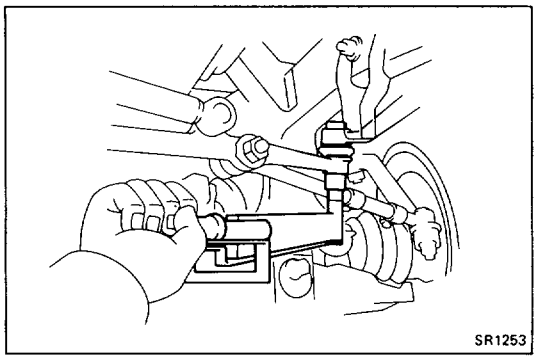
4. **DISCONNECT STEERING DAMPER FROM RELAY ROD**
   (a) Remove the cotter pin and set nut.
   (b) Using SST, disconnect the steering damper from the relay rod.
   SST 09611-22012

5. **INSPECT RELAY ROD FOR DAMAGE OR CRACKS**
   Check for cracks with flaw detecting penetrant.

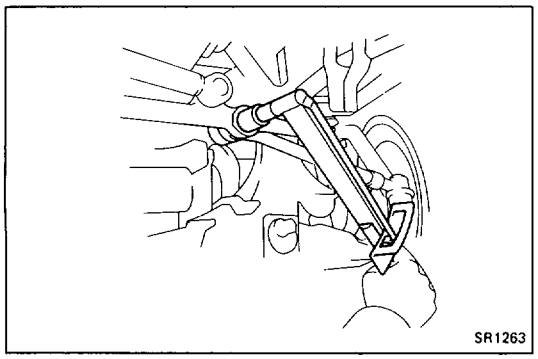


INSTALLATION OF RELAY ROD

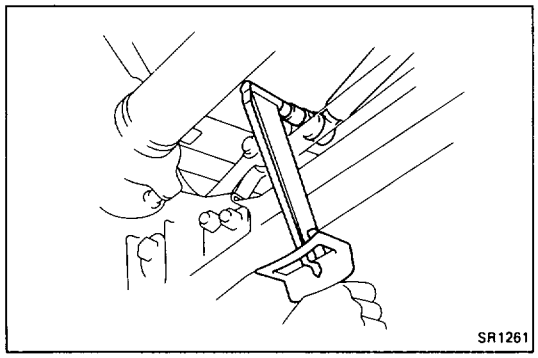
1. **CONNECT RELAY ROD TO IDLER ARM**
   (a) Connect the relay rod to the idler arm.
   (b) Install and torque the mount nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)
   (c) Install a new cotter pin.



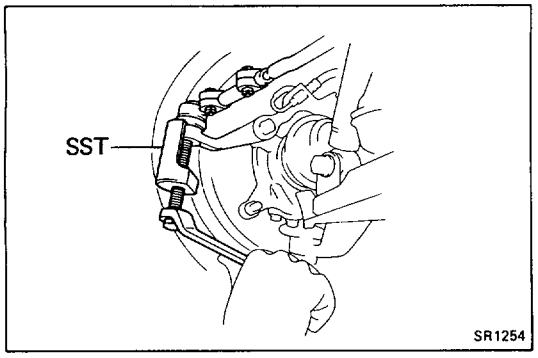
2. **CONNECT RELAY ROD TO PITMAN ARM**
   (a) Connect the relay rod to the pitman arm.
   (b) Install and torque the set nut.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)
   (c) Install a new cotter pin.



3. **CONNECT RELAY ROD TO TIE ROD ENDS**
   (a) Connect the relay rod to the tie rod ends.
   (b) Install and torque the set nuts.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)
   (c) Install a new cotter pin.



4. **CONNECT STEERING DAMPER TO RELAY ROD**
   (a) Connect the steering damper to the relay rod and install the set nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)
   (b) Install a new cotter pin.



Knuckle Arm

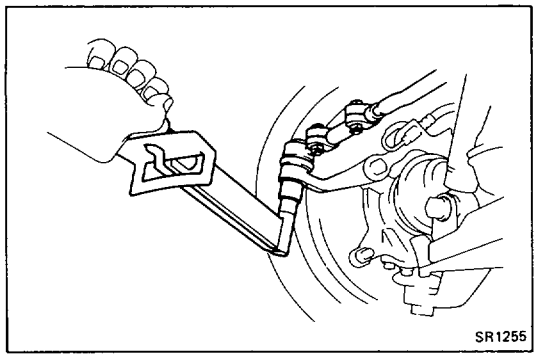
REMOVAL AND INSPECTION OF KNUCKLE ARM

(See page SR-104)

1. **DISCONNECT TIE ROD FROM KNUCKLE ARM**
   Using SST, disconnect the tie rod from the knuckle arm.
   SST 09610-20012

2. **REMOVE KNUCKLE ARM**

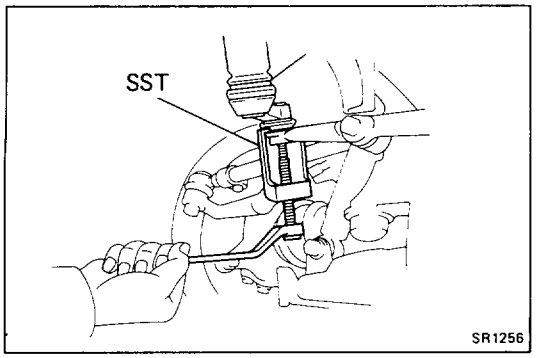
3. **INSPECT KNUCKLE ARM FOR DAMAGE OR CRACKS**
   Check for cracks with flaw detecting penetrant.



INSTALLATION OF KNUCKLE ARM

1. **INSTALL KNUCKLE ARM TO STEERING KNUCKLE**
   Torque: 1,660 kg-cm (120 ft-lb, 163 N·m)

2. **CONNECT TIE ROD TO KNUCKLE ARM**
   Torque the set nuts.
   Torque: 920 kg-cm (67 ft-lb, 90 N·m)



Idler Arm Bracket

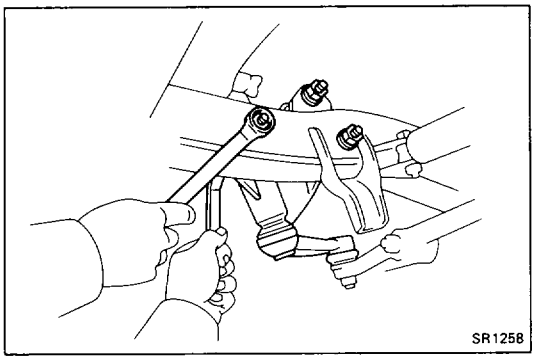
REMOVAL OF IDLER ARM BRACKET

1. DISCONNECT RELAY ROD FROM IDLER ARM

(a) Remove the cotter pin and set nut.

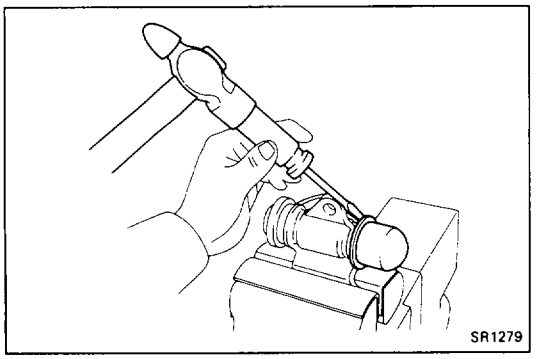
(b) Using SST, disconnect the relay rod from the idler arm.

SST 09610-20012



2. REMOVE IDLER ARM BRACKET

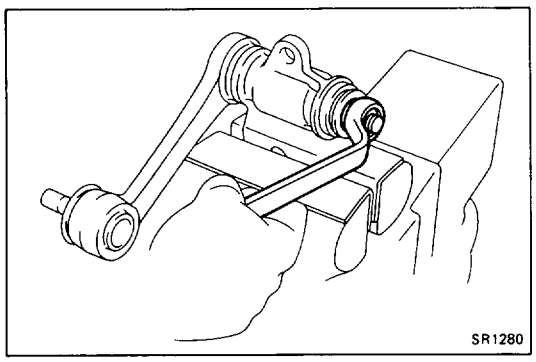
Remove the three bolts and nuts.



DISASSEMBLY OF IDLER ARM BRACKET

1. REMOVE IDLER ARM BRACKET CAP

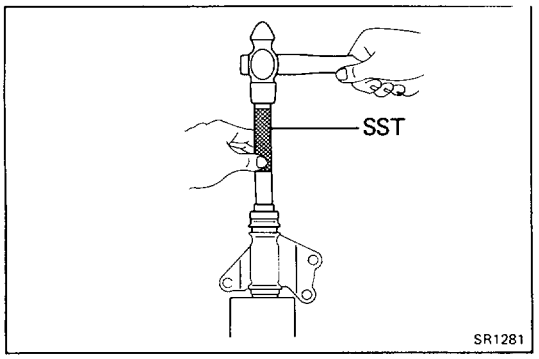
Using a screwdriver and hammer, remove the idler arm bracket cap.



2. REMOVE IDLER ARM WITH SHAFT

Remove the nut and pull the idler arm with the shaft off the idler arm bracket.

3. REMOVE OIL SEAL

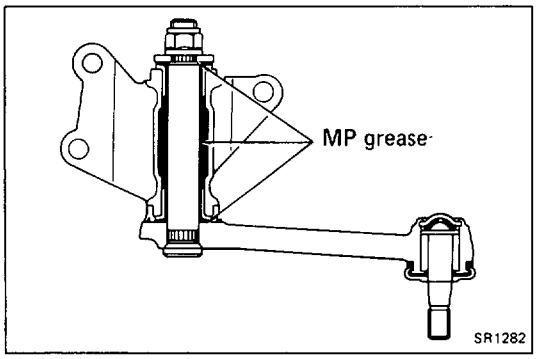


ASSEMBLY OF IDLER ARM BRACKET

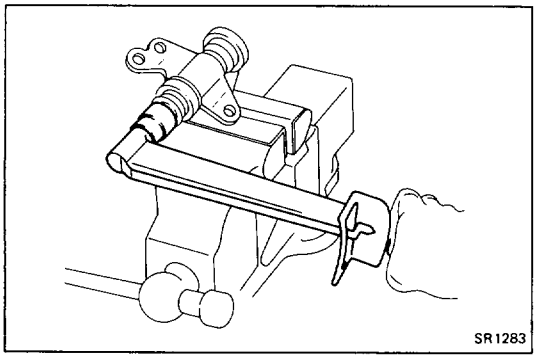
1. INSTALL NEW OIL SEAL

Using SST, tap in the oil seal.

SST 09620-30010 (09624-30010, 09631-00020)



2. APPLY MP GREASE AS SHOWN

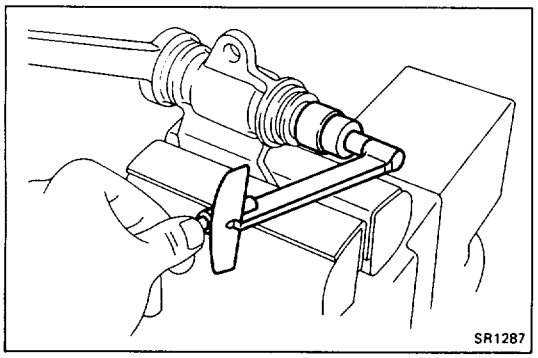


3. INSTALL IDLER ARM WITH SHAFT

(a) Insert the idler arm shaft to the bracket.

(b) Install the washer and nut.

Torque: 970 kg-cm (70 ft-lb, 95 N·m)

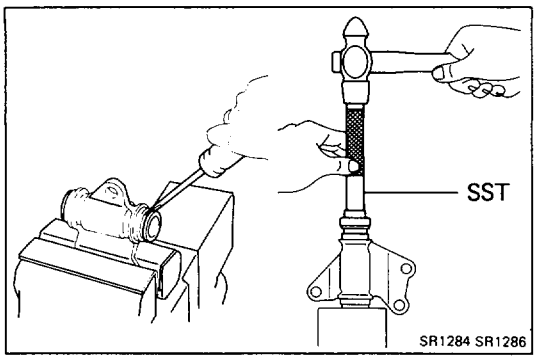


4. INSPECT IDLER ARM FOR ROTATION CONDITION

Using a torque gauge, turn the nut several times and take the torque reading.

Torque(turning): 5 — 30 kg-cm
(5 — 26 in.-lb, 0.5 — 2.9 N·m)

If necessary, replace the bushings.

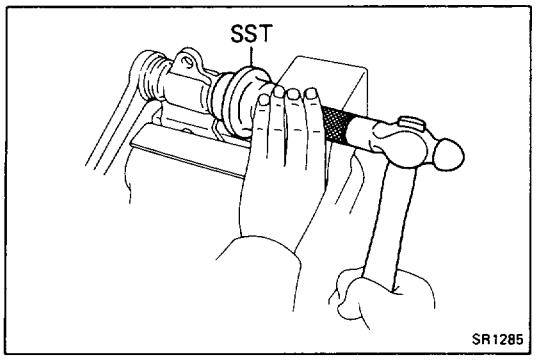


5. IF NECESSARY, REPLACE BUSHING

(a) Using a screwdriver, remove the bushings.

(b) Using SST, install each bushing to the idler arm bracket.

SST 09620-30010 (09627-30010, 09631-00020)



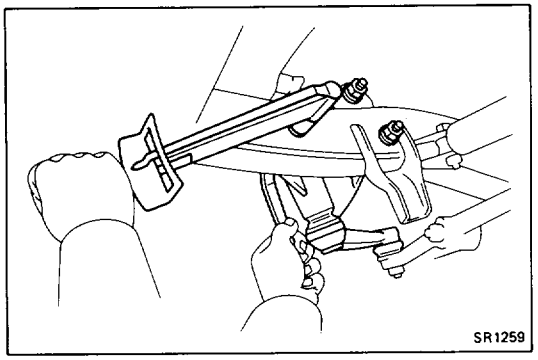
6. **INSTALL IDLER ARM BRACKET CAP**

(a) Apply liquid sealer to the cap end.

Sealant: Part No. 08826-00090, THREE BOND 1281 or equivalent

(b) Using SST, install the idler arm bracket cap.

SST 09223-46011

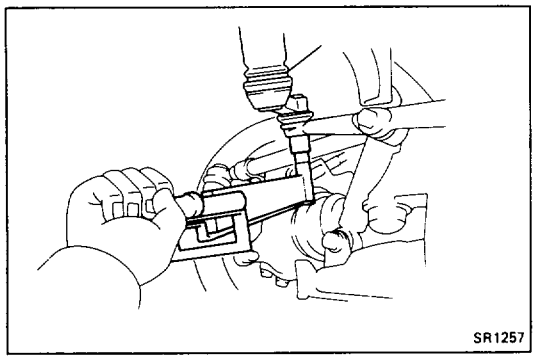


INSTALLATION OF IDLER ARM BRACKET

1. **INSTALL IDLER ARM BRACKET**

Tighten the three bolts and nuts.

Torque: 970 kg-cm (70 ft-lb, 95 N·m)



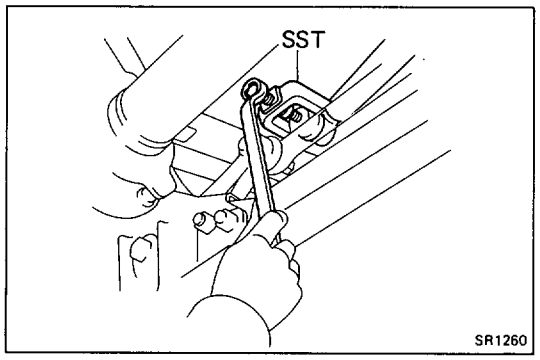
2. **CONNECT IDLER ARM TO RELAY ROD**

(a) Connect the idler arm to the relay rod.

(b) Install and torque the set nuts.

Torque: 600 kg-cm (43 ft-lb, 59 N·m)

(c) Install a new cotter pin.



Steering Damper

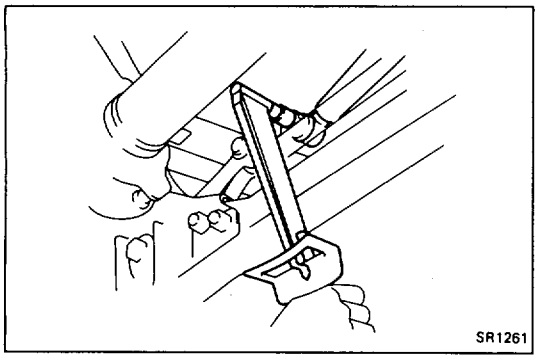
REMOVAL AND INSPECTION OF STEERING DAMPER

(See page SR-104)

1. **DISCONNECT STEERING DAMPER FROM RELAY ROD**
   (a) Remove the cotter pin and set nut.
   (b) Using SST, disconnect the steering damper from the relay rod.
   SST 09611-22012
2. **REMOVE STEERING DAMPER**
   Remove the set bolt, nut and damper.
3. **INSPECT STEERING DAMPER FOR DAMAGE OR OIL LEAKAGE**

INSTALLATION OF STEERING DAMPER

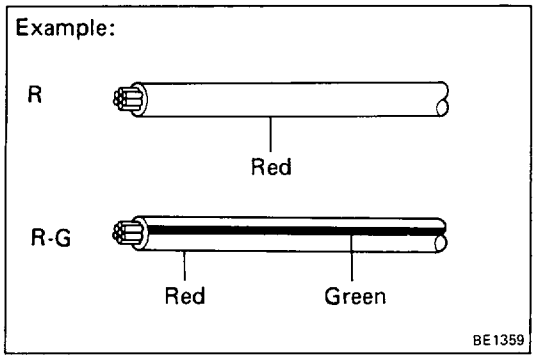
1. **INSTALL STEERING DAMPER**
   (a) Install the damper with bolt and nut.
   Torque: 130 kg-cm (9 ft-lb, 13 N·m)



   (b) Connect the steering damper to the tie rod, and torque the set nut.
   Torque: 600 kg-cm (43 ft-lb, 59 N·m)
   (c) Install a new cotter pin.

BODY ELECTRICAL SYSTEM

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REMOTE CONTROL MIRROR	BE-51
CRUISE CONTROL SYSTEM	BE-52
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CLOCK	BE-84



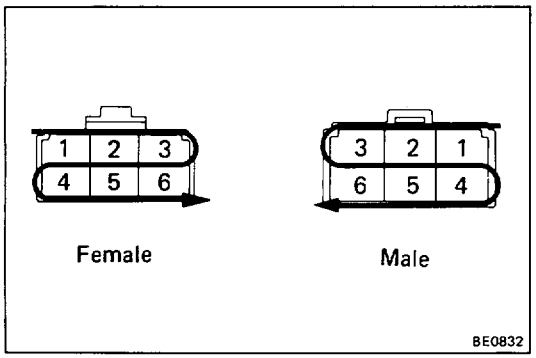
GENERAL INFORMATION

WIRING COLOR CODE

Wire colors are indicated by an alphabetical code.

B = Black	L = Blue	R = Red
BR = Brown	LG = Light Green	V = Violet
G = Green	O = Orange	W = White
GR = Gray	P = Pink	Y = Yellow

The first letter indicates the basic wire color and the second letter indicates the color of the stripe.



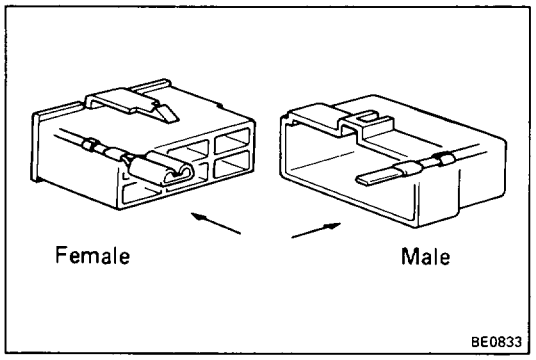
CONNECTOR

1. PIN NUMBER OF FEMALE CONNECTOR

Numbered in order from upper left to lower right.

2. PIN NUMBER OF MALE CONNECTOR

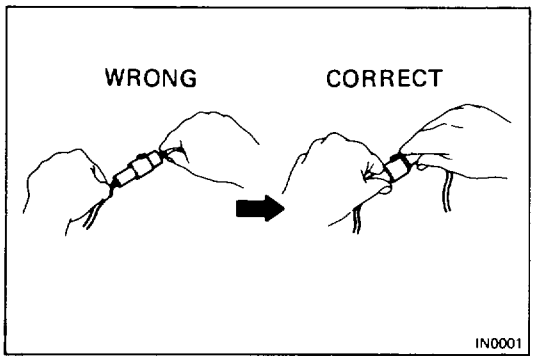
Numbered in order from upper right to lower left.



3. DISTINCTION OF MALE AND FEMALE CONNECTORS

Male and female connectors are distinguished by shape of their internal pins.

(a) All connectors are shown from the open end, and the lock is on top.

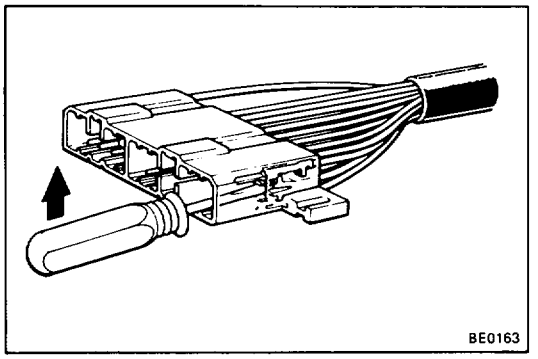


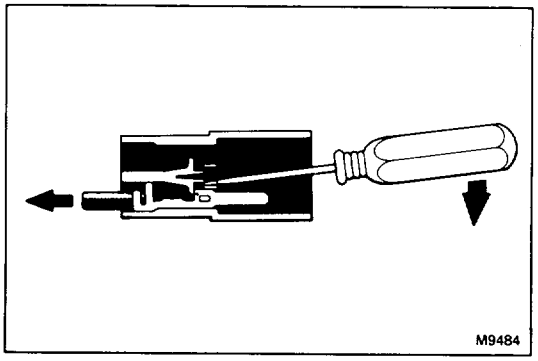
(b) To pull apart the connectors, pull on the connector itself, not the wires.

REPLACEMENT OF COMBINATION SWITCH

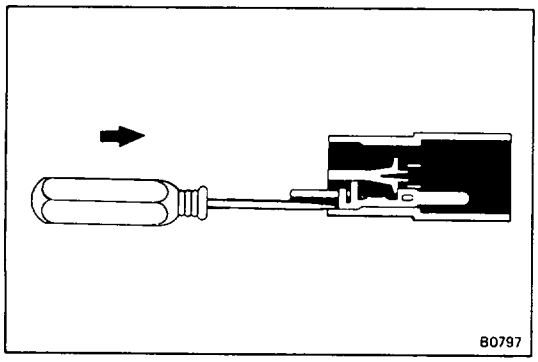
REMOVE TERMINALS FROM CONNECTOR

(a) From the open end, insert a miniature screwdriver between the locking lugs and terminal.





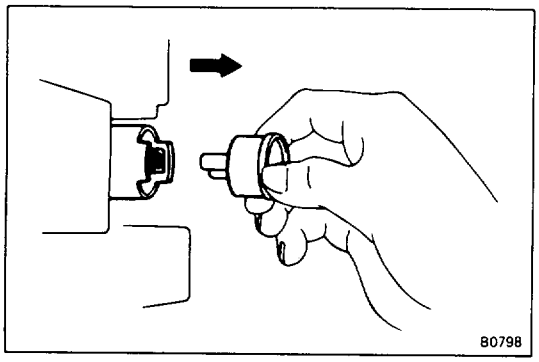
(b) Pry up the locking lugs with the screwdriver and pull the terminal out from the rear.



INSTALL TERMINALS TO CONNECTOR

(a) Push in the terminal until it is securely locked in the connector lug.

(b) Pull on the wire to confirm that it is securely locked.

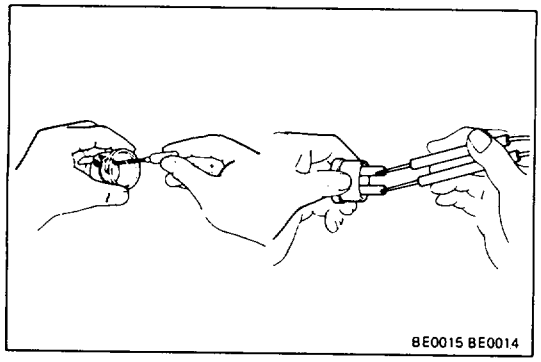


RESET CIRCUIT BREAKER

1. REMOVE CIRCUIT BREAKER

(a) Remove the kick panel.

(b) Remove the circuit breaker.

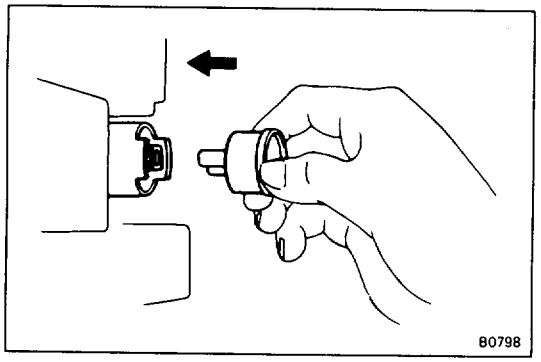


2. RESET CIRCUIT BREAKER

(a) Insert the needle into the reset hole and push it.

(b) Using an ohmmeter, check that there is continuity between both terminals of the circuit breaker.

If there is no continuity, replace the circuit breaker.



3. INSTALL CIRCUIT BREAKER

(a) Install the circuit breaker.

NOTE: If a circuit breaker continues to cut out, a short circuit is indicated. Have the system checked by a qualified technician.

(b) Install the kick panel.

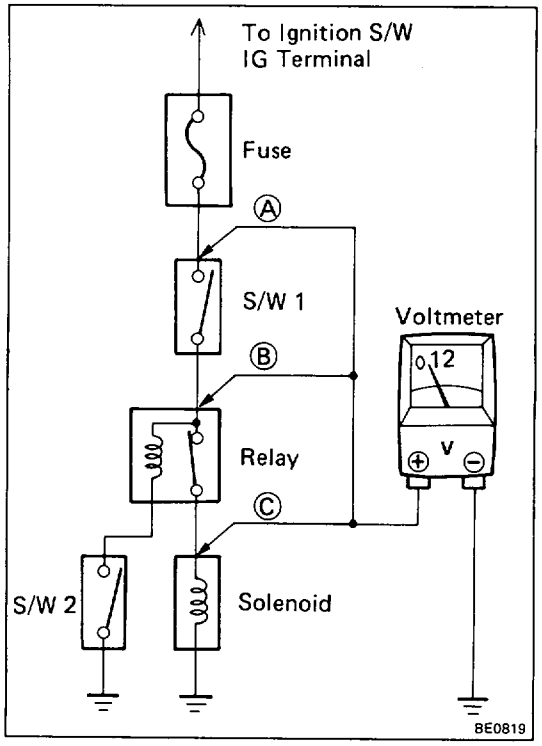
REPLACEMENT OF FUSES

Install new fuses with correct amperage ratings.

CAUTION:

1. **Turn off all electrical components and the ignition switch before replacing a fuse. Do not exceed the fuse amp rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse continues to blow, the circuit is probably shorted. Have the system checked by a qualified technician.



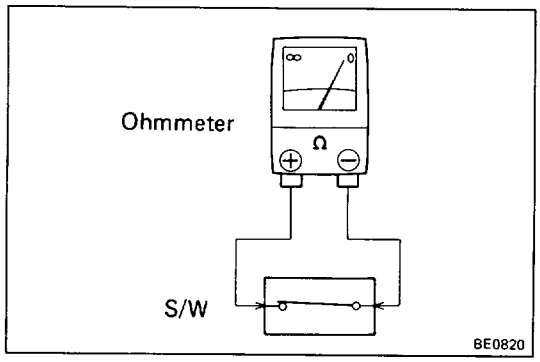
VOLTAGE CHECK

(a) Establish conditions in which voltage is present at the check point.

Example:

Ⓐ – Ignition S/W on
Ⓑ – Ignition S/W and S/W 1 on
Ⓒ – Ignition S/W, S/W 1 and Relay on (S/W 2 off)

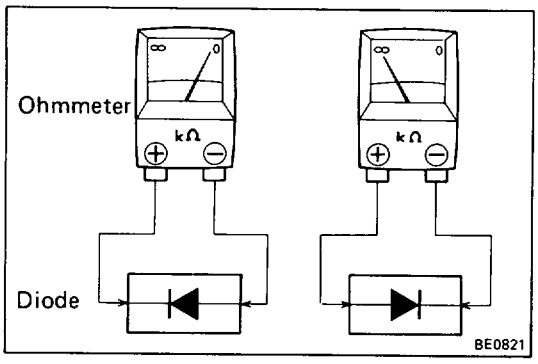
(b) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal, and the positive lead to the connector or component terminal. This check can be done with a test light instead of a voltmeter.



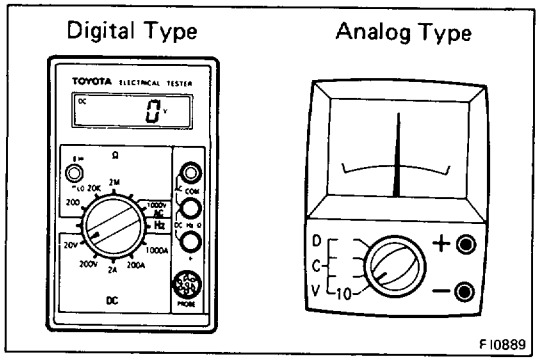
CONTINUITY AND RESISTANCE CHECK

(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

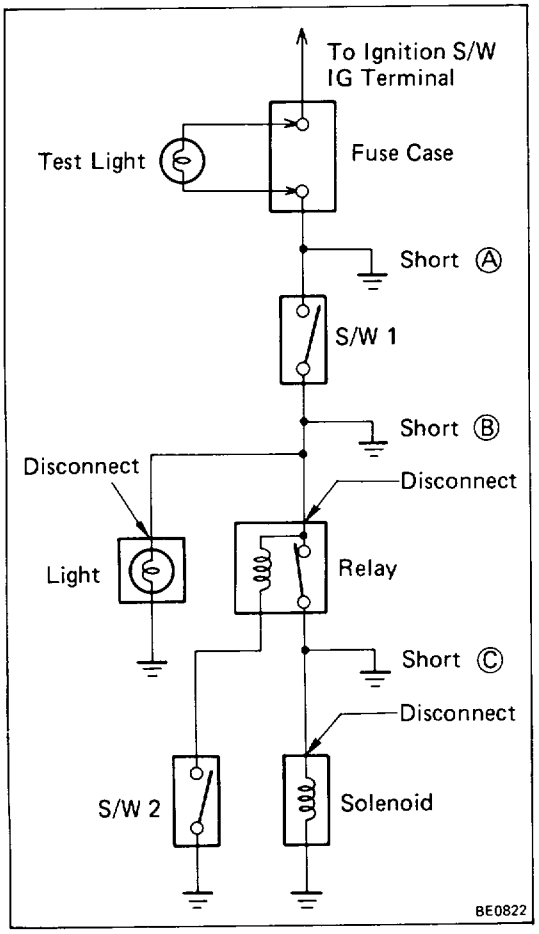
(b) Contact the two leads of an ohmmeter to each of the check points.



If the circuit has diodes, reverse the two leads and check again.
When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.



(c) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit.



FINDING A SHORT CIRCUIT

(a) Remove the blown fuse and disconnect all loads of the fuse.

(b) Connect a test light in place of the fuse.

(c) Establish conditions in which the test light comes on.

Example:

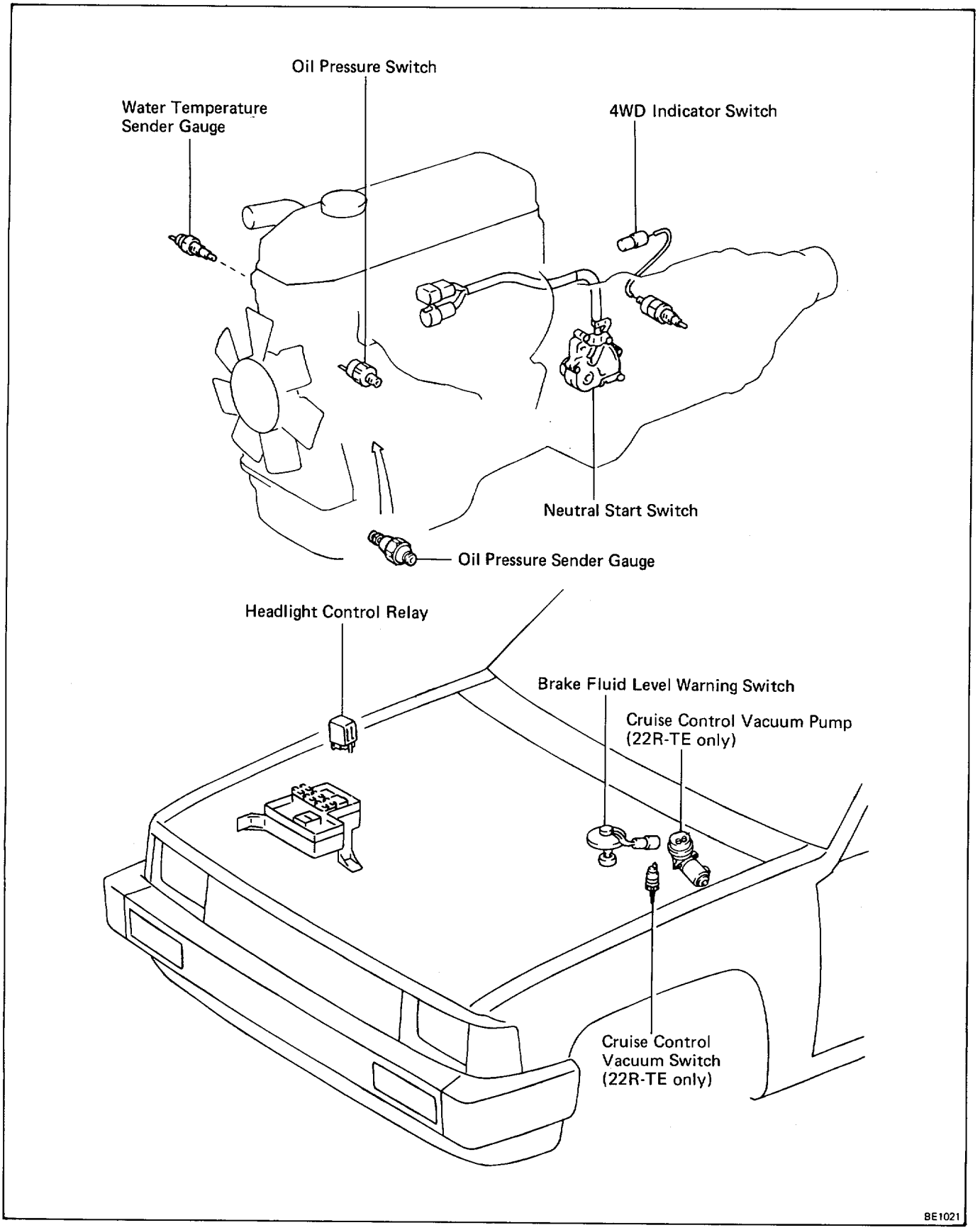
Ⓐ – Ignition S/W on
Ⓑ – Ignition S/W and S/W 1 on
Ⓒ – Ignition S/W, S/W 1 and Relay on (Connect the Relay) and S/W 2 off (or Disconnect S/W 2)

(d) Disconnect and reconnect the connectors while watching the test light.
The short lies between the connector where the test light stays lit and the connector where the light goes out.

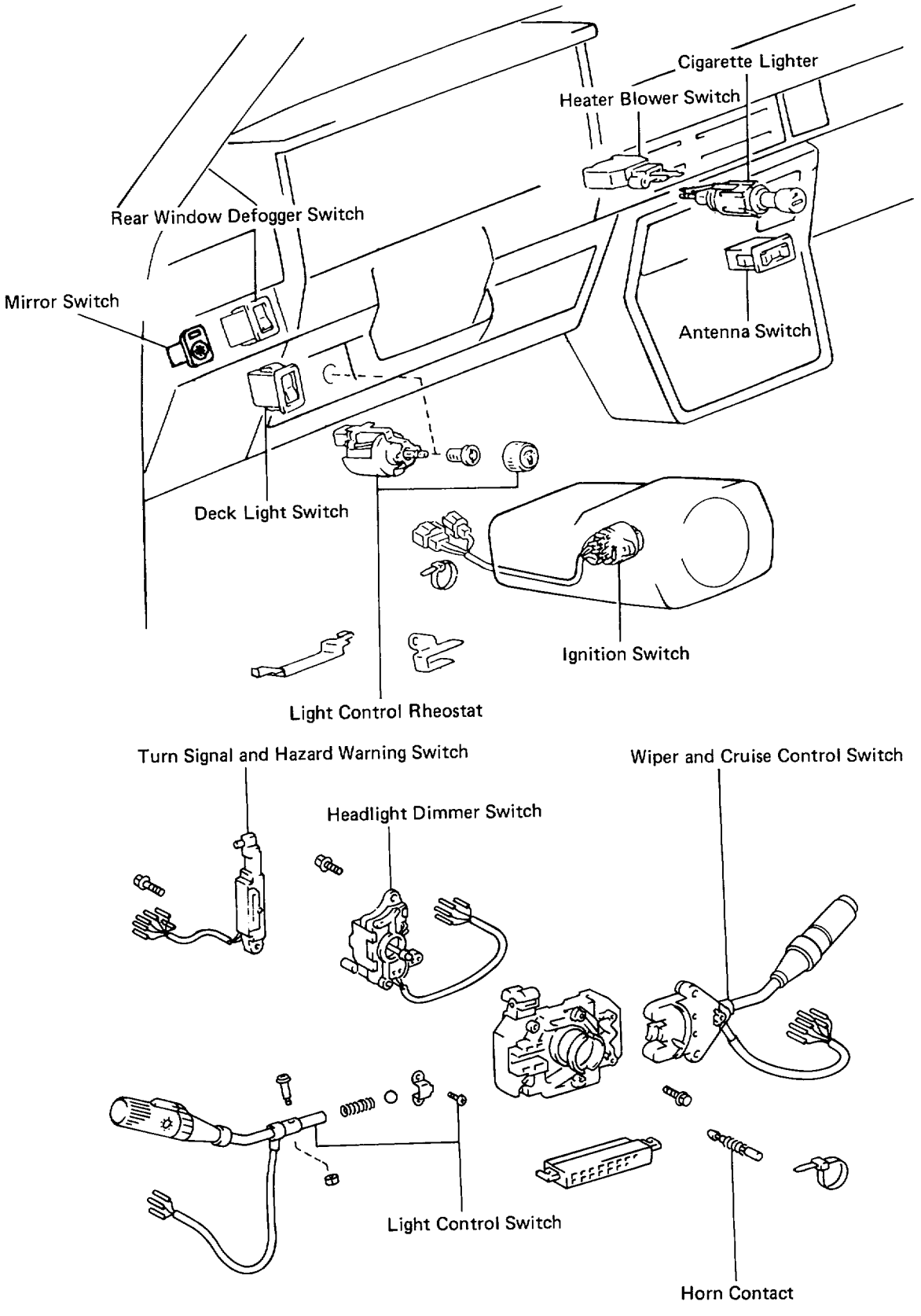
(e) Find the exact location of the short by lightly shaking the problem wire along the body.

LOCATION OF SWITCHES AND RELAYS

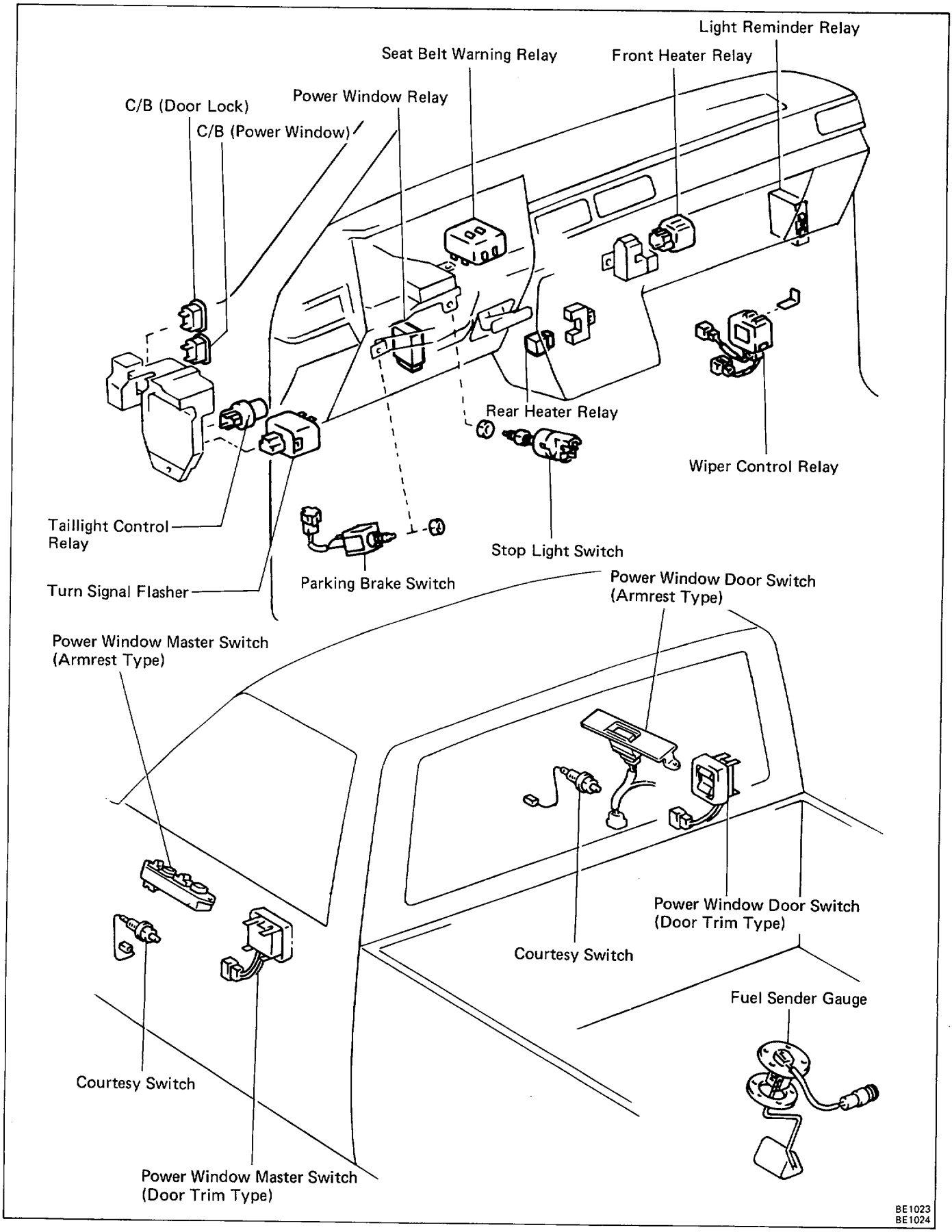
ENGINE AND PASSENGER COMPARTMENT SWITCHES AND RELAYS



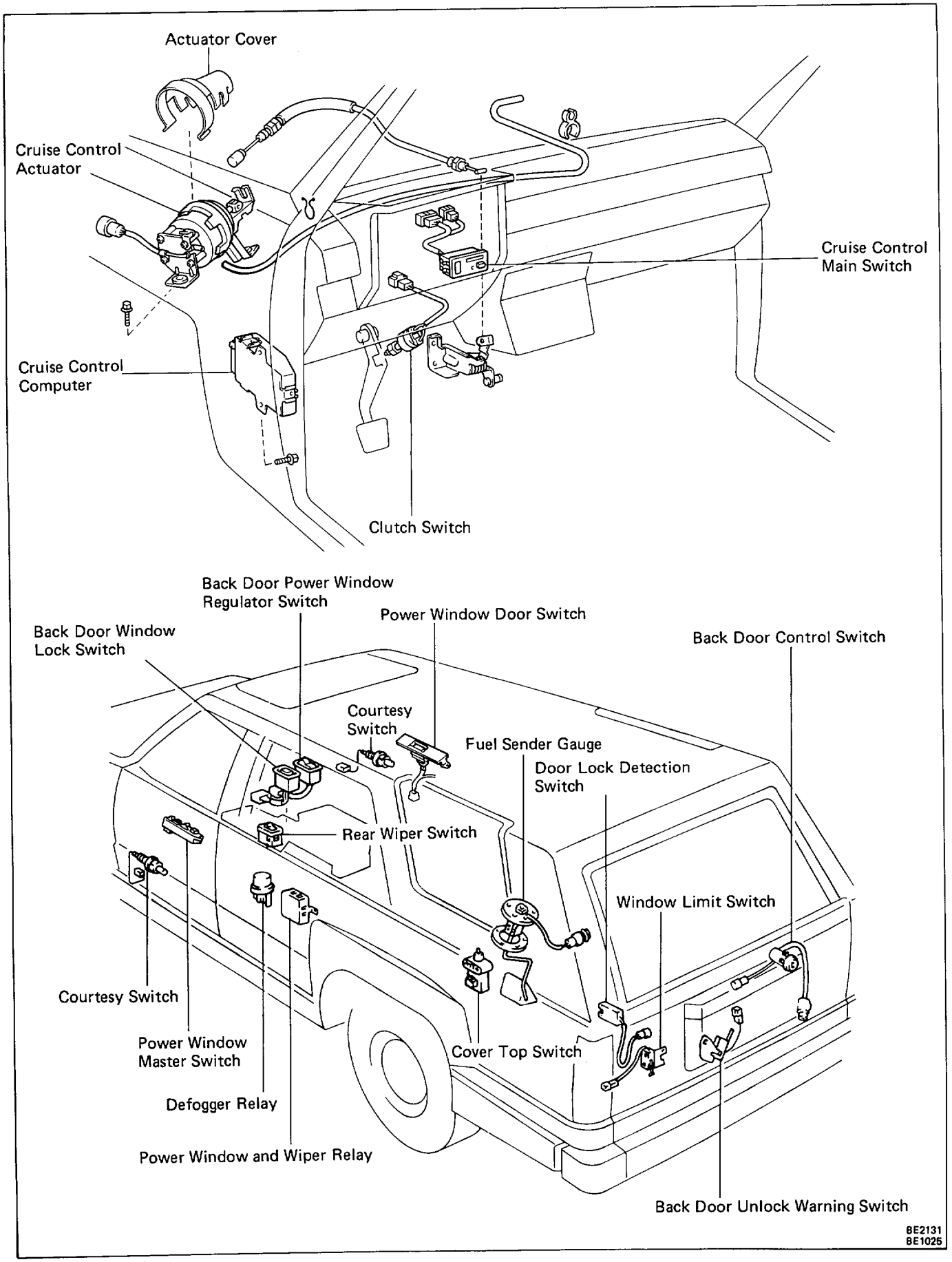
DASH AND STEERING COLUMN SWITCHES AND RELAYS



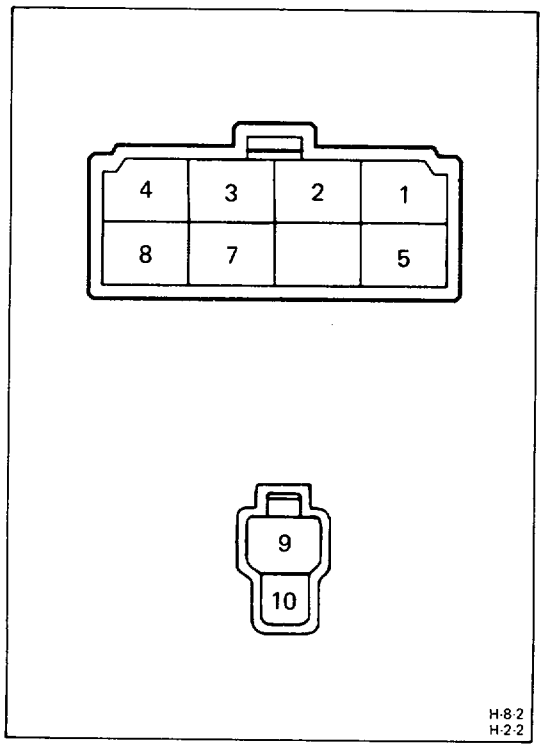
DASH AND STEERING COLUMN SWITCHES AND RELAYS (Cont'd)



DASH AND STEERING COLUMN SWITCHES AND RELAYS (Cont'd)



BE2131
BE1025



IGNITION SWITCH

INSPECTION OF IGNITION SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal		4	3	2	1	8	7	5	9	10
LOCK										
ACC		○	○							
ON		○	○	○		○	○			
START		○		○	○	○	○	○		
Unlock Warning	Normal									
	Push								○	○

If continuity is not as specified, replace the switch.

LIGHTING

Troubleshooting

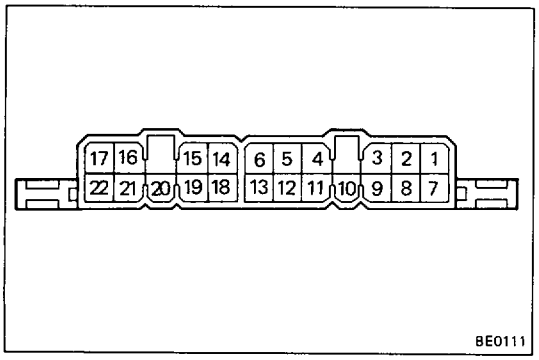
Problem	Possible cause	Remedy	Page
Only one light does not light	Light bulb burned out Socket, wire or ground faulty	Replace bulb Repair as necessary	
Headlights do not light	Fusible link blown Headlight control relay faulty Light control/dimmer switch faulty Wiring or ground faulty	Replace fusible link Check relay Check switch Repair as necessary	 BE-14 BE-13
High beam headlights or headlight flashers do not operate	Light control/dimmer switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE-13
Tail, parking and license light do not light	TAIL fuse blown Fusible link blown Taillight control relay faulty Light control switch faulty Wiring or ground faulty	Replace fuse and check for short Replace fusible link Check relay Check switch Repair as necessary	BE-4 BE-14 BE-13
Stop lights do not light	STOP fuse blown Stop light switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary	BE-4
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	
Instrument lights do not light (taillights light)	Light control rheostat faulty Wiring or ground faulty	Check rheostat Repair as necessary	BE-15
Turn signal does not flash on one side	Turn signal switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE-17
Turn signals do not operate	HAZ-HORN fuse blown Turn signal flasher faulty Turn signal/hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary	BE-4 BE-17 BE-17
Hazard warning lights do not operate	HAZ-HORN fuse blown Turn signal flasher faulty Turn signal/hazard switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher Check switch Repair as necessary	BE-4 BE-17 BE-17

Light Control Switch and Headlight Dimmer Switch

INSPECTION OF LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH

INSPECT CONTINUITY OF LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH

Inspect the switch continuity between terminals.



BE0111

Light control switch

Switch position \ Terminal (Wire color)	10 T or EL (W)	11 EL or T (W)	4 H (R)
OFF			
TAIL	○——	——○	
HEAD	○——	——○	——○

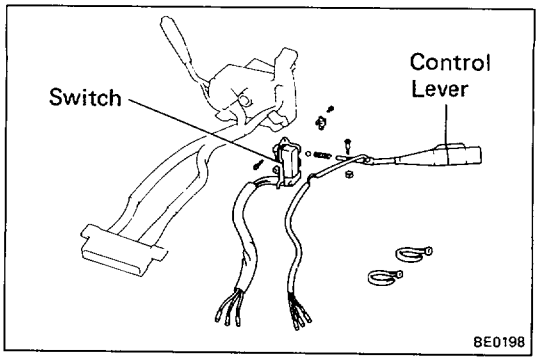
Headlight dimmer switch

Switch position \ Terminal (Wire color)	13 ED (W-B)	6 HL (R-G)	5 HU (R-Y)	12 HF (R-W)
Flash	○——	——	——○	——○
Low Beam	○——	——○		
High Beam	○——	——	——○	

If continuity is not as specified, replace the switch.

REPLACEMENT OF LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH

REPLACE LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH

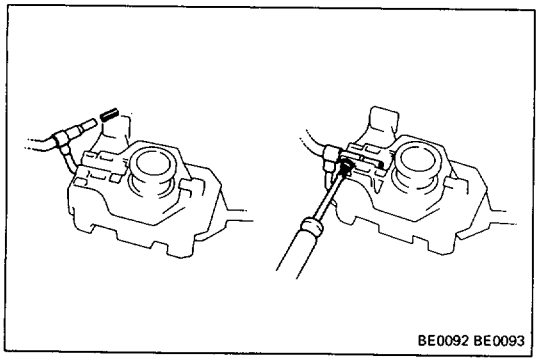


BE0198

(a) Remove the terminals from the connector. (See pages BE-2, 3)

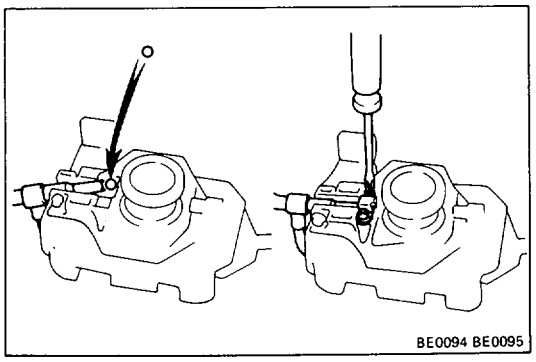
(b) Remove the light control switch.

(c) Remove the headlight dimmer switch.

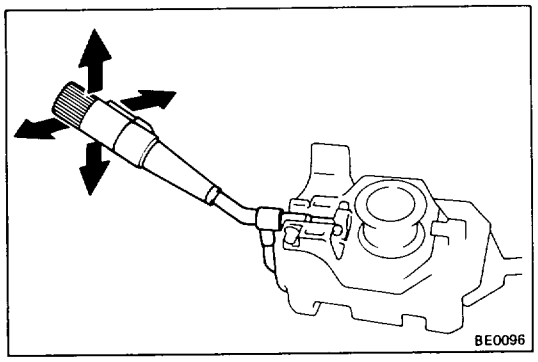

BE0092 BE0093

(d) Install the headlight dimmer switch.

(e) Insert the spring into the lever and install the lever with the set screw and nut.

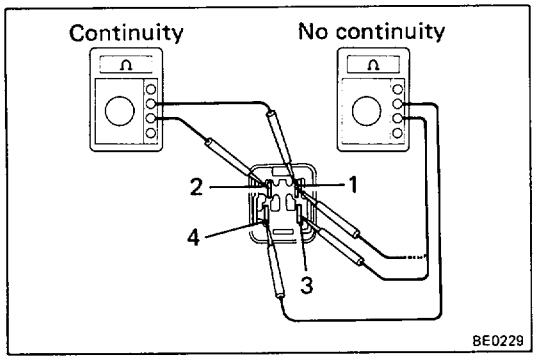

BE0094 BE0095

(f) Place the ball on the spring, position the lever at HI and install the plate.


BE0096

(g) Insure that the switch operates smoothly.

(h) Install the terminals to the connector.
(See pages BE-3, 13)



BE0229

Headlight Control Relay

INSPECTION OF HEADLIGHT CONTROL RELAY

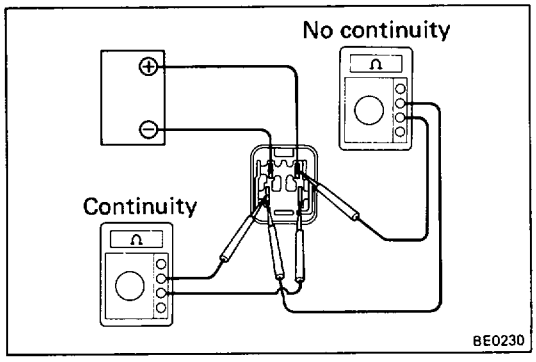
1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 4.

(c) Check that there is no continuity between terminals 1 and 4.

If continuity is not as specified, replace the relay.



BE0230

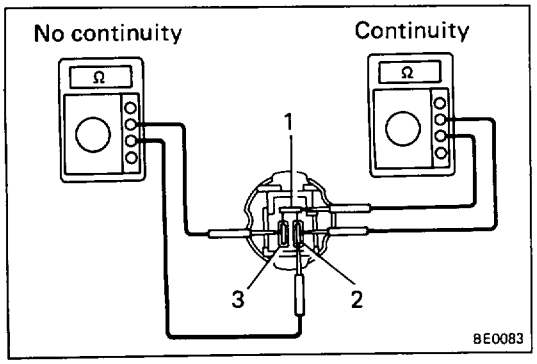
2. INSPECT RELAY OPERATION

(a) Apply battery voltage to terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and 4.

(c) Check that there is no continuity between terminals 1 and 4.

If operation is not as specified, replace the relay.



BE0083

Taillight Control Relay

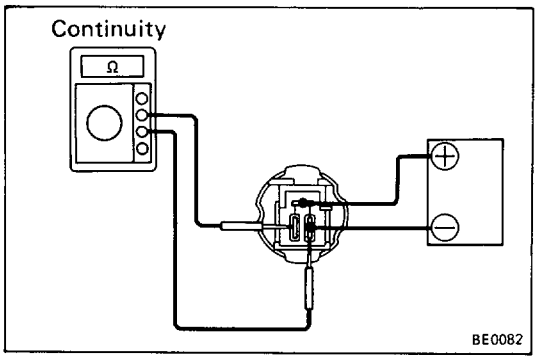
INSPECTION OF TAILLIGHT CONTROL RELAY

1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 2 and 3.

If continuity is not as specified, replace the relay.

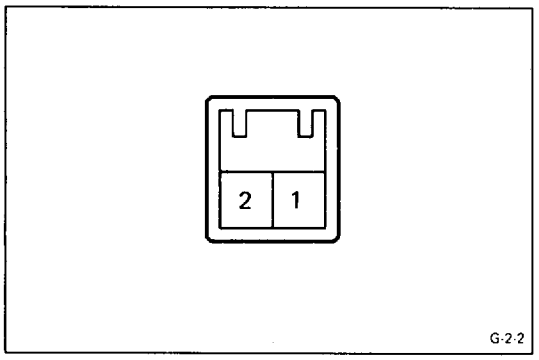


2. **INSPECT RELAY OPERATION**

(a) Apply battery voltage across terminals 1 and 2.

(b) Check that there is continuity between terminals 2 and 3.

If operation is not as specified, replace the relay.



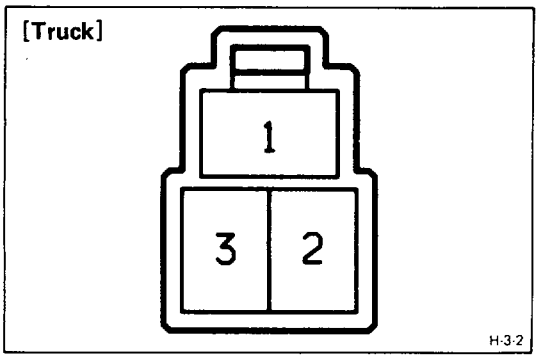
Light Control Rheostat

INSPECTION OF LIGHT CONTROL RHEOSTAT

INSPECT RHEOSTAT RESISTANCE

Point	Resistance (Ω)
Full counterclockwise	∞
Midpoint	Approx. 7
Full clockwise	0

If resistance is not as specified, replace the rheostat.



Deck Light Switch

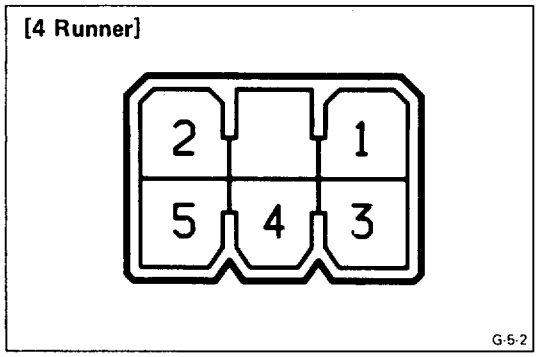
INSPECTION OF DECK LIGHT SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

[Truck]

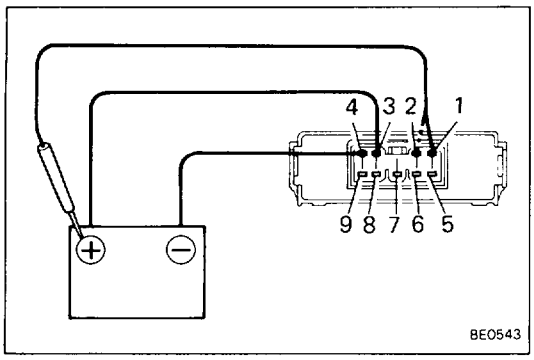
Switch position \ Terminal	1	3	2
OFF		○ ◁▷ ○	
ON	○	○ ◁▷ ○	



[4 Runner]

Switch position \ Terminal	Indicator		3	4	5
	1	2			
ON	○—○			○—○	
OFF	○—○		○		○

If continuity is not as specified, replace the switch or bulb.



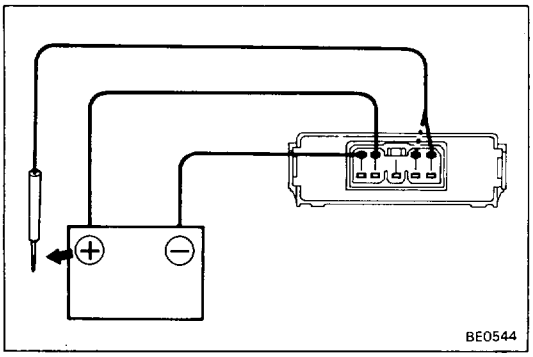
Light Reminder Relay

INSPECTION OF LIGHT REMINDER RELAY

1. INSPECT OPERATION OF WARNING BUZZER CIRCUIT

Connect the positive (+) lead from the battery to terminal 3. Connect the negative (–) lead to terminal 4.

(a) Check that the buzzer does not sound when connected terminal 1 or 2 to the positive (+) lead.

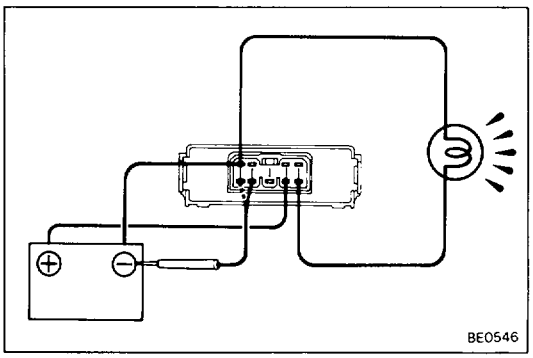


(b) Check that the buzzer sounds when disconnecting terminal 1 or 2 from the positive (+) lead.

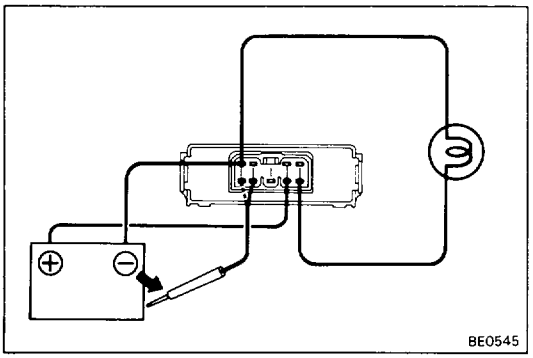
If operation is not as specified, replace the relay.

2. INSPECT OPERATION OF ILLUMINATION CONTROL

Connect the positive (+) lead from the battery to terminal 6. Connect the negative (–) lead to terminal 4. Connect the 1.4W test bulb between terminals 4 and 5.

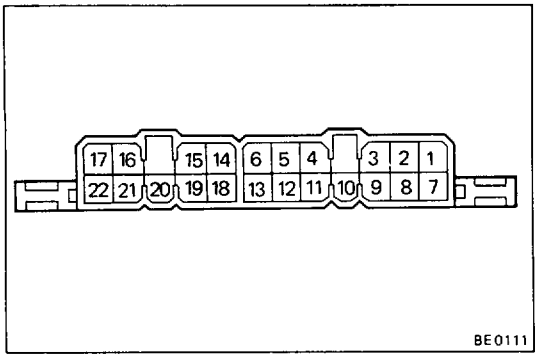


(a) Check that the test bulb lights when connected terminal 8 or 9 to the negative (–) lead.



(b) Check that the test bulb does not light for 6 to 14 seconds after terminal 8 or 9 is disconnected from the negative (–) lead.

If operation is not as specified, replace the relay.



Turn Signal and Hazard Warning Switch

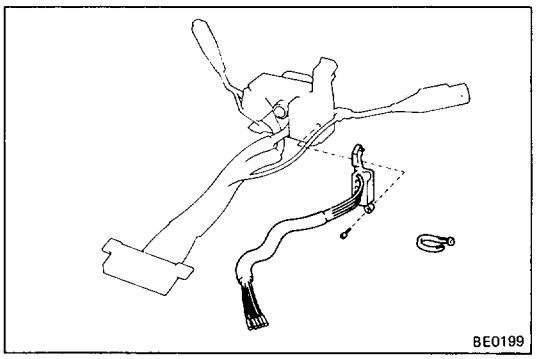
INSPECTION OF TURN SIGNAL AND HAZARD WARNING SWITCH

INSPECT TURN SIGNAL AND HAZARD WARNING SWITCH

Inspect switch continuity between terminals.

Switch position \ Terminal (Wire color)		9 TL (G-B)	3 TB (G-W)	8 TR (G-Y)	2 B_1 (G-L)	7 F (G)	1 B_2 (G-O)
Turn Signal	L	○—○			○—○		
	N				○—○		
	R		○—○		○—○		
Hazard	ON	○—○	○—○	○		○—○	

If continuity is not as specified, replace the switch.



REPLACEMENT OF TURN SIGNAL AND HAZARD WARNING SWITCH

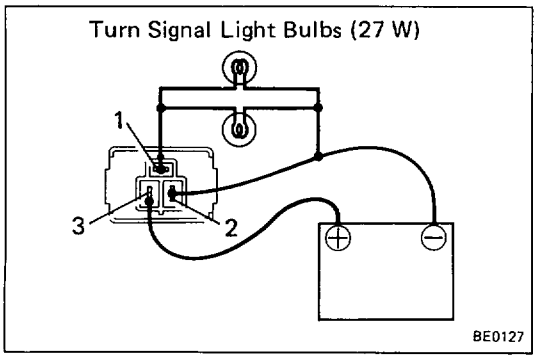
REPLACE TURN SIGNAL AND HAZARD WARNING SWITCH

(a) Remove the terminals from the connector. (See pages BE-2, 3)

(b) Remove the turn signal and hazard switch.

(c) Install the turn signal and hazard switch.

(d) Connect the terminals to the connector. (See pages BE-3, 17)



Turn Signal Flasher

INSPECTION OF TURN SIGNAL FLASHER

INSPECT FLASHER OPERATION

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 2.

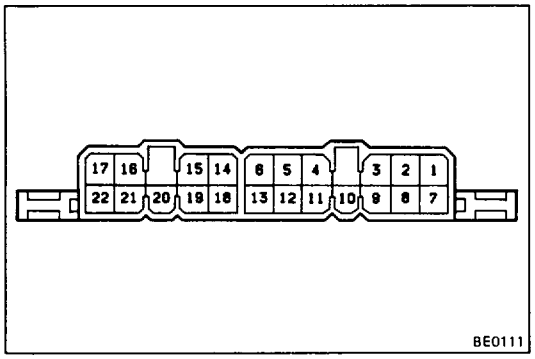
(b) Connect the two turn signal light bulbs parallel to each other to terminals 1 and 2, check that the bulbs turn on and off.

NOTE: The turn signal lights should flash 60 to 120 times per minute.
If one of the front or rear turn signal lights has an open circuit, the number of flashes will be more than 140 per minute.
If operation is not as specified, replace the flasher.

WIPERS AND WASHERS

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Front	Rear
Wipers do not operate or return to off position	WIPER fuse blown	Replace fuse and check for short	BE-4	BE-4
	Wiper motor faulty	Check motor	BE-20	BE-22
	Wiper switch faulty	Check switch	BE-18	BE-21
	Wiring or ground faulty	Repair as necessary		
Wipers do not operate in INT position	Wiper switch faulty	Check switch	BE-18	
	Wiper motor faulty	Check motor	BE-20	
	Wiring or ground faulty	Repair as necessary		
Washers do not operate	Washer hose or nozzle clogged	Repair as necessary		
	Washer motor faulty	Replace motor		
	Washer switch faulty	Check switch	BE-18	BE-21
	Wiring faulty	Repair as necessary		



Front Wiper and Washer Switch

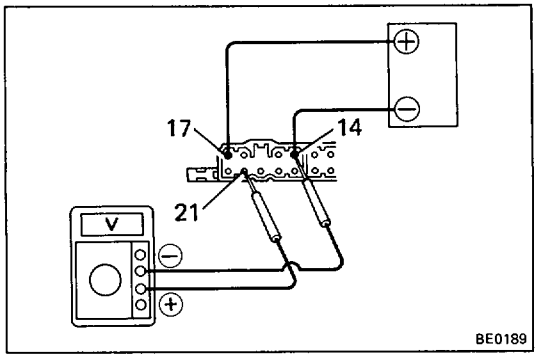
INSPECTION OF FRONT WIPER AND WASHER SWITCH

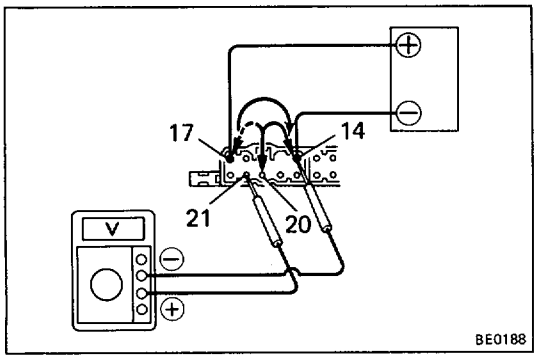
1. INSPECT FRONT WIPER AND WASHER SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch	Switch position \ Terminal (Wire color)	18 +B (L-W)	13 +2 (L-O)	7 +1 (L-B)	4 +S (L-R)	16 Ew (B)	8 W (L)
Wiper	OFF			○—○			
	INT			○—○			
	LO	○—		—○			
	HI	○—	—○				
Washer	OFF						
	ON					○—	—○

If continuity is not as specified, replace the switch.





2. INSPECT INTERMITTENT OPERATION OF SWITCH

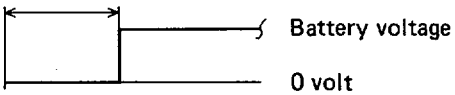
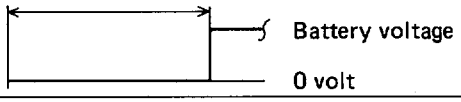
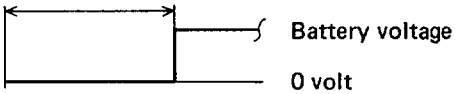
(a) Turn the wiper switch to INT position.

(b) Turn the INT switch to FAST position. (Variable type)

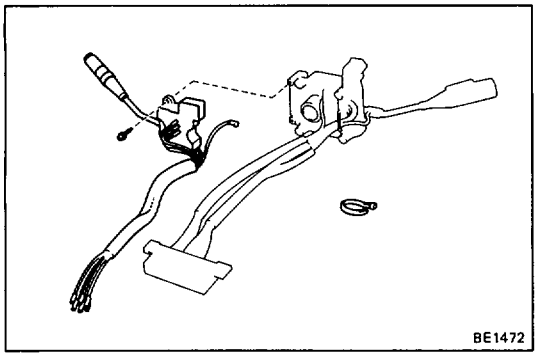
(c) Connect the positive (+) lead from the battery to terminal 17 and the negative (–) lead to terminal 14.

(d) Connect the positive (+) lead from the voltmeter to terminal 21 and the negative (–) lead to terminal 14. Check that the meter needle indicates battery voltage.

(e) After connecting terminal 20 to terminal 17, connect it to terminal 14.
Then, check that the voltage rises from 0 volts to battery voltage with in the times show in the table.

INT time control switch position	Voltage
FAST	Approx. 3 sec. 
SLOW	12 ± 5 sec. 
Non variable type	4.1 ± 1 sec. 

If operation is not as specified, replace the wiper and washer switch.



REPLACEMENT OF WIPER AND WASHER SWITCH

REPLACE WIPER AND WASHER SWITCH

(a) Remove the terminals from the connector. (See pages BE-2, 3)

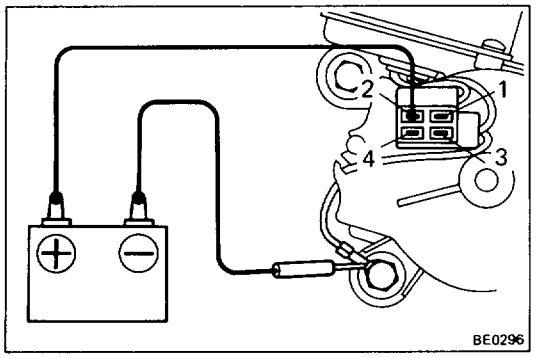
(b) Remove the terminal from the horn contact.

(c) Remove the front wiper and washer switch.

(d) Install the front wiper and washer switch.

(e) Install the terminal to the horn contact.

(f) Install the terminals to the connector. (See pages BE-3, 18)



Front Wiper Motor

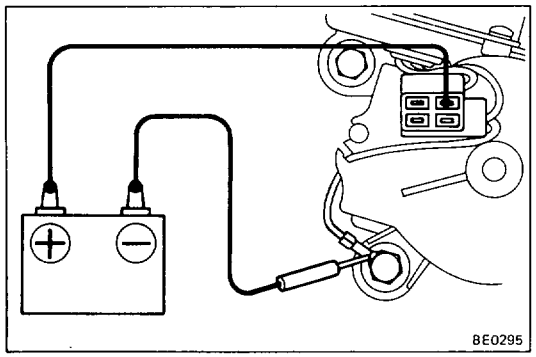
INSPECTION OF FRONT WIPER MOTOR

1. INSPECT THAT MOTOR OPERATES AT LOW SPEED

(a) Disconnect the connector from the wiper motor.

(b) Connect the positive (+) lead from the battery to terminal 2. Connect the negative (–) lead to the motor body.

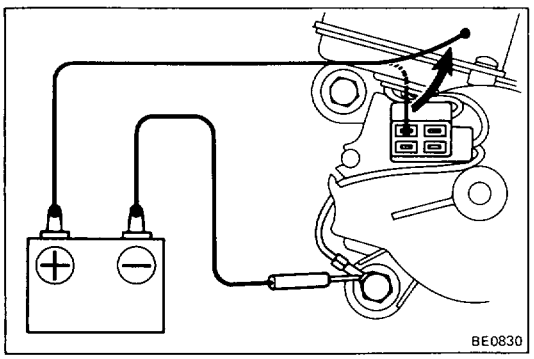
(c) Check that the motor operates at low speed.



2. INSPECT THAT MOTOR OPERATES AT HIGH SPEED

(a) Connect the positive (+) lead from the battery to terminal 1. Connect the negative (–) lead to the motor body.

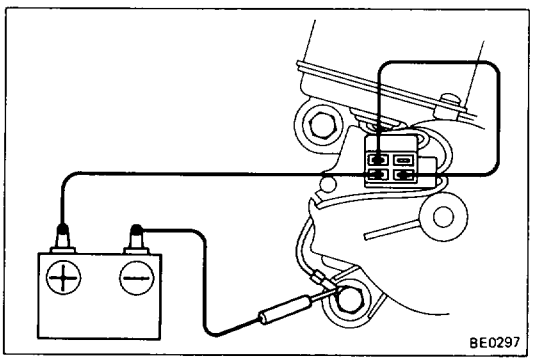
(b) Check that the motor operates at high speed.



3. INSPECT THAT MOTOR OPERATES, STOPPING AT STOP POSITION

(a) Operate the motor at low speed.

(b) Stop motor operation anywhere except the stop position by disconnecting terminal 2.

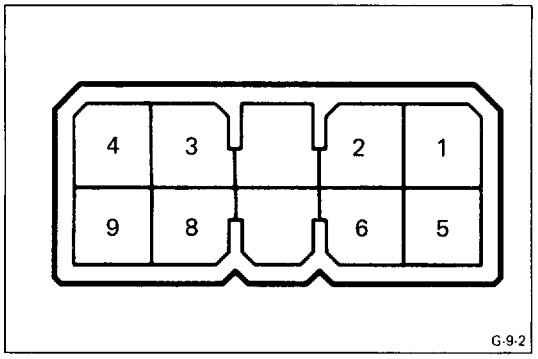


(c) Connect terminals 2 and 3.

(d) Connect the positive (+) lead from the battery to terminal 4. Connect the negative (–) lead to motor body.

(e) Check that the motor stops running at stop position after the motor operates again.

If operation is not as specified, replace the motor.



Rear Wiper and Washer Switch

INSPECTION OF REAR WIPER AND WASHER SWITCH

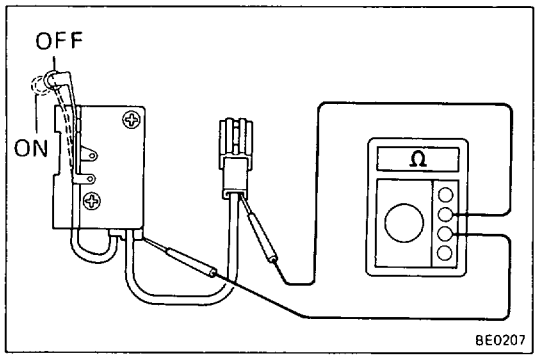
INSPECT SWITCH CONTINUITY

Inspect the continuity between terminals for each switch position shown in the table below.

Switch position \ Terminal	* 1	* 2	3	4	5	6	8	9
OFF	○—○		○		○	○		○
ON	○—○						○	○
Washer	○—○			○			○	○

*For illumination light

If continuity is not as specified, replace the switch or bulb.



Window Limit Switch

INSPECTION OF WINDOW LIMIT SWITCH

INSPECT SWITCH CONTINUITY

Using an ohmmeter, inspect the continuity between the terminal and body ground.

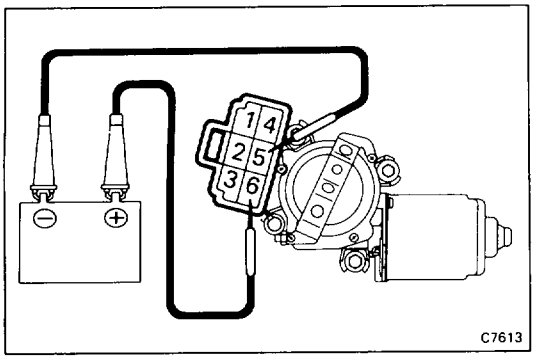
(a) Check that there is no continuity when the switch is pushed (OFF position).

(b) Check that there is continuity when the switch is free (ON position).

If continuity is not as specified, replace the switch.

Power Window and Wiper Relay

(See page BE-48)



Rear Wiper Motor

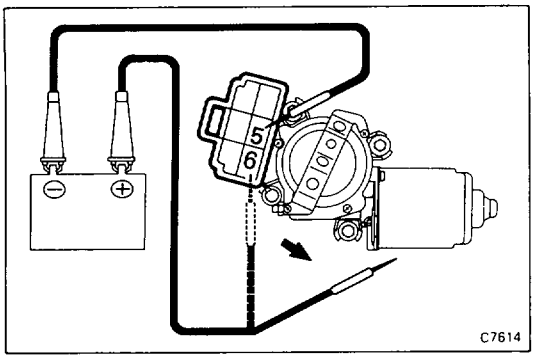
INSPECTION OF REAR WIPER MOTOR

1. INSPECT THAT MOTOR OPERATES

(a) Disconnect the connector from the wiper motor.

(b) Connect the positive (+) lead from the battery to terminal 6. Connect the negative (–) lead to terminal 5.

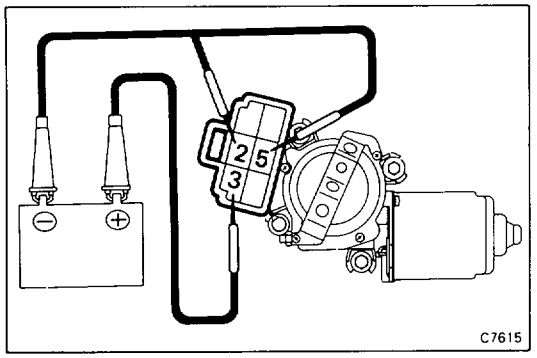
(c) Check that the motor operates.



2. INSPECT THAT MOTOR OPERATES, STOPPING AT STOP POSITION

(a) Operate the motor as above.

(b) Stop motor operation anywhere except the stop position by disconnecting terminal 6.



(c) Connect the positive (+) lead from the battery to terminal 3. Connect the negative (–) lead to terminal 5. Connect the terminals 2 and 5.

(d) Check that the motor stops running at stop position after the motor operates again.

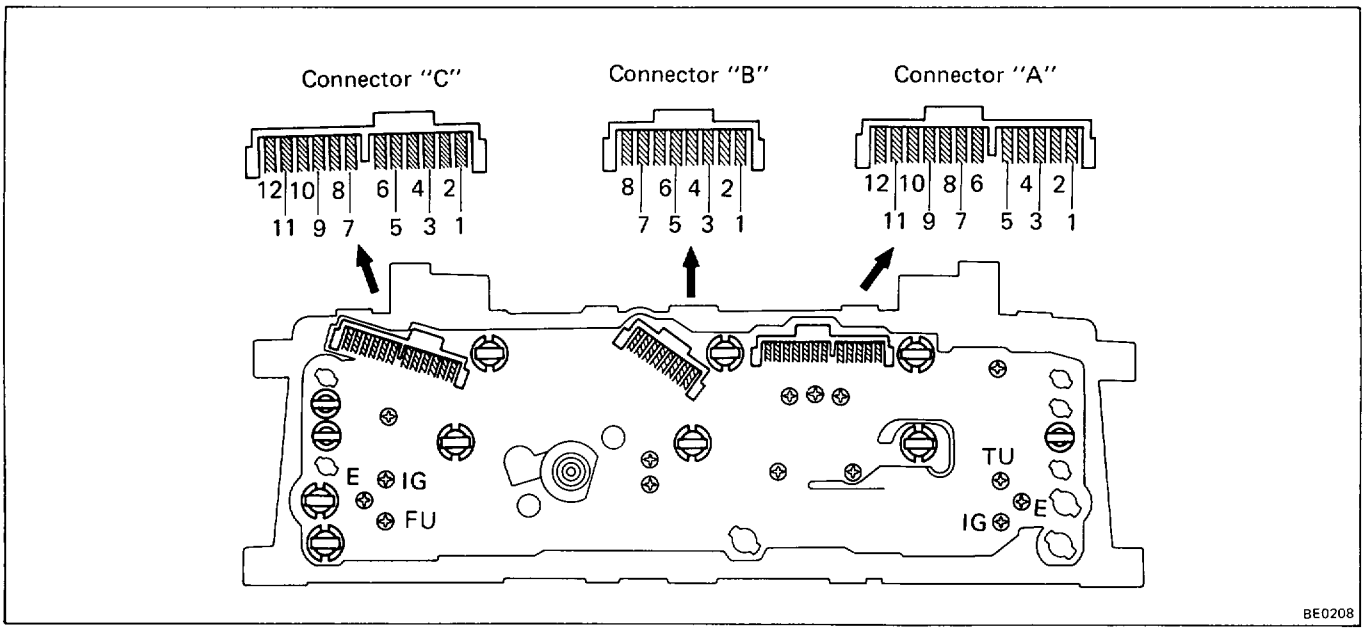
If operation is not as specified, replace the motor.

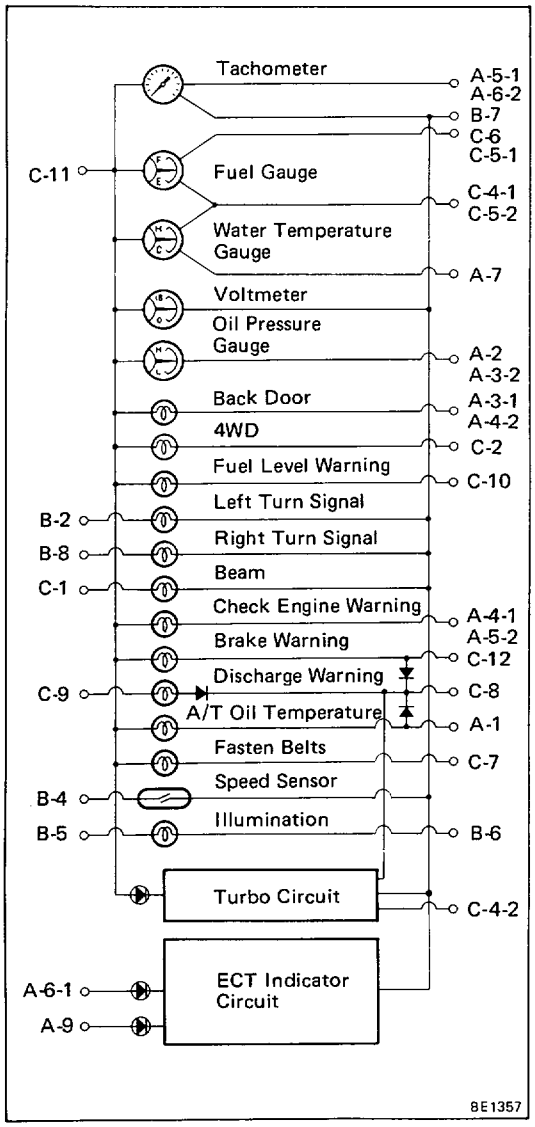
INSTRUMENTS, GAUGES AND WARNING LIGHTS

Troubleshooting

Problem	Possible cause	Remedy	Page
Voltmeter does not work	Fuses blown	Replace in-line fuse and check for short	
	Voltmeter faulty	Check voltmeter	BE-26
	Wiring or ground faulty	Repair as necessary	
Tachometer does not work	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Tachometer faulty	Check tachometer	BE-26
	Wiring or ground faulty	Repair as necessary	
Fuel gauge does not work	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Fuel receiver gauge faulty	Check gauge	BE-27
	Sender gauge faulty	Check sender gauge	BE-28
	Wiring or ground faulty	Repair as necessary	
Water temperature gauge does not work	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Water temperature gauge faulty	Check gauge	BE-29
	Water temperature sender gauge faulty	Check sender gauge	BE-30
	Wiring or ground faulty	Repair as necessary	
Brake warning light does not light	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Bulb burned out	Replace bulb	
	Brake fluid level warning switch faulty	Check switch	BE-31
	Parking brake switch faulty	Check switch	BE-31
	Wiring or ground faulty	Repair as necessary	
Low oil pressure warning light does not light	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Bulb burned out	Replace bulb	
	Oil pressure switch faulty	Check switch	BE-30
	Wiring or ground faulty	Repair as necessary	
Discharge warning light does not light	IGN fuse blown	Replace fuse and check for short	BE-4
	Bulb burned out	Replace bulb	
	Wiring or ground faulty	Repair as necessary	

Combination Meter and Gauge (w/ Tachometer)

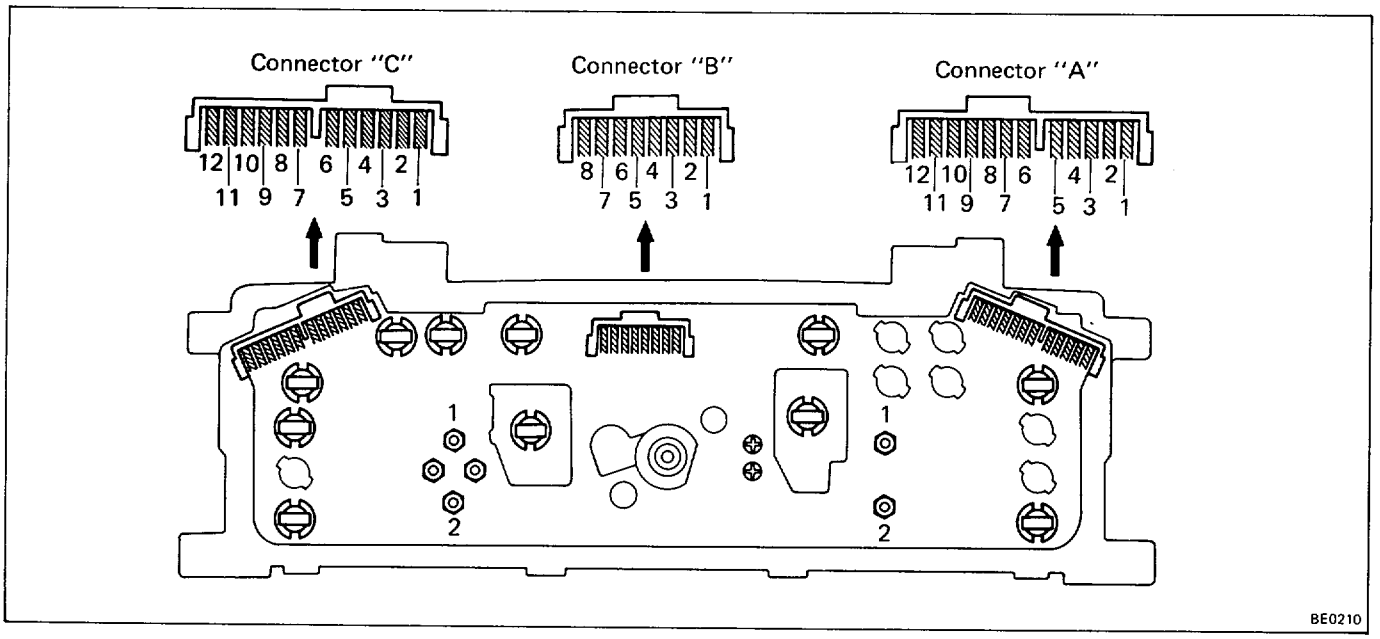


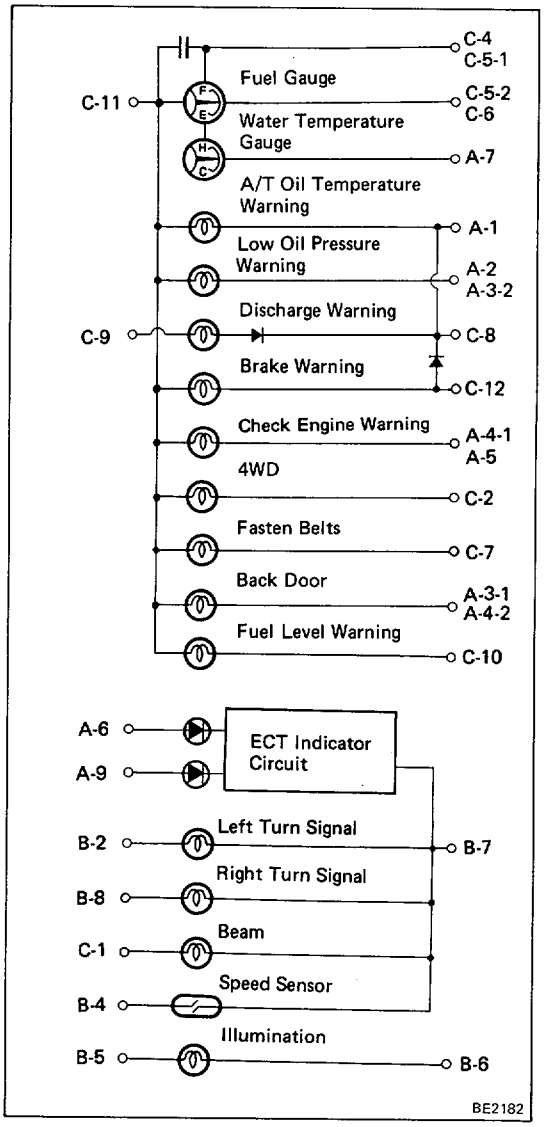


COMBINATION METER CIRCUIT

No.		Wiring connector side
A	1	(w/ ECT) A/T Oil Temperature Gauge
	2	(22R-TE or w/ ECT) Oil Pressure Sender Gauge
	3-1	(22R-TE or w/ ECT) Back Door Unlock Warning Switch and Door Lock Detection Switch
	3-2	(22R-E and w/o ECT) Oil Pressure Sender Gauge
	4-1	(22R-TE or w/ ECT) TCCS ECU
	4-2	(22R-E and w/o ECT) Back Door Unlock Warning Switch and Door Lock Detection Switch
	5-1	(22R-TE or w/ ECT) Ignition Coil
	5-2	(22R-E and w/o ECT) TCCS ECU
	6-1	(w/ ECT) ECT Select Switch NORMAL
	6-2	(22R-E and w/o ECT) Ignition Coil
	7	Water Temperature Sender Gauge
	9	(w/ ECT) ECT Select Switch POWER
B	2	Turn Signal Switch Terminal 9
	4	TCCS ECU and Cruise Control Computer Terminal 7
	5	TAIL Fuse
	6	Light Control Rheostat Terminal 1
	7	Ground
	8	Turn Signal Switch Terminal 8
C	1	Turn Signal Switch Terminal 6
	2	4WD Indicator Switch
	4-1	(22R-E and w/o ECT) Ground
	4-2	(22R-TE) TCCS ECU
	5-1	(22R-E and w/o ECT) Fuel Sender Gauge Terminal 1
	5-2	(22R-TE or w/ ECT) Ground
	6	(22R-TE or w/ ECT) Fuel Sender Gauge Terminal 1
	7	Seat Belt Warning Relay
	8	CHARGE Fuse
	9	IGN Fuse
	10	Fuel Level Warning Switch Terminal 2
	11	ENGINE Fuse
	12	Parking Brake Switch and Brake Fluid Level Warning Switch

Combination Meter and Gauge (w/o Tachometer)





COMBINATION METER CIRCUIT

No.		Wiring connector side
A	1	(w/ ECT) A/T Oil Temperature Gauge
	2	(w/ ECT) Oil Pressure Switch
	3-1	(w/ ECT) Back Door Unlock Warning Switch and Door Lock Detection Switch
	3-2	(w/o ECT) Oil Pressure Switch
	4-1	(w/ ECT) TCCS ECU
	4-2	(w/o ECT) Back Door Unlock Warning Switch and Door Lock Detection Switch
	5	(w/o ECT) TCCS ECU
	6	(w/ ECT) ECT Select Switch NORMAL
	7	Water Temperature Sender Gauge
	9	(w/ ECT) ECT Select Switch POWER
B	2	Turn Signal Switch Terminal 9
	4	TCCS ECU and Cruise Control Computer Terminal 7
	5	TAIL Fuse
	6	Light Control Rheostat Terminal 1
	7	Ground
	8	Turn Signal Switch Terminal 8
C	1	Turn Signal Switch Terminal 6
	2	4WD Indicator Switch
	4	(w/o ECT) Ground
	5-1	(w/ ECT) Ground
	5-2	(w/o ECT) Fuel Sender Gauge Terminal 1
	6	(w/ ECT) Fuel Sender Gauge Terminal 1
	7	Seat Belt Warning Relay
	8	CHARGE Fuse
	9	IGN Fuse
	10	Fuel Level Warning Switch Terminal 2
	11	ENGINE Fuse
	12	Parking Brake Switch and Brake Fluid Level Warning Switch

Speedometer

ON-VEHICLE INSPECTION OF SPEEDOMETER

(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

NOTE: Tire wear and tire over or under inflation will increase indication error.

Standard indication (km/h)	Allowable range (km/h)
20	18 – 23
40	40 – 44
60	60 – 64.5
80	80 – 85
100	100 – 105
120	120 – 125.5
140	140 – 146
160	160 – 167

Standard indication (mph)	Allowable range (mph)
20	20 – 23
40	40 – 43.5
60	60 – 64
80	80 – 84.5
100	100 – 105

(b) Check the speedometer for pointer vibration and abnormal noises.

NOTE: Pointer vibration can be caused by a loose speedometer cable.

Tachometer

ON-VEHICLE INSPECTION OF TACHOMETER

(a) Connect a tune-up test tachometer and start the engine.

(b) Compare the tester and tachometer indications.

If error is excessive, replace the tachometer.

CAUTION:

- **Reversing the connection of the tachometer will damage the transistors and diodes inside.**
- **When removing or installing the tachometer, be careful not to drop or subject it to severe impact.**

Standard indication (rpm)	700	3,000	5,000	7,000
Allowable range (rpm) 25°C DC 13 V	+50 −90	±150	±150	±210

Voltmeter

INSPECTION OF VOLTMETER

Compare the tester and voltmeter indications.

If error is excessive, replace the voltmeter.

Fuel Gauge

INSPECTION OF FUEL GAUGE

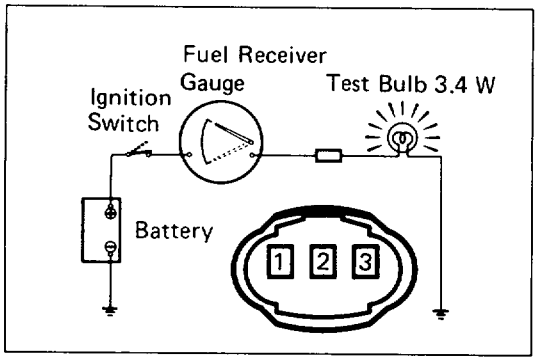
1. INSPECT RECEIVER GAUGE OPERATION (w/ Tachometer)

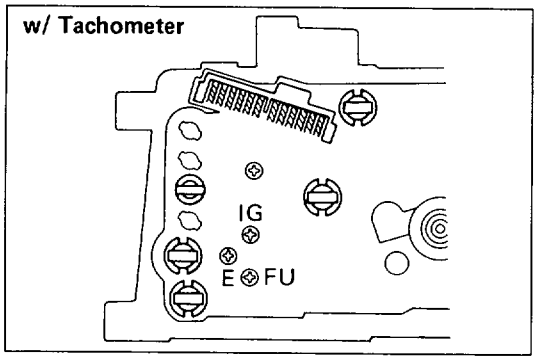
(a) Disconnect the connector from the fuel sender gauge. Turn the ignition switch on. Check that the receiver gauge needle moves to the empty position.

(b) Connect a 3.4 W bulb between terminal 1 and body ground. Check that the bulb lights and that the receiver gauge needle operates.

NOTE: Because of the silicon oil in the gauge, it will take about 90 seconds for the needle to stabilize.

If indication is not correct, remove and test the receiver gauge.

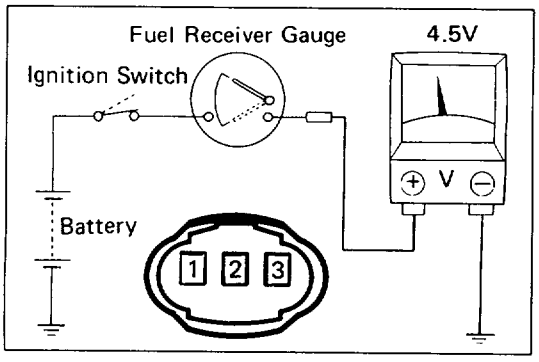




2. MEASURE RECEIVER GAUGE RESISTANCE BETWEEN TERMINALS (w/ Tachometer)

Between terminals	Resistance (Ω)
IG – FU	Approx. 83
FU – E	Approx. 156
IG – E	Approx. 239

If each resistance value is not as shown in the table above, replace the receiver gauge.

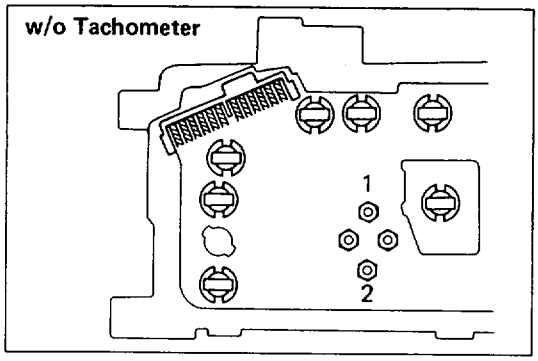


3. INSPECT RECEIVER GAUGE OPERATION (w/o Tachometer)

(a) Disconnect the connector from the fuel sender gauge. Connect the positive (+) lead from the voltmeter to terminal 1 and connect the negative (–) lead from the voltmeter to body ground.

(b) Turn the ignition switch on. Check that the meter needle vibrates near the 4.5V position.

If voltage is not correct, remove and test the receiver gauge.

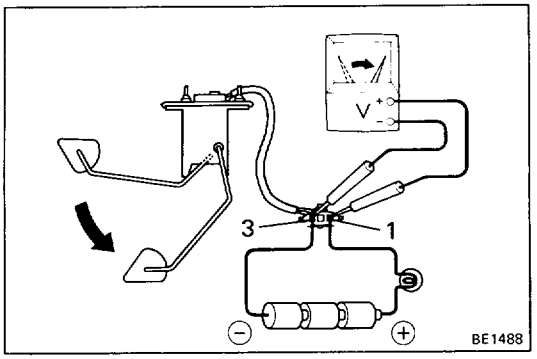


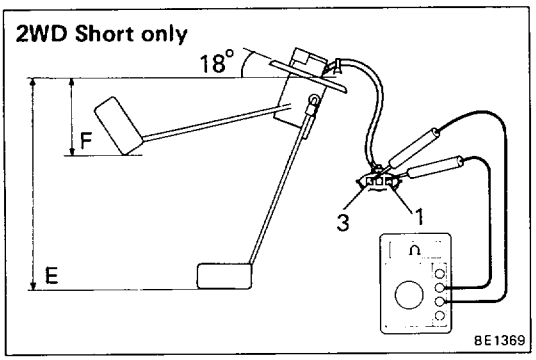
4. MEASURE RECEIVER GAUGE RESISTANCE (w/o Tachometer)

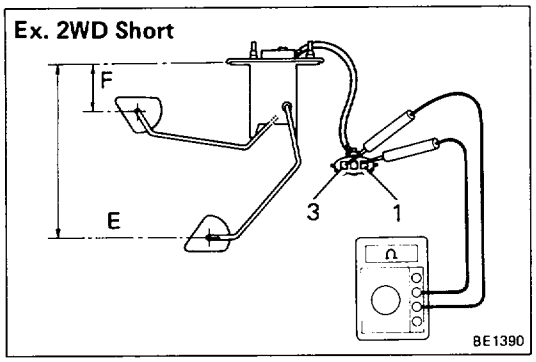
Using an ohmmeter, measure the resistance between terminals 1 and 2.

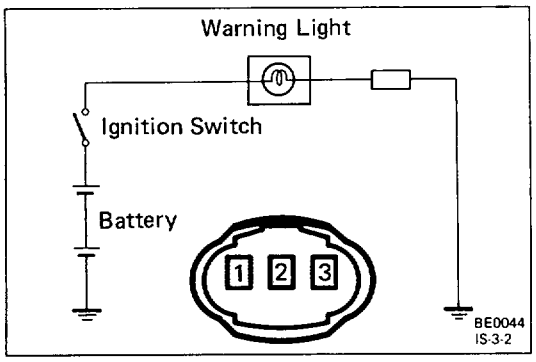
Resistance: Approx. 55 Ω

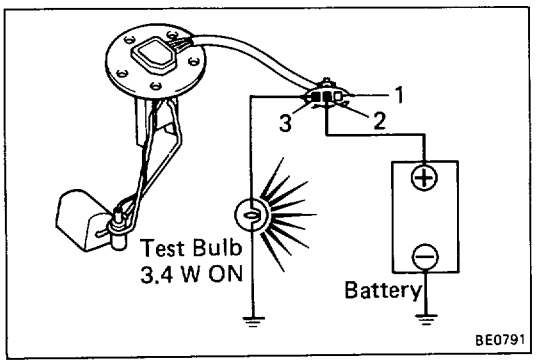
If resistance value is not as specified, replace the receiver gauge.











5. INSPECT SENDER GAUGE OPERATION

(a) Connect a series of three 1.5 V dry cell batterys.

(b) Connect the positive (+) lead from the dry cell batterys to terminal 1 through a 3.4 W test bulb and the negative (–) lead to terminal 3.

(c) Check that the voltage rises between terminals 1 and 3 as the float is moved from the top to bottom position.

(d) Measure the resistance between terminals 1 and 3 for each float position.

2WD

	Float position mm (in.)		Resistance (Ω)
	Short deck	Long deck	
F	78.6 (3.094)	93.6 (3.685)	3^{+2}_{-3}
E	257.1 (10.122)	278.6 (10.968)	110 ± 7.7

4WD

	Float position mm (in.)		Resistance (Ω)
	65 liters	73 liters	
F	105.7 (4.161)	114.3 (4.500)	3^{+2}_{-3}
E	288.2 (11.346)	317.1 (12.484)	110 ± 7.7

If each resistance value is not as shown in the table above, replace the sender gauge.

Fuel Level Warning

INSPECTION OF FUEL LEVEL WARNING

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the fuel level warning switch. Ground the terminal 2.

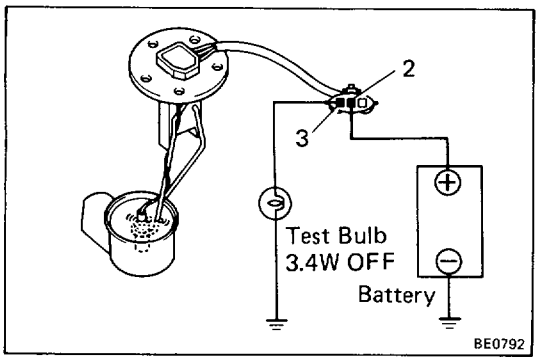
(b) Turn the ignition switch on. Check that the bulb lights.

If operation is not correct, remove and test the bulb.

2. INSPECT LEVEL WARNING SWITCH OPERATION

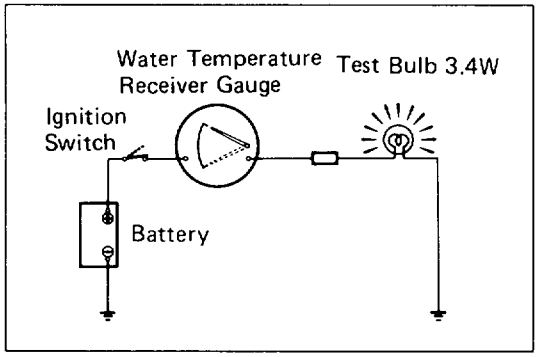
(a) Apply battery voltage between terminals 2 and 3 through a 3.4W bulb. Check that the bulb lights.

NOTE: It will take a short time for the bulb light.



(b) Submerge the switch in gasoline. Check that the bulb goes out.

If operation is not correct, replace the sender gauge.



Water Temperature Gauge

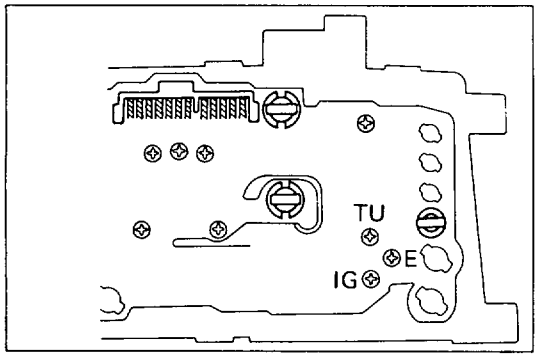
INSPECTION OF WATER TEMPERATURE GAUGE

1. INSPECT RECEIVER GAUGE OPERATION (w/ Tachometer)

(a) Disconnect the connector from the sender gauge. Ground the terminal through a 3.4 W bulb as shown.

(b) Turn the ignition switch on. Check that the bulb lights and that the receiver gauge needle operates.

If indications are not correct, remove and test the receiver gauge.

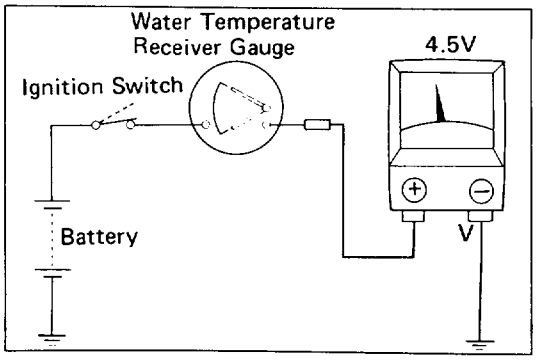


2. MEASURE RECEIVER GAUGE RESISTANCE (w/ Tachometer)

Measure the resistance between terminals.

If each resistance value is not as shown in the table below, replace the receiver gauge.

Between terminals	Resistance (Ω)
IG – TU	Approx. 135
TU – E	Approx. 138
IG – E	Approx. 273

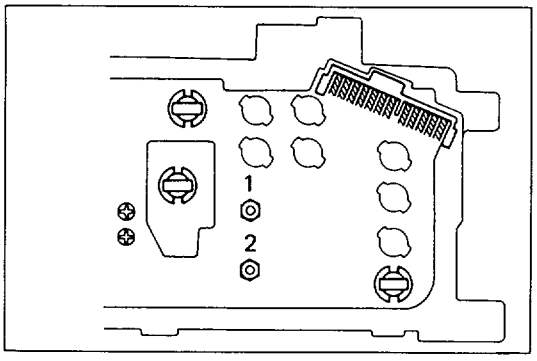


3. INSPECT RECEIVER GAUGE OPERATION (w/o Tachometer)

(a) Disconnect the connector from the sender gauge. Connect the positive (+) lead from the voltmeter to terminal and connect the negative (–) lead from the voltmeter to body ground.

(b) Turn the ignition switch on. Check that the meter needle vibrates near the 4.5 V position.

If voltage value is not correct, remove and test the receiver gauge.

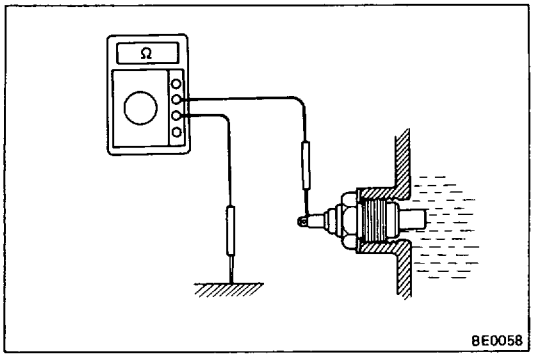


4. MEASURE RECEIVER GAUGE RESISTANCE (w/o Tachometer)

Measure the resistance between terminals 1 and 2.

Resistance: Approx. 25Ω

If resistance value is not correct, replace the receiver gauge.

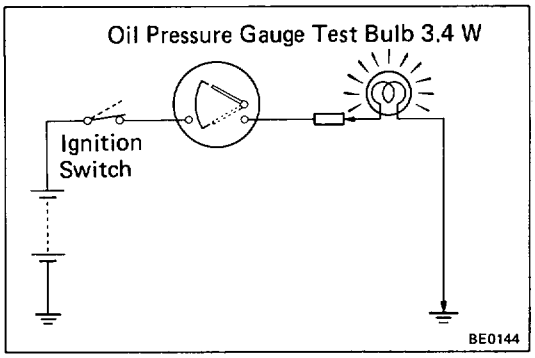


5. MEASURE SENDER GAUGE RESISTANCE

Measure the resistance between the terminal and body ground.

If each resistance value is not as shown in the table below, replace the sender gauge.

Water temperature °C (°F)	Resistance (Ω)
60 (140)	$146.6^{+26.5}_{-4.0}$
115 (239)	$24.3^{+1.3}_{-1.8}$



Oil Pressure Gauge

INSPECTION OF OIL PRESSURE GAUGE

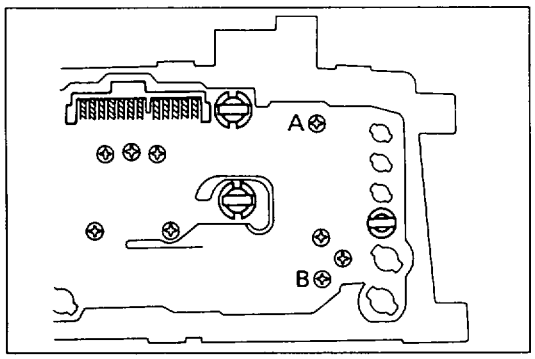
1. INSPECT RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

(b) Turn the ignition switch on. Check that the receiver gauge needle moves to the low position.

(c) Ground the terminal on the wire harness side connector through a 3.4 W test bulb. Check that the receiver gauge needle moves to the high side.

If operation is not as specified, replace the receiver gauge.

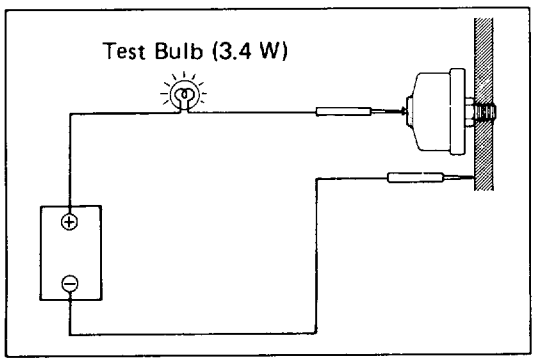


2. MEASURE RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals A and B.

Resistance: Approx. 44 Ω

If resistance value is not correct, replace the receiver gauge.

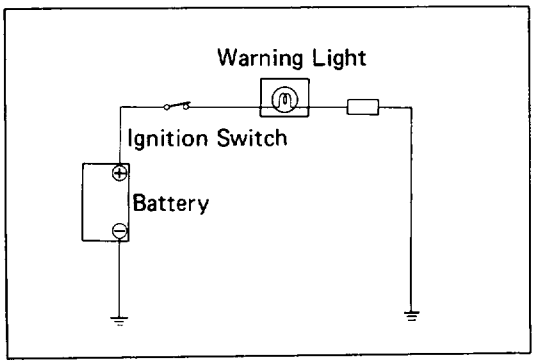


3. INSPECT SENDER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

(b) Connect a 12 V battery to the sender gauge terminal in series with a 3.4 W bulb. Check that the bulb does not light when the engine is stopped, and flashes when the engine is running. The number of flashes should vary with engine speed.

If operation is not correct, replace the sender gauge.



Low Oil Pressure Warning

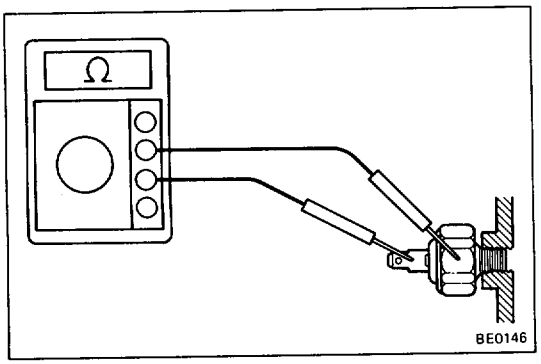
INSPECTION OF LOW OIL PRESSURE WARNING

1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connector from the switch. Connect the switch terminal and body ground.

(b) Turn the ignition switch on. Check that the bulb lights.

If operation is not correct, remove and test the bulb.



2. INSPECT SWITCH OPERATION

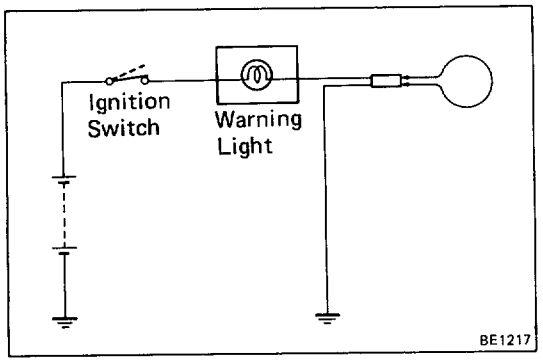
Check the continuity between the terminal and body ground.

(a) Check that there is continuity with the engine stopped.

(b) Check that there is no continuity with the engine running.

NOTE: After the engine has started, oil pressure should rise over 0.2 kg/cm² (2.8 psi, 20 kPa).

If operation is not correct, replace the switch.



Brake Warning

INSPECTION OF BRAKE WARNING

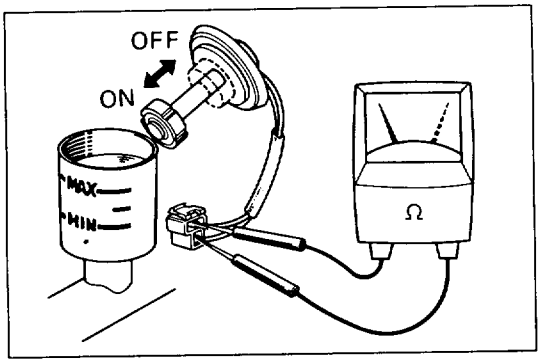
1. INSPECT WARNING LIGHT OPERATION

(a) Disconnect the connectors from the level warning switch and parking brake switch.

(b) Connect the terminals on the wire harness side of the level warning switch connector.

(c) Remove the CHARGE fuse and turn the ignition switch ON. Check that the warning light lights.

If the warning light does not light, test the bulb.

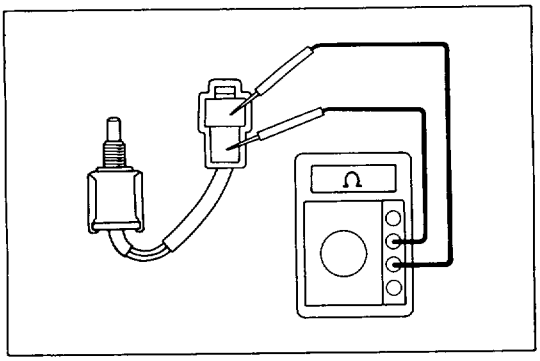


2. INSPECT OPERATION OF BRAKE FLUID LEVEL WARNING SWITCH

(a) Check that there is no continuity between terminals with the switch OFF (float up).

(b) Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.



3. INSPECT OPERATION OF PARKING BRAKE SWITCH

Check the continuity between the terminals.

(a) Check that there is continuity when the switch is free (Parking brake lever pulled)

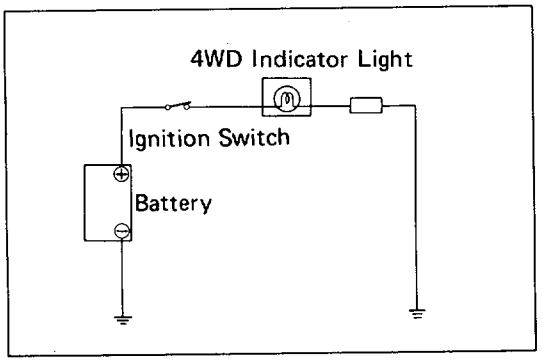
(b) Check that there is no continuity when the switch pin is pushed.
(Parking brake lever returned)

If operation is not correct, replace the switch.

4WD Indicator

INSPECTION OF 4WD INDICATOR

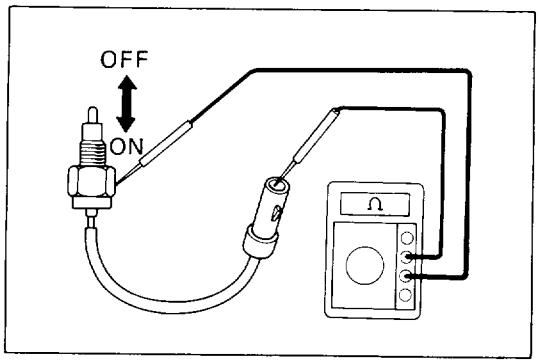
1. INSPECT INDICATOR LIGHT OPERATION



(a) Disconnect the connector from the 4WD indicator switch. Connect the switch terminal and body ground.

(b) Turn the ignition switch on. Check that the bulb lights.

If operation is not correct, remove and test the bulb.



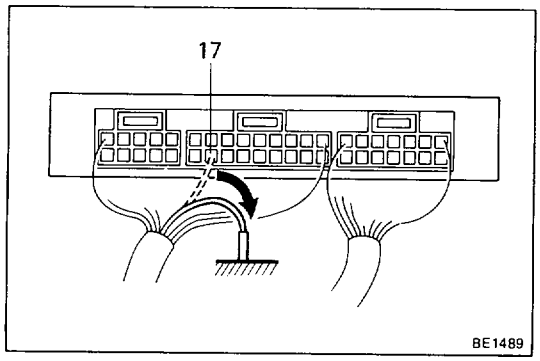
2. INSPECT 4WD INDICATOR SWITCH OPERATION

Check the continuity between the terminal and body.

(a) Check that there is continuity when the switch pin is pushed.

(b) Check that there is no continuity when the switch is free.

If operation is not correct, replace the switch.



Turbocharger Indicator

INSPECTION OF TURBOCHARGER INDICATOR

1. INSPECT INDICATOR LIGHT OPERATION

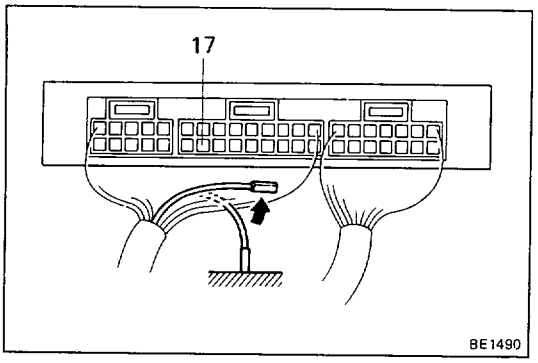
(a) Disconnect the terminal 17 from the TCCS ECU connector and ground it.

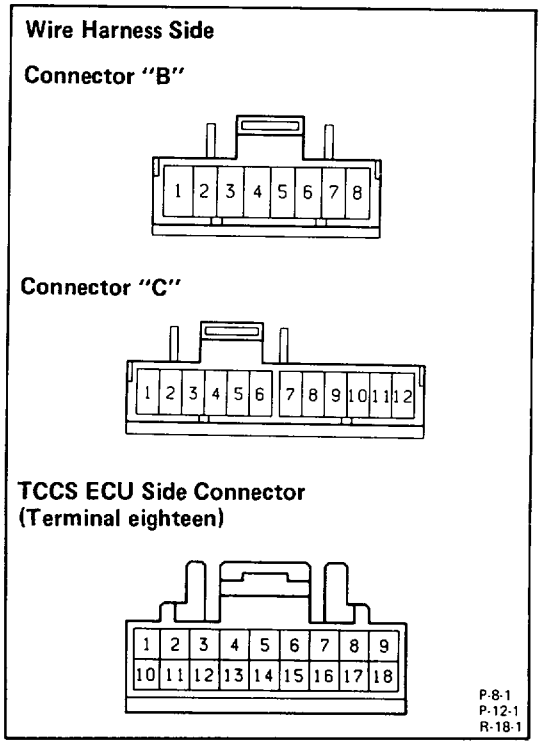
(b) Turn the ignition switch ON. Check that the indicator light lights.

(c) Remove CHARGE fuse. Check that the indicator light goes out.

(d) Disconnect the terminal 17 from the ground. Check that the indicator light lights.

If the operation is not as specified, inspect the indicator light circuit.



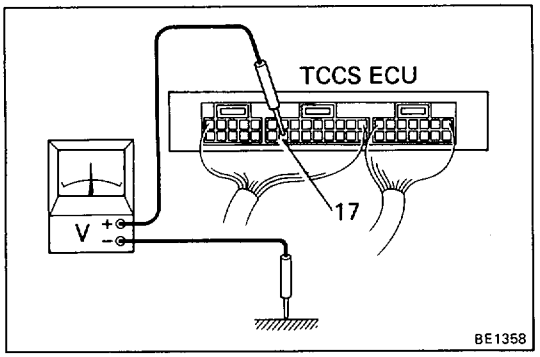


2. INSPECT INDICATOR LIGHT CIRCUIT

Disconnect the connectors from the combination meter and inspect the connectors on the wire harness side.

Check for	Tester connection	Condition	Specified value
Continuity	On the connector "B" 7 – Ground	———	Continuity
Voltage	On the connector "C" 11 – Ground	Ignition switch OFF or ACC	No voltage
		Ignition switch ON	Battery voltage
Continuity	On the connector "C" 4 – Ground	Disconnect the connector from the TCCS ECU	No continuity
		Ground the terminal 17 on the wire harness side	Continuity
Voltage	On the connector "C" 8 – Ground	Stopped engine	No voltage
		Engine running	Battery voltage

If circuit is as specified, replace the tachometer.



3. INSPECT TCCS ECU OPERATION

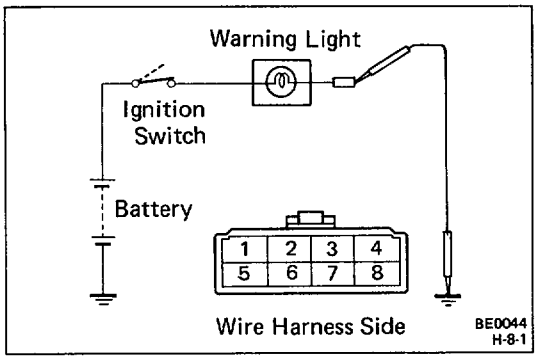
NOTE: Perform the voltage measurement with the connector connected.

(a) Connect the positive (+) lead from the voltmeter to terminal 17 and the negative (–) lead to ground.

(b) While accelerating with the throttle valve fully open after driving at a fixed speed at approx. 1,600 rpm. Check that the meter needle moves from 0V to 5V at approx. 2,400 rpm.

NOTE:
A/T... While shifting into "D" range, inspect the operation.
M/T... While shifting into "2nd" or upper shift position, inspect the operation.

If operation is not as specified, inspect the others voltage of the TCCS ECU. (See FI section on page FI-29)



Fasten Belt Warning

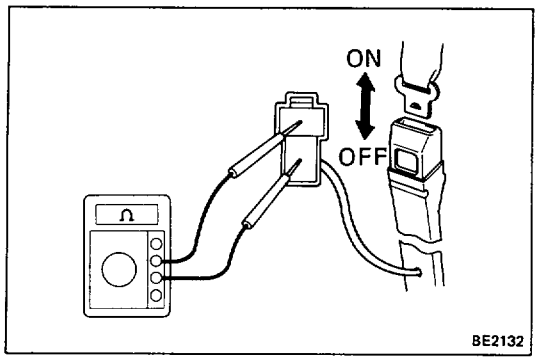
INSPECTION OF BELT WARNING

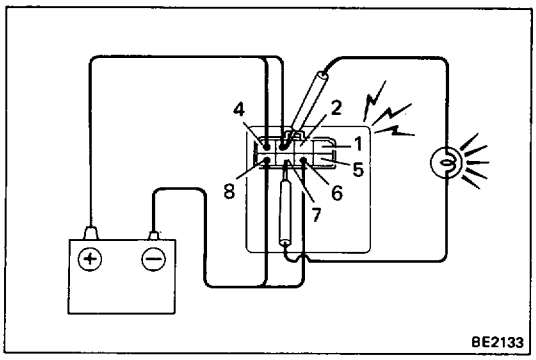
1. INSPECT WARNING LIGHT OPERATION

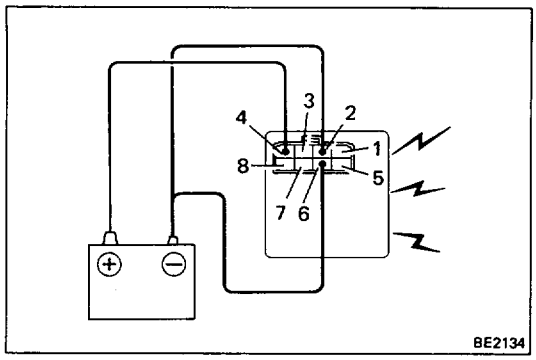
(a) Disconnect the connector from the seat belt warning relay and ground the terminal 7 on the wire harness side.

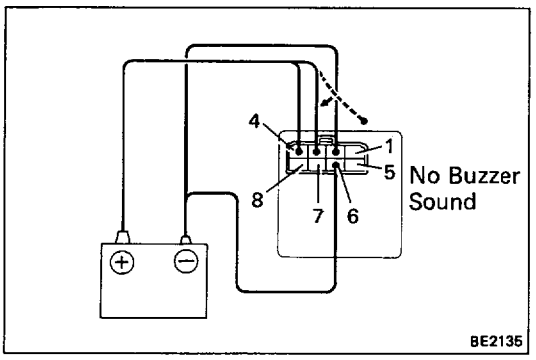
(b) Turn the ignition switch ON, check that the warning light lights.

If warning light does not light, test the bulb.









2. **INSPECT BUCKLE SWITCH OPERATION**

(a) Disconnect the connector from the switch.

(b) Check that there is no continuity between terminals on the switch side connector with the fasten belt.

(c) Check that there is continuity between terminals on the switch side connector with the unfasten belt.

If operation is not as specified, replace the seat belt inner.

3. **INSPECT UNLOCK WARNING SWITCH OPERATION (See page BE-11)**

If operation is not as specified, replace the switch.

4. **INSPECT SEAT BELT WARNING RELAY OPERATION (Seat belt warning circuit)**

(a) Connect the positive (+) lead from the battery to terminals 3 and 4.

(b) Connect the terminal 3 to terminal 7 through the 3.4W test bulb.

(c) Connect the negative (–) lead from the battery to terminals 6 and 8.

(d) Check that the bulb lights and the buzzer sounds for 4 – 8 seconds.

If operation is not as specified, replace the relay.

5. **INSPECT SEAT BELT WARNING RELAY OPERATION (Key warning circuit)**

(a) Connect the positive (+) lead from the battery to terminal 4.

(b) Connect the negative (–) lead from the battery to terminals 2 and 6.

(c) Check that the buzzer sounds.

(d) Connect the positive (+) lead from battery to terminal 3.

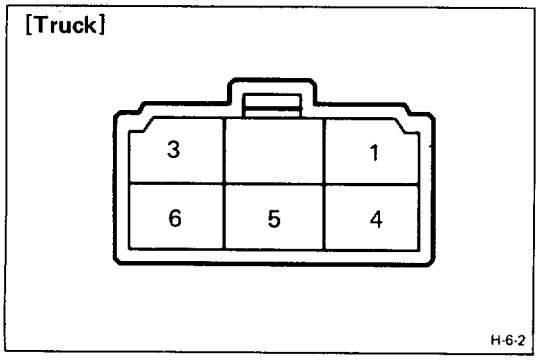
(e) Check that the buzzer stops sounding.

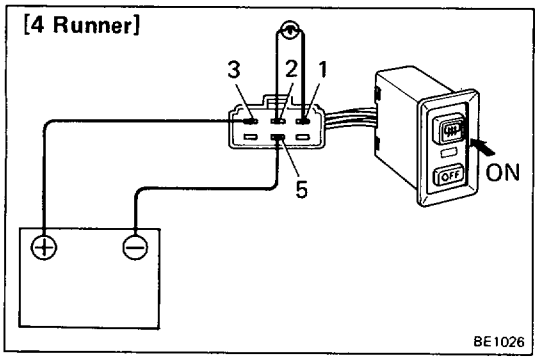
If operation is not as specified, replace the relay.

REAR WINDOW DEFOGGER

Troubleshooting

Problem	Possible cause	Remedy	Page
Rear window defogger does not work	Defogger switch faulty	Check switch	BE-35
	Defogger relay faulty	Check relay	BE-35
	Defogger wire broken	Check wires	BE-36
	Wiring and ground faulty	Repair as necessary	





Rear Window Defogger Switch

INSPECTION OF DEFOGGER SWITCH

[Truck]

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	3	1	5	Illumination 6	Illumination 4
OFF		○	○	○	○
ON	○	○	○	○	○

If continuity is not as specified, replace the switch or bulb.

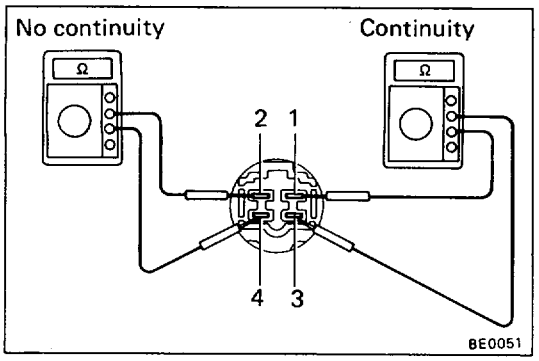
[4 Runner]

INSPECT SWITCH OPERATION

(a) Connect the positive (+) lead from the battery to terminal 3 and connect the negative (−) lead to terminal 5. Connect terminals 1 and 2 through a 3.4 W test bulb.

(b) Push the defogger switch on. Check that the bulb lights for 10 to 20 minutes, then the bulb goes out.

If operation is not as specified, replace the switch.



Rear Window Defogger Relay

INSPECTION OF REAR WINDOW DEFOGGER RELAY

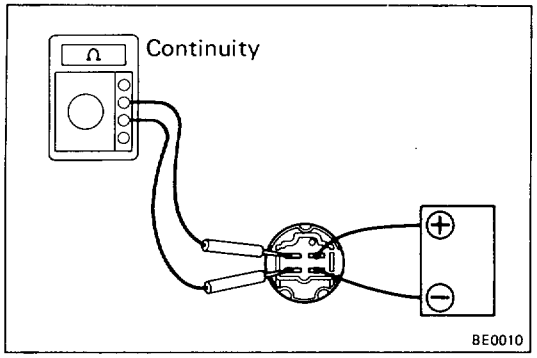
1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 1 and 4.

(c) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



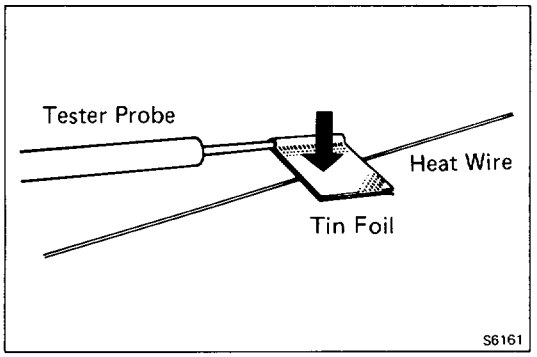
2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 2 and 3.

If operation is not as specified, replace the relay.



Rear Window Defogger Wires

CAUTION:

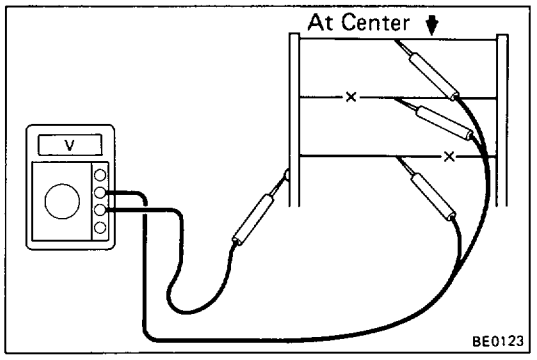
- **When cleaning the glass, use a soft, dry cloth, and wipe the glass in the direction of the wire. Take care not to damage the wires.**
- **Do not use detergents or glass cleaners with abrasive ingredients.**
- **When measuring voltage, wind a piece of tin foil around the tip of the negative probe and press the foil against the wire with your finger as shown.**

INSPECTION OF REAR WINDOW DEFOGGER WIRES

1. INSPECT FOR WIRE BREAKAGE

(a) Turn the ignition switch to ON.

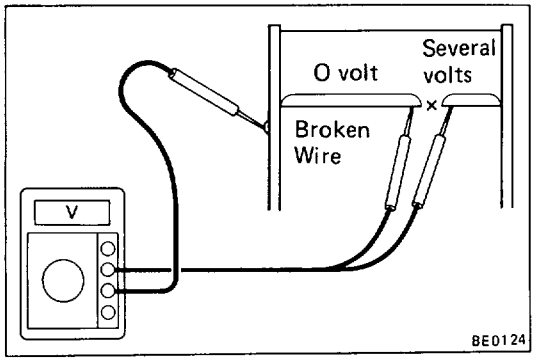
(b) Turn the defogger switch to ON.



(c) Inspect the voltage at the center of each heat wire as shown.

Voltage	Criteria
Approx. 5V	Okay (No break in wire)
Approx. 10V or 0V	Broken wire

NOTE: If there are 10V, the wire is broken between the center of the wire and positive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.



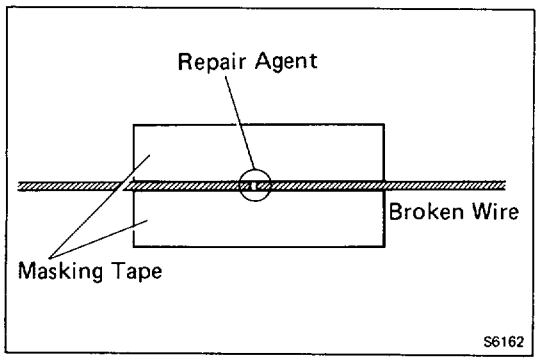
2. INSPECT FOR WIRE BREAKAGE POINT

(a) Place the voltmeter positive (+) lead against the defogger positive (+) terminal.

(b) Place the voltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (–) terminal end.

(c) The point where the voltmeter deflects from zero to several volts is the place where the heat wire is broken.

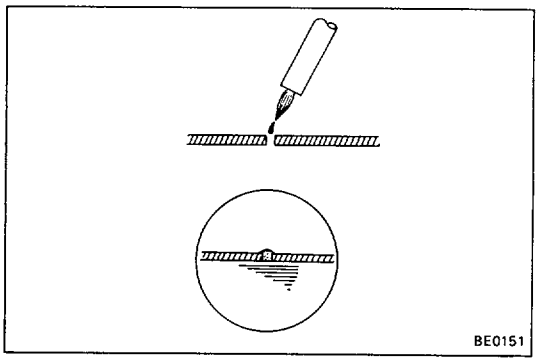
NOTE: If the heat wire is not broken, the voltmeter will indicate 0V at the positive (+) end of the heat wire but gradually increase to about 12V as the meter probe is moved to the other end.



REPAIR OF REAR WINDOW DEFOGGER WIRES

CAUTION: The defogger wire of the 4 RUNNER can not be repaired. If defogger wire is broken, replace the back door window glass assembly.

1. CLEAN BROKEN WIRE WITH CLEANER
2. PLACE MASKING TAPE ALONG BOTH SIDES OF WIRE TO BE REPAIRED

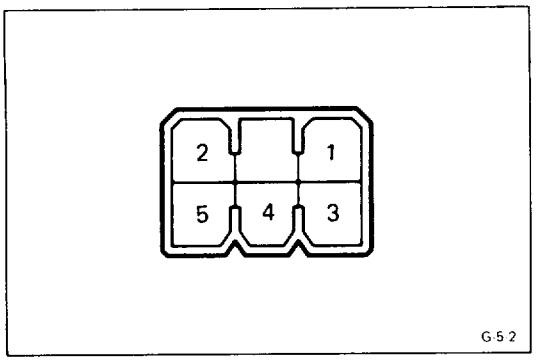


3. REPAIR DEFOGGER WIRES
   (a) Thoroughly mix the repair agent (Dupont paste No. 4817).
   (b) Using a fine tip brush, apply a small amount to the wire.
   (c) After a few minutes, remove the masking tape.
   (d) Allow to stand at least 24 hours.

HEATER

Troubleshooting

Problem	Possible cause	Remedy	Page	
			Front	Rear
Blower does not work when fan switch is on	HEATER fuse blown	Replace fuse and check for short	BE-4	BE-4
	Heater relay faulty	Check relay	BE-38	BE-40
	Heater blower switch faulty	Check switch	BE-38	BE-40
	Heater blower resistor faulty	Check resistor	BE-39	BE-41
	Heater blower motor faulty	Replace motor		
	Wiring or ground faulty	Repair as necessary		
Incorrect temperature output	Control cables broken or binding	Check cables	BE-39	
	Heater hoses leaking or clogged	Replace hoses		
	Water valve faulty	Replace valve		
	Air dampers broken	Repair dampers		
	Air ducts clogged	Repair ducts		
	Heater radiator leaking or clogged	Replace radiator		
	Heater control unit faulty	Repair control unit		



Heater Blower Switch

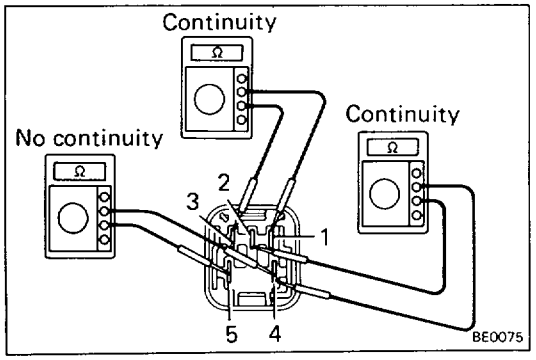
INSPECTION OF HEATER BLOWER SWITCH

INSPECT SWITCH CONTINUITY

Inspect the heater blower switch continuity.

Switch position \ Terminal	4	5	3	1	2
OFF	○				
LO	○	○			
•	○	○	○		
●	○	○		○	
HI	○	○			○

If continuity is not as specified, replace the switch.



Heater Relay

INSPECTION OF HEATER RELAY

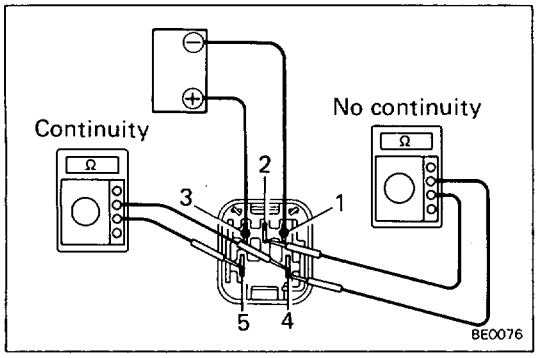
1. **INSPECT RELAY CONTINUITY**

   (a) Check that there is continuity between terminals 1 and 3.

   (b) Check that there is continuity between terminals 2 and 4.

   (c) Check that there is no continuity between terminals 4 and 5.

   If continuity is not as specified, replace the relay.



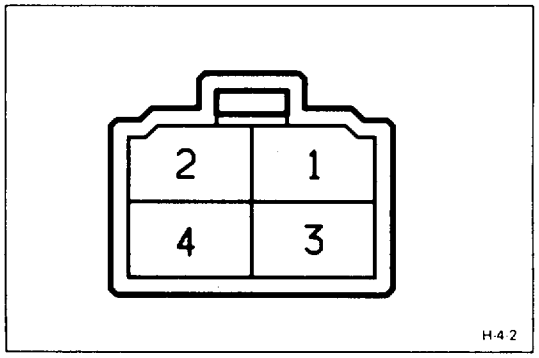
2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Check that there is continuity between terminals 4 and 5.

(c) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.



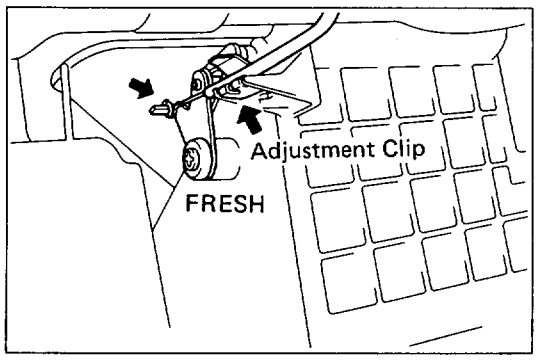
Heater Blower Resistor

INSPECTION OF HEATER BLOWER RESISTOR

INSPECT RESISTOR CONTINUITY

Check that there is continuity between terminals 2 and 4.

If continuity is not as specified, replace the resistor.

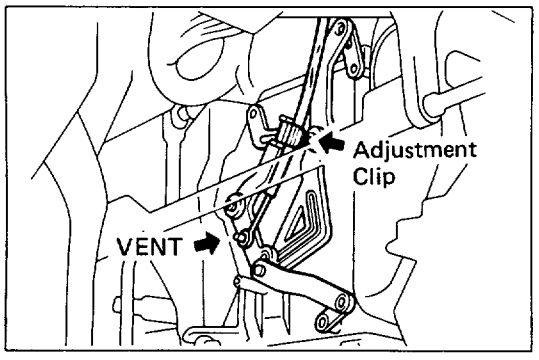


Heater Control

ADJUSTMENT OF HEATER CONTROL

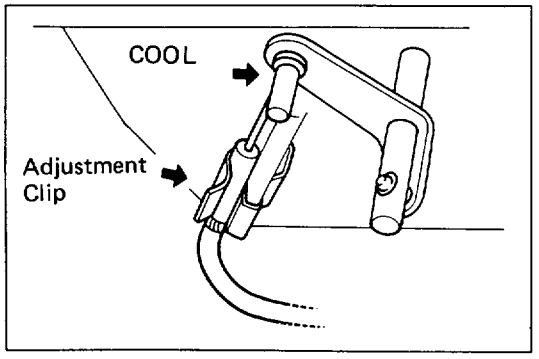
SET AIR INLET DAMPER

Set the air inlet damper and control lever to "FRESH."



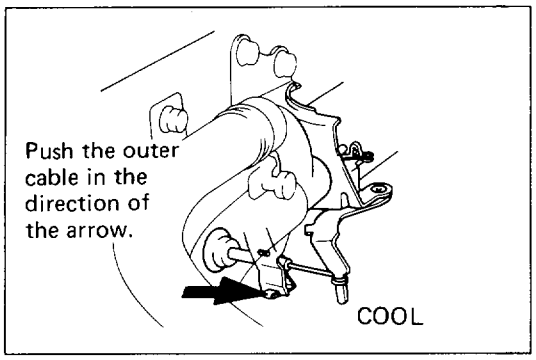
SET MODE SELECTOR DAMPER

Set the mode selector damper and control lever to "VENT."



SET AIR MIX DAMPER

Set the air mix damper and control lever to "COOL."



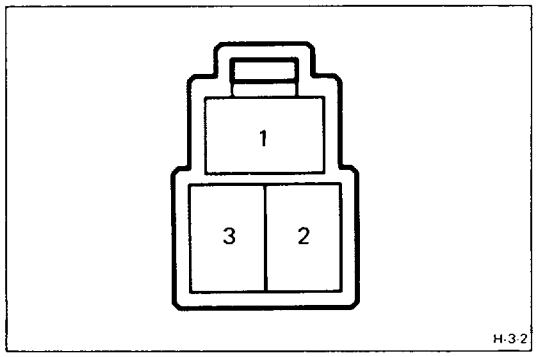
SET WATER VALVE

Set the water valve and control lever to "COOL."

NOTE: Place the water valve on "COOL" and while pushing the outer cable in the "COOL" direction, clamp the outer cable to the water valve bracket.

TEST CONTROL CABLE OPERATION

Move the control levers left and right and check for stiffness and binding through the full range of the levers.



Rear Heater Blower Switch

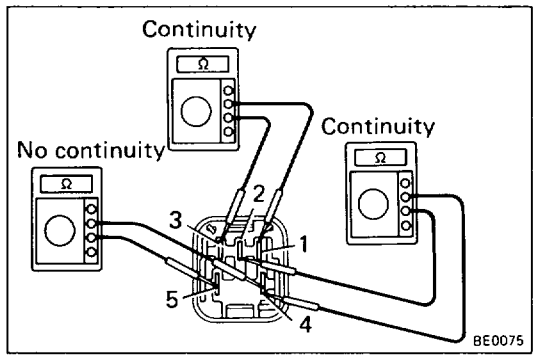
INSPECTION OF REAR HEATER BLOWER SWITCH

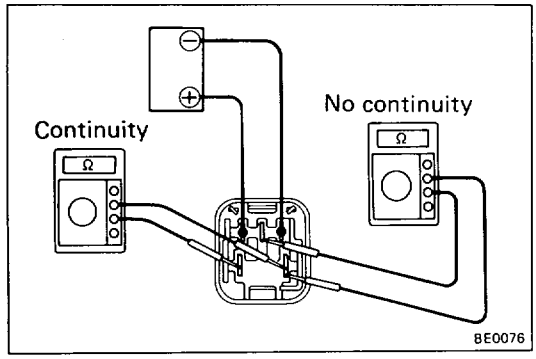
INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	1	2	3
HI	○	○	○
OFF			
LO	○	○	

If continuity is not as specified, replace the switch.





Rear Heater Relay

INSPECTION OF REAR HEATER RELAY

1. INSPECT RELAY CONTINUITY

(a) Check that there is continuity between terminals 1 and 3.

(b) Check that there is continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.

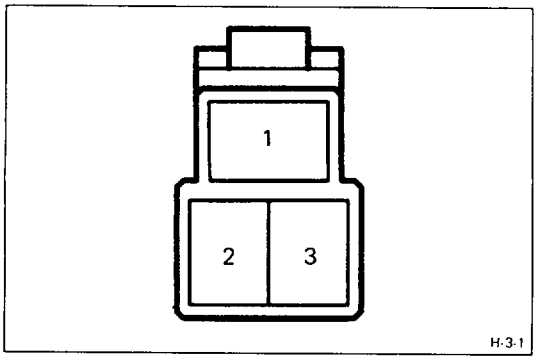
2. INSPECT RELAY OPERATION

(a) Apply the battery voltage across terminals 1 and 3.

(b) Check that there is continuity between terminals 4 and 5.

(c) Check that there is no continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.



Rear Heater Blower Resistor

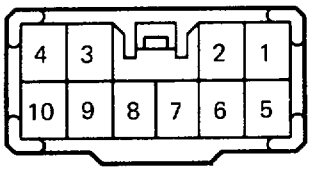
INSPECTION OF REAR HEATER BLOWER RESISTOR

INSPECT RESISTOR CONTINUITY

Check that there is continuity between terminals 1 and 2.

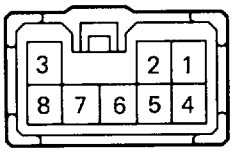
If continuity is not as specified, replace the resistor.

Armrest Type



S-10-2

Door Trim Type



S-8-2

POWER WINDOW

Power Window Master Switch

INSPECTION OF POWER WINDOW MASTER SWITCH

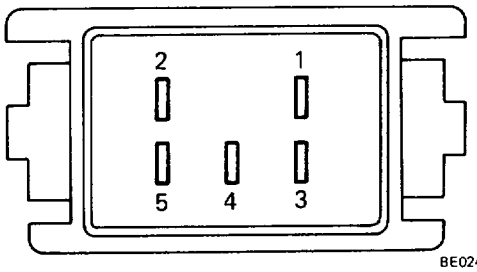
INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Armrest type terminal		1	10	4	5	1	9	4	6
Door trim type terminal		1	3	4	8	1	2	4	5
Switch position \ Operation window		Driver's side				Passenger's side			
Window unlock	UP	○—○		○—○		○—○		○—○	
	OFF		○—○	○—○			○—○	○—○	
	DOWN	○	○—○		○	○	○—○		○
Window lock	UP	○—○		○—○		○—○			
	OFF		○—○	○—○			○		○
	DOWN	○	○—○		○	○			○

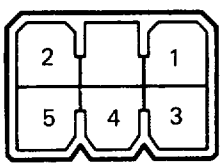
If continuity is not as specified, replace the switch.

Armrest Type



BE0242

Door Trim Type



G-5-2

Power Window Door Switch

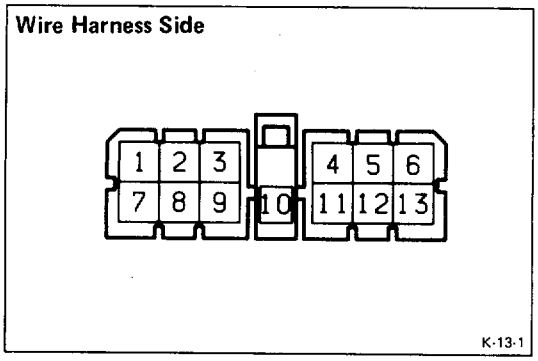
INSPECTION OF POWER WINDOW DOOR SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Armrest type terminal	5	1	4	3	2
Door trim type terminal / Switch position	2	1	5	4	3
UP	○—○		○—○		
OFF		○—○	○—○		○
DOWN	○	○—○			○

If continuity is not as specified, replace the switch.



Power Window and Door Lock Control Relay

ON-VEHICLE INSPECTION OF POWER WINDOW AND DOOR LOCK CONTROL RELAY

INSPECT RELAY CIRCUIT

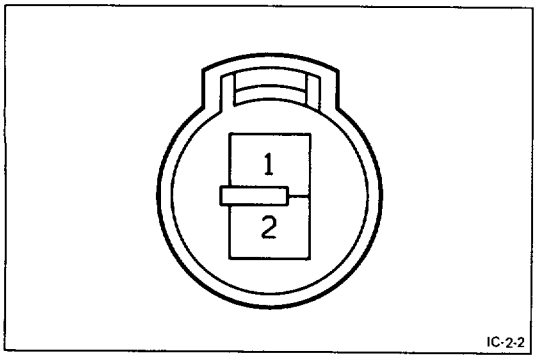
(a) Disconnect the relay connector and inspect the connector on the wire harness side as shown in the table below.

Check for	Tester connection	Condition	Specified value
Continuity	1 – Body ground	Turn door lock switch to UNLOCK.	Continuity
		Turn door lock switch to except UNLOCK.	No continuity
Voltage	2 – Body ground	—	Battery voltage
	5 – Body ground	—	Battery voltage
Continuity	7 – Body ground	Turn door lock switch to LOCK.	Continuity
		Turn door lock switch to except LOCK.	No continuity
Voltage	8 – Body ground	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
Continuity	9 – Body ground	Turn LH and/or RH door courtesy switch on.	Continuity
		Turn LH and RH door courtesy switch off.	No continuity
	10 – Body ground	—	Continuity
	12 – Body ground	Push the following switches, one by one to UP or DOWN • Master switch • Door switch (Window lock switch to unlock)	Continuity
		Push the master switch to neutral position	No continuity
		Push the door switch to neutral position or window lock switch to lock.	

(b) Connect the positive (+) lead from the battery to terminal 4. Connect the negative (–) lead to terminal 3. Check that the solenoid operates lock direction.

If circuit is correct, replace the relay.

Power Window Motor



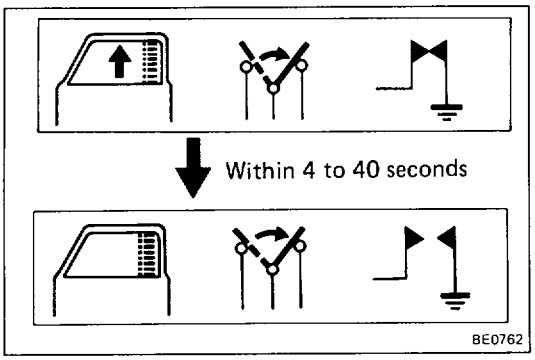
INSPECTION OF POWER WINDOW MOTOR

1. INSPECT MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, and check that the motor turns.

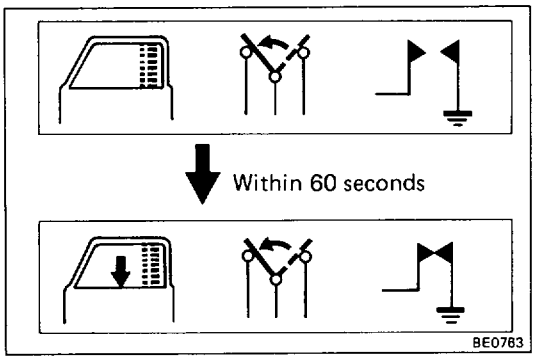
(b) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1, and check that the motor turns the opposite way.

If operation is not as specified, replace the motor.



2. INSPECT CIRCUIT BREAKER OPERATION

(a) With the window fully closed, hold the power window switch on "UP" and check that there is circuit breaker operation noise within 4 to 40 seconds.

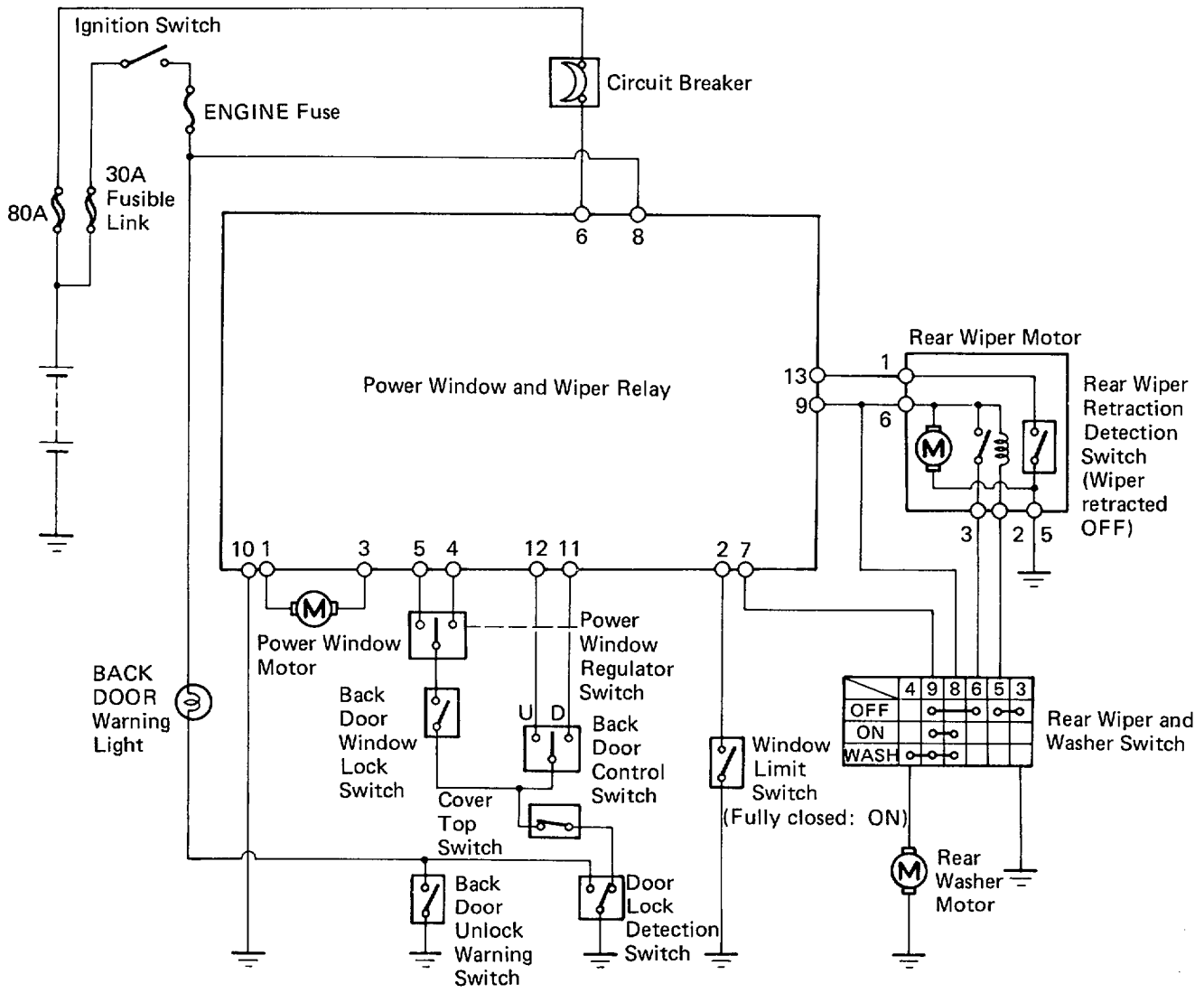


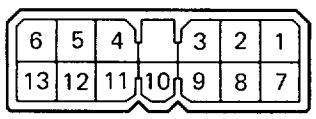
(b) With the window fully closed, hold the switch on "DOWN" and check that the window begins to descend within 60 seconds.

If operation is not as specified, replace the motor.

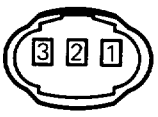
BACK DOOR POWER WINDOW

Wiring Diagram

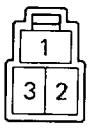




Power Window and Wiper Relay



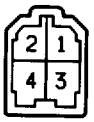
Door Lock Detection Switch



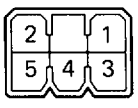
Cover Top Switch



Power Window Motor



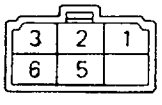
Back Door Window Lock Switch



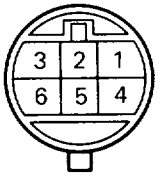
Power Window Regulator Switch



Back Door Unlock Warning Switch



Rear Wiper Retraction Detection Switch



Back Door Control Switch

BE0216

Troubleshooting

Problem	Possible cause	Remedy	Page
Power window does not work	Fusible link blown	Replace fusible link	
	Circuit breaker OFF	Reset breaker and check for short	BE-3
	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Power window and wiper relay faulty	Check relay	BE-48
	Power window regulator switch faulty	Check switch	BE-46
	Back door control switch faulty	Check switch	BE-47
	Cover top switch faulty	Check switch	BE-47
	Door lock detection switch faulty	Check switch	BE-47
	Power window motor faulty	Check motor	BE-48
	Rear wiper retraction detection switch faulty	Check switch	BE-48
	Wiring or ground faulty	Repair as necessary	
BACK DOOR warning light does not light (Ignition switch ON)	ENGINE fuse blown	Replace fuse and check for short	BE-4
	Light bulb burned out	Replace bulb	
	Door lock detection switch faulty (Back door opened)	Check switch	BE-47
	Back door unlock warning switch faulty (Back door unlocked)	Check switch	BE-48
	Wiring or ground faulty	Repair as necessary	

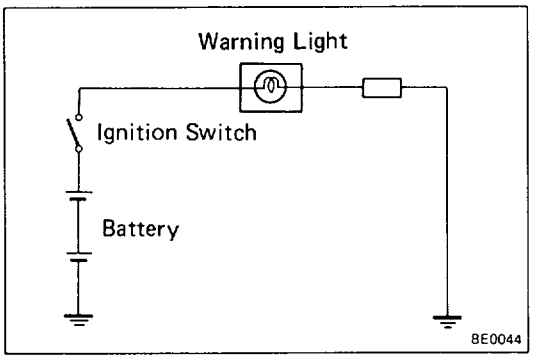
Back Door Warning Light

INSPECTION OF WARNING LIGHT

INSPECT WARNING LIGHT OPERATION

Disconnect the connector from the back door unlock warning switch. Connect the wire harness side connector and body ground. Turn the ignition switch on. Check that the bulb lights.

If operation is not as specified, remove and test the bulb.

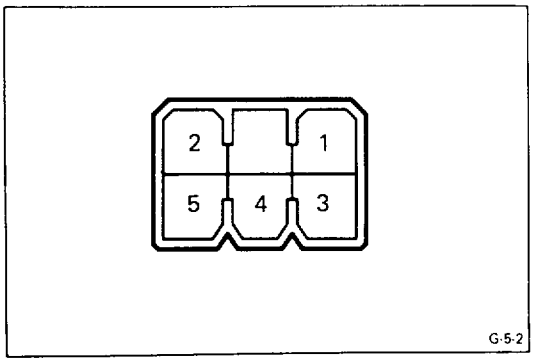


Power Window Regulator Switch

INSPECTION OF REGULATOR SWITCH

INSPECT SWITCH CONTINUITY

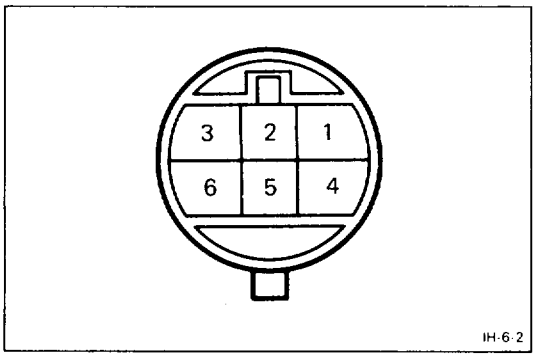
Inspect the switch continuity between terminals.



Switch position \ Terminal	1	2	5	* 3	* 4
UP		○—○		○	○
OFF				○	○
DOWN	○—○			○	○

*For illumination light

If continuity is not as specified, replace the switch.



Back Door Control Switch

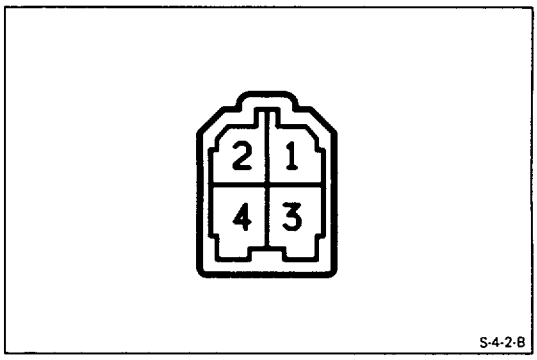
INSPECTION OF CONTROL SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	6	4	5
UP (Left)	○——	——○	
OFF			
DOWN (Right)	○—		—○

If continuity is not as specified, replace the switch.



Back Door Window Lock Switch

INSPECTION OF LOCK SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	2	4	1	3
Free	○——	——○	○—◎—	—○
Lock			○—◎—	—○

If continuity is not as specified, replace the switch.

Door Lock Detection Switch

INSPECTION OF LOCK DETECTION SWITCH

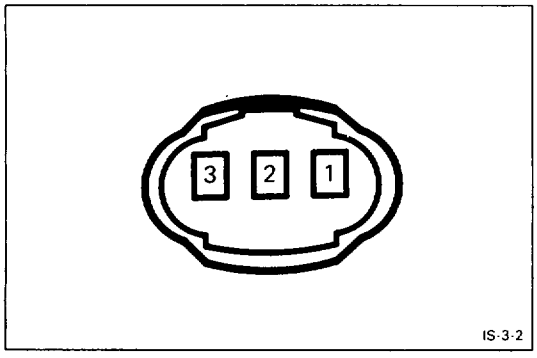
INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	1	2	3
Unlock (Back door opened)	○——	——○	
Locked (Back door closed)	○—		—○

NOTE: When the locked position, lock the left side back door lock assembly by push into the screwdriver or such to the lock assembly.

If continuity is not as specified, replace the switch.



Cover Top Switch

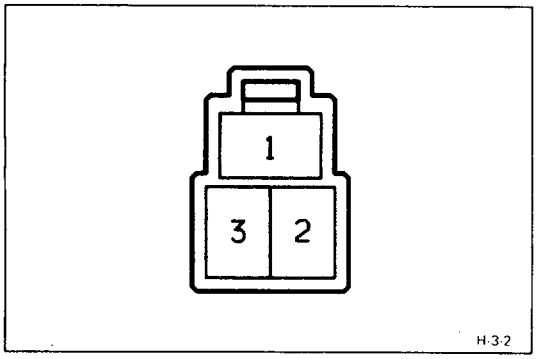
INSPECTION OF COVER TOP SWITCH

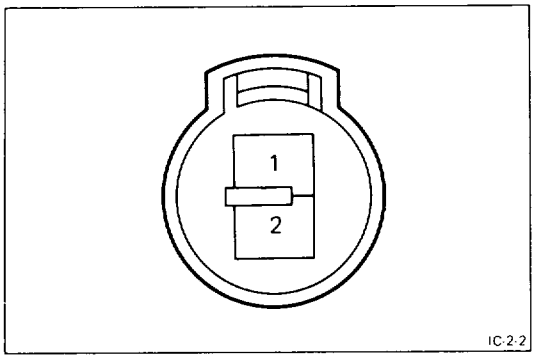
INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	1	2	3
Free	○——	——○	
Pushed		○—	—○

If continuity is not as specified, replace the switch.





Power Window Motor

INSPECTION OF MOTOR

INSPECT MOTOR OPERATION

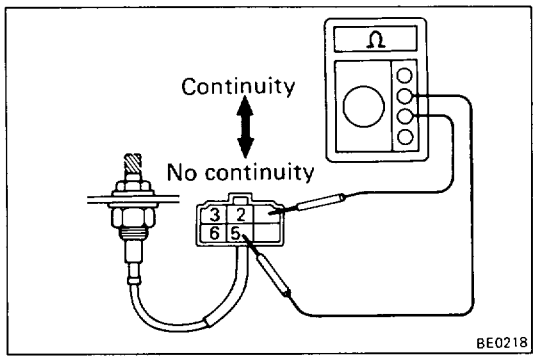
(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, and check that the motor turns.

(b) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1, and check that the motor turns the opposite way.

If operation is not as specified, replace the motor.

Window Limit Switch

(See page BE-21)



Rear Wiper Retraction Detection Switch

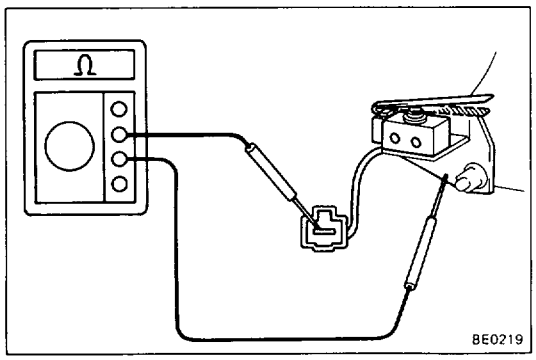
INSPECTION OF RETRACTION DETECTION SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity when the switch free (wiper operating).

(b) Check that there is no continuity when the switch pin pushed (wiper retracted).

If continuity is not as specified, replace the switch.



Back Door Unlock Warning Switch

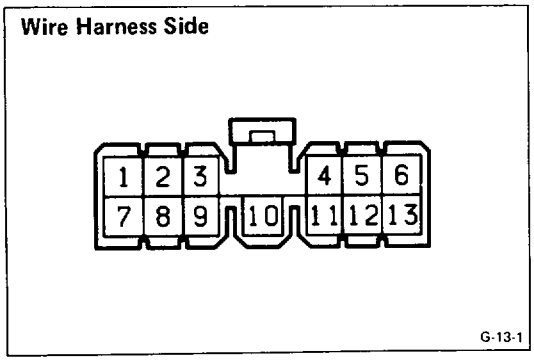
INSPECTION OF UNLOCK WARNING SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity when the switch pin pushed (back door unlock).

(b) Check that there is no continuity when the switch free (back door locked).

If continuity is not as specified, replace the switch.



Power Window and Wiper Relay

INSPECTION OF POWER WINDOW AND WIPER RELAY

INSPECT RELAY CONTINUITY AND VOLTAGE

(a) Disconnect the connector from the relay, and inspect the connector on the wire harness side shown in the chart.

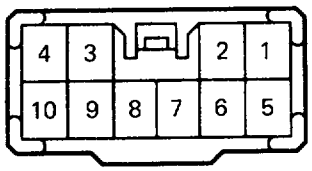
NOTE: Inspect the connector with the cover top installed (Cover top switch ON).

Check for	Tester connection	Condition	Specified value
Continuity	2 – Body ground	Window limit switch ON (Window fully closed)	Continuity
		Window limit switch OFF (Window open)	No continuity
	4 – Body ground	Door lock detection switch LOCKED (Back door close) and window regulator switch DOWN (Window down)	Continuity
		Door lock detection switch UNLOCK (Back door open) or window regulator switch not DOWN (Window not down)	No continuity
	5 – Body ground	Door lock detection switch LOCKED (Back door close) and window regulator switch UP (Window up)	Continuity
		Door lock detection switch UNLOCK (Back door open) or window regulator switch not UP (Window not up)	No continuity
Voltage	6 – Body ground	———	Battery voltage
Continuity	7 – 9	Rear wiper switch ON	Continuity
		Rear wiper switch OFF	No continuity
Voltage	8 – Body ground	Ignition switch ON	Battery voltage
		Ignition switch OFF	No voltage
Continuity	10 – Body ground	———	Continuity
	11 – Body ground	Door lock detection switch LOCKED (Back door close) and door control switch DOWN (Window down)	Continuity
		Door lock detection switch UNLOCK (Back door open) or door control switch not DOWN (Window not down)	No continuity
	12 – Body ground	Door lock detection switch LOCKED (Back door close) and door control switch UP (Window up)	Continuity
		Door lock detection switch UNLOCK (Back door open) or door control switch not UP (Window not up)	No continuity

(b) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 3, and check that the window motor turns. If does not operate, remove and test the motor.

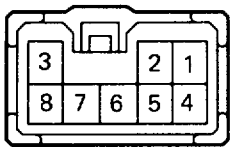
If circuit operation is correct, replace the relay.

Armrest Type

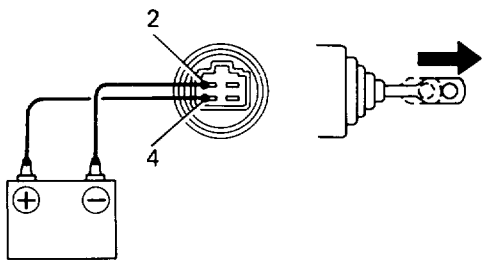


S10-2

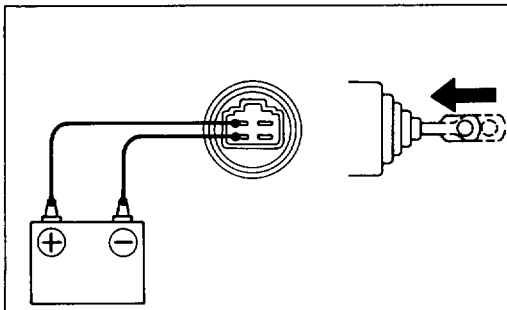
Door Trim Type



S8-2



BE1088



BE1087

DOOR LOCK CONTROL SYSTEM

Door Lock Control Switch

INSPECTION OF DOOR LOCK CONTROL SWITCH

Inspect the switch continuity between terminals.

Armrest type terminal	8	7	4
Door trim type terminal / Switch position	7	6	4
LOCK	○		○
OFF			
UNLOCK		○	○

If continuity is not as specified, replace the switch.

Power Window and Door Lock Control Relay

(See page BE-43)

Door Lock Solenoid

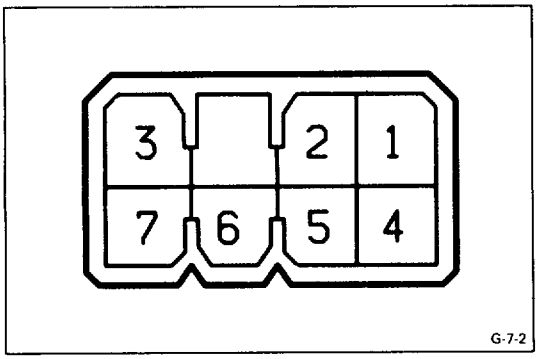
INSPECTION OF DOOR LOCK SOLENOID

INSPECT SOLENOID OPERATION

(a) Connect the positive (+) lead from the battery to terminal 4. Connect the negative (–) lead to terminal 2. Check that the solenoid operates unlock direction.

(b) Connect the positive (+) lead from the battery to terminal 2. Connect the negative (–) lead to terminal 4. Check that the solenoid operates lock direction.

If operation is not as specified, replace the solenoid.



REMOTE CONTROL MIRROR

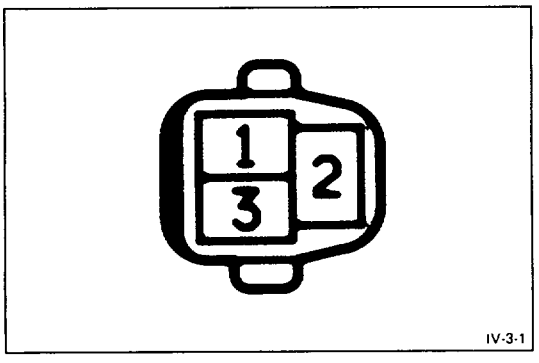
Mirror Switch

INSPECTION OF MIRROR SWITCH

INSPECT SWITCH CONTINUITY

Mirror	Left				Right				
Terminal / Switch position	7	6	1	2	3	2	1	5	4
UP	○——		——○	○——	——○	——○	○——		——○
DOWN	○——		——○	——○	——○	○——	——○		——○
LEFT		○——	——○	○——	——○	——○	○——	——○	
RIGHT		○——	——○	——○	——○	○——	——○	——○	

If continuity is not as specified, replace the switch.



Remote Control Mirror

ON-VEHICLE INSPECTION OF MIRROR

INSPECT RIGHT AND LEFT MIRROR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1. Check that the mirror moves upward.

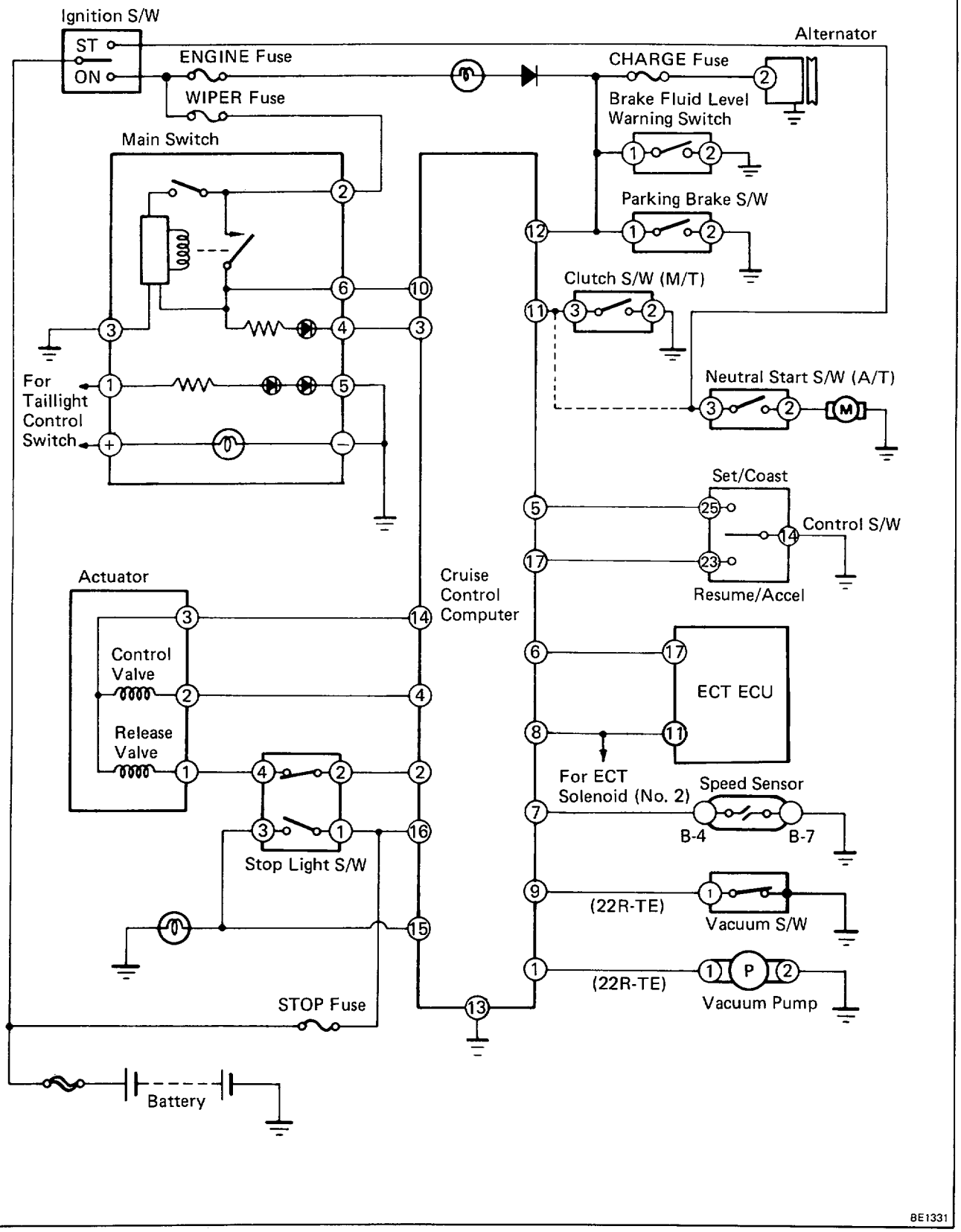
(b) Connect the leads in reverse. Check that the mirror moves to downward.

(c) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1. Check that the mirror moves to the left.

(d) Connect the leads in reverse. Check that the mirror moves to the right.

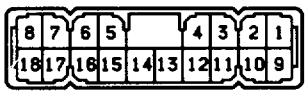
If operation is not as specified, replace the mirror.

CRUISE CONTROL SYSTEM
Wiring Diagram

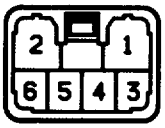


Connectors

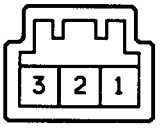
Cruise Control Computer

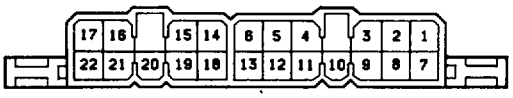


Main S/W

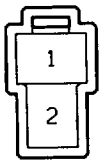


Control S/W

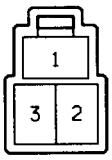




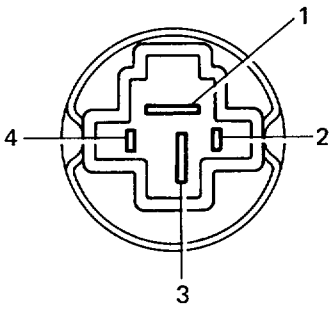
Parking Brake S/W



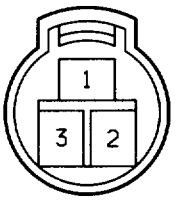
Clutch S/W



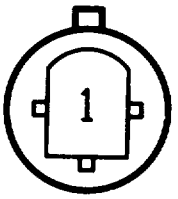
Stop Light Switch



Neutral Start Switch



Vacuum S/W (22R-TE)



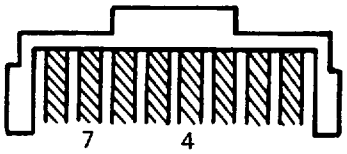
Vacuum Pump (22R-TE)



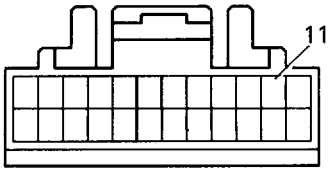
Actuator



Speed Sensor (Connector "B")



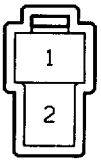
ECT Computer Wire Harness Side



Alternator Wire Harness Side



Brake Fluid Level Warning Switch



S-18-2-A S-6-2 G-3-2
BE0111
H-2-2 H-3-2 BE0336 IC-3-2 IH-1-2
IS-2-2-B IS-3-2-A BE1395
R-24-1 1A-3-1-C H-2-2

Diagnosis System

OUTPUT OF DIAGNOSTIC CODES

1. READ TYPE A CODE

(a) Turn the ignition switch on.

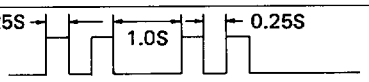
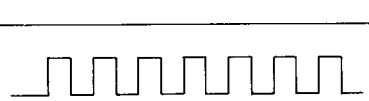
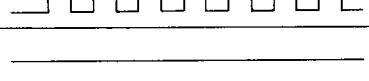
(b) Turn the set/coast switch on, and keep it on.

(c) Push the main switch on.

(d) Turn the set/coast switch off.

(e) Meet the conditions listed below.

(f) Read the diagnostic code on the main switch indicator.

No.	Conditions	Indication code	Diagnosis
1	Set/coast switch on		Set/coast switch circuit is normal.
2	Resume/accel switch on		Resume/accel switch circuit is normal.
3	Vacuum switch on (22R-TE only)		Vacuum switch circuit is normal.
4	Each cancel switch on (Stop light switch, Parking brake switch, Clutch switch, Neutral start switch)		Each cancel switch circuit is normal.
5	Drive 40 km/h (25 mph) or over		Speed sensor circuit is normal.
6	Drive 30 km/h (19 mph) or below		Speed sensor circuit is normal.

NOTE:

- Checking of No. 4 code is done with the jacked up and engine idling.
- If there is no indication code, perform diagnosis and inspection. (See page BE-57)

2. READ TYPE B CODE

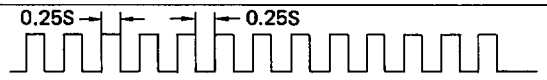
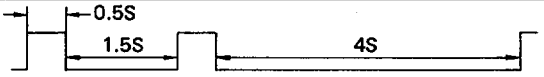
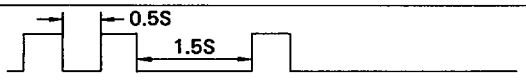
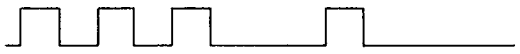
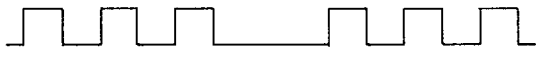
(a) If while driving with the cruise control on, the system is cancelled by a malfunction in either the actuator, speed sensor, or control switch circuit, the main switch indicator will blink 5 times.

(b) While driving at a speed of 16 km/h (10 mph) or less, press the SET/COAST switch three times in two seconds.

NOTE: In order to save the diagnostic code a malfunction has occured, always inspect with the ignition and main switches on.

Should the power be cut, the diagnostic code will be erased from the computer memory.

(c) Read the diagnostic code on the main switch indicator.

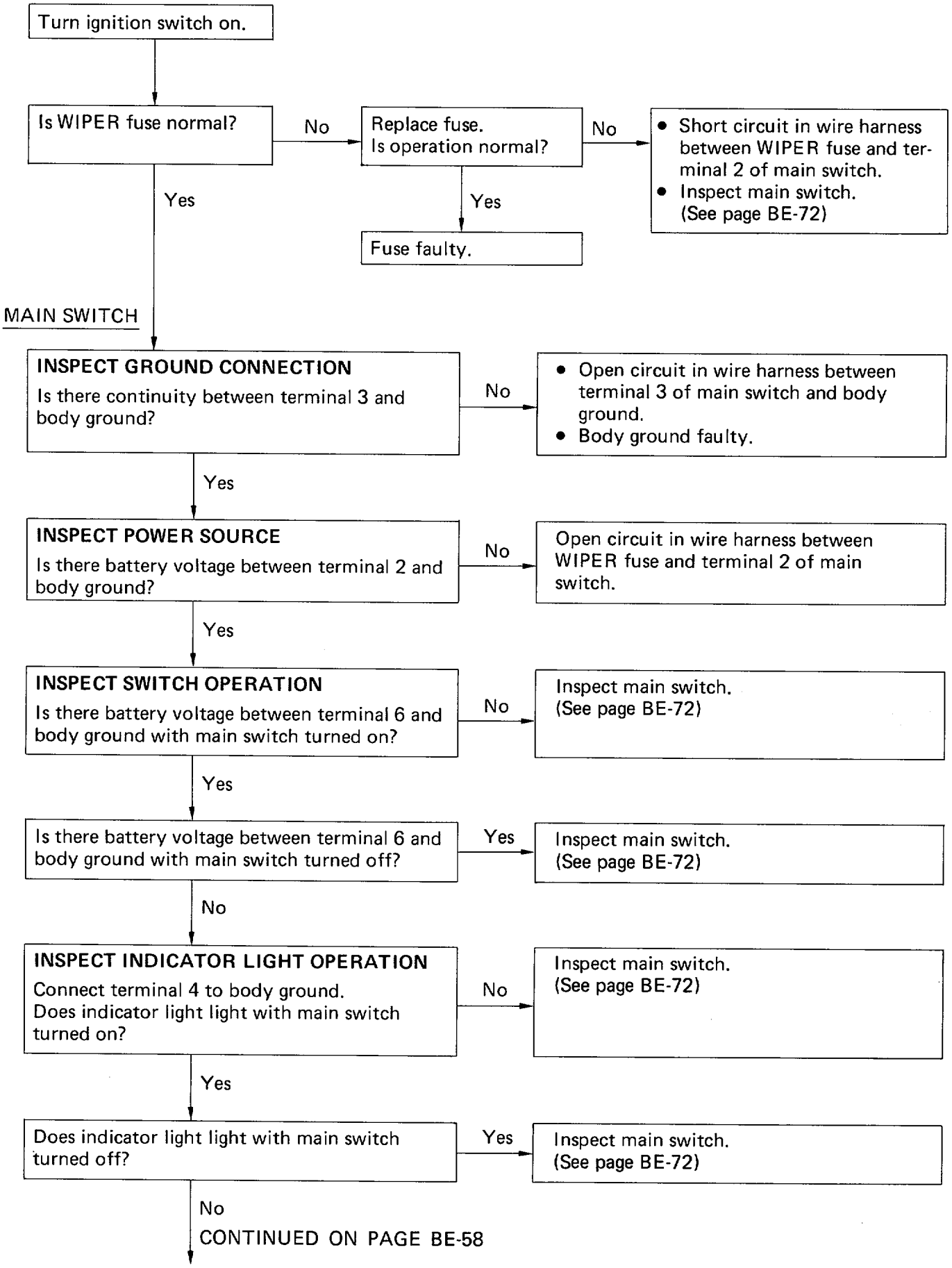
Indication code		Diagnosis
	ON / OFF 	Normal.
11	ON / OFF 	Actuator circuit is abnormal.
21	ON / OFF 	Speed sensor signal circuit is abnormal.
23	ON / OFF 	Speed sensor signal circuit is abnormal. Actuator circuit is abnormal.
31	ON / OFF 	Resume/accel switch circuit is abnormal.
33	ON / OFF 	Resume/accel switch and set/coast switch circuit is abnormal.

NOTE:
- Indication codes appear in order from No. 11.
- Indication is stopped when vehicle speed is over 16 km/h (10 mph) or main switch is turned off.
- If there is no indication code, perform diagnosis and inspection. (See page BE-57)

Troubleshooting

Problem	Inspection item		No.
Cruise control does not operate.	(a) Inspect type A codes.	No. 1 NO No. 2 NO No. 3 NO No. 4 NO No. 5 NO No. 6 NO	B C J F to I E E
	(b) Inspect type B codes.	11 21 23 31 33	D E D,E C B,C
	(c) All codes are normal.		A,D,E
Vehicle speed does not decrease when coast switch turned on.	Inspect No. 1 of type A code.	OK NO	D B
Vehicle speed does not fluctuate when set switch turned on.			
Vehicle speed does not accelerate when accel switch turned on.	Inspect No. 2 of type A code.	OK NO	D C
Vehicle speed does not return to memorized speed when resume switch turned on.			
Setting speed deviates on high side.	—	–	D,E
Setting speed deviates on low side.			
Return and acceleration response is sluggish.	Inspect No. 3 of type A code. (22R-TE only)	OK NO	D J
Setting speed does not cancel when brake pedal depressed.	Inspect No. 4 of type A code.	OK NO	D F
Setting speed does not cancel when parking brake pulled up.	Inspect No. 4 of type A code.	OK NO	D G
Setting speed does not cancel when clutch pedal depressed (M/T only).	Inspect No. 4 of type A code.	OK NO	D H
Setting speed does not cancel when shifted to "N" range (A/T only).	Inspect No. 4 of type A code.	OK NO	D I
Speed can be set below about 40 km/h (25 mph).	Inspect No. 5 of type A code. Inspect No. 6 of type A code.	OK NO	D E
Cruise control will not disengage even about 40 km/h (25 mph).			
A short period after the O/D cut, (Approx. within 14 seconds) the O/D will resume.	—	–	K

A INSPECTION OF POWER SOURCE CIRCUIT



CONTINUED ON PAGE BE-58

CONTINUED FROM PAGE BE-57

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION

Is there continuity between terminal 13 and body ground?

No → • Open circuit in wire harness between terminal 13 and body ground.
• Body ground faulty.

Yes

INSPECT POWER SOURCE

Is there battery voltage between terminal 10 and body ground with main switch turned on?

No → Open circuit in wire harness between terminal 10 of computer and terminal 6 of main switch.

Yes

INSPECT INDICATOR LIGHT CIRCUIT

Connect terminal 3 to body ground.
Does indicator light with main switch turned on?

No → Open circuit in wire harness between terminal 3 of computer and terminal 4 of main switch.

Yes

Disconnect connector from main switch.
Is there continuity between terminal 3 and body ground?

Yes → Short circuit in wire harness between terminal 3 of computer and terminal 4 of main switch.

No

Replace computer.

B INSPECTION OF SET/COAST SWITCH CIRCUIT

Turn ignition switch off.

CONTROL S/W

INSPECT GROUND CONNECTION
Disconnect connector from control switch.
Is there continuity between terminal 14 of wire harness side connector and body ground?

No → • Open circuit in wire harness between terminal 14 and body ground.
• Body ground faulty.

Yes

INSPECT SET/COAST SWITCH OPERATION
Is set/coast switch operation normal?
(See page BE-72)

No → Replace control switch.

Yes

Connect connector to control switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT SET/COAST SWITCH CIRCUIT
Is there continuity between terminal 5 and body ground with set/coast switch turned on?

No → Open or short circuit in wire harness between terminal 5 of computer and terminal 25 of control switch?

Yes

Replace computer.

C INSPECTION OF RESUME/ACCEL SWITCH CIRCUIT

Turn ignition switch off.

CONTROL S/W

INSPECT GROUND CONNECTION
Disconnect connector from control switch.
Is there continuity between terminal 14 of wire harness side connector and body ground?

No → • Open circuit in wire harness between terminal 14 and body ground.
• Body ground faulty.

Yes

INSPECT RESUME/ACCEL SWITCH OPERATION
Is resume/accel switch operation normal?
(See page BE-72)

No → Replace control switch.

Yes

Connect connector to control switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT RESUME/ACCEL SWITCH CIRCUIT
Is there continuity between terminal 17 and body ground with resume/accel switch turned on?

No → Open or short circuit in wire harness between terminal 17 of computer and terminal 23 of control switch.

Yes

Replace computer.

D INSPECTION OF ACTUATOR CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose? — Yes → Replace vacuum hose.

No

ACTUATOR

INSPECT CABLE FREEPLAY
Is control cable freeplay less than 10 mm (0.39 in.)? — No → Adjust control cable freeplay.

Yes

INSPECT ACTUATOR OPERATION
Disconnect connector from actuator.
Is actuator operation normal?
(See page BE-74) — No → Replace actuator.

Yes

STOP LIGHT S/W

INSPECT STOP LIGHT SWITCH CIRCUIT
Disconnect connector from stop light switch.
Is there continuity between terminal 4 of wire harness side connector and body ground? — Yes → Short circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch.

No

Connect connector to actuator.
Is there continuity between terminal 4 of wire harness side connector and body ground? — No → Open circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch.

Yes

INSPECT STOP LIGHT SWITCH OPERATION
Is stop light switch operation normal?
(See page BE-72) — No → Replace stop light switch.

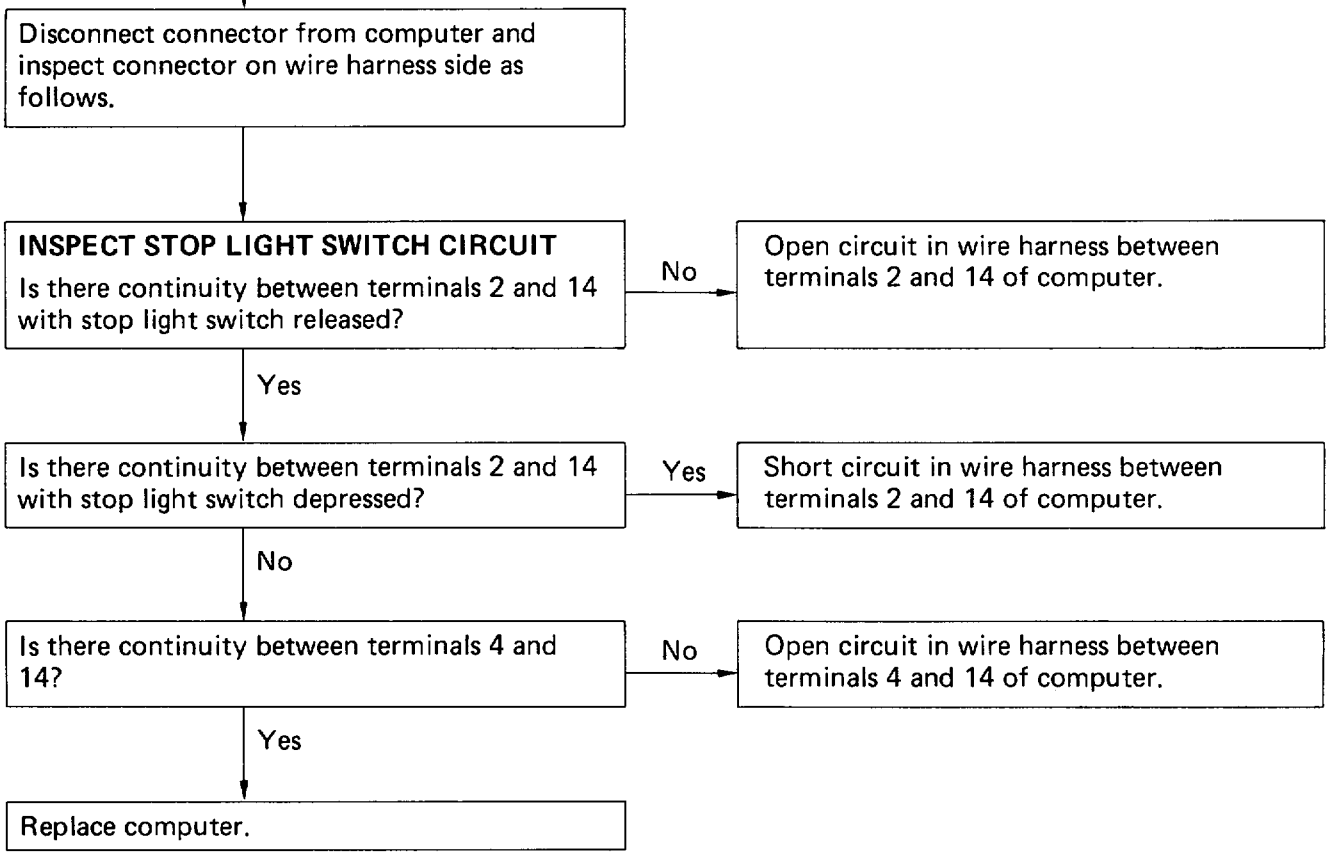
Yes

Connect connector to stop light switch.

CONTINUED ON PAGE BE-62

CONTINUED FROM PAGE BE-61

COMPUTER



E INSPECTION OF SPEED SENSOR CIRCUIT

SPEEDOMETER CABLE

INSPECT SPEEDOMETER CABLE
Does the meter fluctuate when driving at a steady speed?

Yes → Meter cable faulty.

No

Turn ignition switch off.

SPEED SENSOR

INSPECT GROUND CONNECTION
Disconnect connector from meter (Speed sensor).
Is there continuity between terminal B7 of wire harness side connector and body ground?

No → Open circuit in wire harness between terminal B7 and body ground.

Yes

INSPECT SPEED SENSOR OPERATION
Is speed sensor operation normal?
(See page BE-73)

No → Speed sensor faulty.

Yes

COMPUTER

INSPECT SPEED SENSOR CIRCUIT
Disconnect connector from computer.
Is there continuity between terminal B4 of wire harness side connector and terminal 7 of computer?

No → Open circuit wire harness between terminal B4 of speed sensor and terminal 7 of computer.

Yes

Replace computer.

F INSPECTION OF STOP LIGHT SWITCH CIRCUIT

Turn ignition switch off.

Is STOP fuse normal?
- No → Replace fuse. Is operation normal?
  - No → Sort circuit in wire harness between terminal 16 of computer or terminal 1 of stop light switch and fuse.
  - Yes → Fuse faulty.
- Yes

STOP LIGHT S/W

INSPECT GROUND CONNECTION
Disconnect connector from stop light switch.
Is there continuity between terminal 3 of wire harness side connector and body ground?
- No →
  - Open circuit in wire harness between terminal 3 and body ground.
  - Body ground faulty.
- Yes

INSPECT STOP LIGHT SWITCH OPERATION
Is stop light switch operation normal?
(See page BE-72)
- No → Replace stop light switch.
- Yes

Connect connector to stop light switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT STOP FUSE CIRCUIT
Is there battery voltage between terminal 16 and body ground with brake pedal released?
- No → Open circuit in wire harness between terminal 16 of computer and STOP fuse.
- Yes

INSPECT STOP LIGHT SWITCH CIRCUIT
Is there battery voltage between terminal 15 and body ground with brake pedal depressed?
- No → Open circuit in wire harness between terminal 15 of computer and terminal 3 of stop light switch.
- Yes

Replace computer.

G INSPECTION OF PARKING BRAKE SWITCH CIRCUIT

Turn ignition switch off.

ALTERNATOR

INSPECT ALTERNATOR OPERATION
Is alternator operation normal ?
(See page CH-4)

No → Replace alternator.

Yes

BRAKE FLUID LEVEL WARNING SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from brake fluid level warning switch. Is there continuity between terminal 2 of wire harness side connector and body ground ?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT BRAKE WARNING SWITCH
Is brake fluid level warning switch operation normal ?
(See page BE-31)

No → Replace brake warning switch.

Yes

Connect the connector to brake warning switch.

PARKING BRAKE SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from parking brake switch.
Is there continuity between terminal 2 of wire harness side connector and body ground ?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT PARKING BRAKE SWITCH OPERATION
Disconnect connector from parking brake switch.
Is parking brake switch operation normal ?
(See page BE-73)

No → Replace parking brake switch.

Yes

Connect connector to parking brake switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

Remove CHARGE fuse and ignition switch tuned on.

Is there no voltage between terminal 12 and body ground with parking brake pulled up ?

No → Open circuit in wire harness between terminal 12 of computer and terminal 1 of parking brake switch.

Yes

Is there battery voltage between terminal 12 and body ground with parking brake released ?

No → Short circuit in wire harness between terminal 12 of computer and terminal 1 of parking brake switch, terminal 1 of brake fluid level warning switch or terminal 2 of alternator.

Yes

Replace computer.

H INSPECTION OF CLUTCH SWITCH CIRCUIT

Turn ignition switch off.

CLUTCH S/W

INSPECT GROUND CONNECTION
Disconnect connector from clutch switch.
Is there continuity between terminal 2 of wire harness side connector and body ground?

No → • Open circuit in wire harness between terminal 2 and body ground.
• Body ground faulty.

Yes

INSPECT CLUTCH SWITCH OPERATION
Is clutch switch operation normal?
(See page BE-73)

No → Replace clutch switch.

Yes

Connect connector to clutch switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT CLUTCH SWITCH CIRCUIT
Is there continuity between terminal 11 and body ground with clutch pedal depressed?

No → Open circuit in wire harness between terminal 11 of computer and terminal 3 of clutch switch.

Yes

Is there continuity between terminal 11 and body ground with clutch pedal released?

Yes → Short circuit in wire harness between terminal 11 of computer and terminal 3 of clutch switch.

No

Replace computer.

I INSPECTION OF NEUTRAL START SWITCH CIRCUIT

Turn ignition switch off.

NEUTRAL START S/W

INSPECT GROUND CONNECTION
Disconnect connector from neutral start switch.
Is there continuity between terminal 2 of wire harness side connector and body ground?

No → Open circuit in wire harness between terminal 2 and body ground.

Yes

INSPECT NEUTRAL START SWITCH OPERATION
Is neutral start switch operation normal? (See page BE-73)

No → Replace neutral switch.

Yes

Connect connector to neutral start switch.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT NEUTRAL START SWITCH CIRCUIT
Is there continuity between terminal 11 and body ground when shifted to "N" and "P" range?

No → Open circuit in wire harness between terminal 11 of computer and terminal 3 of neutral start switch.

Yes

Replace computer.

J INSPECTION OF VACUUM CIRCUIT (22R-TE only)

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose?

Yes → Replace vacuum hose.

No

VACUUM S/W

INSPECT VACUUM SWITCH CIRCUIT

Disconnect connector from vacuum switch.
Is there continuity between terminal 1 of vacuum switch and body ground?

No →
- Vacuum switch improper installed.
- Body ground faulty.

Yes

INSPECT VACUUM SWITCH OPERATION

Is vacuum switch normal?
(See page BE-75)

No → Replace vacuum switch.

Yes

VACUUM PUMP

INSPECT GROUND CONNECTION

Disconnect connector from vacuum pump.
Is there continuity between terminal 2 of wire harness side connector and body ground?

No →
- Open circuit in wire harness between terminal 2 and body ground.
- Body ground faulty.

Yes

INSPECT VACUUM PUMP OPERATION

Is vacuum pump operation normal?
(See page BE-75)

No → Replace vacuum pump.

Yes

Connect connector to vacuum switch and pump.

CONTINUED ON PAGE BE-69

CONTINUED FROM PAGE BE-68

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT VACUUM SWITCH CIRCUIT
Is there continuity between terminal 9 and body ground?

No → Open circuit in wire harness between terminal 9 of computer and terminal 1 of vacuum switch.

Yes

Start engine (Idling).

Is there continuity between terminal 9 and body ground?

Yes → Short circuit in wire harness between terminal 9 of computer and terminal 1 of vacuum switch.

No

Stop the engine.

INSPECT VACUUM PUMP CIRCUIT
Is there continuity between terminal 1 and body ground?

No → Open circuit in wire harness between terminal 1 of computer and terminal 1 of vacuum switch.

Yes

Is there continuity between terminal 1 and body ground when disconnect connector from vacuum pump?

Yes → Short circuit in wire harness between terminal 1 of computer and terminal 1 of vacuum pump.

No

Replace computer.

K INSPECTION OF ECT SOLENOID CIRCUIT

Turn ignition switch off.

COMPUTER

Disconnect connector from computer and inspect connector on wire harness side as follows.

INSPECT ECT SOLENOID CIRCUIT

Is there continuity between terminal 8 of wire harness side connector and terminal 11 of ECT computer?

No → Open circuit in wire harness between terminal 8 of computer and terminal 11 of ECT computer.

Yes

Is resistance value about 11 – 15 ohm between terminal 8 of wire harness side connector and body ground?

No → Open or short circuit in wire harness between terminal 8 of computer and terminal 11 of ECT computer or ECT solenoid (No. 2).

Yes

INSPECT OVERDRIVE CIRCUIT

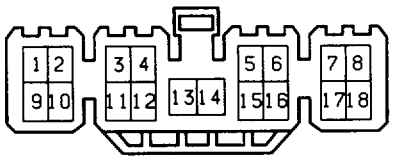
Is there continuity between terminal 6 of wire harness side connector and terminal 17 of ECT computer?

No → Open circuit in wire harness between terminal 6 of computer and terminal 17 of ECT computer.

Yes

Replace computer.

Wire Harness Side



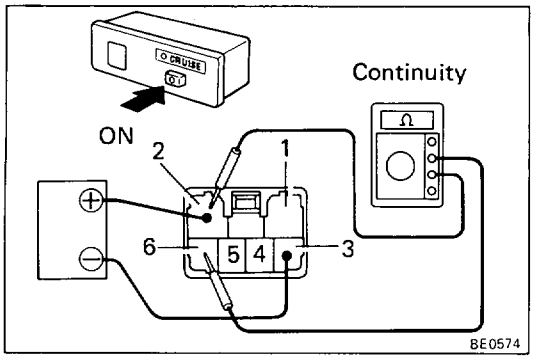
S-18-1

Cruise Control Computer Circuit

INSPECTION OF COMPUTER CIRCUIT

Disconnect the computer connector and inspect the connector on wire harness side as shown in the below.

Connection or measure item	Check for	Tester connection	Condition	Specified value
STOP Fuse	Voltage	16 – Body ground	—	Battery voltage
Stop Light Switch	Voltage	15 – Body ground	Brake pedal depressed	Battery voltage
			Brake pedal released	No voltage
Stop Light Switch and Release Valve	Resistance	2 – 14	Brake pedal released	Approx. 71 Ω
Control Valve	Resistance	4 – 14	—	Approx. 38 Ω
Main Switch	Voltage	10 – Body ground	Turn ignition switch and main switch on	Battery voltage
			Turn ignition switch and main switch off	No voltage
Main Switch (indicator circuit)	Voltage	3 – Body ground	Turn ignition switch and main switch on	Battery voltage
			Turn ignition switch and main switch off	No voltage
Control Switch (set/coast)	Continuity	5 – Body ground	Turn set/coast switch on	Continuity
			Turn set/coast switch off	No continuity
Control Switch (resume/accel)	Continuity	17 – Body ground	Turn resume/accel switch on	Continuity
			Turn resume/accel switch off	No continuity
Speed Sensor	Continuity	7 – Body ground	Vehicle moving slowly	1 pulse each 40 cm (15.75 in.)
Clutch Switch (M/T) or Neutral Start Switch (A/T)	Continuity	11 – Body ground	Clutch pedal depressed or shifted into "N" range	Continuity
			Clutch pedal released or shifted into only range except "N" and "P" range	No continuity
Parking Brake Switch	Voltage	12 – Body ground	Remove CHARGE fuse and ignition switch turned on with parking brake lever pulled up	No voltage
			Remove CHARGE fuse and ignition switch turned on with parking brake lever released.	Battery voltage
Vacuum Switch (22R-TE only)	Continuity	9 – Body ground	Apply vacuum approx. 220 mmHg (8.66 in.Hg, 29.3 kPa)	No continuity
			No vacuum	Continuity
Vacuum Pump (22R-TE only)	Continuity	1 – Body ground	—	Continuity
Body Ground	Continuity	13 – Body ground	—	Continuity



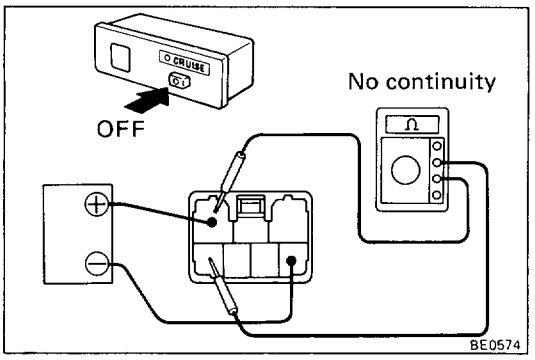
Main Switch

INSPECTION OF MAIN SWITCH

INSPECT SWITCH CONTINUITY

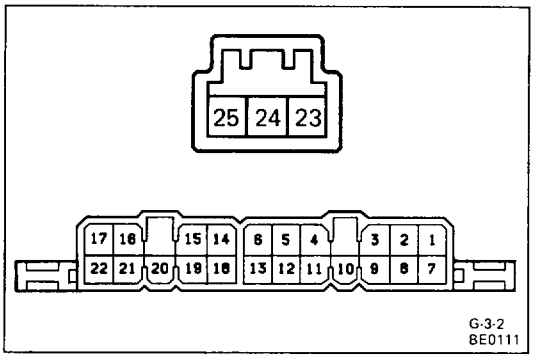
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Check that there is continuity between terminals 2 and 6 with the main switch turned on.



(c) Check that there is no continuity between terminals 2 and 6 with the main switch turned off.

If continuity is not as specified, replace the switch.



Control Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

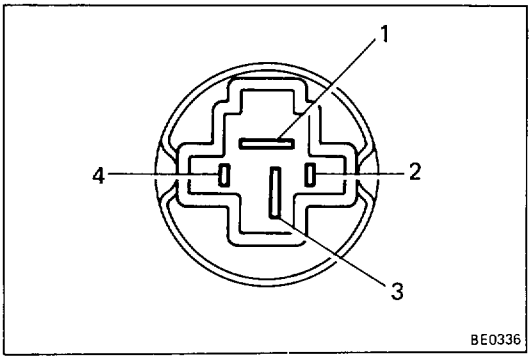
Inspect the switch continuity between terminals.

Terminal / Switch position	14	23	25
RESUME/ACCEL	○——	——○	
OFF			
SET/COAST	○——		——○

If continuity is not as specified, replace the switch.

Stop Light Switch

INSPECTION OF SWITCH

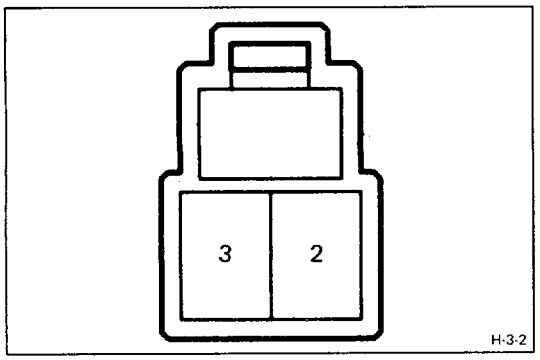


INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Terminal / Switch position	1	2	3	4
Switch free	○——		——○	
Switch pin pushed		○——	——○	

If continuity is not as specified, replace the switch.



Clutch Switch

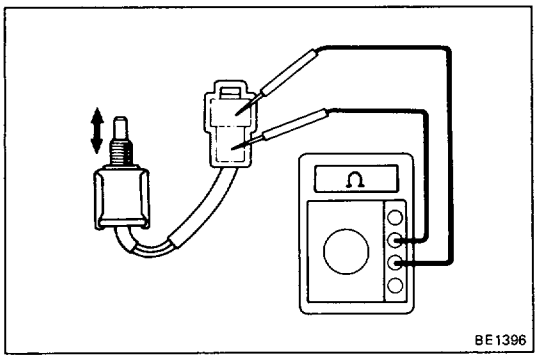
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between terminals 2 and 3 with the switch free.
(Clutch pedal depressed)

(b) Check that there is no continuity between terminals 2 and 3 with the switch pin pushed.
(Clutch pedal released)

If continuity is not as specified, replace the switch.



Parking Brake Switch

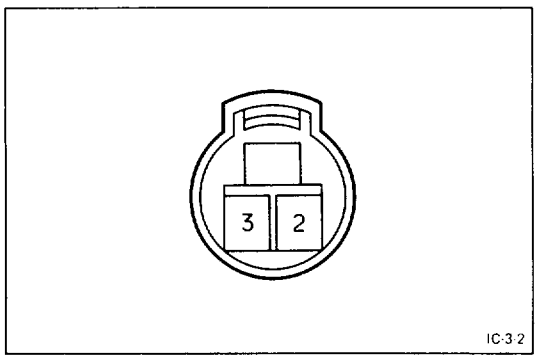
INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

(a) Check that there is continuity between the terminals with the switch free.
(Parking brake lever pulled)

(b) Check that there is no continuity between the terminals with the switch pin pushed.
(Parking brake lever released)

If continuity is not as specified, replace the switch.



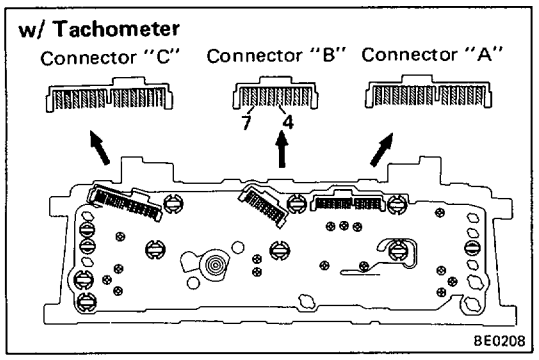
Neutral Start Switch

INSPECTION OF SWITCH

INSPECT SWITCH CONTINUITY

Check that there is continuity between terminals 2 and 3 with switch position "P" and "N" ranges.

If continuity is not as specified, replace the switch.

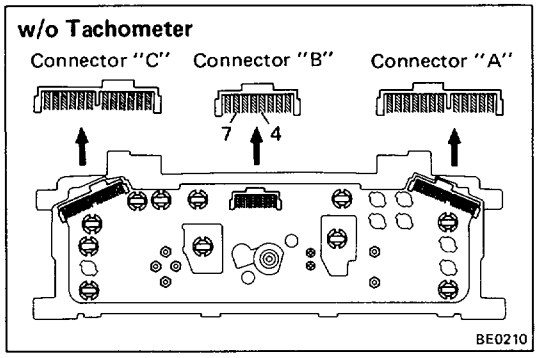


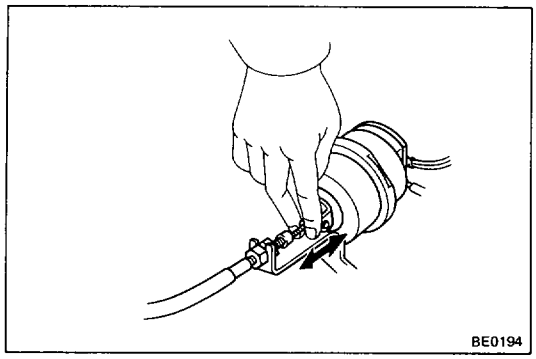
Speed Sensor

INSPECTION OF SENSOR

INSPECT SENSOR CONTINUITY

Check that there is continuity between terminals B4 and B7 four times per each revolution of the shaft.





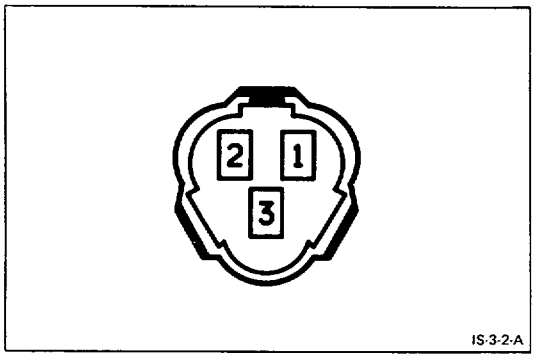
Actuator

INSPECTION OF ACTUATOR

1. INSPECT CONTROL CABLE FREEPLAY

Inspect that the control cable freeplay is less than 10 mm (0.39 in.).

If freeplay is not as specified, adjust the control cable freeplay.

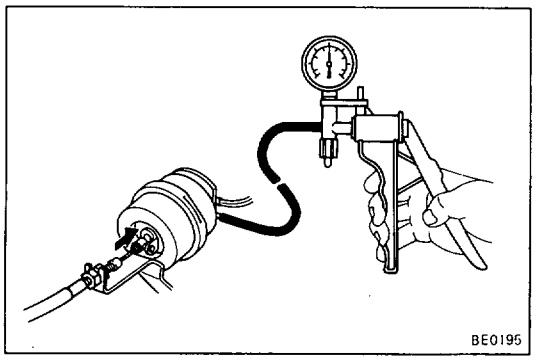


2. INSPECT ACTUATOR RESISTANCE

Measure the resistance value between terminals as follows.

Resistance: **2 – 3 approx. 38 Ω**
1 – 3 approx. 71 Ω

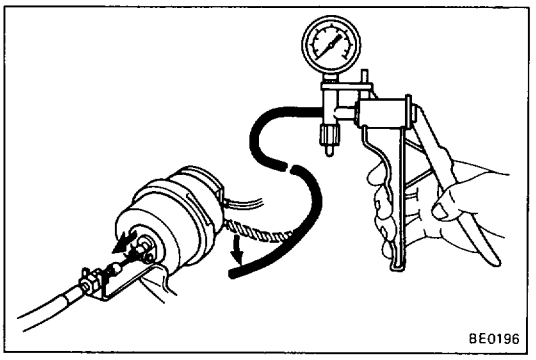
If the resistance value is not as specified, replace the actuator.



3. INSPECT ACTUATOR OPERATION

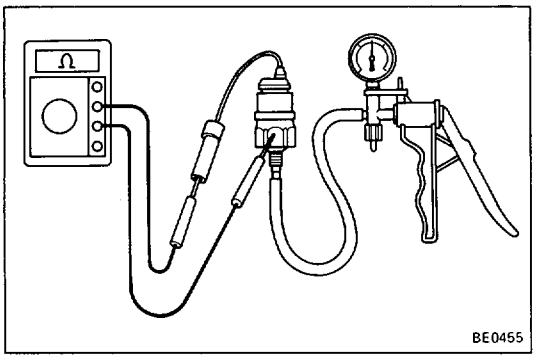
(a) Connect the positive (+) lead from battery to terminals 1 and 2, and the negative (–) lead to terminal 3.

(b) Slowly apply vacuum from 0–300 mmHg (0–11.81 in.Hg, 0–40.0 kPa), and check that the control cable can be pulled smoothly.



(c) Disconnect terminal 1 or 2 and check that the control cable returns to its original position and the vacuum returns to 0 mmHg (0 in.Hg, 0 kPa).

If operation is not as specified, replace the actuator.



Vacuum Switch (22R-TE only)

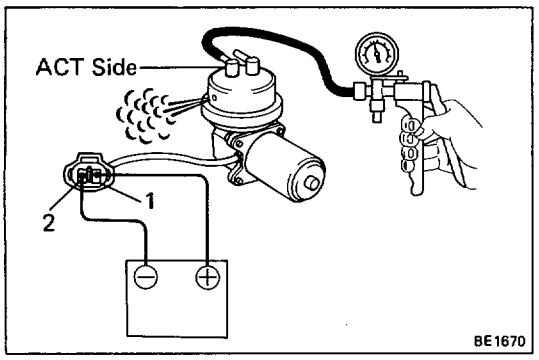
INSPECTION OF SWITCH

INSPECT SWITCH OPERATION

(a) Check that there is no continuity between terminal and body with a vacuum of approx. 220 mmHg (8.66 in.Hg, 29.3 kPa) or above.

(b) Check that there is continuity between terminal and body with no vacuum.

If operation is not as specified, replace the switch.



Vacuum Pump (22R-TE only)

INSPECTION OF PUMP

INSPECT VACUUM PUMP OPERATION

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

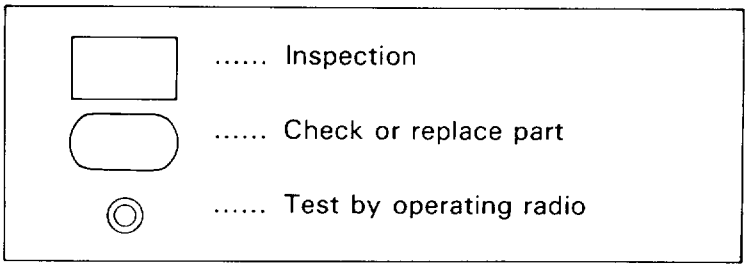
(c) Check that there is the vacuum of 200 mmHg (7.87 in.Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.

RADIO, STEREO TAPE PLAYER AND ANTENNA

Troubleshooting

DESCRIPTION OF SYMBOLS



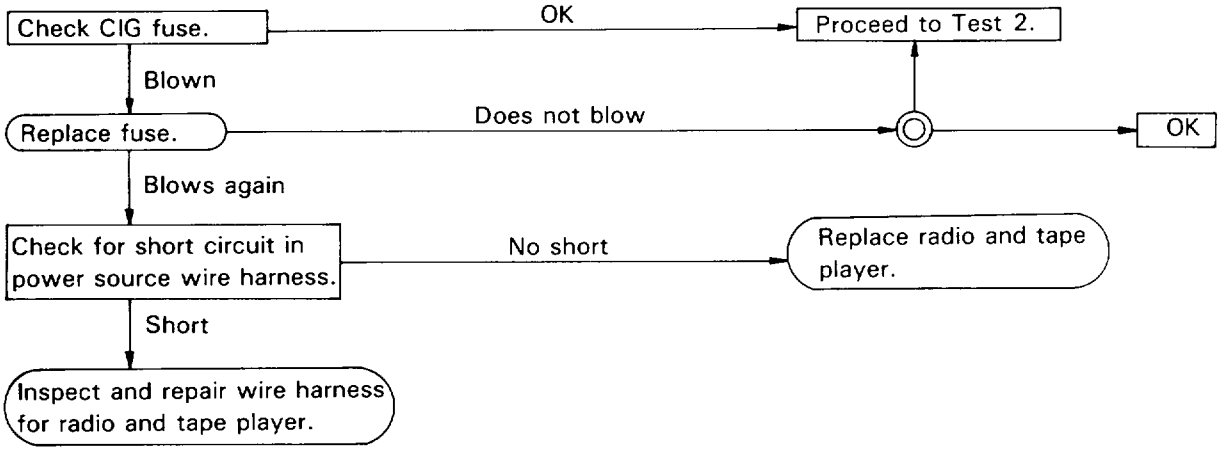
1. DEAD RADIO AND TAPE PLAYER

(a) No power to radio or tape player, or power but no sound.

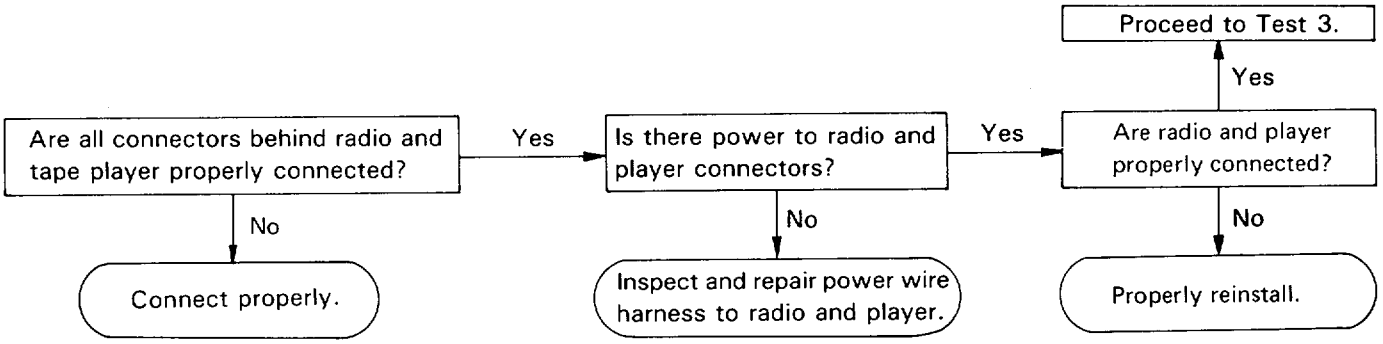
Possible causes:

- Blown CIG fuse
- Short circuit or broken wire in power source wire harness
- Loose connectors behind radio and tape player
- Loose speaker connector
- Defective speaker
- Broken wire in speaker wire harness
- Improperly installed radio or tape player
- Defective radio or tape player

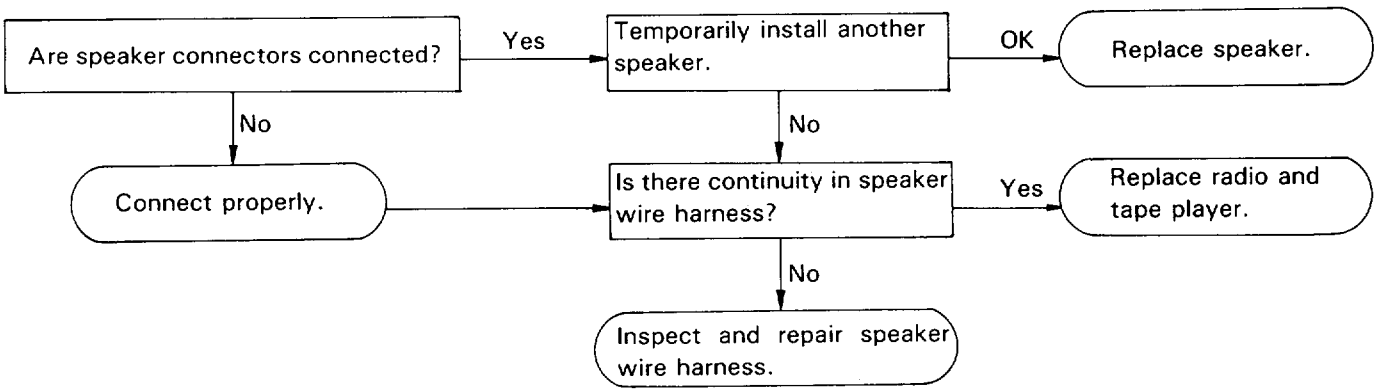
TEST 1



TEST 2



TEST 3

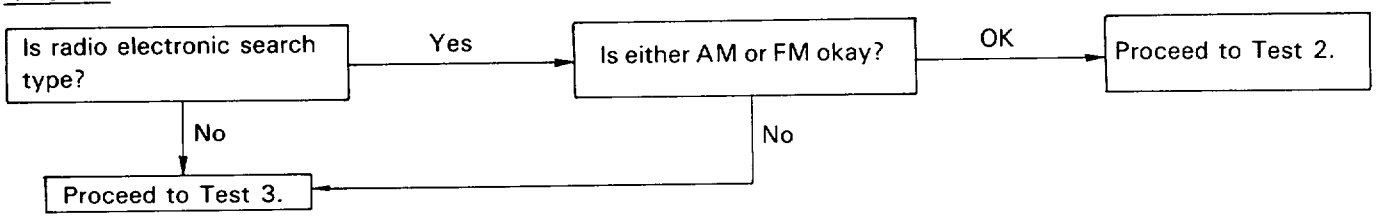


(b) Tape player okay but no sound from either the AM or FM band.

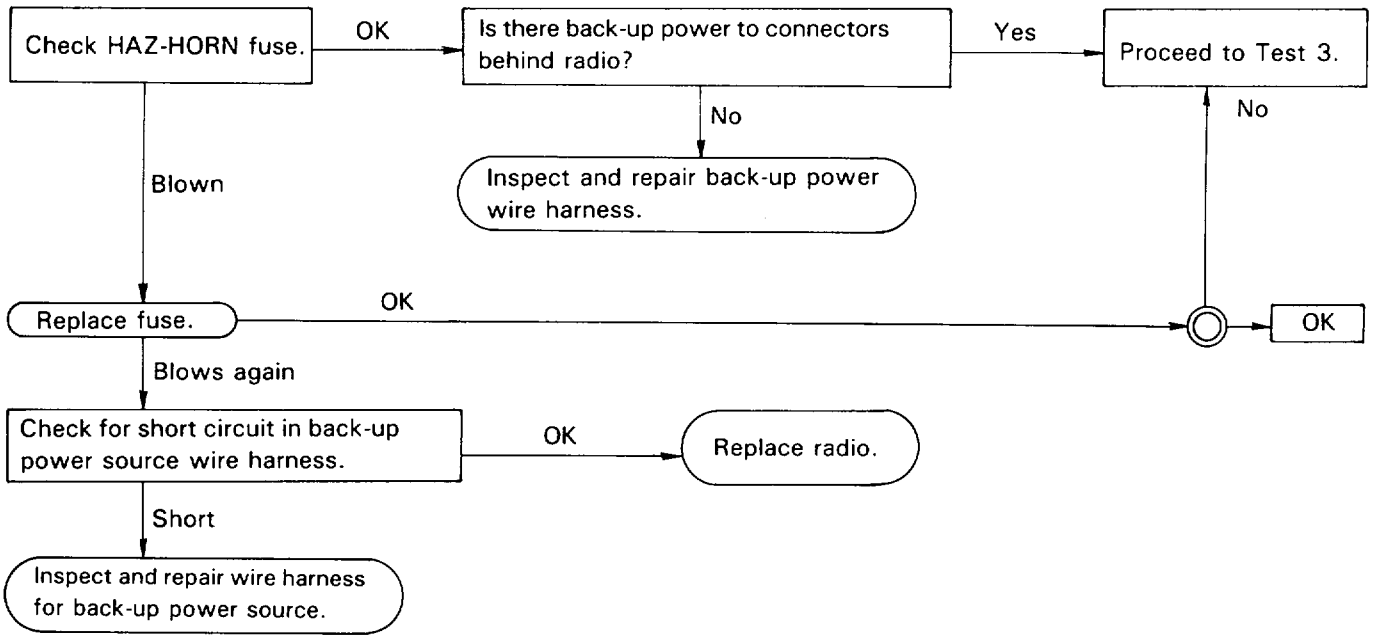
Possible causes:

- Antenna disconnected
- Antenna plug not properly connected
- Defective antenna
- Defective antenna cable
- Defective radio or tape player
- Blown HAZ-HORN fuse
- Short circuit or broken wire in wire harness for back-up power source

TEST 1

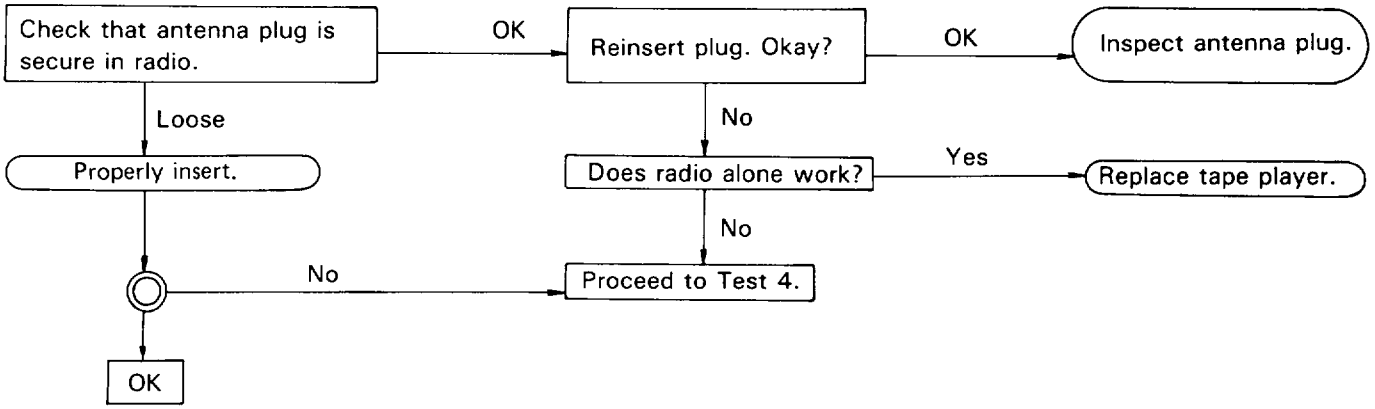


TEST 2

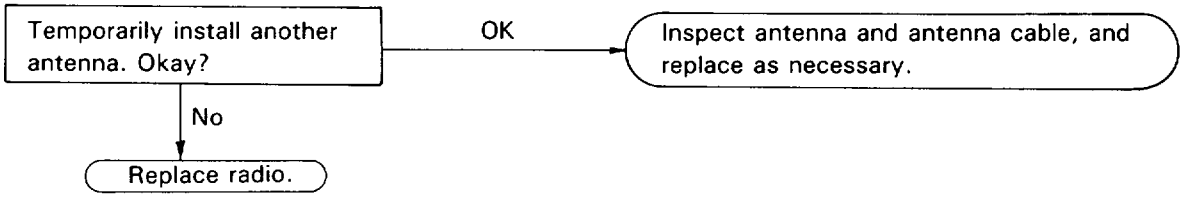


NOTE: Back-up power refers to the storage voltage for preset tuning. This is applied even when the ignition switch is OFF.

TEST 3



TEST 4

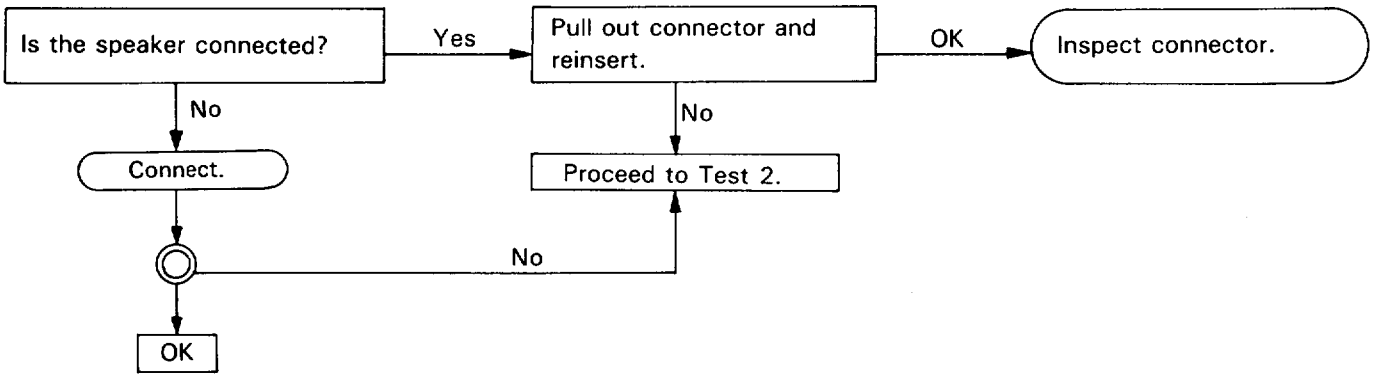


(c) No sound from one speaker.

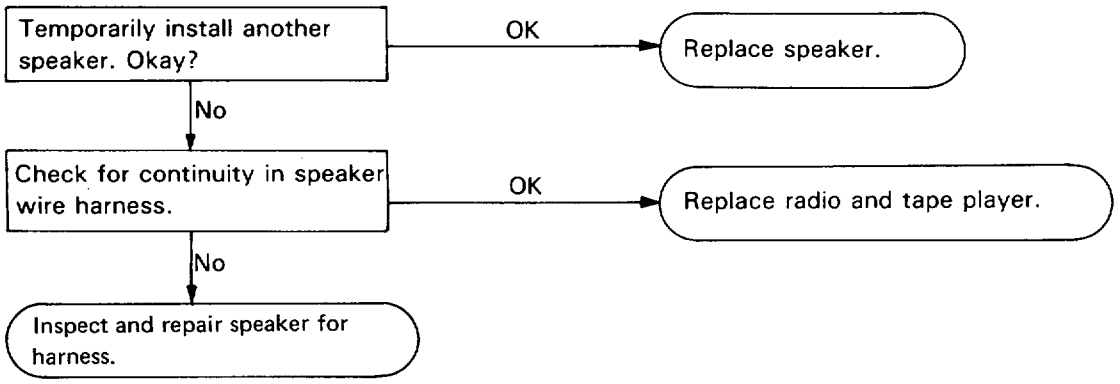
Possible causes:

- Loose speaker connector
- Broken wire in speaker wire harness
- Defective speaker
- Defective radio and tape player

TEST 1



TEST 2

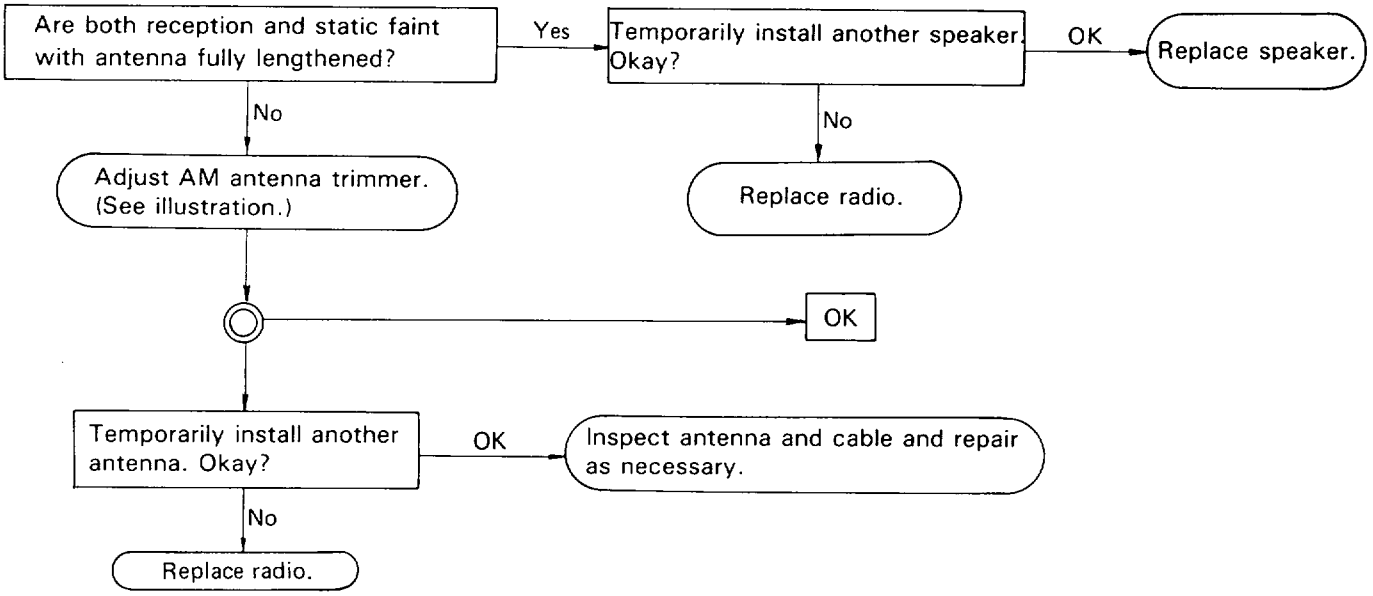


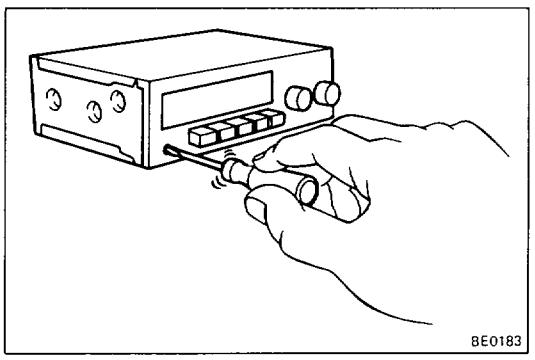
2. FAINT RECEPTION

Possible causes:

- Incorrectly adjusted antenna trimmer
- Defective antenna cable
- Defective speaker
- Defective radio

TEST





(Ex. Electronic Search Type)

NOTE: Adjustment of antenna trimmer.

(1) Fully lengthen the antenna.

(2) With the volume and tone at maximum, turn the dial to around 1,400 kHz where there is no reception.

(3) Adjust the trimmer to where static is loudest.

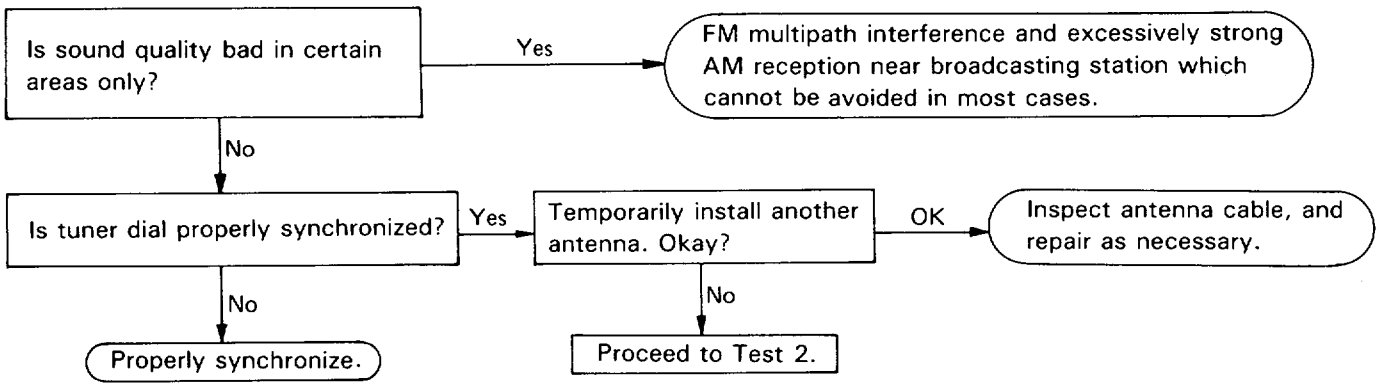
3. BAD SOUND QUALITY

(a) Sound quality bad when radio played.

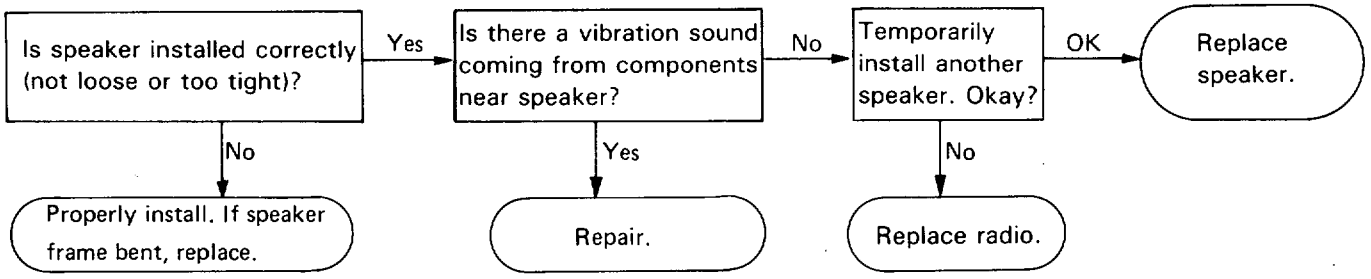
Possible causes:

- Multipath interference excessive interception
- Tuner dial not synchronized with station
- Defective antenna and cable
- Speaker improperly installed
- Vibration sound from components near speaker
- Defective speaker
- Defective radio

TEST 1



TEST 2



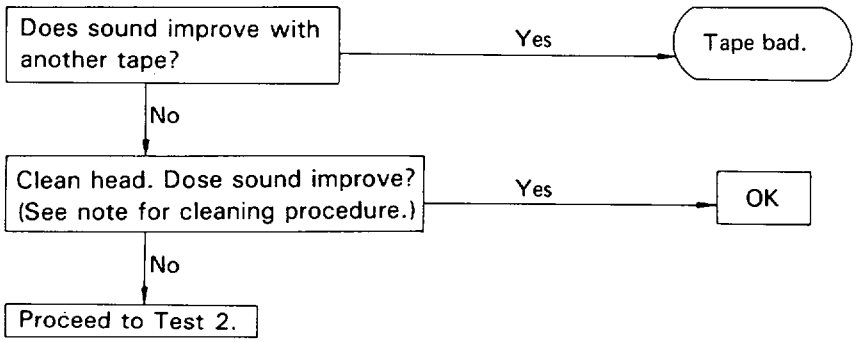
NOTE: FM distortion tends to increase sharply it tuner is not synchronized.

(b) Sound quality bad when tape player played.

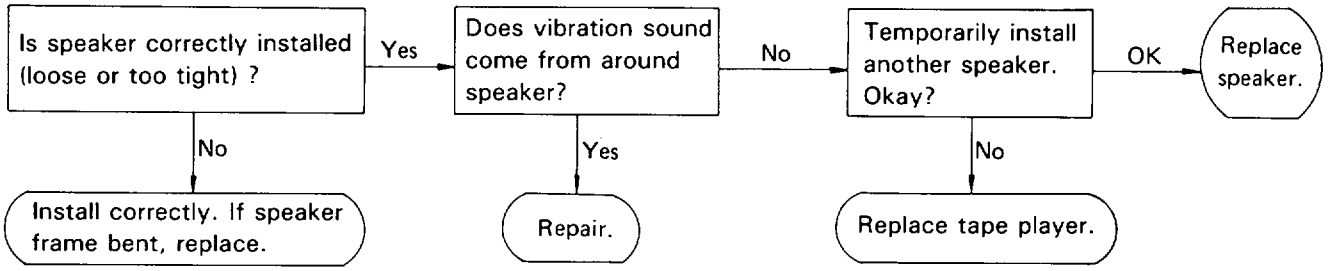
Possible causes:

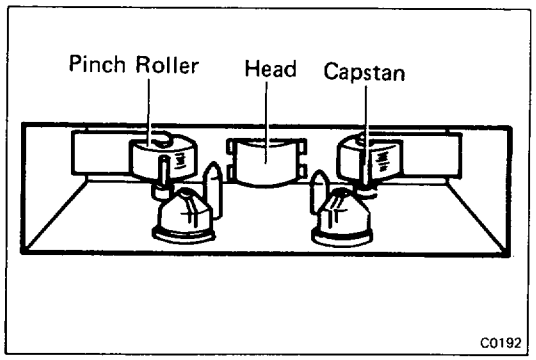
- Bad tape
- Dirty head
- Incorrectly installed speaker
- Vibration noise from around speaker
- Defective speaker
- Defective tape player

TEST 1



TEST 2





NOTE: Head cleaning procedure.

(1) Raise the cassette door with your finger. Next using a pencil or like object, push in the guide as shown.

(2) Using a cleaning pen or cotton applicator soaked in alcohol, clean the head surface, pinch rollers and capstans.

(3) Push in the "eject" button.

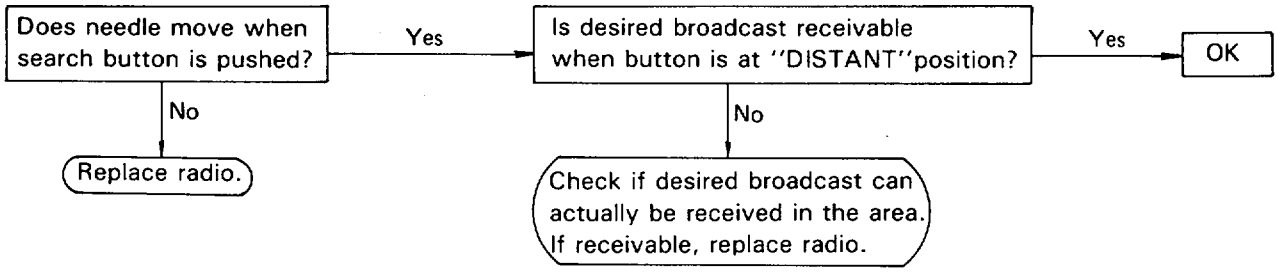
4. DEFECTIVE AUTO-SEARCH MECHANISM

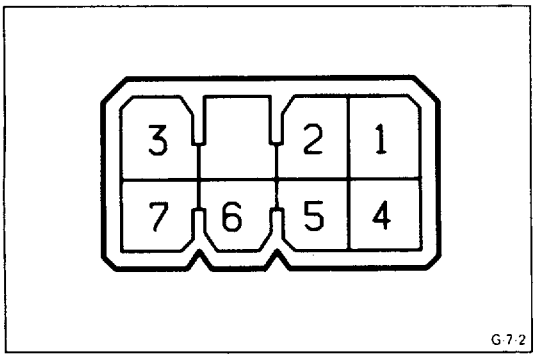
Manual search possible but automatic search mechanism does not function or does not stop at all receivable stations.

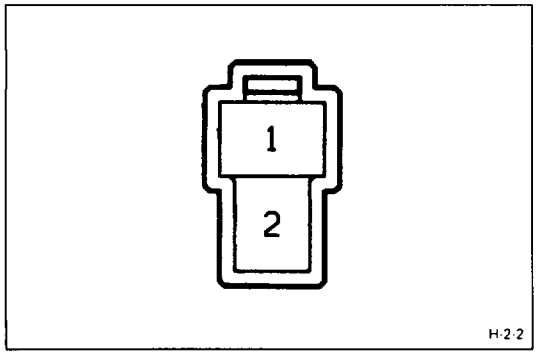
Possible causes:

- Poor search sensitivity (SENS button)
- Defective radio

TEST







Antenna Motor Control Switch

INSPECTION OF CONTROL SWITCH

INSPECT SWITCH CONTINUITY

Inspect the switch continuity between terminals.

Switch position \ Terminal	2	3	5	6	7
UP		○	○	○	○
OFF			○	○	○
DOWN	○		○	○	○

If continuity is not as specified, replace the switch.

Antenna Motor

INSPECTION OF MOTOR

INSPECT MOTOR OPERATION

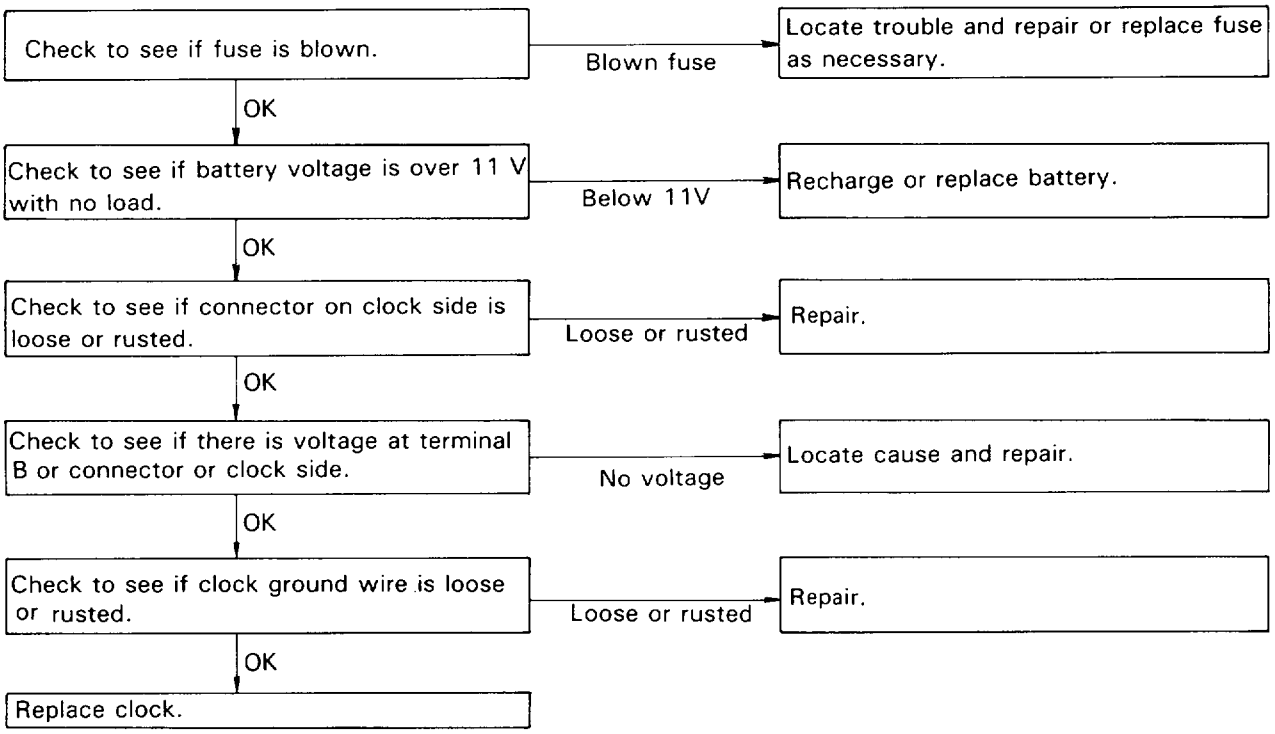
(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (−) lead to terminal 2, and check that the antenna rises.

(b) Connect the positive (+) lead from the battery to terminal 2 and the negative (−) lead to terminal 1, and check that the antenna descends.

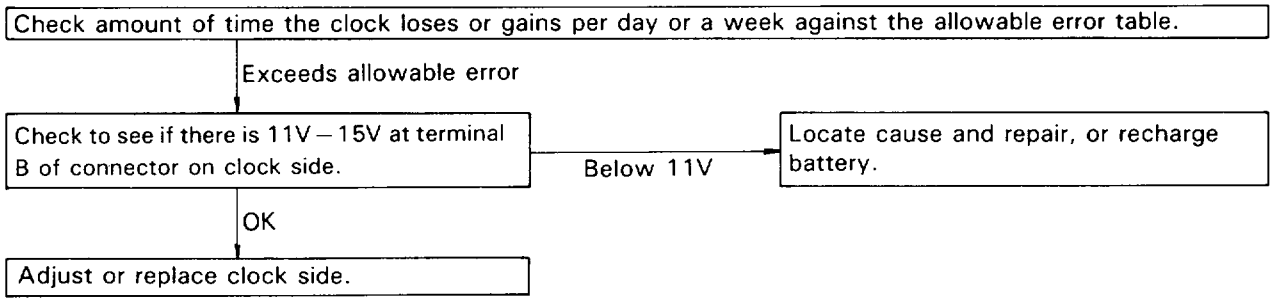
CLOCK

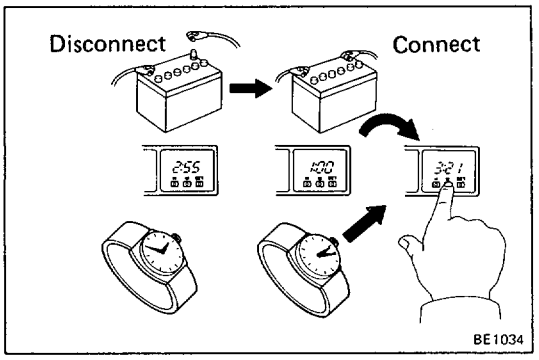
Troubleshooting

CLOCK WILL NOT OPERATE



CLOCK LOSES OR GAINS TIME





1. **INSPECT ALLOWABLE ERROR OF CLOCK**

Check the allowable error of the clock.

Allowable error (per day): ± 1.5 seconds

2. **ADJUSTMENT OF CLOCK**

Adjustment of the quartz clock requires a precise digital counter. Adjustment must be made in a shop specified by the manufacturer.

3. **SETTING OF CLOCK**

(a) Connect the battery terminal.

(b) Check the clock to see that it is running, and then set it to the correct time.

NOTE: Whenever the battery terminal is disconnected, make sure to set the clock to the correct time after reconnecting the battery.

BODY

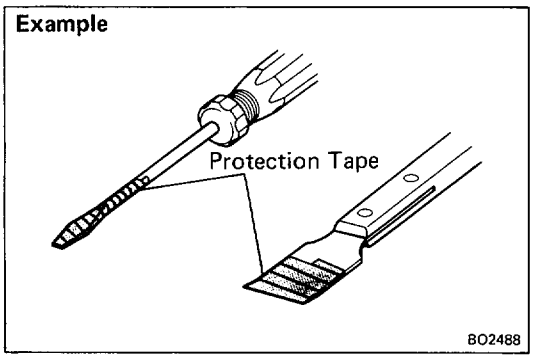
	Page
GENERAL INFORMATON	BO-2
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BACK DOOR	BO-11
MOULDING	BO-20
COVER TOP	BO-25
WINDSHIELD	BO-27
SIDE SLIDE WINDOW	BO-33
QUARTER WINDOW (4 RUNNER)	BO-35
QUARTER WINDOW (TRUCK)	BO-38
BACK WINDOW	BO-39
REAR WIPER	BO-42
SAFETY PAD	BO-44
SEAT	BO-47
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ONE-TOUCH TAIL GATE	BO-52
ROLL-OVER BAR	BO-54
BODY DIMENSIONS	BO-55
FRAME DIMENSIONS	BO-57

GENERAL INFORMATION

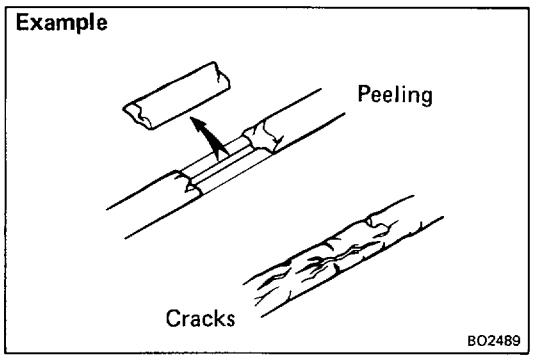
If there is a possibility that the body or/and part may be damaged, first removed the danger before performing repair operations.

Example:

1. Apply protection tape to the body adjacent for removeing and installing body part.



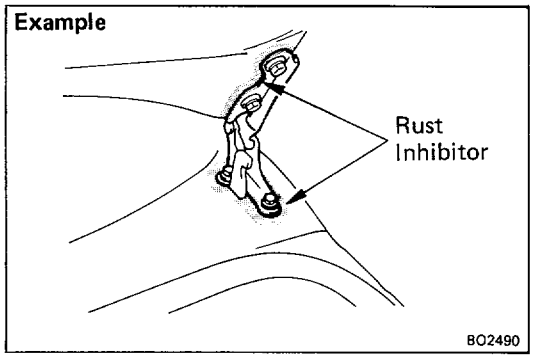
2. When prying off the body parts with a screwdriver or scraper etc., be sure to apply protection tape to the tip or blade to prevent from damaged the paint film or body part.



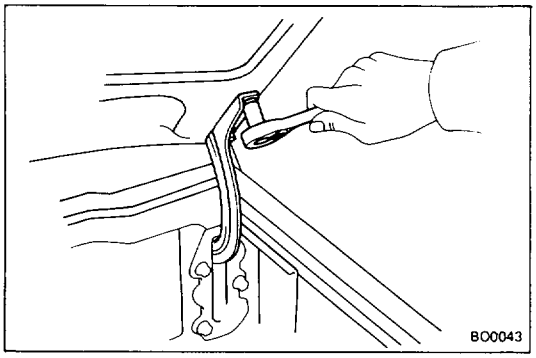
If damaged the anti-rust agents while repairing, be sure to repair with each anti-rust agent.

Example:

1. If body sealer, paint film and undercoat are damaged by peeling, cracks, etc., be sure to repair with each anti-rust agent.



2. If loosen or removed the hinge or exterior body panel, after repairing be sure to apply rust inhibitor.

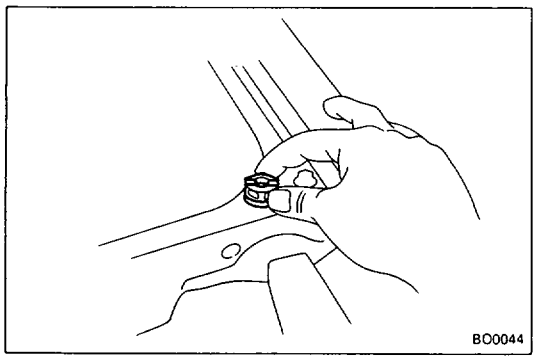


HOOD

ADJUSTMENT OF HOOD

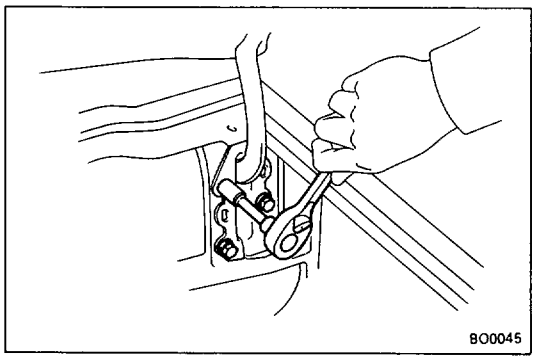
1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

Loosen the hood side hinge bolts to adjust.



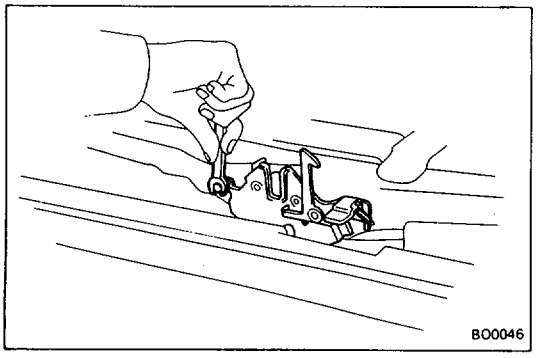
2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

Turn the hood cushions to adjust.



3. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION

Loosen the body side hinge bolts to adjust.

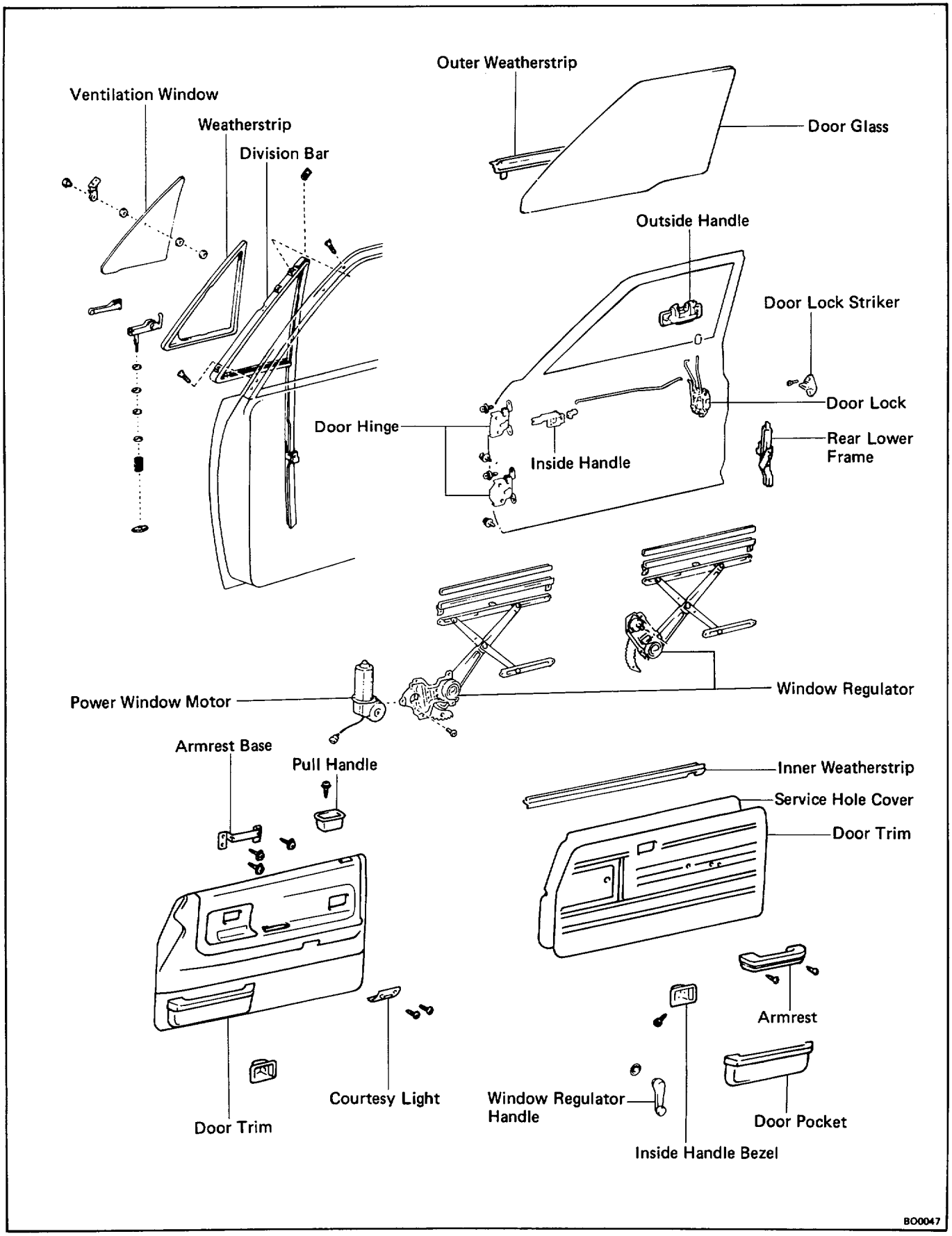


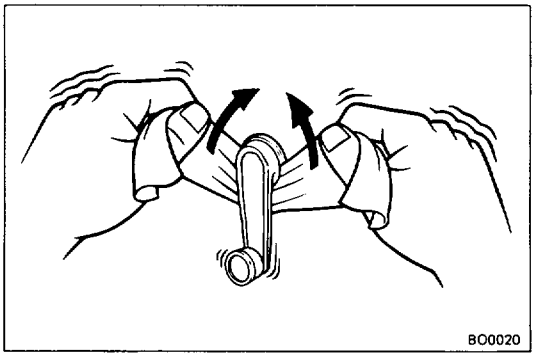
4. ADJUST HOOD LOCK

Loosen the mounting bolts to adjust.

FRONT DOOR

COMPONENTS

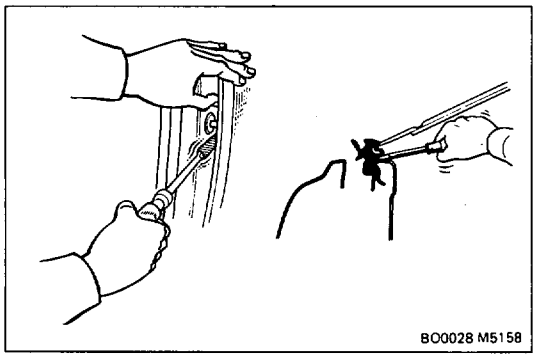



BO0020

DISASSEMBLY OF FRONT DOOR

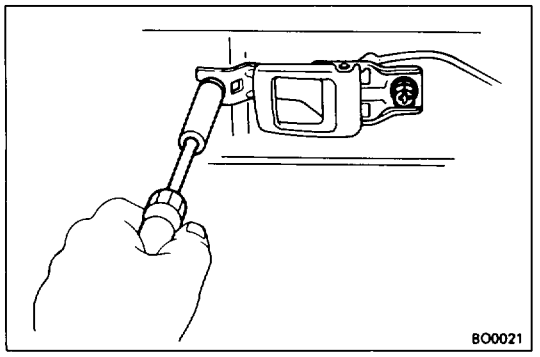
1. **REMOVE FOLLOWING PARTS:**
   (a) Door inside handle bezel
   (b) Armrest or pull handle
   (c) Courtesy light

2. **REMOVE WINDOW REGULATOR HANDLE**
   Pull off the snap ring with a cloth and remove the regulator handle.


BO0028 M5158

3. **REMOVE DOOR TRIM**
   (a) Insert a screwdriver between the trim retainers and door panel to pry it loose.
   CAUTION: Tape the screwdriver tip before use.
   (b) Disconnect the connector from the power window switch.
   (c) (Full door trim type)
   Turn up the trim and using a screwdriver, pry off it.

4. **REMOVE ARMREST BASE**

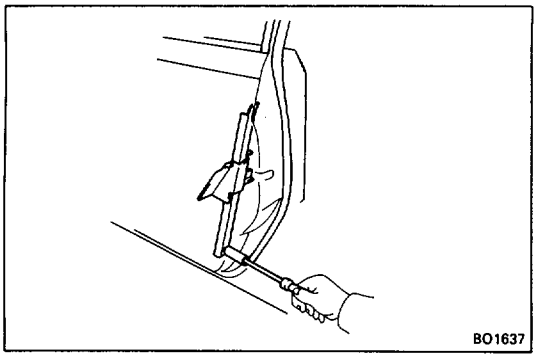

BO0021

5. **REMOVE DOOR INSIDE HANDLE**
   (a) Peel off the outer ridges of the service hole cover.
   (b) Remove the two screws.
   (c) Disconnect the control link from the door lock and remove the handle.

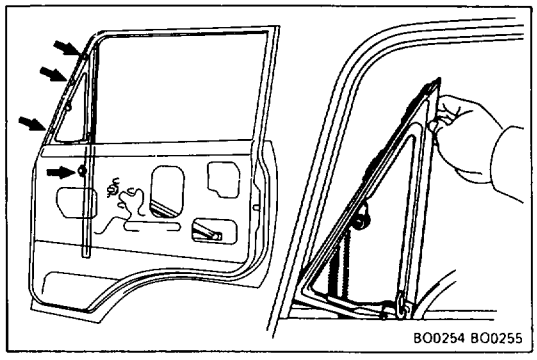
6. **REMOVE SERVICE HOLE COVER**

7. **REMOVE INNER AND OUTER WEATHERSTRIP**

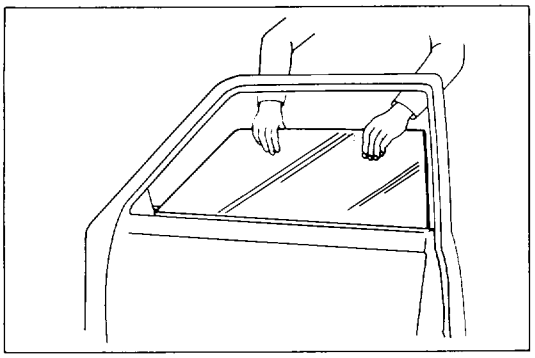
8. **REMOVE GLASS RUN**


BO1637

9. **REMOVE REAR LOWER FRAME**
   (a) Remove the frame set bolt.
   (b) Remove the frame.


BO0254 BO0255

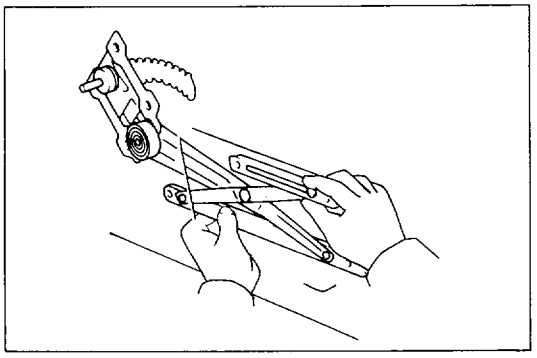
10. **REMOVE VENTILATOR WINDOW**
    (a) Remove two glass channel mounting bolts and place the glass on the bottom of the door cavity.
    (b) Peel off the weatherstrip on the upper side of the ventilator window.
    (c) Remove the three screws.
    (d) Remove the division bar set bolt.
    (e) Remove the ventilator window by pulling it upward.



11. REMOVE DOOR GLASS

(a) (w/o ventilator window type)
Remove two glass channel mounting bolts.

(b) Remove the door glass by pulling it upward.



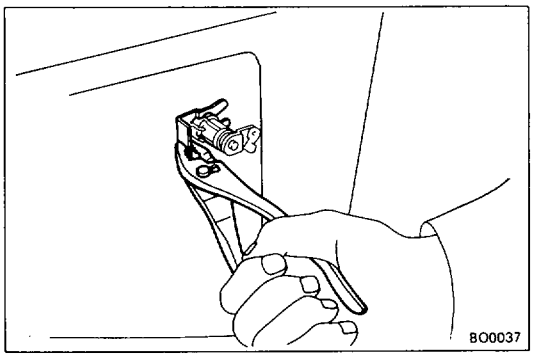
12. REMOVE WINDOW REGULATOR

(a) Disconnect the connector from the power window motor.

(b) Remove the regulator mounting bolts.

(c) (w/o ventilator window type)
Remove the two equalizer arm bracket mounting bolts.

(d) Remove the regulator through the service hole.



13. DISCONNECT FOLLOWING LINKAGES:

(a) Door inside locking control link

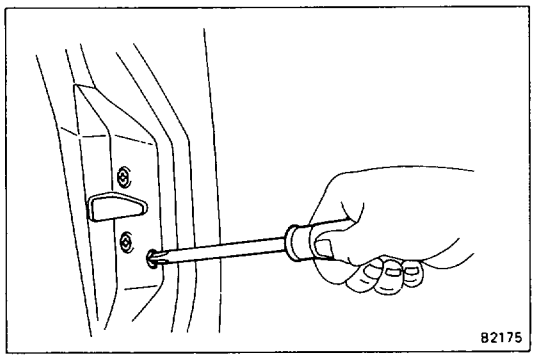
(b) Door outside opening control link

(c) Door outside locking control link

14. REMOVE DOOR LOCK CYLINDER

Remove the retainer with pliers.

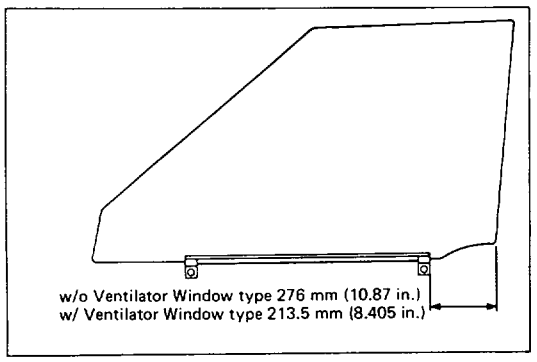
15. REMOVE DOOR OUTSIDE HANDLE



16. REMOVE DOOR LOCK

(a) Disconnect the connector from the door lock solenoid.

(b) Remove the three screws and bolt.

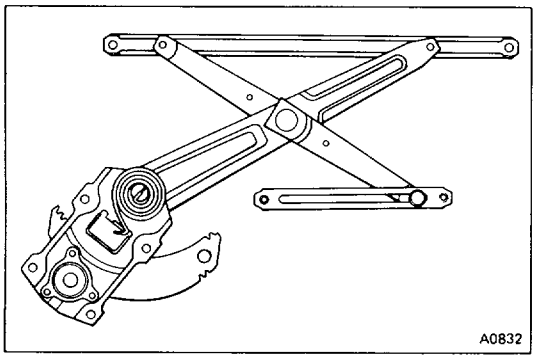


REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT

2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP

3. TAP ON CHANNEL WITH PLASTIC HAMMER

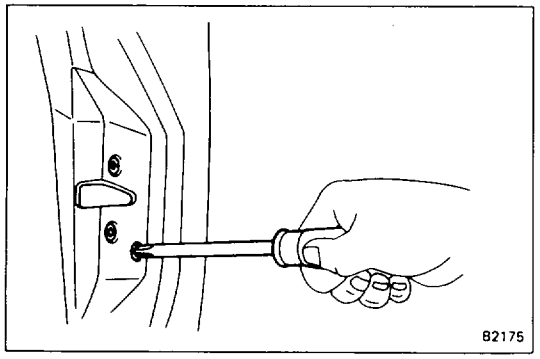


ASSEMBLY OF FRONT DOOR

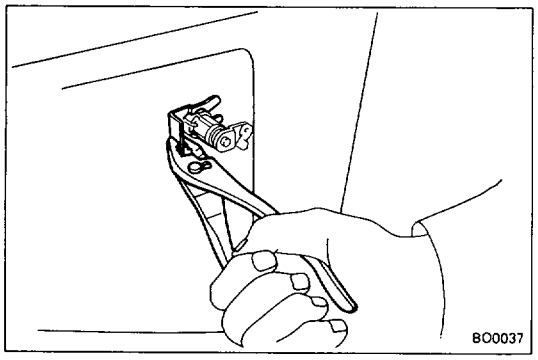
(See page BO-4)

1. **BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE**
   (a) Coat the sliding surface, spring and gears of the window regulator with MP grease.
   (b) Coat the sliding surface of the door lock with MP grease.

   CAUTION: Do not apply MP grease to the spring of the window regulator.

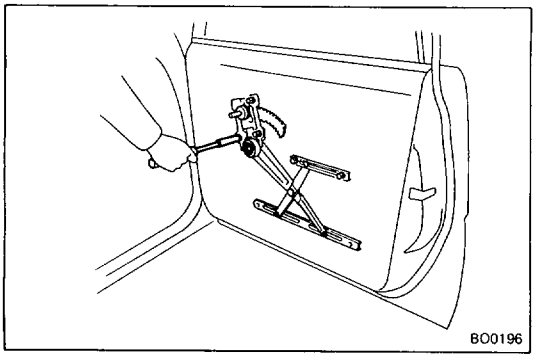


2. **INSTALL DOOR LOCK**
   (a) Install the door lock with the three screws and bolt.
   (b) Connect the connector to the door lock solenoid.



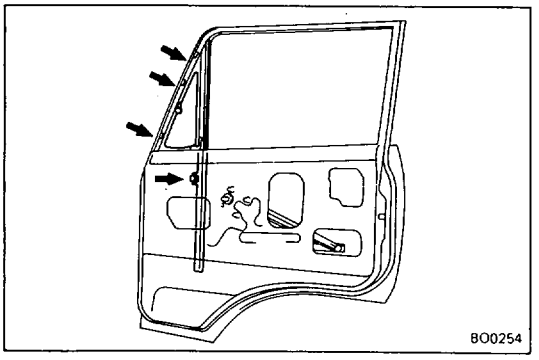
3. **INSTALL DOOR LOCK CYLINDER**
   Install the lock cylinder with the retainer and connect the control link.

4. **INSTALL DOOR OUTSIDE HANDLE**
   Install the handle with the two bolts and connect the control link.

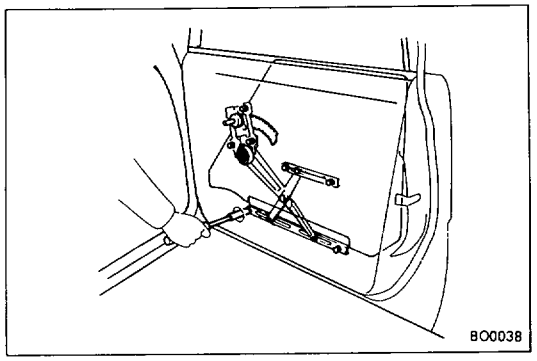


5. **INSTALL WINDOW REGULATOR**
   (a) Place the regulator through the service hole and install the mounting bolts.
   (b) (w/o ventilator window type)
   Install the two equalizer arm bracket mounting bolts.
   (c) Connect the connector to the power window motor.

6. **PLACE DOOR GLASS IN DOOR**
   Insert the door glass in the door cavity.

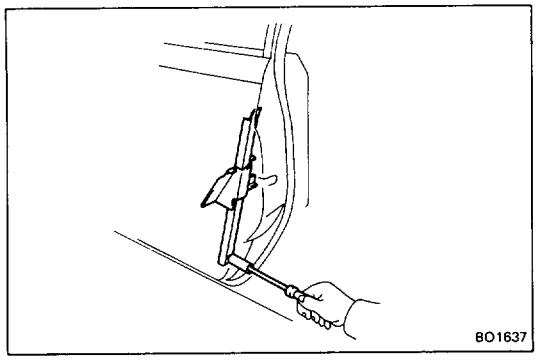


7. **INSTALL VENTILATOR WINDOW**
   (a) Install the three screws.
   (b) Install the division bar set bolt.
   (c) Install the two glass channel mounting bolts.



8. INSTALL DOOR GLASS

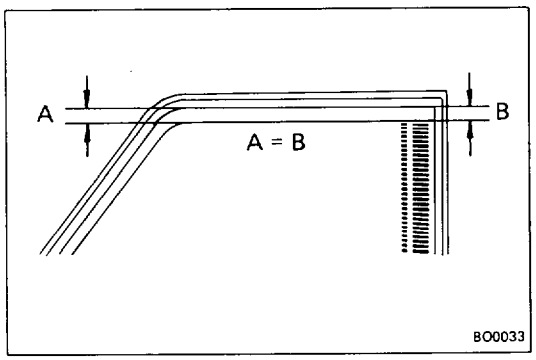
Install the glass to the regulator with the two mounting bolts.



9. INSTALL REAR LOWER FRAME

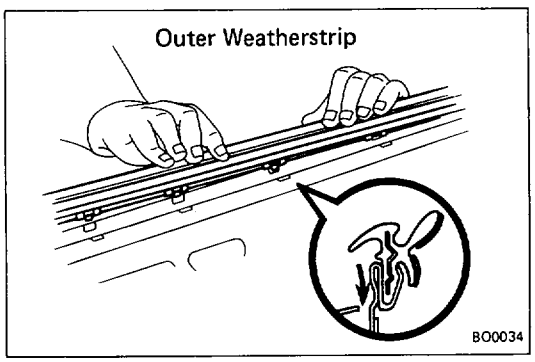
(a) Attach the glass run into the frame.

(b) Install the frame with the bolt.



10. ADJUST DOOR GLASS

Adjust the equalizer arm up or down and tighten it where dimensions A and B, as shown, are equal.

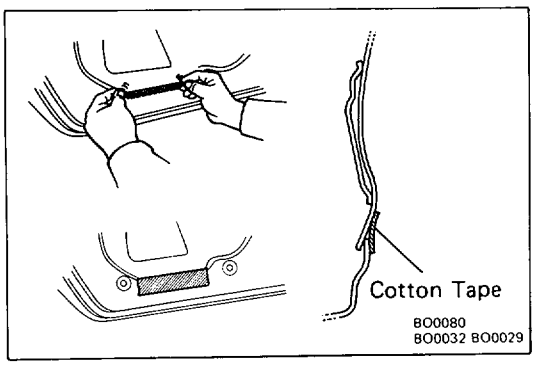


11. INSTALL OUTER WEATHERSTRIP

Insert the claw of the clips into the upper panel hole and push the weatherstrip onto the panel.

12. CONNECT DOOR INSIDE LOCKING CONTROL LINK

13. INSTALL DOOR INSIDE OPENING CONTROL LINK



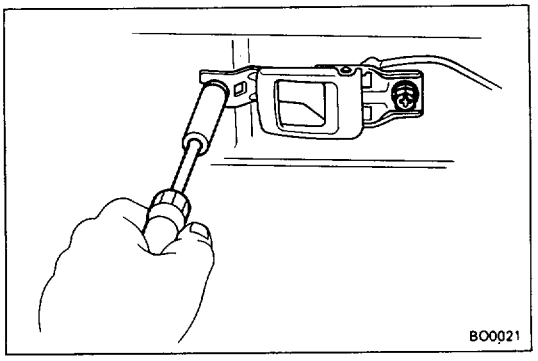
14. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

(b) Insert the lower edge of the service hole cover into the panel slit.

(c) Seal the panel slit with cotton tape.

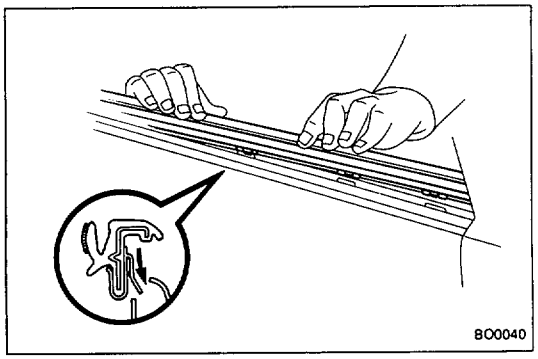
CAUTION: Do not block the trim clip seating with the tape.



15. INSTALL DOOR INSIDE HANDLE

Install the handle with the two screws.

16. INSTALL ARMREST BASE

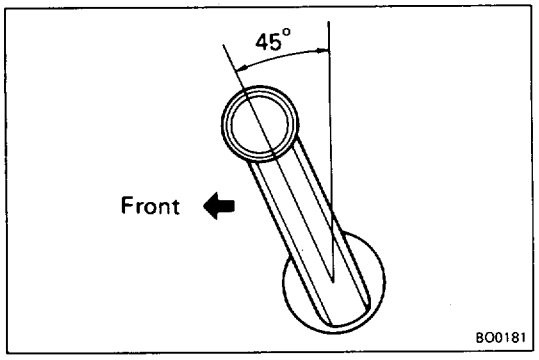


17. INSTALL DOOR TRIM

(a) Connect the connector to the power window switch.

(b) Insert the weatherstrip clips into the door panel holes and push the weatherstrip onto the panel.

(c) Install the door trim.



18. INSTALL WINDOW REGULATOR HANDLE

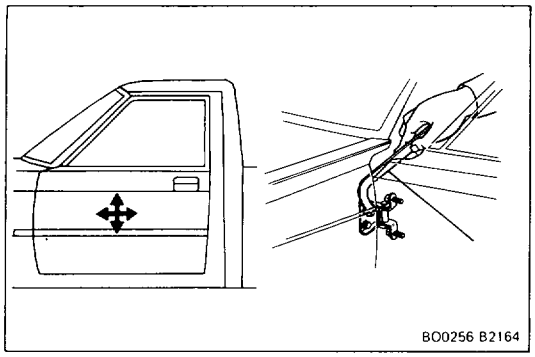
With door window fully closed, install the window regulator handle with a snap ring as shown.

19. INSTALL FOLLOWING PARTS:

(a) Courtesy light

(b) Armrest or pull handle

(c) Door inside handle bezel

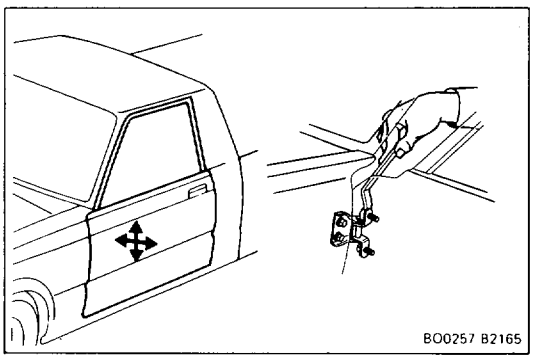


ADJUSTMENT OF FRONT DOOR

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

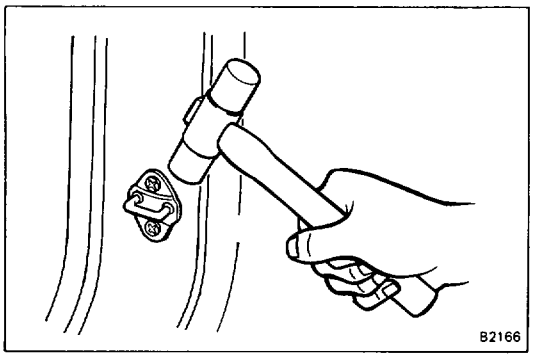
Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812-00010



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.



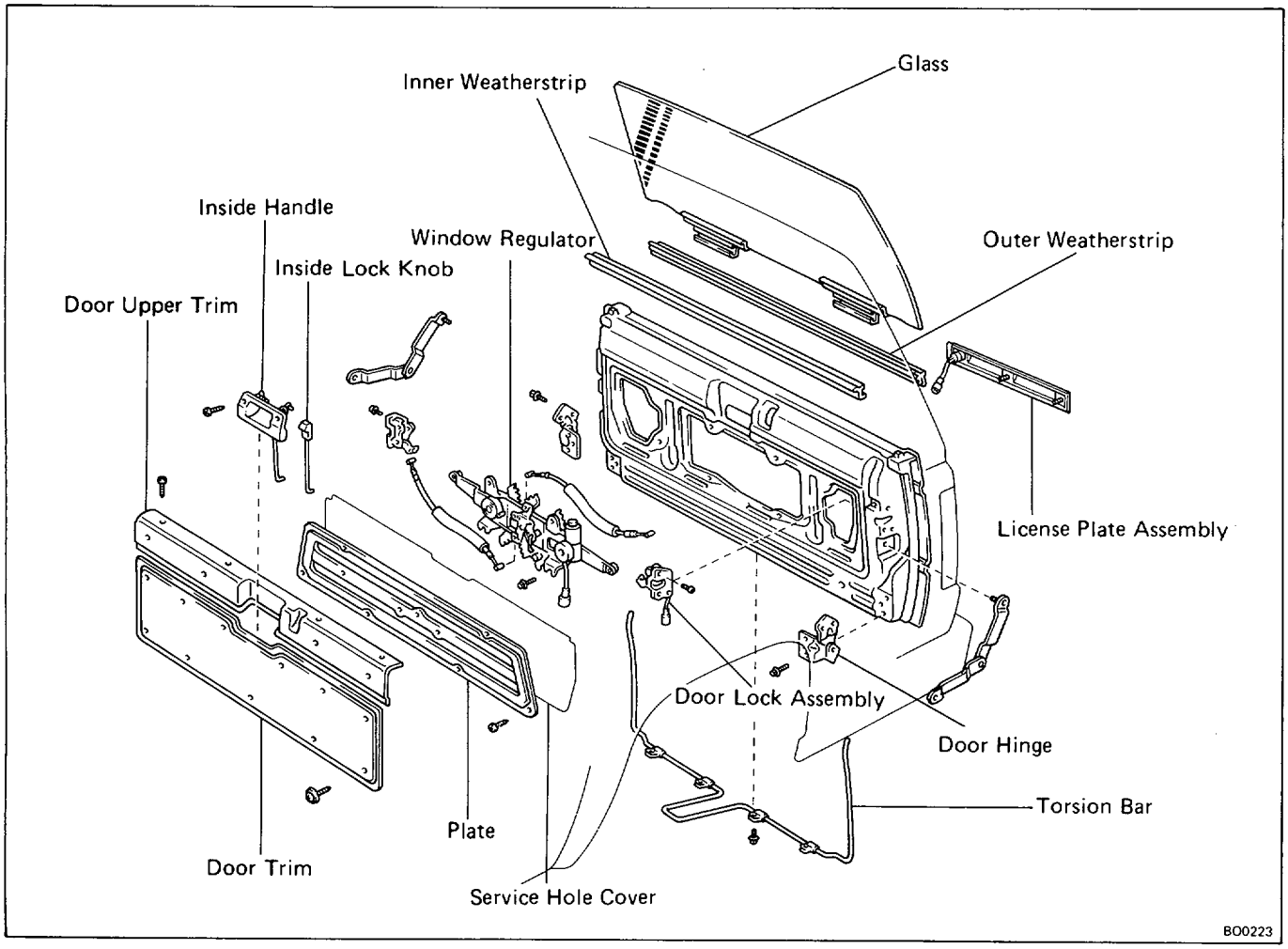
3. ADJUST DOOR LOCK STRIKER

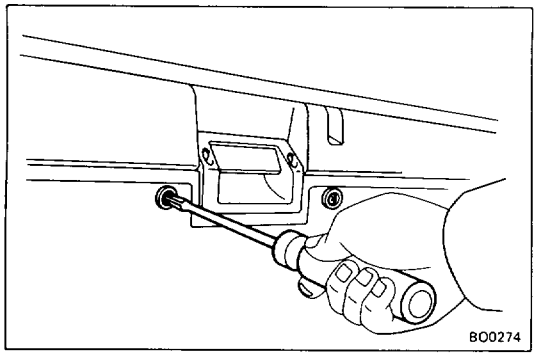
(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Loosen the striker mounting screws to adjust.

BACK DOOR

COMPONENTS

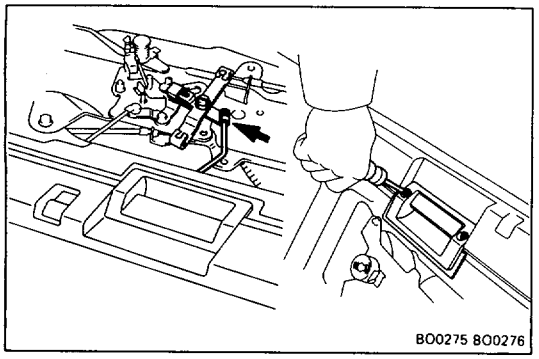




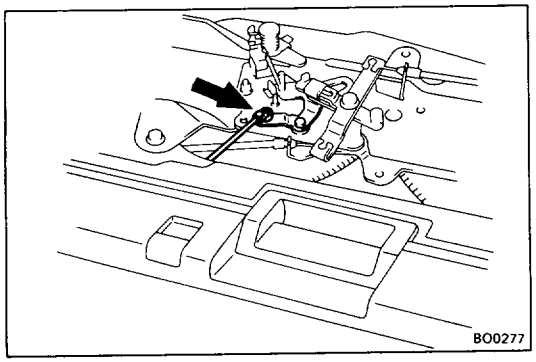
DISASSEMBLY OF BACK DOOR (POWER WINDOW OPERATIVE)

If the power window is not operative.
(See page BO-13)

1. **REMOVE DOOR TRIM**
2. **REMOVE PLATE**
3. **REMOVE SERVICE HOLE COVER**



4. **REMOVE INSIDE HANDLE**
   (a) Disconnect the control link on the regulator side.
   (b) Remove the two screws.
   (c) Remove the inside handle assembly.

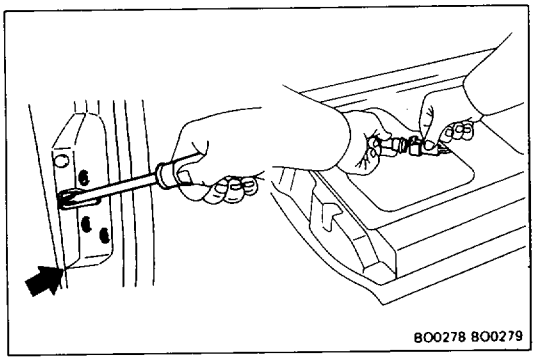


5. REMOVE INSIDE LOCK KNOB AND LINK

Disconnect the inside lock knob link on the regulator side, and remove it.

6. REMOVE DOOR UPPER TRIM

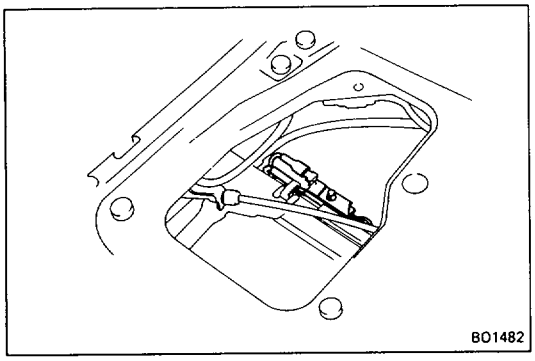
7. REMOVE INNER WEATHERSTRIP



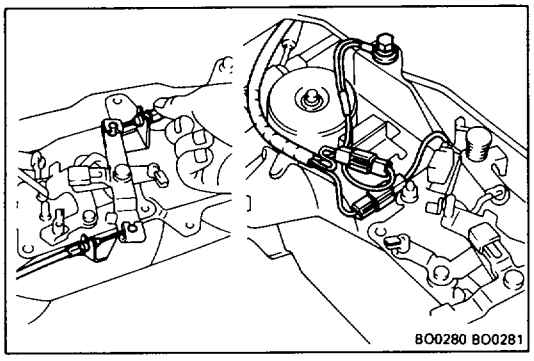
8. RAISE GLASS HALF OF FULL STROKE

Using a screwdriver, move the locking assembly to the lock position and then raise the glass to where the arms of the regulator are in a straight line.

9. DISCONNECT CONNECTOR FROM WINDOW REGULATOR MOTOR



10. DISCONNECT REAR WINDOW DEFOGGER CONNECTORS FROM GLASS



11. DISCONNECT DOOR LOCK CONTROL CABLES

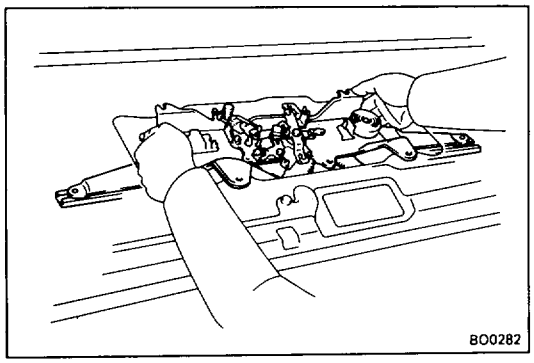
Disconnect the door lock control cables on the regulator side.

12. DISCONNECT CONNECTORS AND GROUND CABLE

Disconnect the two connectors on the regulator and ground cable.

13. REMOVE REGULATOR MOUNT BOLTS

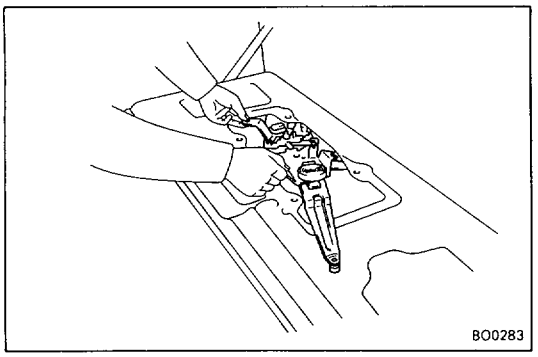
Remove the three regulator mount bolts.



14. SLIDE OUT REGULATOR ARMS FROM GLASS

Slide the regulator left and right, and pull the arms from the glass channel.

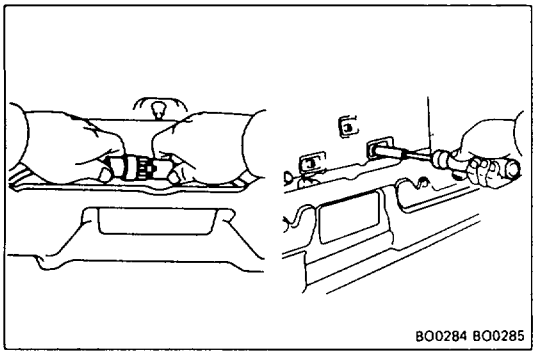
15. REMOVE GLASS



16. REMOVE REGULATOR

First shift the regulator into the cavity and then pull it out.

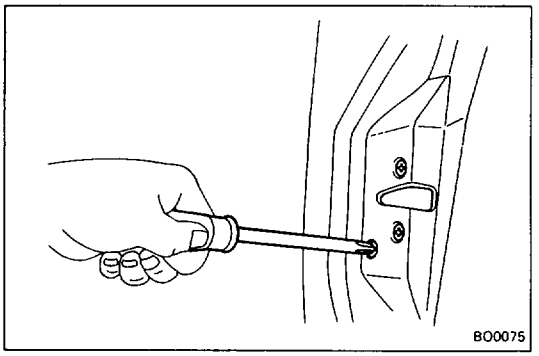
17. REMOVE OUTER WEATHERSTRIP



18. DISCONNECT CONNECTOR FROM OUTER POWER WINDOW SWITCH

19. REMOVE LICENSE PLATE ASSEMBLY

Remove the two nuts and a clip, and remove the license plate assembly.



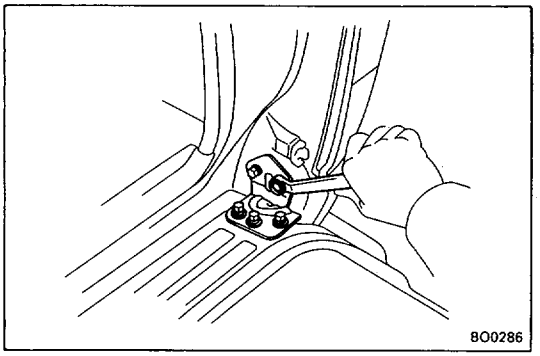
20. REMOVE DOOR LOCK ASSEMBLY

(a) Disconnect the connector from the door lock assembly. (LH side only)

(b) Remove the three screws.

(c) Pull out the door lock assembly from the cavity.

21. PULL OUT WIRING FROM DOOR CAVITY

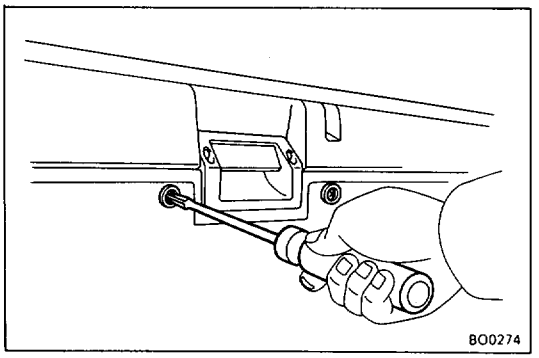


22. REMOVE DOOR

Remove the two bolts of the door hinge and remove the door.

NOTE: Place a shop cloth between the door and bumper so the door does not fall off and get damaged when the bolts are removed.

23. REMOVE TORSION BAR FROM DOOR



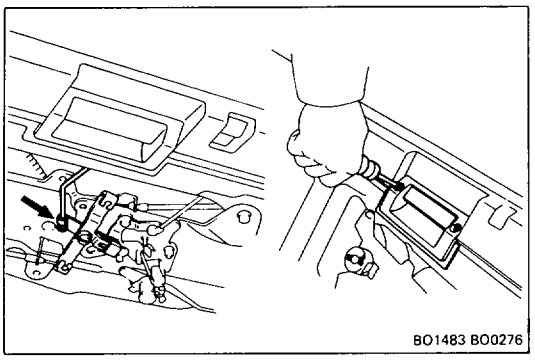
(POWER WINDOW NOT OPERATIVE)

If the power window is operative.
(See page BO-11)

1. REMOVE DOOR TRIM

2. REMOVE PLATE

3. REMOVE SERVICE HOLE COVER

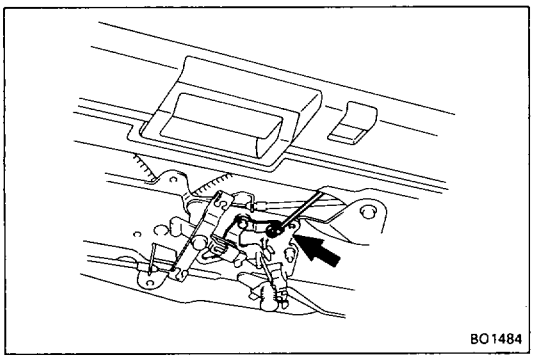


4. REMOVE INSIDE HANDLE

(a) Disconnect the control link on the regulator side.

(b) Remove the two screws.

(c) Remove the inside handle assembly.



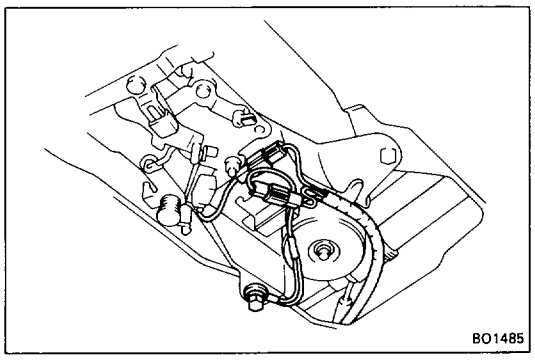
5. REMOVE INSIDE LOCK KNOB AND LINK

Disconnect the inside lock knob link on the regulator side, and remove it.

6. REMOVE DOOR UPPER TRIM

7. REMOVE INNER WEATHERSTRIP

8. DISCONNECT CONNECTOR FROM WINDOW REGULATOR MOTOR

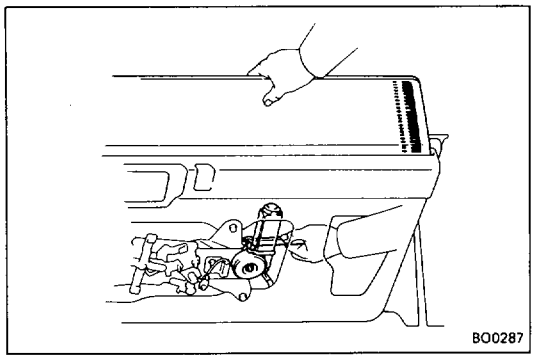


9. DISCONNECT CONNECTORS AND GROUND CABLE

Disconnect the two connectors on the regulator and then disconnect the ground cable by removing the regulator mounting bolt to which it is attached.

10. DISCONNECT DOOR LOCK CONTROL CABLES

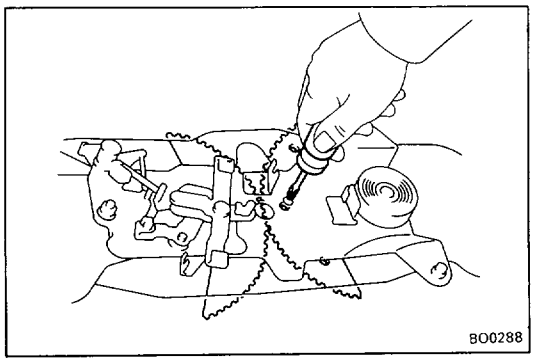
Disconnect the door lock control cables on the regulator side.



11. REMOVE REGULATOR MOTOR

While holding the glass so it does not fly out, remove the regulator motor.

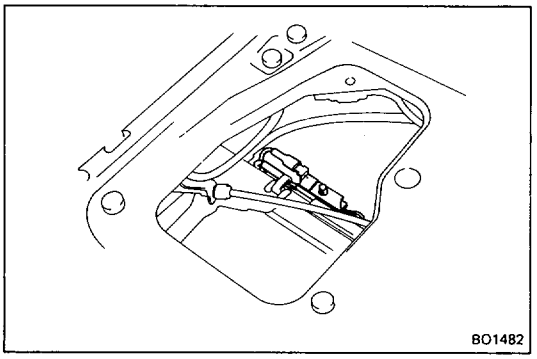
CAUTION: Never attempt to remove the regulator motor without holding the glass as there is danger of the regulator arm swinging up.



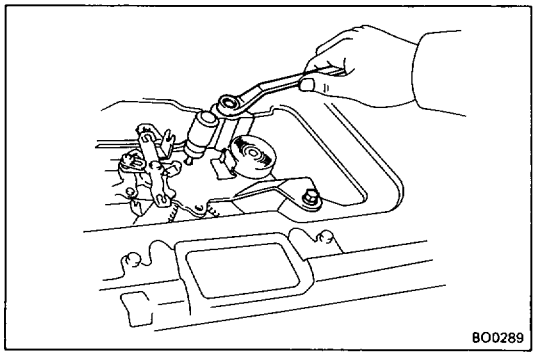
12. LOCK REGULATOR ARM

(a) Lower the glass to lowermost position, and open the back door by pulling the door lock control cables.

(b) Raise the glass to horizontally position the regulator arms. Then insert a stubby screwdriver or such into a service hole in the regulator to secure the arms.

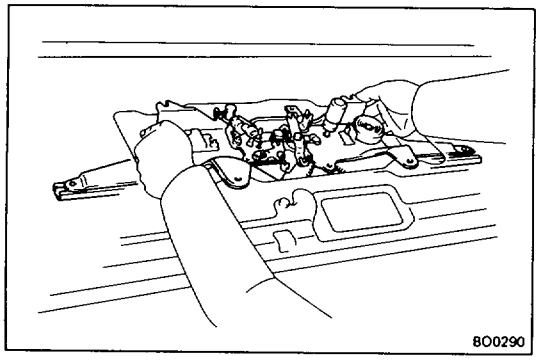


13. DISCONNECT REAR WINDOW DEFOGGER CONNECTORS FROM GLASS



14. REMOVE REGULATOR MOUNT BOLTS

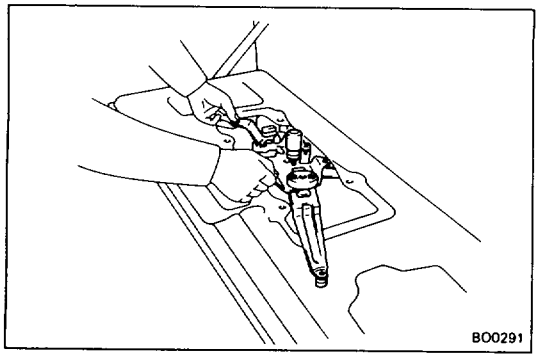
Remove the three regulator mount bolts.



15. SLIDE OUT REGULATOR ARMS FROM GLASS

Slide the regulator left and right, and pull the arms from the glass channel.

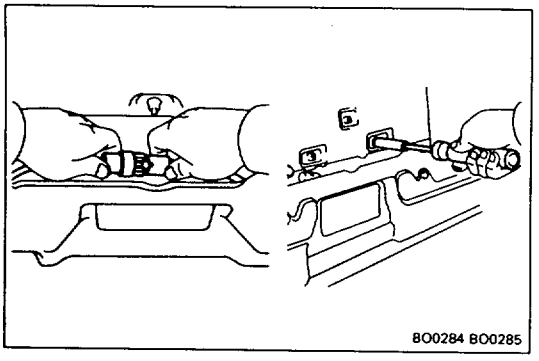
16. REMOVE GLASS



17. REMOVE REGULATOR

First shift the regulator into the cavity and then pull it out.

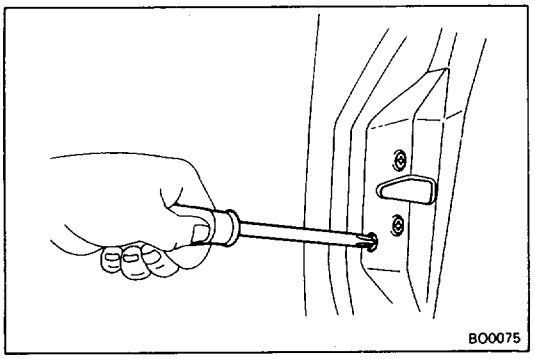
18. REMOVE OUTER WEATHERSTRIP



19. DISCONNECT CONNECTOR FROM OUTER POWER WINDOW SWITCH

20. REMOVE LICENSE PLATE ASSEMBLY

Remove the two nuts and a clip, and remove the license plate assembly.



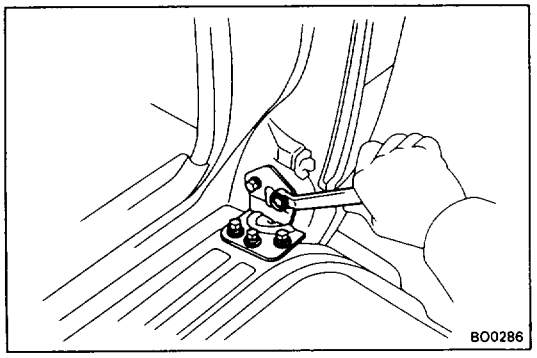
21. REMOVE DOOR LOCK ASSEMBLY

(a) Disconnect the connector from the door lock assembly. (LH side only)

(b) Remove the three screws.

(c) Pull out the door lock assembly from the cavity.

22. PULL OUT WIRING FROM DOOR CAVITY

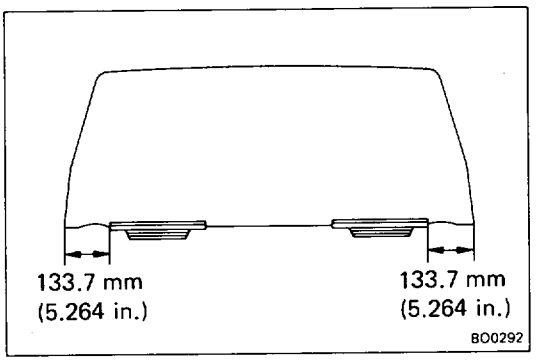


23. REMOVE DOOR

Remove the two bolts of the door hinge and remove the door.

NOTE: Place a shop cloth between the door and bumper so that the door does not fall off and get damaged when the bolts are removed.

24. REMOVE TORSION BAR FROM DOOR



REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT

2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP

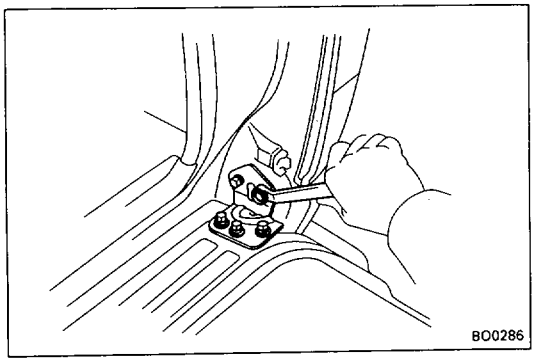
3. INSTALL NEW GLASS CHANNEL BY TAPPING IT WITH PLASTIC HAMMER

ASSEMBLY OF BACK DOOR

1. BEFORE INSTALLING PARTS, APPLY MP GREASE TO THEM

(a) Apply MP grease to the sliding surface, spring and gears of the window regulator.

(b) Apply MP grease to the sliding surface of the door lock.

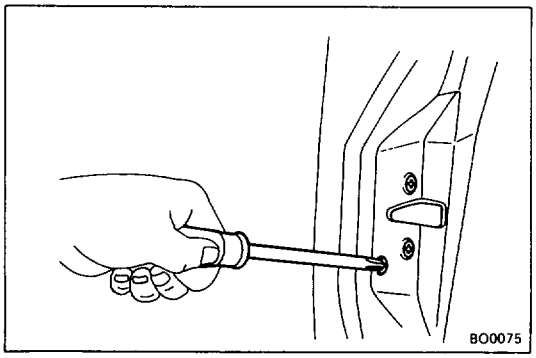


2. INSTALL TORSION BAR TO DOOR

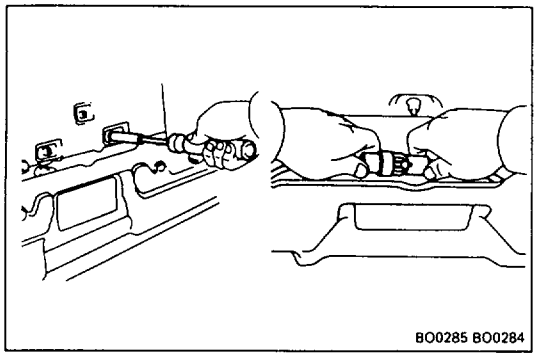
3. INSTALL BACK DOOR

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

4. INSTALL WIRING INTO DOOR CAVITY



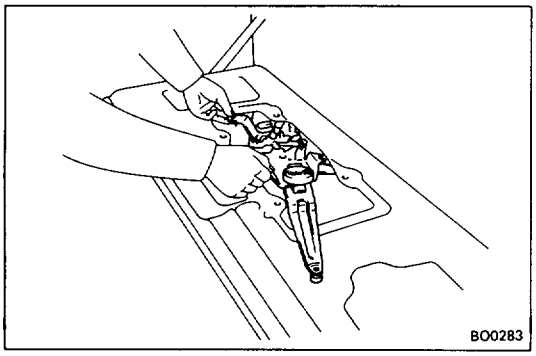
5. **INSTALL DOOR LOCK ASSEMBLY**
   (a) Install the door lock assembly to the door cavity.
   (b) Install the three screws.
   (c) Connect the connector to the door lock assembly. (LH side only)



6. **INSTALL LICENSE PLATE ASSEMBLY**
   Install the two nuts and a clip, and install the license plate assembly.

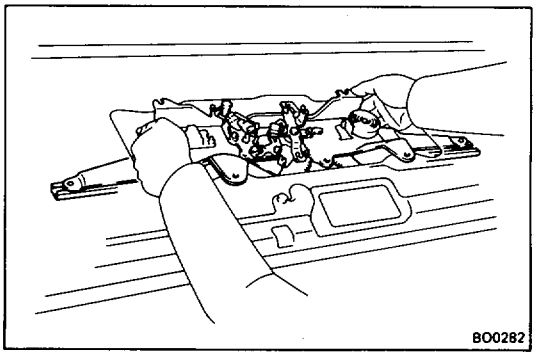
7. **CONNECT CONNECTOR TO OUTER POWER WINDOW SWITCH**

8. **INSTALL OUTER WEATHERSTRIP**



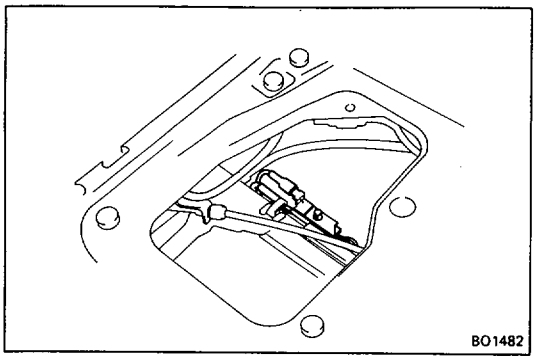
9. **INSTALL REGULATOR**
   NOTE: Before placing the regulator into the cavity, first install the motor and position the arms in a straight line.

10. **INSTALL GLASS**

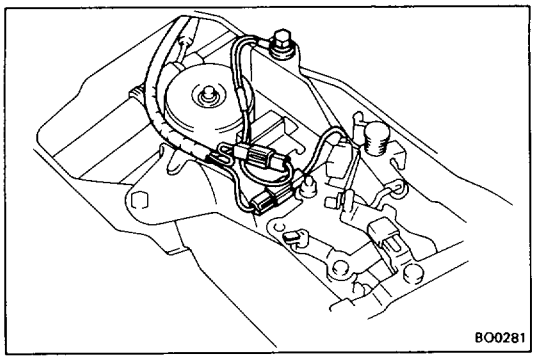


11. **SLIDE REGULATOR ARMS INTO GLASS**
    Slide the regulator left and right to insert the arms into the glass channel.

12. **INSTALL REGULATOR MOUNT BOLTS**
    Install the three mount bolts.

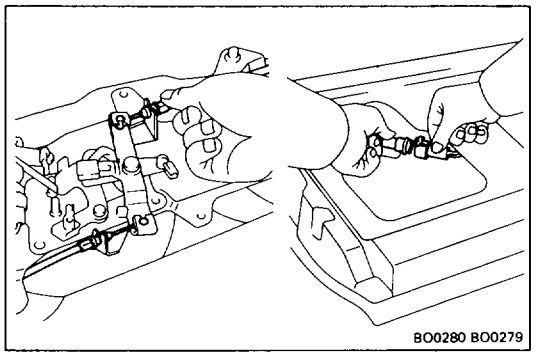


13. **CONNECT REAR WINDOW DEFOGGER CONNECTORS TO GLASS**



14. CONNECT CONNECTORS AND GROUND CABLE

Connect the two connectors on the regulator, and connect the ground cable with the regulator mount bolt.



15. CONNECT DOOR LOCK CONTROL CABLES

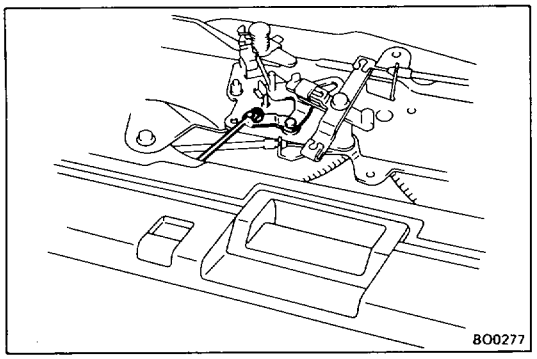
Connect the door lock control cables on the regulator side.

NOTE: When connecting the door lock control cables, clamp them in the original clamps.

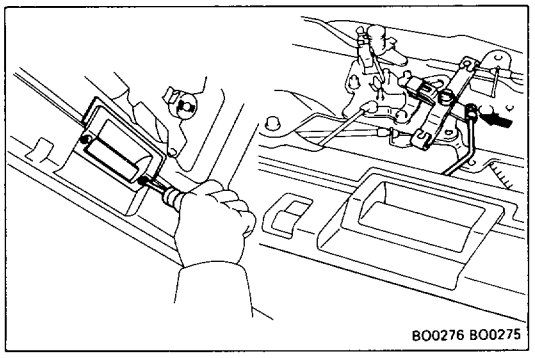
16. CONNECT CONNECTOR TO WINDOW REGULATOR MOTOR

17. INSTALL DOOR UPPER TRIM

18. INSTALL INNER WEATHERSTRIP



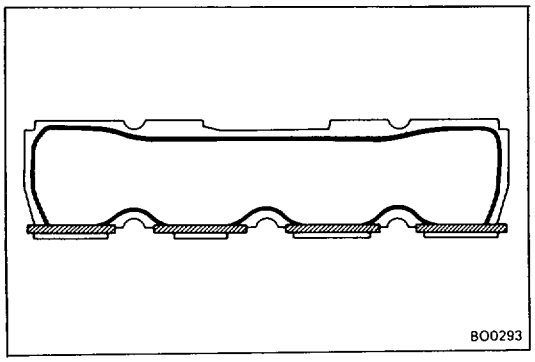
19. INSTALL INSIDE LOCK KNOB AND LINK



20. INSTALL INSIDE HANDLE

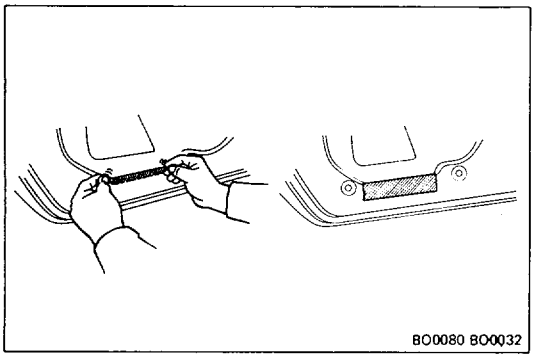
(a) Install the inside handle and two screws.

(b) Connect the control link.



21. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with butyl tape (6 mm or 0.24 in. width).

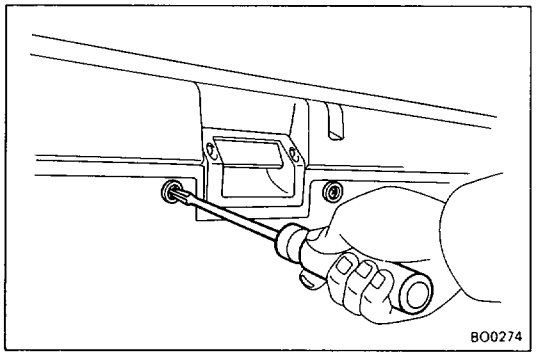


(b) Insert the lower edge of the service hole cover into the panel slit.

(c) Seal the panel slit with cotton tape.

CAUTION: Do not block the trim clip seating with the tape.

22. INSTALL PLATE

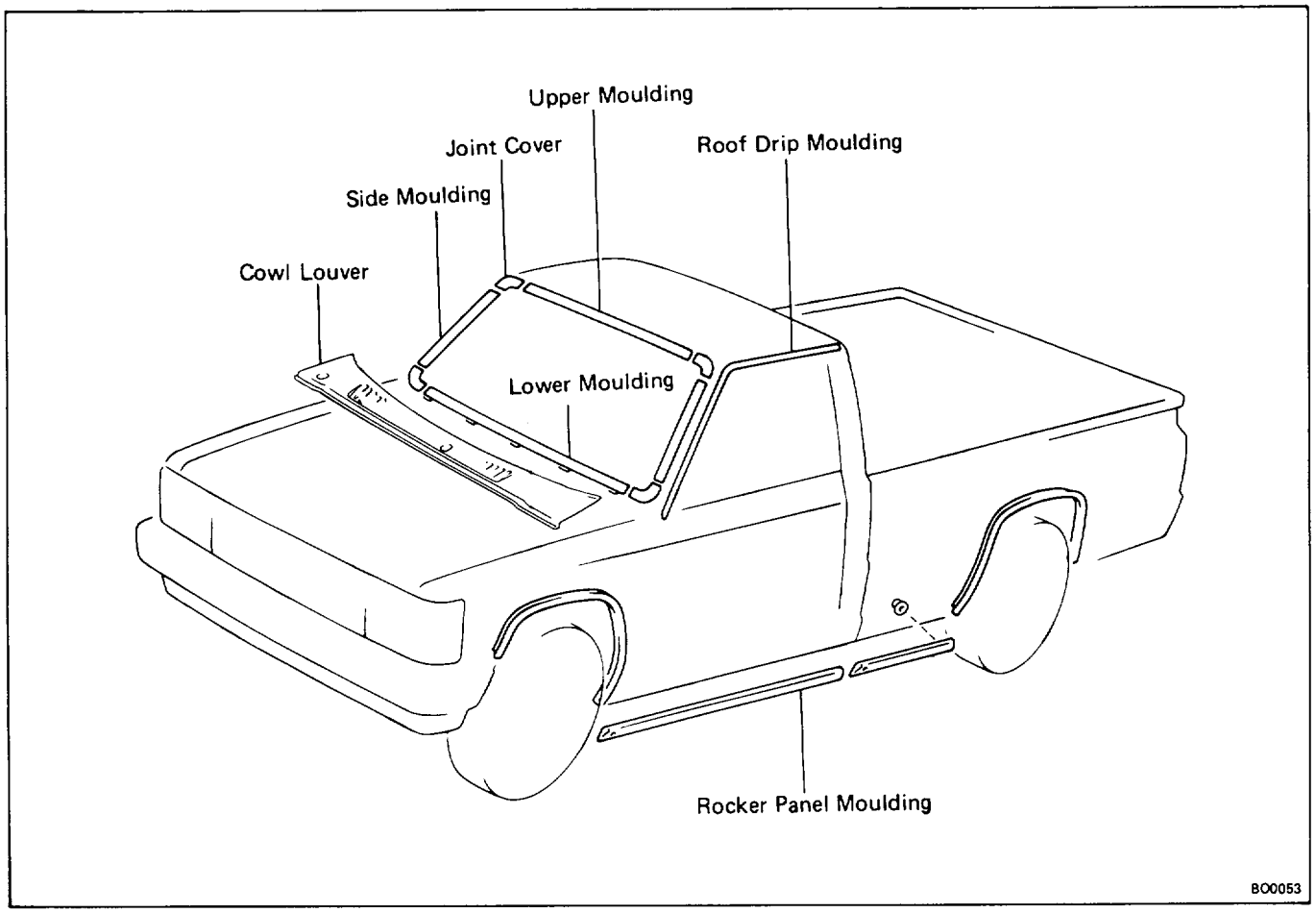


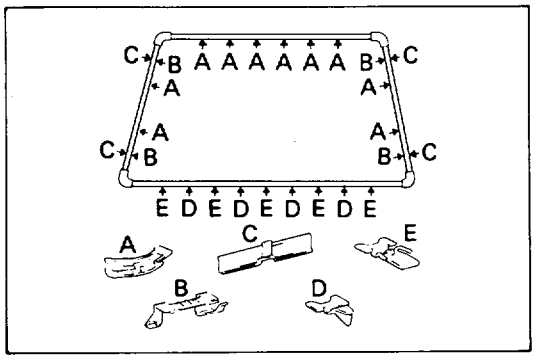
23. INSTALL DOOR TRIM

MOULDING

Windshield Outside Moulding

COMPONENTS

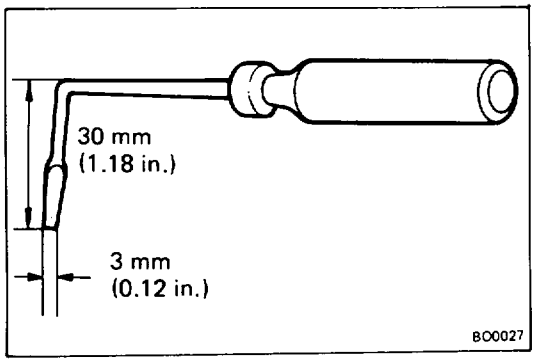




REMOVAL OF OUTSIDE MOULDING

There are four types of clips for moulding installation. Locations of these clips and fasteners are as shown in the figure.

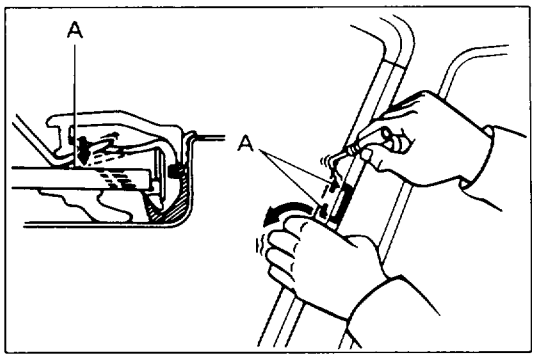
Carefully apply adhesive tape to protect the body.



1. **PREPARE A SMALL SCREWDRIVER**

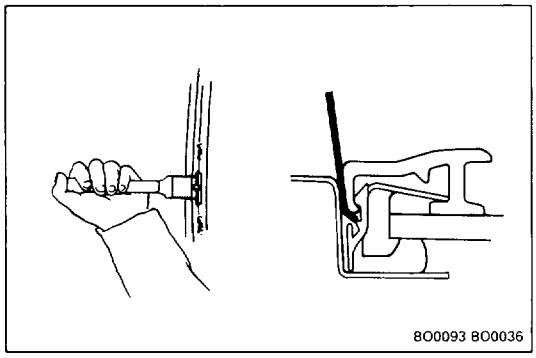
   Bend a screwdriver at right angle as shown.

2. **REMOVE LOWER JOINT COVER**



3. REMOVE SIDE MOULDING

(a) Insert the tip of the screwdriver between the moulding and clip, and twist it to pry loose the clasps (A) on the window side.

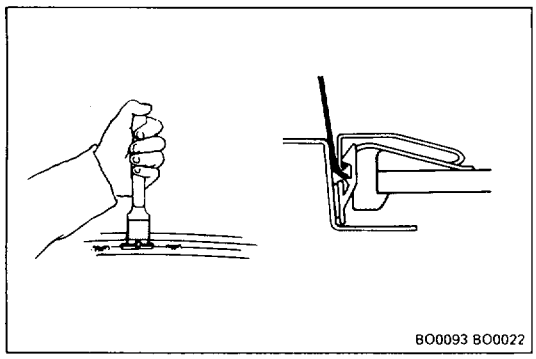


(b) Pry loose the fasteners and clips and remove the moulding.

NOTE: Apply tape to the scraper blade to prevent scratching the vehicle body.

4. REMOVE UPPER JOINT COVER

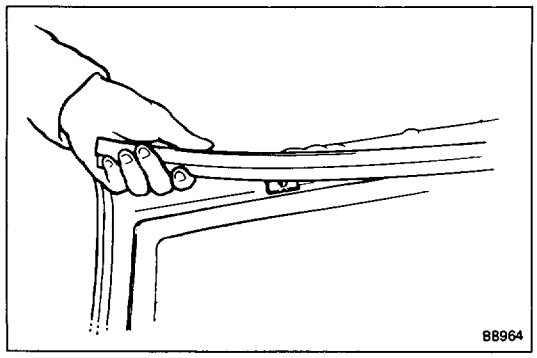
Remove the joint cover from the upper moulding.



5. REMOVE UPPER MOULDING

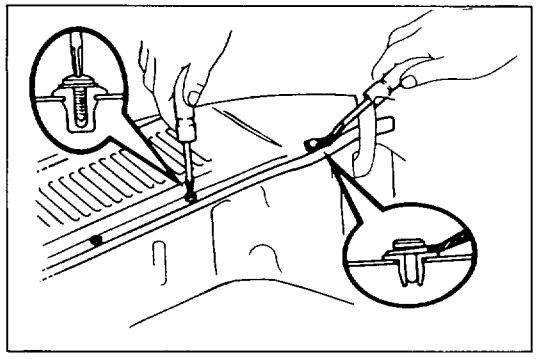
(a) Pry loose the fasteners and clips.

NOTE: Apply tape to the scraper blade to prevent scratching the vehicle body.



(b) Slide the moulding out.

NOTE: Do not bend the moulding.



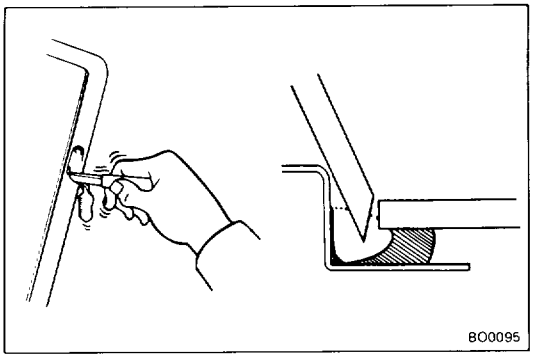
6. REMOVE WIPER ARM

7. REMOVE COWL LOUVER

Remove the two clips and three screws, then and remove the cowl louver.

8. REMOVE LOWER MOULDING

Remove the screws and the moulding.



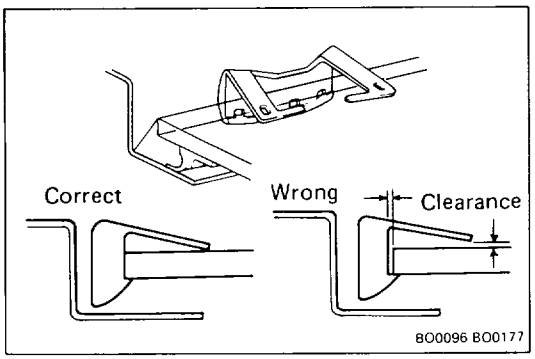
REPLACEMENT OF FASTENER AND CLIP

If any fastener or clip is damaged, replace it.

1. **REMOVE DAMAGED CLIP**

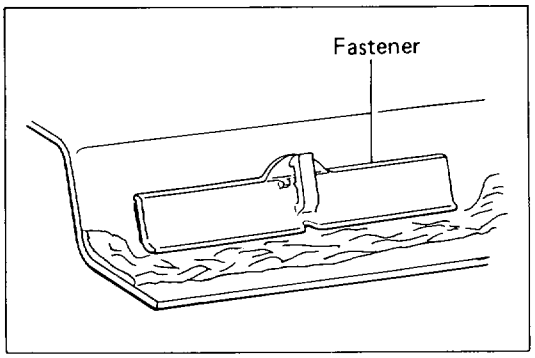
2. **CUT OFF OLD ADHESIVE AROUND CLIP INSTALLATION AREA**

   (a) Grind a notch into the clip so it latches onto the glass edge.



   (b) Temporarily install the clip and insure that it is firmly attached to the glass.

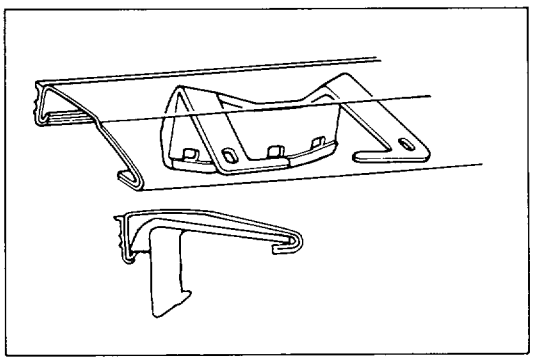
   If the clip is loose, replace it.



3. **REMOVE ANY DAMAGED FASTENER**

4. **CUT OFF OLD ADHESIVE AROUND FASTENER INSTALLATION AREA**

5. **INSTALL FASTENER ONTO BODY WITH DOUBLE-STICK TAPE**



INSTALLATION OF OUTSIDE MOULDING

1. **INSTALL LOWER MOULDING**

   Install the six screws and the moulding.

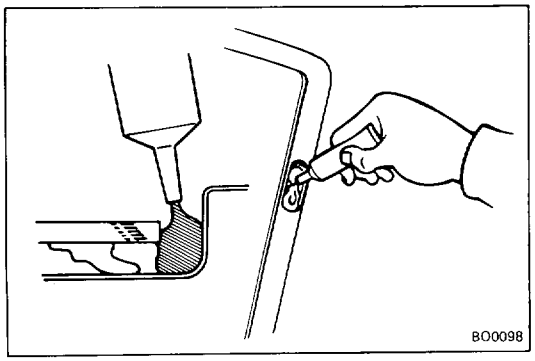
2. **INSTALL COWL LOUVER**

   Install the two clips, three screws and the cowl louver.

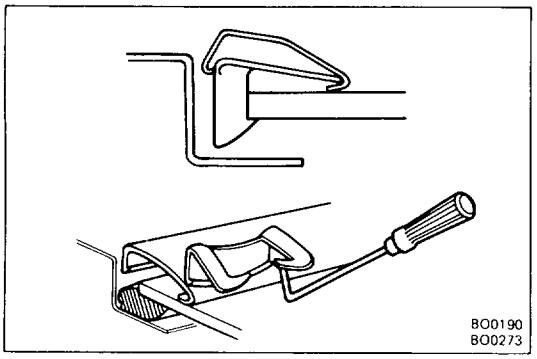
3. **INSTALL WIPER ARM**

4. **INSTALL NEW CLIP INTO MOULDING**

   Install the moulding to the body so that the clips and fasteners are not in a position where they will contact each other.



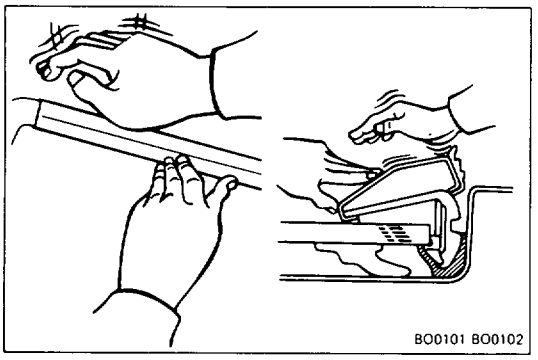
5. **APPLY ADHESIVE AT CLIP INSTALLATION AREA**



6. INSTALL UPPER MOULDING

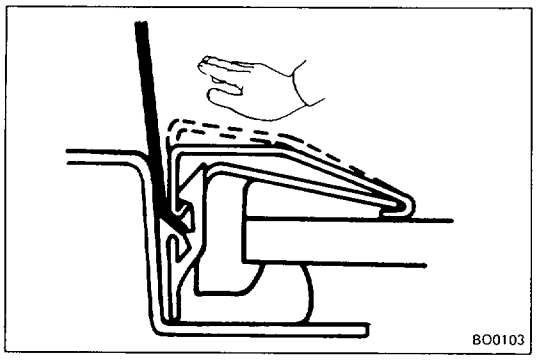
(a) Place the moulding onto the body.

(b) Pry up the clips on the body side and install them to the moulding.



(c) Tap the moulding with your hand to fasten the clips at the glass edge.

At the same time, tap on the fasteners by hand.



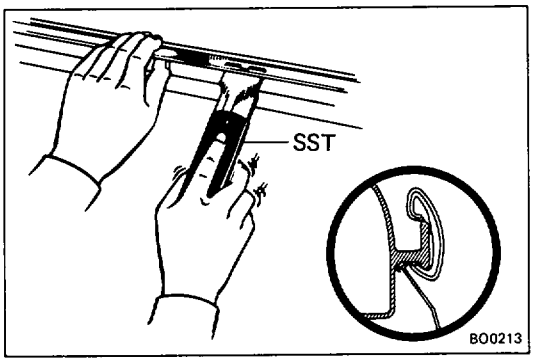
(d) If the moulding is not at the same level as the body, insert a scraper between them and tap on the moulding while pushing on the fastener.

NOTE: Apply tape to the scraper blade to prevent scratching the vehicle body.

7. INSTALL JOINT COVER

Install the joint cover to the upper moulding and lower moulding.

8. INSTALL SIDE MOULDING IN SAME MANNER AS UPPER MOULDING

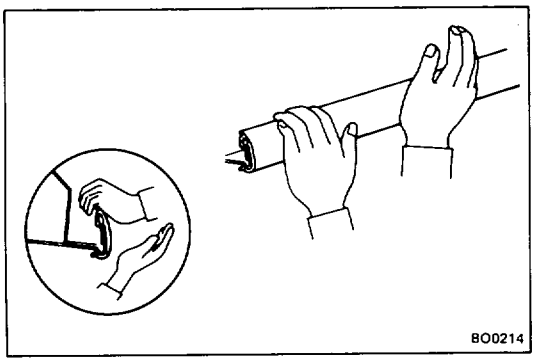


REMOVAL OF ROOF DRIP MOULDING

REMOVE ROOF DRIP MOULDING

Using SST, pull off the roof drip moulding from both ends.

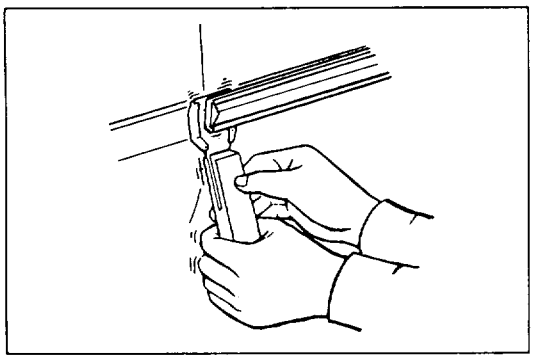
SST 09806-30010



INSTALLATION OF ROOF DRIP MOULDING

INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange. Tap on the moulding by hand.



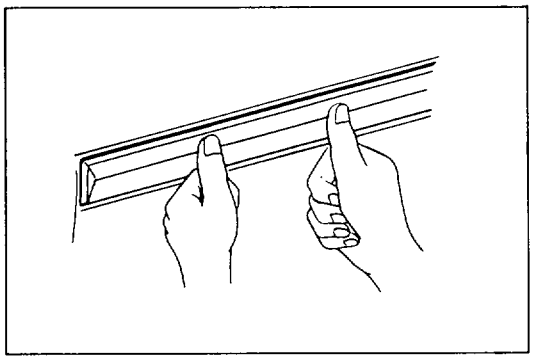
REMOVAL OF ROCKER PANEL MOULDING

REMOVE ROCKER PANEL MOULDING

(a) Remove the set screw.

(b) Using a scraper, pry loose the clip and remove the moulding.

NOTE: Apply tape to the scraper blade to prevent scratching the vehicle body.



INSTALLATION OF ROCKER PANEL MOULDING

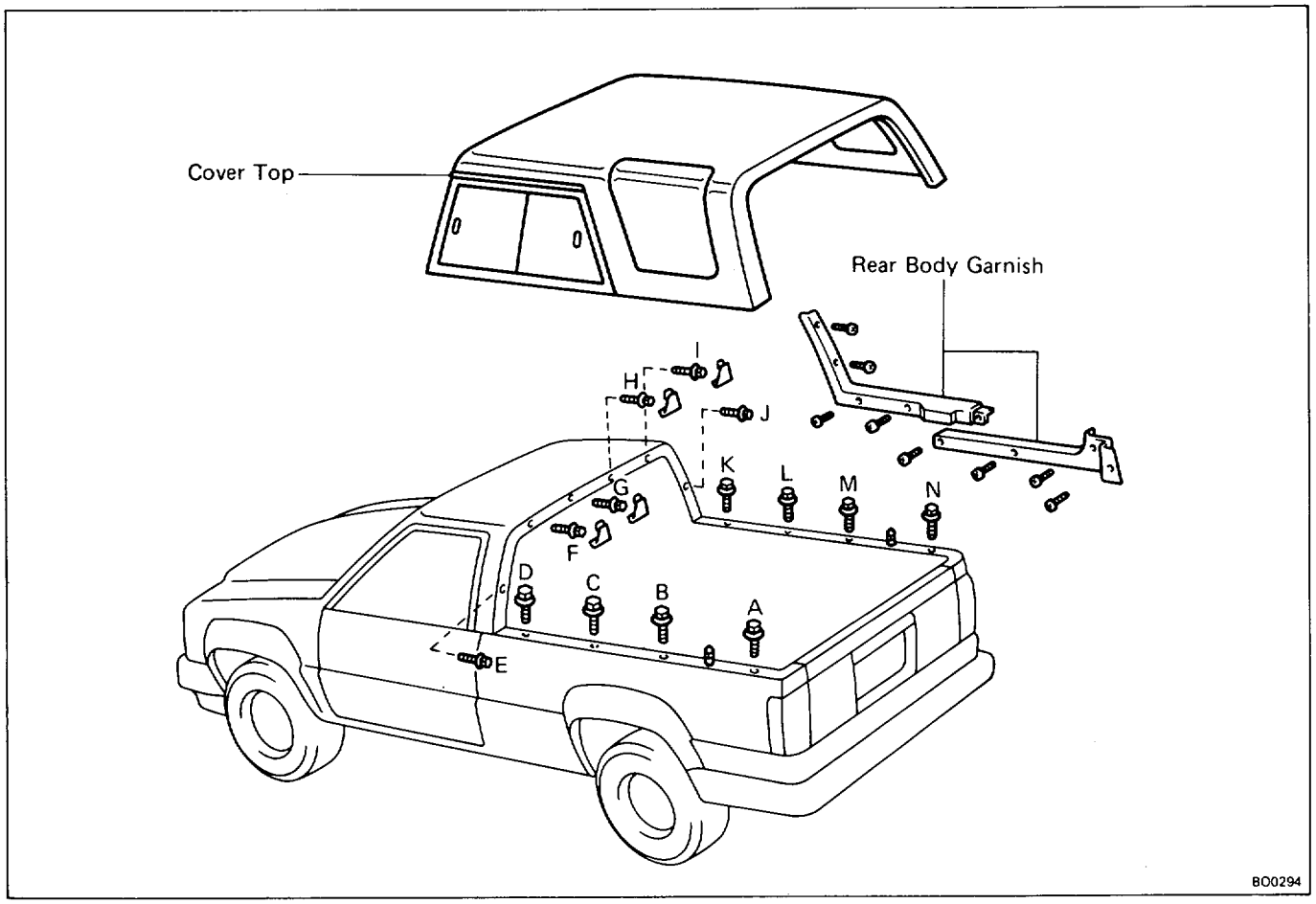
INSTALL ROCKER PANEL MOULDING

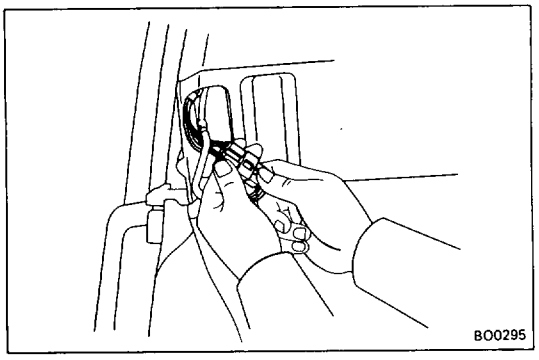
(a) Install the moulding by hand.

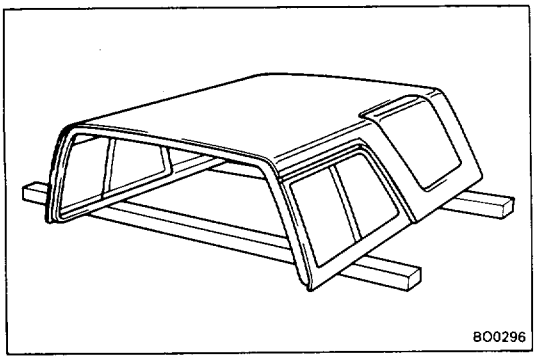
(b) Install the set screw.

COVER TOP

COMPONENTS







REMOVAL OF COVER TOP

1. **OPEN BACK WINDOW FULLY**
2. **REMOVE REAR BODY GARNISHES**
3. **DISCONNECT CONNECTOR AND WASHER HOSE**

   The connector and washer hose are located on the LH side of the rear body.

4. **REMOVE COVER TOP**

   (a) Remove bolt "B".

   NOTE: The cover top switch is turned off when bolt "B" is removed. In this condition back door power window cannot be operated.

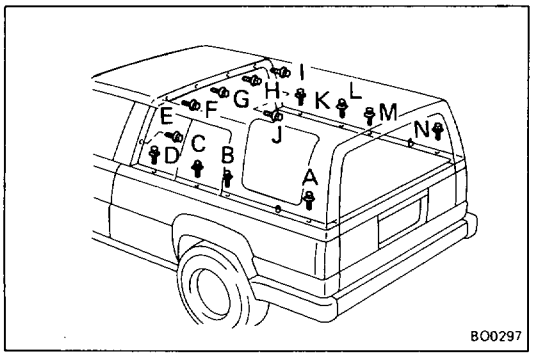
   (b) Remove the other bolts.

   (c) Take the cover top off.

   NOTE: After removing the cover top, place it on pieces of lumber and do not let it come into direct contact with the ground. Do not place anything on top of the cover.

CAUTION:

1. **While the cover top is removed, never reinstall bolt "B" for the purpose of operating the back door power window.**
2. **If bolt "B" is installed to the deck directly, the cover top switch may get damaged due to over protrusion of the bolt.**



INSTALLATION OF COVER TOP

1. **INSTALL COVER TOP TO FIT PROPER POSITION IN FOLLOWING PROCEDURE**

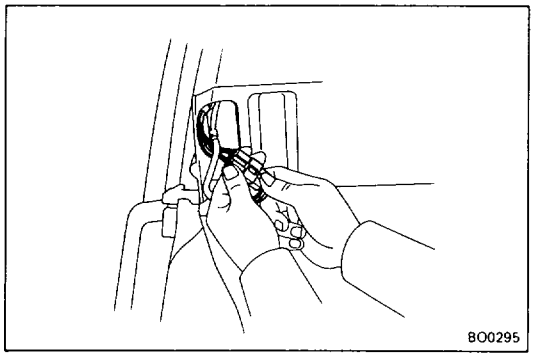
CAUTION: Use only genuine Toyota cover top bolts.

Part No. 90119-08171 or equivalent

(a) Place the cover top on the deck.
(b) Tighten bolts "E" and "J".
(c) Tighten bolts "C" and "L".
(d) Loosen bolts "E" and "J".
(e) Tighten bolts "D" and "K".
(f) Retighten bolts "E" and "J".
(g) Tighten the other bolts except for bolt "B".
(h) Tighten the bolt "B".

NOTE: In this condition as the end of bolt "B" makes contact with the cover top switch, the switch should be on.

Torque: 145 kg-cm (10 ft-lb, 14 N·m)



2. **CONNECT CONNECTOR AND WASHER HOSE**

The connector and washer hose are located on the rear body LH side.

3. **INSTALL REAR BODY GARNISHES**

4. **CLOSE BACK DOOR AND CHECK OPERATION OF BACK DOOR POWER WINDOW**

WINDSHIELD

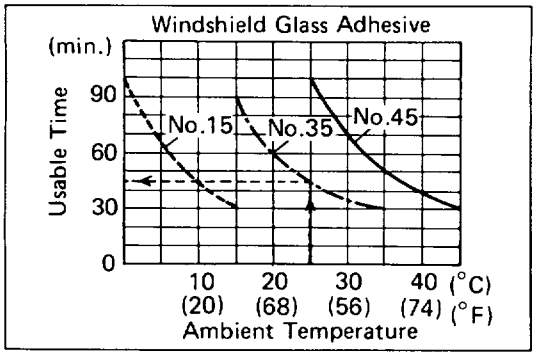
TOOLS AND SUPPLIES

Part name and Part No.	Contents of set	Quantity
Adhesive set 08850-00070 [0 — 15°C (32 — 59°F)] 08850-00080 [15 — 35°C (59 — 95°F)] 08850-00090 [35 — 45°C (95 — 113°F)]	Main agent 500 g (17.64 oz.) Hardening agent 75 g (2.65 oz.) Primer G [for glass] 20 g (0.71 oz.) Primer M [for body] 20 g (0.71 oz.) Sponge for applying primer Piano wire 0.6 mm dia. X 1 m (0.024 in.dia X 39.37 in.) Cartridge	1 can 1 ea. 1 ea. 1 ea. 2 ea. 1 ea. 1 set
Dam kit 04562-30040	Dam Double-stick tape (for sticking on dam)	
	Sealant gun (for applying adhesive) Glass or steel sheet (for mixing adhesive) Putty spatula (for mixing adhesive and correcting adhered parts) Cleaner (for cleaning adhering surfaces)	

Ambient temperature	Part No.	Part name
0 — 15°C (32 — 59°F)	08850-00070	Windshield glass adhesive set No. 15
15 — 35°C (59 — 95°F)	08850-00080	Windshield glass adhesive set No. 35
35 — 45°C (95 — 113°F)	08850-00090	Windshield glass adhesive set No. 45

1. CHOOSE SUITABLE ADHESIVE SET

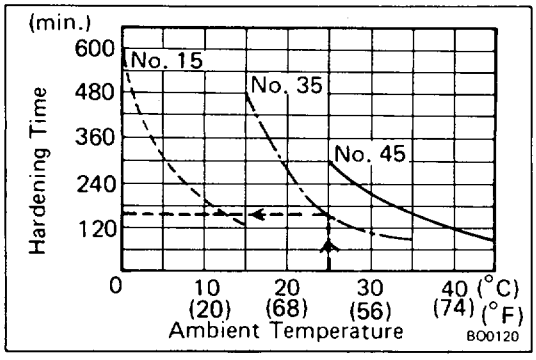
Use an adhesive set suitable for the ambient temperature.



2. CHECK ADHESIVE USABLE TIME

After the mixing main and hardening agents, finish glass installation within the specifield time as shown.

Example:
For glass installation in an ambient temperature of 25°C (77°F), apply adhesive set No.35 within 45 minutes.



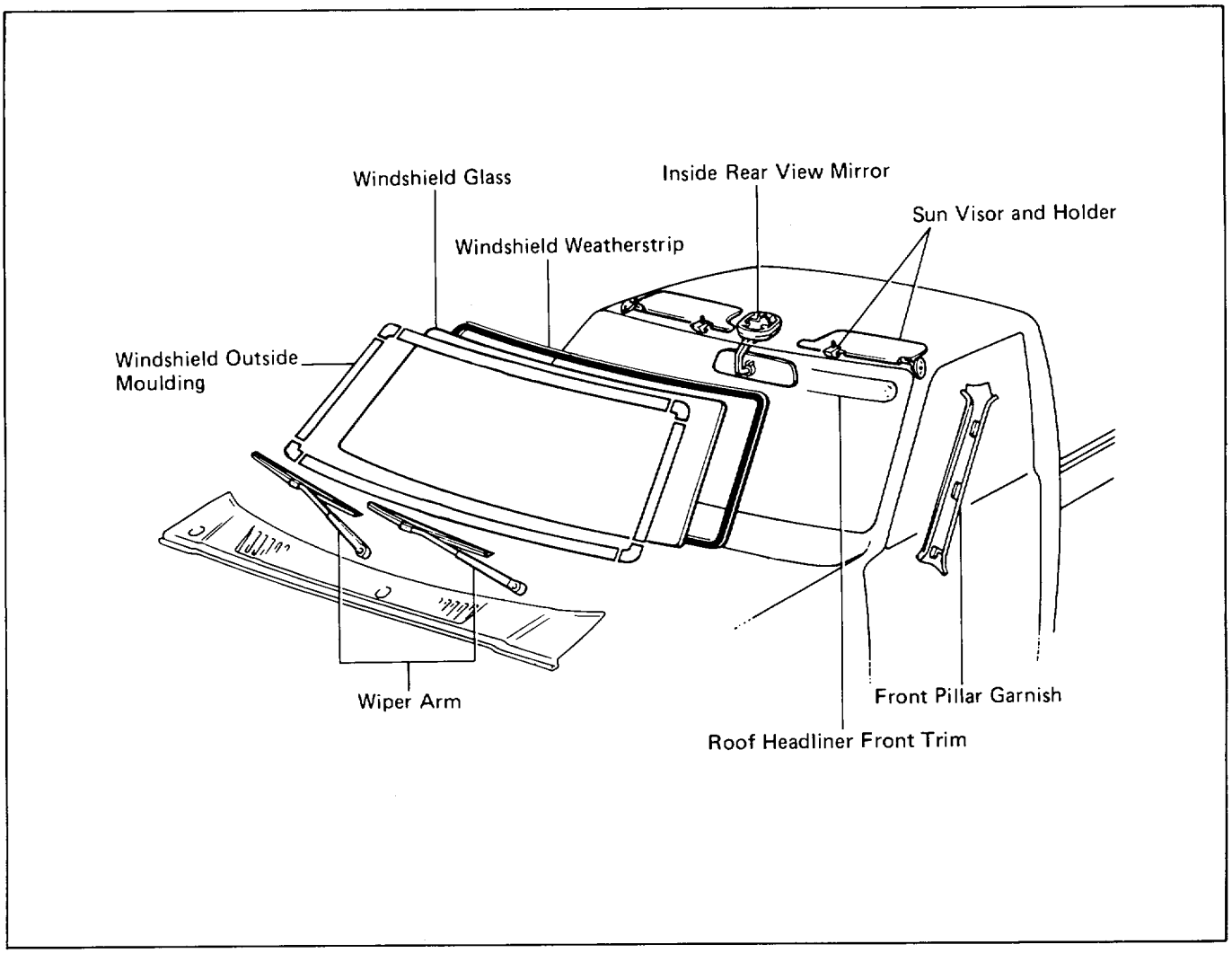
3. CHECK ADHESIVE HARDENING TIME

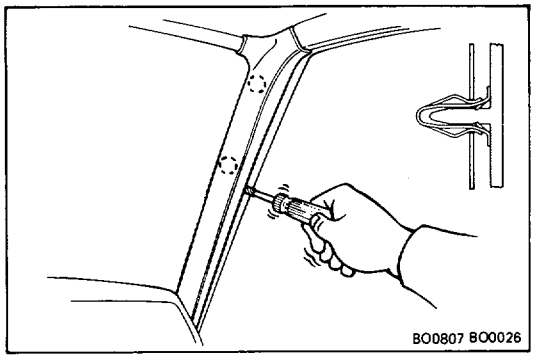
First, mix the main and hardening agents. Then, perform a leak test only after the hardening time has elapsed.

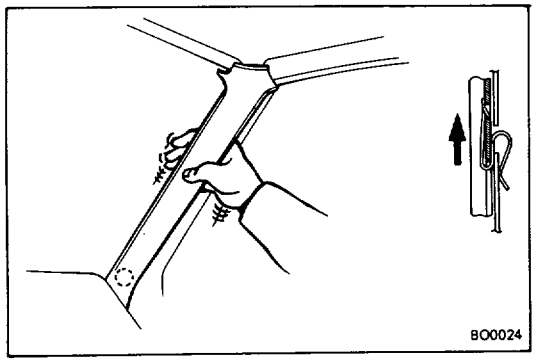
Example:
The hardening time for adhesive set No.35 with an ambient temperature of 25°C (77°F) is 2 1/2 hours.

CAUTION: Do not drive the vehicle until at least double the hardening time has elapsed.

COMPONENTS







REMOVAL OF WINDSHIELD

1. REMOVE FRONT PILLAR GARNISH

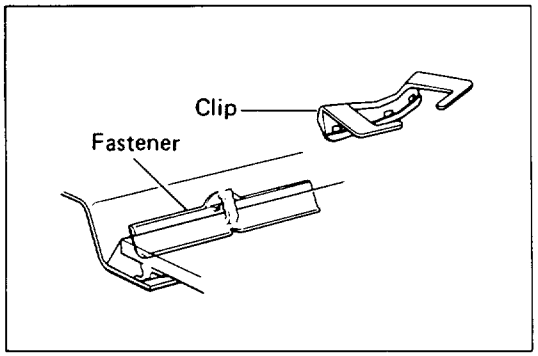
(a) Pry out the clips with a screwdriver.

(b) Pull the garnish upward to remove it.

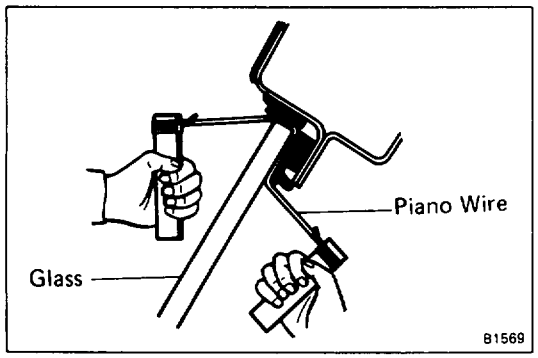
2. **REMOVE FOLLOWING PARTS:**
   (a) Inner rear view mirror
   (b) Roof headliner front trim
   (c) Sun visor and holder

3. **REMOVE WIPER ARM**

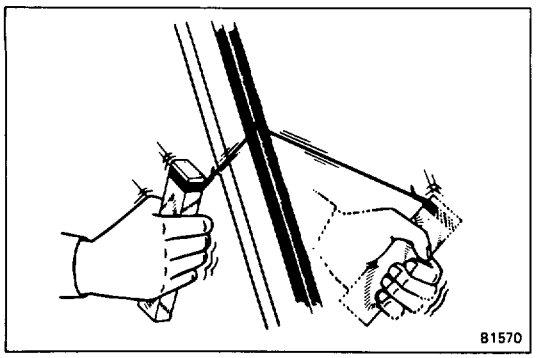
4. **REMOVE WINDSHIELD MOULDING**
   (See pages BO-20, 21)



5. **REMOVE CLIPS**
   Be careful not to damage the clips when removing them from around the glass.
   NOTE: Do not remove the fasteners, but replace any that are deformed.



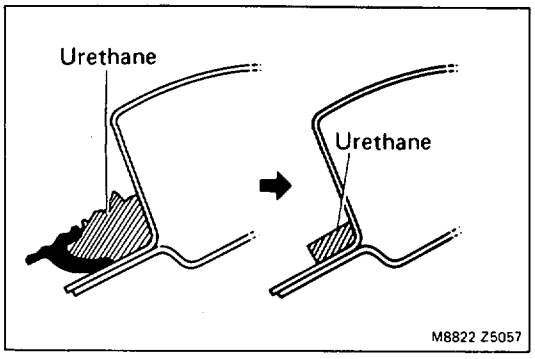
6. **REMOVE WINDSHIELD GLASS**
   (a) Push piano wire through from the interior.
   (b) Tie both wire ends to a wooden block or equivalent.
   CAUTION: When separating, take care not to damage the paint and interior and exterior ornaments.
   To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.

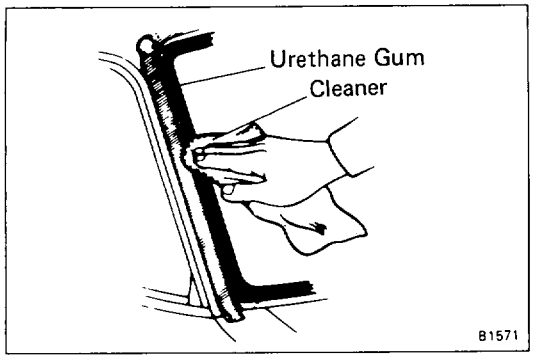


   (c) Cut the adhesive by pulling the piano wire around it.
   (d) Remove the glass.
   CAUTION: Cut off the glass, leaving as much of the urethane layer on the body as possible.

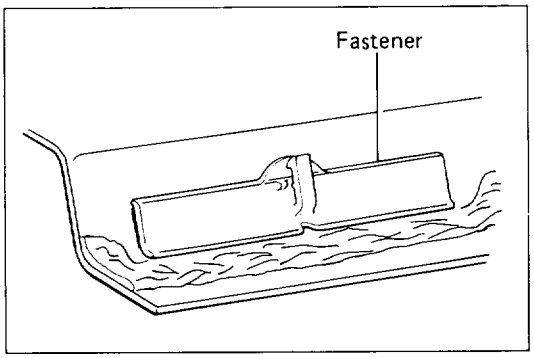
PREPARATION OF INSTALLATION

1. **CLEAN CONTACT SURFACE OF BODY**
   (a) Remove any dam remaining on the body.
   NOTE: Leave as much urethane layer on the body as possible.





(b) Clean the cutting surface of the urethane gum with a piece of cloth saturated in cleaner.

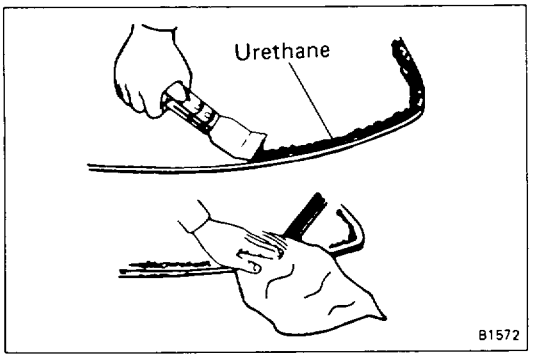


2. IF FASTENERS ARE DAMAGED

(a) Remove any damaged fastener.

(b) Cut off the old adhesive around the fastener installation area.

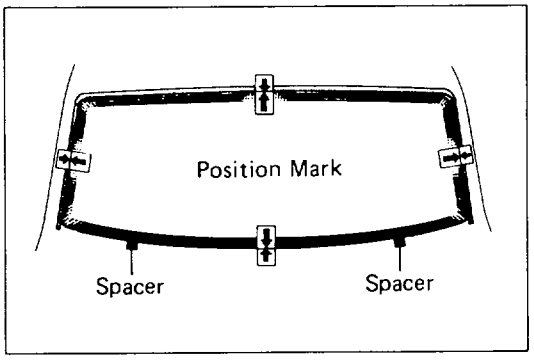
(c) Install a new fastener.



3. CLEAN REMOVED GLASS BEFORE INSTALLATION

(a) Using a scraper, remove the urethane gum sticking to the glass.

(b) Clean the glass with cleaner.



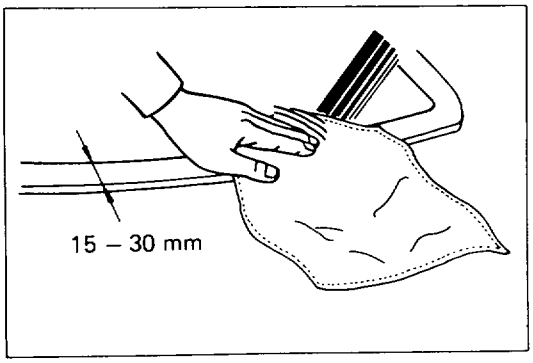
4. POSITION GLASS

(a) Place the glass in correct position.

(b) Check that all contacting parts of the glass rim are perfectly even and do not make contact with the fasteners.

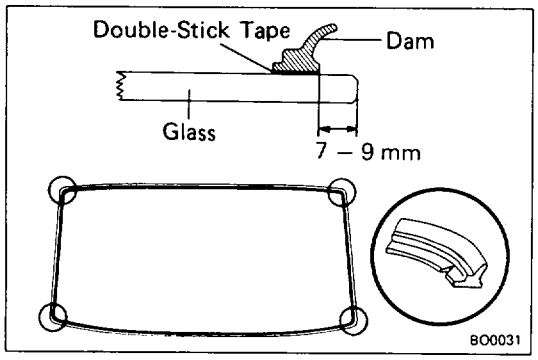
(c) Make reference marks between the glass and body.

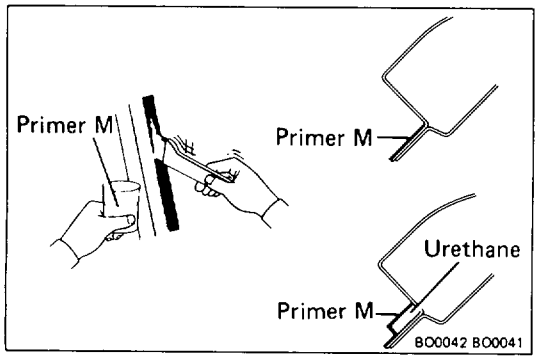
(d) Remove the glass.

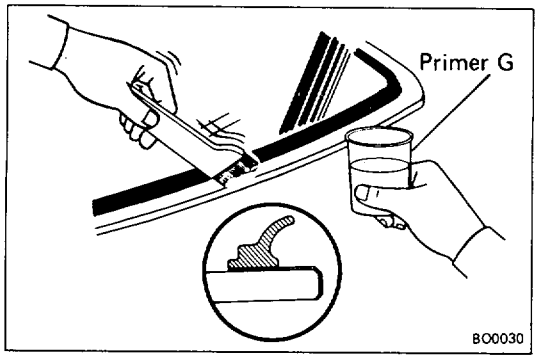


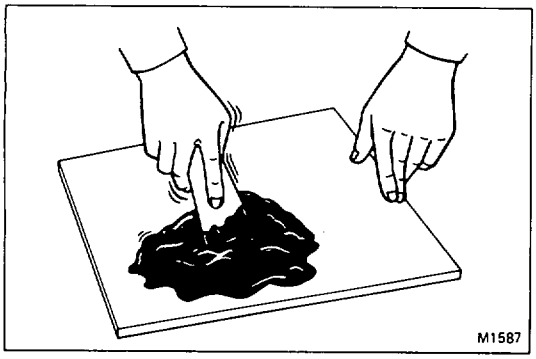
5. CLEAN CONTACT SURFACE OF GLASS

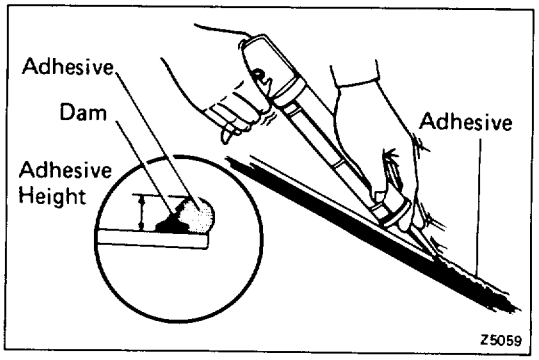
Using cleaner, clean the contact surface 15 — 30 mm (0.59 — 1.18 in.) wide around the entire glass rim.











INSTALLATION OF WINDSHIELD

1. INSTALL DAM

(a) Apply double-stick tape at a point 7 — 9 mm (0.28 — 0.35 in.) from the glass rim.

(b) Place the dam on the double-stick tape.

NOTE: Cut a V-wedge into the corner folds of the dam.

CAUTION: Do not touch the glass face after cleaning it.

2. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.

CAUTION:

- **Let the Primer coating dry for 10 minutes or more. Make sure that the installation of the glass is finished within 2 hours.**
- **Use care not to leave any part of the contact surface uncoated or excessively coated, as Primer M and G serve to boost the adhesive power of the urethane to the glass or body.**
- **Do not keep any of the opened Primer M and G for later use.**

3. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

(b) Before the primer dries, wipe any excess off with a clean cloth to avoid too thick a coat.

CAUTION: Be sure that installation of the glass is finished within 70 minutes.

4. MIX ADHESIVE COATING

CAUTION:

- **Be sure that installation of the glass is finished within usable time. (See step 2 on page BO-27)**
- **The mixture should be made in 5 minutes or less.**

(a) Thoroughly clean the glass plate and putty spatula with solvent.

(b) Using a putty spatula, thoroughly mix the main 500 g (17.64 oz.) and hardening agents 75 g (2.65 oz.) on a glass plate or like object.

5. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle, making a hole 5 mm (0.20 in.) in diameter. Fill the cartridge with adhesive.

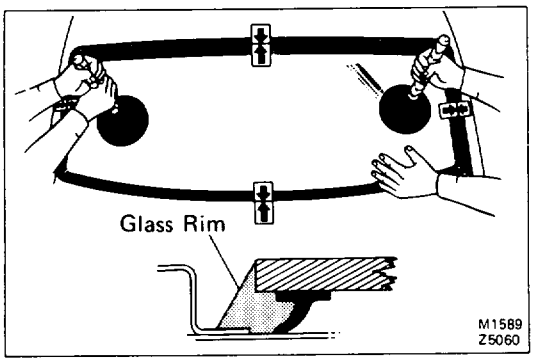
(b) Load the cartridge into the sealer gun.

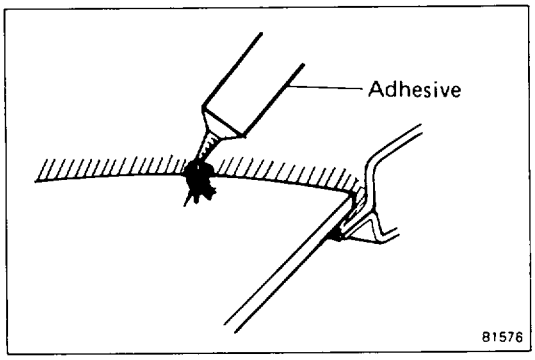
(c) Coat the glass with adhesive on all contact surfaces along the ridge.

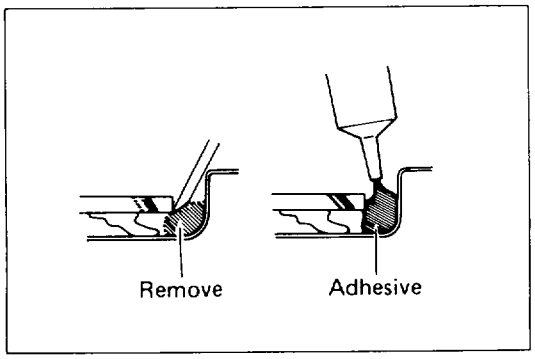
Adhesive thickness:

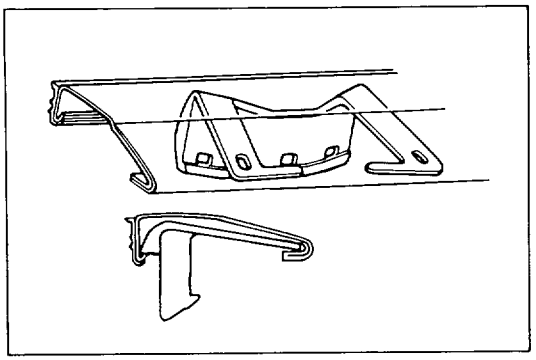
If there is adhesive on the body
3.5 — 5.0 mm (0.138 — 0.197 in.)

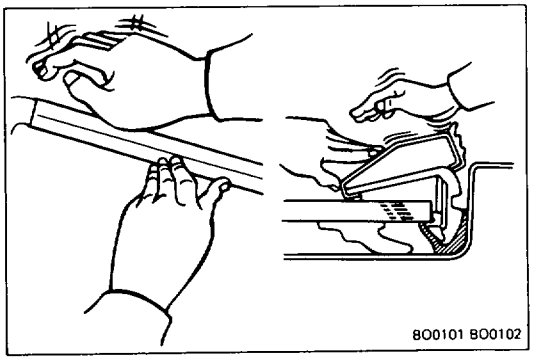
If there is no adhesive on the body
8 — 10 mm (0.31 — 0.39 in.)











6. INSTALL GLASS

(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.

(b) Using a spatula, apply adhesive to the glass rim.

(c) Use a spatula to remove any excess or protruding adhesive.

(d) Fasten the glass securely until the adhesive sets.

7. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

(b) Seal any leak with auto glass sealer.

Part No. 08833-00030 or equivalent

CAUTION: Wait at least twice the hardening time before driving the car.

8. INSTALL OUTSIDE MOULDING

(a) Using a knife, remove the adhesive around the installation area of the clips.

(b) Apply adhesive to the installation area of the clips.

NOTE: Loosely install the clips and confirm that the clip arm is not protruding above the surface.

(c) Install the clips into the moulding.
When installing the moulding, be sure that the clips and fasteners on the body side do not make contact.

(d) Install the outside moulding.

- Install lower moulding.
- Fit on the upper moulding and tap the fasteners on by hand.
- Install the side moulding and slide down the moulding.
- Install the corner joint moulding.

9. INSTALL FOLLOWING PARTS:

(a) Roof headliner front trim

(b) Inner rear view mirror

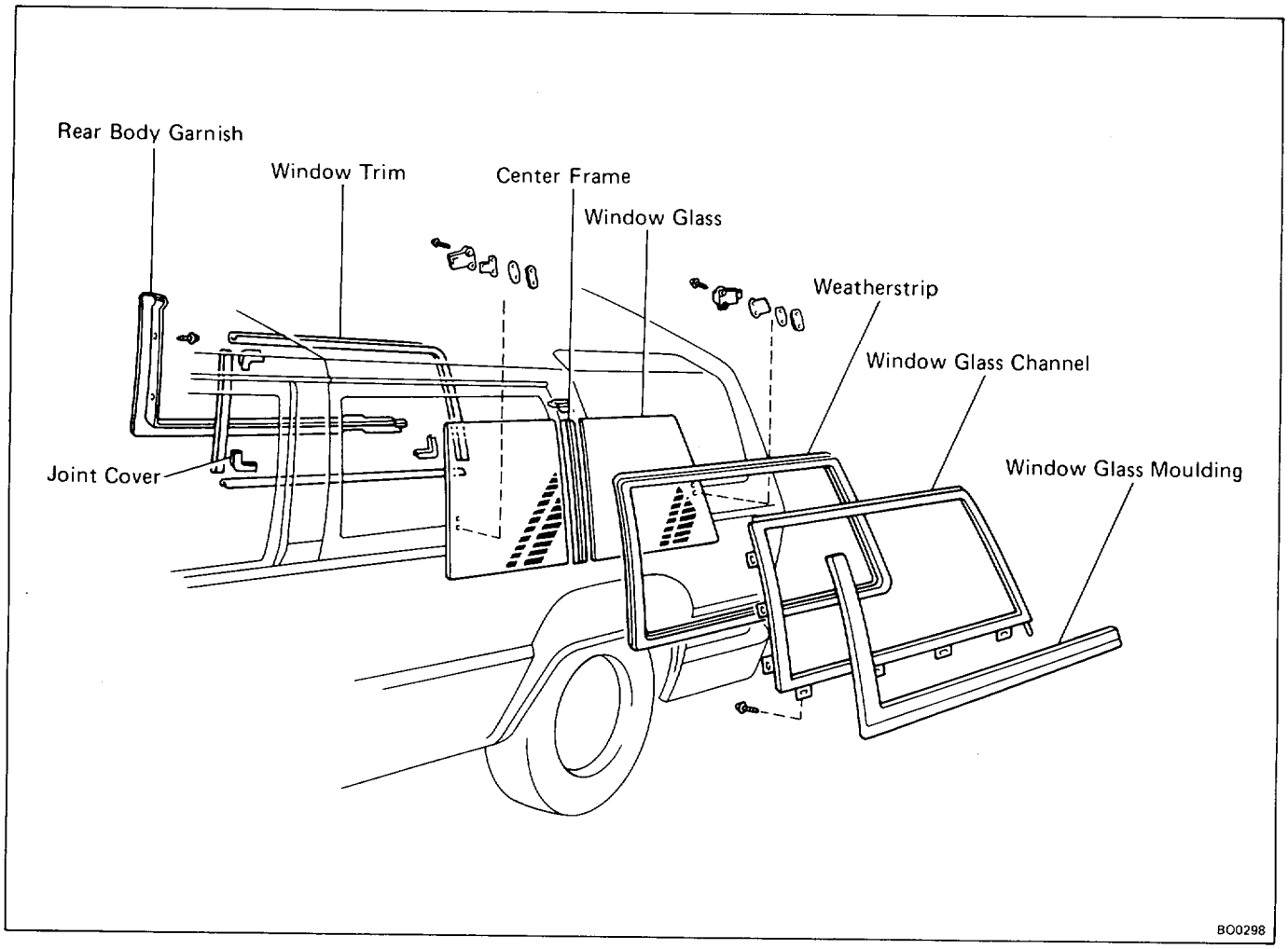
(c) Sun visor and holder

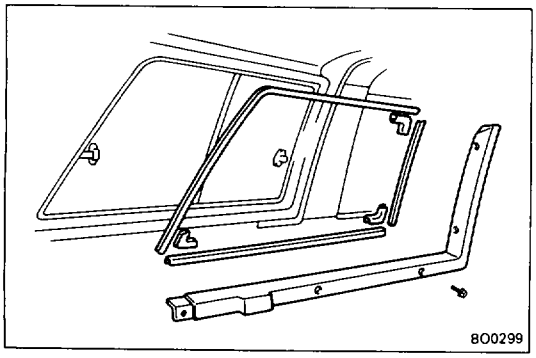
10. INSTALL WIPER ARM

11. INSTALL FRONT PILLAR GARNISH

SIDE SLIDE WINDOW

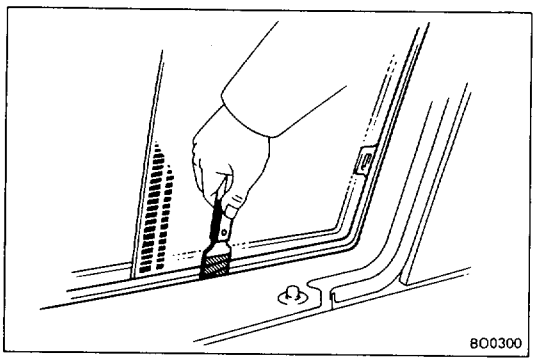
COMPONENTS



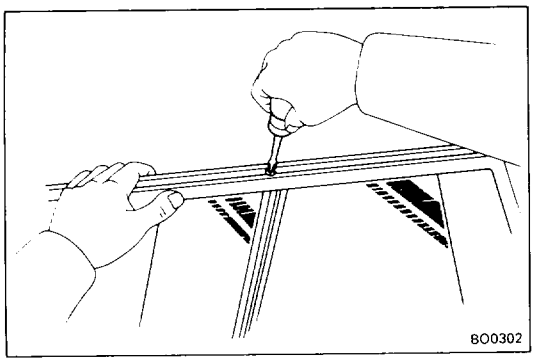


REMOVAL OF SIDE SLIDE WINDOW

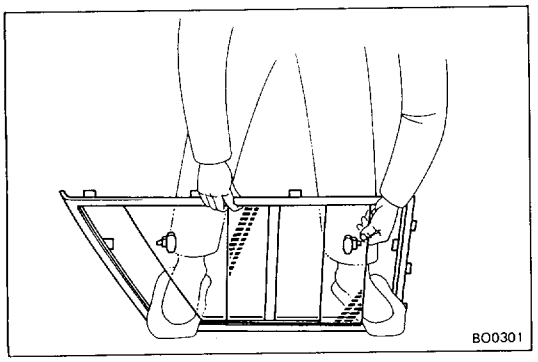
1. **REMOVE REAR BODY GARNISHES**
2. **REMOVE JOINT COVERS**
   Remove the three joint covers.
3. **REMOVE WINDOW TRIMS**
   Remove the three window trims.



4. **REMOVE SIDE SLIDE WINDOW ASSEMBLY**
   Cut the butyl tape with a scraper or such and then push the window assembly outward.



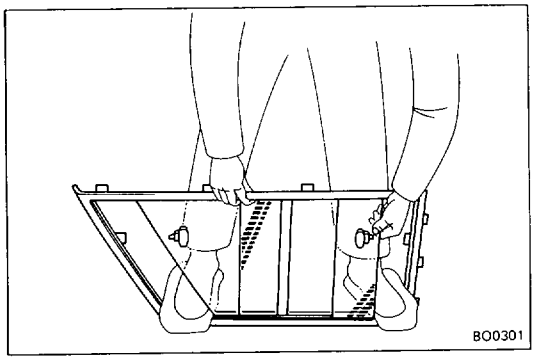
5. **DISASSEMBLE SIDE SLIDE WINDOW**
   (a) Remove the seven screws and window glass moulding.
   (b) Remove the two screws of the center frame.



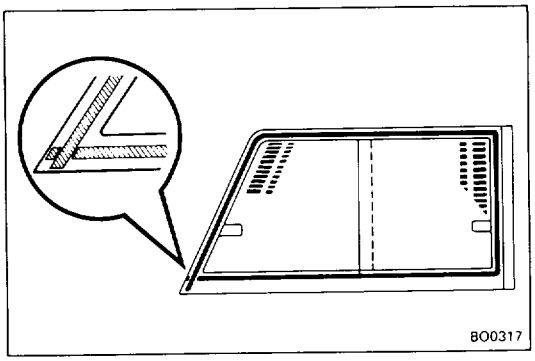
   (c) Pull apart the channels and remove the front glass of the two slide glass panes at the center glass channel.
   (d) Remove the center frame.
   (e) Pull apart the channels and remove the rear glass of the two slide glass panes at the center glass channel.
   (f) Remove the weatherstrip.

INSTALLATION OF SIDE SLIDE WINDOW

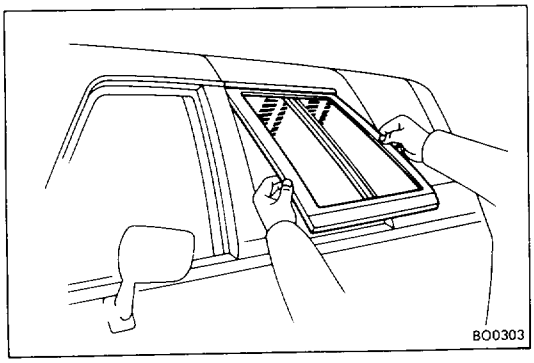
1. **ASSEMBLE SIDE SLIDE WINDOW**
   (a) Install the weatherstrip to the frame.
   (b) Pull apart the channels and install the rear glass of the two slide glass panes at the center glass channel.
   (c) Install the center frame.
   (d) Pull apart the channels and install the front glass of the two slide glass panes at the center glass channel.
   (e) Install the two screws of the center frame.
   (f) Install the window glass moulding and the seven screws.



2. **APPLY BUTYL TAPE TO WINDOW FRAME**
   Apply butyl tape (6 mm or 0.24 in. width) to the slide window frame as shown in the figure.
   NOTE: Firmly press down the overlapping portions of the tape so there are no open gaps.



3. **INSTALL WINDOW ASSEMBLY**
   Install the side slide window assembly to the cover top.

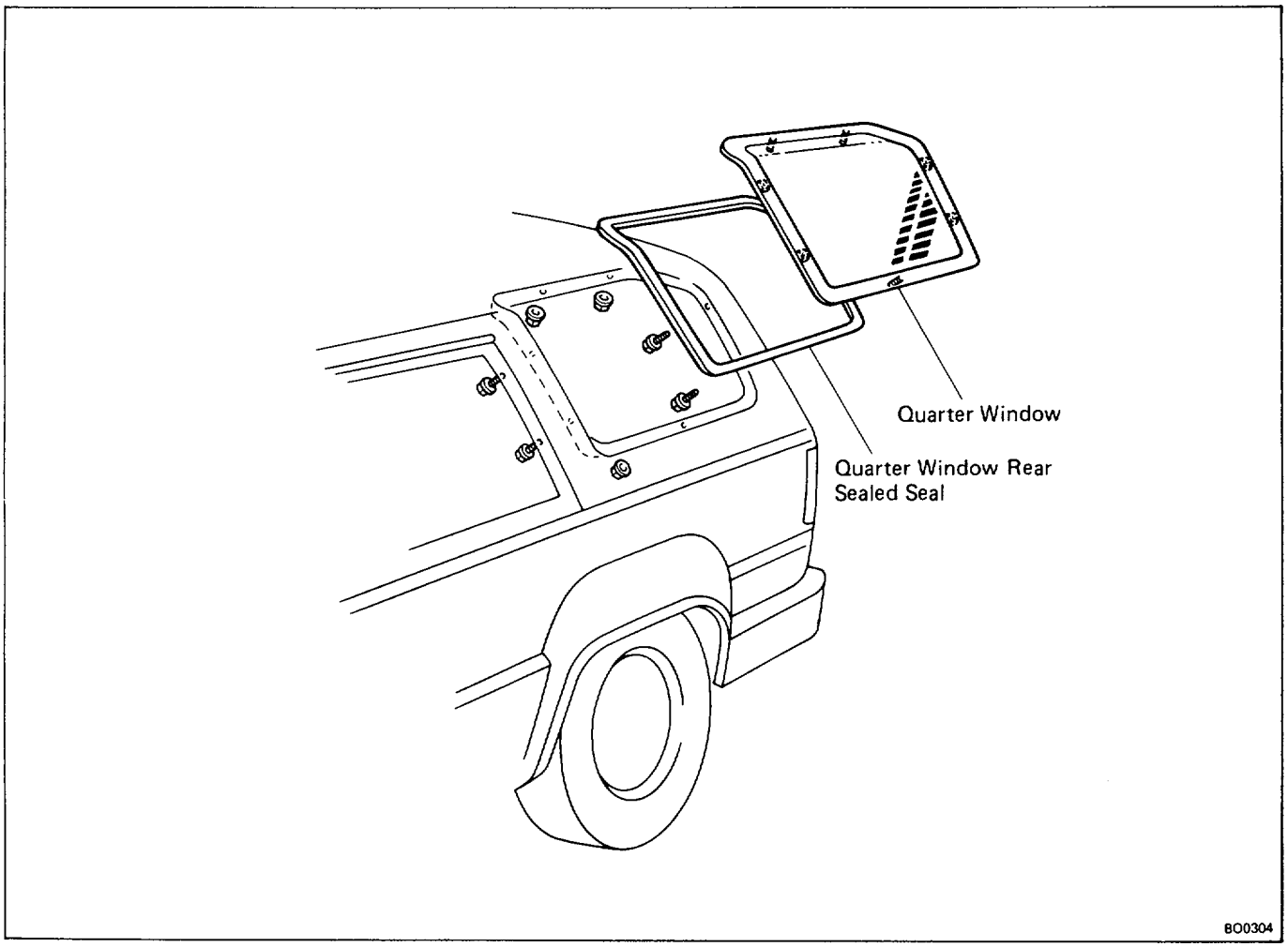


4. **INSTALL WINDOW TRIMS AND JOINT COVERS**
   Install the three window trims and joint covers.

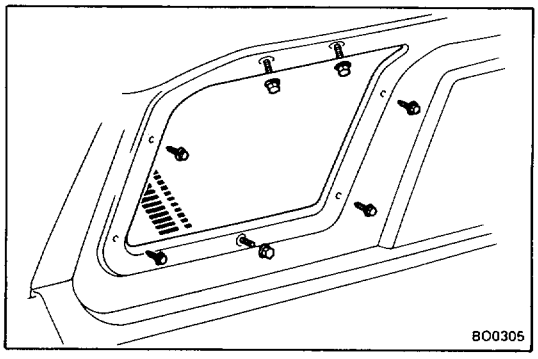
5. **INSTALL REAR BODY GARNISHES**

QUARTER WINDOW (4 RUNNER)

COMPONENTS

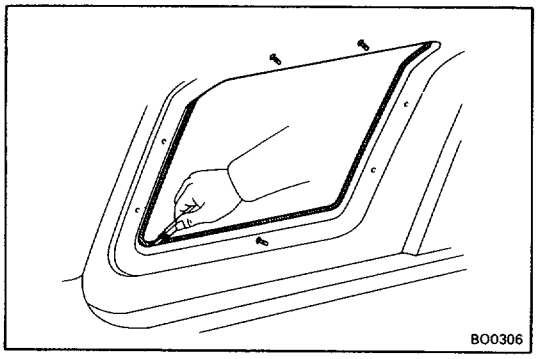


REMOVAL OF QUARTER WINDOW



1. REMOVE NUTS AND BOLTS

Remove the three nuts and four bolts.



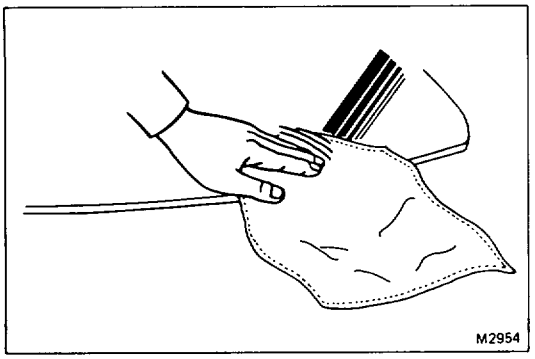
2. REMOVE QUARTER WINDOW GLASS

Using a knife, cut off the window glass seal.
Push out the lower edge of the glass, and then raise the glass to remove it.

INSTALLATION OF QUARTER WINDOW

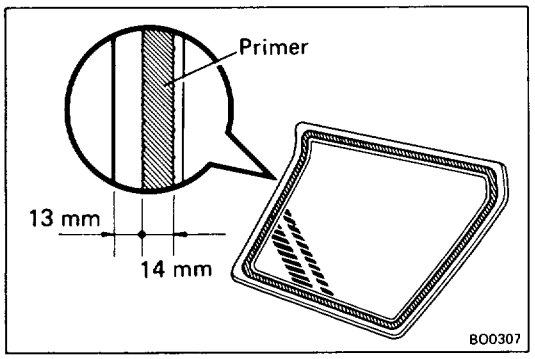
1. PREPARE ITEMS LISTED

Part name and Part No.	Contents of set
Butyl tape set (08850-00065)	Butyl tape 9 mm dia. x 2,500 mm (0.35 x 98.43 in.) Primer 5 cc (0.17 fl.oz.) Sponge (for applying primer) Piano wire 1 mm dia. x 600 mm (0.04 x 23.62 in.) (for cutting around glass)
Materials required	Cleaner (for cleaning adhering surfaces)
Quarter window rear sealed seal (68177-89101)	



2. CLEAN BODY OR GLASS

Using cleaner, wipe off any adhesive left on body or glass.

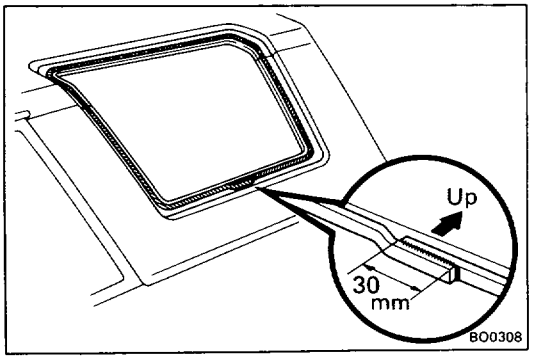


3. INSTALL QUARTER WINDOW GLASS

(a) Using a sponge, coat the glass adhering surface with primer.

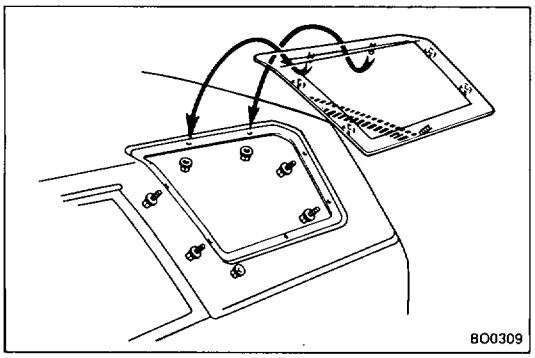
NOTE: Coat the primer 13 mm (0.51 in.) from the glass edge and 14 mm (0.55 in.) wide around the ceramic.

(b) Let the primer coating dry for 10 minutes.



(c) Install the seal to the cover top body.

NOTE: Apply the seal over 30 mm (1.18 in.) of the lower area.



(d) Install the two upper stud bolts to the cover top body.

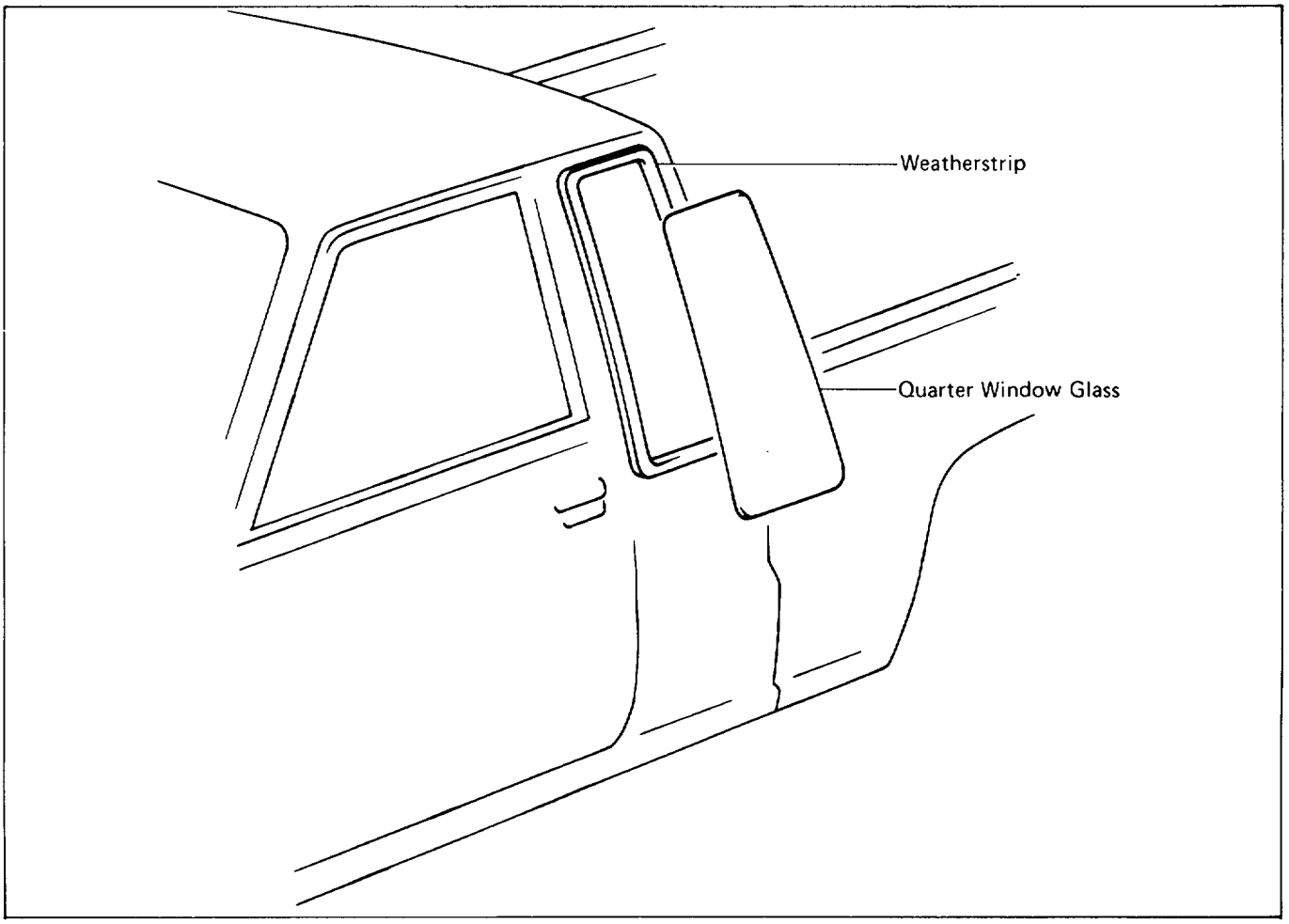
(e) Install the lower stud bolt to the cover top body.

(f) Torque the upper two nuts, and then the lower nut and four bolts.

Torque: 40 kg-cm (35 in.-lb, 3.9 N·m)

QUARTER WINDOW (TRUCK)

COMPONENTS



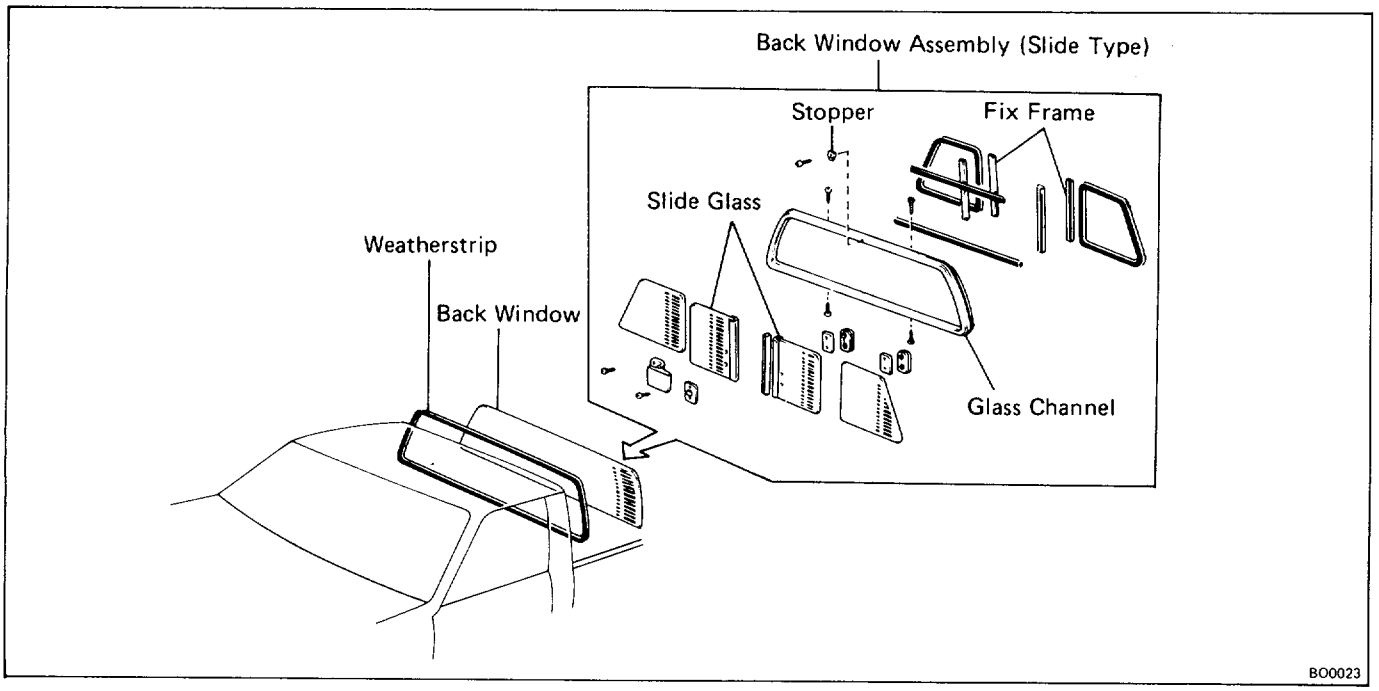
REMOVAL OF QUARTER WINDOW

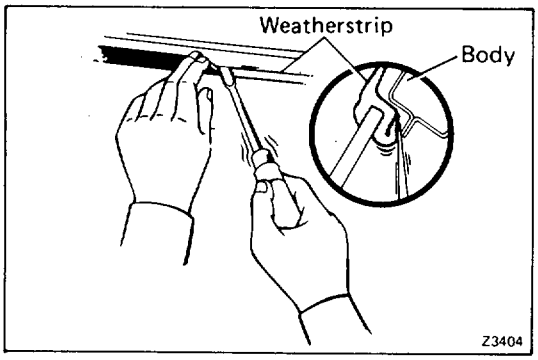
(See page BO-39)

INSTALLATION OF QUARTER WINDOW

(See page BO-40)

BACK WINDOW

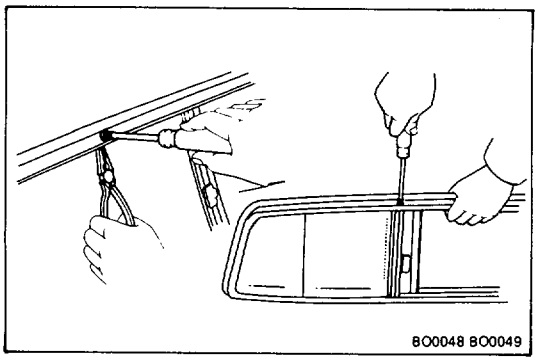




REMOVAL OF BACK WINDOW

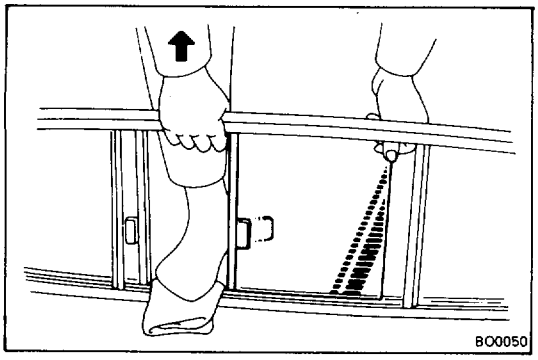
REMOVE BACK WINDOW

Force the weatherstrip lip from the interior to the body flange outside. Pull the back window outward and remove it with the weatherstrip.



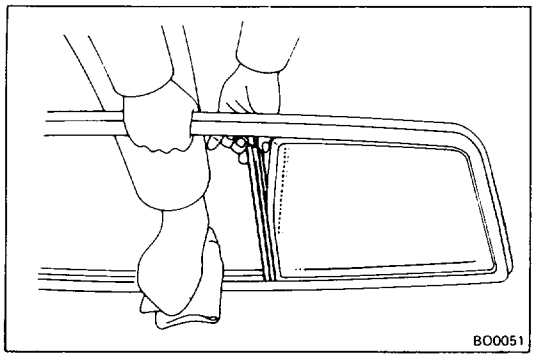
DISASSEMBLY OF BACK WINDOW ASSEMBLY (SLIDE GLASS TYPE)

1. **REMOVE FOLLOWING PARTS:**
   (a) Back window slide glass stopper
   (b) Four screws holding the two fix frames



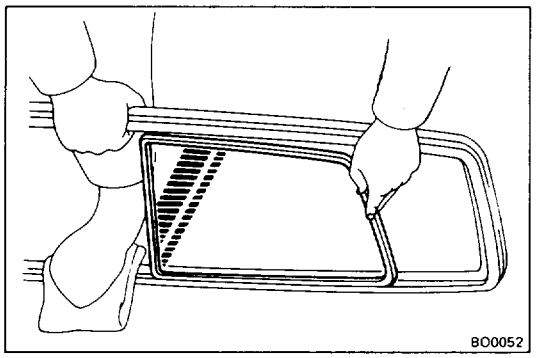
2. **REMOVE SLIDE GLASS**

Pull apart the channels and remove the two slide glass panes at the center area of the glass channel.



3. REMOVE NON-SLIDE GLASS

(a) Pull apart the channels and remove the two fix frames as shown.



(b) Pull apart the channels and remove the two non-slide glass panes as shown.

ASSEMBLY OF BACK WINDOW ASSEMBLY

1. INSTALL NON-SLIDE GLASS

(a) Apply soapy water to the contact face of the weather-strip and to the glass channel flange.

(b) Install the two non-slide glass panes.

(c) Install the two fix frames.

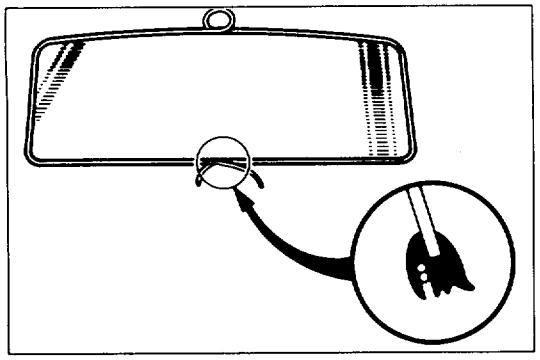
2. INSTALL SLIDE GLASS

Install the two slide glass panes at the center area of the glass channel.

3. INSTALL FOLLOWING PARTS:

(a) Four screws holding the two fix frames

(b) Back window slide glass channel stopper



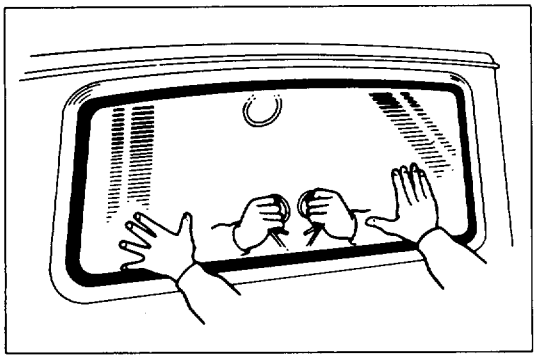
INSTALLATION OF BACK WINDOW

1. INSTALL WEATHERSTRIP ON BACK WINDOW

(a) Attach the weatherstrip to the back window.

CAUTION: If the weatherstrip has become hard, it may develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.

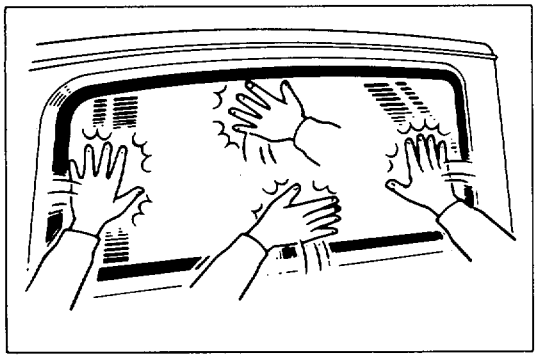


2. INSTALL BACK WINDOW

NOTE: Begin installation in the middle of the lower part of the glass.

(a) Hold the back window in position on the body.

(b) Install the back window by pulling the cord from the interior, while pushing the outside of the weatherstrip with your open hand.



(c) To snug the back window in place, tap from the outside with your open hand.

3. INSPECT FOR LEAKS AND REPAIR

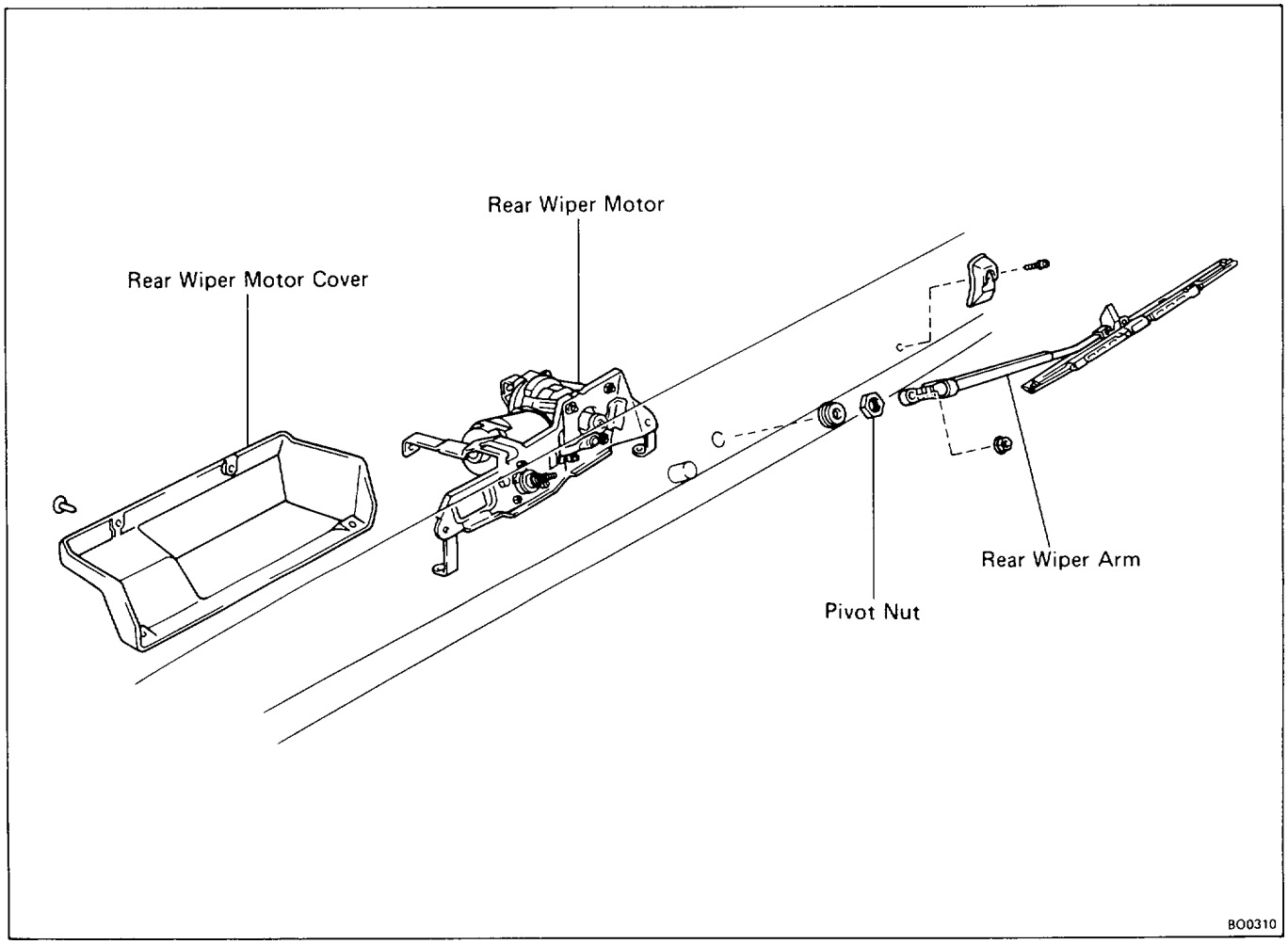
(a) Perform a leak test.

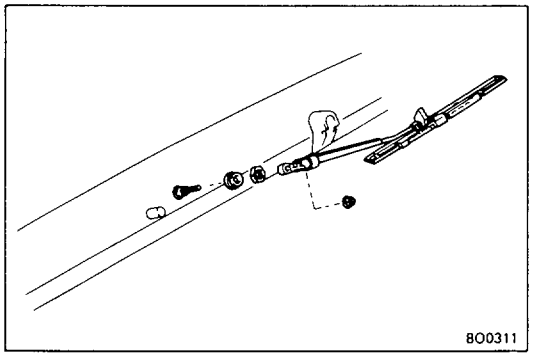
(b) Seal any leak with auto glass sealer.

Part No. 08830-00030 or equivalent

REAR WIPER

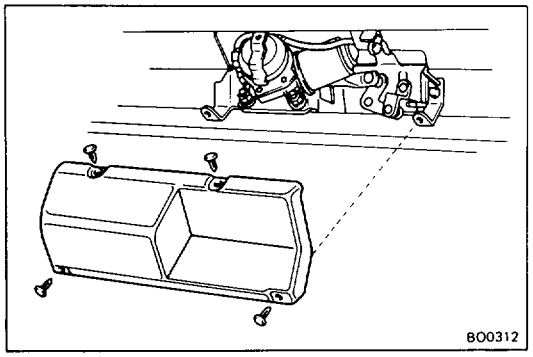
COMPONENTS



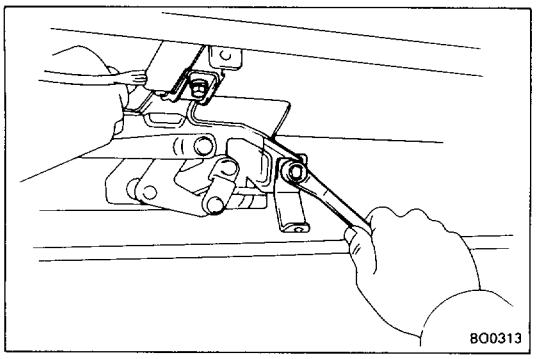


REMOVAL OF REAR WIPER

1. **REMOVE REAR WIPER ARM**
2. **REMOVE PIVOT NUT**



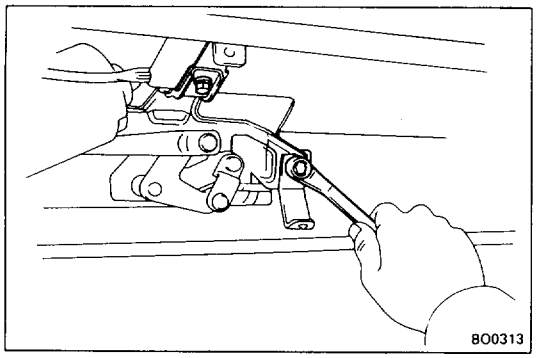
3. **REMOVE WIPER MOTOR COVER**
   Remove the four clips, and remove the cover.
4. **DISCONNECT CONNECTORS AND WASHER HOSE**
   Disconnect the two connectors and washer hose.



5. **REMOVE WIPER MOTOR ASSEMBLY**

   Remove the three bolts, and then remove the wiper motor assembly.

6. **REMOVE WASHER NOZZLE**



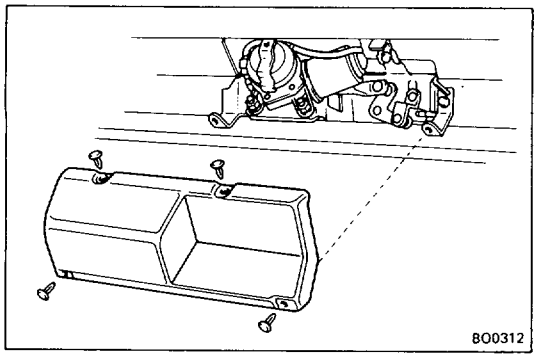
INSTALLATION OF REAR WIPER

1. **INSTALL WASHER NOZZLE**

   Torque: 15 kg-cm (13 in.-lb, 1.5 N·m)

2. **INSTALL WIPER MOTOR ASSEMBLY**

   Install the wiper motor assembly with the three mount bolts.

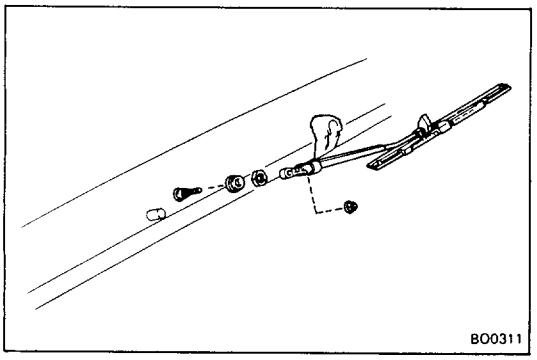


3. **CONNECT CONNECTORS AND WASHER HOSE**

   Connect the two connectors and washer hose.

4. **INSTALL WIPER MOTOR COVER**

   Install the wiper motor cover with the four clips.



5. **INSTALL PIVOT NUT**

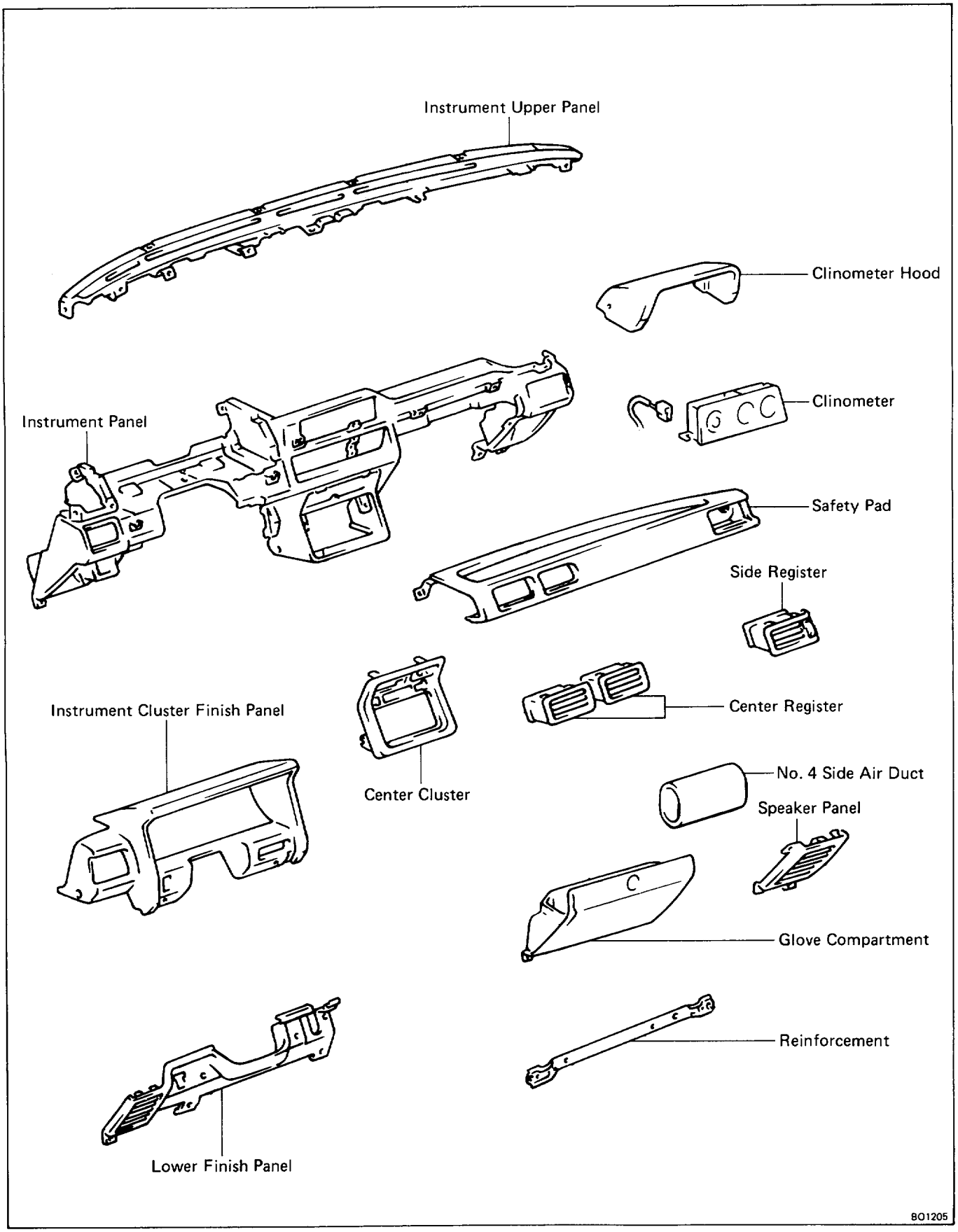
   Torque: 110 kg-cm (8 ft-lb, 11 N·m)

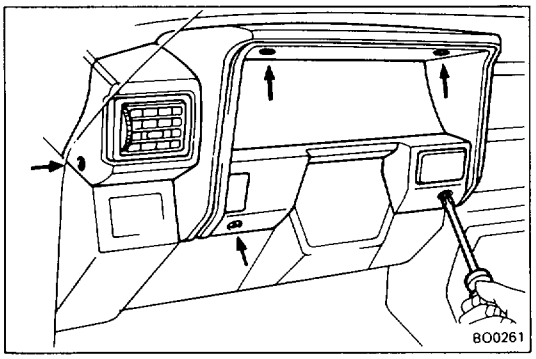
6. **INSTALL REAR WIPER ARM**

   Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)

SAFETY PAD

COMPONENTS



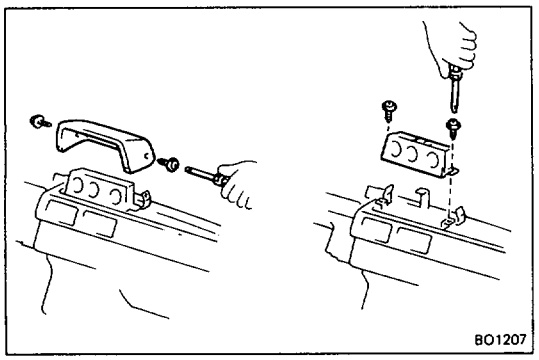


REMOVAL OF SAFETY PAD

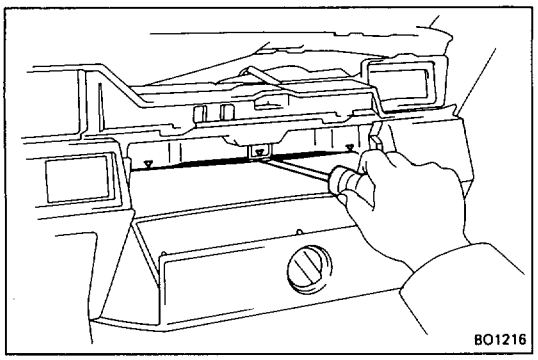
(See page BO-44)

1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**

2. **REMOVE INSTRUMENT CLUSTER FINISH PANEL**
   (a) Remove the five screws.
   (b) Disconnect the connector and remove the finish panel.

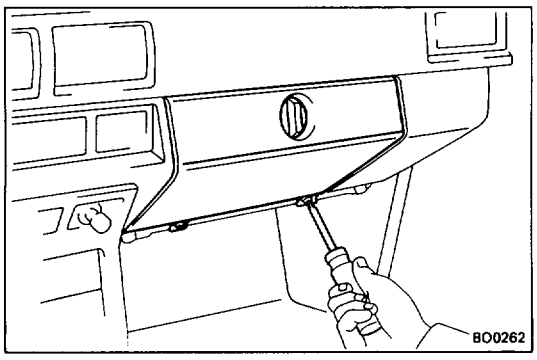


3. **REMOVE CLINOMETER**
   (a) Remove the two screws and meter hood.
   (b) Remove the two meter mounting screws.
   (c) Disconnect the connector and remove the meter.

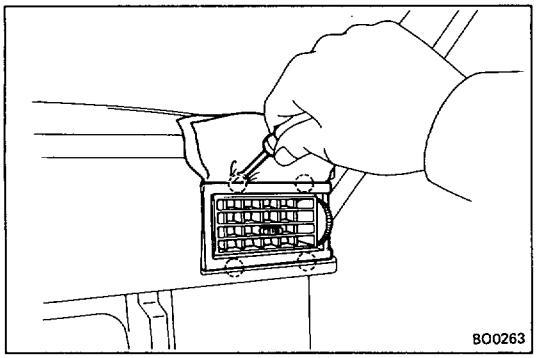


4. **REMOVE GLOVE COMPARTMENT**
   (a) Using a screwdriver, pry between the glove compartment panel and instrument panel.

   NOTE: Pry at the three clips on the glove compartment panel shown in the illustration.



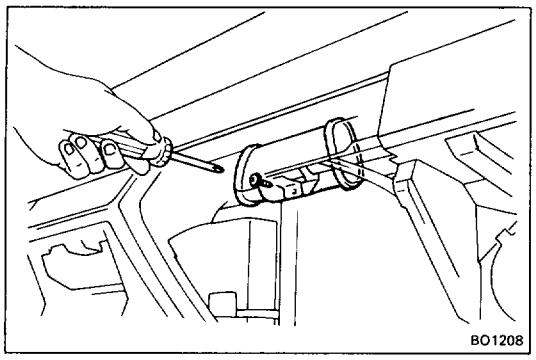
   (b) Remove the two screws.
   (c) Disconnect the connector and remove the glove compartment.



5. **REMOVE SIDE REGISTER**

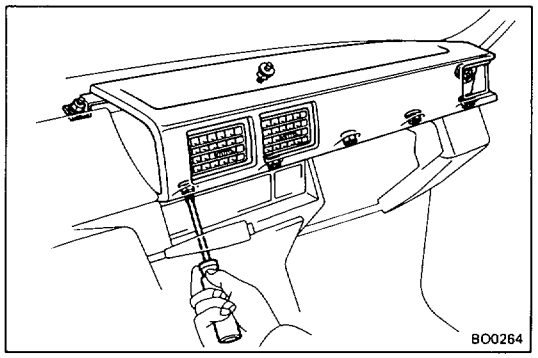
   At the location shown in the illustration, while pressing down the clips with a screwdriver, remove the register.

   CAUTION: A shop rag or like object should be put between the screwdriver and the safety pad when removing the register.



6. REMOVE NO.4 SIDE AIR DUCT

Remove the screw and No.4 side air duct.



7. REMOVE SAFETY PAD

(a) Remove the two nuts, one bolt and five screws.

(b) Pull out the safety pad.

INSTALLATION OF SAFETY PAD

(See page BO-44)

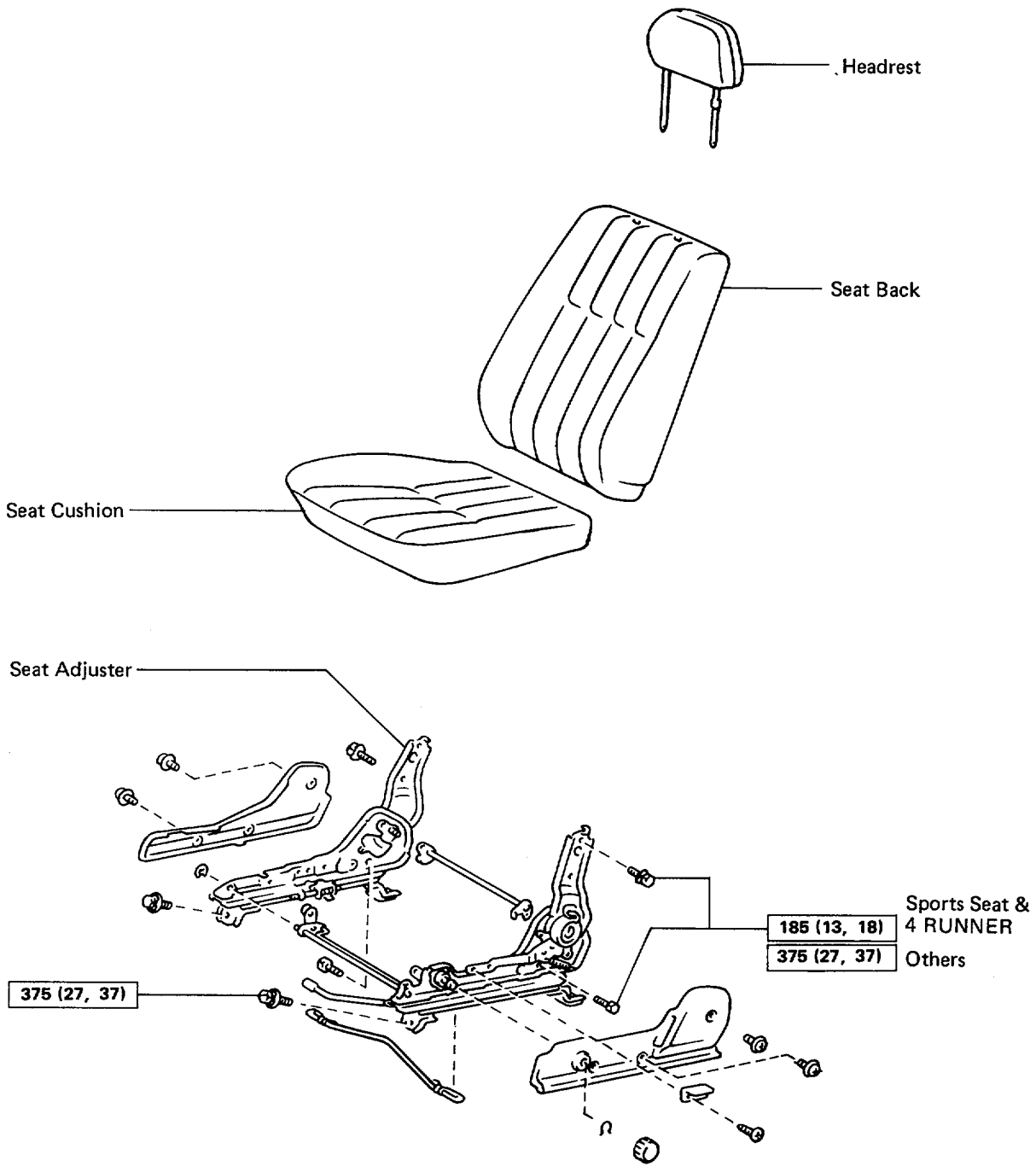
INSTALL SAFETY PAD IN REVERSE SEQUENCE OF REMOVAL

SEAT

Front Seat

COMPONENTS

Separate Seat

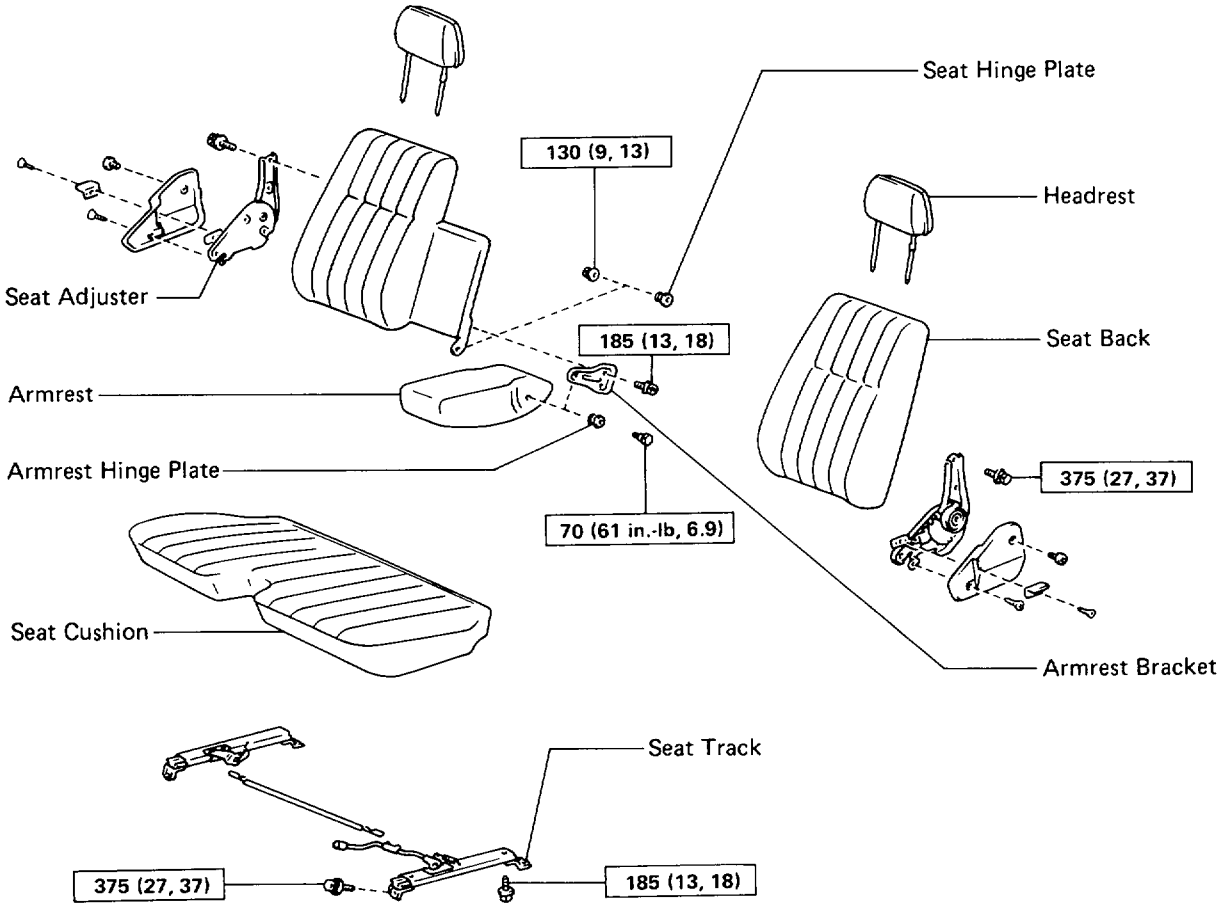


kg-cm (ft-lb, N·m) : Specified torque

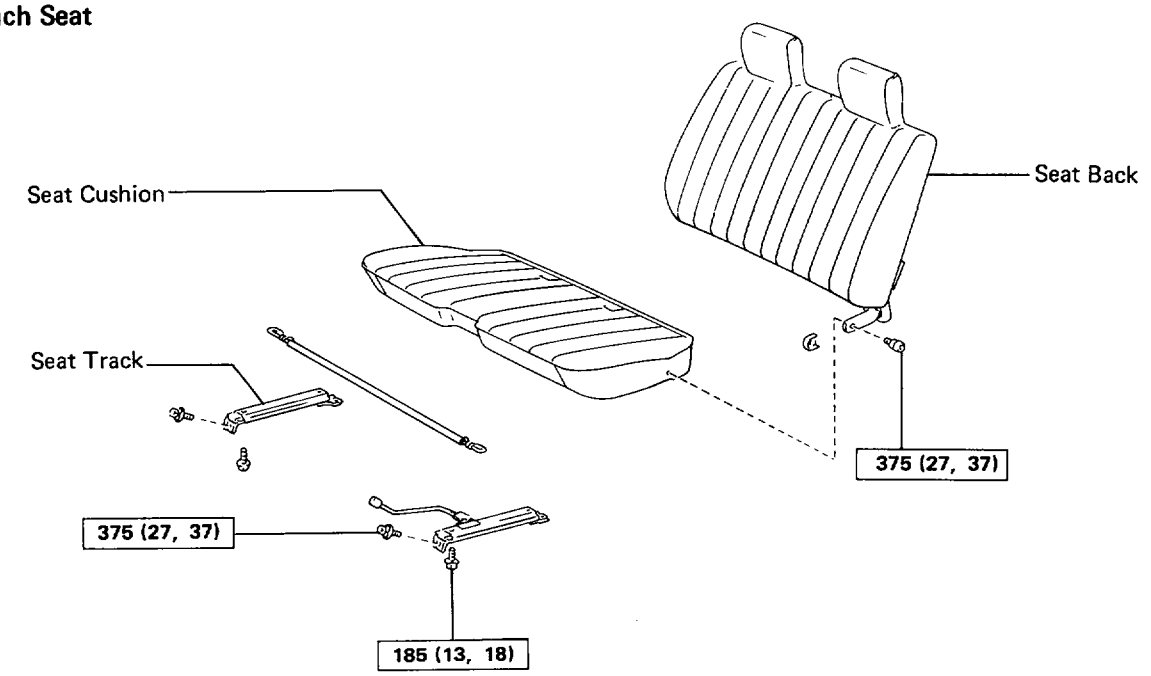
BO1209

COMPONENTS (Cont'd)

Split Bench Seat



Bench Seat

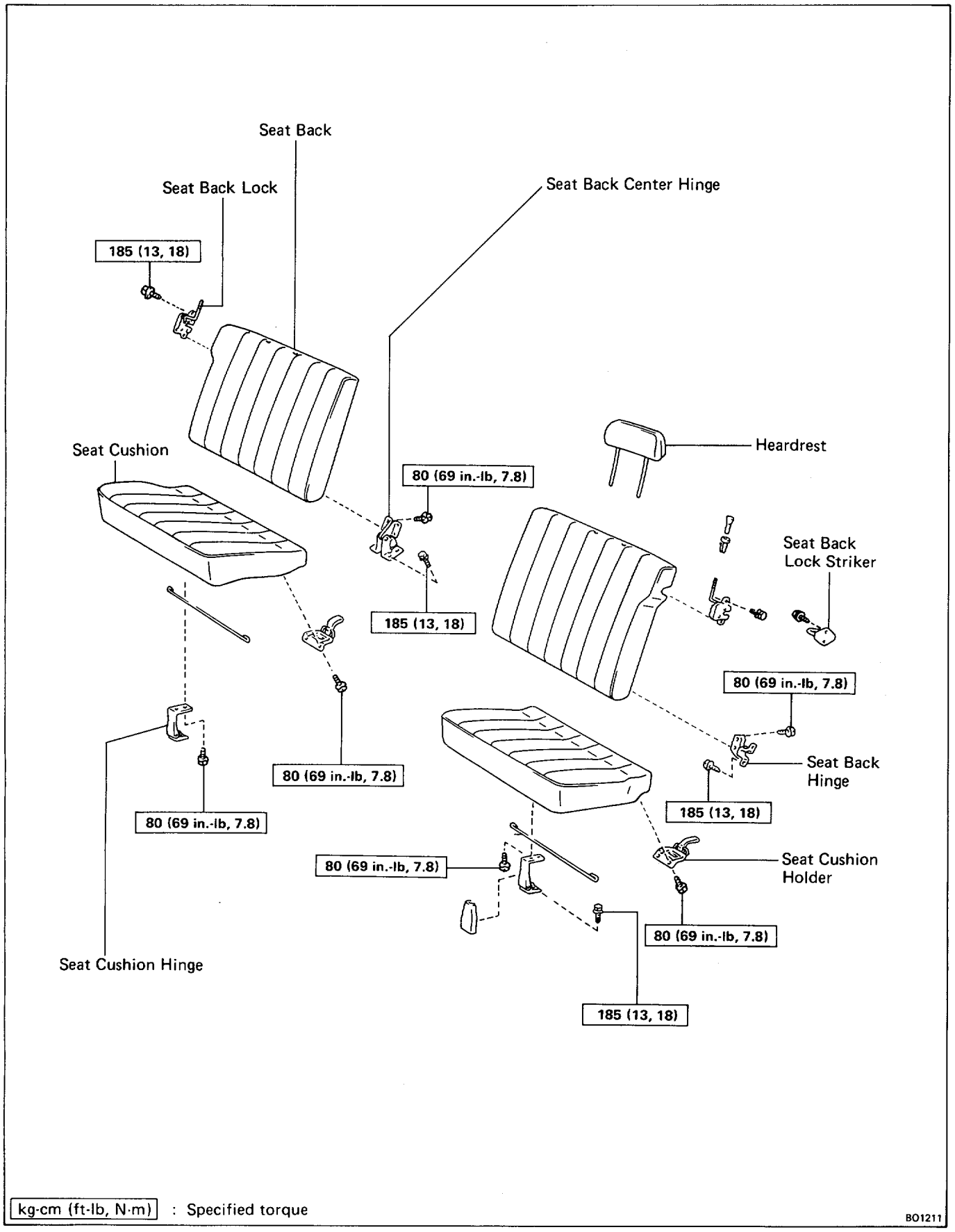


kg-cm (ft-lb, N-m) : Specified torque

BO1159
BO1210

Rear Seat (4 RUNNER)

COMPONENTS



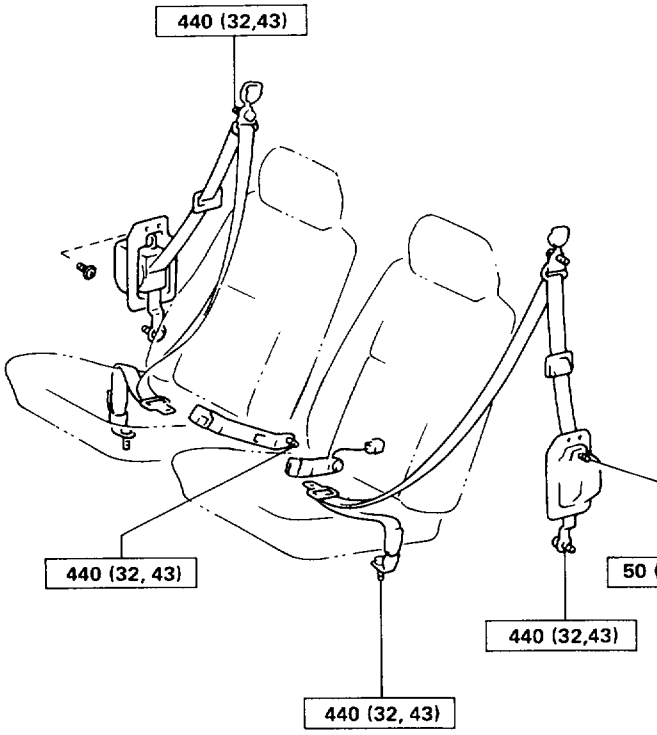
kg-cm (ft-lb, N·m) : Specified torque

BO1211

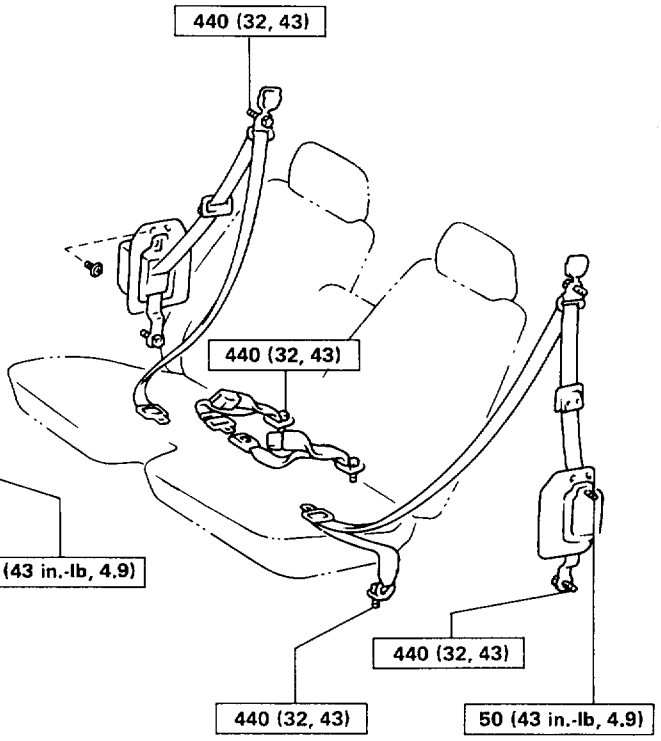
SEAT BELT

COMPONENTS

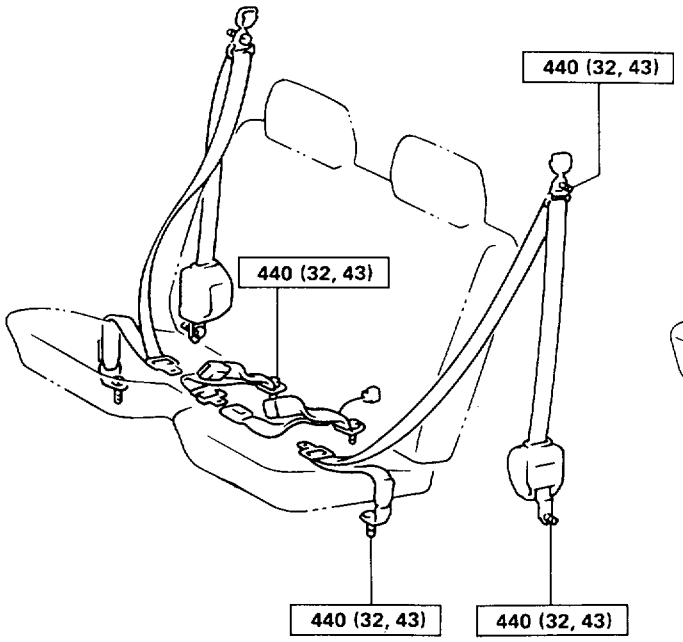
Front Separate Seat



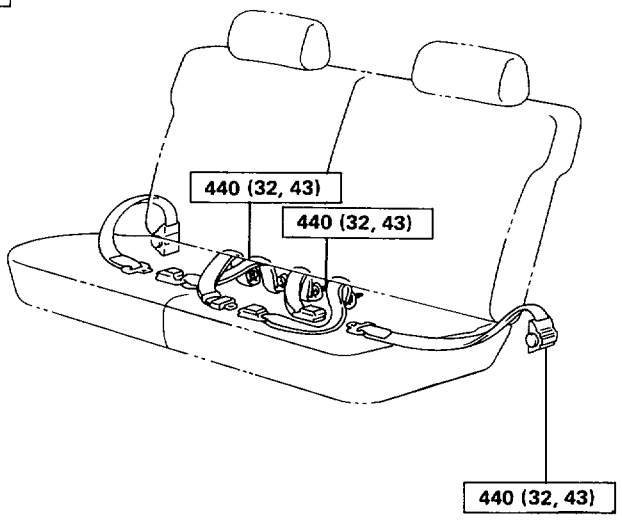
Front Split Bench Seat



Front Bench Seat

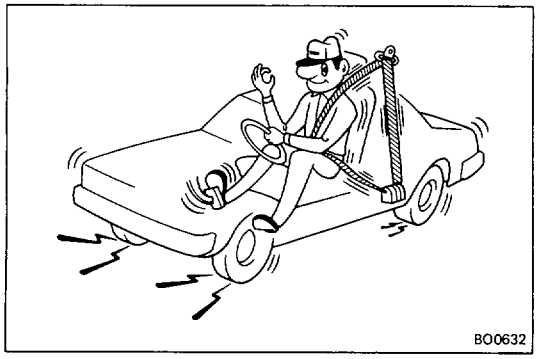


Rear Seat



kg-cm (ft-lb, N·m) : Specified torque

BO1212 BO1213
BO1214 BO1215



FRONT SEAT BELT
[Emergency Locking Retractor (ELR) Type]

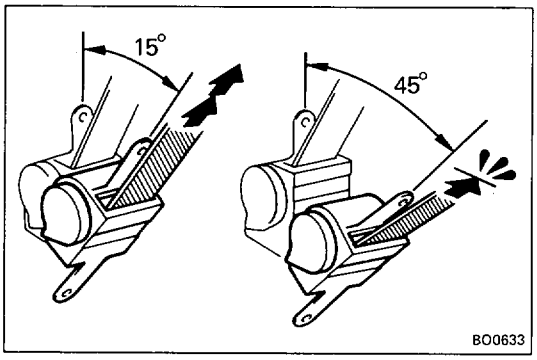
1. RUNNING TEST (IN SAFE AREA)

(a) Fasten the front seat belt.

(b) Drive the car at 10 mph (16 km/h) and make a very hard stop.

(c) Check that the belt is locked and cannot be extended at this time.

NOTE: Conduct this test in safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.



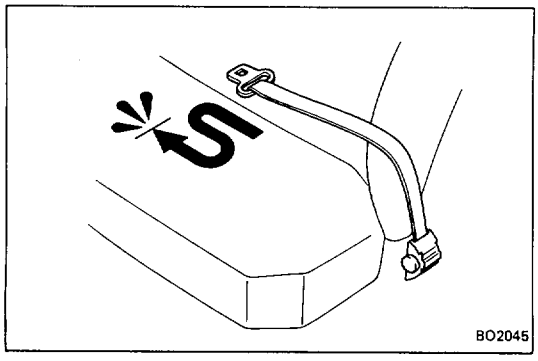
2. STATIC TEST

(a) Remove the locking retractor assembly.

(b) Tilt the retractor slowly.

(c) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.

If a problem is found, replace the assembly.



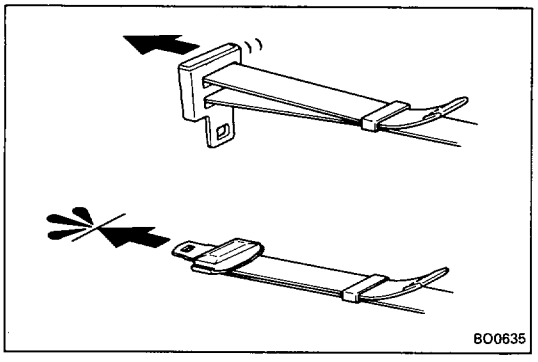
REAR OUTBOARD SEAT BELT
[Automatic Locking Retractor (ALR) Type]

TESTING

(a) Pull out the belt, release it slightly and then pull it out again.

(b) Verify that the belt cannot be extended further.

If a problem is found, replace the assembly.



CENTER SEAT BELT
(Manual Type)

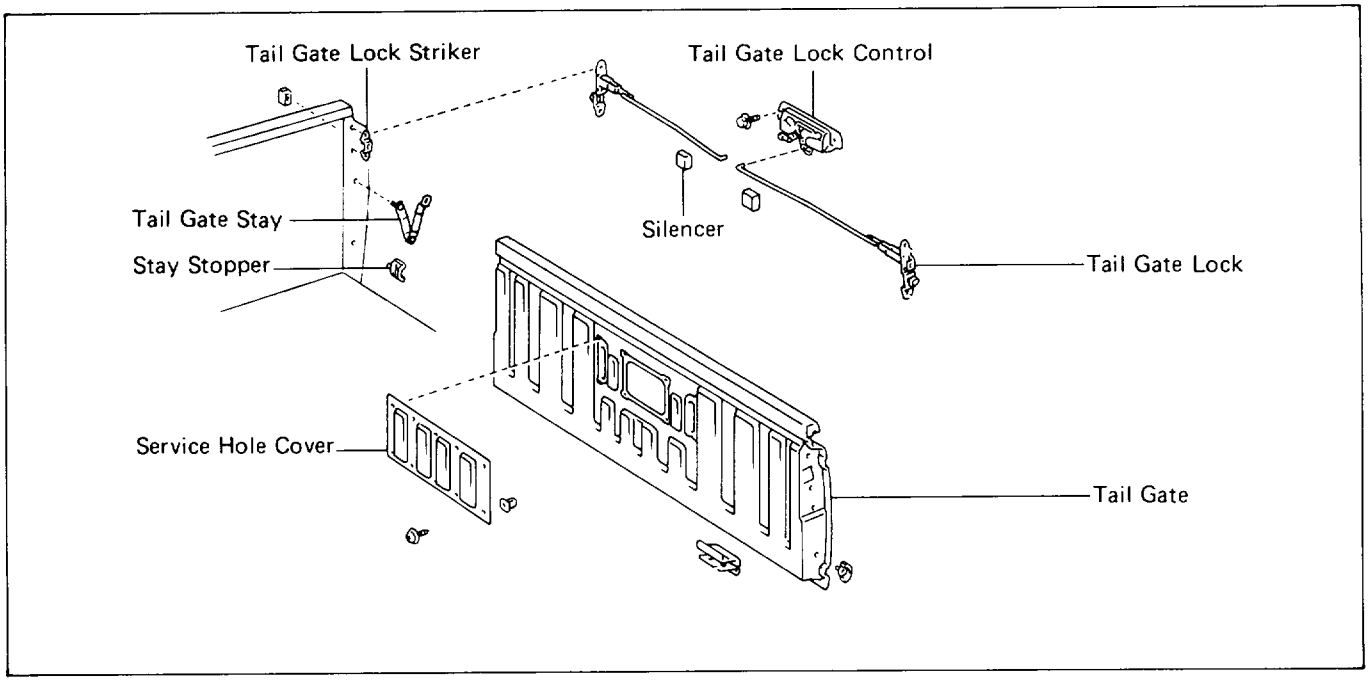
TESTING

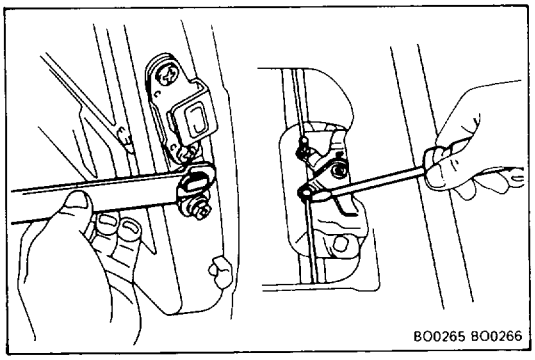
(a) Adjust the belt to the proper length.

(b) Apply a firm load to the belt.

(c) Verify that the belt does not extend.

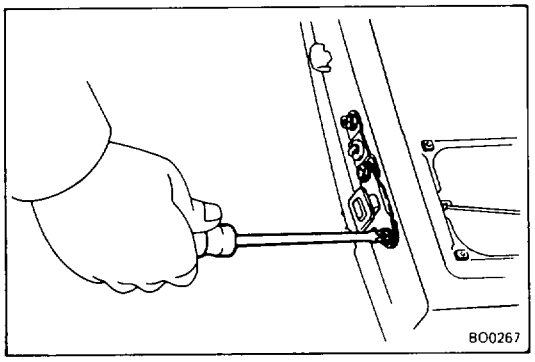
ONE-TOUCH TAIL GATE





REMOVAL OF TAIL GATE LOCK

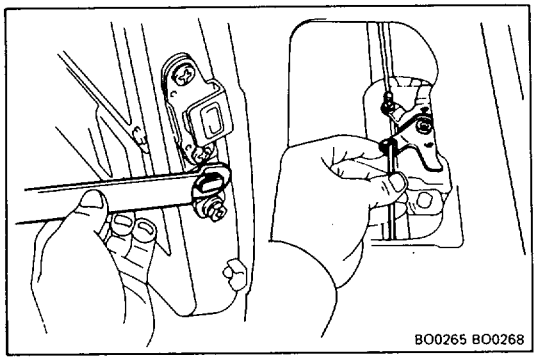
1. **DISCONNECT TAIL GATE STAY FROM TAIL GATE LOCK**
2. **REMOVE SERVICE HOLE COVER**
3. **DISCONNECT TAIL GATE LOCK LINK FROM TAIL GATE LOCK CONTROL**



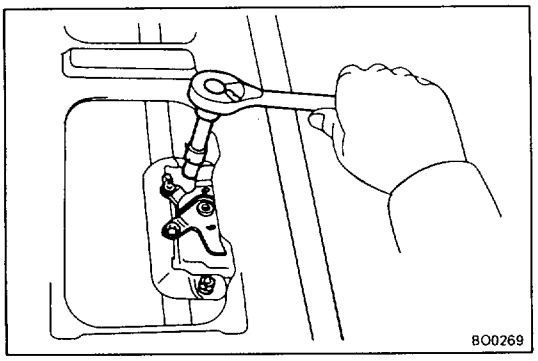
4. **REMOVE TAIL GATE LOCK FROM TAIL GATE**
   Remove the three set screws and the tail gate lock.

INSTALLATION OF TAIL GATE LOCK

1. **INSTALL TAIL GATE LOCK TO TAIL GATE**
   Install the tail gate lock with the three screws.



2. CONNECT TAIL GATE STAY TO TAIL GATE LOCK
3. CONNECT TAIL GATE LOCK LINK TO TAIL GATE LOCK CONTROL
4. INSTALL SERVICE HOLE COVER



REMOVAL OF TAIL GATE LOCK CONTROL

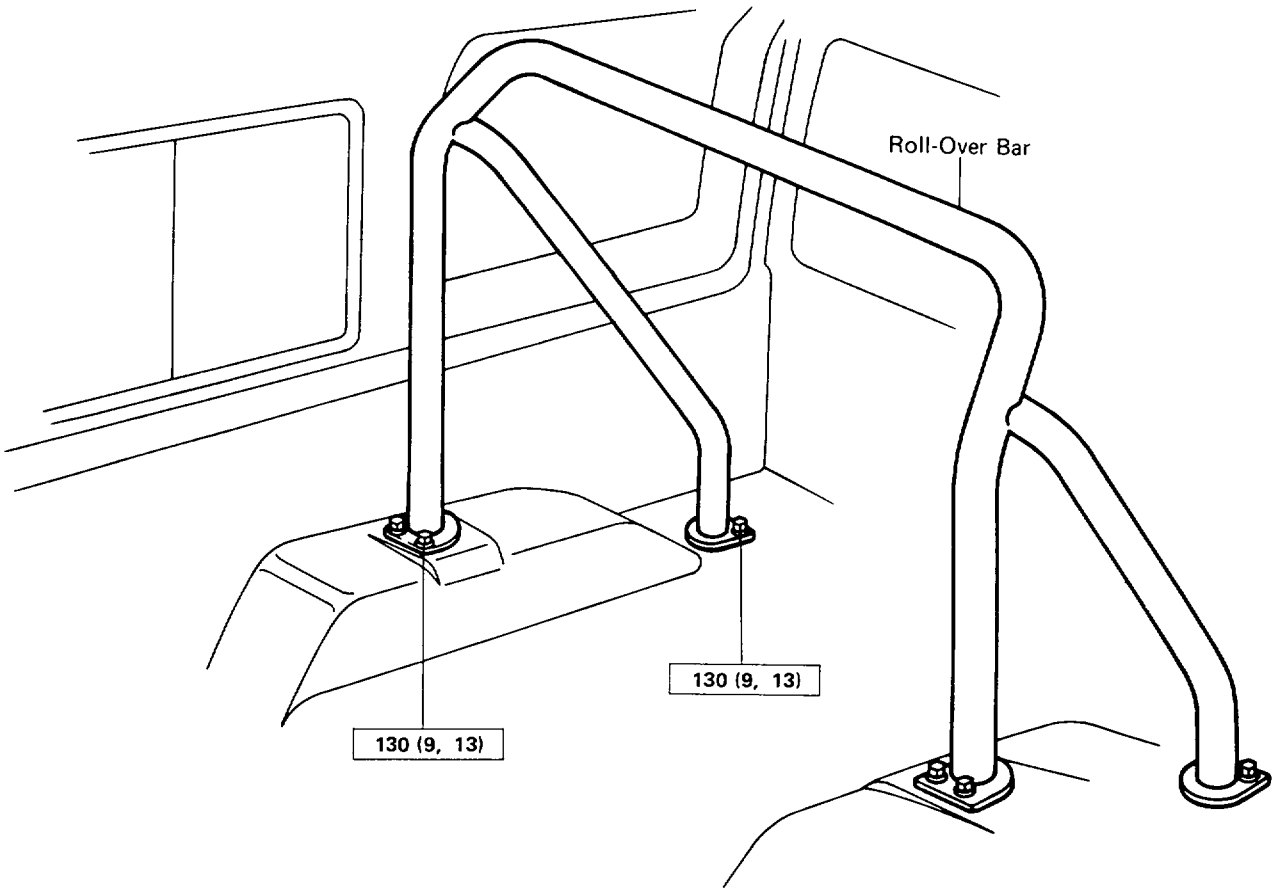
1. REMOVE SERVICE HOLE COVER
2. DISCONNECT TWO TAIL GATE LOCK LINKS
3. REMOVE TAIL GATE LOCK CONTROL

INSTALLATION OF TAIL GATE LOCK CONTROL

INSTALL TAIL GATE LOCK CONTROL IN REVERSE ORDER OF REMOVAL

ROLL-OVER BAR

COMPONENTS

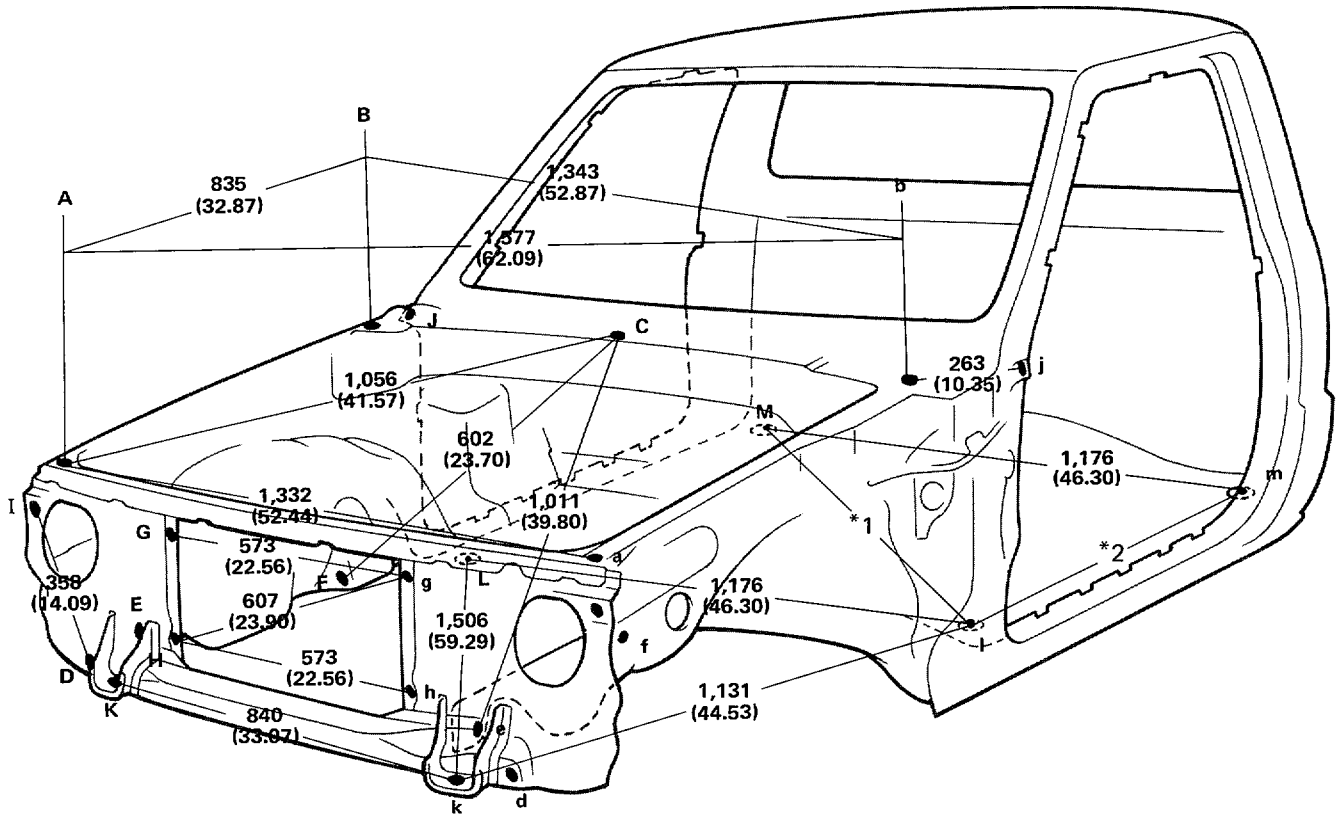


kg-cm (ft-lb, N·m) : Specified torque

BO0809

BODY DIMENSIONS

Engine Room and Front Under Body



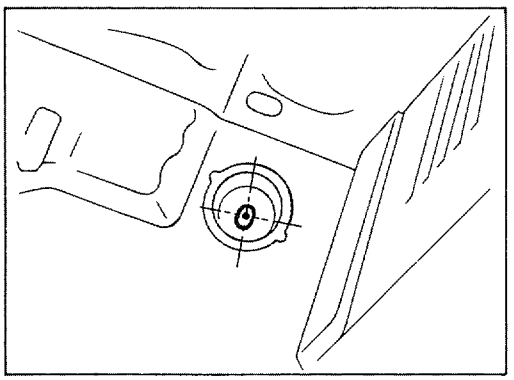
*1 Regular Cabs 1,618 (63.70)
Extra Cabs 1,781 (70.12)

*2 Regular Cabs 1,112 (43.78)
Extra Cabs 1,338 (52.68)

mm (in.)

Symbol	Nomenclature	Hole dia.
A, a	Front fender installation nut	7 (0.28)
B, b	Front fender installation nut	7 (0.28)
C	Cowl ventilation louver installation hole	7.5 x 7.5 (0.30 x 0.30)
D, d	Front crossmember working hole	13 (0.51)
E, e	Fender apron seal installation hole	7 (0.28)
F, f	(4WD) Fender apron patch installation hole (2WD) Fender apron seal installation hole	7 (0.28)
G, g	Radiator installation nut	9 (0.35)
H, h	Radiator installation nut	9 (0.35)
I, i	Front fender installation nut	7 (0.28)
J, j	Front fender installation nut	7 (0.28)
K	Front body mounting hole	11 (0.43)
k	Front body mounting hole	12 x 15 (0.47 x 0.59)
L, l	Front body mounting hole	21 x 15 (0.83 x 0.59)
M, m	Front body mounting hole	21 x 15 (0.83 x 0.59)

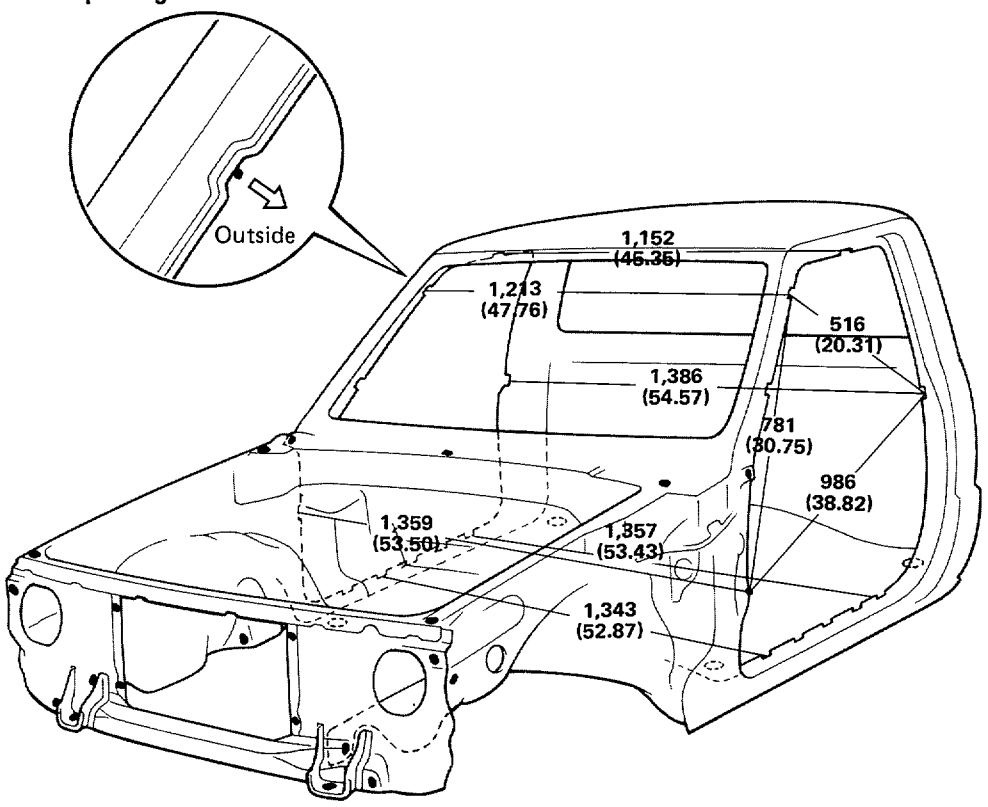
L, l and M, m points



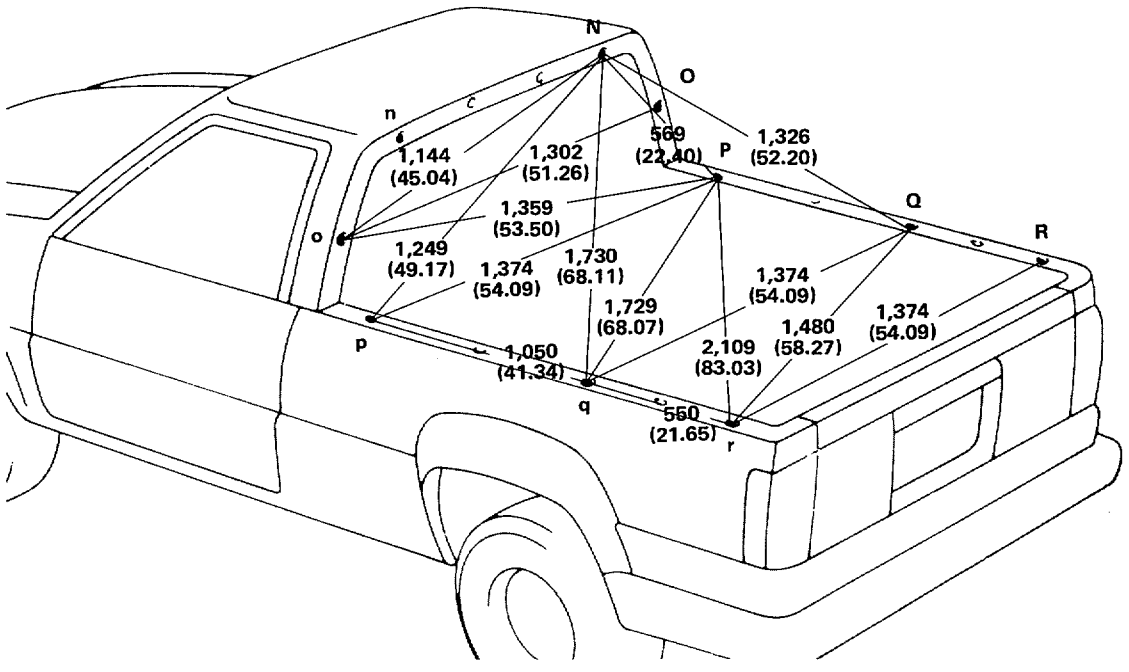
The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

BO2798

Around Door Opening



Rear Deck (4-Runner only)



mm (in.)

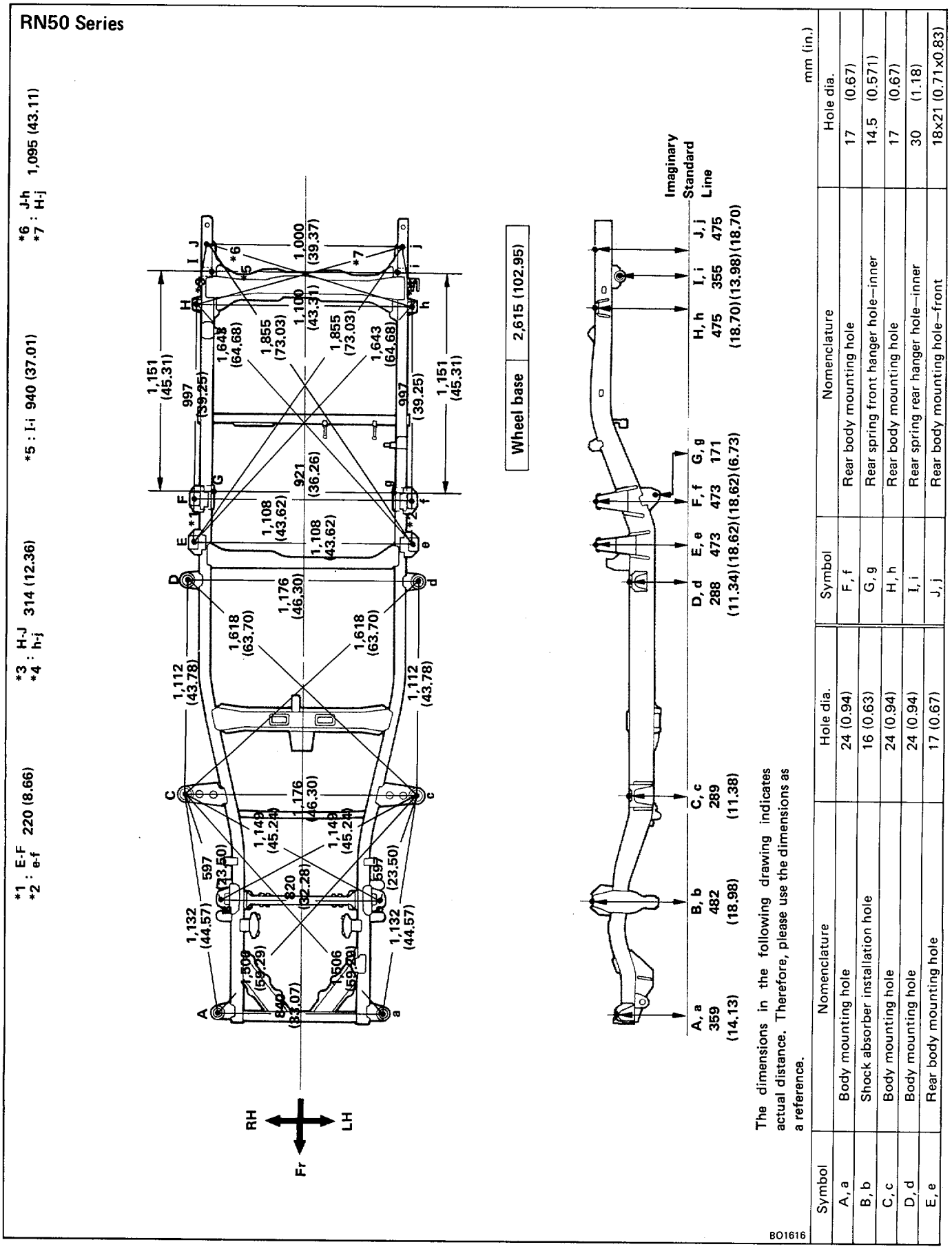
Symbol	Nomenclature	Hole dia.
N, n	Cover top installation nut	13 (0.51)
O, o	Cover top installation nut	13 (0.51)
P, p	Cover top installation nut	13 (0.51)
Q, q	Cover top installation nut	13 (0.51)
R, r	Cover top installation nut	13 (0.51)

The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

BO2799
BO2800

FRAME DIMENSIONS

RN50 Series



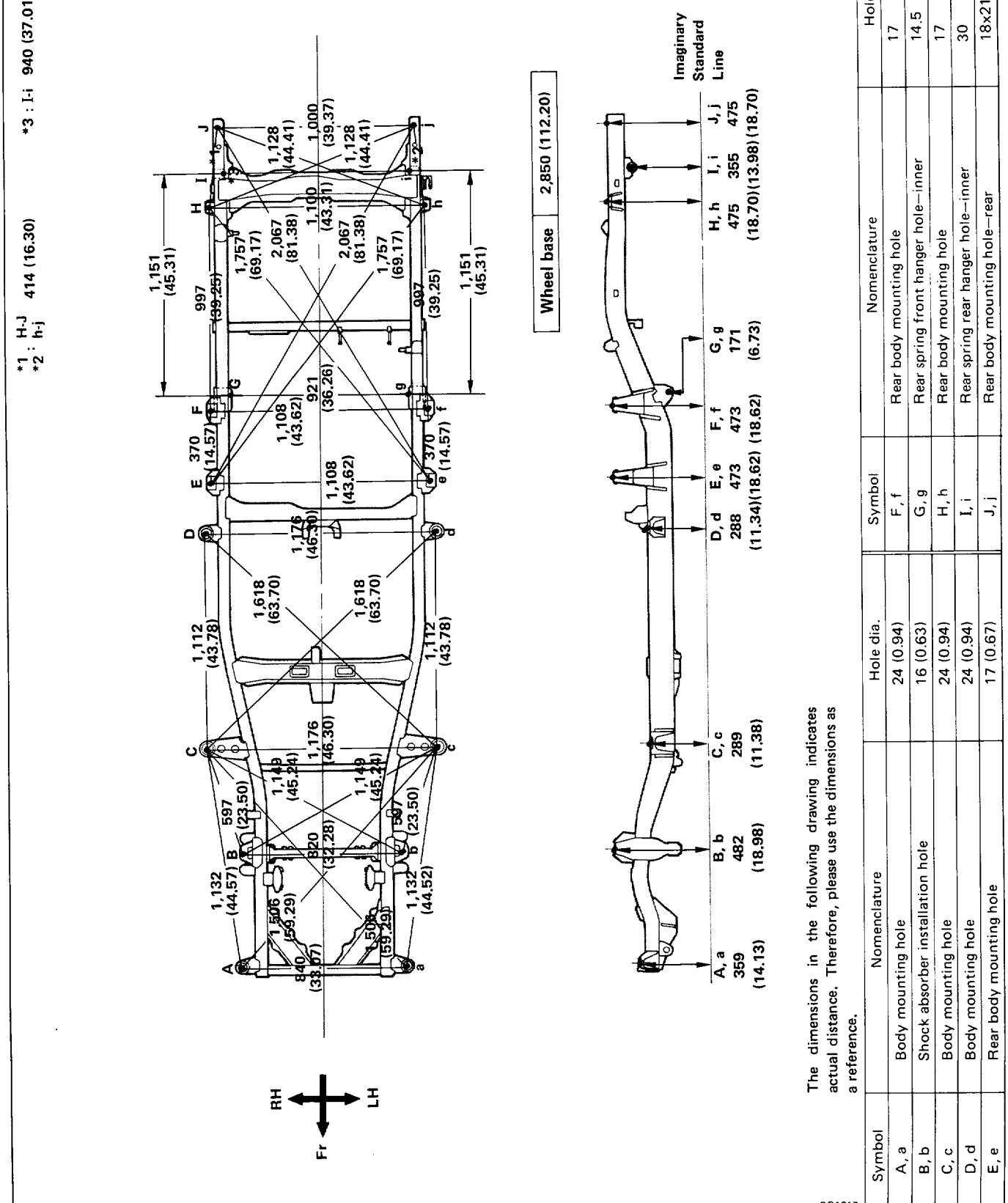
The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole–inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole–inner	30 (1.18)
J, j	Rear body mounting hole–front	18x21 (0.71x0.83)

BO1616

RN55 Series (Regular Cab)



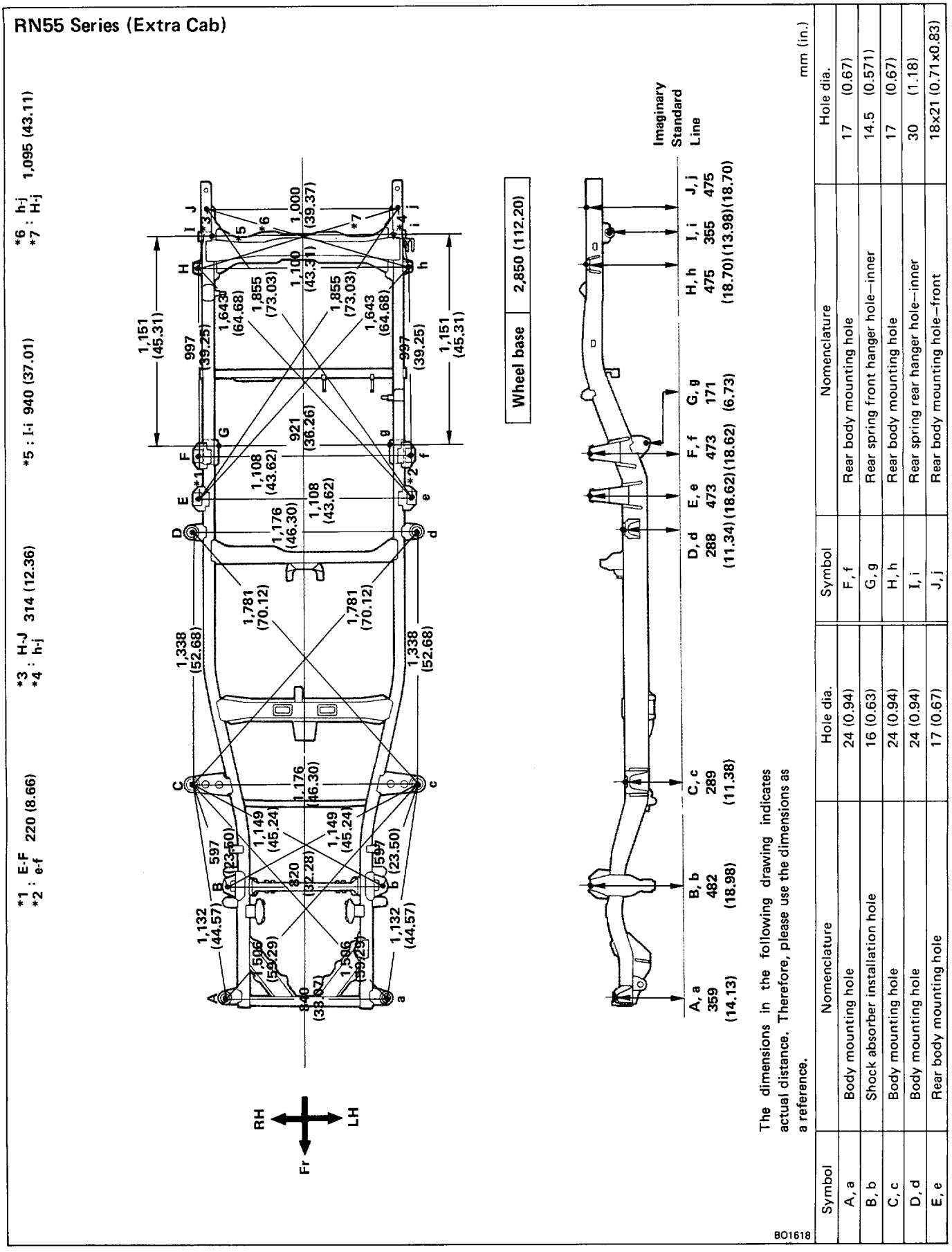
mm (in.)

The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole—inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole—inner	30 (1.18)
J, j	Rear body mounting hole—rear	18x21 (0.71x0.83)

RN55 Series (Extra Cab)



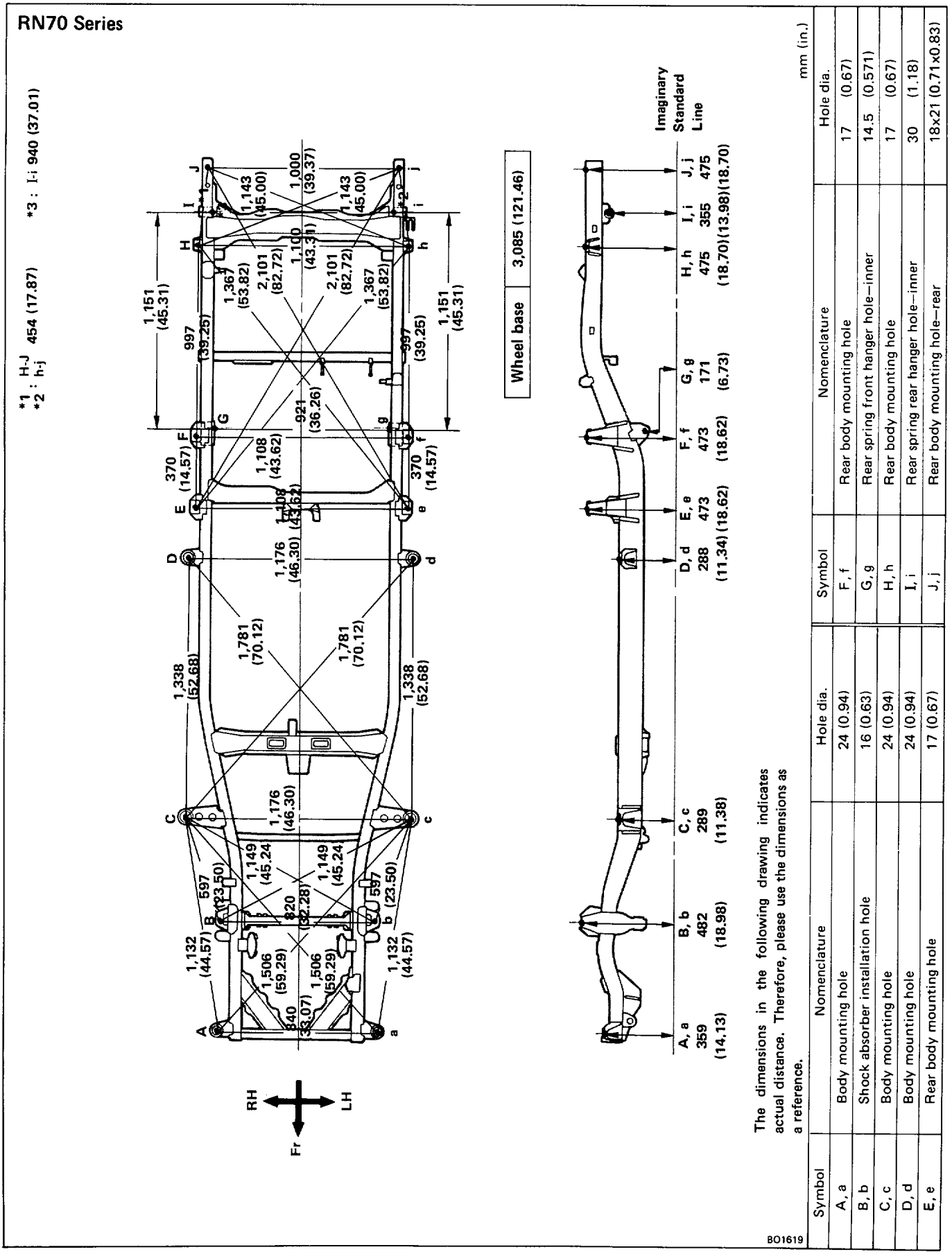
The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole—inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole—inner	30 (1.18)
J, j	Rear body mounting hole—front	18x21 (0.71x0.83)

BO1618

RN70 Series



The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

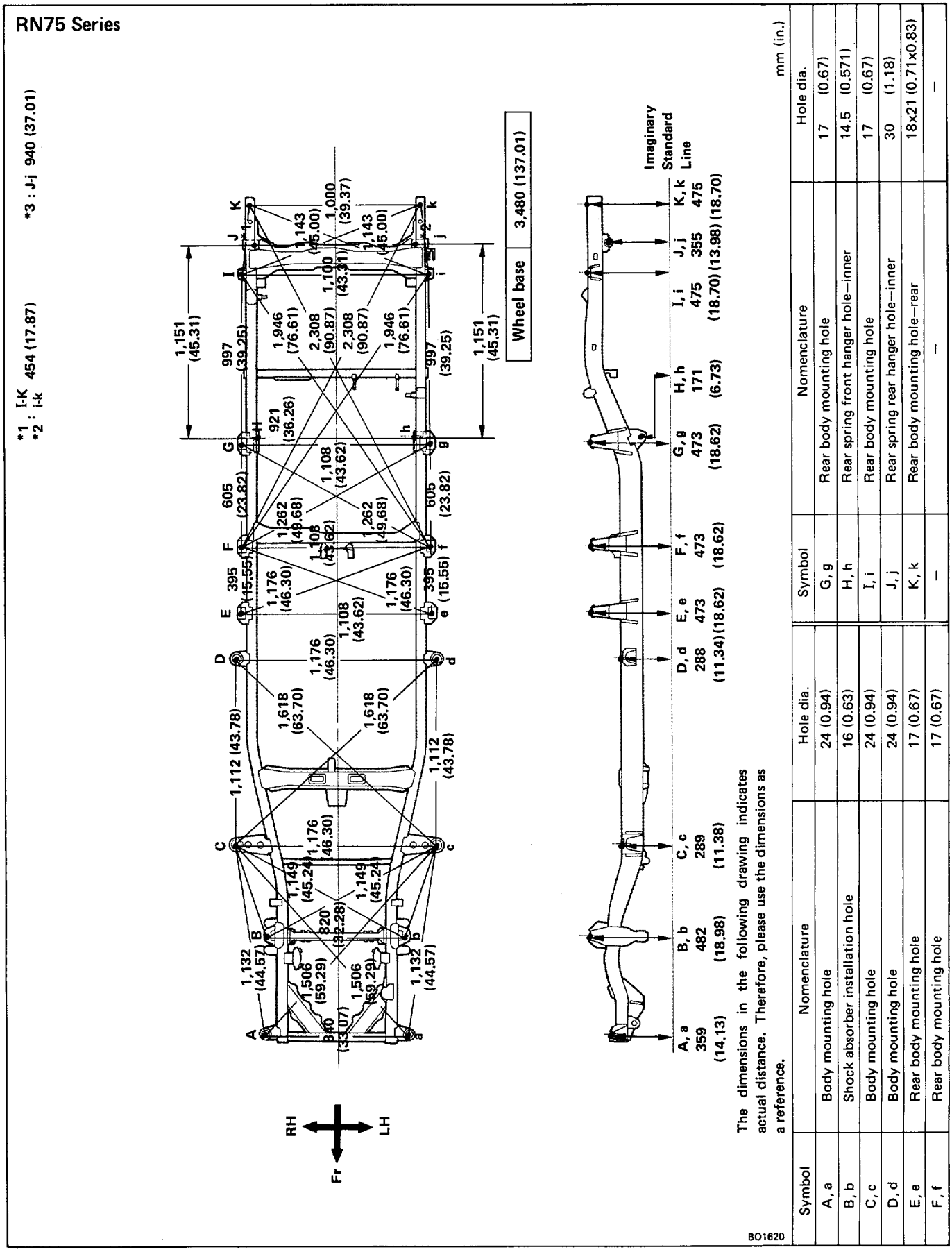
mm (in.)

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole–inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole–inner	30 (1.18)
J, j	Rear body mounting hole–rear	18x21 (0.71x0.83)

BO1619

RN75 Series

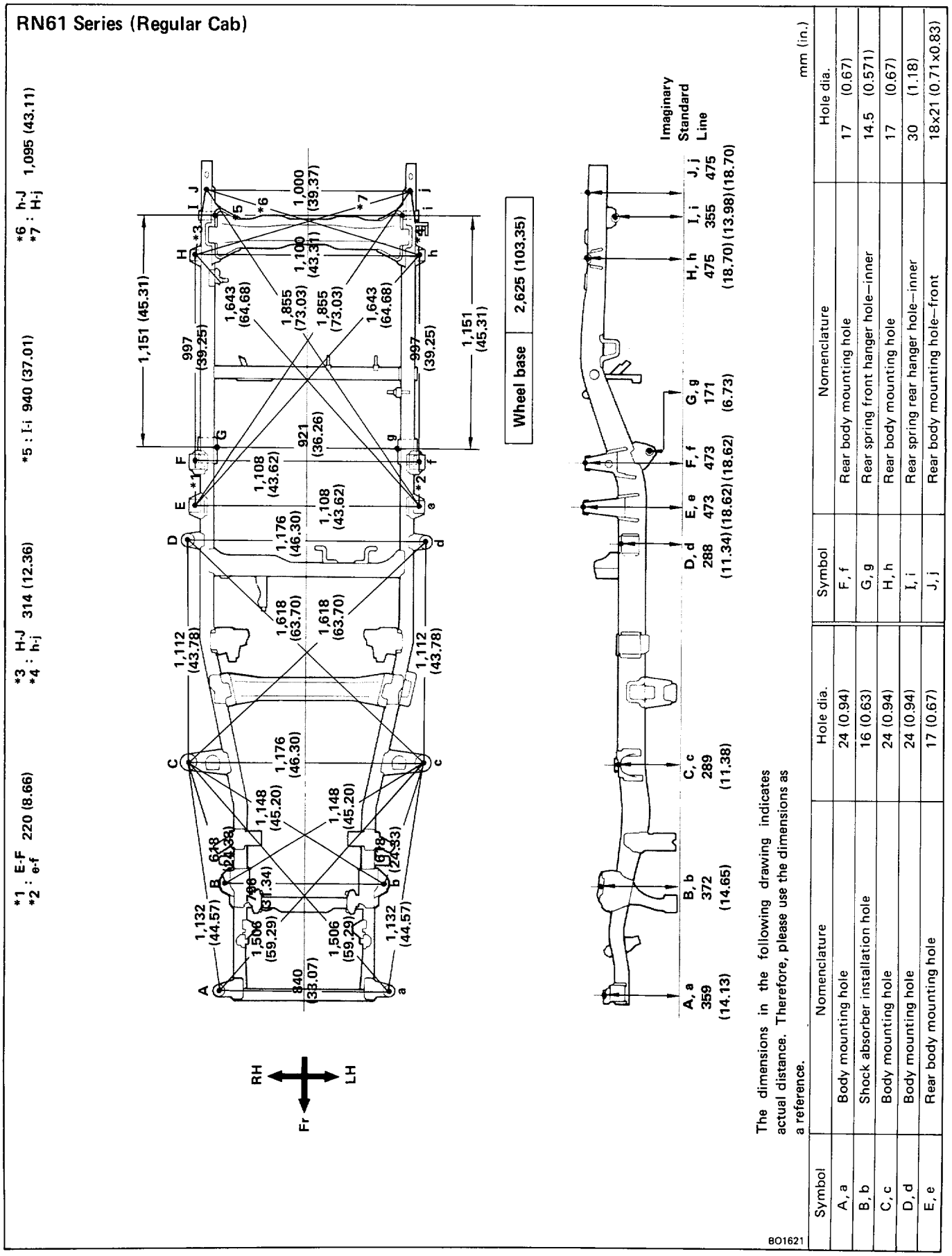


mm (in.)

Symbol	Nomenclature	Hole dia.	Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)	G, g	Rear body mounting hole	17 (0.67)
B, b	Shock absorber installation hole	16 (0.63)	H, h	Rear spring front hanger hole–inner	14.5 (0.571)
C, c	Body mounting hole	24 (0.94)	I, i	Rear body mounting hole	17 (0.67)
D, d	Body mounting hole	24 (0.94)	J, j	Rear spring rear hanger hole–inner	30 (1.18)
E, e	Rear body mounting hole	17 (0.67)	K, k	Rear body mounting hole–rear	18x21 (0.71x0.83)
F, f	Rear body mounting hole	17 (0.67)	–	–	–

The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

RN61 Series (Regular Cab)



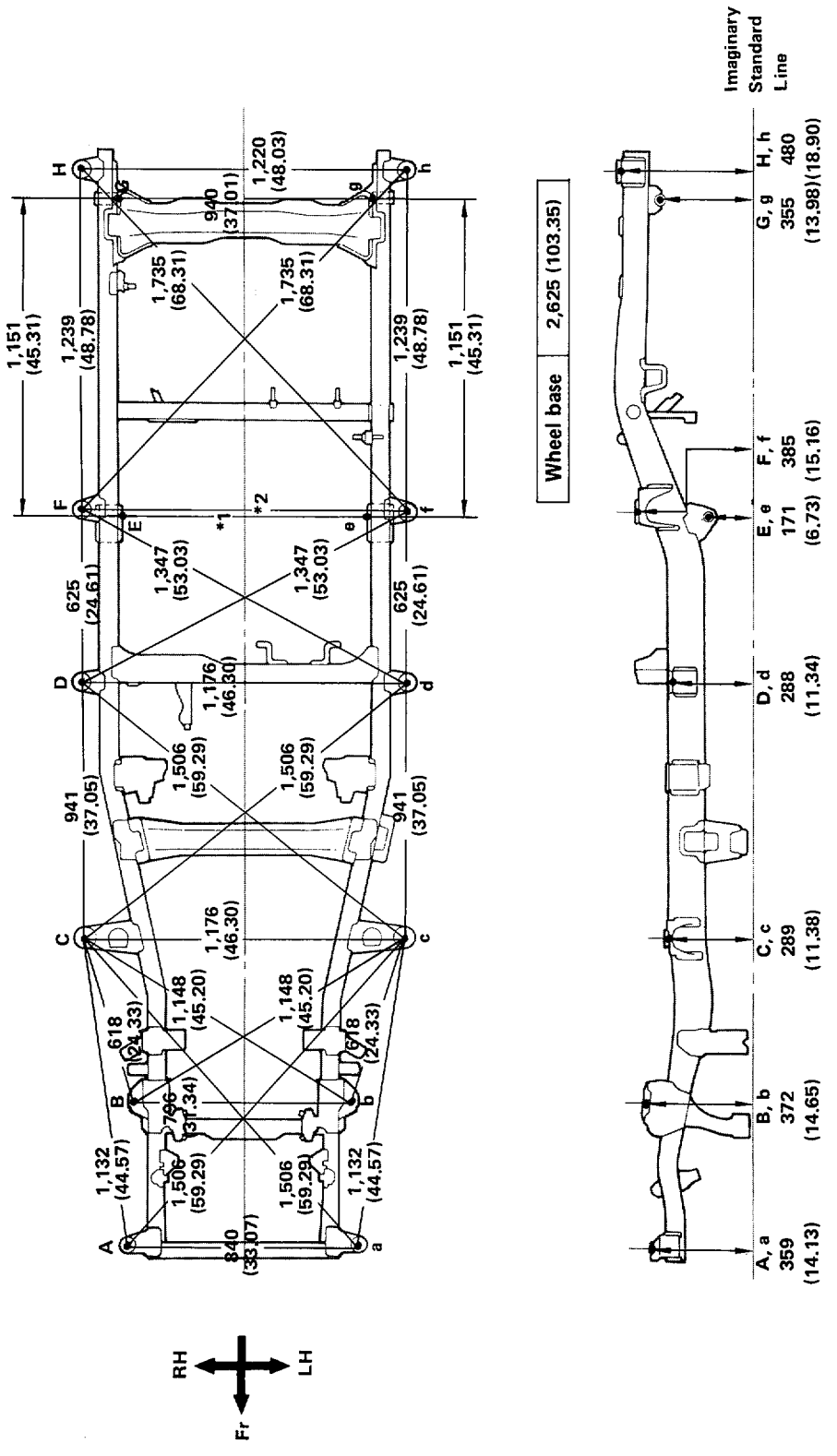
mm (in.)

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole–inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole–inner	30 (1.18)
J, j	Rear body mounting hole–front	18x21 (0.71x0.83)

The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

RN61 Series (4 Runner)



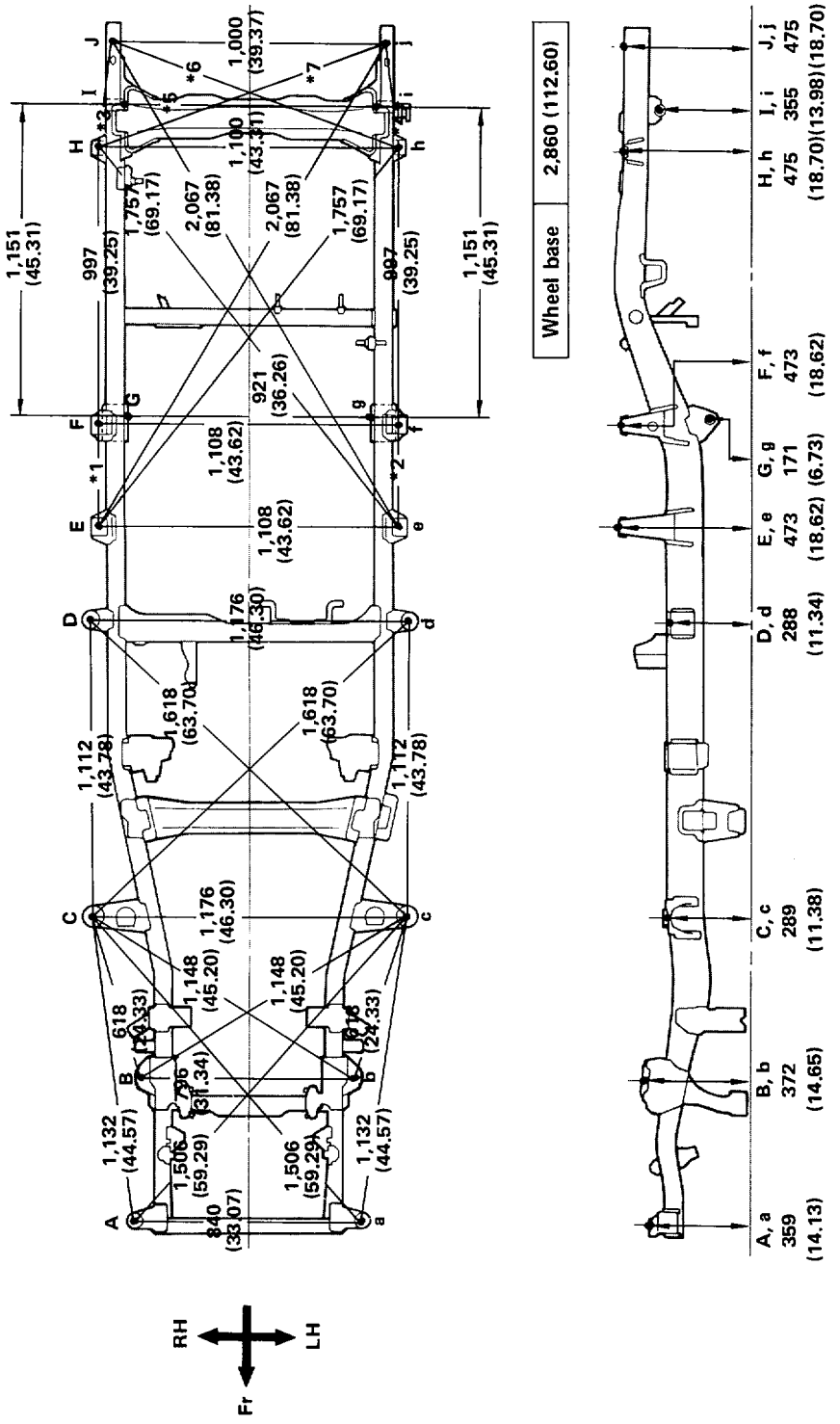
The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

mm (in.)

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)

Symbol	Nomenclature	Hole dia.
E, e	Rear spring front hanger hole—inner	14.5 (0.571)
F, f	Body mounting hole	24 (0.94)
G, g	Rear spring rear hanger hole—inner	30 (1.18)
H, h	Body mounting hole	24 (0.94)

RN66 Series (Regular Cab)



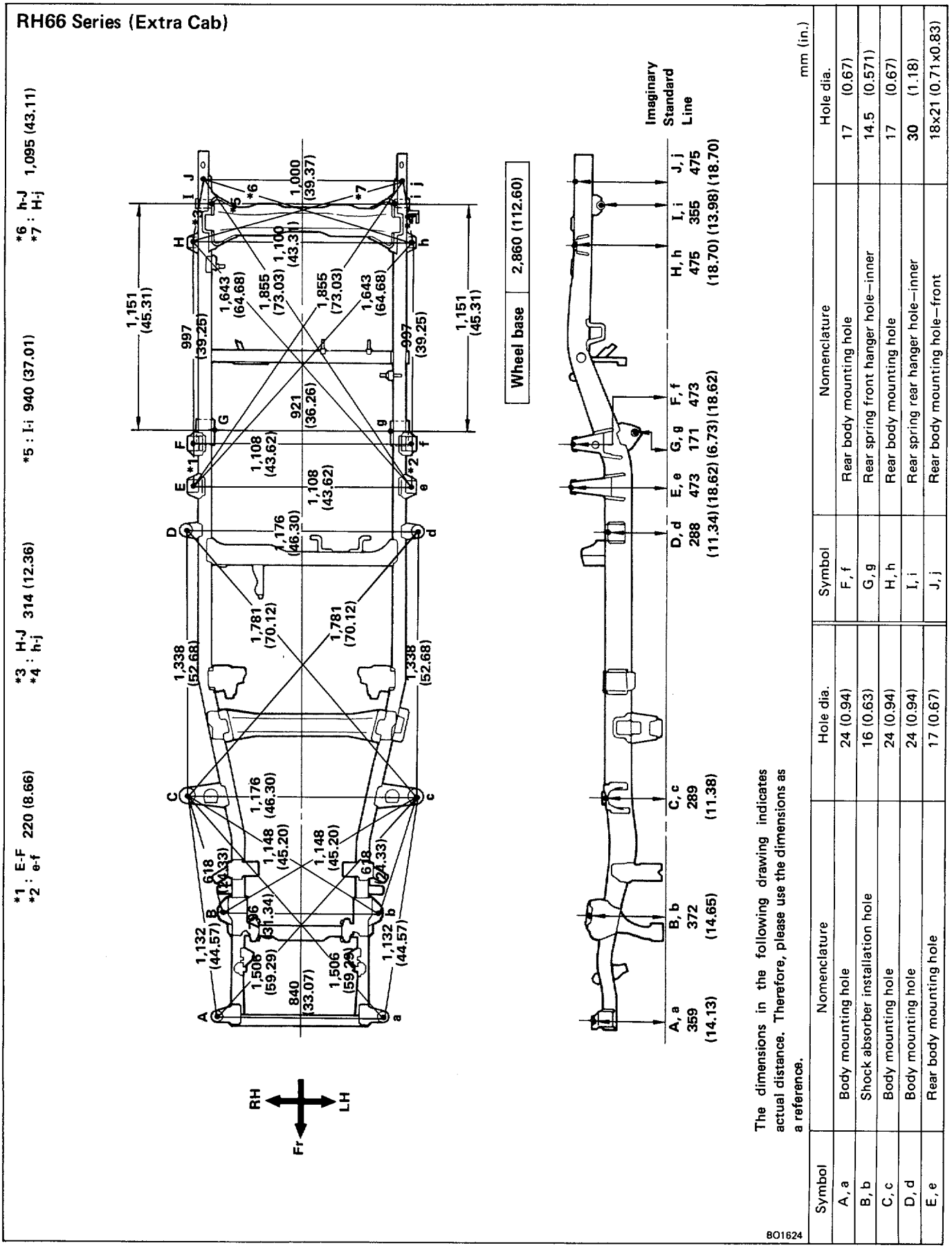
mm (in.)

The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole–inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole–inner	30 (1.18)
J, j	Rear body mounting hole-rear	18x21 (0.71x0.83)

RH66 Series (Extra Cab)



mm (in.)

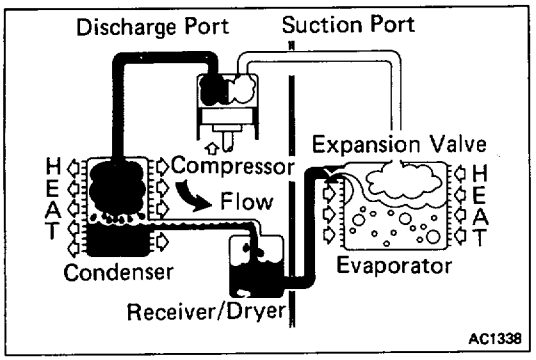
The dimensions in the following drawing indicates actual distance. Therefore, please use the dimensions as a reference.

Symbol	Nomenclature	Hole dia.
A, a	Body mounting hole	24 (0.94)
B, b	Shock absorber installation hole	16 (0.63)
C, c	Body mounting hole	24 (0.94)
D, d	Body mounting hole	24 (0.94)
E, e	Rear body mounting hole	17 (0.67)

Symbol	Nomenclature	Hole dia.
F, f	Rear body mounting hole	17 (0.67)
G, g	Rear spring front hanger hole–inner	14.5 (0.571)
H, h	Rear body mounting hole	17 (0.67)
I, i	Rear spring rear hanger hole–inner	30 (1.18)
J, j	Rear body mounting hole–front	18x21 (0.71x0.83)

AIR CONDITIONING SYSTEM

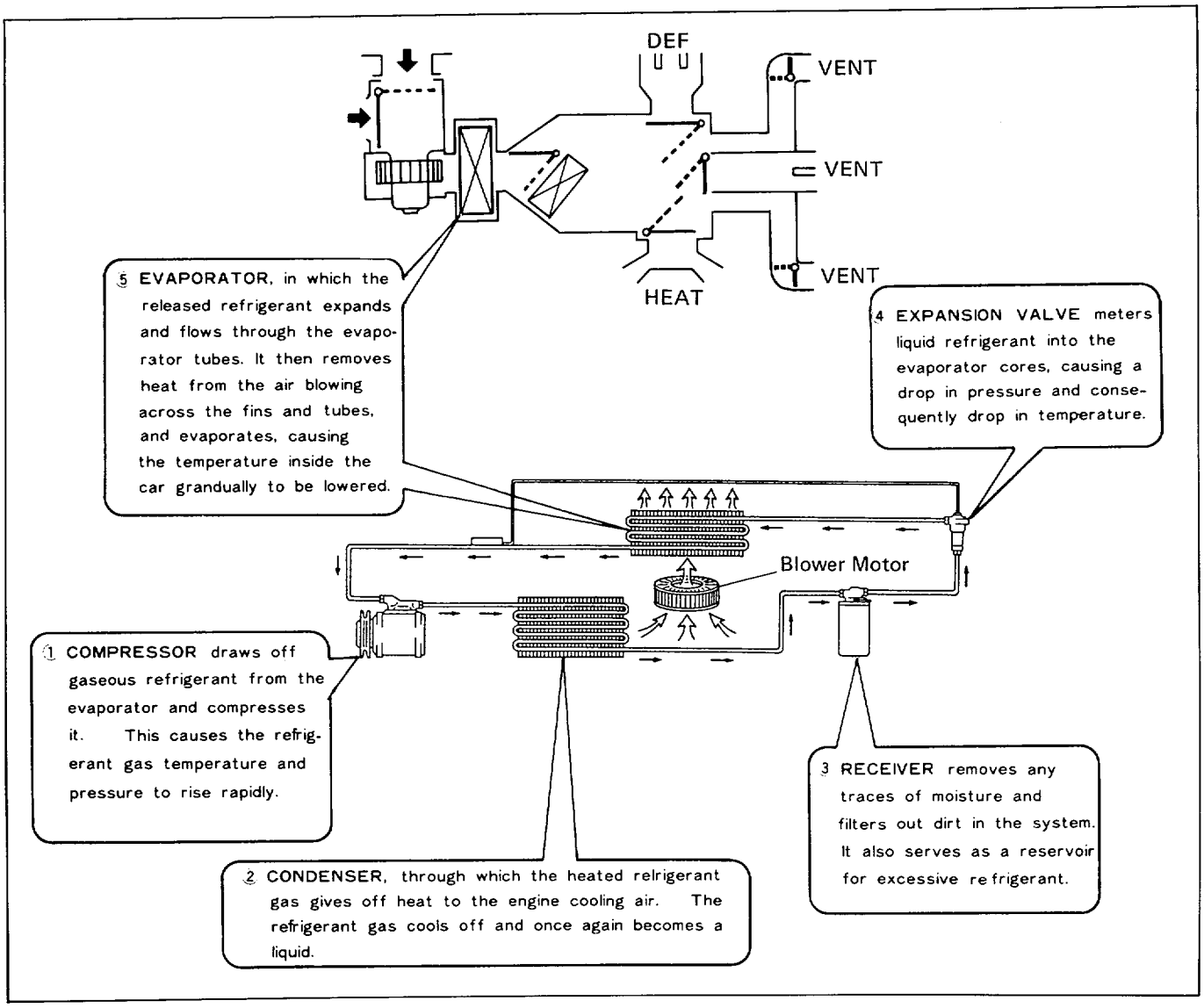
	Page
GENERAL DESCRIPTION	AC-2
AIR CONDITIONING SYSTEM CIRCUIT	AC-4
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PRECAUTIONS	AC-8
SPECIAL TOOLS AND EQUIPMENT	AC-8
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Checking of Refrigeration System with Manifold Gauge	AC-10
ON-VEHICLE INSPECTION	AC-13
REFRIGERATION SYSTEM	AC-14
Checking of Refrigerant Charge	AC-14
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RECEIVER	AC-39
CONDENSER	AC-40
COOLING UNIT	AC-41
Evaporator	AC-43
REFRIGERANT LINES	AC-44
A/C SWITCH	AC-45
LOW PRESSURE SWITCH	AC-45
AIR CONDITIONER AMPLIFIER	AC-46
VACUUM SWITCHING VALVE (VSV)	AC-47



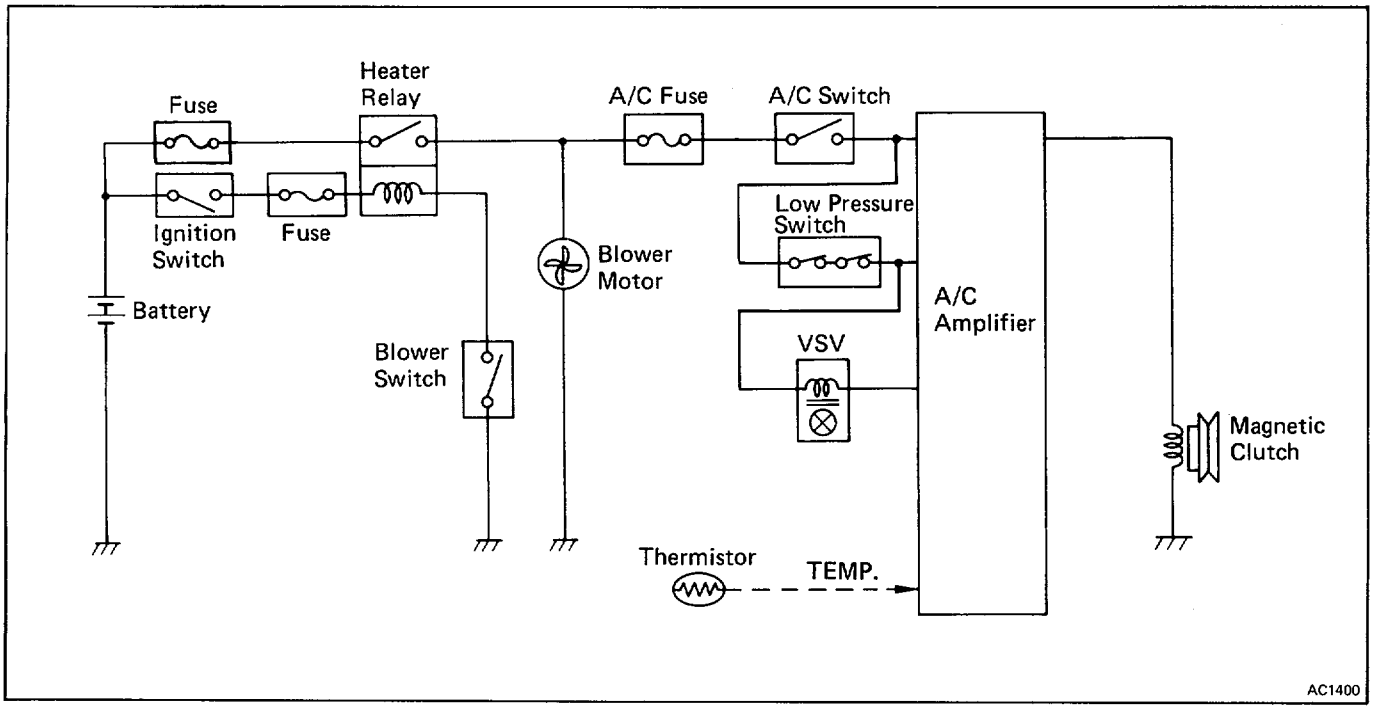
GENERAL DESCRIPTION

REFRIGERATION CYCLE

1. The compressor discharges high temperature and high pressure refrigerant that contains the heat absorbed from the evaporator plus the beat created by the compressor in a discharge stroke.
2. This gaseous refrigerant flows into the condenser. In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
3. This liquid refrigerant flows into the receiver which stores and filters the liquid refrigerant till the evaporator requires the refrigerant.
4. By the expansion valve, the liquid refrigerant changes into low temperature, low pressure liquid and gaseous mixture.
5. This cold and foggy refrigerant flows to the evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air stream passing through the evaporator core is transferred to the refrigerant. All the liquid change into the gaseous refrigerant in the evaporator and only heat-laden gaseous refrigerant is drawn into the compressor. Then, the process is repeated again.



1. PRINCIPLE OF A/C ELECTRICAL CIRCUIT



2. HOW MAGNETIC CLUTCH BE ENERGIZED?

The general process until magnetic clutch is energized is shown below.

① Ignition Switch "ON"

② Blower Switch "ON" ⟶ Heater Relay "ON" (Blower Motor "RUN")

③ A/C Switch "ON" ⟶ A/C Amplifier "ON" (A/C Amp. Main Power Supply)

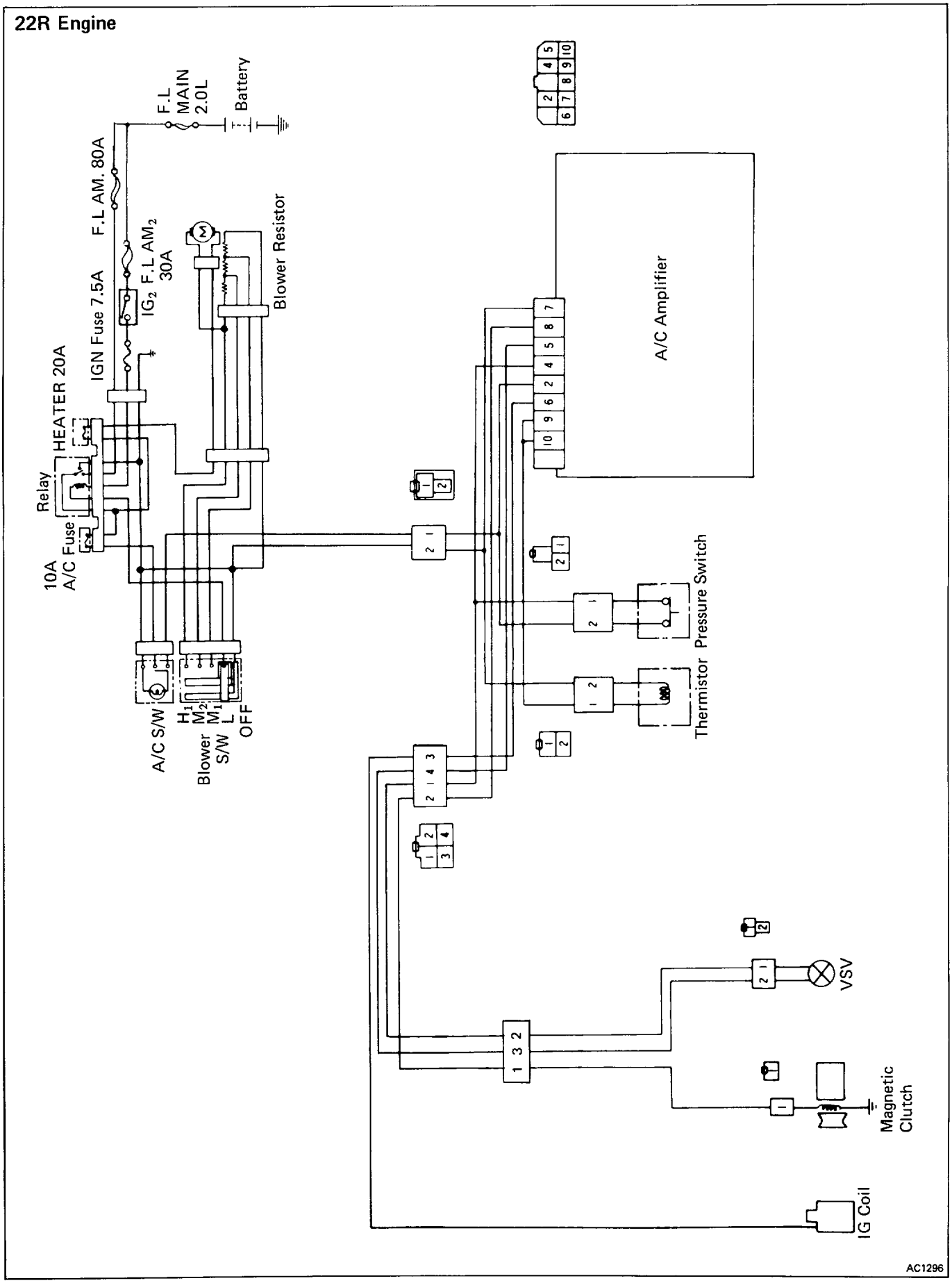
④ Low Pressure Switch "ON":
Refrigerant Condition is more than (2.1 kg/cm² (30 psi, 206 kPa))

⑤ Thermistor supplys temperature of evaporator to A/C amplifier.

⑥ VSV "ON" ⟶ E/G Idle-up

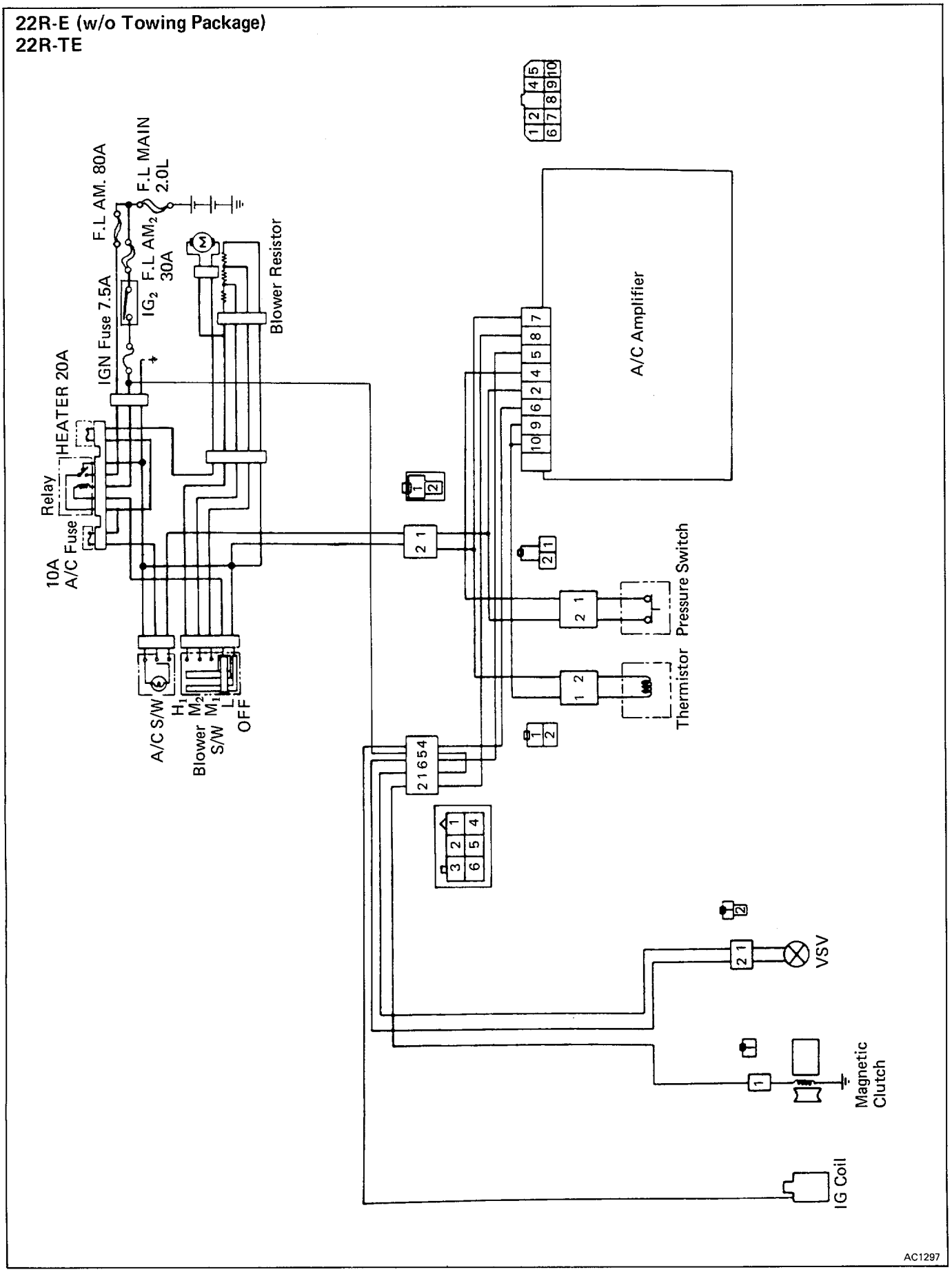
⑦ Magnetic Clutch "ON"

AIR CONDITIONING SYSTEM CIRCUIT



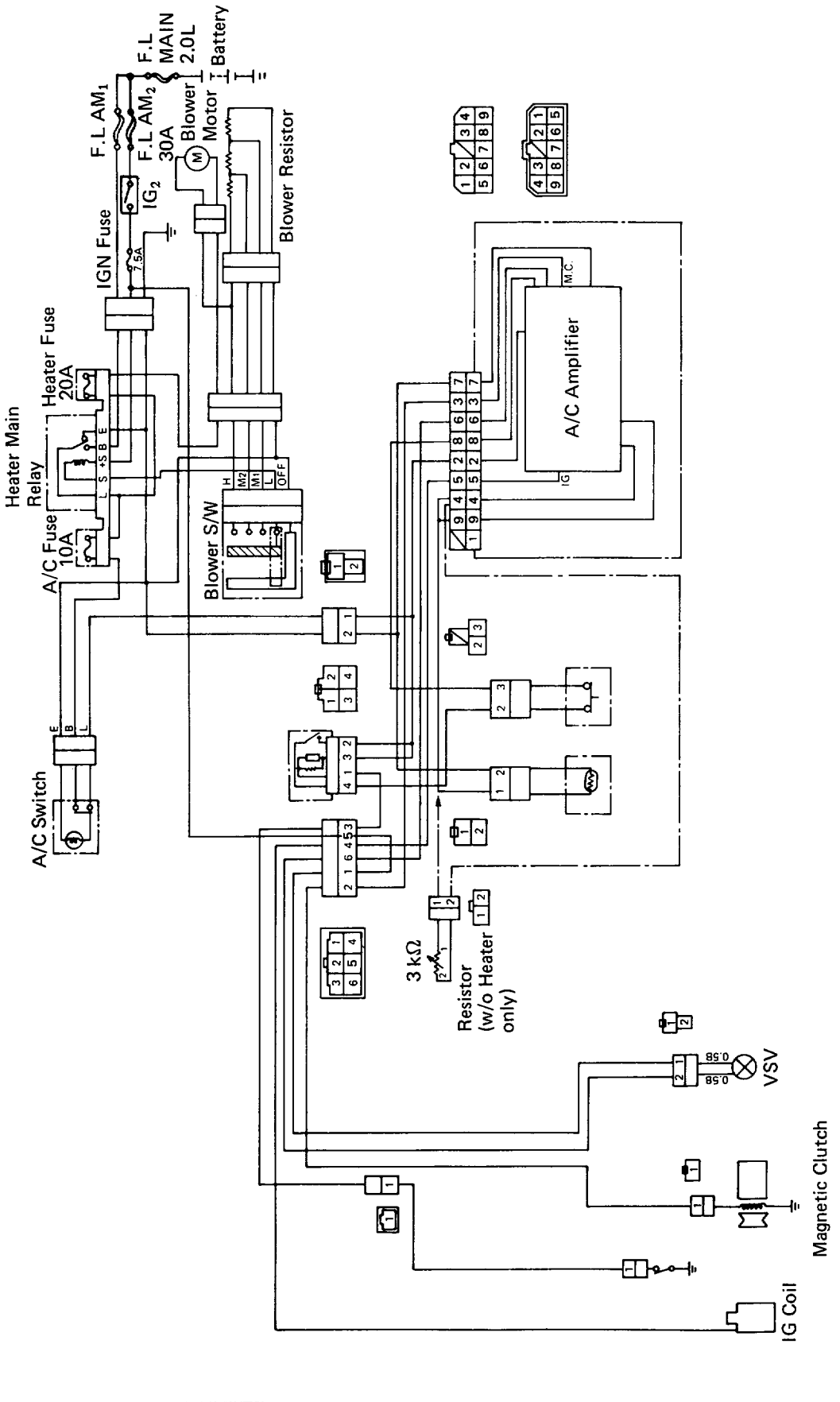
AIR CONDITIONING SYSTEM CIRCUIT (Cont'd)

22R-E (w/o Towing Package)
22R-TE

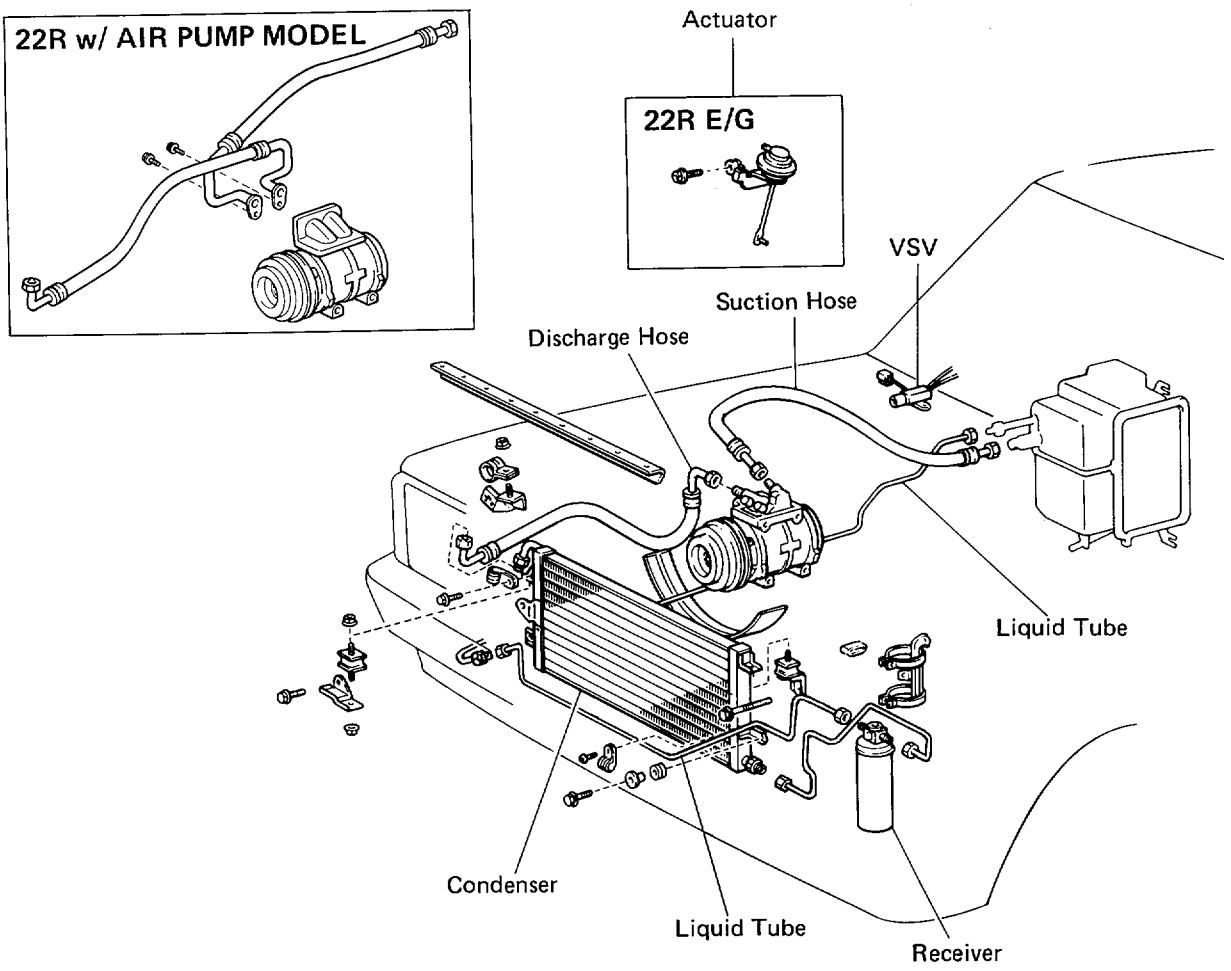


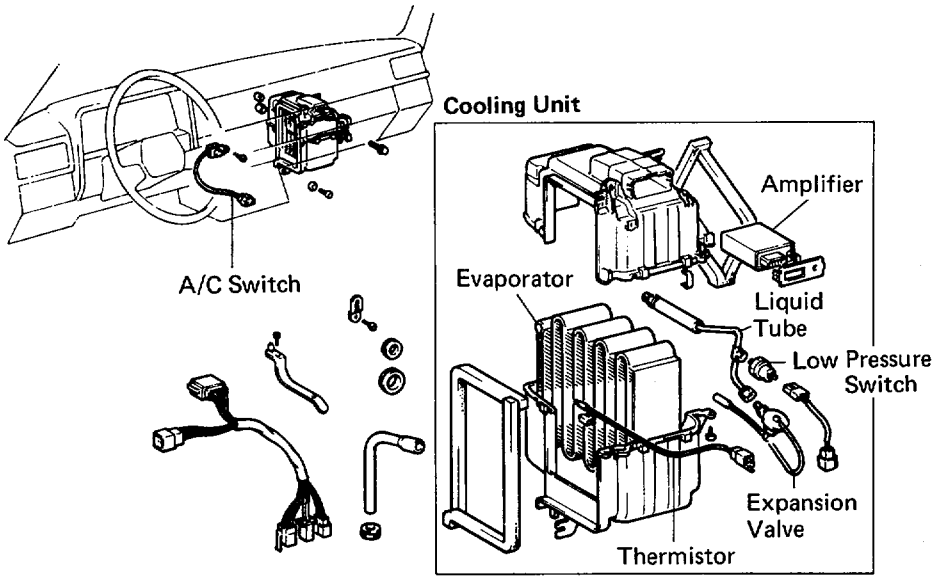
AIR CONDITIONING SYSTEM CIRCUIT (Cont'd)

22R-E (w/ Towing Package)



SYSTEM COMPONENTS





AC0051
AC0052

PRECAUTIONS

1. **The following precautions should be observed when handling refrigerant(R-12):**
   (a) Always wear eye protection.
   (b) Keep the refrigerant container(service drum)below 40°C(104°F).
   (c) Do not handle refrigerant in an enclosed area where there is an open flame.
   (d) Discharge refrigerant slowly when purging the system.
   (e) Be careful that the liquid refrigerant does not get on your skin.

2. **If liquid refrigerant gets in the eyes or on the skin:**
   (a) Do not rub.
   (b) Wash the area with a lot of cool water.
   (c) Apply clean petroleum jelly to the skin.
   (d) Rush to a physician or hospital for immediate professional treatment.
   (e) Do not attempt to treat yourself.

3. **When tubing:**
   (a) Apply a few drops of compressor oil onto the O-ring fittings.
   (b) Use two wrenches to tighten the nuts to prevent twisting the tube.
   (c) Tighten the O-ring fitting to the specified torque.

Tightening torque for O-ring fittings

Fitting size	Torque
0.31 in.Tube	135 kg-cm (10 ft-lb, 13 N·m)
0.50 in.Tube	225 kg-cm (16 ft-lb, 22 N·m)
0.62 in.Tube	325 kg-cm (24 ft-lb, 32 N·m)

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.		Use
Manifold gauge set	07710-58011		To evacuate and charge system
Ohmmeter	—		To diagnosis electrical system
Voltage meter	—		To diagnosis electrical system
Snap ring pliers	07114-84020		To remove pressure plate
Hexagon wrench set	07110-61050		To remove service valves and front housing
Magnet clutch stopper	07112-76060	*1	To remove and install pressure plate
Pressure plate remover	07112-66040	*1	To remove pressure plate
Lipseal remover	07112-85030	*1	To remove seal plate
Seal plate remover	07112-15020	*1	To remove felt
Seal plate replacer	07114-15021	*1	To install seal plate
Magnetic clutch tool set	07110-77011	*2	Includes all of the following
Pressure plate remover	07112-71010	*2	To remove pressure plate
Key remover	07112-45021	*2	To remove key
Shaft plate remover	07112-15010	*2	To remove shaft plate
Shaft seal remover	07114-15010	*2	To remove shaft seal
Shaft plate installing tool	07112-25010	*2	To install shaft plate
Key press tool	07114-45010	*2	To install key

*1; w/ AIR PUMP MODEL *2; w/o AIR PUMP MODEL

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) IGN fuse blown	Replace fuse and check for short	AC-4 to 6
	(b) Magnetic clutch faulty	Check magnetic clutch	AC-15
	(c) A/C switch faulty	Check switch	AC-45
	(d) A/C amplifier faulty	Check amplifier	AC-46
	(e) Wiring or ground faulty	Repair as necessary	AC-4 to 6
	(f) Refrigerant empty	Check refrigerant pressure	AC-14
	(g) Heater relay faulty	Check heater relay	AC-4 to 6
	(h) Pressure switch faulty	Check pressure switch	AC-45
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	AC-13
	(b) Compressor faulty	Check compressor	AC-15
	Expansion valve faulty	Check expansion valve	AC-41
	Leak in system	Test system for leaks	AC-44
	Fusible plug on receiver blown or clogged screen	Check receiver	AC-39
	Blower does not operate		
	(a) HEATER fuse blown	Replace fuse and check for short	AC-4 to 6
	(b) A/C switch faulty	Check A/C switch	AC-45
	(c) Circuit breaker faulty	Check circuit breaker	AC-4 to 6
	(d) Heater relay faulty	Check heater relay	AC-4 to 6
	(e) Blower motor faulty	Check blower motor	
	(f) Wiring faulty	Repair as necessary	AC-4 to 6
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC-13
	Expansion valve faulty	Check expansion valve	AC-41
	Wiring connection faulty	Repair as necessary	AC-4 to 6
	Excessive moisture in system	Evacuate and charge system	
	A/C amplifier faulty	Check amplifier	AC-46
Cool air comes out only at high speed	Condenser clogged	Check condenser	AC-40
	Drive belt slipping	Check or replace drive belt	AC-13
	Compressor faulty	Check compressor	AC-15
	Insufficient or too much refrigerant	Check refrigerant charge	AC-14
	Air in system	Evacuate and charge system	
Insufficient cooling	Condenser clogged	Check condenser	AC-40
	Drive belt slipping	Check or replace drive belt	AC-13
	Magnetic clutch faulty	Check magnetic clutch	AC-15
	Compressor faulty	Check compressor	AC-15
	Expansion valve faulty	Check expansion valve	AC-41
	Insufficient or too much refrigerant	Check refrigerant charge	AC-14
	Air or excessive compressor oil in system	Evacuate and charge system	
	Receiver clogged	Check receiver	AC-39
	Water valve cable faulty	Reset water valve cable	BE-39
	A/C amplifier faulty	Check amplifier	AC-46
Insufficient velocity of cool air	Evaporator clogged or frosted	Clean evaporator fins or filters	AC-43
	Air leakage from cooling unit or air duct	Repair as necessary	AC-41
	Air inlet blocked	Repair as necessary	
	Blower motor faulty	Replace blower motor	
	A/C amplifier faulty	Check amplifier	AC-46

Checking of Refrigeration System with Manifold Gauge

This is a method in which the trouble is located by using a manifold gauge. Read the manifold gauge pressure with the following established conditions:

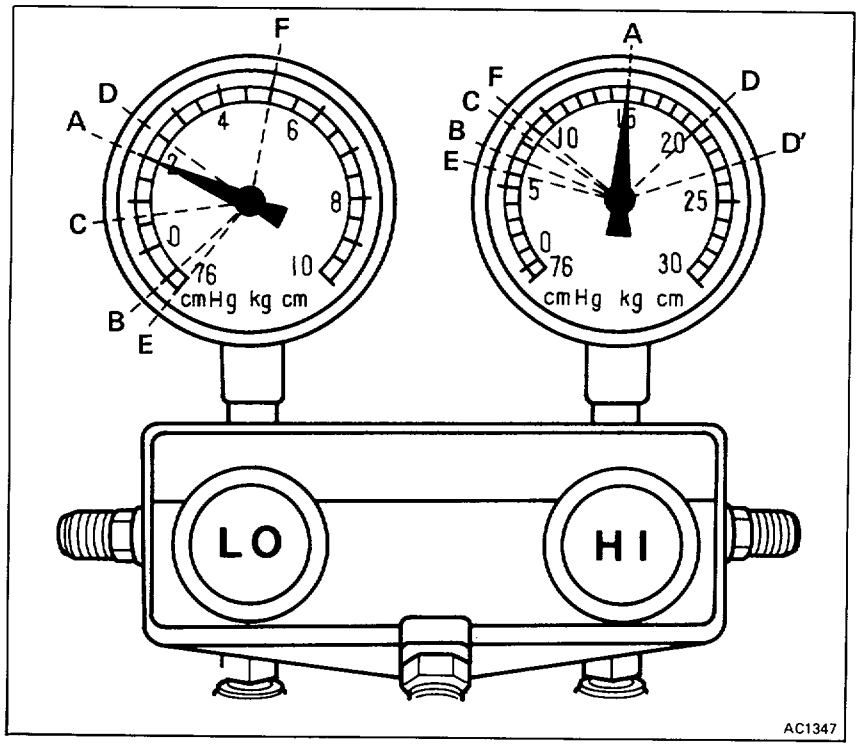
(a) Temperature at the air inlet is 30 — 35°C (86 — 95°F)

(b) Engine running at 2,000 rpm

(c) Blower speed set at high

(d) Temperature control lever set at cool

NOTE: It should be noted that the gauge indivations may vary slightly due to ambient temperature conditions.



NORMALLY FUNCTIONING REFRIGERATION SYSTEM

Gauge reading:

Low pressure side
1.5 — 2.0 kg/cm² (21—28 psi, 147—196 kPa)

High pressure side
14.5 — 15.0 kg/cm² (206—213 psi, 1422—1471 kPa)

Each pointer of manifold gauge points: **A** position

No.	Trouble	Condition	Pointers Position
1	Moisture present in refrigerant system	Preiodically cools and then fails to cool	Between **A** and **B**
2	Insufficient refrigerant	Insufficient cooling	**C**
3	Poor circulation of refrigerant	Insufficient cooling	**C**
4	Refrigerant overcharge or insufficient cooling of condenser	Does not cool sufficiently	**D**
5	Expansion valve improperly mounted heat sensing tube defective (opens too wide)	Insufficient cooling	**D**
6	Air present in refrigeration system	Does not cool sufficiently	Low is **D** High is **D'**
7	Refrigerant does not circulate	Does not cool (Cools from time to time in some cases)	**E**
8	Insufficient compressor	Does not cool	**F**

Checking of Refrigeration System with Manifold Gauge (Cont'd)

No.	Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
1	During operation, pressure at low pressure side sometimes becomes a vacuum and sometimes normal	Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	Drier in oversaturated state ↓ Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant	(1) Replace receiver and drier (2) Remove moisture in cycle through repeated vacuum purging (3) Charge refrigerant to proper amount
2	Pressure low at both low and high pressure sides Bubbles seen in sight glass Insufficient cooling performance	Gas leakage at some place in refrigeration system	Insufficient refrigerant in system ↓ Refrigerant leaking	(1) Check with leak detector and repair (2) Charge refrigerant to proper amount
3	Pressure low at both low and high pressure sides Frost on tubes from receiver to unit	Refrigerant flow obstructed by dirt in receiver	Receiver clogged	Replace receiver
4	Pressure too high at both low and high pressure sides	Unable to develop sufficient performance due to excessive refrigerant in system Condenser cooling insufficient	Excessive refrigerant in cycle → refrigerant overcharged Condenser cooling insufficient → condenser fins clogged or fan motor faulty	(1) Clean condenser (2) Check fan motor operation (3) If (1) and (2) are normal, check refrigerant amount NOTE: Vent out refrigerant through gauge manifold low pressure side by gradually opening valve.
5	Pressure too high at both low and high pressure sides Frost or large amount of dew on piping at low pressure side	Trouble in expansion valve or heat sensing tube not installed correctly Refrigerant flow out	Excessive refrigerant in low pressure piping ↓ Expansion valve opened too wide	(1) Check heat sensing tube installed condition (2) If (1) is notmal, test expansion valve in unit Replace if defective
6	Pressure too high at both low and high pressure sides	Air entered refrigeration system	Air present in refrigeration system ↓ Insufficient vacuum purging	(1) Replace receiver and drier (2) Check compressor oil to see if dirty or insufficient (3) Vacuum purge and charge new refrigerant

Checking of Refrigeration System with Manifold Gauge (Cont'd)

No.	Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
7	Vacuum indicated at low pressure side, very low pressure indicated at high pressure side Frost or dew seen on piping before and after receiver and drier or expansion valve	Refrigerant flow obstructed by moisture or dirt in refrigerant freezing or adhering to expansion valve orifice Refrigerant flow obstructed by gas leakage from expansion valve	Expansion valve orifice clogged ↓ Refrigerant does not flow	Allow to stand for some time and then restart operation to determine if trouble is caused by moisture or dirt. If caused by moisture refer to procedures step 2 on page AC-11. If caused by dirt, remove expansion valve and clean off dirt by blowing with air. If unable to remove dirt, replace valve. Vacuum purge and charge new refrigerant to proper amount. For gas leakage from heat sensing tube, replace expansion valve.
8	Pressure too high at low pressure side Pressure too low at high pressure side	Internal leak in compressor	Compression defective ↓ Valve leaking or broken sliding parts (Piston, cylinder, gasket, etc.) broken	Repair or replace compressor

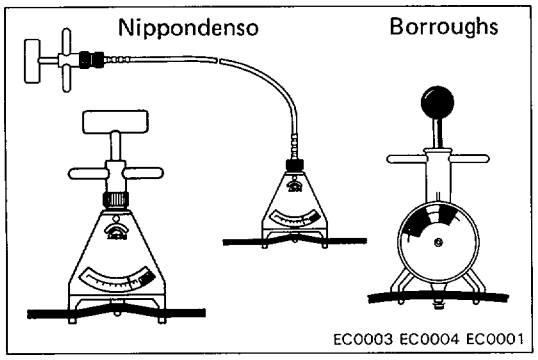
*Note at No. 6
These guage indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

ON-VEHICLE INSPECTION

1. **CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE**

   If the fins are clogged, clean them with pressurized water.

   CAUTION: Be careful not to damage the fins.



2. **CHECK DRIVE BELT TENSION**

   Using a belt tension gauge, check the drive belt tension.

   Belt tension gauge:

   Nippondenso BTG-20 (95506-00020) or
   Borroughs No. BT-33-73F

   Drive belt tension:

	w/o AIR PUMP	w/ AIR PUMP
New belt	125 ± 25 lb	160 ± 20 lb
Used belt	80 ± 20 lb	100 ± 20 lb

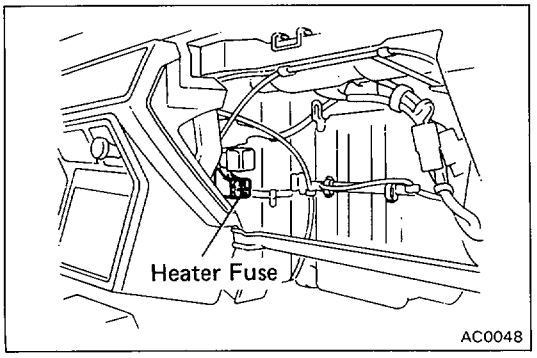
   NOTE:
   - "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
   - "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.

3. **START ENGINE**

4. **TURN ON A/C SWITCH**

   Check that the A/C operates at each position of the blower switch.

   If blower does not operate, check heater fuse.



5. **CHECK MAGNETIC CLUTCH OPERATION**

6. **CHECK THAT IDLE INCREASES**

   When the magnetic clutch engages, engine revolution should increase.

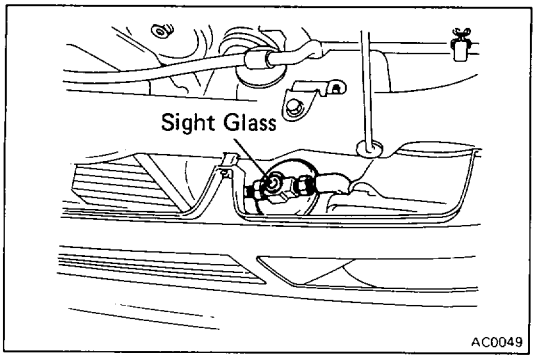
   Standard idle-up rpm: 900 — 1,000 rpm

7. **CHECK AMOUNT OF REFRIGERANT**

   If you can see bubbles in the sight glass, additional refrigerant is needed. (See page AC-14)

8. **IF NO OR INSUFFICIENT COOLING, INSPECT FOR LEAKAGE**

   Using a gas leak detector, inspect each component of the refrigeration system.



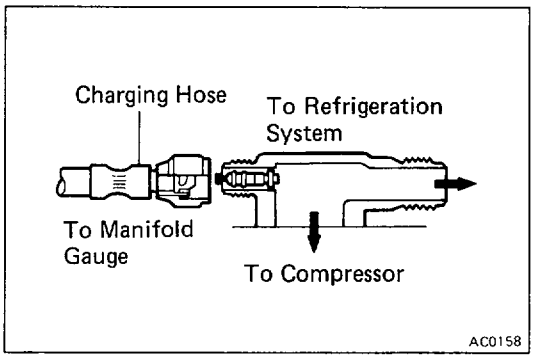
REFRIGERATION SYSTEM

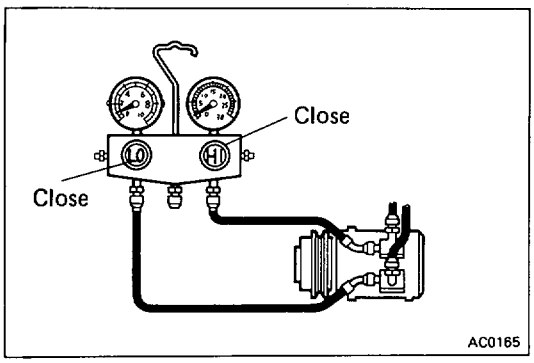
Checking of Refrigerant Charge

1. **RUN ENGINE AT APPROX. 2,000 RPM**
2. **OPERATE AIR CONDITIONER AT MAXIMUM COOLING FOR A FEW MINUTES**
3. **CHECK AMOUNT OF REFRIGERANT**

   Observe the sight glass on the receiver.

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient	Check for leak with gas leak detector
2	No bubbles present in sight glass	Empty, proper or too much	Refer to items 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	Evacuate and charge system. Then check for leak with gas leak detector
4	Temperature between compressor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after air conditioner is turned off, refrigerant in sight glass stays clear	Too much	Discharge excess refrigerant to specified amount
6	When air conditioner is turned off, refrigerant foams and then stays clear	Proper	—





Installation of Manifold Gauge Set

NOTE: Fittings for attaching the manifold gauge set are located on the compressor service valves.

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **INSTALL CHARGING HOSES OF GAUGE SET TO SERVICE VALVES**

   Connect the low pressure hose to the suction service valve and the high pressure hose to the discharge service valve. Tighten the hose nuts by hand.

   NOTE: Do not apply compressor oil to the seat of the connection.

COMPRESSOR

ON-VEHICLE INSPECTION

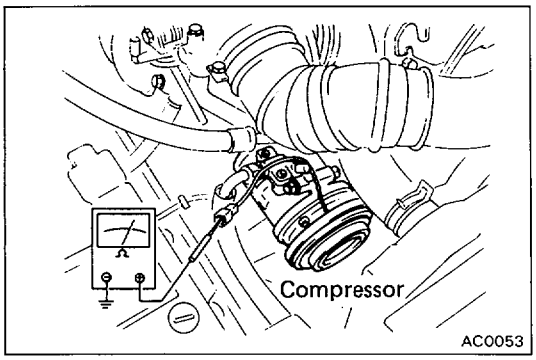
1. **INSTALL MANIFOLD GAUGE SET**
(See page AC-14)

2. **RUN ENGINE AT FAST IDLE**

3. **CHECK COMPRESSOR FOR FOLLOWING:**
   (a) High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.
   (b) Metallic sound
   (c) Leakage from shaft seal

   If defects are found, repair the compressor.

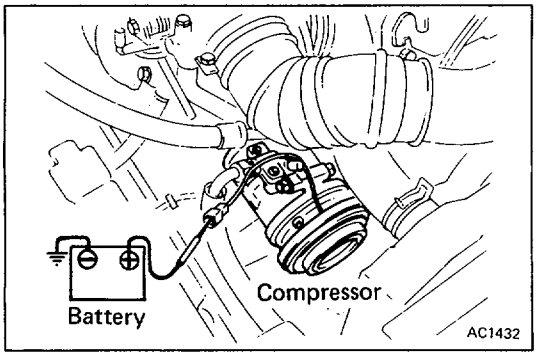
4. **CHECK MAGNETIC CLUTCH**
   (a) Inspect the pressure plate and the rotor for signs of oil.
   (b) Check the clutch bearings for noise and grease leakage.



(c) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.

Standard resistance: 3.7 ± 0.2 Ω at 20°C (68°F)

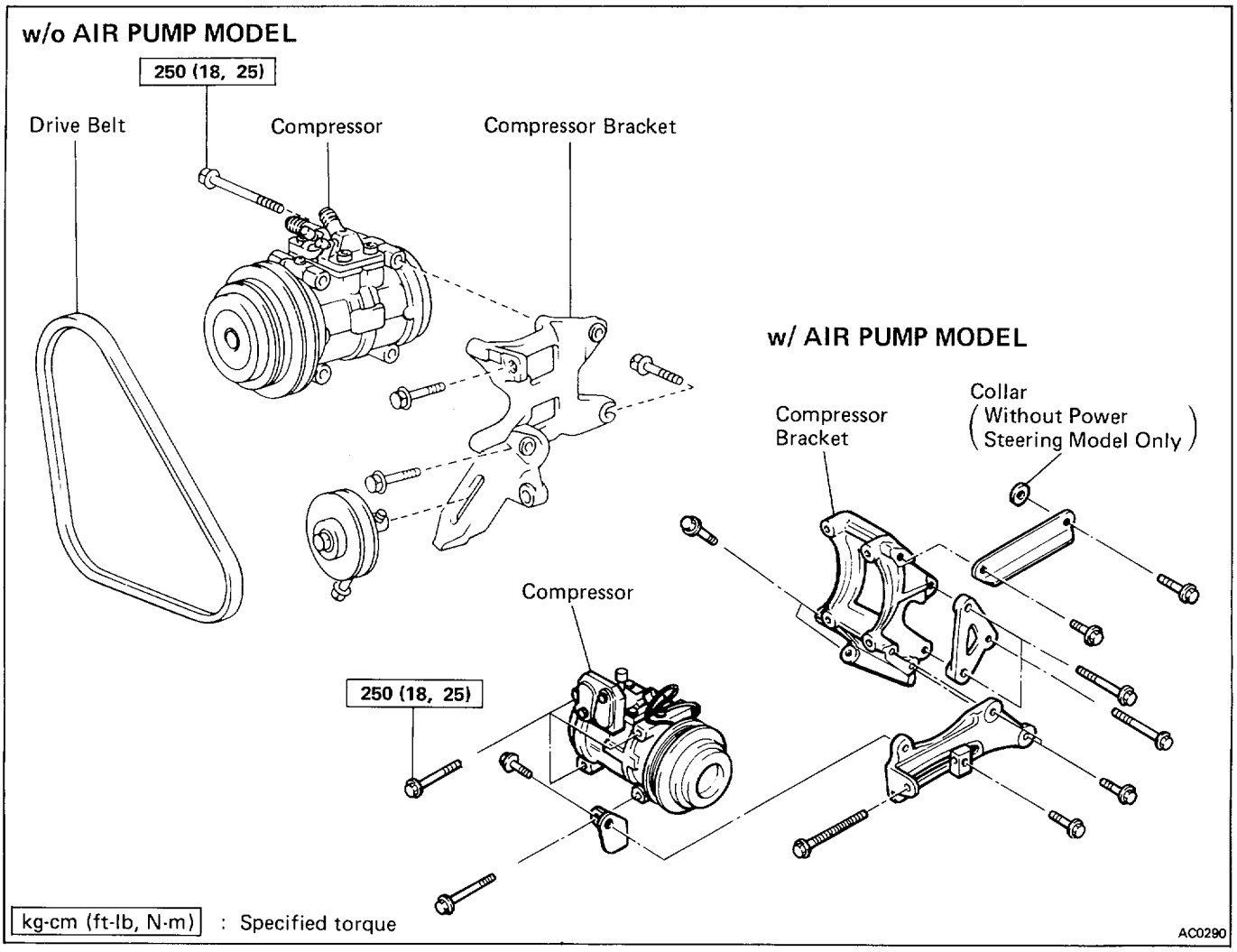
If resistance is not as specified, replace the coil.



(d) Connect the positive (+) lead from the battery to terminal, check that the magnetic clutch to be energized.

If magnetic clutch does not energized, replace the coil.

CAUTION: Do not short positive (+) lead wire harness to the vehicle, applying battery voltage.

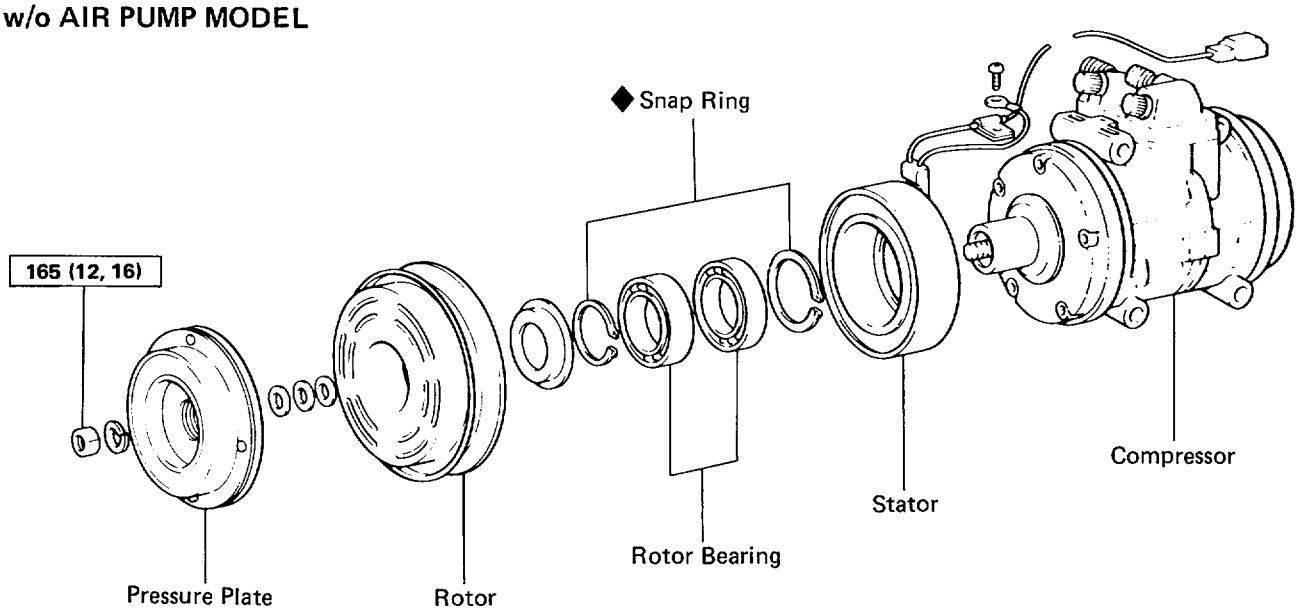


REMOVAL OF COMPRESSOR

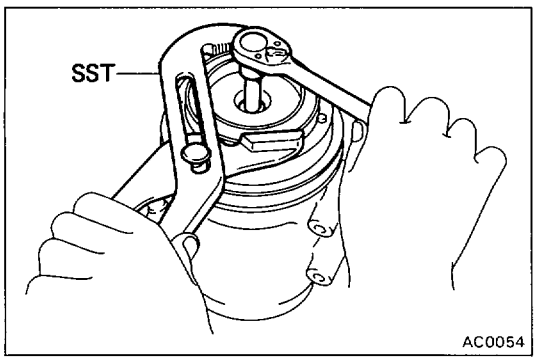
1. **RUN ENGINE AT IDLE FOR 10 MINUTES WITH AIR CONDITIONING ON**
2. **STOP THE ENGINE**
3. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
4. **DISCONNECT CLUTCH LEAD WIRE FROM WIRING HARNESS**
5. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYETEM**
6. **DISCONNECT TWO HOSES FROM COMPRESSOR SERVICE VALVES**

   Cap the open fitting immediately to keep moisture out of the system.
7. **REMOVE COMPRESSOR**
   (a) Remove the fan shroud.
   (b) Loosen the drive belt.
   (c) Remove the compressor mounting bolts and the compressor.

w/o AIR PUMP MODEL



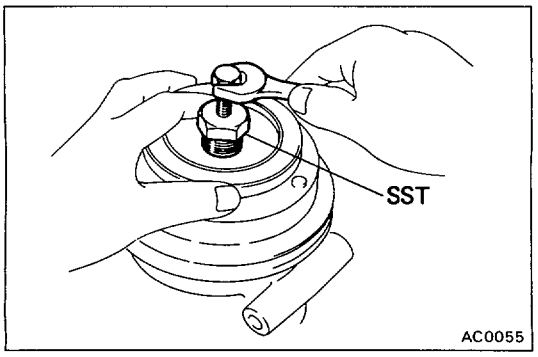
kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part



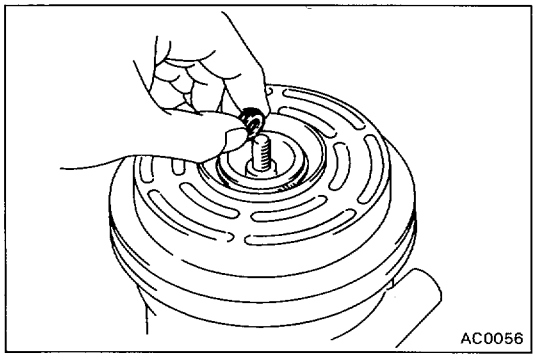
w/o AIR PUMP MODEL
DISASSEMBLY OF MAGNETIC CLUTCH

1. REMOVE PRESSURE PLATE

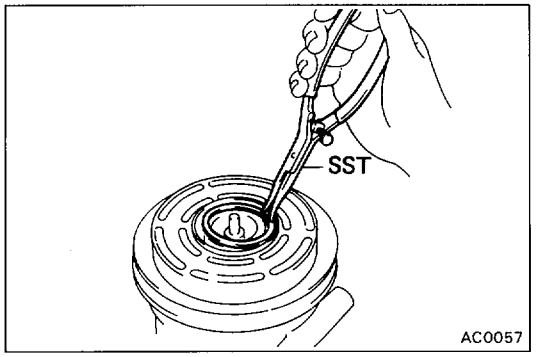
(a) Using SST and a socket, remove the shaft nut.
SST 07110-77011



(b) Using SST and a socket, remove the pressure plate.
SST 07112-71010



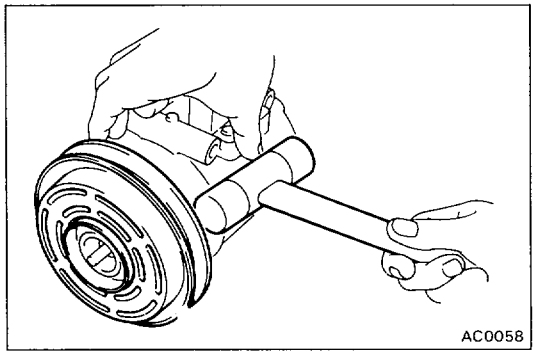
(c) Remove the shims from the shaft.



2. REMOVE ROTOR

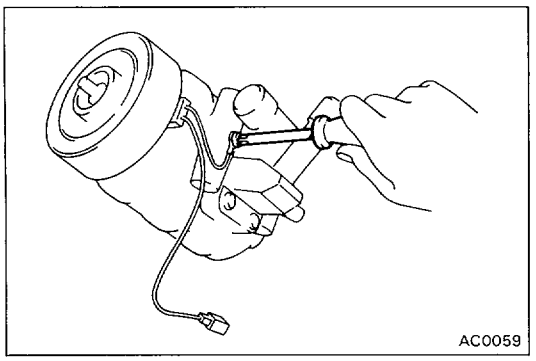
(a) Using SST, remove the snap ring.

SST 07114-84020



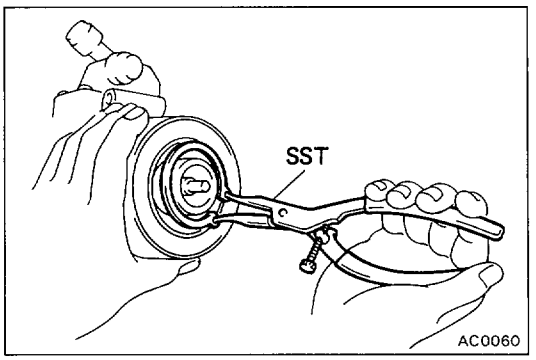
(b) Using a plastic hammer, tap the rotor off the shaft.

CAUTION: Be careful not to damage the pulley when tapping the rotor.



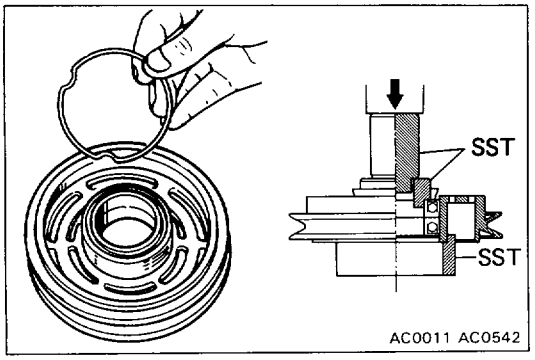
3. REMOVE STATOR

(a) Disconnect the stator lead wires from the compressor housing.



(b) Using SST, remove the snap ring. Remove the stator.

SST 07114-84020



4. REMOVE ROTOR BEARINGS

NOTE: Press the bearings out only if they are to be replaced.

(a) Remove the bearing snap ring from the rotor.

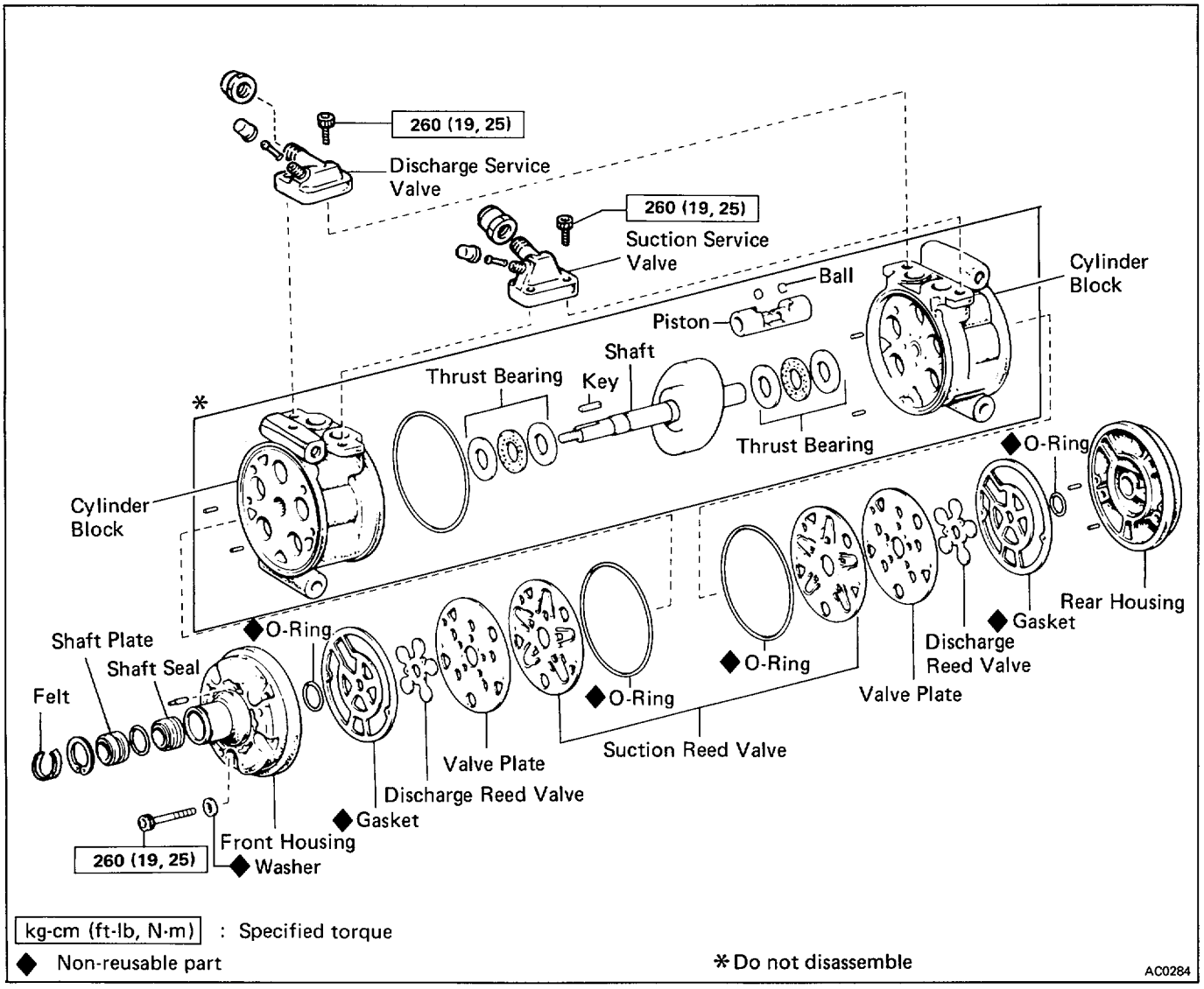
(b) Using SST, press out two bearings.

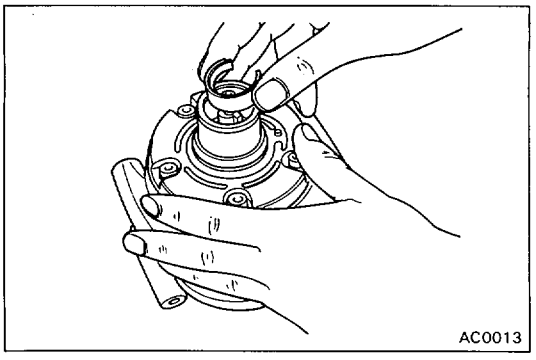
SST 07110-77011

5. INSPECT PRESSURE PLATE AND ROTOR

(a) Inspect the pressure plate and rotor surfaces for wear and scoring. Replace if necessary.

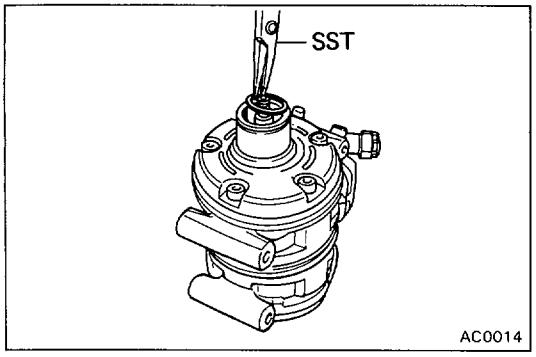
(b) Check the rotor bearings for wear and leakage of grease. Replace if necessary.





DISASSEMBLY OF COMPRESSOR

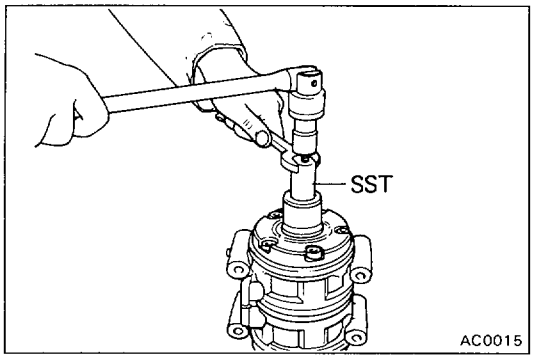
1. REMOVE FELT



2. REMOVE SNAP RING

Using SST, remove the snap ring.

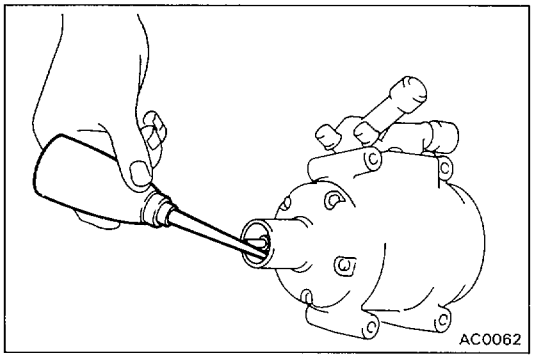
SST 07714-84020



3. **REMOVE KEY**

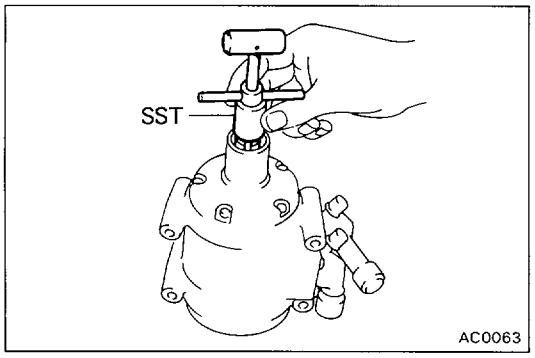
Remove the key from the shaft.

SST 07112-45021



4. **APPLY COMPRESSOR OIL TO INNER BORE**

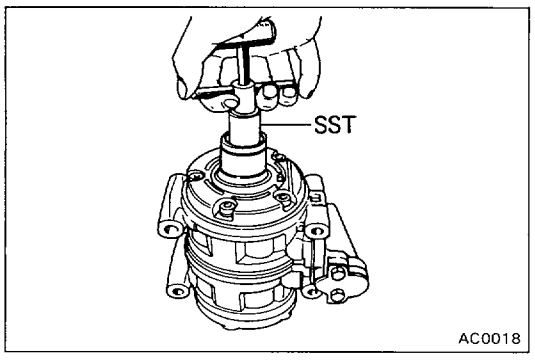
Apply compressor oil to the inner bore of the compressor.



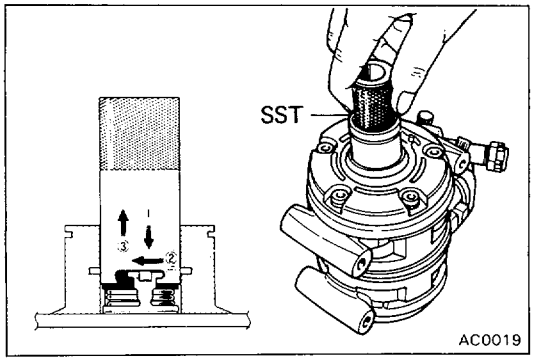
5. **REMOVE SHAFT PLATE**

(a) Insert SST against the shaft. Then push the holder ring downward.

SST 07112-15010



(b) Pull up the remover bar, and remove the shaft plate.

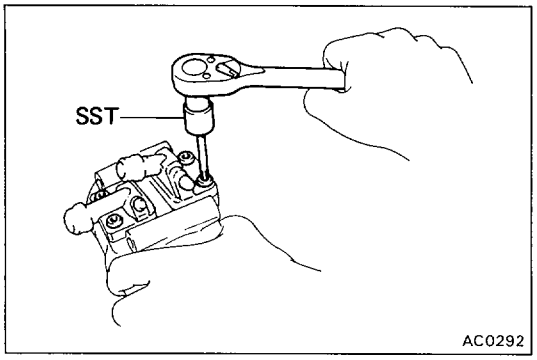


6. **REMOVE SHAFT SEAL**

Insert SST against the shaft, and turn it to the right while pressing on the remover.

Then remove the shaft seal.

SST 07114-15010

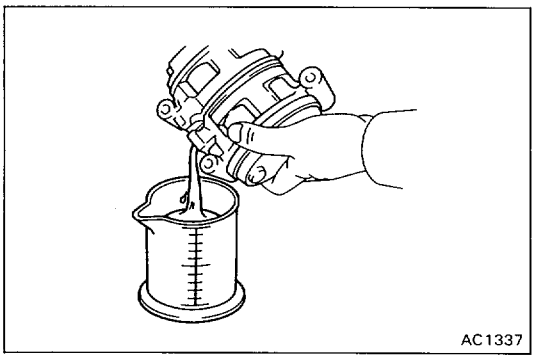


7. REMOVE SERVICE VALVE

(a) Using SST, remove the bolts holding the service valve.

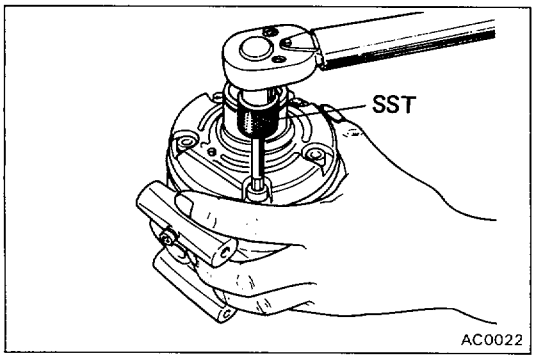
SST 07110-61050

(b) Remove the O-rings from the service valves and discard them.



8. DRAIN COMPRESSOR OIL INTO MEASURING FLASK

Measure the quantity of drained oil because the same amount should be replaced later.

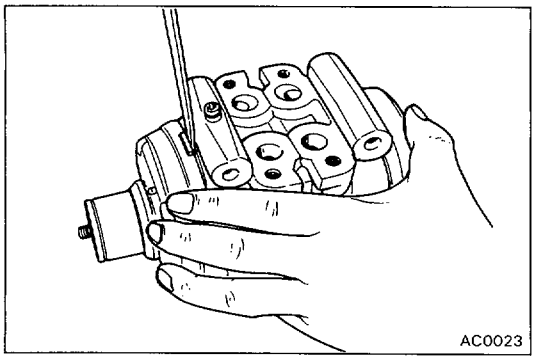


9. REMOVE FRONT HOUSING

(a) Using SST, remove the five through bolts.

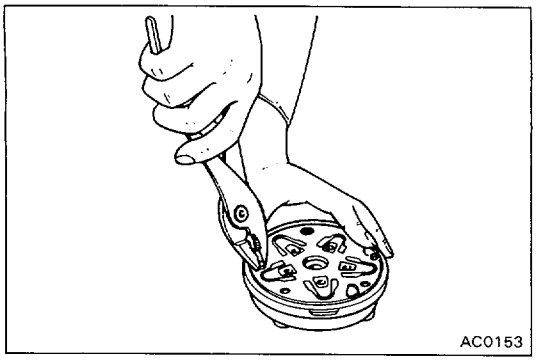
NOTE: Do not reuse the five washers.

SST 07110-61050



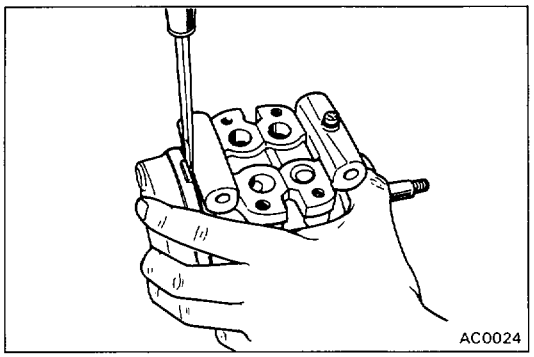
(b) Using a screwdriver, remove the front housing.

CAUTION: Be careful not to scratch the sealing surface of the front housing.



10. REMOVE FRONT VALVE PLATE

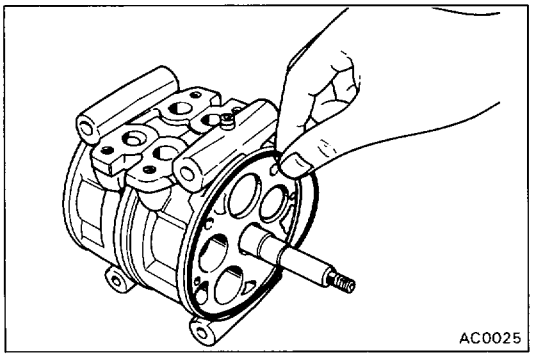
(a) Remove the two pins from the front housing. Discard the pins.



11. REMOVE REAR HOUSING

Using a screwdriver, remove the rear housing.

CAUTION: Be careful not to scratch the sealing surface of the rear housing.

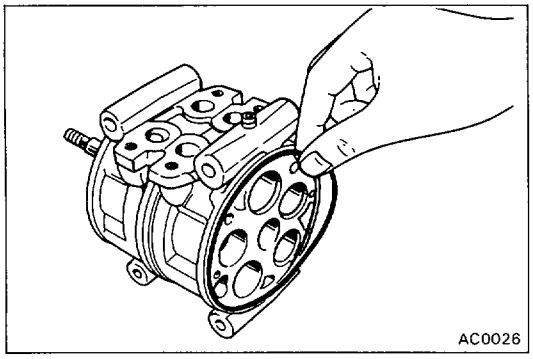


12. REMOVE FRONT AND REAR O-RINGS FROM CYLINDER BLOCK

Discard the O-rings.

ASSEMBLY OF COMPRESSOR

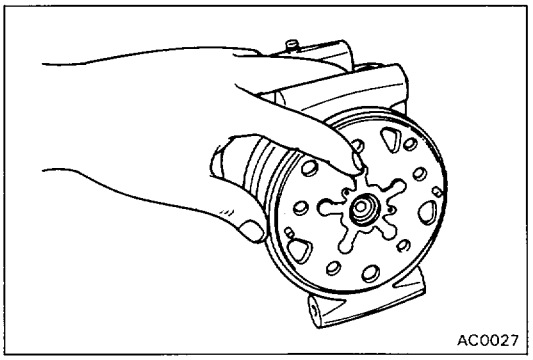
(See page AC-16)



1. INSTALL REAR VALVE PLATE ON REAR CYLINDER

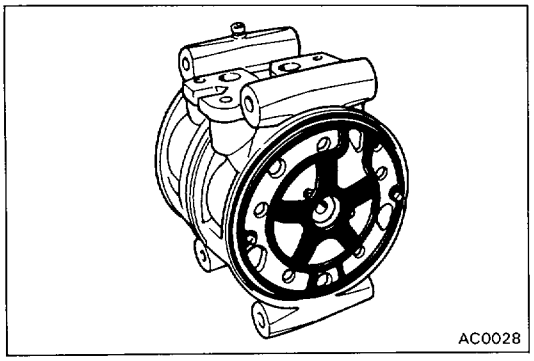
(a) Install the two pins in the rear cylinder.

(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear cylinder.



(c) Install the rear suction valve over the pins on the rear cylinder.

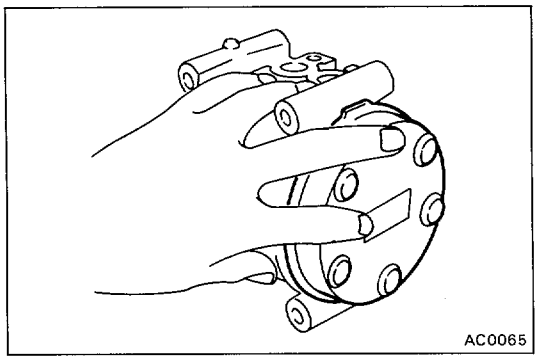
NOTE: The front and rear suction valves are identical.



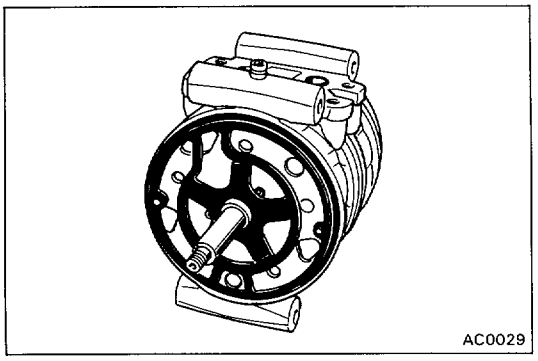
(d) Install the rear valve plate together with the discharge valve over the pins on rear cylinder.

NOTE: The rear valve plate is marked with an "R".

(e) Lubricate the new gasket with compressor oil. Install the gasket on the valve plate.



2. **INSTALL REAR HOUSING ON REAR CYLINDER**



3. **INSTALL FRONT VALVE PLATE ON FRONT CYLINDER**

(a) Install the two pins in the front cylinder.

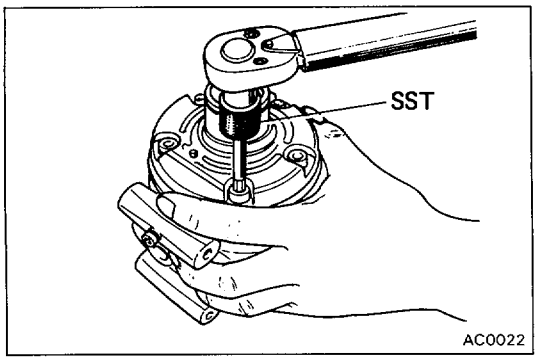
(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear housing.

(c) Install the front suction valve over the pins on the front cylinder.

(d) Install the front valve plate together with the discharge valve over the pins on the front cylinder.

NOTE: The front valve plate is marked with a "F".

(e) Lubricate the new gasket with compressor oil. Install the gasket on the valve plate.

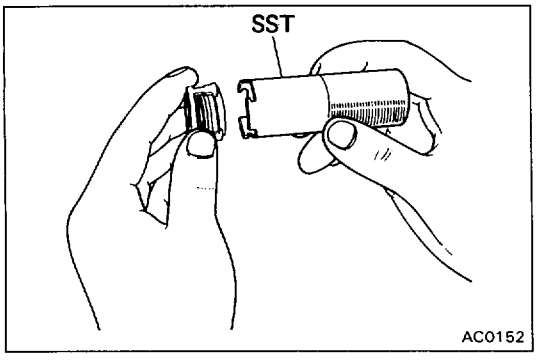


4. **INSTALL FRONT HOUSING ON FRONT CYLINDER AND TIGHTEN FIVE THROUGH BOLTS**

Using a torque wrench and SST, gradually tighten the five through bolts in two or three passes.

SST 07110-61050

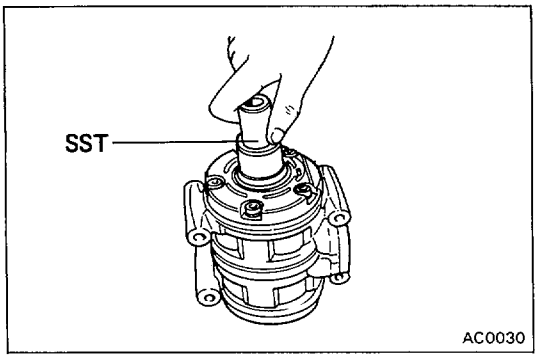
Torque: 260 kg-cm (19 ft-lb, 25 N·m)



5. **INSTALL SHAFT SEAL**

(a) Fit the shaft seal onto SST.

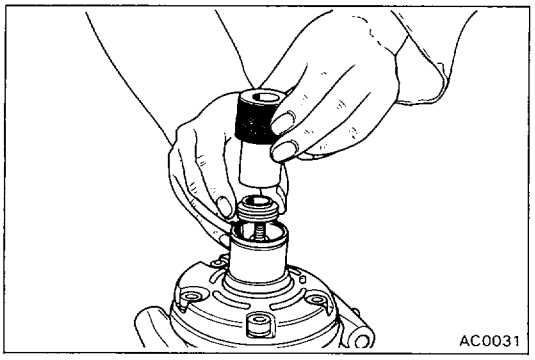
SST 07114-15010



(b) Apply oil to the bore.

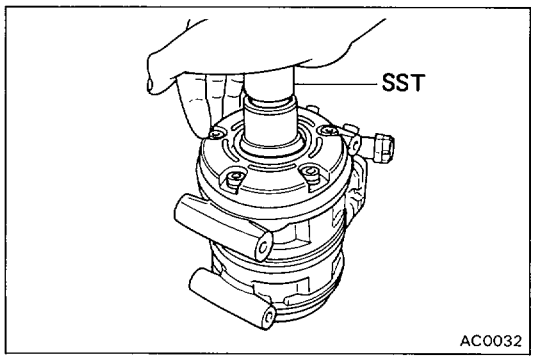
Insert SST, and turn it counterclockwise while lightly pressing in.
Then pull up the SST.

SST 07114-15010



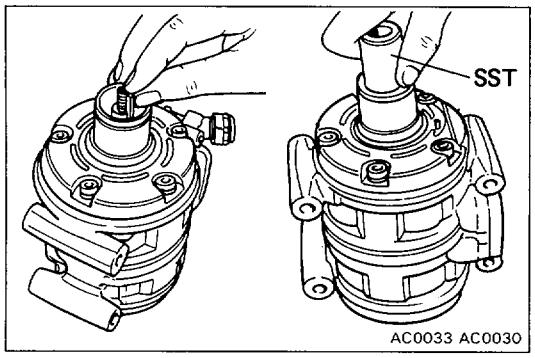
6. INSTALL SHAFT PLATE

(a) Put in the shaft plate.



(b) Press in SST.

SST 07112-25010

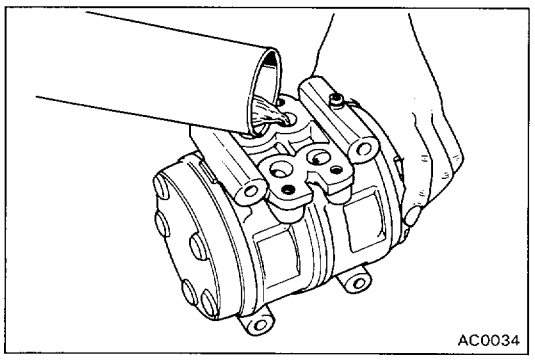


7. INSTALL KEY IN SHAFT GROOVE

Using a plastic hammer and SST, tap the key lightly.

SST 07114-45010

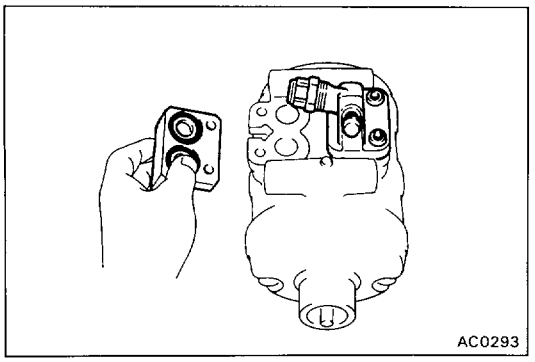
Place the felt inside the bore.
(See page AC-19)



8. POUR COMPRESSOR OIL INTO COMPRESSOR

Add the same quantity plus 20cc of oil into the compressor.

Compressor oil : DENSO OIL 6
SUNISO No.5GS



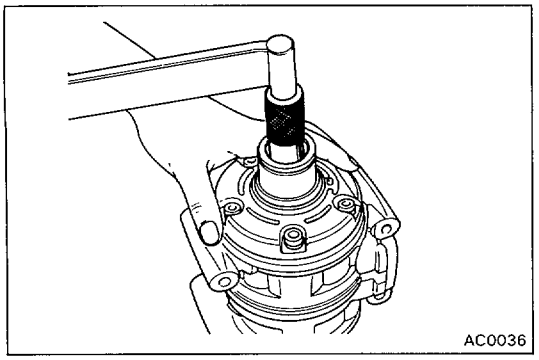
9. INSTALL SERVICE VALVES

(a) Lubricate new O-rings with compressor oil. Install the O-rings in the service valves.

(b) Install the service valves on the compressor. Using a torque wrench and SST, tighten the bolts.

SST 07110-61050

Torque: 260 kg-cm (19 ft-lb, 25 N·m)

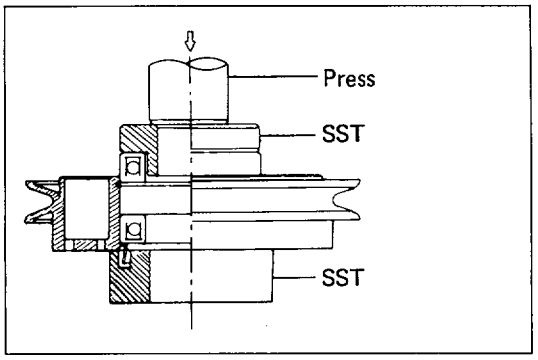


10. CHECK SHAFT STARTING TORQUE

Torque: 30 kg-cm (26 in.-lb, 2.9 N·m) or less

ASSEMBLY OF MAGNETIC CLUTCH

(See page AC-17)

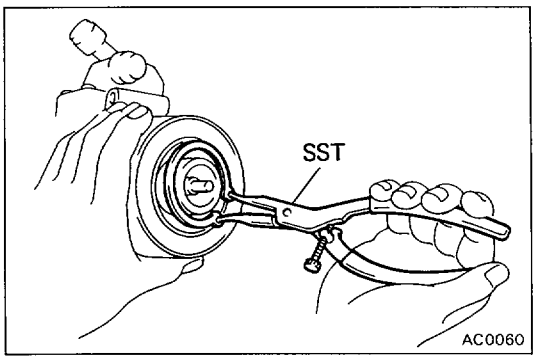


1. INSTALL TWO BEARINGS IN ROTOR

(a) Using SST, press a shield ring and two new bearings into the rotor boss until they are fully seated.

SST 07110-77011

(b) Install the bearing snap ring into the rotor groove.



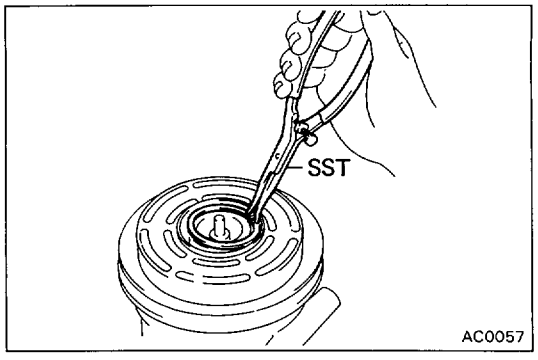
2. INSTALL STATOR

(a) Install the stator on the compressor.

(b) Using SST, install the new snap ring.

SST 07114-84020

(c) Connect the stator lead wires to the compressor housing.

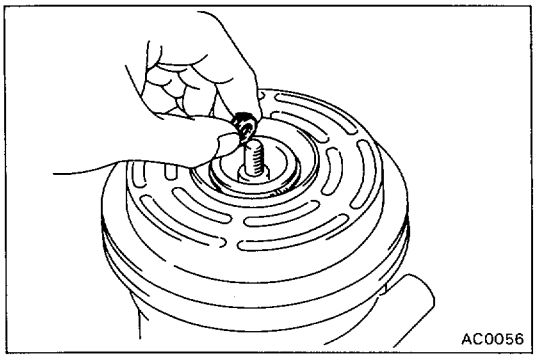


3. INSTALL ROTOR

(a) Install the rotor on the compressor shaft.

(b) Using SST, install the new snap ring.

SST 07114-84020

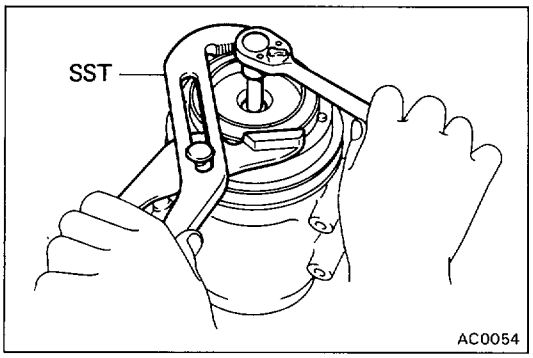


4. INSTALL PRESSURE PLATE

(a) Adjust the clearance between the pressure plate and rotor by putting shims on the compressor shaft.

Standard clearance: 0.6 — 1.0 mm (0.024 — 0.039 in.)

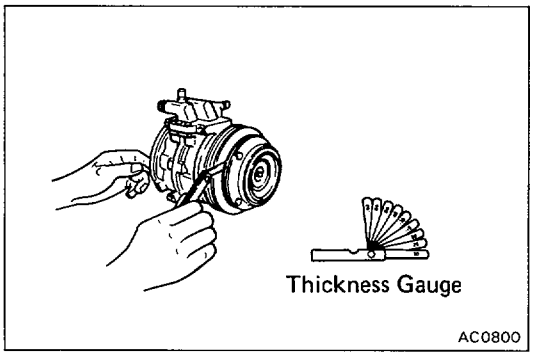
If the clearance is not within tolerance, add or reduce the number of shims to obtain the standard clearance.



(b) Using a torque wrench and SST, install the shaft nut.

SST 07110-77011

Torque: 200 kg-cm (14 ft-lb, 20 N·m)



5. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor, using thickness gauge.

Standard clearance: 0.6 — 1.0 mm (0.024 — 0.039 in.)

If the clearance is not within standard clearance adjust the clearance using the shims to obtain the standard clearance.

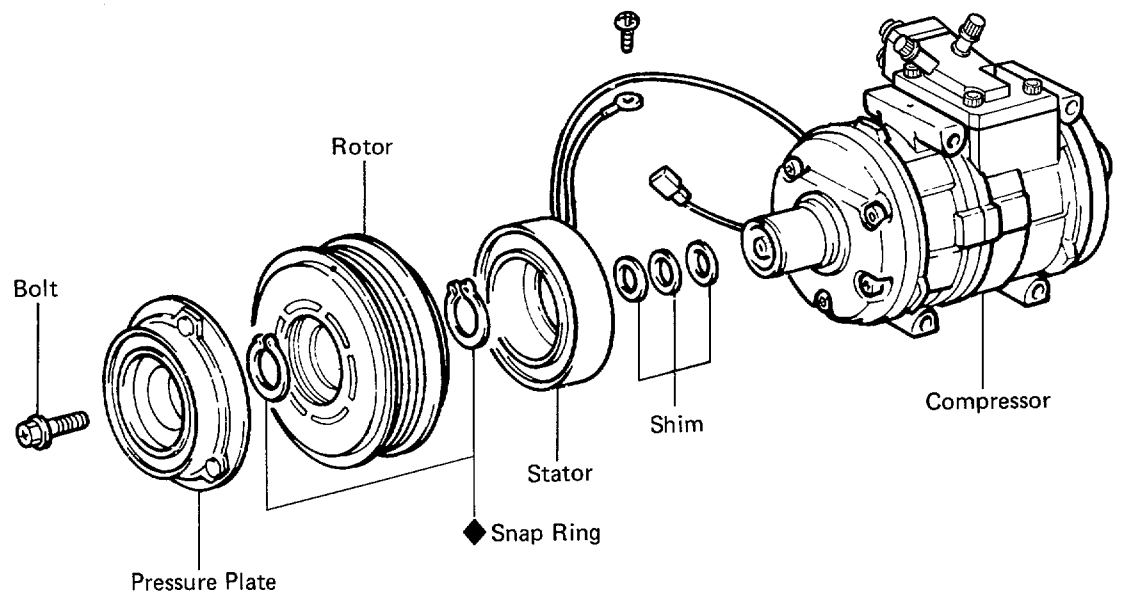
PERFORMANCE TEST OF COMPRESSOR

(See page AC-37)

INSTALLATION OF COMPRESSOR

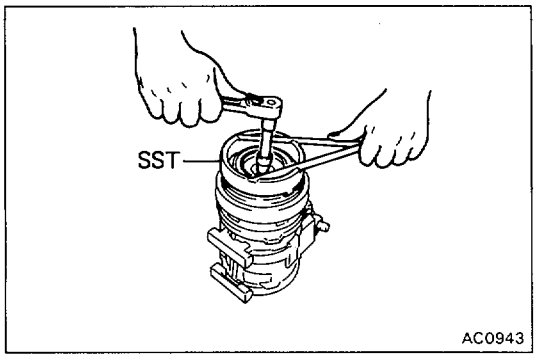
(See page AC-38)

w/ AIR PUMP MODEL



◆ Non-reusable part

AC1433

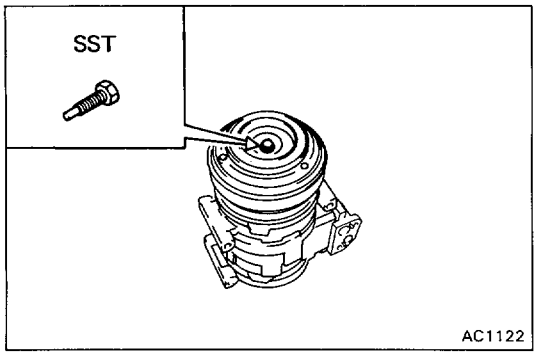


AC0943

w/ AIR PUMP MODEL
DISASSEMBLY OF MAGNETIC CLUTCH

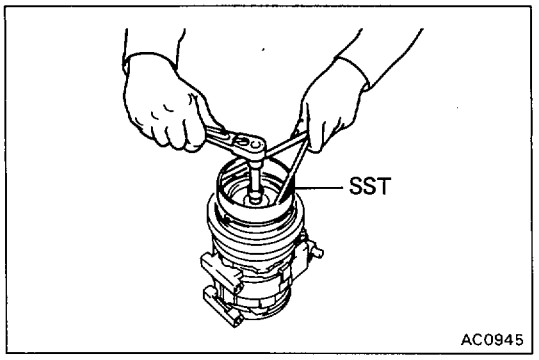
1. **REMOVE PRESSURE PLATE**

(a) Using SST and a socket, remove the shaft bolt.
SST 07112-76060



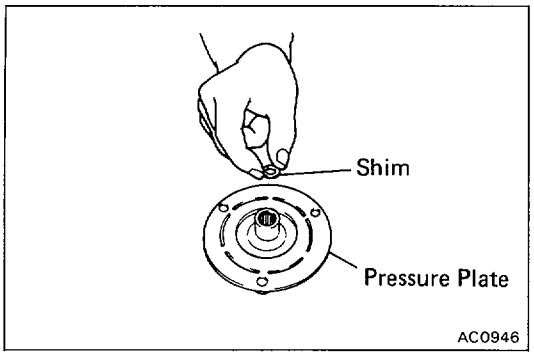
AC1122

(b) Install SST to the pressure plate.
SST 07112-66040

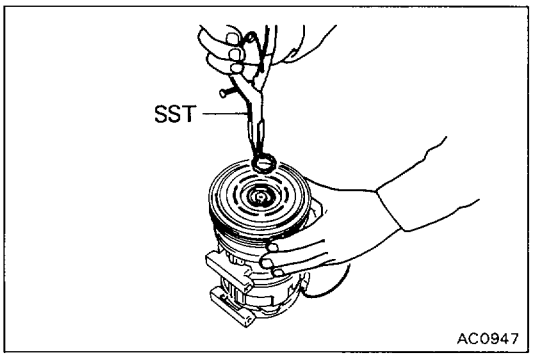


AC0945

(c) Using SST and a socket, remove the pressure plate.
SST 07112-76060



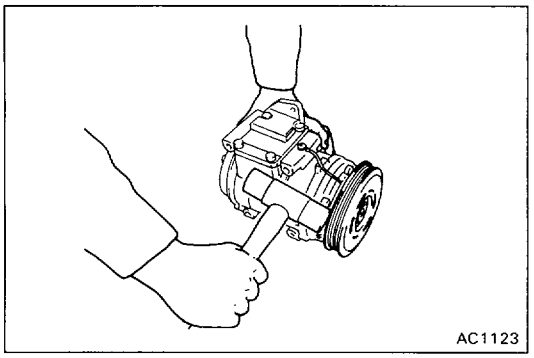
(d) Remove the shims from the pressure plate.



2. REMOVE ROTOR

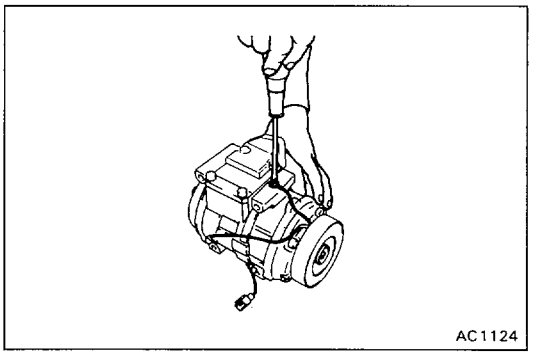
(a) Using SST, remove the snap ring.

SST 07114-84020



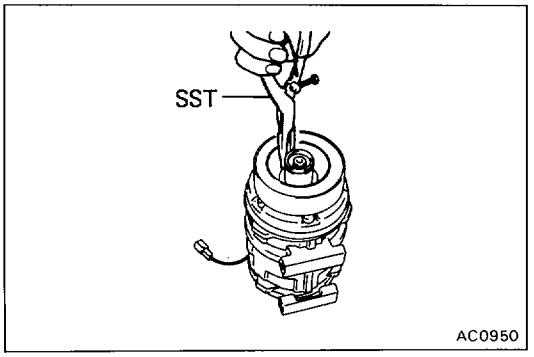
(b) Using a plastic hammer, tap the rotor off the shaft.

CAUTION: Be careful not to damage the pulley when tapping on the rotor.



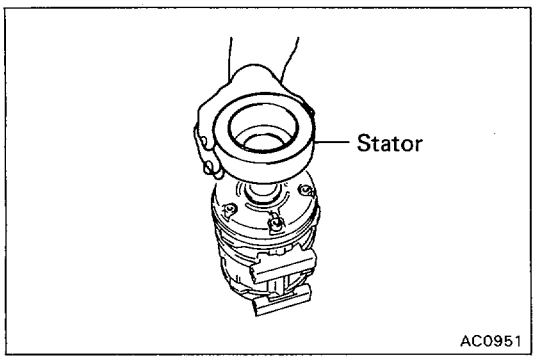
3. REMOVE STATOR

(a) Disconnect the stator lead wire from the compressor housing.

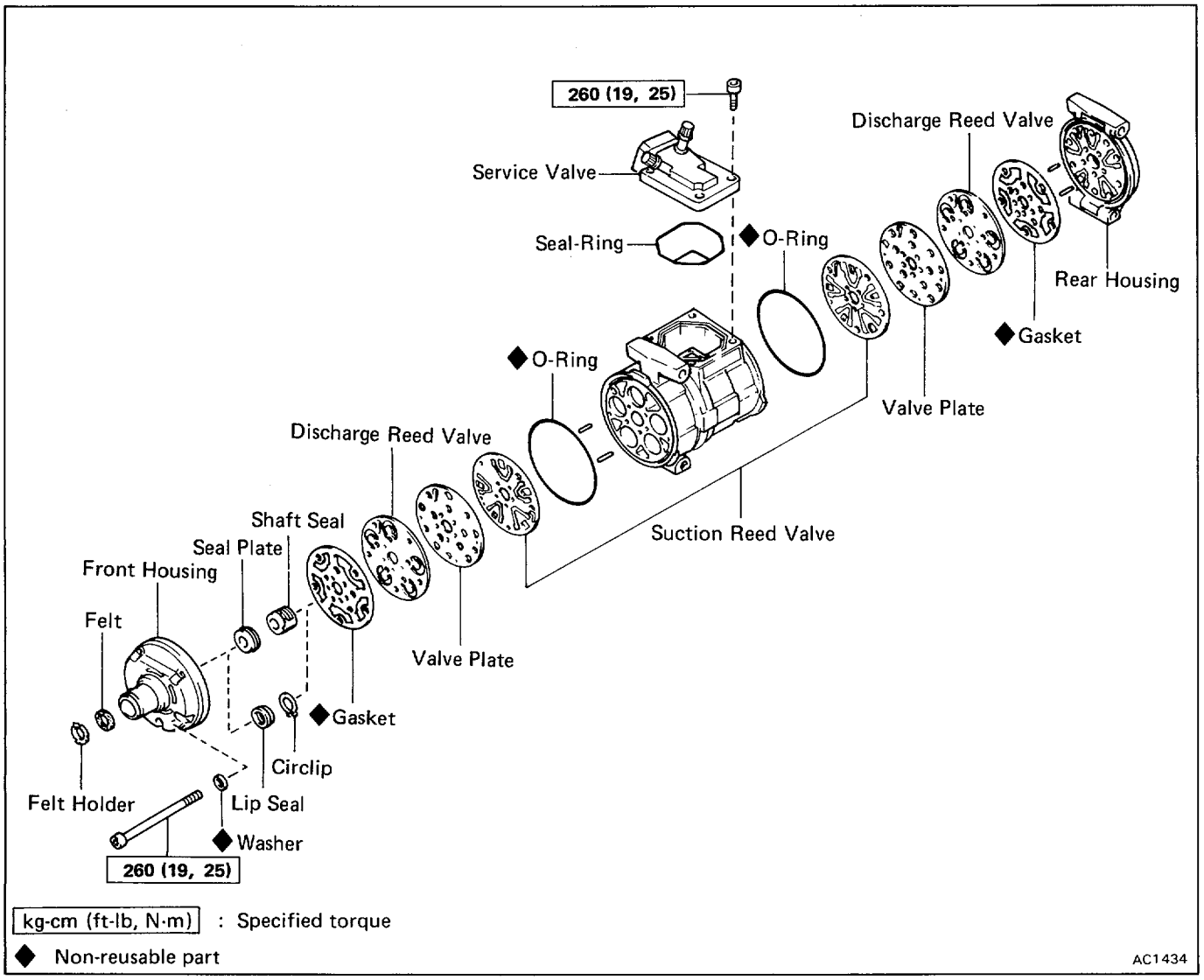


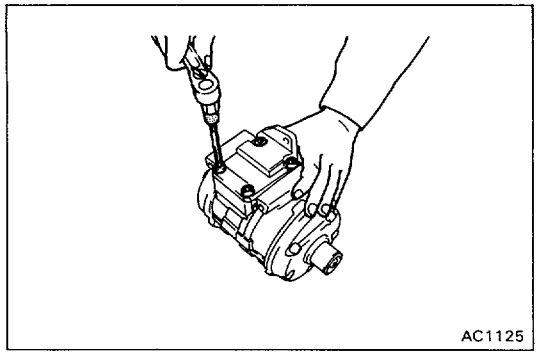
(b) Using SST, remove the snap ring.

SST 07114-84020



(c) Remove the stator.



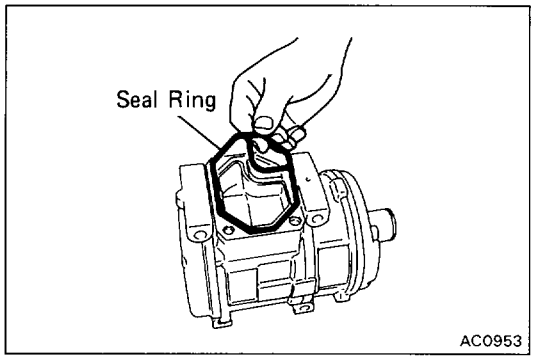


DISASSEMBLY OF COMPRESSOR

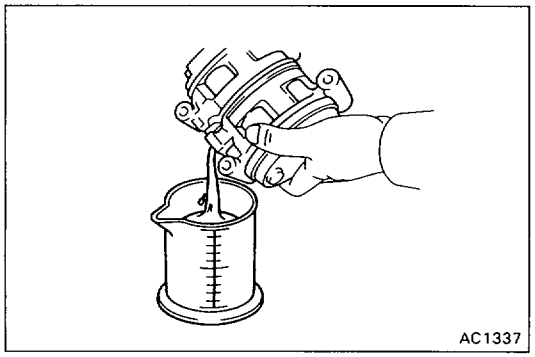
1. REMOVE SERVICE VALVE

(a) Using SST, remove the four bolts holding the service valve.

SST 07110-61050

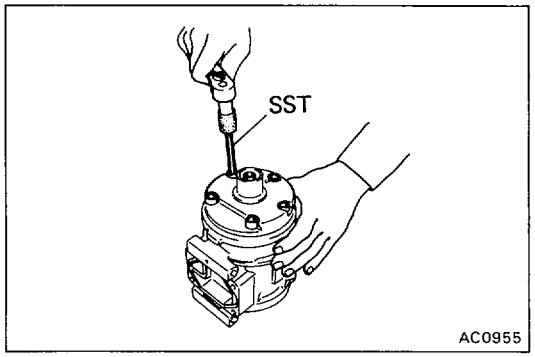


(b) Remove the seal ring from the service valves and discard them.



2. DRAIN COMPRESSOR OIL INTO MEASURING FLASK

Measure the quantity of drained oil because the same amount should be replaced later.

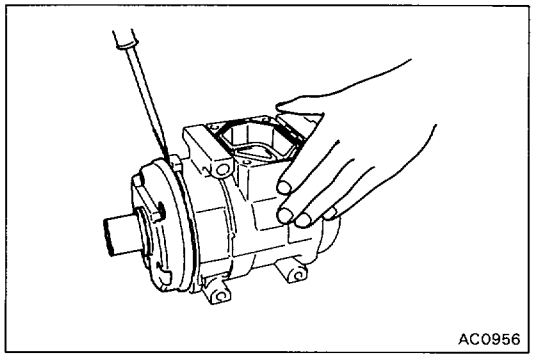


3. REMOVE FRONT HOUSING

(a) Using SST, remove the five through bolts.

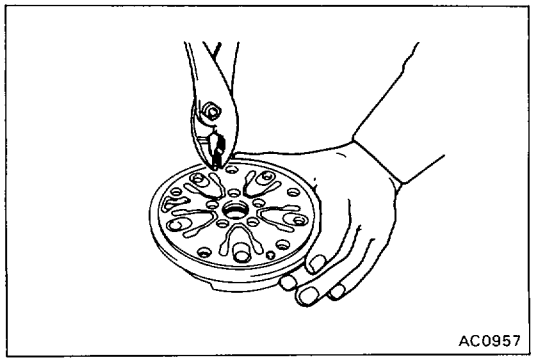
NOTE: Do not reuse the five washers.

SST 07110-61050



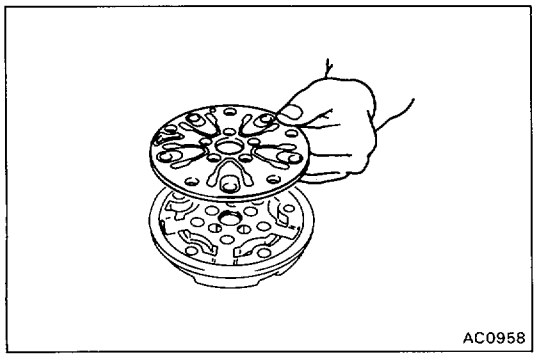
(b) Using a screwdriver, remove the front housing.

CAUTION: Be careful not to scratch the sealing surface of the front housing.

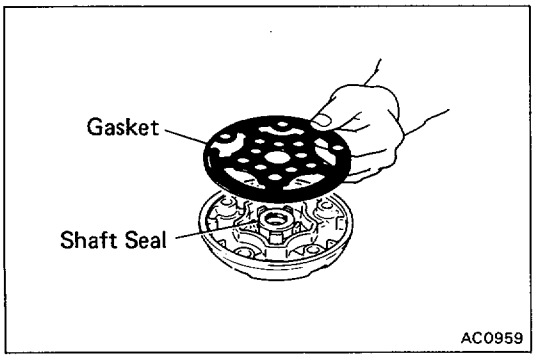


4. REMOVE FRONT VALVE PLATE

(a) Remove the two pins from the front housing. Discard the pins.

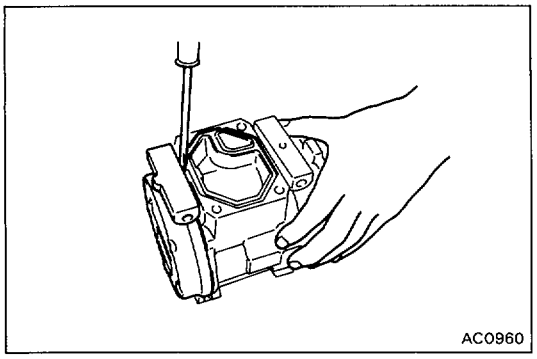


(b) Remove front valve plate with reed valves.



5. REMOVE GASKET

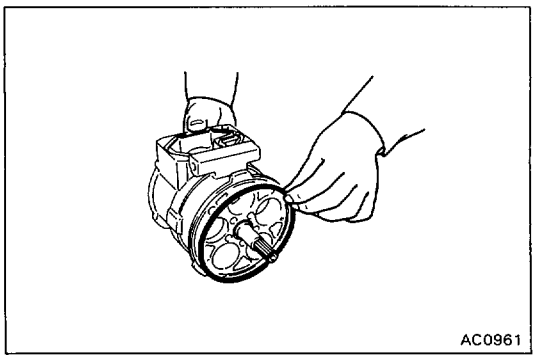
6. REMOVE SHAFT SEAL



7. REMOVE REAR HOUSING

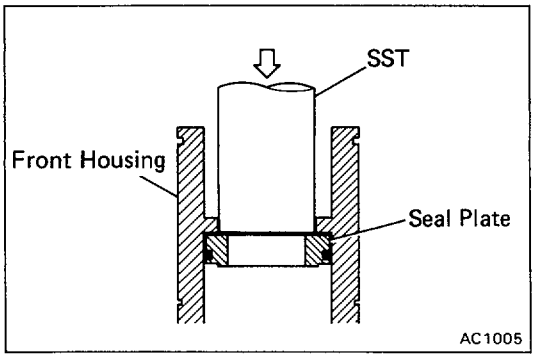
Using a screwdriver, remove the rear housing.

CAUTION: Be careful not to scratch the sealing surface of the rear housing.



8. REMOVE FRONT AND REAR O-RINGS FROM CYLINDER BLOCK

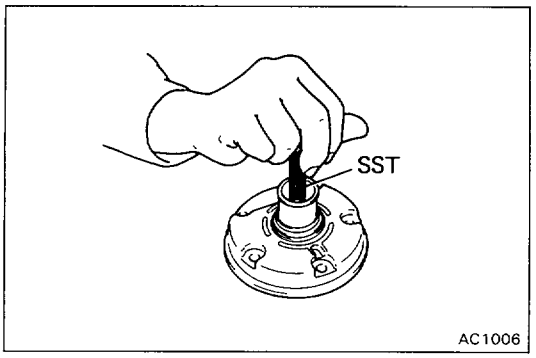
Discard the O-rings.



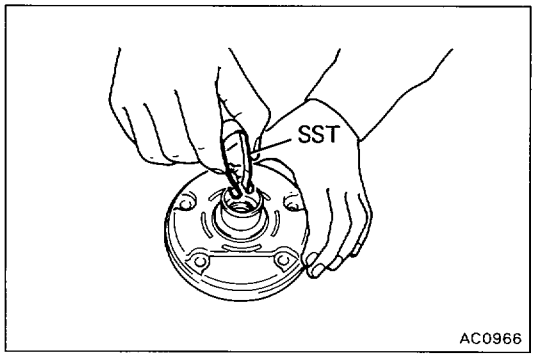
9. REMOVE SEAL PLATE

(a) Set SST on the seal plate.

SST 07112-85030

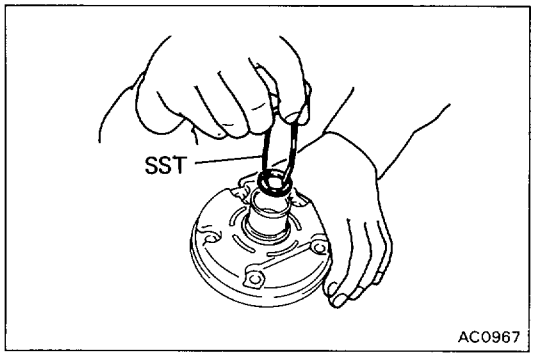


(b) Using SST, put the seal plate out of the front housing.
SST 07112-85030



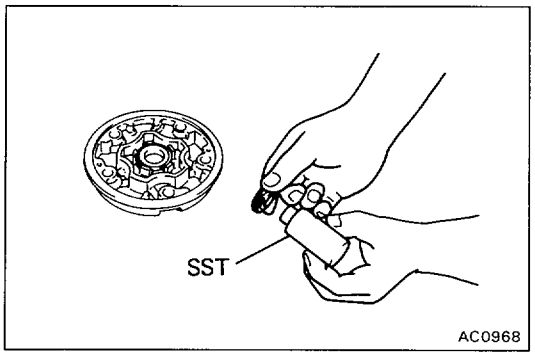
10. REMOVE FELT

(a) Set SST on the felt.
SST 07112-15020



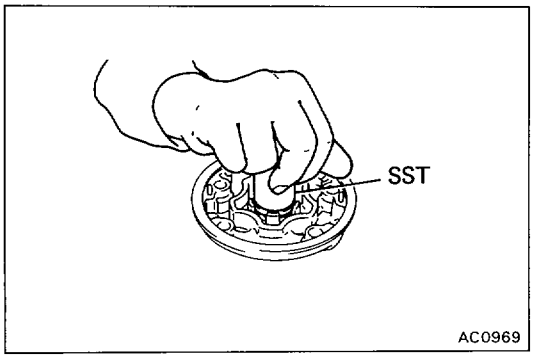
(b) Pull the felt with felt holder out of front housing.
SST 07112-15020

ASSEMBLY OF COMPRESSOR

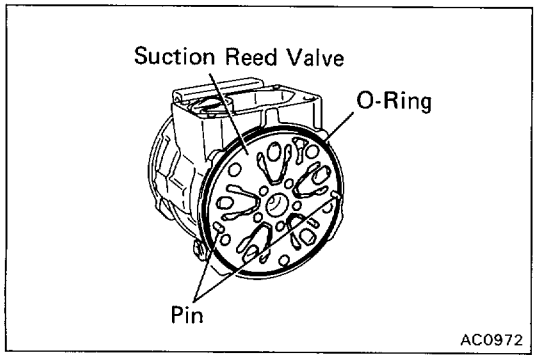


2. INSTALL SEAL PLATE IF SEAL PLATE WAS REMOVED

(a) Fit seal plate on SST.
SST 07114-15021



(b) Install the seal plate.
SST 07114-15021



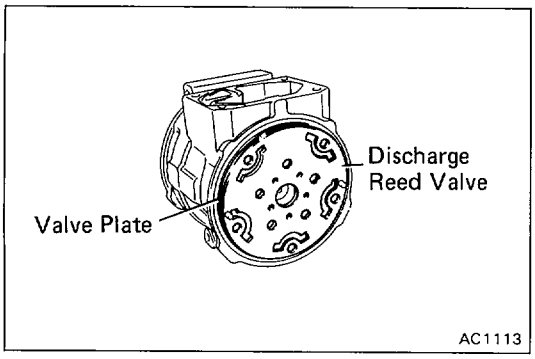
2. INSTALL REAR VALVE PLATE ON REAR CYLINDER

(a) Install two pins in the rear cylinder.

(b) Lubricate a new O-ring with compressor oil. Install the O-ring in teh rear cylinder.

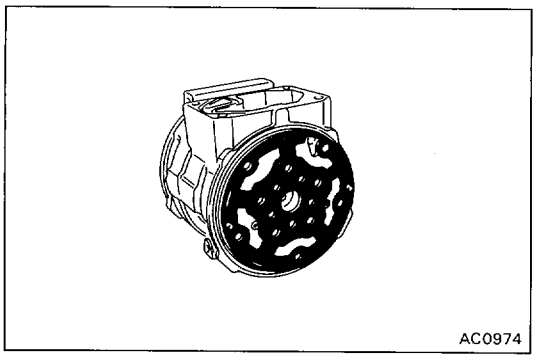
(c) Install the rear suction valve over the pins on the rear cylinder.

NOTE: The front and rear suction valves are identical.

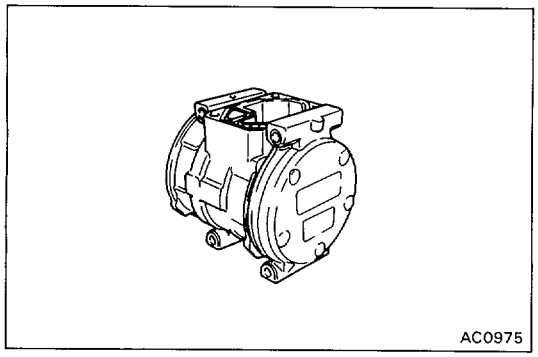


(d) Install the rear valve plate together with the discharge valve over the pins on the rear cylinder.

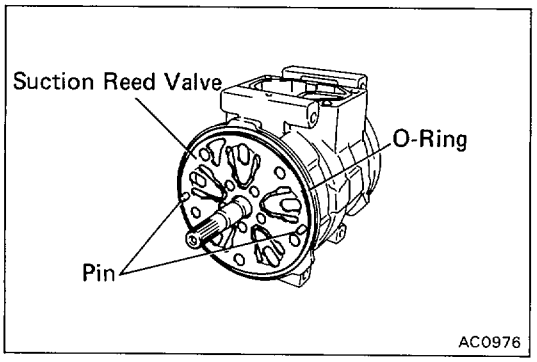
NOTE: The rear valve plate is marked with an "R".



(e) Lubricate the new gasket with compressor oil. Install the gasket on the valve plate.



3. INSTALL REAR HOUSING ON REAR CYLINDER

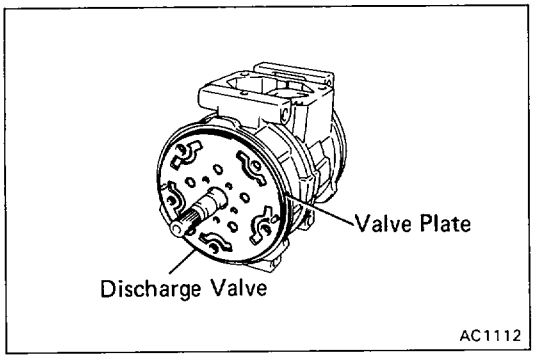


4. INSTALL FRONT VALVE PLATE ON FRONT CYLINDER

(a) Install the two pins in the front cylinder.

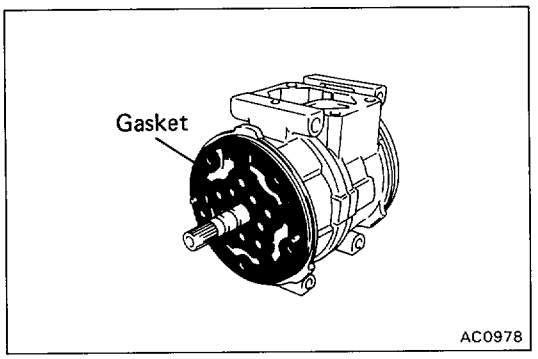
(b) Lubricate a new O-ring with compressor oil. Install the O-ring in the rear housing.

(c) Install the front suction valve over the pins on the front cylinder.

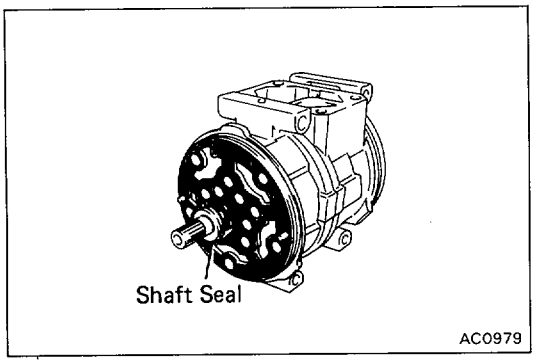


(d) Install the front valve plate together with the discharge valve over the pins on the front cylinder.

NOTE: The front valve plate is marked with a "F".



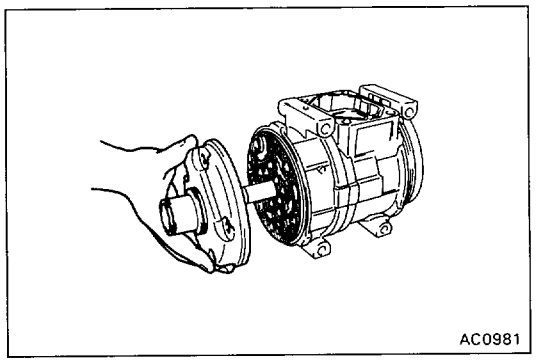
(e) Lubricate the new gasket with compressor oil. Install the gasket on the valve plate.



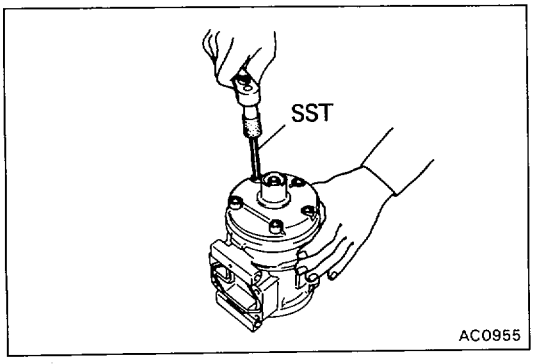
5. INSTALL SHAFT SEAL

Lubricate shaft seal with compressor oil.

Fit the shaft seal on the shaft.



6. INSTALL FRONT HOUSING ON FRONT CYLINDER

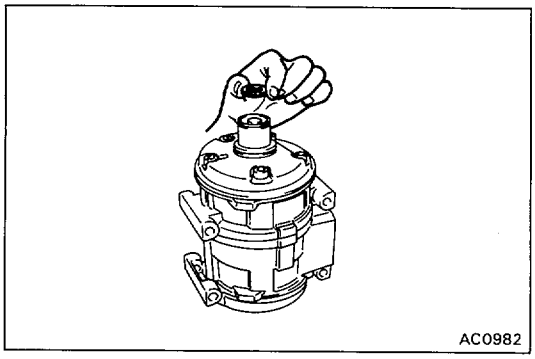


7. TIGHTEN FIVE THROUGH BOLTS

Using SST and torque wrench, gradually tighten the five through bolts in two or three passes.

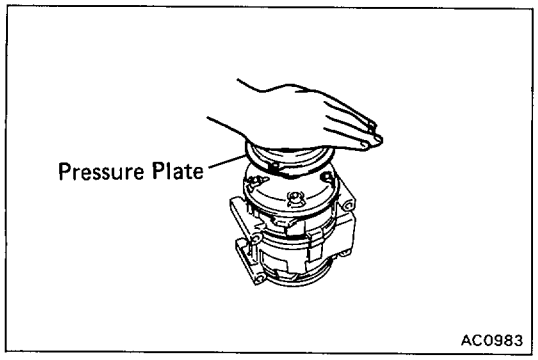
SST 07110-61050

Torque: 260 kg-cm (19 ft-lb, 25 N·m)


AC0982

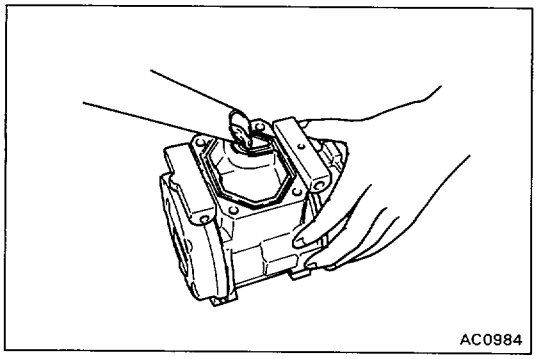
8. INSTALL FELT

(a) Set the felt with felt holder to the front housing.



AC0983

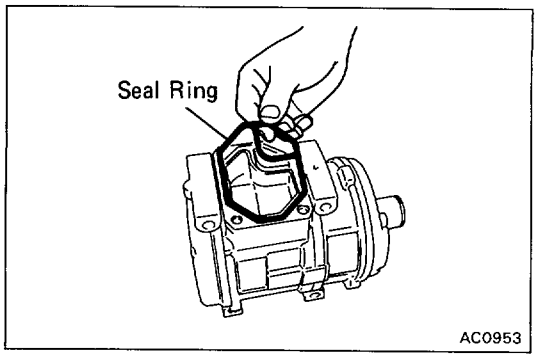
(b) Using pressure plate of magnetic clutch, install the felt.


AC0984

9. POUR COMPRESSOR OIL INTO CPMPRESSOR

Add the same quantity plus 20cc of oil into the compressor.

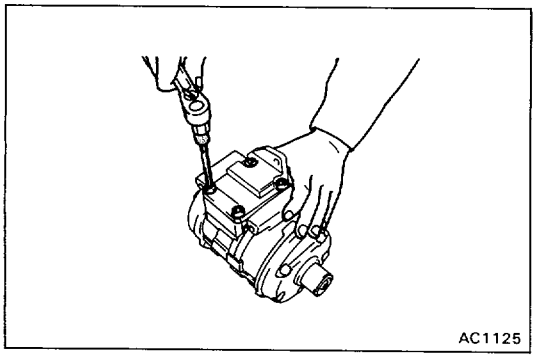
Compressor oil: DENSO OIL 6, SUNISO No.5GS



AC0953

10. INSTALL SERVICE VALVE

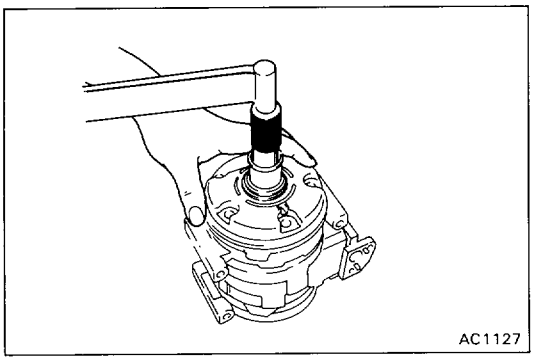
(a) Lubricate new seal ring with compressor oil. Install the seal ring in the service valve.


AC1125

(b) Install the service valve on the compressor. Using SST and torque wrench, tighten the bolts.

SST 07110-61050

Touque: 260 kg-cm (19 ft-lb, 25 N·m)



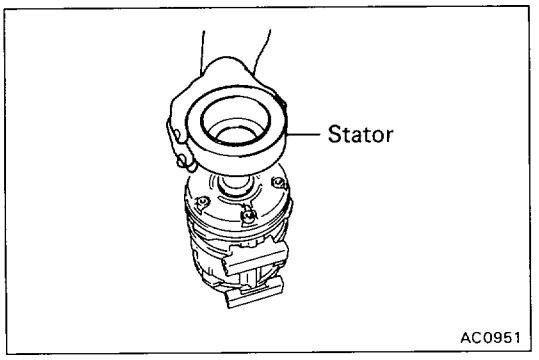
11. **CHECK SHAFT STARTING TORQUE**

Torque: 30kg-cm (26 in.-lb, 2.9 N·m) or less

ASSEMBLY OF MAGNETIC CLUTCH

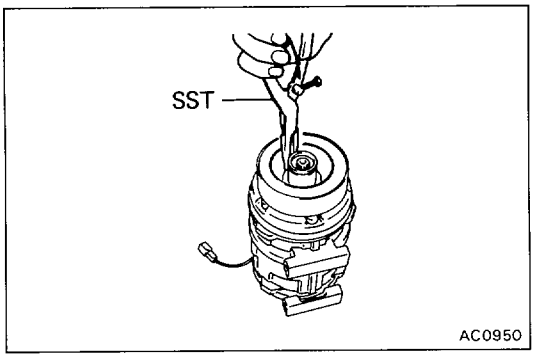
1. **INSTALL STATOR**

(a) Install the stator on the compressor.

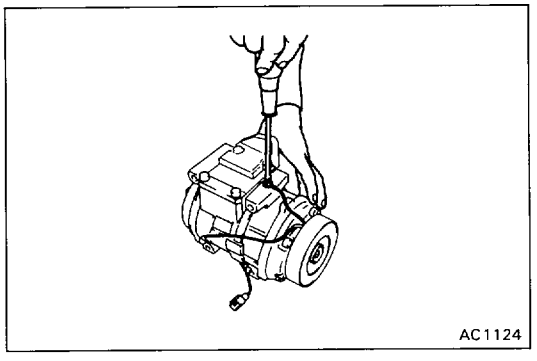


(b) Using SST, install the new snap ring.

SST 07114-84020



(c) Connect the stator lead wires to the compressor housing.

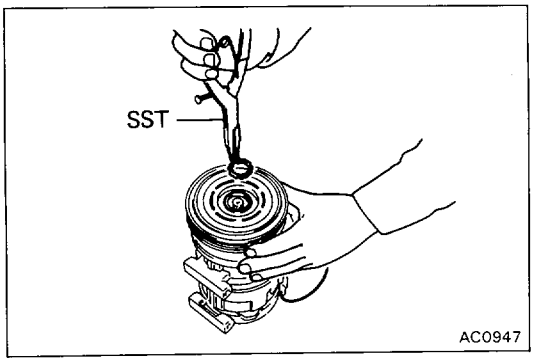


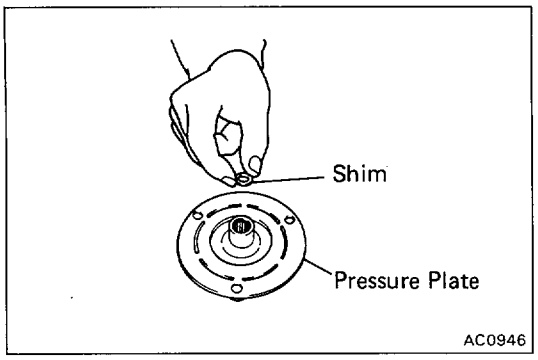
2. **INSTALLL ROTOR**

(a) Install the rotor on the compressor shaft.

(b) Using SST, install the new snap ring.

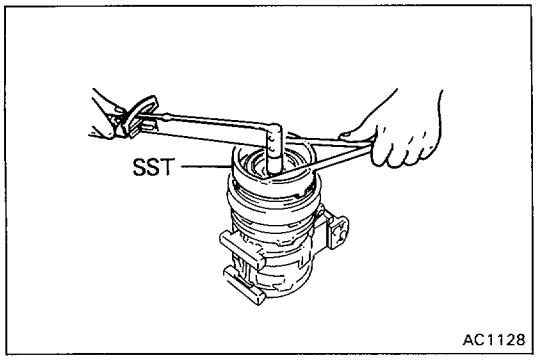
SST 07114-84020





3. INSTALL PRESSURE PLATE

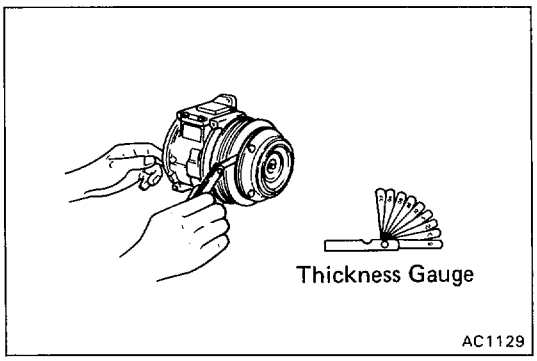
(a) Put the shims to the pressure plate.



(b) Usign SST and torque wrench, install the shaft bolt.

SST 07112-76060

Torque: 140 kg-cm (10 ft-lb, 14 N·m)

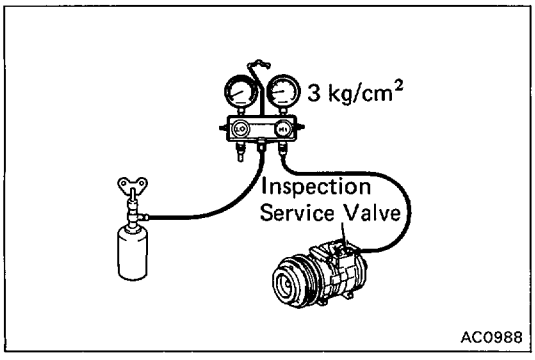


4. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor using thickness gauge.

Standard clearance: 0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

If the clearance is not with tolerance, add or reduce the number of shims to obtain the standard clearance.



PERFORMANCE TEST OF COMPRESSOR

1. PERFORM GAS LEAKAGE TEST

(a) Install the inspection service valve on the service valve.

NOTE: Use only a TOYOTA supplied inspection service valve for the perform gas leakage test.

Part No. (w/ AIR PUMP MODEL)
Suction side 88376-17020
Discharge side 88376-22020
Part No. (w/o AIR PUMP MODEL)
Suction side 88376-26010
Discharge side 88376-26020

(b) Charge the compressor with refrigerant through the charge valve until the pressure is 3 kg/cm² (43 psi, 294 kPa).

(c) Using a gas leak detector, check the compressor for leaks.

If leaks are found, check and replace the compressor.

2. **EVACUATE COMPRESSOR AND CHARGE WITH REFRIGERANT**

Make sure the caps are tight and the compressor is free from the moisture and contamination.

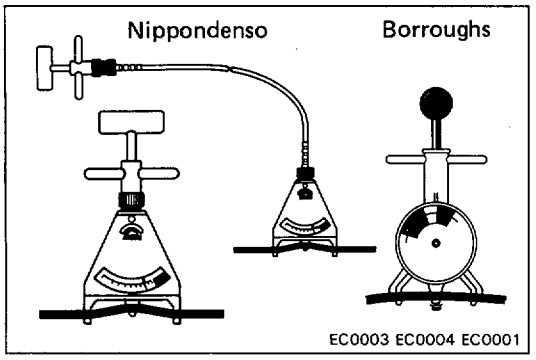
NOTE: When storing a compressor for an extended period, charge the compressor with refrigerant or dry nitrogen gas to prevent corrosion.

INSTALLATION OF COMPRESSOR

(See page AC-16)

1. **INSTALL COMPRESSOR WITH THREE MOUNTING BOLTS**

Torque: 280 kg-cm (20 ft-lb, 27 N·m)



2. **INSTALL DRIVE BELT**

3. **CHECK DRIVE BELT TENSION**

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG-20 (95506-00020) or
Borroughs No. BT-33-73F

Drive belt tension:

	w/o AIR PUMP	w/ AIR PUMP
New belt	125 ± 25 lb	160 ± 20 lb
Used belt	80 ± 20 lb	100 ± 20 lb

NOTE:
- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.

4. **CONNECT TWO HOSES TO COMPRESSOR SERVICE VALVES**

Torque: Discharge line 225 kg-cm (16 ft-lb, 22 N·m)
Suction line 325 kg-cm (24 ft-lb, 32 N·m)

5. **CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS**

6. **CONNECT NEGATIVE CABLE TO BATTERY**

7. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**

8. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK ON GAS LEAKAGE**

Specified amount: 600—750g (1.3—1.7 lb)

RECEIVER

(See page AC-7)

ON-VEHICLE INSPECTION

CHECK SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak detector. Repair as necessary.

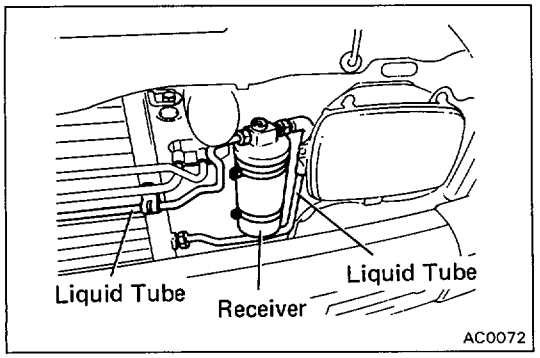
REMOVAL OF RECEIVER

1. **DISCHARGE REFRIGERATION SYSTEM**

2. **DISCONNECT TWO LIQUID TUBES FROM RECEIVER**

   NOTE: Cap the open fittings immediately to keep moisture out of the system.

3. **REMOVE RECEIVER FROM RECEIVER HOLDER**



INSTALLATION OF RECEIVER

1. **INSTALL RECEIVER IN RECEIVER HOLDER**

   NOTE: Do not remove the caps until ready for connection.

2. **CONNECT TWO LIQUID TUBES TO RECEIVER**

   Torque: 135 kg-cm (10 ft-lb, 13 N·m)

3. **IF RECEIVER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR**

   Add 20 cc (0.7 fl.oz.)

4. **EVACUATE AIR FROM AIR CONDITIONING SYSTEM**

5. **CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK ON GAS LEAKAGE**

   Specified amount: 600—750 g (1.3—1.7lb)

CONDENSER

ON-VEHICLE INSPECTION

1. CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE

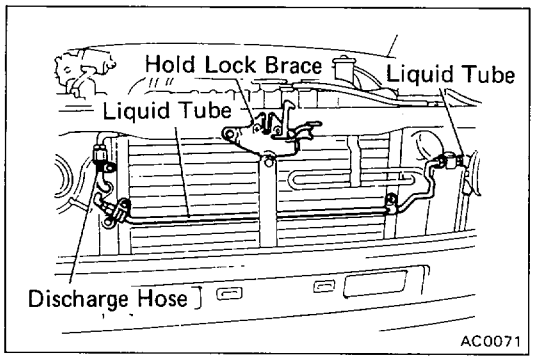
   If the fins are clogged, wash them with water and dry with compressed air.

   CAUTION: Be careful not to damage the fins.

   If the fins are bent, straighten them with a screwdriver or pliers.

2. CHECK CONDENSER FITTINGS FOR LEAKAGE

   Repair as necessary.



REMOVAL OF CONDENSER

(See page AC-7)

1. DISCHARGE REFRIGERATION SYSTEM
2. REMOVE FRONT GRILLE AND HOOD LOCK BRACE
3. DISCONNECT DISCHARGE HOSE FROM CONDENSER INLET FITTING
4. DISCONNECT LIQUID TUBE FROM RECEIVER OUTLET FITTING

   NOTE: Cap the open fittings immediately to keep moisture out of the system.

5. REMOVE CONDENSER

   Remove the four bolts.

INSTALLATION OF CONDENSER

(See page AC-7)

1. INSTALL CONDENSER

   Install the four bolts and nuts, making sure the rubber cushions fit on the mounting flanges correctly.

2. CONNECT LIQUID TUBE TO RECEIVER AND DISCHARGE HOSE TO CONDENSER

   Torque:

Liquid tube	135 kg-cm (10 ft-lb, 13 N·m)
Discharge hose	225 kg-cm (16 ft-lb, 22 N·m)

3. INSTALL FRONT GRILLE AND HOOD LOCK BRACE
4. IF CONDENSER IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

   Add 40 — 50 cc (1.4 — 1.7 fl.oz.)

5. EVACUATE AIR FROM AIR CONDITIONING SYSTEM
6. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK ON GAS LEAKAGE

   Specified amount: 600—750g (1.3—1.7 lb)

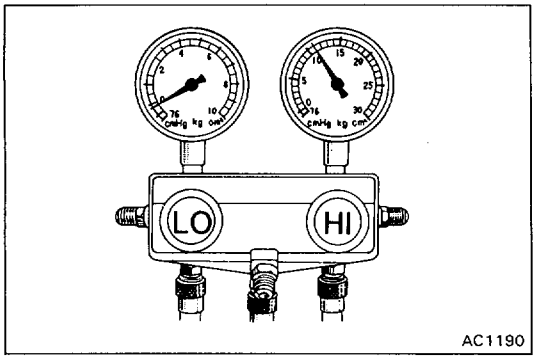
COOLING UNIT

(See page AC-7)

ON-VEHICLE INSPECTION OF EXPANSION VALVE

1. CHECK QUANTITY OF GAS DURING REFRIGERATION CYCLE

2. INSTALL MANIFOLD GAUGE SET
(See page AC-14)



3. RUN ENGINE

Run the engine at 2,000 rpm for at least 5 minutes.

4. CHECK EXPANSION VALVE

If the expansion valve is clogged, the low pressure reading will drop to 0 kg/cm² (0 psi, 0 kPa), otherwise it is OK.

REMOVAL OF COOLING UNIT

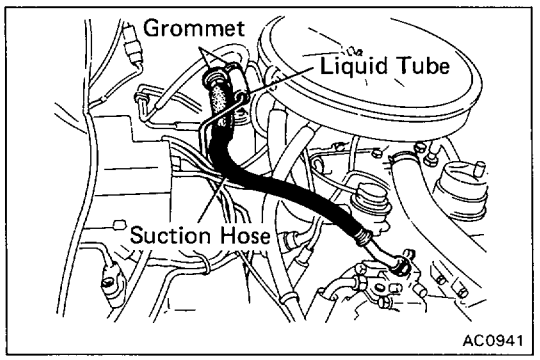
1. DISCONNECT NEGATIVE CABLE FROM BATTERY

2. DISCHARGE REFRIGERATION SYSTEM

3. DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING

4. DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING

NOTE: Cap the open fittings immediately to keep moisture out of the system.



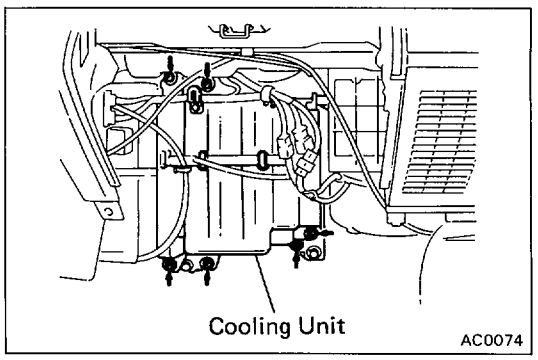
5. REMOVE GROMMETS FROM INLET AND OUTLET FITTINGS

6. REMOVE GLOVE BOX AND REINFORCEMENT

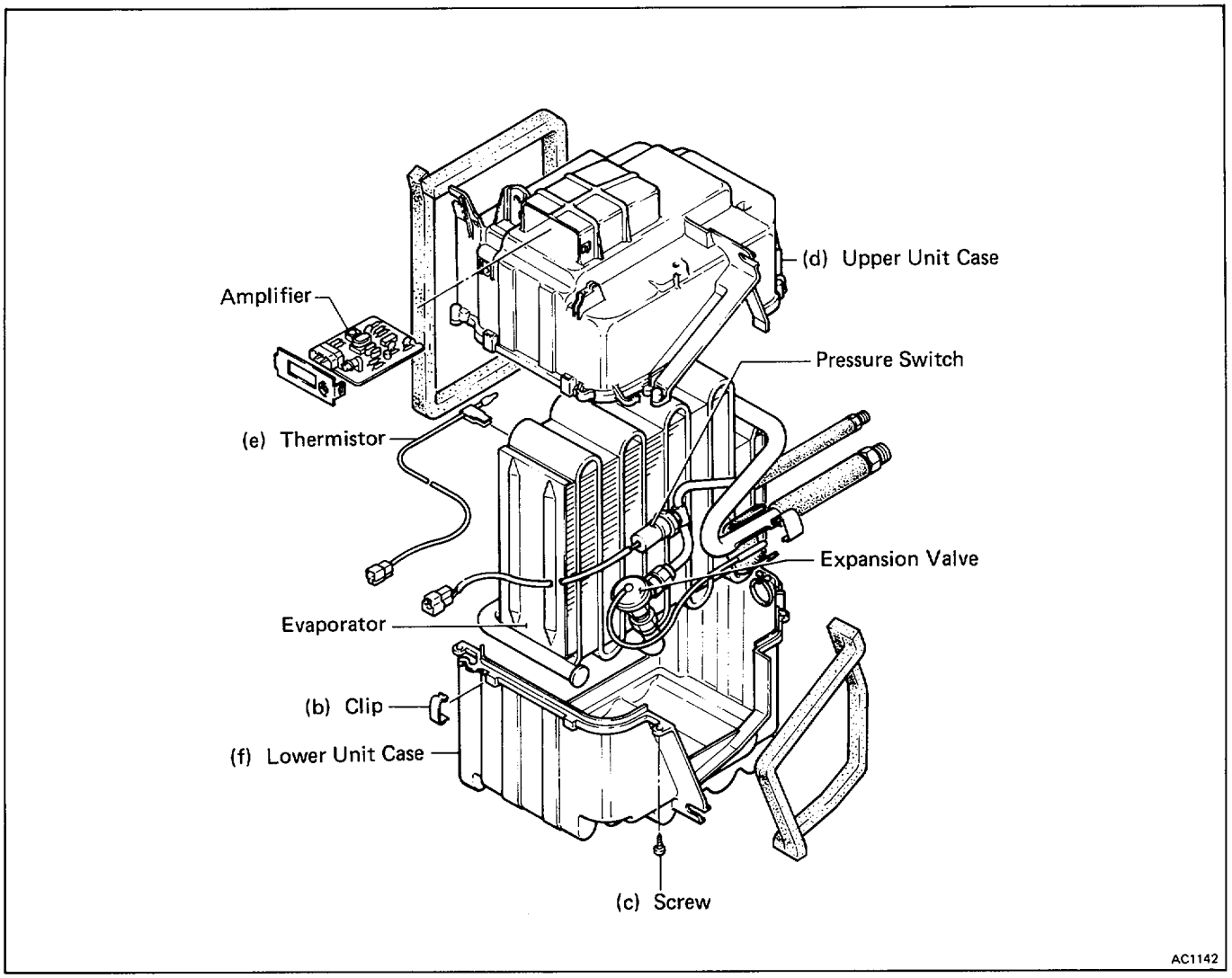
7. DISCONNECT CONNECTORS

8. REMOVE COOLING UNIT

Remove the four screws and a bolt.



DISASSEMBLY OF COOLING UNIT



1. REMOVE LOWER AND UPPER UNIT CASES

(a) Disconnect connectors.

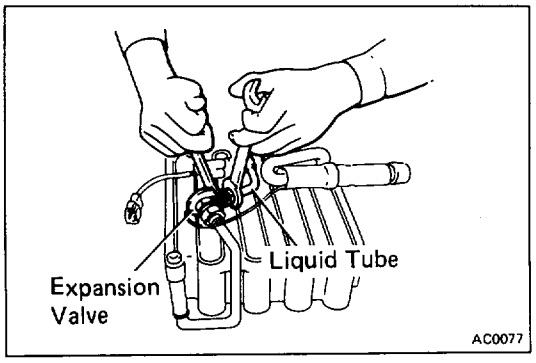
(b) Remove four clips.

(c) Remove four screws.

(d) Remove upper unit case.

(e) Remove thermistor with thermistor holder.

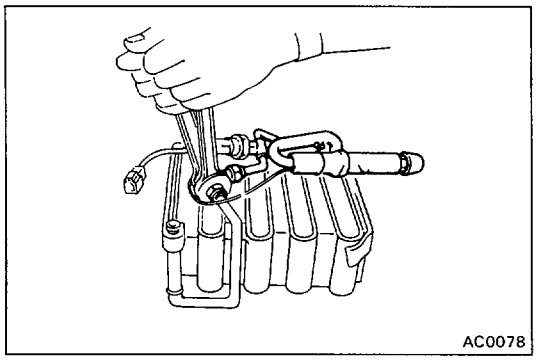
(f) Remove lower unit case.



2. REMOVE EXPANSION VALVE

(a) Disconnect the liquid tube from the inlet fitting of the expansion valve.

(b) Remove the packing and heat sensing tube from suction tube of evaporator.



(c) Remove expansion valve.

Evaporator

INSPECTION OF EVAPORATOR

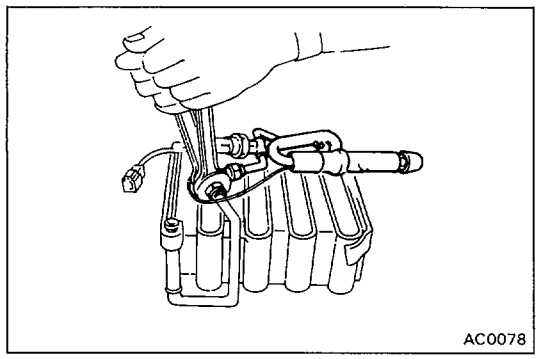
1. **CHECK EVAPORATOR FINS FOR BLOCKAGE**

   If the fins are clogged, clean them with compressed air.

   CAUTION: Never use water to clean the evaporator.

2. **CHECK FITTINGS FOR CRACKS OR SCRATCHES**

   Repair as necessary.



ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.

Torque: 235 kg-cm (17 ft-lb, 23 N·m)

NOTE: Be sure that the O-rings are positioned on the tube fitting.

(b) Install the holder to the suction tube with heat sensitizing tube.

(c) Connect the liquid tube to the inlet fitting of the expansion valve. Torque the nut.

Torque: 135 kg-cm (10 ft-lb, 13 N·m)

(d) Install lower unit case to the evaporator.

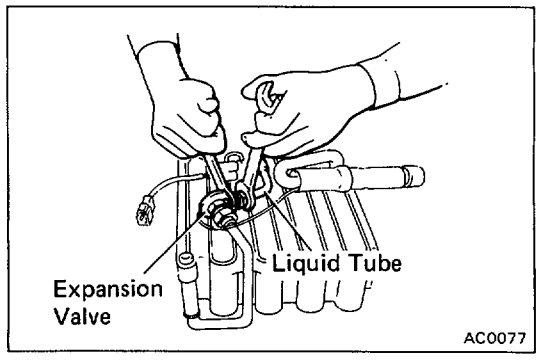
(e) Install thermistor to the evaporator.

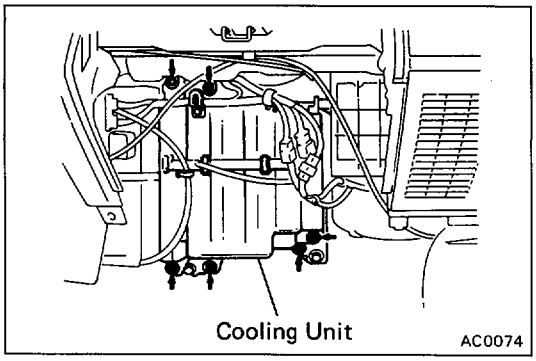
(f) Install upper unit case.

(g) Install four screws.

(h) Install four clips.

(i) Connect connectors.





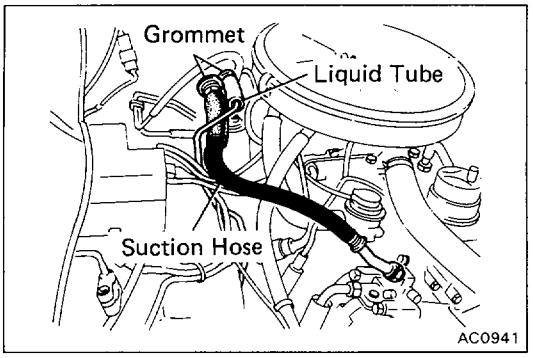
INSTALLATION OF COOLING UNIT

1. **INSTALL COOLING UNIT**

   Install the cooling unit with four screws and a bolt.

2. **CONNECT CONNECTORS**

3. **INSTALL GLOVE BOX AND REINFORCEMENT**



4. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS
5. CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING
   Torque: 135 kg-cm (10 ft-lb, 13 N·m)
6. CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING
   Torque: 325 kg-cm (24 ft-lb, 32 N·m)
7. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR
   Add 40 — 50 cc (1.4 — 1.7 fl.oz.)
8. CONNECT NEGATIVE CABLE TO BATTERY
9. EVACUATE AIR FROM AIR CONDITIONING SYSTEM
10. CAHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK ON GAS LEAKAGE
    Specified amount: 600—750g (1.3—1.7 lb)

REFRIGERANT LINES

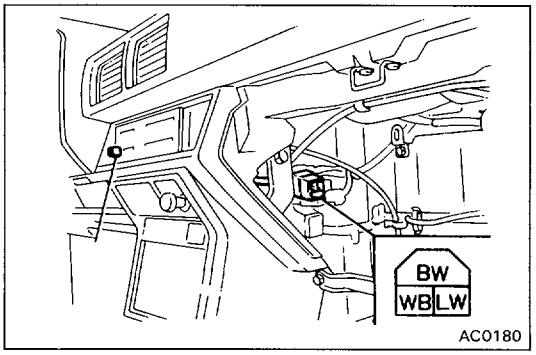
ON-VEHICLE INSPECTION

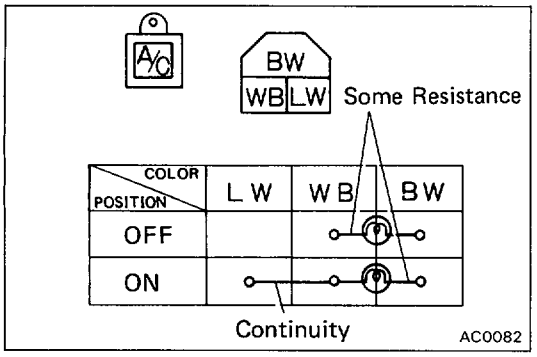
1. INSPECT HOSES AND TUBES FOR LEAKAGE
   Use a gas leak detector. Replace, if necessary.
2. CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE
   Tighten or replace, as necessary.

REPLACEMENT OF REFRIGERANT LINES

(See page AC-7)

1. DISCHARGE REFRIGERATION SYSTEM
2. REPLACE FAULTY TUBE OR HOSE
   NOTE: Cap the open fittings immediately to keep moisture out of the system.
3. TIGHTENING TORQUE FOR O-RING
   (See page AC-8)
4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM
5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK ON GAS LEAKAGE
   Specified amount: 600—750g (1.3—1,7 lb)





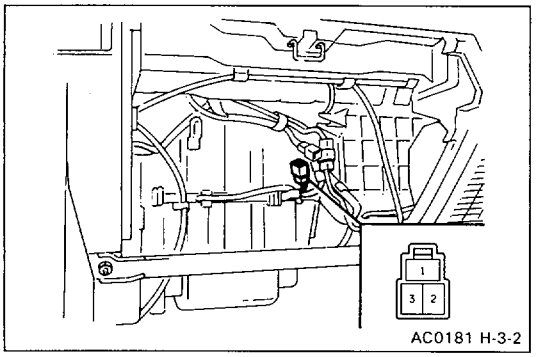
A/C SWITCH

ON-VEHICLE INSPECTION

1. **DISCONNECT NEGATIVE CABLE FROM BATTERY**
2. **REMOVE GLOVE BOX**
3. **DISCONNECT A/C SWITCH CONNECTOR**
4. **CHECK A/C SWITCH FOR CONTINUITY**

   Using an ohmmeter, check for continuity between the terminals for each switch position shown in the table.

   If there is no continuity, replace the A/C switch.
5. **CONNECT A/C SWITCH CONNECTOR**
6. **INSTALL CENTER CLUSTER**
7. **CONNECT NEGATIVE CABLE TO BATTERY**



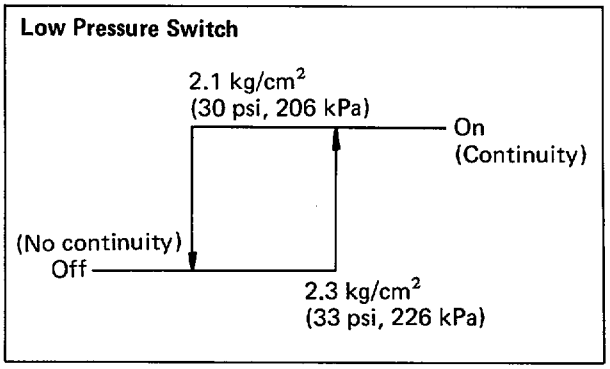
LOW PRESSURE SWITCH

(See page AC-7)

INSPECTION OF LOW PRESSURE SWITCH

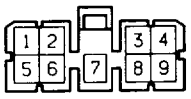
ON-VEHICLE INSPECTION

1. **DISCONNECT CONNECTOR OF PRESSURE SWITCH**
2. **INSPECT PRESSURE SWITCH**
   (a) Install the manifold gauge set.
   (b) Observe the gauge reading.
   (c) Check the continuity between the two terminals of the pressure switch shown in the below.



If defective, replace the pressure switch.

Wire Harness Side



K-9-1

AIR CONDITIONER AMPLIFIER

INSPECTION OF AMPLIFIER

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Test conditions:

(1) Ignition switch: ON

(2) Temparature control lever: MAX COOL

(3) Blower switch: HI

22R Engine

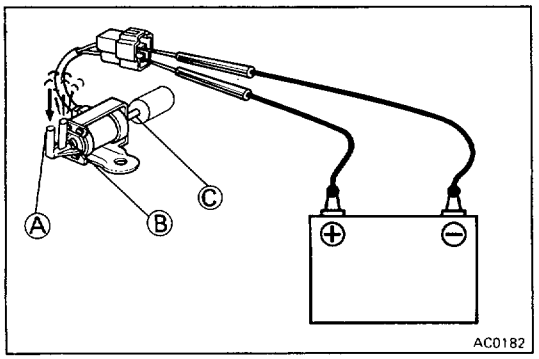
Check for	Tester connection	Condition	Specified value
Continuity	6 – Ground	—	Continuity
Voltage	2 – 6	Turn A/C or ECONO switch on.	Battery voltage
		Turn A/C or ECONO switch off.	No voltage
	3 – 6	Turn A/C or ECONO switch on.	Battery voltage
		Turn A/C or ECONO switch off.	No voltage
	4 – 6	Turn A/C or ECONO switch on.	Battery voltage
		Turn A/C or ECONO switch off.	No voltage
	5 – 6	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
Continuity	8 – 9	—	Continuity
Resistance	9 – 6	—	Approx. 1.7 kΩ at 25°C (77°F)

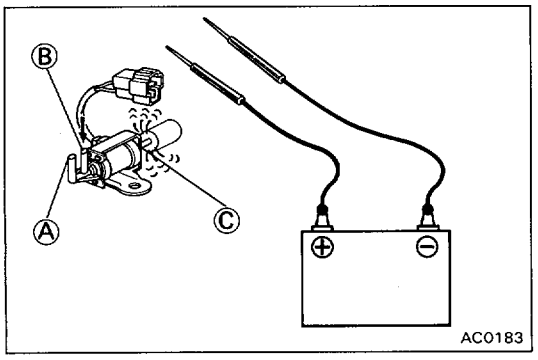
If circuit is correct, replace the amplifier.

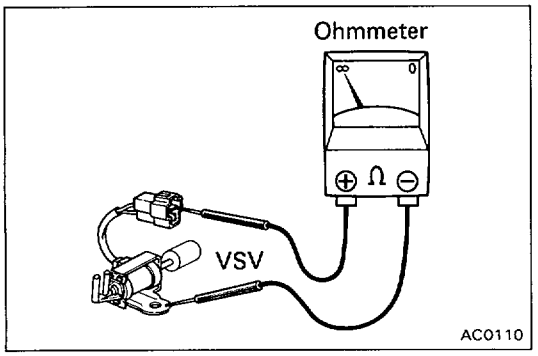
22R-E, 22R-TE Engine

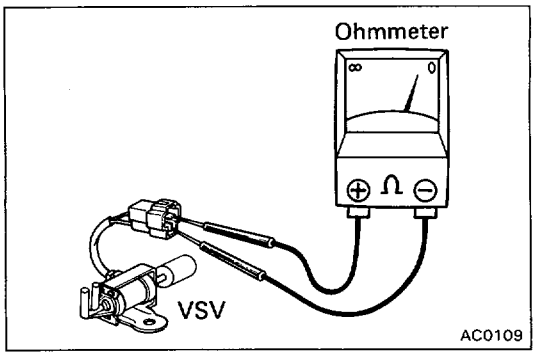
Check for	Tester connection	Condition	Specified value
Continuity	7 – Ground	—	Continuity
Voltage	2 – 7	Turn A/C or ECONO switch on.	Battery voltage
		Turn A/C or ECONO switch off.	No voltage
	8 – 7	Turn A/C or ECONO switch on.	Battery voltage
		Turn A/C or ECONO switch off.	No voltage
	6 – 7	Turn ignition switch on.	Battery voltage
		Turn ignition switch off.	No voltage
	5 – 7	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
Continuity	3 – Ground	—	Continuity
	9 – 4	—	Continuity

If circuit is correct, replace the amplifier.









VACUUM SWITCHING VALVE (VSV)

(See page AC-7)

INSPECTION OF VSV

1. **DISCONNECT VACUUM HOSES AND CONNECTOR FROM VSV**

2. **CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE**

   (a) Connect the VSV terminals to the battery terminals as shown.

   (b) Blow into pipe Ⓐ, and check that air comes out of pipe Ⓑ, but does not come out of filter Ⓒ.

   (c) Disconnect the battery.

   (d) Blow into pipe Ⓑ and check that air comes out of filter Ⓒ but does not come out of pipe Ⓐ.

   If a problem is found, replace the VSV.

3. **CHECK FOR SHORT CIRCUIT**

   Using an ohmmeter, check that there is no continuity between each terminal and VSV body.

   If a short circuit is found, repair or replace the VSV.

4. **CHECK FOR OPEN CIRCUIT**

   Using an ohmmeter, measure the resistance between two terminals of the VSV.

   Specified resistance: 38 — 43 Ω at 20°C (68°F)

   If resistance is not as specified, replace the VSV.

SERVICE SPECIFICATIONS

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MAINTENANCE

Engine

Drive belt tension					
V-ribbed type	Alternator (w/ Air pump)	New belt	160 ± 20 lb		
	With A/C	Used belt	100 ± 20 lb		
	Without A/C	New belt	105 ± 25 lb		
		Used belt	85 ± 20 lb		
Conventional type		New belt	125 ± 25 lb		
		Used belt	80 ± 20 lb		
Coolant capacity w/ heater or air conditioner					
	22R, 22R-E (ex. 4WD A/T)		8.4 liters	8.9 US qts	7.4 Imp. qts
	22R-E (4WD A/T), 22R-TE		9.1 liters	9.6 US qts	8.0 Imp. qts
Engine oil capacity	Drain and refill				
		w/ Oil filter change	4.3 liters	4.5 US qts	3.8 Imp. qts
		w/o Oil filter change	3.8 liters	4.0 US qts	3.3 Imp. qts
Spark plug	Type	ND	W16EXR-U		
		NGK	BPR5EY		
	Gap		0.8 mm	0.031 in.	
Firing order			1–3–4–2		
Valve clearance (hot)		Intake	0.20 mm	0.008 in.	
		Exhaust	0.30 mm	0.012 in.	
Idle speed		22R	700 rpm		
		22R-E	750 rpm		
		22R-TE	800 rpm		
Fast idle speed		22R	3,000 rpm (EGR system OFF and choke opener OFF)		

Chassis

Front brake						
Pad thickness			Limit	1.0 mm	0.039 in.	
Disc thickness	Limit	2WD	FS 17 type	21.0 mm	0.827 in.	
			PD 60 type	24.0 mm	0.945 in.	
		4WD	Limit	19.0 mm	0.748 in.	
Disc runout			Limit	0.15 mm	0.0059 in.	
Rear brake						
Lining thickness			Limit	1.0 mm	0.039 in.	
Drum inner diameter		2WD	Limit	256.0 mm	10.079 in.	
		4WD	Limit	297.0 mm	11.693 in.	
Front axle and suspension						
Ball joint vertical play			Limit	2.3 mm	0.091 in.	
Wheel bearing friction preload (at starting)			2WD	0.6 – 1.8 kg	1.3 – 4.0 lb	5.9 – 17.7 N
			4WD	2.8 – 5.6 kg	6.2 – 12.3 lb	27 – 55 N
Steering wheel freeplay			Limit	30 mm	1.18 in.	
Torque specifications						
Seat mounting bolts				375 kg-cm	27 ft-lb	37 N·m
Leaf spring U-bolt				1,250 kg-cm	90 ft-lb	123 N·m
Strat bar bracket x Frame				530 kg-cm	38 ft-lb	52 N·m

ENGINE MECHANICAL

Specifications

Compression pressure		STD	22R, 22R-E	12 kg/cm²	171 psi	1,177 kPa
			22R-TE	10.5 kg/cm²	149 psi	1,030 kPa
		Limit	22R, 22R-E	10 kg/cm²	142 psi	981 kPa
			22R-TE	8.5 kg/cm²	120 psi	834 kPa
	Differential of pressure between each cylinder			Less than 1.0 kg/cm² (14 psi, 98 kPa)		
Cylinder head	Head surface warpage	Limit		0.15 mm	0.0059 in.	
	Manifold surface warpage	Limit		0.20 mm	0.0079 in.	
	Valve seat Refacing angle		Intake	30°, 45°, 60°		
			Exhaust	30°, 45°, 65°		
	Contacting angle			45°		
	Contacting width			1.2 – 1.6 mm	0.047 – 0.063 in.	
Valve guide bushing	Inner diameter		Intake	8.01 – 8.03 mm	0.3154 – 0.3161 in.	
			Exhaust	8.01 – 8.03 mm	0.3154 – 0.3161 in.	
	Outer diameter		STD	13.040 – 13.051 mm	0.5134 – 0.5138 in.	
			O/S 0.05	13.090 – 13.101 mm	0.5154 – 0.5158 in.	
	Replacing temperature (cylinder head side)			Approx. 90°C (194°F)		
Valve	Valve overall length STD	IN	22R, 22R-E	113.5 mm	4.468 in.	
			22R-TE	113.8 mm	4.480 in.	
		EX	22R, 22R-E	112.4 mm	4.425 in.	
			22R-TE	112.9 mm	4.445 in.	
	Valve face angle		IN & EX	44.5°		
	Stem diameter	STD	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.	
			Exhaust	7.965 – 7.980 mm	0.3136 – 0.3142 in.	
	Stem end refacing	Limit	IN & EX	0.5 mm	0.020 in.	
	Stem oil clearance	STD	Intake	0.025 – 0.06 mm	0.0010 – 0.0024 in.	
			Exhaust	0.03 – 0.065 mm	0.0012 – 0.0026 in.	
		Limit	Intake	0.08 mm	0.0031 in.	
			Exhaust	0.10 mm	0.0039 in.	
	Valve head edge thickness	Limit	22R, 22R-E	0.6 mm	0.024 in.	
			22R-TE IN	0.9 mm	0.035 in.	
			EX	1.1 mm	0.043 in.	
Valve spring	Free length			48.5 mm	1.909 in.	
	Installed load	at 40.5 mm (1.594 in.)				
		STD		30.0 kg	66.1 lb	294 N
		Limit		28.5 kg	62.8 lb	279 N
	Squareness	Limit		1.6 mm	0.063 in.	
Rocker arm and shaft	Rocker shaft diameter			15.97 – 15.99 mm	0.6287 – 0.6295 in.	
	Shaft to arm oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.	
		Limit		0.08 mm	0.0031 in.	
Intake, exhaust manifold and air intake chamber	Manifold surface warpage					
	Limit	Intake		0.2 mm	0.008 in.	
		Exhaust		0.7 mm	0.028 in.	
		Air intake chamber		0.2 mm	0.008 in.	
Chain and sprocket	Crankshaft sprocket wear		Limit	59.4 mm	2.339 in.	
	Camshaft sprocket wear		Limit	113.8 mm	4.480 in.	

Specifications (Cont'd)

Tension and damper	Tensioner head thickness		Limit	11.0 mm	0.433 in.
	Damper No. 1 wear		Limit	0.5 mm	0.020 in.
	Damper No. 2 wear		Limit	0.5 mm	0.020 in.
Camshaft	Thrust clearance		STD	0.08 – 0.18 mm	0.0031 – 0.0071 in.
			Limit	0.25 mm	0.0098 in.
	Journal oil clearance		STD	0.01 – 0.05 mm	0.0004 – 0.0020 in.
			Limit	0.1 mm	0.004 in.
	Journal diameter		STD	32.98 – 33.00 mm	1.2984 – 1.2992 in.
	Circle runout		Limit	0.2 mm	0.008 in.
	Cam height		Intake	42.63 – 42.72 mm	1.6783 – 1.6891 in.
			Exhaust	42.69 – 42.78 mm	1.6807 – 1.6842 in.
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore		STD	92.00 – 92.03 mm	3.6220 – 3.6232 in.
	Cylinder bore wear		Limit	0.2 mm	0.008 in.
	Difference of bore limit between cylinder			Less than 0.03 mm (0.0012 in.)	
	Taper		Limit	0.01 mm	0.0004 in.
	Out-of-round		Limit	0.02 mm	0.0008 in.
	Cylinder block main journal bore				
		STD	3	64.004 – 64.010 mm	2.5198 – 2.5201 in.
			4	64.010 – 64.016 mm	2.5201 – 2.5203 in.
			5	64.016 – 64.022 mm	2.5203 – 2.5205 in.
			U/S 0.25	64.004 – 64.022 mm	2.5198 – 2.5205 in.
Piston and piston ring	Piston diameter	STD	22R, 22R-E	91.970 – 92.000 mm	3.6209 – 3.6220 in.
			22R-TE	91.935 – 91.965 mm	3.6195 – 3.6207 in.
		O/S 0.50	22R, 22R-E	92.470 – 92.500 mm	3.6405 – 3.6417 in.
			22R-TE	92.435 – 92.465 mm	3.6392 – 3.6403 in.
		O/S 1.00	22R, 22R-E	92.970 – 93.000 mm	3.6602 – 3.6614 in.
			22R-TE	92.935 – 92.965 mm	3.6589 – 3.6600 in.
	Piston to cylinder clearance		22R, 22R-E	0.02 – 0.04 mm	0.0008 – 0.0016 in.
			22R-TE	0.055 – 0.075 mm	0.0022 – 0.0030 in.
	Ring to ring groove clearance		STD	0.03 – 0.07 mm	0.0012 – 0.0028 in.
			Limit	0.2 mm	0.008 in.
	Piston ring end gap	STD	No. 1	0.25 – 0.47 mm	0.0098 – 0.0185 in.
			No. 2	0.60 – 0.82 mm	0.0236 – 0.0323 in.
			Oil	0.20 – 0.57 mm	0.0079 – 0.0224 in.
		Maximum	No. 1	1.07 mm	0.0421 in.
			No. 2	1.42 mm	0.0559 in.
			Oil	1.17 mm	0.0461 in.
	Piston pin installing temperature			80°C	176°F
Connecting rod and bearing	Thrust clearance	STD		0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit		0.3 mm	0.012 in.
	Big end inner diameter	STD	A	56.000 – 56.006 mm	2.2047 – 2.2050 in.
			B	56.006 – 56.012 mm	2.2050 – 2.2052 in.
			C	56.012 – 56.018 mm	2.2052 – 2.2054 in.
			U/S 0.25	56.000 – 56.018 mm	2.2047 – 2.2054 in.

Specifications (Cont'd)

Connecting rod and bearing (cont'd)	Connecting rod bearing center wall thickness			
	STD	A	1.484 – 1.488 mm	0.0584 – 0.0586 in.
		B	1.488 – 1.492 mm	0.0586 – 0.0587 in.
		C	1.492 – 1.496 mm	0.0587 – 0.0589 in.
		U/S 0.25	1.626 – 1.636 mm	0.0640 – 0.0644 in.
	Bearing oil clearance	STD	0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit	0.10 mm	0.0039 in.
	Pin to bushing oil clearance	STD	0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit	0.015 mm	0.0006 in.
	Rod bend	Limit	0.05 mm	0.0020 in.
	Rod twist	Limit	0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD	0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit	0.3 mm	0.012 in.
	Thrust washer thickness	STD	2.690 – 2.740 mm	0.1059 – 0.1079 in.
		O/S 1.25	2.753 – 2.803 mm	0.1084 – 0.1104 in.
		O/S 2.50	2.815 – 2.865 mm	0.1108 – 0.1128 in.
	Main journal oil clearance	STD	0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit	0.08 mm	0.0031 in.
	Main journal diameter	STD	59.984 – 60.000 mm	2.3616 – 2.3622 in.
	Main journal finished diameter	U/S 0.25	59.701 – 59.711 mm	2.3504 – 2.3508 in.
	Main bearing center wall thickness			
	STD	3	1.988 – 1.992 mm	0.0783 – 0.0784 in.
		4	1.992 – 1.996 mm	0.0784 – 0.0786 in.
		5	1.996 – 2.000 mm	0.0786 – 0.0787 in.
		U/S 0.25	2.126 – 2.136 mm	0.0837 – 0.0841 in.
	Crank pin diameter	STD	52.988 – 53.000 mm	2.0861 – 2.0866 in.
	Crank pin finished diameter	U/S 0.25	52.701 – 52.711 mm	2.0748 – 2.0752 in.
	Circle runout	Limit	0.1 mm	0.004 in.
	Main journal taper and out-of-round	Limit	0.01 mm	0.0004 in.
	Crank pin journal taper and out-of-round	Limit	0.01 mm	0.0004 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Cylinder head x Cylinder block		800	58	78
Manifold x Cylinder head	Intake	195	14	19
	Exhaust	450	33	44
Crankshaft bearing cap x Cylinder block		1,050	76	103
Connecting rod cap x Connecting rod		700	51	69
Crankshaft pulley x Crankshaft		1,600	116	157
Flywheel x Crankshaft		1,100	80	108
Camshaft bearing cap x Cylinder head		200	14	20
Distributor drive gear x Camshaft		800	58	78
Oil pan x Cylinder block		130	9	13

TURBOCHARGER SYSTEM

Specifications

Turbocharger	Turbocharging pressure	STD	0.37 – 0.50 kg/cm² (5.3 – 7.1 psi, 36 – 49 kPa)
	Bearing shaft axial play	STD	0.13 mm (0.0051 in.) or less

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Turbocharger x Exhaust manifold	400	29	39
Turbocharger x Turbin outlet elbow	260	19	25
Turbocharger x Turbocharger oil pipe	195	14	19
Turbocharger oil pipe union bolt	280	20	27
Turbocharger oil pipe x Cylinder block	195	14	19
Turbocharger x Turbocharger stay	195	14	19
Cylinder block x Turbocharger stay	400	29	39

EFI SYSTEM

Specifications

Pressure regulator	Fuel pressure	at No vacuum	2.3–2.7 kg/cm² 33–38 psi 226–265 kPa
Cold start injector	Resistance		2 – 4 Ω
	Fuel leakage		Less than one drop of fuel per minute
Injector	Resistance	22R-E	1.5 – 3.0 Ω
		22R-TE	1.1 – 2.0 Ω
	Injection volume	22R-E	40 – 50 cc/15 sec (2.4 – 3.1 cu in.)
		22R-TE	65 – 80 cc/15 sec (4.0 – 4.9 cu in.)
	Difference between each injector	22R-E	Less than 6 cc (0.37 cu in.)
		22R-TE	Less than 8 cc (0.49 cu in.)
	Fuel leakage		Less than one drop of fuel per minute
Auxiliary air valve	Resistance		39 – 59 Ω
	Temperature	w/ Valve closed	Approx. 20°C (68°F)
Throttle body	Throttle valve fully closed angle		6°

Throttle position sensor	Clearance between stop screw and lever	Between terminals	Resistance
	0 mm 0 in.	VTA – E_2	0.2 – 0.8 kΩ
	0.57 mm 0.0224 in.	IDL – E_2	Less than 2.3 kΩ
	0.85 mm 0.0335 in.	IDL – E_2	Infinity
	Throttle valve fully opened position	VTA – E_2	3.3 – 10 kΩ
	–	Vcc – E_2	3 – 7 kΩ

EFI main relay	Resistance	1 – 2	60 – 80 Ω
		3 – 4	∞
Circuit opening relay	Resistance	STA – E_1	17 – 25 Ω
		+B – Fc	88 – 132 Ω
		+B – Fp	∞
Resistor	Resistance		2 – 3 Ω each

Specifications (Cont'd)

Start injector time switch	Resistance	STA – STJ	22R-E	30 – 50 Ω (below 10°C, 50°F)
			22R-TE	20 – 40 Ω (below 30°C, 86°F)
			22R-E	70 – 90 Ω (above 25°C, 77°F)
			22R-TE	40 – 60 Ω (above 40°C, 104°F)
		STA – Ground	22R-E	30 – 90 Ω
			22R-TE	20 – 80 Ω
Air flow meter	Resistance	E_2 – Vs		20 – 400 Ω (Measuring plate fully closed)
				20 – 1,200 Ω (Measuring plate fully open)
		E_2 – Vc		100 – 300 Ω
		E_2 – V_B		200 – 400 Ω
		E_1 – Fc		∞ (Measuring plate fully closed)
				0 (Measuring plate open)
		E_2 – THA		10 – 20 kΩ (–20°C, –4°F)
				4 – 7 kΩ (0°C, 32°F)
				2 – 3 kΩ (20°C, 68°F)
				0.9 – 1.3 kΩ (40°C, 104°F)
				0.4 – 0.7 kΩ (60°C, 140°F)
Water temp. sensor	Resistance			10 – 20 kΩ (–20°C, –4°F)
				4 – 7 kΩ (0°C, 32°F)
				2 – 3 kΩ (20°C, 68°F)
				0.9 – 1.3 kΩ (40°C, 104°F)
				0.4 – 0.7 kΩ (60°C, 140°F)
				0.2 – 0.4 kΩ (80°C, 176°F)
Oxygen sensor heater	Resistance			5.1 – 6.3 Ω (20°C, 68°F)
EGR gas temp. sensor	Resistance			69.40 – 88.50 kΩ (50°C, 122°F)
				11.89 – 14.37 kΩ (100°C, 212°F)
				2.79 – 3.59 kΩ (150°C, 302°F)

ECU

NOTE: 1. Perform all voltage and resistance measurements with the ECU connected.
2. Verify that the battery voltage is 11V or above when the ignition switch is ON.
3. The testing probes must not make contact with the ECU Oxygen VF terminals.

Terminals	STD voltage (V)	Condition	
+B – E_1	10 – 14	Ignition switch ON	
BATT – E_1	10 – 14	–	
IDL – E_2	8 – 14	Throttle valve open	
Vcc – E_2	4 – 6	Ignition switch ON	–
VTA – E_2	0.1 – 1.0		Throttle valve fully closed
	4 – 5		Throttle valve fully open
IGt – E_1	0.7 – 1.0	Idling	
STA – E_1	6 – 12	Ignition switch ST position	
No. 10 – E_1 No. 20 – E_1	9 – 14	Ignition switch ON	–
W – E_1	8 – 14	No trouble (CHECK ENGINE light go off) and engine running	
Vc – E_2	6 – 10	Ignition switch ON	–
Vs – E_2	0.5 – 2.5		Measuring plate fully closed
	5 – 10		Measuring plate fully open
	2 – 8	Idling	
THA – E_2	1 – 3	Ignition switch ON	Intake air temperature 20°C or 68°F
THW – E_2	0.1 – 1.0		Coolant temperature 80°C or 176°F
B/K – E_2	8 – 14	Stop light switch ON	

Specifications (Cont'd)

ECU (cont'd)	Terminals	STD voltage (V)	Condition	
	*1 HAC – E_2	Approx. 3.6	Ignition switch ON	760 mmHg (29.92 in.Hg, 101.3 kPa)
	*2 STJ – E_{01}	6 – 12	Ignition switch ST position	Coolant temperature 80°C (176°F)
	Resistance		$E_1 – E_2$	0 Ω
			E_1 – BODY	0 Ω
			$E_1 – E_{01}$	0 Ω
			$E_1 – E_{02}$	0 Ω
	Fuel cut rpm			
	Fuel cut rpm			
	22R-E (M/T, 2WD or stop light S/W ON)			1,000 rpm
	(A/T, 4WD or stop light S/W OFF)			1,900 rpm
	22R-TE			1,800 rpm
	Fuel return rpm			
	22R-E (M/T, 2WD or stop light S/W ON)			1,300 rpm
	(A/T, 4WD or stop light S/W OFF)			1,600 rpm
	22R-TE			1,600 rpm

*1: C & C only *2: 22R-E only

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Fuel line	310	22	30
Fuel pump	15	13 in.-lb	1.5
Fuel drain plug	65	56 in.-lb	6.4
Fuel tank x Body	195	14	19

FUEL SYSTEM

Specifications

Carburetor	Float level		
	Raised position (float top to air horn)		9.8 mm 0.386 in.
	Lowered position (float bottom to air horn)		48 mm 1.89 in.
	Float lip clearance (at float lowered)		1 mm 0.04 in.
	Throttle valve closed angle	Primary	9° from horizontal plane
		Secondary	20° from horizontal plane
	Throttle valve full open angle	Primary	90° from horizontal plane
		Secondary	90° from horizontal plane
	Secondary touch angle		59° from horizontal plane
	Fast idle angle		23° from horizontal plane
	Fast idle speed		3,000 rpm
	Unloader angle		45° from horizontal plane
	Choke breaker opening angle		42° from horizontal plane
	Choke heater resistance	at 20°C (68°F)	20 – 22 Ω
	Idle-up angle		16.5° from horizontal plane
	Dash pot touch angle		24.5° from horizontal plane
	Dash pot setting speed		3,000 rpm
	Idle speed		700 rpm
	Idle mixture adjusting screw presetting		Screw out 3-1/2 turns
	Idle mixture speed		740 rpm

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Fuel drain plug	65	56 in.-lb	6.4
Fuel tank x Body	195	14	19

COOLING SYSTEM

Radiator	Relief valve opening pressure	STD	0.75–1.05 kg/cm^2	10.7–14.9 psi	74–103 kPa
		Limit	0.6 kg/cm^2	8.5 psi	59 kPa
Thermostat	Valve opening temperature				
	Starts to open at		88°C	190°F	
	Fully opens at		100°C	212°F	
	Valve opening travel		8 mm	0.31 in.	

LUBRICATION SYSTEM

Oil pressure (normal operating temperature)				
	at Idle speed		More than 0.3 kg/cm^2 (4.3 psi, 29 kPa)	
	at 3,000 rpm		2.5–5.0 kg/cm^2 (36–71 psi, 245–490 kPa)	
Oil pump	Body clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.
		Limit	0.2 mm	0.008 in.
	Tip clearance			
	Drive gear to crescent	STD	0.15 – 0.21 mm	0.0059 – 0.0083 in.
		Limit	0.3 mm	0.012 in.
	Drive gear to crescent	STD	0.22 – 0.25 mm	0.0087 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Relief valve operating pressure		4.5 kg/cm^2 64 psi	441 kPa

IGNITION SYSTEM

Spark plug	Type	ND	W16EXR-U	
		NGK	BPR5EY	
	Gap		0.8 mm	0.031 in.
High-tension cord	Resistance	Limit	Less than 25 kΩ per cord	
Ignition coil			22R-E, 22R-TE	22R
	Primary coil resistance		0.5 – 0.7 Ω	0.4 – 0.5 Ω
	Secondary coil resistance		11.4 – 15.6 kΩ	8.5 – 11.5 kΩ
	Insulation resistance w/500V megohm meter		10 MΩ or more	—

IGNITION SYSTEM (Cont'd)

Distributor (22R engine)	Air gap		0.2 – 0.4 mm		0.008 – 0.016 in.		
	Distributor advance angle	Governor	Distributor rpm		Advance angle		
			600		Advance begins		
			750		0.2 – 1.7°		
			1,100		2.9 – 4.4°		
			1,500		5.9 – 7.4°		
			2,150		10.5 – 12.0°		
			2,900		11.5 – 13.5°		
		Vacuum		Ex. Calif.		For Calif.	
				mmHg (in.Hg, kPa)	Advance angle	mmHg (in.Hg, kPa)	Advance angle
			Main	80(3.15, 10.7)	Advance begins	80(3.15, 10.7)	Advance begins
				100(3.94, 13.3)	0.7 – 3.8°	120(4.72, 16.0)	1.1 – 3.2°
				150(5.91, 20.0)	6.0 – 8.3°	260(10.24, 34.7)	8.3 – 10.3°
				270(10.64, 36.0)	9.0 – 11.0°	410(16.14, 54.7)	11.5 – 13.5°
			Sub	200(7.87, 26.7)	Advance begins	200(7.87, 26.7)	Advance begins
				230(9.06, 30.7)	0.7 – 3.5°	230(9.06, 30.7)	0.5 – 3.1°
				270(10.63, 36.0)	3.1 – 5.7°	270(10.63, 36.0)	2.9 – 5.5°
				380(14.96, 50.7)	5.0 – 7.0°	380(14.96, 50.7)	5.0 – 7.0°

STARTING SYSTEM

Starter	Rated voltage and output power			12V, 1.0 kW	12V, 1.4 kW
	No-load characteristic		Current	Less than 90A	Less than 90A
			rpm	More than 3,000 rpm at 11.5V	More than 3,500 rpm at 11.5V
	Brush length		STD	13.5 mm 0.531 in.	15.5 mm 0.610 in.
			Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.
	Commutator	Outer diameter	STD	30 mm 1.18 in.	←
			Limit	29 mm 1.14 in.	←
		Undercut depth	STD	0.6 mm 0.024 in.	←
			Limit	0.2 mm 0.008 in.	←
		Circle runout	Limit	0.05 mm 0.0020 in.	←
	Spring installed load		STD	1,785 – 2,415 g (3.9–5.3 lb, 18–24 N)	←
			Limit	1.2 kg (2.6 lb, 12 N)	←

CHARGING SYSTEM

Battery specific gravity When fully charged at 20°C (68°F)			1.25 – 1.27	
Alternator	Rated output ampere		60 A	
	Rotor coil resistance		Less than 3 Ω	
	Brush exposed length	STD	10.5 mm	0.413 in.
		Limit	1.5 mm	0.059 in.
	Slip ring diameter	STD	14.2 – 14.4 mm	0.559 – 0.567 in.
		Limit	12.8 mm	0.504 in.
Alternator regulator	Regulator voltage	at 25°C (77°F)	13.9 – 15.1 V	
		at 115°C (239°F)	13.5 – 14.3 V	

CLUTCH

Specifications

Pedal height (from asphalt sheet)			155.5 mm	6.122 in.
(from floor panel)			157.5 mm	6.201 in.
Push rod play at pedal top			1.0 – 5.0 mm	0.039 – 0.197 in.
Pedal freeplay			5 – 15 mm	0.20 – 0.59 in.
Disc rivet head depth		Limit	0.3 mm	0.012 in.
Disc runout		Limit	0.8 mm	0.031 in.
Diaphragm spring tip alignment		Limit	0.5 mm	0.020 in.
Diaphragm spring finger wear	Depth	Limit	0.6 mm	0.024 in.
	Width	Limit	5.0 mm	0.197 in.
Flywheel runout		Limit	0.2 mm	0.008 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Master cylinder reservoir set bolt	250	18	25
Master cylinder mounting nut	130	9	13
Release cylinder munting bolt	120	9	12
Bleeder plug	110	8	11
Clutch cover x Flywheel	195	14	19
Strap x Clutch pressure plate	195	14	19

MANUAL TRANSMISSION (W46, 55, 56)

Specifications (2WD and 4WD)

Manual transmission (W46, 55, 56)	Output shaft				
	2nd gear journal diameter		Limit	42.85 mm	1.6870 in.
	3rd gear journal diameter		Limit	37.80 mm	1.4882 in.
	Flange thickness		Limit	5.60 mm	0.2205 in.
	Runout		Limit	0.06 mm	0.0024 in.
	1st gear inner race flange thickness		Limit	4.70 mm	0.1850 in.
	1st gear inner race outer diameter		Limit	42.85 mm	1.6870 in.
	Counter gear				
	Center bearing journal outer diameter		Limit	29.90 mm	1.1772 in.
	5th gear journal outer diameter		Limit	26.85 mm	1.0571 in.
	Gear thrust clearance				
		1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
			Limit	0.30 mm	0.0118 in.
		Counter 5th	STD	0.10 – 0.41 mm	0.0039 – 0.0161 in.
			Limit	0.46 mm	0.0181 in.
	Gear oil clearance	1st & 2nd	STD	0.009 – 0.060 mm	0.0004 – 0.0024 in.
			Limit	0.15 mm	0.0059 in.
		3rd	STD	0.060 – 0.103 mm	0.0024 – 0.0041 in.
			Limit	0.20 mm	0.0079 in.
		Counter 5th	STD	0.009 – 0.062 mm	0.0004 – 0.0024 in.
			Limit	0.15 mm	0.0059 in.
	Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance		STD	0.7 – 1.7 mm	0.028 – 0.067 in.
			Limit	0.5 mm	0.020 in.
	Oil seal drive in depth				
	Front bearing retainer			11.4 – 12.0 mm	0.449 – 0.472 in.
	Speedometer driven gear			25 mm	0.98 in.
	Input shaft snap ring thickness				
			Mark		
			1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
			2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
			3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
			4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
			5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
			11	2.30 – 2.35 mm	0.0906 – 0.0925 in.
			12	2.35 – 2.40 mm	0.0925 – 0.0945 in.

Specifications (2WD and 4WD)(Cont'd)

Manual transmission (W46, 55, 56) (cont'd)	Output shaft snap ring thickness			
	Front	Mark		
		D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		11	1.86 – 1.91 mm	0.0732 – 0.0752 in.
		12	1.92 – 1.97 mm	0.0756 – 0.0776 in.
		13	1.98 – 2.03 mm	0.0780 – 0.0799 in.
		14	2.04 – 2.09 mm	0.0803 – 0.0823 in.
		15	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	Rear	Mark		
		8	2.31 – 2.36 mm	0.0909 – 0.0929 in.
		9	2.37 – 2.42 mm	0.0933 – 0.0953 in.
		10	2.43 – 2.48 mm	0.0957 – 0.0976 in.
		11	2.49 – 2.54 mm	0.0980 – 0.1000 in.
		12	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		13	2.61 – 2.66 mm	0.1028 – 0.1047 in.
		14	2.68 – 2.73 mm	0.1055 – 0.1075 in.
		15	2.74 – 2.79 mm	0.1079 – 0.1098 in.
	Reverse gear	Mark		
		5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		11	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		12	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		13	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		14	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		15	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		16	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		17	2.61 – 2.66 mm	0.1028 – 0.1047 in.
		18	2.67 – 2.72 mm	0.1051 – 0.1071 in.
		19	2.73 – 2.78 mm	0.1075 – 0.1094 in.
		20	2.79 – 2.84 mm	0.1098 – 0.1118 in.
		21	2.85 – 2.90 mm	0.1122 – 0.1142 in.
		22	2.91 – 2.96 mm	0.1146 – 0.1165 in.
		23	2.97 – 3.02 mm	0.1169 – 0.1189 in.

Specifications (2WD and 4WD)(Cont'd)

Manual transmission (W46, 55, 56) (cont'd)	Countershaft snap ring thickness			
	Front	Mark		
		1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		6	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		7	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	Rear	Mark		
		1	1.90 – 1.95 mm	0.0748 – 0.0768 in.
		2	1.96 – 2.01 mm	0.0772 – 0.0791 in.
		3	2.02 – 2.07 mm	0.0795 – 0.0815 in.
		4	2.08 – 2.13 mm	0.0819 – 0.0839 in.
		5	2.14 – 2.19 mm	0.0843 – 0.0862 in.
		6	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		7	2.26 – 2.31 mm	0.0890 – 0.0909 in.
	No. 3 clutch hub	Mark		
		2	2.06 – 2.11 mm	0.0811 – 0.0831 in.
		3	2.12 – 2.17 mm	0.0835 – 0.0854 in.
		4	2.18 – 2.23 mm	0.0858 – 0.0878 in.
		5	2.24 – 2.29 mm	0.0882 – 0.0902 in.

Torque Specifications (2WD and 4WD)

Part tightened	kg-cm	ft-lb	N-m
Shift fork set bolt	125	19	12
Straight screw plug	250	18	25
Idler shaft stopper bolt	250	18	25
Front bearing retainer x Transmission case	250	18	25
Intermediate plate x Extension housing or transfer adaptor	375	27	37
Restrict pin	410	30	40
Shift lever housing x Shift and select lever	400	29	39
Shift lever retainer x Extension housing or transfer adaptor	185	13	18
Back-up light switch	410	30	40
Clutch housing x Transmission case	375	27	37
Rear bearing retainer x Intermediate plate	130	9	13
Speedometer driven gear lock plate bolt	130	9	13
Shift fork x Shift fork shaft	200	14	20

MANUAL TRANSMISSION (G40,57)

Specifications (2WD)

Manual transmission (G40, 57)	Output shaft			
	2nd gear journal diameter	Limit	37.984 mm	1.4954 in.
	3rd gear journal diameter	Limit	34.984 mm	1.3773 in.
	Flange thickness	Limit	4.80 mm	0.1890 in.
	Runout	Limit	0.05 mm	0.0020 in.
	Inner race flange thickness	Limit	3.99 mm	0.1571 in.
	Inner race outer diameter	Limit	38.985 mm	1.5348 in.
	Gear thrust clearance			
	1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	Counter 5th	STD	0.10 – 0.30 mm	0.0039 – 0.0118 in.
		Limit	0.30 mm	0.0118 in.
	Gear oil clearance			
	1st & counter 5th	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
		Limit	0.032 mm	0.0013 in.
	2nd & 3rd	STD	0.009 – 0.033 mm	0.0004 – 0.0013 in.
		Limit	0.033 mm	0.0013 in.
	Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance	STD	1.0 – 2.0 mm	0.039 – 0.079 in.
		Limit	0.8 mm	0.031 in.
	Front bearing retainer oil seal			
	Drive in depth		12.2 – 13.2 mm	0.480 – 0.520 in.
	Input shaft snap ring thickness	Mark		
		0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		5	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	Output shaft snap ring thickness			
	Front	Mark		
		C-1	1.75 – 1.80 mm	0.0689 – 0.0709 in.
		D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		D-1	1.85 – 1.90 mm	0.0728 – 0.0748 in.
		E	1.90 – 1.95 mm	0.0748 – 0.0768 in.
		E-1	1.95 – 2.00 mm	0.0768 – 0.0787 in.
		F	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		F-1	2.05 – 2.10 mm	0.0807 – 0.0827 in.

Specifications (2WD) (Cont'd)

Manual transmission (G40, 57) (cont'd)	Output shaft snap ring thickness (cont'd)			
	Rear	Mark		
		A	2.67 – 2.72 mm	0.1051 – 0.1071 in.
		B	2.73 – 2.78 mm	0.1075 – 0.1094 in.
		C	2.79 – 2.84 mm	0.1098 – 0.1118 in.
		D	2.85 – 2.90 mm	0.1122 – 0.1142 in.
		E	2.91 – 2.96 mm	0.1146 – 0.1165 in.
		F	2.97 – 3.02 mm	0.1169 – 0.1189 in.
		G	3.03 – 3.08 mm	0.1193 – 0.1213 in.
		H	3.09 – 3.14 mm	0.1217 – 0.1236 in.
		J	3.15 – 3.20 mm	0.1240 – 0.1260 in.
		K	3.21 – 3.26 mm	0.1264 – 0.1283 in.
		L	3.27 – 3.32 mm	0.1287 – 0.1307 in.
	Counter gear snap ring (Front bearing)	Mark		
		1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		6	2.30 – 2.35 mm	0.0906 – 0.0925 in.

Torque Specifications (2WD)

Part tightened	kg-cm	ft-lb	N·m
Straight screw plug	190	14	19
Extension housing x Transmission case	380	27	37
Restrict pin	280	20	27
Shift lever retainer x Extension housing	185	13	18
Back-up light switch	380	27	37
Front bearing retainer x Transmission case	170	12	17
Rear bearing retainer x Intermediate plate	185	13	18
Reverse shift arm bracket	185	13	18
Counter gear rear lock nut	1,200	87	118
Reverse idler gear shaft stopper bolt	175	13	17
Clutch housing x Transmission case	380	27	37
Shift lever housing bolt	390	28	38
Shift fork x Fork shaft	200	14	20

MANUAL TRANSMISSION (R150)

Specifications (2WD)

Manual transmission (R150)	Output shaft			
	1st gear journal diameter	Limit	38.860 mm	1.5299 in.
	2nd gear journal diameter	Limit	46.860 mm	1.8449 in.
	3rd gear journal diameter	Limit	37.860 mm	1.4905 in.
	Flange thickness	Limit	4.70 mm	0.1850 in.
	Runout	Limit	0.06 mm	0.0024 in.
	Counter gear			
	Roller bearing journal diameter	Limit	27.860 mm	1.0968 in.
	Gear thrust clearance			
	1st	STD	0.10 – 0.45 mm	0.0039 – 0.0177 in.
		Limit	0.50 mm	0.0197 in.
	2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.30 mm	0.0118 in.
	Counter 5th	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
		Limit	0.40 mm	0.0157 in.
	Gear oil clearance			
	1st, 2nd, 3rd & Counter 5th	STD	0.015 – 0.068 mm	0.0006 – 0.0027 in.
		Limit	0.16 mm	0.0063 in.
	Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Synchronizer ring to gear clearance	STD	0.8 – 1.6 mm	0.031 – 0.063 in.
		Limit	0.6 mm	0.024 in.
	Oil seal drive in depth			
	Front bearing retainer		10.5 – 11.5 mm	0.413 – 0.453 in.
	Speedometer driven gear		25 mm	0.98 in.
	Input shaft snap ring thickness			
		Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
	Counter gear snap ring (Front bearing)			
		Mark		
		A	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		B	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		C	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		D	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		E	2.20 – 2.25 mm	0.0866 – 0.0886 in.

Specifications (2WD) (Cont'd)

Manual transmission (R150) (cont'd)	Output shaft snap ring thickness			
	No. 2 clutch hub	Mark		
		A	1.80 – 1.85 mm	0.0709 – 0.0728 in.
		B	1.85 – 1.90 mm	0.0728 – 0.0748 in.
		C	1.90 – 1.95 mm	0.0748 – 0.0768 in.
		D	1.95 – 2.00 mm	0.0768 – 0.0787 in.
		E	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		F	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		G	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	No. 1 clutch hub	Mark		
		A	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		B	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		C	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		D	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		E	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		F	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		G	2.60 – 2.65 mm	0.1024 – 0.1043 in.
	Rear	Mark		
		A	2.65 – 2.70 mm	0.1043 – 0.1063 in.
		B	2.70 – 2.75 mm	0.1063 – 0.1083 in.
		C	2.75 – 2.80 mm	0.1083 – 0.1102 in.
		D	2.80 – 2.85 mm	0.1102 – 0.1122 in.
		E	2.85 – 2.90 mm	0.1122 – 0.1142 in.
		F	2.90 – 2.95 mm	0.1142 – 0.1161 in.
		G	2.95 – 3.00 mm	0.1161 – 0.1181 in.
		H	3.00 – 3.05 mm	0.1181 – 0.1201 in.
		J	3.05 – 3.10 mm	0.1201 – 0.1220 in.
		K	3.10 – 3.15 mm	0.1220 – 0.1240 in.
		L	3.15 – 3.20 mm	0.1240 – 0.1260 in.
		M	3.20 – 3.25 mm	0.1260 – 0.1280 in.
		N	3.25 – 3.30 mm	0.1280 – 0.1299 in.
		P	3.30 – 3.35 mm	0.1299 – 0.1319 in.
		Q	3.35 – 3.40 mm	0.1319 – 0.1339 in.
		R	3.40 – 3.45 mm	0.1339 – 0.1358 in.
		S	3.45 – 3.50 mm	0.1358 – 0.1378 in.

Torque Specifications (2WD)

Part tightened	kg-cm	ft-lb	N-m
Reverse shift arm bracket	185	13	18
Rear bearing retainer x Intermediate plate	185	13	18
Counter gear rear lock nut	1,300	94	127
Shift fork x Shift fork shaft	200	14	20
Straight screw plug	190	14	19
Front bearing retainer x Transmission case	170	12	17
Transmission case x Extension housing	380	27	37
Shift lever housing bolt	390	28	38
Clutch housing x Transmission case	370	27	36
Oil receiver x Extension housing	115	8	11
Back-up light switch	450	33	44
Restrict pin	380	27	37
Shift lever retainer x Extension housing	185	13	18
Transmission x Engine	730	53	72
Transmission x Stiffener plate	380	27	37
Engine rear mounting x Transmission	260	19	25
Engine rear mounting bracket x Support member	440	32	43
Engine rear mounting x Bracket	130	9	13
Exhaust pipe x Exhaust manifold	630	46	62
Exhaust pipe clamp bracket x Clutch housing			
Upper side	380	27	37
Lower side	700	51	69
Clutch release cylinder x Clutch housing	120	9	12

AUTOMATIC TRANSMISSION (A43D)

Specifications

Governor pressure (Vehicle speed reference)			kg/cm²	psi	kPa
Outer shaft rpm	22R-E	22R-E (C & C)			
1,000	(33 km/h, 21 mph)	(29 km/h, 18 mph)	0.9 – 1.5	13 – 21	88 – 147
1,800	(59 km/h, 37 mph)	(52 km/h, 32 mph)	1.6 – 2.2	23 – 31	157 – 216
3,500	(115 km/h, 71 mph)	(100 km/h, 62 mph)	4.1 – 5.3	58 – 75	402 – 520
Line pressure (22R-E engine)					
Engine idling		D range	4.5 – 5.1	64 – 73	441 – 500
		R range	6.8 – 7.6	97 – 108	667 – 745
At stall		D range	10.1 – 11.9	144 – 169	990 – 1,167
		R range	15.0 – 15.8	213 – 224	1,471 – 1,549
Engine stall revolution		22R-E engine	1,900 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)		N range	750 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			20 mm	0.79 in.	
Drive plate runout		Limit	0.20 mm	0.0079 in.	

Shift point schedule (22R-E engine Ex. C & C) km/h (mph) Differential gear ratio 3.583	D range (throttle valve fully open)						L range
	1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	2 → 1
	59 – 76 (37 – 47)	110 – 127 (68 – 79)	No shift *1	*2	100 – 117 (62 – 73)	41 – 56 (25 – 35)	47 – 64 (29 – 40)
	*1 3 → O/D shift up point with closed throttle valve is at 39 – 54 km/h (24 – 34 mph). *2 O/D → 3 down-shift is possible up to maximum speed.						

Shift point schedule (22R-E engine C & C) km/h (mph) Differential gear ratio 4.100	D range (throttle valve fully open)						L range
	1 → 2	2 → 3	3 → O/D	O/D → 3	3 → 2	2 → 1	2 → 1
	51 – 66 (32 – 41)	95 – 111 (59 – 69)	No shift *1	*2	86 – 102 (53 – 63)	35 – 48 (22 – 30)	41 – 56 (25 – 35)
	*1 3 → O/D shift up point with closed throttle valve is at 34 – 47 km/h (21 – 29 mph) *2 O/D → 3 down-shift is possible up to maximum speed.						

Specifications (Cont'd)

Valve body spring	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	No. coils	Wire diameter
	(Upper front valve body)				
	Secondary regulator valve	71.27 (2.8059)	17.43 (0.6862)	15	1.93 (0.0760)
	Down shift plug	39.76 (1.5654)	10.83 (0.4264)	11.5	1.20 (0.0472)
	Throttle valve	21.94 (0.8638)	8.58 (0.3378)	8	0.71 (0.0280)
	(Upper rear valve body)				
	Low coast modulator valve	42.35 (1.6673)	9.24 (0.3638)	15	0.84 (0.0331)
	Sequence valve	37.55 (1.4783)	9.17 (0.3610)	14.5	1.17 (0.0461)
	2-3 shift timing valve	35.10 (1.3819)	8.96 (0.3528)	12.5	0.76 (0.0299)
	Detent regulator valve	29.93 (1.1783)	8.85 (0.3484)	13.5	0.90 (0.0354)
	Intermediate modulator valve	27.26 (1.0732)	9.04 (0.3559)	9.5	1.10 (0.0433)
	(Lower valve body)				
	Primary regulator valve	61.20 (2.4094)	17.20 (0.6772)	13	1.80 (0.0709)
	1-2 shift valve	34.62 (1.3630)	7.56 (0.2976)	13	0.56 (0.0220)
	3-4 shift valve	33.65 (1.3248)	10.60 (0.4173)	14.5	1.10 (0.0433)
	Oil cooler by-pass valve (C & C)	28.90 (1.1378)	13.80 (0.5433)	6.5	1.60 (0.0630)
	Oil cooler by-pass valve (others)	33.32 (1.3118)	13.82 (0.5441)	7	1.32 (0.0520)
	Pressure relief valve ball	32.14 (1.2654)	13.14 (0.5173)	9	2.03 (0.0799)
	Damping check ball	20.00 (0.7874)	4.95 (0.1949)	15	0.38 (0.0150)
	Cooler return check ball	13.70 (0.5394)	10.50 (0.4134)	10	0.50 (0.0197)

Clutch and brake return spring (C_0, C_1, C_2)	Free length	15.10 mm	0.5945 in.
	Coil outer diameter	8.0 mm	0.315 in.
	No. of coils	5.5	
Clutch and brake return spring (B_0, B_1, B_2, B_3)	Free length	16.12 mm	0.6346 in.
	Coil outer diameter	8.0 mm	0.315 in.
	No. of coils	6	

Oil pump	Side clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
		Limit	0.1 mm	0.004 in.
	Body clearance	STD	0.07 – 0.15 mm	0.0028 – 0.0059 in.
		Limit	0.3 mm	0.012 in.
	Tip clearance Driven gear	STD	0.11 – 0.14 mm	0.0043 – 0.0055 in.
		Limit	0.3 mm	0.012 in.
Clutch and brake piston stroke	Front clutch (C_1)	STD	1.32 – 2.66 mm	0.0520 – 0.1047 in.
	Rear clutch (C_2)	STD	0.91 – 1.99 mm	0.0358 – 0.0783 in.
	O/D clutch (C_0)	STD	1.77 – 2.58 mm	0.0697 – 0.1016 in.
	No. 1 brake (B_1)	STD	0.58 – 1.30 mm	0.0228 – 0.0512 in.
	No. 2 brake (B_2)	STD	1.01 – 2.25 mm	0.0398 – 0.0886 in.
Brake clearance	No. 3 brake (B_3)	STD	0.61 – 2.64 mm	0.0240 – 0.1039 in.
	O/D brake (B_0)	STD	0.65 – 2.21 mm	0.0256 – 0.0870 in.

Accumulator piston mm (in.)		Length	Outer diameter
	B_2 Front	48.5 (1.909)	34.8 (1.370)
	C_2 Center	45.0 (1.772)	31.8 (1.252)
	C_1 Rear	49.5 (1.949)	31.8 (1.252)

Specifications (Cont'd)

Accumulator piston spring mm (in.)		Free length	Coil outer diameter	No. coils	Wire diameter
	B_2 Front	66.68 (2.6252)	16.36 (0.6441)	14.5	2.60 (0.1024)
	C_2 Center	55.18 (2.1724)	15.87 (0.6248)	8.5	2.00 (0.0787)
	C_1 Rear	64.68 (2.5465)	17.50 (0.6890)	18.5	2.00 (0.0787)

Bushing bore mm (in.)	Bushing name		Length	Finished bore	Bore limit
	Stator support	Front	9.70 (0.3819)	21.501 – 21.527 (0.8465 – 0.8475)	21.577 (0.8495)
		Rear	17.45 (0.6870)	21.501 – 21.527 (0.8465 – 0.8475)	21.577 (0.8495)
	Oil pump body		13.46 (0.5299)	38.113 – 38.138 (1.5005 – 1.5015)	38.188 (1.5035)
	OD sun gear	Front & Rear	9.70 (0.3819)	23.062 – 23.088 (0.9080 – 0.9090)	23.138 (0.9109)
	OD input shaft		9.00 (0.3543)	11.200 – 11.221 (0.4409 – 0.4418)	11.271 (0.4437)
	Sun gear	Front & Rear	13.50 (0.5315)	21.501 – 21.527 (0.8465 – 0.8475)	21.577 (0.8495)
	Center support		60.07 (2.3650)	36.386 – 36.411 (1.4325 – 1.4335)	36.461 (1.4355)
	Transmission case		13.46 (0.5299)	38.113 – 38.138 (1.5005 – 1.5015)	38.188 (1.5035)
	Output shaft		9.70 (0.3819)	18.001 – 18.026 (0.7087 – 0.7096)	18.076 (0.7117)
	Extension housing		29.75 (1.1713)	38.010 – 38.035 (1.4965 – 1.4974)	38.085 (1.4994)

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Engine x Transmission		650	47	64
Transmission housing x Converter housing	12 mm	580	42	57
	10 mm	345	25	34
Extension housing		345	25	34
Drive plate		850	61	83
Torque converter		280	20	27
Oil pump		215	16	21
Center support		260	19	25
Upper valve body x Lower valve body		55	48 in.-lb	5.4
Valve body		100	7	10
Oil strainer		55	48 in.-lb	5.4
Oil pan		45	39 in.-lb	4.4

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N·m
Cooler pipe union nut	350	25	34
Testing plug	75	65 in.-lb	7.4
Parking lock pawl bracket	75	65 in.-lb	7.4
Drain plug	205	15	20
Governor body	40	35 in.-lb	3.9
Neutral start switch bolt	55	48 in.-lb	5.4

AUTOMATIC TRANSMISSION (A340H)

Specifications

Line pressure (wheel locked)					
Engine idling		D range	3.7 – 4.3 kg/cm^2	53 – 61 psi	363 – 422 kPa
		R range	5.1 – 6.1 kg/cm^2	73 – 87 psi	500 – 598 kPa
At stall		D range	9.5 – 12.0 kg/cm^2	135 – 171 psi	932 – 1,177 kPa
(Throttle valve fully opened)		R range	13.2 – 16.7 kg/cm^2	188 – 238 psi	1,294 – 1,638 kPa
Engine stall revolution			2,200 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)		N range	750 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter installing					
Drive plate runout		Limit	0.20 mm	0.0079 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	

Shift point km/h (mph)	Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3→O/D]	[O/D→3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	46–50 (29–31)	90–98 (56–61)	136–144 (85–89)	37–42 (23–26)	28–33 (17–21)	130–138 (81–86)	81–86 (50–53)	41–45 (25–28)
		PWR	50–57 (31–35)	97–108 (60–67)	155–167 (96–104)	51–58 (32–36)	27–34 (17–21)	149–161 (93–100)	91–102 (57–63)	42–49 (26–30)
	2 range	NORM PWR	46–50 (29–31)	109–117 (68–73)	–	–	–	–	87–110 (54–68)	37–42 (23–26)
	L range	NORM PWR	–	–	–	–	–	–	–	50–54 (31–34)

Lock-up point km/h (mph)	Transfer shift position "H2" or "H4"		Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	3rd	O/D	2nd	3rd	O/D
	D range	NORM	–	–	63–67 (39–42)	–	–	59–63 (37–39)
		PWR	–	–	80–84 (50–52)	–	–	74–78 (46–48)

Transmission Specifications

Oil pump	Body clearance	STD	0.07 – 0.15 mm	0.0028 – 0.0059 in.
		Limit	0.3 mm	0.012 in.
	Tip clearance	STD	0.11 – 0.14 mm	0.0043 – 0.0055 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in.
		Limit	0.1 mm	0.004 in.
Bushing bore	Oil pump body	Limit	38.19 mm	1.5035 in.
	Stator shaft (FR)	Limit	21.58 mm	0.8496 in.
	(RR)	Limit	27.08 mm	1.0661 in.
	O/D direct clutch drum	Limit	27.11 mm	1.0673 in.
	O/D planetary gear	Limit	11.27 mm	0.4437 in.
	Direct clutch drum	Limit	53.97 mm	2.1248 in.
	Forward clutch drum	Limit	24.08 mm	0.9480 in.
	Front planetary ring gear	Limit	24.08 mm	0.9480 in.
	Planetary sun gear	Limit	27.08 mm	1.0661 in.
	Transmission case	Limit	38.19 mm	1.5035 in.
Flange thickness	O/D direct clutch (C_0)	No. 21	3.1 mm	0.122 in.
		No. 20	3.2 mm	0.126 in.
		No. 19	3.3 mm	0.130 in.
		No. 18	3.4 mm	0.134 in.
		No. 17	3.5 mm	0.138 in.
		No. 16	3.6 mm	0.142 in.
	Direct clutch (C_2)	No. 33	3.0 mm	0.118 in.
		No. 32	3.1 mm	0.122 in.
		No. 31	3.2 mm	0.126 in.
		No. 30	3.3 mm	0.130 in.
		No. 29	3.4 mm	0.134 in.
		No. 28	3.5 mm	0.138 in.
		No. 27	3.6 mm	0.142 in.
		No. 34	3.7 mm	0.146 in.
	O/D brake (B_0)	No. 26	3.3 mm	0.130 in.
		No. 25	3.5 mm	0.138 in.
		No. 12	3.6 mm	0.142 in.
		No. 24	3.7 mm	0.146 in.
		No. 11	3.8 mm	0.150 in.
		No. 23	3.9 mm	0.157 in.
		None	4.0 mm	0.157 in.
Clutch piston stroke	O/D direct clutch (C_0)		1.77 – 2.07 mm	0.0697 – 0.0815 in.
	Direct clutch (C_2)		1.03 – 1.33 mm	0.0406 – 0.0524 in.
	Forward clutch (C_1)		3.11 – 3.89 mm	0.1224 – 0.1531 in.
Brake piston stroke	O/D brake (B_0)		1.32 – 1.62 mm	0.0520 – 0.0638 in.
	Second coast brake (B_1)		1.5 – 3.0 mm	0.059 – 0.118 in.
Brake pack clearance	Second brake (B_2)		0.50 – 1.76 mm	0.0197 – 0.0693 in.
	First and reverse brake (B_3)		0.58 – 2.06 mm	0.0228 – 0.0811 in.

Specifications (Cont'd)

	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	No. coils	Color
Valve body spring mm (in.)	(Upper valve body)				
	Down-shift plug	27.4 (1.079)	8.8 (0.346)	11.5	Yellow
	Throttle valve	20.6 (0.811)	9.2 (0.362)	7.5	Blue
		or 23.3 (0.917)	9.2 (0.362)	7.5	White
	3–4 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
	Second coast modulator valve	25.3 (0.996)	8.6 (0.339)	9.5	Orange
	Lock-up relay valve	21.4 (0.843)	5.5 (0.217)	15.5	Light Gray
	Secondary regulator valve	30.9 (1.217)	11.2 (0.441)	8.5	Blue
	Cut-back valve	21.8 (0.858)	6.0 (0.236)	11.5	None
	2–3 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
	Low coast modulator valve	30.4 (1.197)	8.3 (0.327)	8.5	Light Green
	(Lower valve body)				
	Check valve	18.3 (0.720)	12.0 (0.472)	4.5	None
	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	5.5	None
	1–2 shift valve	30.8 (1.213)	9.7 (0.382)	8.5	Purple
	Primary regulator valve	66.7 (2.626)	18.6 (0.732)	10.5	None
	Accumulator control valve	33.9 (1.335)	8.8 (0.346)	10.0	Pink

Output shaft thrust play	0.27 – 0.86 mm (0.0106 – 0.0339 in.)
Second coast brake piston rod length	71.4 mm (2.811 in.) 72.9 mm (2.870 in.)

Accumulator piston spring			Free length mm (in.)	Coil outer diameter mm (in.)	No. coils	Color
	B_2	Upper	53.5 (2.106)	19.7 (0.776)	8.7	Red
		Lower	38.0 (1.496)	19.4 (0.764)	4.9	Light Gray
	C_2	Upper (Outer)	51.0 (2.008)	20.0 (0.787)	7.9	None
		Upper (Inner)	32.1 (1.264)	14.3 (0.563)	8.5	Red
		Lower	39.0 (1.535)	20.8 (0.819)	5.5	Blue
	B_0	–	69.7 (2.744)	16.7 (0.657)	14.3	Light Green
	C_0	–	67.0 (2.638)	17.8 (0.701)	12.5	White

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Engine x Transmission		650	47	64
Transmission housing x Transmission case	10 mm	345	25	34
	12 mm	580	42	57
Transfer case x Transmission case		345	25	34
O/D support x Transmission case		260	19	25
Oil pump x Transmission case		220	16	22
Oil pump body x Stator shaft		100	7	10
Valve body x Transmission case		100	7	10
Oil strainer	Upper	100	7	10
	Lower	70	61 in.-lb	6.9
Oil pan		75	65 in.-lb	7.4

Torque Specifications (Cont'd)

Part tightened		kg-cm	ft-lb	N·m
Temperature		150	11	15
Union		300	22	29
Cooler pipe union nut		350	25	34
Drive plate x Crank shaft		850	61	83
Torque converter x Drive plate		280	20	27
Neutral start switch	Bolt	130	9	13
	Nut	70	61 in.-lb	6.9
Control shaft lever		160	12	16

Transfer Specifications

Valve body spring	Spring	Free length mm (in.)	Coil outer diameter mm (in.)	No. Coils	Color
	(Upper valve body)				
	Direct clutch accumulator valve	55.7 (2.193)	18.3 (0.720)	9.1	Blue
	(Center valve body)				
	Low shift valve	29.2 (1.150)	8.2 (0.323)	11.0	Yellow
	Low-high relay valve	31.7 (1.248)	8.5 (0.335)	9.2	Light Blue
	Accumulator control valve	29.3 (1.154)	8.2 (0.323)	9.8	White
	(Lower valve body)				
	Low-high shift timing valve	31.7 (1.248)	8.6 (0.339)	7.0	Purple
	Low-high orifice control valve	29.7 (1.169)	9.0 (0.354)	10.3	Green
Accumulator piston spring	B_4 accumulator piston	66.5 (2.618)	19.0 (0.748)	13.0	Pink

Clutch piston stroke	Direct clutch (C_3)		2.28 – 2.68 mm	0.0898 – 0.1055 in.
	Front drive clutch (C_4)		2.39 – 3.21 mm	0.0941 – 0.1264 in.
Brake pack clearance	Low speed brake (B_4)		0.91 – 2.10 mm	0.0358 – 0.0827 in.
Bushing bore	Direct clutch drum	Limit	47.65 mm	1.8760 in.
	Center support	Limit	35.08 mm	1.3811 in.
	Front support	Limit	31.35 mm	1.2342 in.
	Ring gear flange	Limit	35.08 mm	1.3811 in.
Oil pump	Body clearance	STD	0.07 – 0.15 mm	0.0028 – 0.0059 in.
		Limit	0.3 mm	0.012 in.
	Tip clearance	STD	0.15 – 0.42 mm	0.0059 – 0.0165 in.
		Limit	0.6 mm	0.024 in.
	Side clearance	STD	0.04 – 0.15 mm	0.0016 – 0.0059 in.
		Limit	0.3 mm	0.012 in.

Specifications (Cont'd)

Flange thickness	Direct clutch (C_3)	3.9 mm	0.154iin.
		4.1 mm	0.161 in.
		4.3 mm	0.169 in.
		4.5 mm	0.177 in.
	Low speed brake (B_4)	3.8 mm	0.150 in.
		4.0 mm	0.157 in.
		4.2 mm	0.165 in.
		4.4 mm	0.173 in.
		4.6 mm	0.181 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Extension housing x Chain rear case		345	25	34
Chain rear case x Chain front case		345	25	34
Chain front case x Transfer case		345	25	34
Transfer case x Transmission case		345	25	34
Valve body x Transfer case		100	7	10
Front support x Transfer case		345	25	34
Transfer oil pump x Chain rear case		160	12	16
Transfer chain oil receiver x Chain front case	Large bolt	345	25	34
	Small bolt	100	7	10
Oil strainer x Chain rear case		70	61 in.-lb	6.9
Oil pump body x Oil pump cover		100	7	10
Front and rear companion flanges		1,250	90	123
Oil pan x Transfer case		75	65 in.-lb	7.4
No. 4 solenoid x Valve body		100	7	10
Detent spring x Valve body		70	61 in.-lb	6.9
Parking lock pawl bracket		70	61 in.-lb	6.9
Union		300	22	29
Transfer oil cooler tube union nut		350	25	34
Transfer position switch	Bolt	130	9	13
	Nut	40	35 in.-lb	3.9
Control shaft lever		160	12	16

TRANSFER

Specifications

Output shaft bearing thrust clearance		Less than 0.10 mm (0.0039 in.)	
Output shaft snap ring thickness	Mark		
	0	2.40 – 2.45 mm	0.0945 – 0.0965 in.
	1	2.45 – 2.50 mm	0.0965 – 0.0984 in.
	2	2.50 – 2.55 mm	0.0984 – 0.1004 in.
	3	2.55 – 2.60 mm	0.1004 – 0.1024 in.
	4	2.60 – 2.65 mm	0.1024 – 0.1043 in.
	5	2.65 – 2.70 mm	0.1043 – 0.1063 in.
Output shaft runout	Limit	0.03 mm	0.0012 in.
Low gear to output shaft oil clearance	STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
	Limit	0.075 mm	0.0030 in.
Low gear thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.30 mm	0.0118 in.
Transfer drive gear to output shaft oil clearance			
	STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
	Limit	0.071 mm	0.0028 in.
Transfer drive gear thrust clearance	STD	0.09 – 0.27 mm	0.0035 – 0.0106 in.
	Limit	0.32 mm	0.0126 in.
Input shaft bearing thrust clearance		Less than 0.15 mm (0.0059 in.)	
Input shaft snap ring thickness	Mark		
	1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter shaft bearing thrust clearance		Less than 0.15 mm (0.0059 in.)	
Counter shaft snap ring thickness	Mark		
	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Idler gear shaft bearing thrust clearance		Less than 0.15 mm (0.0059 in.)	
Idler gear shaft snap ring thickness	Mark		
	A	1.50 – 1.55 mm	0.0591 – 0.0610 in.
	B	1.60 – 1.65 mm	0.0630 – 0.0650 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.

Torque Specifications

Part tightened	kg-cm	ft-lb	N·m
Adaptor x Reduction gear case	400	29	39
Reduction gear case x Front case x Rear case	400	29	39
Rear case x Extension housing	400	29	39
Front case x Rear case	400	29	39
Reduction case x Front case	400	29	39

Torque Specifications (Cont'd)

Part tightened	kg-cm	ft-lb	N·m
Reduction case x Transfer case cover (G52, R151F)	90	78 in.-lb	8.8
Reduction case x Shift lever retainer (W56)	130	9	13
Output shaft x Companion flange	1,250	90	123
Front drive gear bearing retainer x Front case	185	13	18
Front case x Bearing retainer	185	13	18
Straight screw plug	120	9	12

PROPELLER SHAFT

Specifications

Spider axial play			Less than 0.05 mm (0.0020 in.)	
Spider bearing selection				
	Mark			
Bearing cup outer diameter	None	Ex. RN50L-KRA	29.008 – 29.021 mm	1.1420 – 1.1426 in.
		RN50L-KRA	26.015 – 26.028 mm	1.0242 – 1.0247 in.
Bearing hole inner diameter	None	Ex. RN50L-KRA	29.000 – 29.021 mm	1.1417 – 1.1426 in.
		RN50L-KRA	26.000 – 26.021 mm	1.0236 – 1.0244 in.
Bearing cup outer diameter	Red	Ex. RN50L-KRA	29.028 – 29.041 mm	1.1428 – 1.1433 in.
		RN50L-KRA	26.036 – 26.049 mm	1.0250 – 1.0255 in.
Bearing hole inner diameter	Drill	Ex. RN50L-KRA	29.021 – 29.042 mm	1.1426 – 1.1434 in.
		RN50L-KRA	26.021 – 26.042 mm	1.0244 – 1.0253 in.
Snap ring thickness	Color			
	None	Ex. RN50L-KRA	1.475 – 1.525 mm	0.0581 – 0.0600 in.
		RN50L-KRA	2.375 – 2.425 mm	0.0935 – 0.0955 in.
	Brown	Ex. RN50L-KRA	1.525 – 1.575 mm	0.0600 – 0.0620 in.
		RN50L-KRA	2.425 – 2.475 mm	0.0955 – 0.0974 in.
	Blue	Ex. RN50L-KRA	1.575 – 1.625 mm	0.0620 – 0.0640 in.
		RN50L-KRA	2.475 – 2.525 mm	0.0974 – 0.0994 in.
Runout		Limit	0.8 mm	0.031 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Intermediate shaft x Propeller shaft		750	54	74
Propeller shaft x Differential (2WD)		750	54	74
Propeller shaft x Transfer (4WD)		750	54	74
Propeller shaft x Differential (4WD)	Ex. 22R-TE (M/T)	750	54	74
	22R-TE (M/T)	850	61	83
Center support bearing x Body		370	27	36
Intermediate shaft x Center bearing x Joint flange				
	1st	1,850	134	181
	2nd	Loosen nut		
	3rd	700	51	69

FRONT AXLE AND SUSPENSION

Specifications (2WD)

<table>
<tr><td rowspan="10">Cold tire inflation pressure</td><td colspan="2">Tire size</td><td colspan="2">kg/cm^2 (psi, kPa)</td></tr>
<tr><td rowspan="2">205/70 SR 14</td><td>Front</td><td colspan="2">1.9 (28, 190)</td></tr>
<tr><td>Rear</td><td colspan="2">2.2 (32, 220)</td></tr>
<tr><td rowspan="2">7.00–14–6PR</td><td>Front</td><td colspan="2">1.7 (24, 170)</td></tr>
<tr><td>Rear</td><td colspan="2">2.5 (36, 250)</td></tr>
<tr><td rowspan="2">P195/75 R 14</td><td>Front</td><td colspan="2">2.0 (29, 200)</td></tr>
<tr><td>Rear</td><td colspan="2">2.4 (35, 240)</td></tr>
<tr><td rowspan="2">185R14LT–8PR</td><td>Front</td><td colspan="2">1.8 (26, 180)</td></tr>
<tr><td>Rear</td><td colspan="2">4.5 (65, 440)</td></tr>
<tr><td rowspan="2">185R14LT–6PR</td><td>Front</td><td colspan="2">2.0 (29, 200)</td></tr>
<tr><td>Rear</td><td colspan="2">2.0 (29, 200)</td></tr>
<tr><td rowspan="12">Chassis ground clearance</td><td rowspan="2">Body type</td><td rowspan="2">Tire size</td><td colspan="2">Chassis ground clearance mm (in.)</td></tr>
<tr><td>Front</td><td>Rear</td></tr>
<tr><td rowspan="2">1/2 ton Short</td><td>7.00–14–6PR</td><td>269 (10.59)</td><td>287 (11.30)</td></tr>
<tr><td>P195/75 R 14</td><td>251 (9.88)</td><td>269 (10.59)</td></tr>
<tr><td rowspan="3">1/2 ton Long</td><td>7.00–14–6PR</td><td>273 (10.75)</td><td>275 (10.83)</td></tr>
<tr><td>P195/75 R 14</td><td>255 (10.04)</td><td>257 (10.83)</td></tr>
<tr><td>205/70 SR 14</td><td>261 (10.28)</td><td>263 (10.35)</td></tr>
<tr><td>1/2 ton Extra Long</td><td>P195/75 R 14</td><td>255 (10.04)</td><td>262 (10.31)</td></tr>
<tr><td>1.0 ton</td><td>185R14LT–8PR</td><td>262 (10.31)</td><td>286 (11.26)</td></tr>
<tr><td>C & C Long (SRW)</td><td>185R14LT–8PR</td><td>262 (10.31)</td><td>304 (11.97)</td></tr>
<tr><td>C & C Long (DRW)</td><td>185R14LT–6PR</td><td>261 (10.28)</td><td>283 (11.14)</td></tr>
<tr><td>C & C Super Long (DRW)</td><td>185R14LT–6PR</td><td>263 (10.35)</td><td>283 (11.14)</td></tr>
</table>

Specifications (2WD) (Cont'd)

			Inspection STD	Adjustment STD
Front wheel alignment	Toe-in			
	1/2 ton Short	Bias tire	4 ± 2 mm (0.16 ± 0.08 in.)	4 ± 1 mm (0.16 ± 0.04 in.)
		Radial tire	1 ± 2 mm (0.04 ± 0.08 in.)	1 ± 1 mm (0.04 ± 0.04 in.)
	1/2 ton Long	Bias tire	6 ± 2 mm (0.24 ± 0.08 in.)	6 ± 1 mm (0.24 ± 0.04 in.)
		Radial tire	3 ± 2 mm (0.12 ± 0.08 in.)	3 ± 1 mm (0.12 ± 0.04 in.)
	1.0 ton, C & C, 1/2 ton	Extra Long	4 ± 2 mm (0.16 ± 0.08 in.)	4 ± 1 mm (0.16 ± 0.04 in.)
	Camber		0°30' ± 45'	0°30' ± 30'
		Left-right error	30' or less	30' or less
	Steering axis inclination		10°00' ± 45'	–
		Left-right error	30' or less	–
	Caster	1/2 ton Short	0°40' ± 45'	0°40' ± 30'
		1/2 ton Long	1°10' ± 45'	1°10' ± 30'
		1/2 ton Extra Long	1°00' ± 45'	1°00' ± 30'
		1.0 ton	0°35' ± 45'	0°35' ± 30'
		C & C Long (SRW)	0°05' ± 45'	0°05' ± 30'
		C & C Long (DRW)	0°35' ± 45'	0°35' ± 30'
		C & C Super Long (DRW)	0°50' ± 45'	0°50' ± 30'
		Left-right error	30' or less	30' or less
	Slide slip		3.0 mm/m (0.118 in./3.3 ft) or less	
	Wheel angle Max.	Inside wheel	$34^{\circ}{}^{+1^{\circ}}_{-2^{\circ}}$	
		Outside wheel	30°	
		At 20° (outside wheel)	22°15' (Inside wheel)	
Disc wheel lateral runout		Limit	1.2 mm	0.047 in.
Wheel bearing preload (starting) (rotating load at hub bolt)			0.6 – 1.8 kg	1.3 – 4.0 lb 5.9 – 17.7 N
			Add oil seal frictional force	
Hub axial play		Limit	0.05 mm	0.0020 in.
Ball joint vertical play		Limit	2.3 mm	0.091 in.
Ball joint rotation condition		Lower ball joint	25 – 50 kg-cm	22 – 43 in.-lb 2.5 – 4.9 N·m
		Upper ball joint	20 – 40 kg-cm	18 – 34 in.-lb 2.0 – 3.9 N·m

Specifications (4WD)

Coid tire inflation pressure	Tire size	Front kg/cm² (psi, kPa)	Rear kg/cm² (psi, kPa)
	P225/75 R 15	1.8 (26, 180)	2.0 (29, 200)

Front wheel alignment and chassis ground clearance	Model	Chassis Ground clearance mm (in.)		Toe-in mm (in.)	Camber	Caster	Steering axis inclination
				Inspection standard			
		Front	Rear	Adjustment standard			
	RN61L-MRA	285.0 (11.220)	455.0 (17.913)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°10′ ± 45′ 1°10′ ± 30′	11°55′ ± 45′ –
	RN66L-MDA	289.5 (11.398)	452.0 (17.795)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°35′ ± 45′ 0°35′ ± 30′	1°20′ ± 45′ 1°20′ ± 30′	12°00′ ± 45′ –
	RN66L-MDCA	286.0 (11.260)	451.0 (17.756)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°20′ ± 45′ 1°20′ ± 30′	11°55′ ± 45′ –
	RN61L-MSEA	283.0 (11.142)	449.0 (17.677)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°20′ ± 45′ 1°20′ ± 30′	11°55′ ± 45′ –
	RN66L-PDEA	289.0 (11.378)	445.5 (17.539)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°35′ ± 45′ 0°35′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	12°00′ ± 45′ –
	RN66L-PDCEA	286.5 (11.260)	445.5 (17.539)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN66L-MSCEA	283.5 (11.161)	445.5 (17.539)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN61LG-MDEA	287.5 (11.319)	421.0 (16.575)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –
	RN61LG-PDEA	287.5 (11.319)	419.0 (16.496)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°10′ ± 45′ 2°10′ ± 30′	11°55′ ± 45′ –
	RN61LG-MSEA	289.5 (11.398)	421.5 (16.594)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –
	RN61V-MDEA	284.5 (11.201)	422.5 (16.634)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –
	RN61V-PDEA	291.5 (11.476)	422.0 (16.614)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°35′ ± 45′ 0°35′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	12°00′ ± 45′ –
	RN61L-MBZA	284.5 (11.201)	450.5 (17.736)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°15′ ± 45′ 1°15′ ± 30′	11°55′ ± 45′ –
	RN66L-PGCZA	282.0 (11.102)	444.5 (17.500)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN61LG-PGZA	288.0 (11.339)	421.5 (16.594)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –
	RN61L-MDK	286.0 (11.260)	455.0 (17.913)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°10′ ± 45′ 1°10′ ± 30′	11°55′ ± 45′ –
	RN66L-MDK	289.5 (11.398)	452.0 (17.800)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°35′ ± 45′ 0°35′ ± 30′	1°20′ ± 45′ 1°20′ ± 30′	12°00′ ± 45′ –
	RN66L-PDEK	289.0 (11.378)	445.5 (17.539)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°35′ ± 45′ 0°35′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	12°00′ ± 45′ –
	RN66L-MSEK	286.0 (11.260)	445.5 (17.539)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN66L-MSCEK	283.5 (11.161)	445.5 (17.539)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN61V-MSEK	288.5 (11.358)	421.5 (16.594)	4 ± 2 (0.12 ± 0.08) 4 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –

Specifications (4WD)(Cont'd)

Front wheel alignment and chassis ground clearance (cont'd)	Model	Chassis ground clearance mm (in.)		Toe-in mm (in.)	Camber	Caster	Steering axis inclination
				Inspection STD			
		Front	Rear	Adjustment STD			
	RN61V-PSEK	289.0 (11.378)	418.5 (16.476)	4 ± 2 (0.16 ± 0.08) 4 ± 1 (0.16 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°10′ ± 45′ 2°10′ ± 30′	11°55′ ± 45′ –
	RN66L-PGCZK	282.0 (11.102)	445.0 (17.520)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	1°30′ ± 45′ 1°30′ ± 30′	11°55′ ± 45′ –
	RN61LV-PGZK	287.0 (11.300)	421.0 (16.575)	3 ± 2 (0.12 ± 0.08) 3 ± 1 (0.12 ± 0.04)	0°40′ ± 45′ 0°40′ ± 30′	2°05′ ± 45′ 2°05′ ± 30′	11°55′ ± 45′ –
	Camber left-right error			30′ or less			
	Caster left-right error			30′ or less			
	Steering axis inclination left-right error			30′ or less			
Front wheel alignment	Side slip			3.0 mm/m (0.118 in./3.3 ft) or less			
	Wheel angle Max.	Inside wheel		$32°00'^{+1°}_{-2°}$			
		Outside wheel		31°00′			
	At 20° wheel angle	Inside wheel		21°10′			
		Outside wheel		20°			

Disc wheel lateral runout	Limit	1.2 mm	0.047 in.
Wheel bearing preload (starting) (rotating load at hub bolt)		2.9 – 5.7 kg	6.4 – 12.6 lb 28 – 56 N
Free wheeling hub ring oil clearance		0.3 mm	0.012 in.
Automatic locking hub brake shoe thickness	Minimum	1.5 mm	0.059 in.
Front drive shaft thrust clearance		0.075 – 0.690 mm	0.0030 – 0.0272 in.
	Maximum	1.0 mm	0.039 in.
Front drive shaft thrust clearance adjusting shim thickness		1.80 mm	0.0709 in.
		2.25 mm	0.0886 in.
Front drive shaft grease capacity			
	Outboard joint	195 – 205 g	0.43 – 0.45 lb
	Inboard joint	270 – 280 g	0.60 – 0.62 lb
Front drive shaft length		393.9 – 403.9 mm	15.508 – 15.902 in.
Front differential drive pinion bearing preload (starting)			
	New bearing	12 – 19 kg-cm	10.4 – 16.5 in.-lb 1.2 – 1.9 N·m
	Reused bearing	6 – 10 kg-cm	5.2 – 8.7 in.-lb 0.6 – 1.0 N·m
Front differential companion flange deviation			
Maximum longtudinal deviation		0.10 mm	0.0039 in.
Maximum latetudinal deviation		0.10 mm	0.0039 in.
Front differential ring gear runout		0.07 mm	0.0028 in.
Front differential ring gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
Front differential preload (starting)	Total preload	Add drive pinion preload	
		4 – 6 kg-cm	3.5 – 5.2 in.-lb 0.4 – 0.6 N·m
Front differential side gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
Front differential side gear backlash adjusting washer thickness		0.96 – 1.04 mm	0.0378 – 0.0409 in.
		1.06 – 1.14 mm	0.0417 – 0.0449 in.
		1.16 – 1.24 mm	0.0457 – 0.0488 in.
		1.26 – 1.34 mm	0.0496 – 0.0528 in.

Specifications (4WD)(Cont'd)

Front differential backlash or side bearing preload thrust washer thickness	2.57 – 2.59 mm	0.1012-– 0.1020 in.	
	2.60 – 2.62 mm	0.1024 – 0.1031 in.	
	2.63 – 2.65 mm	0.1035 – 0.1043 in.	
	2.66 – 2.68 mm	0.1047 – 0.1055 in.	
	2.69 – 2.71 mm	0.1059 – 0.1067 in.	
	2.72 – 2.74 mm	0.1071 – 0.1079 in.	
	2.75 – 2.77 mm	0.1083 – 0.1091 in.	
	2.78 – 2.80 mm	0.1094 – 0.1102 in.	
	2.81 – 2.83 mm	0.1106 – 0.1114 in.	
	2.84 – 2.86 mm	0.1118 – 0.1126 in.	
	2.87 – 2.89 mm	0.1130 – 0. 1138 in.	
	2.90 – 2.92 mm	0.1142 – 0.1150 in.	
	2.93 – 2.95 mm	0.1154 – 0.1161 in.	
	2.96 – 2.98 mm	0.1165 – 0.1173 in.	
	2.99 – 3.01 mm	0.1177 – 0.1185 in.	
	3.02 – 3.04 mm	0.1189 – 0.1197 in.	
	3.05 – 3.07 mm	0.1201 – 0.1209 in.	
	3.08 – 3.10 mm	0.1213 – 0.1220 in.	
	3.11 – 3.13 mm	0.1224 – 0.1232 in.	
	3.14 – 3.16 mm	0.1236 – 0.1244 in.	
	3.17 – 3.19 mm	0.1248 – 0.1256 in.	
	3.20 – 3.22 mm	0.1260 – 0.1268 in.	
	3.23 – 3.25 mm	0.1272 – 0.1280 in.	
Front differential drive pinion plate washer thickness	2.24 mm	0.0882 in.	
	2.27 mm	0.0894 in.	
	2.30 mm	0.0906 in.	
	2.33 mm	0.0917 in.	
	2.36 mm	0.0929 in.	
	2.39 mm	0.0941 in.	
	2.42 mm	0.0953 in.	
	2.45 mm	0.0965 in.	
	2.48 mm	0.0976 in.	
	2.51 mm	0.0988 in.	
	2.54 mm	0.1000 in.	
	2.57 mm	0.1012 in.	
	2.60 mm	0.1024 in.	
	2.63 mm	0.1035 in.	
	2.66 mm	0.1047 in.	
	2.69 mm	0.1059 in.	
	2.72 mm	0.1071 in.	
Front differential rear oil seal drive in depth	1.5 mm	0.059 in.	
Side gear shaft runout	0.20 mm	0.0079 in.	
Lower ball joint vertical play	0 mm	0 in.	
Upper ball joint vertical play	2.3 mm	0.91 in.	
Lower ball joint turning torque	30 – 60 kg-cm	26 – 52 in.-lb	3.0 – 5.9 N·m
Drive shaft standard length	398.9 mm	15.705 in.	

Torque Specifications (2WD)

Part tightened	kg-cm	ft-lb	N·m
Knuckle stopper bolt lock nut	350	25	34
Tie rod clump bolt	260	19	25
Steering knuckle x Upper ball joint	1,100	80	108
Steering knuckle x Lower ball joint	1,450	105	142
Steering knuckle x Tie rod	920	67	90
Upper suspension arm x Upper ball joint	270	20	26
Lower suspension arm x Lower ball joint	700	51	69
Torsion bar spring lock nut	850	61	83
Lower suspension arm x Strut bar	970	70	95
Lower suspension arm x Stabilizer bar	130	9	13
Lower suspension arm x Shock absorber	185	13	18
Shock absorber x Frame	250	18	25
Lower arm shaft nut	2,300	166	226
Upper arm shaft x Frame	1,000	72	98
Disc brake cylinder x Steering knuckle	900	65	88
Upper suspension Arm set bolt	1,280	93	126
Strut bar x Frame	1,250	90	123
Stabilizer bar bracket x Frame	130	9	13

Torque Specifications (4WD)

Part tightened	kg-cm	ft-lb	N·m
Knuckle stopper bolt lock nut	480	35	47
Free wheeling hub body x Axle hub	315	23	31
Free wheeling hub body x Front drive shaft	185	13	18
Free wheeling hub body x Cover	100	7	10
Automatic locking hub drum x Adjusting nut	70	61 in.-lb	6.9
Axle hub bearing lock nut	480	35	47
Disc brake cylinder x Steering knuckle	1,250	90	123
Upper suspension arm x Upper ball joint	340	25	33
Upper ball joint x Steering knuckle	1,450	105	142
Steering knuckle arm x Steering knuckle	1,660	120	163
Lower suspension arm x Shock absorber	1,400	101	137
Lower suspension arm x Stabilizer bar	260	19	25
Lower suspension arm x Lower ball joint	1,450	105	142
Front drive shaft x Side gear shaft	845	61	83
Front differential x Propeller shaft	750	54	74
Front differential front mounting bolt	1,500	108	147
Front differential rear left mounting bolt	1,700	123	167
Front differential rear right mounting bolt	1,700	123	167
Differential tube x Bracket	1,300	94	127
Front differential x Bracket	1,300	94	127
Ring gear x Differential case	985	71	97
Differential carrier x Differential tube	900	65	85
Differential carrier x Side bearing cap	800	58	78
Differential carrier x Carrier cover	475	34	47
Torsion bar spring lock nut	850	61	83
Lower suspension arm x Frame	2,800	203	275
Upper suspension arm shaft x Frame	1,530	111	150

Torque Specifications (4WD)(Cont'd)

Part tightened	kg-cm	ft-lb	N·m
Upper suspension arm shaft lock nut	2,300	166	226
Upper suspension arm x Torque arm	890	70	95
Shock absorber x Frame	250	18	25
Stabilizer bar bracket x Frame	130	9	13

REAR AXLE AND SUSPENSION

Specifications

Rear axle shaft (Single tire)	Maximum shaft runout	2.0 mm	0.079 in.
	Maximum flange runout	0.2 mm	0.008 in.
Rear axle shaft and hub (Double tire)	Maximum shaft runout	2.0 mm	0.079 in.
	Preload (starting)	Add oil seal frictional force	
		0.1 – 1.5 kg	0.2 – 3.3 lb 1.0 – 14.7 N
7.5 in. Differential 2WD 1/2 ton	Drive pinion bearing preload (starting)		
	New bearing	12–19 kg-cm	10.4–16.5 in.-lb 1.2–1.9 N·m
	Reused bearing	6 – 10 kg-cm	5.2 – 8.7 in.-lb 0.6–1.0 N·m
	Total preload (starting)	Add drive pinion bearing preload	
	New and reused bearing	4 – 6 kg-cm	3.5 – 5.2 in.-lb 0.4–0.6 N·m
	Drive pinion to ring gear backlash	0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Pinion gear to side gear backlash	0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout Limit	0.07 mm	0.0028 in.
	Companion flange deviation Limit		
	Radial	0.10 mm	0.0039 in.
	Lateral	0.10 mm	0.0039 in.
	Ring gear installing temperature	90 – 110°C	194 – 230°F
	Side gear thrust washer thickness	1.0 mm	0.039 in.
		1.1 mm	0.043 in.
		1.2 mm	0.047 in.
		1.3 mm	0.051 in.
	Drive pinion adjusting plate washer thickness	2.24 mm	0.0882 in.
		2.27 mm	0.0894 in.
		2.30 mm	0.0906 in.
		2.33 mm	0.0917 in.
		2.36 mm	0.0929 in.
		2.39 mm	0.0941 in.
		2.42 mm	0.0953 in.
		2.45 mm	0.0965 in.
		2.48 mm	0.0976 in.
		2.51 mm	0.0988 in.
		2.54 mm	0.1000 in.
		2.57 mm	0.1012 in.

Specifications (Cont'd)

7.5 in. Differential 2WD 1/2 ton (cont'd)	Drive pinion adjusting plate washer thickness (cont'd)		2.60 mm	0.1024 in.	
			2.63 mm	0.1035 in.	
			2.66 mm	0.1047 in.	
			2.69 mm	0.1059 in.	
			2.72 mm	0.1071 in.	
8.0 in. Differential 1 ton, C & C and 4WD	Drive pinion bearing preload (starting)				
	22R, 22R-E engine	New bearing	19 – 26 kg-cm	16.5 – 22.6 in.-lb	1.9 – 2.5 N·m
		Reused bearing	9 – 13 kg-cm	7.8 – 11.3 in.-lb	0.9 – 1.3 N·m
	22R-TE engine	New bearing	10 – 16 kg-cm	8.7 – 13.9 in.-lb	1.0 – 1.6 N·m
		Reused bearing	5 – 8 kg-cm	4.3 – 6.9 in.-lb	0.5 – 0.8 N·m
	Total preload (starting)		Add drive pinion bearing preload		
		New and reused bearing	4 – 6 kg-cm	3.5 – 5.2 in.-lb	0.4 – 0.6 N·m
	Drive pinion to ring gear backlash		0.13 – 0.18 mm	0.0051 – 0.0071 in.	
	Pinion gear to side gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.	
	Ring gear runout	Limit	0.10 mm	0.0039 in.	
	Companion flange deviation	Limit			
		Radial	0.10 mm	0.0039 in.	
		Lateral	0.10 mm	0.0039 in.	
	Ring gear installing temperature		90 – 110°C	194 – 230°F	
	Side gear thrust washer thickness		1.6 mm	0.063 in.	
			1.7 mm	0.067 in.	
			1.8 mm	0.071 in.	
	Drive pinion adjusting plate washer thickness		1.70 mm	0.0669 in.	
			1.73 mm	0.0681 in.	
			1.76 mm	0.0693 in.	
			1.79 mm	0.0705 in.	
			1.82 mm	0.0717 in.	
			1.85 mm	0.0728 in.	
			1.88 mm	0.0740 in.	
			1.91 mm	0.0752 in.	
			1.94 mm	0.0764 in.	
			1.97 mm	0.0776 in.	
			2.00 mm	0.0787 in.	
			2.03 mm	0.0799 in.	
			2.06 mm	0.0811 in.	
			2.09 mm	0.0823 in.	
			2.12 mm	0.0835 in.	
			2.15 mm	0.0846 in.	
			2.18 mm	0.0858iin.	
			2.21 mm	0.0870 in.	
			2.24 mm	0.0882 in.	
			2.27 mm	0.0894 in.	
			2.30 mm	0.0906 in.	
			2.33 mm	0.0917 in.	

Torque Specifications

	Part tightened		kg-cm	ft-lb	N·m
Differential	Propeller shaft x Companion flange		750	54	74
	Drive pinion x Companion flange		See page RA-28		
	Ring gear x Differential case		985	71	97
	Bearing cap x Differential carrier		800	58	78
	Differential carrier x Axle housing	Single tire	250	18	25
		Double tire	315	23	31
Rear axle and suspension	Rear axle housing x Bearing retainer		700	51	69
	Spring center bolt		450	33	44
	Spring U bolt x Axle housing		1,250	90	123
	Front spring bracket x Hanger pin		930	67	91
	Rear spring shackle x Leaf spring		930	67	91
	Rear shock absorber x U-bolt seat	2WD	260	19	25
		4WD	650	47	64
	Rear shock absorber x Body	2WD	260	19	25
		4WD	650	47	64
	Axle shaft x Axle hub		340	25	33
	Axle hub x Brake drum		650	47	64
	Stabilizer Bar x Axle housing		115	8	11
	Stabilizer link x Body		170	12	17
	Stabilizer bar x Link		250	18	25

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height	Truck 4WD	144 – 149 mm	5.67 – 5.87 in.
		Truck 4WD & 4 Runner	150 – 155 mm	5.91 – 6.10 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance (from asphalt sheet)	at 50 kg (110.2 lb, 490 N)		
		2WD 1/2 ton	More than 65 mm (2.56 in.)	
		22R-TE	More than 75 mm (2.95 in.)	
		1 ton, C & C	More than 55 mm (2.17 in.)	
		4WD 22R series	More than 55 mm (2.17 in.)	
		22R-TE	More than 50 mm (1.97 in.)	
Brake booster	Booster push rod to piston clearance			
		w/SST	0 mm	0 in.
Front brake (PD60 type disc) (2WD)	Pad thickness	STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
	Disc thickness	STD	25.0 mm	0.984 in.
		Limit	24.0 mm	0.945 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
Front brake (FS-17 type disc) (2WD)	Pad thickness	STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
	Disc thickness	STD	22.0 mm	0.866 in.
		Limit	21.0 mm	0.827 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
Front brake (S12+8 type disc) (4WD)	Pad thickness	STD	9.5 mm	0.374 in.
		Limit	1.0 mm	0.039 in.
	Disc thickness	STD	20.0 mm	0.787 in.
		Limit	19.0 mm	0.748 in.
	Disc runout	Limit	0.15 mm	0.0059 in.
Rear brake (2WD)	Drum inner diameter	STD	254.0 mm	10.000 in.
		Limit	256.0 mm	10.079 in.
	Lining thickness	STD	5.0 mm	0.197 in.
		Limit	1.0 mm	0.039 in.
Rear brake (4WD)	Drum inner diameter	STD	295.0 mm	11.614 in.
		Limit	297.0 mm	11.693 in.
	Lining thickness	STD	6.0 mm	0.236 in.
		Limit	1.0 mm	0.039 in.
Parking brake	Lever travel	at 20 kg (44.1 lb, 196 N) 2WD	10 – 16 clicks	
		4WD	9 – 17 clicks	

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Brake booster clevis lock nut		260	19	25
Brake booster x Pedal bracket		130	9	13
Master cylinder x Brake booster		130	9	13
Master cylinder fluid outlet plug	16 mm	450	33	44
	18 mm	685	50	67
Piston stopper bolt x Master cylinder		100	7	10
Brake tube union nut x Master cylinder		155	11	15
Disc brake cylinder x Torque plate	(2WD) PD60	400	29	39
	FS17	900	65	88
Torque plate x Steering knuckle	(2WD)	1,100	80	108
Disc Brake cylinder x Steering knuckle	(4WD)	1,250	90	123
Brake tube union nut		155	11	15
Bleeder plug		110	8	11
Front disc x Front axle hub		650	47	64
Flexible hose bracket x Disc brake cylinder	(2WD)	185	13	18
Drum brake backing plate x Rear axle housing		700	51	69
Rear brake wheel cylinder x Backing plate (Leading-trailing type – 4WD, 2WD 1/2 ton)		100	7	10
Rear brake wheel cylinder x Backing plate (Duo-servo type – 2WD 1 ton)		145	10	14
Rear brake bleeder plug		110	8	11
Brake tube x Wheel cylinder		155	11	15
Bellcrank bracket x Backing plate		130	9	13
LSP & BV bracket x Frame		195	14	19
LSP & BV x LSP & BV valve bracket		130	9	13
LSP & BV spring x LSP & BV valve bracket		185	13	18
LSP & BV spring x Shackle		185	13	18
LSP & BV shackle lock nut		260	19	25
LSP & BV shackle x Shackle bracket		130	9	13
LSP & BV shackle bracket x Rear axle housing		195	14	19

STEERING

Specifications

Steering	Steering wheel freeplay		30 mm (1.18 in.) or less
	Joint radial play	Maximum	0.06 mm (0.0024 in.)
	Bearing block width	Punch mark	
		Yes	15.97 – 16.00 mm 0.6287 – 0.6299 in.
		No	16.00 – 16.03 mm 0.6299 – 0.6311 in.
Tilt steering	Collar No. 1 outer diameter		17.998 – 18.005 mm 0.7086 – 0.7089 in.
			18.005 – 18.012 mm 0.7089 – 0.7091 in.
			18.012 – 18.019 mm 0.7091 – 0.7094 in.
			18.019 – 18.026 mm 0.7094 – 0.7097 in.
			18.026 – 18.033 mm 0.7097 – 0.7100 in.
	Collar No. 2 outer diameter		18.005 – 18.020 mm 0.7089 – 0.7094 in.
			18.020 – 18.035 mm 0.7094 – 0.7100 in.
	Tilt steering support	Mark	
	shim thickness	None	0.193 – 0.203 mm 0.0078 – 0.0080 in.
		5	0.495 – 0.505 mm 0.0195 – 0.0199 in.
		8	0.795 – 0.805 mm 0.0313 – 0.0317 in.
		14	1.395 – 1.405 mm 0.0549 – 0.0553 in.
		18	1.795 – 1.805 mm 0.0707 – 0.0711 in.
Steering gear housing (2WD)	Sector shaft thrust clearance	Maximum	0.05 mm 0.0020 in.
	Thrust washer thickness		2.00 mm 0.0787 in.
			2.04 mm 0.0803 in.
			2.08 mm 0.0819 in.
			2.12 mm 0.0835 in.
			2.16 mm 0.0850 in.
			2.20 mm 0.0866 in.
	Worm bearing preload	at Starting	3 – 5 kg-cm 2.6–4.3 in.-lb 0.3 – 0.5 N·m
	Total preload	at Starting	8–10.5 kg-cm 6.9–9.1 in.-lb 0.8 – 1.0 N·m
	Gear housing oil level		18 – 28 mm (0.71 – 1.10 in.) from top
Steering gear housing (4WD)	Sector shaft thrust clearance	Maximum	0.05 mm 0.0020 in.
	Thrust washer thickness		1.95 mm 0.0768 in.
			2.00 mm 0.0787 in.
			2.05 mm 0.0807 in.
	Sector shaft bushing inside diameter		32.000 – 32.025 mm 1.2598 – 1.2608 in.
	Worm bearing preload	at Starting	3.5 – 5 kg-cm 3.0–4.3 in.-lb 0.3 – 0.5 N·m
	Total preload	at Starting	8 – 11 kg-cm 6.9–9.5 in.-lb 0.8 – 1.1 N·m
	Gear housing oil level		14 – 17 mm (0.55 – 0.67 in.) from top
Power steering	Drive belt tension		
	(Nippondenso BTG-20 (95506-00020) or Borroughs No. BT-33-73F)	New belt	125 ± 25 lb
		Used belt	80 ± 20 lb
	Maximum rise of oil level		Below 5 mm (0.20 in.)
	Oil pressure at Idle speed	2WD	75 kg/cm^2 (1,067 psi, 7,355 kPa) or more
		4WD	65 kg/cm^2 (924 psi, 6,374 kPa) or more

Specifications (Cont'd)

Power steering (cont'd)	Steering effort		4 kg (8.8 lb, 39 N) or less	
	Rotor shaft bushing oil clearance		0.07 mm (0.0028 in.) or less	
	Rotor to cam ring clearance		0.06 mm (0.0024 in.) or less	
	Vane plate to rotor groove clearance		0.06 mm (0.0024 in.) or less	
	Vane plate	Minimum length	14.97 mm	0.5894 in.
		Minimum height	7.8 mm	0.307 in.
		Minimum thickness	1.7 mm	0.067 in.
	Vane plate length			
	Rotor and cam ring mark			
		None	14.996 – 14.998 mm	0.5904 – 0.5905 in.
		1	14.994 – 14.996 mm	0.5903 – 0.5904 in.
		2	14.992 – 14.994 mm	0.5902 – 0.5903 in.
		3	14.990 – 14.992 mm	0.59016 – 0.59024 in.
		4	14.988 – 14.990 mm	0.5901 – 0.5902 in.
	Flow control valve spring length	STD	50 mm	1.97 in.
		Minimum	47 mm	1.85 in.
	Pump rotating torque		2.8 kg-cm (2.4 in.-lb, 0.3 N·m) or less	
	Power piston ball clearance	Maximum	0.15 mm	0.0059 in.
	Cross shaft adjusting screw thrust clearance		0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Worm bearing preload	at Starting	4.0–6.5 kg-cm	3.5–5.6 in.-lb 0.4–0.6 N·m
	Total preload	at Starting	Add worm bearing preload	
			2 – 3 kg-cm	1.7–2.6 in.-lb 0.2–0.3 N·m
Steering linkage	Idler arm rotating torque	at Turning	5–30 kg-cm	5 – 26 in.-lb 0.5–2.9 N·m

Torque Specifications

Rigid steering	Part tightened	kg-cm	ft-lb	N-m
	Upper bracket x Column tube	55	48 in.-lb	5.4
	Column tube x Column tube bracket	195	14	19
	Column hole cover x Body	80	69 in.-lb	7.8
	Column tube x Body	260	19	25
	Steering wheel x Main shaft	350	25	34
	Main shaft x Intermediate shaft	360	26	35
	Intermediate shaft x Worm shaft	360	26	35
Tilt steering	Pawl set bolt	185	13	18
	Tilt lever retainer	185	13	18
	Tilt steering support stopper bolt	100	7	10
	Upper bracket x Tilt steering support	75	65 in.-lb	7.4
	Column tube x Column bracket	195	14	19
	Main shaft x Intermediate shaft	260	19	25
	Column hole cover x Body	80	69 in.-lb	7.8
	Steering wheel x Main shaft	350	25	34
	Intermediate shaft x Worm shaft	360	26	35
Steering gear housing (2WD)	Worm bearing adjusting screw lock nut	1,830	132	179
	Sector shaft end cover x Gear housing	500	36	49
	Sector shaft adjusting screw lock nut	275	20	27
	Gear housing x Frame	660	48	65
	Pitman arm x Sector shaft	1,250	90	123
	Pitman arm x Relay rod	920	67	90
	Worm shaft x Intermediate shaft	360	26	35
Steering gear housing (4WD)	Worm bearing adjusting screw lock nut	1,100	80	109
	Sector shaft end cover x Gear housing	1,000	72	98
	Sector shaft adjusting screw lock nut	450	33	44
	Gear housing x Frame	970	70	95
	Worm shaft x Intermediate shaft	360	26	35
	Pitman arm x Sector shaft	1,800	130	177
Power steering	Pressure port union x Rear housing	700	51	69
	Front housing x Rear housing	470	34	46
	Suction port union x Rear housing	130	9	13
	Air control valve x Rear housing	370	27	36
	PS pump x Bracket	400	29	39
	PS pump pulley x Rotor shaft	440	32	43
	Pressure tube x Pressure port union	370	27	36
	Ball guide clamp set screw	30	26 in.-lb	2.9
	Worm gear valve body x Gear housing	470	34	46
	Worm bearing adjusting screw lock nut	430	31	42
	Cross shaft end cover x Gear housing	470	34	46
	Cross shaft adjusting screw lock nut	470	34	46

Torque Specifications (Cont'd)

	Part tightened		kg-cm	ft-lb	N·m
Power steering (cont'd)	Gear housing x Frame	2WD	660	48	65
		4WD	970	70	95
	Pressure line x Gear housing		450	33	44
	Return line x Gear housing		450	33	44
	Intermediate shaft x Worm shaft		360	26	35
	Pitman arm x Cross shaft	2WD	1,250	90	123
		4WD	1,800	130	177
	Pitman arm x Relay rod		920	67	90
Steering linkage (2WD)	Pitman arm x Sector shaft		1,250	90	123
	Pitman arm x Relay rod		920	67	90
	Tie rod end clamp bolt		260	19	25
	Tie rod x Relay rod		920	67	90
	Tie rod x Knuckle arm		920	67	90
	Relay rod x Idler arm		600	43	59
	Knuckle arm x Steering knuckle		1,100	80	108
	Steering damper x Frame		130	9	13
	Steering damper x Relay rod		600	43	59
	Idler arm x Idler arm bracket		800	58	78
	Idler arm bracket x Frame		660	48	65
Steering linkage (4WD)	Pitman arm x Sector shaft		1,800	130	177
	Pitman arm x Relay rod		920	67	90
	Tie rod end clamp bolt		260	19	25
	Tie rod x Relay rod		920	67	90
	Tie rod x Knuckle arm		920	67	90
	Relay rod x Idler arm		600	43	59
	Relay rod x Steering damper		600	43	59
	Knuckle arm x Steering knuckle		1,660	120	162
	Idler arm x Idler arm bracket		970	70	95
	Idler arm bracket x Frame		970	70	95

BODY

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
SEAT				
Front Seat (Separate Seat)				
Seat back x Seat adjuster	Sports seat & 4 Runner	185	13	18
	Others	375	27	37
Seat cushion x Seat adjustor	Sports seat & 4 Runner	185	13	18
	Others	375	27	37
Seat adjuster x Body		375	27	37
Front Seat (Split Bench Seat)				
Seat back x Seat adjuster		375	27	37
Seat cushion x Seat adjuster		375	27	37
Seat back x Seat cushion		130	9	13
Armrest bracket x Seat back		185	13	18
Armrest bracket x Armrest		70	61 in.-lb	6.9
Seat cushion x Seat track		185	13	18
Seat track x Body		375	27	37
Front Seat (Bench Seat)				
Seat back x Seat cushion		375	27	37
Seat track x Seat cushion		185	13	18
Seat track x Body		375	27	37
Rear Seat (4 Runner)				
Seat back lock x Seat back		185	13	18
Seat back center hinge x Seat back		80	69 in.-lb	7.8
Seat back center hinge x Body		185	13	18
Seat back hinge x Seat back		80	69 in.-lb	7.8
Seat back hinge x Body		185	13	18
Seat cushion holder x Seat cushion		80	69 in.-lb	7.8
Seat cushion hinge x Seat cushion		80	69 in.-lb	7.8
Seat cushion hinge x Body		185	13	18
SEAT BELT				
ELR x Body	Upper side	50	43 in.-lb	4.9
	Lower side	440	32	43
Seat belt anchor x Body		440	32	43

LUBRICANT

Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil				API grade SF or SF/CC multigrade, fuel efficient and recommended viscosity oil
Drain and refill				
w/o Oil filter change	3.8	4.0	3.3	
w/ Oil filter change	4.3	4.5	3.8	
Dry fill	4.8	5.1	4.2	
Manual transmission oil				API GL-4 or GL-5 SAE 75W-90 or 80W-90
2WD G40, G57	2.2	2.3	1.9	
W46, W55, W56	2.4	2.5	2.1	
4WD W56	3.0	3.2	2.6	
2WD R150	2.6	2.7	2.3	API GL-4 or GL-5 SAE 75W-90
Automatic transmission fluid				ATF DEXRON® II
A43D Dry fill	6.5	6.9	5.7	
Drain and refill	2.4	2.5	2.1	
A340H transmission				
Dry fill	10.3	10.9	9.1	
Drain and refill	4.5	4.8	4.0	
A340H transfer				
Dry fill	1.1	1.2	1.0	
Drain and refill	0.8	0.8	0.7	
Transfer oil W56	1.6	1.7	1.4	API GL-4 or GL-5, SAE 75W-90 or 80W-90
A340H	0.8	0.8	0.7	
Differential oil				API GL-5 hypoid gear oil Above –18°C (0°F) SAE 90 Below –18°C (0°F) SAE 80W-90 or 80W
2WD 7.5 in.	1.35	1.4	1.2	
8.0 in.	1.8	1.9	1.6	
4WD Front	1.6	1.7	1.4	
Rear 22R, 22R-E	2.2	2.3	1.9	
22R-TE	2.35	2.5	2.1	
Steering gear box oil				API GL-4, SAE 90
2WD	380 – 400 cc		23.2 – 24.4 cu in.	
4WD	400 cc		24.4 cu in.	
Power steering fluid				ATF DEXRON® or DEXRON® II
Pump	300 cc		18.3 cu in.	
Total	900 cc		54.9 cu in.	
Ball joint grease (2WD)	–			Molybdenum disulphide lithium base, NLGI No. 1 or No. 2
Chassis grease (4WD)				
Propeller shaft (Except double cardan joint)	–			Lithium base, NLGI No. 2
Double cardan joint				Molybdenum disulphide lithium base, NLGI No. 2

LUBRICANT (Cont'd)

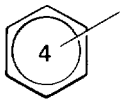
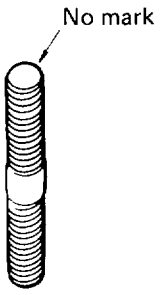
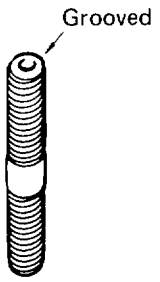
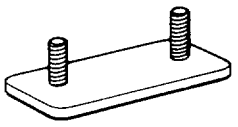
Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Wheel bearing grease	–			Lithium base multipurpose, NLGI No. 2
Steering knuckle and front axle shaft grease (4WD)	–			Molybdenum disulphide lithium base, NLGI No. 2
Brake fluid	–			SAE J1703, DOT 3

STANDARD BOLT TORQUE SPECIFICATIONS

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STANDARD BOLT TORQUE SPECIFICATIONS B-2

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4– 5– 6– 7–	4T 5T 6T 7T	Stud bolt		4T
	 No mark	4T			
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T			6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			kg-cm	ft-lb	N·m	kg-cm	ft-lb	N·m
4T	6	1	55	48 in.-lb	5.4	60	52 in.-lb	5.9
	8	1.25	130	9	13	145	10	14
	10	1.25	260	19	25	290	21	28
	12	1.25	480	35	47	540	39	53
	14	1.5	760	55	75	850	61	83
	16	1.5	1,150	83	113		–	
5T	6	1	65	56 in.-lb	6.4		–	
	8	1.25	160	12	16		–	
	10	1.25	330	24	32		–	
	12	1.25	600	43	59		–	
	14	1.5	930	67	91		–	
	16	1.5	1,400	101	137		–	
6T	6	1	80	69 in.-lb	7.8	90	78 in.-lb	8.8
	8	1.25	195	14	19	215	16	21
	10	1.25	400	29	39	440	32	43
	12	1.25	730	53	72	810	59	79
	14	1.5		–		1,250	90	123
7T	6	1	110	8	11	120	9	12
	8	1.25	260	19	25	290	21	28
	10	1.25	530	38	52	590	43	58
	12	1.25	970	70	95	1,050	76	103
	14	1.5	1,500	108	147	1,700	123	167
	16	1.5	2,300	166	226		–	

SST AND SSM

	Page
SST (SPECIAL SERVICE TOOLS)	C-2
SSM (SPECIAL SERVICE MATERIALS)	C-19

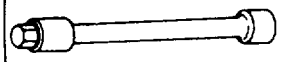
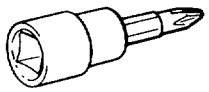
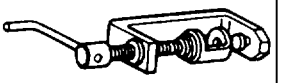
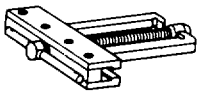
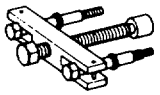
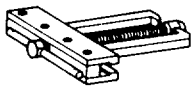
SST (SPECIAL SERVICE TOOLS)

NOTE: Classification

A = SST required for vehicle inspections and minor repairs and multipurpose SST.

B = SST required for major repairs involving disassembly of components.

C = SST required for rather special, less frequent work not of classifiable as either A or B.

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09032-00100	(Oil Pan Seal Cutter)	A	●										●							
	09043-38100	(Hexagon 10 mm Wrench)	A									●		●							
	09060-20010	(Socket Wrench)	B																	●	
	09201-41020	(Valve Stem Oil Seal Replacer)	B						*1 ●												
	09201-60011	(Valve Guide Bushing Remover & Replacer)	A	●								*2 ●	*2 ●		*2 ●						
	09202-43013	(Valve Spring Compressor)	A	●																	
	09213-27010	(Gear Remover)	B									●									
	09213-31021	(Crankshaft Pulley Puller)	A	●								*3 ●									
	09213-36020	(Timing Gear Remover)	B	●				●				*4 ●									
	09213-70010	(Crankshaft Pulley Holding Tool)	A	●																	

Remarks:

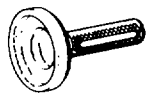
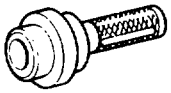
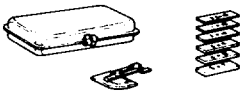
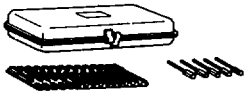
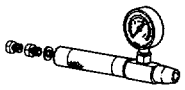
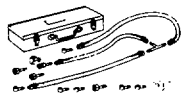
*1 Starter armature bearing for 1.4 kW type only

*2 Speedometer driven gear oil seal

*3 No. 5 gear spline piece

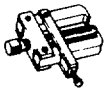
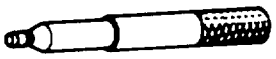
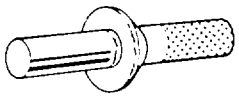
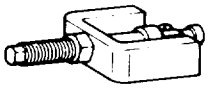
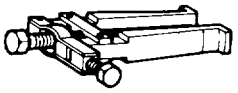
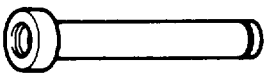
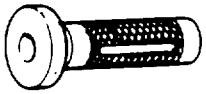
*4 Counter rear bearing and sleeve

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	EC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09222-30010	(Connecting Rod Bushing Remover & Replacer)	B	●																		
	09223-41020	(Crankshaft Rear Oil Seal Replacer)	B	●																		
	09223-46011	(Crankshaft Front Oil Seal Replacer)	B																		*1 ●	
	09223-50010	(Crankshaft Front Oil Seal Replacer)	B	●					●				*2 ●									
	09228-07500	(Oil Filter Wrench)	A						●													
	09236-00101	(Water Pump Overhaul Tool Set)	B																		●	
	(09237-00010)	(Water Pump Bearing Remover & Replacer)																			*3 ●	
	09238-47012	(Water Pump Bearing Remover & Replacer)	B										*4 ●									
	09240-00014	(Carburetor Adjusting Gauge Set)	A					●														
	09240-00020	(Wire Gauge Set)	A												●							
	09258-14010	(Air Pump Tester)	A			●																
	09268-41045	(Injection Measuring Tool Set)	B				●															

Remarks:
- *1 Idler arm bracket cap
- *2 Front bearing retainer oil seal
- *3 Steering main shaft lower bearing
- *4 Shifting key retainer

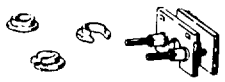
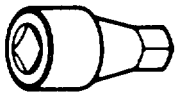
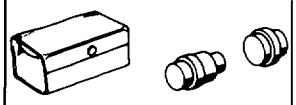
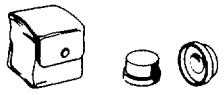
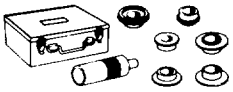
SST (SPECIAL SERVICE TOOLS) (Cont'd)

Illustration	Part No.	Part Name	Classification	EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09268-45012	EFI Fuel Pressure Gauge	A			●															
	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	C						*1 ●												
	09286-46011	Injection Pump Spline Shaft Puller	C						*2 ●	*3 ●											
	09301-20020	(Clutch Guide Tool)	A								●										
	09302-30031	Clutch Diaphragm Spring Height No. 3 Gauge	B								●										
	09303-35011	Input Shaft Front Bearing Puller	A								●										
	09304-30012	Input Shaft Front Bearing Replacer	A								●										
	09305-20012	Gear Shift Lever Remover	A												●						
	09308-00010	(Oil Seal Puller)	A									●		●	●		*4 ●	●		●	
	09308-10010	(Oil Seal Puller)	A									●	●				*4 ●	●			
	09309-35010	Transmission Rear Bearing Replacer	B									*5 ●									
	09310-35010	Countershaft Bearing Replacer	B												*6 ●						

Remarks:

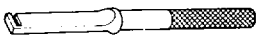
- *1 Starter front bearing (1.0 kW only)
- *2 Armature bearing
- *3 Rear end frame
- *4 4WD only
- *5 Output shaft center bearing
- *6 Front drive gear rear bearing, idler gear front bearing and extension housing oil seal

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09312-20011	(Transmission Gear Remover & Replacer)	B									*1 ●									
	09313-30021	(Detent Ball Plug Socket)	A									●			●						
	09315-00010	(Clutch Release Bearing Remover & Replacer)	A								●										
	09315-00021	(Clutch Release Bearing Remover & Replacer)	A								●										
	09316-60010	(Transmission & Transfer Bearing Replacer)	B									●			●						
	(09316-00010)	(Replacer Pipe)										*2 ●			●						
	(09316-00020)	(Replacer "A")										●			●						
	(09316-00030)	(Replacer "B")										*3 ●									
	(09316-00040)	(Replacer "C")													●						
	(09316-00050)	(Replacer "D")													●						
	(09316-00070)	(Replacer "F")										●			●						
	09320-89010	(Transfer Clutch Spring Compressor)	B											●							

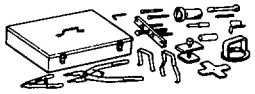
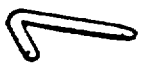
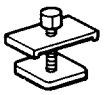
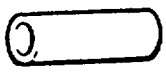
Remarks:
*1 W45, 55 series only
*2 No. 5 gear spline piece
*3 5th gear

SST (SPECIAL SERVICE TOOLS) (Cont'd)

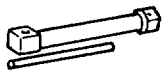
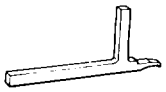
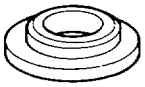
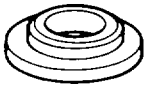
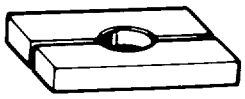
Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT		TF	PR	FA	RA	BR	SR	BO
													2WD (A43D)	4WD (A340H)							
	09325-12010	Transmission Oil Plug	A									*1 ●									
	09325-20010	Transmission Oil Plug	A									*2 ●	●		*3 ●	●					
	09330-00021	Companion Flange Holding Tool	A	●										●	●	●	*4 ●	●			
	09332-25010	Universal Joint Bearing Remover & Replacer	B													●					
	09333-00013	Clutch Diaphragm Spring Aligner	B								●										
	09350-20015	TOYOTA Automatic Transmission Tool Set	B										●								
	(09361-30011)	Manual Valve Lever Shaft Oil Seal Replacer											●								
	(09362-30011)	(Guide Bolt)											●								
	(09363-20010)	Oil Pump Body Setting Band											●								
	(09369-20040)	Piston Spring Compressor Set											●								
	(09370-12010)	Clutch Drum Thrust Play Gauge											●								
	(09388-20010)	(Oil Seal Replacer)											●								

Remarks:
- *1 Transfer adapter oil seal
- *2 Extension housing oil seal
- *3 Extension housing oil seal, front drive gear oil seal and front drive gear dust cover
- *4 4WD only

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	(09397-22020)	One-way Clutch Test Tool Set											●								
	09350-30020	TOYOTA Automatic Transmission Tool Set	B											●							
	(09350-06120)	No. 2 Measure Terminal												●							
	(09350-07020)	(Oil Pump Puller)												●							
	(09350-07030)	No. 1 Piston Spring Compressor												●							
	(09350-07040)	No. 2 Piston Spring Compressor												●							
	(09350-07050)	No. 3 Piston Spring Compressor												●							
	(09350-07060)	No. 1 Snap Ring Expander												●							
	(09350-07070)	No. 2 Snap Ring Expander												●							
	(09350-07080)	Brake Reaction Sleeve Puller												●							
	(09350-07090)	Brake No. 1 Piston Puller												●							
	(09350-07110)	(Oil Seal Replacer)												●							

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT		TF	PR	FA	RA	BR	SR	BO
													2WD (A43D)	4WD (A340H)							
	(09351-32010)	(One-way Clutch Test Tool)												●							
	(09351-32020)	(Stator Stopper)												●							
	(09351-32140)	(Oil Seal Replacer)												●							
	09504-00011	(Differential Side Bearing Adjusting Nut Wrench)	B															●			
	09504-22011	(Differential Side Washer Remover & Replacer)	B														*1 ●				
	09506-30012	(Differential Drive Pinion Rear Bearing Cone Replacer)	B														*1 ●	●			
	09506-35010	(Differential Drive Pinion Rear Bearing Replacer)	B									*2 ●									
	09509-25011	(Rear Axle Bearing Lock Nut Wrench)	A															*3 ●			
	09515-30010	(Rear Wheel Bearing Replacer)	B															*4 ●			
	09517-12010	(Rear Axle Shaft Oil Seal Replacer)	B															*3 ●			
	09521-25011	(Rear Axle Shaft Puller)	B															*4 ●			
	09527-20011	(Rear Axle Shaft Bearing Remover)	B																	*5 ●	

Remarks:

*1 Front hub cap (2WD RN75)

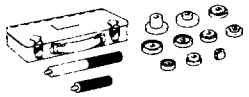
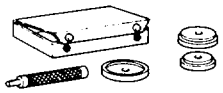
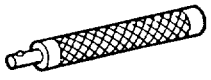
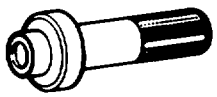
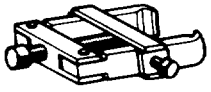
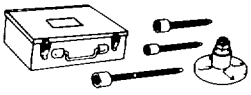
*2 Input shaft bearing, output shaft center bearing, output shaft rear bearing and 5th gear

*3 Double tire

*4 Single tire

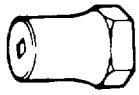
*5 Steering main shaft lower bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09550-10012	(Replacer Set "B")	B														●			●	
	(09252-10010)	(No. 1 Replacer Handle)															*1 ●				
	(09552-10010)	(No. 2 Replacer Handle)																		●	
	(09555-10010)	(Differential Drive Pinion Rear Bearing Replacer)															*1 ●				
	(09557-10010)	(Differential Drive Pinion Front Bearing Replacer)															*1 ●				
	(09559-10010)	(Knuckle Inner Bearing Replacer)															*1 ●			*2 ●	
	09550-22011	(Rear Axle Bearing & Differential Tool Set)	B														●				
	(09550-00020)	(Handle)															*1 ●				
	(09550-00031)	(Replacer)															*1 ●				
	09554-30011	(Differential Oil Seal Replacer)	A														*1 ●	●			
	09556-30010	(Drive Pinion Front Bearing Remover)	B														*1 ●	●			
	09557-22022	(Companion Flange Remover & Replacer)	A													●	*1 ●	●			

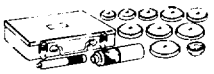
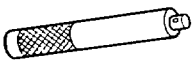
Remarks:
*1 4WD only
*2 Sector shaft oil seal
Worm shaft lower and upper bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration			EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09607-60020	(Front Wheel Adjusting Nut Wrench)	A													*1 ●				
	09608-12010	(Front Hub & Drive Pinion Bearing Replacer Set)	B								●		●							
	(09608-00020)	(Remover & Replacer Handle)									●		*2 ●							
	(09608-00040)	(Front Hub Outer Bearing Cup Replacer)											*2 ●							
	(09608-00050)	(Drive Pinion Front Bearing Cup Replacer)									*3 ●		*2 ●							
	09608-20012	(Front Hub & Drive Pinion Bearing Tool Set)	B						●		●									
	(09608-00030)	(Replacer)							*4 ●											
	(09608-00080)	(Replacer)									*5 ●									
	(09608-03020)	(Handle)									●									
	09608-30012	(Front Hub & Drive Pinion Bearing Tool Set)	B													●	●		●	
	(09608-00060)	(Replacer)															●			
	(09608-04020)	(Handle)														*6 ●	●			

Remarks:
- *1 4WD only
- *2 Transfer front output shaft bearing and oil seal and transfer front drive shaft bearing
- *3 Rear bearing outer race and counter rear bearing
- *4 Front bearing
- *5 Front bearing retainer oil seal
- *6 2WD only

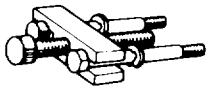
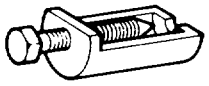
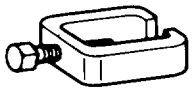
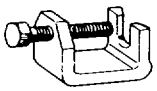
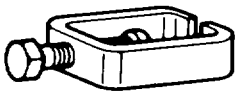
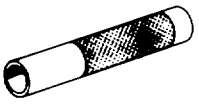
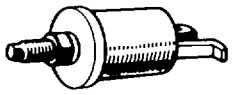
SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	(09608-04030)	Front Hub Inner Bearing Cone Replacer																		*1 ●	
	(09608-04060)	Front Hub Outer Bearing Cup Replacer															*2 ●				
	(09608-04070)	Front Hub Inner Bearing Cup Replacer																●			
	(09608-04100)	Drive Pinion Front Bearing Cup Replacer															*2 ●	●			
	(09608-04110)	Drive Pinion Rear Bearing Cup Replacer																●			
	09608-32010	Steering Knuckle Oil Seal Replacer	B											*3 ●							
	09608-35014	Axle Hub & Drive Pinion Bearing Tool Set	B	●								●		●			●	●			
	(09608-06020)	(Handle)										●		*4 ●			*5 ●	*6 ●			
	(09608-06040)	Front Hub Inner Bearing Cone Replacer		●																	
	(09608-06090)	Front Hub Outer & Steering Worm Bearing Replacer										*7 ●									
	(09608-06100)	Front Hub Outer Replacer										*8 ●		*4 ●				*9 ●			
	(09608-06110)	Front Hub Inner & Drive Pinion Front Bearing Cup Replacer															*5 ●				

Remarks:

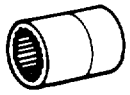
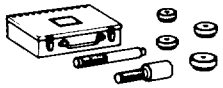
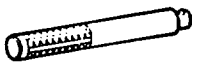
- *1 Power steering pump rotor shaft oil seal
- *2 2WD only
- *3 Transfer front output shaft oil seal
- *4 Transfer front drive shaft oil seal
  Transfer front output shaft oil seal
  Transfer extension housing oil seal
- *5 4WD only
- *6 Double tire
- *7 Counter center bearing outer race and front bearing retainer oil seal
- *8 Rear bearing outer race
- *9 Single tire

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT		TF	PR	FA	RA	BR	SR	BO
													2WD (A43D) 4WD (A340H)								
	(09608-06120)	(Front Hub Outer Bearing Cup Replacer)															*1 ●				
	(09608-06150)	(Rear Hub Outer Bearing Cup Replacer)															*1 ●				
	(09608-06180)	(Drive Pinion Rear Bearing Cup Replacer)															*1 ●	●			
	(09608-06200)	(Rear Axle Bearing Replacer)															*1 ●	*2 ●			
	(09608-06210)	(Rear Axle Bearing Replacer)															*1 ●	*2 ●			
	09609-20011	(Steering Wheel Puller)	A																	●	
	09610-20012	(Pitman Arm Puller)	A										*3 ●				●			*4 ●	
	09610-55012	(Pitman Arm Puller)	A																	●	
	09611-12010	(Tie Rod End Puller)	A																	*5 ●	
	09611-22012	(Tie Rod End Puller)	A																	●	
	09612-22011	(Tilt Handle Bearing Replacer)	B																	●	
	09612-30012	(Steering Worm Bearing Puller)	B												*6 ●					●	

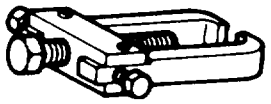
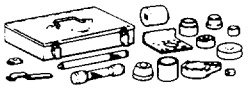
Remarks:
- *1 4WD only
- *2 Double tire
- *3 Oil pump
- *4 Tie rod
- *5 Steering damper, idler arm and relay rod
- *6 Counter gear rear bearing (M/T) and drive gear rear bearing

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT (2WD (A43D))	AT (4WD (A340H))	TF	PR	FA	RA	BR	SR	BO
	09612-65014	(Steering Worm Bearing Puller)	B																	●	
	09616-00010	(Steering Worm Bearing Adjusting Socket)	B																	●	
	09616-22010	(Steering Worm Bearing Adjusting Screw Wrench)	B																	●	
	09616-25010	(Steering Worm Bearing Adjusting Screw Wrench)	B																	●	
	09617-30040	(Worm Bearing Adjusting Screw Lock Nut Wrench)	B																	●	
	09617-60010	(Worm Bearing Adjusting Screw Lock Nut Wrench)	B																	●	
	09620-30010	(Steering Gear Box Replacer Set)	B																	●	
	(09623-30010)	(Steering Worm Bearing & Oil Seal Replacer)																		*1 ●	
	(09624-30010)	(Steering Sector Shaft Oil Seal Replacer)																		*2 ●	
	(09626-30010)	(Steering Worm Front Bearing Replacer)																		●	
	(09627-30010)	(Steering Sector Shaft Bushing Replacer)																		*3 ●	
	(09631-00020)	(Handle)																		●	

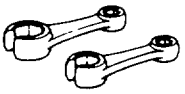
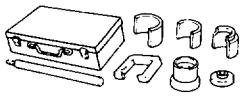
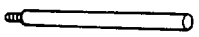
Remarks:
*1 Steering main shaft upper bearing
*2 Steering main shaft lower and upper bearing
*3 Worm shaft oil seal

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT		TF	PR	FA	RA	BR	SR	BO
													2WD (A43D)	4WD (A340H)							
	09628-62011	(Ball Joint Puller)	A														●			*1 ●	
	09630-00011	(Power Steering Gear Housing Overhaul Tool Set)	B																	●	
	(09631-00020)	(Handle)																		●	
	(09631-00030)	(No. 1 Wrench)																		●	
	(09631-00040)	(No. 2 Wrench)																		●	
	(09631-00050)	(No. 3 Wrench)																		●	
	(09631-00070)	(Bearing Remover & Replacer)																		●	
	(09631-00080)	(Replacer "B")																		●	
	(09631-00090)	(Replacer)																		●	
	(09631-00100)	(Sector Shaft Bearing Guide)																		●	
	(09631-00120)	(Teflon Ring Former)																		●	
	(09631-00140)	(Overhaul Stand)																		●	

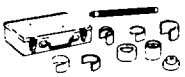
Remark:
*1 Pitman arm

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	(09631-00150)	(Seal Ring Guide)																		●	
	(09631-00160)	(Seal Ring Tool)																		●	
	(09631-00170)	(Bearing Remover & Replacer)																		●	
	09631-22020	(Power Steering Hose Nut 14 x 17 Wrench Set)	A			●														●	
	09636-20010	(Upper Ball Joint Dust Cover Replacer)	B																	*1 ●	
	09703-30010	(Brake Shoe Return Spring Tool)	A																●		
	09709-29017	(LSPV Gauge Set)	C																●		
	09710-26010	(Front Suspension Bushing Tool Set)	B														●				
	(09710-05020)	(Handle)															*2 ●				
	(09710-05030)	(Remover)															*2 ●				
	(09710-05040)	(Gate)															*2 ●				
	(09710-05050)	(Remover)															*2 ●				

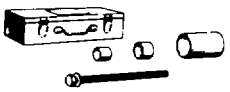
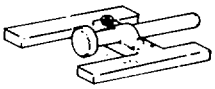
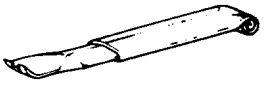
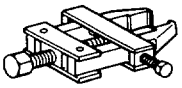
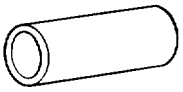
Remarks:
*1 Idler arm bracket cap
*2 4WD only

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration			EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A443D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	(09710-05060)	(Replacer)														*1 ●				
	(09710-05080)	(Rear Base)														*1 ●				
	09710-30020	(Suspension Bushing Tool Set)	B													●				
	(09710-03030)	(Front Suspension Upper Arm Bushing Remover)														●				
	(09710-03040)	(Front Suspension Upper Arm Bushing Removing Base)														●				
	(09710-03060)	(Front Suspension Upper Arm Bushing Replacing Base)														●				
	(09710-03100)	(Front Suspension Lower Arm Bushing Replacer)														●				
	09717-20010	(Brake Shoe Return Spring Remover)	A															●		
	09718-00010	(Shoe Hold Down Spring Driver)	A															●		
	09718-20010	(Brake Shoe Return Spring Replacer)	A															●		
	09726-27011	(Front Lower Arm Bushing Remover & Replacer)	B													*1 ●				
	(09726-02040)	(Replacer)														●				

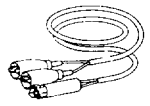
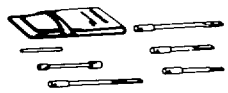
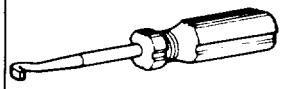
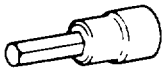
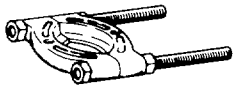
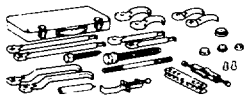
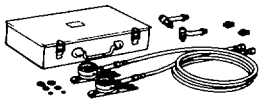
Remark:
*1 4WD only

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	(09726-02050)	(Remover & Replacer)															●				
	(09726-02060)	(No. 2 Base)															●				
	09726-35010	Front Lower Arm Bushing Remover & Replacer	B														*1 ●				
	09737-00010	Brake Booster Push Rod Gauge	A																●		
	09751-36011	Brake Tube Union Nut 10 x 12 Wrench	A								*2 ●						●		●		
	09806-30010	Windshield Moulding Remover	C																		●
	09812-00010	Door Hinge Set Bolt Wrench	C																		●
	09820-00021	Alternator Rear Bearing Puller	B							●											
	09820-00030	Alternator Rear Bearing Replacer	B							●											
	09820-63010	Alternator Pulley Set Nut Wrench Set	B							●											
	09842-30020	Wiring "C" EFI Inspection	B			*3 ●															
	09842-30050	Wiring "A" EFI Inspection	B			●															

Remarks:
*1 2WD only
*2 Clutch tube union nut
*3 22R-TE only

SST (SPECIAL SERVICE TOOLS) (Cont'd)

Section / Classification / Part Name / Part No. / Illustration				EM	TC	FI	FU	LU	ST	CH	CL	MT	AT 2WD (A43D)	AT 4WD (A340H)	TF	PR	FA	RA	BR	SR	BO
	09842-30060	(Wiring "E" EFI Inspection)	B			*1 ●															
	09860-11011	(Carburetor Drive Set)	A				●														
	09910-00015	(Puller Set)	B														*2 ●				
	09921-00010	(Spring Tension Tool)	A									*3 ●	*3 ●		*3 ●						
	09922-00010	(Wrench 5 x 12)	B				●														
	09923-00010	(Hexagon Wrench)	B									●									
	09950-00020	(Bearing Remover)	B									●			●		●	●			
	09950-20017	(Universal Puller)	A									●			●		*4 ●	●		●	
	09992-00094	(Automatic Transmission Oil Pressure Gauge Set)	A										●	●							
	09992-00241	(Turbocharger Pressure Gauge)	C		*5 ●																

Remarks:
- *1 22R-E only
- *2 4WD only
- *3 Speedometer driven gear oil seal
- *4 4WD only
- *5 22R-TE only

NOTE: For reference to SSTs for the Air Conditioning System see page AC-8.

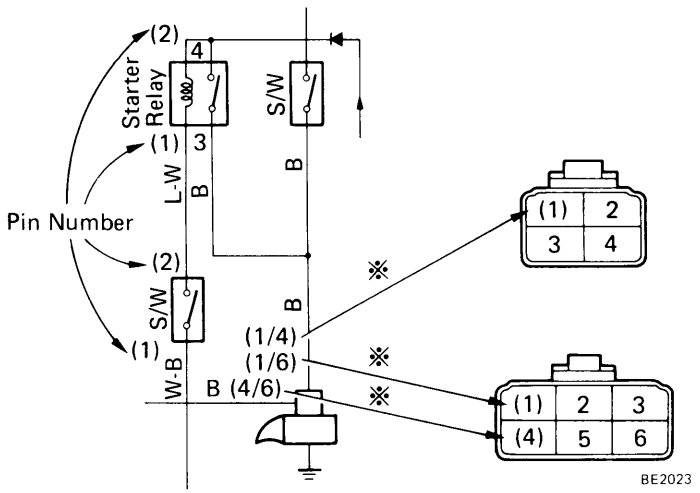
SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Sec.	Use etc.
Seal packing or equivalent	08826-00080	EM	Contact surface of the half circular plug Over the space between the cylinder head and half circular plug The space between the underside of the cylinder block and oil seal retainer and timing chain cover
Seal packing 1281, Three bond 1281 or equivalent	08826-00090	MT	Transmission case, extension housing, transfer adapter and front bearing retainer (R150 and R151F)
		AT	(A340H) Transmission oil pan Transfer oil pan Transfer chain rear case Transfer oil pump
		SR	End cover Adjusting screw lock nut
Adhesive 1324, Three bond 1324 or equivalent	08833-00070	EM	EGR valve mounting bolt (Closest to the front)
		EC	BVSV Water temp. switch
		LU	Oil pump mounting bolt (Top most)
		AT	(A340H) Transfer chain front case set bolt Transfer chain oil reservoir set bolt Transfer oil pan set bolt Transfer chain rear case oil strainer
		FA	Steering knuckle x Knuckle arm set bolt
Adhesive 1344, Three bond 1344, Loctite 242 or equivalent	08833-00080	MT	Straight screw plug Front bearing retainer bolt
		AT	Extension housing set bolt (A43D) Oil pump set bolts (A43D)
		SR	Bearing adjusting screw
Adhesive 1131, Three bond 1131, Loctite 518 or equivalent	08833-00090	AT	(A340H) Transfer case Transfer chain front case Transfer extension housing
Dupont paste No. 4817	–	BE	Rear window defogger wire
Windshield glass adhesive set No. 15	08850-00070	BO	Windshield glass (0 – 15°C or 32 – 59°F)
Windshield glass adhesive set No. 35	08850-00080	BO	Windshield glass (15 – 35°C or 59 – 95°F)
Windshield glass adhesive set No. 45	08850-00090	BO	Windshield glass (35 – 45°C or 95 – 113°F)
Dam kit	04562-30040	BO	Windshield glass
Three cement black	08833-00030	BO	Windshield glass or back door window glass
Butyl tape set	08850-00065	BO	Quarter window glass
Quarter window rear sealed seal	68177-89101	BO	Quarter window glass

ELECTRICAL WIRING DIAGRAMS

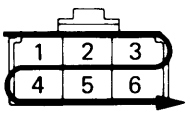
HOW TO READ THIS SECTION

PIN NUMBER



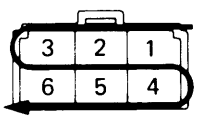
※ When connectors with different numbers of terminals are used with the same parts, the pin number and the numbers of terminals are specified.
e.g. (1/4) = No. 1 pin/4 terminals connector

Numbered in order from upper left to lower right



Female

Numbered in order from upper right to lower left

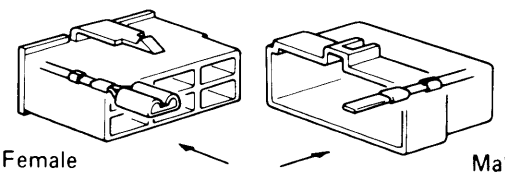


Male

BE0832

Male & female connectors distinguished by shape of their internal pins.

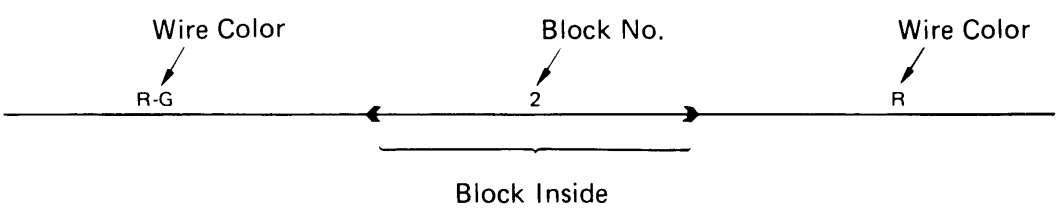
- All connectors are shown from the open end, and the lock is on top.



Female Male

BE0833

JUNCTION BLOCK OR RELAY BLOCK



WIRE COLOR

Wire colors are indicated by an alphabetical code.

B = Black	BR = Brown	G = Green	GR = Gray	L = Blue
LG = Light Green	O = Orange	P = Pink	R = Red	V = Violet
W = White	Y = Yellow			

The 1st letter indicates the basic wire color and the 2nd indicates the stripe color.

Example: R-G indicates a Red wire with a Green stripe.

ABBREVIATION

The following abbreviations are used in this wiring diagram.

A/C	= Air Conditioner	O/D	= Overdrive
A/T	= Automatic Transmission	RH	= Right-hand
CB	= Circuit Breaker	S/W	= Switch
ECU	= Electronic Controlled Unit	TCCS	= Toyota Computer Controlled System
EFI	= Electronic Fuel Injection	VSV	= Vacuum Switching Valve
FL	= Fusible Link	w/	= With
J/B	= Junction Block	w/o	= Without
LH	= Left-hand	2WD	= 2 Wheel Drive
M/T	= Manual Transmission	4WD	= 4 Wheel Drive

SYSTEM INDEX

TOYOTA TRUCK AND 4 RUNNER — 1988 Model (Page 1 to Page 5)

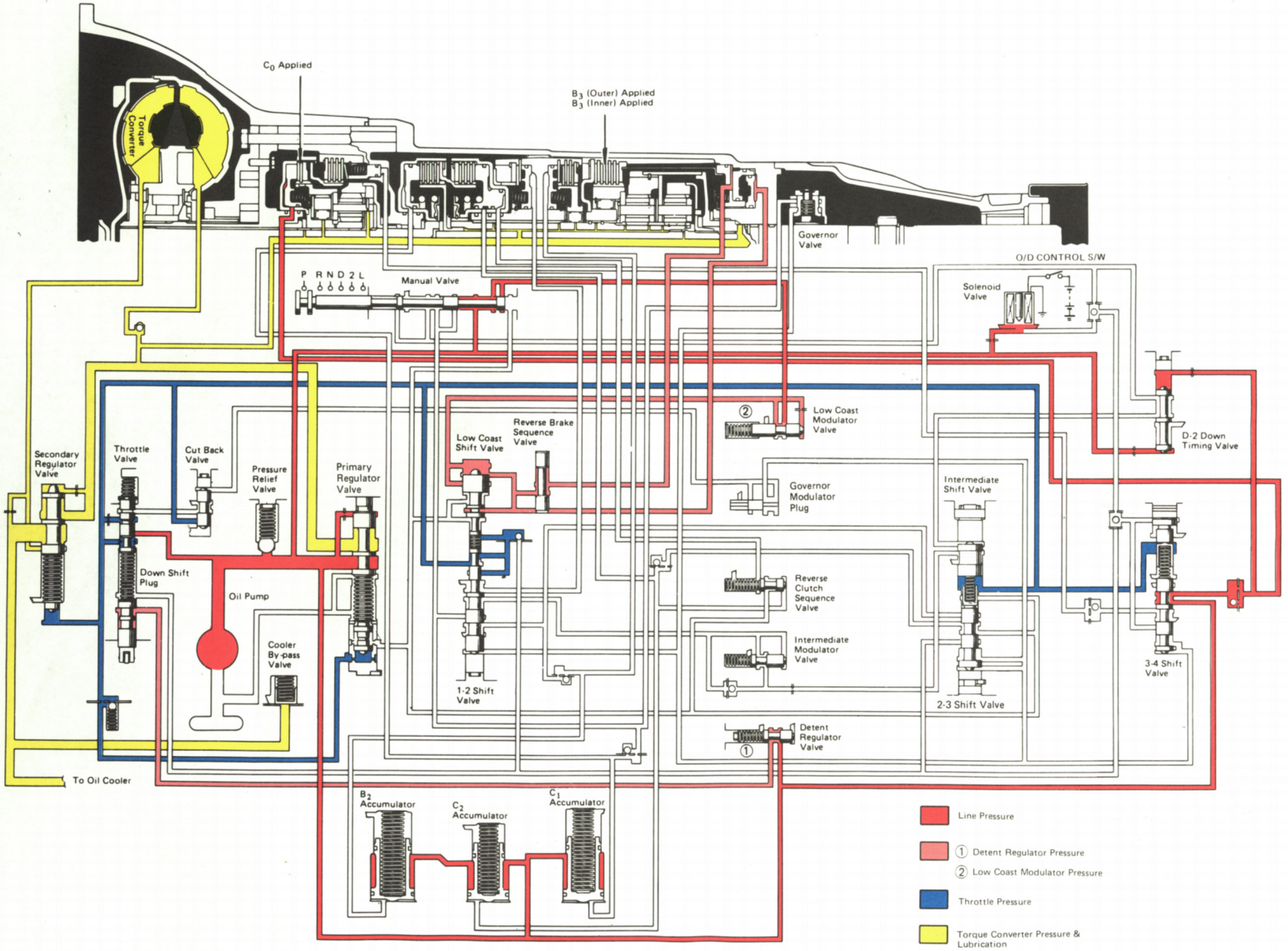
SYSTEMS	LOCATION	SYSTEMS	LOCATION
Air Conditioner, Cooler and Heater	2-5	Overdrive	3-6
Auto Antenna	5-5	Power Source	1-1
Back-up Lights	3-1	Power Windows	4-3, 4-4
Charging	2-1	PPS (Progressive Power Steering)	3-8
Cigarette Lighter	5-4	Radio and Tape Player	5-6
Clock	5-3	Rear Air Conditioner	2-6
Combination Meter	2-7	Rear Window Defogger	3-4
Cruise Control	3-7	Rear Wiper and Washer	4-5
Door Locks	4-3	Remote Control Mirrors	5-4
ECT (Electronic Control Transmission)	4-1	Starting	1-2
EFI	1-6	Stop Lights	3-8
Emission Control	2-3	Taillights and Illumination	4-7
Front Wiper and Washer	3-5	Turn Signal and Hazard	3-2
Headlights	4-8	Unlock and Seat Belt Warning	3-1
Horn	3-3	Work Light	5-1
Ignition	1-3		
Interior Lights	5-2		

AUTOMATIC TRANSMISSION HYDRAULIC CIRCUIT

	Page
A43D HYDRAULIC CIRCUIT	D-2
A340H TRANSMISSION HYDRAULIC CIRCUIT	D-13
A340H TRANSFER HYDRAULIC CIRCUIT	D-22

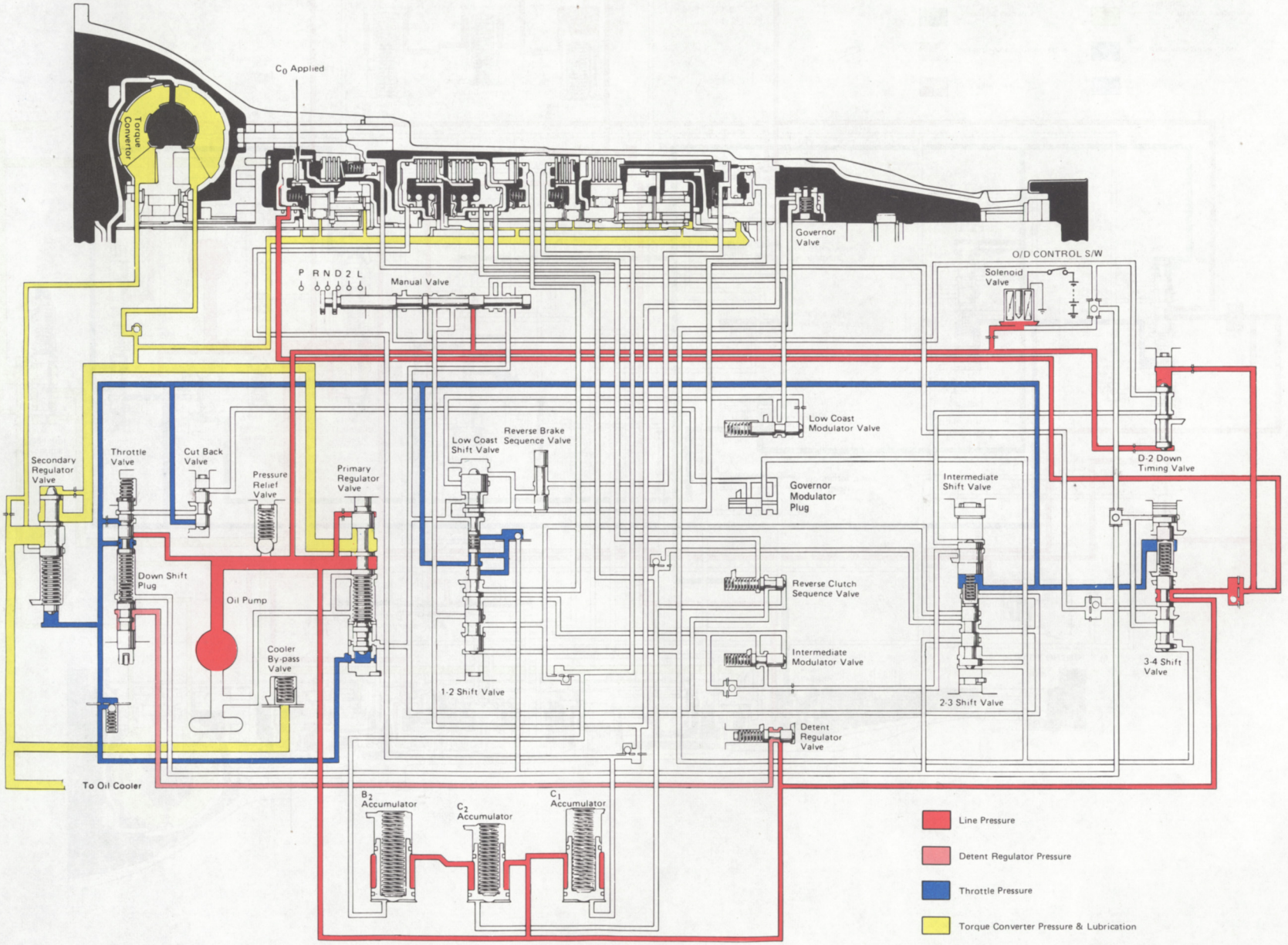
A43D HYDRAULIC CIRCUIT

A43D "P" RANGE CIRCUIT

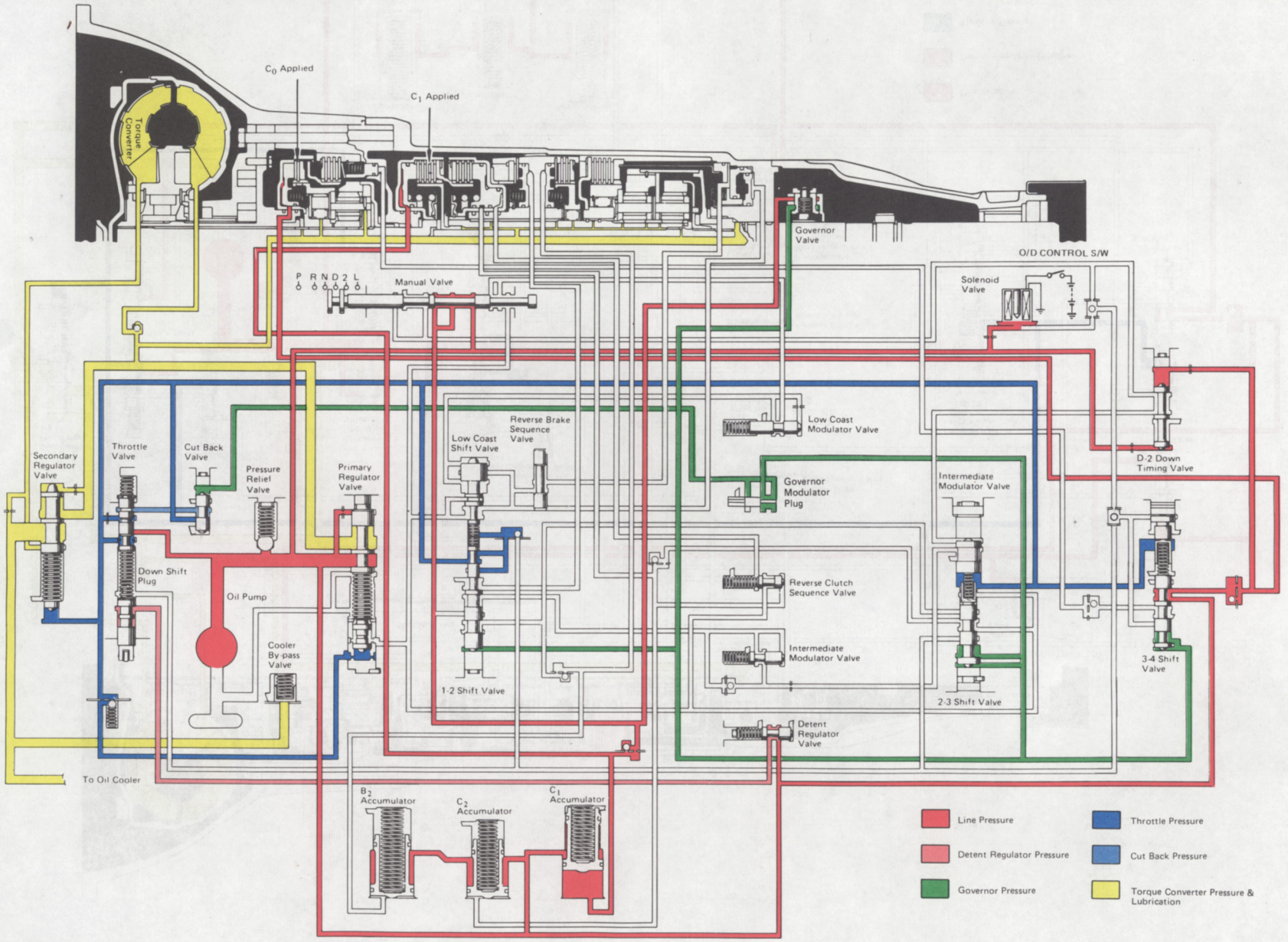


TE0019

A43D "N" RANGE CIRCUIT

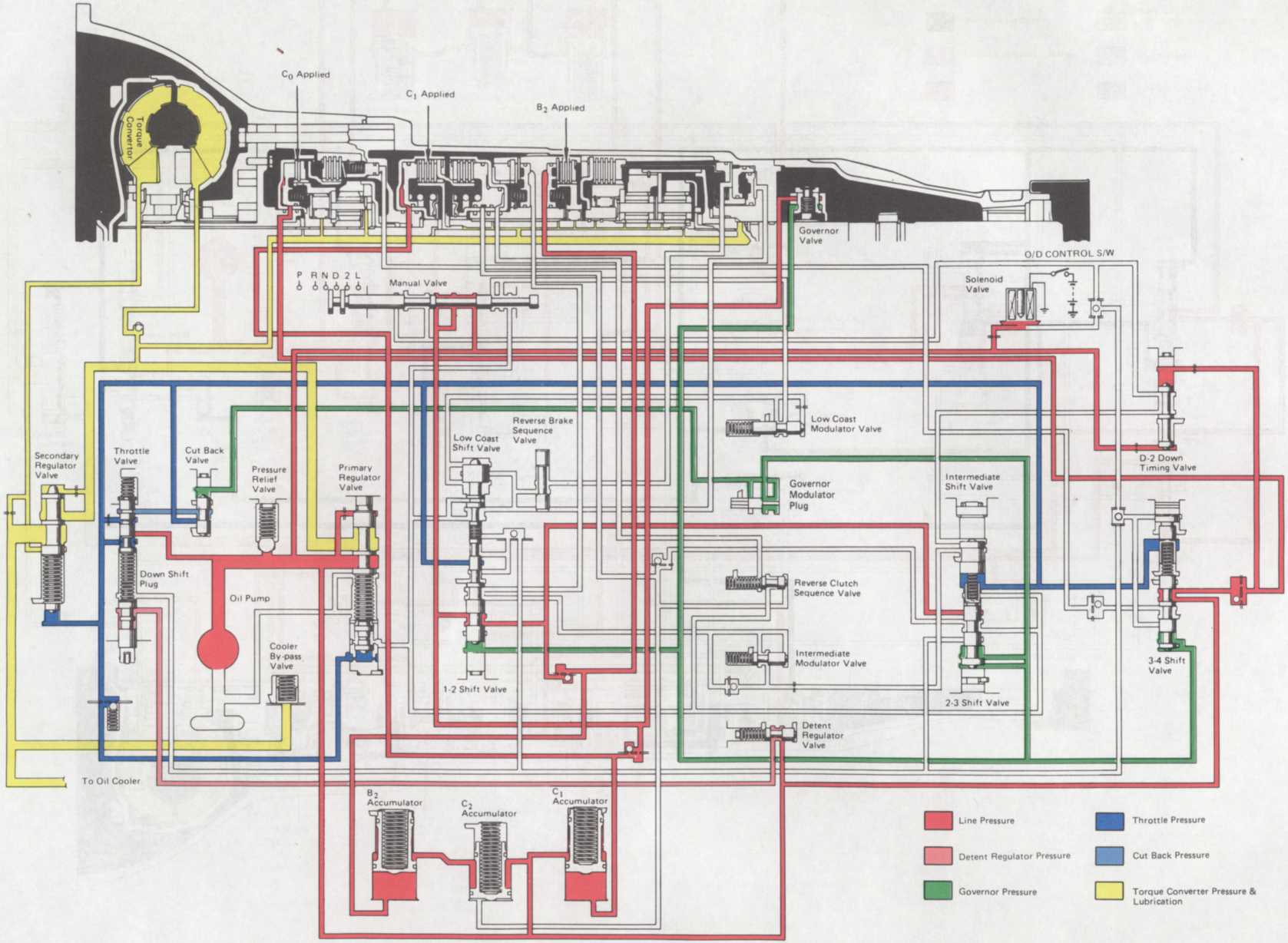


A43D "D" RANGE FIRST GEAR CIRCUIT



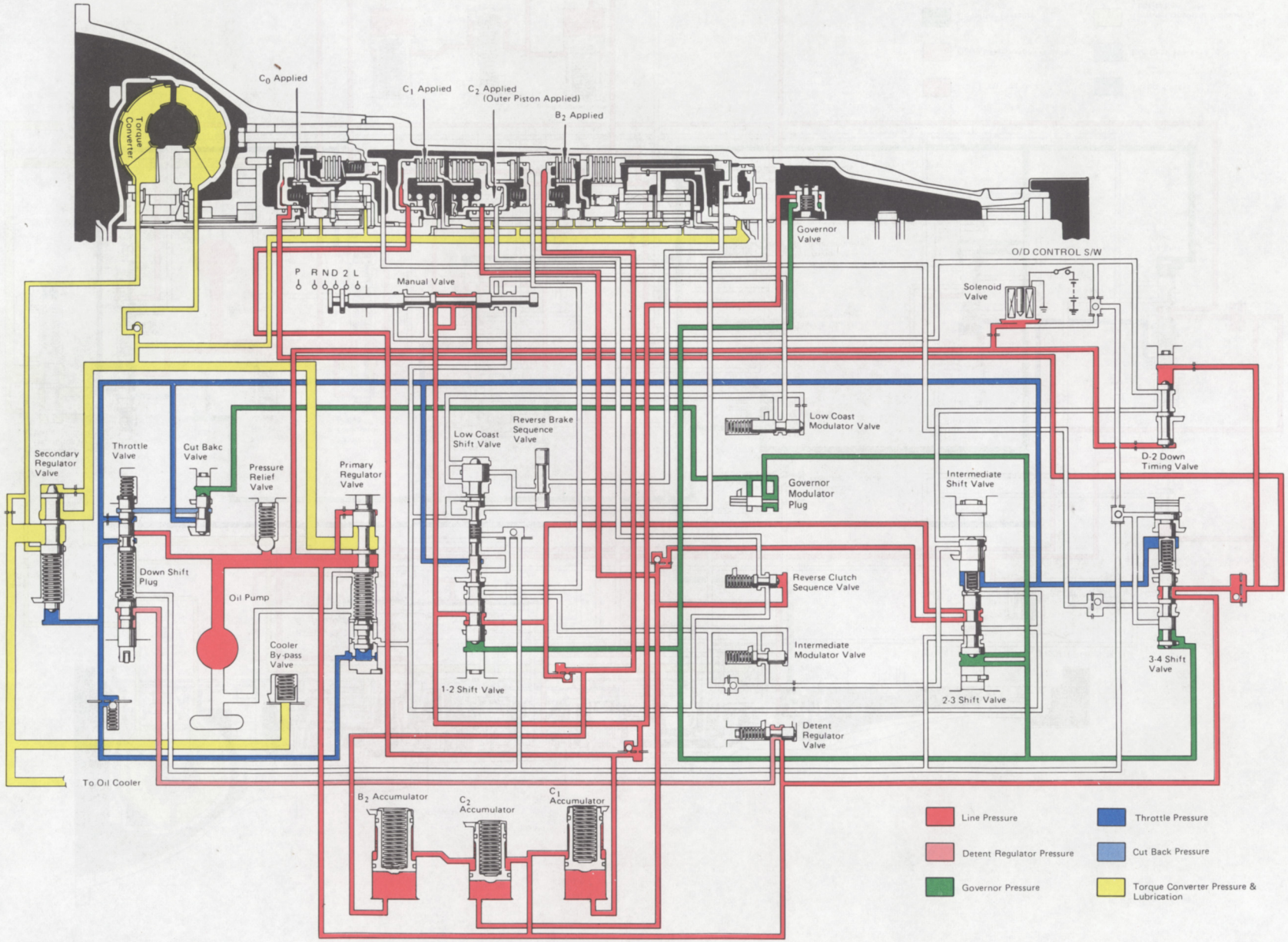
TE0021

A43D "D" RANGE SECOND GEAR CIRCUIT



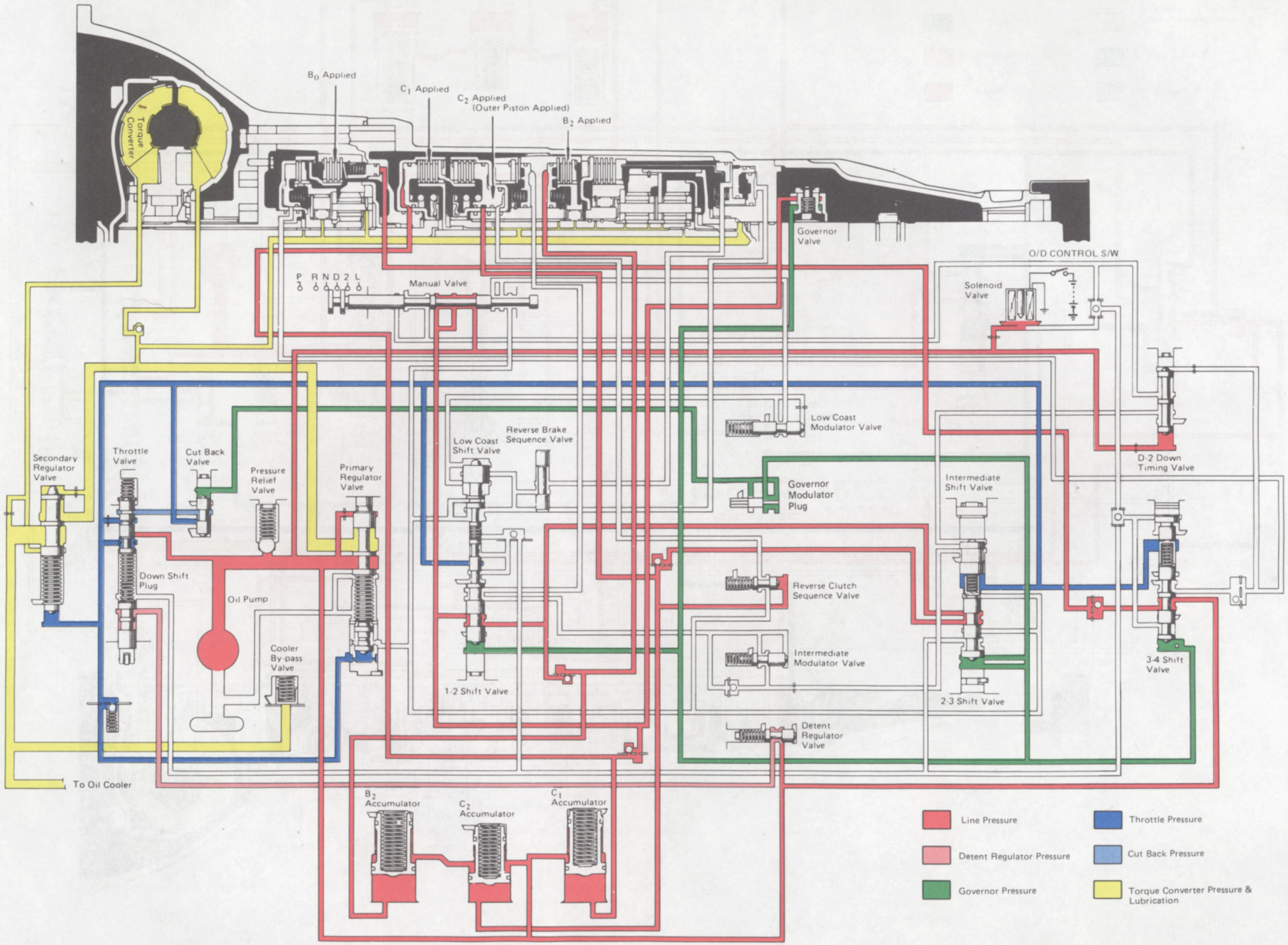
TE0022

A43D "D" RANGE THIRD GEAR CIRCUIT



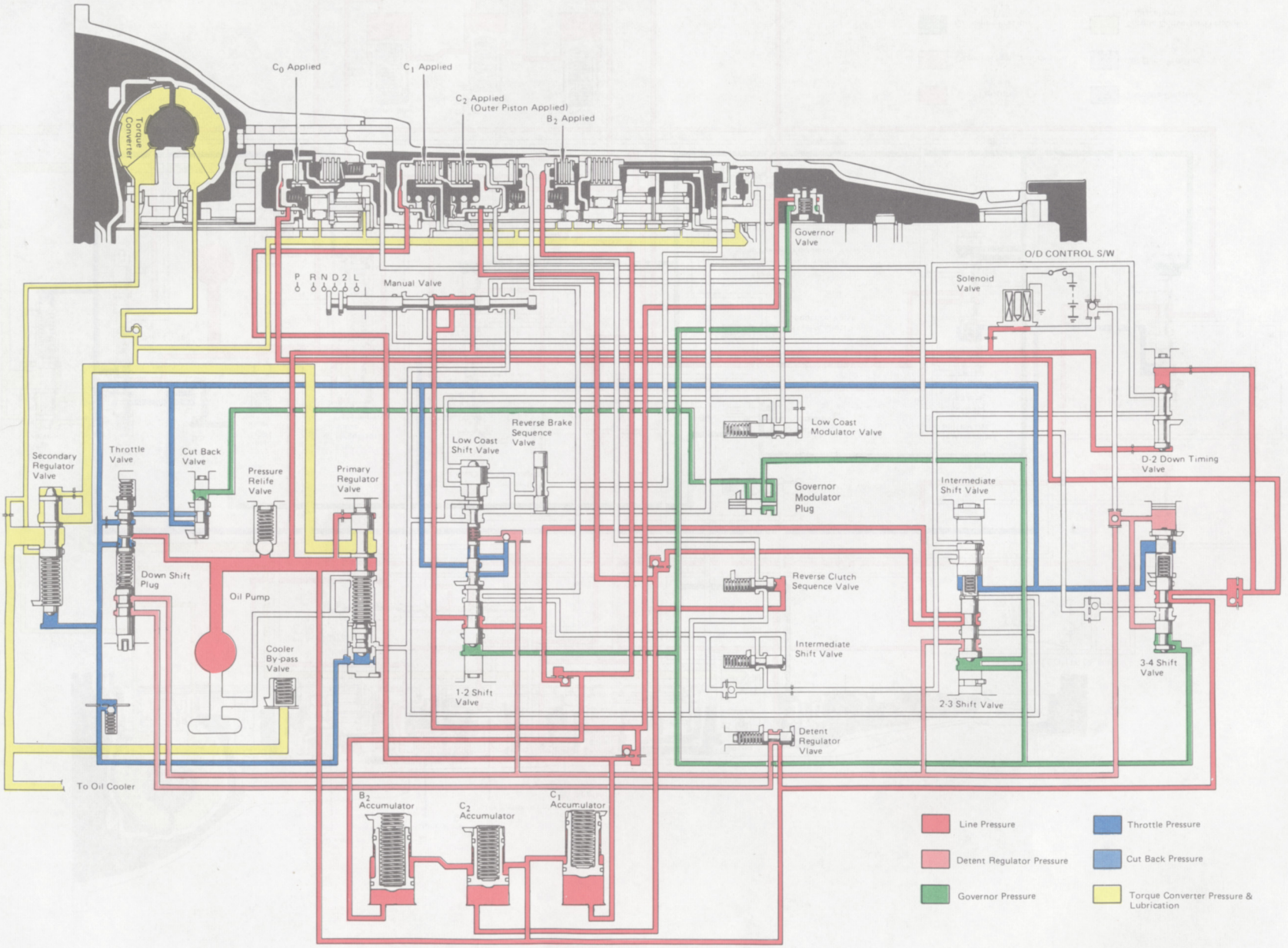
TE0023

A43D "D" RANGE O/D GEAR CIRCUIT



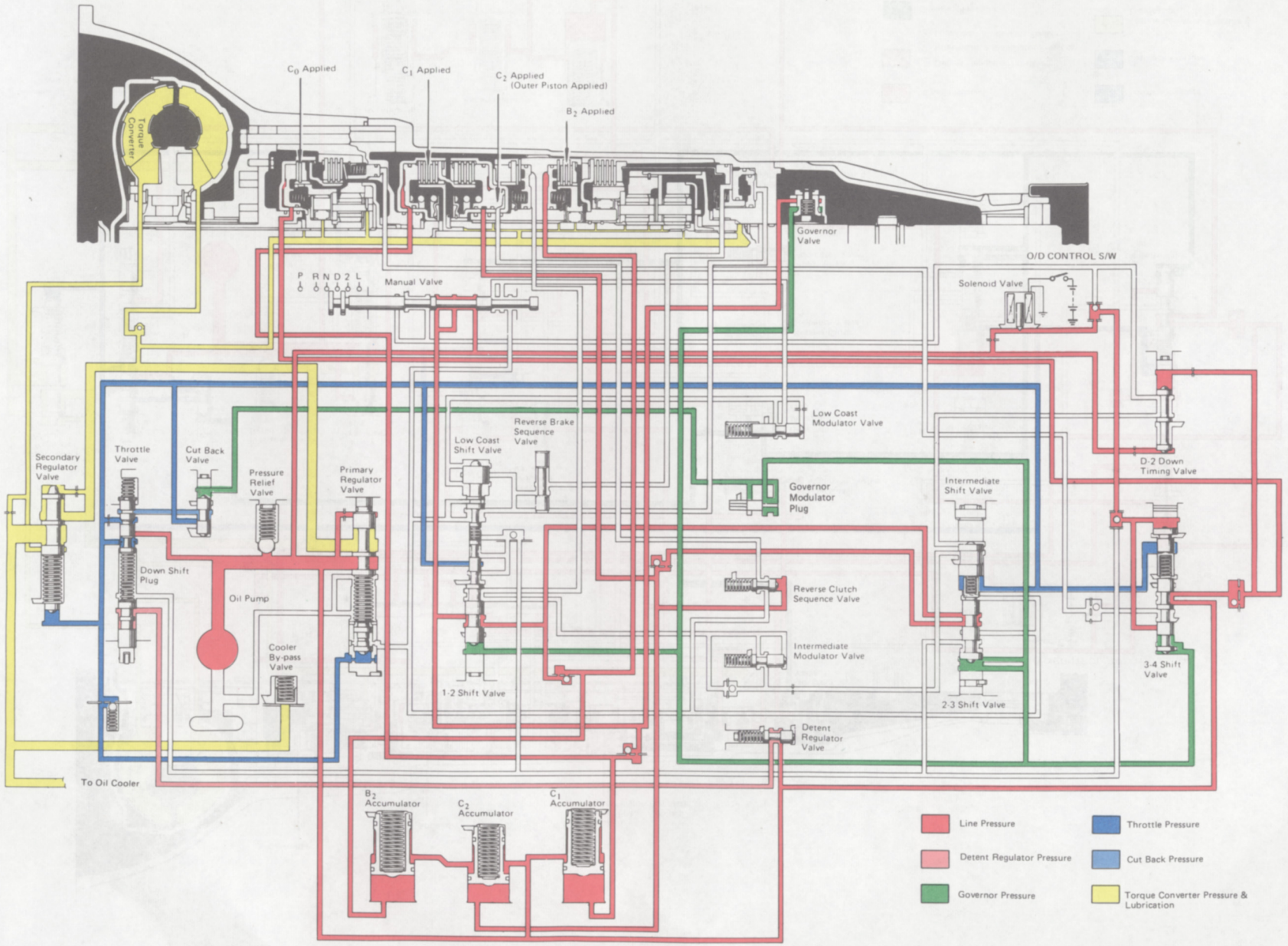
TE0024

A43D "D" RANGE KICK DOWN (O/D → 3) CIRCUIT



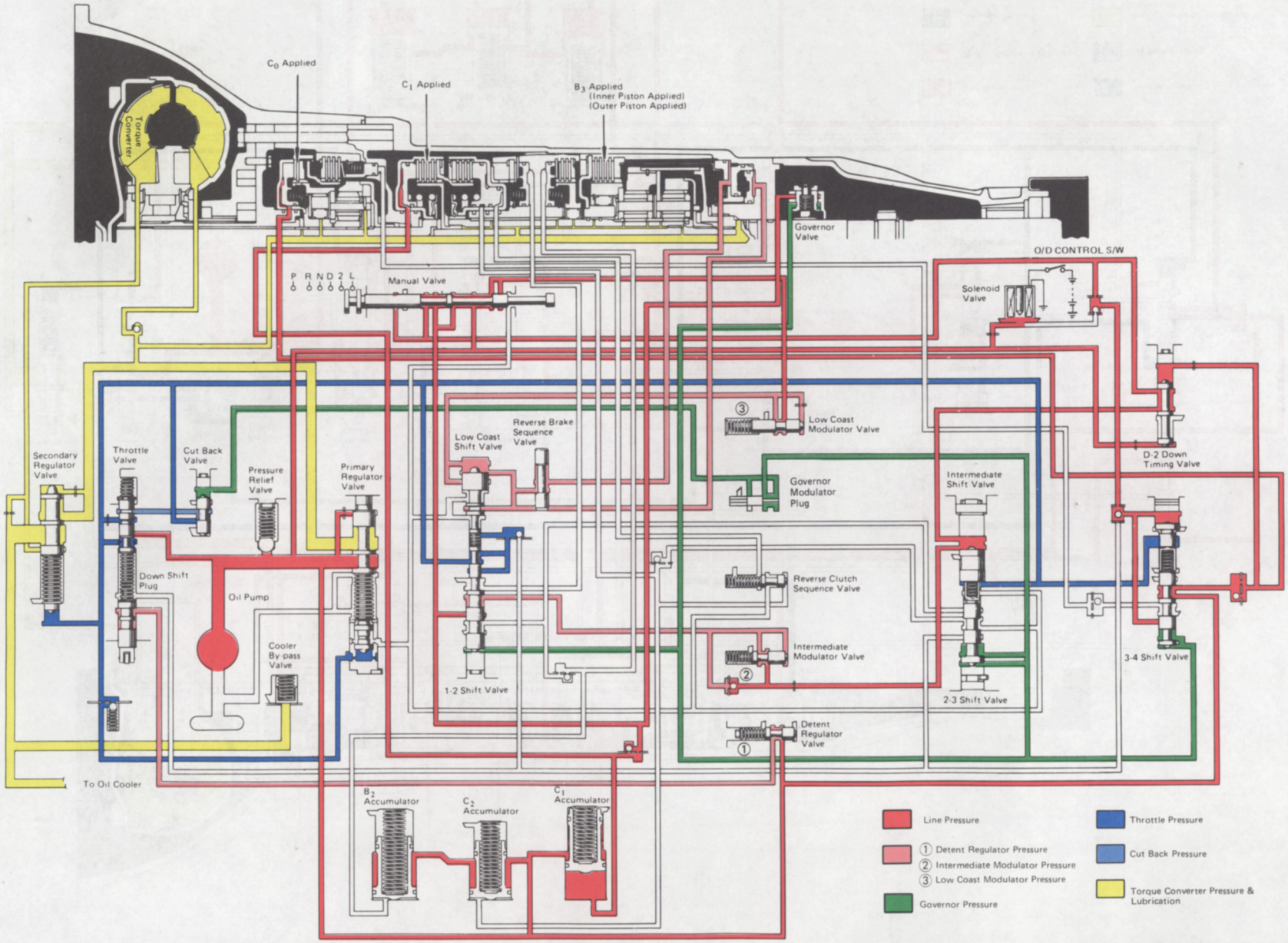
TE0025

A43D "D" RANGE THIRD GEAR CIRCUIT
(O/D Main S/W OFF)

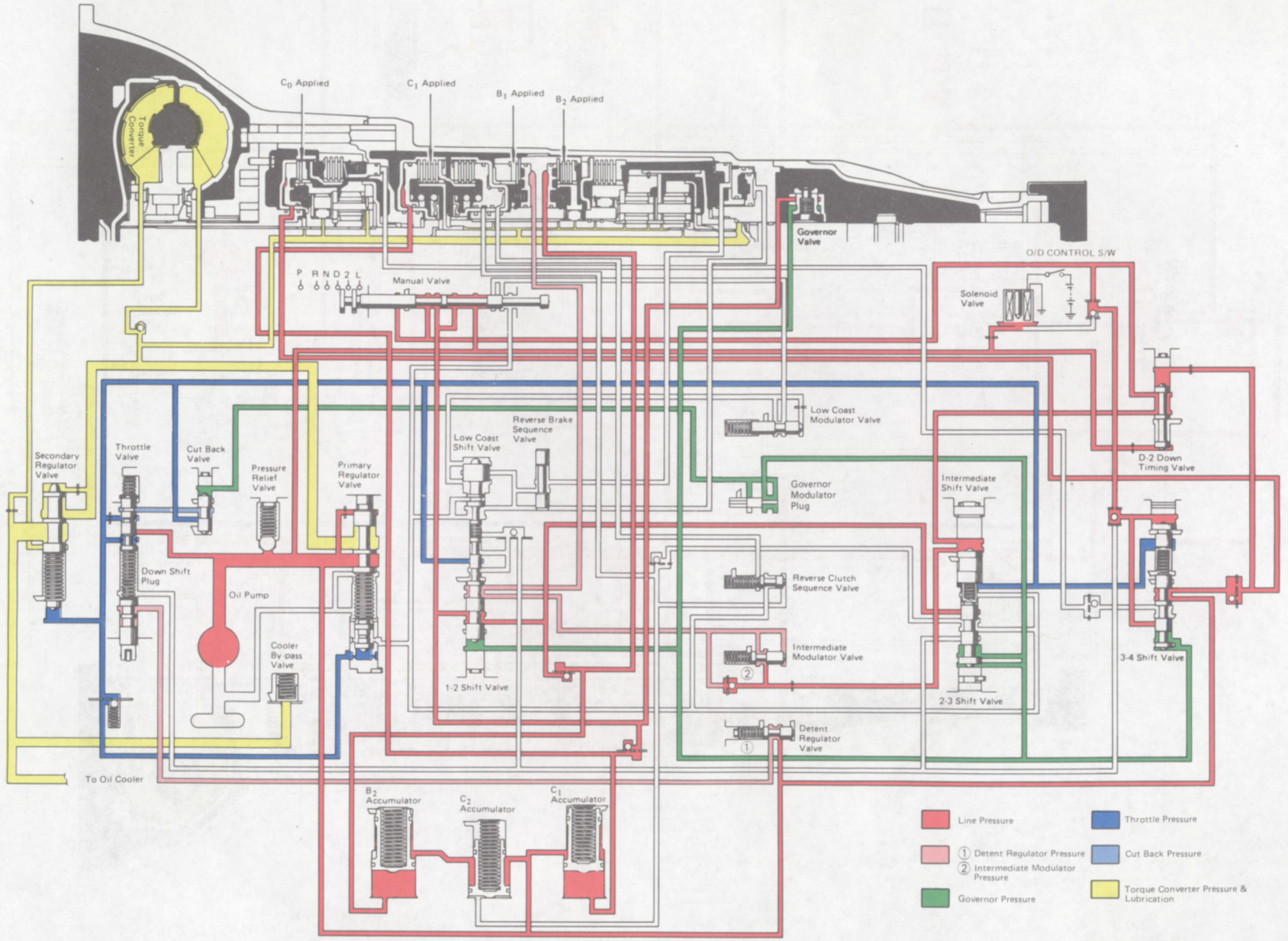


TE0026

A43D "L" RANGE CIRCUIT

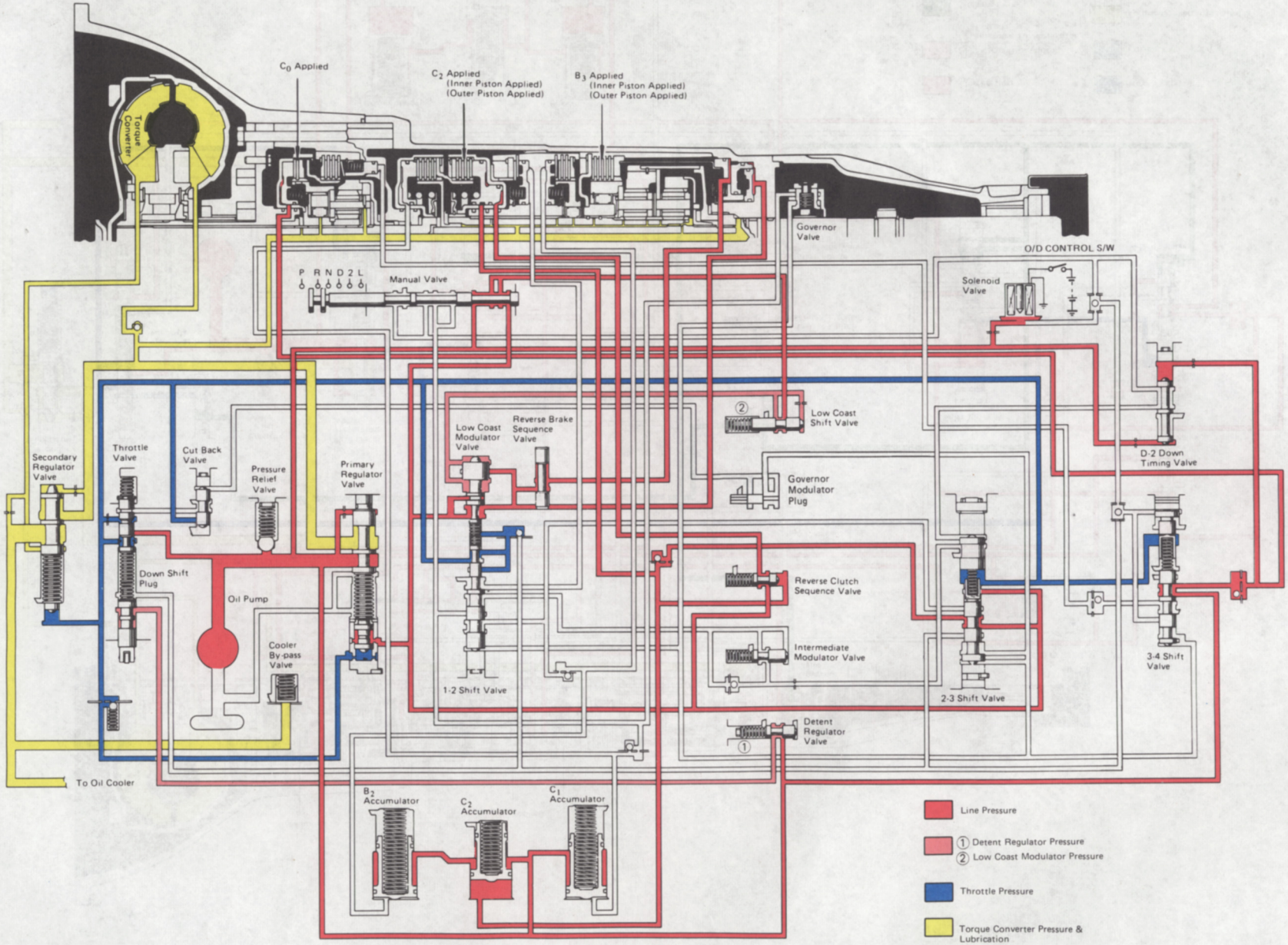


A43D "2" RANGE SECOND GEAR CIRCUIT



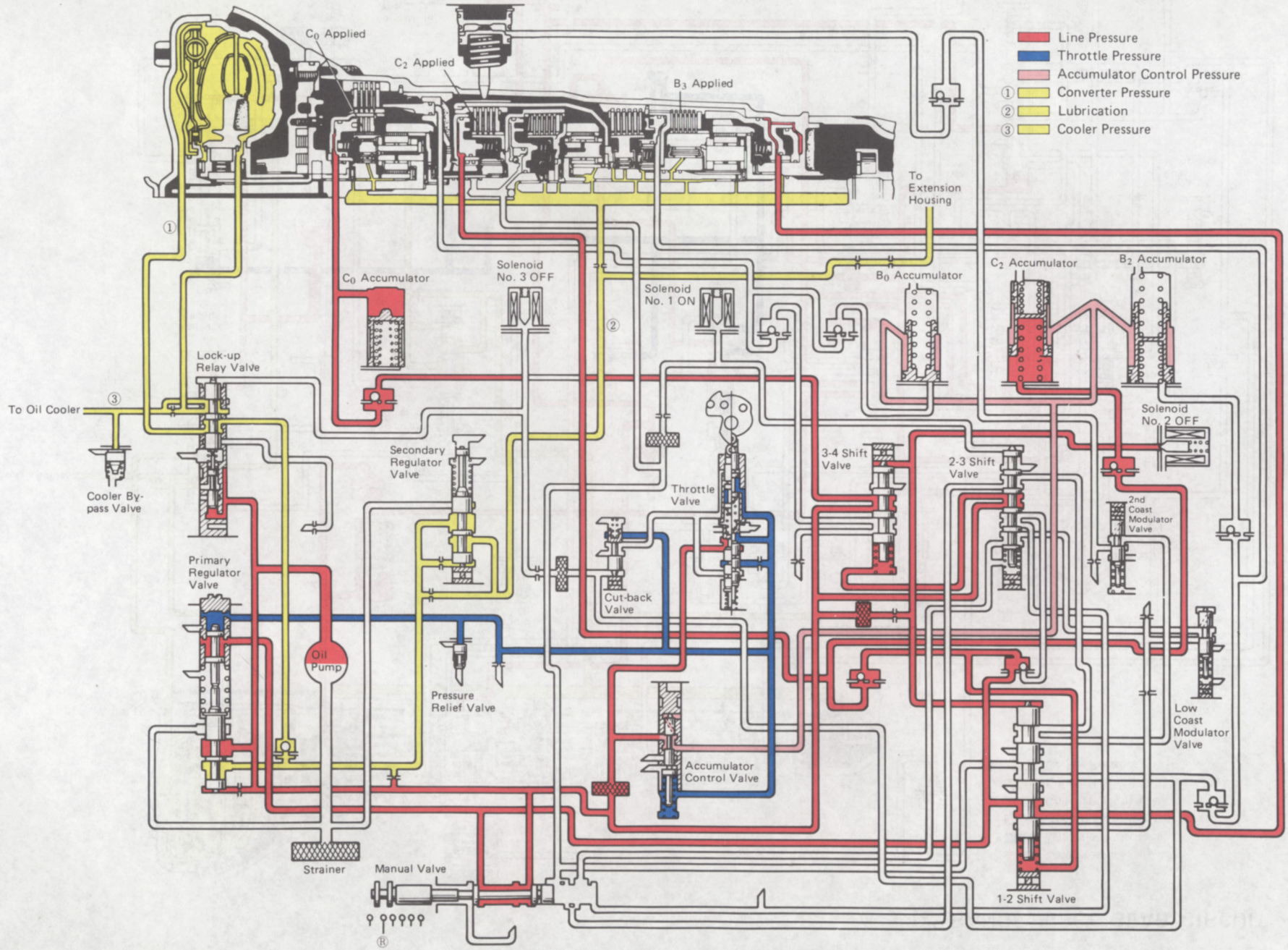
TE0028

A43D "R" RANGE CIRCUIT

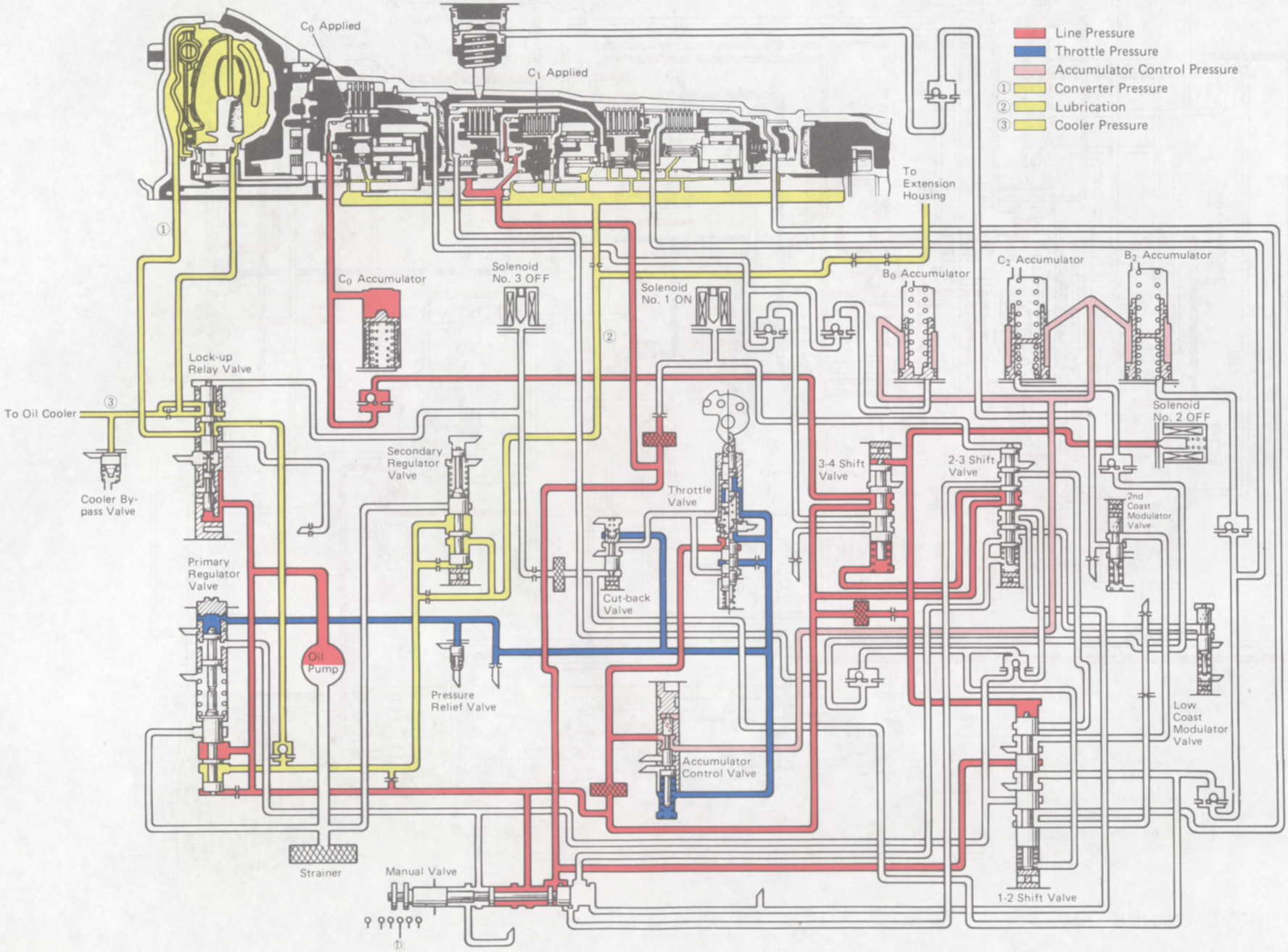


A340H TRANSMISSION HYDRAULIC CIRCUIT

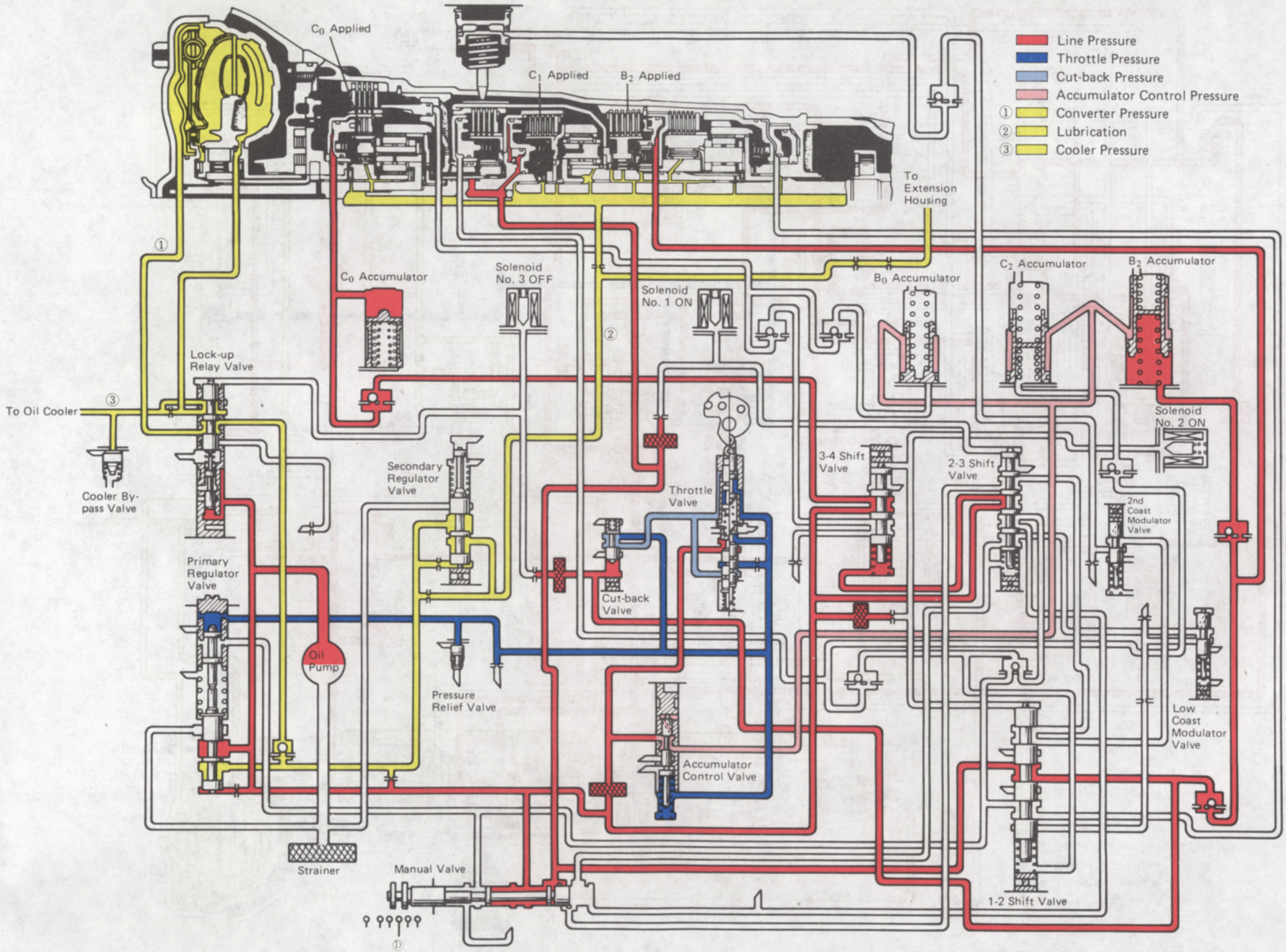
"R" RANGE CIRCUIT



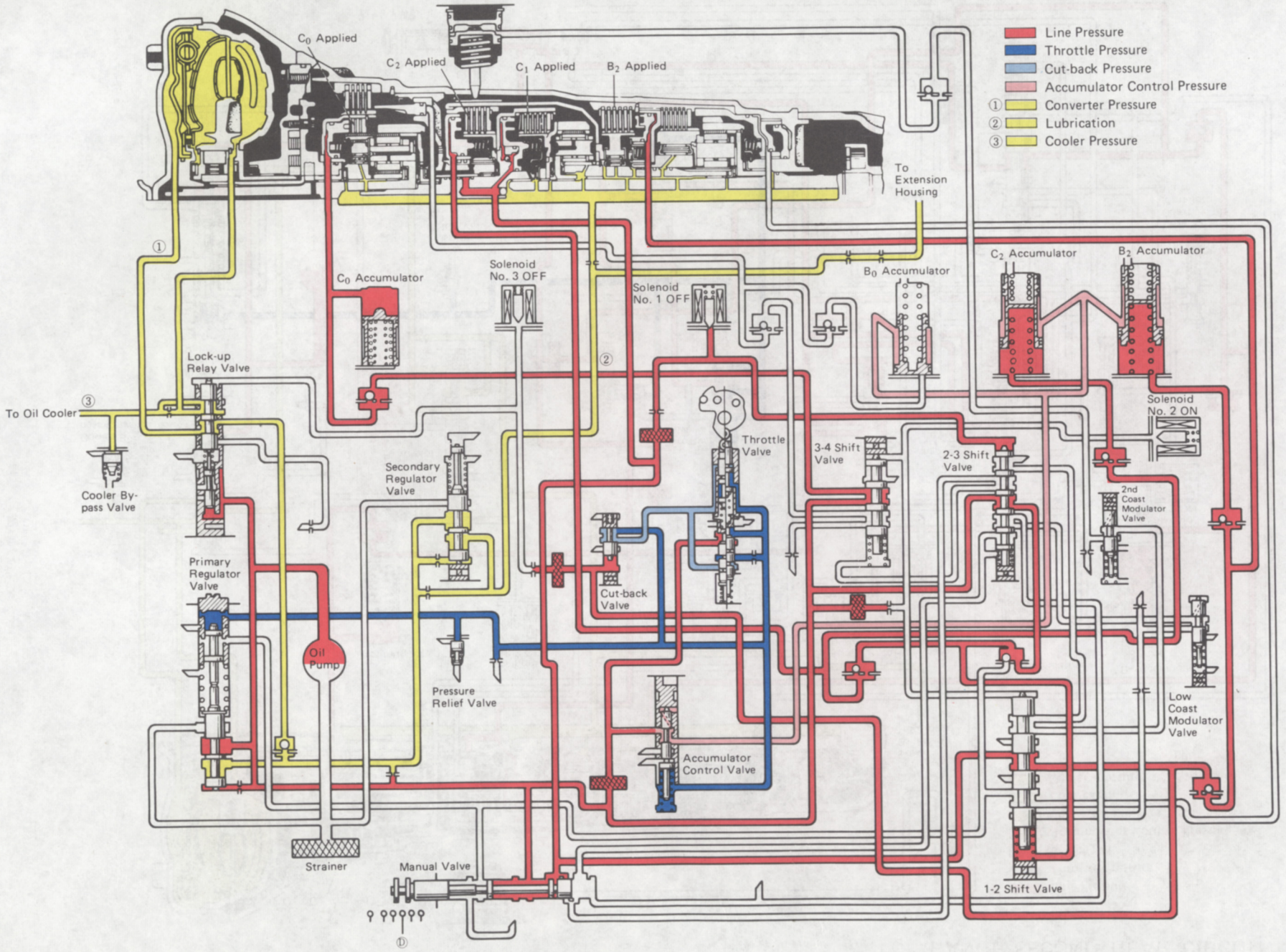
"D" RANGE FIRST GEAR CIRCUIT



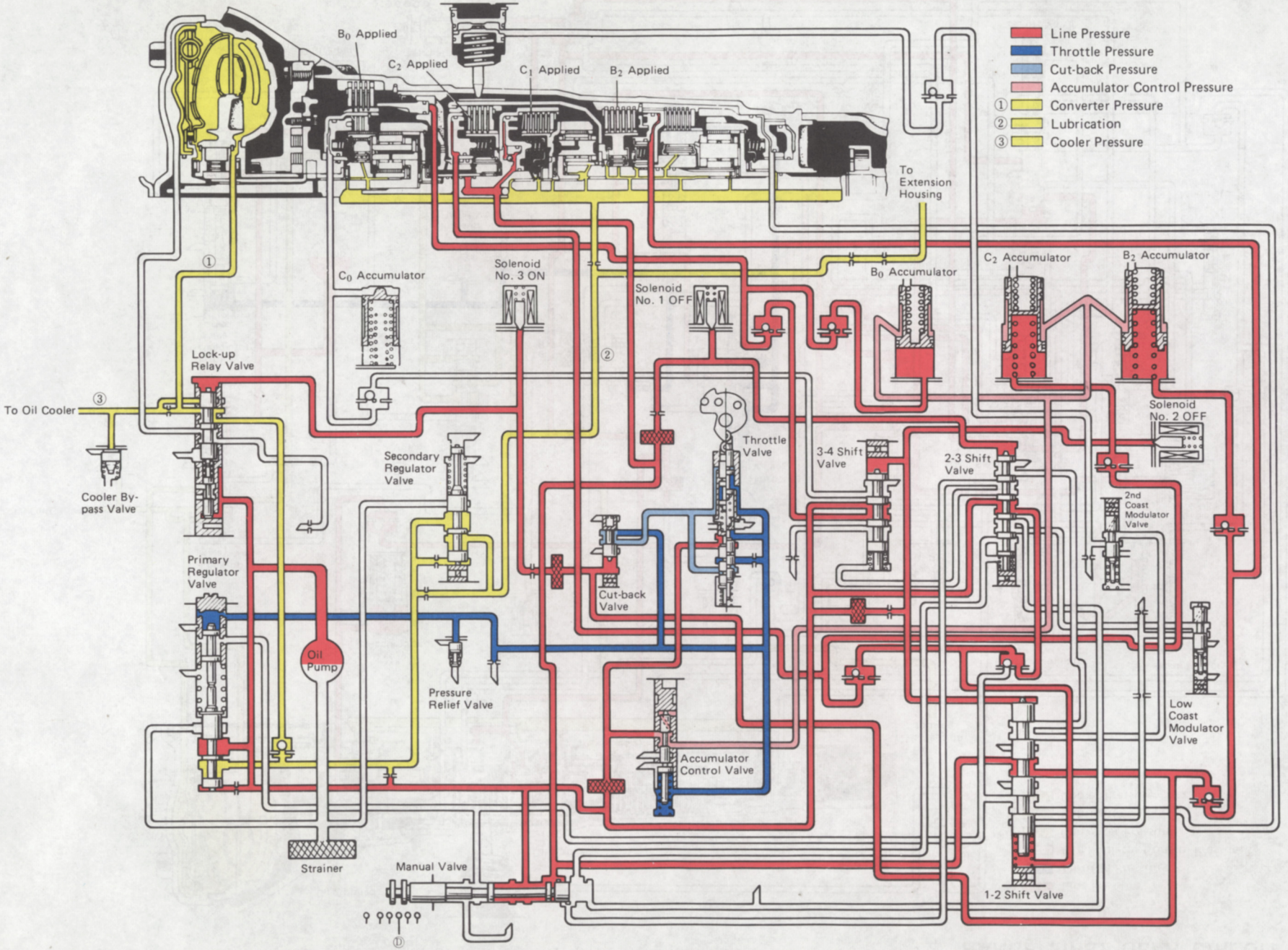
"D" RANGE SECOND GEAR CIRCUIT



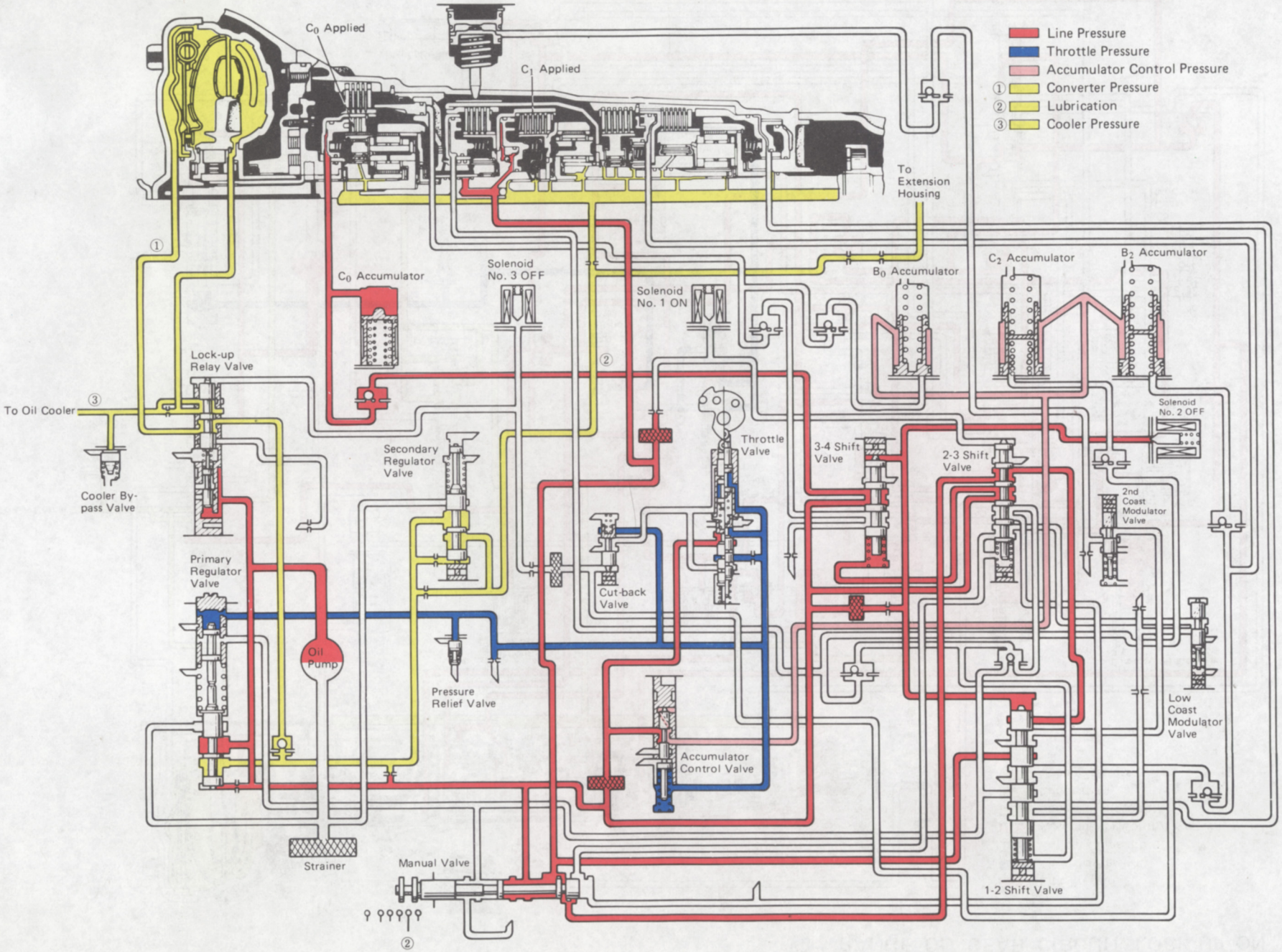
"D" RANGE THIRD GEAR CIRCUIT



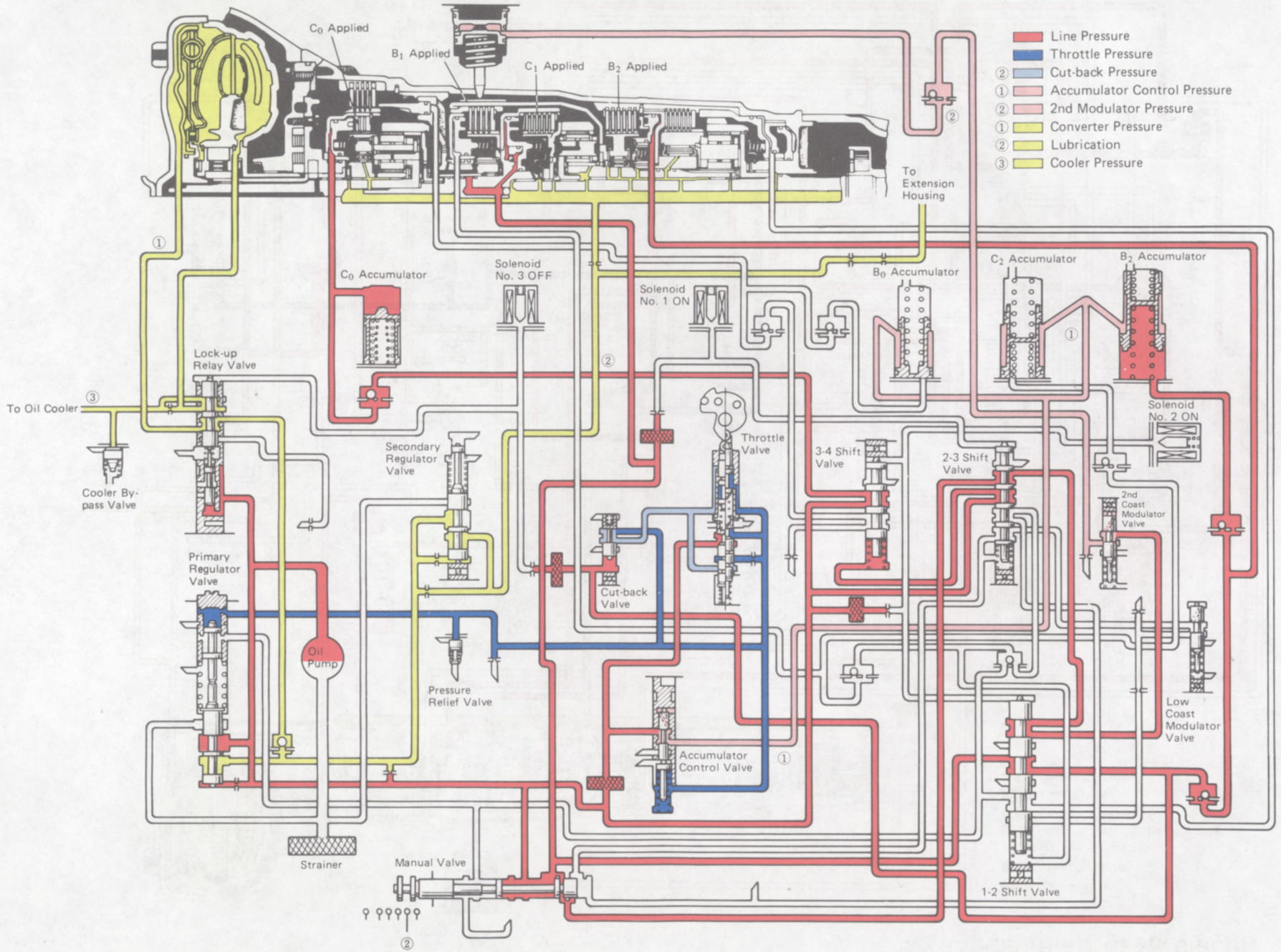
"D" RANGE OD GEAR CIRCUIT LOCK-UP ON



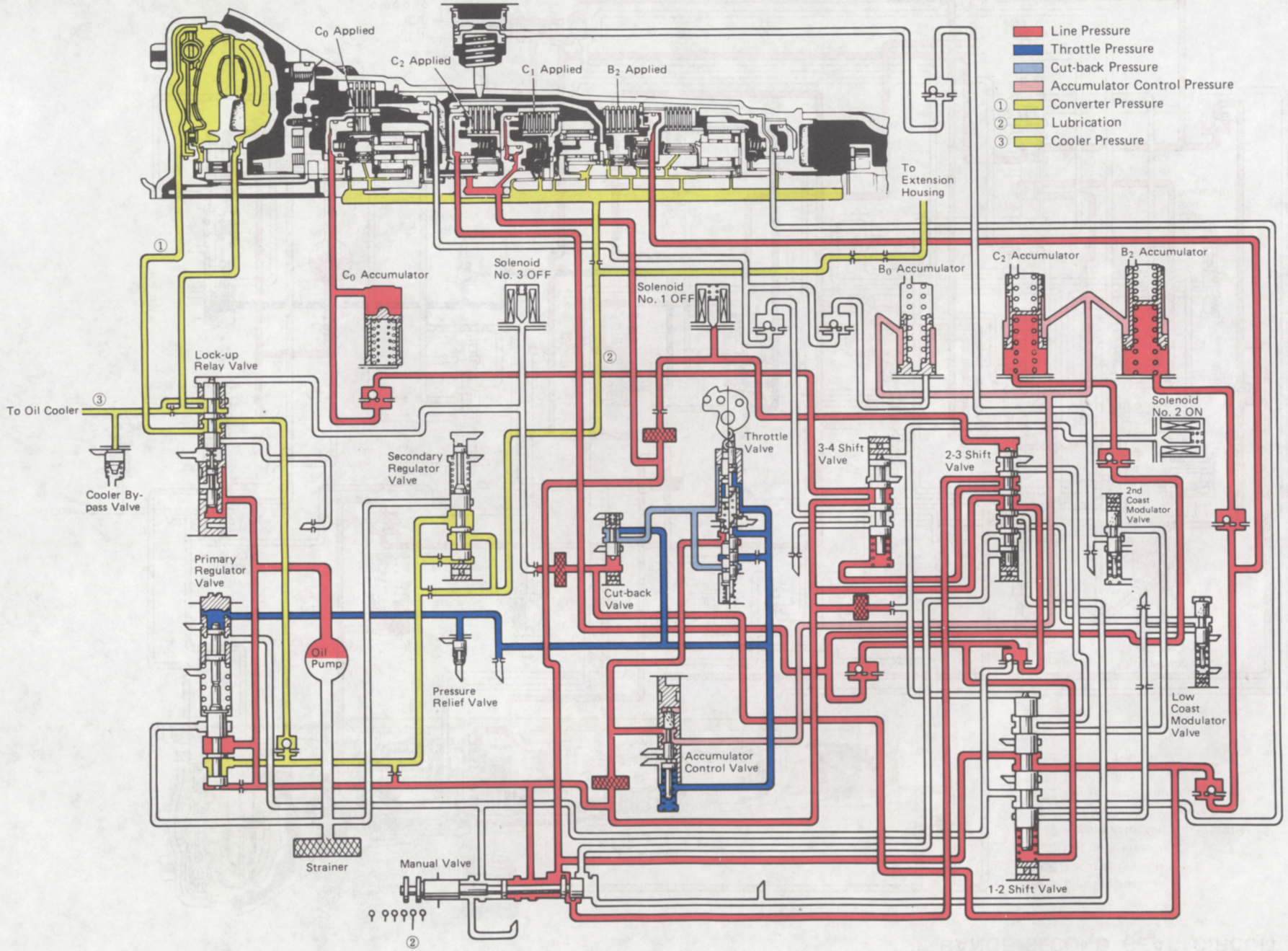
"2" RANGE FIRST GEAR CIRCUIT



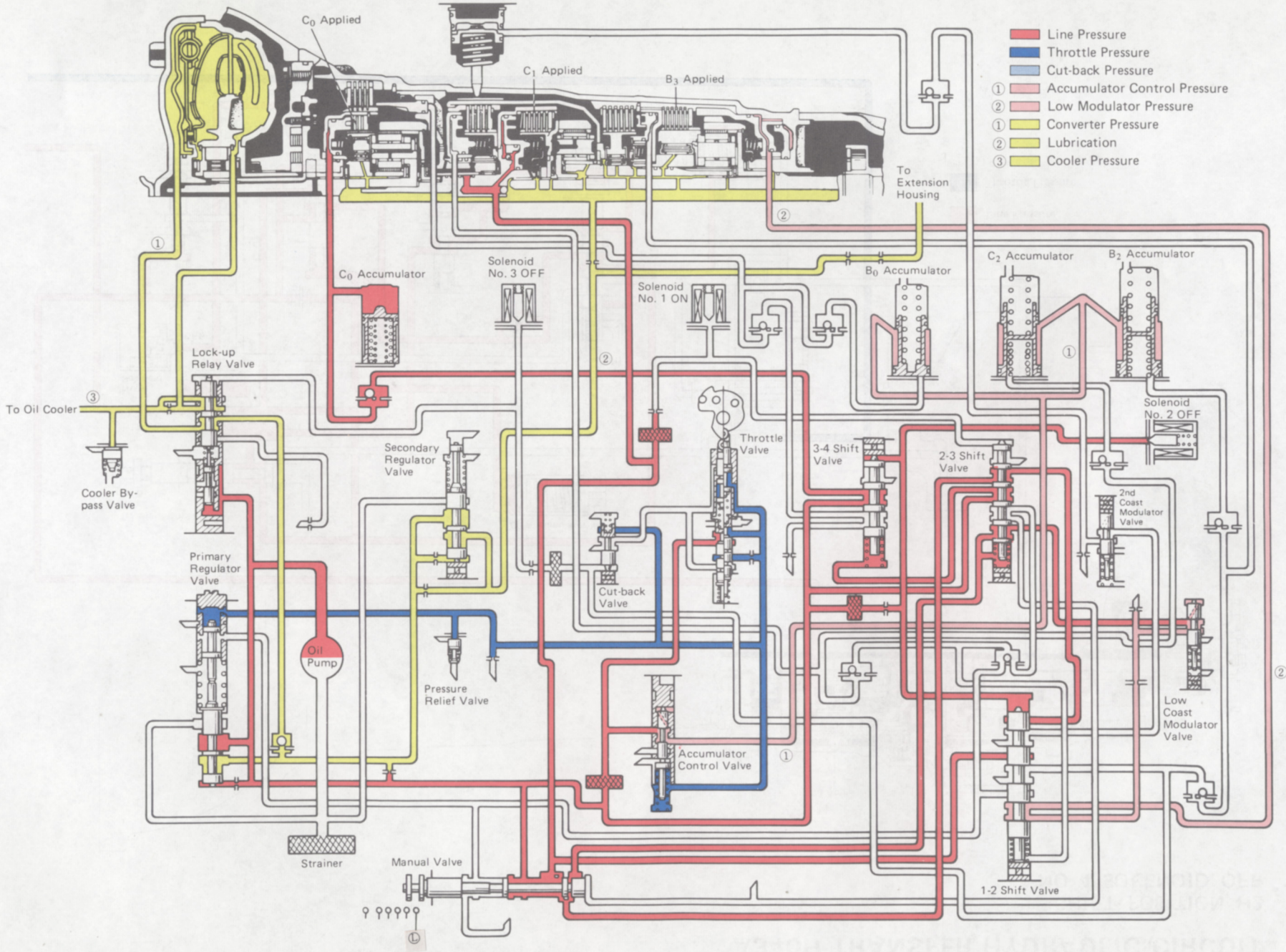
"2" RANGE SECOND GEAR CIRCUIT



"2" RANGE THIRD GEAR CIRCUIT

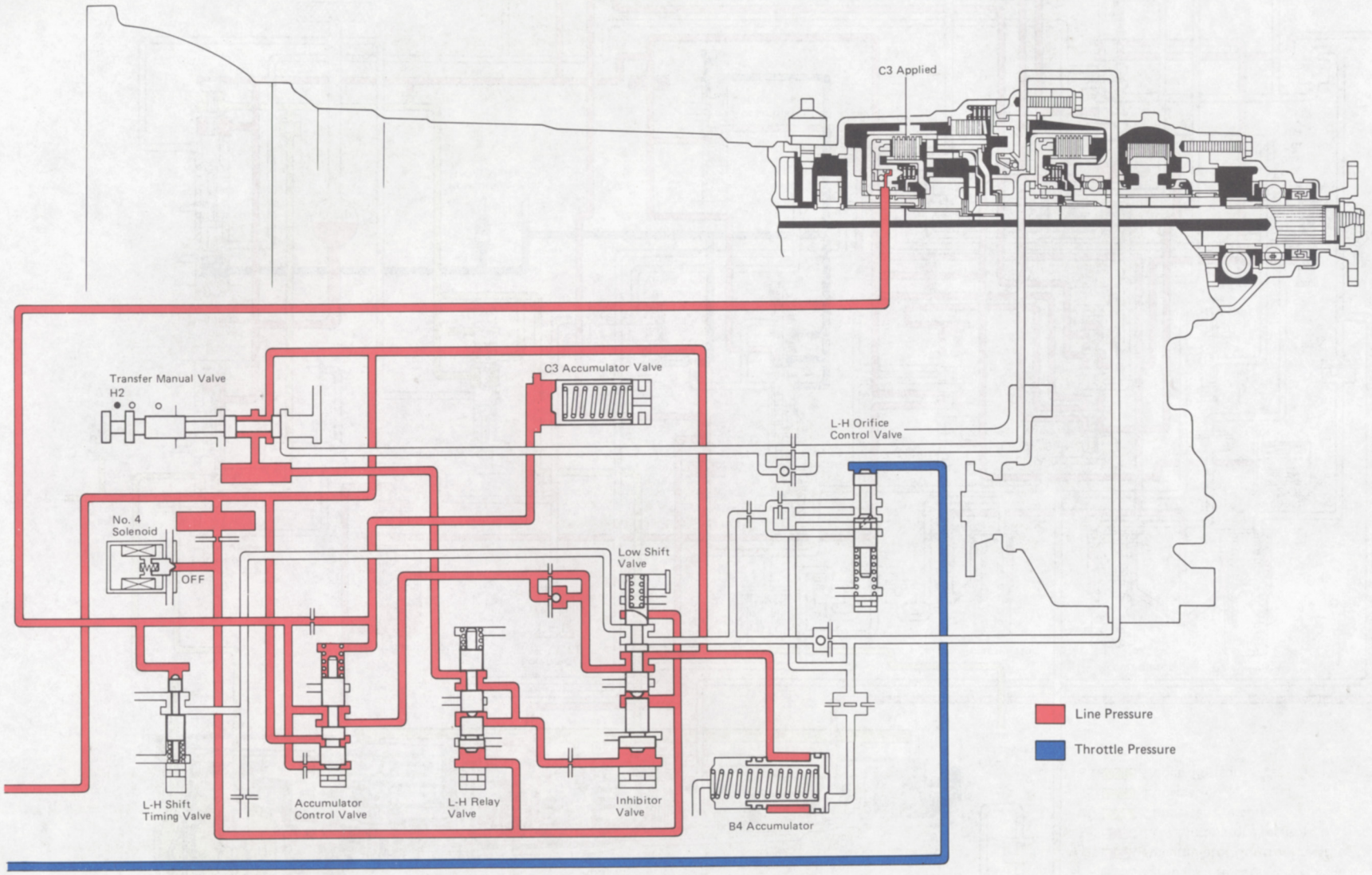


"L" RANGE FIRST GEAR CIRCUIT

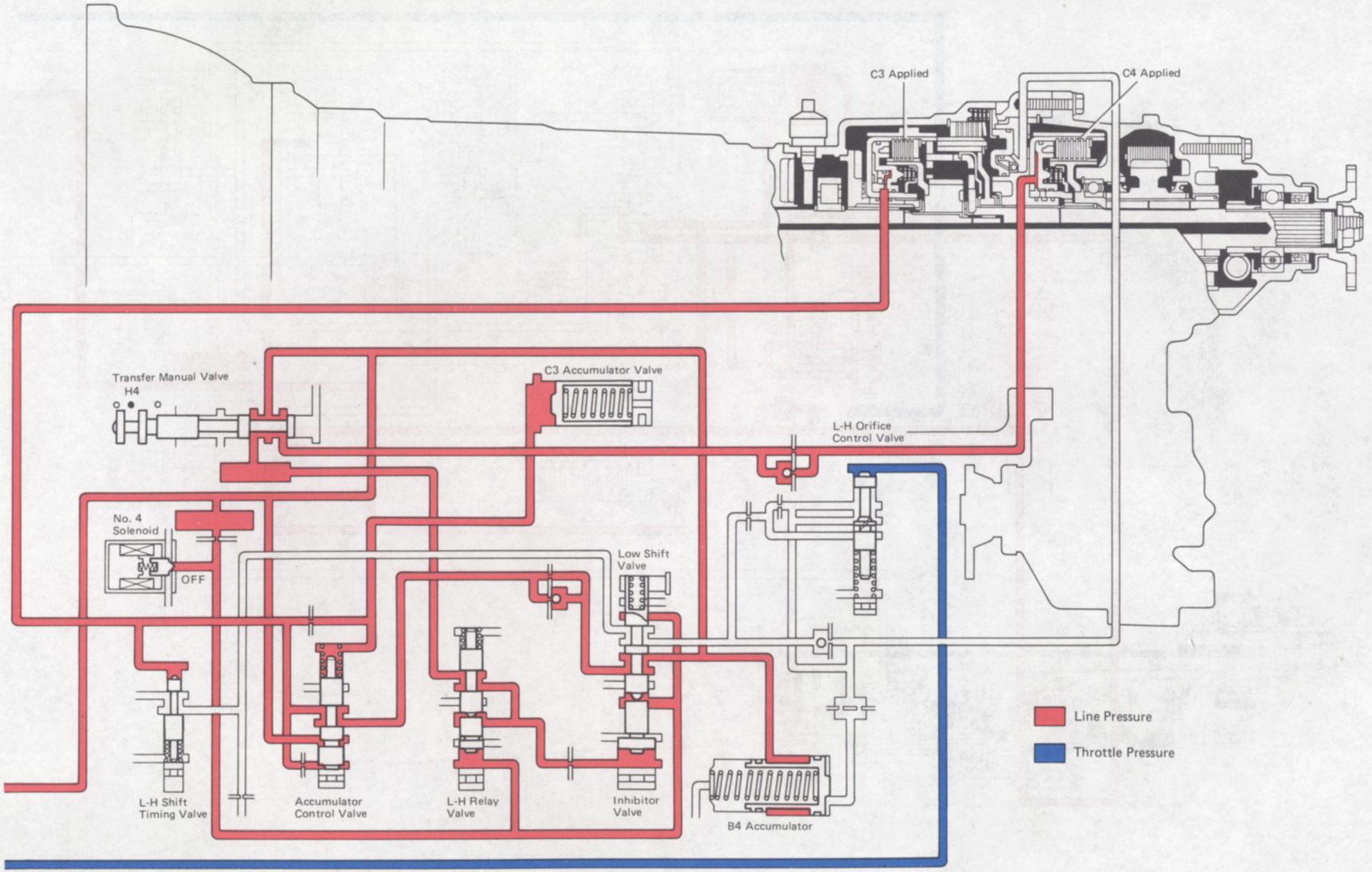


A340H TRANSFER HYDRAULIC CIRCUIT

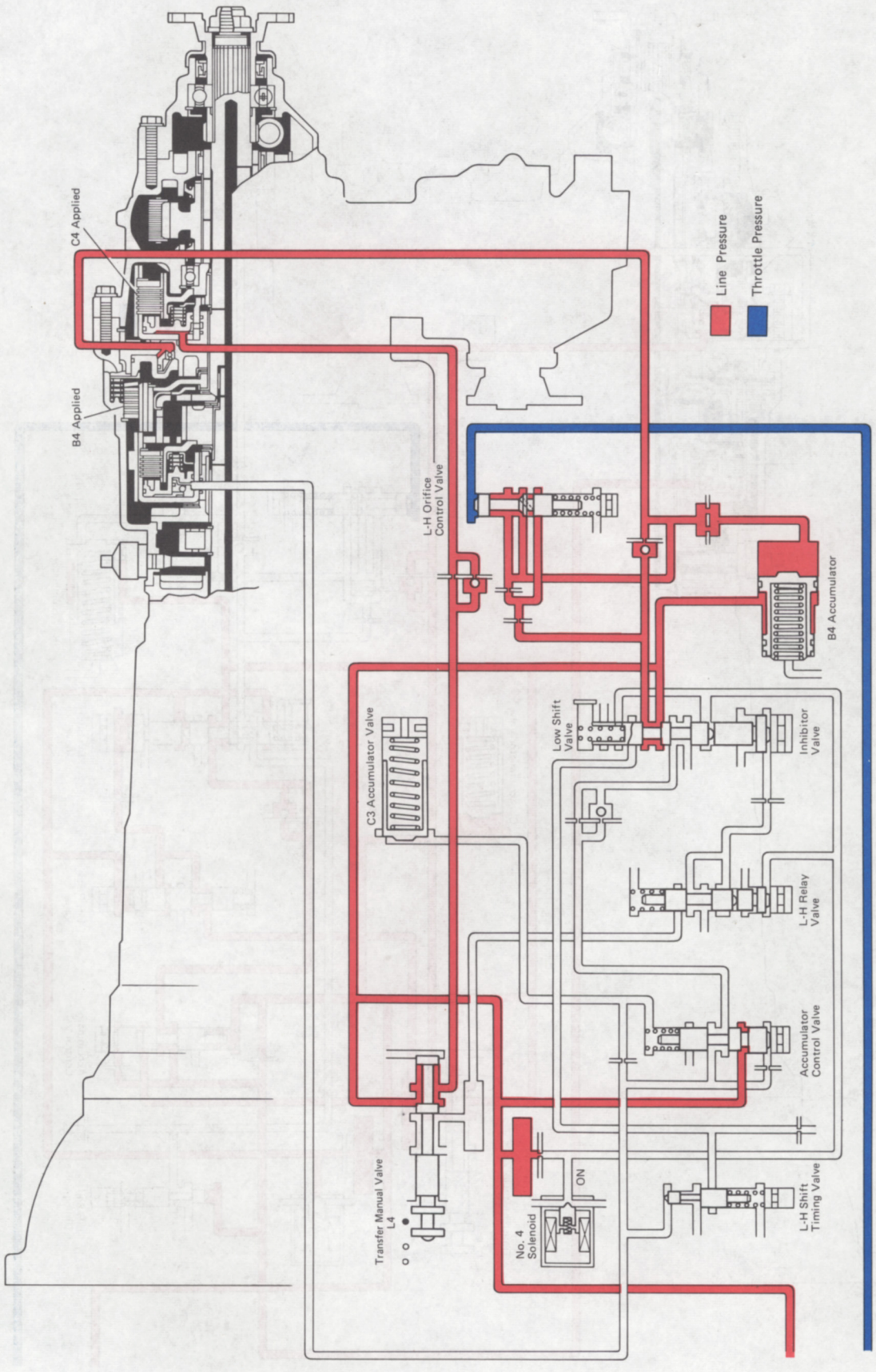
SHIFT POSITION H2
NO. 4 SOLENOID OFF



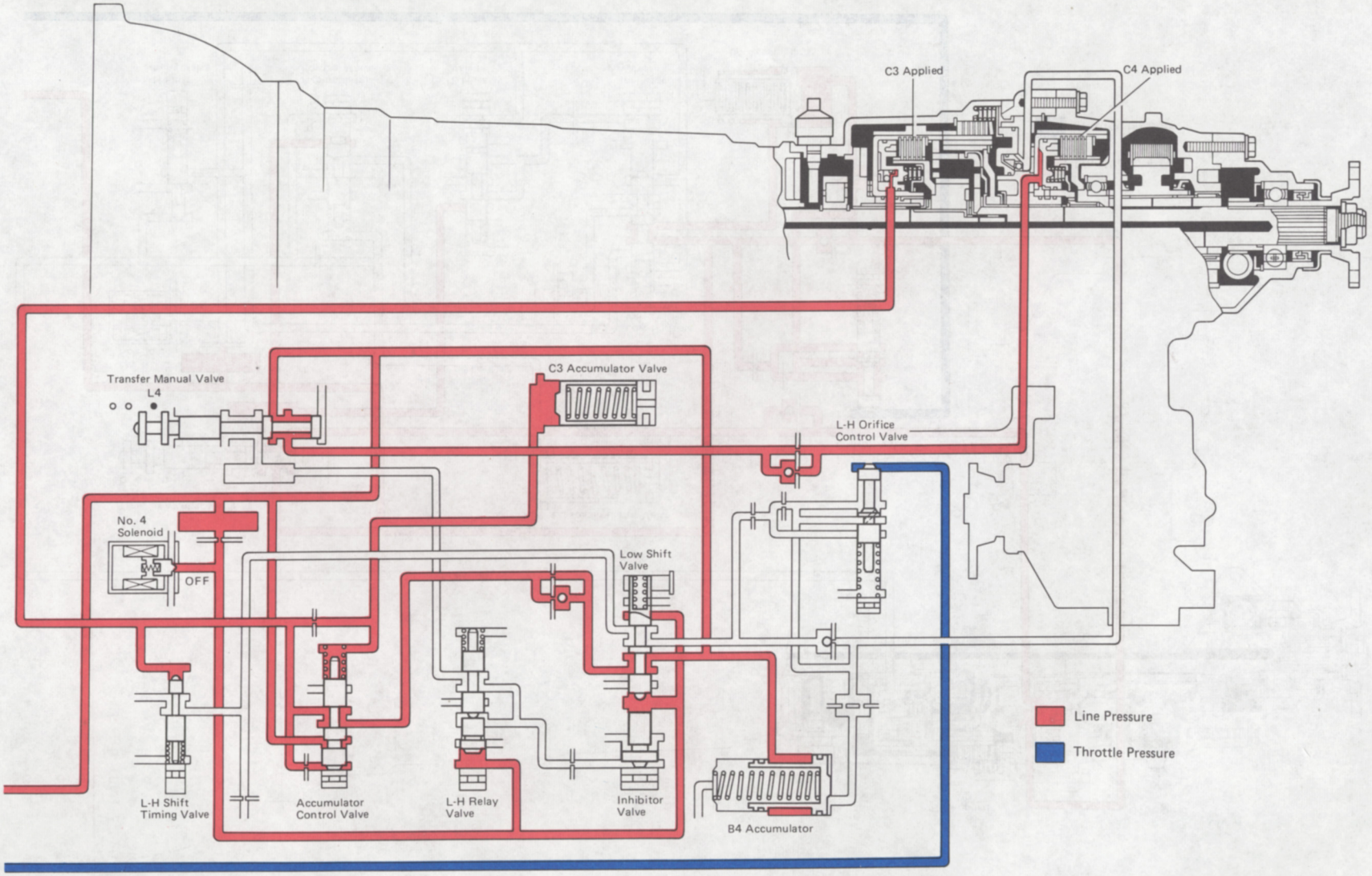
SHIFT POSITION H4
NO. 4 SOLENOID OFF



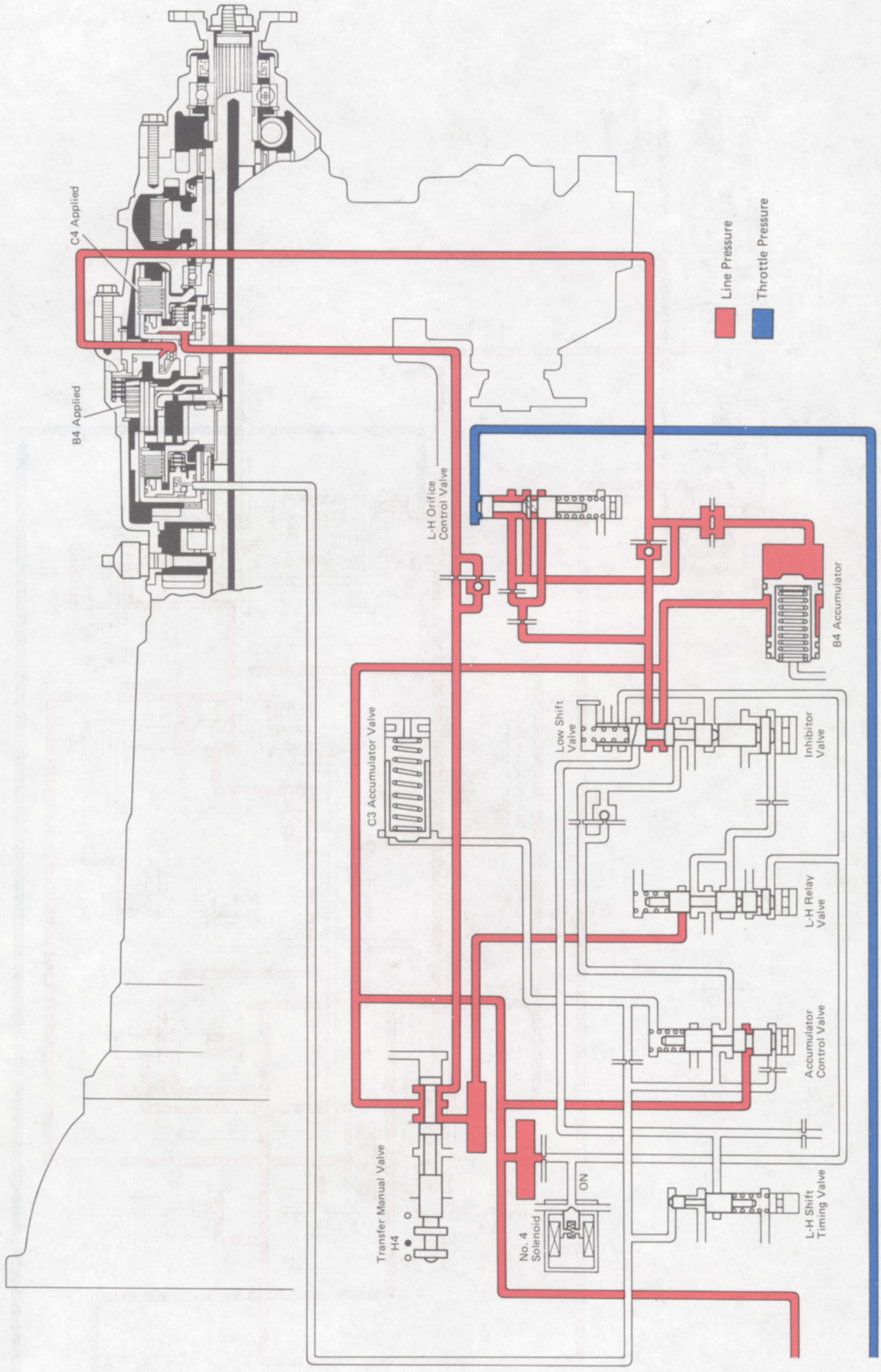
SHIFT POSITION L4
NO. 4 SOLENOID ON



SHIFT POSITION H4 → L4
NO. 4 SOLENOID OFF → OFF



SHIFT POSITION L4 → H4
NO. 4 SOLENOID ON → ON



TOYOTA TRUCK AND 4 RUNNER ELECTRICAL WIRING DIAGRAM-1988 Model (Page 1 to Page 5)

Power Source | Starting | Ignition

1 | 2 | 3 | 4

A | B | C | D | E | E | F | F

W (W/O 60A ALT)

W-R

To "EFI" Fuse (1-5)

IGNITION S/W
ACC 3 L-R
IG1 2 B-Y
ST1 1 B-W, B
AM1 4 W
AM2 8 W-R
IG2 7 B-R
ST2

B-W (A/T) → To EFI ECU (1-6)

B-W (A/T) ← From Cruise Control Computer (3-7)

To EFI ECU (1-7)

To Circuit Opening Relay (1-5)

NEUTRAL START S/W (A/T)

(M/T)

(A/T)

To EFI ECU (1-7)

40A FL AM1 (60A ALT)

60A FL AM1 (55A ALT)
80A FL AM1 (60A ALT)

30A FL AM2

FL MAIN 2.0L

STARTER RELAY (M/T)

COLD START INJECTOR

START INJECTOR TIME S/W

CANCEL S/W (4 Runner M/T)

CLUTCH START S/W (M/T)

BATTERY

STARTER

(22R)

IGNITION COIL

IGNITER

DISTRIBUTOR

NOISE FILTER

CHECK CONNECTOR

To Tachometer (2-8)

To A/C Amplifier (2-5)

To Emission Control Computer (2-2) (2-3)

(22R-E, 22R-TE)

IGNITION COIL

IGNITER

DISTRIBUTOR

To Tachometer (2-8)

To A/C Amplifier (2-5)

To Check Connector (1-6)

To EFI Computer (1-7)

No. 1

No. 3

a
b
c

Ground points

a = Located in right front fender

b = Located on engine block

c = Located in left front fender

EFI

EFI

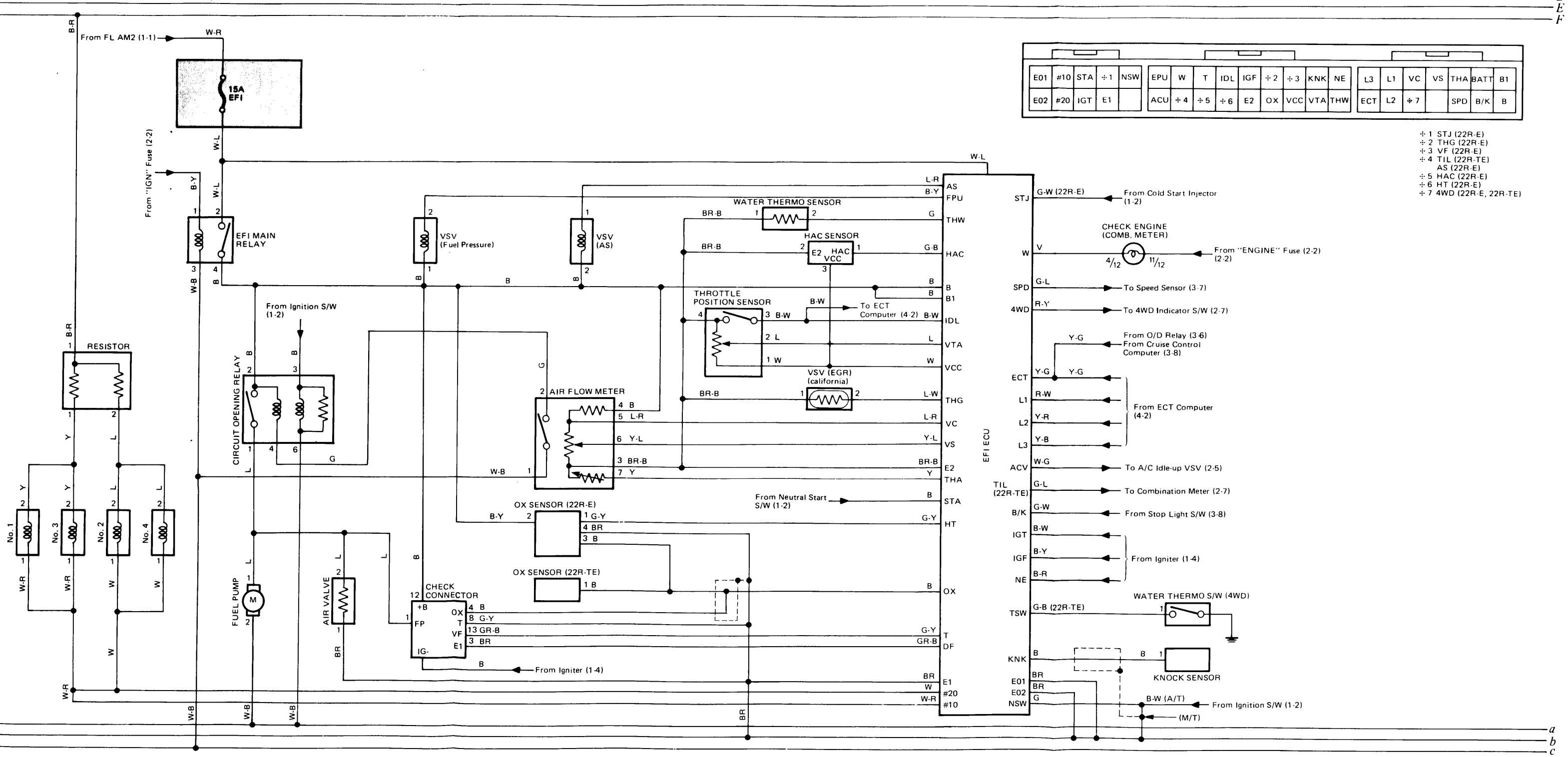
5 6 7 8

A B C D E F

a b c

E01	#10	STA	÷1	NSW	EPU	W	T	IDL	IGF	÷2	÷3	KNK	NE	L3	L1	VC	VS	THA	BATT	B1
E02	#20	IGT	E1		ACU	÷4	÷5	÷6	E2	OX	VCC	VTA	THW	ECT	L2	÷7		SPD	B/K	B

÷1 STJ (22R-E)
÷2 THG (22R-E)
÷3 VF (22R-E)
÷4 TIL (22R-TE)
AS (22R-E)
÷5 HAC (22R-E)
÷6 HT (22R-E)
÷7 4WD (22R-E, 22R-TE)



Charging

Emission Control

1 2 3 4

A B C D E F

7.5A CHARGE

15A ENGINE

7.5A IGN

From "IGN" Fuse (2-2)

CHARGE WARNING LIGHT (COMB. METER)

CHOKE HEATER

From Combination Meter (2-7)
From Emission Control Computer (2-2) (2-3)

ALTERNATOR
(W/ IC Regulator)

To Combination Meter (2-7)
To Power Window Relay (4-4)
To PPS Computer (3-8)
To Neutral Start S/W & ECT Computer (4-1)
To O/D Off Indicator (3-6)
To Back-up Light S/W (3-1)

To Light Reminder Relay (5-3)

To Check Engine (2-8)

To Charge Warning Light (2-1)
To EFI Main Relay (1-6)

To "CHARGE" Fuse (2-1)

From Igniter (1-3)

EACV
VSV (Evapo)
FUEL CUT SOLENOID
CMH RELAY
EBCV

ENISSION CONTROL COMPUTER
(California C & C)

To Speed Sensor (3-7)

VACUUM S/W (400 MMHG)
VACUUM S/W (80 MMHG)
WATER THERMO S/W (50°C)
WATER THERMO S/W (13°C)
CHECK CONNECTOR
OX SENSOR
CMH

From O/D Off Indicator (3-6)

To Door Lock Control Relay (4-3)

From Igniter (1-3)

VSV (Air)
VSV (Evapo)
FUEL CUT SOLENOID
CMH RELAY

EMISSION CONTROL COMPUTER
(Federal and Canada)

To "CHARGE" Fuse (2-1)

To Speed Sensor (3-7)

WATER THERMO S/W (50°C)
WATER THERMO S/W (13°C)
VACUUM S/W
CMH

From O/D Off Indicator (3-6)

22R, 22R-TE 2WD,
22R-E W/O Towing
Package

22R-TE 4WD,
22R-E W/ Towing
Package

From Igniter (1-3) (1-4)

a b c g

Ground points

a = Located in right front fender

b = Located on engine block

c = Located in left front fender

g = Located in left side of instrument panel

Air Conditioner, Cooler and Heater

Rear Air Conditioner

Combination Meter

5 6 7 8

A C D E

B B

10A A/C

20A HEATER

20A REAR HEATER

From "ENGINE" Fuse (2-2)

(22R-E, 22R-TE) (22R)

A/C IDLE-UP VSV

LOW PRESSURE S/W

A/C S/W (W/ Heater)

HEATER RELAY

REAR HEATER RELAY

BLOWER MOTOR

BLOWER RESISTOR

From Igniter (1-3) (1-4)

From EFI ECU (1-7)

22R, 22R-TE 2WD, 22R-E W/O Towing Package

A/C AMPLIFIER

(22R-TE, 22R-E) (22R)

A/C CUT RELAY (22R-TE 4WD, 22R-E W/ Towing Package)

A/C THERMO S/W (106°C)

MAGNET CLUTCH

THERMISTOR

VOLUME S/W (W/O Heater)

HEATER BLOWER S/W

REAR BLOWER MOTOR

REAR BLOWER RESISTOR

REAR BLOWER S/W

REAR HEATER

OIL PRESSURE WARNING LIGHT S/W

FUEL SENDER

BRAKE FLUID LEVEL S/W

PARKING BRAKE S/W

From Cruise Control Computer (3-7)

A/T OIL TEMP.

TURBO

4WD

4WD INDICATOR S/W

To "CHARGE" Fuse (2-1)

From EFI ECU (1-7)

OIL PRESSURE SENDER

WATER TEMP. SENDER

(22R-E W/ ECT, 22R-TE)

(22R-E W/O ECT, 22R)

From Igniter (1-3) (1-4)

(22R-E W/ ECT, 22R-TE)

(22R-E W/O ECT)

OIL

FUEL

VOLT

WATER TEMP.

TACH

a b c g

TOYOTA TRUCK AND 4 RUNNER (Cont'd)

Back-up Lights | Unlock and Seat Belt Warning | Turn Signal and Hazard | Horn | Rear Window Defogger

1 | 2 | 3 | 4

A
C
D
E

15A HAZ-HORN

From "ENGINE" Fuse (2-2)

From "DOME" Fuse (5-2)

UNLOCK WARNING S/W

To Radio and Tape Player (5-6)

TURN SIGNAL AND HAZARD S/W (COMB. S/W)

		B1	B2	F	TB	TL	TR
TURN	RIGHT	○	○	○			
	OFF	○	○				
	LEFT	○	○	○		○	
HAZARD	OFF	○	○				
	ON		○	○	○	○	○

TURN SIGNAL FLASHER

HORN

HORN S/W

20A DEFOG (4 Runner)

15A DEFOG. (Truck)

DEFOGGER S/W

DEFOGGER RELAY

To Back Window Limit S/W (4-5)

BACK-UP LIGHT

6/5 (W/ ECT)
2/2 (W/O ECT)
1/3 (W/ ECT)
1/2 (W/O ECT)

From Neutral Start S/W (A/T) (4-2)

BACK-UP LIGHTS (RR.COMB.LIGHT)

RH | LH

(4 Runner) | (Truck) | (4 Renner)

SEAT BELT WARNING RELAY

(Ex. Turbo ECT)
(Turbo ECT)

SEAT BELT WARNING LIGHT (COMB. METER)

BUCKLE S/W

To Door Courtesy S/W Front LH (5-2)

INDICATOR LH (COMB. METER)

INDICATOR RH (COMB. METER)

FRONT LH | FRONT RH

REAR LH | REAR RH

TURN SIGNAL LIGHTS

(Truck) | (4 Runner)

REAR WINDOW DEFOGGER

a
c
d
e
f
g

Ground Points

a = Located in right front fender

c = Located in left front fender

d = Located on rear side panel LH

e = Located on rear side panel RH

f = Located on left back panel

g = Located in left side of instrument panel

Front Wiper and Washer | Overdrive | Cruise Control | Stop Lights | PPS (Progressive Power Steering)

5 | 6 | 7 | 8

15A DEFOG. (Truck)

15A WIPER

15A STOP

WIPER AND WASHER S/W (COMB. S/W)

	B	S	+1	+2	C	E		E	W
OFF									
MIST									
INT									
LOW									
HIGH									
WASHER									

WIPER RELAY

(INT)

WIPER MOTOR

WASHER MOTOR

O/D RELAY

From "ENGINE" Fuse (2-2)

From EFI ECU (1-7)

LG (22R-E) R-Y (22R)

O/D SOLENOID

O/D OFF INDICATOR

To Emission Control Computer (2-3) (2-4)

O/D MAIN S/W

(Column Shift Type) (Floor Shift Type)

To ECT Solenoid (4-2)

To EFI ECU (1-7)

CRUISE CONTROL COMPUTER

CRUISE CONTROL MAIN S/W

MAIN

INDICATOR

CRUISE CONTROL S/W

SET

RESUME

CRUISE CONTROL STOP S/W

CRUISE CONTROL ACTUATOR

CRUISE CONTROL CLUTCH S/W (M/T)

To Neutral Start S/W (A/T) (1-2)

To Parking Brake S/W & Brake Fluid Level S/W (2-7)

From EFI ECU (1-7) & ECT Computer (4-2)

CRUISE CONTROL VACUUM PUMP

CRUISE CONTROL VACUUM S/W

SPEED SENSOR (COMB. METER)

From Emission Control Computer (2-2) (2-3) From PPS Computer (3-8)

To ECT Computer (4-2)

STOP LIGHT S/W

1/4 (W/ Cruise Control)
1/2 (W/O Cruise Control)
3/4 (W/ Cruise Control)
2/2 (W/O Cruise Control)

To ECT Computer (4-2)

To EFI ECU (1-7)

STOP LIGHTS (RR.COMB.LIGHT)

LH

RH

(Truck)

(4 Runner)

From "ENGINE" Fuse (2-2)

PPS COMPUTER

To Speed Sensor (3-7)

PPS SOLENOID

ECT

ECT (Electronic Control Transmission)

Power Windows (Front) and Door Locks

Pow

1 2 3 4

A C D

From "ENGINE" Fuse (2-2)

O/D OFF INDICATOR

PATTERN SELECT S/W

NORM PWR

PATTERN INDICATOR (COMB.METER)

O/D MAIN S/W

A/T OIL TEMP. SENSOR

CHECK CONNECTOR

To Throttle Position Sensor (1-6)

To Speed Sensor (3-7)

From "STOP" Fuse (3-8)

From Stop Light S/W (3-8)

To Back-up Light (3-1)

NEUTRAL START S/W (A/T)

	L	2L	N	B1	RL
R				○	○
N			○	○	
S		○		○	
L	○			○	

ECT COMPUTER

PWR IG O/D2 IDL SP1 +B BR L 2 N

TH+ TH− DG O/D1 L1 L2 L3 S1 S2 SL S4 SP2 L4 GND

To EFI ECU (1-7)

From Cruise Control Computer (3-7)

ECT SOLENOID

NO. 1 NO. 2 NO. 3 NO. 4 SPEED SENSOR

4WD INDICATOR S/W

From "POWER WINDOW" CB (4-5)

From "IGN" Fuse (2-4)

To Door Courtesy S/W (5-2)

20A DOOR LOCK CB

DOOR LOCK CONTROL RELAY

POWER WINDOW MASTER S/W (Door Lock Control S/W)

LOCK UNLOCK UP DOWN LOCK S/W

POWER WINDOW S/W

DRIVER ASSISTANT

POWER WINDOW MOTOR

DOOR LOCK SOLENOID LH RH

From "ENGINE" Fuse (2-2)

BACK DOOR WARNING LIGHT (COMB. METER)

(Ex. Turbo W/ ECT) (Turbo W/ ECT)

REAR POWER WINDOW MOTOR

REAR POWER WINDOW S/W

BACK DOOR UNLOCK WARNING S/W

DOOR LOCK DETECTION S/W

a b c d f

Ground points

a = Located in right front fender

b = Located on engine block

c = Located in left front fender

d = Located on rear side panel LH

f = Located on left of back panel

Power Windows (Rear) | Rear Wiper and Washer (4 Runner) | Taillights and Illumination | Headlights

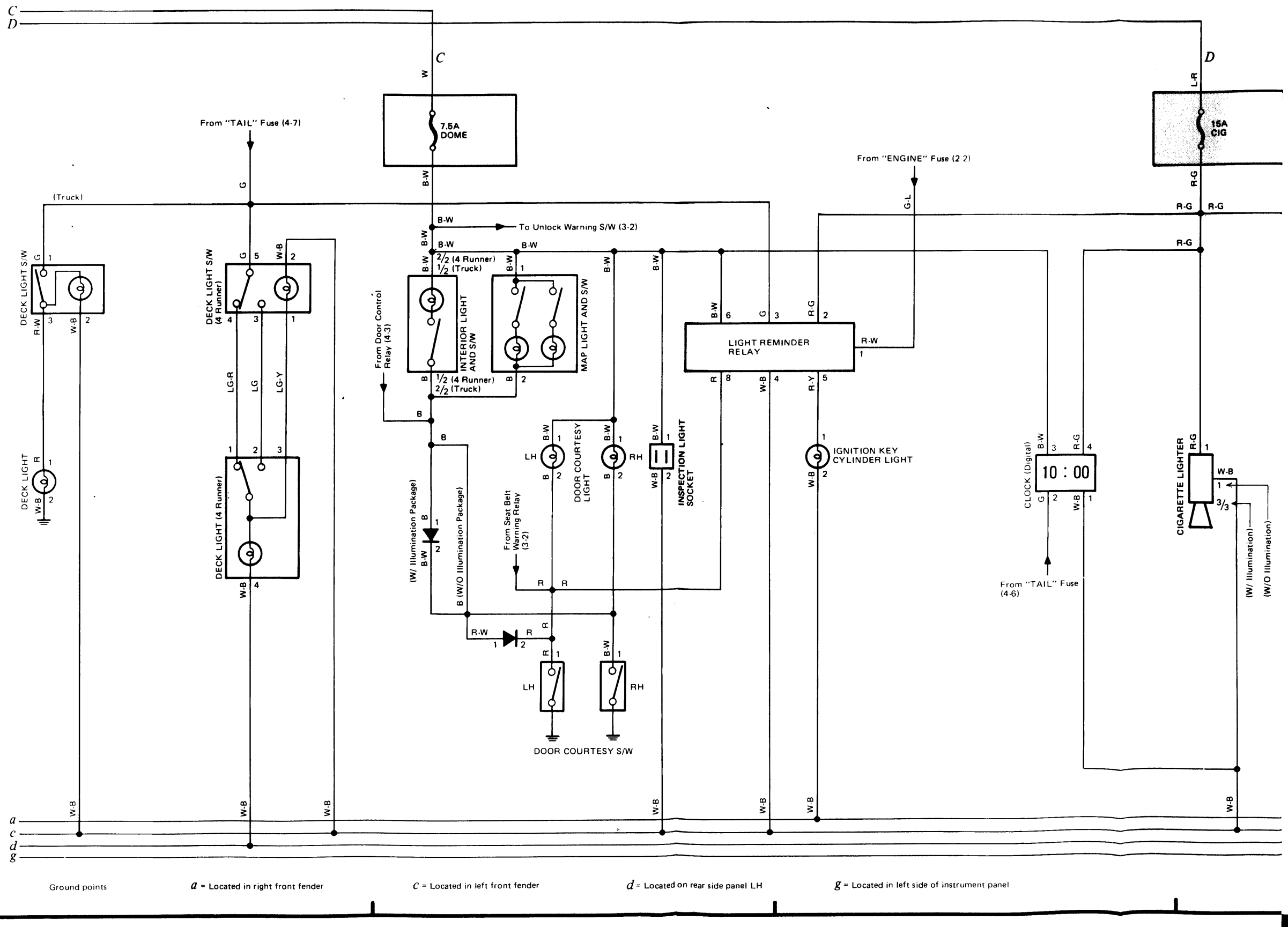
5 | 6 | 7 | 8

C
D
C
A
W
4
20A
POWER WINDOW
CB
3
L
W-R
To Door Control
Relay (4-3)
L
6
POWER WINDOW RELAY
13
G-Y
9
L-R
L-R
REAR WIPER MOTOR
G-Y
L-B
6
M
POINT
SOLENOID
W-B
5
L-R
3
R-L
2
R-W
1
REAR WIPER
RETRACTION
DETECTION S/W
3
5
4
12
11
10
2
7
L-Y
R-Y
G-Y
L-B
L-W
W-B
R-W
L
REAR POWER WINDOW S/W
UP
DOWN
BACK DOOR CONTROL S/W
UP
DOWN
1
2
M
REAR POWER
WINDOW MOTOR
L-R
2
REAR POWER
WINDOW LOCK S/W
4
L-G
L-G
3
COVER TOP
S/W
2
DOOR LOCK DETECTION S/W
G-R
2
L-R
3
OPEN
CLOSE
1
W-B
W-B
From Defogger S/W
(3-3)
1
DIODE
3
L-R
2
R-L
1
BACK WINDOW LIMIT S/W
L
9
L-R
8
L-G
6
L-O
5
W
B
+1
C
S1
EW
OFF
ON
WASHER
L-Y
4
REAR WIPER
AND WASHER S/W
W-B
3
2
M
REAR WASHER
MOTOR
1
W-B
W-B
W-B
W-B
G
To Clock (Digital) (5-3)
G
A/T INDICATOR
(Floor Shift Type)
(Colum Shift Type)
G
2/4
1/2
4/4
2/2
R-B
HEATER CONTROL
G
G
1
W-B
2
R-B
CLINOMETER
B-W
1
B
2
O/D OFF INDICATOR
G
3
G
2
CIGARETTE LIGHTER
G
2
R-B
1
COMB. METER
G
6/10
R-B
5/8
DEFOGGER S/W
G
6
R-B
4
RADIO
G
10/10
R-B
5/6
1
CRUISE
CONTROL S/W
G
R-B
GLOVE BOX
G
1
R-Y
2
1
GLOVE BOX
LIGHT S/W
2
R
15A
TAIL
G
To Light Reminder
Relay (5-1)
G
G
R-B
2
RHEOSTAT
(W/ ECT A/T)
R-B
3
G
2
RHEOSTAT
(M/T, W/O ECT A/T)
4
1
LICENCE LIGHT LH
(4 Runner)
3
1
LICENCE LIGHT RH
(4 Runner)
G-L
3
1
LICENCE LIGHT
LH (Truck)
G-L
1
W-B
2
LICENCE LIGHT
RH (Truck)
G-L
1
W-B
2
TAIL LH
G
2
W-B
3
TAIL RH
G
2
W-B
3
CLEARANCE
LIGHT LH
G
1
W-B
2
CLEARANCE
LIGHT RH
G
1
W-B
2
W
TAILLIGHT RELAY
2
R
3
1
R-B
R-G
10A
HEAD LH
10A
HEAD RH
R-L
3
R-L
4
HEADLIGHT
RELAY
1
5
R-G
R-W
R-G
LH
3
2
1
R-Y
R-G
R-G
HEADLIGHTS
3
RH
2
1
R-G
R-Y
R-Y
R-G
R-G
R-G
HIGH BEAM
INDICATOR LIGHT
(COMB. METER)
1/12
7/8
W-B
R-W
R-B
11
4
R-W
R-W
12
5
R-Y
6
R-G
T
EL
H
OFF
TAIL
HEAD
10
LIGHT
CONTROL S/W
(COMB. S/W)
HF
FU
HL
ED
FLASH
LOW
HIGH
13
DIMMER S/W
(COMB. S/W)
W-B
W-B
W-B
W-B
W-B
W-B
W-B
W-B
W-B
W-B
a
b
c
d
f

TOYOTA TRUCK AND 4 RUNNER (Cont'd)

Work Light | Interior Lights | Clock | Cigarette Lighter

1 | 2 | 3



Ground points

a = Located in right front fender

c = Located in left front fender

d = Located on rear side panel LH

g = Located in left side of instrument panel

Cigarette Lighter | Remote Control Mirrors | Auto Antenna | Radio and Tape Player

4 | 5 | 6

D

L-R

15A CIG

R-G

R-G R-G

R-G

R-G

R-G

R-G

R-G

1 REMOTE CONTROL MIRROR S/W

		B	E	H1	V1	C	V2	H2
RH	UP							
	DOWN							
	LEFT							
	RIGHT							
LH	UP							
	DOWN							
	LEFT							
	RIGHT							

CIGARETTE LIGHTER

R-G 1

W-B 1

3/3

(W/ Illumination)

(W/O Illumination)

W-B 2 Y 6 BR-B 7 LG-R 3 LG 4 LG-B 5

Y 3 BR-B 2

BR-B 2 BR-Y 3

1 LG-R LG-R 1

LH RH

MIRROR MOTORS

W-B

W-B

AUTO ANTENNA MOTOR S/W

R-G 3 R-G 2

UP DOWN

W-B 6

LG 7 LG-W 5

1 M 2

AUTO ANTENNA MOTOR

From "HAZ HORN" Fuse (3.3)

L-Y

L-Y (4 Runner)

4/6 L-Y

(4 Runner) (Truck)

3/10 GR 4/10

W 9/10 2/2 W

R 1/6 1/2 R

2/3 L-Y

W 3/6 3/3 W

1/3 W-B

REAR RH (4 Runner)

SPEAKER

B 2/6 1/2 B

Y 6/6 2/2 Y

2/3 L-Y

3/3 W

1/3 W-B

REAR LH (4 Runner)

W-B

P 2/10 1 P

V 6/10 2 V

FRONT RH

SPEAKER

LG 1/10 1 LG

L 5/10 2 L

FRONT LH

RADIO AND TAPE PLAYER

L-W 7/10

W-B

W-B

W-B

W-B

a

c

d

g